

# NOT RECOMMENDED FOR NEW DESIGNS

\* For new designs please see part numbers: FR01DHIR FR01DVIR

## FM01MHIR FM01MVIR DC-1 MBd RedLink® Fiber Optic Receiver Enhanced Temperature Range



### Data Sheet



#### DESCRIPTION

The Firecomms DC to 1 MBd High Temperature RedLink® receiver uses integrated light detection and amplification in a single piece of silicon giving enhanced immunity to EMI/EMC from the local environment making the unit ideal for use in electrically noisy applications. It operates over an extended industrial temperature range of -40 °C to +95 °C supporting many industrial applications where reliable command and control response is required in electrically harsh environments.

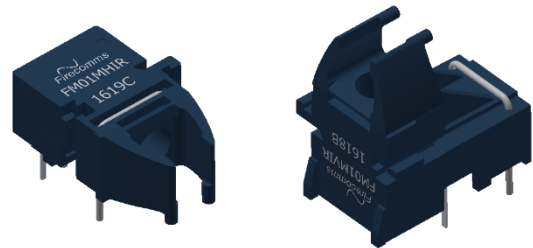
It is housed in a non-conducting blue plastic connector housing which is flame retardant (UL94V-0). The housings are compatible with the Versatile Link style fiber plug, and are ideal for use with both Plastic Optic Fiber (POF) and polymer clad silica (PCS) fiber. It is RoHS compliant.

The receiver has a single ended push-pull logic output compatible to TTL/CMOS.

NOTE: Applications switching 12V/15V should use p/n: FM20VHIR. Applications that require an Open-Collector with  $R_L$  pull up to 5V should use p/n: FM05MHCR.

#### AVAILABLE OPTIONS

Horizontal RedLink® 1 MBd High Temperature Receiver	FM01MHIR
Vertical RedLink® 1 MBd High Temperature Receiver	FM01MVIR



#### FEATURES

- Ideal for use with 1 mm POF and PCS
- Optimized for data transmission: DC- 1 MBd
- Industrial temperature range -40 °C to +95 °C
- RoHS compliant
- Flame retardant (UL 94 V-0) connector housings
- 5V TTL/CMOS compatible output for ease of design
- Low pulse width distortion
- Low current consumption
- High power supply noise rejection
- Compatible with Versatile Link cables and connectors
- Fully integrated photodiode

#### APPLICATIONS

Application	Motor Control, Voltage Isolation, Drives, Inverters, Gaming,
Standard	CAN Bus, Modbus, Profibus
Distance	50 meters Step Index (SI) 1 mm POF
Speed	DC to 1 MBd (NRZ)

## SPECIFICATIONS

**Table 3**  
**RECEIVER PIN DESCRIPTION**

Pin	Name	Symbol
1	Receiver Output	$V_o$
2	Receiver Ground	Gnd
3	Receiver Vcc	Vcc
4	Not Connected	N.C.
5	Retaining Pin	N.C.
8	Retaining Pin	N.C.

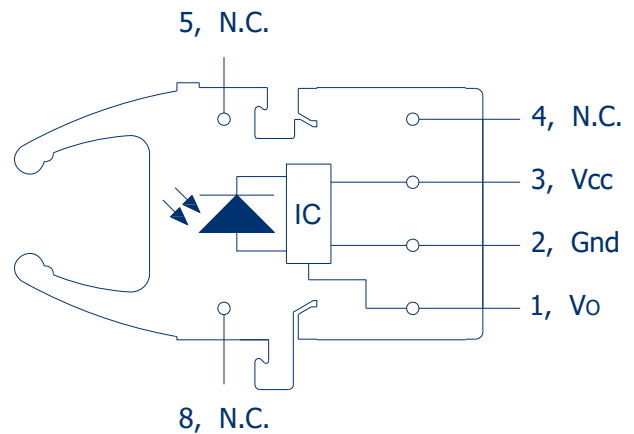


FIGURE 1  
Receiver pin-out, top view

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

Parameter	Symbol	Standard	Level
Electrostatic Discharge, Human Body Model (Contact ESD)	HBM	Mil-STD-883	Level 2 (4 kV)
Storage Compliance	MSL	J-STD-020E	2a (4-week floor life)
Restriction of Hazardous Substances Directive	RoHS	Directive 2011/65/EU	Certified compliant

