ISO-11898 (CAN Bus) mini PCI Express card «mPCIe-CAN»

Data Sheet (v1.3)

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1 Device Overview

«mPCIe-CAN» is a module of two independent, isolated ISO 11898 channels (CAN Bus), in the Mini PCI Express Card construct.

It meets the requirements of the following standards:

- PCI Express Mini Card Electromechanical Specification v1.1;
- PCI Expres Base Specification v1.1

PCI Express interface configuration: Gen1 x1.

Drivers for OS: Windows XP/7 (32 bit and 64 bit), Linux.

1.1 Features

- two entirely independent CAN bus channels;
- CAN 2.0A and CAN 2.0B specifications support;
- bit rates up to 1Mbit/s;
- bus monitor mode;
- galvanic isolation from each bus and between the buses – 2.5kV rms;
- optional 120 Ohm termination on a module for each channel;
- DMA mode support;
- functions for implementation of CAN-based protocols: TTCAN, J1939 and others.

1.2 Ordering Information

mPCIe - CAN
1 ***2***

1) Module form factor and PC connection interface:

− **mPCIe** - Mini PCI Express Card

2) Line type and exchange protocol:

− **CAN** - ISO11898 interface (CAN Bus).

Note:

− SHR-10V-S-B matching connector with embedded cable of the required length is supplied on customer's request;

− 120 Ohm (JP1, JP2) termination connection jumpers or 120 Ohm soldered termination jumper wires are installed on customer's request.

1.3 System Requirements

Any computer system supporting PCI Express™ Mini Card Electromechanical Specification v1.1 and PCI Express™ Base Specification v1.1, as well as OS Windows® XP/7 or Linux.

1.4 Module Dimensions

Mini PCI Express Card - Full Size (F1) form factor.

