



Product Change Notification / SYST-26KZNK554

Date:

28-Aug-2021

Product Category:

32-bit Microcontrollers

PCN Type:

Document Change

Notification Subject:

ERRATA - SAM D21 / DA1 Family Silicon Errata and Data Sheet Clarification Errata Document Revision

Affected CPNs:

[SYST-26KZNK554_Affected_CPN_08282021.pdf](#)

[SYST-26KZNK554_Affected_CPN_08282021.csv](#)

Notification Text:

SYST-26KZNK554

Microchip has released a new Product Documents for the SAM D21 / DA1 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 / DA1 Family Silicon Errata and Data Sheet Clarification](#).

Notification Status: Final

Description of Change:

The following updates were performed in this revision:

- Added new notes to the SAM D21 Family Silicon Device Identification table
- Added a new Data Sheet Clarification for BOD33
- Added the following silicon errata issue:
 - BOD33: 1.21.1 Hysteresis

Impacts to Data Sheet: None

Reason for Change: To Improve Productivity

Change Implementation Status: Complete

Date Document Changes Effective: 28 Aug 2021

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

Attachments:

SAM D21 / DA1 Family Silicon Errata and Data Sheet Clarification

Please contact your local **Microchip sales office** with questions or concerns regarding this notification.

Terms and Conditions:

If you wish to receive Microchip PCNs via email please register for our PCN email service at our **PCN home page** select register then fill in the required fields. You will find instructions about registering for Microchips PCN email service in the **PCN FAQ** section.

If you wish to change your PCN profile, including opt out, please go to the **PCN home page** select login and sign into your myMicrochip account. Select a profile option from the left navigation bar and make the applicable selections.



SAM D21/DA1 Family

SAM D21/DA1 Family Silicon Errata and Data Sheet Clarification

SAM D21/DA1 Family

The SAM D21/DA1 family of devices that you have received conform functionally to the current Device Data Sheet (DS40001882H), 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 the following table.

The errata described in this document will be addressed in future revisions of the SAM D21/DA1 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	G
ATSAMD21J18A	0x10010x00	0x0	0x1	0x2	0x3	N/A	N/A	N/A
ATSAMD21J17A	0x10010x01							
ATSAMD21J16A	0x10010x02							
ATSAMD21J15A	0x10010x03							
ATSAMD21G18A	0x10010x05							
ATSAMD21G18AU ⁽¹⁾	0x10010x0F							
ATSAMD21G17A	0x10010x06							
ATSAMD21G17AU ⁽¹⁾	0x10010x10							
ATSAMD21G16A	0x10010x07							
ATSAMD21G15A	0x10010x08							
ATSAMD21E18A	0x10010x0A							
ATSAMD21E17A	0x10010x0B							
ATSAMD21E16A	0x10010x0C							
ATSAMD21E15A	0x10010x0D							
ATSAMD21J16B	0x10011x20	N/A	N/A	N/A	N/A	0x4	0x5	N/A
ATSAMD21J15B	0x10011x21							
ATSAMD21G16B	0x10011x23							
ATSAMD21G15B	0x10011x24							
ATSAMD21E16B	0x10011x26							
ATSAMD21E16BU ⁽¹⁾	0x10011x55							

.....continued

Part Number	Device Identification (DID[31:0])	Revision (DID.REVISION[3:0])						
		A	B	C	D	E	F	G
ATSAMD21E15B	0x10011x27	N/A	N/A	N/A	N/A	0x4	0x5	N/A
ATSAMD21E15BU ⁽¹⁾	0x10011x56							
ATSAMD21G16L	0x10011x57							
ATSAMD21E16L	0x10011x3E							
ATSAMD21E15L	0x10011x3F	N/A	N/A	N/A	N/A	N/A	0x5	N/A
ATSAMD21E16CU ⁽¹⁾	0x10011x62							
ATSAMD21E15CU ⁽¹⁾	0x10011x63	N/A	N/A	N/A	N/A	N/A	N/A	0x6
ATSAMD21E17D	0x10012x94							
ATSAMD21E17DU ⁽¹⁾	0x10012x95							
ATSAMD21E17L	0x10012x97							
ATSAMD21G17D	0x10012x93							
ATSAMD21G17L	0x10012x96							
ATSAMD21J17D	0x10012x92							

Note:

1. Part numbers ending in "U" correspond to the UUT packaging.

Note: Refer to the “Device Service Unit” chapter in the current Device Data Sheet (DS40001882H) for a detailed information on Device Identification and Revision IDs for your specific device.

Table 2. SAM DA1 Family Silicon Device Identification

Part Number	Device Identification (DID[31:0])	Revision (DID.REVISION[3:0])	
		E	F
ATSAMDA1E14A	0x10011x31	0x4	N/A
ATSAMDA1E15A	0x10011x30	0x4	N/A
ATSAMDA1E16A	0x10011x2F	0x4	N/A
ATSAMDA1G14A	0x10011x2E	0x4	N/A
ATSAMDA1G15A	0x10011x2D	0x4	N/A
ATSAMDA1G16A	0x10011x2C	0x4	N/A
ATSAMDA1J14A	0x10011x2B	0x4	N/A
ATSAMDA1J15A	0x10011x2A	0x4	N/A
ATSAMDA1J16A	0x10011x29	0x4	N/A
ATSAMDA1E14B	0x10011x6C	N/A	0x5
ATSAMDA1E15B	0x10011x6B	N/A	0x5
ATSAMDA1E16B	0x10011x6A	N/A	0x5
ATSAMDA1G14B	0x10011x69	N/A	0x5
ATSAMDA1G15B	0x10011x68	N/A	0x5
ATSAMDA1G16B	0x10011x67	N/A	0x5
ATSAMDA1J14B	0x10011x66	N/A	0x5
ATSAMDA1J15B	0x10011x65	N/A	0x5
ATSAMDA1J16B	0x10011x64	N/A	0x5

Note: Refer to the “Device Service Unit” chapter in the current Device Data Sheet (DS40001882H) for a detailed information on Device Identification and Revision IDs for your specific device.

