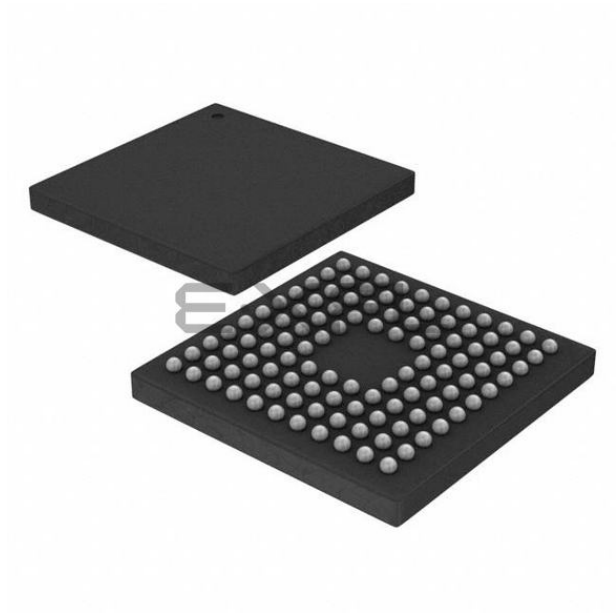

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Discontinued at Digi-Key
Core Processor	ARM® Cortex®-M3
Core Size	32-Bit Single-Core
Speed	32MHz
Connectivity	EBI/EMI, I²C, IrDA, SmartCard, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, POR, PWM, WDT
Number of I/O	90
Program Memory Size	64KB (64K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	16K x 8
Voltage - Supply (Vcc/Vdd)	1.98V ~ 3.8V
Data Converters	A/D 8x12b; D/A 2x12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	112-LFBGA
Supplier Device Package	112-BGA (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/silicon-labs/efm32g290f64-bga112t

  - Supply Voltage Comparator
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- Pre-Programmed USB/UART Bootloader
- Temperature range -40 to 85 ºC
- Single power supply 1.98 to 3.8 V
- Packages
  - BGA112
  - LQFP100
  - TQFP64
  - TQFP48
  - QFN64
  - QFN32

3.1.14 Universal Asynchronous Receiver/Transmitter (UART)

The Universal Asynchronous serial Receiver and Transmitter (UART) is a very flexible serial I/O module. It supports full- and half-duplex asynchronous UART communication.

3.1.15 Low Energy Universal Asynchronous Receiver/Transmitter (LEUART)

The unique LEUART™, the Low Energy UART, is a UART that allows 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/ s. The LEUART includes all necessary hardware support to make asynchronous serial communication possible with minimum of software intervention and energy consumption.

3.1.16 Timer/Counter (TIMER)

The 16-bit general purpose Timer has 3 compare/capture channels for input capture and compare/Pulse-Width Modulation (PWM) output. TIMER0 also includes a Dead-Time Insertion module suitable for motor control applications.

3.1.17 Real Time Counter (RTC)

The Real Time Counter (RTC) contains a 24-bit counter and is clocked either by a 32.768 kHz crystal oscillator, or a 32.768 kHz RC oscillator. In addition to energy modes EM0 and EM1, the RTC is also available in EM2. This makes it ideal for keeping track of time since the RTC is enabled in EM2 where most of the device is powered down.

3.1.18 Low Energy Timer (LETIMER)

The unique LETIMER™, the Low Energy Timer, is a 16-bit timer that is available in energy mode EM2 in addition to EM1 and EM0. Because of this, it can be used for timing and output generation when most of the device is powered down, allowing simple tasks to be performed while the power consumption of the system is kept at an absolute minimum. The LETIMER can be used to output a variety of waveforms with minimal software intervention. It is also connected to the Real Time Counter (RTC), and can be configured to start counting on compare matches from the RTC.

3.1.19 Pulse Counter (PCNT)

The Pulse Counter (PCNT) can be used for counting pulses on a single input or to decode quadrature encoded inputs. It runs off either the internal LFACLK or the PCNTn_S0IN pin as external clock source. The module may operate in energy mode EM0 - EM3.

3.1.20 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 can either be one of the selectable internal references or from external pins. Response time and thereby also the current consumption can be configured by altering the current supply to the comparator.

3.1.21 Voltage Comparator (VCMP)

The Voltage Supply Comparator is used to monitor the supply voltage from software. An interrupt can be generated when the supply falls below or rises above a programmable threshold. Response time and thereby also the current consumption can be configured by altering the current supply to the comparator.

3.1.22 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 one million samples per second. The integrated input mux can select inputs from 8 external pins and 6 internal signals.

3.1.23 Digital to Analog Converter (DAC)

The Digital to Analog Converter (DAC) can convert a digital value to an analog output voltage. The DAC is fully differential rail-to-rail, with 12-bit resolution. It has two single-ended output buffers which can be combined into one differential output. The DAC may be used for a number of different applications such as sensor interfaces or sound output.

