

ESP8503-05D(I)

155Mbps SFP Optical Transceiver, 550M Reach

PRODUCT FEATURES

- **155Mbps data-rate**
- **850nm VCSEL laser and PIN photodetector for 550m transmission with MMF**
- **Compliant with SFP MSA and SFF-8472 with duplex LC receptacle**
- **Digital Diagnostic Monitoring:**
- **Internal Calibration or External Calibration**
- **Compatible with RoHS**
- **+3.3V single power supply**
- **Operating case temperature:**

Standard: 0 to +70°C

Industrial: -40 to +85°C

APPLICATIONS

- **SDH STM-1, S-1.1,L-1.1, L-1.2**
- **SONET OC-3 IR1,LR1,LR2**
- **Fast Ethernet**
- **Other optical links**

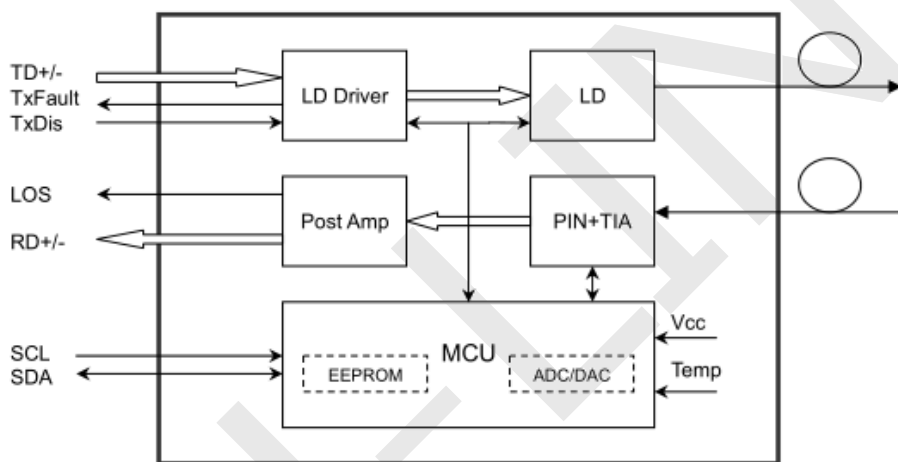
Description

The SFP transceivers are high performance, cost effective modules supporting 155Mbps data-rate and 550m transmission distance with MMF.

The transceiver consists of three sections: a VCSEL laser transmitter, a PIN photodiode integrated with a trans-impedance preamplifier (TIA) and MCU control unit. All modules satisfy class I laser safety requirements.

The transceivers are compatible with SFP Multi-Source Agreement (MSA) and SFF- 8472. For further information, please refer to SFP MSA.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESP8503-05D	155Mbps	VCSEL	MMF	550m	LC	0~70℃	Y
ESP8503-05DI	155Mbps	VCSEL	MMF	550m	LC	-40~85℃	Y

Absolute Maximum Ratings

It has to be noted that the operation in excess of any individual absolute maximum ratings might cause permanent damage to this module.

Parameter	Symbol	Min	Max	Unit	Notes
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Storage Temperature	T _s	-40	85	°C	
Operating Case Temperature	T _{case}	See order Information		°C	
Power Supply Voltage	V _{CC}	-0.5	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	TH _d	0		dBm	

Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	Commercial
Power Supply Voltage	V _{CC}	3.135	3.3	3.465	V	
Power Supply Current	I _{CC}			300	mA	
Data Rate			155		Mb/s	
Control Input Voltage High		2		V _{CC}	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (MMF)	D			550	m	

Specification of Transmitter Electrical Characteristics

The following electrical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Single-ended Input Voltage Tolerance	V _{CC}	-0.3		4.0	V	
Differential Input Voltage Swing	V _{in,pp}	200		2400	mVpp	
Differential Input Impedance	Z _{in}	90	100	110	Ohm	
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	V _{dis}	V _{CC} -1.3		V _{CC}	V	
Transmit Enable Voltage	V _{en}	V _{EE} -0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	V _{out,pp}	500		900	mVpp	
Differential Output Impedance	Z _{out}	90	100	110	Ohm	

Data output rise/fall time	Tr/Tf		100		ps	20% to 80%
LOS Assert Voltage	VlosH	Vcc-1.3		Vcc	V	
LOS De-assert Voltage	VlosL	Vee-0.3		0.8	V	

Optical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	820	850	860	nm	
Spectral Width (RMS)	$\Delta\lambda$			-	nm	
Average Output Power	Pout	-9		-3	dBm	1
Extinction Ratio	ER	9			dB	
Receiver						
Centre Wavelength	λ_c	860		980	nm	
Receiver Sensitivity				-22	dBm	3
Receiver Overload		0			dBm	3
LOS De-Assert	LOSD			-30	dBm	
LOS Assert	LOSA	-45			dBm	
LOS Hysteresis		1		4	dB	
Data Output Swing Differential	Vout	400		1800	mV	4

Notes:

1. The optical power is launched into MMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 2²³-1 test pattern @155Mbps, BER $\leq 1 \times 10^{-10}$.
4. Internally AC-coupled.

