

ESP5524-C0D(I)

2.5Gb/s SFP 1550nm 120km Optical Transceiver Module

PRODUCT FEATURES

- Up to 2.5Gb/s data links
- 1550nm DFB laser transmitter and APD photo-detector
- Up to 120km on 9/125μm SMF
- Hot-pluggable SFP footprint
- Duplex LC/UPC type pluggable optical interface
- Low power dissipation
- Metal enclosure, for lower EMI
- RoHS-10 compliant and lead-free
- Support Digital Diagnostic Monitoring interface
- Compliant with SFF-8472
- Case operating temperature

Commercial: 0 ~ +70°C

Industrial: -40 ~ +85°C



APPLICATIONS

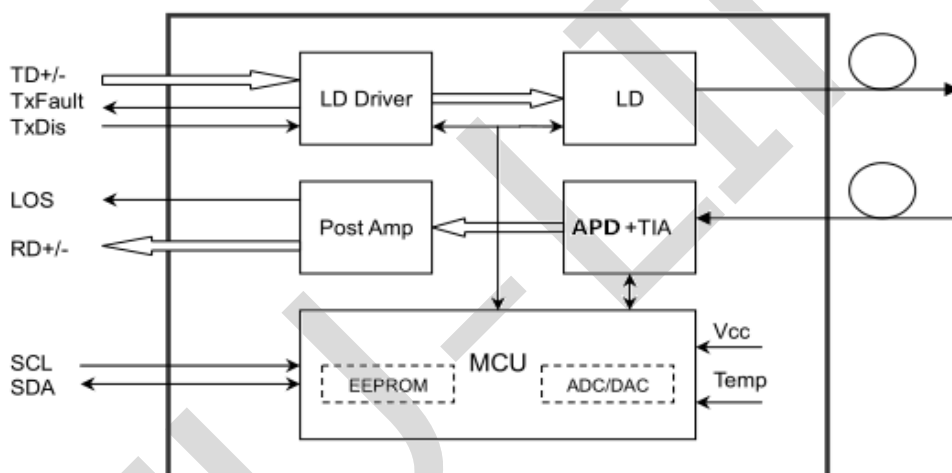
- Switch to Switch Interface
- 1xFiber/2xFiber channel Application
- Gigabit Ethernet
- Switched Backplane Applications
- Router/Server Interface
- Other Optical Links

DESCRIPTIONS

ESP5524-C0D(I) Small Form Factor Pluggable (SFP) transceivers are compatible with the Small Form Factor Pluggable Multi-Sourcing Agreement (MSA). The transceiver consists of five sections: the LD driver, the limiting amplifier, the digital diagnostic monitor, the DFB laser and the APD photo-detector. The module data link up to 120km in 9/125um single mode fiber.

The optical output can be disabled by a TTL logic high-level input of Tx Disable, and the system also can disable the module via I2C. Tx Fault is provided to indicate that degradation of the laser. Loss of signal (LOS) output is provided to indicate the loss of an input optical signal of receiver or the link status with partner. The system can also get the LOS (or Link)/Disable/Fault information via I2C register access.

Module Block Diagram



Ordering Information

Part No.	Data Rate(optical)	Laser	Fiber Type	Distance	Optical Interface	Temp	DDMI	Latch Color
ESP5524-C0D	2.5Gbps	DFB	SMF	120KM	LC	0~70°C	Yes	Green
ESP5524-C0DI	2.5Gbps	DFB	SMF	120KM	LC	-40~85°C	Yes	Green

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
Storage Temperature	TS	-40	85	°C	
Power Supply Voltage	VCC	-0.3	3.6	V	
Relative Humidity (non-condensation)	RH	5	95	%	
Damage Threshold	THd	5		dBm	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typical	Max.	Unit	Notes
Operating Case Temperature	TOP	0		70	°C	commercial
		-40		85		industrial
Power Supply Voltage	VCC	3.135	3.3	3.465	V	
Data Rate			2.5		Gb/s	
Control Input Voltage High		2		Vcc	V	
Control Input Voltage Low		0		0.8	V	
Link Distance (SMF)	D			120	km	9/125um

Electrical Characteristics

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

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Power Consumption	p			0.95	W	commercial
				1.00		Industrial
Supply Current	Icc			280	mA	commercial
				300		Industrial

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	

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmit Disable Assert Time				5	us	
Transmit Disable Voltage	Vdis	Vcc-1.3		Vcc	V	
Transmit Enable Voltage	Ven	Vee-0.3		0.8	V	
Receiver						
Differential Output Voltage Swing	Vout,pp	500		900	mVpp	
Differential Output Impedance	Zout	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 and Characteristics