## RECOMMENDED APPLICATION CIRCUIT

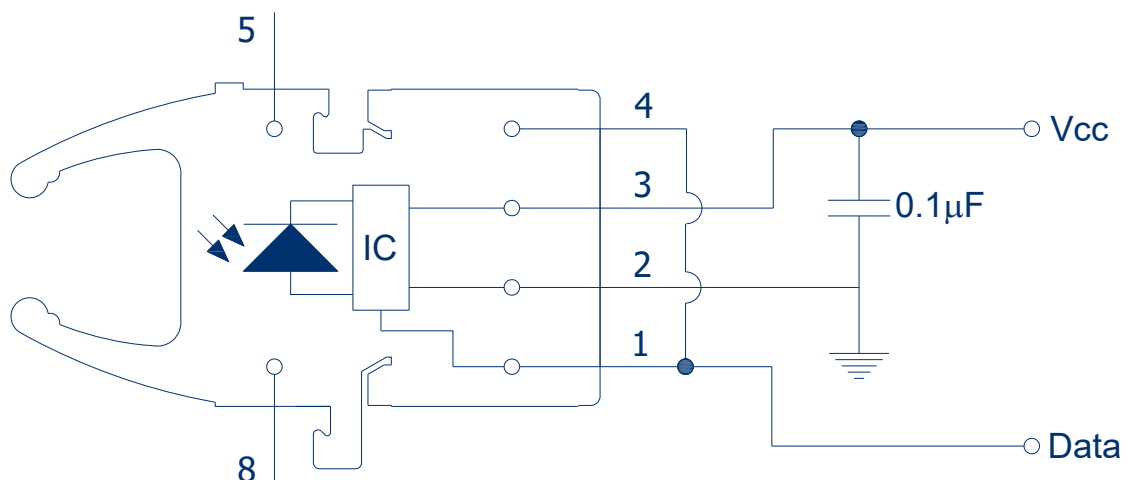


FIGURE 2  
RedLink® Receiver recommended application circuit.

## SPECIFICATIONS

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

These are the absolute maximum ratings at or beyond which the FOT can be expected to be damaged

Notes:

1. 260 °C for 10 seconds, one time only, at least 2.2 mm away from lead root.
2. This is the range of voltages that will not damage the part. It is not the operating range. The correct operating range is  $5V \pm 10\%$ .
3. This is the maximum load current that can be extracted from  $V_o$  or injected into  $V_o$  without causing damage to the IC

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	$T_{stg}$	-40	+95	°C
Operating Temperature	$T_{op}$	-40	+95	°C
Soldering Temperature <sup>[1]</sup>	$T_{slid}$		+260 <sup>[1]</sup>	°C
Non-destructive RX Supply Voltage Range <sup>[2]</sup>	Vcc	-0.5	+5.5	V
Non-destructive Output Load Current <sup>[3]</sup>	$I_{OAVG}$	-25	+25	mA

