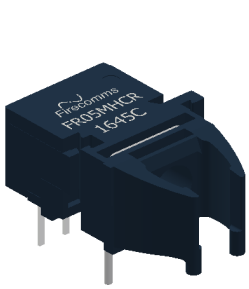
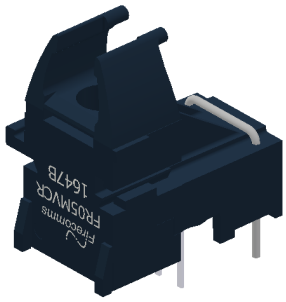
FR05MHCR FR05MVCR

DC-5 MBd RedLink®
Open Collector Receiver

Data Sheet





DESCRIPTION

The Firecomms DC to 5 MBd RedLink receiver is based on a fully integrated photo-diode with TIA and limiting amplifier with open collector output. Housed in non-conducting plastic RedLink connector housings, the receiver is blue in colour. The housing is compatible with the Versatile Link style fiber plug, and are designed primarily for use with Plastic Optic Fiber (POF). The receiver operates over the industrial temperature range of -40 °C to +85 °C supporting many industrial applications where a reliable command and control response is required in electrically harsh environments. The integrated receiver (photodiode, transimpedance amplifier (TIA) and limiting amplifier in a single IC) has enhanced immunity to EMI and EMC from the local environment making the unit ideal for use in electrically noisy applications. It has a single data output with an integrated 1 kΩ pull-up resistor (R_L) and active pull down compatible with standard 5 V TTL/CMOS electronics. The receiver is typically used over POF in industrial serial bus protocol links.
NOTE: This part is only suitable for 5V operation. Applications switching 12V/15V should use p/n: FM20VHIR.

AVAILABLE OPTIONS

Table 1
ORDERING INFORMATION / PART NUMBERS

Horizontal Open Collector RedLink® 5 MBd Receiver	FR05MHCR
Vertical Open Collector RedLink® 5 MBd Receiver	FR05MVCR

FEATURES

- Designed for use with plastic optical fiber (POF)
- Optimized for data transmission from DC to 5 MBd
- Industrial temperature range -40 °C to +85 °C
- RoHS and UL compliant
- Flame retardant (UL 94 V-0) connector housings
- TTL/CMOS compatible output for ease of design
- Low pulse width distortion
- Compatible with Versatile Link cables and connectors

APPLICATIONS

Table 2
APPLICATIONS

Application	Motor Control, Voltage Isolation, Drives, Inverters, Industrial Control, Gaming, Medical Imaging.
Standard	Low-speed serial RS232, RS485, CAN Bus, Modbus
Distance	50 meters Step Index (SI) POF in typical operating conditions 30 meters in worst case conditions [1]
Speed	DC to 5 MBd (NRZ)

Note: 1. Depending on the installation conditions.

SPECIFICATIONS

Table 3
RECEIVER PIN DESCRIPTION

Pin	Name	Symbol
1	Receiver Output	V_0
2	Receiver Ground	Gnd
3	Receiver Vcc	Vcc
4	Open Collector R_L	R_L
5	Retaining Pin	Gnd
8	Retaining Pin	Gnd

