Specification : TS-S94D034C
Date : June 10, 1996

SET

Technical Specification
for
156Mbps Plastic Molded Fiber Optic Transmitter Module

SDT8211-T_-QN

☑ 155.52Mb/s	☐ 622.08Mb/s	☐ other _____
☐ Short Haul Intermediate Reach	☑ Long Haul Long reach	☐ other _____
☑ Transmitter	☐ Receiver	☐ Transceiver
	(☐ 2R / ☐ 3R)	(☐ 2R / ☐ 3R)

SUMITOMO ELECTRIC INDUSTRIES, LTD.

SUMITOMO Electric reserves the right to make changes in the specification described hereinafter without prior notice.

1. General

SDT8211-T_-QN is a compact and high performance digital fiber optic transmitter module ideally designed for high speed data communication systems or telecommunication transmission systems including SDH STM-1 L-1.1 and SONET OC-3 LR-1. The device also meets Bellcore TA-NWT-000253 requirement and ITU-TS G.957 / G.958 recommendation.

• Application	SDH STM-1 L-1.1 / SONET OC-3 LR-1 Compliant
• Data Rate	155.52 Mbps
• Power Supply Voltage	Single +5V (or -5V)
• Electrical Interface	PECL (or ECL)
• Laser Diode	1300 nm InGaAsP / InP
• Connector Interface	FC or SC pigtail, 60cm - long
• Pin Configuration	20 pin Dual in Line

The features of SDT8211-T_-QN are listed below. These features provide many functions and advantages for the system SDT8211-T_-QN used in.

• Features	Low Power Consumption
	Plastic Molded Package
	Uncooled Laser with Automatic Optical Power Control Circuit
	Optical Output Shut-down (Disable)
	Laser Bias Monitor
	Laser Rear Facet Monitor
	Multi-sourced Footprint

Warnings and safety precautions

To avoid personal injury, follow all danger warnings on this product, as well as safety procedures established by your company. Also to avoid damage to equipment or interruption to service, follow all caution warnings on this product, as well as procedures established by your company.

The followings are samples of danger and caution warnings.

DANGER

Risk of personal injury

A danger warning informs the reader of a risk of personal injury

CAUTION

Risk of damage to equipment

A caution warning informs the reader of a risk of service interruption or equipment damage.

DANGER

Risk of electric shock

This warning advises you of a possible electrical hazard. When you see this warning, proceed with care, to avoid personal injury.