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

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Transmitter						
Center Wavelength	λ_C	1530	1550	1570	nm	
Spectrum Bandwidth(RMS)	σ			1	nm	
Side Mode Suppression Ratio	SMSR	30			dB	
Average Optical Power	PAVG	1		6	dBm	1
Optical Extinction Ratio	ER	8.2			dB	
Transmitter OFF Output Power	POff			-45	dBm	
Transmitter Eye Mask		Compliant with G.957(class 1 laser safety)				
Receiver						
Center Wavelength	λ_C	1270		1610	nm	

Parameter	Symbol	Min.	Typical	Max	Unit	Notes
Receiver Sensitivity (Average Power)	Sen.			-30	dBm	2
Input Saturation Power (overload)	Psat	-10			dBm	
LOS Assert	LOSA	-41			dB	3
LOS De-assert	LOSD			-31	dBm	3
LOS Hysteresis	LOSH	0.5	2	6	dBm	

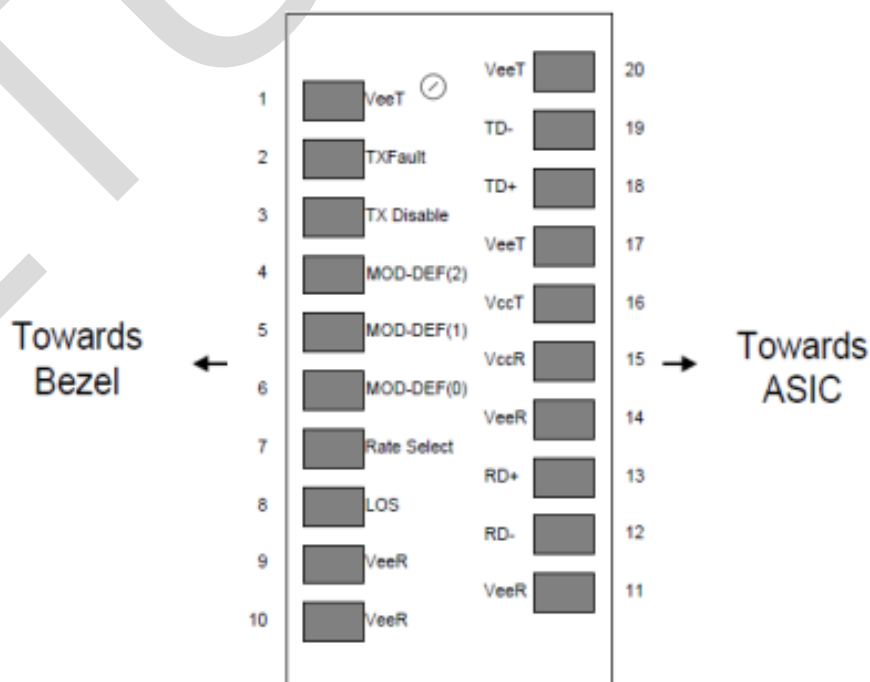
Notes:

- 1.Measure at 2²³-1 NRZ PRBS pattern
- 2.Measured with Light source 1550nm, ER=8.2dB; BER =<10⁻¹² @PRBS=2²³-1 NRZ
- 3.When LOS de-asserted, the RX data+/- output is High-level (fixed).

Digital Diagnostics

Parameter	Symbol	Min.	Max.	Unit	Notes
Temperature monitor	DMI _ Temp	-3	3	℃	Over operating temp
Supply voltage monitor	DMI _ VCC	-0.15	0.15	V	Full operating range
RX power monitor	DMI _ RX	-3	3	dB	
Bias current monitor	DMI _ bias	-10%	10%	mA	
TX power monitor	DMI _ TX	-3	3	dB	

Pin Diagram



Pin Definitions

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 DATAout. AC Coupled	
13	RD+	Receiver Non-inverted DATAout. 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 DATAin. AC Coupled.	
19	TD-	Transmitter Inverted DATAin. 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):

