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Cypress Semiconductor Automotive Product Qualification Report

**QTP# 163005 VERSION **
September 2017**

Automotive 4M Parallel nvSRAM Device Family S8TNV1-5 Technology, Fab 25	
CY14B104NA*	**256K x 16 Automotive nvSRAM**

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

Qual Report	Description of Qualification Purpose	Date Comp
163005	S8TNV Fab Transfer Qualification at Fab 25 using Automotive 4M Parallel nvSRAM Device	Sep 17

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: S8TNV Fab Transfer Qualification at Fab 25 using Automotive 4M Parallel nvSRAM Device	
Marketing Part #:	CY14B104NA*
Device Description:	Automotive 4M Parallel nvSRAM Device
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation Type and Materials:			Proprietary
Generic Process Technology/Design Rule (□-drawn):			Proprietary
Gate Oxide Material/Thickness (MOS):			Proprietary
Name/Location of Die Fab (prime) Facility:			Fab25, Austin Texas
Die Fab Line ID/Wafer Process ID:			S8TNV1-5

ALTERNATIVE FAB FACILITY SITE

FAB SITE	LOCATION	QTP NUMBER
Cypress CMI Fab4	Minnesota , USA	154103

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE	QTP NUMBER
44-Lead TSOP (400mils)	JCET-China (JT)	162804
48-FBGA (6x10x1.2mm)	ASEK-Taiwan (G)	154004

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	ZW44
Package Outline, Type, or Name:	44L-TSOP (400mil)
Mold Compound Name/Manufacturer:	KE-G6000 / Kyocera
Mold Compound Flammability Rating:	V0 UL94
Mold Compound Alpha Emission Rate:	<0.001 CPH/cm2
Oxygen Rating Index: >28%	>28%
Lead Frame Designation:	Full Metal Pad
Lead Frame Material:	Copper
Substrate Material:	N/A
Lead Finish, Composition / Thickness:	NiPdAu-Ag
Die Backside Preparation Method/Metallization:	Backgrind to 11mils
Die Separation Method:	100% Saw
Die Attach Supplier:	Henkel
Die Attach Material:	QMI-509
Bond Diagram Designation	002-14011
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au / 0.9 mil
Thermal Resistance Theta JA °C/W:	43.4 C/W
Package Cross Section Yes/No:	Y
Assembly Process Flow:	001-67698
Name/Location of Assembly (prime) facility:	JCET-China (JT)
MSL LEVEL	3
REFLOW PROFILE	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Sort Test: CMI / Test25, USA Class Test and Finish: CML, Philippines

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BK48C
Package Outline, Type, or Name:	48 FBGA
Mold Compound Name/Manufacturer:	KE G2270 (low alpha) / KYOCERA
Mold Compound Flammability Rating:	V-0
Mold Compound Alpha Emission Rate:	0.001C/CM2-H
Oxygen Rating Index: >28%	52%
Substrate Material:	BT Resin / UMTC
Lead Finish, Composition / Thickness:	SnAgCu 0.3
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Henkel
Die Attach Material:	2025D
Bond Diagram Designation	001-97797
Wire Bond Method:	Thermosonic
Wire Material/Size:	1.0 mil Au
Thermal Resistance Theta JA °C/W:	46.09 °C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-41040
Name/Location of Assembly (prime) facility:	ASE-G
MSL LEVEL	3
REFLOW PROFILE	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Sort Test: CMI / Test25, USA Class Test and Finish: CML, Philippines

Note: Please contact a Cypress Representative for other package 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 = 3.3V	P
NVM Endurance /High Temperature Operating Life Latent Failure Rate	AEC-Q100-005 and JESD22-A108, 150°C Dynamic Operating Condition, Vcc Max = 3.3V	P
High Accelerated Saturation Test (HAST)	JESD22-A110, 130C, 3.3V, 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
Electrostatic Discharge Human Body Model (ESD-HBM)	AEC-Q100-002 500V/1000V/2000V	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	AEC-Q100-011 250V/500V/750V (Corner Pins)	P
Wire Ball Shear	AEC-Q100-001	P
Electrical Distribution	AEC-Q100-009	P
Final Visual	JESD22-B101B	P
NVM Endurance /Data Retention (Plastic)	AEC-Q100-005, Endurance at 25C with Retention at 25C and Endurance at 125C with Retention at 150 C, nonbiased	P
Wire Bond Pull	Mil-Std 883, Method 2011	P
Acoustic Microscopy	JEDEC JSTD-020 Precondition: JESD22-A113 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Static Latch-up	AEC-Q100-004, 125C,± 100mA	P
Post Temperature Cycle Wire Bond Pull	Mil-Std 883, Method 2011	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	10,428 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	97,920 Device Hours	0	0.7	170	** FIT

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

[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 #: 163005

Device	Package	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	22	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	22	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	22	0	
CY14B104NA2 (7A1404B6DB)	ZW44	3721074	611722753	JCET-JT	COMP	22	0	
STRESS: BALL SHEAR								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	30	0	
STRESS: BOND PULL								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	30	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.3V, Vcc Max								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	48	3400	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	48	3400	0	
CY14B104NA2 (7A1404B6DB)	ZW44	3721074	611722753	JCET-JT	48	1489	0	
CY14B104NA2 (7A1404B6DB)	ZW44	3720073	611722754	JCET-JT	48	2139	0	
STRESS: ELECTRICAL DISTRIBUTION								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	30	0	
STRESS: ENDURANCE / DATA RETENTION								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	1000	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	1000	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	1000	80	0	

Reliability Test Data

QTP #: 163005

Device	Package	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ENDURANCE / DATA RETENTION (25C)								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	1000	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	1000	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	1000	80	0	
STRESS: ENDURANCE / HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.3V, Vcc Max								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	408	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	408	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	408	80	0	
STRESS: ESD-CHARGE DEVICE MODEL								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	250	3	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	500	3	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	750	3	0	
CY14B104NA2 (7A1404B6DB)	BK48	4652108	611703704	ASEK-G	250	3	0	
CY14B104NA2 (7A1404B6DB)	BK48	4652108	611703704	ASEK-G	500	3	0	
CY14B104NA2 (7A1404B6DB)	BK48	4652108	611703704	ASEK-G	750	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	500	3	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	1000	3	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	2000	3	0	
STRESS: FINAL VISUAL INSPECTION								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	4830	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	5020	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	970	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 3.3V, 85%RH, PRE COND 192 HR 30C/60%RH, MSL3								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	96	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	192	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	96	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	192	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	96	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	192	80	0	

Reliability Test Data

QTP #: 163005

Device	Package	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PRESSURE COOKER TEST								
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	168	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	168	79	0	
CY14B104NA2 (7A1404B6DB)	ZW44	3721074	611722753	JCET-JT	168	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4715938	611723536	CML-RA	168	80	0	
STRESS: POST TCT BOND PULL								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	500	5	0	
STRESS: PRE/POST LFR CRITICAL PARAMETERS								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	COMP	30	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	COMP	30	0	
STRESS: STATIC LATCH-UP (+/-100mA 125C)								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	6	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	500	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4652108	611705917	JCET-JT	500	80	0	
CY14B104NA2 (7A1404B6DB)	ZW44	4703546	611706560	JCET-JT	500	80	0	