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Continuity of ordering part numbers
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Cypress Semiconductor
Product Qualification Report

QTP#000605
September, 2000

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

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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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_2 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 ≤1.3mil
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)

ELECTRICAL TEST / FINISH DESCRIPTION	
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	Activation Energy	Thermal AF[4]	Failure Rate[5]
High Temperature Operating Life Early Failure Rate	1,126 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	222,446 DHRs	0	0.7	170	24 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] Failure rate estimates do not include the voltage acceleration factor.
[4] 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.

[5] **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
STRESS: HIGH TEMPERATURE STORAGE (Plastic)							
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	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY37256P160-AC	KOREA-Q	9822118	619806102	48	250	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	48	250	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
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	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015 (2,200V)							
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	
STRESS: HI-ACCEL SATURATION TEST (130C,85%RH,5.5V), PRECOND. S/REFLOW + 72 HRS 30C/60%RH							
CY37256P160-AC	KOREA-Q	9822118	619806102	128	43	0	
CY37256P160-AC	KOREA-Q	9826126	619808070	128	45	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 5.5V)							
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	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
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	
STRESS: COLD LIFE TEST (-30C, 6.5V)							
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	
PRESSURE COOKER TEST (121C, 100%RH)							
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
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

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

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