Cypress Semiconductor
Product Qualification Report

QTP# 014201 VERSION 1.1
May, 2003

CY7C9536 / CY7C9536A
Packet over SONET/SDH IC-POSIC™
TSMC 0.18um (T018) Technology, TSMC Fab

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
99154	New Technology TSMC 0.18um (T018) / New Device, CY39100V*, package/pin option	Sept 01
014201	New Pocket over SONET/SDH IC_POSIC™ CY7C9536 / CY7C9536A	Aug 02

Note: Cypress products are manufactured using qualified processes. The technology qualification for this product is referenced above and must be considered to get a complete and thorough evaluation of the reliability of the product.

PRODUCT DESCRIPTION (for qualification)		
Qualification Purpose: Qualify new Pocket over SONET/SDH IC_POSIC™ CY7C9536 / CY7C9536A in technology TSMC 0.18um (T018), TSMC fab		
Marketing Part #:	CY7C9536 / CY7C9536A	
Device Description:	1.8V, Industrial and commercial available in 504-ball L2BGA package.	
Cypress Division:	Cypress Semiconductor Corporation –Data Com Division (DCD)	
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. A
What ID markings on Die:	7C9536A	

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	6	Metal Composition:	Metal 1 - 5 4,000Å Al 0.5%Cu Metal 6: 8,000Å Al 0.5%Cu
Passivation Type and Materials:		17,000Å Oxynitride	
Free Phosphorus contents in top glass layer(%):		0%	
Number of Transistors in Device		10 million	
Number of Gates in Device		3.4million	
Generic Process Technology/Design Rule (□-drawn):		Single Poly, 6 layer metal 0.18um, embedded SRAM	
Gate Oxide Material/Thickness (MOS):		1.8V, SiO_2, 32Å / 3.3V, SiO_2, 70Å	
Name/Location of Die Fab (prime) Facility:		TSMC fab4, Hsinchu, Taiwan	
Die Fab Line ID/Wafer Process ID:		TSMC 0.18um 1P6M Logic with embedded SRAM	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
504-pin L2BGA	**TAIWN-G**

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BL504
Package Outline, Type, or Name:	Cavity down 504-ball, Ball Grid Array (L2BGA) with heat sink
Mold Compound Name/Manufacturer:	Hysol FP4450/4451
Mold Compound Flammability Rating:	V-O per UL 94
Oxygen Rating Index:	>28%
Substrate Material:	BT with copper stiffner and heat sink
Lead Finish, Composition / Thickness:	Solder Ball, 63%Sn, 37%Pb
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Wafer Saw
Die Attach Supplier:	QMI
Die Attach Material:	QMI 505MT
Die Attach Method:	Epoxy
Bond Diagram Designation	10-04600
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au,1.0um
Thermal Resistance Theta JA °C:	11.5°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-41017
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 packages availability.

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 = 1.98V, 125□C Dynamic Operating Condition, Vcc Max = 3.8V, 150□C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 1.98V, 125°C Dynamic Operating Condition, Vcc Max= 3.8V, 150°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max=2.7V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 1.98V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C 130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 5 72 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Temperature Cycle	Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 5 72 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Pressure Cooker	Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C Precondition: JESD22 Moisture Sensitivity MSL 5 72 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C 121°C, 100%RH	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Current Density	Cypress Spec 22-00029	P
SEM X-Section	MIL-STD-883, Method 883-2018-2 / Cypress Spec. 22-00009	P
Age Bond Strength	200C, 4HRS MIL-STD-883, Method 883-2011	P
Low Temperature Operating Life	-30C, 4.3V, 8MHZ	P
Acoustic Microscopy, MSL 5	Low Temperature Operating Life Cypress Spec. 25-00104	P
Static Latchup	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	Thermal AF[3]	Failure Rate[1]
High Temperature Operating Life Early Failure Rate	1,501	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	196,541 DHRs @150C	0	0.7	170	27 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.

[1] **Failure Rate and LFR FIT Rate based on QTP #014201 and QTP #99154**

Reliability Test Data

QTP #: 99154

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V, Vcc Max							
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	48	79	0	
CY39100V208 (7C39480A)	*9050314*	340000428	TAIWN-G	48	76	0	
CY39100V208 (7C39480A)	*9123746*	610120624	TAIWN-G	48	168	0	
CY39100V208 (7C39480A)	*9124765*	610121047	TAIWN-G	48	164	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max							
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	80	79	0	
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	500	79	0	
CY39100V208 (7C39480A)	*9123746*	610120624	TAIWN-G	500	79	0	
CY39100V208 (7C39480A)	*9124765*	610121047	TAIWN-G	168	79	0	
CY39100V208 (7C39480A)	*9124765*	610121047	TAIWN-G	500	79	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY39100V208 (7C39480A)	*9044202*	340000405	TAIWN-G	COMP	9	0	
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	COMP	9	0	
CY39100V208 (7C39480A)	*9050314*	340000428	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300mA							
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	COMP	3	0	
STRESS: ACOUSTIC-MSL5							
CY39100V208 (7C39480A)	*9044202*	340000405	TAIWN-G	COMP	15	0	
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	COMP	15	0	
CY39100V208 (7C39480A)	*9050314*	340000428	TAIWN-G	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY39100V208 (7C39480A)	*9044202*	340000404	TAIWN-G	COMP	10	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.07V, Vcc MAX							
CY39100V208 (7C39480A)	*9107636*	610107389	TAIWN-G	80	77	0	
CY39100V208 (7C39480A)	*9107636*	610107389	TAIWN-G	168	73	0	
STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V							
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	500	48	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 72 HR 30C/60%RH, MSL5							
CY39100V208 (7C39480A)	*9044202*	340000404	TAIWN-G	168	47	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 72 HR 30C/60%RH, MSL5							
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	128	51	0	

Reliability Test Data

QTP #: 99154

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRECONDITION 72 HRS 30C/60%RH, MSL5							
CY39100V208 (7C39480A)	*9044202*	340000404	TAIWN-G	300	46	0	
CY39100V208 (7C39480A)	*9052411*	340100001	TAIWN-G	300	48	0	
CY39100V208 (7C39480A)	*9050314*	340000428	TAIWN-G	300	48	0	

Reliability Test Data

QTP #: 014201

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC-MSL3							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	COMP	15	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	COMP	15	0	
CY7C9536-BL1 (7C9536A)	9214290	*610219100*	TAIWN-G	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 1.98V, Vcc Max							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	96	510	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	96	504	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 1.98V, Vcc Max							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	168	120	0	
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	1008	120	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	168	120	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	1008	120	0	
STRESS: LONG LIFE VERIFICATION, 125C, 1.98V, Vcc Max							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	2016	120	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	2016	120	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	COMP	9	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300Ma							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	COMP	3	0	
STRESS PRESSURE COOKER TEST, 121C, 100%RH,, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	168	47	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 1.98V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	128	44	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	300	46	0	
CY7C9536-BL1 (7C9536A)	9206938	*610210691*	TAIWN-G	500	46	0	
CY7C9536-BL1 (7C9536A)	9214290	*610219100*	TAIWN-G	300	48	0	
CY7C9536-BL1 (7C9536A)	9214290	*610212473*	TAIWN-G	300	40	0	