

10km 25G DWDM TSFP28 Optical Transceiver Module DO-TP28-10

PRODUCT FEATURES

- SFP28 MSA compliant
- 25G electrical interface (OIF CEI-28G-VSR)
- 48 channel(191.3~196.0THz)
- 100GHz channel spacin
- Maximum power consumption 2.5W
- LC duplex connector
- Supports 24.33024G、25.78125Gbps (with FEC) ; 9.8304G、10.1376G、10.3125Gbps
- Up to 10km transmission on single mode fiber
- Operating case temperature: -20 to 85°C
- Single 3.3V power supply
- RoHS-6 compliant

APPLICATIONS

- CPRI/eCPRI
- 10G/25G Ethernet switches and routers

DESCRIPTIONS

DO-TP28-10 is a tunable transceiver module designed for 10km optical communication applications, and it is compliant to SFP28 MSA standard. This module can convert a 25Gb/s electrical data to

25Gb/s optical signals. Similarly, it a 25Gb/s optical input signal to 25Gb/s serial electrical data. It has been designed to meet the harshest external operating conditions including temperature, humidity and EMI interference. The module offers very high functionality and feature integration, accessible via a two-wire serial interface.

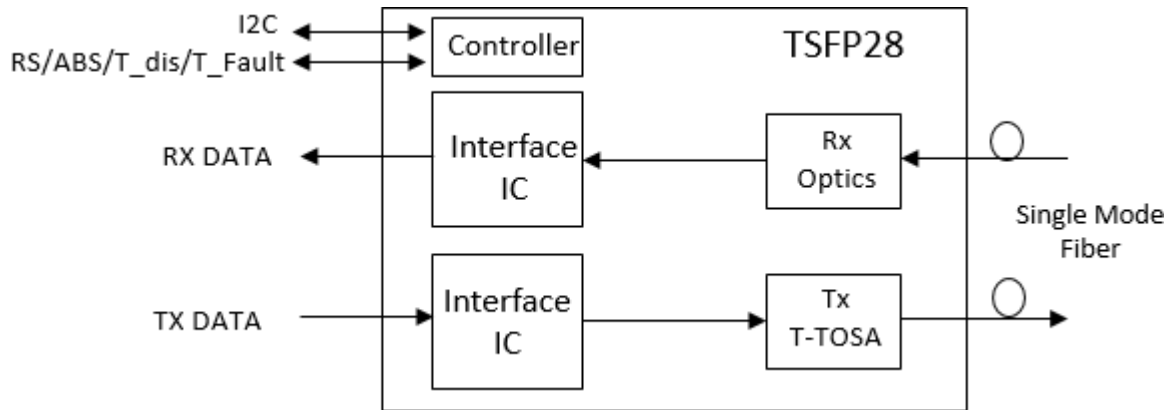


Figure 1. Transceiver Block Diagram

Pin Descriptions

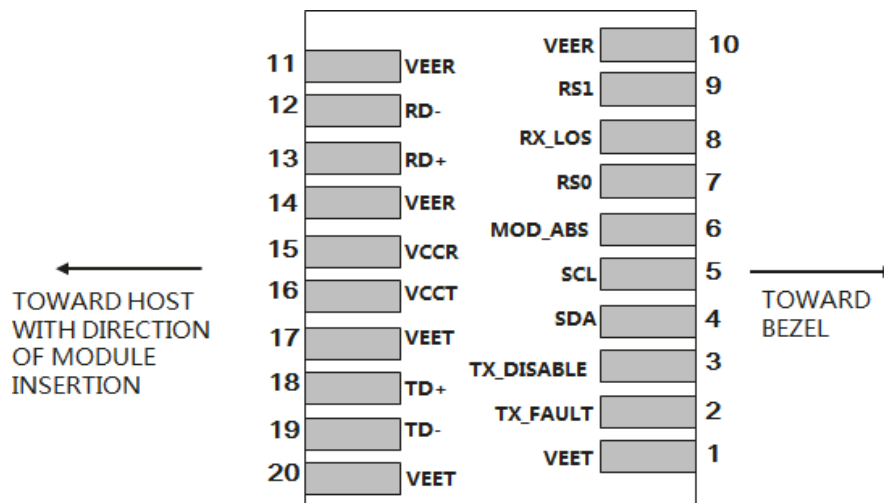


Figure 2. MSA compliant Connector

Pin	Symbol	Description	Notes
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1	VEET	Transmitter ground	1
2	TX_FAULT	Transmitter fault indication	
3	TX_DISABLE	Disables the transmitter or laser output	2
4	SDA	Data line for an I2C series interface	2
5	SCL	Clock line for an I2C series interface	2
6	MOD_ABS	Indicates the module online state (this pin is connected to the VeeT or VeeR pin)	
7	RS0	Selects a rate for the module (this pin is connected to the 33 kilohm resistor)	
8	RX_LOS	Indicates a loss of received signals	2
9	RS1	Selects a rate for the module (this pin is connected to the 33 kilohm resistor)	
10	VEER	Receiver ground	1
11	VEER	Receiver ground	1
12	RD-	Inverse received data output	
13	RD+	Received data output	
14	VEER	Receiver ground	1
15	VCCR	3.3 V receiver power	1
