



EFM32 Gecko EFM32GG12 Errata



This document contains information on the EFM32GG12 errata. The latest available revision of this device is revision A. Errata that have been resolved remain documented and can be referenced for previous revisions of this device. The device data sheet explains how to identify the chip revision, either from package marking or electronically. Errata effective date: September, 2020.

1. Errata Summary

The table below lists all known errata for the EFM32GG12 and all unresolved errata in revision A of the EFM32GG12.

Table 1.1. Errata Overview

Designator	Title/Problem	Workaround Exists	Exists on Revision:
			A
ADC_E213	ADC KEEPINSLOWACC Mode	No	X
CSEN_E201	CSEN_DATA in Debug Mode	Yes	X
CSEN_E202	CSEN Baseline DMA Transfers	Yes	X
DBG_E204	Debug Recovery with JTAG Does Not Work	Yes	X
EMU_E217	EM4S Not Supported in 5V Sub-System Powered Devices at Temperatures Above 85°C	No	X
EMU_E218	Entering Backup Mode with RESETn Low	Yes	X
EMU_E219	5V Regulator Output Affected by DC-DC Mode Changes	Yes	X
EMU_E220	DECOD Reset During Voltage Scaling After EM2 or EM3 Wakeup	Yes	X
I2C_E206	Slave Holds SCL Low After Losing Arbitration	Yes	X
I2C_E207	I2C Fails to Indicate New Incoming Data	Yes	X
LES_E201	LFPRESC Can Extend Channel Start-Up Delay	Yes	X
MSC_E201	Invalid Data Cached After a Bus Fault	Yes	X
MSC_E202	SRAM Does Not Support Prefetch When ECC is Enabled	Yes	X
RMU_E202	External Debug Access Not Available After Watchdog or Lockup Full Reset	Yes	X
TIMER_E202	Continuous Overflow and Underflow Interrupts in Quadrature Counting Mode	Yes	X
USART_E204	IrDA Modulation and Transmission of PRS Input Data	Yes	X
USART_E205	Possible Data Transmission on Wrong Edge in Synchronous Mode	Yes	X
USART_E206	Additional SCLK Pulses Can Be Generated in USART Synchronous Mode	Yes	X
WDOG_E201	Clear Command is Lost Upon EM2 Entry	Yes	X
WTIMER_E201	Continuous Overflow and Underflow Interrupts in Quadrature Counting Mode	Yes	X

2. Current Errata Descriptions

2.1 ADC_E213 – ADC KEEPINSLOWACC Mode

Description of Errata
When WARMUP-MODE in ADC _n _CTRL is set to KEEPINSLOWACC, the ADC does not track the input voltage. Also, the ADC keeps the input muxes closed even during channel switching, making it not recommended to operate the ADC in KEEPINSLOWACC mode.
Affected Conditions / Impacts
KEEPINSLOWACC warmup mode does not function properly.
Workaround
There is currently no workaround for this issue.
Resolution
There is currently no resolution for this issue.

2.2 CSEN_E201 – CSEN_DATA in Debug Mode

Description of Errata
Reading CSEN_DATA in debug mode inadvertently clears pending CSEN data DMA requests.
Affected Conditions / Impacts
Reads of CSEN_DATA clear pending receive data DMA requests. This would be expected in normal operation as the DMA reads CSEN_DATA to transfer newly acquired results. These reads are intentional, but any read of CSEN_DATA, including while in debug mode, has the same effect. Thus, viewing the CSEN module registers in a debugger, such as in Simplicity Studio, can inadvertently clear pending CSEN DMA requests resulting in subsequent data being received out of order and with insertions of random data.
Workaround
Do not use a debugger to read the CSEN registers while DMA is enabled.
Resolution
There is currently no resolution for this issue.

