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Cypress Semiconductor
Product Qualification Report

QTP# 151005 VERSION *A
October 2015

PSoC ™ RADON DEVICE FAMILY S4AD-5 TECHNOLOGY, HHGrace FAB5	
CY8C24794	Mixed Signal Array with On-Chip Controller
CY8C24894	

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 HHGrace using PSoC Device Product Family on S4AD-5 Technology	Aug 06
151005	Qualify Mask Change on Radon for Industrial on S4AD-5 Technology, HHGrace (Fab5)	July 2015

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Mask Change on Radon for Industrial on S4AD-5 Technology, HHGrace	
Marketing Part #:	CY8C24794, CY8C24894
Device Description:	3.3V and 5V Industrial 24Mhz Programmable System on Chip
Cypress Division:	Cypress Semiconductor - Consumer and Computation Division

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_3N_4
Generic Process Technology/Design Rule (□-drawn):			Single Poly, Double Metal, 0.35 □m
Gate Oxide Material/Thickness (MOS):			SiO_2 / 110A
Name/Location of Die Fab (prime) Facility:			HHGrace /Shanghai-China
Die Fab Line ID/Wafer Process ID:			S4AD-5

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
56-Lead QFN	**ASE-G, CML-RA**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LT56B
Package Outline, Type, or Name:	56-Lead QFN
Mold Compound Name/Manufacturer:	GE-7470LA / NITTO
Mold Compound Flammability Rating:	UL-94 V-O
Lead Frame Material:	Copper based – CDA 194 Full Hard
Lead Finish:	NiPdAu
Die Attach Method:	Epoxy, QMI 519
Bond Diagram Designation:	001-53905
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 0.8mil
Thermal Resistance Theta JA °C/W:	22°C/W
Package Outline Drawing:	001-53450
Assembly Process Flow:	11-21099M
Name/Location of Assembly (prime) facility:	CML - RA
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-RA
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=5.5V, 125C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125C	P
High Temperature Steady State life	125C, 5.5V, Vcc Max	P
Low Temperature Operating Life	-40C, 6.5V JESD22-A108	P
High Accelerated Saturation Test (HAST)	130C, 5.25V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260C+0, -5C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65C to 150C Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260C+0, -5C	P
Pressure Cooker	121C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260C+0, -5C	P
Acoustic Microscopy	J-STD-020	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150C,No Bias	P
Dynamic Latch-up	125C, 8.5V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1,100V/ 2,200V / 3,300V JESD22, Method A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V / 1000V / 1,250V JESD22-C101	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Static Latch-up	125C, 200mA	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]	1,508 Devices	0	N/A	N/A	0 PPM [1]
High Temperature Operating Life[1, 2] Long Term Failure Rate	720,000DHRs	0	0 .7	55	23 FIT [2]

[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.

[1] Early Failure Rate was computed from QTP# 151005
[2] Long Term Failure Rate was computed from QTP#060605 LFR Data.

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	1800		
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 #: 151005

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	9	0	
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	8	0	
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
STRESS: HIGH TEMPERATURE OPERATING LIFE- EARLY FAILURE RATE – 96hrs, 125C							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	96	1508	0	
STRESS: STATIC LATCH-UP TESTING, (+/-140mA 85C)							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, (+/-200mA 85C)							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, (+/-140mA 125C)							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-40C, 6.5V, 380HRS)							
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	160	75	0	
CY8C24894 (8C24895DK)	5515003	611516766	CML-RA	380	75	0	
CY8C24894 (8C24895DK)	5515003	611516767	CML-RA	160	75	0	
CY8C24894 (8C24895DK)	5515003	611516767	CML-RA	380	75	0	
CY8C24894 (8C24895DK)	5515003	611516768	CML-RA	160	200	0	
CY8C24894 (8C24895DK)	5515003	611516768	CML-RA	380	200	0	

Document History Page

Document Title: QTP#151005: PSOC TM RADON DEVICE FAMILY "CY8C24794, CY8C24894", S4AD TECHNOLOGY FAB 5
Document Number: 002-00195

Rev.	ECN No.	Orig. of Change	Description of Change
**	4889514	HSTO	Initial Spec Release
*A	4945219	HSTO	Replaced “GSMC” word with “HHGrace”