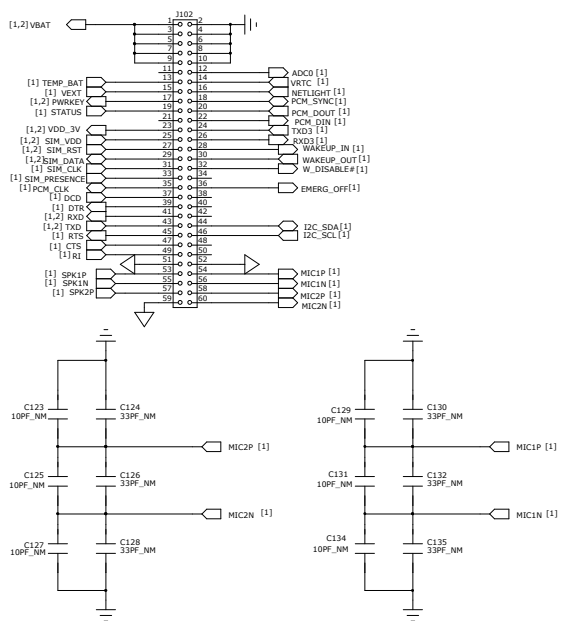
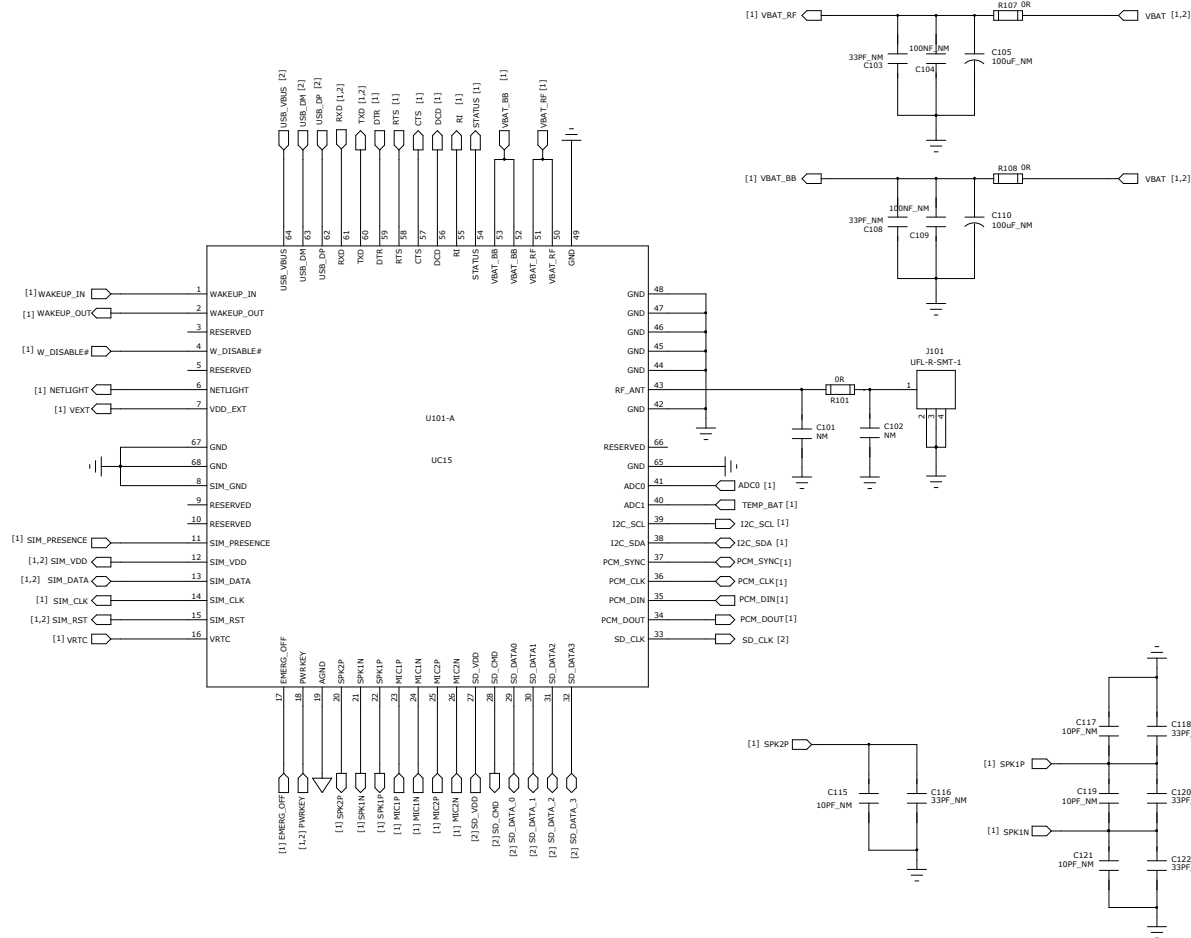
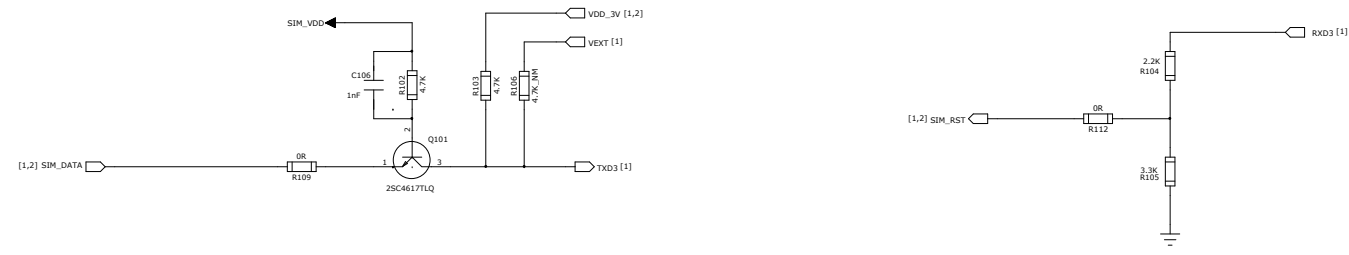


UC15 CONNECT

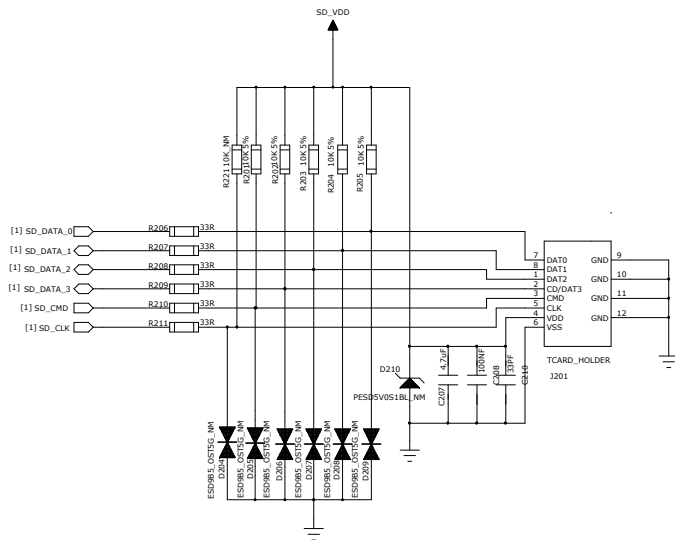


Level translate_DOWNLOAD

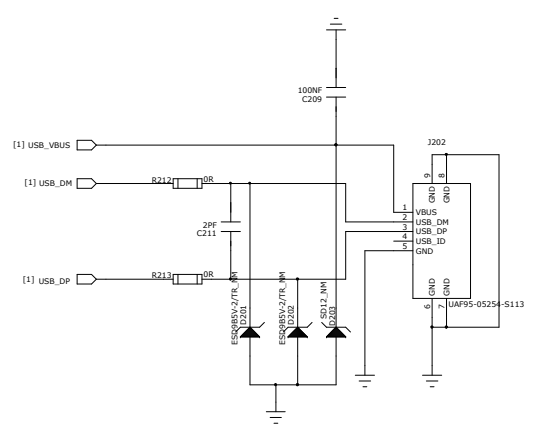


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| DRAWN BY <NAME HERE> | PROJECT | TITLE |
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| SHEET 8 of 9 | | <DATE HERE> |

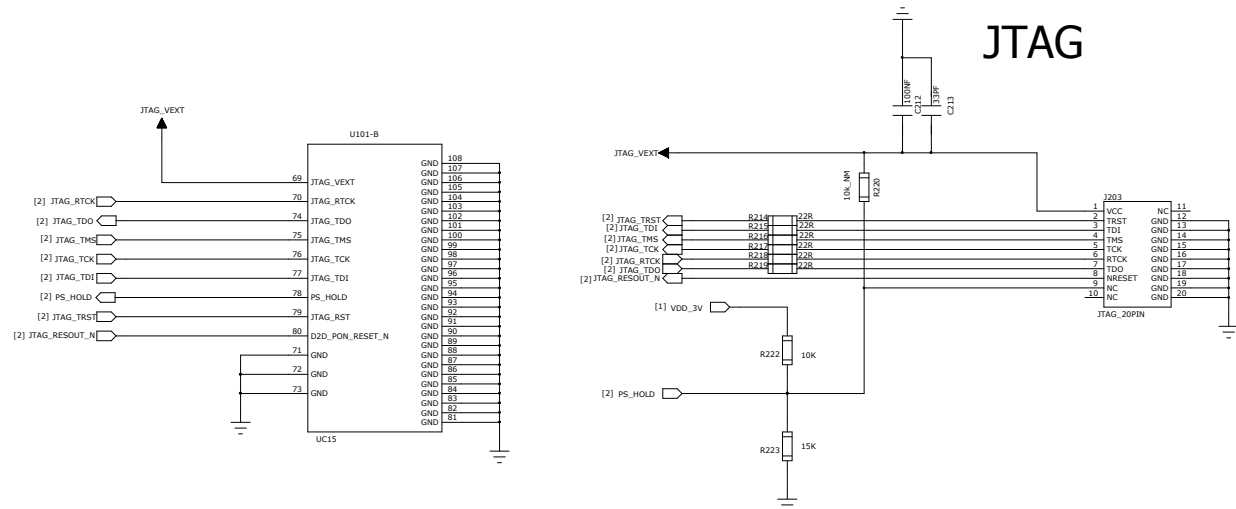
T Flash



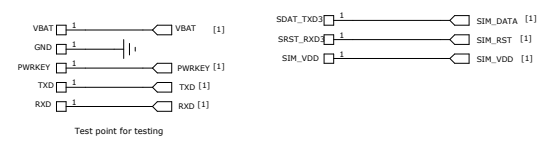
MINI USB_5P



JTAG



TEST POINT



Quectel Technology

| | | |
|---------------------------|------------|-------------|
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| SHEET 8 of 9 | | <DATE HERE> |

Quectel UC15

UMTS/HSDPA Module

UMTS/HSDPA



Dual-mode & Multi-band
for UMTS & GSM



HSDPA 3.6Mbps



LCC Package



Embedded Abundant
Protocols



eCall



Compact Size



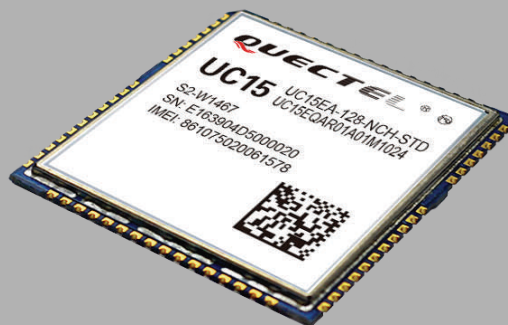
USB 2.0 High Speed
Compliant Interface



USB Drivers



Quectel Enhanced
AT Commands



UC15 is a cost effective UMTS/HSDPA module featuring a maximum data rate of 3.6Mbps downlink and 384Kbps uplink. Designed to be compatible with Quectel GSM/GPRS M10 module in the compact and unified form factor, it provides a flexible and scalable platform for migrating from GSM/GPRS/EDGE to UMTS/HSDPA. This enables integrators and developers to design their applications once and take advantage of true worldwide coverage and service flexibility afforded by the combination of the two most prevalent cellular technologies worldwide.

Its advanced LCC package allows fully automated manufacturing for high volume applications and copper-surfaced bottom design optimizes heat dissipation. The tiny profile in cost optimized SMT form factor and highly integration level enable integrators and developers to easily design their applications and truly benefit from the module's small size, low power consumption and mechanical intensity.

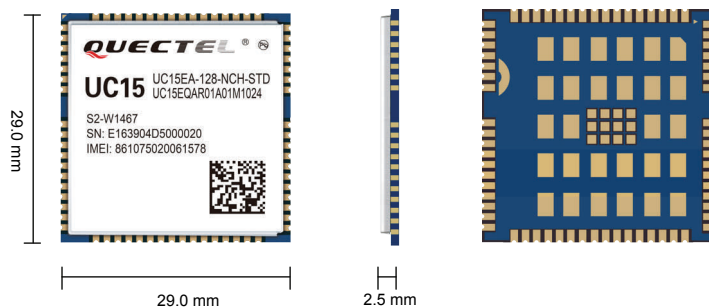
A rich set of Internet protocols, industry-standard interfaces (USB/UART/ADC/NETLIGHT/PCM) and abundant functionalities (USB drivers for Windows XP, Windows Vista, Windows 7, Windows 8, Windows CE, Linux, Android/eCall) extend the applicability of the module to a wide range of M2M applications such as automotive, metering, security, CPE and wireless POS.

Key benefits

- Worldwide UMTS/HSDPA and GSM/GPRS/EDGE coverage
- Minimal SMT form factor ideal for small end products with tight space
- High-quality data and image transmission even in hazard conditions and dark environment
- Fast time-to-market:
Reference designs, evaluation tools and timely technical support minimize design-in time and development efforts
- Robust mounting and interfaces

Quectel UC15

UMTS/HSDPA Module



General Features

| | |
|--------------------------------|---|
| Frequency Bands | UC15-E 900/2100MHz@UMTS 900/1800MHz@GSM UC15-A 850/1900MHz@UMTS 850/900/1800/1900MHz@GSM |
| HSDPA | Release 5 (category 6) |
| EDGE | Downlink only |
| GPRS | Multi-slot Class 12 |
| UMTS | Release 99/5 |
| GSM | Release 99/4 |
| Supply Voltage Range | 3.3V ~ 4.3V, 3.8V typ. |
| Operation Temperature | -40 °C ~ +85 °C |
| Dimensions | 29.0mm×29.0mm×2.5mm |
| Weight | Approx. 4.3g |
| Control via AT commands | 3GPP TS27.007, 27.005 and other enhanced AT Commands |

Specifications

| | |
|------------------------------|---|
| SMS | Point-to-point MO and MT SMS Cell Broadcast Text and PDU Mode |
| HSDPA | Max.3.6Mbps |
| UMTS | Max.384Kbps (DL)/Max.384Kbps (UL) |
| DATA EDGE | Max.236.8Kbps (DL) |
| GPRS | Max.85.6Kbps (DL)/Max.85.6Kbps (UL) |
| CSD | 64 Kbps |
| Speech Codec Modes | HR, FR, EFR, AMR, AMR-WB |
| Voice Echo Arithmetic | Echo Cancellation Noise Reduction |
| Protocols | TCP/UDP/PPP/FTP/HTTP/SMTP/MMS/SSL |

Special Features

| | |
|---------------------------|---|
| Drivers USB Serial | Windows XP, Windows Vista, Windows 7, Windows 8, Windows CE5.0/ 6.0/7.0, Windows Mobile 6.1*/6.5*, Linux 2.6 or later, Android 2.3 or later, |
| RIL | Windows CE6.0*, Windows Mobile 6.1*/6.5*, Android 2.3/4.0 |
| MUX | Linux 2.6 or later, Android 2.3 or later |
| eCall | Accident, Emergency Services |
| Firmware Update | Firmware Update via USB and UART Interface |
| QuecFile | File System Access and Management |
| QuecFOTA | |
| QuecLocator* | |

Electrical Characteristics

| | |
|---------------------|--|
| Output Power | Class 3 (24dBm +1/-3dB) for UMTS bands Class 4 (33dBm ±2dB) for GSM 850/900MHz Class 1 (30dBm ±2dB) for GSM 1800/1900MHz |
| Consumption | 65µA@Power off 3.5mA@Sleep 240mA@GSM voice, max power 540mA@UMTS voice, max power 500mA@GPRS data, max power 520mA@UMTS data, max power 540mA@HSDPA, max power |
| Sensitivity | -110dBm@UMTS Bands -108.5dBm@GSM 900MHz -108dBm@GSM 1800MHz |

Interfaces

| | |
|-----------------------|---|
| USB | 2.0 High Speed |
| Audio Analog | 2 Analog Input and Output Channels, optional |
| Audio Digital* | Digital Audio through PCM Interface, optional |
| UART | 1×Full Functions |
| USIM | 1.8V/ 3V |
| ADC | × 2, 12bits |
| NETLIGHT | |
| STATUS | Indication for Power On and Off Status |

Certification

| | |
|-------------|------------------|
| Plan | CE/GCF/FCC/PTCRB |
|-------------|------------------|

* Under development



UC15 Hardware Design

UMTS/HSDPA Module Series

Rev. UC15_Hardware_Design_V1.5

Date: 2014-12-31



Our aim is to provide customers with timely and comprehensive service. For any assistance, please contact our company headquarters:

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Mail: info@quectel.com

Or our local office, for more information, please visit:

<http://www.quectel.com/support/salesupport.aspx>

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About the Document

History

| Revision | Date | Author | Description |
|----------|------------|-----------------------|--|
| 1.0 | 2013-11-26 | Mountain ZHOU | Initial |
| 1.1 | 2014-01-15 | Huik LI | <ol style="list-style-type: none"> 1. Modified packaging information of UC15 in the Chapter 7.3. 2. Modified Figure 4 and Figure 11. 3. Modified the description of command AT+CFUN in the Chapter 3.5.2. |
| 1.2 | 2014-02-14 | Huik LI | Modified the frequency bands of UC15-A. |
| 1.3 | 2014-04-21 | Huik LI | <ol style="list-style-type: none"> 1. Modified current consumption in Chapter 5.4. 2. Added PCM feature in Chapter 3.12. |
| 1.4 | 2014-11-11 | Huik LI | <ol style="list-style-type: none"> 1. Modified Figure 10 in the Chapter 3.7.1. 2. Released PCM function. 3. Updated the footprint of UC15 in Chapter 6.2. 4. Modified SIM card interface in Chapter 3.13. 5. Updated reference circuit of power supply in Figure 7. 6. Added antenna requirements in Table 27. |
| 1.5 | 2014-12-31 | Huik LI/ Rain ZHOU | <ol style="list-style-type: none"> 1. Updated the current consumption in Table 31. 2. Updated the PCM supports format in Chapter 3.12. 3. Updated the bottom view of the module in Figure 46. 4. Added recommend stencil. |

Contents

| | |
|--|-----------|
| About the Document | 2 |
| Contents | 3 |
| Table Index | 5 |
| Figure Index | 6 |
| 1 Introduction | 8 |
| 1.1. Safety Information..... | 9 |
| 2 Product Concept | 10 |
| 2.1. General Description..... | 10 |
| 2.2. Key Features..... | 11 |
| 2.3. Functional Diagram..... | 13 |
| 2.4. Evaluation Board..... | 14 |
| 3 Application Interface | 15 |
| 3.1. General Description..... | 15 |
| 3.2. Pin Assignment..... | 16 |
| 3.3. Pin Description..... | 17 |
| 3.4. Operating Modes..... | 22 |
| 3.5. Power Saving..... | 23 |
| 3.5.1. Sleep Mode..... | 23 |
| 3.5.1.1. UART Application..... | 23 |
| 3.5.1.2. USB Application with Suspend Function..... | 24 |
| 3.5.1.3. USB Application without Suspend Function..... | 25 |
| 3.5.2. Minimum Functionality Mode..... | 26 |
| 3.6. Power Supply..... | 26 |
| 3.6.1. Power Supply Pins..... | 26 |
| 3.6.2. Decrease Voltage Drop..... | 27 |
| 3.6.3. Reference Design for Power Supply..... | 27 |
| 3.6.4. Monitor the Power Supply..... | 28 |
| 3.6.5. VDD_EXT..... | 28 |
| 3.7. Turn on and off Scenarios..... | 29 |
| 3.7.1. Turn on Module by PWRKEY Pin..... | 29 |
| 3.7.2. Turn off Module..... | 31 |
| 3.7.2.1. Turn off Module by PWRKEY Pin..... | 31 |
| 3.7.2.2. Turn off Module by AT Command..... | 31 |
| 3.7.2.3. Automatic Shutdown..... | 32 |
| 3.8. Reset the Module..... | 32 |
| 3.9. UART Interface..... | 34 |
| 3.9.1. The Connection of UART..... | 35 |
| 3.9.2. UART Application..... | 36 |
| 3.10. Behavior of the RI..... | 38 |
| 3.11. Analog Audio Interface..... | 39 |

| | | |
|-----------|---|-----------|
| 3.11.1. | Decrease TDD Noise and Other Noise..... | 40 |
| 3.11.2. | Microphone Interfaces Application..... | 41 |
| 3.11.3. | Receiver and Speaker Interface Application..... | 42 |
| 3.11.4. | Earphone Interface Application..... | 44 |
| 3.12. | PCM and I2C Interface..... | 45 |
| 3.13. | USIM Card Interface..... | 47 |
| 3.14. | USB Interface..... | 50 |
| 3.15. | ADC Function..... | 51 |
| 3.16. | Network Status Indication..... | 52 |
| 3.17. | Operating Status Indication..... | 53 |
| 4 | Antenna Interface..... | 55 |
| 4.1. | Antenna Interface..... | 55 |
| 4.1.1. | Pin Definition..... | 55 |
| 4.1.2. | Operating Frequency..... | 55 |
| 4.1.3. | Reference Design..... | 56 |
| 4.2. | Antenna Installation..... | 56 |
| 4.2.1. | Antenna Requirement..... | 56 |
| 4.2.2. | Install the Antenna with RF Connector..... | 57 |
| 5 | Electrical, Reliability and Radio Characteristics..... | 59 |
| 5.1. | Absolute Maximum Ratings..... | 59 |
| 5.2. | Power Supply Ratings..... | 60 |
| 5.3. | Operating Temperature..... | 60 |
| 5.4. | Current Consumption..... | 61 |
| 5.5. | RF Output Power..... | 63 |
| 5.6. | RF Receiving Sensitivity..... | 63 |
| 5.7. | Electrostatic Discharge..... | 64 |
| 6 | Mechanical Dimensions..... | 65 |
| 6.1. | Mechanical Dimensions of the Module..... | 65 |
| 6.2. | Footprint of Recommendation..... | 67 |
| 6.3. | Top View of the Module..... | 69 |
| 6.4. | Bottom View of the Module..... | 69 |
| 7 | Storage and Manufacturing..... | 70 |
| 7.1. | Storage..... | 70 |
| 7.2. | Manufacturing and Welding..... | 70 |
| 7.3. | Packaging..... | 72 |
| 8 | Appendix A Reference..... | 73 |
| 9 | Appendix B GPRS Coding Scheme..... | 76 |
| 10 | Appendix C GPRS Multi-slot Class..... | 77 |
| 11 | Appendix D EDGE Modulation and Coding Scheme..... | 78 |

Table Index

| | |
|--|----|
| TABLE 1: FREQUENCY BANDS OF UC15 SERIES | 10 |
| TABLE 2: UC15 KEY FEATURES | 11 |
| TABLE 3: IO PARAMETERS DEFINITION..... | 17 |
| TABLE 4: PIN DESCRIPTION | 17 |
| TABLE 5: OVERVIEW OF OPERATING MODES | 22 |
| TABLE 6: VBAT AND GND PIN | 26 |
| TABLE 7: ELECTRICAL CHARACTERISTICS OF VDD_EXT | 28 |
| TABLE 8: PWRKEY PIN DESCRIPTION | 29 |
| TABLE 9: RESET_N PIN DESCRIPTION | 32 |
| TABLE 10: PIN DEFINITION OF THE UART INTERFACE..... | 34 |
| TABLE 11: LOGIC LEVELS OF DIGITAL I/O | 34 |
| TABLE 12: BEHAVIOR OF THE RI | 39 |
| TABLE 13: PIN DEFINITION OF THE AUDIO INTERFACE | 39 |
| TABLE 14: MICROPHONE CHARACTERISTICS..... | 44 |
| TABLE 15: SPEAKER CHARACTERISTICS | 44 |
| TABLE 16: PIN DEFINITION OF PCM AND I2C INTERFACE..... | 46 |
| TABLE 17: PIN DEFINITION OF THE USIM INTERFACES | 47 |
| TABLE 18: USB PIN DESCRIPTION | 50 |
| TABLE 19: PIN DEFINITION OF THE ADC | 52 |
| TABLE 20: CHARACTERISTICS OF THE ADC..... | 52 |
| TABLE 21: PIN DEFINITION OF NETWORK INDICATOR..... | 52 |
| TABLE 22: WORKING STATE OF THE NETWORK INDICATOR..... | 52 |
| TABLE 23: PIN DEFINITION OF STATUS | 53 |
| TABLE 24: PIN DEFINITION OF THE RF ANTENNA | 55 |
| TABLE 25: MODULE OPERATING FREQUENCIES..... | 55 |
| TABLE 26: ANTENNA CABLE REQUIREMENTS..... | 56 |
| TABLE 27: ANTENNA REQUIREMENTS..... | 57 |
| TABLE 28: ABSOLUTE MAXIMUM RATINGS | 59 |
| TABLE 29: THE MODULE POWER SUPPLY RATINGS | 60 |
| TABLE 30: OPERATING TEMPERATURE..... | 60 |
| TABLE 31: MODULE CURRENT CONSUMPTION | 61 |
| TABLE 32: MODULE CONDUCTED RF OUTPUT POWER..... | 63 |
| TABLE 33: MODULE CONDUCTED RECEIVING SENSITIVITY | 63 |
| TABLE 34: ELECTROSTATICS DISCHARGE CHARACTERISTICS | 64 |
| TABLE 35: RELATED DOCUMENTS | 73 |
| TABLE 36: TERMS AND ABBREVIATIONS | 73 |
| TABLE 37: DESCRIPTION OF DIFFERENT CODING SCHEMES | 76 |
| TABLE 38: DESCRIPTION OF DIFFERENT CODING SCHEMES | 77 |
| TABLE 39: EDGE MODULATION AND CODING SCHEME | 78 |

Figure Index

| | |
|---|----|
| FIGURE 1: FUNCTIONAL DIAGRAM | 13 |
| FIGURE 2: PIN ASSIGNMENT (TOP VIEW) | 16 |
| FIGURE 3: UART SLEEP APPLICATION | 24 |
| FIGURE 4: USB APPLICATION WITH SUSPEND FUNCTION..... | 25 |
| FIGURE 5: USB SLEEP APPLICATION WITHOUT SUSPEND FUNCTION..... | 25 |
| FIGURE 6: STAR STRUCTURE OF THE POWER SUPPLY..... | 27 |
| FIGURE 7: REFERENCE CIRCUIT OF POWER SUPPLY | 28 |
| FIGURE 8: TURN ON THE MODULE BY DRIVING CIRCUIT..... | 29 |
| FIGURE 9: TURN ON THE MODULE BY KEYSTROKE | 30 |
| FIGURE 10: TIMING OF TURNING ON MODULE | 30 |
| FIGURE 11: TIMING OF TURNING OFF MODULE..... | 31 |
| FIGURE 12: REFERENCE CIRCUIT OF RESET_N | 33 |
| FIGURE 13: TIMING OF RESETTING MODULE | 33 |
| FIGURE 14: CONNECTION OF FULL FUNCTIONAL UART PORT | 35 |
| FIGURE 15: CONNECTION OF THREE LINES UART PORT | 35 |
| FIGURE 16: CONNECTION OF UART PORT WITH HARDWARE FLOW CONTROL..... | 36 |
| FIGURE 17: 3.3V LEVEL MATCH CIRCUIT | 36 |
| FIGURE 18: 5V LEVEL MATCH CIRCUIT | 37 |
| FIGURE 19: RS232 LEVEL SHIFT CIRCUIT..... | 38 |
| FIGURE 20: RI BEHAVIOR | 39 |
| FIGURE 21: MICROPHONE REFERENCE DESIGN FOR AIN1&AIN2..... | 41 |
| FIGURE 22: REFERENCE DESIGN FOR AOUT1 | 42 |
| FIGURE 23: REFERENCE DESIGN WITH AN AMPLIFIER FOR AOUT1 | 42 |
| FIGURE 24: REFERENCE DESIGN FOR AOUT2 | 43 |
| FIGURE 25: REFERENCE DESIGN WITH AN AMPLIFIER FOR AOUT2 | 43 |
| FIGURE 26: REFERENCE DESIGN FOR AN EARPHONE | 44 |
| FIGURE 27: PRIMARY MODE TIMING | 45 |
| FIGURE 28: AUXILIARY MODE TIMING | 46 |
| FIGURE 29: REFERENCE CIRCUIT OF PCM APPLICATION WITH AUDIO CODEC..... | 47 |
| FIGURE 30: REFERENCE CIRCUIT OF THE 8-PIN USIM CARD | 48 |
| FIGURE 31: REFERENCE CIRCUIT OF THE 6-PIN USIM CARD | 49 |
| FIGURE 32: REFERENCE CIRCUIT OF USB APPLICATION | 50 |
| FIGURE 33: TEST POINTS OF FIRMWARE UPGRADE | 51 |
| FIGURE 34: REFERENCE CIRCUIT OF THE NETWORK INDICATOR..... | 53 |
| FIGURE 35: REFERENCE CIRCUIT OF THE STATUS | 54 |
| FIGURE 36: REFERENCE CIRCUIT OF ANTENNA INTERFACE | 56 |
| FIGURE 37: DIMENSIONS OF THE UF.L-R-SMT CONNECTOR (UNIT: MM) | 57 |
| FIGURE 38: MECHANICALS OF UF.L-LP CONNECTORS (UNIT: MM)..... | 58 |
| FIGURE 39: SPACE FACTOR OF MATED CONNECTOR (UNIT: MM) | 58 |
| FIGURE 40: UC15 TOP AND SIDE DIMENSIONS | 65 |
| FIGURE 41: UC15 BOTTOM DIMENSIONS (BOTTOM VIEW) | 66 |

| | |
|---|----|
| FIGURE 42: BOTTOM PADS DIMENSIONS (BOTTOM VIEW) | 66 |
| FIGURE 43: RECOMMENDED FOOTPRINT (TOP VIEW) | 67 |
| FIGURE 44: RECOMMEND STENCIL | 68 |
| FIGURE 45: TOP VIEW OF THE MODULE | 69 |
| FIGURE 46: BOTTOM VIEW OF THE MODULE | 69 |
| FIGURE 47: REFLOW SOLDERING PROFILE | 71 |
| FIGURE 48: CARRIER TAPE | 72 |

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1 Introduction

This document defines the UC15 module and describes its hardware interface which are connected with your application and the air interface.

This document can help you quickly understand module interface specifications, electrical and mechanical details. Associated with application notes and user guide, you can use UC15 module to design and set up mobile applications easily.

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1.1. Safety Information

The following safety precautions must be observed during all phases of the operation, such as usage, service or repair of any cellular terminal or mobile incorporating UC15 module. Manufacturers of the cellular terminal should send the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. If not so, Quectel does not take on any liability for customer failure to comply with these precautions.



Full attention must be given to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) cause distraction and can lead to an accident. You must comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Consult the airline staff about the use of wireless devices on boarding the aircraft, if your device offers a Airplane Mode which must be enabled prior to boarding an aircraft.



Switch off your wireless device when in hospitals or clinics or other health care facilities. These requests are desinged to prevent possible interference with sentitive medical equipment.



Cellular terminals or mobiles operate over radio frequency signal and cellular network and cannot be guaranteed to connect in all conditions, for example no mobile fee or an invalid USIM card. While you are in this condition and need emergent help, please remember using emergency call. In order to make or receive call, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.



Your cellular terminal or mobile contains a transmitter and receiver. When it is ON , it receives and transmits radio frequency energy. RF interference can occur if it is used close to TV set, radio, computer or other electric equipment.



In locations with potentially explosive atmospheres, obey all posted signs to turn off wireless devices such as your phone or other cellular terminals. Areas with potentially expositive atmospheres including fuelling areas, below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles such as grain, dust or metal powders.

2 Product Concept

2.1. General Description

UC15 is an embedded UMTS/HSDPA module. Its UMTS-based modem provides data connectivity on HSDPA, WCDMA, EDGE and GPRS networks. UC15 offers a maximum data rate of 3.6Mbps on downlink and also supports GPRS/EDGE multi-slot class 12 as well. GPRS supports the coding schemes CS-1, CS-2, CS-3 and CS-4. EDGE supports CS-1 to CS-4 and MCS-1 to MCS-9 coding schemes. UC15 includes two variants, UC15-A and UC15-E. And both of them are divided into Telematics version and Data Only version. Telematics version supports voice and data, while Data Only version only supports data. This is convenient for you to choose the dedicated type based on the wireless network configuration. The following table shows the entire radio band configuration of UC15 series.

Table 1: Frequency Bands of UC15 Series

| Module | GSM 850 | EGSM 900 | DCS 1800 | PCS 1900 | UMTS 850 | UMTS 900 | UMTS 1900 | UMTS 2100 |
|--------|------------|-------------|-------------|-------------|-------------|-------------|--------------|--------------|
| UC15-A | ● | ● | ● | ● | ● | | ● | |
| UC15-E | | ● | ● | | | ● | | ● |

More details about GPRS/EDGE multi-slot configuration and coding schemes, please refer to Appendix B, C and D.

With a tiny profile of 29.0mm × 29.0mm × 2.5mm, UC15 can meet almost all requirements for M2M application such as automotive, metering, tracking system, security solutions, routers, wireless POS, mobile computing devices, PDA phone and tablet PC, etc.

UC15 is an SMD type module, which can be embedded in your application through its 108-pin pads including 68 LCC signal pads and 40 other pads.

UC15 is integrated with internet service protocols such as TCP/UDP and PPP. Extended AT commands have been developed for you to use these internet service protocols easily.

2.2. Key Features

The following table describes the detailed features of UC15 module.

Table 2: UC15 Key Features

| Feature | Details |
|-----------------------------|--|
| Power Supply | Supply voltage: 3.3V~4.3V Typical supply voltage: 3.8V |
| Frequency Bands | UC15-E: GSM900/1800, UMTS900/2100 UC15-A: GSM850/900/1800/1900, UMTS850/1900 |
| Transmission Data | HSDPA R5: Max 3.6Mbps (DL) WCDMA R99: Max 384kbps (DL)/Max 384kbps (UL) EDGE: Max 236.8kbps (support DL only) GPRS: Max 85.6kbps (DL)/Max 85.6kbps (UL) CSD: 64kbps |
| Transmitting Power | Class 4 (33dBm±2dB) for GSM850 and EGSM900 Class 1 (30dBm±2dB) for DCS1800 and PCS1900 Class 3 (24dBm+1/-3dB) for UMTS850/900/1900/2100 |
| HSDPA and WCDMA Features | HSDPA data rate is corresponded with 3GPP R5. 3.6Mbps on downlink. WCDMA data rate is corresponded with 3GPP R99/R4. 384kbps on downlink and 384kbps on uplink. Support both 16-QAM and QPSK modulation. |
| GSM/GPRS/EDGE Data Features | GPRS: Support GPRS multi-slot class 12 (10 by default) Coding scheme: CS-1, CS-2, CS-3 and CS-4 Maximum of four Rx time slots per frame EDGE: Support EDGE multi-slot class 12 (12 by default). Support downlink only. Support GMSK and 8-PSK for different MCS (Modulation and Coding scheme). Downlink coding schemes: CS 1-4 and MCS 1-9. CSD: CSD transmission rates: 14.4kbps non-transparent. Support Unstructured Supplementary Services Data (USSD). |
| Internet Protocol Features | Support TCP/UDP/PPP/FTP/HTTP/SMTP/MMS/SSL/PING/NITZ/ NTP/HTTPS/SMTPTS protocols. Support the protocols PAP (Password Authentication Protocol) and CHAP (Challenge Handshake Authentication Protocol) usually used |

| | |
|--------------------------|---|
| | for PPP connections. |
| SMS | Text and PDU mode Point to point MO and MT SMS cell broadcast SMS storage: ME by default |
| USIM Interface | Support USIM/SIM card: 1.8V, 3.0V |
| Audio Features | Support two analog input channels and two analog output channels. GSM: HR/FR/EFR/AMR/AMR-WB WCDMA: AMR/AMR-WB Echo cancellation and noise suppression. |
| PCM Interface | Used for audio function with external codec. Support 8-bit A-law and μ -law, and 16-bit linear data formats. Support long frame sync and short frame sync. Support master and slave mode, but must be the master in long frame sync. |
| UART Interface | Seven lines on UART interface. Support RTS and CTS hardware flow control. Baud rate can reach up to 921600bps, 115200bps by default. Used for AT command, data transmission and firmware upgrade. |
| USB Interface | Compliant with USB 2.0 specification (slave only), the data transfer rate can reach up to 480 Mbps at high speed mode. Used for AT command communication, data transmission, software debug and firmware upgrade. USB driver: support Windows XP, Windows Vista, Windows 7, Windows 8, Windows CE5.0/6.0, Windows Mobile 6.1/6.5, Linux 2.6 or later, Android 2.3/4.0 or later. |
| AT Commands | Compliant with 3GPP TS 27.007, 27.005 and Quectel enhanced AT commands. |
| Network Indication | Indicate network activity status. |
| Antenna Interface | Connected via 50ohm antenna pad. |
| Physical Characteristics | Size: 29.0±0.15 × 29.0±0.15 × 2.5±0.2 mm Weight: Approx. 4.3g |
| Temperature Range | Normal operation: -35°C ~ +80°C Restricted operation: -40°C ~ -35°C and +80°C ~ +85°C ¹⁾ Storage temperature: -45°C ~ +90°C |
| Firmware Upgrade | USB interface (recommend) and UART interface. |
| RoHS | All hardware components are fully compliant with EU RoHS directive. |

NOTE

“1)” means when the module works within this temperature range, RF performance might degrade. For example, the frequency error or the phase error would increase.

2.3. Functional Diagram

The following figure shows a block diagram of UC15 and illustrates the major functional parts.

- Power management unit
- Baseband
- DDR+NAND flash
- Radio frequency
- Peripheral interface

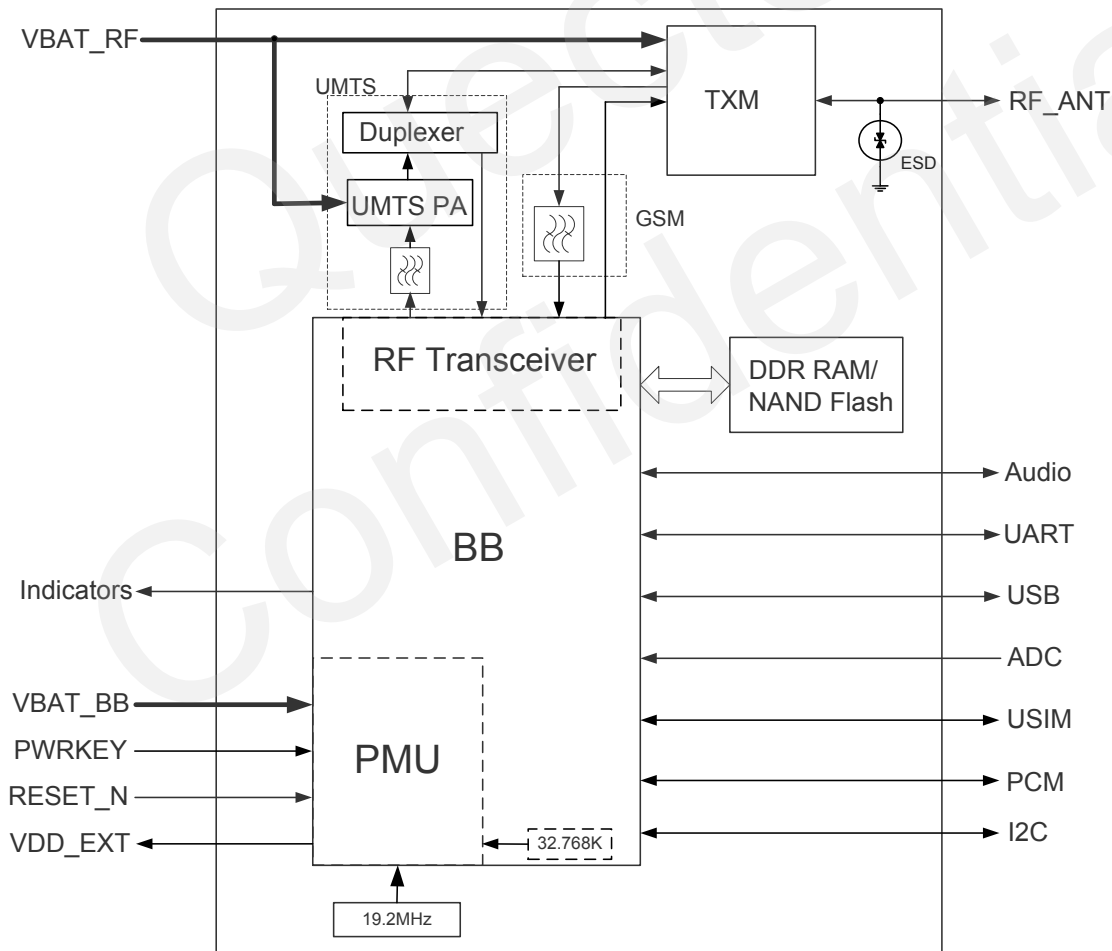


Figure 1: Functional Diagram

2.4. Evaluation Board

In order to help you to develop applications with UC15, Quectel supplies an evaluation board (EVB), RS-232 to USB cable, USB data cable, power adapter, earphone, antenna and other peripherals to control or test the module. For details, please refer to **document [2]**.

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3 Application Interface

3.1. General Description

UC15 is equipped with a 68-pin 1.3mm pitch SMT pads plus 40-pin ground pads and reserved pads that connect to cellular application platform. Sub-interfaces included in these pads are described in details in the following chapters:

- Power supply
- UART interface
- Audio interface
- PCM interface
- USIM interface
- USB interface
- ADC interface
- Indicator interface

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3.2. Pin Assignment

The following figure shows the pin assignment of the UC15 module.

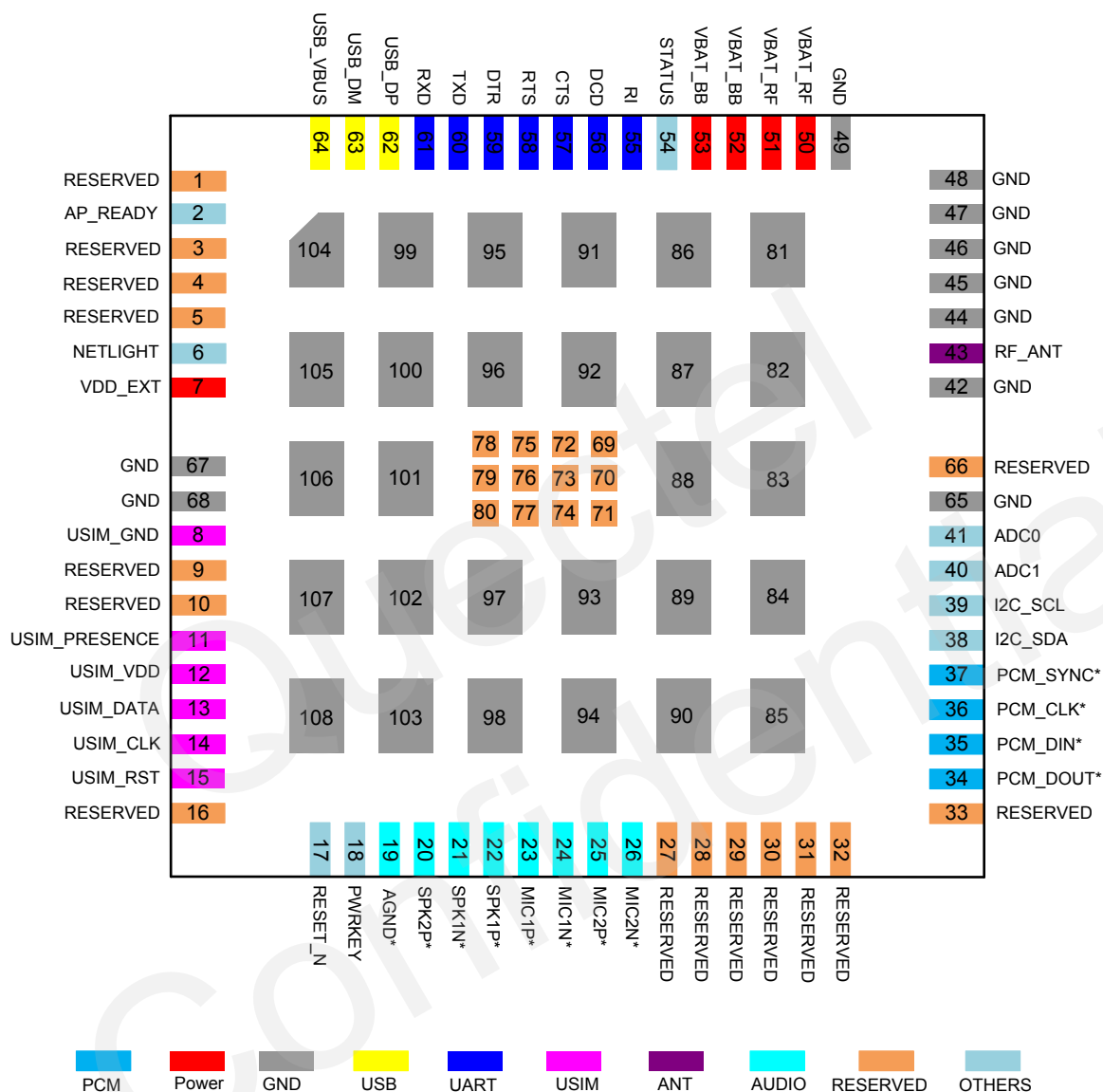


Figure 2: Pin Assignment (Top View)

NOTES

1. Keep all RESERVED pins and unused pins unconnected.
2. GND pads 81~108 should be connected to ground in the design. RESERVED pads 69~80 are used for factory test, they are unused in your design, you can ignore them and don't design them in schematic and PCB decal.
3. "*" means these functions are only supported in Telematics version.

3.3. Pin Description

The pin definition of UC15 is shown in table 4.

Table 3: IO Parameters Definition

| Type | Description |
|------|----------------------------|
| IO | Bidirectional input/output |
| DI | Digital input |
| DO | Digital output |
| PI | Power input |
| PO | Power output |
| AI | Analog input |
| AO | Analog output |

Table 4: Pin Description

| Power Supply | | | | | |
|--------------|---------|-----|--|--|--|
| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
| VBAT_BB | 52,53 | PI | Power supply for module baseband part. | Vmax=4.3V Vmin=3.3V Vnorm=3.8V | It must be able to provide sufficient current up to 0.8A. |
| VBAT_RF | 50,51 | PI | Power supply for module RF part. | Vmax=4.3V Vmin=3.3V Vnorm=3.8V | It must be able to provide sufficient current in a transmitting burst which typically rises to 2.0A. |
| VDD_EXT | 7 | PO | Provide 2.6V for external circuit. | Vnorm=2.6V I _O max=100mA | It is recommend to add a 2.2~4.7uF bypass capacitor when using this pin for power supply. |

| | | |
|-----|---------------------------------|---------|
| GND | 42,44~49 65,67~68 ,81~108 | Ground. |
|-----|---------------------------------|---------|

Turn On/Off

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-------------------------|---|--|
| PWRKEY | 18 | DI | Turn on/off the module. | $R_{PU} \approx 200k\Omega$ $V_{IHmax} = 2.1V$ $V_{IHmin} = 1.3V$ $V_{ILmax} = 0.5V$ | Pull-up to 1.8V internally. |
| RESET_N | 17 | DI | Reset the module. | $V_{IHmax} = 2.1V$ $V_{IHmin} = 1.3V$ $V_{ILmax} = 0.5V$ | Pull-up to 1.8V internally. If unused, keep it open. |

Indication

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|--|--|---|
| STATUS | 54 | DO | Indicate the module operating status. | $V_{OHmax} = 2.6V$ $V_{OHmin} = 2.15V$ $V_{OLmax} = 0.45V$ | 2.6V power domain, if unused, keep it open. |
| NETLIGHT | 6 | DO | Indicate the module network activity status. | $V_{OHmax} = 2.6V$ $V_{OHmin} = 2.15V$ $V_{OLmax} = 0.45V$ | 2.6V power domain, if unused, keep it open. |

USB Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|----------------------------|--|--|
| USB_VBUS | 64 | PI | USB detection. | $V_{max} = 5.25V$ $V_{min} = 3.0V$ $V_{norm} = 5.0V$ | |
| USB_DP | 62 | IO | USB differential data bus. | Compliant with USB 2.0 standard specification. | Require differential impedance of 90Ω. |
| USB_DM | 63 | IO | USB differential data bus. | Compliant with USB 2.0 standard specification. | Require differential impedance of 90Ω. |

USIM Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-------------|--------------------|---------|
|----------|---------|-----|-------------|--------------------|---------|

| | | | | | |
|---------------|----|----|---------------------------------|---|---|
| USIM_GND | 8 | | Specified ground for USIM card. | | |
| USIM_VDD | 12 | PO | Power supply for USIM card. | For 1.8V USIM: Vmax=1.95V Vmin=1.65V For 3.0V USIM: Vmax=3.0V Vmin=2.7V | Either 1.8V or 3.0V is supported by the module automatically. |
| USIM_DATA | 13 | IO | Data signal of USIM card. | For 1.8V USIM: V _{IL} max = 0.6V V _{IH} min = 1.2V V _{OL} max=0.45V V _{OH} min=1.35V For 3.0V USIM: V _{IL} max=1.0V V _{IH} min=1.95V V _{OL} max=0.45V V _{OH} min=2.55V | Pull-up to USIM_VDD with 10k resistor internally. |
| USIM_CLK | 14 | DO | Clock signal of USIM card. | For 1.8V USIM: V _{OL} max=0.45V V _{OH} min=1.35V For 3.0V USIM: V _{OL} max=0.45V V _{OH} min=2.55V | |
| USIM_RST | 15 | DO | Reset signal of USIM card. | For 1.8V USIM: V _{OL} max=0.45V V _{OH} min=1.35V For 3.0V USIM: V _{OL} max=0.45V V _{OH} min=2.55V | |
| USIM_PRESENCE | 11 | DI | USIM card input detection. | V _{IL} min=-0.3V V _{IL} max=0.91V V _{IH} min=1.69V V _{IH} max=2.9V | 2.6V power domain. If unused, keep it open. |

ADC Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-------------|--------------------|---------|
|----------|---------|-----|-------------|--------------------|---------|

| | | | | | |
|------|----|----|--|---------------------------|--------------------------|
| ADC0 | 41 | AI | General purpose analog to digital converter. | Voltage range: 0V to 2.1V | If unused, keep it open. |
| ADC1 | 40 | AI | General purpose analog to digital converter. | Voltage range: 0V to 2.1V | If unused, keep it open. |

UART Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-------------------------|---|---|
| RI | 55 | DO | Ring indicator. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| DCD | 56 | DO | Data carrier detection. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| CTS | 57 | DO | Clear to send. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| RTS | 58 | DI | Request to send. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ | 2.6V power domain, if unused, keep it open. |
| DTR | 59 | DI | Data terminal ready. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ | 2.6V power domain. Pull-up by default, if unused, keep it open. |
| TXD | 60 | DO | Transmit data. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| RXD | 61 | DI | Receive data. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ | 2.6V power domain, if unused, keep it open. |

RF Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-----------------|--------------------|---------|
| RF_ANT | 43 | IO | RF antenna pad. | 50Ω impedance. | |

Analog Audio Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-----------------------|--------------------|--------------------------|
| MIC1P | 23 | AI | Audio positive input. | | If unused, keep it open. |
| MIC1N | 24 | AI | Audio negative input. | | If unused, keep it open. |

| | | | | | |
|-------|----|----|----------------------------------|---------|--|
| MIC2P | 25 | AI | Auxiliary audio positive input. | | If unused, keep it open. |
| MIC2N | 26 | AI | Auxiliary audio negative input. | | If unused, keep it open. |
| SPK1P | 22 | AO | Audio positive output. | | If unused, keep it open. |
| SPK1N | 21 | AO | Audio negative output. | | If unused, keep it open. |
| SPK2P | 20 | AO | Auxiliary audio positive output. | | If unused, keep it open. |
| AGND | 19 | | Analog ground. | Ground. | Separate ground for external audio circuits. |

PCM Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|----------------------------|---|---|
| PCM_DOUT | 34 | DO | PCM data output. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| PCM_DIN | 35 | DI | PCM data input. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ | 2.6V power domain, if unused, keep it open. |
| PCM_CLK | 36 | IO | PCM data bit clock. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |
| PCM_SYNC | 37 | IO | PCM data frame sync signal | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | 2.6V power domain, if unused, keep it open. |

I2C Interface

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|---------|-----|-------------------|---|---|
| I2C_SDA | 38 | IO | I2C serial data. | $V_{ILmin}=-0.3V$ $V_{ILmax}=0.91V$ $V_{IHmin}=1.69V$ $V_{IHmax}=2.9V$ $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | External pull-up resistor is required. 2.6V only, if unused, keep it open. |
| I2C_SCL | 39 | DO | I2C serial clock. | $V_{OLmax}=0.45V$ $V_{OHmin}=2.15V$ | External pull-up resistor is required. |

2.6V only, if unused, keep it open.

Other Pins

| Pin Name | Pin No. | I/O | Description | DC Characteristics | Comment |
|----------|--|-----|---|---|---|
| AP_READY | 2 | DI | Application process or sleep state detection. | V _{IL} min=-0.3V V _{IL} max=0.91V V _{IH} min=1.69V V _{IH} max=2.9V | 2.6V power domain, if unused, keep it open. |
| RESERVED | 1,3~5,9~ 10,16,27 ~33,66, 69~80 | | Reserved. | | Keep these pins unconnected. |

3.4. Operating Modes

The table below briefly summarizes the various operating modes.

Table 5: Overview of Operating Modes

| Mode | Details |
|------------------|---|
| Normal Operation | GSM Idle Software is active. The module has registered to the GSM network and is ready to send and receive data. |
| | GSM Talk/Data GSM connection is ongoing. In this mode, the power consumption is decided by the configuration of power control level (PCL), dynamic DTX control and the working RF band. |
| | GPRS Idle The module is ready for GPRS data transfer, but no data transfer is going on. In this case, power consumption depends on network setting and GPRS configuration. |
| | GPRS Data There is GPRS data in transfer (PPP, TCP or UDP). In this mode, power consumption is decided by the PCL, working RF band and GPRS multi-slot configuration. |
| | EDGE Idle The module is ready for data transfer in EDGE mode, but no data is currently sent or received. In this case, power consumption depends on network settings and EDGE configuration. |
| | EDGE Data There is EDGE data in transfer (PPP, TCP or UDP). In this mode, power consumption is decided by the PCL, working RF band and EDGE multi-slot configuration. |

| | |
|----------------------------|---|
| UMTS Idle | Software is active. The module has registered to the UMTS network and the module is ready to send and receive data. |
| UMTS Talk/Data | UMTS connection is ongoing. In this mode, the power consumption is decided by network setting (e.g. TPC pattern) and data transfer rate. |
| HSDPA Idle | Software is active. The module has registered to the HSDPA network and the module is ready to send and receive data. |
| HSDPA Data | HSDPA data transfer is ongoing. In this mode, the power consumption is decided by network setting (e.g. TPC pattern) and data transfer rate. |
| Minimum Functionality Mode | AT+CFUN=0 command can set the module entering into a minimum functionality mode without removing the power supply. In this case, both RF function and USIM card will be invalid. |
| Sleep Mode | In this mode, the current consumption of the module will be reduced to the minimal level. During this mode, the module can still receive paging message, SMS, voice call and TCP/UDP data from the network normally. Any URC can be output even the module in Sleep Mode. |
| Power Down Mode | In this mode, the power management unit shuts down the power supply for the baseband part and RF part. Software is not active. The serial interface is not accessible. Operating voltage (connected to VBAT_RF and VBAT_BB) remains applied. |

3.5. Power Saving

3.5.1. Sleep Mode

UC15 is able to reduce its current consumption to a minimum value during the sleep mode. The following section describes power saving procedure of UC15.

3.5.1.1. UART Application

If application processor communicates with module via UART interface, the following preconditions can let the module enter into the sleep mode.

- Execute AT command **AT+QSCLK=1** to enable the sleep mode.
- Drive DTR to high level.

The following figure shows the connection between the module and application processor.

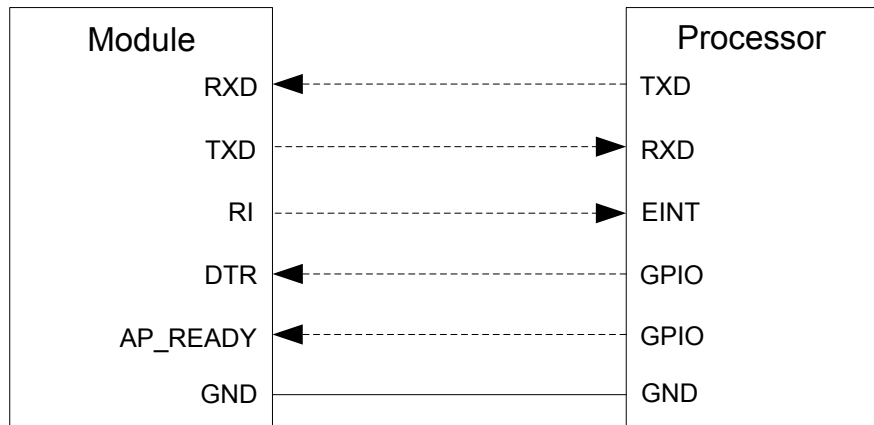


Figure 3: UART Sleep Application

The RI of module is used to wake up the processor, and AP_READY will detect the sleep state of processor (can be configured to high level or low level detection). You should pay attention to the level match shown in dotted line between module and processor.

Drive DTR to low level will wake up the module.

3.5.1.2. USB Application with Suspend Function

If application processor communicates with module via USB interface, and processor supports USB suspend function, following preconditions can let the module enter into the sleep mode.

- Execute AT command **AT+QSCLK=1** to enable the sleep mode.
- The processor's USB bus which is connected with the module USB interface enters into suspended state.

The following figure shows the connection between the module and processor.

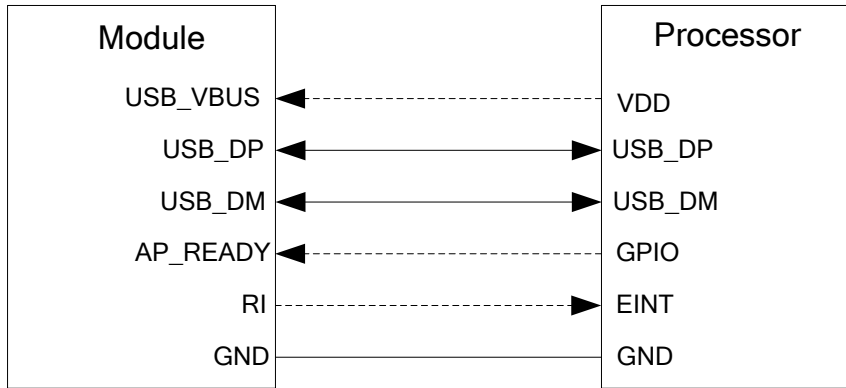


Figure 4: USB Application with Suspend Function

When the processor's USB bus returns to resume state, the module will be woken up.

3.5.1.3. USB Application without Suspend Function

If application processor communicates with module via USB interface, and processor does not support USB suspend function, you should disconnect USB_VBUS with additional control circuit to let the module enter into sleep mode.