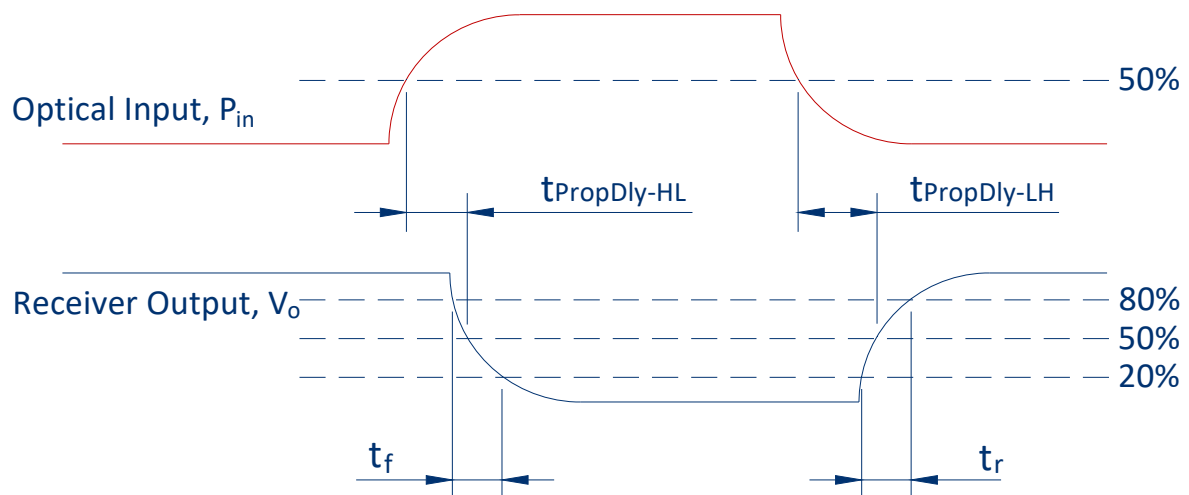


FIGURE 3  
Receiver Propagation Delay and rise/fall time definitions

This Receiver has an output stage that is a standard CMOS push-pull design. It is suitable for operation with standard 5 V and 3.3 V CMOS logic IC's. It is not an open collector stage. It is not compatible with voltages higher than 5.5 V.

If an open collector option is required to switch voltages in the range 5.5 to 3 V then please select part number FM05DHCR.

If an open collector option is required to switch for example 12 or 15 V (range: 3 to 20 V) please select for example part number FM20VHIR which has a MOSFET dedicated for this operation.

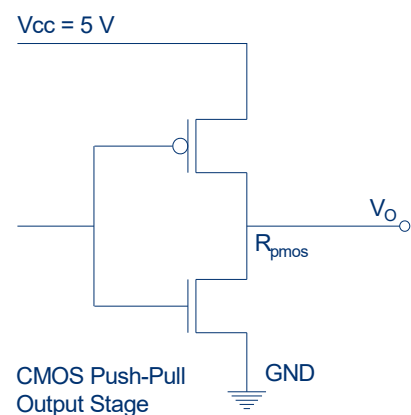


FIGURE 4  
Receiver CMOS Push-Pull output stage.

## SPECIFICATIONS

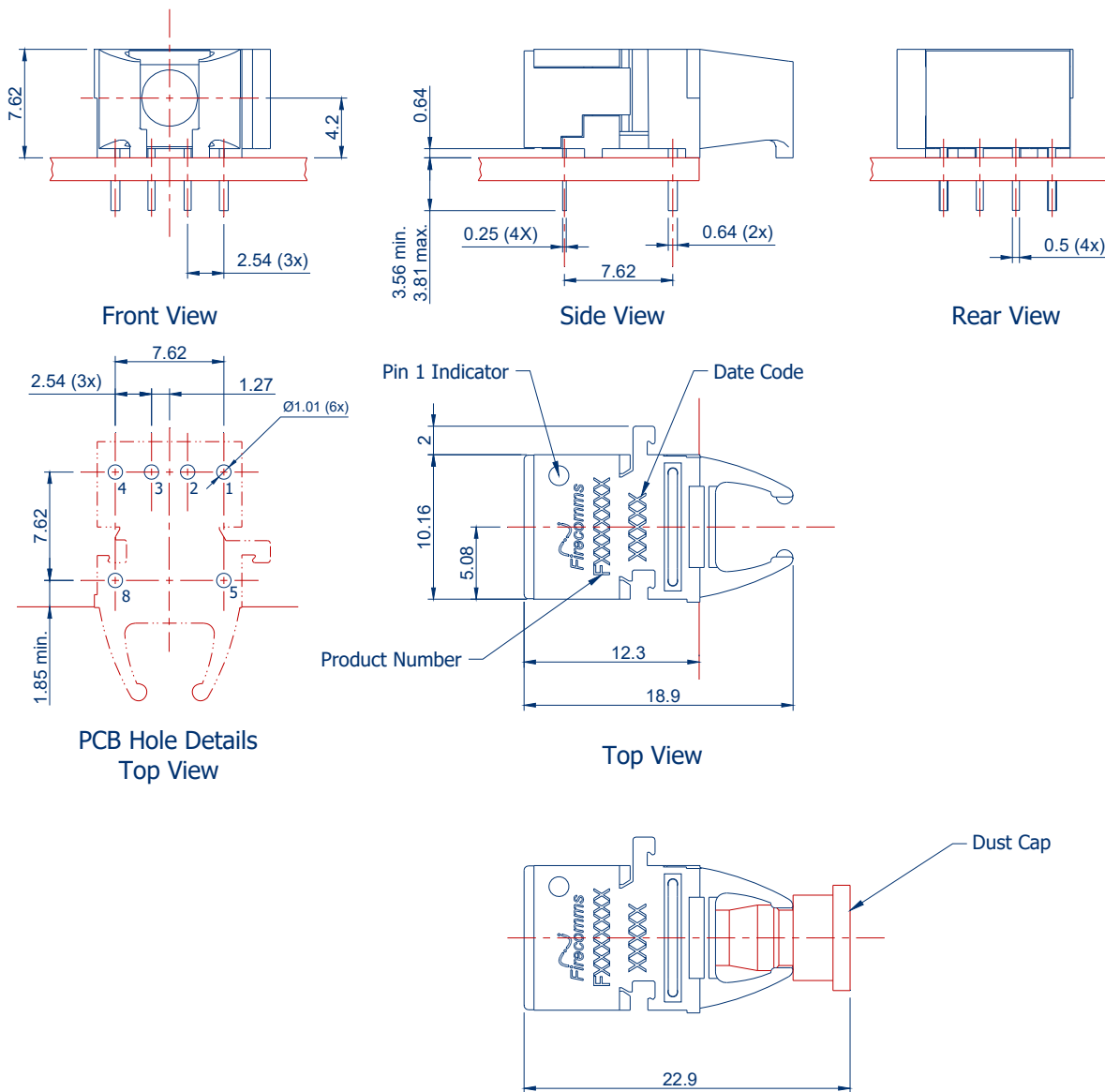
**Table 6**  
**RECEIVER ELECTRICAL AND OPTICAL CHARACTERISTICS**

