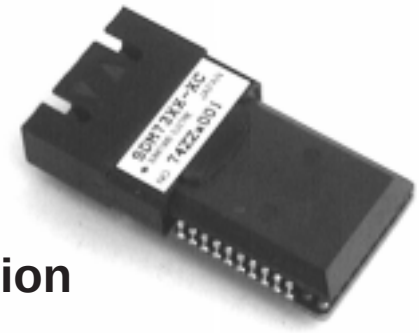


Technical Specification
for
Optical Transceiver Module

SDM7394-XC

☐ 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 the specification described hereinafter without prior notice.

#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 nearby.

⃠ indicates compulsory actions or instructions. Action details are explained near by.

1. General

SDM7394-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-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	622.08 Mbps, NRZ
* Duty Cycle	50%
* Power Supply Voltage	Single +5.0V
* Electrical Interface	PECL
* Fiber Coupled Power	-3 ~ +2dBm (for SMF)
* Sensitivity	-8 ~ -28dBm (Typ. -32dBm)
* Connector Interface	SC Duplex Connector

The features of SDM7394-XC are listed below.

* Features: Low Power Consumption
  Plastic Molded Package
  Multi-sourced Footprint
  - Transmitter..... Uncooled Laser with Automatic Power Control IC
    Optical Output Shut-down (Disable)
    Laser Bias Current Monitor / Optical Output Power Monitor
    Class 1 Laser Product (IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11)
  - Receiver..... Wide Dynamic Range
    Built-in Clock Recovery (including SAW filter)
    ITU-T G.957 / G.958 and Bellcore TA-NWT-000253 Compliant
    Signal Detect (FLAG) Function / Optical Input Power Monitor

2. Block Diagram

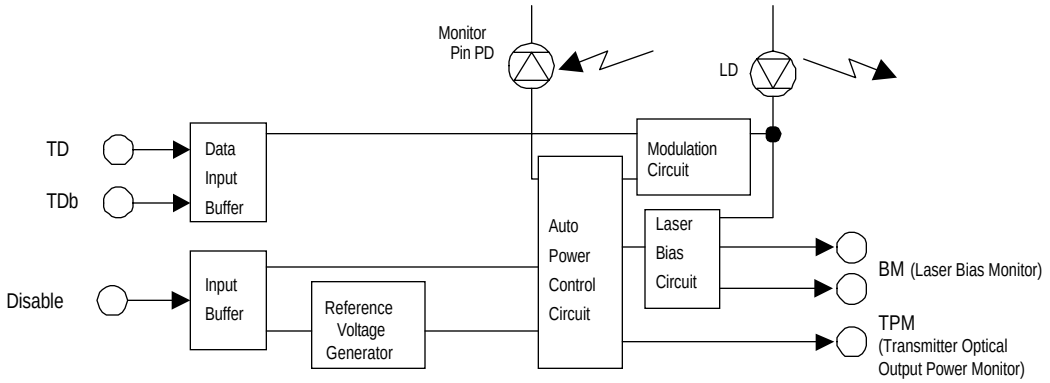


Figure 1-1. Block Diagram (Transmitter)

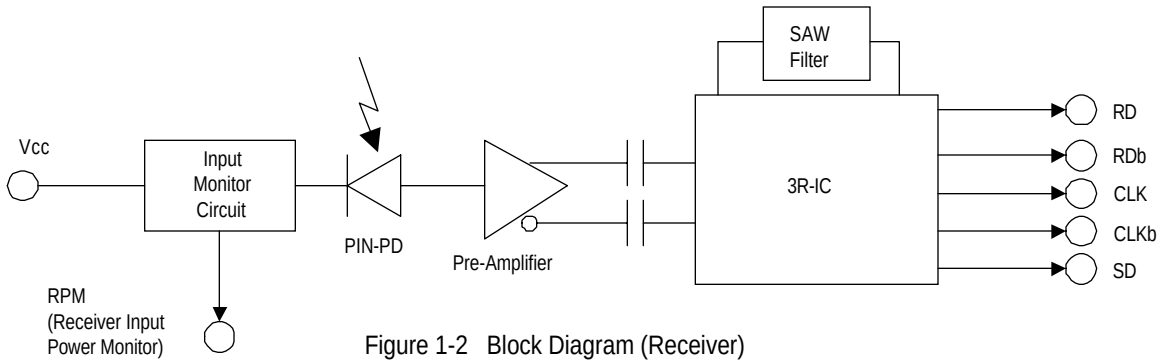


Figure 1-2 Block Diagram (Receiver)

