

## SHORT PIN V23809-E1-E16 LONG PIN V23809-E1-E17-xx\* 1300 nm ESCON® Serial Transceiver Preliminary

### FEATURES

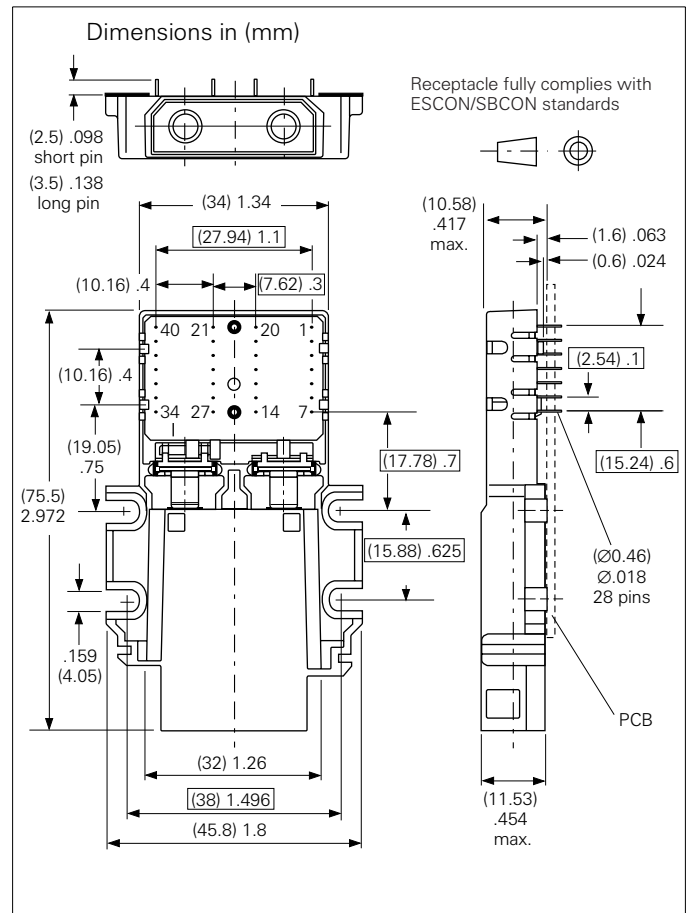
- Complies with ESCON and SBCON standards
- Transceiver includes transmitter, receiver and ESCON/SBCON receptacle
- Transceiver mates keyed ESCON/SBCON connector
- Data rates for ESCON/SBCON applications from 10 to 200 MBaud
- Data rates for individual applications from 10 to 300 MBaud
- Transmission distance of 3 Km and more
- Single power supply of 3.0 V to 5.5 V
- Extremely low power consumption <0.7 W at 3.3 V
- PECL differential inputs and outputs
- System is optimized for 62.5 and 50  $\mu$ m graded index fiber
- 0.7" spacing between optical interface of transmitter and receiver
- Through-hole technology with either 2.5 mm or 3.5 mm pin length
- Low profile for high slot density

### APPLICATIONS

- ESCON architecture
- High speed computer links
- Local area networks
- High definition/digital television
- Switching systems
- Control systems

### Regulatory Compliance

Feature	Standard	Comments
Electromagnetic Interference (EMI)	FCC Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 1 GHz
Immunity: Electrostatic Discharge	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
Eye Safety	IEC 825-1	Class 1



### Absolute Maximum Ratings

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

Supply Voltage ( $V_{CC}-V_{EE}$ )	-0.5 V to 7 V
Data Input Levels (PECL) ( $V_{IN}$ )	$V_{EE}$ to $V_{CC}$
Differential Data Input Voltage ( $\Delta V_{IN}$ )	3 V
Operating Ambient Temperature ( $T_{AMB}$ )	0°C to 85°C
Storage Ambient Temperature ( $T_{STG}$ )	-40°C to 100°C
Humidity/Temperature Test Condition ( $R_H$ )	85%/85°C
Life Test Condition (Operating) ( $T_{AMB}/Life$ )	115°C/1000h
Soldering Conditions, Temp/Time (MIL-STD 883C, Method 2003)	270°C/10s
ESD Resistance (all pins to $V_{EE}$ , human body) (MIL-STD 883C, Method 3015)	1.5 kV
Output Current ( $I_O$ )	50 mA

ESCON® is a registered trademark of IBM.

