Features

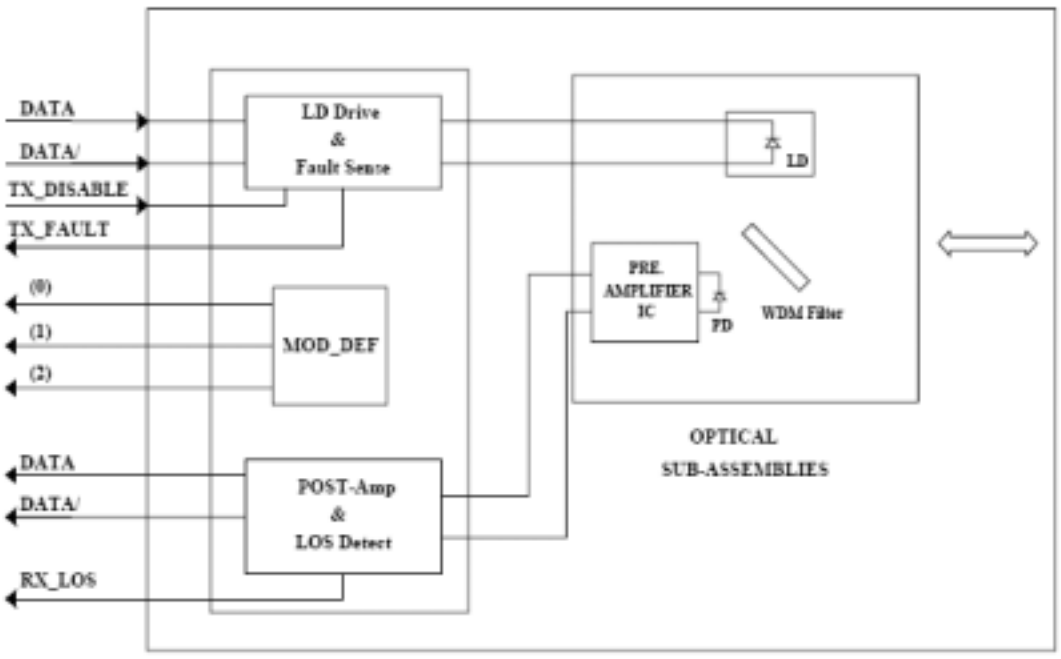
- Transceiver unit with independent
  - 1550nm MQW FP Laser diode transmitter
  - 1310nm InGaAs PIN photodiode receiver
- Meet SFP MSA with single LC receptacle
- SMPTE 297-2006 compatible
- Robust error free transmission of signals from 50Mbps to 3Gbps
- Hot-pluggable
- Metal enclosure for lower EMI
- +3.3V Single power supply
- Operating case temperature:
  Standard : 0 to +70℃
  Industrial : -40 to +85℃
- Qualified to meet the intent of Bellcore reliability practices
- LVPECL logic interface simplifies interface to external circuitry
- LVTTL logic Signal level R_X LOS
- With pull de-latch
- Compliant ROHS and lead free

Application

- SMPTE 297-2006 compatible optical -to- electrical interfaces

General

The optical transceiver is compliant with the Small Form- Factor Pluggable (SFP) Multi-Source Agreement (MSA). It is specifically designed for robust performance in the presence of SDI pathological patterns for SMPTE 259M, SMPTE 292M and SMPTE 424M serial rates. It offers previously unavailable system cost, upgrade, and reliability benefits by virtue of being hot-pluggable.



Transmitter Section

Transmitter is designed for single mode fiber and operates at a nominal wavelength of 1550nm. The transmitter module uses a MQW FP laser diode and full IEC825 and CDRH class 1 eye safety. The output power can be disabled via the single TxDis pin. Logic LVTTL HIGH level disables the transmitter. It contains APC function, temperature compensation circuit, PECL data inputs, LVTTL Txdis input and Tx fault Output interface.

