

# NOT RECOMMENDED FOR NEW DESIGNS

\* For new designs please see part numbers: FB2M5KVR (2.2 mm POF), FB2M5BVR (1.5 mm POF)

## EDL300T

### 125 Mbps Fiber Optic OptoLock® Transceiver Data Sheet



#### DESCRIPTION

Firecomms Ethernet OptoLock® transceiver combines a pair of Firecomms Fast Ethernet fiber optic components within a miniature housing to provide instant termination for bare Plastic Optical Fiber (POF). This POF port significantly quickens and simplifies the connection of devices in communications and infotainment networks.

The design of OptoLock enables the fiber to be cut and terminated to the exact required length on site, allowing even the most novice consumer to quickly and easily terminate the bare optical fiber.

OptoLock is a RCLED-based 650 nm fiber optic solution designed to provide a Fast Ethernet communication link over POF. Firecomms' unique RCLEDs provide high levels of light coupling into the fiber, with short rise and fall times, enabling Ethernet-compliant signaling over large core POF. The simple termination system in the transceiver and the flexibility of POF reduces installation costs to a minimum.

The electrical inputs and outputs are compatible with low-voltage differential signaling levels for simple integration with Ethernet PHY chips.

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 Description	Part Number
OptoLock® Ethernet Transceiver for 2.2mm POF, Black	EDL300T-220
OptoLock® Ethernet Transceiver for 2.2mm POF, White	EDL300T-229
OptoLock® Ethernet Transceiver for 1.5mm POF, Black	EDL300T-150
OptoLock® Ethernet Transceiver for 1.5mm POF, White	EDL300T-159



#### FEATURES

- Simple low-cost termination solution for bare POF
- Versions available for 1.5mm or 2.2mm POF
- Compatible with IEEE 802.3u Fast Ethernet data communications standard
- Logic interface compatible with both LVDS (Low-Voltage Differential Signaling) and CML (Current-Mode Logic)
- Integrated CMOS LED driver IC
- Mechanically and electrically interchangeable with Firecomms-enabled SMI connectors
- High-speed Resonant Cavity LED at red 650 nm with small emission aperture suitable for POF
- Integrated high-sensitivity receiver IC and pin-diode for one-step light-to-digital conversion
- Integrated optics to efficiently focus and direct light
- Optimized for high-speed Fast Ethernet
- RoHS compliant

#### APPLICATIONS

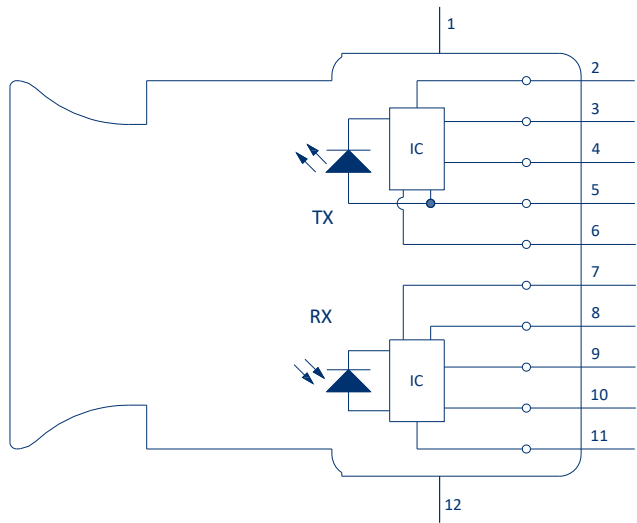
Application	Industrial and Robotic Links
Standard	LVDS Bus
Distance	50 meters Step Index POF <sup>[1]</sup>
Speed	250 Mbps

Note: 1. Depending on the installation conditions

## SPECIFICATIONS

**Table 3**  
**TRANSCEIVER PIN DESCRIPTION**

Pin	Name	Symbol
<b>Transmitter</b>		
1	EMI Shield <sup>[1]</sup>	GND
2	Signal Input (Negative)	TD-
3	Signal Input (Positive)	TD+
4	Ground Pin <sup>[1]</sup>	GND
5	DC Power Input Pin 3.3 V	Vcc
6	Ground Pin <sup>[1]</sup>	GND
<b>Receiver</b>		
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

