

# Cypress Semiconductor Automotive Product Qualification Report

**QTP# 142401 VERSION \*\***  
**May, 2015**

<b>128-Kbit and 256-Kbit Serial Automotive F-RAM</b>	
<b>130nm Technology, Texas Instruments DMOS5 Fab</b>	
<b>CY15B256J-SXA</b>	<b>32K x 8 Serial (I2C) Automotive 256-Kbit F-RAM, -40C to +85C</b>
<b>CY15B128J-SXA</b>	<b>16K x 8 Serial (I2C) Automotive 128-Kbit F-RAM, -40C to +85C</b>
<b>CY15B256Q-SXA</b>	<b>32K x 8 Serial (SPI) Automotive 256-Kbit F-RAM, -40C to +85C</b>
<b>CY15B128Q-SXA</b>	<b>16K x 8 Serial (SPI) Automotive 128-Kbit F-RAM, -40C to +85C</b>

**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT**  
**[reliability@cypress.com](mailto:reliability@cypress.com) or via a CYLINK CRM CASE**

**Prepared By:**  
Becky Thomas  
Reliability Engineer

**Reviewed By:**  
Rene Rodgers  
Reliability Manager

**Approved By:**  
Don Darling (DCDA)  
Reliability Director

**PRODUCT QUALIFICATION HISTORY**

<b>QTP Number</b>	<b>Description of Qualification Purpose</b>	<b>Date</b>
02-60-5112 / 124901	TI Process Qualification 130nm F-RAM Process	Aug 2008 / Dec 2012
141603	128-Kbit and 256-Kbit Serial F-RAM Memory Product Qualification (Industrial, -40C to +85C)	Jan 2015
142401	128-Kbit and 256-Kbit Serial F-RAM Memory Automotive Product Qualification (-40C to +85C)	May 2015

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: 128-Kbit and 256-Kbit Serial F-RAM Memory Automotive Product Qualification (-40C to +85C)	
Automotive Marketing Part #:	CY15B256J-SXA, CY15B128J-SXA, CY15B256Q-SXA, CY15B128Q-SXA
Device Description:	128-Kbit and 256-Kbit Automotive Serial (SPI and I2C) F-RAM Memory
Cypress Division:	Cypress Semiconductor Corporation – Memory Products Division (MPD)

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION</b>			
Number of Metal Layers:	6	Metal Composition:	Metal 1: Cu 3050A Metal 2: Cu 3050A Metal 3: Cu 3050A Metal 4: Cu 3050A Metal 5: Cu 4050A Metal 6: Al 1.0um
Passivation Type and Thickness:		4000A SiO <sub>2</sub> + 3000A SiO <sub>x</sub> N <sub>y</sub> + 4000A SiO <sub>x</sub> N <sub>y</sub> + 4000A Si <sub>3</sub> N <sub>4</sub>	
Generic Process Technology/Design Rule (μ-drawn):		E035.1 F-RAM / 130nm	
Gate Oxide Material/Thickness (MOS):		1.5V 26A 3.3V 70A	
Name/Location of Die Fab (prime) Facility:		Texas Instruments / Dallas, TX	
Die Fab Line ID/Wafer Process ID:		DMOS 5 / E035.1	

### PACKAGE AVAILABILITY

<b>PACKAGE</b>	<b>ASSEMBLY FACILITY SITE</b>
150-mil 8-LD SOIC	UTL-UT
150-mil 8-LD SOIC	CML-RA

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SW815 SZ815
Package Outline, Type, or Name:	8-LD SOIC, 150-mil
Mold Compound Name/Manufacturer:	EME-G600 / Sumitomo
Mold Compound Flammability Rating:	UL 94 V=0 pass
Mold Compound Alpha Emission Rate:	<0.1
Oxygen Rating Index: >28%	54%
Lead Frame Designation:	FMP
Lead Frame Material:	Copper
Substrate Material:	N/A
Lead Finish, Composition / Thickness:	Matte Sn
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Laser Groove/Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	Abletherm 8600
Bond Diagram Designation	001-85999, 001-86119
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au / 0.8 mil
Thermal Resistance Theta JA °C/W:	152 C/W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	001-91702 / 001-91703
Name/Location of Assembly (prime) facility:	UTAC, Thailand (UT)
MSL LEVEL	3
REFLOW PROFILE	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	UTAC, Thailand / CML, Philippines