4.4.1 EM0 Current Consumption

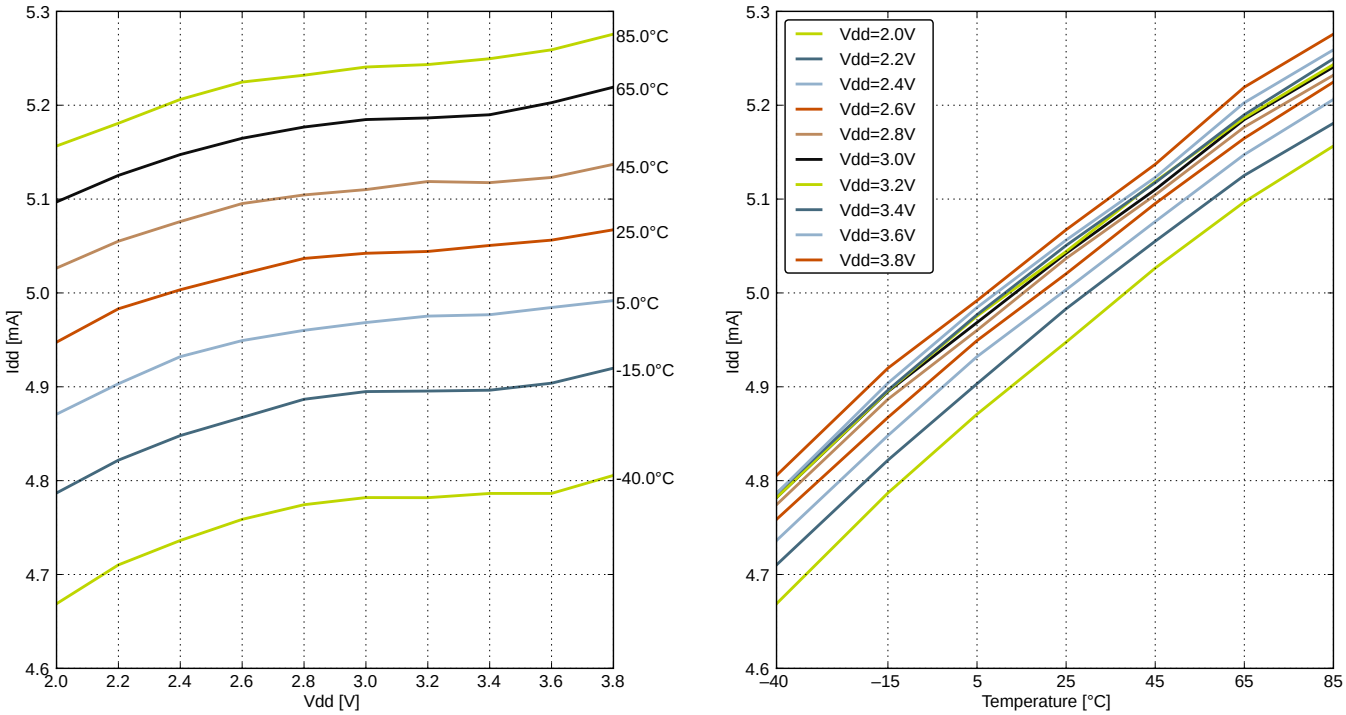

Figure 4.1. EM0 Current consumption while executing prime number calculation code from flash with HFRCO running at 28 MHz

