The I-2532 CAN to Fiber Converter

User's Manual

Warranty

All products manufactured by ICP DAS are under warranty regarding defective materials for a period of one year from the date of delivery to the original purchaser.

Warning

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1 Introduction

Fiber optic transmission medium is a good material to protect data transmission from EMI/RFI interference and has been used in harsh environment extensively. On the other hand, CAN bus is famous in industrial application. More and more users build CAN networks to communicate their controllers, sensors and actuators. In order to solve the problem between different transmission medium, I-2532 is specially designed for converting the electrical CAN bus signal to fiber optic cables.

The fiber length between two I-2532s can be up to 1.4km (4593ft), it is mainly decided by the cable attenuation of fiber and the CAN bus baud. I-2532 is the economic solution for applications which require protecting the data transmission from electrical exposure, surges, lightning or chemical corrosion. Generally, I-2532 can be used in CANopen, DeviceNet and all the other CAN network which follows the ISO 11898-2 standard.

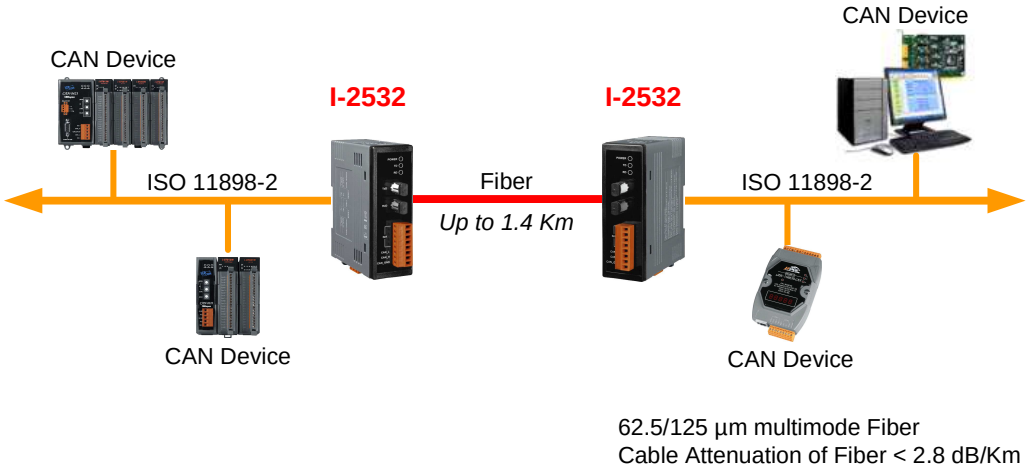

Figure 1-1 Application of I-2532

If users want to know more detail information about the I-2532, please visit our website as follow:

http://www.icpdas.com/products/Remote_IO/can_bus/i-2532.htm

1.1 Features

- Build-in switch for 120Ω terminal resistance
- Up to 100 CAN nodes on CAN Port
- Transmission distance up to 1km on CAN Port
- Transmission distance up to 1.4km on Fiber Port
- Removable terminal block
- Mountable on DIN Rail

1.2 Specifications

- Fiber Port connector type: ST
- Fiber Port operating wavelength: 850nm
- Fiber type: 62.5/125μm, multi-mode
- Compatible with CAN specification 2.0A and 2.0B
- Fully compatible with ISO 11898-2
- Support baud up to 500Kbps, auto-baud detection
- Propagation delay: <125ns
- Power consumption: 0.5W
- Power supply: $+10V_{DC}$ ~ $+30V_{DC}$
- Operating temperature: -25℃ ~ +75℃
- Humidity: 5% ~ 95%, non-condensing
- Dimensions: 32.3mm x 99.0mm x 77.5mm
- ESD、EFT、Surge Protection：
  ESD ： +/- 4KV Contact Discharge
  EFT ： +/- 1KV
  Surge： +/- 2KV

1.3 Applications

- Factory Automation
- Building Automation
- Home Automation
- Vehicle Automation
- Control system
- Monitor system
- …

2 Technical data

2.1 Block Diagram

The following figure is the block diagram illustrating the functions of the I-2532 module.

