DATA SHEET
Small Form Factor LC Fiber Optic Transceiver

GOULD
Fiber Optics

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FEATURES

- Compliant with Specifications for IEEE 802.3z / Gigabit Ethernet
- Multi-sourced 2x5 Package Style with Integral LC Connector
- Performance
  - 850nm VCSEL -550m Links in 50/125 um MMF Cables
  - 1310nm FP-10km Links in 9/125 um SMF Cables
- Single +3.3V Power Supply Operation with PECL Logic I/O Interfaces(DC/AC coupling is optional), TTL Signal Detect and Transmit Disable

APPLICATIONS

- Switch to Switch Interface
- Switched Backbone Application
- High Speed Interface for File Serve
- High Performance Desktop

DESCRIPTION

The SFF transceiver from Gould allows the system designer to implement a range of solutions for multimode/ single mode Gigabit Ethernet applications. The transceivers are configured in the multi-sourced industry standard 2x5 dual-in-line package with an integral LC fiber connector.

Transmitter Section

The transmitter section consists of two options of an 850NM VCSEL or 1310nm FP laser. The laser is driven by a custom IC which accepts differential PECL logic signal and provides bias and modulation control for the laser.

Receiver Section

The receiver of the 850NM VCSEL/1310NM FP includes PIN photodiode with preamplifier in TO-CAN and limited amplifier in PCB. The limited amplifier also includes a Signal Detect circuit which provides a TTL logic- high output upon detection of an optical signal.

APPLICATION SUPPORT

Package and handling Instructions

Package

The package of 850NM VCSEL/1310NM FP is made of metal.

Recommended Solder

The 850NM VCSEL/1310NM FP is compatible with industry standard wave or hand solder processes.

Process Plug

This transceiver is supplied with a process plug for protection of the optical port within the LC connector receptacle. This process plug prevents contamination during wave solder and aqueous rinse as well as during handing, shipping and storage.

Cautions

Electrostatic Discharge

There are two design cases in which immunity to ESD damage is important.

The first case is during handling of the transceiver prior to mounting it on the circuit board. It is important to use normal ESD handling precaution for ESD sensitive devises. These precaution include using grounded wrist straps, work benches, and floor mats in ESD controlled areas. The transceiver performance has been shown to provide adequate performance in typical industry production environments.

The second case to consider is static discharges to the exterior of the equipment chassis containing the transceiver parts. To the extent that the LC connector receptacle is exposed to the out side of the equipment chassis it may be subject to whatever system-level ESD test criteria that the equipment is intended to meet.

Electromagnetic Interference (EMI)
Most equipment designs utilizing GOULD's transceivers will be required to meet the requirements of FCC in the United States, CENELEC EN55022 in Europe and VCCI in Japan.

Immunity
Transceivers of GOULD have good immunity due to the special circuit and shielded design.

Eye Safety
These laser-based transceivers are classified as AEL Class I (U.S.21 CFR(J))and AEL Class I . They are eye safety when used within the datasheet parameter limits and under normal operating condition and under all reasonably foreseeable single fault conditions.

Optical Power Budget and Link Penalties

The worst case optical power budget (OPB) in dB for a fiber optic link is determined by the difference between the minimum transmitter output optical power and minimum receiver sensitivity. This OPB provides the necessary optical signal range to establish a working fiber-optic link. The OPB is allocated for the fiberoptic cable length and the corresponding link penalties. For proper link performance, all penalties that affect the link performance must be accounted for within the link optical power budged.

Data Line Interconnection

850NM VCSEL/1310NM FP are designed to couple to +3.3V PECL signals (DC/AC couple is optional). Figure 3 depicts the circuit options. The transmitter section maintains average optical power of the laser with automatic power control (APC). Compliant with the multi-source agreement, 850NM VCSEL/1310NM FP feature a transmit disable function which is a single-ended +3.3V TTL input. The receiver section is ac-coupled between the preamplifier and the limited-amplifier. The Data and Data-bar outputs of the limited-amplifier are AC/DC (optional) coupled to the host board. Signal detect is a single ended +3.3V TTL output and it should be dc-coupled to the following circuits.

