

### 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 .....   | $V_{CC}+0.5$ V  |
| 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<br>(MIL-STD 883C, 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
- IEC Class 1 laser safety compliant
- FDA Class 1 laser safety compliant under normal operating conditions
- FDA Accession No. 9520890-02
- Single power supply (5 V)
- Signal detect indicator
- PECL differential inputs and outputs
- Process plug included
- Wave solderable and washable with process plug inserted
- Industry standard multisource 1x9 footprint
- For distances of up to 40 km on single mode fiber

## DESCRIPTION

This data sheet describes the Infineon single mode ATM long haul transceiver.

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/LR-1 and ITU-T G.957 STM-1/L.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.

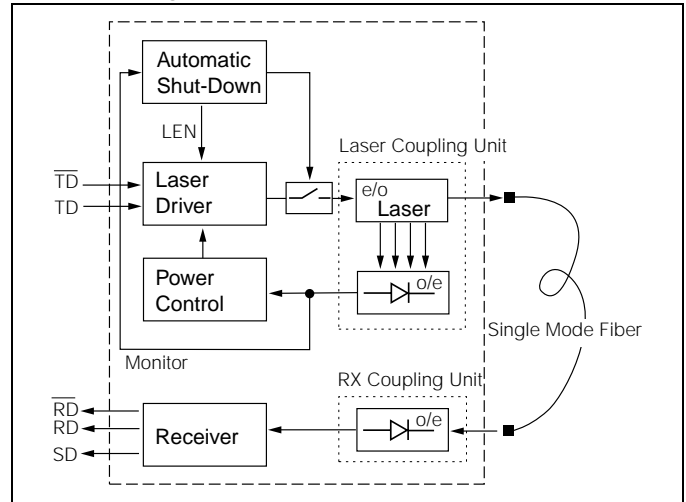
The Infineon single mode ATM long haul transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost WAN applications. It can be used as the network end device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

This transceiver operates at 155.520 Mbit/s from a single power supply (+5 Volt). The differential data inputs and outputs 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 (RD and RDnot). The Signal Detect (SD, active high) shows whether optical data is present<sup>(1)</sup>.

The transmitter converts electrical PECL compatible serial data (TD and TDnot) 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.

This module is a Class 1 laser product, due to an integrated automatic shutdown circuit that disables the laser when it detects transmitter failures.

The transceiver contains a supervisory circuit to monitor the power supply. This circuit makes an internal reset signal whenever the supply voltage drops below the reset threshold. It keeps the reset signal active for at least 140 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>      | $I_{CC}$        |       | 150  | 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    |
| <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)                          | $P_O$       | -5   | -3   | -0   | dBm   |
| Center Wavelength                               | $\lambda_C$ | 1280 |      | 1335 | nm    |
| Spectral Width (FWHM)                           | $D_I$       |      | 2.4  | 3    |       |
| Output Rise Time                                | $t_R$       | 0.6  |      | 2.5  | ns    |
| Output Fall Time                                | $t_F$       |      |      | 3    |       |
| Extinction Ratio (Dynamic)                      | ER          | 10   |      |      | dB    |
| Reset Threshold for $T_X V_{CC}$ <sup>(1)</sup> | $V_{TH}$    | 4.25 | 4.38 | 4.5  | V     |
| Reset Active Time Out <sup>(1)</sup>            | $t_{RES}$   | 140  | 240  | 560  | ms    |
| Eye Diagram <sup>(2)</sup>                      |             |      |      |      |       |

#### Notes

- Laser power is shut down if power supply is below  $V_{TH}$  and switched on if power supply is above  $V_{TH}$  after  $t_{RES}$ .
- Transmitter meets ANSI T1E1.2, SONET OC-3, and ITU-T G.957 mask patterns.

