FluxLight
OPTICAL TRANSCEIVERS

Datasheet

SFP-10G-MRA-T-FL

1G/2.5G/5G/10G, SFP+, RJ45, CAT6A, 30m, COM

Quick Spec

Rate Category:	10G
Supported Rate(s):	1G/2.5G/5G/10G
Cable Type:	Copper (RJ-45)
Form Factor:	SFP+
Reach:	30m
Interface Type:	1000BASE-T/2.5GBASE-T/5GBASE-T/10GBASE-T
Standard/Protocol:	IEEE 802.3an 10GBASE-T, IEEE 802.3bz 2.5G/5GBASE-T, IEEE 802.3ab 1000BASE-T; SFP+ MSA
DDM:	Supported
Connector Type:	RJ45
Power Consumption:	2.5W max
Operating Temperature:	0°C to +70°C (COM)



Overview

The FluxLight SFP-10G-MRA-T-FL is a hot-pluggable multi-rate copper SFP+ transceiver for 1G, 2.5G, 5G and 10 Gigabit Ethernet over twisted-pair cable, with reach up to 30 m at 10 Gb/s over Category 6a or Category 7 cable. At 10 Gb/s it operates as 10GBASE-T (IEEE 802.3an), using 16-level (PAM-16) line encoding at an 800 MHz symbol rate across all four cable pairs; at 2.5G and 5G it operates as 2.5GBASE-T/5GBASE-T (IEEE 802.3bz) and at 1G as 1000BASE-T. The lower rates let an SFP+ port connect to multi-gigabit and Gigabit copper equipment such as Wi-Fi access points and NBASE-T switches; the rates available depend on the host platform. Serial ID and digital diagnostic monitoring (module temperature and supply voltage, per SFF-8472) are available over the two-wire interface. Each SFP-10G-MRA-T-FL is programmed for 100% compatibility with the target OEM platform and is backed by a FluxLight lifetime warranty.

Features

- Multi-rate 1G / 2.5G / 5G / 10G Ethernet over copper twisted-pair cable
- Hot-pluggable SFP+ footprint with compact RJ-45 connector
- Up to 30 m at 10G over Category 6a/7 cable
- Compliant with SFP+ MSA, IEEE 802.3an (10GBASE-T), IEEE 802.3bz (2.5GBASE-T/5GBASE-T) and IEEE 802.3ab (1000BASE-T)
- Digital Diagnostic Monitoring (DDM) per SFF-8472: module temperature and supply voltage
- Single +3.3 V supply, 2.5 W max
- Operating case temperature: 0°C to +70°C (COM)
- RoHS compliant and lead-free
- 100% compatible with and programmed for the target OEM platform
- Backed by a FluxLight lifetime warranty

Applications

- 1G / 2.5G / 5G / 10G Ethernet over copper twisted-pair cable
- Connecting SFP+ switch ports to multi-gigabit Wi-Fi access points, NBASE-T switches, 10G servers and Gigabit Ethernet devices
- Top-of-rack and in-row links up to 30 m at 10G

Absolute Maximum Rating

The operation in excess of any absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit
Storage Temperature	TS	-40	85	°C
Operating Case Temperature	TOP	0	70	°C

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Supply Current	Is		700	800	mA	2.5W max power over full range of voltage and temperature
Input Voltage	Vcc	3.13	3.3	3.47	V	Referenced to GND

General Specifications

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Data Rate	BR		10.3125		Gb/s	10GBASE-T, IEEE 802.3 compatible. Also supports 1G / 2.5G / 5G Ethernet (host-dependent).
Cable Length	L			30	m	Category 6a/7 cable

High-Speed Electrical Signals

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Line Frequency	fL		800		MHz	16-level encoding, per IEEE 802.3, 10GBASE-T
Tx Output Impedance	Zout,TX		100		Ω	Differential
Rx Input Impedance	Zin,RX		100		Ω	Differential
Differential data input swing	$V_{inswing}$	500		1100	mV	Differential
Differential data output swing	$V_{outswing}$	500		1100	mV	Differential
Tx Input Impedance	Zin		100		Ω	Differential
Rx Output Impedance	Zout		100		Ω	Differential
Rise/Fall Time	Tr,Tf	25		47	ps	20%-80%

