Qualification Report

December 1995, QTP# 94045, Version 1.0

128-Macrocell Flash CPLD

(CY7C374)

PRODUCT DESCRIPTION (for qualification)			
Information provided in this document is intended for generic qualification and technically describes the Cypress part supplied:			
Marketing Part #:	CY7C374		
Package:	84-pin Plastic Leaded Chip Carrier (PLCC) 84-pin Ceramic Leaded Chip Carrier (LCC) 84-Pin Grid Array (PGA) 100-pin Thin Quad Plastic Flatpack (TQFP)		
Device Description:	128-Macrocell		
Cypress Division:	Cypress Semiconductor Corporation		
Overall Die (or Mask) REV Level (pre-requisite for qualification):		Rev. A	
Die Size (stepping):	394 mils x 357 mils	What ID markings on Die:	7C374A

TECHNOLOGY/FAB PROCESS DESCRIPTION - FLASH22D			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å Ti, 1200A TiW, 6,000A Al, 500A Ti Metal 2: 1,200A Ti, 9,000A Al
Passivation Type and Materials:		3,000A TEOS + 15,000A Oxynitride	
Free Phosphorus contents in top glass layer(%):		2% PSG	
Die Coating(s), if used:	None		
Generic Process Technology/Design Rule (µ-drawn):		Double Poly, Double Metal / 0.65µm	
Gate Oxide Material/Thickness (MOS):		SiO_2 - Control gate 220Å, Pass gate 165Å, Erase gate 100Å	
Name/Location of Die Fab (prime) Facility:		Cypress Semiconductor - San Jose, CA	
Die Fab Line ID/Wafer Process ID:		Fab 1 / FLASH22D	

PLASTIC PACKAGE/ASSEMBLY DESCRIPTION				
Package Outline, Type, or Name:	84-pin Plastic Leaded Chip Carrier (PLCC) 100-pin Thin Quad Flat Pack (TQFP)			
Mold Compound Name/Manufacturer:	Sumitomo EME-6300H(R)			
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 5			
Name/Location of Assembly (prime) facility:	Anam, Korea (PLCC/TQFP)			

HERMETIC PACKAGE/ASSEMBLY DESCRIPTION			
Package Outline, Type, or Name:	84-pin Ceramic Pin Grid Array (PGA) 100-pin Ceramic Leaded Chip Carrier		
Lead Frame material:	Alloy 42		
Lead Finish, composition:	Solder Dipped, 63%Sn, 37%Pb		
Seal Material:	Glass		
Die Attach Method:	Paste	Die Attach Material:	Silver Glass
Wire Bond Method:	Ultrasonic	Wire Material/Size:	Aluminum / 1.25 mil
Name/Location of Assembly (prime) facility:	Anam, Philippines (Ceramic Leaded Chip Carrier) Cypress Bangkok (Pin Grid Array)		

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

RELIABILITY TESTS PERFORMED

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Data Retention (Hermetic)	250°C, non-biased	P
Data Retention (Plastic)	165°C, non-biased	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 5.75V, 150°C	P
Read and Record Life Test	Dynamic Operating Condition, Vcc = 5.75V, 125°C	P
Military Test Group C	Group C, Subgroup 1 Life Tests, Vcc = 5.75V, 150°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc = 5.75V, 125°C	P
High Accelerated Saturation Test (HAST)	140°C, 85%RH, 5.5V Precondition: 48-Hrs PCT, 3 Cys Solder Reflow	P
Long Life Verification	Dynamic Operating Condition, Vcc = n.nnV, 150°C/125°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Temperature Cycle	JEDEC22 Condition B, -40°C to 125°C, Precondition: Dry-bake, 3 Cys Solder Reflow	P
Pressure Cooker Test	No bias, 121°C, 100%RH, 30 PSIA Precondition: 40 Temperature cycles, Condition C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	MIL-STD-883, Method 3015.7	P 2,200V
Electrostatic Discharge Charge Device Model (ESD-CDM)	Cypress Spec. 25-00020	P 1,000V
Flash Programming Verification	200 Write/Erase Cycles	P
Latchup Sensitivity	In accordance with JEDEC 17. Cypress Spec. 01-00081	P
Aged Bond Strength	MIL-STD-883, Method 2011	P
SEM Analysis	MIL-STD-883, Method 2018	P
Current Density	Cypress Spec 22-00029	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Devive Hours	# Fails	Activation Energy	Acceleration Factor	Failure Rate (FIT)
High Temperature Operating Life Early Failure Rate	Not perform[3]	N/A	N/A	N/A	N/A
High Temperature Operating Life[1,2] Long Term Failure Rate	610,996 DHRs[4]	1	0.45 (non visual)	27 (150°C) 13 (125°C)	222.1
	610,996 DHRs	1	0.30 (Oxide def.)	9 (150°C) 5.6 (125°C)	550.8
	610,996 DHRs	2	See Above	---	773

[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] EFR is not required. A production burn-in of 96 hours at 125°C, 5.75V is performed for this product.
[4] 73,660 DHRs @ 150°C and 537,336 DHRs @ 125°C.

