



EVE2 BLE RS485

Datasheet

Main features

Software

- Micro-kernel with scheduling, power and clock manage
- ment
- Contiki OS
- Tickless design
- Drivers for peripherals
- Bluetooth® 4.1 compliant low energy single-mode protocol stack
- BLE Central and Peripheral side
- NFC
- Remote software upgrade
- UART/RS485 drivers and Modbus protocols

Hardware

- 32-bits Cortex M4 microcontroller from Nordic Semiconductor
- Up to 64MHz CPU speed
- 512 kbytes program FLASH
- 64 kbytes RAM
- 8 Mbytes serial FLASH
- 19 I/O including ADC, Comparators, SPI, UART, I²C, PWM etc.
- Runs from 1.9V-3.6V battery voltage and 5V
- Built-in 3.3V voltage regulator
- Built-in power source selector
- Extreme low power consumption
- UART driver and RS485 transceiver
- 18 x 40 x 3.0 mm



EVE2 BLE RS485 module – actual size

General description

The EVE Platform is an integrated hardware and software platform solution engineered to provide a robust and flexible base for individual product development. Implementing EVE in new products fast-tracks the design process to a detail-design level and reduces the overall cost and time-to-market.

The EVE Platform features standardized IO, common OS and drivers and ultra-low power consumption.

All EVE modules provide full operation capabilities from an APP at smartphones, tablet etc. via BLE (Bluetooth Low Energy). System configuration, firmware upgrade, service functions and log and data reading are easy to do from an APP via BLE.

RS485 description

The UART/RS485 physical layer gives support for UART communication and higher level Modbus protocol.

The EVE2 BLE RS485 supports datarate up to 921600 bps.

Applications

- Industrial control
- Security
- Measurement & data acquisition
- Residences and hotels
- Fire alarm systems
- Medical & Healthcare
- Telecom
- Ship & Offshore
- Yachts
- Recreation
- Consumer electronic

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1 EVE PLATFORM INTRODUCTION

1.1 For all modules

The EVE Platform is a robust, flexible and cost-effective technological platform for a wide range of electronic products and industries. The EVE Platform has been developed and engineered by industry professionals using proven technology and high quality components. All modules are fully tested and certified before delivery, eliminating the need for additional time or cost outlays.

The EVE Platform is designed for optimal integration and fulfills the common technical requirements for product development. All EVE modules are engineered with standardized IO, common OS and drivers, with focus on ultra-low power consumption.

The EVE modules are using the same core functionality and technology, and are differentiated by the communication carrier system they use.

The following features are identical for all EVE modules:

- 19 I/O (ADC, Comparators, SPI, UART, I²C, PWM etc.)
- Pinout
- Ultra-low power microcontroller
- BLE
- NFC
- OS, drivers and development environments
- Filesystem

1.2 RS485

The EVE RS485 module uses the SC16IS750 UART and the SN65HVD1781 fault-protected RS485 transceiver. The module implements RS485 with up to 921600 bps operation. Connectivity part of the module can be turned off to save power.

The RS485 transceiver can be bypassed in case an other external RS485 transceiver should be used.

The platform provides a generic device driver for the UART as well as a top-level Modbus protocol stack.

