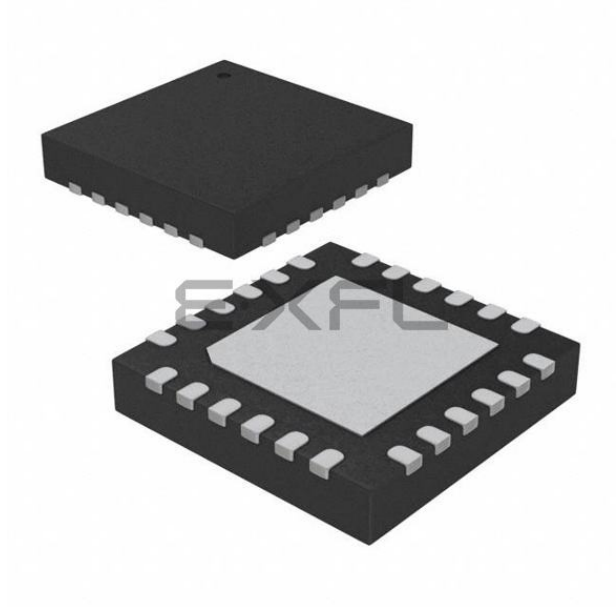

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Applications of "Embedded - Microcontrollers"

Details	
Product Status	Active
Core Processor	ARM® Cortex®-M23
Core Size	32-Bit Single-Core
Speed	32MHz
Connectivity	I²C, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, POR, PWM, WDT
Number of I/O	17
Program Memory Size	32KB (32K x 8)
Program Memory Type	FLASH
EEPROM Size	2K x 8
RAM Size	8K x 8
Voltage - Supply (Vcc/Vdd)	1.62V ~ 3.63V
Data Converters	A/D 5x12b; D/A 1x10b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 85°C (TA)
Mounting Type	Surface Mount
Package / Case	24-VFQFN Exposed Pad
Supplier Device Package	24-VQFN (4x4)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/atsaml11d15a-mu

Bit Pos.	Name	Usage	Factory Setting	Related Peripheral Register
25	WDT_RUNSTDBY	WDT Runstdby at power-on	0x0	WDT.CTRLA
26	WDT_ENABLE	WDT Enable at power-on	0x0	WDT.CTRLA
27	WDT_ALWAYSON	WDT Always-On at power-on	0x0	WDT.CTRLA
31:28	WDT_PER	WDT Period at power-on	0xB	WDT.CONFIG
35:32	WDT_WINDOW	WDT Window mode time-out at power-on	0xB	WDT.CONFIG
39:36	WDT_EWOFFSET	WDT Early Warning Interrupt Time Offset at power-on	0xB	WDT.EWCTRL
40	WDT_WEN	WDT Timer Window Mode Enable at power-on	0x0	WDT.CTRLA
41	BOD33_HYST	BOD33 Hysteresis configuration at power-on	0x0	SUPC.BOD33
42	Reserved	Reserved	Reserved	Reserved
43	RXN	RAM is eXecute Never	0x1	IDAU.SECCTRL
44	DXN	Data Flash is eXecute Never	0x1	NVMCTRL.SECCTRL
63:45	Reserved	Reserved	Reserved	Reserved
71:64	AS	Flash Application Secure Size = AS*0x100	0xFF	IDAU.SCFGA
77:72	ANSC	Flash Application Non-Secure Callable Size = ANSC*0x20	0x0	IDAU.SCFGA
79:78	Reserved	Reserved	Reserved	Reserved
83:80	DS	Data Flash Secure Size = DS*0x100	0x8	IDAU.SCFGA
87:84	Reserved	Reserved	Reserved	Reserved
94:88	RS	RAM Secure Size = RS*0x80	0x7F	IDAU.SCFGR
95	Reserved	Reserved	Reserved	Reserved
96	URWEN	User Row Write Enable	0x1	NVMCTRL.SCFGAD
127:97	Reserved	Reserved	Reserved	Reserved
159:128	NONSECA(1)	Peripherals Non-Secure Status Fuses for Bridge A	0x0000_0000	PAC.NONSECA
191:160	NONSECB(2, 3)	Peripherals Non-Secure Status Fuses for Bridge B	0x0000_0000	PAC.NONSECB
223:192	NONSECC	Peripherals Non-Secure Status Fuses for Bridge C	0x0000_0000	PAC.NONSECC
255:224	USERCRC	CRC of NVM User Row bits 223:64	0x8433651E	Boot ROM

Note:

1. The PAC Peripheral is always secured regardless of its bit value
2. The IDAU and NVMCTRL peripherals are always secured regardless of their bit values.
3. The DSU peripheral is always non-secured regardless of its bit value.

