



Technical Specification for Optical Transceiver Module

SCM6405

- | | | |
|---|---|--|
| <input type="checkbox"/> 155.52Mb/s | <input type="checkbox"/> 622.08Mb/s | <input checked="" type="checkbox"/> other OC-3/12 Dual Rate |
| <input checked="" type="checkbox"/> Short Haul | <input type="checkbox"/> Long Haul | <input type="checkbox"/> other _____ |
| <input type="checkbox"/> Intermediate Reach | <input type="checkbox"/> Long Reach | <input type="checkbox"/> other _____ |
| <input type="checkbox"/> Single 5.0 V | <input checked="" type="checkbox"/> Single 3.3 V | <input type="checkbox"/> other _____ |
| <input checked="" type="checkbox"/> 1.3 μ m | <input type="checkbox"/> 1.55 μ m | <input type="checkbox"/> other _____ |
| <input type="checkbox"/> Transmitter | <input type="checkbox"/> Receiver | <input checked="" type="checkbox"/> Transceiver(2 X 5) |
| | (<input type="checkbox"/> 2R / <input type="checkbox"/> 3R) | (<input checked="" type="checkbox"/> 2R / <input type="checkbox"/> 3R) |

Applicable Part Numbers : SCM6405-GL-ZN(A), SCM6405-GL-CN(A), SCM6405-GL-DN(A)
 SCM6405-GL-ZW(A), SCM6405-GL-CW(A), SCM6405-GL-DW(A)
 SCM6405-JL-ZN(A), SCM6405-JL-CN(A), SCM6405-JL-DN(A)
 SCM6405-JL-ZW(A), SCM6405-JL-CW(A), SCM6405-JL-DW(A)



Sumitomo Electric reserves the right to make changes in this 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 thereafter.

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

(SCM6405)

1. General

Features of SCM6405 are listed below.

- * OC-3/12 Dual Rate Operation
- * Power Supply Voltage Single +3.3V
- * Compact Package Size 49.0 X 13.59 X 9.8 mm (max.)
- * Electrical Interface AC coupled for DATA and LVTTL for Signal Detect and Laser Disable
Circuit ground is internally isolated from frame ground.
- * Fiber Coupled Power -8 ~ -15dBm (Typ. -11dBm) into SMF
- * Input Power Range -8 ~ -28dBm (OC-3/12)
- * Laser Disable Function
- * Signal Detect (SD) Function
- * Connector Interface LC Duplex Receptacle

2. Block Diagram

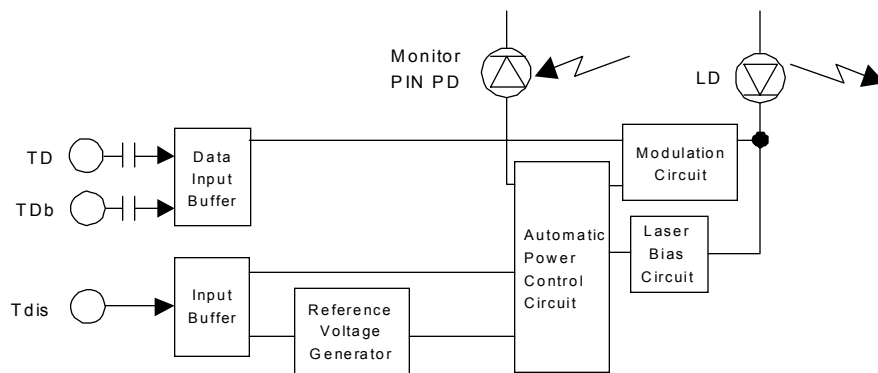


Figure 1. Block Diagram (Transmitter)

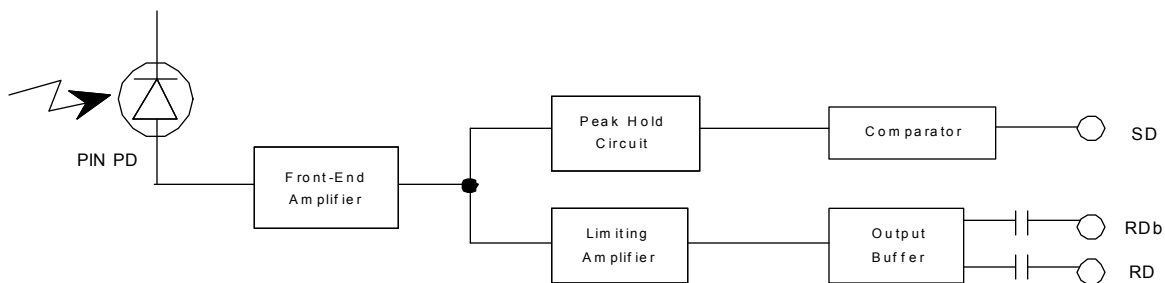


Figure 2. Block Diagram (Receiver)

⚠ 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

3. Package Dimension

3.1 SCM6405-GL-Z#

All dimensions are in mm.