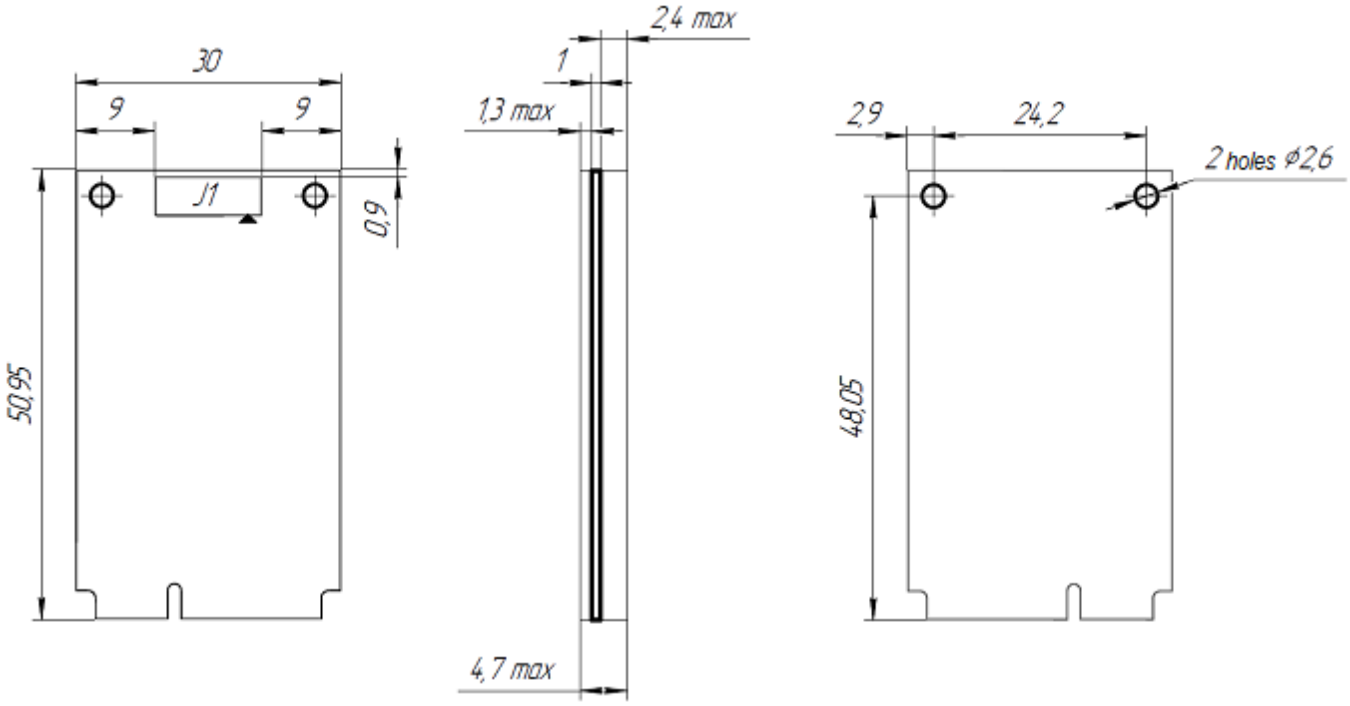

Figure 1 - Dimensional drawing

All dimensions are in mm.

1.5 Device Architecture

Main logic units of «mPCIe-CAN» device are shown in figure 2.

Data and control commands are transmitted to CAN controller registers via PCI-Express bus. CAN bus controllers transmit or receive data into integrated circuits (IC) of transmitter/receiver units. CAN IC in its turn transmits/receives data by means of galvanic protection via the connector (SM10B). Data is transmitted and received via two independent buses.

