
SGE80-D0I-T1

Features

- ◆ Up to 1.25Gbps data rate
- ◆ 1550nm DFB Laser and PIN photo detector
- ◆ Duplex LC receptacle optical interface compliant
- ◆ Single +3.3V power supply
- ◆ Hot-pluggable
- ◆ AC coupling of LVPECL signals
- ◆ International Class1 laser safety certified
- ◆ Operating temperature range:
Industrial: -40°C~+85°C
- ◆ RoHS Compliant
- ◆ DDMI function available with internally calibrated mode

Application

- ◆ Gigabit Ethernet
- ◆ Gigabit Fiber Channel
- ◆ Switch to switch interface
- ◆ Switched backplane applications

Standard

- ◆ Compliant with SFP MSA (INF-8074i)
- ◆ Compliant with SFF-8472
- ◆ Compatible with IEEE802.3ah 2004

Specification:

| Absolute Maximum Ratings | | | | |
|--------------------------|--------|------|-----|------|
| Parameter | Symbol | Min | Max | Unit |
| Storage temperature | TS | -40 | 85 | °C |
| Power Supply Voltage | Vcc | -0.5 | +4 | V |
| Relative Humidity | RH | 5 | 95 | % |

| Recommended Operating Conditions | | | | | |
|----------------------------------|--------|------|---------|------|------|
| Parameter | Symbol | Min | Typical | Max | Unit |
| Operating Case Temperature | Tc | -40 | | 85 | °C |
| Power Supply Voltage | Vcc | 3.13 | 3.3 | 3.47 | V |
| Supply Current ¹ | Icc | | | 300 | mA |
| Data Rate | | | 1.25 | | Gbps |
| Fiber Length 9/125µm core SMF | | - | - | 80 | km |

| Electrical Characteristics | | | | | | |
|----------------------------------------|--------|------|---------|---------|------|-------|
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Transmitter differential input voltage | | 400 | | 2400 | mV | |
| Receiver differential output Voltage | | 600 | | 1200 | mV | |
| Transmit Fault (TX_Fault) | Voh | 2.4 | | Vcc+0.3 | V | LVTTL |
| | Vol | -0.3 | | 0.4 | V | LVTTL |
| Loss of Signal (LOS) | Voh | 2.4 | | Vcc+0.3 | V | LVTTL |
| | Vol | -0.3 | | 0.4 | V | LVTTL |
| TX Disable | Vih | 2 | | Vcc+0.3 | V | LVTTL |
| | Vil | -0.3 | | 0.8 | V | LVTTL |

| Optical transmitter Characteristics | | | | | | |
|-------------------------------------|--------|------|---------|------|------|-------|
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Launched Power (avg.) | Pout | 0 | | 5 | dBm | |
| Operating Wavelength Range | λc | 1520 | 1550 | 1580 | nm | |
| Spectral Width (RMS) | Δλ | | | 1 | nm | DFB |

| Extinction Ratio | ER | 9 | | | dB | 2 |
|------------------------------------|--------------------------------------------------|----------------|---------|-------|-------|-------|
| Side Mode Suppression Ratio | SMSR | 30 | | | dB | |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz | |
| Total Jitter | T _j | | | 0.284 | UI | |
| Optical Rise/Fall Time | Tris/Tfall | | | 260 | Ps | 3 |
| Transmitter and Dispersion Penalty | TDP | | | 1 | dB | |
| Optical Tx Output disable | P _{dis} | | | -45 | dBm | |
| Output Eye Diagram | Complies with IEEE802.3z eye masks when filtered | | | | | |
| Optical receiver Characteristics | | | | | | |
| Parameter | Symbol | Min | Typical | Max | Unit | Notes |
| Receiver Sensitivity | S | | | -24 | dBm | 4 |
| Wavelength Range | λ _c | 1260 | | 1610 | nm | |
| Receiver Reflectance | | | | -27 | dB | |
| Optical Power Input Overload | P _{in-max} | 0.5 | | | dBm | 4 |
| LOS | Optical De-assert | P _d | | -25 | dBm | 4 |
| | Optical Assert | P _a | -35 | | | |
| LOS hysteresis | | 0.5 | | 5 | dB | 5 |

Note1. The supply current is SFP module's working current.

