MPX-2515 User's Guide

MPX-2515 CAN 2.0B USB card features USB 2.0 full speed to CAN 2.0B bus interface in Mini-PCIe form factor. This MPX-2515 User's Guide describes how to use MPX-2515 card.

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1 Technical Guide

1.1 Introduction

The MPX-2515 CAN 2.0B USB card is a USB 2.0 compliant device, which implements Controller Area Network (CAN) version 2.0B interface. This card is made in Mini-PCIe form factor so that this module is able to insert into motherboards that provide Mini-PCIe slot, like most Commell motherboards do. In addition, users are able to connect this card to an USB Type A receptacle that most PC has by using the OALUSB-H4-1 optional cable. MPX-2515 CAN 2.0B USB card provides the following features.

1.1.1 Features

- USB 2.0 Full Speed compliant
- Controller Area Network (CAN) version 2.0B
- Implement ISO-11898 Standard Physical Layer
- Supports 1 Mb/s operation (recommend 125 Kbps)
- Default to 125 Kbps
- On board 120 Ohm line terminator (enabled/disabled by jumper)
- 0 to 8 byte length in the data field
- Standard and extended data and remote frames
- Two receive buffers with prioritized message storage
- Six 29-bit filters
- Two 29-bit masks
- Data byte filtering on the first two data bytes
- One-shot mode ensures message transmission is attempted only one time
- Typical 5 mA active current
- Typical 1 uA standby current (sleep mode)
- Externally-controlled slope for reduced RFI emissions
- Detection of ground fault (permanent Dominant) on TXD input
- Power-on Reset and voltage brown-out protection
- Protection against high-voltage transients
- Automatic thermal shutdown protection
- Up to 112 nodes can be connected
- High-noise immunity due to differential bus implementation
- IEC 61000-4-2 (ESD) ± 15kV (air/contact) protection
- IEC 61000-4-4 (EFT) 50A (5/50ns) protection
- Produced in Mini-PCIe card form factor (easily locked on motherboard)

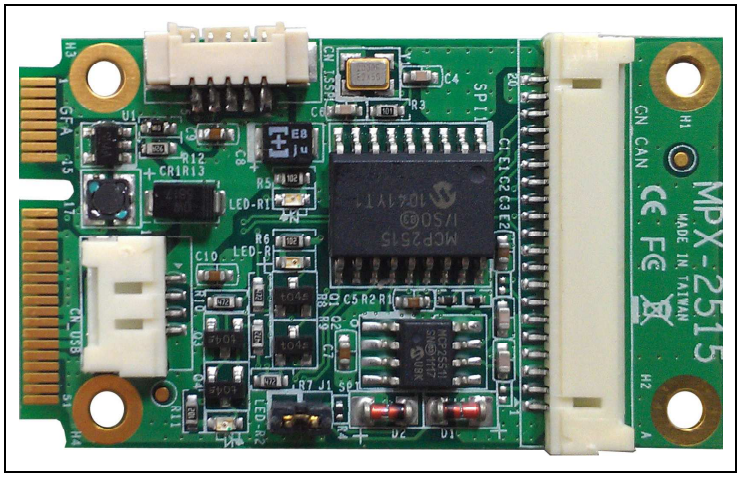


Figure 1 MPX-2515 CAN 2.0B USB Card

1.1.2 Supported Operating Systems

The following operating systems are supported by MPX-2515:

- Microsoft Windows XP 32-/64-bit versions
- Microsoft Windows Vista 32-/64-bit versions
- Microsoft Windows 7 32-/64-bit versions

1.2 MPX-2515 Block Diagram

The MPX-2515 CAN 2.0B USB card is composed of a System on Chip, a stand-alone CAN controller, and a high-speed CAN transceiver.

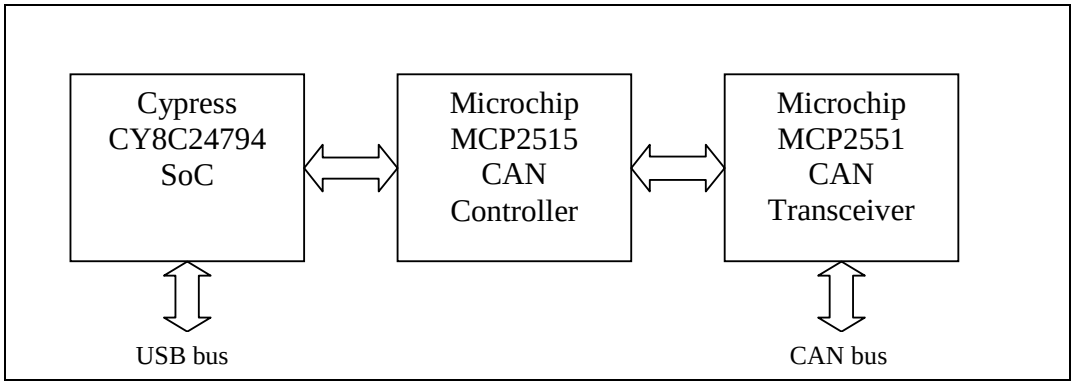


Figure 2 MPX-2515 Block Diagram

The above figure shows the components diagram of the MPX-2515 CAN 2.0B USB card. The Cypress CY24794 controller implemented a USB device that interacts with a USB host to perform requests and return responses. A Microchip MCP2515 CAN controller is connecting to CY24794 via SPI and other signals. Another Microchip MCP2551 CAN Transceiver is interfacing to the CAN bus to send and receive CAN messages.

1.3 CY8C24794 Programmable System-on-Chip

We uses Cypress CY8C24794 PSoC Programmable System-on-Chip as the general purpose controller for MPX-2515 card. A firmware has implement for CY8C24794 to support full speed USB, SPI master, timers, and others for MPX-2515 functionalities. The full speed USB interface is used to communicate with a USB host to perform request packets and return response packets. The SPI master interface however is used to communicate to the MCP2515 CAN bus controller for CAN activities. Please refer to the CY8C24x94 PSoC Programmable System-on-Chip Technical Reference Manual for detail information.

The following figure shows the block diagram of CY8C24794.

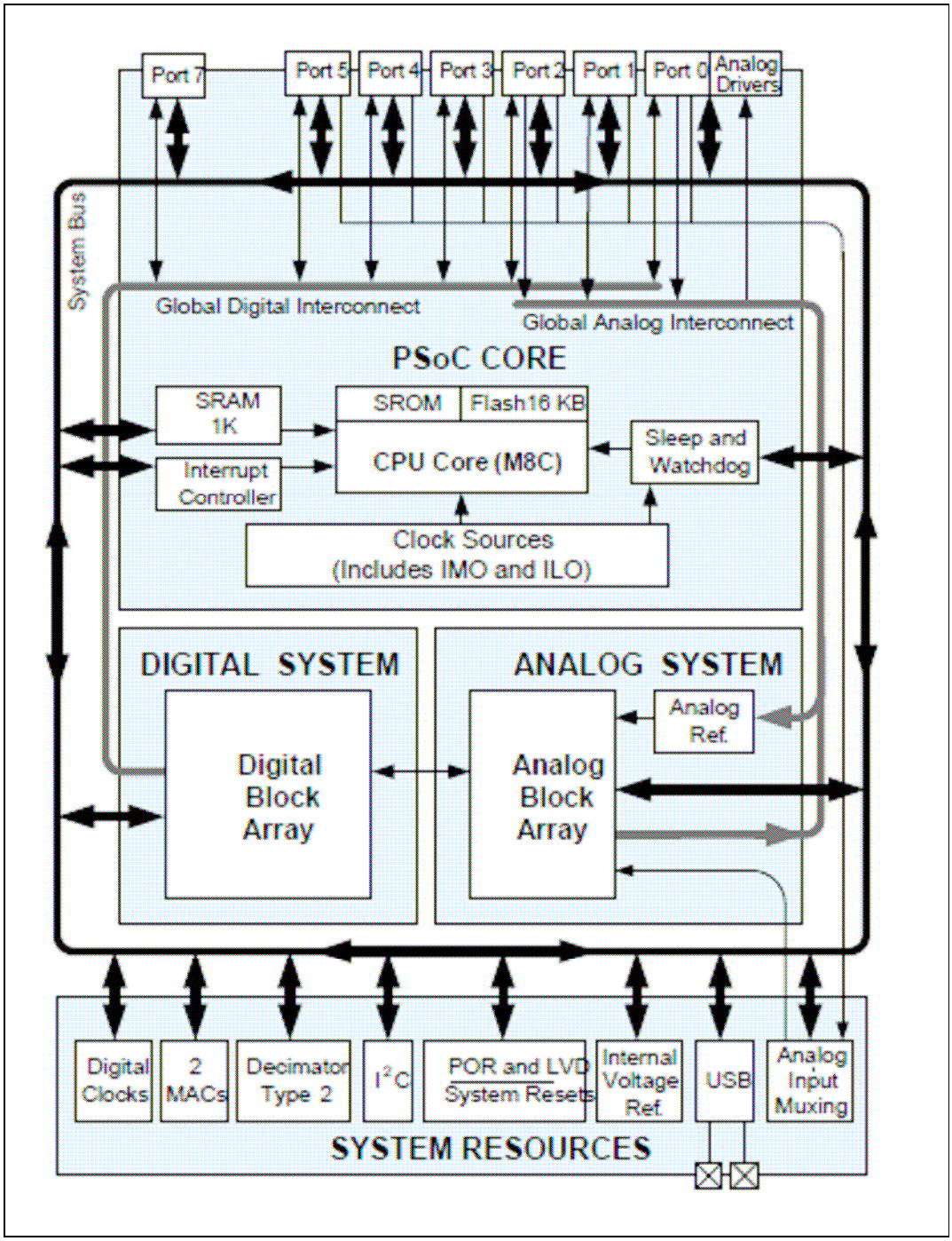


Figure 3 CY8C24794 Block Diagram

1.4 MCP2515 Stand-Alone CAN Controller With SPI Interface

Microchip Technology's MCP2515 is a stand-alone Controller Area Network (CAN) controller that implements the CAN specification, version 2.0B. It is capable of

transmitting and receiving both standard and extended data and remote frames. The MCP2515 has two acceptance masks and six acceptance filters that are used to filter out unwanted messages. Thereby reducing the host MCUs overhead. The MCP2515 interfaces with CY8C24794 microcontroller via an industry standard Serial Peripheral Interface (SPI).

The following figure shows the block diagram of MCP2515

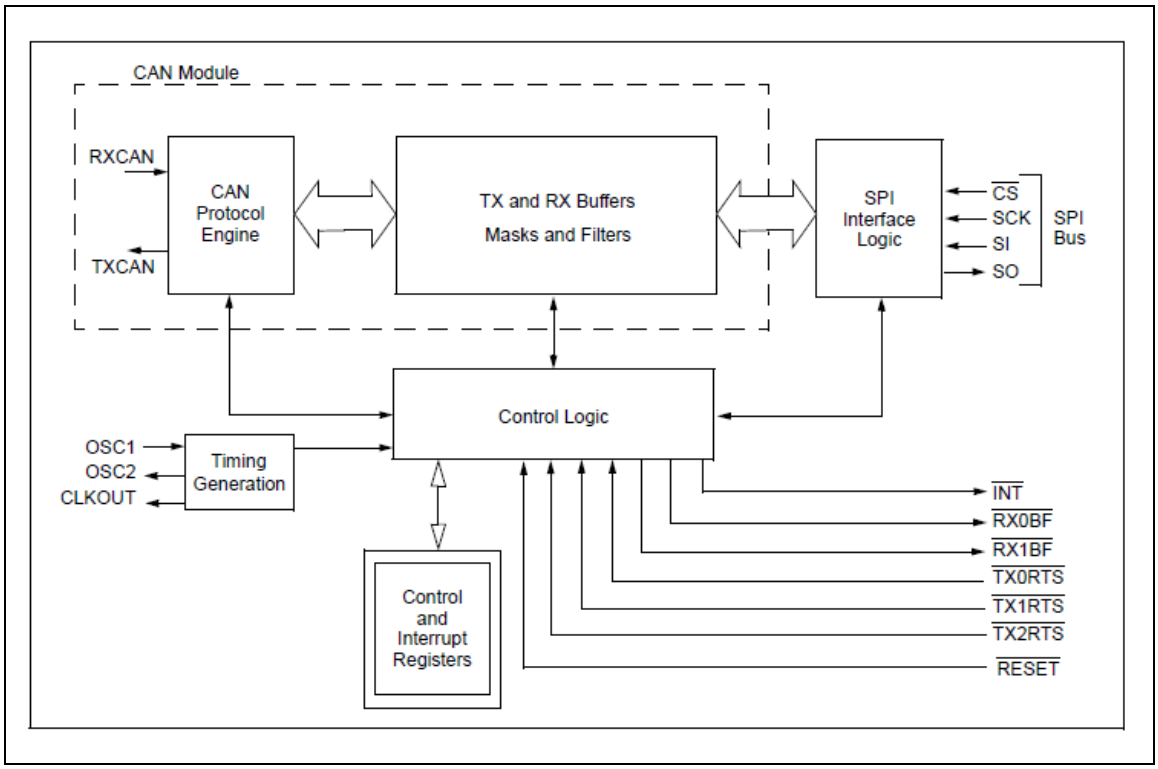


Figure 4 MCP2515 Block Diagram

The MCP2515 has three transmit and two receive buffers, two acceptance masks (one for each receive buffer) and a total of six acceptance filters. The following figure shows the MCP2515 buffers and protocol engine block diagram. Please refer to MCP2515 data sheet for detail information.

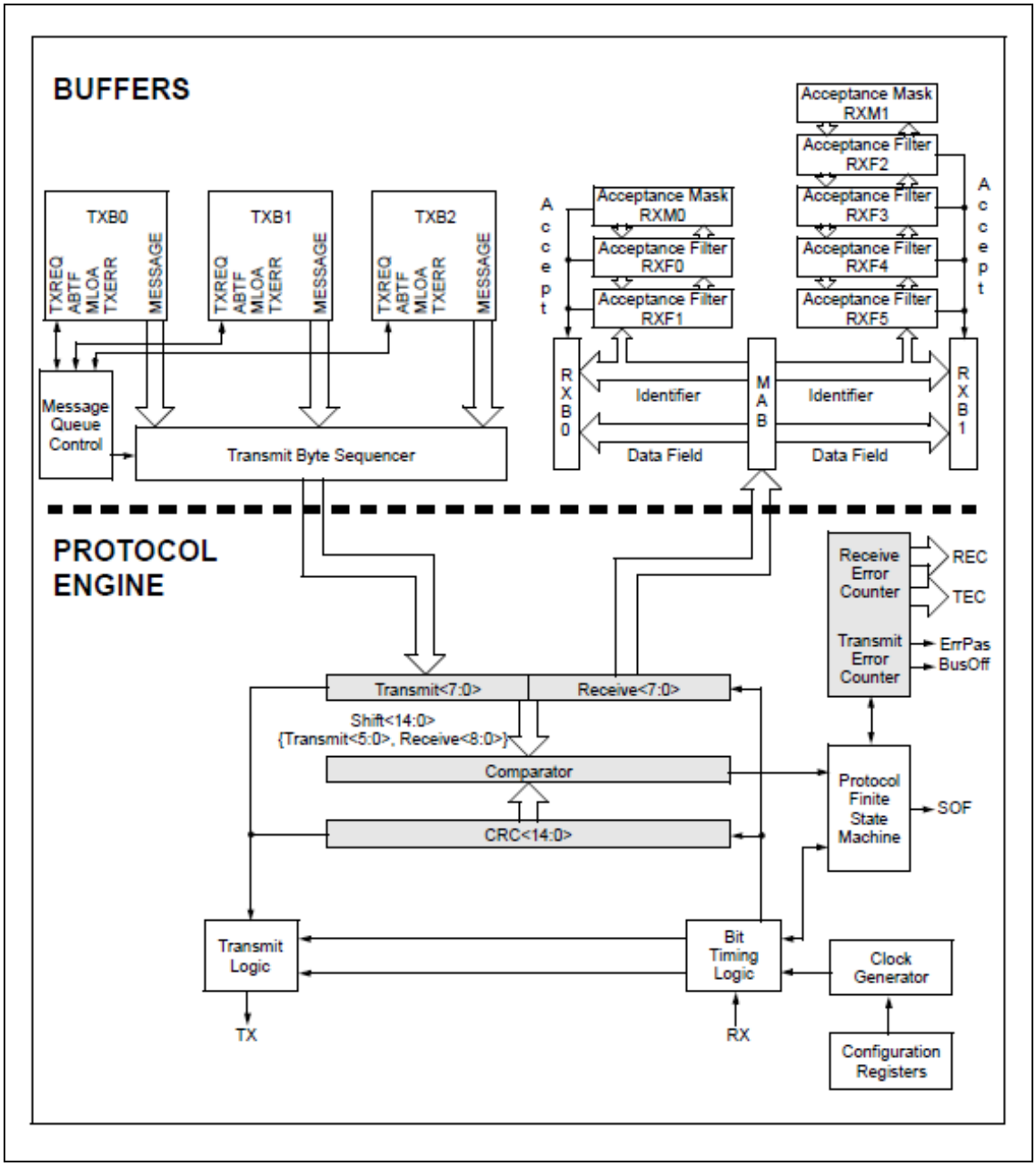


Figure 5 MCP2515 Buffers and Protocol Engine Blcok Diagram

The following table shows the MCP2515 Controller Register Map. Please refer to the MCP2515 data sheet for detail information.

