SIEMENS

SHORT PIN V23809-E1-E16
LONG PIN V23809-E1-E17
1300 nm ESCON® Serial Transceiver

Preliminary Data Sheet

FEATURES

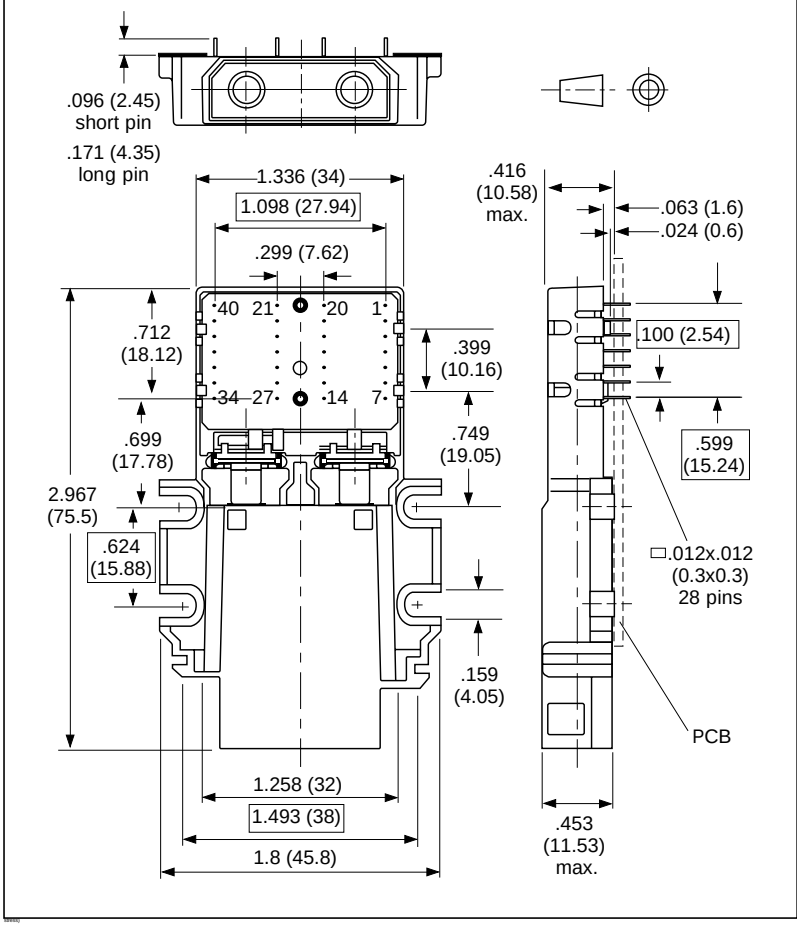
- **Complies with ESCON and SBCON standards**
- **Transceiver includes transmitter, receiver and ESCON/SBCON receptacle**
- **Transceiver mates keyed ESCON/SBCON connector**
- **Data rates for ESCON/SBCON applications from 10 to 200 MBaud**
- **Data rates for individual applications from 10 to 320 MBaud**
- **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 100K differential inputs and outputs**
- **Excellent EMI performance**
- **System is optimized for 62.5 and 50 µm graded index fiber**
- **0.7" spacing between optical interface of transmitter and receiver**
- **Through-hole technology with either 2.45 mm or 4.35 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**

ESCON® is a registered trademark of IBM.

Dimensions in inches (mm)



Maximum Ratings (Absolute maximum stress)

Exceeding any one of these values may destroy the device immediately. However, the electro-optical characteristics described in the following tables are only valid for use under the recommended operating conditions.

Power Dissipation (PD)(1)
- 5 V ..... 1 W
- 3.3 V ..... 0.7 W

Supply voltage (V_{CC}–V_{EE}) ..... –0.5 V to7 V
Data Input Levels (PECL) (V_{IN}) ..... V_{EE} to V_{CC}
Differential Data Input Voltage (ΔV_{IN}) ..... 3 V
Operating Case Temperature (Tcase) ..... –25 to 85°C
Storage Ambient temperature(T_{stg}) ..... –40°C to 100°C
Humidity/Temperature Test Condition (R_H) ..... 85 %/°C
Lifetest Condition (Operating) (Tamb/life) ..... °C/h
Soldering Conditions, Temp/Time
- (MIL-STD 883C, Method 2003) ..... 270/10°C/s

ESD Resistance (all pins to V_{EE}, Human Body) (ESD)
- (MIL-STD 883C, Method 3015) ..... 1.5 kV

Note:

1. For V_{CC}–V_{EE} (min, max). 50% duty cycle.

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 1300nm. The system is fully compatible with the IBM ESCON standard and the upcoming SBCON standard of ANSI. It includes a transmitter and a receiver for data rates of up to 320MBaud. A non-dissipative plastic receptacle matches the ESCON/SBCON duplex connector.

