Computer On Modules

Leading Technology to Accelerate Application Development

- COM Express
- COM-HPC
- SMARC
- QFCS
- COM Design-in Service

ADVANTECH

Enabling an Intelligent Planet

SMARC COM Express® COM-HPC

Key Technology Leader Driving Industrial Standards

As a global market leader, Advantech has played a key role in the development of embedded computer technology. This development encompasses early industrial solutions such as 2006's ETX/XTX, 2010's COM Express 2.0, and 2017's COM Express 3.0 (Type7).

Advantech is honored to have collaborated with leading manufacturers in PICMG to create new standard COM-HPC from an early stage.

COM Express® R1.0

SOM-5788

Q SEVEN

SOM-3569

ETX/XTX

SOM-4466

2000   **2005**   **2008**

Accelerating Application Development with Dedicated Products and Services

Medical

Mainstream Platforms and Advanced Cooling

Quadro Flow Cooling System
• Efficient, silent, and light

High Performance COM Express
• Additional 45 % CPU performance

Automation

Remote Massive Device Management

WISE-Paas/DeviceOn
• Scheduling OTA software
• Hardware monitoring and control

SMARC for Massive Deployment
• Wide Range Power Input, TSN,UFS, Wireless

SOM-6882   SOM-5899

SOM-2569   SOM-2532

COM·HPC™

SOM-8990

COM Express® R2.1

SOM-5899R

COM Express® R3.0

SOM-5962

SMARC

SOM-2569

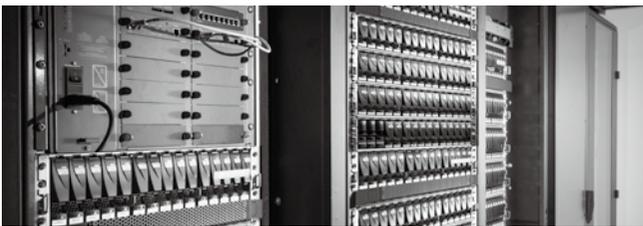2012   2016   2017   2020   2030

Networking

Next Gen. I/O on Server-Grade Computing

I/O Speed Breakthroughs
- PCIe Gen. 4, USB4 and 10GbE

Max. 128GB RAM and Anti-vibration
- Rugged SODIMM

COM-HPC
- Revolutionary performance in edge computing

SOM-5992   SOM-5962   SOM-8990

Defense

Reliable and Robust for Mission Critical Applications

IPC-A-610G Class 3
- Trusted manufacturing processes

Robust COMe Compact
- Onboard RAM and nVME
- PCIe Gen4 and USB4

Big Performance on COMe Mini
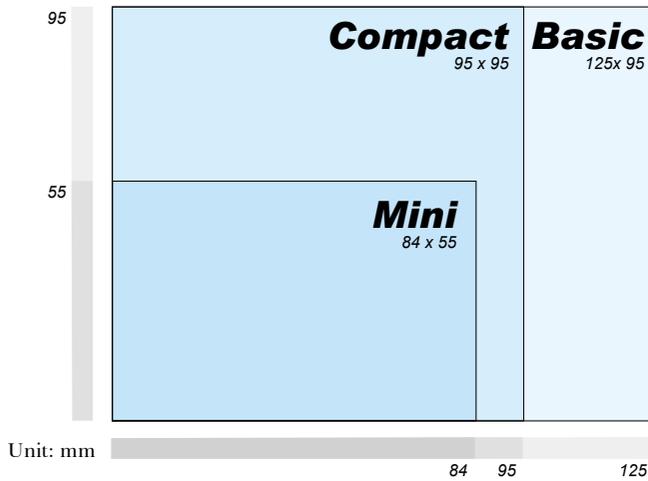- Core™ i7 and LPDDR4

SOM-9590   SOM-6883   SOM-7583

2

COM-Express

Unit: mm

COM Express has been a popular model for more than a decade. Its diverse defined pinout types are suitable for medical, automation, network communication, transportation, and defense applications. This standard enables full range performance in x86 entry-level, mobile and server-grade platform. COM Express is equipped with multiple I/Os, including PCIe4 (16GT/s), USB3.2 (10Gbps), and 10GBase-KR. Available in three sizes, COM express accommodates diverse applications in high-end systems, harsh environments, and on robust machinery.

|	COM Express 3.0 Type 10	COM Express 3.0 Type 6	COM Express 3.0 Type 7
PCI-E x1	4	8	8
PEG/ PCI-E x16	-	1	1
PCI-E x8	-	-	1
LPC / eSPI	v	v	v
Audio	HDA	HDA	-
LAN	1 x GbE	1 x GbE	1 x GbE
			4 x 10GbE
Graphics	LVDS (1 x 24bit) or eDP	LVDS (2 x 24bit) or eDP	-
	1 x DDI	3 x DDI	
	-	VGA	
USB 2.0	6	4	0
USB 3.0/2.0	2	4	4
SATA	2	4	2
COM	2	2	2
Others	8 x GPIO or SDIO, CAN (shared with 1 x COM), SMB, I2C		

COM-HPC
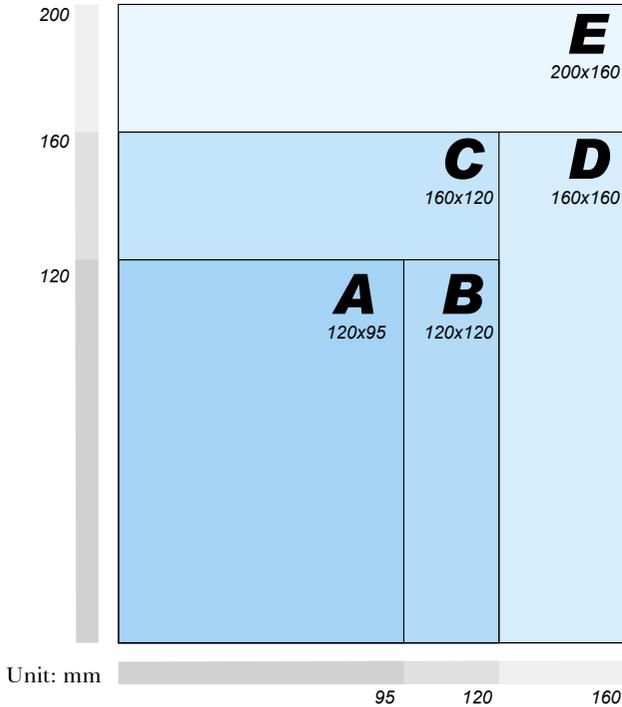
Unit: mm

COM-HPC is a next-generation computer-on-module. It supports more powerful computing unit, memory capacity up to 1TB, and offers next generation high-speed interfaces such as PCIe Gen4/5 (16/32Gbps), USB4.0 (40Gbps), and 25G Ethernet. Such features meet growing demands for data processing and transmission. Coming with Client pinout types by Size A/B/C and Server pinout types by Size D/E, COM-HPC is adaptable to the future use of 5G networks.

|	COM-HPC Server	COM-HPC Client
PCI-E lanes	65	49
BASE-T (max. 10G)	1	2
ETH KR (max. 25G)	8	2
MIPI CSI	-	2
Display (DDI)	-	3
I2S / Soundwire	-	2
USB 4 / USB3.2 gen2 x2	2	4
USB 3.2 gen2 x1	2	0
USB 2.0	4	4
SATA	2	2
Others	12 x GPIO, 2 x UART, 2 x I^{2}C 2 x SPI, eSPI, SMB	

SMARC

SMARC features a versatile small form factor design, and supports unified form factors for ARM and x86 platforms with low power consumption and balanced interfaces. Adaptable to industrial automation, it defines an array of I/Os, including PCIe, USB, multiple LAN, WIFI, Serial Port, CAN bus, and MIPI camera. SMARC is a an ideal solution for AIoT applications.

