

Cypress Semiconductor Reliability Qualification Report

QTP# D13531a, D13531b, D13531c, D13531d Version **

BCM20745 / BCM20746 / BCM20748 / BCM20771

Qualification of: BCM20745 / BCM20746 / BCM20748 / BCM20771, Single Chip SoC Bluetooth Processor in 66 Ball, Fine Pitch Ball Grid Array (FBGA) and 72 Ball, Wafer Level Fine Pitch Ball Grid Array (WFBGA)

**FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT
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I.A. Product and Package Information

Product Description: BCM20745A0KFBG **Cypress Division:** IoT Division
Single Chip SoC Bluetooth Processor

Package: FBGA	QTP: D13531a	
Description: (5.5 x 4.5 x 0.9mm) 66 Ball, Fine Pitch Ball Grid Array Package (FBGA)		Flammability: O2 Index:
Assembly: ASE Taiwan	Molding Compound: Kyocera KE-G1250LKDS	UL-V0 >28
Electrical Test: ASE Singapore	Theta Ja / Psi Jt: 39 °C/W / 1 °C/W	
Substrate/Leadframe: Laminate Substrate	Die Attachment: Ablebond 2025D	
Lead Finish: 98.5Sn/1Ag/0.5Cu	Bond Wire: Copper	
Comments:		

Est. Field Temperature: 55 °C	Life Test Temperature: 125 °C
Est. DC Field Current: 20 mA	Life Test Dynamic Current: 5 mA
Est. Field Voltage: 1.2 V	Life Test Voltage: 1.4 V
Est. Field Power Dissipation: 24.4 mWatts	Est. Stress Power Dissipation: 7 mWatts
Est. Field Tj: 55.9 °C	Est. Stress Tj: 125.2 °C

Die: 20748A0	Die Size: 3.57 x 3.23 mm
Process: 65NM LP	Fab: UMC-12I
Type: Bluetooth	Density: N/A

I.B. Product and Package Information

Product Description: BCM20746A0KFBG **Cypress Division:** IoT Division
Single Chip SoC Bluetooth Processor

Package: FBGA	QTP: D13531b	
Description: (5.5 x 4.5 x 0.9mm) 66 Ball, Fine Pitch Ball Grid Array Package (FBGA)		Flammability: O2 Index:
Assembly: ASE Taiwan	Molding Compound: Kyocera KE-G1250LKDS	UL-V0 >28
Electrical Test: ASE Singapore	Theta Ja / Psi Jt: 39 °C/W / 1 °C/W	
Substrate/Leadframe: Laminate Substrate	Die Attachment: Ablebond 2025D	
Lead Finish: 98.5Sn/1Ag/0.5Cu	Bond Wire: Copper	
Comments:		

Est. Field Temperature: 55 °C	Life Test Temperature: 125 °C
Est. DC Field Current: 20 mA	Life Test Dynamic Current: 5 mA
Est. Field Voltage: 1.2 V	Life Test Voltage: 1.4 V
Est. Field Power Dissipation: 24.4 mWatts	Est. Stress Power Dissipation: 7 mWatts
Est. Field Tj: 55.9 °C	Est. Stress Tj: 125.2 °C

Die: 20748A0	Die Size: 3.57 x 3.23 mm
Process: 65NM LP	Fab: UMC-12I
Type: Bluetooth	Density: N/A

I.C. Product and Package Information

Product Description: BCM20748A0KFBG **Cypress Division:** IoT Division
Single Chip SoC Bluetooth Processor

Package: FBGA	QTP: D13531c	
Description: (5.5 x 4.5 x 0.9mm) 66 Ball, Fine Pitch Ball Grid Array Package (FBGA)		Flammability: O2 Index:
Assembly: ASE Taiwan	Molding Compound: Kyocera KE-G1250LKDS	UL-V0 >28
Electrical Test: ASE Singapore	Theta Ja / Psi Jt: 39 °C/W / 1 °C/W	
Substrate/Leadframe: Laminate Substrate	Die Attachment: Ablebond 2025D	
Lead Finish: 98.5Sn/1Ag/0.5Cu	Bond Wire: Copper	
Comments:		

