

10GBASE-SR SFP+ 850nm 300m Industrial DOM Transceiver

MFM1T02A-SR-I-LL



Application

- 10GBASE-SR/SW
- OBSAI and CPRI application
- Other Optical Links

Features

- Operating Data Rate up to 10.31Gbps
- 850nm VCSEL Laser Transmitter
- 300m with 50/125 μ m MMF
- Single 3.3V Power Supply and TTL Logic Interface
- Hot-Pluggable SFP+ Footprint Duplex LC Connector Interface
- Power Dissipation < 1.0W
- Dispersion tolerance up to 40ps/nm over G.651
- Operating Case Temperature: -40°C~+85°C
- Compliant with MSA SFP+ Specification SFF-8431
- Compliant with IEEE802.3ae 10GBASE-SR/SW
- Fully ROHS 2.0 compliant

Description

The 10G 850NM 300m 850nm VCSEL 10Gigabit Transceiver is designed to transmit and receive serial optical data links up to 10.3125 Gb/s data rate over multimode fiber. The Transceiver is compliant with FC-PI-4, 10G FC, IEEE 802.3ae, SFF-8432, and applicable portions of SFF-8431. The transmitter converts serial CML electrical data into serial optical data. An open collector compatible Transmit Disable (Tx_Dis) is provided. When TX_DIS is asserted High, Transmitter is turned off. The receiver converts serial optical data into serial CML electrical data. An open collector compatible Loss of Signal is provided. The RX_LOS signal indicates insufficient optical power for reliable signal reception at the receiver. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472.

Product Specifications

I. Block diagram

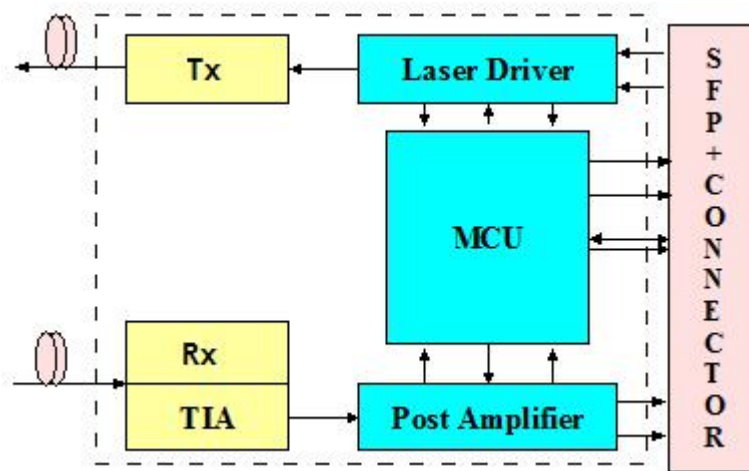


Figure 1 Transceiver functional diagram

II. Absolute Maximum Ratings

Parameter	Symbol	Unit	Min.	Max.
Storage Temperature Range	T _s	°C	-40	85
Relative Humidity	RH	%	0	85
Supply Voltage	VCC	V	-0.3	4

III. Recommended Operating Conditions

Parameters	Unit	min	type	max
Form factor			SFP+	
Data Rate	Gb/s		9.953/10.3125	
Applications	-		10GBASE-SR/SW, OBSAI, CPRI	
Optical Receptacle type	LC/SC		LC	
Fiber Type	SMF/MMF		MMF	
Fiber distance	Km			0.3
Power Consumption	W			1
Operating Case Temperature	°C	-40		85
DDM Calibration Type			Inside Calibration	
Rate select function			no request	
IIC Clock frequency	KHz	100		400
IIC clock stretching	us			500
IIC tHD: Data hold time	ns	300		

IV. Electrical Characteristics

(T_c=-40°C to 85°C, V_{cc}= 3.135 to 3.465V, Data rate: 10.3125Gb/s)

Parameters	Unit	min	type	max
Supply voltage	V	3.135	3.30	3.465
Supply current	mA		-	300

