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FOTX102 Datasheet

Overview

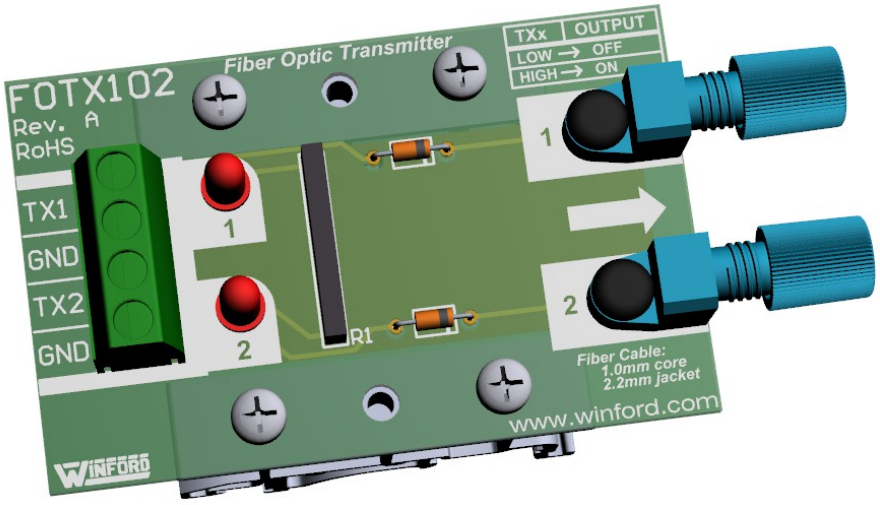
The FOTX102 board provides two fiber optic transmit channels (digital). Terminal blocks provide easy access to the signals while maintaining a compact form factor. A wide operating voltage range allows this product to be used in a wide variety of applications.

The fiber optic transmitters send out visible red light and directly interface with economical fiber cable without the need for connectors. This product is suitable for use with fiber cable having a 1mm core / 2.2mm jacket. It is typically used with the Winford Engineering FORX102 receiver board.

A fiber optic connection provides high levels of electrical isolation and electromagnetic immunity. Since the link uses a fiber optic cable instead of wires, the typical signal-corruption concerns associated with low voltages and long wires (particuarly in electrically noisy environments) is eliminated. This allows a low-voltage signal (e.g., 3.3V, 5V) to be used to control a device up to 75m away.* Furthermore, due to the operating voltage range of this device and its companion device, logic level translation can be easily achieved.

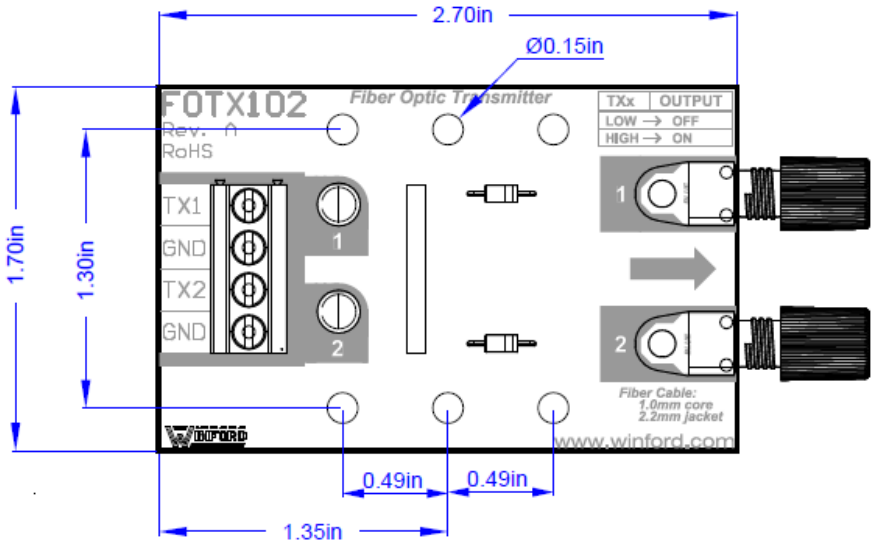
*The maximum allowed length of the fiber optic link depends on a number of factors. See the applications section for more information.

