Cypress Semiconductor
Product Qualification Report

QTP# 060201
May 2013

PSoC™ Mixed Signal Array Hydra Device Family S4AD-5 Technology, Fab4	
CY8C29466 CY8C29566 CY8C29666 CY8C29866 CY8C27466 CY8C27566 CY8C27666 CY8C27866	PSoC™ Mixed Signal Array with On-Chip Controller

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
052004		PSoC 8C21001A Neutron Product Family on SONOS S4AD-5 Technology, Fab4		Aug 05
060201		PSoC 8C29000A Hydra Product Family Transfer on SONOS S4AD-5 Technology, Fab4		Dec 07
080703		Qualify Hydra 8C29000A at CMI on SONOS S4AD-5 Technology, Fab4		Apr 08
082009		Qualify new MM2 mask on Hydra for Industrial (8C29000AC) S4AD-5 Technology, Fab4		Nov 08

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Hydra (8C29000A) Product Family Transfer on S4AD-5 process at Fab4	
Marketing Part #:	CY8C29466, CY8C29566, CY8C29666, CY8C29866, CY8C27466, CY8C27566, CY8C27666, CY8C27866
Device	3.3V and 5V Industrial Programmable System on Chip
Cypress Division:	Cypress Semiconductor Corporation – Consumer and Computation Division

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A TiW/6,000A Al 0.5% Cu /300A TiW Metal 2: 500A TiW/8,000A Al 0.5% Cu/300A TiW
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:			Cypress Semiconductor – Minnesota
Die Fab Line ID/Wafer Process ID:			Fab 4, S4AD-5, SONOS

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
28-Lead PDIP	**PHIL-M, CML-RA**
28/48-Lead SSOP	**PHIL-M, TAIWAN-T, CML-RA, CHINA-JT**
28-Lead SOIC	**CML-RA, CHINA-JT**
48-Lead QFN	**KOREA-L, CML-RA, TAIWAN-G**
44/100-Lead TQFP	**CML-RA, CHINA-JT**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SP28
Package Outline, Type, or Name:	28-Lead SSOP
Mold Compound Name/Manufacturer:	Sumitomo EME-G600
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Ni-Pd-Au
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8290
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-05678
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	90°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	001−09888
Name/Location of Assembly (prime) facility:	Amkor Philippines (M)
MSL Level	3
Reflow Profile	260C

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

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	AEC-Q100-008 and JESD22-A108 Dynamic Operating Condition, Vcc Max = 5.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	AEC-Q100-008 and JESD22-A108 Dynamic Operating Condition, Vcc Max = 5.5V, 125°C	P
High Accelerated Saturation Test (HAST)	130°C, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH, 260°C+0, -5°C Reflow	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, 260°C+0, -5°C Reflow Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH, 260°C+0, -5°C Reflow	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
Data Retention	150°C, No Bias	P
High Temperature Steady State life	125°C, 5.5V, Vcc Max	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 JESD22-C101	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Current Density	Meets the Technology Device Level Reliability Specifications	P
Low Temperature Operating Life	-30C, 5.5V, 8MHZ	P
SEM Analysis	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy	J-STD-020	P
Dynamic Latch up	125C, 8.3V	P
Latch up Sensitivity	125C, ± 200mA, ± 300mA	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]	2.445 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	780,750 DHRs	0	0 .7	55	21 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 #: 052004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	15	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	COMP	15	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	10	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	COMP	10	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	COMP	10	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	500	256	0	
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	1000	256	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	500	256	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	1000	254	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	500	252	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	1000	252	0	
STRESS: ENDURANCE							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	45	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	9	0	
CY8C21534 (8C21534A)	4516674	610522255	TAIWAN-T	COMP	9	0	
CY8C21534 (8C21534A)	4517851	610522404	TAIWAN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	9	0	
CY8C21534 (8C21534A)	4516674	610522255	TAIWAN-T	COMP	9	0	
CY8C21534 (8C21534A)	4517851	610522404	TAIWAN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	3	0	
CY8C21534 (8C21534A)	4516674	610522255	TAIWAN-T	COMP	3	0	
CY8C21534 (8C21534A)	4517851	610522404	TAIWAN-T	COMP	3	0	

