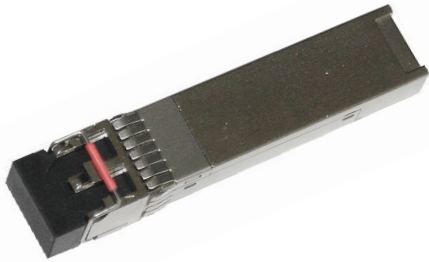


# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX



The RTXM228-2XX transceivers are designed to transmit and receive serial optical data over 40km single mode optical fiber.

They are compliant with SFF-8431, SFF-8432, 10GFC, ITU-T G.691 and 10GBASE-ER/EW. The transmitter converts serial CML electrical data into serial optical data compliant with the IEEE 802.3ae standard. The receiver converts serial optical data into serial CML electrical data. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

## Features

- Operating data 9.953 to 11.3Gbps
- Cooled 1550nm EML laser
- High sensitivity PIN photodiode and TIA
- LC duplex connector
- Hot-pluggable 20 pin connector
- Power consumption <1.8W
- -5°C to 70°C case temperature range
- Single +3.3V power supply
- Fully RoHS Compliant
- All metal housing for superior EMI performance

## Applications

- 10G SONET&SDH
- 10GBASE-ER/EW
- 10G Fiber Channel

## Standards

- ITU-T G.691
- IEEE 802.3  
10G BASE-ER/EW
- SFF-8431 & SFF-8432  
&SFF-8472

## Specifications

(Tc=-5 °C to 70 °C and Vcc= 3.14 to 3.46V)

Parameter	Symbol	Unit	Min	Typ	Max	Note
Transmitter						
Nominal Wavelength	$\lambda$	nm	1528.77		1563.05	
Center wavelength Spacing		GHz	-	100	-	
Wavelength Tolerance		pm	-50		50	
Side Mode Suppression Ratio	SMSR	dB	30			
Spectral Width(-20dB)	$\Delta\lambda$	nm			0.3	
Optical Output Power	Pav	dBm	-1		2	
Extinction Ratio	ER	dB	8.2			
Transmitter and Dispersion Penalty	TDP	dB			3	1
Average Launch Power of OFF Transmitter	POFF	dBm			-30	
Receiver						
Center Wavelength	$\lambda_C$	nm	1260		1620	
Receiver Sensitivity	RSEN	dBm			-15.8	2
Receiver Sensitivity(OMA)	RSEN	dBm			-14.1	2
Overload		dBm	0.5			
Optical Return Loss		dB	27		-	
LOS Assert	LOSA	dBm	-30			
LOS De-Assert LOS	LOSD	dBm			-17	
LOS Hysteresis		dB	0.5		6	

**Note: 1.** Dispersion Penalty at BER= $1 \times 10^{-12}$ , 10.3125Gbps, PRBS 2<sup>31</sup>-1, 40km Fiber.

**2.** Sensitivity for 10.3125G PRBS 2<sup>31</sup>-1 and BER better than or equal to 10E<sup>-12</sup>.

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## Ordering Information

Part No.	Specifications									Application
	Package	Data rate	Laser	Optical Power	Detector	Sensitivity	Temp	Reach	Other	
RTXM228-2XX	SFP+	9.953~11.3G	DWDM-rated EML	-1~+2dBm	PIN	< -16dBm	-5~70°C	40km	CDR DDM	10G SONET&SDH 10GBASE-ER/EW 10G Fiber Channel

## Block diagram

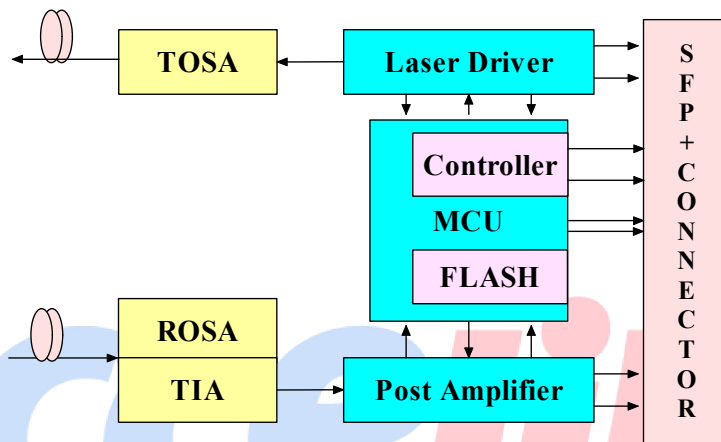


Figure 1. Transceiver functional diagram

## Absolute Maximum Ratings

Parameter	Symbol	Unit	Min	Max
Storage Temperature Range	Ts	°C	-40	85
Relative Humidity	RH	%	0	95