Unit: mm
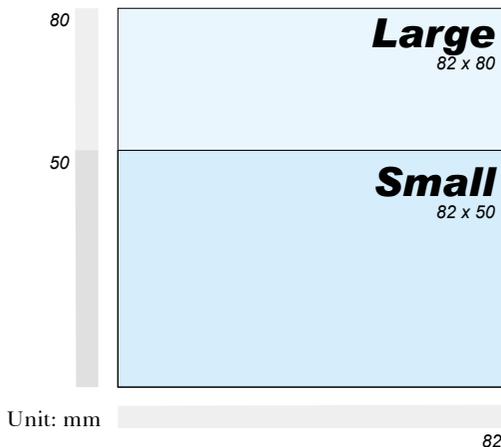
	SMARC	
	Rev. 2.0	Rev. 2.1
PCI-E x1	4	4
eSPI/QSPI	1 / x	1 / 1
Audio	HDA / I2S	HDA / I2S
LAN	2 x GbE	4 x GbE(2 default, 2 optional SerDes)
Graphics	LVDS / eDP / MIPI-DSI	LVDS / eDP / MIPI-DSI
	HDMI / DP++	HDMI / DP++
Camera	2 x MIPI CSI	4 x MIPI CSI
USB 2.0	4	4
USB 3.0	2	2
SATA	1	1
SDIO	1	1
COM	4	4
CAN	2	2
GPIO	12	14
Others	I2C, SMB, SPI	I2C, SMB, SPI

Design-in Service to Accelerate Product Time-to-Market

Advantech COM Design-in Services covers all customers' requirements from the feasibility study, design-in process to volume production, or product lifecycle management of standard product. For some confidential design in customer product, Advantech's R&D provides confidential collaborative design and production. This service functions as an in-house engineer and consultant, customers benefit from streamlined module, accessory, and software selection and installation; providing a one-stop design, verification, and production process. Design-in Service simplifies complex computer-on-modules development, helping customers meet new market challenges.

Planning → **Design** → **Validation** →
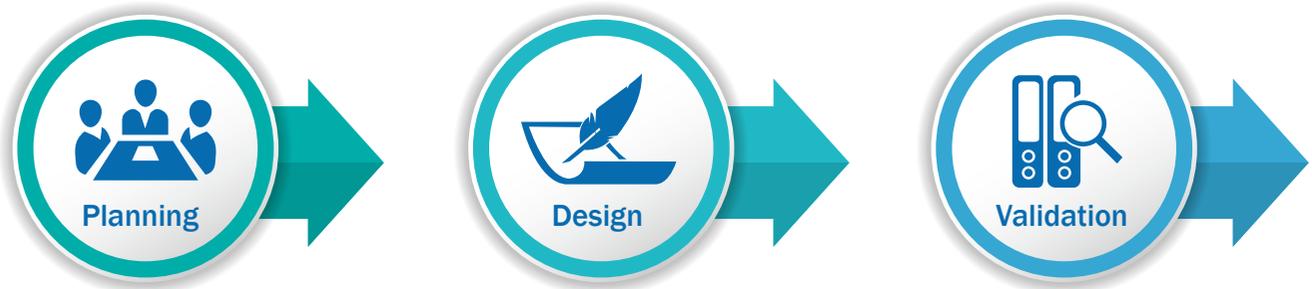
Deliver project proposal	Schematic review and design document	Troubleshooting and risk management
• Technical feasibility study	• Schematic & layout checklist	• Verification and feasibility testing
• Fast & early sample for customer's investigation	• User's manual	• Phenomenon duplication
• Off-the-shelf or customized product selection	• Application note	• Analysis and suggestions
• Hardware and software proposal	• 2D/3D mechanical model	• Sequential debugging SOP
• Performance and power consumption comparison	• IP library	• Local FAE for on-site debug support
• Product selection guide	• Placement and layout check	• BIOS & EC Customization Service
• Evaluation board		

Design-in Service for Standard Products

COM Design-in ensures project success by offering proactive services with pre-validated technology. The 6 phase Design-in process is as follows: planning, design, validation, software and hardware integration, production, and longevity support.
By shortening complex development procedures, customers have more time to focus on their core business. Customers using COM Design-in Services for standard products save money and resources while minimizing development risks.

| Integration | Production | End of Life |

Custom software and thermal solution

- Wide temperature design for extreme environments (-40 °C ~ 85 °C)
- Advanced thermal solution (QFCS) for high TDP products
- Customized thermal solution
- Selected software services
- Embedded peripherals integration

Assured product quality and delivery

- Design quality assurance
- Product mass production
- Localized production and support
- Quality control after delivery

EOL and migration

- Product change notice
- Last-time buy & last shipment
- Product migration proposal

On Demand Board Custom Services

Fast and Reliable Customized Services That Leverage Standard Products for Quicker Time-to-market

The growing demand for embedded applications rises rapidly, but standard products may not be suitable for customers who seek flexible I/O or form factors. Advantech has multiple options to support faster development and time-to market. For applications that require particular functions or platforms with value-added services, Advantech customization services are the solution that meets your expectation.

We offer a comprehensive range of products and services from which to base your solution on and you benefit from many years of our experience in x86 architectures. We offer many types of customization services from modular I/O expansion, board redesign, to full customization. Our exclusive R&D team can help customers to design and review their board solutions so that customers can focus on their own core technology.
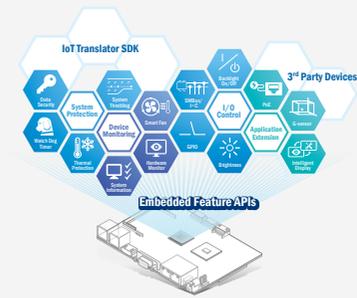

Go-to-Market

Design Analysis Verification

Verified Integration

Custom Board Design

intel
AMD

Qseven
COM-HPC
SMARC
COM Express

Comprehensive Form Factors
Latest Platforms with Silicon Partners

Board Custom Services Give You:

Leading Embedded Technologies	Fast Semi-Customized Services	Reliability Enhancement Services
• Early-access programs joined with silicon partners • Licensed software solutions • Ecosystem partner collaboration	• Customization based on a standard foundation with full range of form factors • Dedicated support team for hardware and firmware design • Certified peripherals	• Product life cycle maintenance • Software maintenance • Logistics management • Extended warranty

Embedded Firmware & Software Integration

Comprehensive Embedded FW and SW Services Accelerate Your IoT Application Development

Any successful project needs to highly integrate hardware and software. Choosing a hardware platform is fairly straightforward, but finding the right firmware and software support takes time and resources. As a leading IPC company, we offer a comprehensive range of hardware and software platforms. Notably, on the software side we offer Embedded Firmware and Software Services aimed at edge and cloud computing accelerating your product development.

