

10G CWDM SFP+ Single-Mode 10km Optical Transceiver

KY-CWDM-10G-10SP

Features

- Supports 9.95Gb/s to 11.1Gb/s bit rates
- Hot-Pluggable SFP+ footprint
- 18-Wavelength CWDM DFB Transmitter from 1270nm to 1610nm, with step 20nm
- 10dB Power Budget at Least
- Duplex LC connector
- Power Dissipation < 1.2W
- Compliant with SFP+ MSA Specification SFF-8431
- Build-in digital diagnostic functions
- Compliant with SFF-8472 MSA
- Case operation temperature range 0°C to 70°C



Applications

- 10GBASE-LR/LW 10G Ethernet
- 10GBASE-LR at 10.31Gbps
- 10GBASE-LW at 9.95Gbps
- Other optical links

Description

The KY-CWDM-10G-10SP series optical transceiver is designed for fiber communications application such as 10G Ethernet (10GBASE-LR), which fully compliant with the specification of SFP+ MSA SFF-8431.

This module is designed for single mode fiber and operates at a nominal wavelength of CWDM wavelength. There are eighteen center wavelengths available from 1270nm to 1610nm, with each step 20nm. A guaranteed minimum optical link budget of 10 dB is offered.

The module is with the SFP+ connector to allow hot plug capability. Single 3.3V power supply is needed. The optical output can be disabled by LVTTTL logic high-level input of TX_DIS. Loss of signal (RX_LOS) output is provided to indicate the loss of an input optical signal of receiver.

This module provides digital diagnostic functions via a 2-wire serial interface as defined by the SFF-8472.

International Distributors

Specifications

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V _{cc}	-0.5	4.0	V
Storage Temperature	T _s	-40	+85	°C
Case Operating Temperature	T _{op}	0	70	°C

Table 2 - Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T _c	0		+70	°C
Power Supply Voltage	V _{cc}	3.13	3.3	3.45	V
Power Supply Current	I _{cc}			350	mA
Data Rate		9.95		11.1	Gbps

Table 3 - CWDM Wavelength Guide

Brand	Nomenclature	Wavelength(nm)		
		Min	Max	Unit
O-band Original	A	1264	1270	1277.5
	B	1284	1290	1297.5
	C	1304	1310	1317.5
	D	1324	1330	1337.5
	E	1344	1350	1357.5
E-band Extended	F	1364	1370	1377.5
	G	1384	1390	1397.5
	H	1404	1410	1417.5
	I	1424	1430	1437.5
	J	1444	1450	1457.5
S-band Short Wavelength	K	1464	1470	1477.5
	L	1484	1490	1497.5
	M	1504	1510	1517.5
	N	1524	1530	1537.5
C-band Conventional	O	1544	1550	1557.5
L-band Long Wavelength	P	1564	1570	1577.5
	Q	1584	1590	1597.5
	R	1604	1610	1617.5

Table 4 - Electrical Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
CML Inputs(Differential)	V_{in}	150		1200	mVpp	1
Input Impedance (Differential)	Z_{in}	85	100	115	ohms	
Tx_DISABLE Input Voltage - High		2		$V_{cc}+0.3$	V	
Tx_DISABLE Input Voltage - Low		0		0.8	V	
Tx_FAULT Output Voltage - High		2		$V_{cc}+0.3$	V	
Tx_FAULT Output Voltage - Low		0		0.8	V	
Receiver						
CML Outputs (Differential)	V_{out}	350		700	mVpp	1
Output Impedance (Differential)	Z_{out}	85	100	115	ohms	
Rx_LOS Output Voltage - High		2		$V_{cc}+0.3$	V	
Rx_LOS Output Voltage - Low		0		0.8		
MOD_DEF (0:2)	VoH	2.5			V	2
	VoL	0		0.5	V	

Table 5 - Optical Characteristics

(TOP = 0 to 70°C, VCC = 3.15 to 3.45V)

