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Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





- Compliant with Fibre Channel and Gigabit Ethernet standard
- Meets mezzanine standard height of 9.8 mm
- Compact integrated transceiver unit with
 - MQW laser diode transmitter
 - InGaAs PIN photodiode receiver
 - Duplex SC receptacle
- Class 1 FDA and IEC laser safety compliant
- Single power supply (5 V or 3.3 V)
- Signal detect indicator (PECL and TTL version)
- PECL differential inputs and outputs
- Process plug included
- Input Signal Monitor (DC/DC-Version)
- Performance exceeds FC 100-SM-LL-I
- Wave solderable and washable with process plug inserted
- For distances of up to 10 km on single mode fiber, and up to 550 m on multimode fiber (use offset jumper as specified in IEEE 802.3)

| Input | Output | Signal detect | Voltage | Part number |
|------------------------------------|--------|---------------|---------|---------------------------------------|
| AC | DC | PECL | 5 V | V23826-K15-C13 |
| | | | 3.3 V | V23826-K15-C313 |
| AC | AC | TTL | 5 V | V23826-K15-C53 |
| | | | 3.3 V | V23826-K15-C353 |
| DC | DC | PECL | 5 V | V23826-K15-C63 ⁽¹⁾ |
| | | | 3.3 V | V23826-K15-C363 ⁽¹⁾ |
| AC | AC | PECL | 5 V | V23826-K15-C73 |
| | | | 3.3 V | V23826-K15-C373 |
| Shield options | | | | Add suffix to PIN |
| Metallized cover, forward springs | | | | -C3 |
| Metallized cover, backward springs | | | | -D3 |

1. Standard version

DESCRIPTION

The Infineon single mode transceiver is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000BASE-LX (Long Wavelength Laser) (IEEE 802.5) and complies with the Fibre Channel Physical and Signaling Interface (FC-PH), ANSI X3I TT Fibre Channel Physical Standard Class 100-SM-LL-I, latest Revision.

The appropriate fiber optic cable is 9 μm (mode field diameter) single mode fiber (up to 10 km) with Duplex SC connector.

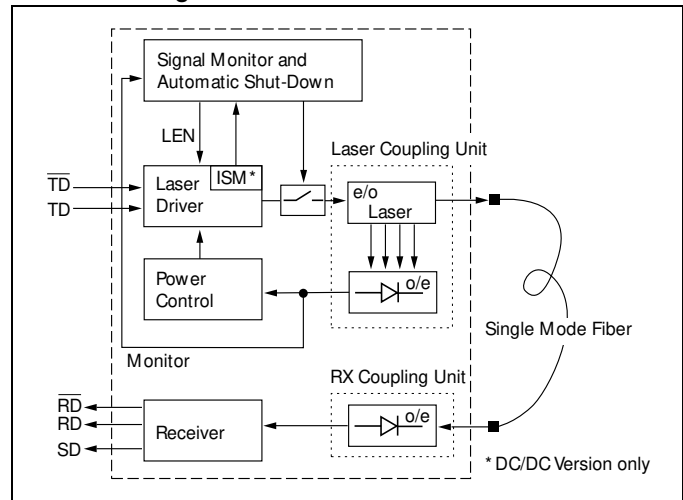
The Infineon single mode transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN, WAN and Gigabit Ethernet applications. It can be used as the network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

This transceiver operates at 1.0625 and 1.3 Gbit/s from a single power supply (+5 Volt or 3.3 Volt). The full differential data inputs and outputs are PECL compatible.

Functional Description

This transceiver is designed to transmit serial data via single mode or multimode 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 electrical PECL compatible serial data (TD and TDnot) into optical serial data.

The following versions are available:

1. AC/DC Transceiver

Tx is AC coupled. Differential 100 Ω load. Rx has standard PECL output and is DC coupled.

2. AC/AC TTL Transceiver

Tx and Rx are AC coupled. Tx has differential 100 Ω load. Signal Detect is TTL compatible.

3. DC/DC Transceiver

Standard PECL inputs and outputs Tx and Rx are DC coupled. This version contains an Input Signal Monitor (ISM) which switches off the transceiver if a continuous low level is applied at Data Input.

