050-313

PRODUCT BRIEF

100 MBPS-4.25 GBPS
MIL-DTL-38999 TYPE 2.5MM ELIO® COMPATIBLE TRANSCEIVER
850NM VCSEL TRANSMITTER, PIN TIA RECEIVER

REV	DESCRIPTION	DATE	APPROVED
1	Preliminary	10/06/2015	SZ/TC
C	Per DCN 61250; Release at Rev C. No change done to datasheet	08/02/2016	GC/SZ
D	Per DCN 61499; Updated outline drawing	08/19/2016	GC/SZ/NH
E	Per DCN 62204; Edit PRBS Specification to 2^7-1	10/11/2016	GC/SZ
F	Per DCN 62678; Add data rate selection to p/n nomenclature	11/10/2016	SZ/GC
G	Per DCN 62857; Changed marking location. Add bag and tag labeling	01/05/2017	NH/GC
H	Per DCN 65980; Remove datarate in P/N nomenclature	07/13/2017	RAS/GC
J	Per DCN 70167; Add patent number	04/23/2018	RAS/GC
K	Per DCN 70824; Patent number added to label drawing, removed inked part number on jam nut version	06/14/2018	SS

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MIL-DTL-38999 TYPE 2.5MM ELIO® COMPATIBLE TRANSCEIVER 100 Mbps – 4.25 Gbps, MMF, 3.3V

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US Patent# US9819107

Glenair 050-313 is a D38999 Type 11-02 receptacle connector that incorporates an opto-electronic transceiver that operates from 100Mbps-4.25Gbps that converts electrical signals to multimode fiber. The transmitter section incorporates an 850nm Laser and laser driver with APC functionality to maintain output power and extinction ratio over the operating temperature range. The transmitter has a disable function as well as a transmitter fault detect function. The receiver section incorporates PIN/TIA and limiting amplifier to quantize electrical output signals. The receiver also offers a CMOS compatible Loss of Signal indicator. The electrical interface for the transceiver are PC tail pins that are intended to mount to a PCB or interface flex circuit; the high speed lines of the Transmitter and Receiver sections are CML compatible. The Glenair optical transceiver is ideal for harsh-environment, extreme shock, vibration and temperature avionics and military applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadrax copper conductors unacceptable

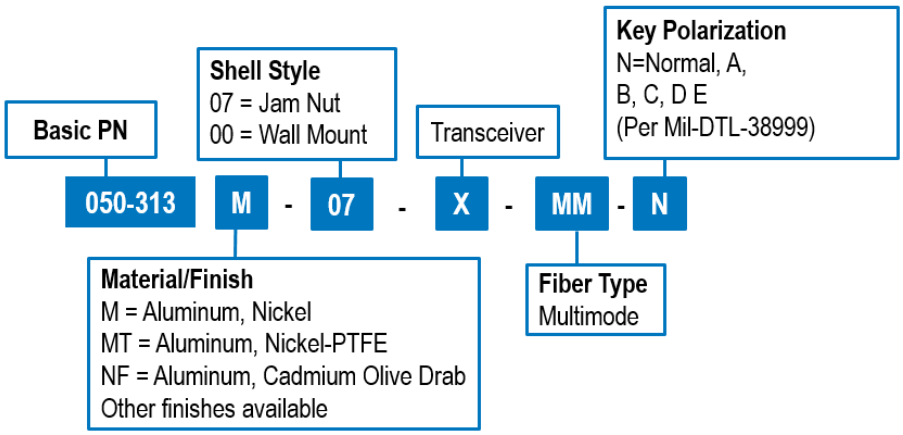
KEY FEATURES/BENEFITS

- Ideal for military and other harsh environment applications.
- MIL-STD-810 mechanical shock and vibration compliance
- MIL-STD-1344 immersion resistance compliance
- Up to 550 Meters for VCSEL 850nm version with Multimode fiber
- Power supply operation from 3.3V
- 850nm VCSEL lasers to support up to 5 Gbps
- PIN PD to support high sensitivity up to 5 Gbps
- ROHS Compliant with M or MT finish
- -40°C to +85°C Operating Case Temperature
- Evaluation fixtures available
- Industry standard CML input and outputs that make for simple integration on customer host PCB
- PCB installation contacts (part of PCB flex) can float approximately .010" – .030" radially and
- axially for ease of installation

