

## **SFP-CWxxTG-60Dx**

10.3Gbps SFP+ CWDM Transceiver, Single Mode, 60km Reach

### **Features**

- Supports up to 10.7Gbps bit rates
- Hot-pluggable SFP+ footprint
- CWDM DFB laser and APD photodiode, Up to 60km for SMF transmission
- Compliant with SFP+ MSA and SFF-8472 with duplex LC receptacle
- Compatible with RoHS
- Single +3.3V power supply
- Real Time Digital Diagnostic Monitoring
- Operating case temperature:
  - Standard: -5 to +70°C
  - Industrial: -40 to +85°C

### **Applications**

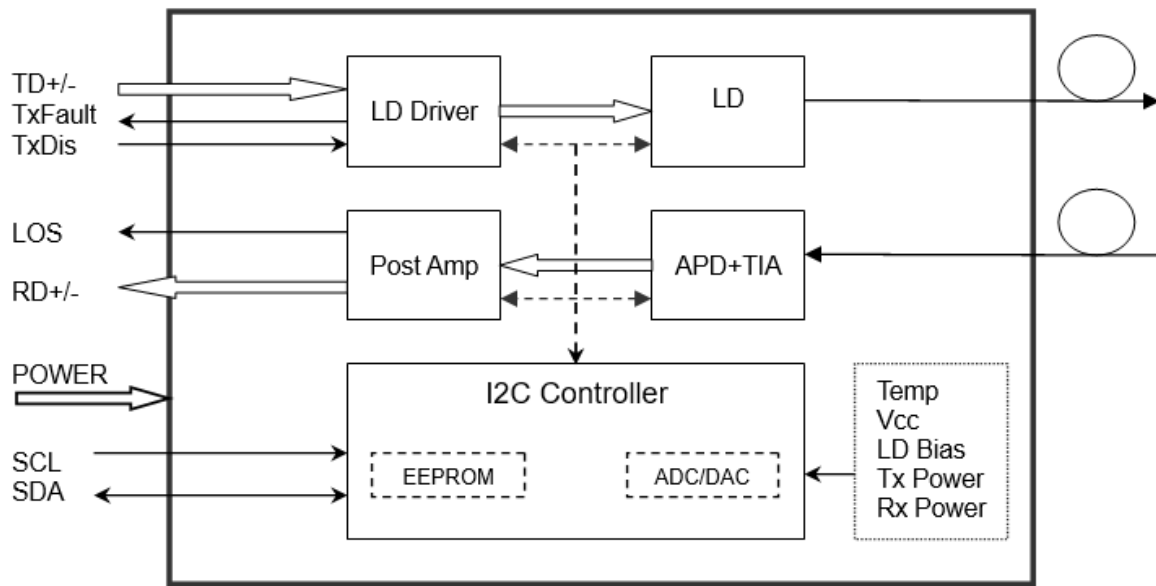
- 10Gbps CWDM Optical systems
- 10GBASE-LR at 10.3125Gbps
- 10GBASE-LW at 9.953Gbps
- LTE systems
- Other Optical links

### **Description**

The SFP+ transceivers are high performance, cost effective modules supporting data rate of 10Gbps and 60km transmission distance with SMF.

The transceiver consists of three sections: a uncooled DFB laser transmitter, a APD photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement and SFF-8472 digital diagnostics functions



**Transceiver functional diagram**

**Absolute Maximum Ratings**

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	°C
Operating Humidity	-	5	85	%

**Recommended Operating Conditions**

Parameter	Symbol	Min	Typical	Max	Unit
Operating Case Temperature	Standard	0		+70	°C
	Extended	-20		+80	°C
	Industrial	-40		+85	°C
Power Supply Voltage	Vcc	3.135	3.30	3.465	V
Power Supply Current	Icc			400	mA
Data Rate		8.0	10.3	10.7	Gbps

**Optical and Electrical Characteristics**

Parameter	Symbol	Min	Typical	Max	Unit	Notes
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	$\lambda_c-6.5$	$\lambda_c$	$\lambda_c+6.5$	nm	
Spectral Width (-20dB)	$\Delta\lambda$			1	nm	
Side-Mode Suppression Ratio	SMSR	30	-		dB	

