

### FEATURES

- Compliant with existing standards
- Compact integrated transceiver unit with
  - MQW laser diode transmitter
  - InGaAs PIN photodiode receiver
  - Duplex ST® receptacle
- Class 1 FDA and IEC laser safety compliant
- FDA Accession No. 9520890
- Single power supply (+5 V)
- Loss of optical signal indicator
- PECL differential inputs and outputs
- Process plug included

### 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 ( $V_{CC}-V_{EE}$ )	6 V
Data Input Levels	GND to $V_{CC}+0.5$ V
Differential Data Input Voltage	2.5 V
Operating Ambient Temperature	0°C to 70°C
Storage Ambient Temperature	-40°C to 85°C
Soldering Conditions Temp/Time	
(MIL-STD 883 C 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  $V_{CC}-2$  V.

### DESCRIPTION

The Siemens single mode ATM transceiver complies with the ATM Forum's *Network Compatible ATM for Local Network Applications* document and ANSI's *Broadband ISDN—Customer Installation Interfaces, Physical Media Dependent Specification*, T1E1.2.

ATM was developed to facilitate solutions in multimedia applications and real time transmission. The data rate is scalable, and the ATM protocol is the basis of the broadband public networks being standardized in the International Telecommunications Union (ITU), the former International Telegraph and Telephone Consultative Committee (CCITT). ATM can also be used in local private applications.

## DESCRIPTION (continued)

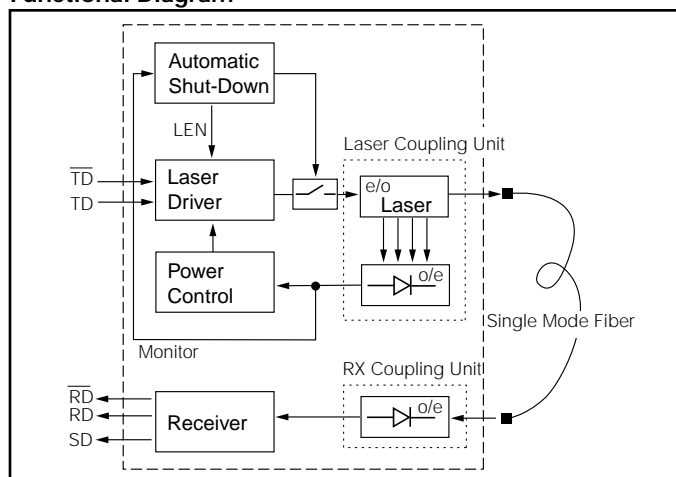
The Siemens single mode ATM transceiver is a single unit comprised of a transmitter, a receiver, and an ST® receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost LAN and WAN applications. It can be used as the network end device interface in workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, and intelligent hubs, as well as local and wide area ATM switches.

This transceiver operates at 155.520 Mbits per second from a single power supply (+5 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. 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 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	250	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, 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  $V_{CC}-2V$ .

## Transmitter Electro-Optical Characteristics

Transmitter	Symbol	Min.	Typ.	Max.	Units
Output Power (Average)	$P_O$	-15.0	-11.0	-8.0	dBm
Center Wavelength	$\lambda_C$	1260		1360	nm
Spectral Width (FWHM)	$\Delta\lambda$			7.7	
Output Rise Time	$t_R$	0.6		2.5	ns
Output Fall Time	$t_F$			3.0	
Extinction Ratio (Dynamic)	ER	8.2			dB
Reset Threshold for $TXV_{CC}$ <sup>(1)</sup>	$V_{TH}$	4.25	4.38	4.5	V
Reset Active Time Out <sup>(1)</sup>	$t_{RES}$	140	240	560	ms
Eye Diagram <sup>(2)</sup>					

## Notes

- Laser power is shut down if power supply is below  $V_{TH}$  and switched on if power supply is above  $V_{TH}$  after  $t_{RES}$ .
- 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>		-33.0	-29.0	dBm
Saturation (Average Power)	P <sub>SAT</sub>	-8.0			
Signal Detect Assert Level <sup>(2)</sup>	P <sub>SDA</sub>	-43	-36.0	-33.5	
Signal Detect Deassert Level <sup>(3)</sup>	P <sub>SDD</sub>	-44.5	37.5	-35.0	
Signal Detect Hysteresis	P <sub>SDA</sub> -P <sub>SDD</sub>	1.0	1.5	3.0	dB
Signal Detect Assert Time <sup>(4)</sup>	t <sub>ASS</sub>	10	30	100	
Signal Detect Deassert Time <sup>(5)</sup>	t <sub>DAS</sub>	30	150	350	
Output Low Voltage <sup>(6)</sup>	V <sub>OL</sub> -V <sub>CC</sub>	-1950		-1630	mV
Output High Voltage <sup>(6)</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>			1.3ns	ns
Output SD Rise/Fall Time <sup>(7)</sup>				40ns	

