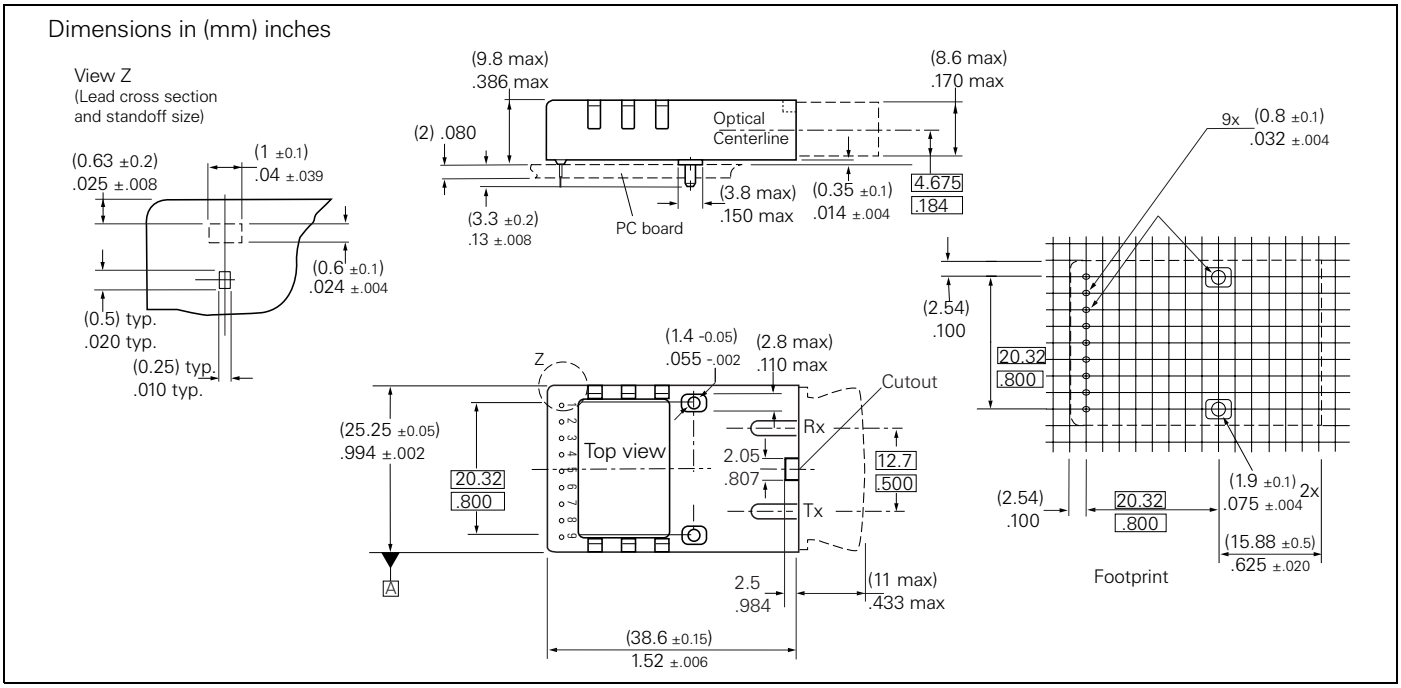
SIEMENS

5 V V23826-K305-C53/73
3.3 V V23826-K305-C353/373

AC/AC Coupled Multimode 850 nm 1.3 Gigabit Ethernet 1x9 Transceiver with Signal Detect TTL or PECL

Preliminary



FEATURES

- **Compliant with Gigabit Ethernet standard**
- **Meets mezzanine standard height of 9.8 mm**
- **Compact integrated transceiver unit with**
  - **VCSEL laser diode transmitter**
  - **Integrated receiver**
  - **Duplex SC receptacle**
- **Class 1 FDA and IEC laser safety compliant**
- **Single power supply (5 V or 3.3 V)**
- **Signal detect indicator TTL or PECL**
- **AC coupled differential inputs and outputs**
- **Process plug included**
- **Wave solderable and washable with process plug inserted**
- **For distances of up to 550 m (dependent on fiber type)**

Absolute Maximum Ratings

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

Package Power Dissipation	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	3 V
Operating Case Temperature	0°C to 70°C
Storage Ambient Temperature	–40°C to 85°C
Soldering Conditions, Temp/Time (MIL-STD 883C, Method 2003)	250°C/5.5s

DESCRIPTION

Siemens Gigabit Ethernet multimode transceiver is based on the Physical Medium Depend (PMD) sublayer and baseband medium, type 1000BASE-SX (short wavelength).