Average Output Power	Pout	0		+5	dBm	1
Extinction Ratio	ER	5.0			dB	
Data Input Swing Differential	VIN	180		850	mV	2
Input Differential Impedance	ZIN	90	100	110	$\Omega$	
TX Disable	Disable	2.0		Vcc	V	
	Enable	0		0.8	V	
TX Fault	Fault	2.0		Vcc	V	
	Normal	0		0.8	V	
<b>Receiver</b>						
Centre Wavelength	$\lambda_c$	1260		1620	nm	
Receiver Sensitivity				-20	dBm	3
Receiver Overload		0.5			dBm	3
LOS De-Assert	LOSD			-21	dBm	
LOS Assert	LOSA	-35			dBm	
LOS Hysteresis		0.5			dB	
Data Output Swing Differential	Vout	300		900	mV	4
LOS	High	2.0		Vcc	V	
	Low			0.8	V	

**Notes:**

1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2<sup>31</sup>-1 test pattern @10312Mbps, BER  $\leq 1 \times 10^{-12}$ .
4. Internally AC-coupled.

### Timing and Electrical

Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	$\mu$ s
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	$\mu$ s
Tx Disable To Reset	t_reset	10			$\mu$ s
LOS Assert Time	t_loss_on			100	$\mu$ s
LOS De-assert Time	t_loss_off			100	$\mu$ s

Serial ID Clock Rate	f_serial_clock		100	400	KHz
MOD_DEF (0:2)-High	VH	2		Vcc	V
MOD_DEF (0:2)-Low	VL			0.8	V