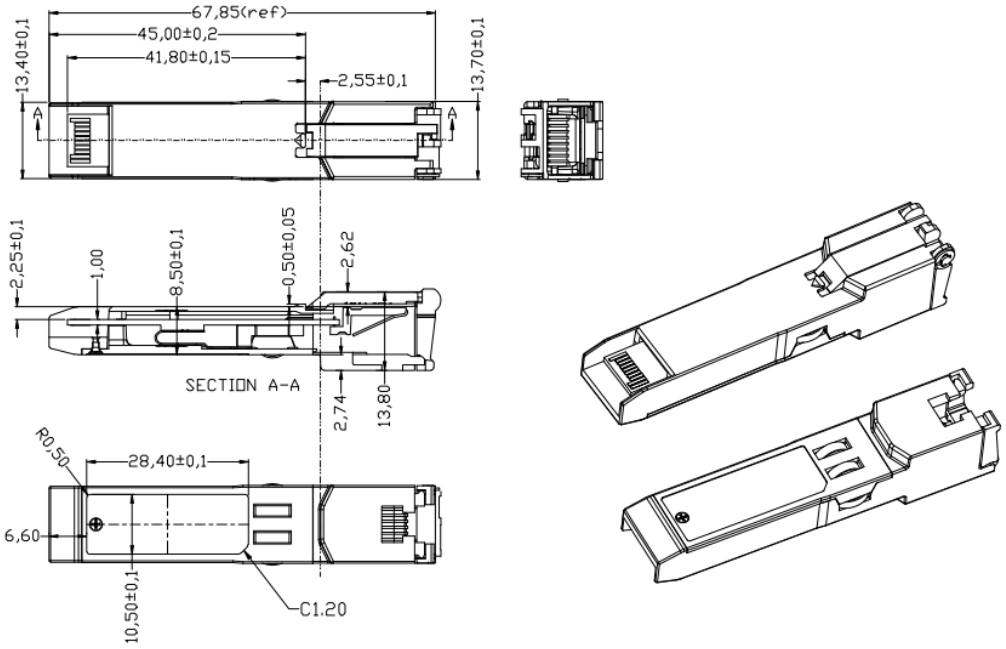
Digital Diagnostic Functions

The module supports digital diagnostic monitoring (DDM) over the two-wire serial interface per SFF-8472. As a copper module it has no laser or optical receiver, so it reports module temperature and supply voltage; the laser bias current and optical power fields are not used.

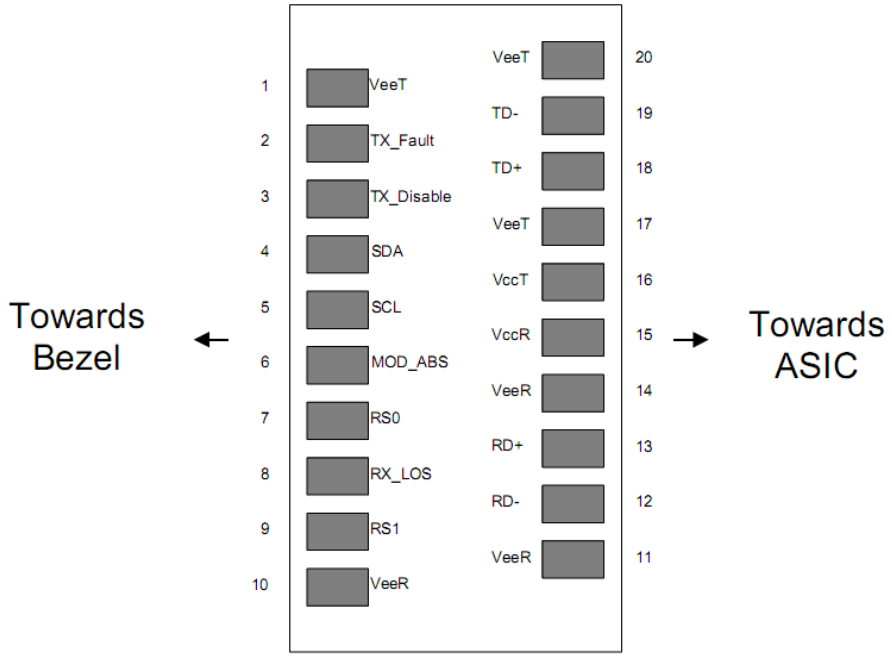
Parameter	Symbol	Reported
Module temperature	DMI_Temp	Yes
Supply voltage	DMI_VCC	Yes
Laser bias current	DMI_Ibias	N/A (copper)
TX optical power	DMI_TX	N/A (copper)
RX optical power	DMI_RX	N/A (copper)

Mechanical Dimensions

Units: mm



Pin Assignment and Description



Pin	Signal Name	Description	Plug Seq.
1	VeeT	Transmitter Ground	1
2	TX FAULT	Transmitter Fault Indication	3
3	TX DISABLE	Transmitter Disable	3
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
9	RS1	Not Connected	3
10	VeeR	Receiver Ground	1
11	VeeR	Receiver Ground	1
12	RD-	Inv. Received Data Out	3
13	RD+	Received Data Out	3
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
19	TD-	Inv. Transmit Data In	3
20	VeeT	Transmitter Ground	1

- TX Fault is not supported.
- TX Disable as described in the SFP+ MSA is applicable to this module.
- MOD_ABS is grounded within the module to indicate that the module is present.
- SCL and SDA are the clock and data lines of the two-wire serial interface for serial ID. They should be pulled up with a 4.7–10 kΩ resistor on the host board.
- RD-/+: These are the differential receiver outputs. They are AC-coupled 100 Ω differential lines which should be terminated with 100 Ω differential at the user SerDes.
- VccR and VccT are the receiver and transmitter power supplies.
- TD-/+: These are the differential transmitter inputs. They are AC-coupled differential lines with 100 Ω differential termination inside the module.

ESD

Normal ESD precautions are required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.