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# Cypress Semiconductor Product Qualification Report

**QTP#154404 VERSION \*\*  
January, 2017**

<b>64kb, 16kb and 4kb F-RAM Memory Product Qualification 130nm Technology, TI 300mm wafer Fab DMOS 6</b>	
FM24C04B-G	4Kb I2C (512Kx8bits) 5V Serial F-RAM Memory
FM24C04B-G2	4Kb I2C (512Kx8bits) 5V Serial F-RAM Memory
FM24C16B-G	16Kb I2C (2,048Kx8bits) 5V Serial F-RAM Memory
FM24C16B-G1	16Kb I2C (2,048Kx8bits) 5V Serial F-RAM Memory
FM24C64B-G	64Kb I2C (8,192Kx8bits) 5V Serial F-RAM Memory
FM24CL04B-G	4Kb I2C (512Kx8bits) 3V Serial F-RAM Memory
FM24CL16B-G	16Kb I2C (2,048Kx8bits) 3V Serial F-RAM Memory
FM24CL16B-DG	16Kb I2C (2,048Kx8bits) 3V Serial F-RAM Memory
FM24CL64B-G	64Kb I2C (8,192Kx8bits) 3V Serial F-RAM Memory
FM24CL64B-DG	64Kb I2C (8,192Kx8bits) 3V Serial F-RAM Memory
FM25040B-G	4Kb SPI (512Kx8bits) 5V Serial F-RAM Memory
FM25C160B-G	16Kb SPI (2,048Kx8bits) 5V Serial F-RAM Memory
FM25640B-G	64Kb SPI (8,192Kx8bits) 5V Serial F-RAM Memory
FM25640B-G2	64Kb SPI (8,192Kx8bits) 5V Serial F-RAM Memory
FM25L04B-G	4Kb SPI (512Kx8bits) 3V Serial F-RAM Memory
FM25L04B-DG	4Kb SPI (512Kx8bits) 3V Serial F-RAM Memory
FM25L16B-G	16Kb SPI (2,048Kx8bits) 3V Serial F-RAM Memory
FM25L16B-DG	16Kb SPI (2,048Kx8bits) 3V Serial F-RAM Memory
FM25CL64B-G	64Kb SPI (8,192Kx8bits) 3V Serial F-RAM Memory
FM25CL64B-DG	64Kb SPI (8,192Kx8bits) 3V Serial F-RAM Memory



**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT  
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### PACKAGE/PRODUCT QUALIFICATION HISTORY

<b>QTP Number</b>	<b>Description of Qualification Purpose</b>	<b>Date</b>
143905	TI FR130 DMOS6 (300mm wafer fab) foundry transfer using the TR20005B (2Mb 2T2C F-RAM product)	January 2017
154404	TI FR130 DMOS6 (300mm wafer fab) foundry qualification using the TR20011B (64kb industrial 2T2C F-RAM product)	January 2017
154906	TI FR130 DMOS6 (300mm wafer fab) foundry qualification using the TA20011B (64kb Automotive 2T2C F-RAM product)	January 2017

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualification of 130nm TR20011B 64kbit 2T2C F-RAM foundry DMOS6 (300mm wafer fab)	
Marketing Part #:	FM24C04B-G, FM24C04B-G2, FM24C16B-G, FM24C16B-G1, FM24C64B-G, FM24CL04B-G, FM24CL16B-G, FM24CL16B-DG, FM24CL64B-G, FM24CL64B-DG, FM25040B-G, FM25C160B-G, FM25640B-G, FM25640B-G2, FM25L04B-G, FM25L04B-DG, FM25L16B-G, FM25L16B-DG, FM25CL64B-G, FM25CL64B-DG
Device Description:	64kb, 16kb and 4kb F-RAM Serial Memory
Cypress Division:	Cypress Semiconductor Corporation – Memory Products Division (MPD)

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION</b>			
Number of Metal Layers:	Proprietary*	Metal Composition:	Proprietary*
Passivation Type and Thickness:		Proprietary*	
Generic Process Technology/Design Rule (□-drawn):		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 6 / E035.1	

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

### PACKAGE AVAILABILITY

<b>PACKAGE</b>	<b>ASSEMBLY FACILITY SITE</b>
<b>8-pin SOIC</b>	UTAC, Thailand (UT)
<b>8-pin TDFN</b>	UTAC, Thailand (UT)

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
Package Designation:	SZ815
Package Outline, Type, or Name:	SOIC 8L (150mils)
Mold Compound Name/Manufacturer:	G600 / Sumitomo
Mold Compound Flammability Rating:	UL 94 V=0 pass
Mold Compound Alpha Emission Rate:	<0.1
Oxygen Rating Index: >28%	53%
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:	Wafer Saw
Die Attach Supplier:	Henkel
Die Attach Material:	8600
Bond Diagram Designation	002-10156
Wire Bond Method:	Thermosonic
Wire Material/Size:	CuPd / 0.8 mil
Thermal Resistance Theta JA °C/W:	147 C/W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	001-95707
Name/Location of Assembly (prime) facility:	UTAC, Thailand (UT)
MSL LEVEL	MSL3
REFLOW PROFILE	260 C

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
Test Location:	UTAC, Thailand / KYEC, Taiwan