Silicon Errata Summary

Table 3. Errata Summary

Module	Feature	Item Number	Issue Summary	Affected Revisions						
				A	B	C	D	E	F	G
XOSC32K	Automatic Gain Control	1.1.1	The automatic amplitude control of the XOSC32K does not work.	X	X	X	X	X	X	X
XOSC32K	External Reset	1.1.2	If the external XOSC32K fails, the external reset will not reset the GCLKs sourced by the XOSC32K.	X	X	X	X	X	X	X
DFLL48M	Write Access to DFLL Register	1.2.1	The DFLL clock must be requested before being configured.	X	X	X	X	X	X	X
DFLL48M	False Out of Bound Interrupt	1.2.2	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.	X	X	X	X	X	X	X
DFLL48M	DFLL Status Bits (PCLKSR Register)	1.2.3	The DFLL status bits in the PCLKSR register during the USB Clock Recovery mode can be incorrect after a USB suspend state.	X	X	X	X	X	X	X
FDPLL	Lock Flag May Clear Randomly	1.3.1	The lock flag (DPLLSTATUS.LOCK) may clear randomly.	X						
FDPLL	FDPLL96M Operation Below 0°C Temperature	1.3.2	96 MHz Fractional Digital Phased Locked Loop (FDPLL96M) operation above 64 MHz is not functional below 0°C.	X	X	X	X			
FDPLL	Lock Time-out Values	1.3.3	The FDPLL lock time-out values are different from the parameters in the data sheet.	X						
FDPLL	DPLLRATIO Register FDPLL Ratio Value	1.3.4	When FDPLL ratio value in the DPLLRATIO register is changed on the fly, STATUS.DPLLDRTO will not be set even though the ratio is updated.	X	X	X	X	X	X	X
ADC	Linearity Error in Single-Shot Mode	1.4.1	In Single-Shot mode and at +125°C, ADC conversions have linearity errors.	X	X	X	X			
ADC	Offset Correction	1.4.2	Offset correction is not supported in the 8-bit and 10-bit conversion resolution.	X	X	X	X	X	X	X
DEVICE	APB Clock	1.5.1	If APB clock is stopped and the GCLK is running, APB read access to read-synchronized registers will freeze the system.	X	X	X	X	X	X	X
DEVICE	VDDIN POR Threshold	1.5.2	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.	X	X	X				
DEVICE	Digital Pin Output in Stand-by Mode	1.5.3	Digital pin outputs from Timer/Counters, AC, GCLK, and SERCOM do not change the value during Stand-by Sleep mode.	X	X					
DEVICE	NVM User Row Mapping Value for WDT	1.5.4	The WDT Window bitfield default value on silicon is not as specified in the NVM User Row Mapping table in the current data sheet.			X	X			
DEVICE	SYSTICK Calibration Value	1.5.5	The SYSTICK calibration value specified in the data sheet is incorrect.	X	X	X	X	X	X	
DEVICE	High Leakage Current on VDDIO	1.5.6	When external reset is active it causes a high leakage current on VDDIO.	X	X	X	X	X		
DEVICE	Standby Entry	1.5.7	Potential device lockup upon standby entry when SysTick interrupt is enabled.	X	X	X	X	X	X	X
DEVICE	Standby Wake-up	1.5.8	Potential lockup on standby wakeup with interrupts disabled.	X	X	X	X	X	X	X
DAC	EMPTY Flag is Set When Leaving Stand-by Mode	1.6.1	DAC.INTFLAG.EMPTY will be set after exiting Sleep mode.	X	X	X	X	X	X	X
DMAC	Consecutive Write Instructions to CRCDATAIN	1.7.1	If data is written to CRCDATAIN in two consecutive instructions, the CRC computation may be incorrect.	X	X	X	X	X	X	
DMAC	Linked Descriptors	1.7.2	When at least one channel using linked descriptors is already active, enabling another DMA channel can result in a channel Fetch Error or an incorrect descriptor fetch.	X	X	X	X	X	X	
DSU	Debugger and DSU Cold-plugging Procedure	1.8.1	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.	X	X	X	X			
DSU	Pause-on-Error is Not Functional	1.8.2	The MBIST Pause-on-Error feature is not functional.	X	X	X	X	X	X	
DSU	CRC32 Computation Failure	1.8.3	The DSU CRC32 computation is not functional on RAM.	X	X	X	X			

.....continued

Module	Feature	Item Number	Issue Summary	Affected Revisions						
				A	B	C	D	E	F	G
EIC	Interrupts	1.9.1	When the EIC is configured to generate an interrupt on a low level or rising edge or both edges with the filter enabled, a spurious flag may appear.	X	X	X	X	X	X	
I ² S	Transmit Serializer	1.10.1	In LSBIT mode, the I ² S RX serializer only works when the slot size is 32 bits.	X	X	X	X	X	X	X
I ² S	I ² S is Not Functional	1.10.2	The I ² S is not functional.	X						
I ² S	Software Reset	1.10.3	The software reset, SWRST, does not propagate inside the I2S module.	X						
I ² S	Client Mode	1.10.4	The I ² S is not functional in Client mode.	X						
I ² S	CPU Clock/I2S Clock Ratio	1.10.5	Depending on the CPU clock/I ² S clock ratio, the SYNCBUSY.CKEN0 flag is occasionally stuck.	X						
I ² S	PDM2 Mode	1.10.6	The PDM2 mode does not function.	X						
I ² S	Rx Serializer	1.10.7	The Rx serializer in the RIGHT Data Slot Formatting Adjust mode does not function when the slot size is not 32 bits.	X	X	X	X			
I ² S	Client Mode (CTRLB Register)	1.10.8	In I ² C Client mode, writing the CTRLB register when in the AMATCH or DRDY interrupt service routines can cause the state machine to reset.	X	X	X	X	X		
NVMCTRL	CRC32 is Not Executed	1.11.1	When the device is secured and the EEPROM emulation area configured to none, the CRC32 is not executed on the entire Flash area	X	X	X	X			
NVMCTRL	Spurious Writes	1.11.2	The default value of MANW in NVM.CTRLB is '0', which can lead to spurious writes to the NVM.	X	X	X	X	X	X	X
NVMCTRL	NVMCTRL.INTFLAG.READY	1.11.3	The NVMCTRL.INTFLAG.READY bit is not updated after a RWWEEER command and will keep holding a '1' value.					X		
NVMCTRL	RWW NVM Command	1.11.4	Incorrect data fetch after RWW NVM command					X	X	X
PTC	WCOMP Interrupt Flag	1.12.1	The WCOMP interrupt flag is not stable.	X	X	X	X			
PORT - I/O Pin Controller	PA24 and PA25 Inputs	1.13.1	PA24 and PA25 cannot be used as an input when configured as GPIO with continuous sampling.	X	X	X	X			
PORT - I/O Pin Controller	PA07 Status During Internal Start-up	1.13.2	While the internal start-up is not completed, the PA07 pin is driven low by the device.	X	X	X	X			
PORT - I/O Pin Controller	PA24 and PA25 Pull-up/Pull-down Configuration	1.13.3	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.	X	X	X	X	X	X	X
PORT - I/O Pin Controller	PA24 and PA25 Pull-down Functionality	1.13.4	Pull-down functionality is not available on GPIO pins, PA24 and PA25.	X	X	X	X	X		
PORT - I/O Pin Controller	Write Protect	1.13.5	Non-debugger IOBUS writes to PAC Write-protected registers are not prevented when the PORT is PAC Write-protected.	X	X	X	X	X	X	X
PM	Debug Logic and Watchdog Reset	1.14.1	In Debug mode, if a Watchdog Reset occurs, the debug session is lost.	X	X	X	X			
PM	Power-down Modes and Wake-up From Sleep	1.14.2	In Standby, Idle1, and Idle2 Sleep modes, the device may not wake from sleep.	X	X	X				
SERCOM	I ² C Client SCL Low Extend Time-out	1.15.1	The I ² C Client SCL low extend time-out and Host SCL low extend time-out cannot be used if SCL low time-out is disabled.	X	X	X	X			
SERCOM	I2C Transaction in Debug Mode	1.15.2	In I ² C Host mode, an ongoing transaction is stopped when the current byte transaction is completed and the corresponding interrupt is triggered if enabled.	X	X	X	X			
SERCOM	SPI with SPI Select Low Detection	1.15.3	If the SERCOM is enabled in SPI mode with SSL detection enabled and CTRLB.RXEN = 1, an erroneous SPI select low interrupt can be generated.	X	X	X	X	X		
SERCOM	USART in Auto-baud Mode	1.15.4	In USART Auto-baud mode, missing stop bits are not recognized as inconsistent sync (ISF) or framing (FERR) errors.	X	X	X	X	X	X	
SERCOM	NACK and Repeated Start in I ² C Host Mode	1.15.5	For High-Speed Host Read operations, sending a NACK forces a STOP to be issued making repeated start not possible in that mode.	X	X	X	X	X	X	X
SERCOM	SERCOM-USART: Collision Detection	1.15.6	In USART operating mode with Collision Detection enabled, the SERCOM will not abort the current transfer as expected if a collision is detected.	X	X	X	X	X	X	X

