



Technical specification for Small Form Factor Pluggable (SFP)

OC-48 (2488.32Mbps)

| Sumitomo Part Number | Function |
|----------------------|--------------------|
| SCP6G28-GL-# W E | SR, 1310nm, 2km |
| SCP6G08-GL-# W E | IR-1, 1310nm, 15km |



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#Safety Precaution Symbols This specification uses various picture symbols to prevent possible injury to operator or other persons or damage to properties for appropriate use of the product. The symbols and definitions are as shown below. Be sure to be familiar with these symbols before reading this specification.

| | |
|--|--|
| | Caution Wrong operation without following this instruction may lead to human injury or property damage. |
|--|--|

| | |
|--|--|
| | Warning Wrong operation without following this instruction may lead to human death or serious injury. |
|--|--|

Examples of picture symbols

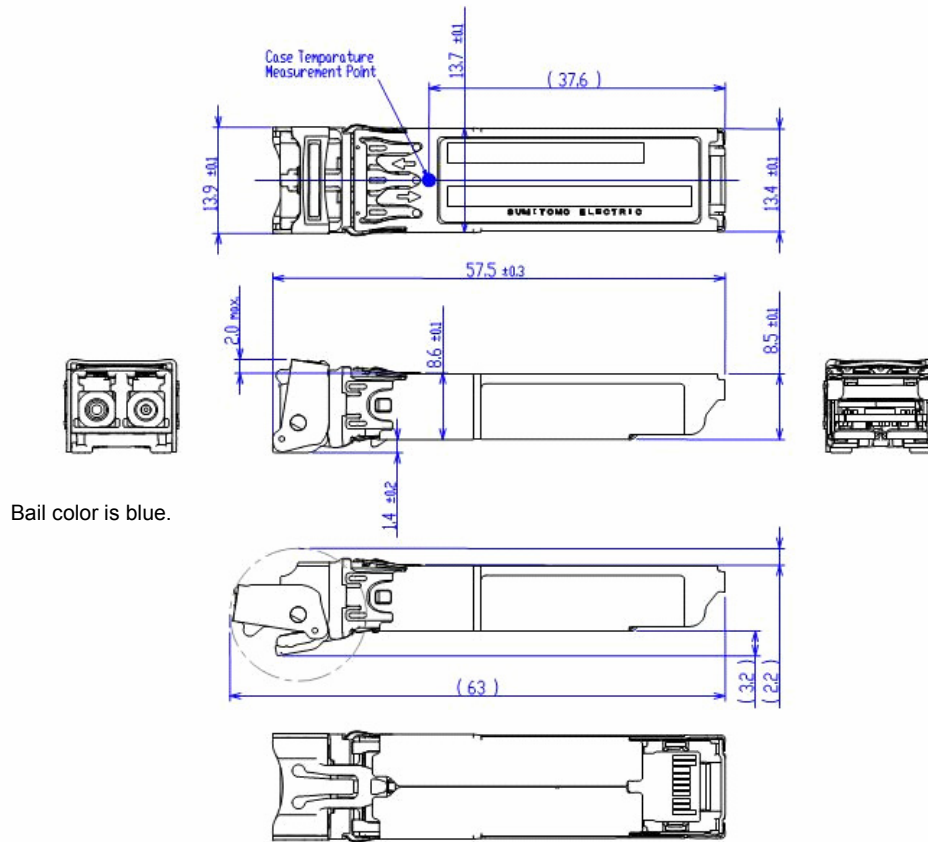


indicates prohibition of actions. Action details are explained thereafter.



indicates compulsory actions or instructions. Action details are explained thereafter.

3 Package dimensions



Note1 All Dimensions in mm

Note2 Dimensions with parentheses indicate the bail and latch release position

Figure 2. Package dimensions

4 Pin assignment and function

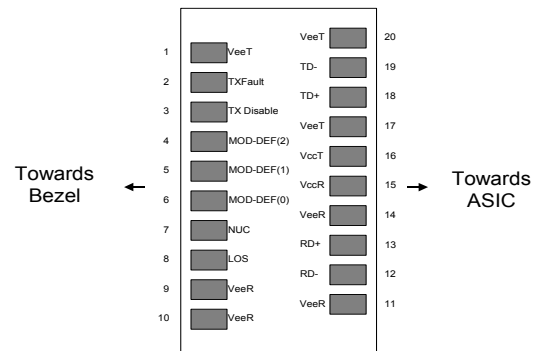


Figure 3. Pin assignment

| Pin number | Name | Function | Plug sequence* | Note |
|------------|-----------|------------------------------|----------------|---------------------------------|
| 1 | VeeT | Transmitter ground | 1 | |
| 2 | TXFault | Transmitter fault indication | 3 | |
| 3 | TXDisable | Transmitter disable input | 3 | Module disables on high or open |
| 4 | MOD-DEF2 | Module definition 2 | 3 | 2 wire serial ID and interface |
| 5 | MOD-DEF1 | Module definition 1 | 3 | 2 wire serial ID and interface |
| 6 | MOD-DEF0 | Module definition 0 | 3 | Grounded internally via 100ohm |
| 7 | NUC | No user connection | 3 | Reserved for future use |
| 8 | LOS | Loss of signal indication | 3 | |
| 9 | VeeR | Receiver ground | 1 | |
| 10 | VeeR | Receiver ground | 1 | |
| 11 | VeeR | Receiver ground | 1 | |
| 12 | RD- | Negative receiver Data out | 3 | |
| 13 | RD+ | Positive receiver Data out | 3 | |
| 14 | VeeR | Receiver ground | 1 | |
| 15 | VccR | Receiver power | 2 | |
| 16 | VccT | Transmitter power | 2 | |
| 17 | VeeT | Transmitter ground | 1 | |
| 18 | TD+ | Positive transmitter Data in | 3 | |
| 19 | TD- | Negative transmitter Data in | 3 | |
| 20 | VeeT | Transmitter ground | 1 | |

*Plug sequence: Pin engagement sequence during hot plugging.

TxFault TxFault is an open collector output that shall be pulled up with a 4.7k to 10kohm resistor on the host board. Pull up voltage is between 2.0V and VccT+0.3V. When high, output indicates a laser fault of some kind. Low indicates normal operation. TxFault is asserted when bias current of laser exceeds the factory-calibrated threshold level or when output power of transmitter degrades above/below the factory-calibrated threshold level.