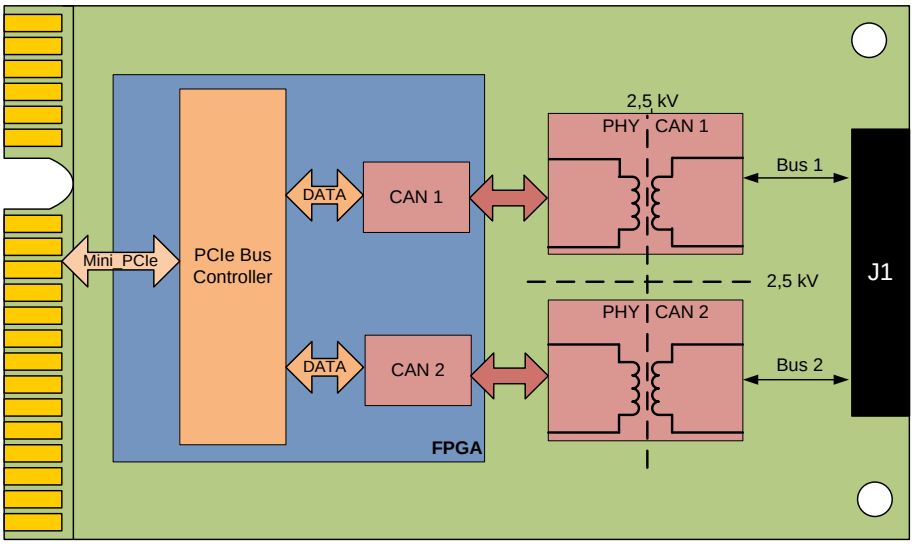

Figure 2 - Structural diagram

1.6 CAN Transmitter/Receiver Units IC Protection Diagram

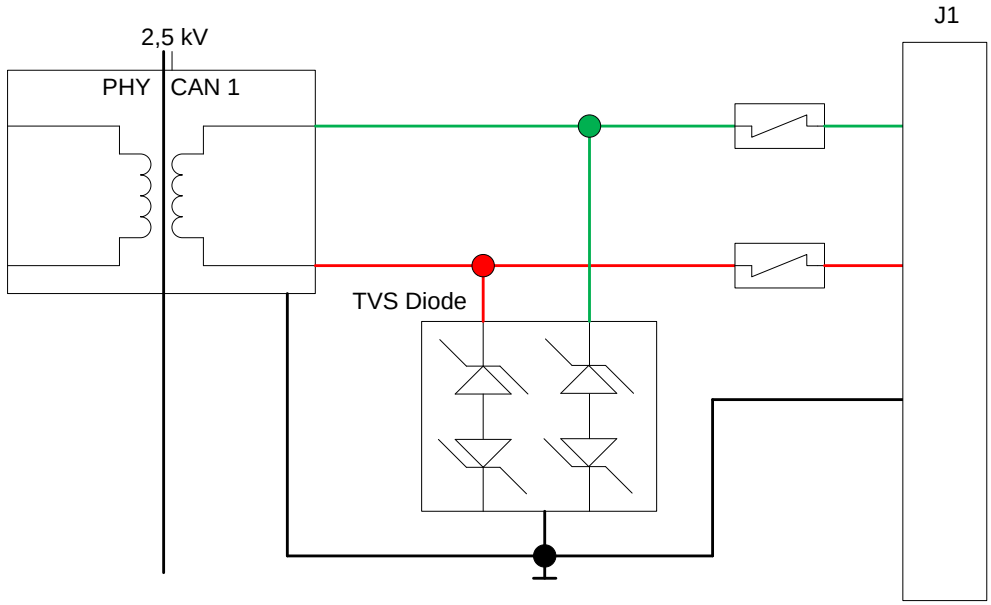

Figure 3 Transmitter/receiver units protection diagram

Picture 3 shows basic protection elements of the CAN bus-based module.

CAN transmitter/receiver unit protection diagram is designed for current and voltage surges limitation (up to 650V lasting up to 10ms), which occur due to short circuit with the alternating circuit line, induction and atmospheric overload to nominal value and self regeneration, after the line problem is removed.

Each CAN PHY provides for galvanic isolation 2.5kV from each of CAN buses.

2.5 kV galvanic separation between CAN buses is designed on the board.

1.7 Specifications

Table 1

Parameter	Minimum Value	Standard Value	Maximum Value	Units of Measurement
Maximum ratings				
+ 3.3 V supply voltage	minus 0.5		+3.75	V
+ 1.5 V supply voltage	minus 0.3		+2.0	V
Receiver				
Input impedance,				
− CANH, CANL	5		25	kOhm
− Differential w/o termination	20		100	kOhm
− Differential with termination		120		Ohm
Threshold voltage,				
− Recessive level	minus 1.0		+0.5	V
− Dominant level	+0.9		+5	V
Input voltage hysteresis		150		mV
Transmitter				
Recessive state (V_{CANL}, V_{CANH})	2.0		3.0	V
Dominant state V_{CANH},	2.75		4.5	V
Dominant state V_{CANL},	0.5		2.0	V
Output differential voltage,	1.5		3.0	V
Short circuit current				
− CANH			minus 200	mA
− CANL			200	mA
Power supply requirements				
Voltage				
− +3.3 V	3.15	3.3	3.45	V
− +1.5 V	1.35	1.5	1.65	V
Consumption current +3.3 V	0,29	0,3	0,35	A
Consumption current +1.5 V	0,20	0,21	0,25	A
Temperature range				
− Operating temperature	minus 40		+85	°C
− Storage temperature	minus 50		+100	°C

Table 1 continued

Parameter	Minimum Value	Standard Value
Dimensions and weight		
Dimensions (W*L*H)	30 x 50.95 x 4.7	mm
Weight	7	gram

1.8 Operating Conditions

«mPCIe-CAN» device ensures safe operation in the following environmental conditions:

- operating temperature: from minus 40°C to +85°C;
- low atmospheric pressure - 100 mm Hg;
- high humidity at a temperature of +35°C, not more than 80%;
- sinusoidal vibration in a frequency range from 5 to 2000 Hz: up to 5 g;
- single acting stroke at 15ms stroke duration: 15 g.

