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Cypress Semiconductor Product Qualification Report

QTP# 021507 VERSION*A
December 2015

Failsafe Device Family & Options	
S4AD-5 SONOS Technology, Fab 2	
CY26049-1/3/4/5	Failsafe™ Communications Clock Generator
CY26049-36	Failsafe™ PacketClock™ Global Communications Clocks
CY23FP12	200-MHz Field Programmable Zero Delay Buffer
CY23FS04 CY23FS08	Failsafe™ 2.5V/3.3V Zero Delay Buffer

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date Comp
010702	New Technology S4AD-5 / New Product, Programmable Clock Generator, CY2414ZC, and its product family.	April 01
021506	New product CY2308A*, CY2309A*, CY23FP12* Programmable Zero Delay Buffer	Sept 02
021507	Failsafe Device family and options Qual using S4AD-5 (SONOS), Fab2	Jan 03

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify new products CY26049*, CY23FS* using Technology S4AD-5, Fab 2	
Marketing Part #:	CY26049*, CY23FS*
Device Description:	2.5V/3.3V, Commercial, available in 16-lead TSSOP and 28-lead SSOP package respectively
Cypress Division:	Cypress Semiconductor Corporation – Memory Products Division (MPD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C80501A

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5	
Number of Metal Layers:	2
Metal Composition:	Metal 1: 500Å Ti/6,000Å Al 0.5% Cu /1,200Å TiW Metal 2: 500Å Ti/8,000Å Al 0.5% Cu/300Å TiW
Passivation Type and Materials:	3,000Å TeOs / 6,000Å Si ₃ N ₄
Free Phosphorus contents in top glass layer(%):	0%
Number of Transistors in Device:	93,000
Number of Gates in Device	23,000
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Single Poly, Double Metal, 0.5 μm
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 110Å
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – CTI Round Rock, TX
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5 (SONOS), R42D-5 derivative w/ 6 additional mask

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
28-lead SSOP	OSE Taiwan (TAIWN-T)
16-lead TSSOP	OSE Taiwan (TAIWN-T)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OSE-Taiwan (28-ld SSOP), Cypress PHIL (16-ld TSSOP)
Fault Coverage:	100%

Note: Please contact a Cypress Representative for other packages availability

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

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 JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C JESD22-A108	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Temperature Cycle	MIL-STD-883, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85°C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Data Retention	150°C ± 5°C no bias	P
High Temperature Steady State life	JESD22-A108: 150°C, 3.63V, Vcc Max	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V 2,000V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Age Bond Strength	200°C, 4hrs MIL-STD-883, Method 883-2011	P
Low Temperature Operating Life	-30°C, 4.3V, 8MHZ	P
Current Density	Meets the Technology Device Level Reliability Specifications	P
Endurance Test	MIL-STD-883, Method 883-1033	P
SEM Analysis	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy, MSL 1	J-STD-020	P
Latchup Sensitivity	125°C, 10V, ± 300mA 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 ⁴
High Temperature Operating Life Early Failure Rate	2,011	1	N/A	N/A	497 PPM
High Temperature Operating Life Early Failure Rate	3,014	1	N/A	N/A	332 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	250,500 DHRs	0	0.7	170	22 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.

⁴ FIT Rate based on QTP #021506 and QTP #010702.



Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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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	
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STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V

CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	48	0	
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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, 2,000V							
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	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: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 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	
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	



Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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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 COND 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	

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 #: 021506

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V, Vcc Max

CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	48	2013	1	UNKNOWN
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max

CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	80	141	0	
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CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	500	141	0	
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STRESS: ESD-CHARGE DEVICE MODEL, 500V

CY2308A* (7C80502A)	2219256	610223702	TAIWN-T	COMP	9	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V

CY23FP12* (7C80504A)	2219256	610229615	TAIWN-T	COMP	9	0	
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STRESS: STATIC LATCH-UP TESTING, 125C, 10V, $\pm 300mA$

CY2308A* (7C80502A)	2219256	610228189	TAIWN-T	COMP	3	0	
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STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HR 85C/85%RH, MSL1

CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	168	48	0	
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STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH, MSL1

CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	300	48	0	
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CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	500	48	0	
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CY23FP12* (7C80504A)	2219256	610226430	TAIWN-T	1000	48	0	
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Reliability Test Data

QTP #: 021507

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY26049ZC (7C826049A)	2219256	610243674/6102	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY26049ZC (7C826049A)	2219256	610243674/6102	TAIWN-T	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, $\pm 300mA$							
CY26049ZC (7C826049A)	2219256	610243674/6102	TAIWN-T	COMP	3	0	



Document History Page

Document Title: QTP 021507: FAILSAFE DEVICE FAMILY & OPTIONS, S4AD-5 SONOS TECHNOLOGY, FAB 2
Document Number: 001-84621

Rev.	ECN No.	Orig. of Change	Description of Change
**	3810582	NSR	Initial Spec Release.
*A	5033738	JYF MEL	Sunset review: Updated QTP title page for template alignment. Removed "Distribution: WEB" and "Posting: NONE" from the document history page.