- Execute AT command **AT+QSCLK=1** to enable the sleep mode.
- Disconnect USB_VBUS.

The following figure shows the connection between the module and application processor.

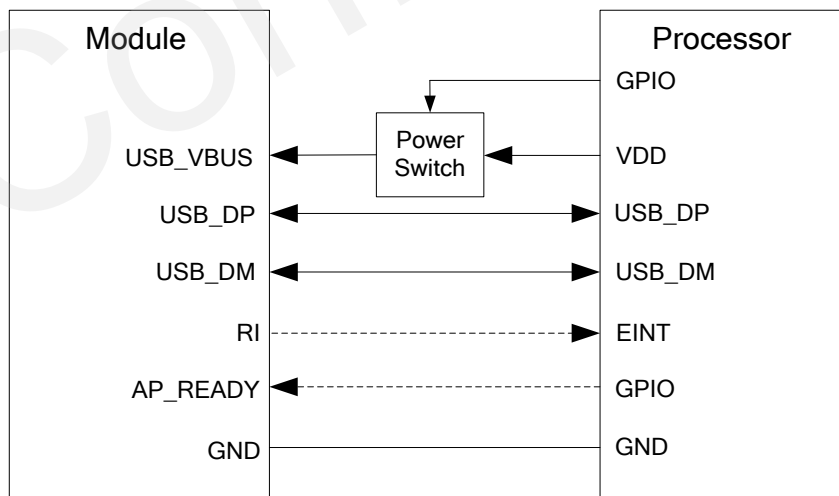


Figure 5: USB Sleep Application without Suspend Function

Supply power to USB_VBUS will wake up the module.

In sleep mode, the module can still receive paging message, SMS, voice call and TCP/UDP data from the network normally, but the UART port is not accessible.

3.5.2. Minimum Functionality Mode

Minimum functionality mode reduces the functionality of the module to minimum level, thus minimizes the current consumption at the same time. This mode can be set as below:

Command **AT+CFUN** provides the choice of the functionality levels: <fun>=0, 1, 4.

- **AT+CFUN=0**: Minimum functionality, RF part and USIM card will be closed.
- **AT+CFUN=1**: Full functionality (by default).
- **AT+CFUN=4**: Disable RF function (airplane mode). All AT commands related to RF function are not accessible.

For detailed information about command **AT+CFUN**, please refer to **document [1]**.

3.6. Power Supply

3.6.1. Power Supply Pins

UC15 provides four VBAT pins to connect with the external power supply. There are two separate voltage domains for VBAT.

- VBAT_RF with two pads for module RF.
- VBAT_BB with two pads for module baseband.

The following table shows the VBAT pins and ground pins.

Table 6: VBAT and GND Pin

| Pin Name | Pin No. | Description | Min. | Typ. | Max. | Unit |
|----------|------------------------------|-----------------------------------|------|------|------|------|
| VBAT_RF | 50,51 | Power supply for module RF. | 3.3 | 3.8 | 4.3 | V |
| VBAT_BB | 52,53 | Power supply for module baseband. | 3.3 | 3.8 | 4.3 | V |
| GND | 42,44~49,65, 67~68,81~108 | Ground. | - | - | - | - |

3.6.2. Decrease Voltage Drop

The power supply range of the module is 3.3~4.3V. Because of the voltage drop during the transmitting time, a bypass capacitor of about 100μF with low ESR should be used. Multi-layer ceramic chip (MLCC) capacitor can provide the best combination of low ESR. Three ceramic capacitors (100nF, 33pF, 10pF) are recommended to be applied to the VBAT pins. The capacitors should be placed close to the VBAT pins of UC15. The following figure shows star structure of the power supply.

The main power supply from an external application should be a single voltage source and has to be expanded to two sub paths with star structure. In addition, in order to get a stable power source, it is suggested to use a zener diode of which reverse zener voltage is 5.1V and dissipation power is more than 0.5W.

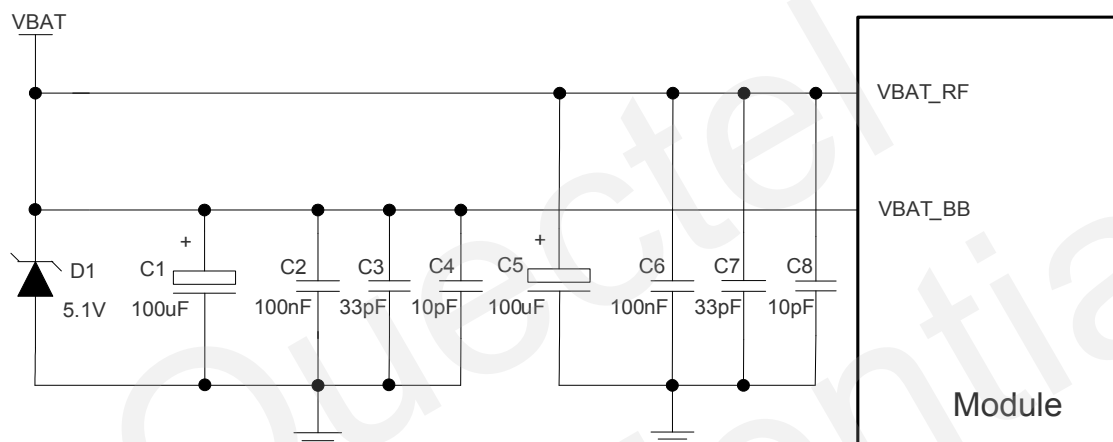


Figure 6: Star Structure of the Power Supply

Please pay special attention to the power supply design for applications. Make sure the input voltage will never drop below 3.3V. If the voltage drops below 3.3V, the module will turn into unnormal state. The PCB traces from the VBAT pins to the power source must be wide enough to ensure that there is not too much voltage drop occurs in the transmitting procedure. The width of VBAT_BB trace should be no less than 1mm, and the width of VBAT_RF trace should be no less than 2mm, and the principle of the VBAT trace is the longer, the wider.

3.6.3. Reference Design for Power Supply

The power design for the module is very important, since the performance of power supply for the module largely depends on the power source. The power supply is capable of providing the sufficient current up to 2A at least. If the voltage drop between the input and output is not too high, it is suggested to use a LDO to supply power for module. If there is a big voltage difference between the input source and the desired output (VBAT), a buck converter is preferred to be used as a power supply.

The following figure shows a reference design for +5V input power source. The designed output for the power supply is about 3.8V and the maximum load current is 3A.

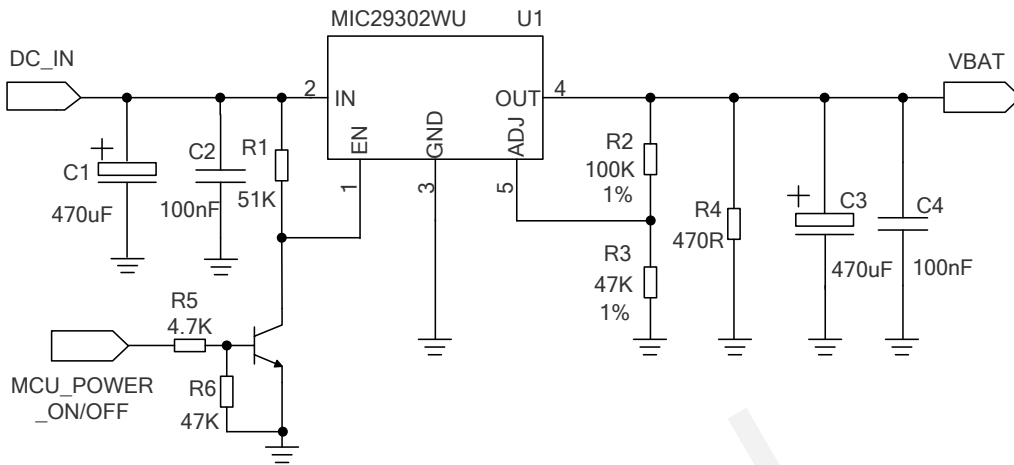


Figure 7: Reference Circuit of Power Supply

NOTE

When the module cannot be turned off by PWRKEY pin or other abnormalities occur, it is suggested to switch off the power supply for module to shut it down, and then power on again.

3.6.4. Monitor the Power Supply

You can use the **AT+CBC** command to monitor the VBAT_BB voltage value. For more details, please refer to **document [1]**.

3.6.5. VDD_EXT

UC15 has a LDO power output, named VDD_EXT. The VDD_EXT is available and output voltage is 2.6V by default, rated at 100mA.

The following table shows electrical characteristics of VDD_EXT.

Table 7: Electrical Characteristics of VDD_EXT

| Symbol | Description | Min. | Typ. | Max. | Unit |
|------------------|----------------|------|------|------|------|
| VDD_EXT | Output voltage | 2.5 | 2.6 | 2.7 | V |
| I _{OUT} | Output current | - | - | 100 | mA |

3.7. Turn on and off Scenarios

3.7.1. Turn on Module by PWRKEY Pin

The following table shows the pin definition of PWRKEY.

Table 8: PWRKEY Pin Description

| Pin Name | Pin No. | Description | DC Characteristics | Comment |
|----------|---------|-------------------------|--|---|
| PWRKEY | 18 | Turn on/off the module. | $V_{IHmax}=2.1V$ $V_{IHmin}=1.3V$ $V_{ILmax}=0.5V$ | Pull-up to 1.8V internally with 200kΩ resistor. |

When UC15 is in power down mode, it can be turned on to normal mode by driving the PWRKEY pin to low level at least 0.1s. It is recommended to use an open collector driver to control the PWRKEY. The STATUS outputs high level after module is turned on successfully. A simple reference circuit is illustrated in the following figure.

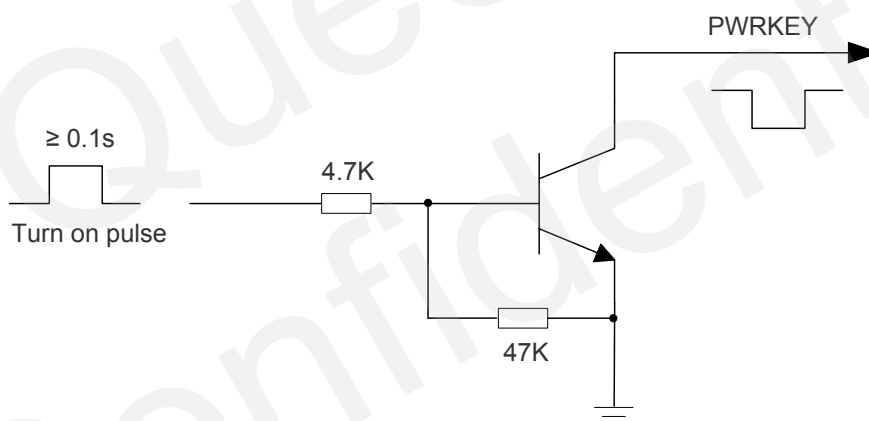


Figure 8: Turn on the Module by Driving Circuit

The other way to control the PWRKEY is to use a button directly. A TVS component is indispensable to be placed nearby the button for ESD protection. When pressing the key, electrostatic strike may generate from finger. A reference circuit is shown in the following figure.

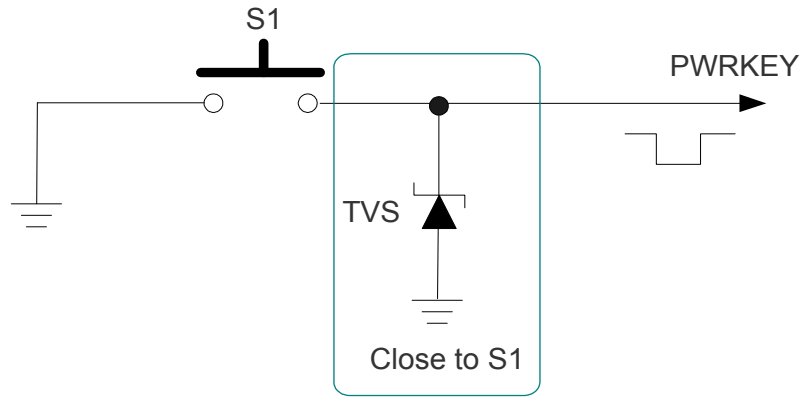


Figure 9: Turn on the Module by Keystroke

The turn on scenarios is illustrated as the following figure.

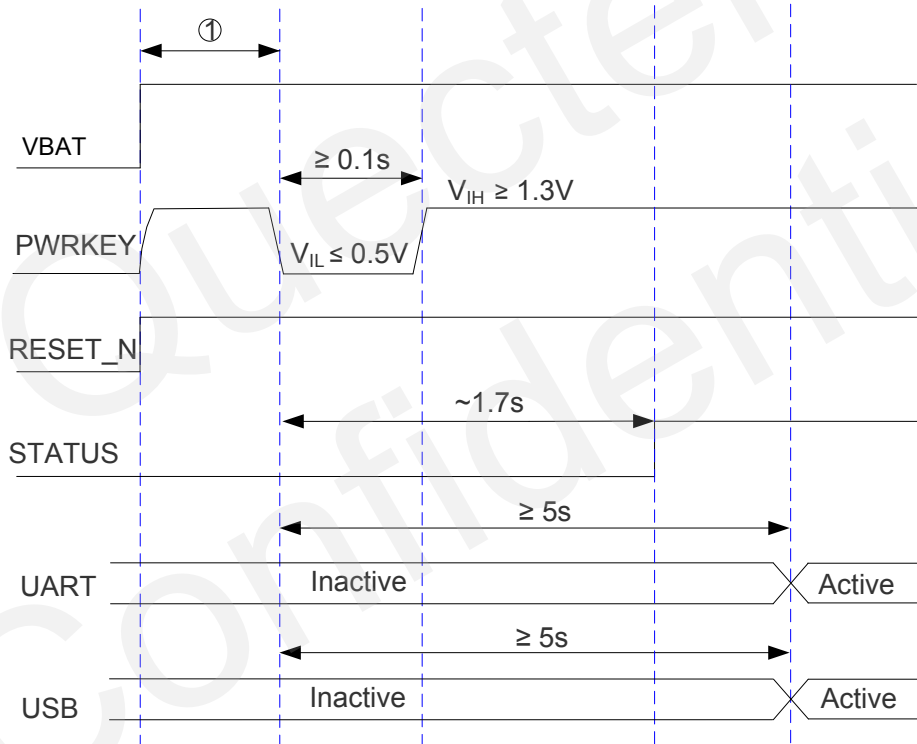


Figure 10: Timing of Turning on Module

NOTE

① Make sure that VBAT is stable before pulling down PWRKEY pin. The time between them is recommended to be more than 0.03s.

3.7.2. Turn off Module

The following procedures can be used to turn off the module:

- Normal power down procedure: Turn off the module by PWRKEY pin.
- Normal power down procedure: Turn off the module by command **AT+QPOWD**.
- Automatic shutdown: Turn off the module automatically if under-voltage or over-voltage is detected.

3.7.2.1. Turn off Module by PWRKEY Pin

Drive the PWRKEY to low level at least 0.6s, the module will execute power-down procedure after PWRKEY is released. The power-down scenario is illustrated as the following figure.

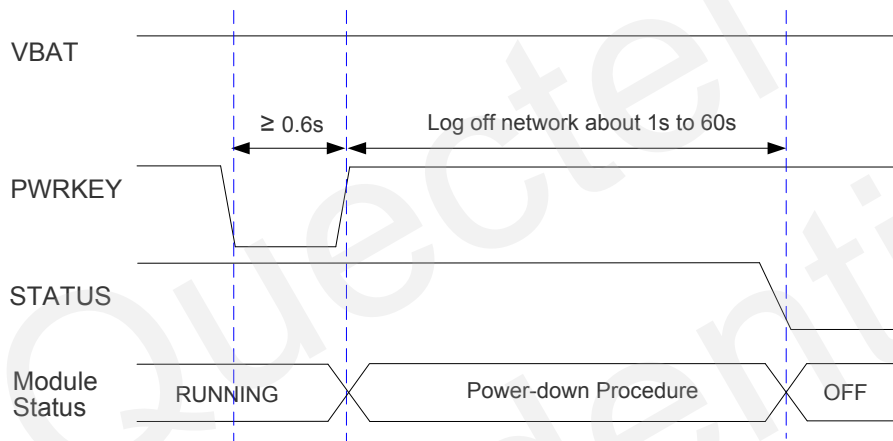


Figure 11: Timing of Turning off Module

During power-down procedure, module will send out URC “NORMAL POWER DOWN” via URC port first, then log off network and save important data. After logging off, module sends out “POWERED DOWN” and shuts down the internal power supply. The power on VBAT pins are not allowed to be switched off before the URC “POWERED DOWN” is output to avoid data loss. If module is not logged off within 60s, module will force to shut down internal power supply.

After that moment, the module enters into power down mode, no other AT commands can be executed.

3.7.2.2. Turn off Module by AT Command

It is also a safe way to use AT command **AT+QPOWD** to turn off the module, which is similar to the way of turning off the module via PWRKEY Pin. Please refer to **document [1]** for details about the AT command of **AT+QPOWD**.

3.7.2.3. Automatic Shutdown

The module will constantly monitor the voltage applied on the VBAT_BB, if the voltage $\leq 3.5V$, the following URC will be presented:

+QIND: "vbatt",-1

If the voltage $\geq 4.21V$, the following URC will be presented:

+QIND: "vbatt",1

The uncritical voltage is 3.3V to 4.3V, If the voltage $> 4.35V$ or $< 3.2V$, the module would automatically shut down itself.

If the voltage $< 3.2V$, the following URC will be presented:

+QIND: "vbatt",-2

If the voltage $> 4.35V$, the following URC will be presented:

+QIND: "vbatt",2

NOTE

The value of voltage threshold can be revised by AT command **AT+QCFG="vbatt"**, refer to *document [1]* for details.

3.8. Reset the Module

The RESET_N can be used to reset the module.

Table 9: RESET_N Pin Description

| Pin Name | Pin No. | Description | DC Characteristics | Comment |
|----------|---------|-------------------|--|---|
| RESET_N | 17 | Reset the module. | $V_{IHmax}=2.1V$ $V_{IHmin}=1.3V$ $V_{ILmax}=0.5V$ | Pull-up to 1.8V internally. If unused, keep it open. |

You can reset the module by driving the RESET_N to low level voltage for 0.05~0.2s and then releasing. Reference circuit is shown in the following figure.

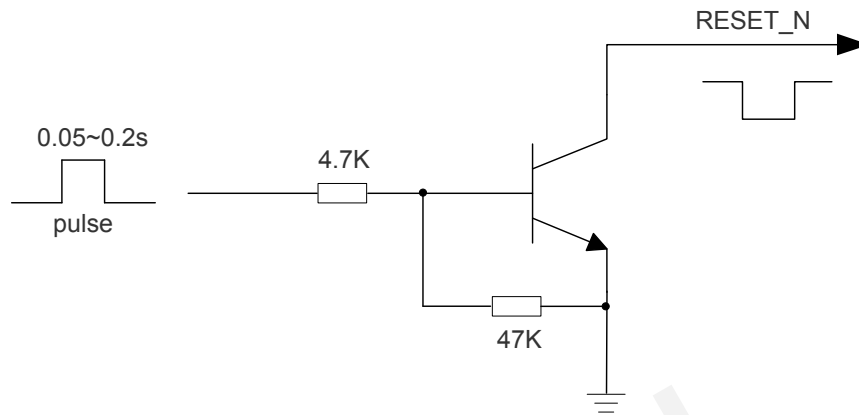


Figure 12: Reference Circuit of RESET_N

The reset scenario is illustrated as the following figure.

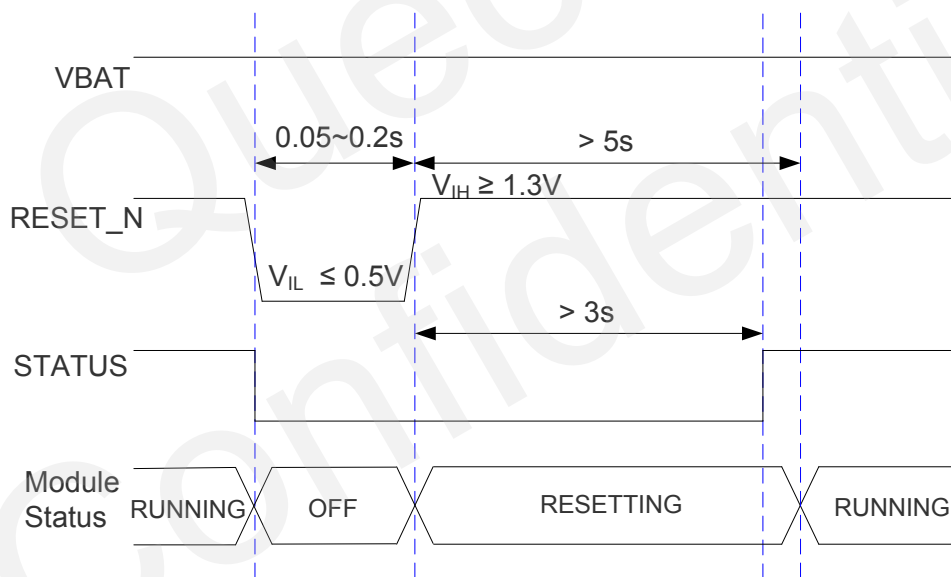


Figure 13: Timing of Resetting Module

NOTE

The low-level pulse through the RESET_N pin cannot last for more than 0.2s, otherwise the module will be powered off.

3.9. UART Interface

The module provides one 7-wire UART interface, and is designed as the DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection. UART interface supports 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800 and 921600bps baud rate. The default is 115200bps, please refer to **document [1]** about **AT+IPR** command for details. This interface can be used for data transmission, AT communication and firmware upgrade.

Table 10: Pin Definition of the UART Interface

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|-------------------------|---|
| RI | 55 | DO | Ring indicator. | 2.6V power domain. If unused, keep it open. |
| DCD | 56 | DO | Data carrier detection. | 2.6V power domain. If unused, keep it open. |
| CTS | 57 | DO | Clear to send. | 2.6V power domain. If unused, keep it open. |
| RTS | 58 | DI | Request to send. | 2.6V power domain. If unused, keep it open. |
| DTR | 59 | DI | Data terminal ready. | 2.6V power domain. If unused, keep it open. |
| TXD | 60 | DO | Transmit data. | 2.6V power domain. If unused, keep it open. |
| RXD | 61 | DI | Receive data. | 2.6V power domain. If unused, keep it open. |

The logic levels are described in the following table.

Table 11: Logic Levels of Digital I/O

| Parameter | Min. | Max. | Unit |
|-----------|------|------|------|
| V_{IL} | -0.3 | 0.91 | V |
| V_{IH} | 1.69 | 2.9 | V |
| V_{OL} | 0 | 0.45 | V |
| V_{OH} | 2.15 | 2.6 | V |

3.9.1. The Connection of UART

The connection between module and host via UART port is very flexible. Three connection ways are illustrated as below.

UART port connection is shown as below when it is applied in modulation-demodulation.

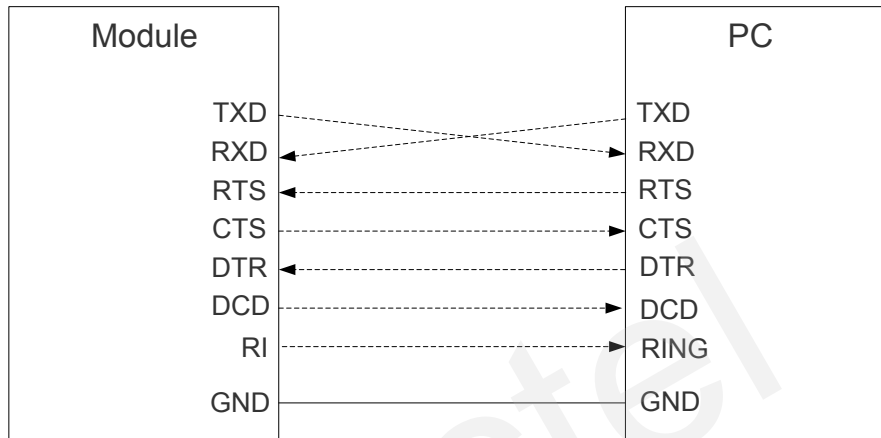


Figure 14: Connection of Full Functional UART Port

Three lines connection is shown as below.

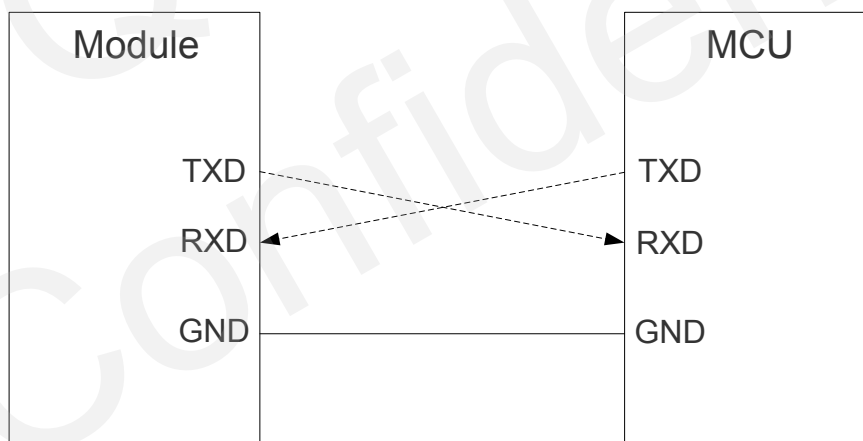


Figure 15: Connection of Three Lines UART Port

UART port with hardware flow control is shown as below. This connection will enhance the reliability of the mass data communication.

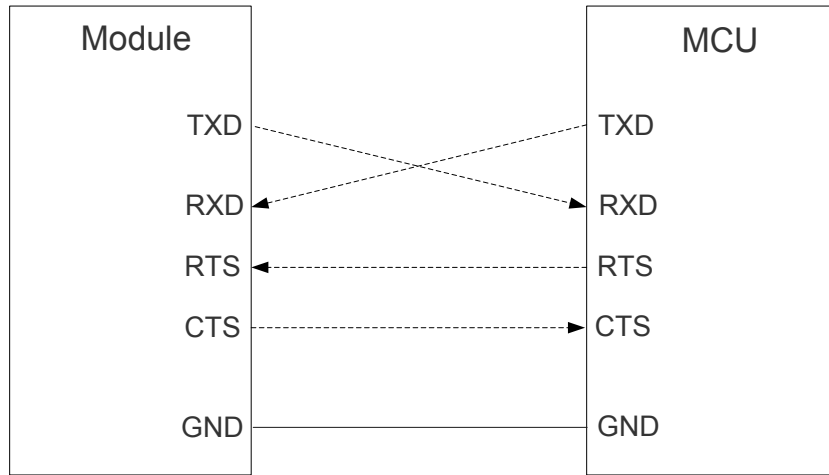


Figure 16: Connection of UART Port with Hardware Flow Control

NOTE

The module disables the hardware flow control by default. AT command **AT+IFC=2,2** is used to enable hardware flow control. AT command **AT+IFC=0,0** is used to disable the hardware flow control. For more details, please refer to **document [1]**.

3.9.2. UART Application

The reference design of 3.3V level match is shown as below. When the peripheral MCU/ARM system is 3V, the divider resistor should be changed from 3.6K to 6.8K.

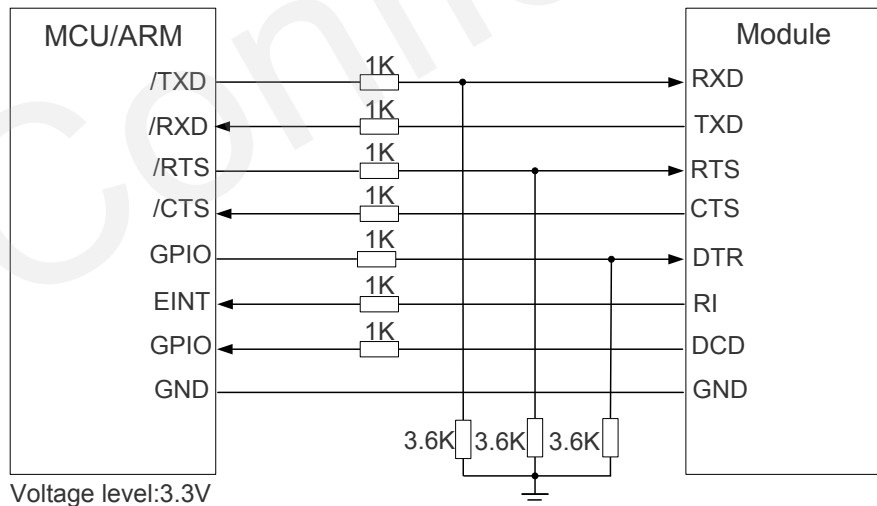


Figure 17: 3.3V Level Match Circuit

The reference design of 5V level match is shown as below. The construction of dotted line can refer to the construction of solid line. Please pay attention to direction of connection. Input dotted line of module should refer to input solid line of the module. Output dotted line of module should refer to output solid line of the module.

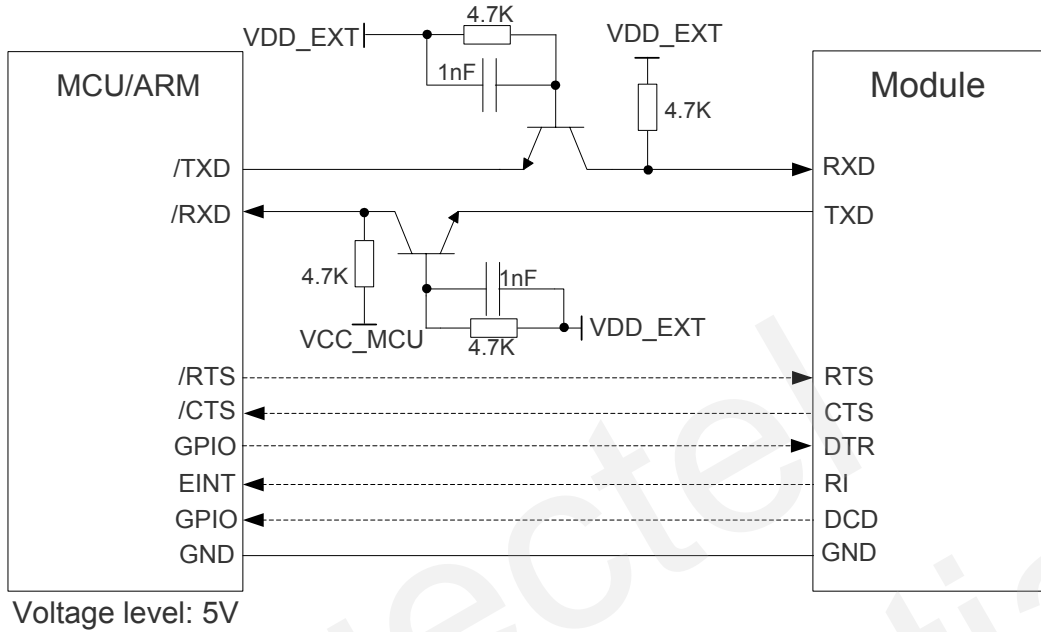


Figure 18: 5V Level Match Circuit

The following figure is an example of connection between module and PC. A RS232 level shifter IC or circuit must be inserted between module and PC, since UART interface do not support the RS232 level, while support the CMOS level only.

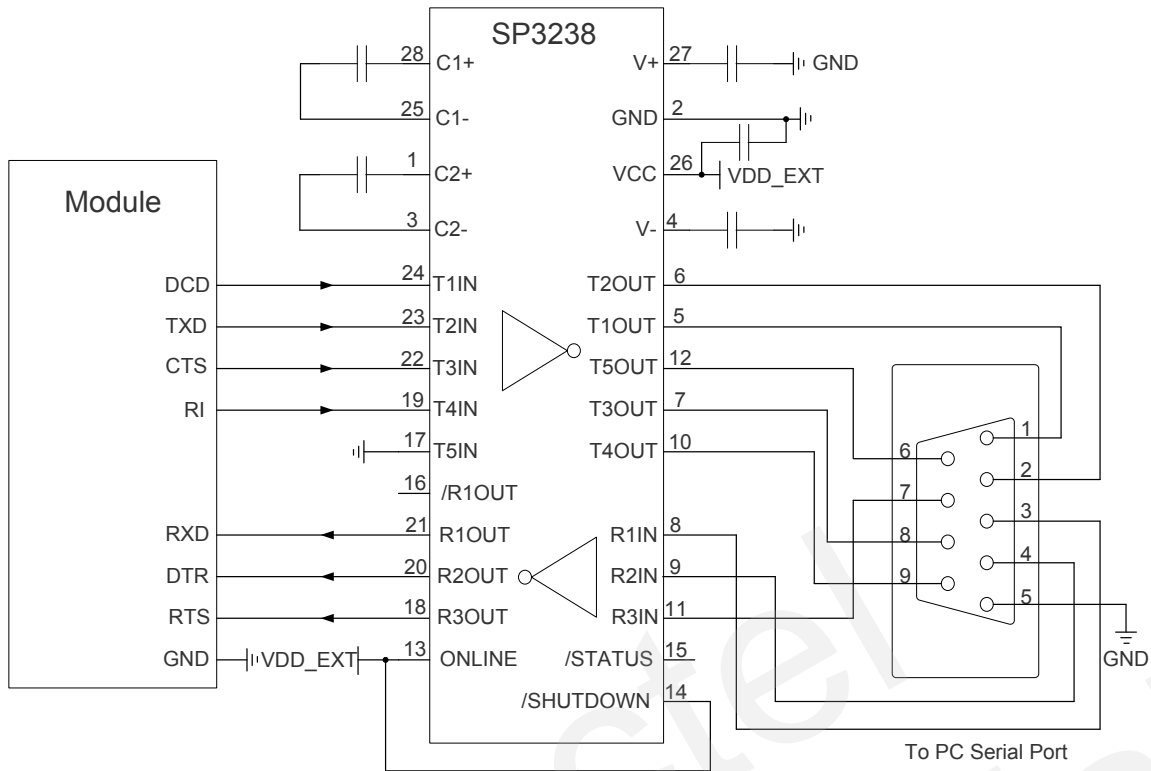


Figure 19: RS232 Level Shift Circuit

NOTES

1. Rising edge on DTR will let the module exit from the data mode by default. It can be disabled by command. Refer to **document [1]** about **AT&D** and **AT&V** for details.
2. DCD is used as data mode indication. Please refer to **document [1]** about command **AT&C** and **AT&V** for details.

3.10. Behavior of the RI

You can use command **AT+QCFG="risignaltpe", "physical"** to configure RI behavior:

No matter which port URC is presented on, URC will trigger the behavior on RI pin.

NOTE

URC can be output from UART port, USB AT port and USB modem port by command **AT+QURCCFG**. The default port is USB AT port.

In addition, RI behavior can be configured flexible. The default behavior of the RI is shown as below.

Table 12: Behavior of the RI

| State | Response |
|-------|--|
| Idle | RI keeps in high level. |
| URC | RI outputs 120ms low pulse when new URC is reported. |

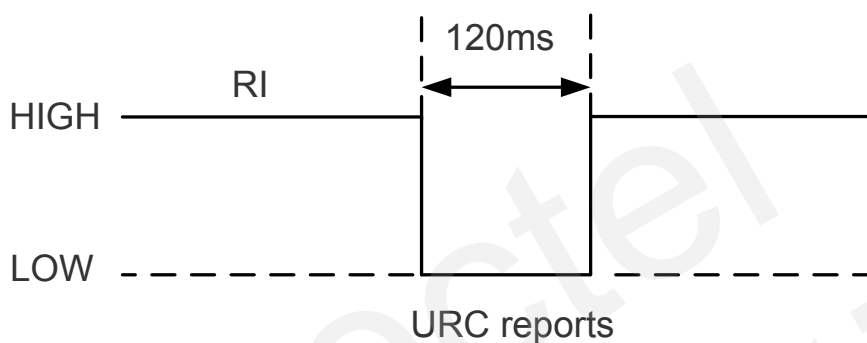


Figure 20: RI Behavior

The RI behavior can be changed by command `AT+QCFG="urc/ri/ring"`, refer to *document [1]* for details.

3.11. Analog Audio Interface

The module provides two analog input channels and two analog output channels.

Table 13: Pin Definition of the Audio Interface

| Interface | Pin Name | Pin No. | I/O | Description | Comment |
|----------------|----------|---------|-----|------------------------|-----------------------------|
| AIN1/ AOUT1 | MIC1P | 23 | AI | Audio positive input. | If it is unused, keep open. |
| | MIC1N | 24 | AI | Audio negative input. | If it is unused, keep open. |
| | SPK1P | 22 | AO | Audio positive output. | If it is unused, keep open. |
| | SPK1N | 21 | AO | Audio negative output. | If it is unused, keep open. |

| | | | | | |
|----------------|-------|----|----|----------------------------------|---|
| AIN2/ AOUT2 | MIC2P | 25 | AI | Auxiliary audio positive input. | If it is unused, keep open. |
| | MIC2N | 26 | AI | Auxiliary audio negative input. | If it is unused, keep open. |
| | SPK2P | 20 | AO | Auxiliary audio positive output. | If it is unused, keep open. |
| | AGND | 19 | | Analog ground. | Suggested to be used for audio circuit. |

- AIN1 and AIN2 may be used for both microphone and line inputs. An electret microphone is usually recommended. AIN1 and AIN2 are both differential input channels.
- AOUT1 and AOUT2 may be used for both receiver and speaker outputs. AOUT1 channel is typically used for a receiver, while AOUT2 channel is typically used for headset or speaker. AOUT1 channel is a differential channel and AOUT2 is a single-ended channel. SPK2P and AGND can establish a pseudo differential mode. Both AOUT1 and AOUT2 support voice and ringtone output.
- These two audio channels can be swapped by **AT+QAUDPATH** command. For more details, please refer to *document [1]*.

Use command **AT+QAUDPATH** to select audio channel:

- 0: AIN1/AOUT1 (normal audio channel), the default value is 0.
- 1: AIN2/AOUT2 (auxiliary audio channel).
- 2: PCM channel.

For each channel, you can use **AT+QMIC** to adjust the input gain level of microphone. You can also use **AT+CLVL** to adjust the output gain level of receiver and speaker. **AT+QSIDET** is to set the side-tone gain level. For more details, please refer to *document [1]*.

3.11.1. Decrease TDD Noise and Other Noise

The 33pF capacitor is applied for filtering out 850/900MHz RF interference when the module is transmitting at GSM850/EGSM900MHz. TDD noise could be heard without this capacitor. Moreover, the 10pF capacitor here is for filtering out 1800/1900MHz RF interference. However, the self-resonant frequency point of a capacitor largely depends on the material and production technique. Therefore, customer should depend on its capacitor vendor to choose the most suitable capacitor for filtering out GSM850MHz, EGSM900MHz, DCS1800MHz and PCS1900MHz separately.

The severity degree of the RF interference in the voice channel during GSM transmitting period largely depends on the application design. In some cases, GSM850/EGSM900 TDD noise is more severe; while in other cases, DCS1800/PCS1900 TDD noise is more obvious. Therefore, customer can have a choice based on test results. Sometimes, even no RF filtering capacitor is required.

The capacitor which is used for filtering out RF noise should be close to audio interface. Audio alignment should be as short as possible.

In order to decrease radio or other signal interference, the position of RF antenna should be kept away from audio interface and audio alignment. Power alignment and audio alignment should not be parallel, and power alignment should be far away from audio alignment.

The differential audio traces should be placed according to the differential signal layout rules.

3.11.2. Microphone Interfaces Application

AIN1/AIN2 channels come with internal bias supply for external electret microphone. A reference circuit is shown in the following figure.

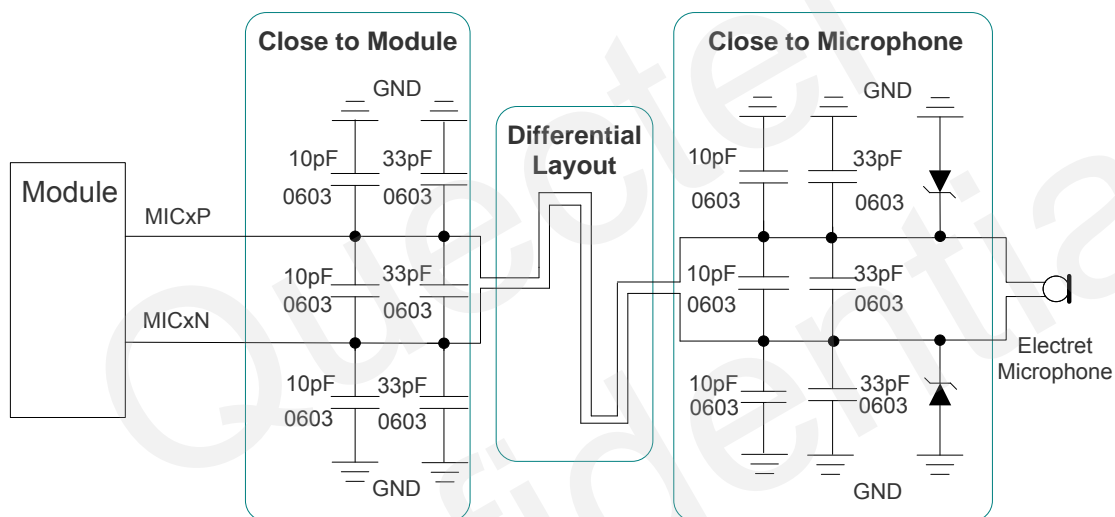


Figure 21: Microphone Reference Design for AIN1&AIN2

3.11.3. Receiver and Speaker Interface Application

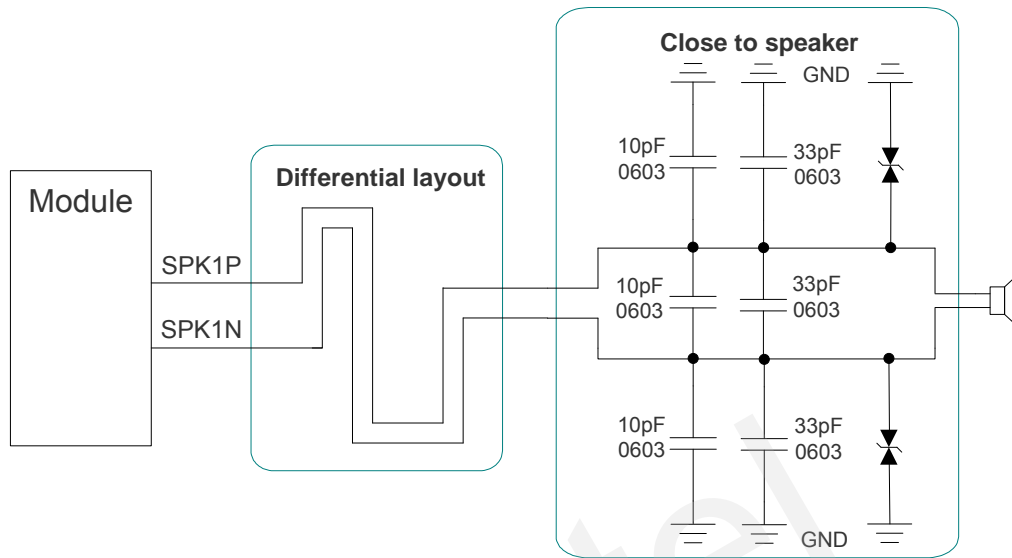


Figure 22: Reference Design for AOUT1

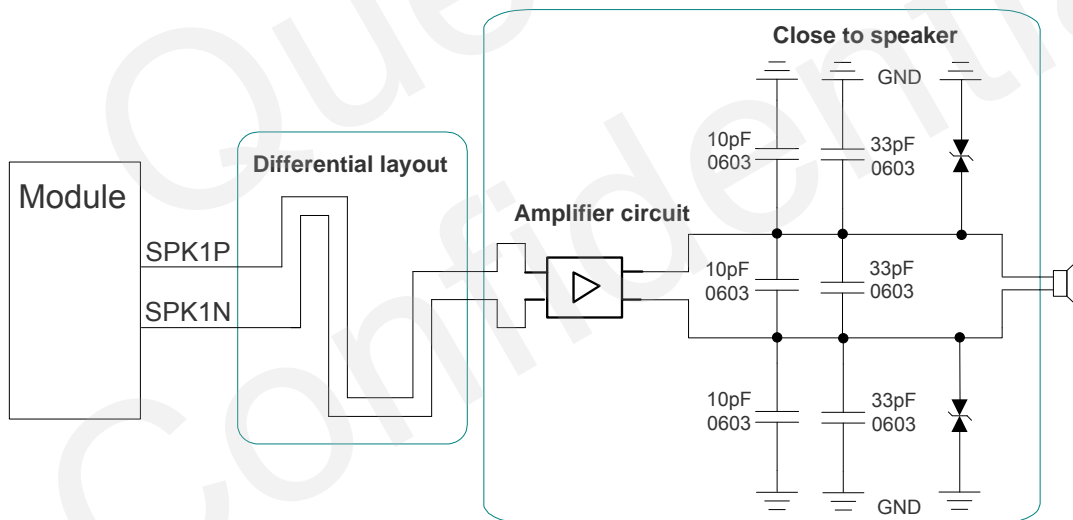


Figure 23: Reference Design with an Amplifier for AOUT1

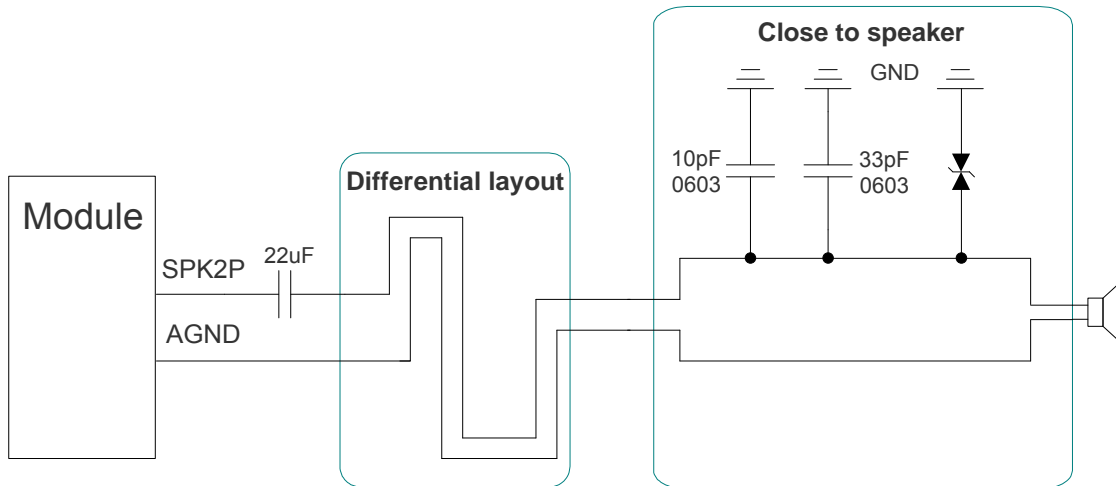


Figure 24: Reference Design for AOUT2

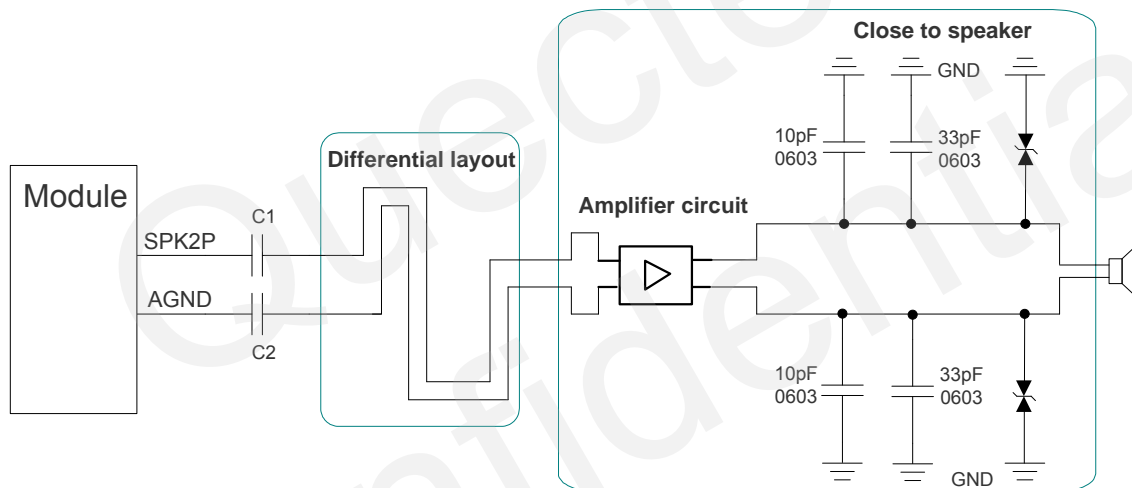


Figure 25: Reference Design with an Amplifier for AOUT2

NOTE

The value of C1 and C2 depends on the input impedance of audio amplifier.

3.11.4. Earphone Interface Application

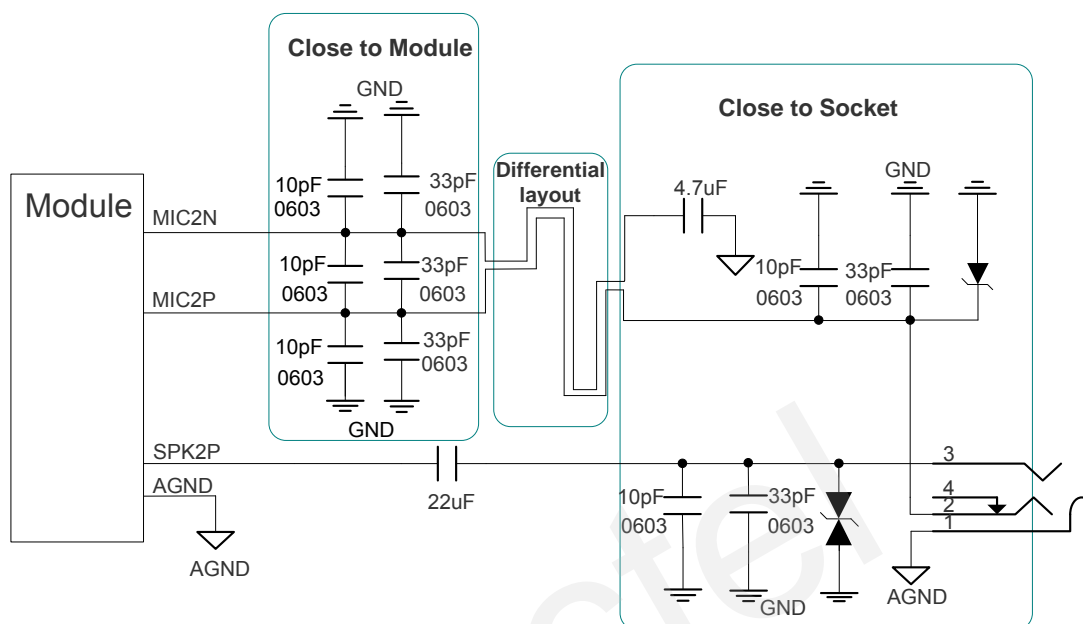


Figure 26: Reference Design for an Earphone

Table 14: Microphone Characteristics

| Parameter | Min. | Typ. | Max. | Unit |
|-----------------|------|------|------|------|
| Working Voltage | 1.65 | 1.8 | 1.95 | V |
| Working Current | 20 | | 1000 | uA |

Table 15: Speaker Characteristics

| Parameter | Min. | Typ. | Max. | Unit | | |
|---------------------------------|--------------|-----------------|------|------|-----|-----|
| Normal Output (AOUT1) | Differential | Supply voltage | 2.0 | 2.1 | 2.2 | V |
| | | Load resistance | 25.6 | 32 | | ohm |
| Auxiliary Output (AOUT2) | Single ended | Supply voltage | 2.0 | 2.1 | 2.2 | V |
| | | Load resistance | 12 | 16 | | ohm |
| Output Power of AOUT1 and AOUT2 | | | 50 | | mW | |

3.12. PCM and I2C Interface

UC15 provides one Pulse Code Modulation (PCM) digital interface, supports 8-bit A-law and μ -law, and 16-bit linear data formats. UC15 supports the following modes:

- Primary mode (short sync, works as both master and slave)
- Auxiliary mode (long sync, works as master only)

UC15 supports an 8 kHz short sync mode at 2048 kHz, the data is sampled on the falling edge of the PCM_CLK and transmitted on the rising edge, and the PCM_SYNC falling edge represents the MSB.

UC15 also supports an 8 kHz long sync mode at 128 kHz, the data is sampled on the falling edge of the PCM_CLK and transmitted on the rising edge, and the PCM_SYNC rising edge represents the MSB.

The following figures show the different timing relationships of these modes.

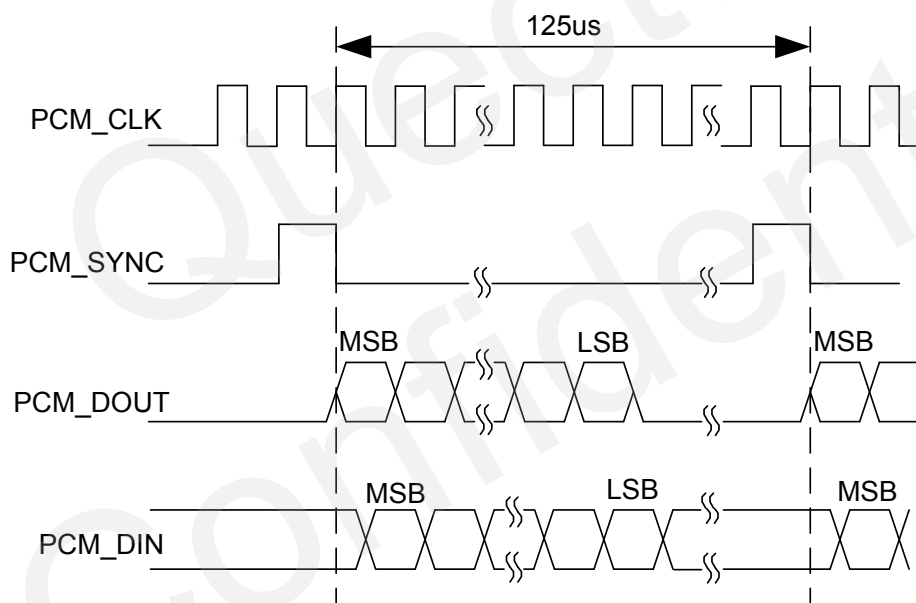


Figure 27: Primary Mode Timing

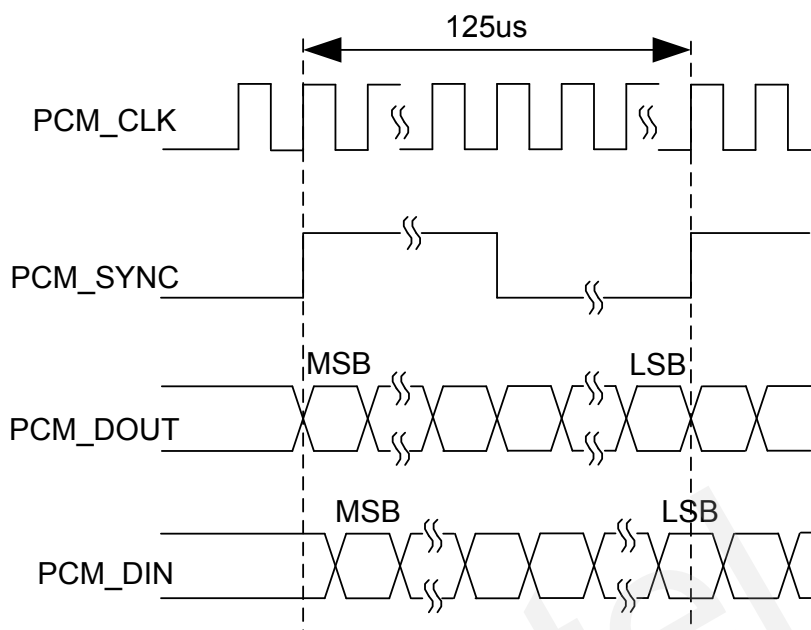


Figure 28: Auxiliary Mode Timing

The following table shows the pin definition of PCM and I2C interface which can be applied on audio codec design.

Table 16: Pin Definition of PCM and I2C Interface

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|----------------------------|--|
| PCM_DOUT | 34 | DO | PCM data output. | 2.6V power domain .If unused, keep it open. |
| PCM_DIN | 35 | DI | PCM data input. | 2.6V power domain. If unused, keep it open. |
| PCM_CLK | 36 | IO | PCM data bit clock. | 2.6V power domain. If unused, keep it open. |
| PCM_SYNC | 37 | IO | PCM data frame sync signal | 2.6V power domain. If unused, keep it open. |
| I2C_SDA | 38 | IO | I2C serial data. | External pull-up resistor is required. 2.6V only. If unused, keep it open. |
| I2C_SCL | 39 | DO | I2C serial clock. | External pull-up resistor is required. 2.6V only. If unused, keep it open. |

UC15's firmware has integrated the configuration on NAU8814 application with I2C interface. The default configuration is master mode which uses short sync data format with 2048 kHz clock. Please refer to **document [1]** for details about the command **AT+QDAI**.

The following figure shows the reference design of PCM interface with external codec IC.

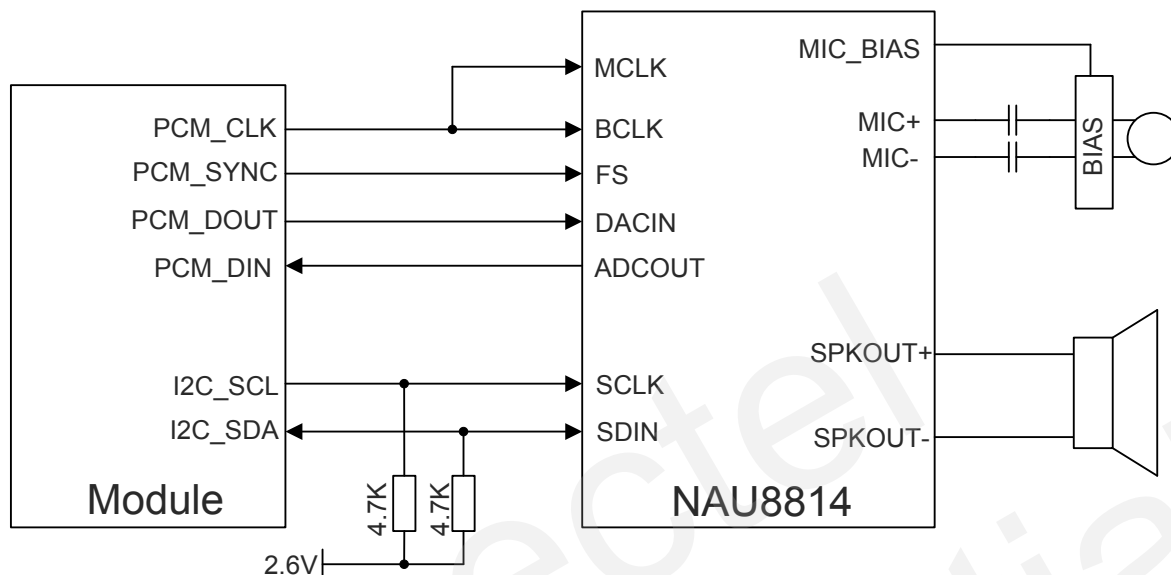


Figure 29: Reference Circuit of PCM Application with Audio Codec

NOTES

1. It is recommended to reserve RC ($R=22\Omega$, $C=22pF$) circuit on the PCM lines, especially for PCM_CLK.
2. I2C bus is the standard interface, which is used with NAU8814 application by default.

3.13. USIM Card Interface

The USIM card interface circuitry meets ETSI and IMT-2000 USIM interface requirements. Both 1.8V and 3.0V USIM cards are supported.