4. AC/AC PECL Transceiver

Tx and Rx are AC coupled. Tx has differential 100 Ω load. Signal Detect is PECL compatible.

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 transmitter failures. A reset is only possible by turning the power off, and then on again.

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 140 milliseconds after the voltage has risen above the reset threshold. During this time the laser is inactive.

TECHNICAL DATA

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

Recommended Operating Conditions

| Parameter | Symbol | Min. | Typ. | Max. | Units |
|---|----------------------------------|-------|------|-------|-------|
| Ambient Temperature | T _{AMB} | 0 | | 70 | °C |
| Power Supply Voltage | V _{CC} -V _{EE} | 3.1 | 3.3 | 3.5 | V |
| | | 4.75 | 5 | 5.25 | |
| Supply Current ⁽¹⁾ | I _{CC} | | | 230 | mA |
| | | | | 270 | |
| Transmitter | | | | | |
| Data Input High Voltage DC/DC | V _{IH} -V _{CC} | -1165 | | -880 | mV |
| Data Input Low Voltage DC/DC | V _{IL} -V _{CC} | -1810 | | -1475 | |
| Data Input Differential Voltage ⁽²⁾ AC/DC, AC/AC TTL, AC/AC PECL | V _{DIFF} | 300 | | 800 | |
| Input Data Rise/Fall Time 10%–90% | t _R , t _F | 100 | | 750 | ps |
| Receiver | | | | | |
| Input Center Wavelength | λ _C | 1270 | | 1355 | nm |

Notes

- For V_{CC}-V_{EE} (min., max.) 50% duty cycle. The supply current does not include the load drive current of the receiver output.
- Peak to peak voltage of one input.

Transmitter Electro-Optical Characteristics

| Transmitter | Symbol | Min. | Typ. | Max. | Units |
|---|------------------|-------|------|------|-------|
| Launched Power (Average) ⁽¹⁾ | P _O | -11.0 | | -3 | dBm |
| Center Wavelength | λ _C | 1270 | | 1355 | nm |
| Spectral Width (RMS) | σ _λ | | | 4 | |
| Relative Intensity Noise | RIN | | | -120 | dB/Hz |
| Extinction Ratio (Dynamic) | ER | 9 | | | dB |
| Reset Threshold ⁽²⁾ | V _{TH} | | 3.5 | | V |
| | | | 2.7 | | |
| Reset Time Out ⁽²⁾ | t _{RES} | 15 | 22 | 35 | ms |

Notes

- Into single mode fiber, 9 μm diameter.
- 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}.

Receiver Electro-Optical Characteristics

| Receiver | Symbol | Min. | Typ. | Max. | Units |
|---|------------------------------------|--------------------------------------|------|-------|-------|
| Sensitivity (Average Power) ⁽¹⁾ | P _{IN} | | -22 | -20 | dBm |
| Saturation (Average Power) | P _{SAT} | | | -3 | |
| Signal Detect Assert Level ⁽²⁾ | P _{SDA} | | | -20 | |
| Signal Detect Deassert Level ⁽³⁾ | P _{SDD} | -30 | | | |
| Signal Detect Hysteresis | P _{SDA} -P _{SDD} | | 1.5 | | dB |
| Signal Detect Assert Time | t _{ASS} | | | 100 | μs |
| Signal Detect Deassert Time | t _{DAS} | | | 350 | |
| Output Low Voltage ⁽⁴⁾ | V _{OL} -V _{CC} | -1950 | | -1600 | mV |
| Output High Voltage ⁽⁴⁾ | V _{OH} -V _{CC} | -1025 | | -720 | |
| Signal Detect Output Voltage AC/AC TTL ⁽⁵⁾ | Low High | V _{SDL} V _{SDH} | 2 | 0.5 | V |
| Data Output Differential Voltage ⁽⁶⁾ | V _{DIFF} | 0.5 | | 0.9 | |
| Output Data Rise/Fall Time, 20%–80% | t _R , t _F | | | 375 | ps |
| Return Loss of Receiver | A _{RL} | 12 | | | dB |

