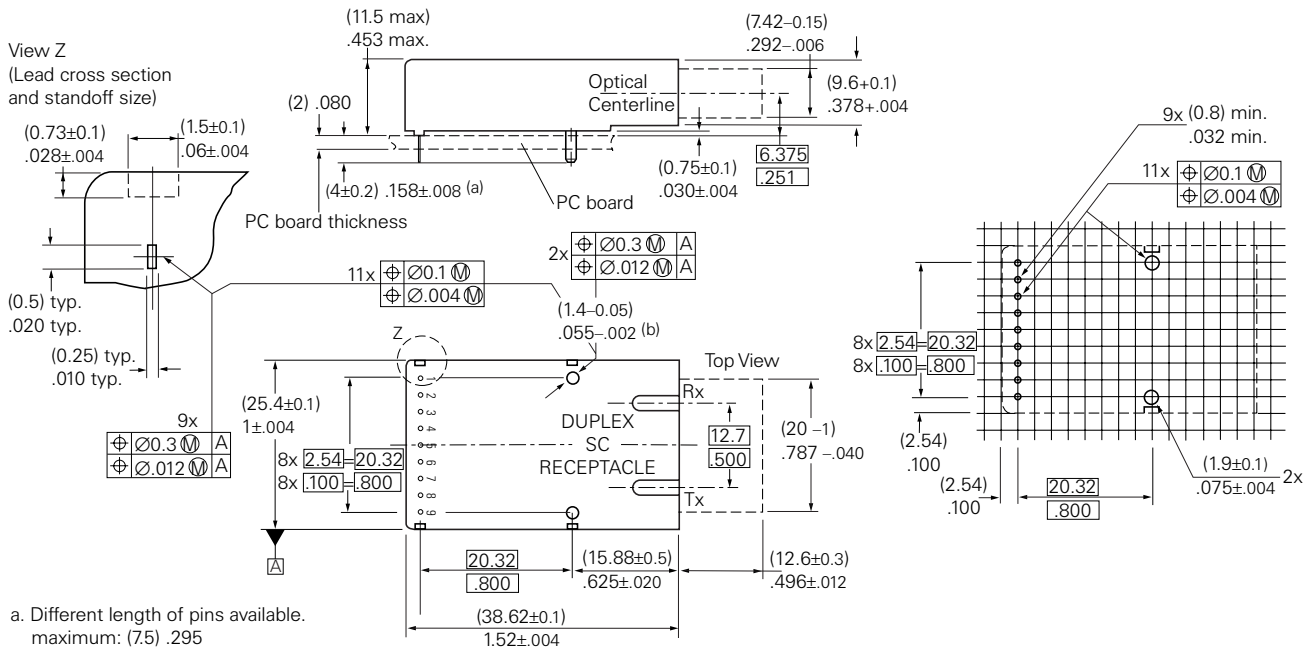
SIEMENS

5 V V23809-K15-C10*
3.3 V V23809-K15-C310*

Single Mode 1.3 Gigabit Ethernet 1x9 Transceiver

Preliminary

Dimensions in (mm) inches



a. Different length of pins available.
maximum: (7.5) .295
b. Isolated posts on request

FEATURES

- **Compliant with existing standards**
- **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. 9520890-04**
- **Single power supply (5 V and 3.3 V)**
- **Signal detect indicator**
- **PECL differential inputs and outputs**
- **Process plug included**
- **Wave solderable and washable with process plug inserted**
- **For distances of up to 3 km (10 km*) on single mode fiber**

*Available also as V23809-K15-C11 (5 V), V23809-K15-C311 (3.3 V) for distances of up to 10 km.

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})	6 V
Data Input Levels (PECL)	V_{CC}–0.5 V
Differential Data Input Voltage	3 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. Add max. 45 mA for the three outputs. Load is 50 Ω to V_{CC}–2 V.

DESCRIPTION

This data sheet describes Siemens single mode transceiver. It is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000BASE-LX (Long Wavelength Laser).

The appropriate fiber optic cable is 9 µm (mode field diameter) single mode fiber (up to 3 km [10 km*]) with Duplex SC connector.

