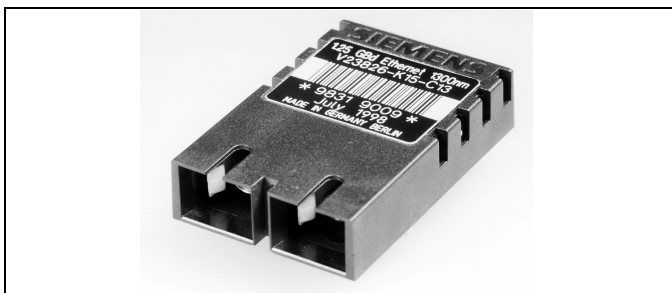
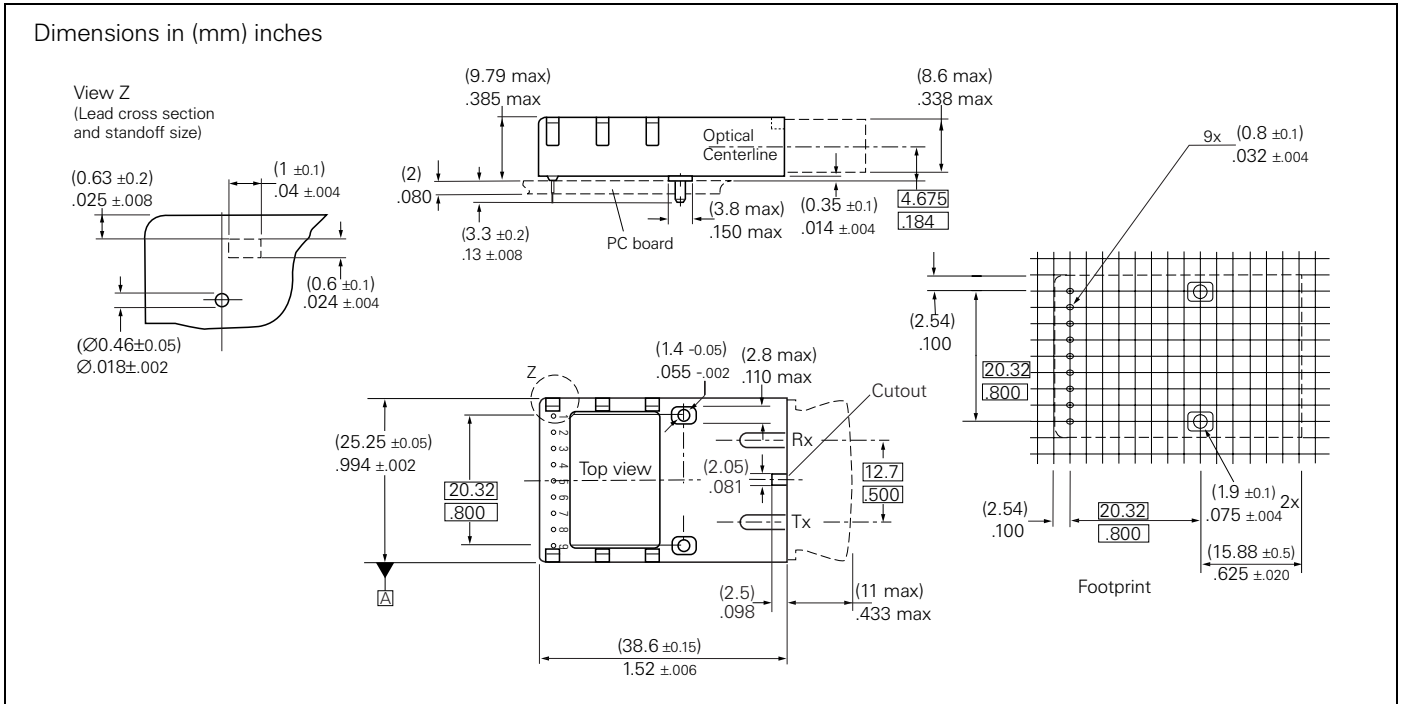