2 ELECTRICAL CHARACTERISTICS

2.1 General part

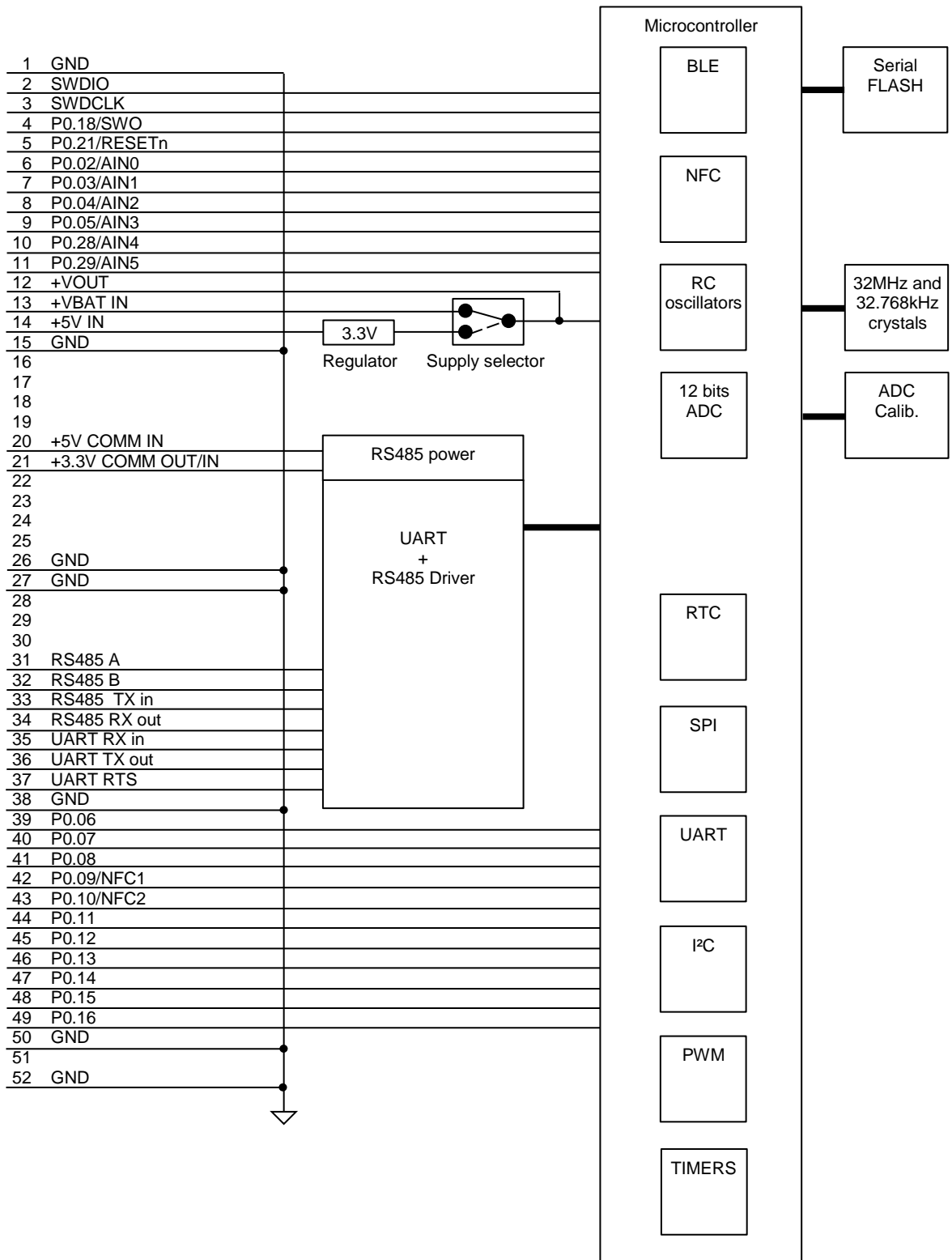
Parameter	Value
Supply voltage +VBAT IN	1.9 V – 3.6 V
Supply voltage +5V IN	2.7 V – 5.5 V
Supply voltage +5V IN if VOUT = 3.3V is required	3.6 V – 5.5 V
Temperature range	-40 °C to +85 °C
Current consumption +VBAT IN (typical):	
• Power down	1 µA
• Idle + RTC	3 µA
• BLE advertising 1/sec	20 µA
• BLE connected; 10msec interval, slave latency=0	400 µA
• BLE connected; 10msec interval, slave latency=49	18 µA
• BLE connected; 100msec interval, slave latency=0	50 µA
• BLE connected; 100msec interval, slave latency=4	18 µA
• BLE connected; 200msec interval, slave latency=0	30 µA
• BLE connected; 500msec interval, slave latency=0	18 µA
• “While (1)” loop	3 mA
Current consumption +5V IN (typical):	
• Power down	110 µA
• BLE advertising 1/sec	130 µA
IO output current capacity selection L / H (typical @ 1.9V)	2 / 2 mA
IO output current capacity selection L / H (typical @ 2.7V)	10 / 9 mA

2.2 RS485 part

Parameter	Value
Supply voltage +5V COMM IN	4.5 V – 5.5 V
Supply voltage +3.3V COMM IN	3.1 V – 3.5 V

3 BLOCK DIAGRAM

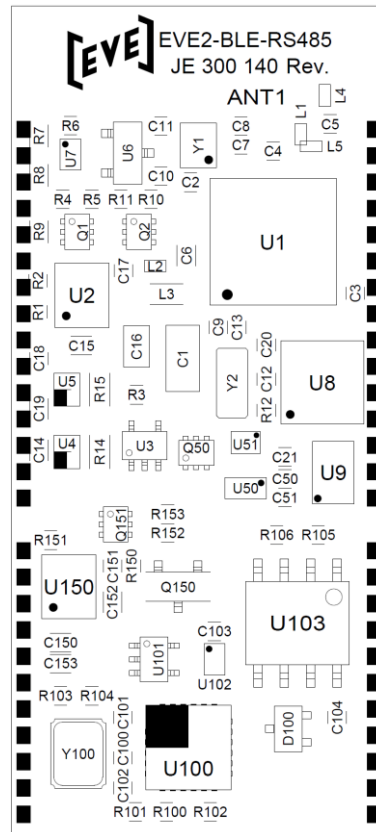
The block diagram shows edge connector number, power blocks, microcontroller, memory, RS485 power/driver and wiring.