Note2: For the measurements, the device was driven with 1.25Gbps data pattern with 2⁷-1 PRBS payload

Note3. Optical transition time is the time interval required for the rising or falling edge of an optical pulse to transition between the 20% and 80% amplitudes relative to the logical 1 and 0 levels

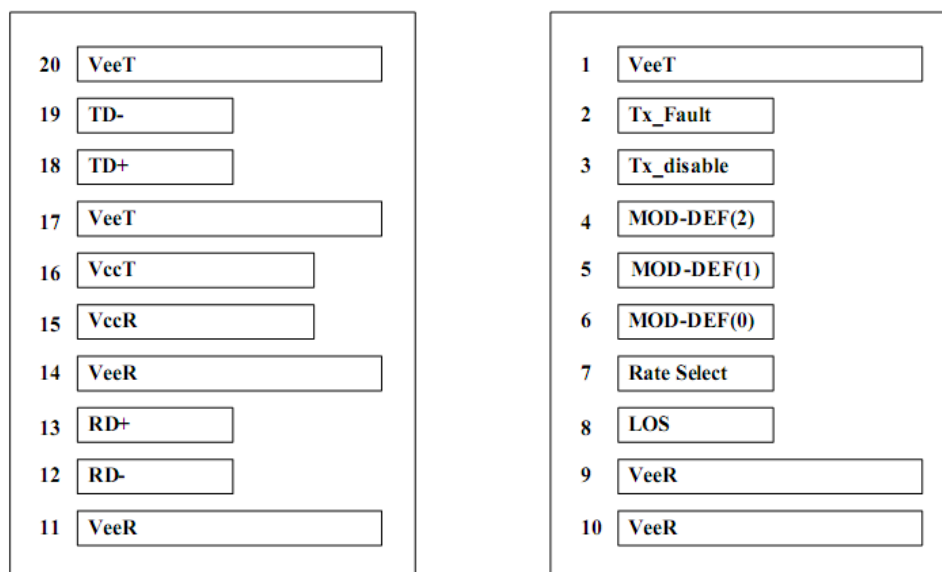
Note4. Measured with a PRBS 2⁷-1 test pattern, @1.25Gbps, ER=10dB, BER<10⁻¹²

Note5. The LOS Hysteresis minimizes 'chatter' on the output line. In principle, Hysteresis alone does not guarantee chatter-free operation.

Digital Diagnostic Monitoring Information

| Parameter | Accuracy | Calibration | Note |
|--------------|----------|-------------|---------------------------|
| Temperature | ±3°C | internal | -40~85°C |
| Voltage | ±3% | internal | 3.1~3.5V |
| Bias Current | ±10% | internal | Specified by normal value |
| TX Power | ±2dB | internal | 0~5dBm |
| RX Power | ±2dB | internal | -24~0dBm |

