DTR-1250-SM

Gigabit Ethernet 1x9 Single Mode Transceivers

Features

- ☑ *Compliant with IEEE 802.3z Draft D5.0 1000BASE-LX Specifications for Gigabit Ethernet*
- ☑ *Distance Options to Support 5km to 70km*
- ☑ *Eye Safe (Class I Laser Safety)*
- ☑ *Excellent EMI & ESD Protection*
- ☑ *Multi-sourced 1x9 Package Style*
- ☑ *Conductive Plastic or Metal Package*
- ☑ *PCI-mezzanine-compliant Conductive Plastic Package (9.8mm maximum height)*
- ☑ *Single +5V Power Supply & PECL Interface*
- ☑ *PECL Signal Detect Output*
- ☑ *Wave Solder Process Compatible*

Description

The DTR-1250-SM series of fiber optic transceivers provide a quick and reliable interface for 1000BASE-LX Gigabit Ethernet applications. In addition to option "L2" for the 5km distance specified in IEEE 802.3z Draft D5.0, five other options with longer distance capability are offered. Option "L1" uses a high power 1310nm Fabry Perot laser with narrower spectral width and center wavelength range to increase the distance to at least 10km. Option "L0" uses an even higher power 1310nm Fabry Perot laser to offer more optical link power budget. Option "H3" uses a 1310nm DFB laser and a high sensitivity receiver to increase the distance to 30km (assuming fiber loss of 0.35dB/km). Option "H5" uses a 1550nm DFB laser and a high sensitivity receiver to increase the distance to over 40km (assuming fiber loss of 0.25dB/km). Finally, option "H7" uses a high power 1550nm DFB laser and an ultra high sensitivity receiver to increase the distance to 70km (assuming fiber loss of 0.25dB/km). All modules satisfy Class I Laser Safety requirements in accordance with the U.S. FDA/CDRH and international IEC-825 standards.

The transmit and receive functions are contained in a single one-row, 9-pin (1x9) package with a Duplex SC, ST or FC optical interface. The transceiver package is made of either PCI-mezzanine-compliant *conductive* plastic (Duplex SC version) with blue coloring or metal (ST and FC version) for excellent EMI shielding.

The transmitter and receiver data interfaces are differential direct-coupled PECL. An alternate version with AC coupling interface is also available. The receiver signal detect output interface is direct-coupled PECL.

The transceivers operate from a single +5V power supply over an operating case temperature range of 0°C to +70°C. A low power consumption version with 3.3 V supply voltage is also offered. Please refer to the DTR-1250-3.3-SM data sheet.

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{st}	- 40	+ 85	°C
Operating Case Temperature	T_{op}	0	+ 70	°C
Supply Voltage	V_{CC}	- 0.5	+ 6.0	V
Input Voltage	V_{in}	- 0.5	V_{CC}	V
Output Current	I_O	-	50	mA
Lead Soldering Temperature & Time	-	-	260°C, 10 sec	

Transmitter Performance Characteristics (over Operating Case Temperature, V_{CC} = 4.75 to 5.25V)

All parameters guaranteed only at typical data rate

Parameter		Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate[1]		B	-	1250	-	Mb/s
Optical Output Power[2]	L2	P_o	- 11.0	-	- 3.0	dBm
	L1		- 9.0	-	- 3.0	
	L0		- 5.0	-	0	
	H3, H5		- 4.0	-	1.0	
	H7		- 3.0	-	2.0	
Center Wavelength	L2	λ_c	1270	1310	1355	nm
	L1, L0		1285	1310	1345	
	H3		1280	1310	1335	
	H5, H7		1480	1550	1580	
Spectral Width (RMS)	L2	$\Delta\lambda_{RMS}$	-	-	4.0	nm
	L1, L0		-	-	2.5	
Spectral Width (-20dB)	H3, H5, H7	$\Delta\lambda_{20}$	-	-	1.0	nm
Extinction Ratio		P_{hi}/P_{lo}	9	-	-	dB
Deterministic Jitter		DJ	-	-	80	ps
Random Jitter		RJ	-	-	147	ps
Relative Intensity Noise		RIN	-	-	- 120	dB/Hz
Transmitter Output Eye		Compliant with Eye Mask Defined in IEEE 802.3z Standard				

[1]Data rate ranges from 50Mb/s to 1300Mb/s. However, some degradation may be incurred in overall performance.
[2]Measured average power coupled into single mode fiber (SMF). For 50μm or 62.5μm multimode fiber (MMF) operation, the output power is 0.5dB less and is measured after a single mode fiber offset-launch mode-conditioning patch cord as specified in IEEE 802.3z Draft 5.0.