APPLICATIONS

- Harsh Environment such as: Airborne, Tactical, Railway, Industrial, Oil and Gas and Shipboard applications
  - Ethernet, FC 1x, 2x, 4x, SFPDP

How To Order



Ratings and Specifications

TABLE 2 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Typ	Max	Units	Notes
Storage Temperature	Ts	-55		+100	°C	
Supply Voltage	V_{cc}	-0.4		3.8	V	VccT & VccR may not differ by more than 0.5V
Maximum Soldering temperature & Time for attaching PC tails to PCB				260 10	°C s	RoHS compliant solder temperature of 260° for 10 seconds

TABLE 3 OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Units	Notes
Operating Temperature, Case	T_{op}	-40		+85	°C	Standard
Supply Voltage	V_{cc}	3.14	3.3	3.46	V	
Supply Current	Icc			180	mA	
Power Supply Noise (Peak-Peak)	V_{cc_ripple}			100	mV	

TABLE 4 ELECTRO-OPTICAL CHARACTERISTICS – TRANSMITTER (T_{OP} UNLESS NOTED OTHERWISE)

Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical Output Power	P_{OUT}	-6.5	-5	-1	dBm	850nm VCSEL
Extinction Ratio, 1.25 Gbps, 2.125 Gbps	Er	7	10		dB	Exceeds OMA for GbE, 1FC, 2FC
Extinction Ratio, 3.2 Gbps & 4.25 Gbps	Er	5			dB	Exceeds OMA for 4FC
Total Jitter	TJ			55	ps	
Optical Wavelength	λ_{OUT}	830	850	860	nm	
Spectral Width, rms	$\Delta\lambda$			0.85	nm	
Relative Intensity Noise	RIN			-117	dB/Hz	
Transmitter Differential Input Impedance	Zin		100		Ohms	AC coupled Internally
Differential Input Voltage	Vin_d	250		2200	mV_{p-p}	CML, 100 ohm

TABLE 5 ELECTRO-OPTICAL CHARACTERISTICS – RECEIVER (T_{OP} UNLESS NOTED OTHERWISE)

Parameter	Symbol	Min	Typ	Max	Units	Notes
SENSITIVITY, BER 10^{-12}, PRBS 2^7-1, Er 10 dB						
@ 1.25 Gbps	P_{IN}		-22.5	-19	dBm	PIN PD @ 1.25 Gbps
@ 2.5 Gbps	P_{IN}		-22.5		dBm	PIN PD @ 2.5 Gbps
@ 3.2 Gbps	P_{IN}		-18.5		dBm	PIN PD @ 3.2 Gbps
@ 4.25 Gbps	P_{IN}		-18		dBm	PIN PD @ 4.25Gbps
Overload, BER 10^{-12}, PRBS 2^7-1	P_{IN}	-1			dBm	@1.25Gbps or @ 4.25 Gbps
Optical Wavelength	λ_{IN}	770		870	nm	
Receiver Differential Output Impedance	Zout		100		Ohms	AC coupled internally
Differential Output Voltage Swing	Vout_d	600		1200	mV	CML, 100 ohm
LOS Assert Level	LOS		-23	-20	dBm	@ 1.25Gbps
LOS Hysteresis	LOS_{HYS}	1.25	2.3		dB	@ 1.25Gbps

Ratings and Specifications (continued)

TABLE 6 COMPLIANCE SPECIFICATIONS

CHARACTERISTIC	Standard	Condition	Notes
ESD	JEDEC EIA JESD22-A114, Class 1C		2000V HBM
Eye Safety	CDRH and IEC-825	Class 1 Laser Product	

