

# FB00AKAR

## 650 nm Analogue OptoLock® Fiber Optic Transceiver



### Data Sheet



#### DESCRIPTION

Firecomms Analogue OptoLock® Transceiver is a duplex connector with a transmitter that uses a high-speed RCLED and a separate receiver channel which has a high bandwidth low capacitance photo-diode.

The high-speed red 650 nm RCLED has optimal optical power at a drive current of approximately 20 mA (1.9 V forward voltage). When biased at this drive current modulating signals can be AC coupled to the RCLED using a suitable coupling capacitor (100 nF to 470 nF) to modulate the optical power and produce a large OMA (optical modulation amplitude).

The receiver is a low capacitance high-speed photo-diode which facilitates receiving light signals from DC up to 125 MHz. Both the TX and RX are separately encapsulated in clear plastic with molded lensing that is design for optical coupling to 1mm diameter plastic optical fiber with an effective NA of 0.5. OptoLock® is protected by U.S. patents 7,597,485 and 7,905,665, Chinese patents 101501545 A and 102135650 B.

#### AVAILABLE OPTIONS

**Table 1**  
**ORDERING INFORMATION / PART NUMBERS**

OptoLock® Analog Sensor for 2.2mm POF	FB00AKAR
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#### FEATURES

- Suitable for analog sensing
- Suitable for both generating and detecting red light
- Visible red light from eye-safe RCLED
- Integrated optics to efficiently focus and direct light to a 1 mm fiber core with 0.5/0.3 NA
- High bandwidth, low capacitance 500  $\mu$ m silicon photo-diode
- RoHS compliant

#### APPLICATIONS

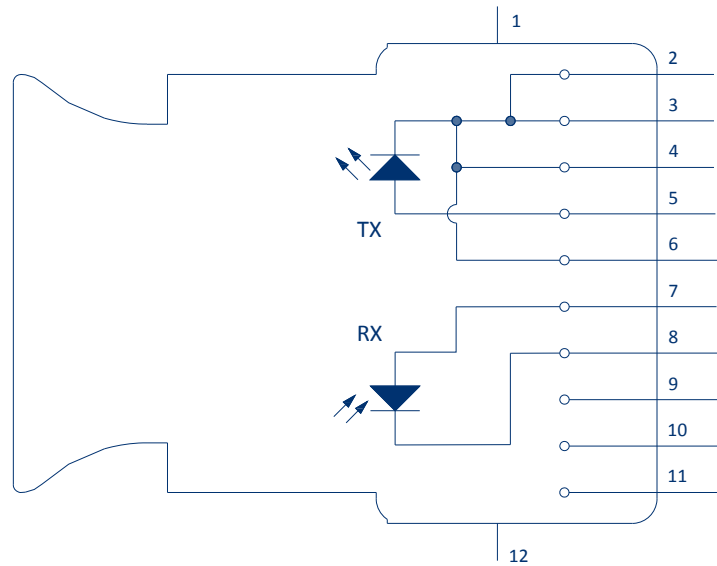
**Table 2**  
**APPLICATIONS**

<b>Application</b>	Visible red-light sensing, Interrupter applications, Security applications, Remote sensing
<b>Speed</b>	DC to 125 MBd

## SPECIFICATIONS

**Table 3**  
**TRANSEIVER PIN DESCRIPTION**

Pin	Name	Symbol
<b>Transmitter</b>		
1	EMI Shield	GND
2	Cathode	TD-
3	Cathode	TD-
4	Cathode	TD-
5	Anode	TD+
6	Cathode	TD-
<b>Receiver</b>		
7	Anode	RD+
8	Cathode	RD-
9	Not Connected	N.C.
10	Not Connected	N.C.
11	Not Connected	N.C.
12	EMI Shield	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
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
Eye Safety		IEC 60825-1	LED Class 1

