Specification : TS-S98D009B
Date : December , 1998

Technical Specification

for

5.0V / 1.25Gbps Optical Transceiver Module

SDM7104-XC

☐ 155.52Mb/s	☐ 622.08Mb/s	☑ other 1.25Gb/s
☑ 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 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

SDM7104-XC is a series of compact and high speed performance digital optical transceiver module ideally designed for versatile high speed network applications. 1310nm high speed InGaAsP FP-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.SDM7104-XC is specifically designed to be used in Gigabit Ethernet applications.

- Data Rate 100 ~ 1,250Mbps, NRZ
- Duty Cycle 50%
- Power Supply Voltage Single +5.0V
- Electrical Interface PECL
- Fiber Coupled Power -9.5dBm ~ -3dBm for SMF
  -11.5dBm ~ -3dBm for MMF(*)
  * Transmitter shall be coupled through a singlemode fiber offset-launch mode-conditioning patch cord.
- Sensitivity -20dBm ~ -3dBm
- Connector Interface SC Duplex Connector
- Compliant with Specifications for IEEE 802.3z Gigabit Ethernet

The features of SDM7104-XC are listed below.

- Features Single 5.0V Operation
  Low Power Consumption
  Applicable for both SMF (2~10,000m) and MMF (2~550m)
  Low Profile (9.4mm Max) Plastic Molded Package
  Multi-sourced 1x9 Footprint

Transmitter..... Uncooled Laser with Automatic Power Control IC
Class 1 Laser Product
(IEC 825 and FDA 21 CFR 1040.10 & 1040.11)

