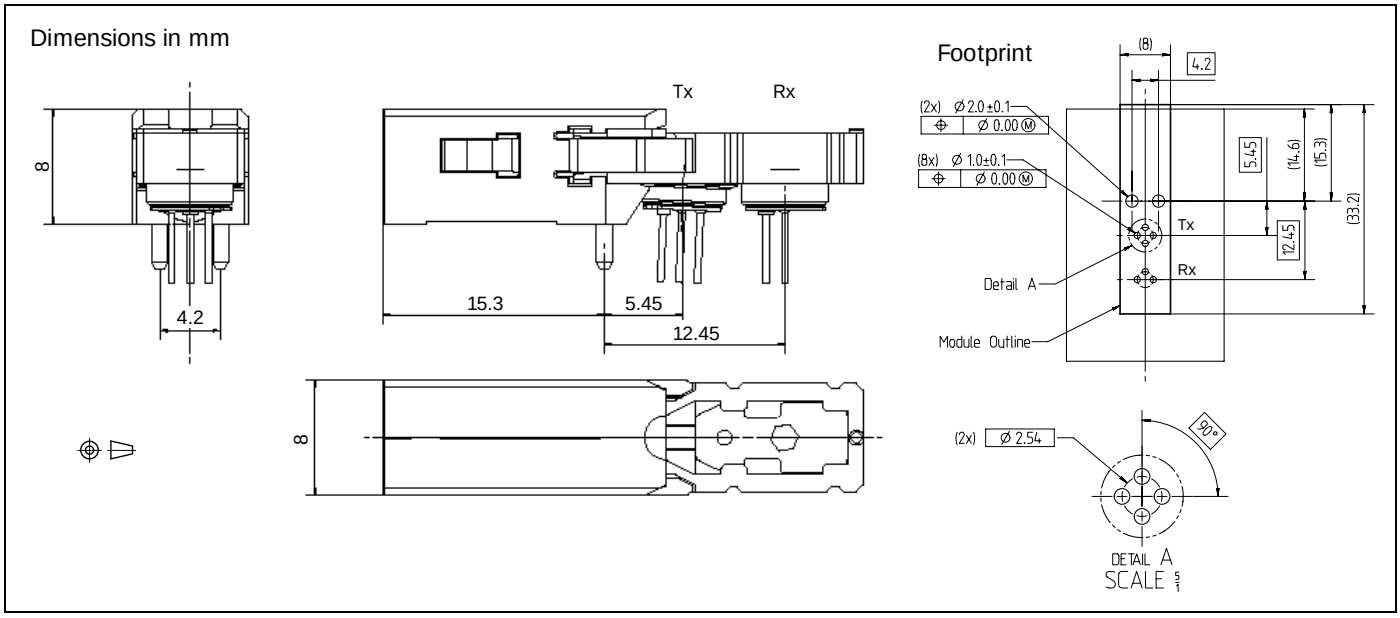
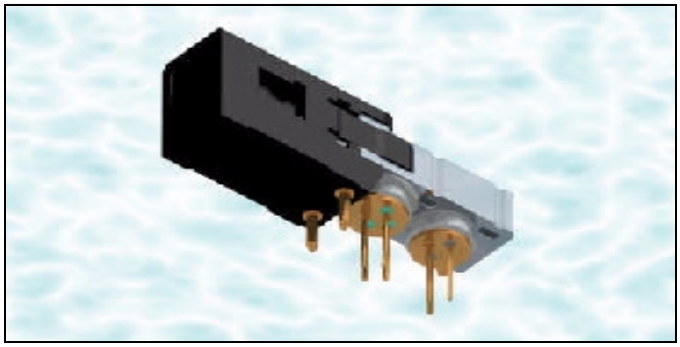
SBx52413DC

2Port T-BIDI Optical Module
1300 nm Emitting, 1550 nm Receiving
MU-Receptacle

Preliminary





FEATURES

- **Integrated Wavelength Division Multiplexer (WDM)**
- **Bi-Directional Transmission in 2nd and 3rd optical window**
- **Single fiber solution**
- **FP-Laser diode with Multi-Quantum Well structure**
- **Class 3B Laser Product**
- **Suitable for bit rates up to 2.5 Gbit/s**
- **Ternary Photodiode at rear mirror for monitoring and control of radiant power**
- **Low noise / high bandwidth InGaAs/InP-PIN-photodiode**
- **Hermetically sealed subcomponents, similar to TO46**
- **MU-Receptacle for easy Push-Pull**
- **Easy mounting and wave soldering supported by solder-studs**
- **No need for fiber handling during PCB assembly**
- **Eliminates the need for fiber jumpers when placed on the edge of a PCB**
- **Fully strain relieved optical port**
- **Very low electrical cross-talk because of short TO-pins**
- **Integrated TIA 155 Mbit/s...2.5 Gbit/s on request**