Notes

- Minimum average optical power at which the BER is less than 1×10⁻¹² or lower. Measured with a 2⁷-1 NRZ PRBS and ER=9 dB. Output of single mode fiber 9 μm diameter.
- 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.
- A decrease in optical power below the specified level will cause the SIGNAL DETECT to change from a High state to a Low state.
- DC/DC, AC/DC for data
DC/DC, AC/DC, AC/AC PECL for Signal Detect
PECL compatible. Load is 50 Ω into V_{CC}-2 V for data, 500 Ω to V_{EE} for Signal Detect. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added. V_{CC}=3.3 V/5 V. T_{AMB}=25°C.
- Max. output current high: -0.4 mA (drive current)
low: +2.0 mA (sink current)
- AC/AC for data. Load 50 Ω to GND or 100 Ω differential. For dynamic measurement a tolerance of 50mV should be added.

Pin Description

| Pin Name | | Level/Logic | Pin# | Description |
|--------------------|------------------|---------------------------------------|------|---|
| RxV _{EE} | Rx Ground | Power Supply | 1 | Negative power supply, normally ground |
| RD | Rx Output Data | PECL Output | 2 | Receiver output data |
| RD _n | | | 3 | Inverted receiver output data |
| SD | Rx Signal Detect | PECL Output active high (TTL C53/353) | 4 | High level on this output shows there is an optical signal. |
| Rx-V _{CC} | Rx 3.3V/5V | Power Supply | 5 | Positive power supply, 3.3V/5V |
| TxV _{CC} | Tx 3.3V/5V | | 6 | |
| TD _n | Tx Input Data | PECL Input | 7 | Inverted transmitter input data |
| TD | | | 8 | Transmitter input data |
| TxV _{EE} | Tx Ground | Power Supply | 9 | Negative power supply, normally ground |
| Case | Support | 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 ± 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 6 GHz; Margins depend on PCB layout and chassis design |

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)).

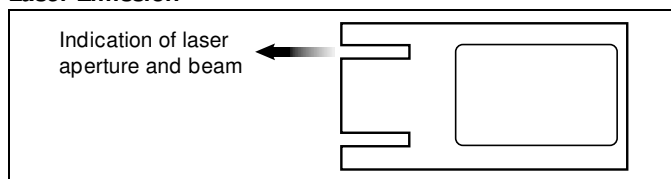
Laser Data

| | |
|--|------------------|
| 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 µW |
| Beam divergence | 4° |

Required Labels

| FDA | IEC |
|--|-----------------------|
| Complies with 21 CFR 1040.10 and 1040.11 | Class 1 Laser Product |

Laser Emission



APPLICATION NOTE

Gigabit transceivers and matching circuits are high frequency components and shall be terminated as recommended in the application notes for proper EMI performance. Electromagnetic emission may be caused by these components.

To prevent emissions it is recommended that cutouts for the fiber connectors be designed as small as possible.

It is strongly recommended that the Tx plug and the Rx plug be separated with a bar that divides the duplex SC opening.