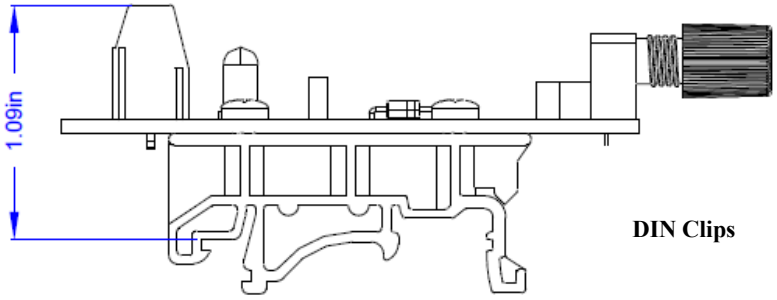
CAUTION: Even at low current levels, the light produced by the fiber optic transmitters can be intense, potentially resulting in eye damage. Avoid looking into the output ports of the fiber optic transmitters.



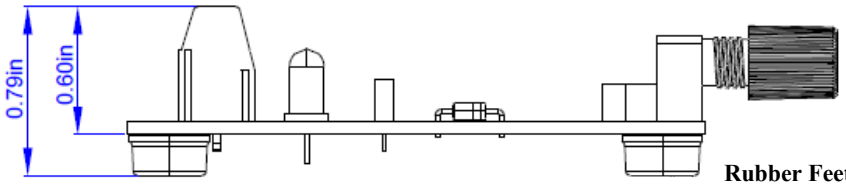
DIN Mounting Option Shown

Dimensions (typical shown)





DIN Clips



Rubber Feet

Part Number Ordering Information

FOTX102	-	
		1

1. Mounting Option

- **FT** Rubber Feet on bottom side of PCB
- **DIN** DIN Rail Mounting Clips

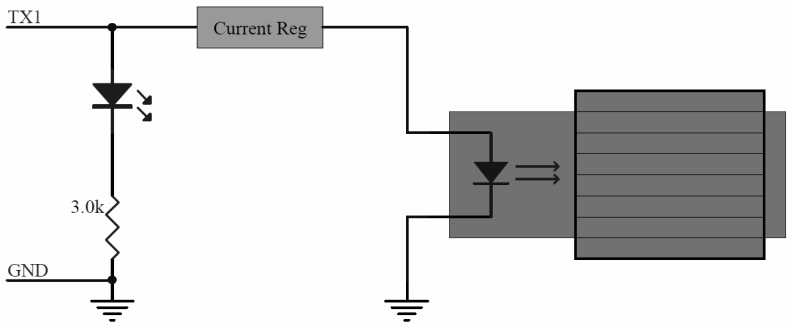
FOTX102 Stocked Part Numbers

The following part numbers represent standard options that are normally stocked:

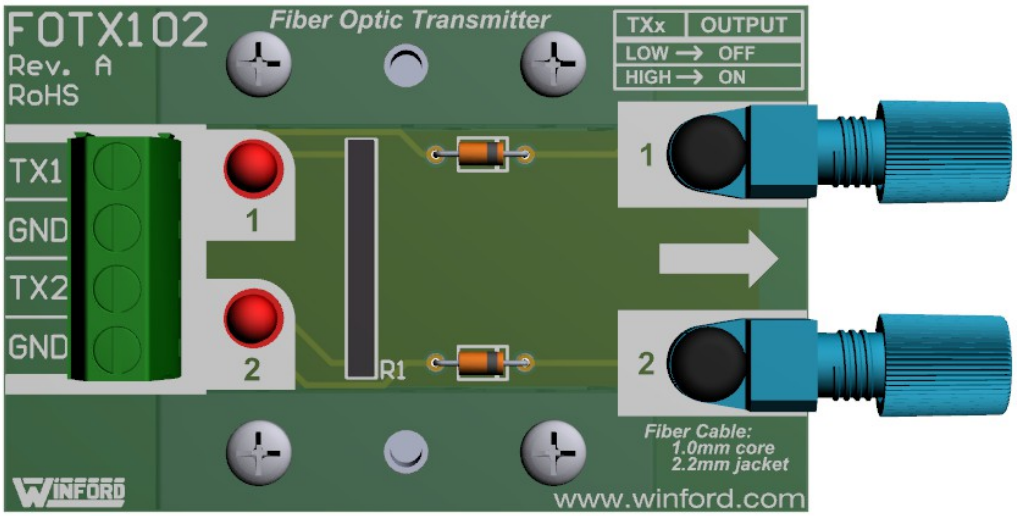
- FOTX102-FT
- FOTX102-DIN

Simplified Schematic Drawing (one channel)

Implementation is the same for both channels. Channel 1 is shown in the figure.



