

Cypress Semiconductor Product Qualification Report

QTP# 044505 VERSION 1.0
July 2005

FX2LP/FX1-128 Device Family C8Q-3R Technology, Fab 4	
CY7C68013A CY7C68014A	EZ-USB FX2LP™ USB Microcontroller
CY7C64713	EZ-USB FX1™ USB Microcontroller Full –Speed USB Peripheral Controller
CY7C68300B CY7C68301B CY7C68320 CY7C68321	EZ-USB AT2LP™ USB 2.0 to ATA/ATAPI Bridge

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
033805	FX2LP/FX1/AT2LP New Device Family on New C8Q-3R Technology, Fab4	Jan 05
044505	7C6810**B Device Family (FX2LP-128) on C8Q-3R Technology, Fab4	Jun 05

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: New Device Family FX2LP/FX1-128 in C8Q-3R Technology from Fab4	
Marketing Part #:	CY68013/4/5/6A, CY7C64713, CY7C68300/1B, CY7C68320/1
Device Description:	3.3V, Commercial, available in 100/128-pin TQFP, 56-pin SSOP and QFN
Cypress Division:	Cypress Semiconductor Corporation – Consumer & Computation Division (CCD)
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. B
What ID markings on Die:	7C68100A

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	4	Metal Composition:	Metal 1: 300A Ti/3,200A Al 0.5% Cu /300A TiW Metal 2: 150A Ti/4,000A Al 0.5% Cu/300A TiW Metal 3: 150A Ti/4,000A Al 0.5% Cu/300A TiW Metal 4: 150A Ti/4,000A Al 0.5% Cu/300A TiW
Passivation Type and Materials:	1,000A TeOs / 9,000A Si ₃ N ₄		
Free Phosphorus contents in top glass layer (%):	0%		
Number of Transistors in Device:	700K		
Number of Gates in Device	120K		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, 0.13 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ DGOX 32/55A		
Name/Location of Die Fab (prime) Facility:	CMI/Fab4		
Die Fab Line ID/Wafer Process ID:	Fab4, C8Q-3R		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
100-Pin TQFP	Cypress Phil (CML-R)
128-Pin TQFP	ASE-Taiwan (TAIWN-G)
56-Pin SSOP	Cypress Phil. (CML-R)
56-Pin QFN	Seoul-Korea (SEOL-L)

Note: Package Qualification details upon request.

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	AZ128
Package Outline, Type, or Name:	128-Pin Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Hitachi CEL9200CYR
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	N/A
Lead Frame Designation:	N/A
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Pure Sn
Die Backside Preparation Method/Metallization:	Grinding
Die Separation Method:	Sawing
Die Attach Supplier:	Dexter
Die Attach Material:	QMI 505
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-06610
Wire Bond Method:	Thermosonic
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	42.27°C/W
Package Cross Section Yes/No:	No
Assembly Process Flow:	49-41035
Name/Location of Assembly (prime) facility:	Taiwan-G

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-R
Fault Coverage:	99.5%

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	Dynamic Operating Condition, Vcc Max = 2.35V, 125°C Dynamic Operating Condition, Vcc Max = 3.8V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max = 2.35V, 125°C Dynamic Operating Condition, Vcc Max = 3.8V, 125°C	P
Long Life Verification	Dynamic Operating Condition, Vcc Max = 3.8V, 125°C	P
Low Temperature Operating Life	-30C, 4.3V	P
High Temperature Steady State life	150°C, 3.63V, Vcc Max	P
High Accelerated Saturation Test (HAST)	130°C, 1.8V/3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30°C/60%RH+3IR-Reflow, 260°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V JESD22, Method A114-B	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Ball Shear	Cypress Spec 24-00018	P
Acoustic Microscopy	Spec. 25-00104	P
Latch up Sensitivity	125°C, ± 100mA/300 mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal ³ A.F	Failure Rate
High Temperature Operating Life Early Failure Rate ¹	2,477 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate	806,008 DHRs	0	0.7	55	21 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 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 #: 033805

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC -MSL3							
CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	COMP	17	0	
CY2SSTU877 (7C87741A)	4416666B	H20592	TAIWN-G	COMP	16	0	
CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	COMP	17	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	16	0	
STRESS: AGE BOND STRENGTH							
CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	COMP	5	0	
CY7C68013A (7C682001A)	4416701	610437657	TAIWN-G	COMP	5	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	3	0	
STRESS: BALL SHEAR							
CY7C68013A (7C682001A)	4416701	610437657	TAIWN-G	COMP	5	0	
STRESS: DYNAMIC LATCH-UP TESTING (6.9V)							
CY7C68013A (7C682001A)	4416701	610437657	TAIWN-G	COMP	3	0	
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	COMP	9	0	
CY7C68013A (7C682000A)	4416666	610437102	TAIWN-G	COMP	9	0	
CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	COMP	9	0	
CY7C68013A (7C682000A)	4416701	610437702	TAIWN-G	COMP	9	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V							
CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	COMP	9	0	
CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	COMP	9	0	
CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	COMP	9	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	COMP	3	0	
CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	COMP	3	0	
CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	COMP	3	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	3	0	