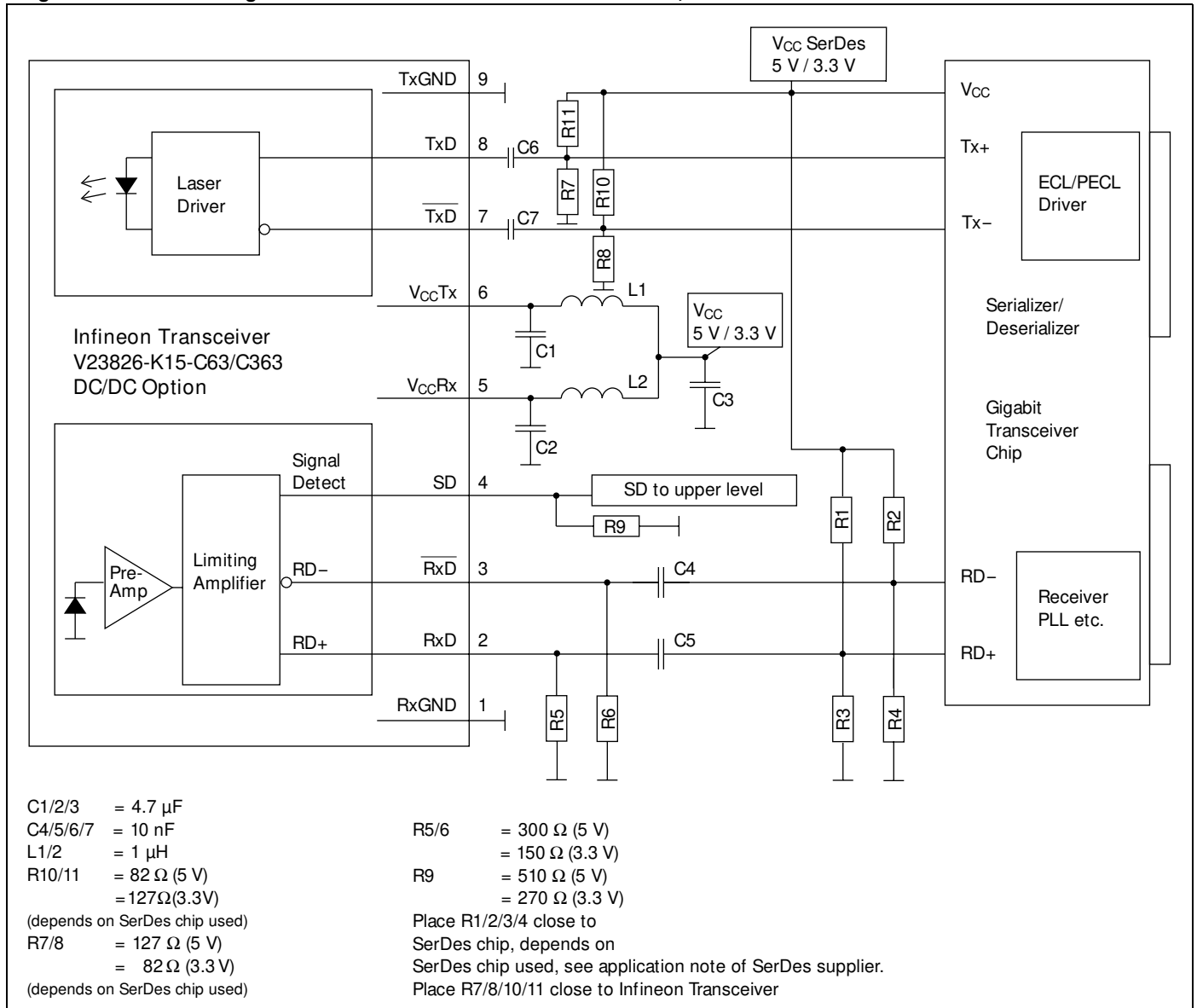
If shielded parts are employed, they should be in proper contact with the bezel (back plane).

Since the shield is galvanically isolated from signal ground it is strongly recommended to prevent any contact between shield and the circuitry i.e. even any ground connection on the pcb may be harmful to EMI performance.

In cases where EMI performance becomes critical it has proven to be helpful when using SC-plugs with less metal parts inside (as Infineon fibers).

APPLICATION NOTE

Single Mode 1300 nm Gigabit Ethernet/Fibre Channel 1x9 Transceiver, DC/DC Version



Values of R1/2/3/4 may vary as long as proper 50 Ω termination to V_{EE} or 100 Ω differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CC}Rx/V_{CC}Tx. We recommend a GND plane under the module for getting good EMI performance.

