

## SFP-50MM85-1HC

850nm SFP56 Multi-Mode Transceiver, With Diagnostic Monitoring and  
Dual CDR Duplex SFP56 Transceiver

### Features

- Operating Data Rate up to 53.125Gbps (26.5625GBd PAM4)
- 850nm VCSEL Transmitter
- Distance up to 100m @50/125µm OM4
- Distance up to 70m @50/125µm OM3
- Single 3.3V Power Supply
- Duplex LC Connector Interface, Hot Pluggable
- Built-in Re-timer, DSP Based
- Power Dissipation < TBD
- Operating Case Temperature Standard: 0°C~+70°C
- Safety Certification: TUV/UL/FDA\*Note1
- RoHS Compliant



### Applications

- IEEE 802.3cd 50GBASE-SR
- Other Optical Link

### Product Description

The SFP-50MM85-1HC series multi-mode transceiver is SFP56 module for duplex optical data communications up to 53.125Gb/s. It is with the SFP+ 20-pin connector to allow hot plug capability. Digital diagnostic functions are available via an I<sup>2</sup>C. It has built-in clock re-timer based on DSP. This module is designed for multi-mode fiber and operates at a nominal wavelength of 850nm.

The transmitter section uses a Vertical Cavity Surface Emitted Laser (VCSEL) and is a Class 1 laser compliant according to International Safety Standard IEC 60825. The receiver section uses an integrated GaAs detector preamplifier (IDP) mounted in an optical header and a limiting post-amplifier IC.

### Absolute Maximum Ratings\*Note3

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>s</sub>	-40	+85	°C
Supply Voltage	VCC	-0.5	3.6	V

Note: Exceeding any one of these values may destroy the device permanently.

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating Case Temperature	T <sub>c</sub>	0		70	°C
Power Supply Voltage	VCC	3.135	3.3	3.465	V
Relative Humidity*Note4	RH	5		85	%
Power Dissipation	P <sub>D</sub>			TBD	W

Note: Non-condensing.

### Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
<b>Input Electrical Specifications</b>						
Differential pk-pk Input Voltage Tolerance		900			mVp-p	
Differential Input Impedance	Z <sub>in</sub>	90	100	110	ohm	
AC Common Mode Voltage				17.5	mVrms	
DC Common Mode Voltage		-350		2850	mV	
TX Disable, RS0, RS1	V <sub>IL</sub>	-0.3		0.8	V	
	V <sub>IH</sub>	2.0		V <sub>cc</sub> +0.3	V	
<b>Output Electrical Specifications</b>						
Differential Output Amplitude				900	mVp-p	
Differential Output Impedance	Z <sub>out</sub>	90	100	110	ohm	
AC Common Mode Voltage				17.5	mVrms	
Eye Width		0.265			UI	@TP4, all 3 PAM4 eyes, 1E-5
Eye Height Differential		70			mV	@TP4, all 3 PAM4 eyes, 1E-5
TX Fault, RX LOS	V <sub>OL</sub>	-0.3		0.4	V	
	V <sub>OH</sub>	2.0		V <sub>cc</sub> +0.3	V	

