Cypress Semiconductor
Product Qualification Report

QTP# 99252 VERSION 1.0
September, 2000

High-Performance CPLDs	
CY37032P44/ **CY37032VP44**	**UltraLogic™ 32-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		E-3 Technology, TSMC fab, CY37256*		Sep 98
99252		New Product CY37032*		Sep 99

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: To qualify CY37032P44 in qualified E3 Technology, TSMC			
Marketing Part #:	CY37032P44/CY37032VP44		
Device Description:	3V and 5V, Commercial available in		
Cypress Division:	Cypress Semiconductor Corporation – Product Line Division (PLD)		
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. A	
Die Size (stepping):	157.6 mils x 75.7 mils	What ID markings on Die:	7C37610A 7C37615A

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 (µ-drawn):		Single Poly EEProm 0.5µm	
Gate Oxide Material/Thickness (MOS):		SiO_2 125Å /180Å (high voltage)	
Name/Location of Die Fab (prime) Facility:		TSMC, Taiwan	
Die Fab Line ID/Wafer Process ID:		TSMC / E3	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY
44-pead TQFP	**KOREA-A**

MAJOR PACKAGE USED IN THIS QUALIFICATION	
Package Designation:	J44S
Package Outline, Type, or Name:	44-lead Plastic Leaded Chip Carrier (PLCC)
Mold Compound Name/Manufacturer:	Nitto-800
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
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:	Ablestik 8361H
Bond Diagram Designation	10-03641
Wire Bond Method:	Thermosonic
Wire Material/Size:	1.3mil
Thermal Resistance Theta JA °C/W:	50.8
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-10002
Name/Location of Assembly (prime) facility:	Anam Korea (KOREA-A)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Anam Korea (KOREA-A)
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 #98376 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Operating Life Latent Failure Rate	1) QTP # QTP #98376 Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
High Temperature Steady State Life	1) QTP #98376 Dynamic Operating Condition, Vcc = 5. 5V, 150°C	P
Read and Record Life Test	1) QTP #98376 Dynamic Operating Condition, Vcc = 5. 5V, 150°C	P
High Accelerated Saturation Test (HAST)	1) QTP #98376 130°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity MSL 5 S/REFLOW + 72 Hrs , 30C/60%RH	P
Pressure Cooker	1) QTP #98376 121C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 5 S/REFLOW + 72 Hrs , 30C/60%RH	P
Temperature Cycle (Plasric)	1) QTP #98376 MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 5 S/REFLOW +72 Hrs , 30C/60%RH	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1) QTP #99252, QTP #98376 2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	1) QTP #99252, QTP #98376 500V Cypress Spec. 25-00020	P
Cold Life Test	1) QTP #98376 -30C, 6.5V	P
Current Density	1) QTP #98376 Cypress Spec. 22-00029	P

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENT (continuation)

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Bond pull	1) QTP #98376 Cypress Spec. 12-00292	P
High Temperature Storage	QTP #98376 165C, no bias	P
SEM Analysis	MIL-STD-883, Method 2018 (98376)	P
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081 (±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	500 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	123,280 DHRs	0	0.7	170	44 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] **Early and Long Term Failure Rate were based on 192/256 Macrocell, E3 Technology, TSCM Fab qualification, QTP 98376**.

RELIABILITY TEST DATA

QTP#: 99252

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: ESD-CHARGE DEVICE MODEL, 1000V							
CY37032P44-JC	KOREA-A	2924686	619917227	COMP	3	0	
CY37032P44-JC	KOREA-A	2925772	619918025	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V							
CY37032P44-JC	KOREA-A	2924686	619917227	COMP	3	0	
CY37032P44-JC	KOREA-A	2925772	619918025	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING, +/-200 mA							
CY37032P44-JC	KOREA-A	2924686	619917227	COMP	3	0	
CY37032P44-JC	KOREA-A	2924686	619917227	COMP	3	0	
CY37032P44-JC	KOREA-A	2925772	619918025	COMP	3	0	

RELIABILITY TEST DATA

QTP#: 98376[1]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMPERATURE STORAGE-PLASTIC, 165C, NO BIAS							
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							
CY37256P160-AC	KOREA-Q	9822118	619806102	1000V	3	0	
CY37192P160-AC	KOREA-Q	9825125	619807493	750V	3	0	
CY37256VP208-NC	TAIWN-J	9826126	619808073	1000V	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015							
CY37256P160-AC	KOREA-Q	9822118	619806102	2000V	3	0	
CY37192P160-AC	KOREA-Q	9825125	619807493	2000V	3	0	
CY37256VP208-NC	TAIWN-J	9826126	619808073	4400V	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 5.5V,85%RH), 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	

[1] 256/192 Macrocell, High Performance CPLDs, E3 Technology, TSMC Fab.

RELIABILITY TEST DATA

QTP#: 98376

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