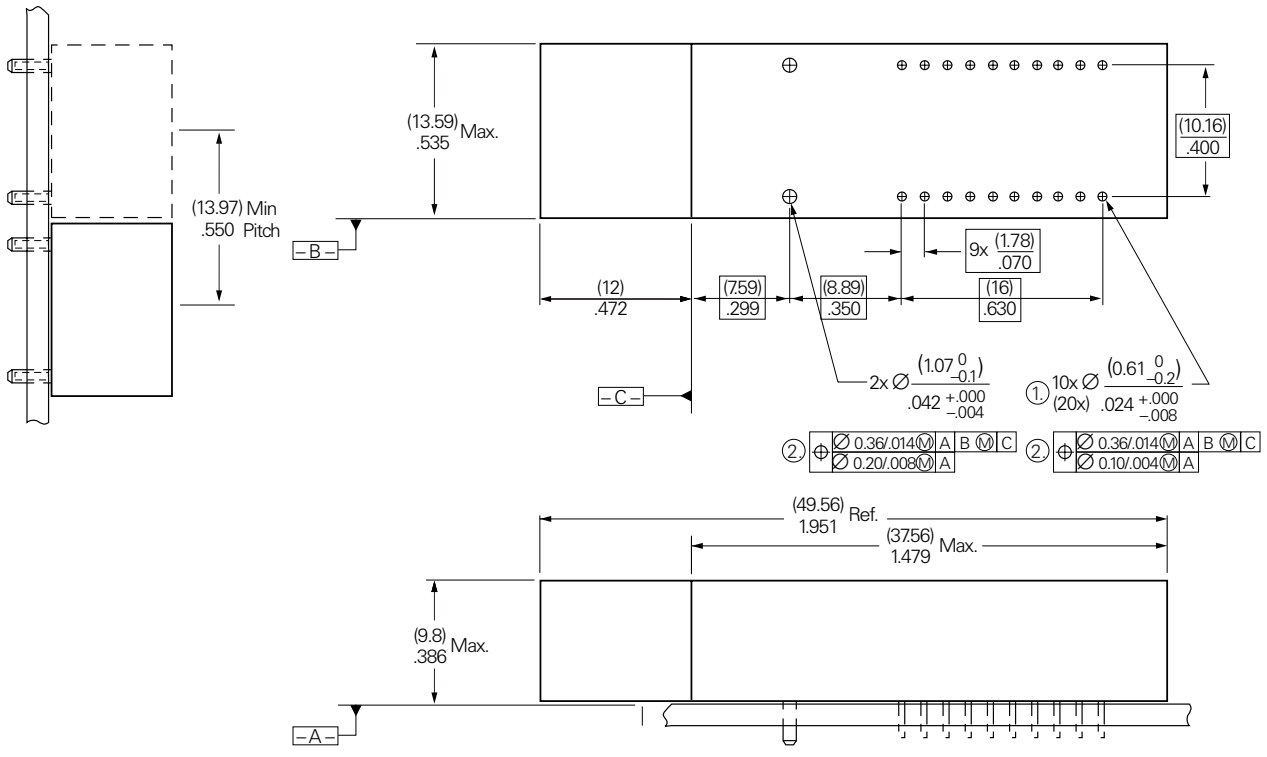
SIEMENS

# V23818-K305-V10

## Small Form Factor
## Multimode 850 nm 1.3 Gigabit Ethernet 2x5 Transceiver with VF-45 (Volition™) Connector

**Preliminary**

Dimensions in (mm) inches




1. Toleranced to accommodate round or rectangular leads.
2. All 22 pins and posts are to be treated as a single pattern.

### FEATURES

- **Small Form Factor transceiver unit for VF-45 (Volition™) connector**
- **RJ-45 style connector system**
- **Half the size of SC Duplex 1x9 transceiver**
- **Fully compliant with all major standards**
- **SONET OC3**
- **Single power supply (+3.3 V)**
- **Extremely low power consumption < 0.7 W**
- **PECL differential inputs and outputs**
- **System optimized for 62.5/50 µm graded index fiber**
- **Multisource footprint**
- **Small footprint for high channel density**
- **UL-94 V-0 certified**
- **ESD Class 2 per MIL-STD 883 Method 3015**
- **Compliant with FCC (Class B) and EN 55022**
- **For distances of up to 550 m**

### Absolute Maximum Ratings

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

| | |
|---|---|
| Package Power Dissipation(1) | 1.5 W |
| 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 |

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.

Volition™ is a trademark of 3M.

## DESCRIPTION

The Siemens Gigabit Ethernet multimode transceiver—part of Siemens Small Form Factor transceiver family—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 VF-45 (Volition™) connector.

