

# FT10MHLR FT10MVLR

## 650 nm DC-10 MBd RedLink® Fiber Optic Transmitter

### Datasheet



#### DESCRIPTION

The Firecomms DC to 10 MBd low current RedLink® transmitter is a highly reliable Resonant Cavity Light Emitting Diode (RCLED) which operates as a visible optical source generating red 650 nm light at data rates from burst mode DC to a maximum of 10 MBd of continuous digital data. The RCLED is encapsulated in a lensed clear molded plastic package for optimum coupling to Plastic Optic Fiber (POF). It operates over the industrial temperature range of -40 °C to +85 °C.

The 10 MBd transmitter produces higher optical power for the same input current relative to the standard Firecomms 10 MBd device (FT10MHNR). This allows a lower overall current consumption when used in an existing link design.

The transmitter is assembled in a gray non-conducting plastic housing requiring low operating current supporting both horizontal and vertical plug options. The use of the eye-safe, visible light simplifies link set-up and testing.

#### AVAILABLE OPTIONS

Package Type	Part Number
10 MBd Horizontal Package Non-Inverting, TTL	FT10MHLR
10 MBd Vertical Package Non-Inverting, TTL	FT10MVLR



#### FEATURES

- Visible RCLED at red wavelength (660 nm)
- Optimized for data transmission from DC to 10 MBd with low current consumption
- Ideal for use with Step Index (SI) Plastic Optic Fiber (POF)
- Industrial temperature range -40 °C to +85 °C  
RoHS compliant
- Flame retardant (UL 94 V-0) connector housings
- Low pulse width distortion
- Compatible with Versatile Link cables and connectors

#### APPLICATIONS

**Table 2**  
**APPLICATIONS**

<b>Application</b>	Automation and Industrial Control, Low-Speed Serial Communications, Voltage Isolation
<b>Standard</b>	Serial RS232, RS485, CAN Bus, Modbus, Profibus, Sercos
<b>Distance</b>	50 meters Step Index (SI) POF <sup>[1]</sup>
<b>Speed</b>	DC to 10 MBd

*Note: 1. Depending on the installation conditions and assuming a Firecomms 10 MBd receiver*

## SPECIFICATIONS

**Table 3**  
**TRANSMITTER PIN DESCRIPTION**

Pin	Name	Symbol
1	RCLED ANODE	TD +
2	RCLED CATHODE	TD -
3	Not Connected	N.C. / Gnd
4	Not Connected	N.C. / Gnd
5	Retaining Pin	Gnd
8	Retaining Pin	Gnd

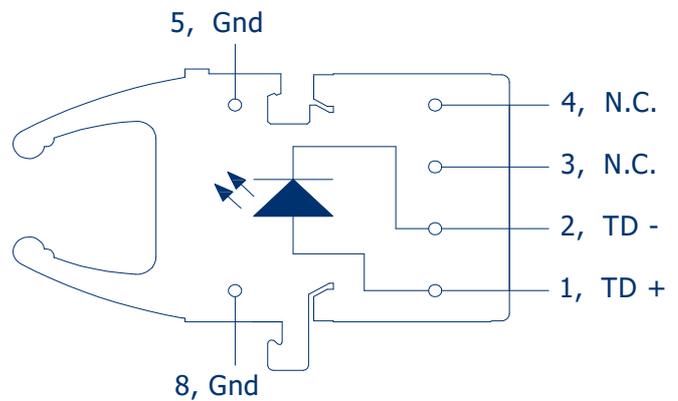


FIGURE 1  
Transmitter pin-out, top view

**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	60950-1	Files No. E362227
Storage Compliance	MSL	J-STD-020	2a (4-week floor life)
Restriction of Hazardous Substances Directive	RoHS	Directive 2011/65/EU	Certified compliant

