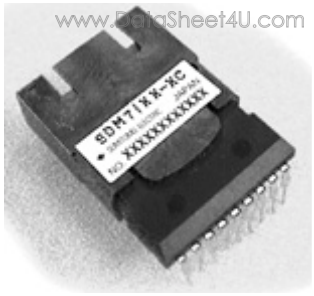
*Specification: TS-S98D043B*
*Date : August , 2000*





# Technical Specification
# for
# Optical Transceiver Module

## SDM7111-XC
## SDM7111-GC

| | | |
|---|---|---|
| ☑ 155.52Mb/s | ☐ 622.08Mb/s | ☐ other _____ |
| ☐ Short Haul Intermediate Reach | ☑ Long Haul Long Reach | ☐ other _____ |
| ☑ Single 5.0 V | ☐ Single 3.3 V | ☐ other _____ |
| ☑ 1.3 μm | ☐ 1.55 μm | ☐ other _____ |
| ☐ Transmitter | ☐ Receiver | ☑ Transceiver |
| | ( ☐ 2R / ☐ 3R ) | ( ☑ 2R / ☐ 3R ) |

SUMITOMO ELECTRIC

Sumitomo Electric reserves the right to make changes in this specification without prior notice.

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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.

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

Example of picture symbols ❗ indicates prohibition of actions. Action details are explained thereafter.

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

# 1. General

SDM7111-XC is a series of compact and high speed performance digital optical transceiver module ideally designed for versatile high speed network applications. 1300nm high speed InGaAsP DFB-LD and InGaAs PIN-PD are provided as a light source and a detector, respectively. Transceiver module has PC board mountable package with electrical and optical interfaces.

| | |
|---|---|
| * Data Rate | 10 ~ 155.52Mbps, NRZ |
| * Duty Cycle | 50% |
| * Power Supply Voltage | Single +5.0V |
| * Electrical Interface | PECL |
| * Fiber Coupled Power | -5dBm for SMF |
| * Sensitivity | ~ -34dBm |
| * Connector Interface | SC Duplex Connector |

The features of SDM7111-XC are listed below.

* Features
  - Low Power Consumption
  - Low Profile (9.8mm Max) Plastic Molded Package
  - Multi-sourced Footprint
  - Transmitter..... Uncooled Laser with Automatic Power Control IC
    Class 1 Laser Product (IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11)
  - Receiver..... Wide Dynamic Range
    Signal Detect (FLAG) Function

# 2. Block Diagram

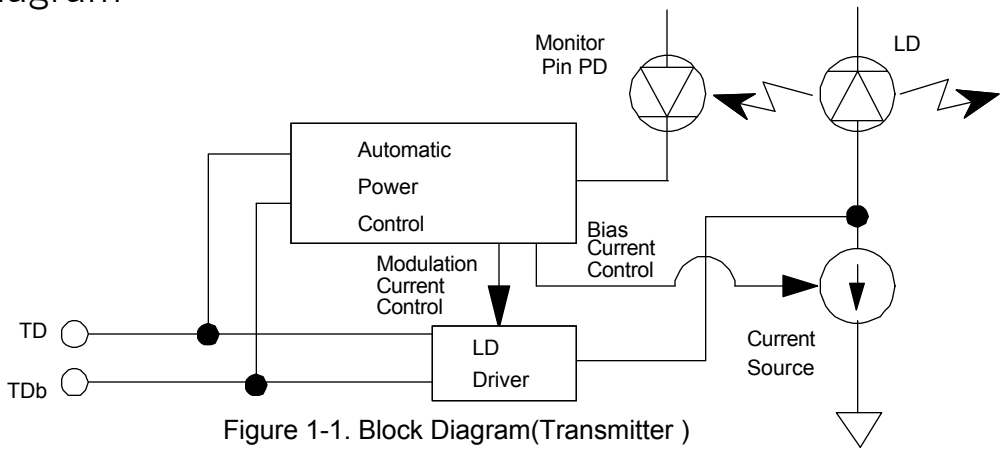



Figure 1-1. Block Diagram(Transmitter )

