

## SFP-25SM31-30C

25Gbps SFP28 Transceiver, Single Mode, 30km Reach

### Features

- Supports up to 25.78Gbps bit rates
- Hot-pluggable SFP+ footprint
- Up to 30km 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



### Applications

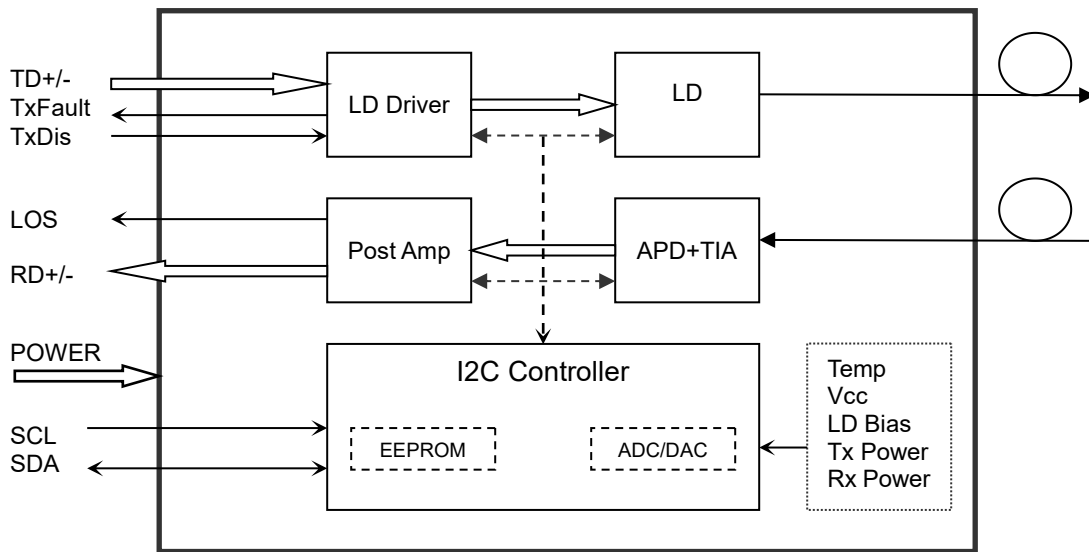
- 25GBASE-ER Lite

### Description

The SFP28 transceivers are high performance, cost effective modules supporting data rate of 25.78Gbps and 30km transmission distance with SMF.

The transceiver consists of three sections: a DML laser transmitter, a APD 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.



Transceiver functional diagram

## Absolute Maximum Ratings

Table1- Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Storage Temperature	T <sub>s</sub>	-40	-	85	°C	
Relative Humidity	R <sub>H</sub>	5	-	95	%	
Power Supply Voltage	V <sub>CC</sub>	-0.3	-	4	V	
Signal Input Voltage	V <sub>SI</sub>	V <sub>CC</sub> -0.3	-	V <sub>CC</sub> +0.3	V	

## Recommended Operating Conditions

Table2- Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note	
Case Operating Temperature	T <sub>case</sub>	0		70	°C		
Power Supply Voltage	V <sub>CC</sub>	3.14	3.3	3.47	V		
Power Supply Current	I <sub>CC</sub>	-		600	mA		
Data Rate	BR		25.78		Gbps	TX Rate/RX Rate	
Transmission Distance	TD		30		km		
Coupled fiber		Single mode fiber					9/125um SMF

## Optical Characteristics

Table3- Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Centre Wavelength	$\lambda_c$	1295		1315	nm	
Average Launched Power	PO	0		+6.0	dBm	
Average Launched Power(Laser Off)	Poff	-	-	-30	dBm	
Spectrum Bandwidth(-20dB)	$\Delta\lambda$	-	-	1	nm	
Side-Mode Suppression Ratio	SMSR	30	-	-	dB	
Transmitter and Dispersion Penalty	TDP			1	dB	
Extinction Ratio	ER	6		-	dB	
Output Eye Mask	Compliant with IEEE 802.3cc					Note (2)
<b>Receiver</b>						
Input Optical Wavelength	$\lambda_{IN}$	1290	-	1325	nm	
Receiver Sensitivity-AVG	PSens			-19	dBm	Note (1)
Receiver Sensitivity-OMA	PSens-OMA			-18.2	dBm	Note(1)
Input Saturation Power (Overload)	PSAT	-4	-	-	dBm	Note (1)
Receiver Reflectance				-26	dB	
Los Of Signal Assert	PA	-30	-	-	dBm	
Los Of Signal De-assert	PD	-	-	-20	dBm	
LOS -Hysteresis	PHys	0.5			dB	

