

Cypress Semiconductor Product Qualification Report

QTP # 154601 VERSION
October 2016**

CCG4 Device Family S8SPR1P Technology, Fab 4 CMI	
CYPD4125*	Type-C Controller Gen4 with Power Delivery
CYPD4126*	
CYPD4135*	
CYPD4136*	
CYPD4225*	
CYPD4226*	
CYPD4235*	
CYPD4236*	

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

QTP Number	Description of Qualification Purpose	Date
083401	Qualify SONOS S8DI-5R Technology in Fab 4 using PSoC 8C20066BC Krypton Device	Jan. 2009
154601	Qualify CCG4 Rev.** Device S8SPR1P Technology in Fab 4	Mar. 2016
162027	Qualify CCG4 Rev.*A Device S8SPR1P Technology in Fab 4	Aug. 2016



PRODUCT DESCRIPTION (for qualification)	
Qualification Purpose: To qualify CCG4 Device S8SPR1P Technology in Fab 4	
Marketing Part #:	CYPD4125*/CYPD4126*/CYPD4135*/CYPD4136*/CYPD4225*/ CYPD4226*/CYPD4235*/CYPD4236*
Device Description:	Type-C Controller Gen4 with Power Delivery
Cypress Division:	Cypress Semiconductor – Data Communication Division

TECHNOLOGY/FAB PROCESS DESCRIPTION			
Number of Metal Layers:	5	Metal Composition:	Metal 1: 100A Ti / 3200 Al 0.5%Cu / 300A TiW Metal 2: 100A Ti/3200 Al 0.5% Cu/350A TiW Metal 3: 150A Ti / 7200 Al 0.5%Cu / 350A TiW Metal 4: 150A Ti / 7200 Al 0.5%Cu / 300A TiW Metal 5: 300A Ti / 12000 Al 0.5%Cu / 300A TiW
Passivation Type and Thickness:		1,000A NFUXOX /6,000A Nitride	
Generic Process Technology/Design Rule (μ -drawn):		S8SPR1	
Gate Oxide Material/Thickness (MOS):		SiO ₂ / 32A & SiO ₂ / 120A	
Name/Location of Die Fab (prime) Facility:		Fab 4, CMI-Minnesota	
Die Fab Line ID/Wafer Process ID:		S8SPR1	

PACKAGE AVAILABILITY

PACKAGE	ASSEMBLY FACILITY SITE	WIRE MATERIAL	QTP NUMBER
40-Lead QFN	CML-RA	0.8 mil CuPd	QTP# 161101

MAJOR PACKAGE INFORMATION USED IN THIS QUALIFICATION	
Package Designation:	LQ40A
Package Outline, Type, or Name:	Quad Flat No Lead (QFN), 6x6x0.6mm
Mold Compound Name/Manufacturer:	GE 7470LA
Mold Compound Flammability Rating:	V-0 UL94
Oxygen Rating Index: >28%	54%
Lead Frame Designation:	With Leadframe Groove
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	001-99438
Wire Bond Method:	Thermosonic
Wire Material/Size:	0.8 mil /CuPd
Thermal Resistance Theta JA °C/W:	17°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

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
Age Bond Strength	200C, 4hrs MIL-STD-883, Method 883-2011	P
Data Retention	150°C, No Bias JESD22-A117 and JESD22-A103	P
Dynamic Latch-up	125°C, 8.5V JESD78	P
Electrostatic Discharge Charge Device Model (ESD-CDM)	500V/1,000V/1,250V JESD22-C101	P
Electrostatic Discharge Human Body Model (ESD-HBM)	500V/1,100V/2,200V /3,300V JESD22, Method A114	P
Electrostatic Discharge Machine Model (ESD-MM)	200V, 220V, 275V, 330V JESD22-A115	P
Endurance Test	MIL-STD-883, Method 883-1033/ JESD22-A117	P
High Accelerated Saturation Test (HAST)	JEDEC STD 22-A110: 130°C, 85% RH, 5.25V 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=2.1V/2.16V, 150°C JESD22-A-108	P
High Temperature Operating Life Early Failure Rate, Regulator On	Dynamic Operating Condition, Vcc Max=5V, 125°C/150°C JESD22-A-108	P
High Temperature Operating Life Latent Failure Rate	Dynamic Operating Condition, Vcc Max=2.1V, 150°C JESD22-A-108	P
High Temperature Steady State life	Static Operating Condition, Vcc Max=2.1V, 150°C JESD22-A-108	P
Low Temperature Operating Life	Dynamic Operating Condition, -30°C, 2.1V JESD22-A108	P
Low Temperature Storage Life	-40°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
SEM Analysis	MIL-STD-883, Method 2018	P
Static Latch-up	85C/125C, +/-140mA 85C, +/- 200mA 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	2,645 Devices	0	N/A	N/A	0 PPM ⁽¹⁾
High Temperature Operating Life Long Term Failure Rate	585,000 DHRs	0	0.7	170	9 FIT ⁽²⁾

