NTL EVA BOARD

INTERFACE ADAPTER FOR

NTL10X OEM MODULES FAMILY

Manual

2020

CONTENTS

1 NTL EVA BOARD FEATURES

NTL Eva Board (interface adapter) is designed to match the interfaces of the NTL10X navigation OEM modules with standard connectors. It can be used at the design and testing stages of the software performance of the OEM modules.

The top of the NTL Eva Board is shown in figure 1.1, communication ports are presented Table 1.1.

Table 1.1 – List of ports provided in the NTL Eva Board

Interface type	Qt.	Port	Connector type	Name on board
RS232	3	COM1, COM2, COM3	DRB-09FA	X1, X2, X3
CAN	1	CAN	DRB-09FA	X13
Ethernet	1	LAN	HFJ11-E1G01ERL	X4
USB	2	STM FS USB (Mini USB), Virtual COM Port (Mini USB2)	Mini USB	X12, X6
JTAG	1	JTAG	BH-20	XP14
Connector for OEM modules	1	X7	PBD2-28	X7
Power connector	1	X5	PJ-002A	X5

S1: Reset button X4: Ethernet X13: CAN XP14, XP13: JTAG

X9: Reserved

X12: Mini USB2
Virtual COM Port

X6: Mini USB
STM FS USB

X5: Power Supply
7B...50B, <0.5A

Antenna input 1

NTL10X navigation
OEM-modules

Antenna input 2

X3: COM3 X2: COM2 X1: COM1

XP7, XP3: Jumpers
Rx3 line : USB/CAN/COM3

XP11: Jumper
Antenna power supply
External / Internal 5V

XP9, XP2: Jumpers
Tx3 line: USB/CAN/COM3

XP6: Jumper
Rx2 line: USB/COM2

XP8: Jumper
Tx2 line: USB/COM2

XP5: Jumper
Rx1 line: USB/COM1

XP4: Jumper
Tx1 line: USB/COM1

XP1: Jumper
BOOT

XP10: Jumper
Board power supply
5V/3.3V

XP12: Jumper
CAN R_load 100 Ohm

VD6, VD8, VD7 :
Green LEDs

NTL10X navigation
OEM-modules
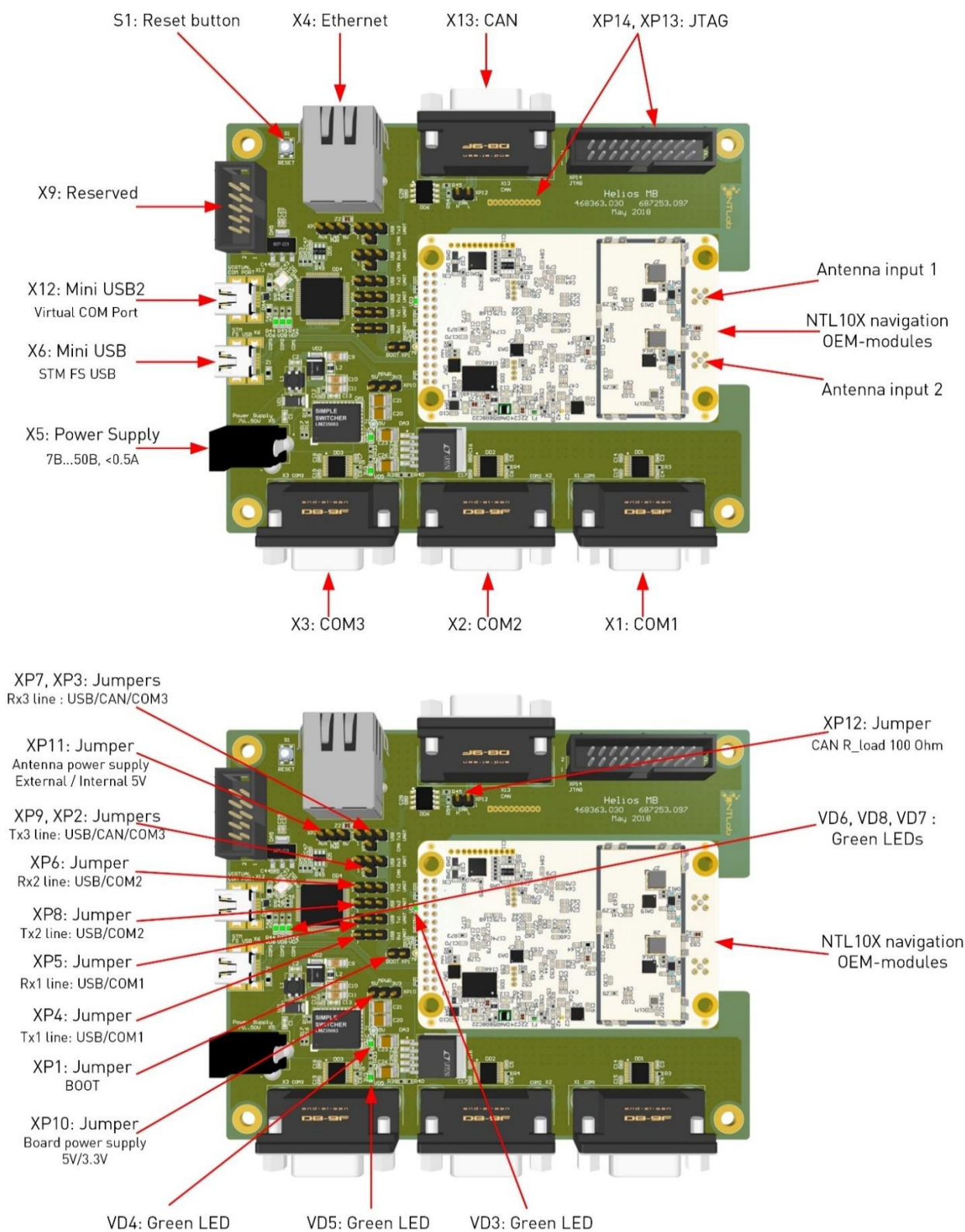
VD4: Green LED VD5: Green LED VD3: Green LED

