Product Change Notification - SYST-25CYWK082

Date:

26 Apr 2018

Product Category:

32-bit PIC Microcontrollers; Others; Clock and Timing - Oscillators; Development Tools

Affected CPNs:

Notification subject:

ERRATA - SAM D21 Family Silicon Errata and Data Sheet Clarification

Notification text:

SYST-25CYWK082

Microchip has released a new DeviceDoc for the SAM D21 Family Silicon Errata and Data Sheet Clarification of devices. If you are using one of these devices please read the document located at SAM D21 Family Silicon Errata and Data Sheet Clarification.

Notification Status: Final

Description of Change:
1) Initial release of this document

Impacts to Data Sheet: None

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 26 Apr 2018

NOTE: Please be advised that this is a change to the document only the product has not been changed.

Markings to Distinguish Revised from Unrevised Devices: N/A

Attachment(s):

SAM D21 Family Silicon Errata and Data Sheet Clarification

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SAM D21 Family

Silicon Errata and Data Sheet Clarification

SAM D21 Family

The SAM D21 family of devices that you have received conform functionally to the current Device Data Sheet (DS40001882B), except for the anomalies described in this document.

The silicon issues discussed in the following pages are for silicon revisions with the Device and Revision IDs listed in Table 1.

The errata described in this document will be addressed in future revisions of the SAM D21 family silicon.

Note: This document summarizes all silicon errata issues from all revisions of silicon, previous as well as current.

Data Sheet clarifications and corrections (if applicable) are located in Data Sheet Clarifications, following the discussion of silicon issues.

Table 1. SAM D21 Family Silicon Device Identification

Part Number	Device Identification (DID[31:0])	Revision (DID.REVISION[3:0])					
		A	B	C	D	E	F
ATSAMD21J18A	0x1001xx00	0x0	0x1	0x2	0x3	NA	NA
ATSAMD21J17A	0x1001xx01						
ATSAMD21J16A	0x1001xx02						
ATSAMD21J15A	0x1001xx03						
ATSAMD21G18A	0x1001xx05						
ATSAMD21G18AU	0x1001xx0F						
ATSAMD21G17A	0x1001xx06						
ATSAMD21G17AU	0x1001xx10						
ATSAMD21G16A	0x1001xx07						
ATSAMD21G15A	0x1001xx08						
ATSAMD21E18A	0x1001xx0A						
ATSAMD21E17A	0x1001xx0B						
ATSAMD21E16A	0x1001xx0C						
ATSAMD21E15A	0x1001xx0D						
ATSAMD21J16B	0x1001xx20	N/A	N/A	N/A	N/A	0x4	0x5
ATSAMD21J15B	0x1001xx21						
ATSAMD21G16B	0x1001xx23						
ATSAMD21G15B	0x1001xx24						
ATSAMD21E16B	0x1001xx26						
ATSAMD21E16BU	0x1001xx55						

Part Number	Device Identification (DID[31:0])	Revision (DID.REVISION[3:0])					
		A	B	C	D	E	F
ATSAMD21E15B	0x1001xx27	N/A	N/A	N/A	N/A	0x4	0x5
ATSAMD21E15BU	0x1001xx56						
ATSAMD21G16L	0x1001xx57						
ATSAMD21E16L	0x1001xx3E						
ATSAMD21E15L	0x1001xx3F						
ATSAMD21E16CU	0x1001xx62	N/A	N/A	N/A	N/A	N/A	0x5
ATSAMD21E15CU	0x1001xx63						

Note: Refer to the “Device Service Unit” chapter in the current Device Data Sheet (DS40001882B) for detailed information on Device Identification and Revision IDs for your specific device.

Table of Contents

1. Errata Issues

The device variant (last letter of the ordering number) is independent of the die revision (DSU.DID.REVISION): The device variant denotes functional differences, whereas the die revision marks evolution of the die.

1.1 32.768 kHz Crystal Oscillator (XOSC32K)

1.1.1 Automatic Gain Control

The automatic amplitude control of the XOSC32K does not work.

Workaround

Use the XOSC32K with Automatic Amplitude control disabled (XOSC32K.AAMPEN = 0).