Electrical and Mechanical Interface Recommended Circuit

Figure 3 shows the recommended interface for deploying 850NM VCSEL/1310NM FP. The power supply filtering arrangements is complied with the SFF MSA.

Power Supply Filtering and Ground Planes

Apart from the recommended power supply filtering circuit, it should be noticed that a continuous ground plane under the transceiver is very important for signal return current. To maximize the shielding effectiveness and minimize the impact of conducted and radiated noise upon receiver

performance the metal cover at the rear of 850NM VCSEL/1310NM FP should be connected to the host board.

Package footprint Considerations

The footprint of 850NM VCSEL/1310NM FP complies with SFF MSA.

Eye Safety Circuit

For an optical transmitter device to be eye-safety in the event of a single fault failure, the transmitter must either maintain eye-safe operation or be disabled.
850NM VCSEL provides three key elements to the laser driver safety circuitry: a monitor diode, a window detector circuit, and direct control of the laser bias. The window detector circuit monitors the average optical power using the monitor diode. If a fault occurs such that the transmitter dc regulation circuit cannot maintain the preset bias conditions for the laser emitter, the transmitter will automatically be disabled. Once this has occurred, an electrical power reset or toggling the transmit disable will allow an attempted turn-on of the transmitter. If fault remains the transmitter will stay disabled. 1310NM FP utilizes an optical subassembly consisting of a short piece of single mode fiber along with a current limiting circuit to guarantee eye-safety. It is intrinsically eye safe and does not require shut down circuitry.

Signal Detect

The Signal Detection circuit provides a TTL low output signal when the optical link is broken or when the optical link is broken or when the transmitter is OFF as defined by the Gigabit Ethernet specification IEEE 802.3z. The Signal Detection threshold is set to transition from a high to low state between the minimum receiver input optional power and –30dBm avg. input optical power indicating a definite optical fault. But it does not detect receiver data error or error-rate.

Electromagnetic Interference (EMI)

850NM VCSEL/1310NM FP has excellent EMI performance for applying in high port density. The nose shields provide a convenient chassis connection to improve EMI suppression.

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Storage Temperature	Ts	-40		+85	℃
Supply Voltage	Vcc	-0.5		5.0	V
Relative Humidity	RH	5		95	%

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Ambient Operating Temperature	T_A	0		+70	℃
Case Temperature	T_c	0		+80	℃
Supply Voltage	Vcc	3.14		3.47	V
Transmitter Differential Input Voltage	V_D	0.4		1.6	V
Received Data Output Load	R_{DL}		50		Ω
Transmitter Disable Input Voltage-Low	R_{IL}			0.8	V
Transmitter Disable Input Voltage-High	R_{IH}	V_{cc}-1.3		V_{cc}	V

Process Compatibility

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Hand Lead Soldering Temperature/Time	T_{sold}/t_{sold}			+260/10	℃/sec
Wave Soldering and Aqueous Wash	T_{sold}/t_{sold}			+260/10	℃/sec

850nm VCSEL

Transmitter Characteristics

(T_A=0• to 70•, Vcc=3.14 to 3.47)

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Supply Current	I_{ccT}			110	mA
Power Dissipation	P_{dist}			0.38	W
Output Optical Power 50/125um NA=0.20,Fiber	P_{out}	-9.5		-4	dBm
Disabled Transmit Output Power				-30	dBm
Extinction Ratio		9.0			dB
Center wavelength		830	850	860	nm
Spectral Width -rms				0.85	nm

Receiver Characteristics

(T_A=0℃ to 70℃, Vcc=3.14 to 3.47)

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Supply Current	I_{ccT}			80	mA
Power Dissipation	P_{dist}			0.28	W
Data Output Voltage-Low	V_{oL}-Vcc	-1.95		-1.62	V
Data Output Voltage-High	V_{oH}-Vcc	-1.05		-0.74	V
Signal Detect Output Voltage-Low	V_{oL}			0.6	V
Signal Detect Output Voltage-High	V_{oH}	2.2			V
Optical Input Sensitivity	P_{MIN}			-17	dBm
Optical Input Saturation	P_{MAX}			0	dBm
Return Loss		12			dB
Signal Detect-Asserted	P_A			-17	dBm
Signal Detect-Deasserted	P_D	-30			dBm
Signal Detect-Hysteresis	P_A - P_D	2			dB