SIEMENS

AC/DC (5V/3.3V) **V23826-K15-C13/C313**
 AC/AC TTL (5V/3.3V) **V23826-K15-C53/C353**
 DC/DC (5V/3.3V) **V23826-K15-C63/C363**
 AC/AC PECL (5V/3.3V) **V23826-K15-C73/C373**
Single Mode 1300 nm 1.0625 GBd Fibre Channel
1.3 Gigabit Ethernet 1x9 Transceiver



FEATURES

- 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)
- A special multimode-only version available on request

Absolute Maximum Ratings

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

Package Power Dissipation ⁽¹⁾	1.5 W
Supply Voltage (V _{CC} -V _{EE}) 5 V	6 V
3.3 V	4 V
Data Input Levels (PECL)	V _{CC} +0.5 V
Differential Data Input Voltage	2.5 V
Operating Ambient Temperature	0° 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

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

DESCRIPTION

The Siemens single mode transceiver is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 100BASE-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-LLI, latest Revision.

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

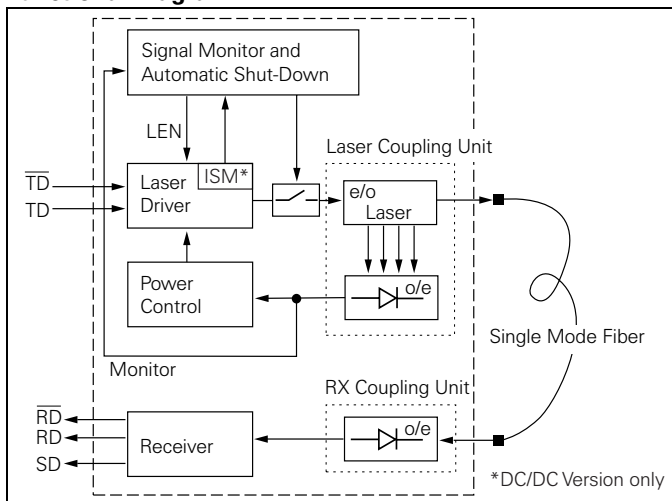
The Siemens single mode transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN, WAN and Gigabit Ethernet applications. It can be used as the network 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 Gbits per second 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 15 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	$^{\circ}\text{C}$	
Power Supply Voltage	3.3 V	$V_{CC-V_{EE}}$	3.1	3.3	3.5	V
	5 V		4.75	5	5.25	
Supply Current ⁽¹⁾	3.3 V	I_{CC}		230	mA	
	5 V			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	

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.
- 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}		2.7		V
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	V _{SDL}		0.5	V
	High	V _{SDH}	2		
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	ARL	12			dB

Notes

- Minimum average optical power at which the BER is less than 1x10⁻¹² 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.

LASER SAFETY

This single mode transceiver is a Class 1 laser product. It complies with IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11. To meet laser safety requirements the transceiver shall be operated within the maximum ratings.

Caution

The use of optical instruments with this product will increase eye hazard!

Usage Restrictions

The optical ports of the modules must be terminated with an optical connector or with a dust plug.

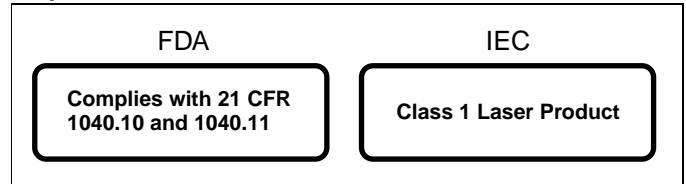
Note

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)).

