

Lightning Series

Mil-Dtl-38999 Optical Transceiver, FC, Ethernet & sFPDP Applications, Multimode, 850nm VCSELS



Two TX & Two RX Channels Operating from 125Mbps to 3.2Gbps

Dual Port, Flange Receptacle

FEATURES

- Suitable for Fast or Gigabit Ethernet, 1x/2xFibre Channel and sFPDP applications from 125Mbps to 3.125Gbps
- Optical fiber link distances up to 550 Meters (50/125µ 500MHz*Km MMF)
- Maximum optical channel bit error rate less than 1×10^{-12}
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per Mil-Std-810 and Mil-Std-1344
- Olive drab cadmium over electroless nickel plating meets stringent EMI / RFI performance specifications
- Aluminum alloy Mil-Dtl-38999 housings are strong, durable, corrosion resistant and light weight
- Mil-T-29504 compliant optical fiber connector interface
- Connector insert configuration conforms to Mil-Std-1560

APPLICATIONS

Lightning series bulkhead 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 Mil-Dtl-38999, Series III shell provides a sealed optical interface that is water-tight to Mil-Std-810 / IP67 / NEMA-4x when mated.

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

DESCRIPTION

Lightning series optical fiber transceivers consist of optoelectronic transmitter and receiver functions integrated into a bulkhead mounted Mil-Dtl-38999, Series III 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. The TX_Fault circuit disables the optical transmitter output when the optical output power or internal current exceeds predefined limits. A CMOS fault signal is generated on the TX_Fault line upon a transmitter optical or electrical fault condition. The fault signal is latched until reset by a toggle of TX_Dis or V_{CC}.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential CML data signals on the receiver (RX+ and RX-) lines and single ended CMOS indicator functions on the Loss of Signal (LOS) lines. 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 Lightning series optical transceivers is a 0.050" x 0.100" solder pin header enabling connection to a rigid or flexible printed circuit assembly.

Lightning series optical fiber transceivers are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

ORDERING INFORMATION

Application	Part Number
Fast or Gigabit Ethernet, 1x/2xFC	P38F-4S1D-FW
sFPDP (2.5 to 3.125Gbps)	P38F-4S1E-FW

See Appendix A3 & A4 for more part number options

P38F-4S1x-FW-DS - July 22, 2010 - Released

Dual Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
Fast Ethernet, GbE, 1x/2xFC or Serial FPDP 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
Differential Input Voltage (p-p)	V_D			2.2	V
RX Output Current	I_o			50	mA

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-40		+85	°C
Supply Voltage	V_{cc}	+3.135		+3.465	V
TX Common Mode Voltage	V_{CM}		2.0		V
TX Differential Input Voltage (p-p)	V_D	0.25		2.2	V
Power Supply Noise (p-p)	N_P			200	mV

SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883	ESD	Class II	2200V
MIL-STD-810	Vibration	30.0g	18mS
MIL-STD-810	Shock	40.0g	6-9mS
MIL-STD-810	Immersion	1.0 meter	2 .0Hours
MIL-STD-1344	Flame Resistance	Method 1012	30 Seconds
MIL-STD-1344	Damp Heat	10 Cycles	24 Hours
MIL-STD-38999	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

MATERIALS

Item	Detail	Notes
Shell	Aluminum Alloy	
Shell Plating	Olive Drab Cadmium over Nickel	QQ-P-416, QQ-N-290
Insert	Thermoplastic	
Interfacial Seal	Elastomer	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-4	Mil-P-31032 Type 4

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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 ⁻¹²)	P_o	-9.5		-4.0	dBm
Optical Output Wavelength	λ_{OUT}	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM
Extinction Ratio	ER	6.0	9.0		dB
Optical Rise, Fall Time (20% to 80%)	$t_{R,F}$			150	pS

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

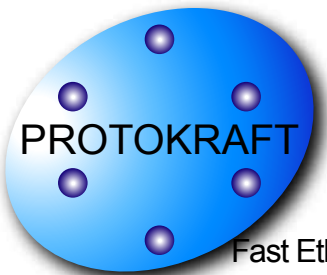
Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity (BER<10 ⁻¹² , ER=9.0) P38x-xS1D-xx @ 125Mbps to 1.25Gbps P38x-xS1D-xx @ 2.125Gbps P38x-xS1E-xx @ 2.5Gbps to 3.125Gbps	P_i	-17.0 -15.0 -15.0		0.0	dBm
Optical Wavelength	λ_{IN}	830		860	nM
RX Data Output - Low	$V_{OL} - V_{CC}$	-1.810		-1.475	V
RX Data Output - High	$V_{OH} - V_{CC}$	-1.165		-0.880	V

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}		100	140	mA

OPTICAL LINK DISTANCES

Protocol	62.5/125 μ 200MHz*Km	50/125 μ 500MHz*Km
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

