



## FEATURES

- Integrated Beam Splitter
- Bi-Directional Transmission in a single optical window
- Single fiber solution, singlemode fiber pigtail with different connector options
- Data rate up to 155 Mbit/s
- FP Laser Diode with Multi-Quantum Well structure, wavelength 1310 nm
- Class 1 Laser Product
- Incorporated laser driver and PIN-TIA Receiver with post-amplifier
- 2x5 Small Form Factor Package with Multisource Footprint

## V23870-A211x-xx00<sup>(\*)</sup> Bi-Directional Pigtail SFF Transceiver 155 Mb/s, 1310 nm Tx / 1310 nm Rx

### Absolute Maximum Ratings

Operating case temperature

V23870-A2111-xx00 ..... 0 to 70 °C

V23870-A2112-xx00 ..... -40 to 85 °C

Storage Ambient Temperature ..... -40 to 85 °C

Supply voltage ..... 3.53 V

Soldering Conditions Temp/Time

Iron Soldering only ..... 400 °C / 10 s

<sup>(\*)</sup> Ordering Information

## V23870 - A211x - xx00

Average Launched Power:  
2: -8 ... -13 dBm

Temperature Range:  
1: 0 ... +70 °C  
2: -40 ... +85 °C

Connector:  
A: Pigtail Only  
B: SC  
C: SC/APC 8°  
F: MU  
H: MU-J  
K: LC

Coupling:  
(Tx/Rx, Signal Detect)  
1: AC/AC, PECL SD  
2: DC/DC, PECL SD  
5: AC/AC, TTL SD  
6: DC/DC, TTL SD

## DESCRIPTION

The Infineon BIDI® transceiver – part of Infineon's Small Form Factor transceiver family – is based on the Physical Medium Depend (PMD) sublayer and baseband medium.

Infineon's BIDI-TRX is designed to handle multiple data rates and can be designed into Fast Ethernet, FDDI, Fiber Channel, ATM-155, SDH STM-1, SONET OC-3, CCTV and other applications as well as different FTTx applications according to the 100 Mbps EFM standard (IEEE 802.3ah). It is suitable for both, short haul applications and distances of 20 km and beyond.

The appropriate fiber optic cable is the 9 $\mu$ m singlemode fiber pigtail with different connector options.

