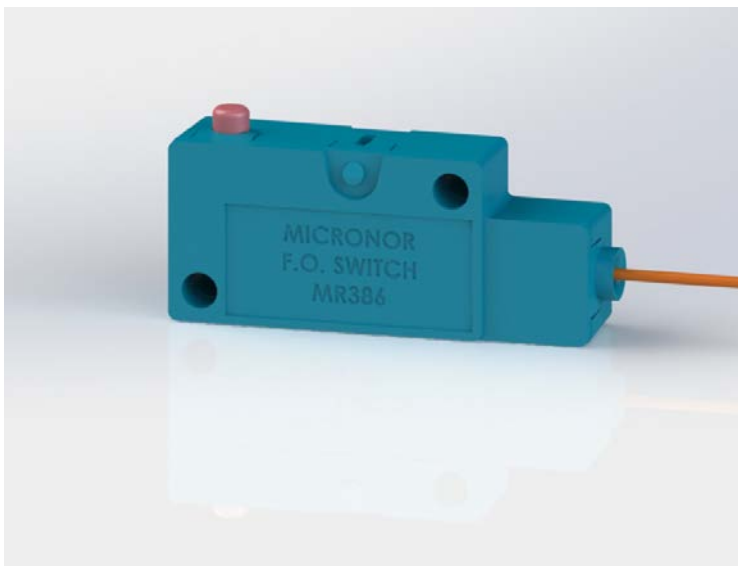




MR386 Series Fiber Optic Micro Switch Instruction Manual

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MICRONOR INC.
900 Calle Plano, Suite K
Camarillo, CA 93012
USA
Tel +1-805-389-6600
Fax +1-805-389-6605
sales@micronor.com
www.micronor.com

For Support in Europe:

MICRONOR AG
Pumpwerkstrasse 32
CH-8105 Regensdorf
Switzerland
Tel +41-44-843-4020
Fax +41-44-843-4039
sales@micronor.ch
www.micronor.ch

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Revision History

Revision	Date	Notes
A	06/06/2016	Initial release

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1. Product Description

1.1. Fiber Optic Micro Switch

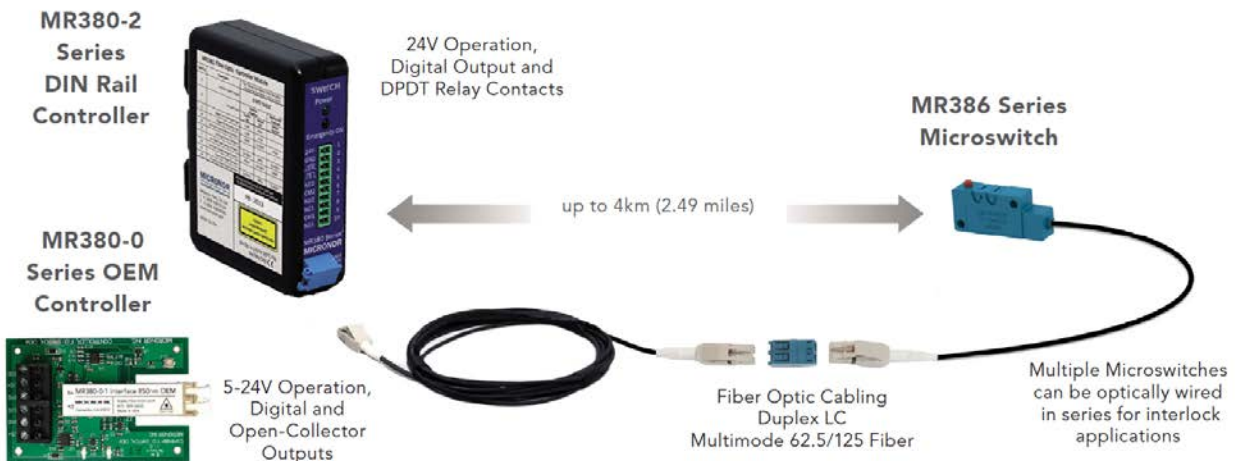


Figure 1. MR386 Series Fiber Optic Micro Switch System

The MR386 Fiber Optic Micro Switch paired with the MR380-0 or MR380-2 series controllers provides a new, innovative signaling detection that can be deployed in difficult, hazardous environments and over very long distances. The Fiber Optic Micro Switch employs a photo interrupt scheme operating over a duplex 62.5/125µm fiber optic link that allows for reliable signal detection. This provides the same mechanical attributes typically associated with ubiquitous electrical micro switches. It has mechanical tactile feedback when the switch toggles – essential when precise switching points need to be set.

There are two switch types, the all non-metallic version is designed to operate within an MRI environment where high magnetic fields would interfere with any electronic switch. The switch may be safely used within the MRI bore because it is immune to the magnetic field as well as invisible to the imaging process. It is also an ideal switch for deployment in highly corrosive atmospheres.

The second version employs a metallic non-magnetic spring and is capable of working over a wider temperature range. The optical signal levels are rated inherently safe, simple mechanical devices; allowing the system to be safely deployed various explosive atmosphere or hazardous location. The entire fiber optic sensor system has a generous system loss budget, allowing for long distance, complex routing, and daisy chaining of multiple switches.