Remote Device Management

WISE-PaaS/DeviceOn
Power up IoT devices with 24/7 operation management

Device Management
- Mass device onboarding
- Cross-platform deployment to Azure
- Group sharing

BIOS & Framework OTA Update
- Remote BIOS and firmware updates
- BIOS recovery mechanism
- Backup and restore

Remote Monitor & Control
- Whitelist protection
- USB lock, keyboard filter
- Remote terminal
- Remote backup and restore

Alerts & Actions
- Notifications by message and mail
- Grouping event log
- Remote desktop troubleshooting
- USB device fail resume

Intelligent Self-Management

Embedded Features APIs
Simplified the Access into Hardware Device Data

• **Cross-Platform** • **Easy Upgrade** • **Fast Development**

Unified APIs
- Standard API for hardware platform
- Cross-platform programming
- Easy upgrade and maintenance
- Ready to use IoT translator SDK

Self Management
- I/O control
- System protection
- Device monitoring
- Application extension

Embedded OS

Add-on Features for Windows 10
Facilitate Your Works from Windows to Device

IoT Device Management
- Azure IoT Edge
- Azure IoT Plug & Play

Features Extension
- HDD PMQ Service
- Virtual COM Service
- Node-Red Service

Operation Safety
- Unified Write Filter
- Keyboard filter
- HORM
- Touch Setting
- USB Device Policy
- Notification Setting

Customization Setup
- Windows Boot Logo
- Ctrl+Alt+Del Screen Option
- OneDrive Settings
- Login Screen
- Windows Update

Embedded BIOS

Diverse BIOS Functions
- Standard API for hardware platform
- Cross-platform programming
- Easy upgrade and maintenance
- Ready to use IoT translator SDK

BIOS Customization Services
- Change logo
- DMI edit
- Configuration tool

American Megatrends

Quadro Flow Cooling System (QFCS)

Advanced High-efficiency Cooling Solution Releases Extreme Computing Performance

To fulfill multiple requirements while developing high computing performance in medical, factory automation, and edge computing applications, engineer has to utilize 100% CPU power with no throttling. The thermal solution must tick several boxes such as high heat dissipation efficiency, low noise margins, and a compact heatsink. Advantech had integrated 4 thermal technologies to bring a perfect off-the-shelf thermal solution QFCS to embedded market.

Thermal Technology Innovation
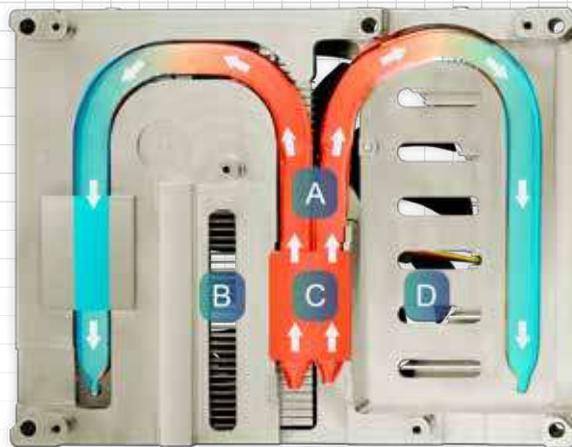
A Two-Phase heat exchange pipe	**B** Mixed fin structure	**C** CPU hard contact	**D** Venting holes
Dual copper heat pipes quickly equalize temperature	Stacked & extrusion fins designed to maximize cooling surface and air exchange	Copper block dissipates heat quickly by making direct contact with CPU	Vertical airflow for expediting memory heat dissipation

Design & Simulation	**Performance Verification**	**Reliability Validation**
Precise calculation & simulation to achieve ultra low heat resistance	Mold sample evaluation and fine tune to maximize thermal efficiency	Endorse reliable operationcapability by strain gauge & vibration test

We See Your Challenges for Optimized Thermal Design

CPU Temperature Overheat

High Noise Level

PCB Bending & CPU Crash

Complex Assembly Process & Extra Jig Cost

Solution for Space-limited System

QFCS Give You:

Release CPU Power without Throttling

100°C

Temperature

60°C

2.9 GHz

2.9 GHz
(No Throttling)

1.8 GHz
(Throttling)

CPU | Memory

Environment Temp. 60°C

Traditional | Advantech DHCS | Advantech QFCS
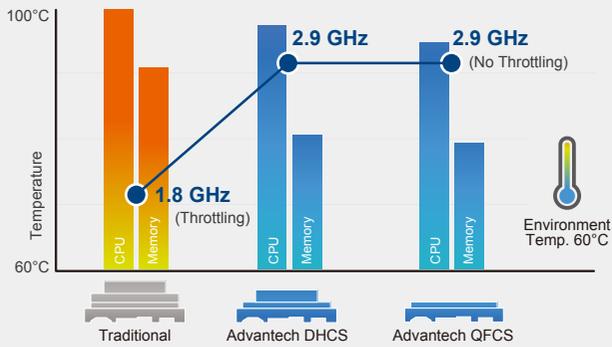
QFCS dissipates the heat produced by 45W processors enabling 100% computing performance.

Thin & Light Cooling Solution

Thinner
46%
Fit space-limited applications

Lighter
47%
System reliability in vibration-sensitive environments

50mm | 27mm — 46% Thinner
Traditional | QFCS

500g | 250g
Traditional | QFCS
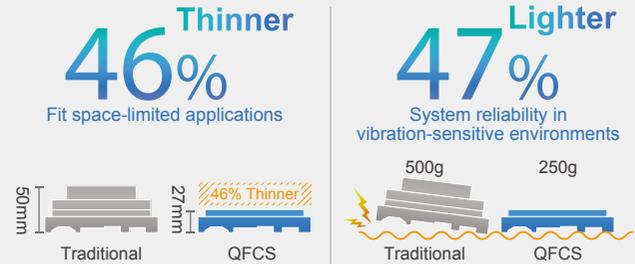
At 27 mm (1.06 in) in height and 150 g (.33 lb) in total weight, QFCS's slim low-profile design fits easily within 1U systems, making it a reliable choice for diverse applications.

Silent Operating

45

The QFCS low-noise fan design produces less than 45dB, enabling enhanced user experiences in hospitals.

Easy Assembly
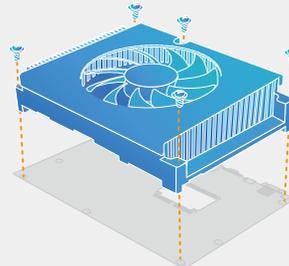
This design's tool-free assembly reduces customer expense by avoiding PCB warp.