Note: BER $\leq$ 5x10<sup>-5</sup>

## Electrical Interface Characteristics

**Table4-High Speed Electrical Interface Characteristics**

Parameter	Symbol	Min	Typ	Max	Unit	Notes
<b>Transmitter</b>						
Differential input swing	Vin(pp)	190		700	mV	
Differential input return loss (min)	RLd(f)	9.5 - 0.37f, 0.01 ≤ f < 8			dB	
		4.75 - 7.4log10(f/14), 8 ≤ f < 19				
Differential to common mode input return loss (min)	RLdc(f)	22-20(f/25.78), 0.01 ≤ f < 12.89			dB	
		15-6(f/25.78), 12.89 ≤ f < 19				
Differential termination mismatch	Tm	-	-	10	%	
Eye width	Ew	-	-	0.46	UI	
Applied pk-pk sinusoidal jitter	Ppj	Per IEEE 802.3bm				
Eye height	Eh	-	95	-	mV	
DC common mode voltage	DCv	-350	-	2850	mV	
<b>Receiver</b>						
Differential data output swing	Vout (pp)	300	-	850	mV	
Eye width	Ew	0.57	-	-	UI	
Vertical eye closure	Vec	-	-	5.5	dB	
Differential output return loss (min)	RLd(f)	9.5 - 0.37f, 0.01 ≤ f < 8			dB	
		4.75 - 7.4log10(f/14), 8 ≤ f < 19				
Common to differential mode conversion return loss (min)	RLdc(f)	22-20(f/25.78), 0.01 ≤ f < 12.89			dB	
		15-6(f/25.78), 12.89 ≤ f < 19				
Differential termination mismatch	Tm	-	-	10	%	
Transition time, 20% to 80%	Tr/Tf	12	-	-	ps	20%~80%

**Table5-LOW Speed Electrical Interface Characteristics**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter</b>						
Transmitter Fault Output-High	VFaultH	2	-	Vcc+0.3	V	
Transmitter Fault Output-Low	VFaultL	0	-	0.8	V	
Transmitter Disable Voltage- High	VDisH	2	-	Vcc+0.3	V	
Transmitter Disable Voltage- low	VDisL	0	-	0.8	V	
<b>Receiver</b>						
LOS Output Voltage-High	VLOSH	2	-	Vcc+0.3	V	
LOS Output Voltage-Low	VLOSL	0	-	0.8	V	

## Diagnostics

**Table6- Diagnostics**

Parameter	Range	Unit	Accuracy	Calibration
Temperature	0 to 70	°C	±3°C	Internal
Voltage	3.0 to 3.6	V	±3%	Internal
Bias Current	0 to 100	mA	±10%	Internal
TX Power	0 to 6	dBm	±3dB	Internal
RX Power	-19 to -4	dBm	±3dB	Internal