## RECOMMENDED APPLICATION CIRCUIT

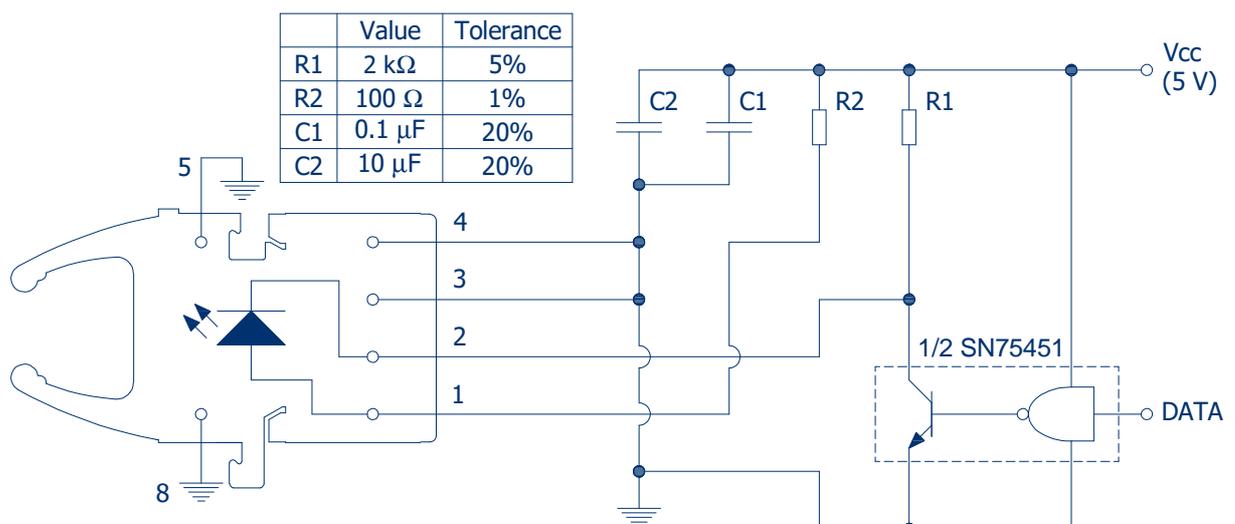


FIGURE 2  
Recommended transmitter application circuit. See note 6 Table 6

## SPECIFICATIONS

**Table 5**  
**ABSOLUTE MAXIMUM RATINGS**

These are the absolute maximum ratings at or beyond which the part 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
2. When peak forward current exceeds 30 mA, the duty cycle must maintain a pulse width (PW) less than 1  $\mu$ s and average forward current less than or equal to 30 mA. [ $30 \text{ mA} \leq I_{\text{FPK}} \leq 45 \text{ mA} \leftrightarrow I_{\text{FAVG}} \leq 30 \text{ mA AND PW} \leq 1 \mu\text{s}$ ]

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	$T_{\text{stg}}$	-40	+85	°C
Operating Temperature	$T_{\text{op}}$	-40	+85	°C
Soldering Temperature <sup>[1]</sup>	$T_{\text{slid}}$		+260 <sup>[1]</sup>	°C
TX Reverse Input Voltage	$V_{\text{R}}$		3	V
TX Peak Forward Input Current <sup>[2]</sup>	$I_{\text{FPK}}$		45	mA
Average Forward Input Current <sup>[2]</sup>	$I_{\text{FAVG}}$		30	mA

