

# Cypress Semiconductor Automotive Product Qualification Report

QTP# 163005 VERSION \*\*  
September 2017

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

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT  
[reliability@cypress.com](mailto:reliability@cypress.com) or via a CYLINK CRM CASE

**Prepared By:**  
Honesto Sintos  
Reliability Engineer

**Reviewed By:**  
Sandhya Chandrashekhar  
Reliability Manager

**Approved By:**  
David Hoffman  
Reliability Director

**PRODUCT QUALIFICATION HISTORY**

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
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

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
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

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	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**

<b>Test Location:</b>	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 <sup>3</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate	10,428 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> 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.

<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<sub>A</sub> =The Activation Energy of the defect mechanism.

K = Boltzmann's constant = 8.62x10<sup>-5</sup> eV/Kelvin.

T<sub>1</sub> is the junction temperature of the device under stress and T<sub>2</sub> is the junction temperature of the device at use conditions.



## Reliability Test Data

**QTP #: 163005**

<i>Device</i>	<i>Package</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
<b>STRESS: ACOUSTIC, MSL3</b>								
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	
<b>STRESS: BALL SHEAR</b>								
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	
<b>STRESS: BOND PULL</b>								
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	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.3V, Vcc Max</b>								
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	
<b>STRESS: ELECTRICAL DISTRIBUTION</b>								
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	
<b>STRESS: ENDURANCE / DATA RETENTION</b>								
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**

<i>Device</i>	<i>Package</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
<b>STRESS: ENDURANCE / DATA RETENTION (25C)</b>								
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	
<b>STRESS: ENDURANCE / HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.3V, Vcc Max</b>								
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	
<b>STRESS: ESD-CHARGE DEVICE MODEL</b>								
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	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B</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	
<b>STRESS: FINAL VISUAL INSPECTION</b>								
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	
<b>STRESS: HI-ACCEL SATURATION TEST, 130C, 3.3V, 85%RH, PRE COND 192 HR 30C/60%RH, MSL3</b>								
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**

<i>Device</i>	<i>Package</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
<b>STRESS: PRESSURE COOKER TEST</b>								
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	
<b>STRESS: POST TCT BOND PULL</b>								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	500	5	0	
<b>STRESS: PRE/POST LFR CRITICAL PARAMETERS</b>								
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	
<b>STRESS: STATIC LATCH-UP (+/-100mA 125C)</b>								
CY14B104NA2 (7A1404B6DB)	ZW44	4647620	611646995	JCET-JT	COMP	6	0	
<b>STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH</b>								
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	



## Document History Page

Document Title: QTP#163005: Automotive 4M Parallel nvSRAM Device Family S8TNV1-5 Technology, Fab 25  
Document Number: 002-21303

Rev.	ECN No.	Orig. of Change	Description of Change
**	5889046	HSTO	Initial spec release