Figure 1.1 – NTL Eva Board Layout

2 STRUCTURE AND OPERATIONAL ASPECTS

The hardware block diagram of the NTL Eva Board is presented in figure 2.1.

The signals transmitted by the 3xUART interfaces from/to the OEM module (XP1 connector) can be converted to RS232 (COM port) or USB interface (Mini USB2 port). This conversion is provided by switching pairs of jumpers XP4–XP5 (for Tx1 line-Rx1 line), XP8–XP6 (for Tx2 line-Rx2 line) and XP9–XP7 (for Tx3 line-Rx3 line) according to the figure 2.2.

So, the Mini USB2 port performs the function of three virtual COM ports.

a)   b)
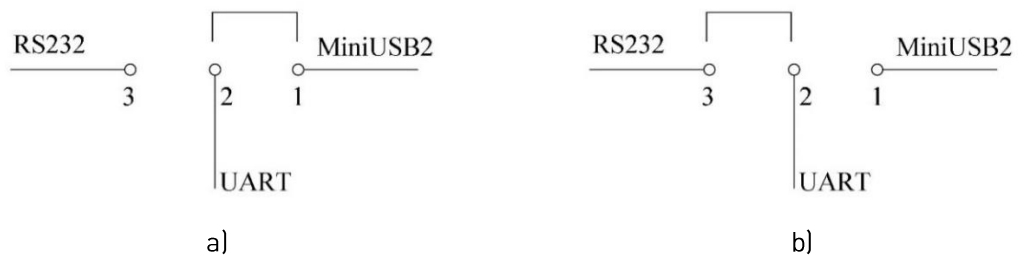
Figure 2.2 – Jumpers position XP4–XP5, XP8–XP6 and XP9–XP7: a) UART to Mini USB2 conversion;
b) UART to RS232 conversion

In addition, depending on the configuration of the OEM module, UART interface signal or a CAN interface signal can be output on the Tx3 line-Rx3 line. The corresponding switching pairs of jumpers XP9, XP2 (for Tx3 line) and XP7, XP3 (for Rx3 line) are presented in figure 2.3.