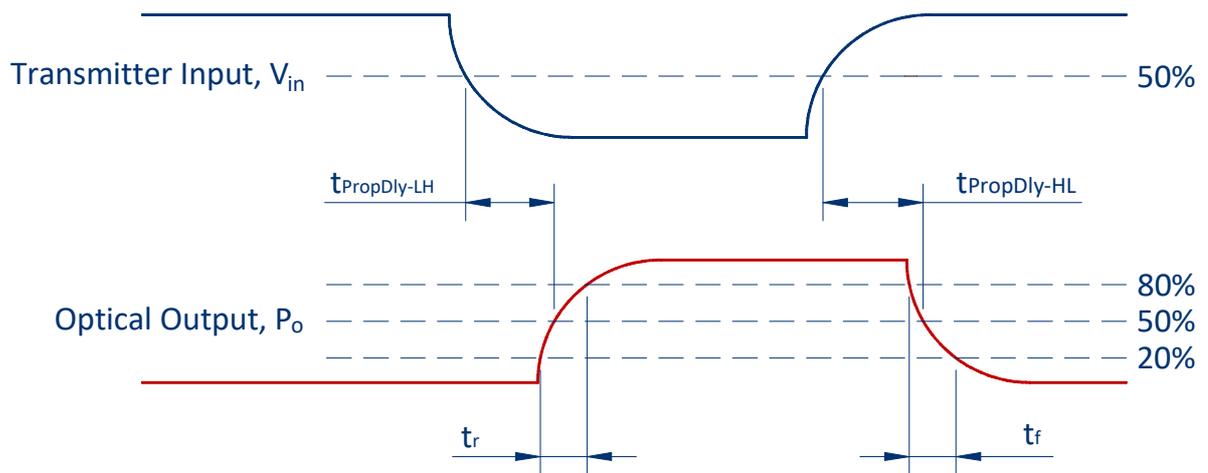


FIGURE 3  
Transmitter Propagation Delay and rise/fall time definitions as per application circuit of Figure 2

## SPECIFICATIONS

**Table 6**  
**TRANSMITTER 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 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 (inverting) as shown in Figure 2 with 50 cm of 0.5 NA POF
4. Emission Wavelength (centroid)  $\lambda_c = \sum P_i \lambda_i / \sum P_i$  (Ref: EIA/TIA std. FOTP-127/6.1, 1991)
5. Spectral Width Root Mean Squared (RMS)  $\lambda_{RMS} = (\sum P_i (\lambda_i - \lambda_c)^2 / \sum P_i)^{1/2}$ . (Ref: EIA/TIA std. FOTP-127/6.3, 1991)
6. Pins 5 and 8 are used for mounting and retaining purposes only. Connect to ground.

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Output Power	P	-3	+2	+4	dBm	1 mm POF I <sub>FDC</sub> = 30 mA
		-9	-3	-1	dBm	1 mm POF I <sub>FDC</sub> = 10 mA
		-11	-5	-3	dBm	1 mm POF I <sub>FDC</sub> = 5 mA
		-14	-8	-6	dBm	1 mm POF I <sub>FDC</sub> = 3 mA
		-20	-15	-12	dBm	200 μm PCS I <sub>FDC</sub> = 30 mA
Emission Wavelength (centroid) <sup>[4]</sup>	$\lambda_c$	640	660	680	nm	I <sub>FDC</sub> = 30 mA
Spectral Width (RMS) <sup>[5]</sup>	$\lambda_{RMS}$		11	20	nm	I <sub>FDC</sub> = 30 mA
Forward Voltage	V <sub>F</sub>	1.4	1.95	2.4	V	I <sub>FDC</sub> = 30 mA
Forward Voltage Temperature Coefficient	$\Delta V_F / \Delta T$		-3.5		mV/°C	I <sub>FDC</sub> = 30 mA
Reverse Input Breakdown Voltage	V <sub>BR</sub>	20			V	I <sub>FDC</sub> = -1 μA
Diode Capacitance	C <sub>0</sub>		11		pF	V = 0 V
Data Rate		DC		10	MBd	
Optical Rise Time (20 % - 80 %)	t <sub>r</sub>		5	7	ns	I <sub>FAVG</sub> = 15 mA <sup>[3]</sup>
Optical Fall Time (80 % - 20 %)	t <sub>f</sub>		7	9	ns	I <sub>FAVG</sub> = 15 mA <sup>[3]</sup>
Propagation Delay Low-to-High (Electrical-to-Optical)	PropDly_ LtoH (EL/OP)	18	22	28	ns	I <sub>FAVG</sub> = 15 mA <sup>[3]</sup>
Propagation Delay High-to-Low (Electrical-to-Optical)	PropDly_ HtoL (EL/OP)	16	24	36	ns	I <sub>FAVG</sub> = 15 mA <sup>[3]</sup>
Pulse Width Distortion	PWD	-2	2	8	ns	I <sub>FAVG</sub> = 15 mA <sup>[3]</sup>