The inputs/outputs are PECL compatible and the unit operates on a single power supply from 3.0 to 5.5V. 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 320MBaud to an optical serial signal. The receiver converts this signal back to an electrical serial signal, depending on the detected optical rate.

Recommended Operating Conditions

Parameter	Sym.	Min.	Typ.	Max.	Units
Ambient Temperature	T_C	0		70	°C
Power Supply Voltage	$V_{CC}–V_{ee}$	3		5.5	V
Supply Current 3.3 V(1)	I_{CC}			190	mA
Supply Current 5 V(1)				210	
Transmitter					
Data Input High Voltage	$V_{IH}–V_{CC}$	–1165		–880	mV
Data Input Low Voltage	$V_{IL}–V_{CC}$	–1810		–1475	
Threshold Voltage	$V_{bb}–V_{CC}$	–1420		–1240	
Input Data Rise/Fall Time, 20–80%	t_R, t_F	0.4		1.3	ns
Data High Time(2)	t_{on}			1000	
Receiver					
Output Center	I_O			25	mA
Input Center Wavelength	I_C	1260		1380	nm
Electrical Output Load(3)	R_L		50	1000	Ω

Notes

1. For V_{CC} –V_{EE} (min.,max.) 50% duty cycle.
2. 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.
3. To achieve proper PECL output levels the 50 Ω termination should be done to V –2 V.

Reliability (Qualification Results)

Test Temperature (HTB)	115°C/388 K
Reference Temperature	35°C/308 K
Duration of HTB Test	>2000 hrs
Activation Energy	0.7 eV
confidencel Level	60%
Number of Tested Modules	> 100

Transmitter Electro-Optical Characteristics

(Values in parentheses are for 320 MBd)

Transmitter	Sym.	Min.	Typ.	Max.	Units
Data Rate	DR	0		200 (320)	MBaud
Supply Current 3.3 V(4)	I_{CC}		100		
Supply Current 5 V(4)			130		
Launched Power (Ave.) BOL into 62.5 µm Fiber (5, 6, 7)	P_O	–21 (–22)	–16.5	–14	dBm
Launched Power (Ave.) EOL into 62.5 µm Fiber (5, 6, 7, 10)		–22 (–23)			
Center Wavelength(8)	I_C	1285		1355	nm
Spectral Width (FWHM)(9)	σλ			160	
Temperature Coefficient, Optical Output Power	TCp			0.03	dB/°C
Output Rise/Fall Time, 20–80%	t_R, t_F		1	1.7 (2)	ns
Deterministic Jitter(11)	J_d		0.6	0.8	
Random Jitter(12)	J_r			0.06	
Extinction Ratio (dynamic)(13)	ER		–16	–13	dB

Notes

4. Transmitter operating at 200 MBaud and 50% duty cycle.
5. Measured at the end of 1 meter fiber, cladding modes removed at a data rate of between 50 and 200 MBaud, 50% duty cycle.
6. Po [dBm]=10 log (Po/1 mW).
7. Po (BOL) >–20 dBm and Po (EOL) >–21.5dBm at T_{case}=60°C.
8. Measured at T_{case}=60°C.
9. Full width, half magnitude of peak wavelength.
10. Over 105 hours lifetime at T_{amb}=35°C.
11. Deterministic Jitter measured at 200MBaud 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. The DJ is the range of the timing variations.
12. RMS value is measured with 1010 pattern at 200 MBaud. Peak-to-peak value is determined as RMS multiplied by 14 for BER 1E-12.
13. Extinction ratio is the logarithmic measure of the optical power in the OFF state (POFF) to twice the average power (P0): ER=10 log [(2xP0)/POFF]; optical power measured in mW or E=ΩP0+3 dBΩ –POFF; optical power measured in dBm.