COM-HPC as Innovative Computing Standard for Server-Grade Performance at the Edge

Scalability & Easy Deployment
Full Spectrum for Diverse Applications

Remote Management
Easy Accessibility & Operations

Data Processing Capability
Manage Mass Data at Edge

Low Latency
Time-Sensitive Communication

High Network Bandwidth
Reduce Data Transmission Time

Extreme CPU Performance & Memory Capacity
- 20 core/110W server grade capability
- Max. 1TB reliable ECC memory

Super Speed I/O Interface
- Max. eight 10 GbE
- USB4 (40Gbps)

More Expansion Bus & Higher Bandwidth
- PCI Express Gen 5 (32GT/s)
- Max. 65 Lanes PCI Express

Product Highlights

COM-HPC Server	SOM-5962	SOM-5992	SOM-9590
• Intel® Xeon® Processor • 20Cores, 512GB memory • 64 lanes PCIe4/5, 8 ports 25G Ethernet • COM-HPC Server pinout	• Intel® Xeon® C3000 • 16Cores, 128GB memory, onboard eMMC & rugged SODIMM • 4 ports 10G Ethernet • COMe Basic Type7	• Intel® Xeon® D-1500 • 16Cores, 128GB memory • 32 lanes PCIe3, 2 ports 10G Ethernet • COMe Basic Type7	• Intel® Xeon® D-1500 • 16Cores, 32GB memory down, onboard SSD • MIL-STD-810G compliance • COMe Basic Type7

SMARC with Unified x86 & RISC Design for Massive IoT Device Deployment

NXP i.MX8M | Intel E3900 | Intel Core U

Cross Platform Compatibility
Unified design for x86 & RISC processors

Faster Time-to-Market
Simplified architecture for easy development

SMARC Design-in Services
Carrier board design reference & consultant

Remote Device Management
On-boarding utility for volume installation

WISE-PaaS/DeviceOn   SGeT   SMARC

Product Highlights

ROM-5720
- NXP i.MX8M
- 4K video decoding
- AIM-Linux software build-in
- SMARC2.0/2.1 compliance, Small FF

SOM-2569
- Intel Atom® E3900
- 8GB memory & eMMC onboard
- Dual GbE & wireless connectivity
- SMARC2.0/2.1 compliance, Small FF

SOM-2582
- Intel® Core™ ULT Processor
- High computing performance
- Multiple LANs & high speed I/Os
- SMARC2.1, Large FF

COM Express Type7 Modules Make Scattered Outdoor Workstations More Reliable and Easier to Manage

Introduction

Energy management in harsh environments and low population areas presents an array of challenges. In this case, Advantech's customer sought a sturdy and reliable solution capable of providing stable, non-stop service across an extensive geographic area. Instead of building many physical structures locally, the customer chose outdoor server cabinets that provided energy service with manageable models that were centrally controlled by the service center. Advantech's solution offered the advantages of mobility, flexibility, and remote service.

Challenges and Objectives

Cluster system architecture proved suitable in this situation. The customer integrated IT-OT for real-time data transmission; making systems work together via process management to ensure accurate information was delivered to the facilities at the right time while also ensuring sufficient cybersecurity.

It was a challenge to sustain stable and timely service for wide areas as the facilities had to operate under demanding environmental conditions. As there was no off-the-shelf ruggedized cluster computer for the customer to develop the necessary ecosystem, the customer faced the following challenges:

- Limited resources to deliver a seamless response in managing scattered infrastructure
- Business expansion—with more service coverage—made batch equipment management difficult
- Ensuring long term support while operating in harsh environments

The Solution

Advantech SOM-5962, a server-grade COM Express Type7 Basic module, provided 2 to 16 core selections and up to 128GB of memory. It passed through the 100% Ta -40~85 °C screening test in Advantech's factory. Moreover, the optional rugged SODIMM design and pre-assembly proved sturdy against the strong shocks caused by heavy wind.

The customer adopted this model and utilized the multiple SKUs and ruggedized design in their cluster system development. They benefitted from reduced development costs and accelerated system development, and quickly deployed the platform design to spread out onto various systems. Because of the flexibility of COM Express, the customer easily expanded their product types based on the basic system design to fulfill requirements in different locations.

The Result

Advantech COM Express has been a popular embedded board for over 10 years and the customer was satisfied with the standard but flexible design. The small form factor provided excellent computing efficiency with low power consumption to feed in their blade server system. Advantech has completed the Type7 server-grade product roadmap—making it is easier to upgrade or transform new outdoor workstations painlessly.

Innovative QFCS Thermal Solution Empowers Ultrasound Devices

Introduction

Ultrasound technology requires a high-speed board design based on multi-bus signal acquisition channels. Medical equipment must reliably operate at a stable temperatures and comply with numerous safety and reliability standards.

Challenge and Objectives

The high-performance boards used in medical equipment are prone to heat dissipation issues. This problem occurs when a high-performance CPU generates an amount of heat.

Similarly, supporting high-definition image output requires an integrated powerful GPU. This combination of unique requirements can cause the following problems for users:

1. Constraints in airflow of the medical device enclosure that requires complicated design.
2. Utilizing max CPU/GPU capabilities can exceed device TDP and necessitate better heat dissipation
3. Available heat dissipation solutions are often expensive and complicated
4. Due to noise restrictions in medical applications, solutions need to be quiet
5. Further issues of performance scalability and easy maintenance

The Solution

SOM-5899 features 9th gen Intel Core processor encased in a COM Express Type6 form factor body. This computer-on-module enables high-performance signal processing and fully meets the design requirements of ultrasound devices. SOM-5899 supports high processing performance and multiple expansion I/O interfaces which designers can utilize to meet ultrasound device requirements.

Platform-Leading Performance

SOM-5899 is equipped with up to 6 core processor and 96GB DDR4 memory capacity, resulting in a significant performance boost over the previous generation.

Quadro Flow Cooling System (QFCS)

Advantech has developed a highly efficient thermal solution– the Quadro Flow Cooling System (QFCS). QFCS technology enables extreme computer performance by supporting 100% CPU power usage. This slim and quiet solution facilitates rapid heat dissipation to resolve the design complexibility of medical device, and fit in the contemporary look.

Powerful Graphics Engine

SOM-5899 features a powerful GPU which supports fast hardware encoding/decoding and HD video. This GPU supports HDMI and DisplayPort interfaces, and can be used with up to three independent displays. By enabling 4K2K resolution graphics, this model increases accuracy of diagnosis.

Computer on Module Reduce SWAP in Military Portable Communications

Introduction

This customer was a military OEM who provides of a range of deployable and tactical communication products to the US military and various government agencies. The company placed great emphasis on mobility and reliability by leveraging emerging commercial technologies to deliver timely cybersecurity military solutions.

Challenge

The customer's challenge was to deliver prototype COTS (commercial off-the-shelf) products capable of withstanding harsh environments to their clients within a 30~60 day window. If the customer could not source an effective solution, they would have to develop their own custom embedded boards despite lacking sufficient time and resources. Complying with government regulations and meeting core requirements presented difficulties: the prototype had to have embedded military feature sets (TPM, ECC, extended temperature range); there was a short two week lead time (for small samples); and there could be no minimum order quantities. The customer initially explored ATX motherboards as a potential option, but found that they did not meet the SWAP (size, weight, and power) requirement for portable applications.

