

**Модуль SFP28, 25G, LR, 10km, 2xLC****Особенности:**

- 1310nm DFB-LD передатчик
- передача данных 24.33Gbps , 25.78Gbps
- одно питание 3.3В с рассеиваемой мощностью < 1.2Вт
- до 10км по одномодовому волокну
- поддержка горячей замены
- соответствие спецификации на SFP28 MSA SFF-8402
- встроенный CDR (clock and data recovery) и DDMI

**Области применения:**

- 10GB / 25GB Ethernet

Part No.	Data Rate	Laser	Fiber Type	Distance	Temp.	CDR	DDMI
SFP28-LR.LC.10	24.33Gbps and 25.78Gbps	1310nm DFB	SMF	10km	0°C ~+70°C	Yes	Yes

**Absolute Maximum Ratings**

Parameter	Symbol	Min.	Max.	Unit
Storage Temperature	T <sub>s</sub>	-45	85	°C
Supply Voltage	V <sub>CC</sub>	-0.5	4.0	V
Operating Relative Humidity	RH	5	95	%

**Recommended Operating Conditions**

Parameter	Sym bol	Min.	Typical	Max.	Unit
Operating Case Temperature	T <sub>A</sub>	0		70	°C
Power Supply Voltage	V <sub>CC</sub>	3.135		3.465	V
Power Supply Current	I <sub>CC</sub>			340	mA

**Performance Specifications - Electrical**

Parameter	Symbol	Min.	Typ.	Max	Unit	Notes
Transmitter						

CML Inputs(Single-ended)	Vin	200		900	mVpp	AC coupled inputs
Input Impedance (Differential)	Zin		100		ohms	Connected directly to TX pins
Tx_DISABLE Input Voltage – High		2		Vcc+0.3	V	
Tx_DISABLE Input Voltage – Low		-0.3		0.8	V	
<b>Receiver</b>						
CML Outputs (Single-ended)	Vout	300		1000	mVpp	AC coupled outputs
Rx_LOS Output Voltage – High		2		Vcc+0.3	V	
Rx_LOS Output Voltage – Low		-0.3		0.8	V	

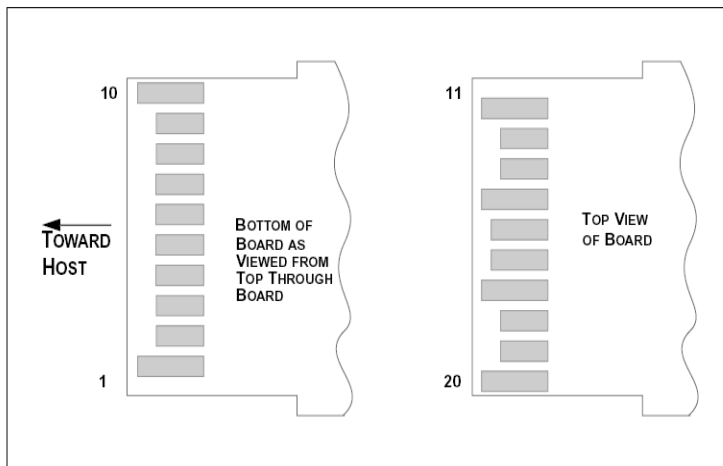
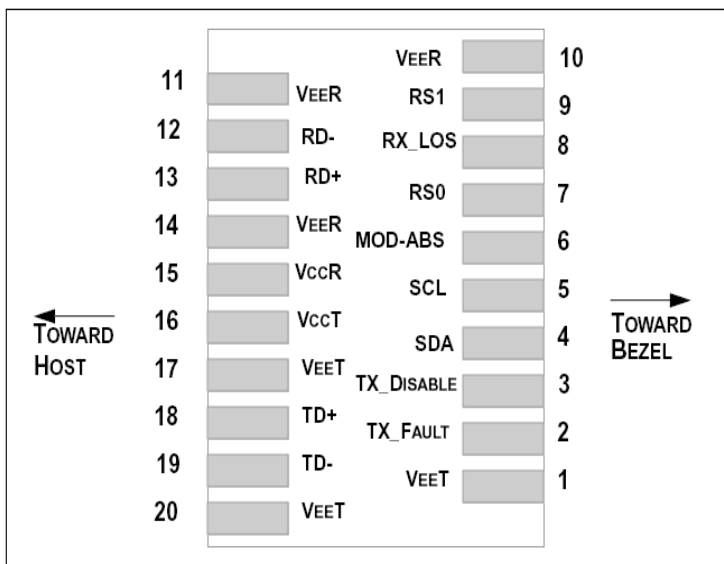
### Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit
9um Core Diameter SMF				10	km
<b>Transmitter</b>					
Centre Wavelength	$\lambda_C$	1295	1310	1325	nm
Spectral Width (-20dB)	$\Delta\lambda$			1	nm
Side Mode Suppression Ratio	SMSR	30			dB
Average Output Power @ 25.78Gb/s	P <sub>out</sub>	-7		2	dBm
Optical Modulation Amplitude (OMA)	P <sub>OMA</sub>	-4		2.2	dBm
Extinction Ratio	ER	3			dB
Transmitter Dispersion Penalty	TDP			2.7	dB
OMA minus TDP		-5			dBm
Transmitter Reflectance				-26	dB
Return Loss tolerance				20	dB
Relative Intensity Noise	RIN			-130	dB/Hz
<b>Receiver</b>					
Centre Wavelength	$\lambda_C$	1295	1310	1325	nm
Average Receive Power	R <sub>pow</sub>	-13.3		2	dBm
Receiver Sensitivity* <sup>Note5</sup>	P <sub>min</sub>			-12	dBm
Receiver Sensitivity	R <sub>XOMA</sub>			-12	dBm

