FR05DxCR

DC-5 MBd Open Collector Dual Supply Voltage RedLink® Receiver

Datasheet

DESCRIPTION

Firecomms DC to 5 MBd Dual supply voltage RedLink® receiver is based on a fully integrated photo-diode with TIA, limiting amplifier, and an open-collector output.

Housed in a non-conducting plastic RedLink® connector housings, the receiver is blue in colour. The housing is compatible with the Versatile Link style fiber plug, and is designed primarily for use with Plastic Optic Fiber (POF).

The receiver operates equally at both the standard 3.3 V and 5 V DC supply rail voltages. It 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.

Internal 1 kΩ pull-up resistor (R_L) suitable for applications implementing an open collector pull up to V_{CC}.

FEATURES

- Designed for use with Plastic Optic Fiber (POF)
- Optimised for data rates of DC to 5 MBd
- Open-Collector Output
- Industrial Temperature Range -40 °C to +85 °C
- Dual 5 V and 3.3 V power supply operation
- RoHS compliant and flame retardant (UL 94 V-0) housing
- Horizontal, Vertical and 30° Tilted options
- Low pulse width distortion
- Compatible with Versatile Link cables and connectors

AVAILABLE OPTIONS

Table 1
ORDERING INFORMATION / PART NUMBERS

5 MBd Horizontal Package Inverting, TTL	FR05DHCR
5 MBd Vertical Package Inverting, TTL	FR05DVCR
5 MBd Titled Package Inverting, TTL	FR05DWCR

APPLICATIONS

Table 2
APPLICATIONS

Application	Automation and Industrial Control. Serial Communications. Voltage Isolation.
Standard	Serial RS232, RS485, CAN-Bus, Modbus
Distance	50 meters Step Index POF [1] 300 meters with 200 µm PCS fiber [1]
Speed	DC to 5 MBd

Note: 1 Depending on the installation conditions

SPECIFICATIONS

Table 3
RECEIVER PIN DESCRIPTION

Pin	Name	Symbol
1	RECEIVER OUTPUT	V_O
2	RECEIVER GROUND	GND
3	RECEIVER VCC	V_{CC}
4	R_L PULL-UP RESISTOR	R_L
5	RETAINING PIN	GND
8	RETAINING PIN	GND

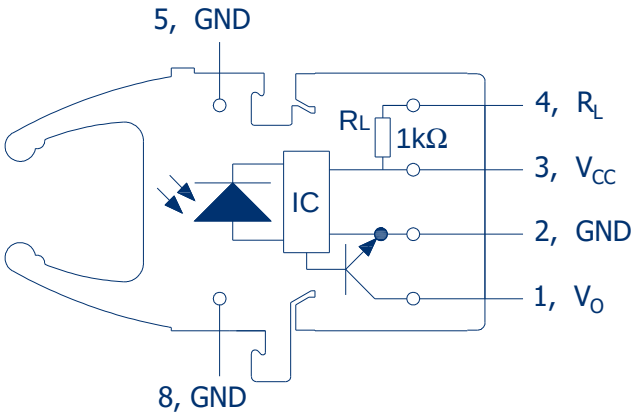

FIGURE 1
Receiver pin-out, top view

Table 4
REGULATORY COMPLIANCE

Parameter	Symbol	Standard	Level
Electrostatic Discharge, Human Body Model (contact ESD)	HBM	Mil-STD-883	Level 2 (4 kV)
UL Certification	UL	60950-1	File No. E362227
Storage Compliance	MSL	J-STD-020	2a (4-week floor life)
Restriction of Hazardous Substances Directive	RoHS	Directive 2011/65/EU Incl. Amendment 2015/863	Certified compliant