TABLE 7 MATERIAL/FINISH

Item	Material/Finish
Shell, Jam Nut	Aluminum
Plating Finish: M	Nickel
Plating Finish: MT	Nickel PTFE
Plating Finish: NF	Olive Drab Cadmium
Contacts	Copper alloy, 50 µInch gold plated
Interfacial Seals, 38999	Elastomer, Fluorosilicon
Optical Ferrules & Sleeves	Zirconia, Ceramic
PC Tail Contacts	Copper Alloy/Gold Plated
Retaining Ring	300 CRES/Passivation
Seal, O-rings	Fluorosilicone or EPDM
Spring	Nickel-plated beryllium copper
PC tail contacts	Copper alloy/gold plated
PCB flex	FR4 & Polyimide
Encapsulant	HYSOL EE4215
Solder type	RoHS compliant Sn95/Sb5 (232°C melting temp) & RoHS compliant Sn96.5/Ag3.0/Cu0.5 (217° melting)

FIGURE 1 - OUTLINE DRAWING CONTINUED (MARKING)

LABELING:

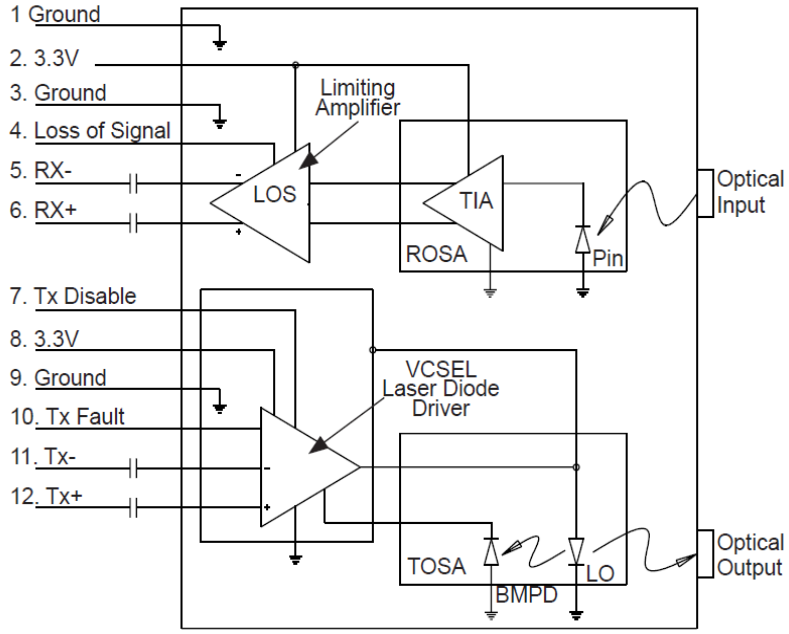
Each unit will be shipped in an antistatic bag. The label on the antistatic bag shall be at a minimum Arial size 10 black font and contain at a minimum the following information:

ANTISTATIC BAG LABEL:
Glenair
Cage Code: 06324
PN: 050-313X-XX-XX-XX-X
Rev: X
QTY: X
J/N: X
D/C:X
S/N*: XXXXXX
*If QTY is more than 1, there is no S/N

FUNCTIONAL DESCRIPTION

Figure 2

Simplified I/O Transceiver Schematic



TRANSMITTER SECTION

Transmit Disable (Tx_Disable, pin 10)

The transmitter section of the transceiver accepts a TTL and CMOS compatible transmit disable control signal input that shuts down the transmitter optical output. A high signal disables the transmitter while a low signal allows normal transceiver operation. Also laser is disabled when TX Disable is open. In the event of a fault (e.g. eye safety circuit activated), cycling this control signal resets the module. Host systems should allow a 10ms interval between successive assertions of this control signal.

Transmit Fault (Tx_Fault, Pin 2)

A catastrophic laser fault will activate the transmitter signal, TX_FAULT, and disable the laser. This signal is an open collector output (pull-up required on the host board). A low signal indicates normal laser operation and a high signal indicates a fault. The TX_FAULT will be latched high when a laser fault occurs and is cleared by toggling the TX_DISABLE input or cycling the power of the transceiver. The transmitter fault condition can also be monitored via the 2-wire serial interface (address A2, byte 110, bit 2).