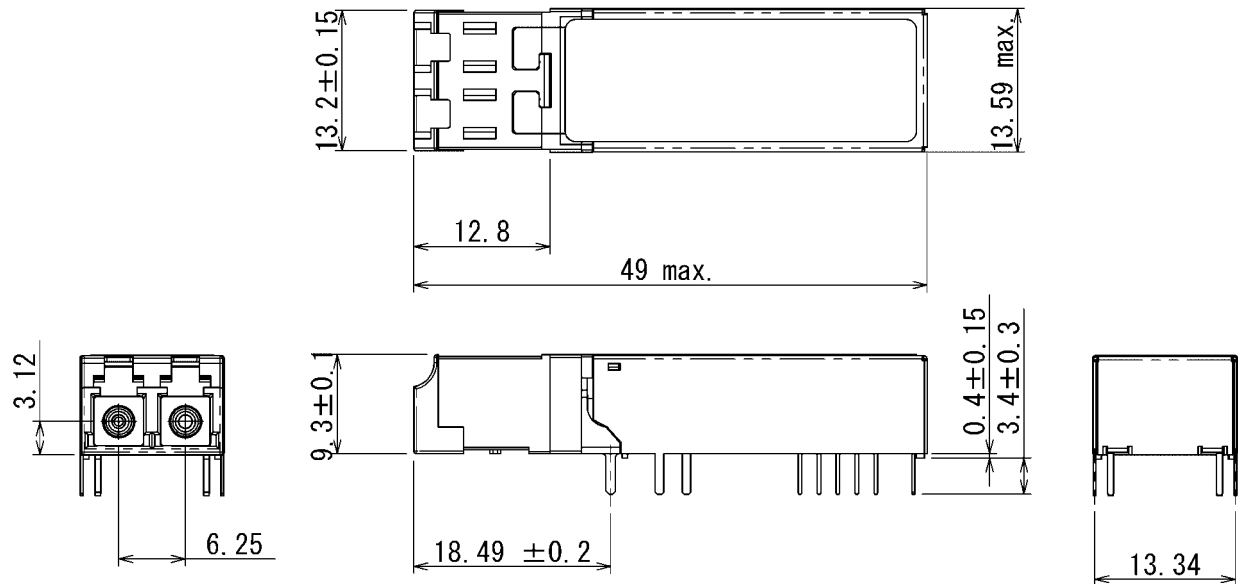


Figure 3. Outline Dimensions (SCM6405-GL-Z#)

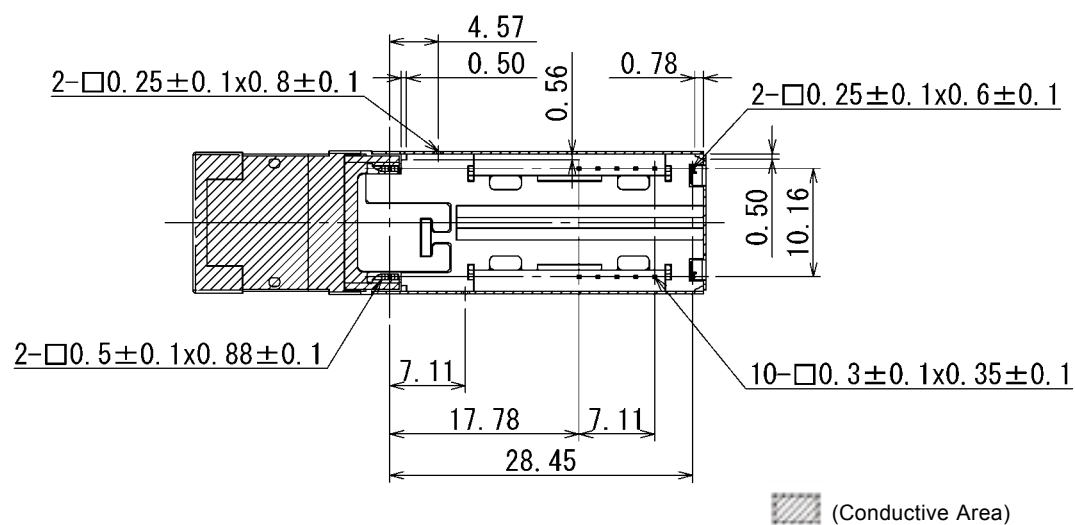



Figure 4. Bottom Side (SCM6405-GL-Z#)

(SCM6405)

All dimensions are in mm.

Figure 9. Outline Dimensions (SCM6405-JL-Z#)

 (Conductive Area)

3.5 SCM6405-JL-C#

All dimensions are in mm.