Reliability Test Data

QTP #: 033805

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 3.63V)

CY7C68013A (7C682005A)	4416701	610438121	TAIWN-G	80	80	0	
CY7C68013A (7C682005A)	4416701	610438121	TAIWN-G	168	80	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 3.8V, Vcc Max)

CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	96	499	0	
CY7C68013A (7C682005A)	4417143	610443845	TAIWN-G	96	514	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 3.8V, Vcc Max)

CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	168	200	0	
CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	1000	194	0	
CY7C68013A (7C682005A)	4417143	610443845	TAIWN-G	168	208	0	
CY7C68013A (7C682005A)	4417143	610443845	TAIWN-G	1000	208	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (125C, 2.35V, Vcc Max)

CY2SSTU877 (7C87741A)	4416666B	H20592	TAIWN-G	96	276	0	
CY2SSTU877 (7C82877A)	4416701	H20501	TAIWN-G	96	126	0	
CY2SSTU877 (7C87741A)	4416701	H20500	TAIWN-G	96	89	0	
CY2SSTU877 (7C87740A)	4416791B	H20536	TAIWN-G	96	169	0	
CY2SSTU877 (7C87741A)	4417975	H20583	TAIWN-G	96	304	0	
CY2SSTU877 (7C87741A)	4419587	H20650	TAIWN-G	96	500	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (125C, 2.35V, Vcc Max)

CY2SSTU877 (7C87741A)	4416666B	H20592	TAIWN-G	1000	253	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	168	150	0	
CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	1000	150	0	

STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR, 30C/60%RH, MSL3

CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	128	47	0	
CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	256	47	0	
CY7C68013A (7C682000A)	4416701	610437702	TAIWN-G	128	47	0	
CY7C68013A (7C682000A)	4416701	610437702	TAIWN-G	256	45	0	

STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 1.8V), PRE COND 192 HR, 30C/60%RH, MSL3

CY2SSTU877 (7C87741A)	4417975	H20583	TAIWN-G	128	43	0	
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Reliability Test Data

QTP #: 033805

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: LOW TEMPERATURE OPERATING LIFE (-30C, 4.3V)

CY7C68013A (7C682005A)	4416701	610438121	TAIWN-G	500	80	0	
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STRESS: HIGH TEMPERATURE STORAGE, 150C, no bias

CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	500	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	1000	50	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	500	45	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	1000	45	0	
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STRESS: PRESSURE COOKER TEST (121C, 100%RH), PRE COND 192 HR, 30C/60%RH, MSL3

CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	168	50	0	
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CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	288	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	168	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	288	50	0	
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CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	168	47	0	
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CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	288	47	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	168	45	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	288	45	0	
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STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS, 30C/60%RH, MSL3

CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	300	50	0	
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CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	500	50	0	
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CY7C68013A (7C681000A)	4416666	610434406	TAIWN-G	1000	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	168	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	500	50	0	
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CY7C68013A (7C681000A)	4416701	610434407/8	TAIWN-G	1000	50	0	
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CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	300	46	0	
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CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	500	45	0	
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CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	1000	45	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	300	45	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	500	45	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	1000	45	0	
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Reliability Test Data

QTP #: 033805

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
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STRESS: STATIC LATCH-UP TESTING (125C, 5.5V, ±300mA)

CY2SSTU877 (7C82877A)	4413035	H19747	TAIWN-G	COMP	3	0	
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CY2SSTU877 (7C87740A)	4417143	H20549	TAIWN-G	COMP	3	0	
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STRESS: STATIC LATCH-UP TESTING (125C, 6.5V, ±300mA)

CY7C68013A (7C682001A)	4416666	610437607	TAIWN-G	COMP	3	0	
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STRESS: STATIC LATCH-UP TESTING (125C, 7.5V, ±300mA)

CY7C68013A (7C682001A)	4416701	610437657	TAIWN-G	COMP	3	0	
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Reliability Test Data

QTP #: 044505

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ESD-CHARGE DEVICE MODEL (500V)							
CY7C68013A (7C681000B)	4445356	610500431	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V							
CY7C68013A (7C681000B)	4445356	610500431	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C68013A (7C681000B)	4445356	610500431	TAIWN-G	COMP	3	0	
STRESS: STATIC LATCH-UP TESTING (125C, 7.5V, ±100mA)							
CY7C68013A (7C681000B)	4450548	610508837	TAIWN-G	COMP	6	0	
CY7C68013A (7C681000B)	4503135	610511953	TAIWN-G	COMP	6	0	
CY7C68013A (7C681000B)	4507150	610517384	TAIWN-G	COMP	6	0	