Process Change Notice #1611161

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PCN Issue Date: 11/16/2016	**Effective Date:** 2/22/2017
Title: EFM8BB2 Datasheet update	

PCN Type:

☒ **Datasheet**	☐ **Foundry**	☐ **Packing**
☐ **Product Revision**	☐ **Assembly**	☐ **Labeling**
☐ **Discontinuance**	☒ **Test**	☐ **Other**

Last Order Date: NA

PCN Details

Description of Change:
Silicon Labs is pleased to announce V1.31 of the EFM8BB2 datasheet. This datasheet release corresponds to the release of the new automotive grade EFM8BB2 devices. These new EFM8BB2 devices have received full AEC-Q100 qualification and are specified for -40 °C to +125 °C operating temperature range. This datasheet release also corresponds to a change in one of the voltage regulator's calibration routines.

The calibration routines for the low dropout voltage regulator (LDO) have been updated and results in a slightly increased (1.8 V vs. 1.85 V) typical LDO output target. This calibration change occurred due to a small drop observed in the LDO output voltage when the device enters lower power modes during an extended characterization study. This LDO output supplies the core and other digital logic on the device. The new calibration method ensures this drop does not occur. No direct issues have been observed on devices using the old calibration method, and this effort is part of the continual improvement process.

Below is a list of changed power consumption specs from the datasheet. Note that some typical values were also slightly increased.

Temperature Grade	Specification	Previous Data Sheet Value (mA)	New Data Sheet Value (mA)
G-grade devices, -40 °C to +85 °C	Normal Mode 49 MHz (Maximum)	9.7	10.1
	Normal Mode 24.5 MHz (Maximum)	4.85	5.2
	Idle Mode 49 MHz (Maximum)	6.6	6.8
	Idle Mode 24.5 MHz (Maximum)	3.2	3.3
I-grade devices, -40 °C to +125 °C	Normal Mode 49 MHz (Maximum)	10.47	10.9
	Normal Mode 24.5 MHz (Maximum)	5.49	5.6
	Idle Mode 49 MHz (Maximum)	7.3	7.4
	Idle Mode 24.5 MHz (Maximum)	3.86	3.9
G-grade devices, -40 °C to +85 °C	Normal Mode 49 MHz (Typical)	9.1	9.4
	Normal Mode 24.5 MHz (Typical)	4.3	4.5
	Idle Mode 49 MHz (Typical)	6.15	6.3
	Idle Mode 24.5 MHz (Typical)	2.8	2.9
I-grade devices, -40 °C to +125 °C	Normal Mode 49 MHz (Typical)	9.1	9.4
	Normal Mode 24.5 MHz (Typical)	4.3	4.5
	Idle Mode 49 MHz (Typical)	6.15	6.3

	Idle Mode 24.5 MHz (Typical)	2.8	2.9

The following changes were also made to the V1.30 and V1.31 datasheet
- The addition of table 4.11 “1.8V Internal Low Dropout Voltage Regulator” to outline its minimum, typical, and maximum voltages.
- The addition of automotive devices in the product selection table and ordering information.
- Addition of AEC-Q100 under the key features and specifications.
- Added thermal resistance (junction to case) for the QFN20 package.
- Added a note linking to the output low voltage and output high voltage table of the port I/Os to the performance curves.
- Added the sizes of transmit and receive FIFOs for the SMBus and I2C slave peripherals.
- Added a line in the introduction section to mention the reference manual where an individual can find more technical information on registers and blocks.
- Added a note on the comparator reference current consumption to clarify its source.

After the issue date of this PCN, the EFM8BB2 datasheet will reflect the changes listed above and all automotive (A) grade EFM8BB2 devices will adhere to the V1.31 datasheet. After the effective date of this PCN all commercial (G) and industrial (I) grade EFM8BB2 devices will adhere to the specifications in the aforementioned datasheet. For questions please contact your Silicon Labs representative.

Reason for Change:

1. The release of the new EFM8BB2 automotive qualified devices.
2. The release of V1.31 of the EFM8BB2 datasheet.
3. The calibration routine for the LDO has been updated and affects power consumption numbers in normal and idle mode.

Impact on Form, Fit, Function, Quality, Reliability:

This is considered a minor change to form, fit, function, quality, and reliability and is part of Silicon Labs’ commitment to a continual improvement process.