## Timing and Electrical

**Table7- Timing and Electrical**

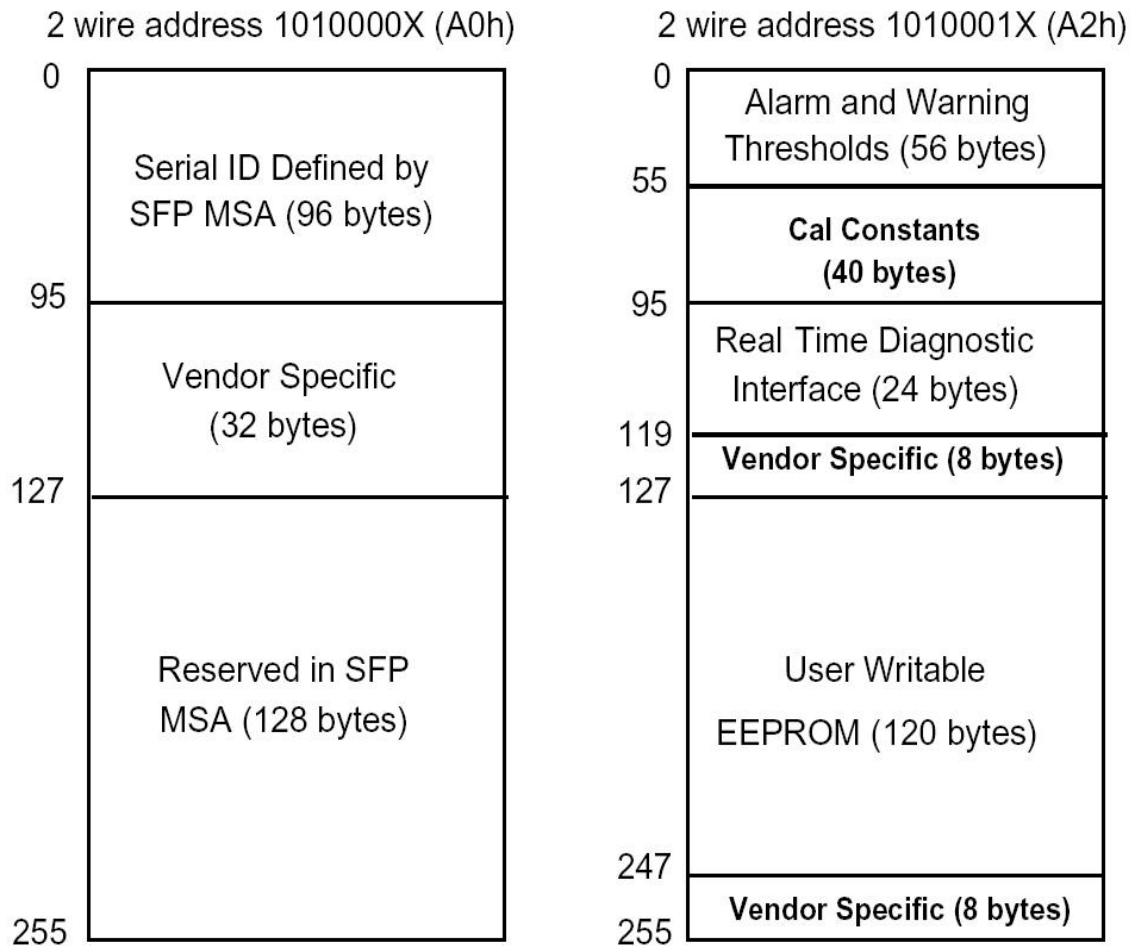
Parameter	Symbol	Min	Typical	Max	Unit
Tx Disable Negate Time	t_on			1	ms
Tx Disable Assert Time	t_off			10	µs
Time To Initialize, including Reset of Tx Fault	t_init			300	ms
Tx Fault Assert Time	t_fault			100	µs
Tx Disable To Reset	t_reset	10			µs
LOS Assert Time	t_loss_on			100	µs
LOS De-assert Time	t_loss_off			100	µs
Serial ID Clock Rate	f_serial_clock		100	400	KHz
MOD_DEF (0:2)-High	V <sub>H</sub>	2		V <sub>cc</sub>	V
MOD_DEF (0:2)-Low	V <sub>L</sub>			0.8	V

## Digital Diagnostic Memory Map

The transceivers provide serial ID memory contents and diagnostic information about the present operating conditions by the 2-wire serial interface (SCL, SDA).

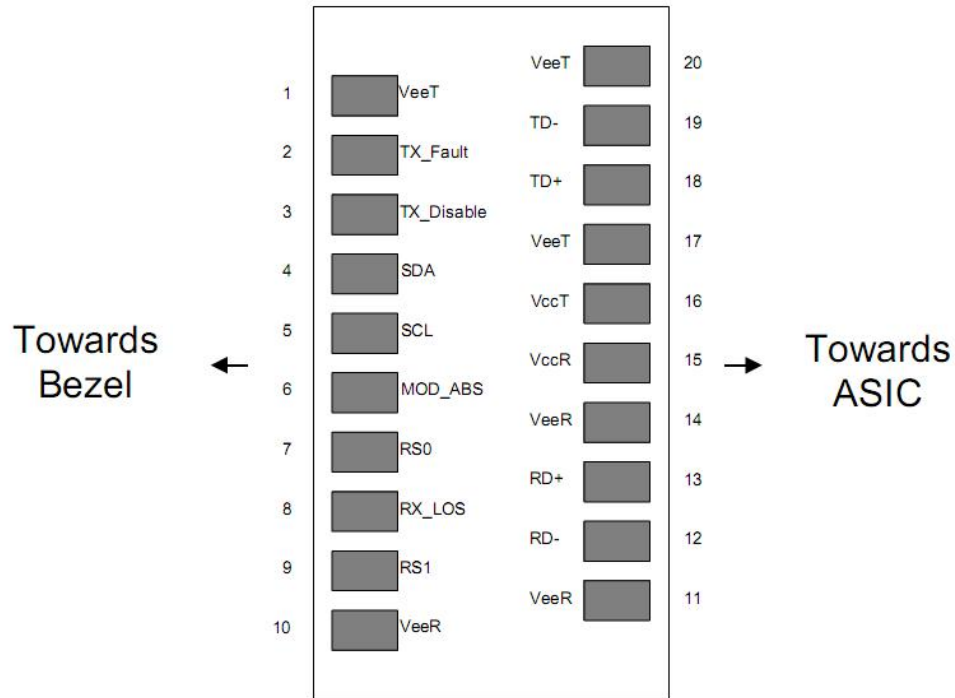
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

The digital diagnostic memory map specific data field defines as following.