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.1.2 External Reset

If the external XOSC32K fails, neither the external pin RST, nor the GCLK software reset can reset the GCLK generators using XOSC32K as the source clock.

Workaround

Do a power cycle to reset the GCLK generators after an external XOSC32K failure.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.2 48 MHz Digital Frequency-Locked Loop (DFLL48M)

1.2.1 Write Access to DFLL Register

The DFLL clock must be requested before being configured; otherwise, a write access to a DFLL register can freeze the device.

Workaround

Write a '0' to the DFLL ONDEMAND bit in the DFLLCTRL register before configuring the DFLL module.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.2.2 False Out of Bound Interrupt

If the DFLL48M reaches the maximum or minimum COARSE or FINE calibration values during the locking sequence, an out of bounds interrupt will be generated. These interrupts will be generated even if the final calibration values at DFLL48M lock are not at maximum or minimum, and therefore, may be false out of bounds interrupts.

Workaround

Check that the lock bits, DFLLLCKC and DFLLLCKF, in the SYSCTRL Interrupt Flag Status and Clear register (INTFLAG) are both set before enabling the DFLLOOB interrupt.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.2.3 DFLL Status Bits (PCLKSR Register)

The DFLL status bits in the PCLKSR register during the USB Clock Recovery mode can be incorrect after a USB suspend state.

Workaround

Do not monitor the DFLL status bits in the PCLKSR register during the USB Clock Recovery mode.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.3 96 MHz Fractional Digital Phase-Locked Loop (FDPLL)

1.3.1 Lock Flag May Clear Randomly

The lock flag (DPLLSTATUS.LOCK) may clear randomly. When the lock flag randomly clears, DPLLLCKR and DPLLLCKF interrupts will also trigger, and the DPLL output is masked.

Workaround

Set DPLLCTRLB.LBYPASS to '1' to disable masking of the DPLL output by the lock status.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.3.2 FDPLL96M Operation Below 0°C Temperature

96 MHz Fractional Digital Phased Locked Loop (FDPLL96M) operation above 64 MHz is not functional below 0°C.

Workaround

If FDPLL96M is configured above 64 MHz, the operating temperature must be above 0°C.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.3.3 Lock Time-out Values

The FDPLL lock time-out values are different from the parameters in the data sheet.

Workaround

The time-out values are:

- DPLLCTRLB.LTIME[2:0] = 4 : 10 ms
- DPLLCTRLB.LTIME[2:0] = 5 : 10 ms
- DPLLCTRLB.LTIME[2:0] = 6 : 11 ms
- DPLLCTRLB.LTIME[2:0] = 7 : 11 ms

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.3.4 DPLLRATIO Register FDPLL Ratio Value

When FDPLL ratio value in the DPLLRATIO register is changed on the fly, STATUS.DPLLLDRTO will not be set even though the ratio is updated.

Workaround

Monitor the INTFLAG.DPLLLDRTO instead of STATUS.DPLLLDRTO to get the status for DPLLRATIO update.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.4 Analog-to-Digital Controller (ADC)

1.4.1 Linearity Error in Single-shot Mode

In Single-shot mode and at +125°C, ADC conversions have linearity errors.

Workarounds

1. At +125°C, do not use the ADC in Single-shot mode. Instead, use the ADC in Free-running mode only.
2. At +125°C, use the ADC in Single-shot mode only with VDDANA > 3V.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.5 Device

1.5.1 APB Clock

If APB clock is stopped and the GCLK is running, APB read access to read-synchronized registers will freeze the system. The CPU and the DAP AHB-AP are stalled, and as a consequence, debug operation is impossible.

Workaround

Do not make read access to read-synchronized registers when the APB clock is stopped and GCLK is running. To recover from this condition, power cycle the device or reset the device using the $\overline{\text{RESET}}$ pin.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.5.2 VDDIN POR Threshold

When VDDIN is lower than the POR threshold during power rise or fall, an internal pull-up resistor is enabled on pins with PTC functionality (see *PORT Function Multiplexing* in the current data sheet). This behavior will be present even if PTC functionality is not enabled on the pin. The POR level is defined in the *Power-On Reset (POR) Characteristics* chapter of the current data sheet.