Eye Safety Circuit

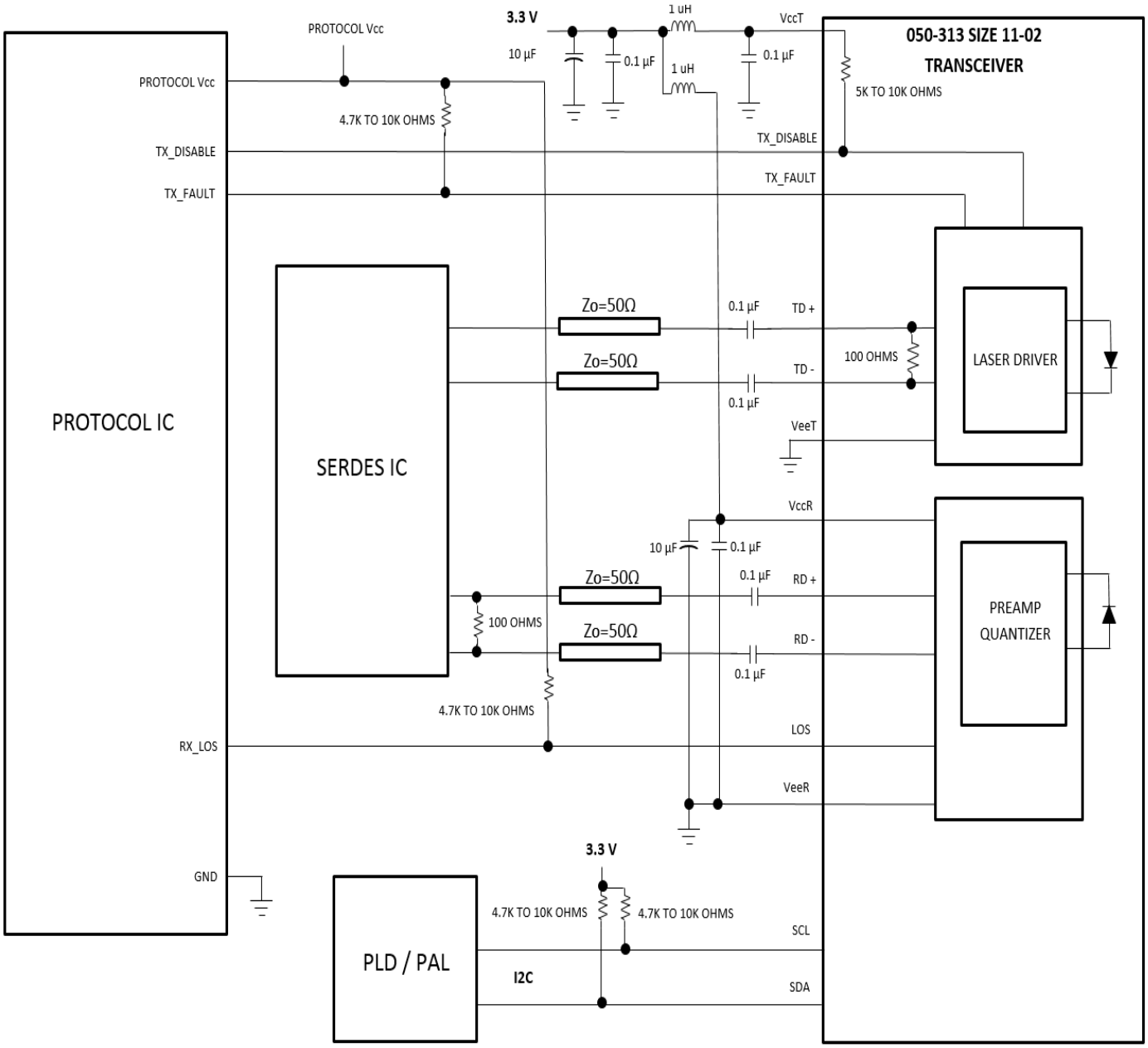
The Transmitter section provides Class 1 eye safety by design and is compliant with US FDA CDRH AEL Class 1 and EN(IEC) 60825-1,2, EN60950 Class 1. The eye safety circuit continuously monitors optical output power levels and will disable the transmitter and assert a TX_FAULT signal upon detecting an unsafe condition. Such unsafe conditions can be created by inputs from the host board (Vcc fluctuation, unbalanced code) or faults within the module.