**Note:** Please contact a Cypress Representative for other package availability.

## RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Electrostatic Discharge Human Body Model (ESD-HBM)	AEC-Q100-002, 500V, 1,000V, 1,500V, 2,000V	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	AEC-Q100-011 250V, 500V, 750V (corner pins)	P
Latchup Sensitivity	AEC-Q100-004, +/-140mA, 5.4V Over-Voltage	P
NVM Endurance /Data Retention (Plastic )	AEC-Q100-005, 7.5 E9 Cycles, 125C, non-biased	P
NVM Endurance / High Temperature Operating Life	AEC-Q100-005 and JESD22-A108, 125C Dynamic Operating Condition, Vcc = 3.60V,	P
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108, 125C Dynamic Operating Condition, Vcc = 3.60V,	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108, 125 C Dynamic Operating Condition, Vcc = 3.60, 125 C	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130 C, 85%RH, 3.60V Precondition: JESD22-A113 Moisture Sensitivity Level (192 Hrs., 30 C°, 60% RH)	P
Temperature Cycle	JESD22- A104, -65 C to 150 C Precondition: JESD22-A113 Moisture Sensitivity Level (192 Hrs., 30 C°, 60% RH)	P
Post Temperature Cycle Wire Bond Pull	Mil-Std 883, Method 2011	P
Pressure Cooker Test	JESD22-A102, 121 C, 100%RH, 15 PSIG Precondition: JESD22-A113 Moisture Sensitivity Level (192 Hrs., 30 C°, 60% RH)	P
Wire Bond Shear	AEC Q100-001	P
Wire Bond Pull	Mil-Std 883, Method 2011	P
Solderability	JESD22-B102	P
Physical Dimensions	JESD22B100 and B108	P
Electrical Distributions	AEC Q100-009	P

## RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF <sup>3</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate	10,499 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	547,000 DHRs* 240,000 DHRs	0	0.7	55	21 FITs

\*Leverage HTOL data from TI 130nm F-RAM Process QTP#124901 (SPEC#001-85093)

<sup>1</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>2</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>3</sup> Thermal Acceleration Factor is calculated from the Arrhenius equation

$$AF = \exp \left[ \frac{E_A}{k} \left[ \frac{1}{T_2} - \frac{1}{T_1} \right] \right]$$

where:

E<sub>A</sub> = The Activation Energy of the defect mechanism.

K = Boltzmann's constant = 8.62x10<sup>-5</sup> eV/Kelvin.

T<sub>1</sub> is the junction temperature of the device under stress and T<sub>2</sub> is the junction temperature of the device at use conditions.



## Reliability Test Data

### QTP #: 142401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
<b>STRESS: ESD-HUMAN BODY CIRCUIT (500V)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	500	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	500	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT (1000V)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	1000	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	1000	3	0	
FM24V01B-G /	4438076	611442261	CML-RA	1100	3	0	
CY15B128J-SXA							
FM25V01B-G/	4438076	611442260	CML-RA	1100	3	0	
CY15B128Q-SXA							
<b>STRESS: ESD-HUMAN BODY CIRCUIT (2000V)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	2000	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	2000	3	0	
FM24V01B-G /	4438076	611442261	CML-RA	2200	8	0	
CY15B128J-SXA							
FM25V01B-G/	4438076	611442260	CML-RA	2200	8	0	
CY15B128Q-SXA							
<b>STRESS: ESD- CHARGED DEVICE MODEL (250V)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	250	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	250	3	0	
<b>STRESS: ESD- CHARGED DEVICE MODEL (500V)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	500	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	500	3	0	
FM24V01B-G /	4438076	611442261	CML-RA	500	9	0	
CY15B128J-SXA							
FM25V01B-G/	4438076	611442260	CML-RA	500	9	0	
CY15B128Q-SXA							