Receiver..... Wide Dynamic Range
Signal Detect Function

2. Block Diagram

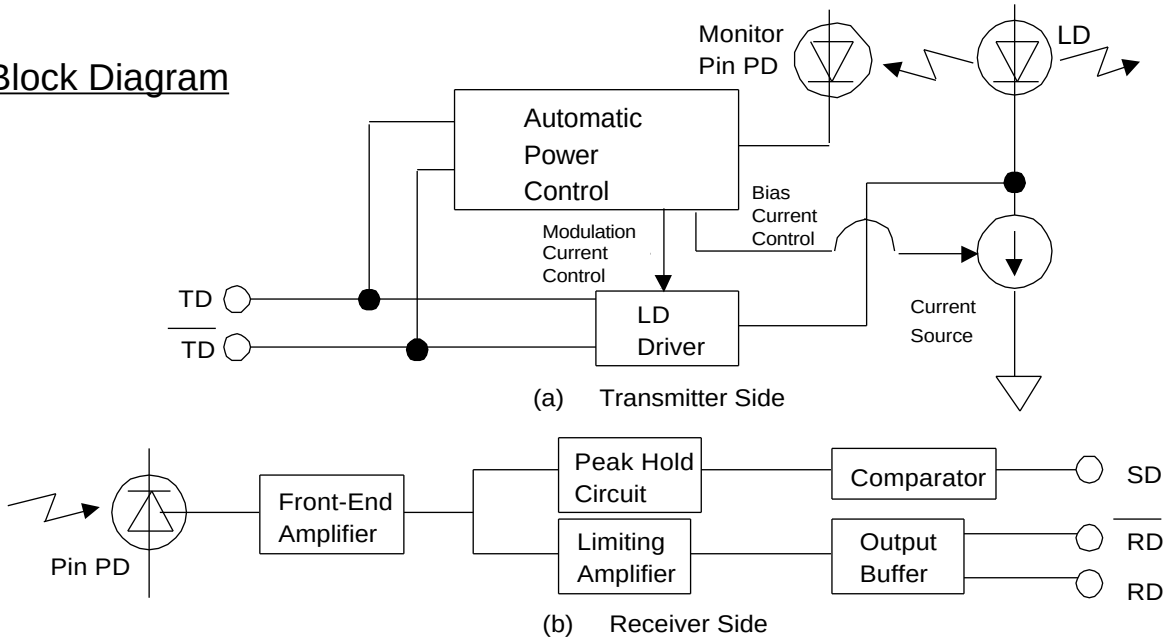
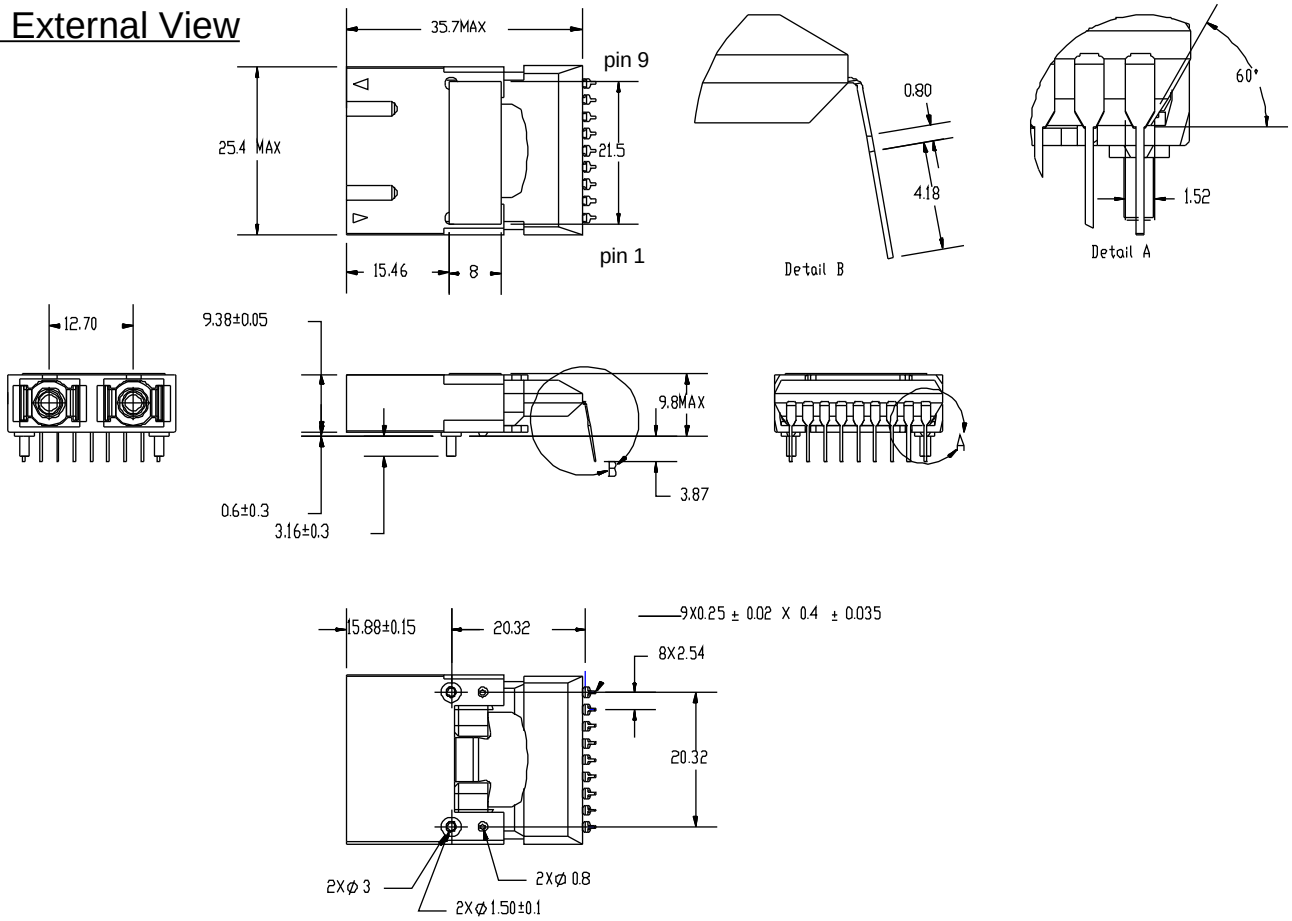


Figure 1 Block Diagram

3. External View



4. Footprint and Pin Assignments

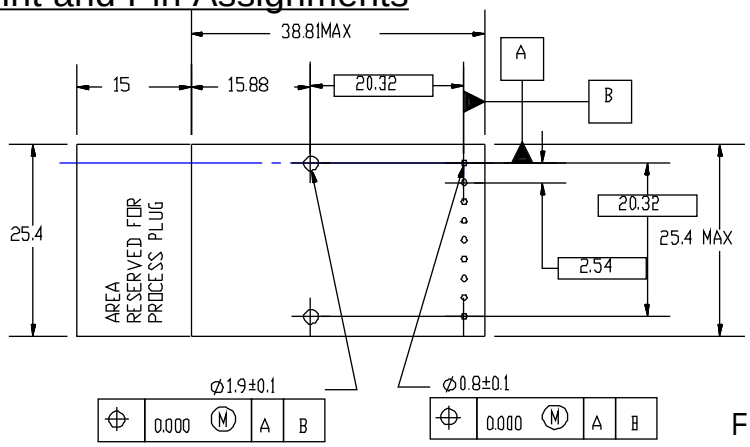


Figure 3: Footprint

No	Symbol	Function
1	V_{eeRX}	Power Supply (-) for Receiver : Connected to GND
2	RD	Received Differential Data (positive)
3	$\overline{RD}$	Received Differential Data (negative)
4	SD	Signal Detect
5	V_{ccRX}	Power Supply (+) for Receiver : Connected to +5.0V
6	V_{ccTX}	Power Supply (+) for Transmitter : Connected to +5.0V
7	$\overline{TD}$	Transmitting Differential Data (negative)
8	TD	Transmitting Differential Data (positive)
9	V_{eeTX}	Power Supply (-) for Transmitter : Connected to GND

