

10G SFP+ Transceiver

MTRS-01X11-G

Features

- Support Multi Rate 1.25-10.709Gbps
- Up to 300m transmission distance on 50µm MMF
- 850nm VCSEL and PIN receiver
- SFI electrical interface
- 2-wire interface for integrated Digital Diagnostic monitoring
- SFP+ MSA package with duplex LC connector
- Hot pluggable
- Very low EMI and excellent ESD protection
- +3.3V power supply
- Power consumption less than 800mW
- Operating case temperature: 0~+70°C

Applications

- 10GBASE-SR at 10.3125Gbps
- Other optical links

Compliance

- Compliant with SFP+ MSA
- Compliant with IEEE 802.3ae-2002
- Compliant with FDA 21 CFR 1040.10 and 1040.11, Class I except for deviations pursuant
- RoHS compliance



Description

MTRS-01X11-G is a high performance, cost effective modules, which is optimized for 10G Ethernet, supporting data-rate of 10.3125Gbps (10GBASE-SR), and transmission distance up to 300m on 50µm MMF. The transceiver consists of two sections: The transmitter section incorporates an 850nm VCSEL driver. The receiver section consists of a PIN photodiode integrated with a transimpedance preamplifier (TIA). The module is hot pluggable into the 20-pin connector .

The high-speed electrical interface is base on low voltage logic, with nominal 100 Ohms differential impedance and AC coupled in the module. 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.

A serial EEPROM in the transceiver allows the user to access transceiver monitoring and configuration data via the 2-wire SFP Management Interface. This interface uses a single address, A0h, with a memory map divided into a lower and upper area. Basic digital diagnostic (DD) data is held in the lower area while specific data is held in a series of tables in the high memory area.

Specification

Absolute Maximum Ratings					
Parameter	Symbol	Min.	Max.	Unit	
Storage Temperature	T _S	-40	+85	°C	
Supply Voltage	V _{CC3}	0	3.6	V	
Relative Humidity	RH	5	95	%	
RX Input Average Power	P _{max}	-	0	dBm	

Recommended Operating Conditions					
Parameter	Symbol	Min.	Typical	Max.	Unit
Operating Case Temperature	T _C	0		70	°C
Power Supply Voltage	V _{CC3}	3.13	3.3	3.47	V
	I _{CC3}			250	mA
Power Dissipation	P _D		600	800	mW
Data Rate			10.3125	10.709	Gbps
Transmission Distance				300	m

Transmitter Operating Characteristic-Optical, Electrical						
Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Center Wavelength	λ _C	840	850	860	nm	Note1
Laser Off Power	P _{off}	-	-	-30	dBm	
Average Optical Power	P _{avg}	-6.5	-	-1	dBm	
Extinction Ratio	ER	3.5	-	-	dB	
Transmitter Dispersion Penalty	TDP	-	-	3.9	dB	
Relative Intensity Noise	R _{in}	-	-	-128	dB/Hz	
Optical Return Loss Tolerance		-	-	12	dB	
Operating Data Rate			10.3125		Gbps	
Optical Eye Mask	Compliant with IEEE 802.3ae					Note2
Single Ended Output Voltage Tolerance		-0.3		4	V	
Common Mode Voltage Tolerance		15		-	mV	
Tx Input Diff Voltage	V _I	90		350	mV	
Tx Fault	V _{oL}	-0.3		0.4	V	At 0.7mA
Data Dependent Input Jitter	DDJ			0.1	UI	
Data Input Total Jitter	T _J			0.28	UI	

Notes:

[1] Average optical power shall be measured using the methods specified in TIA/EIA-455-95.

[2] Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.

Receiver Operating Characteristic-Optical, Electrical

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Center Wavelength	λ_r	840	850	860	nm	
Receiver Sensitivity (OMA)	P _{sens}			-11.1	dBm	
Stressed Sensitivity (OMA)				-7.5	dBm	
Los Assert	LosA	-30		-	dBm	
Los Dessert	LosD			-12	dBm	
Los Hysteresis	LosH	0.5		-	dB	
Overload	Pin			-1	dBm	
Receiver Reflectance				-12	dB	
Operating Data Rate			10.3125		Gbps	
Single Ended Output Voltage Tolerance		-0.3		4	V	
Rx Output Diff Voltage	V _o	150		425	mV	
Rx Output Rise and Fall Time	Tr/Tf	30			ps	20% to 80%
Total Jitter	TJ			0.7	UI	
Deterministic Jitter	DJ			0.42	UI	

Notes:

- [1] Receiver sensitivity is informative. Stressed receiver sensitivity shall be measured with conformance test signal for BER = 1×10^{-12} .
- [2] Vertical eye closure penalty and stressed eye jitter are the test conditions for measuring stressed receiver sensitivity. They are not the required characteristic of the receiver.