## Reliability Test Data

### QTP #: 142401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
--------	-----------	------------	----------	-----------	------	-----	-------------------

**STRESS: ESD- CHARGED DEVICE MODEL (750V)- corner pins**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	750	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	750	3	0	
FM24V01B-G /	4438076	611442261	CML-RA	750	3	0	
CY15B128J-SXA							
FM25V01B-G/	4438076	611442260	CML-RA	750	3	0	
CY15B128Q-SXA							

**STRESS: STATIC LATCH-UP TESTING ( $\pm 140\text{mA}$  current injection and 5.4V overvoltage test, tested at 85C)**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	6	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	6	0	
FM24V01B-G /	4438076	611442261	CML-RA	COMP	6	0	
CY15B128J-SXA							
FM25V01B-G/	4438076	611442260	CML-RA	COMP	6	0	
CY15B128Q-SXA							

**STRESS: NVM ENDURANCE/DATA RETENTION (7.5E9 cycles at 25C, 1000 hours at 125C, non-biased, tested at 85C)**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	1000	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	1000	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	1000	80	0	

**STRESS: NVM ENDURANCE/HIGH TEMPERATURE OPERATING LIFE (7.5E9 cycles at 25C, 1000 hours at 125C, tested room, 85C, -40C)**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	1000	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	1000	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	1000	80	0	

**STRESS: HIGH TEMPERATURE OPERATING LIFE- EARLY FAILURE RATE (125C, 96 hours, 3.60V, tested room and 85C)**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	96	3500	0	
CY15B256Q-SXA	4440062	611439609	UTAC - UT	96	3499	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	96	3500	0	





## Reliability Test Data

### QTP #: 142401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
--------	-----------	------------	----------	-----------	------	-----	-------------------

**STRESS: HIGH TEMPERATURE OPERATING LIFE- LATENT FAILURE RATE (125C, 1,000 hours, 3.60V, tested room and 85C)**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	1000	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	1000	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	1000	80	0	

**STRESS: HIGHLYACCELERATED SATURATION TEST (HAST) (130C, 85%RH, Biased at 3.60V), with MSL3 Preconditioning – 96 hours, tested at room temperature and 85C**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	96	60	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	96	60	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	96	60	0	
CY15B256Q-SXA	4440062	LGQTP1	UTAC - UT	96	80	0	

**STRESS: TEMPERATURE CYCLE, CONDITION C (-65C TO 150C), with MSL3 Preconditioning**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	500	79	0	
CY15B256Q-SXA	4438157	611437933	UTAC - UT	1000	74	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	500	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	1000	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	500	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	1000	80	0	

**STRESS: POST TEMPERATURE CYCLE WIRE BOND PULL**

CY15B256Q-SXA	4438157	611437933	UTAC - UT	500	5	0	
---------------	---------	-----------	-----------	-----	---	---	--



## Reliability Test Data

### QTP #: 142401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH), with MSL3 Preconditioning tested at room temperature</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	96	80	0	
CY15B256Q-SXA	4438157	611437933	UTAC - UT	168	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	96	80	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	168	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	96	80	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	168	80	0	
<b>STRESS: WIRE BALL SHEAR</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	15	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	15	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	COMP	15	0	
<b>STRESS: WIRE BOND PULL</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	15	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	15	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	COMP	15	0	
<b>STRESS: SOLDERABILITY</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	15	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	15	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	COMP	15	0	
<b>STRESS: PHYSICAL DIMENSIONS</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	10	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	10	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	COMP	10	0	



## Reliability Test Data

### QTP #: 142401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
<b>STRESS: Electrical Distributions (room temperature, 85C and -40C)</b>							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	COMP	30	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	COMP	30	0	
CY15B256Q-SXA	4442315	611440779	UTAC - UT	COMP	30	0	



## Document History Page

Document Title: QTP#142401: 128KB AND 256KB SERIAL F-RAM MEMORY AUTOMOTIVE PRODUCT  
QUALIFICATION  
Document Number: 001-97717

Rev.	ECN No.	Orig. of Change	Description of Change
**	4772359	BECK	Initial Release

Distribution: WEB

Posting: None