5. Maximum Absolute Ratings

Parameter	Symbol	Min.	Max.	Unit	Note
Storage Case Temperature	Ts	-40	85	°C	1
Operating Ambient Temperature	Ta	0	70	°C	1
Supply Voltage	Vcc-Vee	0	6.0	V	2
Input Voltage	Vi	Vee	Vcc+0.5	V	3
Lead Soldering (Temperature) (Time)			260 10	°C sec.	4

Note 1. No condensation allowed 2. Vcc > Vee, Vee = GND for Vcc = +5.0V 3. TD, $\overline{TD}$
4. Measured on lead-pins 2mm(0.079inch) off the package bottom

6. Electrical Interface

(Ta=0 to 70, Vcc=4.75 to 5.25V, Vee=GND, unless otherwise specified)

6.1 Transmitter Side

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		V_{CCTX}	4.75	5.00	5.25	V	
Supply Current		I_{CCTX}		70	150	mA	
Input Voltage	(High)	V_{IH}	V_{CCTX} -1.17		V_{CCTX} -0.73	V	1
	(Low)	V_{IL}	V_{CCTX} -1.95		V_{CCTX} -1.45		
Input Current	(High)	I_{IH}	-10		150	µA	1
	(Low)	I_{IL}	-10		10		
Rise / Fall Time of Input Signal		T_{rin} & T_{fin}			240	psec	2

Note 1. V_{CCTX} =+5.0V, T_a =25 °C 2. 20 - 80%

6.2 Receiver Side

Parameter		Symnol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		V_{CCRX}	4.75	5.00	5.25	V	
Supply Current		I_{CCRX}		90	140	mA	1
Output Voltage	(High)	V_{OH}	V_{CCRX}– 1.10		V_{CCRX}– 0.86	V	2,3
(RD,$\overline{RD}$, SD)	(Low)	V_{OL}	V_{CCRX}– 1.86		V_{CCRX}– 1.62		
Rise/Fall Time of Output Signal		T_{rout} T_{fout}		230		psec	6

Note 1. Output current are not included.
Note 2. Output load resistor (R = 50 Ω) is connected to V_{CCRX} – 2.0V
Note 3. VCCRX = +5.0V, Ta = 25°C, Note 4. 20 ~ 80 %

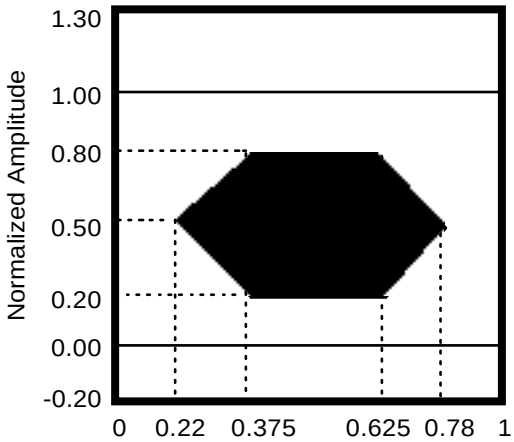
7. Optical Interface

(Ta=0 to 70, Vcc=4.75 to 5.25V, Vee=GND, unless otherwise specified)

7.1 Transmitter Side

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Output Power to SMF/MMF	P_o	-9.5 / -11.5		-3 / -3	dBm	1 2
Extinction Ratio	E_r	9			dB	1
Center Wavelength	λ_{CE}	1285		1343	nm	
Spectral Width (RMS)	$\Delta\lambda$			2.8		
Relative Intensity Noise	RIN			-120	dB/Hz	
Rise/Fall Time(20~80%)	t_r/t_f			0.26	ns	3

Note 1: Measured with 1,250Mbps PRBS 2^{23}-1 NRZ
Note 2: With MMF links, Transmitter shall be coupled through a singlemode fiber offset-launch mode-conditioning patch cord.
Note 3: 1.25Gbps 1010Signal.Refer to Figure 4



Relation between Input Signal and Optical Output Signal

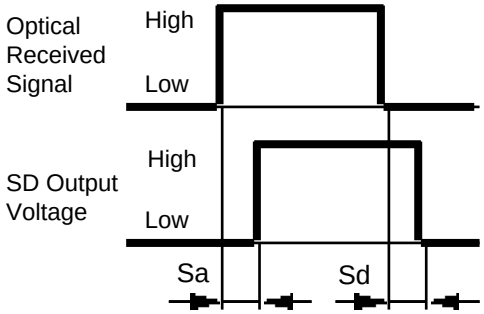
Input Signal		Optical Output Signal
TD	$\overline{TD}$	
High	Low	ON (High)
Low	High	OFF (Low)
High	High	Undefined
Low	Low	Undefined

