Cypress Semiconductor
Product Qualification Report

QTP# 012906 VERSION 1.2
May, 2003

CYS25G0101DX	**Sonet C-48 Transceiver**
B53D-3 Technology, Fab 4	

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

Ed Russell
Reliability Director
(408) 432–7069

Shi-jie Wen
Reliability Engineering
(408) 943-4713

PRODUCT QALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date
002202		Technology transfer from Fab1 to Fab4 using CY7B993V / CY7B994V		Mar 01
011402		New SONET OC-48 Transceiver CYS25G0101DX		Nov 01
012906		All Layer Change		Jan 02

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: To qualify CYS25G0101DX in B53D-3Technology , Fab 4	
Marketing Part #:	CYS25G0101DX
Device Description:	3.3V, Commercial and Industrial, available in 120-lead TQFP with heatsink.
Cypress Division:	Cypress Semiconductor Corporation – Data Com Division (DCD)
Overall Die (or Mask) REV:	Rev. B
What ID markings on Die:	7B9532AC

TECHNOLOGY/FAB PROCESS DESCRIPTION – B53D-3			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A TiW/6,000A Al/0.5%Cu/300A TiW Metal 2: 300A Ti//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 in Device:	70,689		
Number of Gates in Device:	70,689		
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 Minesota		
Die Fab Line ID/Wafer Process ID:	Fab4 / B53D-3		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
120-lead TQFP with heatsink	**Anam Seoul Korea (SEOL-L)**

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	AT120
Package Outline, Type, or Name:	120-pin Thin Quad Flat Pack (TQFP) with heatsink
Mold Compound Name/Manufacturer:	Sumitomo EME7351UL
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:	Ablestik
Die Attach Material:	8361J
Bond Diagram Designation	10-03783
Wire Bond Method:	Thermosonic
Wire Material/Size:	1.0um
Thermal Resistance Theta JA °C/W:	45°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-10044
Name/Location of Assembly (prime) facility:	Anam Seoul Korea (SEOL-L)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Anam Seoul Korea (SEOL-L)
Fault Coverage:	100%

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 = 3.8V, 125° Dynamic Operating Condition, Vcc = 4.0V, 125°	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 125° Dynamic Operating Condition, Vcc = 4.0V, 125°	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 MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 235°C+5, -0°C	P
Pressure Cooker	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)	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)	500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Age Bond Strength	MIL-STD-883C, Method 2011	P
X-Ray	MIL-STD-883, Method 3012, Cypress Spec. 12-00292	P
High Temperature Storage	150°C, No Bias	P
External Visual	Cypress Spec. 12-00292	P
Physical Dimensions	Cypress Spec. 25-00031	P
Bond Pull Test	Cypress Spec. 12-00292	P
Low Temperature Operating Life	-30°C, 4.3V	P
Current Density	Cypress Spec. 22-00029	P
Acoustic Microscopy, MSL 3	Cypress Spec. 25-00104	P
Dynamic Latchup Sensitivity	Cypress Spec. 25-00020	P
Static Latchup Sensitivity	125°C, 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[54]
High Temperature Operating Life Early Failure Rate	2,026	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	1,,189,808 HRs	0	0.7	55	13 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.

---

[4] **EFR and Failure Rate based on QTP #012906, QTP #011402**
[4] **LFR FIT Rate based on QTP #011402 and QTP #002202.**

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 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

QTP #: 002202

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	

Reliability Test Data

QTP #: 002202

Device	*Fab Lot #*	*Assy Lot #*	*Assy Loc*	*Duration*	*Samp*	*Rej*	*Failure Mechanism*
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 #: 011402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CYS25G0101DX-ATC (7B9532A)	4048706	*610111752*	SEOL-L	COMP	15	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610121607*	SEOL-L	COMP	15	0	
CYS25G0101DX -ATC (7B9532A)	4048679	*610123195L1*	SEOL-L	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max							
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	96	1047	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 3.8V, Vcc Max)							
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	168	379	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	1000	366	0	
STRESS: PHYSICAL DIMENSIONS							
CYS25G0101DX -ATC (7B9532A)	4048706	*610111752*	SEOL-L	COMP	5	0	
STRESS: EXTERNAL VISUAL							
CYS25G0101DX -ATC (7B9532A)	4048706	*610111752*	SEOL-L	COMP	15	0	
STRESS: X-RAY							
CYS25G0101DX -ATC (7B9532A)	4048706	*610121607*	SEOL-L	COMP	15	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH), PRE COND 192 HR 30C/60%RH							
CYS25G0101DX -ATC (7B9532A)	4040862	*610102176*	SEOL-L	168	45	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CYS25G0101DX -ATC (7B9532A)	4048706	*610111752*	SEOL-L	300	51	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610111752*	SEOL-L	500	48	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610111752*	SEOL-L	1000	48	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	300	59	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	500	59	0	
CYS25G0101DX -ATC (7B9532A)	4048706	*610118512L1*	SEOL-L	1000	59	0	
CYS25G0101DX -ATC (7B9532A)	4048679	*610123195L1*	SEOL-L	300	59	0	
CYS25G0101DX -ATC (7B9532A)	4048679	*610123195L1*	SEOL-L	500	57	0	
CYS25G0101DX -ATC (7B9532A)	4048679	*610123195L1*	SEOL-L	1000	55	0	

Reliability Test Data

QTP #: 012906

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max							
CYS25G0101DX -ATC (7B9532B)	4146731	*610200339*	SEOL-L	96	979	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CYS25G0101DX -ATC (7B9532B)	4146731	*610200339*	SEOL-L	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 1,100V							
CYS25G0101DX -ATC (7B9532B)	4146731	*610200339*	SEOL-L	COMP	9	0	
STRESS: STATIC LATCHUP, 1215C, 10V							
CYS25G0101DX -ATC (7B9532B)	4146731	*610200339*	SEOL-L	COMP	3	0	