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Cypress Semiconductor
Product Qualification Report

QTP# 151003 VERSION *A
September 2015

PSoC ™ RADON DEVICE FAMILY S4AD-5 TECHNOLOGY, FAB 4	
CY8C24794 CY8C24894	Mixed Signal Array with On-Chip Controller

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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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
053603	PSoC 8C24x94 Radon Device Product Family on S4AD-5 Technology, Fab4	Sep 05
073706	Minor Changes to Metal 2 (MM2) masks on Radon Device (8C24X94AC) on S4AD-5 Technology, Fab 4	Jan 08
081904	Qualify new Mask (MM2, Vneg Cut) on Radon for Industrial on S4AD-5 Technology, Fab4	Jun 08
151003	Qualify Mask Change on Radon for Industrial on S4AD-5 Technology, CMI (Fab4)	Jul 2015

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: Qualify New Device CY8C24x94 Radon Product Family in S4D-5 in Fab 4		
Marketing Part #:	CY8C24794, CY8C24894	
Device Description:	3.3V and 5V Industrial 24Mhz Programmable System on Chip available in 56-Lead QFN	
Cypress Division:	Consumer and Computation Division	
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. A
What ID markings on Die:	8C24094A	

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al /300A TiW Metal 2: 500A Ti/8,000A Al /300A TiW
Passivation Type and Materials:			7,000A TEOS/6,000A Si_3N_4
Free Phosphorus contents in top glass layer (%):			0%
Number of Transistors in Device:			150,000
Number of Gates in Device			25,000
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 – Minnesota
Die Fab Line ID/Wafer Process ID:			Fab 4, S4AD-5, SONOS

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, KYEC-TAIWAN
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, 125°C JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C JESD22-A108	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-883, 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 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 JESD22-A117 and JESD22-A103	P
High Temperature Steady State life	125°C, 5.5V, Vcc Max JESD22-A108	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	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
Low Temperature Operating Life	-40C, 6.5V JESD22-A108	P
Acoustic Microscopy	J-STD-020 JESD22-A117 and JESD22-A103	P
Dynamic Latch up	In accordance with JESD78	P
Static Latch-up	125C, 200mA In accordance with JEDEC 17	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]	1,497 Devices	0	N/A	N/A	0 PPM [1]
High Temperature Operating Life[1, 2] Long Term Failure Rate	528,750 DHRs	0	0 .7	55	31 FIT [2]

[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

[1] Early Failure Rate was computed from QTP# 151003
[2] Long Term Failure Rate was computed from QTP#052004 and 053603 LFR Data.

Reliability Test Data

QTP #: 052004

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL1							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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*	TAIWN-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*	TAIWN-T	500	256	0	
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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*	TAIWN-T	COMP	45	0	
STRESS : ESD-CHARGE DEVICE MODEL, (500V)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	COMP	9	0	
CY8C21534 (8C21534A)	4516674	*610522255*	TAIWN-T	COMP	9	0	
CY8C21534 (8C21534A)	4517851	*610522404*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, (2,200V)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	COMP	9	0	
CY8C21534 (8C21534A)	4516674	*610522255*	TAIWN-T	COMP	9	0	
CY8C21534 (8C21534A)	4517851	*610522404*	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, (2,200V)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	COMP	3	0	
CY8C21534 (8C21534A)	4516674	*610522255*	TAIWN-T	COMP	3	0	
CY8C21534 (8C21534A)	4517851	*610522404*	TAIWN-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*	TAIWN-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*	TAIWN-T	750	235	0	
CY8C21534 (8C21534A)	4517851	*610522404*	TAIWN-T	750	235	0	
CY8C21534 (8C21534A)	4516674	*610522255*	TAIWN-T	750	235	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.5V)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	168	76	0	
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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*	TAIWN-T	500	45	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 168 HR 85C/85%RH (MSL1)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	168	45	0	
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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*	TAIWN-T	COMP	3	0	
CY8C21534 (8C21534A)	4516674	*610522255*	TAIWN-T	COMP	3	0	
CY8C21534 (8C21534A)	4517851	*610522404*	TAIWN-T	COMP	3	0	
STRESS: DYNAMIC LATCH-UP (8.3V)							
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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*	TAIWN-T	300	50	0	
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-T	500	50	0	
CY8C21534 (8C21534A)	4516647	*610521157*	TAIWN-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 #: 053603