## Recommended Operating Conditions

Parameter	Symbol	Unit	Min	Typ	Max
Operating Case Temperature Range	Tc	°C	-5		70
Power Supply Voltage	Vcc	V	3.14	3.3	3.46
Bit Rate	BR	Gb/s			11.3
Bit Error Ratio	BER				10 <sup>-12</sup>
Max Supported Link Length	L	Km			40

# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX

## Electric Ports Definition

Parameter	Symbol	Unit	Min	Typ	Max	Note
Supply Voltage	$V_{CC}$	V	3.14	3.3	3.46	
Power Consumption	P	W			1.8	
<b>Transmitter</b>						
Input Differential Impedance	$R_{IN}$	$\Omega$	80	100	120	
Differential Data Input	$V_{IN}$	mVp-p	180		700	
Transmit Disable Voltage	$V_{DIS}$	V	2		$V_{CCHOST}$	
Transmit Enable Voltage	$V_{EN}$	V	$V_{EE}$		$V_{EE}+0.8$	
Transmit Fault Assert Voltage	$V_{FA}$	V	2		$V_{CCHOST}$	
Transmit Fault De-Assert Voltage	$V_{FDA}$	V	$V_{EE}$		$V_{EE}+0.4$	
<b>Receiver</b>						
Differential Data Output	$V_{OD}$	mVp-p	300		850	
Output Rise Time	$t_{RISE}$	pS	25			
Output Fall Time	$t_{FALL}$	pS	25			
LOS Fault	$V_{LOSFT}$	V	2		$V_{CCHOST}$	
LOS Normal	$V_{LOSNR}$	V	$V_{EE}$		$V_{EE}+0.4$	