APPLICATIONS

- **Access Networks, e.g. Media converter for Fiber-In-The-Loop (FITL), Passive Optical Networks (PON) and Point-to-Point Networks (P2P)**
- **Intra-Office communication between Switches, Add/Drop Multiplexers (ADM), Cross Connects, Routers, Servers etc.**

Absolute Maximum Ratings

Module

Operating temperature range at case, T_C[(1)]..... –40 °C to 85°C
Storage temperature range, T_{stg} ..... –40 °C to 85°C
Wave soldering temperature t_{max}=10 s,
2 mm distance from bottom edge of case, T_S.....260°C

Laser Diode

Direct forward current, I_F max .....120 mA
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} .....3 mW

Note

1 Measured at transmitter TO-header

BIDI® is a registered trademark of Infineon Technologies

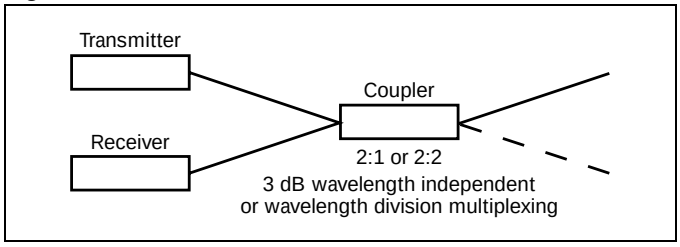
DESCRIPTION

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 (Fig. 1). Transmitter and receiver with pigtails are connected with a fiber-coupler (2:1 or 2:2, wavelength independent or WDM).

Figure 1. Realization with discrete Elements



Infineon has realized this transceiver configuration in a module called a BIDI®.

This module is especially suitable for separating the 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.

A decisive advantage of the module is its use of standard 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.