Receiver Performance Characteristics (over Operating Case Temperature, V_{CC} = 4.75 to 5.25V)

All parameters guaranteed only at typical data rate

Parameter			Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate[1]			B	-	1250	-	Mb/s
Minimum Input Optical Power (10^{-12} BER)[2]		L2, L1, L0	P_{min}	- 20.0	-	-	dBm
		H3, H5		- 21.0	-	-	
		H7		- 23.0	-	-	
Maximum Input Optical Power (10^{-12} BER)[2]			P_{max}	- 3.0	-	-	dBm
Signal Detect Thresholds	Increasing Light Input	L2, L1, L0	P_{sd+}	-	-	- 20.0	dBm
		H3, H5		-	-	- 21.0	
		H7		-	-	- 23.0	
	Decreasing Light Input		P_{sd-}	- 30.0	-	-	
Signal Detect Hysteresis			-	0.5	-	-	dB
Deterministic Jitter			DJ	-	-	170	ps
Random Jitter			RJ	-	-	96	ps
Wavelength of Operation			λ	1100	-	1600	nm
Optical Return Loss			ORL	12	-	-	dB
Electrical 3dB Upper Cutoff Frequency			-	-	-	1500	MHz
Stressed Receiver Sensitivity			Compliant with IEEE 802.3z Standard				

[1]Data rate ranges from 1000Mb/s to 1300Mb/s. However, some degradation may be incurred in overall performance.
[2]Measured with 2^7-1 PRBS at 1250Mb/s at 1310nm wavelength.

Laser Safety: All transceivers are Class I Laser products per FDA/CDRH and IEC-825 standards. They must be operated under specified operating conditions.

Optical Communication Products, Inc.
DATE OF MANUFACTURE:

MANUFACTURED IN THE USA
This product complies with
21 CFR 1040.10 and 1040.11
Meets Class I Laser Safety Requirements

Transmitter Electrical Interface (over Operating Case Temperature, V_{CC} = 4.75 to 5.25V)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input HIGH Voltage[1]	V_{IH}	V_{CC} - 1.165	-	V_{CC} - 0.700	V
Input LOW Voltage[1]	V_{IL}	V_{CC} - 1.890	-	V_{CC} - 1.475	V
Data Input Current - HIGH	I_H	-	-	350	µA
Data Input Current - LOW	I_L	-	-	250	µA
[1]For AC-coupled modules, the input voltage swing is 0.3V minimum and 1.2V maximum.					

Receiver Electrical Interface (over Operating Case Temperature, V_{CC} = 4.75 to 5.25V)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output HIGH Voltage[1]	V_{OH}	V_{CC} - 1.035	-	V_{CC} - 0.700	V
Output LOW Voltage[1]	V_{OL}	V_{CC} - 1.950	-	V_{CC} - 1.595	V
Output Current	I_O	-	-	25	mA
[1]For AC-coupled modules, the output voltage swing into 50Ω load is 0.3V minimum and 1V maximum.					

Electrical Power Supply Characteristics (over Operating Case Temperature, V_{CC} = 4.75 to 5.25V)

Parameter		Symbol	Minimum	Typical	Maximum	Units
Supply Voltage		V_{CC}	4.75	5.0	5.25	V
Supply Current	DC-coupled module	I_{CC}	-	160	250	mA
	AC-coupled module	I_{CC}	-	180	270	mA

Pin Assignments

PIN	FUNCTION
1	RX GND
2	RD+ (RX DATA OUT+)
3	RD- (RX DATA OUT-)
4	SD (RX SIGNAL DETECT)
5	V_{CC}RX
6	V_{CC}TX
7	TD- (TX DATA IN-)
8	TD+ (TX DATA IN+)
9	TX GND

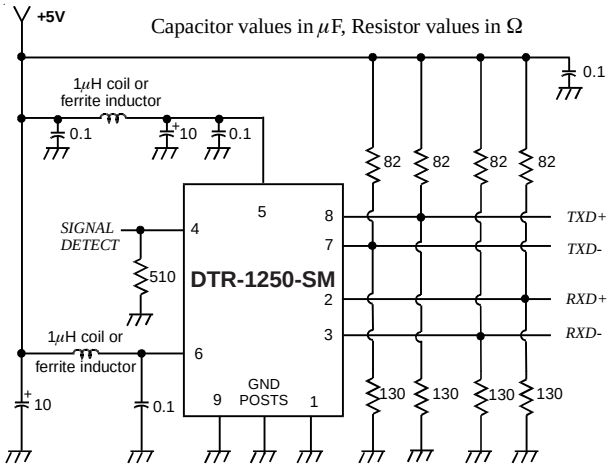


Fig.1 Interfacing DC-coupled module with direct-PECL signals

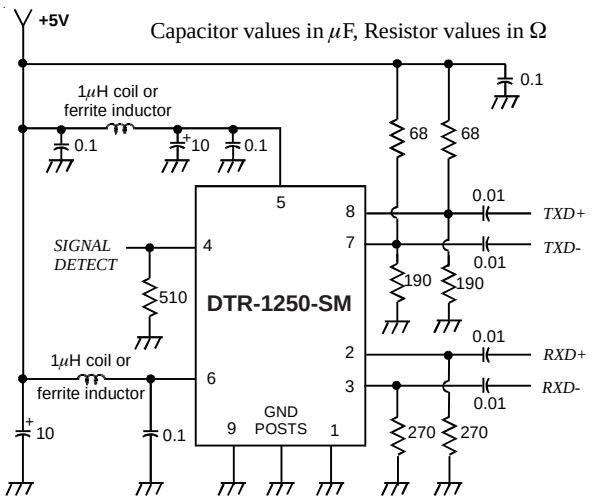


Fig.2 Interfacing DC-coupled module with 3.3 V SERDES IC

Application Notes

DATA interface (DC-coupled module): The interface circuit for the standard DC-coupled module with direct-coupled PECL interface is shown in Figure 1. The termination resistors for the transmitter should be close to the DTR transceiver module. The termination resistors for the receiver (50Ω to V_{CC} - 2V or the Thevenin equivalent resistors shown) should be close to the PHY or SERDES IC, which receives the DATA outputs. When interfacing with 3.3V SERDES IC, AC coupling can be used as shown in Figure 2. The termination resistors required by the SERDES are not shown in this figure.