The appropriate fiber optic cable is 62.5 µm or 50 µm multimode fiber with duplex SC connector.

The Siemens Gigabit Ethernet multimode 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.

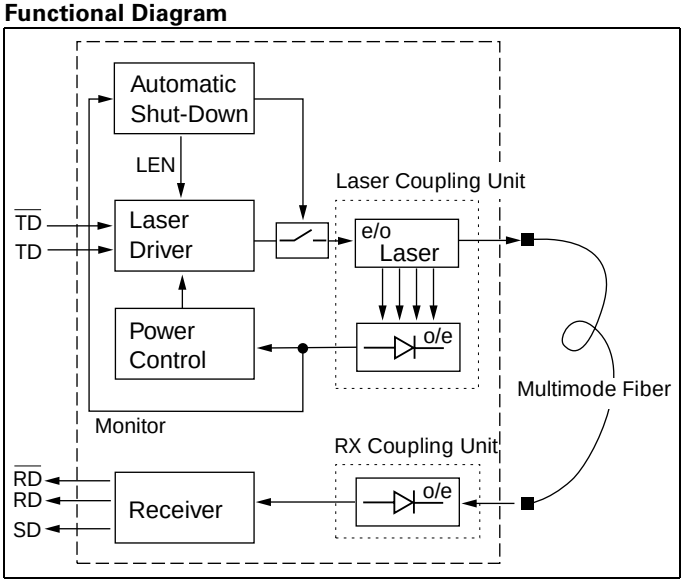
The module is designed for low cost LAN, WAN, and Gigabit Ethernet applications. It can be used as the network end device interface in mainframes, workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, intelligent hubs, and local and wide area switches.

This transceiver operates at 1.3 Gbits per second from a single power supply (+5 V or +3.3 V). 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 multimode cable.

Functional Diagram



The receiver component converts the optical serial data into PECL compatible electrical data (RD and RDnot) which are AC coupled with a biasing build into the transceiver. 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 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 valid only for use under the recommended operating conditions.

Recommended Operating Conditions

Parameter		Symbol	Min.	Typ.	Max.	Units
Case Temperature		T_C	0		70	°C
Power Supply Voltage	C53/C73	V_{CC}–V_{EE}	4.75	5.0	5.25	V
	C353/C373		3.1	3.3	3.5	
Supply Current(1)	C53/C73	I_{CC}		Tbd	Tbd	mA
	C353/C373			Tbd	Tbd	
Transmitter						
Data Input Diff. Voltage(2)		V_{DIFF}	300		900	mV
Receiver						
Input Center Wavelength		λ_C	770		860	nm

Notes

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.
2. Data inputs are AC coupled with 100 Ω differential termination built into the transceiver.

Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Launched Power (Average)(1)	P_O	–10		–4	dBm
Center Wavelength	λ_C	830	850	860	nm
Spectral Width (RMS)	σ_λ			0.85	
Relative Intensity Noise	RIN			–117	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
Rise/Fall Time, 20%–80%	t_R, t_F			0.26	ns
Coupled Power Ratio	CPR	9			dB