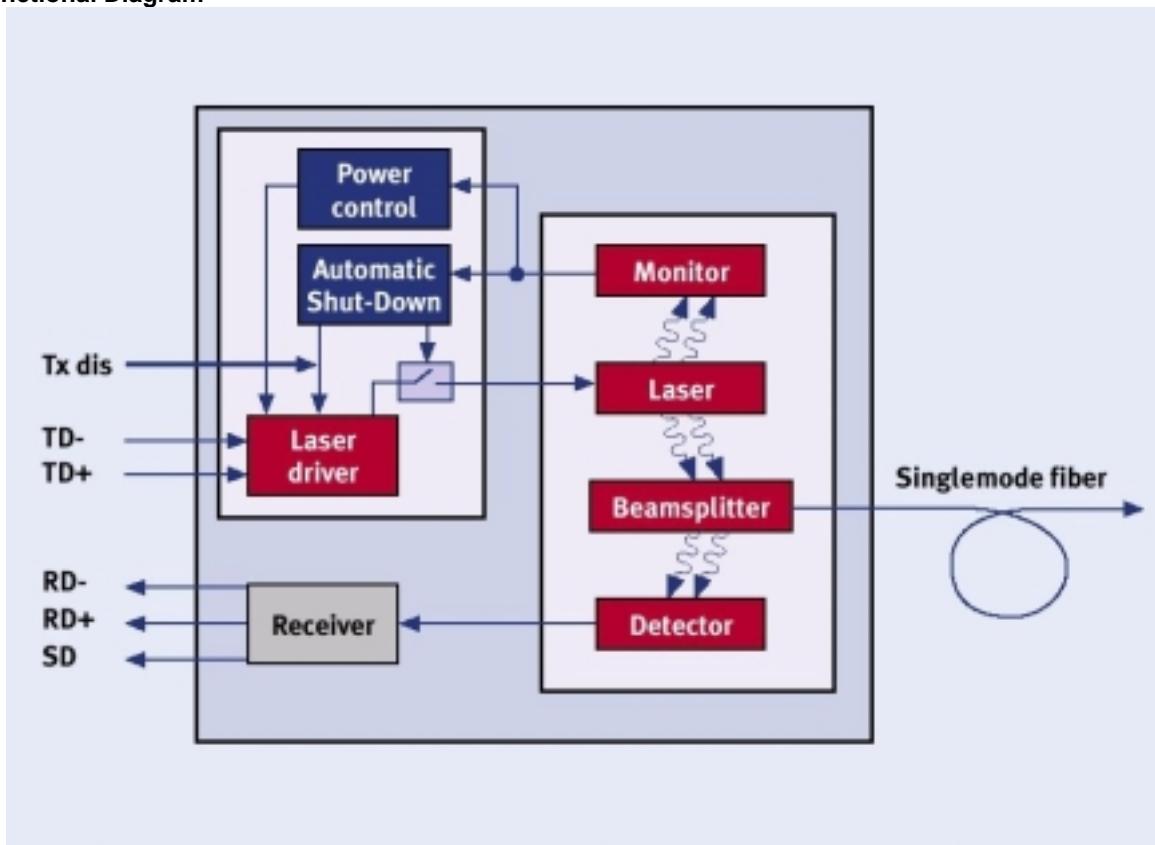
The Infineon BIDI transceiver is a single unit comprised of a transmitter, a receiver, WDM filter or beam splitter, and a singlemode fiber pigtail. This design frees the customer from many alignment and PC board layout concerns.

This transceiver operates at 155Mb/s from a single power supply (+3.3 V). The full differential data inputs and outputs are PECL and LVPECL compatible.

### Functional Description of 2x5 Pin Row Transceiver

This transceiver is designed to transmit and receive serial data via a singlemode 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 an optical signal is present.

The transmitter converts PECL compatible electrical serial data (TD and TDnot) into optical serial data. Data lines are differentially  $100\Omega$  terminated.

The transmitter 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.

Single fault condition is ensured by means of an integrated automatic shutdown circuit that disables the laser when it detects laser fault to guarantee the laser Eye Safety.

The transceiver contains a supervisory circuit to control 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.

The laser can be disabled by the TxDis input.

## Technical Data

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

Recommended Operating Conditions	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature Range at Case <sup>1</sup>	$T_C$	0		+70	°C
Operating Temperature Range at Case <sup>2</sup>	$T_C$	-40		+85	°C
Power Supply Voltage	$V_{CC}-V_{EE}$	3.1	3.3	3.53	V
Transmitter					
Data Input Differential Voltage	$V_{DIFF}$	250		1600	mV
Receiver					
Input Center Wavelength	$\lambda_C$	1500		1600	nm

<sup>1</sup> For V23870-A2111-xx00

<sup>2</sup> For V23870-A2112-xx00



Transmitter	Symbol	Min.	Typ.	Max.	Unit
Average Launched Power	$P_{out,max}$	-13		-8	dBm
Emission wavelength center of range <sup>3</sup>	$\lambda$	1270	1310	1350	nm
Spectral bandwidth (RMS)	$\sigma_\lambda$			3.0	nm
Temperature coefficient of emission wavelength	$\Delta\lambda(T)$			0.5	nm/K
Extinction Ratio (Dynamic)	ER	8.5			dB
Jitter (pkpk)	$J_{PP}$			1	ns
Rise Time (20% - 80%) <sup>4</sup>	$t_R$			2.5	ns
Fall Time (20% - 80%) <sup>5</sup>	$t_F$			2.5	ns
Eye diagram	ITU G.957 mask pattern				
RIN Noise	RIN			-120	dB/√Hz
Reset Threshold <sup>5</sup>	$V_{TH}$	2.5	2.75	2.99	V
Reset Timeout <sup>5</sup>	$t_{RES}$	140	240	560	ms
Power on Delay	$t_{PWR\_ON}$	88	111	140	ms
Shut Off Time for TxDis	$t_{DIS}$			6	ms
Max Tx Supply Current	$I_{TX}$	90		135	mA