RECOMMENDED APPLICATION CIRCUIT

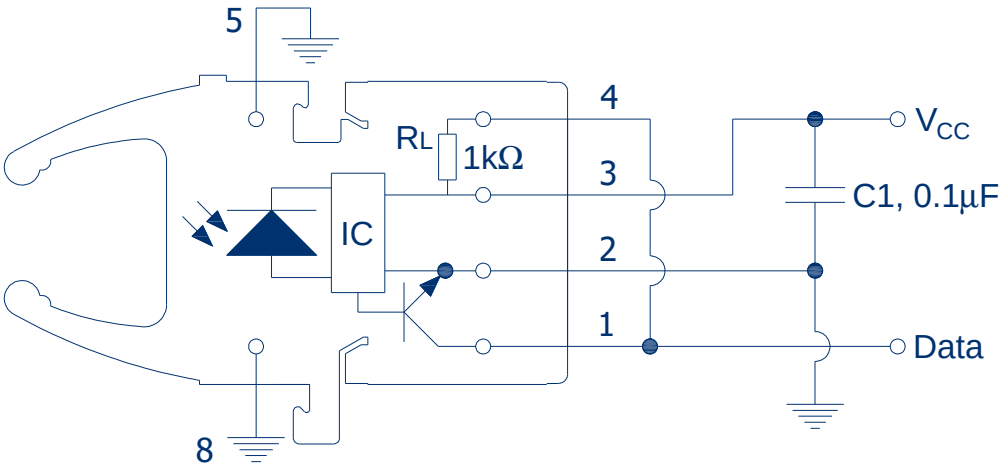

FIGURE 2
Recommended receiver application circuit

SPECIFICATIONS

Table 5
ABSOLUTE MAXIMUM RATINGS

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

1. *260°C for 10 seconds, one time only, at least 2.2 mm away from lead root.*
2. *Applying conditions above absolute maximum ratings is destructive to the device. Functional operation of the device at conditions between maximum operating conditions (5.5 V) and absolute maximum ratings is not implied. Extended exposure to stresses above recommended operating conditions will have an effect on device reliability*

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
Supply Voltage [2]	V_{CC}	-0.5	+7	V
Output Voltage [2]	V_o	-0.5	+7	V
Rx Output Current	I_O		+25	mA
Storage Compliance	MSL		2a	J-STD-020

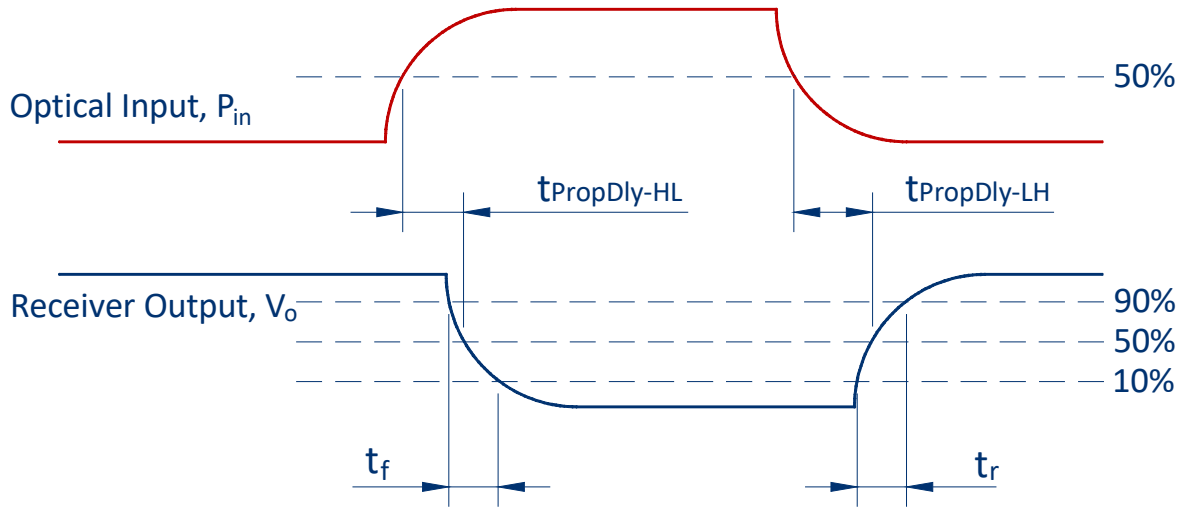

FIGURE 3
Receiver propagation delay and rise/fall time definitions as per application circuit of Figure 2

