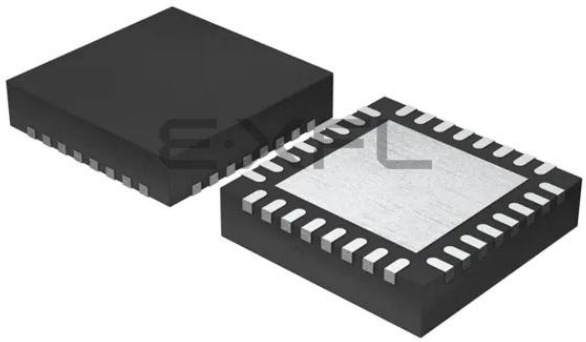
Silicon Labs - EFM32JG1B100F256GM32-B0 Datasheet



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What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Discontinued at Digi-Key
Core Processor	ARM® Cortex®-M3
Core Size	32-Bit Single-Core
Speed	40MHz
Connectivity	I²C, IrDA, LINbus, SmartCard, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, I²S, POR, PWM, WDT
Number of I/O	20
Program Memory Size	256KB (256K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	32K x 8
Voltage - Supply (Vcc/Vdd)	1.85V ~ 3.8V
Data Converters	A/D 24x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	32-VFQFN Exposed Pad
Supplier Device Package	32-QFN (5x5)
Purchase URL	https://www.e-xfl.com/product-detail/silicon-labs/efm32jg1b100f256gm32-b0

3.6.2 Low Energy Universal Asynchronous Receiver/Transmitter (LEUART)

The unique LEUART™ provides two-way UART communication on a strict power budget. Only a 32.768 kHz clock is needed to allow UART communication up to 9600 baud. The LEUART includes all necessary hardware to make asynchronous serial communication possible with a minimum of software intervention and energy consumption.

3.6.3 Inter-Integrated Circuit Interface (I^2C)

The I^2C module provides an interface between the MCU and a serial I^2C bus. It is capable of acting as both a master and a slave and supports multi-master buses. Standard-mode, fast-mode and fast-mode plus speeds are supported, allowing transmission rates from 10 kbit/s up to 1 Mbit/s. Slave arbitration and timeouts are also available, allowing implementation of an SMBus-compliant system. The interface provided to software by the I^2C module allows precise timing control of the transmission process and highly automated transfers. Automatic recognition of slave addresses is provided in active and low energy modes.

3.6.4 Peripheral Reflex System (PRS)

The Peripheral Reflex System provides a communication network between different peripheral modules without software involvement. Peripheral modules producing Reflex signals are called producers. The PRS routes Reflex signals from producers to consumer peripherals which in turn perform actions in response. Edge triggers and other functionality can be applied by the PRS. The PRS allows peripheral to act autonomously without waking the MCU core, saving power.

3.7 Security Features

3.7.1 GPCRC (General Purpose Cyclic Redundancy Check)

The GPCRC module implements a Cyclic Redundancy Check (CRC) function. It supports both 32-bit and 16-bit polynomials. The supported 32-bit polynomial is 0x04C11DB7 (IEEE 802.3), while the 16-bit polynomial can be programmed to any value, depending on the needs of the application.

3.7.2 Crypto Accelerator (CRYPTO)

The Crypto Accelerator is a fast and energy-efficient autonomous hardware encryption and decryption accelerator. EFM32JG1 devices support AES encryption and decryption with 128- or 256-bit keys, ECC over both GF(P) and GF(2^m), and SHA-1 and SHA-2 (SHA-224 and SHA-256).

Supported block cipher modes of operation for AES include: ECB, CTR, CBC, PCBC, CFB, OFB, GCM, CBC-MAC, GMAC and CCM.

Supported ECC NIST recommended curves include P-192, P-224, P-256, K-163, K-233, B-163 and B-233.

The CRYPTO module allows fast processing of GCM (AES), ECC and SHA with little CPU intervention. CRYPTO also provides trigger signals for DMA read and write operations.

3.8 Analog

3.8.1 Analog Port (APORT)

The Analog Port (APORT) is an analog interconnect matrix allowing access to many analog modules on a flexible selection of pins. Each APORT bus consists of analog switches connected to a common wire. Since many clients can operate differentially, buses are grouped by X/Y pairs.

3.8.2 Analog Comparator (ACMP)

The Analog Comparator is used to compare the voltage of two analog inputs, with a digital output indicating which input voltage is higher. Inputs are selected from among internal references and external pins. The tradeoff between response time and current consumption is configurable by software. Two 6-bit reference dividers allow for a wide range of internally-programmable reference sources. The ACMP can also be used to monitor the supply voltage. An interrupt can be generated when the supply falls below or rises above the programmable threshold.

3.8.3 Analog to Digital Converter (ADC)

The ADC is a Successive Approximation Register (SAR) architecture, with a resolution of up to 12 bits at up to 1 Msps. The output sample resolution is configurable and additional resolution is possible using integrated hardware for averaging over multiple samples. The ADC includes integrated voltage references and an integrated temperature sensor. Inputs are selectable from a wide range of sources, including pins configurable as either single-ended or differential.

3.8.4 Digital to Analog Current Converter (IDAC)

The Digital to Analog Current Converter can source or sink a configurable constant current. This current can be driven on an output pin or routed to the selected ADC input pin for capacitive sensing. The full-scale current is programmable between 0.05 µA and 64 µA with several ranges consisting of various step sizes.

3.9 Reset Management Unit (RMU)

The RMU is responsible for handling reset of the EFM32JG1. A wide range of reset sources are available, including several power supply monitors, pin reset, software controlled reset, core lockup reset, and watchdog reset.

3.10 Core and Memory

3.10.1 Processor Core

The ARM Cortex-M processor includes a 32-bit RISC processor integrating the following features and tasks in the system:

- ARM Cortex-M3 RISC processor achieving 1.25 Dhrystone MIPS/MHz
- Memory Protection Unit (MPU) supporting up to 8 memory segments
- Up to 256 kB flash program memory
- Up to 32 kB RAM data memory
- Configuration and event handling of all modules
- 2-pin Serial-Wire debug interface

3.10.2 Memory System Controller (MSC)

The Memory System Controller (MSC) is the program memory unit of the microcontroller. The flash memory is readable and writable from both the Cortex-M and DMA. The flash memory is divided into two blocks; the main block and the information block. Program code is normally written to the main block, whereas the information block is available for special user data and flash lock bits. There is also a read-only page in the information block containing system and device calibration data. Read and write operations are supported in energy modes EM0 Active and EM1 Sleep.

3.10.3 Linked Direct Memory Access Controller (LDMA)

The Linked Direct Memory Access (LDMA) controller features 8 channels capable of performing memory operations independently of software. This reduces both energy consumption and software workload. The LDMA allows operations to be linked together and staged, enabling sophisticated operations to be implemented.

4.1.4 DC-DC Converter

Test conditions: L_{DCDC}=4.7 µH (Murata LQH3NPN4R7MM0L), C_{DCDC}=1.0 µF (Murata GRM188R71A105KA61D), V_{DCDC_I}=3.3 V, V_{DCDC_O}=1.8 V, I_{DCDC_LOAD}=50 mA, Heavy Drive configuration, F_{DCDC_LN}=7 MHz, unless otherwise indicated.

