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Cypress Semiconductor Automotive Product Qualification Report

QTP# 113201 VERSION*B
November, 2014

1 Meg Fast Asynchronous SRAM Family Automotive Devices C9FD-3R Technology, Fab4	
CY7C1021DV26	**1-MBIT (64K X 16) STATIC RAM**
CY7C1021DV33	**1-MBIT (64K X 16) STATIC RAM**
CY7C1021D	**1-MBIT (64 K X 16) STATIC RAM**
CY7C199D	**256 –KBIT (32 K X 8) STATIC RAM**

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

QTP Number	Description of Qualification Purpose	Date
113201	Qualify C9FD-3R SRAM Automotive Technology using, 7C1021P, 1Meg Device, Fab4	Feb 2012
131602	Qualify the 256k option of the C9 technology fabricated in Fab4 for Automotive applications	April 2013

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: : Qualify 1Meg and 256k Async SRAM Automotive device and family, C9FD-3R Technology at Fab4	
Automotive Marketing Part #:	CY7C1021DV26, CY7C1021DV33, CY7C1021D, CY7C199D
Device Description:	2.5V, 3.3V & 5.0V Automotive in 44 TSOP II Package
Cypress Division:	Cypress Semiconductor Corporation – Programmable Systems Division (PSD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 100Å Ti / 3200Å Al / 300Å TiW Metal 2: 150Å Ti / 8000Å Al / 300Å TiW
Passivation Type and Thickness:		1000Å SiO2 / 9000Å Si2N3	
Generic Process Technology/Design Rule (µ-drawn):		CMOS, Double Metal, 0.09µm	
Gate Oxide Material/Thickness (MOS):		20.5Å (LV) & 58Å (HV)	
Name/Location of Die Fab (prime) Facility:		Cypress Semiconductor -- Bloomington, MN	
Die Fab Line ID/Wafer Process ID:		Fab4/ C9FD-3R	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
44-Pin TSOP II 28-Pin SSOP	JT-CHINA

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	ZW44
Package Outline, Type, or Name:	44-Pin TSOPII
Mold Compound Name/Manufacturer:	Hitachi CEL9200CYRU
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	28%
Substrate Material:	N/A
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:	Die Attach Epoxy
Bond Diagram Designation:	001-07792
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	76.93 °C/W
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:	**CML-R**

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
High Temperature Operating Life Early Failure Rate	AEC-Q100-008 and JESD22-A108 Dynamic Operating Condition, Vcc Max = 2.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	JESD22-A108 Dynamic Operating Condition, Vcc Max = 2.5V, 125°C	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130°C, 3.6V, 85%RH Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH, 260°C Reflow	P
Temperature Cycle	JESD22-A104, Condition C, -65°C to 150°C Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH, 260 Reflow	P
Pressure Cooker	JESD22-A102, 121°C, 100%RH, 15 Psig Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH, 260°C Refllow	P
Ball Shear	AEC-Q100-010	P
Bond Pull	Mil-Std 883, Method 2011	P
Electrostatic Discharge Human Body Model (ESD-HBM)	AEC-Q100-002	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	AEC Q100-011	P
Electrical Distributions	AEC Q100-009	P
High Temperature Storage	JESD22-A103, 150C	P
Physical Dimensions	JESD22B100 and B108 AEC Q100-009	P
Post Temp Cycle Bond Pull	Mil-Std 883, Method 2011	P
Solderability	JESD22-B102	P
Static Latch-up	AEC-Q100-004	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	27,897 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	195,000 DHRs	0	0.7	55	85 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 qual samples size not Commercial qual sample size.

Reliability Test Data

QTP #: 113201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: BALL SHEAR							
7C1021N	4843321	610911678	CML-R	COMP	30	0	
STRESS: BOND PULL							
7C1021N	4843321	610911678	CML-R	COMP	30	0	
STRESS: POST TEMP CYCLE BOND PULL							
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	COMP	5	0	
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V, Corner Pins Only							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT, 500V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT, 1,000V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	

Reliability Test Data

QTP #: 113201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT, 1,500V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT, 2,000V							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	3	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	3	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	3	0	
STRESS: ELECTRICAL DISTRIBUTIONS							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	30	0	
CY7A1321NC (7A1321N)	4921164	*610940208*	*CML-R*	COMP	30	0	
CY7A1321NC (7A1321N)	4928054	*610939937*	*CML-R*	COMP	30	0	
STRESS: PHYSICAL DIMENSIONS							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	10	0	
CY7A1321NC (7A1321N)	4921164	*610940208*	*CML-R*	COMP	10	0	
CY7A1321NC (7A1321N)	4928054	*610939937*	*CML-R*	COMP	10	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 2.5V, Vcc Max							
CY7C1021DV26 (7A1221N)	4047497	*611114533*	*CML-R*	48	8015	0	
CY7C1021DV26 (7A1221N)	4048391	*611113972*	*CML-R*	48	9452	0	
CY7C1021DV26 (7A1221N)	4048078	*611108492*	*CML-R*	48	10430	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 2.5V, Vcc Max							
CY7C1021DV26 (7A1221N)	4047497	*611114533*	*CML-R*	1000	100	0	
CY7C1021DV26 (7A1221N)	4048391	*611113972*	*CML-R*	1000	95	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.6V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	96	80	0	
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	128	76	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	96	80	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	128	80	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	96	80	0	