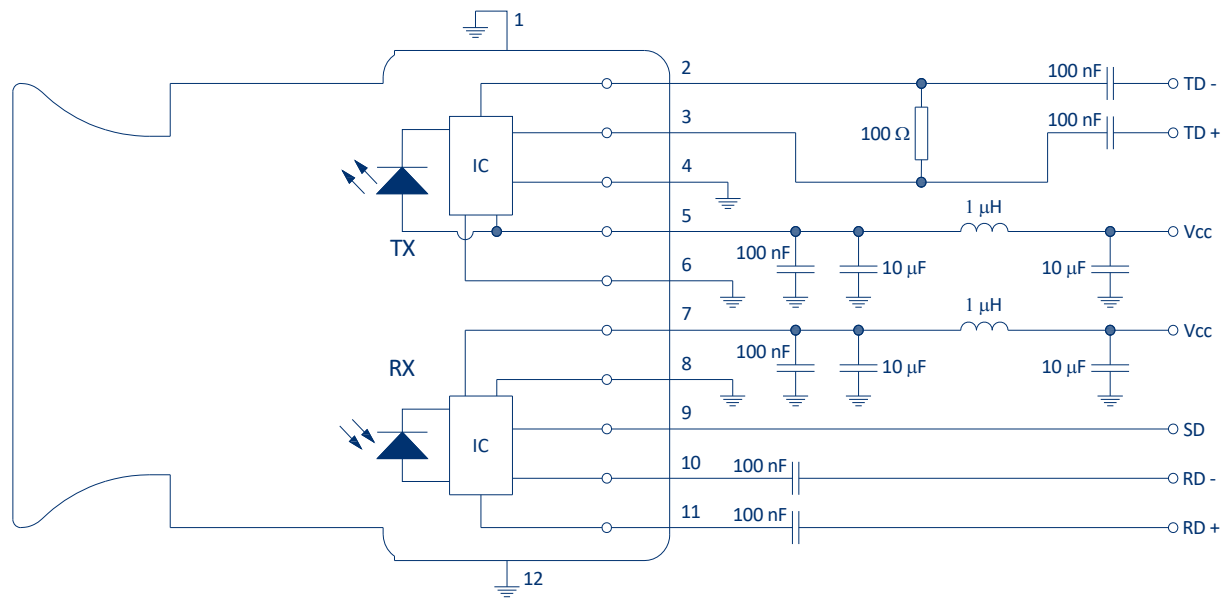


FIGURE 2  
Recommended application circuit schematic to AC couple to a PHY

**Notes:**

1. The transmitter (TX) and receiver (RX) are electrically shielded from each other to prevent crosstalk. To be effective this shield must be grounded
2. Both GND pins of the TX FOT must be connected to GND (they are not connected internally).
3. Power line capacitors should be located as close as possible to the FOT's DC power PINS.
4. The data lines are impedance-matched differential pairs. The PCB layout for these tracks must comply to IEEE standards for high-speed data and impedance matching.
5. Note: The RD + and RD – are already terminated with a 100 Ω resistor internally at the output stage.