2.3 CSEN_E202 – CSEN Baseline DMA Transfers

Description of Errata
DMA transfers to CSEN_DMBASELINE do not occur in the expected order.
Affected Conditions / Impacts
When using delta modulation, a baseline value must be written to CSEN_DMBASELINE before each conversion. However, when DMA is used to do this, these writes occur after the desired conversion instead of before the conversion as is required. This means that in a given sequence of conversions serviced by DMA, the write to CSEN_DMBASELINE that should happen before conversion N is actually written in advance of conversion N + 1, leading to potentially erroneous results.
Workaround
Manually write the first value to CSEN_DMBASELINE and then use the DMA to perform subsequent baseline writes. Therefore, in the case of a sequence consisting of four conversions, the first baseline value would be written to CSEN_DMBASELINE under software control (e.g., before the conversion trigger occurs). The next three values can be written by the DMA after the first and each subsequent conversion occurs. After the final conversion, which would be the fourth in this example, the DMA will service a final write request to CSEN_DMBASELINE. This final transfer can be (1) a dummy value if no further conversions are required, (2) the initial baseline value in the case where conversions are repeated in a loop, or (3) the initial baseline value for a new, yet-to-be-triggered series of conversions.
Resolution
There is currently no resolution for this issue.

2.4 DBG_E204 – Debug Recovery with JTAG Does Not Work

Description of Errata
The debug recovery algorithm of holding down pin reset, issuing a System Bus Stall AAP instruction, and releasing the reset pin does not work when using the JTAG debug interface. When using the JTAG debug interface, the core will continue to execute code as soon as the reset pin is released.
Affected Conditions / Impacts
The debug recovery sequence will not work when using the JTAG debug interface.
Workaround
Use the Serial Wire debug interface to implement the debug recovery sequence.
Resolution
There is currently no resolution for this issue.

2.5 EMU_E217 — EM4S Not Supported in 5V Sub-System Powered Devices at Temperatures Above 85°C

Description of Errata
When system uses 5V sub-system to power up the EFM chip, energy mode EM4 Shutoff is only supported up to 85C. When a system that uses the 5V sub-system to power up the EFM chip is in EM4 Shutoff at a temperature above 85C, the output voltage VREGO of the 5V sub-system will not stay above the required minimum AVDD voltage of 1.62V due to added leakage at high temperatures, which might be above the maximum 20uA current source capability of the 5V sub-system in EM4 Shutoff.
Affected Conditions / Impacts
Systems using the 5V sub-system and EM4S at high temperatures.
Workaround
There is currently no workaround for this issue. The recommendation for the 5V sub-system powered devices is to use EM4 Hibernate instead of EM4 Shutoff at temperatures above 85C.
Resolution
There is currently no resolution for this issue.

2.6 EMU_E218 — Entering Backup Mode with RESETE_n Low

Description of Errata
<p>When the device is configured...</p> <ul style="list-style-type: none"> • for entry into backup mode when main power is removed or otherwise falls below safe operating levels (EMU_BUCTRL programmed accordingly), • with the proper supply present on the BU_VIN pin to provide retention power in backup mode, • where assertion of RESETE_n causes a soft reset (the default behavior because Configuration Lock Word 0 bit 2 is 1 on a factory fresh device shipped with erased flash), and • such that the soft reset event causes the EMU to be reset (RMU_CTRL_PINMODE = FULL, which is the default state, or RMU_CTRL_PINMODE = EXTENDED), <p>...and the RESETE_n pin is asserted (goes low), the system enters backup mode even when main power is not removed or does not fall below the normal operating threshold. The device will not recover from backup mode until a power-on reset occurs.</p>
Affected Conditions / Impacts
Systems making use of backup mode in which the RESETE _n pin can be asserted by an external device and in which assertion of RESETE _n causes a soft reset because the default behavior of the pin has not been changed.
Workaround
<p>There are two possible workarounds for this issue:</p> <ul style="list-style-type: none"> • Program Configuration Lock Word 0 (CLW0) bit 2 to 0 so that assertion of RESETE_n always cause a hard reset. • Change the level of reset caused by assertion of the RESETE_n pin to LIMITED by writing the appropriate value to the PINMODE field in the RMU_CTRL register.
Resolution
There is currently no resolution for this issue.