16	VCCT	3.3 V transmitter power	1
17	VEET	Transmitter ground	1
18	TD+	Transmit data input	
19	TD-	Inverse transmit data input	
20	VEET	Transmitter ground	1

Notes

1. The ground of the module (operating module ground) and that of the module shell are separate from each other.
2. 4.7–10 kilohm resistor is used on the module to pull the output up to 3.15–3.45 V

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	Typ	Max	Unit	Notes
Maximum Supply Voltage	Vcc	0	3.3	3.6	V	
Storage Temperature	Ts	-40		85	°C	
Relative Humidity	RH	0		85	%	1
Damage Threshold, each lane	THd	5			dBm	

Notes

1.Non-condensing

Operating Environments

Electrical and optical characteristics below are defined under this operating environment, unless otherwise specified.

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	Vcc	3.135	3.3	3.465	V
Case Temperature	Top	-20		85	°C
Data Rate		24.33024		25.78125	Gbps
		9.8304		10.3125	
Data Rate Accuracy		-100		100	ppm
Link Distance with G.652				10	km

Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power dissipation				2.5	W	1
Supply Current	Icc			0.76	A	
Transmitter						
Data Rate		24.33024		25.78125	Gbps	CDR Bypass
		9.8304		10.3125		
Differential Voltage pk-pk	Vpp	180		900	mV	

Tx Differential Input Impedance	Z_{IN}		100		Ω	
Transmitter Disable Voltage	V_D	2.0		$V_{cc}+0.3$	V	
Transmitter Enable Voltage	V_{EN}	0		0.8	V	
Receiver						
Data Rate		24.33024		25.78125	Gbps	CDR Bypass
		9.8304		10.3125		
Differential Voltage pk-pk	V_{pp}	450	600	900	mV	
Rx Differential Output Impedance	Z_{out}		100		Ω	
LOS Assert Voltage	V_{LOSA}	2.4		V_{cc}	V	
LOS De-assert Voltage	V_{LOSD}	V_{ee}		$V_{ee}+0.4$	V	
Eye height	EH15	228			mV	
Eye width	EW15	0.57			UI	
Vertical Eye Closure	VEC			5.5	dB	

Notes

- Power dissipation is less than 2.5W when supply voltage is 3.3V

Optical Characteristics

Parameters	Unit	min	type	max
Transmitter				
Output average power	dBm	0		4
Data Rate	Gbps	24.33024		25.78125
		9.8304		10.3125
Data Rate Accuracy	ppm	-100		100
Wavelength Range	THz	191.3		196.0
Wavelength Accuracy	GHz	-12.5		12.5