Receiver Section

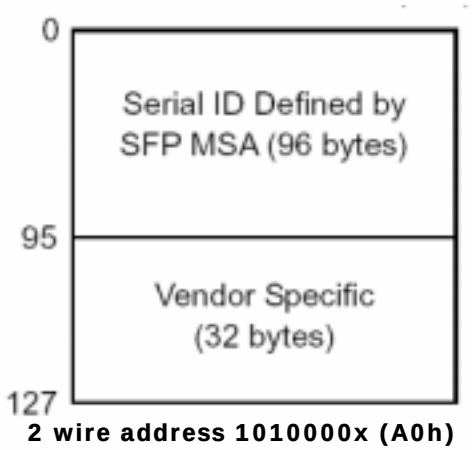
The receiver section uses a hermetic packaged front end receiver (InGaAs PIN and preamplifier). The postamplifier is AC coupled to preamplifier through a capacitor and a low pass filter. The capacitor and LPF are enough to pass the signal from 5Mb/s to 3000Mb/s without significant distortion or performance penalty. The LPF limits the preamplifier bandwidth to improve receiver sensitivity. As the input optical is decreased, LOS will switch from low to high. As the input optical power is increased from very low levels, LOS will switch back from high to low.

EEPROM Section

The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information.

The serial interface uses the 2-wire serial CMOS EEPROM protocol defined for the ATMEL AT24C01A/02/04 family of components. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not write protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

Memory Map:



2 wire address 1010000x (A0h)

Performance Specifications

Table1. Absolute Maximum Ratings

Parameter	Symbol		Min	Max	Unit
Storage Temperature	Tst		-40	+85	℃
Operating Temperature	To	CBT5FM-11-SDI	0	+70	℃
		CBT5FM-12-SDI	-40	+85	
Input Voltage	-		GND	Vcc	V
Power Supply Voltage	Vcc-Vee		-0.5	+3.6	V

Note: Stress in excess of maximum absolute ratings can cause permanent damage to the module

Table2. Operating Environment

Parameter	Symbol		Min	Max	Unit
Power Supply Voltage	Vcc		+3.1	+3.5	V
Ambient Operating Temperature	TA	CBT5FM-11-SDI	0	+70	℃
		CBT5FM-12-SDI	-40	+85	

Table3. Transmitter electrical and optical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Center Wavelength	λ_p	1480	1550	1580	nm	-
Spectral Width(RMS)	$\Delta\lambda$	-	-	3	nm	-
Average Optical Output Power	Po	-12	-	-6	dBm	-
Extinction Ratio	EXT	10	-	-	dB	-
Transmitter disable Voltage	V_D	2.0	-	Vcc	V	-
Transmitter Enable Voltage	V_{EN}	0	-	0.8	V	-
Power supply Current	Icc	-	70	180	mA	1
Data Input Voltage	Vpp	300	-	1600	mV	-
Output Eye Diagram	Compliant with ITU-T.G957					

Table 4.Receiver optical-electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Bit Rate	BR	50	-	3000	Mbps	-
Wavelength	λ	1260	-	1620	nm	-
Saturation	Ps	-3	-	-	dBm	-
LOS Asserted	-	-35	-	-	dBm	-
LOS De-Assert	-	-	-	-22	dBm	-
LOS Hysteresis	-	-	3	-	dB	-
LOS LOW voltage	VLout	-	-	0.8	V	-
LOS HIGH voltage	VHout	2.0	-	-	V	-
Sensitivity for SMPTE 259M	-	-	-22	-20	dBm	Pathological
143-360Mbps		-	-24	-22	dBm	PRBS
Sensitivity for SMPTE 292M	-	-	-22	-20	dBm	Pathological
1.485Gbps		-	-24	-22	dBm	PRBS
Sensitivity for SMPTE 424M	-	-	-19	-18	dBm	Pathological
2.97Gbps		-	-21	-20	ps	PRBS

Data Outputs Voltage	Vpp	400	800	1000	mV	-
Input Power Monitoring Accuracy		-1		+1	dB	-

Notes:

1. **The current excludes the output load current.**
2. **Minimum Sensitivity and saturation levels for BER=1E-12 against $2^{23}-1$ PRBS.**

