



## Fiber Optics

### Medium Power BIDI® Optical Standard Module 1310 nm Emitting, 1310 nm Receiving

SBM52214x

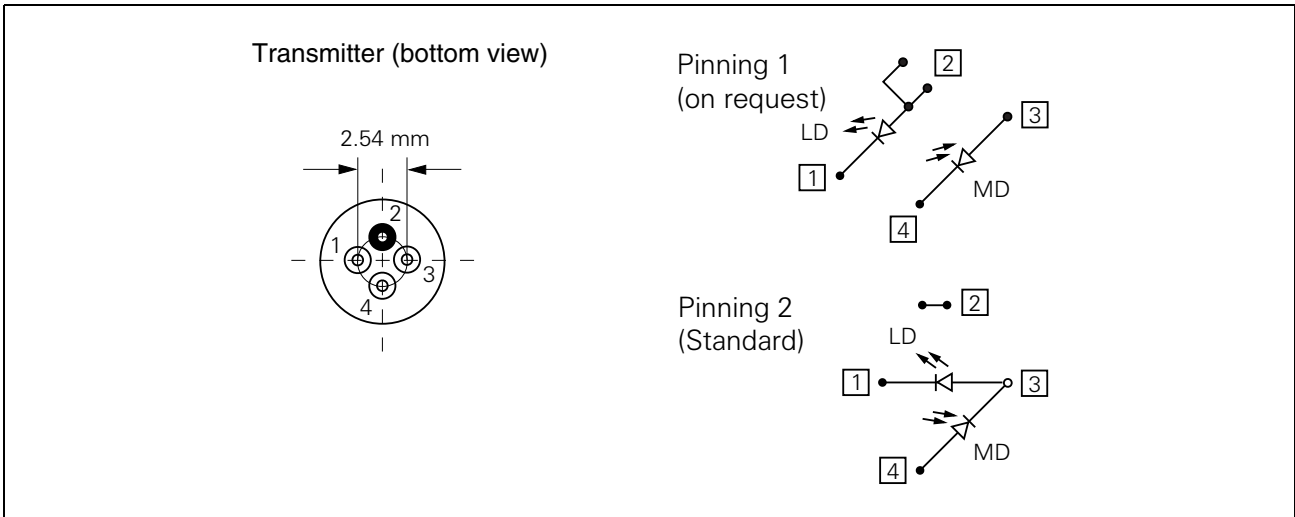
#### Features

- Designed for application in passive-optical networks
- Integrated Wavelength Division Multiplexer (WDM) or Beam Splitter
- Bi-Directional Transmission in one optical window
- Single fiber solution
- FP-Laser Diode with Multi-Quantum Well structure
- Class 3B Laser Product
- Suitable for bit rates up to 1.25 Gbit/s
- Ternary Photodiode at rear mirror for monitoring and control of radiant power
- Low noise / high bandwidth PIN diode
- Hermetically sealed subcomponents, similar to TO 46
- With singlemode fiber pigtail