SPECIFICATIONS

Table 6
RECEIVER ELECTRICAL AND OPTICAL CHARACTERISTICS

Test Conditions:

1. *Wake up Delay is the delay from V_{CC} > 2.75 V to when the output will respond correctly to optical input. Output is un-driven before this time.*
2. *Test data was validated using a transmitter with a 5ns rise and fall time, over the full temperature range of -40 °C to +85 °C, over both supply rail voltage options of 5 V and 3.3 V ± 10%, and over the input optical received power as specified by P_H and P_L. 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. Data referred to as typical are rated at +25 °C*
3. *Testing in the recommended receiver circuit, with Pin 1, V_0 connected to Pin 4, R_L (internal 1 kΩ) and a load capacitance of 15pF.*
4. *Optical signal from the recommended Transmitter circuit.*
5. *PWD for Optical Input of 5 MBd, NRZ 2^7-1 (PRBS7) data, resulting in a BER ≤ 10^{-9}.*
6. *Pins 5 and 8 are only used for mounting and retention purposes. It is recommended that pins 5 and 8 be connected to ground.*

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Supply Current	I_{CC}	11	13	16	mA	R_L is open, [2,3,4]
Wake up Delay$_{(power\ up)}$	$t_{power\text{-}on}$		40		µs	[1]
Voltage Supply	Vcc	2.97	3.35	5.5	V	
High Level Output Current	I_{OH}		0.01	1	µA	Vo = Vcc , Received Power < P_L maximum
Low Level Output Voltage	V_{OL}	0	0.2	0.4	V	Io = 8 mA, Received Power < P_H minimum
POF Optical Power High	P_H	-22		+2	dBm	[2,3], 1mm 0.5 NA POF
POF Optical Power Low	P_L			-40	dBm	[2,3], 1mm 0.5 NA POF
PCS Optical Power High	P_H	-24		-4	dBm	[2,3], 200 µm PCS
PCS Optical Power Low	P_L			-42	dBm	[2,3], 200 µm PCS
Data Rate		DC		5	Mbd	Min UI = 200 ns, Max f = 2.5 MHz
Internal Pull-Up Resistor	R_L	0.7	1	1.5	kΩ	
Output Rise Time (10%-90%)	t_r	60	73	85	ns	[2-5]
Output Fall Time (90%-10%)	t_f	5	15	25	ns	
Pulse Width Distortion	PWD		20	35	ns	
Propagation Delay	$t_{PropDly\text{-}HL}$		45	65	ns	
	$t_{PropDly\text{-}LH}$		30	65	ns	