Detailed Description



SIGNAL	DESCRIPTION
TX1	Input signal, Channel 1
GND	Ground reference
TX2	Input signal, Channel 2
GND	Ground reference

SIGNAL	DESCRIPTION
Output 1	Fiber optic output, Channel 1
Output 2	Fiber optic output, Channel 2

Note that there is one common ground for the board. That is, the two GND terminals are connected.

As indicated in the schematic, each channel has a fiber optic transmitter and an indicator LED.

When an appropriate logic signal is applied to an input, the indicator LED for that channel will light up, and the transmitter output will be activated.

In the absence of an input signal, the indicator LED for the given channel will be off, and the output for that channel will also be off.

Input Signal	LED Indicator	Fiber Optic Output
ON (logic signal is present)	**ON**	**ON** (Red light transmitted)
OFF (logic signal is absent)	**OFF**	**OFF** (No light transmitted)

Operating Conditions

Ambient Temperature Range	–20°C to 60°C
Relative Humidity Range - not icing or condensing	5% to 85% RH

Absolute Maximum Ratings (25 degC, all voltages relative to GND)

Specification	*Symbol*	*Min*	*Typ*	*Max*	*Unit*
Input Signal Voltage	V_TXx	-3		27.5	V

Electrical Performance and Recommended Operating Conditions (at 25 degC, all voltages relative to GND)

Specification / Conditions	*Min*	*Typ*	*Max*	*Unit*
Fiber optic transmitter visible red light wavelength		645		nm
Input signal voltage for ON state*	3.2		25	V
Input signal voltage for OFF state	0		1.0	V
Input signal current, for one channel (total for both indicator LED and transmit LED) V_TXx = 3.3V V_TXx = 5.0V V_TXx = 12V V_TXx = 24V		 7 11 14 17		 mA mA mA mA
Transmit LED current only, for one channel V_TXx = 3.3V V_TXx = 5.0V V_TXx = 12V V_TXx = 24V		 6.4 10 10.5 10		 mA mA mA mA
Output power coupled into plastic fiber (1mm core) V_TXx = 3.3V V_TXx = 5.0V V_TXx = 12V V_TXx = 24V		 120 180 200 180		 uW uW uW uW

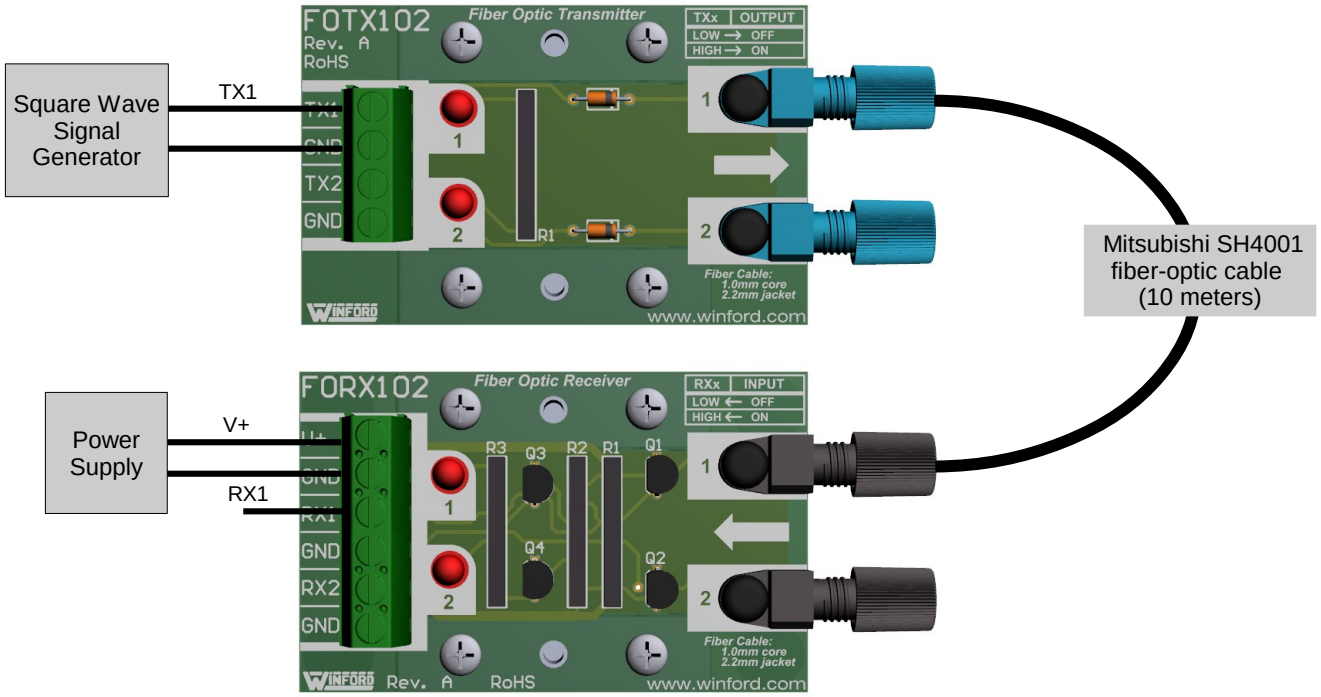
*Note 1: Just having the fiber optic transmit LED in an ON state is not necessarily sufficient to ensure that the signal will be received properly at the receiver. The entire application must be considered, including characteristics of the fiber optic cable, the length of the cable, sensitivity of the receiver, etc.