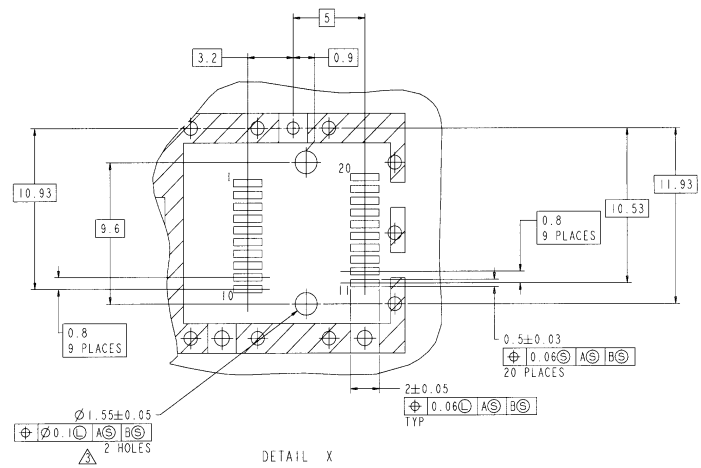
TxDisable TxDisable is an input that is used to shut down the transmitter optical output. It is pulled up within the module with a 4.7kohm resistor.

MOD-DEF MOD-DEF 0, 1 and 2 are module definition pins. They should be pulled up with a 4.7k to 10kohm resistor on the host board. The pull-up voltage shall be VccT. MOD-DEF0 indicates that the module is present. MOD-DEF1 is the clock line of two wire serial interface for serial ID. MOD-DEF2 is the data line of two wire serial interface for serial ID.

LOS LOS is an open collector output that shall be pulled up with a 4.7k to 10kohm resistor. Pull up voltage between 2.0V and VccR+0.3V. Low indicates normal operation.

RD RD+/- are the differential receiver outputs. They are AC-coupled 100ohm differential lines that should be terminated with 100ohm (differential) at the user's SERDES. The AC coupling is done inside the module and is thus not required on the host board.

TD TD+/- are the differential transmitter inputs. They are AC-coupled, differential lines with 100ohm differential termination inside the module. The AC coupling is done inside the module and is thus not required on the host board.



- Notes:
1. Datum and basic dimensions established by customer
 2. Pads and vias are chassis ground, 11 places
 3. Thru holes, plating optional

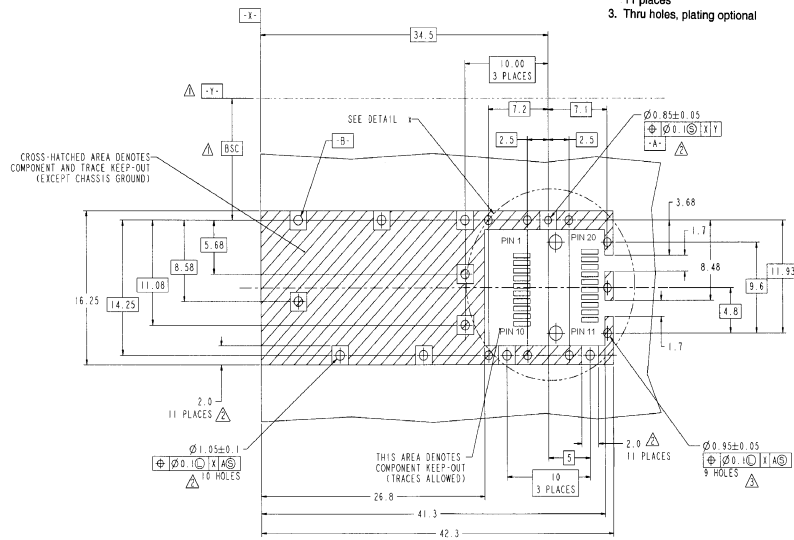
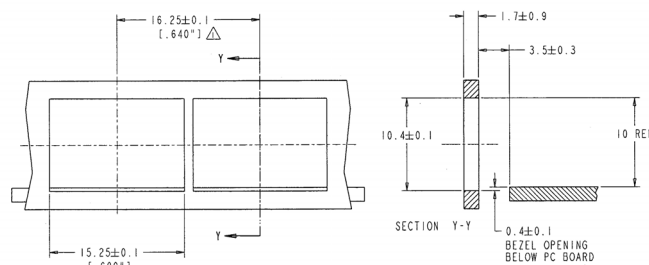


Figure 4 SFP host board mechanical layout



- NOTES:
1. MINIMUM PITCH ILLUSTRATED, ENGLISH DIMENSIONS ARE FOR REFERENCE ONLY
 2. NOT RECOMMENDED FOR PCI EXPANSION CARD APPLICATIONS

Figure 5 Recommended bezel design


5 Absolute maximum ratings

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|---------|------|------|----------|-------|------|
| Storage ambient temperature | Ts | -40 | | 85 | deg.C | 1 |
| Operating case temperature | Tc | -40 | | 85 | deg.C | |
| Optical input level | Pin | | | 3.0 | dBm | |
| Supply voltage | VccT, R | 0 | | 4.0 | V | |
| Input voltage | Vi | 0 | | VccT+0.3 | V | 2 |
| Sink current | Isink | -1 | | 5 | mA | 3 |
| Differential Input Voltage Swing (TD+,TD-) | Vin | | | 2.5 | Vp-p | |


Note

1. No condensation allowed.
2. For MOD-DEF (1:2) and Tx Disable.
3. For LOS and TxFault.

Warning

 Use the product with the rated voltage described in the specification. If the voltage exceeds the maximum rating, overheating or fire may occur.

Caution

 Do not store the product in the area where temperature exceeds the maximum rating, where there is too much moisture or dampness, where there is acid gas or corrosive gas, or other extreme conditions. Otherwise, failure, overheating or fire may occur.

6 Electrical interface

Unless otherwise specified, VccT, R=3.135 to 3.465V and all operating temperature shall be applied.