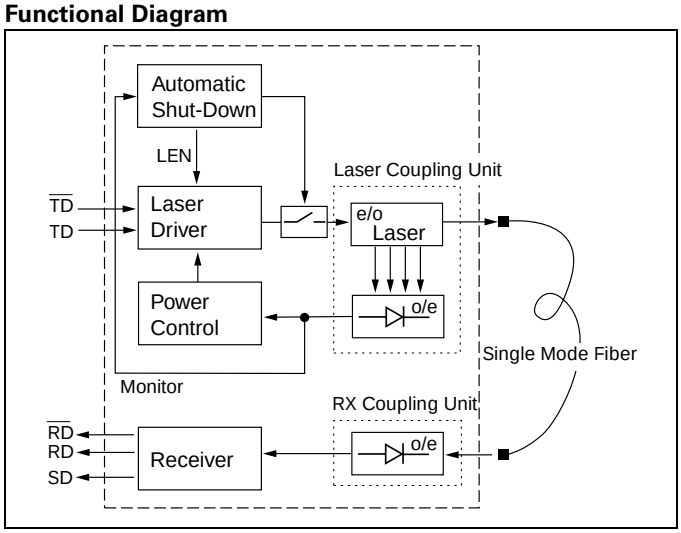
The Siemens single mode transceiver is a single unit comprised of a transmitter, a receiver, and an SC receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN, WAN and Gigabit Ethernet applications. It can be used as the network 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 1.3 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 of 1x9 Pin Row Transceiver

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 an optical signal is present.

The transmitter converts electrical PECL compatible serial data (TD and TDnot) into optical serial data. Data lines are AC coupled with differential 100 Ω termination.

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 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.

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	5 V	V_{CC}–V_{EE}	4.75	5.0	5.25	V
	3.3 V		3.1	3.3	3.5	
Supply Current(1)	5 V	I_{CC}			250	mA
	3.3 V				230	
Transmitter						
Data Input High Voltage		V_{IH}–V_{CC}	–1165		–880	mV
Data Input Low Voltage		V_{IL}–V_{CC}	–1810		–1475	
Input Data Rise/Fall Time 10%–90%		t_R, t_F	100		750	ps
Receiver						
Input Center Wavelength		λ_C	1270		1355	nm

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. Add max. 45 mA for the three outputs. Load is 50 Ω to V_{CC}–2 V.

Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Launched Power (Average)(1)	P_O	11.5		–3	dBm
Center Wavelength	λ_C	1270		1355	nm
Spectral Width (RMS)	σ_I			4	
Relative Intensity Noise	RIN			–116	dB/Hz
Extinction Ratio (Dynamic)	ER	9			dB
Reset Threshold(2)	V_{TH}		2.9		V
Reset Time Out(2)	t_{RES}	140	240	560	ms

Notes

1. Into single mode fiber, 9 µm diameter.
2. 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	
Output Data Rise/Fall Time, 20%–80%	t_R, t_F			375	ps
Return Loss of Receiver	A_{RL}	12			dB

Notes

1. Minimum average optical power at which the BER is less than 1x10E-12 or lower. Measured with a 2^7-1 NRZ PRBS and ER=9 dB.
2. 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.
3. A decrease in optical power below the specified level will cause the SIGNAL DETECT to change from a High state to a Low state.
4. PECL compatible. Load is 50 Ω into V_{CC} –2 V. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added. V_{CC}=3.3 V/5 V.

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
RDn			3	Inverted receiver output data
SD	Rx Signal Detect	PECL Output active high	4	High level on this output shows there is an optical signal.
RxV_{CC}	Rx 3.3 V/5 V	Power Supply	5	Positive power supply, 3.3 V/5 V
TxV_{CC}	Tx 3.3 V/5 V		6	
TDn	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	Support stud (floating)

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. The laser Class 1 is guaranteed within the Absolute 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.

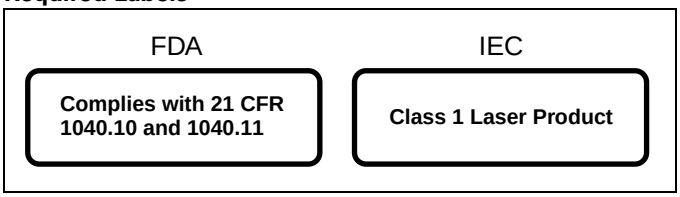
Note

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)).