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.

(1) Early Failure Rate was computed from QTP# 154601

(2) Long Term Failure Rate was computed from QTP# 083401



Reliability Test Data
QTP #: 083401

<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							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	COMP	15	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	COMP	15	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	COMP	15	0	
STRESS: AGE BOND STRENGTH							
CY8C20566 (8C20566AC)	4827949	610844164	CML-R	COMP	3	0	
CY8C20466 (8C20466AC)	4804681	610822808	Malaysia-CA	COMP	3	0	
CY8C20666 (8C20666AC)	4836589	610852813	Malaysia-CA	COMP	3	0	
STRESS: DATA RETENTION, PLASTIC, 150C							
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	500	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	1000	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	500	78	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	1000	78	0	
CY8C20566 (8C20566AC)	4836589	610851914	CML-R	500	78	0	
CY8C20566 (8C20566AC)	4836589	610851914	CML-R	1000	78	0	
STRESS: ENDURANCE							
CY8C20566 (8C20566AC)	4810486	610830786	CML-R	168	77	0	
CY8C20566 (8C20566AC)	4815537	610835437	CML-R	168	77	0	
CY8C20566 (8C20566AC)	4827949	610844164	CML-R	168	79	0	
CY8C20566 (8C20566AC)	4835945	610848270	CML-R	168	78	0	
CY8C20566 (8C20566AC)	4836589	610851914	CML-R	168	76	0	
STRESS: ESD-CHARGE DEVICE MODEL, (500V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	500	9	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	500	9	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	500	9	0	
STRESS: SEM CROSS SECTION							
CY8C20066 (8C20066AC)	4810486	N/A	N/A	COMP	1	0	
STRESS: STATIC LATCH-UP (85C, 8.25V, +/-200mA)							
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	COMP	6	0	
CY8C20666 (8C20666AC)	4836589	610852813	Malaysia-CA	COMP	6	0	
CY8C20666 (8C20666AC)	4837410	410.23.02	Promex	COMP	6	0	

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Reliability Test Data

QTP #: 083401

<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 CIRCUIT PER JESD22, METHOD A114, (2,200V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	2200	8	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	2200	8	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	2200	8	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114, (3,300V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	3300	3	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	3300	3	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	3300	3	0	
STRESS: ESD-MACHINE MODEL, (200V)							
CY8C20236A (8C202662A)	4126494	611143319	KOREA-L	200	5	0	
CY8C20236A (8C202662A)	4125077	611143627	PHIL-MB	200	5	0	
STRESS: ESD-MACHINE MODEL, (220V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	220	6	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	220	6	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	220	6	0	
STRESS: ESD-MACHINE MODEL, (275V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	275	3	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	275	3	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	275	3	0	
STRESS: ESD-MACHINE MODEL, (330V)							
CY8C20566 (8C20566AC)	4810486	610830371	CML-R	330	3	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	330	3	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	330	3	0	
STRESS: DYNAMIC LATCH-UP (125C, 8.5V)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA COMP		5	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA COMP		5	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA COMP		5	0	



