

PT-10G-ER-55

DATASHEET

PRODUCT FEATURES

10GBASE-ER Single-Mode LC 1550nm 40km SFP+ Module

- ▶ Supports 9.95 to 11.3 Gb/s
- ▶ Hot-pluggable
- ▶ Duplex LC connector
- ▶ 1550nm cooled EML transmitter, PIN photo-detector
- ▶ SMF links up to 40km
- ▶ 2-wire interface for management specifications compliant with SFF 8472 digital diagnostic monitoring interface
- ▶ Power supply: +3.3V
- ▶ Power consumption (commercial temperature) < 1.5W
- ▶ Commercial temperature range: 0–70°C
- ▶ RoHS compliant

Applications

- ▶ 10GBASE-ER/EW Ethernet
- ▶ SONET OC-192 / SDH
- ▶ 10G Fiber channel

GENERAL DESCRIPTION

PT-10G-ER-55 is a compact transceiver module for serial optical communication applications at 10 Gb/s. PT-10G-ER-55 converts a 10 Gb/s serial electrical data stream to a 10 Gb/s optical output signal and a 10 Gb/s optical input signal to a 10 Gb/s serial electrical data stream. The high speed 10 Gb/s electrical interface is fully compliant with SFI specification. The high performance 1550 nm cooled EML transmitter and high sensitivity PIN receiver provide superior performance for Ethernet applications at up to 40 km links. This SFP+ module is compliant with SFF-8431, SFF-8432 and IEEE 802.3ae 10GBASE-ER. 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	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, VCC = 3.135 to 3.465 Volts)

Parameter	Symbol	Min	Typical	Max	Unit	Note
Supply Voltage	Vcc	3.135		3.465	V	
Supply Current	Icc			450	mA	
Power Consumption	P			1.5	W	
Transmitter						
Input differential impedance	R_{in}		100		Ω	1
Tx Input Single Ended DC Voltage Tolerance (Ref VeeT)	V	-0.3		4	V	
Differential input voltage swing	$V_{in,pp}$	180		700	mV	2
Transmit Disable Voltage	V_D	2		Vcc	V	3
Transmit Enable Voltage	V_{EN}	Vee		Vee+0.8	V	
Receiver						
Single Ended Output Voltage Tolerance	V	-0.3		4	V	
Rx Output Diff Voltage	V_o	300		850	mV	
Rx Output Rise and Fall Time	T_r/T_f	30			ps	4
LOS Fault	$V_{LOS\ fault}$	2		V_{cc_HOST}	V	5
LOS Normal	$V_{LOS\ norm}$	Vee		Vee+0.8	V	5

Notes:

1. Connected directly to TX data input pins. AC coupling from pins into laser driver IC.
2. Per SFF-8431 Rev 3.0
3. Into 100 ohms differential termination.
4. 20%~80%
5. LOS is an open collector output. Should be pulled up with 4.7k-10k Ω on the host board. Normal operation is logic 0; loss of signal is logic 1. Maximum pull-up voltage is 5.5 V.

OPTICAL PARAMETERS ($T_{OP} = 0$ to 70 °C, $VCC = 3.135$ to 3.465 Volts)

Parameter	Symbol	Min	Typical	Max	Unit	Note
Transmitter						
Center Wavelength	λ_t	1530	1550	1565	nm	
Spectral Width	$\Delta\lambda$			0.3	nm	
Average Optical Power	P_{avg}	-1		4	dBm	1
Optical Power OMA	P_{oma}	-2.1			dBm	
Laser Off Power	P_{off}			-30	dBm	
Extinction Ratio	ER	6			dB	
Transmitter Dispersion Penalty	TDP			3.0	dB	2
Relative Intensity Noise	R_{in}			-128	dB/Hz	3
Optical Return Loss Tolerance		20			dB	
Receiver						
Center Wavelength	λ_r	1260		1600	nm	
Receiver Sensitivity	S_{en}			-16	dBm	4
Stressed Sensitivity (OMA)	$S_{en_{ST}}$			-14	dBm	4
LOS Assert	LOS_A	-27			dBm	
LOS Deassert	LOS_D			-17	dBm	
LOS Hysteresis	LOS_H	0.5			dB	
Overload	Sat	0			dBm	5
Receiver Reflectance	Rrx			-26	dB	

Notes:

1. Average power figures are informative only, per IEEE802.3ae.
2. TWDP figure requires the host board to be SFF-8431 compliant. TWDP is calculated using the Matlab code provided in clause 68.6.6.2 of IEEE802.3ae.
3. 12 dB reflection.
4. Conditions of stressed receiver tests per IEEE802.3ae. CSRS testing requires the host board to be SFF-8431 compliant.
5. Receiver overload specified in OMA and under the worst comprehensive stressed condition.