Depressing the switch interrupts or passes the optical signal and the controller senses the presence or absence of the light. The OEM Controller PCB (MR380-0) is a low cost optical interface providing a stabilized fiber optic source and a sensitive photo detector. The DIN Rail Mount Controller (MR380-1) provides both Double Pole Double Throw (DPDT) relay contacts and digital outputs for signal and control.

1.2. Fields of Application

- Medical MRI environment:
 - Patient Interaction
 - Patient Cradle Limit Switch
 - Physician Supervising Monitor
- High Voltage:
 - Transformer Tap Sensing
 - Breaker Sensor
 - Power Line Sensing
- Hazardous Environments:
 - Oil & Gas, Valve Position Sensing
 - Refining
 - Mining/extracting
- Corrosive Environment:
 - High Humidity
 - Chemical Material Processing
- Security:
 - Secure Tamper Resistant Key Switch

1.3. Features

- Two models - Industrial and Non-Metallic MRI Safe
- Transparent to Magnetic Fields
- Interchangeable with V15-series electrical micro switch
- Complex Routing Capabilities with Multiple Switches in Series
- 100% passive sensing design - no electronics whatsoever
- **Inherently Safe, Simple Mechanical Device**; i.e. sensor can be installed in all manner of hazardous and explosive atmospheres
- Immune to EMI, RFI, lightning, and ground loops
- Immune to high voltages
- Wide System Loss Budget
- Operates over long distances - up to 1.5 km
- DIN rail or OEM controller available
- Available in 62.5/125 μ m

1.4. Available Models

A number of models are available to meet different requirements.

	Non-Metallic	Industrial
Normally Open Light blocked when not pushed	MR386-20-LL	MR386-21-LL
Normally Closed Light throughput when not pushed	MR386-24-LL	MR386-25-LL

M R 3 8 6 - 2 0 - 1 R 5

- | | |
|---|--|
| <p>Fiber</p> <p>2 62.5/125, Type OM1</p> <p>Optical Circuit and Material</p> <p>0 MRI Safe, Non-Metallic, NO</p> <p>4 MRI Safe, Non-Metallic, NC</p> <p>1 Industrial, NO</p> <p>5 Industrial, NC</p> | <p>Optical Pigtail Length</p> <p>1R5 LC Duplex Pigtail, 1.5m (Standard)</p> <p>03 LC Duplex Pigtail, 3m</p> <p>NOTE: Other lengths upon request</p> |
|---|--|

Quick Ship Configurations:

MR386-20-1R5 MR Safe (non-metallic) Microswitch, NO, 62.5/125µm MMF, Pigtail=3m

MR386-24-1R5 MR Safe (non-metallic) Microswitch, NC, 62.5/125µm MMF, Pigtail=3m

MR386-21-1R5 Industrial Microswitch, NO, 62.5/125µm MMF, Pigtail=3m

MR386-25-1R5 Industrial Microswitch, NC, 62.5/125µm MMF, Pigtail=3m

MR380-0-1 OEM Controller, 850nm Multimode

MR380-2-2 DIN Rail Controller, 1310nm Multimode

NO = light blocked when not depressed
 NC = light throughput when not depressed



LED and contacts are active when light throughput detected.

2. Standard Contents

MR386 Switch

- MR386-XY-LL with multimode fiber size and pigtail length as ordered by customer, terminated with LC duplex connector.
- Instruction Manual (this document, one soft copy supplied with each shipment)

Controller Modules – if purchased

MR380-0 OEM Controller PCB:

- MR380-0 Universal OEM Controller Module
- Camden Connector (CTB1301/6A) inserted as part of unit
- Instruction Manual (this document, one soft copy supplied with each shipment)

MR380-2 Controller Module:

- MR380-2 Universal DIN Rail Mount Controller Module
- Phoenix Terminal Block (1879599) inserted as part of unit
- Instruction Manual (this document, one soft copy supplied with each shipment)

3. Installation and Operation

3.1. Mounting the Micro Switch

Typically two mounting holes are sufficient. Below is the recommended hole pattern.

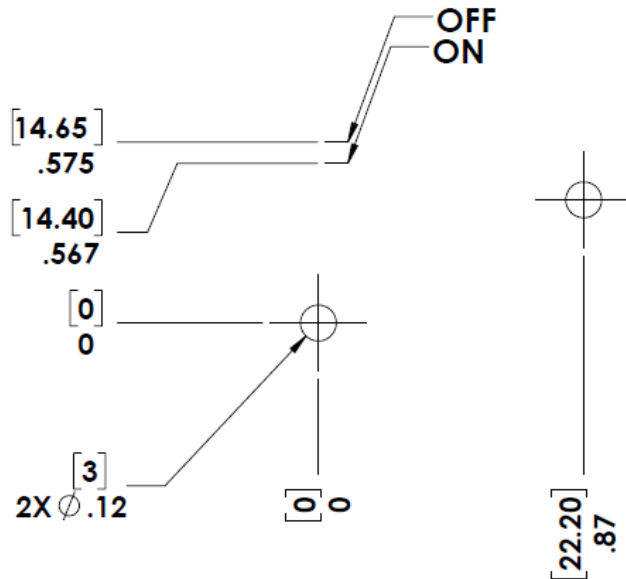


Figure 2. Mounting Hole Pattern

Note: Either UNC 4-40 or M3 screws may be used for mounting the switch. Maximum torque shall not exceed 3 lbs. – in.

