

DC-1 MBd Long Reach RedLink Transmitter and Receiver Pair

DATA SHEET

530 nm DC-1 MBd RedLink® Fiber Optic Transmitter and Receiver Pair

FEATURES

- Optimized for data transmission from DC to 1 MBd
- Visible LED at green wavelength (530 nm)
- Extended length applications over POF (150 - 200 m)
- Industrial temperature range -40 °C to +85 °C
- RoHS compliant and flame retardant (UL 94 V-0) connector housings
- TTL/CMOS compatible for ease of design
- Low pulse width distortion
- Low Current Consumption
- Compatible with Versatile Link cables and connectors

APPLICATIONS

Table 1 APPLICATIONS	
Application	Motor Control, Voltage Isolation, Drives, Inverters, Industrial Control, Gaming, Medical Imaging
Standard	Low-speed serial RS232, RS485, CAN Bus, Modbus, Profibus
Max Distance	150 – 200 meters Step Index (SI) POF depending upon ambient temperature and installation conditions
Speed	DC to 1 MBd



DESCRIPTION

The Firecomms Long Reach DC to 1 MBd RedLink transmitter is based on a highly reliable gallium indium nitride LED. The receiver is based on a fully integrated differential photo-diode with TIA and limiting amplifier.

Housed in non-conducting plastic RedLink connector housings, the FT01MHNG transmitter housing is green and the FR05MHIR receiver is blue. The housings are compatible with the Versatile Link style fiber plug and are ideal for use with Plastic Optic Fiber (POF).

The transmitter can be driven from TTL type logic drivers and the receiver is a single-ended TTL/CMOS type output. Both transmitter and receiver operate over the industrial temperature range of -40 °C to +85 °C supporting many industrial applications where reliable command and control response is required in electrically harsh environments.

The transmitter utilizes a green, 530 nm, eye-safe highly-efficient gallium nitride LED. Since the attenuation of POF is lower at green wavelengths a maximum link distance of greater than 150 m can be easily achieved and is therefore a low cost alternative to using glass fibers. The transmitter operates over a wide range of drive current that can be adjusted using a serial resistor to minimize current consumption for known fiber distances.

The receiver has dual photo-diodes which act as a differential light sensor giving enhanced immunity to EMI and EMC from the local environment making the unit ideal for use in electrically noisy applications. The receiver has a single data output compatible with TTL/CMOS electronics. The transmitter and receiver are typically used at 1 MBd over POF in industrial serial bus protocol links.

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SPECIFICATIONS, TRANSMITTER FT01MHNG

Table 2
DC-1 Mbd TRANSMITTER AND RECEIVER ABSOLUTE MAXIMUM RATINGS

These are the absolute maximum ratings at or beyond which the FOT can be expected to be damaged.

Notes:

- 260 °C for 10 sec, one time only, at least 2.2 mm away from lead wire.
- When peak forward current exceeds 20 mA then the duty cycle must maintain a pulse width (PW) less than 1 μ s and average forward current less than or equal to 20 mA. [20 mA \leq I_{FPK} \leq 40 mA \leftrightarrow I_{FAVG} \leq 20 mA AND PW \leq 1 μ s].

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T _{stg}	-40	+85	°C
Operating Temperature ^[1]	T _{op}	-40	+85	°C
Soldering Temperature ^[1]	T _{slid}		+260 ^[1]	°C
TX Reverse Input Voltage	V _{BR}		5	V
TX Peak Forward Input Current ^[2]	I _{FPK}		40	mA
TX Average Forward Input Current ^[2]	I _{FAVG}		20	mA
Storage Compliance (TX, RX)	MSL		2a	J-STD-020D
RX Supply Voltage	V _{CC}	-0.5	+5.5	V
RX Output current	I _{OAVG}		25	mA

Table 3
DC-10 Mbd TRANSMITTER AND RECEIVER REGULATORY COMPLIANCE

- WARNING:** The LED Class 1 Accessible Emission Limit (AEL) may in some circumstances be exceeded if the maximum I_{FAVG} exceeds 20 mA