⚠ CAUTION

1. BOD12 is calibrated in production and its calibration parameters must not be changed to ensure the correct device behavior.

Table 10-11. SAM L11 UROW Mapping

Offset	Bit Pos.	Name			
0x00	7:0	BOD33 Level	-	NSULCK	SULCK
0x01	15:8	BOD33 Action		BOD33 Disable	BOD33 Level
0x02	23:16	BOD12 Calibration Parameters			

The NVM Temperature Log Row can be read at address 0x00806038.

Table 10-14. Temperature Log Row Bitfields Definition

Bit Position	Name	Description
7:0	ROOM_TEMP_VAL_INT	Integer part of room temperature in °C
11:8	ROOM_TEMP_VAL_DEC	Decimal part of room temperature
19:12	HOT_TEMP_VAL_INT	Integer part of hot temperature in °C
23:20	HOT_TEMP_VAL_DEC	Decimal part of hot temperature
31:24	ROOM_INT1V_VAL	2's complement of the internal 1V reference drift at room temperature (versus a 1.0 centered value)
39:32	HOT_INT1V_VAL	2's complement of the internal 1V reference drift at hot temperature (versus a 1.0 centered value)
51:40	ROOM_ADC_VAL	Temperature sensor 12bit ADC conversion at room temperature
63:52	HOT_ADC_VAL	Temperature sensor 12bit ADC conversion at hot temperature

Important: Hot temperature corresponds to the max operating temperature +/- 5%, so 85°C +/- 5% (package grade 'U') or 125°C +/- 5% (package grade 'F').

Table 10-15. Temperature Log Row Mapping

Offset	Bit Pos.	Name	
0x00	7:0	ROOM_TEMP_VAL_INT	
0x01	15:8	HOT_TEMP_VAL_INT	ROOM_TEMP_VAL_DEC
0x02	23:16	HOT_TEMP_VAL_DEC	HOT_TEMP_VAL_INT
0x03	31:24	ROOM_INT1V_VAL	
0x04	39:32	HOT_INT1V_VAL	
0x05	47:40	ROOM_ADC_VAL	
0x06	55:48	HOT_ADC_VAL	ROOM_ADC_VAL
0x07	63:56	HOT_ADC_VAL	

10.2.4 NVM Boot Configuration Row (BOCOR)

The Non-Volatile Memory Boot Configuration Row (BOCOR) contains device configuration data that are automatically read by the Boot ROM program at device startup.

This row can be updated using the NVMCTRL peripheral.

When writing to the NVM Boot Configuration Row, the new values are not loaded by the other peripherals on the device until a device reset occurs.

The NVM Boot Configuration Row can be read at address 0x0080C000.

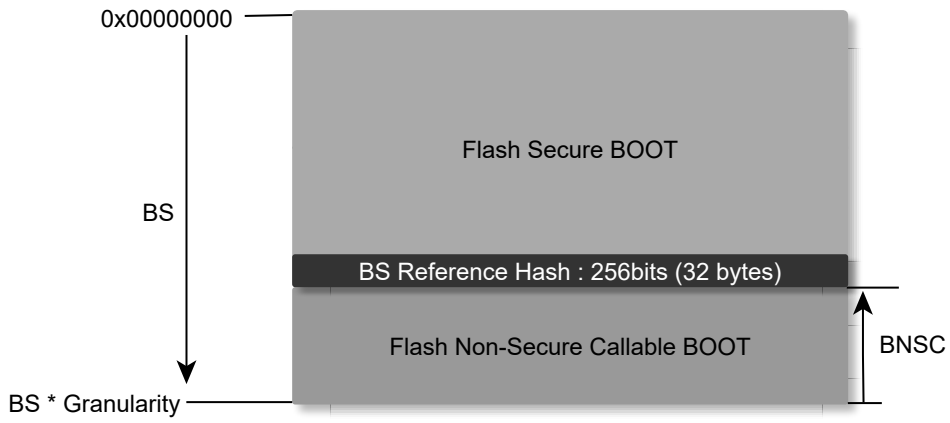
SAM L10 and SAM L11 have different NVM Boot Configuration Row mappings.