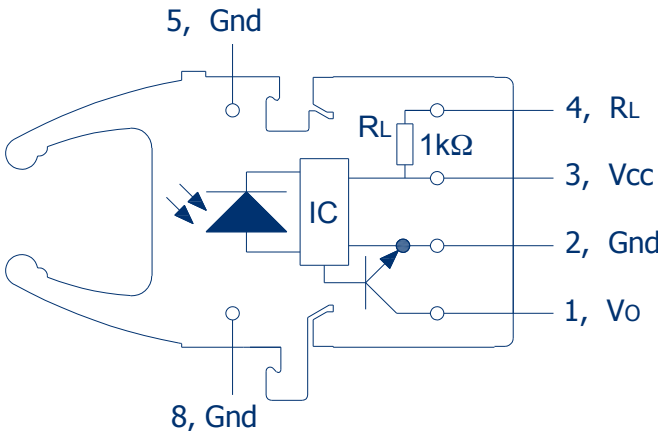


FIGURE 1.
Receiver pin-out with Open-Collector, top view

Table 4
REGULATORY COMPLIANCE

Parameter	Symbol	Standard	Level
Electrostatic Discharge, Human Body Model (Contact ESD)	HBM	Mil-STD-883	Level 2 (4 kV)
Radiated Emissions Immunity	Vm^{-1}	IEC 61000-4-3	15 Vm^{-1}
UL Certification	UL	94 V-0 material	Files No. Pending
Storage Compliance	MSL	J-STD-020E	2a (4-week floor life)
Restriction of Hazardous Substances Directive	RoHS	Directive 2011/65/EU	Certified compliant

RECOMMENDED APPLICATION CIRCUIT

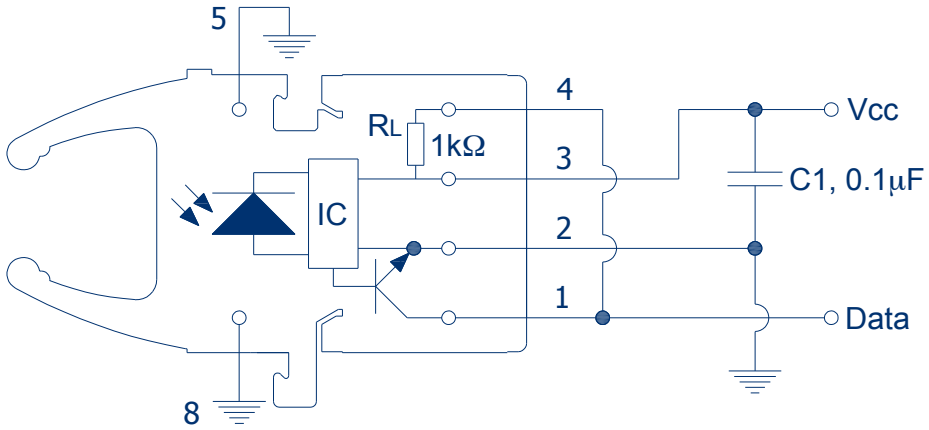


FIGURE 2.
RedLink® Open Collector Receiver recommended application circuit.

SPECIFICATIONS

Table 5
ABSOLUTE MAXIMUM RATINGS

These are the absolute maximum ratings at or beyond which the FOT can be expected to be damaged
Notes:
1. 260 °C for 10 seconds, one time only, at least 2.2 mm away from lead root.

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	T_{stg}	-40	+85	°C
Operating Temperature	T_{op}	-40	+85	°C
Soldering Temperature [1]	T_{sld}		+260 [1]	°C
Output Voltage	Vo	-0.5	+5.5	V
RX Output Current	I_O		25	mA