## ELECTRONIC BLOCK DIAGRAM

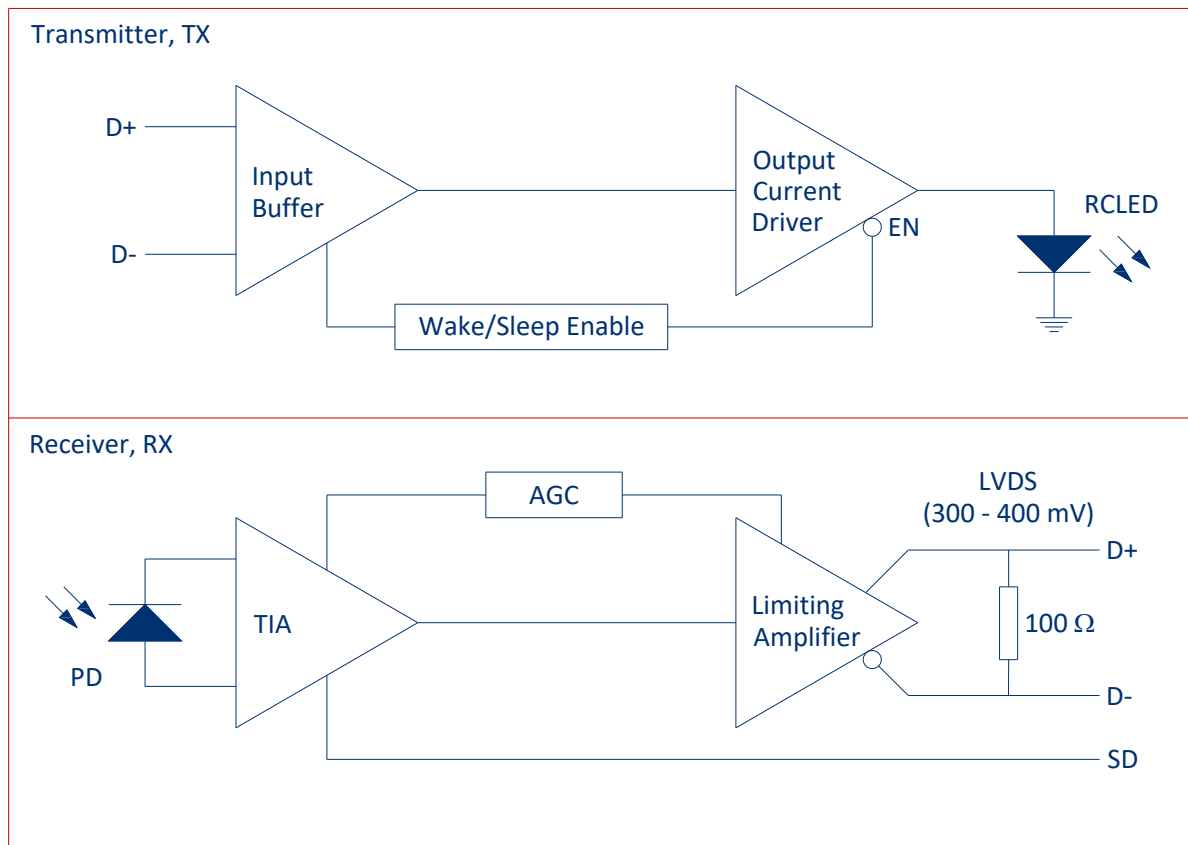


FIGURE 3  
Electronic block diagrams of the TX and RX fiber optic transceivers

## 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	$T_{stg}$	-40	+85	°C
Operating Temperature	$T_{op}$	-20	+70	°C
Soldering Temperature <sup>[1]</sup>	$T_{slid}$		+260 <sup>[1]</sup>	°C
Supply Voltage	$V_R$	-0.5	4.5	V