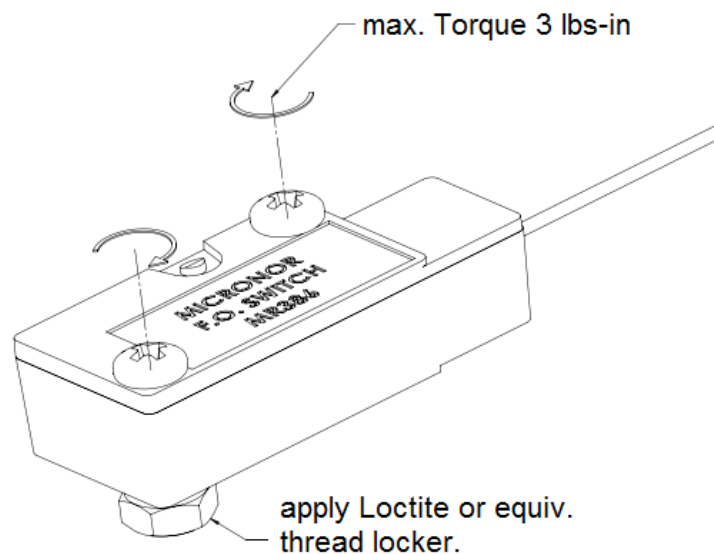


Figure 3. Recommended Torque

3.2. Fiber Optic Cable Routing

The fiber cable should be routed with bends no less than 1" [25mm] radius. When carefully deployed and guided, minimum bend radius is allowable down to 15mm.

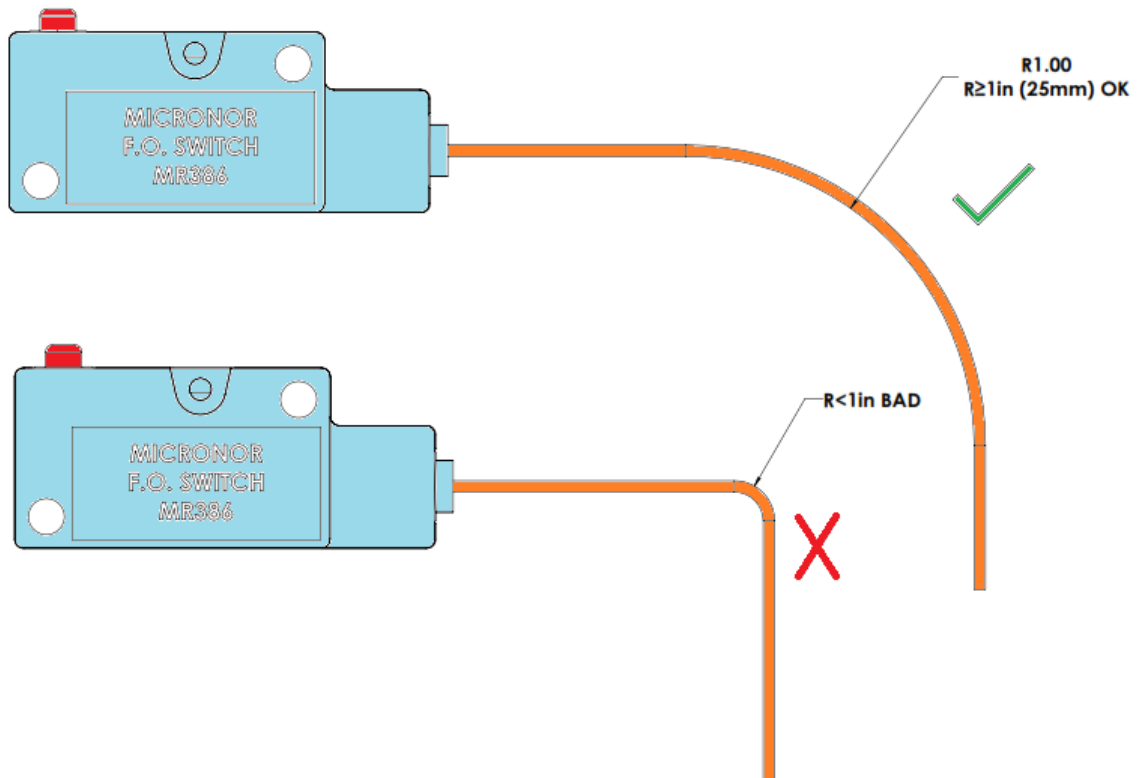


Figure 4. Fiber Optic Cable Routing

4. Warranty Information

Warranty

MICRONOR INC. warrants this product to be free from defects in material and workmanship for a period of 1 (one) year from date of shipment. During the warranty period we will, at our option, either repair or replace any product that proves to be defective.

