

## LWO-SFP28-LR-HPE

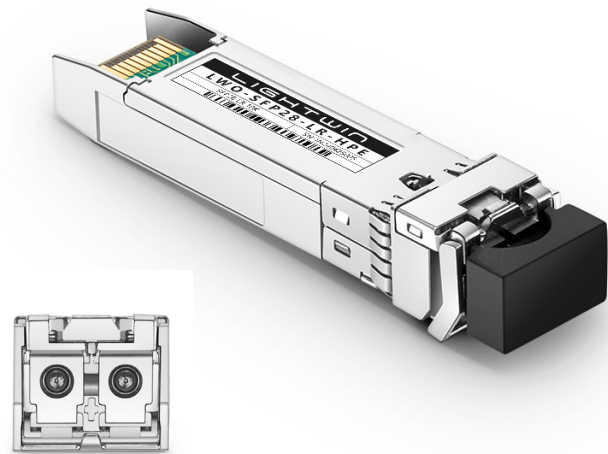
### 25 Gbit SFP28 LR, 10km, DDM, LC-Duplex, Singlemode, Enterprise Version, HP Aruba

#### Features

- Up to 25.78Gbps Data Links
- Up to 10km transmission on SMF
- DFB Laser and PIN receiver
- Build-in dual CDR
- Metal enclosure, for lower EMI
- 2-wire interface with integrated Digital Diagnostic monitoring
- Hot-pluggable SFP28 footprint
- Compliant with SFF-8402 with LC connector
- HP Aruba Coding
- Single 3.3V power supply
- Power dissipation < 1.5 W
- Case operating temperature:
  - Commercial: 0 ~ +70°C
  - Industrial: -40 ~ +85°C

#### Application

- 25GBASE-LR
- eCPRI



#### 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	Typical	Max.	Units
Storage Temperature	$T_S$	-40	-	85	°C
Relative Humidity	$R_H$	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
Rx Damage Threshold	$PR_{dmg}$	3			dBm

#### Recommended Operating Conditions and Power Supply Requirements

Parameter	Symbol	Min	Typical	Max.	Units	Notes
Operating Case Temperature	$T_{OP}$	0		70	°C	commercial
Operating Case Temperature		-40		85		industrial
Power Supply Voltage	$V_{CC}$	3.135	3.3	3.465	V	
Data Rate			25.78		Gb/s	-
Power Supply Current	$I_{CC}$			360	mA	commercial
				450		industrial
Link Distance (SMF)	D			10	km	9/125μm SMF

#### Digital Diagnostic Functions

The following digital diagnostic characteristics are defined over the Recommended Operating Environment unless otherwise specified. It is compliant to SFF-8472 Rev10.2 with internal calibration mode. For external calibration mode please contact our sales staff.

Parameter	Symbol	Min	Max.	Unit	Notes
Temperature monitor absolute error	DMI_Temp	-3	3	°C	Over operating temp
Supply voltage monitor absolute error	DMI_VCC	-3	3	%	Full operating range
RX power monitor absolute error	DMI_RX	-3	3	dB	
Bias current monitor	DMI_bias	-10	10	%	
TX power monitor absolute error	DMI_TX	-3	3	dB	

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**Diagram of Host Board Connector Block Pin Numbers and Names**

