Cypress Semiconductor
Reliability Qualification Report

QTP# D07421 Version **

BCM4319

Qualification of BCM4319, Single-Chip IEEE 802.11 a/b/g/n MAC/Baseband/Radio with Integrated SDIO and USB Interfaces in 138 Ball, Wafer Level Ball Grid Array (WLBGA)

FOR ANY QUESTIONS ON THIS REPORT, PLEASE CONTACT reliability@cypress.com or via a CYLINK CRM CASE

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I. Product and Package Information

Product Description: BCM4319GKUBG
Single-Chip IEEE 802.11 a/b/g/n MAC/Baseband/Radio with Integrated SDIO and USB Interfaces

Cypress Division: IoT Division

Package: WLBGA
QTP: D07421
Description: (5.79 x 4.58 x 0.6mm) 138 Ball, Wafer Level Ball Grid Array (WLBGA)
Flammability: UL-V0
O2 Index: >28
Assembly: SPIL Taiwan
Molding Compound: N/A
Electrical Test: UTAC Singapore
Theta Ja / Psi Jt: 21 °C/W / 1 °C/W
Substrate/Leadframe: N/A
Die Attachment: N/A
Lead Finish: 95.5Sn / 4.0Ag / 0.5Cu
Bond Wire: N/A
Comments:

Est. Field Temperature: 55 °C
Est. DC Field Current: 10 mA
Est. Field Voltage: 1.2 V
Est. Field Power Dissipation: 12 mWatts
Est. Field Tj: 55.2 °C

Life Test Temperature: 125 °C
Life Test Dynamic Current: 3 mA
Life Test Voltage: 1.38 V
Est. Stress Power Dissipation: 4.1 mWatts
Est. Stress Tj: 125.0 °C

Die: 4319B0
Process: 65NM LP
Type: Wireless

Die Size: 5.79 x 4.58 mm
Fab: GF-7
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 D07421:							
Early Life Failure Rate	125°C, Vddnom x 1.15	WLBGA [1]	192	1	0	0.00	24 Hours
HTOL (EL)	125°C, Vddnom x 1.15	WLBGA [1]	96	1	0	0.00	192 Hours
HTOL (IL)	125°C, Vddnom x 1.15	WLBGA [1]	96	1	0	0.00	500 Hours
HTOL (XL)	125°C, Vddnom x 1.15	WLBGA [1]	96	1	0	0.00	1000 Hours
ESD CDM	N/A	WLBGA [1]	3	1	Pass 100V		
ESD HBM	N/A	WLBGA [1]	3	1	Pass 2kV		
ESD MM	N/A	WLBGA [1]	3	1	Pass 100V		
Latch Up	125°C	WLBGA [1]	3	1	Pass 200mA		
Generic Reference Data:							
High Temp Bake	(150°C)	FCFBGA [2]	76	1	0	0.00	500 hours
	(150°C)	FCFBGA [2]	76	1	0	0.00	1000 hours
	(150°C)	WLBGAB [3]	76	1	0	0.00	1000 hours
Preconditioning	(PC5/260°C, +0°C/-5°C)	FCFBGA [2]	228	1	Passed Jedec L1		
	(PC5/260°C, +0°C/-5°C)	WLBGA [3]	228	1	Passed Jedec L1		
Precon+Temp Cycle	(PC5/260°C, -55°C/125°C)	FCFBGA [2]	83	1	0	0.00	500 cycles
	(PC5/260°C, -55°C/125°C)	FCFBGA [2]	83	1	0	0.00	1000 Cycles
	(PC5/260°C, -55°C/125°C)	WLBGA [3]	74	1	0	0.00	500 cycles
	(PC5/260°C, -55°C/125°C)	WLBGA [3]	72	1	0	0.00	1000 cycles
Precon+Thermal Shock	(PC5/260°C, -55°C/125°C)	FCFBGA [2]	88	1	0	0.00	300 Cycles
	(PC5/260°C, -55°C/125°C)	WLBGA [3]	76	1	0	0.00	500 cycles
Precon+HAST	(PC5/260°C, Biased, 130°C/85% RH)	FCFBGA [2]	76	1	0	0.00	96 hours
	(PC5/260°C, Biased, 130°C/85% RH)	WLBGA [3]	76	1	0	0.00	96 hours

Notes / Justification: 1) Results from Qual D07421, BCM4319GKUBG, 65NM LP Wireless in 138 Ball WLBGA (5.79 x 4.58 x 0.6mm)

2) Results from Qual PQa1228, BCM4319GKUBG in 116 Ball FCFBGA (10 x 10 x 1.05mm) - Same Product, Fab, and Process Technology on FCFBGA Interposer

3) Results from Qual PQ01213, BCM4329EKUBG in 194 Ball WLBGA (7.54 x 5.01 x 0.55mm) - Same Package, Fab, Process Technology and Assembly Site

Preconditioning Flows: PC5 (JEDEC L1): Bake 125°C, 24hr => Soak @ 85°C/85%RH, 168hr => 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	(150°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	(PC5/260°C, Biased, 130°C/85% RH)	JESD22-A110
Precon+Temp Cycle	(PC5/260°C, -55°C/125°C)	JESD22-A104
Precon+Thermal Shock	(PC5/260°C, -55°C/125°C)	JESD22-A106
Preconditioning	(PC5/260°C, +0°C/-5°C)	J-STD-020

IV. Revision History

Document Number: 002-19293

Document Title: QTP #D07421: BCM4319, Single-Chip IEEE 802.11 a/b/g/n MAC/Baseband/Radio with Integrated SDIO and USB Interfaces

Rev.	Issue Date	ECN#	Originator	Description
**	3/29/2017	5677194	FCCL	Initial Release.

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