Cypress Semiconductor
Qualification Report

QTP# 97127VERSION 1.1
August, 1997

UltraLogic™ 128-Macrocell Flash CPLD

CY7C374i/CY7C375i

PRODUCT/TECHNOLOGY INFORMATION

PRODUCT DESCRIPTION (for qualification)			
Information provided in this document is intended for generic qualification and technically describes the Cypress part supplied:			
Marketing Part #:	CY7C374i/375i		
Package:	84 pins PLCC/84 pins CLCC		
Device Description:	UltraLogic™ 128-Macrocell Flash CPLD		
Cypress Division:	Cypress Semiconductor Corporation - PLD Division		
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. G		
Die Size (stepping):	327 mils x 193 mils	What ID markings on Die:	7C374i/375i

TECHNOLOGY/FAB PROCESS DESCRIPTION - FLASH24/28			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 6,800Å AL-1%Si/1,200Å TiW Metal 2: 1500Å TiW/10,000Å Al-1%Si/300Å Tiw
Passivation Type and Materials:	3,000A SiO_2 + 15,000A Oxynitride		
Number of transistors in device			
Number of gates in device			
Free Phosphorus contents in top glass layer(%):	None		
Die Coating(s), if used:	None		
Generic Process Technology/Design Rule (µ-drawn):	CMOS FLASH 0.65µm		
Gate Oxide Material/Thickness (MOS):	Gox1 = 225Å, Gox2 = 165Å, Tunel ox = 100Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor - Round Rock, TX		
Die Fab Line ID/Wafer Process ID:	Fab 2 / FLASH24/28		

PACKAGE/ASSEMBLY INFORMATION

PLASTIC PACKAGE/ASSEMBLY DESCRIPTION			
Package Outline, Type, or Name:	84-pin Plastic Leaded Chip Carrier (PLCC)		
Mold Compound Name/Manufacturer:	Nitto-MP8000		
Lead Frame material:	Copper		
Lead Finish, composition:	Solder Plated, 85%Sn, 15%Pb		
Die Attach Area Plating:	Silver Spot		
Die Attach Method:	Paste	Die Attach Material:	Silver Epoxy
Wire Bond Method:	Thermosonic	Wire Material/Size:	Gold / 1.3 mil
JESD22-A112 Moisture Sensitivity Level	Level 3		
Assembly Line ID and Process ID:	Cypress Bangkok, Thailand		

HERMETIC PACKAGE/ASSEMBLY DESCRIPTION			
Package Outline, Type, or Name:	88-pin Ceramic Leaded Chip Carrier (CLCC)		
Lead Seal Method/Material	Glass Seal, KC700/187		
Lead Frame material:	Alloy 42		
Lead Finish, composition:	Sn Pb Solder Dip (63/37)		
Die Attach Method:	Ag Glass	Die Attach Material:	QMI 2419MG
Wire Bond Method:	Ultrasonic	Wire Material/Size:	Al / 1.25 mil
Assembly Line ID and Process ID:	Cypress Bangkok, Thailand		

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

RELIABILITY TESTS PERFORMED

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc = 6.5V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 6.5V, 125°C	P
Read and Record Life Test	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc = 6.0V, 140°C	P
High Accelerated Saturation Test (HAST)	130°C, 85%RH, 5.5V Precondition: JESD22 Moisture Sensitivity Level 3 (192 Hrs , 30/60%RH + 3cys Solder Reflow)	P
Data Bake-Hermetic	250°C, no bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7	2,200V
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020	500V
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081	8.5V

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF[4]	Failure Rate[3]
High Temperature Operating Life Early Failure Rate	1,346 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life[1,2] Long Term Failure Rate	37,500 DHRs (150C)	0	0.7	170	Overall Fit
	163,500 DHRs (125C)	0	0.7	55	59 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 is based on Flash24/28 technology on 128-Macrocell Flash CPLD (QTP #96176 & 97127). Derating factor of 0.326 between 125C and 150C was calculated per Arrhenius equation.
[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.

RELIABILITY TEST DATA

QTP#: 97127[1]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: DATA BAKE-HERMETIC (250C, NO BIAS)							
CY7C374I-YMB	ALPHA-X	2644485	219702728	96	81	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 6.5V)							
CY7C374I-JC	ALPHA-X	2644485	219701614	48	79	0	
CY7C374I-JC	ALPHA-X	2644485	219702747	12	494	0	
CY7C374I-JC	ALPHA-X	2644485	219702747	48	494	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C374I-JC	ALPHA-X	2644485	219701614	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2200V							
CY7C374I-JC	ALPHA-X	2644485	219701614	COMP	3	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 192 HRS 30C/60%RH							
CY7C374I-JC	ALPHA-X	2644485	219701614	128	23	0	
CY7C374I-JC	ALPHA-X	2644485	219701614	128	25	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 6.5V)							
CY7C374I-JC	ALPHA-X	2644485	219701614	80	79	0	
CY7C374I-JC	ALPHA-X	2644485	219701614	500	79	0	
STRESS: READ & RECORD LIFE TEST (125C, 6.5V)							
CY7C374I-JC	ALPHA-X	2644485	219701614	48	10	0	
CY7C374I-JC	ALPHA-X	2644485	219701614	500	10	0	
CY7C374I-JC	ALPHA-X	2644485	219701614	80	10	0	

[1] Qtp 97127, CY7C374i/375i with 15 layer mask changed, Rev G, Flash24/28 technology qualification.

