

**Datasheet**

## SFP Bidirectional Single Fiber Transceivers

SFP-GD-EBZ45 and SFP-GD-EBZ54



### Features

- Designed for SFF-8472 compliance (SFP)
- 1250 Mbps data rates  
- IEEE 802.3ah
- Single-mode optics (Simplex LC)
- Single fiber, bi-directional
- Separate Tx and Rx wavelengths
- Class 1 laser (Tx): 1490nm or 1570nm
- 120 km reach
- Digital Diagnostics (SFF-8724)

### General Operations

| Parameter                                      | Symbol    | Min   | Max   | Unit              |
|--|-----------|-------|-------|-------------------|
| Supply Voltage                                 | $V_{cc}$  | 3.135 | 3.465 | V                 |
| Total Current                                  | $I_{cc}$  | -     | 300   | mA                |
| Power Supply Noise Rejection                   | PSR       | 100   | -     | mV <sub>p-p</sub> |
| Operating Temperature of SFP Case <sup>a</sup> | $T_{opr}$ | -5    | 70    | °C                |
| Storage Temperature                            | $T_{stg}$ | -40   | 85    | °C                |
| Data Rate                                      | DR        | -     | 1250  | Mbps              |

a) Maximum Relative Humidity is 85%, non-condensing

### Transmitter Specifications (Optical)

| Parameter                             | Symbol                 | Min  | Max  | Unit  |
|---------------------------------------|------------------------|------|------|-------|
| Optical Power                         | $P_{op}$               | -2   | 3    | dBm   |
| Optical Crosstalk                     | XT                     | -    | -40  | dB    |
| Average Launch Power Of Off Tx        | $P_{off}$              | -    | -45  | dBm   |
| Extinction Ratio                      | ER                     | 9    | -    | dB    |
| Eye Mask                              | IEEE 802.3ah compliant |      |      |       |
| Optical Rise Time (20% to 80% values) | $t_r$                  | -    | 260  | ps    |
| Optical Fall Time (20% to 80% values) | $t_f$                  | -    | 260  | ps    |
| Mean Tx Wavelength SFP-GD-EBZ45: 1490 | $\lambda$              | 1480 | 1500 | nm    |
| Mean Tx Wavelength SFP-GD-EBZ54: 1570 | $\lambda$              | 1560 | 1580 | nm    |
| Spectral Width                        | $\Delta\lambda$        | -    | 1    | nm    |
| Relative Intensity Noise              | RIN                    | -    | -120 | dB/Hz |
| Transmitter Reflectance               | -                      | -    | -12  | dB    |
| Optical Return Loss Tolerance         | ORLT                   | -    | 12   | dB    |

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### Transmitter Specifications (Electrical)

| Parameter                          | Symbol       | Min      | Max          | Unit     |
|------------------------------------|--------------|----------|--------------|----------|
| Input Differential Impedance       | $R_{in}$     | 80       | 120          | $\Omega$ |
| PECL Single-Ended Data Input Swing | $V_{in,p-p}$ | 250      | 1200         | mV       |
| TxFault_Fault                      | $V_{fault}$  | 2        | $V_{cc}$     | V        |
| TxFault_Normal                     | $V_{normal}$ | $V_{ee}$ | $V_{ee}+0.5$ | V        |
| TxDisable_Disable                  | $V_d$        | 2        | $V_{cc}$     | V        |
| TxDisable_Enable                   | $V_{en}$     | $V_{ee}$ | $V_{ee}+0.8$ | V        |

### Receiver Specifications (Optical)

| Parameter                             | Symbol              | Min               | Max             | Unit |
|---------------------------------------|---------------------|-------------------|-----------------|------|
| Receive Power <sup>b</sup>            | $R_{sens,low/high}$ | -33 (sensitivity) | -9 (saturation) | dBm  |
| Damage Threshold For Receiver         | $P_{in,damage}$     | 6                 | -               | dBm  |
| Mean Rx Wavelength SFP-GD-EBZ45: 1570 | $\lambda$           | 1550              | 1590            | nm   |
| Mean Rx Wavelength SFP-GD-EBZ54: 1490 | $\lambda$           | 1470              | 1510            | nm   |
| LOS Assert                            | -                   | -45               | -               | dBm  |
| LOS De-assert                         | -                   | -                 | -33             | dBm  |
| LOS Hysteresis                        | -                   | 0.5               | -               | dB   |
| Receiver Reflectance                  | -                   | -                 | -12             | dB   |