a)   b)   c)
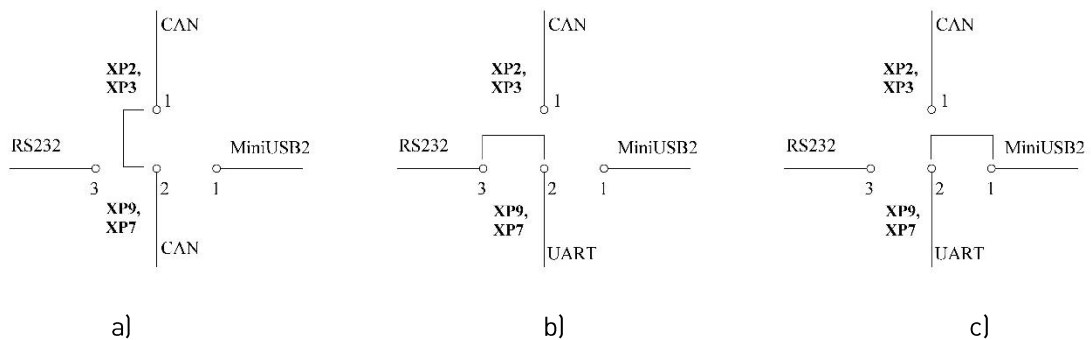
Figure 2.3 – Jumper position XP9, XP2 and XP7, XP3: a) CAN interface; b) UART to RS232 conversion;
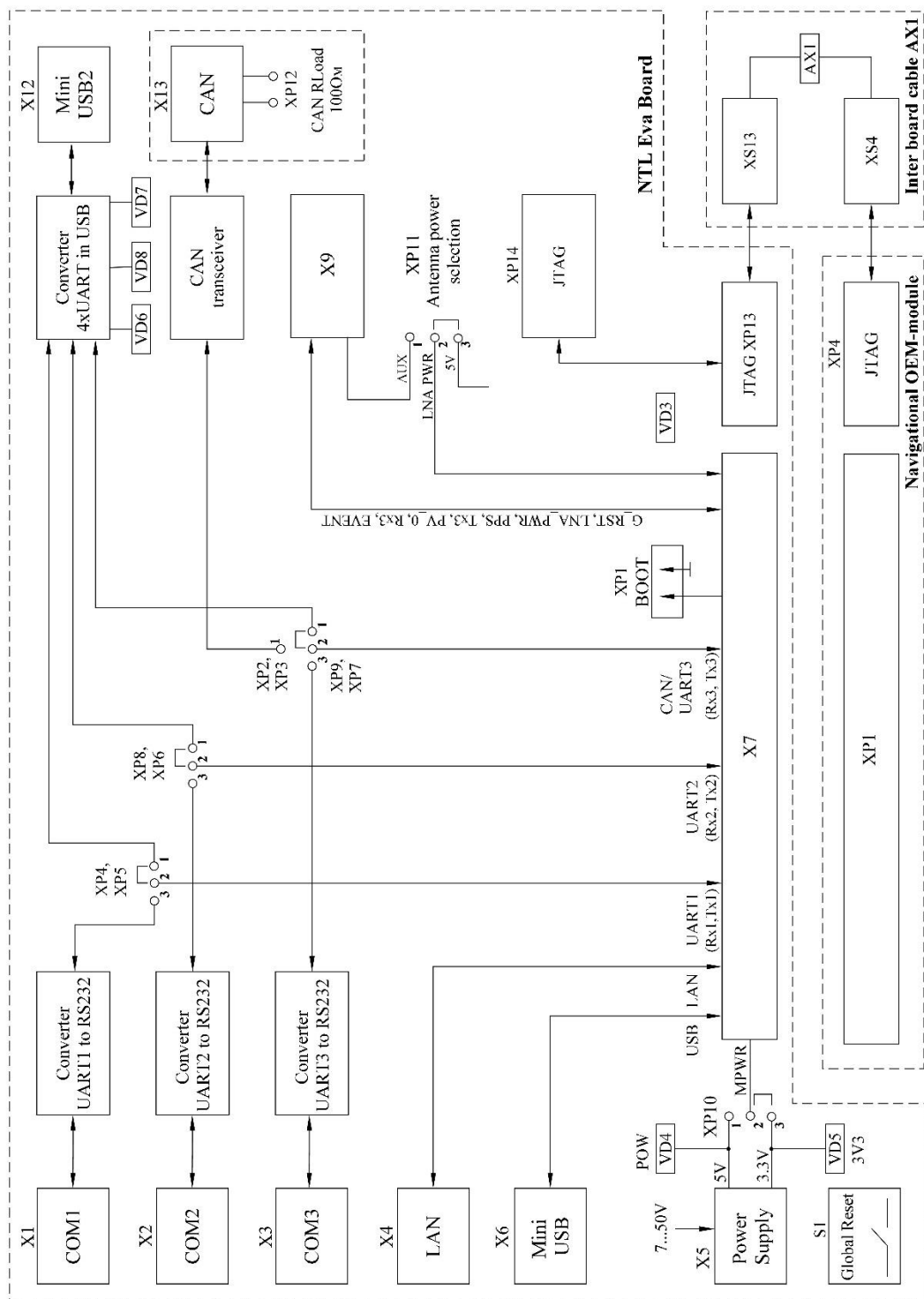c) UART to Mini USB2 conversion

Figure 2.1 – NTL Eva Board Block diagram

Ethernet and USB data are transmitted through the X4 and X6 connectors without conversion.

