

FB2M5LVR

250 Mbps Fiber Optic LC Transceiver



Data Sheet

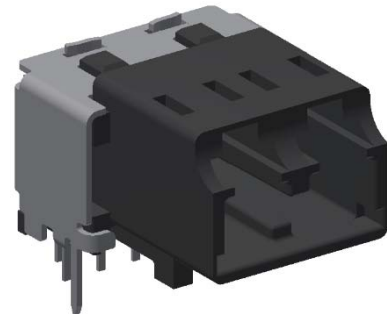


DESCRIPTION

Firecomms industrial LC connector has a small form factor housing, compliant with IEC 61754-20, which includes a pair of transceiver components to provide instant termination for Plastic Optical Fiber (POF) terminated in LC plug assemblies. The LC system offers compact termination ideal for rack mounted applications.

The LC features a reassuring clear click when connected. This version of LC system carries a pair of high-speed Fiber Optic Transceivers (FOTs) designed to provide up to 250 Mbps data links over POF in industrial environments. The FOTs are compatible with low-voltage differential signalling (LVDS) for seamless integration into existing logic bus structures, and are ideal for use with an FPGA or ASIC.

The transceiver has an electrical power saving feature. In the transmitter, the driver IC goes into a sleep state and the RCLED is switched off if there is no data or toning on the input bus. Similarly, if there is no optical signal present, the RX IC will switch into a sleep mode with RX power consumption reduced to a value of 25 μ A or less.



FEATURES

- LC click lock mechanism for confident connections
- Compatible with 8B/10B encoding schemes: 250 Mbps is the NRZ symbol rate
- Resonant Cavity LED (RCLED) at red 650 nm with small emission aperture suitable for POF
- Integrated CMOS driver IC for RCLED
- High sensitivity CMOS receiver IC and PIN diode
- Integrated optics to efficiently focus and direct light
- Low power consumption with power saving features
- -20 °C to +85 °C operating range
- RoHS compliant

AVAILABLE OPTIONS

Table 1

ORDERING INFORMATION / PART NUMBERS

| | |
|---|----------|
| Industrial LC Transceiver, 2.2 mm POF, Black | FB2M5LVR |
|---|----------|

Table 2
APPLICATIONS

| | |
|-------------|---|
| Application | Industrial and Robotic Links |
| Standard | LVDS Bus |
| Distance | 50 meters Step Index POF ^[1] |
| Speed | 250 Mbps |