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							
CY8C24494 (8C24494A)	4529648	*610537024*	TAIWN-T	96	1029	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 5.5V, Vcc Max							
CY8C24494 (8C24494A)	4529648	*610537024*	TAIWN-T	1024	177	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 168 HRS 85C/85%RH (MSL1)							
CY8C24494 (8C24494A)	4529648	*610537024*	TAIWN-T	500	44	0	
CY8C24494 (8C24494A)	4529648	*610537024*	TAIWN-T	1000	44	0	

Reliability Test Data

QTP #: 073706

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: SORT YIELD							
CY8C24494 (8C24494A)	4730443			COMP		COMPARABLE	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C24494 (8C24494A)	4730443	610757002	TWN-T	500	43	0	
CY8C24494 (8C24494A)	4730443	610757002	TWN-T	1000	43	0	
CY8C24494 (8C24494A)	4730443	610757003	TWN-T	500	42	0	
CY8C24494 (8C24494A)	4730443	610757003	TWN-T	1000	42	0	
CY8C24494 (8C24494A)	4730443	610760988	TWN-T	500	80	0	
CY8C24494 (8C24494A)	4730443	610760988	TWN-T	1000	80	0	
STRESS: ENDURANCE							
CY8C24494 (8C24494A)	4730443	610757002	TWN-T	COMP	40	0	
CY8C24494 (8C24494A)	4730443	610757003	TWN-T	COMP	44	0	
CY8C24494 (8C24494A)	4730443	610760988	TWN-T	COMP	79	0	
STRESS: ETEST YIELD							
CY8C24494 (8C24494A)	4730443			COMP		COMPARABLE	

Reliability Test Data

QTP #: 151003

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	500	9	0	
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	1000	3	0	
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	1250	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	1100	3	0	
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	2200	8	0	
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	3300	3	0	
STRESS: HIGH TEMPERATURE OPERATING LIFE- EARLY FAILURE RATE							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	96	1497	0	
STRESS: STATIC LATCH-UP TESTING, (+/-140mA 85C)							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, (+/-200mA 85C)							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, (+/-140mA 125C)							
CY8C24894 (8C24894CC)	4512896	611515053	CML-RA	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-40C, 6.5V)							
CY8C24894 (8C24894CC)	4512896	611515052	CML-RA	240	200	0	
CY8C24894 (8C24894CC)	4512896	611515052	CML-RA	380	200	0	
CY8C24894 (8C24894CC)	4512896	611515052	CML-RA	500	200	0	
CY8C24894 (8C24894CC)	4512896	611515058	CML-RA	240	75	0	
CY8C24894 (8C24894CC)	4512896	611515058	CML-RA	380	75	0	
CY8C24894 (8C24894CC)	4512896	611515058	CML-RA	500	75	0	
CY8C24894 (8C24894CC)	4512896	611515051	CML-RA	240	75	0	
CY8C24894 (8C24894CC)	4512896	611515051	CML-RA	380	75	0	
CY8C24894 (8C24894CC)	4512896	611515051	CML-RA	500	75	0	

Document History Page

Document Title: QTP#151003: PSOC TM RADON DEVICE FAMILY "CY8C24794, CY8C24894" S4AD-5 TECHNOLOGY, FAB 4
Document Number: 002-00194

Rev.	ECN No.	Orig. of Change	Description of Change
**	4889514	HSTO	Initial Spec Release
*A	4932493	HSTO	Updated Static Latch-up Sensitivity condition on Reliability Test Performed per Specification table