SFP4G-SW-85-15

4Gb/s 150M SFP Transceiver

Hot Pluggable, Duplex LC, +3.3V, 850nm, VCSEL, MMF 150M DDM 0~70℃

FEATURES

- Up to 4.25Gb/s bit rates
- Hot-Pluggable
- Duplex LC connector
- 850nm VCSEL transmitter, PIN photo-detector
- MMF links up to 150m
- 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- Power Supply :+3.3V
- Power consumption<0.8W
- Temperature Range: 0~70° C
- RoHS compliant

APPLICATIONS

- Multi-rate 1xFC/2xFC/4XFC
- 1.25Gb/s 1000Base-SX Ethernet

DESCRIPTION

Fibersum' s **SFP4G-SW-85-15** transceivers are designed for use in Fibre Channel links up to 150m at 4.25 Gb/s data rate. The 850nm VCSEL transmitter and high sensitivity PIN receiver provide superior performance for Fibre channel applications at up to 150m links.

The SFP Module compliants with SFP MSA and FC-PI-4 Rev. 8.00. Digital diagnostics functions are available via a 2-wire serial interface, as specified in SFF-8472. The fully SFP compliant form factor provides hot pluggability, easy optical port upgrades and low EMI emission.

- Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit
Storage Temperature	T_S	-40		+85	° C
Case Operating Temperature	T_A	0		70	° C
Maximum Supply Voltage	Vcc	-0.5		4	V
Relative Humidity	RH	0		85	%

- Electrical Characteristics (T_{OP} = 0 to 70 ° C, V_{CC} = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Supply Voltage	Vcc	3.0		3.6	V	
Supply Current	Icc			240	mA	
Transmitter						
Input differential impedance	Rin		100		Ω	1
Single ended data input swing	Vin, pp	250		1200	mV	
Transmit Disable Voltage	VD	2		Vcc	V	
Transmit Enable Voltage	VEN	Vee		Vee+ 0.8	V	2
Receiver						

Single ended data output swing	Vout,pp	250	400	800	mV	3
Data output rise/fall time ≤ 2.125 Gb/s	Tr/f			175	ps	4
Data output rise/fall time =4.25 Gb/s	Tr/f			120	ps	4
LOS Fault	VLOS fault	Vcc-0.5		VccHOST	V	5
LOS Normal	VLOS norm	Vee		Vee+0.5	V	5
Power Supply Rejection	PSR	100			mVpp	6
Deterministic Jitter Contribution ≤ 2.125 Gb/s	RX Δ DJ			51.7	ps	7,8
Determinstic Jitter Contribution =4.25 Gb/s	RX Δ DJ			25.9	ps	8,9
Total Jitter Contribution ≤ 2.125 Gb/s	RX Δ TJ			122.4	ps	8
Total Jitter Contribution =4.25 Gb/s	RX Δ TJ			61.2	ps	9

Notes:

1. AC coupled.
2. Or open circuit.
3. Into 100 ohm differential termination.
4. 20 - 80 %.
5. LOS is LVTTL. Logic 0 indicates normal operation; logic 1 indicates no signal detected.
6. All transceiver specifications are compliant with a power supply sinusoidal modulation of 20 Hz to 1.5 MHz up to specified value applied through the power supply filtering network shown on page 23 of the Small Form-factor Pluggable (SFP) Transceiver Multi-Source Agreement (MSA), September 14, 2000. The Power Supply Rejection applies for a supply voltage range of 3.1 to 3.6 V.
7. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ. Δ.
8. As measured at 0.022 mW OMA.
9. As measured at 0.048 mW OMA.