Pin Definition

Pin Out Diagram

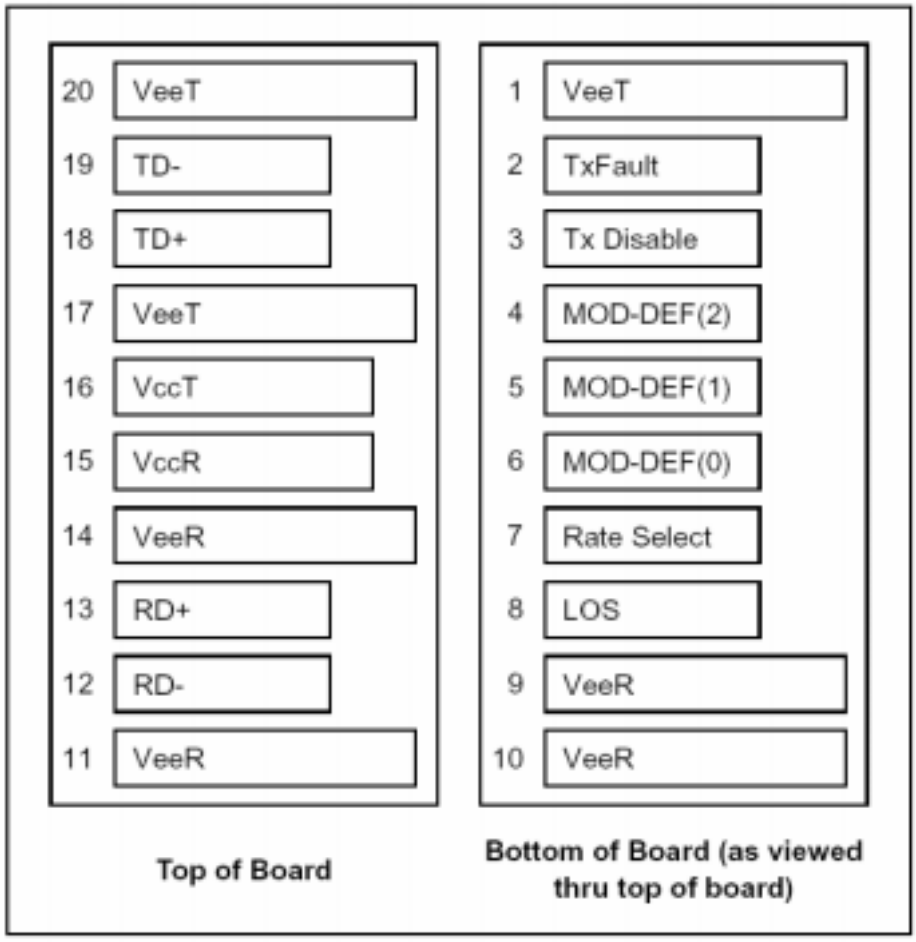


Table5.Pin Function Definitions

Pin#	Name	Description	Notes
1	VeeT	Transmitter Ground	-
2	TX Fault	Transmitter Fault Indication	Notes 1
3	TX Disable	Transmitter Disable	Note 2, Module disables on high or open
4	MOD-DEF2	Module Definition 2	Note3, 2 wire serial ID interface
5	MOD-DEF1	Module Definition 1	Note 3, 2 wire serial ID interface
6	MOD-DEF0	Module Definition 0	Note 3, Grounded in Module
7	Rate Select	Not use	-
8	LOS	Loss of Signal	Notes 4
9	VeeR	Receiver Ground	Note 5
10	VeeR	Receiver Ground	Note 5
11	VeeR	Receiver Ground	Note 5
12	RD-	Inv. Received Data Out	Notes 6
13	RD+	Receiver Data out	Notes 6
14	VeeR	Receiver Ground	Note 5
15	VccR	Receiver Power	Note 7, 3.3V± 5%
16	VccT	Transmitter Power	Note 7, 3.3V± 5%
17	VeeT	Transmitter Ground	Note 5
18	TD+	Transmit Data In	Note 8
19	TD-	Inv. Transmit Data In	Notes 8
20	VeeT	Transmitter Ground	Notes 5

Note:

1. TX Fault is an open collector/drain output, which should be pulled up with a 4.7K–10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT, R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
2. TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7–10 KΩ resistor. Its states are:

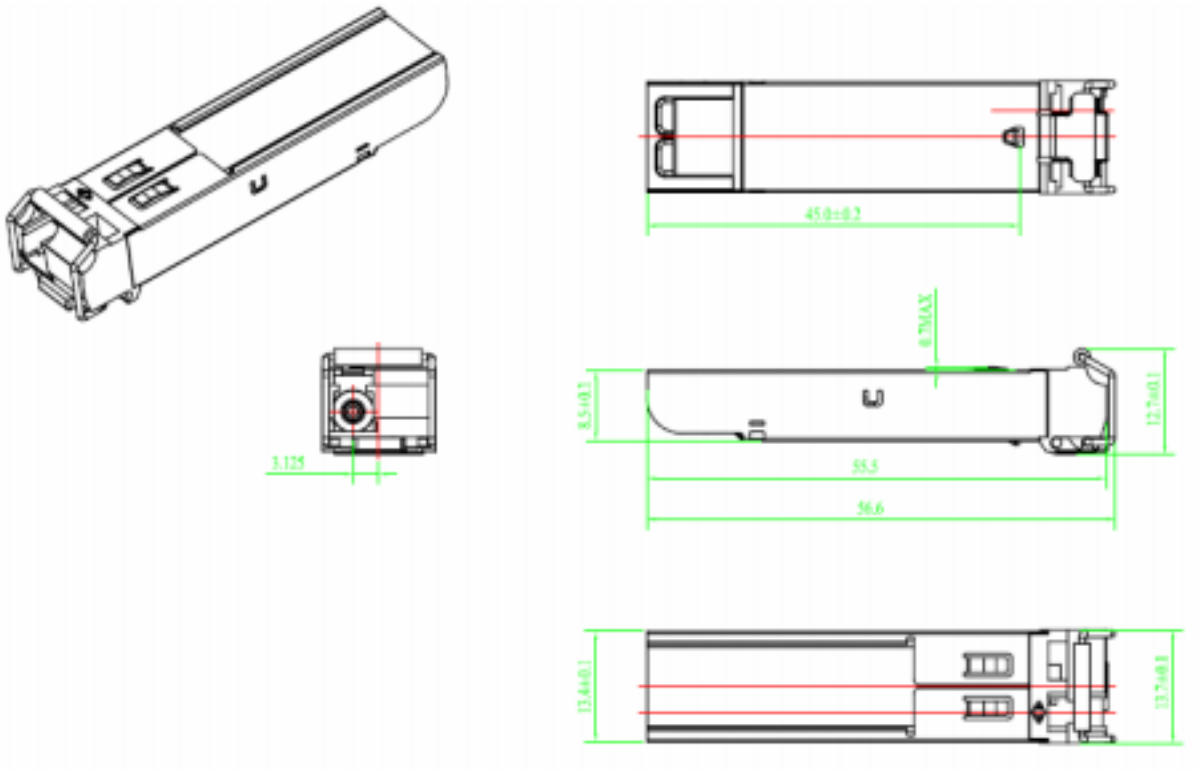
   Low (0 – 0.8V): Transmitter on

   (>0.8, < 2.0V): Undefined

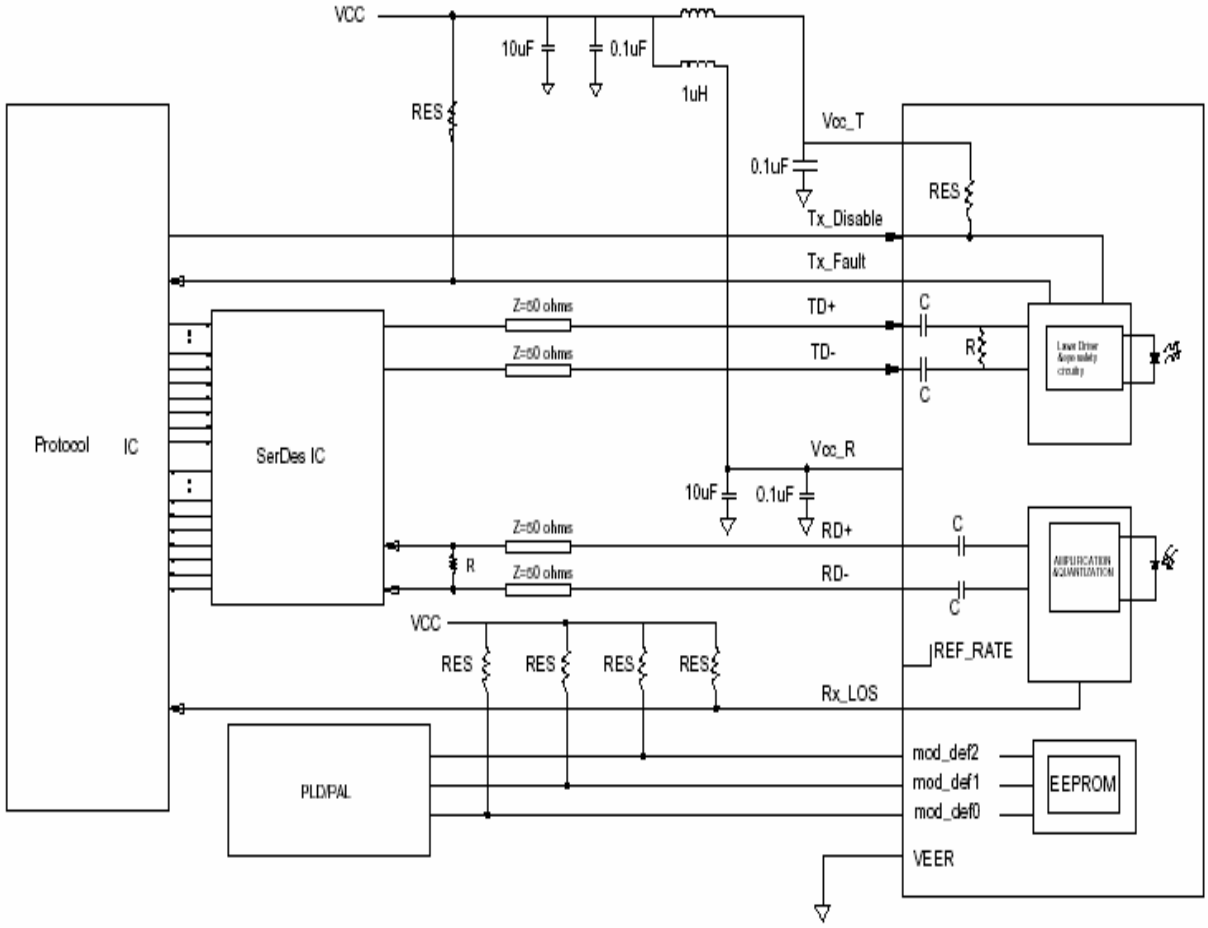
   High (2.0 – 3.465V): Transmitter Disabled

   Open: Transmitter Disabled
3. Mod-Def 0,1,2. These are the module definition pins. They should be pulled up with a 4.7K – 10K Ω resistor on the host board. The pull-up voltage shall be VccT or VccR. Mod-Def 0 is grounded by the module to indicate that the module is present Mod-Def 1 is the clock line of two wire serial interface for serial ID Mod-Def 2 is the data line of two wire serial interface for serial ID
4. LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and VccT, R+0.3V. When high, this output indicates the received optical power is below the worst-case receiver sensitivity(as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
5. VeeR and VeeT may be internally connected within the SFP module.
6. RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
7. VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP connector pin. Maximum supply current is 300mA. Recommended host board power supply filtering is shown below. Inductors with DC resistance of less than 1Ω should be used in order to maintain the required voltage at the SFP input pin with3.3V supply voltage. When the recommended supply filtering network is used, hotplugging of the SFP transceiver module will result in an inrush current of no more than 30 mA greater than the steady state value. VccR and VccT may be internally connected within the SFP transceiver module.
8. TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.