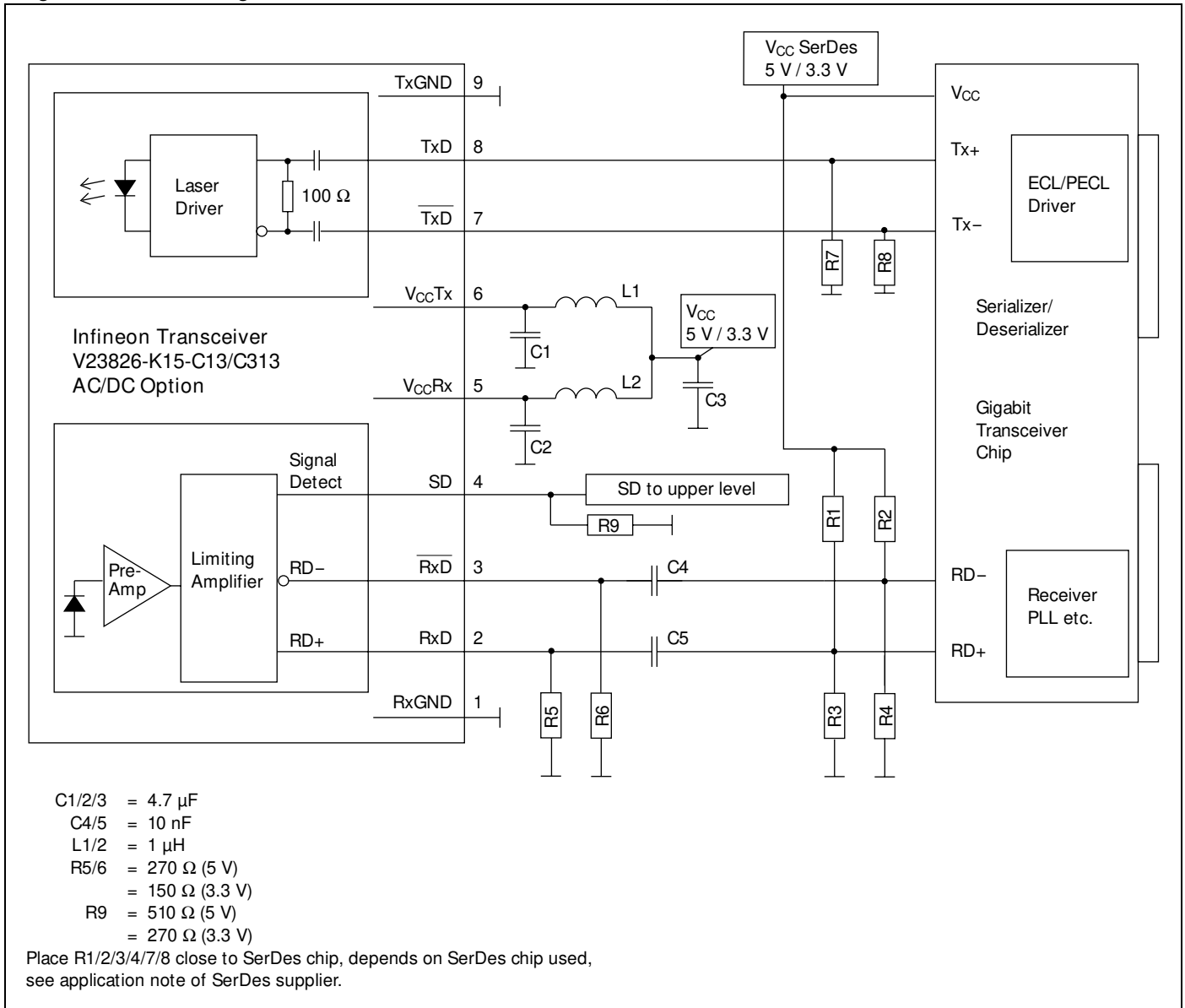
The transceiver contains an automatic shutdown circuit. Reset is only possible if the power is turned off, and then on again. (V_{CC}Tx switched below V_{TH}).

Application Board available on request.

The stud pins S1 and S2 are not connected.

APPLICATION NOTE

Single Mode 1300nm Gigabit Ethernet/Fibre Channel 1x9 Transceiver, AC/DC Version



Values of R1/2/3/4 may vary as long as proper 50 Ω termination to V_{EE} or 100 Ω differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CCRx}/V_{CCTx} . We recommend a GND plane under the module for getting good EMI performance.

