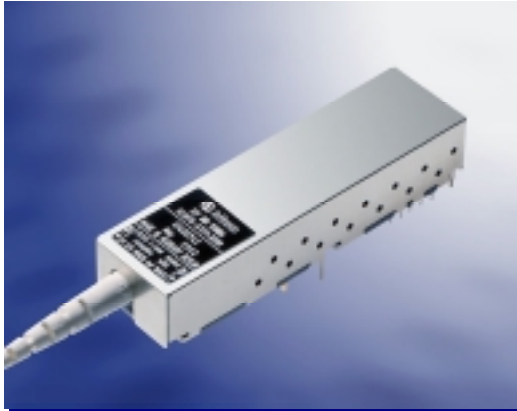




## V23870-A211x-xx00<sup>(\*)</sup>

### Bi-Directional Pigtail SFF Transceiver

### 155 Mb/s, 1310 nm Tx / 1310 nm Rx

#### 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

#### 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 |

\*) 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 9µm singlemode fiber pigtail with different connector options.

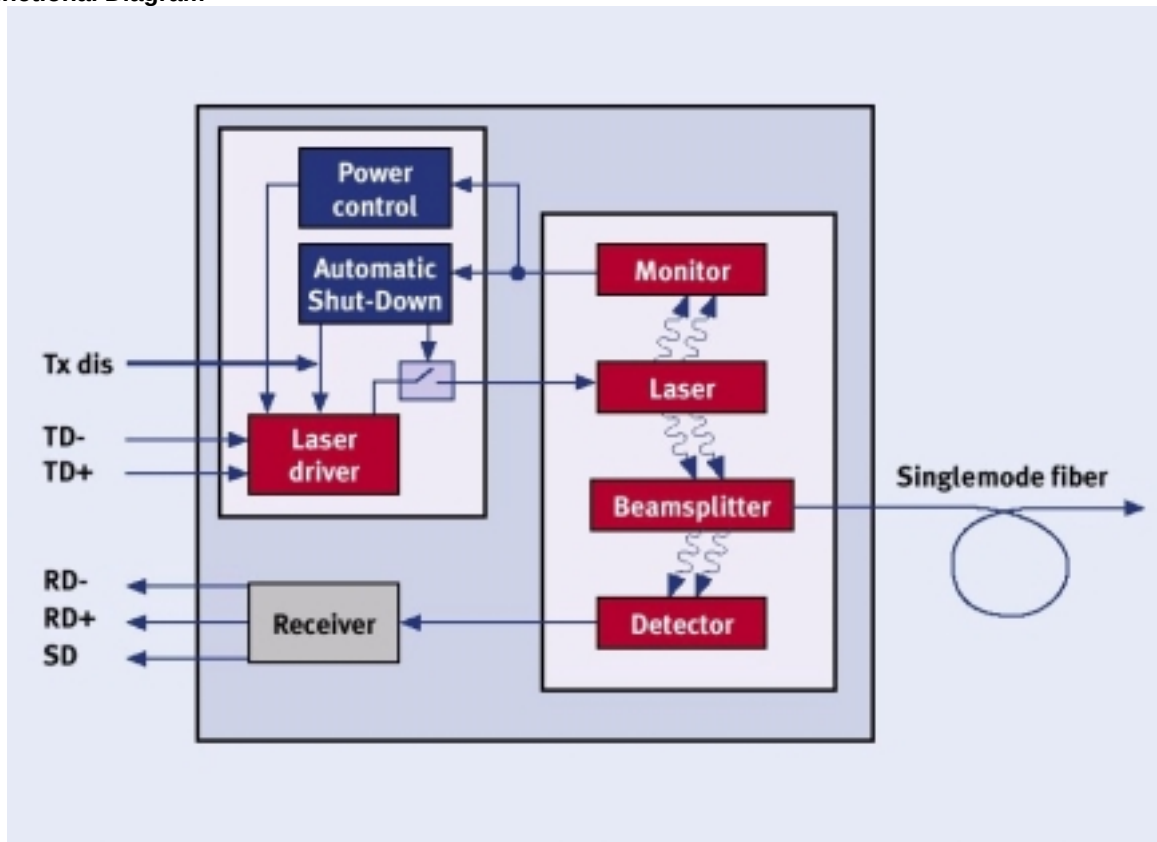
The Infineon BIDI transceiver is a single unit comprised of a transmitter, a receiver, WDM filter or beam splitter, and a singlemode fiber pigtail. This design frees the customer from many alignment and PC board layout concerns.

