OPC10G-xx10DxR

10GBASE-LR CWDM SFP+ Transceiver Module, Single mode, 1270~1610nm, 10km Reach

Features

- Supports 9.95 to 11.3Gb/s bit rates
- Duplex LC connector
- Hot pluggable SFP+ footprint
- Uncooled 1270nm~1610nm DFB transmitter, PIN photo-detector
- Applicable for 10km SMF link distance
- Low power consumption, < 1.0W
- Digital Diagnostic Monitor Interface
- Optical interface compliant to IEEE 802.3ae 10GBASE-LR
- Electrical interface compliant to SFF-8431
- ROHS compliant and lead-free
- Operating Temperature: Standard 0~70ºC, Extended -10~85ºC, Industrial -40~85ºC

Applications

- 10GBASE-LR/10GBASE-LW Ethernet
- 10G Fibre Channel
- 10G Data Center Switches and Routers
- 10G Network interface cards and Fiber Media Converters
- Other Optical Links

Description

Optcore's OPC10G-xx10DxR is a high performance and cost effective 10GBASE-LR CWDM (Coarse Wavelength-Division Multiplexing) SFP+ transceiver module, which provides a high capacity, high bandwidth communication solutions for multiplexed optical networks. This CWDM SFP+ transceiver is designed for 10 Gigabit Ethernet links up to 10km over single mode fiber. It features a highly reliable CWDM DFB transmitter and PIN photo-detector into duplex LC optical connector. There are 18 center wavelengths available from 1270nm to 1610nm with each step 20nm.

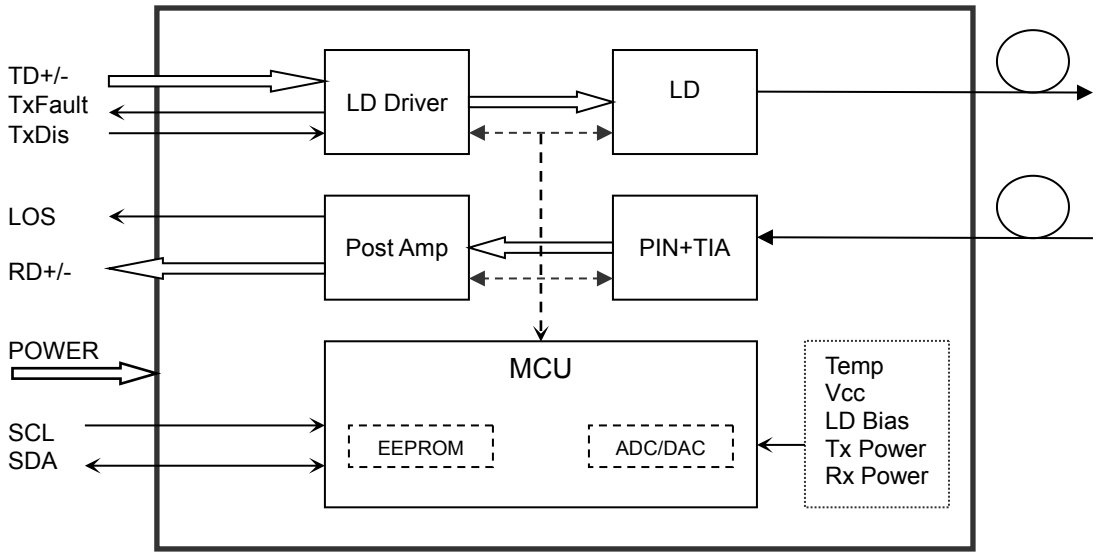
The CWDM SFP+ transceiver module is comply with SFP+ MSA specifications (SFF-8431, SFF-8432, SFF-8472), 10 Gigabit Ethernet specifications (10GBASE-LR/LW per IEEE 802.3ae), and 10G Fibre Channel. It's suitable for use with 10GbE Ethernet switches, routers, network interface cards (NICs), fiber media converters and storage networking equipment. Additionally, the CWDM SFP+ module has been integrated with an enhanced digital diagnostic monitoring interface (DDMI) per SFF-8472, which providing real-time monitoring of the transceiver temperature, laser bias current, optical power, received optical power and transceiver supply voltage.

There are three versions of the series 10GBASE-LR SFP+ CWDM transceiver for different applications. The Standard grade (0~70ºC) is for commonly commercial application, the Extended grade (-10~85ºC) is for Extended temperature application, and the Industrial grade (-40~85ºC) is made with robust and reliable components to meet the needs of Industrial Ethernet application under harsh environmental conditions.