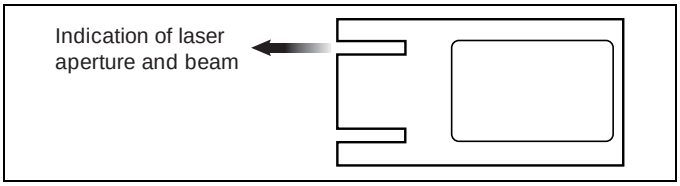
Laser Data

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

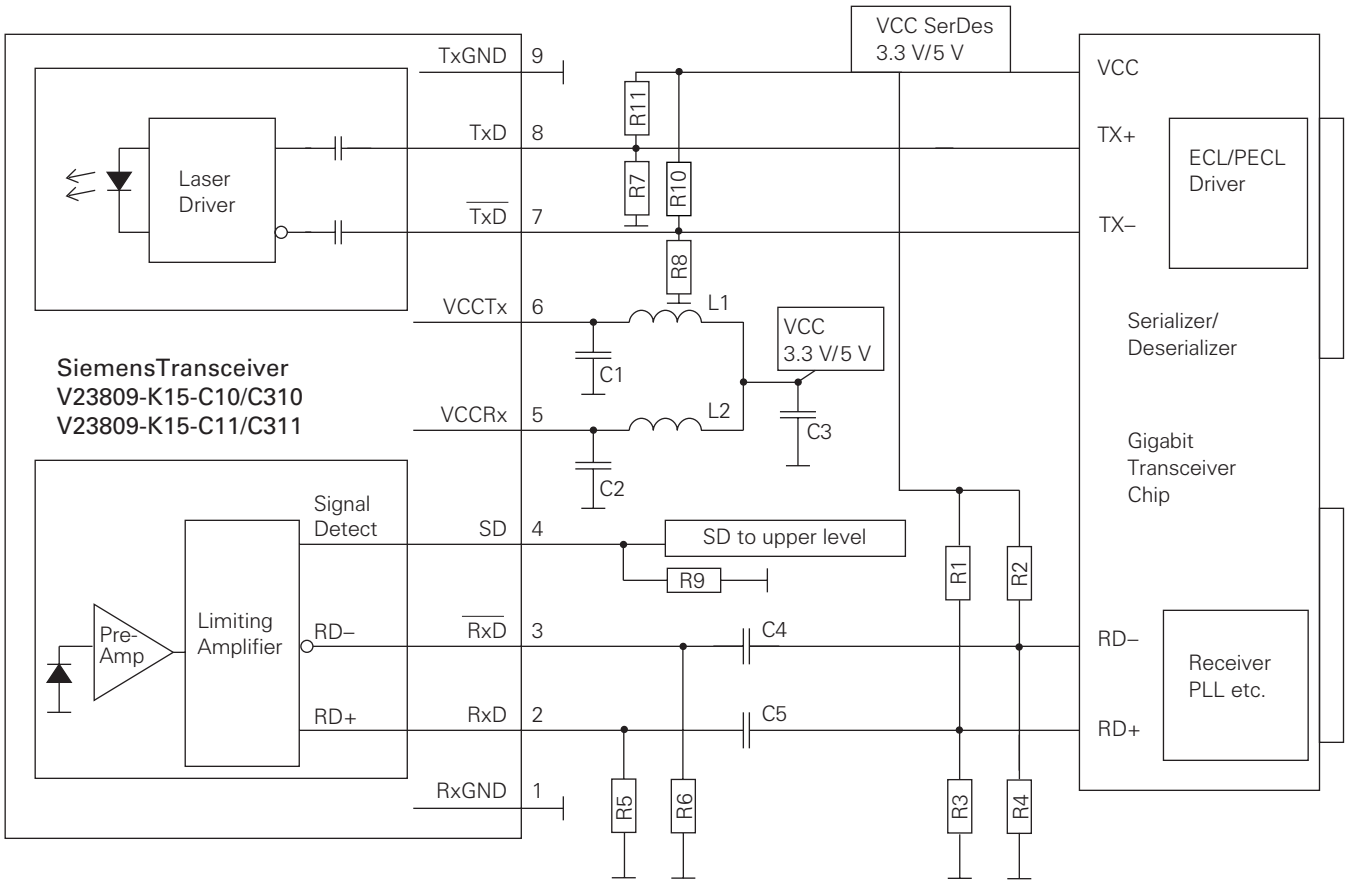


Regulatory Compliance

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.
Emission: Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 1 GHz

APPLICATION NOTE

Single Mode 1300 nm Gigabit Ethernet 1x9 Transceiver



C1/2/3 = 4.7 µF
C4/5 = 10 nF
L1/2 = 1 µH
R1/2/10/11 = 82 Ω for 5 V (depends on SerDes chip used)
=127 Ω for 3.3 V (depends on SerDes chip used)
R3/4/7/8 =130 Ω for 5 V (depends on SerDes chip used)
= 83 Ω for 3.3 V (depends on SerDes chip used)

R5/6 = 200 Ω 270 Ω
R9 = 500 Ω for 5 V
= 200 Ω for 3.3 V
Place R1/2/3/4 close to SerDes chip
Place R7/8/10/11 close to Siemens transceiver

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.

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.