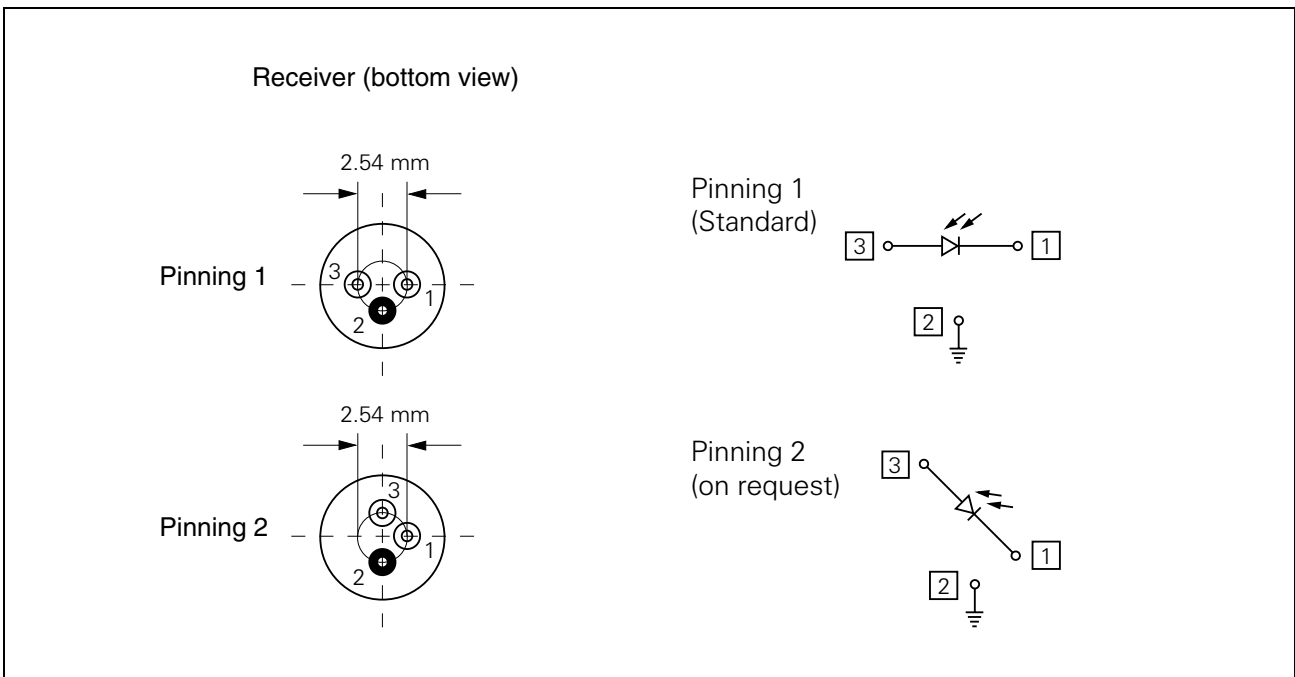


**Pin Configuration**

**Pin Configuration**



**Figure 1 Transmitter**



**Figure 2 Receiver**

**Available Pinnings**

Type	Transmitter	Receiver
SBM52214x	2 (Standard)	1 (Standard)

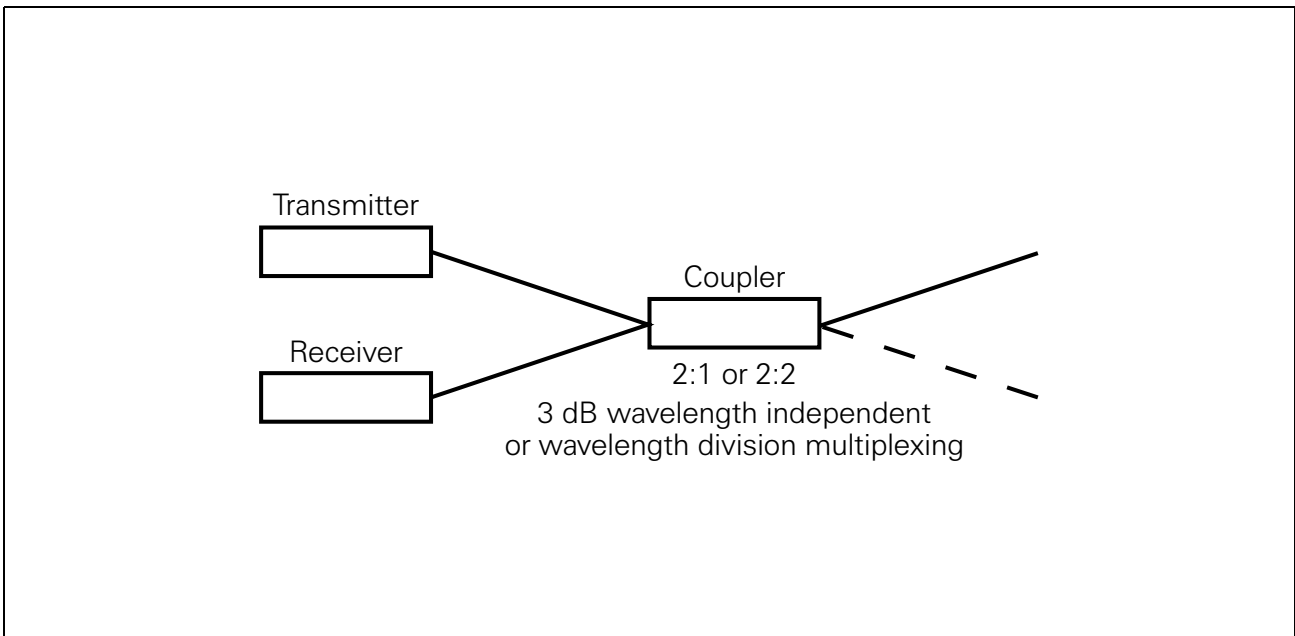
Other Pinnings on request / different drawing set required for non standard pinning