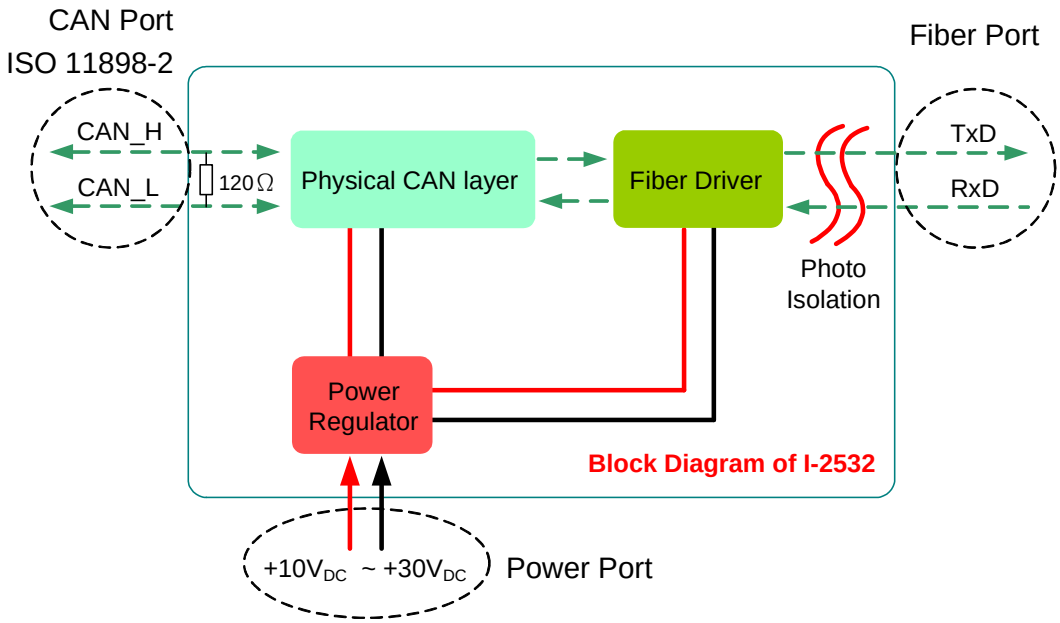

Figure 2-1 Block Diagram of I-2532

2.2 Appearance

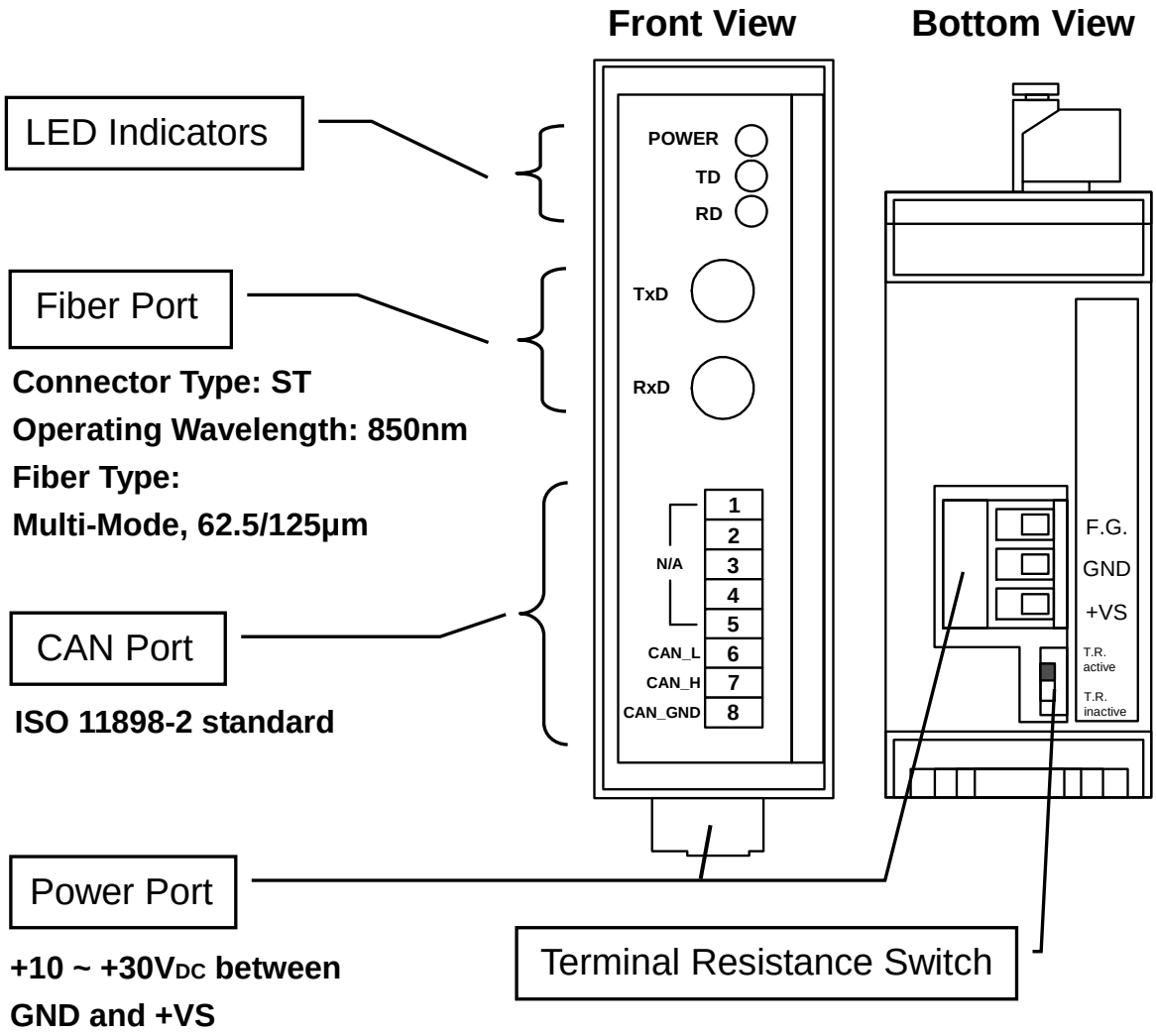

Figure 2-2 Appearance of I-2532

2.3 Pin Assignment

The pin assignment of CAN port, fiber port and power connector of the I-2532 are shown in the following tables.

Table 2-1 Pin Assignment

Port	Name	Description
CAN	CAN_L	CAN_Low, signal line of CAN Port.
	CAN_H	CAN_High, signal line of CAN Port.
	CAN_GND	CAN_Ground, ground voltage level of CAN Port.
Fiber	TXD	Transmit optic data.
	RXD	Receive optic data.
Power	+VS	Voltage Source Input. +10V_{DC} ~ +30V V_{DC}.
	GND	Power Ground.
	F.G.	Frame Ground.

Sometimes, the CAN_GND voltage level of different CAN devices on a CAN bus system are not equal. In this case, it could cause some problems and derogate the system stability. There is one way to relieve this situation; users can connect the CAN_GND of different CAN devices each other to balance the voltage level of CAN_GND.

Electronic circuits are always influenced by different levels of Electro-Static Discharge (ESD), which become worse in a continental climate area. F.G. provides a path for conducting the ESD to the earth ground. Therefore, connecting the F.G correctly can enhance the capability of the ESD protection and improve the module's reliability.

Wiring of CAN_GND and F.G. is not necessary; users can modify the configuration of wiring according to real applications.

2.4 LED Indicator

When the I-2532 is active, the POWER LED will display with red light. Transmitting/receiving one message to/from fiber cable will flash the TD/RD LED once. The TD/RD LED may always be turned on if there are a lot of messages transmitted on fiber cable.

