

**Please note that Cypress is an Infineon Technologies Company.**

The document following this cover page is marked as “Cypress” document as this is the company that originally developed the product. Please note that Infineon will continue to offer the product to new and existing customers as part of the Infineon product portfolio.

**Continuity of document content**

The fact that Infineon offers the following product as part of the Infineon product portfolio does not lead to any changes to this document. Future revisions will occur when appropriate, and any changes will be set out on the document history page.

**Continuity of ordering part numbers**

Infineon continues to support existing part numbers. Please continue to use the ordering part numbers listed in the datasheet for ordering.

# Cypress Semiconductor Product Qualification Report

**QTP#000605****September, 2000**

<b>High-Performance CPLDs Family</b>	
CY37384P208/ CY37384VP208	UltraLogic™ 384-Macrocell ISR™ CPLDs
CY37512P208/ CY37512VP208	UltraLogic™ 512-Macrocell ISR™ CPLDs

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

Zhaomin Ji  
Principal Reliability Engineer  
(408) 432-7021

Mira Ben-Tzur  
Quality Engineering Director  
(408) 943-2675

### **Company Confidential**

A printed copy of this document is considered uncontrolled. Refer to online copy for latest revision.

## PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
98376	New E3.0 Technology Qualification (Generic)	Sep 98
98403	New Product Qualification	May 99
99461	All layer change to enhance functionality (Commercial)	Feb 99
000605	All layer change to enhance functionality (Military)	Jun 00

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: To qualify CY37384*and CY37512*in E3 (TSMC) Technology, Fab 2.			
Marketing Part #:	CY37384*CY37512*		
Device Description:	3V, 5V, Commercial, Industrial and Military available in PQFP,CQFP and BGA Package.		
Cypress Division:	Cypress Semiconductor Corporation – Product Logic Division (PLD)		
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. B	
Die Size (stepping):	229.7s x 587mils	What ID markings on Die:	7C37660B7C37670B 7C37665B7C37675B

TECHNOLOGY/FAB PROCESS DESCRIPTION – E3			
Number of Metal Layers:	3	Metal Composition:	TiN Cap on AL
Passivation Type and Materials:	7K Nitride, 2K Oxide (bottom)		
Free Phosphorus contents in top glass layer(%):	None		
Die Coating(s), if used:	None		
Generic Process Technology/Design Rule (□-drawn):	Single Poly EEPROM 0.5□m		
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> 125Å /180Å (high voltage)		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	TSMC / E3		

#### PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
208-lead PQFP	ASE, Taiwn
292/388-ball BGA	ASE, Taiwan
256-ball FBGA	ASE, Taiwan

**Note:** Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A160
Package Outline, Type, or Name:	160-pin Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Sumitomo-7320
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Designation:	A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plated 90%Sn, 10%Pb
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	8361H
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold $\leq 1.3\text{mil}$
Thermal Resistance Theta JA °C/W:	41.8 °C/W
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	Anam Korea (KOREA-Q)

<b><i>ELECTRICAL TEST / FINISH DESCRIPTION</i></b>	
Test Location:	Anam Korea (KOREA-Q)
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 = 5.75V, 150C (99461/99403/98376)	P
High Temperature Operating Life Long Term Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150C (98403/98376)	P
Read and Record Life Test	Dynamic Operating Condition, Vcc = 5. 5V, 150C (98376)	P
High Temperature Steady State Life	Static Operating Condition, Vcc = 5.5V, 150C (98376)	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65C to 150C (99403/99461) Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs., 30C/60%RH+3IR-Reflow, 220C+5, -0C	P
Temperature Cycle (Plastic Device)	MIL-STD-883C, Method 1010, Condition C, -65C to 150C (98376) Precondition: JESD22 Moisture Sensitivity Level 5 (S/REFLOW +72Hrs , 30C/60%RH)	P
Temperature Cycle (Hermetic)	MIL-STD-883C, Method 1010, Condition C, -65C to 150C (000605) Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs., 85C/85%RH+3IR-Reflow, 220C+5, -0C	P
High Accelerated Saturation Test (HAST)	130C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 5 (98376) (S/REFLOW +72Hrs , 30C/60%RH)	P
Pressure Cooker Test	121C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 5 (98376) (S/REFLOW +72Hrs , 30C/60%RH)	P
Cold Life Test	-30C, 6.5V (98376)	P
Military Life Test (group C)	150C, 3.8V (000605)	P
High Temperature Storage	165C, no Bias (99403)	P
Acoustic Microscopy/C-SAM	Per spec	P
Bond Pull	Per spec	P
Acoustic Microscopy/C-SAM	Per Spec	P
SEM Analysis	MIL-STD-883, Method 2018	P
Current Density	Per datasheet	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7 (2,000V)	p
Electrostatic Discharge Charge Device Model (ESD-CDM)	JESD22-C101C (500V)	p
Latchup Sensitivity	In accordance with JEDEC 17. (±200mA)	P

### RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activatio n Energy	Thermal AF <sup>4</sup>	Failure Rate <sup>5</sup>
High Temperature Operating Life Early Failure Rate	1,126 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life <sup>1,2</sup> Long Term Failure Rate	222,446 DHRs	0	0.7	170	24 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> Failure rate estimates do not include the voltage acceleration factor.

<sup>4</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>5</sup>EFR and LFR based on QTP #98376, 99403 and 99461

## RELIABILITY TEST DATA

### QTP #98376

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
=====							
<b>STRESS: HIGH TEMPERATURE STORAGE (Plastic)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	168	76	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	552	76	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	168	76	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	552	76	0	
-----							
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	48	250	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	48	250	0	
-----							
<b>STRESS: ESD-CHARGE DEVICE MODEL (500V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	COMP	3	0	
CY37192P160-AC	KOREA-Q	9825125	619807493	COMP	3	0	
CY37256VP208-NC	TAIWN-J	9826126	619808073	COMP	3	0	
-----							
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	COMP	3	0	
CY37192P160-AC	KOREA-Q	9825125	619807493	COMP	3	0	
CY37256VP208-NC	TAIWN-J	9826126	619808073	COMP	3	0	
-----							
<b>STRESS: HI-ACCEL SATURATION TEST (130C,85%RH,5.5V), PRECOND. S/REFLOW + 72 HRS 30C/60%RH</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	128	43	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	128	45	0	-----
-----							
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.5V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	80	76	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	168	76	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	80	76	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	168	75	0	
-----							
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	80	116	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	500	88	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	80	140	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	500	140	0	
-----							
<b>STRESS: COLD LIFE TEST (-30C, 6.5V)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	230	45	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	750	45	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	500	45	0	
-----							
<b>PRESSURE COOKER TEST (121C, 100%RH)</b>							
CY37256P160-AC	KOREA-Q	9822118	619806102	168	50	0	
CY37256P160-AC	KOREA-Q	9822118	619806102	288	50	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	168	45	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	288	45	0	
-----							

## RELIABILITY TEST DATA

Company Confidential

A printed copy of this document is considered uncontrolled. Refer to online copy for latest revision.