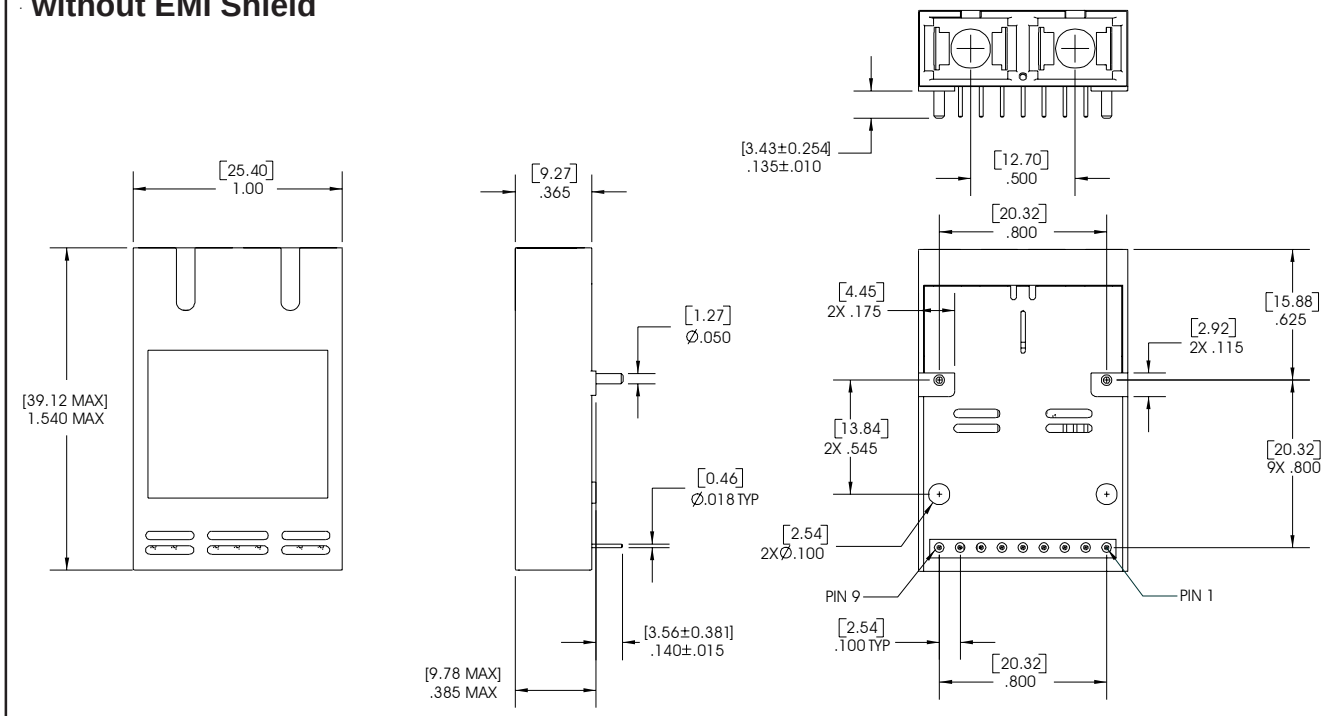
The transmitter incorporates an Average Power Control (APC) loop to stabilize the average optical output power against temperature variation; therefore, when the input data is all continuous "zeroes" or all continuous "ones", the transmitter optical output power is a constant level equal to the nominal average optical output power (not at the "OFF" or "ON" level).

DATA interface (AC-coupled module): For modules with AC coupling option, both transmitter and receiver interfaces have internal bias, termination and AC coupling capacitors. The transmitter can be directly connected to the driving SERDES. The receiver can be connected directly to the external 50Ω load (termination resistor of the SERDES).

SIGNAL DETECT: The signal detect circuit monitors the level of the incoming optical signal and generates a logic LOW signal when an insufficient photocurrent is produced. The signal detect output is PECL level requiring termination (510Ω to *GND* is recommended).

