

## Direct 9 Series

ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC & sFPDP  
Applications, Multimode, 850nm

### Duplex Optical Transceiver Unit

#### FEATURES

- Compliant with Fast or Gigabit Ethernet - IEEE-802.3:2005 and 1x/2x/4xFC - ANSI Fibre Channel FC-PI-2, FC-PI and FC-PH-2
- Optical fiber link distances up to 550 Meters (50/125µ 500MHz\*Km MMF)
- Maximum optical channel bit error rate less than  $1 \times 10^{-12}$
- Operating temperature range from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Shock and vibration resistant per RTCA / D0-160E
- Electroless nickel plating meets stringent EMI / RFI performance specifications
- D-Subminiature housings are strong, durable, corrosion resistant and light weight
- ARINC 801 compliant optical fiber connector interface
- Threaded mating connectors provide secure interface conditions in high vibration environments

#### APPLICATIONS

Direct 9 series printed circuit board mounted optical transceivers enable high speed network communications over long distances in harsh environments.

- Fast or Gigabit Ethernet switches and peripherals
- Fibre Channel switches and peripherals
- sFPDP data links
- Video displays

The size 9 D-Subminiature shell provides a rugged optical interface that is compliant with ARINC 801.

The multimode optical fiber interface supports applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadrx copper conductors unacceptable.



One TX & One RX Channel Operating from 125Mbps to 4.25Gbps

#### DESCRIPTION

Direct 9 series D-Subminiature optical fiber transceivers consist of optoelectronic transmitter and receiver functions integrated into a printed circuit board mounted D-Subminiature / ARINC 801 compliant receptacle connector. The optical transmitters are 850nm VCSEL lasers. The transmitter input lines are driven with differential CML signals applied to the transmitter (TX+ and TX-) lines. Dual loop, temperature compensated, VCSEL drivers convert the transmitter input signals to suitable VCSEL bias and modulation currents.

Outputs from the receivers consist of differential CML data signals on the receiver (RX+ and RX-) lines. A CMOS signal is generated on the LOS line upon loss of a valid incoming optical signal. The receiver data lines are squelched upon LOS assertion, preventing errant data generation when an invalid incoming optical signal is presented to the transceiver. The electrical interface to the Direct 9 series D-Subminiature optical transceivers is a solder pin field with the same PCB footprint as existing electrical 9 position D-Subminiature connectors.

Direct 9 series D-Subminiature optical fiber transceivers are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

#### ORDERING INFORMATION

Application	Part Number
Fast or GbE, 1x/2x Fibre Channel	P24D-2S1D-EF
sFPDP - 2.5 to 3.125Gbps	P24D-2S1E-EF
4xFC	P24D-2S1G-EF

Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

### ABSOLUTE MAXIMUM RATINGS

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage Temperature	$T_s$	-55		+100	°C
Supply Voltage	$V_{cc}$	-0.5		+4.5	V
TX_DIS Input Voltage	$V_i$	-0.5		$V_{cc} + 0.5$	V

### RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	$T_A$	-40		+85	°C
Power Supply Voltage	$V_{cc}$	+3.135		+3.465	V
Power Supply Noise (p-p)	$N_p$			200	mV
TX Differential Input Voltage (p-p)	$V_D$	0.25		2.2	V

### ENVIRONMENTAL OPERATING CONDITIONS

Requirement	Feature	Condition	Notes
RTCA / D0-160E	ESD	HBM	2200V
RTCA / D0-160E	Vibration	30.0g	18mS
RTCA / D0-160E	Shock	40.0g	6-9mS
RTCA / D0-160E	Flame Resistance		30 Seconds
RTCA / D0-160E	Damp Heat	10 Cycles	24 Hours
ARINC 801	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

### MATERIALS

Item	Detail	Notes
D-Subminiature Shell	Nickel Plated Steel	
Solder Pins	Brass	
Solder Pin Plating	Gold over Nickel	
Insert	Thermoplastic	
Shield	Nickel Plated Steel	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	

Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

**OPTICAL TRANSMITTERS  $T_A$  = Operating Temperature Range,  $V_{CC} = 3.135V$  to  $3.465V$**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power (BER<10 <sup>-12</sup> )	$P_o$	-6.5		-1.0	dBm
Optical Output Wavelength	$\lambda_{OUT}$	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM
Extinction Ratio	ER	9.0			dB
Optical Rise, Fall Time (20% to 80%)	$t_{R,F}$			80	pS