b) Measured at  $10^{-12}$  BER, PRBS 2<sup>7</sup>-1, 9dB ER

### Receiver Specifications (Electrical)

| Parameter                           | Symbol        | Min | Max | Unit |
|-------------------------------------|---------------|-----|-----|------|
| PECL Single Ended Data Output Swing | $V_{out,p-p}$ | 185 | 800 | mV   |
| Data Output Rise Time               | $t_r$         | -   | 175 | ps   |
| Data Output Fall Time               | $t_f$         | -   | 175 | ps   |

### Timing and Electrical

| Parameter                                       | Symbol              | Min      | Max          | Unit    |
|---|---------------------|----------|--------------|---------|
| Tx Disable Negate Time                          | $t_{on}$            | -        | 1            | ms      |
| Tx Disable Assert Time                          | $t_{off}$           | -        | 10           | $\mu$ s |
| Time To Initialize, Including Reset Of Tx Fault | $t_{init}$          | -        | 300          | ms      |
| Tx Fault Assert Time                            | $t_{fault}$         | -        | 100          | $\mu$ s |
| Tx Disable To Reset                             | $t_{reset}$         | 10       | -            | $\mu$ s |
| LOS Assert Time                                 | $t_{loss_{on}}$     | -        | 100          | $\mu$ s |
| LOS De-assert Time                              | $t_{loss_{off}}$    | -        | 100          | $\mu$ s |
| Serial ID Clock Rate                            | $f_{serial\_clock}$ | -        | 100          | KHz     |
| RX_LOS Voltage (High)                           | $RX\_LOS_H$         | 2        | $V_{cc}$     | V       |
| RX_LOS Voltage (Low)                            | $RX\_LOS_L$         | -        | 0.8          | V       |
| LOS Output Voltage-Fault                        | $V_{LOS\ fault}$    | 2        | $V_{cc}$     | V       |
| LOS Output Voltage-Normal                       | $V_{LOS\ normal}$   | $V_{ee}$ | $V_{ee}+0.5$ | V       |
| MOD_DEF (0:2)-High                              | $V_H$               | 2        | $V_{cc}$     | V       |
| MOD_DEF (0:2)-Low                               | $V_L$               | $V_{ee}$ | $V_{ee}+0.5$ | V       |

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### Digital Diagnostics

| Parameter    | Range         | Accuracy | Unit | Calibration | Bit Value | Formula   |
|--------------|---------------|----------|------|-------------|-----------|---|
| Temperature  | -5 to 70      | ± 3      | °C   | Internal    | 1/256 C   | $T_c(C) = T_{ad}(16 \text{ bit signed twos complement}) / 256$  |
| Voltage      | 0 to $V_{CC}$ | 0.1      | V    | Internal    | 100µV     | $V(\text{Volts}) = V_{ad}(16 \text{ bit unsigned integer}) * 0.1$                                     |
| Bias Current | 0 to 120      | 5        | mA   | External    | -         | $I(\text{mA}) = I_{slope} * I_{ad}(16 \text{ bit unsigned integer}) + I_{offset}$                     |
| TX Power     | -2 to 3       | ±3 dB    | dBm  | External    | -         | $TX\_PWR(\mu W) = TX\_PWR_{slope} * TX\_PWR_{ad}(16 \text{ bit unsigned integer}) + TX\_PWR_{offset}$ |
| RX Power     | -33 to -9     | ±3 dB    | dBm  | External    | -         | $RX\_PWR(\mu W) = A_0 + A_1 * x + A_2 * x^2 + A_3 * x^3 + A_4 * x^4$                                  |