Note: 1. Depending on the installation conditions

SPECIFICATIONS

Table 3
TRANSCEIVER PIN DESCRIPTION

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

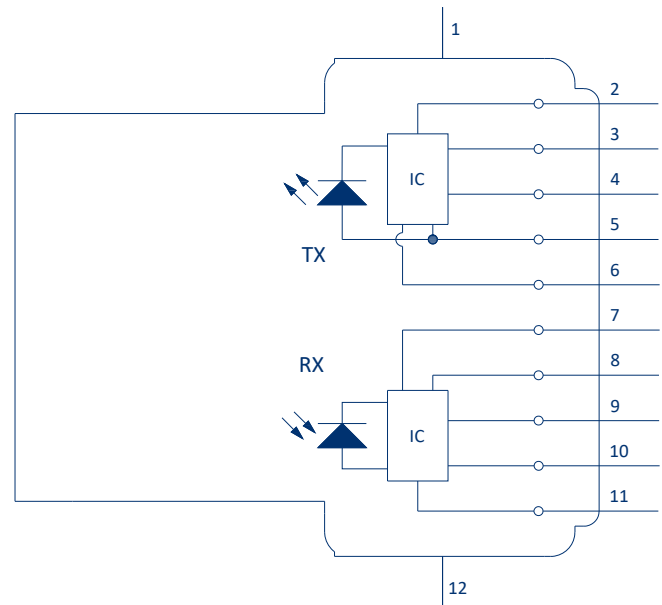


FIGURE 1
Transceiver pin-out, top view

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

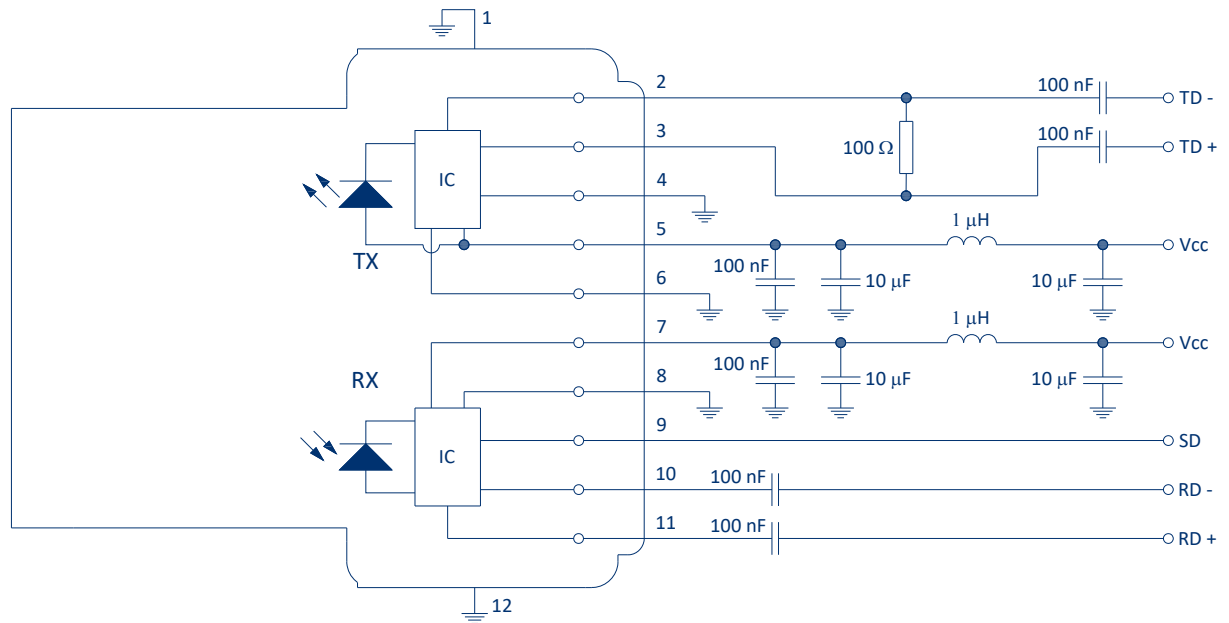


FIGURE 2
Recommended application circuit schematic to AC couple to a PHY.

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 – lines are already terminated with a 100 Ω resistor internally at the output stage

