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Cypress Semiconductor Automotive Product Qualification Report

QTP# 075101 VERSION *A
June 2014

2 MEG FAST ASYNC STATIC RAM AUTOMOTIVE DEVICES R7FD-3R TECHNOLOGY, FAB 4	
CY7C1011CV33	**2- Mbit (128K x 16) Static RAM**

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

QUAL REPORT	DESCRIPTION OF QUALIFICATION PURPOSE	DATE COMP.
034402	CY7C1020CV33, 512Kb and family on R7FD-3R Technology from Fab4, AEC-Q100 Automotive Application	Jul 04
075101	Automotive Device Qualification for the 7A13412FC, 2Meg R7FD-3R Fast Async w/ NSM Fix	Jan 08

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	To qualify 7A13412FC device, 2Meg R7FD-3R Fast Async w/ NSM Fix for automotive application
Marketing Part #:	CY7C1011CV33-10ZSXA
Device Description:	3.3V, R7FD-3R, 128K X 16
Cypress Division:	Cypress Semiconductor Corporation – Memory and Imaging Division

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 150A TiW, 4200A Al /300A TiW Metal 2: 300A Ti, 8000A Al /300A TiW
Passivation Type and Materials:			1000A TEOS / 9,000A PECVD Nitrite
Generic Process Technology/Design Rule (µ-drawn):			0.15µm
Gate Oxide Material/Thickness (MOS):			SiO_2 , 32A
Name/Location of Die Fab (prime) Facility:			Cypress Semiconductor-Bloomington, MN
Die Fab Line ID/Wafer Process ID:			Fab4, R7FD-3R

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
44-Lead TSOP II	**CML-RA, JT-CHINA**

Note: Package Qualification details available upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	ZW44
Package Outline, Type, or Name:	44-Lead Thin Small Outline Package (TSOP II)
Mold Compound Name/Manufacturer:	Hitachi CEL9200CYR
Mold Compound Flammability Rating:	UL 94 V0
Mold Compound Alpha Emission Rate :	0.001counts/cm2-h Max
Oxygen Rating Index:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	NiPdAu
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Dexter
Die Attach Material:	QMI509
Die Attach Method:	Epoxy Dispense
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	42.96
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	CML-R
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	KYEC, TAIWAN, CML-RA
Fault Coverage:	100%

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
Wire Bond Shear	AEC-Q100-001	P
Wire Bond Pull	Mil-Std 883, Method 2011	P
External Visual	JESD22-B100	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	250V/500V/750V (Corner Pins) AEC-Q100-011	P
Electrical Distributions	AEC-Q100-009	P
Electrostatic Discharge Human Body Model (ESD-HBM)	500V/1000V/1500V/2,000V AEC-Q100-002	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130°C, 3.65V,85%RH Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108, 150°C Dynamic Operating Condition, Vcc = 2.3V, 150°C	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108, 150°C Dynamic Operating Condition, Vcc Max = 2.3V, 150°C	P
High Temperature Storage	JESD22-A103, 150°C	P
Static Latch-up	AEC-Q100-004, 125C, 5.4V, ± 100mA	P
Physical Dimensions	JESD22B100 and B108	P
Pressure Cooker	JESD22-A102, 121°C, 100%RH, 15PSIG Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
Solderability	JESD22-B102	P
Temperature Cycle	JESD22-A104, -65°C to 150°C Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 235°C+0, -5°C	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	10,494 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	97,920 DHRs	0	0.7	170	55 FIT [2]

Based on Automotive qual samples size not Commercial qual sample size.

1 Assuming an ambient temperature of 55C and a junction temperature rise of 15C.
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 #: 034402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.3V, Vcc Max							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	24	839	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	24	839	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	24	832	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.3V, Vcc Max							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	48	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	80	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	408	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	48	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	80	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	408	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	48	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	80	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	408	80	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 500V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 1,000V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 1,500V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,000V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V (Corner Pins)							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	6	0	

Reliability Test Data

QTP #: 034402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: BOND PULL							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	5	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.45 V, ±100mA							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	6	0	
STRESS: ELECTRICAL DISTRIBUTIONS							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	30	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	COM	30	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	COMP	30	0	
STRESS: HIGH TEMPERATURE STORAGE, 150ºC							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	500	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	1000	80	0	
STRESS: PHYSICAL DIMENSIONS							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	30	0	
STRESS: SOLDERABILITY							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	15	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	COMP	15	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	COMP	15	0	
STRESS: BALL SHEAR							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	5	0	
STRESS: EXTERNAL VISUAL							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	COMP	1351	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	COMP	1199	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	COMP	1197	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.65V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	96	77	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	128	77	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	96	75	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	128	75	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	96	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	128	80	0	

Reliability Test Data

QTP #: 034402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	96	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	168	77	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	96	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	168	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	96	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	168	80	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	300	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	500	80	0	
CY7C1020CV33 (7C1320G)	4320164	610345596	CML-R	1000	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	300	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	500	80	0	
CY7C1020CV33 (7C1320G)	4210573	610347340	CML-R	1000	80	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	300	78	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	500	78	0	
CY7C1020CV33 (7C1320G)	4329858	610344870	CML-R	1000	78	0	

Reliability Test Data

QTP #: 075101

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.30V, Vcc Max							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	48	3500	0	
CY7C1011CV33 (7A13412F)	4709996	610752257	CML-R	48	3497	0	
CY7C1011CV33 (7A13412F)	4710395	610762258	CML-R	48	3497	0	
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114, 500V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114, 1000V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114, 1500V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114, 2000V							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, +/100mA							
CY7C1011CV33 (7A13412F)	4711544	610762256	CML-R	COMP	6	0	
STRESS: ELECTRICAL DISTRIBUTION							
CY7C1011CV33 (7A13412F)	4706875	610722768	CML-R	COMP	30	0	
CY7C1011CV33 (7A13412F)	4647740	610702615	CML-R	COMP	30	0	
CY7C1011CV33 (7A13412F)	4648473	610702464	CML-R	COMP	30	0	

Document History Page

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Rev.	ECN No.	Orig. of Change	Description of Change
**	4039062	ILZ	Initial Spec Release Qualification report published on Cypress.com is documented on memo HGA-342 and not in spec format. Initiated spec for QTP 075101 and all data from memo# HGA-342 was transferred to qualification report spec template. Deleted package qualification details on package qualification history table. Deleted Cypress reference Spec and replaced with Industry Standards Updated package availability based on current qualified test & assembly site.
*A	4416191	HSTO	Align qualification report based on the new template in the front page

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