The Solution

Advantech presented the customer with the SOM-5992 COM Express Basic Module with the highest memory content in the industry (128GB) and the SOM-6898 COM Express Compact Module with a powerful 7th gen Intel processor and advanced security features. The customer relied on Advantech's extensive embedded computing and BIOS customization experience to deliver the smallest and most secure, man-portable communication systems with the necessary quality and performance for meeting the demands of the military market.

Results

The SOM-5992 COM Express Basic Module provided four memory slots, enabling customers to offer 128GB of DDR4 memory in their servers to outperform the competition in virtualization. The SOM-6898 COM Express Compact Module with excellent computing performance and security features enabled the customer to upgrade their visualization server modules to become the best in the industry. As a valued partner to all its customers, Advantech delivered COTS COM express modules with the correct MIL features sets and met the required production quantity within a record time, enabling the customer to meet their fiscal year revenue goals.

COM Express® Sparks Design Flexibility & Scalability for Inflight Entertainment

Introduction

In this case, the customer is a Tier 1 inflight entertainment (IFE) solutions provider involved in producing everything from DSU(digital server unit) head-end systems to VDU(video display unit) seat back displays. IFE offers entertainment solutions onboard aircrafts — systems that play movies, music, and games. IFE suppliers are constantly adapting by reviewing consumer market conditions and exploring new ways in which they can provide optimal entertainment options through onboard devices.

IFE providers view passengers bringing mobile devices onto the aircraft as one of the biggest sources of competition. To stay ahead of the game, one of the key differentiators airlines offer today is access to newly released movies that are not yet available to the general public.US carriers typically do not use in-seat IFE solutions as they are too costly. Instead, in-flight WiFi allowing passengers to connect their devices to onboard entertainment is frequently provided as an alternative. Today, the total IFE market base for in-seat installation hits about 200k units annually.

Challenge and Objectives

The customer was looking to upgrade their solutions with higher bandwidth to provide the best possible in-flight entertainment experience for passengers. At the same time, they needed to keep their system costs competitive, power consumption low, and didn't want to add extra weight. The customer's requirements are summarized here:

- More server bandwidth while keeping system weight and cost down.
- A scalable solution to future-proof possible bandwidth

requirements.
- A solution with a longer product life cycle: the customer's standard design cycle was 3-5 years and their prior solution they were using had a limited ability to add extra bandwidth.

The Solution

The SOM-5992 COM Express Basic Type7 Module was selected for this project for its stock availability, cost effectiveness, customization capacity, low power consumption, and its 2 lanes of 10GbE capacity. Without this product, the customer would have had to revert back to make their own chip down design using the Xeon-D.

Customization implemented:
- Eliminated some of the Broadcom switches that were used in the previous design. The result saved on cost, lowered power consumption, and reduced overall system footprint and weight.
- Complied with the ARINC 600 industry standard footprint to accommodate server size constraints.

Results

Advantech was able to provide an evaluation board within a relatively short time frame. Removing the Broadcom chips reduced the customer's costs, saving an estimated $360,000 on their annual purchase budget. The customer is very pleased with Advantech's next generation COM module. Based on the product roadmap, the unit will increase more bandwidth and will support up to 8K resolutions. The delivery was in sync with the customer's requirements for higher resolution movies and better music quality.

Product Selection

NEW   NEW

Model Name		SOM-5962	SOM-9590	SOM-5992
Form Factor		COM Express Basic	COM Express Basic	COM Express Basic
Pin-out Type		COM R3.0 Type 7	COM R3.0 Type 7	COM R3.0 Type 7
Processor System	CPU	Intel® Atom Processor C3000 Series	Intel® Xeon Processor D1539	Intel® Xeon Processor D-1500 Series
	Base Frequency	2.2GHz-1.5GHz	1.6 GHz	2.2 - 1.3 GHz
	Processor Core	16/12/8/4/2	8	16/12/8/6/4/2
	LLC	16/12/8/4MB	12MB	24/12/9/6/3MB
	CPU TDP	31/25/17/16/11.5/8.5W	31/25/17/16/11.5/8.5W	45/35/25W
	Chipset	-	-	-
Memory	Technology	DDR4 2400/2133/1866	DDR4 2133	DDR4 2400/2133/1866
	ECC Support	ECC and non-ECC	ECC	ECC and non-ECC
	Max. Capacity	128GB	32GB	128GB
	Socket	4 x 260P SODIMM	-	4 x 260P SODIMM
Graphics	Controller	-	-	-
	Max. Frequency	-	-	-
	VGA	-	-	-
	LCD (TTL/LVDS/eDP)	-	-	-
	DDI (HDMI/DVI/DisplayPort)	-	-	-
	Multiple Displays	-	-	-
Expansion	PCIe x16	-	1	1
	PCIe x8	1 (up to 2 by option)	1	1
	PCIe x4	1	-	-
	PCIe x1	-	7	7
	PCI Masters	-	-	-
	ISA Bus	-	-	-
	LPC	1	1	1
Serial Bus	SMBus	1	1	1
	I²C Bus	1	1	1
	CAN Bus	-	-	-
Ethernet	Gigabit Ethernet	Intel® I210AT/IT	Intel® I210IT	Intel® I210AT/IT
	GbE Speed	10/100/1000 Mbps	10/100/1000 Mbps	10/100/1000Mbps
	10GB Ethernet	4 (10G/2.5G by SKU)	2	2
I/O	SATA	2	2	2
	PATA Channel	-	-	-
	USB3.1 Gen2	-	-	-
	USB3.0	4	4	4
	USB2.0	4	4	4
	Audio	-	-	-
	SPI Bus	Yes	Yes	Yes
	GPIO	8	8	8
	SDIO (GPIO pin shared)	-	-	-
	Watchdog	1	1	1
	COM Port	2 (2-wire)	2 (2-wire)	2 (2-wire)
	LPT/FDD	-	-	-
	PS/2	-	-	-
	IR	-	-	-
	Onboard Storage	eMMC	SATA SSD	-
	TPM	TPM2.0	TPM2.0	TPM2.0
Power	Power Type	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin
	Supply Voltage	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V
	Power Consumption Max.	32.6 Watt	45.56W	55.5W
	Power Consumption Idle	11.8 Watt	12.75W	13.77W
Environment	Operating Temp.	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60° C (32 ~ 140° F)
	Extended Temp.(Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)
Mechanical	Dimensions	125 x 95 mm (4.92" x 3.74")	125 x 95 mm (4.92" x 3.74")	125 x 95mm (4.92" x 3.74")