2. Block Diagram

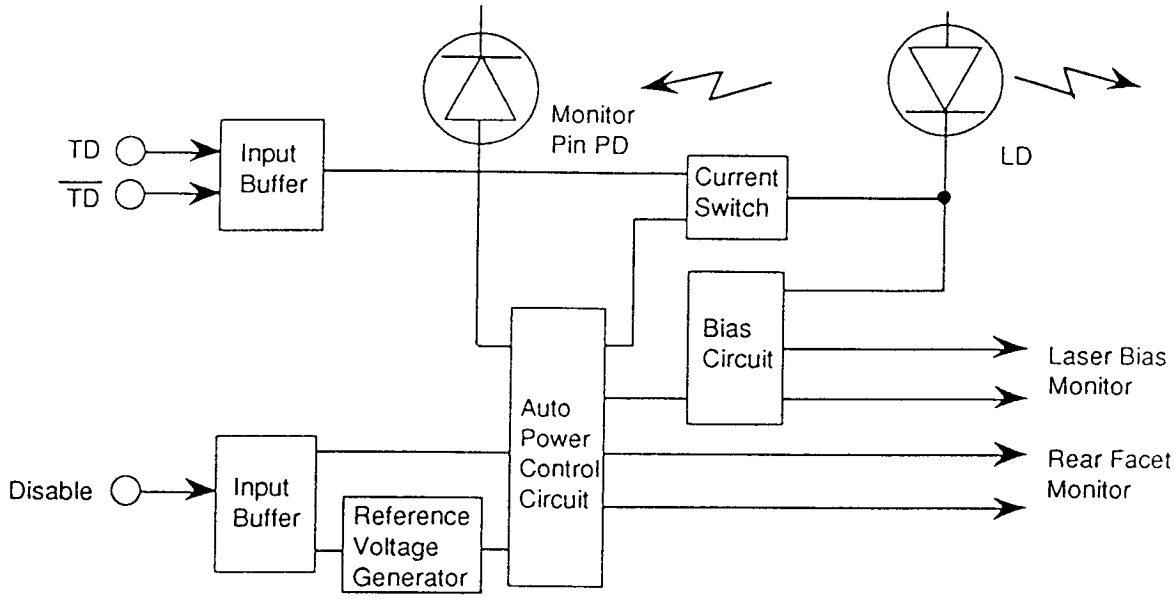


Figure 1 Block Diagram

3. Package Dimension

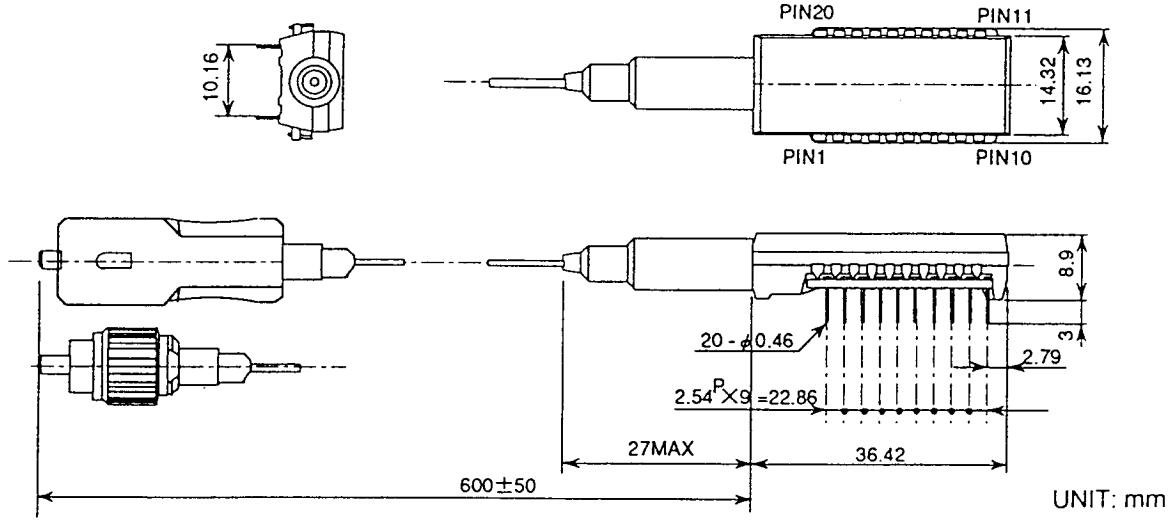


Figure 2. External View

DANGER

-Lead pin can penetrate the skin.Handle with care.

-The module consists semiconductor devices and electrical circuit. Taking it apart or making it over may cause short-circuit and electrical hazard.

CAUTION

-Mechanical shocks or over stress may cause the damage on the performance of this optical module. Please avoid them.

-This module is highly integrated Taking the module apart may cause some serious influences on its characteristics. Once it should be taken apart, no spesification on these sheets could be guaranteed.

4. Pin Assignment

No.	Symbol	Function
1	NC	Non Connection.
2	BM (+)	Monitoring Pin for LD Bias Current (Refer to Figure 3)
3	NC	Non Connection.
4	BM (-)	Monitoring Pin for LD Bias Current (Refer to Figure 3)
5	Vee	Power Supply (-) : Vee = GND for Vcc = +5V or Vee = -5V for Vcc = GND
6	Vcc	Power Supply (+) : Vcc = +5V for Vee = GND or Vcc = GND for Vee = -5V
7	Disable	LD Disable Input (Refer to 9. Relation between Disable Input Voltage and Optical Output Power)
8	Vcc	Power Supply (+) : Vcc = +5V for Vee = GND or Vcc = GND for Vee = -5V
9	Vcc	Power Supply (+) : Vcc = +5V for Vee = GND or Vcc = GND for Vee = -5V
10	NC	Non Connection.
11	NC	Non Connection.
12	Vcc	Power Supply (+) : Vcc = +5V for Vee = GND or Vcc = GND for Vee = -5V
13	NC	Non Connection.
14	Vee	Power Supply (-) : Vee = GND for Vcc = +5V or Vee = -5V for Vcc = GND
15	$\overline{TD}$	Negative Data Input (Refer to 6. Electrical Interface)
16	TD	Positive Data Input (Refer to 6. Electrical Interface)
17	RFM (-)	Monitoring pin for Rear Facet Monitor Current (Refer to Figure 3)
18	Vcc	Power Supply (+) : Vcc = +5V for Vee = GND or Vcc = GND for Vee = -5V
19	RFM (+)	Monitoring pin for Rear Facet Monitor Current (Refer to Figure 3)
20	NC	Non Connection.