**OPTICAL RECEIVERS  $T_A$  = Operating Temperature Range,  $V_{CC} = 3.135V$  to  $3.465V$**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity (BER<10 <sup>-12</sup> , ER=9.0) P24x-xS1D-xx @ 125Mbps to 1.25Gbps P24x-xS1D-xx @ 2.125Gbps P24x-xS1E-xx @ 2.5Gbps to 3.125Gbps P24x-xS1G-xx @ 4.25Gbps	$P_i$	-17.0 -15.0 -15.0 -14.0		0.0	dBm
Optical Wavelength	$\lambda_{IN}$	830		860	nM

**POWER SUPPLY CURRENT  $T_A$  = Operating Temperature Range,  $V_{CC} = 3.135V$  to  $3.465V$**

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port	$I_{CCT}$		175	250	mA

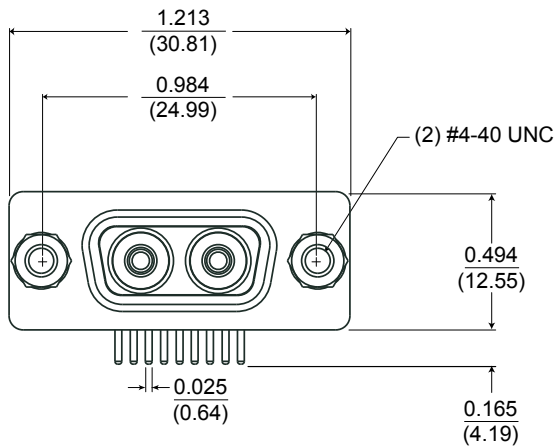
**OPTICAL LINK DISTANCES**

Protocol	62.5/125 $\mu$ 200MHz*Km	50/125 $\mu$ 500MHz*Km
4xFibre Channel - ANSI X3.297 FC-PI-2	75M	150M
2xFibre Channel - ANSI X3.297 FC-PI	150M	300M
Gigabit Ethernet - IEEE-802.3:2005	275M	550M
1xFibre Channel - ANSI X3.297 FC-PH-2	300M	500M

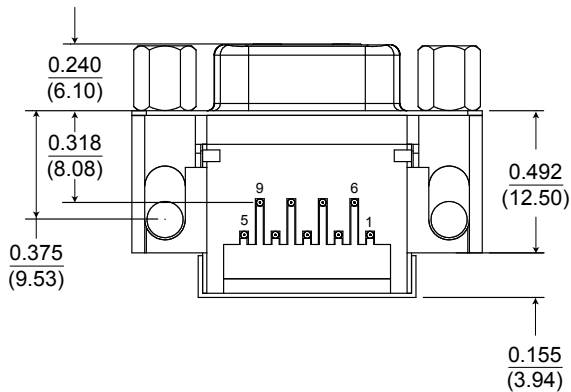
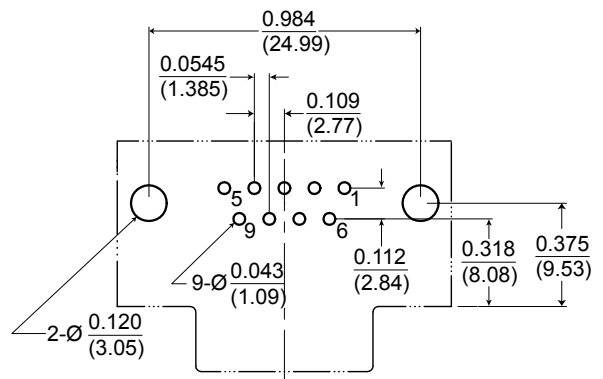
Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

**OUTLINE DRAWING**

Dimensions are shown as: inches (mm)



**Recommended PCB Layout  
Top View - Component Side**



Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

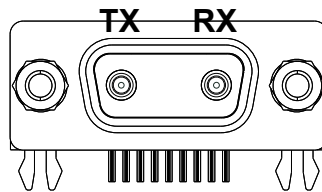
### ELECTRICAL PIN ASSIGNMENTS

D-Subminiature Shell Size 09

Pin Number	Symbol	Description	Logic Family
1	RX-	Receiver Data - Output	CML
2	RX+	Receiver Data - Output	CML
3	GND	Ground	N/A
4	TX-	Transmitter Data - Input	CML Internal 100Ω differential termination
5	TX+	Transmitter Data - Input	CML Internal 100Ω differential termination
6	V <sub>cc</sub>	Power Supply	N/A
7	LOS	Loss of Signal Indicator - Output Satisfactory Optical Input: Low Unsatisfactory Optical Input: Open	Open Drain CMOS
8	TX Dis	Transmit Disable - Input Logic 1: Disable Optical Output Logic 0: Enable Optical Output	CMOS Internal 4.7KΩ to 10.0KΩ pullup / pulldown
9	GND	Ground	N/A