## Pin Assignment

### Pin Diagram



## Pin Descriptions

Table8- Pin Descriptions

Pin	Signal Name	Description	Plug Seq.	Notes
1	V <sub>EET</sub>	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	RS1	Not Connected	3	
10	V <sub>EER</sub>	Receiver ground	1	
11	V <sub>EER</sub>	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4
13	RD+	Received Data Out	3	Note 4
14	V <sub>EER</sub>	Receiver ground	1	

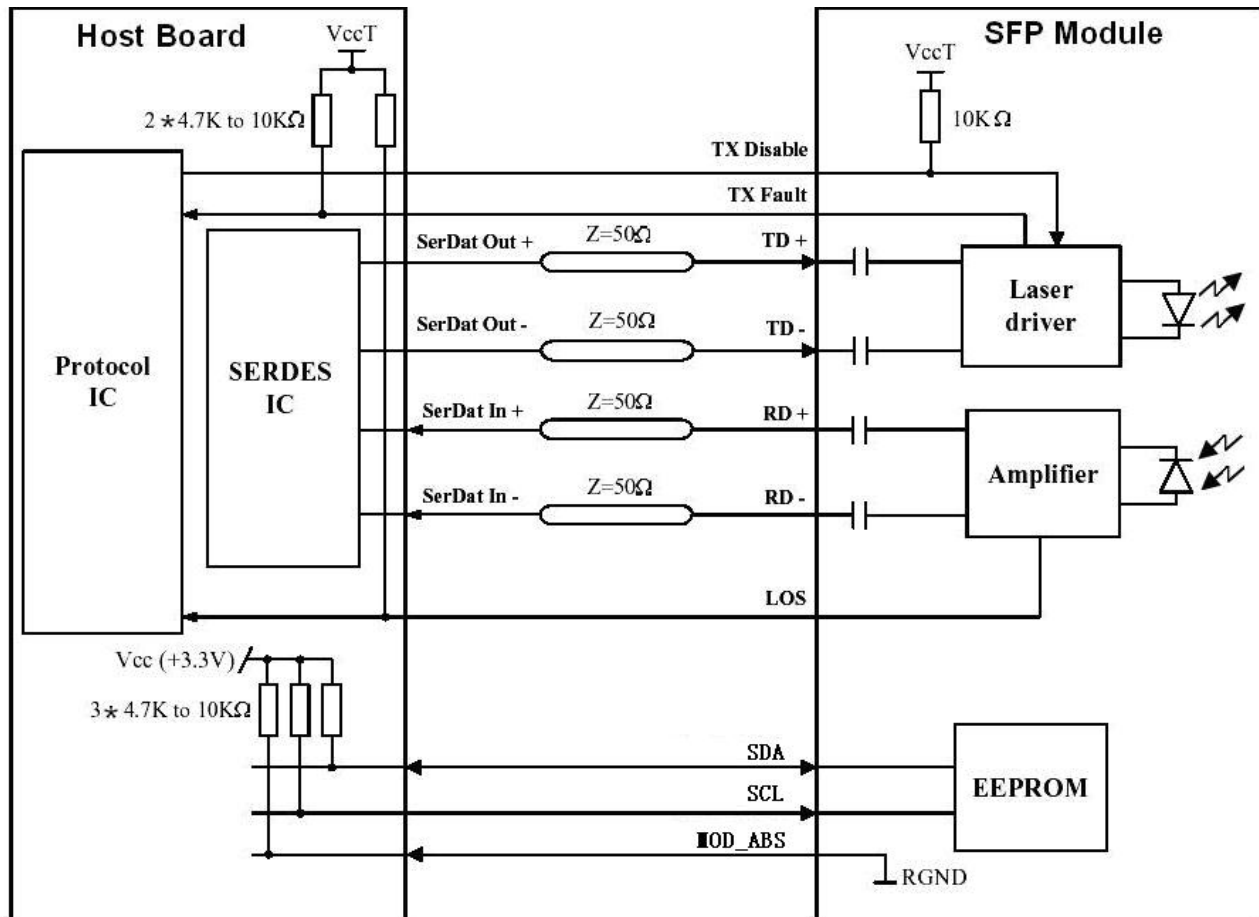
15	V <sub>CCR</sub>	Receiver Power Supply	2	
16	V <sub>CCT</sub>	Transmitter Power Supply	2	
17	V <sub>EET</sub>	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V <sub>EET</sub>	Transmitter Ground	1	