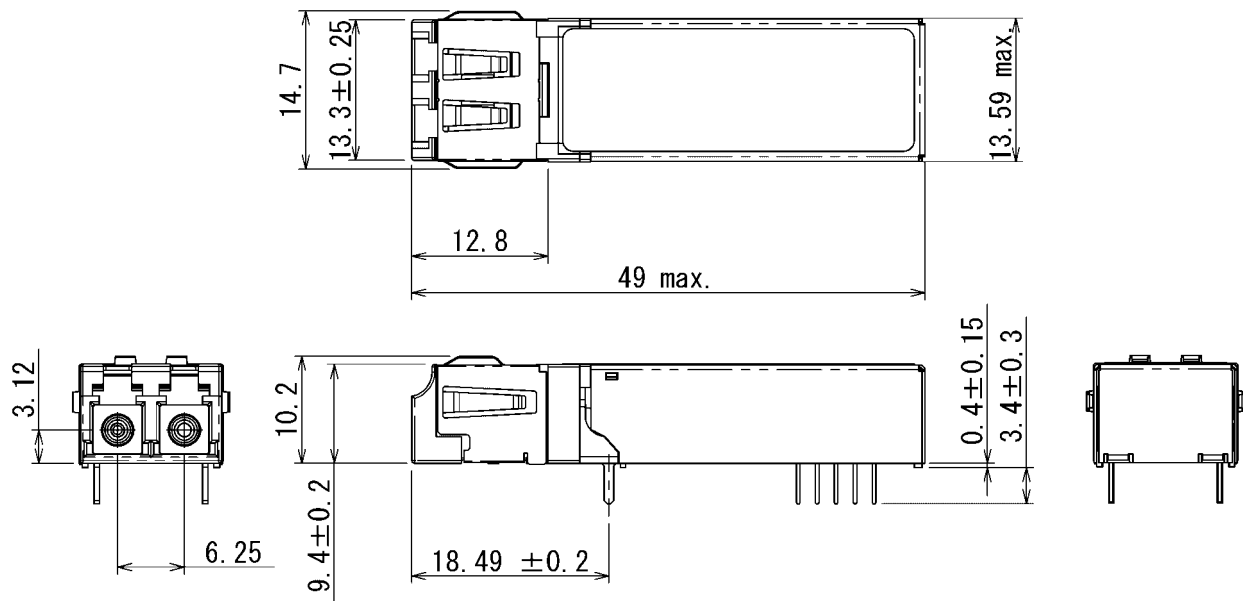


Figure 11. Outline Dimensions (SCM6405-JL-C#)

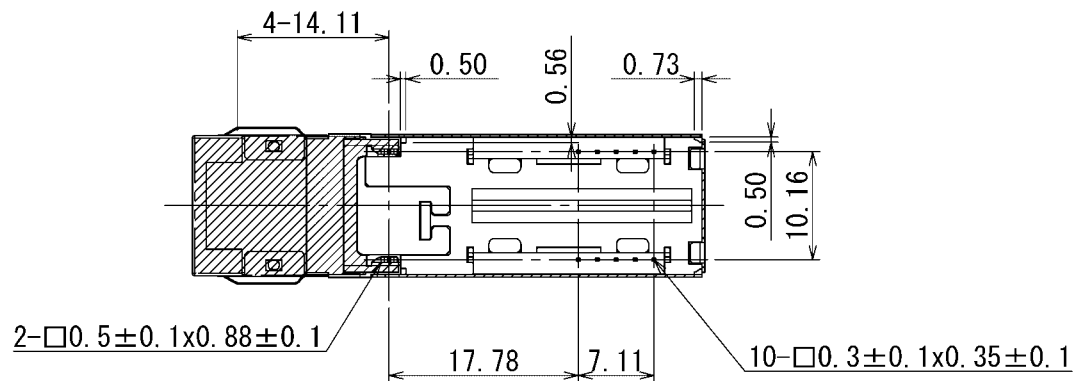


 (Conductive Area)

Figure 12. Bottom Side (SCM6405-JL-C#)

(SCM6405)

3.6 SCM6405-JL-D#

All dimensions are in mm.

