25G SFP28 BIDI 80 km Transceiver

SFP28 Series

- **Data rate up to 25.78125Gb/s**
- **Up to 80km reach for G.652 SMF**
- **Compliant to IEEE 802.3cc, SFF-8472 and SFF-8419**
- **Complies with EU Directive 2015/863/EU**
- **Max. power consumption: Commercial 2.2 W and Industrial 2.8W**
- **RoHS 6 compliance**

The SFP28 25Gb/s BIDI transceiver is a high-performance, long-reach optical module designed for up to 80 km transmission over single-mode fiber (SMF). Supporting data rates up to 25.78125 Gb/s, the module is compliant with IEEE 802.3cc, SFF-8472, and SFF-8419 standards, making it suitable for high-speed applications such as 25G Ethernet and CPRI links. Its compact SFP28 form factor with a single LC interface enables efficient bidirectional transmission over a single fiber.

The transceiver utilizes a high-performance EML transmitter combined with an integrated SOA and PIN/TIA receiver, ensuring excellent optical performance and extended transmission reach. Operating at nominal wavelengths of approximately 1295 nm or 1309 nm, the module supports stable long-distance communication with high sensitivity and low noise characteristics. The electrical interface is compliant with SFI specifications, with AC-coupled high-speed differential signaling for reliable signal integrity.

Designed for efficiency and reliability, the module offers low power consumption and supports both commercial and industrial operating environments. It also provides digital diagnostic monitoring (DDM) via a standard I^2C interface, enabling real-time monitoring of key parameters such as temperature, voltage, and optical power. With its robust design and long-reach capability, the SFP28 25G BIDI transceiver is ideal for carrier-grade networks, long-distance data links, and next-generation access infrastructure.

Key Features

- Support data rate up to 25.78125Gb/s
- Hot-Pluggable SFP Footprint and Single LC Connector
- Up to 80km reach for G.652 SMF
- EML TX and Integrated SOA & PIN TIA RX
- Temperature Range:

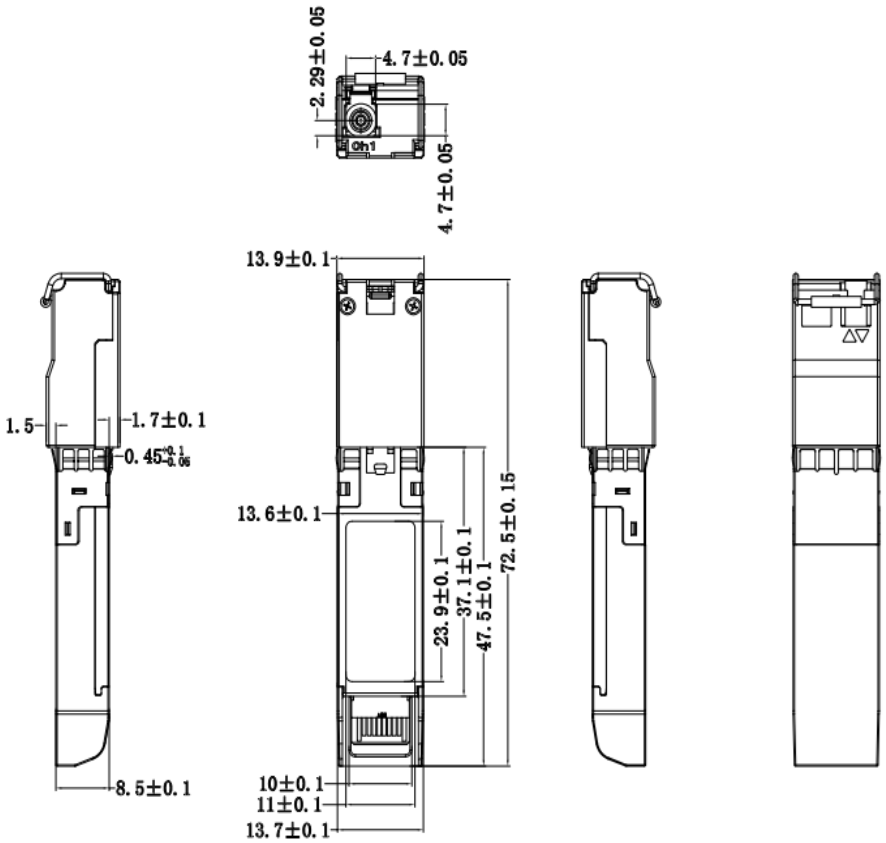
  Commercial: 0°C ~ 70°C

  Industrial: -40°C ~ 85°C
- Power consumption

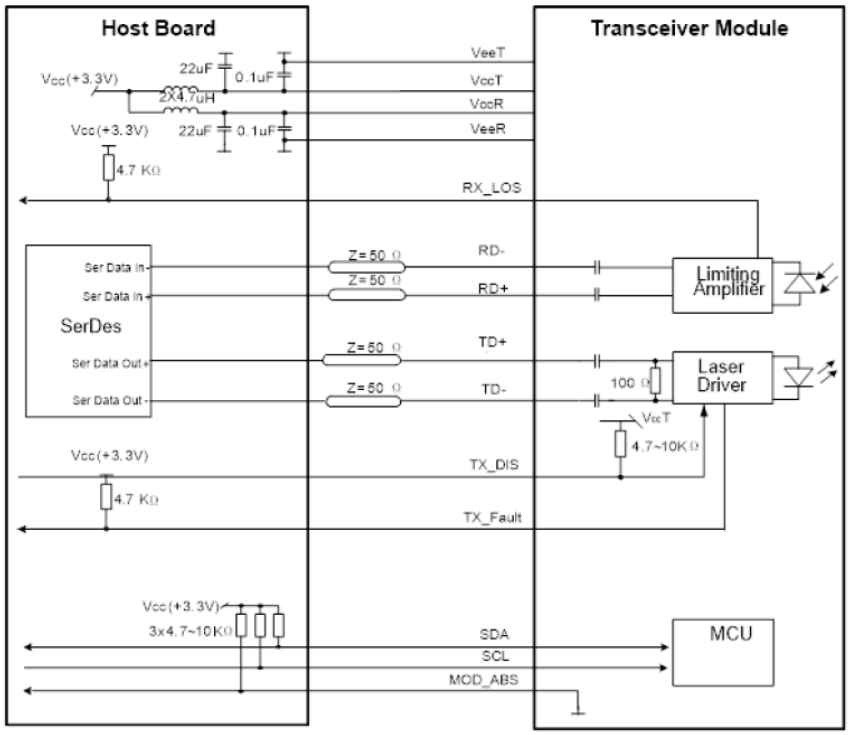
  Commercial: 2.2W

  Industrial: 2.8W
- RoHS 6 compliance
- Compliant to IEEE 802.3cc, SFF-8472 and SFF-8419
- Complies with EU Directive 2015/863/EU

Outline Diagram



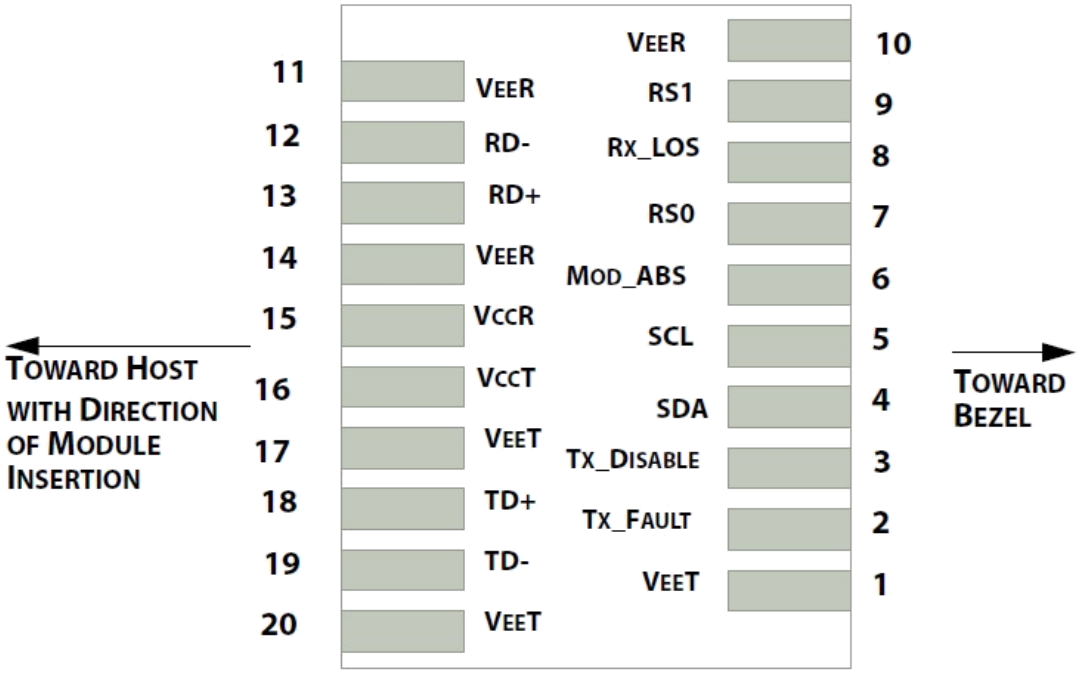
Recommended Interface Circuit



Digital Diagnostic Monitoring Functions

Parameter	Range	Accuracy	Unit	Calibration
Temperature	-40 to 85	±3	°C	Internal
Voltage	3.13 to 3.47	±3%	V	Internal
Tx Bias Current	0 to 100	±10%	mA	Internal
Tx Output Power	2 to 7	±3	dB	Internal
Rx Input Power	-28 to -4	±3	dB	Internal