To exercise this warranty, write or call your local MICRONOR INC. representative, or contact MICRONOR INC. headquarters. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

Limitations of Warranty

This warranty does not apply to defects resulting from unauthorized modification or misuse of any product or part. This warranty also does not apply to Fiber Optic Connector interfaces, fuses or AC line cords. This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability of fitness for a particular use. MICRONOR INC. shall not be liable for any indirect, special or consequent damages.

Contact Information:

Micronor Inc.
900 Calle Plano, Suite K
Camarillo, CA 93012
USA

Phone +1-805-389-6600
Fax +1-805-389-6605
Email sales@micronor.com
URL www.micronor.com

For Europe:

Micronor AG
Pumpwerkstrasse 32
CH-8015 Regensdorf
SWITZERLAND

Phone +41-44-843-4020
Phone +41-44-843-4039
Email sales@micronor.ch
URL www.micronor.ch

5. Specifications

5.1. MR386 Micro Switch

Switching Characteristics	
Durability	>1,000,000 Operations minimum
Actuation Force	MRI: 1.49 N (150gF) Industrial: 0.49 N (50 gF)
Release Force	MRI: 0.49 N (50 gF) Industrial: 0.13 (13 gF)
Switch Hysteresis	MRI: 0.25 mm Industrial: 0.26 mm
Operating Frequency	150 operations per minute max
Optical Interface	
Pigtail Configuration	LC Duplex Plug, Fiber type and pigtail length per ordering coder
Insertion Loss	For MR386-2X-YY: IL=3.5dB max (3.0dB typical), 62.5/125µm OM1 MM Fiber
Maximum Distance	Distance depends on the user's system loss budget which is the total round-trip loss of all optical link components. Consult Application Note AN118 for more information.
Environmental	
Temperature Range	Non-Metallic : -5°C to +60°C (23°F to +140°F) Industrial : -40°C to +80°C (-40°F to +150°F)
Humidity	15 – 90% RH, Non-Condensing, Non-Icing
Ingress Protection	IP40
Vibration	10 to 55Hz, 1.5mm amplitude
Shock Resistance	200 m/s ² (Approx. 20G) max.
MR Attributes	
MRI Usage Zones	ACR Guidance Document for Safe MR Practices
Materials	MRI Safe sensor is designed for safe use in all MR Zones I-V Both immune and invisible to the MRI electromagnetic field
Explosive Atmospheres	Non-metallic except for fiber connector end
Explosive Atmospheres	
EX Classification	Inherently Safe, Simple Mechanical Device when used with MR380 Controller IECEX Test Report GB/CML/ExTr 16.0105.00/00
ATEX	CE EPL Mb/Gb/Gc/Db/Dc
IEC Ex	EPL Mb/Gb/Gc/Db/Dc
NEC	Exempt
Physical Attributes	
Housing Dimension	V15 compatible, Consult Mechanical Reference Drawing
Unit Weight	Sensor with 1.5 meter pigtail, 15 g (0.53 oz)

Specifications subject to change without notice

NOTE:

For additional clarification of parameters related to Functional Safety, Laser Safety, Explosive Atmospheres and CE Marking, consult the following additional Micronor documents:

- 93-0380-01, Declaration of Conformity - Summary. This document is the short form version of the Declaration of Conformity and is posted on the Micronor.com website.
- 93-0380-02, Declaration of Conformity - Detailed Report. This Document is the long form version of the Declaration of Conformity with supporting detail and risk assessments in support of CE marking. Contact Micronor Sales for a copy.
- This Switch and associated Controller is a component and must be certified at the system level.

6. Determining System Loss Budget

Refer to Application Note AN118, [Determining System Loss Budget](#).