3. Package Dimension

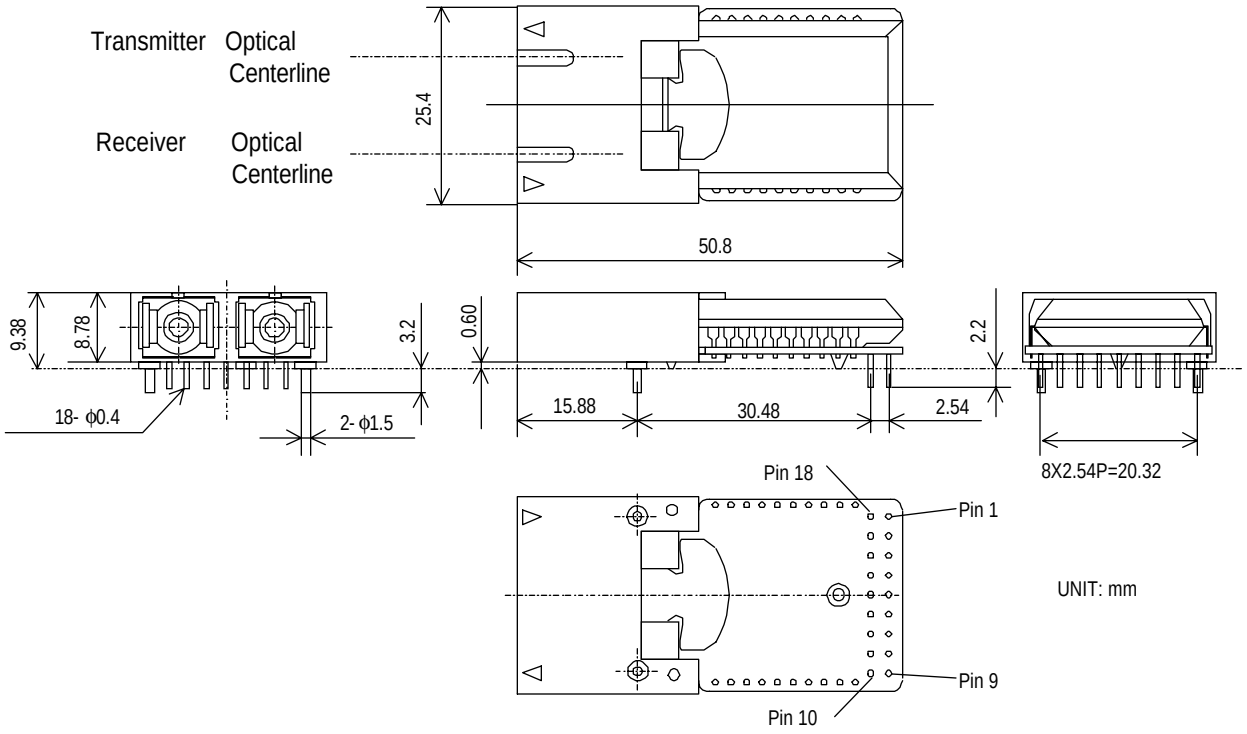


Figure 2. Package Dimension

⚠Caution

Do not disassemble this product. Otherwise, failure, electrical shock overheating or fire may occur.
Handle the lead pin 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	N/C	Non Connection (Internally)
2	N/C	Non Connection (Internally)
3	RCLKb	Differential Clock Output (Negative)
4	RCLK	Differential Clock Output (Positive)
5	BM(-)	Monitoring pin for LD Bias Monitor
6	BM(+)	Monitoring pin for LD Bias Monitor
7	Disable	LD Disable Input
8	RPM	Receiver Input Power Monitor
9	TPM	Transmitter Output Power Monitor
10	Veetx	Power Supply (-) for Transmitter : Connected to GND
11	TD	Transmitter Differential Data (Positive)
12	TDb	Transmitter Differential Data (Negative)
13	Vcctx	Power Supply (+) for Transmitter : Connected to +5.0V
14	Vccrx	Power Supply (+) for Receiver : Connected to +5.0V
15	FLAG(SD)	FLAG (Signal Detect)
16	RDb	Differential Data Output (Negative)
17	RD	Differential Data Output (Positive)
18	Veerx	Power Supply (-) for Receiver : Connected to GND

NC pins should left open for additional functions in the future

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	Vi	Vee	Vcc+0.5	V	3
Lead Soldering (Temperature)			260	°C	4
(Time)			10	sec.	