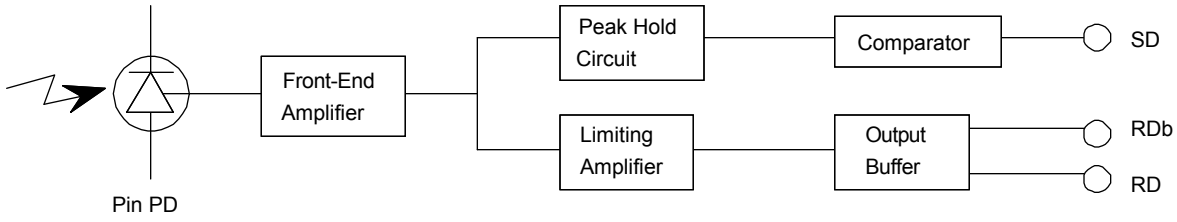



Figure 1-2. Block Diagram(Receiver )

# 3. Package Dimension

All dimensions are in mm.

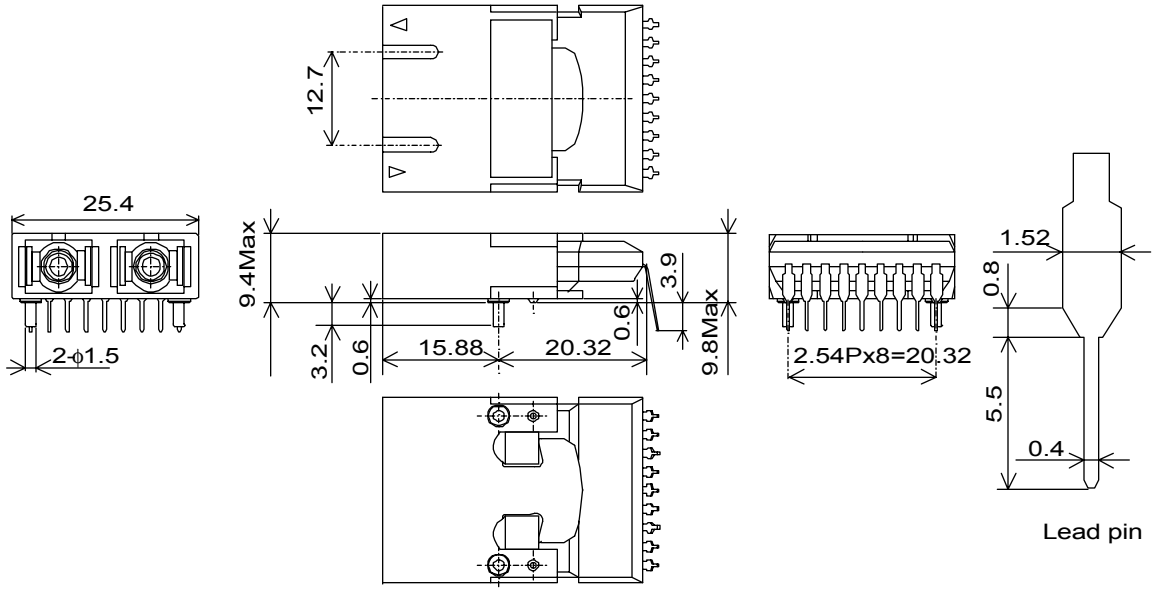
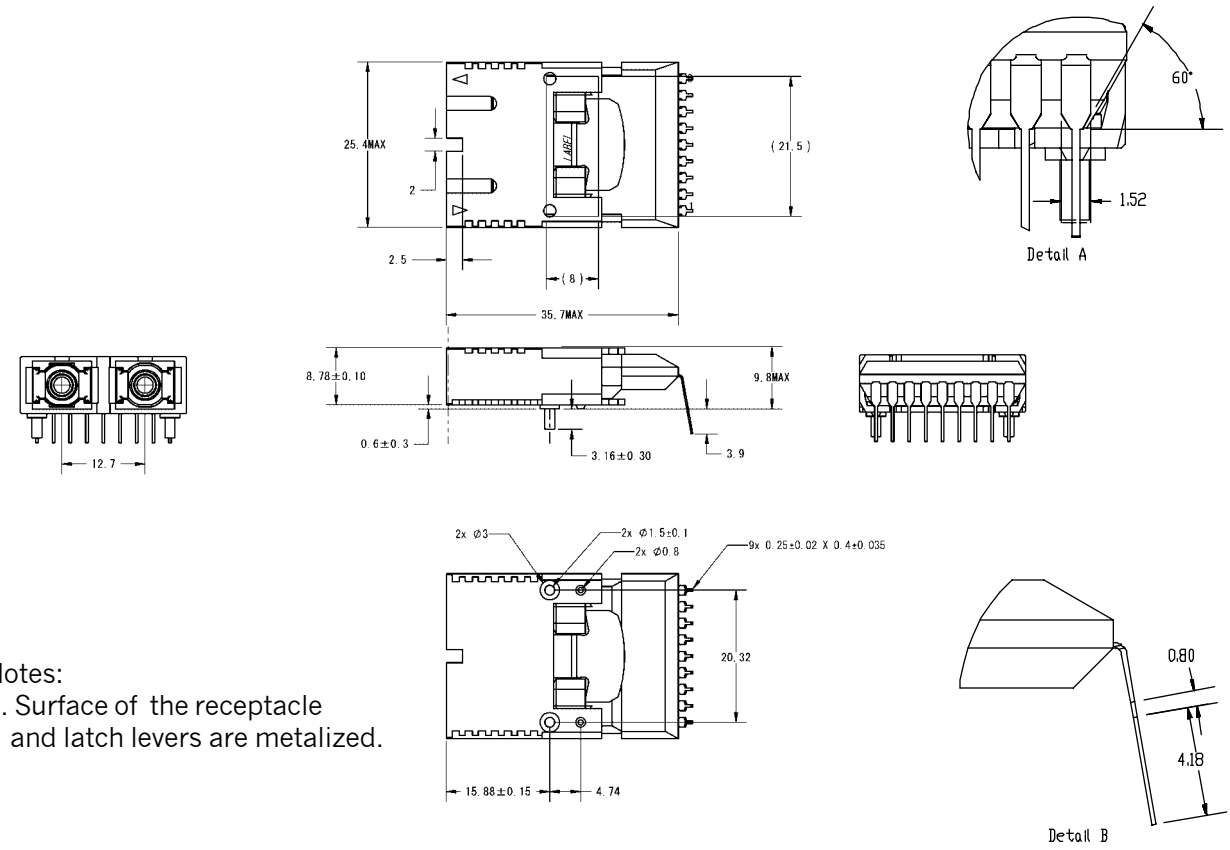


