

Cypress Semiconductor Product Qualification Report

**QTP# 012204 VERSION 1.0
September 2001**

High Accuracy EPROM Programmable Crystal Oscillator

L28 Technology, Fab 2

CY2039WAF / CY5039WAF

10-30 MHz

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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Reliability Director
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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
97403	New Technology L28/New Device CY227*	Apr 98
004604	New Device, CY5039WAF	Dec 00
012204	MM1 mask change to device CY5039WAF to enhance functionality	Jun 01

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: New MM1 mask change to CY5039WAF Device to enhance functionality, L28 Technology, Fab 2.			
Marketing Part #:	CY2039WAF / 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		
Die Size (stepping):	58.9 mils x 43.5 mils	What ID markings on Die:	7C80320A

TECHNOLOGY/FAB PROCESS DESCRIPTION - L28			
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 ₂ N ₄		
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 μ m		
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		

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	S2032
Package Outline, Type, or Name:	20-lead SOIC
Mold Compound Name/Manufacturer:	Sumitomo 6300HR
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	> 28%
Lead Frame Designation:	S
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated, 90% ± 5 Sn - 10% ± 5 Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablebond
Die Attach Material:	8361H
Die Attach Method:	Epoxy
Bond Diagram Designation	10-02947
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold/1.0mil
Thermal Resistance Theta JA °C/W:	79.5
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:	CSPI-R
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	1) QTP #98225 Dynamic Operating Condition, Vcc = 5.75V, 150C 2) QTP #97403 Dynamic Operating Condition, Vcc = 3.65V, 150C	P
High Temperature Operating Life Latent Failure Rate	1) QTP #97403 Dynamic Operating Condition, Vcc = 3.65V, 150C	P
Read and Record	1) QTP #97403 Dynamic Operating Condition, Vcc = 3.65V, 150C	P
High Accelerated Saturation Test (HAST)	1) QTP #97403 140°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs, 85°C/85%RH	P
Temperature Cycle	1) QTP #97403 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)	1) QTP #012204, QTP#004604, QTP #97403 MIL-STD-883, Method 3015.7 (2,200V)	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #012204, QTP#004604, QTP #97403 Cypress Spec. 25-00020 (500V)	P
High Temperature Storage	1) QTP #97403 165C, no bias	P
Data Retention	1) QTP #97403 165C, no bias	P
Age Bond Pull	1) QTP #97403 MIL-STD-883, Method 2011	P
Cold Life Test	1) QTP #97403 30C, 6.5V	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Latchup Sensitivity	1) QTP #012204, QTP #004604 125°C, 12V, ±300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal³ A.F	Failure Rate⁴
High Temperature Operating Life Early Failure Rate	1000 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	173,900 DHRs	0	0.7	170	31 FITs

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 EFR and LFR FIT Rate based on QTP #97403

Reliability Test Data

QTP #: 012204

<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-CHARGE DEVICE MODEL (500V)							
CY5039-SC (7C80320A)	2116112	610118650	CSPI-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY5039-SC (7C80320A)	2116112	610118650	CSPI-R	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, 12V, +/-300mA)							
CY5039-SC (7C80320A)	2116112	610118650	CSPI-R	COMP	3	0	

Reliability Test Data

QTP #: 004604

<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-CHARGE DEVICE MODEL (500V)							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING (125C, 12V, +/-300mA)							
CY5039-SC (7C80320)	2043316	610049646	CSPI-R	COMP	3	0	

RELIABILITY TEST DATA

QTP 97403

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

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: READ & RECORD LIFE TEST (150C, 3.65V)							
CY2273APVC	CSPI-R	2734307	619709732	48	10	0	
CY2273APVC	CSPI-R	2734307	619709732	80	10	0	
CY2273APVC	CSPI-R	2734307	619709732	500	10	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. 168 HRS 85C/85%RH							
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	