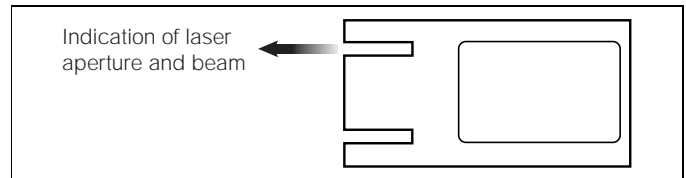
Laser Data

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



Laser Emission



Pin Description

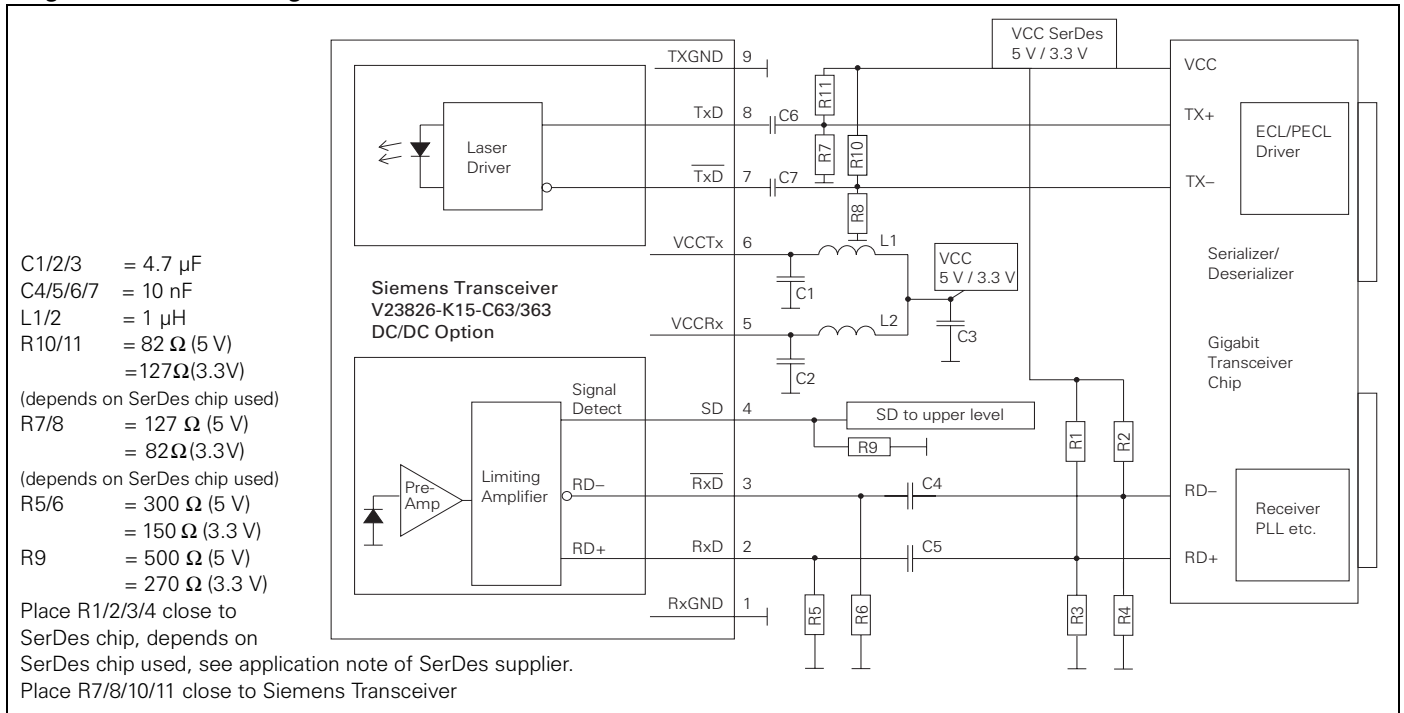
Pin Name	Level/Logic	Pin#	Description
RxV _{EE}	Rx Ground	1	Negative power supply, normally ground
RD	Rx Output Data	2	Receiver output data
RD _n		3	Inverted receiver output data
SD	Rx Signal Detect	4	High level on this output shows there is an optical signal.
RxV _{CC}	Rx 3.3 V/5 V	5	Positive power supply, 3.3 V/5 V
TxV _{CC}	Tx 3.3 V/5 V		
TD _n	Tx Input Data	7	Inverted transmitter input data
TD		8	Transmitter input data
TxV _{EE}	Tx Ground	9	Negative power supply, normally ground
Case	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 1000-4-2	Discharges of ±15kV with an air discharge probe on the receptacle cause no damage.
Immunity: Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 1000-4-3	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.

