



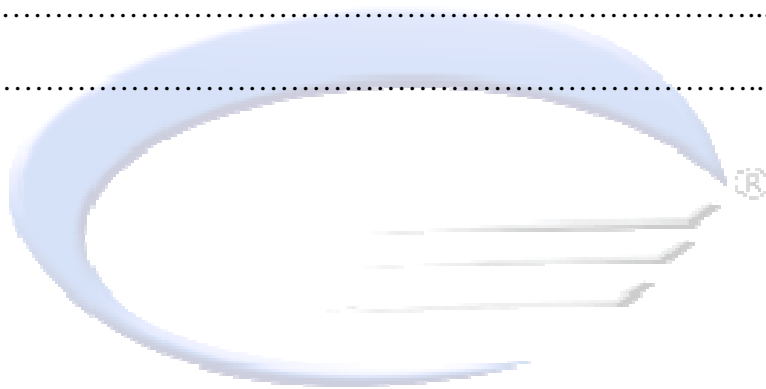
RJR POLYMERS, INC.

Reliability Qualification Report  
RQFN55-24-A and RQFN44-12-A  
Package Qualification  
September 14, 2011

# RJR Polymers Reliability Qualification Report RQFN55-24-A and RQFN44-12-A

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## Purpose

This reliability report qualifies the RQFN55-24-A (RQFNA-01-00) and RQFN44-12-A (RQFNA-02-00) packages. These packages are fabricated at RJR Polymers facility in Oakland, California.

## Background Information

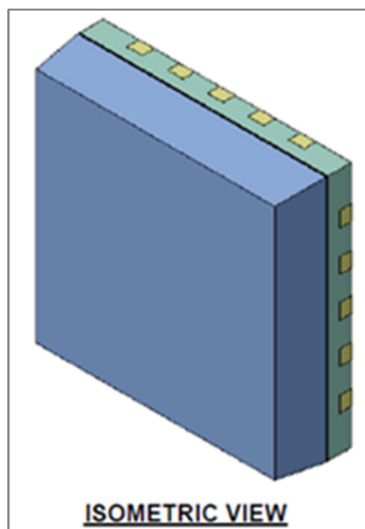
The RQFN package is an air cavity plastic package. It has many applications in the RF power, wireless, and sensor technology applications.

The near hermetic RQFN package is a direct replacement of ceramic in all applications. The RQFN has advantages over ceramic QFN because of direct soldering of die pad to PCB. The RQFN has better ground for RF applications and better thermal performance. It can also be shipped in an array for more cost effective assembly operations.

The qualification consists of production lots fabricated at RJR Polymers Oakland facility. The reliability stress tests are performed per industry standards (JEDEC, AEC, and MIL-STD-883). The devices used were mechanical samples.

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Figure 1. Package drawing of the RQFN55-24-A.



**Device Description:**

**Table 1.** Detailed device description of the RQFN55-24-A and RQFN44-12-A.

Package	RQFN55-24-A	RQFN44-12-A
Assembly Site	Oakland, California	Oakland, California
Package Size	5 mm x 5 mm	4 mm x 4 mm
Die Pad	3.4mm x 3.4mm	2.5 mm x 2.5 mm
LF Thickness	0.254 mm	0.38 mm
LF Material	CDA 194 F/H	CDA 194 F/H
Plating	NiPdAu	NiAu

**Table 2.** List of reliability lab companies, locations, and tests performed.

Reliability Lab	Location	Tests Completed
RJR Polymers Facility	Oakland, California	MSL, HTSL, LTSL
ISE Labs Inc	Freemont, CA	Temperature Cycling

**Table 3.** Lot numbers used for this qualification.

RQFN55-24-A	RQFN44-12-A
JT4008A	JT4008E
JT4008B	JT4045A
JT4008C	JT4045B
JT4008D	JT4045C
JT4046A	
JT4046B	
JT4046C	

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## Qualification Tests and Results

The qualification tests were performed per standard test conditions (JEDEC, AEC-101, MIL-STD-883).

**Table 4a.** Qualification results for the RQFN55-24-A package.

	<b>Stress</b>	<b>Abbv.</b>	<b>Ref.</b>	<b>Conditions</b>	<b>Duration/Accept</b>	<b>Lot A</b>	<b>Lot B</b>	<b>Lot C</b>
1	MSL 3	MSL3	J-STD-020D	IR = 260°C	End Point / 0 Fail	0/70	0/70	0/70
2	Temperature Cycling	TC	JESD22-A104	Condition G (-40°C to +125°C)	500 cycles / 0 Fail	0/210	0/40	
3	High Temperature Storage Life	HTSL	JESD22-A103C	Condition A (125°C)	1000 hours / 0 Fail	0/70	0/70	
4	Low Temperature Storage Life	LTSL	JESD22-A119	Condition A (-40°C)	1000 hours / 0 Fail	0/70	0/70	

**Table 4b.** Qualification results for the RQFN44-12-A package.

	<b>Stress</b>	<b>Abbv.</b>	<b>Ref.</b>	<b>Conditions</b>	<b>Duration/Accept</b>	<b>Lot A</b>	<b>Lot B</b>	<b>Lot C</b>
1	MSL 3	MSL3	J-STD-020D	IR = 260°C	End Point / 0 Fail	0/70	0/70	0/70
2	Temperature Cycling	TC	JESD22-A104	Condition G (-40°C to +125°C)	500 cycles / 0 Fail	0/210		
3	High Temperature Storage Life	HTSL	JESD22-A103C	Condition A (125°C)	1000 hours / 0 Fail	0/70		
4	Low Temperature Storage Life	LTSL	JESD22-A119	Condition A (-40°C)	1000 hours / 0 Fail	0/70		

## Explanation of Tests

### **Stress Test/Specification: Moisture Level Preconditioning (MSL)/J-STD-020D**

**Purpose:** The tests are performed to simulate the board mounting process where parts are subjected to a high temperature for a short duration. These tests detect mold compound delamination from the die and leadframe.