Parameter	Symbol	Standard	Level
Electrostatic Discharge, Human Body Model (contact ESD)	HBM	Mil-STD-883	Level 2 (4 kV)
Storage Compliance	MSL	J-STD-020D	2a (4 week floor life)
Restriction of Hazardous Substances Directive	RoHS	Directive 2002/95/EC	Certified compliant
Eye Safety ^[1]		IEC 60825-1	LED Class 1

SPECIFICATIONS, Handling

RedLink devices are color coded, FT01MHNG transmitters are green and receivers are blue. They are auto-insertable. They are tested for handling in static controlled assembly processes (HBM). Cleaning, degreasing and post solder washing should be carried out using standard solutions compatible with both plastics and the environment. For example, recommended solutions for degreasing are alcohols, (methyl, isopropyl and isobutyl). In the soldering process, non-halogenated water soluble fluxes are recommended. RedLink products are not suitable for use in reflow solder processes (infrared/vapor-phase reflow). The dust plug should be kept in place during soldering, washing and drying processes to avoid contamination of the active optical area of each connector.

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SPECIFICATIONS, TRANSMITTER FT01MHNG (continued)

Table 3 TRANSMITTER ELECTRICAL AND OPTICAL CHARACTERISTICS						
<i>Test Conditions:</i>						
1. Test data was validated over the full temperature range of -40°C to +85°C, and over the full drive current range.						
2. Optical power for POF is measured when coupled into 0.5 m of a 1 mm diameter 0.5 NA POF and a large area detector.						
3. As measured in the given application circuit (non-inverting) as shown in FIG. 7 with 50 cm of 0.5 NA POF						
Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Output Power	P	-2	1	4	dBm	I _{FDC} = 20 mA
Peak Emission	λ _p	520	530	540	nm	I _{FDC} = 20 mA
Spectral Width	RMS	15	20	30	nm	I _{FDC} = 20 mA
Forward Voltage	V _F	2.5	3.0	3.5	V	I _{FDC} = 20 mA
Reverse Input Breakdown Voltage	V _{BR}	10			V	I _{FDC} = -10μA
Data Rate		DC		1	MBd	
Optical Rise Time (20%-80%)	t _r		50	90	ns	I _{FAVG} = 10 mA [3]
Optical Fall Time (80%-20%)	t _f		40	100	ns	I _{FAVG} = 10 mA [3]
Propagation Delay Low-to-High (Electrical-to-Optical)	PropDly _{LH}	49	67	96	ns	I _{FAVG} = 10 mA [3] Fig 2
Propagation Delay High-to-Low (Electrical-to-Optical)	PropDly _{HL}	27	34	53	ns	I _{FAVG} = 10 mA [3] Fig 2
Pulse Width Distortion	PWD	-18	-34	-52	ns	I _{FAVG} = 10 mA [3] Fig 2

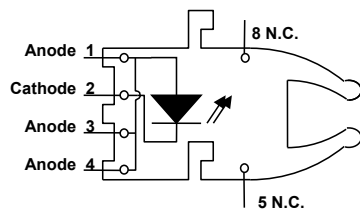


FIGURE 1
Transmitter pin numbering

Table 4 TRANSMITTER PIN DESCRIPTION		
Pin	Name	Symbol
1	RCLED ANODE	TX+
2	RCLED CATHODE	TX-
3	RCLED ANODE	TX+
4	RCLED ANODE	TX+
5	Retaining Pin	N.C.
8	Retaining Pin	N.C.

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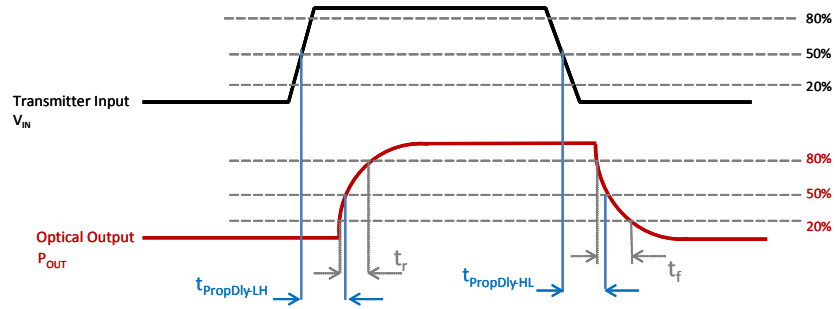