channel spacing	GHz		100	
Extinction Ratio (ER)	dB	7		
Side-Mode Suppression Ratio (SMSR)	dB	30		
RIN20OMA	dB/Hz			-130
Optical Return Loss Tolerance	dB			20
Transmitter reflectance	dB			-26
Transmitter eye mask definition {X1, X2, X3, Y1, Y2, Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4} Hit ratio 5×10^{-5} hits per sample		
Receiver				
Data Rate	Gbps	24.33024		25.78125
		9.8304		10.3125
Wavelength Range	THz	191.3		196.0
Saturation Power	dBm	0		
Receiver sensitivity	dBm			-16 (5e-5 FEC)
Receiver sensitivity(after 10km)	dBm			-16(5e-5 FEC)
Receiver reflectance	dB			-26
LOS Assert	dBm	-27		
LOS Deassert	dBm			-19
LOS Hysteresis	dB	0.5		
SRS eye mask definition { X1, X2, X3, Y1, Y2, Y3}		{0.31, 0.4, 0.45, 0.34, 0.38, 0.4}		

EEPROM Definitions

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Address	Name of Field	Description	Value (hex)	Notes
0	Identifier	Type of transceiver	03	SFP28
1	Ext. Identifier	Extended identifier of type of transceiver	04	two-wire interface ID module
2	Connector	Code for connector type	07	LC Receptical

3	Transceiver	10G Ethernet Compliance Codes Infiniband Compliance Codes	00	
4		ESCON Compliance Codes SONET Compliance Codes	00	
5		SONET Compliance Codes	00	
6		Ethernet Compliance Codes	00	
7		Fibre Channel Link Length Fibre Channel Technology	00	
8		Fibre Channel Technology SFP+ Cable Technology	00	
9		Fibre Channel Transmission Media	00	
10		Fibre Channel Speed	00	
11	Encoding	Code for high speed serial encoding algorithm	03	NRZ
12	BR, Nominal	Nominal signalling rate, units of 100MBd. (see details for rates > 25.4Gb/s)	FF	>25.4Gbps, addresses 66 and 67 determine bit rate
13	Rate Identifier	Type of rate select functionality	0D	
14	Length(SMF,km)	Link length supported for single mode fiber, units of km	0A	10KM
15	Length (SMF)	Link length supported for single mode fiber, units of 100 m	64	10KM
16	Length (50um)	Link length supported for 50 um OM2 fiber, units of 10 m	00	
17	Length (62.5um)	Link length supported for 62.5 um OM1 fiber, units of 10 m	00	
18	Length (OM4 or copper cable)	Active Cable Link Length, units of m	00	
19	Length (OM3)	Link length supported for 50 um OM3 fiber, units of 10 m	00	
20-35	Vendor name	SFP vendor name(ASCII)		
36	Transceiver	Code for electronic or optical compatibility	03	25GBASE-LR
37-39	Vendor OUI	SFP vendor IEEE company ID	00 00 00	
40-55	Vendor PN	Part number provided by SFP vendor (ASCII)		

56-59	Vendor rev	Revision level for part number provided by vendor (ASCII)	41 20 20 20	A
60-61	Wavelength	Laser wavelength (Passive/Active Cable Specification Compliance)	00 00	Tunable
62	Unallocated		00	
63	CC_BASE	Check code for Base ID Fields (addresses 0 to 62)	Programmed by Factory	
64	Options	Indicates which optional transceiver signals are implemented	3C	Retimer or CDR indicator, Cooled Transceiver, Power Level 3, Limit Receiver Output;
65	Options	Indicates which optional transceiver signals are implemented	7A	Tunable, Rate_select, TX_DISABLE, TX_FAULT, Rx_LOS
66	BR, max	Upper bit rate margin, units of % (see details for rates > 25.4Gb/s)	67	25.78125Gbps
67	BR, min	Lower bit rate margin, units of % (see details for rates > 25.4Gb/s)	00	
68-83	Vendor SN	Serial number provided by vendor (ASCII)	Programmed by Factory	
84-91	Date code	Vendor's manufacturing date code	Programmed by Factory	
92	Diagnostic Monitoring Type	Indicates which type of diagnostic monitoring is implemented (if any) in the transceiver	68	1. Received power measurement type is average power 2. Internally calibrated 3. DDM implemented
93	Enhanced Options	Indicates which optional enhanced features are implemented (if any) in the transceiver	7A	These functions implemented: 1. Soft TX_DISABLE control 2. Soft TX_FAULT monitoring 3. Soft RX_LOS monitoring 4. Soft RATE_SELECT control

94	SFF-8472 Compliance	Indicates which revision of SFF-8472 the transceiver complies with	08	SFF-8472
95	CC_EXT	Check code for the Extended ID Fields (addresses 64 to 94)	Programmed by Factory	
96-127	Vendor Specific	Vendor Specific EEPROM	Programmed by Factory	

Digital Diagnostic Monitoring Functions

DO-TP28-10 support the I2C-based Diagnostic Monitoring Interface (DMI) defined in document SFF- 8472.