1310nm FP

Transmitter Characteristics

(T_A=0℃ to 70℃, Vcc=3.14 to 3.47)

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Supply Current	I_{ccT}			120	mA
Power Dissipation	P_{dist}			0.42	W
Output Optical Power 9/125um NA=0.20,Fiber	P_{out}	-9.5		-3	dBm
Disabled Transmit Output Power				-30	dBm
Extinction Ratio		9.0			dB
Center wavelength		1280	1310	1330	nm
Spectral Width -rms				3	nm

Receiver Characteristics
(T_A=0℃ to 70℃, V_{CC}=3.14 to 3.47)

Parameter	Symbol	Min.	Typ.	Max.	UNITS
Supply Current	I_{CCT}			100	mA
Power Dissipation	Pdist			0.33	W
Data Output Voltage-Low	V_{OL}-V_{CC}	-1.81		-1.62	V
Data Output Voltage-High	V_{OH}-V_{CC}	-1.05		-0.88	V
Signal Detect Output Voltage-Low	V_{OL}			0.6	V
Signal Detect Output Voltage-High	V_{OH}	2.2			V
Optical Input Sensitivity	P_{MIN}			-20	dBm
Optical Input Saturation	P_{MAX}			0	dBm
Return Loss		12			dB
Signal Detect-Asserted	P_A			-20	dBm
Signal Detect-Deasserted	P_D	-30			dBm
Signal Detect-Hysteresis	P_A - P_D	2			dB

PIN TABLE

Pin	Symbol	Functional Description
1	V_{EER}	Receiver Signal Ground
2	V_{CCR}	Receiver Power Supply
3	SD	Signal Detect Normal Operation: logic “1”output Fault Condition: logic “0”output
4	RD-	Received Data Output Bar
5	RD+	Receiver data output
6	V_{CCT}	Transmitter Power Supply
7	V_{EET}	Transmitter Signal Ground
8	TDis	Transmitter Disable Normal Operation: logic “0”--Laser On or Open Circuit Transmit Disabled: logic “1” --Laser Off
9	TD+	Transmitter Data In
10	TD-	Transmitter data In Bar