6.1 Operating characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------|---------|-------|------|-------|------|------|
| Supply Voltage | VccT, R | 3.135 | 3.30 | 3.465 | V | |
| Power Dissipation | Pw | | | 1.0 | W | 1 |

Note

1. 2488.32Mbps, PRBS 2²³-1, NRZ, 50% duty cycle data.

6.2 Transmitter

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|---------|---------|------|----------|------|------|
| Differential Input Voltage Swing (TD+,TD-) | Vin | 0.3 | | 1.6 | Vpp | 1 |
| Input Differential Impedance | Zin | 80 | 100 | 120 | ohm | |
| Tx Fault | High | VfaultH | 2.0 | VccT+0.3 | V | 2 |
| | Low | VfaultL | 0 | 0.8 | V | 2, 3 |
| Tx Disable | Disable | Vdi | 2.0 | VccT | V | 4 |
| | Enable | Vei | 0 | 0.8 | V | |

Note

1. Refer to Figure 6.
2. Tx Fault is pulled up to VccT with a 4.7k - 10kohm resistor on the host board.
When high, output indicates a laser fault of some kind. Low indicates normal operation.
3. Sink Current: 3mA
4. Tx Disable input is internally terminated to VccT via 7.5kohm resistor. If left open, transmitter is disabled.

6.3 Receiver

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|------|---------|------|------|----------|------|------|
| Differential output voltage swing(RD+,RD-) | | Vout | 0.4 | | 1.2 | Vp-p | 1 |
| Data Rise / Fall Time | | tr / tf | | | 200 | ps | 2 |
| LOS Output Voltage | High | Vloh | 2.0 | | VccR+0.3 | V | 3 |
| | Low | Vlol | 0 | | 0.8 | V | 3,4 |

Note

1. Rdiff=100ohm. Refer to figure 6.
2. 20-80% value.
3. LOS should be pulled up to VccR with a 4.7k – 10kohm resistor on the host board. Low indicates normal status.
4. Sink current 3mA.

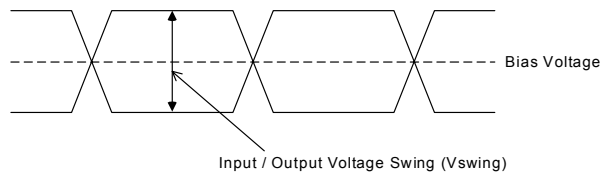


Figure 6. Definition of differential input/output voltage swing

6.4 Module definition

| Parameter | | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------------|------|--------|------|------|------|------|------|
| MOD_DEF(1:2) Input Voltage | High | Vih | 2.0 | | VccT | V | 1 |
| | Low | Vil | 0 | | 0.8 | V | |
| MOD_DEF(2) Output Voltage | High | Voh | 2.0 | | VccT | V | 1 |
| | Low | Vol | 0 | | 0.8 | V | 1 |

Note

1. Should be pulled up to VccT with a 4.7k – 10kohm resistor on the host board.

7 Optical interface

Unless otherwise specified, VccT, R=3.135 to 3.465V and all operating temperature shall be applied.

7.1 Transmitter

| Parameter | Symbol | | SCP6G28 | SCP6G08 | Unit | Note |
|--------------------------------|--|------|------------------------|---------|-------|------|
| Bit Rate Range | - | | 2488.32Mbps +/- 100ppm | | Mbps | |
| Average Output Power (Enabel) | Po | Max. | -3 | 0 | dBm | 1 |
| | | Min. | -10 | -5 | | |
| Average Output Power (Disable) | Pdis | Max. | -45 | | | |
| Extinction Ratio | Er | Min. | 8.2 | | dB | |
| Center Wavelength | λc | Max. | 1360 | 1360 | nm | |
| | | Min. | 1266 | 1260 | | |
| Spectral Width (RMS) | Δλ,rms | Max. | 4 | | | |
| Spectral Width (-20dB Width) | Δλ-20 | Max. | | 1 | | |
| Side Mode Suppression Ratio | SMSR | Min. | | 30 | dB | |
| Eye Mask for Optical Output | Compliant with Telcordia GR-253 CORE and ITU-T G.957 | | | | | |
| Jitter Generation | Tjpk | Max. | 0.07 | | Ujpp | 2 |
| | Tjrms | Max. | 0.007 | | Ujrms | |

Note

1. Measured at 2488.32Mbps, PRBS2^23-1, 50%duty cycle, NRZ.

2. SONET OC-48c data pattern filled with a 2²³-1, PRBS payload.

Measured with a band pass filter having a high-pass cutoff frequency of 12kHz and a low-pass cutoff frequency of 20MHz.

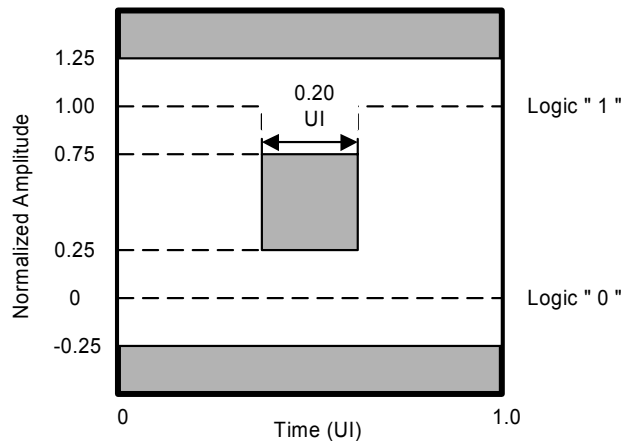


Figure 7. Optical Pulse Mask with Fourth Order Bessel Thomson Filter Specified in ITU-T G.957

| |
|---|
| ⚠ Warning |
| <p>⊘ Do not look at the laser beam projection area (e.g. end of optical connector) with naked eyes or through optical equipment while the power is supplied to this product. Otherwise, your eyes may be injured.</p> |

