



125 / 155Mbps 1x9 100BASE-EX Transceiver **Duplex SC, 1310nm FP, SMF 60KM, LVPECL / PECL Signal Detection**

Part Number: F1X9-Ax-S13-60P



Overview

F1X9-Ax-S13-60P 1X9 SIP package style transceivers are compliant with the industrial standard specification. The high performance uncooled 1310nm FP transmitter and high sensitivity PIN receiver provide superior performance for Fast Ethernet and SONET OC-3 / SDH STM-1 applications up to SMF 60km optical links.

Applications

- Fast Ethernet 100BASE-LX/EX @125M
- SONET OC-3 / SDH STM-1 @155M

Features

- Compatible with Fast Ethernet 100BASE-LX
- Compliant with SONET OC-3 LR-1 and SDH STM-1 L1.1
- Industry Standard 1x9 Footprint
- 1310nm FP laser transmitter
- Duplex SC/ST/FC connector
- Single 3.3V or 5V Power Supply
- DC-coupled Differential PECL inputs and outputs
- LVPECL / PECL Signal Detection Output
- Wave Solderable and Aqueous Washable
- Link distance 60km over SM fiber
- RoHS Compliant

Laser Safety

- This is a Class 1 Laser Product complies with 21 CFR 1040.10 and 1040.11 except for conformance with IEC 60825-1 Ed. 3., as described in Laser Notice No. 56, dated May 8, 2019.
- Caution: Use of control or adjustments or performance of procedure other than those specified herein may result in hazardous radiation exposure.



Absolute Maximum Ratings

Parameters	Symbol	Min.	Max.	Unit
Storage Temperature	T _{ST}	-40	+85	°C
Storage Relative Humidity	RH	5	95	%
Supply Voltage (F1X9-Ax-S13-60P)	V _{CC}	0	+4.5	V
Supply Voltage (F1X9-Ax-S13-60P5)	V _{CC}	0	+6.0	V

Recommended Operating Conditions

Parameters	Symbol	Min.	Typ.	Max.	Unit
Case Operating Temp. (F1X9-Ax-S13-60P)	T _{OP}	0	-	+70	°C
Case Operating Temp. (F1X9-Ax-S13-60Pi)	T _{OP}	-40	-	+85	°C
Supply Voltage (F1X9-Ax-S13-60P5)	V _{CC}	+3.15	+3.3	+3.45	V
Supply Voltage (F1X9-Ax-S13-60P5i)	V _{CC}	+4.75	+5.0	+5.25	V
Supply Current @3.3V	I _{CC}			250	mA
Power Consumption	P			825	mW
Lead Soldering Limits	T _{sold}			260/10	°C/Sec

Transmitter Electro-optical Characteristics

T_{OP} = 0 °C~70 °C (F1X9-Ax-S13-60P); T_{OP} = -40 °C~85 °C (F1X9-Ax-S13-60Pi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR		125	155	Mb/s	
Optical Launch Power	P _o	-5		0	dBm	1
Optical Center Wavelength	λ _c	1280	1310	1340	nm	
Spectral Width (RMS)	Δλ		2	4	nm	
Optical Extinction Ratio	ER	10			dB	
Optical Eye Mask		IEEE802.3ah and ITU-T G.957				
Optical Rise/Fall Time (20%~80%)	T _r / T _f			2	ns	
Differential Data Input Swing	V _{IN}	300		1600	mV	
Data Input Voltage-Low	V _{IL} -V _{CC}	-1.81		-1.48	V	
Data Input Voltage-High	V _{IH} -V _{CC}	-1.16		-0.88	V	

Note1: The optical power is launched into a 9/125μm single-mode fiber.



Receiver Electro-optical Characteristics

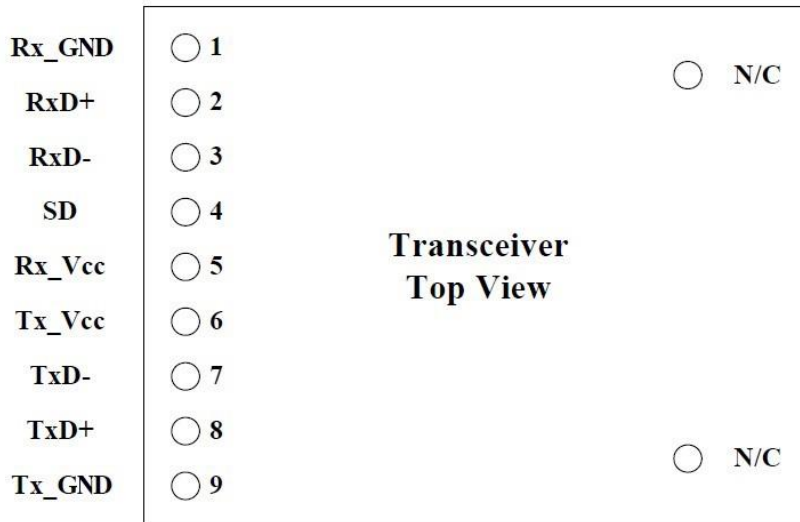
$T_{OP} = 0^{\circ}\text{C} \sim 70^{\circ}\text{C}$ (F1X9-Ax-S13-60P); $T_{OP} = -40^{\circ}\text{C} \sim 85^{\circ}\text{C}$ (F1X9-Ax-S13-60Pi)