Package information

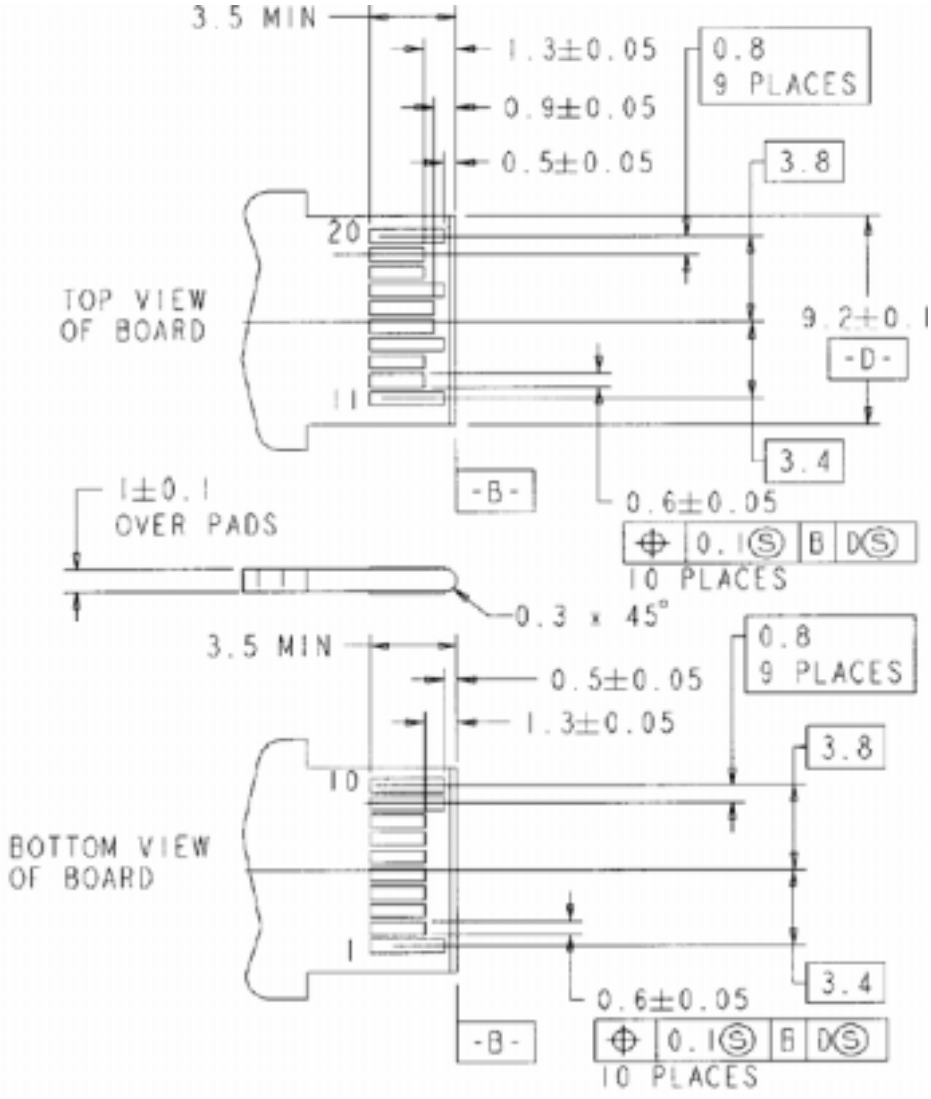


Recommended Circuit



Note: 4.7K ohms < RES < 10K ohms

Recommended Board Layout Hole Pattern



For More Information

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Ordering Information

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Package form：
P： SFP(W/DDM)
T：SFP(WO/DDM)

wavelength：
1：1310nm/1310nm
2：1550nm/1550nm
3：1310nm/1550nm
4：1490nm/1310nm
5：1550nm/1310nm
6：1490nm/1550nm
7：1550nm/1490nm
8：1310nm/1490nm

LD/PD type：
F：FP/PIN
D：DFB/PIN

Data Rate：
3：155M
4：622M
5：1.25G
6：2.5G
M：2.5G/155M

Output Power：
5: -10~-3dBm

Operating
Tempe Range：
1：0～70℃
2：-40～85℃