

# **Cypress Semiconductor Product Qualification Report**

**QTP# 005105 VERSION 5.0  
June 2005**

**CY7C65640A TetraHub™ High Speed USB  
Hub Controller**

**R52FFD-3 Technology, Fab 4**

**CYPRESS TECHNICAL CONTACT FOR QUALIFICATION DATA:**

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### TECHNOLOGY QUALIFICATION HISTORY

<b>Qual Report</b>	<b>Description of Qualification Purpose</b>	<b>Date Comp</b>
99311	New R52D-3 Technology /New 2Meg,CY7C1329 SRAM device	Aug 99
011205	New Technology derivative R52FFD-3, Fab 4 / New 1Meg, GB/s Quad Port Switch CY7C04312BV/ CY7C04314BV	June 01
005105	New TetraHub™ High Speed USB Hub Controller CY7C65640	Oct 02
040601	HX2 Rev D CY7C65640/4 Mask change (CTM1, MM1, V1M, MM2) Fix TT	Mar 04
044401	HX2 Rev E CY7C65640A Mask change (CTM1, MM1, V1M, MM2)	Nov 04

**Cypress products are manufactured using qualified processes. The technology qualification for this product is referenced above and must be considered to get a complete and thorough evaluation of the reliability of the product.**

<b>PRODUCT DESCRIPTION (for qualification)</b>	
Qualification Purpose: Qualify New TetraHub™ High Speed USB Hub Controller CY7C65640A in R52FFD-3 technology, Fab 4	
Marketing Part #:	CY7C65640A
Device Description:	3.3V, Commercial , available in 56-Lead QFN package
Cypress Division:	Cypress Semiconductor Corporation -Personal Communication Division (PCD)
Overall Die (or Mask) REV:	Rev. C/D/E
What ID markings on Die:	7C65640C/7C65641D/7C65642E

<b>TECHNOLOGY/FAB PROCESS DESCRIPTION R52FFD-3</b>	
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%
Die Coating(s), if used:	N/A
Number of Transistors:	500,000
Number of Gates:	100,000
Generic Process Technology/Design Rule (μ-drawn):	CMOS, Double Metal, 0.25 μm
Gate Oxide Material/Thickness (MOS):	SiO <sub>2</sub> 55Å
Name/Location of Die Fab (prime) Facility:	Cypress Semiconductor – Bloomington, MN
Die Fab Line ID/Wafer Process ID:	Fab4/R52FFD-3

**PACKAGE AVAILABILITY**

<b>PACKAGE</b>	<b>ASSEMBLY FACILITY SITE</b>
56-Lead QFN	Amkor Seoul Korea (KOREA-L)

Note: Package Qualification details upon request.

<b>MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION</b>	
<b>Package Designation:</b>	LF56
<b>Package Outline, Type, or Name:</b>	56-Lead Quad Flat no Lead (QFN)
<b>Mold Compound Name/Manufacturer:</b>	Sumitomo EME G700
<b>Mold Compound Flammability Rating:</b>	V-O per UL94
<b>Oxygen Rating Index:</b>	>28%
<b>Lead Frame Material:</b>	Copper
<b>Lead Finish, Composition / Thickness:</b>	Tin-Lead, 85%Sn, 15%Pb (300~800 uinch)
<b>Die Backside Preparation Method/Metallization:</b>	N/A
<b>Die Separation Method:</b>	Wafer Saw
<b>Die Attach Supplier:</b>	Ablebond
<b>Die Attach Material:</b>	Ablebond 8290
<b>Die Attach Method:</b>	Dispensing
<b>Bond Diagram Designation</b>	10-04394
<b>Wire Bond Method:</b>	Thermosonic
<b>Wire Material/Size:</b>	Gold, 1.0mil
<b>Thermal Resistance Theta JA °C/W:</b>	23.27°C/W
<b>Package Cross Section Yes/No:</b>	N/A
<b>Assembly Process Flow:</b>	49-10045
<b>Name/Location of Assembly (prime) facility:</b>	Amkor Korea (SEOL_L)

<b>ELECTRICAL TEST / FINISH DESCRIPTION</b>	
<b>Test Location:</b>	Cypress Philippines (CML-R)
<b>Fault Coverage:</b>	98%

