

Cypress Semiconductor Product Qualification Report

QTP#164010 VERSION**
September 2017

EZ-PD™ CCG2 USB Type-C PD Controller Device Family S8PR2-10R Technology, HH Grace Fab 1	
CYPD2103**	EZ-PD™ CCG2 USB Type-C Port Controller with Power Delivery
CYPD2104**	
CYPD2105**	
CYPD2106**	
CYPD2119**	
CYPD2120**	
CYPD2122**	
CYPD2123**	
CYPD2124**	
CYPD21227**	
CYPD21228**	
CYPD21032**	
CYPD21037**	
CYPD21038**	
CYPD21042**	
CYPD21047**	
CYPD21048**	
CYPD21052**	

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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PRODUCT QUALIFICATION HISTORY

QTP Number	Description of Qualification Purpose	Date
164010	Qualification of EZ-PD™ CCG2 USB Type-C PD Controller Device, S8PR2-10R Technology in HH Grace Fab 1	Sept 2017

PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: To qualify EZ-PD™ CCG2 USB Type-C PD Controller Device, S8PR2-10R Technology in HH Grace Fab 1	
Marketing Part #:	CYPD2103**/ CYPD2104**/ CYPD2105**/ CYPD2106**/ CYPD2119**/CYPD2120**/ CYPD2122**/ CYPD2123**/ CYPD2124**/ CYPD21227**/CYPD21228**/ CYPD21032**/ CYPD21037**/ CYPD21038**/ CYPD21042**/ CYPD21047**/ CYPD21048**/ CYPD21052**
Device Description:	EZ-PD™ CCG2 USB Type-C Port Controller with Power Delivery
Cypress Division:	Cypress Semiconductor – MCU and Connectivity Division (MCD)

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	Proprietary	Metal Composition:	Proprietary
Passivation Type and Thickness:	Proprietary		
Generic Process Technology/Design Rule (μ-drawn):	S8PR-10R		
Gate Oxide Material/Thickness (MOS):	Proprietary		
Name/Location of Die Fab (prime) Facility:	HH Grace (Fab 1), Taiwan		
Die Fab Line ID/Wafer Process ID:	S8PR-10		

ALTERNATIVE FAB FACILITY SITE

FAB SITE	LOCATION	QTP NUMBER
Fab 4	Bloomington, Minnesota	145202
Fab 25	Austin, Texas	160809

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQ24
Package Outline, Type, or Name:	Quad Flat No Lead (QFN), 4x4x0.6mm
Mold Compound Name/Manufacturer:	GE7470L-A/Nitto
Mold Compound Flammability Rating:	V-0 UL94
Oxygen Rating Index: >28%	54%
Lead Frame Designation:	FMP
Lead Frame Material:	Copper
Lead Finish, Composition / Thickness:	NiPdAu
Die Backside Preparation Method/Metallization:	Backgrind
Die Separation Method:	Saw Process
Die Attach Supplier:	Henkel
Die Attach Material:	QMI 519
Bond Diagram Designation	001-93281
Wire Bond Method:	Thermosonic
Wire Material/Size:	0.8 mil /CuPd
Thermal Resistance Theta JA °C/W:	18.36 °C /W
Package Cross Section Yes/No:	Yes
Assembly Process Flow:	11-21099
Name/Location of Assembly (prime) facility:	CML-RA
MSL Level	3
Reflow Profile	260C

ELECTRICAL TEST / FINISH DESCRIPTION	
Test Location:	CML-RA

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE	WIRE MATERIAL	QTP NUMBER
14L DFN	UTL-Thailand	CuPd	QTP# 153601
	ASE-Taiwan (G)	CuPd	QTP# 152007
24L QFN	ASE-Taiwan (G)	CuPd	QTP# 153006
	CML-RA	CuPd	QTP# 153007
20-Ball WLCSP	DT-Philippines	-	QTP# 145201
	ASE-Taiwan (G)	-	QTP# 161901