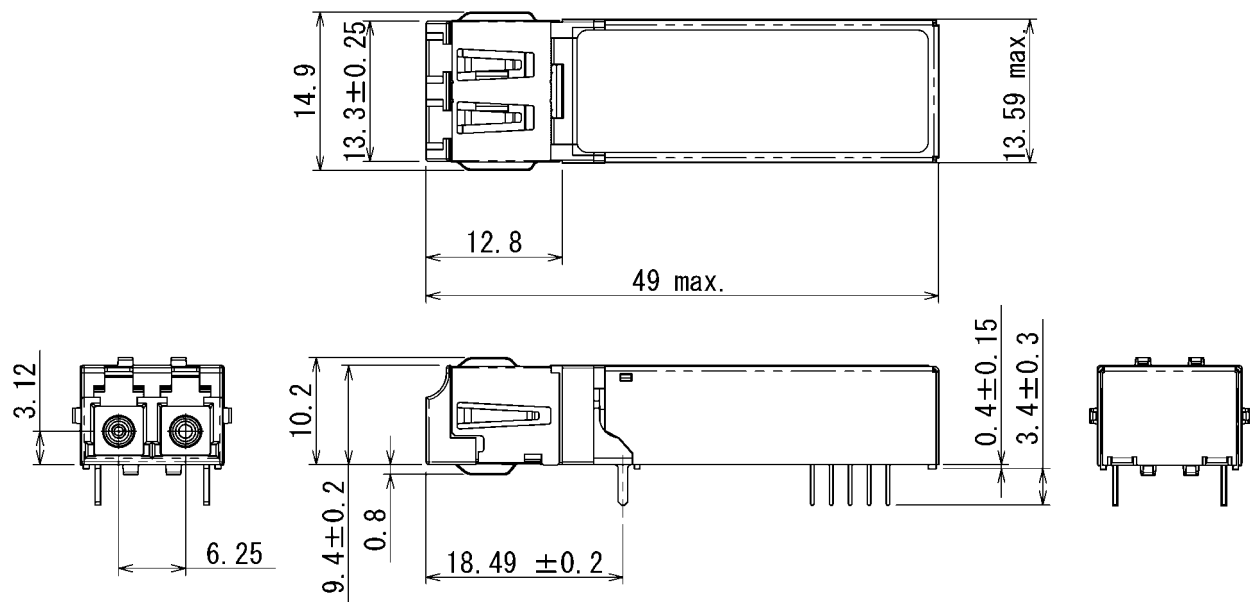


Figure 13. Outline Dimensions (SCM6405-JL-D#)

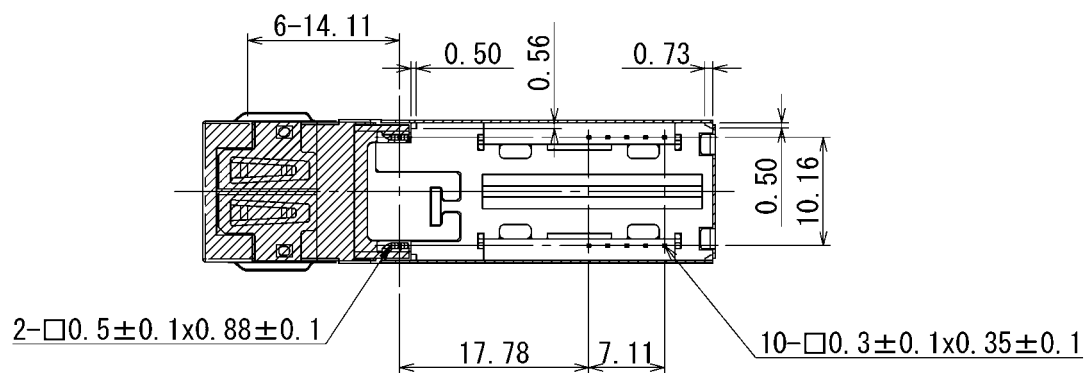


 (Conductive Area)

Figure 14. Bottom Side (SCM6405-JL-D#)

(SCM6405)

