

General Description

The OIER6 transceiver, lead free and RoHs compliant, allows to implement Fast Ethernet (100 Mbps) or Ethernet (10 Mbps) over more than 50 meters *POF fiber 0.5 NA*. The connector type is standard EM-RJ connector.

The electric parts are shielded with metal case and metal connector, in order to increase the immunity level and decrease the emissions; the robustness let the product to be ready for industrial use.

The transmitter element is a 660nm red LED, that is driven by a dedicated IC. The driver allows to have a differential input signal, compatible with PECL standard, and converts it into a modulated current driving the LED. The driver allows also a good polarization of the emitter element.

The receiver unit is a PIN photodiode, packaged with an amplifier and coupled with a dedicated driver, in order to give a differential output signal and signal detect output, both compatible with PECL standard.

Even if the power supply range is wide on both elements, for obtaining the best performances it is suggested to supply transmitter at 3.3V and receiver at 5V. The inputs and the outputs data pin are internally AC coupled and adapted to 50 Ohm.

Applications

Factory automation at 10 MBd and 100 MBd speed
Fast Ethernet/Ethernet networking over POF
Link distance more than 50m

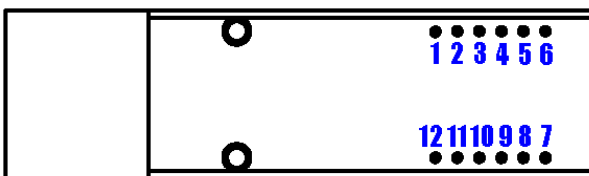


Figure 1 – Pinout: bottom view

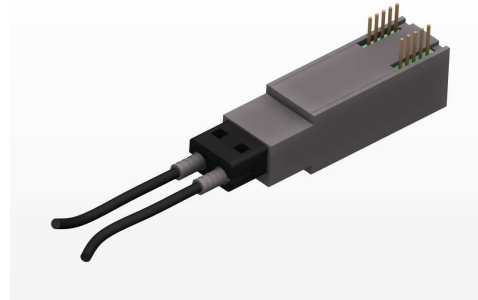


Figure 2 – Optical Transceiver

Features

- Compatible with electrical and optical performances for Fast Ethernet over Plastic Optical Fiber
- Compliant to RoHS European Directive
- Extended temperature range
- High immunity level
- PECL signal compatible
- Wide voltage supply range
- Internal PECL terminations
- Trimmerable modulation led current
- Receiver Signal Strength Indication

Pin Functions

No.	Name	Function
1	RSSI	Receiver Signal Strength Indicator
2	Rx Gnd	Receiver's ground
3	Rx Vcc	Receiver's power supply
4	SD	Signal detect
5	RX _{data-}	Receiver Data -
6	RX _{data+}	Receiver Data +
7	TX Vcc	Transmitter's power supply
8	TX Gnd	Transmitter's ground
9	Tx DIS	Transmitter disable
10	TX _{data+}	Tx data input +
11	TX _{data-}	Tx data input -
12	I _{mod}	LED modulation current

IMPORTANT NOTE

Informations in this Datasheet is believed to be accurate and reliable. However, no responsibility is assumed by Optoi for its use. Specifications and circuitry are subject to change in order to improve the device's performances.

Ordering Information

OIER6

POF fast ethernet transceiver

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max	Unit
T _A	Operating Temperature Range [†]	-40	85	°C
V _{CC}	Supply Voltage Range [†]	3	5.5	V
T _S	Storage Temperature	-40	100	°C

