

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, PLEASE 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 ₃ N 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:	Alebond 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

<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>
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

<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>
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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

<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>
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

<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>
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

<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>
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