The Siemens Gigabit Ethernet multimode transceiver is a single unit comprised of a transmitter, a receiver, and an VF-45 receptacle. This design frees the customer from many alignment and PC board layout concerns.

This transceiver supports the innovative Volition connectorization concept, which competes with UTP/CAT 5 solutions. It is compatible with RJ-45 style backpanels for fiber-to-the-desktop applications while providing the advantages of fiber optic technology. The receptacle accepts the new SG connector. The Small Form Factor is specially developed for distances of up to 550 m.

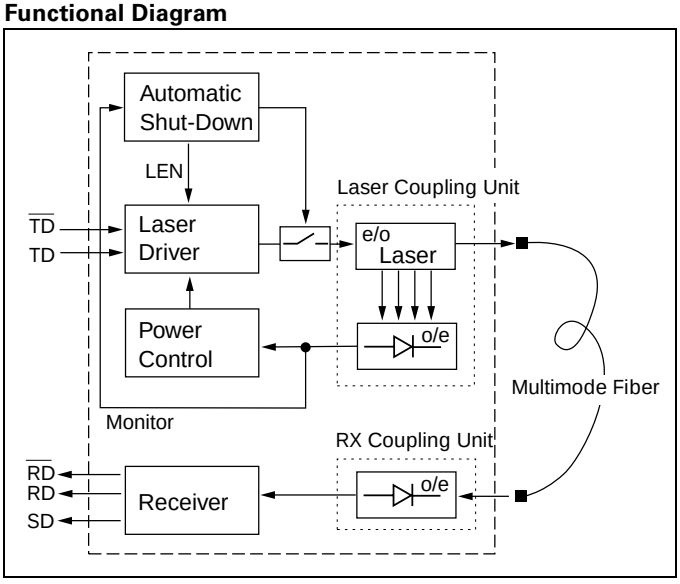
The module is designed for low cost LAN, WAN, and Gigabit Ethernet applications. It can be used as the network end device interface in mainframes, workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, intelligent hubs, and local and wide area switches.

This transceiver operates at 1.25 Gbits per second from a single power supply (+3.3 V). The full differential data inputs and outputs are PECL compatible.

### Functional Description of 2x5 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). 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 | $V_{CC}$–$V_{EE}$ | 3.1 | 3.3 | 3.5 | V |
| Supply Current(1) | $I_{CC}$ | | Tbd | Tbd | mA |
| **Transmitter** | | | | | |
| Data Input Low Voltage(2) | $V_{IL}$–$V_{CC}$ | 300 | | 900 | mV |
| Input Data Rise/Fall Time, 10%–90% | $t_R$, $t_F$ | 100 | | 750 | ps |
| **Receiver** | | | | | |
| Input Center Wavelength | $\lambda_C$ | 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 | $\lambda_C$ | 830 | 850 | 860 | nm |
| Spectral Width (RMS) | $\sigma_I$ | | | 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 Time, 20%–80% | $t_R$ | | | 0.26 | ns |

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 | $t_{ASS}$ | | | 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 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. PECL compatible. Load is 50 Ω into $V_{CC}$–2V. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added.

### 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 |

### 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. Because the transceiver design is designed to be inhevently eye safe, it does not require open fiber control thus eliminating complex electronics or mechanics.

**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 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.

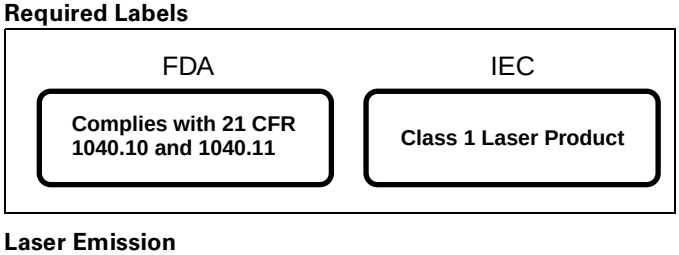
Note

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)).