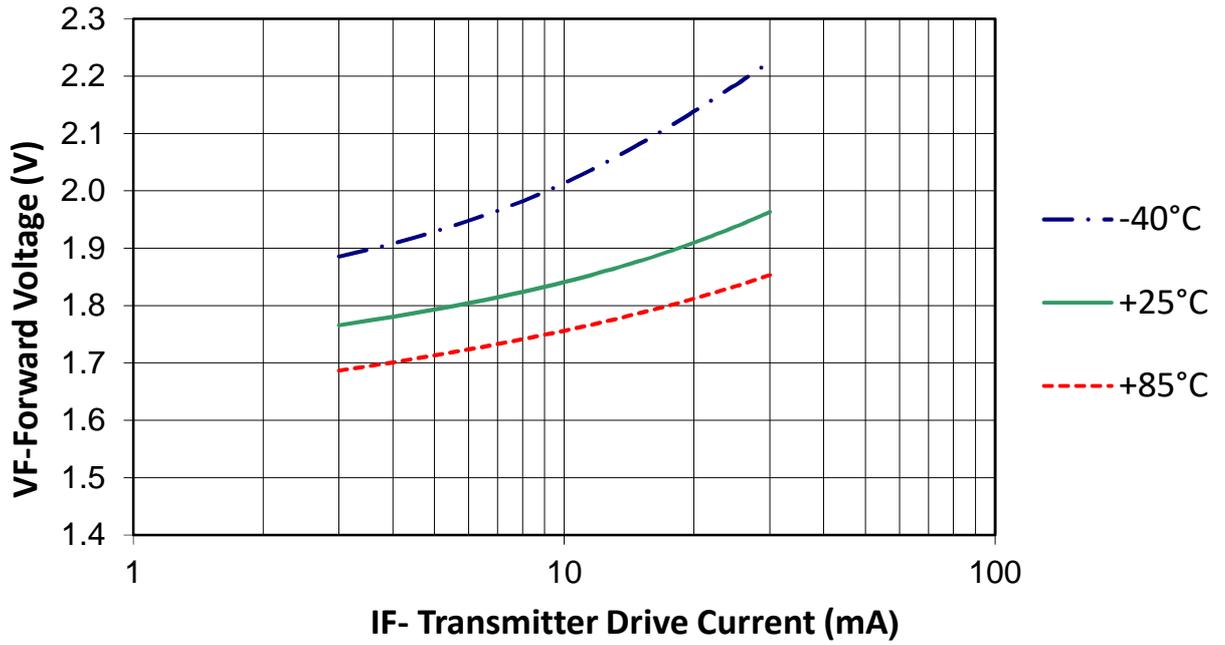


FIGURE 4  
Typical forward voltage (VF) vs. drive current (IF,DC).