7. Mechanical Reference Drawings

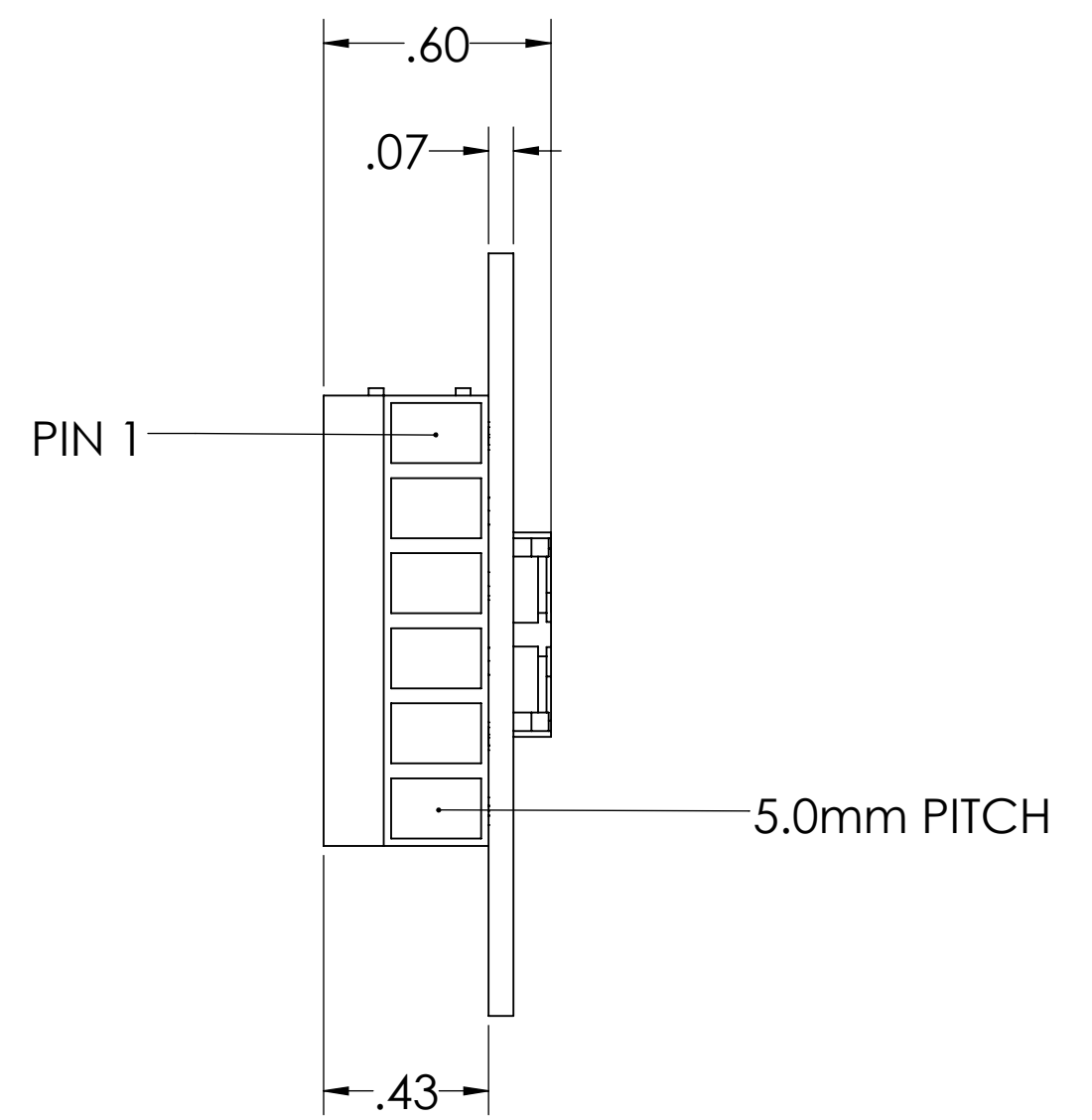
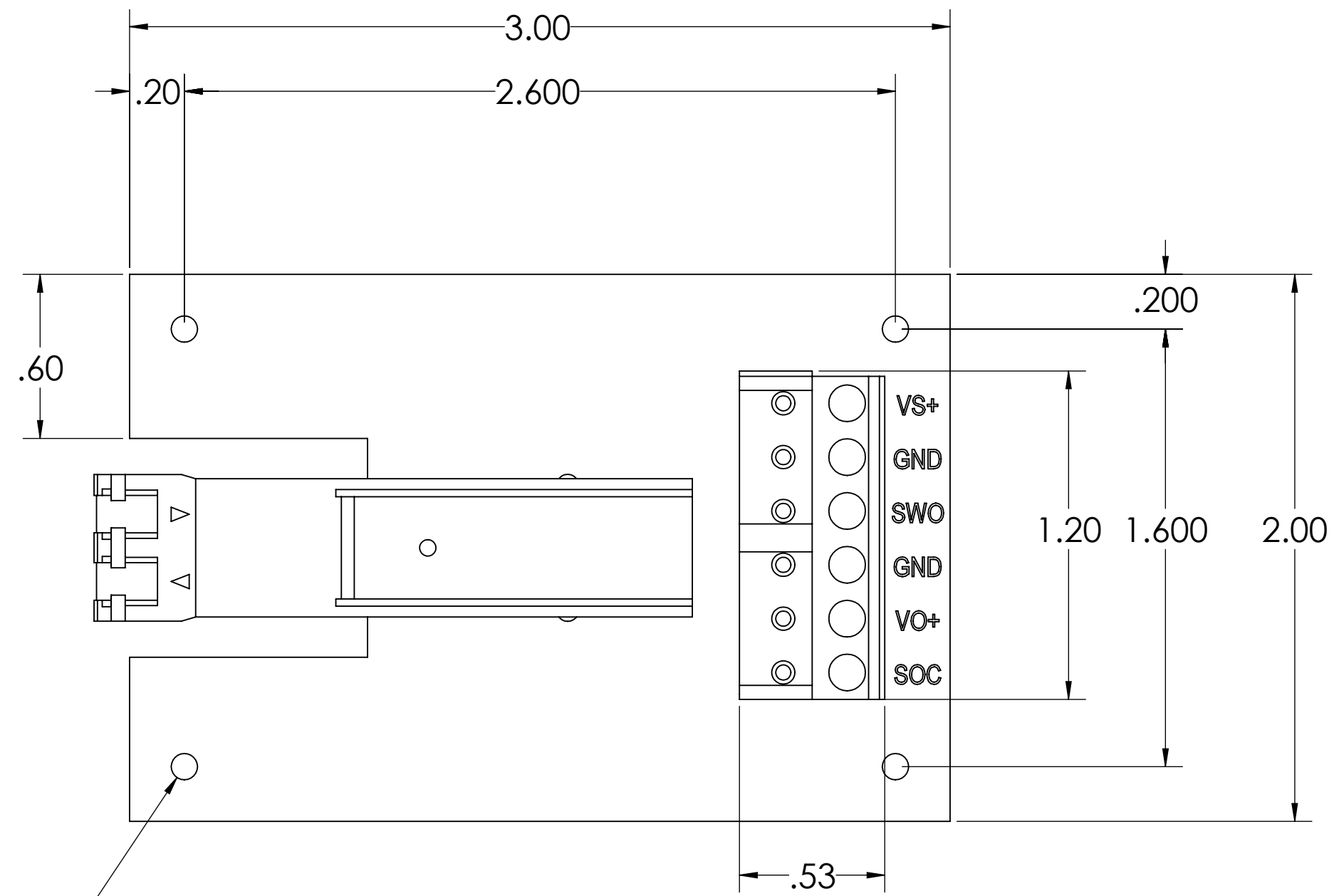
7.1. MR380-2 Controller