The host can access real-time performance of transmitter and receiver optical power, temperature, supply voltage and bias current.

Performance Item	Related Bytes(A2H memory)	Monitor Error	Notes
Module temperature	96 to 97	+/-3°C	1, 2
Module voltage	98 to 99	< 3%	2
LD Bias current	100 to 101	< 10%	2
Transmitter optical power	102 to 103	< 3dB	2
Receiver optical power	104 to 105	< 3dB	2

Note

- 1, Actual temperature test point is fixed on module case around Laser 2, Full operating temperature range

Alarm and Warning Thresholds

DO-TP28-10 support alarms function, indicating the values of the preceding basic performance are lower or higher than the thresholds.

Performance Item	Alarm Threshold Bytes(A2H memory)	Unit	Low threshold	High threshold
Temp Alarm	00 to 03	°C	-30	95
Temp Warning	04 to 07	°C	-20	85
Voltage Alarm	08 to 11	V	2.97	3.63
Voltage Warning	12 to 15	V	3.135	3.465

Bias Alarm	16 to 19	mA	1	80
Bias Warning	20 to 23	mA	2	70
TX Power Alarm	24 to 27	dBm	-2	6
TX Power Warning	28 to 31	dBm	0	4
RX Power Alarm	32 to 35	dBm	-18	2
RX Power Warning	36 to 39	dBm	-16	0

Mechanical Specifications

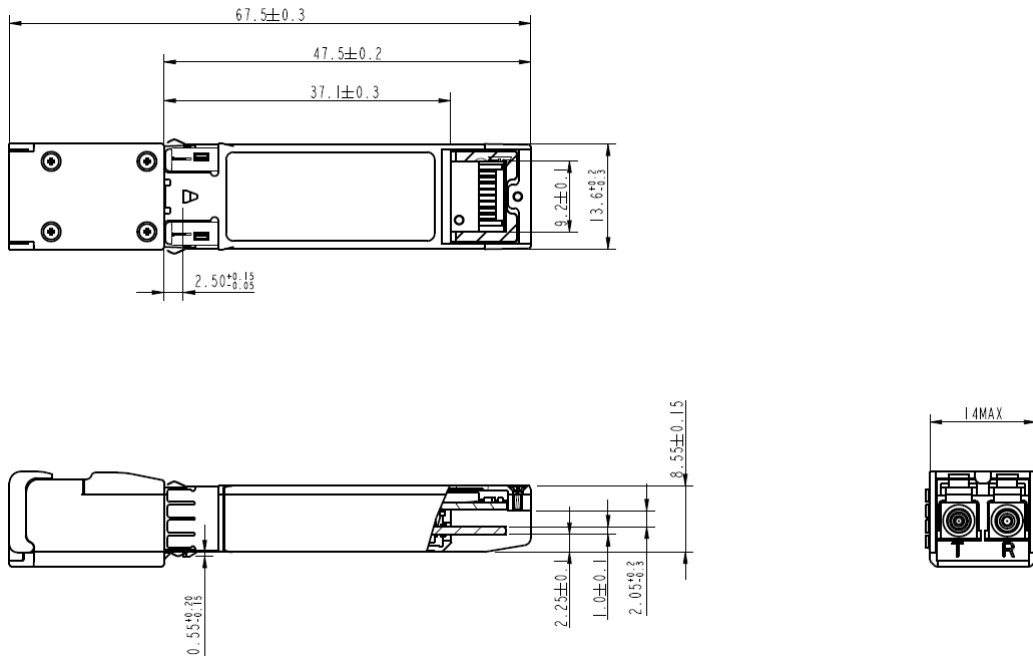


Figure 3. Mechanical Dimensions