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

0.5 NA POF fiber, PECL outputs terminated with 50Ω to V_{CC} - 2V, data rate = 125Mbps. Typical values are at T_A = +25°C, V_{CC} = + 3.3V for tx module and V_{CC} = + 5V for rx module. Fiber length and I_{mod} pin connection are each time specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Transmitter						
V _{CC}	Supply Voltage Range		3	3.3	5.5	V
I _{TX}	Average Supply Current	I _{mod} pin connects to 1.5kΩ	104	110	115	mA
		I _{mod} pin connects to GND	207	233	247	
P _{DTX}	Transmitter’s total power consumption	I _{mod} pin connects to 1.5kΩ	343	363	380	mW
		I _{mod} pin connects to GND	683	769	815	
Receiver						
V _{CC-RX}	Supply Voltage Range		3	5.0	7	V
I _{RX}	Average Supply Current		137	139	141	mA
P _{DRX}	Receiver’s total power dissipation		685	695	705	mW
V _D	Differential Input Voltage		0.5	1	2.4	V
V _{OL}	Data Output Voltage – Low ‡	Differential signal	-573	-560	-540	mV
V _{OH}	Data Output Voltage – High ‡	Differential signal	552	570	602	mV
V _{OH} -V _{OL}	Data Output Voltage - Swing	Differential signal	1100	1130	1170	mV
T _r	Data Output Rise Time	Differential signal	1.34	1.42	1.82	ns
T _f	Data Output Fall Time	Differential signal	1.30	1.40	1.76	ns
DCD	Duty Cycle Distortion (pulse width distortion)	2m fiber, I _{mod} to 1.5kΩ		0.12	0.26	ns
		50m fiber, I _{mod} to GND	-0.07	0.02	0.12	
DDJ	Data Dependent Jitter	2m fiber, I _{mod} to 1.5kΩ	0.72	0.80	1.04	ns
		50m fiber, I _{mod} to GND	1.04	1.20	1.56	
RJ	Random Jitter	2m fiber, I _{mod} to 1.5kΩ		0.12	0.16	ns
		50m fiber, I _{mod} to GND	0.2	0.44	1.3	
Coupled						
T _A	Operating Temperature Range		-40		85	°C
I _{CC}	Supply module Current	2m fiber, I _{mod} to 1.5kΩ	241	249	256	mA
		50m fiber, I _{mod} to GND	344	372	388	
P _D	Total power dissipation	2m fiber, I _{mod} to 1.5kΩ	1028	1058	1085	mW
		50m fiber, I _{mod} to GND	1368	1464	1520	
RL	Data and Signal Detect Output Load			50		Ω
B	Signalling Rate (Fast-Ethernet)	4B/5B, 5		125		Mbps
	Signalling Rate (Ethernet)	Manchester, 5		20		Mbps
B _{max}	Maximum Signalling Rate	2m fiber, I _{mod} to 1.5kΩ		220		Mbps
		50m fiber, I _{mod} to GND		190		Mbps

† This is not a test parameter, but for information only.

‡ The output has 100nF decoupling capacitors embedded, in order to remove the DC offset

OPTICAL CHARACTERISTICS

T_A = 25°C, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Transmitter						
P _O	Average Launched Power (1mmPOF, NA=0.5)	2m fiber, I _{mod} to 1.5kΩ	-5.30	-3.30		dBm
		50m fiber, I _{mod} to GND	-14.50	-9.70	-8.20	
λ _c	Central Wavelength		640	660	670	nm
Δλ	Spectral half width (FWHM)			10	20	nm
t _r	Optical Rise Time (10%-90%)			4.3		ns
t _f	Optical Fall Time (10%-90%)			4.7		ns
t _{da}	Tx disable assert time			0.01	0.5	us
t _{dn}	Tx disable negate time			0.01	0.5	us
Receiver						
OMA	Unstressed receiver sensitivity (POF)	Ac mode. Measured with PRBS 7 sequence, BER<2x10 ⁻¹⁰		-23		dBm
λ _o	Operating Wavelength			650		nm
P _A	Signal Detect Asserted	PRBS 7 seq, 125Mbps	-25			dB
P _D	Signal Detect Deasserted	PRBS 7 seq, 125Mbps			-28	dB

EYE DIAGRAM

with 2-meter POF fiber (I_{mod} pin to 1.5kΩ)

with 50-meter POF fiber (I_{mod} pin to ground)