### Receiver Electro-Optical Characteristics

| Receiver                                    | Symbol            | Min.  | Typ.  | Max.  | Units   |
|---|-------------------|-------|-------|-------|---------|
| Sensitivity (Average Power) <sup>(1)</sup>  | $P_{IN}$          |       | -38   | -35   | dBm     |
| Saturation (Average Power)                  | $P_{SAT}$         | 0     |       |       |         |
| Signal Detect Assert Level <sup>(2)</sup>   | $P_{SDA}$         |       | -40.5 | -38   |         |
| Signal Detect Deassert Level <sup>(3)</sup> | $P_{SDD}$         | -45   | -42   |       |         |
| Signal Detect Hysteresis                    | $P_{SDA}-P_{SDD}$ | 1     | 1.5   | 3     | dB      |
| Signal Detect Assert Time <sup>(4)</sup>    | $t_{ASS}$         | 10    | 40    | 100   | $\mu$ s |
| Signal Detect Deassert Time <sup>(5)</sup>  | $t_{DAS}$         | 30    | 680   | 1000  |         |
| Output Low Voltage <sup>(6)</sup>           | $V_{OL}-V_{CC}$   | -1950 |       | -1630 | mV      |
| Output High Voltage <sup>(6)</sup>          | $V_{OH}-V_{CC}$   | -1025 |       | -735  |         |
| Output Data, Rise/Fall Time, 10%–90%        | $t_R, t_F$        |       |       | 1.3   | ns      |
| Output SD Rise/Fall Time <sup>(7)</sup>     |                   |       |       | 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.
- Measured by switching the light from  $< -40$  dBm to  $-25$  dBm.
- Measured by switching the light from  $-25$  dBm to  $< -40$  dBm. Switching from higher power levels increases this time.
- 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.
- PECL compatible. A high level on this output shows that optical data is applied to the optical input.

## Pin Description

| Pin Name          |                  | Level / Logic           | Pin# | Description  |
|-------------------|------------------|-------------------------|------|--|
| RxV <sub>EE</sub> | Rx Ground        | Power Supply            | 1    | Negative power supply, normally ground   |
| RD                | Rx Output Data   | PECL Output             | 2    | Receiver output data   |
| RDn               |                  |                         | 3    | Inverted receiver output data  |
| SD                | Rx Signal Detect | PECL Output active high | 4    | A high level on this output shows that optical data is applied to the optical input. |
| RxV <sub>CC</sub> | Rx +5V           | Power Supply            | 5    | Positive power supply, +5V   |
| TxV <sub>CC</sub> | Tx +5V           |                         | 6    | Positive power supply, +5V   |
| TDn               | Tx Input Data    | PECL Input              | 7    | Inverted transmitter input data  |
| TD                |                  |                         | 8    | Transmitter input data   |
| TxV <sub>EE</sub> | Tx Ground        | Power Supply            | 9    | Negative power supply, normally ground   |
|                   | Stud Pin         | Mech. Support           | S1/2 | Stud connected to V <sub>EE</sub>  |

## 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<br>IEC 61000-4-2               | Discharges of ±15kV with an air discharge probe on the receptacle cause no damage.   |
| Immunity: Radio Frequency Electromagnetic Field                     | EN 61000-4-3<br>IEC 61000-4-3               | With a field strength of 10 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<br>EN 55022 Class B<br>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.**

**Do not view into the open optical port for more than 60 seconds.**

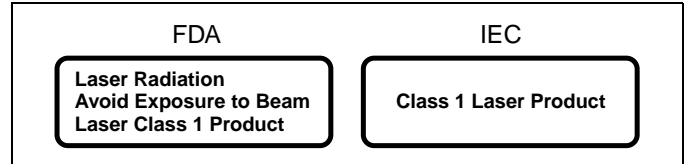
### Note

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 (j)).