2.7 EMU_E219 — 5V Regulator Output Affected by DC-DC Mode Changes

Description of Errata
<p>When the 5V regulator — which also powers the transceiver on devices with USB — is enabled and regulating (typically to 3.3V), its output as seen on the VREGO pin can experience momentary fluctuations in response to certain DC-DC converter mode transitions.</p> <p>For example, in the worst case, a DC-DC transition from BYPASS mode to LOWNOISE mode can cause VREGO to momentarily overshoot by approximately 550 mV for around 10 ms. Similarly, a DC-DC transition from OFF mode to LOWNOISE mode can cause VREGO overshoot of approximately 330 mV for around 1 ms. These transient durations correlate directly with the time it takes for V_{DCDC} to return to 1.8V when the device is connected as recommended in <i>Application Note AN0948: EFM32 and EFR32 Series 1 Power Configurations and DC-DC</i>.</p> <p>In both cases, after the momentary overshoot, the VREGO output will recover to a DC level approximately 30 mV higher than it was when the DC-DC converter was in the BYPASS or OFF modes.</p>
Affected Conditions / Impacts
USB communications could be interrupted in systems where both the 5V regulator and DC-DC converter are used, and the DC-DC mode is changed. The overshoot and subsequent settling of VREGO above its nominal output level after a DC-DC mode change may present concerns if VREGO powers AVDD, IOVDD, or other components in the system.
Workaround
<p>Because VREGO supplies the USB transceiver, DC-DC mode transitions from BYPASS to LOWNOISE or OFF to LOWNOISE should not be performed while USB communications activity is ongoing in order to avoid the risk of generating a bit error.</p> <p>If VREGO is used to supply AVDD, IOVDD, or other components in the system, care should be taken to ensure that circuits in these power domains are tolerant of the kinds of supply perturbations described above and/or to limit DC-DC mode transitions to periods when the system can tolerate such supply perturbations.</p>
Resolution
There is currently no resolution for this issue.

2.8 EMU_E220 – DECBOD Reset During Voltage Scaling After EM2 or EM3 Wakeup

Description of Errata
An infrequent, asynchronous and unrelated internal event can intermittently delay normal BOD state-machine transition sequencing during voltage scaling from VSCALE0 (1.0 Vdc) to VSCALE2 (1.2 Vdc) when emerging from EM2/EM3 to EM0. This delay can cause erroneous DECBOD resets on some devices.
Affected Conditions / Impacts
Systems operating with core voltage scaling can experience a decouple voltage brownout reset (DECBOD) when exiting EM2 or EM3.
Workaround
Systems that use core voltage scaling need to enter EM2 or EM3 via a RAM executed wait for interrupt instruction with interrupts disabled. Additionally, the EMU writes shown below should be added around EM2/EM3 entry and exit and after voltage scaling completes. This prevents the BOD state-machine transition signals from being delayed. This workaround adds 2.7 μ s to the voltage scaling operation. Note: This workaround is included in <code>em_emu.c</code> in the v2.7.4.0 or later of the Gecko SDK. It is recommended to workaround this issue by using the latest Gecko SDK version.
<pre>// Execute from RAM with interrupts disabled *(uint32_t *) (EMU_BASE + 0x1A4) = 0x1f << 10; __WFI(); *(uint32_t *) (EMU_BASE + 0x14C) = 0x01 << 31; // Enable Interrupts and return to flash execution // After voltage scaling is complete *(uint32_t *) (EMU_BASE + 0x14C) &= ~(0x01 << 31); EMU->IFC = 0xFFFFFFFF;</pre>
Resolution
There is currently no resolution for this issue.

2.9 I2C_E206 – Slave Holds SCL Low After Losing Arbitration

Description of Errata
If, while transmitting data as a slave, arbitration is lost, SCL is unintentionally held low for an indefinite period of time.
Affected Conditions / Impacts
The winner of arbitration cannot use the bus because SCL is never released.
Workaround
If the I ² C arbitration lost flag is asserted (<code>I2C_IF_ARBLOST = 1</code>) in slave mode (<code>I2C_STATE_MASTER = 0</code>), application software needs to wait for at least one SCL high time and then issue the transmission abort command (set <code>I2C_CMD_ABORT = 1</code>), thus releasing SCL.
Resolution
There is currently no resolution for this issue.