Table 17: Pin Definition of the USIM Interfaces

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|-----------------------------|---|
| USIM_VDD | 12 | PO | Power supply for USIM card. | Either 1.8V or 3.0V is supported by the module automatically. |

| | | | | |
|---------------|----|----|---------------------------------|-------------------|
| USIM_DATA | 13 | IO | Data signal of USIM card. | |
| USIM_CLK | 14 | DO | Clock signal of USIM card. | |
| USIM_RST | 15 | DO | Reset signal of USIM card. | |
| USIM_PRESENCE | 11 | DI | USIM card detection input. | 2.6V power domain |
| USIM_GND | 8 | | Specified ground for USIM card. | |

The following figure shows the reference design of the 8-pin USIM card.

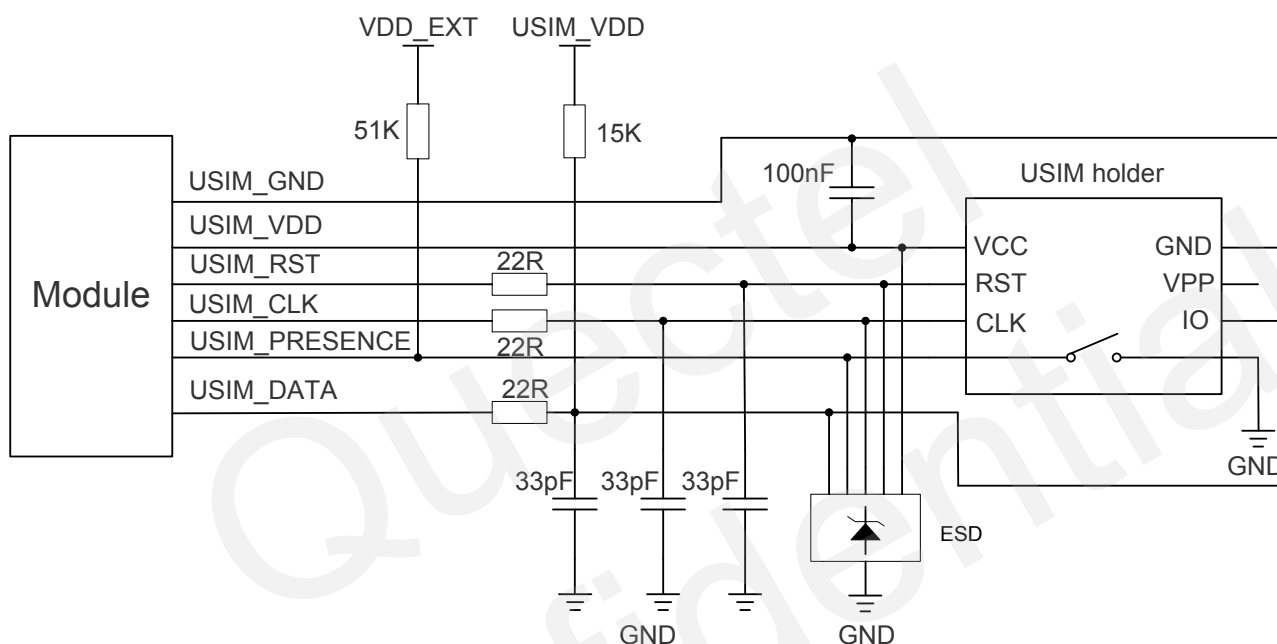


Figure 30: Reference Circuit of the 8-Pin USIM Card

NOTE

Some AT commands are invalid when USIM card is not applied.

UC15 supports USIM card hot-plugging via the USIM_PRESENCE pin. For details, refer to **document [1]** about the command **AT+QSIMDET**. If you do not need the USIM card detection function, keep USIM_PRESENCE unconnected. The reference circuit for using a 6-pin USIM card holder is illustrated as the following figure.

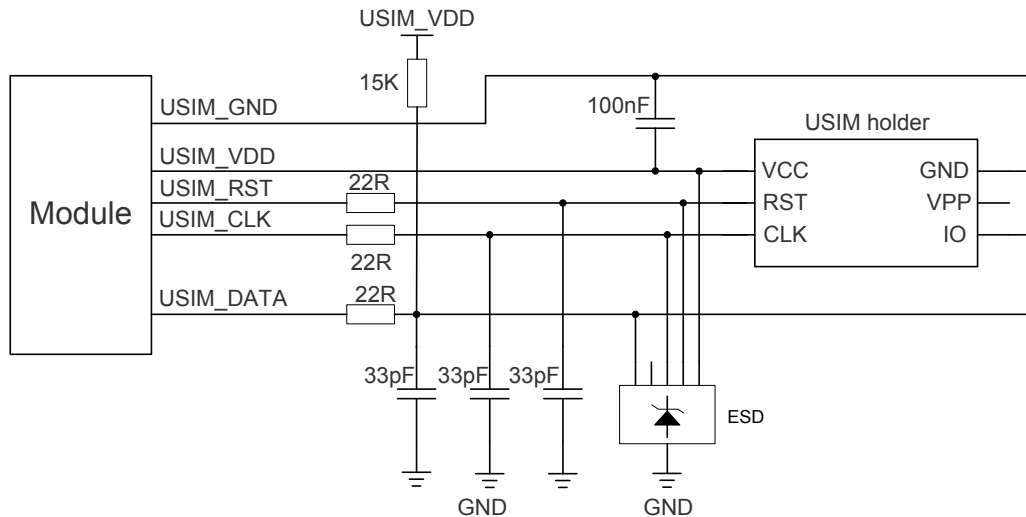


Figure 31: Reference Circuit of the 6-Pin USIM Card

In order to enhance the reliability and availability of the USIM card in customer's application, please follow the following criterion in the USIM circuit design:

- Keep layout of USIM card as close as possible to the module. Assure the possibility of the length of the trace is less than 200mm.
- Keep USIM card signal away from RF and VBAT alignment.
- Assure the ground between module and USIM cassette short and wide. Keep the width of ground and USIM_VDD no less than 0.5mm to maintain the same electric potential. The decouple capacitor of USIM_VDD should be less than 1uF and must be near to USIM cassette.
- To avoid cross-talk between USIM_DATA and USIM_CLK, keep them away with each other and shield them with surrounded ground.
- In order to offer good ESD protection, it is recommended to add TVS. The capacitance of ESD component is less than 50pF. The 22Ω resistors should be added in series between the module and the USIM card so as to suppress the EMI spurious transmission and enhance the ESD protection. The 33pF capacitors are used for filtering interference of GSM850/900. Please note that the USIM peripheral circuit should be close to the USIM card holder.
- The pull-up resistor on USIM_DATA line can improve anti-jamming capability when long layout trace and sensitive occasion is applied.

3.14. USB Interface

UC15 contains one integrated Universal Serial Bus (USB) transceiver which complies with the USB 2.0 specification and supports high speed (480Mbps), full speed (12Mbps) and low speed (1.5Mbps) mode. The USB interface is primarily used for AT command, data transmission, software debug and firmware upgrade. The following table shows the pin definition of USB interface.

Table 18: USB Pin Description

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|--------------------------------------|---------------------------------------|
| USB_DP | 62 | IO | USB differential data bus (positive) | Require differential impedance of 90Ω |
| USB_DM | 63 | IO | USB differential data bus (negative) | Require differential impedance of 90Ω |
| USB_VBUS | 64 | PI | USB detection | 3.0~5.25V Typical 5.0V |

More details about the USB 2.0 specifications, please visit <http://www.usb.org/home>.

The following figure shows the reference circuit of USB interface.

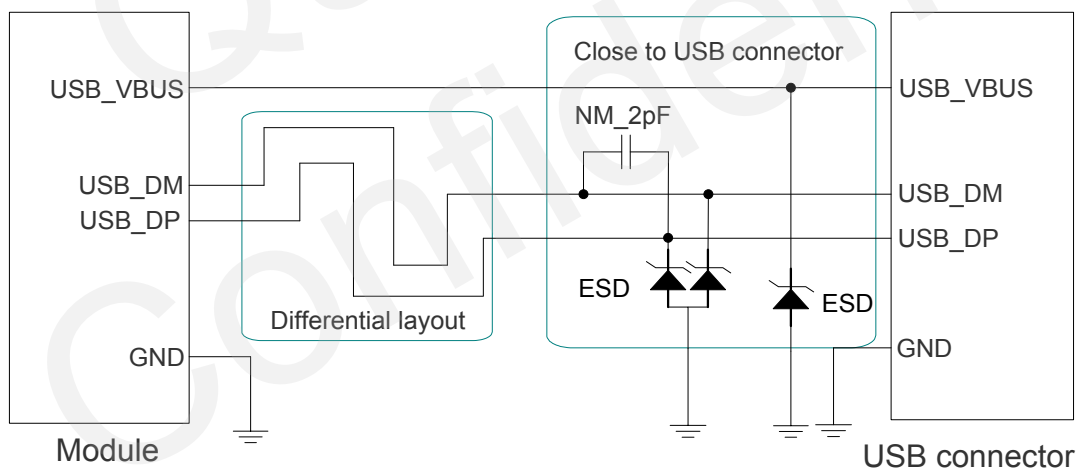


Figure 32: Reference Circuit of USB Application

In order to ensure the USB interface design corresponding with the USB 2.0 specification, please comply with the following principles.

- It is important to route the USB signal traces as differential pairs with total grounding. The impedance of USB differential trace is 90ohm.
- Keep the ESD components as closer to the USB connector as possible.
- Pay attention to the influence of junction capacitance of ESD component on USB data lines. Typically, the capacitance value should be less than 2pF.
- Do not route signal traces under crystals, oscillators, magnetic devices and RF signal traces. It is important to route the USB differential traces in inner-layer with ground shielding not only upper and lower layer but also right and left side.

NOTE

UC15 module can only be used as a slave device.

The USB interface is recommended to be reserved for firmware upgrade in your design. The following figure shows the recommended test points.

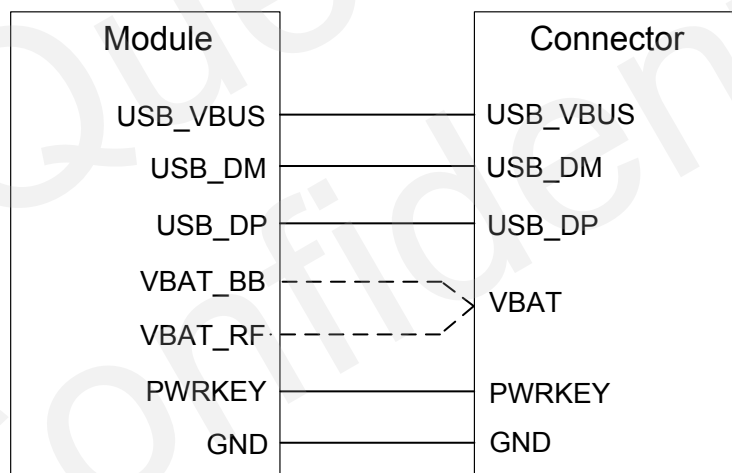


Figure 33: Test Points of Firmware Upgrade

3.15. ADC Function

The module provides two analog-to-digital converters (ADC) to digitize the analog signal to 12-bit digital data. Using AT command **AT+QADC=0** can read the voltage value on ADC0 pin. Using AT command **AT+QADC=1** can read the voltage value on ADC1 pin. For more details of these AT commands, please refer to *document [1]*.

In order to improve the accuracy of ADC, the trace of ADC should be surrounded by ground.

Table 19: Pin Definition of the ADC

| Pin Name | Pin NO. | Description |
|----------|---------|--|
| ADC0 | 41 | General purpose analog to digital converter. |
| ADC1 | 40 | General purpose analog to digital converter. |

The following table describes the characteristics of the ADC function.

Table 20: Characteristics of the ADC

| Parameter | Min. | Typ. | Max. | Unit |
|--------------------|------|------|------|------|
| ADC0 Voltage Range | 0 | | 2.1 | V |
| ADC1 Voltage Range | 0 | | 2.1 | V |
| Sample Rate | | 2.4 | | MHz |
| ADC Resolution | | 12 | | bits |

3.16. Network Status Indication

The module provides a pin named NETLIGHT to indicate the module network status which can be used to drive a LED. The following tables describe pin definition and logic level changes in different network status.

Table 21: Pin Definition of Network Indicator

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|--|---|
| NETLIGHT | 6 | DO | Indicate the module network activity status. | 2.6V power domain. If unused, keep it open. |

Table 22: Working State of the Network Indicator

| Pin Name | Status | Description |
|----------|------------------------|--------------------|
| NETLIGHT | 200ms High/1800ms Low. | Network searching. |
| | 1800ms High/200ms Low. | Idle. |

| | |
|-----------------------|---------------------------|
| 125ms High/125ms Low. | Data transfer is ongoing. |
| Always High. | Voice calling. |
| Always Low. | Sleep. |

A reference circuit is shown in the following figure.

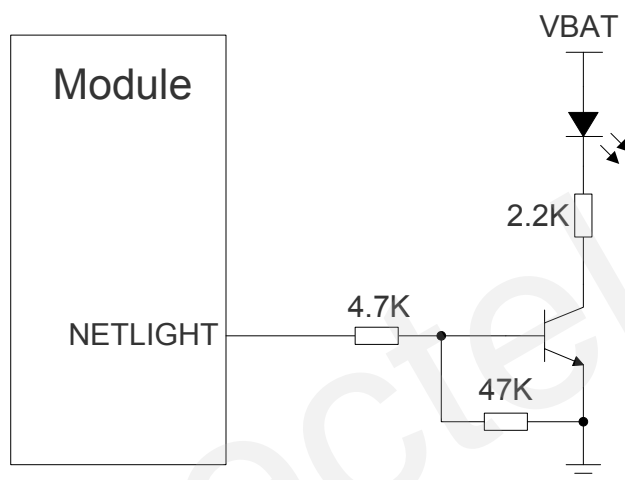


Figure 34: Reference Circuit of the Network Indicator

3.17. Operating Status Indication

The STATUS is used to indicate the module operation status. When the module is turned on normally, the STATUS will output high level.

Table 23: Pin Definition of STATUS

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|---------------------------------------|---|
| STATUS | 54 | DO | Indicate the module operation status. | 2.6V power domain. If unused, keep it open. |

A reference circuit is shown in the following figure.

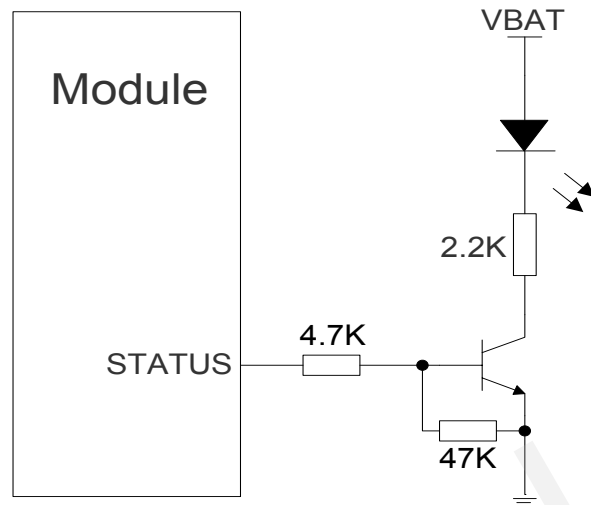


Figure 35: Reference Circuit of the STATUS

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4 Antenna Interface

4.1. Antenna Interface

4.1.1. Pin Definition

Pin definition of RF antenna is shown as below.

Table 24: Pin Definition of the RF Antenna

| Pin Name | Pin No. | I/O | Description | Comment |
|----------|---------|-----|----------------|---------------|
| RF_ANT | 43 | IO | RF antenna pad | 50Ω impedance |

4.1.2. Operating Frequency

Table 25: Module Operating Frequencies

| Band | Receive | Transmit | Unit |
|----------|-------------|-------------|------|
| GSM850 | 869 ~ 894 | 824 ~ 849 | MHz |
| EGSM900 | 925 ~ 960 | 880 ~ 915 | MHz |
| DCS1800 | 1805 ~ 1880 | 1710 ~ 1785 | MHz |
| PCS1900 | 1930 ~ 1990 | 1850 ~ 1910 | MHz |
| UMTS2100 | 2110 ~ 2170 | 1920 ~ 1980 | MHz |
| UMTS1900 | 1930 ~ 1990 | 1850 ~ 1910 | MHz |
| UMTS900 | 925 ~ 960 | 880 ~ 915 | MHz |
| UMTS850 | 869 ~ 894 | 824 ~ 849 | MHz |

4.1.3. Reference Design

The RF interface has an impedance of 50Ω. The reference design of RF antenna is shown as below. It should reserve a π-type matching circuit for better RF performance. The capacitors are not mounted by default.

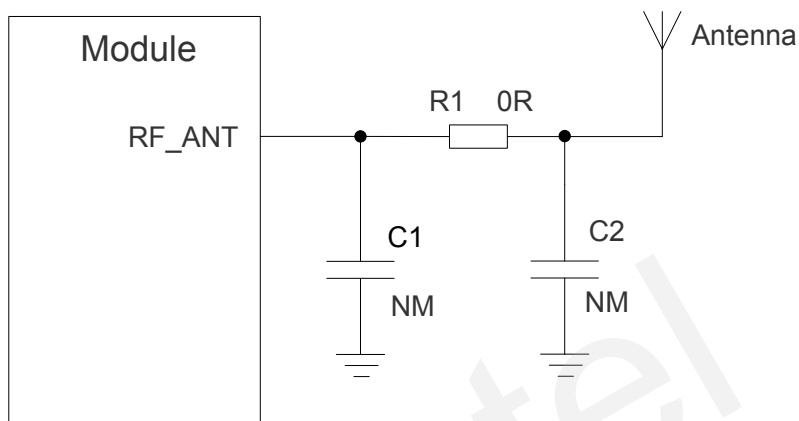


Figure 36: Reference Circuit of Antenna Interface

4.2. Antenna Installation

4.2.1. Antenna Requirement

The following table shows the requirements on GSM/UMTS antenna.

Table 26: Antenna Cable Requirements

| Type | Requirements |
|----------------------------------|-------------------------------|
| GSM850/EGSM900 UMTS850/900 | Cable insertion loss < 0.5dB. |
| DCS1800/PCS1900 UMTS1900/2100 | Cable insertion loss < 0.9dB. |

Table 27: Antenna Requirements

| Type | Requirements |
|---------------------|---|
| Frequency Range | UC15-A: GSM Quad-band: 850/900/1800/1900MHz. UMTS Dual-band: 850/1900MHz. UC15-E: GSM Dual-band: 900/1800MHz. UMTS Dual-band: 900/2100MHz. |
| VSWR | ≤ 2 |
| Gain (dBi) | 1 |
| Max Input Power (W) | 50 |
| Input Impedance (Ω) | 50 |
| Polarization Type | Vertical |

4.2.2. Install the Antenna with RF Connector

The following is the antenna installation with RF connector provided by HIROSE. The recommended RF connector is UF.L-R-SMT.

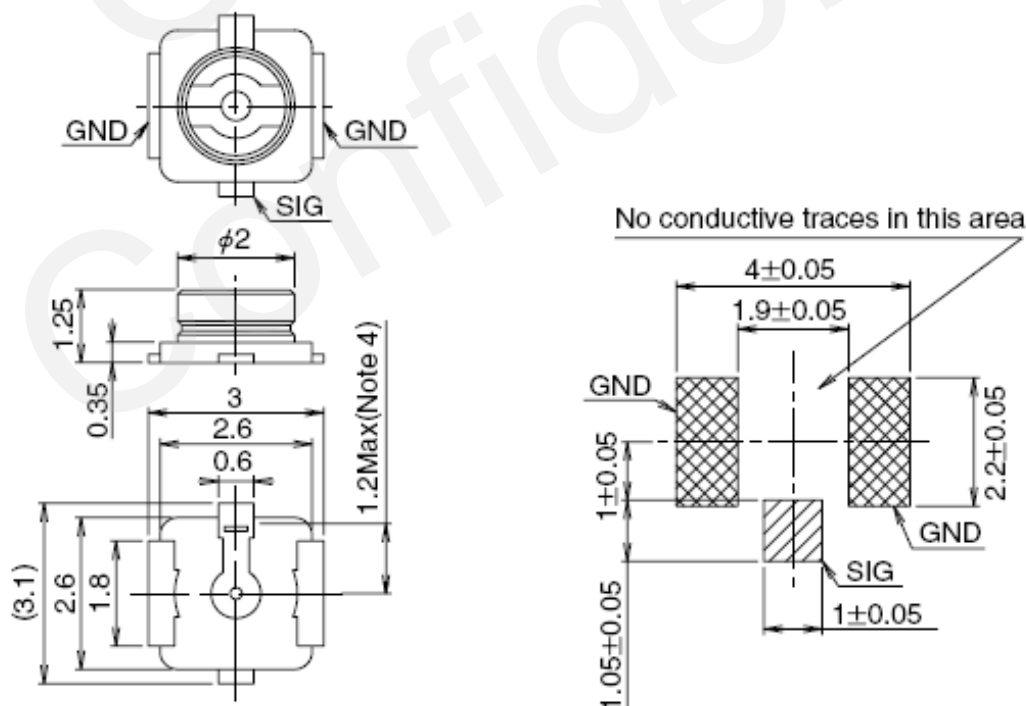


Figure 37: Dimensions of the UF.L-R-SMT Connector (Unit: mm)

You can use U.FL-LP serial connector listed in the following figure to match the UF.L-R-SMT.

| Part No. | U.FL-LP-040 | U.FL-LP-066 | U.FL-LP(V)-040 | U.FL-LP-062 | U.FL-LP-088 |
|------------------|------------------------------|---|------------------------------|----------------------------|------------------------------|
| | | | | | |
| Mated Height | 2.5mm Max. (2.4mm Nom.) | 2.5mm Max. (2.4mm Nom.) | 2.0mm Max. (1.9mm Nom.) | 2.4mm Max. (2.3mm Nom.) | 2.4mm Max. (2.3mm Nom.) |
| Applicable cable | Dia. 0.81mm Coaxial cable | Dia. 1.13mm and Dia. 1.32mm Coaxial cable | Dia. 0.81mm Coaxial cable | Dia. 1mm Coaxial cable | Dia. 1.37mm Coaxial cable |
| Weight (mg) | 53.7 | 59.1 | 34.8 | 45.5 | 71.7 |
| RoHS | YES | | | | |

Figure 38: Mechanicals of UF.L-LP Connectors (Unit: mm)

The following figure describes the space factor of mated connector:

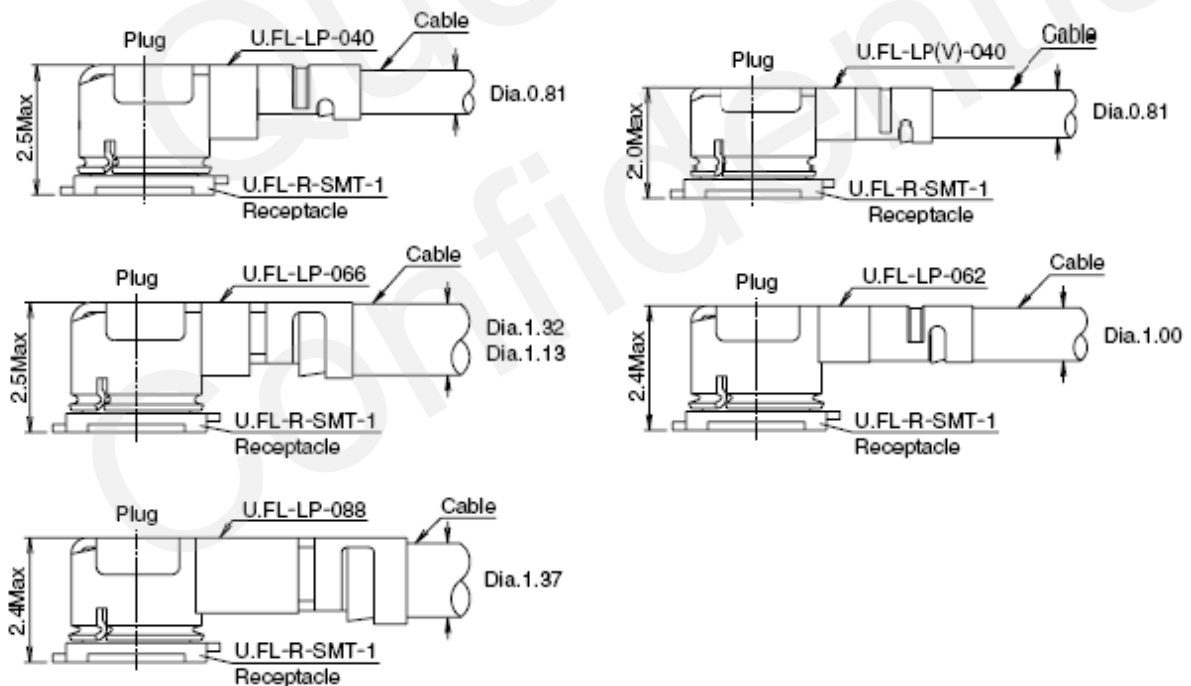


Figure 39: Space Factor of Mated Connector (Unit: mm)

For more details, please visit <http://www.hirose.com>.

5 Electrical, Reliability and Radio Characteristics

5.1. Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital and analog pins of module are listed in the following table:

Table 28: Absolute Maximum Ratings

| Parameter | Min. | Max. | Unit |
|--|------|------|------|
| VBAT_RF/VBAT_BB | -0.5 | 4.7 | V |
| USB_VBUS | -0.5 | 6.0 | V |
| Peak Current of VBAT_BB | 0 | 0.8 | A |
| Peak Current of VBAT_RF | 0 | 1.8 | A |
| Voltage at Digital Pins (1.8V digital I/O) | -0.3 | 2.1 | V |
| Voltage at Digital Pins (2.6V digital I/O) | -0.3 | 2.9 | V |
| Voltage at ADC0 | 0 | 2.2 | V |
| Voltage at ADC1 | 0 | 2.2 | V |

5.2. Power Supply Ratings

Table 29: The Module Power Supply Ratings

| Parameter | Description | Conditions | Min. | Typ. | Max. | Unit |
|-------------------|--|--|------|------|------|------|
| VBAT | VBAT_BB and VBAT_RF | Voltage must stay within the min/max values, including voltage drop, ripple, and spikes. | 3.3 | 3.8 | 4.3 | V |
| | Voltage drop during transmitting burst | Maximum power control level on GSM850 and EGSM900. | | | 400 | mV |
| I _{VBAT} | Peak supply current (during transmission slot) | Maximum power control level on GSM850 and EGSM900. | | 1.8 | 2.0 | A |
| USB_VBUS | USB detection | | 3.0 | 5.0 | 5.25 | V |

5.3. Operating Temperature

The operating temperature is listed in the following table.

Table 30: Operating Temperature

| Parameter | Min. | Typ. | Max. | Unit |
|------------------------------------|-----------|------|-----------|------|
| Normal Temperature | -35 | +25 | +80 | °C |
| Restricted Operation ¹⁾ | -40 ~ -35 | | +80 ~ +85 | °C |
| Storage Temperature | -45 | | +90 | °C |

NOTE

¹⁾ When the module works within the temperature range, the deviations from the RF specification may occur. For example, the frequency error or the phase error would increase.

5.4. Current Consumption

The values of current consumption are shown below.

Table 31: Module Current Consumption

| Parameter | Description | Conditions | Typ. | Unit | |
|------------|--------------------------------|--------------------------------|--|--|----|
| I_{VBAT} | OFF state supply current | Power down | 65 | uA | |
| | GSM/GPRS supply current | Sleep (USB disconnected) | 3.1 @DRX=2 2.0 @DRX=5 1.6 @DRX=9 | mA | |
| | | Sleep (USB suspended) | 3.3 @DRX=2 2.2 @DRX=5 1.8 @DRX=9 | mA | |
| | | Idle (USB disconnected) @DRX=5 | 30 | mA | |
| | WCDMA supply current | Idle (USB connected) @DRX=5 | 60 | mA | |
| | | Sleep (USB disconnected) | 3.4 @DRX=6 2.4 @DRX=7 2.0 @DRX=8 1.6 @DRX=9 | mA | |
| | | | Sleep (USB suspended) | 3.6 @DRX=6 2.4 @DRX=7 2.1 @DRX=8 1.7 @DRX=9 | mA |
| | Idle (USB disconnected) @DRX=6 | | | 30 | mA |
| | Idle (USB connected) @DRX=6 | | | 60 | mA |
| | GPRS data transfer | GSM850 1DL/1UL @PCL=5 | 222 | mA | |
| | | GSM850 4DL/1UL @PCL=5 | 235 | mA | |
| | | GSM850 3DL/2UL @PCL=5 | 335 | mA | |
| | | GSM850 2DL/3UL @PCL=5 | 420 | mA | |
| | | GSM850 1DL/4UL @PCL=5 | 480 | mA | |
| | | EGSM900 1DL/1UL @PCL=5 | 220 | mA | |
| | | EGSM900 4DL/1UL @PCL=5 | 230 | mA | |

| | | | |
|---------------------|---------------------------|-----|----|
| | EGSM900 3DL/2UL @PCL=5 | 330 | mA |
| | EGSM900 2DL/3UL @PCL=5 | 415 | mA |
| | EGSM900 1DL/4UL @PCL=5 | 470 | mA |
| | DCS1800 1DL/1UL @PCL=0 | 180 | mA |
| | DCS1800 4DL/1UL @PCL=0 | 180 | mA |
| | DCS1800 3DL/2UL @PCL=0 | 250 | mA |
| | DCS1800 2DL/3UL @PCL=0 | 307 | mA |
| | DCS1800 1DL/4UL @PCL=0 | 345 | mA |
| | PCS1900 1DL/1UL @PCL=0 | 170 | mA |
| | PCS1900 4DL/1UL @PCL=0 | 170 | mA |
| | PCS1900 3DL/2UL @PCL=0 | 238 | mA |
| | PCS1900 2DL/3UL @PCL=0 | 295 | mA |
| | PCS1900 1DL/4UL @PCL=0 | 331 | mA |
| WCDMA data transfer | UMTS2100 HSDPA @max power | 420 | mA |
| | UMTS1900 HSDPA @max power | 475 | mA |
| | UMTS850 HSDPA @max power | 440 | mA |
| | UMTS900 HSDPA @max power | 445 | mA |
| GSM voice call | GSM850 @PCL=5 | 260 | mA |
| | EGSM900 @PCL=5 | 250 | mA |
| | DCS1800 @PCL=0 | 200 | mA |
| | PCS1900 @PCL=0 | 188 | mA |
| WCDMA voice call | UMTS2100 @max power | 430 | mA |
| | UMTS1900 @max power | 480 | mA |
| | UMTS850 @max power | 440 | mA |
| | UMTS900 @max power | 450 | mA |

5.5. RF Output Power

Table 32: Module Conducted RF Output Power

| Frequency | Max. | Min. |
|-----------|--------------|------------|
| GSM850 | 33dBm±2dB | 5dBm±5dB |
| EGSM900 | 33dBm±2dB | 5dBm±5dB |
| DCS1800 | 30dBm±2dB | 0dBm±5dB |
| PCS1900 | 30dBm±2dB | 0dBm±5dB |
| UMTS850 | 24dBm+1/-3dB | -56dBm±5dB |
| UMTS900 | 24dBm+1/-3dB | -56dBm±5dB |
| UMTS1900 | 24dBm+1/-3dB | -56dBm±5dB |
| UMTS2100 | 24dBm+1/-3dB | -56dBm±5dB |

NOTE

In GPRS 4 slots TX mode, the max output power is reduced by 2.5dB. This design conforms to the GSM specification as described in Chapter 13.16 of 3GPP TS 51.010-1.

5.6. RF Receiving Sensitivity

Table 33: Module Conducted Receiving Sensitivity

| Frequency | Receive Sensitivity (Typ.) | Unit |
|-----------|----------------------------|------|
| GSM850 | -108.5 | dBm |
| EGSM900 | -108.5 | dBm |
| DCS1800 | -108.5 | dBm |
| PCS1900 | -108.5 | dBm |
| UMTS850 | -110 | dBm |
| UMTS900 | -110 | dBm |
| UMTS1900 | -110 | dBm |

UMTS2100

-110

dBm

5.7. Electrostatic Discharge

The module is not protected against electrostatics discharge (ESD) in general. Consequently, it is subject to ESD handling precautions that typically apply to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates the module.

The following table shows the module electrostatics discharge characteristics.

Table 34: Electrostatics Discharge Characteristics

| Tested Points | Contact Discharge | Air Discharge | Unit |
|-------------------|-------------------|---------------|------|
| VBAT, GND | ±5 | ±10 | kV |
| Antenna Interface | ±4 | ±8 | kV |
| Other Interfaces | ±0.5 | ±1 | kV |

6 Mechanical Dimensions

This chapter describes the mechanical dimensions of the module. All dimensions are measured in mm.

6.1. Mechanical Dimensions of the Module

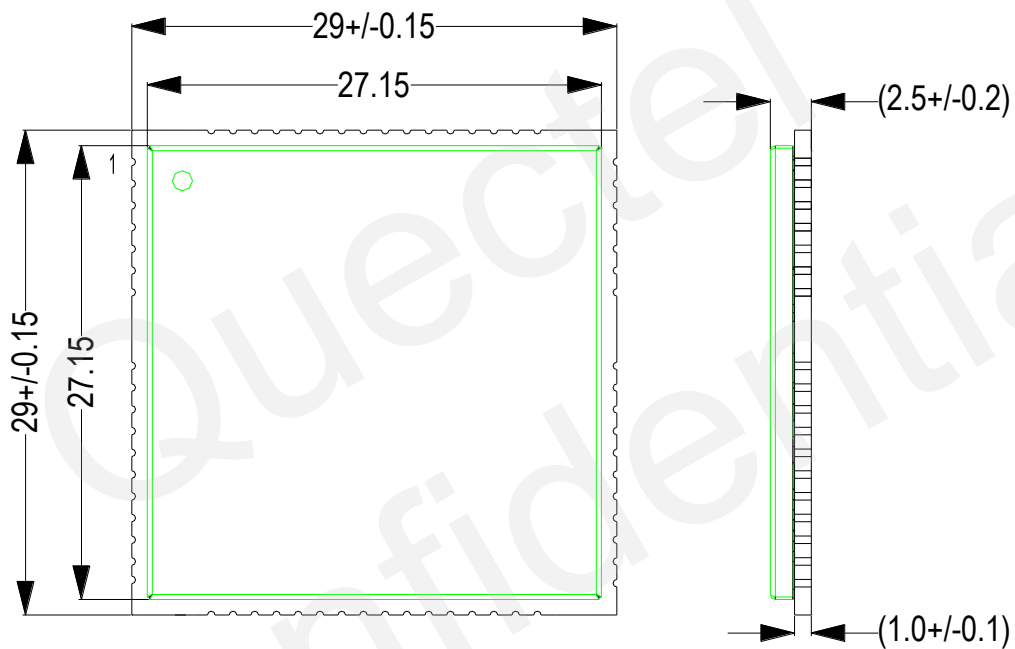


Figure 40: UC15 Top and Side Dimensions

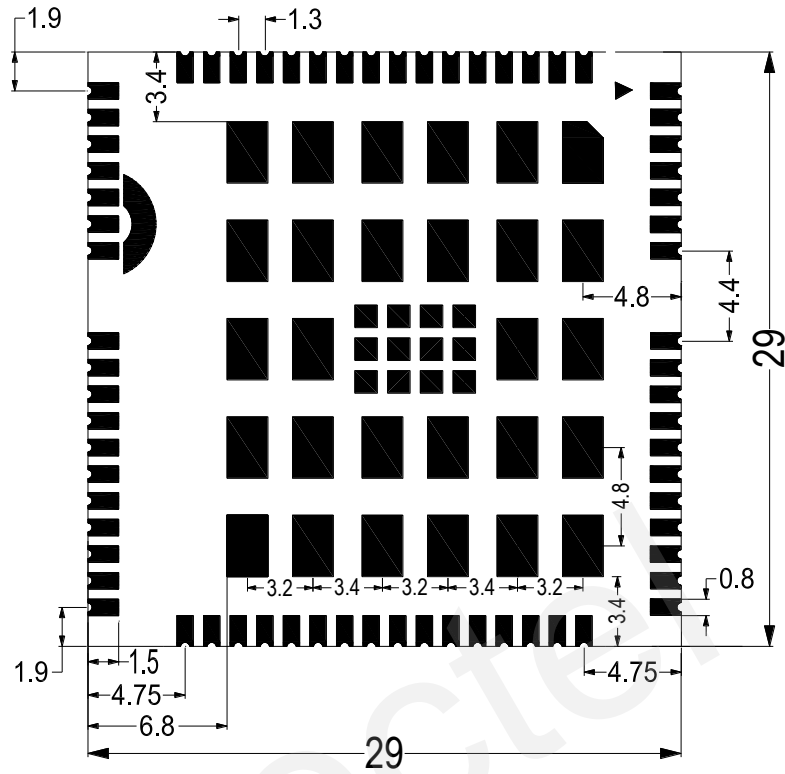


Figure 41: UC15 Bottom Dimensions (Bottom View)

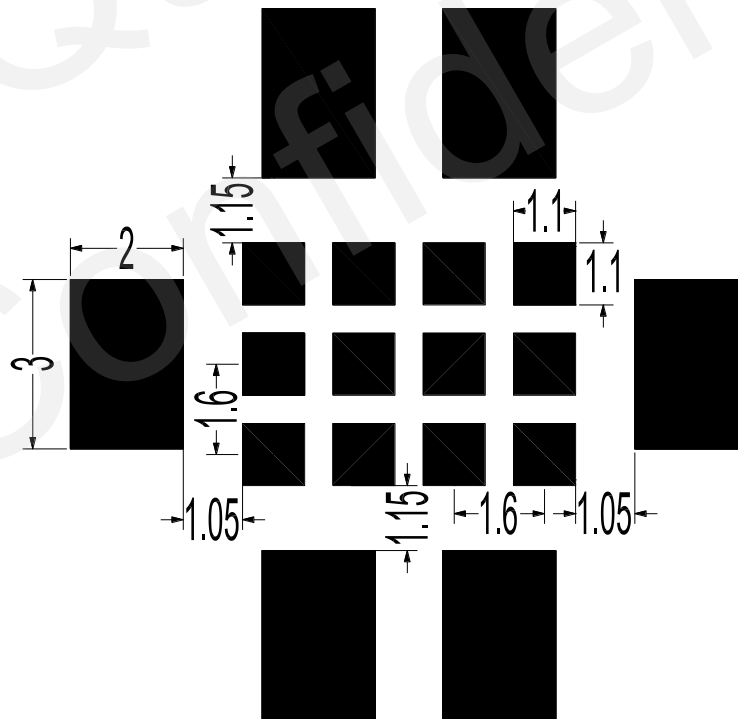


Figure 42: Bottom Pads Dimensions (Bottom View)

6.2. Footprint of Recommendation

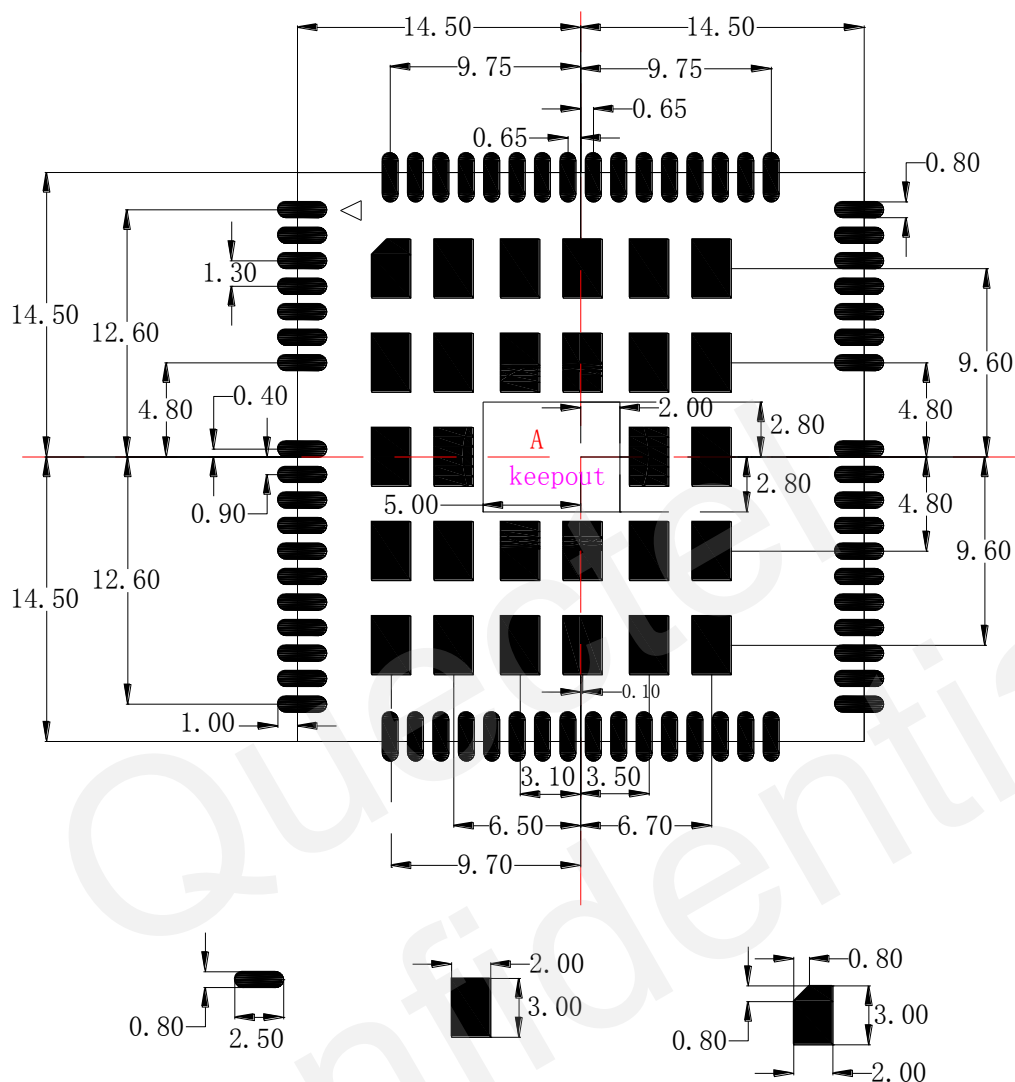


Figure 43: Recommended Footprint (Top View)

NOTES

1. Refer to **Figure 2** about the pin distribution (especially for pin 65, 66, 67 and 68).
2. The area **A** should be kept out. And the 69~80 pins in area **A** should not be designed in schematic and PCB decal.
3. In order to maintain the module, keep about 3mm between the module and other components in the host PCB.

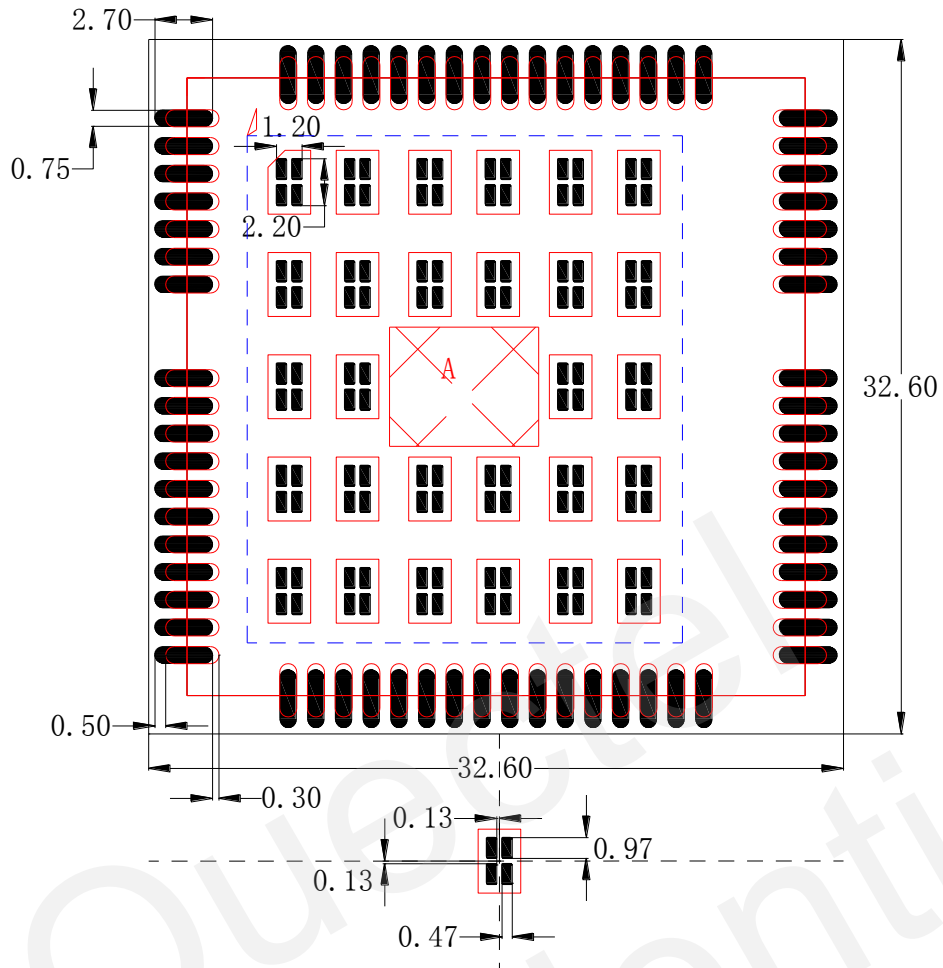


Figure 44: Recommend Stencil

NOTES

1. The thickness of stencil for the pads at the bottom of module is recommended as 0.18mm, and the thickness of LCC pins is recommended as 0.2mm.
2. For better SMT solder, the GND pad at the bottom of the module is divided into four small pads.

6.3. Top View of the Module



Figure 45: Top View of the Module

6.4. Bottom View of the Module

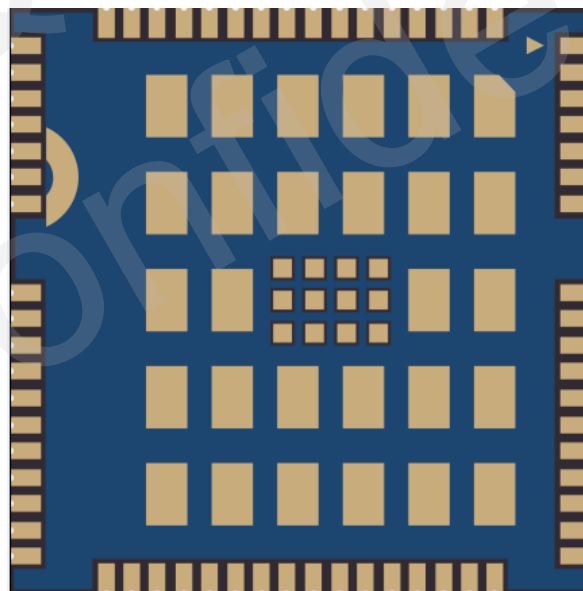


Figure 46: Bottom View of the Module

7 Storage and Manufacturing

7.1. Storage

UC15 is stored in the vacuum-sealed bag. The restriction of storage condition is shown as below.

Shelf life in sealed bag is 12 months at $< 40^{\circ}\text{C}/90\%\text{RH}$.

After this bag is opened, devices that will be subjected to reflow solder or other high temperature process must be:

- Mounted within 72 hours at factory conditions of $\leq 30^{\circ}\text{C}/60\%\text{RH}$.
- Stored at $< 10\% \text{RH}$.

Devices require bake, before mounting, if:

- Humidity indicator card is $> 10\%$ when read $23^{\circ}\text{C}\pm 5^{\circ}\text{C}$.
- Mounted for more than 72 hours at factory conditions of $\leq 30^{\circ}\text{C}/60\% \text{RH}$.

If baking is required, devices may be baked for 48 hours at $125^{\circ}\text{C}\pm 5^{\circ}\text{C}$.

NOTE

As plastic container cannot be subjected to high temperature, module needs to be taken out from container to high temperature (125°C) bake. If shorter bake times are desired, please refer to IPC/JEDECJ-STD-033 for bake procedure.

7.2. Manufacturing and Welding

The squeegee should push the paste on the surface of the stencil that makes the paste fill the stencil openings and penetrate to the PCB. The force on the squeegee should be adjusted so as to produce a clean stencil surface on a single pass. To ensure the module soldering quality, the thickness of stencil at the hole of the module pads should be 0.18mm. For details, please refer to **document [4]**.

It is suggested that peak reflow temperature is 235~245°C (for SnAg3.0Cu0.5 alloy). Absolute max reflow temperature is 260°C. To avoid damage to the module when it was repeatedly heated, it is suggested that the module should be mounted after the first panel has been reflowed. The following picture is the actual diagram which we have operated.

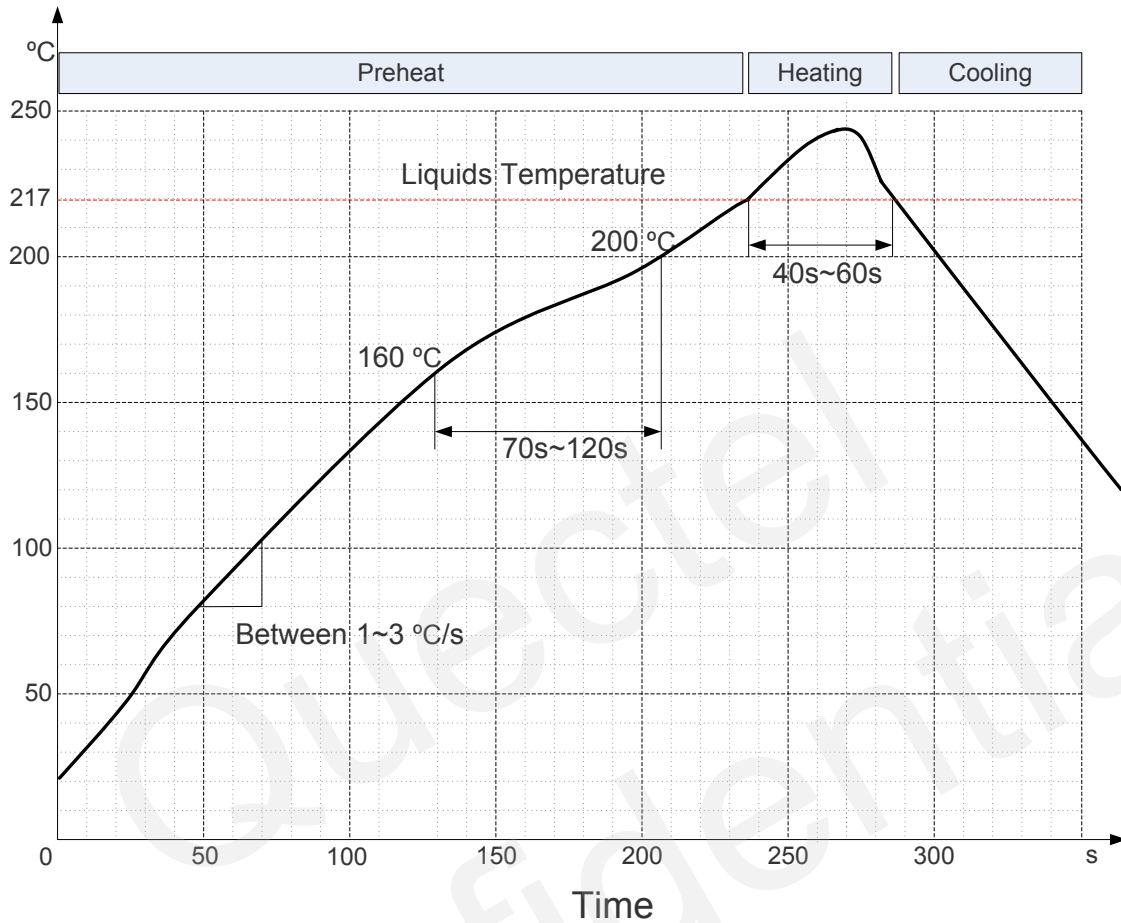


Figure 47: Reflow Soldering Profile

7.3. Packaging

UC15 is packaged in the tap and reel carriers. One reel is 12.4m length and contains 250pcs modules. The following figure shows the package details.

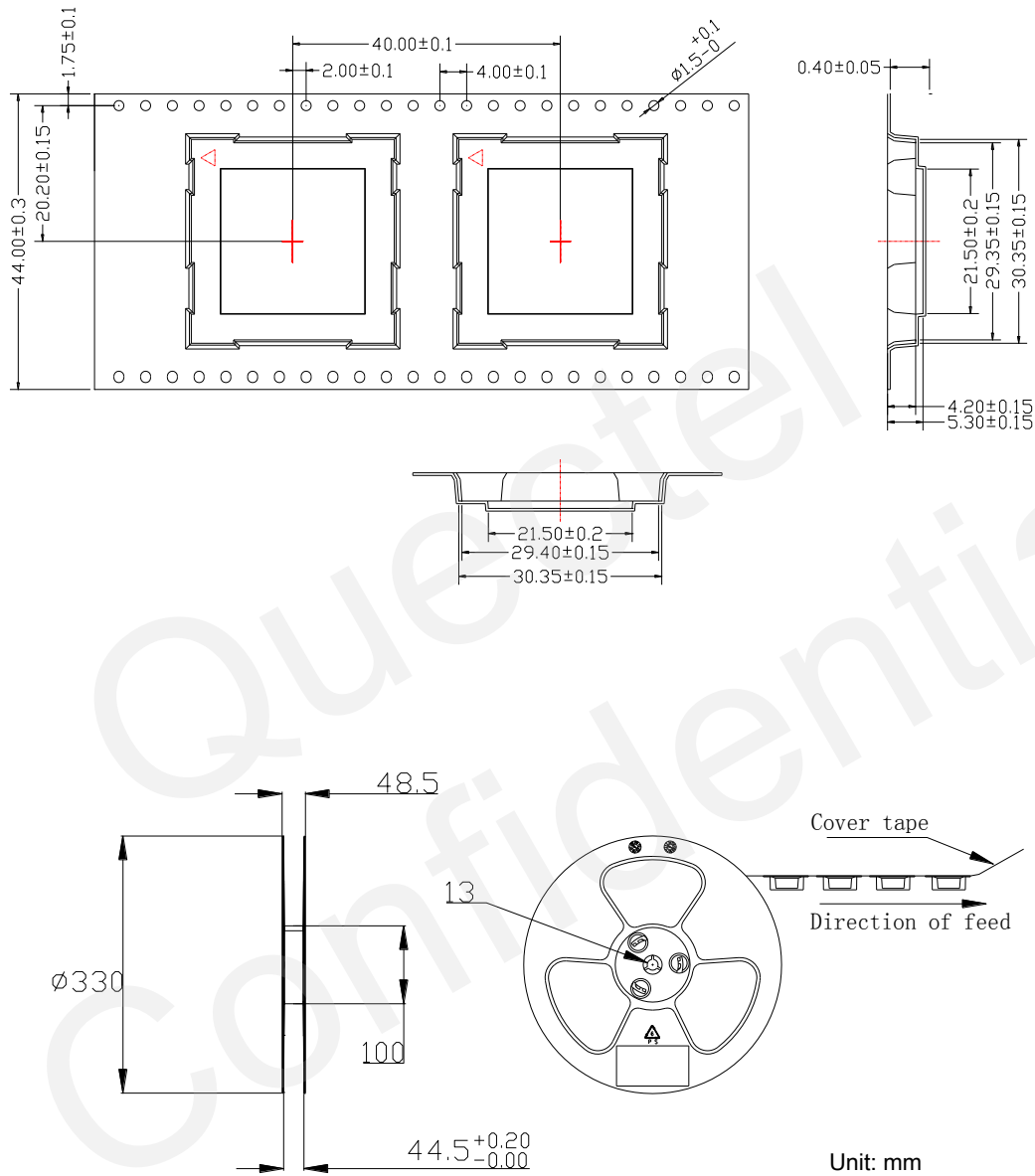


Figure 48: Carrier Tape

8 Appendix A Reference

Table 35: Related Documents

| SN | Document Name | Remark |
|-----|---|---------------------------------|
| [1] | Quectel_UC15_AT_Commands_Manual | UC15 AT commands manual |
| [2] | Quectel_M10_EVB_User_Guide | M10 EVB user guide |
| [3] | Quectel_UC15_Reference_Design | UC15 reference design |
| [4] | Quectel_Module_Secondary_SMT_User_Guide | Module secondary SMT user guide |

Table 36: Terms and Abbreviations

| Abbreviation | Description |
|--------------|---|
| AMR | Adaptive Multi-rate |
| bps | Bits Per Second |
| CHAP | Challenge Handshake Authentication Protocol |
| CS | Coding Scheme |
| CSD | Circuit Switched Data |
| CTS | Clear to Send |
| DRX | Discontinuous Reception |
| DCE | Data Communications Equipment (typical module) |
| DTE | Data Terminal Equipment (typical computer, external controller) |
| DTR | Data Terminal Ready |
| DTX | Discontinuous Transmission |

| | |
|-------|---|
| EFR | Enhanced Full Rate |
| EGSM | Extended GSM900 Band (including standard GSM900 band) |
| ESD | Electrostatic Discharge |
| FR | Full Rate |
| GMSK | Gaussian Minimum Shift Keying |
| GSM | Global System for Mobile Communications |
| HR | Half Rate |
| HSDPA | High Speed Down Link Packet Access |
| IMEI | International Mobile Equipment Identity |
| Imax | Maximum Load Current |
| LED | Light Emitting Diode |
| LSB | Least Significant Bit |
| ME | Mobile Equipment |
| MO | Mobile Originated |
| MS | Mobile Station (GSM Engine) |
| MT | Mobile Terminated |
| PAP | Password Authentication Protocol |
| PBCCH | Packet Broadcast Control Channel |
| PCB | Printed Circuit Board |
| PDU | Protocol Data Unit |
| PPP | Point-to-Point Protocol |
| PSK | Phase Shift Keying |
| QAM | Quadrature Amplitude Modulation |
| QPSK | Quadrature Phase Shift Keying |
| RF | Radio Frequency |

| | |
|--------------------|---|
| RMS | Root Mean Square (value) |
| Rx | Receive |
| SIM | Subscriber Identification Module |
| SMS | Short Message Service |
| TX | Transmitting Direction |
| UART | Universal Asynchronous Receiver & Transmitter |
| UMTS | Universal Mobile Telecommunications System |
| URC | Unsolicited Result Code |
| USIM | Universal Subscriber Identity Module |
| USSD | Unstructured Supplementary Service Data |
| V _{max} | Maximum Voltage Value |
| V _{norm} | Normal Voltage Value |
| V _{min} | Minimum Voltage Value |
| V _{IHmax} | Maximum Input High Level Voltage Value |
| V _{IHmin} | Minimum Input High Level Voltage Value |
| V _{ILmax} | Maximum Input Low Level Voltage Value |
| V _{ILmin} | Minimum Input Low Level Voltage Value |
| V _{Imax} | Absolute Maximum Input Voltage Value |
| V _{Imin} | Absolute Minimum Input Voltage Value |
| V _{OHmax} | Maximum Output High Level Voltage Value |
| V _{OHmin} | Minimum Output High Level Voltage Value |
| V _{OLmax} | Maximum Output Low Level Voltage Value |
| V _{OLmin} | Minimum Output Low Level Voltage Value |
| VSWR | Voltage Standing Wave Ratio |
| WCDMA | Wideband Code Division Multiple Access |

9 Appendix B GPRS Coding Scheme

Table 37: Description of Different Coding Schemes

| Scheme | CS-1 | CS-2 | CS-3 | CS-4 |
|------------------------------|------|------|------|------|
| Code Rate | 1/2 | 2/3 | 3/4 | 1 |
| USF | 3 | 3 | 3 | 3 |
| Pre-coded USF | 3 | 6 | 6 | 12 |
| Radio Block excl.USF and BCS | 181 | 268 | 312 | 428 |
| BCS | 40 | 16 | 16 | 16 |
| Tail | 4 | 4 | 4 | - |
| Coded Bits | 456 | 588 | 676 | 456 |
| Punctured Bits | 0 | 132 | 220 | - |
| Data Rate Kb/s | 9.05 | 13.4 | 15.6 | 21.4 |

10 Appendix C GPRS Multi-slot Class

Twenty-nine classes of GPRS multi-slot modes are defined for MS in GPRS specification. Multi-slot classes are product dependant, and determine the maximum achievable data rates in both the uplink and downlink directions. Written as 3+1 or 2+2, the first number indicates the amount of downlink timeslots, while the second number indicates the amount of uplink timeslots. The active slots determine the total number of slots the GPRS device can use simultaneously for both uplink and downlink communications. The description of different multi-slot classes is shown in the following table.

