

## FEATURES

- **Compliant with IBM ESCON single mode standard**
- **Compact integrated transceiver unit with**
  - **MQW laser diode transmitter**
  - **InGaAs PIN photodiode receiver**
  - **Duplex SC receptacle**
- **FDA Class 1 laser safety compliant under normal operating conditions**
- **IEC Class 1 laser safety compliant**
- **Single power supply (5 V)**
- **Loss of optical signal indicator**
- **PECL differential inputs and outputs**
- **Process plug included**
- **Wave solderable and washable with process plug inserted**

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### Absolute Maximum Ratings

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

Package Power Dissipation <sup>(1)</sup> .....	1.5 W
Supply Voltage (V <sub>CC</sub> –V <sub>EE</sub> ) .....	6 V
Data Input Levels (PECL) .....	V <sub>CC</sub> –0.7 V
Differential Data Input Voltage .....	3 V
Operating Ambient 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  $50\ \Omega$  to  $V_{CC}-2\text{ V}$ .

### DESCRIPTION

This data sheet describes the Siemens single mode ESCON transceiver.

The Siemens single mode ESCON transceiver is a single unit comprised of a transmitter, a receiver, and an SC duplex single mode receptacle. 1300 nm long wavelength technology is combined with the well-established 1x9 industry standard footprint. This design frees the customer from many alignment and PC board layout concerns.

The system is compatible with the IBM single mode ESCON standard and the upcoming SBCON standard of ANSI.

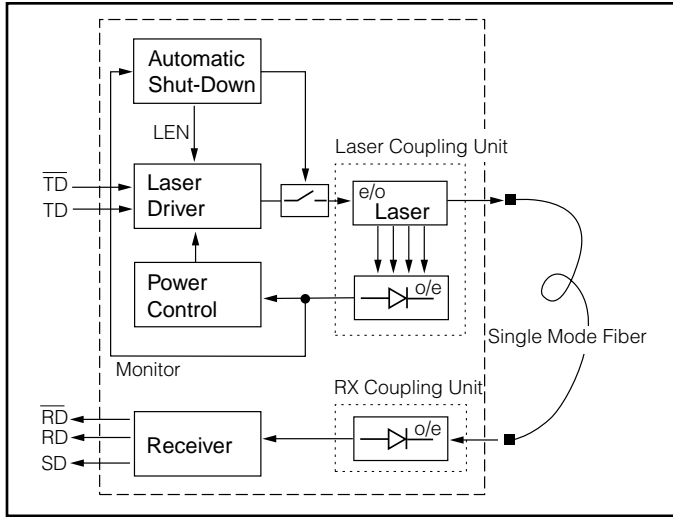
Based on laser technology and single mode fiber, the link can be extended up to 20 Km and beyond.

This transceiver operates at 200 Mbits per second from a single power supply (+5 Volt). The full differential data inputs and outputs are PECL compatible. It is designed to be encoded with 8B/10B signal layers.

### 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 a optical signal is present. If no optical input signal is present, the receiver data outputs are switched to static low level (RD=Low, RDnot=High).

The transmitter converts PECL compatible electrical serial data (TD and TDnot) into optical serial data. It 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 a 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.

This module is a Class 1 laser product, due to an integrated automatic shutdown circuit that disables the laser when it detects transmitter failures.

The transceiver contains a supervisory circuit to monitor 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
Ambient Temperature	$T_{AMB}$	0		70	°C
Power Supply Voltage	$V_{CC}-V_{EE}$	4.75	5.0	5.25	V
Supply Current <sup>(1)</sup>	$I_{CC}$		150	270	mA
<b>Transmitter</b>					
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%	$t_R, t_F$	0.4		1.3	ns
<b>Receiver</b>					
Output Current	$I_O$			25	mA
Input Center Wavelength	$\lambda_C$	1260		1360	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. Add max. 45 mA for the three outputs. Load is 50  $\Omega$  to  $V_{CC}-2$  V.

### Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average)	$P_O$	-8	-6	-3	dBm
Center Wavelength	$\lambda_C$	1261		1360	nm
Spectral Width (FWHM)	$\Delta\lambda$		2.4	7.6	
Output Rise Time	$t_R$	0.6		2.2	ns
Output Fall Time	$t_F$				
Extinction Ratio (dynamic)	ER	8.2			dB
Eye Diagram <sup>(1)</sup>					

#### Note

- Transmitter meets ANSI T1E1.2, SONET OC-3, and ITU G.957 mask patterns.

## Receiver Electro-Optical Characteristics

Receiver	Symbol	Min.	Typ.	Max.	Units
Sensitivity (Average Power) <sup>(1)</sup>	P <sub>IN</sub>		-38	-35	dBm
Saturation (Average Power)	P <sub>SAT</sub>	-3			
Signal Detect Assert Level <sup>(2)</sup>	P <sub>SDA</sub>		-40.5	-38	
Signal Detect Deassert Level <sup>(3)</sup>	P <sub>SDD</sub>	-45	-42		
Signal Detect Hysteresis	P <sub>SDA</sub> -P <sub>SDD</sub>	1	1.5	3	dB
Output Low Voltage <sup>(4)</sup>	V <sub>OL</sub> -V <sub>CC</sub>	-1950		-1630	mV
Output High Voltage <sup>(4)</sup>	V <sub>OH</sub> -V <sub>CC</sub>	-1025		-735	
Output Data Rise/Fall Time, 10%-90%	t <sub>R</sub> , t <sub>F</sub>			1.3	ns
Output SD Rise/Fall Time <sup>(5)</sup>				40	

### Notes

1. Minimum average optical power at which the BER is less than 1 x 10E-10 or lower. Measured with a 2<sup>23</sup>-1 NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3, and ITU G.957.
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  $\Omega$  into V<sub>CC</sub>-2 V. Measured under DC conditions at 25°C. For dynamic measurements a tolerance of 50 mV should be added. V<sub>CC</sub>=5 V.
5. PECL compatible. A high level on this output shows that an optical signal is applied to the optical input.