● Optical Parameters(T_{OP} = 0 to 70° C, V_{CC} = 3.135 to 3.465 Volts)

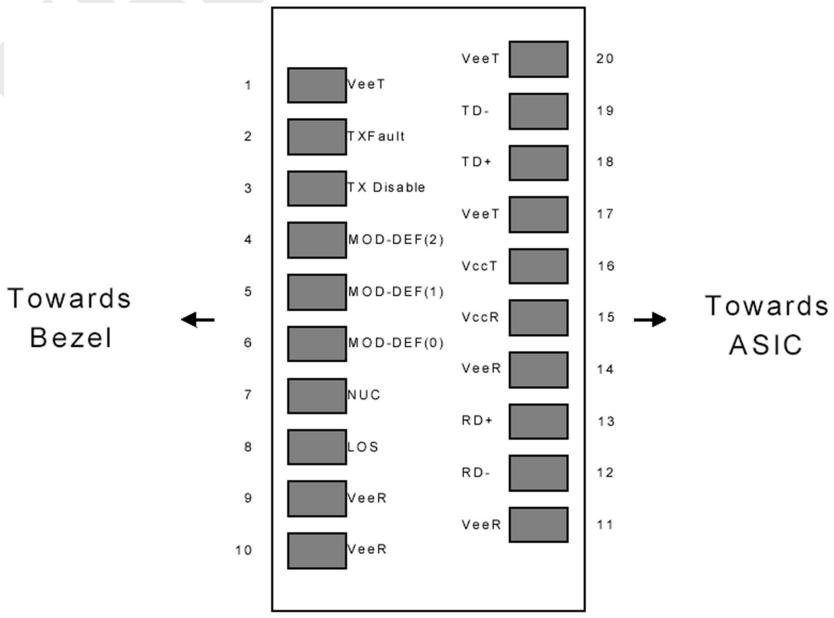
Parameter	Symbol	Min	Typ	Max	Unit	Ref.
Transmitter						
Output Opt. Power	P_{OUT}	-9		-3	dBm	1
Center Wavelength	λ_c	830		860	nm	2
Spectral Width	σ			0.85	nm	2
Optical Modulation Amplitude =4.25 Gb/s	OMA	247			μW	2,3
Optical Modulation Amplitude ≤2.125 Gb/s	OMA	156			μW	2,3
Optical Rise/Fall Time =4.25 Gb/s	tr/ tf			105	ps	4
Optical Rise/Fall Time ≤2.125 Gb/s	tr/ tf			160	ps	5
Relative Intensity Noise	RIN			-118	dB/Hz	
Deterministic Jitter Contribution ≤ 2.125 Gb/s	TX Δ DJ			59.8	ps	6
Deterministic Jitter Contribution =4.25 Gb/s	TX Δ DJ			28.2	ps	6
Total Jitter Contribution ≤ 2.125 Gb/s	TX Δ TJ			119	ps	
Total Jitter Contribution = 4.25 Gb/s	TX Δ TJ			59.8	ps	
Extinction Ratio = 1.25 Gb/s	ER	9			dB	7
Receiver						
Receiver Sensitivity = 1.0625 Gb/s	RxSEN			-20	dBm	8
Receiver Sensitivity = 2.125 Gb/s	RxSEN			-18	dBm	8
Receiver Sensitivity = 4.25 Gb/s	RxSEN			-16	dBm	8
Overload	RxMAX			0	dBm	
Receiver Elec. 3 dB cutoff frequency				1500	MHz	9
Receiver Elec. 3 dB cutoff frequency				2500	MHz	10
Optical Center Wavelength	λ_c	770		860	nm	
Optical Return Loss		12			dB	
LOS De-Assert	LOSD			-20	dBm	
LOS Assert	LOSA	-30			dBm	
LOS Hysteresis		0.5			dB	
General Specifications						
Data Rate	BR	1062		4250	Mb/s	11
Bit Error Rate	BER			10^{-12}		12
Max. Supported Link Length on MMF@ 4X Fibre Channel	LMAX			150	m	13

Notes:

1. Class 1 Laser Safety per FDA/CDRH and EN (IEC) 60825 regulations.
2. Also specified to meet curves in FC-PI-2 10.0 Figures 18, 19, and 21, which allow trade-off between wavelength, spectral width and OMA. Rate selectable part is specified to meet IEEE Draft P802.3ah /D2.0 Figure 59-3.
3. Equivalent extinction ratio specification for Fibre Channel. Allows smaller ER at higher average power.
4. Unfiltered, 20-80%.
5. Unfiltered, 20-80%.
6. Measured with DJ-free data input signal. In actual application, output DJ will be the sum of input DJ and DJ. Δ.
7. Applicable for Rate Selectable version only in low bandwidth mode.
8. Measured with conformance signals defined in FC-PI-2 10.0 specifications. Measured with PRBS $2^{7}-1$ at 10^{-12} BER.
9. Rate Selectable version in low bandwidth mode.
10. Rate Selectable version in high bandwidth mode.
11. 1x/2x/4x Fibre Channel compliant.
12. Tested with a PRBS $2^{7}-1$ test pattern.
13. Distances are indicative only. Please refer to the Optical Specifications in Section IV to calculate a more accurate link budget based on specific conditions in your application.

● Pin Assignment

Diagram of Host Board Connector Block Pin Numbers and Name



Pin Function Definitions

Pin No	Name	Function	Plug Seq	Notes
1	VeeT	Transmitter Ground	1	1
2	TX Fault	Transmitter Fault Indication	3	
3	TX Disable	Transmitter Disable	3	2
4	MOD-DEF2	Module Definition	2	3
5	MOD-DEF1	Module Definition 1	3	3
6	MOD-DEF0	Module Definition 0	3	3
7	Rate Select	Not Connected	3	4
8	LOS	Loss of Signal	3	5
9	VeeR	Receiver Ground	1	1
10	VeeR	Receiver Ground	1	1
11	VeeR	Receiver Ground		1
12	RD-	Inv. Received Data Out	3	6
13	RD+	Received Data Out	3	6
14	VeeR	Receiver Ground	3	1
15	VccR	Receiver Power	2	1
16	VccT	Transmitter Power	2	
17	VeeT	Transmitter Ground	1	
18	TD+	Transmit Data In	3	6
19	TD-	Inv. Transmit In	3	6
20	VeeT	Transmitter Ground	1	

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
3. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. MOD_DEF(0) pulls line low to indicate module is plugged in.
4. Rate select is not used
5. LOS is open collector output. Should be pulled up with 4.7k - 10 kohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
6. AC Coupled

SFP Module EEPROM Information and Management

The SFP modules implement the 2-wire serial communication protocol as defined in the SFP-8472. The serial ID information of the SFP modules and Digital Diagnostic Monitor parameters can be accessed through the I^2C interface at address A0h and A2h. The memory is mapped in

Table 1. Detailed ID information (A0h) is listed in Table 2. And the DDM specification at address A2h. For more details of the memory map and byte definitions, please refer to the SFF-8472, "Digital Diagnostic Monitoring Interface for Optical Transceivers". The DDM parameters have been internally calibrated.

Table 1. Digital Diagnostic Memory Map (Specific Data Field Descriptions)

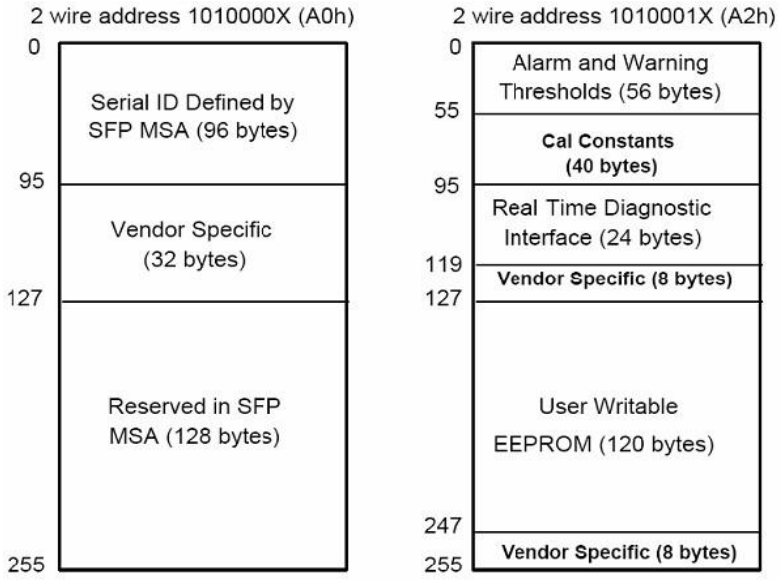


Table 2 - EEPROM Serial ID Memory Contents (A0h)