FIGURE 2
Transmitter propagation delay and rise/fall time definitions

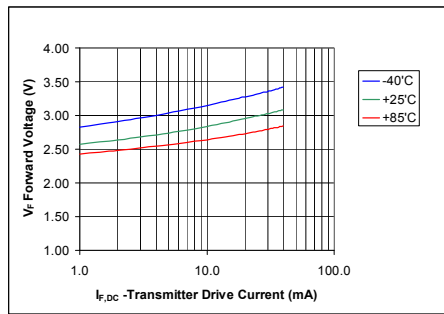


FIGURE 3
Typical forward voltage vs. drive current

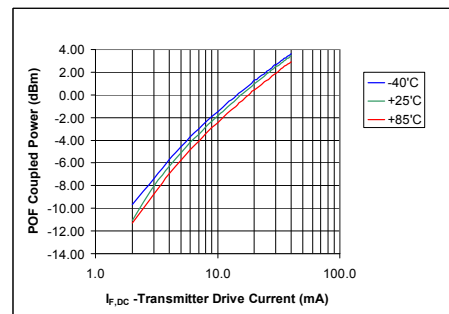


FIGURE 4
Typical optical output power vs. drive current

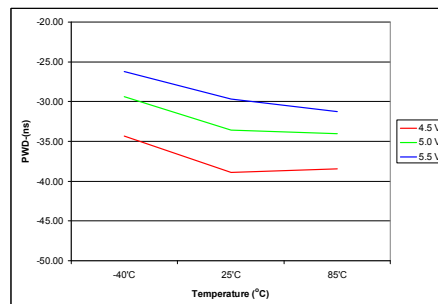


FIGURE 5
Typical pulse width distortion vs. temperature

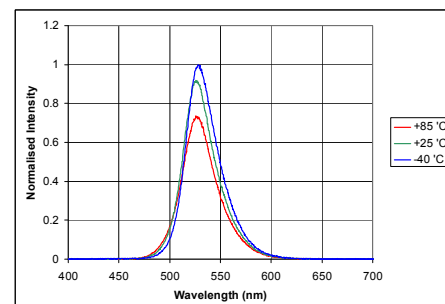


FIGURE 6
Typical spectra vs. temperature

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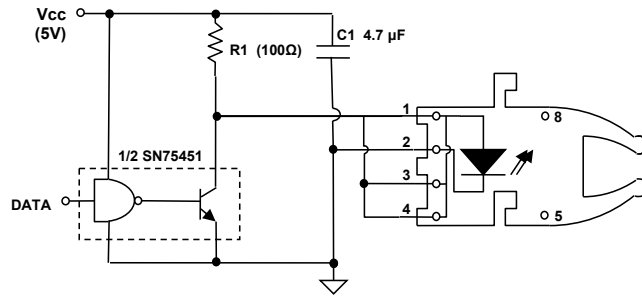


FIGURE 7
 Non-inverting application circuit for the FT01MHNG; for temperature range 0 °C to +70 °C, use SN75451B as the driver IC, for temperature range -40 °C to +85 °C, use SN55451B. $I_{F,ON}$ = 20 mA nominal at +25 °C

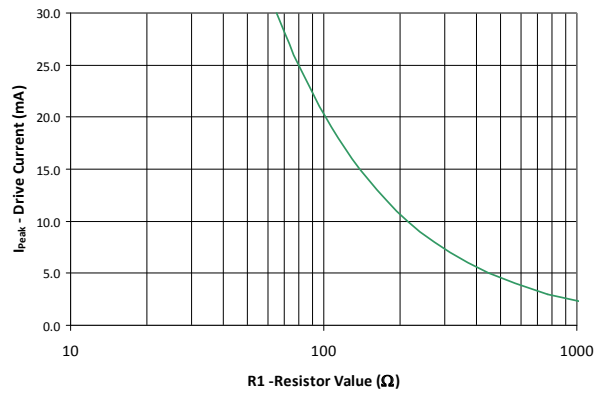


FIGURE 8
 Graph of peak drive current against series resistance (R1)