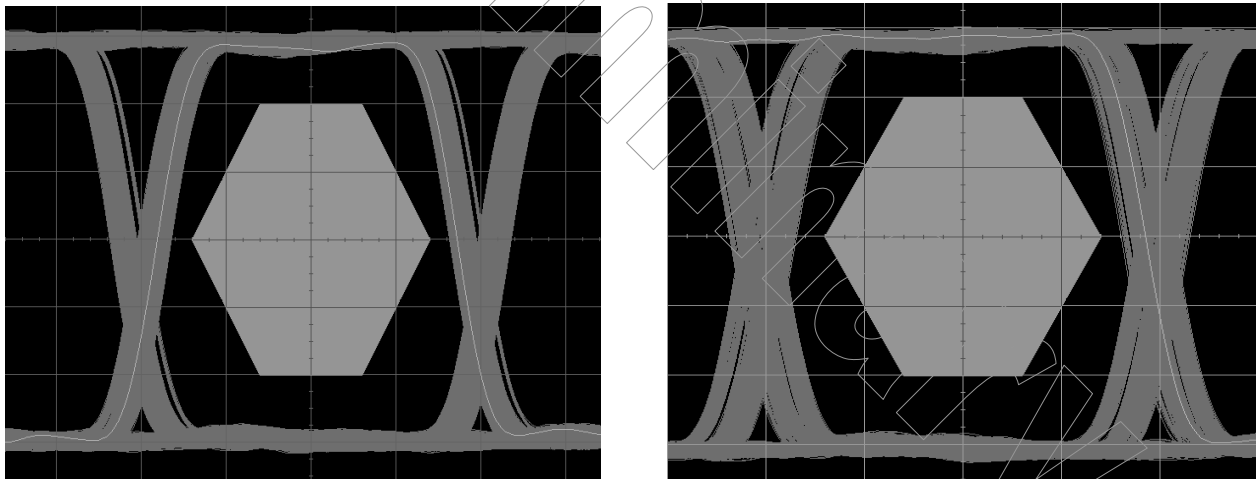


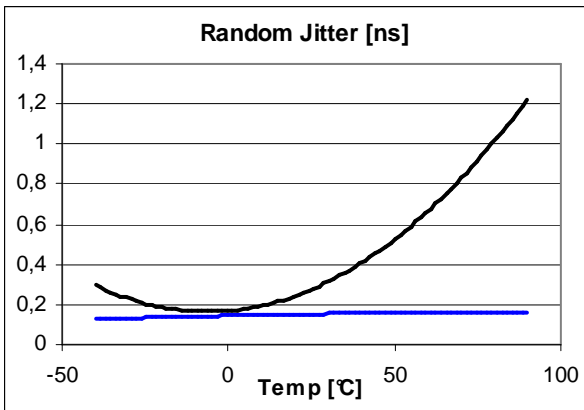
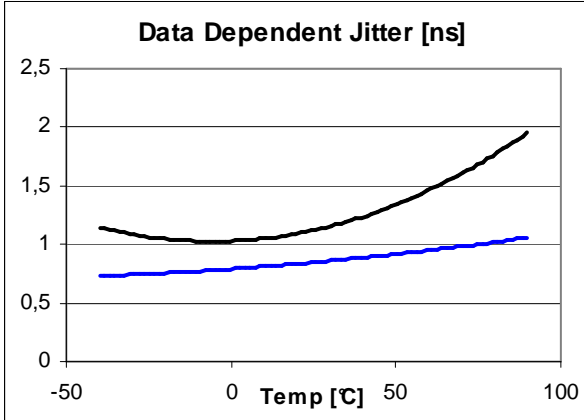
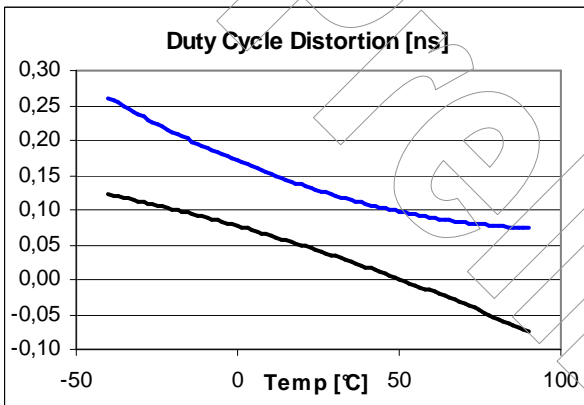
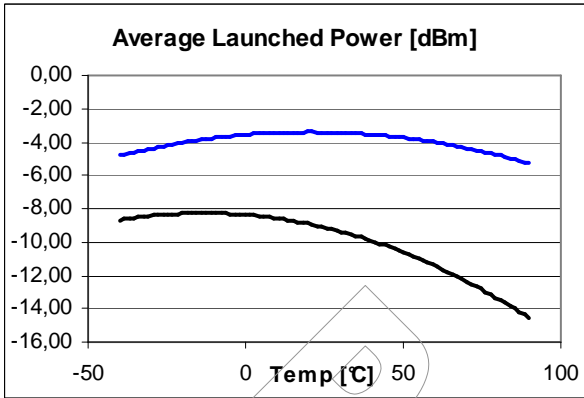
Figure 3 – Differential signal, sequence PRBS7, data rate 125Mbps §§

TEMPERATURE CHARACTERISTICS

Data rate=125Mbps

Blue plots: end of 2m fiber, I_{mod} pin to GND with 1.5kΩ.