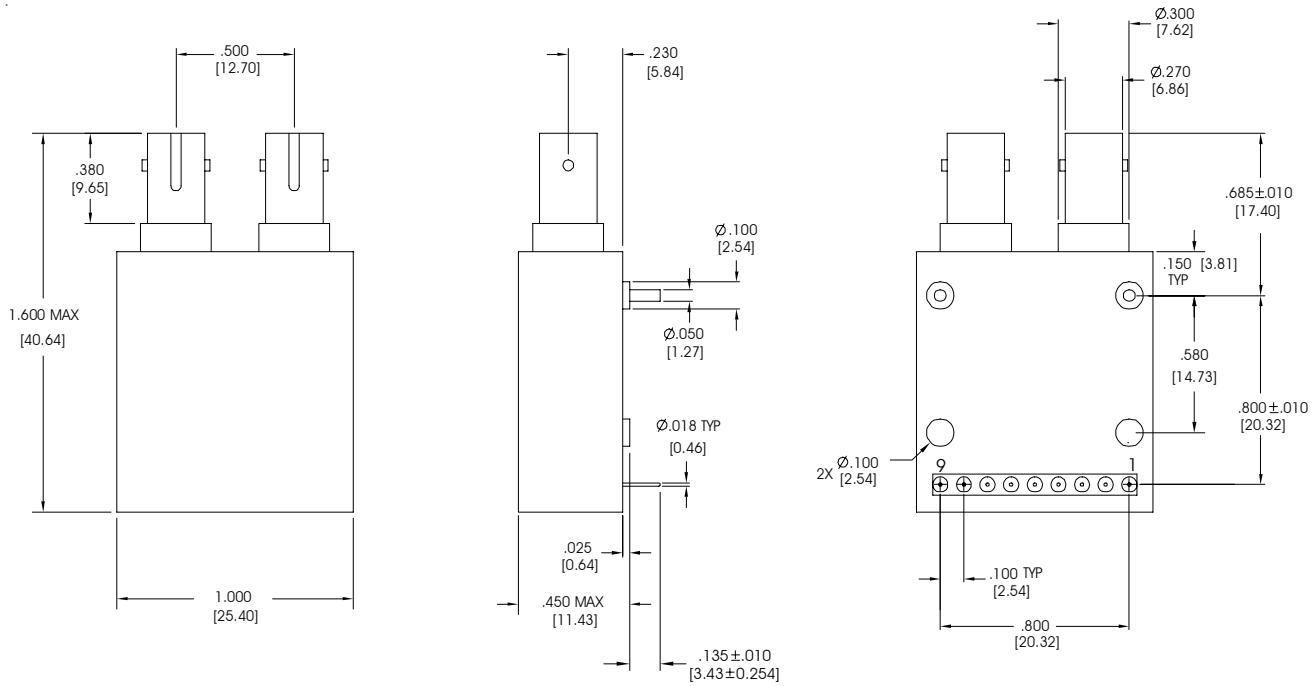
Power supply and grounding: The power supply line should be well-filtered. All 0.1μF power supply bypass capacitors should be as close to the DTR transceiver module as possible. The two front GND posts should be grounded to circuit ground or chassis ground.

Duplex SC Receptacle Package without EMI Shield



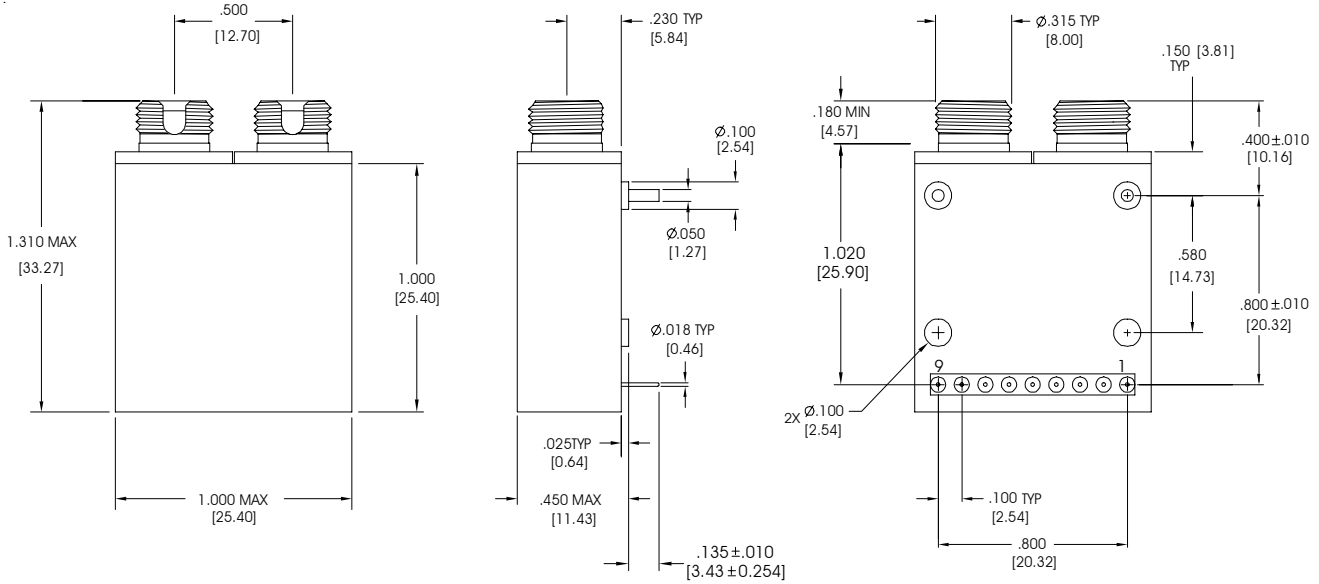
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