<sup>3</sup>  $P_{opt} = P_{out,max}$  at  $T=25^\circ\text{C}$

<sup>4</sup> Rise and fall times are measured with the OC-3 filter ON

<sup>5</sup> Laser power is shut down if power supply is below  $V_{TH}$  and switch on if power supply is above  $V_{TH}$  after  $t_{RES}$ .



Receiver	Symbol	Min.	Typ.	Max.	Unit
Receiving wavelength center of range <sup>6</sup>	$\lambda_R$	1270	1310	1350	nm
Sensitivity (Average Power) <sup>7</sup>	$P_{IN}$			-21	dBm
Saturation (Average Power)	$P_{SAT}$	-3.0			dBm
Signal Detect Assert Level <sup>8</sup>	$P_{SDA}$			-22	dBm
Signal Detect Deassert Level <sup>9</sup>	$P_{SDD}$	-31			dBm
Signal Detect Hysteresis	$P_{SDA^-}$ $P_{SDD}$	0.5	4	6	dB
Signal Detect Assert Time	$t_{ASS}$			100	$\mu$ s
Signal Detect Deassert Time	$t_{DAS}$			350	$\mu$ s
Data Output Differential Voltage <sup>10</sup>	$V_{DIFF}$	0.4	0.8	1.0	V
Rise/Fall Time	$t_R; t_F$			1.5	ns
Max Rx Supply Current <sup>11</sup>	$I_{RX}$		60	130	mA

Module Electro-Optical Characteristics	Symbol	Min.	Typ.	Max.	Unit
Optical Isolation <sup>12</sup>	ORL	14			dB

<sup>6</sup>  $P_{opt} = P_{out,max}$  at  $T=25^\circ C$

<sup>7</sup> Minimum average optical power at which the BER is less than  $1 \times 10^{-10}$ . Measured with a  $10^{23} - 1$  NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3, and ITU G.957.

<sup>8</sup> An increase in optical power above the specified level will cause the SIGNAL DETECT output to switch from a Low state to a High state.

<sup>9</sup> A decrease in optical power below the specified level will cause the SIGNAL DETECT to change from a High state to a Low state.

<sup>10</sup> AC/AC for data. Load  $50\Omega$  to GND or  $100\Omega$  differential. For dynamic measurement a tolerance of 50mV should be added.

<sup>11</sup> Supply current excluding Rx output load.

<sup>12</sup> Source wavelength is 1550 nm, BiDi Tx and Rx is Off



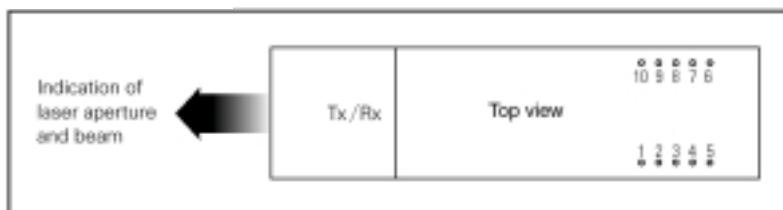
### Fiber Data

The mechanical fiber characteristics are described in the following table.

