

Cypress Semiconductor Product Qualification Report

QTP# 051803 VERSION 1.0
January 2006

CY28SRC04	PCI-Express Clock Generator (Four-100-MHz Differential SRC Clock)
R52T-3 Technology, Fab4	

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

Sabbas Daniel
VP Quality Engineering
(408) 943-2685

Miguel Maldonado
Principal Reliability Engineer
(408) 943-4874

TECHNOLOGY QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
024604	R52T-3 Technology Process Derivative Qual	May 03
025003	New Device A30M (CY28409) Base Die in R52T-3 Technology	June 03
051803	CY28SRC04 Rev. A, New A30M Base Option Device in R52T-3 Technology	Nov 05

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: CY28SRC04 Rev. A, New A30M Base Option Device in R52T-3 Technology	
Marketing Part #:	CY28SRC04
Device Description:	PCI-Express Clock Generator (Four 100MHz Differential SRC Clock), 3.3V available 24-Lead TSSOP
Cypress Division:	Cypress Semiconductor Corporation – Consumer & Computation Division (CCD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	CY7C8A040A

TECHNOLOGY/FAB PROCESS DESCRIPTION - R52T-3			
Number of Metal Layers:	3	Metal Composition:	Metal 1: 500Å TiW / 6000Å Al / 500Å TiW Metal 2: 500Å TiW / 6000Å Al / 500Å TiW Metal 3: 300Å Ti / 8000Å Al / 300Å TiW
Passivation Type and Materials:	1000Å SiO ₂ / 9000Å Si ₃ N ₄		
Free Phosphorus contents in top glass layer (%):	0%		
Number of Transistors in Device	44,000		
Number of Gates in Device	5,500		
Generic Process Technology/Design Rule (μ-drawn):	CMOS – Triple Metal, 0.25μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ , 55Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor -- Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R52T-3		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
24-Lead TSSOP	TAIWAN-T

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	ZZ24
Package Outline, Type, or Name:	24-Lead Thin Shrunk Small Outline Package (TSSOP)
Mold Compound Name/Manufacturer:	CEL9200HF
Mold Compound Flammability Rating:	V-0 per UL94
Oxygen Rating Index:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn
Die Backside Preparation Method/Metallization:	Backgrinding
Die Separation Method:	100% Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8340
Die Attach Method:	Epoxy Cure
Bond Diagram Designation:	10-07059
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0 mil
Thermal Resistance Theta JA °C/W:	94.59°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-35028
Name/Location of Assembly (prime) facility:	OSE-Taiwan (T)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CML-R)
Fault Coverage:	100%

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, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 3.8V, 125°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max = 3.3V, 125°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+0, -5°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
High Temperature Storage	150°C ± 5°C no bias	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 Cypress Spec. 25-00020	P
Age Bond Strength	200C, 4HRS MIL-STD-883, Method 883-2011	P
Low Temperature Operating Life	-30C, 3.8V/4.3V, 8MHZ	P
Acoustic Microscopy	Cypress Spec. 25-00104	P
Dynamic Latch-up	125C, 6V	P
Static Latch-up	125C, ± 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 AF ⁴	Failure Rate
High Temperature Operating Life Early Failure Rate	4,743 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	749,328 DHRs	0	0.7	55	22 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.

Reliability Test Data

QTP #: 024604

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-, MSL3							
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	18	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 3.8V, Vcc Max)							
CY6981-BA (7C6981A)	4147861	610221501/2/27521	TAIWN-G	96	1342	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	96	1020	0	
CY6981-BA (7C6981A)	4223346	610243127/3004/7	TAIWN-G	96	1015	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 3.8V, Vcc Max)							
CY6981-BA (7C6981A)	4147861	610221501/2	TAIWN-G	168	182	0	
CY6981-BA (7C6981A)	4147861	610221501/2	TAIWN-G	500	182	0	
CY6981-BA (7C6981A)	4147861	610221501/2	TAIWN-G	1000	182	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	168	182	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	500	182	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	1000	180	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	168	368	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	500	368	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	9	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	9	0	
ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	9	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, 10V, +/-300mA)							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	3	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	COMP	3	0	
STRESS: PRESSURE COOKER TEST, (121C, 100%RH), PRE CONDITION 192 HR 30C/60%RH, MSL3							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	168	50	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	168	48	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	288	48	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	168	48	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	288	48	0	