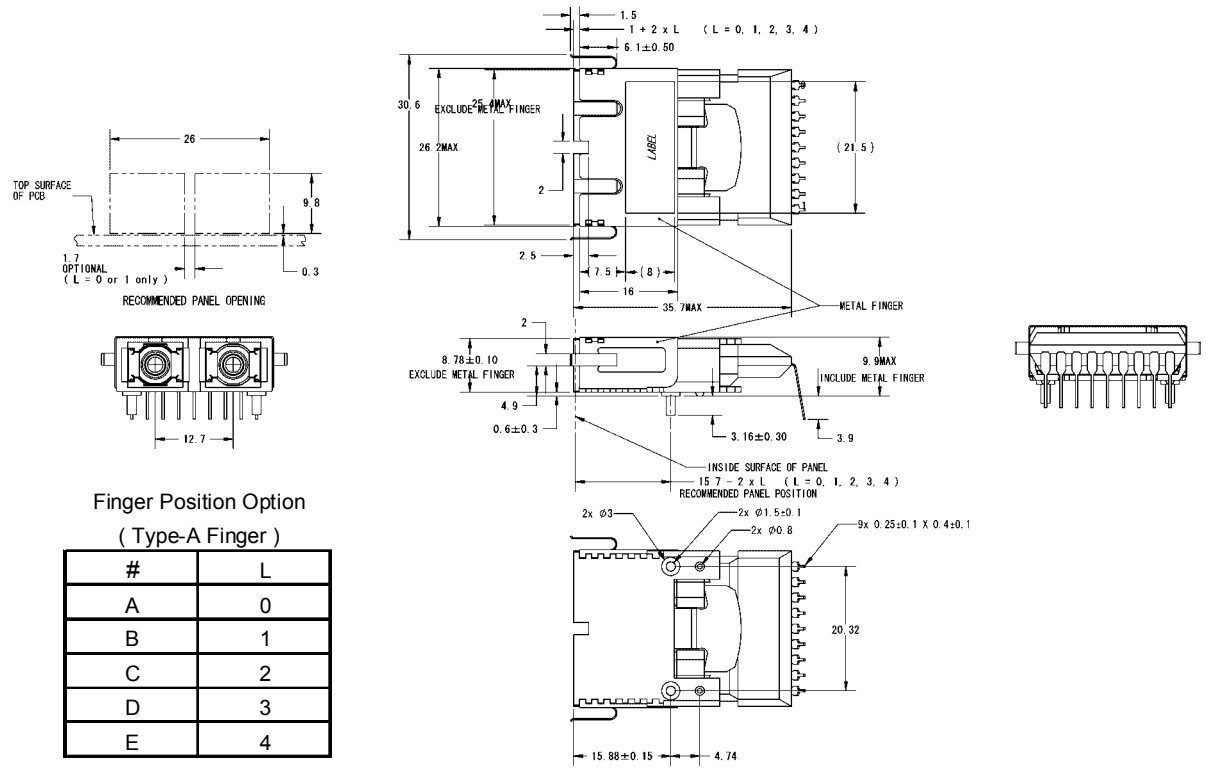

Figure2-1. Outline Dimensions ( SDM7111-XC )




Notes:
1. Surface of the receptacle and latch levers are metalized.

Figure2-2. Outline Dimensions ( SDM7111-GC-ZN )

All dimensions are in mm.




Finger Position Option
( Type-A Finger )

| # | L |
|---|---|
| A | 0 |
| B | 1 |
| C | 2 |
| D | 3 |
| E | 4 |

Figure2-3. Outline Dimensions ( SDM7111-GC-#N )

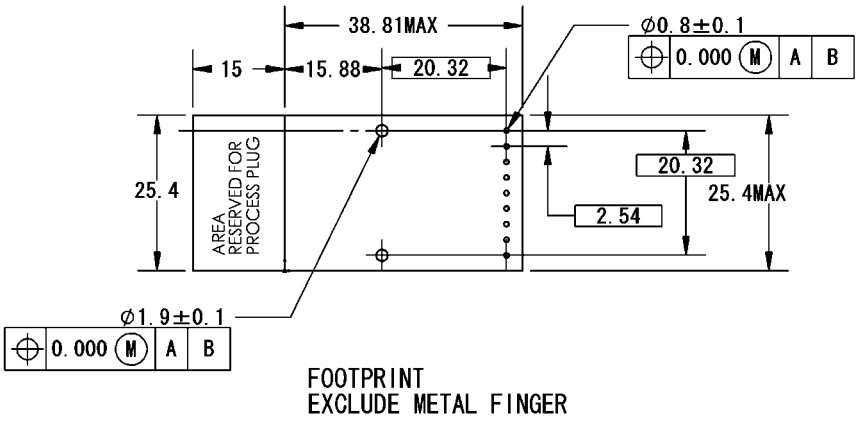



Figure2-4.RecommendedFootprint

## ⚠Caution

Do not disassemble this product. Otherwise, failure, electrical shock, overheating or fire may occur.
Handle the lead pins carefully. Use assisting tools or prospective aids as required. A lead pin may injure skin or human body

## 4. Pin Assignment

| No. | Symbol | Function |
|---|---|---|
| 1 | Veerx | Power Supply (-) for Receiver : Connected to GND |
| 2 | RD | Differential Data Output (Positive) |
| 3 | RDb | Differential Data Output (Negative) |
| 4 | FLAG(SD) | FLAG (Signal Detect) |
| 5 | Vccrx | Power Supply (+) for Receiver : Connected to +5.0V |
| 6 | Vcctx | Power Supply (+) for Transmitter : Connected to +5.0V |
| 7 | TDb | Transmitter Differential Data (Negative) |
| 8 | TD | Transmitter Differential Data (Positive) |
| 9 | Veetx | Power Supply (-) for Transmitter : Connected to GND |

## 5. Absolute Maximum Ratings

| Parameter | Symbol | min. | Max | Unit | Note |
|---|---|---|---|---|---|
| Storage Case Temperature | Ts | -40 | 85 | °C | 1 |
| Operating Case Teperature | Tc | 0 | 70 | °C | 1 |
| Supply Voltage | Vcc-Vee | 0.0 | 6.0 | V | 2 |
| Input Voltage (TD, TDb) | Vi | 0.0 | Vcc | V | |
| Output Voltage (RD, RDb, SD) | Io | | 30 | mA | |
| Lead Soldering (Temperature) | Ltemp | | 260 | °C | 3 |
| Lead Soldering (Time) | Ltime | | 10 | sec. | 3 |