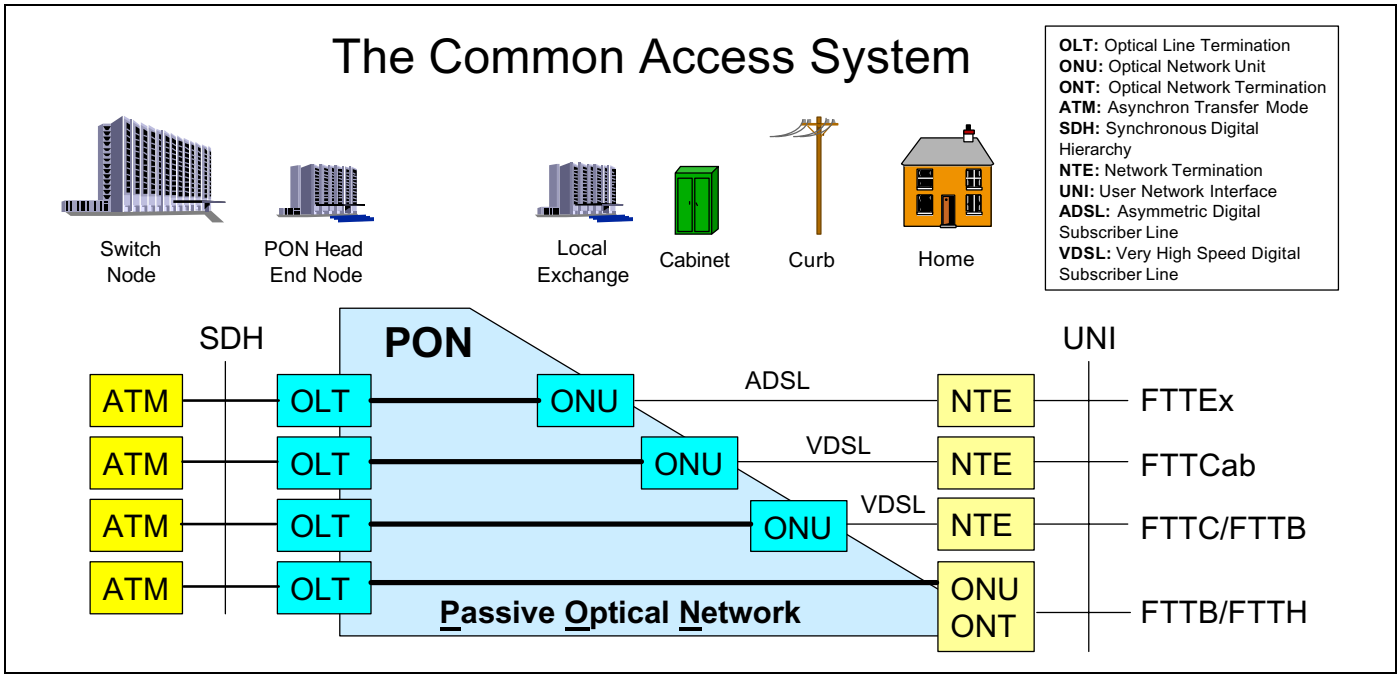
FSAN Applications

The generation of a service-independent platform providing a high transport capacity based on the existing infrastructure is the most important goal with respect to the standardization of new systems for the access network. For FSAN (Full Service Access Network) there have been several Working Groups working on a special system configuration. The target of FSAN was to make a specification for

Fiber To The Cabinet (FTTCab)
Fiber To The Curb (FTTC)
Fiber To The Building (FTTB)
Fiber To The Home (FTTH).

The FSAN Basic Network Structure is shown below.

FSAN Basic Network Structure



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 (T_1=25°C, T_2=85°C)

Parameter		Symbol	Min.	Max.	Unit
Optical output power (maximum)	SBL52413DC (Low Power)	$P_{max, peak}$	0.4		mW
	SBM52413DC (Medium Power)		1.2		
	SBH52413DC (High Power)		2.0		
Maximum forward current		I_{max} (T_1)		80	mA
		I_{max} (T_2)		120	
Emission wavelength center of range –40...85°C P_F=1 mW		λ_{trans}	1260	1360	nm
Spectral width(A1)		$\Delta\lambda$		5.8	
Temperature coefficient of wavelength		TC		0.5	nm/K
Rise time (10%–90%)		t_r		500	ps
Fall time (10%–90%)		t_f		500	
Threshold current		I_{th} (T_1)	2	26	mA
		I_{th} (T_2)		45	
Radiant power at I_{th}		P_{th} (T_1)		50	µW
		P_{th} (T_2)		50	
Slope efficiency (0.2 to 2 mW)		η (T_1)		150	mW/A
		η (T_2)	35	150	
Power saturation(A6) (0.2 to 2 mW)		S_{sat} (T_1)	–30	30	%
		S_{sat} (T_2)	–30	30	
Forward voltage P_F=1 mW		V_F		1.5	V
Differential series resistance		R_S		8	Ω

Note

A*. See “General Measuring Notes” on page 5.

Monitor Diode Electro-Optical Characteristics

Parameter	Symbol	Min.	Max.	Unit
Dark current P_{opt}=0 mW, V_R=5 V	I_R (T_1)		200	nA
	I_R (T_2)		200	
Photocurrent P_{opt}=1 mW, V_R=5 V	I_P (T_1)	100	1000	µA
	I_P (T_2)	100	1000	
Capacitance V_R=5 V, f=1 MHz	C_5 (T_1)		10	pF
	C_5 (T_2)		10	
Tracking error(A7) V_R=5 V	TE	–1	1	dB

Receiver Diode Electro-Optical Characteristics

Parameter	Symbol	Min.	Max.	Unit
Spectral responsivity V_R=–5 V, P_{opt}=1 µW	$S_{1550\ nm}$	0.7		A/W
Dark current V_R=5 V, P_{opt}=0 mW	I_D		50	nA
Total capacitance V_R=3 V, f=1 MHz, V_{RF}=30 mV	C		1.5	pF
Rise and fall time (10%...90%), V_R=5 V, P_{opt}=(0.1...1) mW, 50 Ω	t_r; t_f		500	ps

Module Electro-Optical Characteristics

Parameter	Symbol	Min.	Max.	Unit
Optical Crosstalk(A8) P_{opt}=200 µW, λ=1310 ±30 nm	$CRT_{int.}$ $CRT_{ext.}$		–47	dB
Return Loss	$RL_{1550\ nm}$		–20	

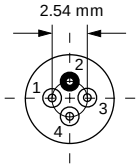
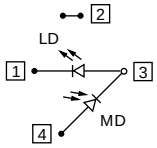
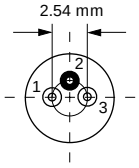
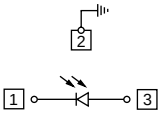
Note

A*. See “General Measuring Notes” on page 5.