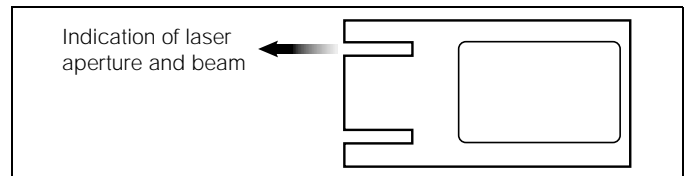
## Laser Data

|  |         |
|--|---------|
| Wavelength   | 1300 nm |
| Total output power (as defined by IEC: 50 mm aperture at 10 cm distance) | 8 mW    |
| Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)  | 600 µW  |
| Beam divergence  | 4°      |

## Required Labels

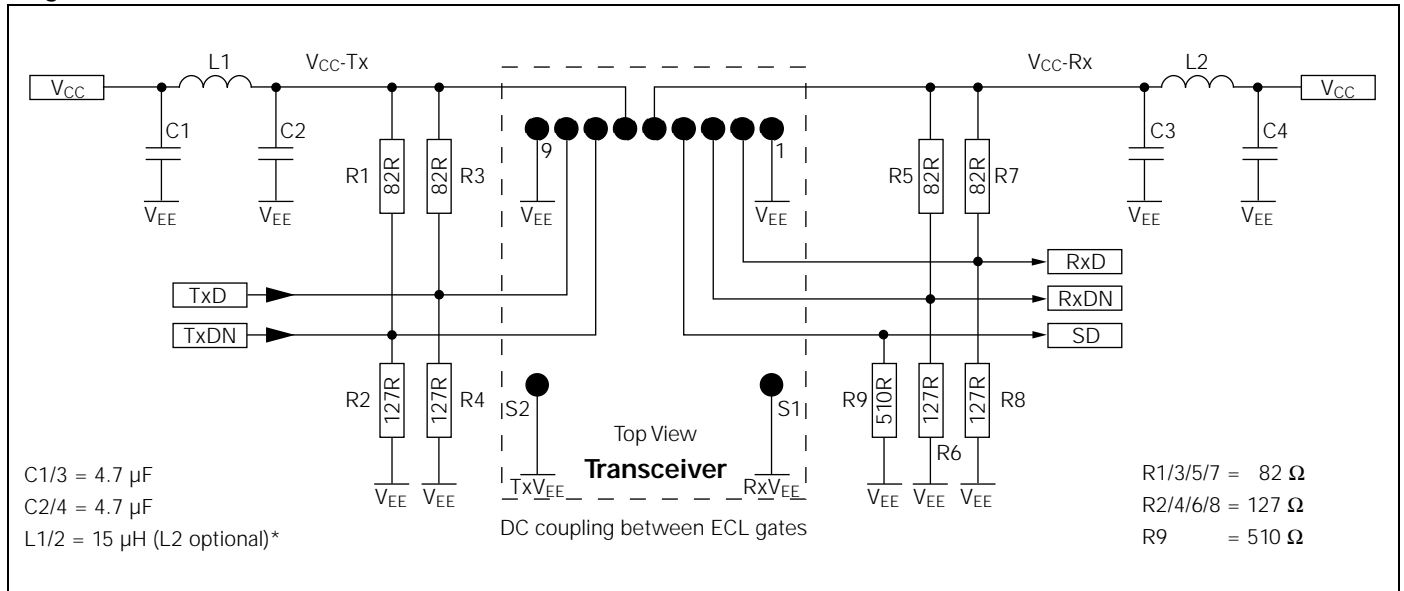


## Laser Emission



## APPLICATION NOTE

### Single Mode 1x9 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 and sensitivity performance. Studs should be connected to this  $V_{EE}$  plane. The transceiver contains an automatic shutdown circuit.

Reset is only possible if the power is turned off, and then on again.  $V_{CC-TX}$  switched below  $V_{TH}$ . Further application notes for electrical interfacing are available upon request. Ask for App-note 82.

Application board available on request.

Published by Infineon Technologies AG

© Infineon Technologies AG 1999  
All Rights Reserved

#### Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.  
Terms of delivery and rights to technical change reserved.  
We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.  
Infineon Technologies is an approved CECC manufacturer.

#### Information

For further information on technology, delivery terms and conditions and prices please contact the Infineon Technologies offices or our Infineon Technologies Representatives worldwide - see our webpage at [www.infineon.com/fiberoptics](http://www.infineon.com/fiberoptics)

#### Warnings

Due to technical requirements components may contain dangerous substances. For information on the types in question please contact your Infineon Technologies offices.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.