4 IO DESCRIPTION

4.1 Pinout

Function	Pin
GND	1
SWDIO	2
SWDCLK	3
SWO/P0.18	4
RESETn/P0.21	5
AIN0/P0.02	6
AIN1/P0.03	7
AIN2/P0.04	8
AIN3/P0.05	9
AIN4/P0.28	10
AIN5/P0.29	11
+VOUT	12
+VBAT IN	13
+5V IN	14
GND	15
(Reserved USB VBUS)	16
(Reserved USB DM)	17
(Reserved USB DP)	18
(Reserved USB ID)	19
+5V COMM IN	20
+3.3V COMM OUT/IN	21
(Reserved Ethernet RXP)	22
(Reserved Ethernet RXM)	23
(Reserved Ethernet TXP)	24
(Reserved Ethernet TXM)	25
GND	26

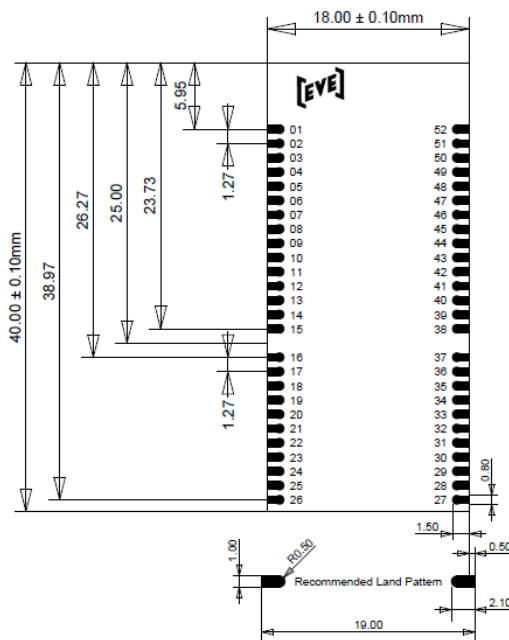


Pin	Function
52	GND
51	(Reserved BLE antenna)
50	GND
49	P0.16
48	P0.15
47	P0.14
46	P0.13
45	P0.12
44	P0.11
43	P0.10/NFC2
42	P0.09/NFC1
41	P0.08
40	P0.07
39	P0.06
38	GND
37	UART RTS
36	UART TX out
35	UART RX in
34	RS485 RX out
33	RS485 TX in
32	RS485 B
31	RS485 A
30	(Reserved Ethernet LED yellow)
29	(Reserved Ethernet LED green/GND)
28	(Reserved RF antenna)
27	GND

Common for all modules

Module specific IO

4.2 Module outline and recommended land pattern



5 HARDWARE DESCRIPTION

5.1 For all modules

The following information is applicable for the common part of all EVE modules.

5.1.1 Microcontroller

The EVE module are based on the microcontroller nRF52832 from Nordic Semiconductor which includes 512 kbytes program FLASH and 64kbytes RAM.

5.1.2 Serial FLASH

The modules contains 8 Mbytes serial flash.

A part of the serial FLASH is used for firmware upgrades, log data etc. The rest of the serial FLASH is available for use by the application software.

5.1.3 Power

5.1.3.1 Battery supply

The EVE module can operate from battery voltage connected to the +VBAT IN terminal. The supply voltage is monitored by the module.

5.1.3.2 +5V supply

The EVE module can operate from 5V connected to the +5V IN terminal. The supply voltage is regulated to 3.3V. Valid 3.3V is monitored by the module.

5.1.3.3 Supply voltage selector

The terminal +5V IN is selected to supply the module while valid voltage from the 3.3V regulator. If the regulator voltage is too low, the +VBAT IN will automatically be selected. The selected voltage is available at the terminal +VOUT.

5.2 RS485

5.2.1 UART driver and RS485 transceiver

The RS485 communication path consists of the UART driver SC16IS750IBS from NXP and the RS485 transceiver SN65HVD1781 from Texas Instruments. The RS485 transceiver is fault protected up to $\pm 70V$. RS485 is a half-duplex communication, but the HW also supports listening on the transmitter as well as a complete shutdown of the communication path.

