

# 250 Mbps Transceiver in LC FB2M5LVR

DATA SHEET



## 650 nm 250 Mbps Fiber Optic Transceiver with LC Termination

**LVDS I/O**

**IEC 61754-20 Compliant**



### 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° to +85°C operating range
- RoHS compliant

### APPLICATIONS

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

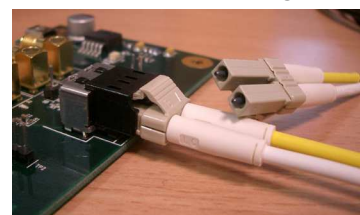
Note:

1. Depending on the installation conditions.

### 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 25uA or less.

#### FB2M5LVR Revision A

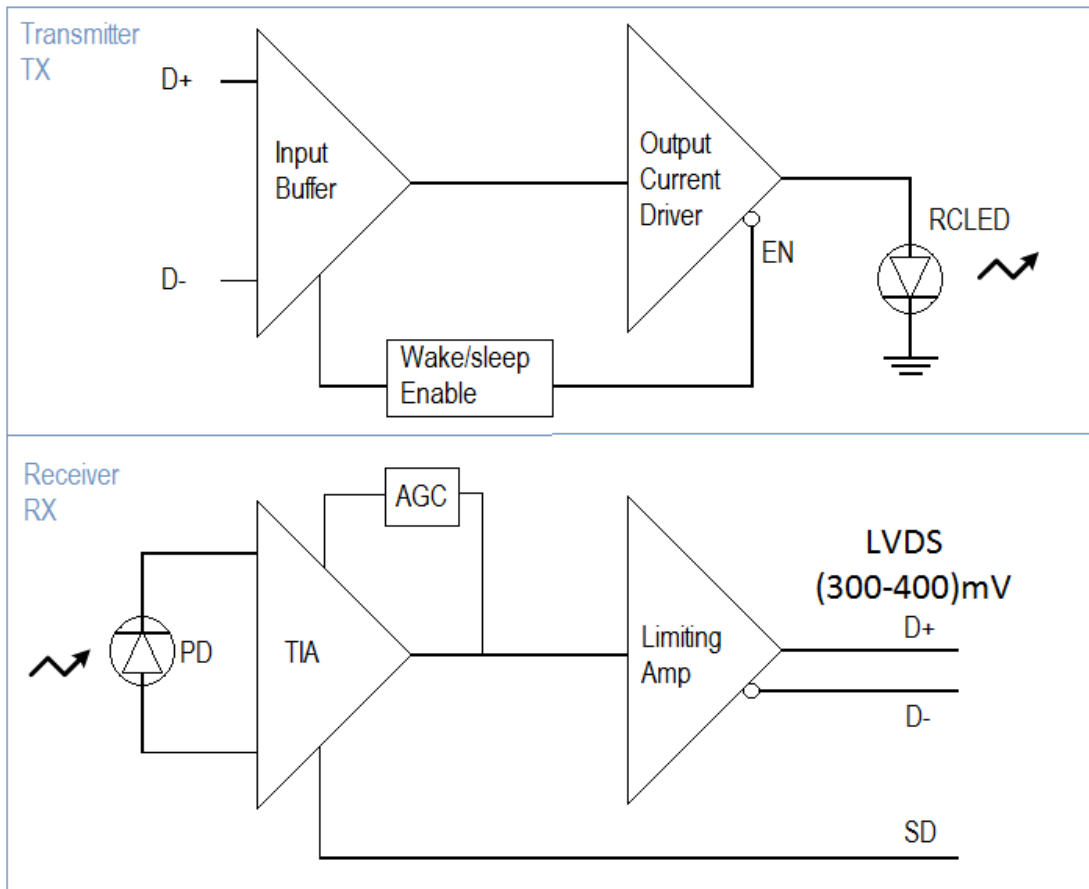
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**SPECIFICATIONS**