Product Identification:

Devices affected at the issue date of this PCN:
EFM8BB21F16A-C-QFN20
EFM8BB21F16A-C-QFN20R
EFM8BB22F16A-C-QFN28
EFM8BB22F16A-C-QFN28R

Devices affected at the effective date of this PCN:
EFM8BB21F16G-C-QFN20
EFM8BB21F16G-C-QFN20R
EFM8BB21F16G-C-QSOP24
EFM8BB21F16G-C-QSOP24R
EFM8BB21F16I-C-QFN20
EFM8BB21F16I-C-QFN20R
EFM8BB21F16I-C-QSOP24
EFM8BB21F16I-C-QSOP24R
EFM8BB22F16G-C-QFN28
EFM8BB22F16G-C-QFN28R
EFM8BB22F16I-C-QFN28
EFM8BB22F16I-C-QFN28R

Last Date of Unchanged Product: 2/22/2017
Qualification Samples: Available upon request.
Specific conditions of acceptance of this change will be considered on a case by case basis if written notice is submitted within 30 days of this notice. To request further data or inquire about this notification, please contact your local Silicon Labs sales representative. A list of Silicon Labs sales representatives is available at www.silabs.com . **In some cases rejection of a change notice may impact Silicon Labs product pricing, delivery, quality, or reliability.**
Customer Early Acceptance Sign Off: **Customers may approve early PCN acceptance by completing the information below:** **Early Acceptance: Date:** _____ **Name:** _____ **Company:** _____ **Email your early Acceptance approval to: katherine.haggar@silabs.com**
Qualification Data: Please see appendix.

Appendix

EFM8BB2x AEC-Q100 Qualification Report

W7101F1 - Product Qualification Report Record Rev. H

EFM8BB2x Rev A2/A3/A4, HHGrace Fabrication, ASECL and UTACTH Assembly

Test Name	Test Condition	Qualification	Lot ID or Start	Fail/Pass or End	Notes	Summary	Status
Test Group A – Accelerated Environment Stress Tests - 20QFN - CuPd Wire ASECL							
HAST	JA110		Q037190	0/77	1		
	130°C, 85%RH	3 lots, N=>77	Q037191	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q037192	0/80	1	0/237	
UHAST	JA110		Q037199	0/81	1		
	130°C, 85%RH	3 lots, N=>77	Q037200	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q037202	0/82	1	0/243	
Temp Cycle	JA104		Q037196	0/80	1		
	Cond C: -65°C to 150°C	3 lots, N=>77	Q037197	0/80	1	3 lots	Pass
	500 cycles		Q037198	0/80	1	0/240	
HTSL	JA103		Q037193	0/30	1		
	150°C, 1000hr	1 lot, N=>45	Q037194	0/30	1	3 lots	Pass
			Q037195	0/30	1	0/90	
Test Group A – Accelerated Environment Stress Tests - 28QFN - CuPd Wire UTACTH							
HAST	JA110		Q035792	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q035788	0/77	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q035789	0/80	1	0/237	
UHAST	JA110		Q037163	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q037164	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q037165	0/80	1	0/240	
Temp Cycle	JA104		Q037160	0/80	1		
	Cond C: -65°C to 150°C	3 lots, N=>77	Q037161	0/80	1	3 lots	Pass
	500 cycles		Q037162	0/80	1	0/240	
HTSL	JA103		Q035682	0/30	1		
	150°C, 1000hr		Q037977	0/80	1		
		1 lot, N=>45	Q037159	0/30	1	4 lots	Pass
			Q037806	0/45	1	0/185	
Test Group A – Accelerated Environment Stress Tests - 24QSOP - CuPd Wire UTACTH							
HAST	JA110		Q036513	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q036515	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q036519	0/80	1	0/240	
UHAST	JA110		Q036526	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q036527	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q036528	0/80	1	0/240	
Temp Cycle	JA104		Q036523	0/80	1		
	Cond C: -65°C to 150°C	3 lots, N=>77	Q036524	0/80	1	3 lots	Pass
	500 cycles		Q036525	0/80	1	0/240	
HTSL	JA103		Q036520	0/28	1		
	150°C, 1000hr	1 lot, N=>45	Q036521	0/28	1	3 lots	Pass
			Q036522	0/28	1	0/84	