Est. Field Temperature: 55 °C	Life Test Temperature: 125 °C
Est. DC Field Current: 20 mA	Life Test Dynamic Current: 5 mA
Est. Field Voltage: 1.2 V	Life Test Voltage: 1.4 V
Est. Field Power Dissipation: 24.4 mWatts	Est. Stress Power Dissipation: 7 mWatts
Est. Field Tj: 55.9 °C	Est. Stress Tj: 125.2 °C

Die: 20748A0	Die Size: 3.57 x 3.23 mm
Process: 65NM LP	Fab: UMC-12I
Type: Bluetooth	Density: N/A

I.D. Product and Package Information

Product Description: BCM20771A0KWFBG **Cypress Division:** IoT Division
Single Chip SoC Bluetooth Processor

Package: WFBGA	QTP: D13531d	
Description: (5.5 x 5 x 0.8mm) 72 Ball, Wafer Level Fine Pitch Ball Grid Array (WFBGA)		Flammability: O2 Index:
Assembly: ASE Shanghai	Molding Compound: Kyocera KE-G1250ULKDS-30	UL-V0 >28
Electrical Test: ASE Singapore	Theta Ja / Psi Jt: 21 °C/W / 1 °C/W	
Substrate/Leadframe: Laminate Substrate	Die Attachment: Ablebond 2025D	
Lead Finish: 98.25Sn/1.2Ag/0.5Cu/0.05Ni	Bond Wire: Copper	
Comments:		

Est. Field Temperature: 55 °C	Life Test Temperature: 125 °C
Est. DC Field Current: 20 mA	Life Test Dynamic Current: 5 mA
Est. Field Voltage: 1.2 V	Life Test Voltage: 1.4 V
Est. Field Power Dissipation: 24.4 mWatts	Est. Stress Power Dissipation: 7 mWatts
Est. Field Tj: 55.5 °C	Est. Stress Tj: 125.1 °C

Die: 20748A0	Die Size: 3.57 x 3.23 mm
Process: 65NM LP	Fab: UMC-12I
Type: Bluetooth	Density: N/A

II. 65nm G/LP/RF Life Test Failure Rate Calculation

HTOL Stress Temperature - 125 °C

Failure Mechanism	Read Points / Test Results				Modeling Parameters @ 55°C					Avg. Failure Rate FITS @ 55°C, 60% Conf.	
	24 hrs	168 hrs	504 hrs	1000 hrs	Ea eV	TAF	VAF	OAF	MTTF (yrs)	Early Life	Inherent Life
PLASTIC											
Sample Size	3305	2755	2083	2083							
Zero fails, Process ave. Ea	0 *	0	0	0	0.7	73	1	73		76	6
Totals	0	0	0	0					19026	76	6

* Contributes to early life FITS

III. Summary of Stress Test Results

Stress Test	Stress Condition	Package Type	Sample Size	Num. of Lots	Num. of Fails	Failure Rate %	Comments
Data From Qualification D13531a, D13531d:							
Early Life Failure Rate	125°C, Vddnom x 1.15	WFBGA ²	190	1	0	0.00	24 Hours
HTOL (EL)	125°C, Vddnom x 1.15	WFBGA ²	95	1	0	0.00	192 Hours
HTOL (IL)	125°C, Vddnom x 1.15	WFBGA ²	95	1	0	0.00	500 Hours
HTOL (XL)	125°C, Vddnom x 1.15	WFBGA ²	95	1	0	0.00	1000 Hours
ESD CDM	N/A	FBGA ¹	3	1	Pass 400V		
	N/A	WFBGA ²	3	1	Pass 400V		
ESD HBM	N/A	FBGA ¹	3	1	Pass 2kV		
	N/A	WFBGA ²	3	1	Pass 2kV		
ESD MM	N/A	FBGA ¹	3	1	Pass 150V		
	N/A	WFBGA ²	3	1	Pass 150V		
Latch Up	125°C	FBGA ¹	3	1	Pass 200mA		
	125°C	WFBGA ²	3	1	Pass 200mA		