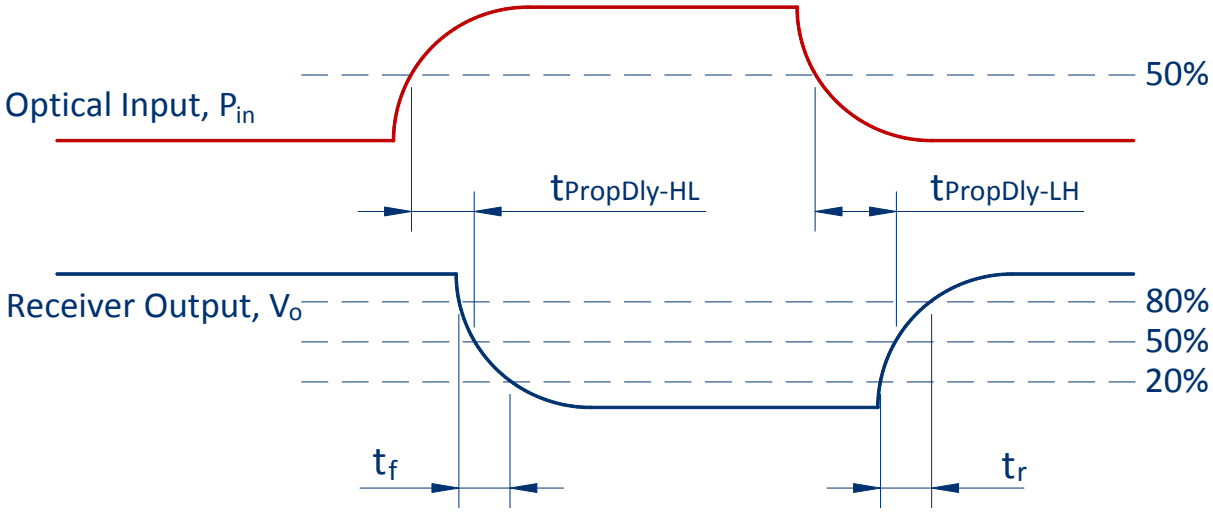


FIGURE 3.
Receiver Propagation Delay and rise/fall time definitions

SPECIFICATIONS

Table 6
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 = 5 V.*
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. Do not electrically connect these pins.*
4. *In the recommended receiver circuit, with V_O loaded with 560 Ω and a load Capacitance of 30 pF and an optical signal from the recommended transmitter circuit.*
5. *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], [4]*
Input Optical Power Level for Logic "1"	P_{RH}			-43	dBm	*VOL = 5.25 V, IOH ≤ 250 µA [2],[4]*
High Level Output Voltage	V_{OH}	4.45	4.99		V	*IOH = -40 uA*
Low Level Output Voltage	V_{OL}	0	0.4	0.5	V	*IOL = 8 mA, PR = PRL, MIN dBm*
Supply Current	I_{CC}		13.7	16	mA	*PR = -1 to -22 dBm [4]*
Data Rate		DC		5	MBd	*Min-UI = 200 ns; Max f = 2.5 MHz*
Internal Pull-up Resistor	R_L	680	1000	1700	Ω	
Rise Time (20-80%)	t_r		27	35	ns	*V_O is loaded with 560 Ω and a load capacitance C_L OF 30 pF, Optical Power -1 to -22 dBm*
Fall Time (80%-20%)	t_f	2	5	10	ns	
Pulse Width Distortion	PWD		20	50	ns	
Propagation Delay Low to High	$t_{PropDly-LH}$		60	100	ns	
Propagation Delay High to Low	$t_{PropDly-HL}$		49	86	ns	