### Diagnostics

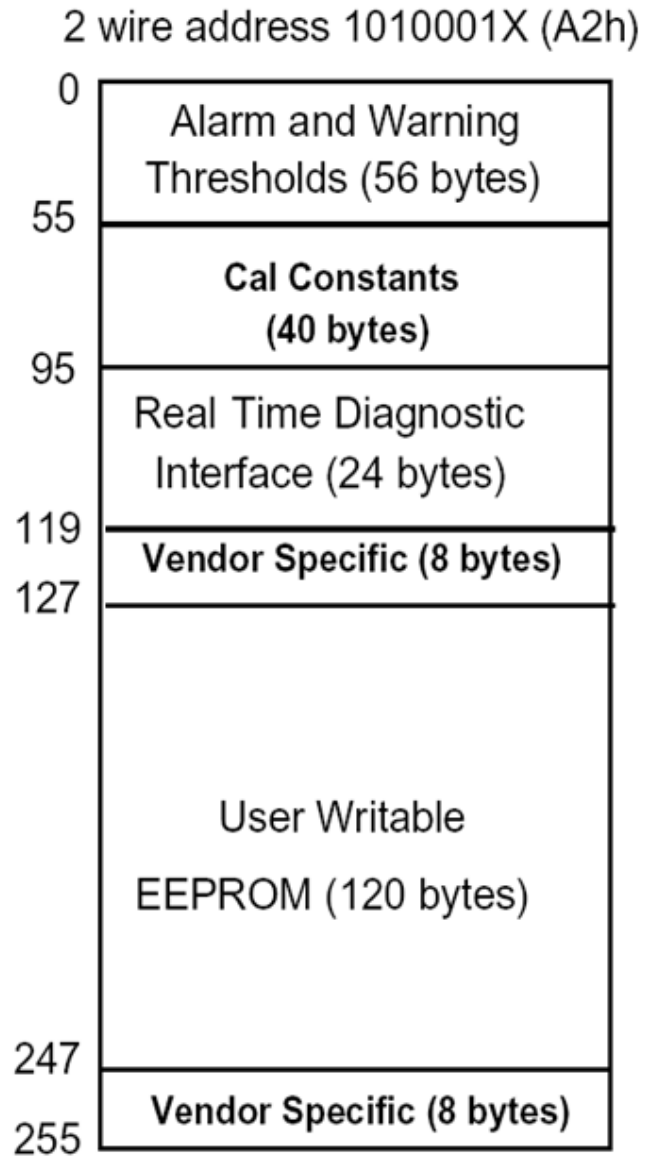
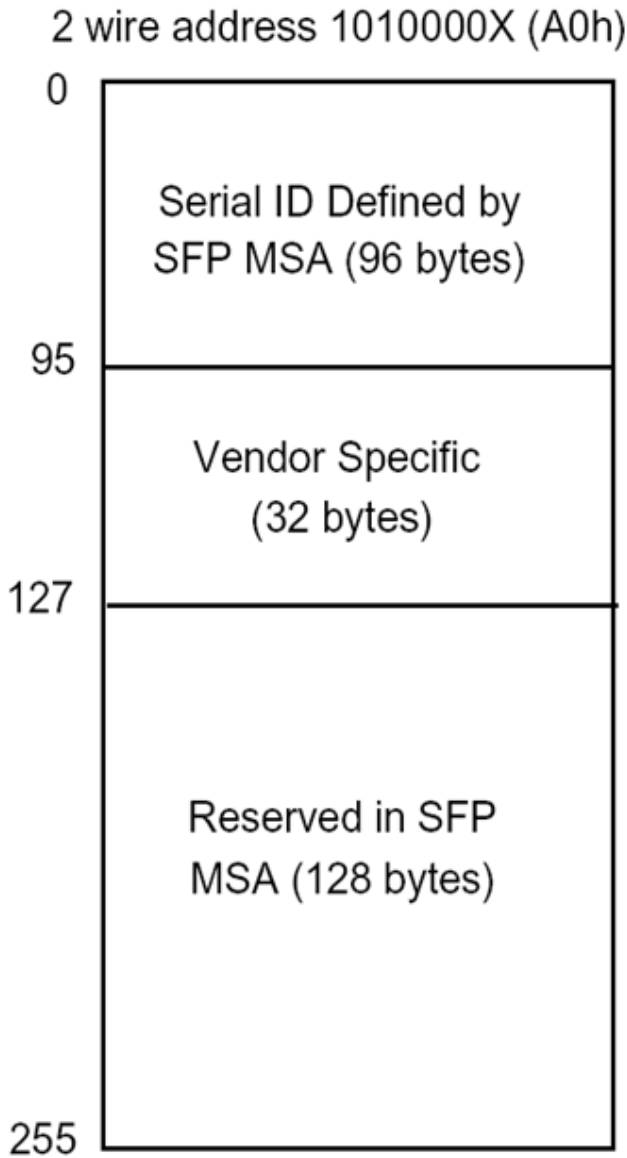
Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to +70	°C	±3°C	Internal
	-20 to +80			
	-40 to +85			
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	-1 to +5	dBm	±3dB	Internal
RX Power	-22 to -6	dBm	±3dB	Internal