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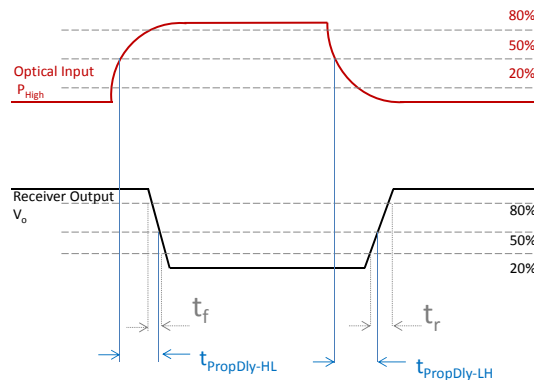
SPECIFICATIONS, RECEIVER

**Table 5
RECEIVER ELECTRICAL AND OPTICAL CHARACTERISTICS**

Test Conditions:

1. Test data was validated over the full temperature range of -40 °C to +85 °C, and over the full voltage range of 4.5V to 5.5V unless otherwise noted. Typical data are at +25 °C with Vcc = 5V.
2. Input power levels are for peak (not average) optical input levels. For 50% duty cycle data, peak optical power is twice the average optical power. Optical power for POF is measured when coupled into 0.5 m of a 1 mm diameter 0.5 NA POF and a large area detector.
3. Pins 5 and 8 are for mounting and retaining purposes. Recommended to connect to Ground Plane, may be left
4. In the recommended receiver circuit, with an optical signal from the recommended transmitter circuit.
5. Pin 4 is electrically isolated internally. Pin 4 may be externally connected to pin 1 for board layout compatibility in existing designs.

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Input Optical Power Level for Logic "0"	P _{RL}	-22		-1	dBm	V _{OL} = 0.5 V, I _{OL} = 8 mA ^{[2],[5]}
Input Optical Power Level for Logic "1"	P _{RH}			-43	dBm	V _{OL} = 5.5 V, I _{OH} ≤ 250 μA ^{[2],[5]}
High Level Output Voltage	V _{OH}	4.45	4.99		V	I _O = -40 uA, ^[4]
Low Level Output Voltage	V _{OL}		0.2	0.4	V	I _{OL} = 8 mA, ^[4]
Supply Current	I _{CC}		13.7	20	mA	V _{CC} = 4.5 to 5.0V, P _R = -1 to -23 dBm ^[4]
Data Rate		DC		1	Mbps	Min UI = 1 μs (Max f = 0.5 MHz)
Rise Time (20% - 80%)	t _r	4.4	11.4	19.8	ns	V _{CC} = 4.5 to 5.5 V, Optical Power (0 to -22 dBm), Temperature = -40 to +85°C
Fall Time (80% - 20%)	t _f	2.0	5.2	10.1	ns	
1 st Pulse, Pulse Width Distortion	PWD-1 st	-40	-10	15	ns	
Pulse Width Distortion	PWD	-25	7	50	ns	
1 st Pulse Propagation Delay (OPTO-ELEC)	PropDly-1 st	32	52	79	ns	
Propagation Delay Low-to-High (OPTO-ELEC, Data/CLK)	PropDly-LH	23	44	67	ns	
Propagation Delay High-to-Low (OPTO-ELEC, Data/CLK)	PropDly-HL	20	49	86	ns	



**FIGURE 9
Receiver propagation delay and rise/fall time definitions**

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SPECIFICATIONS, Receiver (continued)

Table 6 RECEIVER PIN DESCRIPTION		
Pin	Name	Symbol
1	Receiver Output	Vo
2	Receiver Ground	GND
3	Receiver Vcc	Vcc
4	Not Connected	N.C.
5	Retaining Pin	GND/N.C.
8	Retaining Pin	GND/N.C.