Lower Address Bits	Higher-Order Address Bits							
	0000 xxxx	0001 xxxx	0010 xxxx	0011 xxxx	0100 xxxx	0101 xxxx	0110 xxxx	0111 xxxx
0000	RXF0SIDH	RXF3SIDH	RXM0SIDH	TXB0CTRL	TXB1CTRL	TXB2CTRL	RXB0CTRL	RXB1CTRL
0001	RXF0SIDL	RXF3SIDL	RXM0SIDL	TXB0SIDH	TXB1SIDH	TXB2SIDH	RXB0SIDH	RXB1SIDH
0010	RXF0EID8	RXF3EID8	RXM0EID8	TXB0SIDL	TXB1SIDL	TXB2SIDL	RXB0SIDL	RXB1SIDL
0011	RXF0EID0	RXF3EID0	RXM0EID0	TXB0EID8	TXB1EID8	TXB2EID8	RXB0EID8	RXB1EID8
0100	RXF1SIDH	RXF4SIDH	RXM1SIDH	TXB0EID0	TXB1EID0	TXB2EID0	RXB0EID0	RXB1EID0
0101	RXF1SIDL	RXF4SIDL	RXM1SIDL	TXB0DLC	TXB1DLC	TXB2DLC	RXB0DLC	RXB1DLC
0110	RXF1EID8	RXF4EID8	RXM1EID8	TXB0D0	TXB1D0	TXB2D0	RXB0D0	RXB1D0
0111	RXF1EID0	RXF4EID0	RXM1EID0	TXB0D1	TXB1D1	TXB2D1	RXB0D1	RXB1D1
1000	RXF2SIDH	RXF5SIDH	CNF3	TXB0D2	TXB1D2	TXB2D2	RXB0D2	RXB1D2
1001	RXF2SIDL	RXF5SIDL	CNF2	TXB0D3	TXB1D3	TXB2D3	RXB0D3	RXB1D3
1010	RXF2EID8	RXF5EID8	CNF1	TXB0D4	TXB1D4	TXB2D4	RXB0D4	RXB1D4
1011	RXF2EID0	RXF5EID0	CANINTE	TXB0D5	TXB1D5	TXB2D5	RXB0D5	RXB1D5
1100	BFPCTRL	TEC	CANINTF	TXB0D6	TXB1D6	TXB2D6	RXB0D6	RXB1D6
1101	TXRTSCTRL	REC	EFLG	TXB0D7	TXB1D7	TXB2D7	RXB0D7	RXB1D7
1110	CANSTAT	CANSTAT	CANSTAT	CANSTAT	CANSTAT	CANSTAT	CANSTAT	CANSTAT
1111	CANCTRL	CANCTRL	CANCTRL	CANCTRL	CANCTRL	CANCTRL	CANCTRL	CANCTRL

Note: Shaded register locations indicate that these allow the user to manipulate individual bits using the Bit Modify command.

Figure 6 MCP2515 Controller Register Map

The following table shows the MCP2515 Control Register Summary. Please refer to the MCP2515 data sheet for detail information.

Register Name	Address (Hex)	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	POR/RST Value
BFPCTRL	0C	—	—	B1BFS	B0BFS	B1BFE	B0BFE	B1BFM	B0BFM	--00 0000
TXRTSCTRL	0D	—	—	B2RTS	B1RTS	B0RTS	B2RTSM	B1RTSM	B0RTSM	--xx x000
CANSTAT	xE	OPMOD2	OPMOD1	OPMOD0	—	ICOD2	ICOD1	ICOD0	—	100- 000-
CANCTRL	xF	REQOP2	REQOP1	REQOP0	ABAT	OSM	CLKEN	CLKPRE1	CLKPRE0	1110 0111
TEC	1C	Transmit Error Counter (TEC)								0000 0000
REC	1D	Receive Error Counter (REC)								0000 0000
CNF3	28	SOF	WAKFIL	—	—	—	PHSEG22	PHSEG21	PHSEG20	00-- -000
CNF2	29	BTLMODE	SAM	PHSEG12	PHSEG11	PHSEG10	PRSEG2	PRSEG1	PRSEG0	0000 0000
CNF1	2A	SJW1	SJW0	BRP5	BRP4	BRP3	BRP2	BRP1	BRP0	0000 0000
CANINTE	2B	MERRE	WAKIE	ERRIE	TX2IE	TX1IE	TX0IE	RX1IE	RX0IE	0000 0000
CANINTF	2C	MERRF	WAKIF	ERRIF	TX2IF	TX1IF	TX0IF	RX1IF	RX0IF	0000 0000
EFLG	2D	RX1OVR	RX0OVR	TXBO	TXEP	RXEP	TXWAR	RXWAR	EWARN	0000 0000
TXB0CTRL	30	—	ABTF	MLOA	TXERR	TXREQ	—	TXP1	TXP0	-000 0-00
TXB1CTRL	40	—	ABTF	MLOA	TXERR	TXREQ	—	TXP1	TXP0	-000 0-00
TXB2CTRL	50	—	ABTF	MLOA	TXERR	TXREQ	—	TXP1	TXP0	-000 0-00
RXB0CTRL	60	—	RXM1	RXM0	—	RXRTR	BUKT	BUKT	FILHIT0	-00- 0000
RXB1CTRL	70	—	RSM1	RXM0	—	RXRTR	FILHIT2	FILHIT1	FILHIT0	-00- 0000

Figure 7 MCP2515 Control Register Summary

1.5 MCP2551 High-Speed CAN Transceiver

The MCP2551 is a high-speed CAN, fault-tolerant device that serves as the interface between a CAN protocol controller and the physical bus. The MCP2551 device provides differential transmit and receive capability for the CAN protocol controller, and is fully compatible with the ISO-11898 standard, including 24V requirements. It will operate at speeds of up to 1 Mb/s.

The following figure shows the MCP2551 block diagram. Please refer to the MCP2551 data sheet for detail information.

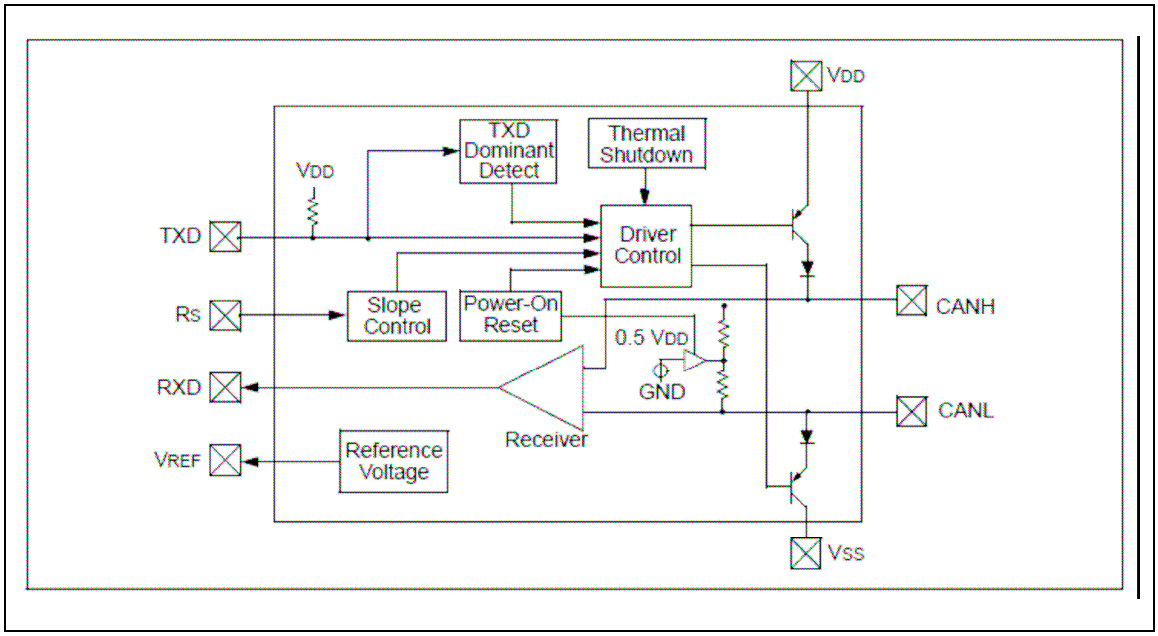


Figure 8 MCP2551 Block Diagram

1.6 MPX-2515 ISO OSI Model

1.6.1 Introduction

This section defines the MPX-2515 card in the ISO OSI reference model. The following figure shows this model.

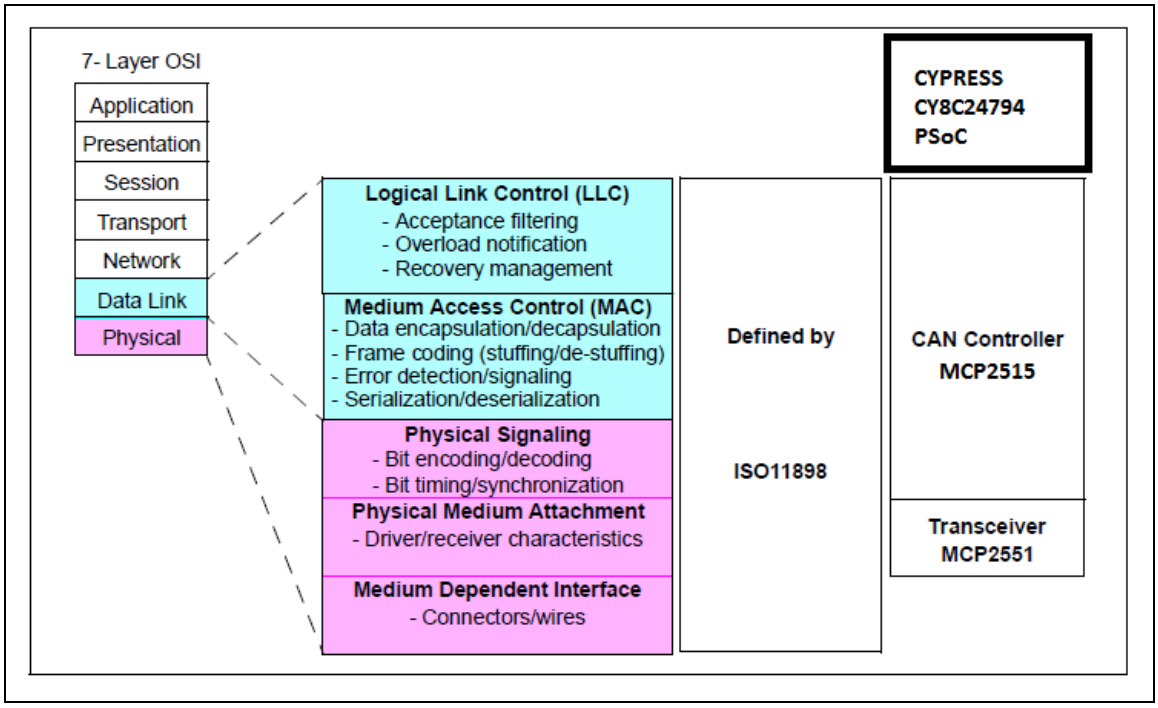


Figure 9 MPX-2515 ISO/OSI Reference Model

The Controller Area Network (CAN) protocol defines the Data Link Layer and part of the Physical Layer in the OSI model. Therefore, all the undefined layers can be defined by the system designer, or can be implemented using existing non-proprietary High Layer Protocols (HLPs) and physical layers.

Data Link Layer The Data Link Layer is defined by the CAN specification. This Data Link Layer is divided into Logical Link Control (LLC) Layer and Medium Access Control Layer (MAC). The Logical Link Control (LLC) manages the overload control and notification, message filtering and recovery management functions. the Medium Access Control (MAC) performs the data encapsulation/decapsulation, error detection and control, bit stuffing/destuffing and the serialization and deserialization functions.

Physical Layer The Physical Medium Attachment (PMA) and Medium Dependent Interface (MDI) are the two sub-layers of the physical layer which are not defined by CAN. However, the Physical Signaling (PS) sub-layer of the physical layer is defined by the CAN specification. The system designer can choose any driver/receiver and transport medium as long as the PS requirements are met.

The International Standards Organization (ISO) has defined a standard which incorporates the CAN specification as well as the physical layer. The standard, ISO-11898, was originally created for high-speed in-vehicle communication using CAN. ISO-11898 specifies the physical layer to ensure compatibility between CAN transceivers.

1.6.2 ISO11898-1 Physical Signaling

The bit encoding/decoding and synchronization shall meet the requirements defined in ISO-11898-1 and it is recommended to follow the definitions as given in the Recommended bit timing settings table. The according bus length estimations are therefore shown in the table follows it.

Bit rate	Nominal bit time t_b	Valid range for location of sample point	Recommended location of sample point
1 Mbit/s	1 µs	75% to 90%	87,5%
800 kbit/s	1,25 µs	75% to 90%	87,5%
500 kbit/s	2 µs	85% to 90%	87,5%
250 kbit/s	4 µs	85% to 90%	87,5%
125 kbit/s	8 µs	85% to 90%	87,5%
50 kbit/s	20 µs	85% to 90%	87,5%
20 kbit/s	50 µs	85% to 90%	87,5%
10 kbit/s	100 µs	85% to 90%	87,5%

Table 1 Recommended bit timing settings

The following table shows the according bus length estimations.

Bit rate	Bus length(1)
1 Mbit/s	25 m
800 kbit/s	50 m
500 kbit/s	100 m
250 kbit/s	250 m
125 kbit/s	500 m
50 kbit/s	1.000 m
20 kbit/s	2.500 m
10 kbit/s	5.000 m

Table 2 Estimated bus lengths

1.7 MPX-2515 Card vs. ISO-11898-2

1.7.1 ISO-11898-2 Overview

ISO-11898-2 is the international standard for high-speed CAN communications in road vehicles. ISO-11898-2 specifies the PMA and MDA sub-layers of the ISO/OSI Physical Layer.

The following figure shows a representation of a common CAN node/bus as described by ISO-11898.

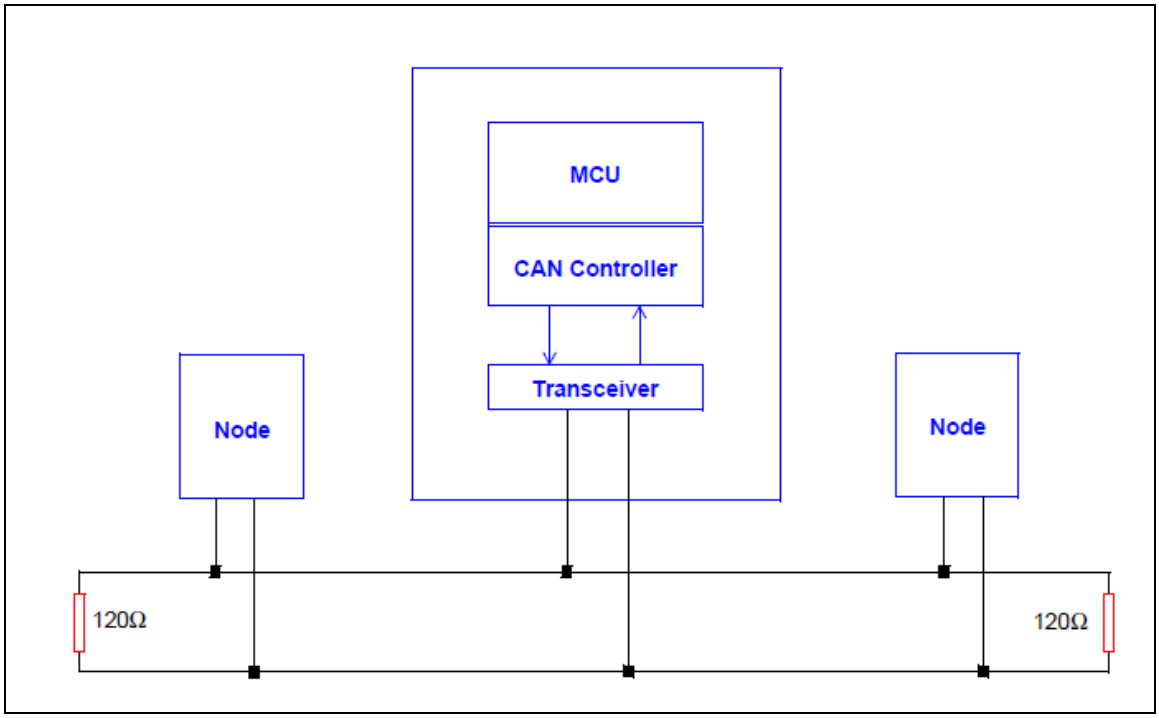


Figure 10 CAN Node on Bus

1.7.2 Bus Levels

CAN specifies two logical states: recessive and dominant. ISO-11898 defines a differential voltage to represent recessive and dominant states (or bits), as shown in the following figure.