Table 4.4. DC-DC Converter

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input voltage range	V_{DCDC_I}	Bypass mode, I_{DCDC_LOAD} = 50 mA	1.85	—	$V_{VREGVDD\_MAX}$	V
		Low noise (LN) mode, 1.8 V output, I_{DCDC_LOAD} = 100 mA, or Low power (LP) mode, 1.8 V output, I_{DCDC_LOAD} = 10 mA	2.4	—	$V_{VREGVDD\_MAX}$	V
		Low noise (LN) mode, 1.8 V output, I_{DCDC_LOAD} = 200 mA	2.6	—	$V_{VREGVDD\_MAX}$	V
Output voltage programmable range[1]	V_{DCDC_O}		1.8	—	$V_{VREGVDD}$	V
Regulation DC Accuracy	ACC_{DC}	Low noise (LN) mode, 1.8 V target output	1.7	—	1.9	V
Regulation Window[2]	WIN_{REG}	Low power (LP) mode, LPCMPBIAS[3] = 0, 1.8 V target output, I_{DCDC_LOAD} ≤ 75 µA	1.63	—	2.2	V
		Low power (LP) mode, LPCMPBIAS[3] = 3, 1.8 V target output, I_{DCDC_LOAD} ≤ 10 mA	1.63	—	2.1	V
Steady-state output ripple	V_R		—	3	—	mVpp
Output voltage under/overshoot	V_{OV}	CCM Mode (LNFORCECCM[3] = 1), Load changes between 0 mA and 100 mA	—	—	150	mV
		DCM Mode (LNFORCECCM[3] = 0), Load changes between 0 mA and 10 mA	—	—	150	mV
		Overshoot during LP to LN CCM/DCM mode transitions compared to DC level in LN mode	—	200	—	mV
		Undershoot during BYP/LP to LN CCM (LNFORCECCM[3] = 1) mode transitions compared to DC level in LN mode	—	50	—	mV
		Undershoot during BYP/LP to LN DCM (LNFORCECCM[3] = 0) mode transitions compared to DC level in LN mode	—	125	—	mV
DC line regulation	V_{REG}	Input changes between $V_{VREGVDD\_MAX}$ and 2.4 V	—	0.1	—	%
DC load regulation	I_{REG}	Load changes between 0 mA and 100 mA in CCM mode	—	0.1	—	%

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Max load current	I_{LOAD_MAX}	Low noise (LN) mode, Heavy Drive[4], T_{amb} ≤ 85 °C	—	—	200	mA
		Low noise (LN) mode, Heavy Drive[4], T_{amb} > 85 °C	—	—	100	mA
		Low noise (LN) mode, Medium Drive[4]	—	—	100	mA
		Low noise (LN) mode, Light Drive[4]	—	—	50	mA
		Low power (LP) mode, LPCMPBIAS[3] = 0	—	—	75	µA
		Low power (LP) mode, LPCMPBIAS[3] = 3	—	—	10	mA
DCDC nominal output capacitor	C_{DCDC}	25% tolerance	1	1	1	µF
DCDC nominal output inductor	L_{DCDC}	20% tolerance	4.7	4.7	4.7	µH
Resistance in Bypass mode	R_{BYP}		—	1.2	2.5	Ω

Note:

1. Due to internal dropout, the DC-DC output will never be able to reach its input voltage, $V_{VREGVDD}$
2. LP mode controller is a hysteretic controller that maintains the output voltage within the specified limits
3. In EMU_DCDCMISCCTRL register
4. Drive levels are defined by configuration of the PFETCNT and NFETCNT registers. Light Drive: PFETCNT=NFETCNT=3; Medium Drive: PFETCNT=NFETCNT=7; Heavy Drive: PFETCNT=NFETCNT=15.

4.1.5 Current Consumption

4.1.5.1 Current Consumption 3.3 V without DC-DC Converter

Unless otherwise indicated, typical conditions are: VREGVDD = AVDD = DVDD = 3.3 V. T_{OP} = 25 °C. EMU_PWRCFG_PWRCG=NODCDC. EMU_DCDCCTRL_DCDCMODE=BYPASS. Minimum and maximum values in this table represent the worst conditions across supply voltage and process variation at T_{OP} = 25 °C. See Figure 5.1 EFM32JG1 Typical Application Circuit, Direct Supply, No DC-DC Converter on page 48.

Table 4.5. Current Consumption 3.3V without DC/DC

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Current consumption in EM0 Active mode with all peripherals disabled	I_{ACTIVE}	38.4 MHz crystal, CPU running while loop from flash[1]	—	127	—	µA/MHz
		38 MHz HFRCO, CPU running Prime from flash	—	88	—	µA/MHz
		38 MHz HFRCO, CPU running while loop from flash	—	100	105	µA/MHz
		38 MHz HFRCO, CPU running CoreMark from flash	—	112	—	µA/MHz
		26 MHz HFRCO, CPU running while loop from flash	—	102	106	µA/MHz
		1 MHz HFRCO, CPU running while loop from flash	—	222	350	µA/MHz
Current consumption in EM1 Sleep mode with all peripherals disabled	I_{EM1}	38.4 MHz crystal[1]	—	61	—	µA/MHz
		38 MHz HFRCO	—	35	38	µA/MHz
		26 MHz HFRCO	—	37	41	µA/MHz
		1 MHz HFRCO	—	157	275	µA/MHz
Current consumption in EM2 Deep Sleep mode.	I_{EM2}	Full RAM retention and RTCC running from LFXO	—	3.3	—	µA
		4 kB RAM retention and RTCC running from LFRCO	—	3	6.3	µA
Current consumption in EM3 Stop mode	I_{EM3}	Full RAM retention and CRYOTIMER running from ULFRCO	—	2.8	6	µA
Current consumption in EM4H Hibernate mode	I_{EM4}	128 byte RAM retention, RTCC running from LFXO	—	1.1	—	µA
		128 byte RAM retention, CRYOTIMER running from ULFRCO	—	0.65	—	µA
		128 byte RAM retention, no RTCC	—	0.65	1.3	µA
Current consumption in EM4S Shutoff mode	I_{EM4S}	no RAM retention, no RTCC	—	0.04	0.11	µA

Note:
1. CMU_HFXOCTRL_LOWPOWER=1

4.1.5.2 Current Consumption 3.3 V using DC-DC Converter

Unless otherwise indicated, typical conditions are: VREGVDD = AVDD = IOVDD = 3.3 V, DVDD = 1.8 V DC-DC output. T_{OP} = 25 °C. Minimum and maximum values in this table represent the worst conditions across supply voltage and process variation at T_{OP} = 25 °C. See Figure 5.2 EFM32JG1 Typical Application Circuit Using the DC-DC Converter on page 48.

Table 4.6. Current Consumption 3.3V with DC-DC

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Current consumption in EM0 Active mode with all peripherals disabled, DCDC in Low Noise DCM mode[1].	I_{ACTIVE}	38.4 MHz crystal, CPU running while loop from flash[2]	—	86	—	µA/MHz
		38 MHz HFRCO, CPU running Prime from flash	—	63	—	µA/MHz
		38 MHz HFRCO, CPU running while loop from flash	—	71	—	µA/MHz
		38 MHz HFRCO, CPU running CoreMark from flash	—	78	—	µA/MHz
		26 MHz HFRCO, CPU running while loop from flash	—	76	—	µA/MHz
Current consumption in EM0 Active mode with all peripherals disabled, DCDC in Low Noise CCM mode[3].		38.4 MHz crystal, CPU running while loop from flash[2]	—	96	—	µA/MHz
		38 MHz HFRCO, CPU running Prime from flash	—	75	—	µA/MHz
		38 MHz HFRCO, CPU running while loop from flash	—	81	—	µA/MHz
		38 MHz HFRCO, CPU running CoreMark from flash	—	88	—	µA/MHz
		26 MHz HFRCO, CPU running while loop from flash	—	94	—	µA/MHz
Current consumption in EM1 Sleep mode with all peripherals disabled, DCDC in Low Noise DCM mode[1].	I_{EM1}	38.4 MHz crystal[2]	—	47	—	µA/MHz
		38 MHz HFRCO	—	32	—	µA/MHz
		26 MHz HFRCO	—	38	—	µA/MHz
Current consumption in EM1 Sleep mode with all peripherals disabled, DCDC in Low Noise CCM mode[3].		38.4 MHz crystal[2]	—	59	—	µA/MHz
		38 MHz HFRCO	—	45	—	µA/MHz
		26 MHz HFRCO	—	58	—	µA/MHz
Current consumption in EM2 Deep Sleep mode. DCDC in Low Power mode[4].	I_{EM2}	Full RAM retention and RTCC running from LFXO	—	2.5	—	µA
		4 kB RAM retention and RTCC running from LFRCO	—	2.2	—	µA
Current consumption in EM3 Stop mode	I_{EM3}	Full RAM retention and CRYOTIMER running from ULFRCO	—	2.1	—	µA
Current consumption in EM4H Hibernate mode	I_{EM4}	128 byte RAM retention, RTCC running from LFXO	—	0.86	—	µA
		128 byte RAM retention, CRYOTIMER running from ULFRCO	—	0.58	—	µA
		128 byte RAM retention, no RTCC	—	0.58	—	µA