Pin Description



Top of Board

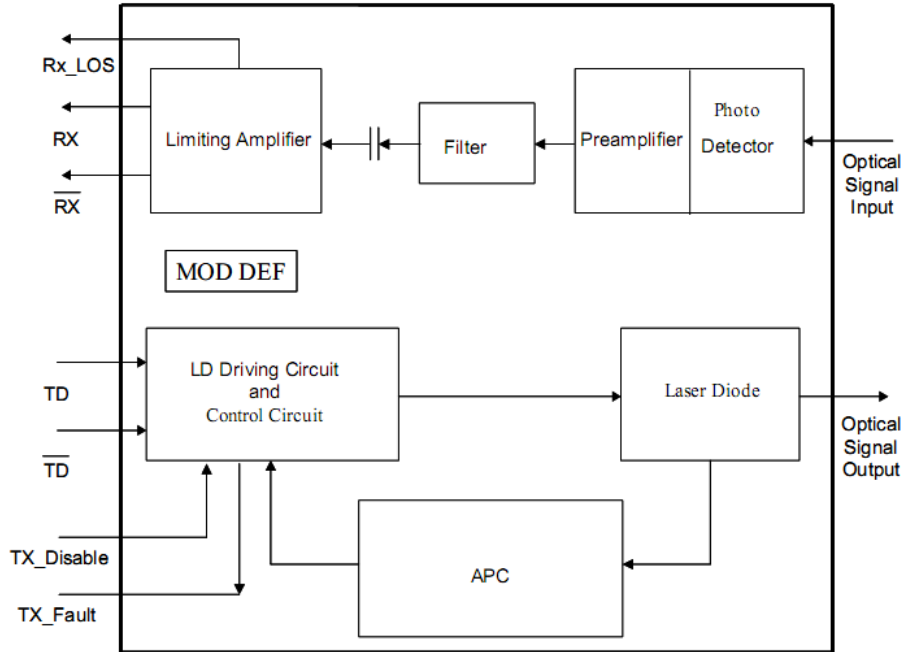
Bottom of Board

As Viewed Through Top of Board

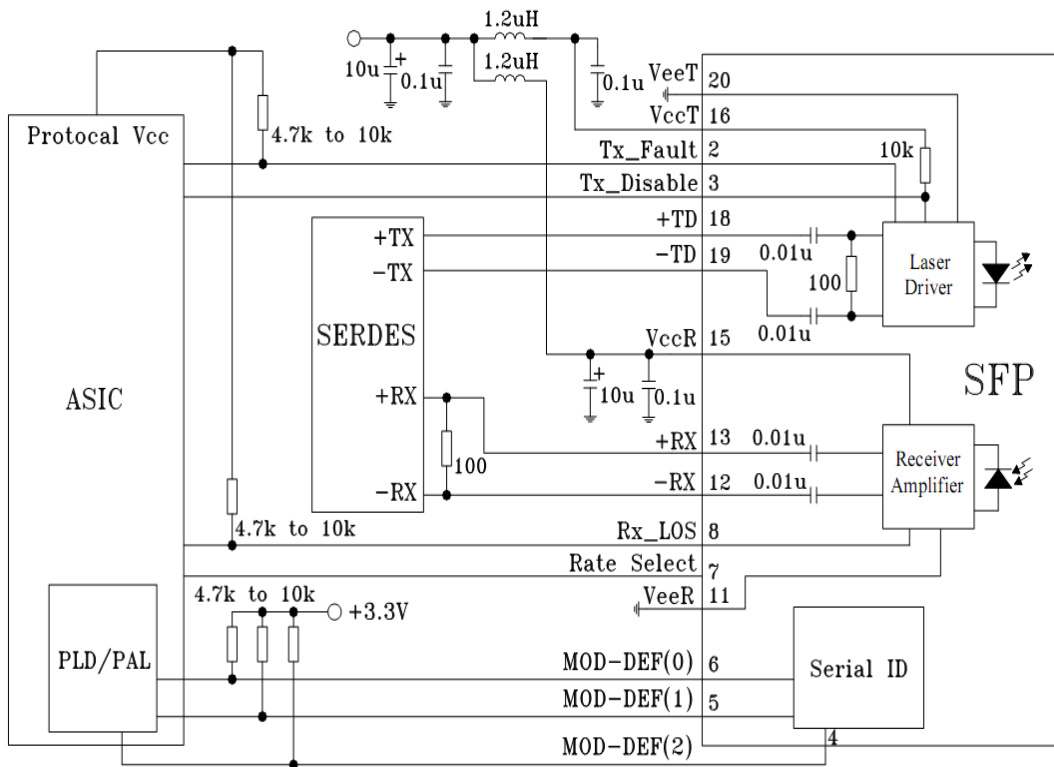
| Pin | Name | Function/Description | Engage-ment | order |
|-----|-------------|-----------------------------------------------------|-------------|-------|
| 1 | VeeT | Transmitter Ground | 1 | |
| 2 | TXFault | Transmitter Fault Indication | 3 | 1 |
| 3 | TX Disable | Transmitter Disable-Module disables on high or open | 3 | 2 |
| 4 | MOD-DEF2 | Module Definition 2-Two wire serial ID interface | 3 | 3 |
| 5 | MOD-DEF1 | Module Definition 1-Two wire serial ID interface | 3 | 3 |
| 6 | MOD-DEF0 | Module Definition 0-Two wire serial ID interface | 3 | 3 |
| 7 | Rate Select | Not Connected | 3 | |
| 8 | LOS | Loss of Signal | 3 | 4 |
| 9 | VeeR | Receiver Ground | 1 | |
| 10 | VeeR | Receiver Ground | 1 | |
| 11 | VeeR | Receiver Ground | 1 | |
| 12 | RD- | Inverse Received Data out | 3 | 5 |
| 13 | RD+ | Received Data out | 3 | 5 |
| 14 | VeeR | Receiver Ground | 1 | |
| 15 | VccR | Receiver Power —— +3.3V±5% | 2 | 6 |
| 16 | VccT | Transmitter Power —— +3.3 V±5% | 2 | 6 |
| 17 | VeeT | Transmitter Ground | 1 | |
| 18 | TD+ | Transmitter Data In | 3 | 7 |
| 19 | TD- | Inverse Transmitter Data In | 3 | 7 |
| 20 | VeeT | Transmitter Ground | 1 | |