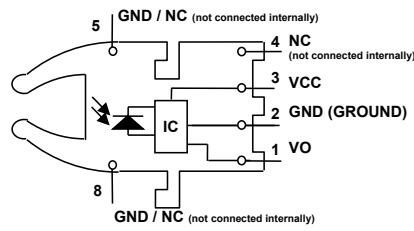


FIGURE 10
Receiver pin numbering

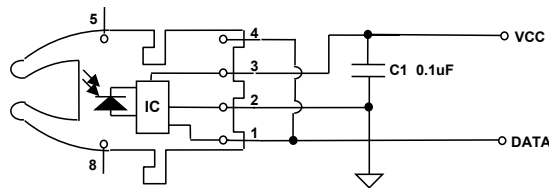


FIGURE 11
RedLink receiver interface circuit

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MECHANICAL DATA, (Horizontal)

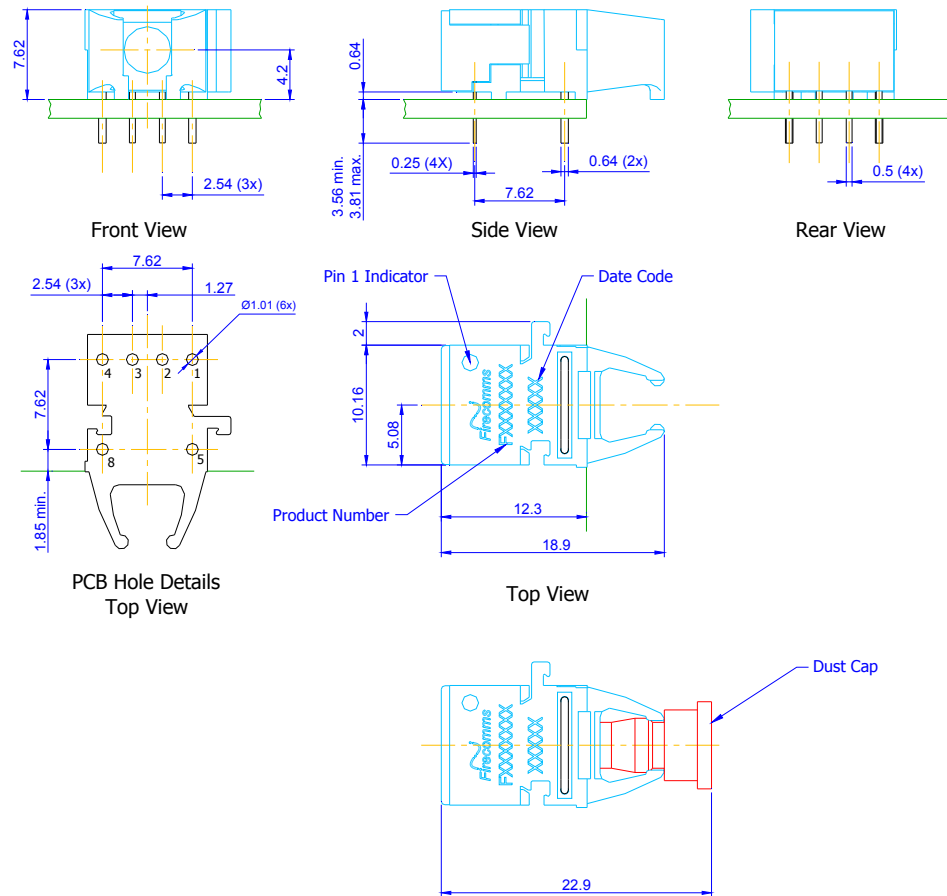


FIGURE 12
 Mechanical dimensions of the Horizontal 1 MBd RedLink transmitter and receiver connectors and PCB footprint, which is a top view. General dimensional tolerance is ± 0.2 mm.

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MECHANICAL DATA, (Vertical)

