

Cypress Semiconductor Product Qualification Report

QTP# 014102 VERSION 2.0
August, 2003

USB High Speed

R52FFD-3 Technology, Fab 4

CY7C68013

**EZ-USB® FX2™ USB
Microcontroller**

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TECHNOLOGY QUALIFICATION HISTORY

Qual Report	Description of Qualification Purpose	Date Comp
011205	New Technology Derivative, R52FFD-3, Fab 4 / New 1Meg, GB/s Quad Port Switch CY7C04312BV/ CY7C04314BV	June 01
014102	New EZ-USB® FX2™ USB Microcontroller , CY68013 and bond option.	Dec 01

PRODUCT DESCRIPTION (for qualification)			
Qualification Purpose: Qualify New device CY7C68013 and bond option in technology R52FFD-3, Fab 4			
Marketing Part #:	CY7C68013		
Device Description:	3.3V, Commercial and Industrial, available in 100/128-pin TQFP and 56-lead SSOP package		
Cypress Division:	Cypress Semiconductor Corporation – Interface Product Division (IPD)		
Overall Die (or Mask) REV:			Rev. E
What ID markings on Die:	7C68013E		

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	2	Metal Composition:	Metal 1: 500Å TiW/6,000Å Al-0.5%Cu/300Å TiW Metal 2: 300Å Ti/8,000Å Al-0.5%Cu/300Å TiW
Passivation Type and Materials:	1,000Å Oxide / 9,000 Å Nitride		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors:	2 million		
Number of Gates:	400,000		
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal, 0.25 μm		
Gate Oxide Material/Thickness (MOS):	SiO ₂ 55Å		
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – Bloomington, MN		
Die Fab Line ID/Wafer Process ID:	Fab4/R52FFD-3		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE
120/128-pin TQFP	ASE Taiwan
56-lead SSOP	CSPI-R

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A128
Package Outline, Type, or Name:	128-pin Thin Quad Flat Pack (TQFP)
Mold Compound Name/Manufacturer:	Sumitomo EME 7320
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plate, 85%Sn, 15%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	10-04107
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold/ 1.0mil
Thermal Resistance Theta JA °C/W:	40°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	49-41004
Name/Location of Assembly (prime) facility:	ASE Taiwan (TAIWN-G)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	ASE Taiwan (TAIWN-G), Cypress CSPI-R, Cypress WA
Fault Coverage:	100%

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

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	O563
Package Outline, Type, or Name:	56-lead Small Shrunk Outline Package (SSOP)
Mold Compound Name/Manufacturer:	Hitachi CEL 9200
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	Solder Plate, 85%Pb, 15%Sn
Die Backside Preparation Method/Metallization:	N/A
Die Separation Method:	Wafer Saw
Die Attach Supplier:	Ablestik
Die Attach Material:	Ablestik 8361H
Die Attach Method:	Silver Epoxy
Bond Diagram Designation	10-04110
Wire Bond Method:	Thermosonic
Wire Material/Size:	Gold, 1.0mil
Thermal Resistance Theta JA °C/W:	47.8°C/W
Package Cross Section Yes/No:	N/A
Assembly Process Flow:	11-20012
Name/Location of Assembly (prime) facility:	Cypress Philippines (CSPI-R)

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	Cypress Philippines (CSPI-R)
Fault Coverage:	100%

Note: Please contact a Cypress Representative for other packages availability

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
High Temperature Operating Life Early Failure	Dynamic Operating Condition, Vcc = 3.8V, 125°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 125°C	P
Temperature Cycle	Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs., 85°C/85%RH+3IR-Reflow, 220°C+5, -0°C 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, 220°C+5, -0°C	P
Pressure Cooker	Precondition: JESD22 Moisture Sensitivity Level 1 168 Hrs., 85°C/85%RH+3IR-Reflow, 220°C+5, -0°C 121°C, 100%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity Level 3 192 Hrs, 30C/60%RH+3IR-Reflow, 220°C+5, 0°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V Cypress Spec. 25-00020	P
Low Temperature Operating Life	30°C, 4.3V	P
Acoustic Microscopy, Level 3	Cypress Spec. 25-00104	P
SEM X-Section	MIL-STD-883C, Method 2018.2	P
Static Sensitivity Latchup	125°C, 10V, ± 300mA accordance with JEDEC 17. Cypress Spec. 01-00081	In P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor ⁴	Failure Rate ⁴
High Temperature Operating Life Early Failure Rate	2,213	0	N/A	N/A	0 PPM
High Temperature Operating Life Long Term Failure Rate ^{1,2}	816,836 HRs	0	0.7	170	20 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.

⁴ EFR Failure Rate based on QTP #014102 and QTP #011205

⁴ LFR FIT Rate based on QTP #011205

Reliability Test Data

QTP #: 011205

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max							
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	96	700	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	96	504	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.8V, Vcc Max							
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	168	410	0	
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	500	409	0	
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	1000	408	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	168	410	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	500	409	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	1000	407	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300mA							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	3	0	
STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V							
CY7C0430BV-BGI (7C04301A)	4025035	610044436	TAIWN-G	500	48	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 3.63V), PRE COND 192 HR 30C/60%RH, MSL3							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	128	46	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	128	57	0	
STRESS: PRESSURE COOKER TES, (121C, 100%RH), PRE COND 192 HR 30C/60%RH, MSL3							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	168	48	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	168	50	0	
STRESS: ACOUSTIC, MSL3							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	COMP	15	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	COMP	15	0	
CY7C0430BV-BGI (7C04301A)	4047508	610103357	TAIWN-G	COMP	15	0	

Reliability Test Data

QTP #: 011205

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	300	48	0	
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	500	48	0	
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	1000	47	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	300	50	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	500	50	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	1000	50	0	
*STRESS: TC COND, C -65C TO 150C							
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	300	48	0	
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	500	48	0	
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	1000	47	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	300	48	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	500	48	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	1000	47	0	

***Note: No precondition performed.**

Reliability Test Data

QTP #: 014102

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max							
CY7C68013-OC (7C68013E)	4139404	610138753	CSPI-R	96	1013	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C68013-AC (7C68013E)	4139404	610138254	TAIWN-G	COMP	9	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V							
CY7C68013-AC (7C68013E)	4139404	610138254	TAIWN-G	COMP	9	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-300mA							
CY7C68013-AC (7C68013E)	4139404	610138254	TAIWN-G	COMP	3	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 168 HR 85C/85%RH, MSL1							
CY7C68013-OC (7C680135B)	4129583	610136607	CSPI-R	168	50	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 168 HR 85C/85%RH, MSL1							
CY7C68013-OC (7C680135B)	4129583	610136607	CSPI-R	300	50	0	