7.2 Receiver

| Parameter | Symbol | | SCP6G28 | SCP6G08 | Unit | Note |
|------------------------|------------------|------|------------------------|---------|------|------|
| Bit Rate Range | - | | 2488.32Mbps +/- 100ppm | | Mbps | |
| Center Wavelength | - | Max. | 1580 | | nm | |
| | | Min. | 1260 | | | |
| Overload | P _{max} | Min. | +0 | | dBm | 1, 2 |
| Minimum Sensitivity | P _{min} | Max. | -19 | | | |
| LOS Activation Level | P _{La} | Max. | -19.5 | | | |
| | | Min. | -35 | | | |
| LOS Deactivation Level | P _{Ld} | Max. | -19 | | 2 | |
| | | Min. | -34.5 | | | |
| LOS Hysteresis | Phys | Max. | 6.0 | | dB | |
| | | Min. | 0.5 | | | |
| Optical Reflectance | REF _r | Max | -27 | | | |

Note

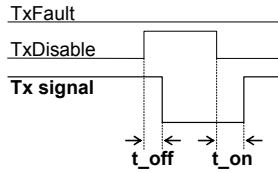
1. BER = 1E-10.
2. Measured at 2488.32Mbps, PRBS²²³-1, NRZ

7.3 Transceiver timing characteristics

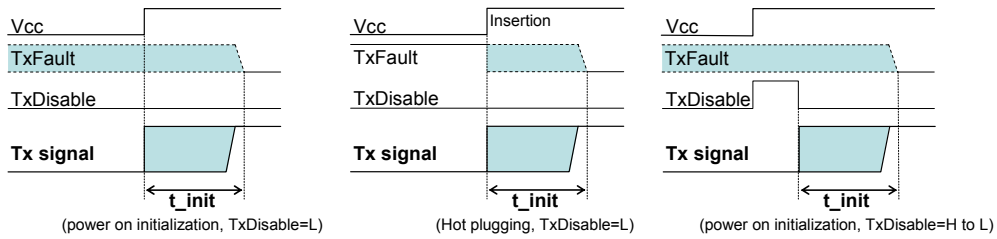
| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------------|-----------------------|------|------|------|------|------|
| TxDisable assert time | t _{off} | | | 10 | us | 1 |
| TxDisable negate time | t _{on} | | | 1 | ms | 2 |
| Time to initialize | t _{init} | | | 300 | ms | 3 |
| TxFault assert time | t _{fault} | | | 100 | us | 4 |
| TxDisable to reset | t _{reset} | 10 | | | us | 5 |
| LOS assert time | t _{loss_on} | | | 100 | us | 6 |
| LOS de-assert time | t _{loss_off} | | | 100 | us | 7 |
| Serial ID clock rate | - | | | 100 | kHz | |

Note

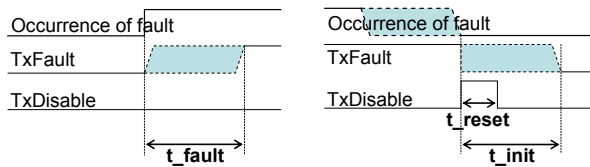
1. Time from rising edge of TxDisable to when the optical output falls below 10% of nominal.
2. Time from falling edge of TxDisable to when the modulated optical output rises above 90% of nominal.



3. From power on or negation of TxFault using TxDisable.



4. Time from transmitter's fault condition to TxFault on.
5. Time to reset TxFault status.



6. Time from Loss of signal state to LOS assert.
7. Time from non-LOS state to LOS de-assert.

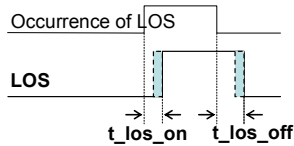


Figure 8. Transceiver timing charts

7.4 TxFault and Tx shutdown options

| Type | TxFault | Tx shutdown on fault |
|------|-------------|----------------------|
| A | Latched | No |
| B | Not latched | No |
| C | Latched | Yes |

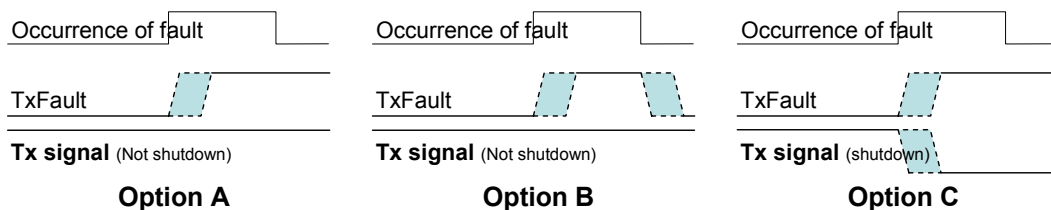


Figure 9. Part number identification for TxFault and Tx shutdown behavior

8 EEPROM memory contents

The data can be read using the 2-wire serial CMOS EEPROM protocol of the Atmel AT24C01A or equivalent.