NC pins should be left open for additional functions in the future.

DANGER

Risk of electric shock: Whenever the module on the circuit board may be handled, confirm that POWER SUPPLY IS NOT PROVIDED.

CAUTION

-The components should be handled in the same manner as ordinary semiconductor devices to prevent the electro-static damages. For safe keeping and carrying, the components should be packaged with ESD proof material. To assemble the components on PCB, the workbench. the soldering iron and the human body should be grounded.

-Never short-circuit. The device may be damaged.

5. Absolute Maximum 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	7	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 = +5V or Vcc = GND for Vee = -5V.
3. TD, $\overline{TD}$ and Disable
4. Measured on leads-pin at 2mm(0.079inch) off the package bottom

CAUTION

-Any overstresses in excess of the Absolute Maximum Ratings shown above may cause permanent damages on the device. Functional operations of the device is not implied at these or any other conditions in excess of given in the operations sections of the data sheet. Exprosure to Absolute Maximum Ratings for extended periods may affect reliability of device.

-Please pay special attention to the atmosphere condition of the components because the dew on the module may cause some electrical damages.

6. Electrical Interface

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

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		Vcc - Vee	4.75	5.00	5.25	V	
Supply Current		Idtx		60	130	mA	1, 2, 3
Input Voltage TD, $\overline{TD}$	High	Vih	Vcc-1.17		Vcc-0.73	V	4, 5
	Low	Vil	Vcc-1.95		Vcc-1.45	V	
Transmitter Disable Voltage		Vd	Vcc-2		Vcc	V	6
Transmitter Enable Voltage		Ven	Vee		Vee+0.4	V	6
LD Bias Monitor Voltage		Vbm	0.01		0.45	V	5, 7
Rear Facet Monitor Voltage		Vrfm	0.01		0.20	V	2, 7

Note
1. Input bias current is not included in Supply Current.
2. Mark Ratio 1/2.
3. 155.52Mbps
4. Vcc-Vee=5V
5. Ta=25°C
6. 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)
7. The Laser Bias and Rear Facet Monitor currents are calculated as ratios of the corresponding voltages to thier current-sensing resistors, 10 Ω and 200 Ω, respectively (See Figure 3). Upon measuring or utilizing these values, use a device whose input impedance is high enough (>1MΩ) compared with those resistors.

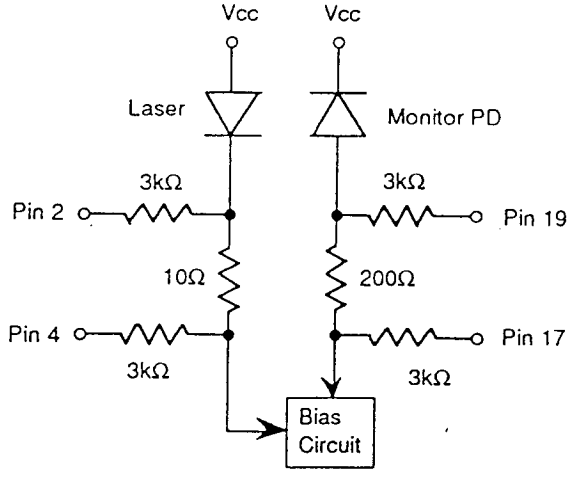


Figure 3 Monitor Circuit Schematic Diagram

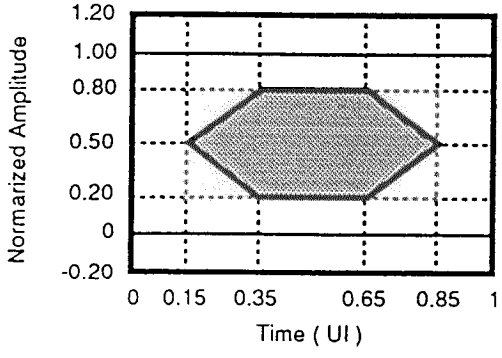


Figure 4 Eye Mask for Optical Output with Fourth Order Bessel-Thomson Filter Specified in ITU-TS G.957

7. Optical Interface

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	Po	-5		0	dBm	1
Extinction Ratio	Er	10			dB	2
Center Wavelength	λ c	1280		1335	nm	
Spectral Width (RMS)	$\Delta\lambda$			4	nm	
Eye Mask for Optical Output	Refer to Figure 4					

Note

1. Measured at the bit rate of 155.52Mbps (2^{23} -1)PRBS NRZ
2. Mark Ratio 1/2.

DANGER

-Unterminated optical connector may emit laser radiation. Do not view with the optical instruments.