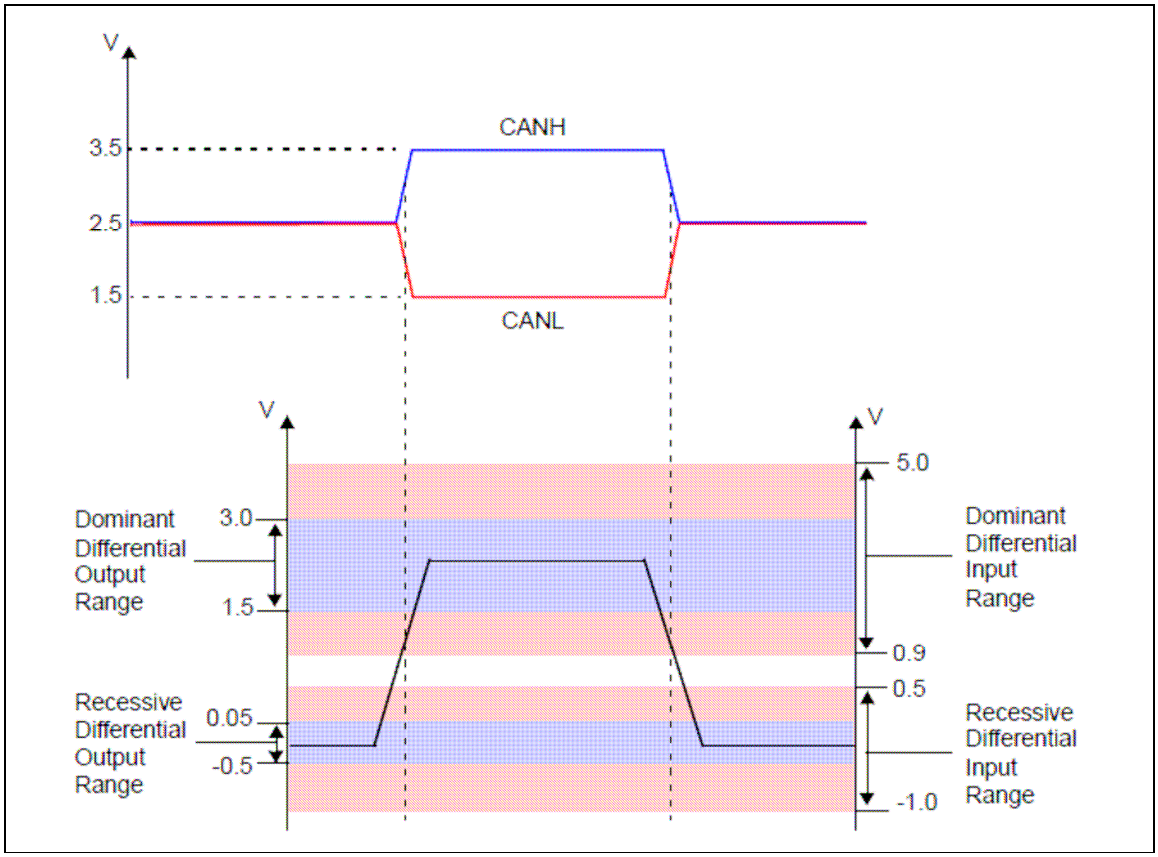


Figure 11 CAN Differential Bus

Recessive State

In the recessive state (i.e., logic '1' on the MCP2551 TXD input), the differential voltage on CANH and CANL is less than the minimum threshold (< 0.5V receiver input or < 1.5V transmitter output).

Dominant State

In the dominant state (i.e., logic '0' on the MCP2551 TXD input), the differential voltage on CANH and CANL is greater than the minimum threshold. A dominant bit overdrives a recessive bit on the bus to achieve nondestructive bitwise arbitration.

1.7.3 Comparison

The ISO-11898-2 specification requires that a compliant or compatible transceiver must meet a number of electrical specifications. The following table shows the major

ISO-11898-2 electrical requirements vs. Microchip MCP2551 specification (and of course MPX-2515 card).

Parameter	ISO-11898-4		MCP2551		Unit	Comments
	min	max	min	max		
DC Voltage on CANH and CANL	-3	+32	-40	+40	V	Exceeds ISO-11898
Transient voltage on CANH and CANL	-150	+100	-250	+250	V	Exceeds ISO-11898
Common Mode Bus Voltage	-2.0	+7.0	-12	+12	V	Exceeds ISO-11898
Recessive Output Bus Voltage	+2.0	+3.0	+2.0	+3.0	V	Meets ISO-11898
Recessive Differential Output Voltage	-500	+50	-500	+50	mV	Meets ISO-11898
Differential Internal Resistance	10	100	20	100	kΩ	Meets ISO-11898
Common Mode Input Resistance	5.0	50	5.0	50	kΩ	Meets ISO-11898
Differential Dominant Output Voltage	+1.5	+3.0	+1.5	+3.0	V	Meets ISO-11898
Dominant Output Voltage (CANH)	+2.75	+4.50	+2.75	+4.50	V	Meets ISO-11898
Dominant Output Voltage (CANL)	+0.50	+2.25	+0.50	+2.25	V	Meets ISO-11898
Permanent Dominant Detection (Driver)	Not Required		1.25	—	ms	
Power-On Reset and Brown-Out Detection	Not Required		Yes		–	

Table 3 MPX-2515 (MCP2551) vs. ISO-11898-2

1.8 MPX-2515 I/O Interfaces

This section defines all input/output ports for MPX-2515 CAN 2.0B USB card. It includes ports for connection and jumper for control.

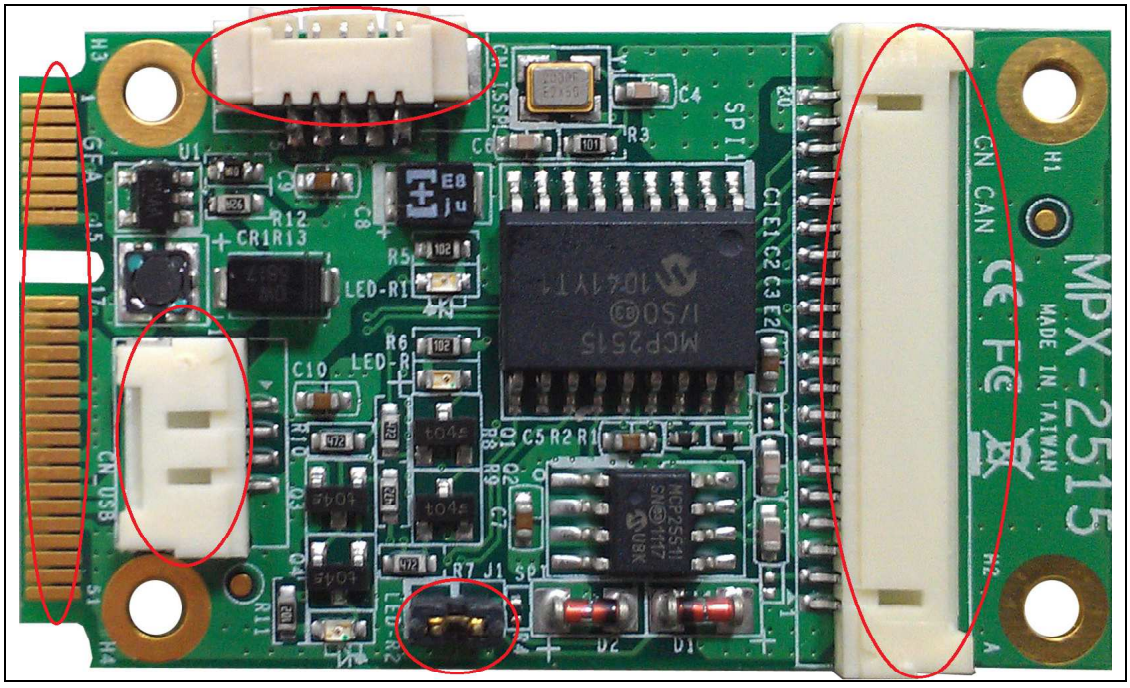


Figure 12 I/O Ports and Jumper

- **Mini card golden finger -** The USB signals of this industrial standard mini-PCIe interface are used to connect to a USB host.
- **CN_USB connector -** The connector for connecting to a USB host by cable. Please refer to its corresponding section for detail information.
- **J1 -** The Line Termination jumper.
- **CN_CAN connector -** The connector for connecting to the CAN bus.
- **CN_ISSP connector -** The connector for firmware uploading.

1.8.1 Mini Card Golden Finger

The MPX-2515 CAN 2.0B USB card implements only the USB D+ and USB D-, ground, and 3.3V voltage supply of the mini card golden finger. Users can use this mini card golden finger to connect to a USB host of the motherboard.

The following figure shows the location of golden finger of MPX-2515 card.

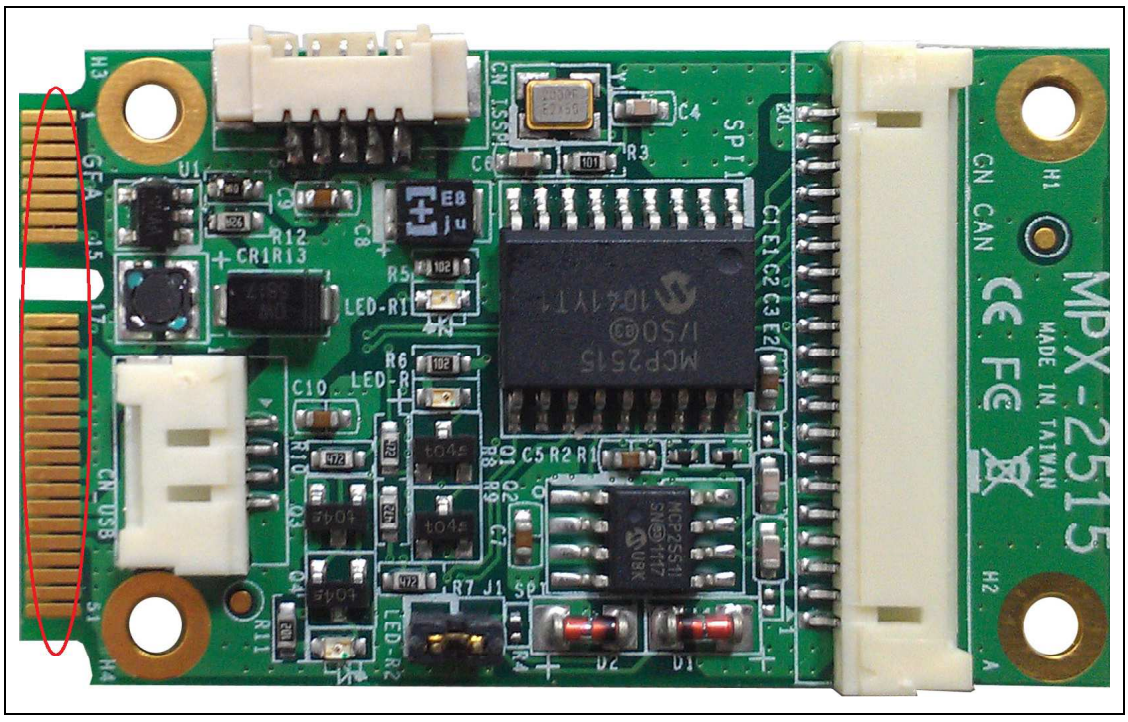


Figure 13 MPX-2515 Golden Finger

The following figure shows the I/O pins definitions of MPX-2515 CAN 2.0B USB card.

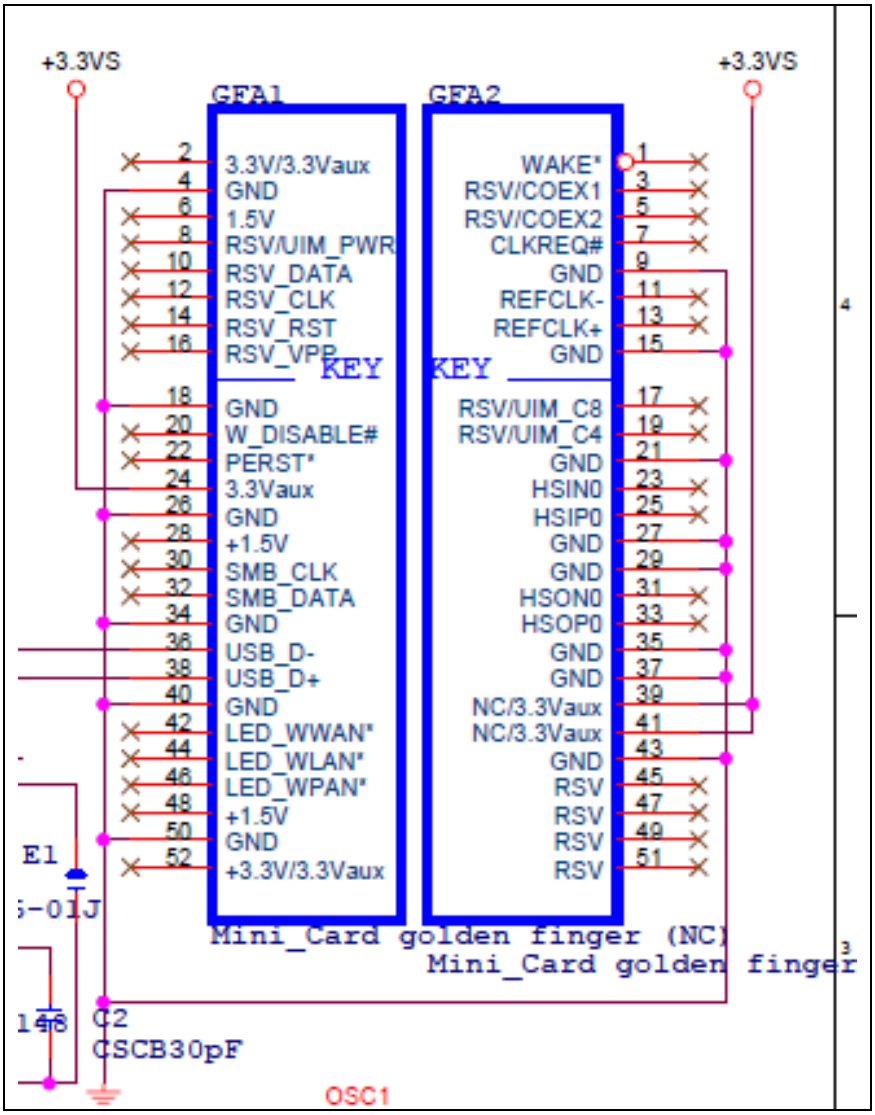


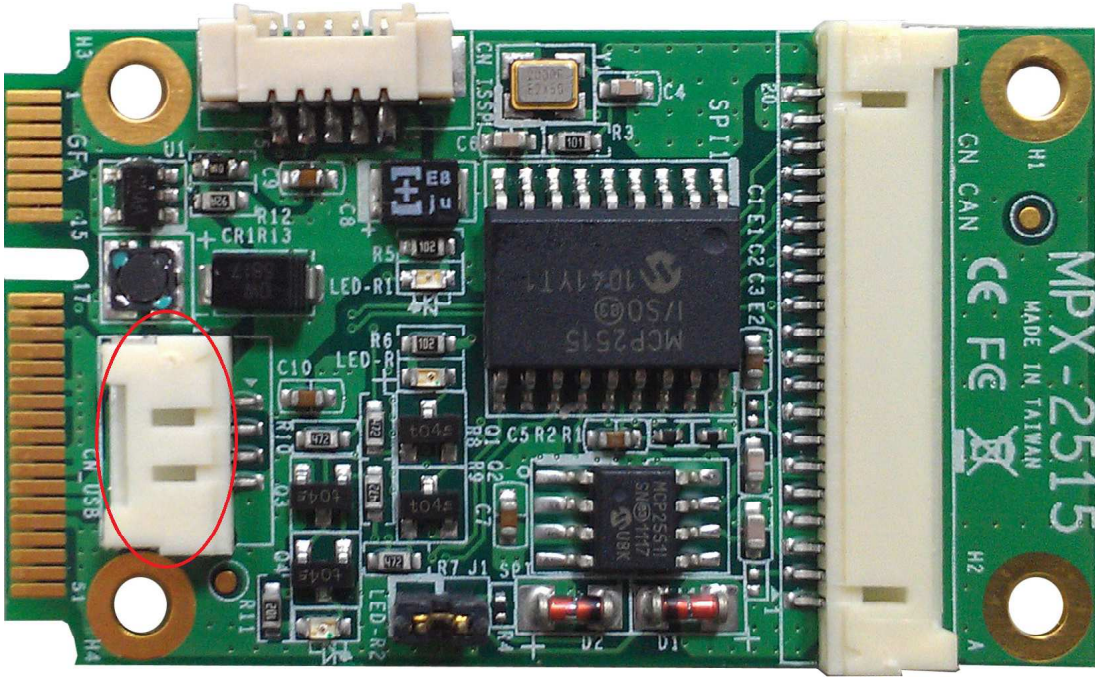
Figure 14 Golden Finger Pins Definitions

1.8.2 CN_USB Connector

This connector is provided to as an alternate to connect the MPX-2515 CAN 2.0B USB card to a USB host. Users can connect OALUSB-H4-1 cable from this connector to a USB Type A receptacle to connect to a USB host.