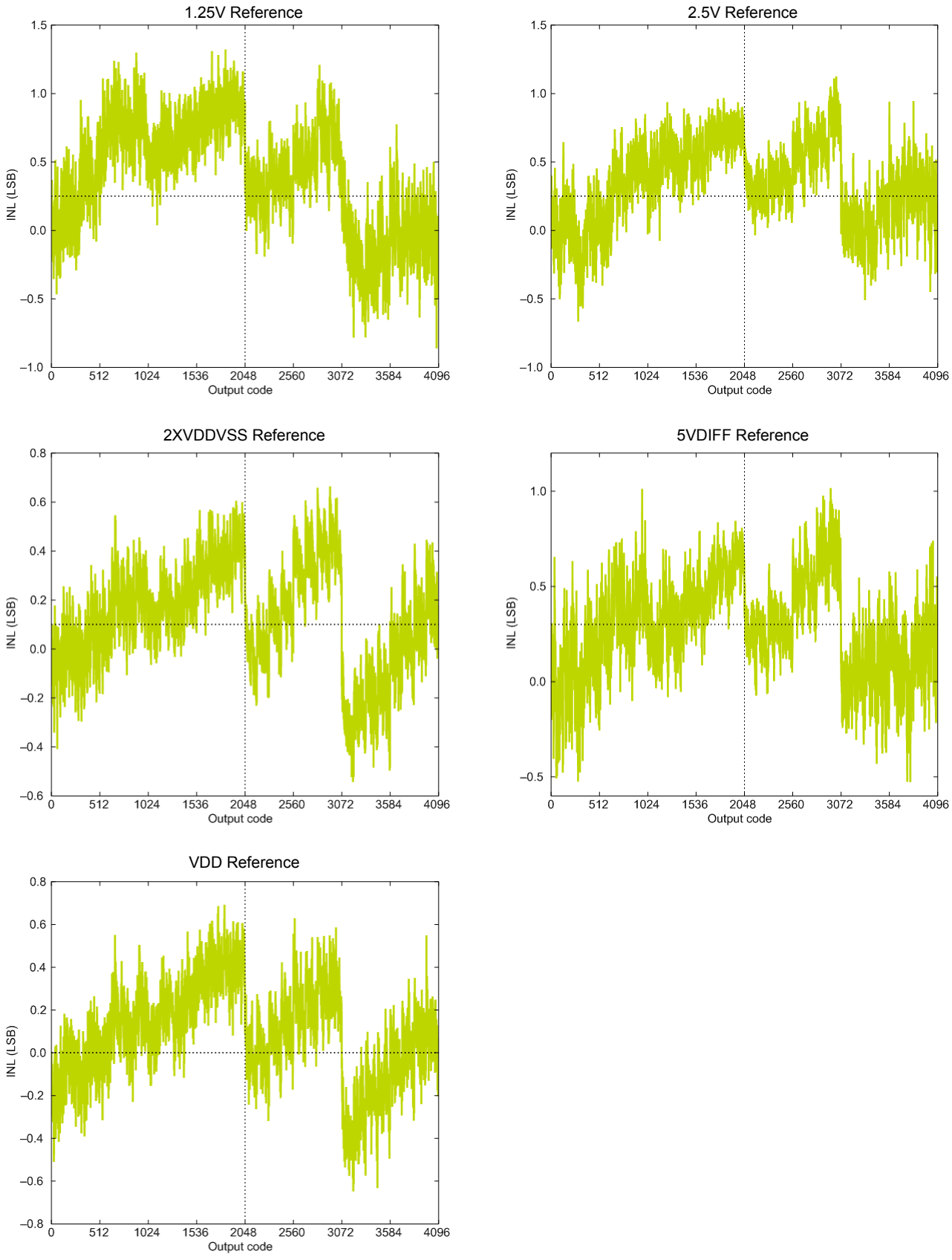

Figure 4.30. ADC Integral Linearity Error vs Code, VDD = 3V, Temp = 25°C

4.13 Voltage Comparator (VCMP)

Table 4.17. VCMP

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Input voltage range	V_{VCMPIN}		—	V_{DD}	—	V
VCMP Common Mode voltage range	V_{VCMPCM}		—	V_{DD}	—	V
Active current	I_{VCMP}	BIASPROG=0b0000 and HALFBIAS=1 in VCMPn_CTRL register	—	0.3	1	µA
		BIASPROG=0b1111 and HALFBIAS=0 in VCMPn_CTRL register. LPREF=0.	—	22	30	µA
Startup time reference generator	$t_{VCMPREF}$	NORMAL	—	10	—	µs
Offset voltage	$V_{VCMPOFFSET}$	Single-ended	—	10	—	mV
		Differential	—	10	—	mV
VCMP hysteresis	$V_{VCMPHYST}$		—	40	—	mV
Startup time	$t_{VCMPSTART}$		—	—	10	µs

The $V_{DD\ Trigger\ Level}$ can be configured by setting the TRIGLEVEL field of the VCMP_CTRL register in accordance with the following equation:

$$V_{DD\ Trigger\ Level} = 1.667V + 0.034 \times TRIGLEVEL$$

4.15 I2C

Table 4.19. I2C Standard-mode (Sm)

Parameter	Symbol	Min	Typ	Max	Unit
SCL clock frequency	f_{SCL}	0	—	100[1]	kHz
SCL clock low time	t_{LOW}	4.7	—	—	µs
SCL clock high time	t_{HIGH}	4.0	—	—	µs
SDA set-up time	$t_{SU,DAT}$	250	—	—	ns
SDA hold time	$t_{HD,DAT}$	8	—	3450[2,3]	ns
Repeated START condition set-up time	$t_{SU,STA}$	4.7	—	—	µs
(Repeated) START condition hold time	$t_{HD,STA}$	4.0	—	—	µs
STOP condition set-up time	$t_{SU,STO}$	4.0	—	—	µs
Bus free time between a STOP and a START condition	t_{BUF}	4.7	—	—	µs

Note:
1. For the minimum HFPERCLK frequency required in Standard-mode, see the I2C chapter in the EFM32G Reference Manual.
2. The maximum SDA hold time ($t_{HD,DAT}$) needs to be met only when the device does not stretch the low time of SCL (t_{LOW}).
3. When transmitting data, this number is guaranteed only when I2Cn_CLKDIV < ((3450*10^{-9} [s] * $f_{HFPERCLK}$ [Hz]) - 4).

Table 4.20. I2C Fast-mode (Fm)

Parameter	Symbol	Min	Typ	Max	Unit
SCL clock frequency	f_{SCL}	0	—	400[1]	kHz
SCL clock low time	t_{LOW}	1.3	—	—	µs
SCL clock high time	t_{HIGH}	0.6	—	—	µs
SDA set-up time	$t_{SU,DAT}$	100	—	—	ns
SDA hold time	$t_{HD,DAT}$	8	—	900[2,3]	ns
Repeated START condition set-up time	$t_{SU,STA}$	0.6	—	—	µs
(Repeated) START condition hold time	$t_{HD,STA}$	0.6	—	—	µs
STOP condition set-up time	$t_{SU,STO}$	0.6	—	—	µs
Bus free time between a STOP and a START condition	t_{BUF}	1.3	—	—	µs

Note:
1. For the minimum HFPERCLK frequency required in Fast-mode, see the I2C chapter in the EFM32G Reference Manual.
2. The maximum SDA hold time ($t_{HD,DAT}$) needs to be met only when the device does not stretch the low time of SCL (t_{LOW}).
3. When transmitting data, this number is guaranteed only when I2Cn_CLKDIV < ((900*10^{-9} [s] * $f_{HFPERCLK}$ [Hz]) - 4).

