

# EDL301T

## Ethernet Optic OptoLock® Transceiver



### Data Sheet



#### DESCRIPTION

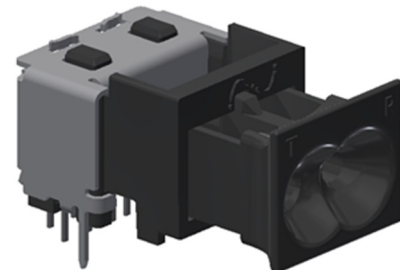
Firecomms Ethernet transceiver combines both transmitter and receiver fiber optic components in a small form factor housing. OptoLock® allows bare fiber termination of standard jacketed Plastic Optic Fiber (POF) with a simple insert and lock system. It is an ideal solution for Fast Ethernet telecoms-installed IPTV and self-installed home networking. The EDL301T-xxx, delivers bandwidth of 100 Mbps over POF in a point-to-point link. It has a very simple interface to any Ethernet PHY IC supporting IEEE 802.3 100Base-FX.

The OptoLock® design enables the fiber to be cut to length on-site with minimum of waste, and terminated quickly and reliably without the need for expensive equipment or specially trained staff (no splicing required).

The transmitter is a high speed RCLED (Resonant Cavity LED) driven by a CMOS IC. The receiver combines a photodiode, transimpedance amplifier and limiting amplifier, providing a digital output on an LVPECL data bus compatible with all Ethernet PHY ICs. OptoLock® is protected by U.S. patents 7,597,485 and 7,905,665, Chinese patents 101501545 A and 102135650 B and other international patents.

#### AVAILABLE OPTIONS

| Part Number | Description   |
|-------------|---|
| EDL301T-220 | OptoLock® Ethernet Transceiver for 2.2mm POF, Black |
| EDL301T-229 | OptoLock® Ethernet Transceiver for 2.2mm POF, White |
| EDL301T-150 | OptoLock® Ethernet Transceiver for 1.5mm POF, Black |
| EDL301T-159 | OptoLock Ethernet Transceiver for 1.5mm POF, White  |



#### FEATURES

- Simple low-cost termination solution for bare POF
- Suitable for standard 1.5 mm or 2.2 mm POF
- LVPECL output data bus (800-1400) mV
- Visible red light from eye-safe RCLED
- Includes CMOS LED driver (TX)
- High-sensitivity CMOS receiver and silicon Photodiode (PD)
- Integrated optics to efficiently couple light to and from 1mm fiber core with 0.5 or 0.3 NA
- Compatible with IEEE 802.3u Fast Ethernet data communications standard
- Seamless digital to light/light to digital conversion
- RoHS compliant

#### APPLICATIONS

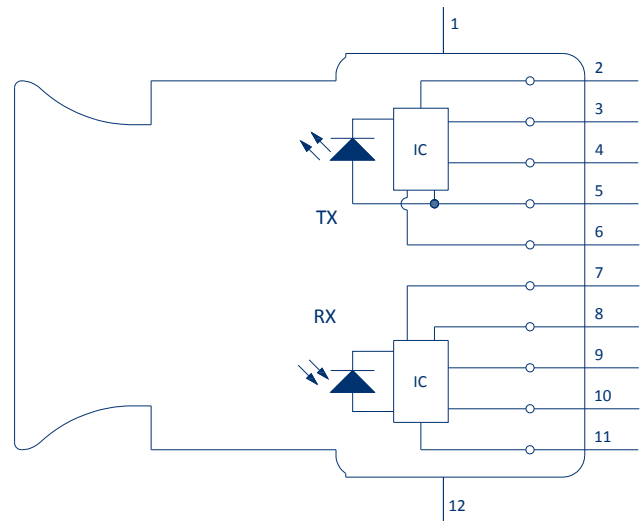
|                    |   |
|--------------------|---|
| <b>Application</b> | Industrial Networking                   |
| <b>Standard</b>    | IEEE 802.3 (100Base-FX)                 |
| <b>Distance</b>    | 50 meters Step Index POF <sup>[1]</sup> |
| <b>Speed</b>       | 125 Mbps                                |