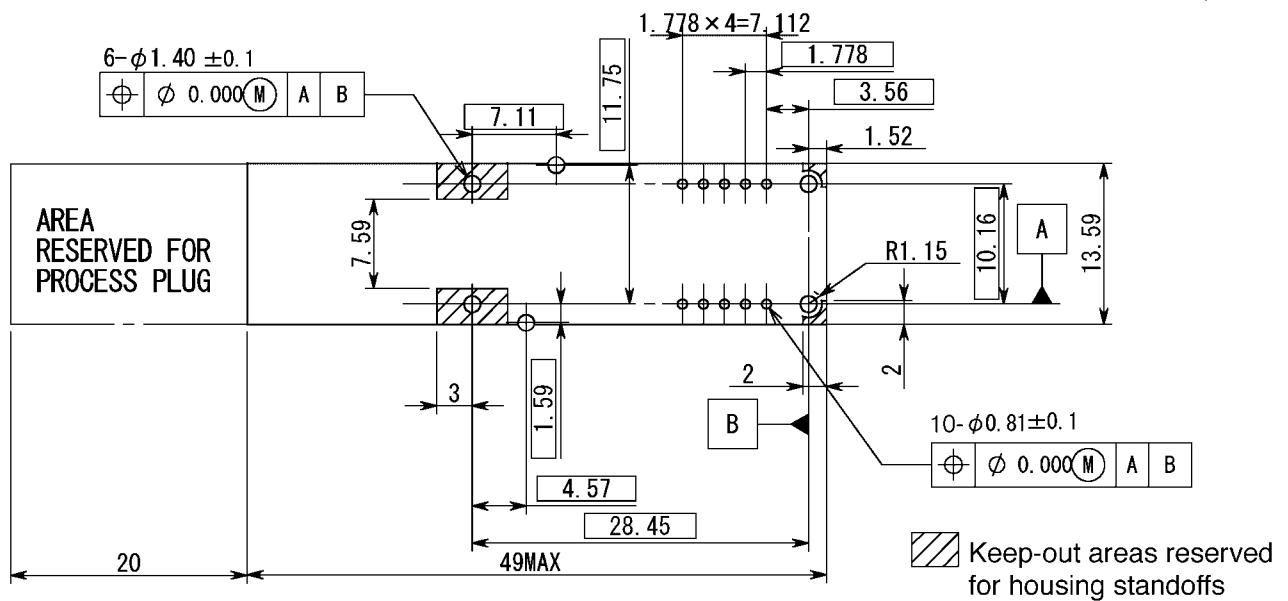


Figure 15. Recommended Footprint

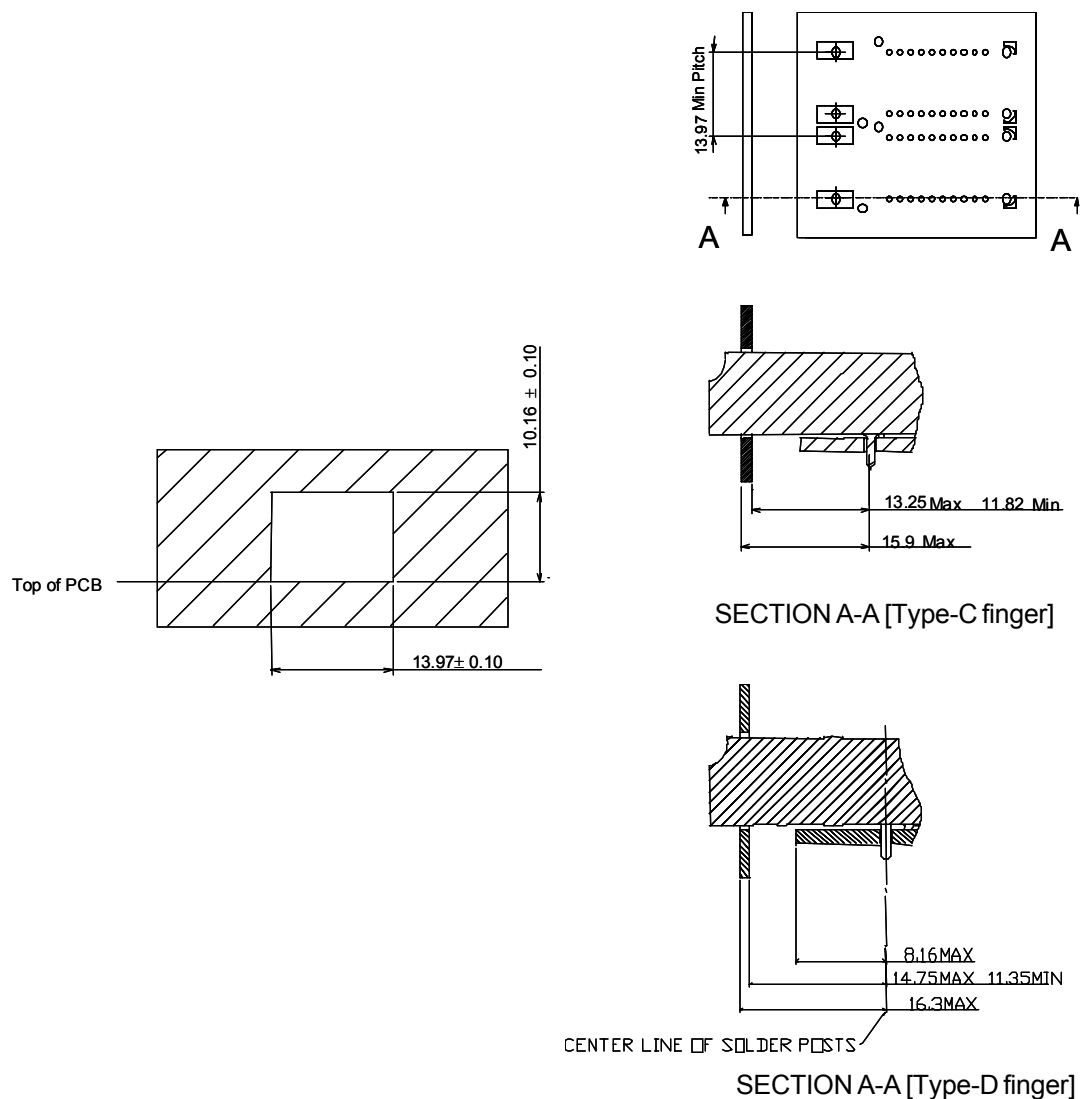


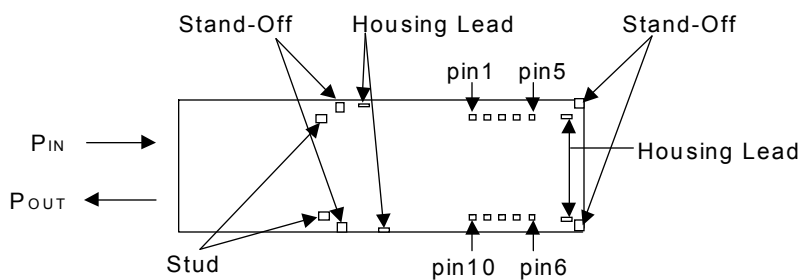
Figure 16. Recommended Bezel Design for Systems Using SFF Transceivers

4. Pin Assignment

No.	Symbol	I/O/P ¹	Level	Description
1	VeeR	P	GND	Power Supply (-) for Receiver.
2	VccR	P	+3.3V DC	Power Supply (+) for Receiver.
3	SD	O	LVPECL ² / LVTTTL	Signal Detect. High level indicates presence of optical input signal (Active High).
4	RDb	O	AC	Inverted Receiver Output Data. AC coupled.
5	RD	O	AC	Non-Inverted Receiver Output Data. AC coupled.
6	VccT	P	+3.3V DC	Power Supply (+) for Transmitter.
7	VeeT	P	GND	Power Supply (-) for Transmitter.
8	Tdis	I	LVTTL / LVCMOS	Transmitter Disable (Active High). Defaults to logic 0 (enable TX) when left open.
9	TD	I	AC	Non-Inverted Transmitter Input Data. AC coupled.
10	TDb	I	AC	Inverted Transmitter Input Data. AC coupled.