Note 1. No condensation allowed. 2. Vcc>Vee, Vcc=+5.0V, Vee=GND
3. Measured on lead pin at 2mm (0.079in.) off the package bottom

**⚠ 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, Vcc-Vee = 4.75 to 5.25 V and all operating temperature shall apply. )

## 6-1. Transmitter side

| Parameter | | Symbol | min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | Vcc-Vee | 4.75 | 5.00 | 5.25 | V | |
| Supply Current | | Idtx | | 70 | 180 | mA | 1 |
| Input Voltage | High | Vih | Vcc-1.17 | | Vcc-0.73 | V | 2 |
| TD, TDb | Low | Vil | Vcc-1.95 | | Vcc-1.45 | | |
| Input Current | High | Iih | -10 | | 150 | μA | 2 |
| TD, TDb | Low | Iil | -10 | | 10 | | |
| Signal Input Rise / Fall Time | | Trin, Tfin | | | 0.5 | nsec. | 3 |

Note 1. Input bias current is not included. 50% duty cycle data. 155.52Mbps 2. Vcc-Vee=5.0V, Tc=25°C 3. 20 ~ 80%

## 6-2. Receiver side

| Parameter | | Symbol | min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Supply Voltage | | Vcc-Vee | 4.75 | 5.00 | 5.25 | V | |
| Supply Current | | Idrx | | 60 | 110 | mA | 1 |
| Data & SD | High | Voh | Vcc-1.03 | | Vcc-0.88 | V | 2 |
| Output Voltage | Low | Vol | Vcc-1.81 | | Vcc-1.62 | | |
| Data Rise / Fall Time of Output Signal | | Trout, Tfout | | | 1.6 | nsec | 3 |

Note 1. Output current is not included.
2. Vccrx=+5.0V, Tc=25°C, Output load resistance
Rl=50Ω to Vccrx-2V for RD, RDb and SD.
3. 20 ~ 80%

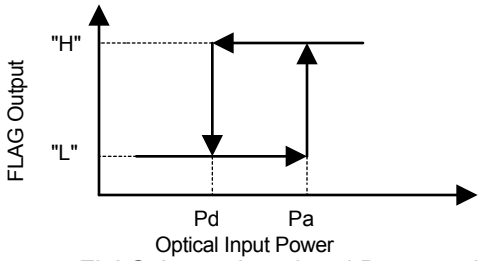



Figure 4. FLAG Assert Level and Deassert Level

# 7. Optical Interface

( Unless otherwise specified, Vcc-Vee = 4.75 to 5.25 V and all operating temperature shall apply. )

## 7-1. Transmitter side

| Parameter | Symbol | min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Average Output Power to SMF | Pos | -5.0 | | 0.0 | dBm | 1 |
| Extinction Ratio | Er | 10.0 | | | dB | 1 |
| Center Wavelength | λc | 1280 | | 1335 | nm | |
| Spectral Width (RMS) | Δλ | | | 4.0 | nm | |
| Eye Mask for Optical Output | Refer to Figure 5 | | | | | |

Note 1. Measured at 155.52Mbps PRBS2^23-1, 50% duty cycle data

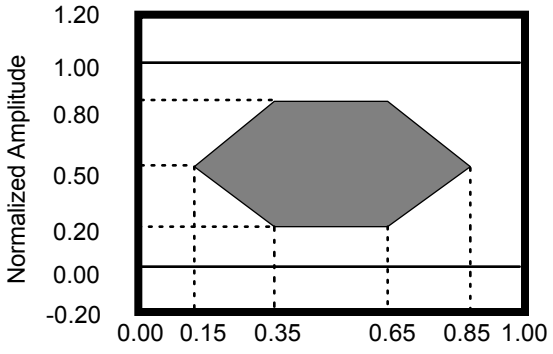



Figure 5. Optical Pulse Mask with Fourth Order Bessel-Thomson Filter Specified in ITU-T G.957

Relation between Input Signal and Optical Output Signal

| Input Signal | | Optical Output Siganl |
|---|---|---|
| TD | TDb | |
| High | Low | ON (High) |
| Low | High | OFF (Low) |
| High | High | Undefined |
| Low | Low | Undefined |

