

Cypress Semiconductor Technology Transfer Qualification Report

QTP# 002202 VERSION*B
October 2014

Robo Clock II™ High-Speed Multi-Phase PLL Clock	
B53D-3 Technology, Fab 4	
CY7B993V	12 – 100 MHZ
CY7B994V	24 – 200 MHZ

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

QTP Number	Description of Qualification Purpose	Date
99256	New Technology B53D-3, Fab1 / CY7B993V / CY7B994V (for reference only)	Aug 00
002202	Technology transfer from Fab1 to Fab4 using CY7B993V / CY7B994V	Mar 01



PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Technology B53D in Fab 4 using CY7B993V/CY7B994V.	
Marketing Part #:	CY7B993V/CY7B994V
Device Description:	3.3V, Commercial and Industrial, available in 100-pin TQFP and 100-ball BGA Package.
Cypress Division:	Cypress Semiconductor Corporation – Memory Product Division (MPD)
Overall Die (or Mask) REV:	Rev. A
What ID markings on Die:	7B993A

TECHNOLOGY/FAB PROCESS DESCRIPTION	
Number of Metal Layers:	2
Metal Composition:	Metal 1: 500A TiW+6,000A Al/0.5%Cu/300A TiW Metal 2: 300A TiW+8,000A Al/0.5%Cu/300A TiW
Passivation Type and Materials:	1,000A TEOS + 9,000A SiN
Free Phosphorus contents in top glass layer(%):	0%
Die Coating(s), if used:	N/A
Number of Transistors:	15,000
Number of Gates:	3,750
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal/0.25 μm
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/B53D-3

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
100-ball FBGA	TAIWN-G
100-pin TQFP	TAIWN-G

Note: **Package Qualification details upon request.**

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A100
Package Outline, Type, or Name:	100-pin Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Hitachi CEL9200
Mold Compound Flammability Rating:	V-O per UL 94
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:	Ablebond 8361H
Die Attach Method:	Epoxy
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0um
Thermal Resistance Theta JA °C/W:	46.7°C/W
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	ASE Taiwan (TAIWN-G)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	ASE Taiwan (TAIWN-G)
Fault Coverage:	100%

Note: Please contact a Cypress Representative for other package availability.

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure	Dynamic Operating Condition, Vcc = 4.0V, 125°C, JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 4.0V, 125°C JESD22-A108	P
High Temp Steady State Life Test	Static Operating Condition, Vcc = 3.63V, 125°C JESD22-A108	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 85%RH, 3.63V MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	JESD22-C101	P
Age Bond Strength	MIL-STD-883C, Method 2011	P
High Temperature Storage	JESD22-A103: 150°C, no bias	P
Bond Pull Test	MIL-STD-883 – Method 2011	P
Low Temperature Operating Life	-30°C, 4.3V, JESD22-A108	P
Current Density	Meets the Technology Device Level Reliability Specifications	P
Acoustic Microscopy, MSL 3	J-STD-020	P
Dynamic Latchup Sensitivity	In accordance with JEDEC 17	P
Static Latchup Sensitivity	125°C, 10V, ± 300mA In accordance with JEDEC 17	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor ³	Failure Rate ⁴
High Temperature Operating Life Early Failure Rate	1,454	0	N/A	N/A	0 PPM
High Temperature Operating Life Long Term Failure Rate ^{1,2}	1,086,660 HRs	0	0.7	55	15 FIT

³ 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 Failure Rate and FIT Rate base on QTP #002202



Reliability Test Data

QTP #: 002202

<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>
STRESS: ACOUSTIC, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE – EARLY FAILURE RAT, (125C, 4.0V, >VCC MAX							
CY7B994V-AC	4030964	610042957	TAIWN-G	96	679	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	96	775	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 125C, 4.0, >Vcc Max							
CY7B994V-AC	4030964	610042957	TAIWN-G	168	330	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	1000	328	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	168	330	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	1000	239	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	2000	239	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 125C, 3.63V,>Vcc Max							
CY7B993V-AC	4021265	610036043	TAIWN-G	168	78	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	336	78	0	
STRESS: HIGH TEMP STORGAE, PLASTIC, 150C							
CY7B993V-AC	4021265	610036043	TAIWN-G	500	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	1000	48	0	
STRESS: LOW TEMPERATURE OPERATING LIKE, -30C,4.3V							
CY7B993V-AC	4021265	610036043	TAIWN-G	500	47	0	
STRESS: DYNAMIC LATCH-UP TESTING 6.79V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	3	0	



Reliability Test Data

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Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	COMP	9	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING 125C, 10V, +/-300mA							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	3	0	
CY7B994V-AC	4030965	610045835	TAIWN-G	COMP	3	0	
CY7B994V-AC	4030964	610052500	TAIWN-G	COMP	3	0	
STRESS: BOND PULL							
CY7B993V-AC	4021265	610036043	TAIWN-G	COMP	30	0	
STRESS: AGE BOND STRENGTH							
CY7B994V-AC	4030964	610052500	TAIWN-G	COMP	15	0	
CY7B994V-AC	4030965	610052501	TAIWN-G	COMP	15	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	128	46	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192HRS 30C/60%RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	168	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	168	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	168	46	0	

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Reliability Test Data

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<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>
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
CY7B993V-AC	4021265	610036043	TAIWN-G	300	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	500	48	0	
CY7B993V-AC	4021265	610036043	TAIWN-G	1000	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	300	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	500	48	0	
CY7B994V-AC	4030964	610042957	TAIWN-G	1000	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	300	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	500	48	0	
CY7B994V-AC	4030964	610045835	TAIWN-G	1000	48	0	



Document History Page

Document Title: QTP 002202: ROBO CLOCK II™ HIGH-SPEED MULTI-PHASE PLL CLOCK, B53D-3
TECHNOLOGY, FAB 4
Document Number: 001-84207

Rev.	ECN No.	Orig. of Change	Description of Change
**	3791446	NSR	Initial Spec Release.
*A	4170151	HSTO	Sunset Review Removed the reference Cypress specs in the reliability tests performed table and replace with the reference industry standards
*B	4550009	HSTO	Align qualification report based on the new template in the front page Add "TM" in the document title to align device description in front page

Distribution: WEB

Posting: None