## SPECIFICATIONS

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

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
DC Supply Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	
Operating Current Consumption	I <sub>CC</sub>		37	52	mA	
Sleep State Current Consumption	I <sub>Sleep</sub>		20	40	μA	< 30 dBm of Light
Data Rate	Baud Rate	10		125	Mbps	
Data Input Capacitance	C <sub>IN</sub>			5	pF	
Data Input Resistance (Single-Ended)	R <sub>IN</sub>		5		kΩ	
Input Common-Mode Range	V <sub>IN-BIAS</sub>	GND+0.8		V <sub>CC</sub> -0.8	V	
Input Voltage Swing	V <sub>IN-SWING</sub>	100		1200	mV	
Minimum Differential Voltage Swing to Ensure Wake-Up	Wake-up Input	50			mV	
Wake-Up Time Delay			5	80	μs	
Optical Power OFF Delay		0.02		20	μs	
Optical Power ON Delay	TPU			5	μs	
Peak Wavelength (T <sub>A</sub> = -20 to +70°C)	λ <sub>peak</sub>	640	660	670	nm	
Spectral Bandwidth (FWHM)	Δλ		23	30	nm	
Average Output Power Coupled into Plastic Fiber at T <sub>A</sub> = -20 to +70°C and 125 Mbps Data Rate	P	-8.5		-2.0	dBm	[3]
Rise Time (20 % - 80 %)	t <sub>R</sub>		1.5	2.0	ns	
Optical Fall Time (80 % - 20 %)	t <sub>F</sub>	0.3	2	3.0	ns	
Extinction Ratio	R <sub>E</sub>	10.0			dB	
Maximum Systematic Jitter at 125 Mbps Coupled into Fiber (Measured after a minimum of 50 cm of POF with 0.3NA)				0.855	ns	
Maximum Random Jitter at 125 Mbps Coupled into Fiber (Measured after a minimum of 50 cm of POF with 0.3NA)				0.855	ns	

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

*Test Conditions:*

1. Test data was validated over the full temperature range of -20 °C to +70 °C, and over the supply range of 3 V to 3.6 V
2. Test data represents operation at the maximum data rate of 100 Mbps using a PRBS7 test pattern (8B/10B encoding, 125 MBd) unless otherwise stated
3. Optical power was coupled from a minimum 0.5 m length of 1 mm diameter core and 0.5 NA step index POF

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
DC Supply Voltage	V <sub>CC</sub>	3.0	3.3	3.6	V	
Current Consumption	I <sub>CC</sub>			45	mA	
Output Impedance Between D and <u>D</u>			100		Ohm	
Offset Common Mode Voltage	V <sub>ocm</sub>		1.2		V	
Output Differential Voltage Swing		500		600	mV	
SD (Signal Detect) Assert/Deassert Time		0.5	5	100	μs	
Receivable Optical Power Sensitivity (SD on)		-24	-26	-28	dBm	
Maximum Allowed Optical Power				-2	dBm	
Rise/Fall Time (10%-90%)				2	ns	