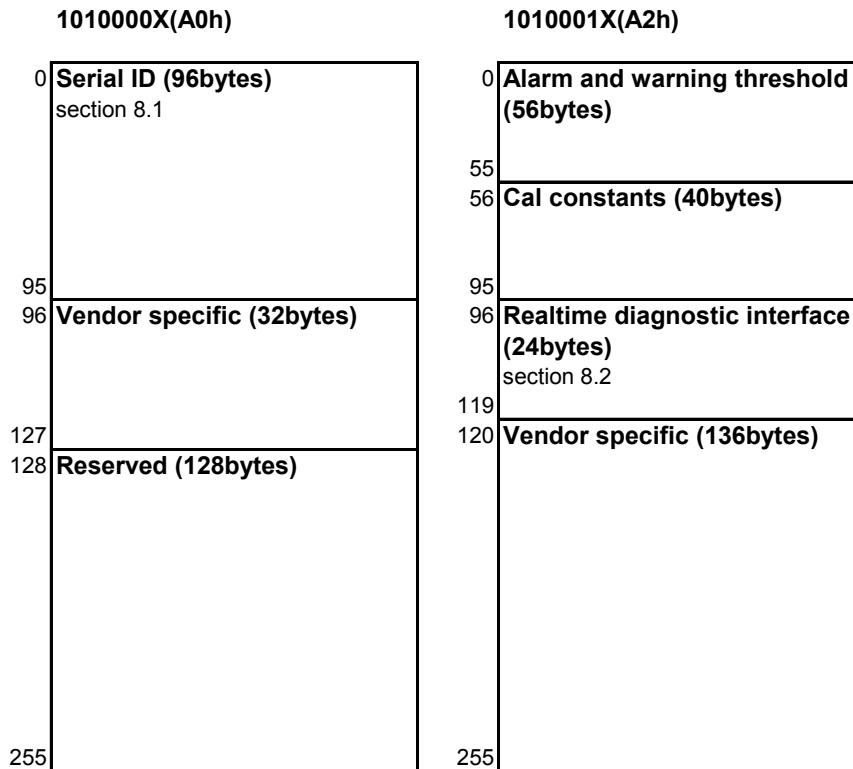


Figure 10. Digital diagnostic memory map

8.1. Serial ID (A0h)

| Address | Name of field | Hex | ASCII | Description | Address | Name of field | Hex | ASCII | Description | | |
|-----------------------|------------------|----------|-------------------|-----------------|----------------------------------|---------------------|-------|----------------------------|-------------|--|-------|
| BASE ID FIELDS | | | | | EXTENDED ID FIELDS | | | | | | |
| 0 | Identifier | 03 | | SFP Transceiver | 64 | Options | 00 | | | | |
| 1 | Ext. Identifier | 04 | | | 65 | | 1A | | | | |
| 2 | Connector | 07 | | LC Connector | 66 | BR, max | 00 | | | | |
| 3 | | 00 | | | 67 | BR, min | 00 | | | | |
| 4 | | 00 | | | 68 | Vendor SN | Note3 | | Year | | |
| 5 | | 00 | | | 69 | | | Month | | | |
| 6 | | 00 | | | 70 | | | | | | |
| 7 | | 00 | | | 71 | | | | | | |
| 8 | | 00 | | | 72 | | | | | | |
| 9 | | 00 | | | 73 | | | | | | |
| 10 | | 00 | | | 74 | | | | | | |
| 11 | | Encoding | 05 | | SONET Scrambled | | | 75 | | | |
| 12 | BR, Nominal | 19 | | 2488.32Mbps | 76 | | | | | | |
| 13 | Reserved | 00 | | | 77 | | | | | | |
| 14 | Length(9um) - km | Note1 | | | 78 | | | | | | |
| 15 | Length (9um) | | | | 79 | | | | | | |
| 16 | Length (50um) | 00 | | | 80 | | | | | | |
| 17 | Length (62.5um) | 00 | | | 81 | | | | | | |
| 18 | Length (Copper) | 00 | | | 82 | | | | | | |
| 19 | Reserved | 00 | | | 83 | | | | | | |
| 20 | Vendor name | 53 | S | | 84 | Date code | Note4 | | | | |
| 21 | | 75 | u | | 85 | | | | | | |
| 22 | | 6D | m | | 86 | | | | | | |
| 23 | | 69 | i | | 87 | | | | | | |
| 24 | | 74 | t | | 88 | | | | | | |
| 25 | | 6F | o | | 89 | | | | | | |
| 26 | | 6D | m | | 90 | | | | | | |
| 27 | | 6F | o | | 91 | | | | | | |
| 28 | | 45 | E | | 92 | | | Diagnostic Monitoring Type | 58 | | Note6 |
| 29 | | 6C | l | | 93 | | | Enhanced Options | F0 | | Note7 |
| 30 | | 65 | e | | 94 | SFF-8472 Compliance | 01 | | Diagnostics | | |
| 31 | | 63 | c | | 95 | CC_EXT | Note5 | | | | |
| 32 | | 74 | t | | VENDOR SPECIFIC ID FIELDS | | | | | | |
| 33 | | 72 | r | | 96 | Read-only | 20 | | | | |
| 34 | 69 | i | | 97 | 20 | | | | | | |
| 35 | 63 | c | | 98 | 20 | | | | | | |
| 36 | Reserved | 00 | | 99 | 20 | | | | | | |
| 37 | Vendor OUI | 00 | | 100 | 20 | | | | | | |
| 38 | 5F | | | 101 | 20 | | | | | | |
| 39 | 53 | S | | 102 | 20 | | | | | | |
| 40 | 43 | C | | 103 | 20 | | | | | | |
| 41 | 50 | P | | 104 | 20 | | | | | | |
| 42 | 36 | 6 | | 105 | 20 | | | | | | |
| 43 | 47 | G | | 106 | 20 | | | | | | |
| 44 | 32/30 | 2/0 | | 107 | 20 | | | | | | |
| 45 | 38 | 8 | | 108 | 20 | | | | | | |
| 46 | 2D | - | | 109 | 20 | | | | | | |
| 47 | 47 | G | | 110 | 20 | | | | | | |
| 48 | 4C | L | | 111 | 20 | | | | | | |
| 49 | 2D | - | | 112 | 20 | | | | | | |
| 50 | 41/42/43 | A/B/C | TxFault Type | 113 | 20 | | | | | | |
| 51 | 57 | W | Temperature Range | 114 | 20 | | | | | | |
| 52 | 45 | E | Diagnostics | 115 | 20 | | | | | | |
| 53 | 20 | | | 116 | 20 | | | | | | |
| 54 | 20 | | | 117 | 20 | | | | | | |
| 55 | 20 | | | 118 | 20 | | | | | | |
| 56 | 41 to 5A | A to Z | Variable | 119 | 20 | | | | | | |
| 57 | 20 | | | 120 | 20 | | | | | | |
| 58 | 20 | | | 121 | 20 | | | | | | |
| 59 | 20 | | | 122 | 20 | | | | | | |
| 60 | Wavelength | Note1 | | 123 | 20 | | | | | | |
| 61 | Reserved | 00 | | 124 | 20 | | | | | | |
| 62 | Reserved | 00 | | 125 | 20 | | | | | | |
| 63 | CC_BASE | Note2 | | 126 | 20 | | | | | | |
| | | | | 127 | 20 | | | | | | |

Note

1. Refer to the section 8-2.
2. Address 63 is a checksum of bytes 0 to 62.
3. Address 68 to 83 is vendor's serial number area.
4. Address 84 to 91 is date-code.
5. Address 95 is a checksum of bytes 64 to 94.
6. Diagnostic monitoring types are listed below.

| Address | Bit | Status | Description |
|---------|-----|--------|---|
| 92 | 7 | 0 | Reserved for legacy diagnostic implementations. |
| 92 | 6 | 1 | Digital diagnostic monitoring is implemented. |
| 92 | 5 | 0 | externally calibrated |
| 92 | 4 | 1 | |
| 92 | 3 | 1 | Receiver power measurement type. 1=Average power. |
| 92 | 2 | 0 | Address change is not required. |
| 92 | 1 | 0 | Reserved |
| 92 | 0 | 0 | Reserved |