Pin Out

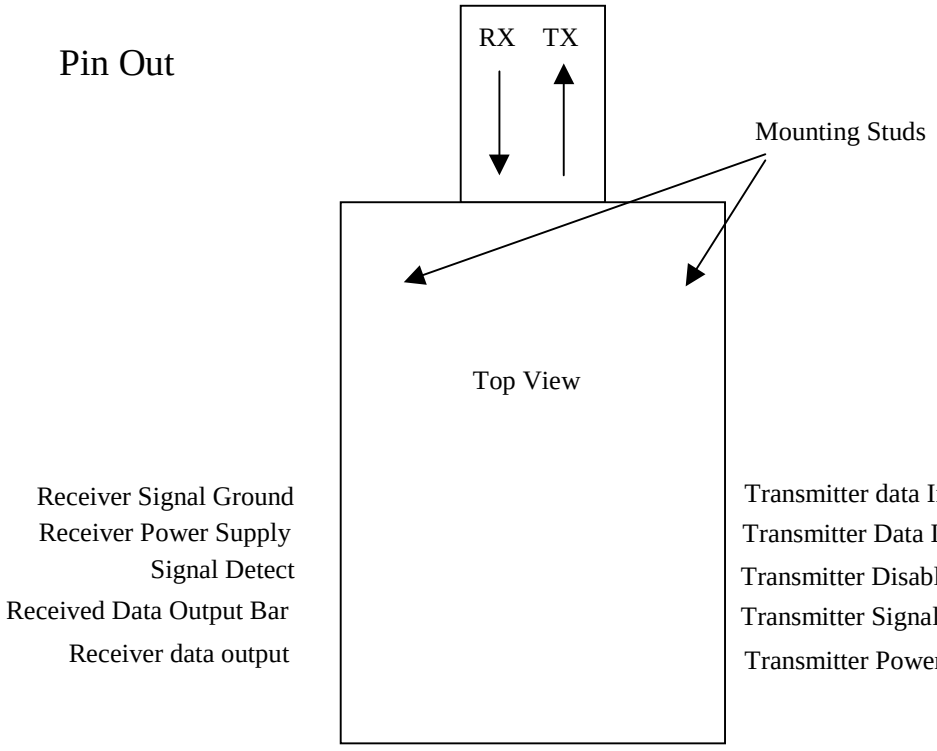
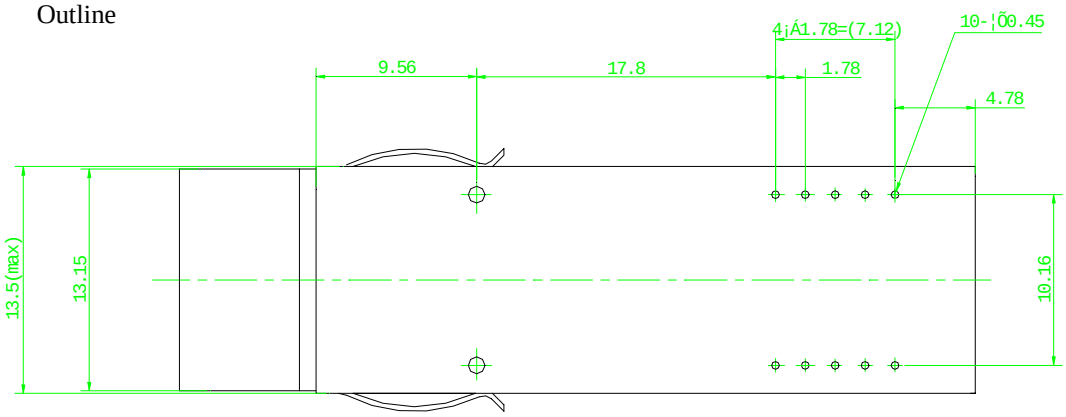
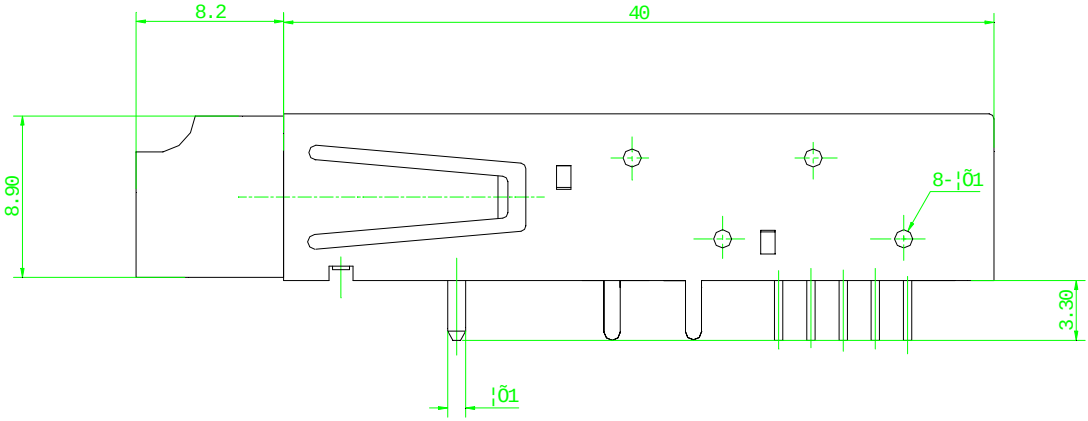