Table 2 ABSOLUTE MAXIMUM RATINGS				
<i>These are the absolute maximum ratings at or beyond which the FOT can be expected to be damaged.</i>				
Parameter	Symbol	Minimum	Maximum	Unit
Storage Temperature	$T_{stg}$	-40	85	°C
Operating Temperature	$T_{op}$	-20	85	°C
Soldering Temperature <sup>[1]</sup>	$T_{sld}$		260 <sup>[1]</sup>	°C
Supply Voltage	$V_R$	-0.5	4.5	V
Receiver Optical Overload	$P_{OL}$		0	dBm
Storage Conditions (Moisture Sensitivity Level)	MSL		2a	J-STD-020D

Notes:

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



**FIGURE 1**  
LC transceiver electronic block diagram

**SPECIFICATIONS (continued)**

**Table 3  
TRANSMITTER 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 3V to 3.6V.
2. Test data represents operation at the maximum data rate of 250 Mbps using a PRBS7 test pattern (8B/10B encoding) unless otherwise stated.
3. Optical power is measured when coupled into 0.5 m of a 1 mm diameter 0.5 NA plastic fiber.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
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
Data Rate	Baud Rate	10		250	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
Peak Wavelength	λ <sub>peak</sub>	640	660	670	nm
Spectral Bandwidth (FWHM)	Δλ		23	30	nm
Average Optical Power <sup>[3]</sup>	P	-10		-2.0	dBm
Optical Rise Time (20%-80%)	t <sub>R</sub>		2.0	2.8	ns
Optical Fall Time (80%-20%)	t <sub>F</sub>	0.3		0.6	ns
Optical Modulation Amplitude (OMA)	OMA	160	590	1250	μW
Total Jitter				1.6	ns

**SPECIFICATIONS (continued)**

**Table 4  
RECEIVER 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 3V to 3.6V.
2. Test data represents operation at the maximum data rate of 250 Mbps using a PRBS7 test pattern (8B/10B encoding) 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 plastic optical fiber.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
DC Supply Voltage	V <sub>cc</sub>	3.0	3.3	3.6	V
Operating Current Consumption	I <sub>cc</sub>	34	36	40	mA
Sleep State Current Consumption	I <sub>sleep</sub>	2	20	25	μA
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		300	350	400	mV
Receivable Optical Power Sensitivity			-24	-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

**SPECIFICATIONS (continued)**

Table 5 TRANSCEIVER PIN DESCRIPTION		
Pin	Name	Symbol
TRANSMITTER		
1	EMI-GND	GND
2	Data Input (Negative)	TD-
3	Data Input (Positive)	TD+
4	Ground Pin <sup>[1]</sup>	GND
5	DC Power Input Pin	Vcc
6	Ground Pin <sup>[1]</sup>	GND
RECEIVER		
7	DC Power Input Pin	Vcc
8	Ground Pin	GND
9	Signal Detect Output	SD
10	Data Output (Negative)	RD-
11	Data Output (Positive)	RD+
12	EMI-GND	GND

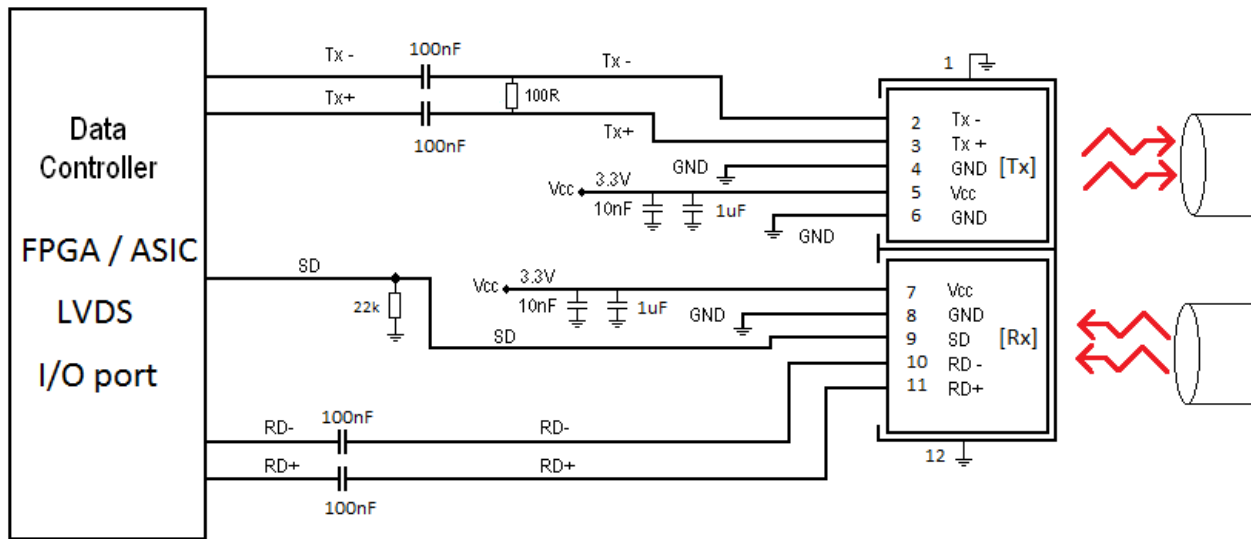
Notes:

- Both ground pins must be connected to the ground plane on the PCB. These pins are not connected internally.



**FIGURE 2**  
LC connector with dust plug, open for connection, and with LC plug inserted

**APPLICATION CIRCUIT**

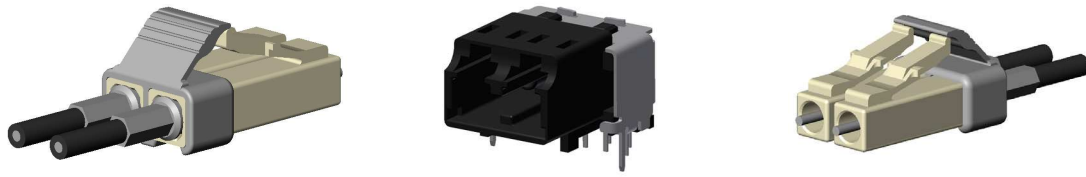


**FIGURE 3**  
Interface circuit schematic to AC couple to a PHY, FPGA or ASIC IC where the IC will not accept a common mode voltage of 1.2V

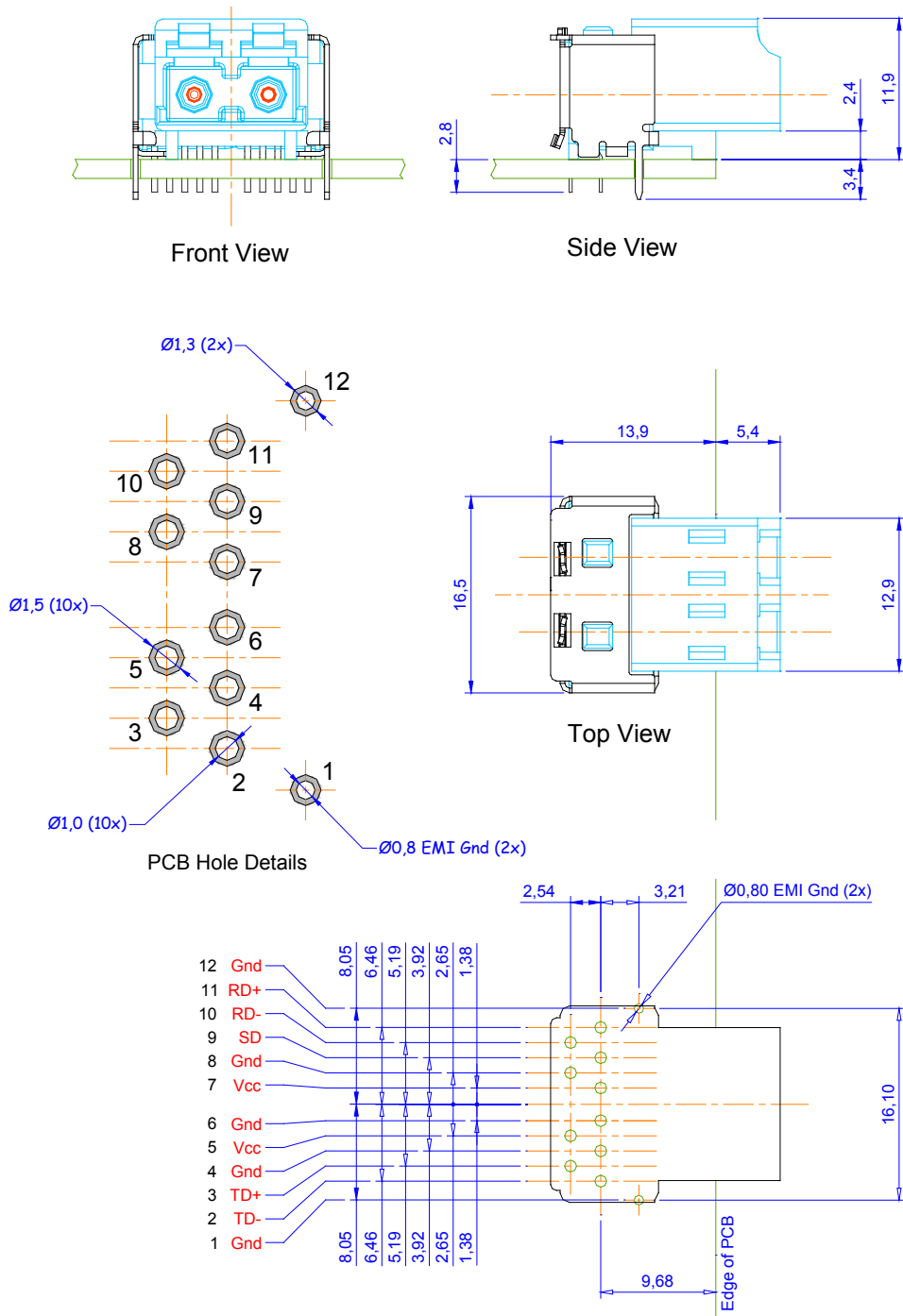
Notes:

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.

**MECHANICAL DATA**



**FIGURE 4**  
Multiple views of the LC connector

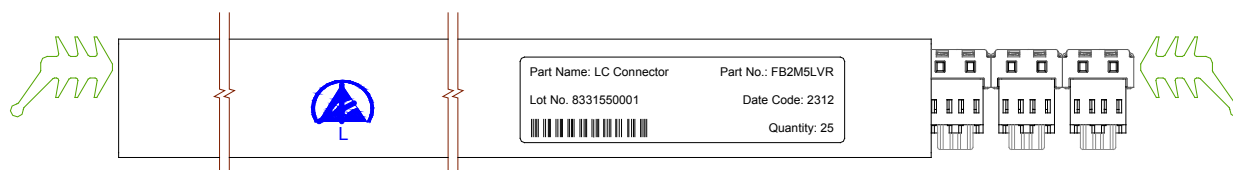


**FIGURE 5**  
Mechanical dimensions of the LC connector and PCB footprint, which is a top view. General dimensional tolerance is  $\pm 0.2\text{mm}$ .

**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 6 PACKING INFORMATION		
Components per Tube		25
	Tube Length	440 mm
	Tube Height	27.4 mm
	Tube Width	19.4 mm
Tubes per Bag		10
Bags per Inner Carton		1
	Inner Carton Length	588 mm
	Inner Carton Height	82 mm
	Inner Carton Width	147 mm
Weight per Inner Carton, Complete		1.7 Kg
Components per Inner Carton		250
Inner Cartons per Outer Carton		4
	Outer Carton Length	600 mm
	Outer Carton Height	179 mm
	Outer Carton width	300 mm
Weight per Outer Carton, Complete		8.1 Kg
Components per Outer Carton		1,000



**FIGURE 6**  
Packing tube for the Firecomms transceiver

**ORDERING INFORMATION**

Table 7 ORDERING INFORMATION		
Part Number	Name	Description
FB2M5LVR	Industrial LC Transceiver, for 2. 2 mm POF, Black	650 nm RCLED-Based Transceiver in LC connector, Color Black, For Use with LC Plugs Containing POF