Black plots: end of 50m fiber, I_{mod} pin set to GND.



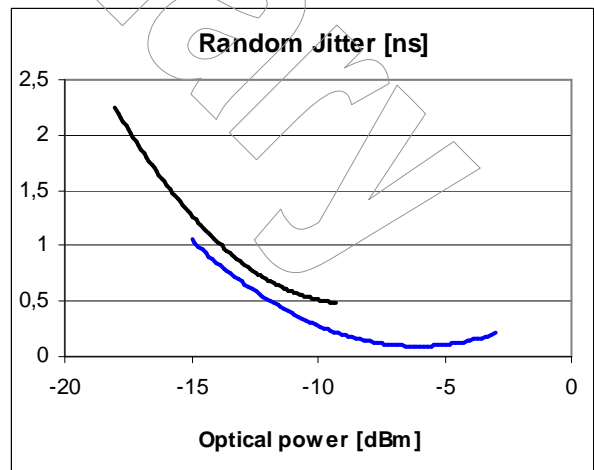
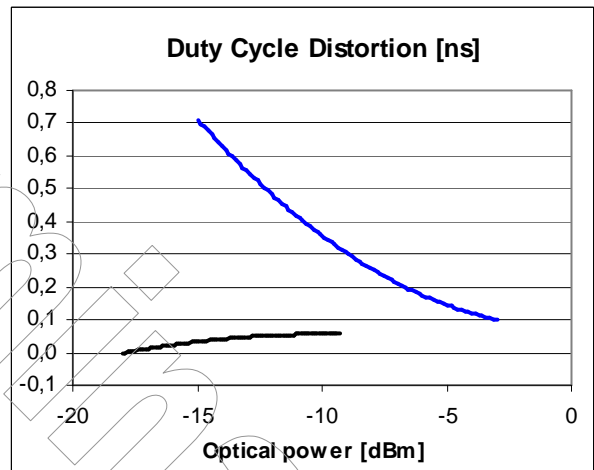
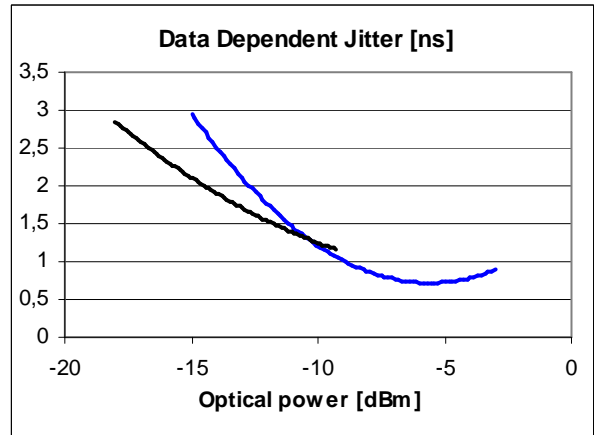
PERFORMANCES VS OPTICAL POWER

T=25°C, data rate=125Mbps.

Blue plots: end of 2m fiber, maximum power is obtained pulling I_{mod} pin down to GND with 1.5kΩ.

Black plots: end of 50m fiber, maximum power is obtained setting I_{mod} pin to GND.

