

### Absolute Maximum Ratings

Exceeding any one of these values may destroy the device immediately.

Package Power Dissipation <sup>(1)</sup> .....	1.5 W
Supply Voltage ( $V_{CC}-V_{EE}$ ) .....	6 V
Data Input Levels .....	$V_{CC}+0.5$
Differential Data Input Voltage .....	2.5 V
Operating Case Temperature .....	0°C to 70°C
Storage Ambient Temperature .....	-40°C to 85°C
Soldering Conditions Temp/Time (MIL-STD 883 C Method 2003) .....	250°C/5.5s

### Note

- For  $V_{CC}-V_{EE}$  (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output. Add max. 45 mA for the three outputs. Load is 50  $\Omega$  to  $V_{CC}-2$  V.

### FEATURES

- Compliant with ATM, SONET OC-3, SDH STM-1
- Compact integrated transceiver unit with
  - MQW laser diode transmitter
  - InGaAs PIN photodiode receiver
  - Duplex SC receptacle
- Class 1 FDA and IEC laser safety compliant
- FDA Accession No. 9520890-08
- Single power supply (5 V)
- Signal detect indicator
- PECL differential inputs and outputs
- Process plug included
- Wave solderable and washable with process plug inserted
- Analog Rx power monitor output
- Industry multisource 2x9 footprint
- For distances of up to 15 km on single mode fiber

## DESCRIPTION

The Infineon single mode ATM transceiver complies with the ATM Forum's *Network Compatible ATM for Local Network Applications* document and ANSI's *Broadband ISDN - Customer Installation Interfaces, Physical Media Dependent Specification*, T1.646-1995, Bellcore-SONET OC-3/IR-1 and ITU-T G.957 STM-1/S.1.1.

ATM was developed to facilitate solutions in multimedia applications and real time transmission. The data rate is scalable, and the ATM protocol is the basis of the broadband public networks being standardized in the International Telecommunications Union (ITU), the former International Telegraph and Telephone Consultative Committee (CCITT). ATM can also be used in local private applications.

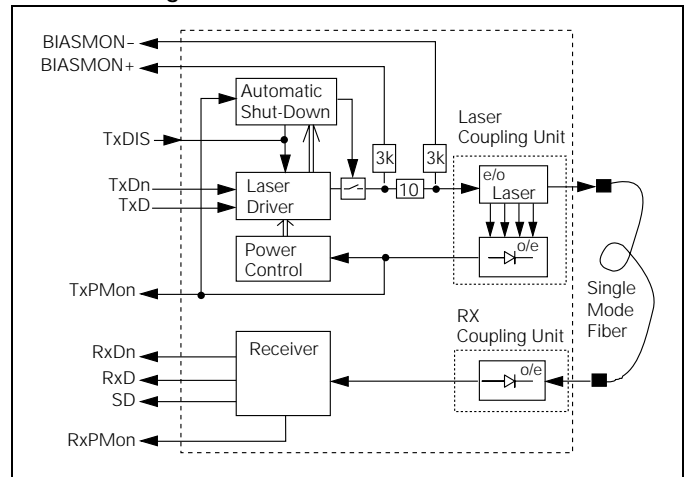
This Infineon single mode ATM transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost WAN applications. It can be used as the network end device interface in workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, and intelligent hubs, and wide area ATM switches.

This transceiver operates at 155.52 Mbit/s from a single power supply (+5 V). The differential data inputs, data outputs and signal detect output are PECL compatible.

## Functional Description

This transceiver is designed to transmit serial data via single mode cable.

### Functional Diagram



The receiver component converts the optical serial data into PECL compatible electrical data (RxD and RxDn). The Signal Detect (SD, active high) shows whether an optical signal is present<sup>(1)</sup>.

This transceiver offers the advantage of an analog Rx power monitor (RxPMON) that can prove and control link status, including transmission distances and security of the connection. This output shows an analog voltage that is proportional to the light input within the range of -20 dBm to -30 dBm.

The transmitter part converts electrical PECL compatible serial data (TxD and TxDn) into optical serial data. It contains a laser driver circuit that drives the modulation and bias current of the laser diode. The currents are controlled by a power control circuit to guarantee constant output power of the laser over temperature and aging.