Figure 2
Package
Outline

Top View



Side View



Bottom View

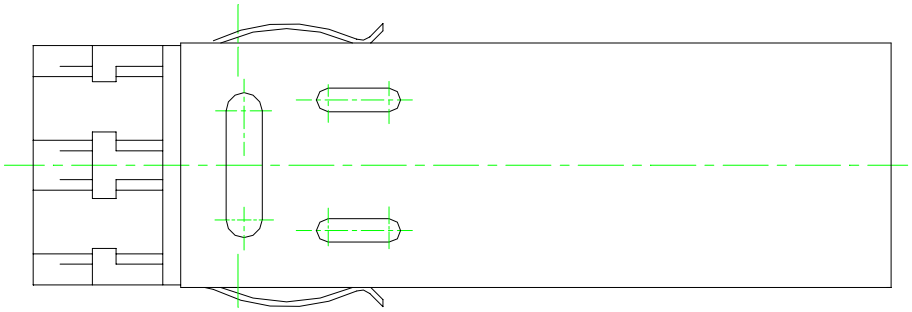


Figure 3 Recommended Interface Circuit

Figure 3(b) DC Coupling

Recommended Interface Circuit

1. DC coupling

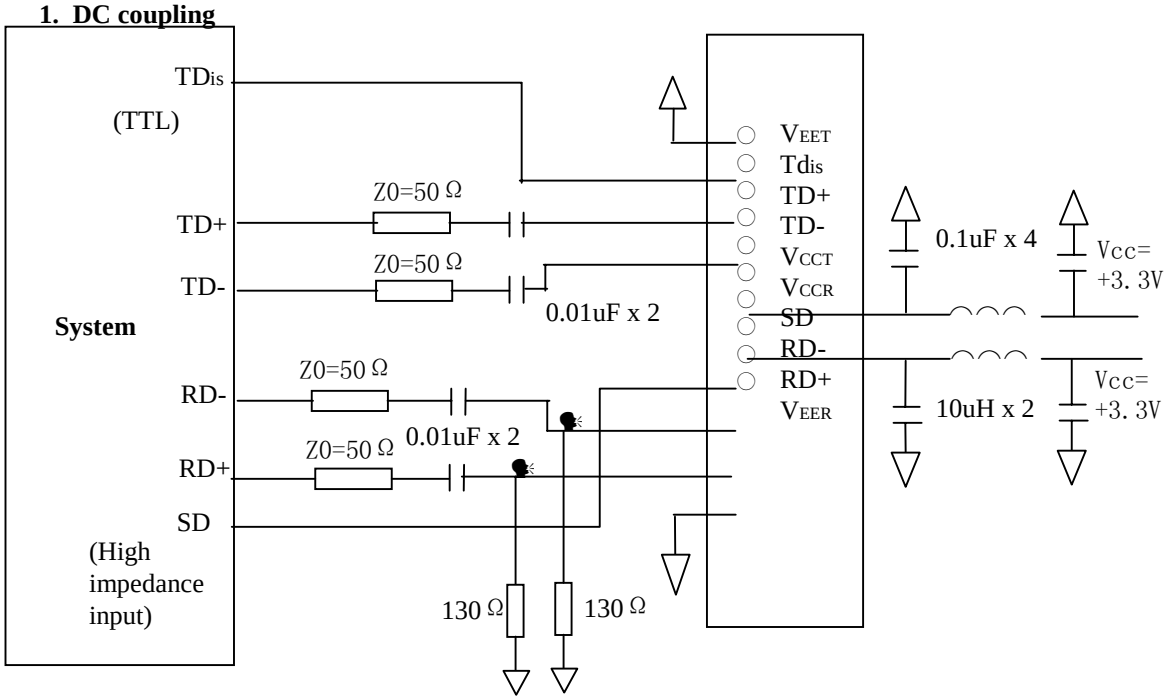
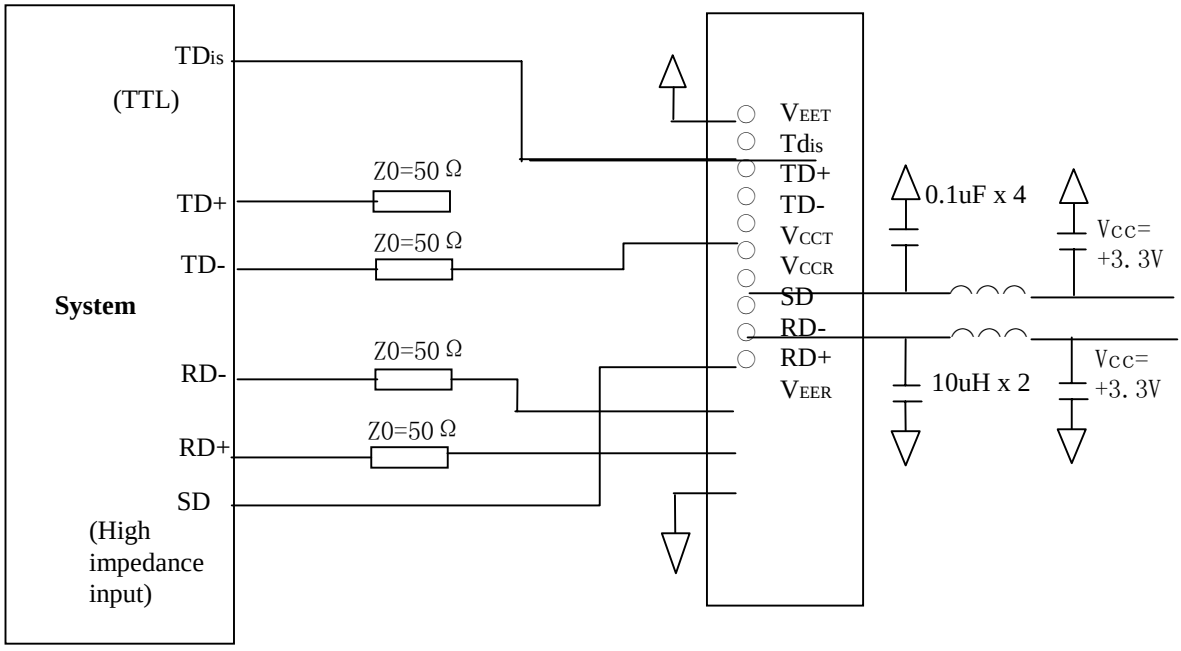