The following figures shows/defines the pins definitions.

Figure 15 MPX-2515 OALUSB Connector



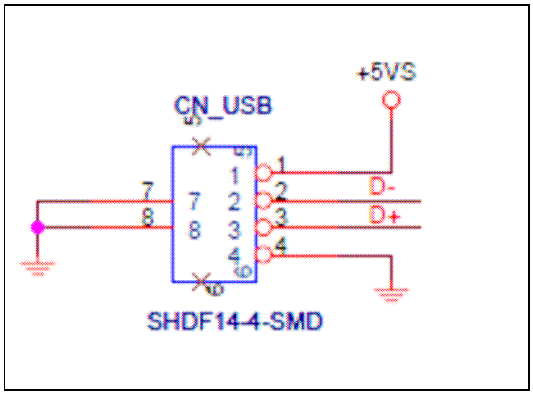


Figure 16 CN_USB Pins Definitions

Please refer to the OALUSB-H4-1 section for the cable information.

1.8.3 Jumper for Line Termination

Users apply this line termination jumper to enable 120 Ohm line termination if the MPX-2515 CAN 2.0B USB card is connecting to a CAN bus at the end side. Users need to apply this 120 Ohm line terminator in order to increase the signaling quality on the bus.

The jumper is enabled by default. Remove the connector if your node is not at the end side of the bus.

J1 Status	120 Ohm Line Termination
Close	Enabled
Open	Disabled

Table 4 J1 Line Termination

The following figure shows the location of the jumper.

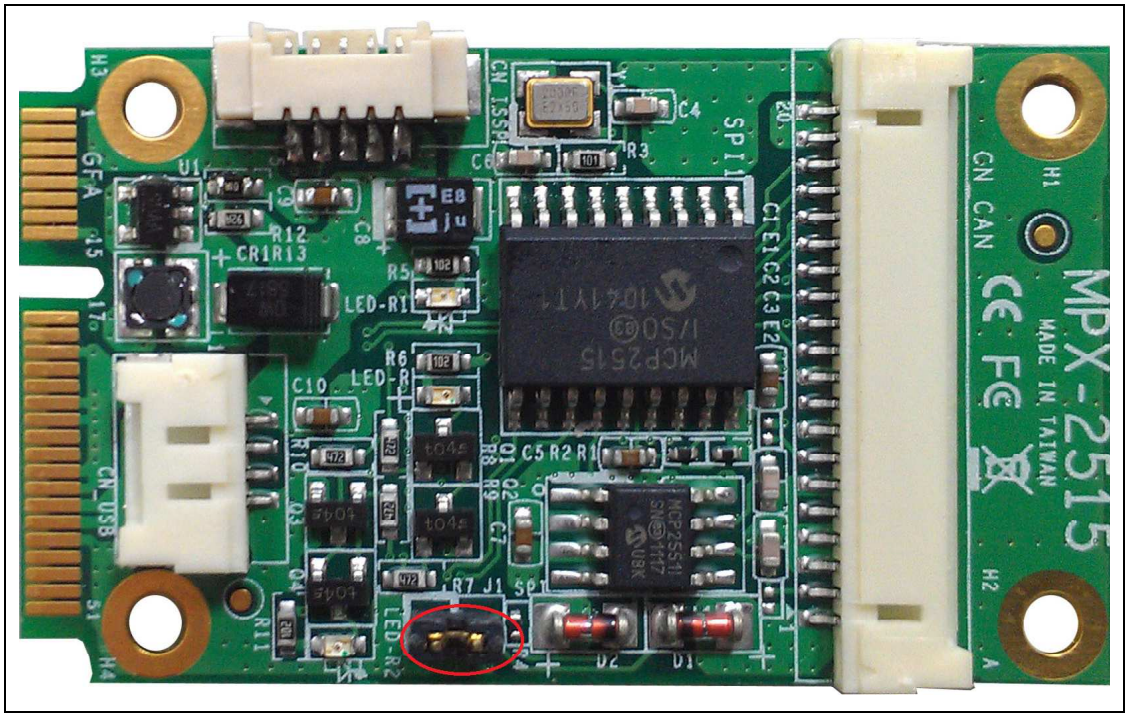


Figure 17 MPX-2515 Line Termination Jumper

1.8.4 CN_CAN Connector

CN_CAN connector provides signals for CAN bus. The OAL-2515 cable connects this port to the CAN bus via D-SUB9 connector, which compliant to the industrial standard.

The following figures show/define the pins definitions of CN_CAN connector.

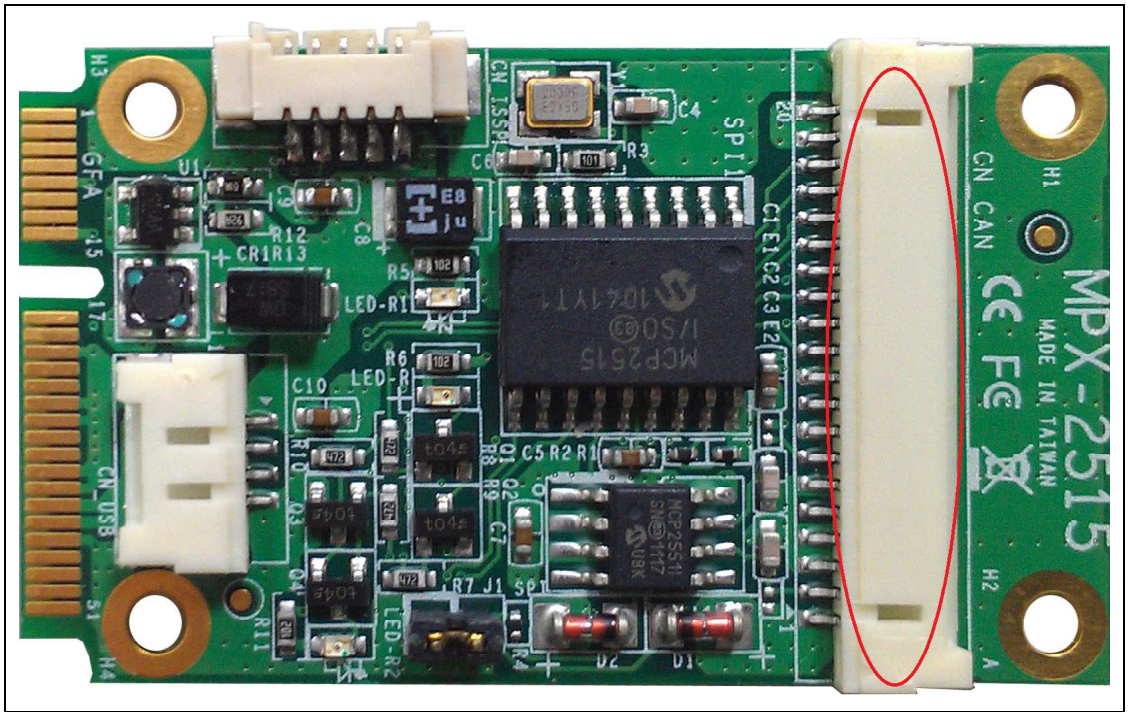


Figure 18 MPX-2515 CN_CAN Connector

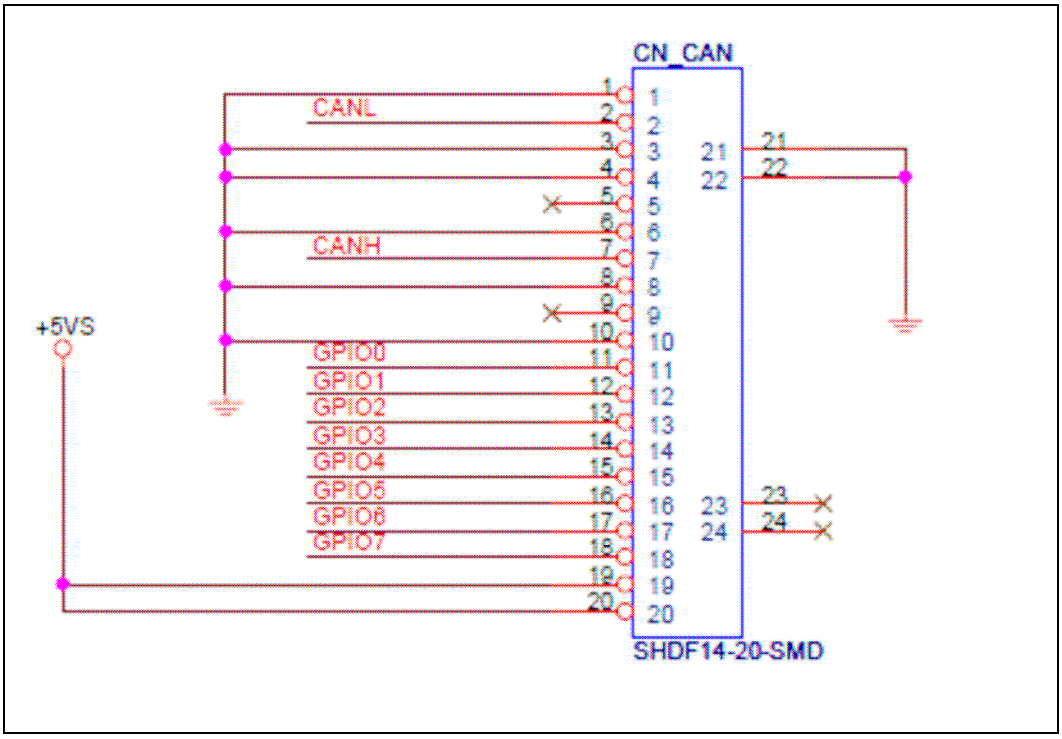


Figure 19 CN_CAN Pins Definitions

Please refer to the OAL-2515 Cable section for cable information.

1.8.5 CN_ISSP Connector

CN_ISSP connector is used to upload MPX-2515 firmware. MPX-2515 users are normally not using this connector.

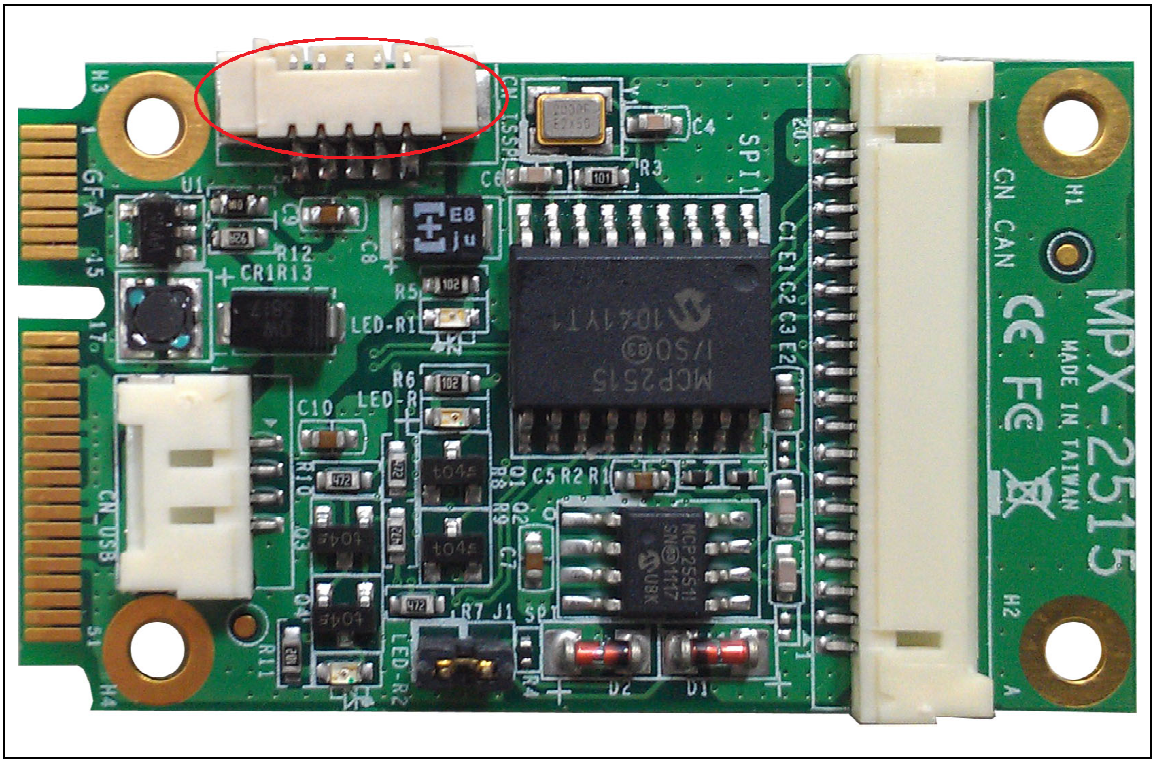


Figure 20 CN_ISSP Connector

1.9 MPX-2515 Card Properties

This section describes all other properties that are not listed above.

1.9.1 USB Properties

This sub-section defines MPX-2515 card USB properties, which include device identifier, device attribute, and endpoints.

- **Vendor ID** = 0xCECE
- **Product ID** = 0x2515
- **USB Device Instance Id:** USB\VID_CECE&PID_2515\1234567, for example.

- **Device String:** "MPX1515 USB-CAN20B Card" is the string shown in the Microsoft Windows platforms.
- **USB Serial Number:** This is a seven digits number, which starts with digit number 1. It looks like 1001234. Every MPX-2515 card has its unique serial number. This serial number can be retrieved by USB default command. Please refer to the example in the SDK chapter.
- **Endpoint 0**: USB default endpoint. USB vendor specific command is implemented in this endpoint.
- **Endpoint 1**: MPX-2515 card implements BULK IN transfer at this endpoint. Application issues a BULK IN transfer to return a response packet from the MPX-2515 card.
- **Endpoint 2:** MPX-2515 card implements BULK OUT transfer at this endpoint. Application then issues a BULK OUT transfer toward this endpoint to ask MPX-2515 firmware to carry out a request packet.
- **Endpoint 3:** INTERRUPT IN transfer. MPX-2515 keep its status in an eight bytes packet so that the application can keep informed by issuing an INTERRUPT IN transfer over this endpoint. Please refer to the CCP chapter for details.
- **Endpoint 4:** BULK IN transfer. Application issues BULK IN transfer over this endpoint to receive all MPX-2515 received CAN messages in a bulk. Please refer to the CCP chapter for details.

The following figure shows the General Properties of the MPX-2515 successfully installed on a Windows system.