The power control uses the output of the monitor PIN diode (mechanically built into the laser coupling unit) as a controlling signal, to prevent the laser power from exceeding the operating limits.

The laser can be switched off with a high signal on the Transmitter Disable pin (TxDis). The TxPMon pin shows a voltage reflecting the optical power output. The bias current is monitored on the BIASMON pins. Both signals can be used to supervise the function of the module.

Aging control is possible using the bias monitor output (BIASMON). The module has an integrated shutdown function that switches the laser off in the event of an internal failure.

The transceiver contains a supervisory circuit to control the power supply. This circuit generates an internal reset signal whenever the supply voltage drops below the reset threshold. It keeps the reset signal active for at least 15 milliseconds after the voltage has risen above the reset threshold. During this time the laser is inactive.

### Note

1. We recommend to switch off the transmitter supply ( $V_{CC-Tx}$ ) if no transmitter input data is applied.

## TECHNICAL DATA

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

### Recommended Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Units
Case Temperature	$T_C$	0		70	°C
Power Supply Voltage	$V_{CC}-V_{EE}$	4.75	5.0	5.25	V
Supply Current <sup>(1)</sup>	$I_{CC}$		230	250	mA
<b>Transmitter</b>					
Data Input High Voltage	$V_{IH}-V_{CC}$	-1165		-880	mV
Data Input Low Voltage	$V_{IL}-V_{CC}$	-1810		-1475	
Input Data Rise/Fall Time, 10%–90%	$t_R, t_F$	0.4		1.3	ns
TxDIS Input High Voltage	$V_{TIH}$	2.0			V
TxDIS Input Low Voltage	$V_{TIL}$			0.8	
<b>Receiver</b>					
Output Current	$I_O$			25	mA
Input Center Wavelength	$\lambda_C$	1260		1360	nm

#### Note

- For  $V_{CC}-V_{EE}$  (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output. Add max. 45 mA for the three outputs. Load is 50  $\Omega$  to  $V_{CC}-2$  V.

### Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average)	$P_O$	-15.0	-11.0	-8.0	dBm
Center Wavelength	$\lambda_C$	1274		1356	nm
Spectral Width, RMS	$\sigma_l$			2.5	
Output Rise/Fall Time, 20%–80%	$t_R, t_F$			0.4	ns
Extinction Ratio (Dynamic)	ER	8.2	12		dB
Eye Diagram <sup>(1)</sup>	ED				
Reset Threshold for Tx $V_{CC}$ <sup>(2)</sup>	$V_{TH}$	2.85	2.93	3.0	V
Reset Active Time Out <sup>(2)</sup>	$t_{RES}$	15	22	35	ms

#### Notes

- Transmitter meets ANSI T1E1.2, SONET OC-3, and ITU-T G.957 mask patterns.
- Laser power is shut down if power supply is below  $V_{TH}$  and switched on if power supply is above  $V_{TH}$  after  $t_{RES}$ . The supervisory circuit can be reset by switching TxDis from high to low.

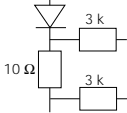
### Receiver Electro-Optical Characteristics

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) <sup>(1)</sup>	$P_{IN}$		-34	-29	dBm
Saturation (Average Power)	$P_{SAT}$	-8.0	-3.0		
Signal Detect Assert Level <sup>(2)</sup>	$P_{SDA}$		-38	-34	
Signal Detect Deassert Level <sup>(3)</sup>	$P_{SDD}$	-44	-40		
Signal Detect Hysteresis	$P_{SDA}-P_{SDD}$		2		dB
Signal Detect Assert Time	$t_{ASS}$		1		ms
Signal Detect Deassert Time	$t_{DAS}$		5		
PECL Output Low Voltage <sup>(4)</sup>	$V_{OL}-V_{CC}$	-1950		-1630	mV
PECL Output High Voltage <sup>(4)</sup>	$V_{OH}-V_{CC}$	-1025		-735	
Output Data, Rise/Fall Time, 20%–80%	$t_R, t_F$		0.7	1	ns
Output SD, Rise/Fall Time				40	

#### Notes

- Minimum average optical power at which the BER is less than  $1 \times 10^{-10}$ . Measured with a 2<sup>23</sup>-1 NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3, and ITU-T G.957.
- An increase in optical power of data signal above the specified level will cause the SIGNAL DETECT to switch from a Low state to a High state.
- A decrease in optical power of data signal below the specified level will cause the SIGNAL DETECT to switch from a High state to a Low state.
- PECL compatible. Load is 50  $\Omega$  into  $V_{CC}-2$  V. Measured under DC conditions at 25°C. For dynamic measurements a tolerance of 50 mV should be added.  $V_{CC}=+5$  V.