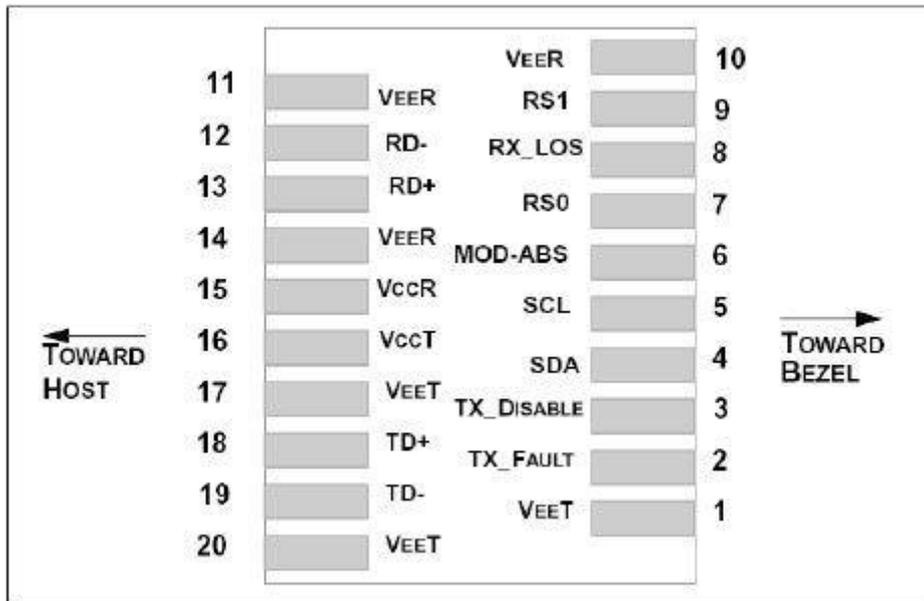
Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Optical Opt. Pwr: 9/125 SMF	P_{out}	-5		0	dBm	1
Optical Extinction Ratio	ER	3.5			dB	
Optical Wavelength	λ	$\lambda_c - 6$	λ_c	$\lambda_c + 7.5$	nm	2
-20dB Spectrum Width	$\Delta\lambda$			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Transmitter and Dispersion Penalty	TDP			2	dB	
Average Launch Power of OFF Transmit	P_{off}			-30	dBm	
TX Jitter Generation(Peak-to-Peak)	TXj			0.1	UI	

TX Jitter Generation (RMS)	TXj RMS			0.01	UI	
Receiver						
Receiver Sensitivity@10.7Gb/s	Pmin			-15	dBm	3
Receiver Overload	Pmax	+0.5			dBm	
Optical Center Wavelength	λ	1260		1620	nm	
Receiver Reflectance	Rrf			-27	dB	
LOS De-Assert	LOS _D			-16	dB	
LOS Assert	LOS _A	-28			dBm	
LOS Hysteresis		1			dB	

Notes:

1. Output power is coupled into a 9/125 μ m SMF
2. ITU-T G.694.2 CWDM wavelength from 1270nm to 1610nm, each step 20nm.
3. Average received power; BER less than 1E-12 and PRBS 231-1 test pattern.