**⚠ Warning**

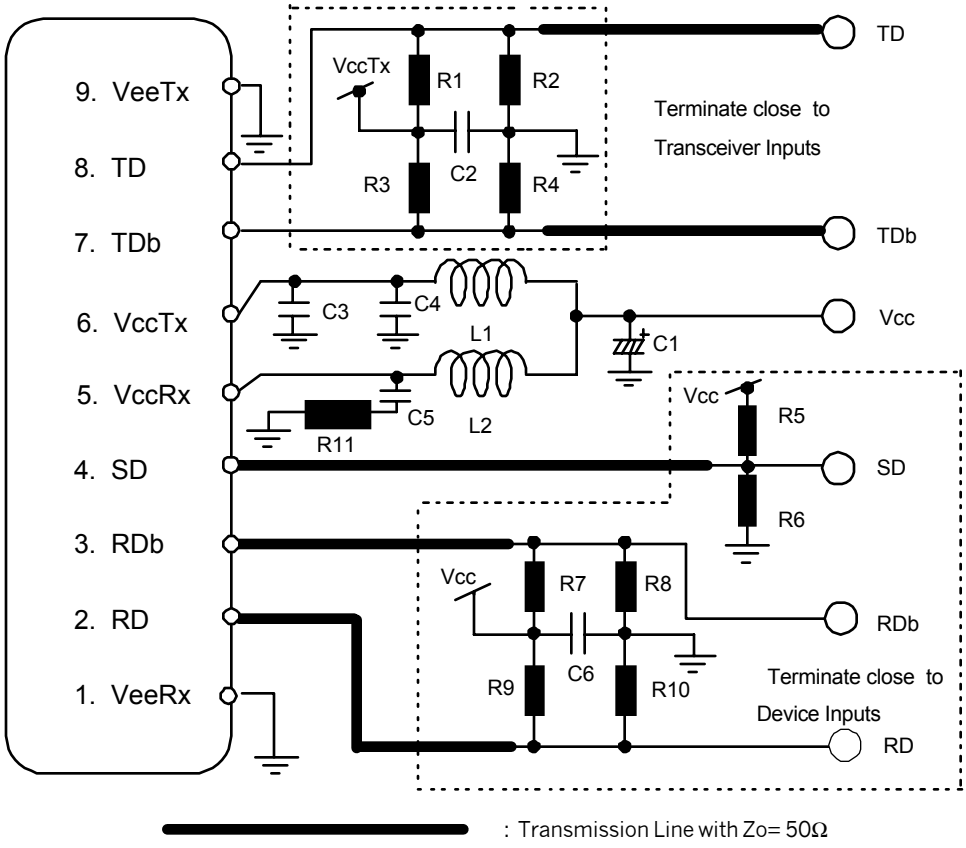
Do not look at the laser beam projection area (e.g. end of optical connector) with naked eyes or through optical equipment while the power is supplied to this product. Otherwise, your eyes may be injured.

## 7-2. Receiver side

| Parameter | Symbol | min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Average Input Power to SMF | Pin | -34.0 | | -8.0 | dBm | 1, 2 |
| Flag Assert Level | Pa | -48.0 | -36.0 | -34.0 | dBm | 2 |
| Flag deassert Level | Pd | -49.0 | -39.0 | -34.0 | dBm | 2 |
| Flag Assert Time | Tsda | | | 100 | µsec | 2, 3 |
| Flag deassert Time | Tsdd | | | 350 | µsec | 2, 3 |

Note 1. BER=10^-10, 2. Measured at the bit rate of 155.52Mbps, PRBS 2^23-1, NRZ
3. 50% duty cycle data

# 8. Recommended Inteface Circuit




R1 = R3 = R5 = R7 = R9 = 82Ω , R2 = R4 = R6 = R8 = R10 = 130Ω , R11=10Ω
C1 = 100 µF, C3 = 2200 pF, C2 = C6 = 0.1 µF, C4 = C5 = 1 µF
L1, L2 : Ferrite Bead ZBF 253D-00 (TDK)

