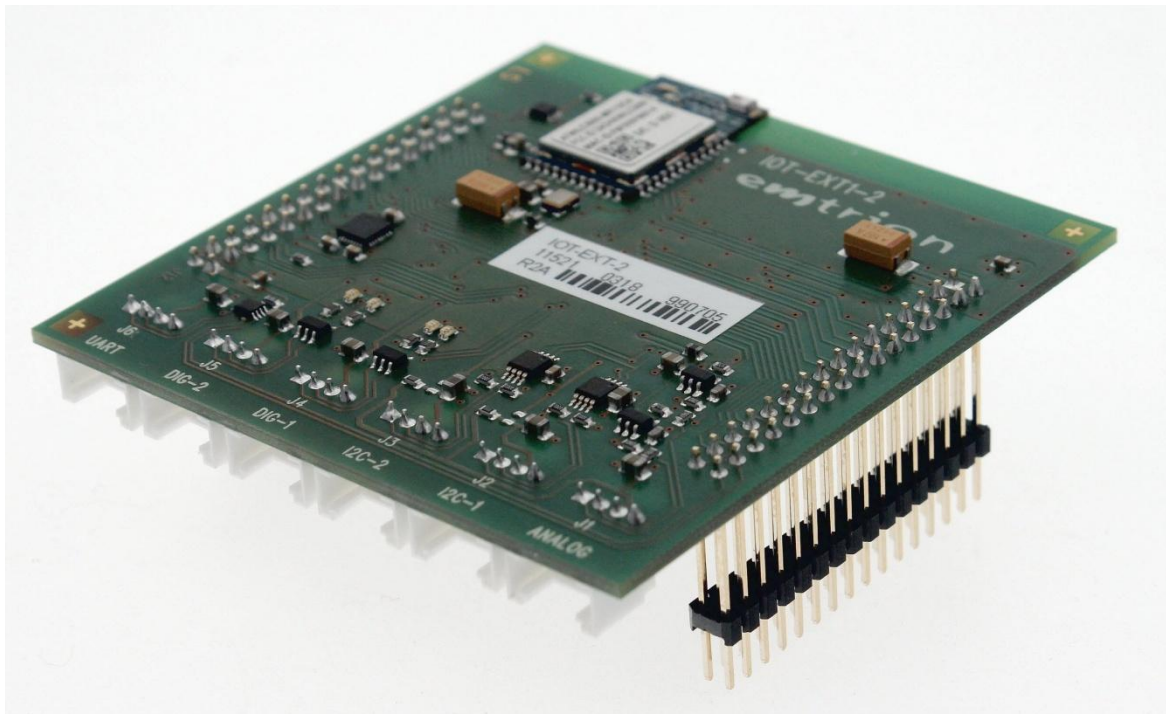


IOT-EXT1

Hardware Description

Rev2/19.03.2018



All rights reserved. This documentation may not be photocopied or recorded on any electronic media without written approval. The information contained in this documentation is subject to change without prior notice. We assume no liability for erroneous information or its consequences. Trademarks used from other companies refer exclusively to the products of those companies.

Revision: **2 / 19.03.2018**

Rev	Date/Signature	Changes
1	30.11.2017/Bue	First revision
2	19.03.2018/Bue	Minor corrections

Content

- 1 Introduction.....4
- 2 Block Diagram4
- 3 Functional Description5
 - 3.1 Wireless module5
 - 3.2 TPM5
 - 3.3 I/O connectors.....5
 - 3.3.1 Introduction5
 - 3.3.2 Analog Inputs5
 - 3.3.3 I2C Interface5
 - 3.3.4 Digital IOs.....6
 - 3.3.5 UART6
- 4 Dimensions6
- 5 Connectors.....7
 - 5.1 J1: Analog Input.....7
 - 5.2 J2 and J3: I2C Interface.....7
 - 5.3 J4: GPIO17
 - 5.4 J5: GPIO27
 - 5.5 J6: UART.....7
 - 5.6 J11: CPU board connector8
 - 5.7 J12: CPU board connector8
- 6 Technical Characteristics9
 - 6.1 Electrical Specifications9
 - 6.2 Environmental Specifications.....9
 - 6.3 Mechanical Specifications9

