

OC-12/STM-4 SFP MULTIMODE TRANSCEIVERS WITH DIGITAL DIAGNOSTICS

TRPA 12MM

Product Description

The TRPA12MM SFP fiber optic transceivers with integrated digital diagnostics monitoring functionality provide a quick and reliable interface for OC-12/STM-4 multimode applications. The diagnostic monitoring functions, alarm and warning features are provided via an I²C serial interface. The transceivers are designed to be compatible with the ATM requirements at OC-12/STM-4 (622Mb/s) data rate.

The TRPA12MM transceivers connect to standard 20-pad SFP connectors for hot plug capability. This allows the system designer to make configuration changes or maintenance by simply plugging in different types of transceivers without removing the power supply from the host system.

The transmitter design incorporates a highly reliable 1310nm LED and an integrated driver circuit. The receiver features a transimpedance amplifier IC for high sensitivity and wide dynamic range. The transmitter and receiver DATA interfaces are AC-coupled internally. LV-TTL Transmitter Disable control input and Loss of Signal output interfaces are also provided.

The transceivers operate from a single +3.3V power supply over three operating case temperature ranges of -5°C to +70°C ("B" option), -5°C to +85°C ("E" option), or -40°C to +85°C ("A" option). The housing is made of plastic and metal for EMI enhancement.



Features

- Compatible with SFP MSA
- Compatible with ATM and Specifications for OC-12/STM-4 (622Mb/s)
- Digital Diagnostics Monitoring through Serial Interface
- Distances up to 500m
- Hot-pluggable
- Three Operating Case Temperature Options
- Loss of Signal Output
- TX Disable Input
- Duplex LC Optical Interface
- Single +3.3V Power Supply

Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_{st}	- 40	+ 85	°C
Operating Case Temperature ¹	"B" option	- 5	+ 70	°C
	"E" option	- 5	+ 85	
	"A" option	- 40	+ 85	
Supply Voltage	V_{cc}	0	+ 5.0	V
Input Voltage	V_{in}	0	V_{cc}	V

¹ Measured on top side of SFP module at the front center vent hole of the cage.

Transmitter Performance Characteristics (Over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate ¹	B	-	622	-	Mb/s
Optical Output Power ²	P_O	- 20.0	-	- 14.0	dBm
Center Wavelength	λ_C	1270	-	1380	nm
Spectral Width (FWHM)	$\Delta\lambda_{FWHM}$	-	140	200	nm
Optical Rise and Fall Time (10% to 90%)	t_r, t_f	-	1.0	1.25	ns
Extinction Ratio	P_{hi}/P_{lo}	10	-	-	dB
Transmitter OFF Power	P_{OFF}	-	-	- 45.0	dBm
Systematic Jitter (DCD & DDJ, peak-to-peak)	SJ	-	-	0.4	ns
Random Jitter (peak-to-peak)	RJ	-	-	0.15	ns

¹ Data rate ranges from 50Mb/s to 700Mb/s. However, some degradation may be incurred in overall performance.² Measured average power coupled into 62.5/125 μ m, 0.275 NA graded-index multimode fiber.

The minimum power specified is at Beginning-of-Life.

Receiver Performance Characteristics (Over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

All parameters guaranteed only at typical data rate

Parameter	Symbol	Minimum	Typical	Maximum	Units
Operating Data Rate ¹	B	-	622	-	Mb/s
Receiver Sensitivity (10^{-10} BER) ²	P_{min}	- 26.0	- 28.0	-	dBm
Maximum Input Optical Power (10^{-10} BER) ²	P_{max}	- 14.0	- 6.0	-	dBm
LOS Thresholds	Increasing Light Input	P_{los+}	-	-	- 26.0
	Decreasing Light Input	P_{los-}	- 40.0	-	-
LOS Hysteresis	-	-	1.0	-	dB
LOS Timing Delay	Increasing Light Input	t_{loss_off}	-	-	100
	Decreasing Light Input	t_{loss_on}	-	-	350
Wavelength of Operation	λ	1100	-	1600	nm

¹ Data rate ranges from 50Mb/s to 700Mb/s. However, some degradation may be incurred in overall performance.² Specified in average optical input power and measured at 622Mb/s and 1310nm wavelength with 2²³-1 PRBS. The sensitivity is guaranteed with eye opening of 0.31ns.