7. Enhanced options are listed below.

| Address | Bit | Status | Description |
|---------|-----|--------|--|
| 93 | 7 | 1 | Alarm/warning flags implemented for all monitored quantities |
| 93 | 6 | 1 | Soft TxDisable control is implemented. |
| 93 | 5 | 1 | Soft TxFault monitoring is implemented. |
| 93 | 4 | 1 | Soft RxLOS monitoring is implemented. |
| 93 | 3 | 0 | Soft rate-select control and monitoring is not implemented. |
| 93 | 2 | 0 | Reserved |
| 93 | 1 | 0 | Reserved |
| 93 | 0 | 0 | Reserved |

8.2. SCP6G28/6G08-xWE EEPROM Information (Transceiver Code etc)

| Address | Name of field | SCP6G28 | SCP6G08 | Description |
|---------|-----------------|---------|---------|--------------------------------------|
| | | Hex | Hex | |
| 3 | Transceiver | 00 | 00 | |
| 4 | | 01 | 12 | 01:SR, 12:IR-1, 0A:IR-2 |
| 5 | | 00 | 00 | |
| 6 | | 00 | 00 | |
| 7 | | 00 | 00 | |
| 8 | | 00 | 00 | |
| 9 | | 00 | 00 | |
| 10 | | 00 | 00 | |
| 14 | Length(9um)- km | 02 | 0F | 02:2km, 0F:15km, 0F:15km |
| 15 | Length(9um) | 14 | 96 | 14:20*100m, 96:150*100m, 96:150*100m |
| 60 | Wavelength | 05 | 05 | 051E: 1310nm, 060E: 1550nm |
| 61 | | 1E | 1E | |

8.3 Real-time diagnostics (A2h)

Setting of bit 6, address 92 means digital diagnostic monitoring is implemented. Two calibration options are possible. If bit 5 of address 92, "Internally calibrated", is set, the transceiver directly reports calibrated values in units of current, power etc. If bit 4, "Externally calibrated", is set, the reported values are A/D counts which must be converted to real world units using calibration values read using 2 wire serial address 1010001X(A2h) from bytes 55 to 95. Monitoring range and accuracy are described in section 8.4.

| Address | Bit | Name | Description |
|---------|-----|------------------------------------|---|
| 96 | MSB | Temperature (T _{AD}) | Junction temperature of the point illustrated in section 3. 16-bit signed 2's complement value. See Note 1 and 6. |
| 97 | LSB | | |
| 98 | MSB | V _{CC} (V _{AD}) | Internally measured supply voltage "V _{ccT} " in a module. Unsigned 16-bit value. See Note 2 and 6. |
| 99 | LSB | | |
| 100 | MSB | Tx bias current (I _{AD}) | Unsigned 16-bit value. See Note 3 and 6. |
| 101 | LSB | | |
| 102 | MSB | Tx power (TP _{AD}) | Measured TX output power. Unsigned 16-bit value. See Note 4 and 6. |
| 103 | LSB | | |
| 104 | MSB | Rx power (RP _{AD}) | Measured RX received power. Unsigned 16-bit value. 1digit=0.1uW. See Note 5 and 6. |
| 105 | LSB | | |
| 106 | - | - | Reserved |
| 107 | - | - | Reserved |
| 108 | - | - | Reserved |
| 109 | - | - | Reserved |

Note

- Temperature (1/256deg.C/digit) $T = T_{slope} * T_{AD} + T_{offset}$ (Ext. cal.)
- V_{cc} (100uV/digit) $V = V_{slope} * V_{AD} + V_{offset}$ (Ext. cal.)
- TX bias current (2uA/digit) $I = I_{slope} * I_{AD} + I_{offset}$ (Ext. cal.)
- TX power (0.1uW/digit) $TP = TP_{slope} * TP_{AD} + TP_{offset}$ (Ext. cal.)
- RX power (0.1uW/digit) $RP = RP4 * RP_{AD}^4 + RP3 * RP_{AD}^3 + RP2 * RP_{AD}^2 + RP1 * RP_{AD} + RP0$ (Ext. cal.)

6. Calibration constants(A2h) are listed below.

| Address | Bytes | Name | Description |
|---------|-------|----------------------|---|
| 56:59 | 4 | RP4 | Single precision floating-point calibration data. Byte 56 is MSB. |
| 60:63 | 4 | PR3 | Single precision floating-point calibration data. Byte 60 is MSB. |
| 64:67 | 4 | PR2 | Single precision floating-point calibration data. Byte 64 is MSB. |
| 68:71 | 4 | PR1 | Single precision floating-point calibration data. Byte 68 is MSB. |
| 72:75 | 4 | RP0 | Single precision floating-point calibration data. Byte 72 is MSB. |
| 76:77 | 2 | I _{slope} | Unsigned fixed-point calibration data. Byte 76 is MSB. |
| 78:79 | 2 | I _{offset} | 16-bit signed 2's complement calibration data. Byte 78 is MSB. |
| 80:81 | 2 | TP _{slope} | Unsigned fixed-point calibration data. Byte 80 is MSB. |
| 82:83 | 2 | TP _{offset} | 16-bit signed 2's complement calibration data. Byte 82 is MSB. |
| 84:85 | 2 | T _{slope} | Unsigned fixed-point calibration data. Byte 84 is MSB. |
| 86:87 | 2 | T _{offset} | 16-bit signed 2's complement calibration data. Byte 86 is MSB. |
| 88:89 | 2 | V _{slope} | Unsigned fixed-point calibration data. Byte 88 is MSB. |
| 90:91 | 2 | V _{offset} | 16-bit signed 2's complement calibration data. Byte 90 is MSB. |
| 92:94 | 3 | - | Reserved |
| 95 | 1 | - | Checksum. Low order 8 bits of the sum at data address 0 to 94. |