TIMING CHARACTERISTICS

Parameter	Symbol	Min	Max	Unit
TX_Disable Assert Time	t_{off}		10	μ s
TX_Disable Negate Time	t_{on}		1	ms
Time to Initialize Include Reset of TX_FAULT	t_{int}		300	ms
TX_FAULT from Fault to Assertion	t_{fault}		100	μ s
TX_Disable Time to Start Reset	t_{reset}	10		μ s
Receiver Loss of Signal Assert Time	T_{A,RX_LOS}		100	μ s
Receiver Loss of Signal Deassert Time	T_{D,RX_LOS}		100	μ s
Rate-Select Change Time	$t_{ratesel}$		10	μ s
Serial ID Clock Time	$t_{serial-clock}$		100	kHz

PIN ASSIGNMENT

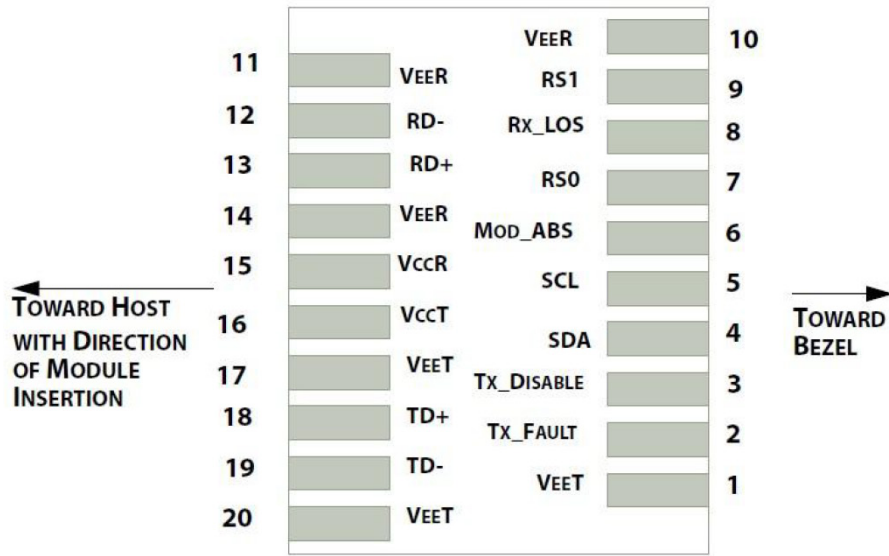


Diagram of host board connector block pin numbers and name

PIN DESCRIPTION

Pin	Name	Function	Note	Pin	Name	Function	Note
1	VeeT	Module transmitter ground	1	11	VeeR	Module receiver ground	1
2	Tx Fault	Module transmitter fault	2	12	RD-	Receiver inverted data output	
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3	13	RD+	Receiver non-inverted data output	
4	SDL	2-wire serial interface data input/output (SDA)		14	VeeR	Module receiver ground	1
5	SCL	2-wire serial interface clock input (SCL)		15	VccR	Module receiver 3.3V supply	
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	2	16	VccT	Module transmitter 3.3V supply	
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s		17	VeeT	Module transmitter ground	1
8	LOS	Receiver Loss of Signal Indication	4	18	TD+	Transmitter inverted data output	
9	RS1	Rate select1, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s		19	TD-	Transmitter non-inverted data output	
10	VeeR	Module receiver ground	1	20	VeeT	Module transmitter ground	1

Notes:

1. The module ground pins 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–10k Ω to Host_Vcc on the host board.
3. This pin shall be pulled up with 4.7k–10k Ω to VccT in the module.
4. This pin is an open collector/drain output pin and shall be pulled up with 4.7k–10k Ω to Host_Vcc on the host board.

