

Cypress Semiconductor Product Qualification Report

**QTP# 102402 VERSION*F
September 2020**

USB 3.0 Device Family	
65nm (LL65H-25ODR) Technology, UMC Fab 12A	
CYWB0163BB CYWB0164BB	West Bridge™ Bay™ USB And Mass Storage Controller
CYWB0263BB	West Bridge™ Benicia™ USB And Mass Storage Peripheral Controller
CYUSB3021 CYUSB3023 CYUSB3025	SD3™ USB And Mass Storage Peripheral Controller
CYUSB3014	EZ-USB™ FX3 Superspeed USB Controller
CYUSB3011	
CYUSB3012	
CYUSB3013	
CYUSB3035 CYUSB3031 CYUSB3033	EZ-USB™ FX3S Superspeed USB Controller
CYUSB2025 CYUSB2024	SD2™ USB and Mass Storage Peripheral Controller
CYUSB3015 CYUSB3016 CYUSB3017	FiFO-to-USB3 controller

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
091706	Qualification of 65nm (LL65) Technology at UMC Fab 12A and New Device CY7C1553K Base Die Product Family	Aug 2009
102402	Qualification of USB3.0 (CYUSB3014, CYUSB3021, CYWB0163BB, CYWB0263BB) Device in UMC LL65H-25ODR	Dec 2011

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose:	Qualification of USB3.0 Device in UMC LL65H-25ODR
Marketing Part #:	CYUSB3014, CYUSB3021, CYWB0163BB, CYWB0263BB, CYUSB3011, CYUSB3012, CYUSB3013, CYWB0164BB, CYUSB3035 , CYUSB3031, CYUSB3033, CYUSB3025, CYUSB2025, CYUSB2024, CYUSB3023, CYUSB3015, CYUSB3016, CYUSB3017
Device Description:	Peripheral Controller for generic applications and handhelds in 121-Ball FBGA and 131 WLCSP
Cypress Division:	Cypress Semiconductor Corporation – MCU and Connectivity Division (MCD)

TECHNOLOGY/FAB PROCESS DESCRIPTION – LL65H-25ODR			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation Type and Materials:	Proprietary		
Generic Process Technology/Design Rule (μ -drawn):	Proprietary		
Gate Oxide Material/Thickness (MOS):	Proprietary		
Name/Location of Die Fab (prime) Facility:	UMC Fab 12		
Die Fab Line ID/Wafer Process ID:	LL65H-25ODR		

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY SITE FACILITY
121-Ball FBGA	CML-RA, G-TAIWAN
131-Ball WLCSP	AMKOR-AU, DT-PHIL

Note: Package Qualification details upon request

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	BK121
Package Outline, Type, or Name:	121-Ball Thin Ball Grid Array (FBGA)
Mold Compound Name/Manufacturer:	KE-G2270 / Kyocera
Mold Compound Flammability Rating:	UL94, V-0
Oxygen Rating Index:	N/A
Substrate Material:	BT resin
Lead Finish, Composition / Thickness:	SAC105
Die Backside Preparation Method/Metallization:	Grinding
Die Separation Method:	Saw
Die Attach Supplier:	Henkel
Die Attach Material:	QMI-506
Die Attach Method:	Epoxy
Bond Diagram Designation:	001-65074
Wire Bond Method:	Thermosonic
Package Cross Section Yes/No:	N/A
Name/Location of Assembly (prime) facility:	CML-RA

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-RA, CML-R, KYEC-TAIWAN

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, Boost Regulated at Core 1.45V, External 2.05V, 125°C Dynamic Operating Condition, 125°C, 3.795V JESD22-A108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Boost Regulated at Core 1.45V, External 2.05V, 125°C/150°C Dynamic Operating Condition, 125°C, 3.795V JESD22-A108	P
Pre/Post LFR AC/DC Char	AC/DC Critical Parameter Char at LFR 80hrs, 500hrs & 1000hrs	P
High Temperature Steady State Life	Static Operating Condition, Vcc Max= 2.25V, 150°C JESD22-A108	P
Low Temperature Operating Life	Dynamic Operating Condition, Vcc = 2.25V / 4.29V, -30°C JESD22-A108	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 85%RH, 2.25V / 3.63V Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30°C, 60% RH, 260°C Reflow)	P
Temperature Humidity Bias Test (THB)	JESD22-A101: 85°C, 85%RH, 2.25V Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30°C, 60% RH, 260°C Reflow)	P
Temperature Cycle	MIL-STD-883, Method 1010, Condition C, -65°C to 150°C Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30°C, 60% RH, 260°C Reflow)	P
Pressure Cooker	JESD22-A102: 121°C, 100%RH, 15 PSIG Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30°C, 60% RH, 260°C Reflow)	P
High Temperature Storage	JESD22-A103:150°C No bias	P
Electrostatic Discharge Human Body Model (ESD-HBM)	2,200V, JESD22-A114	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V, JESD22-C101	P
Electrostatic Discharge Machine Model (ESD-MM)	200V, JESD22-A115	P
Soft Error (Alpha Particle)	JESD89	P
Soft Error (Neutron/Proton)	JESD89	P
Current Density	Meets the Technology Device Level Reliability Specifications	P
Age Bond Strength	200°C, 4HRS MIL-STD-883, Method 883-2011	P
Acoustic Microscopy	J-STD-020 Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30°C, 60% RH, 260°C Reflow)	P
Constructional Analysis	Criteria: Meet external and internal characteristics of Cypress package	P
Dynamic Latch up	In accordance with JESD78	P
Static Latch up	125C, ± 200mA, ± 140mA, JESD78	P

