

SFP-25DOxx-40C

25Gbps SFP28 LAN-WDM Transceiver, 40km Reach

Features

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



Applications

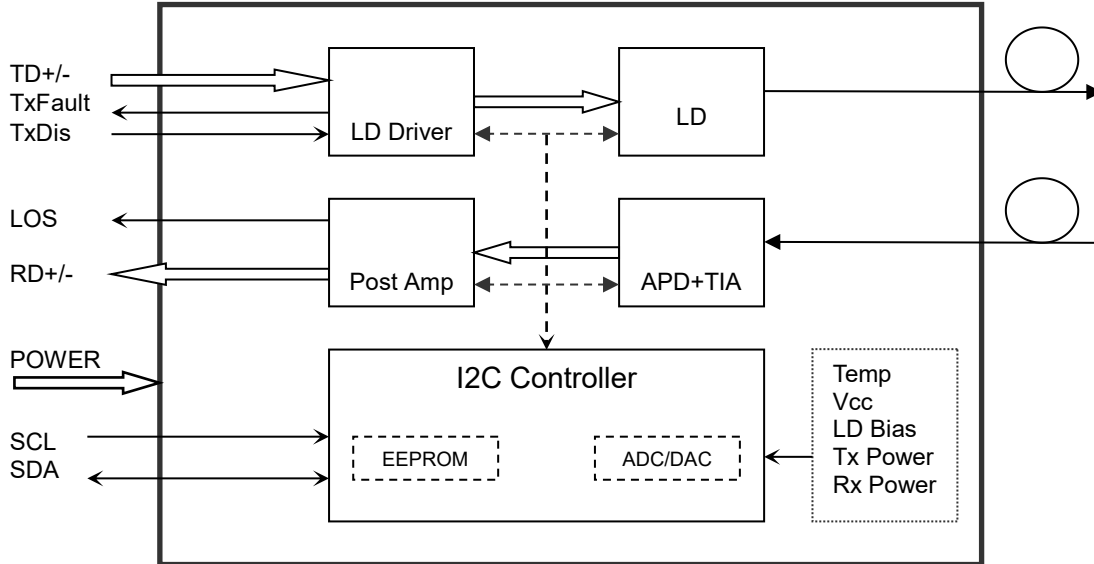
- 25GBASE-ER

Description

The SFP28 transceivers are high performance, cost effective modules supporting data rate of 25.78Gbps and 40km transmission distance with SMF.

The transceiver consists of three sections: a EML 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

Table 1 - Absolute Maximum Ratings

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Storage Temperature	Ts	-40	-	85	°C	
Relative Humidity	RH	5	-	95	%	
Power Supply Voltage	V _{CC}	-0.3	-	4	V	
Signal Input Voltage	V _{SI}	V _{CC} -0.3	-	V _{CC} +0.3	V	

Recommended Operating Environment

Table 2 - Recommended Operating Environment

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Case Operating Temperature	T _{case}	0		70	°C	
Power Supply Voltage	V _{CC}	3.14	3.3	3.47	V	
Power Supply Current	I _{CC}	-		600	mA	
Data Rate	BR		25.78		Gbps	TX Rate/ RX Rate
Transmission Distance	TD		40		km	
Coupled Fiber	Single mode fiber					9/125um SMF

Optical and Electrical Characteristics

SFP-25DOxx-40C: (EML and APD, 40km Reach)

Table 3 - Optical and Electrical Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter						
Lane Wavelengths(Range)		1272.55 to 1274.54 1276.89 to 1278.89 1281.25 to 1283.27 1285.65 to 1287.69 1290.07 to 1292.12 1294.53 to 1296.59 1299.02 to 1301.09 1303.54 to 1305.63 1308.09 to 1310.19			nm	
Average Launched Power	P_O	0		+6.0	dBm	
Average Launched Power (Laser Off)	P_{off}	-	-	-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					2
Receiver						
Input Optical Wavelength	λ_{IN}	1272.55	-	1310.19	nm	
Receiver Sensitivity-AVG	P_{Sens}			-19	dBm	1
Receiver Sensitivity-OMA	$P_{Sens-OMA}$			-18.2	dBm	1
Input Saturation Power (Overload)	P_{SAT}	-4	-	-	dBm	1
Receiver Reflectance				-26	dB	
Los Of Signal Assert	P_A	-30	-	-	dBm	
Los Of Signal De-assert	P_D	-	-	-20	dBm	
LOS -Hysteresis	P_{Hys}	0.5			dB	