-Without optical fiber and connector, the module may provide exessive optical output power. Do not take the module apart nor remove optical fiber and connector.

8. Relation between Input Signal and Optical Output Power

Input Signal		Optical Output Power
TD	$\overline{TD}$	
"H"	"L"	ON ("H")
"L"	"H"	OFF ("L")
"H"	"H"	undefined
"L"	"L"	undefined

9. Relation between Disable Input Voltage and Optical Output Power

Disable Input Voltage [V]	Optical Output Power
"L" (Vee ~ Vee+0.4)	Enabled
"H" (Vcc-2 ~ Vcc)	Disabled (<-45dBm)

Note

1. Enabled for no Disable input (Pin 7 opened)
2. Refer to Figure 6, if interface condition is not suitable.

10. Fiber Pigtail Specification

Parameter	Min.	Typ.	Max.	Unit	Note
Mode Field Diameter		9.5		μm	
Cladding Diameter		125		μm	
Outer Jacket Diameter		0.9		mm	
Optical Fiber Tensile Break Strength			9.8	N	
Bend Radius	30			mm	

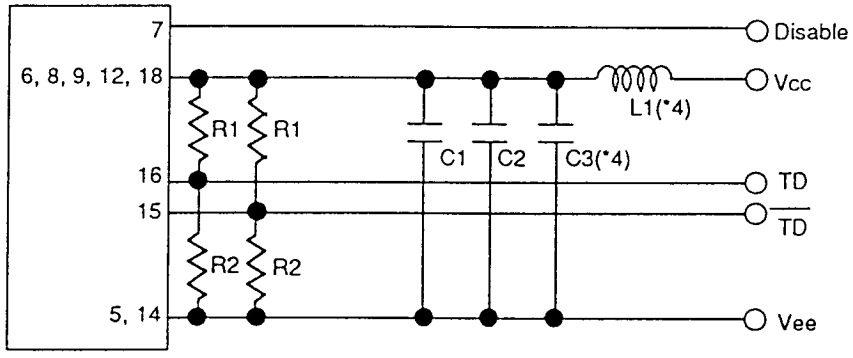
DANGER

-Exposed optical fiber may penetrate your skin. Especialy if it should penetrate your eyes, you may lose your sight. Handle with care. Never take the module apart nor make it over.

CAUTION

-The accessory cap should be attached to the connector part while the optical connector is not in use, because dust on the optical interface port may let the optical power or sensitivity degrade.
-The stress to the fiber pigtail may cause the damage on the performance. The fiber pigtail may snap off by dropping the module.

11. Recommended User Interface



C1 = 0.022 μF / (Ceramic Chip Capacitor)
C2 = 1 μF / (Ceramic Chip Capacitor)
R1 = 82 Ω (≥1 / 8 W)
R2 = 130 Ω (≥1 / 8 W)
R3 = 510 Ω (≥1 / 8 W)

Note : 1. Terminated resistors (R1, R2) should be located as close to the module as possible.
2. 50Ω impedance lines are recommended for TD and $\overline{TD}$.
3. Please refer to Figure 3 for Pin 2, 4, 17 19.
4. C3 = 470 μF, L1 = 100 μH are effective when ripple of power supply is large.