Screw Terminal Wire Sizes

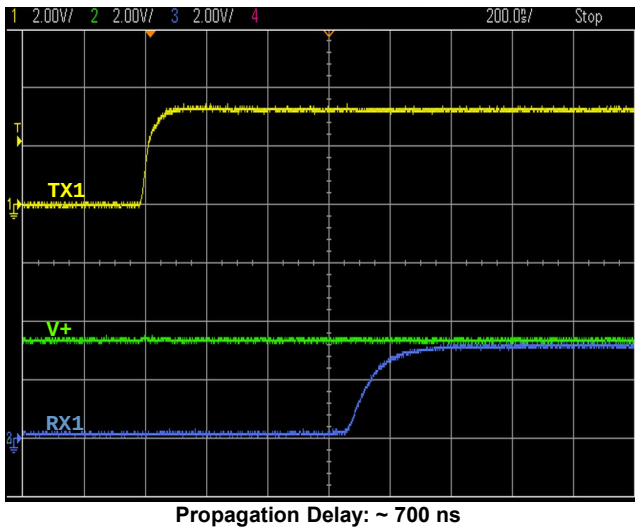
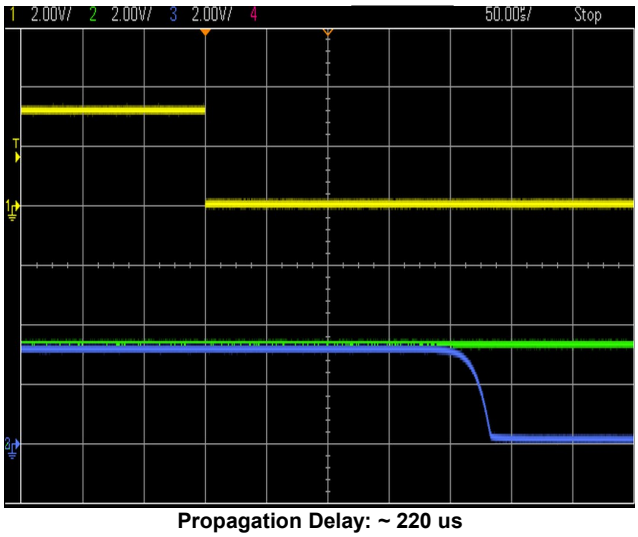
- All Signals and Power: 12-28 AWG