Table 2-2 LED Indicator

POWER LED (Red Light)	
on	module active
off	module inactive

TD LED (Green Light)	
flashing	messages transmitting
off	no message transmitting

RD LED (Green Light)	
flashing	messages receiving
off	no message receiving

2.5 Terminal Resistance Setting

The I-2532 includes one build-in 120Ω terminal resistance, users can decide if the terminal resistance is enabled or not. The switch for terminal resistance is on below of power connector.

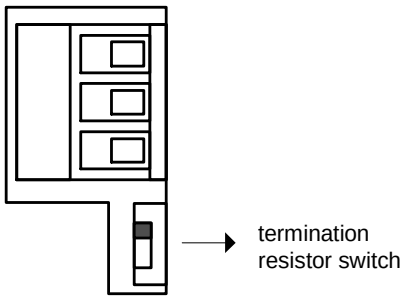

Figure 2-3 Location of Terminal Resistance Switch

The following switch statuses present the condition if the terminal resistance is active (default) or inactive.

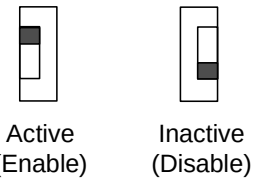

Figure 2-4 Adjustment of Terminal Resistance

In the CAN bus specifications, the bus line of CAN_H and CAN_L must be terminated by a terminal resistance (R_T) for proper operation. The equivalent resistance between CAN_H and CAN_L should be 60Ω. There are some examples below.