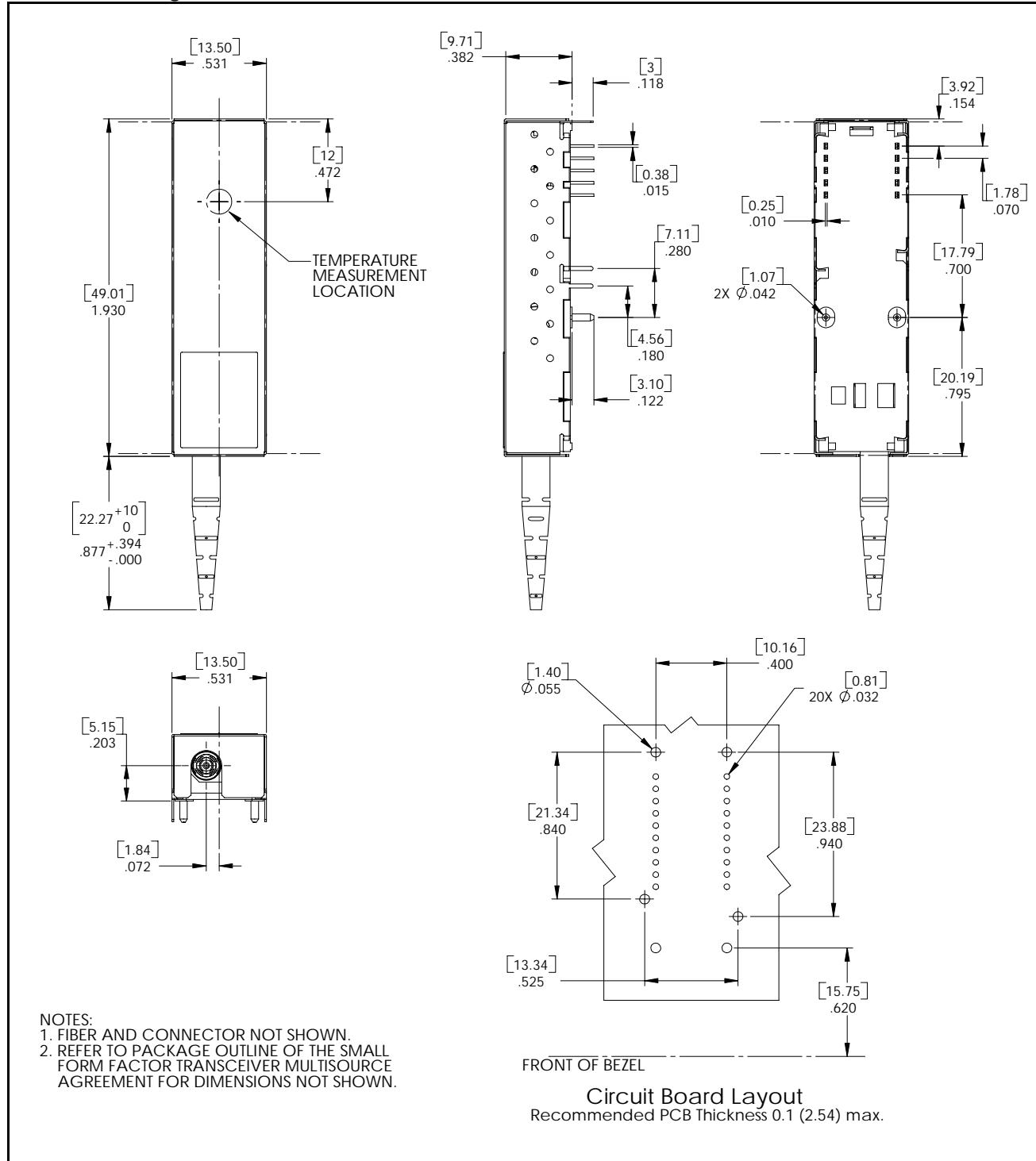
Fiber Characteristics	Min.	Typ.	Max.	Unit
Mode Field Diameter	8	9	10	µm
Cladding Diameter	123	125	127	µm
Mode Field/Cladding Concentricity Error			1	µm
Cladding Non-circularity			2	%
Mode Field Non-circularity			6	nm
Cut off Wavelength	1270			nm
Jacket Diameter	0.8		1	mm
Bending Radius	30			mm
Tensile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