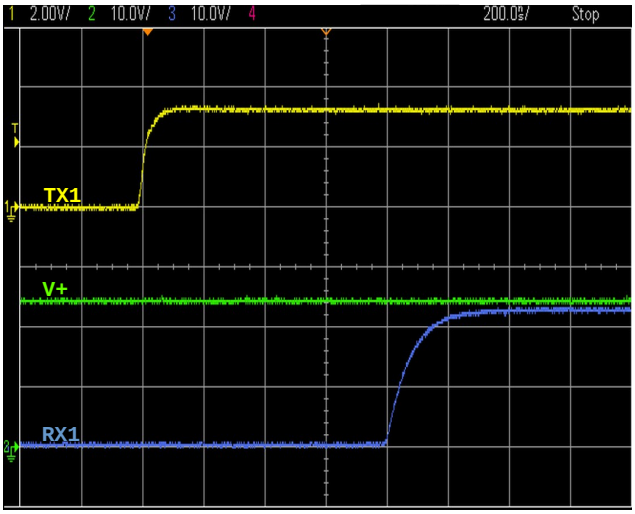
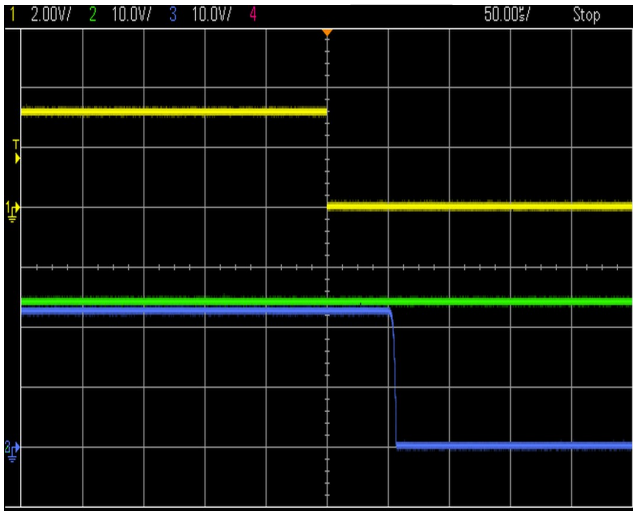
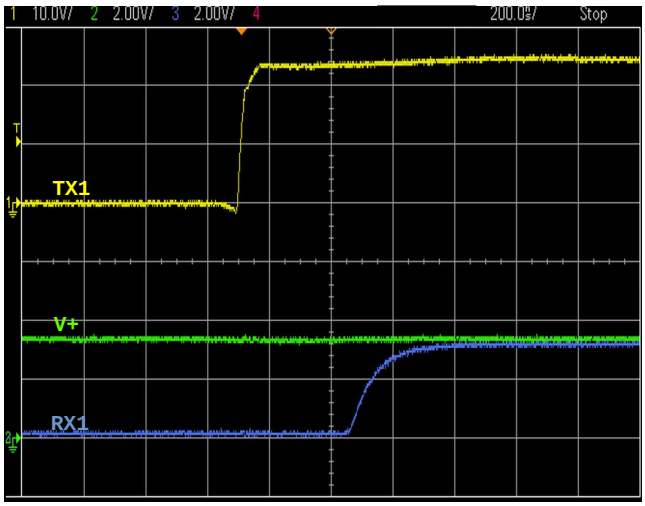
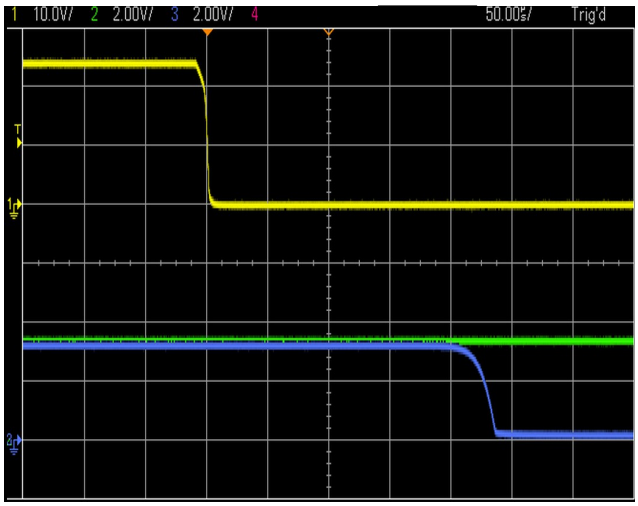
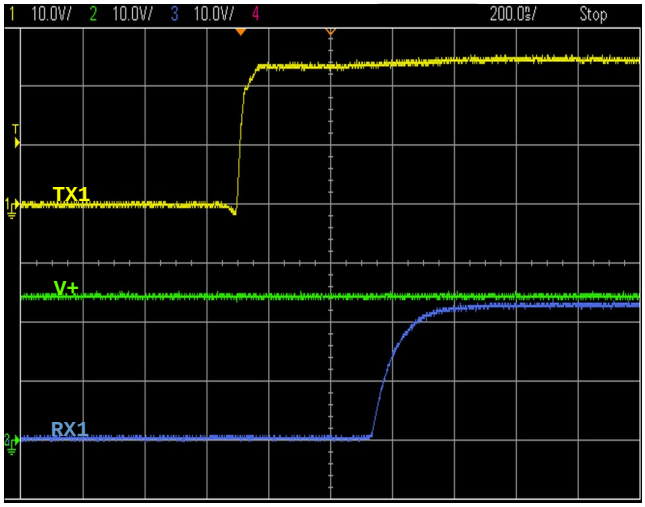
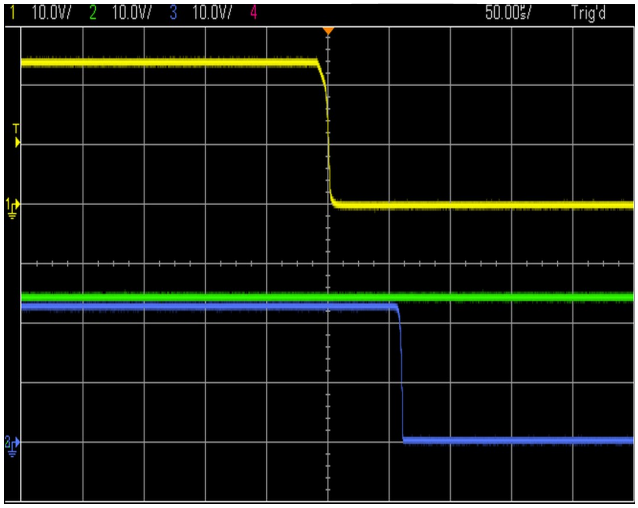
Applications