Notes

1. Into multimode fiber, 62.5 µm or 50 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}		–19	–17	dBm
Saturation (Average Power)		P_{SAT}	0			
Signal Detect Assert Level(2)		P_{SDA}		–24	–20	
Signal Detect Deassert Level(3)		P_{SDD}	–30	–27		
Signal Detect Hysteresis		P_{SDA}– P_{SDD}		3		dB
Signal Detect Assert Time		t_{ASS}			Tbd	µs
Signal Detect Deassert Time		t_{DAS}				
SD Output Low Voltage(4)	K305-C53	V_{SDL}			0.5	V
	K305-C353					
SD Output High Voltage(4)	K305-C53	V_{SDH}	2.4			
	K305-C353		2.2			
SD Output Low Voltage(5)	K305-C73	V_{SDL}	-1.95		-1.62	
	K305-C373					
SD Output High Voltage(5)	K305-C73	V_{SDH}	-1.1		-0.86	
	K305-C373					
Data Output Diff. Voltage(6)		V_{DIFF}	0.5		1.0	
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 1 x 10E–12. 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. TTL compatible, I_{OH} = -0.4 mA, measured under DC conditions.
5. PECL compatible, when V_{CC}-V_{EE} = 5 V R_{LOAD} = 510 Ω to V_{EE}, when V_{CC}-V_{EE} = 3.3 V R_{LOAD} = 270 Ω to V_{EE}
6. Load is either 50 Ω to GND at each output or 100 Ω diff.

LASER SAFETY

This multimode Gigabit Ethernet transceiver is a Class 1 laser product. It complies with IEC 825-1 and FDA 21 CFR 1040.10 and 1040.11. The transceiver must be operated under recommended operating conditions.

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

General Restrictions

Classification is valid only if the module is operated within the specified temperature and voltage limits. The system using the module must provide power supply protection that guarantees that the system power source will cease to provide power if the maximum recommended operation limit or more is detected on the +3.3 V/+5 V at the power source. The case temperature of the module must be in the temperature range given in the recommended operating limits. These limits guarantee the laser safety.

Usage Restrictions

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

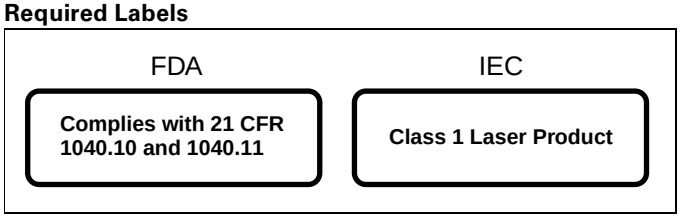
Note

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)).

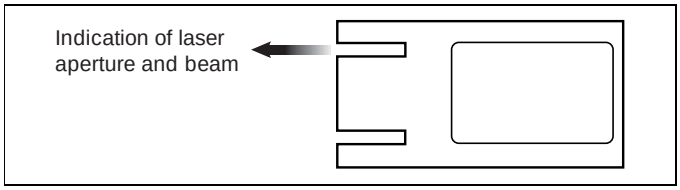
Laser Data

Wavelength	850 nm
Total output power (as defined by IEC: 50 mm aperture at 10 cm distance)	<400 µW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	<70 µW
Beam divergence	12°