.....continued

Module	Feature	Item Number	Issue Summary	Affected Revisions						
				A	B	C	D	E	F	G
SERCOM	SERCOM-USART: USART in Debug Mode	1.15.7	In USART operating mode, if DBGCTRL.DBGSTOP=1, data transmission is not halted after entering Debug mode.	X	X	X	X	X	X	X
SERCOM	SERCOM-I ² C: Client Mode with DMA	1.15.8	In I ² C Client Transmitter mode, at the reception of a NACK, if there is still data to be sent in the DMA buffer, the DMA will push a data to the DATA register.	X	X	X	X	X	X	X
SERCOM	SERCOM-I ² C: I ² C Mode in 10-bit Address	1.15.9	10-bit addressing in I ² C Client mode is not functional.	X	X	X	X	X	X	X
SERCOM	SERCOM-SPI: Data Preload	1.15.10	In SPI Client mode and with Client Data Preload Enabled, the first data sent from the Client will be a dummy byte.	X	X	X	X	X	X	X
SERCOM	CLKHOLD Bit Status in I ² C	1.15.11	STATUS.CLKHOLD bit can be written whereas it is a read-only status bit in both Host and Client modes.	X	X	X	X	X	X	X
SERCOM	Quick Command I ² C	1.15.12	When Quick command is enabled (CTRLB.QCEN=1), the software can issue a repeated Start by either writing CTRLB.CMD or ADDR.ADDR bitfields. If in these conditions, SCL Stretch Mode is CTRLA.SCLSM=1, a bus error will be generated.	X	X	X	X	X	X	X
SERCOM	Repeated Start I ² C	1.15.13	For High-Speed Host Write operations, writing CTRLB.CMD = 0x1 issues a STOP command instead of a Repeated Start making repeated start not possible in that mode.	X	X	X	X	X	X	X
SERCOM	Client Mode I ² C	1.15.14	In Client mode, BUSERR, COLL, LOWTOUT, SEXTTOUT and LENERR STATUS register bits are not automatically cleared when INTFLAG.AMATCH is cleared.	X	X	X	X	X	X	X
TCC	WAVE/WAVEB Registers Hardware Exception	1.16.1	When the Peripheral Access Controller (PAC) protection is enabled, writing to the WAVE or WAVEB registers will not cause a hardware exception.	X	X	X	X			
TCC	Interrupts and Wake-up From Stand-by Mode	1.16.2	The TCC interrupts, FAULT1, FAULT0, FAULTB, FAULTA, DFS, ERR, and CNT, cannot wake the device from Stand-by mode.	X						
TCC	Extra Count Cycle	1.16.3	If an input event triggered STOP action is performed simultaneously as the counter overflows, the first pulse width of the subsequent counter start can be altered with one prescaled clock cycle.	X	X	X	X			
TCC	OVF Flag and DMA	1.16.4	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.	X						
TCC	MCx Flag and DMA	1.16.5	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.	X	X	X	X			
TCC	Two-ramp Mode	1.16.6	In Two-ramp mode, two events will be generated per cycle, one on each ramp's end.	X	X	X	X			
TCC	SYNCBUSY Bit in Stand-by Mode	1.16.7	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'.	X	X	X	X			
TCC	Retrigger in Dual Slope Mode	1.16.8	In Dual-Slope mode a retrigger event does not clear the TCC counter.	X	X	X	X			
TCC	CTRLA.RUNSTDBY Enable Protection	1.16.9	When the RUNSTDBY bit is written after the TCC is enabled, the respective TCC APB bus is stalled and the RUNSTDBY bit in the TCC CTRLA register is not enabled-protected.	X	X	X	X			
TCC	Fault Filtering of Inverted Fault	1.16.10	TCC fault filtering on inverted fault is not functional.	X	X	X	X			
TCC	Recoverable Fault and Blanking Operation	1.16.11	When blanking is enabled, a recoverable fault that occurs during the first increment of a rising TCC is not blanked.	X	X	X	X			
TCC	RAMP 2 Mode	1.16.12	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.	X	X	X	X	X		
TCC	CAPTMARK is Not Functional	1.16.13	FCTRLX.CAPTURE[CAPTMARK] does not function as described in the data sheet.					X	X	
TCC	Capture Using PWP/PPW Mode	1.16.14	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.					X		
TCC	Advance Capture Mode	1.16.15	Advance capture mode does not work.	X	X	X	X	X	X	

SAM D21/DA1 Family

.....continued

Module	Feature	Item Number	Issue Summary	Affected Revisions						
				A	B	C	D	E	F	G
TCC	MAX Capture Mode	1.16.16	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.	X	X	X	X	X	X	
TCC	Dithering Mode	1.16.17	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.	X	X	X	X	X	X	
TCC	TCC0/WO[6] on PA16 and TCC0/WO[7] on PA17	1.16.18	TCC0/WO[6] on PA16 and TCC0/WO[7] on PA17 are not available.	X						
TCC	Interrupt Flags	1.16.19	The TCC interrupt flags are not always properly set when using asynchronous TCC features.					X		
TCC	PATTB	1.16.20	The PATTB register write will not update the PATT register on an update condition.					X	X	X
TCC	PERBUF	1.16.21	In downcounting mode, the Lock Update bit (CTRLB.LUPD) does not protect against a PER register update from the PERBUF register.	X	X	X	X	X	X	X
TCC	TCC with EVSYS in SYNC/RESYNC Mode	1.16.22	TCC Peripheral is not compatible with an EVSYS channel in SYNC or RESYNC Mode.	X	X	X	X	X	X	X
TCC	Prescale	1.16.23	A DMA transfer to the TCC CC register may not initiate when using the TCC MCx as the trigger source (CTRLB.TRIGSRC) and the TCC Prescale (CTRLA.PRESCALE) value is set to 64/256/1024.					X	X	X
TC	Spurious TC Overflow	1.17.1	Spurious TC overflow and Match/Capture events may occur.	X	X	X	X			
TC	TC with EVSYS in SYNC/RESYNC Mode	1.17.2	TC peripheral is not compatible with an EVSYS channel in SYNC or RESYNC mode.	X	X	X	X	X	X	X
USB	FLENC Register	1.18.1	The FLENC register negative sign management is not correct.	X						
Voltage Regulator	Low-Power Mode Above +85°C	1.19.1	The voltage regulator in Low-Power mode is not functional at temperatures above +85°C.	X	X	X	X			
SYSCTRL	XOSC	1.20.1	The XOSC can prevent entry into Stand-by mode regardless of XOSC.RUNSTDBY value.					X	X	X
SYSCTRL	BOD33	1.20.2	The BOD33 interrupt may not be generated second time if VDDANA does not increase above the user-defined threshold (BOD.LEVEL[5:0]) while in Active mode.			X	X	X	X	X
BOD33	Hysteresis	1.21.1	The BOD33 Hysteresis does not work if either an external reset or a watchdog reset occurs during the time that the supply voltage is between VBOD- and VBOD+.	X	X	X	X	X	X	X

Table of Contents

SAM D21/DA1 Family.....	1
1. Silicon Errata Summary.....	3
1. Errata Issues.....	9
1.1. 32.768 kHz Crystal Oscillator (XOSC32K).....	9
1.2. 48 MHz Digital Frequency-Locked Loop (DFLL48M).....	9
1.3. 96 MHz Fractional Digital Phase-Locked Loop (FDPLL).....	10
1.4. Analog-to-Digital Controller (ADC).....	11
1.5. Device.....	12
1.6. Digital-to-Analog Controller (DAC).....	14
1.7. Direct Memory Access Controller (DMAC).....	14
1.8. Device Service Unit (DSU).....	15
1.9. External Interrupt Controller (EIC).....	16
1.10. Integrated Inter-IC Sound (I ² S).....	16
1.11. Non-Volatile Memory Controller (NVMCTRL).....	18
1.12. Peripheral Touch Controller (PTC).....	20
1.13. PORT - I/O Pin Controller.....	20
1.14. Power Manager (PM).....	21
1.15. Serial Communication Interface (SERCOM).....	22
1.16. Timer/Counter for Control Applications (TCC).....	25
1.17. Timer/Counter (TC).....	31
1.18. Universal Serial Bus (USB).....	31
1.19. Voltage Regulator.....	32
1.20. SYSCTRL.....	32
1.21. BOD33.....	33
2. Data Sheet Clarifications.....	34
2.1. Voltage Reference Names.....	34
2.2. DAC Accuracy Characteristics - conversion rate	34
2.3. Decoupling Requirements	34
2.4. Moisture Sensitivity Level.....	34
2.5. BOD33.....	35
3. Appendix A: Revision History.....	36
The Microchip Web Site.....	38
Customer Change Notification Service.....	38
Customer Support.....	38
Microchip Devices Code Protection Feature.....	38
Legal Notice.....	39
Trademarks.....	39
Quality Management System Certified by DNV.....	39

Worldwide Sales and Service.....40

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	G	
X	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	G	
X	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	G	
X	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

Enable the DFLL Out Of Bounds (DFLLOOB) interrupt when configuring the DFLL in closed loop mode. In the DFLLOOB ISR verify the COARSE and FINE calibration bits and process as needed.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	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	G	
X	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	G	
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

None.