ST Receptacle Package



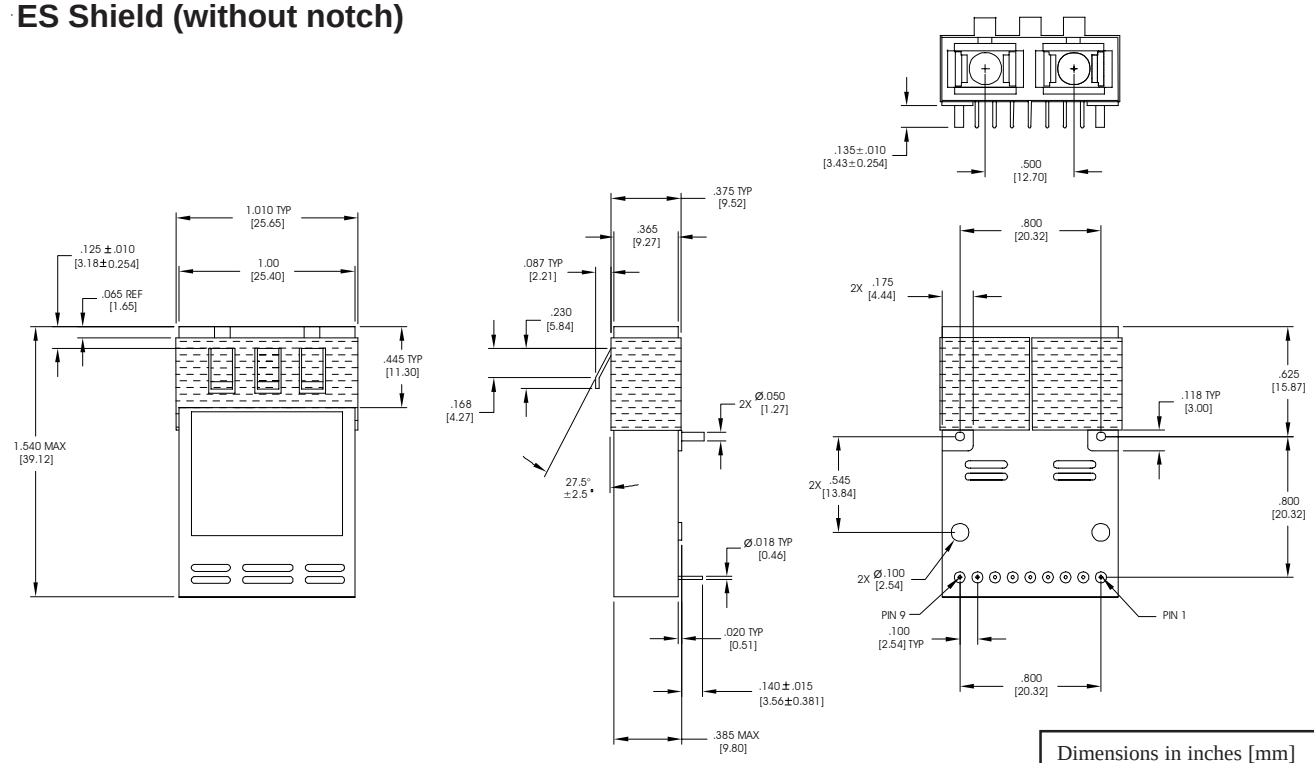
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

FC Receptacle Package



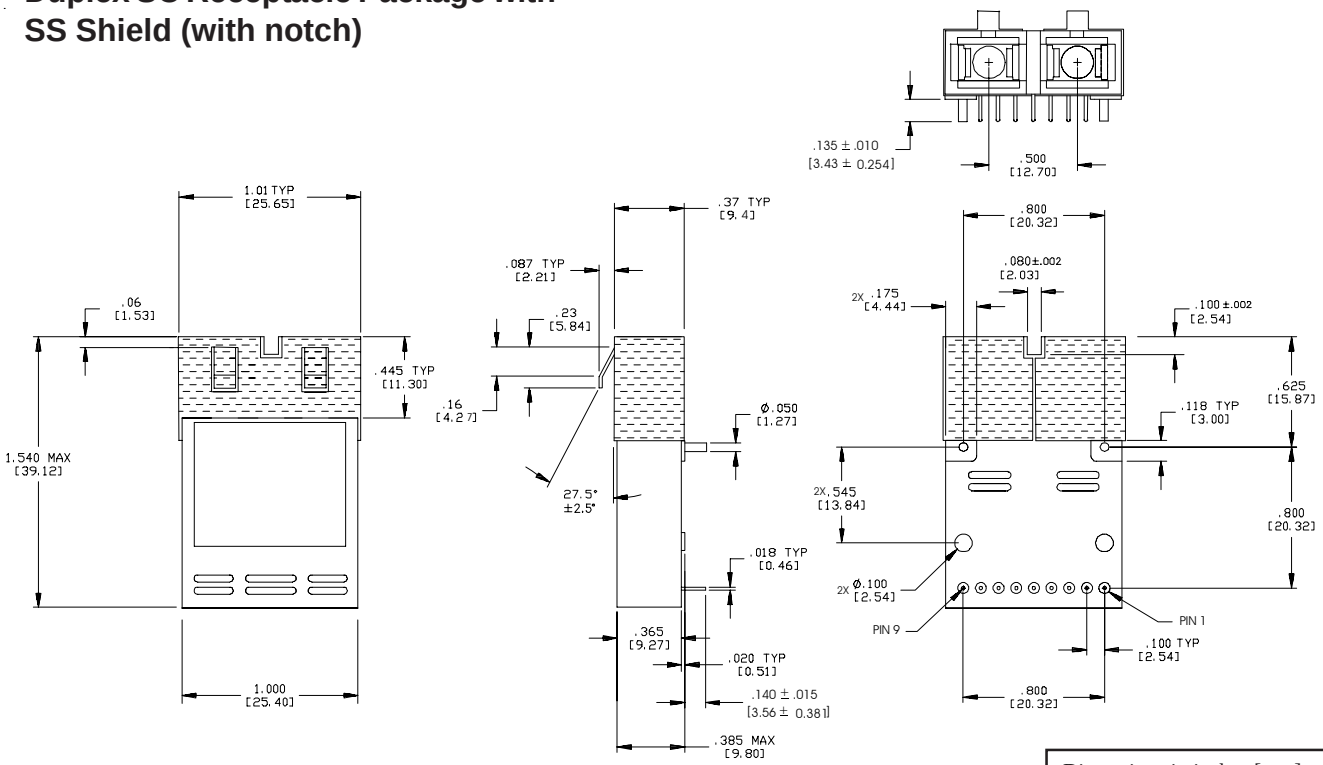
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with ES Shield (without notch)