*Test Conditions:*

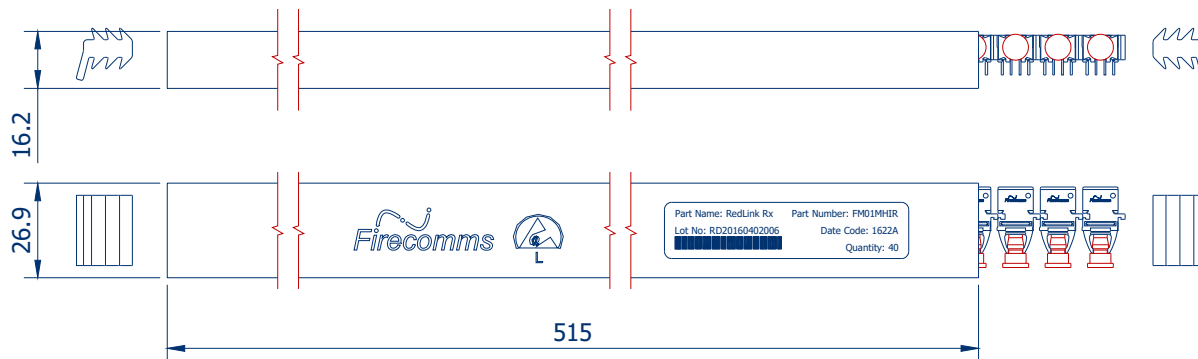
1. Test data was validated over the full temperature range of -40 °C to +95 °C, and over the full voltage range of 4.5 V to 5.5 V unless otherwise noted. Typical data are at +25 °C with  $V_{CC} = 5$  V.
2. Input power levels are for peak (not average) optical input levels. For 50 % duty cycle data, peak optical power is twice the average optical power
3. Pins 5 and 8 are for mounting and retaining purposes.
4. In the recommended receiver circuit, with an optical signal from the recommended transmitter circuit
5. Pin 4 is electrically isolated internally. Pin 4 may be externally connected to pin 1 for board layout compatibility in existing designs

