

Cypress Semiconductor Product Qualification Report

QTP# 010902 VERSION 2.0
March 2005

Programmable Clock Generator Family	
S4AD-5 Technology, Fab 2	
CY22381 CY22392	Three-PLL General Purpose FLASH Programmable Clock Generator
CY22393 CY22394 CY22395	Three-PLL Serial Programmable FLASH Programmable Clock Generator

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
010702	New Technology S4AD-5 / New Product, Programmable Clock Generator Device family , CY2414ZC, and bond option.	Apr 01
010902	New Clock Device Family, CY22392 bond and program option.	Jul 01

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Clock family, Device CY22392 bond and program option, S4AD-5 Technology, Fab 2	
Marketing Part #:	CY22381, CY22392, CY22393, CY22394, CY2295
Device Description:	2.5V/3.3V, Commercial and Industrial available in 16-lead TSSOP and 8-lead SOIC package
Cypress Division:	Cypress Semiconductor Corporation – Interface Clock Division (ICD) WA
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C83900A

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:	50,000
Number of Gates in Device	2,500
Generic Process Technology/Design Rule (μ-drawn):	Single Poly, Double Metal, 0.35 μm
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 110Å
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
8-lead SOIC	OSE Philippines (PHIL-OP) / OSE Taiwan (TAIWN-T)
16-lead TSSOP	OSE Philippines (PHIL-OP) / OSE Taiwan (TAIWN-T)

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	Z1614
Package Outline, Type, or Name:	16-Lead Thin Shrunk Small Outline Package (TSSOP)
Mold Compound Name/Manufacturer:	SHINETSU KMC – 184-2
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated, 85% Sn, 15% Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablebond
Die Attach Material:	84-1LMIS
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-04233
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	92.4°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-35003M
Name/Location of Assembly (prime) facility:	OSE Taiwan (TAIWN-T)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OSE Taiwan (TAIWN-T)
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=3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	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+3IR-Reflow, 235°C+5, 0°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Data Retention	150°C ± 5°C no bias	P
High Temperature Steady State life	150°C, 3.63V, Vcc Max	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,000V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Endurance Test	MIL-STD-883, Method 883-1033	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Current Density	Cypress Spec 22-00029	P
Low Temperature Operating Life	-30C, 4.3V, 8MHZ	P
SEM Analysis	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy, Level 1	Cypress Spec. 25-00104	P
Latchup Sensitivity	± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	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 ¹	4,014 Devices	1	N/A	N/A	249 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	180,000 DHRs	0	0.7	170	30 FITs

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 EFR Failure Rate based on QTP #010902 and QTP #010702.

⁴ LFR FIT Rate based on QTP #010702

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
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: 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: 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	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 4.3V)							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	48	0	
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	

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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							
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: ENDURANCE TEST							
CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	45	0	
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							
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	

Reliability Test Data

QTP #: 010702

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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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 #: 010902

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)

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	48	1000	0	
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STRESS: ESD-CHARGE DEVICE MODEL (500V)

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	COMP	9	0	
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CY22395ZC (7C83902A)	2112738	610118536	TAIWN-T	COMP	9	0	
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CY22381SC (7C83901A)	2114955	610119928	PHIL-OP	COMP	9	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	COMP	9	0	
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CY22395ZC (7C83902A)	2112738	610118536	TAIWN-T	COMP	9	0	
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CY22381SC (7C83901A)	2114955	610119928	PHIL-OP	COMP	9	0	
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STRESS: STATIC LATCH-UP TESTING (125C, 10V, ±300mA)

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	COMP	3	0	
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STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 168 HR 85C/85%RH

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	168	59	0	
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STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH (MSL1)

CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	300	50	0	
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CY22392ZC (7C83900A)	2112738	610118519/20/21	TAIWN-T	500	50	0	
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CY22395* (7C83901A)	2114955	610119928	PHIL-OP	300	50	0	
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CY22395* (7C83901A)	2114955	610119928	PHIL-OP	500	50	0	
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