Cypress Semiconductor
Product Qualification Report

QTP# 042505 VERSION 2.0
April 2006

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PSoC Mixed Signal Array (Neutron Product) Family</th></tr>
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CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
010702		New Technology S4AD-5 / New Product, Programmable Clock Generator, CY2414ZC, its product family and bond option.		Apr 01
042505		PSoC 8C21001A Neutron Product Family on SONOS S4AD-5 Technology, Fab2		Dec 04

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Device PSoC 8C21001A Neutron Product Family on S4AD-5 Technology, Fab2	
Marketing Part #:	CY8C21234, CY8C21334, CY8C21434, CY8C21534, CY8C21634
Device Description:	3.3V and 5V Industrial 24MHz Programmable System on Chip available in 16-Lead SOIC, 20-Lead SSOP and 32 MLF packages
Cypress Division:	Cypress Semiconductor Corporation – Consumer & Computation Division
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	8C21001A

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu /1,200A TiW Metal 2: 500A Ti/8,000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	3,000A TEOs / 6,000A Si_3N_4		
Free Phosphorus contents in top glass layer (%):	0%		
Number of Transistors in Device:	100,000		
Number of Gates in Device	10,000		
Generic Process Technology/Design Rule (µ-drawn):	Single Poly, Double Metal, 0.35 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 110A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5 CTI, SONOS		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
16-Lead SOIC	**OSE Taiwan (TAIWN-T)**
20-Lead SSOP	**Cypress Philippines (CML-RA)**
32-Lead MLF	**Amkor-Seoul Korea (SEOL-L)**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SP20
Package Outline, Type, or Name:	20-Lead Shrunk Small Outline Package (SSOP)
Mold Compound Name/Manufacturer:	Hitachi CEL9220HF
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	100% Pure Tin
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8340
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-06096
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	123°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-35032
Name/Location of Assembly (prime) facility:	OSE Taiwan (TAIWN-T) (20 SSOP)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R
Fault Coverage:	100%

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=3.8V, 150°C Dynamic Operating Condition, Vcc Max=5.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°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, 235°C+0, -5°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 Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+0, -5°C Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow**, 260°C**+0, -5°C	P
Data Retention	150°C ± 5°C No Bias	P
High Temperature Steady State life	150°C, 3.63V, Vcc Max	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,000V/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
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Current Density	Cypress Spec 22-00029	P
Low Temperature Operating Life	-30C, 4.3V, 8MHZ	P
SEM Analysis	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy	Spec. 25-00104	P
Dynamic Latch up	Cypress Spec. 01-00081	P
Latch up Sensitivity	125C, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	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]	1,007 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	180,000 DHRs	0	0 .7	170	30 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 #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	48	1005	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	48	1004	1	NON VISUAL
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	48	1005	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	500	120	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	80	120	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	500	120	0	
STRESS: AGE BOND STRENGTH							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	COMP	15	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	COMP	15	0	
STRESS: DYNAMIC LATCH-UP TESTING (11.5V)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 4.3V)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	500	48	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE CONDITION 168 HR 85C/85%RH (MSL1)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	128	50	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	256	50	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	128	48	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	128	48	0	

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	9	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,000V)							
CY2414ZC (7C841400A)	2103764	*610106177*	TAIWN-T	COMP	10	0	
STRESS: STATIC LATCH-UP TESTING (125C, 10V, ±300mA)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	3	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	COMP	3	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	COMP	3	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	80	80	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	168	80	0	
STRESS: ENDURANCE TEST							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	COMP	45	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	552	80	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	552	80	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	168	80	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	552	80	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE CONDITION 168 HR 85C/85%RH (MSL1)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	168	50	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	168	49	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	168	51	0	

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH (MSL1)							
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2101502	*610106170/1/2*	TAIWN-T	1000	50	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2052404	*610106173/4/5*	TAIWN-T	1000	50	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	300	50	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	500	50	0	
CY2414ZC (7C841400A)	2103764	*610106176/7/8*	TAIWN-T	1000	49	0	

Reliability Test Data

QTP #: 042505

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21334 (8C21334A)	2427548	*610458304N*	TAIWN-T	96	1007	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE CONDITION 168 HR 85C/85%RH (MSL1)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	168	45	0	
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	288	45	0	
STRESS: STATIC LATCH-UP TESTING (125C, 11V, ±300mA)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH (MSL1)							
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	300	45	0	
CY8C21334 (8C21334A)	2425372	*610443723*	TAIWN-T	500	45	0	