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Input Optical Power Level for Logic "0"	$P_{RL}$	-22		-1	dBm	$V_{OL} \leq 0.4$ V $I_{OL} = 8$ mA [2,5]
Input Optical Power Level for Logic "1"	$P_{RH}$			-43	dBm	$V_{OH} \geq 4.45$ V $I_{OH} = -40$ $\mu$ A [2,5]
High Level Output Voltage	$V_{OH}$	4.45	4.99		V	$I_{OH} = -40$ $\mu$ A [4]
Low Level Output Voltage	$V_{OL}$		0.2	0.4	V	$I_{OL} = 8$ mA [4]
Supply Current	$I_{CC}$		13.7	17	mA	PR = -1 to -22 dBm [4]
Power Supply Noise Immunity	PSNI		0.4		$V_{pp}$	Sine Wave DC – 10 MHz @ 25 °C
Data Rate		DC		1	MBd	Min-UI = 1000 ns Max f = 0.5 MHz
Rise Time (20% - 80%)	$t_r$	4.0	11.0	20.0	ns	
Fall Time (80% - 20%)	$t_f$	2.0	5.0	10.0	ns	
1 <sup>st</sup> Pulse, Pulse Width Distortion	PWD-1 <sup>st</sup>	-27	-9	5	ns	
Pulse Width Distortion	PWD	-12	5	35	ns	$C_i = 10$ pF, Optical Power -1 to -22 dBm
1 <sup>st</sup> Pulse Propagation Delay (OPTO-ELEC)	$t_{PropDly\_1st}$	32	52	79	ns	
Propagation Delay Low-to-High (OPTO-ELEC, Data/CLK)	$t_{PropDly\_LH}$	23	44	67	ns	
Propagation Delay High-to Low (OPTO-ELEC, Data/CLK)	$t_{PropDly\_HL}$	20	49	86	ns	