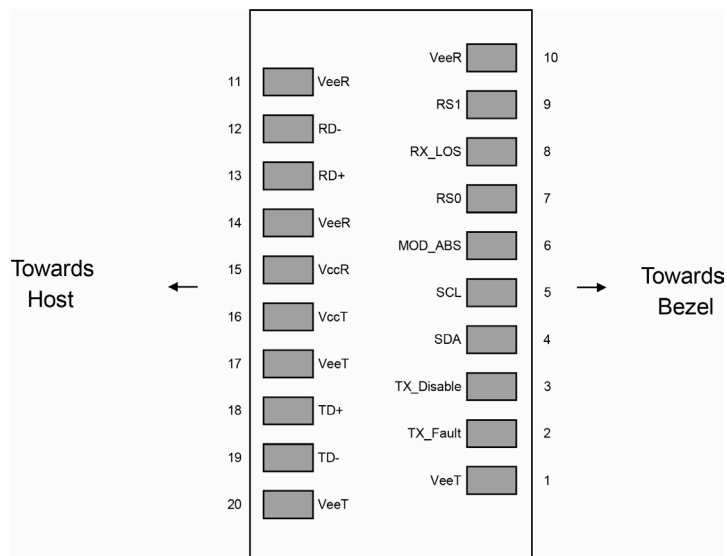


Figure 1: SFP28 module pad layout

### Pad Function Definition

Pin	Logic	Symbol	Name/Description	Note
1		VeeT	Transmitter Ground (Common with Receiver Ground)	1
2	LVTTTL-O	TX_Fault	Transmitter Fault.	2
3	LVTTTL-I	TX_Disable	Transmitter Disable. Laser output disabled on high or open.	3
4	LVTTTL-I/O	SDA	2-wire Serial Interface Data Line	4
5	LVTTTL-I/O	SCL	2-wire Serial Interface Clock Line	4
6		MOD_ABS	Module Absent. Grounded within the module	4
7	LVTTTL-I	RS0	Rate Select 0, internal pull down	5
8	LVTTTL-O	LOS	Loss of Signal indication. Logic 0 indicates normal operation.	6
9	LVTTTL-I	RS1	Rate Select 1, internal pull down	5
10		VeeR	Receiver Ground (Common with Transmitter Ground)	1
11		VeeR	Receiver Ground (Common with Transmitter Ground)	1
12	CML-O	RD-	Receiver Inverted DATA out. AC Coupled	
13	CML-O	RD+	Receiver Non-inverted DATA out. 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	CML-I	TD+	Transmitter Non-Inverted DATA in. AC Coupled	
19	CML-I	TD-	Transmitter Inverted DATA in. AC Coupled	
20		VeeT	Transmitter Ground (Common with Receiver Ground)	1

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#### Notes

1. Circuit ground is internally isolated from chassis ground.
2. TFAULT is an open collector/drain output, which should be pulled up with a 4.7kΩ ~ 10kΩ resistor on the host board if intended for use. Pull up voltage should be between 2.0V to Vcc + 0.3V. A high output indicates a transmitter fault caused by either the TX bias current or the TX output power exceeding the preset alarm thresholds. A low output indicates normal operation. In the low state, the output is pulled to <0.8V.
3. Laser output disabled on TDIS>2.0V or open, enabled on TDIS<0.8V.
4. Should be pulled up with 4.7kΩ ~ 10kΩ host board to a voltage between 2.0V and 3.6V. MOD\_ABS pulls line low to indicate module is plugged in.
5. Internally pulled down per SFF-8431 Rev 4.1.
6. LOS is open collector output. It should be pulled up with 4.7kΩ ~ 10kΩ on host board to a voltage between 2.0V and 3.6V. Logic 0 indicates normal operation; logic 1 indicates loss of signal.

#### Electrical Characteristics

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
<b>Transmitter Section</b>						
Input differential impedance	Rin		100		Ω	1
Single ended data input swing	Vin, pp	180		700	mV	
Transmitter Fault Output-High	V <sub>FaultH</sub>	2	-	Vcc+0.3	V	
Transmitter Fault Output-Low	V <sub>FaultL</sub>	0	-	0.8	V	
Transmitter Disable Voltage- High	V <sub>DisH</sub>	2	-	Vcc+0.3	V	
Transmitter Disable Voltage- low	V <sub>DisL</sub>	0		0.8	V	
<b>Receiver Section</b>						
Differential data output swing	Vout, pp	300		850	mV	2
LOS Output Voltage-High	V <sub>LOSH</sub>	2	-	Vcc+0.3	V	
LOS Output Voltage-Low	V <sub>LOSL</sub>	0	-	0.8	V	