Maximum sustained peak Current(<500ms)	mA			600	
Input differential impedance	Ω		100		
Differential data input swing	mV	300		1200	
Differential data output swing	mV	300		1000	
LOS Squelch(Yes&No)		Yes			
Tx Fault, LOS Output Voltage	High	V	2.0		VCC
	Low	V	VEE		VEE+0.8
Tx Disable	VIL	V	2.0		VCC
	VIH	V	VEE		VEE+0.8

V. Optical Characteristics

(Tc=-40°C to 85°C, Vcc= 3.135 to 3.465V, Data rate: 10.3125Gb/s)

Parameters	Unit	min	type	max
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Transmitter optical characteristics

Laser type			VCSEL	
Output average power	dBm	-6.0		-1
Center wavelength	nm		850	
Wavelength range	nm	840		860
Spectral width	nm			0.45

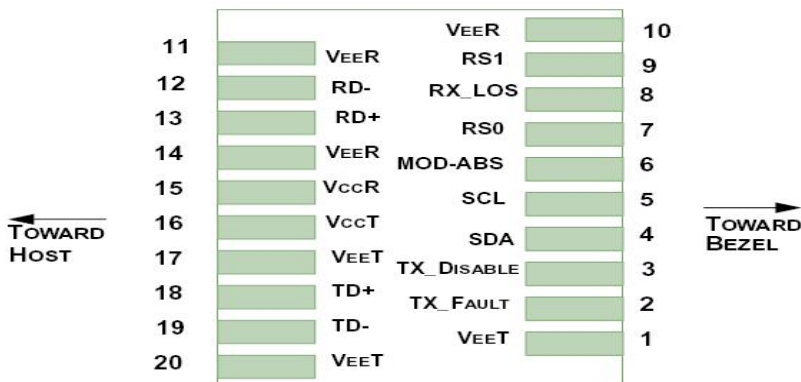
Extinction ratio ER	dB	3		
Eye Mask Margin(1000consecutive snapshots at typical rate and room temperature)		IEEE 802.3-2005 Compliant		
Transmitter and Dispersion Penalty	dB	3.9		
RIN12OMA	dB/Hz			-128
Optical Power for TX DISABLE	dBm	-40		
Optical return loss tolerance	dB			12

Receiver Optical Characteristics

Operating wavelength	nm	840		860
Sensitivity	dBm	-11.1		
Saturation power	dBm	-1		
Max Input power	dBm	0.5		
LOS	Assert	dBm	-25	
	De-assert	dBm		-12.5
	Hysteresis	dB	0.5	6

Optical Return Loss dB 12

VI. Pin function definitions



VII. Transceiver Pin Descriptions

Pin Number	Symbol	Name	Description
1,17,20	VeeT	Transmitter Signal Ground	These pins should be connected to signal ground on the host board.
2	TX Fault	Transmitter Fault Out (OC)	Logic "1" Output = Laser Fault (Laser off before t_{fault}) Logic "0" Output = Normal Operation This pin is open collector compatible, and should be pulled up to Host Vcc with a 10k Ω resistor.
3	TX Disable	Transmitter Disable In (LVTTTL)	Logic "1" Input (or no connection) = Laser off Logic "0" Input = Laser on This pin is internally pulled up to VccT with a 10 k Ω resistor.
4	SDA	Module Definition Identifiers	Serial ID with SFF 8472 Diagnostics Module Definition pins should be pulled up to Host Vcc with 10 k Ω resistors.
5	SCL		
6	MOD-ABS		
7	RS0	Receiver Rate Select (LVTTTL) Transmitter Rate Select (LVTTTL)	These pins have an internal 30k Ω pull-down to ground. A signal on either of these pins will not affect module performance.
9	RS1		
8	LOS	Loss of Signal Out (OC)	Sufficient optical signal for potential BER < 1×10^{-12} = Logic "0" Insufficient optical signal for potential BER < 1×10^{-12} = Logic "1" This pin is open collector compatible, and should be pulled up to Host Vcc with a 10k Ω resistor.
10,11,14	VeeR	Receiver Signal Ground	These pins should be connected to signal ground on the host board.
12	RD-	Receiver Negative DATA Out	Light on = Logic "0" Output Receiver DATA output is internally AC coupled and series terminated with a 50 Ω resistor.
13	RD+	Receiver Positive DATA Out	Light on = Logic "1" Output Receiver DATA output is internally AC coupled and series terminated with a 50 Ω resistor.
15	VccR	Receiver Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3. Recommended power supply filter
16	VccT	Transmitter Power Supply	This pin should be connected to a filtered +3.3V power supply on the host board. See Figure 3. Recommended power supply filter
18	TD+	Transmitter Positive DATA In	Logic "1" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100 Ω resistor.
19	TD-	Transmitter Negative DATA In	Logic "0" Input = Light on Transmitter DATA inputs are internally AC coupled and terminated with a differential 100 Ω resistor.