NEW

Model Name		SOM-5899	SOM-5898	SOM-5897
Form Factor		COM Express Basic	COM Express Basic	COM Express Basic
Pin-out Type		COM R3.0 Type 6	COM R2.1 Type 6	COM R2.1 Type 6
Processor System	CPU	Intel® 9th/8th Gen. Core i7/i5/i3/Xeon/Celeron	Intel® 7th Gen. Core i7/i5/i3/ Xeon	Intel® 6th Gen. Core i7/i5/i3/Xeon/Celeron
	Base Frequency	3.0 - 1.6 GHz	3.0 - 2.1 GHz	2.8 - 1.9 GHz
	Processor Core	6/4/2	4/2	4/2
	LLC	12/9/8/6/2MB	8/6/3MB	8/6/3/2MB
	CPU TDP	45/35/25W	45/35/25W	45/35/25W
	Chipset	Intel® CM246/QM370/HM370	Intel® QM175/CM238	Intel® QM170/CM236
Memory	Technology	DDR4 2666/2400/2133	DDR4 2400/2133	DDR4 2133/1866
	ECC Support	ECC (Xeon only)	ECC (Xeon only)	ECC (Xeon only)
	Max. Capacity	96GB	32GB	32GB
	Socket	3 x 260P SODIMM	2 x 260P SODIMM	2 x 260P SODIMM
Graphics	Controller	Intel® UHD Graphics 610/630/P630	Intel® HD Graphics 630/P630	Intel® HD Graphics 510/530/P530/P580
	Max. Frequency	1.15GHz	350MHz - 1GHz	1.05GHz - 950MHz
	VGA	1	1	1
	LCD (TTL/LVDS/eDP)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)
	DDI (HDMI/DVI/DisplayPort)	up to 3	2; up to 3	2; up to 3
	Multiple Displays	Triple-Display	Triple-Display	Triple-Display
Expansion	PCIe x16	1 (configurable)	1	1
	PCIe x8	-	-	-
	PCIe x4	-	-	-
	PCIe x1	8 (configurable)	8	8
	PCI Masters	-	-	-
	ISA Bus	-	-	-
	LPC	1	1	1
Serial Bus	SMBus	1	1	1
	I²C Bus	1	1	1
	CAN Bus	Optional	-	-
Ethernet	Gigabit Ethernet	Intel® I219LM	Intel® I219 LM	Intel® I219LM
	GbE Speed	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps
	10GB Ethernet	-	-	-
I/O	SATA	4	4	4
	PATA Channel	-	-	-
	USB 3.1 Gen2	4	-	-
	USB3.0	-	4	4
	USB2.0	8	8	8
	Audio	HD Audio	HD Audio	HD Audio
	SPI Bus	1	1	1
	GPIO	8	8	8
	SDIO (GPIO pin shared)	Optional	-	-
	Watchdog	1	1	1
	COM Port	2 (2-wire)	2 (2-wire)	2 (2-wire)
	LPT/FDD	-	-	-
	PS/2	-	-	-
	IR	-	-	-
	Onboard Storage	-	-	-
	TPM	TPM2.0	TPM2.0	Optional
Power	Power Type	ATX: Vin, VSB; AT: Vin	ATX: Vin, VSB; AT: Vin	ATX: Vin, VSB; AT: Vin
	Supply Voltage	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V
	Power Consumption Max.	44.63W	48.1W	43.3W
	Power Consumption Idle	6.89W	6.77W	5.23W
Environment	Operating Temp.	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60° C (32 ~ 140° F)	0 ~ 60 °C (32 ~ 140 °F)
	Extended Temp.(Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)
Mechanical	Dimensions	125 x 95mm (4.92" x 3.74")	125 x 95mm (4.92" x 3.74")	125 x 95mm (4.92" x 3.74")

Product Selection

Model Name		SOM-5894	SOM-5871	SOM-5893
Form Factor		COM Express Basic	COM Express Basic	COM Express Basic
Pin-out Type		COM R2.1 Type 6	COM R3.0 Type 6	COM R2.1 Type6
Processor System	CPU	Intel® 4th Gen. Core i7/i5/i3/Celeron	AMD Ryzen™ V1000	AMD R-Series Bald Eagle
	Base Frequency	2.7 - 1.5 GHz	3.35 - 2.0 GHz	2.7 - 2.2 GHz
	Processor Core	4/2	4/2	4/2
	LLC	6/3/2MB	2/1MB	4/1MB
	CPU TDP	47/37/25W	35-54/12-25W	35/17W
	Chipset	Intel® QM87	-	A77E
Memory	Technology	DDR3L 1600/1333	DDR4 3200/2400	DDR3 2133 ; DDR3L 1600
	ECC Support	ECC (B1 version only)	ECC and non-ECC	-
	Max. Capacity	16GB	32GB	16GB
	Socket	2 x 204P SODIMM	2 x 260P SODIMM	2 x 204P SODIMM
Graphics	Controller	Intel® HD Graphics 4600	AMD Vega GPU	AMD Radeon HD9000
	Max. Frequency	1.0GHz - 900MHz	1.3-1.0GHz	686MHz
	VGA	1	1	1
	LCD (TTL/LVDS/eDP)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)
	DDI (HDMI/DVI/DisplayPort)	3	2; up to 3	up to 3
	Multiple Displays	Triple-Display	Quad-Display	Quad-Display
Expansion	PCIe x16	1	-	1 (Optional)
	PCIe x8	-	1	-
	PCIe x1	7	6	7
	PCI Masters	-	-	-
	ISA Bus	-	-	-
	LPC	1	1	1
Serial Bus	SMBus	1	1	1
	I²C Bus	1	1	1
	CAN Bus	-	Optional	-
Ethernet	Gigabit Ethernet	Intel® I217LM	Intel® I210AT	Intel® I211AT
	GbE Speed	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps
	10GB Ethernet	-	-	-
I/O	SATA	4	2	4
	PATA Channel	-	-	-
	USB3.0	4	3	4
	USB2.0	8	8	8
	Audio	HD Audio	HD Audio	HD Audio
	SPI Bus	1	1	1
	GPIO	8	8	8
	SDIO (GPIO pin shared)	-	-	-
	Watchdog	1	1	1
	COM Port	2 (2-wire)	2 (2-wire)	2 (2-wire)
	LPT/FDD	-	-	-
	PS/2	-	-	-
	IR	-	-	-
	Onboard Storage	-	-	-
	TPM	Optional	TPM2.0	Optional
Power	Power Type	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin
	Supply Voltage	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V
	Power Consumption Max.	42.12W	67.12 W	39.6 W
	Power Consumption Idle	8.5 W	15 W	16.8 W
Environment	Operating Temp.	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)
	Extended Temp.(Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (only on V1404I)	-
Mechanical	Dimensions	125 x 95mm (4.92" x 3.74")	125 x 95mm (4.92" x 3.74")	125 x 95 mm (4.92'' x 3.74")