Table 38: Description of Different Coding Schemes

| Multislot Class | Downlink Slots | Uplink Slots | Active Slots |
|-----------------|----------------|--------------|--------------|
| 1 | 1 | 1 | 2 |
| 2 | 2 | 1 | 3 |
| 3 | 2 | 2 | 3 |
| 4 | 3 | 1 | 4 |
| 5 | 2 | 2 | 4 |
| 6 | 3 | 2 | 4 |
| 7 | 3 | 3 | 4 |
| 8 | 4 | 1 | 5 |
| 9 | 3 | 2 | 5 |
| 10 | 4 | 2 | 5 |
| 11 | 4 | 3 | 5 |
| 12 | 4 | 4 | 5 |

11 Appendix D EDGE Modulation and Coding Scheme

Table 39: EDGE Modulation and Coding Scheme

| Coding Scheme | Modulation | Coding Family | 1 Timeslot | 2 Timeslot | 4 Timeslot |
|---------------|------------|---------------|------------|------------|------------|
| CS-1: | GMSK | / | 9.05kbps | 18.1kbps | 36.2kbps |
| CS-2: | GMSK | / | 13.4kbps | 26.8kbps | 53.6kbps |
| CS-3: | GMSK | / | 15.6kbps | 31.2kbps | 62.4kbps |
| CS-4: | GMSK | / | 21.4kbps | 42.8kbps | 85.6kbps |
| MCS-1 | GMSK | C | 8.80kbps | 17.60kbps | 35.20kbps |
| MCS-2 | GMSK | B | 11.2kbps | 22.4kbps | 44.8kbps |
| MCS-3 | GMSK | A | 14.8kbps | 29.6kbps | 59.2kbps |
| MCS-4 | GMSK | C | 17.6kbps | 35.2kbps | 70.4kbps |
| MCS-5 | 8-PSK | B | 22.4kbps | 44.8kbps | 89.6kbps |
| MCS-6 | 8-PSK | A | 29.6kbps | 59.2kbps | 118.4kbps |
| MCS-7 | 8-PSK | B | 44.8kbps | 89.6kbps | 179.2kbps |
| MCS-8 | 8-PSK | A | 54.4kbps | 108.8kbps | 217.6kbps |
| MCS-9 | 8-PSK | A | 59.2kbps | 118.4kbps | 236.8kbps |

UC15

AT Commands Manual

UMTS/HSPA Module Series

Rev. UC15_AT_Commands_Manual_V1.1

Date: 2014-09-26



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About the Document

History

| Revision | Date | Author | Description |
|----------|------------|-------------|---|
| 1.0 | 2013-12-12 | Jacky ZHANG | Initial |
| 1.1 | 2014-09-26 | Rex ZHANG | <ol style="list-style-type: none">1. Modified the response of AT Commands: +CSMP/+COPS2. Added AT Commands: +CEER/+QSIMDET/+QSIMSTAT/+CGERE P/+QAUDLOOP/+QMIC/+QTONEDET/+QP CMV/+QWDTMF/+QLDTMF/+QLTONE3. Deleted AT+ICF description in AT&W, ATZ4. Modified the description of AT Commands: +CNMI/+CPMS5. Added maximum response time to all AT Commands |

Contents

| | |
|--|-----------|
| About the Document | 2 |
| Contents | 3 |
| Table Index | 8 |
| 1 Introduction | 9 |
| 1.1. Scope of the Document..... | 9 |
| 1.2. AT Command Syntax..... | 9 |
| 1.3. Supported Character Sets..... | 10 |
| 1.4. AT Command Interface..... | 10 |
| 1.5. Unsolicited Result Code | 11 |
| 1.6. Turn off Procedure..... | 11 |
| 2 General Commands | 12 |
| 2.1. ATI Display Product Identification..... | 12 |
| 2.2. AT+GMI Request Manufacturer Identification | 13 |
| 2.3. AT+GMM Request TA Model Identification..... | 13 |
| 2.4. AT+GMR Request TA Revision Identification of Software Release | 14 |
| 2.5. AT+CGMI Request Manufacturer Identification..... | 14 |
| 2.6. AT+CGMM Request Model Identification | 15 |
| 2.7. AT+CGMR Request TA Revision Identification of Software Release..... | 15 |
| 2.8. AT+GSN Request International Mobile Equipment Identity (IMEI) | 16 |
| 2.9. AT+CGSN Request Product Serial Number Identification | 17 |
| 2.10. AT&F Set all Current Parameters to Manufacturer Defaults | 17 |
| 2.11. AT&V Display Current Configuration | 18 |
| 2.12. AT&W Store Current Parameters to User Defined Profile..... | 19 |
| 2.13. ATZ Set all Current Parameters to User Defined Profile..... | 19 |
| 2.14. ATQ Set Result Code Presentation Mode | 20 |
| 2.15. ATV TA Response Format | 20 |
| 2.16. ATE Set Command Echo Mode..... | 22 |
| 2.17. A/ Repeat Previous Command Line | 22 |
| 2.18. ATS3 Set Command Line Termination Character | 23 |
| 2.19. ATS4 Set Response Formatting Character | 24 |
| 2.20. ATS5 Set Command Line Editing Character | 24 |
| 2.21. ATX Set CONNECT Result Code Format and Monitor Call Progress | 25 |
| 2.22. AT+CFUN Set Phone Functionality | 26 |
| 2.23. AT+CMEE Error Message Format..... | 27 |
| 2.24. AT+CSCS Select TE Character Set | 28 |
| 2.25. AT+QURCCFG Configure URC Indication Option | 29 |
| 3 Serial Interface Control Commands | 31 |
| 3.1. AT&C Set DCD Function Mode | 31 |
| 3.2. AT&D Set DTR Function Mode..... | 31 |
| 3.3. AT+ICF Set TE-TA Control Character Framing | 32 |

| | | | |
|----------|--------------------------------|--|-----------|
| 3.4. | AT+IFC | Set TE-TA Local Data Flow Control..... | 33 |
| 3.5. | AT+IPR | Set TE-TA Fixed Local Rate..... | 34 |
| 3.6. | AT+QRIR | Set Ring Line to Inactive..... | 36 |
| 4 | Status Control Commands | | 37 |
| 4.1. | AT+CPAS | Mobile Equipment Activity Status..... | 37 |
| 4.2. | AT+QCFG | Extended Configuration Settings..... | 38 |
| 4.2.1. | AT+QCFG="pwrsavedtr" | Enable/Disable DTR to Control Power Save State..... | 40 |
| 4.2.2. | AT+QCFG="temp" | Temperature Detection..... | 41 |
| 4.2.3. | AT+QCFG="vbatt" | Voltage Detection..... | 43 |
| 4.2.4. | AT+QCFG="gprsattach" | GPRS Attach Mode Configuration..... | 45 |
| 4.2.5. | AT+QCFG="nwscanmode" | Network Search Mode Configuration..... | 45 |
| 4.2.6. | AT+QCFG="nwscanseq" | Network Searching Sequence Configuration..... | 46 |
| 4.2.7. | AT+QCFG="roamservice" | Roam Service Configuration..... | 47 |
| 4.2.8. | AT+QCFG="servicedomain" | Service Domain Configuration..... | 48 |
| 4.2.9. | AT+QCFG="band" | Band Configuration..... | 48 |
| 4.2.10. | AT+QCFG="hsdpacat" | HSDPA Category Configuration..... | 49 |
| 4.2.11. | AT+QCFG="rrc" | RRC Release Version Configuration..... | 50 |
| 4.2.12. | AT+QCFG="sgsn" | UE SGSN Release Version Configuration..... | 51 |
| 4.2.13. | AT+QCFG="msc" | UE MSC Release Version Configuration..... | 51 |
| 4.2.14. | AT+QCFG="gprsmultislot" | GPRS Multislot Class Configuration..... | 52 |
| 4.2.15. | AT+QCFG="edgemultislot" | EDGE Multislot Class Configuration..... | 53 |
| 4.2.16. | AT+QCFG="dtmmultislot" | DTM&EDTM Multislot Class Configuration..... | 53 |
| 4.2.17. | AT+QCFG="urc/ri/ring" | Ring Line Behavior of RING..... | 54 |
| 4.2.18. | AT+QCFG="urc/ri/smsincoming" | Ring Line Behavior of Incoming SMS..... | 56 |
| 4.2.19. | AT+QCFG="urc/ri/other" | Ring Line Behavior of Other URCS..... | 57 |
| 4.2.20. | AT+QCFG="risignaltyp" | Ring Line Signal Outputting Carrier..... | 57 |
| 4.2.21. | AT+QCFG="urc/delay" | Delay URC Indication..... | 58 |
| 4.2.22. | AT+QCFG="amrcodec" | AMR Codec Configuration..... | 59 |
| 4.2.23. | AT+QCFG="sms/unread" | Query the Amount of Unread Message(s)..... | 60 |
| 4.2.24. | AT+QCFG="call/alpha" | Display Alphanumeric Name in Call..... | 60 |
| 4.2.25. | AT+QCFG="sms/alpha" | Display Alphanumeric Name in SMS..... | 61 |
| 4.2.26. | AT+QCFG="apready" | AP Ready Configuration..... | 62 |
| 4.3. | AT+QINDCFG | URC Indication Configuration..... | 63 |
| 4.4. | AT+CEER | Extended Error Report..... | 65 |
| 4.5. | AT+QGBAND | Get Module Operation Band..... | 65 |
| 5 | SIM Related Commands | | 67 |
| 5.1. | AT+CIMI | Request International Mobile Subscriber Identity (IMSI)..... | 67 |
| 5.2. | AT+CLCK | Facility Lock..... | 68 |
| 5.3. | AT+CPIN | Enter PIN..... | 70 |
| 5.4. | AT+CPWD | Change Password..... | 72 |
| 5.5. | AT+CSIM | Generic SIM Access..... | 73 |
| 5.6. | AT+CRSM | Restricted SIM Access..... | 74 |
| 5.7. | AT+QCCID | Show ICCID..... | 75 |

| | | | |
|----------|---------------------------------------|--|------------|
| 5.8. | AT+QFUN | Set Phone Extended Functionality | 76 |
| 5.9. | AT+QINISTAT | Query Status of SIM Card Initialization | 77 |
| 5.10. | AT+QPIN2 | Query/Unlock SIM PIN2/PUK2..... | 78 |
| 5.11. | AT+QPINC | Display PIN Remainder Counter | 78 |
| 5.12. | AT+QSIMDET | SIM Card Detection | 79 |
| 5.13. | AT+QSIMSTAT | SIM Inserted Status Report..... | 80 |
| 6 | Network Service Commands | | 82 |
| 6.1. | AT+COPS | Operator Selection | 82 |
| 6.2. | AT+CREG | Network Registration | 84 |
| 6.3. | AT+CSQ | Signal Quality Report | 85 |
| 6.4. | AT+CPOL | Preferred Operator List..... | 86 |
| 6.5. | AT+COPN | Read Operator Names..... | 88 |
| 6.6. | AT+CTZU | Automatic Time Zone Update..... | 88 |
| 6.7. | AT+CTZR | Time Zone Reporting..... | 89 |
| 6.8. | AT+QLTS | Obtain the Latest Network Time Synchronization..... | 91 |
| 7 | Call Related Commands..... | | 92 |
| 7.1. | ATA | Answer an Incoming Call..... | 92 |
| 7.2. | ATD | Mobile Originated Call to Dial a Number | 93 |
| 7.3. | ATH | Disconnect Existing Connection | 94 |
| 7.4. | AT+CVHU | Voice Hang Up Control | 95 |
| 7.5. | AT+CHUP | Hang Up Call..... | 96 |
| 7.6. | +++ | Switch From Data Mode to Command Mode..... | 96 |
| 7.7. | ATO | Switch From Command Mode to Data Mode..... | 97 |
| 7.8. | ATS0 | Set Number of Rings before Automatically Answering Call..... | 98 |
| 7.9. | ATS6 | Set Pause Before Blind Dialing..... | 99 |
| 7.10. | ATS7 | Set Number of Seconds to Wait for Connection Completion | 99 |
| 7.11. | ATS8 | Set the Number of Seconds to Wait for Comma Dial Modifier | 100 |
| 7.12. | ATS10 | Set Disconnect Delay after Indicating the Absence of Data Carrier..... | 100 |
| 7.13. | AT+CBST | Select Bearer Service Type | 101 |
| 7.14. | AT+CSTA | Select Type of Address | 103 |
| 7.15. | AT+CLCC | List Current Calls of ME | 104 |
| 7.16. | AT+CR | Service Reporting Control..... | 105 |
| 7.17. | AT+CRC | Set Cellular Result Codes for Incoming Call Indication | 106 |
| 7.18. | AT+CRLP | Select Radio Link Protocol Parameter | 107 |
| 7.19. | AT+QECCNUM | Configure Emergency Call Numbers..... | 109 |
| 7.20. | AT+QHUP | Hang Up Call with a Specific Release Cause | 111 |
| 8 | Phonebook Commands..... | | 113 |
| 8.1. | AT+CNUM | Subscriber Number | 113 |
| 8.2. | AT+CPBF | Find Phonebook Entries | 114 |
| 8.3. | AT+CPBR | Read Phonebook Entries | 115 |
| 8.4. | AT+CPBS | Select Phonebook Memory Storage | 116 |
| 8.5. | AT+CPBW | Write Phonebook Entry | 117 |

| | | |
|-----------|---|------------|
| 9 | Short Message Service Commands | 119 |
| 9.1. | AT+CSMS Select Message Service | 119 |
| 9.2. | AT+CMGF Message Format | 120 |
| 9.3. | AT+CSCA Service Center Address | 121 |
| 9.4. | AT+CPMS Preferred Message Storage | 122 |
| 9.5. | AT+CMGD Delete Message | 123 |
| 9.6. | AT+CMGL List Messages | 125 |
| 9.7. | AT+CMGR Read Message | 128 |
| 9.8. | AT+CMGS Send Message | 132 |
| 9.9. | AT+CMMS More Messages to Send | 133 |
| 9.10. | AT+CMGW Write Message to Memory | 134 |
| 9.11. | AT+CMSS Send Message From Storage | 136 |
| 9.12. | AT+CNMA New Message Acknowledgement to UE/TE | 137 |
| 9.13. | AT+CNMI SMS Event Reporting Configuration | 139 |
| 9.14. | AT+CSCB Select Cell Broadcast Message Types | 141 |
| 9.15. | AT+CSDH Show SMS Text Mode Parameters | 142 |
| 9.16. | AT+CSMP Set SMS Text Mode Parameters | 143 |
| 9.17. | AT+QCMGS Send Concatenated Messages | 144 |
| 9.18. | AT+QCMGR Read Concatenated Messages | 146 |
| 10 | Packet Domain Commands | 149 |
| 10.1. | AT+CGATT Attachment or Detachment of PS | 149 |
| 10.2. | AT+CGDCONT Define PDP Context | 150 |
| 10.3. | AT+CGQREQ Quality of Service Profile (Requested) | 151 |
| 10.4. | AT+CGQMIN Quality of Service Profile (Minimum Acceptable) | 154 |
| 10.5. | AT+CGEQREQ 3G Quality of Service Profile (Requested) | 157 |
| 10.6. | AT+CGEQMIN 3G Quality of Service Profile (Minimum Acceptable) | 161 |
| 10.7. | AT+CGACT Activate or Deactivate PDP Context | 165 |
| 10.8. | AT+CGDATA Enter Data State | 166 |
| 10.9. | AT+CGPADDR Show PDP Address | 167 |
| 10.10. | AT+CGCLASS GPRS Mobile Station Class | 168 |
| 10.11. | AT+CGREG Network Registration Status | 169 |
| 10.12. | AT+CGEREP Packet Domain Event Reporting | 170 |
| 10.13. | AT+CGSMS Select Service for MO SMS Messages | 172 |
| 11 | Supplementary Service Commands | 174 |
| 11.1. | AT+CCFC Call Forwarding Number and Conditions Control | 174 |
| 11.2. | AT+CCWA Call Waiting Control | 176 |
| 11.3. | AT+CHLD Call Related Supplementary Services | 178 |
| 11.4. | AT+CLIP Calling Line Identification Presentation | 180 |
| 11.5. | AT+CLIR Calling Line Identification Restriction | 181 |
| 11.6. | AT+COLP Connected Line Identification Presentation | 182 |
| 11.7. | AT+CSSN Supplementary Service Notifications | 184 |
| 11.8. | AT+CUSD Unstructured Supplementary Service Data | 185 |
| 12 | Audio Commands | 187 |

| | | | |
|-----------|---|--|------------|
| 12.1. | AT+CMUT | Mute Control | 187 |
| 12.2. | AT+CALM | Mute the Ring Tone | 188 |
| 12.3. | AT+CRSL | Set Ring Tone Volume | 188 |
| 12.4. | AT+CLVL | Loud Speaker Volume Level..... | 189 |
| 12.5. | AT+QAUDMOD | Set Audio Mode | 190 |
| 12.6. | AT+QAUDPATH | Set the Audio Output Path..... | 191 |
| 12.7. | AT+QSIDET | Set the Side Tone Gain in Current Mode..... | 192 |
| 12.8. | AT+QAUDLOOP | Enable Audio Loop Test..... | 192 |
| 12.9. | AT+QMIC | Set Uplink (MIC) Gains | 193 |
| 12.10. | AT+QRXGAIN | Set Downlink Gains | 194 |
| 12.11. | AT+QTONEDET | Enable/Disable DTMF Detection..... | 195 |
| 12.12. | AT+QWDTMF | Play/Send DTMF Tone (s) | 196 |
| 12.13. | AT+QDAI | Configure Digital Audio Interface..... | 197 |
| 12.14. | AT+QPCMV | Enable to Transfer PCM Data through Port..... | 198 |
| 12.15. | AT+QLDTMF | Play Local DTMF | 199 |
| 12.16. | AT+QLTONE | Play a Local Customized Tone | 200 |
| 12.17. | AT+VTS | DTMF and Tone Generation..... | 201 |
| 12.18. | AT+QRCH | Set the Ring Output Path | 202 |
| 12.19. | AT+VTD | Set Tone Duration | 203 |
| 13 | Hardware Related Commands | | 206 |
| 13.1. | AT+QPOWD | Power Off | 206 |
| 13.2. | AT+CCLK | Clock | 206 |
| 13.3. | AT+CBC | Battery Charge..... | 207 |
| 13.4. | AT+QADC | Read ADC | 208 |
| 13.5. | AT+QSClk | Configure Whether or Not to Enter into Sleep Mode..... | 209 |
| 14 | Appendix | | 210 |
| 14.1. | Reference | | 210 |
| 14.2. | Factory Default Settings Restorable with AT&F | | 211 |
| 14.3. | AT Command Setting Storable with AT&W | | 213 |
| 14.4. | AT Command Settings Storable with ATZ | | 214 |
| 14.5. | Summary of CME ERROR Codes | | 214 |
| 14.6. | Summary of CMS ERROR Codes | | 216 |
| 14.7. | Summary of URC | | 218 |
| 14.8. | SMS Character Sets Conversions | | 221 |
| 14.9. | Release Cause Text List of AT+CEER | | 227 |

Table Index

| | |
|---|-----|
| TABLE 1: TYPES OF AT COMMANDS AND RESPONSES | 10 |
| TABLE 2: AT&V RESPONSE..... | 18 |
| TABLE 3: ATV0&ATV1 RESULT CODES NUMERIC EQUIVALENTS AND BRIEF DESCRIPTION | 21 |
| TABLE 4: PARAMETERS CONFIGURATIONS SUPPORTED BY AT+CBST | 102 |
| TABLE 5: DELAY CLASS | 154 |
| TABLE 6: RELATED DOCUMENTS | 210 |
| TABLE 7: TERMS AND ABBREVIATIONS | 210 |
| TABLE 8: FACTORY DEFAULT SETTINGS RESTORABLE WITH AT&F | 211 |
| TABLE 9: AT COMMAND SETTINGS STORABLE WITH AT&W | 213 |
| TABLE 10: AT COMMAND SETTINGS STORABLE WITH ATZ | 214 |
| TABLE 11: DIFFERENT CODING SCHEMES OF +CME ERROR: <ERR> | 215 |
| TABLE 12: DIFFERENT CODING SCHEMES OF +CMS ERROR: <ERR>..... | 216 |
| TABLE 13: SUMMARY OF URC | 218 |
| TABLE 14: THE WAY OF SMS TEXT INPUT OR OUTPUT..... | 221 |
| TABLE 15: THE INPUT CONVERSIONS TABLE (DCS=GSM 7 BIT AND AT+CSCS="GSM") | 222 |
| TABLE 16: THE OUTPUT CONVERSIONS TABLE (DCS=GSM 7 BIT AND AT+CSCS="GSM") | 223 |
| TABLE 17: GSM EXTENDED CHARACTERS..... | 223 |
| TABLE 18: THE INPUT CONVERSIONS TABLE (DCS=GSM 7 BIT AND AT+CSCS="IRA") | 224 |
| TABLE 19: IRA EXTENDED CHARACTERS | 225 |
| TABLE 20: THE OUTPUT CONVERSIONS TABLE (DCS=GSM 7 BIT AND AT+CSCS="IRA") | 226 |
| TABLE 21: GSM EXTENDED CHARACTERS..... | 226 |
| TABLE 22: RELEASE CAUSE TEXT LIST OF AT+CEER | 227 |

1 Introduction

1.1. Scope of the Document

This document presents the AT Commands Set for Quectel cellular engine UC15.

1.2. AT Command Syntax

The “AT” or “at” prefix must be set at the beginning of each command line. To terminate a command line enter <CR>. Commands are usually followed by a response that includes “<CR><LF><response><CR><LF>”. Throughout this document, only the responses are presented, “<CR><LF>” are omitted intentionally.

The AT Commands Set implemented by UC15 is a combination of 3GPP TS 27.007, 3GPP TS 27.005 and ITU-T recommendation V.25ter and the AT Commands developed by Quectel.

All these AT commands can be split into three categories syntactically: “**basic**”, “**S parameter**”, and “**extended**”. They are listed as follows:

- **Basic syntax**

These AT commands have the format of “AT<x><n>”, or “AT&<x><n>”, where “<x>” is the command, and “<n>” is/are the argument(s) for that command. An example of this is “ATE<n>”, which tells the DCE whether received characters should be echoed back to the DTE according to the value of “<n>”. “<n>” is optional and a default will be used if it is missing.

- **S parameter syntax**

These AT commands have the format of “ATS<n>=<m>”, where “<n>” is the index of the **S** register to set, and “<m>” is the value to assign to it.

- **Extended syntax**

These commands can be operated in several modes, as following table:

Table 1: Types of AT Commands and Responses

| | | |
|--------------------------|---------------------------------|--|
| Test Command | AT+<x>=? | This command returns the list of parameters and value ranges set by the corresponding Write Command or internal processes. |
| Read Command | AT+<x>? | This command returns the currently set value of the parameter or parameters. |
| Write Command | AT+<x>=<...> | This command sets the user-definable parameter values. |
| Execution Command | AT+<x> | This command reads non-variable parameters affected by internal processes in the UE |

1.3. Supported Character Sets

The UC15 AT command interface defaults to the **GSM** character set. The UC15 supports the following character sets:

- GSM
- UCS2
- IRA

The character set can be configured and interrogated by using the “AT+CSCS” command (3GPP TS 27.007). The character set is defined in 3GPP TS 27.005. The character set affects transmission and reception of SMS and SMS Cell Broadcast Messages, the entry and display of phone book entries text field.

1.4. AT Command Interface

The UC15 AT command interface includes two USB ports (USB MODEM port and USB AT port) and one main UART port. Both the USB MODEM port and the main UART port support AT command and data transfer. The USB AT port only supports AT command.

UART Port Feature:

The baud rates of 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 3200000, 3686400 and 4000000 are supported at present. The default is 115200.

The main UART port supports hardware flow control lines RTS and CTS. But it is off by default. AT command “AT+IFC=2,2” is used to enable hardware flow control.

1.5. Unsolicited Result Code

As an Unsolicited Result Code and a report message, URC is not issued as part of the response related to an executed AT command. URC is issued by the UC15 without being requested by the TE and it is issued automatically when a certain event occurs. Typical events leading to URCs are incoming calls ("RING"), received short messages, high/low voltage alarm, high/low temperature alarm etc. For most of these messages, they will be outputted from USB AT port by default if CMUX function is disabled, and you can configure the interface for URC output by using the AT command "AT+QURCCFG" (This command only effects when CMUX function is disabled). If CMUX function is enabled, URCs will be outputted from CMUX2 port by default. While the interface used for URC output is reserved by an active data connection or a long running AT command, URCs are buffered internally and will be issued after the interface becomes idle status.

1.6. Turn off Procedure

It is recommended to execute AT+QPOWD command to turn off the module, as it is the safest and best way. This procedure is realized by letting the module log off from the network and allowing the software to enter into a secure and safe data state before disconnecting the power supply.

After sending AT+QPOWD, do not enter any other AT commands. The module outputs message "POWERED DOWN" and sets the STATE pin as low to enter into the shutdown state. In order to avoid data loss, it is suggested to wait for 1s to switch off the VBAT after the STATE pin is set as low and the URC "POWERED DOWN" is outputted. If "POWERED DOWN" has not been received after 65s, you should force to switch off the VBAT.

2 General Commands

2.1. ATI Display Product Identification Information

The ATI command delivers a product information text.

ATI Display Product Identification Information

Execution Command

ATI

Response

TA issues product information text.

Quectel

UC15

Revision: <revision>

OK

Maximum Response Time

300ms

Reference

V.25ter

Parameter

<revision>

Revision of software release

Example

ATI

Quectel

UC15

Revision: UC15EQAR01A01E1G

OK

2.2. AT+GMI Request Manufacturer Identification

AT+GMI returns a manufacturer identification text. See also: AT+CGMI.

| AT+GMI Request Manufacturer Identification | |
|---|---|
| Test Command AT+GMI=? | Response OK |
| Execution Command AT+GMI | Response TA reports one or more lines of information text which permit the user to identify the manufacturer. Quectel OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

2.3. AT+GMM Request TA Model Identification

AT+GMM returns a product model identification text. Command is identical with AT+CGMM.

| AT+GMM Request TA Model Identification | |
|---|---|
| Test Command AT+GMM=? | Response OK |
| Execution Command AT+GMM | Response TA returns a product model identification text. UC15 OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

2.4. AT+GMR Request TA Revision Identification of Software Release

AT+GMR delivers a product firmware version identification. Command is identical with AT+CGMR.

AT+GMR Request TA Revision Identification of Software Release

| | |
|------------------------------------|--|
| Test Command AT+GMR=? | Response OK |
| Execution Command AT+GMR | Response TA reports one or more lines of information text which permit the user to identify the revision of software release. Revision: <revision> OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

<revision> Revision of software release

Example

```
AT+GMR
Revision: UC15EQAR01A01E1G

OK
```

2.5. AT+CGMI Request Manufacturer Identification

AT+CGMI returns a manufacturer identification text. See also: AT+GMI.

AT+CGMI Request Manufacturer Identification

| | |
|-------------------------------------|--|
| Test Command AT+CGMI=? | Response OK |
| Execution Command AT+CGMI | Response TA returns manufacturer identification text. Quectel |

| | |
|-----------------------------|-------|
| | OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

2.6. AT+CGMM Request Model Identification

AT+CGMM returns a product model identification text. Command is identical with AT+GMM.

| AT+CGMM Request Model Identification | |
|---|---|
| Test Command AT+CGMM=? | Response OK |
| Execution Command AT+CGMM | Response TA returns product model identification text. UC15 OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

2.7. AT+CGMR Request TA Revision Identification of Software Release

AT+CGMR delivers a product firmware version identification. Command is identical with AT+GMR.

| AT+CGMR Request TA Revision Identification of Software Release | |
|---|---|
| Test Command AT+CGMR=? | Response OK |
| Execution Command AT+CGMR | Response TA returns identification text of product software version. Revision: <revision> OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

<revision> Identification text of product software version

2.8. AT+GSN Request International Mobile Equipment Identity (IMEI)

AT+GSN returns the International Mobile Equipment Identity (IMEI). Command is identical with AT+CGSN.

AT+GSN Request International Mobile Equipment Identity (IMEI)

| | |
|------------------------------------|--|
| Test Command AT+GSN=? | Response OK |
| Execution Command AT+GSN | Response TA reports the IMEI (International Mobile Equipment Identity) number in information text which permit the user to identify the individual ME device. <IMEI> OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

<IMEI> IMEI of the telephone

NOTE

The serial number (IMEI) varies with the individual ME device.

2.9. AT+CGSN Request Product Serial Number Identification

AT+CGSN returns International Mobile Equipment Identity (IMEI). Command is identical with: AT+GSN.

AT+CGSN Request Product Serial Number Identification

| | |
|-------------------------------------|--|
| Test Command AT+CGSN=? | Response OK |
| Execution Command AT+CGSN | Response <IMEI> OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

2.10. AT&F Set all Current Parameters to Manufacturer Defaults

AT&F resets AT command settings to their factory default values. However, the command does not change the current baud rate of UART.

AT&F Set all Current Parameters to Manufacturer Defaults

| | |
|---|---|
| Execution Command AT&F[<value>] | Response TA sets all current parameters to the manufacturer defined profile. See Table 8: Factory Default Settings Restorable with AT&F OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|----------------------|----------|--|
| <value> | <u>0</u> | Set all TA parameters to manufacturer defaults |
|----------------------|----------|--|

2.11. AT&V Display Current Configuration

AT&V displays the current settings of several AT command parameters, including the single-letter AT command parameters which are not readable otherwise.

AT&V Display Current Configuration

| | |
|--------------------------------------|---|
| Execution Command AT&V | Response TA returns the current parameter setting See Table 2: AT&V Response OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Table 2: AT&V Response

| AT&V |
|---------|
| &C: 1 |
| &D: 1 |
| &F: 0 |
| &W: 0 |
| E: 1 |
| Q: 0 |
| V: 1 |
| X: 4 |
| Z: 0 |
| S0: 0 |
| S3: 13 |
| S4: 10 |
| S5: 8 |
| S6: 2 |
| S7: 0 |
| S8: 2 |
| S10: 15 |
| |
| OK |

2.12. AT&W Store Current Parameters to User Defined Profile

AT&W stores the current AT command settings to a user defined profile in non-volatile memory.

AT&W Store Current Parameters to User Defined Profile

| | |
|---|---|
| Execution Command AT&W[<n>] | Response TA stores the current parameter settings in the user defined profile. See Table 9: AT Command Settings Storable with AT&W. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|----------|--|
| <n> | <u>0</u> | Profile number to store current parameters |
|-----|----------|--|

2.13. ATZ Set all Current Parameters to User Defined Profile

ATZ restores the current AT command settings to the user defined profile in non-volatile memory, if one was stored with AT&W before. Any additional AT command on the same command line may be ignored. ATZ does not change the current baud rate of UART.

ATZ Set all Current Parameters to User Defined Profile

| | |
|--|---|
| Execution Command ATZ[<value>] | Response TA sets all current parameters to the user defined profile. See Table 10: AT Command Settings Storable with ATZ. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|---------|----------|---------------------------|
| <value> | <u>0</u> | Reset to profile number 0 |
|---------|----------|---------------------------|

2.14. ATQ Set Result Code Presentation Mode

ATQ controls whether the result code is transmitted to the CE. Other information text transmitted as response is not affected.

ATQ Set Result Code Presentation Mode

| | |
|--|---|
| Execution Command ATQ<n> | Response This parameter setting determines whether or not the TA transmits any result code to the TE. Information text transmitted in response is not affected by this setting. If <n>=0: OK If <n>=1: (none) |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|---|---|
| <n> | 0 | TA transmits result code |
| | 1 | Result codes are suppressed and not transmitted |

2.15. ATV TA Response Format

This command determines the contents of header and trailer transmitted with AT command result codes and information responses.

The result codes, their numeric equivalents and brief descriptions of the use of each are listed in the following table.

ATV TA Response Format

| | |
|--|---|
| Execution Command ATV<value> | Response This parameter setting determines the contents of the header and trailer transmitted with result codes and information responses. When <value>=0 0 When <value>=1 |
|--|---|

| | |
|-----------------------|---------|
| | OK |
| Maximum Response Time | 300ms |
| Reference | V.25ter |

Parameter

| | | |
|---------|---|---|
| <value> | 0 | Information response: <text><CR><LF> Short result code format: <numeric code><CR> |
| | 1 | Information response: <CR><LF><text><CR><LF> Long result code format: <CR><LF><verbose code><CR><LF> |

Example

```

ATV1 //Set <value>=1
OK
AT+CSQ
+CSQ: 30,0

OK //When <value>=1 result code is OK
ATV0 //Set <value>=0
0
AT+CSQ
+CSQ: 30,0
0 //When <value>=0 result code is 0

```

Table 3: ATV0&ATV1 Result Codes Numeric Equivalents and Brief Description

| ATV1 | ATV0 | Description |
|------------|------|--|
| OK | 0 | Acknowledges execution of a command |
| CONNECT | 1 | A connection has been established; the DCE is moving from command state to online data state |
| RING | 2 | The DCE has detected an incoming call signal from network |
| NO CARRIER | 3 | The connection has been terminated or the attempt to establish a connection failed |
| ERROR | 4 | Command not recognized, command line maximum length exceeded, parameter value invalid, or other problem with processing the command line |

| | | |
|-------------|---|--|
| NO DIALTONE | 6 | No dial tone detected |
| BUSY | 7 | Engaged (busy) signal detected |
| NO ANSWER | 8 | "@" (Wait for Quiet Answer) dial modifier was used, but remote ringing followed by five seconds of silence was not detected before expiration of the connection timer (S7) |

2.16. ATE Set Command Echo Mode

ATE controls if the module echoes characters received from TE during AT command state.

ATE Set Command Echo Mode

| | |
|--|---|
| Execution Command ATE<value> | Response This setting determines whether or not the TA echoes characters received from TE during command state. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|----------------------|---|---------------|
| <value> | 0 | Echo mode off |
| | 1 | Echo mode on |

2.17. A/ Repeat Previous Command Line

A/ repeats previous AT command line, and "/" acts as the line terminating character.

A/ Repeat Previous Command Line

| | |
|--------------------------------|-------------------------------------|
| Execution Command A/ | Response Repeat Previous Command |
| Reference V.25ter | |

Example

```

ATI
Quectel
UC15
Revision: UC15EQAR01A01E1G

OK
A/ //Repeat previous command
Quectel
UC15
Revision: UC15EQAR01A01E1G

OK
    
```

2.18. ATS3 Set Command Line Termination Character

ATS3 determines the character recognized by the module to terminate an incoming command line. It is also generated for result codes and information text, along with character value set via ATS4.

ATS3 Set Command Line Termination Character

| | |
|--|--|
| Read Command ATS3? | Response <n> OK |
| Write Command ATS3=<n> | Response This parameter setting determines the character recognized by TA to terminate an incoming command line. The TA also returns this character in output. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

<n> 000-013-127 Command line termination character (Default 013=<CR>)

2.19. ATS4 Set Response Formatting Character

ATS4 determines the character generated by the module for result code and information text, along with the command line termination character set via ATS3.

ATS4 Set Response Formatting Character

| | |
|---------------------------|---|
| Read Command ATS4? | Response <n> OK |
| Write Command ATS4=<n> | Response This parameter setting determines the character generated by the TA for result code and information text. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | |
|-----|--|
| <n> | 000-010-127 Response formatting character (Default 010=<LF>) |
|-----|--|

2.20. ATS5 Set Command Line Editing Character

ATS5 determines the character value used by the module to delete the immediately preceding character from the AT command line (i.e. equates to backspace key).

ATS5 Set Command Line Editing Character

| | |
|---------------------------|--|
| Read Command ATS5? | Response <n> OK |
| Write Command ATS5=<n> | Response This parameter setting determines the character recognized by TA as a request to delete the immediately preceding character from the command line. OK |
| Maximum Response Time | 300ms |

Reference
V.25ter

Parameter

<n> 000-008-127 Response editing character (Default 008=<Backspace>)

2.21. ATX Set CONNECT Result Code Format and Monitor Call Progress

ATX determines whether or not the module transmits particular result codes to the TE. It also controls whether or not the module verifies the presence of a dial tone when it begins dialing, and whether or not engaged tone (busy signal) detection is enabled.

ATX Set CONNECT Result Code Format and Monitor Call Progress

| | |
|--|--|
| Execution Command ATX<value> | Response This parameter setting determines whether or not the TA detected the presence of dial tone and busy signal and whether or not TA transmits particular result codes. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|---------|---|---|
| <value> | 0 | CONNECT result code only returned, dial tone and busy detection are both disabled |
| | 1 | CONNECT<text> result code only returned, dial tone and busy detection are both disabled |
| | 2 | CONNECT<text> result code returned, dial tone detection is enabled, busy detection is disabled |
| | 3 | CONNECT<text> result code returned, dial tone detection is disabled, busy detection is enabled |
| | 4 | CONNECT<text> result code returned, dial tone and busy detection are both enabled |

2.22. AT+CFUN Set Phone Functionality

AT+CFUN controls the functionality level. It can also be used to reset the UE.

AT+CFUN Set Phone Functionality

| | |
|---|--|
| Test Command AT+CFUN=? | Response +CFUN: (list of supported <fun> s),(list of supported <rst> s) OK |
| Read Command AT+CFUN? | Response +CFUN: <fun> OK |
| Write Command AT+CFUN=<fun>[,<rst>] | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 15s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|--------------------|---|---|
| <fun> | 0 | Minimum functionality |
| | 1 | Full functionality (Default) |
| | 4 | Disable phone both transmit and receive RF circuits |
| <rst> | 0 | Do not reset the ME before setting it to <fun> power level This is default when <rst> is not given |
| | 1 | Reset the ME. The device is fully functional after the reset. This value is available only for <fun> =1 |

Example

```

AT+CFUN=0 //Switch phone to minimum functionality
OK
AT+COPS?
+COPS: 0 //No operator is registered

OK
AT+CPIN?
    
```

```

+CME ERROR: 10 //SIM is not inserted
AT+CFUN=1 //Switch phone to full functionality
OK

+CPIN: SIM PIN
AT+CPIN=1234
OK

+CPIN: READY

+QIND: PB DONE

+QIND: SMS DONE
AT+CPIN?
+CPIN: READY

OK
AT+COPS?
+COPS: 0,0,"CHN-UNICOM",2 //Operator is registered

OK
    
```

2.23. AT+CMEE Error Message Format

AT+CMEE controls the format of error result codes: "ERROR", error numbers or verbose messages as "+CME ERROR: <err>" and "+CMS ERROR: <err>".

AT+CMEE Error Message Format

| | |
|------------------------------|--|
| Test Command AT+CMEE=? | Response +CMEE: (list of supported <n>s) OK |
| Read Command AT+CMEE? | Response +CMEE: <n> OK |
| Write Command AT+CMEE=<n> | Response TA disables or enables the use of result code +CME ERROR: <err> as an indication of an error related to the functionality of the ME. OK |

| | |
|-----------------------|-------|
| Maximum Response Time | 300ms |
| Reference | |
| 3GPP TS 27.007 | |

Parameter

| | | |
|-----|---|---|
| <n> | 0 | Disable result code |
| | 1 | Enable result code and use numeric values |
| | 2 | Enable result code and use verbose values |

Example

```

AT+CMEE=0 //Disable result code
OK
AT+CPIN=1234
ERROR //Only "ERROR" will be displayed
AT+CMEE=1 //Enable error result code with numeric values
OK
AT+CPIN=1234
+CME ERROR: 10
AT+CMEE=2 //Enable error result code with verbose (string)
values
OK
AT+CPIN=1234
+CME ERROR: SIM not inserted
    
```

2.24. AT+CSCS Select TE Character Set

AT+CSCS write command informs the module which character set is used by the TE. It enables the UE to convert character strings correctly between TE and UE character sets.

AT+CSCS Select TE Character Set

| | |
|---------------------------|---|
| Test Command AT+CSCS=? | Response +CSCS: (list of supported <chset>s) OK |
| Read Command AT+CSCS? | Response +CSCS: <chset> OK |

| | |
|---|---|
| Write Command AT+CSCS=<chset> | Response Set character set <chset> which is used by the TE. The TA can then convert character strings correctly between the TE and ME character sets. OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|---------|--------|----------------------------------|
| <chset> | "GSM" | GSM default alphabet |
| | "IRA" | International reference alphabet |
| | "UCS2" | UCS2 alphabet |

Example

```

AT+CSCS? //Query the current character set
+CSCS: "GSM"

OK
AT+CSCS="UCS2" //Set the character set to "UCS2"
OK
AT+CSCS?
+CSCS: "UCS2"

OK

```

2.25. AT+QURCCFG Configure URC Indication Option

This command is used to configure the output port of URC.

AT+QURCCFG Configure URC Indication Option

| | |
|---|---|
| Test Command AT+QURCCFG=? | Response +QURCCFG: "urcport",("usbat","usbmodem","uart1") OK |
| Write Command AT+QURCCFG="urcport"[,<urcportvalue>] | If configuration parameters are omitted, return current configuration: +QURCCFG: "urcport",<urcportvalue> |

| | |
|---|---|
| | <p>OK</p> <p>If configuration parameters are entered, response:</p> <p>OK</p> <p>ERROR</p> |
| <p>Read Command</p> <p>AT+QURCCFG?</p> | <p>Response</p> <p>Return current configurations:</p> <p>+QURCCFG: "urcport",<urcportvalue></p> <p>OK</p> |
| <p>Maximum Response Time</p> | <p>300ms</p> |

Parameter

| | | |
|-----------------------------|---------------------|--|
| <urcportvalue> | Set URC output port | |
| "usbat" | USB AT port | |
| "usbmodem" | USB modem port | |
| "uart1" | Main UART | |

NOTES

1. Configuration of URC output port will be saved to NV immediately by default.
2. After configuration of URC output port is set successfully, it will take effect immediately.

Example

```
AT+QURCCFG=?
+QURCCFG: "urcport",("usbat","usbmodem","uart1")
```

OK

```
AT+QURCCFG?
```

```
+QURCCFG: "urcport","usbat"
```

OK

```
AT+QURCCFG="urcport","uart1"
```

OK

```
AT+QURCCFG?
```

```
+QURCCFG: "urcport","uart1"
```

OK

3 Serial Interface Control Commands

3.1. AT&C Set DCD Function Mode

AT&C controls the behavior of the UE's DCD line.

AT&C Set DCD Function Mode

| | |
|---|---|
| Execution Command AT&C[<value>] | Response This parameter determines how the state of circuit 109(DCD) relates to the detection of received line signal from the distant end. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|---------|----------|---|
| <value> | 0 | DCD line is always ON |
| | <u>1</u> | DCD line is ON only in the presence of data carrier |

3.2. AT&D Set DTR Function Mode

AT&D determines how the UE responds if DTR line is changed from the ON to the OFF condition during online data mode.

AT&D Set DTR Function Mode

| | |
|---|--|
| Execution Command AT&D[<value>] | Response This parameter determines how the TA responds when circuit 108/2(DTR) is changed from the ON to the OFF condition during data mode. OK |
|---|--|

| | |
|-----------------------|-------|
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|----------------------|---|--|
| <value> | 0 | TA ignores status on DTR |
| | 1 | ON->OFF on DTR: Change to command mode with remaining the connected call |
| | 2 | ON->OFF on DTR: Disconnect data call, change to command mode. During state DTR=OFF, auto-answer is off |

3.3. AT+ICF Set TE-TA Control Character Framing

AT+ICF determines the serial interface character framing format and parity received by TA from TE.

| AT+ICF Set TE-TA Control Character Framing | |
|--|---|
| Test Command AT+ICF=? | Response +ICF: (list of supported <format>s),(list of supported <parity>s) OK |
| Read Command AT+ICF? | Response +ICF: <format> , <parity> OK |
| Write Command AT+ICF=[<format>,<parity>] | Response This parameter setting determines the serial interface character framing format and parity received by TA from TE. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----------------------|---|------------------------|
| <format> | 3 | 8 data 0 parity 1 stop |
| <parity> | 0 | Odd |
| | 1 | Even |
| | 2 | Mark (1) |

3 Space (0)

NOTES

1. The command is applied for command state.
2. The **<parity>** field is ignored if the **<format>** field specifies no parity.

3.4. AT+IFC Set TE-TA Local Data Flow Control

AT+IFC determines the flow control behavior of the serial port.

AT+IFC Set TE-TA Local Data Flow Control

| | |
|---|---|
| Test Command AT+IFC=? | Response +IFC: (list of supported <dce_by_dte> s),(list of supported <dte_by_dce> s) OK |
| Read Command AT+IFC? | Response +IFC: <dce_by_dte> , <dte_by_dce> OK |
| Write Command AT+IFC=<dce_by_dte> , <dte_by_dce> | Response This parameter setting determines the data flow control on the serial interface for data mode. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | |
|---------------------------|---|
| <dce_by_dte> | Specifies the method will be used by TE when receiving data from TA |
| <u>0</u> | None |
| 2 | RTS flow control |
| <dte_by_dce> | Specifies the method will be used by TA when receiving data from TE |
| <u>0</u> | None |
| 2 | CTS flow control |

NOTE

This flow control is applied for data mode.

Example

```
AT+IFC=2,2 //Open the hardware flow control
OK
AT+IFC?
+IFC: 2,2
OK
```

3.5. AT+IPR Set TE-TA Fixed Local Rate

AT+IPR is used to query and set the baud rate of the UART. The default baud rate value (<rate>) is 115200bps. <rate> setting will not be restored with AT&F.

AT+IPR Set TE-TA Fixed Local Rate

| | |
|---|---|
| Test Command AT+IPR=? | Response +IPR: (list of supported auto detectable <rate>s),(list of supported fixed-only<rate>s) OK |
| Read Command AT+IPR? | Response +IPR: <rate> OK |
| Write Command AT+IPR=<rate> | Response This parameter setting determines the data rate of the TA on the serial interface. After the delivery of any result code associated with the current command line, the rate of command takes effect. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | |
|---------------------|-------------------------|
| <rate> | Baud rate of per second |
| | 9600 |
| | 19200 |
| | 38400 |
| | 57600 |
| | <u>115200</u> |
| | 230400 |
| | 460800 |
| | 921600 |
| | 3200000 |
| | 3686400 |
| | 4000000 |

NOTES

1. If a fixed baud rate is set, make sure that both TE (DTE, usually external processor) and TA (DCE, Quectel module) are configured to the same rate.
2. The value of **AT+IPR** cannot be restored with **AT&F** and **ATZ**, but it is still storable with **AT&W**.
3. In multiplex mode, the baud rate cannot be changed by the write command **AT+IPR=<rate>**, and the setting is invalid and not stored even if **AT&W** is executed after the write command.
4. A selected baud rate takes effect after the write commands are executed and acknowledged by "OK".

Example

```
AT+IPR=115200 //Set fixed baud rate to 115200
OK
AT&W //Store current setting, that is, the serial communication
      speed is 115200 after restarting module
OK
AT+IPR?
+IPR: 115200
OK
AT+IPR=115200;&W //Set fixed baud rate to 115200 and store current setting
OK
```

3.6. AT+QRIR Set Ring Line to Inactive

If the behavior of ring line is "always", you should restore ring line to inactive by AT+QRIR. The behavior of ring line is controlled by AT+QCFG. Please refer to AT+QCFG="urc/ri/ring", AT+QCFG="urc/ri/smsincoming" and "AT+QCFG="urc/ri/other".

AT+QRIR Restore Ring Line to Inactive

| | |
|-------------------------------------|---------------------------------------|
| Test Command AT+QRIR=? | Response OK |
| Execution Command AT+QRIR | Response OK ERROR |
| Maximum Response Time | 300ms |

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4 Status Control Commands

4.1. AT+CPAS Mobile Equipment Activity Status

AT+CPAS execute command queries the module's activity status.

| AT+CPAS Mobile Equipment Activity Status | |
|--|---|
| Test Command AT+CPAS=? | Response +CPAS: (list of supported <pas>s) OK |
| Execution Command AT+CPAS | Response TA returns the activity status of ME. +CPAS: <pas> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | | |
|-------|---|-------------------------------|
| <pas> | 0 | Ready |
| | 3 | Ringing |
| | 4 | Call in progress or call hold |

Example

```
AT+CPAS
+CPAS: 0 //Module is idle
```

```

OK
ATD10086;
OK
AT+CLCC
+CLCC: 1,0,3,0,0,"10086",129

OK
AT+CPAS
+CPAS: 3 //Module is ringing

OK
AT+CLCC
+CLCC: 1,0,0,0,0,"10086",129

OK
AT+CPAS
+CPAS: 4 //Call in progress

OK
    
```

4.2. AT+QCFG Extended Configuration Settings

AT+QCFG is used to query and configure various settings of UE.

AT+QCFG Extended Configuration Settings

| Test Command | Response |
|--------------|--|
| AT+QCFG=? | +QCFG: "pwrsavedtr", (list of supported <value>s) +QCFG: "temp", ((list of supported <temptype>s), (list of supported <tempvalue>s), (list of supported <temponoff>s)) +QCFG: "vbatt", ((list of supported <vbatttype>s), (list of supported <vbattvalue>s), (list of supported <vbattonoff>s)) +QCFG: "airplanecontrol", (list of supported <airplanecontrol>s) +QCFG: "gprsattach", (list of supported <attachmode>s) +QCFG: "nwscanmode", (list of supported <scanmode>s), |

(list of supported <effect>s)
+QCFG: "nwscanseq",
(list of supported <scanseq>s),
(list of supported <effect>s)
+QCFG: "roamservice",
(list of supported <roammode>s),
(list of supported <effect>s)
+QCFG: "servicedomain",
(list of supported <service>s),
(list of supported <effect>s)
+QCFG: "band",
(list of supported <bandval>s),
(list of supported <effect>s)
+QCFG: "hsdpacat",
(list of supported <cat>s)
+QCFG: "rrc",
(list of supported <rrcr>s)
+QCFG: "sgsn",
(list of supported <sgsnr>s)
+QCFG: "msc",
(list of supported <mscr>s)
+QCFG: "gprsmultislot",
(list of supported <gprslot>s)
+QCFG: "edgemultislot",
(list of supported <edgeslot>s)
+QCFG: "dtmmultislot",
(list of supported <dtmslot>s)
+QCFG: "pcmclk",
(list of supported <pcmclkout>s),
(list of supported <pcmclkfreq>s)
+QCFG: "urc/ri/ring",
(list of supported <typeri>s),
(list of supported <pulseduration>s),
(list of supported <activeduration>s),
(list of supported <inactiveduration>s),
(list of supported <ringnodisturbing>s)
+QCFG: "urc/ri/smsincoming",
(list of supported <typeri>s),
(list of supported <pulseduration>s)
+QCFG: "urc/ri/other",
(list of supported <typeri>s),
(list of supported <pulseduration>s)
+QCFG: "risignatype",
(list of supported <risignatype>s)

| | |
|-----------------------|---|
| | <p>+QCFG: "amrcodec", (list of supported <preference>s)</p> <p>+QCFG: "sms/unread"</p> <p>+QCFG: "call/alpha", (list of supported <value>s)</p> <p>+QCFG: "sms/alpha", (list of supported <value>s)</p> <p>+QCFG: "apready", (list of supported <value>s)</p> <p>OK</p> |
| Maximum Response Time | 300ms |
| Reference | |

4.2.1. AT+QCFG="pwrsavedtr" Enable/Disable DTR to Control Power Save State

AT+QCFG="pwrsavedtr" can be used to enable or disable physical DTR pin to control power save state.

AT+QCFG="pwrsavedtr" Enable/Disable DTR to Control Power Save State

| | |
|---|---|
| Write Command AT+QCFG="pwrsavedtr" [,<value>] | <p>Response</p> <p>If configuration parameters are omitted (+QCFG="pwrsavedtr"), return current configuration: +QCFG: "pwrsavedtr", <value></p> <p>OK</p> <p>If configuration parameters are entered: OK</p> <p>ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------|---|
| <value> | <p>Number format, enable/disable DTR to control power save state</p> <p>While <value> is enabled, pulling up DTR pin can trigger module to sleep mode and pulling down DTR pin can wake up module. This option is only valid for non-mux mode, and cannot be saved. After module is restarted, it will return to default value</p> <p>0 Disable</p> <p>1 Enable</p> |
|---------|---|

4.2.2. AT+QCFG="temp" Temperature Detection

AT+QCFG="temp" can enable temperature detection and set corresponding parameters.

About Temperature Detection:

When the temperature is lower than the lowest temperature limit, the module will output:

+QIND: "temp",-2

If the temperature did not rise to a degree greater than the lowest temperature within 50 seconds, the module will be turned off automatically. When the temperature is greater than the lowest temperature limit, but lower than the low temperature warning limit, the module will output:

+QIND: "temp",-1

When temperature is greater than the highest temperature limit, the module will output:

+QIND: "temp",2

If the temperature did not drop to a degree lower than the highest temperature limit within 5 seconds, the module will be turned off automatically.

When the temperature is lower than the highest temperature limit, but greater than the high temperature warning limit, the module will output:

+QIND: "temp",1

When the temperature comes back from the low temperature warning limit or the high temperature warning limit to normal temperature range, the module will output:

+QIND: "temp",0

The configuration will be stored to NV automatically.

AT+QCFG="temp" Temperature Detection

Write Command

AT+QCFG="temp"[,<temptype>,<temp value>,<temponoff>]

Response

If configuration parameters are omitted
(+QCFG="temp"), return current configuration:
+QCFG: "temp",
(<temptype>,<tempvalue>,<temponoff>),
(<temptype>,<tempvalue>,<temponoff>),
...

| | |
|-----------------------|--|
| | <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|--------------------------|---|
| <temptype> | Temperature type |
| -2 | Indicate the lowest temperature |
| -1 | Indicate low temperature warning |
| 1 | Indicate high temperature warning |
| 2 | Indicate the highest temperature |
| <tempvalue> | Temperature threshold value (One over one thousand degrees Celsius) |
| (-35000~ <u>-40000</u>) | The lowest temperature limit (If below this limit, the module will be shut down) |
| (-30000~ <u>-35000</u>) | Low temperature warning limit |
| (70000~ <u>80000</u>) | High temperature warning limit |
| (80000~ <u>90000</u>) | The highest temperature limit (If above this limit, the module will be shut down) |
| <temponoff> | Enable/disable temperature detection function |
| <u>0</u> | Disable |
| 1 | Enable |

Example

```

AT+QCFG="temp",-1 //Query the low temperature warning limit and setting
+QCFG: "temp",-1,-35000,0

OK
AT+QCFG="temp",-1,-35000,1 //Set the low temperature warning limit
OK

<Enable temperature detection, when greater than the lowest temperature limit, lower than low
temperature warning limit>

+QIND: "temp",-1 //URC report, when temperature is lower than warning temperature

<Enable temperature detection, when temperature is back to normal temperature range>

+QIND: "temp",0 //URC report, when temperature is back to normal temperature

```

4.2.3. AT+QCFG="vbatt" Voltage Detection

AT+QCFG="vbatt" can enable voltage detection and set corresponding parameters.

About Voltage Detection:

When the voltage is lower than the lowest voltage limit, the module will output:

+QIND: "vbatt",-2

If it does not come back to a degree greater than the lowest voltage limit within 2 seconds, the module will be turned off automatically.

When the voltage is greater than the lowest voltage limit, but lower than low voltage warning limit, the module will output:

+QIND: "vbatt",-1

When the voltage is greater than the highest voltage limit, the module will output:

+QIND: "vbatt",2

If it does not come back to a degree greater than highest voltage limit within 2 seconds, the module will be turned off automatically.

When the voltage is lower than the highest voltage limit, but greater than high voltage warning limit, the module will output:

+QIND: "vbatt",1

When the voltage comes back to normal voltage range, the module will output:

+QIND: "vbatt",0

Voltage detection is enabled by default. It is suggested to enable voltage detection in order to avoid module breakdown due to excessively high or low voltage.

The configuration will be stored to NV automatically.

AT+QCFG="vbatt" Voltage Detection

Write Command

AT+QCFG="vbatt" [<vbatttype>,<vbatt value> [<vbatonoff>]]

Response

If configuration parameters are omitted (**+QCFG="vbatt"**), return current configuration:
+QCFG: "vbatt",

| | |
|-----------------------|--|
| | <p>(<vbatttype>,<vbattvalue>,<vbattonoff>), (<vbatttype>,<vbattvalue>,<vbattonoff>), ... OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | | |
|---------------------------|---|--|
| <vbatttype> | Voltage type | |
| | -2 | Indicate the lowest voltage |
| | -1 | Indicate low voltage warning |
| | 1 | Indicate high voltage warning |
| | 2 | Indicate the highest voltage |
| <vbattvalue> | Voltage threshold value (mv) | |
| | (<u>3200</u> ~3420) | The lowest voltage limit (If below this limit, the module will shut down) |
| | (3480~ <u>3500</u> ~3520) | Low voltage warning limit |
| | (4190~ <u>4210</u> ~4230) | High voltage warning limit |
| | (4280~ <u>4350</u> ~4400) | The highest voltage limit (If above this limit, the module will shut down) |
| <vbattonoff> | Enable/disable voltage detection function | |
| | 0 | Disable |
| | 1 | Enable |

Example

<Enable voltage detection, when greater than the lowest voltage limit, lower than the low voltage warning limit>

+QIND: "vbatt",-1 //URC report, when voltage is lower than low voltage warning limit

<Enable voltage detection, when the voltage is back to normal voltage range>

+QIND: "vbatt",0 //URC report, when the voltage is back to normal voltage

AT+QCFG="vbatt",-1 //Query low voltage warning limit

+QCFG: "vbatt",(-1,3500,1)


```
OK
AT+QCFG="vbatt",-1,3500,0 //Disable low voltage warning limit
OK
```

4.2.4. AT+QCFG="gprsattach" GPRS Attach Mode Configuration

AT+QCFG="gprsattach" specifies the mode to attach GPRS when UE is powered on. This configuration is valid only after the module is restarted.

AT+QCFG="gprsattach" GPRS Attach Mode Configuration

| | |
|---|---|
| Write Command AT+QCFG="gprsattach" [<attachmode>] | Response If configuration parameters are omitted (+QCFG="gprsattach"), return current configuration: +QCFG: "gprsattach",<attachmode> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------------|--|
| <attachmode> | Number format, the mode to attach GRPS when UE is powered on |
| 0 | Manual attach |
| <u>1</u> | Auto attach |

4.2.5. AT+QCFG="nwscanmode" Network Search Mode Configuration

AT+QCFG="nwscanmode" specifies the mode of searching network. If **<effect>** is omitted, the configuration will take effect immediately.

AT+QCFG="nwscanmode" Network Search Mode Configuration

| | |
|--|---|
| Write Command AT+QCFG="nwscanmode" [<scanmode> [<effect>]] | Response If configuration parameters are omitted (+QCFG="nwscanmode"), return current configuration: +QCFG: "nwscanmode",<scanmode> |
|--|---|

| | |
|-----------------------|---|
| | <p>OK</p> <p>If configuration parameters are entered:</p> <p>OK</p> <p>ERROR</p> <p>If error is related to ME functionality:</p> <p>+CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|-------------------------|---|
| <scanmode> | <p>Number format, network search mode</p> <p><u>0</u> AUTO</p> <p>1 GSM Only</p> <p>2 UMTS Only</p> |
| <effect> | <p>Number format, when to take effect</p> <p>0 Take effect after UE reboots</p> <p><u>1</u> Take effect immediately</p> |

4.2.6. AT+QCFG="nwscanseq" Network Searching Sequence Configuration

AT+QCFG="nwscanseq" specifies the sequence of searching network. If **<effect>** is omitted, the configuration will take effect immediately.