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- Note1.** TX Fault is open collector/drain output which should be pulled up externally with a 4.7K – 10K Ω resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates a laser fault of some kind. Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.
- Note2.** TX Disable input is used to shut down the laser output per the state table below. It is pulled up within the module with a 4.7K – 10K Resistor.
Low (0 – 0.8V): Transmitter on;
Between (0.8V and 2V): Undefined High;
(2.0 – V_{ccT}): Transmitter Disabled;
Open: Transmitter Disabled.
- Note3.** Mod-Def 0, 1, 2. These are the module definition pins. They should be pulled up with a 4.7 – 10K Resistor on the host board to supply less than $V_{ccT}+0.3V$ or $V_{ccR}+0.3V$.
Mod-Def 0 is grounded by the module to indicate that the module is present.
Mod-Def 1 is clock line of two wire serial interface for optional serial ID.
Mod-Def 2 is data line of two wire serial interface for optional serial ID.
- Note4.** LOS (Loss of signal) is an open collector/drain output which should be pulled up externally with a 4.7 – 10K resistor on the host board to supply $<V_{ccT}+0.3V$ or $V_{ccR}+0.3V$. When high, this output indicates the received optical power is below the worst case receiver sensitivity (as defined by the standard in use). Low indicates normal operation. In the low state, the output will be pulled to $<0.8V$.
- Note5.** RD-/+: These are the differential receiver outputs. They are AC coupled 100 Ω differential lines which should be terminated with 100 Ω differential at the user SERDES. The AC coupling is done inside the module and thus not required on the host board.
- Note6.** V_{ccR} and V_{ccT} are the receiver and transmitter power supplies. They are defined as $3.3V\pm5\%$ at the SFP connector pin. The in-rush current will typically be no more than 30mA above steady state supply current after 500ns.
- Note7.** TD-/+: These are the differential transmitter inputs. They are AC coupled differential lines with 100 Ω differential termination inside the module. The AC coupling is done inside the module and is thus not required on host board.

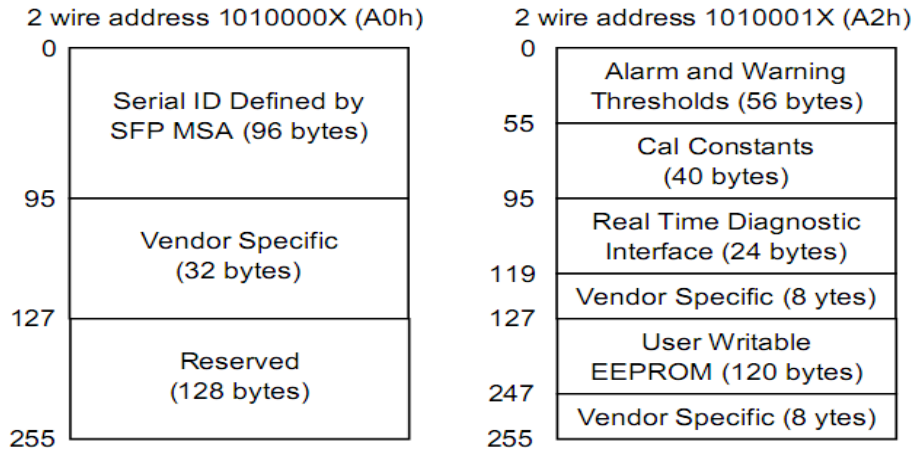
Block Diagram



Typical application Circuit



Digital Diagnostic Memory Map



EEPROM Serial ID Memory Contents

The optical transceiver contains an EEPROM. It provides access to sophisticated identification information that describes the transceiver's capabilities, standard interfaces, manufacturer, and other information. When the serial protocol is activated, the host generates the serial clock signal (SCL, Mod Def 1). The positive edge clocks data into those segments of the EEPROM that are not writing protected within the SFP transceiver. The negative edge clocks data from the SFP transceiver. The serial data signal (SDA, Mod Def 2) is bi-directional for serial data transfer. The host uses SDA in conjunction with SCL to mark the start and end of serial protocol activation. The memories are organized as a series of 8-bit data words that can be addressed individually or sequentially.