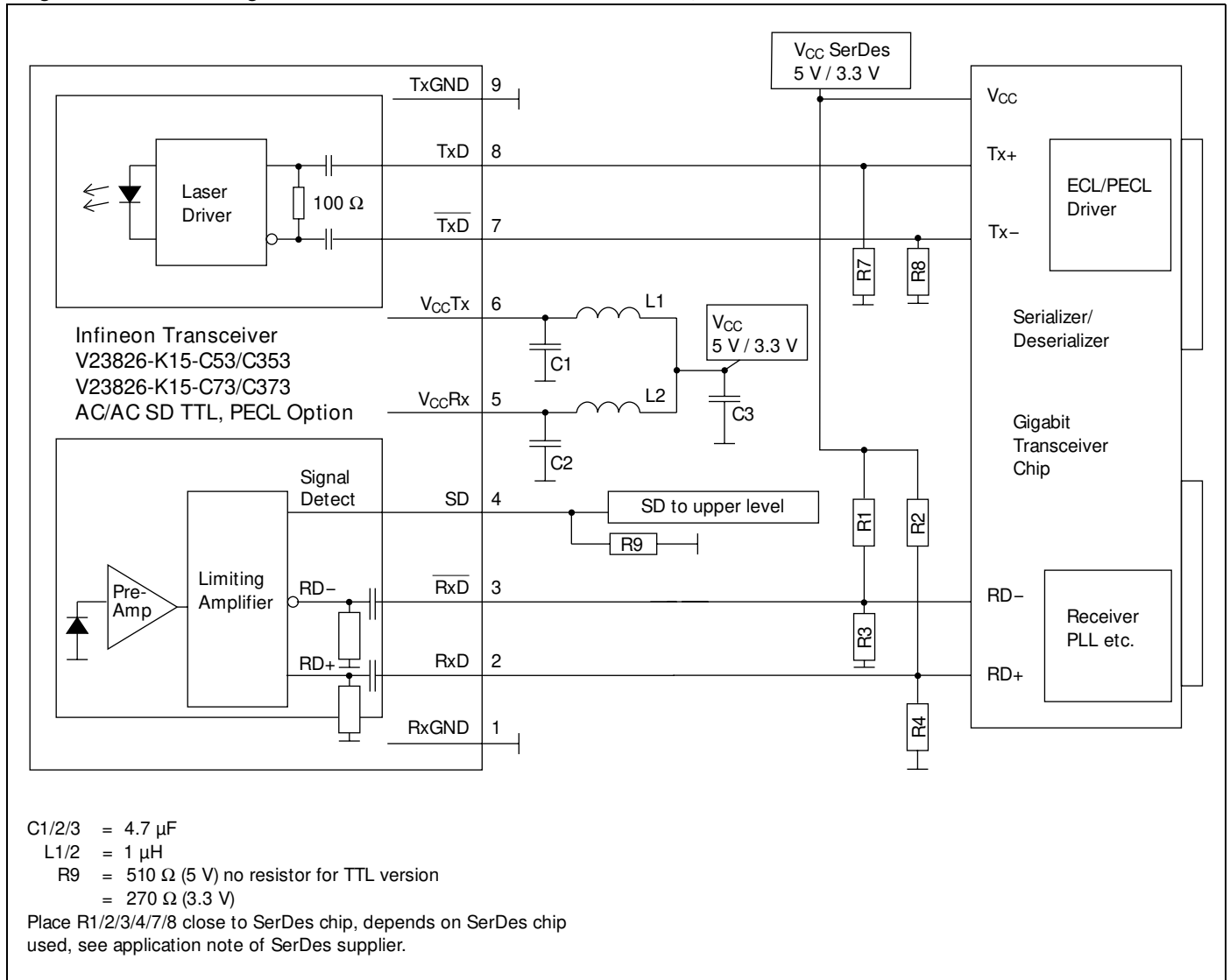
The transceiver contains an automatic shutdown circuit. Reset is only possible if the power is turned off, and then on again. (V_{CCTx} switched below V_{TH}).

Application Board available on request.

The stud pins S1 and S2 are not connected.

APPLICATION NOTE

Single Mode 1300nm Gigabit Ethernet/Fibre Channel 1x9 Transceiver, AC/AC TTL and AC/AC PECL Versions



The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CC}Rx/V_{CC}Tx. We recommend a GND plane under the module for getting good EMI performance.