NEW

Model Name		SOM-6882	SOM-6898	SOM-6897	SOM-6896	SOM-6894
Form Factor		COM Express Compact	COM Express Compact	COM Express Compact	COM Express Compact	COM Express Compact
Pin-out Type		COM R3.0 Type 6	COM R2.1 Type 6	COM R2.1 Type 6	COM R2.1 Type 6	COM R2.1 Type 6
Processor System	CPU	Intel® 8th Gen. Core i7/i5/ i3/Celeron	Intel® 7th Gen. Core i7/i5/ i3/Celeron	Intel® 6th Gen. Core i7/i5/ i3/Celeron	Intel® 5th Gen. Core i7/i5/ i3/Celeron	Intel® 4th Gen. Core i7/i5/ i3/Celeron
	Base Frequency	2.2 - 1.6GHz	2.8 - 2.2GHz	2.6 - 2.0GHz	2.2 - 1.8GHz	1.9 - 1.6GHz
	Processor Core	4/2	2	2	2	2
	LLC	8/6/4/2MB	4/3/2MB	4/3/2MB	4/3/2MB	4/3/2MB
	CPU TDP	15 W	15W	15W	15W	15W
	Chipset	-	-	-	-	-
Memory	Technology	DDR4 2400	DDR4 2133	DDR3L 1600	DDR3L 1600	DDR3L 1600
	ECC Support	N/A	N/A	-	-	-
	Max. Capacity	64GB	32GB	16GB	16GB	16GB
	Socket	2 x 260P SO-DIMM	2 x 260P SODIMM	2 x 204P SODIMM	2 x 204P SODIMM	2 x 204P SODIMM
Graphics	Controller	Intel® UHD Graphics 620/610	Intel® HD Graphics 620/610	Intel® HD Graphics 520/510	Intel® HD Graphics 6000/5500	Intel® HD Graphics 5000/4400
	Max. Frequency	1.15 - 1.0 GHz	1.15 - 0.9 GHz	1.15 - 0.9 GHz	1.0 - 0.85 GHz	1.1 - 1.0GHz
	VGA	1	1	1	1	1
	LCD (TTL/LVDS/eDP)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)	LVDS 2-CH 18/24-bit eDP (optional)
	DDI (HDMI/DVI/DisplayPort)	2 (DDI2 optional)	2 (DDI2 optional)	2 (DDI2 optional)	2 (DDI2 optional)	2 (DDI2 optional)
	Multiple Displays	Triple-Display	Triple-Display	Triple-Display	Triple-Display	Triple-Display
Expansion	PCIe x16	-	-	-	-	-
	PCIe x8	-	-	-	-	-
	PCIe x4	1 (Optional)	-	-	-	-
	PCIe x1	8	4 PCIe x1 +1 PCIe x4 (Optional 5)	4 PCIe x1 +1 PCIe x4 (Optional 5)	4	4 (Optional 1 PCIex4)
	PCI Masters	-	-	-	-	-
	PCI Masters	-	-	-	-	-
	ISA Bus	1	-	-	-	-
	LPC	1	1	1	1	1
Serial Bus	SMBus	1	1	1	1	1
	I²C Bus	1	1	1	1	1
	CAN Bus	-	-	-	-	-
Ethernet	Controller	Intel® I219LM	Intel® I219LM	Intel® I219LM	Intel® I218LM	Intel® I218LM
	Speed	10/100/1000 Mbps	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps
I/O	SATA	2 (3 for optioanl)	2 (3 for optioanl)	2 (3 for optioanl)	4	4
	PATA Channel	-	-	-	-	-
	USB3.0	4	4	4	2	2
	USB2.0	8	8	8	8	8
	Audio	HD Audio	HD Audio	HD Audio	HD Audio	HD Audio
	SPI Bus	2	1	1	1	1
	GPIO	8	8	8	8	8
	SDIO (GPIO pin shared)	1	1	1	1	-
	Watchdog	1	1	1	1	1
	COM Port	2 (2-wire)	2 (2-wire)	2 (2-wire)	2 (2-wire)	2 (2-wire)
	LPT/FDD	-	-	-	-	-
	PS/2	-	-	-	-	-
	IR	-	-	-	-	-
	Onboard Storage	eMMC	Optional eMMC	-	-	-
	TPM	TPM2.0	Optional	Optional	Optional	-
Power	Power Type	ATX/ATX: Vin,	ATX: Vin, VSB; AT: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin
	Supply Voltage	Vin: 8.5-20V, RTC Battery: 2.0V ~ 3.3V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V
	Power Consumption Max.	59.721 W	24.61W	20.73W	22.58W	22.08W
	Power Consumption Idle	4.204 W	4.16W	4.12W	3.13W	4.44W
Environment	Operating Temp.	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)
	Extended Temp.(Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-20 ~ 85 °C (-4 ~ 185 °F)
Mechanical	Dimensions	95 x 95 mm (3.74" x 3.74")	95 x 95 mm (3.74" x 3.74")	95 x 95 mm (3.74" x 3.74")	95 x 95 mm (3.74'' x 3.74")	95 x 95 mm (3.74" x 3.74")

Product Selection

Model Name		SOM-6869	SOM-6867	SOM-7569	SOM-7567
Form Factor		COM Express Compact	COM Express Compact	COM-Express Mini	COM Express Mini
Pin-out Type		COM R2.1 Type 6	COM R2.1 Type 6	COM R2.1 Type 10	COM R2.1 Type 10
Processor System	CPU	Intel® Atom® E3900 & Pentium®/Celeron® N series	Intel® Atom® E3800 & Celeron® N/J series	Intel® Atom® E3900 & Pentium®/Celeron® N series	Intel® Atom® E3800 & Celeron® N/J series
	Base Frequency	1.6-1.1GHz	2.0 - 1.19GHz	1.6-1.1GHz	2.0-1.33GHz
	Processor Core	4/2	4/2	4/2	4/2/1
	LLC	2MB	2/1MB	2MB	2/1/512KB
	CPU TDP	6/6/12/9.5/6.5/10W	10 - 6W	12/9.5/6.5/6W	10/8/7.5/6/5/3W
	Chipset	-	-	-	-
Memory	Technology	DDR3L 1866 for non-ECC/1600 for ECC	DDR3L 1333	DDR3L 1866/1600	DDR3L 1333/1066
	ECC Support	A1: non-ECC; B1: ECC	-	ECC and non-ECC	-
	Max. Capacity	8GB	8GB	8GB	4GB
	Socket	2 x 204P SODIMM	2 x 204P SODIMM	-	-
Graphics	Controller	Intel® HD Graphics	Intel® HD Graphics	Intel® HD Graphics	Intel® HD Graphics
	Max. Frequency	750 - 550MHz	792 - 854MHz	750-550MHz	854-792MHz
	VGA	1	1	-	-
	LCD (TTL/LVDS/eDP)	LVDS 2-CH 18/24-bit BOM optional eDP	LVDS 2-CH 18/24-bit BOM optional eDP	LVDS: 1-CH 18/24-bit BOM optional eDP	LVDS 1-CH 18/24-bit
	DDI (HDMI/DVI/DisplayPort)	2 (DDI2 optional)	2 (DDI2 optional)	1	1
	Multiple Displays	Triple-Display	Dual-Display	Dual-Display	Dual-Display
Expansion	PCIe x16	-	-	-	-
	PCIe x1	4 (Optional 5)	3 (Optional 4)	4 (Optional 1PCIex4)	3 (Optional 4 PCIe x1 or 1 PCIe x4 without LAN)
	PCI Masters	-	-	-	-
	ISA Bus	-	-	-	-
	LPC	1	1	1	1
Serial Bus	SMBus	1	1	1	1
	I²C Bus	1	1	1	1
	CAN Bus	Optional	-	Optional	-
Ethernet	Controller	Intel® I210IT/I210AT	Intel® I210	Intel® I210AT/IT	Intel® I210E
	Speed	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps	10/100/1000Mbps
I/O	SATA	2	2	2	1 (Optional 2)
	PATA Channel	-	-	-	-
	USB3.0	2	1	2	1
	USB2.0	8	8	8	4
	Audio	HD Audio	HD Audio	HD Audio	HD Audio
	SPI Bus	1	1	1	1
	GPIO	8	8	8	8
	SDIO (GPIO pin shared)	-	-	Optional	-
	Watchdog	1	1	1	1
	COM Port	2 (2-wire)	2 (2-wire)	2 (2-wire)	2 (2-wire)
	LPT/FDD	-	-	-	-
	PS/2	-	-	-	-
	IR	-	-	-	-
	Onboard Storage	-	Optional SSD	eMMC	SLC/MLC SSD
	TPM	TPM2.0	Optional	TPM2.0	-
Power	Power Type	ATX: Vin, VSB; AT: Vin	ATX: Vin, VSB, AT: Vin	ATX:Vin, VSB, AT:Vin	ATX: Vin, VSB, AT: Vin
	Supply Voltage	Vin: 8.5-20V VSB: 4.75-5.25V	Vin: 8.5-20V VSB: 4.75-5.25V	ATX (Vin 4.75-20V, Vsb 4.75-5.25V) AT (Vin 4.75-20V)	ATX (Vin 4.75-20V, Vsb 4.75-5.25V) AT (Vin 4.75-20V)
	Power Consumption Max.	14.76W	15.36W	14.73W (E3950)	16.56 W (E3845)
	Power Consumption Idle	4.46W	9.48W	4.68W (E3950)	8.04 W (E3845)
Environment	Operating Temp.	0 ~ 60° C (32 ~ 140° F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)
	Extended Temp. (Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)
Mechanical	Dimensions	95 x 95 mm (3.74" x 3.74")	95 x 95 mm (3.74'' x 3.74")	84 x 55 mm (3.3" x 2.17")	84 x 55 mm (3.3" x 2.17")