2.10 I2C_E207 – I²C Fails to Indicate New Incoming Data

Description of Errata
A race condition exists in which the I ² C fails to indicate reception of new data when both user software attempts to read data from and the I ² C hardware attempts to write data to the I2C_RXFIFO in the same cycle.
Affected Conditions / Impacts
When this race condition occurs, the RXFIFO enters an invalid state in which both I2C_STATUS_RXDATAV = 0 and I2C_STATUS_RXFULL = 1. This causes the I ² C to discard new incoming data bytes because RXFULL = 1 and would otherwise prevent user software from reading last byte written by the I ² C hardware to RXFIFO because RXDATAV = 0.
Workaround
User software can recognize and clear this invalid RXDATAV = 0 and RXFULL = 1 condition by performing a dummy read of the RXFIFO (I2C_RXDATA). This restores the expected RXDATAV = 1 and RXFULL = 0 condition. The data from this read can be discarded, and user software can now read the last byte written by the I ² C hardware to the RXFIFO (the byte which caused the invalid RXDATAV = 0 and RXFULL = 1 condition).
No data will be lost as long as user software completes this recovery procedure (performing the dummy read and then reading the remaining valid byte in the RXFIFO) before the I ² C hardware receives the next incoming data byte.
Resolution
There is currently no resolution for this issue.

2.11 LES_E201 — LFPRESC Can Extend Channel Start-Up Delay

Description of Errata
Setting LESENSE_TIMCTRL_LFPRESC to a value other than DIV1 may delay channel start-up longer than the number of LFACLK _{LESENSE} clock cycles specified by LESENSE_TIMCTRL_STARTDLY.
Affected Conditions / Impacts
Delaying channel start-up delays the subsequent excitation and measurement phases and may have an impact on the data returned by the LESENSE.
Workaround
If a channel start-up delay is used (LESENSE_TIMCTRL_STARTDLY > 0), LESENSE_TIMCTRL_LFPRESC must be set to DIV1.
Resolution
There is currently no resolution for this issue.

2.12 MSC_E201 – Invalid Data Cached After a Bus Fault

Description of Errata
The instruction cache is not flushed in the event of a bus fault. As a result, when an instruction fetch results in a bus fault, invalid data may be cached. When invalid data is cached due to a bus fault, the next time the instruction that caused the bus fault is fetched, the processor core will get the invalid cached data without any bus fault.
Affected Conditions / Impacts
This problem manifests itself in software that implements a bus fault handler because the processing of the bus fault does not invalidate the instruction cache.
Workaround
Set MSC->CACHECMD.INVCACHE=1 upon entering the bus fault handler to invalidate the instruction cache.
Resolution
There is currently no resolution for this issue.

2.13 MSC_E202 – SRAM Does Not Support Prefetch When ECC is Enabled

Description of Errata
Prefetch cannot be used when the corresponding SRAM has ECC enabled.
Affected Conditions / Impacts
Erroneous write-back operations can lead to further corruption when 1-bit ECC errors occur. The optional bus fault upon 2-bit errors (MSC->CTRL.RAMECCERRFAULTEN=1) can cause the SRAM to generate invalid bus protocol responses, leading to unpredictable bus master (e.g. CPU or LDMA) behavior.
Workaround
Because this erratum was discovered on the pin-compatible predecessor, EFM32GG11, a preventive measure was implemented on EFM32GG12. When both ECC and prefetch are enabled, the automatic hardware write back feature that corrects 1-bit ECC errors is disabled. This permits both ECC and prefetch to remain enabled, as well as the optional generation of bus faults upon 2-bit errors, but requires software to perform the necessary write back operations to correct words in which 1-bit ECC errors are detected (MSC_IF_RAM1ERR1B or MSC_IF_RAMERR1B is set).
Resolution
There is currently no resolution for this issue.

2.14 RMU_E202 – External Debug Access Not Available After Watchdog or Lockup Full Reset

Description of Errata
When a reset is triggered in full-reset mode, a debugger will not be able to read AHB-AP or ARM core registers.
Affected Conditions / Impacts
Systems using the full reset mode for watchdog or lockup resets will see limited debugging capability after one of these resets triggers.
Workaround
There are three possible workarounds: <ul style="list-style-type: none"> • Software should configure peripherals to either LIMITED or EXTENDED mode if full debugger functionality is needed after a watchdog or lockup reset. • When using FULL reset mode, appending at least 9 idle clock cycles to the last debug command will allow the transaction to complete. • A power cycle or hard pin reset will restore normal operation.
Resolution
There is currently no resolution for this issue.