See following page for reference drawings for MR380-1 Controller.

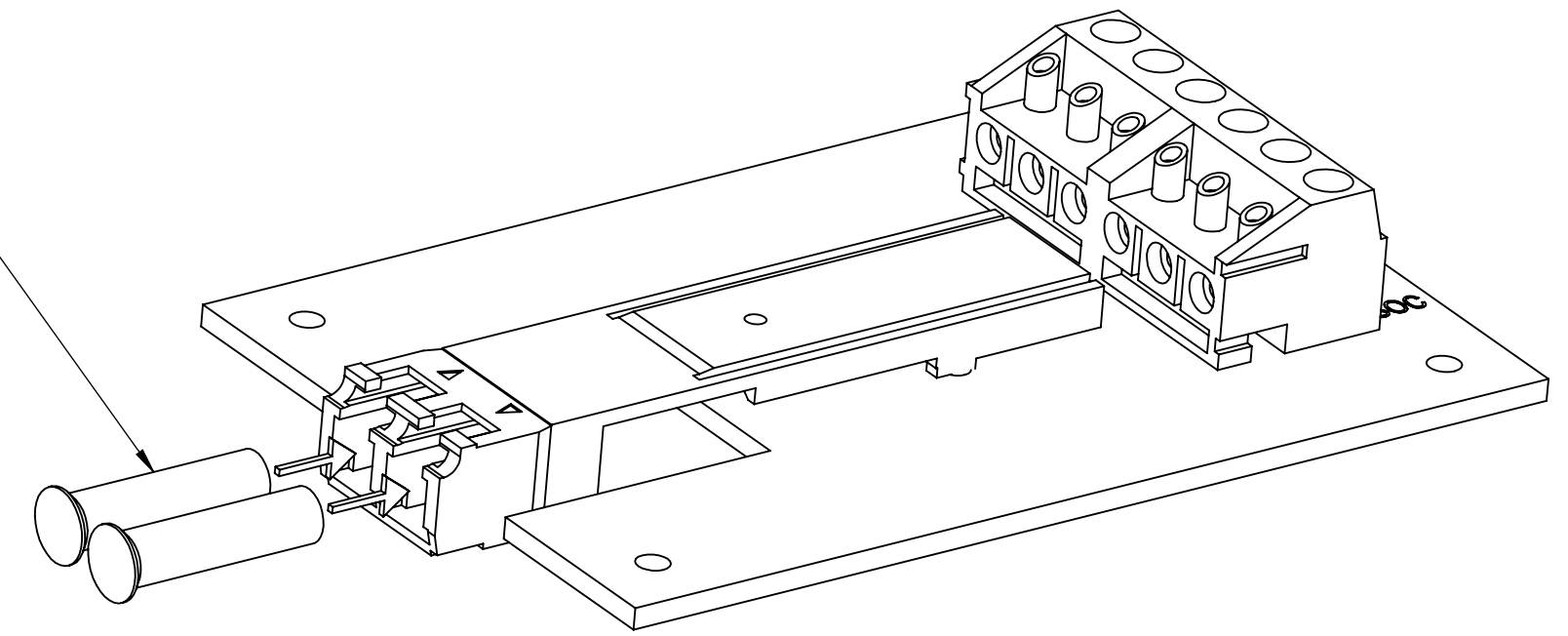
7.2. MR386 Sensor

See following page for reference drawings for MR386 Sensor.