### MECHANICAL DATA

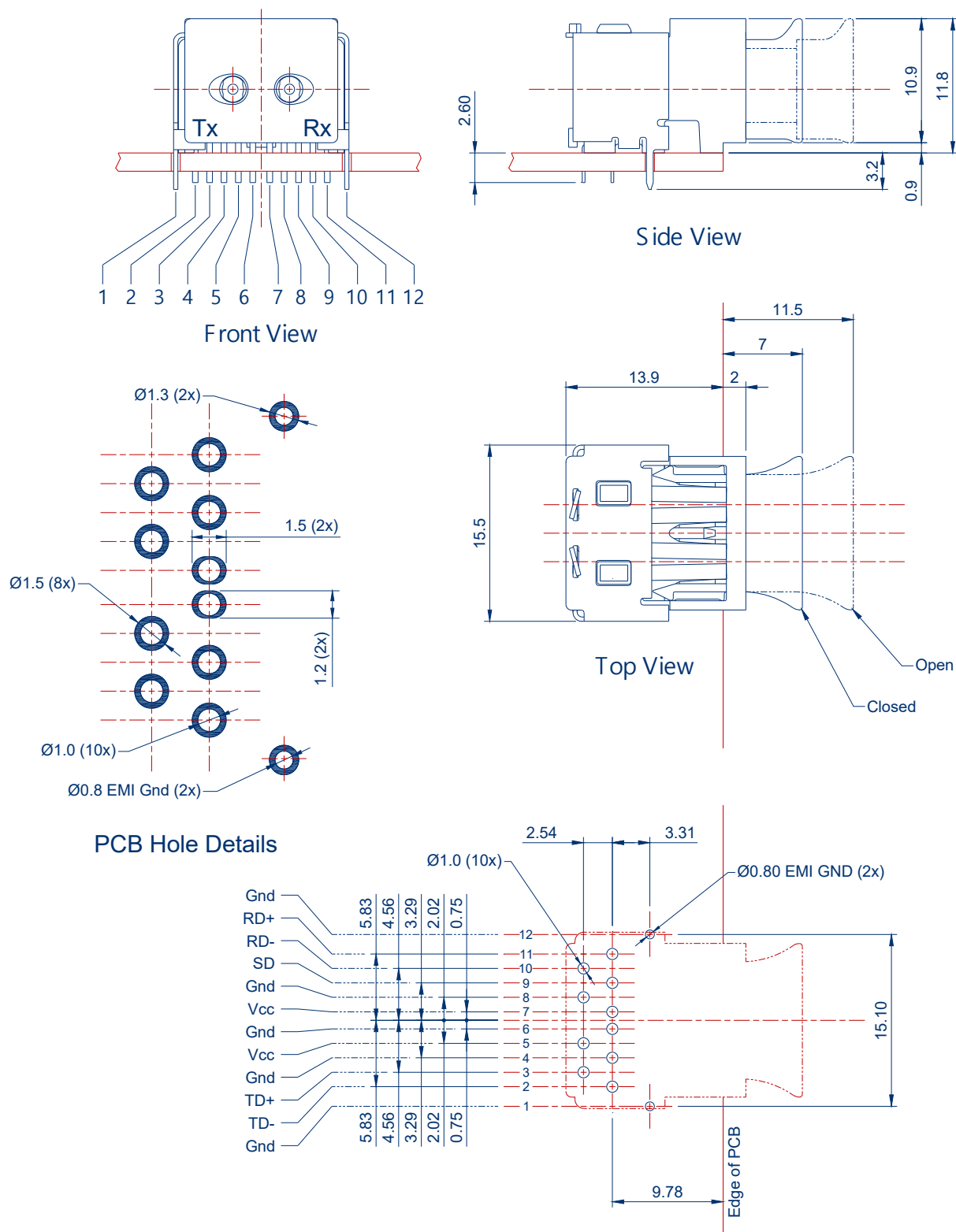


FIGURE 4

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.

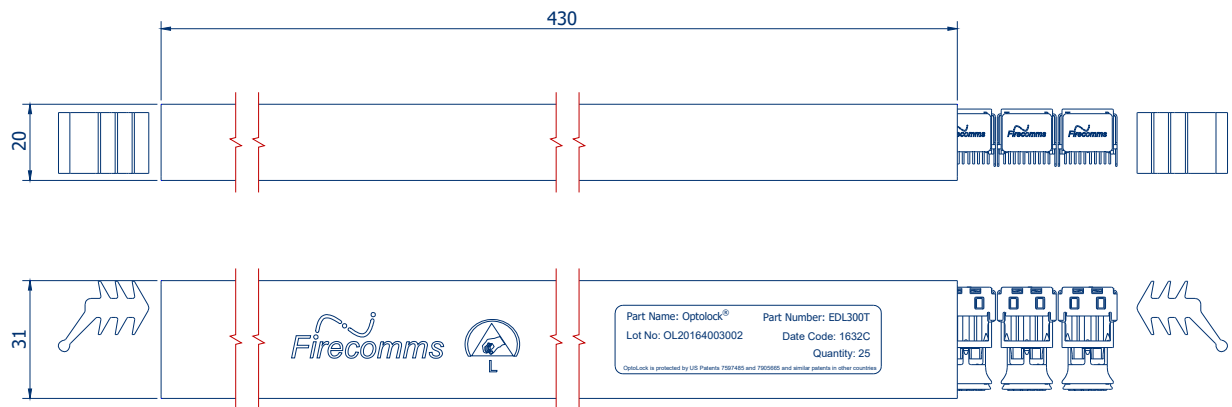


FIGURE 5  
Packing tube for Firecomms EDL300T OptoLock® Transceivers

## PART HANDLING

The 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 Width	31 mm
Tube Height	20 mm
Tubes per Bag	10
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	7.52 kg
Components per Outer Carton	1000

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