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Cypress Semiconductor Automotive Product Qualification Report

**QTP# 141002 VERSION **
July 2014**

Automotive Sync SRAM R9T-3R Technology, Fab4	
CY7C1361C	**9-MBIT (256 K X 36) FLOW-THROUGH SYNC SRAM**
CY7C13451G	**4-MBIT (128 K X 36) FLOW-THROUGH SYNC SRAM**

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
141002	Qualification of Automotive R9 9M Sync R9T-3R Technology in Fab4 using 7A13451X and 7A13611X device.	June 14

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualification of 7A13451X/7A13611X R9 Sync SRAM device and family for Automotive Application.	
Marketing Part #:	CY7C13451G, CY7C1361C
Device Description:	4-MBIT (256 K X 36/512 K X 18) FLOW-THROUGH SRAM 9-MBIT (256 K X 36/512 K X 18) FLOW-THROUGH SRAM
Cypress Division:	Cypress Semiconductor Corporation – Memory Programmable Division(MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION – S8DIN-5RP			
Number of Metal Layers:	3	Metal Composition:	Metal 1: 100A CoTi, 3200A Al, 300A TiW Metal 2: 150Å Ti / 6000Å Al / 300Å TiW Metal 3: 150Å Ti / 8000Å Al / 300Å TiW
Passivation Type and Materials:			1000Å Oxide TEOS / 9000Å Nitride
Generic Process Technology/Design Rule (□-drawn):			CMOS, Triple Metal, 90nm
Gate Oxide Material/Thickness (MOS):			Nitridized SiO2, 23Å
Name/Location of Die Fab (prime) Facility:			CMI / Minnesota
Die Fab Line ID/Wafer Process ID:			Fab4, R9T-3R

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
165 BGA	ASEK-Taiwan (G)

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	165 BGA
Package Outline, Type, or Name:	165 BGA- Ball Grid Array (13x15mm)
Mold Compound Name/Manufacturer:	KE-G2250LKDS / Kyocera
Mold Compound Flammability Rating:	V-O per UL94
Mold Compound Alpha Emission Rate:	N/A
Oxygen Rating Index:	>28%
Lead Frame Designation:	N/A
Lead Frame Material:	A181730
Lead Finish, Composition / Thickness:	95.5%Sn / 4.0%Ag / 0.5%Cu
Die Backside Preparation Method/Metallization:	Backgrinding
Die Separation Method:	Sawing
Die Attach Supplier:	Ablestik
Die Attach Material:	Film
Die Attach Method:	Film Attach
Bond Diagram Designation:	001-89943 & 001-89948
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au / 1.0mil
Thermal Resistance Theta JA ºC/W:	30.09ºC/W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	001-90100
Name/Location of Assembly (prime) facility:	ASEK-Taiwan (G)
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108, 150°C Dynamic Operating Condition, Vcc Max = 2.25V	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108, 150°C Dynamic Operating Condition, Vcc Max = 2.25V	P
Constructional Analysis	Criteria: Meet external and internal characteristics of Cypress package	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130C, 3.6V, 85%RH Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Temperature Cycle	JESD22-A104, -65°C to 150°C Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	JESD22-A102, 121C, 100%RH, 15 Psig Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
High Temp Storage	JESD22-A103: 150 C, no bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	AEC-Q100-002 500V/1000V/1500V/2000V	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	AEC-Q100-011 250V/500V/750V	P
Wire Ball Shear	AEC-Q100-001	P
Wire Bond Pull	Mil-Std 883, Method 2011	P
Electrical Distribution	AEC-Q100-009	P
Solder Ball Shear	AEC Q100-010	P
Final Visual	JESD22-B101B	P
Physical Dimensions	JESD22-B100/108	P
Solderability	JESD22-B102	P
Acoustic Microscopy	JEDEC JSTD-020	P
Static Latch-up	AEC-Q100-004, 85C,± 140mA / 85C, ±200mA / 125C, , ±140mA	P
Post Temperature Cycle Wire Bond Pull	Mil-Std 883, Method 2011	P
Dye Penetrant Test	Criteria: No Package Crack	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	10,534 Devices	0	N/A	N/A	0 PPM
NVM Endurance / High Temperature Operating Life[1,2] Long Term Failure Rate	97,920 Device Hours	0	0.7	170	** FIT

[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.

**Insufficient samples to calculate FIT Rate.
**Based on Automotive qualification samples size.

Reliability Test Data

QTP #: 141002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTICS							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	22	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	22	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	22	0	
STRESS: BALL SHEAR							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	150	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	150	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	150	0	
STRESS: BOND PULL							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	150	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	150	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	150	0	
STRESS: CONSTRUCTIONAL ANALYSIS							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	5	0	
STRESS: DYE PENETRANT							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	15	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	15	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	15	0	
STRESS: ELECTRICAL DISTRIBUTION							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	30	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	30	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	30	0	
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	3	0	

Reliability Test Data

QTP #: 141002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 1,000V							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 1,500V							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 2,000V							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	COMP	3	0	
STRESS: FINAL VISUAL							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	COMP	5151	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	4249	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	4258	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 3.6%RH, 5.5V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	96	80	0	
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	168	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	96	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	168	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	96	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	168	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.25V, Vcc Max							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	48	3514	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	48	3551	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	48	3469	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.25V, Vcc Max							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	408	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	408	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	408	80	0	
STRESS: HIGH TEMP STORAGE							
CY7C1361C (7A13611XC)	4337048	611400745P1	ASEK-G	1000	80	0	

Reliability Test Data

QTP #: 141002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	96	80	0	
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	168	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	96	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	168	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	96	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	168	80	0	
STRESS: PHYSICAL DIMENSION							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	30	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	30	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	30	0	
STRESS: POST TEMPERATURE CYCLE WIRE BOND PULL							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	5	0	
STRESS: PRE /POST LFR CRITICAL PARAMETER							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	30+2	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	30+2	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	30+2	0	
STRESS: STATIC LATCH-UP TESTING, +/-140mA 85C							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	6	0	
STRESS: STATIC LATCH-UP TESTING, +/-200mA 85C							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, +/-140mA 125C							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	3	0	
STRESS: SOLDERABILITY							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	15	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	15	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	15	0	

Reliability Test Data

QTP #: 141002

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: SOLDER BALL SHEAR							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	COMP	15	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	COMP	15	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	COMP	15	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	500	85	0	
CY7C1361C (7A13611XC)	4337048	611400745	ASEK-G	1000	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	500	80	0	
CY7C1361C (7A13611XC)	4322973	611400744	ASEK-G	1000	80	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	500	79	0	
CY7C13451G (7A13451XC)	4323400	611400743	ASEK-G	1000	79	0	

Document History Page

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