## Pin Description

Pin Name		Level	Pin#	Description
NC			1-4	Pin not connected
Bias Mon	Bias Monitor 	Analog Voltage		This output shows an analog voltage that is proportional to the laser bias current. Use this output to check proper laser operation and for end of life indications. Limit: Bias Current $I_{BIAS} < 60 \text{ mA}$ $I_{BIAS} = \frac{U}{10 \Omega}$
		Bias Mon -	5	
		Bias Mon +	6	
TxDis	Tx Disable/Enable	TTL-Input	7	A low signal switches the laser on. A high signal switches the laser off.
RxPMon	Rx Power Monitor	Analog Voltage	8	This output shows an analog voltage that is proportional to the light input. Output voltage RxPMon = 2.5 V (typical) at -20 dBm opt. input signal and RxPMon = 0.3 V (typical) at -30 dBm opt. input signal. Source Resistance $R_S = 300 \text{ k}\Omega$ .
TxPMon	Tx Power Monitor	Analog Voltage	9	This output shows an analog voltage that is proportional to the light output. This output can be used for laser safety functions. Output Voltage $V_{mon} = 1.2$ , Source Resistance $R_S = 100 \text{ k}\Omega$
TxV <sub>EE</sub>	Tx Ground	Power Supply	10	Negative power supply, normally ground
TxD	Tx Input Data	PECL Input	11	Transmitter input data
TxDn			12	Inverted transmitter input data
TxV <sub>CC</sub>	Tx +5 V	Power Supply	13	Positive power supply, +5 V
RxV <sub>CC</sub>	Rx +5 V			
SD	Rx Signal Detect	PECL Output active high	15	A high level on this output shows that optical data is applied to the optical input.
RxDn	Rx Output Data	PECL Output	16	Inverted receiver output data
RxD			17	Receiver output data
RxV <sub>EE</sub>	Rx Ground	Power Supply	18	Negative power supply, normally ground
	Stud Pin	Mech. Support	S1/2	Not connected

## Regulatory Compliance

Feature	Standard	Comments
Electrostatic Discharge (ESD) to the Electrical Pins	MIL-STD 883C Method 3015.4	Class 1 (>1000 V)
Immunity: Electrostatic Discharge (ESD) to the Duplex SC Receptacle	EN 61000-4-2 IEC 61000-4-2	Discharges of $\pm 15 \text{ kV}$ with an air discharge probe on the receptacle cause no damage.
Immunity: Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 61000-4-3	With a field strength of 3 V/m rms, noise frequency ranges from 10 MHz to 1 GHz. No effect on transceiver performance between the specification limits.
Emission: Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 1 GHz

### EYE SAFETY

This laser based single mode transceiver is a Class 1 product. It complies with IEC 60825-1 and FDA 21 CFR 1040.10 and 1040.11.

To meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

### Caution

**All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required.**

**Tampering with or modifying the performance of the device will result in voided product warranty.**

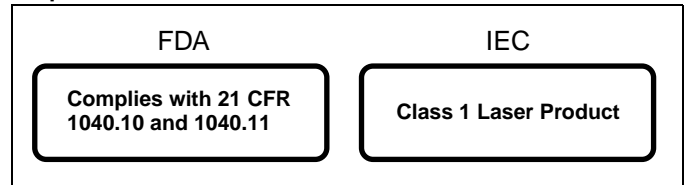
### Note

Failure to adhere to the above restrictions could result in a modification that is considered an act of "manufacturing," and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).