The NTL Eva Board contains a JTAG debugging interface that communicates with an external OEM module (XP4) through JTAG XP13 by inter board cable AX1 (XS4, XS13).

The board power supply is provided by external power source 7V...50V. The input voltage is converted by DC-DC Converter and Low Dropout Linear Regulator to operating supply voltages of 5V and 3,3V. The selection of the board power supply is provided by jumper XP10 (figure 2.4).
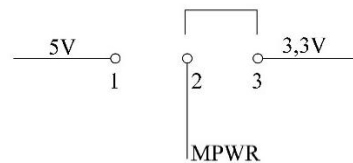

Figure 2.4 – Jumper position XP10

The antenna power supply is provided either by the internal 5V DC power supply or by auxiliary power source (AUX). Antenna power selection is provided by the position of the XP11 jumper (figure 2.5).
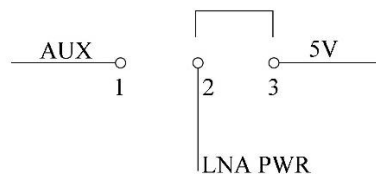

Figure 2.5 – Jumper position XP11

3 JUMPERS ASSIGNMENT AND DESCRIPTION

Table 3.1 provides the definition of some conventions used in the present document. Table 3.2 shows the jumpers assignment and description.

Table 3.1 – ON/OFF conventions

Convention	Definition
Jumper XPx ON	Jumper fitted
Jumper XPx OFF	Jumper not fitted

Table 3.2 – Jumpers

Name	Description	Jumper state
XP1	Boot mode selection. Used for service purpose only.	XP1 OFF*: X7 pin3 and X7 pin11 is in logical «0»; XP1 ON: X7 pin3 and X7 pin11 is in logical «1»;
XP2	Used to transmit CAN signals to NTL10X (Tx3 line)	XP2 OFF*: CAN signal is not transmitted to the NTL10X; XP2 ON - jumper set between XP2 pin1 and XP9 pin2 - CAN signal is transmitted to the NTL10X;
XP3	Used to transmit CAN signals from NTL10X (Rx3 line)	XP3 OFF*: CAN signal is not transmitted from the NTL10X; XP3 ON - jumper set between XP3 pin1 and XP7 pin2 - CAN signal is transmitted from the NTL10X;
XP4 (Rx1)	Used to choose UART signals to NTL10X (Tx1 line)	You have two options, depending on how you insert a jumper on XP4: • XP4 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **mini USB to NTL10X** (UART1); • XP4 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **RS232 to NTL10X** (UART1 COM1);

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* Jumpers position on the board for Getting started

Table continuation 3.2 – Jumpers

Name	Description	Jumper state
XP5 (Tx1)	Used to choose where to transmit UART signals from NTL10X (Rx1 line)	You have two options, depending on how you insert a jumper on XP5: • XP5 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **NTL10X to mini USB** (UART1); • XP5 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **NTL10X to RS232** (UART1 COM1);
XP6 (Tx2)	Used to choose where to transmit UART signals from NTL10X (Rx2 line)	You have two options, depending on how you insert a jumper on XP6: • XP6 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **NTL10X to mini USB** (UART2); • XP6 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **NTL10X to RS232** (UART2 COM2);
XP7 (Tx3)	Used to choose where to transmit UART signals from NTL10X (Rx3 line)	You have two options, depending on how you insert a jumper on XP7: • XP7 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **NTL10X to mini USB** (UART3); • XP7 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **NTL10X to RS232** (UART3 COM3);
XP8 (Rx2)	Used to choose UART signals to NTL10X (Tx2 line)	You have two options, depending on how you insert a jumper on XP8: • XP8 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **mini USB to NTL10X** (UART2); • XP8 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **RS232 to NTL10X** (UART2 COM2);

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* Jumpers position on the board for Getting started

Table continuation 3.2 – Jumpers

XP9 (Rx3)	Used to choose UART signals to NTL10X (Tx3 line)	You have two options, depending on how you insert a jumper on XP9: • XP9 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **mini USB to NTL10X** (UART3); • XP9 ON – jumper set between pins 2 and 3 (pin3 is the closest to the NTL10X module) – **RS232 to NTL10X** (UART3 COM3);
XP10	Used to choose how to provide NTL10X with DC power	You have two options, depending on how you insert a jumper on XP10: • XP10 ON* - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **5V** DC is provided to the NTL10X; • XP10 ON – jumper set between pins 2 and 3 – **3,3V** DC is provided to the NTL10X;
XP11	Used to choose how to provide antenna with DC power	You have two options, depending on how you insert a jumper on XP11: • XP11 ON - jumper set between pins 1 and 2 (pin1 is the closest to the mini USB connector) – **"AUX"** DC is provided to the antenna; • XP11 ON* – jumper set between pins 2 and 3 – **5V** DC is provided to the antenna
XP12	CAN 100 Ohm load	XP12 OFF*: no load; XP12 ON: 100 Ohm load.