Generic Reference Data:

High Temp Bake	(175°C)	FBGA ³	80	1	0	0.00	155 hours
Preconditioning	(PC2/260°C, +0°C/-5°C)	FBGA ³	260	1	Passed Jedec L3		
	(PC2/260°C, +0°C/-5°C)	WFBGA ⁴	260	1	Passed Jedec L3		
Precon+Temp Cycle	-55°C/125°C	FBGA ³	76	1	0	0.00	500 cycles
	-55°C/125°C	FBGA ³	76	1	0	0.00	1000 cycles
	-55°C/125°C	WFBGA ⁴	76	1	0	0.00	500 cycles
	-55°C/125°C	WFBGA ⁴	76	1	0	0.00	1000 cycles
Precon+Thermal Shock	-55°C/125°C	FBGA ³	76	1	0	0.00	500 cycles
	-55°C/125°C	FBGA ³	76	1	0	0.00	300 cycles
	-55°C/125°C	WFBGA ⁴	76	1	0	0.00	500 cycles
	-55°C/125°C	WFBGA ⁴	76	1	0	0.00	300 cycles
Precon+HAST	130°C/85% RH	FBGA ³	76	1	0	0.00	96 hours
	130°C/85% RH	WFBGA ⁴	76	1	0	0.00	96 hours

- Notes / Justification:**
- 1) Results from Qual D13531a, BCM20745A0KFBG, 65NM LP Bluetooth in 66 Ball FBGA (5.5 x 4.5 x 0.9mm)
 - 2) Results from Qual D13531d, BCM20771A0KWFBG, 65NM LP Bluetooth in 72 Ball WFBGA (5.5 x 5 x 0.8mm)
 - 3) Results from Qual PQ01740, BCM20740A2KFB1G in 66 Ball FBGA (5.5 x 4.5 x 0.9mm) - Same Process Technology, FBGA Package, Material Set, and Assembly Location
 - 4) Results from Qual PQ01749, BCM20702A1KWFBG in 50 Ball WLBGA (4.5 x 4 x 0.8mm) - Same Process Technology, WFBGA Package, Material Set, and Assembly Location

Preconditioning Flows: PC2 (JEDEC L3): Bake 125°C, 24hr => Soak @ 30°C/60%RH, 192hr => 3x Reflow

Reliability Tests Performed per Specification Requirements

Stress	Condition	Specification Reference
Early Life Failure Rate	125°C, Vddnom x 1.15	JESD22-A108 / AEC-Q100-008
ESD CDM	N/A	JS002 / AEC-Q100-011
ESD HBM	N/A	JS001 / AEC-Q100-002
ESD MM	N/A	JS001 / AEC-Q100-002
High Temp Bake	(175°C)	JESD22-A103
HTOL (EL)	125°C, Vddnom x 1.15	JESD22-A108
HTOL (IL)	125°C, Vddnom x 1.15	JESD22-A108
HTOL (XL)	125°C, Vddnom x 1.15	JESD22-A108
Latch Up	125°C	JESD78 / AEC Q100-004
Precon+HAST	130°C/85% RH	JESD22-A110
Precon+Temp Cycle	-55°C/125°C	JESD22-A104
Precon+Thermal Shock	-55°C/125°C	JESD22-A106
Preconditioning	(PC2/260°C, +0°C/-5°C)	J-STD-020
Preconditioning	(PC2/260°C, +0°C/-5°C)	J-STD-020 / EIAJ ED-4701-100 Method 104

IV. Revision History

Document Number: 002-18283

Document Title: QTP #D13531a/b/c/d: BCM20745 / BCM20746 / BCM20748 / BCM20771, Single Chip SoC Bluetooth Processor

Rev.	Issue Date	ECN#	Originator	Description
**	12/22/2016	5564237	FCCL	Initial Release.

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