



EVE2 Reference Card

Datasheet

Main features

Debug

- SWD debug interface
- USB debugger

Software

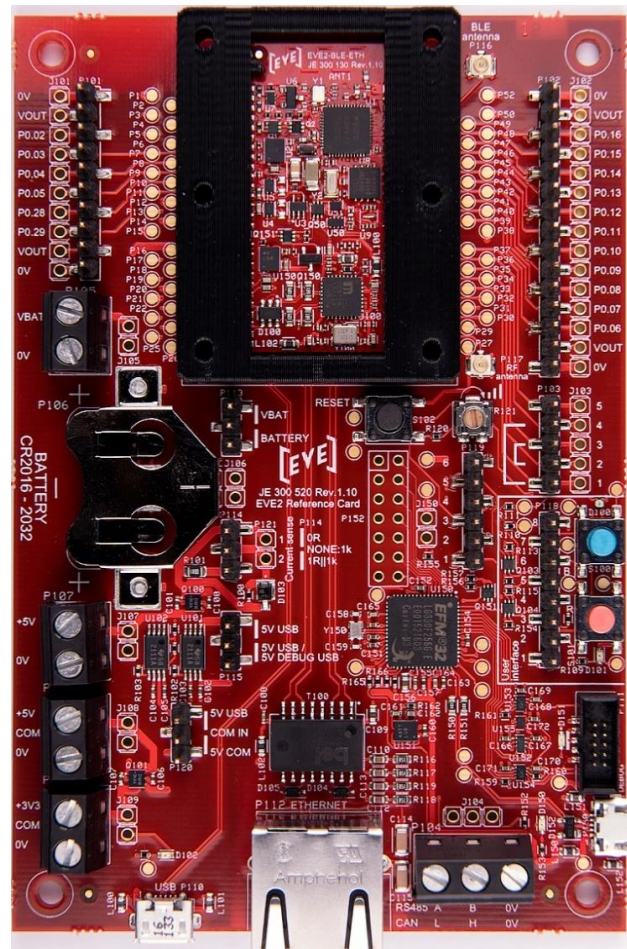
- ICE Debugger software for on-board or external debugging via USB

Hardware

- Socket for EVE2 modules
- SWD debug connector
- USB connector for on-board or external debugging
- Shunt resistors for current measurement
- Connectors for power and all module IO
- Connectors supporting communication carrier interface (Ethernet, RS485, CAN, USB)
- UMCC antenna connection for BLE and radio
- User Interface
 - 1 RGB LED
 - 1 green LED
 - 1 pot. meter
 - 2 general tactile switches
 - 1 reset switch
- Multiple power sources with priority setup by strapping
- Separate power connection for communication carrier part (Ethernet, RS485, CAN, USB)
- 80 x 120 mm

General description

The EVE Reference Card is a quick way for evaluation, prototyping and application development for the EVE modules.



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1 EVE REFERENCE CARD INTRODUCTION

1.1 Description

The EVE2 Reference Card is a useful tool to start working with the EVE2 modules. The card contains:

- General IO connectors
- User interface with switches, LEDs and pot. meter
- Connector for Ethernet and Ethernet transformer
- Connectors for the communication carriers RS485, CAN and USB
- Connectors for different ways of powering the Reference Card
- Connectors for external antenna for BLE and radio
- All power connections and the battery clips have polarity protection

The Reference Card can also be used for prototyping and application development.

In addition to the above features making the Reference Card very useful as a target for an EVE2 module project, the Reference Card can also be an ICE debugger for either an external target or a target running on the Reference Card itself.