Workaround

Use a pin without PTC functionality if the pull-up could damage your application during power up.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X					

1.5.3 Digital Pin Output in Stand-by Mode

Digital pin outputs from Timer/Counters, Analog Comparator (AC), Generic Clock Controller (GCLK), and SERCOM (I^2C and SPI) do not change the value during Stand-by Sleep mode.

Workaround

Set the voltage regulator in Normal mode before entering Stand-by Sleep mode to keep digital pin output enabled. This is done by setting the RUNSTDBY bit in the VREG register.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X						

1.5.4 NVM User Row Mapping Value for WDT

The WDT Window bitfield default value on silicon is not as specified in the *NVM User Row Mapping* table in the current data sheet. The data sheet defines the default value as 0x5, while it on silicon this value is 0xB.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
		X	X				

1.5.5 SYSTICK Calibration Value

The SYSTICK calibration value specified in the data sheet is incorrect.

Workaround

The correct SYSTICK calibration value is 0x40000000. This value should not be used to initialize the Systick RELOAD value register, which should be initialized instead with a value depending on the main clock frequency and on the tick period required by the application. For a detailed description of the SYSTICK module, refer to the official ARM® Cortex®-M0+ documentation.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.5.6 High Leakage Current on VDDIO

When external reset is active it causes a high leakage current on VDDIO.

Workaround

Minimize the time external reset is active.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X			

1.6 Digital-to-Analog Controller (DAC)

1.6.1 EMPTY Flag is Set When Leaving Stand-by Mode

When DAC.CTRLA.RUNSTDBY = 0 and DATABUF is written (not empty), and if the device goes to Stand-by Sleep mode before a Start Conversion event, DAC.INTFLAG.EMPTY will be set after exiting Sleep mode.

Workaround

After waking from Stand-by mode, ignore and clear the flag DAC.INTFLAG.EMPTY.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.7 Direct Memory Access Controller (DMAC)

1.7.1 Consecutive Write Instructions to CRCDATAIN

If data is written to CRCDATAIN in two consecutive instructions, the CRC computation may be incorrect.

Workaround

Add a `NOP` instruction between each write to the CRCDATAIN register.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.7.2 Linked Descriptors

When at least one channel using linked descriptors is already active, enabling another DMA channel (with or without linked descriptors) can result in a channel Fetch Error (FERR) or an incorrect descriptor fetch.

This occurs if the channel number of the channel being enabled is lower than the channel already active.

Workaround

When enabling a DMA channel while other channels using linked descriptors are already active, the channel number of the new channel enabled must be greater than the other channel numbers.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.8 Device Service Unit (DSU)

1.8.1 Debugger and DSU Cold-plugging Procedure

If a debugger has issued a DSU Cold-Plugging procedure and then released the CPU from the resulting CPU Reset Extension, the CPU will be held in CPU Reset Extension after any upcoming reset event.

Workaround

The CPU must be released from the CPU Reset Extension either by writing a one in the DSU STATUSA.CRSTEXT register or by applying an external reset with SWCLK high or by power cycling the device.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.8.2 Pause-on-Error is Not Functional

The MBIST Pause-on-Error feature is not functional.

Workaround

Do not use the Pause-on-Error feature.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.8.3 CRC32 Computation Failure

The DSU CRC32 computation is not functional on RAM.

Workaround

Before using the CRC32 on RAM, execute the following code:

```
*(volatile unsigned int* 0x41007058) &= ~0x30000UL;
```

After using the CRC32, execute the following code:

```
*(volatile unsigned int* 0x41007058) |= 0x20000UL;
```

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.9 External Interrupt Controller (EIC)

1.9.1 Interrupts

When the EIC is configured to generate an interrupt on a low level or rising edge or both edges (CONFIGn.SENSEx) with the filter enabled (CONFIGn.FILTENx), a spurious flag may appear for the dedicated pin on the INTFLAG.EXTINT[x] register as soon as the EIC is enabled using the CTRLA ENABLE bit.

Workaround
Clear the INTFLAG bit once the EIC is enabled and before enabling the interrupts.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.10 Integrated Inter-IC Sound (I^2S)

1.10.1 Transmit Serializer

In LSBIT mode (i.e., SERCTRL.BITREV is set), the I^2S RX serializer only works when the slot size is 32 bits.