Pin Assignment



Pin	Name	Description	Note
1	VeeT	Module transmitter ground	1
2	Tx Fault	Module transmitter fault	2
3	Tx Disable	Transmitter Disable; Turns off transmitter laser output	3
4	SDL	2 wire serial interface data input/output (SDA)	4
5	SCL	2 wire serial interface clock input (SCL)	4
6	MOD-ABS	Module Absent, connect to VeeR or VeeT in the module	4
7	RS0	Rate select0, optionally control SFP+ receiver. When high, input data rate >4.5Gb/ s; when low, input data rate <=4.5Gb/s	5
8	LOS	Receiver Loss of Signal Indication	6
9	RS1	Rate select0, optionally control SFP+ transmitter. When high, input data rate >4.5Gb/s; when low, input data rate <=4.5Gb/s	1
10	VeeR	Module receiver ground	1
11	VeeR	Module receiver ground	1
12	RD-	Receiver inverted data output	
13	RD+	Receiver non-inverted data output	
14	VeeR	Module receiver ground	1
15	VccR	Module receiver 3.3V supply	
16	VccT	Module transmitter 3.3V supply	
17	VeeT	Module transmitter ground	1
18	TD+	Transmitter inverted data output	
19	TD-	Transmitter non-inverted data output	
20	VeeT	Module transmitter ground	1

Notes:

1. Circuit ground is internally isolated from chassis ground.
2. Tx FAULT is an open collector/drain output, which should be pulled up with a 4.7k – 10k Ohms 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 Tx DIS >2.0V or open, enabled on Tx DIS <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.

Specifications

Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Storage Temperature	Tstg	-40		+85	°C	
Operating Case Temperature	T_O	0		70	°C	Commercial
	T_O	-40		85	°C	Industrial
Storage Relative Humidity	R_{HS}	5		95	%	
Operating Relative Humidity	R_{HO}	5		85	%	
DC Supply Voltage	V_{CC}	0		3.6	V	

Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Operating Case Temperature	Top	0	-	70	°C	Commercial
		-40		85		Industrial
Power Supply Voltage	V_{CC}	3.13	3.3	3.47	V	
Transmission Distance	TD	-	-	80	km	Over SMF

Electrical Characteristics

High-Speed Signal: Compliant to CEI-25G-VSR

Low-Speed Signal: Compliant to SFF-8431

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
Supply Voltage		V_{CC}	3.135		3.465	V	
Supply Current		I_{CC}			660	mA	Commercial
					850		Industrial
Power Consumption		P			2.2	W	Commercial
					2.8		Industrial
Transmitter (Module Input)							
Differential Input Resistance		R_R_{din}	90	100	110	Ω	
Input Differential Voltage		R_V_{diff}	-	-	900	mVpp	
Tx_Disable	Normal Operation	V_{IL}	-0.3	-	0.8	V	
	Laser Disable	V_{IH}	2.0	-	V_{CC}+0.3	V	
Receiver (Module Output)							
Differential Resistance		T_R_d	90	100	110	Ohm	

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
Output Differential Voltage		T_V_{diff}	-	-	900	mVpp	
Differential Termination Resistance Mismatch		T_R_{dm}	-	-	10	%	
Rx los	Normal Operation	V_{OL}	-0.3	-	0.4	V	
	Loss Signal	V_{OH}	2		V_{CCHOST}	V	

Optical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Transmitter						
Average Output Power	P_{OUT}	2		7	dBm	1
Average Output Power(Laser Off)	P_{OFF}			-30	dBm	
Wavelength	λ	1294.53 1308.09	1295.56 1309.14	1296.59 1310.19	nm	
Spectrum Bandwidth @ -20dB	Δλ			1	nm	
Side mode suppression ratio(SMSR)	SMSR	30			dB	
Extinction ratio	ER	8			dB	
RIN20OMA	RIN			-128	dB/Hz	
Transmitter and dispersion penalty (TDP)				2.7	dB	
Receiver						
Wavelength	λ	1308.09 1294.53	1309.14 1295.56	1310.19 1296.59	nm	
Received Sensitivity	P_{IN}			-27	dBm	1
Optical Power Overload	$P_{IN}(SAT)$	-4			dBm	
Damage threshold		3			dBm	2
Rx_LOS of Signal Assert	P_A	-40			dBm	
Rx_LOS of Signal De-assert	P_D			-28	dBm	
Rx_LOS of Signal Hysteresis	PHy	0.5		5	dB	
Optical Return Loss Tolerance	ORLT	20			dB	

Notes:

1. Test pattern: PRBS31. BER<$5x10^{-5}$.
2. The receiver shall be able to tolerate, without damage, continuous exposure to an optical input signal having this average power level. The receiver does not have to operate correctly at this input power.

Communication Interface Timing Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
TX_Disable Assert Time	t_off			100	us	
TX_Disable Negate Time	t_on			2	ms	
Time to Initialize Include Reset of TX_FAULT	t_int			300	ms	
TX_FAULT from Fault to Assertion	t_fault			100	us	
TX_Disable Time to Start Reset	t_reset	10			us	
Receiver Loss of Signal Assert Time	TA,RX_LOS			100	us	
Receiver Loss of Signal Deassert Time	Td,RX_LOS			100	us	
Rate-Select Chage Time	t_ratesel			10	us	

Ordering Information

Product Name	Product Description
SFP28-25G-BD-80	SFP28 25GBASE BIDI ER TX1309nm/RX1295nm 80km LC SMF DDM Optical Transceiver Module

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