AT+QCFG="nwscanseq" Network Searching Sequence Configuration

| | |
|---|--|
| <p>Write Command</p> <p>AT+QCFG="nwscanseq"[,<scanseq>[,<effect>]]</p> | <p>Response</p> <p>If configuration parameters are omitted (+QCFG="nwscanseq"), return current configuration: +QCFG: "nwscanseq",<scanseq></p> <p>OK</p> <p>If configuration parameters are entered:</p> <p>OK</p> <p>ERROR</p> <p>If error is related to ME functionality:</p> <p>+CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------|--|
| <scanseq> | Number format, network search sequence |
| | 0 AUTO |
| | 1 GSM prior to WCDMA |
| | <u>2</u> WCDMA prior to GSM |
| <effect> | Number format, when to take effect |
| | 0 Take effect after UE restarts |
| | <u>1</u> Take effect immediately |

4.2.7. AT+QCFG="roamservice" Roam Service Configuration

AT+QCFG="roamservice" is used to enable or disable the roam service. If **<effect>** is omitted, the configuration will take effect immediately.

AT+QCFG="roamservice" Roam Service Configuration

| | |
|---|---|
| Write Command AT+QCFG="roamservice"[,<roammode>[,<effect>]] | Response If configuration parameters are omitted (+QCFG="roamservice"), return current configuration: +QCFG: "roamservice",<roammode> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|-------------------------|---|
| <roammode> | Number format, the mode of roam service |
| | 1 Disable roam service |
| | 2 Enable roam service |
| | <u>255</u> AUTO |
| <effect> | Number format, when to take effect |
| | 0 Take effect after UE reboots |
| | <u>1</u> Take effect immediately |

4.2.8. AT+QCFG="servicedomain" Service Domain Configuration

AT+QCFG="servicedomain" specifies the registered service domain. If **<effect>** is omitted, the configuration will take effect immediately.

AT+QCFG="servicedomain" Service Domain Configuration

Write Command

AT+QCFG="servicedomain" [,<service> [,<effect>]]

Response

If configuration parameters are omitted (+QCFG="servicedomain"), return current configuration:
+QCFG: "servicedomain",<service>

OK

If configuration parameters are entered:

OK

ERROR

If error is related to ME functionality:

+CME ERROR: <err>

Maximum Response Time

300ms

Parameter

<service>

Service domain of UE

0 CS only

1 PS only

2 CS & PS

<effect>

Number format, when to take effect

0 Take effect after UE reboots

1 Take effect immediately

4.2.9. AT+QCFG="band" Band Configuration

AT+QCFG="band" specifies the band of UE. If **<effect>** is omitted, the configuration will take effect immediately.

AT+QCFG="band" Band Configuration

Write Command

AT+QCFG="band" [,<bandval> [,<effect>]]

Response

If configuration parameters are omitted (+QCFG="band"), return current configuration:
+QCFG: "band",<bandval>

| | |
|-----------------------|--|
| | <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | | | | | | | | | | | | | | | | | | | | | |
|------------------------|---|---|------------------------------|---|-------------------------|---|---------|---|---------|----|------------|----|------------|----|-----------|-----|-----------|-----|-----------|-----|--|
| <bandval> | <p>The band of UE(e.g. 511=1+2+4+8+16+128+256 means GSM900& GSM1800& GSM850& GSM1900& WCDMA2100& WCDMA900& WCDMA 800)</p> <table> <tr><td>1</td><td>GSM 900</td></tr> <tr><td>2</td><td>GSM 1800</td></tr> <tr><td>4</td><td>GSM 850</td></tr> <tr><td>8</td><td>GSM1900</td></tr> <tr><td>16</td><td>WCDMA 2100</td></tr> <tr><td>32</td><td>WCDMA 1900</td></tr> <tr><td>64</td><td>WCDMA 850</td></tr> <tr><td>128</td><td>WCDMA 900</td></tr> <tr><td>256</td><td>WCDMA 800</td></tr> <tr><td>512</td><td>Any, acquire any of the band class system.</td></tr> </table> | 1 | GSM 900 | 2 | GSM 1800 | 4 | GSM 850 | 8 | GSM1900 | 16 | WCDMA 2100 | 32 | WCDMA 1900 | 64 | WCDMA 850 | 128 | WCDMA 900 | 256 | WCDMA 800 | 512 | Any, acquire any of the band class system. |
| 1 | GSM 900 | | | | | | | | | | | | | | | | | | | | |
| 2 | GSM 1800 | | | | | | | | | | | | | | | | | | | | |
| 4 | GSM 850 | | | | | | | | | | | | | | | | | | | | |
| 8 | GSM1900 | | | | | | | | | | | | | | | | | | | | |
| 16 | WCDMA 2100 | | | | | | | | | | | | | | | | | | | | |
| 32 | WCDMA 1900 | | | | | | | | | | | | | | | | | | | | |
| 64 | WCDMA 850 | | | | | | | | | | | | | | | | | | | | |
| 128 | WCDMA 900 | | | | | | | | | | | | | | | | | | | | |
| 256 | WCDMA 800 | | | | | | | | | | | | | | | | | | | | |
| 512 | Any, acquire any of the band class system. | | | | | | | | | | | | | | | | | | | | |
| <effect> | <p>When to take effect</p> <table> <tr><td>0</td><td>Take effect after UE reboots</td></tr> <tr><td>1</td><td>Take effect immediately</td></tr> </table> | 0 | Take effect after UE reboots | 1 | Take effect immediately | | | | | | | | | | | | | | | | |
| 0 | Take effect after UE reboots | | | | | | | | | | | | | | | | | | | | |
| 1 | Take effect immediately | | | | | | | | | | | | | | | | | | | | |

NOTES

- UC15-A supports GSM850&GSM900&GSM1800&GSM1900&WCDMA850&WCDMA1900 band. The default value is 111.
- UC15-E supports GSM900&GSM1800&WCDMA900&WCDMA2100 band. The default value is 147.

4.2.10. AT+QCFG="hsdpacat" HSDPA Category Configuration

AT+QCFG="hsdpacat" specifies the HSDPA category. This configuration is valid only after the module is restarted.

AT+QCFG="hsdpacat" HSDPA Category Configuration

Write Command

AT+QCFG="hsdpacat"[,<cat>]

Response

If configuration parameters are omitted

| | |
|-----------------------|--|
| | <p>(+QCFG="hsdpacat"), return current configuration: +QCFG: "hsdpacat",<cat></p> <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|--------------------|----------------|
| <cat> | HSDPA category |
| <u>6</u> | Category 6 |
| 12 | Category 12 |

4.2.11. AT+QCFG="rrc" RRC Release Version Configuration

AT+QCFG="rrc" specifies the RRC release version. This configuration is valid only after the module is restarted.

AT+QCFG="rrc" RRC Release Version Configuration

| | |
|--|---|
| Write Command AT+QCFG="rrc" [<rrcr>] | <p>Response</p> <p>If configuration parameters are omitted (+QCFG="rrc"), return current configuration: +QCFG: "rrc",<rrcr></p> <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|----------------------|
| <rrcr> | RRC release version. |
| | 0 R99 |
| | 1 R5 |

4.2.12. AT+QCFG="sgsn" UE SGSN Release Version Configuration

AT+QCFG="sgsn" specifies the UE SGSN release version. This configuration is valid only after the module is restarted.

AT+QCFG="sgsn" UE SGSN Release Version Configuration

| | |
|---|--|
| Write Command AT+QCFG="sgsn" [,<sgsnr>] | Response If configuration parameters are omitted (+QCFG="sgsn"), return current configuration: +QCFG: "sgsn",<sgsnr> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|----------------------|----------------------|
| <sgsnr> | SGSN release version |
| | 0 R97 |
| | 1 R99 |
| | 2 Dynamic |

4.2.13. AT+QCFG="msc" UE MSC Release Version Configuration

AT+QCFG="msc" specifies the UE MSC release version. This configuration is valid only after the module is restarted.

AT+QCFG="msc" UE MSC Release Version Configuration

| | |
|--|--|
| Write Command AT+QCFG="msc"[,<mscr>] | Response If configuration parameters are omitted (+QCFG="msc"), return current configuration: +QCFG: "msc",<mscr> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|---------------------|
| <mscr> | MSC release version |
| 0 | R97 |
| 1 | R99 |
| 2 | Dynamic |

4.2.14. AT+QCFG="gprsmultislot" GPRS Multislot Class Configuration

AT+QCFG="gprsmultislot" specifies the GPRS multislot class. This configuration is valid only after the module is restarted.

AT+QCFG="gprsmultislot" GPRS Multislot Class Configuration

| | |
|--|--|
| Write Command AT+QCFG="gprsmultislot"[,<gprsslot>] | Response If configuration parameters are omitted (+QCFG="gprsmultislot"), return current configuration: +QCFG: "gprsmultislot",<gprsslot> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: |
|--|--|

| | |
|-----------------------|--------------------------------|
| | +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------|--|
| <gprslot> | Number format, GPRS multislot class Range is 1-12, 30-34, default value is 10 |
|------------------------|--|

4.2.15. AT+QCFG="edgemultislot" EDGE Multislot Class Configuration

AT+QCFG="edgemultislot" specifies the EDGE multislot class. This configuration is valid only after the module is restarted.

AT+QCFG="edgemultislot" EDGE Multislot Class Configuration

| | |
|---|---|
| Write Command AT+QCFG="edgemultislot"[,<edgeslot >] | Response If configuration parameters are omitted (+QCFG="edgemultislot"), return current configuration: +QCFG: "edgemultislot",<edgeslot> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|-------------------------|---|
| <edgeslot> | Number format, EDGE multislot class Range is 1-34, default value is 12 |
|-------------------------|---|

4.2.16. AT+QCFG="dtmmultislot" DTM&EDTM Multislot Class Configuration

AT+QCFG="dtmmultislot" specifies the DTM&EDTM multislot class. This configuration is valid only after the module is restarted.

AT+QCFG="dtmmultislot" DTM&EDTM Multislot Class Configuration

| | |
|--|--|
| Write Command AT+QCFG="dtmmultislot" [<dtmslot>] | Response If configuration parameters are omitted (+QCFG="dtmmultislot"), return current configuration: +QCFG: "dtmmultislot",<dtmslot> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------|---|
| <dtmslot> | Number format, DTM&EDTM multislot class |
| 0 | Class 0 |
| 1 | Class 5 |
| 2 | Class 9 |
| 3 | Class 11 |

4.2.17. AT+QCFG="urc/ri/ring" Ring Line Behavior of RING

AT+QCFG="urc/ri/ring", AT+QCFG="urc/ri/smsincoming" and AT+QCFG="urc/ri/other" control the behavior of ring line when URC is reported. These configurations will be stored into NV automatically. The ring line is active low. AT+QCFG="urc/ri/ring" specifies the behavior of ring line when RING is presented to indicate an incoming call.

The sum of parameter **<activeduration>** and **<inactiveduration>** determines the interval time of "RING" indications when a call is coming.

AT+QCFG="urc/ri/ring" Ring Line Behavior of RING

| | |
|--|---|
| Write Command AT+QCFG="urc/ri/ring" [<typeri>,<pulseduration>,<activeduration>,<inactiveduration>,<ringnodisturbing>,<pulsecount>]]]]]]] | Response If configuration parameters are omitted (+QCFG="urc/ri/ring"), return current configuration: +QCFG: "urc/ri/ring",<typeri>,<pulseduration>,<activeduration>,<inactiveduration>,<ringnodisturbing>,<pulsecount> |
|--|---|

| | |
|-----------------------|---|
| | <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------------------|--|
| <typeri> | <p>The behavior of the ring line when URCs are presented</p> <p>"off" No change. Ring line keeps inactive</p> <p>"pulse" Pulse. Pulse width determined by <pulseduration></p> <p>"always" Change to active. You may restore to inactive by +QRIR</p> <p>"auto" When "RING" is presented to indicate an incoming call, ring line changes to and keeps active. When ring of the incoming call ends, either answering or hanging up the incoming call, ring line will change to inactive</p> <p>"wave" When "RING" is presented to indicate an incoming call. The ring line outputs a square wave. Both <activeduration> and <inactiveduration> are used to set parameters of the square wave. When the ring of incoming call ends, either answering or hanging up the incoming call, ring line will change to inactive</p> |
| <pulseduration> | Set the width of pulse. Value ranges from 1 to 2000ms and default is 120ms. This parameter is only meaningful when <typeri> is "pulse". If this parameter is not needed, you can set it as null |
| <activeduration> | Set the active duration of the square wave, value ranges from 1 to 10000ms, and the default is 1000ms. This parameter is only meaningful when <typeri> is "wave" |
| <inactiveduration> | Set the inactive duration of the square wave, value ranges from 1 to 10000ms, and the default is 5000ms. This parameter is only meaningful when <typeri> is "wave" |
| <ringnodisturbing> | <p>Set whether the ring line behavior could be disturbed. This parameter is only meaningful when <typeri> is configured to "auto" or "wave". For example, when <typeri> is configured to "wave", if you need the square wave not to be disturbed by other URCs (including SMS related URCs), you should set <ringnodisturbing> to "on"</p> <p>"off" It can be disturbed by other URCs which the behavior of ring line is caused by an incoming call ringing</p> |

| | | |
|---------------------------|------|---|
| | "on" | It cannot be disturbed by other URCs which the behavior of ring line is caused by an incoming call ringing. |
| <pulsecount> | | The count of pulse. This parameter is only meaningful when <typeri> is "pulse". Value ranges from 1 to 5 and default is 1. The interval time between two pulse is equal to <pulseduration> . |

4.2.18. AT+QCFG="urc/ri/smsincoming" Ring Line Behavior of Incoming SMS

AT+QCFG="urc/ri/smsincoming" specifies the behavior of ring line when related incoming message URCs are presented. Related incoming message URCs list: **+CMTI,+CMT,+CDS,+CBM**.

AT+ QCFG="urc/ri/smsincoming" Ring Line Behavior of Incoming SMS

| | |
|--|--|
| Write Command AT+QCFG="urc/ri/smsincoming" [,<typeri> [,<pulseduration> [,<pulsecount>]]] | Response If configuration parameters are omitted (+QCFG="urc/ri/smsincoming"), return current configuration: +QCFG: "urc/ri/smsincoming",<typeri>,<pulseduration>,<pulsecount> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------------|---|
| <typeri> | The behavior of the ring line when URC are presented "off" No change. Ring line keeps inactive "pulse" Pulse. Pulse width determined by <pulseduration> "always" Change to active. You should restore to inactive by +QRIR |
| <pulseduration> | Set the width of pulse. Value ranges from 1 to 2000ms and the default is 120ms. This parameter is only valid when <typeri> is "pulse" |
| <pulsecount> | The count of pulse. This parameter is only meaningful when <typeri> is "pulse". Value ranges from 1 to 5 and default is 1. The interval time between two pulse is equal to <pulseduration> . |

4.2.19. AT+QCFG="urc/ri/other" Ring Line Behavior of Other URCs

AT+QCFG="urc/ri/other" specifies the behavior of ring line when other URCs are presented.

AT+QCFG="urc/ri/other" Ring Line Behavior of Other URCs

| | |
|--|---|
| Write Command AT+QCFG="urc/ri/other" [,<typeri> [,<pulseduration> [,<pulsecount>]]] | Response If configuration parameters are omitted (+QCFG="urc/ri/other"), return current configuration: +QCFG: "urc/ri/other",<typeri>,<pulseduration>,<pulsecount> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------------|--|
| <typeri> | The behavior of the ring line when URCs are presented "off" No change. Ring line keeps inactive "pulse" Pulse. Pulse width determined by <pulseduration> |
| <pulseduration> | Set the width of pulse. Value ranges from 1 to 2000ms and the default is 120ms. This parameter is valid only when <typeri> is "pulse" |
| <pulsecount> | The count of pulse. This parameter is only meaningful when <typeri> is "pulse". Value ranges from 1 to 5 and default is 1. The interval time between two pulse is equal to <pulseduration> . |

4.2.20. AT+QCFG="risignatype" Ring Line Signal Outputting Carrier

AT+QCFG="risignatype" specifies the carrier of ring line signal outputting.

AT+QCFG="risignatype" Ring Line Signal Outputting Carrier

| | |
|--|---|
| Write Command AT+QCFG="risignatype" [,<risignatype>] | Response If configuration parameters are omitted (+QCFG="urc/ri/other"), return current configuration: +QCFG: "risignatype",<risignatype> |
|--|---|

| | |
|-----------------------|---|
| | <p>OK</p> <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|----------------------------|---|
| <risignatype> | The carrier of ring line signal output |
| "respective" | The ring line behaves on the port which URC is presented. For example, if URC is presented on UART port, it is physical ring line. If URC is presented on USB modem port, it is virtual ring line. If URC is presented on USB AT port, no ring line for USB AT port which does not support ring line. +QURCCFG="urcport" can get the port which URC is presented |
| "physical" | No matter which port URC is presented on, URC only causes the behavior of physical ring line |

4.2.21. AT+QCFG="urc/delay" Delay URC Indication

AT+QCFG="urc/delay" can delay the output of URC indication until ring line pulse end.

AT+QCFG="urc/delay" Delay URC Indication

| | |
|--------------------------------|---|
| Write Command | Response |
| AT+QCFG="urc/delay"[,<enable>] | <p>If configuration parameter is omitted +QCFG: "urc/delay",<enable></p> <p>OK</p> <p>If configuration parameter is entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <err></p> |
| Reference | |

Parameter

| | | |
|-----------------------|----------|---|
| <enable> | <u>0</u> | URC indication will be output when ring line pulse start |
| | 1 | URC indication will be output when ring line pulse end(only the type of ring line is "pulse", refer to AT+QCFG="urc/ri/ring" , AT+QCFG="urc/ri/smsincoming" and AT+QCFG="urc/ri/other") |

4.2.22. AT+QCFG="amrcodec" AMR Codec Configuration

AT+QCFG="amrcodec" can be used to configure the AMR. This configuration is valid only after the module is restarted.

AT+QCFG="amrcodec" AMR Codec Configuration

| | |
|---|--|
| Write Command AT+QCFG="amrcodec" [,<preference >] | Response If configuration parameters are omitted (+QCFG="amrcodec"), return current configuration: +QCFG: "amrcodec", <preference> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------------|--|
| <preference> | AMR configurations(e.g. 7=1+2+4 means GSM AMR NB&GSM AMR WB&GSM HR AMR). |
| 0 | No AMR configuration |
| 1 | GSM AMR NB |
| 2 | GSM AMR WB |
| 4 | GSM HR AMR |
| 8 | WCDMA AMR WB |
| <u>15</u> | The above four AMR configurations are supported |
| 16 | Reserved |
| 32 | Reserved |
| 64 | Reserved |
| 128 | Reserved |

255 All AMR configurations are supported

4.2.23. AT+QCFG="sms/unread" Query the Amount of Unread Message(s)

AT+QCFG="sms/unread" is used to query the amount of unread message(s).

AT+QCFG="sms/unread" Query the Amount of Unread Message(s)

| | |
|--|---|
| Write Command AT+QCFG="sms/unread" | Response +QCFG: "sms/unread","SM",<smcount>,"ME",<mecount> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------|---|
| <smcount> | The amount of unread message(s) in SM storage |
| <mecount> | The amount of unread message(s) in ME storage |

4.2.24. AT+QCFG="call/alpha" Display Alphanumeric Name in Call

AT+QCFG="call/alpha" can display the parameter **<alpha>** in the result of **+CLCC** and the result of other call related commands or URCs (e.g. **+CLIP**).

AT+QCFG="call/alpha" Display Alphanumeric Name in Call

| | |
|---|---|
| Write Command AT+QCFG="call/alpha" [,<value>] | Response If configuration parameters are omitted +QCFG: "call/alpha",<value> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
|---|---|

| | |
|-----------------------|-------|
| Maximum Response Time | 300ms |
| Reference | |

Parameter

| | |
|----------------------|---|
| <value> | Display parameter <alpha> or not |
| <u>0</u> | Not display |
| 1 | Display |

4.2.25. AT+QCFG="sms/alpha" Display Alphanumeric Name in SMS

AT+QCFG="sms/alpha" can display the parameter **<alpha>** in the result of **+CMGR** and the result of other SMS related commands or URCs (e.g. **+CMT**).

AT+QCFG="sms/alpha" Display Alphanumeric Name in SMS

| | |
|---|--|
| Write Command AT+QCFG="sms/alpha"[,<value>] | Response If configuration parameters are omitted +QCFG: "sms/alpha",<value> OK If configuration parameters are entered: OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | |

Parameter

| | |
|----------------------|---|
| <value> | Display parameter <alpha> or not |
| <u>0</u> | Not display |
| 1 | Display |

4.2.26. AT+QCFG="apready" AP Ready Configuration

AT+QCFG="apready" is used to set AP ready pin status detection. AP_READY (PIN2) is the default indicator pin. MCU could change the level indicator pin according to its actual demands.

When URC is reported and the level of indicator pin is invalid, this module will store the reported URC and periodically detect indicator pin's level until it turns to valid, and then stored URC will be reported. When the reported URC is stored, RI pin status will still change according to your configuration.

AT+QCFG="apready" AP Ready Configuration

| | |
|--|---|
| Test Command AT+QCFG=? | Response +QCFG: "apready",(0,1),(0,1),(100-3000) OK |
| Read Command AT+ QCFG="apready" | +QCFG:"apready",<enable>,<level>,<interval> OK |
| Set Command AT+QCFG="apready",<enable >[,<level>,[<interval>]] | Response OK ERROR |

Parameter

| | |
|-------------------------|---|
| <enable> | Enable/disable AP ready status detection. <u>0</u> Disable AP ready status detection 1 Enable AP ready status detection |
| <level> | Indicator pin's valid level. The parameter is only effective when indicator pin's detection is running. <u>0</u> Low level 1 High level |
| <interval> | Detection period, unit is ms. The parameter is only effective when indicator pin's detection is running. When indicator pin's level is invalid and URC is reported, this parameter will be used as detection interval to check indicator pin's level until it is valid. The default value is 500ms. |

NOTES

1. The configuration will be saved to NV automatically.
2. The maximum size to store URC is 15. Module will clear the earliest URC to store new one when exceeds 15.
3. When AP ready is running, module only stores one "RING" during call.

4. If AP_READY is suspending, the default level depends on parameter <level>.

Example

```
AT+QCFG="apready",1,0,800 //Set configuration
OK
AT+QCFG="apready"
+QCFG: "apready",0,0,300 //Read configuration
OK
```

4.3. AT+QINDCFG URC Indication Configuration

AT+QINDCFG is used to control URC indication.

AT+QINDCFG URC Indication Configuration

Test Command
AT+QINDCFG=?

Response
+QINDCFG: "all",(0,1),(0,1)
+QINDCFG: "csq",(0,1),(0,1)
+QINDCFG: "smsfull",(0,1),(0,1)
+QINDCFG: "ring",(0,1),(0,1)
+QINDCFG: "smsincoming",(0,1),(0,1)
+QINDCFG: "ccinfo",(0,1),(0,1)
OK

Read Command
AT+QINDCFG?

Response
+QINDCFG: "all",<enable>
+QINDCFG: "csq",<enable>
+QINDCFG: "smsfull",<enable>
+QINDCFG: "ring",<enable>
+QINDCFG: "smsincoming",<enable>
+QINDCFG: "ccinfo",<enable>
OK

Write Command
AT+QINDCFG=<urctype>[,<enable>[,<savetonvram>]]

Response
If configuration parameters are omitted (AT+QCFG=<urctype>), current configuration will be returned:
+QINDCFG: <urctype>,<enable>
OK

| | |
|-----------------------|---|
| | <p>If configuration parameters are entered: OK ERROR</p> <p>If error is related to ME functionality: +CME ERROR: <errcode></p> |
| Maximum Response Time | 300ms |

Parameter

| | |
|----------------------------|---|
| <urctype> | <p>URC type</p> <p>"all" Main switch of all URCs. Default is on</p> <p>"csq" Indication of signal strength and channel bit error rate change (similar to AT+CSQ). Default is off. If this configuration is on, present: +QIND: "csq",<rsssi>,<ber></p> <p>"smsfull" SMS storage full indication. Default is off. If this configuration is on, present: +QIND: "smsfull",<storage></p> <p>"ring" "RING" indication. Default is on</p> <p>"smsincoming" Incoming message indication, Default is on. Related URCs list: +CMTI,+CMT,+CDS,+CBM.</p> <p>"ccinfo" Indication of voice call state change (Parameters similar to AT+CLCC). Default is off. When voice call state changes to connected (MO&MT call), alerting (MO call),incoming (MT call),ended (MO&MT call), present: +QIND: "ccinfo",<idx>,<dir>,<stat>,<mode>,<empty>[,<number>,<type>,[<alpha>]] The value of <stat> as below: 0 Connected 3 Alerting 4 Incoming -1 End About the explanation of other parameters, please refer to AT+CLCC</p> |
| <enable> | <p>URC indication is on or off</p> <p>0 Off 1 On</p> |
| <savetonvram> | <p>Whether to save configuration into NV, the default is not saved</p> <p><u>0</u> Not save 1 Save</p> |

4.4. AT+CEER Extended Error Report

AT+CEER is used to query an extended error and report the cause of the last failed operation, such as:

- Fail to release call
- Fail to set up a call (both mobile originated or terminated)
- Fail to modify a call by using Supplementary Services
- Fail to activate, register, query, deactivate or deregister a Supplementary Service
- Fail to attach GPRS or fail to activate PDP context
- Fail to detach GPRS or fail to deactivate PDP context

The release cause **<text>** is a text to describe the cause information given by the network.

| AT+CEER Extended Error Report | |
|-------------------------------------|---|
| Test command AT+CEER=? | Response OK |
| Execution command AT+CEER | Response +CEER: <text> OK ERROR If error is related to ME functionality: +CME ERROR: <errcode> |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|---|
| <text> | Release cause text. Reason for the last call failure to setup or release (listed in 14.9 Release Cause Text List of AT+CEER). Both CS and PS domain call types are reported. Cause data is captured from Call Manager events and cached locally to later use by this command. |
|---------------------|---|

4.5. AT+QGBAND Get Module Operation Band

AT+QGBAND can get the current operation band of module.

| AT+QGBAND Get Module Operation Band | |
|-------------------------------------|-----------------------|
| Test Command AT+QGBAND=? | Response OK |

| | |
|---------------------------------------|--|
| Execution Command AT+QGBAND | Response +QGBAND: <currentband> OK |
| Reference | |

Parameter

| | |
|----------------------------|----------------------------------|
| <currentband> | Current operation band of module |
| 1 | GSM 900 |
| 2 | GSM 1800 |
| 4 | GSM 850 |
| 8 | GSM 1900 |
| 16 | WCDMA 2100 |
| 32 | WCDMA 1900 |
| 64 | WCDMA 850 |
| 128 | WCDMA 900 |
| 256 | WCDMA 800 |

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5 SIM Related Commands

5.1. AT+CIMI Request International Mobile Subscriber Identity (IMSI)

AT+CIMI requests the International Mobile Subscriber Identity (IMSI) which is intended to permit the TE to identify the individual SIM card or active application in the UICC (GSM or USIM) that is attached to MT.

AT+CIMI Request International Mobile Subscriber Identity (IMSI)

| | |
|-------------------------------------|--|
| Test Command AT+CIMI=? | Response OK |
| Execution Command AT+CIMI | Response TA returns <IMSI> for identifying the individual SIM which is attached to ME. <IMSI> OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

<IMSI> International Mobile Subscriber Identity (string without double quotes)

Example

```
AT+CIMI
460023210226023 //Query IMSI number of SIM which is attached to ME
OK
```

5.2. AT+CLCK Facility Lock

AT+CLCK is used to lock, unlock or interrogate a MT or a network facility **<fac>**. The command can be aborted when network facilities are set or interrogated.

| AT+CLCK Facility Lock | |
|---|--|
| Test Command AT+CLCK=? | Response +CLCK: (list of supported <fac> s) OK |
| Write Command AT+CLCK=<fac>,<mode>,[<passwd>[,<class>]] | Response This command is used to lock, unlock or interrogate a ME or a network facility <fac> . Password is normally needed to do such actions. When querying the status of a network service (<mode> =2) the response line for 'not active' case (<status> =0) should be returned only if service is not active for any <class> . If <mode> is not equal 2 and command is successful: OK If <mode> =2 and command is successful: +CLCK: <status>[,<class>] [+CLCK: <status>[, <class>]] [...] OK |
| Maximum Response Time | 5s |
| Reference | 3GPP TS 27.007 |

Parameter

| | | |
|--------------------|------|--|
| <fac> | "SC" | SIM (lock SIM/UICC card installed in the currently selected card slot) (SIM/UICC asks password in MT power-up and when this lock command issued) |
| | "AO" | BAOC (Barr All Outgoing Calls) (refer to 3GPP TS 22.088 clause 1) |
| | "OI" | BOIC (Barr Outgoing International Calls) (refer to 3GPP TS 22.088 clause 1) |
| | "OX" | BOIC-exHC (Barr Outgoing International Calls except to Home Country) (refer to 3GPP TS 22.088 clause 1) |
| | "AI" | BAIC (Barr All Incoming Calls) (refer to 3GPP TS 22.088 clause 2) |
| | "IR" | BIC-Roam (Barr Incoming Calls when Roaming outside the home country) (refer |

| | | |
|----------|----|---|
| | | to 3GPP TS 22.088 clause 2) |
| "AB" | | All Barring services (refer 3GPP TS 22.030) (applicable only for <mode>=0) |
| "AG" | | All outgoing barring services (refer 3GPP TS 22.030) (applicable only for <mode>=0) |
| "AC" | | All incoming barring services (refer 3GPP TS 22.030) (applicable only for <mode>=0) |
| "FD" | | SIM card or active application in the UICC (GSM or USIM) fixed dialing memory feature (if PIN2 authentication has not been done during the current session, PIN2 is required as <passwd>) |
| "PF" | | Lock Phone to the very First inserted SIM/UICC card (also referred in the present document as PH-FSIM) (MT asks password when other than the first SIM/UICC card is inserted) |
| "PN" | | Network Personalization (refer to 3GPP TS 22.022) |
| "PU" | | Network Subset Personalization (refer to 3GPP TS 22.022) |
| "PP" | | Service Provider Personalization (refer to 3GPP TS 22.022) |
| "PC" | | Corporate Personalization (refer to 3GPP TS 22.022) |
| <mode> | 0 | Unlock |
| | 1 | Lock |
| | 2 | Query status |
| <passwd> | | Password |
| <class> | 1 | Voice |
| | 2 | Data |
| | 4 | FAX |
| | 7 | All telephony except SMS (Default) |
| | 8 | Short message service |
| | 16 | Data circuit sync |
| | 32 | Data circuit async |
| <status> | 0 | Off |
| | 1 | On |

Example

```

AT+CLCK="SC",2
+CLCK: 0 //Query the status of SIM card lock, 0-unlock

OK
AT+CLCK="SC",1,"1234" //Lock SIM card, the password is 1234
OK
AT+CLCK="SC",2
+CLCK: 1 //Query the status of SIM card lock, 1-lock

OK
AT+CLCK="SC",0,"1234" //Unlock SIM card
OK

```

5.3. AT+CPIN Enter PIN

AT+CPIN is used to enter a password or query whether or not module requires a password which is necessary before it can be operated (SIM PIN, SIM PUK, PH-SIM PIN, etc.).

| AT+CPIN Enter PIN | |
|---|--|
| Test Command AT+CPIN=? | Response OK |
| Read Command AT+CPIN? | Response TA returns an alphanumeric string indicating whether or not some password is required. +CPIN: <code> OK |
| Write Command AT+CPIN=<pin>[,<new pin>] | Response TA stores a password which is necessary before it can be operated (SIM PIN, SIM PUK, etc.). If the PIN is to be entered twice, the TA shall automatically repeat the PIN. If no PIN request is pending, no action is taken and an error message, +CME ERROR , is returned to TE. If the PIN required is SIM PUK or SIM PUK2, the second pin is required. This second pin, <new pin> , is used to replace the old pin in the SIM. OK |
| Maximum Response Time | 5s |
| Reference | 3GPP TS 27.007 |

Parameter

| | | |
|---------------------|---------------|---|
| <code> | READY | MT is not pending for any password |
| | SIM PIN | MT is waiting for SIM PIN to be given |
| | SIM PUK | MT is waiting for SIM PUK to be given |
| | SIM PIN2 | MT is waiting for SIM PIN2 to be given |
| | SIM PUK2 | MT is waiting for SIM PUK2 to be given |
| | PH-NET PIN | MT is waiting for network personalization password to be given |
| | PH-NET PUK | MT is waiting for network personalization unblocking password to be given |
| | PH-NETSUB PIN | MT is waiting for network subset personalization password to be given |

| | |
|------------------------|--|
| PH-NETSUB PUK | MT is waiting for network subset personalization unblocking password to be given |
| PH-SP PIN | MT is waiting for service provider personalization password to be given |
| PH-SP PUK | MT is waiting for service provider personalization unblocking password to be given |
| PH-CORP PIN | MT is waiting for corporate personalization password to be given |
| PH-CORP PUK | MT is waiting for corporate personalization unblocking password to be given |
| <pin> | Password (string type). If the requested password was a PUK, such as SIM PUK1 or PH-FSIM PUK or another password, then <pin> must be followed by <new pin> |
| <new pin> | New password (string type) if the requested code was a PUK. |

Example

```
//Enter PIN
AT+CPIN?
+CPIN: SIM PIN //Query PIN code is locked

OK
AT+CPIN=1234 //Enter PIN
OK

+CPIN: READY
AT+CPIN? //PIN has already been entered
+CPIN: READY

OK

//Enter PUK and PIN
AT+CPIN?
+CPIN: SIM PUK //Query PUK code is locked

OK
AT+CPIN="26601934","1234" //Enter PUK and new PIN password
OK

+CPIN: READY
AT+CPIN?
+CPIN: READY //PUK has already been entered

OK
```

5.4. AT+CPWD Change Password

AT+CPWD sets a new password for the facility lock function defined by command Facility Lock **+CLCK**.

| AT+CPWD Change Password | |
|--|---|
| Test Command AT+CPWD=? | Response TA returns a list of pairs which present the available facilities and the maximum length of their password. +CPWD: (list of supported <fac>s),(<pwdlength>s) OK |
| Write Command AT+CPWD=<fac>,<oldpwd>,<newpwd> > | Response TA sets a new password for the facility lock function. OK |
| Maximum Response Time | 5s |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|-------------|---|
| <fac> | "SC" SIM (lock SIM/UICC card) (SIM/UICC asks password in MT power-up and when this lock command issued) |
| | "AO" BAOC (Barr All Outgoing Calls, refer to 3GPP TS 22.088 clause 1) |
| | "OI" BOIC (Barr Outgoing International Calls, refer to 3GPP TS 22.088 clause 1) |
| | "OX" BOIC-exHC (Barr Outgoing International Calls except to Home Country, refer to 3GPP TS 22.088 clause 1) |
| | "AI" BAIC (Barr All Incoming Calls, refer to 3GPP TS 22.088 clause 2) |
| | "IR" BIC-Roam (Barr Incoming Calls when Roaming outside the home country, refer to 3GPP TS 22.088 clause 2) |
| | "AB" All barring services (refer to 3GPP TS 22.030, applicable only for <mode>=0) |
| | "AG" All outgoing barring services (refer to 3GPP TS 22.030, applicable only for <mode>=0) |
| | "AC" All incoming barring services (refer to 3GPP TS 22.030, applicable only for <mode>=0) |
| | "P2" SIM PIN2 |
| <pwdlength> | Integer type, max length of password |
| <oldpwd> | Password specified for the facility from the user interface or with command. |
| <newpwd> | New password |

Example

```

AT+CPIN?
+CPIN: READY

OK
AT+CPWD="SC","1234","4321"           //Change SIM card password to "4321"
OK

//Restart module or re-activate the SIM card

AT+CPIN                               //Query PIN code is locked
+CPIN: SIM PIN
OK
AT+CPIN="4321"                         //PIN must be entered to define a new password "4321"
OK

+CPIN: READY
    
```

5.5. AT+CSIM Generic SIM Access

AT+CSIM allows a direct control of the SIM that is installed in the currently selected card slot by a distant application on the TE. The TE shall then keep the processing of SIM information within the frame specified by GSM/UMTS.

| AT+CSIM Generic SIM Access | |
|---|--|
| Test Command AT+CSIM=? | Response OK |
| Write Command AT+CSIM= <length>,<command> | Response +CSIM: <length>,<response> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|-------------------------|---|
| <length> | Integer type. Length of <command> or <response> string |
| <command> | Command transferred by the MT to the SIM in the format as described in 3GPP TS 51.011 |
| <response> | Response to the command transferred by the SIM to the MT in the format as described in 3GPP TS 51.011 |

5.6. AT+CRSM Restricted SIM Access

AT+CRSM offers easy and limited access to the SIM database. It transmits the SIM **<command>** and its required parameters to the MT.

| AT+CRSM Restricted SIM Access | |
|---|---|
| Test Command AT+CRSM=? | Response OK |
| Write Command AT+CRSM=<command>[,<fileId>[,<P1>,<P2>,<P3>[,<data>][,<pathId>]]] | Response +CRSM: <sw1>,<sw2>[,<response>] OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|---|---|
| <command> | USIM command number 176 READ BINARY 178 READ RECORD 192 GET RESPONSE 214 UPDATE BINARY 220 UPDATE RECORD 242 STATUS |
| <fileId> | Integer type; identifier for an elementary data file on USIM, if used by <command> |
| <P1>, <P2>, <P3> | Integer type; parameters transferred by the MT to the SIM. These parameters |

| | |
|---------------------------------|--|
| | are mandatory for every command, except GET RESPONSE and STATUS. The values are described in 3GPP TS 51.011 |
| <data> | Information which shall be written to the SIM (hexadecimal character format; refer to +CSCS) |
| <pathId> | Contains the directory path of an elementary file on a UICC in hexadecimal format |
| <sw1>, <sw2> | Integer type; information from the SIM about the execution of the actual command. These parameters are delivered to the TE in both cases, on successful or failed execution of the command |
| <response> | Response of a successful completion of the command previously issued (hexadecimal character format; refer +CSCS). STATUS and GET RESPONSE return data, which gives information about the current elementary data field. This information includes the type of file and its size (refer 3GPP TS 51.011). After READ BINARY, READ RECORD or RETRIEVE DATA command the requested data will be returned. <response> is not returned after a successful UPDATE BINARY, UPDATE RECORD or SET DATA command |

5.7. AT+QCCID Show ICCID

AT+QCCID returns the ICCID (Integrated Circuit Card Identifier) number of the SIM card.

| AT+QCCID Show ICCID | |
|--------------------------------------|---|
| Test Command AT+QCCID=? | Response OK |
| Execution Command AT+QCCID | Response +QCCID: <iccid> OK ERROR |
| Maximum Response Time | 300ms |

Example

```

AT+QCCID //Query ICCID of the SIM card
+QCCID: 898600220909A0206023

OK

```

5.8. AT+QFUN Set Phone Extended Functionality

AT+QFUN can be used to perform a power up/down to the SIM card. "OK" will be returned immediately. Host can judge it works or not from querying +CPIN? or other commands and URCs about SIM card.

AT+QFUN Set Phone Extended Functionality

| | |
|--|---|
| Test Command AT+ QFUN=? | Response +QFUN: (5,6) OK |
| Write Command AT+QFUN=<op> | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|-------------------|--|
| <op> | Operation |
| | 5 Perform a power down to the SIM card |
| | 6 Perform a power up to the SIM card |

NOTES

1. If you want to use **+QFUN** to swap SIM card, there should be some time delay after power down or power up SIM card. The delay time is recommended as 5 seconds at least.
2. It is not recommended to swap SIM card fleetly or frequently.

Example

```

AT+CPIN?
+CPIN: READY

OK
AT+QFUN=5           //Perform a power down to the SIM/USIM card
OK

+CPIN: NOT READY
    
```



```

AT+CPIN?
+CME ERROR: SIM not inserted
AT+QFUN=6 //Perform a power down to the SIM/USIM card
OK

+CPIN: READY

+QUSIM: 1 //If it is a USIM
AT+CPIN?
+CPIN: READY

OK
    
```

5.9. AT+QINISTAT Query Status of SIM Card Initialization

AT+QINISTAT is used to query status of SIM/USIM card initialization.

AT+QINISTAT Query Status of SIM Card Initialization

| | |
|---|---|
| Test Command AT+QINISTAT=? | Response +QINISTAT: (0-7) OK |
| Execution Command AT+QINISTAT | Response +QINISTAT: <status> OK |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------|---|
| <status> | Status of SIM card initialization. Actual value is the sum of several of the following four kinds (e.g. 7=1+2+4 means CPIN READY&SMS DONE&PHB DONE) |
| 0 | Initial state |
| 1 | CPIN READY. Operation like lock/unlock PIN is allowed |
| 2 | SMS initialization complete |
| 4 | Phonebook initialization complete |

5.10. AT+QPIN2 Query/Unlock SIM PIN2/PUK2

AT+QPIN2 is used to query or unlock SIM PIN2/PUK2.

AT+QPIN2 Query/Unlock SIM PIN2/PUK2

| | |
|---|---|
| Test Command AT+QPIN2=? | Response OK |
| Read Command AT+QPIN2? | Response +QPIN2: <code> OK |
| Write Command AT+QPIN2=<pin>[,<newpin>] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 5s |

Parameter

| | |
|------------------------|--|
| <code> | READY MT is not pending for SIM PIN2/PUK2 SIM PIN2 MT is waiting SIM PIN2 to be given SIM PUK2 MT is waiting SIM PUK2 to be given |
| <pin> | Password (string type). If the requested password is a PUK, then <pin> must be followed by <new pin> |
| <new pin> | New password (string type) if the requested code is a PUK |

5.11. AT+QPINC Display PIN Remainder Counter

AT+QPINC can query the number of attempts left to enter the password of SIM PIN/PUK.

AT+QPINC Display PIN Remainder Counter

| | |
|-----------------------------------|---|
| Test Command AT+QPINC=? | Response +QPINC: ("SC","P2") OK |
| Read Command | Response |

| | |
|--------------------------------------|--|
| AT+QPINC? | +QPINC: "SC", <pincounter>,<pukcounter> +QPINC: "P2", <pincounter>,<pukcounter> OK |
| Write Command AT+QPINC=<facility> | Response +QPINC: <facility>,<pincounter>,<pukcounter> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|--------------|--|
| <facility> | "SC" SIM PIN "P2" SIM PIN2 |
| <pincounter> | Number of attempts left to enter the password of PIN |
| <pukcounter> | Number of attempts left to enter the password of PUK |

5.12. AT+QSIMDET SIM Card Detection

AT+QSIMDET enables SIM/USIM card hotswap function. SIM/USIM card is detected by GPIO interrupt. You should also set the level of SIM/USIM detecting pin when the SIM card is inserted. This command can be saved by AT&W.

| AT+QSIMDET SIM Card Detection | |
|--|---|
| Test Command AT+QSIMDET=? | Response +QSIMDET: (0,1),(0,1) OK |
| Read Command AT+QSIMDET? | Response +QSIMDET: <enable>,<insert_level> OK |
| Write Command AT+QSIMDET=<enable>,<insert_level> > | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------------|---|
| <enable> | Switch on or off detecting SIM/USIM card 0 Off 1 On |
| <insert_level> | The level of SIM detection pin when a SIM card is inserted 0 Low level 1 High level |

NOTE

Hotswap function is invalid if the configured value of **<insert_level>** is inconsistent with hardware design.

Example

```

AT+QSIMDET=1,0 //If SIM/USIM detection pin level is low when SIM/USIM card inserted
OK
<Remove SIM/USIM card>
+CPIN: NOT READY
<Insert SIM/USIM card>
+CPIN: READY //If PIN1 of the SIM/USIM card is unlocked
    
```

5.13. AT+QSIMSTAT SIM Inserted Status Report

AT+QSIMSTAT can query SIM/USIM inserted status or enable SIM/USIM inserted status report. The configuration of this command can be saved by AT&W.

AT+QSIMSTAT SIM Inserted Status Report

| | |
|--|---|
| Test Command AT+QSIMSTAT=? | Response +QSIMSTAT: (0,1) OK |
| Read Command AT+QSIMSTAT? | Response +QSIMSTAT: <enable>,<inserted_status> OK |
| Write Command AT+QSIMSTAT=<enable> | Response OK ERROR |

| | |
|-----------------------|-------|
| Maximum Response Time | 300ms |
|-----------------------|-------|

Parameter

| | |
|--------------------------------|--|
| <enable> | Enable or disable SIM/USIM inserted status report. If it is enabled, when SIM/USIM card removes or inserts, the URC: +QSIMSTAT: <enable>,<inserted_status> will be reported. <u>0</u> Disable 1 Enable |
| <inserted_status> | SIM/USIM is inserted or removed. This argument is not allowed to be set. 0 Removed 1 Inserted 2 Unknown, before SIM initialization |

Example

```

AT+QSIMSTAT? //Query SIM/USIM inserted status
+QSIMSTAT: 0,1

OK
AT+QSIMDET=1,0
OK
AT+QSIMSTAT=1 //Enable SIM/USIM inserted status report
OK
AT+QSIMSTAT?
+QSIMSTAT: 1,1

OK
<Remove SIM/USIM card>
+QSIMSTAT : 1,0 //Report of SIM/USIM inserted status: removed

+CPIN: NOT READY
AT+QSIMSTAT?
+QSIMSTAT: 1,0

OK
<Insert SIM/USIM card>
+QSIMSTAT : 1,1 //Report of SIM/USIM inserted status: inserted

+CPIN: READY
    
```

6 Network Service Commands

6.1. AT+COPS Operator Selection

AT+COPS returns the current operators and their status and allows to set automatic or manual network selection.

AT+COPS Operator Selection

Test Command
AT+COPS=?

Response

TA returns a set of five parameters, each representing an operator present in the network. Any of the formats may be unavailable and should then be an empty field. The list of operators shall be in order: home network, networks referenced in SIM and other networks.

+COPS: (list of supported<stat>, long alphanumeric <oper>, short alphanumeric <oper>, numeric <oper>s)[,< Act>]s]
[,,(list of supported <mode>s),(list of supported <format>s)]

OK

If error is related to ME functionality:

+CME ERROR: <err>

Read Command
AT+COPS?

Response

TA returns the current mode and the currently selected operator. If no operator is selected, <format>, <oper> and <Act> are omitted.

+COPS: <mode>[,<format>[,<oper>][,<Act>]]

OK

If error is related to ME functionality:

+CME ERROR: <err>

Write Command
**AT+COPS=
<mode>[,<format>[,<oper>[,<Act>]]]**

Response

TA forces an attempt to select and register the GSM/UMTS network operator. If the selected operator is not available, no other operator shall be selected (except <mode>=4). The

| | |
|-----------------------|--|
| | format of selected operator name shall apply to further read commands (+COPS?). |
| | OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 180s, determined by network. |
| Reference | 3GPP TS 27.007 |

Parameter

| | | |
|-----------------------|---|--|
| <stat> | 0 | Unknown |
| | 1 | Operator available |
| | 2 | Operator current |
| | 3 | Operator forbidden |
| <oper> | Operator in format as per <mode> | |
| <mode> | 0 | Automatic mode; <oper> field is ignored |
| | 1 | Manual operator selection; <oper> field shall be present and <Act> optionally |
| | 2 | Manual deregister from network |
| | 3 | Set only <format> (for read Command +COPS?), do not attempt registration/deregistration (<oper> and <Act> fields are ignored); this value is not applicable in read command response |
| | 4 | Manual/automatic selected, <oper> field shall be presented; if manual selection fails, automatic mode (<mode> =0) is entered |
| <format> | 0 | Long format alphanumeric <oper> ; can be up to 16 characters long |
| | 1 | Short format alphanumeric <oper> |
| | 2 | Numeric <oper> ; GSM location area identification number |
| <Act> | Access technology selected | |
| | 0 | GSM |
| | 2 | UTRAN |
| | 3 | GSM W/EGPRS |
| | 4 | UTRAN W/HSDPA |

Example

```

AT+COPS=? //List all current network operators
+COPS:
(2,"CHN-UNICOM","UNICOM","46001",2),(1,"CHN-UNICOM","UNICOM","46001",0),(3,"CHINA
MOBILE","CMCC","46000",0),(0,1,2,3,4),(0,1,2)

OK
AT+COPS? //Query the currently selected network operator

```

+COPS: 0,0,"CHN-UNICOM",0

OK

6.2. AT+CREG Network Registration

AT+CREG returns the network registration status. The write command sets whether or not to present URC.

AT+CREG Network Registration

| | |
|---|--|
| Test Command AT+CREG=? | Response +CREG: (list of supported <n>s) OK |
| Read Command AT+CREG? | Response TA returns the status of result code presentation and an integer <stat> which shows whether the network has currently indicated the registration of the ME. Location information elements <lac> and <ci> are returned only when <n>=2 and ME is registered in the network. +CREG: <n>,<stat>[,<lac>,<ci>[,<Act>]] OK If error is related to ME functionality: +CME ERROR: <err> |
| Write Command AT+CREG=<n> | Response TA controls the presentation of an unsolicited result code +CREG: <stat> when <n>=1 and there is a change in the ME network registration status. OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|-----|---|--|
| <n> | 0 | Disable network registration unsolicited result code |
| | 1 | Enable network registration unsolicited result code +CREG: <stat> |
| | 2 | Enable network registration unsolicited result code with location information +CREG: <stat>[,<lac>,<ci>[,<Act>]] |

| | | |
|---------------------|---|---|
| <stat> | 0 | Not registered, ME is not currently searching a new operator to register to |
| | 1 | Registered, home network |
| | 2 | Not registered, but ME is currently searching a new operator to register to |
| | 3 | Registration denied |
| | 4 | Unknown |
| | 5 | Registered, roaming |
| <lac> | String type, two bytes location area code in hexadecimal format | |
| <ci> | String type, two bytes cell ID in hexadecimal format | |
| <Act> | Access technology selected | |
| | 0 | GSM |
| | 2 | UTRAN |

Example

```

AT+CREG=1
OK

+CREG: 1 //URC reports that ME has registered
AT+CREG=2 //Activates extended URC mode
OK

+CGREG: 1,"D504","08043799",2 //URC reports that operator has found location area code and cell ID
  
```

6.3. AT+CSQ Signal Quality Report

AT+CSQ indicates the received signal strength **<rssi>** and the channel bit error rate **<ber>**.

AT+CSQ Signal Quality Report

| | |
|------------------------------------|--|
| Test Command AT+CSQ=? | Response +CSQ: (list of supported <rssi> s),(list of supported <ber> s) OK |
| Execution Command AT+CSQ | Response +CSQ: <rssi> , <ber> OK +CME ERROR: <err> Execution Command returns received signal strength indication <rssi> and channel bit error rate <ber> from the ME. Test Command returns values supported by the TA. |
| Maximum Response Time | 300ms |

Reference
3GPP TS 27.007

Parameter

| | | |
|---|-------------------------------------|---|
| <rsssi> | 0 | -113 dBm or less |
| | 1 | -111 dBm |
| | 2...30 | -109... -53 dBm |
| | 31 | -51 dBm or greater |
| | 99 | Not known or not detectable |
| <p>According to 3GPP TS 27.007 [47], the <rsssi> value is not applicable to 3G networks. Yet, with a view to employing +CSQ for all networks has been designed to show a <rsssi> value derived from the 3G specific RSCP parameter is shown by AT+QENG . Nevertheless, please note that connection quality in 3G networks is depending on further factors. For example, despite good <rsssi> or RSCP values for signal quality, data throughput may vary depending on the number of subscribers sharing the same cell. Please get details by +QENG</p> | | |
| <ber> | Channel bit error rate (in percent) | |
| | 0...7 | As RXQUAL values in the table in 3GPP TS 45.008 subclause 8.2.4 |
| | 99 | Not known or not detectable |

Example

```

AT+CSQ=?
+CSQ: (0-31,99),(0-7,99)

OK
AT+CSQ
+CSQ: 28,0 //Query the current signal strength indication is 28 and channel bit error rate is 0

OK
    
```

NOTES

After using network related commands such as **+CCWA**, **+CCFC**, users are advised to wait for 3s before entering AT+CSQ. This is recommended to ensure that any network access required for the preceding command has finished.

6.4. AT+CPOL Preferred Operator List

AT+CPOL edits and queries the list of the preferred operators.

AT+CPOL Preferred Operator List

| | |
|--|---|
| Test Command AT+CPOL=? | Response +CPOL: (list of supported <index> s),(list of supported <format> s) OK |
| Read Command AT+CPOL? | Response Query the list of the preferred operators: +CPOL: <index> , <format> , <oper> [, <GSM> , <GSM_compact> , <UTRAN>] <index> , <format> , <oper> [, <GSM> , <GSM_compact> , <UTRAN>] [...] OK |
| Write Command AT+CPOL= <index> [, <format>][, <oper> [<GSM> , <GSM_compact> , <UTRAN>]]] | Response Edit the list of the preferred operators OK ERROR If the <index> is given but the <operator> is left out, the entry is deleted. |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|----------------------------|--|
| <index> | Integer type; the order number of operator in the SIM/USIM preferred operator list |
| <format> | 0 Long format alphanumeric <oper> 1 Short format alphanumeric <oper> 2 Numeric <oper> |
| <oper> | String type; <format> indicates if the format is alphanumeric or numeric (see +COPS) |
| <GSM> | GSM access technology 0 Access technology is not selected 1 Access technology is selected |
| <GSM_Compact> | GSM compact access technology 0 Access technology is not selected 1 Access technology is selected |
| <UTRAN> | UTRAN access technology |

| | |
|---|-----------------------------------|
| 0 | Access technology is not selected |
| 1 | Access technology is selected |

6.5. AT+COPN Read Operator Names

The AT+COPN command returns the list of operator names from the ME. Each operator code **<numeric>** that has an alphanumeric equivalent **<alphan>** in the ME memory is returned.

AT+COPN Read Operator Names

| | |
|-------------------------------------|---|
| Test Command AT+COPN=? | Response OK |
| Execution Command AT+COPN | Response +COPN: <numeric1>,<alpha1> [+COPN: <numeric2>,<alpha2> [...]] OK +CME ERROR: <err> |
| Maximum Response Time | Depends on the number of operator names |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|------------------------|---|
| <numeric> | String type; operator in numeric format (see +COPS) |
| <alphan> | String type; operator in long alphanumeric format (see +COPS) |

6.6. AT+CTZU Automatic Time Zone Update

This set command enables and disables automatic time zone update via NITZ. The configuration is stored to NV automatically.

AT+CTZU Automatic Time Zone Update

| | |
|----------------------------------|--|
| Test Command AT+CTZU=? | Response +CTZU: (0,1) OK |
| Write Command | Response |

| | |
|-----------------------------|---------------------------------------|
| AT+CTZU=<on_off> | OK ERROR |
| Read Command AT+CTZU? | Response +CTZU: <on_off> OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|---------|--|
| <onoff> | Integer type, indicates the mode of automatic time zone update |
| 0 | Disable automatic time zone update via NITZ. |
| 1 | Enable automatic time zone update via NITZ |

Example

```

AT+CTZU?
+CTZU: 0

OK
AT+CTZU=?
+CTZU: (0,1)

OK
AT+CTZU=10
ERROR
AT+CTZU=1
OK
AT+CTZU?
+CTZU: 1

OK

```

6.7. AT+CTZR Time Zone Reporting

This command controls the time zone reporting of changed event. If reporting is enabled the MT returns the unsolicited result code **+CTZV: <tz>or +CTZE: <tz>,<dst>,<time>** whenever the time zone is changed. The configuration is stored to NV automatically.

AT+CTZR Time Zone Reporting

| | |
|---|--|
| Test Command AT+CTZR=? | Response +CTZR: (0-2) OK |
| Write Command AT+CTZR=<reporting> | Response OK ERROR |
| Read Command AT+CTZR? | Response +CTZR: <reporting> OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|--------------------------|--|
| <reporting> | Integer type, indicates the mode of time zone reporting <ul style="list-style-type: none"> 0 Disable time zone reporting of changed event 1 Enable time zone reporting of changed event by unsolicited result code +CTZV: <tz> 2 Enable extended time zone reporting by unsolicited result code +CTZE: <tz>,<dst>,<time> |
| <tz> | String type, represents the sum of the local time zone (difference between the local time and GMT is expressed in quarters of an hour) plus daylight saving time. The format is " $\pm zz$ ", expressed as a fixed width, two digit integer with the range -48 ... +56. To maintain a fixed width, numbers in the range -9 ... +9 are expressed with a leading zero, e.g. "-09", "+00" and "+09" |
| <dst> | Integer type, indicates whether <tz> includes daylight savings adjustment <ul style="list-style-type: none"> 0 <tz> includes no adjustment for Daylight Saving Time 1 <tz> includes +1 hour (equals 4 quarters in <tz>) adjustment for daylight saving time 2 <tz> includes +2 hours (equals 8 quarters in <tz>) adjustment for daylight saving time |
| <time> | String type, represents the local time. The format is "YYYY/MM/DD,hh:mm:ss", expressed as integers representing year (YYYY), month (MM), date (DD), hour (hh), minute (mm) and second (ss). This parameter can be provided by the network when delivering time zone information and will be presented in the unsolicited result code of extended time zone reporting if provided by the network |

Example

```
AT+CTZR=2
OK
AT+CTZR?
+CTZR: 2

OK

+CTZE: +32,0,2013/08/23,06:51:13 //<reporting> is 2
```

6.8. AT+QLTS Obtain the Latest Network Time Synchronization

AT+QLTS is used to obtain the latest network time synchronization.

AT+QLTS Obtain the Latest Network Time Synchronization

| | |
|-------------------------------------|--|
| Test Command AT+QLTS=? | Response OK |
| Execution Command AT+QLTS | Response Execution Command returns latest time for Network synchronization: +QLTS: <time>,<ds> OK |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|---|
| <time> | String type. Format is "YYYY/MM/DD,hh:mm:ss±zz", indicates year (two last digits), month, day, hour, minutes, seconds and time zone (indicates the difference, expressed in quarters of an hour, between the local time and GMT; range -48...+56). E.g. 6th of May 2004, 22:10:00 GMT+2 hours |
| <ds> | Daylight saving time. It is zero equals to "04/05/06,22:10:00+08,0" |

Example

```
AT+QLTS
+QLTS: "13/08/23,06:51:13+32,0"

OK
```

7 Call Related Commands

7.1. ATA Answer an Incoming Call

ATA connects the module to an incoming voice or data call indicated by a "RING" URC.

ATA Answer an Incoming Call

Execution Command

ATA

Response

TA sends off-hook to the remote station.

Response in case of data call, if successfully connected

CONNECT<text> TA switches to data mode.

Note: **<text>** output only if **ATX<value>** parameter setting with the **<value>** >0.

When TA returns to command mode after call release:

OK

Response in case of voice call, if successfully connected:

OK

Response if no connection:

NO CARRIER

Maximum Response Time

90s, determined by network.

Reference

V.25ter

NOTES

1. Any additional commands on the same command line are ignored.
2. This command may be aborted generally by receiving a character during execution. The aborting is not possible during some states of connection establishment such as handshaking.
3. See also **ATX**.

Example

```

RING //A voice call is ringing
AT+CLCC
+CLCC: 1,1,4,0,0,"02154450290",129

OK
ATA //Accept the voice call with ATA
OK
    
```

7.2. ATD Mobile Originated Call to Dial a Number

ATD can be used to set up outgoing voice and data calls. Supplementary Services can also be controlled with ATD.