### Pin Description 1x9 Pin Row

Pin Name		Level	Pin #	Description
RxV <sub>EE</sub>	Rx Ground	Power Supply	1	Negative power supply, normally ground
RD	Rx Output Data	PECL Output	2	Receiver output data
RDn	Rx Output Data	PECL Output	3	Inverted receiver output data
Rx SD	RX Signal Detect	PECL Output active high	4	A high level on this output shows that an optical signal is applied to the optical input.
RxV <sub>CC</sub>	Rx +5 V	Power Supply	5	Positive power supply, +5 V
TxV <sub>CC</sub>	Tx +5 V	Power Supply	6	Positive power supply, +5 V
TDn	Tx Input Data	PECL Input	7	Inverted transmitter input data
TD	Tx Input Data	PECL Input	8	Transmitter input data
TxV <sub>EE</sub>	Tx Ground	Power Supply	9	Negative power supply, normally ground
	Ground	Power Supply	S1/2	V <sub>EE</sub> /GND Support Stud (GND) connect to V <sub>EENB</sub>

## LASER SAFETY

This single mode ESCON transceiver is a Class 1 laser product. It complies with IEC 825-1 and with 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. Do not view into the open optical port for more than 60 seconds!**

### 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 +5 V at the power source. The operating 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)).

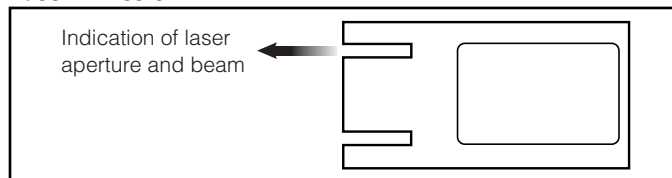
### Laser Data

Wavelength	1300 nm
Total output power (as defined by IEC: 50 mm aperture at 10 cm distance)	5 mW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	325 $\mu$ W
Beam divergence	4°

### Required Labels

FDA	IEC
<b>Laser Radiation Avoid Exposure to Beam Laser Class 1 Product</b>	<b>Class 1 Laser Product</b>

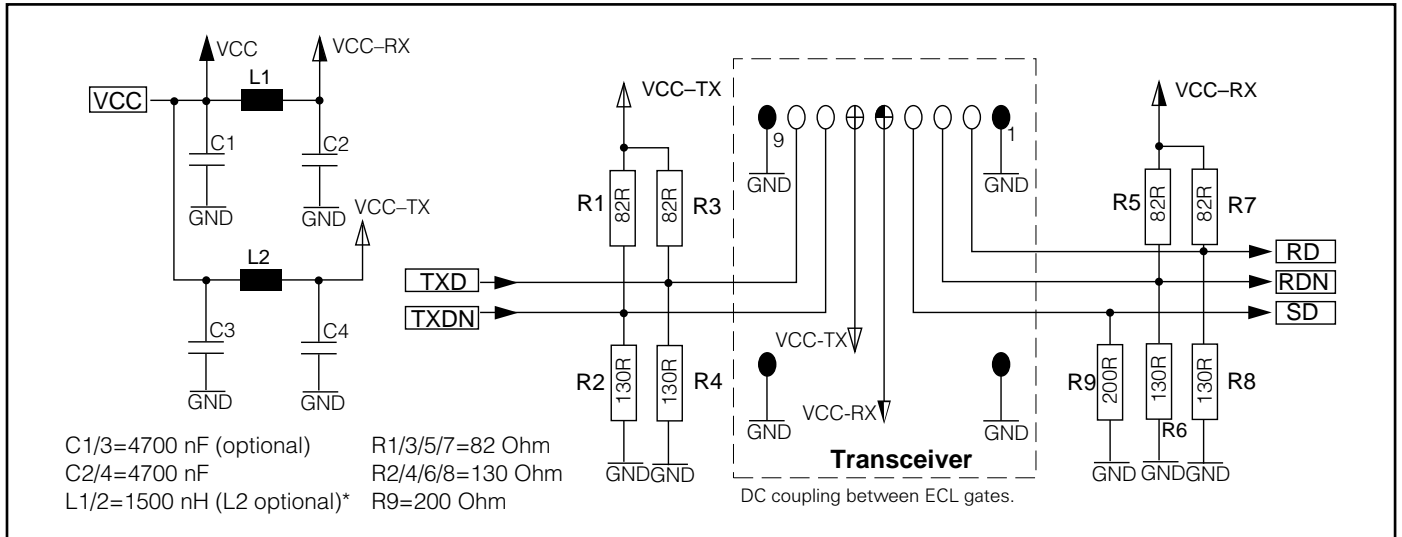
### Laser Emission



## 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 $\pm 15\text{kV}$ 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 1X9 PIN ROW TRANSCEIVER



The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module  $V_{CC-RX}/V_{CC-TX}$ . A GND plane under the module is required for good EMI and sensitivity performance. Studs must be

connected to this GND plane. 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  $V_{TH}$ .