ELECTRONIC BLOCK DIAGRAM

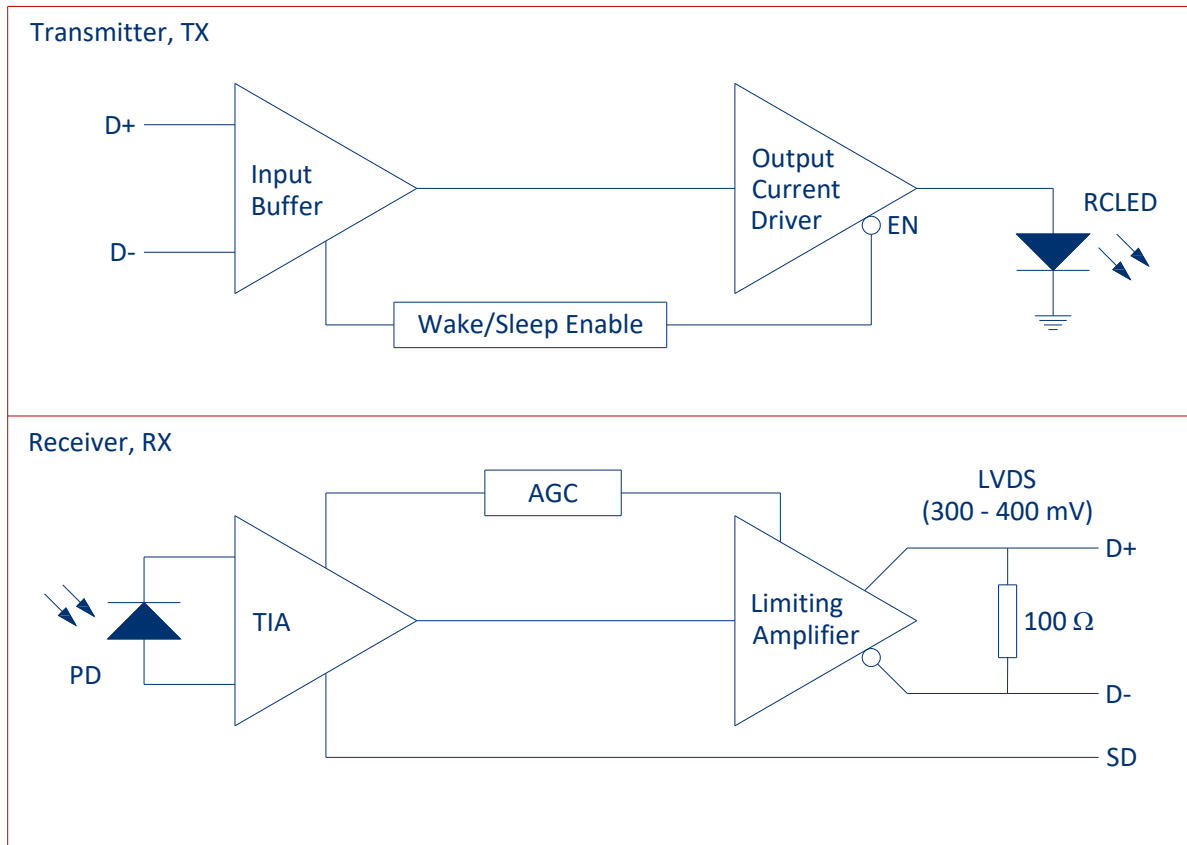


FIGURE 3
Electronic block diagrams of the TX and RX fiber optic transceivers

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 | +85 | °C |
| Soldering Temperature ^[1] | T_{sld} | | +260 ^[1] | °C |
| Supply Voltage | V_R | -0.5 | 4.5 | V |
| Receiver Optical Overload | P_{OL} | | 0 | dBm |

SPECIFICATIONS

Table 6
TRANSMITTER ELECTRICAL AND OPTICAL CHARACTERISTICS

| Parameter | Symbol | Min | Typical | Max | Unit | Test Condition |
|--|-----------------------|---------|---------|----------------------|------|-------------------|
| DC Supply Voltage | V _{CC} | 3.0 | 3.3 | 3.6 | V | |
| Operating Current Consumption | I _{CC} | | 37 | 52 | mA | |
| Sleep State Current Consumption | I _{Sleep} | | 20 | 40 | μA | < 30 dBm of light |
| Data Rate | Baud Rate | 10 | | 250 | Mbps | |
| Data Input Capacitance | C _{IN} | | | 5 | pF | |
| Data Input Resistance (Single-Ended) | R _{IN} | | 5 | | kΩ | |
| Input Common-Mode Range | V _{IN-BIAS} | GND+0.8 | | V _{CC} -0.8 | V | |
| Input Voltage Swing | V _{IN-SWING} | 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 | |
| Peak Wavelength | λ _{peak} | 640 | 660 | 670 | nm | |
| Spectral Bandwidth (FWHM) | Δλ | | 23 | 30 | nm | |
| Average Optical Power | P | -10 | | -2.0 | dBm | [3] |
| Rise Time (20 % - 80 %) | t _R | | 2.0 | 2.8 | ns | |
| Fall Time (80 % - 20 %) | t _F | 0.3 | | 0.6 | ns | |
| Optical Modulation Amplitude | OMA | 160 | 590 | 1250 | μW | |
| Total Jitter | | | | 1.6 | ns | |

