050-360

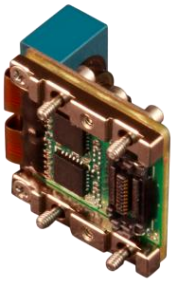
DATA SHEET

100 MBPS-5 GBPS PC BOARD MOUNT DUAL-TRANSMITTER (2) 850NM VCSEL TRANSMITTERS SMALL & COMPACT WITH RUGGED CONSTRUCTION FOR HARSH ENVIRONMENTS INCLUDING RADIATION EXPOSURE

REV	DESCRIPTION	DATE	APPROVED
1	Preliminary	07/13/2015	SZ
2	Updated radiation exposure data	10/01/2015	RL
3	Add ECCN information	11/17/2016	SZ/GC
4	Edit Bag and Tag Labeling	12/13/2016	RAS/GC
5	Add Material/Finish Table and new Evalboard picture	03/10/2017	RAS/GC
6	Change ER to 5dB for “-2” version	10/09/2018	RAS/SZ

050-360 DATASHEET
PC Board Mount Dual-Transmitter
100 Mbps – 5 Gbps, MMF, 3.3V

Radiation-Tolerant Fiber Optic Dual-Transmitter, 100M-5Gbps, 850nm, MMF, 3.3V



Glenair 050-360, is a ruggedized harsh environment PC Board Mount Dual-transmitter designed for use in harsh environments that include high levels of gamma and neutron radiation. The transmitters utilize GaAs vertical cavity surface emitting laser (VCSEL) devices and SiGe/CMOS driver and control electronics that have been tested and found to be tolerant of gamma and neutron radiation exposure to high levels. The electrical control circuitry does not employ a microprocessor. The mechanical design is suited to the harsh temperature and vibration environments found in the Aerospace, Military and Nuclear Industrial applications. The dual-transmitter interfaces with the host PCB through a high speed surface-mount electrical connector.

Each transmitter includes a Transmitter Optical Subassembly (TOSA) and laser driver circuitry. The TOSA, containing an 850 nm VCSEL (Vertical Cavity Surface Emitting Laser) light source, is located at the optical interface and mates with the GC optical connector. The TOSA is driven by a laser driver, which converts differential logic signals into an analog laser diode drive current. This laser driver circuit regulates the optical power at a constant level provided the data pattern is DC balanced (for example 8B10B encoding).

KEY FEATURES/BENEFITS

- SFP Compatible Electrical Input signal levels
- 850nm VCSEL lasers to support up to 5 Gbps
- Industry standard CML outputs that make for simple integration on customer host PCB
- Glenair Rugged GC Optical connector for high shock and vibration applications
- Dual-Transmitter is securely mounted with screws to PCB to ensure excellent shock and vibration performance
- High-Speed Electrical plug-in connector eliminates the need for soldering & enables ease of servicing
- Captive screws to simplify manufacturing logistics and assembly
- Small package size: Approx. 0.8” x 0.9” x 0.5”
- -40°C to +85°C Operating Case Temperature
- Glenair fiber jumpers available to connect from dual-transmitter to any Glenair Mil/Aero Fiber Optic Connector Style
- Evaluation fixtures available
- Radiation exposure test without errors:
  - Gamma: >165 Krad
  - Neutron: 250 x 10^{10} /cm^2

APPLICATIONS

- Harsh Environment such as: Synchrotron Particle Detectors, Nuclear Generation, Medical or Processing Facilities and Equipment, Spacecraft, Shipboard
  - Ethernet, Fibrechannel, 1x, 2x, 4x, SFPDP

HOW TO ORDER

Table 1 Part Number Options

Part Number	Description
050-360-1	100Mbps-2.5Gbps
050-360-2	2.5Gbps-5Gbps

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

TABLE 3 OPERATING CONDITIONS

Parameter	Symbol	Min	Typ	Max	Units	Notes
Operating Temperature, Case	T_{op}	-40		+85	°C	
Supply Voltage	V_{cc}	3.135	3.3	3.465	V	
Supply Current	Icc		180	200	mA	Typical @ +85°C
Power Supply Noise (Peak-Peak)	V_{cc_ripple}			100	mV	