ATD Mobile Originated Call to Dial a Number

| | |
|--|--|
| Execution Command ATD<n>[<mgsms>][:] | <p>Response</p> <p>This command can be used to set up outgoing voice, data or FAX calls. It also serves to control supplementary services.</p> <p>If no dial tone and (parameter setting ATX2 or ATX4): NO DIALTONE</p> <p>If busy and (parameter setting ATX3 or ATX4): BUSY</p> <p>If a connection cannot be established: NO CARRIER</p> <p>If connection is successful and non-voice call. CONNECT<text> TA switches to data mode. <text> output only if ATX<value> parameter setting with the <value> >0</p> <p>When TA returns to command mode after call release: OK</p> <p>If connection is successful and voice call: OK</p> |
| Maximum Response Time | 5s, determined by network (AT+COLP=0). |
| Reference V.25ter | |

Parameter

| | |
|---------|--|
| <n> | String of dialing digits and optionally V.25ter modifiers Dialing digits: 0-9, *, #, +, A, B, C Following V.25ter modifiers are ignored: ,(comma), T, P, !, W, @ |
| <mgsms> | String of GSM modifiers: I Activates CLIR (Disable presentation of own number to called party) i Deactivates CLIR (Enable presentation of own number to called party) G Activates closed user group invocation for this call only g Deactivates closed user group invocation for this call only |
| <;> | Only required to set up voice call, return to command state |

NOTES

1. This command may be aborted generally by receiving an **ATH** command or a character during execution. The aborting is not possible during some states of connection establishment such as handshaking.
2. Parameter "I" and "i" only if no *# code is within the dial string.
3. See **ATX** command for setting result code and call monitoring parameters.
4. Responses returned after dialing with **ATD**
For voice call two different responses mode can be determined. TA returns "OK" immediately either after dialing was completed or after the call was established. The setting is controlled by **AT+COLP**. Factory default is **AT+COLP=0**, which causes the TA returns "OK" immediately after dialing was completed, otherwise TA will return "OK", "BUSY", "NO DIAL TONE", "NO CARRIER".
5. Using **ATD** during an active voice call:
 - When a user originates a second voice call while there is already an active voice call, the first call will be automatically put on hold.
 - The current states of all calls can be easily checked at any time by using the **AT+CLCC** command.

Example

```
ATD10086; //Dialing out the party's number
OK
```

7.3. ATH Disconnect Existing Connection

ATH disconnects circuit switched data calls or voice calls. AT+CHUP is also used to disconnect the voice call.

ATH Disconnect Existing Connection

| | |
|------------------------------------|---|
| Execution Command ATH[n] | Response Disconnect existing call by local TE from command line and terminate call. OK |
| Maximum Response Time | 90s, determined by network. |
| Reference V.25ter | |

Parameter

| | | |
|-----|---|---|
| <n> | 0 | Disconnect from line and terminate call |
|-----|---|---|

7.4. AT+CVHU Voice Hang Up Control

AT+CVHU controls whether ATH can be used to disconnect the voice call.

AT+CVHU Voice Hang Up Control

| | |
|--|---|
| Test Command AT+CVHU=? | Response +CVHU: (list of supported<mode>s) OK |
| Read Command AT+CVHU? | Response +CVHU: <mode> OK |
| Write Command AT+CVHU=<mode> | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|--------|---|--|
| <mode> | 0 | ATH is disconnected |
| | 1 | ATH is ignored but "OK" response is returned |

7.5. AT+CHUP Hang Up Call

AT+CHUP cancels all voice calls in the state of Active, Waiting and Held. For data connections, use ATH.

AT+CHUP Hang Up Call

| | |
|-------------------------------------|---------------------------------------|
| Test Command AT+CHUP=? | Response OK |
| Execution Command AT+CHUP | Response OK ERROR |
| Maximum Response Time | 90s, determined by network. |
| Reference 3GPP 27.007 | |

Example

```
RING //Incoming call
AT+CHUP //Hang up call
OK
```

7.6. +++ Switch From Data Mode to Command Mode

The +++ character sequence causes the module to switch from data mode to AT command mode. It allows inputting AT commands while maintaining the data connection with the remote device.

+++ Switch From Data Mode to Command Mode

| | |
|---------------------------------|---|
| Execution Command +++ | Response This command is only available during TA is in data mode. The“+++” character sequence causes the TA to cancel the data flow over the AT interface and switch to command mode. This allows you to enter AT command while maintaining the data connection with the remote server or, accordingly, the GPRS connection. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

NOTES

1. To prevent the“+++” escape sequence from being misinterpreted as data, it should comply to following sequence:
 - Do not input any character within T1 time (1000ms) before inputting “+++”.
 - Input “+++” within 1000ms, and no other characters can be inputted during this time.
 - Do not input any character within T1 time (1000ms) after “+++” has been inputted.
 - Switch to command mode, otherwise return to step 1.
2. To return from command mode back to data mode: Enter **ATO**
 - Another way to change to command mode is through DTR, refer to **AT&D** command for details.

7.7. ATO Switch From Command Mode to Data Mode

ATO resumes the connection and switches back from command mode to data mode.

ATO Switch From Command Mode to Data Mode

Execution Command

ATO[n]

Response

TA resumes the connection and switches back from command mode to data mode.

If connection is not successfully resumed:

NO CARRIER

else

TA returns to data mode from command mode **CONNECT**

<text>

Maximum Response Time

300ms

Reference

V.25ter

Parameter

| | | |
|------------------|---|---------------------------------------|
| <n> | 0 | Switch from command mode to data mode |
|------------------|---|---------------------------------------|

NOTE

TA returns to data mode from command mode **CONNECT <text>,<text>** only if **ATX** parameter is set as value>0.

7.8. AT\$0 Set Number of Rings before Automatically Answering Call

AT\$0 controls automatic answering mode for the incoming calls.

AT\$0 Set Number of Rings Before Automatically Answering Call

| | |
|---|--|
| Read Command AT\$0? | Response <n> OK |
| Write Command AT\$0=<n> | Response This parameter setting determines the number of rings before auto-answer. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|---------|---|
| <n> | 000 | Automatic answering is disabled |
| | 001-255 | Enable automatic answering on the ring number specified |

NOTE

If <n> is set too high, the calling party may hang up before the call is answered automatically.

Example

```

AT$0=3 //Set three rings before automatically answering a call
OK
RING //Call coming
RING
RING //Automatically answering the call after three rings
    
```

7.9. ATS6 Set Pause Before Blind Dialing

ATS6 is implemented for compatibility reasons only, and has no effect.

ATS6 Set Pause Before Blind Dialing

| | |
|--|---------------------------|
| Read Command ATS6? | Response <n> OK |
| Write Command ATS6=<n> | Response OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|-------------|--|
| <n> | 000-002-010 | Number of seconds to wait before blind dialing |
|-----|-------------|--|

7.10. ATS7 Set Number of Seconds to Wait for Connection Completion

ATS7 specifies the amount of time to wait for the connection completion in case of answering or originating a call. If no connection is established during this time, the module disconnects from the line.

ATS7 Set Number of Seconds to Wait for Connection Completion

| | |
|--|--|
| Read Command ATS7? | Response <n> OK |
| Write Command ATS7=<n> | Response This parameter setting determines the amount of time to wait for the connection completion in case of answering or originating a call. OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|---------|---|
| <n> | 000 | Disabled |
| | 001-255 | Number of seconds to wait for connection completion |

7.11. ATS8 Set the Number of Seconds to Wait for Comma Dial Modifier

ATS8 is implemented for compatibility reasons only, and has no effect.

ATS8 Set the Number of Seconds to Wait for Comma Dial Modifier

| | |
|--|---------------------------|
| Read Command ATS8? | Response <n> OK |
| Write Command ATS8=<n> | Response OK |
| Maximum Response Time | 300ms |
| Reference V.25ter | |

Parameter

| | | |
|-----|-------------|--|
| <n> | 000 | No pause when comma encountered in dial string |
| | 001-002-255 | Number of seconds to wait |

7.12. ATS10 Set Disconnect Delay after Indicating the Absence of Data Carrier

ATS10 determines the amount of time, which the UE remains connected in absence of a data carrier.

ATS10 Set Disconnect Delay after Indicating the Absence of Data Carrier

| | |
|-------------------------------|---------------------------|
| Read Command ATS10? | Response <n> OK |
| Write Command | Response |

| | |
|------------------------|---|
| ATS10=<n> | This parameter setting determines the amount of time that the TA will remain connected in absence of data carrier. If the data carrier is once more detected before disconnection, the TA remains connected. OK |
| Maximum Response Time | 300ms |
| Reference | V.25ter |

Parameter

| | | |
|------------------|-------------|---|
| <n> | 001-015-254 | Number of tenths of seconds to wait before disconnecting after UE has indicated the absence of received line signal |
|------------------|-------------|---|

7.13. AT+CBST Select Bearer Service Type

AT+CBST write command selects the bearer service **<name>**, the data rate **<speed>** and the connection element **<ce>** to be used when data calls are originated.

| AT+CBST Select Bearer Service Type | |
|---|--|
| Test Command AT+CBST=? | Response +CBST: (list of supported <speed> s) ,(list of supported <name> s) ,(list of supported <ce> s) OK |
| Read Command AT+CBST? | Response +CBST: <speed> , <name> , <ce> OK |
| Write Command AT+CBST=[<speed>[,<name>[,<ce>]]] | Response TA selects the bearer service <name> with data rate <speed> , and the connection element <ce> to be used when data calls are originated. OK |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | | |
|----------------------|--|---|
| <speed> | <u>0</u> | Automatic speed selection |
| | 7 | 9600 bps (V.32) |
| | 12 | 9600 bps (V.34) |
| | 14 | 14400 bps (V.34) |
| | 16 | 28800 bps (V.34) |
| | 17 | 32000 bps (V.34) |
| | 39 | 9600 bps (V.120) |
| | 43 | 14400 bps (V.120) |
| | 48 | 28800 bps (V.120) |
| | 51 | 56000 bps (V.120) |
| | 71 | 9600 bps (V.110) |
| | 75 | 14400 bps (V.110) |
| | 80 | 28800 bps (V.110 or X.31 flag stuffing) |
| | 81 | 38400 bps (V.110 or X.31 flag stuffing) |
| 83 | 56000 bps (V.110 or X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI or RDI service in order to get FTM84 64000 bps (X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI service in order to get FTM) | |
| 84 | 64000 bps (X.31 flag stuffing; this setting can be used in conjunction with asynchronous non-transparent UDI service in order to get FTM) | |
| 116 | 64000 bps (bit transparent) | |
| 134 | 64000 bps (multimedia) | |
| <name> | <u>0</u> | Asynchronous Modem |
| | 1 | Synchronous Modem |
| | 4 | Asynchronous Modem (RDI) |
| <ce> | 0 | Transparent |
| | <u>1</u> | Non-transparent |

Table 4: Parameters Configurations Supported by AT+CBST

| <speed> | GSM | WCDMA | SYNC. | ASYNC. | ASYNC. (RDI) | TRANSP. | NON- TRANSP. |
|----------------------|------------|--------------|--------------|---------------|-------------------------|----------------|-------------------------|
| 0 | Y | Y | N | Y | N | N | Y |
| 7 | Y | N | N | Y | N | N | Y |
| 12 | Y | N | N | Y | N | N | Y |
| 14 | Y | Y | N | Y | N | N | Y |
| 16 | N | Y | N | Y | N | N | Y |

| | | | | | | | |
|-----|---|---|---|---|---|---|---|
| 17 | N | Y | N | Y | N | N | Y |
| 39 | Y | N | N | Y | N | N | Y |
| 43 | Y | Y | N | Y | N | N | Y |
| 48 | N | Y | N | Y | N | N | Y |
| 51 | N | Y | N | Y | N | N | Y |
| 71 | Y | N | N | Y | N | N | Y |
| 75 | Y | Y | N | Y | N | N | Y |
| 80 | Y | Y | N | Y | N | N | Y |
| 81 | Y | Y | N | Y | N | N | Y |
| 83 | Y | Y | N | Y | Y | N | Y |
| 84 | N | Y | N | Y | N | N | Y |
| 116 | N | Y | Y | N | N | Y | N |
| 134 | N | Y | Y | N | N | Y | N |

NOTE

3GPP TS 22.002 lists the allowed combinations of the sub-parameters.

7.14. AT+CSTA Select Type of Address

AT+CSTA write command selects the type of number for further dialing commands ATD according to 3GPP Technical Specifications. Test command returns values supported a compound value.

| AT+CSTA Select Type of Address | |
|----------------------------------|--|
| Test Command AT+CSTA=? | Response +CSTA: (list of supported <type>s) OK |
| Read Command AT+CSTA? | Response +CSTA: <type> |

| | |
|--|----------------|
| | OK |
| Write Command AT+CSTA=<type> | Response OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|---------------------|---|
| <type> | Current address type setting. |
| 129 | Unknown type |
| 145 | International type (contains the character "+") |

7.15. AT+CLCC List Current Calls of ME

The execution command returns the list of all current calls. If the command is executed successfully, but no calls are existed, no information but OK response is sent to the TE.

AT+CLCC List Current Calls of ME

| | |
|-------------------------------------|---|
| Test Command AT+CLCC=? | Response OK |
| Execution Command AT+CLCC | Response TA returns a list of current calls of ME. If command execute successfully but no calls are existed, no information but OK response is sent to TE. [+CLCC: <id1>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,<alpha>]] [+CLCC: <id2>,<dir>,<stat>,<mode>,<mpty>[,<number>,<type>[,<alpha>]] [...] OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------|--|
| <idx> | Integer type; call identification number as described in 3GPP TS 22.030 sub clause 4.5.5.1; this number can be used in AT+CHLD command operations |
| <dir> | 0 Mobile originated (MO) call 1 Mobile terminated (MT) call |
| <stat> | State of the call 0 Active 1 Held 2 Dialing (MO call) 3 Alerting (MO call) 4 Incoming (MT call) 5 Waiting (MT call) |
| <mode> | Bearer/tele service 0 Voice 1 Data 2 FAX |
| <empty> | 0 Call is not one of multiparty (conference) call parties 1 Call is one of multiparty (conference) call parties |
| <number> | Phone number in string type in format specified by <type> |
| <type> | Type of address of octet in integer format(Refer to 3GPP TS 24.008 , sub clause 10.5.4.7 for details). Usually, it has three kinds of values: 129 Unknown type 145 International type(contains the character "+") 161 National type |
| <alpha> | Alphanumeric representation of <number> corresponding to the entry found in phonebook |

7.16. AT+CR Service Reporting Control

AT+CR controls the module whether or not to transmit an intermediate result code **+CR: <serv>** to the TE when a call is being set up.

If it is enabled, an intermediate result code is transmitted at the point during connect negotiation at which the TA has determined which speed and quality of service will be used, before any error control or data compression reports are transmitted, and before any final result code (e.g. **CONNECT**) is transmitted.

AT+CR Service Reporting Control

Test Command
AT+CR=?

Response
+CR: (list of supported **<mode>**s)

OK

| | |
|--|---|
| Read Command AT+CR? | Response +CR: <mode> OK |
| Write Command AT+CR=[<mode>] | Response TA controls whether or not intermediate result code +CR: <serv> is returned from the TA to the TE when a call set up. OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|---------------------|-----------|------------------------------|
| <mode> | 0 | Disable |
| | 1 | Enable |
| <serv> | ASYNC | Asynchronous transparent |
| | SYNC | Synchronous transparent |
| | REL ASYNC | Asynchronous non-transparent |
| | REL SYNC | Synchronous non-transparent |
| | GPRS | GPRS |

7.17. AT+CRC Set Cellular Result Codes for Incoming Call Indication

AT+CRC controls whether or not to use the extended format of incoming call indication.

When it is enabled, an incoming call is indicated to the TE with unsolicited result code **+CRING: <type>** instead of the normal **RING**.

AT+CRC Set Cellular Result Codes for Incoming Call Indication

| | |
|---|---|
| Test Command AT+CRC=? | Response +CRC: (list of supported <mode>s) OK |
| Read Command AT+CRC? | Response +CRC: <mode> OK |
| Write Command AT+CRC=[<mode>] | Response TA controls whether or not the extended format of incoming |

| | |
|-----------------------------|---------------------------------------|
| | call indication is used. OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|---------------------|-----------|------------------------------|
| <mode> | <u>0</u> | Disable extended format |
| | 1 | Enable extended format |
| <type> | ASYNC | Asynchronous transparent |
| | SYNC | Synchronous transparent |
| | REL ASYNC | Asynchronous non-transparent |
| | REL SYNC | Synchronous non-transparent |
| | FAX | Facsimile |
| | VOICE | Voice |

Example

```

AT+CRC=1 //Enable extended format
OK
+CRING: VOICE //Indicate incoming call to the TE
ATH
OK
AT+CRC=0 //Disable extended format
OK
RING //Indicate incoming call to the TE
ATH
OK

```

7.18. AT+CRLP Select Radio Link Protocol Parameter

AT+CRLP write command sets radio link protocol (RLP) parameters used when non-transparent data calls are originated.

AT+CRLP Select Radio Link Protocol Parameter

| | |
|----------------------------------|--|
| Test Command AT+CRLP=? | Response TA returns values supported. RLP (Radio Link Protocol) |
|----------------------------------|--|

| | |
|---|--|
| | <p>versions 0 and 1 share the same parameter set. TA returns only one line for this set (where <ver> is not present).</p> <p>+CRLP: (list of supported <iws>s),(list of supported <mws>s),(list of supported <T1>s),(list of supported <N2>s), <ver> (list of supported <iws>s),(list of supported <mws>s),(list of supported <T1>s),(list of supported <N2>s), <ver> (list of supported <iws>s),(list of supported <mws>s),(list of supported <T1>s),(list of supported <N2>s), <ver></p> <p>OK</p> |
| <p>Read Command AT+CRLP?</p> | <p>Response</p> <p>TA returns current settings for RLP version. RLP versions 0 and 1 share the same parameter set. TA returns only one line for this set (where <ver> is not present).</p> <p>+CRLP: <iws>,<mws>,<T1>,<N2>,<ver> +CRLP: <iws>,<mws>,<T1>,<N2>,<ver> +CRLP: <iws>,<mws>,<T1>,<N2>,<ver></p> <p>OK</p> |
| <p>Write Command AT+CRLP=[<iws>,<mws>,<T1>,<N2>,<ver>]</p> | <p>Response</p> <p>TA sets radio link protocol (RLP) parameters used when non-transparent data calls are set up.</p> <p>OK</p> |
| <p>Maximum Response Time</p> | <p>300ms</p> |
| <p>Reference 3GPP TS27.007</p> | |

Parameter

| | | |
|-------|------------------------|--|
| <iws> | 0-61 0-240-488 | Interworking window size (IWF to MS) For <ver>=2 |
| <mws> | 0-61 0-240-488 | Mobile window size(MS to IWF) For <ver>=2 |
| <T1> | 38-48-255 42-52-255 | Acknowledgment timer T1 in a unit of 10ms For <ver>=2 |
| <N2> | 1-6-255 | Retransmission attempts N2 |
| <ver> | 0-2 | RLP version number in integer format |

7.19. AT+QECCNUM Configure Emergency Call Numbers

AT+QECCNUM can be used to query, add and delete ECC numbers (emergency call numbers). There are two kinds of ECC numbers, ECC numbers without SIM and ECC numbers with SIM. The default ECC numbers without SIM is 911, 112, 00, 08, 110, 999, 118 and 119. The default ECC number with SIM is 911 and 112. 911 and 112 will always be supported as ECC numbers, and cannot be deleted. ECC numbers can be saved into NV automatically. If the SIM card contains ECC File, the numbers in ECC File can also be regarded as ECC numbers.

The maximal supported ECC numbers of each type is 20.

| AT+QECCNUM Configure Emergency Call Numbers | |
|---|--|
| Test Command AT+QECCNUM=? | Response +QECCNUM: (0-3) OK |
| Write Command AT+QECCNUM=<mode>,<type>[,<eccnum1>[,<eccnum2>,...[,<eccnumN>]]] | Response If <mode> is equal to 0, query the ECC numbers, <eccnumN> should be omitted, return: +QECCNUM: <type>,<eccnum1>,<eccnum2>[...] OK If <mode> is not equal to 0: <mode>=1 is used to add the ECC number; <mode>=2 is used to delete the ECC number. In this case, at least one ECC number <eccnumN> should be inputted, return: OK ERROR If <mode>=3 is used to replace the ECC number chosen by <type>. In this case, at least one ECC number <eccnumN> should be inputted, returns: OK ERROR |
| Read Command AT+QECCNUM? | Response +QECCNUM: 0,<eccnum1>,<eccnum2>[...] +QECCNUM: 1,<eccnum1>,<eccnum2>[...] OK |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------|--|
| <mode> | ECC number operation mode 0 Query ECC numbers 1 Add ECC numbers 2 Delete ECC numbers 3 Replace ECC numbers |
| <type> | ECC number type 0 ECC numbers without SIM 1 ECC numbers with SIM |
| <eccnum> | String type; ECC numbers(e.g.110,119) |

Example

```

AT+QECCNUM=? //Query all the supported ECC number operation mode.
+QECCNUM: (0-3)

OK
AT+QECCNUM? //Query all the ECC numbers without SIM or with SIM
+QECCNUM: 0, "112", "911", "00", "08", "110", "999", "118", "119"
+QECCNUM: 1, "112", "911"

OK
AT+QECCNUM=0,1 //Query all the ECC numbers with SIM
+QECCNUM: 1, "112", "911"

OK
AT+QECCNUM=1,1,"110", "234" //Add "110" and "234" into the type of ECC numbers with SIM
OK
AT+QECCNUM=0,1 //Query all the ECC numbers with SIM
+QECCNUM: 1, "112", "911", "110", "234"

OK
AT+QECCNUM=2,1,"110" //Delete "110" from the type of ECC numbers with SIM
OK
AT+QECCNUM=0,1 //Query all the ECC numbers with SIM
+QECCNUM: 1, "112", "911", "234"

OK
AT+QECCNUM? //Query all the ECC numbers with SIM
+QECCNUM: 0, "911", "112", "00", "08", "110", "999", "118", "119"
+QECCNUM: 1, "112", "911", "229", "222"

OK

```

```

AT+QECCNUM=3,1,"189","147" //Replace ECC numbers to 189 and 147 from the type which with SIM
OK
AT+QECCNUM? //Query all the ECC numbers with SIM
+QECCNUM: 0,"911","112","00","08","110","999","118","119"
+QECCNUM: 1,"112","911","189","147"

OK
AT+QECCNUM=2,1 //Delete all ECC numbers from the type which with SIM
OK
AT+QECCNUM? //Query all the ECC numbers with SIM
+QECCNUM: 0,"911","112","00","08","110","999","118","119"
+QECCNUM: 1,"112","911"

OK

```

7.20. AT+QHUP Hang Up Call with a Specific Release Cause

AT+QHUP can terminate call(s) with a specific 3GPP TS 24.008 release cause specified by host (Including voice and data calls).

AT+QHUP Hang Up Call with a Specific Release Cause

| | |
|---|---|
| Test Command AT+QHUP=? | Response OK |
| Write Command AT+QHUP=<cause>[,<idx>] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 90s, determined by network. |

Parameter

| | |
|----------------------|--|
| <cause> | Release cause, 3GPP TS 24.008 release cause to be indicated to the network |
| 1 | Release cause "unassigned (unallocated) number" |
| 16 | Release cause "normal call clearing" |
| 17 | Release cause "user busy" |
| 18 | Release cause "no user responding" |
| 21 | Release cause "call rejected" |
| 27 | Release cause "destination out of order" |

| | | |
|--------------------|----------|---|
| | 31 | Release cause "normal, unspecified" |
| | 88 | Release cause "incompatible destination" |
| <idx> | | Call identification number is an optional index in the list of current calls indicated by +CLCC . +QHUP will terminate the call identified by the given call number. The default call number 0 is not assigned to any call, but signifies all calls |
| | <u>0</u> | Terminate all known calls. However, if circuit switches data calls and voice calls at the same time, this command only terminates the CSD calls |
| | 1...7 | Terminate the specific call with identification number |

Example

```

AT+QHUP=?           //Test Command
OK
ATD10010;           //Dial10010
OK
ATD10086;           //Dial10086
OK
AT+CLCC             //Query the status of calls
+CLCC: 1,0,1,0,0,"10010",129
+CLCC: 2,0,0,0,0,"10086",129

OK
AT+QHUP=17,1        //Terminate call of which call ID is 1. Disconnect cause is "user busy"
OK
AT+CLCC             //Query the status of calls
+CLCC: 1,0,0,0,0,"10086",129

OK
AT+QHUP=16          //Terminate all existed calls. Disconnect cause is "normal call clearing"
OK
AT+CLCC
OK

```

8 Phonebook Commands

8.1. AT+CNUM Subscriber Number

AT+CNUM can get the subscribers own number(s) from the SIM.

| AT+CNUM Subscriber Number | |
|-------------------------------------|---|
| Test Command AT+CNUM=? | Response OK |
| Execution Command AT+CNUM | Response [+CNUM: [<alpha>], <number>,<type>] [+CNUM: [<alpha>], <number>,<type>] OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP 27.007 | |

Parameter

| | |
|-----------------------|---|
| <alpha> | Optional alphanumeric string associated with <number> ; the used character set should be the one selected with command Select TE Character Set +CSCS |
| <number> | String type phone number of format specified by <type> |
| <type> | Type of address of octet in integer format (Refer to 3GPP TS 24.008, subclause 10.5.4.7 for details). Usually, it has three kinds of values: 129 Unknown type 145 International type(contains the character "+") 161 National type |

8.2. AT+CPBF Find Phonebook Entries

AT+CPBF can search the phonebook entries starting with the given **<findtext>** string from the current phonebook memory storage selected with **+CPBS**, and return all found entries sorted in alphanumeric order.

AT+CPBF Find Phonebook Entries

| | |
|--|---|
| Test Command AT+CPBF=? | Response +CPBF: <nlength>,<tlength> OK |
| Write Command AT+CPBF=<findtext> | Response [+CPBF: <index>,<number>,<type>,<text>] [...] OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | Depends on the storage of phonebook entries. |
| Reference 3GPP 27.007 | |

Parameter

| | |
|-------------------------|---|
| <nlength> | Integer type, indicates the maximum length of field <number> |
| <tlength> | Integer type, indicates the maximum length of field <text> |
| <findtext> | String type, field of maximum length <tlength> in current TE character set specified by +CSCS |
| <index> | Integer type, in the range of location numbers of phone book memory |
| <type> | Type of address of octet in integer format (Refer to 3GPP TS 24.008, subclause 10.5.4.7 for details). Usually, it has three kinds of values: 129 Unknown type 145 International type(contains the character "+") 161 National type |
| <text> | String type, field of maximum length <tlength> in current TE character set specified by +CSCS |

8.3. AT+CPBR Read Phonebook Entries

AT+CPBR can return phonebook entries in location number range **<index1>... <index2>** from the current phonebook memory storage selected with **+CPBS**. If **<index2>** is left out, only location **<index1>** is returned.

AT+CPBR Read Phonebook Entries

| | |
|---|---|
| Test Command AT+CPBR=? | Response +CPBR: (list of supported <index>s),<nlength>,<tlength> OK |
| Write Command AT+CPBR=<index1>[,<index2>] | Response +CPBR: <index1>,<number>,<type>,<text> [+CPBR: <index2>,<number>,<type>,<text> [...]] OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | Depends on the storage of phonebook entries. |
| Reference 3GPP 27.007 | |

Parameter

| | |
|------------------------|---|
| <index> | Integer type, in the range of location numbers of phone book memory |
| <nlength> | Integer type, indicates the maximum length of field <number> |
| <tlength> | Integer type, indicates the maximum length of field <text> |
| <index1> | The first phone book record to read |
| <index2> | The last phonebook record to read |
| <type> | Type of address of octet in integer format (Refer to 3GPP TS 24.008, subclause 10.5.4.7 for details). Usually, it has three kinds of values: 129 Unknown type 145 International type(contains the character "+") 161 National type |
| <text> | String type, field of maximum length <tlength> in current TE character set specified by +CSCS |

8.4. AT+CPBS Select Phonebook Memory Storage

AT+CPBS selects phonebook memory storage, which is used by other phonebook commands. Read command returns currently selected memory, and number of used locations and total number of locations in the memory when supported by manufacturer. Test command returns supported storages as compound value.

AT+CPBS Select Phonebook Memory Storage

| | |
|---|---|
| Test Command AT+CPBS=? | Response +CPBS: (list of supported <storage>s) OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Read Command AT+CPBS? | Response +CPBS: <storage>,<used>,<total> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Write Command AT+CPBS=<storage> | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP 27.007 | |

Parameter

| | | |
|-----------|------|--|
| <storage> | "SM" | SIM phonebook |
| | "DC" | ME dialed calls list (+CPBW may not be applicable on this storage) |
| | "FD" | SIM fix dialing-phone book (+CPBW operation need the authority of PIN2) |
| | "LD" | SIM last-dialing-phone book (+CPBW may not be applicable on this storage) |
| | "MC" | ME missed (unanswered) calls list(+CPBW may not be applicable on this storage) |
| | "ME" | Mobile equipment phonebook |

| | |
|---------|--|
| "RC" | ME received calls list (+CPBW may not be applicable on this storage) |
| "EN" | SIM (or ME) emergency number (+CPBW may not be applicable on this storage) |
| "ON" | SIM own numbers (MSISDNs) list |
| <used> | Integer type, indicates the total number of used locations in selected memory |
| <total> | Integer type, indicates the total number of locations in selected memory |

8.5. AT+CPBW Write Phonebook Entry

AT+CPBW writes phonebook entry in location number <index> in the current phonebook memory storage selected with **+CPBS**. It can also delete a phonebook entry in location number <index>.

AT+CPBW Write Phonebook Entry

| | |
|--|---|
| Test Command AT+CPBW=? | Response +CPBW: (The range of supported <index>s), <nlength>, (list of supported <type>s), <tlength> OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Write Command AT+CPBW=[<index>][,<number>[,<type>[,<text>]]] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP 27.007 | |

Parameter

| | |
|-----------|--|
| <index> | Integer type, in the range of location numbers of phone book memory. If <index> is not given, the first free entry will be used. If <index> is given as the only parameter, the phonebook entry specified by <location> is deleted |
| <nlength> | Integer type, indicates the maximum length of field <number> |
| <tlength> | Integer type, indicates the maximum length of field <text> |
| <type> | Type of address of octet in integer format (Refer to 3GPP TS 24.008, subclause 10.5.4.7 for details). Usually, it has three kinds of values: |

| | | |
|---------------------|-----|--|
| | 129 | Unknown type |
| | 145 | International type(contains the character "+") |
| | 161 | National type |
| <text> | | String type field of maximum length <tlength> in current TE character set specified by +CSCS |

Example

```
AT+CSCS="GSM"
```

```
OK
```

```
AT+CPBW=10,"15021012496",129,"QUECTEL"
```

```
OK
```

```
//Make a new phonebook entry at location 10
```

```
AT+CPBW=10
```

```
//Delete entry at location 10
```

```
OK
```

Quectel
Confidential

9 Short Message Service Commands

9.1. AT+CSMS Select Message Service

AT+CSMS selects message service **<service>** and returns the types of messages supported by the ME.

| AT+CSMS Select Message Service | |
|---|---|
| Test Command AT+CSMS=? | Response +CSMS: (list of supported <service> s) OK |
| Read Command AT+CSMS? | Response +CSMS: <service> , <mt> , <mo> , <bm> OK |
| Write Command AT+CSMS=<service> | Response +CSMS: <mt> , <mo> , <bm> OK If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.005 | |

Parameter

| <service> | Type of message service |
|------------------------|---|
| 0 | 3GPP TS 23.040 and 3GPP TS 23.041 (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 Phase 2 version 4.7.0; Phase 2+ features which do not require new command syntax may be supported, e.g. correct routing of messages with new Phase 2+ data coding schemes) |
| 1 | 3GPP TS 23.040 and 3GPP TS 23.041 (the syntax of SMS AT commands is compatible with 3GPP TS 27.005 Phase 2+ version; the requirement of |

| | | |
|------|----------------------------|---|
| | <service> | setting 1 is mentioned under corresponding command description-s) |
| <mt> | Mobile terminated messages | |
| | 0 | Type not supported |
| | <u>1</u> | Type supported |
| <mo> | Mobile originated messages | |
| | 0 | Type not supported |
| | <u>1</u> | Type supported |
| <bm> | Broadcast type messages | |
| | 0 | Type not supported |
| | <u>1</u> | Type supported |

Example

```

AT+CSMS=? //Test command
+CSMS: (0,1)

OK
AT+CSMS=1 //Set type of message service as 1
+CSMS: 1,1,1

OK
AT+CSMS? //Read command
+CSMS: 1,1,1,1

OK

```

9.2. AT+CMGF Message Format

AT+CMGF specifies the input and output format of the short messages. <mode> indicates the format of messages used with send, list, read and write commands and unsolicited result codes resulting from received messages.

Mode can be either PDU mode (entire TP data units used) or text mode (headers and body of the messages given as separate parameters). Text mode uses the value of parameter <chset> specified by command +CSCS to inform the character set to be used in the message body in the TA-TE interface.

AT+CMGF Message Format

| Test Command | Response |
|--------------|------------------------------------|
| AT+CMGF=? | +CMGF: (list of supported <mode>s) |
| | OK |

| | |
|--|--|
| Read Command AT+CMGF? | Response +CMGF: <mode> OK |
| Write Command AT+CMGF[=<mode>] | Response TA sets parameter to denote which kind of I/O format of messages is used. OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.005 | |

Parameter

| | | |
|---------------------|----------|-----------|
| <mode> | <u>0</u> | PDU mode |
| | 1 | Text mode |

9.3. AT+CSCA Service Center Address

AT+CSCA write command updates the SMSC address when mobile originated SMS are transmitted. In text mode, the setting is used by write commands. In PDU mode, setting is used by the same commands, but only when the length of the SMSC address is coded into the **<pdu>** parameter which equals to zero.

AT+CSCA Service Center Address

| | |
|---|---|
| Test Command AT+CSCA=? | Response OK |
| Read Command AT+CSCA? | Response +CSCA: <sca>,<tosca> OK |
| Write Command AT+CSCA=<sca>[,<tosca>] | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|----------------------|---|
| <sca> | Service center address. 3GPP TS 24.011 RP SC address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <tosca> |
| <tosca> | Type of service center address. 3GPP TS 24.011 RP SC address Type-of-Address octet in integer format (default refer to <toda>) |

Example

```

AT+CSCA="+8613800210500",145 //Set SMS service center address
OK
AT+CSCA? //Query SMS service center address
+CSCA: "+8613800210500",145
OK

```

9.4. AT+CPMS Preferred Message Storage

AT+CPMS selects memory storages **<mem1>**, **<mem2>** and **<mem3>** for reading and writing and so on.

AT+CPMS Preferred Message Storage

| | |
|--|---|
| Test Command AT+CPMS=? | Response +CPMS: (list of supported <mem1>s),(list of supported <mem2>s),(list of supported <mem3>s) OK |
| Read Command AT+CPMS? | Response +CPMS: <mem1>,<used1>,<total1>,<mem2>,<used2>,<total2>,<mem3>,<used3>,<total3> OK |
| Write Command AT+CPMS=<mem1>[,<mem2>[,<mem3>]] | Response TA selects memory storages <mem1> , <mem2> and <mem3> to be used for reading, writing, etc. +CPMS: <used1>,<total1>,<used2>,<total2>,<used3>,<total3> OK |

| | |
|-----------------------|--|
| | If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.005 |

Parameter

| | |
|-----------------------|--|
| <mem1> | Messages to be read and deleted from this memory storage "SM" SIM message storage "ME" Mobile Equipment message storage "MT" Same as "ME" storage |
| <mem2> | Messages will be written and sent to this memory storage "SM" SIM message storage "ME" Mobile equipment message storage "MT" Same as "ME" storage |
| <mem3> | Received messages will be placed in this memory storage if routing to PC is not set ("CNMI") "SM" SIM message storage "ME" Mobile equipment message storage "MT" Same as "ME" storage |
| <usedx> | Integer type, number of current messages in <memx> |
| <totalx> | Integer type, total number of messages which can be stored in <memx> |
| <totalx> | Integer type, number of messages storable in <memx> |

Example

```

AT+CPMS="SM","SM","SM" //Set SMS message storage as "SM"
+CPMS: 0,50,0,50,0,50

OK
AT+CPMS? //Query the currently SMS message storage
+CPMS: "SM",0,50,"SM",0,50,"SM",0,50

OK

```

9.5. AT+CMGD Delete Message

AT+CMGD deletes a short message from the preferred message storage **<mem1>** location **<index>**. If **<delflag>** is presented and not set to 0, then the ME shall ignore **<index>** and follow the rules of **<delflag>** shown as below.

AT+CMGD Delete Message

| | |
|---|---|
| Test Command AT+CMGD=? | Response +CMGD: (list of supported <index> s),(list of supported <delflag> s) OK |
| Write Command AT+CMGD=<index>[,<delflag>] | Response TA deletes message from preferred message storage <mem1> location <index> . OK If error is related to ME functionality: +CMS ERROR:<err> |
| Maximum Response Time | 300ms. Note: Operation of <delflag> depends on the storage of deleted messages. |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|------------------------|--|
| <index> | Integer type, in the range of location numbers supported by the associated memory |
| <delflag> | <p><u>0</u> Delete message specified in <index></p> <p>1 Delete all read messages from <mem1> storage, leaving unread messages and stored mobile originated messages (whether sent or not) untouched</p> <p>2 Delete all read messages from <mem1> storage and sent mobile originated messages, leaving unread messages and unsent mobile originated messages untouched</p> <p>3 Delete all read messages from <mem1> storage, sent and unsent mobile originated messages, leaving unread messages untouched</p> <p>4 Delete all messages from <mem1> storage</p> |

Example

```

AT+CMGD=1 //Delete message specified in <index>=1
OK
AT+CMGD=1,4 //Delete all messages from <mem1> storage
OK

```


9.6. AT+CMGL List Messages

AT+CMGL write command returns messages with status value **<stat>** from preferred message storage **<mem1>** to the TE. If the status of the message is "REC UNREAD", the status in the storage changes to "REC READ". When executing command AT+CMGL without status value **<stat>**, it will report the list of SMS with "REC UNREAD" status.

AT+CMGL List Messages

Test Command

AT+CMGL=?

Response

+CMGL: (list of supported **<stat>**s)

OK

Write Command

AT+CMGL=<stat>

Response

If text mode (**+CMGF=1**) and command successful:

For SMS-SUBMITs and/or SMS-DELIVERs:

+CMGL:

<index>,**<stat>**,**<oa/da>**,**[<alpha>]**,**[<scts>]**,**[<tooa/toda>**,**<length>**]**<CR><LF><data>**[**<CR><LF>**

+CMGL:

<index>,**<stat>**,**<da/oa>**,**[<alpha>]**,**[<scts>]**,**[<tooa/toda>**,**<length>**]**<CR><LF><data>**[**...**]

For SMS-STATUS-REPORTs:

+CMGL:

<index>,**<stat>**,**<fo>**,**<mr>**,**[<ra>]**,**[<tora>]**,**<scts>**,**<dt>**,**<st>****>**[**<CR><LF>**

+CMGL:

<index>,**<stat>**,**<fo>**,**<mr>**,**[<ra>]**,**[<tora>]**,**<scts>**,**<dt>**,**<st>****>**[**...**]

For SMS-COMMANDs:

+CMGL: **<index>**,**<stat>**,**<fo>**,**<ct>**[**<CR><LF>**

+CMGL: **<index>**,**<stat>**,**<fo>**,**<ct>**[**...**]

For CBM storage:

+CMGL:**<index>**,**<stat>**,**<sn>**,**<mid>**,**<page>**,**<pages>****<CR><LF><data>**[**<CR><LF>**

+CMGL:

<index>,**<stat>**,**<sn>**,**<mid>**,**<page>**,**<pages>****<CR><LF><data>**[**...**]

OK

| | |
|-------------------------------------|--|
| | <p>Else if PDU mode (+CMGF=0) and Command successful: +CMGL:<index>,<stat>,<[alpha]>,<length><CR><LF><pdu><CR><LF> +CMGL: <index>,<stat>,<[alpha]>,<length><CR><LF><pdu>[...]]</p> <p>OK</p> <p>Else if error is related to ME functionality: +CMS ERROR: <err></p> |
| Execution Command AT+CMGL | <p>Response</p> <p>List all messages with "REC UNREAD" status from message storage <mem1>, then status in the storage changes to "REC READ".</p> |
| Maximum Response Time | <p>300ms.</p> <p>Note: Operation of <stat> depends on the storage of listed messages.</p> |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|----------------------|--|
| <stat> | <p>In text mode:</p> <p>"REC UNREAD" Received unread messages</p> <p>"REC READ" Received read messages</p> <p>"STO UNSENT" Stored unsent messages</p> <p>"STO SENT" Stored sent messages</p> <p>"ALL" All messages</p> <p>In PDU mode:</p> <p>0 Received unread messages</p> <p>1 Received read messages</p> <p>2 Stored unsent messages</p> <p>3 Stored sent messages</p> <p>4 All messages</p> |
| <index> | Integer type, in the range of location numbers supported by the associated memory |
| <da> | Destination Address. 3GPP TS 23.040 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <toda> |
| <oa> | Originating address. 3GPP TS 23.040 TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in TS 27.007); type of address is given by <tooa> |
| <alpha> | String type alphanumeric representation of <da> or <oa> corresponding to the entry |

| | |
|-----------------------|--|
| | found in MT phonebook; implementation of this feature is manufacturer specified; the used character set should be the one selected with command Select TE Character Set +CSCS (see definition of this command in 3GPP TS 27.007) |
| <scts> | Service center time stamp. 3GPP TS 23.040 TP-Service-Centre-Time-Stamp in time-string format (refer to <dt>) |
| <toda> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address octet in integer format. |
| <toa> | Type of originating address. 3GPP TS 24.011 TP-Originating-Address Type-of-Address octet in integer format (default refer to <toda>) |
| <length> | Message length, integer type, indicating in the text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length) |
| <data> | <p>In the case of SMS: 3GPP TS 23.040 TP-User-Data in text mode responses; format:</p> <ul style="list-style-type: none">- If <dcs>, indicates that 3GPP TS 23.038 GSM 7 bit default alphabet is used and <fo> indicates that 3GPP TS 23.040 TP-User-Data-Header-Indication is not set- If TE character set other than "HEX" (refer to command Select TE Character Set +CSCS in 3GPP TS 27.007): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A- If TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character II (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))- If <dcs>, indicates that 8-bit or UCS2 data coding scheme is used, or <fo> indicates that 3GPP TS 23.040 TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) <p>In the case of CBS: 3GPP TS 23.041 CBM Content of Message in text mode responses; format:</p> <ul style="list-style-type: none">- If <dcs>, indicates that 3GPP TS 23.038 GSM 7 bit default alphabet is used:- If TE character set other than "HEX" (refer to command +CSCS in 3GPP TS 27.007): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A- If TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number- If <dcs>, indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number |
| <pdu> | In the case of SMS: 3GPP TS 24.011 SC address followed by 3GPP TS 23.040 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))3GPP TS 27.007 |

Example

```

AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CMGL="ALL" //List all messages from message storage
+CMGL: 1,"STO UNSENT",",",,
<This is a test from Quectel>
+CMGL: 2,"STO UNSENT",",",,
<This is a test from Quectel>
OK

```

9.7. AT+CMGR Read Message

AT+CMGR write command returns SMS message with location value **<index>** from message storage **<mem1>** to the TE. If status of the message is "REC UNREAD", status in the storage changes to "REC READ".

AT+CMGR Read Message

| Test Command | Response |
|----------------------------------|--|
| AT+CMGR=? | OK |
| Write Command AT+CMGR=<index> | <p>Response</p> <p>TA returns SMS message with location value <index> from message storage <mem1> to the TE. If status of the message is "REC UNREAD", status in the storage changes to "REC READ".</p> <p>1) If text mode (+CMGF=1) and command is executed successfully: For SMS-DELIVER: +CMGR: <stat>,<oa>,[<alpha>],[<scts>],[<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data></p> <p>OK</p> <p>For SMS-SUBMIT: +CMGR: <stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcs>,<vp>],<sca>,<tosca>,<length>]<CR><LF><data></p> |

| | |
|-----------------------------|--|
| | <p>OK</p> <p>For SMS-STATUS-REPORTs:</p> <p>+CMGR: <stat>,<fo>,<mr>,<ra>,<tora>,<scts>,<dt>,<st></p> <p>OK</p> <p>For SMS-COMMANDs:</p> <p>+CMGR: <stat>,<fo>,<ct>,<pid>,<mn>,<da>,<toda>,<length><CR><LF><cdata></p> <p>OK</p> <p>For CBM storage:</p> <p>+CMGR: <stat>,<sn>,<mid>,<dc>,<page>,<pages><CR><LF><data></p> <p>OK</p> <p>2) If PDU mode (+CMGF=0) and command successful: +CMGR: <stat>,<alpha>,<length><CR><LF><pdu></p> <p>OK</p> <p>3) If error is related to ME functionality: +CMS ERROR: <err></p> |
| Maximum Response Time | Depends on the length of message content. |
| Reference 3GPP TS 27.005 | |

Parameter

| | | | |
|---------|--|--------------|--------------------------|
| <index> | Integer type, in the range of location numbers supported by the associated memory | | |
| <stat> | PDU mode | Text mode | Explanation |
| | 0 | "REC UNREAD" | Received unread messages |
| | 1 | "REC READ" | Received read messages |
| | 2 | "STO UNSENT" | Stored unsent messages |
| | 3 | "STO SENT" | Stored sent messages |
| | 4 | "ALL" | All messages |
| <alpha> | String type alphanumeric representation of <da> or <oa> corresponding to the entry | | |

| | |
|-----------------------|--|
| | found in MT phonebook; implementation of this feature is manufacturer specified; the used character set should be the one selected with command Select TE Character Set +CSCS (see definition of this command in 3GPP TS 27.007) |
| <da> | Destination address. 3GPP TS 23.040 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <toda> |
| <oa> | Originating address. 3GPP TS 23.040 TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in TS 27.007); type of address is given by <tooa> |
| <scts> | Service center time stamp. 3GPP TS 23.040 TP-Service-Centre-Time-Stamp in time-string format (refer to <dt>) |
| <fo> | First octet. Depending on the command or result code: First octet of 3GPP TS 23.040 SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT, or SMS-COMMAND in integer format. If a valid value has been entered once, parameter can be omitted |
| <pid> | Protocol identifier. 3GPP TS 23.040 TP-Protocol-Identifier in integer format (default 0) |
| <dcs> | Data coding scheme. Depending on the command or result code: 3GPP TS 23.038 SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format |
| <vp> | Validity period. Depending on SMS-SUBMIT <fo> setting: 3GPP TS 23.040 TP-Validity-Period either in integer format or in time-string format (refer to <dt>) |
| <mn> | Message number. 3GPP TS 23.040 TP-Message-Number in integer format |
| <mr> | Message reference. 3GPP TS 23.040 TP-Message-Reference in integer format |
| <ra> | Recipient address. 3GPP TS 23.040 TP-Recipient-Address Address-Value field in string format; BCD numbers (or GSM default alphabet characters) are converted to characters of the currently selected TE character set (refer to command AT+CSCS.); type of address given by <tora> |
| <tora> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address octet in integer format (default refer <toda>) |
| <toda> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address octet in integer format |
| <tooa> | Type of originating address.3GPP TS 24.011 TP-Originating-Address Type-of-Address octet in integer format (default refer to <toda>) |
| <sca> | Service center address. 3GPP TS 24.011 RP SC address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <tosca> |
| <tosca> | Type of service center address. 3GPP TS 24.011 RP SC address Type-of-Address octet in integer format (default refer to <toda>) |
| <length> | Message length, integer type, indicating in the text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the |

length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length)

<data>

In the case of SMS: 3GPP TS 23.040 TP-User-Data in text mode responses; format:

- If **<dcs>**, indicates that 3GPP TS 23.038 GSM 7 bit default alphabet is used and **<fo>** indicates that 3GPP TS 23.040 TP-User-Data-Header-Indication is not set:
- If TE character set other than "HEX" (refer to command Select TE Character Set +CSCS in 3GPP TS 27.007): ME/TA converts GSM alphabet into current TE character set according to rules of Annex A
- If TE character set is "HEX": ME/TA converts each 7-bit character of GSM 7 bit default alphabet into two IRA character long hexadecimal number (e.g. character II (GSM 7 bit default alphabet 23) is presented as 17 (IRA 49 and 55))
- If **<dcs>**, indicates that 8-bit or UCS2 data coding scheme is used, or **<fo>** indicates that 3GPP TS 23.040 TP-User-Data-Header-Indication is set: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))

In the case of CBS: 3GPP TS 23.041 CBM Content of Message in text mode responses; format:

- If **<dcs>**, indicates that 3GPP TS 23.038 GSM 7 bit default alphabet is used:
- If TE character set other than "HEX" (refer command +CSCS in 3GPP TS 27.007): ME/TA converts GSM alphabet into current TE character set according rules of Annex A
- If TE character set is "HEX": ME/TA converts each 7-bit character of the GSM 7 bit default alphabet into two IRA character long hexadecimal number
- If **<dcs>**, indicates that 8-bit or UCS2 data coding scheme is used: ME/TA converts each 8-bit octet into two IRA character long hexadecimal number

<pdu>

In the case of SMS: 3GPP TS 24.011 SC address followed by 3GPP TS 23.040 TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65))3GPP TS 27.007

Example

```
+CMTI: "SM",3 //Indicates that new message has been received and saved
                to <index>=3 of "SM"
AT+CSDH=1
OK
AT+CMGR=3 //Read message
+CMGR: "REC UNREAD","+8615021012496",,"13/12/13 15:06:37+32",145,4,0,0,"+8
613800210500",145,27
<This is a test from Quectel>
OK
```

9.8. AT+CMGS Send Message

AT+CMGS write command sends a short message from TE to network (SMS-SUBMIT). After invoking the write command, wait for the prompt ">" and then start to write the message. Then enter <CTRL-Z> to indicate the ending of PDU and begin to send the message. Sending can be cancelled by giving <ESC> character. Abortion is acknowledged with "OK", though the message will not be sent. The message reference <mr> is returned to the TE on successful message delivery. The value can be used to identify message upon unsolicited delivery status report result code.

AT+CMGS Send Message

| | |
|--|---|
| Test Command AT+CMGS=? | Response OK |
| Write Command 1) If text mode (+CMGF=1): AT+CMGS=<da>[,<toda>]<CR> text is entered <ctrl-Z/ESC> ESC quits without sending 2) If PDU mode (+CMGF=0): AT+CMGS=<length><CR> PDU is given <ctrl-Z/ESC> | Response TA sends message from a TE to the network (SMS-SUBMIT). Message reference value <mr> is returned to the TE on successful message delivery. Optionally (when +CSMS <service> value is 1 and network supports) <scts> is returned. Values can be used to identify message upon unsolicited delivery status report result code. If text mode (+CMGF=1) and sent successfully: +CMGS: <mr> OK If PDU mode (+CMGF=0) and sent successfully: +CMGS: <mr> OK If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 120s, determined by network. |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|--------|--|
| <da> | Destination address. 3GPP TS 23.040 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSMS in 3GPP TS 27.007); type of address is given by <toda> |
| <toda> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address |

| | |
|-----------------------|--|
| | octet in integer format |
| <length> | Message length. Integer type, indicating in the text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length) |
| <mr> | Message reference. 3GPP TS 23.040 TP-Message-Reference in integer format |

Example

```

AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CSCS="GSM" //Set character set as GSM which is used by the TE
OK
AT+CMGS="15021012496"
> <This is a test from Quectel> //Enter in text, <CTRL+Z> sends message, <ESC>
quit without sending
+CMGS: 247
OK
  
```

9.9. AT+CMMS More Messages to Send

AT+CMMS controls the continuity of the SMS relay protocol link. If the feature is enabled (and supported by the currently used network) multiple messages can be sent faster as the link is kept open.

| AT+CMMS More Messages to Send | |
|---|---|
| Test Command AT+CMMS=? | Response +CMMS: (list of supported<n>s) OK |
| Read Command AT+CMMS? | Response +CMMS: <n> OK |
| Write Command AT+CMMS=<n> | Response OK ERROR If error is related to ME functionality: +CMS ERROR: <err> |

| | |
|-----------------------|------------------------------|
| Maximum Response Time | 120s, determined by network. |
| Reference | 3GPP TS 27.005 |

Parameter

- <n>** 0 Feature disabled
- 1 Keep enabled until the time between the response of the latest message send command (**+CMGS**, **+CMSS**, etc.) and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), then ME shall close the link and TA switches **<n>** back to 0 automatically
 - 2 Enable (if the time between the response of the latest message send command and the next send command exceeds 1-5 seconds (the exact value is up to ME implementation), ME shall close the link but TA will not switch **<n>** back to 0 automatically)

NOTE

After the use of read command, a delay of 5-10 seconds is required before issuing the write command, otherwise the "**+CMS ERROR: 500**" may appear.

9.10. AT+CMGW Write Message to Memory

AT+CMGW write and execution commands store a short message (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage **<mem2>**. Memory location **<index>** of the stored message is returned. Message status will be set to "stored unsent" by default, but parameter **<stat>** also allows other status values to be given.

The syntax of input text is same as the one specified in the write command **+CMGS**.

AT+CMGW Write Message to Memory

| | |
|--|---|
| Test Command AT+CMGW=? | Response OK |
| Write Command 1) If text mode (+CMGF=1): AT+CMGW=<oa/da>[,<toa/toda>[,<stat>]] <CR> text is entered <ctrl-Z/ESC> <ESC> quits without sending | Response TA transmits SMS message (either SMS-DELIVER or SMS-SUBMIT) from TE to memory storage <mem2> . Memory location <index> of the stored message is returned. By default message status will be set to 'stored unsent', but parameter <stat> also allows other status values to be given. If writing is successful: |

| | |
|--|--|
| 2) If PDU mode (+CMGF=0): AT+CMGW=<length>[,<stat>]<CR> PDU is given <ctrl-Z/ESC> | +CMGW: <index> OK If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|----------|--|
| <da> | Destination address. 3GPP TS 23.040 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <toda> |
| <oa> | Originating address. 3GPP TS 23.040 TP-Originating-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in TS 27.007); type of address given by <tooa> |
| <tooa> | Type of originating address. 3GPP TS 24.011 TP-Originating-Address Type-of-Address octet in integer format (default refer to <toda>) |
| <toda> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address octet in integer format |
| <length> | Message length. Integer type, indicating in the text mode (+CMGF=1) the length of the message body <data> (or <cdata>) in characters; or in PDU mode (+CMGF=0), the length of the actual TP data unit in octets (i.e. the RP layer SMSC address octets are not counted in the length) |
| <pdu> | In the case of SMS: 3GPP TS 24.011 SC address followed by 3GPP TS 23.04TPDU in hexadecimal format: ME/TA converts each octet of TP data unit into two IRA character long hexadecimal number (e.g. octet with integer value 42 is presented to TE as two characters 2A (IRA 50 and 65)) |
| <index> | Index of message in selected storage <mem2> |

Example

```

AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CSCS="GSM" //Set character set as GSM which is used by the TE
OK
AT+CMGW="15021012496"
> <This is a test from Quectel> //Enter in text, <CTRL+Z> writes message, <ESC> quits

```

```

without sending
+CMGW: 4

OK
AT+CMGF=0 //Set SMS message format as PDU mode
OK
AT+CMGW=18
> 0051FF00000008000A0500030002016D4B8BD5
+CMGW: 5

OK

```

9.11. AT+CMSS Send Message From Storage

AT+CMSS write command sends message with location value **<index>** from message storage **<mem2>** to the network (SMS-SUBMIT or SMS-COMMAND). If new recipient address **<da>** is given for SMS-SUBMIT, it shall be used instead of the one stored with the message.

AT+CMSS Send Message From Storage

| | |
|---|---|
| Test Command AT+CMSS=? | Response OK |
| Write Command AT+CMSS=<index>[,<da>[,<toda>]] | <p>Response</p> <p>TA sends message with location value <index> from message storage <mem2> to the network (SMS-SUBMIT). If new recipient address <da> is given, it shall be used instead of the one stored with the message. Reference value <mr> is returned to the TE on successful message delivery. Values can be used to identify message upon unsolicited delivery status report result code.</p> <p>1) If text mode (+CMGF=1) and sent successfully: +CMSS: <mr>[,<scts>]</p> <p>OK</p> <p>2) If PDU mode(+CMGF=0) and sent successfully; +CMSS: <mr> [,<ackpdu>]</p> <p>OK</p> <p>3) If error is related to ME functionality: +CMS ERROR: <err></p> |

| | |
|-----------------------|------------------------------|
| Maximum Response Time | 120s, determined by network. |
| Reference | 3GPP TS 27.005 |

Parameter

| | |
|-----------------------|--|
| <index> | Integer type, in the range of location numbers supported by the associated memory |
| <da> | Destination Address. 3GPP TS 23.040 TP-Destination-Address Address-Value field in string format; BCD numbers (or GSM 7 bit default alphabet characters) are converted to characters of the currently selected TE character set (refer to command +CSCS in 3GPP TS 27.007); type of address is given by <toda> |
| <toda> | Type of recipient address. 3GPP TS 24.011 TP-Recipient-Address Type-of-Address octet in integer format |
| <mr> | Message reference. 3GPP TS 23.040 TP-Message-Reference in integer format. |
| <scts> | Service center time stamp. 3GPP TS 23.040 TP-Service-Centre-Time-Stamp in time-string format (refer to <dt>) |
| <ackpdu> | Format is same for <pdu> in case of SMS, but without 3GPP TS 24.011 SC address field and parameter shall be bounded by double quote characters like a normal string type parameter |

Example

```

AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CSCS="GSM" //Set character set as GSM which is used by the TE
OK
AT+CMGW="15021012496"
> Hello //Enter in text, <CTRL+Z> sends message, <ESC> quits
without sending
+CMGW: 4
OK
AT+CMSS=4 //Send the message of index is 4 from memory storage.
+CMSS: 54
OK

```

9.12. AT+CNMA New Message Acknowledgement to UE/TE

AT+CNMA write and execute command confirms successful receipt of a new message (SMS-DELIVER or SMS-STATUS-REPORT) routed directly to the TE. If the UE does not receive acknowledgement within

the required time (net-work timeout), it will send a "RP-ERROR" message to the network. The UE will automatically disable rout to the TE by setting both **<mt>** and **<ds>** values of AT+CNMI to 0.

AT+CNMA New Message Acknowledgement to UE/TE

| | |
|---|---|
| Test Command AT+CNMA=? | Response +CNMA: (list of supported <n>s) OK |
| Execution Command AT+CNMA | Response OK ERROR If error is related to ME functionality: +CMS ERROR: <err> |
| Write Command AT+CNMA=<n> | Response OK ERROR If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.005 | |

Parameter

| | |
|------------------|--|
| <n> | Parameter required only for PDU mode |
| 0 | Command operates similarly as in text mode |
| 1 | Send positive (RP-ACK) acknowledgement to the network. Accepted only in PDU mode |
| 2 | Send negative (RP-ERROR) acknowledgement to the network. Accepted only in PDU mode |

NOTE

Execute and write command shall only be used when AT+CSMS parameter **<service>** equals to 1 (phase 2+) and an appropriate URC has been issued by the module, i.e.:

+CMT for **<mt>**=2 incoming message classes 0,1,3 and none;

+CMT for **<mt>**=3 incoming message classes 0 and 3;

+CDS for **<ds>**=1.

Example

```

AT+CSMS=1
OK
AT+CNMI=1,2,0,0,0
OK

+CMT: "+8615021012496",,"13/12/03,17:07:21+32",145,4,0,0,"+8613800551500",145,28
This is a test from Quectel. //Short message is outputted directly when SMS is incoming.
AT+CNMA //Send ACK to the network
OK
AT+ CNMA
+CMS ERROR: 340 //The second time returns error, it needs ACK only once

```

9.13. AT+CNMI SMS Event Reporting Configuration

AT+CNMI write command selects the procedure, how the received new messages from the network are indicated to the TE when TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), message receiving should be done as specified in 3GPP TS 23.038.