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 I2C 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)

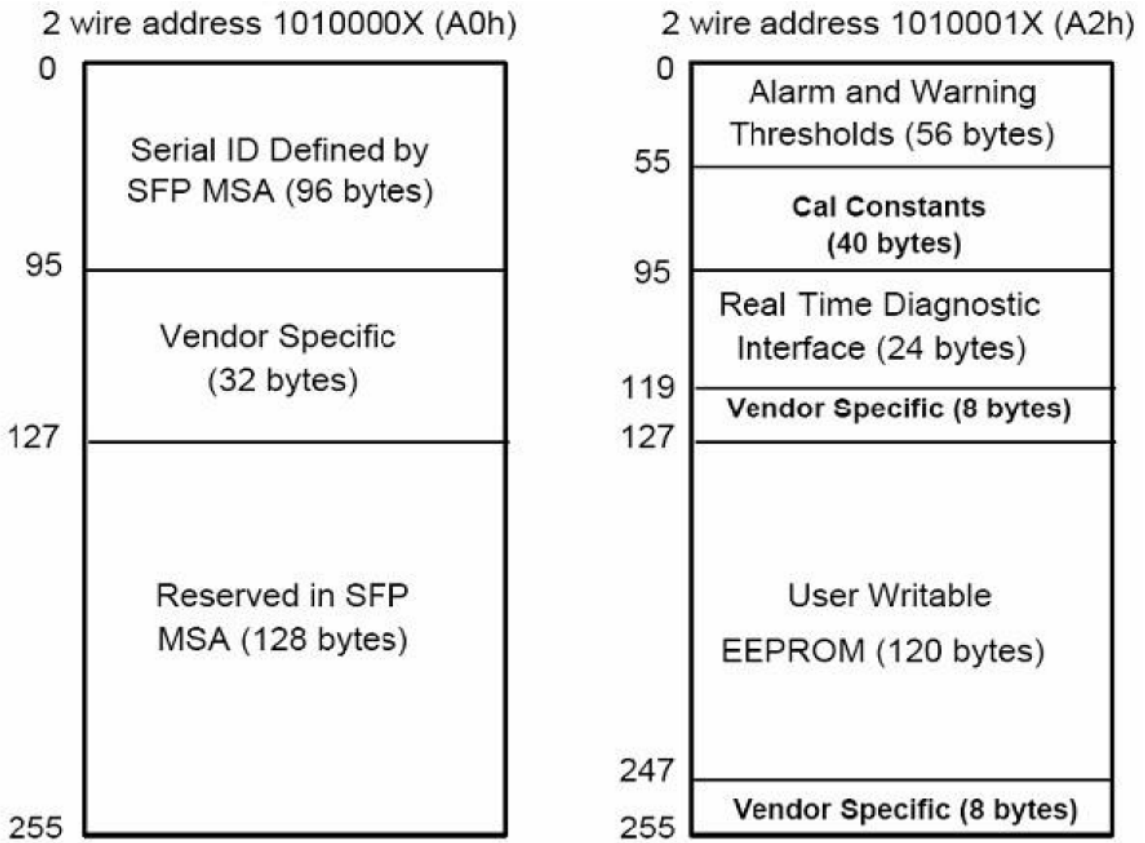


Table 2. EEPROM Serial ID Memory Contents (A0h)

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	10G Base-ER
11	1	Encoding	64B/66B
12	1	BR, Nominal	Nominal baud rate, unit of 100 Mbps
13-14	2	Reserved	(0000h)
15	1	Length (9 μ m)	Link length supported for 9/125 μ m fiber, units of 100 m
16	1	Length (50 μ m)	Link length supported for 50/125 μ m fiber, units of 10 m
17	1	Length (62.5 μ m)	Link length supported for 62.5/125 μ m fiber, units of 10 m
18	1	Length (Copper)	Link length supported for copper, units of meters
19	1	Reserved	
20-35	16	Vendor Name	SFP vendor name
36	1	Reserved	
37-39	3	Vendor OUI	SFP transceiver vendor OUI ID
40-55	16	Vendor PN	Part Number (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	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	Vendor specific date, read only
128-255	128	Reserved	Reserved for SFF-8079