\* Revision code 1, 2, ...

## DESCRIPTION

The Siemens ESCON/SBCON optical devices, along with the ESCON / SBCON optical duplex connector, are best suited for high speed fiber optic duplex transmission systems operating at a wavelength of 1300 nm. The system is fully compatible with the IBM ESCON standard and the SBCON standard of ANSI. It includes a transmitter and a receiver for data rates of up to 320 MBaud. A non-dissipative plastic receptacle matches the ESCON/SBCON duplex connector.

The inputs/outputs are PECL compatible and the unit operates from a single power supply of 3.0 V to 5.5 V. As an option, the data output stages can be switched to static low levels during absence of light as indicated by the Signal Detect function.

The optical interface of transmitter and receiver have standard 0.7" spacing. The receptacle and connector have been keyed in order to prevent reverse insertion of the connector into the receptacle. After proper insertion the connector is securely held by a snap-in lock mechanism.

The transmitter converts a serial electrical PECL input signal with data rates of up to 320 MBaud to an optical serial signal. The receiver converts this signal back to an electrical serial signal, depending on the detected optical rate.

## 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	$V_{CC}-V_{EE}$	3		5.5	V
Supply Current 3.3 V <sup>(1)</sup>	$I_{CC}$			230	mA
Supply Current 5 V <sup>(1)</sup>				260	
<b>Transmitter</b>					
Data Input High Voltage	$V_{IH}-V_{CC}$	-1165		-880	mV
Data Input Low Voltage	$V_{IL}-V_{CC}$	-1810		-1475	
Threshold Voltage	$V_{BB}-V_{CC}$	-1380		-1260	
Input Data Rise/Fall Time, 20%–80%	$t_R, t_F$	0.4		1.3	ns
Data High Time <sup>(2)</sup>	$t_{ON}$			1000	
<b>Receiver</b>					
Output Current	$I_O$			25	mA
Input Center Wavelength	$\lambda_C$	1260		1380	nm
Electrical Output Load <sup>(3)</sup>	$R_L$		50	1000	$\Omega$

### Notes

- For  $V_{CC}-V_{EE}$  (min., max.). 50% duty cycle. Receiver output loads not included.
- To maintain good LED reliability the device should not be held in the ON state for more than the specified time. Normal operation should be done with 50% duty cycle.
- To achieve proper PECL output levels the 50  $\Omega$  termination should be done to  $V_{CC}-2$  V.

## Transmitter Electro-Optical Characteristics

(Values in parentheses are for 300 MBd)

Transmitter	Symbol	Min.	Typ.	Max.	Units
Data Rate	DR	0		200 (300)	MBaud
Supply Current	$I_{CC}$		165		mA
Launched Power (Ave.) BOL into 62.5 $\mu$ m Fiber <sup>(1, 2, 3)</sup>	$P_O$	-21 (-22)	-16.5	-14	dBm
Launched Power (Ave.) EOL into 62.5 $\mu$ m Fiber <sup>(1, 2, 3, 4)</sup>		-22 (-23)			
Center Wavelength <sup>(5)</sup>	$\lambda_C$	1280		1355	nm
Spectral Width (FWHM) <sup>(6)</sup>	$\Delta\lambda$			175	
Temperature Coefficient, Optical Output Power	$TC_p$			0.03	dB/°C
Output Rise/Fall Time, 20%–80%	$t_R, t_F$		1.0	1.7 (2)	ns
Deterministic Jitter <sup>(7)</sup>	$J_D$		0.6	0.8	
Random Jitter <sup>(8)</sup>	$J_R$			0.06	
Extinction Ratio (Dynamic) <sup>(9)</sup>	ER		-16	-13	dB