Note 1. No condensation allowed. 2. Vcc>Vee, Vcc=+5.0V, Vee=GND
3. TD, TDb, Disable 4. 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.

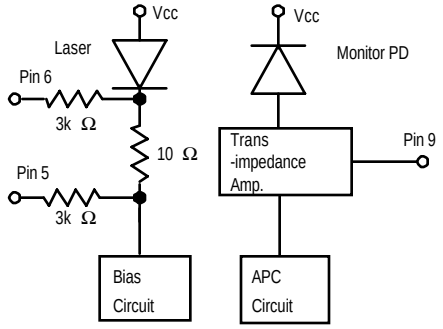
6. Electrical Interface

(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	140	mA	1, 2, 3
Input Voltage	High	Vih	Vcc-1.17		Vcc-0.73	V	4, 5
TD, TDb	Low	Vil	Vcc-1.95		Vcc-1.45		
Input Current	High	Iih	-10		150	µA	4, 5
TD, TDb	Low	Iil	-10		10		
Signal Input Rise / Fall Time					0.5	nsec.	6
Disable Input Voltage		Vdi	Vee+2.0		Vcc	V	7
Disable Input Current		Idi	-10	140	200	µA	
LD Bias Monitor Voltage		Vbm	0.01	0.05	0.50	V	5, 8
Optical Output Monitor	Low level	Vtpm			0.3	V	9
	Normal			1.5			
	High level		3.1				

Note 1. Input bias current is not included. 2. 50% duty cycle data 3. 622.08Mbps 4. Vcc-Vee=5.0V 5. Tc=25°C 6. 20~80% 7. The transmitter is enabled as default state and requires an external voltage only to disable. (Refer to "9. Relation between Disable input Voltage and Optical Output Power 8. The Laser Bias Monitor Current is calculated as ratio of the corresponding voltage to the current-sensing resistor, 10Ω (See Figure 3). Upon measuring or utilzing this value, please use a device whose impedance is high enough (>1MΩ) compared with those resistors. 9. Refer to Figure 4.



Fugure 3. Monitor Pin

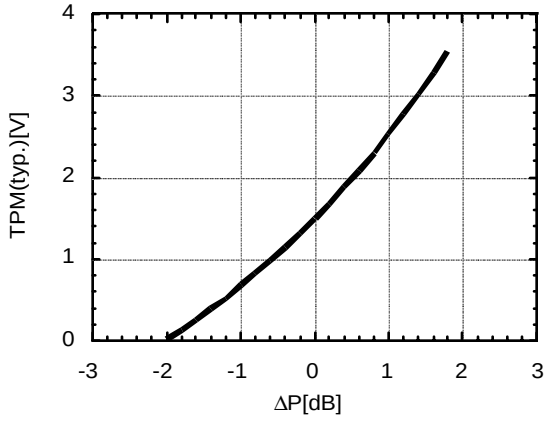


Figure 4. Output Power Change versus th Optical Output Monitor Voltage (typ.)

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		145	200	mA	1,2
Data & Clock Output Voltage	High	Voh	Vcc-1.03		Vcc-0.88	V	3
	Low	Vol	Vcc-1.81		Vcc-1.62		
FLAG Output Voltage	High	Voh	Vcc-1.03		Vcc-0.88	V	4
	Low	Vol	Vcc-1.81		Vcc-1.62		
Clock Rise / Fall Time		Trc / Tfc			500	psec.	5
Data Rise / Fall Time		Trd / Tfd			700	psec.	
Flag Assert Time		Ta			100	µsec	6
Flag Deassert Time		Td			100	µsec	
Clock Sampling Point		Tcsp	600	700	800	nsec.	7
Clock Jitter (rms)		Tjc			16	psec.	2, 3, 8
Clock Duty		Cduty	45	50	55	%	
Data Jitter (rms)		Tjd			40	psec.	
Optical Input Power Monitor	@-20dBm	Vrpm		2.6		V	9
	@-28dBm			0.4			