Affected Silicon Revisions

A	B	C	D	E	F	G	
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	G	
X							

1.3.4 DPLLRATIO Register FDPLL Ratio Value

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

Workaround

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

Affected Silicon Revisions

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

1.4.2 Offset Correction

Offset correction using the OFFSETCORR register is not supported in the 8-bit and 10-bit conversion resolution.

Workarounds

None.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	X	X	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 **RESET** pin.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	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	G	
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 (I²C 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	G	
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	G	
		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	G	
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	G	
X	X	X	X	X			

1.5.7 Potential Lockup on Standby Entry

When the SysTick interrupt is enabled, a device lockup can occur when the SysTick interrupt coincides with the standby entry.

Workaround

Disable the SysTick interrupt before entering standby and re-enable it after wake up.

Affected Silicon Revisions

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

1.5.8 Potential Lockup on Standby Wakeup with Arm Core PRIMASK=1

Upon wake up from standby with Arm Core register PRIMASK = 1, the first instruction fetched by the CPU in Flash memory will be the first instruction following the WFI. This instruction may be returned corrupted and lead to unpredictable behavior.

If PRIMASK = 0, the first instruction fetched by the CPU will be the first instruction of the interrupt handler. This one will be correctly returned to the CPU.

.

Workaround

Two possible workarounds can be used independently:

1. Disable Flash sleep in Standby Sleep mode (SLEEPFRM = DISABLED).
2. Place the standby sleep function in SRAM and make sure that at least one dummy Flash fetch is completed before exiting the function. This can be achieved by reading 2 data in memory with addresses separated by at least the cache size. Because the first read could be a cache hit, the second one will be a cache miss and will generate a real read in memory.

The following code may be used:

```
__attribute__((noinline, section(".ramfunc")))
void ram_sleep(void)
{
    DSB();
    WFI();

    // The following sequence ensures that the flash is ready before returning from the RAM code
    #define CACHE_SIZE_IN_BYTES 64
    ({volatile unsigned int *}FLASH_ADDR)[CACHE_SIZE_IN_BYTES/sizeof(unsigned int)]; //will
    read a word at FLASH_ADDR + 0x40 in this case
    ({volatile unsigned int *}FLASH_ADDR)[(CACHE_SIZE_IN_BYTES*2)/sizeof(unsigned int)]; //will
    read a word at FLASH_ADDR + 0x80 in this case
}
```

Affected Silicon Revisions

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

1.8.2 Pause-on-Error is Not Functional

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

Workaround

None.

Affected Silicon Revisions

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

1.10 Integrated Inter-IC Sound (I²S)

1.10.1 Transmit Serializer

In LSBIT mode (i.e., SERCTRL.BITREV is set), the I²S 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	G	
X	X	X	X	X	X	X	

1.10.2 I²S is Not Functional

The I²S is not functional.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X							

1.10.3 Software Reset

The software reset, SWRST, does not propagate inside the I²S module. As a consequence, Client 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	G	
	X						

1.10.4 Module is Not Functional in Client Mode

The I²S is not functional in Client 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	G	
	X						

1.10.5 CPU Clock/I²S Clock Ratio

Depending on the CPU clock/I²S 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	G	
	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 I²S controller should be configured in normal Receive mode with one slot.

Affected Silicon Revisions

A	B	C	D	E	F	G	
	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	G	
	X	X	X				

1.10.8 Client Mode (CTRLB Register)

In I²C Client 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	G	
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	G	
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	G	
X	X	X	X	X	X	X	

1.11.3 NVMCTRL.INTFLAG.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 RWWEEER 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	G	
				X			

1.11.4 RWW NVM Command

Incorrect Data Fetch after RWW NVM Command

Issuing an NVM command on RWWEE region while the NVM Controller cache is enabled, can result in incorrect data fetch afterward.

Workaround

Disable the NVM Controller cache before issuing any RWW NVM command. Enable the cache only after the internal RWW operation is complete.

Pseudo Code

```
NVMCTRL->CTRLB.CACHEDIS |= NVMCTRL_CTRLB_CACHEDIS_Msk;
NVMRWW_ErasePage();
while(NVMCTRL_IsBusy());
NVMCTRL->CTRLB.CACHEDIS &= ~NVMCTRL_CTRLB_CACHEDIS_Msk;
```

Affected Silicon Revisions

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

1.13.5 Write-Protect

The non-debugger IOBUS writes to the PAC Write-protected registers are not prevented when the PORT is PAC Write-protected.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	X	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	G	
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 SLEEPFRM bits in the NVMCTRL.CTRLB register must be written to 3 (NVMCTRL - CTRLB.bit.SLEEPFRM = 3) to ensure correct operation of the device. The average power consumption of the device will increase with 20 μ A compared to the values in the *Electrical Characteristics* chapter of the current data sheet.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	X	X					

1.15 Serial Communication Interface (SERCOM)

1.15.1 I2C Client SCL Low Extend Time-out

The I2C Client SCL low extend time-out (CTRLA.SEXTTOEN) and Host 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 Host or Client SCL low extend time-outs, enable the SCL low time-out (CTRLA.LOWTOUT = 1).

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	X	X	X				

1.15.2 I2C Transaction in Debug Mode

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

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	X	X	X				

1.15.3 SPI with SPI Select Low Detection

If the SERCOM is enabled in SPI mode with SSL detection enabled (CTRLB.SSDE) and CTRLB.RXEN = 1, an erroneous SPI 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	G	
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	G	
X	X	X	X	X	X		

1.15.5 NACK and Repeated Start in I²C Host Mode

For High-Speed Host Read operations, sending a NACK (CTRLB.CMD = 0x2) forces a STOP to be issued, making repeated start not possible in that mode.

Workaround

None.

Affected Silicon Revisions

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

1.15.6 SERCOM-USART: Collision Detection

In USART Operating mode with Collision Detection enabled (CTRLB.COLDEN=1), the SERCOM will not abort the current transfer as expected if a collision is detected, and if the SERCOM APB Clock is lower than the SERCOM Generic Clock.

Workaround

The SERCOM APB clock must always be higher than the SERCOM Generic Clock to support collision detection.

Affected Silicon Revisions

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

1.15.7 SERCOM-USART: USART in Debug Mode

In USART operating mode, if DBGCTRL.DBGSTOP=1, data transmission is not halted after entering Debug mode.

Workaround

None.

Affected Silicon Revisions

A	B	C	D	E	F	G	

X	X	X	X	X	X	X	
---	---	---	---	---	---	---	--

1.15.8 SERCOM-I²C: Client Mode with DMA

In I²C Client Transmitter mode, at the reception of a NACK, if there is still data to be sent in the DMA buffer, the DMA will push a data to the DATA register. Because a NACK was received, the transfer on the I²C bus will not occur causing the loss of this data.