**Description**

The Infineon module for bidirectional optical transmission has been designed for different optical networks structures.

In the last few years the structure has changed from point to point planned for Broad band ISDN to a point to multipoint passive optical network (PON) architecture for the optical network in the subscriber loop.

A transceiver can be realized with discrete elements (**Figure 3**). Transmitter and receiver with pigtailed are connected with a fiber-coupler (2:1 or 2:2, wavelength independent or WDM).

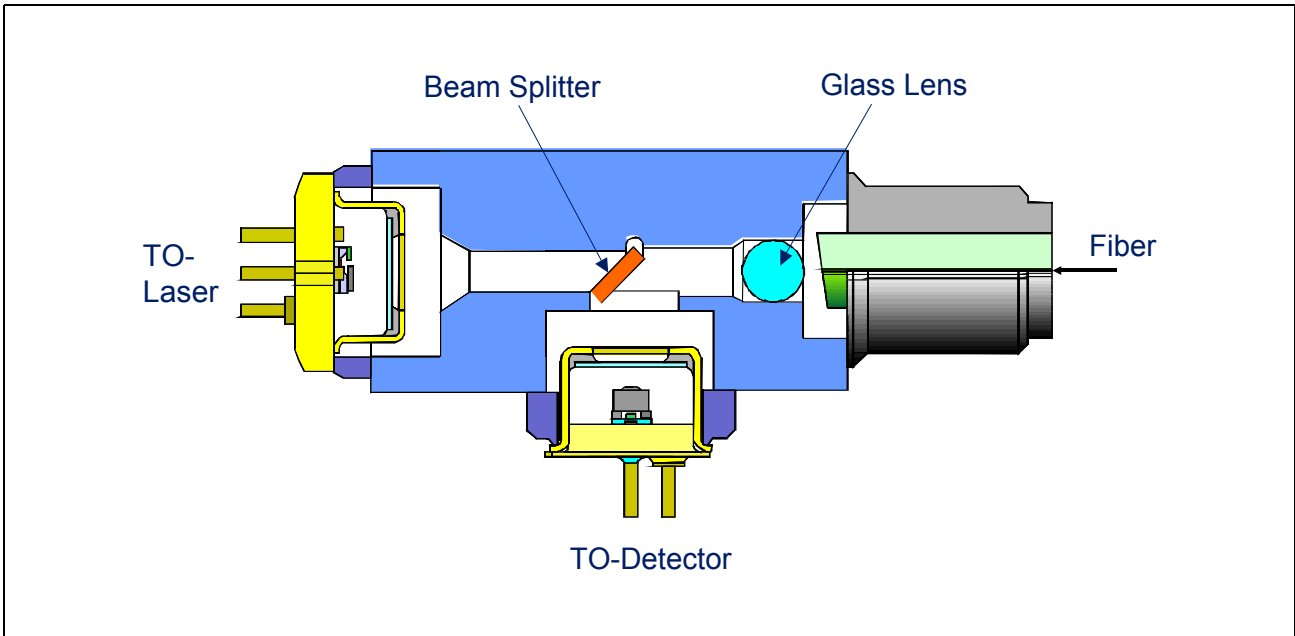


**Figure 3 Realization with Discrete Elements**

Infineon has realized this transceiver configuration in a compact module called a BIDI® (**Figure 4**).

This module is especially suitable for separating the opposing signals at the ends of a link. It replaces a discrete solution with a transmitter, receiver and coupler.

