

Cypress Semiconductor Product Qualification Report

QTP# 042806 VERSION 1.0
January 2005

S4ADLATCH Technology, Fab 2	
CY5048WAF	Flash Programmable Capacitor Tuning Array Die for Crystal Oscillator

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, CY2414ZC, its product family and bond option.	Apr 01
042806	New Product, WLAN Clock Generator, CY5048WAF, S4ADLatch Technology, Fab2	Jan 05

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify New Product CY5048WAF in S4ADLatch in Fab 2	
Marketing Part #:	CY5048WAF
Device Description:	3.3V, Industrial, available in 8-lead SOIC package
Cypress Division:	Cypress Semiconductor Corporation – Timing Technology Division
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C80330A

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu /1,200A TiW Metal 2: 500A Ti/8,000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	3,000A TeOs / 6,000A Si ₃ N ₄		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	8,000		
Number of Gates in Device	2,000		
Generic Process Technology/Design Rule (μ-drawn):	Single Poly, Double Metal, 0.35 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 7A		
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	Amkor-Philippines (PHIL-M)

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	SZ0815
Package Outline, Type, or Name:	8-lead SOIC
Mold Compound Name/Manufacturer:	6600H/SUMITOMO
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Designation:	NA
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn / 0.8~1.2 uinch
Die Backside Preparation Method/Metallization:	Grinding
Die Separation Method:	Sawing
Die Attach Supplier:	Ablestik
Die Attach Material:	8290
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-06135
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	193.04°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-24026
Name/Location of Assembly (prime) facility:	AMKOR

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Washington
Fault Coverage:	95%

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 168 Hrs, 85C/85%RH+3IR-Reflow, 260°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 168 Hrs, 85C/85%RH+3IR-Reflow, 260°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 168 Hrs, 85C/85%RH+3IR-Reflow, 260°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 Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	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	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
High Temperature Operating Life Early Failure Rate ¹	1010 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	244,580 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.

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: 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	

Reliability Test Data

QTP #: 010702

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

CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	500	48	0	
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STRESS: ENDURANCE TEST

CY2414ZC (7C841400A)	2101502	610106170/1/2	TAIWN-T	COMP	45	0	
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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

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 #: 042806

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)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	48	1010	0	
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STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V, Vcc Max)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	80	130	0	
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CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	500	129	0	
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STRESS: ESD-CHARGE DEVICE MODEL (500V)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	COMP	9	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	COMP	3	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	COMP	9	0	
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STRESS: DATA RETENTION, PLASTIC, 150C

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	168	80	0	
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CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	500	80	0	
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CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	1000	80	0	
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STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 168 HR 85C/85%RH (MSL1)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	168	48	0	
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CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	288	48	0	
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STRESS: STATIC LATCH-UP TESTING (125C, 9V, ±300mA)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	COMP	3	0	
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STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH (MSL1)

CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	300	48	0	
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CY5048SXI (7C80330A)	2433160	610453536/7/8	PHIL-M	500	48	0	
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