## Pin Description

Pin Name		Level/ Logic	Pin#	Description
$V_{EEr}$	Receiver Signal Ground	N/A	1	
$V_{CCr}$	Receiver Power Supply	N/A	2	
SD	Signal Detect	see options on page 1	3	Normal Operation: Logic "1" Output, represents that light is present at receiver input Fault Condition: Logic "0" Output Recommended Termination of $510 \Omega$ to Vee, for PECL
RD-	Received Data Out Not	PECL	4	
RD+	Received Data Out	PECL	5	
$V_{CCt}$		N/A	6	Transmitter Power Supply
$V_{EEt}$		N/A	7	Transmitter Signal Ground
TxDis	Transmitter Disable/Enable	TTL-Input	8	A low/open signal switches the laser on. A high signal switches the laser off.
TD+	Transmit Data	PECL	9	Transmitter Data In
TD-	Transmit Data Not	PECL	10	Transmitter Data In Not
MS	Mounting Studs	N/A	MS1 MS2	Mounting Studs are provided for transceiver mechanical attachment to the circuit board.
HL	Housing Leads	N/A	T1 T2 T3 T4	The transceiver Housing Leads are provided for additional signal grounding. The holes in the circuit board must be included and be tied to signal ground.



## Technical drawings





## EYE SAFETY

This laser based singlemode 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 maximum operating limits.

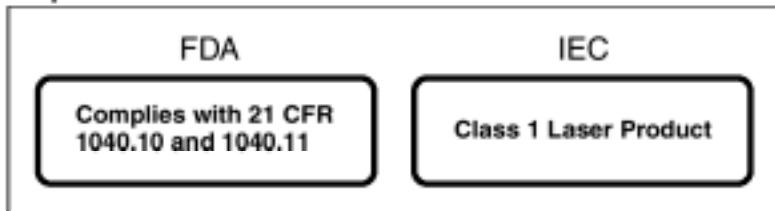
### Caution

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

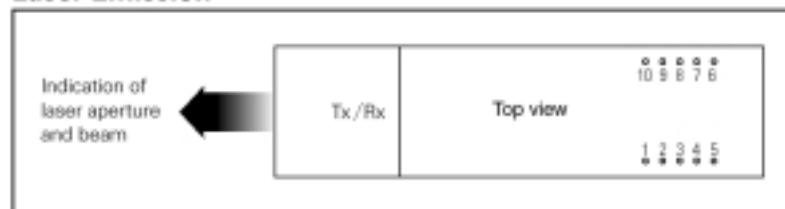
**Tampering with or modifying the performance of the device will result in voided product warranty.**

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)).