4.1.8.2 HFXO

Table 4.11. HFXO

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Crystal Frequency	f_{HFXO}		38	38.4	40	MHz
Supported crystal equivalent series resistance (ESR)	ESR_{HFXO}	Crystal frequency 38.4 MHz	—	—	60	Ω
Supported range of crystal load capacitance [1]	C_{HFXO_CL}		6	—	12	pF
On-chip tuning cap range [2]	C_{HFXO_T}	On each of HFXTAL_N and HFXTAL_P pins	9	20	25	pF
On-chip tuning capacitance step	SS_{HFXO}		—	0.04	—	pF
Startup time	t_{HFXO}	38.4 MHz, ESR = 50 Ω, C_L = 10 pF	—	300	—	µs
Frequency Tolerance for the crystal	FT_{HFXO}	38.4 MHz, ESR = 50 Ω, CL = 10 pF	-40	—	40	ppm

Note:
1. Total load capacitance as seen by the crystal
2. The effective load capacitance seen by the crystal will be C_{HFXO_T} /2. This is because each XTAL pin has a tuning cap and the two caps will be seen in series by the crystal.

4.1.8.3 LFRCO

Table 4.12. LFRCO

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Oscillation frequency	f_{LFRCO}	ENVREF = 1 in CMU_LFRCOCTRL, T_{AMB} ≤ 85 °C	30.474	32.768	34.243	kHz
		ENVREF = 1 in CMU_LFRCOCTRL, T_{AMB} > 85 °C	30.474	—	39.7	kHz
		ENVREF = 0 in CMU_LFRCOCTRL	30.474	32.768	33.915	kHz
Startup time	t_{LFRCO}		—	500	—	µs
Current consumption [1]	I_{LFRCO}	ENVREF = 1 in CMU_LFRCOCTRL	—	342	—	nA
		ENVREF = 0 in CMU_LFRCOCTRL	—	494	—	nA

Note:
1. Block is supplied by AVDD if ANASW = 0, or DVDD if ANASW=1 in EMU_PWRCTRL register

4.1.8.4 HFRCO and AUXHFRCO

Table 4.13. HFRCO and AUXHFRCO

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Frequency Accuracy	f_{HFRCO_ACC}	Any frequency band, across supply voltage and temperature	-2.5	—	2.5	%
Start-up time	t_{HFRCO}	$f_{HFRCO} \geq 19$ MHz	—	300	—	ns
		$4 < f_{HFRCO} < 19$ MHz	—	1	—	µs
		$f_{HFRCO} \leq 4$ MHz	—	2.5	—	µs
Current consumption on all supplies	I_{HFRCO}	$f_{HFRCO} = 38$ MHz	—	204	228	µA
		$f_{HFRCO} = 32$ MHz	—	171	190	µA
		$f_{HFRCO} = 26$ MHz	—	147	164	µA
		$f_{HFRCO} = 19$ MHz	—	126	138	µA
		$f_{HFRCO} = 16$ MHz	—	110	120	µA
		$f_{HFRCO} = 13$ MHz	—	100	110	µA
		$f_{HFRCO} = 7$ MHz	—	81	91	µA
		$f_{HFRCO} = 4$ MHz	—	33	35	µA
		$f_{HFRCO} = 2$ MHz	—	31	35	µA
		$f_{HFRCO} = 1$ MHz	—	30	35	µA
Step size	SS_{HFRCO}	Coarse (% of period)	—	0.8	—	%
		Fine (% of period)	—	0.1	—	%
Period Jitter	PJ_{HFRCO}		—	0.2	—	% RMS

4.1.8.5 ULFRCO

Table 4.14. ULFRCO

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Oscillation frequency	f_{ULFRCO}		0.95	1	1.07	kHz

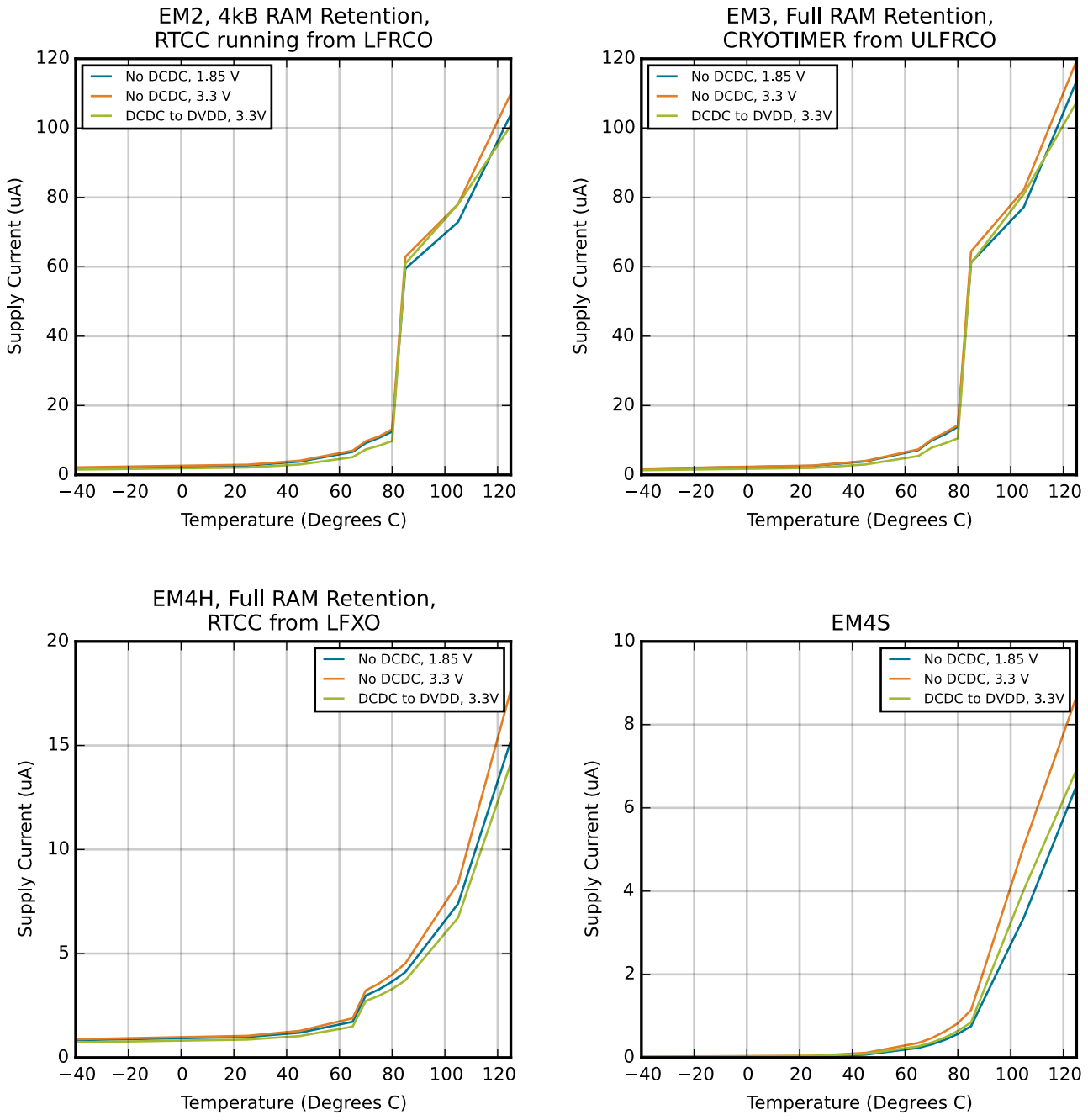


Figure 4.5. EM2, EM3, EM4H and EM4S Typical Supply Current

4.2.2 DC-DC Converter

Default test conditions: CCM mode, LDCDC = 4.7 µH, CDCDC = 1.0 µF, VDCDC_I = 3.3 V, VDCDC_O = 1.8 V, FDCDC_LN = 7 MHz