Figure 21 General Properties of MPX-2515

The following figure shows the Device Instance ID of the MPX-2515 on a Windows system.

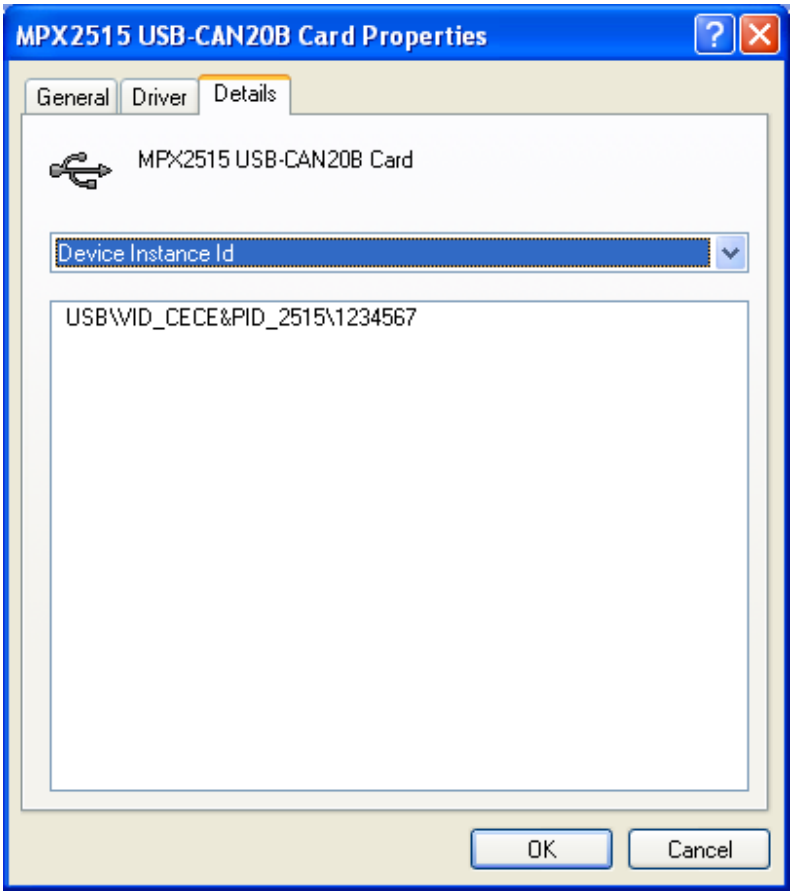


Figure 22 Device Instance ID of MPX-2515

1.9.2 LED Indicators

The following table defines the LED indicators that are used in the MPX-2515 card. Please be noted that these LED indicators can be turned off by the software. CCP provides a command that the application can issue to command MPX-2515 card to either turn on or turn off these LED indicators. Please refer to the CCP section for the format of this command.

POSITION	COLOR	DESCRIPTION
Q2	Red	CAN bus errors
Q3	Green	System timer blinking
Q5	Yellow	CAN bus received/transmit activities

Table 5 MPX-2515 LED Indicators

1.10 OAL-2515 Cable

OAL-2515 cable is used to connect the MPX-2515 CAN 2.0B USB card to the CAN bus. This cable has D-SUB9 standard connector for CAN bus. The OAL-2515 cable is compliant to CiA 303 CANopen Recommendation Par1 Cabling and connector pin assignment.

The following figure shows the drawing of OAL-2515 cable. Please refer to the GSE1205001.pdf (comes in the product CD) for detail information.

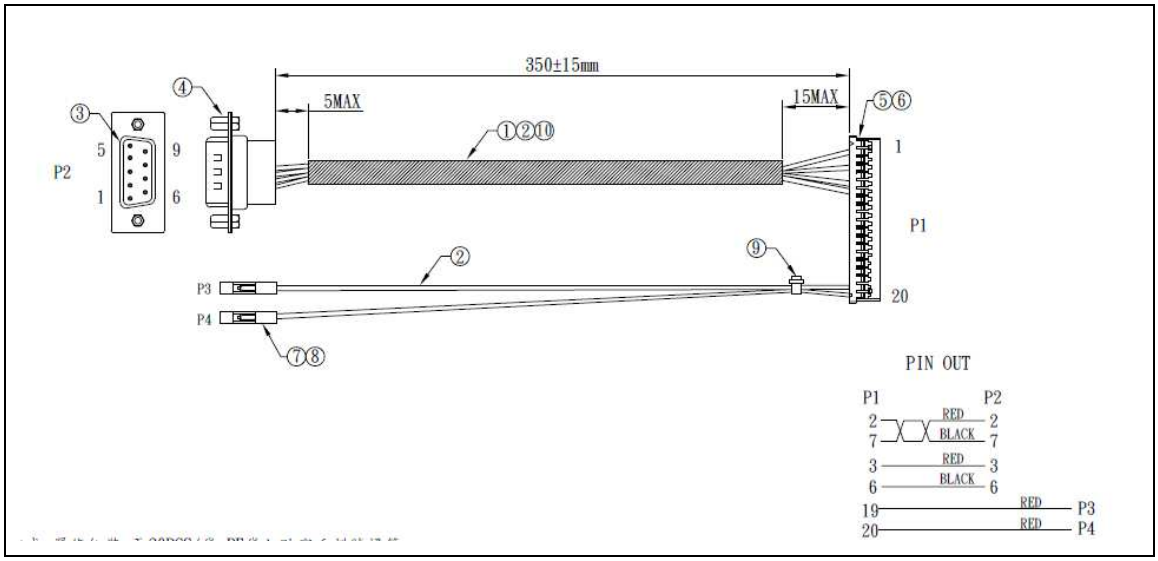


Figure 23 OAL-2515 Drawing

The 9-pin D-SUB male connector is used to connect to a CAN bus network. The following figure shows the 9-pin D-SUB male connector pin outs.

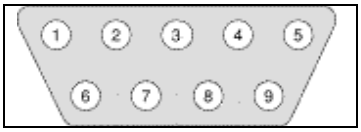


Figure 24 D-SUB Male 9-Pin Connector

The following table defines the pin outs of the 9-pin D-SUB connector for CAN bus.

PIN	NAME	DESCRIPTION
1	N/C	No Connect
2	CAN_L	CAN LOW
3	CAN GND	CAN Ground
4	N/C	No connect
5	N/C	Optional CAN_SHIELD
6	CAN GND	Optional CAN Ground

7	CAN_H	CAN HIGH
8	N/C	No Connect
9	N/C	No Connect

Table 6 OAL-2515 D-SUB9 Male Pin Outs

1.11 OALUSB-H4-1 Cable

The OALUSB-H4-1 cable is used to connect the MPX-2515 CAN 2.0B USB card to a USB host Type A receptacle. The following figure shows its drawing.

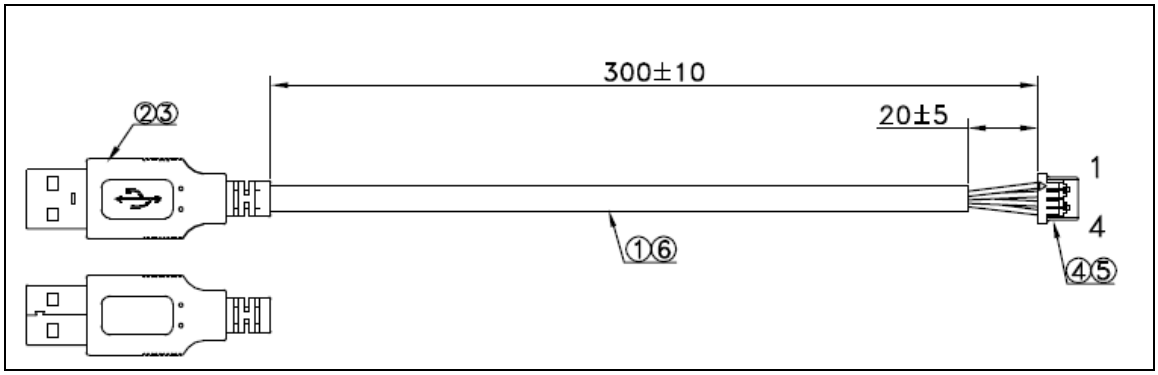


Figure 25 OALUSB-H4-1 Drawing

1.12 OALUSB-H4 Cable

The OALUSB-H4 cable is used to connect the MPX-2515 CAN 2.0B USB card to a USB host pin header on the motherboard. The following figure shows its drawing.

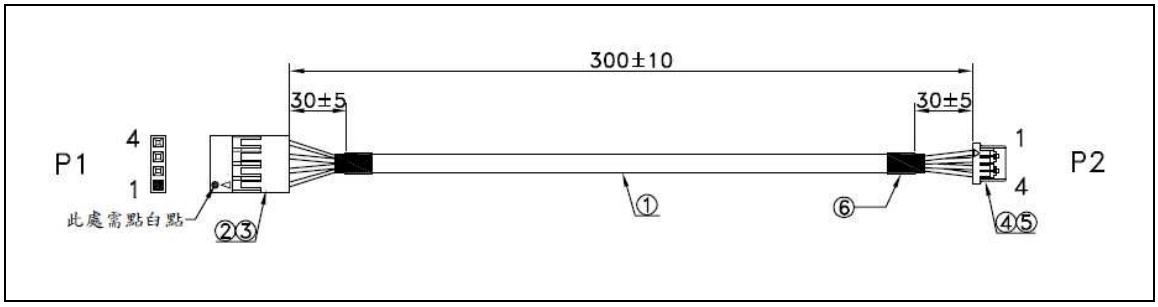


Figure 26 Cable OALUSB-H4 Drawing

Please be noted that the P1 end connects to a USB host pin header on a motherboard while P2 end connects to the CN_USB connector of MPX-2515 card.

1.13 How to Connect

1.13.1 Connect to USB Host via Mini-PCIe Slot

One of the two ways to connect to a USB host is inserting the MPX-2515 card into a Mini-PCIe slot.

You simply insert the MPX-2515 card golden finger portion into an industrial standard Mini-PCIe slot makes this MPX-2515 card connecting to a USB host.

The following figure shows of how to insert MPX-2515 card into a Mini-PCIe slot so that it connects to a USB host.

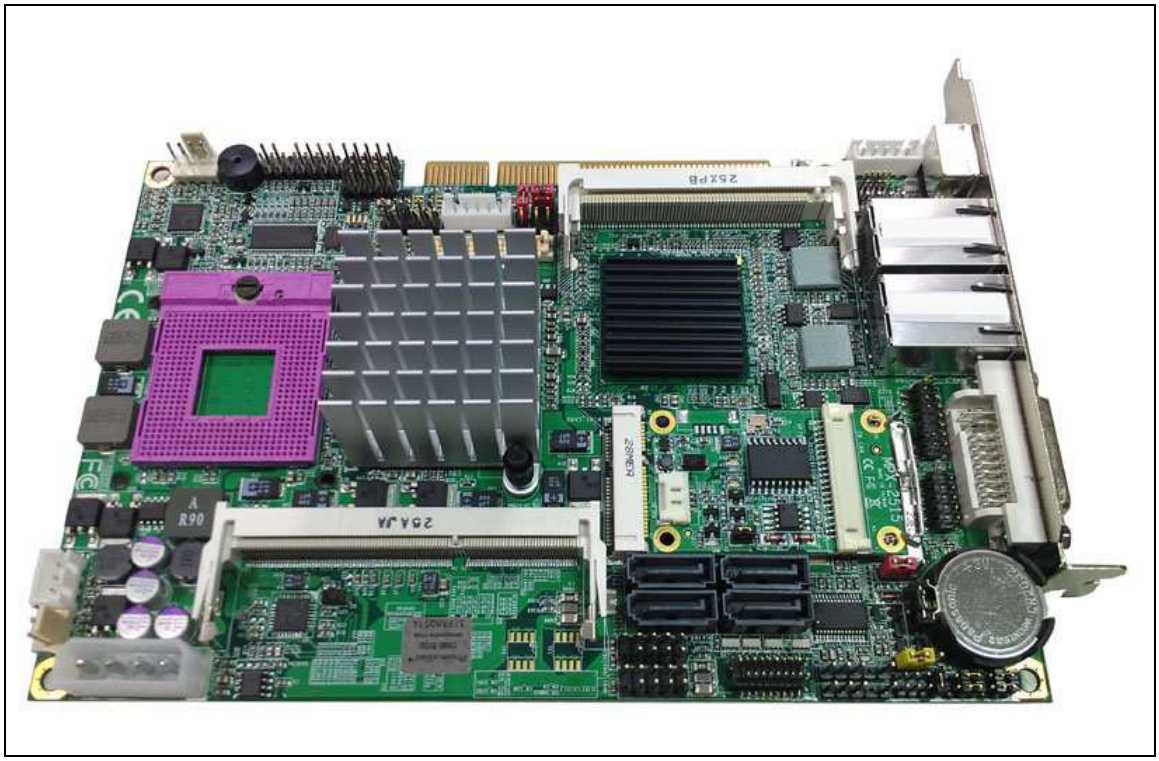


Figure 27 MPX-2515 Card Inserted Into a Mini-PCIe Slot

1.13.2 Connect to USB Host via Cable

You can connect the MPX-2515 card to a USB host by using OALUSB-H4-1 or OALUSB-H4 cable alternatively if a Mini-PCIe slot is not available or you prefer to connect to a USB Host Type A receptacle or your motherboard (like most Commell motherboards) that has USB Host pin header.

Simply connect OALUSB-H4-1 cable to CN_USB connector of MPX-2515 card and the other Type A plug is used to connect to a USB Type A receptacle.

The following figures shows how you use OALUSB-H4-1 cable to connect MPX-2515 card to a PC USB host.

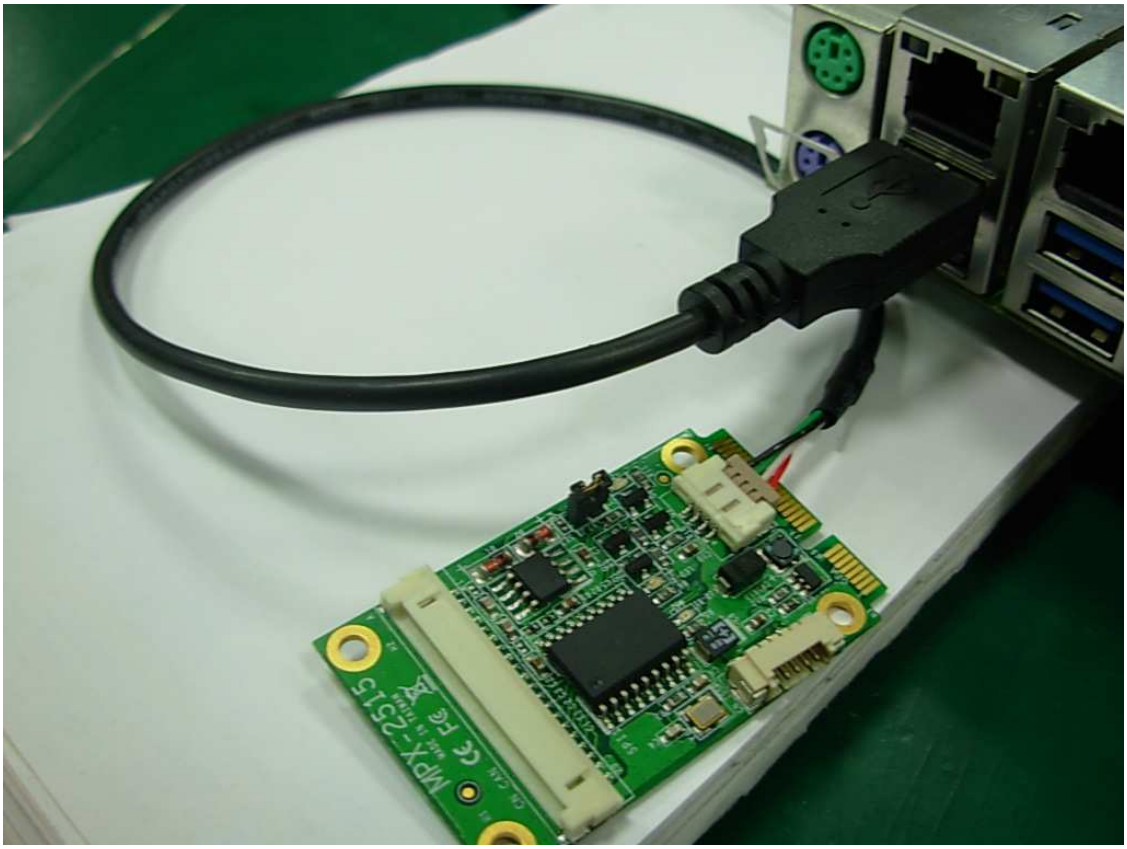


Figure 28 Connect to a USB Host Type A Receptacle

The following figure shows how to use the OALUSB-H4 cable to connect MPX-2515 card to a USB host pin header on a motherboard.