Figure 4 Optical Pulse Mask with Fourth Order Bessel Thompson Filter Specified in ITU-T G.957

7.2 Receiver Side

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Receiver Power	P_{in}	-20		-3	dBm	1
SD Assert Level	Pa	-30		-19	dBm	
SD Deassert Level	Pd	-30		-19	dBm	2
SD Hysteresis	Phys		3		dB	
SD Assert Time	Sa			100	µsec	2, 3
SD Deassert Time	Sd			350	µsec	

Note 1. BER=1.0 X 10^{-12}, 1.25Gbps, PRBS=2^7-1 2. 1.25Gbps, 1010 Signal 3. Refer to Figure 5

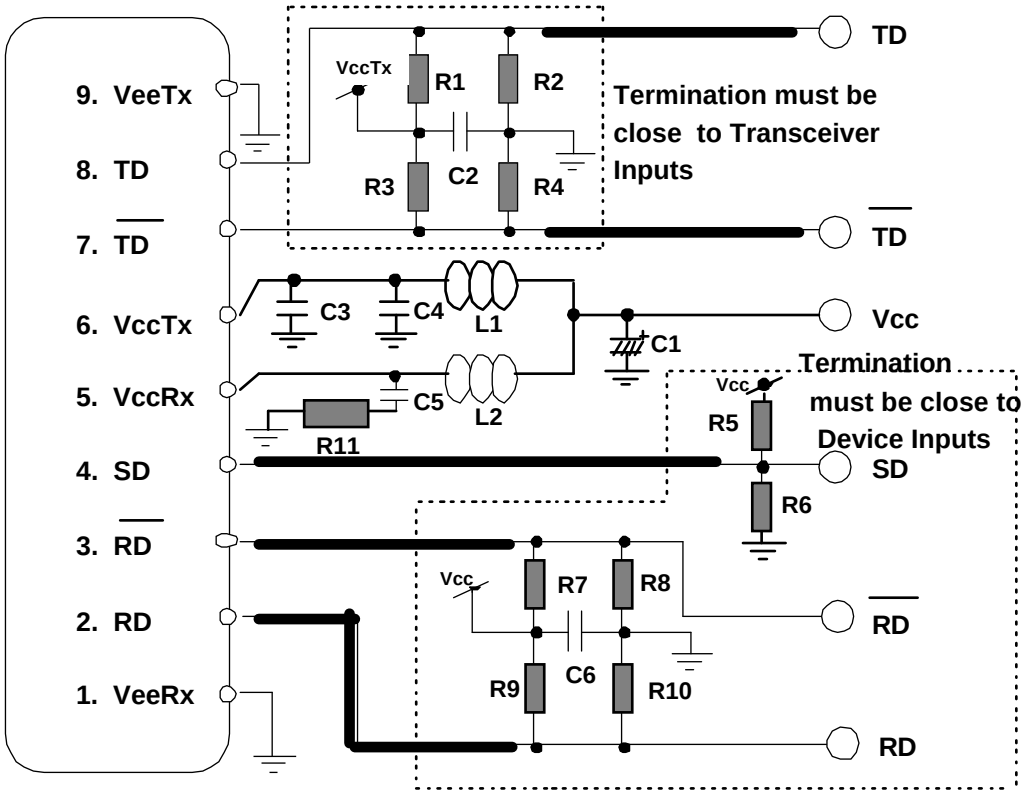


Relation between Optical Received Signal and Data Output

Optical Received Signal	Data Output	
	RD	$\overline{RD}$
High (ON)	High	Low
Low (OFF)	Low	High

Figure 5. SD Timing Chart

8. Recommended Interface Circuit



R1 = R3 = R5 = R7 = R9 = 82 Ω, R2 = R4 = R6 = R8 = R10 = 130 Ω, R11=10 Ω
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.Laser Safety

-This transmitter is a laser class 1 product acc. FDA, complies with 21CFR1040. 10 and 1040.11.
-This transmitter is a laser class 1 product acc.IEC 825-1.

10. Reliability

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	0
	Vibration	MIL-STD-883 Method 2007	Condition A 20 G 20-2,000 Hz 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 >5,000hrs.	---	25	---	25	0
			>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	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 or 85°C /85%RH 2,000hrs.	20% 20%	11 11	0 0	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

11.Other Precaution

Under such a strong vibration environment as in automobile, the permormance and reliability are not guaranteed.

The govermental 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 diposed of according to your company's safe working practice.

12. Ordering Information

Connector type	Ordering Number
SC Duplex	SDM7104-XC

13. For More Information

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