Note: 1. Depending on the installation conditions

## SPECIFICATIONS

**Table 3**  
**TRANSCIVER PIN DESCRIPTION**

| Pin         | Name                      | Symbol |
|-------------|---------------------------|--------|
| Transmitter |                           |        |
| 1           | EMI Shield <sup>[1]</sup> | GND    |
| 2           | Signal Input (Negative)   | TX-    |
| 3           | Signal Input (Positive)   | TX+    |
| 4           | Ground Pin <sup>[1]</sup> | GND    |
| 5           | DC Power Input Pin 3.3 V  | Vcc    |
| 6           | Ground Pin <sup>[1]</sup> | GND    |
| Receiver    |                           |        |
| 7           | DC Power Input Pin 3.3 V  | Vcc    |
| 8           | Ground Pin <sup>[1]</sup> | GND    |
| 9           | Signal Detect Output      | SD     |
| 10          | Data Output (Negative)    | RD-    |
| 11          | Data Output (Positive)    | RD+    |
| 12          | EMI Shield <sup>[1]</sup> | GND    |



**FIGURE 1**  
Transceiver pin-out, top view

1. NB: EMI Shield ground pins must be connected to the signal ground plane on the PCB. This is important to prevent cross-talk between TX and RX and also to shield the FOT's from external EMI/EMC and ESD

**Table 4**  
**REGULATORY COMPLIANCE**

| Parameter                                     | Symbol | Standard             | Level                  |
|---|--------|----------------------|------------------------|
| Storage Compliance                            | MSL    | J-STD-020E           | 2a (4-week floor life) |
| Restriction of Hazardous Substances Directive | RoHS   | Directive 2011/65/EU | Certified compliant    |
| Eye Safety                                    |        | IEC 60825-1          | LED Class 1            |

## RECOMMENDED APPLICATION CIRCUIT

The generalized recommended application circuit is shown in Figure 2. Each PHY IC manufacturer will recommend a termination configuration for their design; please refer to the relevant product data sheets. Some examples from the most popular PHYs are provided in Firecomms' EDL301T Application Note. It is important that the data lines are treated as controlled impedance, matched differential pairs, and that the crystal used in conjunction with the PHY is of a suitably high tolerance.

Signal Detect is an open-collector CMOS output from the receiver (RX). It is low ( $\leq 0.6$  V) when there is no optical data or optical data below the lower optical power sensitivity level. It is high ( $\approx 3.3$  V) when there is optical data present with a power level above the minimum sensitivity level.

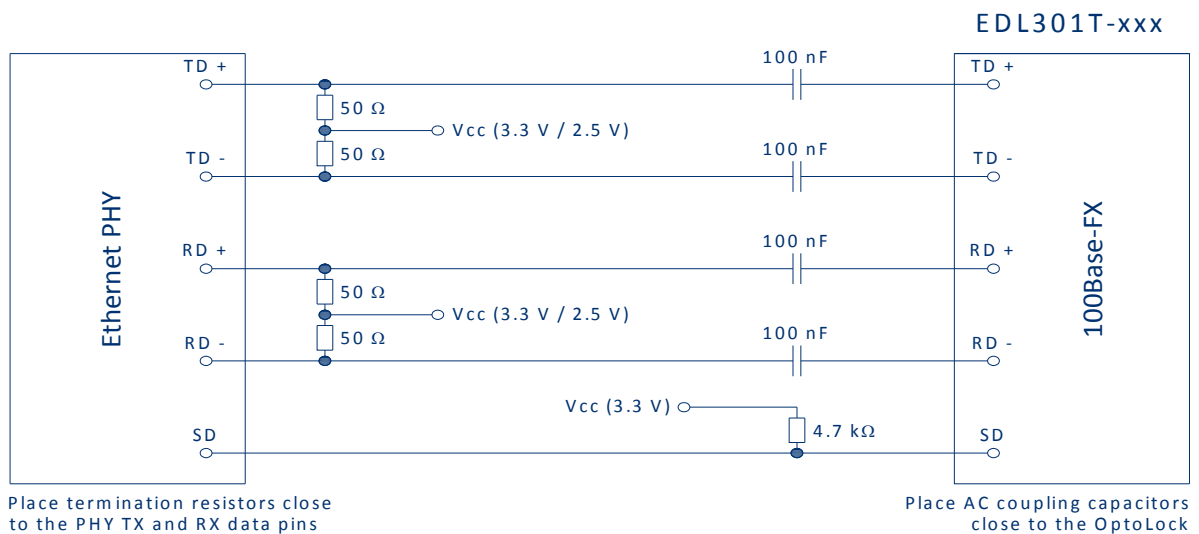


FIGURE 2  
Recommended application circuit layout for an AC coupled EDL301T-xxx.