#### Notes

1. Connected directly to TX data input pins. AC coupled thereafter.
2. Into 100 ohms differential termination.

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### Optical Characteristics

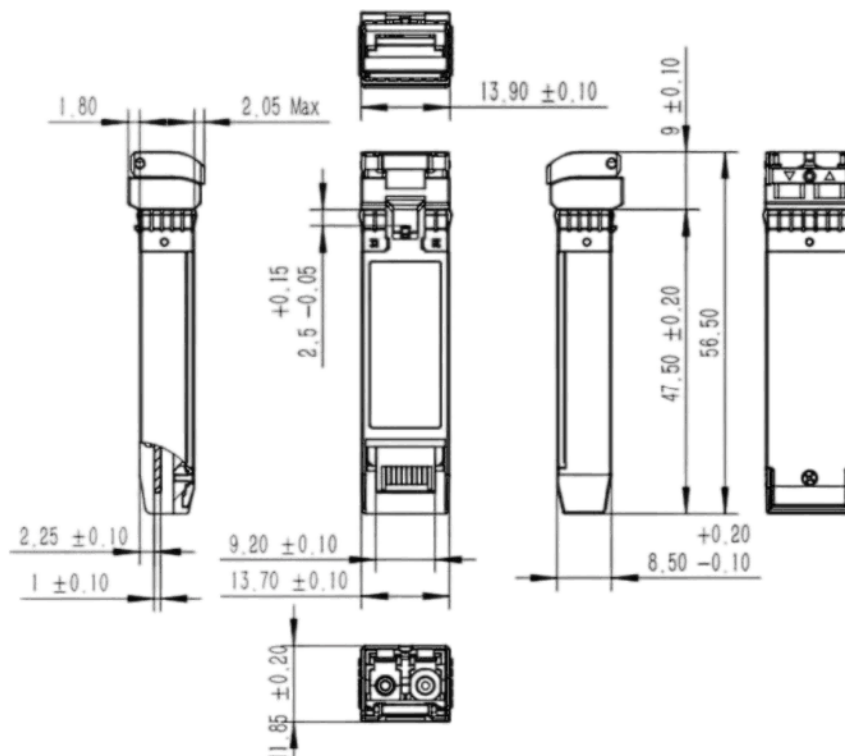
The following optical characteristics are defined over the Recommended Operating Environment unless otherwise specified.

Parameter	Symbol	Unit	Min	Typ	Max	Notes
<b>Transmitter Section</b>						
Signaling rate	DR	Gb/s		25.78125 ±100 ppm		
Center Wavelength	$\lambda$	nm	1295	1310	1325	
Spectrum Bandwidth (-20dB)	$\Delta\lambda$	nm		1	1	
Side-Mode Suppression Ratio	SMSR	dB	30			
Extinction ratio	ER	dB	3.0			1
Transmitter eye mask {X1, X2, X3, Y1, Y2, Y3}				{0.31,0.4,0.45,0.34,0.38,0.4}		
<b>Receiver Section</b>						
Receive Rate	DR	Gb/s		25.78125 ±100 ppm		
Wavelength Range	$\lambda$	nm	1295		1325	
Average Receive Power	$P_{in}$	dBm	-13.3		2	
Rx Sensitivity@25.78 Gb/s	RSENS	dBm			-12	2
Los De-Assert	$P_d$	dBm			-15	
Los Assert	$P_a$	dBm	-30			
Loss Hysteresis	$P_d - P_a$	dBm	0.5		6	

### Notes

1. Measured with a PRBS  $2^{31}-1$  test pattern, @25.78Gb/s.
2. Measured with BER =  $<5 \times 10^{-5}$  @PRBS= $2^{31}-1$  NRZ.

### Mechanical Dimensions



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#### 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.

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#### Laser Safety

This is a Class 1 Laser Product according to EN 60825-1:2014. This product complies 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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