

# Cypress Semiconductor Product Qualification Report

QTP# 071104 VERSION 1.0  
December 2007

<b>PSoC Mixed Signal Array Proton Product Family</b>	
S4AD-5 Technology, Fab5	
<b>CY8C21123</b> <b>CY8C21223</b> <b>CY8C21323</b>	<b>PSoC™ Mixed Signal Array with On-Chip Controller</b>

## CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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### PRODUCT QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
060605	Qualify GSMC using PSoC Device Product Family on S4AD-5 Technology	Aug 06
071104	Qualify PSoC 8C21000A Proton Device on S4AD-5 Technology, Fab5	Nov 07

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualify PSoC 8C21000A Proton Device on S4AD-5 Technology, Fab5	
Marketing Part #:	CY8C21123, CY8C21223, CY8C21323, CY8C21000
Device Description:	3.3V and 5V Industrial 24Mhz Programmable System on Chip
Cypress Division:	Cypress Semiconductor - Consumer and Computation Division

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5</b>			
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 <sub>3</sub> N <sub>4</sub>		
Generic Process Technology/Design Rule (μ-drawn):	Single Poly, Double Metal, 0.35 μm		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 110A		
Name/Location of Die Fab (prime) Facility:	GSMC/China		
Die Fab Line ID/Wafer Process ID:	S4AD-5 GSMC SONOS		

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY SITE FACILITY</b>
<b>8/16- Lead SOIC</b>	<b>CML-RA, PHIL-M, TAIWAN-T</b>
<b>20- Lead SSOP</b>	<b>TAIWAN-T, CML-RA</b>
<b>24-Lead MLF</b>	<b>AMKOR-L (KOREA)</b>

**Note:** Package Qualification details upon request.

<b>MAJOR PACKAGE INFORMATION FOR THIS QUALIFICATION</b>	
<b>Package Designation:</b>	SZ16
<b>Package Outline, Type, or Name:</b>	16-Lead Small Outline Integrated Circuit (SOIC)
<b>Mold Compound Name/Manufacturer:</b>	EME 6600H/Sumitomo
<b>Mold Compound Flammability Rating:</b>	V-0 PER UL-94
<b>Oxygen Rating Index:</b>	None
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Pure Sn
<b>Die Backside Preparation Method/Metallization:</b>	Backgrind
<b>Die Separation Method:</b>	100% Saw
<b>Die Attach Supplier:</b>	Ablestik
<b>Die Attach Material:</b>	8290
<b>Die Attach Method:</b>	Epoxy
<b>Bond Diagram Designation:</b>	001-11906
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au. 1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	125C
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-24026
<b>Name/Location of Assembly (prime) facility:</b>	Amkor-Phil
<b>MSL Level</b>	1
<b>Reflow Profile</b>	260C

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	CML-R

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

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT**

<b>Stress/Test</b>	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
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, <b>260°C</b> +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, <b>260°C</b> +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, <b>260°C</b> +0, -5°C	P
Acoustic Microscopy	Spec. 25-00104	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  JESD22, Method A114-E	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 Cypress Spec. 25-00020	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Static Latch-up	125C, ± 200mA Cypress Spec. 01-00081	P

### RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal <sup>3</sup> A.F	Failure Rate
High Temperature Operating Life Early Failure Rate <sup>1</sup>	1,010 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	720,000DHRs	0	0.7	55	23 FIT

<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 #: 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>
<b>STRESS: ACOUSTIC, MSL1</b>							
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	
<b>STRESS: AGE BOND STRENGTH</b>							
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	
<b>STRESS: DATA RETENTION, PLASTIC, 150C</b>							
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	
<b>STRESS: ENDURANCE</b>							
CY8C24494 (8C24494A)	9621713	610632687A	PHIL-M	COMP	47	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, (500V)</b>							
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	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)</b>							
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

<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: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)</b>							
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	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 8.5V, +/-200mA)</b>							
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	
<b>STRESS: DYNAMIC LATCH-UP (125C, 8.5V)</b>							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	COMP	2	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)</b>							
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
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)</b>							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	168	180	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	1000	180	0	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	
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)</b>							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	168	80	0	
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	336	80	0	
<b>STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 5.5V</b>							
CY8C24494 (8C24494A)	9621713	610632687	PHIL-M	500	45	0	

## Reliability Test Data

QTP #: 060605

<b>Device</b>	<b>Fab Lot #</b>	<b>Assy Lot #</b>	<b>Assy Loc</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
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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 #: 071104

<b>Device</b>	<b>Fab Lot #</b>	<b>Assy Lot #</b>	<b>Assy Loc</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
<b>STRESS: DATA RETENTION, PLASTIC, 150C</b>							
CY8C21223 (8C212235AK)	5716010	610751198	PHIL-M	500	40	0	
CY8C21223 (8C212235AK)	5716010	610751202	PHIL-M	500	40	0	
<b>STRESS: ENDURANCE</b>							
CY8C21223 (8C212235AK)	5716010	610751198	PHIL-M	COMP	39	0	
CY8C21223 (8C212235AK)	5716010	610751202	PHIL-M	COMP	39	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, (500V)</b>							
CY8C212323 (8C213235AK)	5716010	610747058	TWN-T	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-E, (2,200V)</b>							
CY8C212323 (8C213235AK)	5716010	610747058	TWN-T	COMP	8	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)</b>							
CY8C21223 (8C212235AK)	5716010	610751198	PHIL-M	96	505	0	
CY8C21223 (8C212235AK)	5716010	610751202	PHIL-M	96	505	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)</b>							
CY8C21223 (8C212235AK)	5716010	610751198	PHIL-M	168	90	0	
CY8C21223 (8C212235AK)	5716010	610751202	PHIL-M	168	90	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, +/-200mA)</b>							
CY8C212323 (8C213235AK)	5716010	610747058	TWN-T	COMP	6	0	