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# Cypress Semiconductor Product Qualification Plan

**QTP# 082704 VERSION \*F**  
**January 2018**

<b>S8 Product Qualification</b> <b>Non-Volatile SRAM Product Family</b> <b>Cypress, Skywater</b>	
<b>CY14B104K*</b> <b>CY14B104LA*</b> <b>CY14B104M*</b> <b>CY14B104NA*</b>	<b>4M 3V RTC/Non RTC Non-Volatile SRAM Device</b>
<b>CY14E104K*</b> <b>CY14E104LA*</b> <b>CY14E104M*</b> <b>CY14E104NA*</b>	<b>4M 5V RTC/Non RTC Non-Volatile SRAM Device</b>
<b>CY14B102NS*</b>	<b>2M 3V Non RTC Non-Volatile SRAM Device</b>
<b>CY14V104LA*</b> <b>CY14V104NA*</b>	<b>4-M 1.8V (512 K X 8 / 256 K X 16) NVSRAM</b>

**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT**  
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### QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
071304	To qualify S8 SONOS technology and 4M nvSRAM devices CY14B104L / CY14B104N (7C14104AC base die) using S8TNV-5R, fabricated at Minnesota (Skywater)	Nov 2008
082704	To qualify 4M nvSRAM Evans ( <i>with both RTC-Real Time Clock and bond options for Non-RTC</i> ) devices CY14B104*/CY14B102*/CY14E104* (7C14104CC base die) using S8TNV-5R, fabricated at Minnesota (Skywater)	July 2009
092804	1 Million Endurance Qualification for 4 Meg Evans nvSRAM	Nov 2009
102305	Qualification for Evans 1.8V IO part Derived from 6 Mask TO of Base Die Evans, S8TNV-5R at Skywater	Feb 2011

PRODUCT DESCRIPTION (for qualification)	
Purpose: Qualification of S8 technology & S8TNV-5R 4M nvSRAM product at Skywater	
Marketing Part #:	CY14B104/CY14B102/CY14E104/CY14E102
Device Description:	1.8V, 3V & 5V Commercial/Industrial, available in 44-Lead TSOP II / 48 BGA / 54TSOPII
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)

TECHNOLOGY/FAB PROCESS DESCRIPTION – S8TNV-5R			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation:	Proprietary		
Generic Process Technology/Design Rule (drawn):	Proprietary		
Gate Oxide Material/Thickness (MOS):	Proprietary		
Name/Location of Die Fab (prime) Facility:	Skywater-- Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Skywater / S8TNV-5R		

	PACKAGE / ASSEMBLY INFORMATION
Assembly Site:	PHIL-M, CML-RA
Package:	44-Lead TSOP II
Mold Compound:	CEL 9200CYR-R
Die Attach:	QMI-509
Die Size:	154 x 332 Mil (3910um x 8435um)
Leadframe Design:	C 7025 – HALF HARD / 8 DOT SLOTTED RMP
Leadfinish/solder ball:	NiPdAu
Wire (Al/Au) diam:	1.0 Mil/Au
MSL:	3
Solder Reflow Temp:	260C

**Note:** Package Qualification details upon request

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT**

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate (EFR)	Dynamic Operating Condition, 150°C, 2.7V/5.25, 48 Hours JESD22-A-108-B	P
High Temperature Operating Life Latent Failure Rate (LFR)	Dynamic Operating Condition, 150°C, 2.7V, 500 Hours JESD22-A-108-B	P
Pre/Post LFR AC/DC Char	AC/DC Critical Parameter Char at LFR 0hrs, 80hrs & 500hrs	P
Endurance	200K Cycles @ 90C, Per datasheet	P
Data Retention	150°C, 1000 Hours	P
Temperature Cycle	-65°C to 150°C, JESD22-A-104 500 Cycles, Require Precondition	P
High Accelerated Saturation Test (HAST)	130°C, 3.3V, 85%RH, JESD22-A-110-B 128 Hours, Require Precondition	P
Pressure Cooker	121°C/100%RH, JESD22-A102-C 168 Hours, Require Precondition	P
Precondition	JESD22 Moisture Sensitivity	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V, JESD22-A114E	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V, JESD22-C101C	P
Electrostatic Discharge Machine Model (ESD-MM)	200V, JESD22-A115-A	P
Latch-up Sensitivity	5.4V, ± 200mA, 125°C, EIA/JESD78	P
Age Bond Strength	Mil-Std-883, Method 2011	P
Acoustic (M3)	J-STD-020	P
Soft Error (Alpha Particle)	JESD89A	P
Soft Error (Neutron/Proton)	JESD89A	P
SEM X-Section	XY audit at center wafer and edge wafer	P
Low Temperature Operating Life Test	Dynamic Operating Condition, 2.7V, -30°C, 500 Hours	P
High Temp Steady State Life Test	Static Operating Condition, 2.7V, 150°C, 1000 Hours	P

### RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF <sup>4</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate	15,428 Devices*	1	N/A	N/A	65 PPM
High Temperature Operating Life <sup>1,2</sup> , Long Term Failure Rate	464,500 DHRs*	0	0.7	170	12 FITs

\* EFR device number and LFR device hours are based on the total samples tested.