NEW   NEW

Model Name		SOM-2569	SOM-3569	SOM-3567	SOM-4466
Form Factor		SMARC	QSeven	Qseven	ETX
Pin-out Type		SMARC 2.0/2.1	QSeven 2.1	Qseven 2.1	ETX 3.0
Processor System	CPU	Intel Atom® E3900 & Pentium®/ Celeron® N series	Intel Atom® E3900 & Pentium®/ Celeron® N series	Intel Atom® E3800 & Celeron® N/J series	AMD G-Series T56N/T40E/T16R
	Base Frequency	2.5-1.8GHz	1.6-1.1GHz	2.0-1.33GHz	1.0-615MHz
	Processor Core	4/2	4/2	4/2/1	1
	LLC	2 MB	2MB	2MB/1MB/512KB	512KB
	CPU TDP	12/9/6.5/6W	12/9/6.5/6W	10/8/6/5/4.3/3 W	4.5/6.4/18W
	Chipset	-	-	-	AMD A55E
Memory	Technology	LPDDR4 2400	LPDDR4 2400	DDR3L 1333/1066	DDR3 1066
	ECC Support	-	-	-	-
	Max. Capacity	8GB	8GB	8GB	4GB
	Socket	-	-	-	1 x 204P SODIMM
Graphics	Controller	Intel® HD Graphics 505/500	Intel® HD Graphics	Intel® HD Graphics	AMD Radeon HD6320/HD6250
	Max. Frequency	750/650/600/550MHz	750-550MHz	854-750MHz	276MHz
	VGA				1
	LCD (TTL/LVDS/eDP)	LVDS 2-CH 18/24-bit BOM optional eDP	LVDS 2-CH 18/24-bit BOM optional eDP	LVDS 2-CH 18/24-bit BOM optional eDP	LVDS 1-CH 18/24-bit TTL 1-CH 18-bit
	DDI (HDMI/DVI/DisplayPort)	2 (1 DP , 1 HDMI)	1	1	-
	Multiple Displays	Triple-Display	Dual-Display	Dual-Display	Dual-Display
Expansion	PCIe x16	-	-	-	-
	PCIe x8	-	-	-	-
	PCIe x4	-	-	-	-
	PCIe x1	4	4 (Optional 1 PCIex4)	3 (Optional 4 PCIex1 without LAN)	-
	PCI Masters	-	-	-	4
	ISA Bus	-	-	-	1
	LPC	-	1	1	-
Serial Bus	SMBus	1	1	1	1
	I²C Bus	1	1	1	1
	CAN Bus	Optional	Optional	-	-
Ethernet	Controller	2 x Intel® I210IT	Intel® I210IT	Intel® I210IT	Realtek RTL8105E
	Speed	10/100/1000 Mbps	10/100/1000 Mbps	10/100/1000 Mbps	10/100 Mbps
	10GB Ethernet	-	-	-	-
I/O	SATA	1	2	2	2
	PATA Channel	-	-	-	2
	USB 3.1 Gen2	-	-	-	-
	USB3.0	2	1(Optional 2)	1	-
	USB2.0	6	8	6	4
	Audio	1 HD Audio / Up to 2 I2S	HD Audio	HD Audio	HD Audio
	SPI Bus	1	1	1	-
	GPIO	12	-	-	1
	SDIO (GPIO pin shared)	1	1	-	-
	Watchdog	1	1	1	1
	COM Port	4 (2 x 4-wire/2 x2-wire)	2 (2 x 4-wire, 1 on MFG pins)	2 (2 x 4-wire, 1 on MFG pins)	2
	LPT/FDD	-	-	-	1
	PS/2	-	-	-	KB/MS
	IR	-	-	-	1
	Onboard Storage	eMMC	eMMC	eMMC	mSATA socket
	TPM	TPM2.0	TPM2.0	-	-
Power	Power Type	ATX/ATX: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin	ATX: Vin, VSB, AT: Vin
	Supply Voltage	Vin: 5V±5%, VSB: 5V±5%, RTC Battery: 2.0-3.3V	Vin: 5V±5%, VSB: 5V±5%, RTC Battery: 2.0-3.3V	Vin: 5V±5%, VSB: 5V±5%, RTC Battery: 2.0-3.3V	Vin: 4.75-5.25V, VSB: 4.75-5.25V
	Power Consumption Max.	14.11 W	9.1 W	7.53 W	7.75 W
	Power Consumption Idle	3.45 W	2.82 W	3.28 W	6.1 W
Environment	Operating Temp.	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)	0 ~ 60 °C (32 ~ 140 °F)
	Extended Temp. (Optional)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)	-40 ~ 85 °C (-40 ~ 185 °F)
Mechanical	Dimensions	82 x 50 mm (3.23" x 1.97")	70 x 70 mm (2.75" x 2.75")	70 x 70 mm (2.75" x 2.75")	114 x 95 mm (3.74" x 4.5")

Worldwide Offices

Greater China

China
Toll Free	800-810-0345
Beijing	86-10-6298-4346
Shanghai	86-21-3632-1616
Shenzhen	86-755-8212-4222
Chengdu	86-28-8545-0198
Hong Kong	852-2720-5118

Taiwan
Toll Free	0800-777-111
Taipei & IoT Campus	886-2-2792-7818
Taichung	886-4-2372-5058
Kaohsiung	886-7-392-3600

Middle East and Africa
Israel	072-2410527

Asia

Japan
Toll Free	0800-500-1055
Tokyo	81-3-6802-1021
Osaka	81-6-6267-1887
Nagoya	81-0800-500-1055

Korea
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