TQFP64 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
39	VDD_DREG	Power supply for on-chip voltage regulator.			
40	DECOUPLE	Decouple output for on-chip voltage regulator. An external capacitance of size $C_{DECOUPLE}$ is required at this pin.			
41	PC8	ACMP1_CH0	TIM2_CC0 #2	US0_CS #2	
42	PC9	ACMP1_CH1	TIM2_CC1 #2	US0_CLK #2	
43	PC10	ACMP1_CH2	TIM2_CC2 #2	US0_RX #2	
44	PC11	ACMP1_CH3		US0_TX #2	
45	PC12	ACMP1_CH4			CMU_CLK0 #1
46	PC13	ACMP1_CH5	TIM0_CDTI0 #1/3 TIM1_CC0 #0 PCNT0_S0IN #0		
47	PC14	ACMP1_CH6	TIM0_CDTI1 #1/3 TIM1_CC1 #0 PCNT0_S1IN #0		
48	PC15	ACMP1_CH7	TIM0_CDTI2 #1/3 TIM1_CC2 #0		DBG_SWO #1
49	PF0		LETIM0_OUT0 #2		DBG_SWCLK #0/1
50	PF1		LETIM0_OUT1 #2		DBG_SWDIO #0/1
51	PF2				ACMP1_O #0 DBG_SWO #0
52	PF3		TIM0_CDTI0 #2		
53	PF4		TIM0_CDTI1 #2		
54	PF5		TIM0_CDTI2 #2		
55	IOVDD_5	Digital IO power supply 5.			
56	VSS	Ground.			
57	PE8		PCNT2_S0IN #1		
58	PE9		PCNT2_S1IN #1		
59	PE10		TIM1_CC0 #1	US0_TX #0	BOOT_TX
60	PE11		TIM1_CC1 #1	US0_RX #0	BOOT_RX
61	PE12		TIM1_CC2 #1	US0_CLK #0	
62	PE13			US0_CS #0	ACMP0_O #0
63	PE14			LEU0_TX #2	
64	PE15			LEU0_RX #2	

5.4.2 Alternate Functionality Pinout

A wide selection of alternate functionality is available for multiplexing to various pins. This is shown in the following table. The table shows the name of the alternate functionality in the first column, followed by columns showing the possible LOCATION bitfield settings.

Note: Some functionality, such as analog interfaces, do not have alternate settings or a LOCATION bitfield. In these cases, the pinout is shown in the column corresponding to LOCATION 0.

Table 5.11. Alternate functionality overview

Alternate	LOCATION				
Functionality	0	1	2	3	Description
ACMP0_CH4	PC0				Analog comparator ACMP0, channel 0.
ACMP0_CH5	PC1				Analog comparator ACMP0, channel 1.
ACMP0_CH6	PC2				Analog comparator ACMP0, channel 2.
ACMP0_CH7	PC3				Analog comparator ACMP0, channel 3.
ACMP0_O	PE13				Analog comparator ACMP0, digital output.
ACMP1_CH0	PC8				Analog comparator ACMP1, channel 0.
ACMP1_CH1	PC9				Analog comparator ACMP1, channel 1.
ACMP1_CH2	PC10				Analog comparator ACMP1, channel 2.
ACMP1_CH3	PC11				Analog comparator ACMP1, channel 3.
ACMP1_O	PF2				Analog comparator ACMP1, digital output.
ADC0_CH0	PD0				Analog to digital converter ADC0, input channel number 0.
ADC0_CH1	PD1				Analog to digital converter ADC0, input channel number 1.
ADC0_CH2	PD2				Analog to digital converter ADC0, input channel number 2.
ADC0_CH3	PD3				Analog to digital converter ADC0, input channel number 3.
ADC0_CH4	PD4				Analog to digital converter ADC0, input channel number 4.
ADC0_CH5	PD5				Analog to digital converter ADC0, input channel number 5.
ADC0_CH6	PD6				Analog to digital converter ADC0, input channel number 6.
ADC0_CH7	PD7				Analog to digital converter ADC0, input channel number 7.
BOOT_RX	PE11				Bootloader RX.
BOOT_TX	PE10				Bootloader TX.
CMU_CLK0	PA2	PC12			Clock Management Unit, clock output number 0.
CMU_CLK1	PA1	PD8			Clock Management Unit, clock output number 1.
DAC0_OUT0	PB11				Digital to Analog Converter DAC0 output channel number 0.
DBG_SWCLK	PF0	PF0			Debug-interface Serial Wire clock input. Note that this function is enabled to pin out of reset, and has a built-in pull down.
DBG_SWDIO	PF1	PF1			Debug-interface Serial Wire data input / output. Note that this function is enabled to pin out of reset, and has a built-in pull up.

LQFP100 Pin# and Name		Pin Alternate Functionality / Description				
Pin #	Pin Name	Analog	EBI	Timers	Communication	Other
37	PB9					
38	PB10					
39	PB11	DAC0_OUT0		LETIM0_OUT0 #1		
40	PB12	DAC0_OUT1		LETIM0_OUT1 #1		
41	AVDD_1	Analog power supply 1.				
42	PB13	HFXTAL_P			LEU0_TX #1	
43	PB14	HFXTAL_N			LEU0_RX #1	
44	IOVDD_3	Digital IO power supply 3.				
45	AVDD_0	Analog power supply 0.				
46	PD0	ADC0_CH0		PCNT2_S0IN #0	US1_TX #1	
47	PD1	ADC0_CH1		TIM0_CC0 #3 PCNT2_S1IN #0	US1_RX #1	
48	PD2	ADC0_CH2		TIM0_CC1 #3	US1_CLK #1	
49	PD3	ADC0_CH3		TIM0_CC2 #3	US1_CS #1	
50	PD4	ADC0_CH4			LEU0_TX #0	
51	PD5	ADC0_CH5			LEU0_RX #0	
52	PD6	ADC0_CH6		LETIM0_OUT0 #0	I2C0_SDA #1	
53	PD7	ADC0_CH7		LETIM0_OUT1 #0	I2C0_SCL #1	
54	PD8					CMU_CLK1 #1
55	PC6	ACMP0_CH6			LEU1_TX #0 I2C0_SDA #2	
56	PC7	ACMP0_CH7			LEU1_RX #0 I2C0_SCL #2	
57	VDD_DREG	Power supply for on-chip voltage regulator.				
58	VSS	Ground.				
59	DECOUPLE	Decouple output for on-chip voltage regulator. An external capacitance of size $C_{DECOUPLE}$ is required at this pin.				
60	PE0			PCNT0_S0IN #1	U0_TX #1	
61	PE1			PCNT0_S1IN #1	U0_RX #1	
62	PE2					ACMP0_O #1