The basic devices are a laser diode and a photodiode, each in a TO package, plus the filter in the beam path. A lens in the TO laser concentrates the light and enables it to be launched into the single-mode fiber of the module. In the same way the light from the fiber is focused onto the small, light-sensitive area of the photodiode to produce a high photo current. The mirror for coupling out the received signal is arranged in the beam so that the transmitter and receiver are at right angles to each other. This means the greatest possible degree of freedom in the layout of the electric circuit.



**Figure 4 Compact Realization of the Transceiver in One Module**

A decisive advantage of the module is its use of standard TO components. These devices, produced in large quantities, are hermetically sealed and tested before they are built in. This makes a very substantial contribution to the excellent reliability of the module. The solid metal package of the module serves the same purpose. It allows the use of modern laser welding techniques for reliable fixing of the different elements and the fiber holder.

**Technical Data**
**Absolute Maximum Ratings**

Parameter	Symbol	Limit Values		Unit
		min.	max.	

**Module**

Operating temperature range at case	$T_C$	-40	85	°C
Storage temperature range	$T_{stg}$	-40	85	
Soldering temperature ( $t_{max} = 10$ s, 2 mm distance from bottom edge of case)	$T_S$		260	

**Laser Diode**

Direct forward current	$I_{F\ max}$		120	mA
Radiant power CW	$P_{F,\ rad}$		2	mW
Reverse Voltage	$V_R$		2	V

**Monitor Diode**

Reverse Voltage	$V_R$		10	V
Forward Current	$I_F$		2	mA

**Receiver Diode**

Reverse Voltage	$V_R$		10	V
Forward Current	$I_F$		2	mA
Optical power into the optical port	$P_{port}$		1.5	mW

**Technical Data**

The electro-optical characteristics described in the following tables are only valid for use within the specified maximum ratings or under the recommended operating conditions.

**Transmitter Electro-Optical Characteristics**

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Optical output power (maximum)	$P_{F, \max}$	1.2			mW
Emission wavelength center of range, $P_F = 0.5 P_{F, \max}$ .	$\lambda_{\text{trans}}$	1270		1350	nm
Spectral width (RMS)	$\sigma_\lambda$			5	
Temperature coefficient of wavelength	$TC$			0.5	nm/K
Threshold current (whole temperature range)	$I_{\text{th}}$	2		45	mA
Forward voltage, $P_F = 0.5 P_{F, \max}$ .	$V_F$			1.5	V
Radiant power at $I_{\text{th}}$	$P_{\text{th}}$			50	$\mu\text{W}$
Slope efficiency ( $-40\dots 85^\circ\text{C}$ )	$\eta$	20		100	mW/A
Variation of 1st derivative of P/I (0.1 to 1.0 mW)	$S_{\text{var}}$	-30		30	%
Differential series resistance	$R_S$			8	$\Omega$
Rise time (10%–90%)	$t_r$		100	200	ps
Fall time (10%–90%)	$t_f$		270	500	

**Monitor Diode Electro-Optical Characteristics**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Dark current, $V_R = 5 \text{ V}$ , $P_F = 0$ , $T = T_{\text{max}}$	$I_R$		200	nA
Photocurrent, $V_R = 5 \text{ V}$ , $P_F = 0.5 P_{F, \max}$	$I_P$	50	1500	$\mu\text{A}$
Capacitance, $V_R = 5 \text{ V}$ , $f = 1 \text{ MHz}$	$C_5$		10	pF
Tracking error <sup>1)</sup> , $V_R = 5 \text{ V}$	TE	-1	1	dB

<sup>1)</sup> The tracking error TE is the maximum deviation of  $P_F$  at constant current  $I_{\text{mon}}$  over a specified temperature range and relative to the reference point:  $I_{\text{mon, ref}} = I_{\text{mon}} (T = 25^\circ\text{C}, P_F = 0.5 P_{F, \max.})$ . Thus, TE is given by:

$$\text{TE}[\text{dB}] = 10 \times \log \frac{P_F[T_C]}{P_F[25^\circ\text{C}]}$$

**Receiver Diode Electro-Optical Characteristics**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Spectral sensitivity, $V_R = 5\text{ V}$ , $\lambda = 1310\text{ nm}$	$S_{\text{rec}}$	0.3	1	A/W
Rise and fall time (10%–90%) $R_L = 50\ \Omega$ , $V_R = 5\text{ V}$	$t_r$ ; $t_f$		1	ns
Total capacitance $V_R = 5\text{ V}$ , $P_{\text{opt}} = 0$ , $f = 1\text{ MHz}$	$C$		1.5	pF
Dark current, $V_R = 5\text{ V}$ , $P_{\text{opt}} = 0$	$I_D$		50	nA