Reliability Test Data

QTP #: 113201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMPERATURE STORAGE, 150C, no bias							
CY7C1041DV33 (7C1341NC)	4837387	*610852195*	*CML-R*	500	90	0	
CY7C1041DV33 (7C1341NC)	4837387	*610852195*	*CML-R*	1000	90	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1021DV26 (7A1221N)	4047497	*611114533*	*CML-R*	96	100	0	
CY7C1021DV26 (7A1221N)	4047497	*611114533*	*CML-R*	168	100	0	
CY7C1021DV26 (7A1221N)	4048391	*611113972*	*CML-R*	96	100	0	
CY7C1021DV26 (7A1221N)	4048391	*611113972*	*CML-R*	168	100	0	
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	96	85	0	
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	168	85	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	96	85	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	168	85	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	96	84	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	168	84	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1021DV26 (7A1221N)	4047497	*611114533*	*CML-R*	500	100	0	
CY7C1021DV26 (7A1221N)	4048391	*611113972*	*CML-R*	500	100	0	
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	500	84	0	
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	1000	79	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	500	85	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	1000	85	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	500	85	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	1000	85	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±140mA							
CY7C1021DV33 (7A1321N)	4929718	*610942243*	*CML-R*	COMP	6	0	
CY7C1021DV26 (7A1221N)	4005676	*611035531*	*CML-R*	COMP	6	0	
CY7C1021D (7C1021N)	4843321	*610911678*	*CML-R*	COMP	6	0	

Reliability Test Data

QTP #: 113201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: SOLDERABILITY							
CY7C1041DV33 (7A1341N)	4843257	*610904289*	*CML-R*	COMP	15	0	
CY7C1041DV33 (7A1341N)	4844386	*610904290*	*CML-R*	COMP	15	0	
CY7C1041DV33 (7A1341N)	4844644	*610904291*	*CML-R*	COMP	15	0	

Reliability Test Data

QTP #: 131602

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: BOND SHEAR							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	5	0	
STRESS: BOND PULL							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	5	0	
STRESS: CONSTRUCTIONAL ANALYIS							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	5	0	
STRESS: DYE PENETRATION TEST							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	15	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	COMP	15	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	COMP	15	0	
STRESS: ELECTRICAL DISTRIBUTION							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	30	0	
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (500V)							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (1000V)							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (1500V)							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, 125C, +/-140ma							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	6	0	

Reliability Test Data

QTP #: 131602

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-E, (2000V)							
CY7C199D (7A199NC)	4142187	611202758	JT-CHINA	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 5.2V, 85%RH, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	96	76	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	96	77	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	96	77	0	
STRESS: HIGH TEMP STORAGE							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	1000	77	0	
STRESS: PHYSICAL DIMENSION							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	10	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	COMP	10	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	COMP	10	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	96	77	0	
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	168	77	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	96	77	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	168	77	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	96	77	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	168	77	0	
STRESS: SOLDERABILITY							
CY7C199D (7A199NC)	4226590	611302812	JT-CHINA	COMP	15	0	
CY7C199D (7A199NC)	4226590	611302813	JT-CHINA	COMP	15	0	
CY7C199D (7A199NC)	4226590	611302814	JT-CHINA	COMP	15	0	

Reliability Test Data

QTP #: 131602

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C –65C TO 150C, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	500	77	0	
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	1000	77	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	500	77	0	
CY7C199D (7A199NC)	4226590	611300482	JT-CHINA	1000	77	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	500	77	0	
CY7C199D (7A199NC)	4226590	611300483	JT-CHINA	1000	77	0	
STRESS: POST TCT BOND PULL							
CY7C199D (7A199NC)	4226590	611300481	JT-CHINA	COMP	5	0	

Document History Page

Document Title: QTP 113201: 1 MEG FAST ASYNCHRONOUS SRAM FAMILY AUTOMOTIVE DEVICES, C9FD-3R TECHNOLOGY, FAB4
Document Number: 001-83867

Rev.	ECN No.	Orig. of Change	Description of Change
**	3764958	NSR	Initial Spec Release
*A	3981511	ILZ	Added QTP 131602 : Qualify the 256k bond option (7A199NC) of the C9 1Meg die (7A1021P) fabricated in Fab4 for Automotive applications
*B	4565616	JYF	Sunset review: Updated QTP title page for template alignment.

Distribution: WEB

Posting: None