<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:

$E_A$  = The Activation Energy of the defect mechanism.

$k$  = Boltzmann's constant =  $8.62 \times 10^{-5}$  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 #: 071304

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.7V, Vcc Max**

CY14B104L (7C14104AC)	4811240	610819876	CML-RA	48	1222	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	48	1316	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	48	932	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	48	813	0	

**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.7V, Vcc Max**

CY14B104L (7C14104AC)	4811240	610819876	CML-RA	500	120	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	500	120	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	500	119	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	500	119	0	

**STRESS: Pre-/ Post HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE CHAR**

CY14B104L (7C14104AC)	4811240	610819876	CML-RA	80/500	10	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	80/500	10	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	80/500	10	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	80/500	10	0	

**STRESS: ENDURANCE, 200K CYCLES, 90C**

CY14B104L (7C14104AC)	4811240	610819876	CML-RA	COMP	80	0	
CY14B104L (7C14104AC)	4817305	610841260	CML-RA	COMP	77	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	160	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	COMP	80	0	
CY14B104L (7C14104AC)	4817306/4818074		CML-RA	COMP	3307	0	

**STRESS: DATA RETENTION, 150C**

CY14B104L (7C14104AC)	4817306	610830615	CML-RA	1000	77	0	
CY14B104L (WAFER)	4817306	610830615	CML-RA	1008	228	0	
CY14B104L (7C14104AC)	4817305	610841260	CML-RA	1000	80	0	
CY14B104L (WAFER)	4817305	610841260	CML-RA	1008	216	0	
CY14B104L (7C14104AC)	4818074	N/A	CML-RA	1000	80	0	
CY14B104L (WAFER)	4818074	N/A	CML-RA	1008	402	0	

## Reliability Test Data

QTP #: 071304

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	8	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	8	0	
CY14B104L (7C14104AC)	4811240	610819876	CML-RA	COMP	8	0	

**STRESS: ESD-CHARGE DEVICE MODEL, 500V**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	9	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	9	0	
CY14B104L (7C14104AC)	4811240	610819876	CML-RA	COMP	9	0	

**STRESS: ESD-MACHINE MODEL, 200V**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	5	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	5	0	
CY14B104L (7C14104AC)	4811240	610819876	CML-RA	COMP	5	0	

**STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.3V, PRE COND 192 HR 30C/60%RH, MSL3**

CY14B104L (7C14104AC)	4811240	610819876	CML-RA	128	77	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	128	80	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	128	77	0	

**STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	168	77	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	168	80	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	168	77	0	

**STRESS: Temperature Cycle COND. C, -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	1000	77	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	1000	80	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	500	80	0	

**STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±200mA**

CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	6	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	COMP	6	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	COMP	6	0	



## Reliability Test Data

QTP #: 071304

<i>Device</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: AGE BOND</b>							
CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	10	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	10	0	
CY14B104L (WAFER)	4818074	N/A	CML-RA	COMP	10	0	
<b>STRESS: ACOUSTIC-MSL3</b>							
CY14B104L (7C14104AC)	4807004	610812949	CML-RA	COMP	15	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	15	0	
CY14B104L (7C14104AC)	4814841	610832326	CML-RA	COMP	15	0	
<b>STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, FIT=550 FIT/Mbit @ 85C, Vcc Nom</b>							
CY14B104L (7C14104AC)	4811240	610819876	CML-RA	COMP	3	0	
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	COMP	3	0	
CY14B104L (7C14104AC)	4819437	610842294	CML-RA	COMP	3	0	
<b>STRESS: SER – NEUTRON/PROTON</b>							
CY14B104L (7C14104AC)	4808220	N/A	CML-RA	COMP	3	0	
<b>STRESS: LOW TEMPERATURE OPERATING LIFE TEST, -30C, 2.7V, Vcc Max</b>							
CY14B104L (7C14104AC)	4817306	610830615	CML-RA	500	77	0	
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.7V, Vcc Max</b>							
CY14B104L (7C14104AC)	4811240	610819876	CML-RA	1000	76	0	