10.2.4.1 SAM L10 Boot Configuration Row

Table 10-16. SAM L10 BOCOR Bitfields Definition

Bit Pos.	Name	Usage	Factory Setting	Related Peripheral Register
31:0	Reserved	Reserved	Reserved	Reserved
39:32	BOOTPROT	Boot Protection size = BOOTPROT*0x100	0x00	Boot ROM

Figure 14-4. BS Hash location in BS memory area



Important: The Non-Secure BOOT region as well as Secure or Non-Secure APPLICATION regions are not part of the Secure Boot verification. So if an authentication of one of these memory regions is required, it must be handled by the user code itself.

14.4.2.3.3 BOCOR Verification

When BOOTOPT>0, the hash for the NVM BOCOR row is computed on the whole NVM BOCOR row excluding BOCORHASH fuse value which is the fuse where to store the hash reference value [0x80C00E0:0x80C00FF]:

BOCOR Offset	Bit Position	Name
0xE0-0xFF	2047:1792	BOCORHASH

14.4.2.4 Typical Boot Timings

Depending on the boot authentication options, the Boot ROM will require a certain time to complete its different tasks.

The delay is given from the release of the CPU reset to the execution of the first instruction of the user code.

Table 14-5. SAM L11 Typical Boot Timings

Boot options	Time to reach User Code
BOOTOPT=0	2.30 ms
BOOTOPT=1, BS=0x40	207 ms
BOOTOPT=1, BS=0x80	409 ms
BOOTOPT=2, BS=0x40	209 ms
BOOTOPT=2, BS=0x80	411 ms

14.4.3 Debug Access Levels

The SAM L10 has only two debug access levels (DAL):

- DAL2: Highest debug level access with no restrictions in term of memory and peripheral accesses.
- DAL0: No access is authorized except with a debugger using the Boot ROM Interactive mode.

16.6.3 Debugger Probe Detection

16.6.3.1 Cold Plugging

Cold-Plugging is the detection of a debugger when the system is in reset. Cold-Plugging is detected when the CPU reset extension is requested, as described above.

16.6.3.2 Hot Plugging

Hot-Plugging is the detection of a debugger probe when the system is not in reset. Hot-Plugging is not possible under reset because the detector is reset when POR or $\overline{\text{RESET}}$ are asserted. Hot-Plugging is active when a SWCLK falling edge is detected. The SWCLK pad is multiplexed with other functions and the user must ensure that its default function is assigned to the debug system. If the SWCLK function is changed, the Hot-Plugging feature is disabled until a power-reset or external reset occurs. Availability of the Hot-Plugging feature can be read from the Hot-Plugging Enable bit of the Status B register (STATUSB.HPE).

Figure 16-3. Hot-Plugging Detection Timing Diagram

The presence of a debugger probe is detected when either Hot-Plugging or Cold-Plugging is detected. Once detected, the Debugger Present bit of the Status B register (STATUSB.DBGPRES) is set. For security reasons, Hot-Plugging is not available when DAL equals to 0x0.

This detection requires that pads are correctly powered. Thus, at cold startup, this detection cannot be done until POR is released. If DAL equals 0x0, Cold-Plugging is the only way to detect a debugger probe, and so the external reset timing must be longer than the POR timing. If external reset is de-asserted before POR release, the user must retry the procedure above until it gets connected to the device.

Related Links

30. NVMCTRL – Nonvolatile Memory Controller

16.6.4 Boot Communication Channels

Boot Communication Channels allow communication between a debug adapter and the CPU executing the Boot ROM at startup. The Boot ROM implements system level commands. Refer to 14. Boot ROM for more information.

16.7 Programming

Programming the Flash or RAM memories is only possible when the debugger access level is sufficient to access the desired resource:

If DAL is equal to:

- 0x2: debugger can access secured and non-secure areas
- 0x1 (**SAM L11 only**): debugger can access only non-secure areas, refer to Table 16-4.

16.12.17 Peripheral Identification 4

Name: PID4
Offset: 0x1FD0
Reset: 0x00000000
Property: -

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
Access								
Reset								

Bit	15	14	13	12	11	10	9	8
Access								
Reset								

Bit	7	6	5	4	3	2	1	0
	FKBC[3:0]				JEPCC[3:0]			
Access	R	R	R	R	R	R	R	R
Reset	0	0	0	0	0	0	0	0

Bits 7:4 – FKBC[3:0] 4KB Count
These bits will always return zero when read, indicating that this debug component occupies one 4KB block.