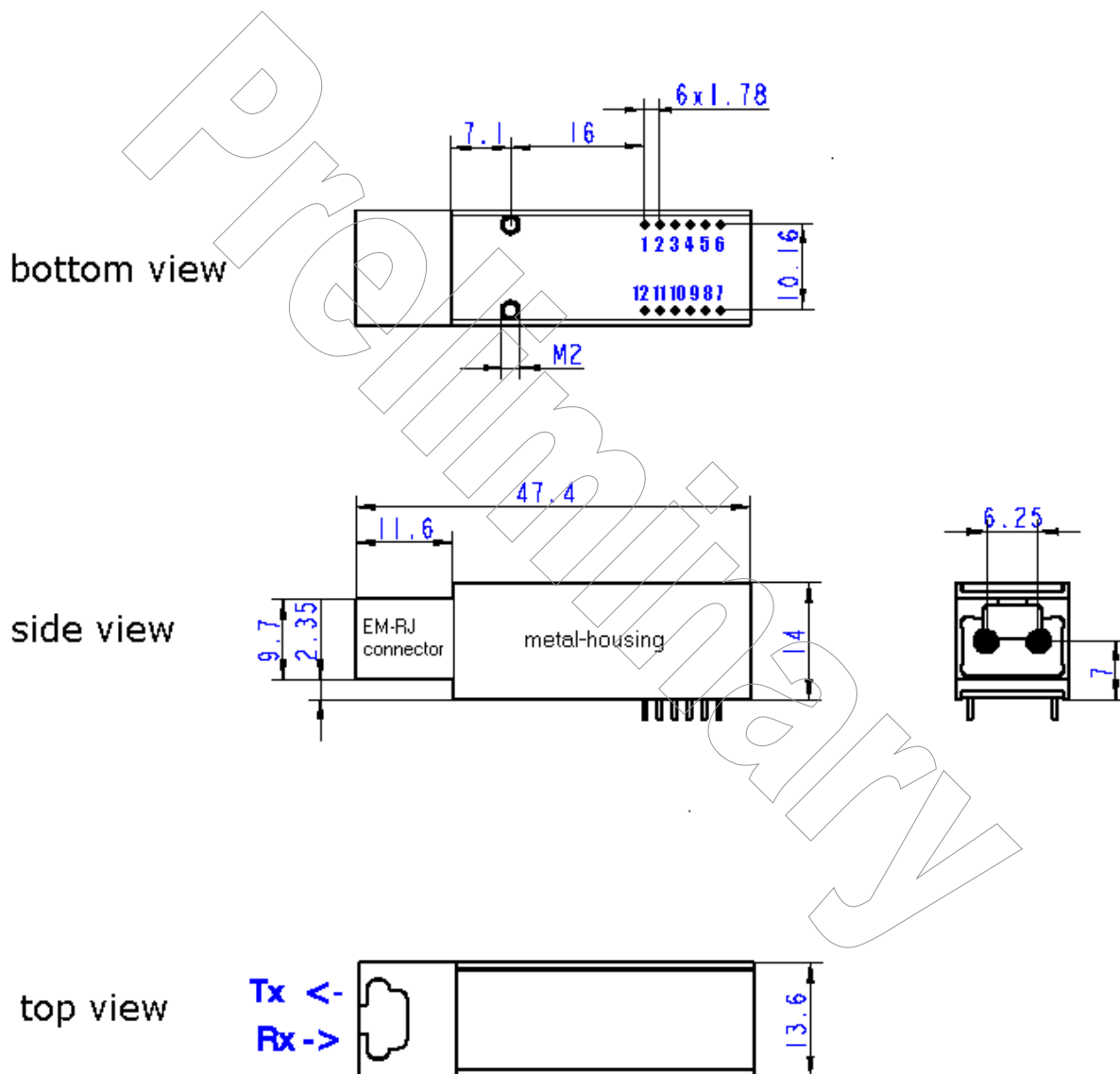
Lower powers are obtained decreasing I_{mod} (increasing the resistance connected between I_{mod} and ground).



MECHANICAL DIMENSIONS

Unit: mm

Tolerance: ± 0.1mm



Detailed Description

The OIER6 is internally balanced, in order to work well for the most common applications. If the user wants to improve the performance in some parameters, or simply needs another configuration (PECL terminations, SD thresholds etc..) ask to the manufacturer.

Pin description

Pin 1 RSSI: receiver signal strength indicator. The voltage at RSSI indicates the input-signal power: it is reduced approximately to 2.8V when SD is deasserted.

Pin 2 Rx Gnd: receiver ground pin. Directly connect this pin to the receiver ground plane of the host board.

Pin 3 Rx Vcc: receiver power supply pin. Provide +3.3 VDC. This line is internally filtered.