Note:

1. BER \leq 5x10⁻⁵

Electrical Interface Characteristics

High Speed Electrical Interface Characteristics

Table 4 - Electrical Interface Characteristics

Parameter	Symbol	Min	Typical	Max	Unit	Notes
Transmitter						
Differential input swing	$V_{in(pp)}$	190		700	mV	
Differential input return loss (min)	$RL_d(f)$	9.5 - 0.37f, $0.01 \leq f < 8$			dB	
		4.75 - 7.4log10(f/14), $8 \leq f < 19$				
Differential to common mode input return loss (min)	$RL_{dc}(f)$	22-20(f/25.78), $0.01 \leq f < 12.89$			dB	
		15-6(f/25.78), $12.89 \leq f < 19$				
Differential termination mismatch	T_m	-	-	10	%	
Eye width	E_w	-	-	0.46	UI	
Applied pk-pk sinusoidal jitter	P_{pj}	Per IEEE 802.3bm				
Eye height	E_h	-	95	-	mV	
DC common mode voltage	DCv	-350	-	2850	mV	
Receiver						
Differential data output swing	$V_{out(pp)}$	300	-	850	mV	
Eye width	E_w	0.57	-	-	UI	
Vertical eye closure	V_{ec}	-	-	5.5	dB	
Differential output return loss (min)	$RL_d(f)$	9.5 - 0.37f, $0.01 \leq f < 8$			dB	
		4.75 - 7.4log10(f/14), $8 \leq f < 19$				
Common to differential mode conversion return loss (min)	$RL_{dc}(f)$	22-20(f/25.78), $0.01 \leq f < 12.89$			dB	
		15-6(f/25.78), $12.89 \leq f < 19$				
Differential termination mismatch	T_m	-	-	10	%	
Transition time, 20% to 80%	T_r/T_f	12	-	-	ps	20%~80%

LOW Speed Electrical Interface Characteristics

Parameter	Symbol	Min.	Typical	Max.	Unit	Note
Transmitter						
Transmitter Fault Output-High	V _{FaultH}	2	-	V _{cc} +0.3	V	
Transmitter Fault Output-Low	V _{FaultL}	0	-	0.8	V	
Transmitter Disable Voltage- High	V _{DisH}	2	-	V _{cc} +0.3	V	
Transmitter Disable Voltage- low	V _{DisL}	0	-	0.8	V	
Receiver						
LOS Output Voltage-High	V _{LOSH}	2	-	V _{cc} +0.3	V	
LOS Output Voltage-Low	V _{LOSL}	0	-	0.8	V	