## ELECTRONIC BLOCK DIAGRAM

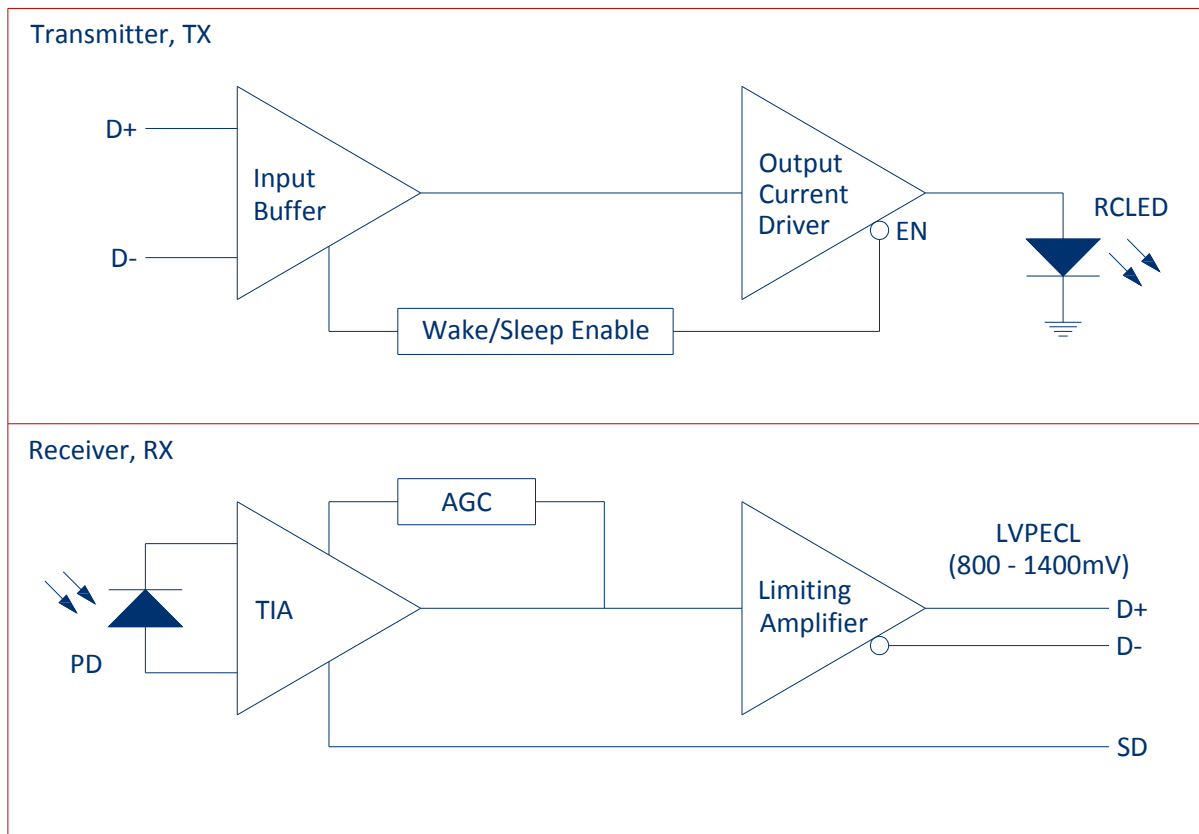


FIGURE 3  
Electronic block diagram of the EDL301T-xxx.

