

Cypress Semiconductor Product Qualification Report

QTP# 022202 VERSION 2.0
April 2005

Quad HotLink II Family B53D-3 Technology, Fab 4	
CYP15G0101DXA	Single Channel Hotlink II™ Transceiver
CYP15G0201DXA	Dual Hotlink II™ Transceiver
CYP15G0401DXA	Quad Hotlink II™ Transceiver
CYP15G0402DXA	Quad Hotlink II™ Serdes

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
002202	Technology transfer from Fab1 to Fab4 using CY7B993V / CY7B994V	Mar 01
011406	New Product, Quad HOTLink II family, CYP15G0401DXA/ CYP15G0402DXA	Oct 01
012603	Seven layer mask change to enhance functionality.	Feb 02
022202	New Product CYP15G0101DXA/ CYP15G0201DXA by extension	May 02

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Quad HOTLink II family in technology B53D-3, Fab4	
Marketing Part #:	CYP15G0101DXA/ CYP15G0201DXA / CYP15G0401DXA / CYP15G0402DXA
Device Description:	3.3V, Commercial and Industrial, available in 256-balls L2BGA, 100/196-balls FBGA package respectively
Cypress Division:	Cypress Semiconductor Corporation – Data Com Division (DCD)
Overall Die (or Mask) REV:	Rev. B
What ID markings on Die:	7B9294A

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%		
Number of Transistors:	362,417		
Number of Gates:	90,604		
Generic Process Technology/Design Rule (□-drawn):	CMOS, Double Metal/0.25 □m		
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
100/196	ASE Taiwan
256-ball L2BGA	TAIWN-G

Note: Package Qualification details upon request.

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 = 3.65V, 125°C Dynamic Operating Condition, Vcc = 3.8V, 125°C Dynamic Operating Condition, Vcc = 4.0V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.65V, 125°C Dynamic Operating Condition, Vcc = 3.8V, 125°C Dynamic Operating Condition, Vcc = 4.0V, 125°C	P
Long Life Verification	Dynamic Operating Condition, Vcc = 4.0V, 125°C	P
High Temp Steady State Life Test	Static Operating Condition, Vcc = 3.63V, 125°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
High Accelerated Saturation Test (HAST)	130°C 85%RH, 3.63V Precondition: JESD22 Moisture Sensitivity MSL3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1,100V, 2,200V MIL-STD-883, Method 3015	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
High Temperature Storage	150°C, no bias	P
Low Temperature Operating Life	-30°C, 4.3V	P
Age Bond Strength	MIL-STD-883C, Method 2011	P
Acoustic Microscopy, MSL 3	Cypress Spec. 25-00104	P
Dynamic Latchup Sensitivity	Cypress Spec. 25-00020	P
Static Latchup Sensitivity	125C, 10V, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor ³	Failure Rate
High Temperature Operating Life Early Failure Rate	3,675 Devices	1	N/A	N/A	272 PPM
High Temperature Operating Life Long Term Failure Rate ^{1,2}	1,645,730 HRs	0	0.7	55	10 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 #: 002202

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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 RATE, 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, 4.0V, >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	
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	

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: 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	
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	

Reliability Test Data

QTP #: 011406

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	COMP	15	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	COMP	15	0	
CYP15G0401DX -BGC (7B9294A)	4107603	610113544L1	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RATE, 125C, 3.8V, >VCC MAX							
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	96	199	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610122108S1	TAIWN-G	96	507	0	
CYP15G0401DX BGC (7B9294A)	4107603	610122107	TAIWN-G	96	508	1	BIPOLAR TRANSISTOR BREAKDOWN
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 125C, 3.8, >Vcc Max							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	168	189	0	
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	2097	146	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	168	199	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	2016	167	0	
STRESS: ESD-CDM, 500V							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	COMP	9	0	
STRESS: ESD-HBM DONE, 2,200V							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	128	49	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192HRS 30C/60%RH, MSL3							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	168	50	0	
STRESS: TC CONDITION C, -65C TO 150C, PRE COND. 192 HRS 30C/60% RH, MSL3							
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	300	50	0	
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	500	50	0	
CYP15G0401DX -BGC (7B9294A)	4048678	610111566L2	TAIWN-G	1000	50	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	300	50	0	
CYP15G0401DX BGC (7B9294A)	4106284	610113332	TAIWN-G	500	50	0	
CYP15G0401DX -BGC (7B9294A)	4106284	610113332	TAIWN-G	1000	48	0	
CYP15G0401DX -BGC (7B9294A)	4107603	610113544L1	TAIWN-G	300	50	0	

Reliability Test Data

QTP #: 012603

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE - EARLY FAILURE RATE, 125C, 3.65V, >VCC MAX							
CYP15G0401DXA -BGC (7B9294A)	4140699	610141195	TAIWN-G	96	1007	0	
STRESS: HIGH TEMP DYNAMIC OPERTING LIFE-LATENT FAILURE RATE, 125C, 3.65, >Vcc Max							
CYP15G0401DXA -BGC (7B9294A)	4140699	610141195	TAIWN-G	168	1004	0	
STRESS: ESD-CDM, 500V							
CYP15G0401DXA -BGC (7B9294A)	4140699	610141195	TAIWN-G	COMP	9	0	
STRESS: ESD-HBM DONE, 2,200V							
CYP15G0401DXA -BGC (7B9294A)	4140699	610141195	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
CYP15G0401DXA -BGC (7B9294A)	4140699	610141195	TAIWN-G	COMP	3	0	