### Notes

- Measured at the end of 1 meter fiber. Cladding modes removed at a data rate of between 50 and 200 MBaud, 50% duty cycle.
- $P_O$  [dBm] =  $10 \log (P_O/1 \text{ mW})$ .
- $P_O$  (BOL) > -20 dBm and  $P_O$  (EOL) > -21.5 dBm at  $T_{CASE}=60^\circ\text{C}$ .
- Over  $10^5$  hours lifetime at  $T_{AMB}=35^\circ\text{C}$ .
- Measured at  $T_{CASE}=60^\circ\text{C}$ .
- Full width, half magnitude of peak wavelength.
- Measured at 200 MBaud with Jitter Test Pattern shown in Figure 3. In the test pattern are five positive and five negative transitions. Measure the time of the 50% crossing of all 10 transitions. The time of each crossing is then compared to the mean expected time of the crossing. Deterministic jitter is the range of the timing variations. Input duty cycle 50% referred to differential zero.
- RMS value is measured with 1010 pattern. Peak-to-peak value is determined as RMS multiplied by 14 for BER  $1E-12$ . Data input jitter considered to be zero. Noise on input signal must be added geometrically.
- Extinction ratio is the logarithmic measure of the optical power in the OFF state ( $P_{OFF}$ ) to twice the average power ( $P_O$ ).  $ER = 10 \log [(2 \times P_O)/P_{OFF}]$  (optical power measured in mW), or  $E = |P_O + 3 \text{ dB}| - P_{OFF}$  (optical power measured in dBm).

## Receiver Electro-Optical Characteristics

(Values in parentheses are for 300 MBd)

Receiver	Symbol	Min.	Typ.	Max.	Units
Data Rate	DR	10		200 (300)	MBaud
Supply Current (w/o ECL Outputs) <sup>(1)</sup>	I <sub>CC</sub>		80	90	mA
Sensitivity (Average Power) BOL <sup>(2, 3, 4)</sup>	P <sub>IN</sub>	−32.5 (−29)	−35.5		dBm
Sensitivity (Average Power) EOL <sup>(2, 3, 4, 5)</sup>		−32 (−28.5)	−35		
Saturation (Average Power)	P <sub>SAT</sub>	−14			
Signal Detect Assert Level <sup>(6)</sup>	P <sub>SDA</sub>	−44.5		−36	
Signal Detect Deassert Level <sup>(6)</sup>	P <sub>SDD</sub>	−45		−37.5	
Signal Detect Hysteresis	P <sub>SDA</sub> − P <sub>SDD</sub>	0.5	2.5	4	dB
Signal Detect Reaction Time	SDreac	3		500	μs
Output Low Voltage <sup>(7)</sup>	V <sub>OL</sub> − V <sub>CC</sub>	−1810		−1620	mV
Output High Voltage <sup>(7)</sup>	V <sub>OH</sub> − V <sub>CC</sub>	−1025		−880	
Output Data Rise/Fall Time, 20%–80% <sup>(7)</sup>	t <sub>R</sub> , t <sub>F</sub>	0.5	0.7	1.3	ns
Output SD Rise/Fall Time, 20%–80%				40	
Deterministic Jitter (8, 9)	J <sub>D</sub>		0.35	0.45	
Random Jitter <sup>(10)</sup>	J <sub>R</sub>			0.15	