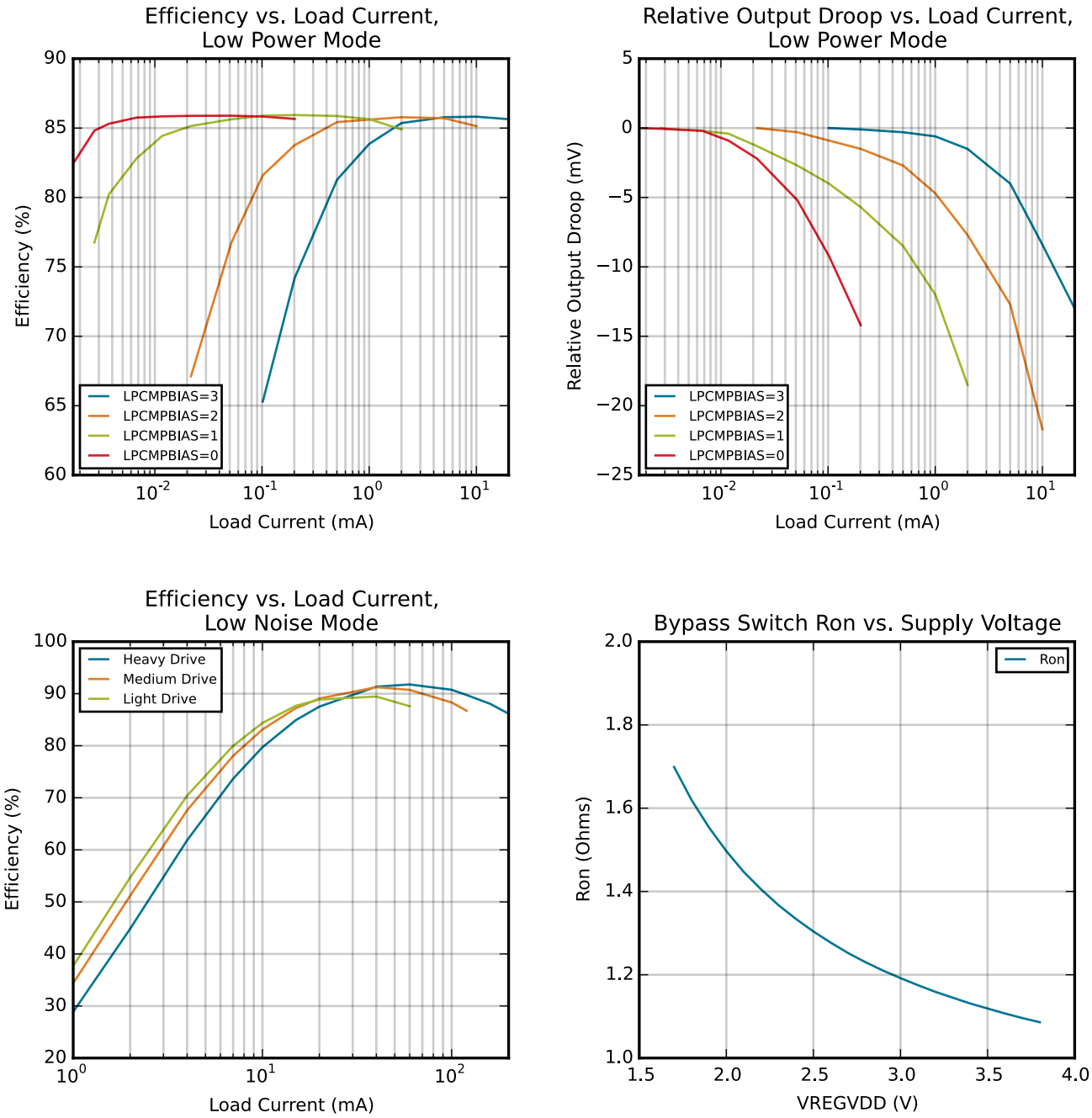


Figure 4.6. DC-DC Converter Typical Performance Characteristics

6. Pin Definitions

6.1 EFM32JG1 QFN48 with DC-DC Definition

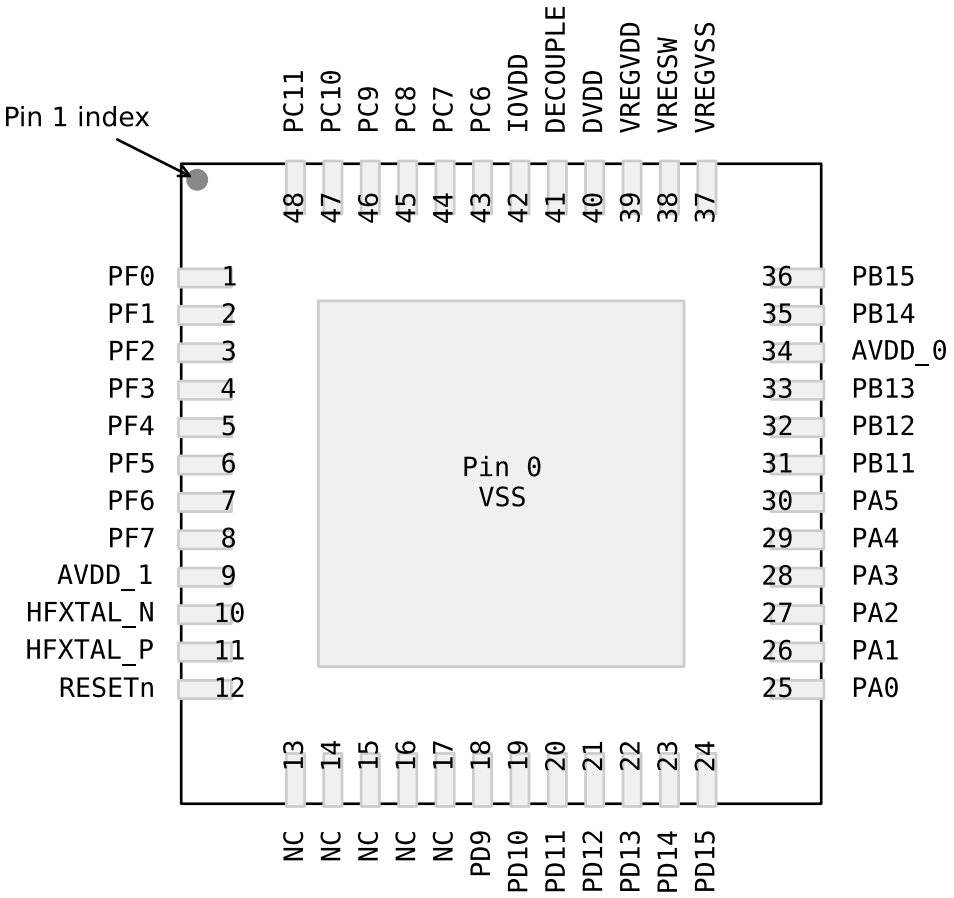


Figure 6.1. EFM32JG1 QFN48 with DC-DC Pinout

QFN48 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
46	PC9	BUSAY BUSBX	TIM0_CC0 #14 TIM0_CC1 #13 TIM0_CC2 #12 TIM0_CDTI0 #11 TIM0_CDTI1 #10 TIM0_CDTI2 #9 TIM1_CC0 #14 TIM1_CC1 #13 TIM1_CC2 #12 TIM1_CC3 #11 LE- TIM0_OUT0 #14 LE- TIM0_OUT1 #13 PCNT0_S0IN #14 PCNT0_S1IN #13	US0_TX #14 US0_RX #13 US0_CLK #12 US0_CS #11 US0_CTS #10 US0_RTS #9 US1_TX #14 US1_RX #13 US1_CLK #12 US1_CS #11 US1_CTS #10 US1_RTS #9 LEU0_TX #14 LEU0_RX #13 I2C0_SDA #14 I2C0_SCL #13	PRS_CH0 #11 PRS_CH9 #14 PRS_CH10 #3 PRS_CH11 #2 ACMP0_O #14 ACMP1_O #14
47	PC10	BUSAX BUSBY	TIM0_CC0 #15 TIM0_CC1 #14 TIM0_CC2 #13 TIM0_CDTI0 #12 TIM0_CDTI1 #11 TIM0_CDTI2 #10 TIM1_CC0 #15 TIM1_CC1 #14 TIM1_CC2 #13 TIM1_CC3 #12 LE- TIM0_OUT0 #15 LE- TIM0_OUT1 #14 PCNT0_S0IN #15 PCNT0_S1IN #14	US0_TX #15 US0_RX #14 US0_CLK #13 US0_CS #12 US0_CTS #11 US0_RTS #10 US1_TX #15 US1_RX #14 US1_CLK #13 US1_CS #12 US1_CTS #11 US1_RTS #10 LEU0_TX #15 LEU0_RX #14 I2C0_SDA #15 I2C0_SCL #14	CMU_CLK1 #3 PRS_CH0 #12 PRS_CH9 #15 PRS_CH10 #4 PRS_CH11 #3 ACMP0_O #15 ACMP1_O #15 GPIO_EM4WU12
48	PC11	BUSAY BUSBX	TIM0_CC0 #16 TIM0_CC1 #15 TIM0_CC2 #14 TIM0_CDTI0 #13 TIM0_CDTI1 #12 TIM0_CDTI2 #11 TIM1_CC0 #16 TIM1_CC1 #15 TIM1_CC2 #14 TIM1_CC3 #13 LE- TIM0_OUT0 #16 LE- TIM0_OUT1 #15 PCNT0_S0IN #16 PCNT0_S1IN #15	US0_TX #16 US0_RX #15 US0_CLK #14 US0_CS #13 US0_CTS #12 US0_RTS #11 US1_TX #16 US1_RX #15 US1_CLK #14 US1_CS #13 US1_CTS #12 US1_RTS #11 LEU0_TX #16 LEU0_RX #15 I2C0_SDA #16 I2C0_SCL #15	CMU_CLK0 #3 PRS_CH0 #13 PRS_CH9 #16 PRS_CH10 #5 PRS_CH11 #4 ACMP0_O #16 ACMP1_O #16 DBG_SWO #3