**Module Electro-Optical Characteristics**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Optical Crosstalk <sup>1)</sup>	CRT		-22	dB

<sup>1)</sup> Optical Crosstalk is defined as

$$\text{CRT}[\text{dB}] = 10 \times \log \frac{I_{\text{Det},0}}{I_{\text{Det},1}}$$

with:  $I_{\text{Det},0}$ : the photocurrent with  $P_F = 0.5 P_{F, \text{max}}$ , without optical input, CW laser operation,  $V_R = 2\text{ V}$  and  $I_{\text{Det},1}$ : the photocurrent without  $P_F$ , but  $0.5 P_{F, \text{max}}$  optical input power,  $\lambda = 1310\text{ nm}$ .

**End of Life Time Characteristics**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Threshold current at $T = T_{\text{max}}$	$I_{\text{th}}$		60	mA
Current above threshold, over full temperature range, at $I_{\text{mon, ref}} = I_{\text{mon}}$ ( $T = 25^\circ\text{C}$ , $P_F = 0.5 P_{F, \text{max}}$ , BOL)	$\Delta I_F$	7	70	
Tracking Error	TE	-1.5	1.5	dB
Detector Dark Current, $V_R = 2\text{ V}$ , $T = T_{\text{max}}$	$I_R$		400	nA
Monitor Dark Current, $V_R = 2\text{ V}$ , $T = T_{\text{max}}$	$I_R$		1	$\mu\text{A}$

**Fiber Data**

The mechanical fiber characteristics are described in the following table.

**Fiber Characteristics**

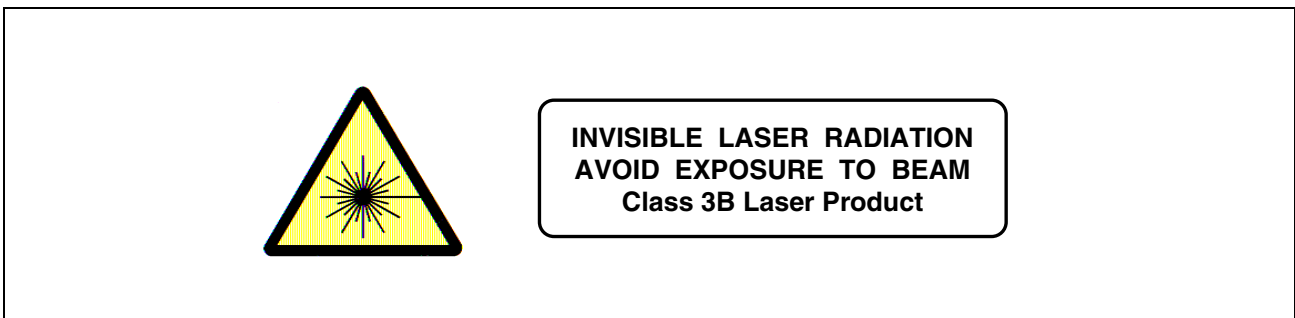
Parameter	Limit Values			Unit
	min.	typ.	max.	
Mode Field Diameter	8	9	10	μm
Cladding Diameter	123	125	127	
Mode Field/Cladding Concentricity Error			1	
Cladding Non-circularity			2	%
Mode Field Non-circularity			6	
Cut off Wavelength	1270			nm
Jacket Diameter	0.8		1	mm
Bending Radius	30			
Tensile Strength Fiber Case	5			N
Length	0.8		1.2	m



**Eye Safety**

Ensure to avoid exposure of human eyes to high power laser diode emitted laser beams. Especially do not look directly into the laser diode or the collimated laser beam when the diode is activated.