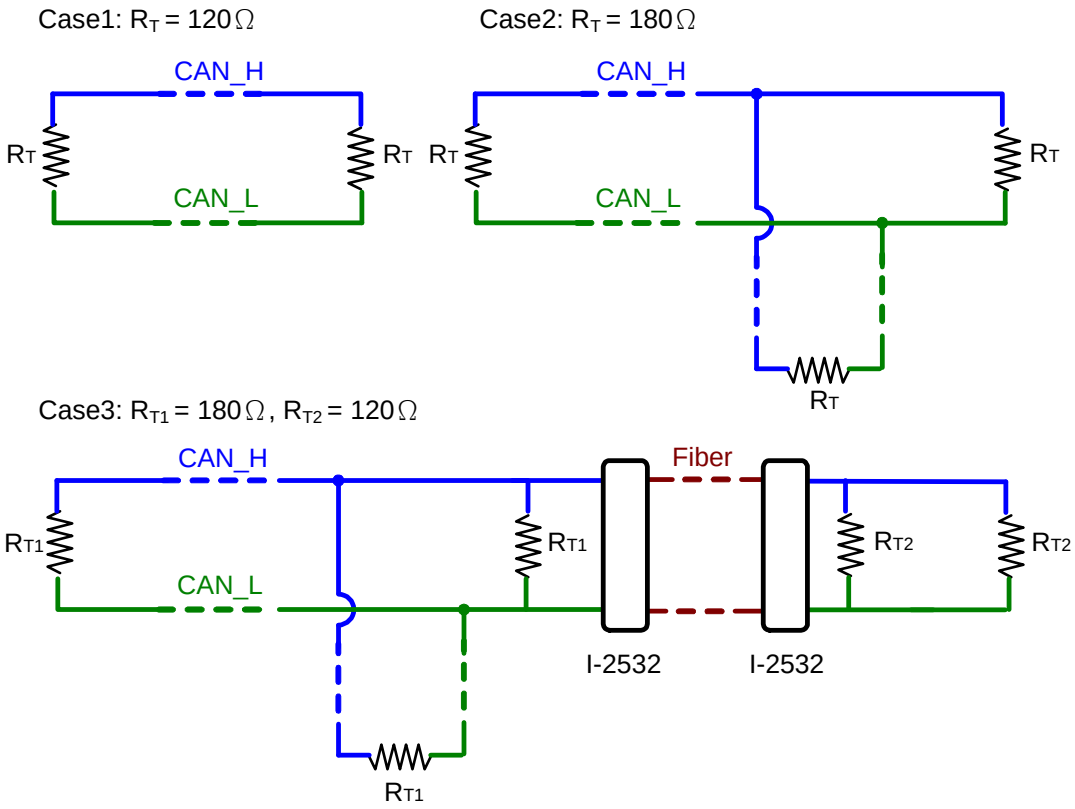

Figure 2-5 Terminal Resistance

2.6 Wire Connection

The wire connection of I-2532 is displayed below.

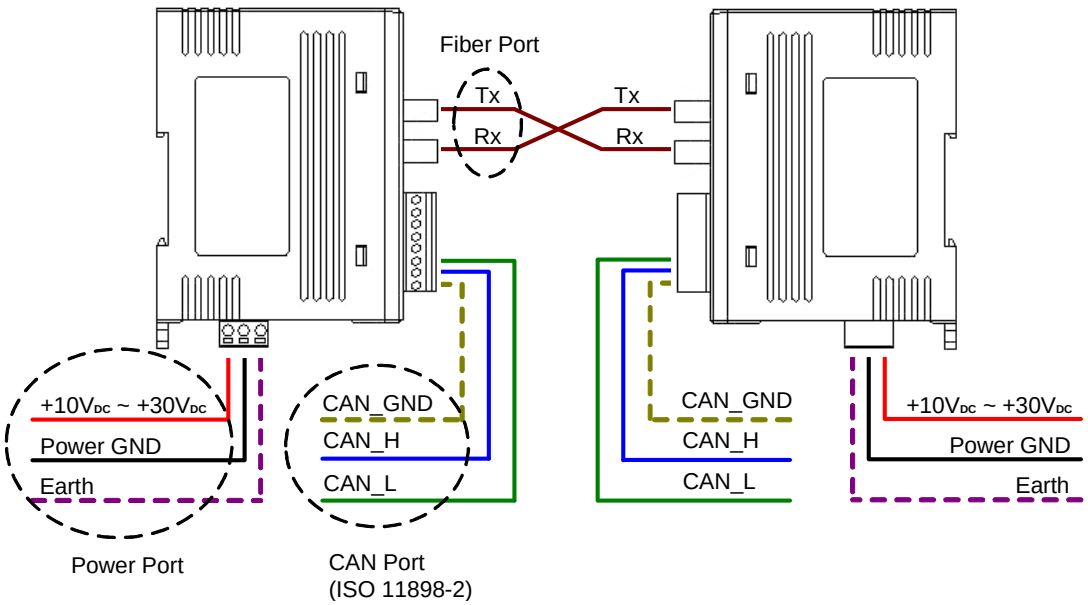

Figure 2-6 Wire Connection of I-2532

The I-2532 has a metallic board attached to the back of the plastic basket. This metallic board and the F.G. pin of power connector are interconnected inside the I-2532. When users mount the I-2532 onto a metal DIN rail, users can connect the DIN rail to Earth Ground to replace connecting the F.G. pin of power connector.

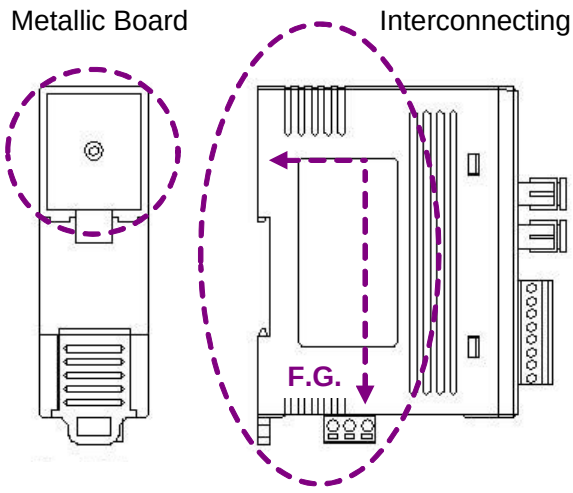

Figure 2-7 Metallic Board at Back of I-2532

3 Network Deployment

3.1 Definition

The definition of segment in a CAN bus system are shown as following figure. The segment 2 is fiber cable. Generally, the segment 1 and segment 3 are copper cable. The copper cable is a balanced (differential) 2-wire interface. It may be a Shielded Twisted Pair (STP), Un-shielded Twisted Pair (UTP), or Ribbon cable.