BGA112 Pin# and Name		Pin Alternate Functionality / Description				
Pin #	Pin Name	Analog	EBI	Timers	Communication	Other
D3	PB15					
D4	VSS	Ground.				
D5	IOVDD_6	Digital IO power supply 6.				
D6	PD9	LCD_SEG 28	EBI_CS0 #0			
D7	IOVDD_5	Digital IO power supply 5.				
D8	PF1			LETIM0_OUT1 #2		DBG_SWDIO #0/1
D9	PE7				US0_TX #1	
D10	PC8	ACMP1_CH0		TIM2_CC0 #2	US0_CS #2	
D11	PC9	ACMP1_CH1		TIM2_CC1 #2	US0_CLK #2	
E1	PA6		EBI_AD15 #0		LEU1_RX #1	
E2	PA5		EBI_AD14 #0	TIM0_CDTI2 #0	LEU1_TX #1	
E3	PA4		EBI_AD13 #0	TIM0_CDTI1 #0	U0_RX #2	
E4	PB0			TIM1_CC0 #2		
E8	PF0			LETIM0_OUT0 #2		DBG_SWCLK #0/1
E9	PE0			PCNT0_S0IN #1	U0_TX #1	
E10	PE1			PCNT0_S1IN #1	U0_RX #1	
E11	PE3					ACMP1_O #1
F1	PB1			TIM1_CC1 #2		
F2	PB2			TIM1_CC2 #2		
F3	PB3			PCNT1_S0IN #1	US2_TX #1	
F4	PB4			PCNT1_S1IN #1	US2_RX #1	
F8	VDD_DREG	Power supply for on-chip voltage regulator.				
F9	VSS_DREG	Ground for on-chip voltage regulator.				
F10	PE2					ACMP0_O #1
F11	DECOUPLE	Decouple output for on-chip voltage regulator. An external capacitance of size $C_{DECOUPLE}$ is required at this pin.				
G1	PB5				US2_CLK #1	
G2	PB6				US2_CS #1	
G3	VSS	Ground.				
G4	IOVDD_0	Digital IO power supply 0.				
G8	IOVDD_4	Digital IO power supply 4.				
G9	VSS	Ground.				

QFN64 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
6	PA5	LCD_SEG18	TIM0_CDTI2 #0	LEU1_TX #1	
6	PA6	LCD_SEG19		LEU1_RX #1	
8	IOVDD_0	Digital IO power supply 0.			
9	PB3	LCD_SEG20	PCNT1_S0IN #1	US2_TX #1	
10	PB4	LCD_SEG21	PCNT1_S1IN #1	US2_RX #1	
11	PB5	LCD_SEG22		US2_CLK #1	
12	PB6	LCD_SEG23		US2_CS #1	
13	PC4	ACMP0_CH4	LETIM0_OUT0 #3 PCNT1_S0IN #0	US2_CLK #0	
14	PC5	ACMP0_CH5	LETIM0_OUT1 #3 PCNT1_S1IN #0	US2_CS #0	
15	PB7	LFXTAL_P		US1_CLK #0	
16	PB8	LFXTAL_N		US1_CS #0	
17	PA12	LCD_BCAP_P	TIM2_CC0 #1		
18	PA13	LCD_BCAP_N	TIM2_CC1 #1		
19	PA14	LCD_BEXT	TIM2_CC2 #1		
20	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.			
21	PB11	DAC0_OUT0	LETIM0_OUT0 #1		
22	PB12	DAC0_OUT1	LETIM0_OUT1 #1		
23	AVDD_1	Analog power supply 1.			
24	PB13	HFXTAL_P		LEU0_TX #1	
25	PB14	HFXTAL_N		LEU0_RX #1	
26	IOVDD_3	Digital IO power supply 3.			
27	AVDD_0	Analog power supply 0.			
28	PD0	ADC0_CH0	PCNT2_S0IN #0	US1_TX #1	
29	PD1	ADC0_CH1	TIM0_CC0 #3 PCNT2_S1IN #0	US1_RX #1	
30	PD2	ADC0_CH2	TIM0_CC1 #3	US1_CLK #1	
31	PD3	ADC0_CH3	TIM0_CC2 #3	US1_CS #1	
32	PD4	ADC0_CH4		LEU0_TX #0	
33	PD5	ADC0_CH5		LEU0_RX #0	
34	PD6	ADC0_CH6	LETIM0_OUT0 #0	I2C0_SDA #1	
35	PD7	ADC0_CH7	LETIM0_OUT1 #0	I2C0_SCL #1	
36	PD8				CMU_CLK1 #1
37	PC6	ACMP0_CH6		LEU1_TX #0 I2C0_SDA #2	

5.8 EFM32G842 (TQFP64)

5.8.1 Pinout

The EFM32G842 pinout is shown in the following figure and table. Alternate locations are denoted by "#" followed by the location number (Multiple locations on the same pin are split with "/"). Alternate locations can be configured in the LOCATION bitfield in the *_ROUTE register in the module in question.