## RECOMMENDED APPLICATION CIRCUIT

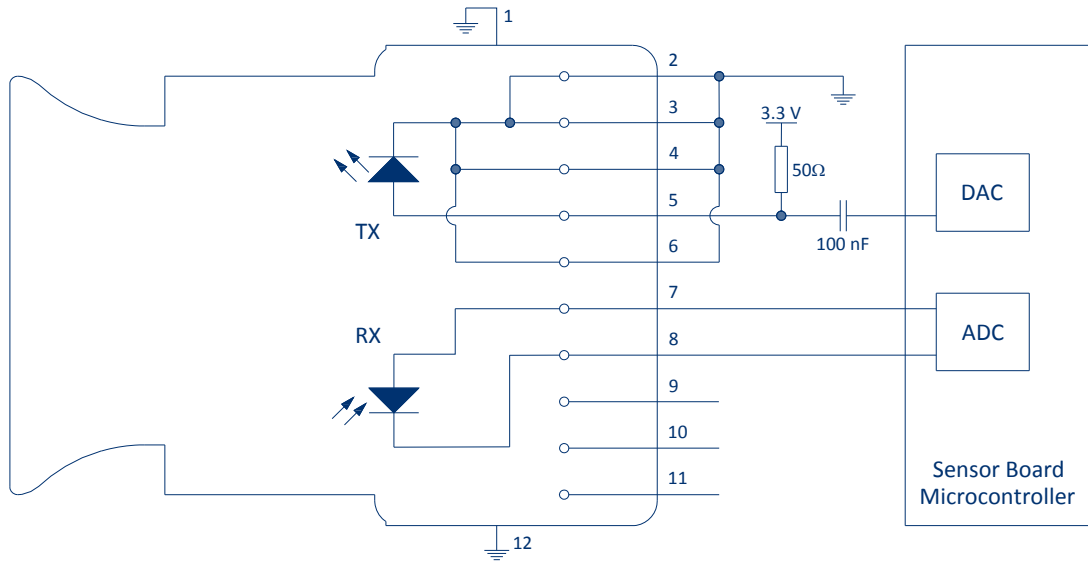


FIGURE 2  
Recommended application circuit

## 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:

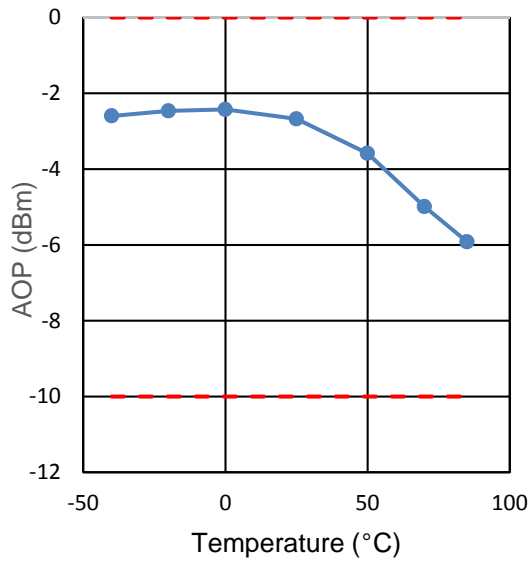
1. 260 °C for 10 seconds, one time only, at least 2.2 mm away from lead root

Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	$T_{stg}$	-40	+85	°C
Operating Temperature	$T_{op}$	-40	+85	°C
Soldering Temperature <sup>[1]</sup>			+260	°C
Reverse Voltage (Receiver)	$V_{cc}$		+20	V
Power Consumption (Receiver)	$P_{peak}$		+0.2	W
Reverse Voltage (Transmitter)	$V_R$	+1.7	+2.3	V
Power Consumption (Transmitter)	$P_{peak}$		+0.2	W
Average Current (Transmitter)	$I_{avg}$		+50	mA
Peak Current (Transmitter)	$I_{peak}$		+90	mA

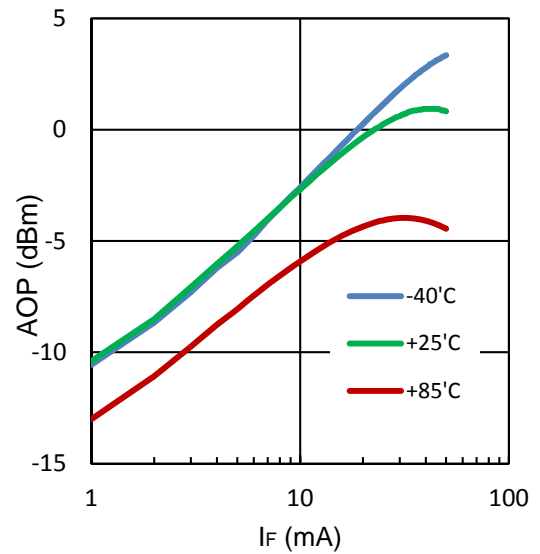
## SPECIFICATIONS

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

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Peak Wavelength	$\lambda_{\text{peak}}$	640	660	670	nm	10 mA, -40 °C to 85 °C
Spectral Bandwidth (FWHM)	$\Delta\lambda$	18	24	27	nm	10 mA, -40 °C to 85 °C
Average Output Power	P	-10	-5.5	0	dBm	10 mA, -40 °C to 85 °C
Change in Optical Power over Temp	$\Delta P$			5	dB	10 mA, -40 °C to 85 °C
Optical Rise Time (20 %-80 %)	$T_R$	0.50	1.30	2.50	ns	0-2 V Square Wave
Optical Fall Time (80 %-20 %)	$T_F$	0.40	0.50	2	ns	0-2 V Square Wave
Cut off Frequency (-3 dB Optical power)	$f_c$	5		100	MHz	Min @ 10 mA bias Max @ 20 mA bias
Capacitance	$C_0$		5		pF	$V_f=0\text{ V}, f=1\text{ MHz}$



