

# FM05DHCR FM05DVCR

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

## Preliminary Data Sheet



### DESCRIPTION

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

It is 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).

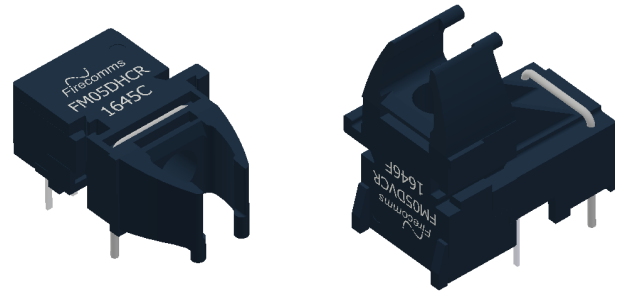
The receiver operates equally at both the standard 3.3 V and 5 V DC supply rail voltages. It operates over the industrial temperature range of -40 °C to +85 °C supporting many industrial applications where a reliable command and control response is required in electrically harsh environments.

The 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. The receiver has a single data output with an integrated 1kΩ pull-up resistor ( $R_L$ ) and active pull down compatible with standard TTL/LVTTL/CMOS

### AVAILABLE OPTIONS

Table 1  
ORDERING INFORMATION / PART NUMBERS

5 MBd Horizontal Package Inverting, TTL	FM05DHCR
5 MBd Vertical Package Inverting, TTL	FM05DVCR



### FEATURES

- Designed for use with Plastic Optic Fiber (POF)
- Optimized for data transmission from DC-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 and Vertical options available
- Low pulse width distortion
- Compatible with Versatile Link cables and connectors

### APPLICATIONS

Table 2  
APPLICATIONS

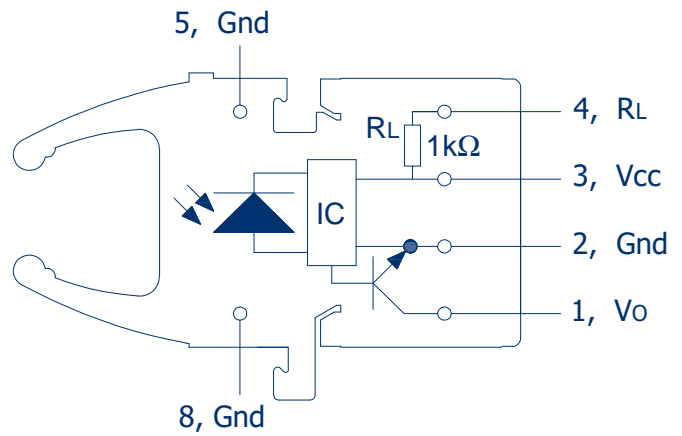
Application	Automation and Industrial Control. Serial Communications. Voltage Isolation.
Standard	Serial RS232, RS485, CAN-Bus, MODBUS
Distance	50 meters Step Index POF <sup>[1]</sup> 300 meters with 200 μm PCS fiber <sup>[1]</sup>
Speed	DC to 5 MBd

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	VCC
4	Open Collector	$R_L$
5	Retaining Pin	GND
8	Retaining Pin	GND

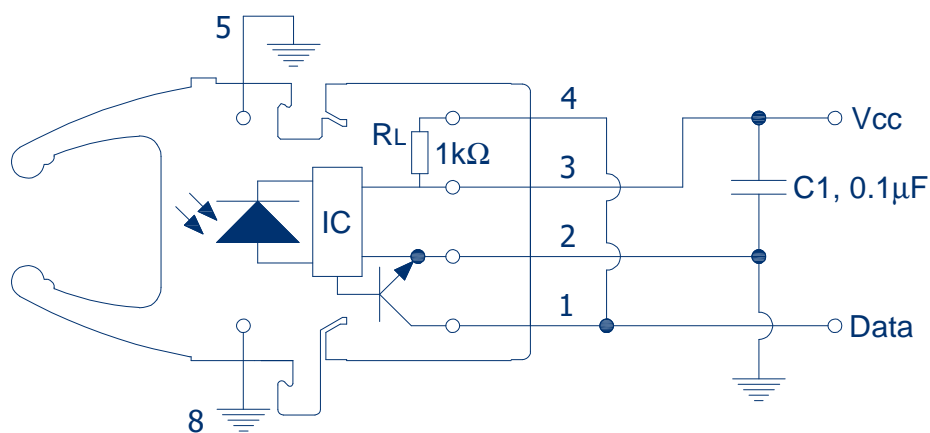


**FIGURE 1**  
Receiver pin-out, top view.

**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	Files No. (Pending)
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**  
Recommended receiver application circuit.