RELIABILITY TESTS PERFORMED PER SPECIFICATION REQUIREMENTS

Stress/Test	Test Condition (Temp/Bias)	Result P/F
Acoustic Microscopy	J-STD-020 Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30 °C, 60% RH, 260°C Reflow)	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V/750V/1,000V/1,250V/1,500V/1,750V/2,000V JESD22-C101	P
Electrostatic Discharge Human Body Model (ESD-HBM)	500V/1,100V/2,200V /3,300V/4,000V/5,000V JESD22, Method A114	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 85% RH, 6.6V Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30 °C, 60% RH, 260°C Reflow)	P
High Accelerated Saturation Test (HAST) - Unbiased	JEDEC STD 22-A110: 130°C, 85% RH Precondition: JESD22 Moisture Sensitivity Level (192 Hrs., 30 °C, 60% RH, 260°C Reflow)	P
High Temperature Operating Life Early Failure Rate	Dynamic Operating Condition, Vcc Max=2.27V, 150°C JESD22-A-108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=2.27V, 150°C JESD22-A-108	P
High Temperature Storage	JESD22-A103:150°C No bias	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
Pre/Post LFR AC/DC Char	AC/DC Critical Parameter Char at 0 hour/500hrs	P
Static Latch-up	85°C, +/- 140mA, +/- 200mA, +/-300mA 125°C, +/-100mA, +/-140mA JESD 78	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

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	5,622 Devices	0	N/A	N/A	0 PPM
High Temperature Operating Life Long Term Failure Rate	181,000 DHRs	0	0.7	170	30 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 = 8.62x10⁻⁵ 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 #: 164010

<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: ACOUSTIC, MSL3							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	15	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	15	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	15	0	
STRESS: ESD-CHARGE DEVICE MODEL							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	500	9	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	750	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1000	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1250	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1500	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1750	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	2000	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	500	9	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	750	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1000	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1250	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1500	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1750	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	2000	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	500	9	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	750	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1000	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1250	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1500	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1750	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	2000	3	0	
STRESS: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	500	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1100	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	2200	8	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	3300	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	4000	3	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	5000	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	500	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1100	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	2200	8	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	3300	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	4000	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	5000	3	0	

Reliability Test Data

QTP #: 164010

<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: ESD-HUMAN BODY MODEL PER JESD22, METHOD A114							
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	500	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1100	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	2200	8	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	3300	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	4000	3	0	
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 6.6V), PRE COND 192 HR 30C/60%RH (MSL3)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	96	30	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	96	80	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	96	80	0	
STRESS: HI-ACCEL SATURATION TEST - UNBIASED (130C, 85%RH), PRE COND 192 HR 30C/60%RH (MSL3)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	96	80	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	96	80	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	96	80	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150C, 2.27V, Vcc Max)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	48	1016	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	48	2049	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	48	1050	0	
CYPD21228 (7CP64101D)	8725027	611727134	CML-RA	48	1507	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.27V, Vcc Max)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	80	50	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	80	50	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	80	82	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	500	82	0	
CYPD21228 (7CP64101D)	8652035	611709688	CML-RA	80	50	0	
CYPD21228 (7CP64101D)	8652035	611709688	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8652035	611709691	CML-RA	80	50	0	
CYPD21228 (7CP64101D)	8652035	611709691	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8652035	611709685	CML-RA	80	40	0	
CYPD21228 (7CP64101D)	8652035	611709685	CML-RA	500	40	0	
CYPD21228 (7CP64101D)	8652035	611709694	CML-RA	80	40	0	
CYPD21228 (7CP64101D)	8652035	611709694	CML-RA	500	40	0	
STRESS: HIGH TEMPERATURE STORAGE, 150C							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1000	50	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	500	50	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1000	50	0	

Reliability Test Data

QTP #: 164010

<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: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	96	80	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	168	80	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	96	79	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	168	79	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	96	80	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	168	80	0	
STRESS: PRE/POST LFR PARAMETER ASSESSMENT							
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	0	10+2	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	500	10+2	0	
STRESS: STATIC LATCH-UP (125C, 100mA)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	6	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	6	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	6	0	
STRESS: STATIC LATCH-UP (125C, 140mA)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 140mA)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 200mA)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, 300mA)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	COMP	3	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	COMP	3	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	500	80	0	
CYPD21228 (7CP64101D)	8652035	611706419	CML-RA	1000	80	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	500	80	0	
CYPD21228 (7CP64101D)	8706009	611709674	CML-RA	1000	80	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	500	80	0	
CYPD21228 (7CP64101D)	8706009	611708473	CML-RA	1000	80	0	



Document History Page

Document Title: QTP# 164010: EZ-PDTM CCG2 USB Type-C Port Controller with Power Delivery Device Family, S8PR2-10R Technology, HH Grace Fab 1
Document Number: 002-21135

Rev.	ECN No.	Orig. of Change	Description of Change
**	5877920	JYF	Initial spec release.