

Cypress Semiconductor Automotive Product Qualification Report

QTP# 142401 VERSION *A
June, 2015

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

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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

QTP Number	Description of Qualification Purpose	Date
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



PRODUCT DESCRIPTION (for qualification)	
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)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	Proprietary*	Metal Composition:	Proprietary*
Passivation Type and Thickness:	Proprietary*		
Generic Process Technology/Design Rule (μ -drawn):	CMOS / 130nm		
Gate Oxide Material/Thickness (MOS):	Proprietary*		
Name/Location of Die Fab (prime) Facility:	Texas Instruments / Dallas		
Die Fab Line ID/Wafer Process ID:	DMOS 5 / E035.1		

*Texas Instruments' proprietary information is available with signed NDA.

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
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 ³	Failure Rate
High Temperature Operating Life Early Failure Rate	10,499 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} 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)

- ¹ Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.
- ² Chi-squared 60% estimations used to calculate the failure rate.
- ³ 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_A =The Activation Energy of the defect mechanism.

K = Boltzmann's constant = 8.62×10^{-5} eV/Kelvin.

T_1 is the junction temperature of the device under stress and T_2 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
STRESS: ESD-HUMAN BODY CIRCUIT (500V)							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	500	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	500	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT (1000V)							
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							
STRESS: ESD-HUMAN BODY CIRCUIT (2000V)							
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							
STRESS: ESD- CHARGED DEVICE MODEL (250V)							
CY15B256Q-SXA	4438157	611437933	UTAC - UT	250	3	0	
CY15B256J-SXA	4440062	611439609	UTAC - UT	250	3	0	
STRESS: ESD- CHARGED DEVICE MODEL (500V)							
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 (± 140mA 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

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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
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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	
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Reliability Test Data

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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
STRESS: PRESSURE COOKER TEST (121C, 100%RH), with MSL3 Preconditioning tested at room temperature							
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	
STRESS: WIRE BALL SHEAR							
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	
STRESS: WIRE BOND PULL							
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	
STRESS: SOLDERABILITY							
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	
STRESS: PHYSICAL DIMENSIONS							
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	



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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration/	Samp	Rej	Failure Mechanism
STRESS: Electrical Distributions (room temperature, 85C and -40C)							
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
*A	4804484	BECK	Indicated "Proprietary" Items on the "TECHNOLOGY/FAB PROCESS DESCRIPTION" Table, Page 3.

Distribution: WEB

Posting: None