

### 100-02160-PRO

Calix® 100-02160 Compatible TAA Compliant 10GBase-DWDM 100GHz SFP+ Transceiver (SMF, 1554.94nm, 40km, DOM, 0 to 70C, LC)

#### Features

- SFF-8432 and SFF-8472 Compliance
- Temperature-stabilized EML transmitter and PIN receiver
- Duplex LC Connector
- Commercial Temperature 0 to 70 Celsius
- Single-mode Fiber
- Hot Pluggable
- Excellent ESD Protection
- Metal with Lower EMI
- RoHS Compliant and Lead Free



#### Applications:

- 10x Gigabit Ethernet over DWDM
- 8x/10x Fibre Channel
- Access, Metro and Enterprise

#### Product Description

This Calix® 100-02160 compatible SFP+ transceiver provides 10GBase-DWDM throughput up to 40km over single-mode fiber (SMF) using a wavelength of 1554.94nm via an LC connector. It is guaranteed to be 100% compatible with the equivalent Calix® transceiver. This easy to install, hot swappable transceiver has been programmed, uniquely serialized and data-traffic and application tested to ensure that it will initialize and perform identically. Digital optical monitoring (DOM) support is also present to allow access to real-time operating parameters. This transceiver is Trade Agreements Act (TAA) compliant. We stand behind the quality of our products and proudly offer a limited lifetime warranty.

Proline's transceivers are RoHS compliant and lead-free.

TAA refers to the Trade Agreements Act (19 U.S.C. & 2501-2581), which is intended to foster fair and open international trade. TAA requires that the U.S. Government may acquire only "U.S. – made or designated country end products.



## Wavelength Guide (100GHz ITU-T Channel)

Channel #	Frequency (THz)	Center Wavelength (nm)
17	191.7	1563.86
18	191.8	1563.05
19	191.9	1562.23
20	192.0	1561.42
21	192.1	1560.61
22	192.2	1559.79
23	192.3	1558.98
24	192.4	1558.17
25	192.5	1557.36
26	192.6	1556.55
27	192.7	1555.75
28	192.8	1554.94
29	192.9	1554.13
30	193.0	1553.33
31	193.1	1552.52
32	193.2	1551.72
33	193.3	1550.92
34	193.4	1550.12
35	193.5	1549.32
36	193.6	1548.51
37	193.7	1547.72
38	193.8	1546.92
39	193.9	1546.12
40	194.0	1545.32
41	194.1	1544.53
42	194.2	1543.73
43	194.3	1542.94
44	194.4	1542.14
45	194.5	1541.35
46	194.6	1540.56
47	194.7	1539.77
48	194.8	1538.98
49	194.9	1538.19

50	195.0	1537.40
51	195.1	1536.61
52	195.2	1535.82
53	195.3	1535.04
54	195.4	1534.25
55	195.5	1533.47
56	195.6	1532.68
57	195.7	1531.90
58	195.8	1531.12
59	195.9	1530.33
60	196.0	1529.55
61	196.1	1528.77

### Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ	Max.	Unit
Storage Temperature	Tstg	-40		85	°C
Supply Voltage	Vcc	-0.5		4.0	V
Operating Case Temperature	Tc	0	25	70	°C
Relative Humidity	RH	5		95	%
Data Rate			10.3125		Gbps

## Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes	
Supply Voltage	Vcc	3.135	3.3	3.465	V		
Module Supply Current	Icc			450	mA		
Power Dissipation	P <sub>D</sub>			1500	mW		
<b>Transmitter</b>							
Input Differential Impedance	Z <sub>in</sub>		100		Ω		
Differential Data Input Swing	V <sub>in,p-p</sub>	180		700	mV <sub>p-p</sub>		
TX_FAULT	Transmitter Fault	V <sub>OH</sub>	2.0		VccHost	V	
	Normal Operation	V <sub>OL</sub>	0		0.8	V	
TX_DISABLE	Transmitter Disable	V <sub>IH</sub>	2.0		VccHost	V	
	Transmitter Enable	V <sub>IL</sub>	0		0.8	V	
<b>Receiver</b>							
Output Differential Impedance	Z <sub>o</sub>		100		Ω		
Differential Data Output Swing	V <sub>out,p-p</sub>	300		850	mV <sub>p-p</sub>	1	
Data Output Rise Time, Fall Time	t <sub>r</sub> , t <sub>f</sub>	28			ps	2	
RX_LOS	Loss of Signal (LOS)	V <sub>OH</sub>	2.0		VccHost	V	3
	Normal Operation	V <sub>OL</sub>	0		0.8	V	3

### Notes:

1. Internally AC coupled, but requires an external 100Ω differential load termination.
2. 20-80%.
3. LOS is an open collector output. Should be pulled up with 4.7KΩ on the host board.

## Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Transmitter</b>						
Launch Optical Power	PO	-1		4	dBm	1
Center Wavelength Range	$\lambda_c$	1528.77		1563.86	nm	
Center Wavelength Spacing			100		GHZ	
Center Wavelength Tolerance	$\Delta\lambda_c$	-100		100	pm	
Extinction Ratio	EX	8.2			dB	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty	TDP			2.0	dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Optical Return Loss Tolerance	ORLT			21	dB	
Pout @ TX-Disable Asserted	Poff			-30	dBm	
Eye Diagram	IEEE Std 802.3-2005 10Gb Ethernet 10GBASE-ER compatible					
<b>Receiver</b>						
Center Wavelength	$\lambda_c$	1528		1565	nm	
Receiver Sensitivity ( $P_{avg}$ )	S			-15	dBm	
Receiver Overload ( $P_{avg}$ )	POL	-1			dBm	
Optical Return Loss	ORL	26			dB	
LOS De-Assert	LOSD			-16	dBm	
LOS Assert	LOSA	-35			dBm	
LOS Hysteresis		0.5			dB	

### Notes:

1. The optical power is launched into 9/125 $\mu$ m SMF.
2. Measured with a PRBS  $2^{31}-1$  test pattern @10.3125Gbps.
3. Measured with PRBS  $2^{31}-1$  test pattern, 10.3125Gb/s, BER< $10^{-12}$ .
4. Comply with IEEE 802.3-2005.

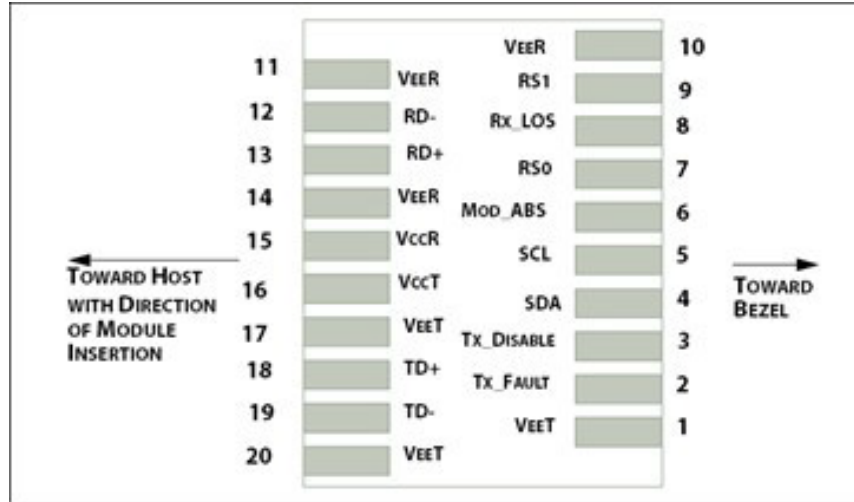
## Pin Descriptions

Pin	Symbol	Name/Descriptions	Ref.
1	VeeT	Transmitter Ground.	1
2	TX_Fault	Transmitter Fault (LVTTTL-O) - High indicates a fault condition.	2
3	TX_Disable	Transmitter Disable (LVTTTL-I) – High or open disables the transmitter.	3
4	SDA	Two wire serial interface Data Line (LVCMOS-I/O) (MOD-DEF2).	4
5	SCL	Two wire serial interface Clock Line (LVCMOS-I/O) (MOD-DEF1)	4
6	MOD_ABS	Module Absent (Output), connected to VeeT or VeeR in the module.	5
7	RS0	Rate Select 0 – Not used, Presents high input impedance.	
8	RX_LOS	Receiver Loss of Signal (LVTTTL-O).	2
9	RS1	Rate Select 1 – Not used, Presents high input impedance.	
10	VeeR	Receiver Ground.	1
11	VeeR	Receiver Ground.	1
12	RD-	Inverse Received Data out (CML-O).	
13	RD+	Received Data out (CML-O).	
14	VeeR	Receiver Ground.	
15	VccR	Receiver Power - +3.3V.	
16	VccT	Transmitter Power - +3.3 V.	
17	VeeT	Transmitter Ground.	1
18	TD+	Transmitter Data In (CML-I).	
19	TD-	Inverse Transmitter Data In (CML-I).	
20	VeeT	Transmitter Ground.	1