Workaround

Configure the DMA transfer size to the number of data to be received by the I²C Host. DMA cannot be used if the number of data to be received by the Host is unknown.

Affected Silicon Revisions

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

1.15.9 SERCOM-I²C: I²C Mode in 10-bit Address

10-bit addressing in I²C Client mode is not functional.

Workaround

None.

Affected Silicon Revisions

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

1.15.10 SERCOM-SPI: Data Preload

In SPI Client mode and with Client Data Preload Enabled (CTRLB.PLOADEN = 1), the first data sent from the Client will be a dummy byte if the Host cannot keep the SPI Select (SS) line low until the end of transmission.

Workarounds

In SPI Client mode, the SPI Select pin (SS) must be kept low by the Host until the end of the transmission if the Client Data Preload feature is used (CTRLB.PLOADEN = 1).

Affected Silicon Revisions

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

1.15.11 CLKHOLD Bit Status in I²C

STATUS.CLKHOLD bit can be written whereas it is a read-only status bit in both Host and Client modes.

Workarounds

Do not clear STATUS.CLKHOLD bit to preserve the current clock hold state.

Affected Silicon Revisions

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

1.15.12 Quick Command I²C

When Quick command is enabled (CTRLB.QCEN=1), the software can issue a repeated Start by either writing CTRLB.CMD or ADDR.ADDR bit fields. If, in these conditions, SCL Stretch Mode is CTRLA.SCLSM=1, a bus error will be generated.

Workarounds

Use Quick Command mode (CTRLB.QCEN=1) only if SCL Stretch Mode is CTRLA.SCLSM=0.

Affected Silicon Revisions

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

1.15.13 Repeated Start I²C

For High-Speed Host Write operations, writing CTRLB.CMD = 0x1 issues a STOP command instead of a Repeated Start, making repeated start is not possible in that mode.

Workarounds

None.

Affected Silicon Revisions

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

1.15.14 Client Mode I²C

In Client mode, the BUSERR, COLL, LOWTOUT, SEXTTOUT and LENERR STATUS register bits are not automatically cleared when INTFLAG.AMATCH is cleared.

Workarounds

PERBUFclear the STATUS register bits, such as BUSERR, COLL, LOWTOUT, SEXTTOUT and LENERR by writing these STATUS bits to 1, when INTFLAG.AMATCH is cleared.

Affected Silicon Revisions

A	B	C	D	E	F	G	
X	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	G	

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	G	
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	G	
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	G	
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	G	
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	G	
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	G	
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	G	
X	X	X	X				

1.16.9 CTRLA.RUNSTDBY Enable Protection

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

Workaround

None.

Affected Silicon Revisions

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

1.16.11 Recoverable Fault and Blanking Operation

When 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	G	
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	G	
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	G	
				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	G	
				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	G	
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	G	
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	G	
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	G	
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	G	
				X			

1.16.20 PATTB

The PATTB register write will not update the PATT register on an update condition.

Workaround

Write directly to the PATT register when an update is required.

Affected Silicon Revisions

A	B	C	D	E	F	G	
				X	X	X	

1.16.21 PERBUF

In down-counting mode, the Lock Update bit (CTRLB.LUPD) does not protect against a PER register update from the PERBUF register.

Workaround

None.

Affected Silicon Revisions

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

1.16.22 TCC with EVSYS in SYNC/RESYNC Mode

TCC peripheral is not compatible with an EVSYS channel in SYNC or RESYNC mode.

Workaround

Use TCC with an EVSYS channel in ASYNC mode.

Affected Silicon Revisions

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

1.16.23 Prescale

A DMA transfer to the TCC.CC register may not initiate when using the TCC MCx as the trigger source (CTRLB.TRIGSRC), and the TCC Prescale (CTRLA.PRESCALE) value is set to 64/256/1024.

Workaround

Use the TCC.CCB for DMA transfers, or the GCLK division register (GENDIV.DIV) to divide the TCC input clock to a range that is suitable to match the required 64/256/1024 prescale clock values. To ensure this does not have an impact on other modules in the system, the divided GCLK used to supply the TCC peripheral with its input clock should not source other peripheral modules.

Affected Silicon Revisions

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

1.17.2 TC with EVSYS in SYNC/RESYNC Mode

TC peripheral is not compatible with an EVSYS channel in SYNC or RESYNC mode.

Workaround

Use TC with an EVSYS channel in ASYNC mode.

Affected Silicon Revisions

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

1.20 SYSCTRL

1.20.1 XOSC

The XOSC can prevent entry into Stand-by mode regardless of XOSC.RUNSTDBY value.

Workaround

Change the clock source for gclk0 to the internal RC OSC, and then disable the XOSC before entering Standby mode.

Affected Silicon Revisions

A	B	C	D	E	F	G	
				X	X	X	

1.20.2 BOD33

The BOD33 interrupt may only generate once if VDDANA does not increase above the user-defined threshold (BOD.LEVEL[5:0]) when in Active mode. If in Standby mode, when the BOD33 interrupt is generated, the device will have to be in Active mode while VDDANA increases above BOD.LEVEL to re-enable the BOD33 interrupt.

Workaround

None.

Affected Silicon Revisions

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

1.21 BOD33

1.21.1 Hysteresis

The BOD33 Hysteresis does not work if either an external reset or a watchdog reset occurs during the time that the supply voltage is between VBOD- and VBOD+. If one of those resets occurs, the device will continue operation if the supply voltage is above VBOD- and the reset condition is lifted.

Workaround

Use the BOD33 Level in the NVM User Row as an upper BOD threshold and configure the SYSCTRL.BOD33 Level bitfield to be the lower threshold, and therefore generating a hysteresis.

Affected Silicon Revisions

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

2. Data Sheet Clarifications

The following typographic corrections and clarifications are to be noted for the latest revision of the device Data Sheet (DS40001882H). The corrected information is shown in **BOLD** type.

2.1 Voltage Reference Names

Voltage reference names in all Electrical Characteristics chapters have been aligned and harmonized with the names in use in the rest of the data sheet.

- "INT1V1" has been renamed "BANDGAP", corresponding to the internal 1.1V Bandgap
- "Internal 1.1V Bandgap Reference Characteristics" chapter has been renamed to "Bandgap and Internal 1.0V Reference Characteristics", and a new line has been added for the "INT1V" parameter
- ADC "VREFINT1V" has been renamed "INT1V"
- ADC "VREFINTVCC0" has been renamed "INTVCC0"
- ADC "VREFINTVCC1" has been renamed "INTVCC1"
- ADC Differential Mode Offset Error and Gain Error: "bandgap" condition has been corrected to "VREF = INT1V"
- DAC "internal reference voltage 1" has been renamed "INT1V"
- DAC "internal reference voltage 2" has been renamed "VDDANA"
- DAC CTRLB.REFSEL "INTREF" option has been renamed "INT1V"

2.2 DAC Accuracy Characteristics - conversion rate

The Note 1 in all the DAC Accuracy Characteristics tables has been updated as follows: **All values are measured using a conversion rate of 35 ksps.**

2.3 Decoupling Requirements

Table 41-18 Decoupling Requirements is updated to match with the requirements provided in Table 37-19 and Figure 44-2 Schematic Checklist Power Supply. The updated table 41-18 is shown as follows:

Table 2-1. Decoupling requirements

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
C _{IN} ⁽¹⁾	Input regulator capacitor, between V _{DDIN} and GND	Ceramic dielectric X7R	-	10	-	μF
			-	100	-	nF
C _{OUT} ⁽²⁾	Output regulator capacitor, between V _{DDCORE} and GND	-	0.8	1	-	μF
ESR Cout	External Series Resistance of Cout		-	-	1	Ω

Note: 1. It is recommended to use ceramic X7R capacitor with low-series resistance. Refer to Figure 45-1 for a typical circuit connections of the decoupling capacitor.