Reliability Test Data
QTP #: 083401

<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: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150, 2.1V, Vcc Max)							
CY8C20566 (8C20566AC)	4827949	610844164	CML-R	48	1002	0	
CY8C20566 (8C20566AC)	4815537	610835437	CML-R	48	1008	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	48	1004	1	Read NV Latch (1)
CY8C20466 (8C20466AC)	4836589	610851747	Malaysia-CA	48	1004	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE REGULATOR ON (150, 5V, Vcc Max)							
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	48	45	0	
CY8C20566 (8C20566AC)	4835945	610848270	CML-R	48	45	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE REGULATOR ON (125C, 5V, Vcc Max)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	96	45	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-LATENT FAILURE RATE (150C, 2.1V, Vcc Max)							
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	80	390	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	500	390	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	80	390	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	500	390	0	
CY8C20466 (8C20466AC)	4836589	610851747	Malaysia-CA	80	390	0	
CY8C20466 (8C20466AC)	4836589	610851747	Malaysia-CA	500	390	0	
STRESS: HIGH TEMP STEADY STATE LIFE TEST (150C, 2.1V)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	80	77	0	
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	168	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	80	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	168	77	0	
CY8C20566 (8C20566AC)	4835945	610848270	CML-R	80	77	0	
CY8C20566 (8C20566AC)	4835945	610848270	CML-R	168	77	0	
STRESS: LOW TEMPERATURE DYNAMIC OPERATING LIFE, -30C, 2.1V							
CY8C20566 (8C20566AC)	4815537	610835437	CML-R	500	77	0	
CY8C20566 (8C20566AC)	4835945	610848270	CML-R	500	77	0	

(1) Destroyed during failure analysis



Reliability Test Data

QTP #: 083401

Device	Fab Lot #	Assy Lot #	Assy Lot	Duration	Samp	Rej	Failure Mechanism
STRESS: HI-ACCEL SATURATION TEST (130C, 85%RH, 5.25V), PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	128	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	128	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	256	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	128	77	0	
STRESS: PRESSURE COOKER TEST (121C, 100%RH), 15 Psig, PRE COND 192 HR 30C/60%RH (MSL3)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	168	77	0	
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	333	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	168	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	288	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	168	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	288	77	0	
STRESS: TC COND. C -65C TO 150C, PRE COND 192 HRS 30C/60%RH (MSL3)							
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	500	77	0	
CY8C20466 (8C20466AC)	4810486	610828990	Malaysia-CA	1000	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	500	77	0	
CY8C20466 (8C20466AC)	4815537	610834184	Malaysia-CA	1000	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	500	77	0	
CY8C20466 (8C20466AC)	4835945	610847274	Malaysia-CA	1000	77	0	



Reliability Test Data

ER #: 114031

<i>Device</i>	<i>Fab Lot #</i>	<i>Assy Lot #</i>	<i>Assy Lot</i>	<i>Duration</i>	<i>Samp</i>	<i>Rej</i>	<i>Failure Mechanism</i>
STRESS: LOW TEMPERATURE STORAGE, -40C, No Bias							
CY8C20236A (8C202662A)	4137730	611155459	L-KOREA	1000	100	0	



Reliability Test Data QTP #: 154601

<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-CHARGE DEVICE MODEL							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	500	9	0	
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	1000	3	0	
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	1250	3	0	
STRESS: ESD-HUMAN BODY CIRCUIT PER JESD22, METHOD A114							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	500	3	0	
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	1100	3	0	
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	2200	8	0	
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	3300	3	0	
STRESS: ESD-MACHINE MODEL							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	200	5	0	
STRESS: HIGH TEMP DYNAMIC OPERATING LIFE-EARLY FAILURE RATE (150, 2.16V, Vcc Max)							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	48	1495	0	
CYPD4125 (7CP64201A)	4533512	611541756	CML-RA	48	634	0	
CYPD4125 (7CP64201A)	4533512	611603598	CML-RA	48	516	0	
STRESS: STATIC LATCH-UP (85C, +/-140mA)							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (85C, +/-200mA)							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	COMP	3	0	
STRESS: STATIC LATCH-UP (125C, +/-140mA)							
CYPD4225 (7CP64200A)	4533512	611539766	CML-RA	COMP	3	0	



Reliability Test Data QTP #: 162027

<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>
YIELD: E-TEST							
7C64200A	4619839	N/A	N/A	COMP			EQUIVALENT
YIELD: SORT							
7C64200A	4619839	N/A	N/A	COMP			EQUIVALENT



Document History Page

Document Title: QTP# 154601: CCG4 DEVICE FAMILY, S8SPR1P TECHNOLOGY, FAB 4 (CMI)
Document Number: 002-16926

Rev.	ECN No.	Orig. of Change	Description of Change
**	5463181	JYF	Initial spec release.