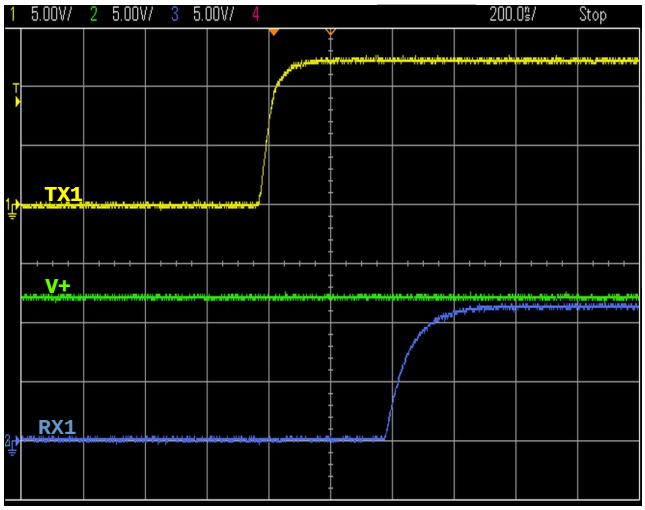
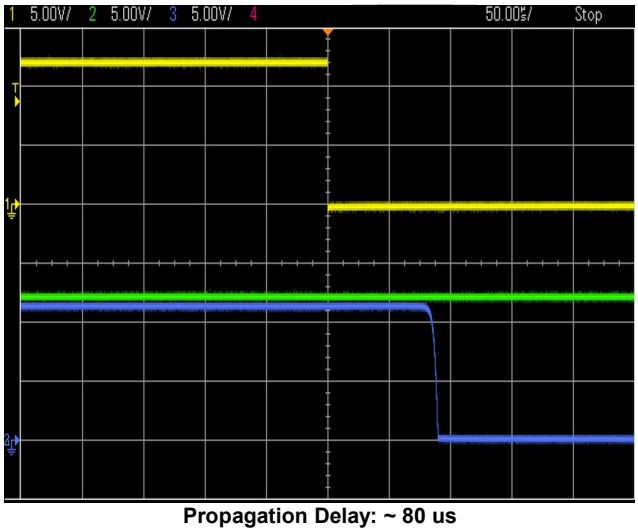
This device is intended to be used with fiber optic receiver FORX102. The information below assumes the following typical configuration. Note that there is no external pullup resistor used on the FORX102 output.