Diagnostics

Table 4 – Diagnostics Specification

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

Table 5 - 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

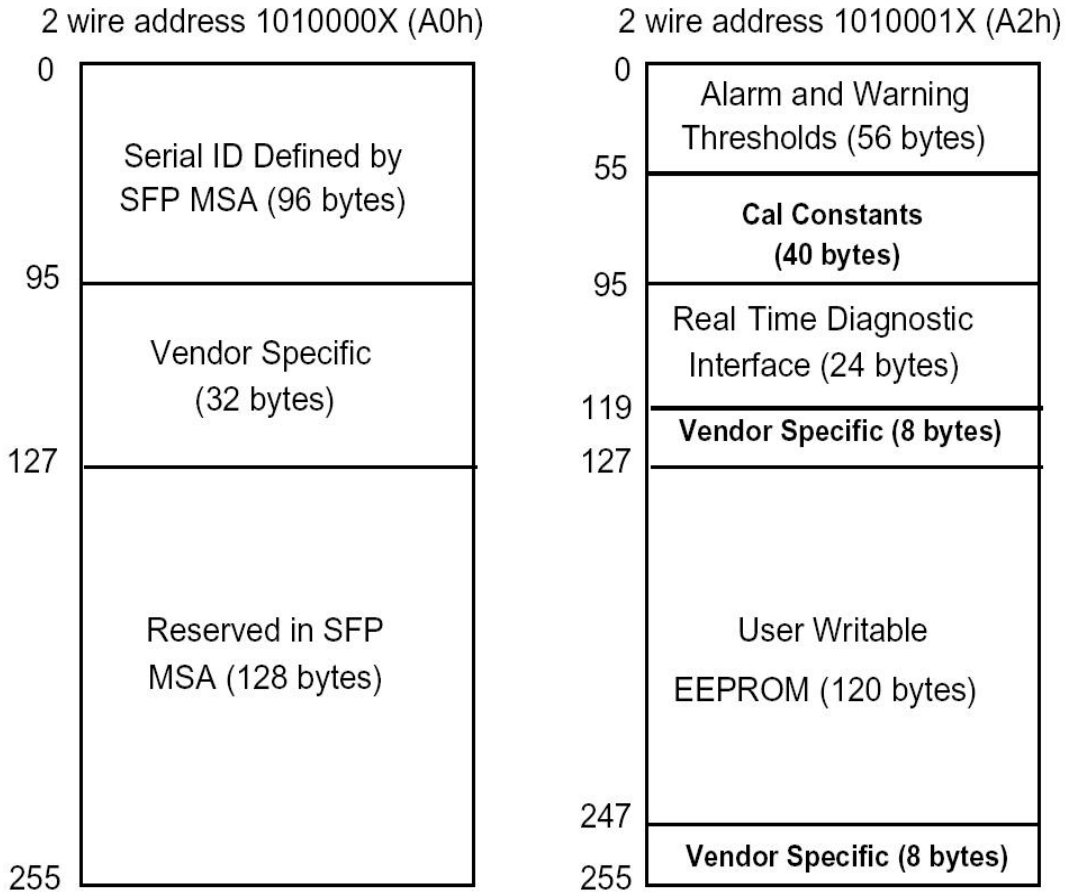
LOS Assert Time	t_loss_on			100	μs
LOS De-assert Time	t_loss_off			100	μs
Serial ID Clock Rate	f_serial_clock		100	400	KHz
MOD_DEF (0:2)-High	VH	2		Vcc	V
MOD_DEF (0:2)-Low	VL			0.8	V

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).

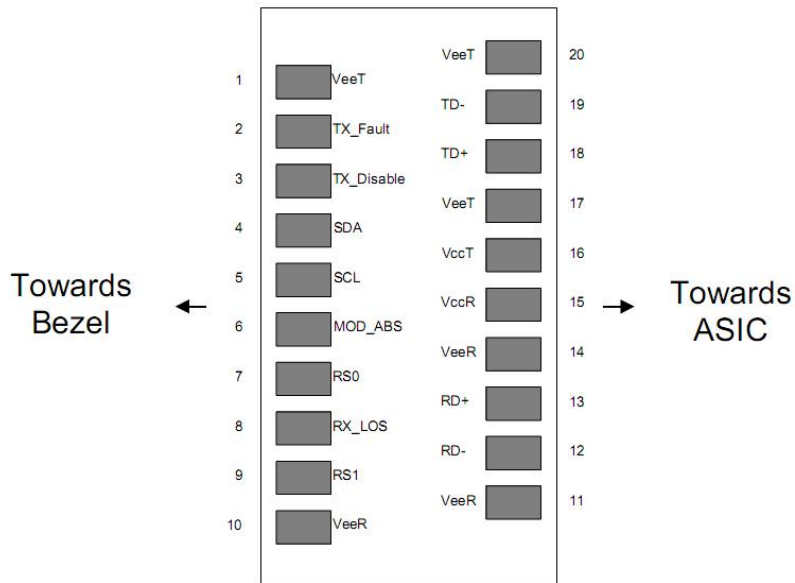
The diagnostic information with internal calibration or external calibration all are implemented, including received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring.