Data Address	Length (Byte)	Name of Length	Description and Contents
Base ID Fields			
0	1	Identifier	Type of Serial transceiver (03h=SFP)
1	1	Reserved	Extended identifier of type serial transceiver (04h)
2	1	Connector	Code of optical connector type (07=LC)
3-10	8	Transceiver	
11	1	Encoding	NRZ(03h)
12	1	BR, Nominal	Nominal baud rate, unit of 100Mbps
13-14	2	Reserved	(0000h)
15	1	Length(9um)	Link length supported for 9/125um fiber, units of 100m
16	1	Length(50um)	Link length supported for 50/125um fiber, units of 10m
17	1	Length(62.5um)	Link length supported for 62.5/125um fiber, units of

			10m
18	1	Length(Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name: Fibersum
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number: “SFP4G-SW-85-15” (ASCII)
56-59	4	Vendor rev	Revision level for part number
60-62	3	Reserved	
63	1	CCID	Least significant byte of sum of data in address 0-62
Extended ID Fields			
64-65	2	Option	Indicates which optical SFP signals are implemented (001Ah = LOS, TX_FAULT, TX_DISABLE all supported)
66	1	BR, max	Upper bit rate margin, units of %
67	1	BR, min	Lower bit rate margin, units of %
68-83	16	Vendor SN	Serial number (ASCII)
84-91	8	Date code	Fibersum’s Manufacturing date code
92-94	3	Reserved	
95	1	CCEX	Check code for the extended ID Fields (addresses 64 to 94)
Vendor Specific ID Fields			
96-127	32	Readable	Fibersum specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

- **Digital Diagnostic Monitor Characteristics**

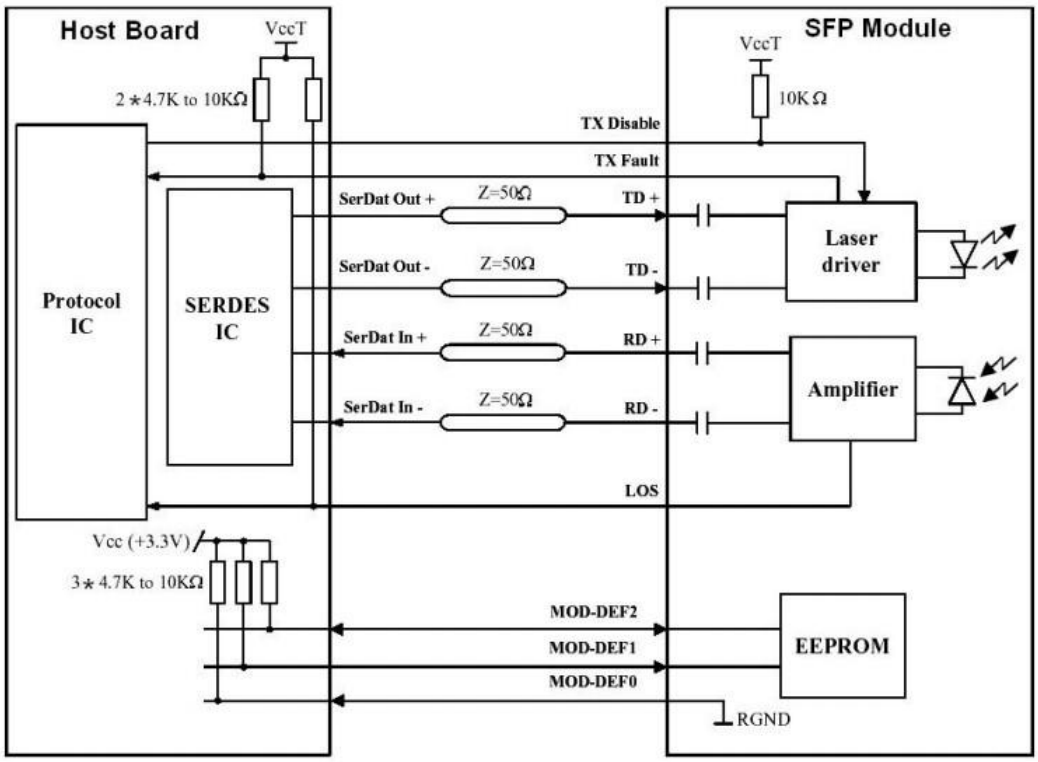
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	° C
98-99	VCC3 Internal Supply Voltage	±3.0	%
100-101	Laser Bias Current	±10	%
102-103	Tx Output Power	±3.0	dBm
104-105	Rx Input Power	±3.0	dBm