Laser Safety: All transceivers are Class I Laser products per FDA/CDRH and IEC-60825 standards. They must be operated under specified operating conditions.

**Oplink Communications, Inc.**

DATE OF MANUFACTURE:

This product complies with
21 CFR 1040.10 and 1040.11
Meets Class I Laser Safety Requirements

Transmitter Electrical Interface (Over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Input Voltage Swing (TD+ & TD-) ¹	V_{PP-DIF}	0.25	-	2.4	V
Input HIGH Voltage (TX Disable) ²	V_{IH}	2.0	-	V_{CC}	V
Input LOW Voltage (TX Disable) ²	V_{IL}	0	-	0.8	V

¹ Differential peak-to-peak voltage.² There is an internal 4.7 to 10k Ω pull-up resistor to V_{CC} .**Receiver Electrical Interface** (Over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Output Voltage Swing (RD+ & RD-) ¹	V_{PP-DIF}	0.6	-	2.0	V
Output HIGH Voltage (LOS) ²	V_{OH}	2.0	-	$V_{CC} + 0.3$	V
Output LOW Voltage (LOS) ²	V_{OL}	0	-	0.5	V

¹ Differential peak-to-peak voltage across external 100 Ω load.² Open collector compatible, 4.7 to 10k Ω pull-up resistor to V_{CC} (Host Supply Voltage).**Electrical Power Supply Characteristics** (Over Operating Case Temperature, $V_{CC} = 3.13$ to $3.47V$)

Parameter	Symbol	Minimum	Typical	Maximum	Units
Supply Voltage	V_{CC}	3.13	3.3	3.47	V
Supply Current	I_{CC}	-	210	285	mA

Module Definition

MOD_DEF(0) pin 6	MOD_DEF(1) pin 5	MOD_DEF(2) pin 4	Interpretation by Host
TTL LOW	SCL	SDA	Serial module definition protocol

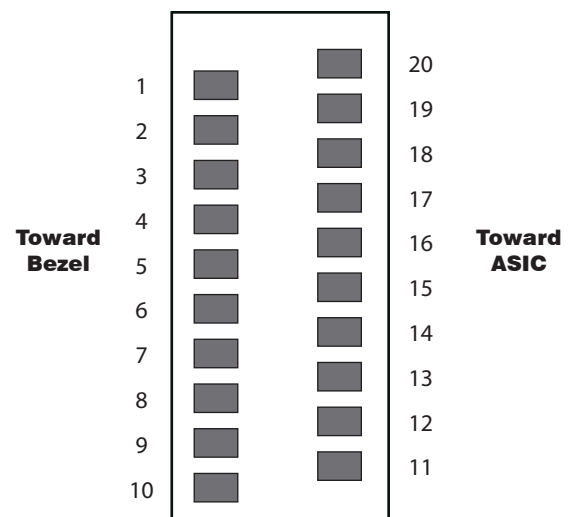
Electrical Pad Layout

20	TX GND	1	TX GND
19	TD- (TX DATA IN-)	2	TX Fault
18	TD+ (TX DATA IN+)	3	TX Disable
17	TX GND	4	MOD_DEF(2)
16	VccTX	5	MOD_DEF(1)
15	VccRX	6	MOD_DEF(0)
14	RX GND	7	NO CONNECTION
13	RD+ (RX DATA OUT+)	8	LOS
12	RD- (RX DATA OUT-)	9	RX GND
11	RX GND	10	RX GND