**Conditions:** 24hrs Bake@125+5/-0 °C + 192 hours 30°C/60 R.H. +3X IR Reflow @ 260°C +1X Flux Immersion + DI Rinse

**Possible Failure Mechanisms/Modes:** Failure mechanisms include corrosion, fractured wire bonds and passivation cracks.

### **Stress Test/Specification: Temperature Cycling (TC)/JESD22-A104**

**Conditions:** Ta = -40°C to +125°C; unbiased

**Read Points:** 0, 500 cycles

**Purpose:** Accelerate failure mechanisms caused by cycling between high and low temperatures.

**Possible Failure Mechanisms/Modes:** Failure mechanisms include fatigue and cracking related failures like broken bonds or cracked die due to stresses caused by thermal mismatches in Coefficients of Thermal Expansion (CTE). Failure modes include degradation of thermal and electrical characteristics and catastrophic failure.

### **Stress Test/Specification: High Temperature Storage Life (HTSL)/JESD22-A103**

**Conditions:** 125°C

**Purpose:** A failure mechanisms which are thermally activated through the application of extreme temperature.

**Possible Failure Mechanisms:** Failure mechanisms include mechanical failure. Failure modes include poor package design, assembly, or materials.

### **Stress Test/Specification: Low Temperature Storage Life (LTSL)/JESD22-A119**

**Conditions:** -40°C

**Purpose:** A failure mechanisms which are thermally activated through the application of extreme temperature.

**Possible Failure Mechanisms:** Failure mechanisms include mechanical failure. Failure modes include poor package design, assembly, or materials.

## Quality Tests and Results

**Table 5.** Quality tests performed on RQFN55-24-A package.

	<b>Test</b>	<b>Sample Size</b>	<b>Mean (g)</b>	<b>St Dev</b>
<b>1</b>	<b>Wire Pull</b>	<b>40</b>	<b>10.84</b>	<b>0.75</b>
<b>2</b>	<b>Lid Shear</b>	<b>10</b>	<b>17.2</b>	<b>3.01</b>

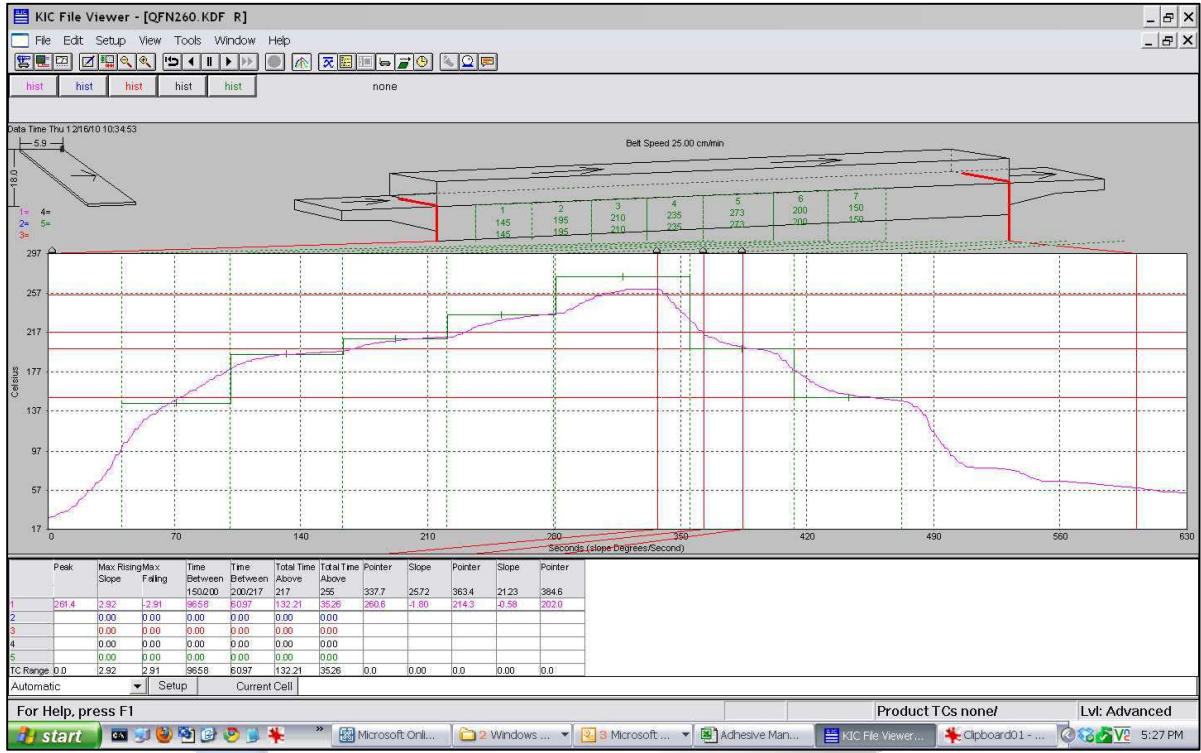
## Summary

The reliability test results documented herein qualify the RQFN55-24-A and RQFN44-12-A package. The package manufacturing and assembly of these packages occur at the RJR Polymers Oakland facility.



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## APPENDIX A. IR REFLOW PROFILE (260°C)



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## Revision History

- A. Corrected MSL3 environmental conditions in “Explanation of Tests”. Rick Luevanos 09/20/2011
- B. Corrected Table 5 to units of grams. Rick Luevanos 12/7/2011



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