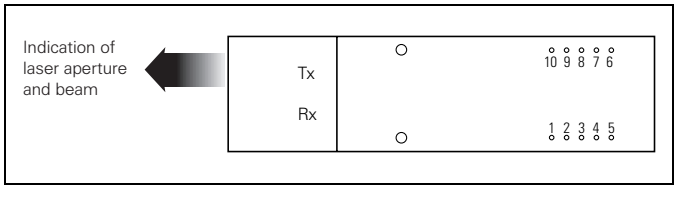
### Laser Data

| | |
|---|---|
| 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



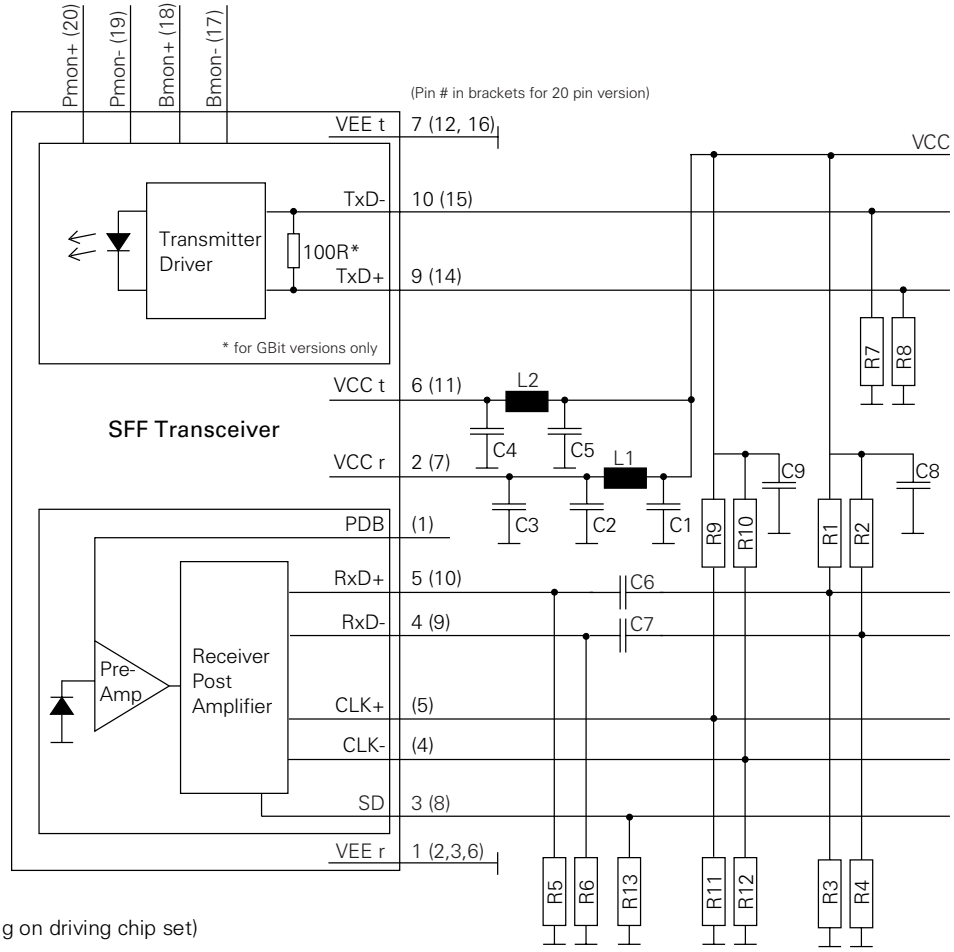

### Laser Emission



**Pin Description**

| Pin Name | | Level/Logic | Pin# | Description |
|---|---|---|---|---|
| $V_{EEr}$ | Receiver Signal Ground | N/A | 1 | |
| $V_{CCr}$ | Receiver Power Supply | N/A | 2 | |
| SD | Signal Detect | PECL | 3 | Normal Operation: Logic "1" Output<br>Fault Condition: Logic "0" Output |
| RD- | Received Data Out Bar | PECL | 4 | No internal terminations will be provided. |
| RD+ | Received Data Out | PECL | 5 | No internal terminations will be provided. |
| $V_{CCt}$ | | N/A | 6 | Transmitter Power Supply |
| $V_{EEt}$ | | N/A | 7 | Transmitter Signal Ground |
| TDis | | TTL | 8 | Optional use for Laser based products only. |
| TD+ | | PECL | 9 | Transmitter Data In |
| TD- | | PECL | 10 | Transmitter Data In Bar<br>See TD+ pin for terminations |
| MS | MS | N/A | MS | Mounting Studs<br>The mounting studs are provided for transceiver mechanical attachment to the circuit board. They also provide an optional connection of the transceiver to the equipment chassis ground.<br>The holes in the circuit board must be tied to chassis ground. |

**APPLICATION NOTE**
**850nm Gigabit Ethernet 2x5 Transceiver**




L1/2 = 1 ... 4.7 µH
C1/2/6/7 = 10 nF
C3 = 4.7 ... 10 µF
C4/5 = 4.7 ... 10 µF
C8 = 100 nF
R1/2 = 82 Ω
R3/4 = 127 Ω
R5/6/13 = 200 Ω
R7/8 = 200 Ω (depending on driving chip set)
R9/10 = 130 Ω
R11/12 = 82 Ω