

ESP5503-40D(I)

155Mbps SFP Optical Transceiver, 40KM Reach

PRODUCT FEATURES

- **Supports up to 155Mbps bit rates**
- **Hot-pluggable SFP footprint**
- **15500nm DFB laser and PIN photo detector, Up to 40km for SMF transmission**
- **Compliant with SFP MSA and SFF-8472 with duplex LC receptacle**
- **Compatible with RoHS**
- **Single +3.3V power supply**
- **Real Time Digital Diagnostic Monitoring**
- **Operating case temperature:**

Standard: 0 to +70°C

Industrial: -40 to +85°C

APPLICATIONS

- **155Mbps Optical systems**
- **Fast Ethernet**
- **SONET OC-3 IR1,LR1,LR**
- **Other Optical links**

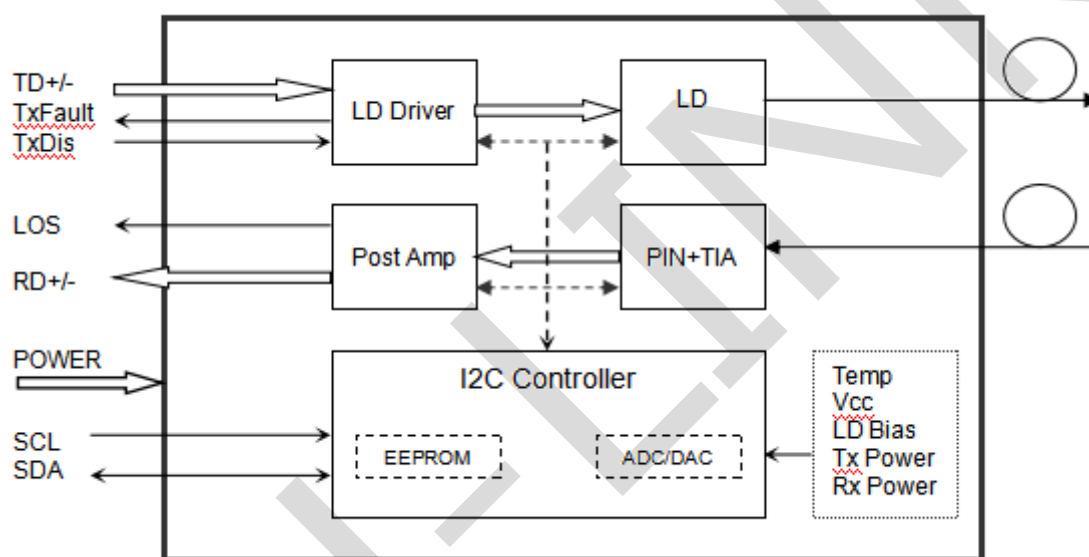
DESCRIPTIONS

The SFP transceivers are high performance, cost effective modules supporting data rate of 125Mbps/155Mbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a FP 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 and SFF-8472 digital diagnostics functions.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI
ESP5503-40D	155Mbps	DFB	SMF	40km	LC	0~70℃	Y
ESP5503-40DI	155Mbps	DFB	SMF	40km	LC	-40~ +85	Y

Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	Vcc	-0.5	4.5	V
Storage Temperature	Ts	-40	+85	℃
Operating Humidity	-	5	85	%

Recommended Operating Conditions

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Operating Case Temperature	T _{OP}	0		70	°C	Commercial
		-40		85		Industrial
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 (SMF)	D			40	km	9/125um

Specification of Transmitter Electrical Characteristics

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		1200	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	V _{losH}	V _{CC} -1.3		V _{CC}	V	
LOS De-assert Voltage	V _{losL}	V _{EE} -0.3		0.8	V	

Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Transmitter						
Centre Wavelength	λ_c	1260	155	1360	nm	
Spectral Width (RMS)	$\Delta\lambda$			3	nm	
Side-Mode Suppression Ratio	SMSR	-	-	-	dB	
Average Output Power	P_{out}	-8		-3	dBm	1
Extinction Ratio	ER	9.0			dB	
Data Input Swing Differential	V_{IN}	200		1200	mV	2
Receiver						
Centre Wavelength	λ_c	1260		1610	nm	
Receiver Sensitivity				-32	dBm	3
Receiver Overload		-8			dBm	3
LOS De-Assert	LOS_D			-33	dBm	
LOS Assert	LOS_A	-45			dBm	
LOS Hysteresis		0.5		4	dB	
Data Output Swing Differential	V_{out}	500	600	900	mV	4

Notes:

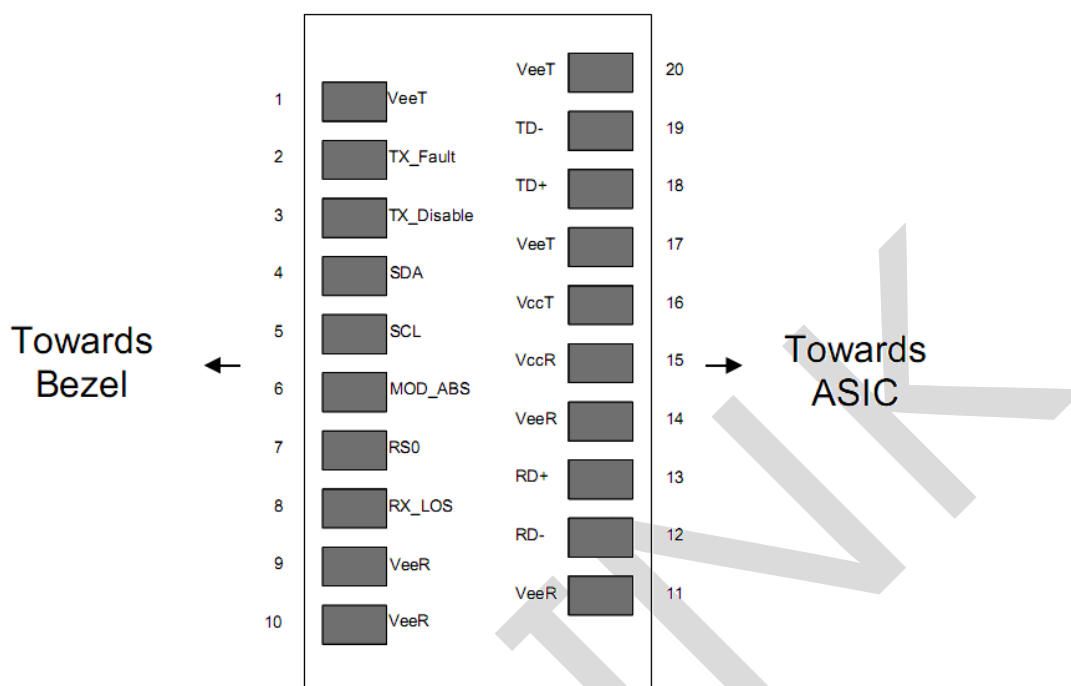
1. The optical power is launched into SMF.
2. PECL input, internally AC-coupled and terminated.
3. Measured with a PRBS 223-1 test pattern @155Mbps, BER $\leq 1 \times 10^{-12}$.
4. Internally AC-coupled.

Digital Diagnostics

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	degC	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 Diagram



Pin Definitions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V _{EET}	Transmitter Ground	1	
2	TX FAULT	Transmitter Fault Indication	3	Note 1
3	TX DISABLE	Transmitter Disable	3	Note 2
4	SDA	SDA Serial Data Signal	3	
5	SCL	SCL Serial Clock Signal	3	
6	MOD_ABS	Module Absent. Grounded within the module	3	
7	RS0	Not Connected	3	
8	LOS	Loss of Signal	3	Note 3
9	V _{EE} R	Receiver ground	1	
10	V _{EE} R	Receiver ground	1	
11	V _{EE} R	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V _{EE} R	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	

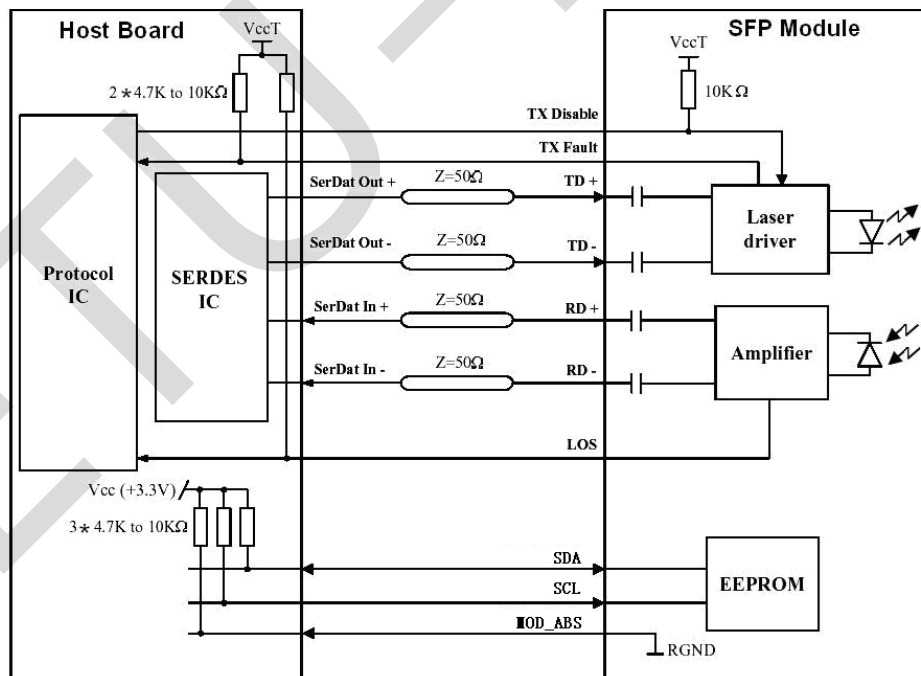
Pin	Signal Name	Description	Plug Seq.	Notes
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V _{EET}	Transmitter Ground	1	