## SPECIFICATIONS

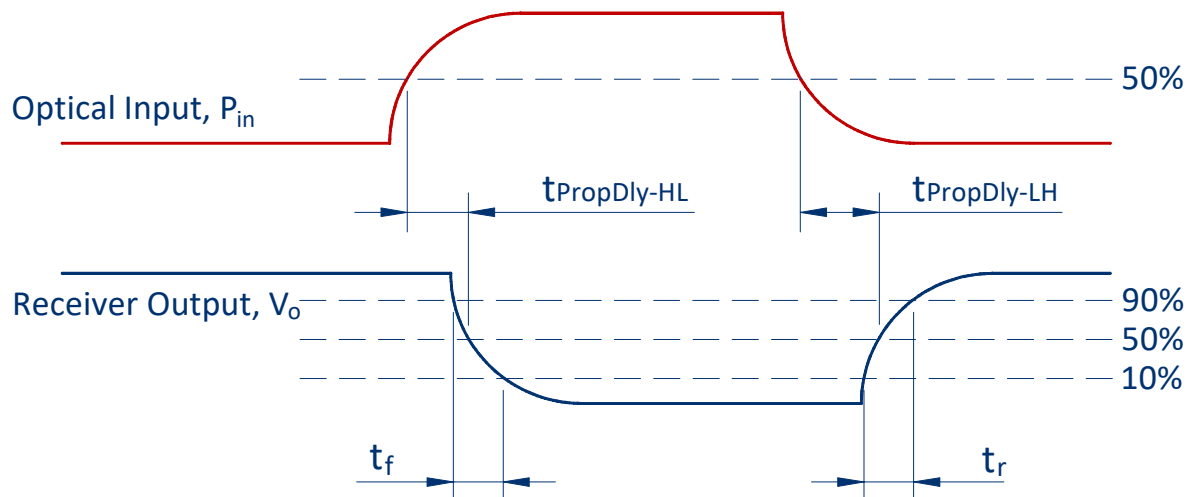
**Table 5**  
**ABSOLUTE MAXIMUM RATINGS**

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

*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	$T_{op}$	-40	+85	°C
Soldering Temperature <sup>[1]</sup>	$T_{sld}$		+260 <sup>[1]</sup>	°C
Supply Voltage	Vcc	-0.5	5.5	V
Output Voltage	$V_o$	-0.5	5.5	V
RX Output Current	$I_o$		+25	mA
Storage Compliance	MSL		2a	J-STD-020E



**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 VCC > 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 over the full temperature range of -40 °C to +85 °C, and 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<sub>H</sub> and P<sub>L</sub>. 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<sub>0</sub> connected to Pin 4, R<sub>L</sub> (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<sup>2</sup>-1 (PRBS7) data, resulting in a BER ≤ 10<sup>-9</sup>.*
6. *Pins 5 and 8 are used for mounting and retaining purposes. It is recommended that pins 5 and 8 be connected to ground.*

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Supply Current	I <sub>CC</sub>	11	13	16	mA	R <sub>L</sub> is open, [2,3,4]
Wake up Delay <sub>(power up)</sub>	t <sub>power-on</sub>		40		us	[1]
Voltage Supply	V <sub>CC</sub>	2.97	3.35	5.5	V	
High Level Output Current	I <sub>OH</sub>		0.01	1	uA	V <sub>o</sub> = V <sub>CC</sub> P <sub>R</sub> ≤ P <sub>RL</sub> , MIN
Low Level Output Voltage	V <sub>OL</sub>	0	0.2	0.4	V	I <sub>OL</sub> = 8 mA, P <sub>R</sub> ≥ P <sub>RL</sub> , MIN
POF Optical Power High	P <sub>H</sub>	-22		-2	dBm	[2,3], 1mm 0.5 NA POF
POF Optical Power Low	P <sub>L</sub>			-40	dBm	[2,3], 1mm 0.5 NA POF
PCS Optical Power High	P <sub>H</sub>	-24		-4	dBm	[2,3], 200 μm PCS
PCS Optical Power Low	P <sub>L</sub>			-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 <sub>L</sub>	850	1000	1700	Ω	
Output Rise Time (10%-90%)	t <sub>r</sub>	60	73	85	ns	
Output Fall Time (90%-10%)	t <sub>f</sub>	5	15	25	ns	
Pulse Width Distortion	PWD		20	35	ns	[2-5]
Propagation Delay	t <sub>PropDly-HL</sub>		45	65	ns	
	t <sub>PropDly-LH</sub>		30	45	ns	