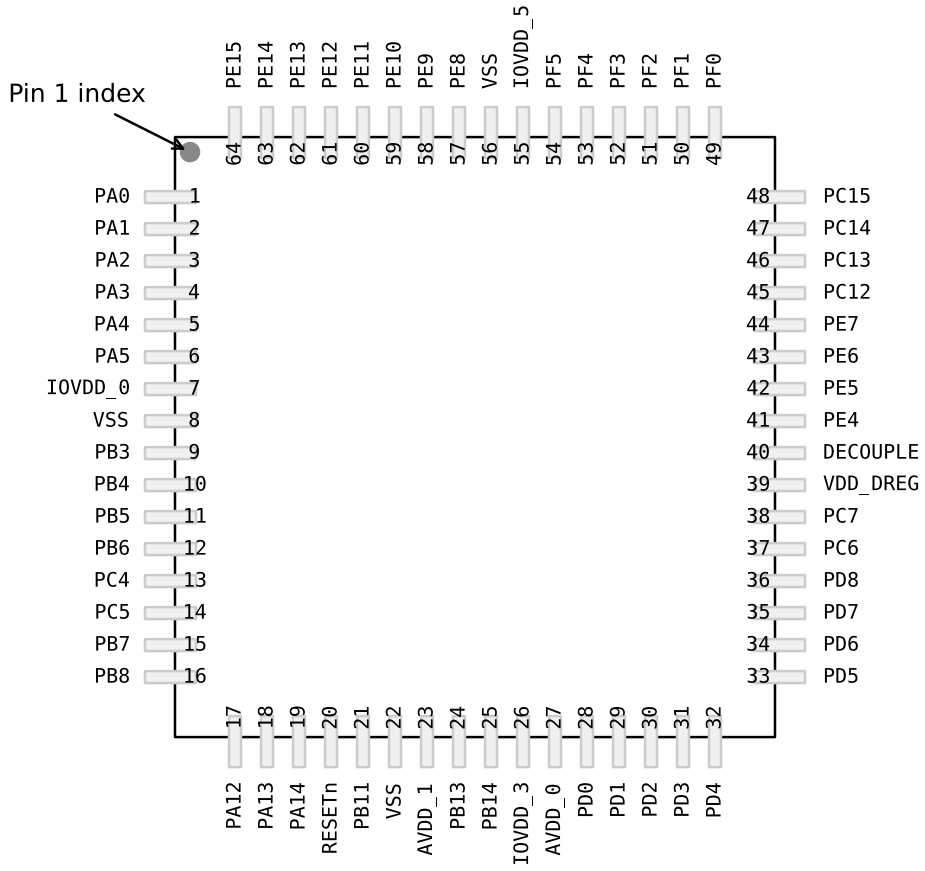

Figure 5.8. EFM32G842 Pinout (top view, not to scale)

Table 5.22. Device Pinout

TQFP64 Pin# and Name		Pin Alternate Functionality / Description			
Pin #	Pin Name	Analog	Timers	Communication	Other
1	PA0	LCD_SEG13	TIM0_CC0 #0/1	I2C0_SDA #0	
2	PA1	LCD_SEG14	TIM0_CC1 #0/1	I2C0_SCL #0	CMU_CLK1 #0
3	PA2	LCD_SEG15	TIM0_CC2 #0/1		CMU_CLK0 #0
4	PA3	LCD_SEG16	TIM0_CDTI0 #0		
5	PA4	LCD_SEG17	TIM0_CDTI1 #0		

Alternate	LOCATION				
Functionality	0	1	2	3	Description
TIM0_CC0	PA0	PA0		PD1	Timer 0 Capture Compare input / output channel 0.
TIM0_CC1	PA1	PA1		PD2	Timer 0 Capture Compare input / output channel 1.
TIM0_CC2	PA2	PA2		PD3	Timer 0 Capture Compare input / output channel 2.
TIM0_CDTI0	PA3	PC13	PF3	PC13	Timer 0 Complimentary Deat Time Insertion channel 0.
TIM0_CDTI1	PA4	PC14	PF4	PC14	Timer 0 Complimentary Deat Time Insertion channel 1.
TIM0_CDTI2	PA5	PC15	PF5	PC15	Timer 0 Complimentary Deat Time Insertion channel 2.
TIM1_CC0	PC13	PE10			Timer 1 Capture Compare input / output channel 0.
TIM1_CC1	PC14	PE11			Timer 1 Capture Compare input / output channel 1.
TIM1_CC2	PC15	PE12			Timer 1 Capture Compare input / output channel 2.
TIM2_CC0		PA12			Timer 2 Capture Compare input / output channel 0.
TIM2_CC1		PA13			Timer 2 Capture Compare input / output channel 1.
TIM2_CC2		PA14			Timer 2 Capture Compare input / output channel 2.
US0_CLK	PE12	PE5			USART0 clock input / output.
US0_CS	PE13	PE4			USART0 chip select input / output.
US0_RX	PE11	PE6			USART0 Asynchronous Receive. USART0 Synchronous mode Master Input / Slave Output (MISO).
US0_TX	PE10	PE7			USART0 Asynchronous Transmit.Also used as receive input in half duplex communication. USART0 Synchronous mode Master Output / Slave Input (MOSI).
US1_CLK	PB7	PD2			USART1 clock input / output.
US1_CS	PB8	PD3			USART1 chip select input / output.
US1_RX		PD1			USART1 Asynchronous Receive. USART1 Synchronous mode Master Input / Slave Output (MISO).
US1_TX		PD0			USART1 Asynchronous Transmit.Also used as receive input in half duplex communication. USART1 Synchronous mode Master Output / Slave Input (MOSI).
US2_CLK	PC4	PB5			USART2 clock input / output.
US2_CS	PC5	PB6			USART2 chip select input / output.
US2_RX		PB4			USART2 Asynchronous Receive. USART2 Synchronous mode Master Input / Slave Output (MISO).
US2_TX		PB3			USART2 Asynchronous Transmit.Also used as receive input in half duplex communication. USART2 Synchronous mode Master Output / Slave Input (MOSI).