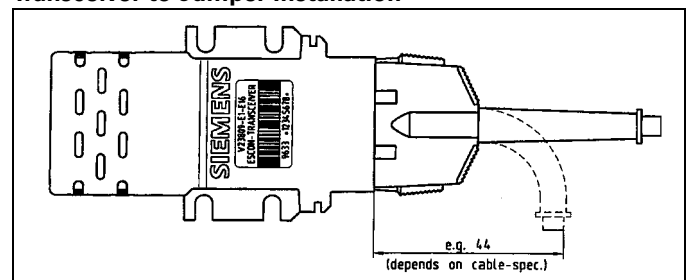
### Notes

- For V<sub>CC</sub> −V<sub>EE</sub> (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output. Add max. 60 mA for the four outputs. Load is 50 Ω to V<sub>CC</sub> −2 V.
- Measured at the end of 1 meter and at a duty cycle of 50%. Cladding modes are removed.
- P<sub>O</sub> [dBm]=10 log (P<sub>O</sub>/1 mW).
- Measured at BER=1E-12, 200 MBaud transmission rate and 50% duty cycle 2<sup>7</sup>-1 PRBS pattern. Center wavelength between 1200 nm and 1500 nm. Fiber type 62.5/125μm/0.29 NA or 50/125 μm/0.2 NA. Input optical rise and fall times are 1.2 and 1.5 ns (20%–80%) respectively.
- Over 10<sup>5</sup> hours lifetime at T<sub>AMB</sub>=35°C.
- Indicating the presence or absence of optical power at the receiver input. Signal detect at logic High when asserted. All powers are average power levels. Pattern 2<sup>7</sup>-1 at 200 MBaud.
- Load is 50 Ω to V<sub>CC</sub> −2 V. A minimum measurement tolerance of 50 mV should be allowed due to dynamic measurement of data outputs.
- Measured at 200 MBaud with Jitter Test Pattern shown in Figure 3. In the test pattern are five positive and five negative transitions. Measure the time of the 50% crossing of all 10 transitions. The time of each crossing is then compared to the mean expected time of the crossing. Deterministic jitter is the range of the timing variations.
- Measured at optical input power level greater than −20 dBm.
- Largely due to thermal noise. Measured at −33.0 dBm. To convert from specified RMS value to peak-to-peak value (at BER 1E-12) multiply value by 14.

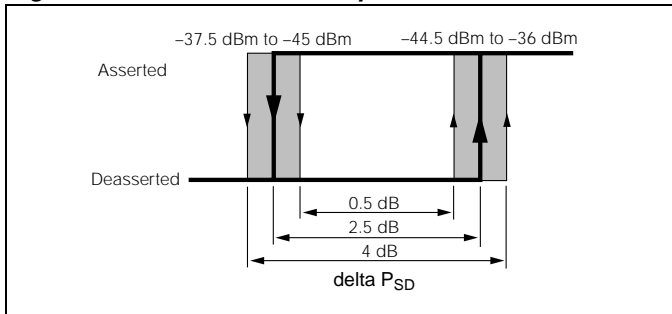
## Pin Description for ESCON Serial Transceiver 4x7 Pin Row

Pin#	Pin Name		Level/ Logic	Description
1	TxV <sub>BB</sub>		PECL Input	Threshold voltage for unused input when transmitter driven with single ended input signal
2–7, 14, 17, 18	TxV <sub>EE</sub>	Tx Ground	Power Supply	Negative Tx supply voltage
15, 16	TxV <sub>CC</sub>	Tx +3.3 V to 5 V	Power Supply	Power supply for Tx
19	TxD	Tx Input Data	PECL Input	Transmitter input data
20	TxDn	Tx Input Data	PECL Input	Inverted transmitter input data
21	RxDn	Rx Output Data Inverted	PECL Output	Inverted data output
22	RxD	Rx Output Data	PECL- Output	Data output. A logic high on the pin with a logic low on complementary pin means a high-level of light received
23, 25, 34–38	RxV <sub>EE</sub>	Rx Ground	Power Supply	Negative RX supply voltage
24	RxV <sub>CC1</sub>	Rx +3.3 V to 5 V	Power Supply	Power supply – receiver buffer & output stages
26, 27	RxV <sub>CC2</sub>	Rx +3.3 V to 5 V	Power Supply	Power supply preamp & bias – photodiode
39	RxSD	Rx Signal Detect	PECL Out- put active high	A high level on this output shows an optical signal is applied to the optical input
40	RXSDn	Rx Signal De- tect Inverted	PECL Out- put active low	A low level on this output shows an optical signal is applied to the optical input