## MECHANICAL DATA, HORIZONTAL

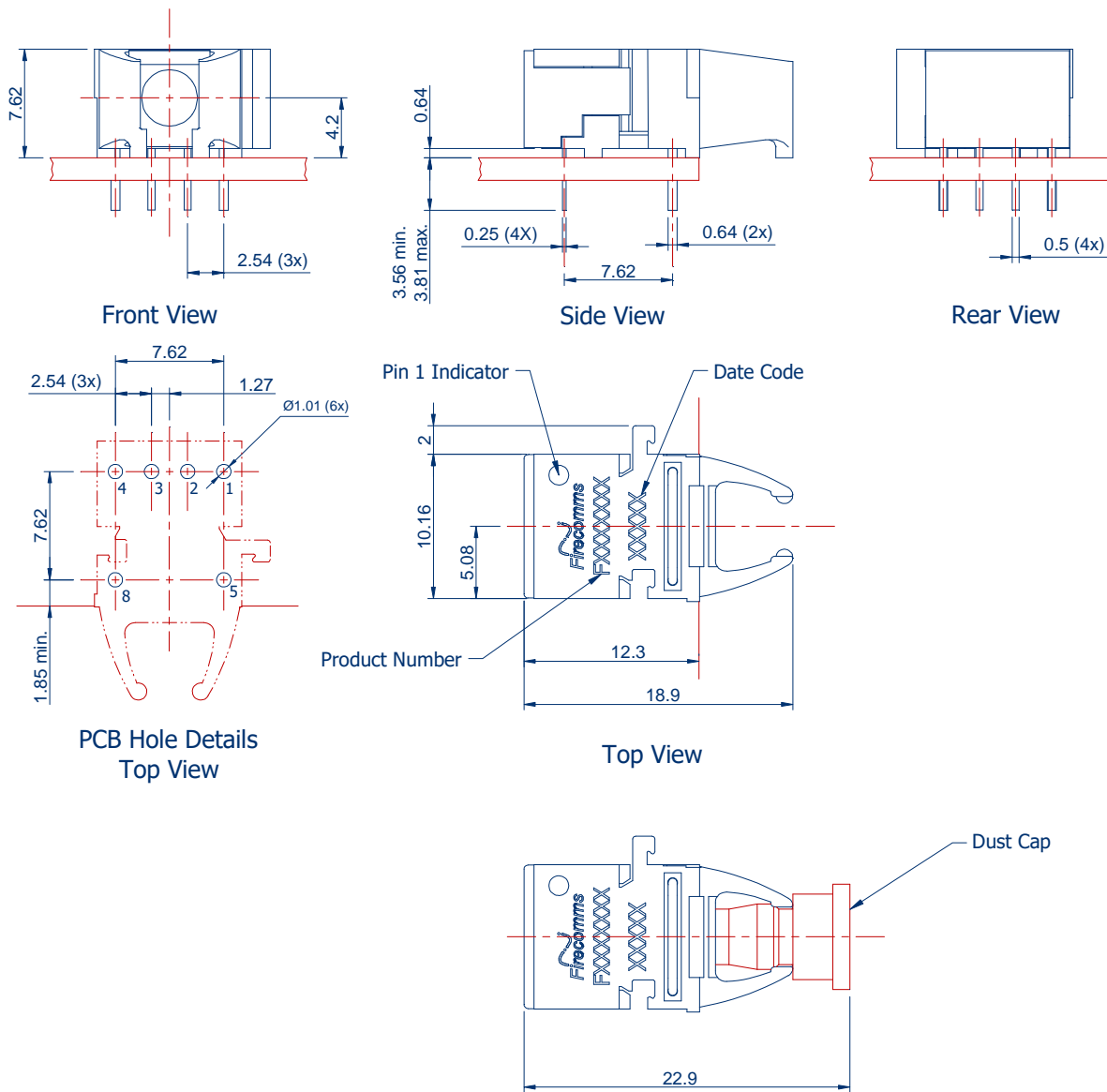


FIGURE 4  
Mechanical dimensions of the horizontal receivers and PCB footprint, which is a top view.  
General dimensional tolerance is  $\pm 0.2$  mm