SFP+ Transceiver Electrical Pad Layout



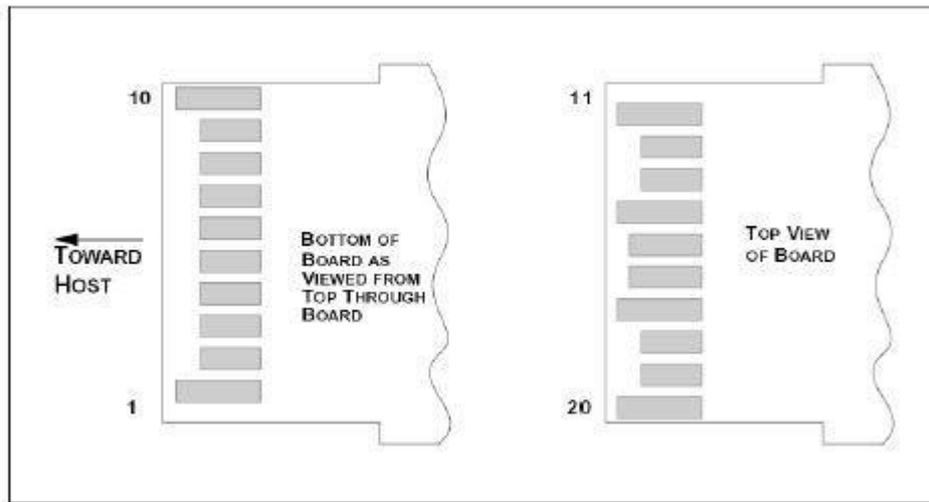


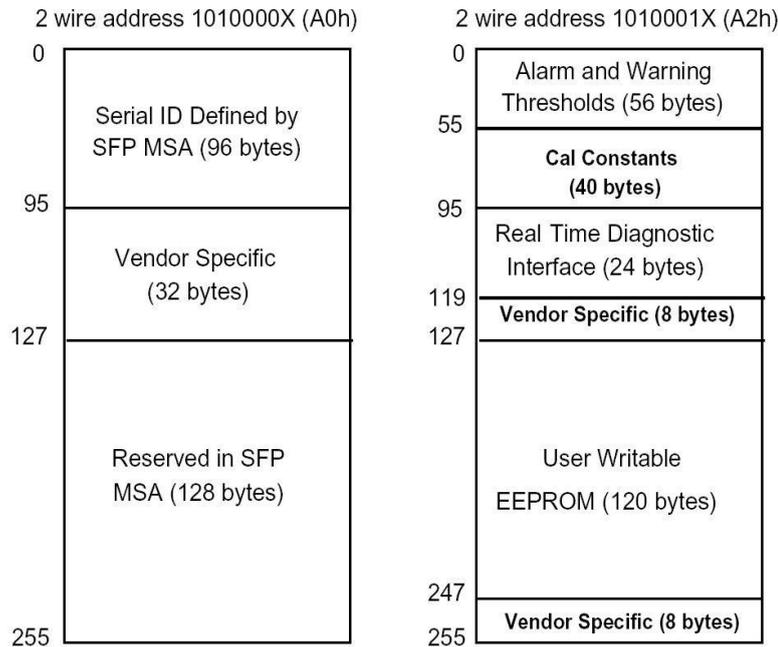
Table 6 - Diagnostics Specification

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal / External
Voltage	3.0 to 3.6	V	±3%	Internal / External
Bias Current	0 to 100	mA	±10%	Internal / External
TX Power	0 to +5	dBm	±3dB	Internal / External
RX Power	-23 to -3	dBm	±3dB	Internal / External

Digital Diagnostic Memory Map

The 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 Function Definitions

Pin	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	MOD_DEF(2)	Serial Data Signal	3	Note 3, Data line for Serial ID
5	MOD_DEF(1)	SCL Serial Clock Signal	3	Note 3, Clock line for Serial ID
6	MOD_DEF(0)	TTL Low	3	Note 3
7	RS0	RX Rate Select (LVTTTL)	3	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL)	1	This pin has an internal 30k pull down to ground. A signal on this pin will not affect module performance
10	VeeR	Receiver ground	1	Note 5
11	VeeR	Receiver ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver ground	1	Note 5
15	VccR	Receiver Power Supply	2	3.3V ± 5%, Note 7
16	VccT	Transmitter Power Supply	2	3.3V ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8