VIII. Digital Diagnostic Interface Definition

The 2-wire serial interface addresses of the SFP+ module are 1010000x (A0h) and 1010001x (A2h). They are shown in Figure 4.

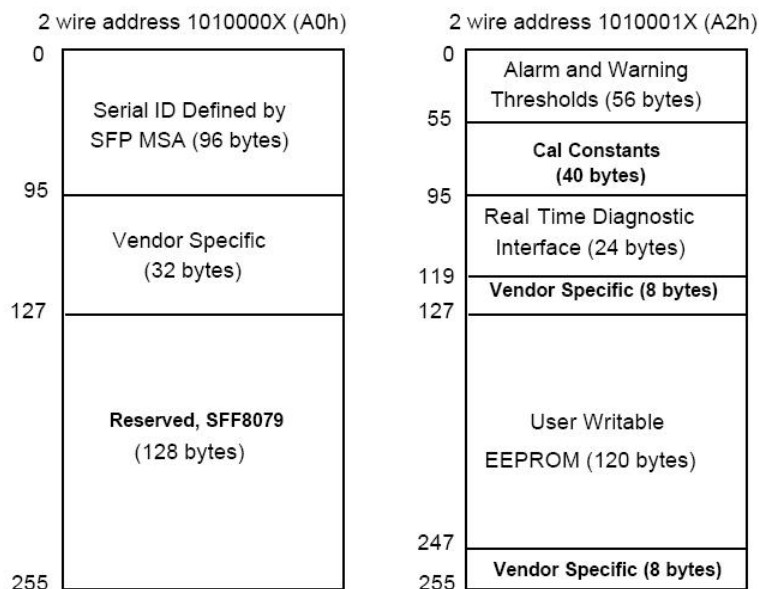


Figure 4 Digital Diagnostic Memory Map

IX. Electrostatic Discharge (ESD).

The 10G 850NM 300m is compatible with ESD levels found in typical manufacturing and operating environments as described in Table Regulatory compliance. In the normal handling and operation of optical transceivers, ESD is of concern in two circumstances.

The first case is during handling of the transceiver prior to insertion into an SFP+ compliant cage. To protect the device, it's important to use normal ESD handling pre-cautions. These include use of grounded wrist straps, work-benches and floor wherever a transceiver is handled.

The second case to consider is static discharges to the exterior of the host equipment chassis after installation. If the optical interface is exposed to the exterior of host equipment cabinet, the transceiver may be subject to system level ESD requirements.

X. Electromagnetic Interference (EMI).

Equipment incorporating gigabit transceivers is typically subject to regulation by the FCC in the United States, CENELEC EN55022 (CISPR 22) in Europe. The 10G 850NM 300m compliance to these standards is detailed in Table Regulatory compliance. The metal housing and shielded design of the 10G 850NM 300m minimizes the EMI challenge facing the equipment designer.

XI. EMI Immunity (Susceptibility)

Due to its shielded design, the EMI immunity of the 10G 850NM 300m exceeds typical industry standards.