Timing Performance

Conditions	*Typical Timing, Rising Edge*	*Typical Timing, Falling Edge*
Transmitter: TX1 amplitude: 3.3V **Receiver:** V+ supply: 3.3V	 **Propagation Delay: ~ 700 ns**	 **Propagation Delay: ~ 220 us**

Conditions	*Typical Timing, Rising Edge*	*Typical Timing, Falling Edge*
Transmitter: TX1 amplitude: 3.3V **Receiver:** V+ supply: 24V	 **Propagation Delay: ~ 900 ns**	 **Propagation Delay: ~ 60 us**
Transmitter: TX1 amplitude: 24V **Receiver:** V+ supply: 3.3V	 **Propagation Delay: ~ 400 ns**	 **Propagation Delay: ~220 us**
Transmitter: TX1 amplitude: 24V **Receiver:** V+ supply: 24V	 **Propagation Delay: ~ 470 ns**	 **Propagation Delay: ~60 us**

Conditions	*Typical Timing, Rising Edge*	*Typical Timing, Falling Edge*
Transmitter: TX1 amplitude: 12V **Receiver:** V+ supply: 12V	 **Propagation Delay: ~ 500 ns**	 **Propagation Delay: ~ 80 us**

Note that timing will vary somewhat based on the application. If any particular timing parameter is critical for a given application, please consult Winford Engineering to discuss the specific operating conditions of the application.

Fiber Optic Cable Selection

While Mitsubishi SH4001 fiber optic cable provides good performance at a reasonable price point, there are various other products available that would also work. In addition to the physical dimensions (1mm core, 2.2mm jacket), be aware of the attenuation of the cable at the light wavelength being used (~ 645nm in this case). Note that the cable attenuation will affect the allowed distance between the transmitter and receiver.

Fiber Optic Cable Cutting

When cutting fiber optic cable, it is advisable to make the cut straight and clean in order to minimize losses and achieve maximum performance. There are simple, economical razor blade cutters available such as Panasonic part number FX-CT2.

For best results, you may choose to polish the end of the cable after cutting it. However, be aware that if the polishing job is not done correctly, then it is better to not polish it at all. A badly-polished cable end is often going to have more losses than a straight razor cut with no polishing.

Fiber Optic Cable Installation

To install the cable into a receiver or transmitter, ensure that the locking nut is loose, and then simply insert the cable thru the locking nut and push it in until the fiber core seats against the the lense of the receiver / transmitter. Tighten the nut to achieve a snug fit, but do not exceed a torque of 0.4 N-m.

Fiber Optic Cable Transmission Length Allowed

The components used in these products are generally intended for use with fiber optic cables up to 75m. The max allowed cable length for any particular application will depend on the transmitter current, losses in the cable ends, losses in the cable itself, and supply voltage at the receiver. Below is a chart that may be used as a guideline for typical conditions, for device FOTX102 transmitting to receiver FORX102, considering the transmit voltage applied (TXx) and the receiver supply voltage (V+).

This chart assumes the use of fiber optic cable SH4001 (Mitsubishi) with a clean, straight razor cut on each end (not polished), and relatively low-speed digital signal transmission.

	Receiver Supply V+ = 3.3V	Receiver Supply V+ = 5.0V	Receiver Supply V+ = 12V	Receiver Supply V+ = 24V
Transmit Signal TXx = 3.3V	Up to 75m	Up to 75m	Up to 55m	Up to 40m
Transmit Signal TXx = 5.0V	Up to 75m	Up to 75m	Up to 65m	Up to 50m
Transmit Signal TXx = 12V	Up to 75m	Up to 75m	Up to 70m	Up to 55m
Transmit Signal TXx = 24V	Up to 75m	Up to 75m	Up to 70m	Up to 55m

Fiber optic cable length allowed (Typical)

System Analysis: Failure Modes & Effects

When designing any system, it is advisable to ensure that there is a thorough understanding of what will happen when each piece of the system fails. It is the responsibility of the system designer to ensure that the failure effects are understood, and that appropriate countermeasures or redundancies are implemented if warranted.

If there are additional questions about using this product in a particular application, please contact Winford Engineering for more information.

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