### MECHANICAL DATA, HORIZONTAL

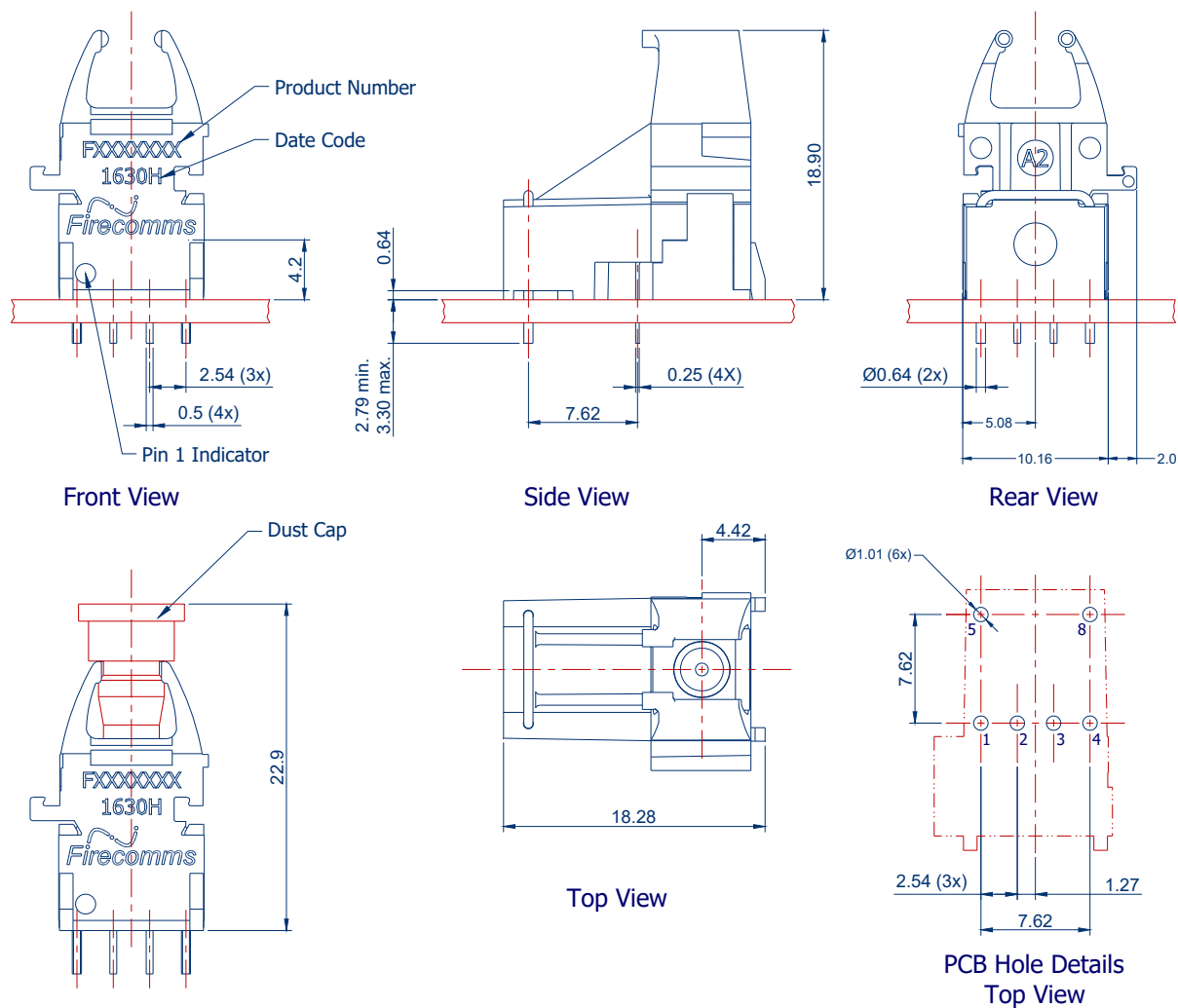


**FIGURE 5**  
Mechanical dimensions of the horizontal receivers and PCB footprint, which is a top view  
General dimensional tolerance is  $\pm 0.2$  mm

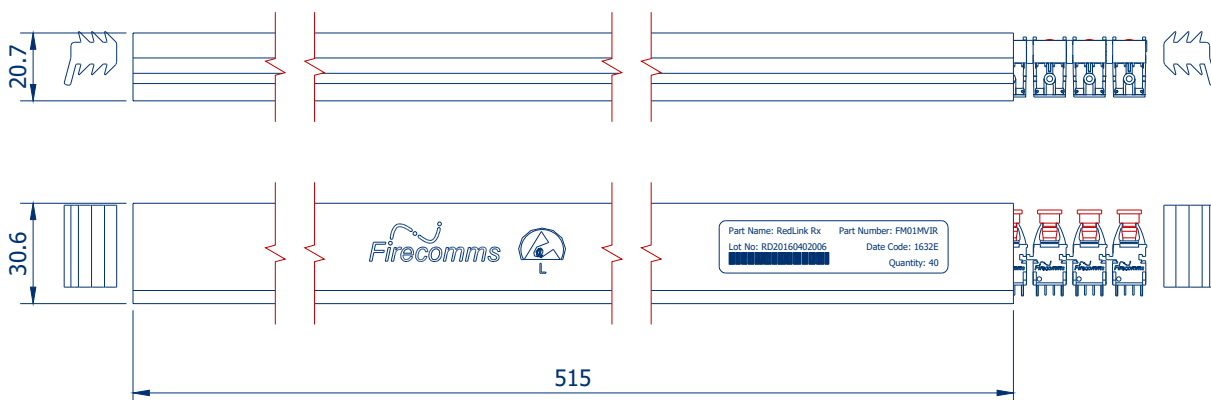


**FIGURE 6**  
Packing tube for Firecomms Horizontal RedLink® Receivers.

### MECHANICAL DATA, VERTICAL



**FIGURE 7**  
Mechanical dimensions of the vertical receivers and PCB footprint, which is a top view  
General dimensional tolerance is  $\pm 0.2$  mm



**FIGURE 8**  
Packing tube for Firecomms Vertical RedLink® Receivers.

## **PART HANDLING**

The Firecomms high voltage RedLink® receiver devices are color coded blue. 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 parts 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 component.

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.

**Table 7**  
**PACKING INFORMATION**

	<b>Horizontal</b>	<b>Vertical</b>
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	8.15 kg	9.61 kg
Components per Outer Carton	2,000	2,000

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