(OMA)* <sup>Note5</sup>					
Stressed Receiver Sensitivity* <sup>Note5</sup>	RX <sub>SRS</sub>			-9.5	dBm
Receiver Overload	P <sub>max</sub>	2			dBm
Receiver Overload (OMA)	P <sub>max</sub>	2.2			dBm
Damage threshold		3			dBm
Receiver Reflectance				-26	dB
LOS De-Assert	LOS <sub>D</sub>			-17	dBm
LOS Assert	LOS <sub>A</sub>	-30			dBm
LOS Hysteresis	HY	0.5			dB

Note5: Measured with data rate at 25.78Gb/s, BER less than 5E-5 with PRBS 2<sup>31</sup>-1.

### SFP28 Transceiver Electrical Pad Layout



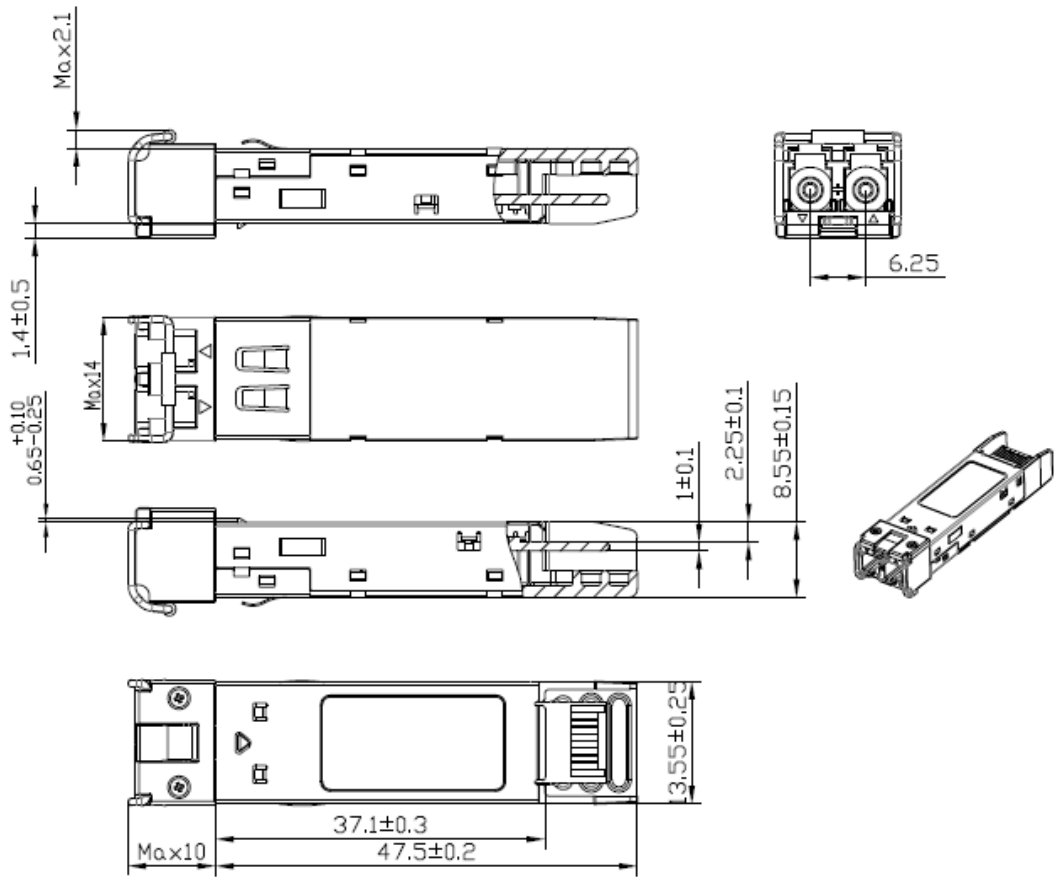
## Pin Function Definitions

Pin Num.	Name	Function	Plug Seq.	Notes
1	VeeT	Transmitter Ground	1	
2	TX Fault	Transmitter Fault Indication	3	Note 1
3	TX Disable	Transmitter Disable	3	Note 2, Module disables on high or open
4	SDA	Module Definition 2	3	Data line for Serial ID.
5	SCL	Module Definition 1	3	Clock line for Serial ID.
6	MOD-ABS	Module Definition 0	3	Note 3
7	RS0	RX Rate Select (LVTTTL).	3	Rate Select 0, optionally controls SFP28 module receiver. This pin is pulled low to VeeT with a >30K resistor..
8	LOS	Loss of Signal	3	Note 4
9	RS1	TX Rate Select (LVTTTL).	1	Rate Select 1, optionally controls SFP28 module transmitter. This pin is pulled low to VeeT with a >30K resistor.
10	VeeR	Receiver Ground	1	Note 5
11	VeeR	Receiver Ground	1	Note 5
12	RD-	Inv. Received Data Out	3	Note 6
13	RD+	Received Data Out	3	Note 6
14	VeeR	Receiver Ground	1	Note 5
15	VccR	Receiver Power	2	3.3V ± 5%, Note 7
16	VccT	Transmitter Power	2	3.3V ± 5%, Note 7
17	VeeT	Transmitter Ground	1	Note 5
18	TD+	Transmit Data In	3	Note 8
19	TD-	Inv. Transmit Data In	3	Note 8
20	VeeT	Transmitter Ground	1	Note 5

**Notes:**

- 1) TX Fault is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor on the host board. Pull up voltage between 2.0V and  $V_{ccT/R}+0.3V$ . When high, output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 2) TX disable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7K~10 K  $\Omega$  resistor. Its states are:  
Low (0 – 0.8V): Transmitter on (>0.8, < 2.0V): Undefined  