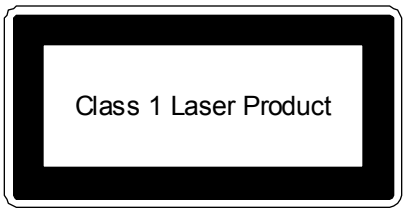
Figure 6 Recommended Interface Circuit

# 9. Reliability Test

| Bellcore TA-NWT-000983 Issue 2, December 1993 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Heading | Test | Reference | Condition | Sampling | | | SEI Plan | |
| | | | | LTPD | SS | C | SS | F/C |
| Mechanical Integrity | Mechanical Shock | MIL-STD-883 Method 2002 | Condition B<br>5 times/axis | | | | | |
| | | | 500G, 1.0 ms | 20% | 11 | 0 | --- | --- |
| | | | 1,500G, 0.5ms | 20% | 11 | 0 | 11 | 0 |
| | Vibration | MIL-STD-883 Method 2007 | Condition A<br>20 G<br>20-2,000 Hz<br>4 min/cycle; 4 cycles/axis | 20% | 11 | 0 | 11 | 0 |
| | Thermal Shock | MIL-STD-883 Method 1011 | ΔT=100°C | 20% | 11 | 0 | 11 | 0 |
| | Solderability | MIL-STD-883 Method 2003 | (steam aging not required) | 20% | 11 | 0 | 11 | 0 |
| | Fiber Pull | | 1 Kg; 3 times;5sec. | 20% | 11 | 0 | --- | --- |
| | | | 2 Kg; 3 times; 5sec. | 20% | 11 | 0 | --- | --- |
| Endurance | Accel. Aging (High Temp.) | (R)-453 Section 5.18 | +85C; rated power<br>>5,000hrs. | --- | 25 | --- | 25 | 0 |
| | | | >10,000hrs. | --- | 10 | --- | --- | --- |
| | High Temp. Storage | ---------- | max. storage T (T=85°C)<br>>2,000 | 20% | 11 | 0 | --- | --- |
| | Low Temp. Storage | ---------- | min. storage T (T=-40°C)<br>>2,000 | 20% | 11 | 0 | 11 | 0 |
| | Temperature Cycling | Section 5.20 | - 40°C to +85°C | | | | | |
| | | | 400 times pass/fail | 20% | 11 | 0 | --- | --- |
| | | | 500 times for info. | --- | 11 | --- | --- | --- |
| | | | 500 times pass/fail | 20% | 11 | 0 | 11 | 0 |
| | | | 1000 times for info. | --- | 11 | --- | 11 | 0 |
| | Damp Heat (if using epoxy) | MIL-STD-202 M103 or IEC 68-2-3 | 40°C , 95%, 56days | 20% | 11 | 0 | 11 | 0 |
| | | | or 85°C /85%RH 2,000hrs. | 20% | 11 | 0 | --- | --- |
| | Cyclic Moisture Resistance | Section 5.23 | ---------- | 20% | 11 | 0 | 11 | 0 |
| Special Tests | Internal Moisture | MIL-STD-883 Method 1018 | < 5,000 ppm water vapor | 20% | 11 | 0 | 11 | 0 |
| | Flammability | TR357:Sec. 4.4.2.5 | ---------- | ---- | ---- | --- | ---- | OK |
| | ESD Threshold | Section 5.22 | ---------- | ---- | 6 | --- | 6 | 0 |

# 10. Laser Safety

This product uses a semiconductor laser system and is a laser class 1 product acc. FDA, complies with 21CFR1040. 10 and 1040.11. Also this product is a laser class 1 product acc. IEC 825-1.




**⚠ Caution**

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

## 11. 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**

- Be sure to carry out correct soldering for connection to peripheral circuits in order to prevent contact failure or short-circuit. Otherwise, a strong laser beam may cause eye injury, overheating or fire.
- Do not put this product or components of this product into your mouth. This product contaions material harmful to health.

**⚠ Caution**

- Be sure to turn the power off when you touch this product connected to the printed circuit boards. Otherwise, electric shock may occur.
- Dispose this product or equipment including this product properly as an industrial waste according to the regulations.

## 12. Ordering Information

| Ordering Number | Connector type | Operating Temperature |
|---|---|---|
| SCM7111-XC | SC Duplex Connector, Non-metallized. | -5 ~ 70°C |
| SCM7111-GC-#N | SC Duplex Connector, Metallized. See chart below for detail. | |

SDM7111-GC-# N

EMI Shield Finger Option
Z : Without Finger
A ~ E : With Type-A Finger
*Letter specifies finger position.
Refer to Figure2-3 for detail.

## 13. For More Information

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