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 100Ω 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 <sub>C</sub>                   | 0    |      | +70  | °C   |
| Operating Temperature Range at Case <sup>2</sup> | T <sub>C</sub>                   | -40  |      | +85  | °C   |
| Power Supply Voltage                             | V <sub>CC</sub> -V <sub>EE</sub> | 3.1  | 3.3  | 3.53 | V    |
| <b>Transmitter</b>                               |                                  |      |      |      |      |
| Data Input Differential Voltage                  | V <sub>DIFF</sub>                | 250  |      | 1600 | mV   |
| <b>Receiver</b>                                  |                                  |      |      |      |      |
| Input Center Wavelength                          | λ <sub>C</sub>                   | 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                                    | $t_{Ri}, t_F$       |      |      | 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



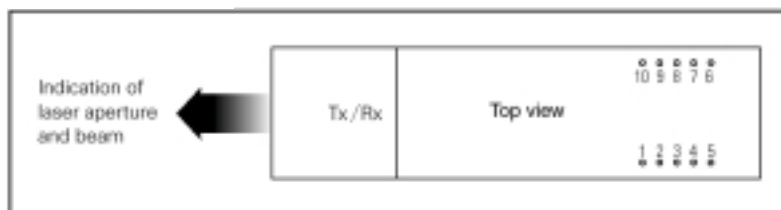
### Fiber Data

The mechanical fiber characteristics are described in the following table.