Pin 4 SD: signal detect pin. If an optical signal is present at the input of the receiver, Sd output is a logic "1". Absence of an optical signal to the receiver results in a logic "0" output. This Signal Detect output can be used to drive a PECL input on an upstream circuit, such as Signal Detect input.

Pin 5 Rx_{data-}: receiver data out bar. This data line is a PECL compatible differential line, which is internally terminated with a 82 Ω pull up to Vcc and 130 Ω pull down to ground. The line is also AC decoupled.

Pin 6 Rx_{data+}: receiver data out. This data line is a PECL compatible differential line, which is internally terminated with a 82 Ω pull up to Vcc and 130 Ω pull down to ground. The line is also AC decoupled.

Pin 7 Rx Vcc: transmitter power supply pin. Provide +5 VDC. This line is internally filtered.

Pin 8 Rx Gnd: transmitter ground pin. Directly connect this pin to the receiver ground plane of the host board.

Pin 9 Tx Dis: transmitter disable input. This input is used to shut down the transmitter light output. It is internally pulled low with a ~50 kΩ resistor.

Open or Low (0-0.8 V) - transmitter on

Between (0.8-2.0 V) - undefined

High (2.0-3.63 V) – transmitter off

To start the transmission, also I_{mod} pin must be connected to ground.

Pin 10 Tx_{data+}: transmitter data in. This data line is an AC coupled differential line which does not need any termination at the user SERDES. The AC coupling is done inside the module and therefore not required on the host board.

Pin 11 Tx_{data-}: transmitter data in. This data line is an AC coupled differential line which does not need any termination at the user SERDES. The AC coupling is done inside the module and therefore not required on the host board.

Pin 12 I_{mod} : modulation LED current pin. It is suggest to connect I_{mod} to ground for fibers longer than 15m. For shorter fibers let pull this pin down to ground through 1.5kΩ resistor or more.

Package

The transceiver package consist of six basic elements; two optical packages, a metal connector, two electrical subassembly and the housing. The package outline drawing and pin out are shown in Figure 1. The package is a metal package in order to increase the component robustness.

The transmission part and receiver part are physically and electrically separate, the power supply lines are filtered, in order to reject the power supply noise. It is really important to guarantee a clean power supply to the module.

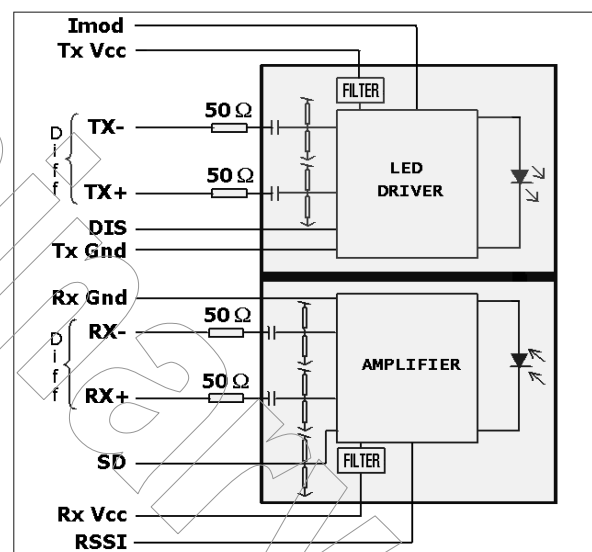


Figure 4 – block diagram

Electrical circuit

Data input and output lines are internally PECL terminated. The lines are also AC coupled with internal capacitors.

The LED driver supplies a correct waveform to the LED, that is prebiased.

It is important to take care of the layout of your circuit board to achieve optimum performance from the transceiver. A power supply decoupling circuit is recommended to filter out noise to assure optimal product performance. It is further recommended that a contiguous ground plane be provided in the circuit board directly under the transceiver to provide a low inductance ground for signal return current. This recommendation is in keeping with good high frequency board layout practices. The PECL receiver output of the transceiver is DC-coupled to the PECL compliant

network interface through a Thévenin equivalent transformation, which is developed for a 5V power supply application. The PECL outputs are pulled up to Vcc with a 82 Ω resistor, pulled down to ground with an 130 Ω resistor (Vcc-2V termination PECL compliant) and they are protected from ESD. The receiver's amplifier has an internal feedback loop to correct the DC offset in the signal path.

Preliminary