7.2 LQFP100 PCB Layout

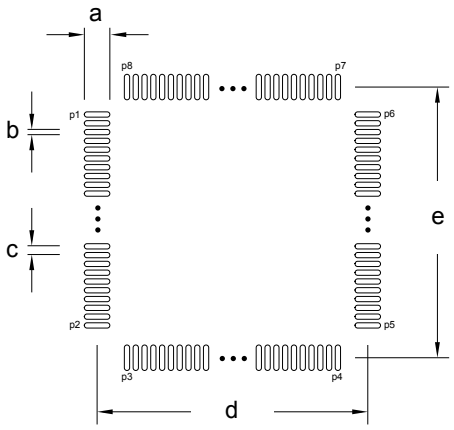

Figure 7.2. LQFP100 PCB Land Pattern

Table 7.2. LQFP100 PCB Land Pattern Dimensions (Dimensions in mm)

Symbol	Dim. (mm)	Symbol	Pin Number	Symbol	Pin Number
a	1.45	P1	1	P6	75
b	0.30	P2	25	P7	76
c	0.50	P3	26	P8	100
d	15.40	P4	50		
e	15.40	P5	51		

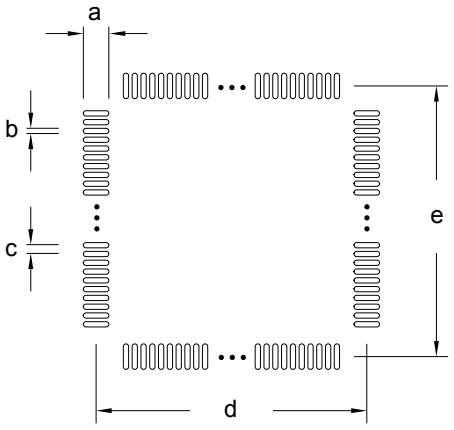

Figure 7.3. LQFP100 PCB Solder Mask

Table 7.3. LQFP100 PCB Solder Mask Dimensions (Dimensions in mm)

Symbol	Dim. (mm)
a	1.57
b	0.42
c	0.50
d	15.40
e	15.40

9.3 TQFP48 Package Marking

In the illustration below package fields and position are shown.

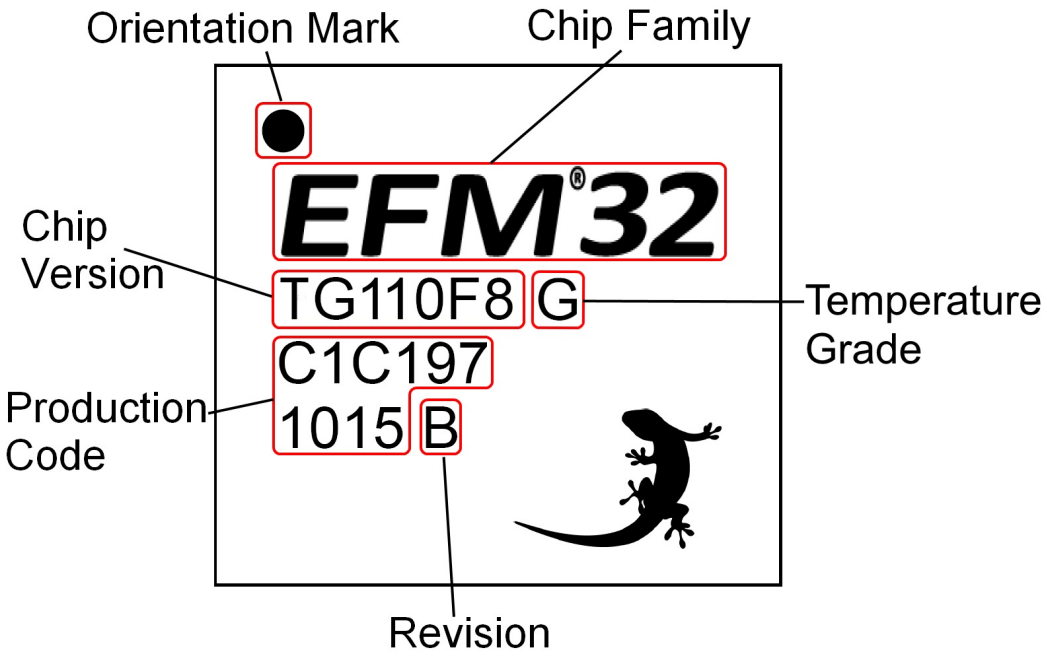

Figure 9.5. Example Chip Marking (Top View)

11.2 QFN32 PCB Layout

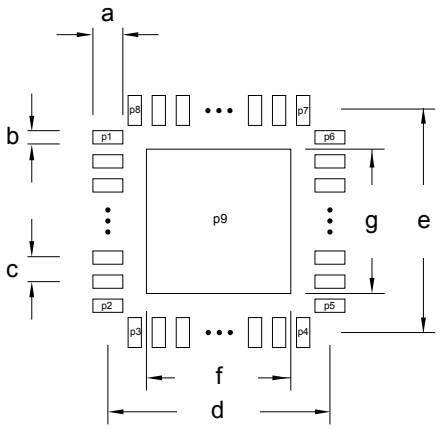

Figure 11.2. QFN32 PCB Land Pattern

Table 11.2. QFN32 PCB Land Pattern Dimensions (Dimensions in mm)

Symbol	Dim. (mm)	Symbol	Pin Number	Symbol	Pin Number
a	0.80	P1	1	P6	24
b	0.35	P2	8	P7	25
c	0.65	P3	9	P8	32
d	6.00	P4	16	P9	33
e	6.00	P5	17		
f	4.40				
g	4.40				