RELIABILITY FAILURE RATE SUMMARY

Stress/Test	Device Tested/ Device Hours	# Fails	Activation Energy	Thermal AF ³	Failure Rate
High Temperature Operating Life Early Failure Rate	10,092 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life ^{1,2} Long Term Failure Rate (150°C)	89,000 DHRs	0	0.7	170	14 FIT
High Temperature Operating Life ^{1,2} Long Term Failure Rate (125°C)	891,500 DHRs	0	0.7	55	

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 = 8.62x10⁻⁵ eV/Kelvin.

T₁ is the junction temperature of the device under stress and T₂ is the junction temperature of the device at use conditions.

Reliability Test Data

QTP #: 091706

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	COMP	15	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	COMP	15	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	COMP	5	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	COMP	5	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	COMP	5	0	
STRESS: DYNAMIC LATCH-UP							
CY7C1470V33 (7C1470A)	4321389	610417278	CML-R	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CY7C1514KV18 (7C1553K)	8842022	610852338	TAIWN-G	COMP	8	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	COMP	8	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	COMP	8	0	
CY7C1514KV18 (7C1553K)	8844021	610908348	TAIWN-G	COMP	8	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CY7C1514KV18 (7C1553K)	8842022	610852338	TAIWN-G	COMP	9	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	COMP	9	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	COMP	9	0	
STRESS: ESD-MACHINE MODEL, 200V							
CY7C1514KV18 (7C1553K)	8842022	610852338	TAIWN-G	COMP	5	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 2.25V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	128	78	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	128	77	0	
STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C							
CY7C1514KV18 (7C1553K)	8844020	610851583	TAIWN-G	1000	70	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST, 150C, 2.25V, Vcc Max							
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	336	77	0	

Reliability Test Data

QTP #: 091706

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, BOOST REGULATED AT CORE 1.45V, EXTERNAL 2.05V							
CY7C15631KV18 (7C1553K)	8908001	610920385	TAIWN-G	96	2367	0	
CY7C15631KV18 (7C1553K)	8912000	610920386	TAIWN-G	96	2217	0	
CY7C15631KV18 (7C1553K)	8910015	610920548	TAIWN-G	96	1321	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 150C, BOOST REGULATED AT CORE 1.45V, EXTERNAL 2.05V							
CY7C1514KV18 (7C1553K)	8844021	610908348	TAIWN-G	500	178	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, BOOST REGULATED AT CORE 1.45V, EXTERNAL 2.05V							
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	1000	178	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	1000	178	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 2.25V Vcc							
CY7C1514KV18 (7C1553K)	8842022	610852338	TAIWN-G	500	45	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	168	76	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	168	78	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	168	77	0	
STRESS: Pre-/ Post HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE CHAR							
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	COMP	10	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 3.42V, +/-240mA							
CY7C1514KV18 (7C1553K)	8844020	610854680	TAIWN-G	COMP	9	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	COMP	9	0	
CY7C1514KV18 (7C1553K)	8844021	610908348	TAIWN-G	COMP	9	0	
CY7C15631KV18 (7C1553K)	8911000	610922436	TAIWN-G	COMP	9	0	
STRESS: TEMPERATURE CYCLE COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	1000	77	0	
CY7C1514KV18 (7C1553K)	8844020	610854240	TAIWN-G	1000	78	0	
CY7C1514KV18 (7C1553K)	8844022	610906896	TAIWN-G	1000	77	0	
STRESS: STRESS: TEMPRATURE HUMIDITY TEST, 85C, 85%RH, 2.25V, PRE COND 192 HR 30C/60%RH, MSL3							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	1000	77	0	

Reliability Test Data

QTP #: 091706

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, @ 85C, Vcc Nom							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	COMP	3	0	
STRESS: X-SECTION/STEM XY AUDIT							
CY7C1514KV18 (7C1553K)	8842022	610851583	TAIWN-G	COMP	1WF		