1 Introduction

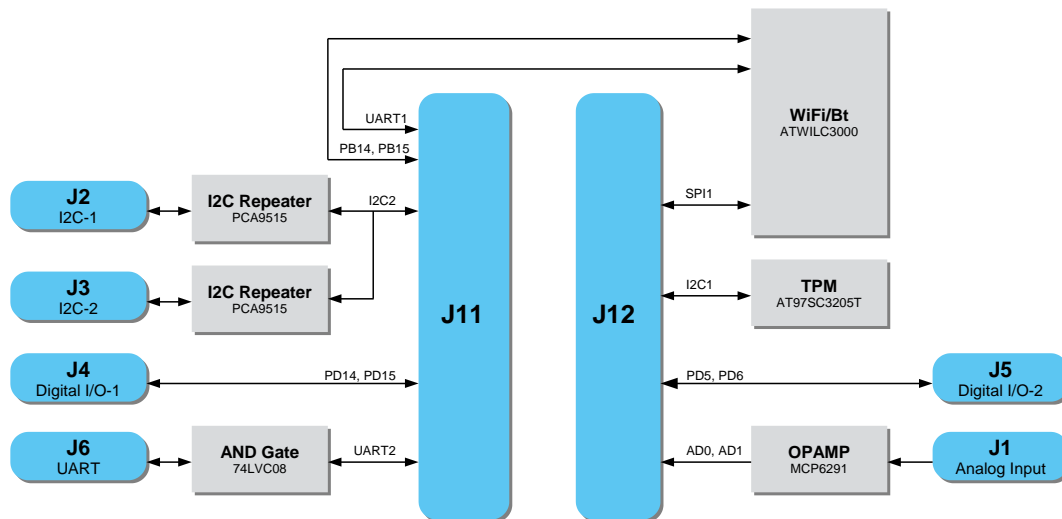
The IOT-EXT1 is an extension module for the CPU module SBC-SAMA5D36 which provides WiFi/Bluetooth interfaces to connect the CPU to wireless networks.

Besides the wireless interfaces the module contains six I/O connectors that comply with the Grove sensor system from the company Seeed. Suitable sensors can be purchased from many distributors.

To support secure communication a TPM is provided on the IOT-EXT1. Further security building blocks are already integrated in the CPU SAMA5D36 itself.

The module is plugged upside down onto the CPU module with 24 mm distance between the PCBs.

2 Block Diagram



3 Functional Description

3.1 Wireless module

A WiFi/Bluetooth module ATWILC3000 from Microchip is incorporated. The WiFi interface conforms to IEEE® 802.11 b/g/n. The Bluetooth interface is Bluetooth® 4.0 compliant and optimized for low-power mobile applications.

The following connections between the wireless module and the CPU SAMA5D36 are used:

- The WiFi interface is connected to the interface SPI1
- The Bluetooth interface is connected to the interface UART1
- UART0 is connected to the debug UART interface of the ATWILC3000.
- By a Low level of GPIO PB14 the wireless module is disabled.
- By a Low level of GPIO PB25 the wireless module is set into reset state.
- Interrupts from the wireless module are available at GPIO PB15.

3.2 TPM

A TPM AT97SC3205T from Microchip is provided for cryptographic key management.

The TPM is connected to the I²C interface TWI1. Its 7-bit I²C address is 0x29.

By a Low level of the GPIO PD19 the TPM is set into reset state.

3.3 I/O connectors

3.3.1 Introduction

Six connectors that comply with the Grove standard from Seeed are provided to connect sensors and actors. The six connectors have the following characteristics:

- 2 * I²C, with selectable 3.3V or 5V high level
- 2 * 2 bit GPIO
- 1 * UART
- 1 * 2 channel analog input

3.3.2 Analog Inputs

The analog inputs AD0 and AD1 are available at the connector. The inputs are protected by OPAMPs which also serve as impedance converter.

The voltage range of the inputs is 0 .. 5 VDC. The input impedance is 156 kΩ.

3.3.3 I²C Interface

Both I²C interface connectors are connected in parallel to interface TWI2. The interfaces are protected and separated from each other by repeaters PCA9515A.

The high level and power supply at pin 3 of the connectors can be configured to be 3.3V or 5V by soldering 0R bridges. By default 5V level is configured.