Bits 3:0 – JEPCC[3:0] JEP-106 Continuation Code
These bits will always return zero when read.

23.8.9 DFLLULP Control

Name: DFLLULPCTRL
Offset: 0x1C
Reset: 0x0000
Property: PAC Write-Protection, Enable-Protected, Write-synchronized

Bit	15	14	13	12	11	10	9	8
						DIV[2:0]		
Access	R	R	R	R	R	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

Bit	7	6	5	4	3	2	1	0
	ONDEMAND	RUNSTDBY	DITHER	SAFE	BINSE		ENABLE	
Access	R/W	R/W	R/W	R/W	R/W		R/W	R
Reset	0	0	0	0	0		0	0

Bits 10:8 – DIV[2:0] Division Factor
This field defines the division factor for the output frequency of the DFLLULP.

This value from production test, which depends on PL0 or PL2 mode, must be copied from the NVM software calibration row into the DFLLULPCTRL register by software.

The value must be changed before switching on a new Performance Level mode (PL0 or PL2).

These bits are not synchronized.

Value	Name	Description
0x0	DIV1	Frequency divided by 1
0x1	DIV2	Frequency divided by 2
0x2	DIV4	Frequency divided by 4
0x3	DIV8	Frequency divided by 8
0x4	DIV16	Frequency divided by 16
0x5	DIV32	Frequency divided by 32
0x6 – 0x7	-	Reserved

Bit 7 – ONDEMAND On Demand
The On Demand operation mode allows the oscillator to be enabled or disabled, depending on peripheral clock requests.

If the ONDEMAND bit has been previously written to '1', the oscillator will be running only when requested by a peripheral. If there is no peripheral requesting the oscillator's clock source, the oscillator will be in a disabled state.

If On Demand is disabled, the oscillator will always be running when enabled.

In standby sleep mode, the On Demand operation is still active.

This bit is not enabled-protected. This bit is not synchronized.

25.8.4 Status

Name: STATUS
Offset: 0x0C
Reset: x,y initially determined from NVM User Row after reset
Property: -

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
Access								
Reset								

Bit	15	14	13	12	11	10	9	8
				ULPVREFRDY		VCORERDY		VREGRDY
Access				R		R		R
Reset				x		1		1

Bit	7	6	5	4	3	2	1	0
						B33SRDY	BOD33DET	BOD33RDY
Access						R	R	R
Reset						0	0	y

Bit 12 – ULPVREFRDY Low Power Voltage Reference Ready

Value	Description
0	The ULPVREF voltage is not as expected.
1	The ULPVREF voltage is the target voltage.

Bit 10 – VCORERDY VDDCORE Voltage Ready

Value	Description
0	The VDDCORE voltage is not as expected.
1	The VDDCORE voltage is the target voltage.

Bit 8 – VREGRDY Voltage Regulator Ready

Value	Description
0	The selected voltage regulator in VREG.SEL is not ready.
1	The voltage regulator selected in VREG.SEL is ready and the core domain is supplied by this voltage regulator.

Bit 2 – B33SRDY BOD33 Synchronization Ready

26.8.1 Control A

Name: CTRLA
Offset: 0x00
Reset: x initially determined from NVM User Row after reset
Property: PAC Write-Protection, Write-Synchronized

Bit	7	6	5	4	3	2	1	0
	ALWAYSON	RUNSTDBY				WEN	ENABLE	
Access	R/W	R/W				R/W	R/W	
Reset	x	x				x	x	

Bit 7 – ALWAYSON Always-On
This bit allows the WDT to run continuously. After being set, this bit cannot be written to '0', and the WDT will remain enabled until a power-on Reset is received. When this bit is '1', the Control A register (CTRLA), the Configuration register (CONFIG) and the Early Warning Control register (EWCTRL) will be read-only, and any writes to these registers are not allowed.

Writing a '0' to this bit has no effect.

This bit is not Enable-Protected.

This bit is loaded from NVM User Row at start-up.

Value	Description
0	The WDT is enabled and disabled through the ENABLE bit.
1	The WDT is enabled and can only be disabled by a power-on reset (POR).