### Digital Diagnostic Memory Map

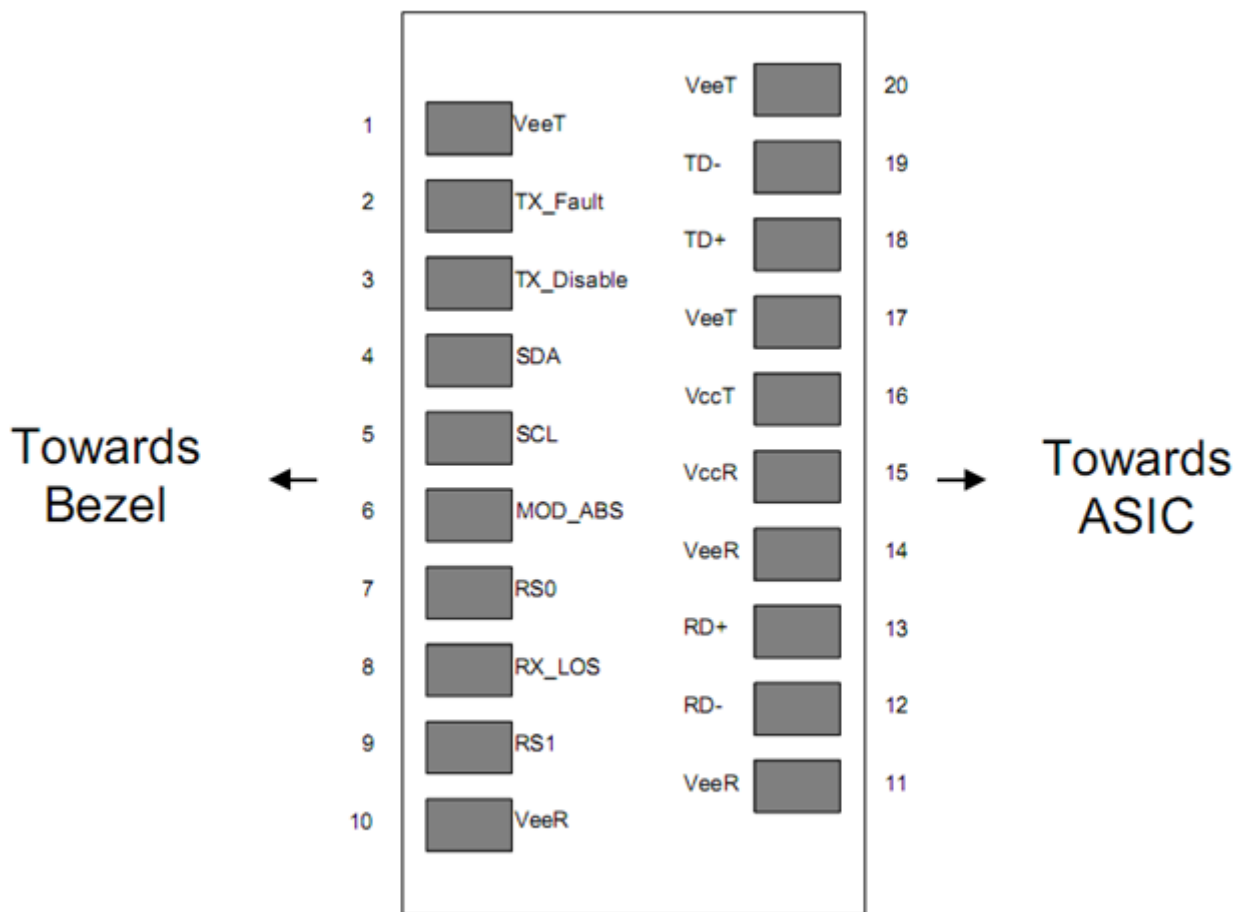
The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

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 Descriptions**



Pin	Signal Name	Description	Plug Seq.	Notes
1	VEET	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	VEER	Receiver ground	1	
11	VEER	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	VEER	Receiver ground	1	
15	VCCR	Receiver Power Supply	2	
16	VCCT	Transmitter Power Supply	2	