3.3.4 Digital IOs

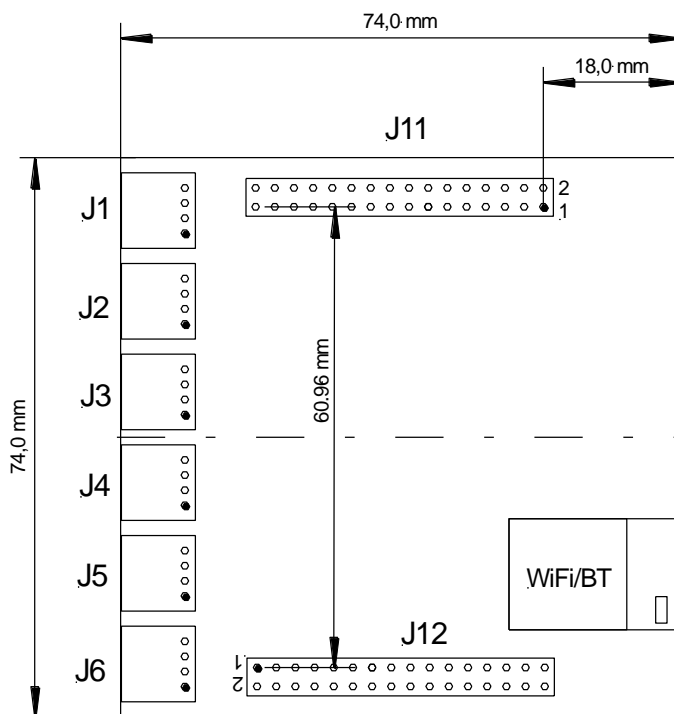
The digital GPIOs PD14, PD15, PD5 and PD6 of the SAMA5D36 CPU are available at the Digital IO connectors. The pins are protected from overvoltage by Transil diodes.

Yellow LEDs which shine when the line is high signal the level of the lines. The burden by the LEDs is 3 mA.

3.3.5 UART

The receive input RxD and the transmit output TxD of UART2 are connected. The pins are protected by LVC gates.

4 Dimensions



5 Connectors

5.1 J1: Analog Input

Type Grove connector

Function	Pin
AD0	1
AD1	2
5V	3
GND	4

5.2 J2 and J3: I2C Interface

Type Grove connector

Function	Pin
SCL	1
SDA	2
3V3/5V*	3
GND	4

* Default configuration

5.3 J4: GPIO1

Type Grove connector

Function	Pin
PD14	1
PD15	2
3V3	3
GND	4

5.4 J5: GPIO2

Type Grove connector

Function	Pin
PD5	1
PD6	2
3V3	3
GND	4

5.5 J6: UART

Type Grove connector

Function	Pin
RxD	1
TxD	2
3V3	3
GND	4

5.6 J11: CPU board connector

Type 16 * 2 pin header, 2.54 mm pitch

Function	Pin		Function
5V	1	2	3V3
GND	3	4	GND
-	5	6	RESET#
GND	7	8	-
PB14	9	10	TWD2
PB15	11	12	TCK2
PD14	13	14	-
PD15	15	16	-
-	17	18	-
RXD0	19	20	-
TXD0	21	22	-
PB25	23	24	-
CTS1	25	26	-
RTS1	27	28	-
RXD1	29	30	RXD2
TXD1	31	32	TXD2

5.7 J12: CPU board connector

Type 16 * 2 pin header, 2.54 mm pitch

Function	Pin		Function
3V3	1	2	3V3
GND	3	4	GND
-	5	6	MISO1
-	7	8	MOSI1
-	9	10	SCK1
-	11	12	CS0_1#
-	13	14	TWD1
-	15	16	TWCK1
-	17	18	-
-	19	20	-
-	21	22	PD19
-	23	24	AD0
PD5	25	26	AD1
PD6	27	28	-
-	29	30	-
-	31	32	-

6 Technical Characteristics

6.1 Electrical Specifications

Supply voltage	3.3 V, +/-5%
Current consumption	0.1 A (no I/O connector plugged)

6.2 Environmental Specifications

Operating temperature	Standard: 0°C ... +70°C -ET: -40°C ... +85°C
Storage temperature	-40 ... +125°C
Relative humidity	0 ... 95 %, non-condensing

6.3 Mechanical Specifications

Weight	approx. 80 g
Board	Glasepoxi FR-4, UL-listed, 2 layers
Dimensions	74 mm x 74.0 mm x 30.0 mm