Table 7
RECEIVER ELECTRICAL AND OPTICAL CHARACTERISTICS

Test Conditions:

1. Test data was validated over the full temperature range of -20 °C to +85 °C, and over the supply range of 3 V to 3.6 V
2. Test data represents operation at the maximum data rate of 200 Mbps using a PRBS7 test pattern (8B/10B encoding, 250 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 _{cc} | 3.0 | 3.3 | 3.6 | V | |
| Operating Current Consumption | I _{cc} | 34 | 36 | 40 | mA | |
| Sleep State Current Consumption | I _{sleep} | 2 | 20 | 25 | μA | |
| Output Impedance Between D and <u>D</u> | | | 100 | | Ohm | |
| Offset Common Mode Voltage | V _{ocm} | | 1.2 | | V | |
| Output Differential Voltage Swing | | 300 | 350 | 400 | mV | |
| Receivable Optical Power Sensitivity | | | | -22 | dBm | |
| Maximum Allowed Optical Power | | | | 0 | dBm | |
| Rise Time (10 % - 90 %) | | | 1.0 | 2.5 | ns | |
| Fall Time (90 % - 10 %) | | | 1.0 | 2.0 | ns | |
| Wake Up Time from Sleep State | | | 10 | 100 | μs | |

MECHANICAL DATA

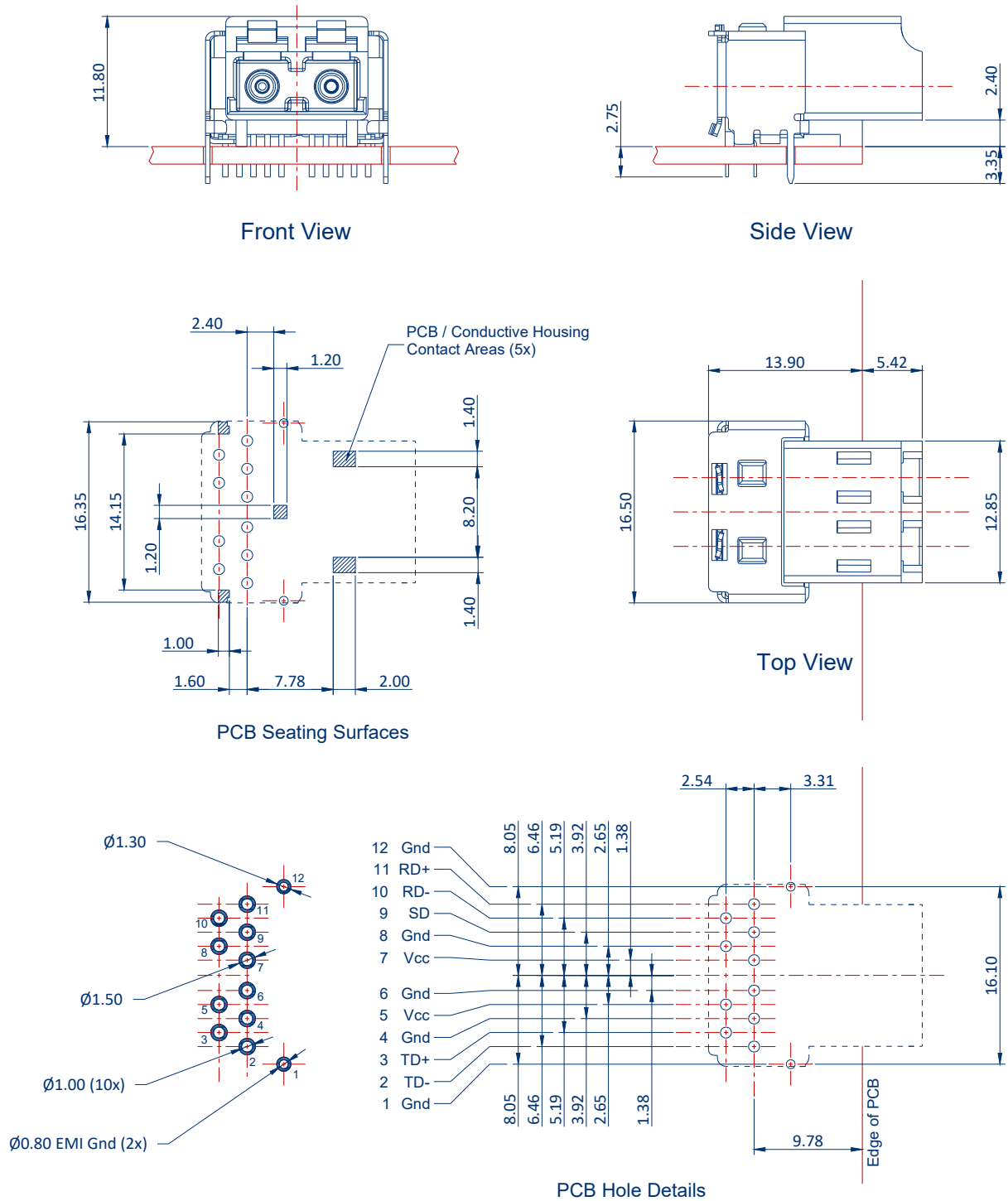


FIGURE 4