8.4 A/D accuracy and monitoring range

| Parameter | Accuracy | Monitoring range | | Unit | Note |
|-----------------|------------|------------------|-------|-------|---------|
| | | Min. | Max. | | |
| Temperature | +/- 3deg.C | -40 | 85 | deg.C | 1 |
| Vcc | +/- 3% | 3.135 | 3.465 | V | |
| Tx bias current | +/- 10% | 1 | 60 | mA | 2 |
| Tx power | +/- 3dB | -10 | -3 | dBm | SCP6G28 |
| | | -5 | +0 | | SCP6G08 |
| Rx Power Note3 | +/-3dB | -22 | +0 | dBm | |

Note

1. Junction temperature. Specified at Vcc=3.3V.
2. Specified by nominal value.
3. At specified transmitter wavelength.

8.5 Optional status bit(A2h)

| Address | Bit | Name | Description |
|---------|-----|----------------|---|
| 110 | 0 | Data ready bar | Indicates transceiver has achieved power up and data is ready. Bit remains high until data is ready to be read. |

8.6 Alarm and Warning Flags(A2h)

| Address | Bit | Name | Description |
|---------|-----|-----------------------|--|
| 112 | 7 | Temp High Alarm | Set when temperature exceeds high alarm level. |
| | 6 | Temp Low Alarm | Set when temperature is below low alarm level. |
| | 5 | Vcc High Alarm | Set when measured internal voltage exceeds high alarm level. |
| | 4 | Vcc Low Alarm | Set when measured internal voltage is below low alarm level. |
| | 3 | Tx bias High Alarm | Set when TX bias current exceeds high alarm level. |
| | 2 | Tx bias Low Alarm | Set when TX bias current is below low alarm level. |
| | 1 | Tx power High Alarm | Set when TX output power exceeds high alarm level. |
| | 0 | Tx power Low Alarm | Set when TX output power is below low alarm level. |
| 113 | 7 | RX power High Alarm | Set when received power exceeds high alarm level. |
| | 6 | RX power Low Alarm | Set when received power is below low alarm level. |
| | 5:0 | Reserved | |
| 114 | 7:0 | Reserved | |
| 115 | 7:0 | Reserved | |
| 116 | 7 | Temp High Warning | Set when temperature exceeds high warning level. |
| | 6 | Temp Low Warning | Set when temperature is below low warning level. |
| | 5 | Vcc High Warning | Set when measured internal voltage exceeds high warning level. |
| | 4 | Vcc Low Warning | Set when measured internal voltage is below low warning level. |
| | 3 | Tx bias High Warning | Set when TX bias current exceeds high warning level. |
| | 2 | Tx bias Low Warning | Set when TX bias current is below low warning level. |
| | 1 | Tx power High Warning | Set when TX output power exceeds high warning level. |
| | 0 | Tx power Low Warning | Set when TX output power is below low warning level. |
| 117 | 7 | RX power High Warning | Set when received power exceeds high warning level. |
| | 6 | RX power Low Warning | Set when received power is below low warning level. |
| | 5:0 | Reserved | |
| 118 | 7:0 | Reserved | |
| 119 | 7:0 | Reserved | |

8.5 Alarm and Warning warning threshold

| A2h Address | Meaning | Unit | SCP6G08-GL-AWE | SCP6G28-GL-AWE |
|-------------|-----------------------|------|----------------|----------------|
| 00-01 | Temp High Alarm | deg | 97 | 105 |
| 02-03 | Temp Low Alarm | deg | -45 | -45 |
| 04-05 | Temp High Warning | deg | 95 | 95 |
| 06-07 | Temp Low Warning | deg | -45 | -45 |
| 08-09 | Vcc High Alarm | V | 4 | 4 |
| 10-11 | Vcc Low Alarm | V | 2.8 | 2.8 |
| 12-13 | Vcc High Warning | V | 3.6 | 3.6 |
| 14-15 | Vcc Low Warning | V | 3 | 3 |
| 16-17 | TX Bias High Alarm | mA | 70 | 70 |
| 18-19 | TX Bias Low Alarm | mA | 0 | 0 |
| 20-21 | TX Bias High Warning | mA | 60 | 60 |
| 22-23 | TX Bias Low Warning | mA | 0 | 0 |
| 24-25 | TX Power High Alarm | dBm | +3 | 0 |
| 26-27 | TX Power Low Alarm | dBm | -8 | -13 |
| 28-29 | TX Power High Warning | dBm | +1 | -2 |
| 30-31 | TX Power Low Warning | dBm | -6 | -11 |
| 32-33 | RX Power High Alarm | dBm | NA | NA |
| 34-35 | RX Power Low Alarm | dBm | NA | NA |
| 36-37 | RX Power High Warning | dBm | NA | NA |
| 38-39 | RX Power Low Warning | dBm | NA | NA |