XII. Regulatory compliance

Feature	Test Method	Performance
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883C Method 3015.7	Class 1 (> 1500 Volts)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	Variation of IEC 61000-4-2	Typically, no damage occurs with 15 kV when the duplex LC connector receptacle is contacted by a Human Body Model probe.
Electromagnetic Interference (EMI)	CISPR22 ITE Class B EN55022 Class B FCC Class B	Compliant with standards
Immunity	IEC61000-4-3 Class 2 EN55024	Typically show no measurable effect from a 3V/m field swept from 80 to 1000MHz applied to the transceiver without a chassis enclosure.

XIII. Typical application circuit

Recommended "Typical Application Schematics" are shown in Figure 3.

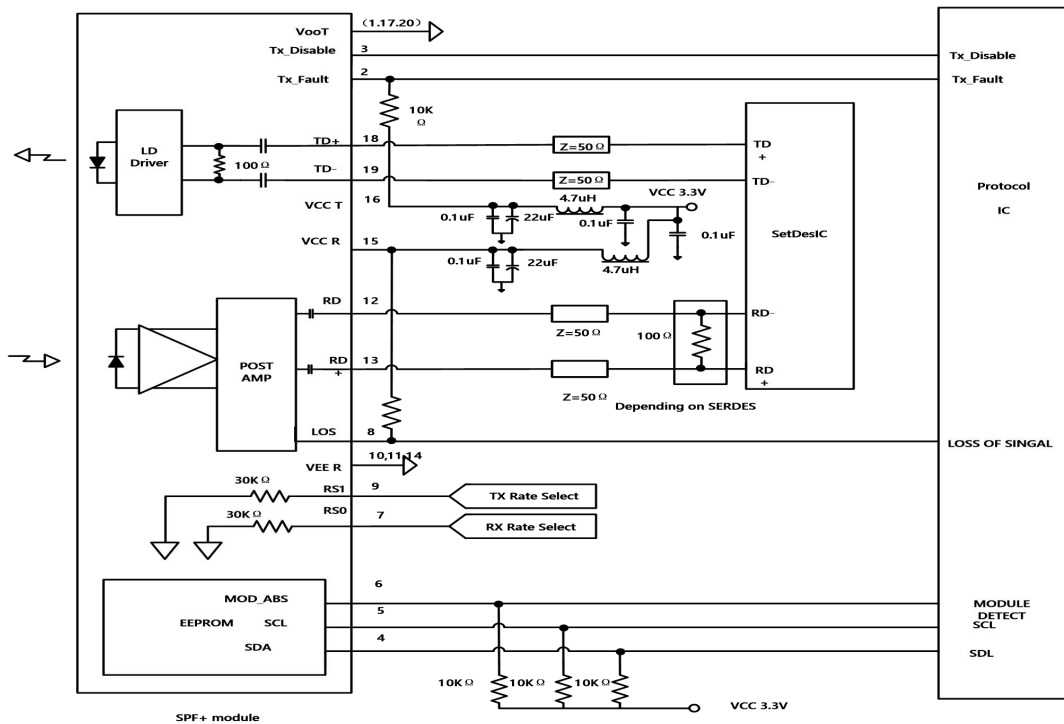


Figure 3 Typical application schematics

XIV. Diagnostic Monitor Functions

Diagnostic Monitor Functions interface uses the 2 wire address 1010001X (A2). Memory contents of Diagnostic Monitor Functions are shown in table below.

XV. Memory contents of Diagnostic Monitor Function

1) DDM threshold

Parameters	High Alarm	Low Alarm	High Warning	Low Warning
temperature	95	-50	85	-40
voltage	3.6	3	3.5	3.1
Ibias	12	1	10	2
Tx power	1	-8	-1	-6
Rx power	1	-13.1	-1	-11.1

2) DDM accuracy requirements

Parameters	Unit	Requirements
temperature	°C	+/-3
voltage	V	+/-3%
Ibias	mA	+/-10%
Tx power	dB	+/-3dB
Rx power	dB	+/-3dB

3) DDM enhanced options

Parameters	Requirements
Soft Tx-disable	support
Soft Tx-fault	support
Soft Rx-los	support

XVI. Package outline

