

Cypress Semiconductor Product Qualification Report

QTP# 002105VERSION 1.1
May, 2003

<p>High Accuracy EPROM Programmable Single-PLL Clock Generator</p>

<p>L28 Technology, CTI Fab 2 and TSMC Fab 2A, Taiwan</p>
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<p>CY2077</p>

<p>390 kHz - 133MHz at 5V 390 kHz -100 MHz at 3.3V</p>

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

Ed Russell
Reliability Director
(408) 432-7069

Rene Rodgers
Staff Reliability Engineer
(408)943-2732

PRODUCT QALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date
99285	Technology Qualification (Generic)	Mar 00
000402	Product Qualification (die sale only)	Jul 00
002105	Package Options (CTI Fab 2/TSMC-Fab-2A)	Sep 00

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify CY2077 product fabricated at CTI fab 2 and TSMC-2A, Taiwan using L28 Technology.	
Marketing Part #:	CY2077SC/CY2077ZC
Device Description:	3.3V and 5V, Commercial and Industrial available in 8-lead SOIC/TSSOP package.
Cypress Division:	Cypress Semiconductor Corporation – Clock Product Division, WA Division
Overall Die (or Mask) REV:	Rev. A
What ID markings on Die:	7C80380A

TECHNOLOGY/FAB PROCESS DESCRIPTION - L28-TSMC			
Number of Metal Layers:	2	Metal Composition:	Metal 1: Ti 400Å /TiN1,000Å /AlSiCu 4,700Å /TiN 375Å Metal 2: Ti 1,500Å / AlSiCu 8,000Å / TiN 375Å
Passivation Type and Materials:	SiN 3,000Å /SOG 3,150Å /SiN 12,000Å		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Single Poly, Double Metal /0.65 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 125 Å		
Name/Location of Die Fab (prime) Facility:	TSMC-2A, Taiwan		
Die Fab Line ID/Wafer Process ID:	TSMC-2A /L28-TSMC		

TECHNOLOGY/FAB PROCESS DESCRIPTION - L28-CTI			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500/1,200Å TiW/6,000Å Al/1,200Å TiW Metal 2: 1,500Å TiW/10,000Å Al/150Å Ti
Passivation Type and Materials:	3,000Å TEOS + 15,000Å Si ₂ N ₄		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Single Poly, Double Metal /0.65 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 145 Å		
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 (extended qual to 8ld)	OMEDATA, (INDNS-O), OSE (PHIL-OP), ANAM (PHIL-M)
16-lead TSSOP (extended qual to 8ld)	ANAM (PHIL-M), OSE (TAIWN-T)

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	S2032
Package Outline, Type, or Name:	20-lead SOIC
Mold Compound Name/Manufacturer:	Sumitomo EME6300HR
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Designation:	S
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	85%Tin- 15%Lead min. 250 micro inches
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablebond
Die Attach Material:	8361H
Bond Diagram Designation	10-03768
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold, 1.0mil
Thermal Resistance Theta JA °C/W:	79.5 (3IR-Reflow, 220°C+5, -0°C)
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20008M
Name/Location of Assembly (prime) facility:	Cypress Philippines (CSPI-R)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	OMEDATA, (INDN-O), CSPI-R, OSE (PHIL-OP)
Fault Coverage:	100%

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bi	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C Dynamic Operating Condition, Vcc = 3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 150°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65C to 150C Precondition: JESD22 Moisture Sensitivity Level 1 168 hrs, 85C/85%RH+3IR-Reflow, 220°C+5, 0°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85/85% RH+3IR-Reflow, 220°C+5, 0°C	P
Pressure Cooker	121C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85/85% RH+3IR-Reflow, 220°C+5, 0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	p
High Temperature Steady State Life	Cypress Spec. 29-00020, VCC=150C, 3.63V	P
Low Temperature Operating Life	Cypress Spec. 25-00089, -3-C	P
High Temperature Storage	Cypress Spec. 25-00060, 150C	P
Age Bond	MIL-STD-883, Method 2011	P
SEM	MIL-STD-883, Method 2018-2	P
Ball Shear	Cypress Spec. 12-00292	P
Latchup Sensitivity	± 200mA 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 ⁴
High Temperature Operating Life Early Failure Rate	2,019	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	181,660 DHRs	0	0.7	170	30 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 Early Failure Rate based on QTP #99285 and #000402

⁴ Long Term Failure Rate was based on QTP #99285, L28-TSMC Technology at TMSC-2A qualification.

RELIABILITY TEST DATA

QTP#: 99285

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMPERATURE STORAGE (150C)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	500	85	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.8V)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	48	335	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	48	234	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	48	101	0	
CY2280-OC	CSPI-R	2942829	619933793/4/5	48	349	0	
STRESS: ESD-CHARGE DEVICE MODEL (1000V)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	COMP	3	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	COMP	3	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C/85%RH/3.63V), PRECOND. 168 HRS 85C/85%RH							
CY2280-OC	CSPI-R	2937109	619927291/2/3	S/RE-FLOW	50	0	
CY2280-OC	CSPI-R	2937109	619927291/2/3	128	50	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	80	77	0	
CY2280-OC	CSPI-R	2937109	619927291/2/3	168	77	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.8V)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	80	120	0	
CY2280-OC	CSPI-R	2937109	619927291/2/3	500	120	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	80	120	0	
CY2280-OC	CSPI-R	2937190	619928659/60/61	500	120	0	
CY2280-OC	CSPI-R	2942829	619933793/4/5	80	125	0	
CY2280-OC	CSPI-R	2942829	619933793/4/5	500	123	0	
STRESS: LOW TEMPERATURE OPERATING LIFE (-30C/8MHZ)							
CY2280-OC	CSPI-R	2937190	619928659/60/61	500	50	0	
STRESS: PRESSURE COOKER TEST, MSL 1 (121C, 100%RH)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	S/RE-FLOW	53	0	
CY2280-OC	CSPI-R	2937109	619927291/2/3	168	53	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH (MSL 1)							
CY2280-OC	CSPI-R	2937109	619927291/2/3	S/RE-FLOW	50	0	
CY2280-OC	CSPI-R	2937109	619927291/2/3	300	50	0	

RELIABILITY TEST DATA

QTP#: 000402

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
=====							
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY5037A-SC	CSPI-R	2949740	610003291/2/3	48	500	0	
CY5037A-SC	CSPI-R	2949740	610003291/2/3	48	500	0	

STRESS: ESD-CHARGE DEVICE MODEL (1000V)							
CY5037A-SC	CSPI-R	2949740	610003291/2/3	COMP	3	0	

STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY5037A-SC	CSPI-R	2949740	610003291/2/3	COMP	3	0	

Reliability Test Data

QTP #: 002105

<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: ESD-CDM DONE (500V)							
CY2077ZC	2026226	610036061	TAIWN-T	COMP	9	0	
CY2077ZC	2026226	610036061	TAIWN-T	COMP	3	0	
CY2077SC	2026226	610036062	PHIL-OP	COMP	9	0	
CY2077SC	2026226	610036062	PHIL-OP	COMP	3	0	
STRESS: ESD-HBM DONE (2,200V)							
CY2077ZC	2026226	610036061	TAIWN-T	COMP	9	0	
CY2077SC	2026226	610036062	PHIL-OP	COMP	9	0	