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	NEW RELEASE	8/4/2016	AD



4X ϕ .096 THRU ALL



PART NUMBER ORDERING CODE

MR380 - X - X

PRODUCT WAVELENGTH

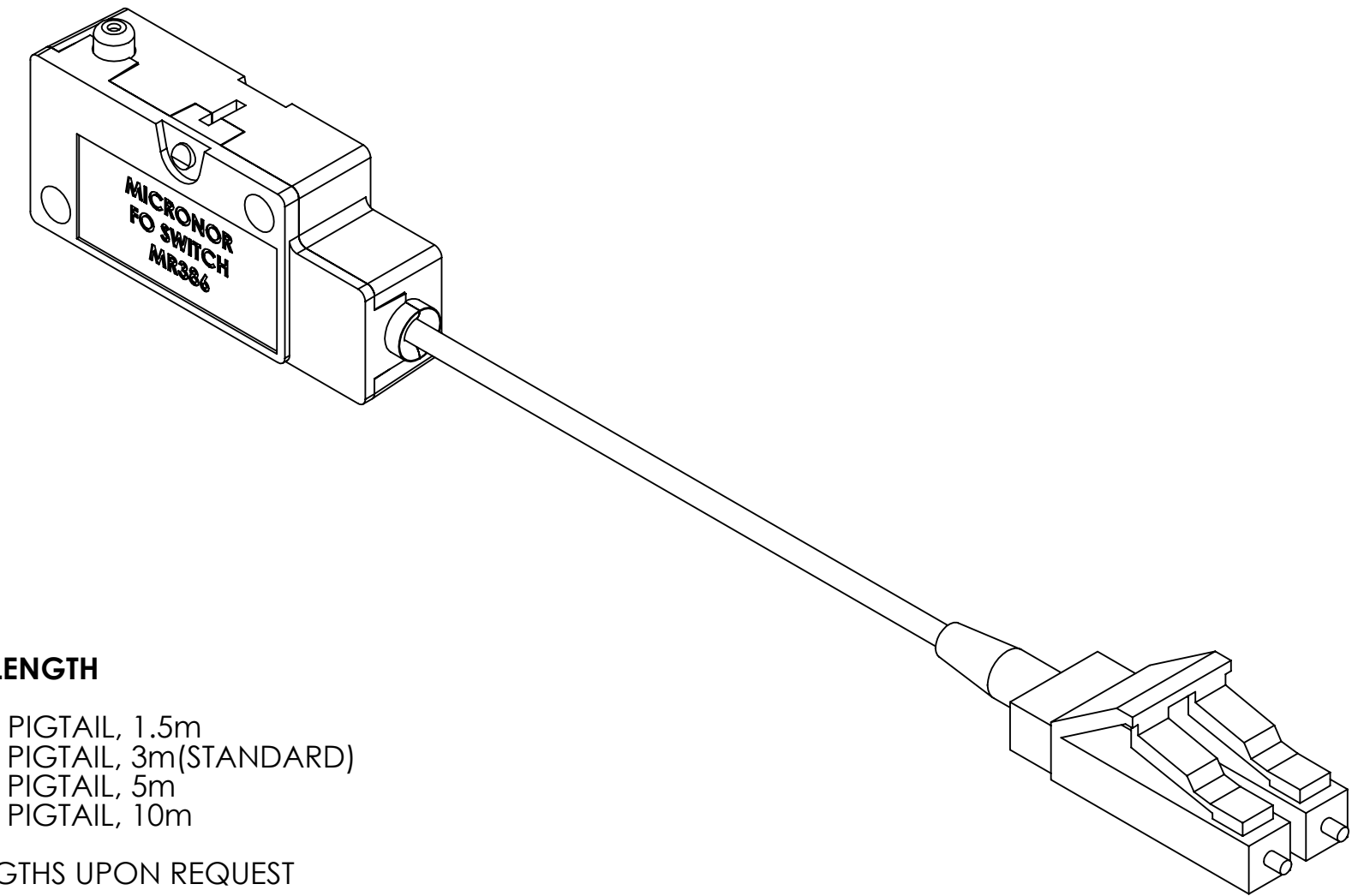
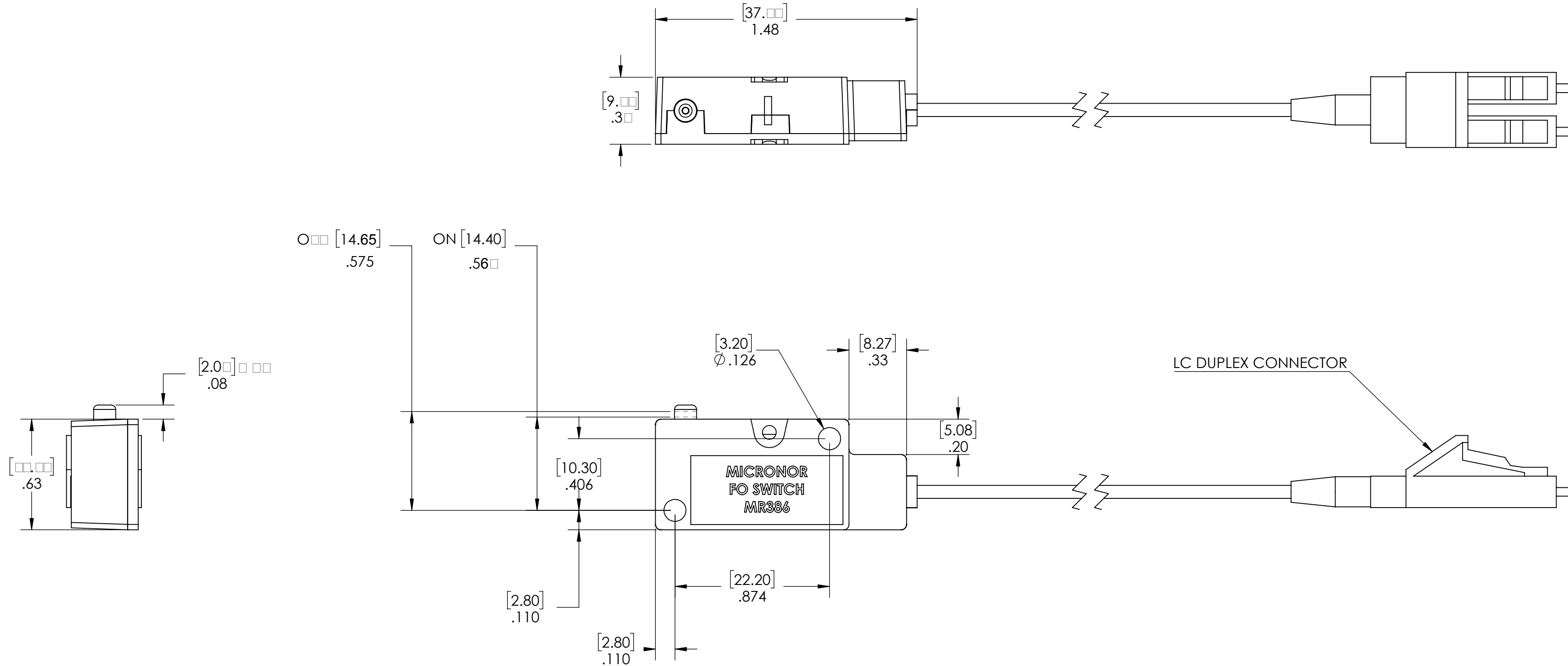
0 PCB CONTROLLER 1 MULTIMODE 850nm