2 REFERENCE CARD HW LAYOUT

2.1 EVE module and connectors

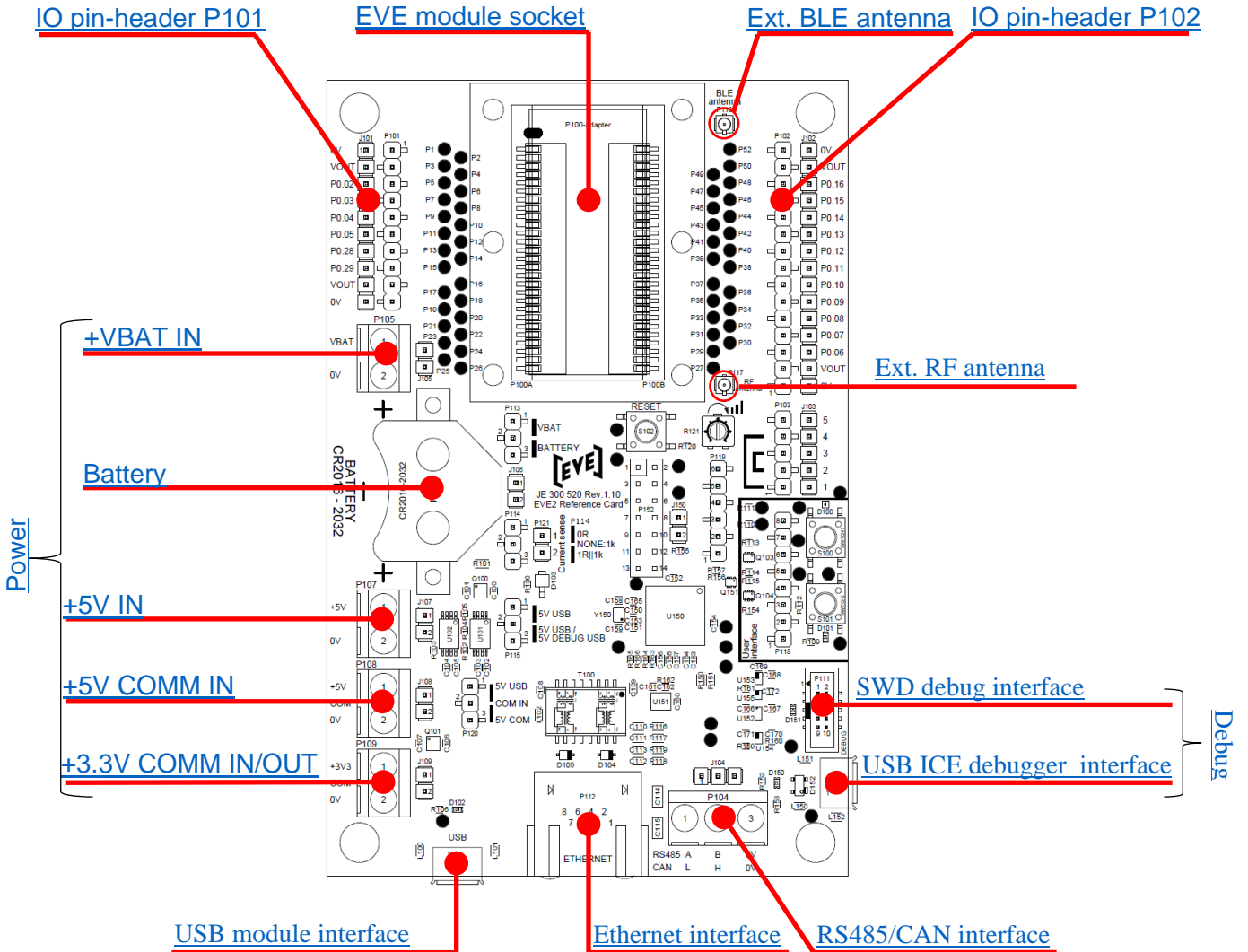


Figure 2.1 EVE module and connectors

Note! The connectors pointed out in the figure is described below.

2.1.1 EVE module socket

Socket where the EVE module is mounted to the Reference Card.

2.1.2 IO pin-header P101

A 10-pins header with general IO.

Pin 1 and 10 are connected to GND.

Pin 2 and 9 are connected to +VOUT.

