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Cypress Semiconductor
Product Qualification Report

QTP# 062509 VERSION *A
July 2014

Neutron Device Family S4AD-5 Technology, GSMC	
CY8C21234 CY8C21334 CY8C21434 CY8C21534 CY8C21634	Mixed Signal Array with On-Chip Controller
CY8C9520	20 - Bit I/O Expander with EEPROM

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

Qual Report		Description of Qualification Purpose		Date Comp
060605		Qualify GSMC using PSoC Device Product Family on S4AD-5 Technology		Aug 06
062509		Neutron Device Product Family on S4AD-5 Technology transfer to GSMC		Aug 06
071504		14 Layer Mask Change on Neutron Device Family, S4AD-5 Technology, Fab4		Aug 07
073401		Minor Changes to Poly (P1M) and Metal 2 (MM2) masks on Neutron (8C21005AK), S4AD-5		Dec 07

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Transfer Neutron Device Product Family in S4D-5 Technology at GSMC Foundry	
Marketing Part #:	CY8C21234, CY8C21334, CY8C21334 CY8C21534, CY8C21634
Device Description:	3.3V and 5V Industrial 24Mhz Programmable System on Chip
Cypress Division:	Cypress Semiconductor – Programmable System Division (PSD)

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 250A TiN/5,800A Al/700A TiN Metal 2: 500A TiN/8,000A Al/250A TiN
Passivation Type and Materials:		7,000A TeOs /6,000A Si_3N_4	
Generic Process Technology/Design Rule (µ-		Single Poly, Double Metal, 0.35 µm	
Gate Oxide Material/Thickness (MOS):		SiO_2 / 110A	
Name/Location of Die Fab (prime) Facility:		GSMC/Shanghai-China	
Die Fab Line ID/Wafer Process ID:		S4AD-5 GSMC SONOS	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
16-Pin SOIC	**PHIL-M, CML-RA**
20-Lead SSOP	**TAIWN-T**
28-Lead SSOP	**PHIL-M, TAIWN-T**
56-Lead SSOP	**CML-RA**
32-Lead MLF	**SEOUL-L, ASE-G,CML-RA**
32-Lead Thin MLF	**SEOUL-L, MALAYSIA-CA**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION FOR THIS QUALIFICATION	
Package Designation:	SP28
Package Outline, Type, or Name:	28-Lead Shrunk Small Outline Package (SSOP)
Mold Compound Name/Manufacturer:	G600 - Sumitomo
Mold Compound Flammability Rating:	V-0 PER UL-94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	Ablebond 8290
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-06220
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	95.0°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	001-00365
Name/Location of Assembly (prime) facility:	Amkor-Phil
MSL Level	1
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	KYEC-Taiwan , CML-RA

Note: Please contact a Cypress Representative for other packages availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C	P
High Temperature Steady State life	125°C, 5.5V, Vcc Max	P
Low Temperature Operating Life	-30°C, 5.5V	P
High Accelerated Saturation Test (HAST)	130°C, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Acoustic Microscopy	J-STD-020	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150°C ± 5°C No Bias	P
Dynamic Latch-up	125C, 8.5V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Static Latch-up	125C, ± 200mA JEDEC 78	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal[3] A.F	Failure Rate
High Temperature Operating Life Early Failure Rate[1]	1,034 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	720,000DHRs	0	0 .7	55	23 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.

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	15	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	15	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	10	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	10	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	10	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	336	256	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	256	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1500	256	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	336	256	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	256	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	336	256	0	
STRESS: ENDURANCE							
CY8C24494 (8C24494A)	9621713	*610632687A*	PHIL-M	COMP	47	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	9	0	
CY8C24494 (8C24795A)	9623716	*610639349*	SEOL-L	COMP	9	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	9	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	9	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	9	0	

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8C24494 (8C24494A)	9623715	*610635880*	PHIL-M	COMP	3	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	COMP	3	0	
CY8C24494 (8C24994A)	9621713		C-USA	COMP	3	0	
CY8C24494 (8C24494A)	9623715	*610638054*	SEOL-L	COMP	3	0	
CY8C24494 (8C24995A)	9623716	*610639350*	SEOL-L	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.5V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	COMP	2	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	96	1005	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	96	1144	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	96	908	1	CAPACITOR DEFECT
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	1000	180	0	
CY8C24494 (8C24494A)	9623716	*610639767A*	PHIL-M	1000	180	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	80	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	336	80	0	
STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 5.5V							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	45	0	

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	128	49	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	128	49	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	288	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	47	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	168	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	288	50	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	500	50	0	
CY8C24494 (8C24494A)	9621713	*610632687*	PHIL-M	1000	50	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	500	49	0	
CY8C24494 (8C24494A)	9623715	*610635580*	PHIL-M	1000	49	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	300	50	0	
CY8C24494 (8C24494A)	9623716	*610639767*	PHIL-M	500	49	0	

Reliability Test Data

QTP #: 062509

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	COMP	3	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	500	300	0	
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	1000	300	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	96	1000	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	168	180	0	
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	1000	180	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	168	45	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	300	50	0	
CY8C21534 (8C215345A)	9628722	*610642654*	PHIL-M	1000	50	0	

Reliability Test Data

QTP #: 071504

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21534 (8C215345A)	5711008	*610732788*	SEOUL-L	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C21534 (8C215345A)	5711008	*610732788*	SEOUL-L	COMP	9	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21534 (8C215345A)	5711008	*610730064*	CML-RA	96	1034	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)							
CY8C21534 (8C215345A)	5711008	*610732788*	SEOUL-L	COMP	6	0	

Reliability Test Data

QTP #: 073401

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: SORT YIELD							
CY8C21534 (8C215345A)	5730006			COMP		COMPARABLE	
STRESS: DATA RETENTION							
CY8C21534 (8C215345A)	5730006	610757866	PHIL-M	500	30	0	
CY8C21534 (8C215345A)	5730006	610757866	PHIL-M	1000	30	0	
CY8C21534 (8C215345A)	5730006	610757867	PHIL-M	500	30	0	
CY8C21534 (8C215345A)	5730006	610757867	PHIL-M	1000	30	0	
CY8C21534 (8C215345A)	5730006	610757868	PHIL-M	500	30	0	
CY8C21534 (8C215345A)	5730006	610757868	PHIL-M	1000	30	0	
STRESS: ENDURANCE							
CY8C21534 (8C215345A)	5730006	610757866	PHIL-M	COMP	30	0	
CY8C21534 (8C215345A)	5730006	610757867	PHIL-M	COMP	25	0	
CY8C21534 (8C215345A)	5730006	610757868	PHIL-M	COMP	25	0	
STRESS: ETEST DATA							
CY8C21534 (8C215345A)	5730006			COMP		COMPARABLE	

Document History Page

Document Title: QTP# 062509: NEUTRON DEVICE FAMILY "CY8C21234/1334/1434/1534/1634" S4AD-5 TECHNOLOGY, GSMC
Document Number: 001-88313

Rev.	ECN No.	Orig. of Change	Description of Change
**	4049906	HSTO	Initial Spec Release Qualification report published on Cypress.com is documented on memo HGA-549 and was transferred to qualification report spec template. Add device CY8C9520 in this QTP report.
*A	4437539	HSTO	Align qualification report based on the new template in the front page Update Cypress division from Consumer and Computation Division (CCD) to Programmable System Division (PSD) at page3.

Distribution: WEB

Posting: None