Notes:

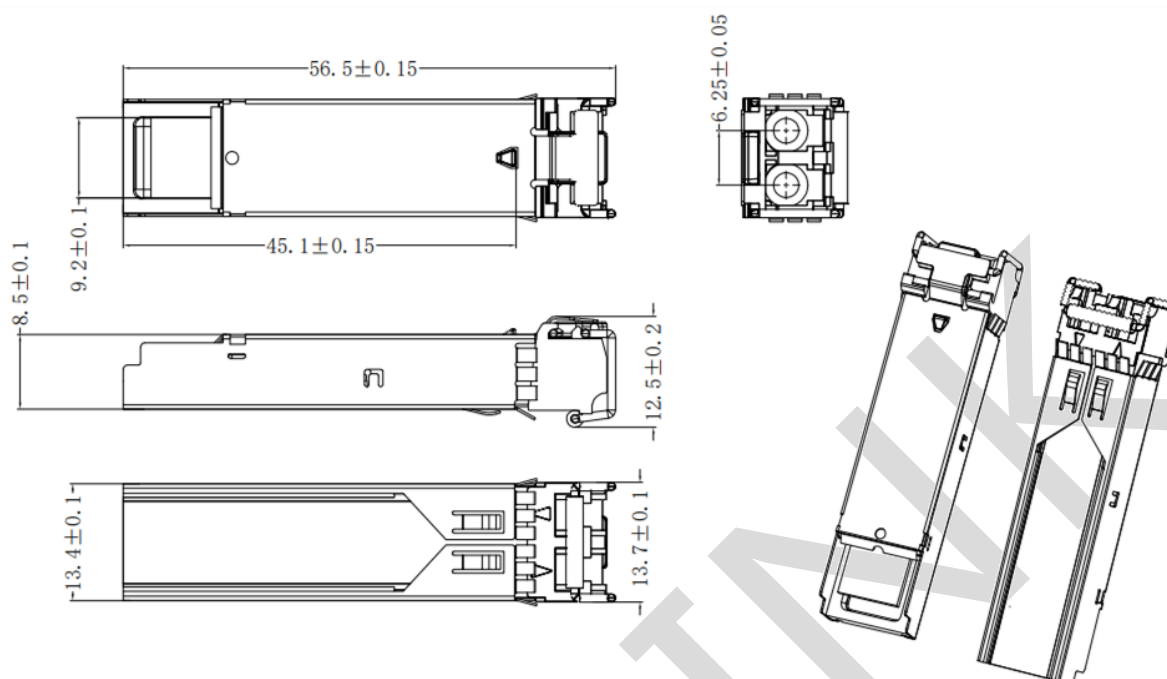
Plug Seq.: Pin engagement sequence during hot plugging.

- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V_{cc}+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 0.8V.
- 2) Laser output disabled on TDIS >2.0V or open, enabled on TDIS <0.8V.
- 3) LOS is open collector output. Should be pulled up with 4.7k~10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.
- 4) RD-/+: These are the differential receiver outputs. They are internally AC-coupled 100 differential lines which should be terminated with 100Ω (differential) at the user SERDES.
- 5) TD-/+: These are the differential transmitter inputs. They are internally AC-coupled, differential lines with 100Ω differential termination inside the module.

Recommended Interface Circuit



Mechanical Diagram



Revision History

Version No.	Date	Description
1.0	February 12, 2015	Preliminary datasheet
2.0	October 11, 2018	Product upgrades
3.0	July 27, 2024	Format change

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