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Cypress Semiconductor
Product Qualification Report

QTP# 082406 VERSION*B
May 2015

Programmable Clock Device Family S4AD-5 Technology, GSMC	
CY22388 **CY22389** **CY22391** **CY24745** **CY24378** **CY24488**	**Factory Programmable Quad PLL Clock Generator with VCXO**

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
reliability@cypress.com or via a CYLINK CRM CASE

Prepared By:
Honesto Sintos
Reliability Engineer

Reviewed By:
Zhaomin Ji
Reliability Manager

Approved By:
Don Darling
Reliability Director

PACKAGE/PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
060605	Qualify GSMC using PSoC Device Product Family on S4AD-5 Technology	Aug 06
082406	CY22389 (7C84980B base die) S4AD Latch Fab transfer from CTI to GSMC	July 09

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: To transfer CY22388 (7C84980B die) S4AD Latch Fab from CTI to GSMC	
Marketing Part #:	CY22388, CY22389, CY22391, CY24745, CY24378, CY24488
Device Description:	7C84980B is a 4 PLL, VCXO, programmable clock, S4AD Latch Die
Cypress Division:	Cypress Semiconductor – Data Communication 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 Si3N4
Generic Process Technology/Design Rule (µ-			Single Poly, Double Metal, 0.35 µm
Gate Oxide Material/Thickness (MOS):			SiO_2 / 70A
Name/Location of Die Fab (prime) Facility:			GSMC/China
Die Fab Line ID/Wafer Process ID:			Fab-5, S4AD-LATCH SONOS

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
20-Lead TSSOP	OSE, TAIWAN
32-Lead QFN	CML-RA,AMKOR (P1)
20-Lead QSOP	CML
16-Lead TSSOP	CML-RA,

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION FOR THIS QUALIFICATION	
Package Designation:	ZZ20/ LT32B/SQ201/ZZ16
Package Outline, Type, or Name:	20-Lead Thin Shrunk Small Outline Package (TSSOP) 32-Lead Quad Flat No-Lead Package (QFN) 20-Lead Quarter SOIC Package (QSOP) 16-Lead Thin Shrunk Small Outline Package (TSSOP)
Mold Compound Name/Manufacturer:	CEL-9200HF- Hitachi/ Sumitomo-G770H / 9200R-Hitachi/ 9200CYR-Hitachi
Mold Compound Flammability Rating:	N/A
Mold Compound Alpha Emission Rate:	<0.001(ZZ20), <0.1(LT32B), <0.01(SQ201), <0.01(ZZ16)
Oxygen Rating Index:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn/ NiPdAu/ NiPdAu/ NiPdAu/
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	100% Saw
Die Attach Supplier:	Ablestik/ QMI/ QMI/ QMI
Die Attach Material:	8340/ 519/ 509/ 509
Die Attach Method:	Epoxy
Bond Diagram Designation:	10-06878
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au/1.0mil
Thermal Resistance Theta JA °C/W:	101. 33°C/W / 50°C/W / 130°C/W / 121°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-35028M 11-20028M
Name/Location of Assembly (prime) facility:	OSE TAIWAN, CML, RA
MSL Level	3
Reflow Profile	260C

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

Note: Please contact a Cypress Representative for other package 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=5.5V, 125°C Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=5.5V, 125°C Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Temperature Steady State life	125°C, 5.5V, Vcc Max	P
Low Temperature Operating Life	-30°C, 5.5V	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** 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 Reflow	P
Pressure Cooker	121°C, 100%RH, 15 Psig Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH, 260°C Reflow	P
Acoustic Microscopy	J-STD-020	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150°C ± 5°C No Bias	P
Dynamic Latch-up	125C, 8.5V	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114	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
Static Latch-up	125C, 5.2V, 6.2V, ± 200mA/ ± 240mA JESD78	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF[3]	Failure Rate
High Temperature Operating Life Early Failure Rate[1]	1507 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1, 2] Long Term Failure Rate	726,400 DHRs	0	0 .7	55	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.

Reliability Test Data

QTP #: 060605

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	SampRej	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	180	0	
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 #: 082406

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY22389K (7C84980BK)	4835778	610844927	TAIWN-T	COMP	9	0	
CY22391K (7C84980BK)	4835778	610845257	CA	COMP	9	0	
CY24745K (7C84984BK)	4835778	610844717	CML	COMP	9	0	
CY24378K (7C84981BK)	4835778	610844928	RA	COMP	9	0	
CY24488K (7C84982BK)	4835778	610854776	RA	COMP	9	0	
STRESS: ESD-HUMAN BODY MODEL, (2,200V)							
CY22389K (7C84980BK)	4835778	610844927	TAIWN-T	COMP	8	0	
CY22391K (7C84980BK)	4835778	610845257	CA	COMP	8	0	
CY24745K (7C84984BK)	4835778	610844717	CML	COMP	8	0	
CY24378K (7C84981BK)	4835778	610844928	RA	COMP	8	0	
CY24488K (7C84982BK)	4835778	610854776	RA	COMP	8	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V, Vcc Max)							
CY22389K (7C84980BK)	4835778	610844927	TAIWN-T	48	1507	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)							
CY22389K (7C84980BK)	4835778	610844927	TAIWN-T	80	80	0	
STRESS: STATIC LATCH-UP TESTING (125C, 5.4V, +/-200mA)							
CY22389K (7C84980BK)	4835778	610844927	TAIWN-T	COMP	6	0	
CY22391K (7C84980BK)	4835778	610845257	CA	COMP	6	0	
CY24745K (7C84984BK)	4835778	610844717	CML	COMP	6	0	
CY24378K (7C84981BK)	4835778	610844928	RA	COMP	6	0	
CY24488K (7C84982BK)	4835778	610854776	RA	COMP	6	0	

Document History Page

Document Title: QTP#082406 : PROGRAMMABLE CLOCK DEVICE FAMILY, S4AD-5 TECHNOLOGY, GSMC
Document Number: 001-87439

Rev.	ECN No.	Orig. of Change	Description of Change
**	3989798	ILZ	Initial Spec Release Documented & converted Memo ZIJ-92 to qualification report spec format Removed Version 1.0 in the title page. Deleted Carsem Malaysia as Assembly site facility and replaced with qualified assembly site Amkor (P1) & CML-RA – page 3 Removed Carsem Malaysia and reference spec on package information table – page 4 Removed Cypress reference specs in the reliability tests performed table - page
*A	4369870	HSTO	Align qualification report based on the new template in the front page Deleted obsolete specs 10-06995, 10-06876 and 11-20051M in page 5.
*B	4759107	HSTO	Update reference for Reliability Director Removed obsolete spec 001-42123.

Distribution: WEB

Posting: None