High (2.0 – 3.465V): Transmitter Disabled Open: Transmitter Disabled
- 3) Module Absent, connected to VeeT or VeeR in the module.
- 4) LOS (Loss of Signal) is an open collector/drain output, which should be pulled up with a 4.7K – 10K $\Omega$  resistor. Pull up voltage between 2.0V and  $V_{cc\_Host}$ . When high, this output indicates the received optical power is below the worst-case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to < 0.8V.
- 5) VeeR and VeeT may be internally connected within the SFP28 module.
- 6) RD-/+ : These are the differential receiver outputs. They are AC coupled 100 $\Omega$  differential lines which should be terminated with 100 $\Omega$  (differential) at the user SERDES. The AC coupling is done inside the module and is thus not required on the host board. The voltage swing on these lines will be between 185 and 425 mV differential (92.5 –212.5 mV single ended) when properly terminated.
- 7) VccR and VccT are the receiver and transmitter power supplies. They are defined as 3.3V  $\pm$ 5% at the SFP+ connector pin. Maximum supply current is 340mA. Inductors with DC resistance of less than 1 ohm should be used in order to maintain the required voltage at the SFP28 input pin with 3.3V supply voltage. When the recommended supply-filtering network is used, hot plugging of the SFP28 transceiver module will result in an inrush current of no more than 30mA greater than the steady state value. VccR and VccT may be internally connected within the SFP28 transceiver module.
- 8) TD-/+ : These are the differential transmitter inputs. They are AC-coupled, differential lines with 100 $\Omega$  differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board. The inputs will accept differential swings of 90 – 800 mV (45 – 400 mV single-ended), though it is recommended that values between 90 and 800 mV differential (45 – 400 mV single-ended) be used for best EMI performance.

Mechanical Specifications



Unremarked tolerances  $\pm 0.2mm$