The CWDM SFP+ transceiver need use with CWDM Multiplexer/Demultiplexer (CWDM Mux/Demux) that is separately

sold by Optcore.

Transceiver functional diagram



Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Notes
Maximum Supply Voltage	Vcc	-0.5	4.5	V	
Storage Temperature	T_S	-40	85	°C	
Operating Humidity	RH	5	85	%	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply Voltage	Vcc	3.13	3.3	3.47	V	
Power Supply Current	Icc			300	mA	
Case Operating Temperature	Tc	0		70	°C	Standard
		-10		85	°C	Extended
		-40		85	°C	Industrial
Data Rate		9.95	10.3125	11.3	Gbps	
Maximum Link Length	L_{MAX}			10	km	

Optical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Operating Wavelength	λ	λ-7.5nm	λ	λ+7.5nm	nm	1
Ave. output power (Enabled)	P_{AVE}	-6.0		0	dBm	2
Side-Mode Suppression Ratio	SMSR	30			dB	
Extinction Ratio	ER	3.5			dB	

RMS spectral width	Δλ			1	nm	
Rise/Fall time (20%~80%)	Tr/Tf			50	ps	
Dispersion penalty	TDP			3.2	dB	
Relative Intensity Noise	RIN			-128	dB/Hz	
Output Optical Eye	Compliant with IEEE 802.3ae					
Receiver						
Operating Wavelength	λ	1260		1620	nm	
Receiver Sensitivity	P_{SEN}			-14.4	dBm	3
Overload	P_{AVE}			+0.5	dBm	
LOS Assert	Pa	-30			dBm	
LOS De-assert	Pd			-17	dBm	
LOS Hysteresis	Pd-Pa	0.5			dB	

Note :

1. The wavelength λ=1470nm~1610nm, Total 8 wavelengths, 20nm spacing
2. Measured at 10.3125b/s with PRBS 2^{31} -1 NRZ test pattern.
3. Under the ER worst =3.5, measured at 10.3125 Gb/s with PRBS 2^{31} -1 NRZ test pattern for BER < $1x10^{-12}$

Electrical Characteristics

Parameter	Symbol	Min.	Typ	Max.	Unit	Note
Transmitter						
Differential data input swing	$V_{IN,PP}$	180		700	mVpp	1
Transmit Disable Voltage	VD	VCC-0.8		Vcc	V	
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8		
Input differential impedance	Rin		100		Ω	
Receiver						
Differential data output swing	Vout,pp	350		850	mVpp	2
Output rise time and fall time	Tr, Tf	28			Ps	3
LOS asserted	V_{LOS_F}	VCC-0.8		Vcc	V	4
LOS de-asserted	V_{LOS_N}	Vee		Vee+0.8	V	4

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Into 100Ω differential termination.
3. 20 – 80%. Measured with Module Compliance Test Board and OMA test pattern. Use of four 1's and four 0's sequence in the PRBS 9 is an acceptable alternative.
4. LOS is an open collector output. Should be pulled up with 4.7kΩ – 10kΩ on the host board. Normal operation is logic 0; loss of signal is logic 1.