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

**RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS**

<b>Stress/Test</b>	<b>Test Condition (Temp/Bias)</b>	<b>Result P/F</b>
High Temperature Operating Life Early Failure	Dynamic Operating Condition, Vcc = 3.8V, 125°C Dynamic Operating Condition, Vcc = 4.5V, 150°C	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc = 3.8V, 125°C Dynamic Operating Condition, Vcc = 3.8V, 150°C	P
High Temperature Steady State Life	Dynamic Operating Condition, Vcc = 3.63V, 150°C	P
High Temperature	165°C, no bias	P
Temperature Cycle	MIL-STD-883C, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C	P
Pressure Cooker	121°C, 100%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C	P
High Accelerated Saturation Test (HAST)	130°C, 3.63V, 85%RH Precondition: JESD22 Moisture Sensitivity MSL 3 192 Hrs., 30°C/60%RH+3IR-Reflow, 220°C+0, -5°C	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V MIL-STD-883, Method 3015	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
Low Temperature Operating Life	-30°C, 4.3V	P
Alpha Particle Sensitivity	Cypress Spec. 25-00055	P
Age Bond Pull	MIL-STD-883, Method 2011	P
Current Density	Cypress Spec. 22-00029	P
Acoustic Microscopy, MSL 3	Cypress Spec. 25-00104	P
SEM X-Section	MIL-STD-883C, Method 2018.2	P
Static Latchup Sensitivity	125°C, ± 300mA In accordance with JEDEC 17. Cypress Spec. 01-00081	P

### RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Acceleration Factor <sup>4</sup>	Failure Rate
High Temperature Operating Life Early Failure Rate @ 125C	2,198 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life Early Failure Rate @ 150C	8,317 Devices	1	N/A	N/A	120 PPM
High Temperature Operating Life Long Term Failure Rate <sup>1,2</sup>	2,096,955 HRs	3	0.7	170	8 FIT

<sup>1</sup> Assuming an ambient temperature of 55°C and a junction temperature rise of 15°C.

<sup>2</sup> Chi-squared 60% estimations used to calculate the failure rate.

<sup>3</sup> 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 =  $8.62 \times 10^{-5}$  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#: 99311

Device	Ass Loc	Fab lot#	Assy lot#	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	COMP	3	0	
CY7C1329-AC (7C1329D)	CSPI-R	4901357	619903817	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	COMP	3	0	
CY7C1329-AC (7C1329D)	CSPI-R	4901357	619903817	COMP	3	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 150C, 4.5V</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4905886	619909761	48	2988	0	
CY7C1329-AC (7C1329D)	CSPI-R	4905886	619909761	48	1205	0	
CY7C1329-AC (7C1329D)	CSPI-R	4905886	619909776	48	871	0	
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911324	48	1584	1	PARTICLE DEFECT
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911327	48	1669	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/-200mA</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	COMP	3	0	
<b>STRESS: HI-ACCEL SATURATION TEST (130C/85%RH/3.63V), PRECOND. 192 HRS 30C/60%RH, MSL3</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	128	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	256	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4901357	619903817	128	48	0	
<b>STRESS: HIGH TEMPERATURE STORAGE, 165C, NO BIAS</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4842121	619815465	336	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4843204	619815797	336	48	0	
<b>STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 3.63V</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4842121	619815465	80	80	0	
CY7C1329-AC (7C1329D)	CSPI-R	4842121	619815465	168	80	0	
CY7C1329-AC (7C1329D)	CSPI-R	4843204	619815797	80	80	0	
CY7C1329-AC (7C1329D)	CSPI-R	4843204	619815797	168	80	0	
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRECOND. 192 HRS 30C/60%RH, MSL3</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	168	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4901357	619903817	168	46	0	

## Reliability Test Data

**QTP#: 99311**

<b>Device</b>	<b>Ass Loc</b>	<b>Fab lot#</b>	<b>Assy lot#</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, 3.8V</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4905886	619909761	80	1196	0	
CY7C1329-AC (7C1329D)	CSPI-R	4905886	619909761	500	799	0	
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911324	80	1491	1	UNKNOWN CAUSE
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911324	500	1199	1	UNKNOWN CAUSE
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911327	80	1640	0	
CY7C1329-AC (7C1329D)	CSPI-R	4909345	619911327	500	1451	1	UNKNOWN CAUSE
<b>STRESS: STATIC LATCH-UP TESTING, 9.98V +/-200 mA</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4853292	619902690	COMP	3	0	
CY7C1329-AC (7C1329D)	CSPI-R	4901357	619903817	COMP	3	0	
<b>STRESS: TC COND. C, -65 TO 150C, PRECOND. 192 HRS 30C/60%RH, MSL 3</b>							
CY7C1329-AC (7C1329D)	CSPI-R	4842121	619815465	300	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4842121	619815465	1000	48	0	
CY7C1329-AC (7C1329D)	CSPI-R	4843204	619815797	300	45	0	
CY7C1329-AC (7C1329D)	CSPI-R	4843204	619815797	1000	45	0	



## Reliability Test Data

QTP #: 011205

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
<b>STRESS: ACOUSTIC, MSL3</b>							
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	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.8V, Vcc Max</b>							
CY7C0430BV-BGI (7C04301A)	4049157	610108702	TAIWN-G	96	700	0	
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	96	504	0	
<b>STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.8V, Vcc Max</b>							
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	
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V</b>							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	9	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +I300mA</b>							
CY7C0430BV-BGI (7C04301A)	4101120	610110033	TAIWN-G	COMP	3	0	
<b>STRESS: LOW TEMPERATURE OPERATING LIFE, -30C, 4.3V</b>							
CY7C0430BV-BGI (7C04301A)	4025035	610044436	TAIWN-G	500	48	0	
<b>STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	128	46	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	128	57	0	
<b>STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3</b>							
CY7C0430BV-BGI (7C04301A)	4044731	610051943	TAIWN-G	168	48	0	
CY7C0430BV-BGI (7C04301A)	4045135	610101405	TAIWN-G	168	50	0	