### Notes:

1. The module signal grounds are isolated from the module case.
2. This is an open collector/drain output that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.
3. This input is internally biased high with a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccT.
4. 2-Wire Serial interface clock and data lines require an external pull-up resistor dependent on the capacitance load.
5. This is the ground return that on the host board requires a 4.7K $\Omega$  to 10K $\Omega$  pull-up resistor to VccHost.

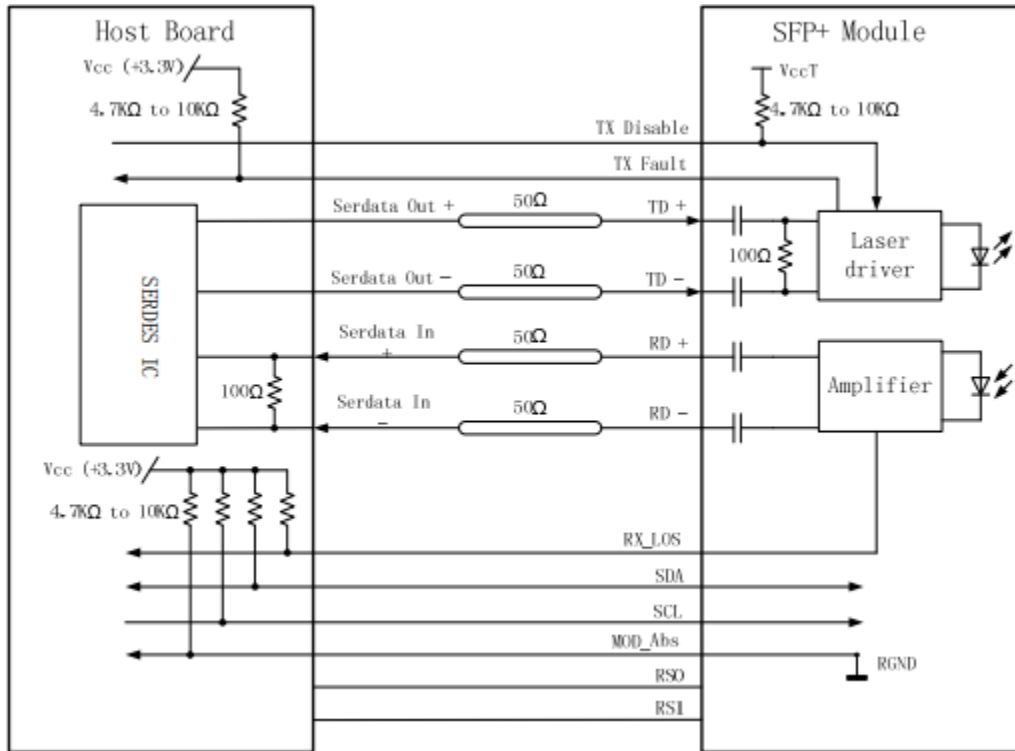
### Host PCB SFP+ Pad Assignment Top View



### Recommended Host Board Power Supply Filter Network



## Recommended Application Interface Block Diagram



## Mechanical Specifications





# PCB Layout Recommendation

**Notes:**

1. Datum and basic dimensions established by customer
2. Pads and vias are chassis ground, 11 places
3. Thru holes, plating optional



**About Us:**

Proline Options is one of North America's leading providers of transceivers and high speed cabling. With a reputation for quality, tested products that cover the connectivity spectrum, Proline Options has a solution for you regardless of the specification.

At Proline Options, every product is tested in its intended application - never batch or spec tested only. We run bandwidth, distance and IOS network tests. We have documented an impressive 0.03% failure rate over the last 10 years. To continue this rate of success we invest millions annually in our own on-site testing lab.



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