

# **Cypress Semiconductor Product Qualification Report**

**QTP# 004604 VERSION 1.2  
May, 2003**

**High Accuracy EPROM Programmable Crystal Oscillator**

**L28 Technology, Fab 2**

**CY5039WAF**

**10-30 MHz**

## **CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

Ed Russell  
Reliability Director  
(408) 432-7069

Rene Rodgers  
Staff Reliability Engineer  
(408) 943-2732

### PRODUCT QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
97403	New Technology L28/New Device CY227*	Apr 98
98225	New Device CY2037AWAF/CY5037AWAF, L28 Technology	Sep 98
004604	New DeviceCY5039WAF (4-layer mask revision of qualified CY5037AWAF), L28 Technology	Dec 00

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualify CY5039WAF Device in qualified L28 Technology , Fab 2.	
Marketing Part #:	CY5039WAF
Device Description:	3.3 or 5V, Commercial available via Die/Wafer form sale
Cypress Division:	Cypress Semiconductor Corporation – Interface Clock Division (ICD) WA
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A
What ID markings on Die:	7C80320A

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION - L28</b>			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500A Ti/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 <sub>2</sub> N <sub>4</sub>		
Free Phosphorus contents in top glass layer(%):	N/A		
Die Coating(s), if used:	N/A		
Number of Transistors in Device	4909		
Number of Gates in Device	1227		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Single Poly, Double Metal /0.65 μm		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> / 145 A		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab2/L28		

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	S2032
<b>Package Outline, Type, or Name:</b>	20-lead SOIC
<b>Mold Compound Name/Manufacturer:</b>	Sumitomo 6300HR
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	>28%
<b>Lead Frame Designation:</b>	S
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Solder Plated, 90% ± 5 Sn - 10% ± 5 Pb
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Supplier:</b>	Ablebond
<b>Die Attach Material:</b>	8361H
<b>Die Attach Method:</b>	Epoxy
<b>Bond Diagram Designation</b>	10-02947
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Gold/1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	79.5
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	11-20008M
<b>Name/Location of Assembly (prime) facility:</b>	Cypress Philippines (CSPI-R)

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	CSPI-R
<b>Fault Coverage:</b>	100%

**Note:** Please contact a Cypress Representative for other packages availability.

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT**

<b>Stress/Test</b>	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150C Dynamic Operating Condition, Vcc = 3.65V, 150C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150C Dynamic Operating Condition, Vcc = 3.65V, 150C	P
Read and Record	Dynamic Operating Condition, Vcc = 3.65V, 150C	P
High Accelerated Saturation Test (HAST)	140°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85°C/85%RH	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85°C/85%RH	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7 (2,200V)	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020 (500V)	P
High Temperature Storage	165C, no bias	P
Data Retention	165C, No Bias	P
Age Bond Pull	MIL-STD-883, Method 2011	P
Cold Life Test	-30C, 6.5V	P
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081 (+/- 300mA)	P

**RELIABILITY FAILURE RATE SUMMARY**

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal <sup>3</sup> A.F	Failure Rate <sup>4</sup>
High Temperature Operating Life Early Failure Rate	1,850 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	231,900 DHRs	0	0.7	170	23 FIT

<sup>1</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>2</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>3</sup> 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 =  $8.62 \times 10^{-5}$  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.

<sup>4</sup> EFR and LFR FIT Rate based on QTP #97403 and QTP #98225

**RELIABILITY TEST DATA**

**QTP 97403**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
<b>STRESS: DATA RETENTION (165C, NO BIAS)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	168	78	0	
CY2273APVC	CSPI-R	2732995	619708289/319	552	78	0	
CY2273APVC	CSPI-R	2735423	619709731	168	78	0	
CY2273APVC	CSPI-R	2735423	619709731	552	78	0	
CY2273APVC	CSPI-R	2734307	619709732	168	78	0	
CY2273APVC	CSPI-R	2734307	619709732	552	78	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 3.65V)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	48	180	0	
CY2273APVC	CSPI-R	2735423	619709731	48	340	0	
CY2273APVC	CSPI-R	2734307	619709732	48	330	0	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 2000V</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 4000V</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	COMP	3	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 10V)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (140C, 3.63V, 85%RH), PRECOND. 168 HRS 85C/85%RH</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	128	44	0	
CY2273APVC	CSPI-R	2732995	619708289/319	256	44	0	
CY2273APVC	CSPI-R	2734307	619709732	128	45	0	
<b>STRESS: HIGH TEMPERATURE STORAGE (165C, NO BIAS)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	336	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	500	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	45	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 3.65V)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	80	116	0	
CY2273APVC	CSPI-R	2732995	619708289/319	500	116	0	
CY2273APVC	CSPI-R	2735423	619709731	80	120	0	
CY2273APVC	CSPI-R	2735423	619709731	500	116	0	
CY2273APVC	CSPI-R	2734307	619709732	80	116	0	
CY2273APVC	CSPI-R	2734307	619709732	500	115	0	
<b>STRESS: COLD LIFE TEST (-30C, 6.5V)</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	500	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	44	0	
<b>STRESS: READ &amp; RECORD LIFE TEST (150C, 3.65V)</b>							
CY2273APVC	CSPI-R	2734307	619709732	48	10	0	
CY2273APVC	CSPI-R	2734307	619709732	80	10	0	
CY2273APVC	CSPI-R	2734307	619709732	500	10	0	

**RELIABILITY TEST DATA**

**QTP 97403**

<b>DEVICE</b>	<b>ASSY-LOC</b>	<b>FABLOT#</b>	<b>ASSYLOT#</b>	<b>DURATION</b>	<b>S/S</b>	<b>REJ</b>	<b>FAIL MODE</b>
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH</b>							
CY2273APVC	CSPI-R	2732995	619708289/319	300	45	0	
CY2273APVC	CSPI-R	2732995	619708289/319	1000	45	0	
CY2273APVC	CSPI-R	2735423	619709731	300	48	0	
CY2273APVC	CSPI-R	2735423	619709731	1000	48	0	
CY2273APVC	CSPI-R	2734307	619709732	300	47	0	
CY2273APVC	CSPI-R	2734307	619709732	1000	47	0	



**RELIABILITY TEST DATA**

**QTP#: 98225**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	112	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
CY5037AES	CSPI-R	2825234	619808136	48	148	0	
STRESS: ESD-CHARGE DEVICE MODEL (1,000V)							
CY5037AES	CSPI-R	2825234	619808136	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY5037AES	CSPI-R	2825234	619808136	COMP	3	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY5037AES	CSPI-R	2825234	619808136	500	116	0	
STRESS: STATIC LATCH-UP TESTING (125C, 12V)							
CY5037AES	CSPI-R	2825234	619808136	COMP	3	0	

## **Reliability Test Data**

**QTP #: 004604**

<b>Device</b>	<b>Fab Lot #</b>	<b>Assy Lot #</b>	<b>Assy Loc</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
<b>STRESS: ESD-CHARGE DEVICE MODEL (500V)</b>							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)</b>							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	9	0	
<b>STRESS: STATIC LATCH-UP TESTING (125C, 12V, +/-300mA)</b>							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	3	0	