Control and Status I/O Timing Characteristics

Parameter	Symbol	Min.	Max.	Unit	Note
TX Disable Assert Time	t _{off}		10	μ s	Note1
TX Disable Negate Time	t _{on}		1	ms	Note2
Time to initialize including reset of TX_Fault	t _{init}		300	ms	Note3
TX Fault Assert Time	t _{fault}		100	μ s	Note4
TX Disable to Reset	t _{reset}	10		μ s	Note5
LOS Assert Time	t _{loss_on}		100	μ s	Note6
LOS Deassert Time	t _{loss_off}		100	μ s	Note7
Rate-Select Change Time	t _{ratesel}		10	μ s	Note8
Serial ID Clock Rate	f _{serial_clock}		100	kHz	

Notes:

- [1] Time from rising edge of TX Disable to when the optical output falls below 10% of nominal
- [2] Time from falling edge of TX Disable to when the modulated optical output rises above 90% of nominal
- [3] From power on or negation of TX Fault using TX Disable
- [4] Time from fault to TX fault on
- [5] Time TX Disable must be held high to reset TX_fault
- [6] Time from LOS state to RX LOS assert
- [7] Time from non-LOS state to RX LOS deassert.
- [8] Time from rising or falling edge of Rate Select input until receiver bandwidth is in conformance with appropriate