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4 LEDs ASSIGNMENT AND DESCRIPTION

Six LED indicators used for monitoring the status of the board:

- Green LED VD3 is indicator of the position value;
- Green LED VD4 (POW) is indicator of the DC power supply 5V;
- Green LED VD5 (3V3) is indicator of the DC power supply 3,3V;
- Green LED VD6 is indicator for service purposes;
- Green LED VD7 is indicator for service purposes;
- Green LED VD8 is indicator for service purposes.

5 POWER SUPPLY AND POWER SELECTION

The board power supply is provided by an external power source 7V...50V DC:

- DC power supply 3,3V*;
- DC power supply 5V**.

The antenna power supply is provided either by external power source or by auxiliary power source (AUX):

- DC power supply 5V**;
- DC power supply from an auxiliary power source connected on X9.

Power selection is provided by the position of the corresponding jumpers (see chapter 3).

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* Provided by the DC-DC converter and the Low Dropout Linear Regulator
** Provided by the DC-DC converter

6 DESCRIPTION OF I/O CONNECTOR PIN OUT PBD2-28

The description and assignment of the pin-outs of the PBD2-28 connector are presented in Table 6.1.

Table 6.1 – Connector type: PBD2-28

Pin	Name	I/O	Type	Description
1	USB_ID	Output	CMOS_3.3	MCU STM32H7 USB FS
2	USB_VBUS	Output		MCU STM32H7 USB FS
3	BOOT	Output		MCU STM32H7 boot mode selection
4	TPO-MID	Power		MCU STM32 ETHERNET
5	LNA_PWR	Power	Analogue	Antenna power supply
6	Power	Power	Analogue	NTL10X OEM module power supply
7	USB_D-	I/O	CMOS_3.3	MCU STM32H7 USB FS
8	USB_D+	I/O		MCU STM32H7 USB FS
9	GRESET	Output		Reset control (active-low)
10	MF01	I/O		MCU STM32H7 GPIO
11	MF02	I/O		MCU STM32H7 GPIO
12	TxD3/CANTx	Output		UART3 Tx line (optionally CAN Tx line)
13	EVENT	Output		MCU STM32H7
14,17,20,22	GND	Power	Analogue	Signal and Power Ground
15	RXD1	Input	CMOS_2.5	UART1 Rx line
16	TXD1	Output		UART1 Tx line
18	RXD2	Input		UART2 Rx line
19	TXD2	Output		UART2 Tx line
21	PV	Input	CMOS_3.3	«Position Valid» indicator
23	PPS	Input	CMOS_2.5	PPS time mark
24	RxD3/CANRx	Input	CMOS_3.3	UART3 Rx line (optionally CAN Rx line)
25	TPI +	Input		MCU STM32H7 Ethernet
26	TPO +	Output		MCU STM32H7 Ethernet
27	TPI –	Input		MCU STM32H7 Ethernet
28	TPO –	Output		MCU STM32H7 Ethernet

7 SPECIFICATIONS

The NTL Eva Board has the following main characteristics:

- Duplex operation;
- 28-pin dual-row male header;
- Number of custom LEDs: 6 qt.;
- Data transmission and reception rates:
    - USB-interface: mini USB – up to 12 Mbps (USB Full Speed), mini USB2 – up to 2 Mbps;
    - RS232-interface: up to 2 Mbps;
    - UART-interface: up to 2 Mbps;
    - CAN-interface: up to 5 Mbps;
    - Ethernet-interface: 10 Mbps or 100 Mbps (supports links to 10BaseT/100BaseT networks);
- Power supply: (7...50) V;
- OEM module supply voltage:
    - 3,3V (+- 10%),
    - 5V (+- 10%);
- Maximum load current of the OEM module:
    - 1A (3,3V),
    - 2,5A (5V);
- Power consumption: < 1W;
- Operating temperature: -40° to +85°C.

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