Parameters	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Data Rate	DR		125	155	Mb/s	
Receiver Sensitivity	SEN			-35	dBm	1
Maximum Receive Power	P_{RX-MAX}	-3			dBm	1
Optical Center Wavelength	λ_C	1100		1600	nm	
Signal Detect Assert	SDA			-35	dBm	
Signal Detect De-Assert	SD _D	-46			dBm	
Signal Detect Hysteresis	SD _{HY}	0.5			dB	
Differential Data Output Swing	V _{OUT}	300		1000	mV	
Data Output Voltage-Low	V _{OL} -V _{CC}	-2.0		-1.58	V	
Data Output Voltage-High	V _{OH} -V _{CC}	-1.1		-0.74	V	
Signal Detect O/P Voltage Low	V _{SDL} -V _{CC}	-2.0		-1.58	V	
Signal Detect O/P Voltage High	V _{SDH} -V _{CC}	-1.1		-0.74	V	

Note1: Measured with a PRBS 2²³-1 test pattern @155Mbps BER<10⁻¹².



Pin Assignment



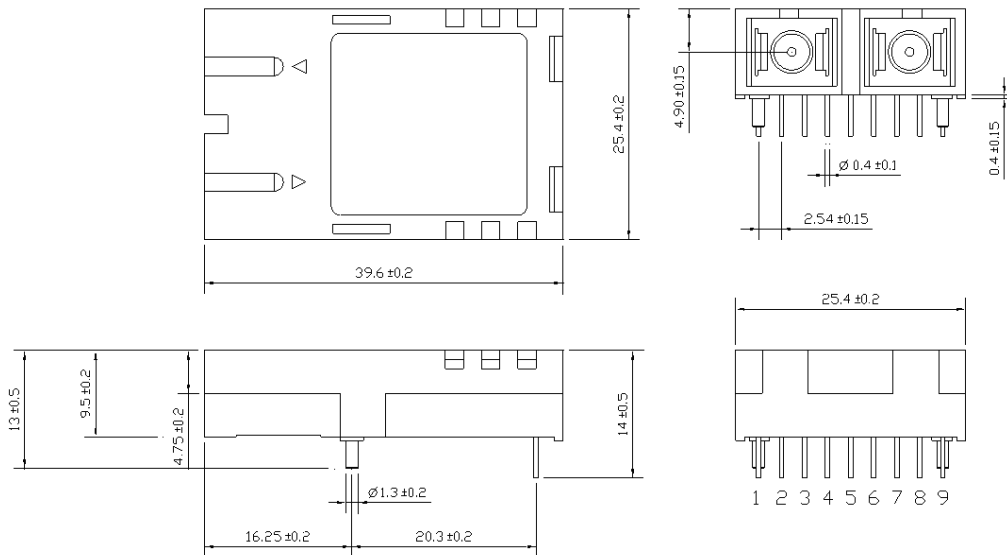
Pin Description

Pin	Name	Function / Description
1	Rx_GND	Receiver Signal Ground
2	RxD+	Receiver Non-inverted Data Out
3	RxD-	Receiver Inverted Data Out
4	SD	Signal Detect is used to open collector output with PECL/LVPECL level Normal optical input levels to the receiver result in a logic "1" output
5	Rx_Vcc	Receiver Power Supply
6	Tx_Vcc	Transmitter Power Supply
7	TxD-	Transmitter Inverted Data In
8	TxD+	Transmitter Non-inverted Data In
9	Tx_GND	Transmitter Signal Ground