Mechanical dimensions of the product, and PCB footprint, which is a top view
General dimensional tolerance is ± 0.2 mm

Note: The plastic housing of the FB2M5LVR LC connector is made from an electrically conductive fibre-filled plastic material. Electrically conductive traces on the connector seating surface of the printed circuit board should not run underneath the connector housing. If it is necessary to run electrically conductive traces underneath the connector, their positions must not coincide with the PCB seating surfaces shown above.

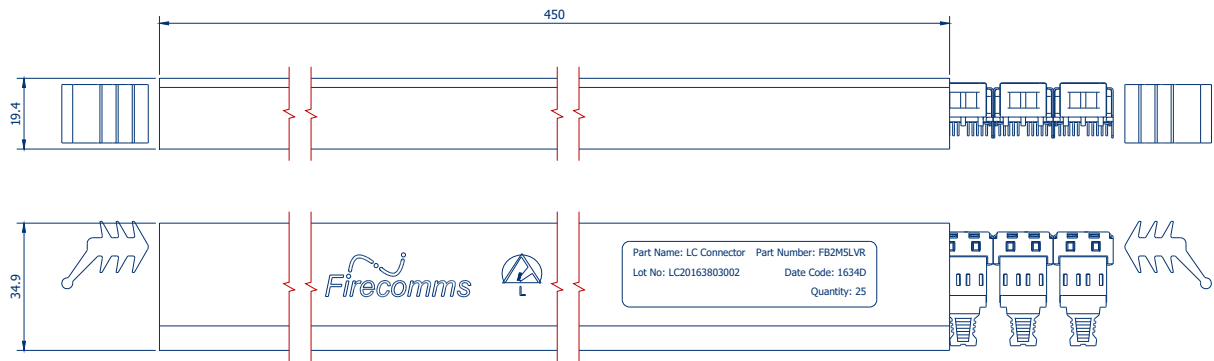


FIGURE 5
Packing tube for Firecomms FB2M5LVR Optical LC Transceivers

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 | 450 mm |
| Tube Width | 34.9 mm |
| Tube Height | 19.4 mm |
| Tubes per Bag | 10 |
| Bags per Inner Carton | 1 |
| Inner Carton Length | 588 mm |
| Inner Carton Width | 147 mm |
| Inner Carton Height | 82 mm |
| Weight per Inner Carton, Complete | 1.95 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 | 8.10 kg |
| Components per Outer Carton | 1,000 |

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