**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
Data Retention (Plastic)	125C, non-biased JESD22-A117 and JESD22-A103	P
Endurance Test/High Temperature Operating Life	Dynamic Operating Condition, Vcc = 3.6V, 125 C JESD22-A108	P
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 3.6V, 125 C JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.6V, 125 C JESD22-A108	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130C, 85%RH, nnV Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs., 30 C, 60% RH)	P
Pressure Cooker Test	JESD22-A102: 121 C, 100%RH, 15 PSIG Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs., 30 C, 60% RH)	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65 C to 150 C Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs., 30 C, 60% RH)	P
Acoustic Microscopy	J-STD-020 Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs., 30 C, 60% RH)	P
Electrostatic Discharge Human Body Model (ESD-HBM)	(1,100V, 2,200V, 3,300V) JEDEC EIA/JESD22-A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	(500V, 750V, 1,000V, 1,250V, 1,500V, 1,750V, 2,000V) JESD22-C101	P
Static Latch up	85C, $\pm$ 140mA JESD78	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	13,575 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	576,000 DHRs	0	0.7	55	29 FIT

<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:

$E_A$  =The Activation Energy of the defect mechanism.

$K$  = Boltzmann's constant =  $8.62 \times 10^{-5}$  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 #: 154404**

Device	package	Fab Lot#	Assy Lot#	Assy Loc	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: ACOUSTIC, MSL3</b>								
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	22	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	22	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	22	0	
<b>STRESS: TEMPERATURE CYCLE CONDITION C (-65C TO 150C) , with MSL3 Preconditioning</b>								
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	500	80	0	
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	1000	80	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	500	80	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	1000	80	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	500	85	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	1000	80	0	
<b>STRESS: PRESSURE COOKER TEST(121C,100%RH, with MSL3 Preconditioning)</b>								
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	168	80	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	168	80	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	168	80	0	
<b>STRESS: HIGH ACCELERATED SATURATION TEST(130C, 85%RH, with MSL3 Preconditioning)</b>								
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	96	80	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	96	79	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	96	80	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(500V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	9	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	9	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	9	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	9	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(750V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(1000V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(1250V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(1500V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(1750V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL(2000V)</b>								
FM25L04B7-DG	LH08ABAALL	2604000	611626749	UT	COMP	3	0	
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0	
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0	

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CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0
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**STRESS: ESD-HUMAN BODY CIRCUIT (1100V)**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	3	0
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0
CY15E064J-SXE	SZ815QSARC	2628000	611627195	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0

**STRESS: ESD-HUMAN BODY CIRCUIT (2200V)**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	8	0
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	8	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	8	0
CY15E064J-SXE	SZ815QSARC	2628000	611627195	UT	COMP	8	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	8	0

**STRESS: ESD-HUMAN BODY CIRCUIT (3300V)**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	3	0
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0
CY15E064J-SXE	SZ815QSARC	2628000	611627195	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0

**STRESS: STATIC LATCH-UP (+/-140mA 85C)**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	3	0
CY15E004Q-SXE	SZ815QSARC	2617003	611626746	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0
CY15E004Q-SXE	SZ815QSARC	2628000	611627202	UT	COMP	3	0
CY15E064J-SXE	SZ815QSARC	2628000	611627195	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	3	0
FM25040B7-G	SZ815QTALC	2604000	611604085	UT	COMP	3	0

**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	96	2939	0
CY15B064Q-SXE	SZ815QSARC	2617003	611626743	UT	96	2582	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	96	2578	0
CY15E064J-SXE	SZ815QSARC	2628000	611627195	UT	96	2467	0
FM24CL64B7-G	SZ815QTALC	2604000	611604320	UT	96	493	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	96	1377	0
FM25040B7-G	SZ815QTALC	2604000	611604085	UT	96	464	0
FM24C16B7-G	SZ815QTALC	2604000	611604318	UT	96	675	0

**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	500	198	0
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	1000	198	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	500	200	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	1000	200	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	500	178	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	1000	178	0

**STRESS: AGED BOND STRENGTH**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	3	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	5	0

**STRESS: DATA RETENTION, 125C**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	500	80	0
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	1000	80	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	500	80	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	1000	80	0
FM24CL64B7-G	SZ815QTALC	2604000	611604320	UT	500	80	0
FM24CL64B7-G	SZ815QTALC	2604000	611604320	UT	1000	80	0

**STRESS: ENDURANCE AND HIGH TEMPERATURE OPERATING LIFE, 125C**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	500	77	0
CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	1000	77	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	500	77	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	1000	77	0

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CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	500	80	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	1000	80	0

**STRESS: PRE/POST LFR CRITICAL PARAMETER**

CY15E064J-SXE	SZ815QSARC	2617003	611626749	UT	COMP	32	0
CY15B064Q-SXE	SZ815QSARC	2628000	611627194	UT	COMP	32	0
CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	32	0

**STRESS: CONSTRUCTIONAL ANALYSIS**

CY15B064Q-SXE	SZ815QSARC	2604000	611604412	UT	COMP	5	0
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## Document History Page

Document Title: QTP #154404: 64KB, 16KB AND 4KB F-RAM MEMORY PRODUCT QUALIFICATION 130NM TECHNOLOGY, TI 300MM WAFER FAB DMOS 6

Document Number: 002-18473

Rev.	ECN No.	Orig. of Change	Description of Change
**	5592865	SUZH	Initial Release