**FIGURE 3**  
Average POFC Coupled Optical Power / dBm  
for  $I_f = 10\text{ mA}$ , against temperature



**FIGURE 4**  
Average POFC Coupled Optical Power (dBm)  
against forward current  $I_f$  (mA)

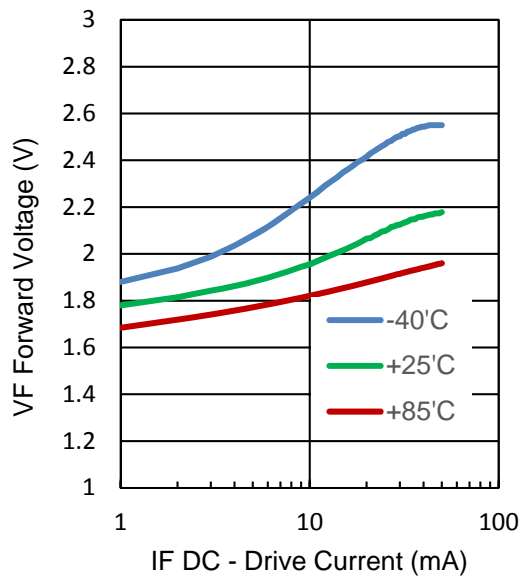


FIGURE 5  
Forward Voltage Vf (V) against forward current If (mA)

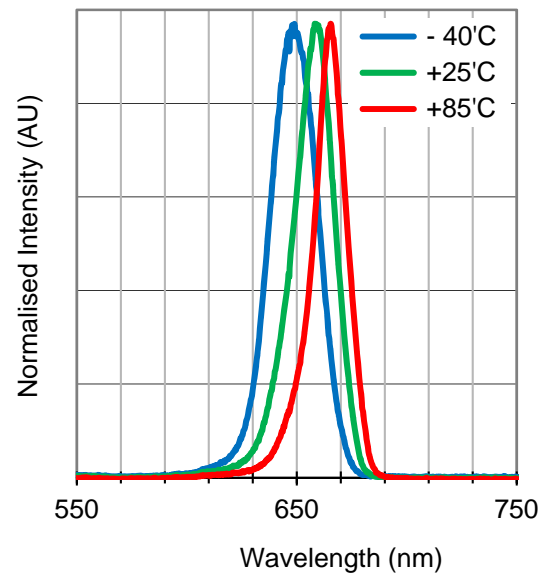


FIGURE 6  
Normalized Intensity (AU) against Wavelength (nm)

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

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Responsivity @ 650 nm	R		0.3	0.42	A/W	
Dark Current	IR		20	100	nA	
Upper Cut off Frequency	fc, -3dB		125	300	MHz	
Dark Noise Density			10		A/√Hz	
Optical Rise Time (20 % - 80 %)	tr		1		ns	
Optical Fall Time (80 % - 20 %)	tf		1		ns	
Capacitance	C <sub>0</sub>		3		pF	For bias = 8 V, f= 1 MHz