APPLICATION NOTE

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



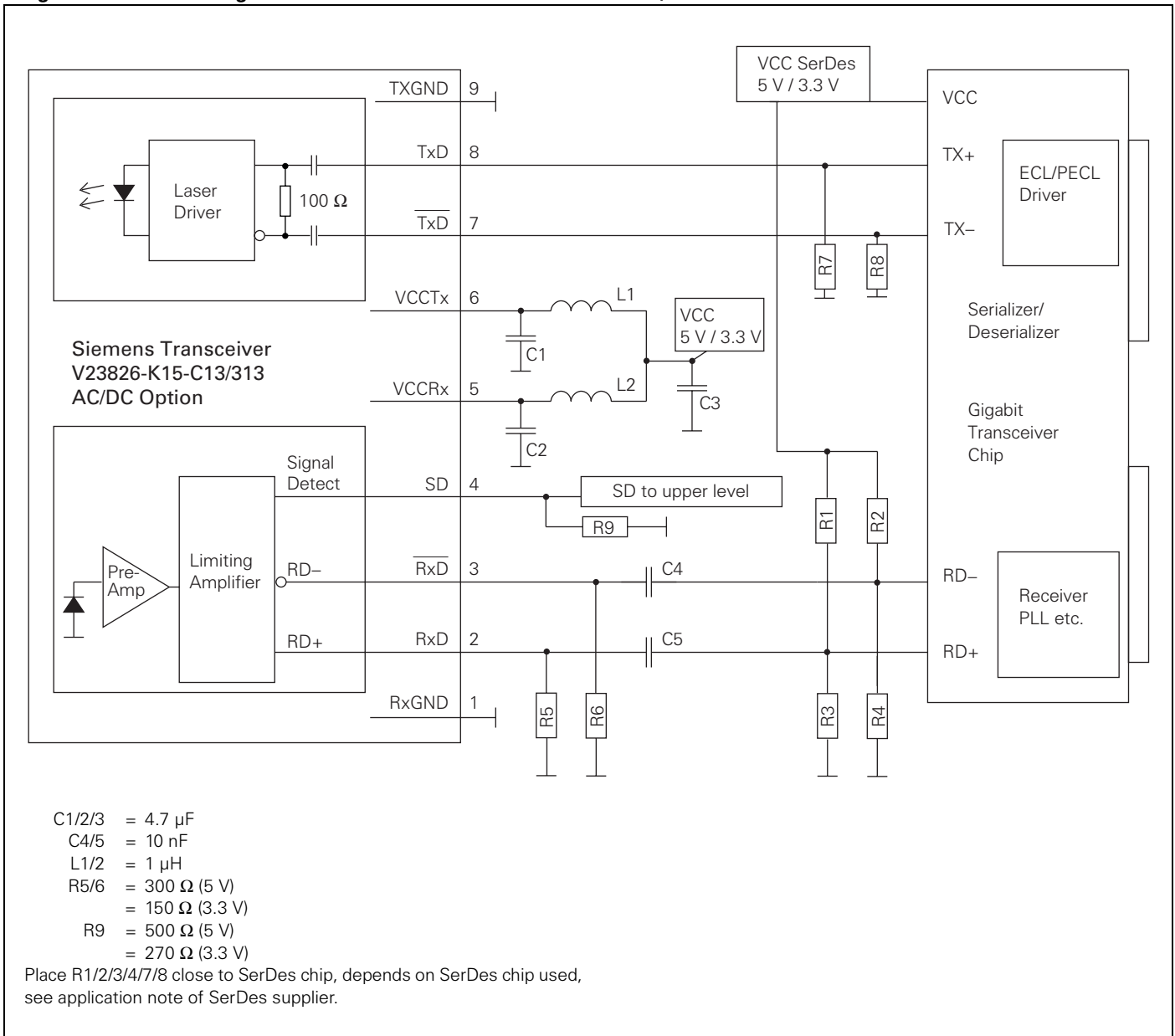
Values of R1/2/3/4 may vary as long as proper 50 Ω termination to V_{EE} or 100 Ω differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CC}RX/V_{CC}TX. We recommend a GND plane under the module for getting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