Pin 3 through 8 are general IO (digital IO, ADC or analog comparator inputs).

2.1.3 IO pin-header P102

A 15-pins header with general-IO.

Pin 1 and 15 are connected to GND.

Pin 2 and 14 are connected to +VOUT.

Pin 3 through 13 are general digital IO. Pin 6 and 7 may be used for NFC.

2.1.4 Ext. BLE antenna

The UMCC antenna connector P116 is used for a production version of the EVE module where the internal BLE PCB antenna is replaced by a connection to an external BLE antenna.

2.1.5 Ext. RF antenna

The UMCC antenna connector P117 is used for modules with radio interface.

2.1.6 Debug

2.1.6.1 USB ICE debugger interface

The USB ICE debugger interface (an USB micro-B connector) P150, is used when running the EVE Reference Card as an ICE debugger. The debugger is connected to a PC through this USB connection.

The green LED D150 will be on if P150 is connected.

The connector may also be the +5V power source as described in [+5V selection](#).

2.1.6.2 SWD debug interface

The 10-pins SWD debug connector P111 is a connector for internal or external target.

2.1.6.3 ICE debugger and target configurations

The target for debugging may be either internal or external:

1. Internal target: An EVE module is mounted to the EVE Reference Card and the SWD debug connector P111 must be left opened/not connected. The EVE Reference Card is an ICE debugger and the EVE module is the target for test/debugging.
2. External target: The EVE module is not mounted to the EVE Reference Card (the EVE module socket is left open) and the external target is connected to the SWD debug connector P111. The EVE Reference Card is an ICE debugger connected to an external target.

Note that it is also possible to connect an external ICE debugger to the SWD debug interface, using the module mounted to the EVE Reference Card as the target. In this case the USB ICE debugger interface P150 must not be connected.

2.1.6.4 Configuration of the ICE debugger

The ICE debugger built in the EVE Reference Card can be configured via an embedded web-interface, available at the address <http://eve-dbg.local/index.html>. The configuration interface allows to change the card's IP address, set an alias host address for the card and configure role of the blue LED (D151), controlled by the debugger. See the embedded web-interface in the figure below.

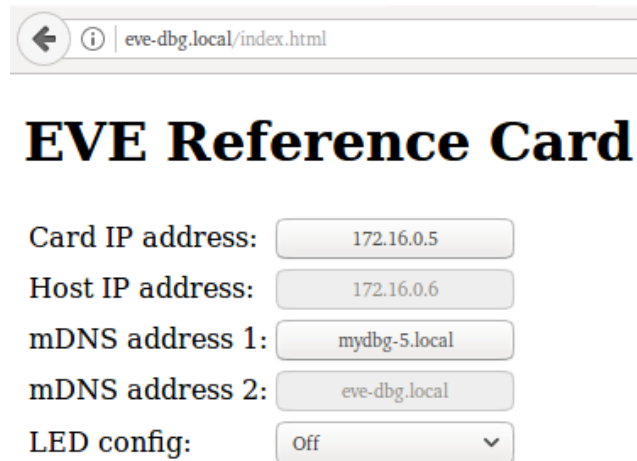


Figure 2.2 Embedded web-interface

2.1.6.5 Connection to the ICE debugger

The ICE debugger supports a standard GDB Remote Serial Protocol (RSP), so any GDB-compatible software can be used on the host side for debugging. Below you can find an example of a gdbinit script for the debugger. The example is for a given softdevice revision and a project file called ExampleDemo.

```
target remote 172.16.0.1:2331
define run
  mon reset
  cont
end
mon halt
mon swo EnableTarget 64000000 2000000 1 0
load /opt/nrf51sdk/s132_nrf52_2.0.1_softdevice.hex
load Build/ExampleDemo.elf
file Build/ExampleDemo.elf
run
```

The ICE debugger exposes module's SWO interface to the TCP port 2333. The SWO signal is part of the 10 pins SWD connector. See the [SWD debug interface](#). The interface can be accessed using any TCP terminal client like telnet or PuTTY. Example:

```
$ telnet 172.16.0.1 2333
EVE debugger: terminal output channel
.....
.....
Initialising
Processes running
[ETH] Waiting for link is up.
...
```

2.1.7 RS485/CAN interface

The screw terminal P104 can be used for RS485 or CAN connection according to Table 2.1. This is applicable for a Reference Card using an RS485 (EVE2_BLE_RS485) or a CAN (EVE2_BLE_CAN) module.