## Reliability Test Data

QTP #: 082704

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.7V, Vcc Max</b>							
CY14B104 (7C14104B)	4847698	610905735	CML-RA	48	1787	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	48	1774	0	
CY14B104 (7C14104B)	4850719	610914474	CML-RA	48	1555	1	1-unfilled via, FA#082704-3CE1 CAR#200930051
CY14B104 (7C14104B)	4906080	610918905	CML-RA	48	1136	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.7V, Vcc Max</b>							
CY14B104 (7C14104B)	4847698	610905735	CML-RA	500	118	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	500	147	0	
CY14B104 (7C14104B)	4850719	610914474	CML-RA	500	186	0	
<b>STRESS: Pre-/ Post HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE CHAR</b>							
CY14B104 (7C14104B)	4847698	610905735	CML-RA	80/500	10	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	80/500	10	0	
<b>STRESS: ENDURANCE (90C), 200K CYCLES+168 HOURS DATA RETENSION</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	80	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	COMP	89	0	
<b>STRESS: DATA RETENTION (150C) + 200K ENDURANCE</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	1000	80	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	1000	80	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	8	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	COMP	8	0	
CY14B104 (7C14104B)	4850719	610910242	CML-RA	COMP	8	0	
CY14B104 (7C14104B)	4906080	610918905	CML-RA	COMP	8	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	9	0	
CY14B104 (7C14104B)	4847698	610914510	CML-RA	COMP	9	0	
CY14B104 (7C14104B)	4847698	610918518	CML-RA	COMP	9	0	
<b>STRESS: ESD-MACHINE MODEL, 200V</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	5	0	
<b>STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.3V, PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	128	80	0	

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## Reliability Test Data

QTP #: 082704

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	168	77	0	
<b>STRESS: Temperature Cycle COND. C, -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	1000	75	0	
CY14B104 (7C14104B)	4841954	610855137	CML-RA	1000	77	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±200mA</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	9	0	
CY14B104 (7C14104B)	4850719	610910241	CML-RA	COMP	9	0	
CY14B104 (7C14104B)	4850719	610910242	CML-RA	COMP	9	0	
CY14B104 (7C14104B)	4906080	610918905	CML-RA	COMP	9	0	
<b>STRESS: ACOUSTIC-MSL3</b>							
CY14B104 (7C14104B)	4847698	610904566	CML-RA	COMP	15	0	
CY14B104 (7C14104B)	4841954	610855137	CML-RA	COMP	15	0	
<b>STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, @ 85C, Vcc Nom</b>							
CY14B104 (7C14104B)	4850719	610910241	CML-RA	COMP	3	0	

## Reliability Test Data

QTP #: 092804

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: ENDURANCE (90C) 1 MILLION CYCLES+168 HOURS DATA RETENTION</b>							
CY14B104NA (7C1404B6C)	4850719	610910241	CML-R	COMP	80	0	
CY14B104LA (7C1404B8C)	4919815	610923434	CML-R	COMP	80	0	
<b>STRESS: ENDURANCE (24C) 1 MILLION CYCLES+168 HOURS DATA RETENTION</b>							
CY14B104K (7C1404B1C)	4847698	610905735	CML-R	COMP	79	0	

## Reliability Test Data

QTP #: 102305

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 5.25V, Vcc Max**

CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	48	817	0	
CY14V104LA (7C1424B8C)	4020495	611053396	CML-RA	48	223	0	
CY14V104NA (7C1424B6C)	4024884	611058700	CML-RA	48	454	0	

**STRESS: ESD-CHARGE DEVICE MODEL, 500V**

CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	COMP	9	0	
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**STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V**

CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	COMP	8	0	
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**STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±140mA**

CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	COMP	6	0	
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**STRESS: TEMPERATURE CYCLE COND. C, -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3**

CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	500	77	0	
CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	1000	77	0	

## Document History Page

Document Title: 082704: 4M S8 PRODUCT QUALIFICATION NON-VOLATILE SRAM (NVS RAM) PRODUCT  
 FAMILY CYPRESS, SKYWATER  
 Document Number: 001-61286

Rev.	ECN No.	Orig. of Change	Description of Change
**	2924009	HGA	Initial spec release
*A	3394466	NSR	Remove Revision 3.0 in Title Page Added CY14V104LA* and Added CY14V104NA* Device. Added QTP 102305 in History page and reliability test data. Added 1.8V in Device Description table. Remove QTP#s 090603 and 082703 in History page and QTP data. Re-compute EFR/FFR Failure rate. Corrected Thermal AF in Reliability Failure Rate Summary table from 169 to 170.
*B	4001157	HSTO	-Replaced Memory Image Division (MID) with Memory Product Division(MPD) in Product Description -Deleted Cypress referenced specs 25-00060, 25-00020, 01-00081, 25-00104, 001-47027, 001-45212 and retained/replaced with industry standards in Reliability Test Performed per Specification Requirements Table.
*C	4074076	HSTO	Change Spec title from "082704: S8 PRODUCT QUALIFICATION NON-VOLATILE SRAM PRODUCT FAMILY CYPRESS, CMI (FAB 4)" to "082704: 4M S8 PRODUCT QUALIFICATION NON-VOLATILE SRAM (NVS RAM) PRODUCT FAMILY CYPRESS, CMI (FAB 4)".
*D	4379024	HSTO	Align qualification report based on the new template in the front page
*E	4775580	HSTO	Update reference for Reliability Director
*F	6444730	HSTO	Update Cypress logo Update contact person for Reliability Director and Reliability Manager Modify "TECHNOLOGY/FAB PROCESS DESCRIPTION" table Replace "CMI (Fab4)" with Skywater in spec title and body of spec. Update HAST voltage"
		FRA	Removed Distribution and Posting in document history page.