### Notes

1. Minimum average optical power at which the BER is less than 1x10<sup>-10</sup>. 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 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 switch from a High state to a Low state.
4. Measured by switching the light from <-40 dBm to -25 dBm.
5. Measured by switching the light from -25 dBm to <-40 dBm. Switching from higher power levels increases this time.
6. 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.
7. 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/ Logic	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			3	Inverted receiver output data
Rx SD	RX Signal Detect	PECL Output active high	4	High level on this output shows 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		6	
TDn	Tx Input Data	PECL Input	7	Inverted transmitter input data
TD			8	Transmitter input data
TxV <sub>EE</sub>	Tx Ground	Power Supply	9	Negative power supply, normally ground

## 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 $\pm 15$ 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

## LASER SAFETY

This single mode ATM 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 +5V 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.

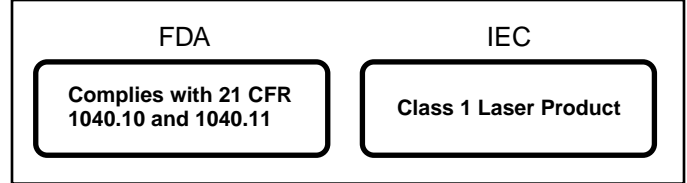
### Note

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)].

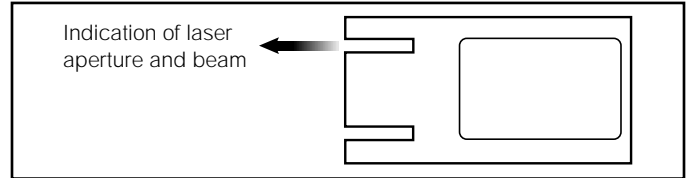
## Laser Data

Wavelength	1300 nm
Total output power (as defined by IEC: 50 mm aperture at 10 cm distance)	2 mW
Total output power (as defined by FDA: 7 mm aperture at 20 cm distance)	180 $\mu$ W
Beam divergence	4°

## Required Labels

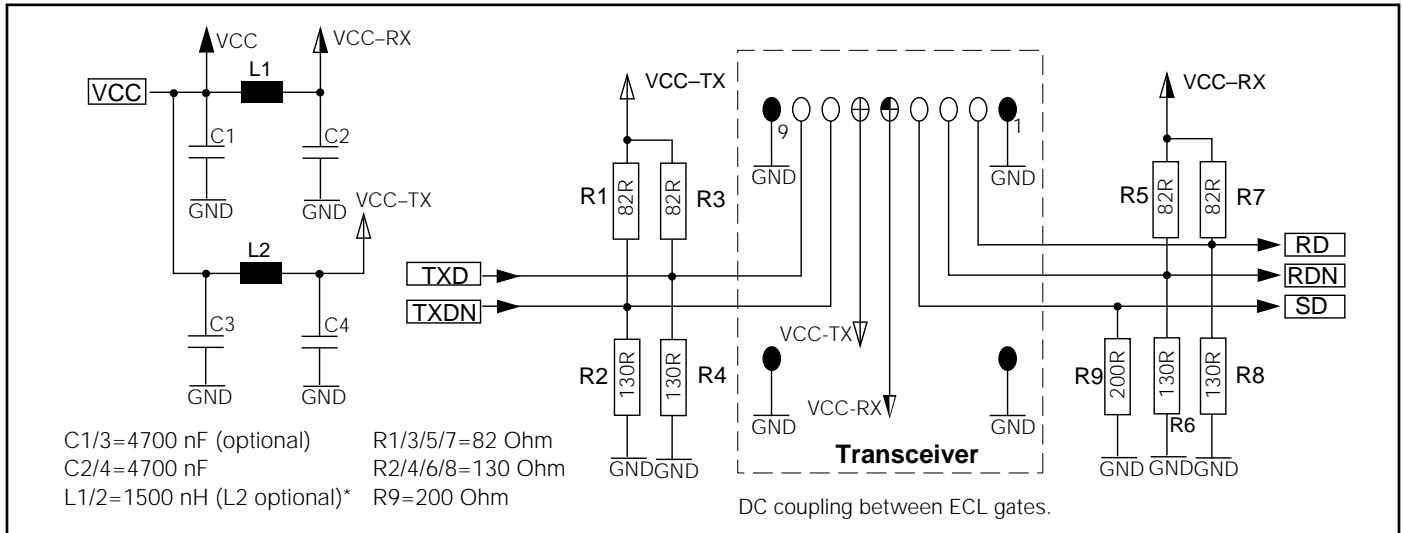


## Laser Emission



## APPLICATION NOTE

### 1x9 Pin Row Transceiver



\*Recommended choke is Siemens Matsushita B78108-S1153-K or B78148-S1153-K ( $Q_{min}=60$ , max. DC resistance=0.6 Ohm).

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  $V_{TH}$ .