6.3 EFM32JG1 QFN32 with DC-DC Definition

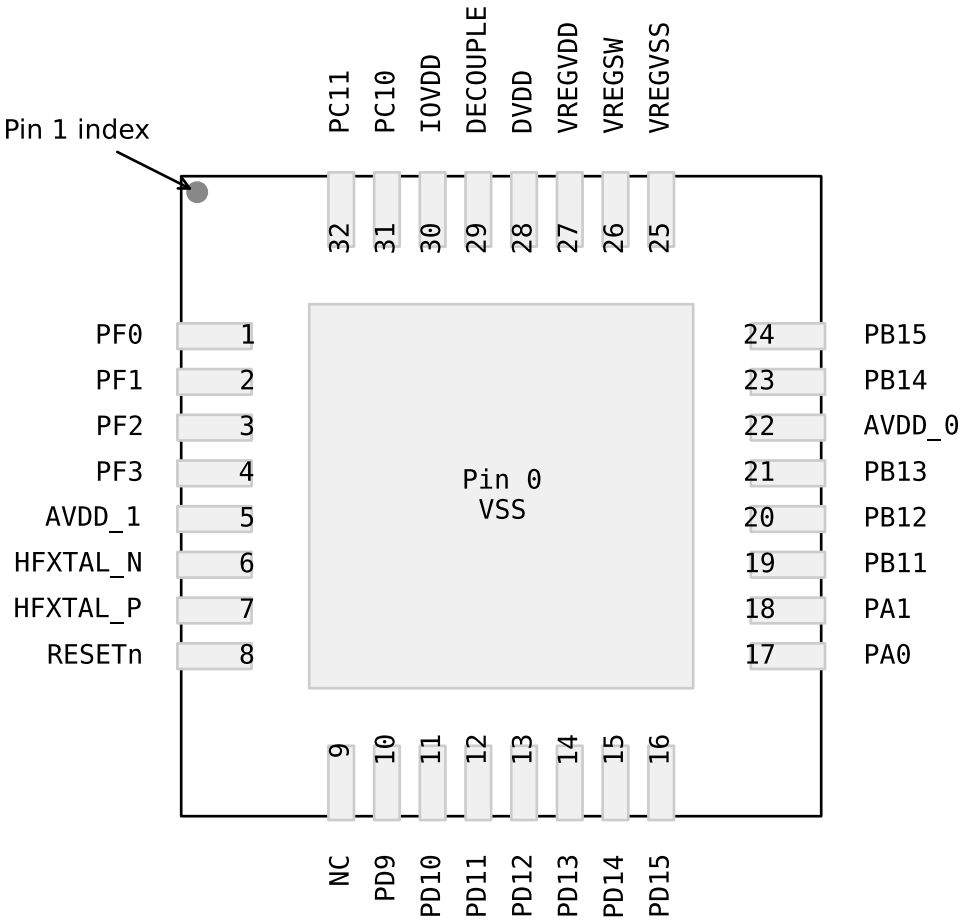


Figure 6.3. EFM32JG1 QFN32 with DC-DC Pinout

QFN32 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
4	PF3	BUSAY BUSBX	TIM0_CC0 #27 TIM0_CC1 #26 TIM0_CC2 #25 TIM0_CDTI0 #24 TIM0_CDTI1 #23 TIM0_CDTI2 #22 TIM1_CC0 #27 TIM1_CC1 #26 TIM1_CC2 #25 TIM1_CC3 #24 LE-TIM0_OUT0 #27 LE-TIM0_OUT1 #26 PCNT0_S0IN #27 PCNT0_S1IN #26	US0_TX #27 US0_RX #26 US0_CLK #25 US0_CS #24 US0_CTS #23 US0_RTS #22 US1_TX #27 US1_RX #26 US1_CLK #25 US1_CS #24 US1_CTS #23 US1_RTS #22 LEU0_TX #27 LEU0_RX #26 I2C0_SDA #27 I2C0_SCL #26	CMU_CLK1 #6 PRS_CH0 #3 PRS_CH1 #2 PRS_CH2 #1 PRS_CH3 #0 ACMP0_O #27 ACMP1_O #27 DBG_TDI #0
5	AVDD	Analog power supply .			
6	HFXTAL_N	High Frequency Crystal input pin.			
7	HFXTAL_P	High Frequency Crystal output pin.			
8	RESETn	Reset input, active low.To apply an external reset source to this pin, it is required to only drive this pin low during reset, and let the internal pull-up ensure that reset is released.			
9	NC	No Connect.			
10	PD9	BUSCY BUSDX	TIM0_CC0 #17 TIM0_CC1 #16 TIM0_CC2 #15 TIM0_CDTI0 #14 TIM0_CDTI1 #13 TIM0_CDTI2 #12 TIM1_CC0 #17 TIM1_CC1 #16 TIM1_CC2 #15 TIM1_CC3 #14 LE-TIM0_OUT0 #17 LE-TIM0_OUT1 #16 PCNT0_S0IN #17 PCNT0_S1IN #16	US0_TX #17 US0_RX #16 US0_CLK #15 US0_CS #14 US0_CTS #13 US0_RTS #12 US1_TX #17 US1_RX #16 US1_CLK #15 US1_CS #14 US1_CTS #13 US1_RTS #12 LEU0_TX #17 LEU0_RX #16 I2C0_SDA #17 I2C0_SCL #16	CMU_CLK0 #4 PRS_CH3 #8 PRS_CH4 #0 PRS_CH5 #6 PRS_CH6 #11 ACMP0_O #17 ACMP1_O #17
11	PD10	BUSCX BUSDY	TIM0_CC0 #18 TIM0_CC1 #17 TIM0_CC2 #16 TIM0_CDTI0 #15 TIM0_CDTI1 #14 TIM0_CDTI2 #13 TIM1_CC0 #18 TIM1_CC1 #17 TIM1_CC2 #16 TIM1_CC3 #15 LE-TIM0_OUT0 #18 LE-TIM0_OUT1 #17 PCNT0_S0IN #18 PCNT0_S1IN #17	US0_TX #18 US0_RX #17 US0_CLK #16 US0_CS #15 US0_CTS #14 US0_RTS #13 US1_TX #18 US1_RX #17 US1_CLK #16 US1_CS #15 US1_CTS #14 US1_RTS #13 LEU0_TX #18 LEU0_RX #17 I2C0_SDA #18 I2C0_SCL #17	CMU_CLK1 #4 PRS_CH3 #9 PRS_CH4 #1 PRS_CH5 #0 PRS_CH6 #12 ACMP0_O #18 ACMP1_O #18