Optical Characteristics

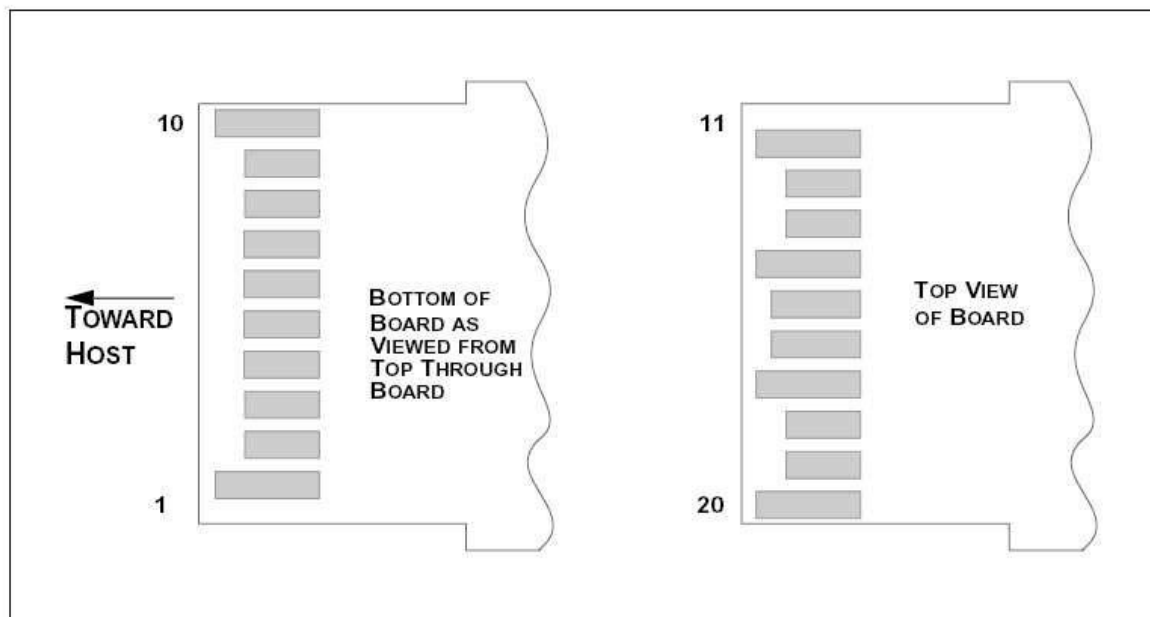
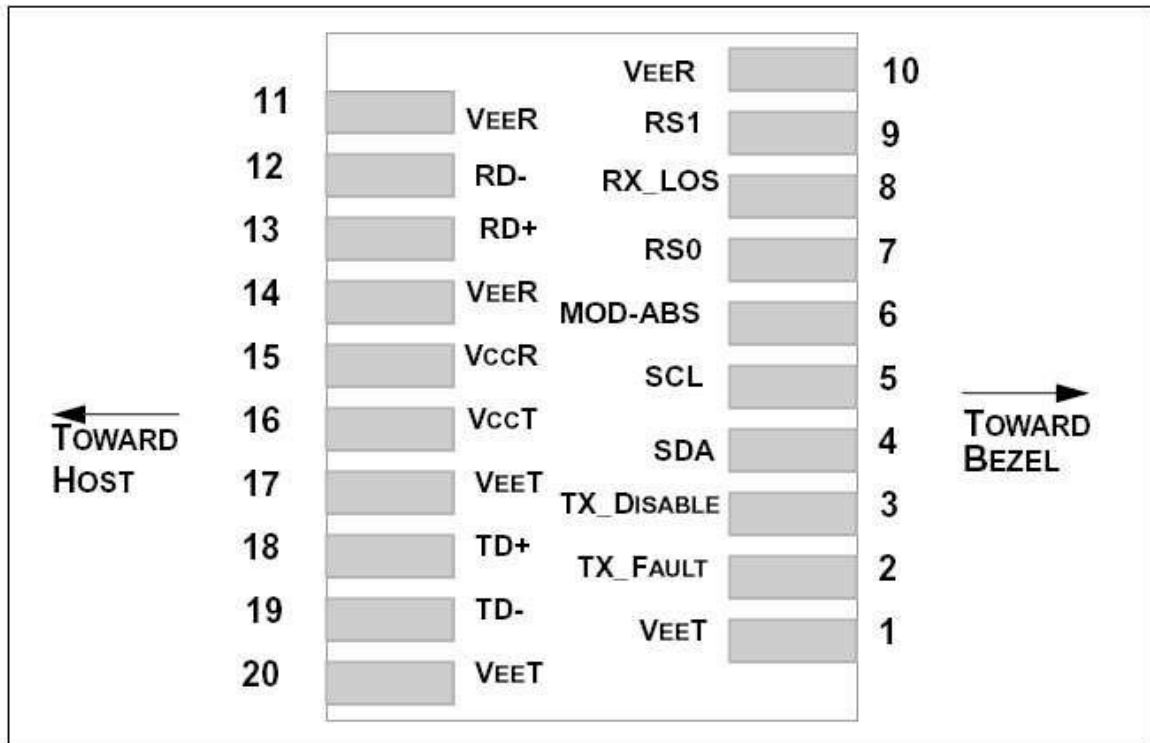
Parameter	Symbol	Min.	Typ.	Max.	Unit
50/125µm MMF OM3		2		70	m
50/125µm MMF OM4		2		100	m
Signaling Rate			26.5625 ± 100ppm		GBd
Modulation Format			PAM4		
Transmitter					
Centre Wavelength	$\lambda_c$	840	850	860	nm
RMS Spectral Width	$\Delta\lambda$			0.6	nm
Average Launch Power	PAVG	-6.5		4	dBm
Outer Optical Modulation Amplitude* <sup>Note5</sup>	POMA	-4.5		3	dBm
Launch Power in OMA <sub>outer</sub> minus TDECQ		-5.9			dB
Transmitter and Dispersion Eye Closure	TDECQ			4.5	dB
TDECQ -10log <sub>10</sub> (C <sub>eq</sub> )				4.5	dB
Average Launch Power of OFF Transmitter	POFF			-30	dB
Extinction Ratio	ER	3			dB
Transmitter Transition Time				34	ps
RIN <sub>12</sub> OMA				-128	dB/Hz
Optical Return Loss tolerance				12	dB
Encircled flux			≥86% at 19µm ≤30% at 4.5µm		
Receiver					
Centre Wavelength	$\lambda_c$	840	850	860	nm
Damage threshold		5			dBm
Average Receive Power	RAVG	-8.4		4	dBm
Receiver Power, OMA <sub>outer</sub>	ROMA			3	dBm
Receiver Reflectance				-12	dB
Stressed Receiver Sensitivity, OMA <sub>outer</sub>				-3.4	dBm
Receiver Sensitivity, OMA <sub>outer</sub>	SenOMA		Note6		
LOS Assert	LOS <sub>A</sub>	-17			dBm
LOS De-Assert	LOS <sub>D</sub>			-11	dBm
LOS Hysteresis		0.5			dB
Condition of Stressed Receiver Sensitivity Test:					
Stressed Eye Closure for PAM4	SECQ			4.5	dB