Note 1. Output current is not included. 2. Measured at the bit rate of 622.08Mbps, PRBS 2^23-1, NRZ
3. Vcc=+5.0V, Tc=25°C, Output load resistance Rl=50Ω to Vcc-2V for RD, RDb, RCLK and RCLKb
4. Vcc=+5.0V, Tc=25°C, Output load resistance Rl=50Ω to Vcc-2V
5. 20~80%, Input capacitance and stray capacitance of measuring devices should be less tham 2pF. 6. Refer to Figure 5.
7. Phase difference between rising edge of RD and Rising edge of RCLK. Refer to Figure 5.
8. Optical Input Power: -28.0 ~ -8.0dBm 9. Refer to Figure 6.

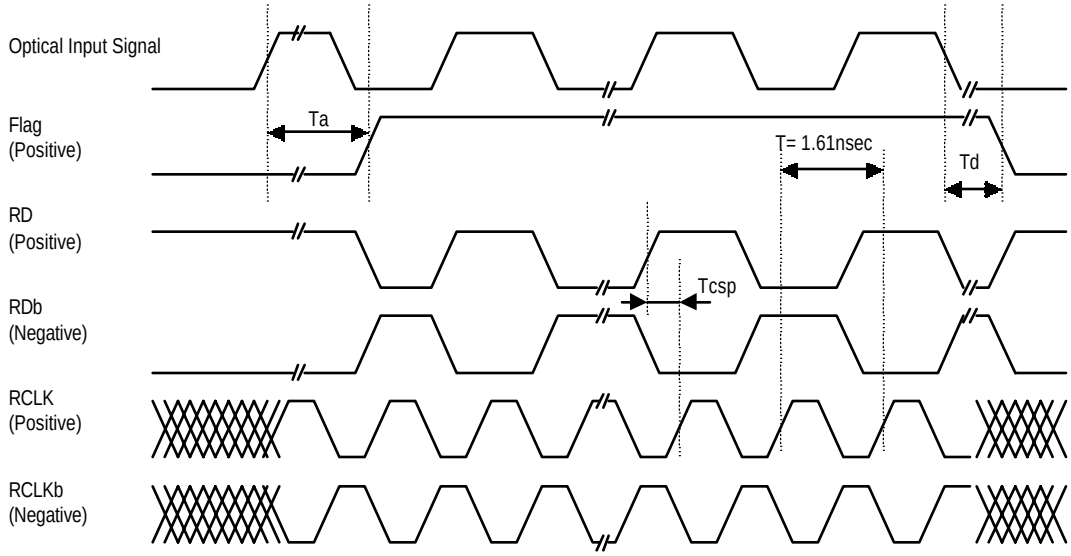


Figure 5. Timing Chart

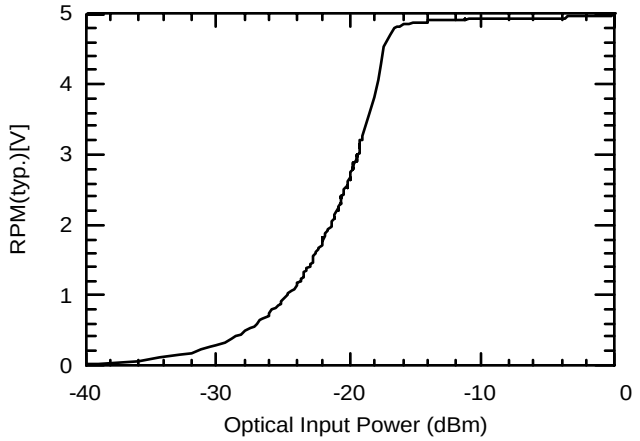


Figure 6. Iutput Power versus the Optical Input Monitor Voltage (typ.)