Table 2.1 RS485/CAN interface

Pin	Description
1	RS485 A or CAN Low
2	RS485 B or CAN High
3	GND

2.1.8 Ethernet interface

The connector P112 is used for Ethernet/RJ45 connection. This is applicable for a Reference Card using an Ethernet module (EVE2_BLE_ETH).

2.1.9 USB module interface

The connector P110 (USB micro-AB) is used for USB connection. This is applicable for a Reference Card using an USB module (EVE2_BLE_USB).

The green LED D102 will be on if P110 is connected.

The connector may also be the +5V power source as described in [+5V selection](#).

2.1.10 Power

All the EVE modules have a general part which is powered by either battery input (+VBAT IN) or +5V (+5V IN). The +5V input voltage is regulated to 3.3V, but if the regulated voltage is too low, the +VBAT IN will automatically be selected. The selected voltage is available at the terminal +VOUT. See the sub-sections +VBAT IN, Battery and +5V IN below.

For the battery input, the EVE Reference Card have two possibilities, either a battery could be mounted in the on-board battery clips P106, or it can be connected to the screw terminal input connector P105.

For the communication carrier part of the module, which is specific for each module, there is a separate power connection. The EVE Reference Card use the +5V COMM IN and/or +3.3V COMM IN/OUT screw terminals for powering the communication part. See the sub-sections +5V COMM IN and +3.3V COMM IN/OUT below.

Even if the EVE module power system is divided in a general part and module specific communication carrier part as described above, the EVE Reference Card also allow configuration/strapping so that both parts can be powered from one source.

2.1.10.1 VBAT

The screw terminal P105 can be used for connection of external battery supply. See section [Battery selection](#) for strapping of battery sources.

2.1.10.2 BATTERY

The battery clips P106 can be used for an on-board CR2016-2032 battery. See section [Battery selection](#) for strapping of battery sources to the EVE module.

2.1.10.3 +5V

The screw terminal P107 is the main +5V IN power source to the EVE module.
See section [+5V selection](#) for strapping of +5V IN source to the EVE module.

2.1.10.4 +5V COM

The screw terminal P108 is the main +5V COMM IN power source, used for the communication carrier system.
See section [+5V COMM selection](#) for strapping of +5V COMM IN source to the EVE module.

2.1.10.5 +3V3 COM

The screw terminal P109 is either an output or an input:

1. Output: Internally in the EVE module, +5V COMM IN voltage will be regulated to +3.3V, which will be output at EVE module pin 21 (+3.3V COMM OUT/IN) and available at the +3V3 COM connector.
2. Input: The communication carrier system can be powered from +3.3V at the +3V3 COM connector. In this case the voltage will be input at EVE module pin 21 (+3.3V COMM OUT/IN) and the connector +5V COM must be connected to 0V.