## SPECIFICATIONS

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

*These are the absolute maximum ratings at or beyond which the component 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 <sub>stg</sub> | -20     | +85     | °C   |
| Operating Temperature                | T <sub>op</sub>  | -20     | +70     | °C   |
| Soldering Temperature <sup>[1]</sup> |                  |         | +260    | °C   |
| Supply Voltage                       | V <sub>CC</sub>  | -0.5    | +4.5    | V    |
| Receiver Optical Power Overload      | P <sub>OL</sub>  |         | 0       | dBm  |

## SPECIFICATIONS

**Table 6**  
**TRANSMITTER ELECTRICAL AND OPTICAL CHARACTERISTICS**

| Parameter                        | Symbol           | Min     | Typical | Max           | Unit       | Test Condition |
|----------------------------------|------------------|---------|---------|---------------|------------|----------------|
| Supply Voltage                   | $V_{CC}$         | 3.00    | 3.30    | 3.60          | V          |                |
| Current Consumption              | $I_{CC}$         | 30.0    | 37.0    | 52.0          | mA         |                |
| Data Rate                        |                  | 10      | 100     | 125           | Mbps       |                |
| Input Capacitance                | $C_{in}$         |         |         | 5.00          | pF         |                |
| Input Resistance                 | $R_{in}$         |         | 5.00    |               | k $\Omega$ |                |
| Input Common-Mode Voltage Range  | $V_{IB}$         | GND+0.8 |         | $V_{CC}$ -0.8 | V          |                |
| Differential Input Voltage Swing | $V_{ID}$         | 100     |         | 1200          | mV         |                |
| Optical Power OFF Delay          | $T_{PD}$         | 0.02    |         | 20.00         | $\mu$ s    |                |
| Optical Power ON Delay           | $T_{PU}$         |         |         | 5.00          | $\mu$ s    |                |
| Peak Wavelength                  | $\lambda_{peak}$ | 640     | 660     | 670           | nm         |                |
| Spectral Bandwidth (FWHM)        | $\Delta\lambda$  | 18      | 24      | 27            | nm         |                |
| Average Output Power             | $P_{50}$         | -8.5    | -5.5    | -1.5          | dBm        |                |
| Optical Rise Time (20 % - 80 %)  | $T_R$            | 0.50    | 1.30    | 2.50          | ns         |                |
| Optical Fall Time (80 % - 20 %)  | $T_F$            | 0.40    | 0.50    | 0.60          | ns         |                |
| Optical Modulation Amplitude     | OMA              | 160     | 590     | 1250          | $\mu$ W    |                |
| Open Eye Width                   | $T_{eye}$        | 6.5     | 7.4     | 7.9           | ns         |                |

**Table 7**  
**RECEIVER ELECTRICAL AND OPTICAL CHARACTERISTICS**

*Notes:*

1. All tests were performed using an OptoLock connector for 2.2mm jacket coupled to 1mm core 0.5NA POF.
2. Test data was obtained at the upper data rate limit of 100 Mbps using a PRBS7 (encoded, 125MBd) test pattern.
3. Test data was validated at 125 Mbps over the temperature range -20 °C to +70 °C and over the supply voltage range 2.97 V to 3.63V.

