

### Absolute Maximum Ratings

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

Package Power Dissipation <sup>(1)</sup> .....	1 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 Ambient Temperature.....	0°C to 70°C
Storage Ambient Temperature.....	-40°C to 85°C
Soldering Conditions, Temp/Time (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 existing FDDI standard
- 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. 9520890-21
- 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

## DESCRIPTION

This data sheet describes the Infineon Single Mode SC FDDI transceiver, which complies with the current Fiber Distributed Data Interface (FDDI) Single Mode Fiber Physical Layer Medium Dependent (SMF-PMD ANSI standard).

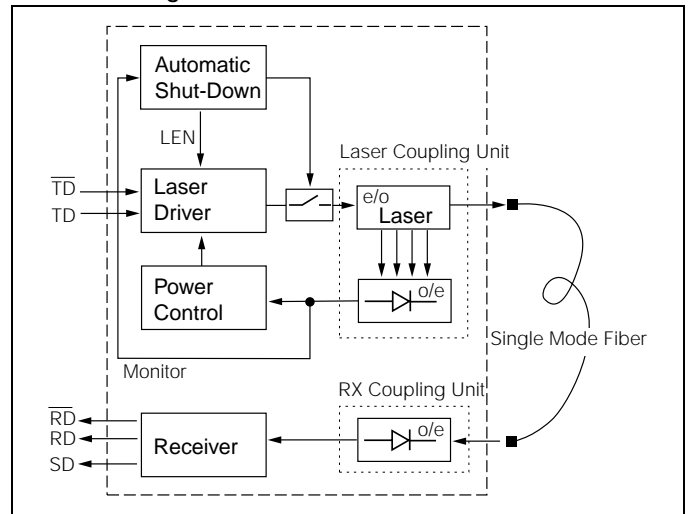
The Infineon single mode SC FDDI transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN and WAN applications. It can be used as the network end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

This transceiver operates at 125 MBit/s from a single power supply (+5 Volt). The full 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 in 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
Ambient Temperature	T <sub>AMB</sub>	0		70	°C
Power Supply Voltage	V <sub>CC-V<sub>EE</sub></sub>	4.75	5.0	5.25	V
Supply Current <sup>(1)</sup>	I <sub>CC</sub>		150	250	mA
<b>Transmitter</b>					
Data Input High Voltage	V <sub>IH-V<sub>CC</sub></sub>	-1165		-880	mV
Data Input Low Voltage	V <sub>IL-V<sub>CC</sub></sub>	-1810		-1475	
Input Data Rise/Fall Time, 10%-90%	t <sub>R</sub> , t <sub>F</sub>	0.4		1.3	ns
<b>Receiver</b>					
Output Current	I <sub>O</sub>			25	mA
Input Center Wavelength	λ <sub>C</sub>	1260		1360	nm

#### Note

- For V<sub>CC-V<sub>EE</sub></sub> (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 Ω to V<sub>CC-2 V</sub>.

### Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average) <sup>(1)</sup>	P <sub>O</sub>	-20	-16	-14	dBm
Center Wavelength <sup>(2, 3)</sup>	λ <sub>C</sub>	1270		1340	nm
Spectral Width (RMS) <sup>(3, 4)</sup>	σ <sub>I</sub>			15	
Output Rise Time <sup>(5)</sup>	t <sub>R</sub>	0.6		3.5	ns
Output Fall Time <sup>(5)</sup>	t <sub>F</sub>				
Extinction Ratio (Dynamic)	ER	10			dB
Overshoot	OS			25	%
Duty Cycle Distortion <sup>(6, 7)</sup>	DCD			1.0	ns
Data Dependent Jitter <sup>(7, 8)</sup>	DDJ			0.6	
Random Jitter <sup>(7, 9)</sup>	RJ			0.69	

#### Notes

- Measured at the end of 5 meters of single mode fiber. The FDDI Halt Line state (12.5 MHz square wave) is used. Specified values are valid for EOL and over the whole temperature range.
- The weighted average wavelength of the optical spectrum output.
- FOTP-127 is used to measure central wavelength and RMS spectral width.
- The weighted root mean square (RMS) width of the optical output spectrum.
- To 90% (90% to 10%) levels. Measured using the Halt Line state (12.5 MHz square wave).
- Measurement done using the Idle Line state (62.5 MHz square wave).
- Test method as in PMD Appendix A. All jitter values are peak-to-peak.
- Measurement done using the Worst Case test pattern described in the PMD Appendix A.5.
- Measurement done using the Idle Line state (62.5 MHz square wave). BER=2.5<sup>-10</sup>.

### Receiver Electro-Optical Characteristics

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) <sup>(1)</sup>	P <sub>IN</sub>		-33	-31	dBm
Saturation (Average Power) <sup>(1)</sup>	P <sub>SAT</sub>	-14			
Signal Detect Assert Level <sup>(2)</sup>	P <sub>SDA</sub>			-31	
Signal Detect Deassert Level <sup>(3)</sup>	P <sub>SDD</sub>	-40.5		-32.5	
Signal Detect Hysteresis	P <sub>SDA-P<sub>SDD</sub></sub>	1			dB
Signal Detect Assert Time	t <sub>ASS</sub>			100	μs
Signal Detect Deassert Time	t <sub>DAS</sub>			350	
Output Low Voltage <sup>(4)</sup>	V <sub>OL-V<sub>CC</sub></sub>	-1950		-1630	mV
Output High Voltage <sup>(4)</sup>	V <sub>OH-V<sub>CC</sub></sub>	-1025		-735	
Output Data Rise/Fall Time, 10%-90%	t <sub>R</sub> , t <sub>F</sub>			1.3	ns
Output SD Rise/Fall Time <sup>(5)</sup>				40	
Duty Cycle Distortion <sup>(6, 7)</sup>	DCD			0.4	
Data Dependent Jitter <sup>(7, 8)</sup>	DDJ			1.0	
Random Jitter <sup>(7, 9)</sup>	RJ			2.1	

