Cypress Semiconductor Reliability Qualification Report

QTP# D21144 Version **

BCM88335

Qualification of: BCM88335, Single-Chip 5G Wi-Fi IEEE 802.11ac MAC/Baseband/Radio with Integrated Bluetooth 4.1 for Automotive Applications in 145 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:	BCM88335L2CUBG Single-Chip 5G Wi-Fi IEEE 802.11ac MAC/Baseband/Radio with Integrated Bluetooth 4.1 for Automotive Applications	**Cypress Division:**	IoT Division

Package:	WLBGA	**QTP:**	D21144		
Description:	(4.909 x 5.453 x 0.55mm) 145 Ball, Wafer Level Ball Grid Array (WLBGA)			**Flammability:**	**O2 Index:**
Assembly:	ASE Taiwan	**Molding Compound:**	N/A	UL-V0	>28
Electrical Test:	ASE Taiwan	**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	**Life Test Temperature:**	125 °C
Est. DC Field Current:	100 mA	**Life Test Dynamic Current:**	25 mA
Est. Field Voltage:	3.0 V	**Life Test Voltage:**	3.5 V
Est. Field Power Dissipation:	300 mWatts	**Est. Stress Power Dissipation:**	87.5 mWatts
Est. Field Tj:	61.3 °C	**Est. Stress Tj:**	126.8 °C

Die:	43353TLA1-T	**Die Size:**	4.90 x 5.45 mm
Process:	40NM LPRF	**Fab:**	TSMC-14
Type:	Bluetooth	**Density:**	N/A

II. 40nm GLL/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	500 hrs	1000 hrs	Ea eV	TAF	VAF	OAF	MTTF (yrs)	Early Life	Inherent Life
PLASTIC											
Sample Size	2716	2519	1559	1559							
Zero fails, Process ave. Ea	0 *	0	0	0	0.66	71	1	71		88	8
Totals	**0**	**0**	**0**	**0**					**14269**	**88**	**8**

* - Contributes to early life FITS

III. Summary of Stress Test Results

Data From Qualification D21144:

Stress Test	Stress Condition	Package Type	Sample Size	Num. of Lots	Num. of Fails	Failure Rate %	Comments
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
ESD CDM	N/A	WLBGA [1]	3	1	Pass 300V		
ESD HBM	N/A	WLBGA [1]	3	1	Pass 1kV		
ESD MM	N/A	WLBGA [1]	3	1	Pass 50V		
Latch Up	125°C	WLBGA [1]	3	1	Pass 200mA		

Generic Reference Data:

Test	Condition	Package					
Early Life Failure Rate	125°C, Vddnom x 1.15	WLBGA [2]	192	1	0	0.00	24 Hours
HTOL (EL)	125°C, Vddnom x 1.15	WLBGA [2]	231	3	0	0.00	192 Hours
HTOL (IL)	125°C, Vddnom x 1.15	WLBGA [2]	231	3	0	0.00	500 Hours
HTOL (XL)	125°C, Vddnom x 1.15	WLBGA [2]	231	3	0	0.00	1000 Hours
High Temp Bake	(150°C)	WLBGA [3]	77	1	0	0.00	1000 Hours
	(150°C)	WLBGA [4]	76	1	0	0.00	1000 Hours
	(150°C)	WLBGA [5]	76	1	0	0.00	1000 Hours
Preconditioning	(PC5/245°C, +0°C/-5°C)	WLBGA [3]	77	1	Passed Jedec L1		
	(PC5/245°C, +0°C/-5°C)	WLBGA [3]	154	1	Passed Jedec L1		
	(PC5/245°C, +0°C/-5°C)	WLBGA [4]	77	1	Passed Jedec L1		
	(PC5/245°C, +0°C/-5°C)	WLBGA [4]	154	1	Passed Jedec L1		
	(PC5/260°C, +0°C/-5°C)	WLBGA [5]	260	1	Passed Jedec L1		
	(PC5/260°C, +0°C/-5°C)	WLBGA [6]	154	1	Passed Jedec L1		
	(PC5/260°C, +0°C/-5°C)	WLBGA [7]	260	1	Passed Jedec L1		
Precon+Temp Cycle	(PC5/245°C, -55°C/125°C)	WLBGA [3]	77	1	0	0.00	500 Cycles
	(PC5/245°C, -55°C/125°C)	WLBGA [3]	77	1	0	0.00	1000 Cycles
	(PC5/245°C, -55°C/125°C)	WLBGA [4]	77	1	0	0.00	500 Cycles
	(PC5/245°C, -55°C/125°C)	WLBGA [4]	77	1	0	0.00	1000 Cycles
	(PC5/260°C, -55°C/125°C)	WLBGA [5]	77	1	0	0.00	500 cycles
	(PC5/260°C, -55°C/125°C)	WLBGA [5]	77	1	0	0.00	1000 cycles
Precon+HAST	(PC5/260°C, Biased, 130°C/85% RH)	WLBGA [5]	77	1	0	0.00	96 hours
	(PC5/260°C, Biased, 130°C/85% RH)	WLBGA [6]	77	1	0	0.00	96 hours
	(PC5/260°C, Biased, 130°C/85% RH)	WLBGA [7]	77	1	0	0.00	96 hours
Precon+uHAST	(PC5/260°C, Unbiased, 130°C/85% RH)	WLBGA [3]	77	1	0	0.00	96 Hours
	(PC5/260°C, Unbiased, 130°C/85% RH)	WLBGA [4]	77	1	0	0.00	96 Hours
	(PC5/260°C, Unbiased, 130°C/85% RH)	WLBGA [5]	77	1	0	0.00	96 hours
Temp Humidity Test	(Unbiased, 85°C/85% RH)	WLBGA [3]	77	1	0	0.00	1000 hours
	(Unbiased, 85°C/85% RH)	WLBGA [4]	77	1	0	0.00	1000 hours
	(Unbiased, 85°C/85% RH)	WLBGA [5]	77	1	0	0.00	500 hours
	(Unbiased, 85°C/85% RH)	WLBGA [5]	77	1	0	0.00	1000 hours

Notes / Justification:
1) Results from Qual D21144, BCM88335L2CUBG, 40NM LPRF Bluetooth in 145 Ball WLBGA (4.909 x 5.453 x 0.55mm)
2) Results from Qual D21715, BCM89335L2CUBG in 145 Ball WLBGA (4.91 x 5.45 x 0.55mm) - Similar Product from Same Fab and Technology
3) Results from Qual PQ03027, in 140 Ball WLBGA (4.51 x 5.31 x 0.55mm) - Similar Package from Same Assembly Location
4) Results from Qual PQ03029, in 140 Ball WLBGA (4.51 x 5.31 x 0.55mm) - Similar Package from Same Assembly Location
5) Results from Qual PQ03334, BCM4359H1KUBG in 194 Ball WLBGA (7.54 x 5.01 x 0.55mm) - Similar Package from Same Assembly Location
6) Results from Qual PQ02779, BCM43493CUBG in 194 Ball WLBGA (7.54 x 5.01 x 0.55mm) - Similar Package from Same Assembly Location
7) Results from Qual PQ03305, BCM4359H1KUBG in 194 Ball WLBGA (7.54 x 5.01 x 0.55mm) - Similar Package from Same Assembly Location

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	(PC5/245°C, -55°C/125°C)	JESD22-A104
Precon+Temp Cycle	(PC5/260°C, -55°C/125°C)	JESD22-A104
Precon+uHAST	(PC5/260°C, Unbiased, 130°C/85% RH)	JESD22-A118
Preconditioning	(PC5/245°C, +0°C/-5°C)	J-STD-020
Preconditioning	(PC5/260°C, +0°C/-5°C)	J-STD-020
Temp Humidity Test	(Unbiased, 85°C/85% RH)	JESD22-A101

IV. Revision History

Document Number: 002-18551

Document Title: QTP #D21144: BCM88335, Single-Chip 5G Wi-Fi IEEE 802.11ac MAC/Baseband/Radio with Integrated Bluetooth 4.1 for Automotive Applications

Rev.	Issue Date	ECN#	Originator	Description
**	1/25/2017	5603734	FCCL	Initial Release.

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