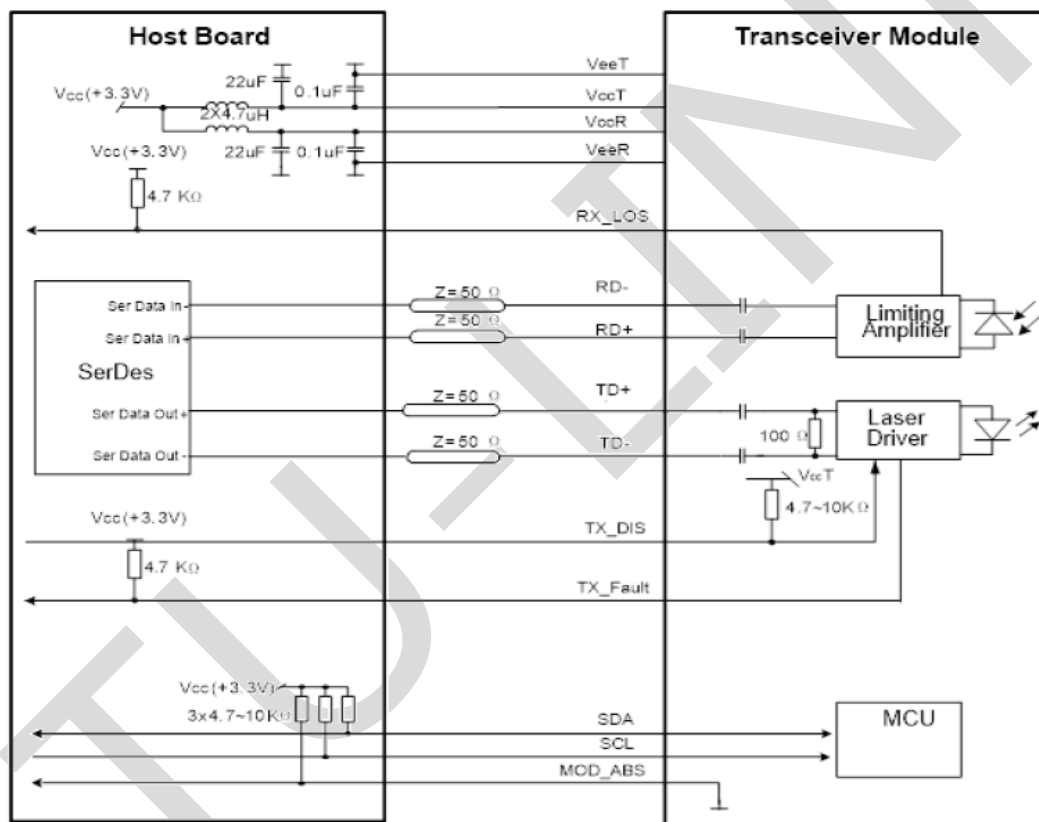
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2) High (2.0 – 3.465V): Full Bandwidth

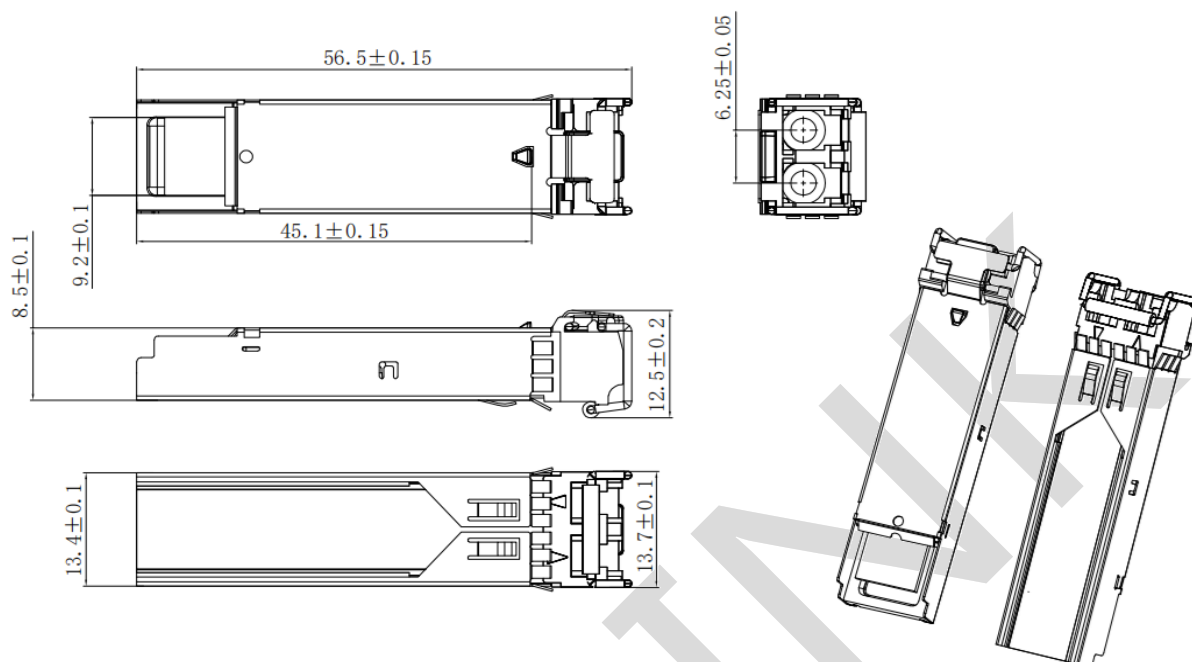
3) Open: Reduced Bandwidth

4) 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 Diagram



Revision History

Version No.	Date	Description
1.0	May 8, 2015	Preliminary datasheet
2.0	October 11, 2018	Product upgrades
3.0	July 29, 2024	Format change

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