| Parameter  | Symbol              | Min   | Typical | Max   | Unit | Test Condition |
|--|---------------------|-------|---------|-------|------|----------------|
| Supply Voltage   | V <sub>CC</sub>     | 3.0   | 3.3     | 3.6   | V    |                |
| Current Consumption  | I <sub>CC</sub>     | 35    | 43      | 50    | mA   |                |
| Data Rate  |                     | 10    | 100     | 125   | Mbps | [3]            |
| Output Differential Impedance                                  | R <sub>DIFF</sub>   |       | 100     |       | Ω    |                |
| Output Common-Mode Voltage                                     | V <sub>OB</sub>     |       | 1.2     |       | V    |                |
| Output Differential Voltage Swing                              | V <sub>OD</sub>     | 800   | 1150    | 1400  | mV   |                |
| Optical Rise Time (10% - 90%)                                  | T <sub>R</sub>      | 2     | 1.6     | 3     | ns   | 10 % - 90 %    |
| Optical Fall Time (90% - 10%)                                  | T <sub>F</sub>      | 2     | 1.6     | 3     | ns   | 90 % - 10 %    |
| Average Input Sensitivity                                      | P <sub>in</sub>     |       |         | -24   | dBm  |                |
| Optical Overload   |                     |       |         | 0     | dBm  |                |
| Signal Detect Assert/De-assert Time                            | T <sub>SD</sub>     | 0.1   | 0.25    | 0.6   | μs   |                |
| Signal Detect Optical Assert Level                             | p <sub>SD-AS</sub>  | -32.0 | -27.5   | -24.0 | dBm  |                |
| Signal Detect Optical De-assert Level                          | P <sub>SD-DAS</sub> | -32.0 | -28.5   | -25.0 | dBm  |                |
| Signal Detect Voltage High (V <sub>OH</sub> -V <sub>CC</sub> ) | V <sub>SDH</sub>    | 2.4   | 3.0     | 3.6   | V    |                |
| Signal Detect Voltage Low (V <sub>OL</sub> -V <sub>CC</sub> )  | V <sub>SDL</sub>    | 0.0   | 0.05    | 0.10  | V    |                |
| Open Eye Width   | EW                  | 6.5   | 7.4     | 7.9   | ns   |                |