DIGITAL DIAGNOSTIC MONITOR CHARACTERISTICS

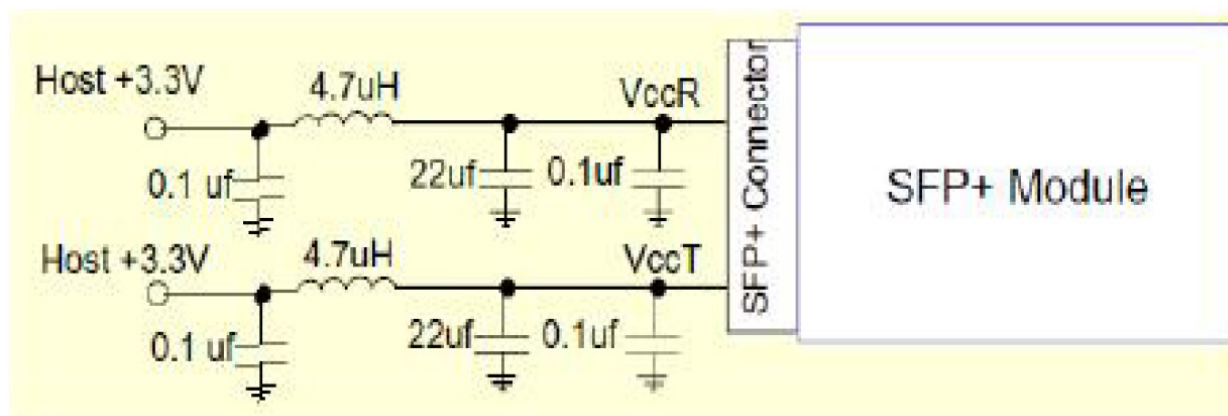
Data Address	Parameter	Accuracy	Unit
96-97	Transceiver Internal Temperature	±3.0	°C
100-101	Laser Bias Current	±10	%
100-101	Tx Output Power	±3.0	dBm
100-101	Rx Input Power	±3.0	dBm
100-101	VCC3 Internal Supply Voltage	±3.0	%

REGULATORY COMPLIANCE

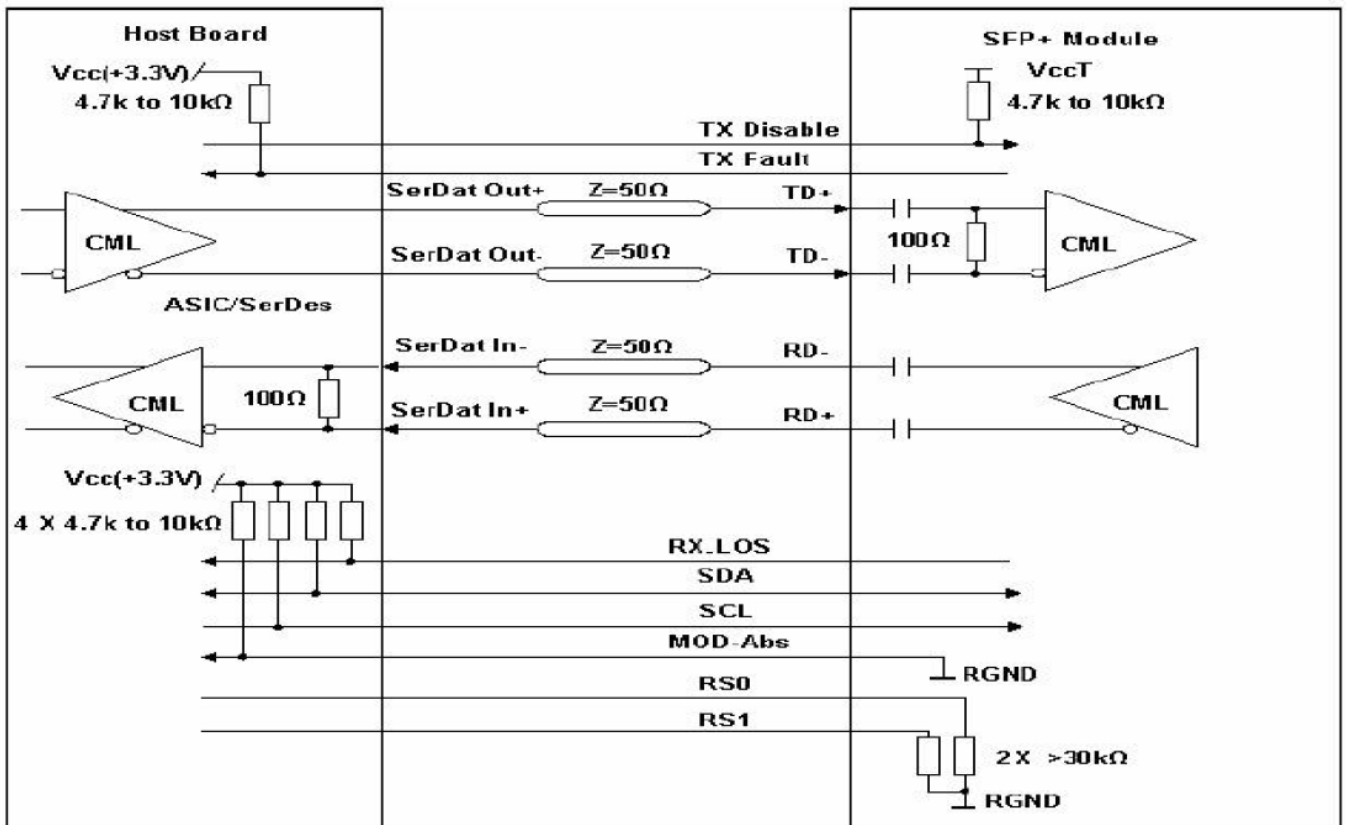
The transceiver complies with international Electromagnetic Compatibility (EMC) and international safety requirements and standards (see details in Table following).