Diagnostics

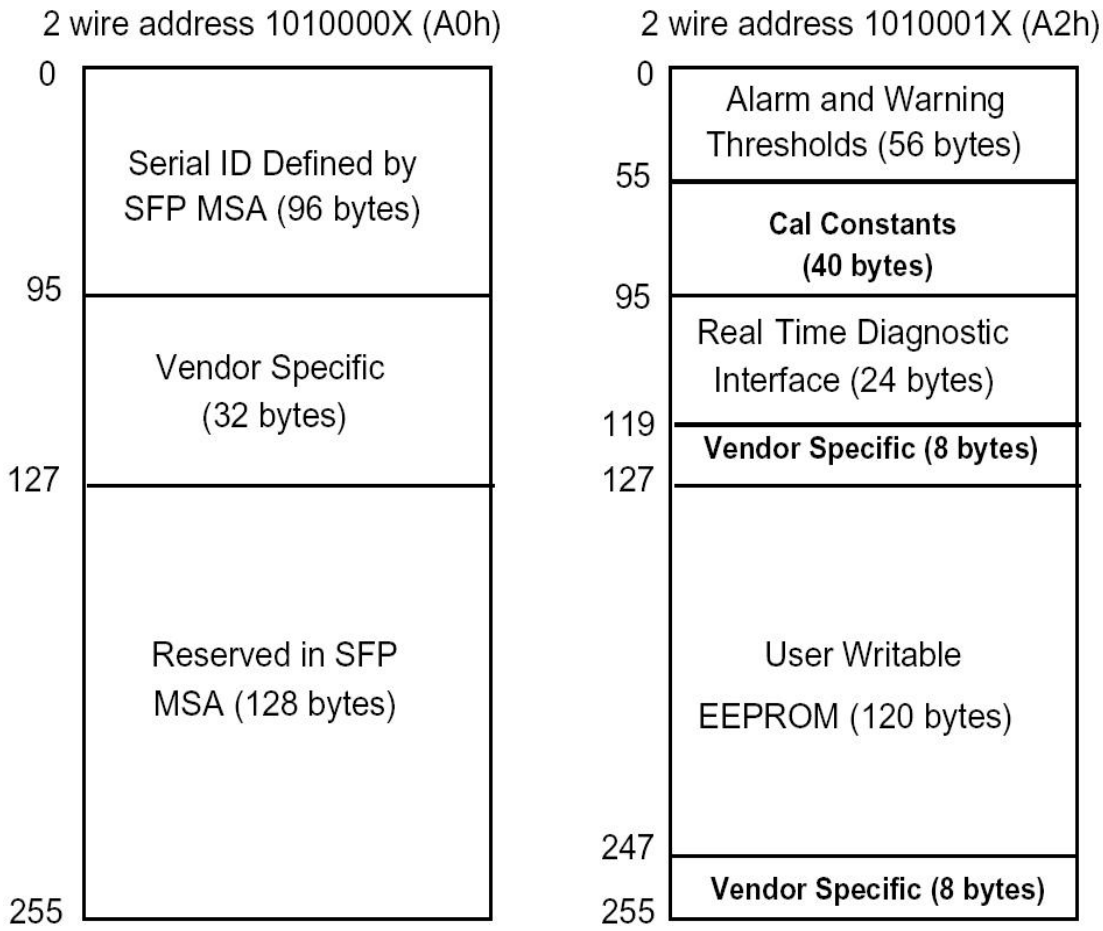
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
	-10 to +85			
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 15	mA	±10%	Internal
TX Power	-6.0 to -0.5	dBm	±3dB	Internal
RX Power	-16 to -1	dBm	±3dB	Internal

Digital Diagnostic Memory Map

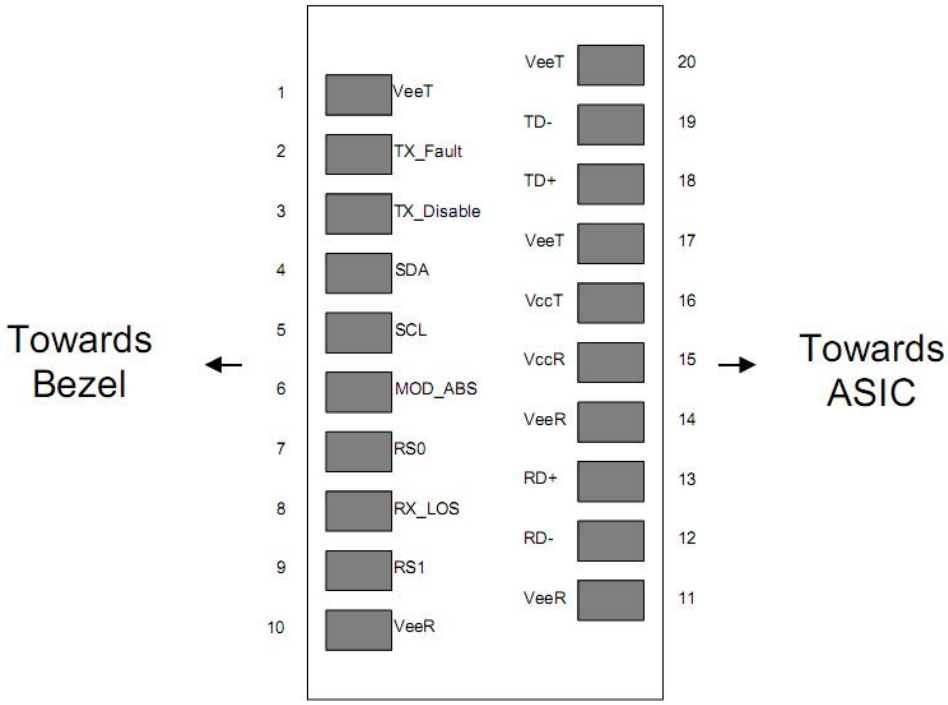
The 10GBASE-LR SFP+ CWDM transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



Pin Definitions



Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V_{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	RS1	Not Connected	3	
10	V_{EER}	Receiver ground	1	
11	V_{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V_{EER}	Receiver ground	1	
15	V_{CCR}	Receiver Power Supply	2	
16	V_{CCT}	Transmitter Power Supply	2	
17	V_{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V_{EET}	Transmitter Ground	1	

Notes:

Plug Seq.: Pin engagement sequence during hot plugging.

1. TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and Vcc+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.

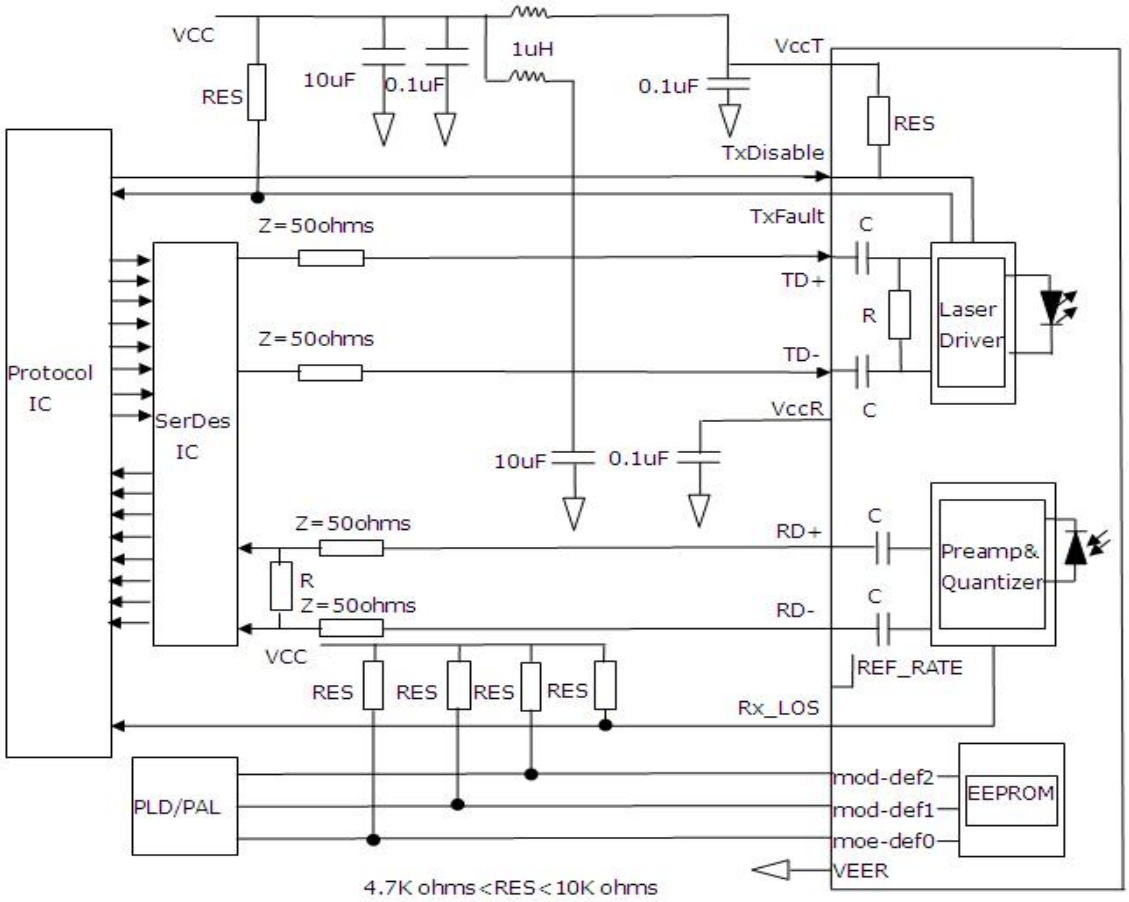
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.

3. LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

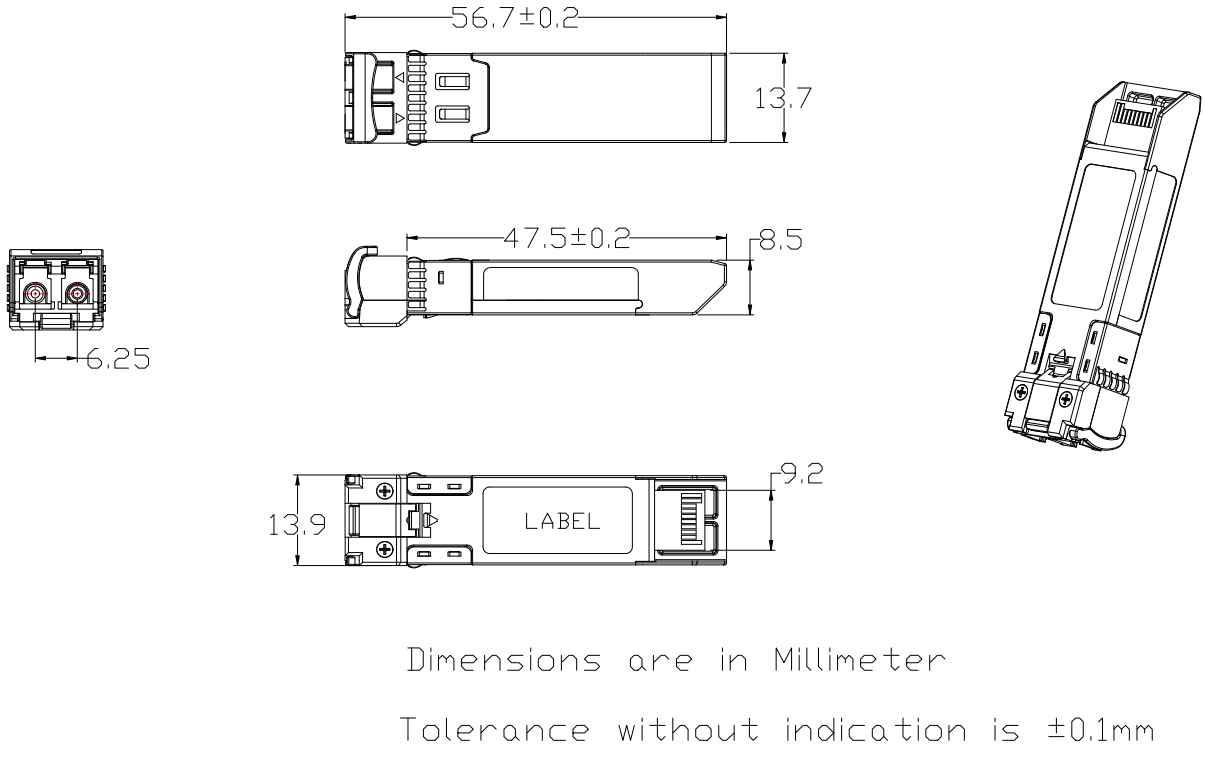
4. RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.

5. TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Dimensions



Ordering information

Part number	Description
Commercial Temperature	
OPC10G-2710DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1270nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-2910DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1290nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-3110DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1310nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-3310DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1330nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-3510DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1350nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-3710DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1370nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-3910DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1390nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-4110DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1410nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-4310DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1430nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-4510DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1450nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-4710DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1470nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-4910DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1490nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-5110DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1510nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-5310DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1530nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-5510DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1550nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-5710DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1570nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-5910DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1590nm, 10km, LC, DDM, 0ºC~+70ºC
OPC10G-6110DCR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1610nm, 10km, LC, DDM, 0ºC~+70ºC

Industrial Temperature	
OPC10G-2710DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1270nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-2910DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1290nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-3110DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1310nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-3310DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1330nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-3510DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1350nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-3710DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1370nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-3910DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1390nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-4110DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1410nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-4310DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1430nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-4510DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1450nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-4710DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1470nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-4910DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1490nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-5110DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1510nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-5310DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1530nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-5510DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1550nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-5710DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1570nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-5910DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1590nm, 10km, LC, DDM, -40ºC~+85ºC
OPC10G-6110DTR	10GBASE-LR CWDM SFP+ Transceiver, SMF, 1610nm, 10km, LC, DDM, -40ºC~+85ºC

⚠ Warnings

Process plug

The transceiver optics is supplied with a dust cover. This plug protects the transceiver optics during standard manufacturing processes by preventing contamination from air borne particles.It is recommended that the dust cover remain in the transceiver whenever an optical fiber connector is not inserted.

Handling Precautions

The transceiver optics is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

Laser Safety

The transceiver optics is a Class 1 laser product per international standard IEC 60825-1. Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

For more product information, visit us on the web at www.optcore.net