| Pin | Function   | Notes                  |
|-----|------------|------------------------|
| 1   | $V_{eeT}$  | TX GND                 |
| 2   | TX_FAULT   | Open Collector         |
| 3   | TX_DISABLE | Internally Pulled High |
| 4   | MOD_DEF2   | Serial Data Input      |
| 5   | MOD_DEF1   | Serial Clock Input     |
| 6   | MOD_DEF0   | Internally Grounded    |
| 7   | NC         | Not Connected          |
| 8   | LOS        | Open Collector         |
| 9   | $V_{eeR}$  | RX Ground              |
| 10  | $V_{eeR}$  | RX Ground              |
| 11  | $V_{eeR}$  | RX Ground              |
| 12  | RXD-       | RX Data Negative       |
| 13  | RXD+       | RX Data Positive       |
| 14  | $V_{eeR}$  | RX GND                 |
| 15  | $V_{ccR}$  | RX Power               |
| 16  | $V_{ccT}$  | TX Power               |
| 17  | $V_{eeT}$  | TX GND                 |
| 18  | TXD+       | TX Data Positive       |
| 19  | TXD-       | TX Data Negative       |
| 20  | $V_{eeT}$  | TX GND                 |

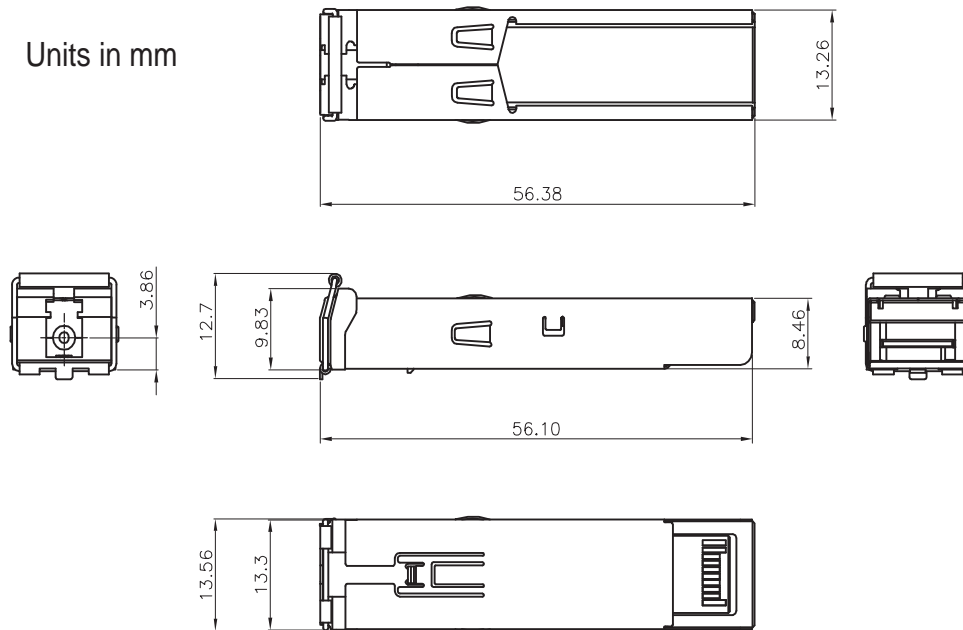
### Ordering Information

| Model               | Description                   | Data Rate (Mbps) | Wavelength (nm) |      | Connector Type | Bail Latch Color | Distance Range (km) |
|---------------------|-------------------------------|------------------|-----------------|------|----------------|------------------|---------------------|
|                     |                               |                  | Tx              | Rx   |                |                  |                     |
| <b>SFP-GD-EBZ45</b> | SFP Bidirectional Transceiver | 1250             | 1490            | 1570 | LC             | Purple           | 32 -120             |
| <b>SFP-GD-EBZ54</b> | SFP Bidirectional Transceiver | 1250             | 1570            | 1490 | LC             | Orange           | 32 -120             |

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### Outline Drawing

Units in mm



### Regulatory Compliances

RoHS directive; China RoHS; California RoHS Law, USA and Canada UL listing; 21CFR 1040.10 and 1040.11; SFP MSA SFF-8074i; SFF-8472; Telecordia GR-468

### Warnings

**Handling Precautions:** This device is susceptible to damage as a result of electrostatic discharge (ESD). A static free environment is highly recommended. Follow guidelines according to proper ESD procedures.

**Laser Safety:** Radiation emitted by laser devices can be dangerous to human eyes. Avoid eye exposure to direct or indirect radiation.

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