End of Life Time Characteristics

Parameter	Symbol	Min.	Max.	Unit
Threshold current at T=T_{max}	I_{th}		60	mA
Current above threshold, full temperature range, at $I_{mon,ref}$=I_{mon} (T=25°C, P_F=0.5 $P_{F, max.}$, BOL)	ΔI_F	7	70	
Tracking Error	TE	–1.5	1.5	dB
Detector Dark Current V_R=2 V, T=T_{max}	I_R		400	nA
Monitor Dark Current V_R=2 V, T=T_{max}	I_R		1	µA

Pin Description

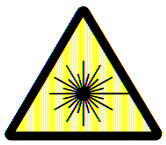
	Pinning (bottom view)	Pin Description
Transmitter		
		Pinning 2 (Standard) 
Receiver		
		Pinning 1 

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

Required Labels



INVISIBLE LASER RADIATION
AVOID EXPOSURE TO BEAM
Class 3B Laser Product

Class IIIb LASER PRODUCT according to FDA Regulations complies with 21 CFR 1040.10 and 1040.11

Required Label

Laser Data

Wavelength (–40...85°C)	1260 nm...1360 nm
Maximum total output power	less than 50 mW
Beam divergence (1/e^2)	10°

Receptacle

For MU-Connector.

Recommended Fiber

Parameter	Min.	Typ.	Max.	Unit
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

Quality / Reliability / Package

The product fulfills the generic requirements according to Telcordia GR-468-CORE.

Labeling

	Infineon
	BIDI
	MADE IN GERMANY
	SBx52413DC
	RG .....
	Part No.
	Year/Week

Documentation

$I_{f,\ 25°C}$, $I_{f,\ 85°C}$, $I_{th,\ 25°C}$, $I_{th,\ 85°C}$, $\eta_{25°C}$, $\eta_{85°C}$, λ, $I_{mon,\ 25°C}$, $I_{mon,\ 85°C}$

General Measuring Notes

A1 Spectral Width

Fabry-Perot-Laserdiode (Multimode)

$$\lambda_m = \frac{\sum_n A_i \cdot \lambda_i}{\sum_n A_i} \; ; \quad \Delta\lambda(RMS) = \sqrt{\frac{\sum_n A_i(\lambda_i - \lambda_m)^2}{\sum_n A_i}}$$

λ_m : Center emission wavelength

λ_i : Single mode wavelengths

$\Delta\lambda$(RMS) : Spectral width (RMS)

A_i : Factor $P(I_i) / P(I_m)$

n : Number of modes ($A_i / A_m > 0.01$)

DFB-Lasermodule (Single Mode)

$\Delta\lambda$(3 dB) : FW at –3 dB Signal decrease

$\Delta\lambda$(20 dB) : FW at –20 dB Signal decrease

A2 Laser Noise Performance (RIN)

The optical noise power relative to the average power is called "R(elative) I(ntensity) N(oise)".

$$RIN = 10 \cdot \log\left[\frac{P_{Noise}^2 \cdot 1Hz}{P_{avg.}^2 \cdot BW}\right] \; ; \; BW: \text{ Bandwidth}$$

A3 Laser Relax Frequency

Standard measurement.

A4 Frequency Response Flatness

Standard measurement.

A6 Power Saturation S_{sat}

The saturation S_{sat} is defined as the total slope change (η–η_0) at a certain laser forward current related to the maximum power slope η_0 in the threshold region.

$$S_{sat}[\%] = 100 \cdot \frac{(\eta - \eta_0)}{\eta_0}$$

A7 Tracking Error TE

The temperature dependence of the output power at a constant monitor current I_{mon} over the whole operating temperature range related to a reference point $P(I_{mon}=\text{const.}, T_{case}=25°C)$.

$$TE = 10 \cdot \log\left(\frac{P(I_{mon}, T_{case})}{P(I_{mon}, T_{case} = 25°C)}\right)$$

A8 Optical Crosstalk

Standard measurement.

$CRT_{int.}$: Crosstalk at Receiver for internal transmitter specific wavelength.

$CRT_{ext.}$: Crosstalk at Receiver for external transmitter specific wavelength.

A9 Return Loss

Standard measurement.

A10 Receiver Diode Linearity

Standard measurement.

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www.infineon.com/fiberoptics

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