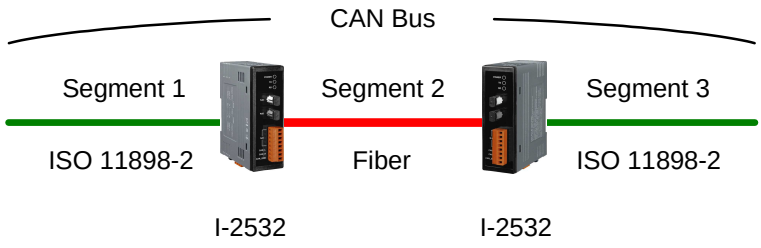

Figure 3-1 Segment in CAN bus system

3.2 Driving Capability

Before introducing the driving capability of I-2532, some characteristics of copper cable must be assumed. The AC parameters are 120Ω impedance and 5 ns/m line delay, and the DC parameter follows the table shown below.

Table 3-1 Recommended DC parameters for CAN Bus Line

Wire Cross-Section [mm^2]	Resistance [Ω/km]
~0.25 (AWG23)	< 90
~0.5 (AWG20)	< 50
~0.8 (AWG18)	< 33
~1.3 (AWG16)	< 20

Under the conditions described above, users can refer to the following table to know the maximum node numbers in each segment following ISO 11898-2 and the maximum segment length when using different type of wire.

Table 3-2 Driving Capability

Wire Cross-Section [mm2]	The maximum segment length [m] under the case of specific node number in this segment			
	16 Nodes	32 Nodes	64 Nodes	100 Nodes
~0.25 (AWG23)	< 220	< 200	< 170	< 150
~0.5 (AWG20)	< 390	< 360	< 310	< 270
~0.8 (AWG18)	< 590	< 550	< 470	< 410
~1.3 (AWG16)	< 980	< 900	< 780	< 670

3.3 Fiber Selection & Fiber Length

The specification of fiber used to connect I-2532 is shown as following table.

Table 3-3 Specification of Fiber

Type	Diameter [μm] (Core/Cladding)	Operating Wavelength [nm]
Multi-Mode	62.5/125	850

Higher attenuation of fiber will reduce the transmission distance. Users can use following table to know the relationship between those two.

Table 3-4 Attenuation & Fiber Length

Attenuation [dB/km]	Fiber Length [m]
2.8	< 1400
4	< 400

3.4 Baud and Bus Length

The limitation of baud on a CAN bus system is restricted by propagation delay. On the other hand, long bus length leads to long propagation delay. The relationship between baud and bus length is displayed below.

Table 3-5 Baud, Bus Length

Baud [bit/sec]	Ideal Bus Length [m]
500K	< 100
250K	< 250
125K	< 500
50K	< 1000
20K	< 2500
10K	< 5000

The definition of segments the relationship between segment length (L_{SEG1}, L_{SEG2} …) and bus length (L_{BUS}) in the same CAN bus system are shown in the following figure.