**Class 3B Laser Product According to IEC 60825-1**



**Figure 5 Required Labels**

**Class IIIb Laser Product According to FDA Regulations Complies with 21 CFR 1040.10 and 1040.11**

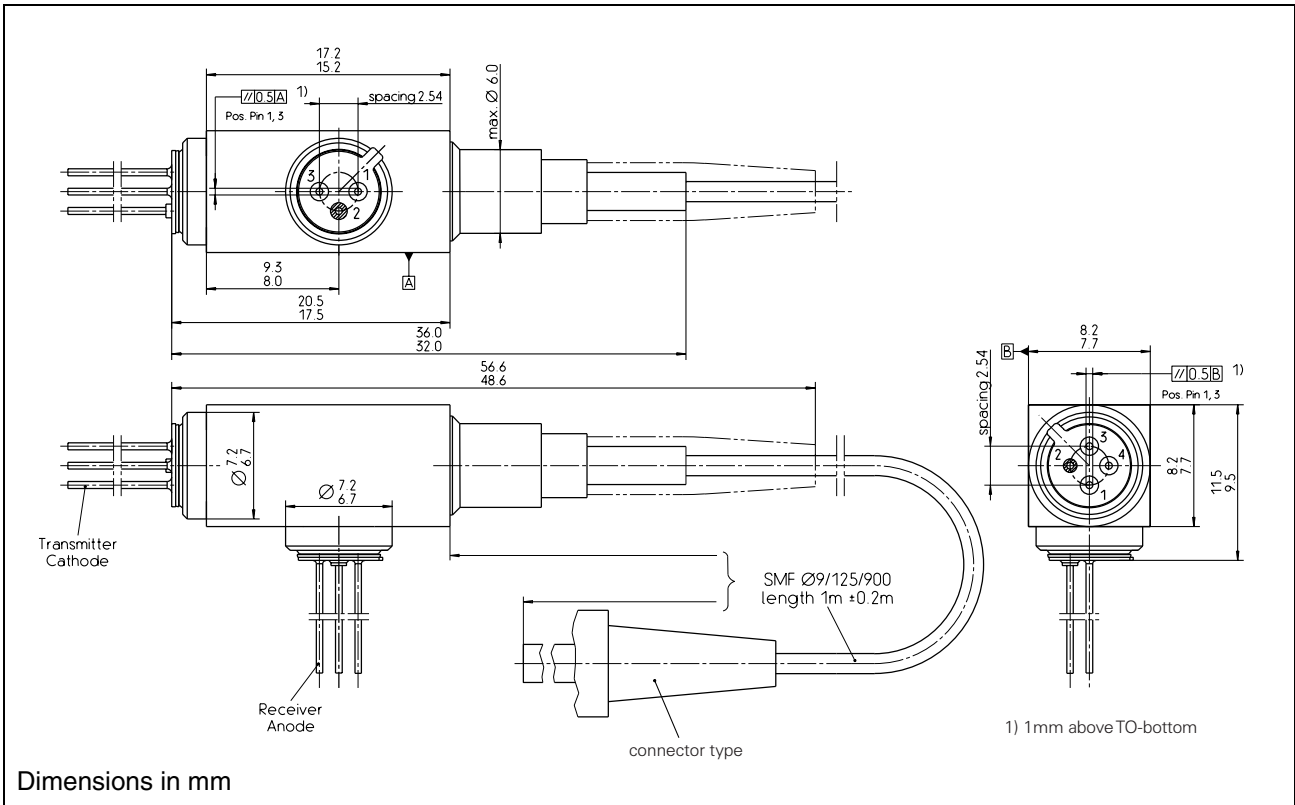


**Figure 6 Required Label**

**Laser Data**

Wavelength	1310 nm
Maximum total output power	less than 50 mW
Beam divergence (1/e <sup>2</sup> )	10°

**Package Outlines**



**Figure 7**

**Connector Options**

Model	Type
SBM52214G SBM51214G	SM FC/PC
SBM52214N SBM51214N	SM SC/PC 0°
SBM52214Z SBM51214Z	SM without connector

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**SBM52214x****Revision History: 2002-05-01**

DS0

Previous Version:

Page	Subjects (major changes since last revision)
	Document's layout has been changed: 2002-Aug.

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