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



Pin Assignment

Pin Diagram



Pin Descriptions

Table 6- Pin Descriptions

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	RS1	Not Connected	3	
10	V _{EER}	Receiver ground	1	
11	V _{EER}	Receiver ground	1	
12	RD-	Inv. Received Data Out	3	Note 4

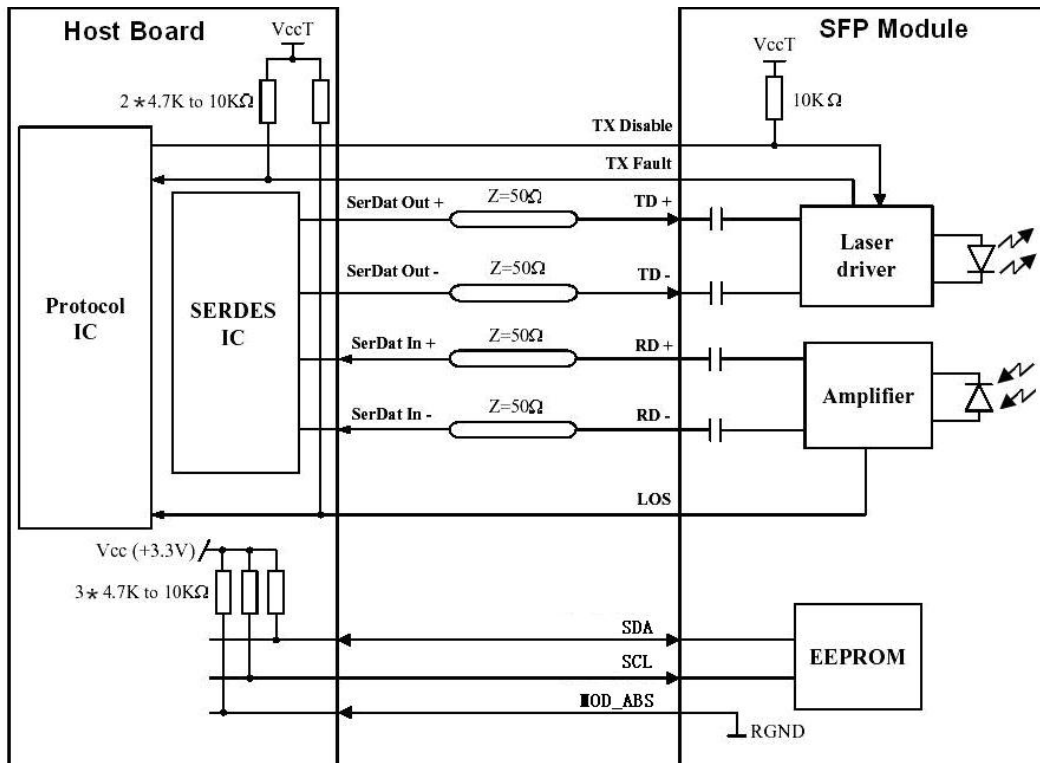
13	RD+	Received Data Out	3	Note 4
14	V _{EER}	Receiver ground	1	
15	V _{CCR}	Receiver Power Supply	2	
16	V _{CCT}	Transmitter Power Supply	2	
17	V _{EET}	Transmitter Ground	1	
18	TD+	Transmit Data In	3	Note 5
19	TD-	Inv. Transmit Data In	3	Note 5
20	V _{EET}	Transmitter Ground	1	

Notes:

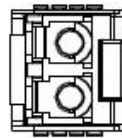
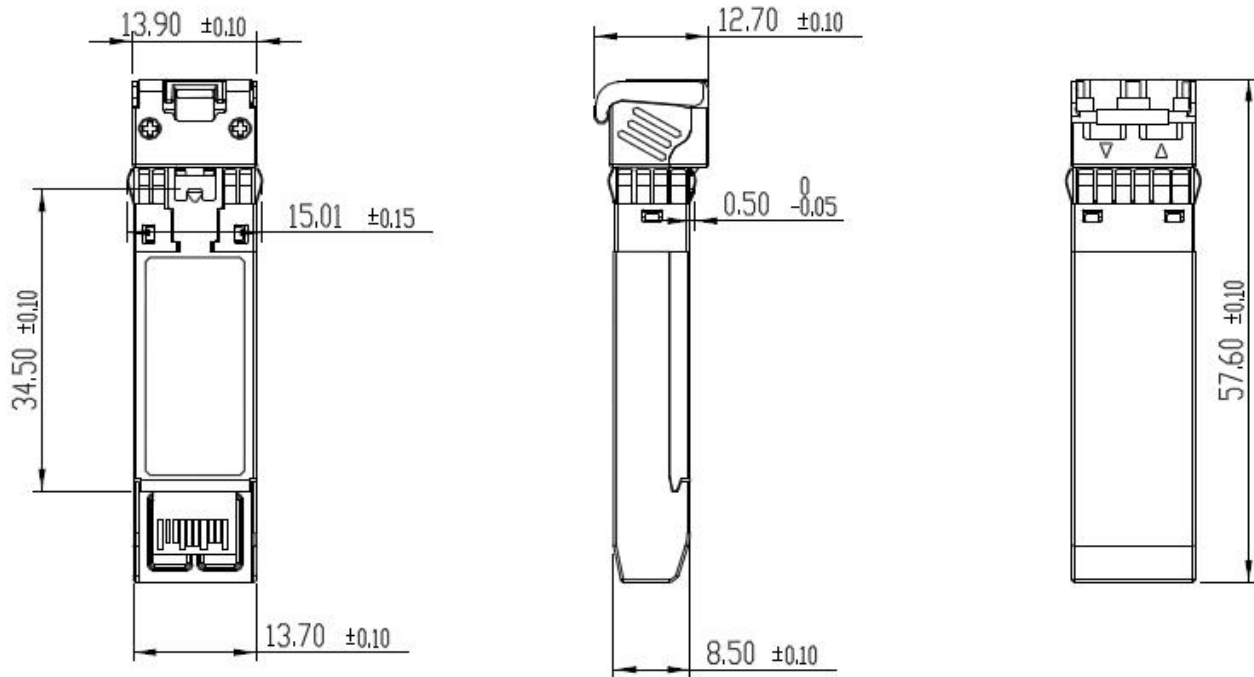
Plug Seq.: Pin engagement sequence during hot plugging.

- 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 Dimensions



Ordering information

Table 7- Ordering information

Part Number	Product Description
SFP-25DOxx-40C	25.78Gbps SFP28 LWDM, LC Connector, 40km, with DDM

LC Wavelength Guide		
Channel	Central Wavelength	Wavelength Range
02	1273.54	1272.55 to 1274.54
03	1277.89	1276.89 to 1278.89

04	1282.26	1281.25 to 1283.27
05	1286.67	1285.65 to 1287.69
06	1291.10	1290.07 to 1292.12
07	1295.56	1294.53 to 1296.59
08	1300.05	1299.02 to 1301.09
09	1304.58	1303.54 to 1305.63
10	1309.14	1308.09 to 1310.19

ESD

This transceiver is specified as ESD threshold 1kV for high speed data pins and 2kV for all other electrical input pins, tested per MIL-STD-883, Method 3015.4 /JESD22-A114-A (HBM). However, normal ESD precautions are still required during the handling of this module. This transceiver is shipped in ESD protective packaging. It should be removed from the packaging and handled only in an ESD protected environment.

Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated (June 24, 2007).

Caution: Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

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