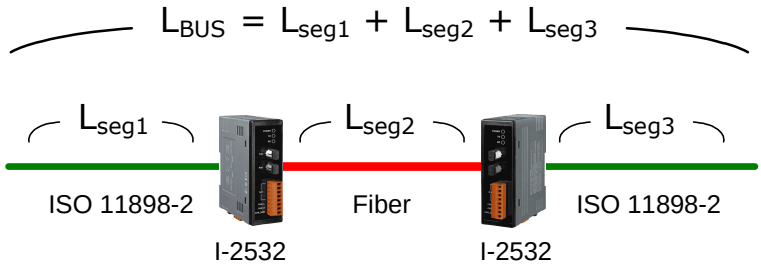

Figure 3-2 Segment Length and Bus Length

When users add one pair of I-2532 into a CAN bus system, the ideal bus length will reduce 50 meters because the propagation delay of one I-2532 is equal to the propagation delay caused by 25 meters bus length. For example, if users use baud 50Kbps and add two I-2532s into a CAN bus system, the ideal bus length should less than 950 meters (1000-25*2=950).

4 Dimension

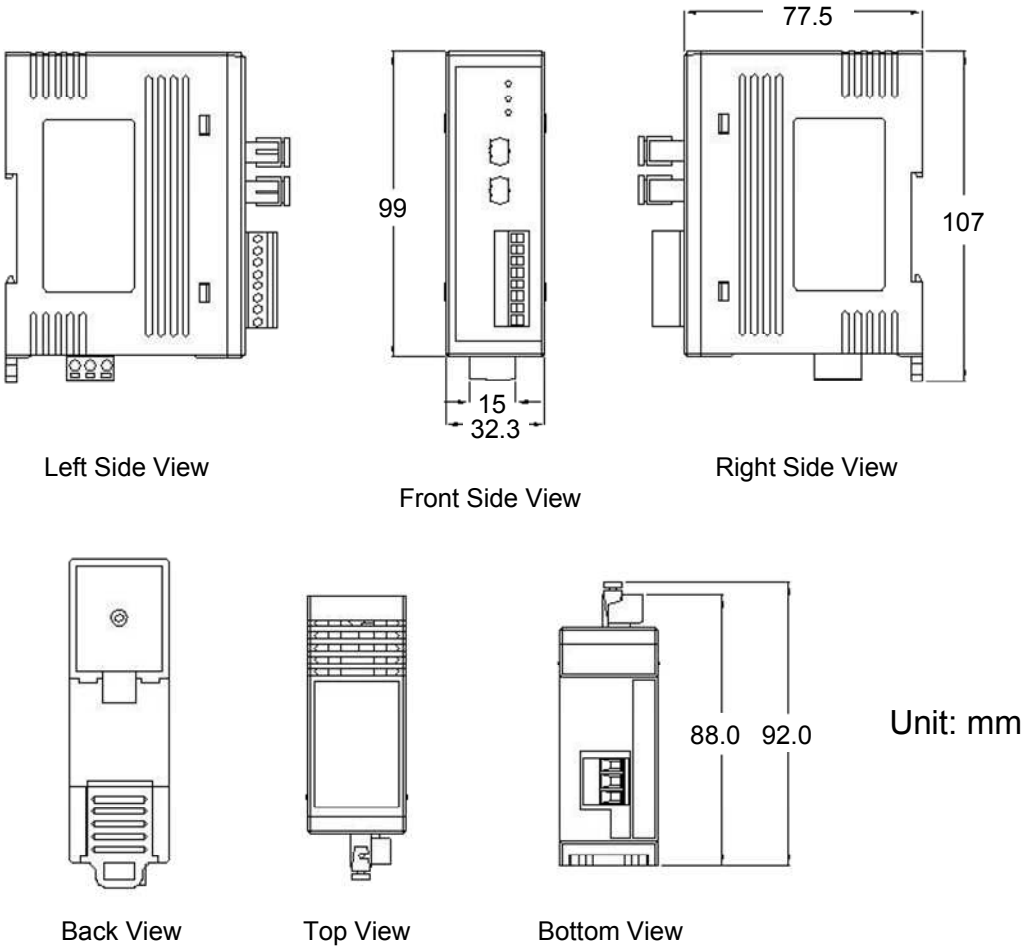

Figure 4-1 Dimension of I-2532