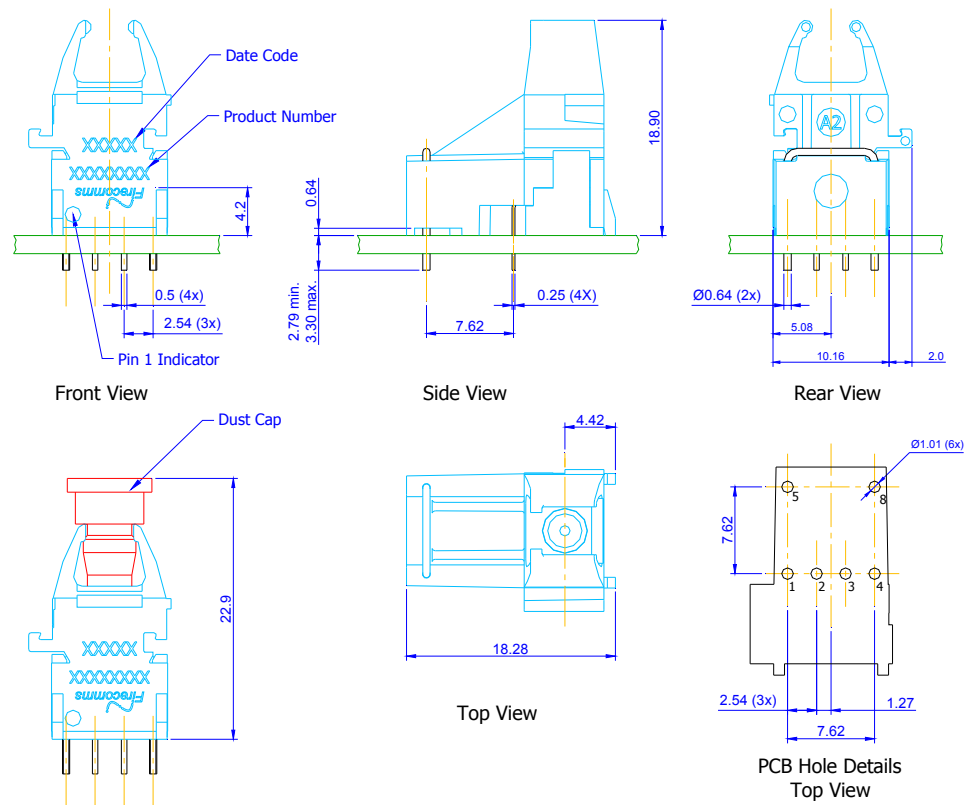


FIGURE 13
Mechanical dimensions of the Vertical 1 MBd RedLink transmitter and receiver connectors and PCB footprint, which is a top view. General dimensional tolerance is ± 0.2 mm.

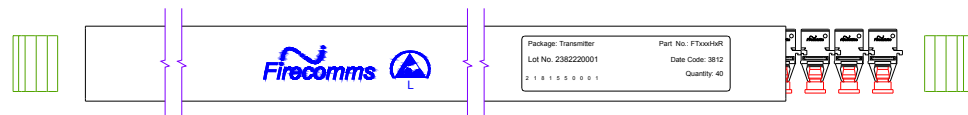


FIGURE 14
Packing tube for the Firecomms 1 MBd transmitter and/or receiver

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PACKING INFORMATION

Components are packed in PVC anti-static tubes in moisture barrier bags. Bags should be opened only in static-controlled locations, and standard procedures should be followed for handling moisture sensitive components.

Table 7
PACKING INFORMATION

		Horizontal	Vertical
Components per Tube	Tube Length	40	40
	Tube Height	515 mm	515 mm
	Tube Depth	16.2 mm	21.0 mm
	Tube Depth	26.9 mm	30.8 mm
Tubes per Bag		5	5
Bags per Inner Carton	Inner Carton Length	1	1
	Inner Carton Height	630 mm	630 mm
	Inner Carton Height	70 mm	70 mm
	Inner Carton Depth	105 mm	105 mm
Weight per Inner Carton, Complete		0.48 Kg	0.66 Kg
Components per Inner Carton		200	200
Inner Cartons per Outer Carton	Outer Carton Length	10	10
	Outer Carton Length	650 mm	650 mm
	Outer Carton Height	235 mm	235 mm
	Outer Carton Depth	376 mm	376 mm
Weight per Outer Carton, Complete		5.28 Kg	6.98 Kg
Components per Outer Carton		2,000	2,000

ORDERING INFORMATION

Table 8
ORDERING INFORMATION

Part Number	Name	Description
FT01MHNG	RedLink 1 MBd Transmitter, Horizontal	RedLink 530 nm, Horizontal, DC-1 MBd LED-Based Transmitter, Gray Housing
FR01MHIR	RedLink 1 MBd Receiver, Horizontal	DC to 1 MBd Receiver, Horizontal, Blue Housing
FT01MVNG	RedLink 1 MBd Transmitter, Vertical	RedLink 530 nm, Vertical, DC-1 MBd LED-Based Transmitter, Gray Housing
FR01MVIR	RedLink 1 MBd Receiver, Vertical	DC to 1 MBd Receiver, Vertical, Blue Housing

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