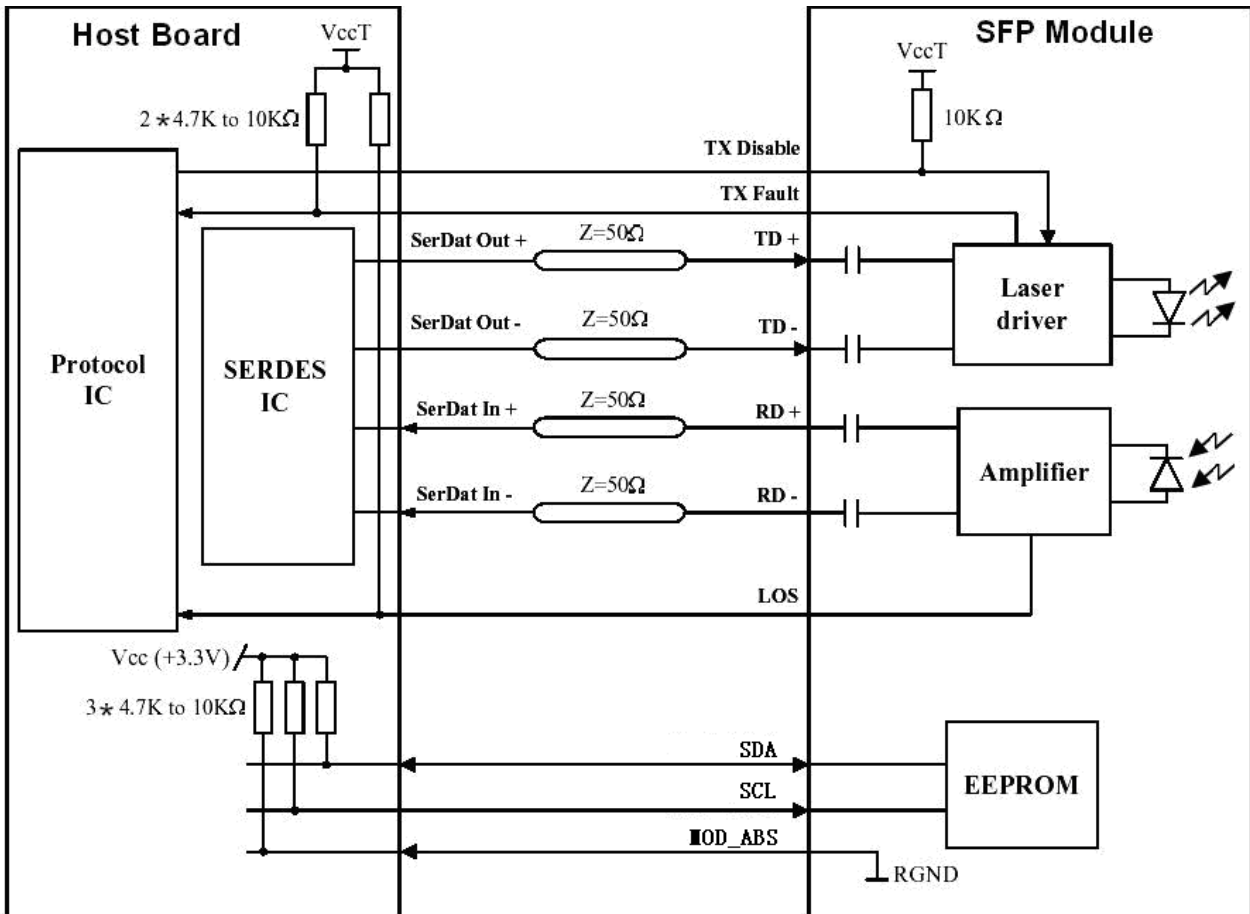
17	VEET	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	VEET	Transmitter Ground	1	

### 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

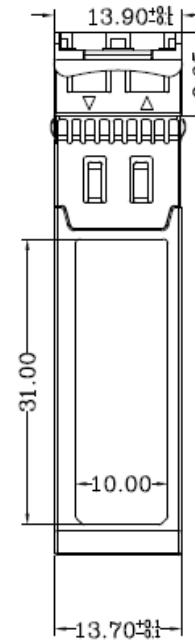
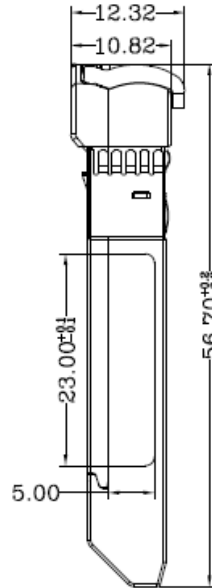
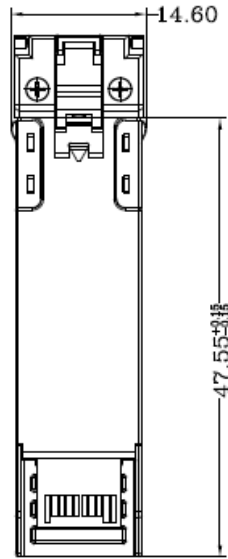
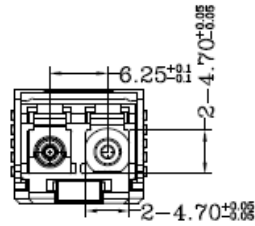


### Mechanical Dimensions



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### Ordering information

Part Number	Product Description
SFP-CWxxTG-60DC	1270~1330nm CWDM, 10Gbps, LC, 60km, 0°C~+70°C, with DDM
SFP-CWxxTG-60DI	1270~1330nm CWDM, 10Gbps, LC, 60km, -40°C~+85°C, with DDM