2.15 TIMER_E202 — Continuous Overflow and Underflow Interrupts in Quadrature Counting Mode

Description of Errata
When the TIMER is configured to operate in quadrature decoder mode with the overflow interrupt enabled and the counter value (TIMER_CNT) reaches the top value (TIMER_TOP), the overflow interrupt is requested continuously even if the interrupt flag (TIMER_IF_OF) is cleared. Similarly, if the underflow interrupt is enabled and the counter value reaches zero, the underflow interrupt is requested continuously even if the interrupt flag (TIMER_IF_UF) is cleared. The interrupt can be cleared only after the counter value has incremented or decremented so that the overflow or underflow condition no longer applies.
Affected Conditions / Impacts
Because the counter is clocked by its CC0 and CC1 inputs in quadrature decoder mode and not the prescaled HFPERCLK, overflow and underflow events remain latched as long as TIMER_CNT remains at the value that triggered the overflow or underflow condition. Until the counter is no longer in the overflow or underflow condition, it is not possible to clear the associated interrupt flag.
Workaround
Short of disabling the relevant interrupts, the simplest workaround is to manually change TIMER_CNT so that the overflow or underflow condition no longer exists. Insert the following or similar code in the interrupt handler for the timer in question (TIMER0 in this case) to do this:
<pre>uint32 intFlags = TIMER_IntGet(TIMER0); if((intFlags & TIMER_IF_OF) && (TIMER0->CNT == TIMER0->TOP)) TIMER0->CNT = 0; if((intFlags & TIMER_IF_UF) && (TIMER0->CNT == 0x0)) TIMER0->CNT = TIMER0->TOP;</pre>
It may be necessary for firmware to account for this adjustment in calculations that include the counter value.
Resolution
There is currently no resolution for this issue.

2.16 USART_E204 — IrDA Modulation and Transmission of PRS Input Data

Description of Errata
If the USART IrDA modulator is configured to accept input from a PRS channel, the incoming data stream will not be transmitted because the required clock from the baud rate generator is never enabled.
Affected Conditions / Impacts
It is not possible for the USART IrDA modulator to directly transmit data from a source other than the USART's own transmitter. The USART_IRCTRL_IRPRSEN bit should remain at its reset state of 0.
Workaround
Assuming the data to be sent via the PRS is also data that could be received by the EFM32/EFR32 USART, then the data can be received using the USART's PRS RX feature (USART_INPUT_RXPRS = 1), stored in RAM (e.g., using DMA), and then transmitted with IrDA mode enabled. In cases where IrDA operation is transmit-only, the PRS RX data can be received on the same USART doing the transmission. If IrDA operation is bidirectional, then another USART must be used to receive the PRS data.
If the data to be sent is in some other format (e.g., pulses from a timer output), then there is no direct way to transmit it using the IrDA modulator. It would be necessary to capture the data in some other way and reformat it as serial data timed according to the clock generated by the USART.
Resolution
There is currently no resolution for this issue.

2.17 USART_E205 — Possible Data Transmission on Wrong Edge in Synchronous Mode

Description of Errata
<p>If the USART is configured to operate in synchronous mode with...</p> <ol style="list-style-type: none"> 1. USART_CLKDIV_DIV = 0 (clock = $f_{HFPERCLK} \div 2$) 2. USART_CTRL_CLKPHA = 0 3. USART_TIMING_CSHOLD = 1 <p>...and data is loaded into the transmit FIFO (say, by the LDMA) at the exact same time as the USART state machine begins to insert the requested one bit time extension of chip select hold time (USART_TIMING_CSHOLD = 1), the first bit of the new data word is incorrectly transmitted on the leading clock edge of the subsequent data bit and not the trailing clock edge of the current data bit.</p>
Affected Conditions / Impacts
<p>Reception of each data bit by the slave is tied to a specific clock edge, thus the late transmission by the master of the first bit of a word may cause the slave to receive the incorrect data, especially if the data setup time for the slave approaches or exceeds one half the shift clock period.</p>
Workaround
<p>Because there is no way to specifically time a write to the transmit FIFO such that it does not occur when the USART state machine changes state, use one of the following workarounds to avoid the risk for data corruption described above:</p> <ul style="list-style-type: none"> • Set USART_CLK_DIV > 0. • Use USART_TIMING_CSHOLD = 0 or USART_TIMING_CSHOLD > 1. • Use USART_CTRL_CLKPHA = 1. This option is particularly useful with SPI flash memories as many support operations in both the CLKPOL = CLKPHA = 0 and CLKPOL = CLKPHA = 1 modes.
Resolution
<p>There is currently no resolution for this issue.</p>