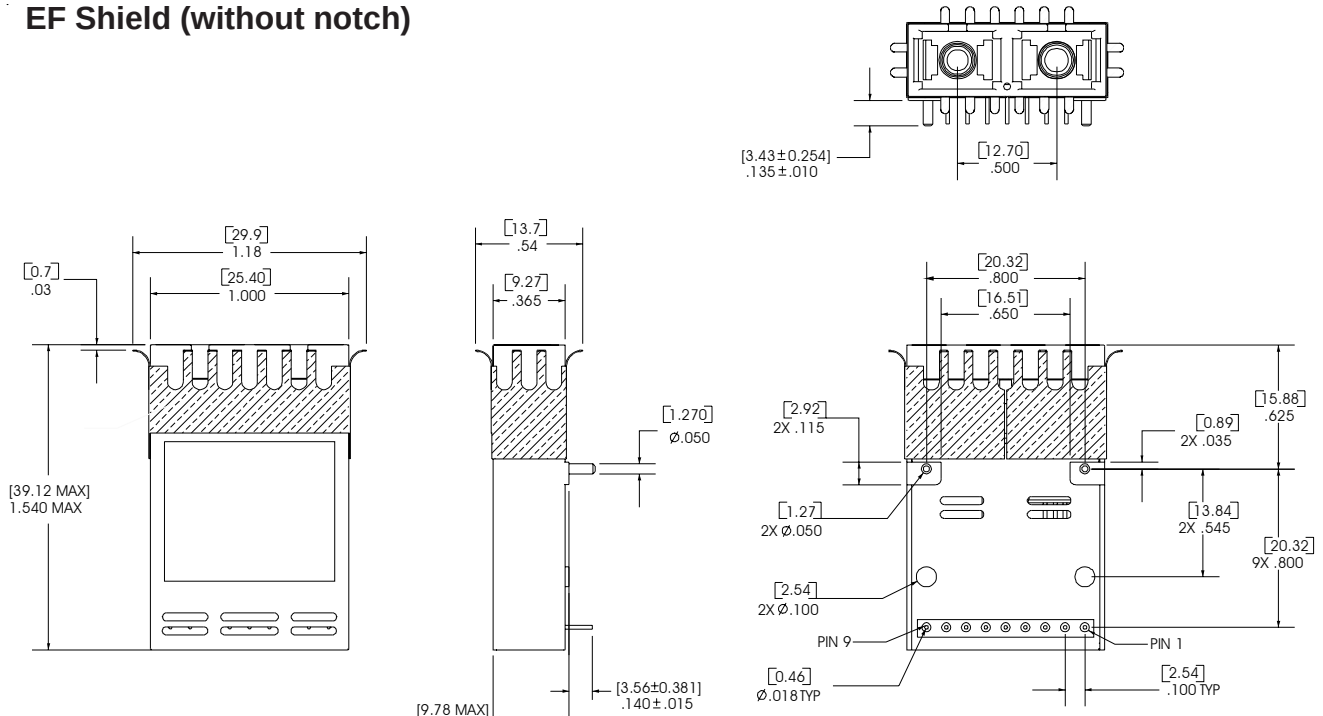
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with SS Shield (with notch)