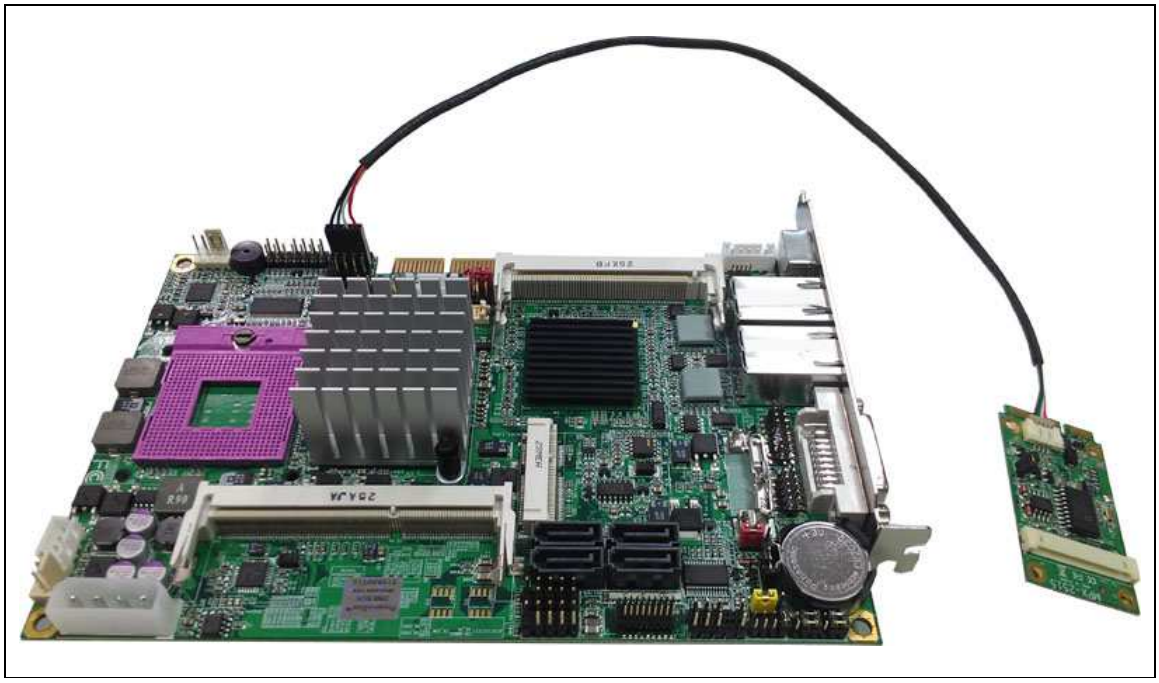


Figure 29 Usage of OALUSB-H4 Cable

1.13.3 Connect to CAN Bus

The following figure shows an example of the CAN bus node connection.

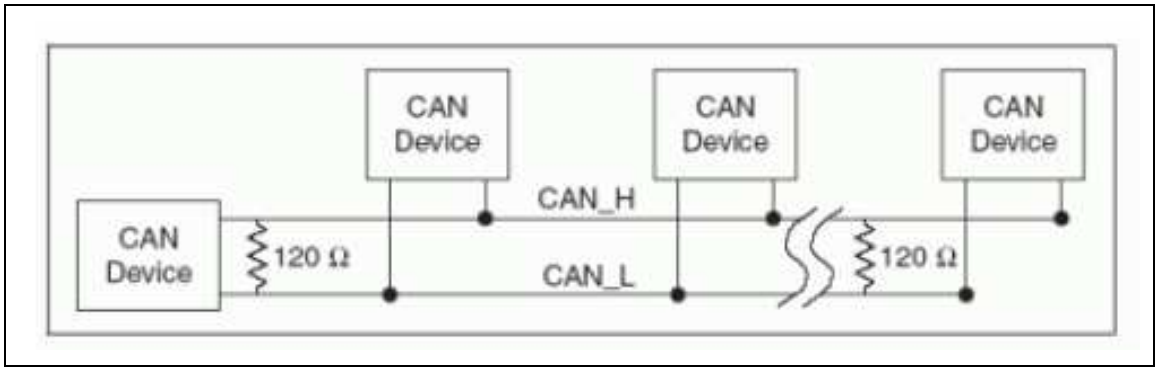


Figure 30 High-Speed CAN Networking

OAL-2515 cable is the cable that connects MPX-2515 card to the CAN bus. OAL-2515 one ends with a 9-pin D-SUB connector for connecting to the CAN bus networking.

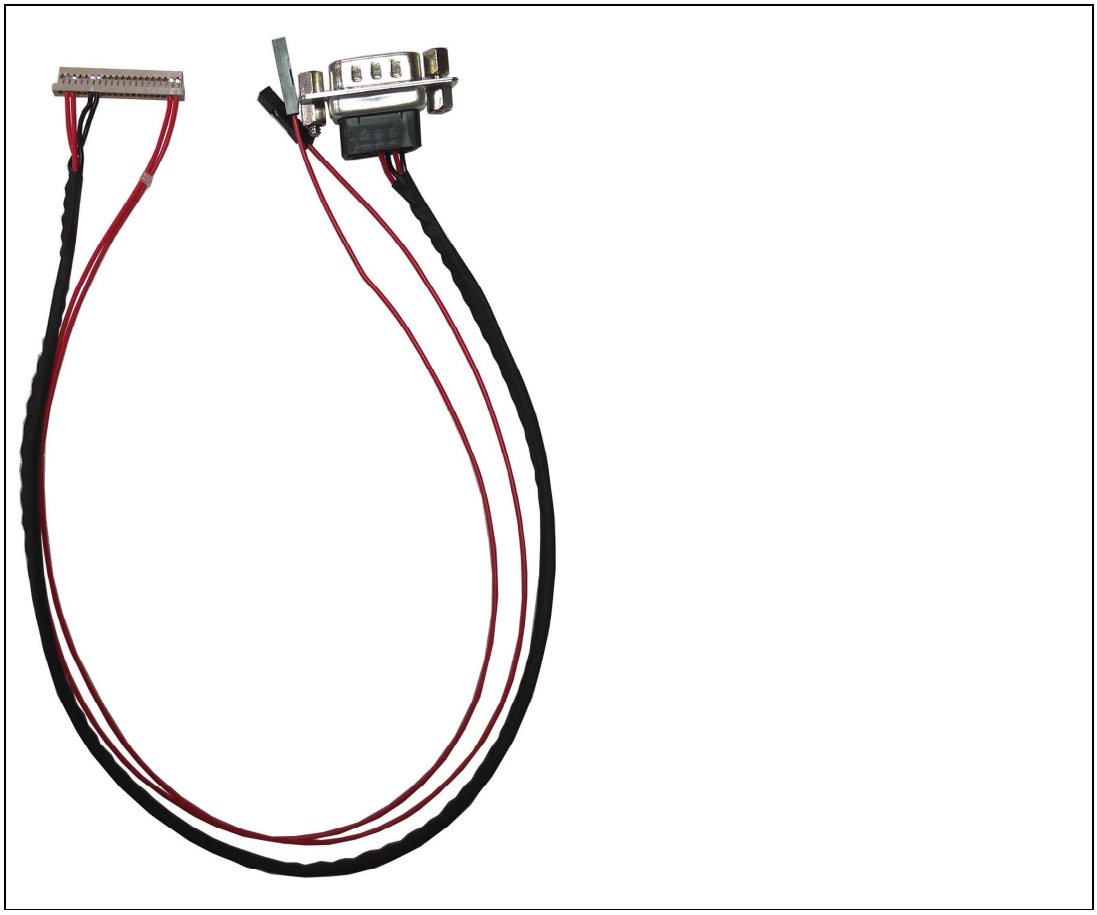


Figure 31 MPX-2515 Card Connects to CAN bus

Line Termination

It's important that you need to enable the Line Termination provided on the MPX-2515 card if you are happening to connect the MPX-2515 card to the end of a CAN bus networking. Users enable/disable the line termination by closing/opening the Line Termination Jumper on the MPX-2515 card.

Line Termination

For high-speed CAN, both ends of the pair of signal wires (CAN_H and CAN_L) must be terminated. The termination resistors on a cable should match the nominal impedance of the cable. ISO 11989 requires a cable with a nominal impedance of 120 Ohm. MPX-2515 card provides 120 Ohm resistor for termination. Users enable/disable 120 Ohm line termination by closing/opening the jumper.

2 Device Drivers

This chapter describes how to install the corresponding drivers for your target operating system.

2.1 Device Drivers for Windows

The following figure shows the MPX-2515 card device drivers file organization for different Microsoft Windows systems.

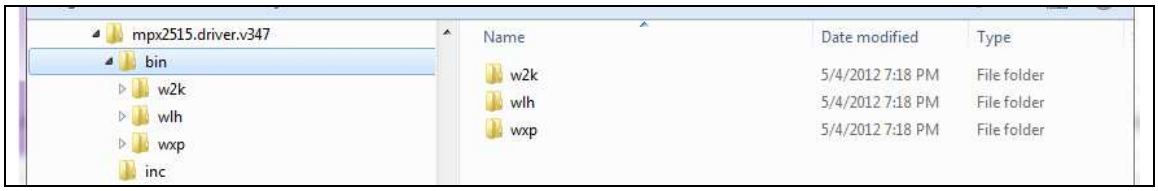


Figure 32 Device Drivers Organization

The following figure shows the Device Driver Properties after the MPX-2515 card has successfully installed.

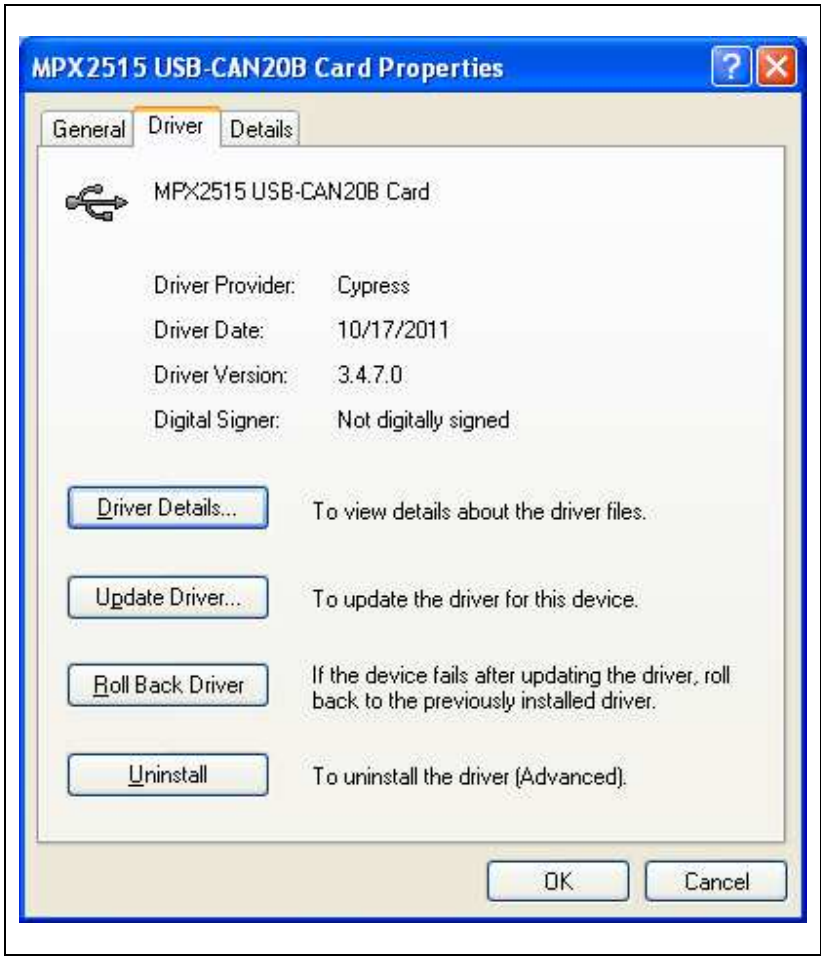


Figure 33 MPX-2515 Card Device Driver Properties

2.1.1 Windows 2000

The following figure shows the MPX-2515 card device driver for Windows 2000. File path is .\mpx2515.driver.v347\bin\w2k\x86.

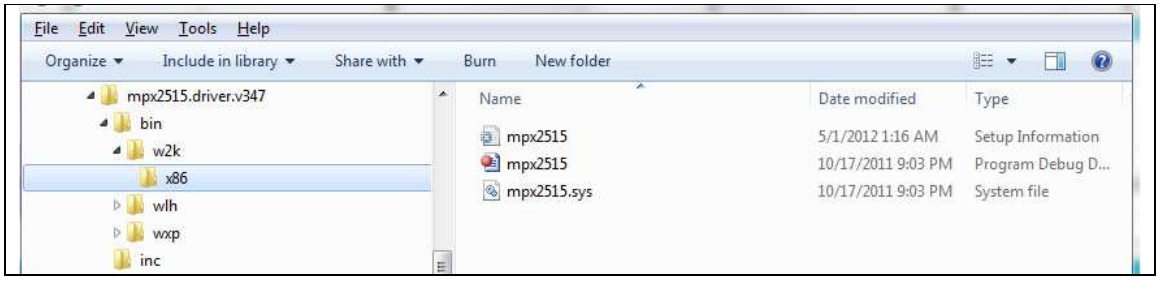


Figure 34 Device Driver for Windows 2000

2.1.2 Windows XP (32-bit) Device Driver

The following figure shows the MPX-2515 card device driver for Windows XP 32-bit version. File path is .\mpx2515.driver.v347\bin\wxp\x86.

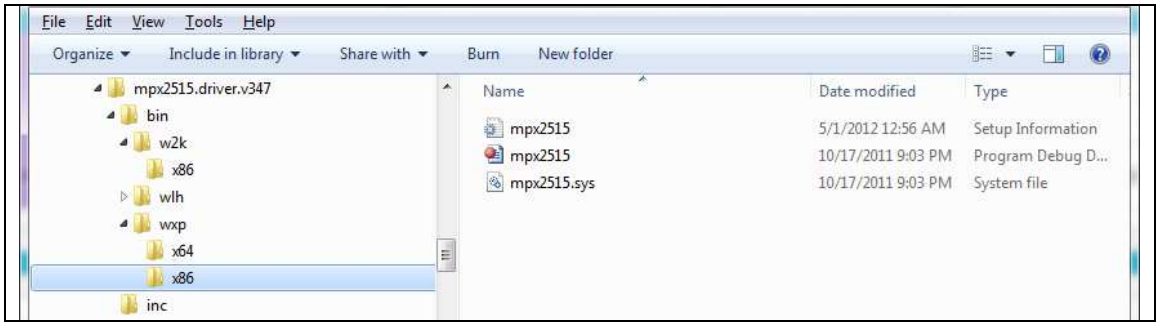


Figure 35 Windows XP 32-bit Device Driver

2.1.3 Windows XP (64-bit) Device Driver

The following figure shows the MPX-2515 card device driver for Windows XP 664-bit version. File path is .\mpx2515.driver.v347\bin\wxp\x64.

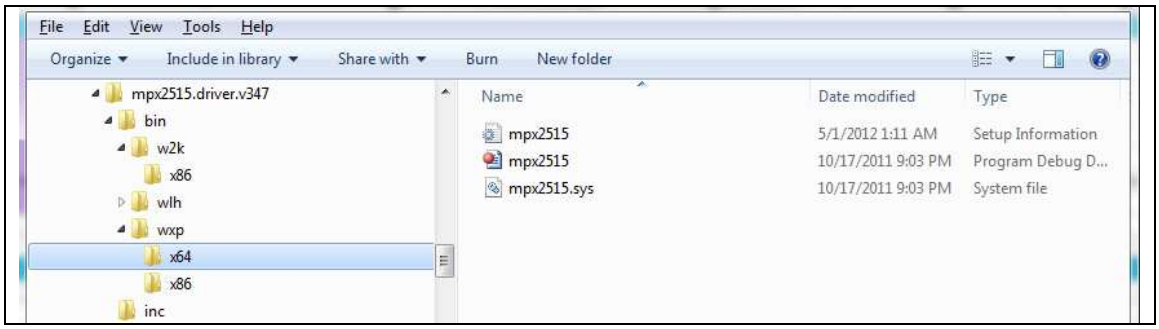


Figure 36 Windows XP 64-bit Device Driver

2.1.4 Windows Vista (32-bit) and Windows 7 (32-bit) Device Driver

The following figure shows the MPX-2515 card device driver for Windows Vista and Windows 7 32-bit version. File path is .\mpx2515.driver.v347\bin\wlh\x86.