5.2.2 Power

The UART driver and the RS485 transceiver at the EVE module can operate from 5V connected to the +5V COMM IN terminal. The supply voltage is regulated to 3.3V. Valid 3.3V is monitored by the module. The regulated voltage is available at the terminal +3.3V COMM OUT/IN.

The UART driver and the RS485 transceiver can also be powered from external 3.3V regulator at terminal +3.3V COMM OUT/IN. In this case the terminal +5V COMM IN must be connected to 0V.

6 FUNCTION DESCRIPTION

6.1 For all modules

The following functional description is common for the EVE Platform.

6.1.1 Micro-kernel

The software shipped with the EVE Platform implements a tiny and yet powerful micro-kernel, which provides basic system functionality such as:

- System clock, power and watchdog management
- Scheduling and delayed execution using workitems in μs and ms range
- Tickless system timer
- Drivers for EVE peripheral
- Built-in bootloader with in-circuit firmware upgrade functionality
- SWD debug print channel
- BLE
- NFC

6.1.2 OS

The EVE Platform are intended for Contiki OS environment. Contiki is a minimalistic OS, which has been designed, developed and maintained mainly by Adam Dunkels and Swedish Institute of Computer Science during the last 10 years under BSD license.

Contiki provides non-preemptive multitasking concept using protothreads, a type of lightweight stackless threads designed for severely memory constrained systems. Protothreads provides linear code execution for event-driven systems implemented in C.

In addition to multitasking and protothreads Contiki core provides synchronization primitives, event timers, static, pooled and dynamic memory allocation, as well as a lot of other primitives. EVE extends Contiki with functionality, provided by the micro-kernel, microwork scheduling and tickless design.

Contiki implements a file system (CoffeeFS), which can be rolled out on FLASH media with relatively small footprint. EVE provides external FLASH drivers and glue layer for the file system.

Contiki also provides a set of off-the-shelf applications which can be used as building blocks for products. The main focus within the set is communication protocols and stacks.

EVE extends Contiki with a Free-RTOS-like layer for the use-cases where traditional multitasking is more preferable. Existing Free-RTOS apps can be easily ported to EVE.

6.1.3 Bootloader

The EVE micro-kernel includes a bootloader which provides API for in-circuit re-flashing of the MCU. The bootloader supports firmware upgrade over BLE.

6.1.4 Debug interface

The two-pin SWD interface is used for debugging, and SWO interface is used for debug prints and traces. This standard interface means that almost any SWD/SDO-compatible ICE debugger can be used with the EVE.

The EVE Reference board has a built-in SWD/SDO GDB-compatible ICE debugger with USB interface for debugging. The debugger is supported by the EVE software development environment.

6.2 BLE

6.2.1 Protocols

Bluetooth® 4.1 compliant low energy single-mode protocol stack, S132 supported by Nordic nRF52832 device:

- Link layer, L2CAP, ATT, SM, GATT (Client and Server) and GAP

Central side functionality:

- Central and Observer roles - up to 8 simultaneous connections
- Security Manager including MITM and OOB pairing

Peripheral side functionality:

- Concurrent Peripheral and Broadcaster roles
- Full SMP support including MITM and OOB pairing

6.3 RS485

The EVE Platform provides a device driver for the UART with a generic UART API. It also provides a Modbus protocol stack for use with Modbus applications.

7 REVISION HISTORY

Revision:	Date:	Description
1.10	15. Aug. 2017	First release
1.21	27. Sep. 2017	Upgraded voltage ref. for ADC calibration and improved monitoring of valid +5V availability.

8 ORDERING INFORMATION

8.1 Part number structure

<EVE family>-<Interface>-<Comm. carrier>-<Flash size><Prod.version><Voltage>-<Revision>

Code	Possible values	Description
EVE family:	EVE2	
Interface:	BLE	
Comm. carrier:	blank	No extra communication carrier
	ETH	Ethernet communication carrier
	RS485	RS485 communication carrier
	CAN	CAN communication carrier
Flash size:	512	512 kbytes
Prod.version:	S	Production version (S=Standard)
Voltage:	3.3	3.3V
Revision:	Rx.yy	x = Main revision number, yy = Minor revision number

8.2 Available parts

Part number	Module Size	Pins	FLASH Size	Voltage	Status
EVE2-BLE-RS485-512S3.3-R1.10	18x40x3.0 mm	52	512 kbytes	3.3V	Obsolete
EVE2-BLE-RS485-512S3.3-R1.21	18x40x3.0 mm	52	512 kbytes	3.3V	Active