#### Notes

- Minimum average power at which the BER is less than 2.5<sup>-10</sup> or lower. Measured with the ANSI Worst Case pattern from Appendix 5 of the PMD.
- 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 Ω into V<sub>CC-2 V</sub>. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added. V<sub>CC</sub>=5 V.
- PECL compatible. A high level on this output shows that optical data is applied to the optical input.
- Measurement done using the Idle Line state (62.5 MHz square wave).
- Test method as in PMD Appendix A. All jitter values are peak-to-peak.
- Measurement done using the Worst Case test pattern described in the PMD Appendix A.5.
- Measurement done using the Idle Line state (62.5 MHz square wave). BER=2.5<sup>-10</sup>.

## Pin Description

Pin Name	Level	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	Rx Output Data	PECL Output	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 +5 V	Power Supply	5	Positive power supply, +5 V
TxV <sub>CC</sub>	Tx +5 V	Power Supply	6	Positive power supply, +5 V
TDn	Tx Input Data	PECL Input	7	Inverted transmitter input data
TD	Tx Input Data	PECL Input	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 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 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 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.**

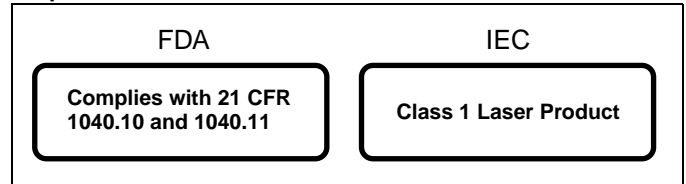
### Note

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 (l)).

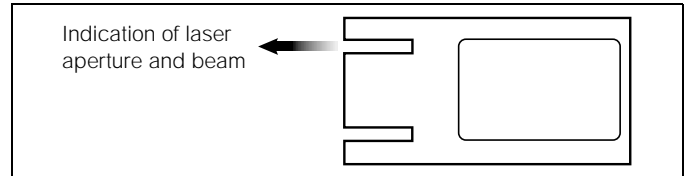
## Laser Data

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

## Required Labels

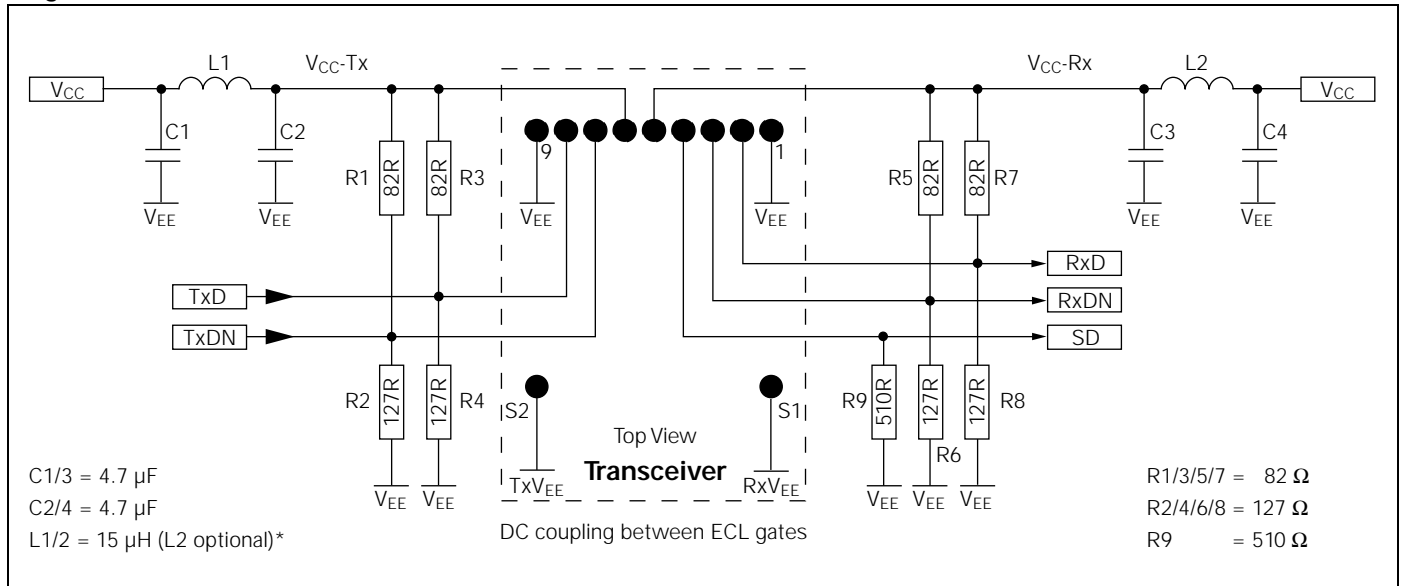


## Laser Emission



## 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.

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#### Attention please!

The information herein is given to describe certain components and shall not be considered as warranted characteristics.  
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#### Warnings

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

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