Bit 6 – RUNSTDBY Run in Standby
This bit controls the behavior of the watchdog during standby sleep mode. This bit can only be written when CTRLA.ENABLE is zero or CTRLA.ALWAYSON is one:

- When CTRLA.ALWAYSON=0, this bit is enable-protected by CTRLA.ENABLE.
- When CTRLA.ALWAYSON=1, this bit is not enable-protected by CTRLA.ENABLE.

These bits are loaded from NVM User Row at startup.

Value	Description
0	The WDT is disabled during standby sleep.
1	The WDT is enabled continues to operate during standby sleep.

Bit 2 – WEN Watchdog Timer Window Mode Enable
This bit enables Window mode. It can only be written if the peripheral is disabled unless CTRLA.ALWAYSON=1. The initial value of this bit is loaded from Flash Calibration.

This bit is loaded from NVM User Row at startup.

Value	Description
0	Window mode is disabled (normal operation).
1	Window mode is enabled.

30.8.2 Control B

Name: CTRLB
Offset: 0x04
Reset: 0x00000080
Property: PAC Write-Protection, Write-Secure

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
						CACHEDIS	READMODE[1:0]	
Access						RW/R/RW	RW/R/RW	RW/R/RW
Reset						0	0	0

Bit	15	14	13	12	11	10	9	8
					FWUP		SLEEPPRM[1:0]	
Access					RW/R/RW		RW/R/RW	RW/R/RW
Reset					0		0	0

Bit	7	6	5	4	3	2	1	0
				RWS[3:0]				
Access				RW/R/RW	RW/R/RW	RW/R/RW	RW/R/RW	
Reset				0	0	0	0	

Bit 18 – CACHEDIS Cache Disable
This bit is used to disable the cache.

Value	Description
0	The cache is enabled
1	The cache is disabled

Bits 17:16 – READMODE[1:0] NVMCTRL Read Mode

Value	Name	Description
0x0	NO_MISS_PENALTY	The NVM Controller (cache system) does not insert wait states on a cache miss. Gives the best system performance.
0x1	LOW_POWER	Reduces power consumption of the cache system, but inserts a wait state each time there is a cache miss. This mode may not be relevant if CPU performance is required, as the application will be stalled and may lead to increased run time.
0x2	DETERMINISTIC	The cache system ensures that a cache hit or miss takes the same amount of time, determined by the number of programmed Flash wait states. This mode can be used for real-time applications that require deterministic execution timings.
0x3	Reserved	

31.8.3 Interrupt Enable Set

Name: INTENSET
Offset: 0x005
Reset: 0x00
Property: PAC Write-Protection

Bit	7	6	5	4	3	2	1	0
							DRP	ERR
Access							R/W	R/W
Reset							0	0

Bit 1 – DRP Data Remanence Prevention Complete Interrupt Enable
Writing a zero to this bit has no effect.

Writing a one to this bit will set the Data Remanence Prevention Complete Interrupt Enable bit, which enables the data remanence prevention complete interrupt.

Value	Description
0	Data remanence prevention complete interrupt is disabled.
1	Data remanence prevention complete interrupt is enabled.

Bit 0 – ERR TrustRAM Read Error Interrupt Enable
Writing a zero to this bit has no effect.

Writing a one to this bit will set the TrustRAM Read Error Interrupt Enable bit, which enables the TrustRAM read error interrupt.

Value	Description
0	TrustRAM read error interrupt is disabled.
1	TrustRAM read error interrupt is enabled.

PMUXO[3:0]	Name	Description
0x8	I	Peripheral function I selected
0x9-0xF	-	Reserved

Bits 3:0 – PMUXE[3:0] Peripheral Multiplexing for Even-Numbered Pin
These bits select the peripheral function for even-numbered pins (2*n) of a PORT group, if the corresponding PINCFGy.PMUXEN bit is '1'.

Not all possible values for this selection may be valid. For more details, refer to the *I/O Multiplexing and Considerations.*

PMUXE[3:0]	Name	Description
0x0	A	Peripheral function A selected
0x1	B	Peripheral function B selected
0x2	C	Peripheral function C selected
0x3	D	Peripheral function D selected
0x4	E	Peripheral function E selected
0x5	-	Reserved
0x6	G	Peripheral function G selected
0x7	H	Peripheral function H selected
0x8	I	Peripheral function I selected
0x9-0xF	-	Reserved

33.7.18 Channel Security Attribution Check

Name: NSCHKCHAN
Offset: 0x1DC
Reset: 0x00000000
Property: PAC Write-Protection

This register allows the user to select one or more channels to check their security attribution as non-secured.

