Cypress Semiconductor
Product Qualification Report

QTP# 000901 VERSION 1.1
May, 2003

Three-PLL Programmable Clock Generator Fab 2 – L28 Technology
CY2292AS

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
95197		New Technology L28 / CY2291 (Rev A/C) Device		Feb 96
96061		CY2291 (Rev D) Device family, L28 Technology		Mar 96
000901		Metal Mask layer change to enhance functionality to CY2292 device		Oct 00

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify Metal Mask layer change to CY2292 device in L28 Technology, fab 2	
Marketing Part #:	CY2292AS
Device Description:	3.3V or 5V, Commercial and Industrial available in 8ld, 16ld, and 20ld respectively SOIC package
Cypress Division:	Cypress Semiconductor Corporation - Clock Product Division, WA Division
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. D
What ID markings on Die:	7C83003A

TECHNOLOGY/FAB PROCESS DESCRIPTION - L28			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500ATi/1,200A TiW/6.000A Al/1,200A TiW Metal 2: 1,500A TiW/10,000A Al/150A Ti
Passivation Type and Materials:			3,000A TEOS + 15.000A Si_2N_4
Generic Process Technology/Design Rule (μ-drawn):			CMOS, Single Poly, Double Metal /0.65 μm
Gate Oxide Material/Thickness (MOS):			SiO_2 / 145 A
Name/Location of Die Fab (prime) Facility:			Cypress Semiconductor – Round Rock, TX
Die Fab Line ID/Wafer Process ID:			Fab2/L28

PACKAGE AVAILABILITY

PACKAGE TYPE	ASSEMBLY SITE FACILITY
16-lead SOIC	**Omedata Indonesia (INDNS-O), OSE, Philippines (PHIL-OP)**

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	S1651
Package Outline, Type, or Name:	16-lead SOIC
Mold Compound Name/Manufacturer:	Nitto MP-8000CH
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Finish, Composition / Thickness:	Solder Plated, 85%Sn - 15% Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Method:	Epoxy
Die Attach Supplier:	Ablestik
Die Attach Material:	8361H
Bond Diagram Designation	10-02699
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold, 1.0mil
Thermal Resistance Theta JA °C/W:	83 °C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-70032M
Name/Location of Assembly (prime) facility:	Omedata Indonesia (INDNS-O)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OSE Philippines (PHIL-OP)
Fault Coverage:	100%

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.5V/5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.5V, 150°C	P
Long Life Verification	Dynamic Operating Condition, Vcc = 5.5V, 150°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65C to 150C Precondition: JESD22 Moisture Sensitivity Level 1 48 hrs, PCT, 121C, 100%RH+3IR-Reflow, 220°C+5, -0°C	P
High Accelerated Saturation Test (HAST)	140C, 85%RH, 3.8V 140C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 1 48 hrs, PCT, 121C, 100%RH+3IR-Reflow, 220°C+5, -0°C	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
High Temperature Storage	165C, No Bias	P
Age Bond Strength	MIL-STD-883, Method 2011	P
High Temperature Steady State Life	150C, 5.5V	P
Cold Life Test	-30C, 6.5V	P
SEM Analysis	MIL-STD-883, Method 2018	P
Latchup Sensitivity	±100mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal[3] A.F	Failure Rate[4]
High Temperature Operating Life Early Failure Rate	2,062 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	406,000 DHRs	0	0.7	170	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.

RELIABILITY TEST DATA

[4] **EFR and LFR FIT Rate based on QTP #96061 and QTP #98195**

QTP#: 95197

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMPERATURE STORAGE-PLASTIC (165C, NO BIAS)							
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	168	76	0	
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	552	78	0	
CY2291SC(7C83000D	PHIL-M	3520751	13109(SWR)	168	80	0	
CY2291SC(7C83000D	PHIL-M	3520751	13109(SWR)	552	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.50V)							
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	48	354	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	48	354	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	48	354	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 85%RH, 5.5V), PRECONDITION 48 HRS PCT							
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	128	49	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	128	50	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.5V)							
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	80	76	0	
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	168	76	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	80	76	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	168	76	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	80	76	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	168	76	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.5V)							
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	80	116	0	
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	500	116	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	80	120	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	197	120	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	500	116	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	80	116	0	
CY2291SC(7C83000D)	PHIL-M	3520751	13109(SWR)	500	116	0	
STRESS: EXTENDED DYNAMIC BURN-IN (150C, 5.5V)							
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	1000	116	0	
CY2291SC(7C83000D)	PHIL-M	3518546	13041(SWR)	2000	116	0	
STRESS: COLD LIFE TEST (-30C, 6.5V)							
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	500	47	0	
CY2291SC(7C83000D)	PHIL-M	3519671	13040(SWR)	1000	47	0	

RELIABILITY TEST DATA

QTP#: 96061

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMPERATURE STORAGE-PLASTIC (165C, NO BIAS)							
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	168	76	0	
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	552	76	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.5V)							
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	48	372	0	
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	48	256	0	
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	48	256	0	
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	48	116	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 85%RH, 5.5V), PRECONDITION 48 HRS PCT							
CY2291SC(7C83000D)	PHIL-M	3538829	349522690	128	45	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.5V)							
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	80	116	0	
CY2291SC(7C83000D)	PHIL-M	3539971	349524602	500	116	0	
STRESS: TEMP CYCLE, COND. C, -65 TO 150C, PRECONDITION 48 HRS PCT							
CY2291SC(7C83000D)	PHIL-M	3538829	349522690	300	45	0	
CY2291SC(7C83000D)	PHIL-M	3538829	349522690	1000	45	0	

Reliability Test Data

QTP #: 000901

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODE, 1000VV							
CY2292AS-SC (7C83303D)	20058033	*510004431*	INDNS-O	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 3,300VV							
CY2292AS-SC (7C83303D)	20058033	*510004431*	INDNS-O	COMP	3	0	
STRESS:STATIC LATCH-UP TESTING, 125C, 10V, +/-100mA							
CY2292AS-SC (7C83303D)	20058033	*510004431*	INDNS-O	COMP	3	0	