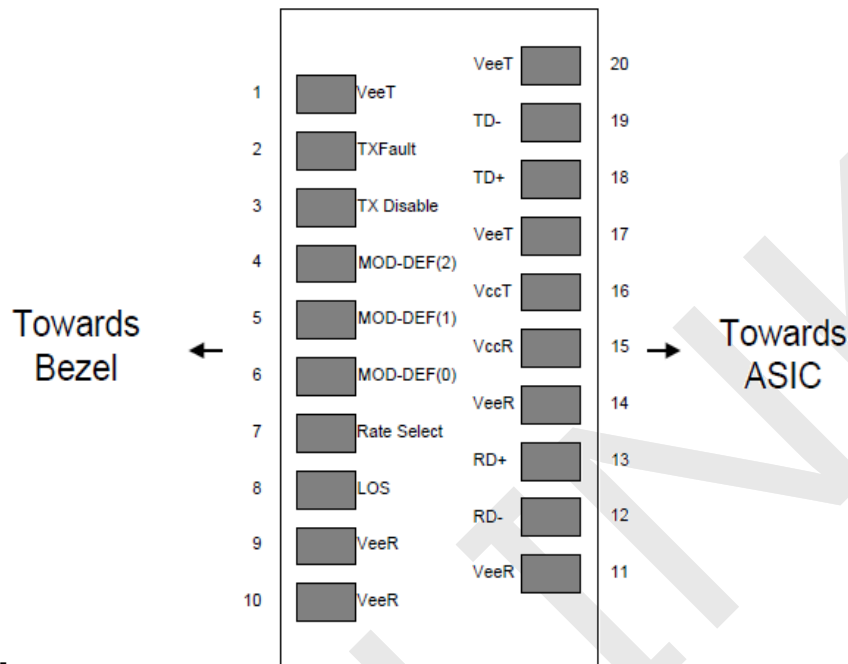
Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min.	Max	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°CC	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-0.15	0.15	V	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	

Bias current monitor	DMI_bias	-10%	10%	mA	
TX power monitor absolute error	DMI_TX	-3	3	dB	

Pin Assignment



Pin Description

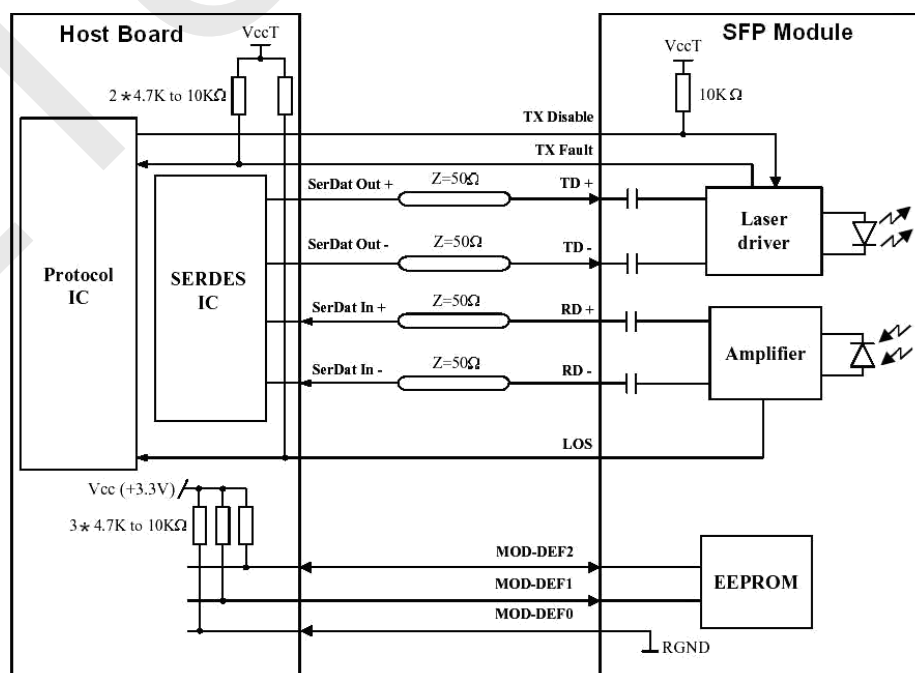
PIN	Name	Name/Description	Notes
1	VEET	Transmitter Ground (Common with Receiver Ground)	1
2	TXFAULT	Transmitter Fault.	
3	TXDIS	Transmitter Disable. Laser output disabled on high or open.	2
4	MOD_DEF(2)	Module Definition 2. Data line for Serial ID.	3
5	MOD_DEF(1)	Module Definition 1. Clock line for Serial ID.	3
6	MOD_DEF(0)	Module Definition 0. Grounded within the module.	3
7	Rate Select	No connection required	4
8	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	5
9	VEER	Receiver Ground (Common with Transmitter Ground)	1
10	VEER	Receiver Ground (Common with Transmitter Ground)	1
11	VEER	Receiver Ground (Common with Transmitter Ground)	1
12	RD-	Receiver Inverted DATA out. AC Coupled	
13	RD+	Receiver Non-inverted DATA out. AC Coupled	
14	VEER	Receiver Ground (Common with Transmitter Ground)	1
15	VCCR	Receiver Power Supply	
16	VCCT	Transmitter Power Supply	