QFN32 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
12	PD11	BUSCY BUSDX	TIM0_CC0 #19 TIM0_CC1 #18 TIM0_CC2 #17 TIM0_CDTI0 #16 TIM0_CDTI1 #15 TIM0_CDTI2 #14 TIM1_CC0 #19 TIM1_CC1 #18 TIM1_CC2 #17 TIM1_CC3 #16 LE- TIM0_OUT0 #19 LE- TIM0_OUT1 #18 PCNT0_S0IN #19 PCNT0_S1IN #18	US0_TX #19 US0_RX #18 US0_CLK #17 US0_CS #16 US0_CTS #15 US0_RTS #14 US1_TX #19 US1_RX #18 US1_CLK #17 US1_CS #16 US1_CTS #15 US1_RTS #14 LEU0_TX #19 LEU0_RX #18 I2C0_SDA #19 I2C0_SCL #18	PRS_CH3 #10 PRS_CH4 #2 PRS_CH5 #1 PRS_CH6 #13 ACMP0_O #19 ACMP1_O #19
13	PD12	BUSCX BUSDY	TIM0_CC0 #20 TIM0_CC1 #19 TIM0_CC2 #18 TIM0_CDTI0 #17 TIM0_CDTI1 #16 TIM0_CDTI2 #15 TIM1_CC0 #20 TIM1_CC1 #19 TIM1_CC2 #18 TIM1_CC3 #17 LE- TIM0_OUT0 #20 LE- TIM0_OUT1 #19 PCNT0_S0IN #20 PCNT0_S1IN #19	US0_TX #20 US0_RX #19 US0_CLK #18 US0_CS #17 US0_CTS #16 US0_RTS #15 US1_TX #20 US1_RX #19 US1_CLK #18 US1_CS #17 US1_CTS #16 US1_RTS #15 LEU0_TX #20 LEU0_RX #19 I2C0_SDA #20 I2C0_SCL #19	PRS_CH3 #11 PRS_CH4 #3 PRS_CH5 #2 PRS_CH6 #14 ACMP0_O #20 ACMP1_O #20
14	PD13	BUSCY BUSDX	TIM0_CC0 #21 TIM0_CC1 #20 TIM0_CC2 #19 TIM0_CDTI0 #18 TIM0_CDTI1 #17 TIM0_CDTI2 #16 TIM1_CC0 #21 TIM1_CC1 #20 TIM1_CC2 #19 TIM1_CC3 #18 LE- TIM0_OUT0 #21 LE- TIM0_OUT1 #20 PCNT0_S0IN #21 PCNT0_S1IN #20	US0_TX #21 US0_RX #20 US0_CLK #19 US0_CS #18 US0_CTS #17 US0_RTS #16 US1_TX #21 US1_RX #20 US1_CLK #19 US1_CS #18 US1_CTS #17 US1_RTS #16 LEU0_TX #21 LEU0_RX #20 I2C0_SDA #21 I2C0_SCL #20	PRS_CH3 #12 PRS_CH4 #4 PRS_CH5 #3 PRS_CH6 #15 ACMP0_O #21 ACMP1_O #21
15	PD14	BUSCX BUSDY	TIM0_CC0 #22 TIM0_CC1 #21 TIM0_CC2 #20 TIM0_CDTI0 #19 TIM0_CDTI1 #18 TIM0_CDTI2 #17 TIM1_CC0 #22 TIM1_CC1 #21 TIM1_CC2 #20 TIM1_CC3 #19 LE- TIM0_OUT0 #22 LE- TIM0_OUT1 #21 PCNT0_S0IN #22 PCNT0_S1IN #21	US0_TX #22 US0_RX #21 US0_CLK #20 US0_CS #19 US0_CTS #18 US0_RTS #17 US1_TX #22 US1_RX #21 US1_CLK #20 US1_CS #19 US1_CTS #18 US1_RTS #17 LEU0_TX #22 LEU0_RX #21 I2C0_SDA #22 I2C0_SCL #21	CMU_CLK0 #5 PRS_CH3 #13 PRS_CH4 #5 PRS_CH5 #4 PRS_CH6 #16 ACMP0_O #22 ACMP1_O #22 GPIO_EM4WU4