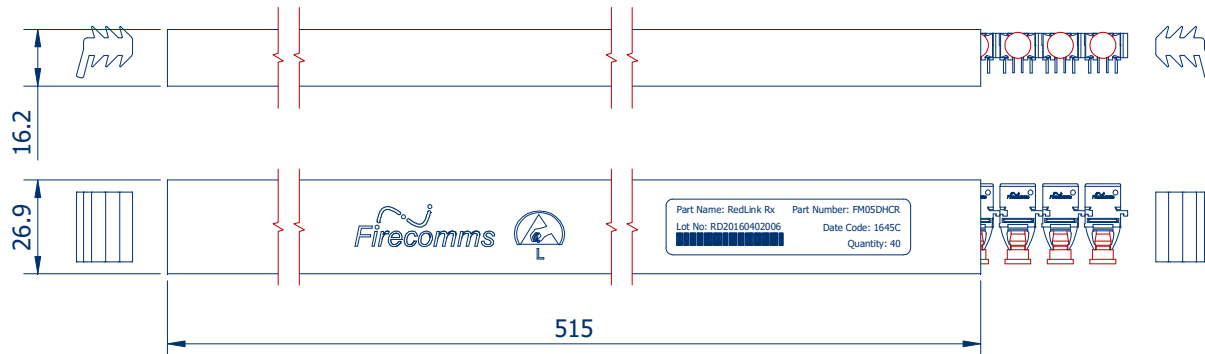


FIGURE 5  
Packing tube for Firecomms Horizontal RedLink® Receivers

## MECHANICAL DATA, VERTICAL

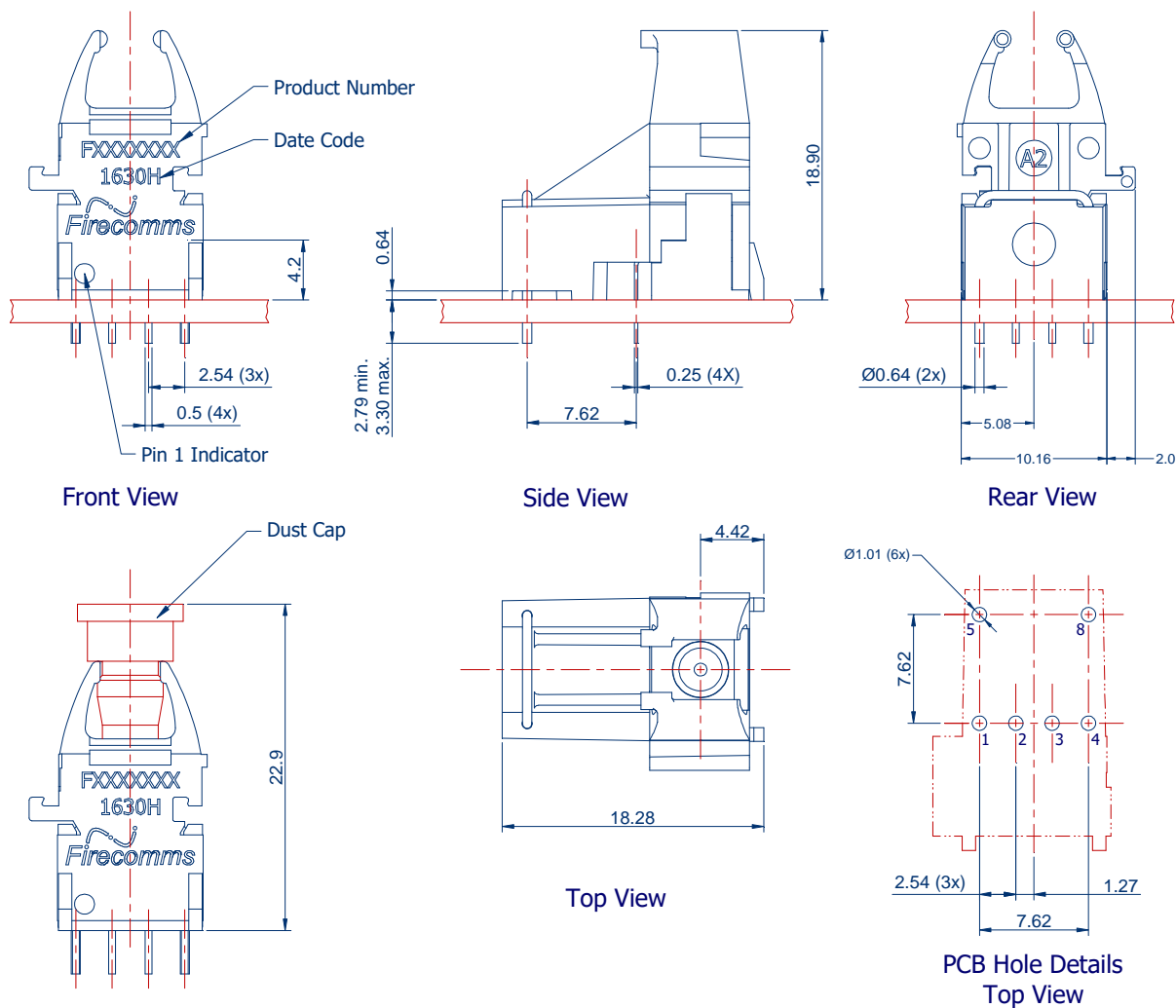


FIGURE 6  
Mechanical dimensions of the vertical receivers and PCB footprint, which is a top view.  
General dimensional tolerance is  $\pm 0.2$  mm

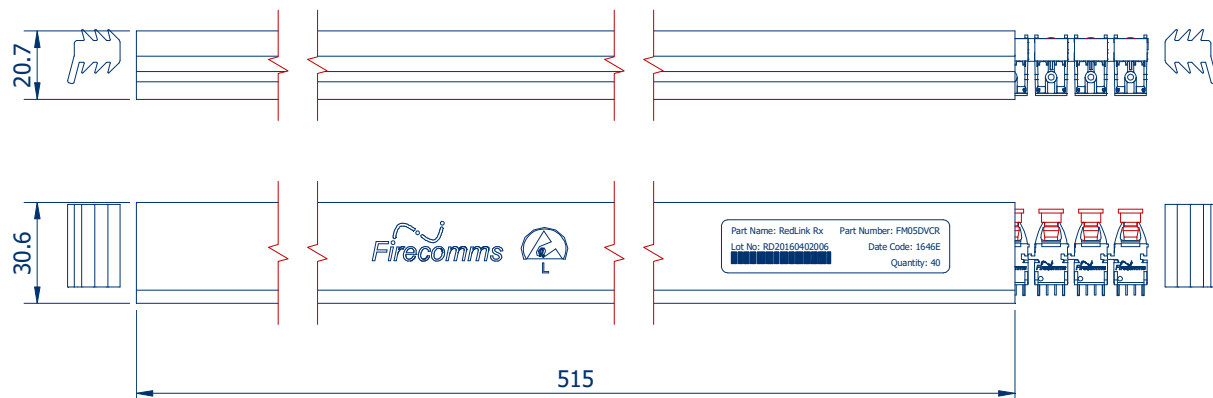


FIGURE 7  
Packing tube for Firecomms Vertical RedLink® Receivers

## PART HANDLING

Firecomms' 5 MBd RedLink® devices are color coded, receivers are blue, transmitters are gray. 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 product are not permitted.

In the soldering process, non-halogenated water soluble fluxes are recommended. RedLink® products 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-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**

	Horizontal	Vertical
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	8.14 kg	9.59 kg
Components per Outer Carton	2,000	2,000

For the most recent revision or further information please visit [www.firecomms.com](http://www.firecomms.com) or contact the company directly at the following address, Firecomms Ltd, 2200 Airport Business Park, Cork, IRELAND. Copyright© 2004-20016 Firecomms. All rights reserved. Firecomms refers to Firecomms Limited and/or its subsidiaries. Firecomms assumes no responsibility for inaccuracies or omissions in the information contained in this document. Specifications are subject to change without notice. No patent rights are granted to any of the circuits described herein.