Cypress Semiconductor
Product Qualification Plan

QTP# 082704 VERSION *E
May 2014

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

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 Cypress Minnesota CMI (Fab4)		Nov 2008
082704		To qualify 4M nvSRAM Evans (*with both RTC-Real Time Clock and bond options for Non-RTC)* devices CY14B104*/CY14B102*/CY14E104* (7C14104CC base die) using S8TNV-5R, fabricated at Cypress Minnesota CMI (Fab4)		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 Fab 4		Feb 2011

PRODUCT DESCRIPTION (for qualification)	
Purpose: Qualification of S8 technology & S8TNV-5R 4M nvSRAM product at CMI (Fab 4)	
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			
3	Metal Composition:		Metal 1: 300Å TiW / 3,200Å Al / 100Å Ti Metal 2: 300Å TiW / 3,200Å Al / 100Å Ti Metal 3: 300Å TiW / 8,000Å Al / 150Å Ti
Passivation:		Si_2N_3 7000Å & SiO2 700Å	
Generic Process Technology/Design Rule (drawn):		S8TNV-5R/0.13μm	
Gate Oxide Material/Thickness (MOS):		32Å (LV) & 110Å (HV)	
Name/Location of Die Fab (prime) Facility:		Cypress Semiconductor -- Bloomington, MN	
Die Fab Line ID/Wafer Process ID:		Fab4 / 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^{0}C to 150^{0}C, JESD22-A-104 500 Cycs, Require Precondition	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 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[4]	Failure Rate
High Temperature Operating Life Early Failure Rate	15,428 Devices*	1	N/A	N/A	65 PPM
High Temperature Operating Life[1,2,] 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.

[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 #: 071304

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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
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, 1.98V, 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

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: AGE BOND							
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	
STRESS: ACOUSTIC-MSL3							
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	
STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, FIT=550 FIT/Mbit @ 85C, Vcc Nom							
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	
STRESS: SER – NEUTRON/PROTON							
CY14B104L (7C14104AC)	4808220	*N/A*	*CML-RA*	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE TEST, -30C, 2.7V, Vcc Max							
CY14B104L (7C14104AC)	4817306	*610830615*	*CML-RA*	500	77	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.7V, Vcc Max							
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
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.7V, Vcc Max							
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	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.7V, Vcc Max							
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	
STRESS: Pre-/ Post HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE CHAR							
CY14B104 (7C14104B)	4847698	*610905735*	*CML-RA*	80/500	10	0	
CY14B104 (7C14104B)	4850719	*610910241*	*CML-RA*	80/500	10	0	
STRESS: ENDURANCE (90C), 200K CYCLES+168 HOURS DATA RETENSION							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	COMP	80	0	
CY14B104 (7C14104B)	4850719	*610910241*	*CML-RA*	COMP	89	0	
STRESS: DATA RETENTION (150C) + 200K ENDURANCE							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	1000	80	0	
CY14B104 (7C14104B)	4850719	*610910241*	*CML-RA*	1000	80	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
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	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
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	
STRESS: ESD-MACHINE MODEL, 200V							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	COMP	5	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 1.98V, PRE COND 192 HR 30C/60%RH, MSL3							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	128	80	0	

Reliability Test Data

QTP #: 082704

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	168	77	0	
STRESS: Temperature Cycle COND. C, -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	1000	75	0	
CY14B104 (7C14104B)	4841954	*610855137*	*CML-RA*	1000	77	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±200mA							
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	
STRESS: ACOUSTIC-MSL3							
CY14B104 (7C14104B)	4847698	*610904566*	*CML-RA*	COMP	15	0	
CY14B104 (7C14104B)	4841954	*610855137*	*CML-RA*	COMP	15	0	
STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, @ 85C, Vcc Nom							
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
STRESS: ENDURANCE (90C) 1 MILLION CYCLES+168 HOURS DATA RETENTION							
CY14B104NA (7C1404B6C)	4850719	*610910241*	*CML-R*	COMP	80	0	
CY14B104LA (7C1404B8C)	4919815	*610923434*	*CML-R*	COMP	80	0	
STRESS: ENDURANCE (24C) 1 MILLION CYCLES+168 HOURS DATA RETENTION							
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
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	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	COMP	8	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 5.4V, ±140mA							
CY14V104LA (7C1424B8C)	4020495	611053397	CML-RA	COMP	6	0	
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 (NVSRAM) PRODUCT FAMILY CYPRESS, CMI (FAB 4)
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 (NVSRAM) 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

Distribution: WEB

Posting: None