Required Labels



Laser Emission



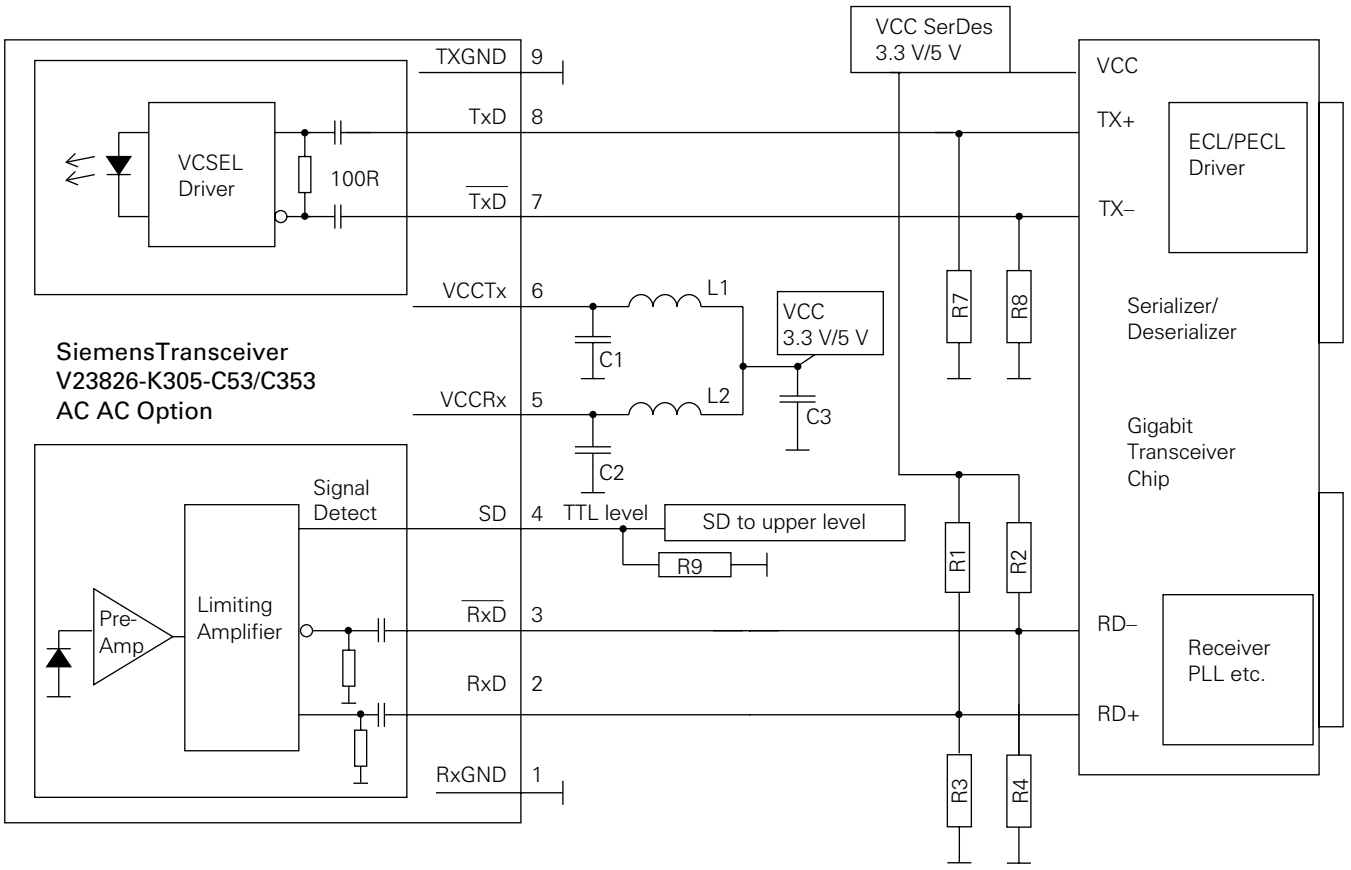
Pin Description 1x9 Pin Row

Pin Name		Level	Pin #	Description
RxV_{EE}	Rx Ground	Power Supply	1	Negative power supply, normally ground
RD	Rx Output Data	PECL Output AC coupled	2	Receiver output data
RDn	Rx Output Data	PECL Output AC coupled	3	Inverted receiver output data
SD	RX Signal Detect	Output active high	4	A high level on this output shows that 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	Power Supply	6	Positive power supply, 3.3 V/5 V
TDn	Tx Input Data	PECL Input AC coupled	7	Inverted transmitter input data
TD	Tx Input Data	PECL Input AC coupled	8	Transmitter input data
TxV_{EE}	Tx Ground	Power Supply	9	Negative power supply, normally ground
Case	Ground	Mech. Support	S1/2	Support stud (floating)

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 FOR 850 NM GIGABIT ETHERNET 1X9 TRANSCEIVER



C1/2/3= 4.7 µF
L1/2 = 1 µH
R1/2 = Depends on SerDes chip used
R3/4 = Depends on SerDes chip used

R7/8 = Biasing (depends on SerDes chip)
R9 = 1 kΩ to 2 kΩ (K305-C53/C353)
= 510 Ω (K305-C73)
= 270 Ω (K305-C373)
Place R1/2/3/4/7/8 close to SerDes chip
Place R5/6 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.

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