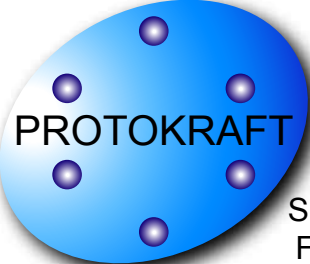
### INSERT ARRANGEMENT

D-Subminiature Shell Size 09



Front face of the  
transceiver socket  
insert shown!

Mating cable plug  
interface opposite.



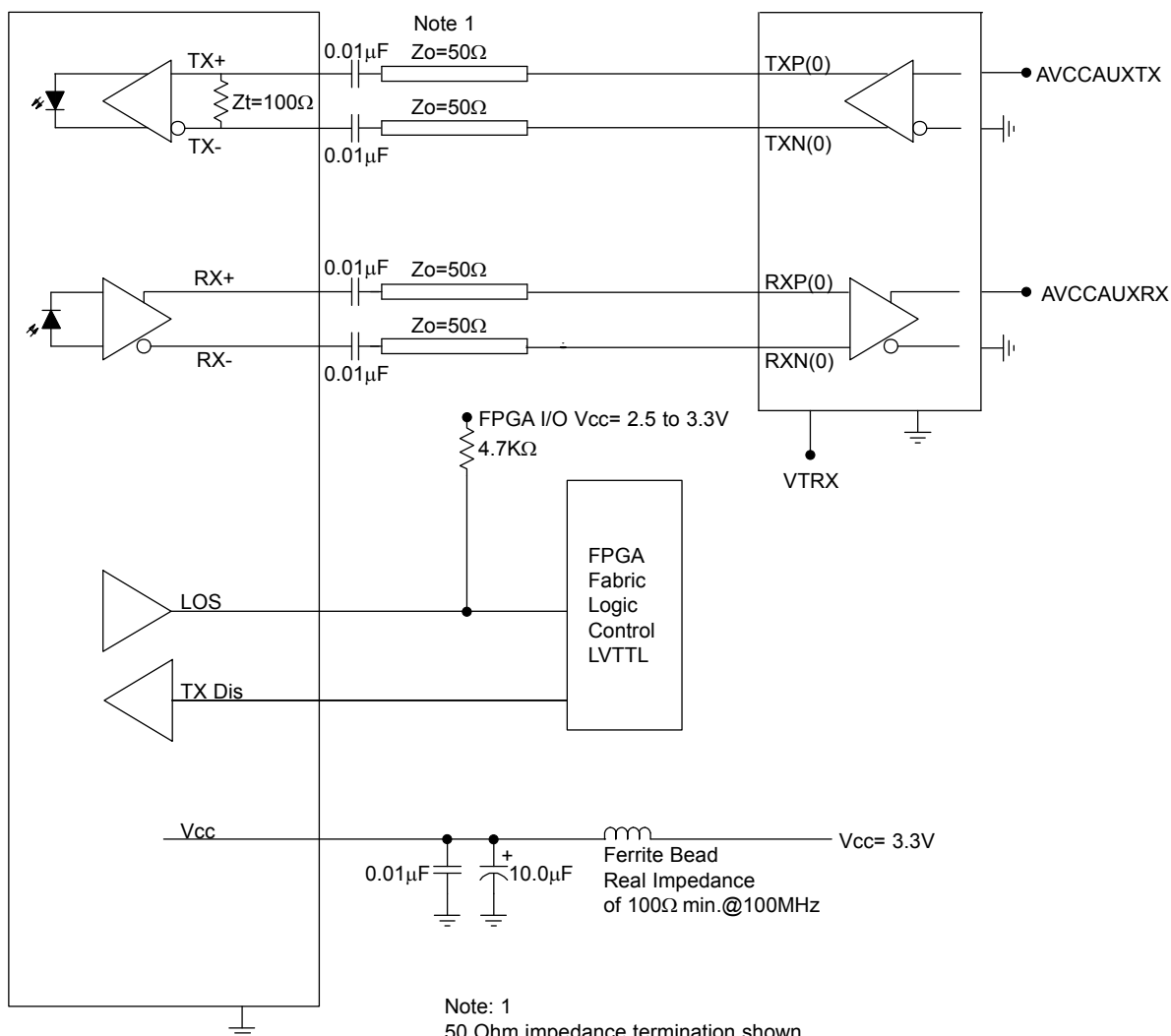
## Facilitating Secure Communications in Harsh Environments

Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

### APPLICATION SCHEMATIC For Xilinx Rocket I/O Interfaces

#### Optical Transceiver

#### Xilinx Rocket I/O



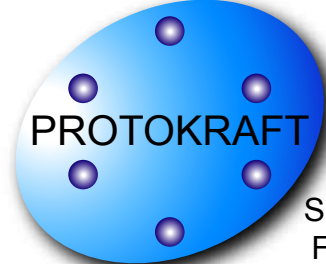
Typical application schematic shown  
For alternate applications or termination  
techniques, please consult the Factory

Note: 1  
50 Ohm impedance termination shown.  
For alternate impedance requirements,  
please consult the Factory.

All Protokraft statements, technical information and recommendations related to the products herein are based upon information believed to be reliable or accurate. However, the accuracy or completeness thereof is not guaranteed, and Protokraft assumes no responsibility for any inaccuracies. The user assumes all risks and liability whatsoever in connection with the use of a product or its application. Protokraft reserves the right to change at any time, without prior or subsequent notice, the design, specifications, function, fit or form of its products described herein, including withdrawal at any time of a product offered for sale herein. Protokraft makes no representations that the products herein are free from any intellectual property claims of others. Protokraft and the Protokraft logo are trademarks of Protokraft, LLC. Other trademarks are the property of their respective holders. Contact Protokraft for prices and availability. For the most recent version of this data sheet, please go to the Protokraft website at <http://www.protokraft.com>. In case of discrepancy, the web version takes precedence over any printed literature. ©2004 Protokraft, LLC. All rights reserved.

P24D-2S1x-EF-DS - July 2, 2010 - Released

4545 West Stone Drive, Kingsport, TN 37660 ☎+1.423.578.7200 📠+1.423.578.7201 ✉info1@protokraft.com 🌐http://www.protokraft.com



Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

## APPENDIX A1

### DIRECT 9 FIBER OPTIC CABLE PLUG / ARINC 801 PIN TERMINI

#### DIRECT 9 CABLE PLUG P/N

COMBO D-SUB	
SUPPLIER	P/N
PROTOKRAFT	D9P-1



#### ARINC 801 LUXCIS\* FIBER PIN TERMINUS

SUPPLIER	FIBER OPTIC CABLE STRUCTURE	
	ML - LOOSE & TIGHT	MT - ULTRA TIGHT
TYCO	1828199-1	1828200-1



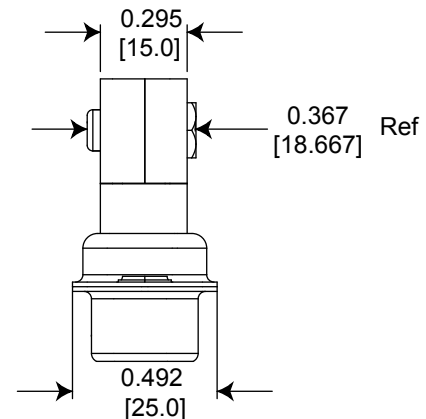
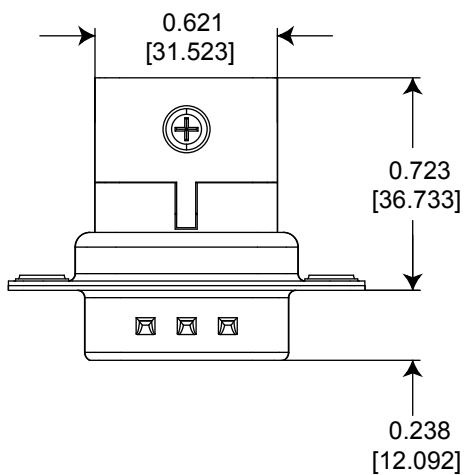
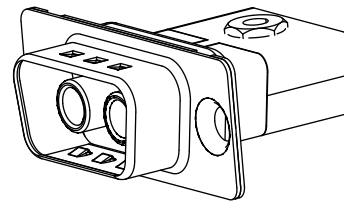
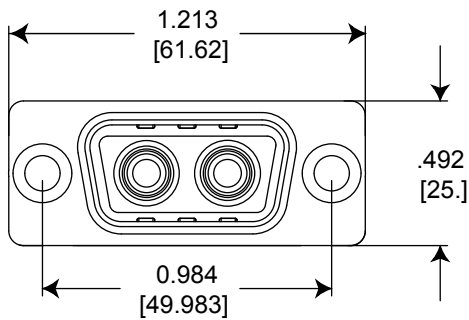
\*Luxcis is a trademark of Radiall

Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

## APPENDIX A2

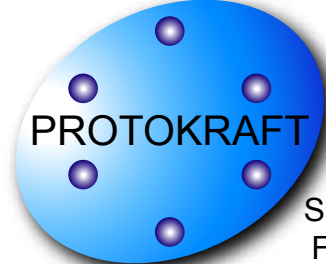
### Direct 9 Fiber Optic D-Subminiature Cable Plug Insert

Dimensions are shown as: inches [mm]



**Protokraft Direct 9 Fiber Optic Cable Plug Part Number: D9P-1**

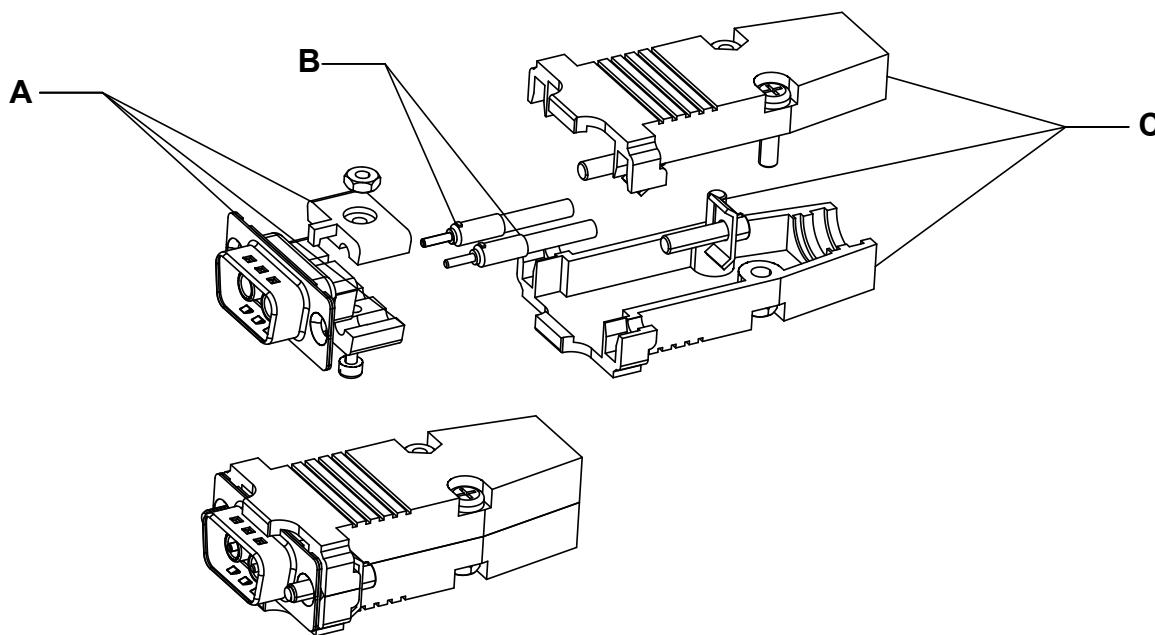
See Appendix A3 for assembly instructions and additional components required for a complete assembly



Single Port Direct 9 Series D-Subminiature / ARINC 801 Optical Transceiver,  
Fast or GbE, 1x/2x/4xFC or sFPDP Applications, Multimode, 850nm VCSELs

## APPENDIX A3

### Direct 9 Fiber Optic D-Subminiature Cable Assembly Instructions



#### Protokraft Direct 9 Fiber Optic Cable Assembly

ITEM	MANUFACTURER	PART NUMBER
A	PROTOKRAFT	D9P-1
B	TYCO ELECTRONICS	1828199-1 or 18282000-1
C	TYCO ELECTRONICS	Example: 1-828276-6