Receiver Electro-Optical Characteristics

(values in parentheses are for 320 MBd)

Receiver	Symbol	Min.	Typ.	Max.	Units
Data Rate	Dr	10		200 (320)	MBaud
Supply current (w/o ECL outputs)(1)	I_{CC}		80	90	mA
Sensitivity (Average Power) BOL(2, 3, 4)	P_{IN}	–32.5 (–29)	–35.5		dBm
Sensitivity (Average Power) EOL(2, 3, 4, 5)		–32 (–28.5)	–35		
Saturation (Average Power)	P_{SAT}	–14			
Signal Detect Assert Level(6)	P_{SDA}	–44.5		–36	
Signal Detect Deassert Level(6)	P_{SDD}	–45		–37.5	
Signal Detect Hysteresis	P_{SDA}–P_{SDD}	0.5	1.5	3	dB
Signal Detect Reaction Time	SDreac	3		500	µs
Output LO Voltage(7)	V_{OL}–V_{CC}	–1810		–1620	mV
Output HI Voltage(7)	V_{OH}–V_{CC}	–1025		–880	
Output Data Rise/Fall Time, 20–80%(7)	t_R, t_F	0.5	0.7	1.3	ns
Output SD Rise/Fall Time, 20–80%				40	
Deterministic Jitter (8, 9)	J_d		0.35	0.45	
Random Jitter(10)	J_r			0.15	

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. 60 mA for the four outputs. Load is 50 Ω to V_{CC} –2 V.
2. Measured at the end of 1 meter fiber, cladding modes removed at a data rate of between 50 and 200 MBaud, 50% duty cycle.
3. Po [dBm]=10 log (Po [mW])
4. Measured at BER=1E-12, 200 MBaud transmission rate and 50% duty cycle 2^7-1 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 1.5ns (20–80%) respectively.
5. Over 10^5 hours lifetime at T_{amb}=35°C
6. 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 2^7-1 at 200 MBaud.
7. Load is 50 Ω to V_{CC}–2 V. A minimum measurement tolerance of 50mV should be allowed due to dynamic measurement of data outputs.
8. Deterministic Jitter 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. The DJ is the range of the timing variations.
9. Measured at optical input power level greater than -200 dBm.
10. 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	TxVbb		PECL Input	Threshold voltage for unused input when transmitter driven with single ended input signal
2–7, 14,17,18	TxVee	Tx Ground	Power Supply	Negative TX supply voltage
15,16	TxVcc	Tx +5V	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	RxVee	Rx Ground	Power Supply	Negative RX supply voltage
24	RxVcc1	Rx +5V	Power Supply	Power supply—receiver buffer & output stages
26,27	RxVcc2	Rx +5V	Power Supply	Power supply preamp & bias—photodiode
39	RxSD	Rx Signal Detect	PECL Output active high	A high level on this output shows an optical signal is applied to the optical input
40	RXSDn	Rx Signal Detect Inverted	PECL Output active low	A low level on this output shows an optical signal is applied to the optical input

Figure 1. Transceiver to jumper Installation

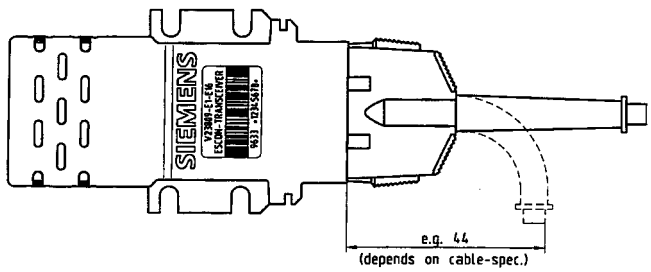


Figure 2. Signal detect threshold and hysteresis

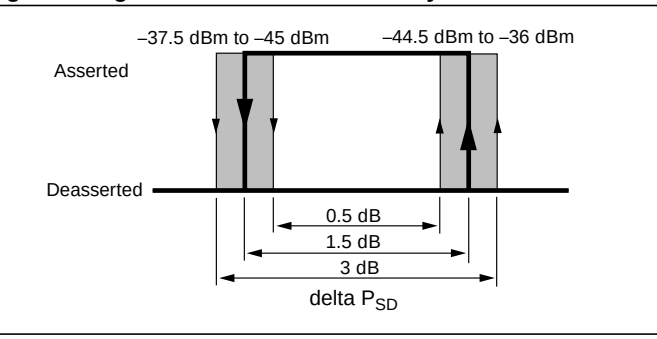
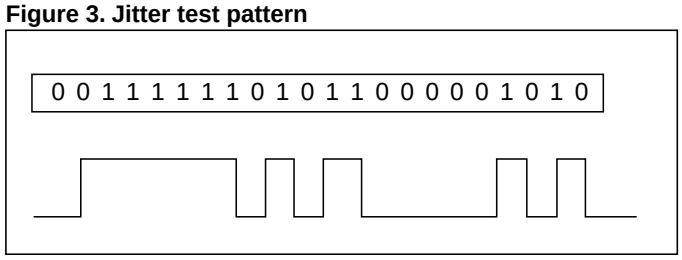


Figure 3. Jitter test pattern



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 regarding emission and immission of radiation and provides immunity against conductive noise. Some basic recommendations are given in this document to ensure proper functionality in the field.

