Cypress Semiconductor
Product Qualification Report

QTP# 022804 VERSION 1.0
June, 2003

CY27EE16ZE	1 PLL In-system Programmable Clock Generator with Individual 16K EEPROM
S4AD-5 Technology, Fab 2	

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
022804		New 1PLL In-system Programmable Clock Generator with Individual 16K EEPROM CY27EE16ZE		May 03
031103		Metal Mask Change to 7C8A100A		May 03

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify CY27EE16ZE in S4AD-5 Technology, Fab 2	
Marketing Part #:	CY27EE16ZE
Device Description:	3.3V, Commercial & Industrial available in 20-lead TSOP (Exposed Pad)
Cypress Division:	Cypress Semiconductor Corporation – Timing Technology Division (TTD) WA
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C8A100A

TECHNOLOGY/FAB PROCESS DESCRIPTION S4AD-5			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/6,000A Al 0.5% Cu /1,200A TiW Metal 2: 500A Ti/8,000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	3,000A TeOs / 6,000A Si_3N_4		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	50,000		
Number of Gates in Device	2,500		
Generic Process Technology/Design Rule (µ-drawn):	Single Poly, Double Metal, 0.35 µm		
Gate Oxide Material/Thickness (MOS):	SiO_2 / 110°A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – CTI Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2, S4AD-5		

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CML-R)
Fault Coverage:	100%

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	ZE2017
Package Outline, Type, or Name:	20-lead Thin Small Outline Packages (TSOP)
Mold Compound Name/Manufacturer:	Sumitomo EME G700/Sumitomo
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper Base
Lead Finish, Composition / Thickness:	Solder Plated 85% +10/-5Sn, 15% +5/-10Pb
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Sawing
Die Attach Supplier:	Ablestik
Die Attach Material:	Ablebond 8290
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-04846
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	94.2°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-24025
Name/Location of Assembly (prime) facility:	Anam-PHIL (PHIL-M)

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
20-lead TSOP	Anam-Philippines (PHIL-M)

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=3.8V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=3.8V, 150°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V,85%RH Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C	P
Temperature Cycle	Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Pressure Cooker	Precondition: JESD22 Moisture Sensitivity MSL 1 168 Hrs, 85C/85%RH+3IR-Reflow, 235°C+5, 0°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+5, -0°C 121°C, 100%RH	P
High Temperature Storage	150°C ± 5°C No Bias	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
Endurance Test	MIL-STD-883, Method 883-1033	P
SEM X-Sections	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy	MSL1, MSL3 Cypress Spec. 25-00104	P
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	Thermal[3] A.F	Failure Rate[4]
High Temperature Operating Life Early Failure Rate[1]	1213	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	196,580 DHRs	1	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.

Reliability Test Data

QTP #: 022804

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC,-MSL1							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	COMP	15	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	COMP	15	0	
CY27EE16FZE (7C8A103A)	2235454	*610249800*	PHIL-M	COMP	15	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 3.8V, Vcc Max							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	48	1213	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V, Vcc Max							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	80	394	1	ISB
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	500	393	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	COMP	9	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	COMP	9	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	COMP	3	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	COMP	3	0	
STRESS: HIGH TEMPERATURE STORAGE, 150°C, No Bias							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	500	78	0	
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	1000	78	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 168 HR 85C/85%RH, MSL1							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	128	47	0	
STRESS PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HRS., 85C/85%RH, MSL1							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	168	48	0	
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	288	48	0	

Reliability Test Data

QTP #: 022804

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HRS., 30C/60%RH, MSL3							
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	168	50	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 168 HRS 85C/85%RH, MSL1							
CY27EE16SC (7C8A101A)	2235454	*610246907*	PHIL-M	300	48	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	300	50	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	500	50	0	
CY27EE16FZE (7C8A103A)	2235454	*610246908*	PHIL-M	1000	50	0	

Reliability Test Data

QTP #: 031103

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY27EE16SC (7C8A101A)	2235454	*610307059*	PHIL-M	COMP	9	0	
CY27EE16SC (7C8A101A)	2235454	*610307072*	PHIL-M	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY27EE16SC (7C8A101A)	2235454	*610307059*	PHIL-M	COMP	9	0	
CY27EE16SC (7C8A101A)	2235454	*610307072*	PHIL-M	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA							
CY27EE16SC (7C8A101A)	2235454	*610307059*	PHIL-M	COMP	3	0	