MECHANICAL DATA, HORIZONTAL

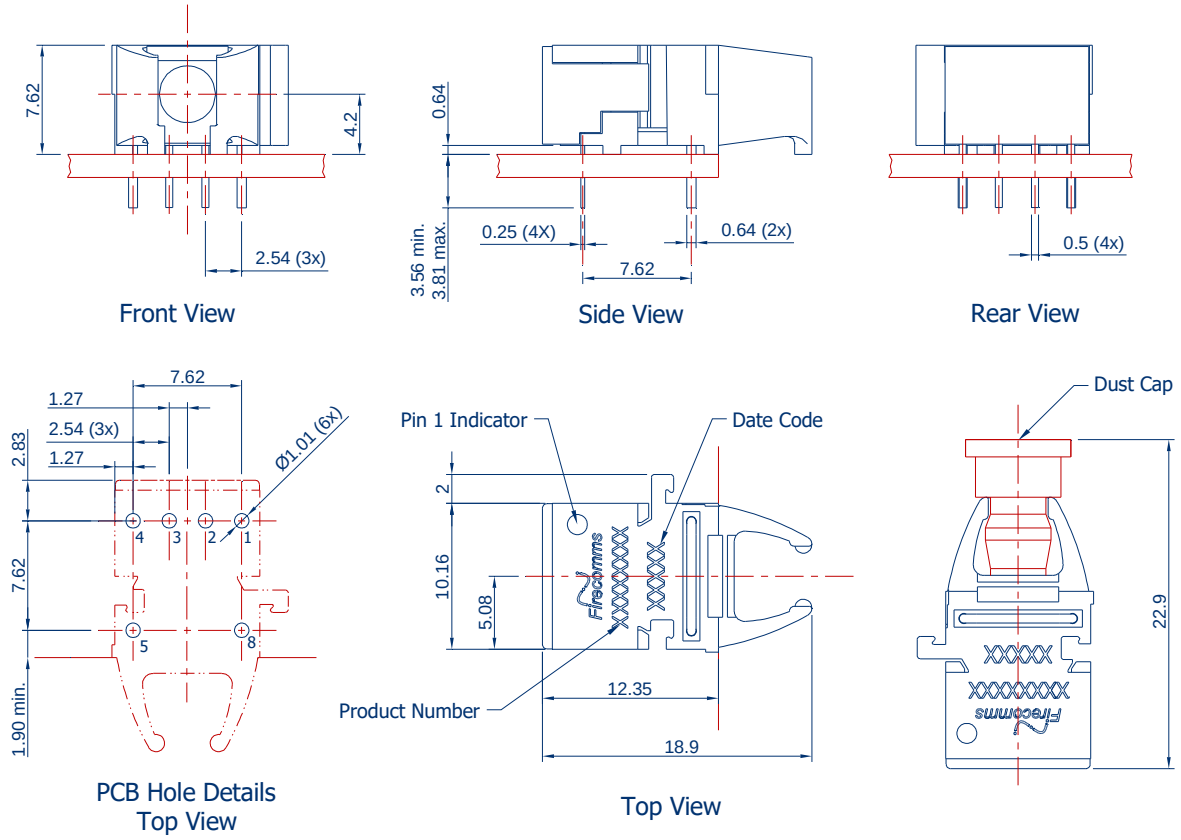

FIGURE 4
Mechanical dimensions of RedLink® horizontal connectors and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

