

Cypress Semiconductor Product Qualification Report

QTP# 030310 VERSION 1.0
June, 2003

CY7C68310	ISD-300LP™ Low-Power USB 2.0 to ATA/ATAPI Bridge IC
NEC 0.25um Technology	

CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:

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PRODUCT QUALIFICATION HISTORY

Qual Report		Description of Qualification Purpose		Date Comp
030310		Qualify CY7C68310 Device in NEC 0.25um Technology		June 03

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: Qualify CY7C68310 on NEC 0.25umTechnology	
Marketing Part #:	CY7C68310
Device Description:	3.3V, Commercial available in 80-lead Thin Quad Flat Packs (TQFP)
Cypress Division:	Cypress Semiconductor Corporation – Personal Communication Division (PCD) WA
Overall Die (or Mask) REV Level (pre-requisite for qualification):	Rev. A1
What ID markings on Die:	NECD 84705

TECHNOLOGY/FAB PROCESS DESCRIPTION – NEC 0.25um			
Number of Metal Layers:	5	Metal Composition:	AlCu
Passivation Type and Materials:	P-SiON (1um) / Polyimide (5um)		
Free Phosphorus contents in top glass layer(%):	0%		
Number of Transistors in Device:	1.6M		
Number of Gates in Device	80K gate User Logic + USB2.0		
Generic Process Technology/Design Rule (μ-drawn):	CMOS 0.25um		
Gate Oxide Material/Thickness (MOS):	SiO ₂ / 60A		
Name/Location of Die Fab (prime) Facility:	NEC Electronics America (Roseville)		
Die Fab Line ID/Wafer Process ID:	NEC Roseville M-Line/DSY8-USB84705M611		

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	NEC Yamagata
Fault Coverage:	97%

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	A80
Package Outline, Type, or Name:	80-lead Thin Quad Flat Packs (TQFP)
Mold Compound Name/Manufacturer:	Epoxy/Sumitomo Bakelite
Mold Compound Flammability Rating:	V-O per UL94
Oxygen Rating Index:	>28%
Lead Frame Material:	Copper Base
Lead Finish, Composition / Thickness:	Solder Plated, Sn-Pb/5 to 20um
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Dicing Saw
Die Attach Supplier:	Sumitomo Bakelite
Die Attach Material:	Ag Paste
Die Attach Method:	Dispensing
Bond Diagram Designation:	10-05022
Wire Bond Method:	UNTC
Wire Material/Size:	Au, 1.0mil
Thermal Resistance Theta JA °C/W:	74.85°C/W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	NEC
Name/Location of Assembly (prime) facility:	NEC Yamagata

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
80-lead TQFP	NEC Yamagata

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=2.875V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=2.875V, 150°C	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max=2.7V, 125°C	P
High Accelerated Saturation Test (HAST)	130°C, 2.7V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs, 30C/70%RH+3IR-Reflow, 235°C+5, 0°C	P
Temperature Cycle	Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/70%RH+3IR-Reflow, 235°C+5, -0°C MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
Pressure Cooker	Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/70%RH+3IR-Reflow, 235°C+5, -0°C 121°C, 100%RH	P
High Bias 85C/85C	Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/70%RH+3IR-Reflow, 235°C+5, -0°C MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C	P
High Temperature Storage	150°C ± 5°C No Bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	1200V MIL-STD-883, Method 3015.7	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	200V Cypress Spec. 25-00020	P
Bond Pull	Cypress Spec 12-00292	P
Physical Dimensions	Cypress Spec. 25-00031	P
Die Shear	Cypress Spec 12-00292	P
Age Bond	Cypress Spec 12-00292	
Solderability, Steam Aged	Cypress Spec. 25-00018	P
X-Ray	MIL-STD-883, Method 32012, Cypress Spec. 12-00292	P
SEM X-Sections	MIL-STD-883, Method 883-2018-2	P
Acoustic Microscopy	MSL3 Cypress Spec. 25-00104	P
Latchup Sensitivity	125C, 10V, 7V, ± 300mA 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 ⁴
High Temperature Operating Life Early Failure Rate ¹	3045	0	N/A	N/A	0 PPM

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 #: 030310

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
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STRESS: ACOUSTIC,-MSL3

CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	15	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	COMP	15	0	
CY7C68310 -AC	RF32-3013	0315L3901	NEC	COMP	15	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 2.875V, Vcc Max

CY7C68310 -AC	RF31-2319	0313L3901	NEC	48	1005	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	48	1020	0	
CY7C68310 -AC	RF32-3013	0315L3901	NEC	48	1020	0	

STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 2.875V, Vc c Max

CY7C68310 -AC	RF31-2319	0313L3901	NEC	80	119	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	500	119	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	80	119	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	500	119	0	
CY7C68310 -AC	RF32-3013	0315L3901	NEC	80	119	0	

STRESS: HIGH TEMP STATIC OPERATING STEADY STATE LIFE, 125C, 2.7V, Vc c Max

CY7C68310 -AC	RF31-2319	0313L3901	NEC	168	76	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	500	76	0	

STRESS: ESD-CHARGE DEVICE MODEL, 200V

CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	3	0	
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STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 1200V

CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	3	0	
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STRESS: STATIC LATCH-UP TESTING, 125C, 10V, ±300mA

CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	3	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	COMP	3	0	

STRESS: STATIC LATCH-UP TESTING, 125C, 7V, ±300mA

CY7C68310 -AC	RF32-3013	0315L3901	NEC	COMP	3	0	
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Reliability Test Data

QTP #: 030310

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: BOND PULL							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	10	0	
STRESS: PHYSICAL DIMENSION							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	5	0	
STRESS: DIE SHEAR							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	15	0	
STRESS: AGE BOND							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	15	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	COMP	15	0	
CY7C68310 -AC	RF32-3013	0315L3901	NEC	COMP	15	0	
STRESS: SOLDERABILITY							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	40	0	
STRESS: X-RAY							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	COMP	15	0	
STRESS: HIGH TEMPERATURE STORAGE, 150°C, No Bias							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	500	45	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	1000	45	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 2.7V, PRE COND 192 HR 30C/70%RH, MSL3							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	128	45	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	256	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	128	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	256	45	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.6V, PRE COND 192 HR 30C/70%RH, MSL3							
CY7C68310 -AC	RF32-3013	0315L3901	NEC	128	45	0	
CY7C68310 -AC	RF32-3013	0315L3901	NEC	256	45	0	
STRESS: HIGH BIASED TEST, 85C/85%RH, 2.7V, PRE COND 192 HR 30C/70%RH, MSL3							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	500	45	0	

Reliability Test Data

QTP #: 030310

Device	Fab Lot #	Assy Lot #	Assy Loc	Duration	Samp	Rej	Failure Mechanism
STRESS PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/70%RH, MSL3							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	168	45	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	288	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	168	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	288	45	0	
CY7C68310 -AC	RF32-3013	0313L3901	NEC	168	45	0	
CY7C68310 -AC	RF32-3013	0313L3901	NEC	288	45	0	
STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/70%RH, MSL3							
CY7C68310 -AC	RF31-2319	0313L3901	NEC	300	45	0	
CY7C68310 -AC	RF31-2319	0313L3901	NEC	500	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	300	45	0	
CY7C68310 -AC	RF32-2437	0313L3901A	NEC	500	45	0	
CY7C68310 -AC	RF32-3013	0313L3901	NEC	300	45	0	