2 Hardware Installation

«mPCIe-CAN» device can be installed in any compatible system which supports PCI Express™ Mini Card Electromechanical Specification v1.1 and PCI Express™ Base Specification v1.1 (endpoint) standards.

ATTENTION!

Always take maximum possible precautions to prevent the device damage by static voltage discharge.

This device supports Plug and Play technology. After installation of «mPCIe-CAN» into the system and its reset, all interruptions and memory shall be distributed automatically.

2.1 Hardware Configuration

Line termination can be switched on for each of the two buses.

120 Ohm terminators will be switched ON by a jumper installation into the relevant connector.

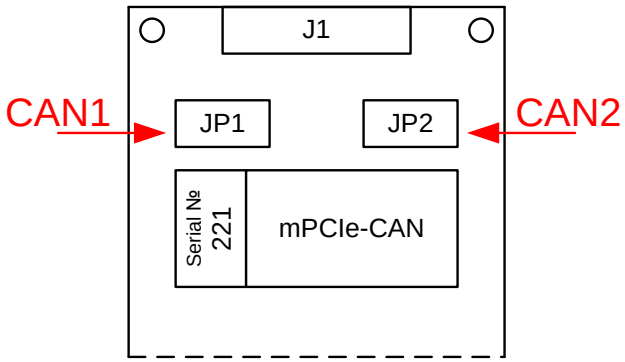

Figure 4 - Location of jumper connectors

Jumper JP1 corresponds to the CAN1 bus.
Jumper JP2 corresponds to the CAN2 bus.

After «mPCIe-CAN» is inserted into the slot, you will only have to install a driver supplied as part of the package and reboot the OS. Then the device will be identified by the system and ready to work.

3 Detailed Description of Connectors and Connection Methods

«mPCIe-CAN» has two connectors: PCI-Express 1x and SM10B. Detailed description of connectors and methods of their connection is given below.

- **P** – Power supply contacts;
- **NC** – Contacts not used;
- **I** – Device input signal contacts;
- **O** – Device output signal contacts;
- **I/O** - Device bidirectional signal contacts.

3.1 MiniPCI-Express x1 connector

This section describes location and purpose of miniPCI-Express connector pins. The miniPCI-Express connector conforms to the PCI Express™ Mini Card Electromechanical Specification v1.1 standard. Detailed connector description is given in figure 5 and in table 2.

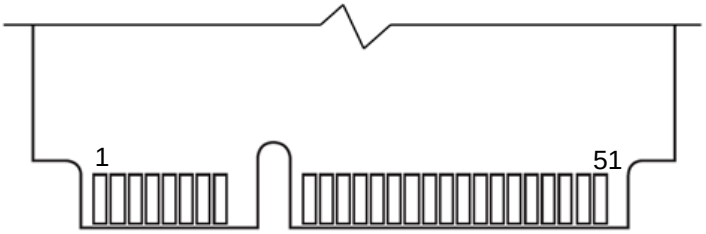

Figure 5.1 - Top Side

Table 2.1

Output No.	Signal Name	Signal Type	Description
1	WAKE_N	NC	Not used
3	RSV_B1	NC	Not used
5	RSV_B2	NC	Not used
7	CLKREQ_N	O	Reference frequency signal request output (REFCLK).
9	GND1	P	General ground
11	REFCLK_N	I	“Negative” reference frequency input
13	REFCLK_P	I	“Positive” reference frequency input
15	GND2	P	General ground
17	RSV_C1	NC	Not used
19	RSV_C2	NC	Not used
21	GND3	P	General ground
23	PER_N0	O	“Negative” data output
25	PER_P0	O	“Positive” data output
27	GND4	P	General ground
29	GND5	P	General ground
31	PET_N0	I	“Negative” data input
33	PET_P0	I	“Positive” data input
35	GND6	P	General ground
37	RSV_A1	NC	Not used
39	RSV_A2	NC	Not used
41	RSV_A3	NC	Not used
43	RSV_A4	NC	Not used
45	RSV_A5	NC	Not used
47	RSV_A6	NC	Not used
49	RSV_A7	NC	Not used
51	RSV_A8	NC	Not used