- **Regulatory Compliance**

The SFP4G-SW-85-15 complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

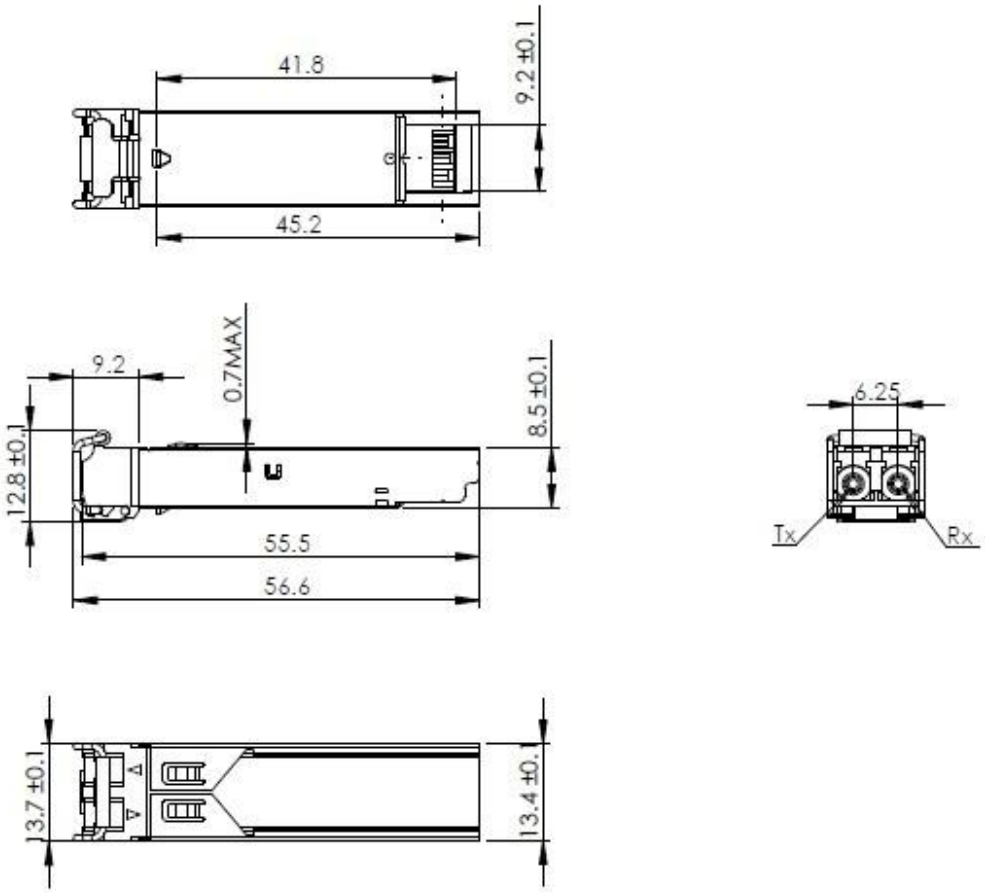
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD-883E Method 3015.7	Class 1(>1000 V)
Electrostatic Discharge (ESD) to the Duplex LC Receptacle	IEC 61000-4-2 GR-1089-CORE	Compatible with standards
Electromagnetic Interference (EMI)	FCC Part 15 Class B EN55022 Class B (CISPR 22B) VCCI Class B	Compatible with standards
Laser Eye Safety	FDA 21CFR 1040.10 and 1040.11 EN60950, EN (IEC) 60825-1,2	Compatible with Class 1 laser product.

- Recommended Circuit



Recommended High-speed Interface Circuit

Mechanical Dimensions:



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