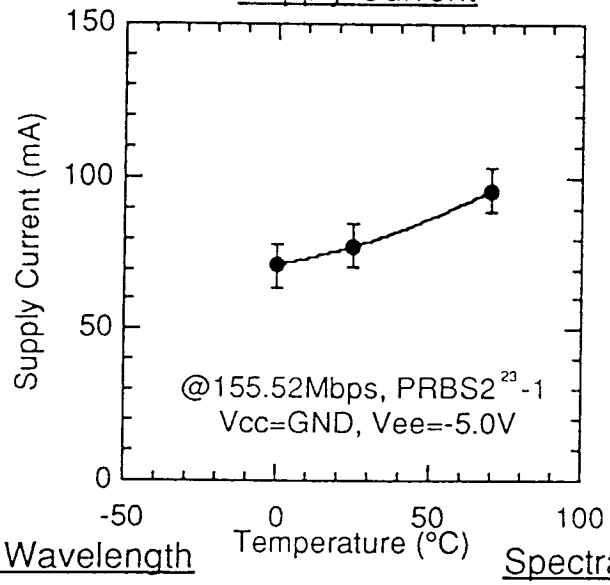
Figure 5 Recommended User Interface

CAUTION

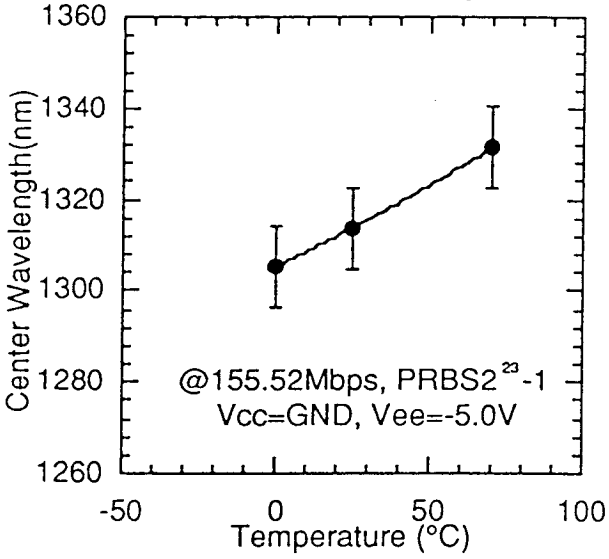
-To eliminate the ripple noise to supply voltage, a ripple filter should be placed as close to the component as possible.
-The signal input and output terminals should not be short-circuited to supply voltage or ground.