TABLE 4 ELECTRO-OPTICAL CHARACTERISTICS – TRANSMITTER

Parameter	Symbol	Min	Typ	Max	Units	Notes
Optical Output Power	P_{OUT}	-6.5	-5	-1	dBm	850nm VCSEL
Extinction Ratio, 1.25 Gbps, 2.5 Gbps	Er	7	10		dB	Exceeds OMA for GbE, 1FC, 2FC
Extinction Ratio, 2.5 Gbps, 4.25 Gbps	Er	5			dB	Exceeds OMA for 4FC
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 RESERVED

Parameter	Symbol	Min	Typ	Max	Units	Notes

Ratings and Specifications (continued)

TABLE 6 COMPLIANCE SPECIFICATIONS

CHARACTERISTIC	Standard	Condition	Notes
Mechanical Shock	MIL-STD-810	Para. 516.6, proc. I, 650g	0.9 ms operating
Mechanical Vibration	MIL-STD-810	Para. 514.6, 40g rms	Random, operating
ESD	MIL-STD-883		1000V HBM
Flame Resistance	MIL-STD-1344	Method 1012, Cond. B	30 seconds
Damp Heat	MIL-STD-1344	Method 1002.2, Cond. B	10 cycles , 24 hours
Eye Safety	CDRH and IEC-825	Class 1 Laser Product	

TABLE 7 MATERIAL/FINISH

Item	Material/Finish
PCB	FR4
PCB flex	FR4 & Polyimide
Railings	Aluminum 6061-T6 per ASTM-B221/B211M or Equivalent
Screws	CRES Type, 302, 303, 304, 305, or 316
Optical Ferrules & Sleeves	Zirconia, Ceramic
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:

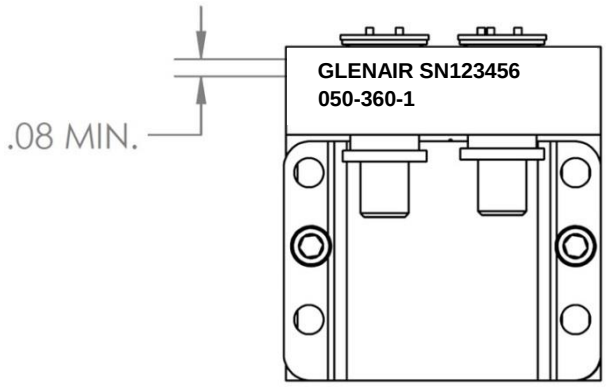
Each unit will be shipped in an antistatic bag. The label on the antistatic bag shall be at a minimum Arial size 10 black font and contain at a minimum the following information:

ANTISTATIC BAG LABEL:
Glenair
Cage Code: 06324
PN: 050-360-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

Each unit will be marked, either with a label or laser engraving, as follows:

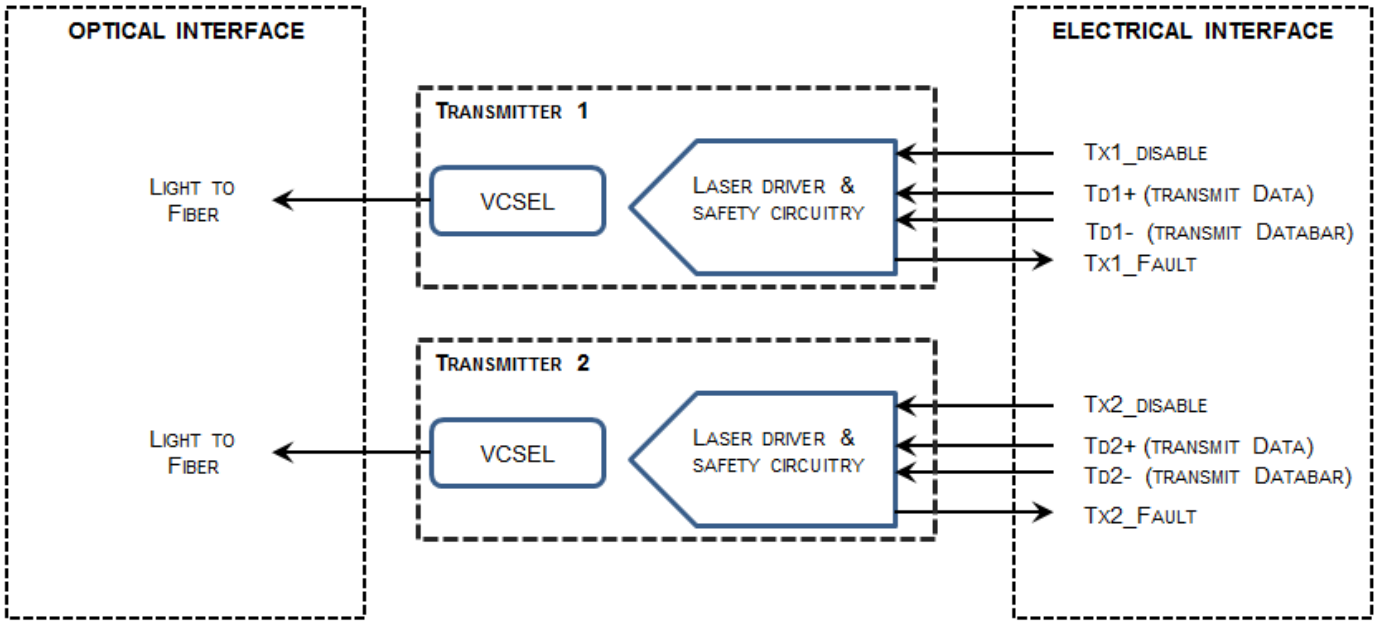
1. Marking font to be Arial, greater than .08 inches in height.
2. Minimum Marking on each part will include the following:
   - Glenair
   - Serial number
   - Glenair Part Number

Example Minimum Marking:
GLENAIR SN123456
050-360-1



FUNCTIONAL DESCRIPTION

Figure 2 **Board Mount Dual-Transmitter Block Diagram**



TRANSMITTER SECTION

Transmit Disable (TX1_Disable and TX2_Disable)

The transmitters accept 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 dual-transmitter 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 (TX1_FAULT and TX2_FAULT)

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 dual-transmitter.

Eye Safety Circuit

The Transmitters 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.