Workaround
In SERCTRL.SERMODE RX, SERCTRL.BITREV LSBIT must be used with CLKCTRL.SLOTSIZE 32.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.10.2 I^2S is Not Functional

The I^2S is not functional.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.10.3 Software Reset

The software reset, SWRST, does not propagate inside the I^2S module. As a consequence, Slave mode may not be reconfigured correctly and may result in unexpected behavior of the SYNCBUSY register.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
	X						

1.10.4 Module is Not Functional in Slave Mode

The I^2S is not functional in Slave mode (i.e., when (FSSEL = 1, SCKSEL = 1).

Workaround
None. FSSEL and SCKSEL must be '0'.

Affected Silicon Revisions

A	B	C	D	E	F		
	X						

1.10.5 CPU Clock/I^2S Clock Ratio

Depending on the CPU clock/I^2S clock ratio, the SYNCBUSY.CKEN0 flag is occasionally stuck at '1' when starting a new audio stream with CTRLA.SWRST = 1, CTRLA.ENABLE = 1, and CTRLA.CKEN0 = 1.

Workaround
Disable the IP by writing a '0' to CTRLA.ENABLE before resetting it (CTRLA.SWRST = 1).

Affected Silicon Revisions

A	B	C	D	E	F		
	X						

1.10.6 PDM2 Mode is Not Functional

The PDM2 mode (i.e., when using two PDM microphones) does not function.

Workaround
None. Only one PDM microphone can be connected. Therefore, the I^2S controller should be configured in normal Receive mode with one slot.

Affected Silicon Revisions

A	B	C	D	E	F		
	X						

1.10.7 Rx Serializer

The Rx serializer in the RIGHT Data Slot Formatting Adjust mode (SERCTRL.SLOTADJ clear) does not function when the slot size is not 32 bits.

Workaround
In SERCTRL.SERMODE RX, SERCTRL.SLOTADJ RIGHT must be used with CLKCTRL.SLOTSIZE 32.

Affected Silicon Revisions

A	B	C	D	E	F		
	X	X	X				

1.10.8 Slave Mode (CTRLB Register)

In I^2C Slave mode, writing the CTRLB register when in the AMATCH or DRDY interrupt service routines can cause the state machine to reset.

Workaround
Write CTRLB.ACKACT to '0' using the following sequence:

```
// If higher priority interrupts exist, then disable so that the
// following two writes are atomic.
SERCOM - STATUS.reg = 0;
SERCOM - CTRLB.reg = 0;
// Re-enable interrupts if applicable.
```

Write CTRLB.ACKACT to '1' using the following sequence:

```
SERCOM - CTRLB.reg = SERCOM_I2CS_CTRLB_ACKACT;
```

Otherwise, only write to CTRLB in the AMATCH or DRDY interrupts if it is to close out a transaction.

When not closing a transaction, clear the AMATCH interrupt by writing a '1' to its bit position instead of using CTRLB.CMD. The DRDY interrupt is automatically cleared by reading/writing to the DATA register in Smart mode. If not in Smart mode, DRDY should be cleared by writing a '1' to its bit position.

Code Replacements Examples:

Current:

```
SERCOM - CTRLB.reg |= SERCOM_I2CS_CTRLB_ACKACT;
```

Change to:

```
 SERCOM - STATUS.reg = 0;
SERCOM - CTRLB.reg = SERCOM_I2CS_CTRLB_ACKACT;
SERCOM - CTRLB.reg &= ~SERCOM_I2CS_CTRLB_ACKACT;
SERCOM - CTRLB.reg = 0;
/* ACK or NACK address */
SERCOM - CTRLB.reg |= SERCOM_I2CS_CTRLB_CMD(0x3);
// CMD=0x3 clears all interrupts, so to keep the result similar,
// CMD=0x3 clears all interrupts, so to keep the result similar,
// PREC is cleared if it was set.
if (SERCOM - INTFLAG.bit.PREC) SERCOM - INTFLAG.reg = SERCOM_I2CS_INTFLAG_PREC;
SERCOM - INTFLAG.reg = SERCOM_I2CS_INTFLAG_AMATCH;
```

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X			

1.11 Non-Volatile Memory Controller (NVMCTRL)

1.11.1 CRC32 is Not Executed on the Entire Flash Area

When the device is secured and the EEPROM emulation area configured to none, the CRC32 is not executed on the entire Flash area but up to the on-chip Flash size minus half a row.