## MECHANICAL DATA

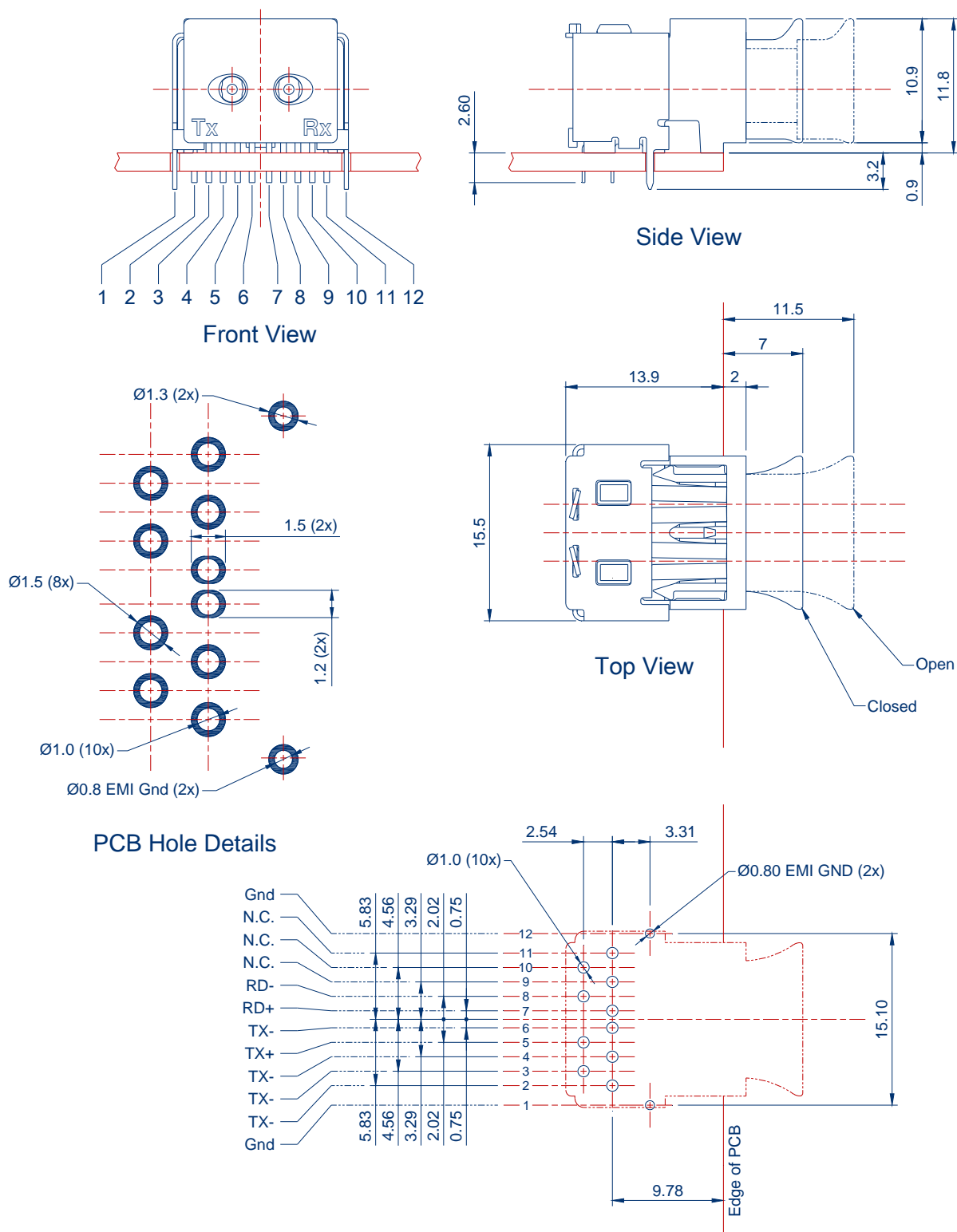


FIGURE 7

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.

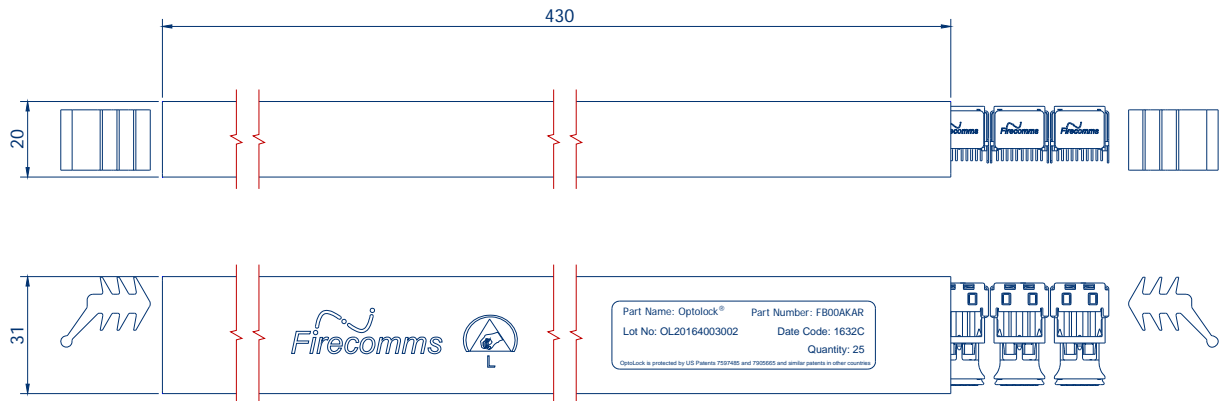


FIGURE 8  
Packing tube for Firecomms FB00AKAR OptoLock® Transceivers

## PART HANDLING

The OptoLock® components 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 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.

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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