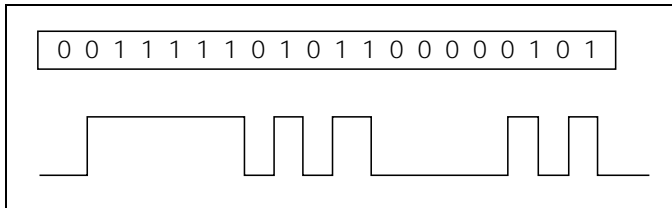
## Transceiver to Jumper Installation



## Signal Detect Threshold and Hysteresis



## Jitter Test Pattern



## APPLICATION NOTE

### Power Supply Filtering

In most of the applications using ESCON 200 MBd optical transceivers additional high speed circuits such as switching power supply, clock oscillator, or high speed multiplexer are present on the application board. These often create power supply noise at a high spectral bandwidth caused by very fast transitions in today's chip technology.

The Siemens ESCON Transceiver Family provides superior EMI performance with regards to the emission and immission of radiation and provides immunity against conductive noise. Some basic recommendations are presented herein to ensure proper functionality in the field.

### Receiver Section

For the receiver part of an ESCON transceiver the footprint shows 2 power supply sections:

$V_{CC1}$  (Pin 24) and  $V_{CC2}$  (Pins 26,27).

$V_{CC1}$  is the power supply for the post amplifier and the ECL

output stages of the receiver.  $V_{CC2}$  supplies more sensitive parts of the receiver.

Pins 26 and 27 are the supply pins for the preamplifier and the bias for the photodiode.

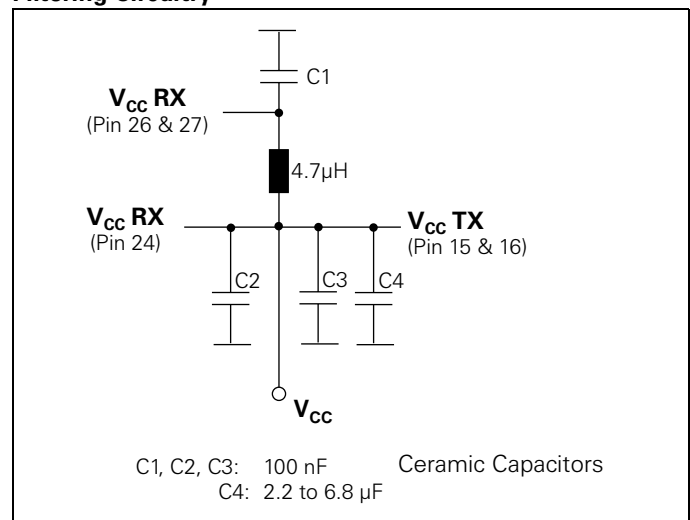
### Transmitter Section

The transmitter consists of only one power supply. Its LED diode driving current is in the range of 60mA. This is very high compared to the switching currents on the receiver section. To buffer these peaks, external capacitors are recommended. Capacitors will also reduce ringing on the power supply of the customer's board.

### Transceiver Filtering

For overall functionality, the sensitive stage of the receiver section ( $V_{CC2}$ ) must be decoupled from the output stages and from high switching currents on the transmitter section.

### Filtering Circuitry



The use of SMD components is recommended.

Common layout rules, such as short connection between capacitors and pins, ground layers etc., should be applied for optimum board design and operation.

