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Cypress Semiconductor
Product Qualification Report

QTP# 071104 VERSION*A
September 2014

PSoC Mixed Signal Array Product Family S4AD-5 Technology, Fab5	
CY8C21123 **CY8C21223** **CY8C21323**	**PSoC™ Mixed Signal Array with On-Chip Controller**

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
071104		Qualify PSoC 8C21000A Device on S4AD-5 Technology, Fab5		Nov 07

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify PSoC 8C21000A 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

TECHNOLOGY/FAB PROCESS DESCRIPTION –R28			
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 Si3N4
Generic Process Technology /Design Rule (□-drawn):			Single Poly, Double Metal, 0.35 µm
Gate Oxide Material/Thickness (MOS):in			SiO2 / 110A
Name/Location of Die Fab (prime) Facility:			GSMC/China
Die Fab Line ID/Wafer Process ID:			S4AD-5 GSMC SONOS

PACKAGE AVAILABILITY

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

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PLASTIC PACKAGE / ASSEMBLY DESCRIPTION	
Package Designation	SZ16
Package Outline, Type, or Name:	16-Lead Small Outline Integrated Circuit (SOIC)
Mold Compound Name/Manufacturer:	EME 6600/Sumitomo
Mold Compound Flammability Rating:	V-0 PER UL-94
Oxygen Rating Index:	None
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:	8290
Die Attach Method:	Epoxy
Bond Diagram Designation:	001-11906
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au. 1.0mil
Thermal Resistance Theta JA °C/W:	125C
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-24026
Name/Location of Assembly (prime) facility	Amkor-Phil
MSL Level	1
Reflow Profile	260C

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

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location	**CML-R**

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 JESD22, Method A114-E	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.	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 JESD78B	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 Rate3	1,010 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life1,2 Long Term Failure Rate	720,000 DHRs	0	0 .7	55	23 FIT

1 Assuming an ambient temperature of 55C and a junction temperature rise of 15C.
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 #: 071104

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

Document History Page

Document Title: QTP#071104: PSoC Mixed Signal Array Product Family "CY8C21123/21223/21323" S4AD-5 Technology, Fab5
Document Number: 001-89221

Rev.	ECN No.	Orig. of Change	Description of Change
**	4125299	HSTO	Initial Spec Release Initiate report as per memo HGA-252.
*A	4517702	HSTO	Align qualification report based on the new template in the front page

Distribution: WEB

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