Important: This register is only available for **SAM L11** and has no effect for **SAM L10**.

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
Access								
Reset								

Bit	15	14	13	12	11	10	9	8
Access								
Reset								

Bit	7	6	5	4	3	2	1	0
	CHANNELn[7:0]							
Access	RW/RW/RW	RW/RW/RW	RW/RW/RW	RW/RW/RW	RW/RW/RW	RW/RW/RW	RW/RW/RW	RW/RW/RW
Reset	0	0	0	0	0	0	0	0

Bits 7:0 – CHANNELn[7:0] Channel n Selection [n=7..0]
These bits selects the individual channels for security attribution check. If any channel selected in NSCHKCHAN has the corresponding bit in NONSECCHAN set to the opposite value, then the NSCHK interrupt flag will be set.

Value	Description
0	0-to-1 transition will be detected on corresponding NONSECCHAN bit.
1	1-to-0 transition will be detected on corresponding NONSECCHAN bit.

35.6.2.6 Data Reception

The receiver accepts data when a valid start bit is detected. Each bit following the start bit will be sampled according to the baud rate or XCK clock, and shifted into the receive shift register until the first stop bit of a frame is received. The second stop bit will be ignored by the receiver.

When the first stop bit is received and a complete serial frame is present in the receive shift register, the contents of the shift register will be moved into the two-level or four-level receive buffer. Then, the Receive Complete interrupt flag in the Interrupt Flag Status and Clear register (INTFLAG.RXC) will be set, and the optional interrupt will be generated.

The received data can be read from the DATA register when the Receive Complete interrupt flag is set.

35.6.2.6.1 Disabling the Receiver

Writing '0' to the Receiver Enable bit in the CTRLB register (CTRLB.RXEN) will disable the receiver, flush the two-level or four-level receive buffer, and data from ongoing receptions will be lost.

35.6.2.6.2 Error Bits

The USART receiver has three error bits in the Status (STATUS) register: Frame Error (FERR), Buffer Overflow (BUFOVF), and Parity Error (PERR). Once an error happens, the corresponding error bit will be set until it is cleared by writing ‘1’ to it. These bits are also cleared automatically when the receiver is disabled.

There are two methods for buffer overflow notification, selected by the Immediate Buffer Overflow Notification bit in the Control A register (CTRLA.IBON):

When CTRLA.IBON=1, STATUS.BUFOVF is raised immediately upon buffer overflow. Software can then empty the receive FIFO by reading RxDATA, until the receiver complete interrupt flag (INTFLAG.RXC) is cleared.

When CTRLA.IBON=0, the buffer overflow condition is attending data through the receive FIFO. After the received data is read, STATUS.BUFOVF will be set along with INTFLAG.RXC.

35.6.2.6.3 Asynchronous Data Reception

The USART includes a clock recovery and data recovery unit for handling asynchronous data reception.

The clock recovery logic can synchronize the incoming asynchronous serial frames at the RxD pin to the internally generated baud-rate clock.

The data recovery logic samples and applies a low-pass filter to each incoming bit, thereby improving the noise immunity of the receiver.

35.6.2.6.4 Asynchronous Operational Range

The operational range of the asynchronous reception depends on the accuracy of the internal baud-rate clock, the rate of the incoming frames, and the frame size (in number of bits). In addition, the operational range of the receiver is depending on the difference between the received bit rate and the internally generated baud rate. If the baud rate of an external transmitter is too high or too low compared to the internally generated baud rate, the receiver will not be able to synchronize the frames to the start bit.

There are two possible sources for a mismatch in baud rate: First, the reference clock will always have some minor instability. Second, the baud-rate generator cannot always do an exact division of the reference clock frequency to get the baud rate desired. In this case, the BAUD register value should be set to give the lowest possible error. Refer to *Clock Generation – Baud-Rate Generator* for details.

Recommended maximum receiver baud-rate errors for various character sizes are shown in the table below.

