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# Cypress Semiconductor Product Qualification Report

QTP# 082506 VERSION\*B  
September 2014

<b>PCI-E Clock Family</b>	
<b>R52T-3 Technology, Fab 4</b>	
<b>CY28437</b>	<b>CLOCK GENERATOR FOR INTEL® GRANTSDALE CHIPSET</b>
<b>CY24291</b> <b>CY24292</b> <b>CY24293</b>	<b>PCI-E GENERAL CLOCKS</b>

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

Qual Report	Description of Qualification Purpose	Date Comp
024604	R52T-3 Technology Process Derivative Qual	May 03
040903	New Device B30M (CY28437) Base Die in R52T-3 Technology	Feb 05
082506	Qualification of new PCI-E Clock devices 7C8B049A and 7C8B050A - a 6-layer mask option from previously qualified B30M die	Dec 08

PCIe Clock Devices			
Mkt Part#	BE Part#	Package	Device
CY24291	7C8B3091A	48TSSOP / ZZ48	7C8B049AC
CY24292	7C8B3092A	32QFN / LQ32	7C8B049AC
CY24293	7C8B3093A	16TSSOP / ZZ16	7C8B050AC

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualification of new PCI-E Clock devices 7C8B049A and 7C8B050A - a 6-layer mask option from previously qualified B30M 6C8B001AC die – R52T-3 technology fabricated at CMI (Fab4)	
Marketing Part #	CY24291, CY24292, CY24293
Device Description:	PCI-E General Clock, 3.3V available in 48-TSSOP, 16-TSSOP, 32-QFN
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	CY7C8B049A/50A

TECHNOLOGY/FAB PROCESS DESCRIPTION R52D-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 <sub>2</sub> / 9000Å Si <sub>3</sub> N <sub>4</sub>		
Generic Process Technology/Design Rule (μ-drawn):	CMOS – Triple Metal, 0.25μm		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> , 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
48-Lead TSSOP	APPI-ANAM Manila, Philippines
16-Lead TSSOP	Cypress CML Autoline, Philippines
32-Lead QFN	Amkor Technology, Philippines

**Note:** Package Qualification details upon request

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	Various
<b>Package Outline, Type, or Name:</b>	48-TSSOP/ZZ48, 32-QFN/LQ32, 16-TSSOP/ZZ16
<b>Mold Compound Name/Manufacturer:</b>	48TSSOP : G700K 32 QFN : Nitto 7470-LA 16TSSOP : CEL9200CYR
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	20-80u NiPdAu lead finish
<b>Die Attach Material:</b>	48TSSOP : Abelstik 8290 32QFN : AMK-06 16TSSOP : QMI-509
<b>Wire Material/Size:</b>	48TSSOP & 32QFN: Au/ Diam: 0.8, 16TSSOP: Au / Diam : 0.9
<b>Name/Location of Assembly (prime) facility:</b>	48 TSSOP @M , 16TSSOP @RA , 32QFN @MB
<b>MSL:</b>	3
<b>Solder Reflow Temp:</b>	260C

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	48 TSSOP and 32 QFN – Cypress CML-R, KYEC 16 TSSOP – Cypress CML-RA, KYEC, KYEC

## 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 Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+0, -5°C 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+0, -5°C 168 Hrs, 85C/85%RH+3IR-Reflow, 260°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	3,300V JESD22, Method A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V JESD22-C101	P
Electrostatic Discharge Machine Model (ESD-MM)	200V	P
Acoustic Microscopy, MSL 3	J-STD-020	P
Static Latch-up	6.5V, ± 240mA, 125°C, EIA/JESD78	P

## RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF <sup>4</sup>	Failure Rate <sup>5</sup>
High Temperature Operating Life Early Failure Rate <sup>1</sup>	1,000 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>2,3</sup> Long Term Failure Rate	547,000 DHRs	0	0.7	55	30 FIT

<sup>1</sup> A production burn-in of 24 Hrs at 150°C, 4.5V is required for the product.