2.18 USART_E206 — Additional SCLK Pulses Can Be Generated in USART Synchronous Mode

Description of Errata
<p>When inter-character spacing is enabled (USART_TIMING_ICS > 0) and USART_CTRL_CLKPHA = 1 in synchronous master mode, an extra clock pulse is generated after each frame transmitted except the last (that frame which when sent results in both the transmit FIFO and transmit shift register being empty).</p>
Affected Conditions / Impacts
<p>The extra clock pulse generated at the end of the first frame would cause a slave device to clock in the first bit of the next frame it expects to receive even though the USART is not yet driving that data. The slave would lose synchronization with the master and erroneously receive all frames after the first.</p>
Workaround
<p>Do not enable inter-character spacing when CLKPHA = 1. If a delay between frames is necessary, insert one manually with a software delay loop. Data cannot be transmitted using DMA in this case.</p>
Resolution
<p>There is currently no resolution for this issue.</p>

2.19 WDOG_E201 – Clear Command is Lost Upon EM2 Entry

Description of Errata
If the device enters EM2 while the clear command is still being synchronized, the watchdog counter may not be cleared as expected.
Affected Conditions / Impacts
If the watchdog counter is not cleared as expected, the device can encounter a watchdog reset.
Workaround
Wait for WDOG_SYNCBUSY_CMD to clear before entering EM2. Note that WDOG can be clocked from one of the low-frequency clock sources and will require additional time to enter EM2 when implementing this workaround.
Resolution
There is currently no resolution for this issue.

2.20 WTIMER_E201 — Continuous Overflow and Underflow Interrupts in Quadrature Counting Mode

Description of Errata
When the WTIMER is configured to operate in quadrature decoder mode with the overflow interrupt enabled and the counter value (WTIMER_CNT) reaches the top value (WTIMER_TOP), the overflow interrupt is requested continuously even if the interrupt flag (WTIMER_IF_OF) is cleared. Similarly, if the underflow interrupt is enabled and the counter value reaches zero, the underflow interrupt is requested continuously even if the interrupt flag (WTIMER_IF_UF) is cleared. Only after the counter value has incremented or decremented so that the overflow or underflow condition no longer applies can the interrupt be cleared.
Affected Conditions / Impacts
Because the counter is clocked by its CC0 and CC1 inputs in quadrature decoder mode and not the prescaled HPERCLK, overflow and underflow events remain latched as long WTIMER_CNT remains at the value that triggered the overflow or underflow condition. Until the counter is no longer in the overflow or underflow condition, it is not possible to clear the associated interrupt flag.
Workaround
Short of disabling the relevant interrupts, the simplest workaround is to manually change WTIMER_CNT so that the overflow or underflow condition no longer exists. Insert the following or similar code in the interrupt handler for the timer in question (WTIMER0 in this case) to do this:
<pre>uint32 intFlags = TIMER_IntGet(WTIMER0); if((intFlags & WTIMER_IF_OF) && (WTIMER0->CNT == WTIMER0->TOP)) WTIMER0->CNT = 0; if((intFlags & WTIMER_IF_UF) && (WTIMER0->CNT == 0x0)) WTIMER0->CNT = WTIMER0->TOP;</pre>
It may be necessary for firmware to account for this adjustment in calculations that include the counter value.
Resolution
There is currently no resolution for this issue.

3. Revision History

Revision 0.3

September, 2020

- Added [I2C_E207](#), [USART_E206](#) and [WDOG_E201](#).

Revision 0.2

April, 2020

- Added [EMU_E220](#), [LES_E201](#), [TIMER_E202](#), [USART_E205](#), and [WTIMER_E201](#).
- Migrated to new errata document format.

Revision 0.1

December, 2018

- Initial release.

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