MECHANICAL DATA, HORZIONTAL

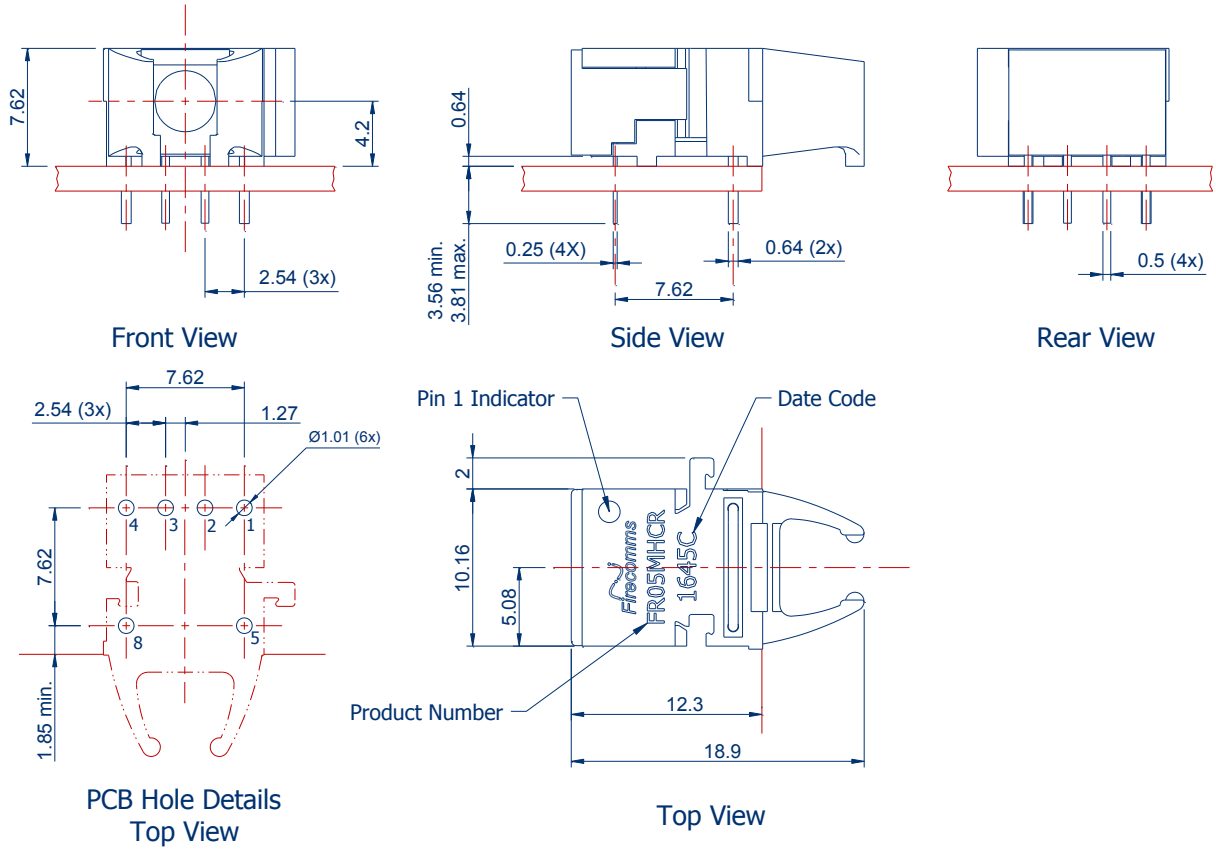


FIGURE 4.
Mechanical dimensions of the horizontal connectors and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

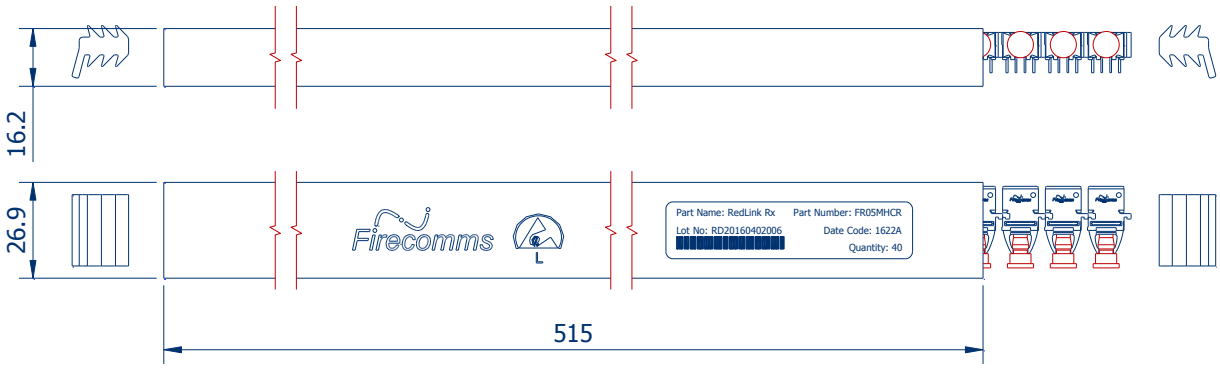


FIGURE 5.
Packing tube for Firecomms Horizontal RedLink® Receivers.