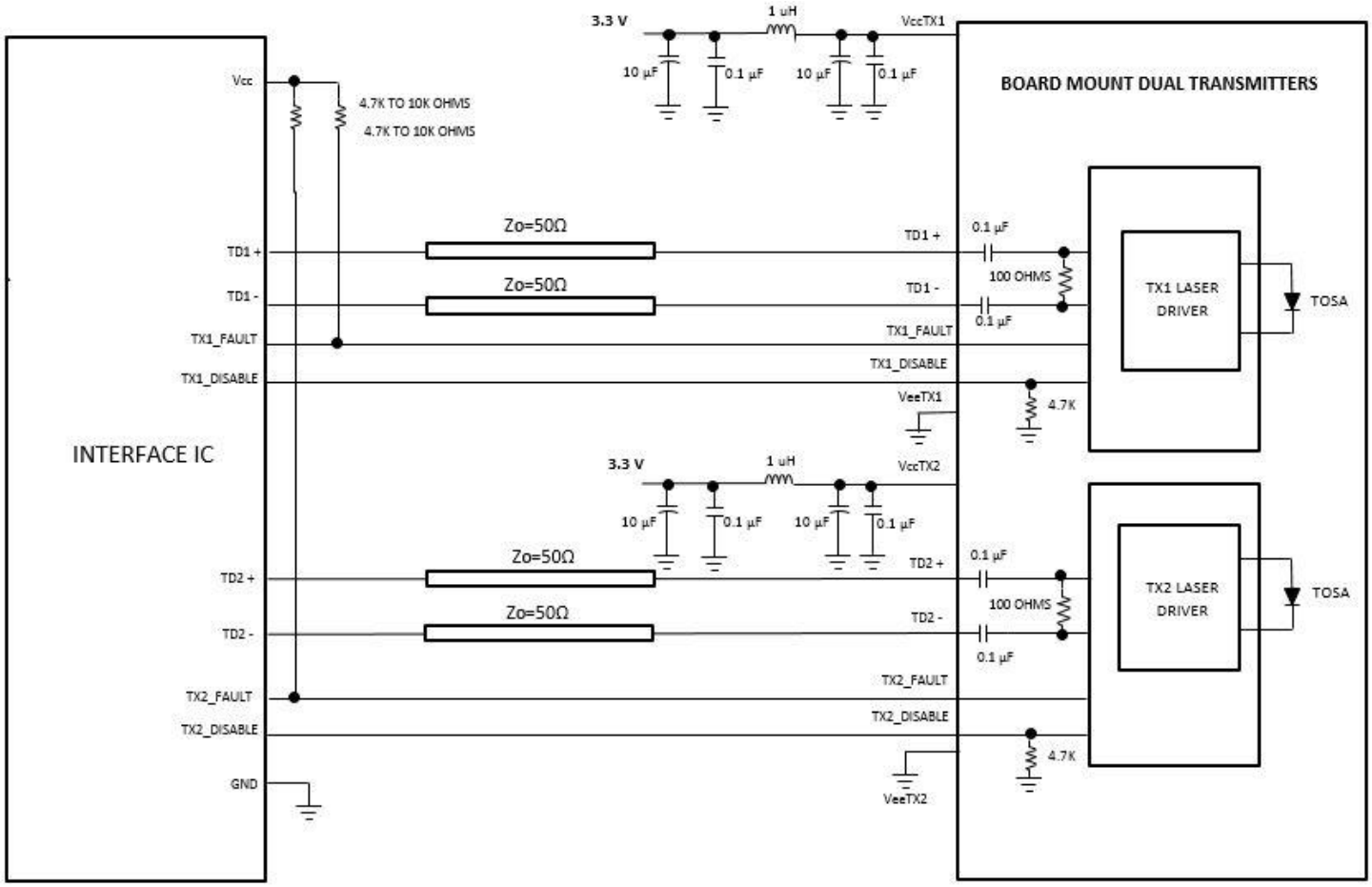
FUNCTIONAL I/O

The PC board mount dual-transmitter accepts industry standard differential signals such as LVPECL and CML within the scope of the SFP MSA.

Figure 3 illustrates a recommended interface circuit to link the PC board mount dual-transmitter to the supporting Physical Layer integrated circuits.

The PC board mount dual-transmitter interfaces with the host circuit board through twenty I/O pins identified by function in Table 8. The dual-transmitter high speed transmit and receive interfaces require SFP MSA compliant signal lines on the host board. The TX1_DISABLE, TX2_DISABLE, TX1_FAULT and TX2_FAULT require TTL lines on the host if used. If an application chooses not to take advantage of the functionality of these pins TX1_Disable and TX2_Disable need to be tied to GND, TX1_Fault, TX2_Fault do not need to be connected.