Figure 3(b) AC Coupling

2. AC coupling

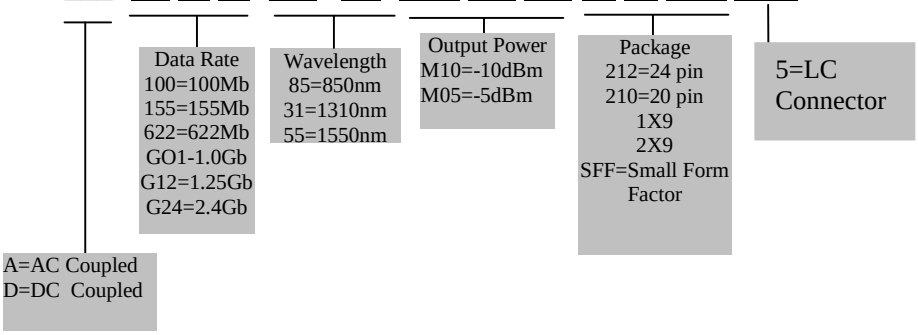


ORDERING INFORMATION

Transceivers

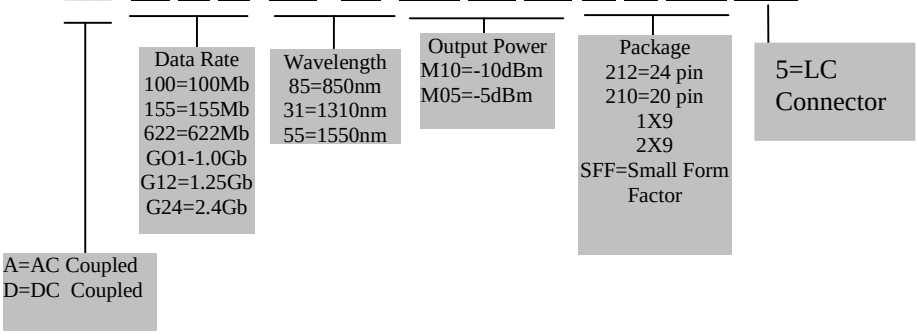
850nm VCSEL

TC -___ - G 1 2 - 8 5 - M 1 0 - S F F - 5



1310 FP Laser

TC -___ - G 1 2 - 3 1 - M 1 0 - S F F - 5



For custom options and additional information, please contact us at:

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