## Reliability Test Data

QTP #: 011205

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
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**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	470		
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 #: 005105

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: ACOUSTIC, MSL3**

CY7C65640-LFC (7C65640A)	4133340	610138258	SEOL-L	COMP	15	0	
CY7C65640-LFC (7C65640A)	4133340	610138259	SEOL-L	COMP	15	0	
CY7C65640-LFC (7C65640A)	4133340	610138260	SEOL-L	COMP	15	0	

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

CY7C65640-LFC (7C65640C)	4217056	421705225	SEOL-L	96	994	0	
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**STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.8V, Vcc Max**

CY7C65640-LFC (7C65640C)	4217056	421705225	SEOL-L	168	120	0	
CY7C65640-LFC (7C65640C)	4217056	421705225	SEOL-L	1000	120	0	

**STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3. 3V, PRE COND 192 HR 30C/60%RH, MSL3**

CY7C65640-LFC (7C65640A)	4144354	421705225	SEOL-L	128	50	0	
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**STRESS: PRESSURE COOKER TEST, 121C, 100%RH, PRE COND 192 HR 30C/60%RH, MSL3**

CY7C65640-LFC (7C65640A)	4133340	610138258	SEOL-L	168	50	0	
CY7C65640-LFC (7C65640A)	4133340	610138259	SEOL-L	168	50	0	

**STRESS: ESD-CHARGE DEVICE MODEL, 500V**

CY7C65640-LFC (7C65640C)	4206970	610213221	SEOL-L	COMP	9	0	
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**STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V**

CY7C65640-LFC (7C65640C)	4206970	610213221	SEOL-L	COMP	9	0	
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**STRESS: STATIC LATCH-UP TESTING, 125C, 10V, +/300mA**

CY7C65640-LFC (7C65640C)	4206970	610213221	SEOL-L	COMP	3	0	
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**STRESS: TC COND. C -65C TO 150C, PRECONDITION 192 HRS 30C/60%RH, MSL3**

CY7C65640-LFC (7C65640A)	4133340	610138258	SEOL-L	300	49	0	
CY7C65640-LFC (7C65640A)	4133340	610138258	SEOL-L	500	49	0	
CY7C65640-LFC (7C65640A)	4133340	610138258	SEOL-L	1000	49	0	
CY7C65640-LFC (7C65640A)	4133340	610138259	SEOL-L	300	50	0	
CY7C65640-LFC (7C65640A)	4133340	610138259	SEOL-L	500	50	0	
CY7C65640-LFC (7C65640A)	4133340	610138259	SEOL-L	1000	50	0	
CY7C65640-LFC (7C65640A)	4133340	610138260	SEOL-L	300	49	0	
CY7C65640-LFC (7C65640A)	4133340	610138260	SEOL-L	500	49	0	
CY7C65640-LFC (7C65640A)	4133340	610138260	SEOL-L	1000	49	0	

## Reliability Test Data

QTP #: 040601

<b>Device</b>	<b>Fab Lot #</b>	<b>Assy Lot #</b>	<b>Ass Loc</b>	<b>Duration</b>	<b>Samp</b>	<b>Rej</b>	<b>Failure Mechanism</b>
<b>STRESS: ESD-CHARGE DEVICE MODEL, 500V</b>							
CY7C65640-LFC (7C65641D)	4345354	610403328	SEOL-L	COMP	9	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V</b>							
CY7C65640-LFC (7C65641D)	4345354	610403328	SEOL-L	COMP	3	0	
<b>STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V</b>							
CY7C65640-LFC (7C65641D)	4345354	610403328	SEOL-L	COMP	9	0	
<b>STRESS: STATIC LATCH-UP TESTING, 125C, 6.8V, +I300mA</b>							
CY7C65640-LFC (7C65641D)	4345354	610403328	SEOL-L	COMP	3	0	

## Reliability Test Data

QTP #: 044401

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
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**STRESS: ESD-CHARGE DEVICE MODEL, 500V**

CY7C65640A-LFC (7C65642E)	4437247	610454474	SEOL-L	COMP	9	0	
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**STRESS: ESD-HUMAN BODY CIRCUIT PER MIL STD 883, METHOD 3015, 2,200V**

CY7C65640A-LFC (7C65642E)	4437247	610454474	SEOL-L	COMP	3	0	
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**STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114-B, 2,200V**

CY7C65640A-LFC (7C65642E)	4437247	610454474	SEOL-L	COMP	9	0	
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**STRESS: STATIC LATCH-UP TESTING, 125C, 7.5V, +I300mA**

CY7C65640A-LFC (7C65642E)	4437247	610454474	SEOL-L	COMP	3	0	
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