- 2 WARNING: KEEP CONNECTOR COVERS IN PLACE DURING STORAGE TO PROTECT OPTICAL CONNECTOR
- 1 WARNING: AVOID SHARP BENDS IN FIBER CABLING KEEP BEND RADIUS GREATER THAN 0.5 INCH [13MM].

NOTES: UNLESS OTHERWISE SPECIFIED

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UNLESS OTHERWISE SPECIFIED:		NAME	DATE	MICRONOR INC. CAMARILLO, CA (805) 389-6600
DIMENSIONS ARE IN INCHES		DRAWN	A DU	
TOLERANCES:		CHECKED		TITLE:
FRACTIONAL \pm		ENG APPR.		CONTROLLER OEM
ANGULAR: MACH \pm BEND \pm		MFG APPR.		
TWO PLACE DECIMAL \pm .01		Q.A.		C MR380-0 A
THREE PLACE DECIMAL \pm .004		COMMENTS:		SCALE: 2:1 WEIGHT: SHEET 1 OF 1
INTERPRET GEOMETRIC TOLERANCING PER:				
MATERIAL				
FINISH				
NEXT ASSY	USED ON			
APPLICATION				
DO NOT SCALE DRAWING				



PART NUMBER ORDERING CODE

MR386 - X X - XX

FIBER
2 62.5/125, TYPE OM1

OPTICAL CIRCUIT AND MATERIAL
0 MRI SAFE, NON-METALLIC, NO
4 MRI SAFE, NON METALLIC, NC
1 INDUSTRIAL, NO
5 INDUSTRIAL, NC

OPTICAL PIGTAIL LENGTH

1R5 LC DUPLEX PIGTAIL, 1.5m
03 LC DUPLEX PIGTAIL, 3m(STANDARD)
05 LC DUPLEX PIGTAIL, 5m
10 LC DUPLEX PIGTAIL, 10m

NOTE: OTHER LENGTHS UPON REQUEST

- 2 WARNING: KEEP CONNECTOR COVERS IN PLACE DURING STORAGE TO PROTECT FIBER OPTIC INTERFACES
 - 1 WARNING: AVOID SHARP BENDS AND CABLE PINCHING. KEEP BEND RADIUS GREATER THAN 0.5 INCH [13MM].
- NOTES: UNLESS OTHERWISE SPECIFIED

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DIMENSIONS ARE IN INCHES		A DU	4/22/16	CAMARILLO, CA (805) 389-6600	
TOLERANCES:		CHECKED	RR	10/5/2016	TITLE:
FRACTIONAL ±		ENG APPR.			M R
ANGULAR: MACH ±		MFG APPR.			
BEND ±		Q.A.			
TWO PLACE DECIMAL ±.02		COMMENTS:			
THREE PLACE DECIMAL ±.004					
INTERPRET GEOMETRIC TOLERANCING PER:	MATERIAL				SIZE DWG. NO.
FINISH	APPLICATION				C MR 6
	DO NOT SCALE DRAWING				REVISION
					SCALE: 2:1 WEIGHT: SHEET 1 OF 1