Note: 2. It is recommended to use ceramic or solid tantalum capacitor with low ESR ≤ 1 ohms.

2.4 Moisture Sensitivity Level

The Moisture Sensitivity Level (MSL) specification is removed from the Data Sheet chapter "Package Drawings". For determining the Moisture Sensitivity Level, go to www.microchip.com/quality.

2.5 BOD33

Updated BOD33 Levels for the SAM DA1.

The changes to Table 41-20 are shown in **BOLD**.

BOD33.Level	Conditions	Symbol	Min.	Typ.	Max.	Unit
34	Hysteresis On	VBOD+	-	2.68	2.74	V
39			-	2.87	2.94	
48			-	3.2	3.3	
34	Hysteresis Off	VBOD- or VBOD+	2.51	2.59	2.65	
39			2.7	2.77	2.85	
48			3	3.07	3.2	

3. Appendix A: Revision History

Revision G Document - 08/2021

The following updates were performed in this revision:

- Added new notes to the [SAM D21 Family Silicon Device Identification](#) table
- Added a new Data Sheet Clarification for [BOD33](#)
- Added the following silicon errata issue:
 - [BOD33: 1.21.1 Hysteresis](#)

Revision F Document - 03/2021

The SPI, I²S, and I²C standards use the terminology "Master" and "Slave." The equivalent Microchip terminology, "Host" and "Client," is used in this document. This terminology has been updated throughout the document for this revision.

The following [Data Sheet Clarifications](#) were added in this revision:

- [Voltage Reference Names](#)
- [DAC Accuracy Characteristics - Conversion Rate](#)
- [Decoupling Requirements](#)
- [Moisture Sensitivity Level](#)

The following Silicon errata were added in this revision:

- [ADC: 1.4.2 Offset Correction](#)
- [DEVICE: 1.5.7 Standby Entry](#)
- [DEVICE: 1.5.8 Standby Wake-up](#)

Rev E Document 03/2020

The following items were updated in this revision:

- The Device Identification was updated in [SAM D21 Family Silicon Device Identification](#)
- Added a new table, [SAM DA1 Family Silicon Device Identification](#)
- Obsolete Data Sheet Clarifications were removed

The following errata was added in this revision:

- [NVMCTRL 1.11.4: RWW NVM Command](#)

Rev D Document (04/2019)

The following [Data Sheet Clarifications](#) were added:

- System Controller - XOSC
- Electrical Characteristics - Crystal Oscillator (XOSC)
- Schematic Checklist - Crystal Oscillator

Rev C Document (11/2018)

The following errata is added:

- Prescale

Rev B Document (9/2018)

The following Errata Issues were added:

- Write Protect
- NACK and Repeated Start in I²C Host Mode
- SERCOM-USART: Collision Detection
- SERCOM-USART: USART in Debug Mode
- SERCOM-I²C: Client Mode with DMA

- SERCOM-I²C: I²C Mode in 10-bit Address
- SERCOM-SPI: Data Preload
- CLKHOLD Bit Status in I²C
- Quick Command I²C
- Repeated Start I²C
- Client Mode I²C
- PATTB
- PERBUF
- TCC with EVSYS in SYNC/RESYNC Mode
- TC with EVSYS in SYNC/RESYNC Mode
- XOSC
- BOD33

Rev A Document (4/2018)

Initial release of this document.

The Microchip Web Site

Microchip provides online support via our web site at www.microchip.com/. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQ), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

Customer Change Notification Service

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at www.microchip.com/. Under "Support", click on "Customer Change Notification" and follow the registration instructions.

Customer Support

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or Field Application Engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at: www.microchip.com/support

Microchip Devices Code Protection Feature

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Legal Notice

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights unless otherwise stated.

Trademarks

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BeaconThings, BitCloud, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Helder, JukeBlox, KeeLoq, KeeLoq logo, Klear, LANCheck, LINK MD, maXStylus, maXTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, RightTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, chipKIT, chipKIT logo, CodeGuard, CryptoAuthentication, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, PureSilicon, QMatrix, RightTouch logo, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQL, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

All other trademarks mentioned herein are property of their respective companies.

© 2018, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-8816-3

Quality Management System Certified by DNV

ISO/TS 16949

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Worldwide Sales and Service

AMERICAS	ASIA/PACIFIC	ASIA/PACIFIC	EUROPE
Corporate Office 2355 West Chandler Blvd. Chandler, AZ 85224-6199 Tel: 480-792-7200 Fax: 480-792-7277 Technical Support: http://www.microchip.com/support Web Address: www.microchip.com	Asia Pacific Office Suites 3707-14, 37th Floor Tower 6, The Gateway Harbour City, Kowloon Hong Kong Tel: 852-2943-5100 Fax: 852-2401-3431 Australia - Sydney Tel: 61-2-9868-6733 Fax: 61-2-9868-6755 China - Beijing Tel: 86-10-8569-7000 Fax: 86-10-8528-2104 China - Chengdu Tel: 86-28-8665-5511 Fax: 86-28-8665-7889 China - Chongqing Tel: 86-23-8980-9588 Fax: 86-23-8980-9500 China - Dongguan Tel: 86-769-8702-9880 China - Guangzhou Tel: 86-20-8755-8029 China - Hangzhou Tel: 86-571-8792-8115 Fax: 86-571-8792-8116 China - Hong Kong SAR Tel: 852-2943-5100 Fax: 852-2401-3431 China - Nanjing Tel: 86-25-8473-2460 Fax: 86-25-8473-2470 China - Qingdao Tel: 86-532-8502-7355 Fax: 86-532-8502-7205 China - Shanghai Tel: 86-21-3326-8000 Fax: 86-21-3326-8021 China - Shenyang Tel: 86-24-2334-2829 Fax: 86-24-2334-2393 China - Shenzhen Tel: 86-755-8864-2200 Fax: 86-755-8203-1760 China - Wuhan Tel: 86-27-5980-5300 Fax: 86-27-5980-5118 China - Xian Tel: 86-29-8833-7252 Fax: 86-29-8833-7256	China - Xiamen Tel: 86-592-2388138 Fax: 86-592-2388130 China - Zhuhai Tel: 86-756-3210040 Fax: 86-756-3210049 India - Bangalore Tel: 91-80-3090-4444 Fax: 91-80-3090-4123 India - New Delhi Tel: 91-11-4160-8631 Fax: 91-11-4160-8632 India - Pune Tel: 91-20-3019-1500 Japan - Osaka Tel: 81-6-6152-7160 Fax: 81-6-6152-9310 Japan - Tokyo Tel: 81-3-6880-3770 Fax: 81-3-6880-3771 Korea - Daegu Tel: 82-53-744-4301 Fax: 82-53-744-4302 Korea - Seoul Tel: 82-2-554-7200 Fax: 82-2-558-5932 or 82-2-558-5934 Malaysia - Kuala Lumpur Tel: 60-3-6201-9857 Fax: 60-3-6201-9859 Malaysia - Penang Tel: 60-4-227-8870 Fax: 60-4-227-4068 Philippines - Manila Tel: 63-2-634-9065 Fax: 63-2-634-9069 Singapore Tel: 65-6334-8870 Fax: 65-6334-8850 Taiwan - Hsin Chu Tel: 886-3-5778-366 Fax: 886-3-5770-955 Taiwan - Kaohsiung Tel: 886-7-213-7830 Taiwan - Taipei Tel: 886-2-2508-8600 Fax: 886-2-2508-0102 Thailand - Bangkok Tel: 66-2-694-1351 Fax: 66-2-694-1350	Austria - Wels Tel: 43-7242-2244-39 Fax: 43-7242-2244-393 Denmark - Copenhagen Tel: 45-4450-2828 Fax: 45-4485-2829 Finland - Espoo Tel: 358-9-4520-820 France - Paris Tel: 33-1-69-53-63-20 Fax: 33-1-69-30-90-79 France - Saint Cloud Tel: 33-1-30-60-70-00 Germany - Garching Tel: 49-8931-9700 Germany - Haan Tel: 49-2129-3766400 Germany - Heilbronn Tel: 49-7131-67-3636 Germany - Karlsruhe Tel: 49-721-625370 Germany - Munich Tel: 49-89-627-144-0 Fax: 49-89-627-144-44 Germany - Rosenheim Tel: 49-8031-354-560 Israel - Ra'anana Tel: 972-9-744-7705 Italy - Milan Tel: 39-0331-742611 Fax: 39-0331-466781 Italy - Padova Tel: 39-049-7625286 Netherlands - Druenen Tel: 31-416-690399 Fax: 31-416-690340 Norway - Trondheim Tel: 47-7289-7561 Poland - Warsaw Tel: 48-22-3325737 Romania - Bucharest Tel: 40-21-407-87-50 Spain - Madrid Tel: 34-91-708-08-90 Fax: 34-91-708-08-91 Sweden - Gothenberg Tel: 46-31-704-60-40 Sweden - Stockholm Tel: 46-8-5090-4654 UK - Wokingham Tel: 44-118-921-5800 Fax: 44-118-921-5820