## MECHANICAL DATA

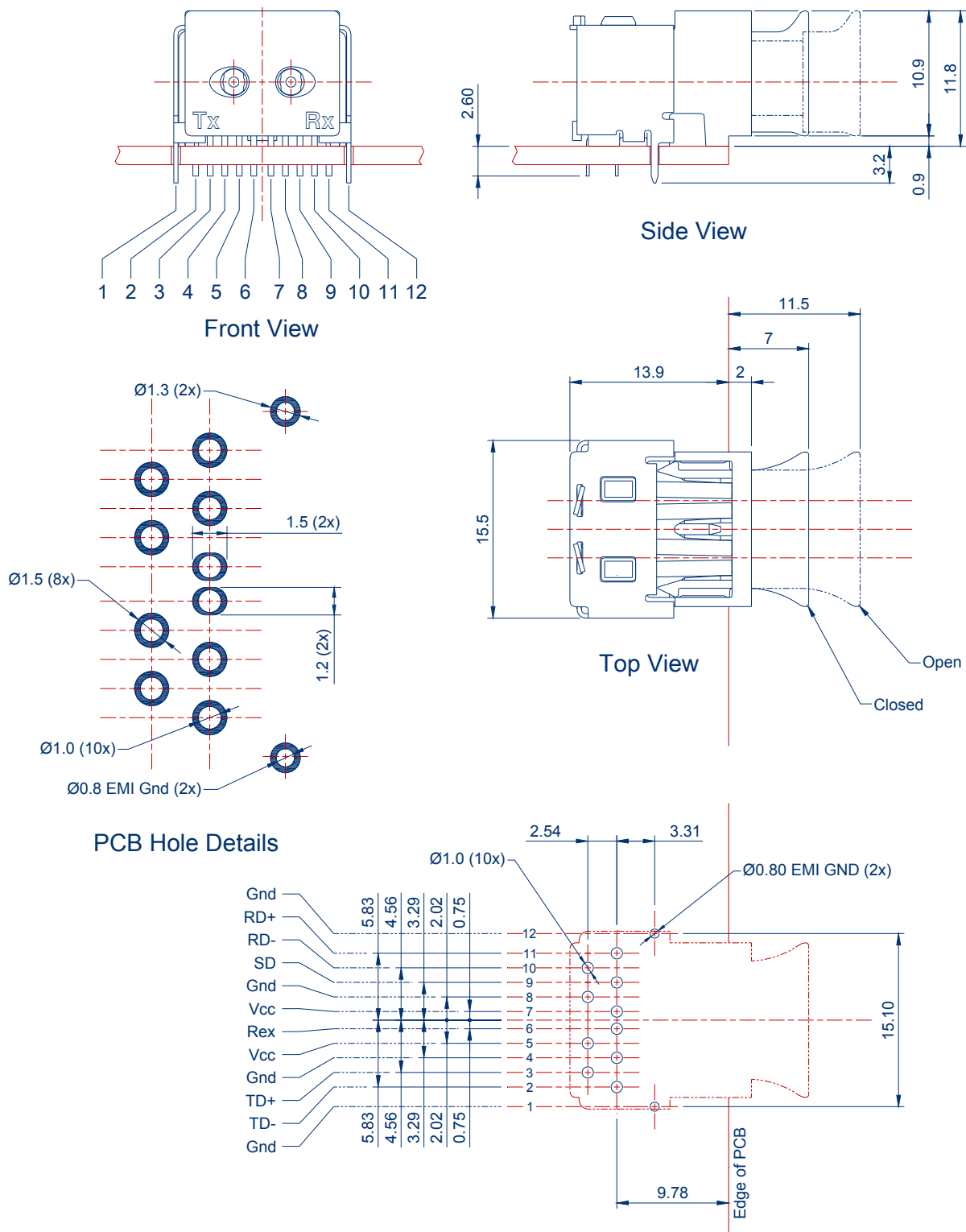


FIGURE 4

Mechanical dimensions of the product, and PCB footprint, which is a top view

General dimensional tolerance is  $\pm 0.2$  mm

NOTE: For PCB layout extra care is required with pin 6 and pin 7. On the PCB top and bottom metal they require a non-circular pad. The VIA's are standard plated circular through holes, however, the VIA top and bottom solder pad areas are non-circular 1.2 mm wide and 1.5 mm long oval shapes.

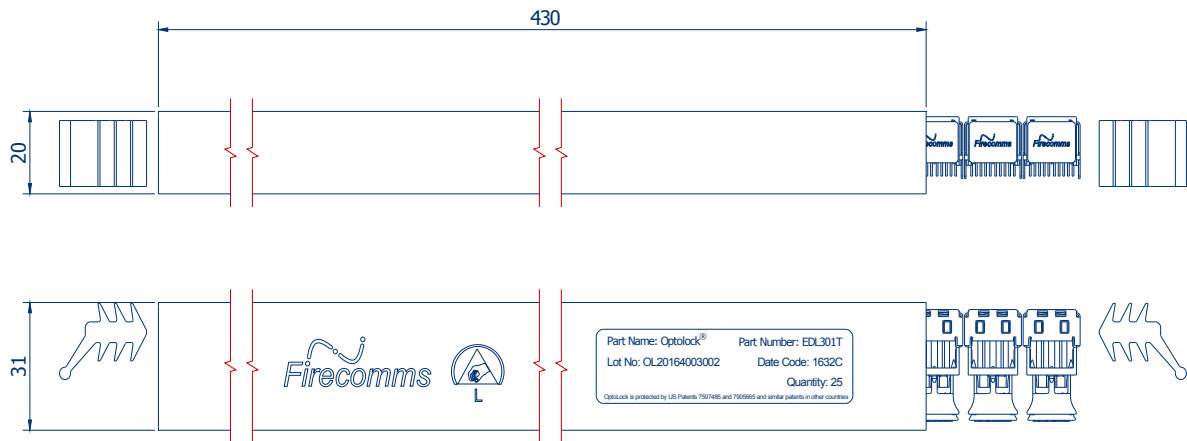


FIGURE 5  
Packing tube for Firecomms EDL301T OptoLock® Transceivers

## PART HANDLING

These transceivers 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 components 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 connector.

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

|  |         |
|--|---------|
| Components per Tube                    | 25      |
| Tube Length                            | 430 mm  |
| Tube Height                            | 20 mm   |
| Tube Depth                             | 31 mm   |
| Tubes per Moisture Barrier Bag         | 10      |
| Moisture Barrier Bags per Inner Carton | 1       |
| Inner Carton Length                    | 588 mm  |
| Inner Carton Width                     | 147 mm  |
| Inner Carton Height                    | 84 mm   |
| Weight per Inner Carton, Complete      | 1.80 kg |
| Components per Inner Carton            | 250     |
| Inner Cartons per Outer Carton         | 4       |
| Outer Carton Length                    | 600 mm  |
| Outer Carton Width                     | 310 mm  |
| Outer Carton Height                    | 195 mm  |
| Weight per Outer Carton, Complete      | 7.53 kg |
| Components per Outer Carton            | 1,000   |

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