<sup>2</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>3</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>4</sup> 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 =  $8.62 \times 10^{-5}$  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**

<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>
<b>STRESS: ACOUSTIC, MSL3</b>							
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	18	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125, 3.8V, Vcc Max)</b>							
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	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 3.8V, Vcc Max)</b>							
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	610243127/3004/7	TAIWN-G	168	82	0	
CY6981-BA (7C6981A)	4223346	610243127/3004/7	TAIWN-G	500	82	0	
CY6981-BA (7C6981A)	4223346	610243127/3004/7	TAIWN-G	1000	80	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	168	368	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	500	368	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, (500V)</b>							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	9	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)</b>							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	9	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	COMP	9	0	
<b>STRESS: STATIC LATCH-UP (125C, 10V, +/-300mA)</b>							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	COMP	3	0	
CY6981-BA (7C6981A)	4238026	610250542	TAIWN-G	COMP	3	0	
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)</b>							
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	

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## Reliability Test Data

**QTP #: 024604**

<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>
<b>STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR 30C/60%RH (MSL3)</b>							
CY6981-BA (7C6981A)	4147861	610221501/2/2752	TAIWN-G	128	50	0	
CY6981-BA (7C6981A)	4223346	610243127/3004	TAIWN-G	128	47	0	
<b>STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)</b>							
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 #: 040903**

<b>Device</b>	<b>Fab Lot #</b>	<b>Assy Lot #</b>	<b>Assy Loc</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
<b>STRESS: ESD-CHARGE DEVICE MODEL, (500V)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2200V</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	COMP	3	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125, 3.8V, Vcc Max)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	96	442	0	
CY28437OXCT(7C828437A)	4444247	610463737	CML-R	96	260	0	
CY28437OXCT(7C828437A)	4444247	610463736	CML-R	96	298	0	
<b>STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	168	45	0	
<b>STRESS: STATIC LATCH-UP (125C, 8.48V, +/-300mA)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	COMP	3	0	
<b>STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)</b>							
CY28437OXCT(7C828437A)	4444247	610463705	CML-R	300	45	0	

## Reliability Test Data

**QTP #: 082506**

<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>
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2200V</b>							
CY24291ZXI	4820920	610847319	M	COMP	8	0	
CY24292ZXI	4820920	610849226	MB	COMP	8	0	
CY24293ZXI	4820920	610848451	RA	COMP	8	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 3300V</b>							
CY24291ZXI	4820920	610847319	M	COMP	3	0	
CY24292ZXI	4820920	610849226	MB	COMP	3	0	
CY24293ZXI	4820920	610848451	RA	COMP	3	0	
<b>STRESS: STATIC LATCH-UP TESTING , 125C, 5.4V, ±200mA</b>							
CY24291ZXI	4820920	610847319	M	COMP	6	0	
CY24292ZXI	4820920	610849226	MB	COMP	6	0	
CY24293ZXI	4820920	610848451	RA	COMP	6	0	
<b>STRESS: STATIC LATCH-UP TESTING , 125C, 6.5V, ±240mA</b>							
CY24291ZXI	4820920	610847319	M	COMP	3	0	
CY24292ZXI	4820920	610849226	MB	COMP	3	0	
CY24293ZXI	4820920	610848451	RA	COMP	3	0	
<b>STRESS: ESD-MACHINE MODEL, 200V</b>							
CY24293ZXI	4134252	611212494	CML-RA	COMP	5	0	



## Document History Page

Document Title: QTP 082506: PCI-E CLOCK FAMILY, R52T-3 TECHNOLOGY, FAB 4  
Document Number: 001-82813

Rev.	ECN No.	Orig. of Change	Description of Change
**	3742756	NSR	Initial Spec Release. The previous version of this qual report is posted in memo ZIJ-67. Changes to ZIJ-67: <ul style="list-style-type: none"><li>- Update Version 1.0 to 2.0 in the Title page.</li><li>- Re-arrange the Title in the front page.</li><li>- Change product Division from DCD to MPD</li><li>- Removed the reference Cypress specs in the reliability tests performed table and replaced with industry standards.</li><li>- Added ESD Machine Model (MM) data.</li></ul>
*A	4127178	HSTO	Sunset Review Deleted "Version 2.0" in the Title page. Updated test location facility based on current qualified test site
*B	4507404	HSTO	Align qualification report based on the new template in the front page

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