MECHANICAL DATA, VERTICAL

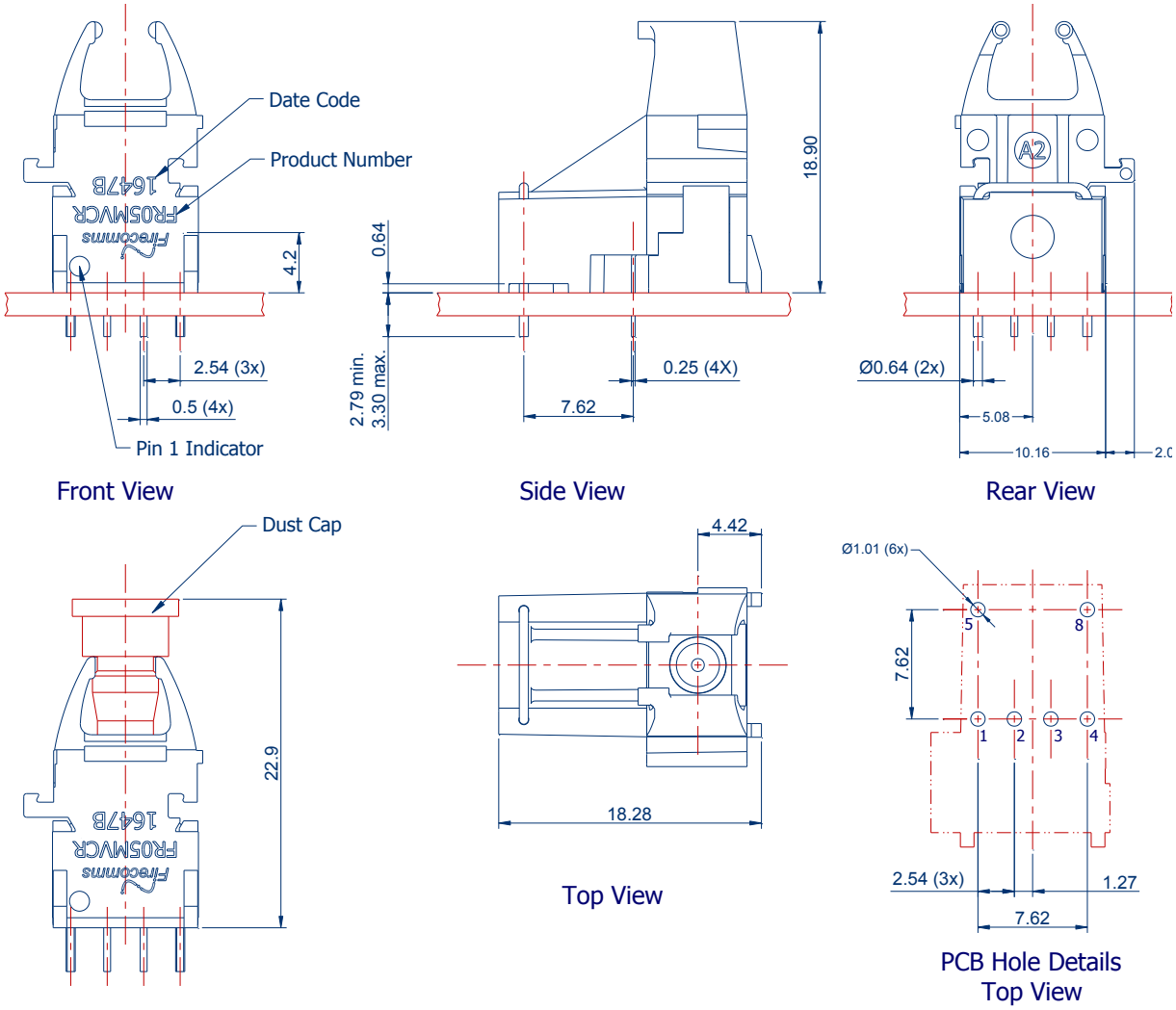


FIGURE 6.
Mechanical dimensions of the vertical receiver connectors and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