## Pin function definitions

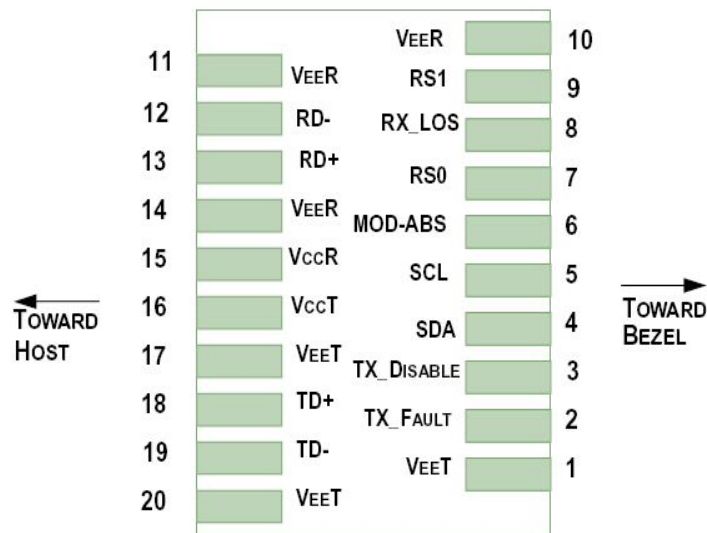


Figure 2. Pin function definitions

Table 1: Transceiver pin descriptions

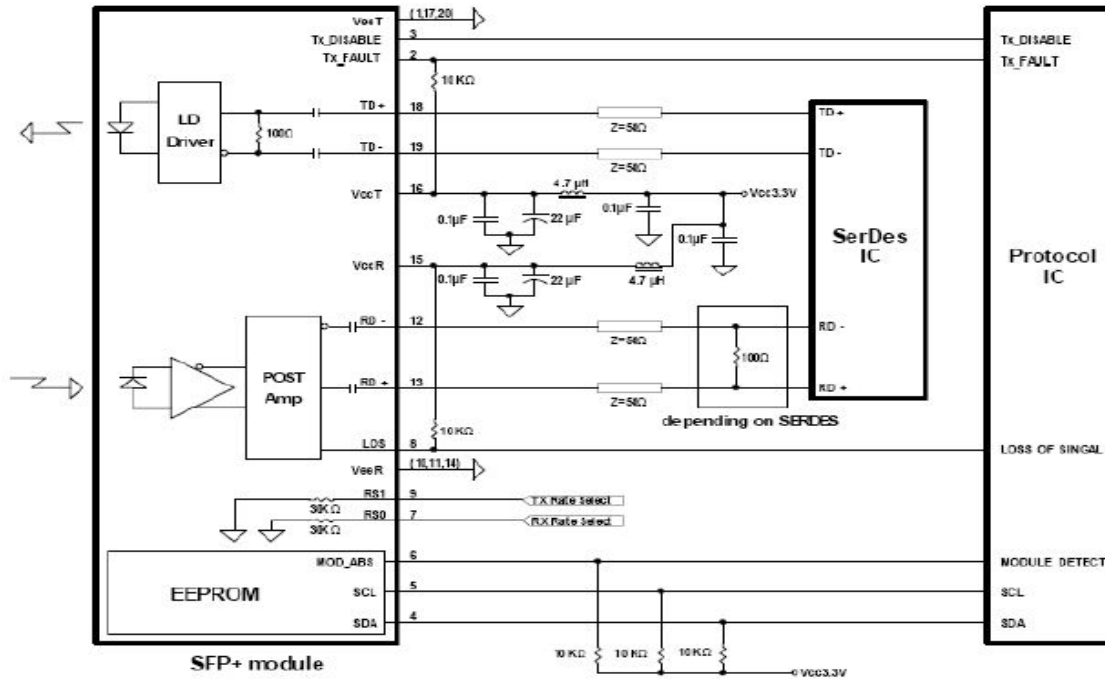
Pin Number	Symbol	Name	Description
1,17,20	VeeT	Transmitter Signal Ground	These pins should be connected to signal ground on the host

# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX

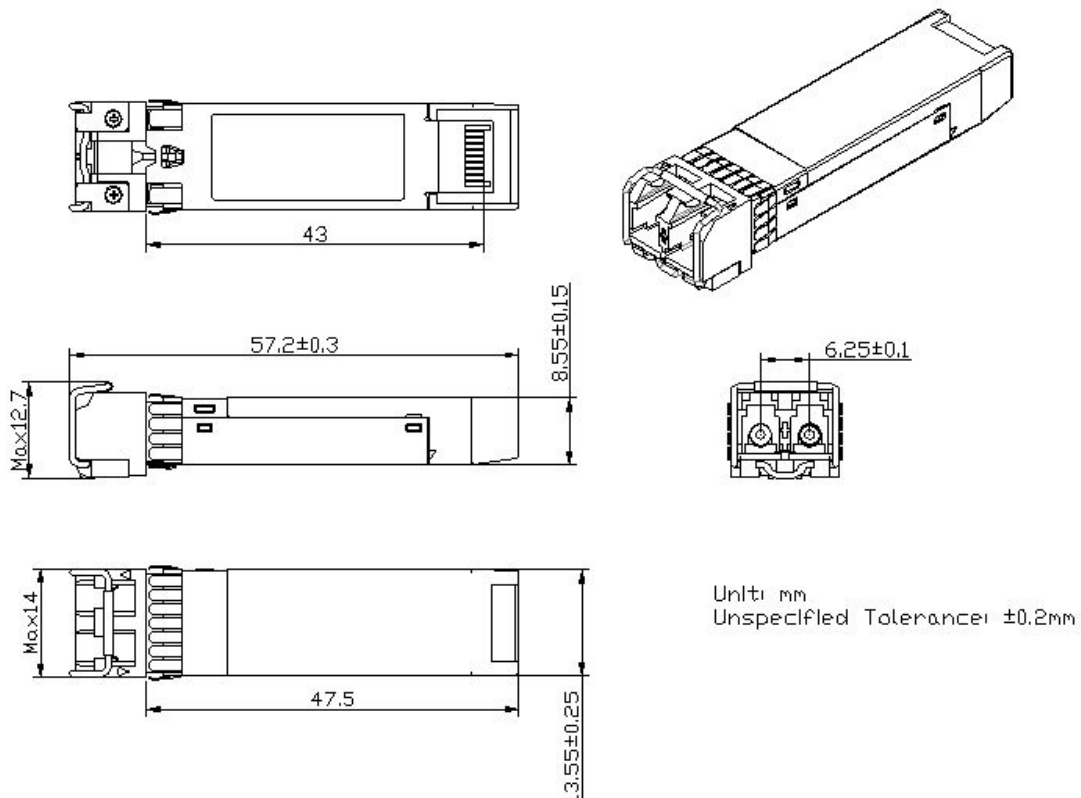
			board.
2	TX Fault	Transmitter Fault Out (OC)	Logic "1" Output = Laser Fault (Laser off before t <sub>fault</sub> ) Logic "0" Output = Normal Operation This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
3	TX Disable	Transmitter Disable In (LVTTL)	Logic "1" Input (or no connection) = Laser off Logic "0" Input = Laser on This pin is internally pulled up to VccT with a 10 kΩ resistor.
4	SDA		Serial ID with SFF 8472 Diagnostics
5	SCL	Module Definition Identifiers	Module Definition pins should be pulled up to Host Vcc with 10 kΩ resistors.
6	MOD-ABS		
7	RS0	Receiver Rate Select (LVTTL)	These pins have an internal 30kΩ pull-down to ground. A signal on either of these pins will not affect module performance.
9	RS1	Transmitter Rate Select (LVTTL)	
8	LOS	Loss of Signal Out (OC)	Sufficient optical signal for potential BER < 1x10 <sup>-12</sup> = Logic "0" Insufficient optical signal for potential BER < 1x10 <sup>-12</sup> = Logic "1" This pin is open collector compatible, and should be pulled up to Host Vcc with a 10kΩ resistor.
10,11,14	VeeR	Receiver Signal Ground	These pins should be connected to signal ground on the host board.
12	RD-	Receiver Negative DATA Out (CML)	Light on = Logic "0" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.
13	RD+	Receiver Positive DATA Out (CML)	Light on = Logic "1" Output Receiver DATA output is internally AC coupled and series terminated with a 50Ω resistor.
15	VccR	Receiver Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3.Recommended power supply filter
16	VccT	Transmitter Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3.Recommended power supply filter
18	TD+	Transmitter Positive DATA In (CML)	Logic "1" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.
19	TD-	Transmitter Negative DATA In (CML)	Logic "0" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100Ω resistor.

# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX

## Typical Application Circuit



## Package Outline



# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX

## Regulatory Compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.4	Class1 (>1KV) for high speed I/O pins Class 1 (> 2KV) for all other pins
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	Variation of IEC 61000-4-2	The SFP+ modules meet ESD requirements given in EN61000-4-2, criterion B test specification such that units are subjected to 15kV air discharges during operation and 8kV direct contact discharges to the case.
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B	Compliant with standards
EMC		FCC Class B/CE Class B
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.
RoHS Compliance		Less than 1000 ppm of cadmium, lead, mercury, hexavalent chromium, polybrominated biphenyls, and polybrominated biphenyl ethers.

Product Code	Frequency(THz)	Center Wavelength(nm)
RTXM228-218	191.80	1563.05
RTXM228-219	191.90	1562.23
RTXM228-220	192.00	1561.42
RTXM228-221	192.10	1560.61
RTXM228-222	192.20	1559.79
RTXM228-223	192.30	1558.98
RTXM228-224	192.40	1558.17
RTXM228-225	192.50	1557.36
RTXM228-226	192.60	1556.55
RTXM228-227	192.70	1555.75
RTXM228-228	192.80	1554.94
RTXM228-229	192.90	1554.13
RTXM228-230	193.00	1553.33
RTXM228-231	193.10	1552.52
RTXM228-232	193.20	1551.72
RTXM228-233	193.30	1550.92
RTXM228-234	193.40	1550.12
RTXM228-235	193.50	1549.32
RTXM228-236	193.60	1548.51
RTXM228-237	193.70	1547.72

# 10Gb/s 40Km DWDM SFP+ Transceivers RTXM228-2XX

RTXM228-238	193.80	1546.92
RTXM228-239	193.90	1546.12
RTXM228-240	194.00	1545.32
RTXM228-241	194.10	1544.53
RTXM228-242	194.20	1543.73
RTXM228-243	194.30	1542.94
RTXM228-244	194.40	1542.14
RTXM228-245	194.50	1541.35
RTXM228-246	194.60	1540.56
RTXM228-247	194.70	1539.77
RTXM228-248	194.80	1538.98
RTXM228-249	194.90	1538.19
RTXM228-250	195.00	1537.40
RTXM228-251	195.10	1536.61
RTXM228-252	195.20	1535.82
RTXM228-253	195.30	1535.04
RTXM228-254	195.40	1534.25
RTXM228-255	195.50	1533.47
RTXM228-256	195.60	1532.68
RTXM228-257	195.70	1531.90
RTXM228-258	195.80	1531.12
RTXM228-259	195.90	1530.33
RTXM228-260	196.00	1529.55
RTXM228-261	196.10	1528.77