Reliability Test Data

QTP #: 102402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: ACOUSTIC, MSL3							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	15	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	COMP	14	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	COMP	15	0	
CYUSB3014 (7C07201AO)	8103023	611135559	CML-RA	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	3	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	COMP	3	0	
STRESS: CONSTRUCTIONAL ANALYSIS							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	5	0	
CYUSB3014 (7C07201AO)	8103023	611135559	CML-RA	COMP	5	0	
STRESS: DYNAMIC LATCH-UP							
CYUSB3014 (7C07201AO)	8117021	611140448	CML-RA	COMP	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JEDEC EIA/JESD22-A114-B, 2,200V							
CYUSB3014 (7C07201AO)	8117021	611140448	CML-RA	COMP	8	0	
CYUSB3014 (7C07201AO)	8125000	611150816	CML-RA	COMP	8	0	
STRESS: ESD-CHARGE DEVICE MODEL, 500V							
CYUSB3014 (7C07201AO)	8117021	611140448	CML-RA	COMP	9	0	
CYUSB3014 (7C07201AO)	8125000	611150816	CML-RA	COMP	9	0	
STRESS: HI-ACCEL SATURATION TEST, 130C, 85%RH, 3.63V, PRE COND 192 HR 30C/60%RH, MSL3							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	128	78	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	128	81	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	256	81	0	
STRESS: HIGH TEMPERATURE STORAGE, PLASTIC, 150C							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	500	82	0	
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	1000	82	0	
STRESS: LOW TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, -30C, 4.29V Vcc							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	500	78	0	

Reliability Test Data

QTP #: 102402

Device	Fab Lot #	Assy Lot #	Ass Loc	Duration	Samp	Rej	Failure Mechanism
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE, 125C, 3.795V							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	96	3195	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	96	3370	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	96	2519	0	
CYUSB3014 (7C07201AO)	8103023	611135559	CML-RA	96	1008	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE, 125C, 3.795V							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	500	176	0	
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	1000	175	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	168	180	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	1000	180	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	168	180	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	1000	180	0	
STRESS: PRESSURE COOKER TEST, 121C, 100%RH, 15 Psig, PRE COND 192 HR 30C/60%RH, MSL3							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	168	82	0	
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	288	82	0	
CYUSB3014 (7C07201AO)	8103023	611135559	CML-RA	168	82	0	
CYUSB3014 (7C07201AO)	8103023	611135559	CML-RA	288	82	0	
STRESS: STATIC LATCH-UP TESTING, 125C, 1.88V, 5.4V, 9V, +/-140mA							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	6	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	COMP	6	0	
CYUSB3014 (7C07201AO)	8117021	611140448	CML-RA	COMP	6	0	
CYUSB3014 (7C07201AO)	8125000	611150816	CML-RA	COMP	6	0	
STRESS: TEMPERATURE CYCLE COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH, MSL3							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	500	81	0	
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	1000	81	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	500	77	0	
CYUSB3014 (7C07201AO)	8103024	611127694	CML-RA	1000	77	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	500	80	0	
CYUSB3014 (7C07201AO)	8112001	611134663	GQ-TAIWAN	1000	80	0	

Reliability Test Data

QTP #: 102402

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Ass Loc</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS : SER – ALPHA PARTICLE, 3-TEPM, 3-VOLTAGE, @ 85C, Vcc Nom							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	2	0	
STRESS: X-SECTION/STEM XY AUDIT							
CYUSB3014 (7C07201AO)	8103023	611119246	CML-RA	COMP	1 WFR	0	

Document History Page

Document Title: QTP 102402: USB 3.0 DEVICE FAMILY, 65NM (LL65H-25ODR) TECHNOLOGY, UMC FAB 12A
Document Number: 001-76071

Rev.	ECN No.	Orig. of Change	Description of Change
**	3524125	NSR	Initial spec release.
*A	3685191	NSR	Added CYUSB3011, CYUSB3012 and CYUSB3013 part numbers in front page in reference to memo DEPM-145. Added G-Taiwan for the assembly site for 121 BGA package. Removed the reference Cypress Spec in the Reliability Tests Performed table to show only the reference Industry standards.
*B	3881196	NSR	Added CYWB0164BB and CYUSB3035 part numbers in front page in reference to memo CHRB-7.
*C	4050724	NSR	Added CYUSB3031, CYUSB3033, CYUSB3025, CYUSB2025, CYUSB2024, CYUSB3023 part numbers in reference to memo CHRB-30. Updated the package availability table. Updated Electrical Test Location.
*D	4272228	HSTO	Update contact information in front page to align with current qualification report template.
*E	4678942	HSTO	Align qualification report based on the new template in the front page Deleted obsolete spec#11-20099
*F	6965563	JYF	MPN update and alignment to current qualification report template.