Reliability Test Data

QTP #: 052004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	120	1002	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	120	1002	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	120	1002	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5.5V, Vcc Max)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	750	235	0	
CY8C21534 (8C21534A)	4517851	610522404	TAIWAN-T	750	235	0	
CY8C21534 (8C21534A)	4516674	610522255	TAIWAN-T	750	235	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	168	76	0	
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	336	76	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C21234 (8C21234A)	4516647	610527569	PHIL-M	128	49	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	128	44	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	128	44	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 5.5V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	500	45	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	168	45	0	
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	336	45	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	168	45	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	336	45	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	168	45	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	336	45	0	
STRESS: STATIC LATCH-UP TESTING (125C, 11V, ±300mA)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	3	0	
CY8C21534 (8C21534A)	4516674	610522255	TAIWAN-T	COMP	3	0	
CY8C21534 (8C21534A)	4517851	610522404	TAIWAN-T	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (8.3V)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	COMP	3	0	

Reliability Test Data

QTP #: 052004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	300	50	0	
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	500	50	0	
CY8C21534 (8C21534A)	4516647	610521157	TAIWAN-T	1000	50	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	300	45	0	
CY8C21234 (8C21234A)	4516674	610521849	PHIL-M	1000	45	0	
CY8C21234 (8C21234A)	4517851	610522407	PHIL-M	300	45	0	

Reliability Test Data

QTP #: 060201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD ACOUSTIC, MSL3							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	COMP	15	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	COMP	15	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	COMP	15	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21434 (8C29466A)	4547386	610608768	PHIL-M	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-E, (2,200V)							
CY8C21434 (8C29466A)	4547386	610608768	PHIL-M	COMP	8	0	
STRESS: NVM ENDURANCE / DATA RETENTION TEST							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	1008	79	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	1008	78	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	1008	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 5.5V, Vcc Max							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	48	815	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	48	815	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	48	815	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 5.5V, Vcc Max							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	1000	84	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	1000	84	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	1000	84	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	96	80	0	
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	168	80	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	96	79	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	168	79	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	96	76	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	168	76	0	

Reliability Test Data

QTP #: 060201

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 5.25V, PRE COND 192 HR 30C/60%RH, MSL3							
CY8C29466 (8C29466A)	4547386	610608768	PHIL-M	128	80	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	96	78	0	
CY8C29466 (8C29466A)	4548960	610608766	PHIL-M	128	78	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	96	78	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	128	78	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY8C29466 (8C29466A)	4547386	*610608768*	PHIL-M	500	80	0	
CY8C29466 (8C29466A)	4547386	*610608768*	PHIL-M	1000	75	0	
CY8C29466 (8C29466A)	4548960	*610608766*	PHIL-M	500	80	0	
CY8C29466 (8C29466A)	4548960	*610608766*	PHIL-M	1000	79	0	
CY8C29466 (8C29466A)	4549207	610610435	PHIL-M	1000	80	0	
STRESS: STATIC LATCH-UP TESTING (125C, 8.50V, ±200mA)							
CY8C21434 (8C29466A)	4547386	610608768	PHIL-M	COMP	3	0	

Reliability Test Data

QTP #: 080703

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: E-TEST							
CY8C29666 (8C29666A)	4749916	610809099	CML-R				COMPARABLE
CY8C29466A (8C29466A)	4749916	610809465	PHIL-M				COMPARABLE
STRESS: SORT YIELD							
CY8C29666 (8C29666A)	4749916	610809099	CML-R				COMPARABLE
CY8C29466A (8C29466A)	4749916	610809465	PHIL-M				COMPARABLE

Reliability Test Data

QTP #: 082009

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 250V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-CHARGE DEVICE MODEL, 750V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ENDURANCE							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		1008	80	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 500V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 1000V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 1500V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 2000V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 4000V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22-A114-B, 6000V							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0
STRESS: E-TEST DISTRIBUTION							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	30	0
STRESS: E-TEST YIELD							
CY8C29466 (8A29466A)	4824302	N/A	N/A		COMPARABLE		
STRESS: SORT YIELD							
CY8C29466 (8A29466A)	4824302	N/A	N/A		COMPARABLE		
STRESS: STATIC LATCH-UP TESTING, 125C, 7.88V, +/200mA							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	6	0
STRESS: STATIC LATCH-UP TESTING, 125C, 8.66V, +/240mA							
CY8C29466 (8A29466A)	4824302	610837905	PHIL-M		COMP	3	0

Document History Page

Document Title: QTP#060201 : PSoC TM Mixed Signal Array Hydra Device Family S4AD-5 Technology, Fab4
Document Number: 001-87727

Rev.	ECN No.	Orig. of Change	Description of Change
**	4011453	ILZ	Initial Spec Release Qualification report published on Cypress.com is documented on memo HGA-650 and not in spec format. Initiated spec for QTP 060201 and data from HGA-650 was transferred to qualification report spec template

Distribution: WEB

Posting: None