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

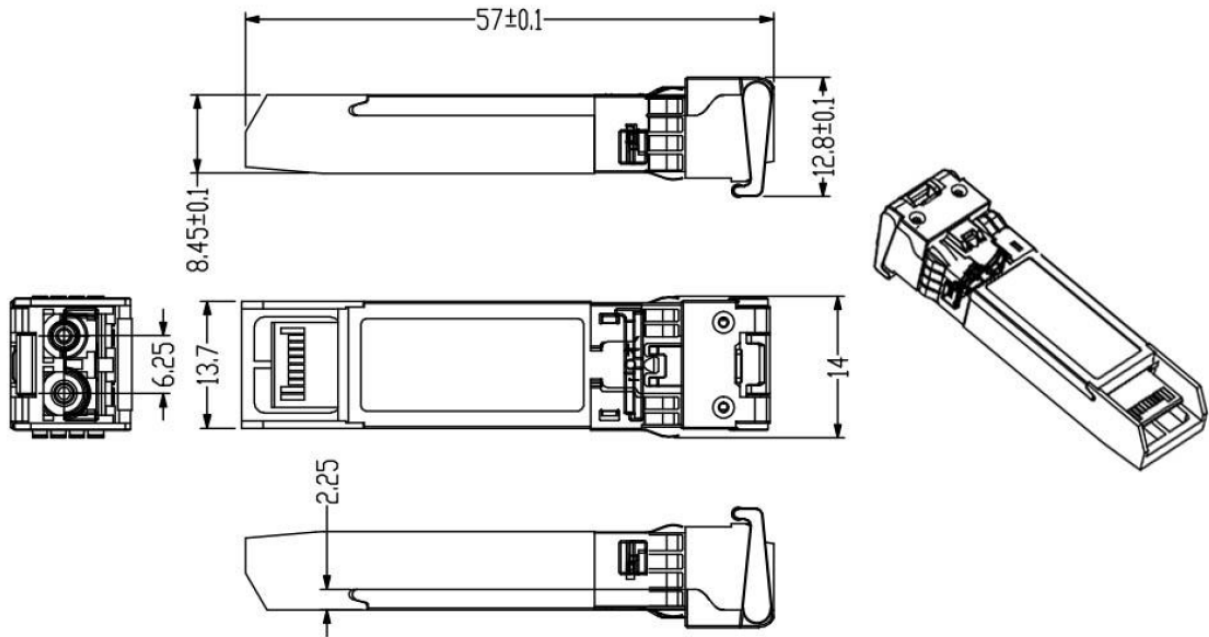


Recommended Host Board Power Supply Circuit



Recommended High-speed Interface Circuit

MECHANICAL DIMENSIONS



ORDERING INFORMATION

Part Number	Description	Application	Data Rate	Fiber Type
PT-10G-ER-55	10GBASE-ER SFP+	10GBASE-ER/EW	10G Ethernet	Single-Mode Fiber