Workaround

When using CRC32 on a protected device with the EEPROM emulation area configured to none, compute the reference CRC32 value to the full chip Flash size minus a half row.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.11.2 Spurious Writes

The default value of MANW in NVM.CTRLB is '0', which can lead to spurious writes to the NVM if a data write is done through a pointer with a wrong address corresponding to the NVM area.

Workaround

Set MANW in the NVM.CTRLB register to '1' at start-up

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.11.3 NVMCTRL.INTFLAD.READY Bit

The NVMCTRL.INTFLAG.READY bit is not updated after a `RWWEEER` command and will keep holding a '1' value. If a new `RWWEEER` command is issued it can be accepted even if the previous `RWWEEER` command is ongoing. The ongoing NVM `RWWEER` command will be aborted, and the content of the row under erase will be unpredictable.

Workaround

Perform a dummy write to the page buffer right before issuing a `RWWEEER` command. This will cause the INTFLAG.READY bit to behave as expected.

Affected Silicon Revisions

A	B	C	D	E	F		
				X			

1.12 Peripheral Touch Controller (PTC)

1.12.1 WCOMP Interrupt Flag

The WCOMP interrupt flag is not stable. The WCOMP interrupt flag will not always be set as described in the data sheet.

Workaround

Do not use the WCOMP interrupt. Instead, use the WCOMP event.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.13 PORT - I/O Pin Controller

1.13.1 PA24 and PA25 Inputs

PA24 and PA25 cannot be used as an input when configured as GPIO with continuous sampling (cannot be read by PORT).

Workarounds

1. Use PA24 and PA25 for peripherals or only as output pins.
2. Configure PA31 to PA24 for on-demand sampling (CTRL[31:24] all zeroes) and access the IN register through the APB (not the IOBUS), to allow waiting for on-demand sampling.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.13.2 PA07 Status During Internal Start-up

While the internal start-up is not completed, the PA07 pin is driven low by the device. Then, as with all of the other pins, it is configured as a High Impedance pin.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.13.3 PA24 and PA25 Pull-up/Pull-down Configuration

On PA24 and PA25 pins the pull-up and pull-down configuration is not disabled automatically when alternative pin function is enabled, with the exception for USB.

Workaround
For PA24 and PA25 pins, the GPIO pull-up and pull-down must be disabled before enabling alternative functions on them.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.13.4 PA24 and PA25 Pull-down Functionality

Pull-down functionality is not available on GPIO pins, PA24 and PA25

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X			

1.14 Power Manager (PM)

1.14.1 Debug Logic and Watchdog Reset

In Debug mode, if a Watchdog Reset occurs, the debug session is lost.

Workaround
A new debug session must be restart after a Watchdog Reset.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.14.2 Power-down Modes and Wake-up From Sleep

In Standby, Idle1, and Idle2 Sleep modes, the device may not wake from sleep. An External Reset, Power on Reset, or Watchdog Reset will start the device again.

Workaround
The SLEEPPRM bits in the NVMCTRL.CTRLB register must be written to 3 (NVMCTRL - CTRLB.bit.SLEEPPRM = 3) to ensure correct operation of the device. The average power consumption of the device will increase with 20 µA compared to the values in the *Electrical Characteristics* chapter of the current data sheet.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X					

1.15 Serial Communication Interface (SERCOM)

1.15.1 I2C Slave SCL Low Extend Time-out

The I²C Slave SCL low extend time-out (CTRLA.SEXTTOEN) and Master SCL low extend time-out (CTRLA.MEXTTOEN) cannot be used if SCL low time-out (CTRLA.LOWTOUT) is disabled. When SCTRLA.LOWTOUT = 0, GCLK_SERCOM_SLOW is not requested.