Approved by: Vincent Hidajat 1 of 3 Prepared on: 16-Aug-16

EFM8BB2x AEC-Q100 Qualification Report

W7101F1 - Product Qualification Report Record Rev. H

EFM8BB2x Rev A2/A3/A4, HHGrace Fabrication, ASECL and UTACTH Assembly							
Test Name	**Test Condition**	**Qualification**	**Lot ID or Start**	**Fail/Pass or End**	**Notes**	**Summary**	**Status**
Test Group A – Accelerated Environment Stress Tests - 24QFN - CuPd Wire UTACTH							
HAST	JA110		Q035792	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q035788	0/77	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q035789	0/80	1	0/237	
UHAST	JA110		Q037163	0/80	1		
	130°C, 85%RH	3 lots, N=>77	Q037164	0/80	1	3 lots	Pass
	Vcc=3.6V, 96 hours		Q037165	0/80	1	0/240	
Temp Cycle	JA104		Q038520	0/80	1		
	Cond C: -65°C to 150°C	3 lots, N=>77	Q038521	0/80	1	3 lots	Pass
	500 cycles		Q038522	0/80	1	0/240	
HTSL	JA103		Q035682	0/30	1		
	150°C, 1000hr	1 lot, N=>45	Q037977	0/80	1	3 lots	Pass
			Q037159	0/30	1	0/140	
Test Group B – Accelerated Lifetime Simulation Tests							
HTOL	JA108		Q035684	0/84			
	$T_J \geq 125°C$, Dynamic	3 lots, N=>77	Q035685	0/84		3 lots	Pass
	Vcc=3.6V, 1000 hours		Q037250	0/80		0/248	
LTOL	JA108						
	-40°C, Dynamic	1 lot, N=>32	Q036550	0/35		1 lots	Pass
	Vcc=3.6V, 1000 hours					0/35	
ELFR	AEC-Q100-008		Q035681	0/839			
	$T_J \geq 125°C$, Dynamic	3 lots, N=>800	Q036910	0/839			
	Vcc=3.6V, 48 hours		Q037251	0/836		4 lots	Pass
			Q036509	0/840		0/3354	
Data Retention	AEC Q100-005		Q035781	0/45			
High Temp	150°C, 1000hrs	3 lots, N=>39	Q035783	0/44		3 lots	Pass
			Q037252	0/45		0/134	
Data Retention	AEC Q100-005		Q035784	0/45			
Low Temp	25°C, 1000hrs	3 lots, N=>38	Q035786	0/45		3 lots	Pass
			Q037253	0/45		0/135	
NVM P/E Cycling	AEC Q100-005		Q035787	0/84			
High Temp	85°C, 24hrs	3 lots, N=>77	Q035782	0/84		3 lots	Pass
			Q037254	0/84		0/252	
NVM P/E Cycling	AEC Q100-005		Q035791	0/80			
Low temp	55°C, 24hrs	3 lots, N=>77	Q035785	0/80		3 lots	Pass
			Q037255	0/84		0/244	

EFM8BB2x AEC-Q100 Qualification Report

W7101F1 - Product Qualification Report Record Rev. H

EFM8BB2x Rev A2/A3/A4, HHGrace Fabrication, ASECL and UTACTH Assembly

Test Name	Test Condition	Qualification	Lot ID or Start	Fail/Pass or End	Notes	Summary	Status
Test Group C – Package Assembly Integrity Tests							
Wire Bond Pull	M-STD-883 Performed post-TC	5 units, N=>30 20QFN	Q037487	0/5	2	1 lots 0/5	Pass
Wire Bond Pull	M-STD-883 Performed post-TC	5 units, N=>30 28QFN	Q037489	0/5	3	1 lots 0/5	Pass
Wire Bond Pull	M-STD-883 Performed post-TC	5 units, N=>30 24QSOP	Q037707	0/5	4	1 lots 0/5	Pass
Wire Bond Pull	M-STD-883 Performed post-TC	5 units, N=>30 24QFN	Q038577	0/5	5	1 lots 0/5	Pass
Test Group E – Electrical Verification							
ESD-HBM	AEC-Q100-002	1 lot, N=>3	Q036561 Q035689 Q037643				2 kV 2 kV 2 kV
ESD-CDM	AEC-Q100-011	1 lot, N=>3	Q036705 Q035688 Q037648 Q036558 Q036512 Q038628		2 3 3 3 4 5		1500 V 1250 V 1250 V 1500 V 1500 V 1500 V
Latch Up	AEC-Q100-004 ±200mA	1 lot, N=>6	Q037647 Q037674	125 °C 25 °C			Pass Pass
Electromagnetic Compatibility	SAE J1752	1 lot, N=>1	Q038023				Pass

Notes:
1. Parts are Pre-conditioned at MSL2/260°C
2. 20-QFN
3. 28-QFN
4. 24-QSOP
5. 24-QFN

This report applies to the following part numbers:

EFM8BB21F16G-C-QSOP24	EFM8BB21F16I-C-QSOP24	EFM8BB21F16A-C-QFN20
EFM8BB21F16G-C-QFN20	EFM8BB21F16I-C-QFN20	EFM8BB22F16A-C-QFN28
EFM8BB22F16G-C-QFN28	EFM8BB22F16I-C-QFN28	

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