Notes:

1. I/O/P stands for signal input, signal output, and DC power/bias supply, respectively.
2. LVPECL : SCM6405-##-##, LVTTTL : SCM6405-##-##A.



- * Mounting Studs are provided for mechanical support to the circuit board.
It is recommended that the holes in the circuit board be connected to frame ground.
- * **(SCM6405-JL-## has no Housing Leads.)**
- * Stand-Offs provide gap between the circuit board and the module to help escape residual water after aqueous wash.

Figure 17. Bottom View

5. Absolute Maximum Ratings

Parameter	Symbol	Min.	Max	Unit	Note
Storage Case Temperature	Ts	-40	85	°C	1
Operating Case Temperature	Tc	-5	70	°C	2
		-40	85		3
Supply Voltage	Vcc	0.0	4.0	V	
Input Voltage	Vi	0.0	Vcc+0.5	V	4
Lead Soldering Conditions	Temperature	Ltemp	260	°C	5
	Time	Ltime	10	sec.	

Notes:

1. No condensation allowed.
2. SCM6405-#L-#N(A)
3. SCM6405-#L-#W(A)
4. TD, TDb, Tdis
5. 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 = 3.135 to 3.465 V and all operating temperature shall apply.)

6-1. Transmitter side

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		Vcc	3.135	3.30	3.465	V	
Supply Current		Idtx		70	150	mA	1, 2, 3
Differential Input Voltage Swing (TD,TDb)		Vin	0.4		2.00	Vp-p	4
Signal Input Rise / Fall Time					0.5	nsec.	5
Tdis Input Voltage	High	Vdi	2.0		Vcc	V	6
	Low	VeI	0.0		0.8	V	
Tdis Input Current	High	Idi	-10	140	200	μA	

Notes:

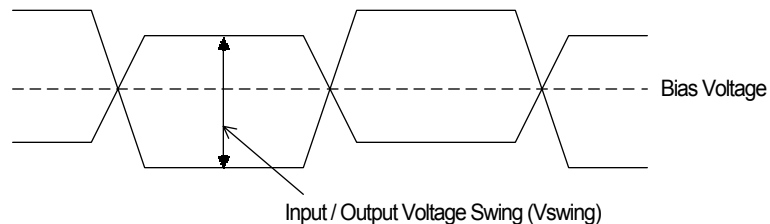
1. Input bias current is not included. 2. 50% duty cycle data. 3. 622.08Mbps, PRBS2²³-1, NRZ.
4. Refer to Figure 18 5. 20-80%.
6. Refer to Section 8, "Relation between Disable Input Voltage and Optical Output Power", for detail.

6-2. Receiver side

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage		Vcc	3.135	3.30	3.465	V	
Supply Current		Idrx		75	125	mA	1
Differential Output Voltage Swing (RD,RDb)		Vout	0.40		1.90	Vp-p	
SD Output Voltage	High	Vspoh	Vcc-1.10		Vcc-0.86	V	2
	Low	Vspol	Vcc-1.89		Vcc-1.65	V	
	High	Vstoh	2.2		Vcc	V	3
	Low	Vstol	0.0		0.5	V	
Data Rise / Fall Time		Tr / Tf			0.5	nsec.	4
SD Assert Time		Ta	2.3		100	μsec	5
SD Deassert Time		Td	2.3		100	μsec	

Notes:

1. Output current is not included. 622.08Mbps, PRBS2²³-1, NRZ.
2. LVPECL Output. (SCM6405-###) 270Ω to GND.
3. LVTTTL Output. (SCM6405-###A)
4. 20-80%.
5. 622.08Mbps, PRBS2²³-1, NRZ.



$$\text{Differential Input / Output Voltage Swing (Vin / Vout)} = 2 \times \text{Vswing}$$

Figure 18. Definition of Differential Input / Output Voltage Swing

7. Optical Interface

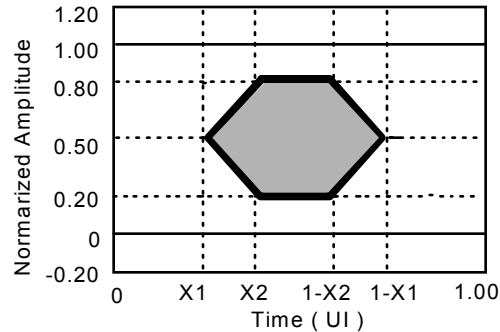
(Unless otherwise specified, $V_{cc} = 3.135$ to 3.465 V and all operating temperature shall apply.)