The Module provides diagnostic information about the present operating conditions. The transceiver generates this diagnostic data by digitization of internal analog signals. Calibration and alarm/warning threshold data is written during device manufacture. Received power monitoring, transmitted power monitoring, bias current monitoring, supply voltage monitoring and temperature monitoring all are implemented. The diagnostic data are raw A/D values and must be converted to real world units using calibration constants stored in EEPROM locations 56 – 95 at wire serial bus address A2h. The digital diagnostic memory map specific data fields define as following.

EEPROM Serial ID Memory Contents (2-Wire Address A0h)

| Address | Name of field | Hex | Description |
|-----------------------|-----------------|-----|----------------------------|
| BASE ID Fields | | | |
| 00 | Identifier | 03 | SFP transceiver |
| 01 | Ext. Identifier | 04 | Serial ID module supported |
| 02 | Connector | 07 | LC |

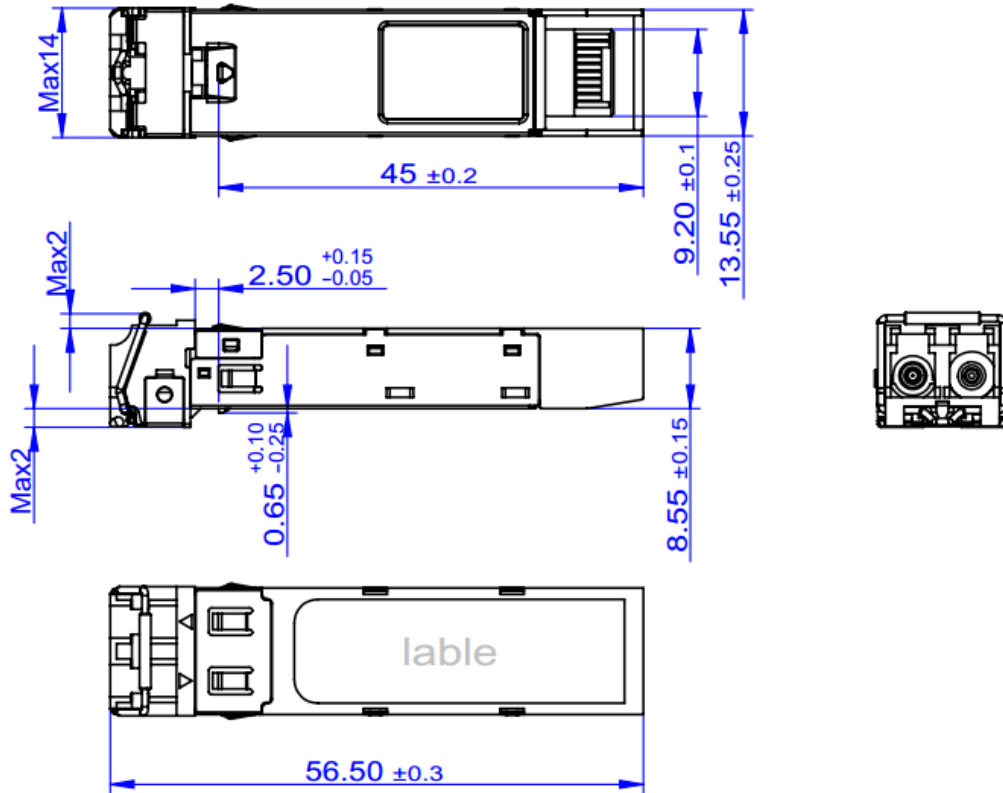
| | | | |
|---------------------------------|----------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| 03-10 | Transceiver Codes | 00 00 00 | Not defined |
| 11 | Encoding | 01 | Encoding codes |
| 12 | BR, Nominal | 0C | Nominal 1244Mbps transmitter |
| 13 | Rate Identifier | 00 | Not defined |
| 14 | Length(9um)-km | 50 | Transceiver transmit distance |
| 15 | Length(9um)-m | FF | |
| 16 | Length(50um) | 00 | |
| 17 | Length(62.5um) | 00 | |
| 18 | Length(cable) | 00 | |
| 19 | Length(OM3) | 00 | |
| 20-35 | Vendor Name | 4D 45 4E 54 45 43 48 4F 50 54 4F... | "MENTECHOPTO"(ASCII character) |
| 36 | Reserved | 00 | Not defined |
| 37-39 | Vendor OUI | 00 00 00 | Not defined |
| 40-55 | Vendor P/N | | |
| 56-59 | Vendor P/N Rev. | 31 2E 30 20 | "1.0"(ASCII character) |
| 60-61 | Laser Wavelength | 06 0E | 1550nm |
| 62 | Reserved | 00 | Not defined |
| 63 | CC_BASE | XX | Check sum of bytes 0-62 |
| Extended ID Fields | | | |
| 64-65 | Options | 00 1A | RX_LOS, TX_Fault are implemented |
| 66 | BR, max | 14 | Upper bit rate margin,20% |
| 67 | BR, min | 14 | Lower bit rate margin,20% |
| 68-83 | Vendor SN | | Vendor Serial Number in ASCII character |
| 84-91 | Date Code | Data Code | Vendor Date Code in ASCII character |
| 92 | Diagnostic Monitoring Type | 68 | Digital Diagnostic monitoring implemented "Internally calibrated" is implemented, RX measurement type is "Average Power" |
| 93 | Enhanced options | F0 | Optional Alarm/warning flags, soft Tx_Disable control and monitoring, soft Tx_Fault and soft RX_LOS monitoring are implemented |
| 94 | SFF-8472 compliant | 05 | SFF-8472 compliant with revision 11.0 |
| 95 | CC-EXT | XX | Check sum of bytes 64-94 |
| Vendor Specific ID Field | | | |
| 96-127 | Vendor Specific | 00 | Vendor specific EEPROM |
| 128-255 | Reserved | 00 | Reserved for future use |