QFN32 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
20	PB12	BUSCX BUSDY	TIM0_CC0 #7 TIM0_CC1 #6 TIM0_CC2 #5 TIM0_CDTI0 #4 TIM0_CDTI1 #3 TIM0_CDTI2 #2 TIM1_CC0 #7 TIM1_CC1 #6 TIM1_CC2 #5 TIM1_CC3 #4 LE-TIM0_OUT0 #7 LE-TIM0_OUT1 #6 PCNT0_S0IN #7 PCNT0_S1IN #6	US0_TX #7 US0_RX #6 US0_CLK #5 US0_CS #4 US0_CTS #3 US0_RTS #2 US1_TX #7 US1_RX #6 US1_CLK #5 US1_CS #4 US1_CTS #3 US1_RTS #2 LEU0_TX #7 LEU0_RX #6 I2C0_SDA #7 I2C0_SCL #6	PRS_CH6 #7 PRS_CH7 #6 PRS_CH8 #5 PRS_CH9 #4 ACMP0_O #7 ACMP1_O #7
21	PB13	BUSCY BUSDX	TIM0_CC0 #8 TIM0_CC1 #7 TIM0_CC2 #6 TIM0_CDTI0 #5 TIM0_CDTI1 #4 TIM0_CDTI2 #3 TIM1_CC0 #8 TIM1_CC1 #7 TIM1_CC2 #6 TIM1_CC3 #5 LE-TIM0_OUT0 #8 LE-TIM0_OUT1 #7 PCNT0_S0IN #8 PCNT0_S1IN #7	US0_TX #8 US0_RX #7 US0_CLK #6 US0_CS #5 US0_CTS #4 US0_RTS #3 US1_TX #8 US1_RX #7 US1_CLK #6 US1_CS #5 US1_CTS #4 US1_RTS #3 LEU0_TX #8 LEU0_RX #7 I2C0_SDA #8 I2C0_SCL #7	PRS_CH6 #8 PRS_CH7 #7 PRS_CH8 #6 PRS_CH9 #5 ACMP0_O #8 ACMP1_O #8 DBG_SWO #1 GPIO_EM4WU9
22	AVDD	Analog power supply .			
23	PB14	LFXTAL_N BUSCX BUSDY	TIM0_CC0 #9 TIM0_CC1 #8 TIM0_CC2 #7 TIM0_CDTI0 #6 TIM0_CDTI1 #5 TIM0_CDTI2 #4 TIM1_CC0 #9 TIM1_CC1 #8 TIM1_CC2 #7 TIM1_CC3 #6 LE-TIM0_OUT0 #9 LE-TIM0_OUT1 #8 PCNT0_S0IN #9 PCNT0_S1IN #8	US0_TX #9 US0_RX #8 US0_CLK #7 US0_CS #6 US0_CTS #5 US0_RTS #4 US1_TX #9 US1_RX #8 US1_CLK #7 US1_CS #6 US1_CTS #5 US1_RTS #4 LEU0_TX #9 LEU0_RX #8 I2C0_SDA #9 I2C0_SCL #8	CMU_CLK1 #1 PRS_CH6 #9 PRS_CH7 #8 PRS_CH8 #7 PRS_CH9 #6 ACMP0_O #9 ACMP1_O #9
24	PB15	LFXTAL_P BUSCY BUSDX	TIM0_CC0 #10 TIM0_CC1 #9 TIM0_CC2 #8 TIM0_CDTI0 #7 TIM0_CDTI1 #6 TIM0_CDTI2 #5 TIM1_CC0 #10 TIM1_CC1 #9 TIM1_CC2 #8 TIM1_CC3 #7 LE-TIM0_OUT0 #10 LE-TIM0_OUT1 #9 PCNT0_S0IN #10 PCNT0_S1IN #9	US0_TX #10 US0_RX #9 US0_CLK #8 US0_CS #7 US0_CTS #6 US0_RTS #5 US1_TX #10 US1_RX #9 US1_CLK #8 US1_CS #7 US1_CTS #6 US1_RTS #5 LEU0_TX #10 LEU0_RX #9 I2C0_SDA #10 I2C0_SCL #9	CMU_CLK0 #1 PRS_CH6 #10 PRS_CH7 #9 PRS_CH8 #8 PRS_CH9 #7 ACMP0_O #10 ACMP1_O #10

Alternate	LOCATION								
Functionality	0 - 3	4 - 7	8 - 11	12 - 15	16 - 19	20 - 23	24 - 27	28 - 31	Description
GPIO_EM4WU12	0: PC10								Pin can be used to wake the system up from EM4
I2C0_SCL	0: PA1 1: PA2 2: PA3 3: PA4	4: PA5 5: PB11 6: PB12 7: PB13	8: PB14 9: PB15 10: PC6 11: PC7	12: PC8 13: PC9 14: PC10 15: PC11	16: PD9 17: PD10 18: PD11 19: PD12	20: PD13 21: PD14 22: PD15 23: PF0	24: PF1 25: PF2 26: PF3 27: PF4	28: PF5 29: PF6 30: PF7 31: PA0	I2C0 Serial Clock Line input / output.
I2C0_SDA	0: PA0 1: PA1 2: PA2 3: PA3	4: PA4 5: PA5 6: PB11 7: PB12	8: PB13 9: PB14 10: PB15 11: PC6	12: PC7 13: PC8 14: PC9 15: PC10	16: PC11 17: PD9 18: PD10 19: PD11	20: PD12 21: PD13 22: PD14 23: PD15	24: PF0 25: PF1 26: PF2 27: PF3	28: PF4 29: PF5 30: PF6 31: PF7	I2C0 Serial Data input / output.
LETIM0_OUT0	0: PA0 1: PA1 2: PA2 3: PA3	4: PA4 5: PA5 6: PB11 7: PB12	8: PB13 9: PB14 10: PB15 11: PC6	12: PC7 13: PC8 14: PC9 15: PC10	16: PC11 17: PD9 18: PD10 19: PD11	20: PD12 21: PD13 22: PD14 23: PD15	24: PF0 25: PF1 26: PF2 27: PF3	28: PF4 29: PF5 30: PF6 31: PF7	Low Energy Timer LETIM0, output channel 0.
LETIM0_OUT1	0: PA1 1: PA2 2: PA3 3: PA4	4: PA5 5: PB11 6: PB12 7: PB13	8: PB14 9: PB15 10: PC6 11: PC7	12: PC8 13: PC9 14: PC10 15: PC11	16: PD9 17: PD10 18: PD11 19: PD12	20: PD13 21: PD14 22: PD15 23: PF0	24: PF1 25: PF2 26: PF3 27: PF4	28: PF5 29: PF6 30: PF7 31: PA0	Low Energy Timer LETIM0, output channel 1.
LEU0_RX	0: PA1 1: PA2 2: PA3 3: PA4	4: PA5 5: PB11 6: PB12 7: PB13	8: PB14 9: PB15 10: PC6 11: PC7	12: PC8 13: PC9 14: PC10 15: PC11	16: PD9 17: PD10 18: PD11 19: PD12	20: PD13 21: PD14 22: PD15 23: PF0	24: PF1 25: PF2 26: PF3 27: PF4	28: PF5 29: PF6 30: PF7 31: PA0	LEUART0 Receive input.
LEU0_TX	0: PA0 1: PA1 2: PA2 3: PA3	4: PA4 5: PA5 6: PB11 7: PB12	8: PB13 9: PB14 10: PB15 11: PC6	12: PC7 13: PC8 14: PC9 15: PC10	16: PC11 17: PD9 18: PD10 19: PD11	20: PD12 21: PD13 22: PD14 23: PD15	24: PF0 25: PF1 26: PF2 27: PF3	28: PF4 29: PF5 30: PF6 31: PF7	LEUART0 Transmit output. Also used as receive input in half duplex communication.
LFXTAL_N	0: PB14								Low Frequency Crystal (typically 32.768 kHz) negative pin. Also used as an optional external clock input pin.
LFXTAL_P	0: PB15								Low Frequency Crystal (typically 32.768 kHz) positive pin.
PCNT0_S0IN	0: PA0 1: PA1 2: PA2 3: PA3	4: PA4 5: PA5 6: PB11 7: PB12	8: PB13 9: PB14 10: PB15 11: PC6	12: PC7 13: PC8 14: PC9 15: PC10	16: PC11 17: PD9 18: PD10 19: PD11	20: PD12 21: PD13 22: PD14 23: PD15	24: PF0 25: PF1 26: PF2 27: PF3	28: PF4 29: PF5 30: PF6 31: PF7	Pulse Counter PCNT0 input number 0.
PCNT0_S1IN	0: PA1 1: PA2 2: PA3 3: PA4	4: PA5 5: PB11 6: PB12 7: PB13	8: PB14 9: PB15 10: PC6 11: PC7	12: PC8 13: PC9 14: PC10 15: PC11	16: PD9 17: PD10 18: PD11 19: PD12	20: PD13 21: PD14 22: PD15 23: PF0	24: PF1 25: PF2 26: PF3 27: PF4	28: PF5 29: PF6 30: PF7 31: PA0	Pulse Counter PCNT0 input number 1.
PRS_CH0	0: PF0 1: PF1 2: PF2 3: PF3	4: PF4 5: PF5 6: PF6 7: PF7	8: PC6 9: PC7 10: PC8 11: PC9	12: PC10 13: PC11					Peripheral Reflex System PRS, channel 0.