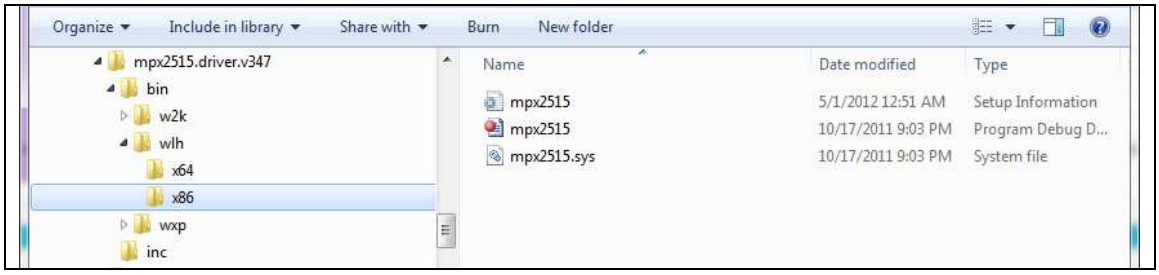


Figure 37 Windows Vista and Windows 7 Device Driver (32-bit)

2.1.5 Windows Vista (64-bit) and Windows 7 (64-bit) Device Driver

The following figure shows the MPX-2515 card device driver for Windows Vista and Windows 7 64-bit version. File path is .\mpx2515.driver.v347\bin\wlh\x64.

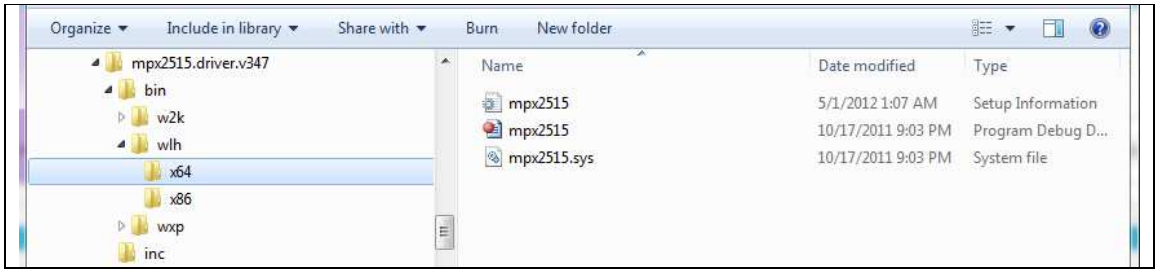


Figure 38 Windows Vista and Windows 7 Device Driver (64-bit)

2.2 How to Install Device Driver

This section describes the procedure to install the MPX-2515 card device driver for your target Microsoft Windows platform.

Have your product CD ready to be accessed by your Windows. Connect the MPX-2515 card through USB via one of the three methods mentioned in the previous sections and following the device driver setup instructions. The following screen shots will give you a detail ideal of the device driver setup procedure.

3 Firmware Update

3.1 Introduction

The MPX-2515 implements a bootloader that can reprogram the CY8C24794 device over the USB interface. The bootloading information can be sent through Cypress USB Bootloader Host interface

The USB bootloader supports a fully functional device reprogramming ability with built in error detection and an industry standard communication interface.

This chapter describes the steps of updating the firmware for MPX-2515 card via Cypress bootloader feature.

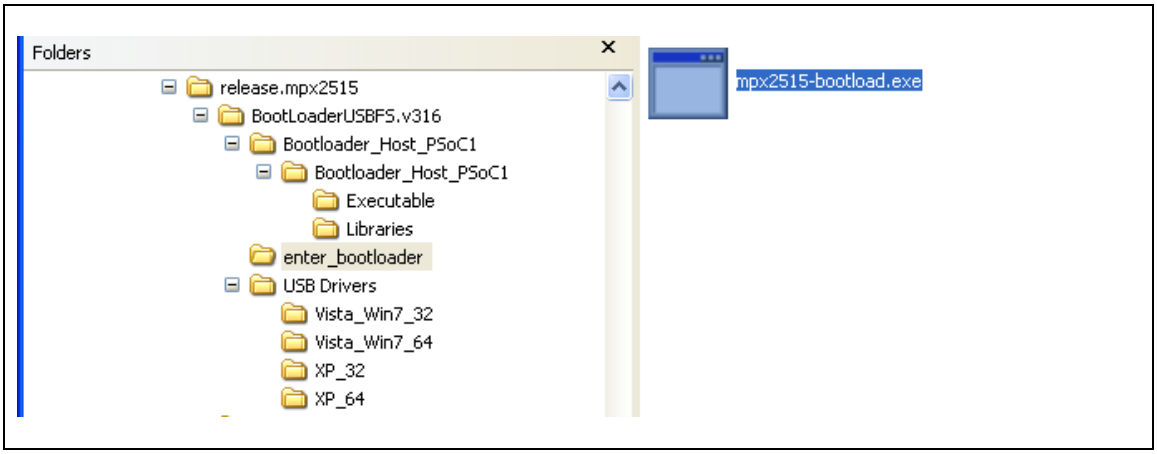
- Have bootloader device drivers ready. bootloader device drivers are different with MPX-2515 device drivers. Bootloader device drivers are come with the production CD. This procedure runs only at the first time firmware update.
- Enter bootloader mode. Please refer to 3.2 for detail description.
- Install bootloader device driver. Only in the first time update.
- Execute bootloader host application. Please refer to 3.4 for detail information. This completes the update procedure.

3.2 Enter Boot Loader

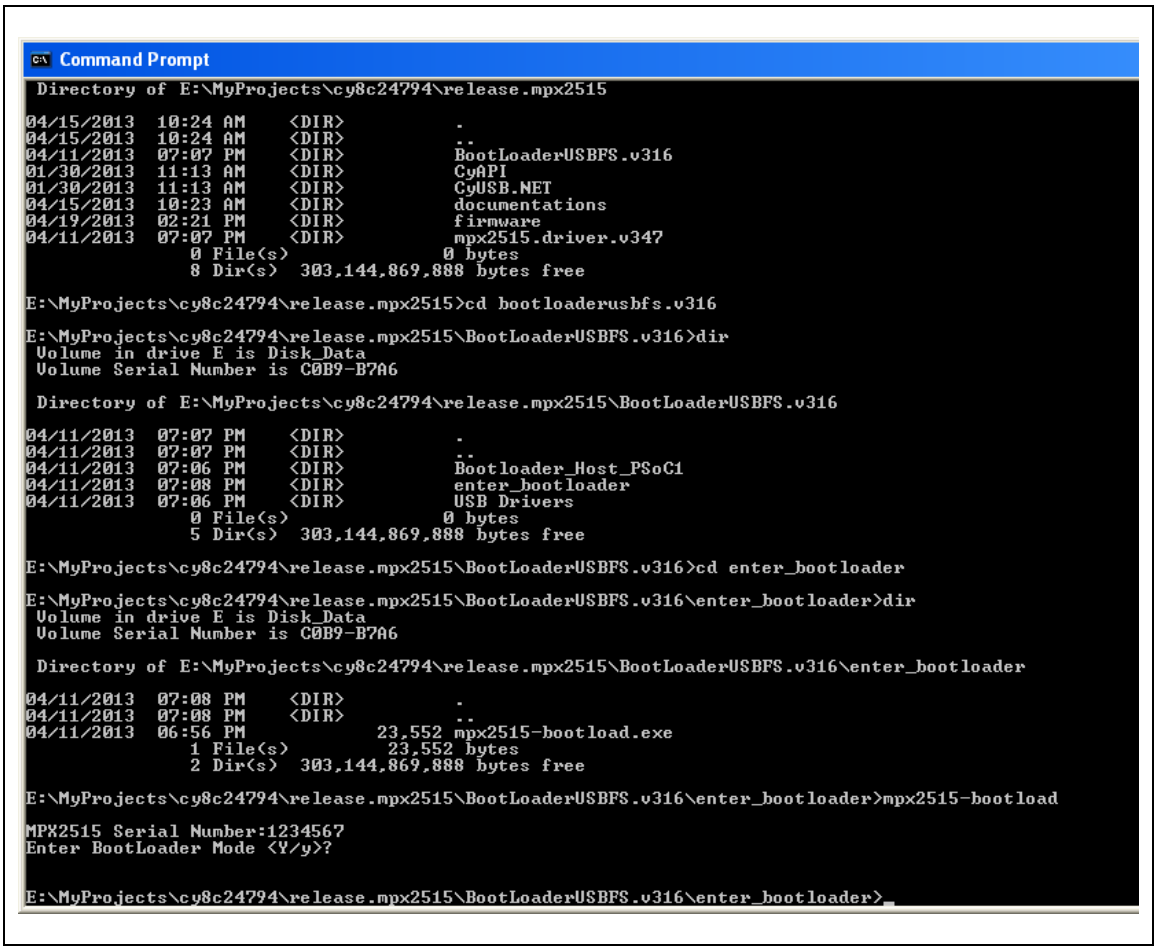
The MPX-2515 firmware needs to be in the bootloader mode in order to take bootloader commands from the PC USB host application.

Commell provides a DOS utility to put MPX-2515 firmware into bootloader mode. Please have the MPX-2515 card well connecting to the PC USB host platform before proceeding the update process.

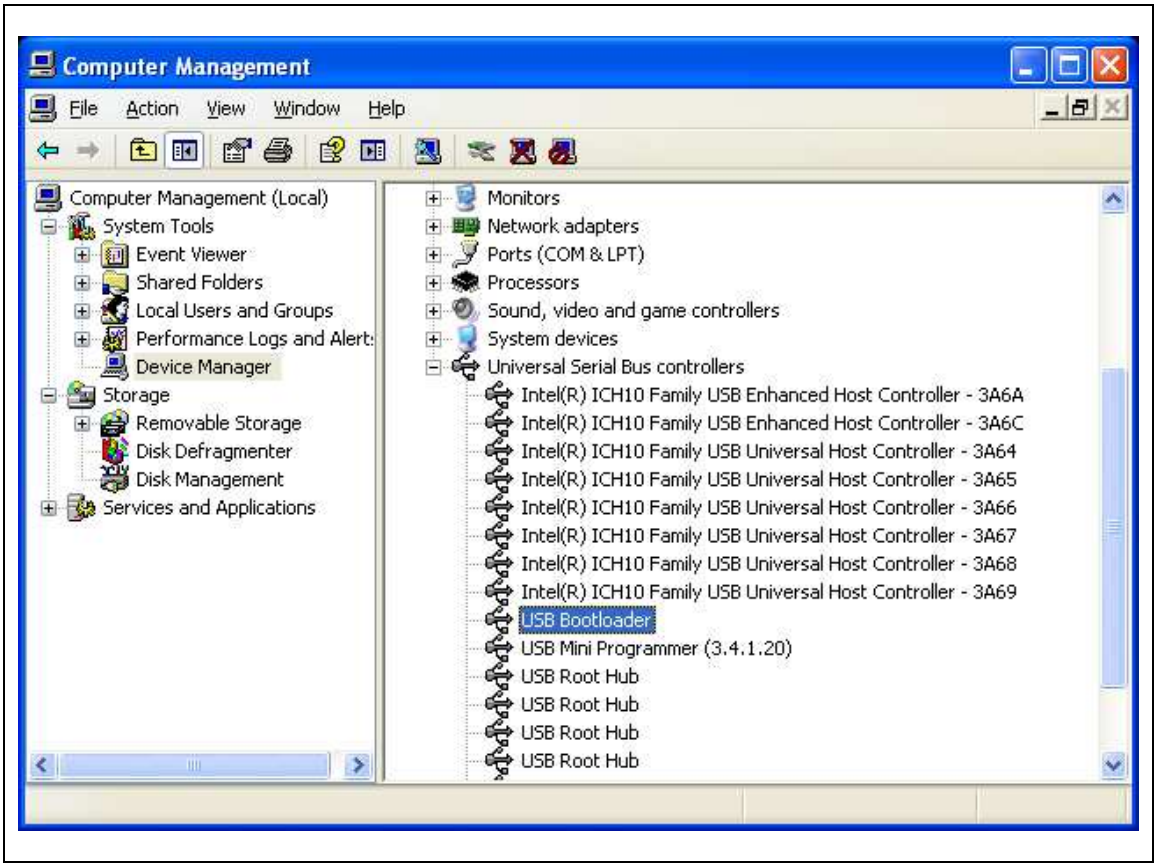
The following figure shows where the enter bootloader DOS utility locates in the production CD.



The following figure shows how this mpx2515-bootload.exe is running.



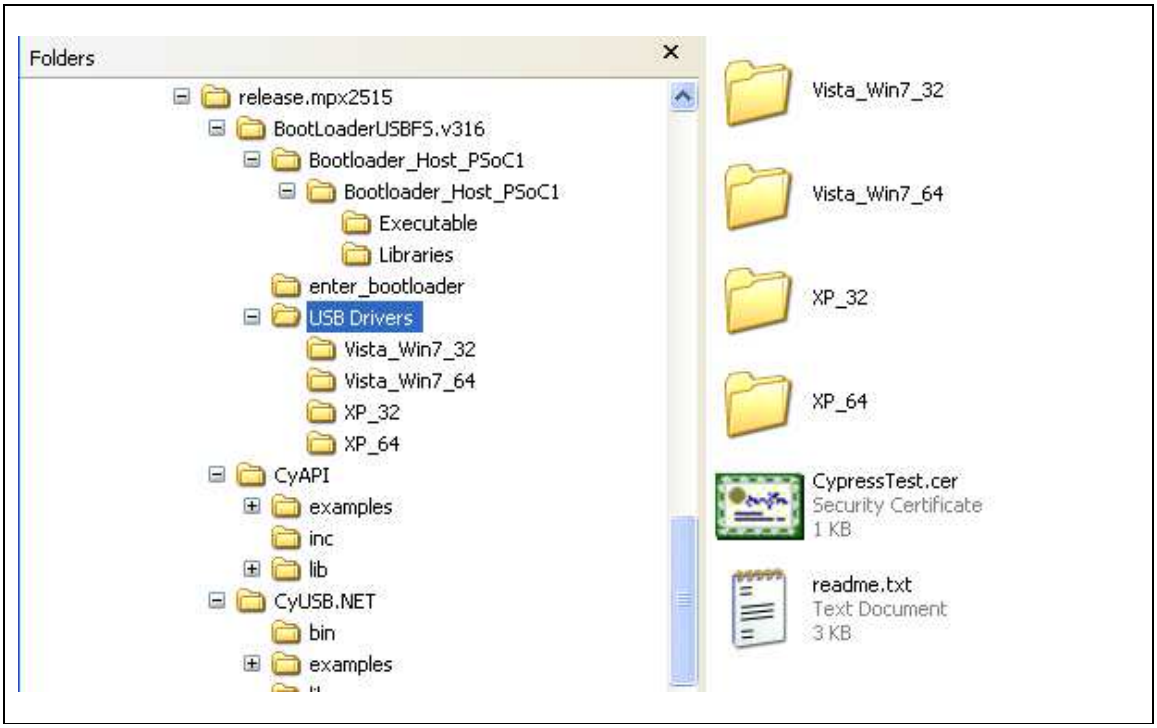
You check whether the MPX-2515 is in bootloader mode or not via checking the "USB Bootloader" device in USB category of the Device Manager. The following figure shows the MPX-2515 has been changed to the "USB Bootloader" mode.



3.3 Install Boot Loader Device Driver

You will be prompted by the Windows if the MPX-2515 card is entering the bootloader mode in the first time.