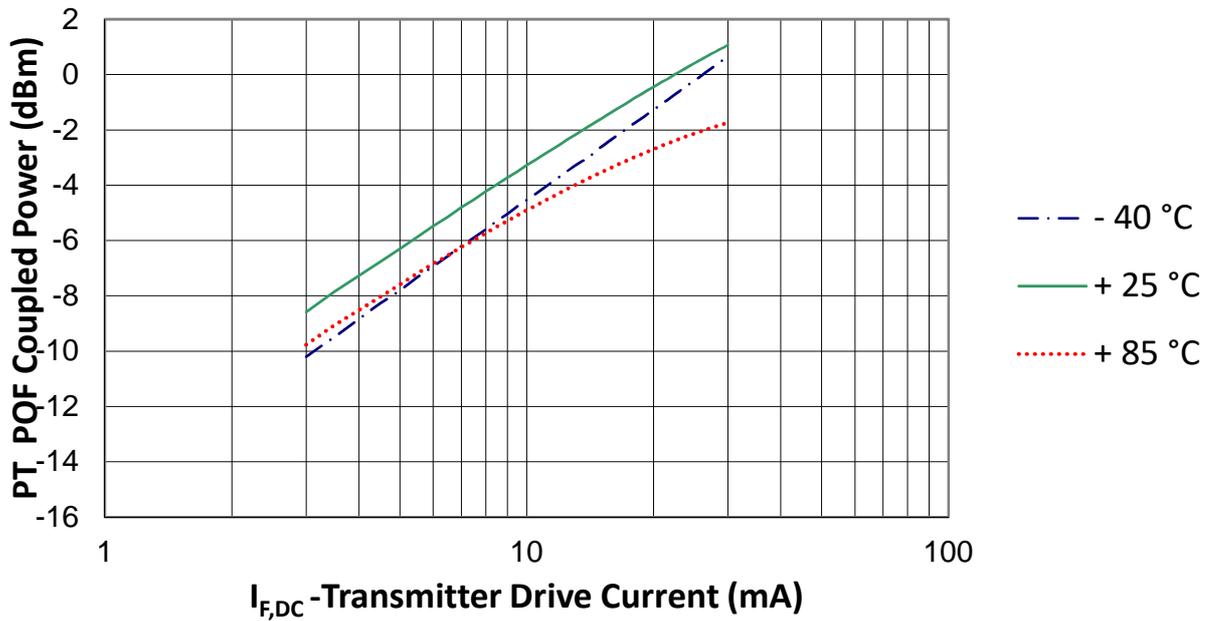


FIGURE 5  
Typical normalized optical power vs. drive current.

### MECHANICAL DATA, HORIZONTAL

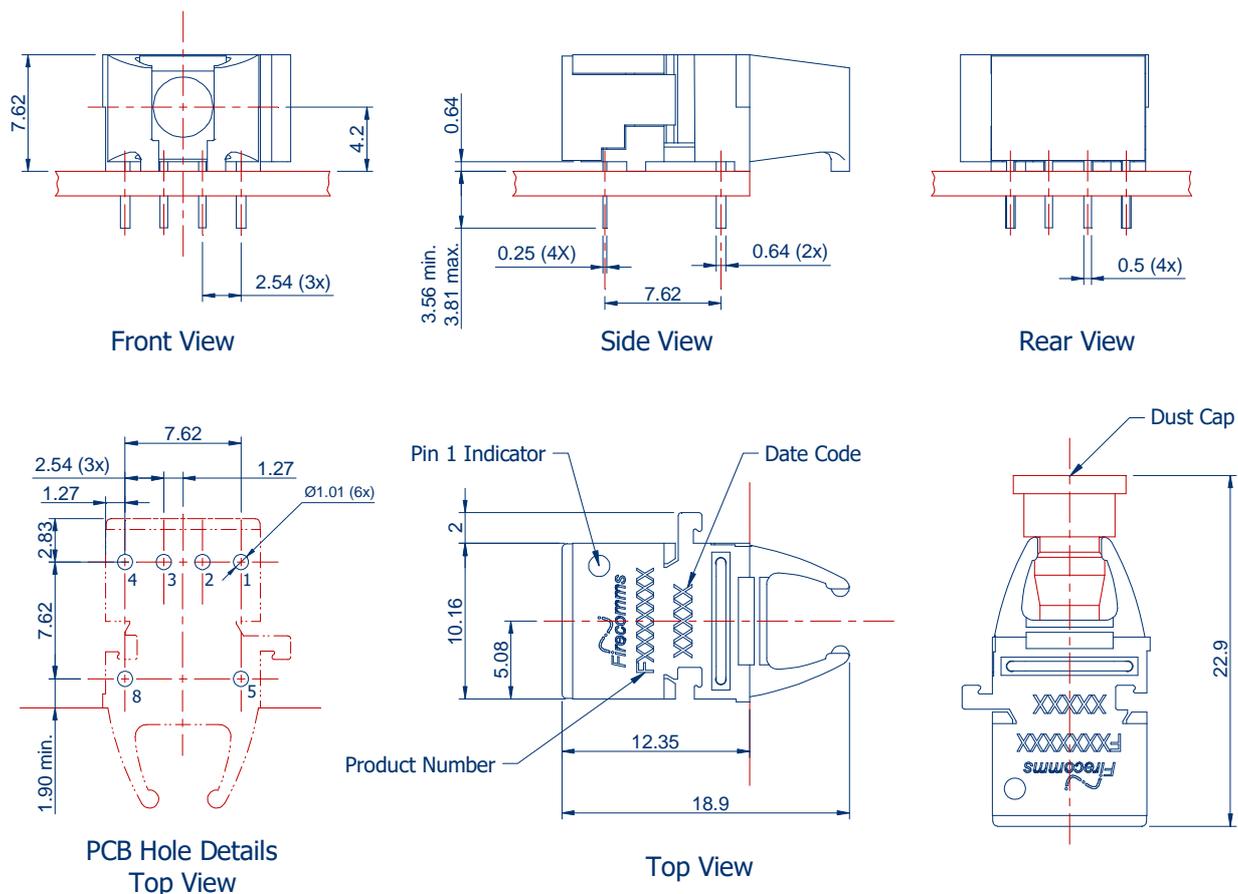


FIGURE 6  
Mechanical dimensions of the horizontal connectors and PCB footprint, which is a top view  
General dimensional tolerance is  $\pm 0.2$  mm