Receiver Section

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

Vcc1-PIN 24, Vcc2-PIN 26,27 (see dimensional drawing).

Vcc1 is the power supply for the post amplifier and the ECL output stages of the receiver.

Vcc2 supplies more sensitive parts of the receiver.

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

Transmitter Section

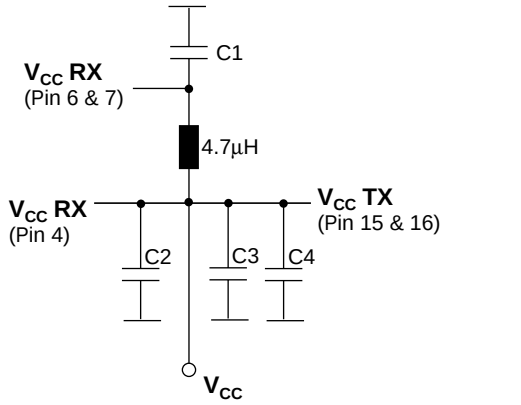
The transmitter consists of only one power supply.

Its LED diode driving current is in the range of 60mA. This is very high compared to the switching currents on the receiver section. For buffering these peaks, external capacitors are recommended. An additional effect of these capacitors will be to reduce ringing on the power supply of the customer's board.

Transceiver Filtering

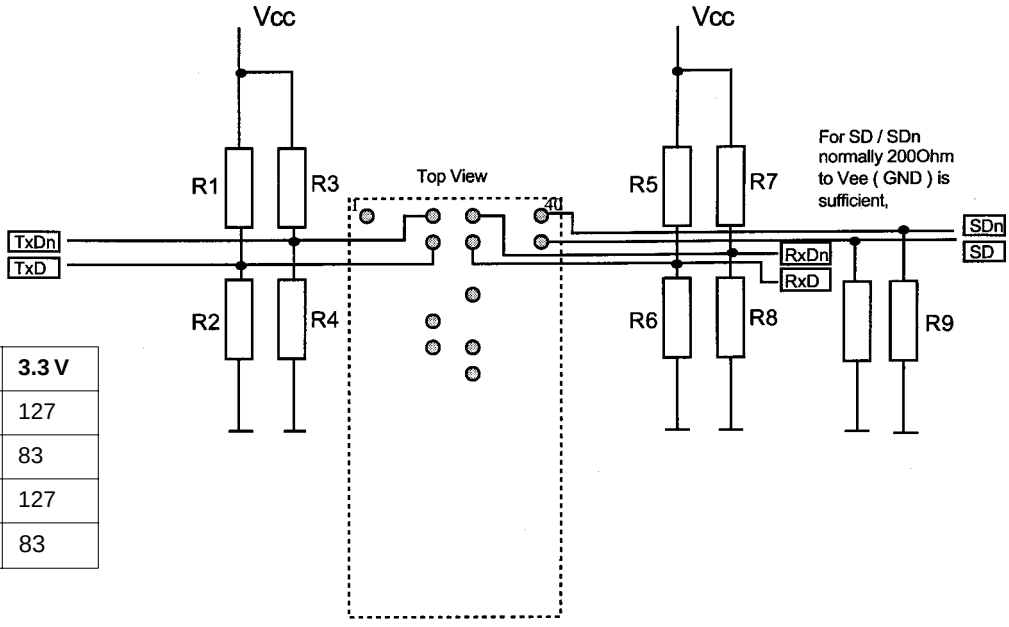
For the overall functionality, the sensitive stage of the receiver section (Vcc2) must be decoupled from the output stages and from high switching currents on the transmitter section.

Figure 4. Filtering circuitry



The use of SMD components is recommended.

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



R in Ω	5 V	4 V	3.3 V
R1/3	82	100	127
R2/4	130	100	83
R5/7	82	100	127
R6/8	130	100	83

R9=200 Ω