DEVICE RELATAED RELIABILITY TEST DATA

QTP#: 96176[2]

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: DATA BAKE-HERMETIC (250C, NO BIAS)							
CY7C374I-YC	ALPHA-X	2620451	219612105	96	76	0	
STRESS: DATA BAKE-PLASTIC (165C, NO BIAS)							
CY7C374I-JC	KOREA-A	2611212	349605154	168	79	0	
CY7C374I-JC	KOREA-A	2611212	349605154	552	79	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 5.75V)							
CY7C374I-YM	ALPHA-X	2613470	219607661	12	93	0	1 EOS
CY7C374I-YM	ALPHA-X	2613470	219607661	60	90	0	3 EOS
CY7C374I-YM	ALPHA-X	2613470	219607661	96	87	0	1 EOS
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 6.5V)							
CY7C374I-JC	KOREA-A	2611212	349604951	12	79	0	
CY7C374I-JC	KOREA-A	2611212	349604951	48	79	0	
CY7C374I-JC	KOREA-A	2611212	349605154	24	91	0	
CY7C374I-JC	KOREA-A	2611212	349605154	96	91	0	
CY7C375I-AC	KOREA-Q	2612340	349605999/34960	48	77	0	
CY7C374I-JC	KOREA-A	2612340	349606397	12	94	0	
CY7C374I-JC	KOREA-A	2612340	349606397	48	93	0	
CY7C374I-JC	KOREA-A	2620499	349608901	12	79	0	
CY7C374I-JC	KOREA-A	2620499	349608901	48	79	0	
CY7C374I-JC	KOREA-A	2625097	349610752	48	84	0	
CY7C374I-JC	KOREA-A	2625097	349610752	96	84	0	
STRESS: GROUP C, SUBGROUP 1, LIFE TEST (150C, 5.75V)							
CY7C374I-YMB	ALPHA-X	2613470	219607661	184	47	0	1 EOS
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. 24 HRS 85C/60%RH							
CY7C374I-JC	KOREA-A	2612340	349606397	36	10	0	
CY7C374I-JC	KOREA-A	2612340	349606397	128	10	0	
CY7C374I-JC	KOREA-A	2612340	349606397	128	14	0	
CY7C374I-JC	KOREA-A	2612340	349606397	128	14	0	
STRESS: HI-ACCEL SATURATION TEST (140C, 5.5V), PRECOND. DB + 72 HRS 30C/60%RH							
CY7C374I-JC	KOREA-A	2611212	349605154	128	47	0	
CY7C375I-AC	KOREA-Q	2613561	349607199	128	27	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 5.5V), PRECOND. DB + 72 HRS 30C/60%RH							
CY7C375I-AC	KOREA-Q	2612340	349605999/34960	128	36	0	

[2] Qtp 96176, CY7C374i/375i, Rev. D, Flash24/28 technology qualification.

DEVICE RELATED RELIABILITY TEST DATA

QTP#: 96176

DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	REJ	FAIL MODE
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.75V)							
CY7C374I-JC	KOREA-A	2611212	349605154	168	79	0	
CY7C374I-JC	KOREA-A	2611212	349605154	336	79	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V)							
CY7C374I-YM	ALPHA-X	2613470	219607661	12	79	0	
CY7C374I-YM	ALPHA-X	2613470	219607661	60	75	0	
CY7C374I-YM	ALPHA-X	2613470	219607661	500	75	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 6.5V)							
CY7C374I-JC	KOREA-A	2611212	349604951	500	79	0	
CY7C375I-AC	KOREA-Q	2612340	349605999/34960	500	76	0	
CY7C374I-JC	KOREA-A	2612340	349606397	500	93	0	
CY7C374I-JC	KOREA-A	2620499	349608901	80	79	0	
STRESS: TC COND. C, -65 TO 150C, HERMETIC DEVICES							
CY7C374I-YM	ALPHA-X	2613470	219607661	100	48	0	
CY7C374I-YM	ALPHA-X	2613470	219607661	1000	48	0	
STRESS: TC COND. C, -65 TO 150C, PRECONDITION DRY-BAKE							
CY7C374I-JC	KOREA-A	2611212	349604951	300	48	0	
CY7C374I-JC	KOREA-A	2611212	349604951	1000	47	0	
STRESS: TC COND. C, -65 TO 150C, PRECOND. DBAKE + 72 HRS 30/60%RH							
CY7C375I-AC	KOREA-Q	2612340	349605999/34960	300	48	0	
CY7C375I-AC	KOREA-Q	2612340	349605999/34960	1000	48	0	