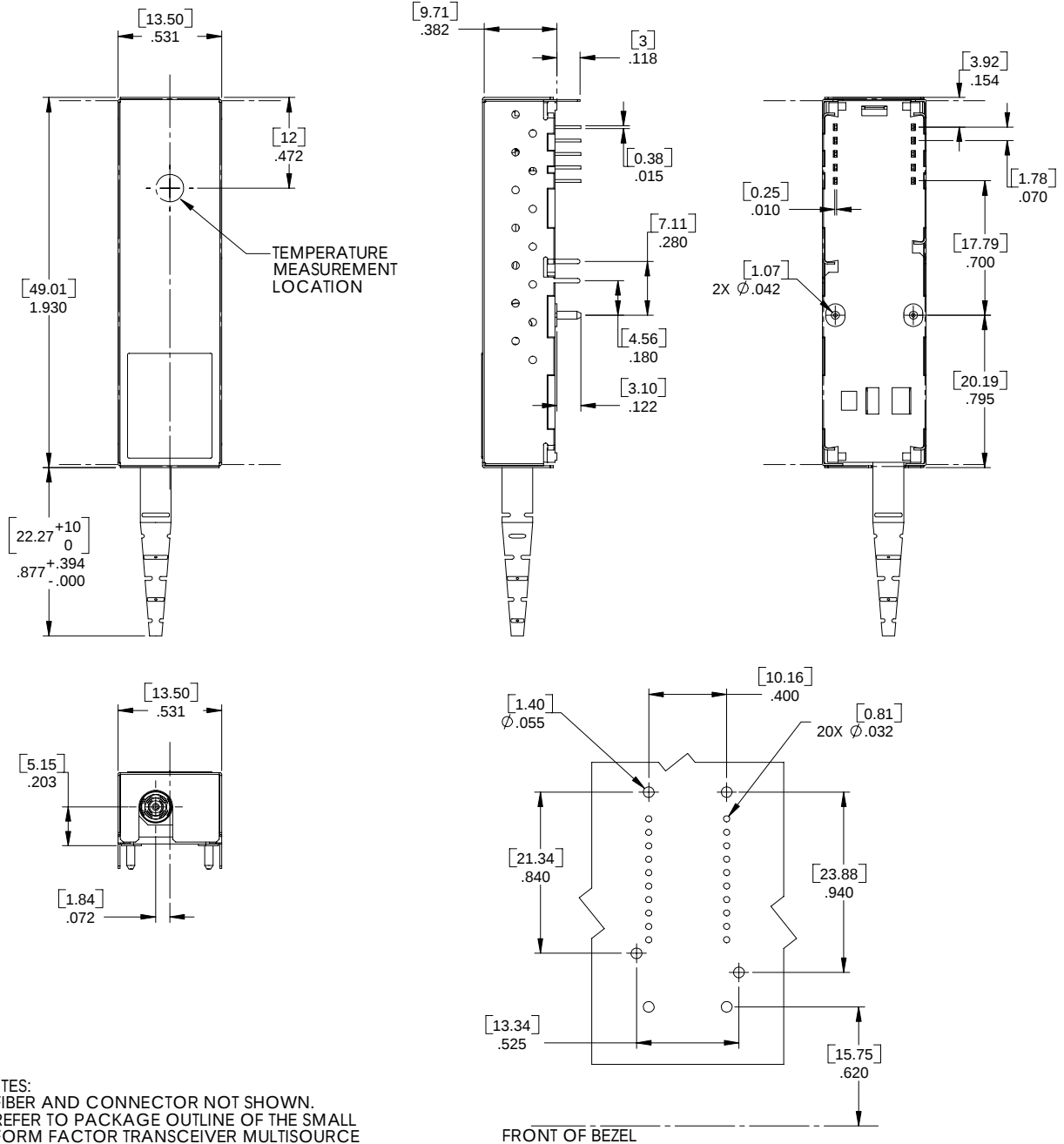
| Fiber Characteristics                   | Min. | Typ. | Max. | Unit |
|-----------------------------------------|------|------|------|------|
| Mode Field Diameter                     | 8    | 9    | 10   | μm   |
| Cladding Diameter                       | 123  | 125  | 127  | μm   |
| Mode Field/Cladding 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 <sub>EEr</sub> | Receiver Signal Ground     | N/A                   | 1                    |                                                                                                                                                                                                      |
| V <sub>CCr</sub> | 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<br>Fault Condition: Logic "0" Output<br>Recommended Termination of 510 $\Omega$ to V <sub>ee</sub> , for PECL |
| RD-              | Received Data Out Not      | PECL                  | 4                    |                                                                                                                                                                                                      |
| RD+              | Received Data Out          | PECL                  | 5                    |                                                                                                                                                                                                      |
| V <sub>CCt</sub> |                            | N/A                   | 6                    | Transmitter Power Supply                                                                                                                                                                             |
| V <sub>EEt</sub> |                            | N/A                   | 7                    | Transmitter Signal Ground                                                                                                                                                                            |
| TxDIs            | Transmitter Disable/Enable | TTL-Input             | 8                    | A low/open signal switches the laser on.<br>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<br>MS2           | Mounting Studs are provided for transceiver mechanical attachment to the circuit board.                                                                                                              |
| HL               | Housing Leads              | N/A                   | T1<br>T2<br>T3<br>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



- NOTES:
1. FIBER AND CONNECTOR NOT SHOWN.
  2. REFER TO PACKAGE OUTLINE OF THE SMALL FORM FACTOR TRANSCEIVER MULTISOURCE AGREEMENT FOR DIMENSIONS NOT SHOWN.

FRONT OF BEZEL

### Circuit Board Layout

Recommended PCB Thickness 0.1 (2.54) max.