Affected Catalog Part Numbers (CPN)

ATSAMD21E15A-MFT
ATSAMD21E15B-AF
ATSAMD21E15B-AFT
ATSAMD21E15B-AU
ATSAMD21E15B-AUT
ATSAMD21E15B-AZ
ATSAMD21E15B-AZT
ATSAMD21E15B-MF
ATSAMD21E15B-MFT
ATSAMD21E15B-MFTA7
ATSAMD21E15B-MU
ATSAMD21E15B-MUT
ATSAMD21E15B-MZ
ATSAMD21E15B-MZT
ATSAMD21E15B-MZTVAO
ATSAMD21E15B-MZVAO
ATSAMD21E15B-UUT
ATSAMD21E15L-AF
ATSAMD21E15L-AFT
ATSAMD21E15L-MF
ATSAMD21E15L-MFT
ATSAMD21E15L-MNT
ATSAMD21E16B-AF
ATSAMD21E16B-AFT
ATSAMD21E16B-AU
ATSAMD21E16B-AUT
ATSAMD21E16B-AZ
ATSAMD21E16B-AZT
ATSAMD21E16B-MF
ATSAMD21E16B-MFT
ATSAMD21E16B-MU
ATSAMD21E16B-MU-SLL
ATSAMD21E16B-MUT
ATSAMD21E16B-MUT-SLL
ATSAMD21E16B-MZ
ATSAMD21E16B-MZT
ATSAMD21E16B-MZTV16
ATSAMD21E16B-MZTVAO
ATSAMD21E16B-UUT
ATSAMD21E16B-UTA5
ATSAMD21E16B-UTB4
ATSAMD21E16L-AF
ATSAMD21E16L-AFT
ATSAMD21E16L-MF
ATSAMD21E16L-MFT
ATSAMD21E16L-MNT

ATSAMD21E16L-MNTA4
ATSAMD21E16L-MNTA7
ATSAMD21E16L-MNTB7
ATSAMD21E16L-MNTP01
ATSAMD21E17A-AF
ATSAMD21E17A-AFT
ATSAMD21E17A-AU
ATSAMD21E17A-AUA1
ATSAMD21E17A-AUT
ATSAMD21E17A-AUTA1
ATSAMD21E17A-AZ
ATSAMD21E17A-AZT
ATSAMD21E17A-MF
ATSAMD21E17A-MFT
ATSAMD21E17A-MU
ATSAMD21E17A-MUA1
ATSAMD21E17A-MUT
ATSAMD21E17A-MUTA1
ATSAMD21E17A-MZ
ATSAMD21E17A-MZT
ATSAMD21E17D-AF
ATSAMD21E17D-AFT
ATSAMD21E17D-AU
ATSAMD21E17D-AUT
ATSAMD21E17D-AZ
ATSAMD21E17D-AZT
ATSAMD21E17D-AZTVAO
ATSAMD21E17D-AZVAO
ATSAMD21E17D-MF
ATSAMD21E17D-MFT
ATSAMD21E17D-MU
ATSAMD21E17D-MUT
ATSAMD21E17D-MUT-SLL
ATSAMD21E17D-MZ
ATSAMD21E17D-MZT
ATSAMD21E17D-MZTV02
ATSAMD21E17D-MZTVAO
ATSAMD21E17D-MZVAO
ATSAMD21E17D-UUT
ATSAMD21E17L-AF
ATSAMD21E17L-AFT
ATSAMD21E17L-MF
ATSAMD21E17L-MFT
ATSAMD21E17L-MN
ATSAMD21E17L-MNT
ATSAMD21E18A-AF
ATSAMD21E18A-AFT
ATSAMD21E18A-AU
ATSAMD21E18A-AU-SLL

ATSAMD21E18A-AUA1
ATSAMD21E18A-AUT
ATSAMD21E18A-AUTA1
ATSAMD21E18A-AZ
ATSAMD21E18A-AZT
ATSAMD21E18A-AZTVAO
ATSAMD21E18A-AZVAO
ATSAMD21E18A-MF
ATSAMD21E18A-MFT
ATSAMD21E18A-MU
ATSAMD21E18A-MU-SLL
ATSAMD21E18A-MUA1
ATSAMD21E18A-MUDBG
ATSAMD21E18A-MUT
ATSAMD21E18A-MUTA1
ATSAMD21E18A-MUTDBG
ATSAMD21E18A-MZ
ATSAMD21E18A-MZT
ATSAMD21E18A-MZTVAO
ATSAMD21E18A-MZVAO
ATSAMD21G15B-AF
ATSAMD21G15B-AFT
ATSAMD21G15B-AU
ATSAMD21G15B-AUT
ATSAMD21G15B-AZ
ATSAMD21G15B-AZT
ATSAMD21G15B-MF
ATSAMD21G15B-MFT
ATSAMD21G15B-MU
ATSAMD21G15B-MUT
ATSAMD21G15B-MZ
ATSAMD21G15B-MZT
ATSAMD21G15B-MZTVAO
ATSAMD21G16B-AF
ATSAMD21G16B-AFT
ATSAMD21G16B-AU
ATSAMD21G16B-AUT
ATSAMD21G16B-AZ
ATSAMD21G16B-AZT
ATSAMD21G16B-MF
ATSAMD21G16B-MFT
ATSAMD21G16B-MU
ATSAMD21G16B-MUT
ATSAMD21G16B-MZ
ATSAMD21G16B-MZT
ATSAMD21G16B-MZTV15
ATSAMD21G16B-MZTV23
ATSAMD21G16B-MZTVAO
ATSAMD21G16L-MNT