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}).

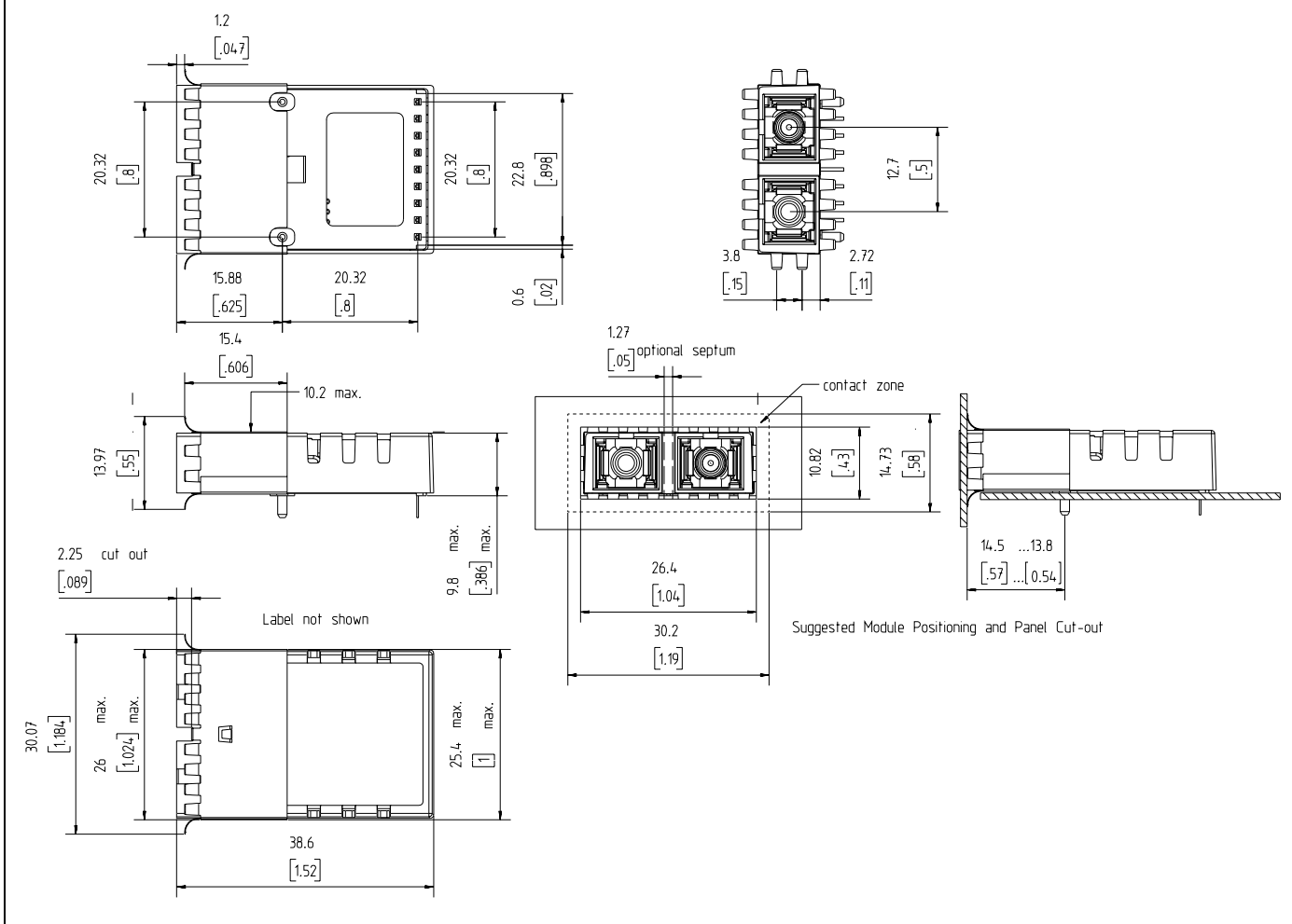
Application Board available on request.

The stud pins S1 and S2 are not connected.