## 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.

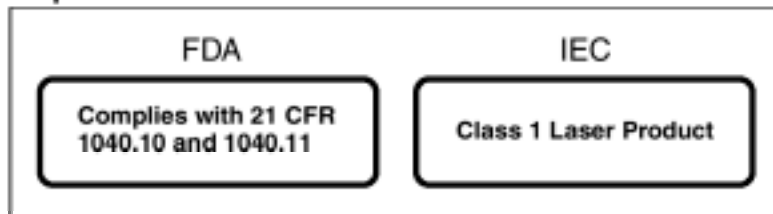
### Caution

**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

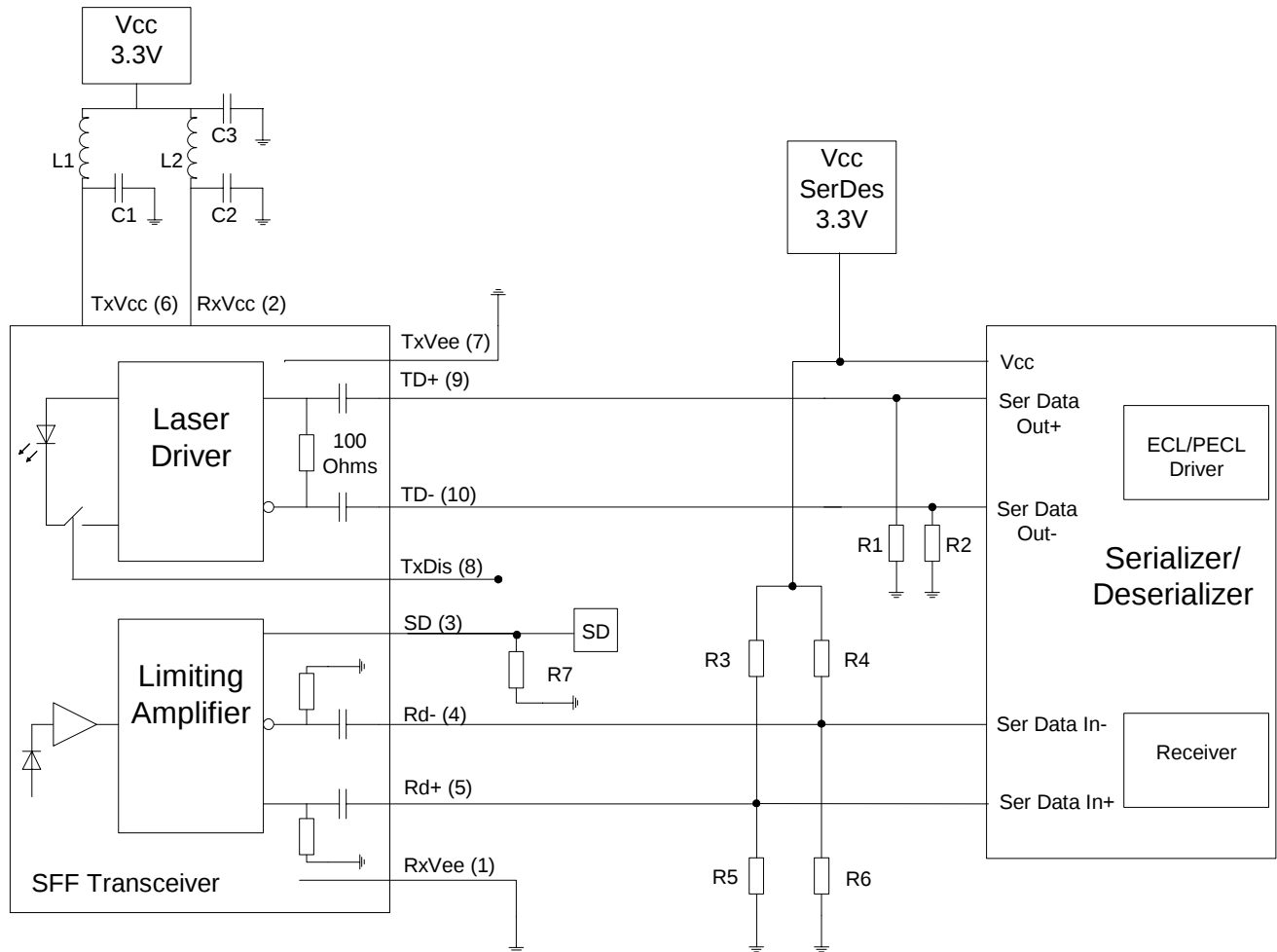
### Transceiver Assembly/Soldering

#### Recommended requirements

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

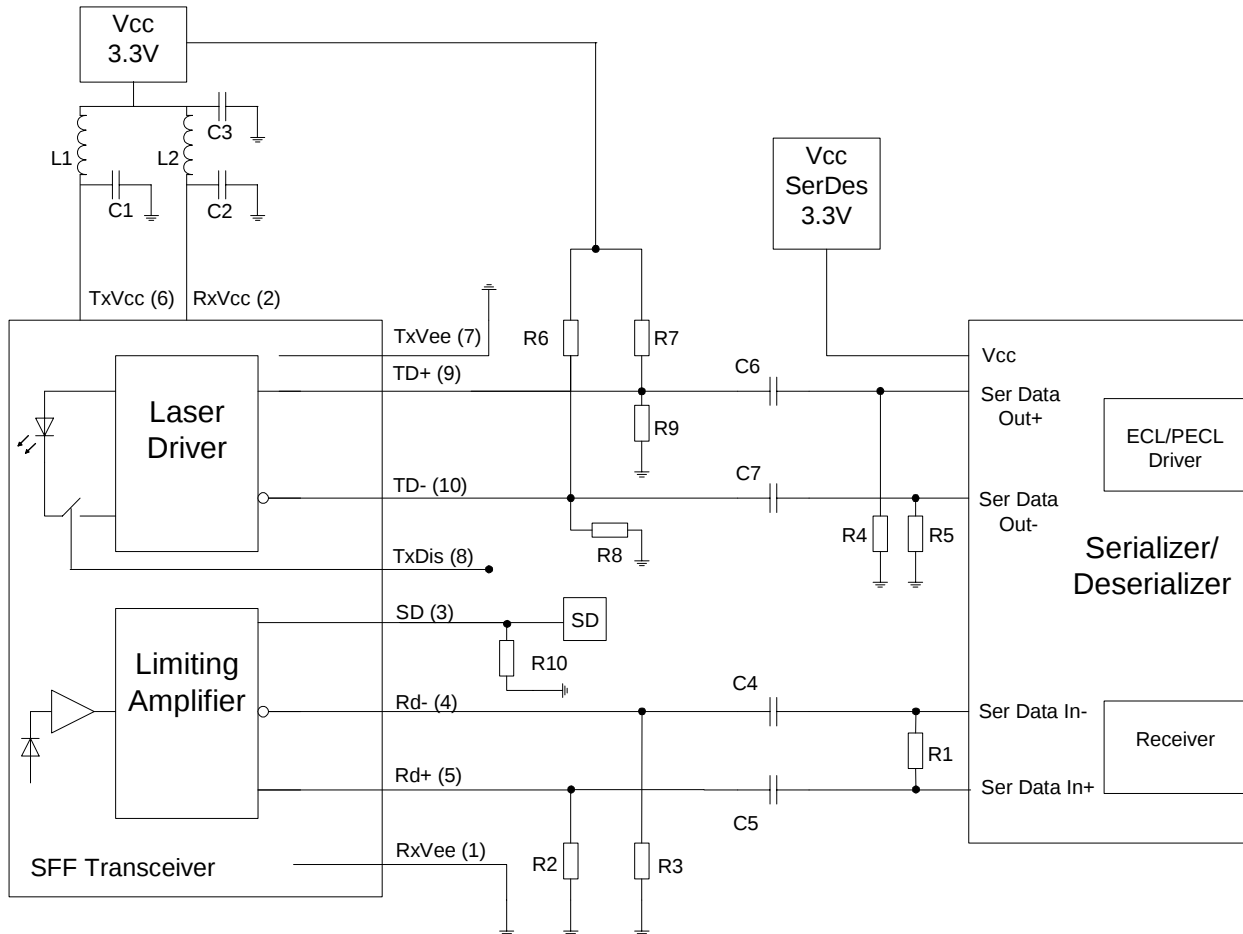
| Type             | Conditions                                      | Standard                       |
|------------------|-------------------------------------------------|--------------------------------|
| Iron - soldering | iron tip temp. < 400 °C<br>solder time < 10 sec | IEC 68 2-20 test Tb, methode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

## Данный компонент на территории Российской Федерации

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Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

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