# RELIABILITY TEST DATA

QTP #98376

DEVICE ASSY-LOC FABLOT# ASSYLOT# DURATION S/S REJ FAIL MODE=====

## STRESS: READ & RECORD LIFE TEST (150C, 5.5V)

CY37256P160-AC KOREA-Q 9826126 619808070 168 10 0

## STRESS: TC COND. C, -65 TO 150C, PRECOND. S/REFLOW + 72 HRS 30/60%RH (MSL 5)

CY37256P160-AC KOREA-Q 9822118 619806102 300 50 0

CY37256P160-AC KOREA-Q 9822118 619806102 1000 50 0

CY37256P160-AC KOREA-Q 9826126 619808070 300 50 0

## STRESS: ACOUSTIC MICROSCOPY

CY37512P208-NC TAIWN-G 9850159 619817519 COMP 15 0

CY37512P208-NC TAIWN-G 9850158 619817611 COMP 15 0

## STRESS: HIGH TEMPERATURE STORAGE-PLASTIC (165C, NO BIAS)

CY37512P208-NC TAIWN-G 9850158 619817611 168 76 0

CY37512P208-NC TAIWN-G 9850158 619817611 552 76 0

CY37512P208-NC TAIWN-G 9901171 619901312 168 79 0

CY37512P208-NC TAIWN-G 9901171 619901312 552 79 0

## STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)

CY37512P256-BGC TAIWN-G 9850159 619817515 48 262 0

CY37512P208-NC TAIWN-G 9901171 619903378 48 275 0

## STRESS: ESD-CHARGE DEVICE MODEL (500V)

CY37512VP256-BGC 9850160 COMP 3 0

CY37512P208-NC TAIWN-G 9850158 619817611 COMP 3 0

CY37512P352-BG TAIWN-G 9850158 619900229 COMP 3 0

CY37512P256-BGC TAIWN-G 9901171 619903378 COMP 3 0

## STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)

CY37512VP256-BGC 9850160 COMP 3 0

CY37512P208-NC TAIWN-G 9850158 619817611 COMP 3 0

CY37512P352-BG TAIWN-G 9850158 619900229 COMP 3 0

## STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)

CY37512P256-BGC TAIWN-G 9850159 619817515 80 81 0

CY37512P256-BGC TAIWN-G 9850159 619817515 500 73 0

CY37512P208-NC TAIWN-G 9901171 619903378 80 273 0

CY37512P208-NC TAIWN-G 9901171 619903378 500 83 0

## RELIABILITY TEST DATA

**QTP #98376**

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE=====
=====	=====	=====	=====	=====	=====	=====	=====

**STRESS: PRESSURE COOKER TEST (121C, 100%RH)**

CY37512P208-NC	TAIWN-G	9850158	619817611	168	47	0
CY37512P208-NC	TAIWN-G	9850158	619817611	288	47	0

**STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)**

CY37512P208-NC	TAIWN-G	9850159	619817519	300	50	0
CY37512P208-NC	TAIWN-G	9850158	619817611	300	48	0
CY37512P208-NC	TAIWN-G	9850158	619817611	1000	48	0
CY37512P208-NC	TAIWN-G	9901171	619901312	300	50	0
CY37512P208-NC	TAIWN-G	9901171	619901312	1000	50	0



## RELIABILITY TEST DATA QTP #98403

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL	MODE
=====								
STRESS: STATIC LATCH-UP (+/-200mA)								
CY37512VP256-BGC		9850160		COMP	3	0		
CY37512P208-NC	TAIWN-G	9850158	619817611	COMP	3	0		
CY37512P352-BG	TAIWN-G	9850158	619900229	COMP	3	0		

## RELIABILITY TEST DATA

### QTP #000605

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp ReJ</i>	<i>Failure Mechanism</i>
<b>STRESS: ESD-CHARGE DEVICE MODEL (1,000v)</b>						
CY37512VP208-UMB	2002489	610009029	USA-GA	COMP	3	0
CY37512P208-UM	2945276	619935690	USA-GA	COMP	3	0
<b>STRESS: MILITARY LIFE TEST 150C, 3.8V</b>						
CY37512VP208-UMB	2002489	610009029	USA-GA	184	29	0
CY37512VP208-UMB	2002489	610009029	USA-GA	184	21	0
<b>STRESS: TC CONDITION C, 150C TO -65C, HERMETIC DEVICE</b>						
CY37512VP208-UM	2002489B	610009029	USA-GA	100	48	0
CY37512VP208-UM	2002489B	610009029	USA-GA	1000	48	0

## RELIABILITY TEST DATA

### QTP #99461

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	ReJ	Failure Mechanism
--------	-----------	------------	----------	----------	------	-----	-------------------

**STRESS: ESD-CHARGE DEVICE MODEL (1,000v)**

CY37512P256-BGC	2945276	619935818	TAIWN-G	COMP	3	0	
-----------------	---------	-----------	---------	------	---	---	--

**STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)**

CY37512P256-BGC	2945276	619935818	TAIWN-G	COMP	3	0	
-----------------	---------	-----------	---------	------	---	---	--

**STRESS: HIGH TEMP DYNAMIC OPERATING EARLY LIFE FAILURE RATE (150C, 5.75V)**

CY37512P208-UM	2945276	619935690	ALTOS-GA	80	89	0	
----------------	---------	-----------	----------	----	----	---	--

**STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH (MSL 3)**

CY37512P256-BGC	2945276	619935818	TAIWN-G	300	48	0	
CY37512P256-BGC	2945276	619935818	TAIWN-G	500	48	0	

**Document History Page**

Document Title: QTP 000605: CY37383X/CY37512X ULTRALOGIC 384/512 MACROCELL  
ISR CPLD PRODUCT QUALIFICATION REPORT  
Document Number: 001-90733

Rev.	ECN No.	Orig. of Change	Description of Change
**	4253423	ZIJ	Initial spec release.

Distribution: WEB

Posting: None