12. Typical Characteristics Information

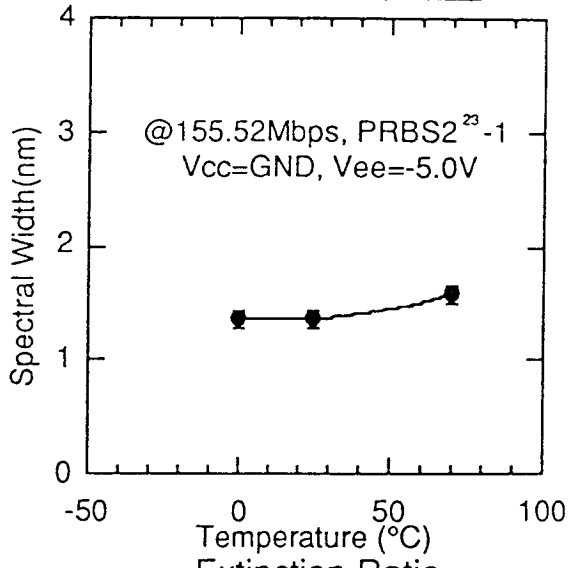
Supply Current



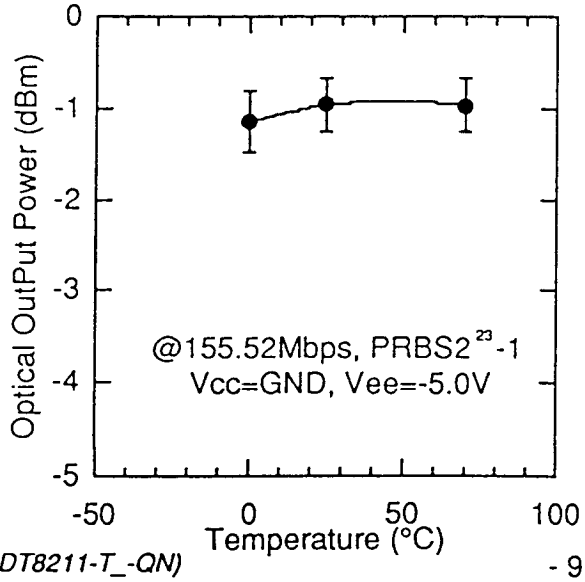
Center Wavelength



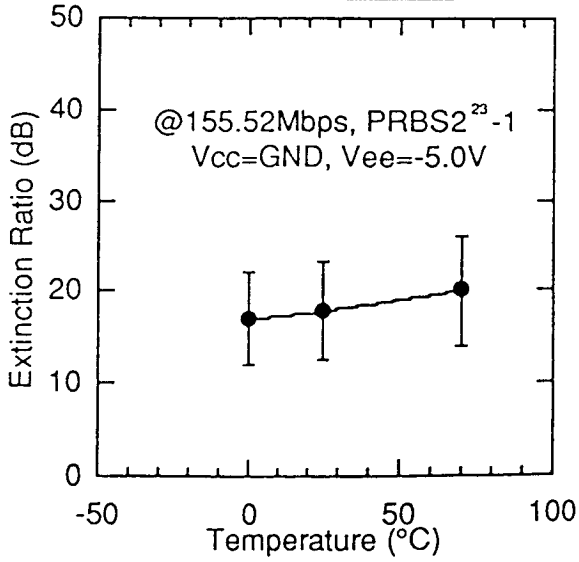
Spectral Width (RMS)