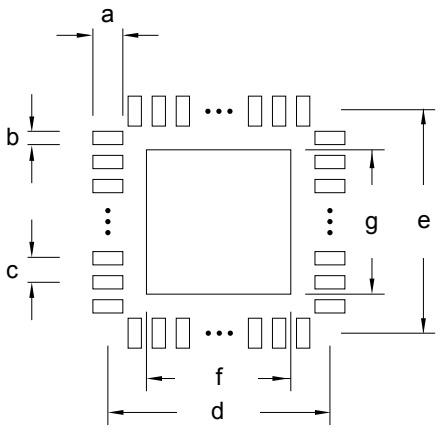

Figure 11.3. QFN32 PCB Solder Mask

Table 11.3. QFN32 PCB Solder Mask Dimensions (Dimensions in mm)

Symbol	Dim. (mm)
a	0.92
b	0.47
c	0.65

Corrected pin number for symbol P3 in Table 11.2 QFN32 PCB Land Pattern Dimensions (Dimensions in mm) on page 191.

Updated package marking figures to include temperature grade.

13.3 Revision 1.90

May 22nd, 2015

For devices with an ADC, Added clarification on conditions for INL_{ADC} and DNL_{ADC} parameters.

Corrected EM2 current consumption condition in Electrical Characteristics section.

Added AUXHFRCO to block diagram and Electrical Characteristics.

Updated HFRCO table in the Electrical Characteristics section.

Updated EM0, EM2, EM3, and EM4 maximum current specifications in the Electrical Characteristics section.

Updated the Output Low Voltage maximum for sinking 20 mA with VDD = 3.0 V in the Electrical Characteristics section.

Updated the Input Leakage Current maximum in the Electrical Characteristics section.

Updated the minimum and maximum frequency specifications for the LFRCO, HFRCO, and AUXHFRCO in the Electrical Characteristics section.

Updated the maximum current consumption of the HFRCO in the Electrical Characteristics section.

Updated the maximum current consumption of the HFRCO in the Electrical Characteristics section.

Added some minimum ADC SNR, SNDR, and SFDR specifications in the Electrical Characteristics section.

Added some minimum and maximum ADC offset voltage, DNL, and INL specifications in the Electrical Characteristics section.

Added maximum DAC current specifications in the Electrical Characteristics section.

Added maximum ACMP current and maximum and minimum offset voltage specifications in the Electrical Characteristics section.

Added maximum VCMP current and updated typical VCMP current specifications in the Electrical Characteristics section.

Updated references to energyAware Designer to Configurator.

13.4 Revision 1.80

July 2nd, 2014

Corrected single power supply voltage minimum value from 1.85V to 1.98V.

Updated current consumption.

Updated transition between energy modes.

Updated power management data.

Updated GPIO data.

Updated LFXO, HFXO, HFRCO and ULFRCO data.

Updated LFRCO and HFRCO plots.

For devices with an ACMP, updated ACMP data.

13.11 Revision 1.20

December 17th, 2010

This revision applies the following devices:

- EFM32G200
- EFM32G210
- EFM32G230
- EFM32G280
- EFM32G290
- EFM32G840
- EFM32G880
- EFM32G890

Increased max storage temperature.

Added data for <150°C and <70°C on Flash data retention.

Changed latch-up sensitivity test description.

Added IO leakage current.

For LQFP100 devices, updated ESD CDM value.

Added Flash current consumption.

Updated HFRCO data.

Updated LFRCO data.

Added graph for ADC Absolute Offset over temperature.

Added graph for ADC Temperature sensor readout.

13.12 Revision 1.11

November 17th, 2010

This revision applies the following devices:

- EFM32G200
- EFM32G210
- EFM32G230
- EFM32G280
- EFM32G290
- EFM32G840
- EFM32G880
- EFM32G890

Corrected maximum DAC clock speed for continuous mode.

Added DAC sample-hold mode voltage drift rate.

Added pulse widths detected by the HFXO glitch detector.

Added power sequencing information to Power Management section.

13.13 Revision 1.10

September 13th, 2010

This revision applies the following devices:

- EFM32G200
- EFM32G210
- EFM32G230
- EFM32G280
- EFM32G290
- EFM32G840
- EFM32G880
- EFM32G890

For LQFP100 devices, corrected number of GPIO pins.

Added typical values for $R_{ADCFILT}$ and $C_{ADCFILT}$.

Added two conditions for DAC clock frequency; one for sample/hold and one for sample/off.

Added RoHS information and specified leadframe/solderballs material.

Added Serial Bootloader to feature list and system summary.

Updated ADC characterization data.

Updated DAC characterization data.

Updated RCO characterization data.

Updated ACMP characterization data.

Updated VCMP characterization data.

13.14 Revision 1.00

April 23rd, 2010

This revision applies the following devices:

- EFM32G200
- EFM32G210
- EFM32G230
- EFM32G280
- EFM32G290
- EFM32G840
- EFM32G880
- EFM32G890

ADC_VCM line removed.

Added pinout illustration and additional pinout table.

Changed "Errata" chapter. Errata description moved to separate document.

Document changed status from "Preliminary".

Updated "Electrical Characteristics" chapter.

For EFM32G222

May 20th, 2011

Updated LFXO load capacitance section.

13.21 Revision 0.80

October 19th, 2009

This revision applies the following devices:

- EFM32G200
- EFM32G210
- EFM32G230
- EFM32G280
- EFM32G290
- EFM32G840
- EFM32G880
- EFM32G890

Initial preliminary revision