Workaround

To use the Master or Slave SCL low extend time-outs, enable the SCL low time-out (CTRLA.LOWTOUT = 1).

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.15.2 I²C Transaction in Debug Mode

In I²C master mode, an ongoing transaction should be stalled immediately when DBGCTRL.DBGSTOP is set and the CPU enters Debug mode. Instead, it is stopped when the current byte transaction is completed and the corresponding interrupt is triggered if enabled.

Workaround

In I²C master mode, keep DBGCTRL.DBGSTOP = 0 when in Debug mode.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.15.3 SPI with Slave Select Low Detection

If the SERCOM is enabled in SPI mode with SSL detection enabled (CTRLB.SSDE) and CTRLB.RXEN = 1, an erroneous slave select low interrupt (INTFLAG.SSL) can be generated.

Workaround

Enable the SERCOM first with CTRLB.RXEN = 0. In a subsequent write, set CTRLB.RXEN = 1.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X			

1.15.4 USART in Auto-baud Mode

In USART Auto-baud mode, missing stop bits are not recognized as inconsistent sync (ISF) or framing (FERR) errors.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.16 Timer/Counter for Control Applications (TCC)

1.16.1 WAVE/WAVEB Registers Hardware Exception

When the Peripheral Access Controller (PAC) protection is enabled, writing to the WAVE or WAVEB registers will not cause a hardware exception.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.2 Interrupts and Wake-up From Stand-by Mode

The TCC interrupts, FAULT1, FAULT0, FAULTB, FAULTA, DFS, ERR, and CNT, cannot wake the device from Stand-by mode.

Workaround
Do not use the TCC interrupts, FAULT1, FAULT0, FAULTB, FAULTA, DFS, ERR, and CNT, to wake the device from Stand-by mode.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.16.3 Extra Count Cycle

If an input event triggered STOP action is performed at the same time as the counter overflows, the first pulse width of the subsequent counter start can be altered with one prescaled clock cycle.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.4 OVF Flag and DMA

If the OVF flag in the INTFLAG register is already set when enabling the DMA, this will trigger an immediate DMA transfer and overwrite the current buffered value in the TCC register.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.16.5 MCx Flag and DMA

If the MCx flag in the INTFLAG register is set when enabling the DMA, this will trigger an immediate DMA transfer and overwrite the current buffered value in the TCC register.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.6 Two-ramp Mode

In Two-ramp mode, two events will be generated per cycle, one on each ramp's end. EVCTRL.CNTSEL.END cannot be used to identify the end of a double ramp cycle.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.7 SYNCBUSY Bit in Stand-by Mode

When waking up from the Stand-by Power Save mode, the SYNCBUSY.CTRLB, SYNCBUSY.STATUS, SYNCBUSY.COUNT, SYNCBUSY.PATT, SYNCBUSY.WAVE, SYNCBUSY.PER and SYNCBUSY.CCx bits may be locked to '1'.

Workaround
After waking up from Stand-by Power Save mode, perform a software reset of the TCC if you are using the SYNCBUSY.CTRLB, SYNCBUSY.STATUS, SYNCBUSY.COUNT, SYNCBUSY.PATT, SYNCBUSY.WAVE, SYNCBUSY.PER or SYNCBUSY.CCx bits

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.8 Retrigger in Dual Slope Mode

In Dual Slope mode a retrigger event does not clear the TCC counter.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.9 CTRLA.RUNDSTDBY Enable Protection

When the RUNSTDBY bit is written after the TCC is enabled, the respective TCC APB bus is stalled and the RUNDSTBY bit in the TCC CTRLA register is not enabled-protected.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.10 Fault Filtering of Inverted Fault

TCC fault filtering on inverted fault is not functional.

Workaround
Use only non-inverted faults.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.11 Recoverable Fault and Blanking Operation

With blanking is enabled, a recoverable fault that occurs during the first increment of a rising TCC is not blanked.

Workaround
None.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.16.12 RAMP 2 Mode

In RAMP 2 mode with Fault keep, qualified and restart, and if a fault occurred at the end of the period during the qualified state, the switch to the next ramp can have two restarts.