SECQ-10log <sub>10</sub> (C <sub>eq</sub> )				4.5	dB
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Note

1. Even if the TDECQ<1.4dB, the OMA (min) must exceed this value.
2. Sensitivity=max(-6.5, SECQ-7.9)dB with BER<2.4x10<sup>-4</sup> pre-FEC

## Transceiver Electrical Pad Layout



## Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	Note 5
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP56 module receiver. This pin is pulled low to VeeT with a >30K resistor.
8	RX LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP56 module transmitter. This pin is pulled low to VeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3V ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3V ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

### Notes:

1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor on the host board. Pull up voltage between 2.0V and VccT/R+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.

2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10 K Ω resistor. Its states are:

Low (0 – 0.8V): Transmitter on

(>0.8, < 2.0V): Undefined

High (2.0 – 3.465V): Transmitter Disabled Open:  
Transmitter Disabled

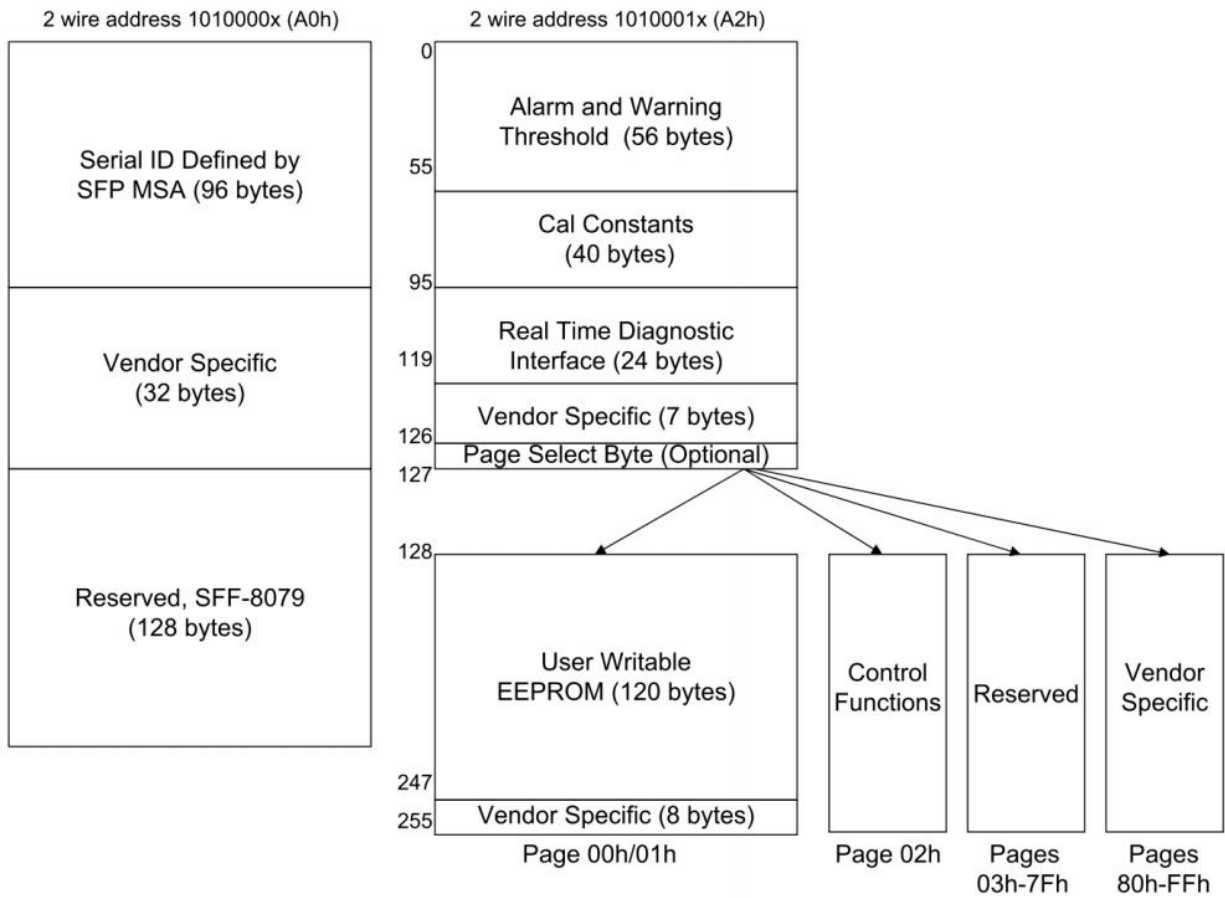
3) Module Absent, connected to VeeT or VeeR in the module.

- 4) RX LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10KΩ resistor. Pull up voltage between 2.0V and Vcc\_Host. When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 5) VeeR and VeeT may be internally connected within the SFP56 module.
- 6) RD-/+: These are the differential receiver outputs. They are AC coupled 100Ω differential lines which should be terminated with 100Ω (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V ±5% at the SFP+ connector pin. Maximum supply current is TBD. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP56 input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP56 transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP56 transceiver module.
- 8) TD-/+: These are the differential transmitter inputs. They are AC-coupled, differential lines with 100Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board

## EEPROM

When the serial protocol is activated, the host generates the serial clock signal (SCL). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP56 transceiver. The negative edge clocks data from the SFP56 transceiver. The serial data signal (SDA) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. If the module is defined as external calibrated, the diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2H. The digital diagnostic memory map specific data field define as following. For detail EEPROM information, please refer to the related document of SFF 8472 Rev 12.4.



## Ordering information

Part Number	Data Rate	Laser	Fiber Type	Distance	Temp.	CDR	DDMI
SFP-50MM85-1HC	Up to 53.125Gbps	850nm VCSEL	OM3	2~70m	0°C	Yes	Yes
			OM4	2~100m	~+70°C		

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