RELIABILITY TEST DATA

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DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	Rej	Fail Mode
STRESS: DATA BAKE-HERMETIC (250C, NO BIAS)							
CY7C374-YC	PHIL-M	1433295	349413105	96	79	0	
CY7C374-YC	PHIL-M	1433295	349413105	168	79	0	
STRESS: DATA BAKE-PLASTIC (165C, NO BIAS)							
CY7C374-JC	KOREA-A	1412457	49405073	168	79	0	
CY7C374-JC	KOREA-A	1412457	49405073	552	79	0	
CY7C374-JC	KOREA-A	1404252	49405480	168	79	0	
CY7C374-JC	KOREA-A	1404252	49405480	552	79	0	
STRESS: GROUP C, SUBGROUP 1, LIFE TEST (150C, 5.75V)							
CY7C374-GMB	ALPHA-X	1441525	219414661	184	78	0	2 EOS
STRESS: HI-ACCEL SATURATION TEST (140C, 85%RH, 5.5V), PRECONDITION 48 HRS PCT							
CY7C374-JC	KOREA-A	1412447	49405074	128	45	0	
CY7C374-JC	KOREA-A	1404252	49405480	128	48	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (125C, 5.75V) ACTUAL CONDITION 125C /5.75V							
CY7C374-JC	KOREA-A	1412457	49405073	168	78	0	
CY7C374-JC	KOREA-A	1412457	49405073	336	78	0	
CY7C374-JC	KOREA-A	1419739	49408152	217	60	0	
CY7C374-JC	KOREA-A	1419739	49408152	433	60	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 5.75V) ACTUAL CONDITION 150C /5.75V							
CY7C374-YC	PHIL-M	1424939	49409172/3	80	78	0	1 EOS
CY7C374-YC	PHIL-M	1424939	49409172/3	500	76	1	2 EOS/1 NON VISUAL
CY7C374-YC	PHIL-M	1424939	49409172/3	1000	71	0	4 EOS
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 5,75V)							
CY7C374-JC	KOREA-A	1412457	49405073	168	154	0	
CY7C374-JC	KOREA-A	1412457	49405073	1000	153	1	1 OXIDE DEFECT
CY7C374-JC	KOREA-A	1412457	49405073	1500	152	0	
CY7C374-JC	KOREA-A	1412457	49405073	2000	152	0	
CY7C374-JC	KOREA-A	1412447	49405074	168	79	0	
CY7C374-JC	KOREA-A	1412447	49405074	1000	78	0	1 EOS
CY7C374-JC	KOREA-A	1412447	49405074	2000	78	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH)							
CY7C374-JC	KOREA-A	1412447	49405074	168	16	0	
CY7C374-JC	KOREA-A	1412447	49405074	288	16	0	
CY7C374-JC	KOREA-A	1401159	49405479	168	32	0	
CY7C374-JC	KOREA-A	1401159	49405479	288	32	0	

CY7C374-JC	KOREA-A	1404252	49405480	168	48	0
CY7C374-JC	KOREA-A	1404252	49405480	288	48	0

STRESS: READ & RECORD LIFE TEST (125C, 5.75V)

CY7C374-JC	KOREA-A	1412457	49405073	168	10	0

STRESS: TEMP CYCLE, COND. C, -65C TO 150C
ACTUAL CONDITION 150C /-65C

CY7C374-YC	PHIL-M	1424939	49409172/3	100	49	0
CY7C374-YC	PHIL-M	1424939	49409172/3	1000	47	0

RELIABILITY TEST DATA

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DEVICE	ASSY-LOC	FABLOT#	ASSYLOT#	DURATION	S/S	Rej	Fail Mode
CY7C374-AC	KOREA-A	1442568	349415643	500	48	0	
CY7C374-AC	KOREA-A	1442568	349415643	1000	48	0	
CY7C374-AC	KOREA-A	1442568	349415643	1500	48	0	
CY7C374-JC	KOREA-A	1419739	49408149/50/51	300	45	0	
CY7C374-JC	KOREA-A	1419739	49408149/50/51	500	45	0	
CY7C374-JC	KOREA-A	1419739	49408149/50/51	1000	45	0	
CY7C374-JC	KOREA-A	1419739	49408149/50/51	1500	45	0	

STRESS: TEMP CYCLE, JEDEC22 COND. B, -40 TO 125C, PRECONDITION DRY BAKED