Reliability Test Data

QTP #: 024604

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE CONDITION 192 HRS 30C/60%RH, MSL3							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	128	50	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	128	47	0	
STRESS: TC COND. C -65C TO 150C, PRE CONDITION 192 HRS 30C/60%RH, MSL3							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	300	50	0	
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	500	50	0	
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	1000	50	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	300	48	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	500	48	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	1000	48	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	300	48	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	500	48	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	1000	48	0	

Reliability Test Data

QTP #: 025003

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL1							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	15	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	COMP	15	0	
CY28409 (7C828409A)	4239218	610303255	CML-R	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max							
CY28409 (7C828409A)	4225874	610244243	CML-R	96	1028	0	
CY28409 (7C828409A)	4249184	610308584	CML-R	96	338	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.8V, Vcc Max							
CY28409 (7C828409A)	4249184	610308584	CML-R	168	120	0	
CY6981-BA (7C6981A)	4147861	610221501/2	TAIWN-G	168	183	0	
CY6981-BA (7C6981A)	4147861	610221501/2	TAIWN-G	500	182	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	168	182	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	500	182	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 125C, 3.3V, Vcc Max							
CY28409 (7C828409A)	4225874	610244243	CML-R	168	80	0	
CY28409 (7C828409A)	4225874	610244243	CML-R	336	80	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	9	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	COMP	9	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	9	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	COMP	9	0	
STRESS: DYNAMIC LATCH-UP TESTING, 125C, 6V							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 10V, +/-300mA)							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	3	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	COMP	3	0	

Reliability Test Data

QTP #: 025003

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: AGE BOND							
CY28409 (7C828409A)	4225874	610244243	CML-R	COMP	45	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	COMP	45	0	
STRESS: HIGH TEMPERATURE STORAGE, 150C, No Bias							
CY28409 (7C828409A)	4225874	610244243	CML-R	500	50	0	
CY28409 (7C828409A)	4225874	610244243	CML-R	1000	50	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE, -30C, 3.8V, Vcc							
CY62137V (7C62137A)	4852210	619903364	CML-R	500	45	0	
CY62137V (7C62137A)	4852210	619903364	CML-R	1000	45	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE, -30C, 4.3V, Vcc							
CY62137V (7C62137A)	4912701	619914860	CML-R	500	46	0	
CY62137V (7C62137A)	4912701	619914860	CML-R	1000	45	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE CONDITION 168 HR 85C/85%RH, MSL1							
CY28409 (7C828409A)	4225874	610244243	CML-R	128	50	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH), PRE CONDITION 168 HR 85C/85%RH, MSL1							
CY28409 (7C828409A)	4225874	610244243	CML-R	168	50	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	168	50	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	288	50	0	
STRESS: TC COND. C -65C TO 150C, PRE CONDITION 168 HR 85C/85%RH, MSL1							
CY28409 (7C828409A)	4225874	610244243	CML-R	300	50	0	
CY28409 (7C828409A)	4225874	610244243	CML-R	500	50	0	
CY28409 (7C828409A)	4225874	610244243	CML-R	1000	50	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	300	50	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	500	50	0	
CY28409 (7C828409A)	4247855	610302721	CML-R	1000	50	0	
CY28409 (7C828409A)	4239218	610303255	CML-R	300	48	0	
CY28409 (7C828409A)	4239218	610303255	CML-R	500	48	0	
CY28409 (7C828409A)	4239218	610303255	CML-R	1000	48	0	

Reliability Test Data

QTP #: 051803

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY28SRC04ZXC (7C8SRC04A)	4504233	610527215	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V							
CY28SRC04ZXC (7C8SRC04A)	4504233	610527215	TAIWN-T	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY28SRC04ZXC (7C8SRC04A)	4504233	610527215	TAIWN-T	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 9.0V, +/-300mA)							
CY28SRC04ZXC (7C8SRC04A)	4504233	610527215	TAIWN-T	COMP	3	0	