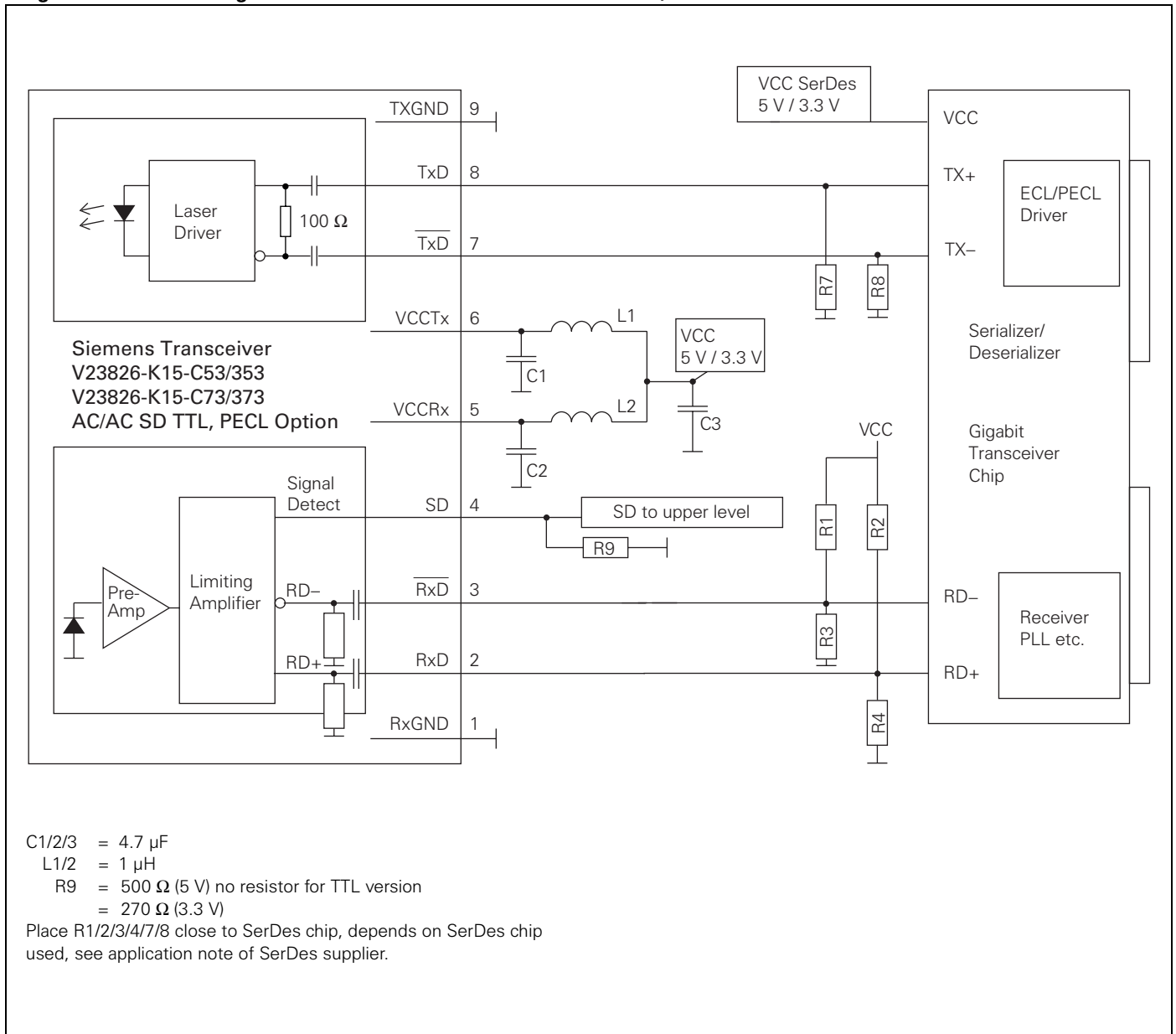
Values of R1/2/3/4 may vary as long as proper 50 Ω termination to V_{EE} or 100 Ω differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module V_{CCRx}/V_{CCTx} . We recommend a GND plane under the module for getting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