RECEIVER SECTION

Receiver Loss of Signal (LOS)

The Loss Of Signal (LOS) output indicates an unusable optical input power level. The post-amplification IC includes transition detection circuitry which monitors the ac level of incoming optical signals and provides a TTL/CMOS compatible status signal to the host. A low LOS logic level indicates the presence of an optical input while a high LOS logic level indicates an unusable optical input. The LOS thresholds are factory-set so that a high output indicates a definite optical fault has occurred (e.g. failed transmitter, broken or disconnected fiber connection to the transceiver, etc.).

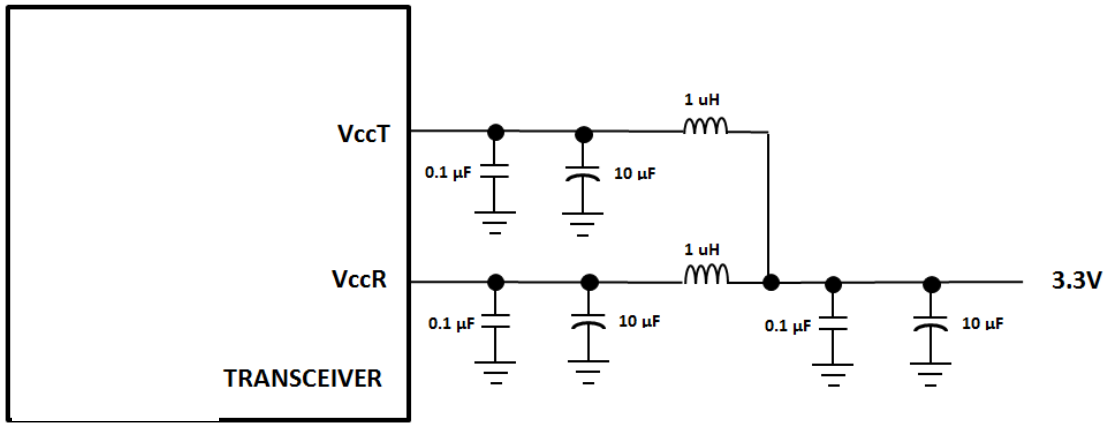
FIGURE 3 RECOMMENDED TRANSCEIVER HOST BOARD SCHEMATIC



Required Host Board Components

A power supply noise rejection filter as describe in SFP MSA is required on the host PCB to meet data sheet performance. This is filter incorporates an inductor which should be rated to 400 mADC and 1 Ω series resistance or better. It should not be replaced with a ferrite. The required filter is illustrated in Figure 4. Also, the host PCB for the PCB Mount Transceiver requires 4.7 K to 10 KΩ pull-up resistors for TX_FAULT, LOS, SCA and SDL lines.

FIGURE 4 RECOMMENDED HOST BOARD POWER SUPPLY FILTERING CIRCUIT



Fiber Compatibility

The transceiver is capable of transmission at 2 to 550 meters with 50/125 µm fiber, and at 2 to 275 meters with 62.5 125 µm fiber, for 1.25 GBd Ethernet. It is capable of transmission up to 550m with 50/125 µm fiber and up to 300m with 62.5/125 µm fiber, for 1.0625 GBd Fiber Channel.

Electrostatic Discharge (ESD)

The Transceiver is compatible with ESD levels found in typical manufacturing and operating environments as described JEDEC EIA JESD22-A114, Class 1C (<2000Volts) HBM. Glenair recommends that devices are handled with ESD precautions to limit exposure to below 500V HBM.

There are two design cases in which immunity to ESD damage is important. The first case is during handling of the transceiver prior to insertion to the host board. To protect the transceiver, it's important to use standard industry ESD handling precautions. These precautions include using grounded wrist straps, work benches, and floor mats in ESD controlled areas. The ESD sensitivity of the Glenair Transceiver is compatible with typical industry production environments.

The second case to consider is static discharges to the exterior of the host equipment after installation, in which case the transceiver may be subject to system-level ESD requirements.

Application Support

To assist in the transceiver design and evaluation process, Glenair offers the following aids:

- Evaluation board & Product Manual which facilitates in the testing of the Transceiver.
- 3D Step file to support modeling of mechanical fit and routing

Customer Manufacturing Processes

Recommended PCB installation soldering: Contacts can withstand locally applied soldering heating of pins typical RoHS compliant solder temperature of 260° for 10 seconds