38.7.2.1 Control A

Name: CTRLA
Offset: 0x00
Reset: 0x00000000
Property: PAC Write-Protection, Write-Synchronized, Enable-Protected

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
			COPEN1	COPEN0			CAPTEN1	CAPTEN0
Access			R/W	R/W			R/W	R/W
Reset			0	0			0	0

Bit	15	14	13	12	11	10	9	8
					ALOCK	PRESCALER[2:0]		
Access					R/W	R/W	R/W	R/W
Reset					0	0	0	0

Bit	7	6	5	4	3	2	1	0
	ONDEMAND	RUNSTDBY	PRESCSYNC[1:0]		MODE[1:0]		ENABLE	SWRST
Access	R/W	R/W	R/W	R/W	R/W	R/W	R/W	W
Reset	0	0	0	0	0	0	0	0

Bits 20, 21 – COPENx Capture On Pin x Enable
Bit x of COPEN[1:0] selects the trigger source for capture operation, either events or I/O pin input.

Value	Description
0	Event from Event System is selected as trigger source for capture operation on channel x.
1	I/O pin is selected as trigger source for capture operation on channel x.

Bits 16, 17 – CAPTENx Capture Channel x Enable
Bit x of CAPTEN[1:0] selects whether channel x is a capture or a compare channel.

These bits are not synchronized.

Value	Description
0	CAPTEN disables capture on channel x.
1	CAPTEN enables capture on channel x.

Bit 11 – ALOCK Auto Lock
When this bit is set, Lock bit update (LUPD) is set to '1' on each overflow/underflow or re-trigger event.

This bit is not synchronized.

38.7.2.12 Synchronization Busy

Name: SYNCBUSY
Offset: 0x10
Reset: 0x00000000
Property: -

Bit	31	30	29	28	27	26	25	24
Access								
Reset								

Bit	23	22	21	20	19	18	17	16
Access								
Reset								

Bit	15	14	13	12	11	10	9	8
Access								
Reset								

Bit	7	6	5	4	3	2	1	0
		CCx	PER	COUNT	STATUS	CTRLB	ENABLE	SWRST
Access		R	R	R	R	R	R	R
Reset		0	0	0	0	0	0	0

Bit 6 – CCx Compare/Capture Channel x Synchronization Busy
For details on CC channels number, refer to each TC feature list.

This bit is set when the synchronization of CCx between clock domains is started.

This bit is also set when the CCBUFx is written, and cleared on update condition. The bit is automatically cleared when the STATUS.CCBUFx bit is cleared.

Bit 5 – PER PER Synchronization Busy
This bit is cleared when the synchronization of PER between the clock domains is complete.

This bit is set when the synchronization of PER between clock domains is started.

This bit is also set when the PER is written, and cleared on update condition. The bit is automatically cleared when the STATUS.PERBUF bit is cleared.

Bit 4 – COUNT COUNT Synchronization Busy
This bit is cleared when the synchronization of COUNT between the clock domains is complete.

This bit is set when the synchronization of COUNT between clock domains is started.

Bit 3 – STATUS STATUS Synchronization Busy
This bit is cleared when the synchronization of STATUS between the clock domains is complete.

This bit is set when a '1' is written to the Capture Channel Buffer Valid status flags (STATUS.CCBUFVx) and the synchronization of STATUS between clock domains is started.

Bit 2 – CTRLB CTRLB Synchronization Busy
This bit is cleared when the synchronization of CTRLB between the clock domains is complete.

This bit is set when the synchronization of CTRLB between clock domains is started.

Bit 1 – ENABLE ENABLE Synchronization Busy
This bit is cleared when the synchronization of ENABLE bit between the clock domains is complete.

This bit is set when the synchronization of ENABLE bit between clock domains is started.

Bit 0 – SWRST SWRST Synchronization Busy
This bit is cleared when the synchronization of SWRST bit between the clock domains is complete.

This bit is set when the synchronization of SWRST bit between clock domains is started.

41.8.1 Control A

Name: CTRLA
Offset: 0x00
Reset: 0x00
Property: PAC Write-Protection, Write-Synchronized

Bit	7	6	5	4	3	2	1	0
	ONDEMAND	RUNSTDBY					ENABLE	SWRST
Access	R/W	R/W					R/W	R/W
Reset	0	0					0	0

Bit 7 – ONDEMAND On Demand Control
The On Demand operation mode allows the ADC to be enabled or disabled, depending on other peripheral requests.

In On Demand operation mode, i.e., if the ONDEMAND bit has been previously set, the ADC will only be running when requested by a peripheral. If there is no peripheral requesting the ADC will be in a disable state.

If On Demand is disabled the ADC will always be running when enabled.

In standby sleep mode, the On Demand operation is still active if the CTRLA.RUNSTDBY bit is '1'. If CTRLA.RUNSTDBY is '0', the ADC is disabled.