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	Po	-3.0		+2.0	dBm	1
Extinction Ratio	Er	10.0			dB	1
Center Wavelength	λc	1280		1335	nm	
Spectral Width @-20dB	Δλ20			1.0	nm	
Side Mode Supression Ratio	Sr	30.0			dB	
Eye Mask for Optical Output	Refer to Figure 7					

Note 1. Measured at 622.08Mbps PRBS2^23-1, 50% duty cycle data

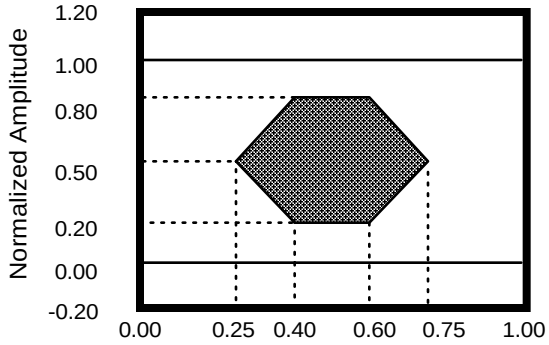


Figure 7. Optical Pulse Mask with Fourth Order Bessel-Thomson Filter Specified in ITU-T G.957

Relation between Input Signal and Optical Output Signal

Input Signal		Optical Output Siganl
TD	TDb	
High	Low	ON (High)
Low	High	OFF (Low)
High	Low	Undefined
Low	High	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
Bit Rate Range	-	622.08 +/- 50ppm			Mbps	
Center Wavelength	-	1261		1580	nm	
Minimum Sensitivity	Pmin		-32.0	-28.0	nm	1, 2
Overload	Pmax	-8.0			nm	1, 2
Consecutive Identical Digit	CID	72	100		bits	3
Flag Assert Level	Pa	-48	-33	-28	dBm	2, 4
Flag deassert Level	Pd	-49	-35	-28	dBm	

Note 1. BER=10^-10

2. Measured at the bit rate of 622.08Mbps, PRBS 2^23-1, NRZ

3. Optical Input Power: -28.0 ~ -8.0dBm, Duty 50% input signal

4. Refer to Figure 5

8. Relation between Disable Input Voltage and Optical Output Power

Disable Input Voltage	Optical Output Power
"L" (Vee ~ Vee+0.4V)	Enabled
"H" (Vee+2.0 ~ Vcc)	Disabled (<-45dBm)

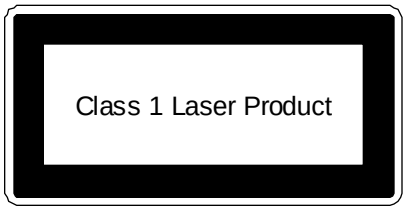
Note. Enabled for no Disable input (pin 7 opened)

9. Reliability Test

Bellcore TA-NWT-000983 Issue 2, December 1993								
Heading	Test	Reference	Condition	Sampling			SEI Result	
				LTPD	SS	C	SS	F/C
Mechanical Integrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B 5 times/axis					
			500G, 1.0 ms	20%	11	0	---	---
			1,500G, 0.5ms	20%	11	0	11	TBD
	Vibration	MIL-STD-883 Method 2007	Condition A 20 G 20-2,000 Hz 4 min/cycle; 4 cycles/axis	20%	11	0	11	TBD
	Thermal Shock	MIL-STD-883 Method 1011	ΔT=100°C	20%	11	0	11	TBD
	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 >5,000hrs.	---	25	---	25	TBD
			>10,000hrs.	---	10	---	---	---
	High Temp. Storage	----------	max. storage T (T=85°C) >2,000	20%	11	0	---	---
	Low Temp. Storage	----------	min. storage T (T=-40°C) >2,000	20%	11	0	11	TBD
	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	TBD
			1000 times for info.	---	11	---	11	TBD
	Damp Heat (if using epoxy)	MIL-STD-202 M103 or IEC 68-2-3	40°C , 95%, 56days	20%	11	0	11	TBD
			or 85°C /85%RH 2,000hrs.	20%	11	0	---	---
	Cyclic Moisture Resistance	Section 5.23	----------	20%	11	0	11	TBD
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	< 5,000 ppm water vapor	20%	11	0	11	TBD
	Flammability	TR357:Sec. 4.4.2.5	----------	----	----	---	----	OK
	ESD Threshold	Section 5.22	----------	----	6	---	6	TBD

10. Laser Safety

This product uses a semiconductor laser system and is a laser class 1 product acc. FDA, complies with 21CFR 1040. 10 and 1040.11. Also this product is a laser class 1 product acc. IEC 825-1.



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
SDM7394-XC	SC Duplex Connector

13. For More Information

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Sumitomo Electric Lightwave Corp., 78 Alexander Drive,Research Triangle Park, NC 27709
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