AT+CNMI SMS Event Reporting Configuration

| Test Command | Response |
|---|---|
| AT+CNMI=? | <p>+CNMI: (list of supported <mode>s),(list of supported <mt>s),(list of supported <bm>s),(list of supported <ds>s),(list of supported <bfr>s)</p> <p>OK</p> |
| Read Command AT+CNMI? | <p>Response</p> <p>+CNMI: <mode>,<mt>,<bm>,<ds>,<bfr></p> <p>OK</p> |
| Write Command AT+CNMI[=<mode>[,<mt>[,<bm>[,<ds>[,<bfr>]]]] | <p>Response</p> <p>TA selects the procedure on how the received new messages from the network are indicated to the TE when TE is active, e.g. DTR signal is ON. If TE is inactive (e.g. DTR signal is OFF), receiving message should be done as specified in 3GPP TS 23.038.</p> <p>OK</p> <p>ERROR</p> <p>If error is related to ME functionality:</p> |

| | |
|-----------------------|--------------------------------|
| | +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | |
| 3GPP TS 27.005 | |

Parameter

| | | |
|---------------------|---|--|
| <mode> | 0 | Buffer unsolicited result codes in the TA. If TA result code buffer is full, indications can be buffered in some other place or the oldest indications may be discarded and replaced with the new received indications |
| | 1 | Discard indication and reject new received message unsolicited result codes when TA-TE link is reserved (e.g. in on-line data mode). Otherwise forward them directly to the TE |
| | 2 | Buffer unsolicited result codes in the TA when TA-TE link is reserved (e.g. in on-line data mode) and flush them to the TE after reservation. Otherwise forward them directly to the TE |
| <mt> | | The rules for storing received SMSs depend on its data coding scheme (refer to 3G PPTS 23.038), preferred memory storage (+CPMS) setting and the value is: |
| | 0 | No SMS-DELIVER indications are routed to the TE |
| | 1 | If SMS-DELIVER is stored into ME/TA, indication of the memory location is routed to the TE by using unsolicited result code: +CMTI: <mem>,<index> |
| | 2 | SMS-DELIVERs (except class 2) are routed directly to the TE using unsolicited result code: +CMT: [<alpha>],<length><CR><LF><pdu> (PDU mode enabled) or +CMT:<oa>,<alpha>,<scts>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<tosca>,<length>]<CR><LF><data> (Text mode enabled; about parameters in italics, refer to Command Show Text Mode Parameters +CSDH). Class 2 messages result in indication as defined in <mt>=1 |
| | 3 | Class 3 SMS-DELIVERs are routed directly to TE by using unsolicited result codes defined in <mt>=2 . Messages of other classes result in indication as defined in <mt>=1 |
| <bm> | | The rules for storing received CBMs depend on its data coding scheme (refer to 3 GPP TS 23.038), the setting of Select CBM Types (+CSCB) and the value is: |
| | 0 | No CBM indications are routed to the TE |
| | 2 | New CBMs are routed directly to the TE using unsolicited result code: +CBM: <length><CR><LF><pdu> (PDU mode); or +CBM: <sn>,<mid>,<dcs>,<page>,<pages><CR><LF><data> (text mode) |
| <ds> | 0 | No SMS-STATUS-REPORTs are routed to the TE |
| | 1 | SMS-STATUS-REPORTs are routed directly to the TE |
| <bfr> | 0 | TA buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1...2 is entered ("OK" response shall be given before flushing the codes) |
| | 1 | TA buffer of unsolicited result codes defined within this command is cleared when |

<mode> 1...2 is entered

NOTE

Unsolicited result code:

| | |
|--|--|
| +CMTI: <mem>,<index> | Indicates that new message has been received |
| +CMT: [<alpha>],<length><CR><LF><pdu> | Short message is outputted directly |
| +CBM: <length><CR><LF><pdu> | Cell broadcast message is outputted directly |

Example

```

AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CSCS="GSM" //Set character set as GSM which is used by the TE
OK
AT+CNMI=1,2,0,1,0 //Set SMS-DELIVERs are routed directly to the TE
OK

+CMT: "+8615021012496",,"13/03/18,17:07:21+32",145,4,0,0,"+8613800551500",145,28
This is a test from Quectel. //Short message is outputted directly when SMS is incoming
    
```

9.14. AT+CSCB Select Cell Broadcast Message Types

AT+CSCB write command selects which types of CBMs are to be received by the ME. The command writes the parameters in non-volatile memory.

AT+CSCB Select Cell Broadcast Message Types

| | |
|--|---|
| Test Command AT+CSCB=? | Response It returns supported modes as a compound value. +CSCB: (list of supported <mode>s) OK |
| Read Command AT+CSCB? | Response +CSCB: <mode>,<mids>,<dcss> OK |
| Write Command AT+CSCB=<mode>[,mids>[,<dcss>]] | Response TA selects which types of CBMs are to be received by the ME. OK If error is related to ME functionality: |

| | |
|-----------------------|--------------------------------|
| | +CMS ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.005 |

Parameter

| | | |
|---------------------|----------|--|
| <mode> | <u>0</u> | Message types specified in <mids> and <dcss> are accepted |
| | 1 | Message types specified in <mids> and <dcss> are not accepted |
| <mids> | | String type, all different possible combinations of CBM message identifiers (refer to <mid>) (default is empty string), e.g. "0,1,5,320-478,922" |
| <dcss> | | String type, all different possible combinations of CBM data coding schemes (refer to <dc>) (default is empty string), e.g. "0-3,5" |

9.15. AT+CSDH Show SMS Text Mode Parameters

AT+CSDH write command controls whether or not detailed header information is shown in text mode result codes.

| AT+CSDH Show SMS Text Mode Parameters | |
|--|--|
| Test Command AT+CSDH=? | Response +CSDH: (list of supported <show> s) OK |
| Read Command AT+CSDH? | Response +CSDH: <show> OK |
| Write Command AT+CSDH[=<show>] | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.005 |

Parameter

| | | |
|---------------------|----------|--|
| <show> | <u>0</u> | Do not show header values defined in commands +CSCA and +CSMP (<sca> , <tosca> , <fo> , <vp> , <pid> and <dcs>) nor <length> , <toda> or <tooa> in +CMT , +CMGL , +CMGR result codes for SMS-DELIVERs and SMS-SUBMITs in text mode |
| | 1 | Show the values in result codes |

Example

```

AT+CSDH=0
OK
AT+CMGR=2
+CMGR: "STO UNSENT" , "",
<This is a test from Quectel>

OK
AT+CSDH=1
OK
AT+CMGR=2
+CMGR: "STO UNSENT" , "", ,128,17,0,0,143, "+8613800551500" ,145,18
<This is a test from Quectel>

OK

```

9.16. AT+CSMP Set SMS Text Mode Parameters

AT+CSMP is used to set values for additional parameters needed when a short message is sent to the network or placed in a storage in text mode.

AT+CSMP Set SMS Text Mode Parameters

| Test Command | Response |
|---|---|
| AT+CSMP=? | OK |
| Read Command AT+CSMP? | Response +CSMP: <fo>,<vp>,<pid>,<dcs> |
| Write Command AT+CSMP=[<fo>,<vp>,<pid>,<dcs>] | Response TA selects values for additional parameters needed when SM |

| | |
|-----------------------|--|
|]]] | is sent to the network or placed in a storage when text mode is selected (+CMGF=1). It is possible to set the validity period starting from when the SM is received by the SMSC (<vp> is in range 0... 255) or define the absolute time of the validity period termination (<vp> is a string). OK |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.005 |

Parameter

| | |
|--------------------|---|
| <fo> | First octet. Depending on the command or result code: First octet of 3GPP TS 23.040 SMS-DELIVER, SMS-SUBMIT (default 17), SMS-STATUS-REPORT and SMS-COMMAND in integer format. If a valid value has been entered once, parameter can be omitted |
| <vp> | Validity period. Depending on SMS-SUBMIT <fo> setting: 3GPP TS 23.040 TP-Validity-Period either in integer format or in time-string format (refer to <dt>) |
| <pid> | Protocol identifier. 3GPP TS 23.040 TP-Protocol-Identifier in integer format (default 0). |
| <dcs> | Data coding scheme. Depending on the command or result code: 3GPP TS 23.038 SMS Data Coding Scheme (default 0), or Cell Broadcast Data Coding Scheme in integer format |

9.17. AT+QCMGS Send Concatenated Messages

AT+QCMGS is used to send concatenated messages. When sending a concatenated message, which is different from AT+CMGS, each segment of the concatenated message must be identified by the additional parameters: **<uid>**, **<msg_seg>** and **<msg_total>**. When sending all segments of the message one by one, AT+QCMGS must be executed multiple times (equal to **<msg_total>**) for each segment. This command is only used in text mode (AT+CMGF=1).

AT+QCMGS Send Concatenated Messages

| | |
|--|--|
| Test Command AT+QCMGS=? | Response OK |
| Write Command If text mode (+CMGF=1): AT+QCMGS=<da>[,<tda>][,<uid>,<msg_seg>,<msg_total>]<CR> text is entered <ctrl-Z/ESC> | Response If text mode (+CMGF=1) and sent successfully: +QCMGS: <mr> OK ERROR |

| | |
|-----------------------|--|
| | If error is related to ME functionality: +CMS ERROR: <err> |
| Maximum Response Time | 120s, determined by network. |

Parameter

| | |
|---|---|
| <uid> | Message identification in the user data header (UDH). Range from 0 to 255. This parameter is defined and inputted by the user. All segments of a same concatenated message must have the same <uid> . Different concatenated messages should have different <uid> |
| <msg_seg> | Sequence number of a concatenated message. Range from 0 to 7 <msg_seg>=0 means: ignore the value and regarded it as a non-concatenated message |
| <msg_total> | The total number of the segments of one concatenated message. Range from 0 to 7. <msg_total>=0 or 1 means: ignore the value and regard it as a non-concatenated message |
| <da> ,<tda>,<mr> | Please refer to AT+CMGS |

NOTES

- For concatenated messages, the maximum length will be reduced by the length of the user data header (UDH). 3GPP TS 23.040 defines two kinds of UDH length: 6 bytes and 7 bytes, because the two kinds of **<uid>** are 8 bit and 16 bit. AT+QCMGS uses 8 bit **<uid>**. So:
 - In the case of GSM 7 bit default alphabet data coding scheme, the maximum length of each segment of a concatenated message is $(140 \text{ octets} - 6) * 8 / 7 = 153$ characters.
 - In the case of 16 bit UCS2 data coding scheme, the maximum length of each segment is $(140 - 6) / 2 = 67$ characters.
 - In the case of 8-bit data coding scheme, the maximum length of each segment is $140 - 6 = 134$.
- <mr>**, Message-Reference field gives an integer representation of a reference number of the SMS-SUBMIT or SMS-COMMAND submitted to the SC by the MS, and it is used to confirm the SMS-DELIVER received from SC duplicate or not. **<uid>**, the field of UDH, is message identification of the concatenated SMS, which is different from **<mr>**. Each segment in a concatenated message should have the same **<uid>**, but **<mr>** must be incremented for each segment of a concatenated message.
- AT+QCMGS doesn't support to send message in PDU mode (AT+CMGF=0).

Example

```
AT+CMGF=1 //Set SMS message format as text mode
OK
AT+CSCS="GSM" //Set character set as GSM which is used by the TE
```

```

OK
AT+QCMGS= "15056913384",120,1,2 <CR> //Input 120 for <uid>,send the first segment of the
//Concatenated SMS

>ABCD<Ctrl-Z>
+QCMGS: 190

OK
AT+QCMGS= "15056913384",120,2,2 <CR> //Send the second segment of the concatenated SMS
>EFGH<Ctrl-Z>
+QCMGS: 191

OK
    
```

9.18. AT+QCMGR Read Concatenated Messages

The function of AT+QCMGR is similar to AT+CMGR, except that the message to be read is a segment of concatenated messages, parameters: **<uid>**, **<msg_seg>** and **<msg_total>** would be show in the result. You should concatenate several segments to a whole concatenated message according to these three parameters. Similar to AT+QCMGS, and AT+QCMGR is only used in text mode (AT+CMGF=1).

AT+QCMGR Read Concatenated Messages

| Test Command | Response |
|-----------------------------------|--|
| AT+QCMGR=? | OK |
| Write Command AT+QCMGR=<index> | Response If text mode (+CMGF=1) and command is executed successfully: For SMS-DELIVER: +QCMGR: <stat>,<oa>,[<alpha>],<scts>[,<tooa>,<fo>,<pid>,<dcsc>,<sca>,<tosca>,<length>][,<uid>,<msg_seg>,<msg_total>] <CR><LF><data> |
| | OK For SMS-SUBMIT: +QCMGR: <stat>,<da>,[<alpha>][,<toda>,<fo>,<pid>,<dcsc>,<vp>],<sca>,<tosca>,<length>][,<uid>,<msg_seg>,<msg_total>] <CR><LF><data> |
| | OK |

| | |
|-----------------------|--|
| | <p>For SMS-STATUS-REPORTs: +QCMGR: <code><stat>,<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st></code></p> <p>OK</p> <p>For SMS-COMMANDs: +QCMGR: <code><stat>,<fo>,<ct>[,<pid>],[<mn>],[<da>],[<toda>],<length><CR><LF><cdata></code></p> <p>OK</p> <p>Else If error is related to ME functionality: +CMS ERROR: <err></p> |
| Maximum Response Time | Depends on the length of message content. |

Parameter

| | |
|--------------------------|---|
| <uid> | Message identification in the user data header(UDH). Range from 0 to 65535 (see NOTES). All segments of a same concatenated message have same <uid> . Different concatenated messages should have different <uid> |
| <msg_seg> | Sequence number of a concatenated message. Range from 1 to 7 |
| <msg_total> | The total number of the segments of one concatenated message. Range is from 2 to 7 |
| | Other parameters please refer to AT+CMGR |

NOTES

1. The **<uid>** in **AT+QCMGR** is different from the **<uid>** in **AT+QCMGS**. It is possible that UE receives concatenated messages with 8 bits or 16 bits **<uid>**. So its maximal value is 255 with 8 bits and 65535 with 16 bits.
2. If the message to be read is not a concatenated message, **<uid>**, **<msg_seg>** and **<msg_total>** would not be showed in the result.

Example

```
+CMTI: "ME",3           //The first message of a concatenated message comes
+CMTI: "ME",4           //The second message of a concatenated message comes

AT+QCMGR= 3             //Read the first segment of the concatenated message
+QCMGR: "REC UNREAD", "+8615056913384", "13/07/30,14:44:37+32", 120,1,2
```

ABCD

OK

AT+QCMGR= 4 //Read the second segment of the concatenated message

+QCMGR: "REC UNREAD", "+8615056913384" , "13/07/30,14:44:37+32" ,120,2,2

EFGH

OK

Quectel
Confidential

10 Packet Domain Commands

10.1. AT+CGATT Attachment or Detachment of PS

The AT+CGATT write command is used to attach the MT to, or detach the MT from the Packet Domain service. After the command has completed, the MT remains in V.25ter command state. If the MT is already in the requested state, the command is ignored and the **OK** response will be returned. If the requested state cannot be achieved, an **ERROR** or **+CME ERROR** response is returned.

| AT+CGATT Attachment or Detachment of PS | |
|---|--|
| Test Command AT+CGATT=? | Response +CGATT: (list of supported <state>s) OK |
| Read Command AT+CGATT? | Response +CGATT: <state> OK |
| Write Command AT+CGATT=<state> | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 75s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|--|--------------------------------------|
| <state> | Indicates the state of PS attachment |
| 0 | Detached |
| 1 | Attached |
| Other values are reserved and will result in an ERROR response to the Write Command | |

Example

```

AT+CGATT=1 //Attach to PS service
OK
AT+CGATT=0 //Detach from PS service
OK
AT+CGATT? //Query the current PS service state
+CGATT: 0
OK

```

10.2. AT+CGDCONT Define PDP Context

AT+CGDCONT specifies PDP context parameters for a specific context <cid>. A special form of the write command (AT+CGDCONT=<cid>) causes the values for context <cid> to become undefined. It is not allowed to change the definition of an already activated context.

The AT+CGDCONT read command returns the current settings for each defined PDP context.

AT+CGDCONT Define PDP Context

| | |
|---|--|
| Test Command AT+CGDCONT=? | Response +CGDCONT: (range of supported <cid>s), <PDP_type>, <APN>, <PDP_addr>, (list of supported <data_comp>s), (list of supported <head_comp>s) OK |
| Read Command AT+CGDCONT? | Response +CGDCONT: <cid>,<PDP_type>,<APN>,<PDP_addr>,<data_comp>,<head_comp> [...] OK |
| Write Command AT+CGDCONT=<cid>[,<PDP_type>[,<APN>[,<PDP_addr>[,<data_comp>[,<head_comp>]]]]] | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|--------------------------|---|
| <cid> | PDP context identifier, a numeric parameter which specifies a particular PDP context definition. The parameter is local to the TE-MT interface and is used in other PDP context-related commands. The range of permitted values (minimum value=1) is returned by the test form of the command |
| <PDP_type> | Packet data protocol type, a string parameter which specifies the type of packet data protocol "IP" Internet Protocol (IETF STD 5) "PPP" "IPV6" "IPV4V6" |
| <APN> | Access point name, a string parameter that is a logical name that is used to select the GGSN or the external packet data network. If the value is null or omitted, then the subscription value will be requested |
| <PDP_addr> | A string parameter identifies the MT in the address space applicable to the PDP. If the value is null or omitted, then a value may be provided by the TE during the PDP startup procedure or, failing that, a dynamic address will be requested. The allocated address may be read using the +CGPADDR command |
| <data_comp> | A numeric parameter that controls PDP data compression (applicable for SNDCP only) (refer to 3GPP TS 44.065) <u>0</u> Off (default if value is omitted) 1 On (manufacturer preferred compression) 2 V.42bis 3 V.44 |
| <head_comp> | A numeric parameter that controls PDP header compression (refer to 3GPP TS 44.065 and 3GPP TS 25.323) <u>0</u> Off 1 On 2 RFC1144 3 RFC2507 |

10.3. AT+CGQREQ Quality of Service Profile (Requested)

AT+CGQREQ allows the TE to specify a quality of service profile that is used when the MT activates a PDP context.

The write command specifies a profile for the context **<cid>**. A special form of the write command, AT+CGQREQ=**<cid>** causes the requested profile for context number **<cid>** to become undefined. The read command returns the current settings for each defined context. Details can be found in 3GPP TS 23.107 and all of parameters save in NV automatically.

AT+CGQREQ Quality of Service Profile (Requested)

| | |
|--|--|
| Test Command AT+CGQREQ=? | Response +CGQREQ: <PDP_type> , (list of supported <precedence>s), (list of supported <delay>s), (list of supported <reliability>s), (list of supported <peak>s), (list of supported <mean>s) OK |
| Read Command AT+CGQREQ? | Response [+CGQREQ: <cid>,<precedence>,<delay>,>reliability>,<peak>,<mean>] > [+CGQREQ: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean>] > [...] OK |
| Write Command AT+CGQREQ=<cid>[,<precedence>[,<delay>[,<reliability>[,<peak>[,<mean>]]]]] | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|--------------|---|
| <cid> | A numeric parameter which specifies a particular PDP context definition (see +CGDCONT command) |
| <PDP_type> | Packet Data Protocol type "IP" Internet Protocol (IETF STD 5) "PPP" "IPV6" "IPV4V6" |
| <precedence> | A numeric parameter which specifies the precedence class <u>0</u> Network subscribed value 1 High priority. Service commitments shall be maintained ahead of precedence classes 2 and 3 |

| | | |
|----------------------------|----------|---|
| | 2 | Normal priority. Service commitments shall be maintained ahead of precedence class 3 |
| | 3 | Low priority. Service commitments shall be maintained |
| <delay> | | A numeric parameter which specifies the delay class. This parameter defines the end-to-end transfer delay incurred in the transmission of SDUs through the network. For the detail please refer to Table 5: Delay Class |
| | <u>0</u> | Network subscribed value |
| <reliability> | | A numeric parameter which specifies the reliability class |
| | <u>0</u> | Network subscribed value |
| | 1 | Non real-time traffic, error-sensitive application that cannot cope with data loss |
| | 2 | Non real-time traffic, error-sensitive application that can cope with infrequent data loss |
| | 3 | Non real-time traffic, error-sensitive application that can cope with data loss, GMM/SM, and SMS |
| | 4 | Real-time traffic, error-sensitive application that can cope with data loss |
| | 5 | Real-time traffic, error non-sensitive application that can cope with data loss |
| <peak> | | A numeric parameter which specifies the peak throughput class, in octets per second. |
| | <u>0</u> | Network subscribed value |
| | 1 | Up to 1 000 (8 kbit/s) |
| | 2 | Up to 2 000 (16 kbit/s) |
| | 3 | Up to 4 000 (32 kbit/s) |
| | 4 | Up to 8 000 (64 kbit/s) |
| | 5 | Up to 16 000 (128 kbit/s) |
| | 6 | Up to 32 000 (256 kbit/s) |
| | 7 | Up to 64 000 (512 kbit/s) |
| | 8 | Up to 128 000 (1024 kbit/s) |
| | 9 | Up to 256 000 (2048 kbit/s) |
| <mean> | | A numeric parameter which specifies the mean throughput class, in octets per hour |
| | <u>0</u> | Network subscribed value |
| | 1 | 100 (~0.22 bit/s) |
| | 2 | 200 (~0.44 bit/s) |
| | 3 | 500 (~1.11 bit/s) |
| | 4 | 1 000 (~2.2 bit/s) |
| | 5 | 2 000 (~4.4 bit/s) |
| | 6 | 5 000 (~11.1 bit/s) |
| | 7 | 10 000 (~22 bit/s) |
| | 8 | 20 000 (~44 bit/s) |
| | 9 | 50 000 (~111 bit/s) |
| | 10 | 100 000 (~0.22 kbit/s) |
| | 11 | 200 000 (~0.44 kbit/s) |
| | 12 | 500 000 (~1.11 kbit/s) |
| | 13 | 1 000 000 (~2.2 kbit/s) |
| | 14 | 2 000 000 (~4.4 kbit/s) |

| | |
|----|--------------------------|
| 15 | 5 000 000 (~11.1 kbit/s) |
| 16 | 10 000 000 (~22 kbit/s) |
| 17 | 20 000 000 (~44 kbit/s) |
| 18 | 50 000 000 (~111 kbit/s) |
| 31 | Best effort |

Table 5: Delay Class

| SDU Size | Delay Class | Mean Transfer Delay | 95 Percentile |
|-------------|-----------------|---------------------|---------------|
| 128 octets | 1 (Predictive) | <0.5 | <1.5 |
| | 2 (Predictive) | <5 | <25 |
| | 3 (Predictive) | <50 | <250 |
| | 4 (Best Effort) | Unspecified | - |
| 1024 octets | 1 (Predictive) | <0.5 | <1.5 |
| | 2 (Predictive) | <5 | <25 |
| | 3 (Predictive) | <50 | <250 |
| | 4 (Best Effort) | Unspecified | - |

10.4. AT+CGQMIN Quality of Service Profile (Minimum Acceptable)

AT+CGQMIN allows the TE to specify a minimum acceptable profile which is checked by the MT against the negotiated profile when the PDP context is activated. The write command specifies a profile for the context identified by the context identification parameter **<cid>**.

A special form of the write command, AT+CGQMIN=**<cid>** causes the minimum acceptable profile for context number **<cid>** to become undefined. In this case no check is made against the negotiated profile. The read command returns the current settings for each defined context. Details can be found in 3GPP TS 23.107 and all of parameters save in NV automatically.

AT+CGQMIN Quality of Service Profile (Minimum Acceptable)

Test Command
AT+CGQMIN=?

Response
+CGQMIN: **<PDP_type>**,
(list of supported **<precedence>**s),
(list of supported **<delay>**s),

| | |
|--|--|
| | (list of supported <reliability> s), (list of supported <peak> s), (list of supported <mean> s) |
| | OK |
| Read Command AT+CGQMIN? | Response [+CGQMIN: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean >] [+CGQMIN: <cid>,<precedence>,<delay>,<reliability>,<peak>,<mean >] [...] |
| | OK |
| Write Command AT+CGQMIN=<cid>[,<precedence>[,<delay>[,<reliability>[,<peak>[,<mean>]]]]] | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|---------------------------|--|
| <cid> | A numeric parameter which specifies a particular PDP context definition (see +CGDCONT command) |
| <PDP_type> | Packet Data Protocol type "IP" Internet protocol (IETF STD 5) "PPP" "IPV6" "IPV4V6" |
| <precedence> | A numeric parameter which specifies the precedence class <u>0</u> Network subscribed value 1 High priority. Service commitments shall be maintained ahead of precedence classes 2 and 3 2 Normal priority. Service commitments shall be maintained ahead of precedence class 3 3 Low priority. Service commitments shall be maintained |
| <delay> | A numeric parameter which specifies the delay class. This parameter defines the end-to-end transfer delay incurred in the transmission of SDUs through the network |

| | |
|----------------------------|---|
| | For the detail please refer Table 5: Delay Class |
| | <u>0</u> Network subscribed value |
| <reliability> | A numeric parameter which specifies the reliability class |
| | <u>0</u> Network subscribed value |
| | 1 Non real-time traffic, error-sensitive application that cannot cope with data loss |
| | 0 Non real-time traffic, error-sensitive application that can cope with infrequent data loss ³ |
| | 1 Non real-time traffic, error-sensitive application that can cope with data loss, GMM/SM, and SMS |
| | 4 Real-time traffic, error-sensitive application that can cope with data loss |
| | 5 Real-time traffic, error non-sensitive application that can cope with data loss |
| <peak> | A numeric parameter which specifies the peak throughput class, in octets per second |
| | <u>0</u> Network subscribed value |
| | 1 Up to 1 000 (8 kbit/s) |
| | 2 Up to 2 000 (16 kbit/s) |
| | 3 Up to 4 000 (32 kbit/s) |
| | 4 Up to 8 000 (64 kbit/s) |
| | 5 Up to 16 000 (128 kbit/s) |
| | 6 Up to 32 000 (256 kbit/s) |
| | 7 Up to 64 000 (512 kbit/s) |
| | 8 Up to 128 000 (1024 kbit/s) |
| | 9 Up to 256 000 (2048 kbit/s) |
| <mean> | A numeric parameter which specifies the mean throughput class, in octets per hour |
| | <u>0</u> Network subscribed value |
| | 1 100 (~0.22 bit/s) |
| | 2 200 (~0.44 bit/s) |
| | 3 500 (~1.11 bit/s) |
| | 4 1 000 (~2.2 bit/s) |
| | 5 2 000 (~4.4 bit/s) |
| | 6 5 000 (~11.1 bit/s) |
| | 7 10 000 (~22 bit/s) |
| | 8 20 000 (~44 bit/s) |
| | 9 50 000 (~111 bit/s) |
| | 10 100 000 (~0.22 kbit/s) |
| | 11 200 000 (~0.44 kbit/s) |
| | 12 500 000 (~1.11 kbit/s) |
| | 13 1 000 000 (~2.2 kbit/s) |
| | 14 2 000 000 (~4.4 kbit/s) |
| | 15 5 000 000 (~11.1 kbit/s) |
| | 16 10 000 000 (~22 kbit/s) |

| | |
|----|--------------------------|
| 17 | 20 000 000 (~44 kbit/s) |
| 18 | 50 000 000 (~111 kbit/s) |
| 31 | Best effort |

10.5. AT+CGEQREQ 3G Quality of Service Profile (Requested)

AT+CGEQREQ allows the TE to specify a UMTS Quality of Service Profile that is used when the MT activates a PDP context. Details can be found in 3GPP TS 23.107 and all of parameters save in NV automatically.

AT+CGEQREQ 3G Quality of Service Profile (Requested)

Test Command
AT+CGEQREQ=?

Response
+CGEQREQ: <PDP_type>,
(list of supported <Traffic class>s),
(list of supported <Maximum bitrate UL>s),
(list of supported <Maximum bitrate DL>s),
(list of supported <Guaranteed bitrate UL>s),
(list of supported <Guaranteed bitrate DL>s),
(list of supported <Delivery order>s),
(list of supported <Maximum SDU size>s),
(list of supported <SDU error ratio>s),
(list of supported <Residual bit error ratio>s),
(list of supported <Delivery of erroneous SDUs>s),
(list of supported <Transfer delay>s),
(list of supported <Traffic handling priority>s),
(list of supported <Source statistics descriptor>s),
(list of supported <Signalling indication>s)

OK

Read Command
AT+CGEQREQ?

Response
[+CGEQREQ: <cid>,
<Traffic class>,
<Maximum bitrate UL>,
<Maximum bitrate DL>,
<Guaranteed bitrate UL>,
<Guaranteed bitrate DL>,
<Delivery order>,
<Maximum SDU size>,
<SDU error ratio>,
<Residual bit error ratio>,
<Delivery of erroneous SDUs>,
<Transfer delay>,

| | | |
|--------------------------------------|---|---|
| | 1 | Streaming |
| | 2 | Interactive |
| | 3 | Background |
| | <u>4</u> | Subscribed value |
| <Maximum bitrate UL> | Integer type, indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bit rate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) | |
| | <u>0</u> | Subscribed value |
| | 1~5760 | |
| <Maximum bitrate DL> | Integer type, indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) | |
| | <u>0</u> | Subscribed value |
| | 1~21600 | |
| <Guaranteed bitrate UL> | Integer type, indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. T+CGEQREQ=...,32, ...) | |
| | <u>0</u> | Subscribed value |
| | 1~5760 | |
| <Guaranteed bitrate DL> | Integer type, indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) | |
| | <u>0</u> | Subscribed value |
| | 1~21600 | |
| <Delivery order> | Integer type, indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not (refer 3GPP TS 24.008 subclause 10.5.6.5) | |
| | 0 | No |
| | 1 | Yes |
| | <u>2</u> | Subscribed value |
| <Maximum SDU size> | Integer type, (1,2,3,...) indicates the maximum allowed SDU size in octets. If the parameter is set to '0' the subscribed value will be requested (refer 3GPP TS 24.008 subclause 10.5.6.5) | |
| | <u>0</u> | Subscribed value |
| | 10...1520 | (value needs to be divisible by 10 without remainder) |
| | 1502 | |
| <SDU error ratio> | String type, indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of 5×10^{-3} would be specified as "5E3" (e.g. AT+CGEQREQ=..., "5E3", ...) | |
| | <u>"0E0"</u> | Subscribed value |
| | "1E2" | |
| | "7E3" | |

| | | |
|---|--|--|
| | "1E3" | |
| | "1E4" | |
| | "1E5" | |
| | "1E6" | |
| | "1E1" | |
| <Residual bit error ratio> | String type, indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as "mEe". As an example a target residual bit error ratio of 5•10-3 would be specified as "5E3" (e.g. AT+CGEQREQ=..., "5E3", ...) | |
| | <u>"0E0"</u> | Subscribed value |
| | "5E2" | |
| | "1E2" | |
| | "5E3" | |
| | "4E3" | |
| | "1E3" | |
| | "1E4" | |
| | "1E5" | |
| | "1E6" | |
| | "6E8" | |
| <Delivery of erroneous SDUs> | Integer type, indicates whether SDUs detected as erroneous shall be delivered or not (refer to 3GPP TS 24.008 [8] subclause 10.5.6.5) | |
| | 0 | No |
| | 1 | Yes |
| | 2 | No detect |
| | <u>3</u> | Subscribed value |
| <Transfer delay> | Integer type, (0,1,2,...) indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. If the parameter is set to '0' the subscribed value will be requested (refer to 3GPP TS 24.008 subclause 10.5.6.5) | |
| | <u>0</u> | Subscribed value |
| | 100~150 | (value needs to be divisible by 10 without remainder) |
| | 200~950 | (value needs to be divisible by 50 without remainder) |
| | 1000~4000 | (value needs to be divisible by 100 without remainder) |
| <Traffic handling priority> | Integer type, (1,2,3,...) specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers. If the parameter is set to '0' the subscribed value will be requested (refer to 3GPP TS 24.008 [8] subclause 10.5.6.5) | |
| | <u>0</u> | Subscribed |
| | 1 | |
| | 2 | |
| | 3 | |
| <Source Statistics Descriptor> | Integer type, specifies characteristics of the source of the submitted SDUs for a PDP context | |

| | | |
|--------------------------------------|---|---|
| | 0 | Characteristics of SDUs is unknown |
| | 1 | Characteristics of SDUs corresponds to a speech source |
| <Signalling Indication> | | Integer type, indicates signaling content of submitted SDUs for a PDP context |
| | 0 | PDP context is not optimized for signaling |
| | 1 | PDP context is optimized for signaling <PDP_type> |

10.6. AT+CGEQMIN 3G Quality of Service Profile (Minimum Acceptable)

AT+CGEQMIN allows the TE to specify a minimum acceptable profile, which is checked by the MT against the negotiated profile returned in the PDP context establishment and PDP context modification procedures. Details can be found in 3GPP TS 23.107 and all of parameters save in NV automatically.

AT+CEGQMIN 3G Quality of Service Profile (Minimum Acceptable)

| | |
|-------------------------------------|--|
| Test Command AT+CGEQMIN=? | Response +CGEQMIN: <PDP_type> , (list of supported <Traffic class> s), (list of supported <Maximum bitrate UL> s), (list of supported <Maximum bitrate DL> s), (list of supported <Guaranteed bitrate UL> s), (list of supported <Guaranteed bitrate DL> s), (list of supported <Delivery order> s), (list of supported <Maximum SDU size> s), (list of supported <SDU error ratio> s), (list of supported <Residual bit error ratio> s), (list of supported <Delivery of erroneous SDUs> s), (list of supported <Transfer delay> s), (list of supported <Traffic handling priority> s), (list of supported <Source statistics descriptor> s), (list of supported <Signalling indication> s) |
| Read Command AT+CGEQMIN? | Response [+CGEQMIN: <cid> , <Traffic class> , <Maximum bitrate UL> , <Maximum bitrate DL> , <Guaranteed bitrate UL> , <Guaranteed bitrate DL> , <Delivery order> , <Maximum SDU size> , <SDU error ratio> , |

| | |
|--------------------------------------|--|
| | service is optimized (refer 3GPP TS 24.008 subclause 10.5.6.5). If the Traffic class is specified as conversational or streaming, then the Guaranteed and Maximum bitrate parameters should also be provided |
| | 0 Conversational |
| | 1 Streaming |
| | 2 Interactive |
| | 3 Background |
| | <u>4</u> Subscribed value |
| <Maximum bitrate UL> | Integer type, indicates the maximum number of kbits/s delivered to UMTS (up-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) |
| | <u>0</u> Subscribed value |
| | 1~5760 |
| <Maximum bitrate DL> | Integer type, indicates the maximum number of kbits/s delivered by UMTS (down-link traffic) at a SAP. As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) |
| | <u>0</u> Subscribed value |
| | 1~21600 |
| <Guaranteed bitrate UL> | Integer type, indicates the guaranteed number of kbits/s delivered to UMTS (up-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. T+CGEQREQ=...,32, ...) |
| | <u>0</u> Subscribed value |
| | 1~5760 |
| <Guaranteed bitrate DL> | Integer type, indicates the guaranteed number of kbits/s delivered by UMTS (down-link traffic) at a SAP (provided that there is data to deliver). As an example a bitrate of 32kbit/s would be specified as '32' (e.g. AT+CGEQREQ=...,32, ...) |
| | <u>0</u> Subscribed value |
| | 1~21600 |
| <Delivery order> | Integer type, indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not (refer 3GPP TS 24.008 subclause 10.5.6.5) |
| | 0 No |
| | 1 Yes |
| | <u>2</u> Subscribed value |
| <Maximum SDU size> | Integer type, (1,2,3,...) indicates the maximum allowed SDU size in octets. If the parameter is set to '0' the subscribed value will be requested (refer 3GPP TS 24.008 subclause 10.5.6.5) |
| | <u>0</u> Subscribed value |
| | 10...1520 (value needs to be divisible by 10 without remainder) |
| | 1502 |
| <SDU error ratio> | String type, indicates the target value for the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. The value is specified as 'mEe'. As an example a target SDU error ratio of |

$5 \cdot 10^{-3}$ would be specified as "5E3" (e.g. AT+CGEQREQ=..., "5E3", ...)

"0E0" Subscribed value

"1E2"

"7E3"

"1E3"

"1E4"

"1E5"

"1E6"

"1E1"

<Residual bit error ratio> String type, indicates the target value for the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs. The value is specified as "mEe". As an example a target residual bit error ratio of $5 \cdot 10^{-3}$ would be specified as "5E3" (e.g. AT+CGEQREQ=..., "5E3", ...)

"0E0" Subscribed value

"5E2"

"1E2"

"5E3"

"4E3"

"1E3"

"1E4"

"1E5"

"1E6"

"6E8"

<Delivery of erroneous SDUs> Integer type, indicates whether SDUs detected as erroneous shall be delivered or not (refer to 3GPP TS 24.008 [8] subclause 10.5.6.5)

0 No

1 Yes

2 No detect

3 Subscribed value

<Transfer delay> Integer type, (0,1,2,...) indicates the targeted time between request to transfer an SDU at one SAP to its delivery at the other SAP, in milliseconds. If the parameter is set to '0' the subscribed value will be requested (refer to 3GPP TS 24.008 subclause 10.5.6.5)

0 Subscribed value

100~150 (value needs to be divisible by 10 without remainder)

200~950 (value needs to be divisible by 50 without remainder)

1000~4000 (value needs to be divisible by 100 without remainder)

<Traffic handling priority> Integer type, (1,2,3,...) specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers. If the parameter is set to '0' the subscribed value will be requested (refer to 3GPP TS 24.008 [8] subclause 10.5.6.5)

0 Subscribed

1

| | | |
|---|---|--|
| | 2 | |
| | 3 | |
| <Source Statistics Descriptor> | Integer type, specifies characteristics of the source of the submitted SDUs for a PDP context | |
| | 0 | Characteristics of SDUs is unknown |
| | 1 | Characteristics of SDUs corresponds to a speech source |
| <Signalling Indication> | Integer type, indicates signaling content of submitted SDUs for a PDP context. | |
| | 0 | PDP context is not optimized for signaling |
| | 1 | PDP context is optimized for signaling <PDP_type> |

10.7. AT+CGACT Activate or Deactivate PDP Context

The AT+CGACT write command is used to activate or deactivate the specified PDP context(s). After the command has completed, the MT remains in V.250 command state. If any PDP context is already in the requested state, the state for that context remains unchanged. If the MT is not PS attached when the activation form of the command is executed, the MT first performs a PS attach and then attempts to activate the specified contexts. If no **<cid>** specifies the activation/deactivation form of the command, it will activate or deactivate all defined contexts.

| AT+CGACT Activate or Deactivate PDP Context | |
|--|---|
| Test Command AT+CGACT=? | Response +CGACT: (list of supported <state> s) OK |
| Read Command AT+CGACT? | Response +CGACT:<cid>,<state>[<CR><LF>+CGACT: <cid><state>...] OK |
| Write Command AT+CGACT=<state>,<cid> | Response OK NO CARRIER If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 150s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|----------------------|---|
| <state> | Indicates the state of PDP context activation 0 Deactivated 1 Activated Other values are reserved and will result in an ERROR response to the Write Command |
| <cid> | A numeric parameter which specifies a particular PDP context definition (see +CGDCONT command) |

Example

```
AT+CGDCONT=1,"IP","UNINET" //Define PDP context
OK
AT+CGACT=1,1 //Activated PDP
OK
AT+CGACT=0,1 //Deactivated PDP
OK
```

10.8. AT+CGDATA Enter Data State

The AT+CGDATA write command causes the MT to perform whatever actions are necessary to establish communication between the TE and the network using one or more packet domain PDP types. This may include per-forming a PS attach and one or more PDP context activations. Commands following the AT+CGDATA command in the AT command line will not be processed by the MT.

If the **<L2P>** parameter value is unacceptable to the MT, the MT shall return an **ERROR** or **+CME ERROR** response. Otherwise, the MT issues the intermediate result code **CONNECT** and enters V.250 online data state. After data transfer is complete, and the layer 2 protocol termination procedure has completed successfully, the command state is reentered and the MT returns the final result code **OK**.

AT+CGDATA Enter Data State

| | |
|---|--|
| Test Command AT+CGDATA=? | Response +CGDATA: (list of supported <L2P> s) OK |
| Write Command AT+CGDATA=<L2P>[,<cid>[,<cid>[,...]]] | Response CONNECT ERROR If error is related to ME functionality: +CME ERROR: <err> |

| | |
|-----------------------|----------------|
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|--------------------|---|
| <L2P> | A string parameter that indicates the layer 2 protocol to be used between the TE and MT: PPP Point to Point protocol for a PDP such as IP Other values are not supported and will result in an ERROR response to the execution command |
| <cid> | A numeric parameter which specifies a particular PDP context definition (see +CGDCONT command) |

10.9. AT+CGPADDR Show PDP Address

The AT+CGPADDR write command returns a list of PDP addresses for the specified context identifiers. If no **<cid>** is specified, the addresses for all defined contexts are returned.

| AT+CGPADDR Show PDP Address | |
|--|---|
| Test Command AT+CGPADDR=? | Response +CGPADDR: (list of defined <cid> s) OK |
| Write Command AT+CGPADDR[=<cid>[,<cid>[,...]]] | Response +CGPADDR: <cid> , <PDP_addr> [+CGPADDR: <cid> , <PDP_addr> [...] OK ERROR OK |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

| | |
|-------------------------|---|
| <cid> | A numeric parameter which specifies a particular PDP context definition (see +CGDCONT command) |
| <PDP_addr> | A string that identifies the MT in the address space applicable to the PDP. The address may |

be static or dynamic. For a static address, it will be the one set by the **+CGDCONT** command when the context was defined. For a dynamic address it will be the one assigned during the last PDP context activation that used the context definition referred to **<cid>** **<PDP_address>** is omitted if none is available

Example

```

AT+CGDCONT=1,"IP","UNINET" //Define PDP context
OK
AT+CGACT=1,1 //Activated PDP
OK
AT+CGPADDR=1 //Show PDP address
+CGPADDR: 1,"10.76.51.180"
OK
    
```

10.10. AT+CGCLASS GPRS Mobile Station Class

AT+CGCLASS is used to set the MT to operate according to the specified mode of operation, see 3GPP TS 23.060.

AT+CGCLASS GPRS Mobile Station Class

| | |
|--|--|
| Test Command AT+CGCLASS=? | Response +CGCLASS: (list of supported <class> s) OK |
| Read Command AT+CGCLASS? | Response +CGCLASS: <class> OK |
| Write Command AT+CGCLASS=<class> | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|----------------------|---|
| <class> | A string parameter which indicates the GPRS mobile class (Functionality in descending order) "A" Class A |
|----------------------|---|

10.11. AT+CGREG Network Registration Status

The AT+CGREG command queries the network registration status and controls the presentation of an unsolicited result code **+CGREG: <stat>** when **<n>=1** and there is a change in the MT's GPRS network registration status in GERAN/UTRAN, or unsolicited result code **+CGREG: <stat>[,<lac>],<ci>[,<AcT>],<rac>]]** when **<n>=2** and there is a change of the network cell in GERAN/UTRAN.

AT+CGREG Network Registration Status

| | |
|--|---|
| Test Command AT+CGREG=? | Response +CGREG: (list of supported <n>s) OK |
| Read Command AT+CGREG? | Response +CGREG: <n>,<stat>[,<lac>,<ci>[,<Act>]] OK |
| Write Command AT+CGREG=[<n>] | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|---------------------|---|---|
| <n> | 0 | Disable network registration unsolicited result code |
| | 1 | Enable network registration unsolicited result code +CGREG:<stat> |
| | 2 | Enable network registration and location information unsolicited result code +CGREG: <stat>[,<lac>,<ci>[,<Act>]] |
| <stat> | 0 | Not registered, MT is not currently searching an operator to register to .The UE is in GMM state GMM-NULL or GMM-DEREGISTERED-INITIATED. The GPRS service is disabled, the UE is allowed to attach for GPRS if requested by the user. |
| | 1 | Registered, home network .The UE is in GMM state GMM-REGISTERED or GMM-ROUTING-AREA-UPDATING-INITIATED INITIATED on the home PLMN. |

| | |
|-------|---|
| 2 | Not registered, but MT is currently trying to attach or searching an operator to register to. The UE is in GMM state GMM-DEREGISTERED or GMM-REGISTERED-INITIATED. The GPRS service is enabled, but an allowable PLMN is currently not available. The UE will start a GPRS attach as soon as an allowable PLMN is available |
| 3 | Registration denied. The UE is in GMM state GMM-NULL. The GPRS service is disabled, the UE is not allowed to attach for GPRS if requested by the user |
| 4 | Unknown |
| 5 | Registered, roaming <lac> String type; two byte location area code in hexadecimal format (e.g. "00C3" equals to 195 in decimal) |
| <lac> | String type, two byte location area code in hexadecimal format |
| <ci> | String type, two byte cell ID in hexadecimal format |
| <Act> | Access technology selected |
| 0 | GSM |
| 2 | UTRAN |

Example

```
AT+CGATT=0
```

```
OK
```

```
+CGREG: 2
```

```
AT+CGATT=1
```

```
OK
```

```
+CGREG: 1,"D504","080428B5",2
```

10.12. AT+CGEREP Packet Domain Event Reporting

Set command enables or disables sending of unsolicited result codes +CGEV: XXX from MT to TE in the case of certain events occurring in the Packet Domain MT or the network. **<mode>** controls the processing of unsolicited result codes specified within this command. **<bfr>** controls the effect on buffered codes when **<mode>** 1 or 2 is entered.

AT+CGEREP Packet Domain Event Reporting

| | |
|------------------------------------|---|
| Test Command AT+CGEREP=? | Response +CGEREP: (list of supported <mode> s),(list of supported <bfr> s) OK |
| Read Command AT+CGEREP? | Response +CGEREP: <mode> , <bfr> |

| | |
|--|-------------------------|
| | OK |
| Write Command AT+CGEREP=mode[,<bfr>] | Response OK ERROR |
| Execution Command AT+CGEREP | Response OK |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|---------------------|----------|--|
| <mode> | <u>0</u> | Buffer unsolicited result codes in the MT; if MT result code buffer is full, the oldest ones can be discarded. No codes are forwarded to the TE. |
| | 1 | Discard unsolicited result codes when MT-TE link is reserved (e.g. in on-line data mode); otherwise forward them directly to the TE. |
| | 2 | Buffer unsolicited result codes in the MT when MT-TE link is reserved (e.g. in on-line data mode) and flush them to the TE when MT-TE link becomes available; otherwise forward them directly to the TE. |
| <bfr> | <u>0</u> | MT buffer of unsolicited result codes defined within this command is cleared when <mode> 1 or 2 is entered. |
| | 1 | MT buffer of unsolicited result codes defined within this command is flushed to the TE when <mode> 1 or 2 is entered (OK response shall be given before flushing the codes). |

NOTE

The unsolicited result codes and the corresponding events are defined as follows:

1. **+CGEV: REJECT <PDP_type>, <PDP_addr>**: A network request for PDP context activation occurred when the MT was unable to report it to the TE with a +CRING unsolicited result code and was automatically rejected.
2. **+CGEV: NW REACT <PDP_type>, <PDP_addr>, [<cid>]**: The network has requested a context reactivation. The **<cid>** used to reactivate the context is provided if known to the MT.
3. **+CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>]**: The network has forced a context deactivation. The **<cid>** used to activate the context is provided if known to the MT.
4. **+CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>]**: The mobile equipment has forced a context deactivation. The **<cid>** used to activate the context is provided if known to the MT.
5. **+CGEV: NW DETACH**: The network has forced a Packet Domain detach. This implies that all active contexts have been deactivated. These are not reported separately.
6. **+CGEV: ME DETACH**: The mobile equipment has forced a Packet Domain detach. This implies that all active contexts have been deactivated. These are not reported separately.

7. **+CGEV: NW CLASS <class>**: The network has forced a change of MS class. The highest available class is reported (see **AT+CGCLASS**).
8. **+CGEV: ME CLASS <class>**: The mobile equipment has forced a change of MS class. The highest available class is reported (see **AT+CGCLASS**).

Example

```
AT+CGEREP=?
+CGEREP: (0-2),(0,1)
```

OK

```
AT+CGEREP?
+CGEREP: 0,0
```

OK

10.13. AT+CGSMS Select Service for MO SMS Messages

AT+CGSMS specifies the service or service preference that the MT will use to send MO (mobile originated) SMS messages.

AT+CGSMS Select Service for MO SMS Messages

| | |
|--|---|
| Test Command AT+CGSMS=? | Response +CGSMS: (list of currently available <service> s) OK |
| Read Command AT+CGSMS? | Response +CGSMS: <service> OK |
| Write Command AT+CGSMS=[<service>] | Response OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|------------------------|--|
| <service> | A numeric parameter which indicates the service or service preference to be used |
| 0 | GPRS |
| 1 | Circuit switch |
| 2 | GPRS preferred (use circuit switched if GPRS not available) |
| 3 | Circuit switch preferred (use GPRS if circuit switched not available) |

NOTE

The circuit switched service route is the default method.

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11 Supplementary Service Commands

11.1. AT+CCFC Call Forwarding Number and Conditions Control

AT+CCFC allows control of the call forwarding supplementary service according to 3GPP TS 22.082. Registration, erasure, activation, deactivation and status query are supported.

AT+CCFC Call Forwarding Number and Conditions Control

Test Command

AT+CCFC=?

Response

+CCFC: (list of supported <reads>s)

OK

Write Command

AT+CCFC=<reads>,<mode>[,<number>[,<type>[,<class>[,<subaddr>[,<satype>[,<time>]]]]]]]

Response

TA controls the call forwarding supplementary service. Registration, erasure, activation, deactivation, and status query are supported.

Only ,<reads> and <mode> should be entered with mode (0-2,4)

If <mode><>2 and command successful

OK

If <mode>=2 and command successful (only in connection with <reads> 0-3)

For registered call forwarding numbers:

+CCFC: <status>, <class1>[, <number>, <type>[,<subaddr>,<satype>[,<time>]]] [<CR><LF>+CCFC:]

OK

If no call forwarding numbers are registered (and therefore all classes are inactive):

+CCFC: <status>, <class>

OK

Where <status>=0 and <class>=15

| | |
|-----------------------|--|
| | If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | |
| 3GPP TS 27.007 | |

Parameter

| | | |
|------------------------|---|---|
| <reads> | 0 | Unconditional |
| | 1 | Mobile busy |
| | 2 | No reply |
| | 3 | Not reachable |
| | 4 | All call forwarding (0-3) |
| | 5 | All conditional call forwarding (1-3) |
| <mode> | 0 | Disable |
| | 1 | Enable |
| | 2 | Query status |
| | 3 | Registration |
| | 4 | Erasure |
| <number> | Phone number in string type of forwarding address in format specified by <type> | |
| <type> | Type of address in integer format; default value is 145 when dialing string includes international access code character "+", otherwise 129 | |
| <subaddr> | String type sub-address of format specified by <satype> | |
| <satype> | Type of sub-address in integer | |
| <class> | 1 | Voice |
| | 2 | Data |
| | 4 | FAX |
| | 7 | All telephony except SMS |
| | 8 | Short message service |
| | 16 | Data circuit sync |
| | 32 | Data circuit async |
| <time> | 1...30 | When "no reply" (<reads> =no reply) is enabled or queried, this gives the time in seconds to wait before call is forwarded, default value is 20 |
| <status> | 0 | Not active |
| | 1 | Active |

Example

```

AT+CCFC=0,3,"15021012496" //Register the destination number for unconditional call
                           forwarding (CFU)
OK
AT+CCFC=0,2 //Query the status of CFU without specifying <class>
+CFC: 1,1,"+8615021012496",145,,,

```

```

OK
AT+CCFC=0,4 //Erase the registered CFU destination number
OK
AT+CCFC=0,2 //Query the status, no destination number
+CCFC: 0,255
OK
    
```

11.2. AT+CCWA Call Waiting Control

The AT+CCWA command allows control of the call waiting supplementary service according to 3GPP TS 22.083. Activation, deactivation and status query are supported.

| AT+CCWA Call Waiting Control | |
|--|---|
| Test Command AT+CCWA=? | Response +CCWA: (list of supported <n>s) OK |
| Read Command AT+CCWA? | Response +CCWA: <n> OK |
| Write Command AT+CCWA[=<n>][,<mode>[,<class>]] | Response TA controls the call waiting supplementary service. Activation, deactivation and status query are supported. If <mode><2 and command successful OK If <mode>=2 and command successful +CCWA: <status>,<class1>[<CR><LF>+CCWA:<status>,<class2>[...]] OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|-----------------------|--|--|
| <n> | 0 | Disable presentation of an unsolicited result code |
| | 1 | Enable presentation of an unsolicited result code |
| <mode> | When <mode> parameter is not given, network is not interrogated | |
| | 0 | Disable |
| | 1 | Enable |
| | 2 | Query status |
| <class> | A sum of integers, each integer represents a class of information | |
| | 1 | Voice (telephony) |
| | 2 | Data (bearer service) |
| | 4 | FAX(facsimile) |
| | 16 | Data circuit sync |
| | 32 | Data circuit async |
| <status> | 0 | Disable |
| | 1 | Enable |
| <number> | Phone number in string type of calling address in format specified by <type> | |
| <type> | Type of address octet in integer format | |
| | 129 | Unknown type (ISDN format number) |
| | 145 | International number type (ISDN format) |
| <alpha> | Optional string type alphanumeric representation of <number> corresponding to the entry found in phone book | |

NOTES

- <status>**=0 should be returned only if service is not active for any **<class>** i.e. +CCWA: 0, 7 will be returned in this case.
- When **<mode>**=2, all active call waiting classes will be reported. In this mode the command is abortable by pressing any key.
- Unsolicited result code:
When the presentation call waiting at the TA is enabled (and call waiting is enabled) and a terminating call set up during an established call, an unsolicited result code is returned:
+CCWA: <number>,<type>,<class>[,<alpha>]

Example

```

AT+CCWA=1,1 //Enable presentation of an unsolicited result code
OK
ATD10086; //Establish a call
OK
+CCWA: "02154450293",129,1 //Indication of a call that has been waiting

```

11.3. AT+CHLD Call Related Supplementary Services

The AT+CHLD command allows the control of the following call related services:

- A call can be temporarily disconnected from the MT but the connection is retained by the network;
- Multiparty conversation (conference calls);
- The served subscriber who has two calls (one held and the other either active or alerting) can connect the other parties and release the served subscriber's own connection.

Calls can be put on hold, recovered, released and added to a conversation, and transferred similarly as defined in 3GPP TS 22.030.

This is based on the GSM/UMTS supplementary services HOLD (Call Hold; refer 3GPP TS 22.083 clause 2), MPTY (Multi Party; refer 3GPP TS 22.084) and ECT (Explicit Call Transfer; refer 3GPP TS 22.091). The interaction of this command with other commands based on other GSM/UMTS supplementary services is described in the GSM/UMTS standards. Call Hold, Multi Party and Explicit Call Transfer are only applicable to teleservice 11.

| AT+CHLD Call Related Supplementary Services | |
|--|---|
| Test Command AT+CHLD=? | Response +CHLD: (list of supported <n>s) OK |
| Write Command AT+CHLD[=<n>] | Response TA controls the supplementary services call hold, multiparty and explicit call transfer. Calls can be put on hold, recovered, released, added to conversation and transferred. OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|-----|---|---|
| <n> | 0 | Terminate all held calls or UDUB (User Determined User Busy) for a waiting call. If a call is waiting, terminate the waiting call. Otherwise, terminate all held calls (if any) |
| | 1 | Terminate all active calls (if any) and accept the other call (waiting call or held call). It can terminate active call if there is only one call |

| | |
|----|--|
| 1X | Terminate the specific call number X |
| 2 | Place all active calls on hold (if any) and accept the other call (waiting call or held call) as the active call |
| 2X | Place all active calls except call X on hold |
| 3 | Add the held call to the active calls |
| 4 | Connects the two calls and disconnects the subscriber from both calls (ECT) |

Example

```

ATD10086; //Establish a call
OK

+CCWA: "02154450293",129,1 //Indication of a call that has been waiting
AT+CHLD=2 //Place the active call on hold and accept the waiting call as
the active call

OK
AT+CLCC
+CLCC: 1,0,1,0,0,"10086",129 //The first call on hold

+CLCC: 2,1,0,0,0,"02154450293",129 //The second call be active

OK
AT+CHLD=21 //Place the active call except call X=1 on hold
OK
AT+CLCC
+CLCC: 1,0,0,0,0,"10086",129 //The first call be active

+CLCC: 2,1,1,0,1,"02154450293",129 //The second call on hold

OK
AT+CHLD=3 //Add a held call to the active calls in order to set up a
conference (multiparty) call

OK
AT+CLCC
+CLCC: 1,0,0,0,1,"10086",129

+CLCC: 2,1,0,0,1,"02154450293",129

OK

```

11.4. AT+CLIP Calling Line Identification Presentation

AT+CLIP refers to the GSM/UMTS supplementary service CLIP (Calling Line Identification Presentation) that enables a called subscriber to get the calling line identity (CLI) of the calling party when receiving a mobile terminated call.

AT+CLIP Calling Line Identification Presentation

| | |
|---|--|
| Test Command AT+CLIP=? | Response +CLIP: (list of supported <n>s) OK |
| Read Command AT+CLIP? | Response +CLIP: <n>,<m> OK |
| Write Command AT+CLIP[=<n>] | Response TA enables or disables the presentation of the calling line identity (CLI) at the TE. It has no effect on the execution of the supplementary service CLIP in the network. OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 15s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | | |
|-----------|--|--|
| <n> | 0 | Suppress unsolicited result codes |
| | 1 | Display unsolicited result codes |
| <m> | 0 | CLIP not provisioned |
| | 1 | CLIP provisioned |
| | 2 | Unknown |
| <number> | Phone number in string type of calling address in format specified by <type> | |
| <subaddr> | String type subaddress of format specified by <satype> | |
| <satype> | Type of subaddress octet in integer format (refer 3GPP TS 24.008 [8] subclause 10.5.4.8) | |
| <type> | Type of address octet in integer format; | |
| | 129 | Unknown type (ISDN format number) |
| | 145 | International number type (ISDN format) |
| <alpha> | String type alphanumeric representation of <number> corresponding to the entry | |

| | | |
|----------------|---|---|
| | | found in phone book |
| <CLI validity> | 0 | CLI valid |
| | 1 | CLI has been withheld by the originator |
| | 2 | CLI is not available due to interworking problems or limitations of originating network |

NOTE

Unsolicited result code:

When the presentation of the CLIP at the TE is enabled (and calling subscriber allows), an unsolicited result code is returned after every RING (or **+CRING: <type>**) at a mobile terminating call:

+CLIP: <number>,<type>,[subaddr],[satype],[<alpha>],<CLI validity>

Example

AT+CPBW=1,"02151082965",129,"QUECTEL"

OK

AT+CLIP=1

OK

RING

+CLIP: "02151082965",129,,,"QUECTEL",0

11.5. AT+CLIR Calling Line Identification Restriction

AT+CLIR refers to the CLIR supplementary service (Calling Line Identification Restriction) according to 3GPP TS 22.081 and the OIR supplementary service (Originating Identification Restriction) according to 3GPP TS 24.607) that allows a calling subscriber to enable or disable the presentation of the calling line identity (CLI) to the called party when originating a call.

AT+CLIR Calling Line Identification Restriction

Test Command

AT+CLIR=?

Response

+CLIR: (list of supported <n>s)

OK

Read Command

AT+CLIR?

Response

+CLIR: <n>,<m>

OK

| | |
|---|--|
| Write Command AT+CLIR=<n> | Response TA restricts or enables the presentation of the calling line identity (CLI) to the called party when originating a call. The command overrides the CLIR subscription (default is restricted or allowed) when temporary mode is provisioned as a default adjustment for all following outgoing calls. This adjustment can be revoked by using the opposite Command. OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 15s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|------------------|--|
| <n> | Parameter sets the adjustment for outgoing calls |
| 0 | Presentation indicator is used according to the subscription of the CLIR service |
| 1 | CLIR invocation |
| 2 | CLIR suppression |
| <m> | Parameter shows the subscriber CLIR service status in the network |
| 0 | CLIR not provisioned |
| 1 | CLIR provisioned in permanent mode |
| 2 | Unknown (e.g. no network, etc.) |
| 3 | CLIR temporary mode presentation restricted |
| 4 | CLIR temporary mode presentation allowed |

11.6. AT+COLP Connected Line Identification Presentation

AT+COLP refers to the GSM/UMTS supplementary service COLP (Connected Line Identification Presentation) that enables a calling subscriber to get the connected line identity (COL) of the called party after setting up a mobile originated call. The command enables or disables the presentation of the COL at the TE. It has no effect on the execution of the supplementary service COLR in the network.

