

# Cypress Semiconductor Product Qualification Report

QTP# 060703 VERSION 1.0  
June 2006

<b>CY28451-2</b>	<b>Clock Generator for Intel® Lakeport Chipset</b>
<b>R52T-3 Technology, Fab4</b>	

## **CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

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### TECHNOLOGY QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
024604	R52T-3 Technology Process Derivative Qual	May 03
040903	New Device B30M (CY28437) Base Die in R52T-3 Technology	Feb 05
060703	CY28451-2 Rev. B Mask/Bond Option from qualified B30M Base Die in R52T-3 Technology	May 06

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: CY28451-2 Rev. B Mask/Bond Option from qualified B30M Base Die in R52T-3 Technology	
Marketing Part #:	CY28451-2
Device Description:	3.3V, Clock Generator for Intel® Lakeport Chipset available in 56-Pin SSOP/TSSOP
Cypress Division:	Cypress Semiconductor Corporation –Consumer & Computation Division (CCD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. B
What ID markings on Die:	CY7C8B008A

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - R52T-3</b>			
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>		
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 <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**

<b>PACKAGE</b>	<b>ASSEMBLY SITE FACILITY</b>
<b>56-Pin SSOP/TSSOP</b>	<b>CML-R</b>

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	SP56
<b>Package Outline, Type, or Name:</b>	56-Pin Shrunk Small Outline Packages
<b>Mold Compound Name/Manufacturer:</b>	Nitto-MP8500
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	NA
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	NiPdAu
<b>Die Backside Preparation Method/Metallization:</b>	Backgrind
<b>Die Separation Method:</b>	100% Saw
<b>Die Attach Supplier:</b>	Dexter
<b>Die Attach Material:</b>	QMI 509
<b>Die Attach Method:</b>	Epoxy Cure
<b>Bond Diagram Designation</b>	001-03894
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Au. 0.8mil
<b>Thermal Resistance Theta JA °C/W:</b>	71.6°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	11-20048
<b>Name/Location of Assembly (prime) facility:</b>	CML-R
<b>Moisture Level/Profile</b>	<b>MSL3/260C</b>

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	CML-R
<b>Fault Coverage:</b>	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 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	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
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
Acoustic Microscopy	Cypress Spec. 25-00104	P
Static Latch-up	125C, ± 200mA/± 300mA Cypress Spec. 01-00081	P

**RELIABILITY FAILURE RATE SUMMARY**

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF <sup>4</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate	4,377 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	547,000 DHRs	0	0.7	55	30 FITs

<sup>1</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>2</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>3</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

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
<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 (125C, 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	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	
<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>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 TESTING (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), 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	

## 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, 2,200V</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, 125C, 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), PRE COND 168 HR 85C/85%RH, MSL1</b>							
CY28437OXCT (7C828437A)	4444247	610463705	CML-R	168	45	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 8.48V, +/-300mA)</b>							
CY28437OXCT (7C828437A)	4444247	610463705	CML-R	COMP	3	0	
<b>STRESS: TC COND. C -65C TO 150C, PRE COND 168 HR 85C/85%RH, MSL1</b>							
CY28437OXCT (7C828437A)	4444247	610463705	CML-R	300	45	0	

## Reliability Test Data

QTP #: 060703

<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>							
CY28451OXC (7C884512B)	4536027	610600609	CML-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V</b>							
CY28451OXC (7C884512B)	4536027	610600609	CML-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V</b>							
CY28451OXC (7C884512B)	4536027	610600609	CML-R	COMP	3	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 6.5V, +/-200mA)</b>							
CY28451OXC (7C884512B)	4536027	610600609	CML-R	COMP	3	0	