9 Recommended interface circuit

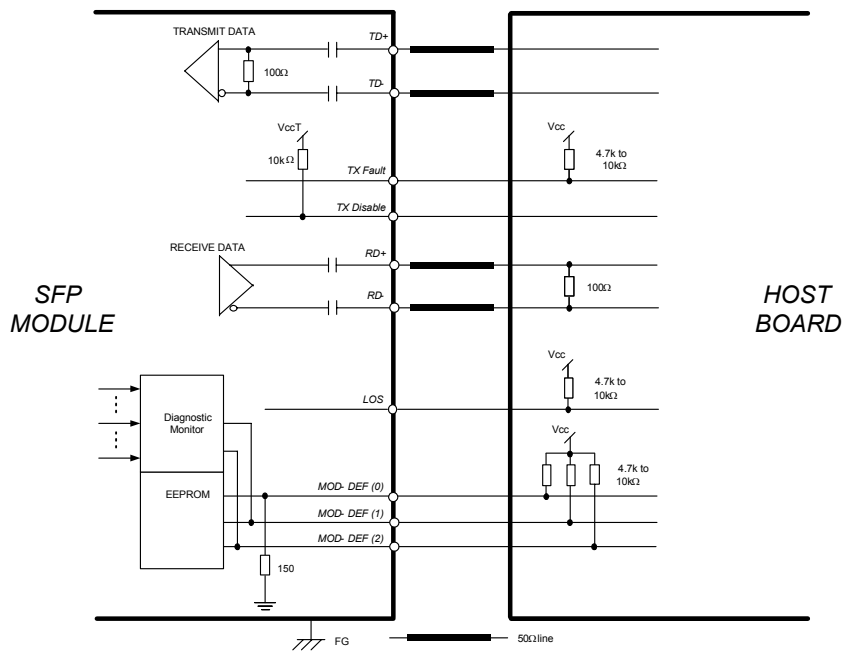


Figure 11. Recommended interface circuit

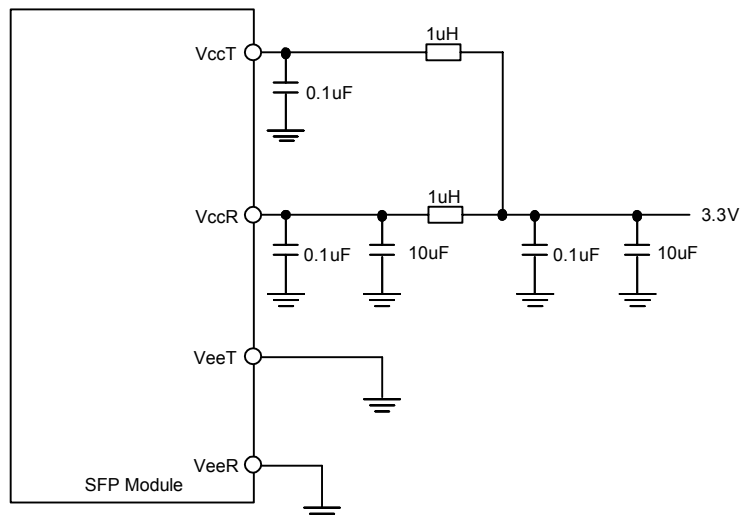


Figure 12. Recommended supply filtering network

10. RoHS COMPLIANCY

Compliance versus requirements contained inside the following reference document is guaranteed:

"Directive 2002/95/EC of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment: from official journal of European Union (European Parliament and of the Council). This product is Compliant at RoHS-6/6 level and Contains no leaded solders.

11 Reliability test program

GR-468-CORE Issue 1, December 1998 Laser module

| Heading | Test | Reference | Conditions | Sampling | | |
|----------------------|----------------------------|---|---|----------|----------|--------|
| | | | | LTPD | SS | C |
| Mechanical Integrity | Mechanical shock | MIL-STD-883 Method 2002 | 5 times/axis 1,500G, 0.5ms | 20 | 11 | 0 |
| | Vibration | MIL-STD-883 Method 2007 | Cond. A 20G, 20 to 2,000Hz, 4min/cy, 4cy/axis | 20 | 11 | 0 |
| Endurance | Accel. aging (High temp.) | (R)-4-53 Section 5.18 | 85deg.C; rated power 1,000h for pass/fail 2,000 & 5,000h for info | - | 25 10 | - |
| | Low temp. storage | - | Minimum storage temperature 1,000h for pass/fail 2,000h for info | 20 | 11 | 0 |
| | Temperature cycling | Section 5.20 | -40 to 85deg.C 500cy for pass/fail 1,000cy for info | 20 - | 11 11 | 0 - |
| | Damp heat with bias | MIL-STD-202 Method 103 or IEC-60068-2-3 | 85deg.C/85%RH 1,000h | 20 | 11 | 0 |
| | Cyclic moisture resistance | Section 5.23 | - | 20 | 11 | 0 |
| Special test | Internal moisture | MIL-STD-883 Method 1018 | Max. 5,000ppm water vapor | 20 | 11 | 0 |
| | ESD threshold | Section 5.22 | | - | 6 | - |

SS; sample size

C; maximum number of failure allowed to pass the test.

12 Laser safety



This product uses a semiconductor laser system and is a laser class 1 product acceptable FDA, complies with 21CFR 1040.10 and 1040.11. Also this product is a laser class 1 product acceptable IEC60825-1:2001.

|  Caution | |
|--|--|
|  | If this product is used under conditions not recommended in the specification or this product is used with unauthorized revision, classification for laser product safety standard is invalid. Classify the product again at your responsibility and take appropriate actions. |

13 Other precaution

Under such a strong vibration environment as in automobile, the performance and reliability are not guaranteed. The governmental approval is required to export this product to other countries. To dispose of these components, the appropriate procedure should be taken to prevent illegal exportation.

This module must be handled, used and disposed of according to your company's safe working practice.

|  Warning | |
|--|---|
|  | Operating transceiver products can have an outer package temperature exceeding 70 degC. To reduce the risk of injury from burns, do not touch the transceiver module under any circumstances while it is operational. When installing or uninstalling products that have been operating, handle with extreme care. |

| | |
|---|--|
| ⚠ Warning | |
|  | Do not put this product or components of this product into your mouth. This product contains material harmful to health. |

| | |
|---|---|
| ⚠ Caution | |
|  | Dispose this product or equipment including this product properly as industrial waste according to the regulations. |

14 Ordering information

Part number

SCP6G **8** - **GL** - **W** **E**

Calibration type of diagnostic monitor

E: External calibration

Operating case temperature range

W: -40 to 85degC

TxFault type

| Type | TxFault | Tx shutdown on fault |
|------|-------------|----------------------|
| A | Latched | No |
| B | Not latched | No |
| C | Latched | Yes |

Transmitter Distance and Wavelength

2: SR (2Km), 1310nm

0: IR-1 (15Km), 1310nm

15 For more information

U.S.A.

Excelight Communications, Inc.

4021 Stirrup Creek Drive, Suite 200, Durham, NC 27703 USA

Tel. +1-919-361-1600 / Fax. +1-919-361-1619

E-mail: info@excelight.com

<http://www.excelight.com>

Europe

Sumitomo Electric Europe Ltd.

220 Centennial Park, Elstree, Herts, WD6 3SL UK

Tel. +44-208-953-8681 / Fax. +44-208-207-5950

E-mail: photonics@sumielectric.com

<http://www.sumielectric.com>

Japan

Sumitomo Electric Industries, Ltd.

1 Taya-cho, Sakae-ku, Yokohama, 244-8588 Japan

Tel. +81-45-853-7154 / Fax. +81-45-851-1932

E-mail: product-info@ppd.sei.co.jp

http://www.sei.co.jp/Electro-optic/index_e.html