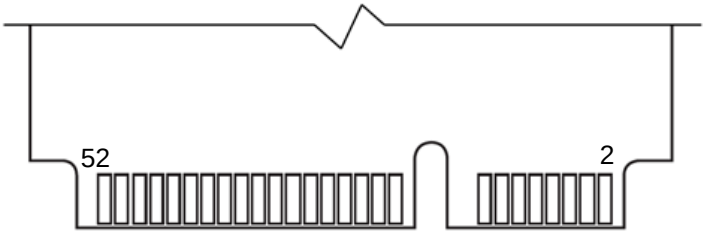

Figure 5.2 Bottom Side

Table 2.2

Output No.	Signal Name	Signal Type	Description
2	+3.3V1	P	Power supply input +3.3V
4	GND7	P	General ground
6	+1.5V1	P	Power supply input +1.5V
8	UIM_PWR	P	Not used
10	UIM_DATA	I/O	Not used
12	UIM_CLK	I	Not used
14	UIM_RESET	I	Not used
16	UIM_VPP	P	Not used
18	GND8	P	General ground
20	W_DISABLE_N	I	Not used
22	PERST_N	I	Reset signal input
24	+3.3VAUX	P	Not used
26	GND9	P	General ground
28	+1.5V2	P	Power supply input +1.5V
30	SMB_CLK	I	Not used
32	SMB_DATA	I/O	Not used
34	GND10	P	General ground
36	USB_D-	I/O	Not used
38	USB_D+	I/O	Not used
40	GND11	P	General ground
42	LED_WWAN_N	O	Not used
44	LED_WLAN_N	O	Not used
46	LED_WPAN_N	O	Not used
48	+1.5V3	P	Power supply input +1.5V
50	GND12	P	General ground
52	+3.3V2	P	Power supply input +3.3V

3.2 SM10B connector for CAN Bus

SM10B-SRSS-TB (SM10B) connector is designed for connection to CAN Bus interface. Sample connector and loop connection is shown in figure 7.

Location and purpose of SM10B connector outputs is described in table 3. Detailed information on the connector is given on the manufacturer's website: http://www.jst.com.

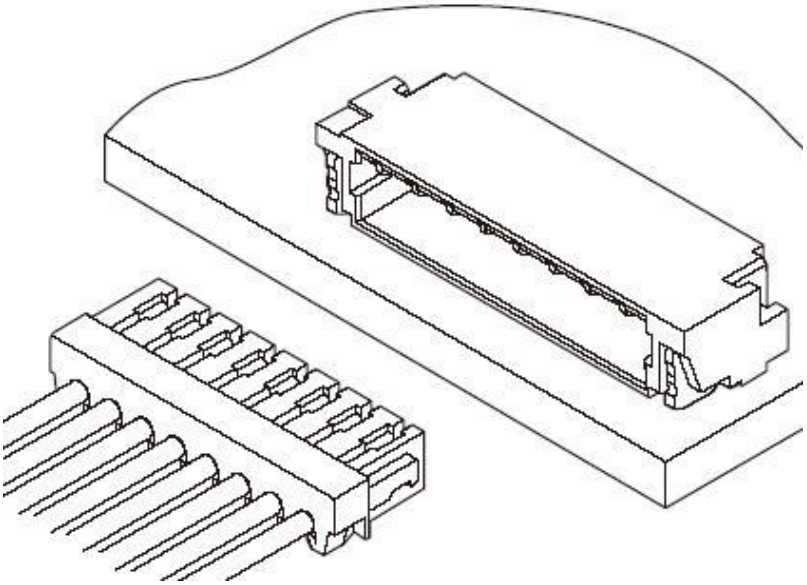

Figure 6 - SM10B connector with a matching part

The matching part of SHR-10V-S-B connector with the wired cable of the required length is supplied on customer's request.