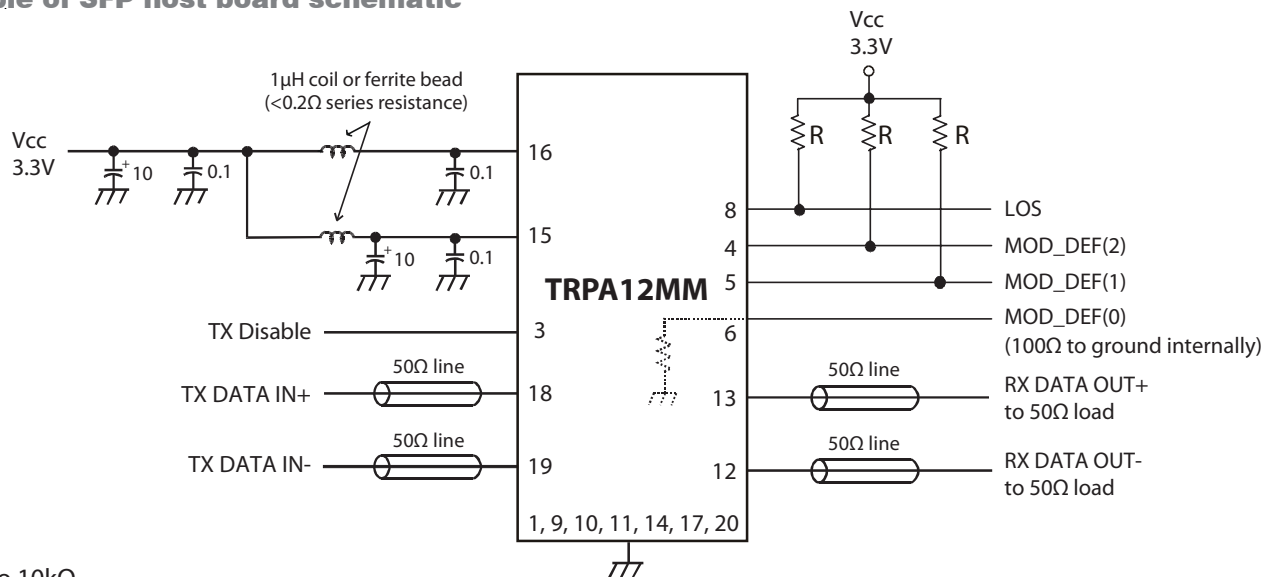
Top of Board

Bottom of Board
(as viewed thru top of board)

Pin 2 Internally Grounded.

Host Board Connector Pad Layout

Example of SFP host board schematic



Application Notes

Electrical Interface: All signal interfaces are compliant with the SFP MSA specification. The high speed DATA interface is differential AC-coupled internally with 0.1µF and can be directly connected to a 3.3V SERDES IC. All low speed control and sense output signals are open collector TTL compatible and should be pulled up with a 4.7 - 10kΩ resistor on the host board.

Loss of Signal (LOS): The Loss of Signal circuit monitors the level of the incoming optical signal and generates a logic HIGH when an insufficient photocurrent is produced.

TX Fault: Per SFP MSA, pin 2 is TX Fault. This transceiver is LED based and does not support TX Fault. Pin 2 is internally connected to transmitter circuit ground (TX GND) to indicate normal operation.

TX Disable: When the TX Disable pin is at logic HIGH, the transmitter optical output is disabled (less than -45dBm).