17	VEET	Transmitter Ground (Common with Receiver Ground)	1
18	TD+	Transmitter Non-Inverted DATA in. AC Coupled.	
19	TD-	Transmitter Inverted DATA in. AC Coupled.	
20	VEET	Transmitter Ground (Common with Receiver Ground)	1

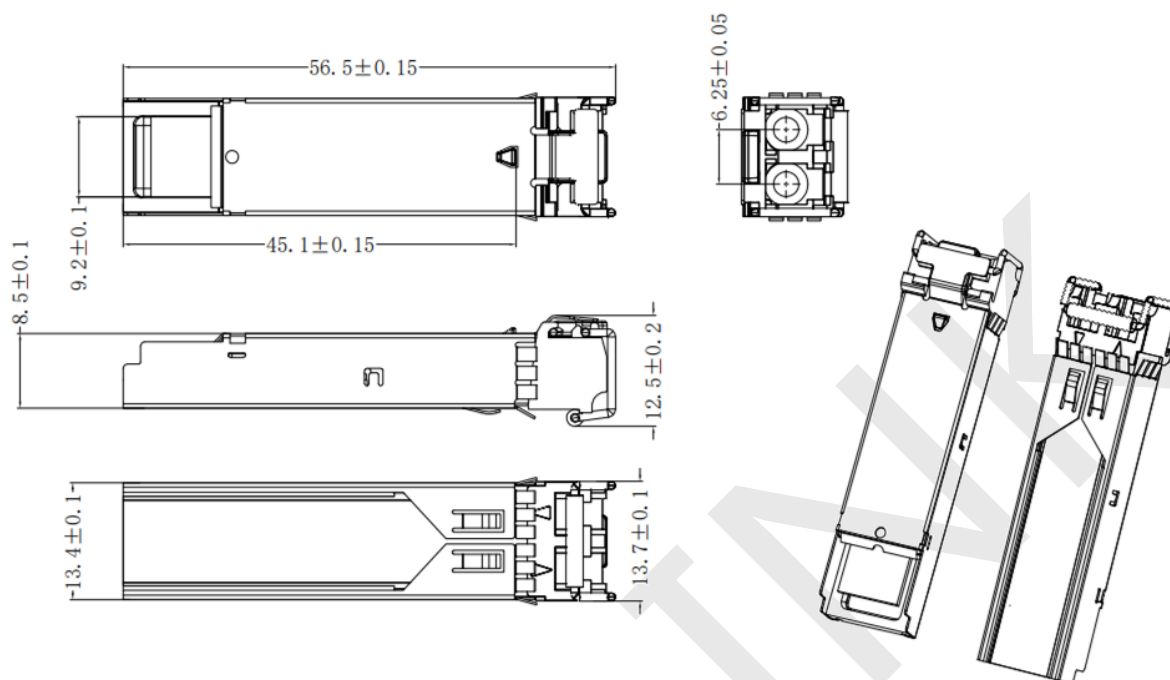
Notes:

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-10k ohms 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. This is an optional input used to control the receiver bandwidth for compatibility with multiple data rates (most likely Fiber Channel 1x and 2x Rates). If implemented, the input will be internally pulled down with > 30kΩ resistor. The input states are:
 - 1) Low (0 – 0.8V): Reduced Bandwidth
 - 2) (>0.8, < 2.0V): Undefined
 - 3) High (2.0 – 3.465V): Full Bandwidth
 - 4) Open: Reduced Bandwidth
5. LOS is open collector output should be pulled up with 4.7k-10k ohms on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

Recommended Interface Circuit



Mechanical Dimensions



Revision History

Version No.	Date	Description
1.0	Sep,12, 2014	Preliminary datasheet
2.0	October 18,207	Product upgrades
3.0	July 26, 2024	Format change

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