Workaround
Avoid faults few cycles before the end or the beginning of a ramp.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X			

1.16.13 CAPTMARK is Not Functional

FCTRLX.CAPTURE[CAPTMARK] does not function as described in the data sheet. CAPTMARK cannot be used to identify captured values triggered by fault inputs source A or B on the same channel.

Workaround
Use two different channels to timestamp FaultA and FaultB.

Affected Silicon Revisions

A	B	C	D	E	F		
				X	X		

1.16.14 Capture Using PWP/PPW Mode

When a capture is done using PWP or PPW mode, CC0 and CC1 are always fill with the period. It is not possible to get the pulse width.

Workaround
Use the PWP feature on TC instead of TCC

Affected Silicon Revisions

A	B	C	D	E	F		
				X			

1.16.15 Advance Capture Mode

Advance capture mode (CAPTMIN CAPTMAX LOCMIN LOCMAX DERIV0) doesn't work if an upper channel is not in one of these mode. For example, when CC[0]=CAPTMIN, CC[1]=CAPTMAX, CC[2]=CAPTEN, and CC[3]=CAPTEN, CAPTMIN and CAPTMAX will not work.

Workaround

Basic capture mode must be set in lower channel and advance capture mode in upper channel.

For example, CC[0]=CAPTEN , CC[1]=CAPTEN , CC[2]=CAPTMIN, CC[3]=CAPTMAX

All capture will be done as expected.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.16.16 MAX Capture Mode

In Capture mode while using MAX Capture mode, with the Timer set in up counting mode, if an input event occurred within two cycles before TOP, the value captured is '0' instead of TOP.

Workarounds

1. If the event is controllable, the capture event should not occur when the counter is within two cycles before the TOP value.
2. Use the Timer in Down Counter mode and capture the MIN value instead of the MAX value.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.16.17 Dithering Mode

Using TCC in Dithering mode with external retrigger events can lead to an unexpected stretch of right-aligned pulses, or a shrink of left-aligned pulses.

Workaround

Do not use retrigger events/actions when the TCC is configured in Dithering mode.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X	X	X		

1.16.18 TCC0/WO[6] on PA16 and TCC0/WO[7] on PA17 Are Not Available

TCC0/WO[6] on PA16 and TCC0/WO[7] on PA17 are not available.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.16.19 Interrupt Flags

The TCC interrupt flags INTFLAG.ERR, INTFLAG.DFS, INTFLAG.UFS, INTFLAG.CNT, INTFLAG.FAULTA,INTFLAG.FAULTB, INTFLAG.FAULT0, INTFLAG.FAULT1 are not always properly set when using asynchronous TCC features.

Workaround

Do not use these flags when using asynchronous TCC features.

Affected Silicon Revisions

A	B	C	D	E	F		
				X			

1.17 Timer/Counter (TC)

1.17.1 Spurious TC Overflow

Spurious TC overflow and Match/Capture events may occur.

Workaround

Do not use the TC overflow and Match/Capture events. Use the corresponding interrupts instead.

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

1.18 Universal Serial Bus (USB)

1.18.1 FLENC Register

The FLENC register negative sign management is not correct.

Workaround

The following rule must be used for negative values:

- FLENC 0x8 (hex) is equal to '0' decimal.
- FLENC 0x9 to 0xF (hex) are equal to -1 to -7 decimal instead of -7 to -1.

Affected Silicon Revisions

A	B	C	D	E	F		
X							

1.19 Voltage Regulator

1.19.1 Low-Power Mode Above +85°C

The voltage regulator in Low-Power mode is not functional at temperatures above +85°C.

Workaround

Enable normal mode on the voltage regulator in Stand-by Sleep mode.

Example code:

```
// Set the voltage regulator in normal mode configuration in Stand-by Sleep mode
SYSCTRL->VREG.bit.RUNSTDBY = 1;
```

Affected Silicon Revisions

A	B	C	D	E	F		
X	X	X	X				

2. Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest version of the device data sheet (DS40001882B):

Note: Corrections in tables, registers, and text are shown in **bold**. Where possible, the original bold text formatting has been removed for clarity.

No clarifications to report at this time.

3. Appendix A: Revision History

Rev A Document (4/2018)
Initial release of this document.

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