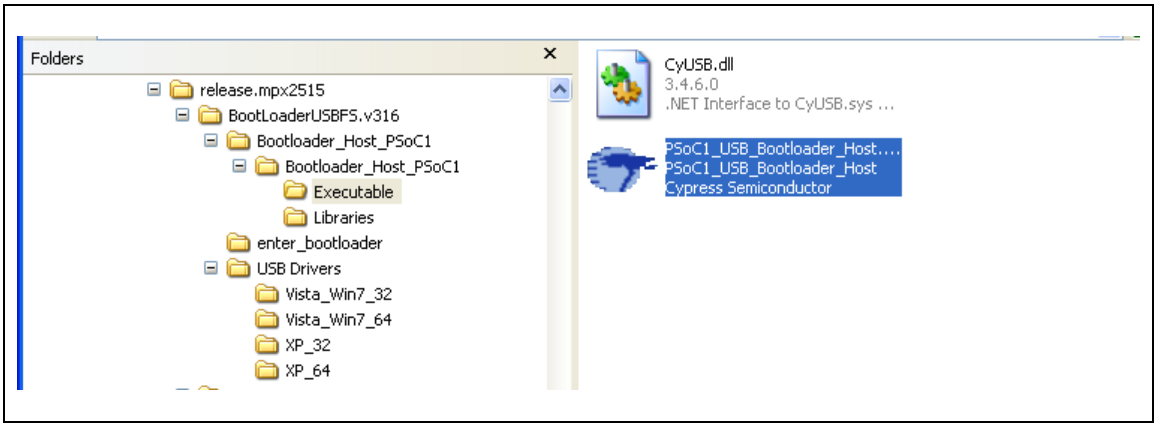
The following figure shows all possible USB Bootloader mode device drivers for Microsoft Windows Systems. Please pick up the one that meets your installing operating system.



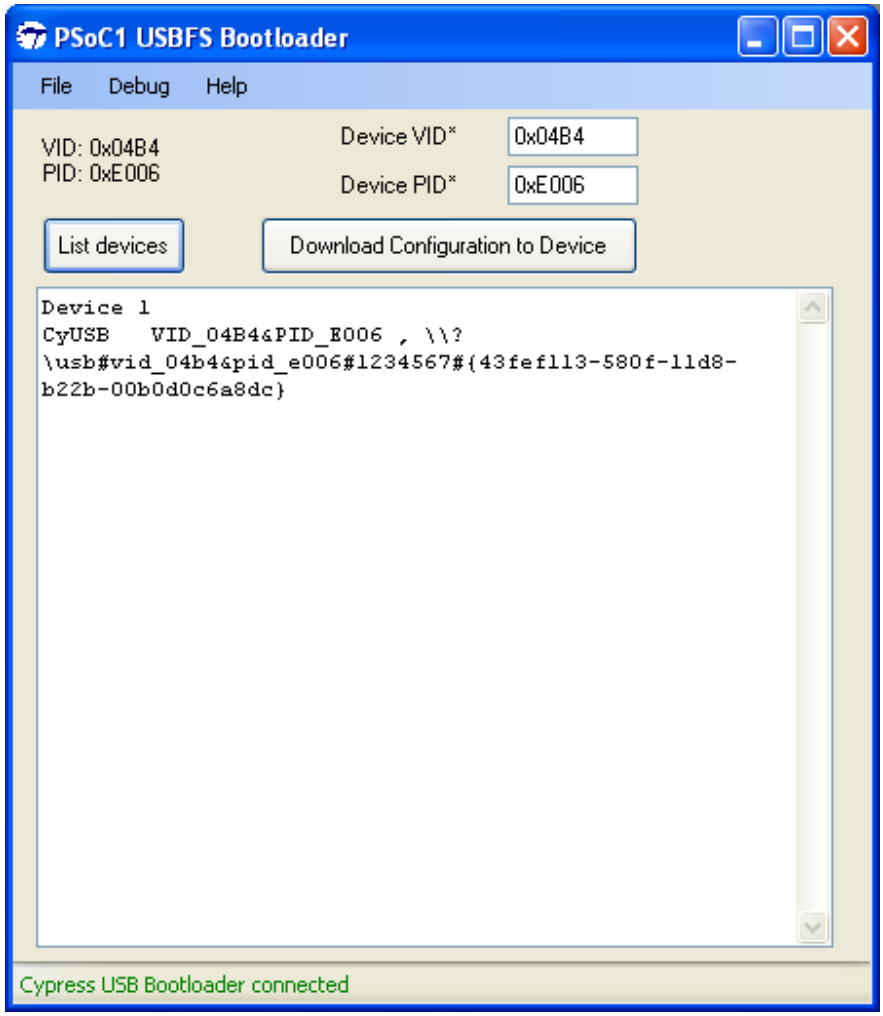
Please follows the Device Driver Installation Wizard to install a appropriate device driver from the provided USB Bootloader device drivers folders.

3.4 Boot Loader Host Application

The MPX-2515 firmware now is ready to be updated. Launch the Cypress Bootloader host application. The following figure shows where is this bootloader host application.

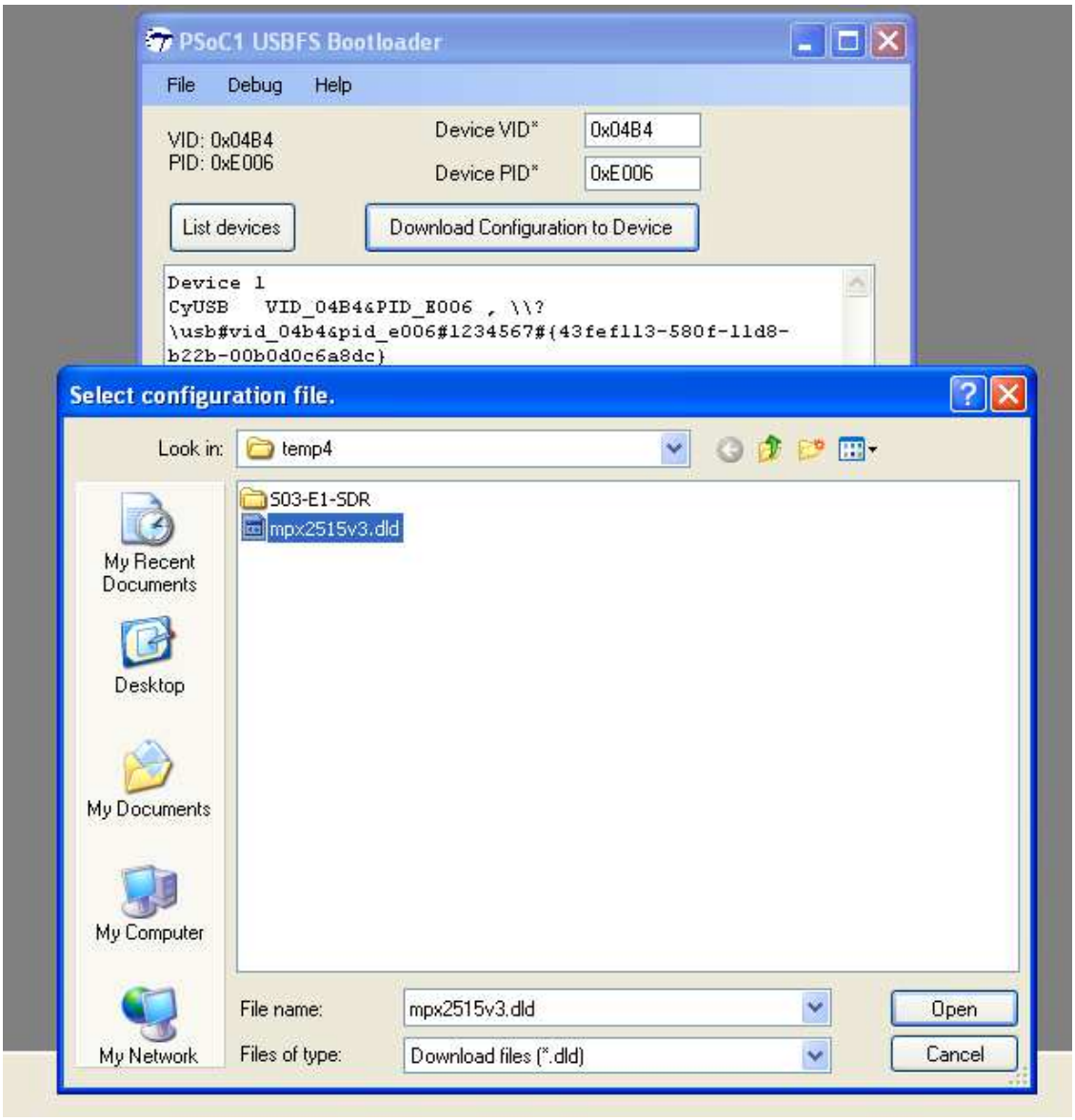


The following figure shows how the PSoC1_USB_Bootloader_Host_Application is running.



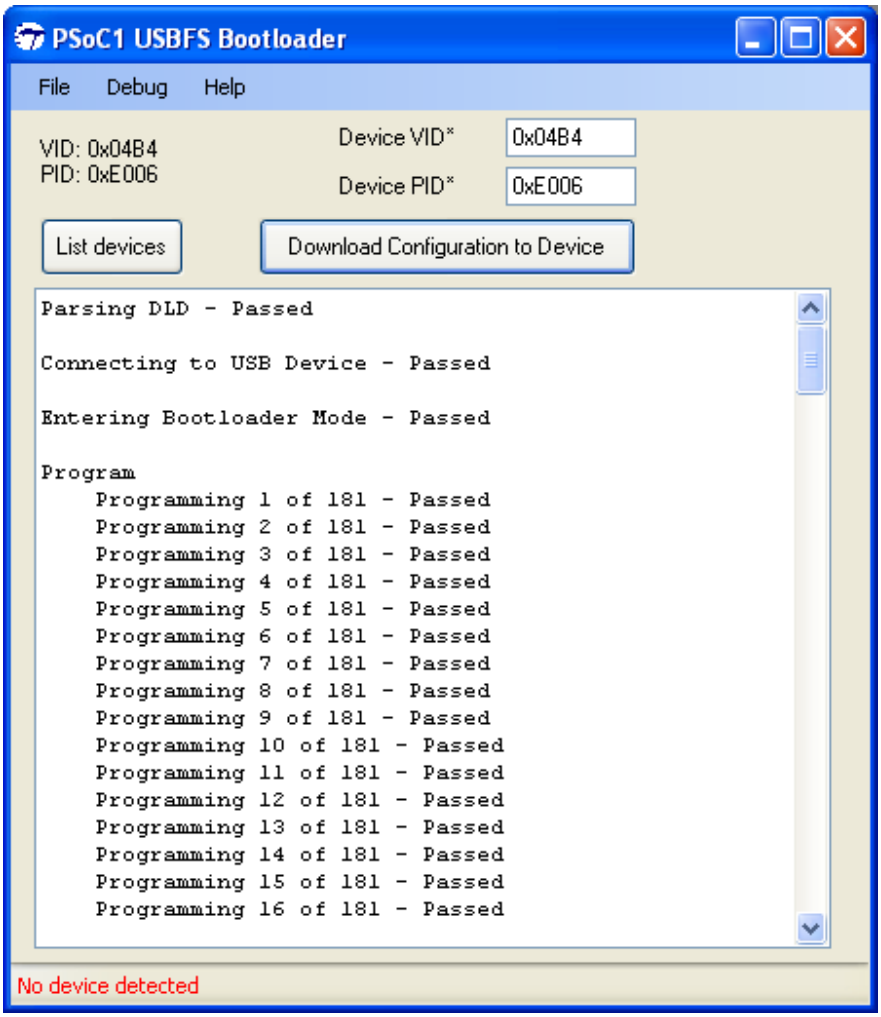
List devices ---> This program lists devices that are in bootloader mode by clicking the "List devices" button.

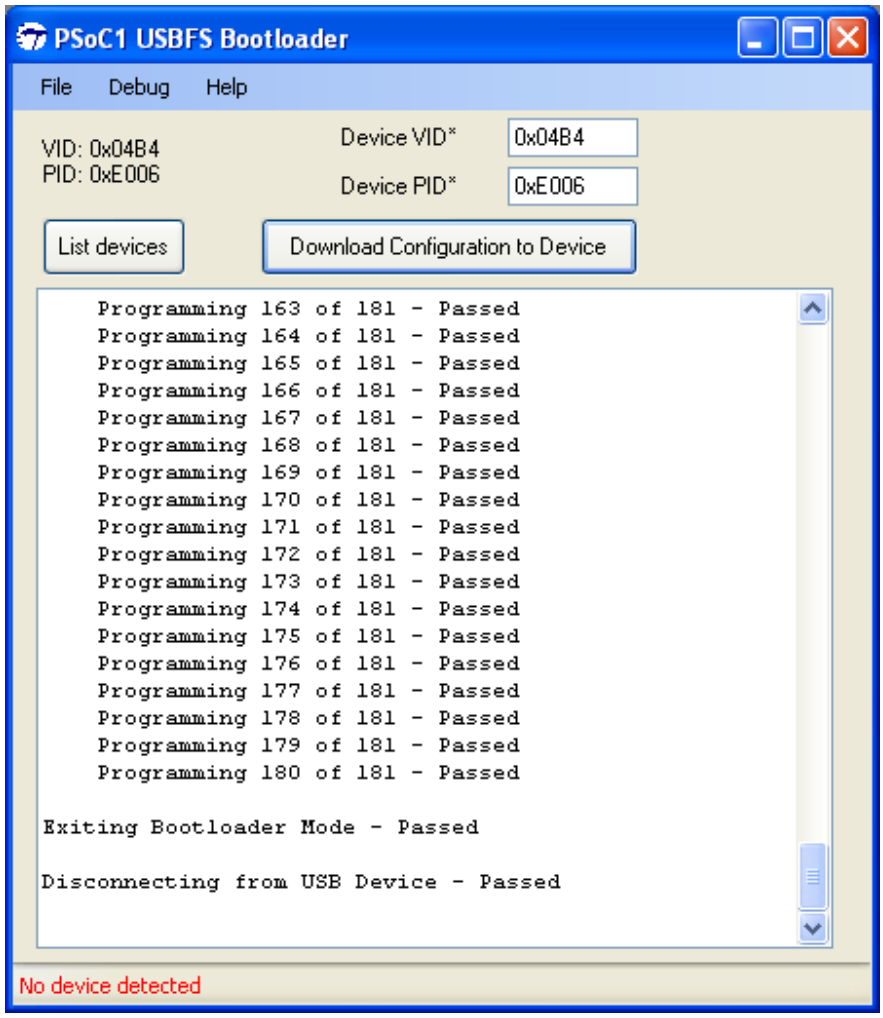
Download Configuration to device ---> Click on this button to choose the new configuration file to reprogram the MPX-2515 firmware. The following file dialog shows after this button has been clicked.



Choose the .DLD file that released from Commell to proceed the new firmware updating process.

The following figures show the updating messages during the update process.


PSoC1 USBFS Bootloader
File
Debug
Help
VID: 0x04B4
PID: 0xE006
Device VID*
0x04B4
Device PID*
0xE006
List devices
Download Configuration to Device
Parsing DLD - Passed
Connecting to USB Device - Passed
Entering Bootloader Mode - Passed
Program
Programming 1 of 181 - Passed
Programming 2 of 181 - Passed
Programming 3 of 181 - Passed
Programming 4 of 181 - Passed
Programming 5 of 181 - Passed
Programming 6 of 181 - Passed
Programming 7 of 181 - Passed
Programming 8 of 181 - Passed
Programming 9 of 181 - Passed
Programming 10 of 181 - Passed
Programming 11 of 181 - Passed
Programming 12 of 181 - Passed
Programming 13 of 181 - Passed
Programming 14 of 181 - Passed
Programming 15 of 181 - Passed
Programming 16 of 181 - Passed
No device detected



You are now completed the MPX-2515 firmware update process.

3.5 In Case Failed

Here is the steps to following if the firmware update process is failed.

- Keep the Cypress Bootloader Host Application running still.
- Disconnect the MPX-2515 card from the USB receptacle.
- Re-insert the MPX-2515 card into the same USB receptacle.

- Repeat the update procedures.

4 Reference

[1] CY8C24x94 PSoC Programmable System-on-Chip Technical Reference Manual (TRM). Cypress Document No. 001-14463 Rev. *E.

[2] MCP2515 Stand-Alone CAN Controller With SPI Interface DS21801F, Microchip.

[3] MCP2551 High-Speed CAN Transceiver DS21667F, 2010 Microchip.

[4] Microsoft Visual Studio 2010 Help, Microsoft.

[5] CiA 301 CANopen application layer and communication profile version 4.2.0, 21 February 2011, CAN in Automation.

[6] CiA 103 Intrinsically safe capable physical layer version 1.0.0, February 2010, CAN in Automation.

[7] CiA 303 CANopen Recommendation Part 1 Cabling and connector pin assignment Version 1.8.0, 27 April 2012, CAN in Automation.

[8] A CAN Physical Layer Discussion, AN228, DS00228A, 2002 Microchip.