7. QFN48 Package Specifications

7.1 QFN48 Package Dimensions

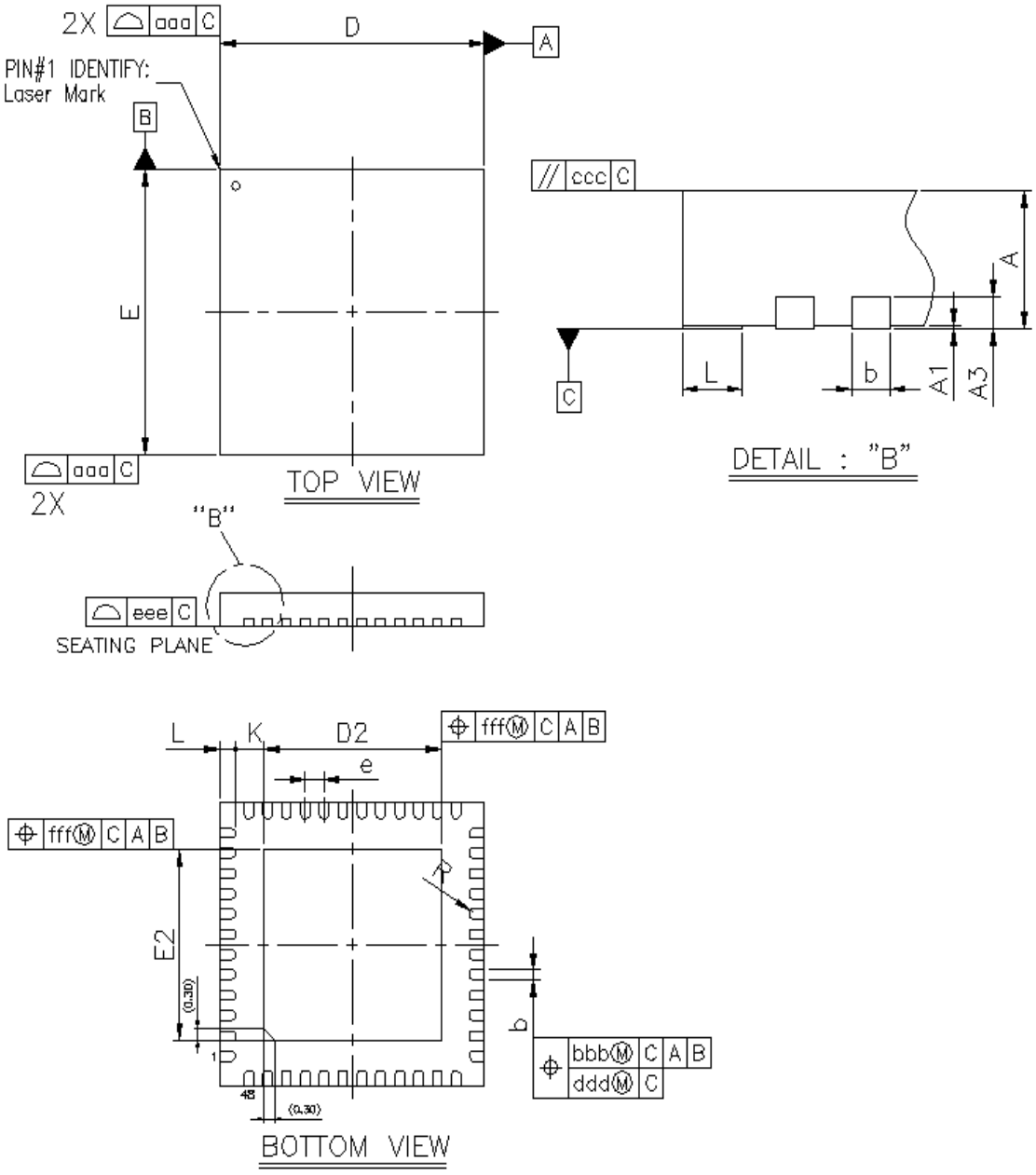


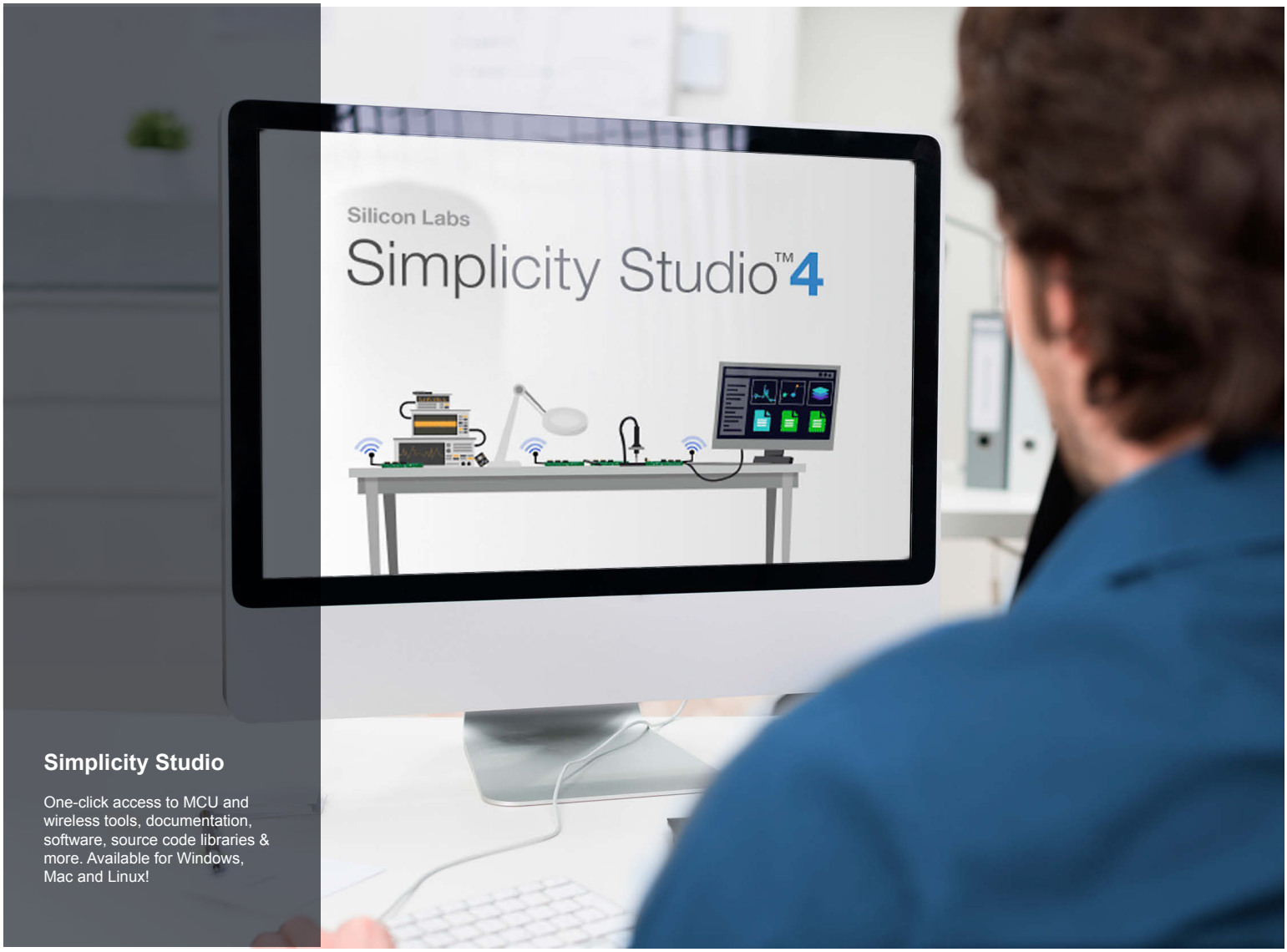
Figure 7.1. QFN48 Package Drawing

7.3 QFN48 Package Marking

Figure 7.3. QFN48 Package Marking

The package marking consists of:

- PPPPPPPPP – The part number designation.
- TTTTTT – A trace or manufacturing code. The first letter is the device revision.
- YY – The last 2 digits of the assembly year.
- WW – The 2-digit workweek when the device was assembled.
- # – Reserved for future use. Current value is 0.



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