Digital Diagnostic Monitoring Interface: Alarm and Warning Thresholds

(2-Wire Address A2h)

| Address | #Bytes | Name | Real Value | Unit | Hex |
|---------|--------|-----------------------|------------|------|-----|
| | | | Industrial | | |
| 00-01 | 2 | Temp High Alarm | 100 | °C | |
| 02-03 | 2 | Temp Low Alarm | -50 | °C | |
| 04-05 | 2 | Temp High Warning | 85 | °C | |
| 06-07 | 2 | Temp Low Warning | -40 | °C | |
| 08-09 | 2 | Voltage High Alarm | 3.7 | V | |
| 10-11 | 2 | Voltage Low Alarm | 3 | V | |
| 12-13 | 2 | Voltage High Warning | 3.5 | V | |
| 14-15 | 2 | Voltage Low Warning | 3.1 | V | |
| 16-17 | 2 | Bias High Alarm | 80 | mA | |
| 18-19 | 2 | Bias Low Alarm | 1 | mA | |
| 20-21 | 2 | Bias High Warning | 70 | mA | |
| 22-23 | 2 | Bias Low Warning | 1.5 | mA | |
| 24-25 | 2 | TX Power High Alarm | 7 | dBm | |
| 26-27 | 2 | TX Power Low Alarm | -2 | dBm | |
| 28-29 | 2 | TX Power High Warning | 5 | dBm | |
| 30-31 | 2 | TX Power Low Warning | 0 | dBm | |
| 32-33 | 2 | RX Power High Alarm | 2.5 | dBm | |
| 34-35 | 2 | RX Power Low Alarm | -26 | dBm | |
| 36-37 | 2 | RX Power High Warning | 0.5 | dBm | |
| 38-39 | 2 | RX Power Low Warning | -24 | dBm | |
| 40-55 | 16 | Reserved | Reserved | | |

Package Outline



Regulatory Compliance

| Feature | Test | Method |
|------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------|
| Electrostatic Discharge (ESD) to the Electrical Pins | MIL-STD-883E Method 3015.7 | Class 1(>1000V for SFI pins, >2000V for other pins.) |
| Electrostatic Discharge (ESD) Immunity | IEC61000-4-2 | Class 2(>4.0kV) |
| Electromagnetic Interference (EMI) | CISPR22 ITE Class B FCC Class B CENELEC EN55022 VCCI Class 1 | Comply with standard |
| Immunity | IEC61000-4-3 | Comply with standard |
| Eye Safety | FDA 21CFR 1040.10 and 1040.11 EN (IEC) 60825-1,2 | Compatible with Class I laser Product |

Ordering information

| Part. No | Specifications | | | | | | | | |
|--------------|----------------|-------------|----------|----------|-----|-----------|-----------|------------|-----|
| | Pack | Rate (Gbps) | Tx (nm) | Po (dBm) | RX | Sen (dBm) | Temp (°C) | Reach (km) | DDM |
| SGE80-D0I-T1 | SFP | 1.25 | 1550 DFB | 0~5 | PIN | <-24 | -40~+85 | 80 | Y |