ATSAMD21G16L-MNTA7
ATSAMD21G16L-MNTP01
ATSAMD21G16L-MUT
ATSAMD21G16L-MUTN01
ATSAMD21G17A-AF
ATSAMD21G17A-AFT
ATSAMD21G17A-AU
ATSAMD21G17A-AUA1
ATSAMD21G17A-AUT
ATSAMD21G17A-AUTA1
ATSAMD21G17A-AZ
ATSAMD21G17A-AZT
ATSAMD21G17A-MF
ATSAMD21G17A-MFT
ATSAMD21G17A-MU
ATSAMD21G17A-MUA1
ATSAMD21G17A-MUT
ATSAMD21G17A-MUTA0
ATSAMD21G17A-MUTA1
ATSAMD21G17A-MZ
ATSAMD21G17A-MZT
ATSAMD21G17A-UUT
ATSAMD21G17D-AF
ATSAMD21G17D-AFT
ATSAMD21G17D-AU
ATSAMD21G17D-AUT
ATSAMD21G17D-AZ
ATSAMD21G17D-AZT
ATSAMD21G17D-AZTV05
ATSAMD21G17D-MF
ATSAMD21G17D-MFT
ATSAMD21G17D-MU
ATSAMD21G17D-MUT
ATSAMD21G17D-MZ
ATSAMD21G17D-MZT
ATSAMD21G17D-MZTV01
ATSAMD21G17D-MZTV03
ATSAMD21G17D-MZTV04
ATSAMD21G17D-MZTVAO
ATSAMD21G17L-MF
ATSAMD21G17L-MFT
ATSAMD21G17L-MN
ATSAMD21G17L-MNT
ATSAMD21G17L-MU
ATSAMD21G17L-MUT
ATSAMD21G18A-AF
ATSAMD21G18A-AFT
ATSAMD21G18A-AU
ATSAMD21G18A-AU-SLL

ATSAMD21G18A-AUA1
ATSAMD21G18A-AUT
ATSAMD21G18A-AUTA1
ATSAMD21G18A-AUTN01
ATSAMD21G18A-AZ
ATSAMD21G18A-AZT
ATSAMD21G18A-MF
ATSAMD21G18A-MFT
ATSAMD21G18A-MU
ATSAMD21G18A-MU-SLL
ATSAMD21G18A-MUA1
ATSAMD21G18A-MUT
ATSAMD21G18A-MUTA0
ATSAMD21G18A-MUTA1
ATSAMD21G18A-MUTN01
ATSAMD21G18A-MZ
ATSAMD21G18A-MZT
ATSAMD21G18A-MZTV02
ATSAMD21G18A-MZTVAO
ATSAMD21G18A-MZVAO
ATSAMD21G18A-UNTN01
ATSAMD21G18A-UUT
ATSAMD21J15B-AF
ATSAMD21J15B-AFT
ATSAMD21J15B-AU
ATSAMD21J15B-AUT
ATSAMD21J15B-AZ
ATSAMD21J15B-AZT
ATSAMD21J15B-CUT
ATSAMD21J15B-MF
ATSAMD21J15B-MFT
ATSAMD21J15B-MU
ATSAMD21J15B-MUT
ATSAMD21J15B-MZ
ATSAMD21J15B-MZT
ATSAMD21J16B-AF
ATSAMD21J16B-AFT
ATSAMD21J16B-AU
ATSAMD21J16B-AUT
ATSAMD21J16B-AZ
ATSAMD21J16B-AZT
ATSAMD21J16B-AZVAO
ATSAMD21J16B-CUT
ATSAMD21J16B-MF
ATSAMD21J16B-MFT
ATSAMD21J16B-MU
ATSAMD21J16B-MUT
ATSAMD21J16B-MZ
ATSAMD21J16B-MZT

ATSAMD21J16B-MZTVAO
ATSAMD21J16B-MZVAO
ATSAMD21J17A-AF
ATSAMD21J17A-AFT
ATSAMD21J17A-AU
ATSAMD21J17A-AUA1
ATSAMD21J17A-AUT
ATSAMD21J17A-AUTA1
ATSAMD21J17A-AZ
ATSAMD21J17A-AZT
ATSAMD21J17A-CU
ATSAMD21J17A-CUA1
ATSAMD21J17A-CUT
ATSAMD21J17A-CUTA1
ATSAMD21J17A-MF
ATSAMD21J17A-MFT
ATSAMD21J17A-MU
ATSAMD21J17A-MUA1
ATSAMD21J17A-MUT
ATSAMD21J17A-MUTA1
ATSAMD21J17A-MZ
ATSAMD21J17A-MZT
ATSAMD21J17D-AF
ATSAMD21J17D-AFT
ATSAMD21J17D-AU
ATSAMD21J17D-AUT
ATSAMD21J17D-AZ
ATSAMD21J17D-AZT
ATSAMD21J17D-AZTVAO
ATSAMD21J17D-AZVAO
ATSAMD21J17D-CU
ATSAMD21J17D-CUT
ATSAMD21J17D-MF
ATSAMD21J17D-MFT
ATSAMD21J17D-MU
ATSAMD21J17D-MUT
ATSAMD21J17D-MUTN01
ATSAMD21J17D-MZ
ATSAMD21J17D-MZT
ATSAMD21J17D-MZTVAO
ATSAMD21J17D-MZVAO
ATSAMD21J18A-AF
ATSAMD21J18A-AFT
ATSAMD21J18A-AU
ATSAMD21J18A-AU-SLL
ATSAMD21J18A-AUA1
ATSAMD21J18A-AUT
ATSAMD21J18A-AUTA0
ATSAMD21J18A-AUTA1

ATSAMD21J18A-AZ
ATSAMD21J18A-AZT
ATSAMD21J18A-AZTV04
ATSAMD21J18A-AZTVAO
ATSAMD21J18A-AZVAO
ATSAMD21J18A-CU
ATSAMD21J18A-CUA1
ATSAMD21J18A-CUT
ATSAMD21J18A-CUTA1
ATSAMD21J18A-MF
ATSAMD21J18A-MFT
ATSAMD21J18A-MU
ATSAMD21J18A-MU-SLL
ATSAMD21J18A-MUA1
ATSAMD21J18A-MUT
ATSAMD21J18A-MUTA1
ATSAMD21J18A-MUTN01
ATSAMD21J18A-MZ
ATSAMD21J18A-MZT
ATSAMD21J18A-MZTV01
ATSAMD21J18A-MZTV03
ATSAMD21J18A-MZTVAO
ATSAMD21J18A-W-NG
ATSAMDA1E14B-ABT
ATSAMDA1E14B-MBT
ATSAMDA1E15A-ABT
ATSAMDA1E16A-ABT
ATSAMDA1E16A-MBT
ATSAMDA1E16A-MBTV02001
ATSAMDA1E16B-ABT
ATSAMDA1E16B-ABTV12
ATSAMDA1E16B-ABTV17
ATSAMDA1E16B-ABTVAO
ATSAMDA1E16B-MBT
ATSAMDA1E16B-MBTV01
ATSAMDA1E16B-MBTV09
ATSAMDA1E16B-MBTV11
ATSAMDA1E16B-MBTV13
ATSAMDA1E16B-MBTV19001
ATSAMDA1E16B-MBTV22
ATSAMDA1E16B-MBTVAO
ATSAMDA1G14A-ABT
ATSAMDA1G14B-ABT
ATSAMDA1G14B-MBT
ATSAMDA1G15A-ABT
ATSAMDA1G15B-ABT
ATSAMDA1G15B-ABTVAO
ATSAMDA1G15B-MBT
ATSAMDA1G16A-ABT

ATSAMDA1G16A-MBT
ATSAMDA1G16B-ABT
ATSAMDA1G16B-ABTV08
ATSAMDA1G16B-ABTV14
ATSAMDA1G16B-ABTV25
ATSAMDA1G16B-ABTVAO
ATSAMDA1G16B-MBT
ATSAMDA1G16B-MBTV20
ATSAMDA1G16B-MBTVAO
ATSAMDA1J14B-ABT
ATSAMDA1J15A-ABT
ATSAMDA1J15B-ABT
ATSAMDA1J16A-ABT
ATSAMDA1J16A-ABTV01
ATSAMDA1J16B-ABT
ATSAMDA1J16B-ABTV03
ATSAMDA1J16B-ABTV05
ATSAMDA1J16B-ABTV06
ATSAMDA1J16B-ABTV18
ATSAMDA1J16B-ABTV21
ATSAMDA1J16B-ABTV24
ATSAMDA1J16B-ABTVAO
ATSAMDA1J16B-ABV06