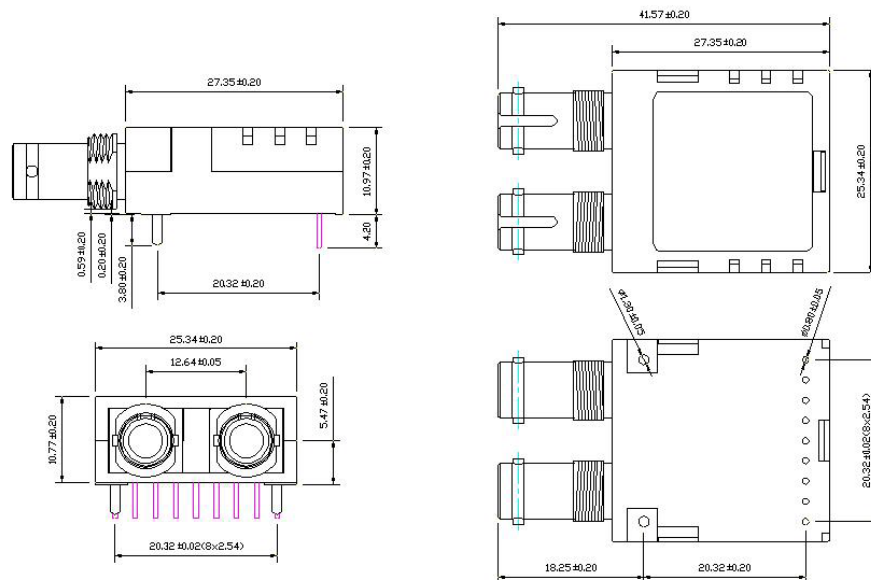


Mechanical Dimensions

(1) SC Connector Type

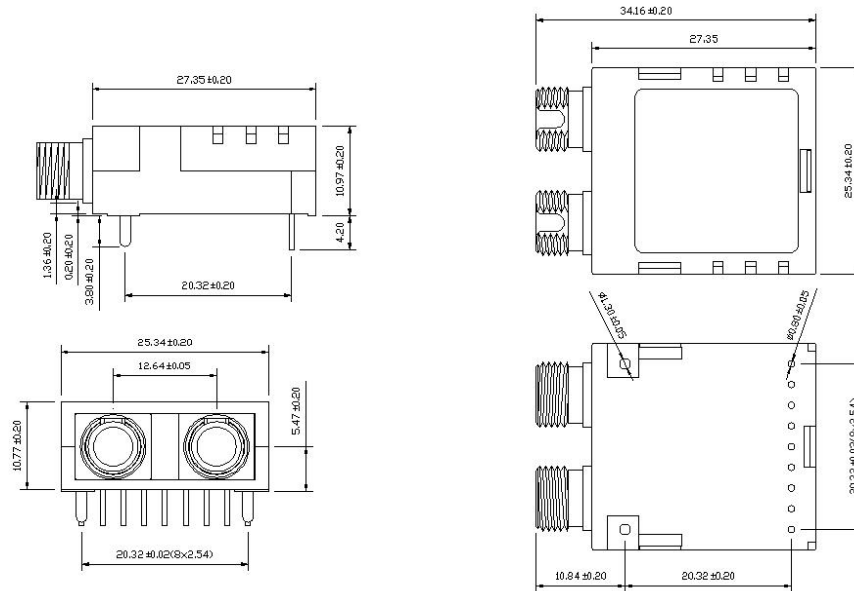


(2) ST Connector Type





(3) FC Connector Type



(All Dimensions are ±0.20mm Unless Otherwise Specified, Unit: mm)



Ordering Information

Part No.	Tx / Rx	Conn.	I/O	SD	Link	Voltage	Temp.
F1X9-A1-S13-60P	1310nm / 1100nm ~ 1600nm	SC	DC/DC	LVPECL	SMF 60km	3.3V	0~70°C
F1X9-A1-S13-60Pi		SC	DC/DC	LVPECL		3.3V	-40~85°C
F1X9-A5-S13-60P		Plastic ST	DC/DC	LVPECL		3.3V	0~70°C
F1X9-A5-S13-60Pi		Plastic ST	DC/DC	LVPECL		3.3V	-40~85°C
F1X9-AM-S13-60P		Metal ST	DC/DC	LVPECL		3.3V	0~70°C
F1X9-AM-S13-60Pi		Metal ST	DC/DC	LVPECL		3.3V	-40~85°C
F1X9-A3-S13-60P		FC	DC/DC	LVPECL		3.3V	0~70°C
F1X9-A3-S13-60Pi		FC	DC/DC	LVPECL		3.3V	-40~85°C
F1X9-A1-S13-60P5	1310nm / 1100nm ~ 1600nm	SC	DC/DC	PECL	SMF 60km	5V	0~70°C
F1X9-A1-S13-60P5i		SC	DC/DC	PECL		5V	-40~85°C
F1X9-A5-S13-60P5		Plastic ST	DC/DC	PECL		5V	0~70°C
F1X9-A5-S13-60P5i		Plastic ST	DC/DC	PECL		5V	-40~85°C
F1X9-AM-S13-60P5		Metal ST	DC/DC	PECL		5V	0~70°C
F1X9-AM-S13-60P5i		Metal ST	DC/DC	PECL		5V	-40~85°C
F1X9-A3-S13-60P5		FC	DC/DC	PECL		5V	0~70°C
F1X9-A3-S13-60P5i		FC	DC/DC	PECL		5V	-40~85°C

NOTE: Distances are indicative only. To calculate a more precise link budget based on specific conditions in your application, please refer to the optical characteristics.