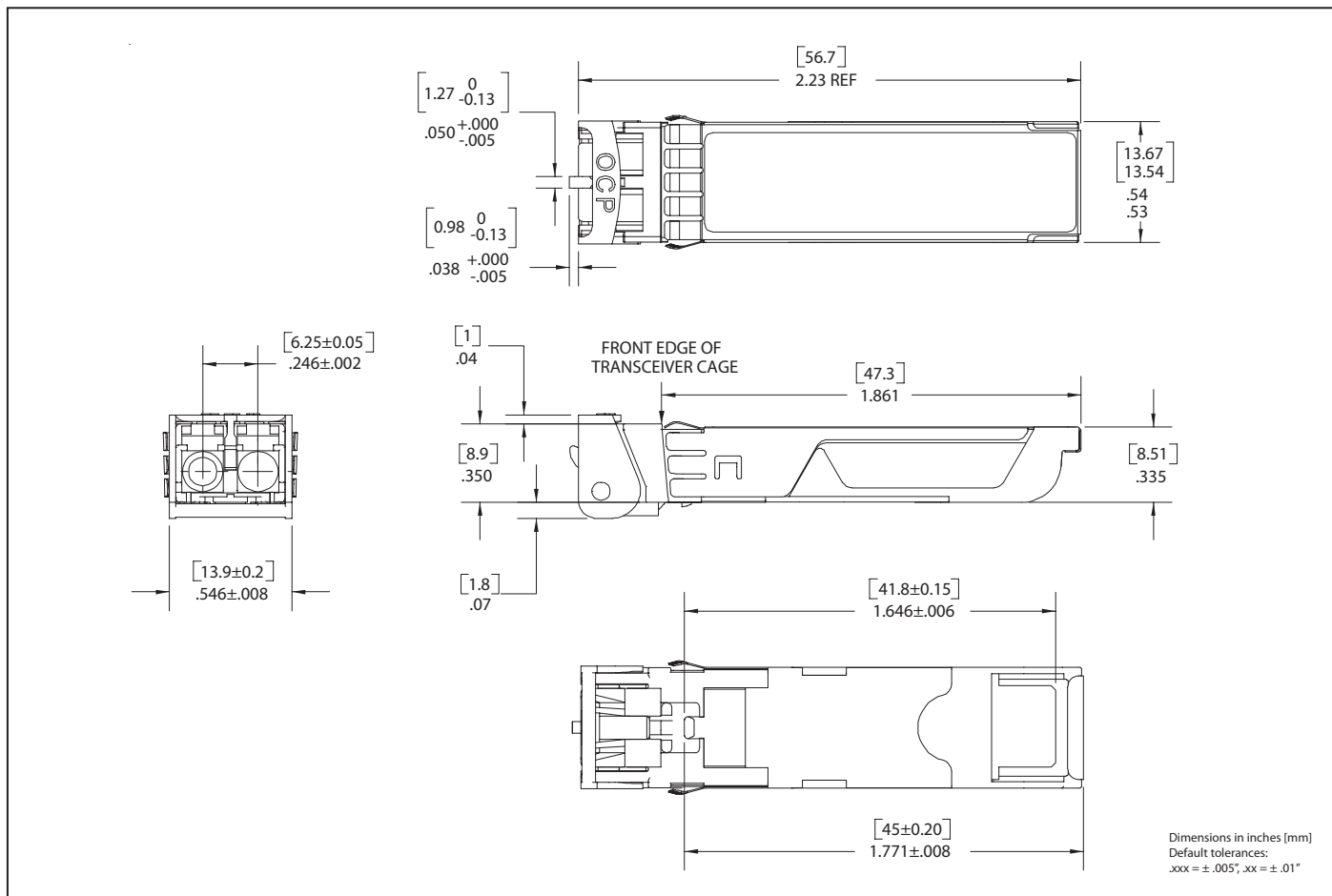
Serial Identification and Monitoring: The module definition of SFP is indicated by the three module definition pins,

MOD_DEF(0), MOD_DEF(1) and MOD_DEF(2). Upon power up, MOD_DEF(1:2) appear as NC (no connection), and MOD_DEF(0) is TTL LOW. When the host system detects this condition, it activates the serial protocol (standard two-wire I²C serial interface) and generates the serial clock signal (SCL). The positive edge clocks data into the EEPROM segments of the SFP that are not write protected, and the negative edge clocks data from the SFP.

The serial data signal (SDA) is for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The supported monitoring functions are RPM (receiver power monitor), internal temperature and module supply voltage. The device is internally calibrated.

The data transfer protocol and the details of the mandatory and vendor specific data structures are defined in the SFP MSA, and SFF-8472, Rev. 9.3.

Power Supply and Grounding: The power supply line should be well-filtered. All 0.1µF power supply bypass capacitors should be as close to the transceiver module as possible.

Package Outline

Ordering Information

Oplink can provide a remarkable range of customized optical solutions. For detail, please contact Oplink's Sales and Marketing for your requirements and ordering information (510) 933-7200 or Sales@oplink.com.

Model Name	Operation Temperature	Latch Color	Nominal Wavelength
TRPA12MM3BAS	-5°C to +70°C	Gray	1310nm
TRPA12MM3EAS	-5°C to +85°C	Gray	1310nm
TRPA12MM3AAS	-40°C to +85°C	Gray	1310nm