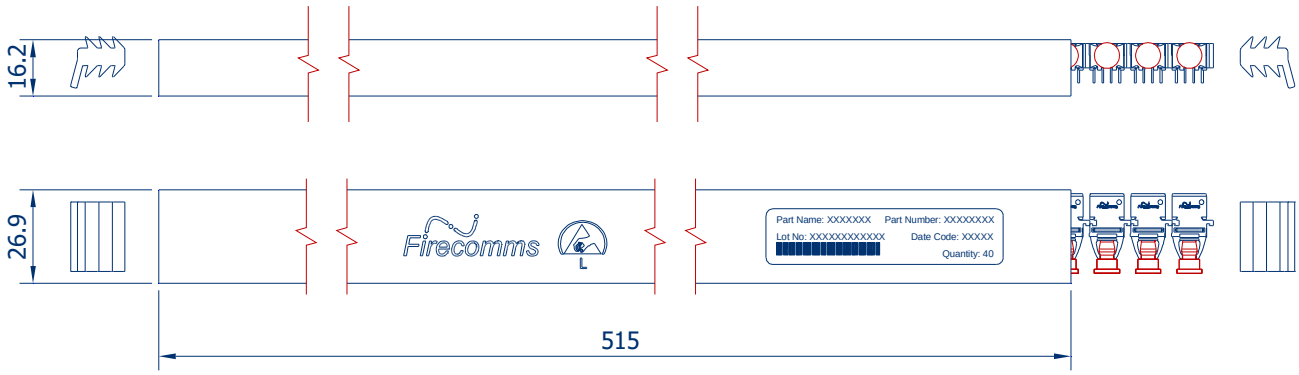

FIGURE 5
Packing tube for Firecomms RedLink® horizontal connectors

MECHANICAL DATA, VERTICAL

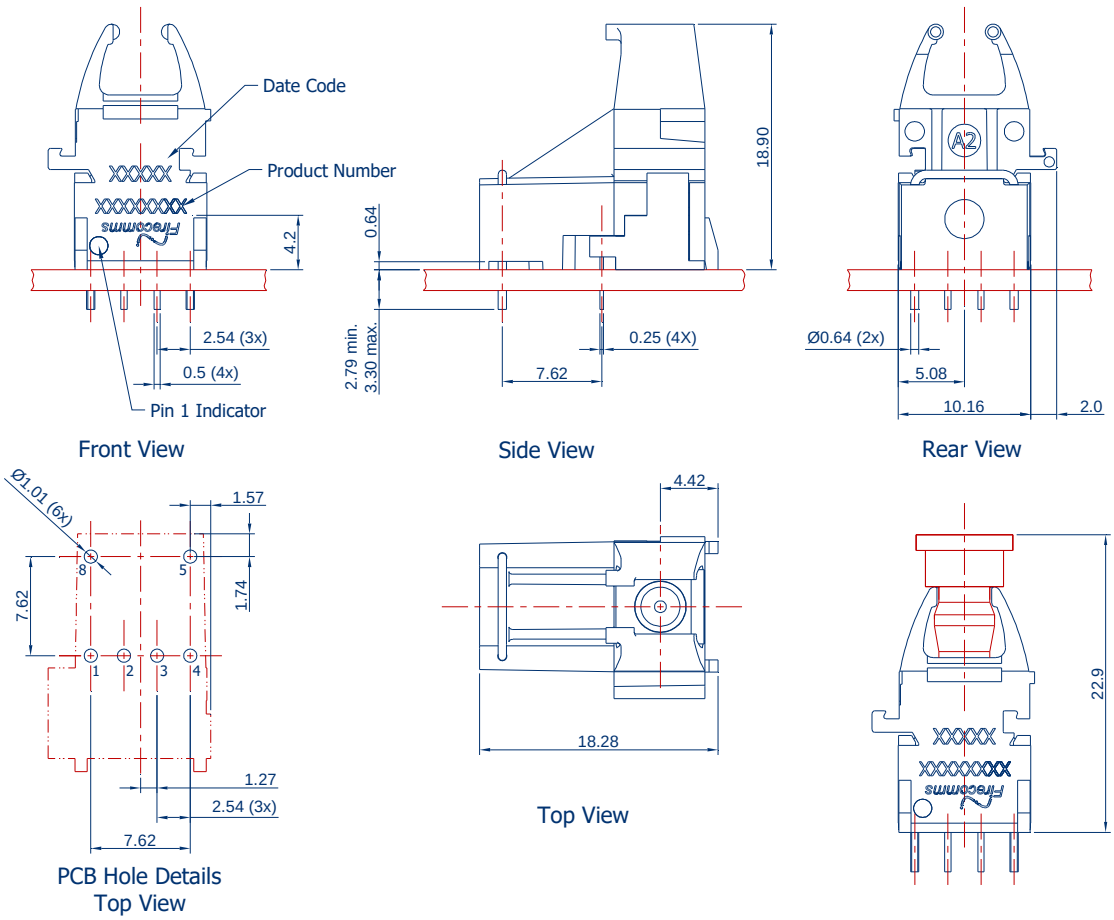

FIGURE 6
Mechanical dimensions of RedLink® vertical connectors and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