7-1. Transmitter side

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Average Output Power	P_o	-15.0	-11.0	-8.0	dBm	1
Extinction Ratio	E_r	8.2			dB	1
Center Wavelength	λ_c	1274		1356	nm	
Spectral Width (RMS)	$\Delta\lambda$			2.5	nm	
Eye Mask for Optical Output	Compliant with Telcordia GR-253 CORE and ITU G.957					

Notes:

1. Measured at 622.08Mbps, PRBS2²³-1, 50% duty cycle, NRZ



Rates	X1	X2
155.52Mbps	0.15	0.35
622.08Mbps	0.25	0.40

Figure 19. 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 Signal
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
Optical Input Wavelength	-	1260		1580	nm	
Minimum Sensitivity	P_{min}		-33.0	-28.0	dBm	1, 2, 3
Overload	P_{max}	-8.0			dBm	1, 2, 3
SD Assert Level	P_a	-45.0		-28.0	dBm	2, 3
SD Deassert Level	P_d	-45.0		-29.0	dBm	
SD Hysteresis	P_{phys}	1.0		6.0	dB	

Notes:

1. BER=10⁻¹⁰

2. Measured at the bit rate of 622.08Mbps, PRBS 2²³-1, NRZ

3. Measured at the bit rate of 155.52Mbps, PRBS 2²³-1, NRZ

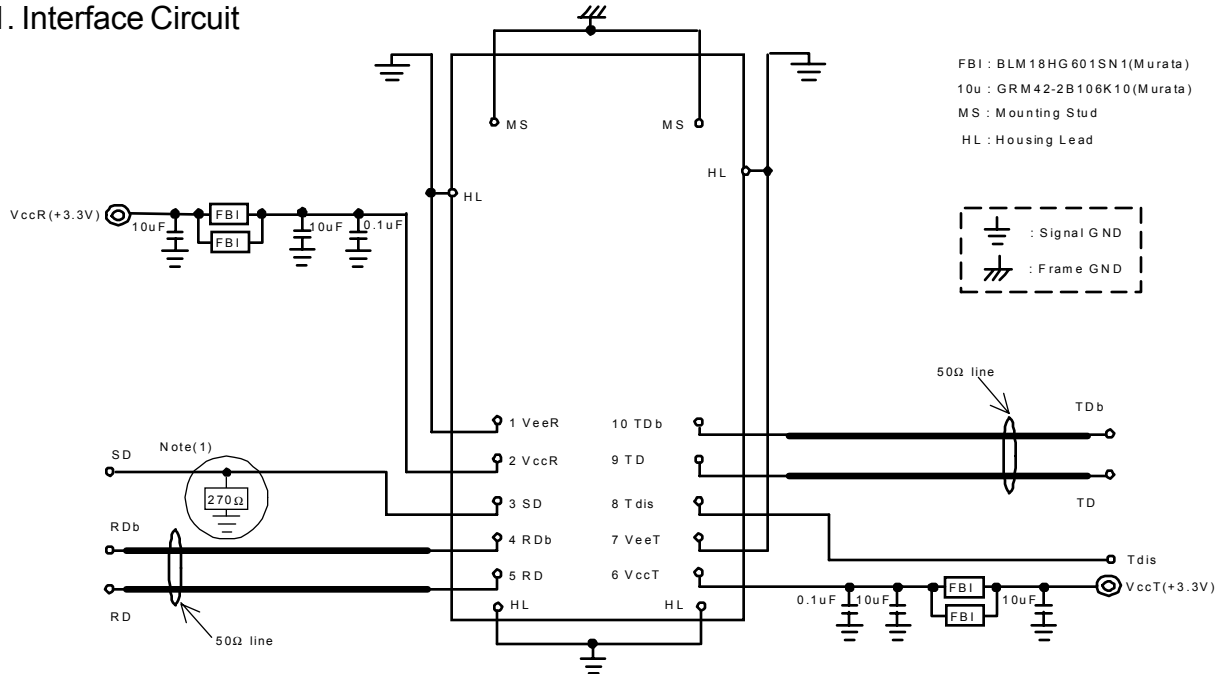
8. Relation between Disable Input Voltage and Optical Output Power

Tdis Input Voltage	Optical Output Power
"L"(0.0 ~ 0.8V)	Enabled
"H"(2.0V ~ Vcc)	Disabled (<-45dBm)
Open	Enabled

(SCM6405)

9. Recommended Information

9-1. Interface Circuit



Notes:

(1) SD Interface

270Ω pull-down resistor required for SCM6405-##-## (LVPECL SD Output)

No pull-down resistor required for SCM6405-##-##A (LVTTTL SD Output)

(2) 0.1uF capacitors on VccR/VccT lines should be as close as possible to module pins.

(3) 50Ω line pattern and component placements on RD/RDb and TD/TDb lines should be symmetrical for better impedance matching.

(SCM6405-JL-## has no Housing Leads.)