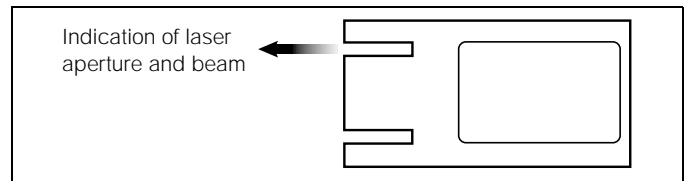
### Laser Data

Wavelength	1300 nm
Total output power (as defined by IEC: 50 mm aperture at 10 cm distance)	less than 2 mW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	less than 180 $\mu$ W
Beam divergence	4°

### Required Labels

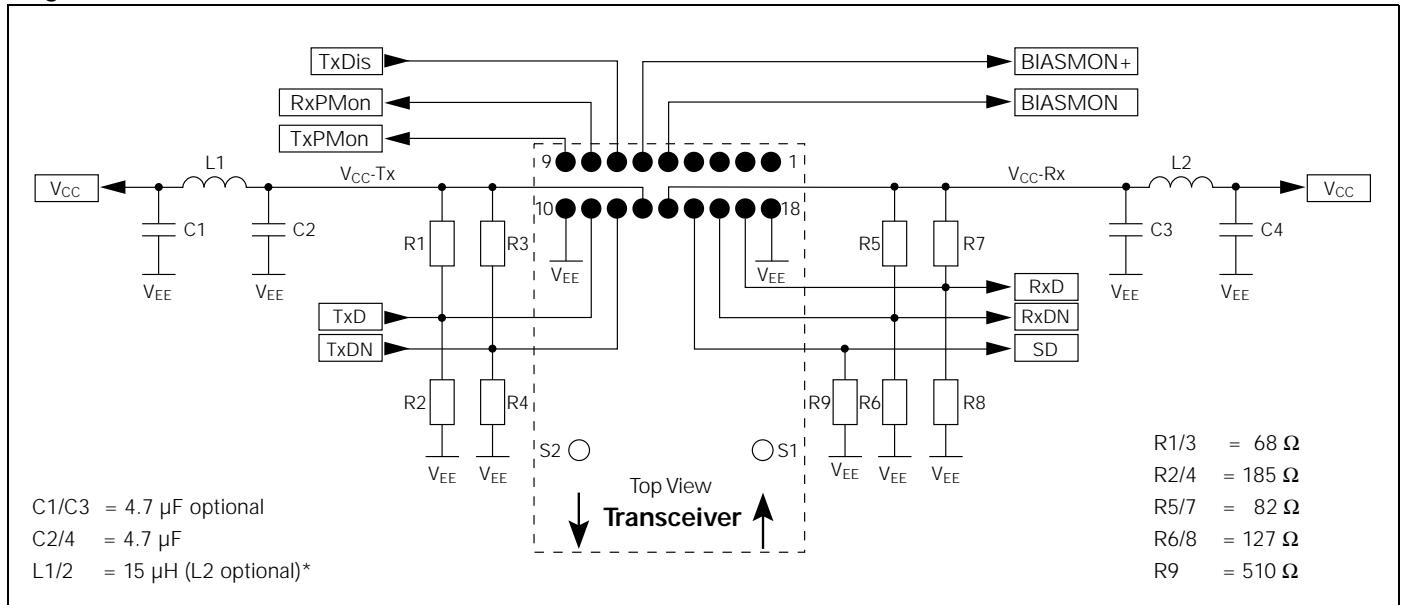


### Laser Emission



## APPLICATION NOTE

### Single Mode 155 MBd ATM 2x9 Transceiver



\* Recommended choke is Siemens Matsushita B78108-S1153-K or B78148-S1153-K ( $Q_{\min}=60$ , max. DC resistance  $=0.6 \Omega$ ).

The power supply filtering is recommended for good EMI performance. Use short tracks from the inductor L1/L2 to the module  $V_{CC-Rx}/V_{CC-Tx}$ . We recommend a  $V_{EE}$  plane under the module for getting good EMI performance. The transceiver contains an automatic shutdown circuit. Reset is only possible

when the power is turned off, and then on again ( $V_{CC-Tx} = 0 \text{ V}$ ). The receiver data signals should be terminated with  $50 \Omega$  at the far end. Terminations should be placed very close to the receiver data pins in combination with AC coupling.

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#### Attention please!

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#### Warnings

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