2.2 Strapping and user interface

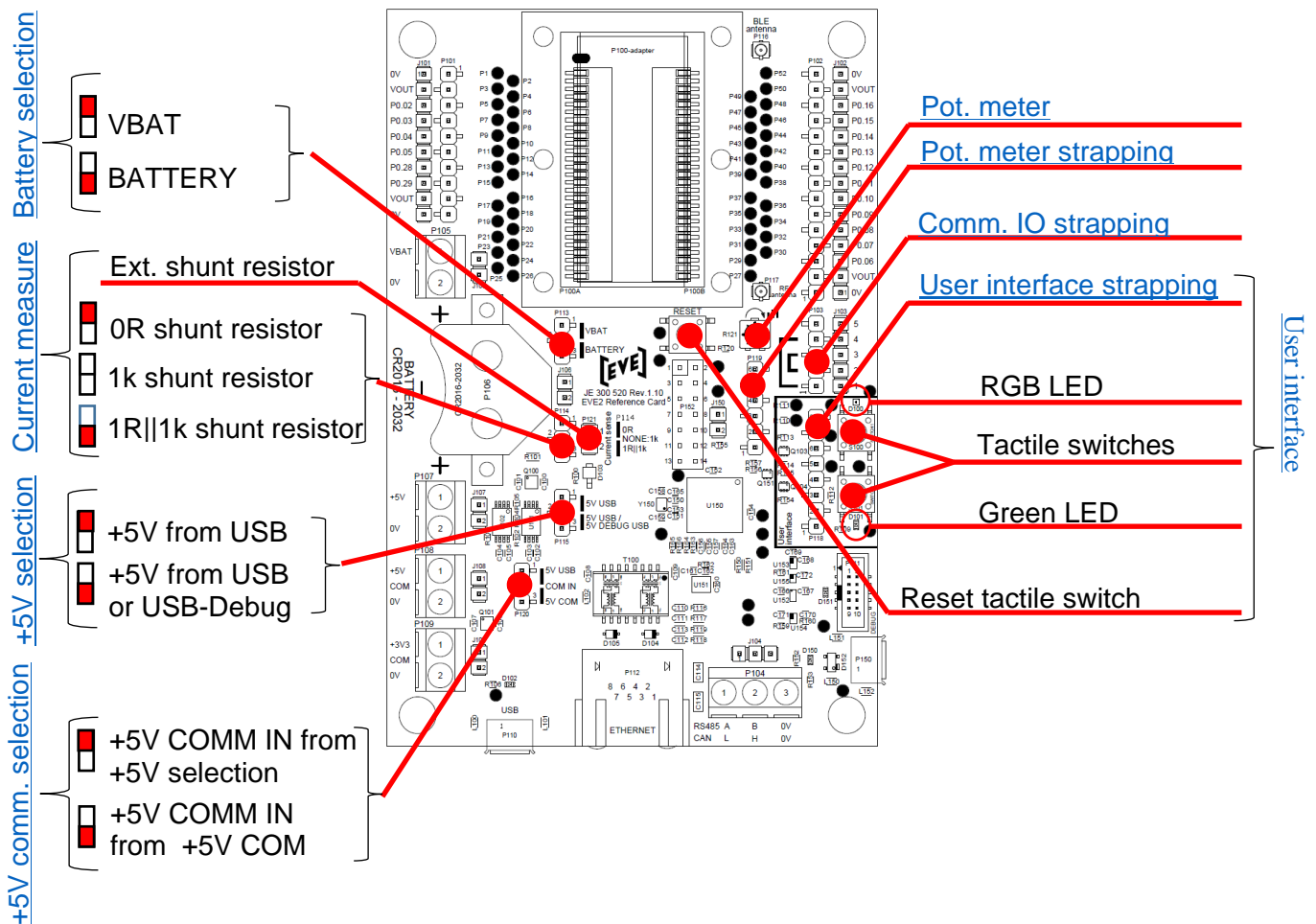


Figure 2.3 Strapping and user interface

Note! The strapping fields and user interface parts pointed out in the figure is described below.

2.2.1 Battery selection

Selection of the battery source input to the EVE module by pin-header P113.

Table 2.2 Battery selection

Strap position	Selection
upper	Screw terminal P105 (labeled VBAT)
lower	Battery clips P106 (labeled BATTERY)

2.2.2 +5V selection

The possible sources for +5V are:

- Connector P107 labeled +5V
- Connector for EVE2_BLE_USB module P110 labeled USB
- USB connector for debug P150 labeled DEBUG

The +5V connector P107 is the main source for +5V, i.e. if a voltage above 4.4V is available at this connector, it will have priority regardless of the strapping described in the below table. If +5V is not present at +5V connector P107, the following source is selected at P115:

Table 2.3 +5V selection by P115

Strap position	Source selection
upper	Connector P110 - USB
lower	Connector P110 or P150 (USB or DEBUG), whichever have the highest voltage

2.2.3 +5V COMM selection

Strapping of the +5V source input to the communication carrier part of the EVE module (+5V COMM IN) by the pin-header P120.