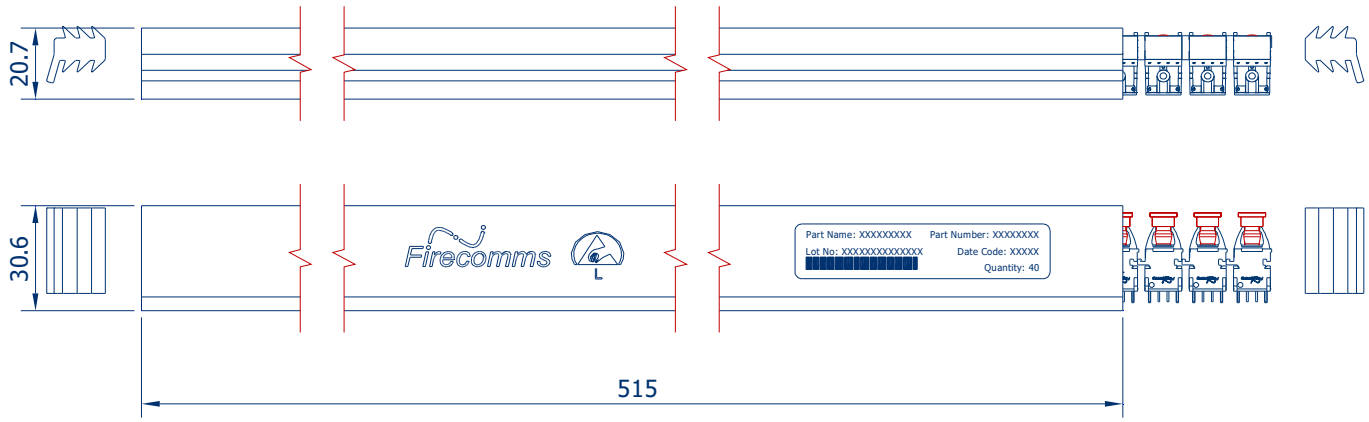

FIGURE 7
Packing tube for Firecomms RedLink® vertical connectors

MECHANICAL DATA, 30° TILTED

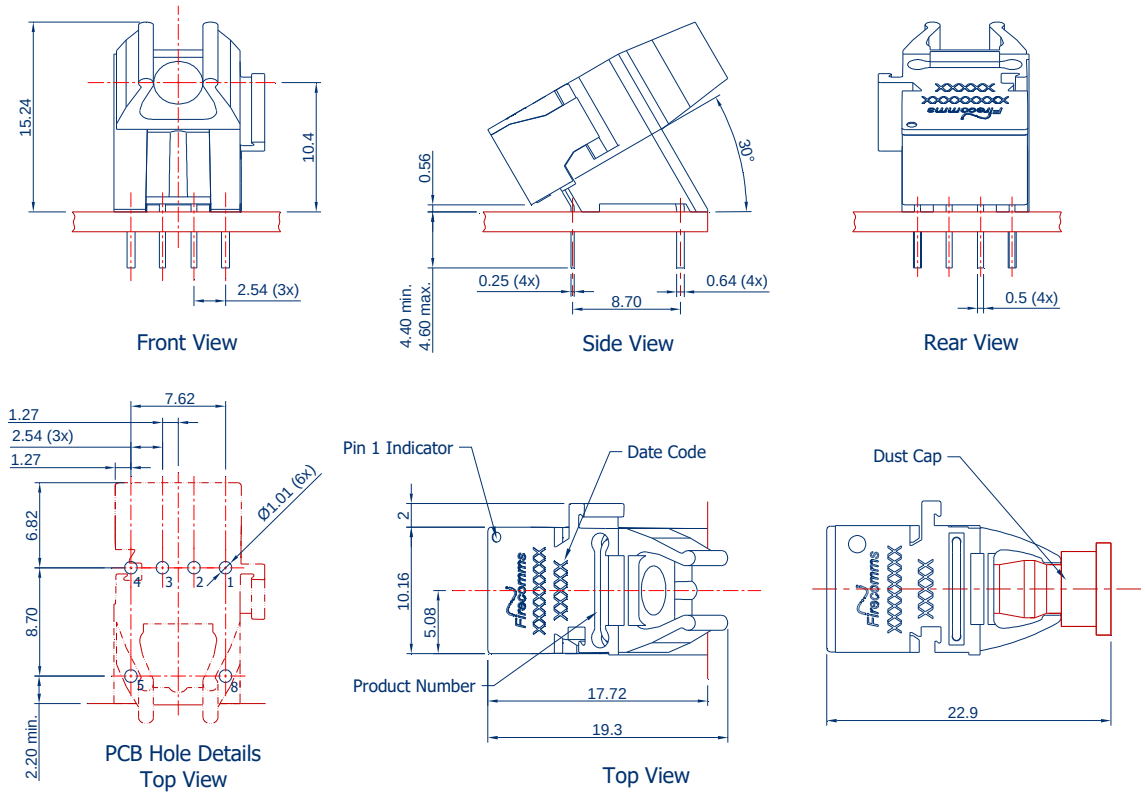

FIGURE 8
Mechanical dimensions of RedLink® tilted connectors and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

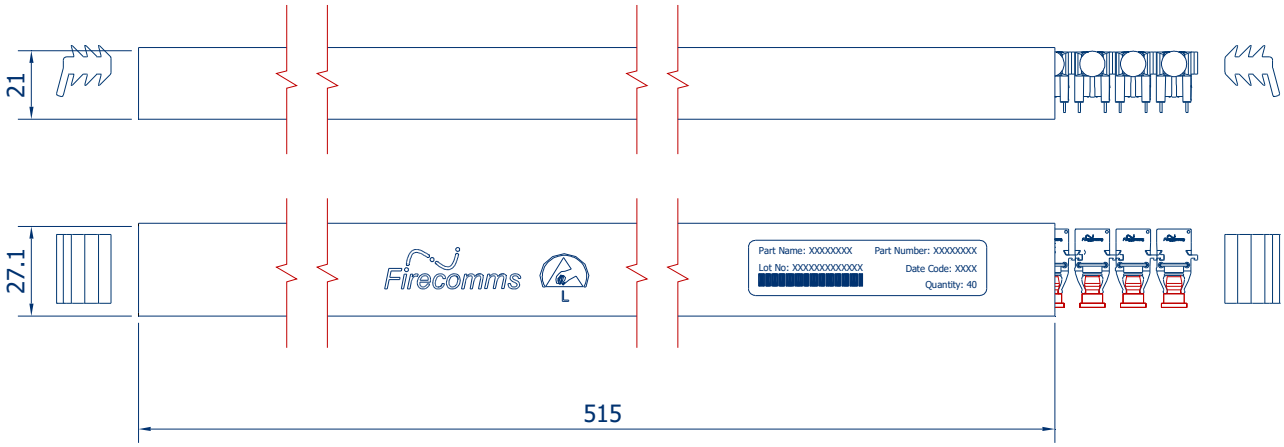

FIGURE 9
Packing tube for Firecomms RedLink® tilted connectors

PART HANDLING

Firecomms RedLink® connectors are auto-insertable and tested for handling in static-controlled assembly processes (Human Body Model - 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. RedLink® connectors 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 and 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	Tilted
Components per Tube		40	40	40
	Tube Length	515 mm	515 mm	515 mm
	Tube Height	16.2 mm	20.7 mm	21 mm
	Tube Depth	26.9 mm	30.6 mm	27.1 mm
Tubes per Bag		5	5	5
Bags per Inner Carton		1	1	1
	Inner Carton Length	630 mm	630 mm	630 mm
	Inner Carton Width	70 mm	70 mm	70 mm
	Inner Carton Height	105 mm	105 mm	105 mm
Weight per Inner Carton, Complete		0.77 kg	0.92 kg	0.92 kg
Components per Inner Carton		200	200	200
Inner Cartons per Outer Carton		10	10	10
	Outer Carton Length	650 mm	650 mm	650 mm
	Outer Carton Width	235 mm	235 mm	235 mm
	Outer Carton Height	376 mm	376 mm	376 mm
Weight per Outer Carton, Complete		8.13 kg	9.60 kg	9.60 kg
Components per Outer Carton		2,000	2,000	2,000