Figure 20. Recommended Interface Circuit

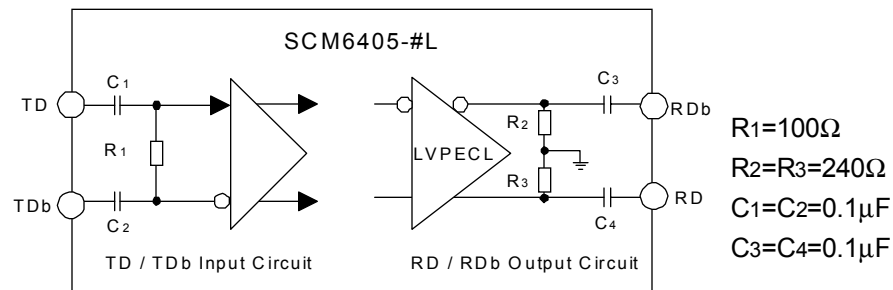
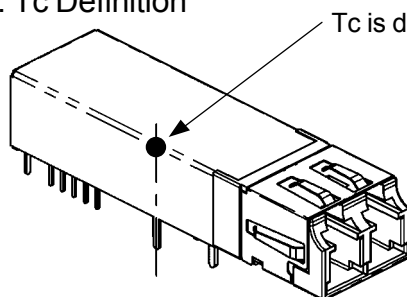


Figure 21. Data Input / Output Circuit

9-2. Tc Definition



Tc is defined as surface temperature of this point.

Forced convection (minimum 1.0m/s) is recommended to ensure Tc be kept below its absolute maximum rating where the ambient temperature is close to the maximum allowed Tc.

(SCM6405)

10. 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, 20-2,000 Hz, 4min/cy, 4cy/axis	20	11	0
	Thermal Shock	MIL-STD-883 Method 1011	Delta T=100°C 0°C to 100°C	20	11	0
	Solderability	MIL-STD-883 Method 2003	(steam aging not required)	20	11	0
Endurance	Accel. Aging (High Temp.)	(R)-4-53 Section 5.18	85°C; rated power 1,000 hrs. for pass/fail 2,000, 5,000 hrs. for info.	-	25 10	-
	Low Temp. Storage	-	min. storage T 1,000 hrs. for pass/fail 2,000 hrs. for info.	20	11	0
	Temperature Cycling	Section 5.20	-40°C to +85°C 500 for pass/fail 1,000 for info.	20 -	11 11	0 -
	Damp Heat	MIL-STD-202 Method 103 or IEC-60068-2-3	85°C/85%RH 1,000hrs.	20	11	0
	Cyc. Moist. Res.	Sec. 5.23	-	20	11	0
Special Tests	Internal Moisture	MIL-STD-883 Method 1018	Max. 5,000ppm water vapour	20	11	0
	ESD Threshold	Section 5.22		-	6	-

SS : Sample Size

C : Maximum number of failure allowed to pass the test.

11. 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 IEC 60825.

Class 1 Laser Product

⚠ 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.

12. 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.

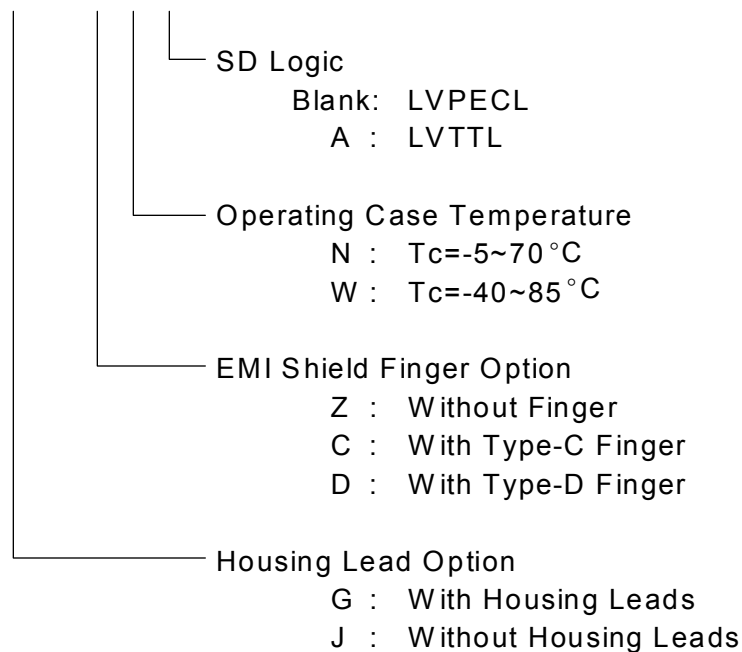
This module must be handled, used and disposed of according to your company's safe working practice.

⚠ 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 contains 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.

13. Ordering Information

13-1. Ordering Number

SCM6405 - **a** L - **b** **c** **d** (LC Duplex Receptacle, Metallized)



13-2. Part Number on Label

Part Number on Label	Operating Temperature
SCM6405 - a L - d	T _c =-5~70 °C
SCM6405 - a L - W d	T _c =-40~85 °C

14. For More Information

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