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specification

Pin-out Definition

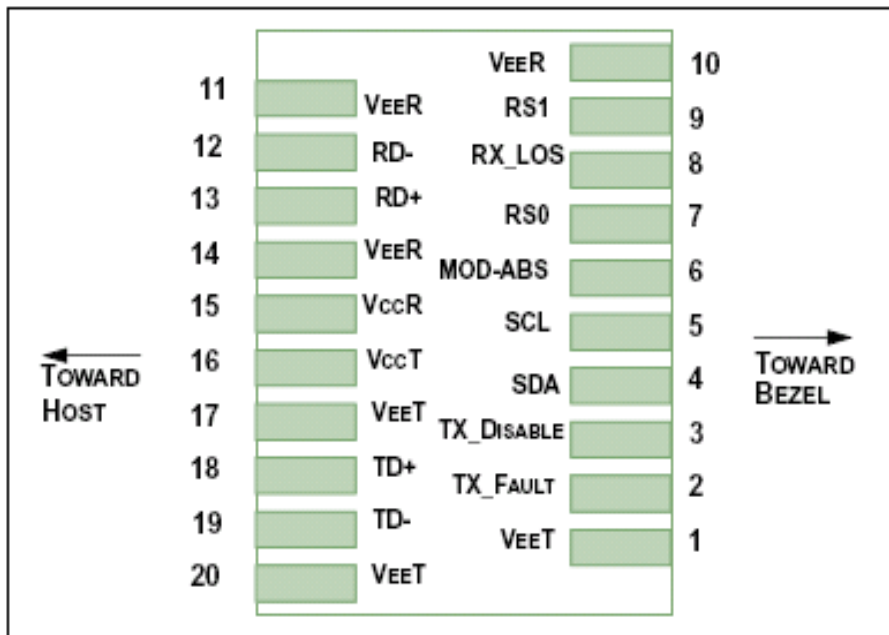


Figure1

Pin Assignment

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Module Transmitter Ground	Note1
2	LVTTL-O	TX_Fault	Module Transmitter Fault	Note2
3	LVTTL-I	TX_Disable	Transmitter Disable; Turns off transmitter laser output	Note3
4	LVTTL-I/O	SDA	2-wire Serial Interface Data Line (Same as MOD-DEF2 as defined in the INF-8074i)	Note4
5	LVTTL-I/O	SCL	2-wire Serial Interface Clock (Same as MOD-DEF1 as defined in the INF-8074i)	Note4
6		MOD_ABS	Module Absent, connected to VeeT or VeeR in the module	Note5
7	LVTTL-I	RS0	Rate Select 0, optionally controls SFP+ module receiver. When High input data rate > 4.25 GBd and when LOW input data rate 4.25 GBd.	Note6
8	LVTTL-O	RX_LOS	Receiver Loss of Signal Indication (In FC designated as RX_LOS, in SONET designated as LOS, and in Ethernet designated at Signal Detect)	Note2
9	LVTTL-I	RS1	Rate Select 1, optionally controls SFP+ transmitter. When High input data rate > 4.25 GBd and when LOW input data rate 4.25 GBd.	Note6
10		VeeR	Module Receiver Ground	Note1
11		VeeR	Module Receiver Ground	Note1
12	CML-O	RD-	Receiver Inverted Data Output	
13	CML-O	RD+	Receiver Non-Inverted Data Output	
14		VeeR	Module Receiver Ground	Note1

15		VccR	Module Receiver 3.3 V Supply	
16		VccT	Module Transmitter 3.3 V Supply	
17		VeeT	Module Transmitter Ground	Note1
18	CML-I	TD+	Transmitter Non-Inverted Data Input	
19	CML-I	TD-	Transmitter Inverted Data Input	
20		VeeT	Module Transmitter Ground	Note1

Notes:

- [1] The module signal ground pins, VeeR and VeeT, shall be isolated from the module case.
- [2] This pin is an open collector/drain output pin and shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board. Pull ups can be connected to multiple power supplies, however the host board design shall ensure that no module pin has voltage exceeding module VccT/R + 0.5 V.
- [3] This pin is an open collector/drain input pin and shall be pulled up with 4.7k-10kohms to VccT in the module.
- [4] See [sff-8431 4.2 2-wire Electrical Specifications](#) .
- [5] This pin shall be pulled up with 4.7k-10kohms to Host_Vcc on the host board.
- [6] If implementing SFF-8079 pin 7 and 9 are used for AS0 and AS1 respectively.

Block Diagram of Transceiver

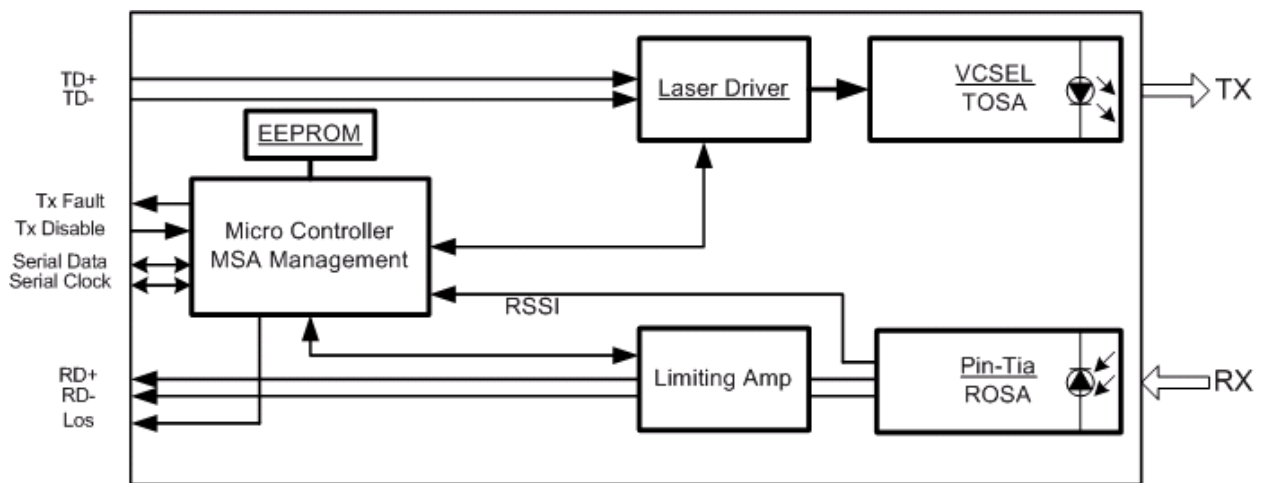


Figure2

Transmitter Section

The transmitter converts 10Gbit/s serial PECL or CML electrical data into serial optical data compliant with the 10GBASE-SR standard. An open collector compatible Transmit Disable (Tx_Dis) is provided. A logic "1," or no connection on this pin will disable the laser from transmitting. A logic "0" on this pin provides normal operation. The transmitter has an internal automatic power control loop (APC) to ensure constant optical power output across supply voltage and temperature variations. An open collector compatible Transmit Fault (Tx_Fault) is provided. TX_Fault is a module output contact that when high, indicates that the module transmitter has detected a fault condition related to laser operation or safety. The TX_Fault output contact is an open drain/collector and shall be pulled up to the Vcc_Host in the host with a resistor in the range 4.7-10 kΩ. TX_Disable is a module input contact.