### Required Labels



### Laser Emission



## APPLICATION NOTES

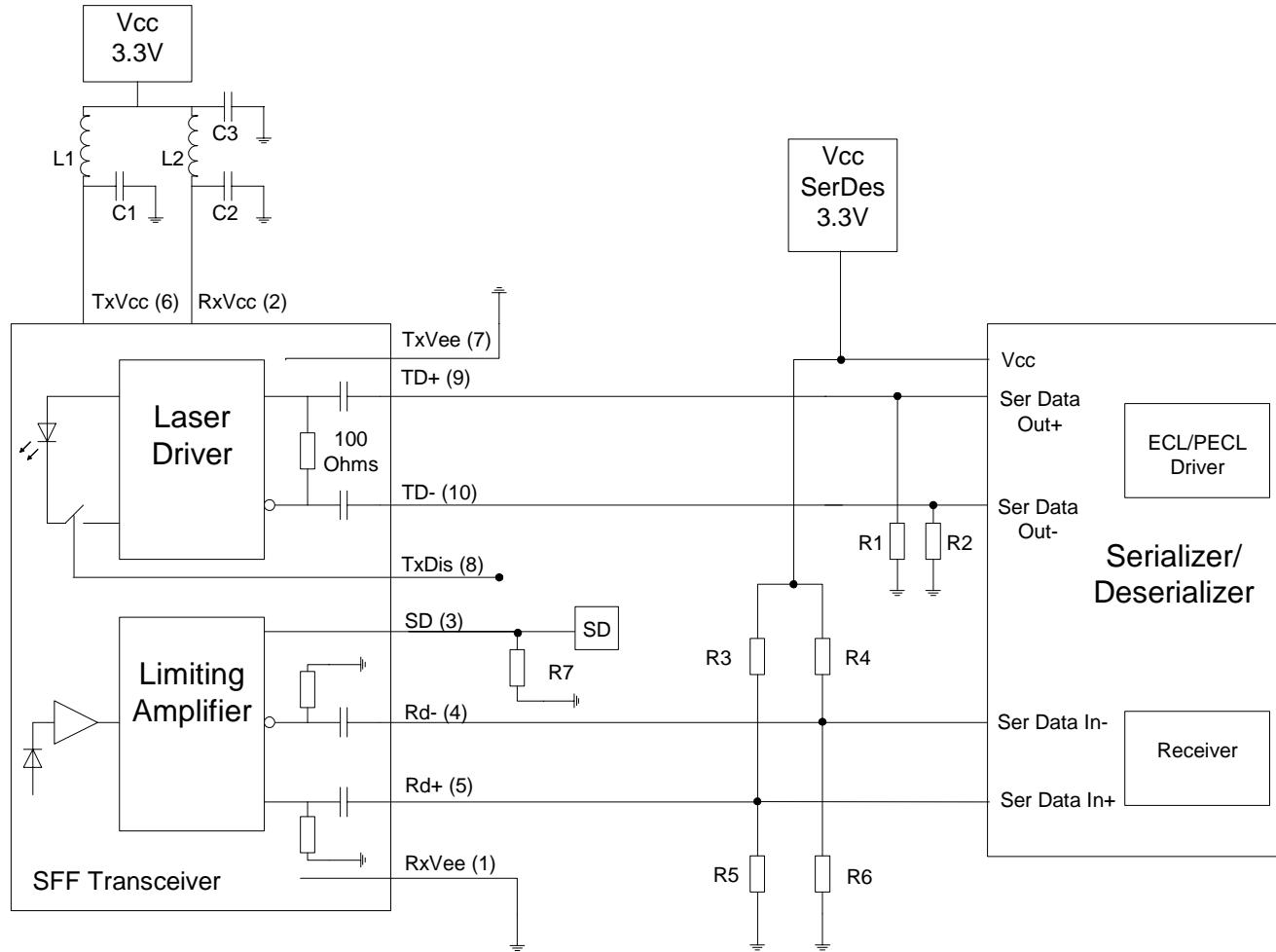
### Transceiver Assembly/Soldering

#### Recommended requirements

- avoid temperatures on fiber and connector above 85°C
- only iron soldering permitted
- single pin or simultaneous pin soldering valid

Type	Conditions	Standard
Iron - soldering	iron tip temp. < 400 °C solder time < 10 sec	IEC 68 2-20 test Tb, methode 2