SHIELD OPTION

Shield with forward springs, -C3

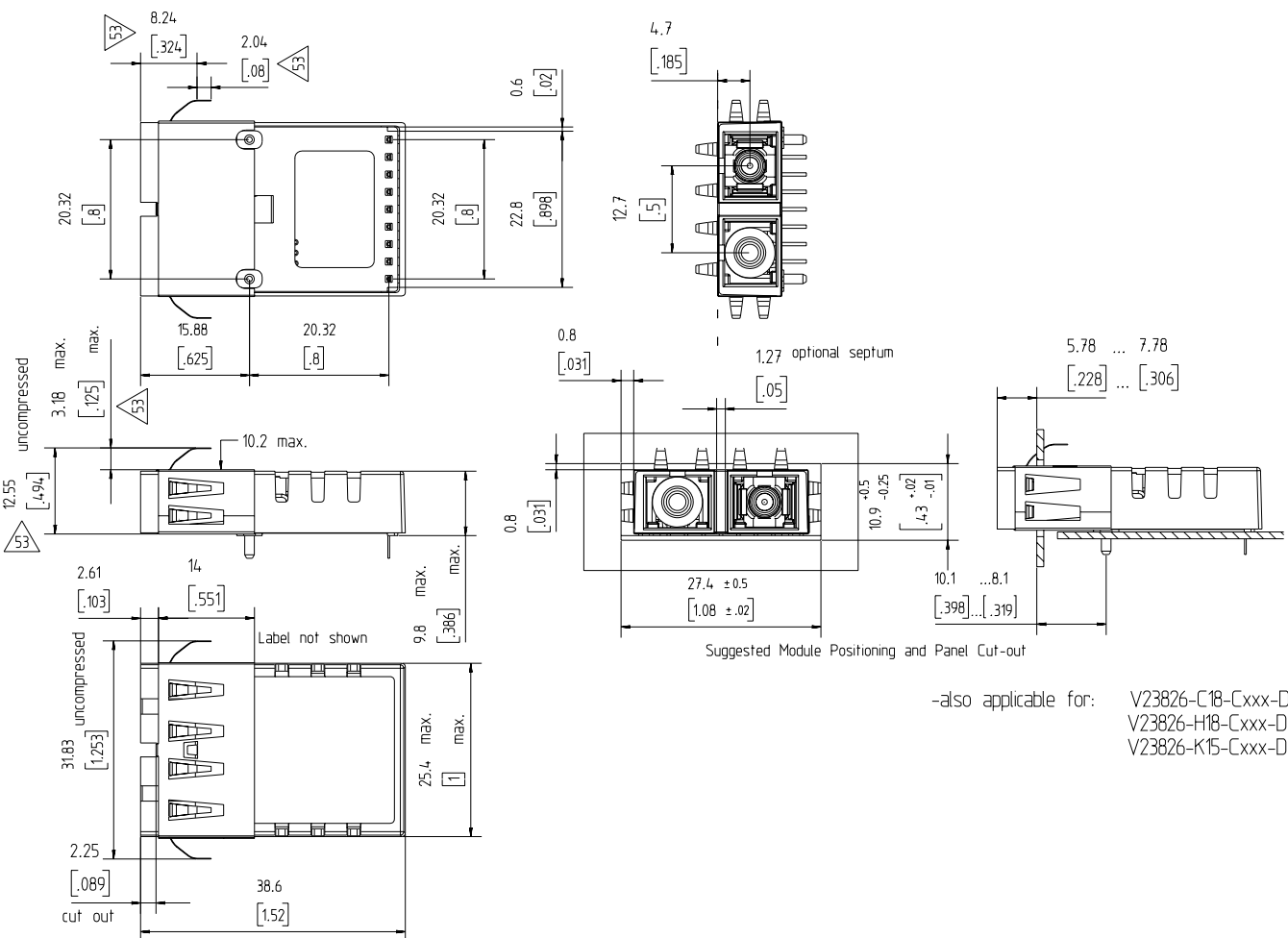
Dimensions in mm [inches]



SHIELD OPTION

Shield with backward springs, -D3

Dimensions in mm [inches]



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