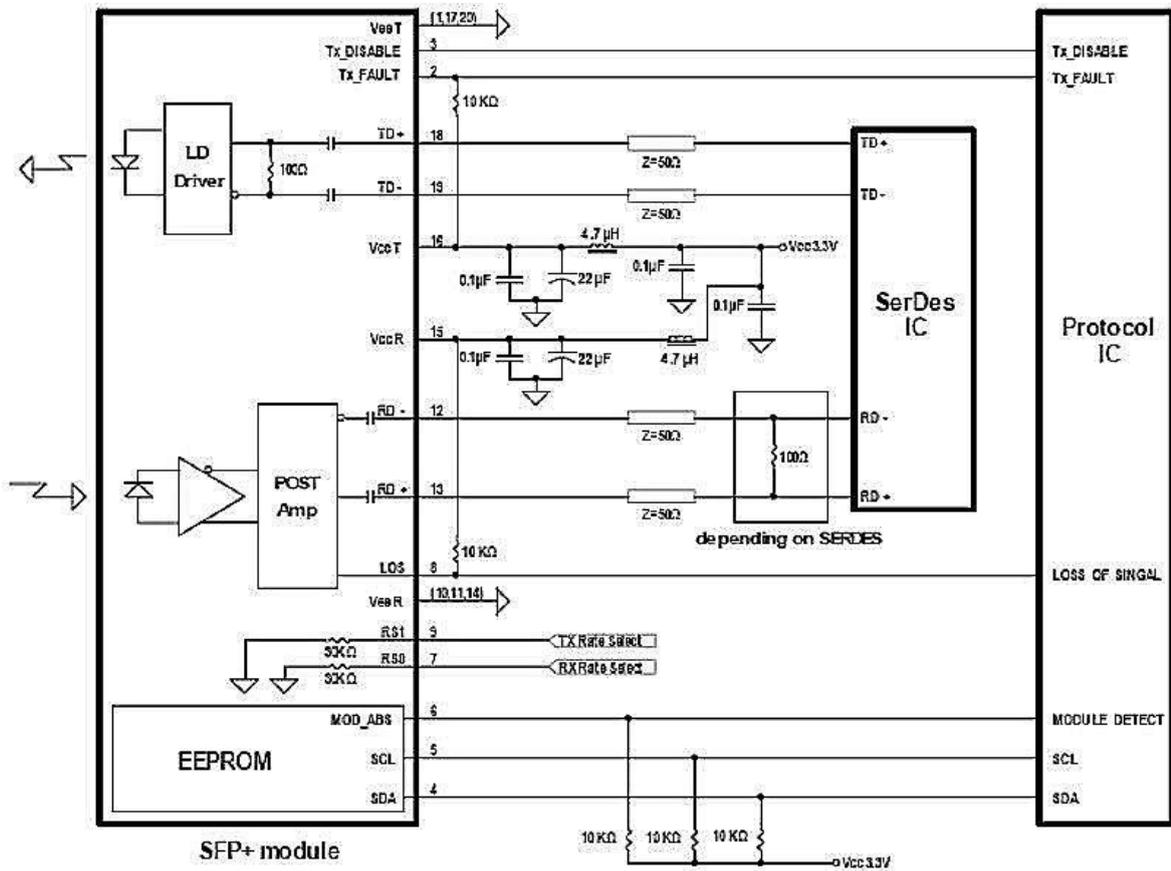
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

Notes:

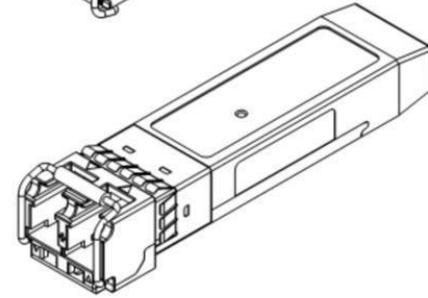
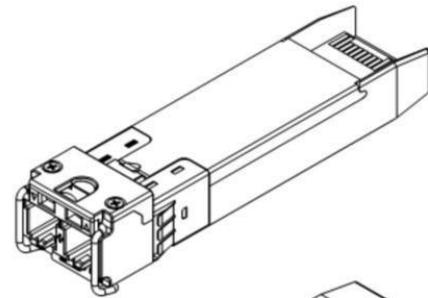
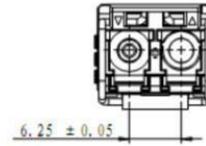
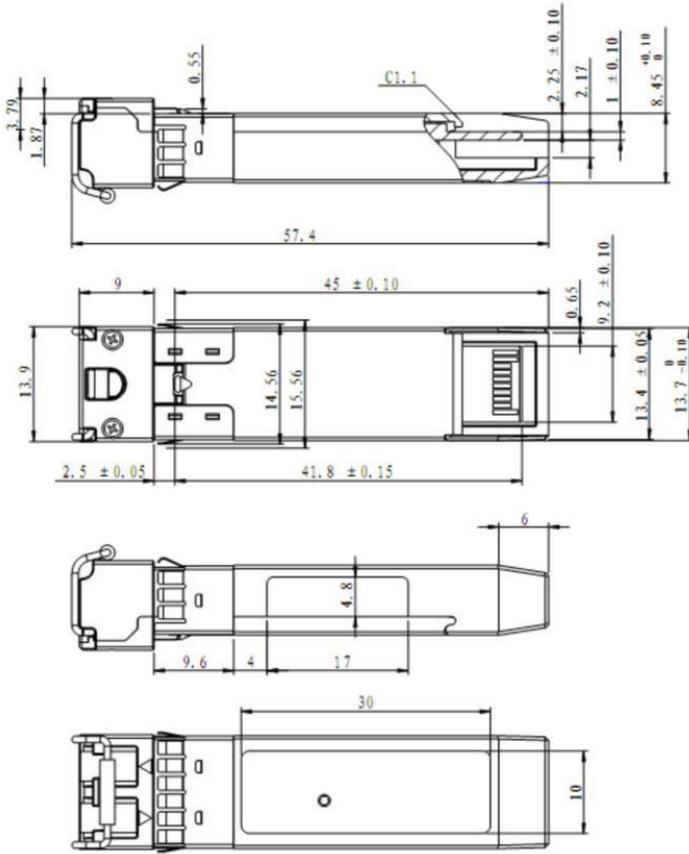
Plug Seq.: Pin engagement sequence during hot plugging.

- TX Fault is an open collector/drain output, which should be pulled up with a 4.7K ~ 10KΩ resistor on the host board to 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.
- TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10KΩ resistor. Its states are:
 Low (0 to 0.8V): Transmitter on
 (>0.8, < 2.0V): Undefined
 High (2.0 to 3.465V): Transmitter Disabled
 Open: Transmitter Disabled
- Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7k ~ 10kΩ 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 serialID
 Mod-Def 2 is the data line of two wire serial interface for serialID
- 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.
- VeeR and VeeT may be internally connected within the SFP+ module.
- 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. The voltage swing on these lines will be between 370 and 700 mV differential (185 – 350 mV single ended) when properly terminated.
- 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 1 ohm should be used in order to maintain the required voltage at the SFP+ input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP+ transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP+ transceiver module.
- 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. The inputs will accept differential swings of 150 – 1200 Mv (75 – 600Mv single-ended), though it is recommended that values between 150 and 1200 mV differential (75 – 600Mv single-ended) be used for best EMI performance.

Recommended Interface Circuit



Mechanical Dimensions



Ordering Information

Part No.	Data Rate (Gbps)	Wavelength (nm)	Fiber Type	Connector Type	Transmission Distance (km)	Operating case temperature (°C)	Digital Diagnostics
KY-CWDM-10G-10SP	10	1270 to 1610	SMF	LC	10	0 to +70	Yes

All statements, technical information, and recommendations related to the products herein are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and no responsibility is assumed for any inaccuracies. Please contact KAYA Instruments for more information.

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