The +5V COM connector P108 is the main source for +5V to the communication carrier part, but the +5V source can also come from the general +5V selection. See section [+5V selection](#) and the table below.

Table 2.4 +5V COMM selection by P120

Strap position	Selection
upper	+5V COMM IN from general +5V selection
lower	+5V COMM IN from P108

2.2.4 Current measurement

The EVE Reference Card contains a network of resistors and the pin-header P114 for measuring the current flowing from the battery power source.

The table below describes strapping options for selection of on-board shunt resistors for this current measurement.

Table 2.5 Current measurement

Strap position	Selection
No strap	1k shunt resistor
upper	0R shunt resistor
lower	1R 1k shunt resistor

In addition to the shunt resistors described above, an external resistor may be connected in parallel to these, using the solder pads at P121. P121 is also useful for connection of a multimeter for measuring the shunt resistor voltage.

2.2.5 Comm. IO strapping

The connector/pin-header P103 can be used for setup of module internal or external RS485 transceiver/CAN controller.

Table 2.6 Use of internal RS485 transceiver/CAN driver


Pin position	Selection
1	 Strapping visualized
2	
3	
4	
5	Not applicable

Table 2.7 Use of external RS485 transceiver/CAN driver

Pin position	Selection
1	Not applicable
2	Not applicable
3	Connect to external transceiver/driver data output
4	Connect to external transceiver/driver data input
5	RTS/STBY signal to external transceiver/driver

2.2.6 Pot-meter

The Pot-meter R121 can be powered and connected to IO-input using the pin-header P119.

Table 2.8 Strapping for use of Reference Card pot-meter

Pin position	Selection
1	+VOUT
2	Supply to the pot-meter can be connected to pin 1 or strapped to another voltage \leq VOUT.
3	Connect of pot-meter output to any analog input. See the IO pin-header P101 pin 3 to 8.
4	GND
5	GND
6	GND

2.2.7 User interface

The user interface consist of the following parts:

1. 1 RGB LED (D100) for general use.
2. 1 green LED (D101) for general use.
3. 2 tactile switches (S100 and S101).
4. 1 tactile switch (S102) for reset of EVE module.

Strapping of the user interface can be done using the pin-header P118 as described in the table below.

Table 2.9 Strapping of user interface

Pin position	Selection
1	+VOUT
2	Input to the green LED. Can be connected to pin 1 or strapped to any general output at the IO pin-headers P101 or P102 .
3	Red input to RGB LED. Can be connected to pin 1 or strapped to any general output at the IO pin-headers P101 or P102 .
4	Green input to RGB LED. Can be connected to pin 1 or strapped to any general output at the IO pin-headers P101 or P102 .
5	Blue input to RGB LED. Can be connected to pin 1 or strapped to any general output at the IO pin-headers P101 or P102 .
6	Tactile switch 1 (S100, with blue cap) output can be connected to any Input pin. See the IO pin-headers P101 or P102
7	Tactile switch 2 (S101, with red cap) output can be connected to any Input pin. See the IO pin-headers P101 or P102
8	GND

3 REVISION HISTORY

Revision:	Date:	Description
1.11	17. Oct. 2017	First release

4 ORDERING INFORMATION

4.1 Part number structure

<EVE family>-REFCARD-<Revision>

Code	Possible values	Description
EVE family:	EVE2	
Revision:	Rx.yy	x = Major revision number, yy = Minor revision number

4.2 Available parts

Part number	Module Size	Status
EVE2-REFCARD-R1.11	80x120 mm	Active