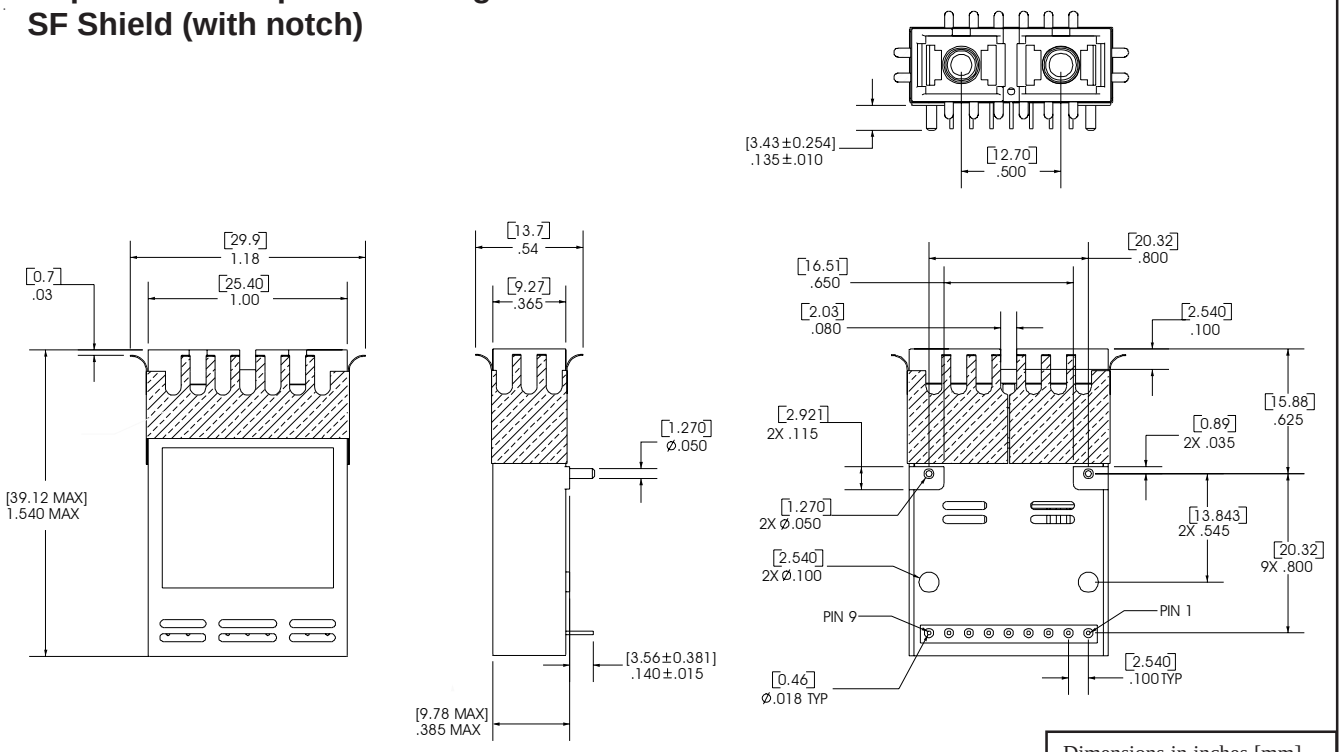
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with EF Shield (without notch)



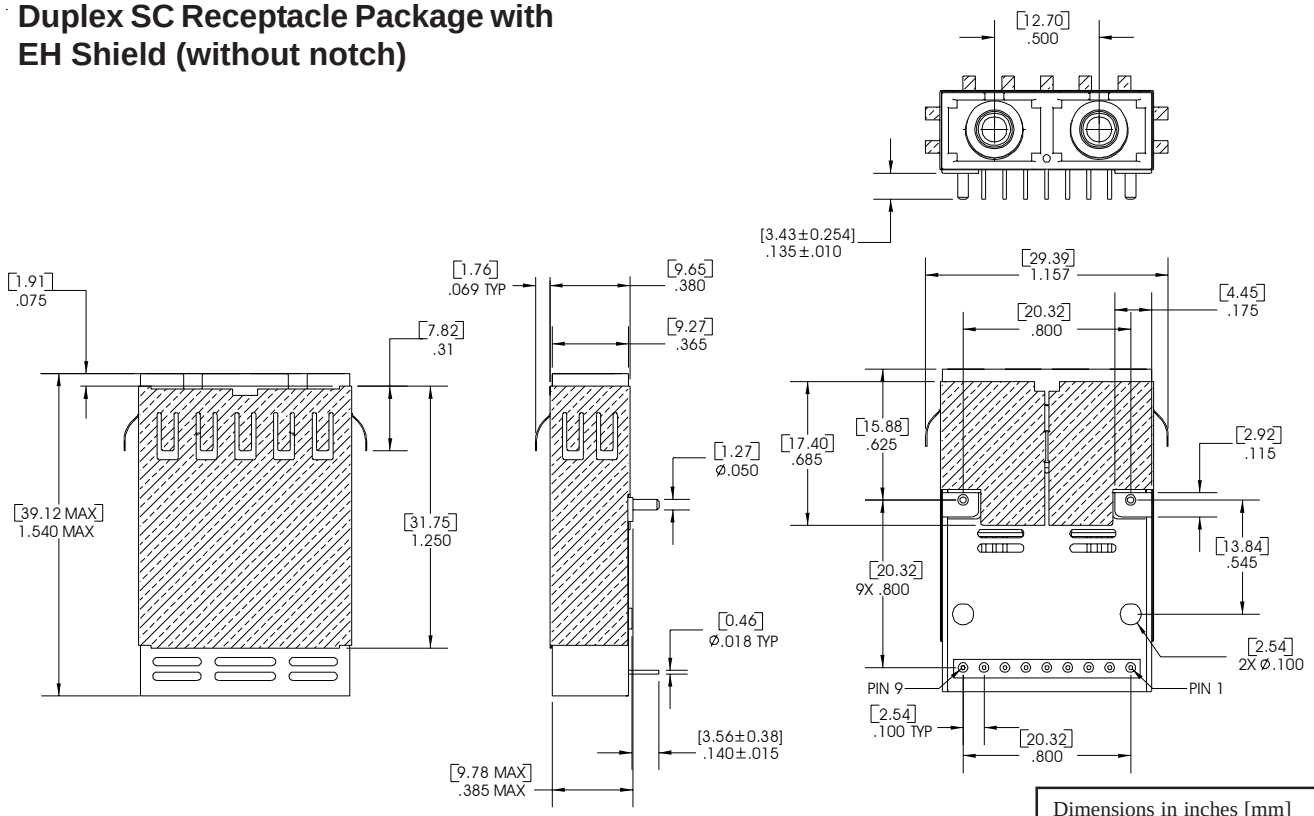
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with SF Shield (with notch)