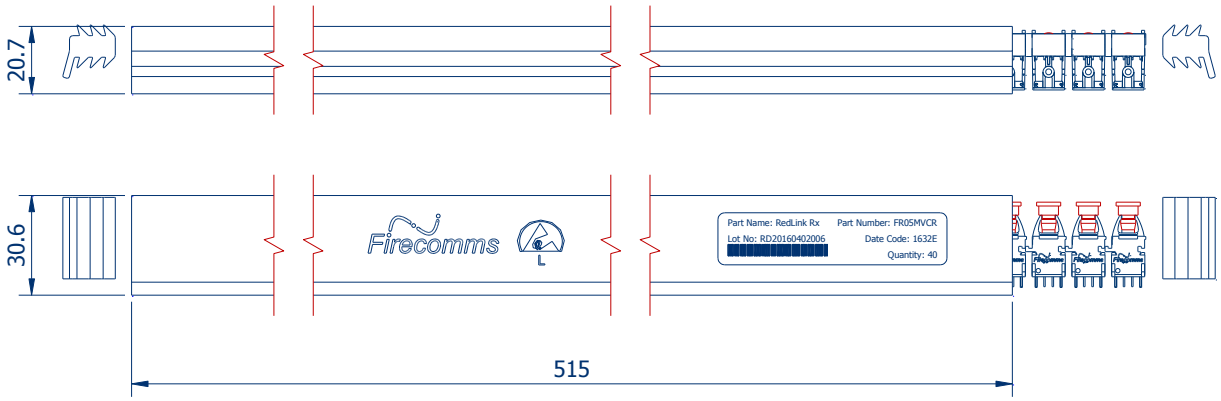


FIGURE 7.
Packing tube for Firecomms Vertical RedLink® Receivers.

PART HANDLING

The Firecomms high voltage RedLink® receiver devices are color coded 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). Acetone, ethyl acetate, phenol or similar solution based products are not permitted.

In the soldering process, non-halogenated water soluble fluxes are recommended. These parts are not suitable for use in reflow solder processes (infrared/vapor-phase reflow). The dust plug should remain in place during soldering, washing and drying processes to avoid contamination of the active optical area of each component.

The Moisture Sensitivity Level (MSL) classification of this device is 2a according to JEDEC J-STD-020E. The shelf life of an unopened MBB (Moisture Barrier Bag) is 24 months at < 40 °C and < 90 % R.H. Once the Moisture Barrier Bag is opened the devices can be either

a) Stored in normal factory conditions < 30 °C and < 60 % R.H. for a maximum of 672 hours (4 Weeks) prior to soldering.
b) Stored at < 10 % R.H. (Dry Cabinet).

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		40	40
	Tube Length	515 mm	515 mm
	Tube Height	16.2 mm	21.0 mm
	Tube Depth	26.9 mm	30.8 mm
Tubes per Bag		5	5
Bags per Inner Carton		1	1
	Inner Carton Length	630 mm	630 mm
	Inner Carton Width	70 mm	70 mm
	Inner Carton Height	105 mm	105 mm
Weight per Inner Carton, Complete		0.77 kg	0.92 kg
Components per Inner Carton		200	200
Inner Cartons per Outer Carton		10	10
	Outer Carton Length	650 mm	650 mm
	Outer Carton Width	235 mm	235 mm
	Outer Carton Height	376 mm	376 mm
Weight per Outer Carton, Complete		8.15 kg	9.61 kg
Components per Outer Carton		2,000	2,000

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