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When TX_Disable is asserted high or left open, the SFP+ module transmitter output shall be turned off. This contact shall be pulled up to VccT with a 4.7 kΩ to 10 kΩ resistor

Receiver Section

The receiver converts 10Gbit/s serial optical data into serial PECL/CML electrical data. An open collector compatible Loss of Signal is provided. Rx_LOS when high indicates an optical signal level below that specified in the relevant standard. The Rx_LOS contact is an open drain/collector output and shall be pulled up to Vcc_Host in the host with a resistor in the range 4.7-10 kΩ, or with an active termination. Power supply filtering is recommended for both the transmitter and receiver. The Rx_LOS signal is intended as a preliminary indication to the system in which the SFP+ is installed that the received signal strength is below the specified range. Such an indication typically points to non-installed cables, broken cables, or a disabled, failing or a powered off transmitter at the far end of the cable.

Recommended Interface Circuit

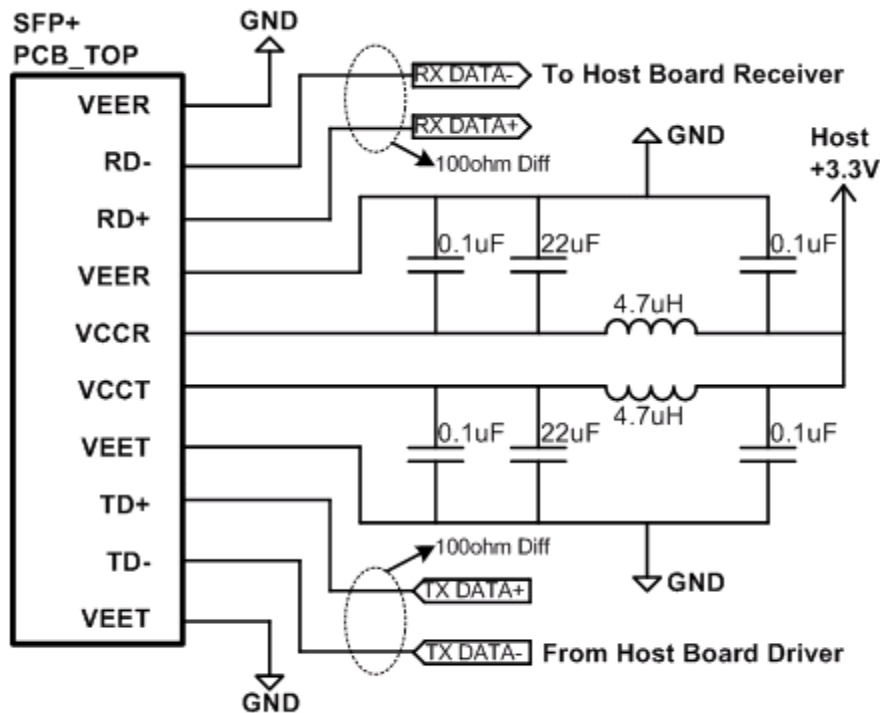


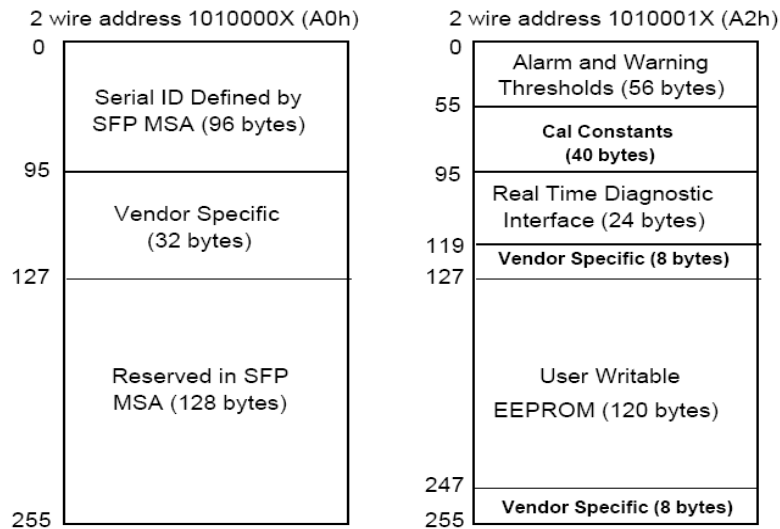
Figure3

Dimensions

Table 1: Key Mechanical Dimension

Designator	Dimension (mm)	Tolerance (mm)	Comments
A	10.00	Recommended Maximum	Module length extending outside of cage, see Note 4. Other lengths are application specific.
B	10.00	Maximum	Designated EMI ground spring area, see Note 5
C	3.00	Maximum	EMI spring/Cage Contact Point, see Note 6
D	14.00	Maximum	Module width extending outside of cage, see Note 4
E	13.55	±0.25	Module width
F	15.50	Maximum	Distance to front end of optional heat sink area, see Note 1
H	1.25	Minimum	Top slot distance from edge, see note 8
J	1.00	Maximum	Top slot depth, see note 8
K	3.25	Reference	Height of module kick-out spring area
L	2.10	Maximum	Module top height extending outside of cage see Note 4
M	2.25	±0.10	Distance from bottom of Module to printed circuit board
N	2.00	±0.25	Distance from rear shoulder to printed circuit board
P	37.10	±0.30	Distance from positive stop to bottom opening of Module and beginning of bottom rear relief

Digital Diagnostic Memory Map



EEPROM Information (A0h)