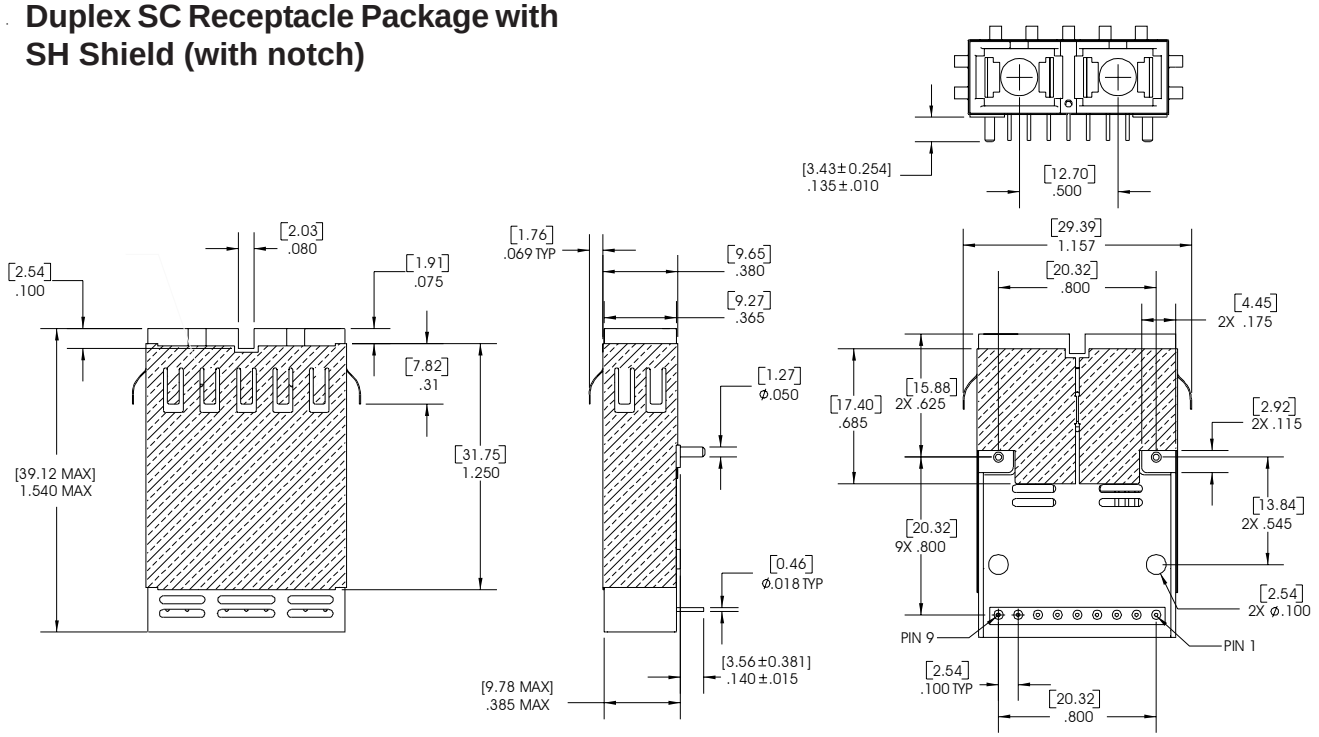
Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with EH Shield (without notch)



Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Duplex SC Receptacle Package with SH Shield (with notch)



Dimensions in inches [mm]
Default tolerances:
.xxx = ± .005", .xx = ± .01"

Ordering Information for SC (without EMI shield), ST and FC modules

Module Name	Connector	Coupling
DTR-1250-SM-*Yn*	SC	DC
DTR-1250-SM-AC-*Yn*	SC	AC
DTR-1250-SM-ST-*Yn*	ST	DC

Module Name	Connector	Coupling
DTR-1250-SM-SA-*Yn*	ST	AC
DTR-1250-SM-FC-*Yn*	FC	DC
DTR-1250-SM-FA-*Yn*	FC	AC

Options for *Yn*: L2 (5km with Fabry Perot laser, 1000BASE-LX compliant)
L1 (10km with Fabry Perot laser)
L0 (10km with higher power Fabry Perot laser to offer more optical link power budget)
H3 (30km with 1310nm DFB laser)
H5 (40km with 1550nm DFB laser)
H7 (70km with 1550nm DFB laser)

Ordering Information for SC modules (with EMI shield)

DTR -1250 - SM - *XX* - *XX* - *Yn*

see Options for *Yn* above

EMI Shield Option
ES : ES shield w/o notch, DC-coupling
AE : ES shield w/o notch, AC-coupling
SS : SS shield w/ notch
EF : EF shield w/o notch
SF : SF shield w/ notch
EH : EH shield w/o notch
SH : SH shield w/ notch

Coupling Option
Blank : For ES and AE EMI shield options only
DC : DC Coupling
AC : AC Coupling

Optical Communication Products, Inc.
6101 Variel Avenue, Woodland Hills, CA 91367, Tel.: 818-251-7100, FAX: 818-251-7111, www.ocp-inc.com