**Notes:**

Plug Seq.: Pin engagement sequence during hot plugging.

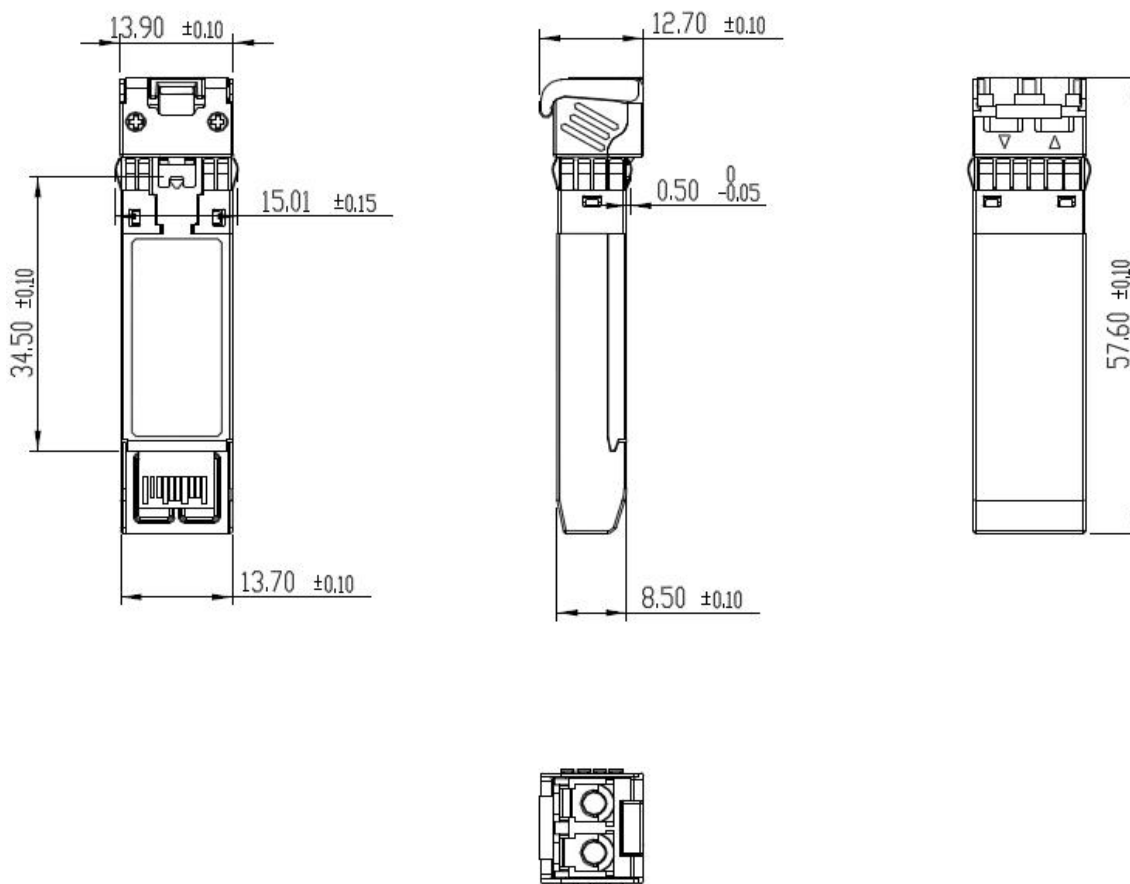
- 1) TX Fault is an open collector output, which should be pulled up with a 4.7k~10kΩ resistor on the host board to a voltage between 2.0V and V<sub>cc</sub>+0.3V. Logic 0 indicates normal operation; Logic 1 indicates a laser fault of some kind. In the low state, the output will be pulled to less than 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 Dimensions



## Ordering information

Table9- Ordering information

Part Number	Product Description
SFP-25SM31-30C	1310nm, 25.78Gbps, LC, 30km, 0°C~+70°C, with DDM

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