Addr.	Field Size (Bytes)	Name of Field	Hex	Description
0	1	Identifier	03	SFP
1	1	Ext. Identifier	04	SFP function is defined by serial ID only
2	1	Connector	07	LC Connector
3-10	8	Transceiver	10	Transceiver Codes
11	1	Encoding	06	64B/66B

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12	1	BR, Nominal	67	10300Mb/s
13	1	Rate Identifier	00	Unspecified
14	1	Length (9um) km	00	Transceiver transmit distance
15	1	Length (9um) 100m	00	Transceiver transmit distance
16	1	Length (50um)10m	1E	Transceiver transmit distance,300m
17	1	Length (62.5um) 10m	00	Transceiver transmit distance
18	1	Length (Copper)	00	Not compliant
19	1	Length (50um OM3)	1E	Transceiver transmit distance,300m
20-35	16	Vendor name	48 47 20 47 45 4E 55 49 4E 45 20 20 20 20 20 20	"HG GENUINE" Vendor Name(ASCII)
36	1	Reserved	00	
37-39	3	Vendor OUI	00 00 00	
40-55	16	Vendor PN	4D 54 52 53 2D 30 31 58 31 31 2D 47 20 20 20 20	"MTRS-01X11-G"Part No.(ASCII)
56-59	4	Vendor rev	31 2E 30 20	"1.0" (ASCII)
60-61	2	Wavelength	03 52	Transceiver wavelength
62	1	Reserved	00	
63	1	CC_BASE	C7	Check code for Base ID Fields
64-65	2	Options	00 1A	TX_DISABLE, TX_FAULT and Loss of Signal implemented.
66	1	BR,MAX	00	Not Specified
67	1	BR,MIN	00	Not Specified
68-83	16	Vendor SN	SN(Variable)	Serial Number of transceiver(ASCII).
84-91	8	Date code	DC(Variable)	Manufactory Date Code.
92	1	Diagnostic Monitoring Type	68	Digital diagnostic monitoring implemented, "Internally calibrated" is implemented
93	1	Enhanced Options	F0	Optional Alarm/Warning flags implemented for all monitored quantities, Optional Soft TX_Disable control and monitoring implemented, Optional Soft TX_FAULT monitoring implemented, Optional Soft RX_LOS monitoring implemented
94	1	SFF_8472 Compliance	03	Includes functionality described in Rev9.4 SFF-8472
95	1	CC_EXT	CS(Variable)	Check sum for Extended ID Field.
96-127	32	Vendor Specific	Read only	Depends on customer information Filled by zero
128-255	128	Reserved	Read only	Filled by zero

Ordering Information

Part No	Specification
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	Pack	Rate	Tx	Pout	Rx	S	Top	Reach	Others
MTRS-01X11-G	SFP	10G	850nm VCSEL	-6.5 ~ -1dBm	PIN	<-11.1dBm	0~70℃	300m	DDM/RoHS

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