Table 3

Output No.	Signal Name	Signal Type	Description
1	CAN2_L	IO	Bus 2 CAN Low line.
2	CAN2_H	IO	Bus 2 CAN-High line.
3	CAN2_Gnd	IO	Bus 2 Signal Ground.
4	RSV_C4	NC	Not used
5	RSV_C5	NC	Not used
6	RSV_C6	NC	Not used
7	RSV_C7	NC	Not used
8	CAN1_Gnd	IO	Bus 1 Signal Ground.
9	CAN1_H	IO	Bus 1 CAN-High line.
10	CAN1_L	IO	Bus 1 CAN-Low line.

3.3 Connection to CAN Bus

By means of crossover cable, «mPCIe-CAN» can be connected to a CAN bus or a connector on the body of the system in which the module is installed.

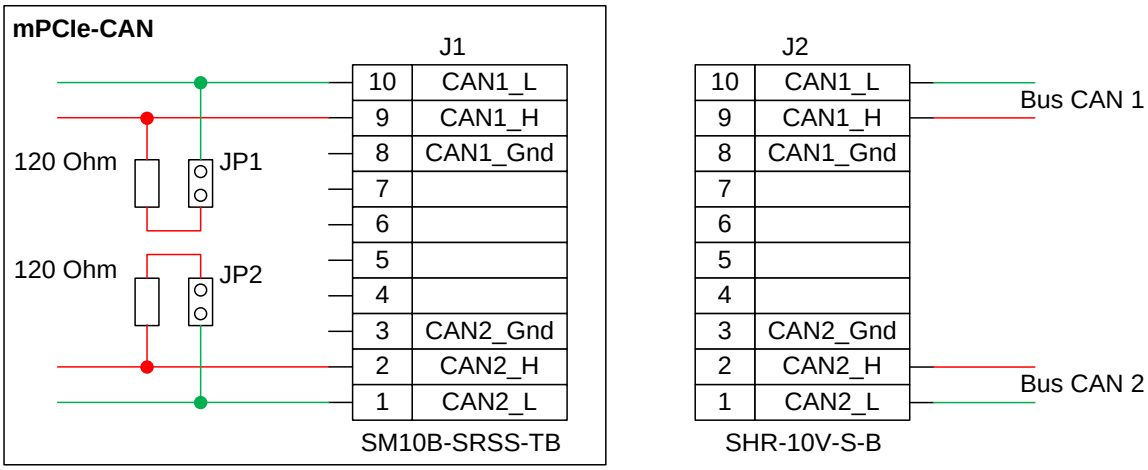

Figure 7 - Connection to CAN Bus

Depending on configuration of each CAN bus to which the module is connected, termination can be included for each bus on the «mPCIe-CAN» module.

4 Software

Two SW packages are developed for the «mPCIe-CAN» board. One for operation in Windows family OS, the other - for Linux family OS.

SW package for Windows was developed and tested on «Microsoft Windows XP 32 bit edition», «Microsoft Windows 7 32 bit edition», «Microsoft Windows 7 64 bit edition» OS OS. It consists of the driver and static library.

The file «Windows_mPCIe-CAN_driver_manual_VerX», where X is a document version, contains driver description;

The file «Windows_mPCIe-CAN_library_manual_VerX», where X is a document version, contains library description.

These files contain information on installation, list of functions and their description.

SW package for Linux was developed and tested on «Debian 6.0.5» OS, and it consists of the driver only.

The file «Linux_mPCIe-CAN_driver_manual_VerX», where X is a document version, contains driver description. This file contains information on installation, list of functions and their description.

5 Revision History

Revision	Date	Modification
1.0	12.11.2012	Initial release.
1.1	15.12.2014	Clause «1.7 Environmental impact» is updated.
1.2	18.12.2014	Figure 2 in section 1.5 on page 6 is corrected. Clause «4 Software installation» is updated.
1.3	22.12.2014	Chapter «4 Software» is updated.