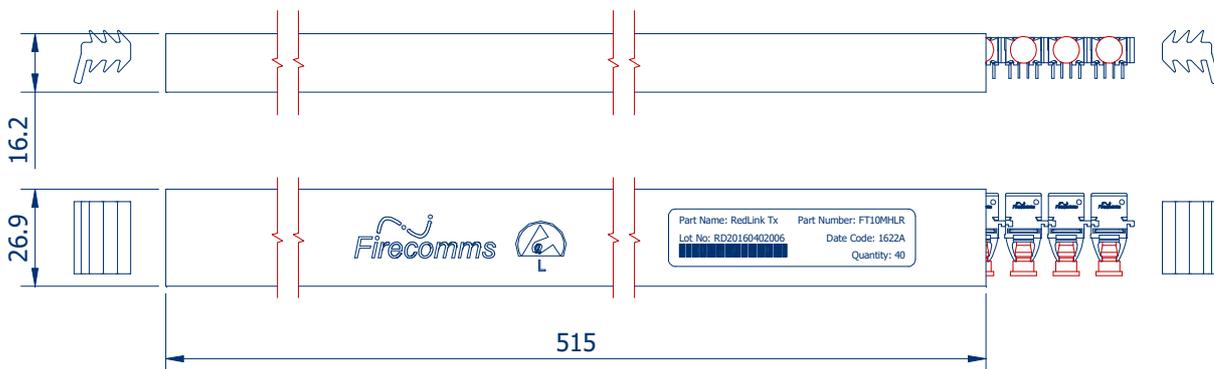


FIGURE 7  
Packing tube for Firecomms Horizontal RedLink Transmitters

## MECHANICAL DATA, VERTICAL

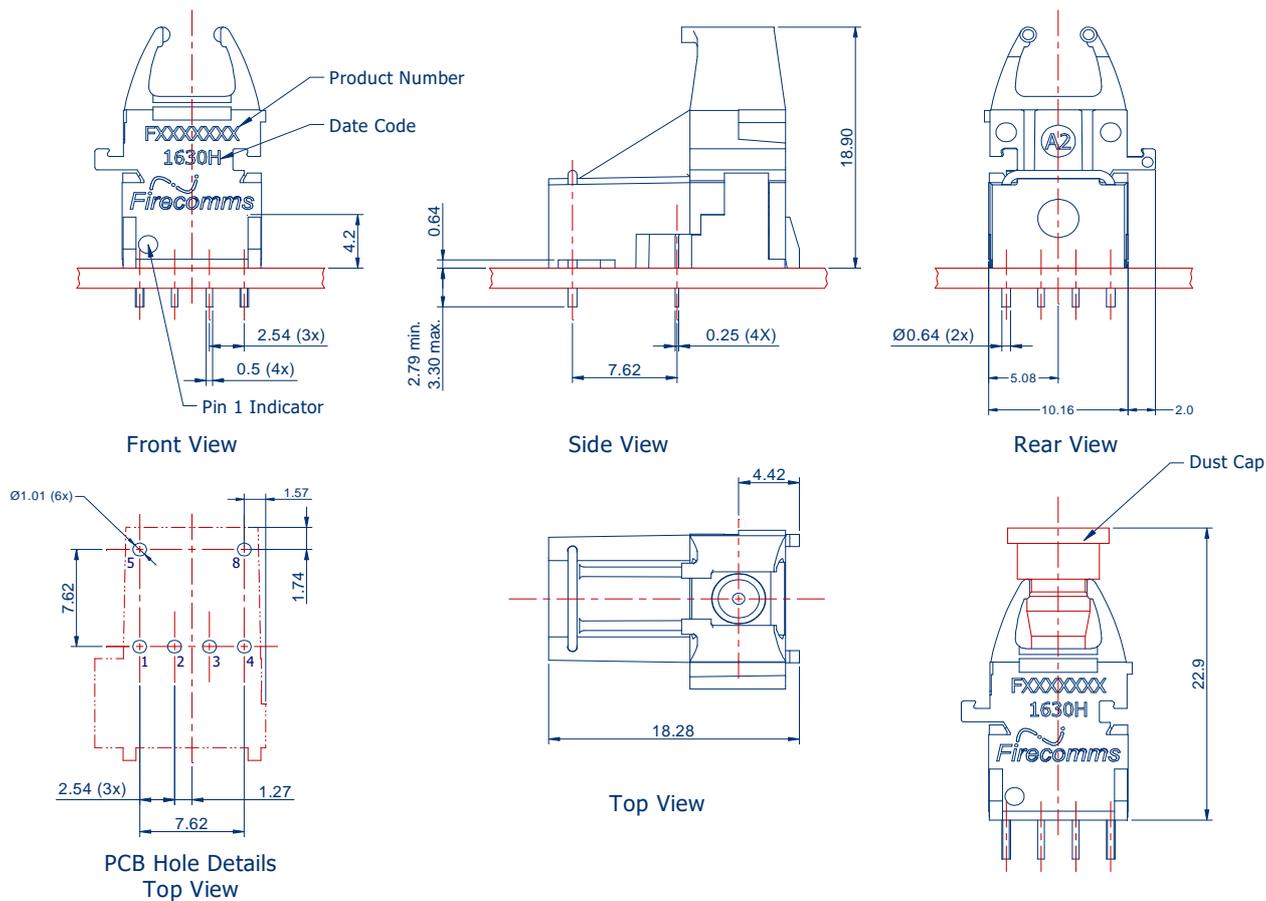


FIGURE 8  
Mechanical dimensions of the vertical transmitter connectors and PCB footprint, which is a top view  
General dimensional tolerance is  $\pm 0.2$  mm

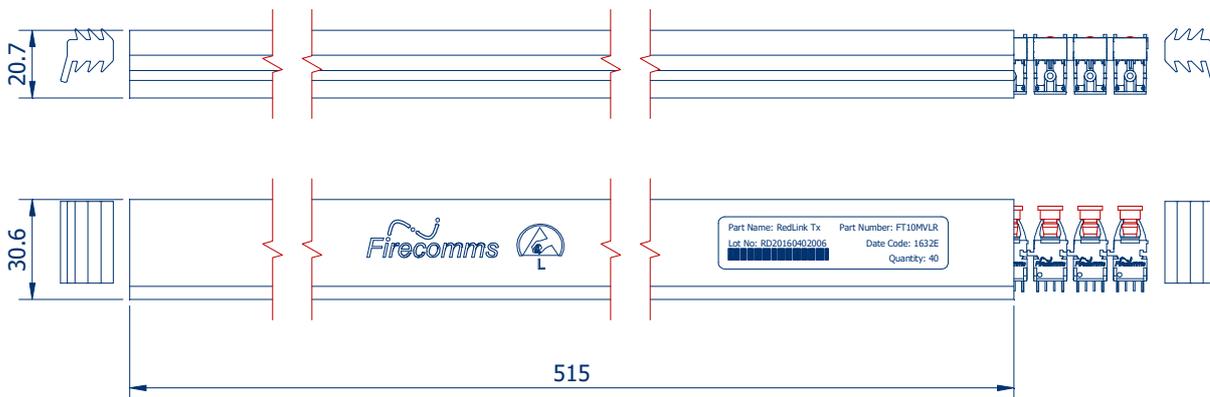


FIGURE 9  
Packing tube for Firecomms Vertical RedLink Transmitters

## **PART HANDLING**

The Firecomms DC-10 MBd 650 nm RedLink transmitter devices are color coded gray. 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 products 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 part.

The Moisture Sensitivity Level (MSL) classification of this device is 2a according to JEDEC J-STD-020. 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	8.13 kg	9.60 kg
Components per Outer Carton	2,000	2,000

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