AT+COLP Connected Line Identification Presentation

| | |
|----------------------------------|---|
| Test Command AT+COLP=? | Response +COLP: (list of supported <n>s) OK |
|----------------------------------|---|

| | |
|---|---|
| Read Command AT+COLP? | Response +COLP: <n>,<m> OK |
| Write Command AT+COLP[=<n>] | Response TA enables or disables the presentation of the COL (Connected Line) at the TE for a mobile originating a call. It has no effect on the execution of the supplementary service COLR in the network. Intermediate result code is returned from TA to TE before any +CR or V.25ter responses. OK |
| Maximum Response Time | 15s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|------------------------|---|
| <n> | Parameter sets/shows the result code presentation status in the TA 0 Disable 1 Enable |
| <m> | Parameter shows the subscriber COLP service status in the network 0 COLP not provisioned 1 COLP provisioned 2 Unknown (e.g. no network, etc.) |
| <number> | Phone number in string type, format specified by <type> |
| <type> | Type of address octet in integer format 129 Unknown type(ISDN format number) 145 International number type(ISDN format) |
| <subaddr> | String type sub-address of format specified by <satype> |
| <satype> | Type of sub-address octet in integer format (refer to 3GPP TS 24.008 sub clause 10.5.4.8) |
| <alpha> | Optional string type alphanumeric representation of <number> corresponding to the entry found in phone book |

NOTE

Intermediate result code:

When enabled (and called subscriber allows), an intermediate result code is returned before any +CR or V.25ter responses:

+COLP: <number>,<type>,<subaddr>,<satype> ,<alpha>

Example

```
AT+CPBW=1,"02151082965",129,"QUECTEL"
OK
AT+COLP=1
OK
ATD02151082965;
+COLP: "02151082965",129,,,"QUECTEL"
OK
```

11.7. AT+CSSN Supplementary Service Notifications

AT+CSSN refers to supplementary service related network initiated notifications. The write command enables/disables the presentation of notification result codes from TA to TE.

AT+CSSN Supplementary Service Notifications

| | |
|---|---|
| Test Command AT+CSSN=? | Response +CSSN: (list of supported <n>s),(list of supported <m>s) OK |
| Read Command AT+CSSN? | Response +CSSN: <n>,<m> OK |
| Write Command AT+CSSN=<n>[,<m>] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|-----|---|
| <n> | Integer type, parameter sets/shows the +CSSI intermediate result code presentation status to the TE |
| 0 | Disable |
| 1 | Enable |

| | |
|----------------------|--|
| <m> | Integer type (parameter sets/shows the +CSSU unsolicited result code presentation status to the TE) 0 Disable 1 Enable |
| <code1> | Integer type, it is manufacturer specific, which of these codes are supported 0 Unconditional call forwarding is active 1 Some of the conditional call forwardings are active 2 Call has been forwarded 3 Waiting call is pending 5 Outgoing call is barred |
| <code2> | Integer type, it is manufacturer specific, which of these codes are supported 0 The incoming call is a forwarded call 2 Call has been put on hold (during a voice call) 3 Call has been retrieved (during a voice call) 5 Held call was terminated by other party 10 Additional incoming call forwarded |

NOTES

- When **<n>=1** and a supplementary service notification is received after a mobile originated call setup, the **+CSSI** intermediate result code is sent to TE before any other MO call setup result codes:
+CSSI: <code1>
- When **<m>=1** and a supplementary service notification is received during a mobile terminated call setup or during a call, the **+CSSU** unsolicited result code is sent to TE:
+CSSU: <code2>

11.8. AT+CUSD Unstructured Supplementary Service Data

AT+CUSD allows control of the Unstructured Supplementary Service Data (USSD) according to 3GPP TS 22.090. Both network and mobile initiated operations are supported.

Parameter **<mode>** is used to disable/enable the presentation of an unsolicited result code. The value **<mode>=2** is used to cancel an ongoing USSD session. For an USSD response from the network, or a network initiated operation, the format is: **+CUSD: <status>[,<rspstr>[,<dcs>]]**.

When **<reqstr>** is given, a mobile initiated USSD string or a response USSD string to a network initiated operation is sent to the network. The response USSD string from the network is returned in a subsequent **+CUSD** URC.

AT+CUSD Unstructured Supplementary Service Data

Test Command

Response

| | |
|---|--|
| AT+CUSD=? | +CUSD: (list of supported <mode>s) OK |
| Read Command AT+CUSD? | Response +CUSD: <mode> OK |
| Write Command AT+CUSD=<mode>[,<reqstr>[,<dcsc>]] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 120s, determined by network. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|----------|---|
| <mode> | Integer type, sets/shows the result code presentation status to the TE 0 Disable the result code presentation to the TE 1 Enable the result code presentation to the TE 2 Cancel session(not applicable to read command response) |
| <reqstr> | Unstructured Supplementary Service Data (USSD) to be sent to the network. If this parameter is not given, network is not interrogated. |
| <rspstr> | Unstructured Supplementary Service Data (USSD) received from the network. |
| <dcsc> | Integer type, 3GPP TS 23.038 Cell Broadcast Data Coding Scheme (default 15) |
| <status> | USSD response from the network or the network initiated operation 0 No further user action required (network initiated USSD Notify, or no further information needed after mobile initiated operation) 1 Further user action required (network initiated USSD Request, or further information needed after mobile initiated operation) 2 USSD terminated by network 3 Other local client has responded 4 Operation not supported 5 Network time out |

12 Audio Commands

12.1. AT+CMUT Mute Control

AT+CMUT is used to enable and disable the uplink voice muting during a voice call.

| AT+CMUT Mute Control | |
|-------------------------------|---|
| Test Command AT+CMUT=? | Response +CMUT: (list of supported<on>s) OK |
| Read Command AT+CMUT? | Response +CMUT: <on> OK |
| Write Command AT+CMUT=<on> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|------|--|
| <on> | Numerical type. |
| 0 | Uplink volume is normal during the call. |
| 1 | Uplink volume is mute during the call. |

NOTES

1. This command is valid only during the call.
2. After the call is over, it returns to default value.

12.2. AT+CALM Mute the Ring Tone

AT+CALM is used to mute the ring tone, i.e., there is no ring tone when a call is coming.

AT+CALM Mute the Ring Tone

| | |
|--|---|
| Test Command AT+CALM=? | Response +CALM: (list of supported<on>s) OK |
| Read Command AT+CALM? | Response +CALM: <on> OK |
| Write Command AT+CALM=<on> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|------|----------------------|
| <on> | Numeric type. |
| 0 | Ring tone is normal. |
| 1 | Ring tone is mute. |

NOTE

This parameter will not be saved.

12.3. AT+CRSL Set Ring Tone Volume

AT+CRSL can be used to set the volume of ring tone.

AT+CRSL Set Ring Tone Volume

| | |
|----------------------------------|---|
| Test Command AT+CRSL=? | Response +CRSL: (list of supported<volume>s) OK |
|----------------------------------|---|

| | |
|--|---|
| Read Command AT+CRSL? | Response +CRSL: <volume> OK |
| Write Command AT+CRSL=<volume> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

<volume> Numeric type, indicates the configured volume of ring tone.
Range: 0-7, default: 3

NOTE

This parameter will not be saved.

12.4. AT+CLVL Loud Speaker Volume Level

AT+CLVL is used to select the volume of the internal loudspeaker of the MT.

AT+CLVL Loud Speaker Volume Level

| | |
|--|---|
| Test Command AT+CLVL=? | Response +CLVL: (list of supported<volume>s) OK |
| Read Command AT+CLVL? | Response +CLVL: <volume> OK |
| Write Command AT+CLVL=<volume> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

<volume> Numeric type, indicates the configured call volume.
Range: 0-7, default: 3

NOTE

This parameter will not be saved.

12.5. AT+QAUDMOD Set Audio Mode

AT+QAUDMOD is used to set the audio mode, including the default gain of uplink and downlink, echo cancellation mode and so on to suit for corresponding application scenarios.

AT+QAUDMOD Set Audio Mode

| | |
|---|--|
| Test Command AT+QAUDMOD=? | Response +QAUDMOD: (0-8) OK |
| Test Command AT+QAUDMOD? | Response +QAUDMOD: <mode> OK |
| Write Command AT+QAUDMOD=<mode> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

<mode> Numeric type, indicates the current configured audio mode.

- 0 Handset mode.
- 1 Headset mode.
- 2 Hands free kit mode.
- 3 Analog hands free kit mode.
- 4 Loudspeaker mode.
- 5 AUX PCM Handset mode.
- 6 AUX PCM Headset mode.

- 7 AUX PCM Loudspeaker mode.
- 8 Bluetooth headset mode.

NOTE

This parameter will not be saved.

12.6. AT+QAUDPATH Set the Audio Output Path

AT+QAUDPATH can be used to set the current audio output path, that is MIC&SPEAKER path or AUX PCM path.

AT+QAUDPATH Set Audio Output Path

| | |
|--|---|
| Test Command AT+QAUDPATH=? | Response +QAUDPATH: (0-2) OK |
| Read Command AT+QAUDPATH? | Response +QAUDPATH: <path> OK |
| Write Command AT+QAUDPATH=<path> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|---|
| <path> | Numeric type, indicates the configured output path. |
| <u>0</u> | MIC1&SPEAKER1 |
| 1 | MIC2&SPEAKER2 |
| 2 | AUX PCM |

NOTE

This parameter will not be saved.

12.7. AT+QSIDET Set the Side Tone Gain in Current Mode

AT+QSIDET is used to set the side tone gain value of the current mode.

AT+QSIDET Set the Side Tone Gain in Current Mode

| | |
|--|---|
| Test Command AT+QSIDET=? | Response +QSIDET: (0-65535) OK |
| Read Command AT+QSIDET? | Response +QSIDET: <stgain> OK |
| Write Command AT+QSIDET=<stgain> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

<stgain> Numeric type; indicates the configured side tone gain in current mode.
Range: 0-65535. Default value might be different in different audio mode.

NOTE

This parameter will not be saved.

12.8. AT+QAUDLOOP Enable Audio Loop Test

This command is used to enable audio loop test.

AT+QAUDLOOP Enable Audio Loop Test

| | |
|--------------------------------------|--|
| Test Command AT+QAUDLOOP=? | Response +QAUDLOOP: (0,1),(0-2) OK |
|--------------------------------------|--|

| | |
|---|--|
| Read Command AT+QAUDLOOP? | Response +QAUDLOOP: <enable>,<path> OK |
| Set Command AT+QAUDLOOP=<enable>[,<path>] | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------|--|
| <enable> | Numeric type, to enable or disable audio loop test. 0 Disable audio loop test. 1 Enable audio loop test. |
| <path> | Numeric type, indicates test path. 0 MIC1&SPEAKER1 1 MIC2&SPEAKER2 2 AUX PCM |

NOTE

This parameter will not be saved.

12.9. AT+QMIC Set Uplink (MIC) Gains

This command is used to set MIC gains in order to change uplink volume.

AT+QMIC Set Uplink (MIC) Gains

| | |
|----------------------------------|--|
| Test Command AT+QMIC=? | Response +QMIC: (1),(0-65535),(0-65535) OK |
| Read Command AT+QMIC? | Response +QMIC: <txgain1>,<txgain2>,<txdgain> OK |
| Set Command | Response |

| | |
|--|-------------|
| AT+QMIC=<txgain1>,<txgain2>[,<txd gain>] | OK ERROR |
|--|-------------|

Parameter

| | |
|-----------|---|
| <txgain1> | Numeric type, reserved, set to 1. |
| <txgain2> | Numeric type, indicates uplink codec gain, ranges: 0-65535. Default value might be different in different audio mode. |
| <txdgain> | Numeric type, indicates uplink digital gain, ranges: 0-65535. Default value might be different in different audio mode. |

NOTE

1. This parameter will be saved to NV immediately by default
2. If you set AT+QAUDPATH=2, the <txgain2> is invalid on UC15 module.

12.10. AT+QRXGAIN Set Downlink Gains

This command is used to set RX gains which aim to change downlink volume.

AT+QRXAGIN Set Downlink Gains

| | |
|---|---|
| Test Command AT+QRXGAIN=? | Response +QRXGAIN: (0),(0-65535),(0-65535) OK |
| Read Command AT+QRXGAIN? | Response +QRXGAIN: <rxgain1>,<rxgain2>,<rxdgain> OK |
| Write Command AT+QRXGAIN=<rxgain1>,<rxgain2>[,<rxdgain>] | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|------------------------|--|
| <rxgain1> | Numeric type, reserved, set to 0 |
| <rxgain2> | Numeric type, indicates downlink codec gain, range: 0-65535. Default value might be different in different audio modes |
| <rxdgain> | Numeric type, indicates downlink digital gain, range: 0-65535. Default value might be different in different audio modes |

NOTE

1. This parameter will be saved to NV immediately by default.
2. If you set AT+QAUDPATH=2, the **<rxgain2>** is invalid by UC15.

12.11. AT+QTONEDT Enable/Disable DTMF Detection

This command is used to enable or disable DTMF detection. When you enable this function, DTMF tones sent by other side will be detected, and report ASCII code on the serial port which you assigned.

AT+QTONEDT Enable/Disable DTMF Detection

| | |
|---|--|
| Test Command AT+QTONEDT=? | Response +QTONEDT: (0,1) OK |
| Read Command AT+QTONEDT? | Response +QTONEDT: <enable> OK |
| Write Command AT+QTONEDT=<enable> | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference | |

Parameter

| | |
|-----------------------|-------------------------------|
| <enable> | Enable/disable DTMF detected. |
| <u>0</u> | Disable |
| 1 | Enable |

NOTES

- Settings will take effect immediately, but when you reset the module, settings will revert to the default values.
- DTMF characters – ASCII table:

| DTMF | ASCII | DTMF | ASCII |
|------|-------|------|-------|
| 0 | 48 | 8 | 56 |
| 1 | 49 | 9 | 57 |
| 2 | 50 | A | 65 |
| 3 | 51 | B | 66 |
| 4 | 52 | C | 67 |
| 5 | 53 | D | 68 |
| 6 | 54 | * | 42 |
| 7 | 55 | # | 35 |

12.12. AT+QWDTMF Play/Send DTMF Tone (s)

This command is used to play or send DTMF tone(s).

AT+QWDTMF Play/Send DTMF Tone (s)

| | |
|--|---|
| Test Command AT+QWDTMF=? | Response +QWDTMF: (0-7),(0-7),("<DTMF_code>,<continuance_time>,<mute_time>[,...]") OK |
| Set Command AT+QWDTMF=<ulvolume>,<dlvolume>,<"<DTMF_code>,<continuance_time>,<mute_time>[,...]"> | Response OK ERROR After playing completely, report: +QWDTMF: 5 |
| Maximum Response Time | 300ms |

Parameter

| | |
|--------------------------|---|
| <ulvolume> | Numeric type, up-link volume, range: 0-7. |
| <dlvolume> | Numeric type, down-link volume, range: 0-7. |
| <DTMF_code> | String type |

- 0 DTMF 0
- 1 DTMF 1
- 2 DTMF 2
- 3 DTMF 3
- 4 DTMF 4
- 5 DTMF 5
- 6 DTMF 6
- 7 DTMF 7
- 8 DTMF 8
- 9 DTMF 9
- A DTMF A
- B DTMF B
- C DTMF C
- D DTMF D
- * DTMF *
- # DTMF #

<continuance_time> Numeric type, indicates duration of each DTMF tone. Unit: ms.
<mute_time> Numeric type, indicates mute time. Unit: ms.

NOTES

This parameter will not be saved.

12.13. AT+QDAI Configure Digital Audio Interface

AT+QDAI is used to configure the digital audio interface. While **<io>=1**, you can define the PCM mode (master/slave mode) by yourself; while **<io>=2**, and the external codec chip linked with PCM interface is the NAU8814 model through the I2C, the module can be used directly and set by the default configurations; while **<io>=3**, and the external codec chip linked with PCM interface is the ALC5616 model through the I2C, the module can be used directly and set by the default configurations.

AT+QDAI Configure Digital Audio Interface

| | |
|----------------------------------|---|
| Test Command AT+QDAI=? | Response +QDAI: (1-3),(0,1),(0,1),(0-5),(0-2) OK |
| Read Command AT+QDAI? | Response +QDAI: <io>[,<mode>,<fsync>,<clock>,<format>] OK |

| | |
|--|---------------------------------------|
| Write Command AT+QDAI=<io>[,<mode>,<fsync>,<clock>[,<format>]] | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | | |
|-----------------------|---|---|
| <io> | 1 | Digital PCM output (customer defined) |
| | 2 | Analog output (for our default audio codec NAU8814) |
| | 3 | Analog output (for our default audio codec ALC5616) |
| <mode> | 0 | Master mode |
| | 1 | Slave mode |
| <fsync> | 0 | Primary mode (short-sync) |
| | 1 | Auxiliary mode (long-sync) |
| <clock> | 0 | 128K |
| | 1 | 256K |
| | 2 | 512K |
| | 3 | 1024K |
| | 4 | 2048K |
| | 5 | 4096K |
| <format> | 0 | 16-bit linear |
| | 1 | 8-bit a-law |
| | 2 | 8-bit u-law |

NOTES

1. Configuration of **<io>** will be saved to NV immediately by default.
2. Support master& slave mode under short sync signal, master mode under long sync signal by now.
3. When you select short-sync& master mode, support 256K-4096K clock frequency. And if you select long-sync& master mode, only support 128K clock frequency.
4. When you select slave mode, you must provide master& sync clock to module.
5. When you select NAU8814 or ALC5616, please do not input other parameters, the PCM interface will be set by the default configurations.
6. UC15 module does not support ALC5616 codec. If you set AT+QDAI=3, it will return ERROR.

12.14. AT+QPCMV Enable to Transfer PCM Data through Port

This command is used to transfer PCM data through USB/UART port. When you dial a call, the sound from the opposite side will be decoded as PCM data and output from PCM port. When you input PCM

data to the port, the data will be transmitted to the opposite side through the network. Once the call is over, the port will stop outputting, and the input data will be invalid. PCM data format is 8K, 16bit linear.

AT+QPCMV Enable to Transfer PCM Data through Port

| | |
|--|---|
| Test Command AT+QPCMV=? | Response +QPCMV: (0,1),(0) OK |
| Read Command AT+QPCMV? | Response +QPCMV: <enable>,<port> OK |
| Write Command AT+QPCMV=<enable>[,<port>] | Response OK ERROR |
| Maximum Response Time | 300ms |
| Reference | |

Parameter

| | |
|-----------------------|---|
| <enable> | If this function is enabled when you dial a call, the sound from the opposite side will be output from PCM port. When you input PCM data to the port, the data will be transmitted to the opposite side. 0 Disable 1 Enable |
| <port> | PCM port 0 USB reserved port |

NOTE

All the settings will take effect immediately. When you reset the module, settings will revert to the default values.

12.15. AT+QLDTMF Play Local DTMF

AT+QLDTMF is used to play a DTMF string, maximum length is 20 characters. You can use AT+QLDTMF to stop playing.

AT+QLDTMF Play Local DTMF

| | |
|---|---|
| Test Command AT+QLDTMF=? | Response +QLDTMF: (1-1000),(0-9,*,#,A-G) OK |
| Write Command AT+QLDTMF=<n>,<DTMF_string>[,<y>] | Response OK If error is related to ME functionality: +CME ERROR: <err> After playing completely, report: +QLDTMF: 5 |
| Execute Command AT+QLDTMF | Response OK |
| Maximum Response Time | 300ms |

Parameter

| | |
|----------------------------|---|
| <n> | Numeric type, indicates every DTMF play time and mute time. Range: 0-1000, unit is 1/100 second when <y> is set to 1; or 1/10 second when <y> is not set. |
| <DTMF_string> | String type, max 20 DTMFs, separated by comma. DTMFs: 0-9, #, *, A-G. |
| <err> | 901 Audio unknown error 902 Audio invalid parameters 903 Audio operation not supported 904 Audio device busy |

12.16. AT+QLTONE Play a Local Customized Tone

AT+QLTONE is used to play a customized tone, use **<period_on>** to indicate play time, **<period_off>** to indicate mute time and **<duration>** to indicate total time.

AT+QLTONE Play a Local Customized Tone

| | |
|--|--|
| Test Command AT+QLTONE=? | Response +QLTONE: (0,1),(100-4000),(0-1000),(0-1000),(0-15300000) OK |
| Write Command AT+QLTONE=<mode>[,<frequency>] | Response OK |

| | |
|--|--|
| <period_on>,<period_off>,<duration>] | After playing completely, report: +QLTONE: 0 If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |

Parameter

| | | |
|--------------|--|-------------------------------|
| <mode> | 0 | Stop playing |
| | 1 | Start playing |
| <frequency> | Tone frequency, unit: Hz, range: 100-4000Hz | |
| <period_on> | Play time of tone, unit: ms, range: 0-1000ms | |
| <period_off> | Mute time of tone, unit: ms, range: 0-1000ms | |
| <duration> | Total time of tone, unit ms, range: 0-15300000ms | |
| <err> | 901 | Audio unknown error |
| | 902 | Audio invalid parameters |
| | 903 | Audio operation not supported |
| | 904 | Audio device busy |

12.17. AT+VTS DTMF and Tone Generation

The AT+VTS command is used to send ASCII characters which cause MSC to transmit DTMF tones to a remote subscriber. This command can only be operated in voice call.

| AT+VTS DTMF and Tone Generation | |
|--|---|
| Test Command AT+VTS=? | Response +VTS: (0-9,A-D,*,#),(0-255) OK |
| Write Command AT+VTS=<DTMF_string>[,<duration>] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | Depends on the length of <DTMF_string> and <duration>. |
| Reference 3GPP TS 27.007 | |

Parameter

| | |
|----------------------------|--|
| <DTMF_string> | ASCII characters including 0-9, #, *, A, B, C, D. The string should be enclosed in quotation marks ("...") When sending multiple tones at a time, the time <interval> of two tones can be specified by +VTD. The maximal length of the string is 31 |
| <duration> | The duration of each tone in 1/10 seconds with tolerance. Value ranges from 0 to 255 and default is 0. If the duration is less than the minimum time specified by the network, the actual duration will be network specified time. If this parameter is omitted, <duration> is specified by +VTD |

12.18. AT+QRCH Set the Ring Output Path

AT+QRCH can be used to set the ring output path, that is SPEAKER1, SPEAKER2 or AUX PCM.

| AT+QRCH Set Ring Output Path | |
|--|---|
| Test Command AT+QRCH=? | Response +QRCH: (0-2) OK |
| Read Command AT+QRCH? | Response +QRCH: <path> OK |
| Write Command AT+QRCH=<path> | Response OK ERROR |
| Maximum Response Time | 300ms |

Parameter

| | |
|---------------------|--|
| <path> | Numeric type, indicates the configured output path |
| 0 | SPEAKER1 |
| 1 | SPEAKER2 |
| 2 | AUX PCM |

NOTE

Configuration will be not saved.

12.19. AT+VTD Set Tone Duration

AT+VTD is used to set the duration of DTMF tones. This command can also set time interval of two tones when sending multiple tones at a time.

| AT+VTD Set Tone Duration | |
|---|---|
| Test Command AT+VTD=? | Response +VTS: (0-255),(0-255) OK |
| Read Command AT+VTD? | Response +VTD: <duration>,<interval> OK |
| Write Command AT+VTD=<duration>[,<interval>] | Response OK ERROR If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | 3GPP TS 27.007 |

Parameter

<duration> The duration of each tone in 1/10 seconds with tolerance. Value ranges from 0 to 255 and default is 3. If the duration is less than the minimum time specified by the network, the actual duration will be network specified time.

<interval> The time interval of two tones when sending multiple tones at a time by **+VTS**. Value ranges from 0 to 255 and default is 0.

NOTE

Configuration will be not saved.

Example

```
AT+CMUT=1 //The uplink volume will be 0 when the command is used during the call.
OK
AT+CMUT=1 //If there is no call, it will return ERROR when using commands.
```

ERROR

AT+CALM=1 //Mute the ring tone.

OK

RING //A call is coming, but no ring tone.

AT+CRSL=1 //Set the ring tone volume as 1.

OK

AT+CLVL=4 //Set the downlink volume as 4.

OK

AT+QAUDMOD=4 //Set the current audio mode as loudspeaker mode.

OK

AT+QAUDPATH=1 //Set the MIC2&SPEAKER2 as current input path and output path.

OK

AT+QSIDET=1234 //During a call, set the current side tone gain as 1234.

OK

AT+QAUDLOOP=1 //Enable audio loop test.

OK

AT+QMIC=1,4000,4000 //Set uplink path codec gain&digital gain to 4000.

OK

AT+CLVL=5 //Set speaker volume to 5

OK

AT+QRXGAIN=0,4000 //Set downlink path codec gain to 4000

OK

AT+QTOEDET=1 //Enable DTMF detection.

OK

//When the opposite side sends a DTMF 0; module will detect the tone, and it will report in the format of ASCII code.

+QTOEDET: 48

AT+QWDTMF=5,5,"0,100,100,1,200,200,2,300,300"

OK

//When playing completed, report complete URC.

+QWDTMF: 5

AT+QDAI=? //Query the range.

+QDAI: (1-3),(0,1),(0,1),(0-5),(0-2)

OK

AT+QDAI? //Query current interface configuration.

+QDAI: 1,0,0,4,0

OK

AT+QDAI=1,1,0,4,1 //Set AUX PCM interface to slave short-sync mode, PCM format is 8-bit a-law.


```
OK
AT+QDAI=2 //Select NUA8814.
OK
AT+QDAI=3 //Select ALC5616.
OK
AT+QPCMV=1,0 //Enable USB audio and use reserved port to transfer PCM data.
OK

//Some PCM data will be output from reserved port during a call.

AT+QPCMV=0 //Disable USB audio.
OK
AT+QLDTMF=? //Query the range.
+QLDTMF: (1-1000),(0-9,*,#,A-G)

OK
AT+QLDTMF=2,"A,B,1,2,#" //Play A,B,1,2,#, paly time and mute time is 200ms.
OK
AT+QLDTMF //Stop playing.
OK
AT+QLTONE=? //Query the range.
+QLTONE: (0,1),(100-4000),(0-1000),(0-1000),(0-15300000)

OK
AT+QLTONE=1,1000,200,300,3000 //Play a 1000Hz tone, play time is 200ms, mute time is 300ms
and total time is 3000ms.

OK
AT+QLTONE=0 //Stop playing.
OK
ATD12345678900; //Dial.
OK
<Call connected>
AT+VTS="1" //The remote can listen DTMF tone.
OK
AT+VTS="1234567890A" //Send multiple tones at a time.
OK
```

13 Hardware Related Commands

13.1. AT+QPOWD Power Off

The command AT+QPOWD is used to shut down the module. The UE will return OK immediately when the command is executed. Then the UE deactivates the network. After it is completed, the UE outputs the message "POWERED DOWN" and sets the STATE pin as low to enter into the shutdown state. The maximum time for network log-off is 60 seconds. In order to avoid data loss, it is only allowed to turn off the UE power after the module's STATE pin is set as low and the URC "POWERED DOWN" is outputted. If "POWERED DOWN" has not been received after 65s, you should force to switch off the VBAT.

AT+QPOWD Power Off

| | |
|------------------------------------|-----------------------|
| Execute Command AT+QPOWD | Response OK |
| Maximum Response Time | 300ms |

13.2. AT+CCLK Clock

AT+CCLK sets and queries the real time clock (RTC) of the module. The current setting is retained until the module is totally disconnected from power.

AT+CCLK Clock

| | |
|--|---|
| Test Command AT+CCLK=? | Response OK |
| Read Command AT+CCLK? | Response +CCLK: <time> OK |
| Write Command AT+CCLK=<time> | Response OK If error is related to ME functionality: +CME ERROR: <err> |

| | |
|-----------------------|-------|
| Maximum Response Time | 300ms |
| Reference | |
| 3GPP TS 27.007 | |

Parameter

<time> String type value, format is "yy/MM/dd, hh:mm:ss±zz", indicates year (two last digits), month, day, hour, minutes, seconds and time zone (indicates the difference, expressed in quarters of an hour, between the local time and GMT; range: -48...+56). E.g. May 6th, 1994, 22:10:00 GMT+2 hours equals to "94/05/06,22:10:00+08"

Example

```
AT+CCLK? //Query the local time
+CCLK: "08/01/04, 00:19:43+00"
OK
```

13.3. AT+CBC Battery Charge

AT+CBC returns battery connection status **<bcs>** and battery charge level **<bcl>** of the MT.

| AT+CBC Battery Charge | |
|-----------------------------|--|
| Test Command AT+CBC=? | Response +CBC: (list of supported <bcs> s),(list of supported <bcl> s),(voltage) OK |
| Execution Command AT+CBC | Response +CBC: <bcs> , <bcl> , <voltage> OK If error is related to ME functionality: +CME ERROR: <err> |
| Maximum Response Time | 300ms |
| Reference | |
| 3GPP TS 27.007 | |

Parameter

| | |
|------------------------|--|
| <bc> | Charge status |
| 0 | ME is not charging |
| 1 | ME is charging |
| 2 | Charging has finished |
| <bcl> | Battery connection level |
| 0...100 | Battery has 0-100 percent of capacity remaining vent |
| <voltage> | Battery voltage(mV) |

13.4. AT+QADC Read ADC

This command is used to read the voltage of the ADC channel.

| AT+QADC Read ADC | |
|---|---|
| Test Command AT+ QADC=? | Response +QADC: (0,1) OK |
| Read Command AT+QADC=<port> | Response +QADC: <status>,<value> OK |
| Maximum Response Time | 300ms |

Parameter

| | |
|-----------------------|----------------------------------|
| <port> | Channel number of the ADC |
| 0 | ADC Channel 0 |
| 1 | ADC Channel 1 |
| <status> | 0 Fail |
| | 1 Success |
| <value> | The voltage of the ADC port (mV) |

13.5. AT+QSCLK Configure Whether or Not to Enter into Sleep Mode

AT+QSCLK command is used to control whether the module enters into sleep mode or not. When AT+QSCLK is enabled and DTR is pulled up, the module can directly enter sleep mode. If AT+QSCLK is enabled and DTR is pulled down, you need to pull up the DTR pin first, then module can enter into sleep mode. The module will be waked up by some temporarily network interaction message (such as regularly listening to paging messages from the base station).

AT+QSCLK Configure Whether or Not to Enter into Sleep Mode

| | |
|--|--|
| Test Command AT+QSCLK=? | Response +QSCLK: (list of supported <n>s) OK |
| Read Command AT+QSCLK? | Response +QSCLK: <n> OK |
| Write Command AT+QSCLK=<n> | Response OK |
| Maximum Response Time | 300ms |

Parameter

| | | |
|-----|----------|--|
| <n> | <u>0</u> | Disable slow clock |
| | 1 | Enable slow clock, it is controlled by DTR |

14 Appendix

14.1. Reference

Table 6: Related Documents

| SN | Document Name | Remark |
|-----|----------------|---|
| [1] | V.25ter | Serial asynchronous automatic dialing and control |
| [2] | 3GPP TS 27.007 | Digital cellular telecommunications (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; AT command set for User Equipment (UE) |
| [3] | 3GPP TS 27.005 | Digital cellular telecommunications (Phase 2+); Universal Mobile Telecommunications System (UMTS); LTE; Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE- DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) |

Table 7: Terms and Abbreviations

| Abbreviation | Description |
|--------------|-------------------------------|
| AMR | Adaptive Multi-Rate |
| ME | Mobile Equipment |
| TA | Terminal Adapter |
| MS | Mobile Station |
| DCE | Data Communication Equipment |
| TE | Terminal Equipment |
| DTE | Data Terminal Equipment |
| RTS/CTS | Request To Send/Clear To Send |

| | |
|------|--|
| GPRS | General Packet Radio Service |
| DCD | Dynamic Content Delivery |
| DTR | Data Terminal Ready |
| CSD | Circuit Switch Data |
| PSC | Primary Synchronization Code |
| PDP | Packet Data Protocol |
| TCP | Transmission Control Protocol |
| UDP | User Datagram Protocol |
| ECT | Explicit Call Transfer supplementary service |

14.2. Factory Default Settings Restorable with AT&F

Table 8: Factory Default Settings Restorable with AT&F

| AT Command | Parameters | Factory Defaults |
|------------|------------|------------------|
| ATE | <value> | 1 |
| ATQ | <n> | 0 |
| ATS0 | <n> | 000 |
| ATS3 | <n> | 013 |
| ATS4 | <n> | 010 |
| ATS5 | <n> | 008 |
| ATS6 | <n> | 002 |
| ATS7 | <n> | 000 |
| ATS8 | <n> | 002 |
| ATS10 | <n> | 015 |
| ATV | <value> | 1 |

| | | |
|----------|-----------------------------|------------------|
| ATX | <value> | 4 |
| AT&C | <value> | 1 |
| AT&D | <value> | 1 |
| AT+ICF | <format>,<parity> | 3,3 |
| AT+IFC | <dce_by_dte>,<dte_by_dce> | 0,0 |
| AT+CREG | <n> | 0 |
| AT+CGREG | <n> | 0 |
| AT+CBST | <speed>,<name>,<ce> | 0,0,1 |
| AT+CMEE | <n> | 1 |
| AT+CSCS | <chset> | "GSM" |
| AT+CSTA | <type> | 129 |
| AT+CR | <mode> | 0 |
| AT+CRC | <mode> | 0 |
| AT+CSMS | <service> | 0 |
| AT+CMGF | <mode> | 0 |
| AT+CSMP | <fo>,<vp>,<pid>,<dcs> | 17,167,0,0 |
| AT+CSDH | <show> | 0 |
| AT+CSCB | <mode> | 0 |
| AT+CPMS | <mem1>,<mem2>,<mem3> | "ME", "ME", "ME" |
| AT+CNMI | <mode>,<mt>,<bm>,<ds>,<bfr> | 2,1,0,0,0 |
| AT+CMMS | <n> | 0 |
| AT+CVHU | <mode> | 0 |
| AT+CLIP | <n> | 0 |
| AT+COLP | <n> | 0 |
| AT+CLIR | <n> | 0 |

| | | |
|------------|---------|---|
| AT+CSSN | <n> | 0 |
| AT+CLVL | <level> | 2 |
| AT+CMUT | <n> | 0 |
| AT+QAUDMOD | <mode> | 0 |

14.3. AT Command Setting Storable with AT&W

Table 9: AT Command Settings Storable with AT&W

| AT Command | Parameters | Display with AT&V |
|-------------|---------------------------|-------------------|
| ATE | <value> | Yes |
| ATQ | <n> | Yes |
| ATS0 | <n> | Yes |
| ATS7 | <n> | Yes |
| ATS10 | <n> | Yes |
| ATV | <value> | Yes |
| ATX | <value> | Yes |
| AT&C | <value> | Yes |
| AT&D | <value> | Yes |
| AT+IFC | <dce_by_dte>,<dte_by_dce> | No |
| AT+IPR | <rate> | No |
| AT+CREG | <n> | No |
| AT+CGREG | <n> | No |
| AT+QSIMDET | <enable>,<insert_level> | No |
| AT+QSIMSTAT | <enable> | No |

14.4. AT Command Settings Storable with ATZ

Table 10: AT Command Settings Storable with ATZ

| AT Command | Parameters | Factory Defaults |
|------------|---------------------------|------------------|
| ATE | <value> | 1 |
| ATQ | <n> | 0 |
| ATS0 | <n> | 000 |
| ATS7 | <n> | 000 |
| ATS10 | <n> | 015 |
| ATV | <value> | 1 |
| ATX | <value> | 4 |
| AT&C | <value> | 1 |
| AT&D | <value> | 1 |
| AT+IFC | <dce_by_dte>,<dte_by_dce> | 0,0 |
| AT+CREG | <n> | 0 |
| AT+CGREG | <n> | 0 |

14.5. Summary of CME ERROR Codes

Final result code **+CME ERROR: <err>** indicates an error related to mobile equipment or network. The operation is similar to **ERROR** result code. None of the following commands in the same command line is executed. Neither **ERROR** nor **OK** result code shall be returned.

<err> values are mostly used by common message commands. The following table lists most of general and GRPS related **ERROR** Codes. For some GSM protocol failure cause described in GSM specifications, the corresponding **ERROR** codes are not included.

Table 11: Different Coding Schemes of +CME ERROR: <err>

| Code of <err> | Meaning |
|---------------|-----------------------------------|
| 0 | Phone failure |
| 1 | No connection to phone |
| 2 | Phone-adaptor link reserved |
| 3 | Operation not allowed |
| 4 | Operation not supported |
| 5 | PH-SIM PIN required |
| 6 | PH-FSIM PIN required |
| 7 | PH-FSIM PUK required |
| 10 | SIM not inserted |
| 11 | SIM PIN required |
| 12 | SIM PUK required |
| 13 | SIM failure |
| 14 | SIM busy |
| 15 | SIM wrong |
| 16 | Incorrect password |
| 17 | SIM PIN2 required |
| 18 | SIM PUK2 required |
| 20 | Memory full |
| 21 | Invalid index |
| 22 | Not found |
| 23 | Memory failure |
| 24 | Text string too long |
| 25 | Invalid characters in text string |

| | |
|----|---|
| 26 | Dial string too long |
| 27 | Invalid characters in dial string |
| 30 | No network service |
| 31 | Network timeout |
| 32 | Network not allowed - emergency calls only |
| 40 | Network personalization PIN required |
| 41 | Network personalization PUK required |
| 42 | Network subset personalization PIN required |
| 43 | Network subset personalization PUK required |
| 44 | Service provider personalization PIN required |
| 45 | Service provider personalization PUK required |
| 46 | Corporate personalization PIN required |
| 47 | Corporate personalization PUK required |

14.6. Summary of CMS ERROR Codes

Final result code **+CMS ERROR: <err>** indicates an error related to mobile equipment or network. The operation is similar to ERROR result code. None of the following commands in the same command line is executed. Neither **ERROR** nor **OK** result code shall be returned.

<err> values are mostly used by common message commands:

Table 12: Different Coding Schemes of +CMS ERROR: <err>

| Code of <err> | Meaning |
|---------------|-----------------------|
| 300 | ME failure |
| 301 | SMS ME reserved |
| 302 | Operation not allowed |

| | |
|-----|----------------------------------|
| 303 | Operation not supported |
| 304 | Invalid PDU mode |
| 305 | Invalid text mode |
| 310 | SIM not inserted |
| 311 | SIM pin necessary |
| 312 | PH SIM pin necessary |
| 313 | SIM failure |
| 314 | SIM busy |
| 315 | SIM wrong |
| 316 | SIM PUK required |
| 317 | SIM PIN2 required |
| 318 | SIM PUK2 required |
| 320 | Memory failure |
| 321 | Invalid memory index |
| 322 | Memory full |
| 330 | SMSC address unknown |
| 331 | No network |
| 332 | Network timeout |
| 500 | Unknown |
| 512 | SIM not ready |
| 513 | Message length exceeds |
| 514 | Invalid request parameters |
| 515 | ME storage failure |
| 517 | Invalid service mode |
| 528 | More message to send state error |

| | |
|-----|---------------------|
| 529 | MO SMS is not allow |
| 530 | GPRS is suspended |
| 531 | ME storage full |

14.7. Summary of URC

Table 13: Summary of URC

| Type | Index | URC Display | Meaning | Condition |
|--------------|-------|-------------------------------------|--|--------------------|
| Power on/off | 1 | N/A | Main switch of all URCs. Default is on | AT+QINDCFG="all",1 |
| | 2 | RDY | ME initialization is successful | N/A |
| | 3 | +CFUN: 1 | All function of the ME is available | N/A |
| | 4 | +CPIN: <state> | SIM card pin state | N/A |
| | 5 | +QUSIM: 0 | Use SIM card | N/A |
| | 6 | +QUSIM: 1 | Use USIM card | N/A |
| | 7 | +QIND: SMS DONE | SMS initialization finished | N/A |
| | 8 | +QIND: PB DONE | Phonebook initialization finished | N/A |
| | 9 | POWERED DOWN | Module power down | AT+QPOWD |
| Network | 10 | +QIND: "csq",<rsssi>,<ber> | Indication of signal strength and channel bit error rate change | AT+QINDCFG="csq",1 |
| | 11 | +CREG: <stat> | Indicate registration status of the ME | AT+CREG=1 |
| | 12 | +CREG: <stat>[,<lac>,<ci>[,<Act>]] | After cell neighborhood changing shows whether the network has currently indicated the registration of the ME, with location area code | AT+CREG=2 |
| | 13 | +CGREG: <stat> | Indicate network registration status of the ME | AT+CGREG=1 |
| | 14 | +CGREG: <stat>[,<lac>,<ci>[,<Act>]] | Indicate network registration and location information of the ME | AT+CGREG=2 |

| | | | | |
|------|----|---|---|----------------------------|
| | 15 | +CTZV: <tz> | Time zone reporting | AT+CTZR=1 |
| | 16 | +CTZE: <tz>,<dst>,<time> | Extended time zone reporting | AT+CTZR=2 |
| | 17 | +CMTI: <mem>,<index> | New message is received, and saved to memory | See AT+CNMI |
| | 18 | +CMT: [<alpha>],<length><CR><LF><pdu> | New short message is received and output directly to TE (PDU mode) | See AT+CNMI |
| | 19 | +CMT: <oa>,<alpha>,<sct s>[,<tooa>,<fo>,<pid>,<dcs>,<sca>,<to sca>,<length>]<CR><LF><data> | New short message is received and output directly to TE (Text mode) | See AT+CNMI |
| SMS | 20 | +CBM: <length><CR> | New CBM is received and output directly (PDU mode) | See AT+CNMI |
| | 21 | +CBM: <sn>,<mid>,<dcs>,<page>,<pages>,<CR>,<LF><data> | New CBM is received and output directly to TE (Text mode) | See AT+CNMI |
| | 22 | +CDS:<length><CR><LF><pdu> | New CDS is received and output directly (PDU mode) | See AT+CNMI |
| | 23 | +CDS:<fo>,<mr>,[<ra>],[<tora>],<scts>,<dt>,<st> | New CDS is received and output directly to TE (Text mode) | See AT+CNMI |
| | 24 | +QIND: "smsfull",<storage> | SMS storage full indication | AT+QINDCFG="smsfull",1 |
| | 25 | +CMTI,+CMT,+CDS ,+CBM | Incoming message indication | AT+QINDCFG="smsincoming",1 |
| | 26 | RING | "RING" indication | AT+QINDCFG="ring",1 |
| Call | 27 | +COLP: <number>,<type>,[<subaddr>],[<satype>],[<alpha>] | The presentation of the COL (connected line) at the TE for a mobile originated call | AT+COLP=1 |
| | 28 | +CLIP: <number>,<type>,[<subaddr>],[<satype>],[<alpha>],<CLI validity> | Mobile terminating call indication | AT+CLIP=1 |
| | 29 | +CRING: <type> | An incoming call is indicated to the TE with unsolicited result code instead of the normal RING | AT+CRC=1 |

| | | | |
|----|--|--|-----------------------------------|
| | +CCWA: <number>,<type>,<class>[,<alpha>] | Call waiting indication | AT+CCWA=1,1 |
| 31 | +CSSI: <code1> | Show the +CSSI intermediate result code presentation status to the TE | AT+CSSN=1 |
| 32 | +CSSU: <code2> | Show the +CSSU unsolicited result code presentation status to the TE | AT+CSSN=<n>,1 |
| 33 | +CUSD: <status>[,<rspstr>[,<dc>]] | USSD response from the network, or a network initiated operation | AT+CUSD=1 |
| 34 | +QIND: "ccinfo",<idx>,<dir>,<stat>,<mode>,<mp>,<type>[,<number>,<type>[,<alpha>]] | Indication of voice call state change | AT+QINDCFG="ccinfo",1 |
| 35 | +QIND: "temp",-2 | Indicate the lowest temperature | AT+QCFG="temp",-2,<tempvalue>,1 |
| 36 | +QIND: "temp",-1 | Indicate low temperature warning | AT+QCFG="temp",-1,<tempvalue>,1 |
| 37 | +QIND: "temp",1 | Indicate high temperature warning | AT+QCFG="temp",1,<tempvalue>,1 |
| 38 | +QIND: "temp",2 | Indicate the highest temperature | AT+QCFG="temp",2,<tempvalue>,1 |
| 39 | +QIND: "temp",0 | The temperature comes back to normal temperature range | N/A |
| 40 | +QIND: "vbatt",-2 | Indicate the lowest voltage | AT+QCFG="vbatt",-2,<vbattvalue>,1 |
| 41 | +QIND: "vbatt",-1 | Indicate low voltage warning | AT+QCFG="vbatt",-1,<vbattvalue>,1 |
| 42 | +QIND: "vbatt",1 | Indicate high voltage warning | AT+QCFG="vbatt",1,<vbattvalue>,1 |
| 43 | +QIND: "vbatt",2 | Indicate the highest voltage | AT+QCFG="vbatt",2,<vbattvalue>,1 |
| 44 | +QIND: "vbatt",0 | The voltage comes back to normal voltage range | N/A |
| 45 | +CGEV: REJECT <PDP_type>,<PDP_addr> | A network requests for PDP activation, and was automatically rejected. | AT+CGEREP=2,1 |
| 46 | +CGEV: NW REACT | The network requests PDP reactivation | AT+CGEREP=2,1 |

Hardware

| | | | |
|----|---|---|---------------|
| | <PDP_type>, <PDP_addr>, [<cid>] | | |
| 47 | +CGEV: NW DEACT <PDP_type>, <PDP_addr>, [<cid>] | The network has forced a context deactivation | AT+CGEREP=2,1 |
| 48 | +CGEV: ME DEACT <PDP_type>, <PDP_addr>, [<cid>] | The ME has forced a context deactivation. | AT+CGEREP=2,1 |
| 49 | +CGEV: NW DETACH | The network has forced a Packet Domain detach. | AT+CGEREP=2,1 |
| 50 | +CGEV: ME DETACH | The mobile equipment has forced a Packet Domain detach. | AT+CGEREP=2,1 |
| 51 | +CGEV: NW CLASS <class> | The network has forced a change of MS class. | AT+CGEREP=2,1 |
| 52 | +CGEV: ME CLASS <class> | The mobile equipment has forced a change of MS class. | AT+CGEREP=2,1 |

14.8. SMS Character Sets Conversions

3GPP TS 23.038 DCS (Data Coding Scheme) defined three kinds of character sets, GSM 7 bit default alphabet, 8 bit data and UCS2 (16bit). AT+CSMP can set the DCS in text mode (AT+CMGF=1).

In text mode, DCS (Data Coding Scheme) and AT+CSCS determine the way of SMS text input or output. Because the low 8 bit of UCS2 character is same as the IRA character, so the conversion table of DCS=GSM 7 bit and **AT+CSCS="UCS2"** is similar to **AT+CSCS="IRA"**. The difference lies in the way of SMS text input or output, please refer to Table 14.

Table 14: The Way of SMS Text Input or Output

| DCS | AT+CSCS | The Way of SMS Text Input or Output |
|-----------|---------|--|
| GSM 7 bit | GSM | Input or output GSM character sets. |
| GSM 7 bit | IRA | Input or output IRA character sets. Input: UE will convert IRA characters to GSM characters. Output: UE will convert GSM characters to IRA characters. |

| | | |
|-----------|------|--|
| GSM 7 bit | UCS2 | Input or output a hex string similar to PDU mode. So only support characters '0'-'9' and 'A'-'F'. Input: UE will convert the UCS2 hex string to GSM characters. Output: UE will convert the GSM characters to UCS2 hex string. |
| UCS2 | - | Ignore the value of AT+CSCS, input or output a hex string similar to PDU mode. So only support characters '0'-'9' and 'A'-'F'. |
| 8 bit | - | Ignore the value of AT+CSCS, input or output a hex string similar to PDU mode. So only support characters '0'-'9' and 'A'-'F'. |

When DCS=GSM 7 bit, the input or output needs conversion. The detailed conversion tables are shown as below.

Table 15: The Input Conversions Table (DCS=GSM 7 bit and AT+CSCS="GSM")

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|----|--------|----|----|----|----|----|----|
| 0 | 00 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| 1 | 01 | 11 | 21 | 31 | 41 | 51 | 61 | 71 |
| 2 | 02 | 12 | 22 | 32 | 42 | 52 | 62 | 72 |
| 3 | 03 | 13 | 23 | 33 | 43 | 53 | 63 | 73 |
| 4 | 04 | 14 | 24 | 34 | 44 | 54 | 64 | 74 |
| 5 | 05 | 15 | 25 | 35 | 45 | 55 | 65 | 75 |
| 6 | 06 | 16 | 26 | 36 | 46 | 56 | 66 | 76 |
| 7 | 07 | 17 | 27 | 37 | 47 | 57 | 67 | 77 |
| 8 | 08 | 18 | 28 | 38 | 48 | 58 | 68 | 78 |
| 9 | 09 | 19 | 29 | 39 | 49 | 59 | 69 | 79 |
| A | 0A | Submit | 2A | 3A | 4A | 5A | 6A | 7A |
| B | 0B | Cancel | 2B | 3B | 4B | 5B | 6B | 7B |
| C | 0C | 1C | 2C | 3C | 4C | 5C | 6C | 7C |
| D | 0D | 1A | 2D | 3D | 4D | 5D | 6D | 7D |
| E | 0E | 1E | 2E | 3E | 4E | 5E | 6E | 7E |
| F | 0F | 1F | 2F | 3F | 4F | 5F | 6F | 7F |

Table 16: The Output Conversions Table (DCS=GSM 7 bit and AT+CSCS="GSM")

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|------|----|----|----|----|----|----|----|
| 0 | 00 | 10 | 20 | 30 | 40 | 50 | 60 | 70 |
| 1 | 01 | 11 | 21 | 31 | 41 | 51 | 61 | 71 |
| 2 | 02 | 12 | 22 | 32 | 42 | 52 | 62 | 72 |
| 3 | 03 | 13 | 23 | 33 | 43 | 53 | 63 | 73 |
| 4 | 04 | 14 | 24 | 34 | 44 | 54 | 64 | 74 |
| 5 | 05 | 15 | 25 | 35 | 45 | 55 | 65 | 75 |
| 6 | 06 | 16 | 26 | 36 | 46 | 56 | 66 | 76 |
| 7 | 07 | 17 | 27 | 37 | 47 | 57 | 67 | 77 |
| 8 | 08 | 18 | 28 | 38 | 48 | 58 | 68 | 78 |
| 9 | 09 | 19 | 29 | 39 | 49 | 59 | 69 | 79 |
| A | 0D0A | | 2A | 3A | 4A | 5A | 6A | 7A |
| B | 0B | | 2B | 3B | 4B | 5B | 6B | 7B |
| C | 0C | 1C | 2C | 3C | 4C | 5C | 6C | 7C |
| D | 0D | 1A | 2D | 3D | 4D | 5D | 6D | 7D |
| E | 0E | 1E | 2E | 3E | 4E | 5E | 6E | 7E |
| F | 0F | 1F | 2F | 3F | 4F | 5F | 6F | 7F |

Table 17: GSM Extended Characters

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|------|---|---|------|---|---|---|
| 0 | | | | | 1B40 | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | 1B14 | | | | | | |

| | |
|---|------|
| 5 | |
| 6 | |
| 7 | |
| 8 | 1B28 |
| 9 | 1B29 |
| A | |
| B | |
| C | 1B3C |
| D | 1B3D |
| E | 1B3E |
| F | 1B2F |

Table 18: The Input Conversions Table (DCS=GSM 7 bit and AT+CSCS="IRA")

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|-----------|--------|----|----|----|------|----|------|
| 0 | | 20 | 20 | 30 | 00 | 50 | 20 | 70 |
| 1 | 20 | 20 | 21 | 31 | 41 | 51 | 61 | 71 |
| 2 | 20 | 20 | 22 | 32 | 42 | 52 | 62 | 72 |
| 3 | 20 | 20 | 23 | 33 | 43 | 53 | 63 | 73 |
| 4 | 20 | 20 | 02 | 34 | 44 | 54 | 64 | 74 |
| 5 | 20 | 20 | 25 | 35 | 45 | 55 | 65 | 75 |
| 6 | 20 | 20 | 26 | 36 | 46 | 56 | 66 | 76 |
| 7 | 20 | 20 | 27 | 37 | 47 | 57 | 67 | 77 |
| 8 | backspace | 20 | 28 | 38 | 48 | 58 | 68 | 78 |
| 9 | 20 | 20 | 29 | 39 | 49 | 59 | 69 | 79 |
| A | 0A | Submit | 2A | 3A | 4A | 5A | 6A | 7A |
| B | 20 | Cancel | 2B | 3B | 4B | 1B3C | 6B | 1B28 |

| | | | | | | | | |
|---|----|----|----|----|----|------|----|------|
| C | 20 | 20 | 2C | 3C | 4C | 1B2F | 6C | 1B40 |
| D | 0D | 20 | 2D | 3D | 4D | 1B3E | 6D | 1B29 |
| E | 20 | 20 | 2E | 3E | 4E | 1B14 | 6E | 1B3D |
| F | 20 | 20 | 2F | 3F | 4F | 11 | 6F | 20 |

Table 19: IRA Extended Characters

| | A | B | C | D | E | F |
|---|----|----|----|----|----|----|
| 0 | 20 | 20 | 20 | 20 | 7F | 20 |
| 1 | 40 | 20 | 20 | 5D | 20 | 7D |
| 2 | 20 | 20 | 20 | 20 | 20 | 08 |
| 3 | 01 | 20 | 20 | 20 | 20 | 20 |
| 4 | 24 | 20 | 5B | 20 | 7B | 20 |
| 5 | 03 | 20 | 0E | 20 | 0F | 20 |
| 6 | 20 | 20 | 1C | 5C | 1D | 7C |
| 7 | 5F | 20 | 09 | 20 | 20 | 20 |
| 8 | 20 | 20 | 20 | 0B | 04 | 0C |
| 9 | 20 | 20 | 1F | 20 | 05 | 06 |
| A | 20 | 20 | 20 | 20 | 20 | 20 |
| B | 20 | 20 | 20 | 20 | 20 | 20 |
| C | 20 | 20 | 20 | 5E | 07 | 7E |
| D | 20 | 20 | 20 | 20 | 20 | 20 |
| E | 20 | 20 | 20 | 20 | 20 | 20 |
| F | 20 | 60 | 20 | 1E | 20 | 20 |

Table 20: The Output Conversions Table (DCS=GSM 7 bit and AT+CSCS="IRA")

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|------|----|----|----|----|----|----|----|
| 0 | 40 | 20 | 20 | 30 | A1 | 50 | BF | 70 |
| 1 | A3 | 5F | 21 | 31 | 41 | 51 | 61 | 71 |
| 2 | 24 | 20 | 22 | 32 | 42 | 52 | 62 | 72 |
| 3 | A5 | 20 | 23 | 33 | 43 | 53 | 63 | 73 |
| 4 | E8 | 20 | A4 | 34 | 44 | 54 | 64 | 74 |
| 5 | E9 | 20 | 25 | 35 | 45 | 55 | 65 | 75 |
| 6 | F9 | 20 | 26 | 36 | 46 | 56 | 66 | 76 |
| 7 | EC | 20 | 27 | 37 | 47 | 57 | 67 | 77 |
| 8 | F2 | 20 | 28 | 38 | 48 | 58 | 68 | 78 |
| 9 | C7 | 20 | 29 | 39 | 49 | 59 | 69 | 79 |
| A | 0D0A | | 2A | 3A | 4A | 5A | 6A | 7A |
| B | D8 | | 2B | 3B | 4B | C4 | 6B | E4 |
| C | F8 | C6 | 2C | 3C | 4C | D6 | 6C | F6 |
| D | 0D | E6 | 2D | 3D | 4D | D1 | 6D | F1 |
| E | C5 | DF | 2E | 3E | 4E | DC | 6E | FC |
| F | E5 | C9 | 2F | 3F | 4F | A7 | 6F | E0 |

Table 21: GSM Extended Characters

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|----|---|---|----|---|---|---|
| 0 | | | | | 7C | | | |
| 1 | | | | | | | | |
| 2 | | | | | | | | |
| 3 | | | | | | | | |
| 4 | | 5E | | | | | | |

5

6

7

8 7B

9 7D

A

B

C 5B

D 7E

E 5D

F 5C

14.9. Release Cause Text List of AT+CEER

Table 22: Release Cause Text List of AT+CEER

CS Internal Cause

No cause information available (default)

Phone is offline

No service available

Network release, no reason given

Received incoming call

Client ended call

UIM not present

Access attempt already in progress

Access failure, unknown source

Concur service not supported by network

No response received from network

GPS call ended for user call

SMS call ended for user call

Data call ended for emergency call

Rejected during redirect or handoff

Lower-layer ended call

Call origination request failed

Client rejected incoming call

Client rejected setup indication

Network ended call

No funds available

No service available

Full service not available

Maximum packet calls exceeded

Video connection lost

Video protocol closed after setup

Video protocol setup failure

Internal error

CS Network Cause

Unassigned/unallocated number

No route to destination

Channel unacceptable

Operator determined barring

Normal call clearing

User busy

No user responding

User alerting, no answer

Call rejected

Number changed

Non selected user clearing

Destination out of order

Invalid/incomplete number

Facility rejected

Response to status enquiry

Normal, unspecified

No circuit/channel available

Network out of order

Temporary failure

Switching equipment congestion

Access information discarded

Requested circuit/channel not available

Resources unavailable, unspecified

Quality of service unavailable

Requested facility not subscribed

Incoming calls barred within the CUG

Bearer capability not authorized

Bearer capability not available

Service/option not available

Bearer service not implemented

ACM >= ACM max

Requested facility not implemented

Only RDI bearer is available

Service/option not implemented

Invalid transaction identifier value

User not member of CUG

Incompatible destination

Invalid transit network selection

Semantically incorrect message

Invalid mandatory information

Message non-existent/not implemented

Message type not compatible with state

IE non-existent/not implemented

Conditional IE error

Message not compatible with state

Recovery on timer expiry

Protocol error, unspecified

Interworking, unspecified

CS Network Reject

IMSI unknown in HLR

Illegal MS

IMSI unknown in VLR

IMEI not accepted

Illegal ME

GPRS services not allowed

GPRS and non GPRS services not allowed

MS identity cannot be derived

Implicitly detached

PLMN not allowed

Location area not allowed

Roaming not allowed

GPRS services not allowed in PLMN

No suitable cells in location area

MSC temporary not reachable

Network failure

MAC failure

Synch failure

Congestion

GSM authentication unacceptable

Service option not supported

Requested service option not subscribed

Service option temporary out of order

Call cannot be identified

No PDP context activated

Semantically incorrect message

Invalid mandatory information

Message type non-existent

Message type not compatible with state

Information element non-existent

Message not compatible with state

RR release indication

RR random access failure

RRC release indication

RRC close session indication

RRC open session failure

Low level failure

Low level failure, no redial allowed

Invalid SIM

No service

Timer T3230 expired

No cell available

Wrong state

Access class blocked

Abort message received

Other cause

Timer T303 expired

No resources

Release pending

Invalid user data

PS Internal Cause

Invalid connection identifier

Invalid NSAPI

Invalid primary NSAPI

PDP establish timeout

Invalid field

SNDCP failure

RAB setup failure

No GPRS context

PDP activate timeout

PDP modify timeout

PDP inactive max timeout

PDP lower layer error

PDP duplicate

Access technology change

PDP unknown reason

CS PS Network Cause

LLC or SNDTCP failure

Insufficient resources

Missing or unknown APN

Unknown PDP address or PDP type

User authentication failed

Activation rejected by GGSN

Activation rejected, unspecified

Service option not supported

Requested service option not subscribed

Service option temporary out of order

NSAPI already used (not sent)

Regular deactivation

QoS not accepted

Network failure

Reactivation required

Feature not supported

Semantic error in the TFT operation

Syntactical error in the TFT operation

Unknown PDP context

PDP context without TFT already activated

Semantic errors in packet filter

Syntactical errors in packet filter

Invalid transaction identifier

Semantically incorrect message

Invalid mandatory information

Message non-existent/not implemented

Message type not compatible with state

IE non-existent/not implemented

Conditional IE error

Message not compatible with state

Protocol error, unspecified

Quectel
Confidential