This bit is not synchronized.

Value	Description
0	The ADC is always on , if enabled.
1	The ADC is enabled, when a peripheral is requesting the ADC conversion. The ADC is disabled if no peripheral is requesting it.

Bit 6 – RUNSTDBY Run in Standby
This bit controls how the ADC behaves during standby sleep mode.

This bit is not synchronized.

Value	Description
0	The ADC is halted during standby sleep mode.
1	The ADC is not stopped in standby sleep mode. If CTRLA.ONDEMAND=1, the ADC will be running when a peripheral is requesting it. If CTRLA.ONDEMAND=0, the ADC will always be running in standby sleep mode.

Bit 1 – ENABLE Enable
Due to synchronization there is delay from writing CTRLA.ENABLE until the peripheral is enabled/disabled. The value written to CTRL.ENABLE will read back immediately and the ENABLE bit in the SYNCBUSY register (SYNCBUSY.ENABLE) will be set. SYNCBUSY.ENABLE will be cleared when the operation is complete.

Value	Description
0	The ADC is disabled.
1	The ADC is enabled.

41.8.5 Interrupt Enable Clear

Name: INTENCLR
Offset: 0x04
Reset: 0x00
Property: PAC Write-Protection

This register allows the user to disable an interrupt without doing a read-modify-write operation. Changes in this register will also be reflected in the Interrupt Enable Set (INTENSET) register.

Bit	7	6	5	4	3	2	1	0
						WINMON	OVERRUN	RESRDY
Access						R/W	R/W	R/W
Reset						0	0	0

Bit 2 – WINMON Window Monitor Interrupt Enable
Writing a '0' to this bit has no effect.

Writing a '1' to this bit will clear the Window Monitor Interrupt Enable bit, which disables the corresponding interrupt request.

Value	Description
0	The window monitor interrupt is disabled.
1	The window monitor interrupt is enabled, and an interrupt request will be generated when the Window Monitor interrupt flag is set.

Bit 1 – OVERRUN Overrun Interrupt Enable
Writing a '0' to this bit has no effect.

Writing a '1' to this bit will clear the Overrun Interrupt Enable bit, which disables the corresponding interrupt request.

Value	Description
0	The Overrun interrupt is disabled.
1	The Overrun interrupt is enabled, and an interrupt request will be generated when the Overrun interrupt flag is set.

Bit 0 – RESRDY Result Ready Interrupt Enable
Writing a '0' to this bit has no effect.

Writing a '1' to this bit will clear the Result Ready Interrupt Enable bit, which disables the corresponding interrupt request.

Value	Description
0	The Result Ready interrupt is disabled.
1	The Result Ready interrupt is enabled, and an interrupt request will be generated when the Result Ready interrupt flag is set.

Mode	Conditions	Regulator	PL	CPU Clock	Vcc	Ta	Typ.	Max.	Units
		BUCK	PL0	DFLLUP at 8 MHz	1.8V		28.1	72	
					3.3V		18.5	47	
				OSC 8 MHz	1.8V		32.2	73	
					3.3V		25.3	51	
				OSC 4 MHz	1.8V		38.4	121	
					3.3V		31.9	86	
			PL2	FDPLL96 at 32 MHz	1.8V		41.5	55	
					3.3V		24.6	34	
				DFLLULP at 32 MHz	1.8V		37.1	53	
					3.3V		22.0	32	
IDLE		LDO	PL0	DFLLUP at 8 MHz	1.8V		16.0	81	
					3.3V		16.2	82	
				OSC 8 MHz	1.8V		19.8	82	
					3.3V		22.0	85	
				OSC 4 MHz	1.8V		26.2	152	
					3.3V		29.2	157	
			PL2	FDPLL96 at 32 MHz	1.8V		20.3	54	
					3.3V		20.4	54	
				DFLLULP at 32 MHz	1.8V		14.3	32	
					3.3V		14.4	33	
		BUCK	PL0	DFLLUP at 8 MHz	1.8V		11.1	52	
					3.3V		8.3	35	
				OSC 8 MHz	1.8V		15.5	55	
					3.3V		15.2	40	
				OSC 4 MHz	1.8V		21.3	100	
					3.3V		21.6	73	
			PL2	FDPLL96 at 32 MHz	1.8V		14.9	30	
					3.3V		9.1	19	
				DFLLULP at 32 MHz	1.8V		10.6	24	
					3.3V		6.7	15	