### AC/AC coupling



L1, L2: 1...4.7  $\mu$ H

C1, C2, C3: 4.7...10  $\mu$ F

R1, R2: biasing of outputs depending on Serializer

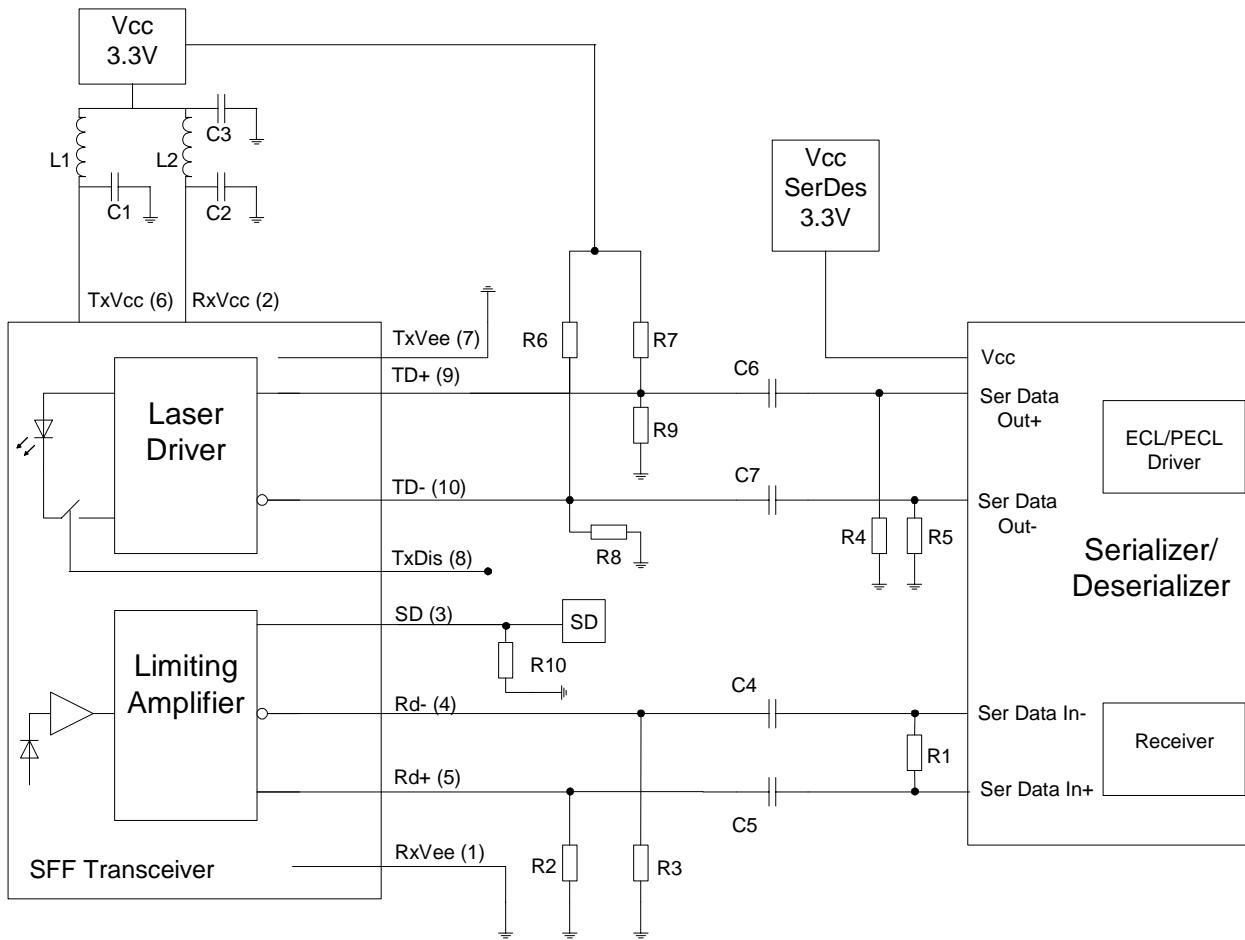
R3, R4: 127 Ohms

R5, R6: 80 Ohms

R7: 510 Ohms for PECL signal detect, open for TTL

Place R1/2/3/4/5/6 as close to SerDes chip as possible

### DC/DC coupling



L1, L2: 1...4.7  $\mu$ H

C1, C2, C3: 4.7...10  $\mu$ F

C4, C5, C6, C7: 100 nF

R1: 100 Ohms

R2, R3: 150 Ohms

R4, R5: biasing of outputs depending on Serializer

R6, R7: 127 Ohms

R8, R9: 80 Ohms

R10: 510 Ohms for PECL signal detect, open for TTL

Place R1/4/5 as close to SerDes as possible

Place R2/3 as close to transceiver as possible