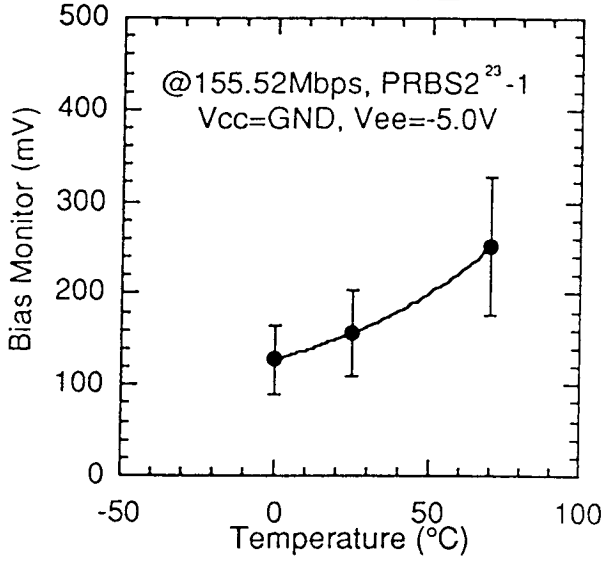
Optical OutPut Power



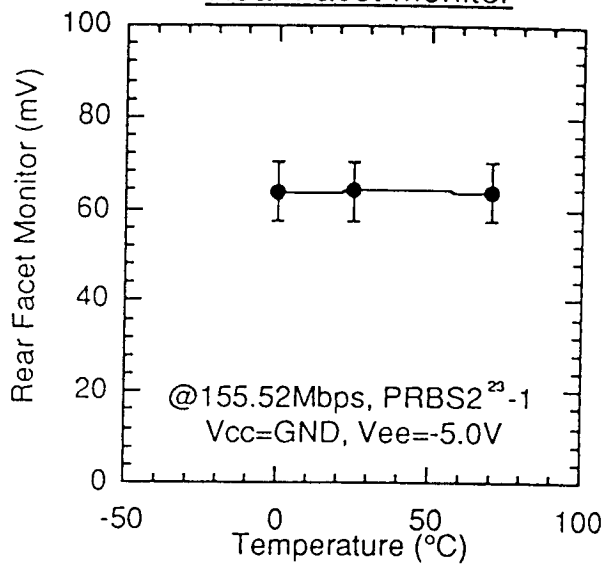
Extinction Ratio



Bias Monitor



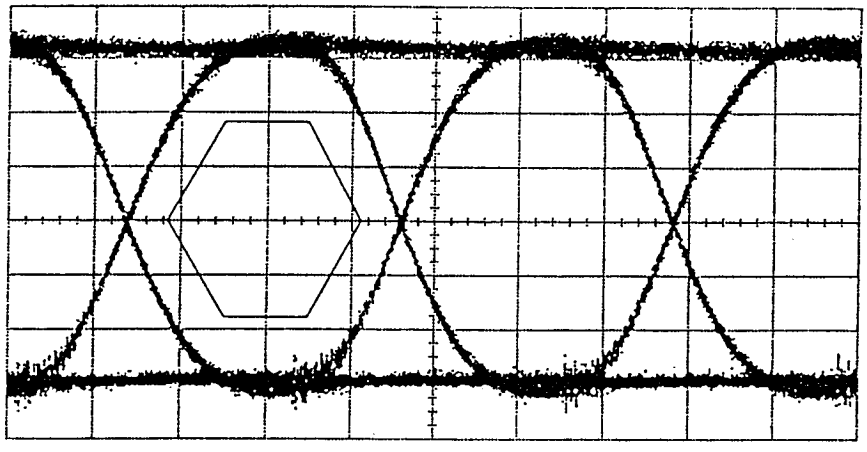
Rear Facet Monitor



Typical Output Waveform

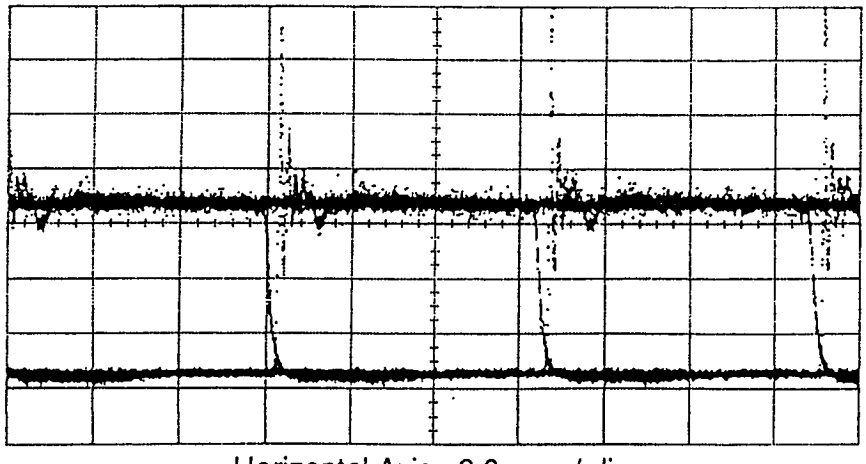
@155.52Mbps, PRBS 2^{23}-1, Vcc=GND, Vee=-5V, 25°C

with fourth order Bessel-Thomson Filter specified in ITU-TS G.957



Horizontal Axis : 2.0nsec / div.
Vertical Axis : 10mV / div.

without fourth order Bessel-Thomson Filter specified in ITU-TS G.957



Horizontal Axis : 2.0nsec / div.
Vertical Axis : 20mV / div.

13.Reliability Test

Bellcore TA-TSY-000983							
Heading	Test	Reference	Condition	Sampling Plan		SEI Results	
				LTPD	SS	SS	F/C
Mechanical Integrity	Mechanical Shock	MIL-STD-883 Method 2002	Condition B 500 G 0.5 ms 5 times/axis	20%	11	11	0
	Vibration	MIL-STD-883 Method 2007	Condition A 20 G 20-2,000 Hz 4 min/cycle; 4 cycles/axis	20%	11	11	0
	Thermal Shock	MIL-STD-883 Method 1011	ΔT=100°C	20%	11	11	0
	Solderability	MIL-STD-883 Method 2003	(steam aging not required)	20%	11	11	0
	Fiber Pull	(UNC)	> 1 Kg; 3 times	20%	11	11	0
			> 2 Kg; 10 times	20%	11		
Endurance	Accelerated Aging	Section 6.26 max. rated power	+85°C ambient; > 5,000 hrs.		SS>25	25	0
			+85°C ambient; >10,000 hrs.		10<SS<25		
	Low Temp. Aging	Section 6.26 max. rated power	-40°C ambient; > 2,000 hrs.		SS>25	25	0
			- 40°C ambient; > 4,000 hrs.		10<SS<25		
	Temperature Cycling	Section 6.29	- 40 °C to +85°C 400 times pass/fail 500 times for info.	20%	11		
		(UNC)	- 40 °C to +85°C 500 times pass/fail 1000 times for info.	20%	11	11	0
	Damp Heat (if using epoxy)	MIL-STD-202 M103 or IEC 68-2-3	40 °C , 95%, 56days	20%	11	11	0
	Cyclic Moisture Resistance	Section 6.32	(to be determined)	20%	11		
		(UNC)	(TBD) MIL-STD-883 M1004	20%	11	11	0
	High Temp. Storage	Section 6.30	+ 85°C ; > 2,000hrs.	20%	11		
	Low Temp. Storage	Section 6.31	-40°C ; > 2,000hrs.	20%	11	11	0
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	< 5,000 ppm water vapor	20%	11	11	0
	Flammability	TR-TSY-000078					OK
	ESD Threshold	Section 6.37	> 500V, HBM		> 6	6	0

14. 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.

15.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.

16. Ordering Information

Connector type	Ordering Number
FC - PC	SDT8211-TD-QN
SC	SDT8211-TC-QN

17. For More Information

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