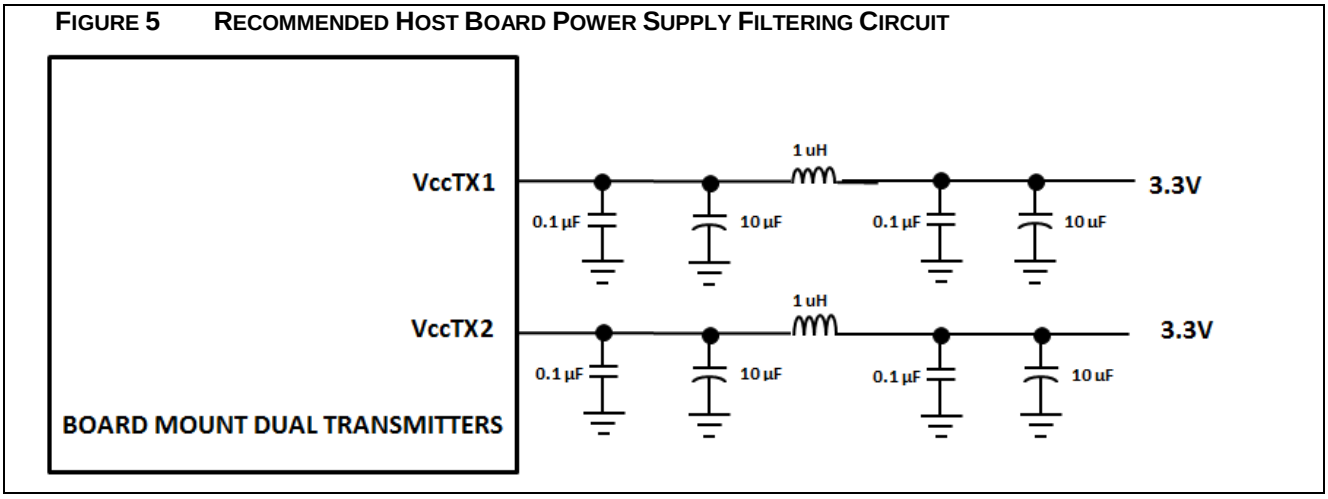
FIGURE 3 RECOMMENDED BOARD MOUNT DUAL-TRANSMITTER HOST BOARD SCHEMATIC



Required Host Board Components

A power supply noise rejection filter is required on the host PCB to meet data sheet performance. This filter incorporates an inductor which should be rated 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 board mount dual-transmitter requires 4.7 K to 10 KΩ pull-up resistors for TX1_FAULT and TX2_FAULT lines.

FIGURE 5 RECOMMENDED HOST BOARD POWER SUPPLY FILTERING CIRCUIT



Fiber Compatibility

The dual-transmitter 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 Dual-transmitter is compatible with ESD levels found in typical manufacturing and operating environments as described JEDEC EIA JESD22-A114-A, Class 1 (<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 dual-transmitter prior to insertion to the host board. To protect the dual-transmitter, 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 board mount dual-transmitter 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 dual-transmitter may be subject to system-level ESD requirements.

Application Support

To assist in the dual-transmitter design and evaluation process, Glenair offers the following aids:

- Evaluation board & Product Manual, part number 050-330-MMF-EVALBOARD, which facilitates in the testing of the board mount dual-transmitter.
- 3D Step file to support modeling of mechanical fit and routing
- PADS schematic and PCB layout library files that can be exported into customer's PCB software design program
- Applications Aid Example of PCB layout including details of high speed transmission designs

Customer Manufacturing Processes

This module is mounted with screws and interfaces with a high-speed low cost surface mount electrical connector residing on the host PC board. The board mount dual-transmitter is not designed for aqueous wash, IR reflow, or wave soldering processes and should be mounted on the host board after host PC board has been through its assembly process.

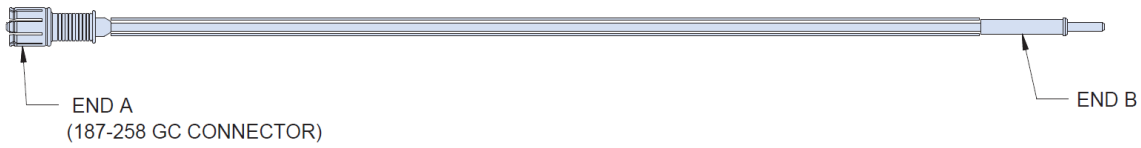
ACCESSORIES

Fiber Optic Jumper Cables to support connection to Mil/Aerospace Connectors

KEY FEATURES:

- Jumper cable between Glenair Dual-transmitter (end A) and Mil/Aero Connector termini (End B)
- Offered with either Multimode and Single Mode fibers

FIGURE 6
Fiber Optic Jumper Cable Assembly (see separate Glenair sales drawing FA02454 for details)



PCB Threaded Inserts, PN 059-0007

KEY FEATURES

- Simplifies installation of board mount dual-transmitters eliminating the need for washers and nuts
- Soldered to PCB to eliminate need for handling nuts during assembly
- Existing Options to support PCB thickness from 0.03” to 0.92”
- Can support thicker PCB if required

EVALUATION Boards, PN 050-330, Include

- MANUAL with test block diagram, schematic and Evaluation board PCBA
- Multiple types of board mount Dual-transmitter modules supported by this evaluation board
- 2 fiber optic cables (~1m, GC connector to LC connector)