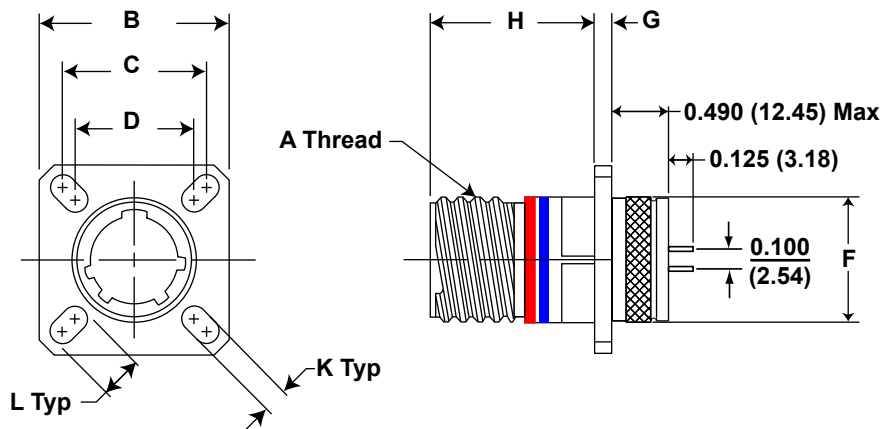


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Fast Ethernet, GbE, 1x/2xFC or Serial FPDP Applications, Multimode, 850nm VCSELs

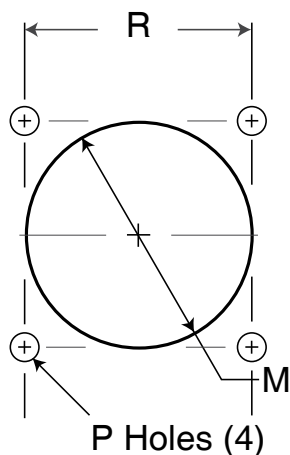
OUTLINE DRAWING

Dimensions are shown as: inches (mm)



Outline Dimensions

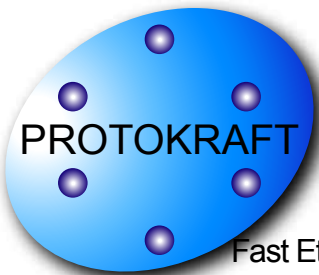
Shell Size Code	Shell Size	A Thread	B Sq Max	C Bsc	D Bsc	F Max	G Max	H Max	K	L
F	19	1.2500-.1P-.3L-TS-2A	1.450 (36.8)	1.156 (29.4)	1.062 (27.0)	1.229 (31.22)	0.098 (2.5)	0.820 (20.8)	0.128 (3.3)	0.194 (4.9)



Panel Cutout Dimensions Rear Panel Mounting Only

Shell Size Code	Shell Size	M Min	P Holes	R Bsc
F	19	1.297 (32.94)	0.133 (3.4) 0.123 (3.1)	1.156 (29.4)

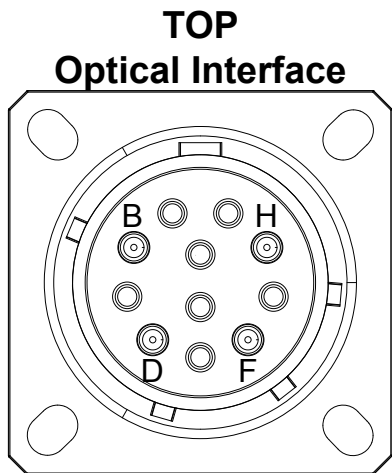
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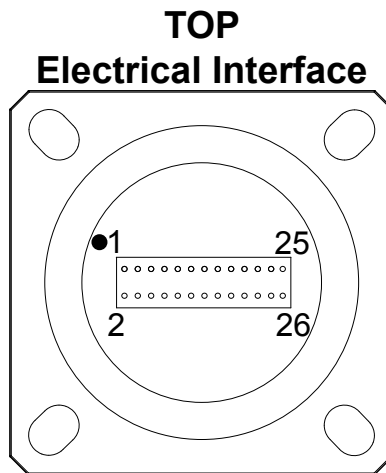
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OPTICAL TRANSCEIVER INSERT ARRANGEMENT



Front face of the optical transceiver insert shown, fiber optic cable plug opposite - see Appendix A2 for details



Back face of the optical transceiver insert shown - see Printed Circuit Board Footprint and Electrical Pin Assignment pages for details

OPTICAL TRANSCEIVER RECEPTACLE PORT ASSIGNMENTS

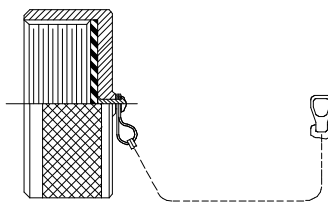
FUNCTION	OPTICAL		ELECTRICAL	
	TX	RX	TX (-,+)	RX (-,+)
0	H	F	9, 11	5,3
1	B	D	21, 23	17,15

RECEPTACLE PROTECTION CAPS

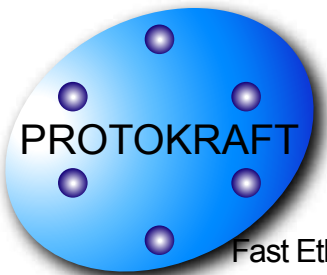
*MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS

MS RECEPTACLE CAP P/N

See Appendix A1



*See DSCC or SAE QPL for Approved Suppliers

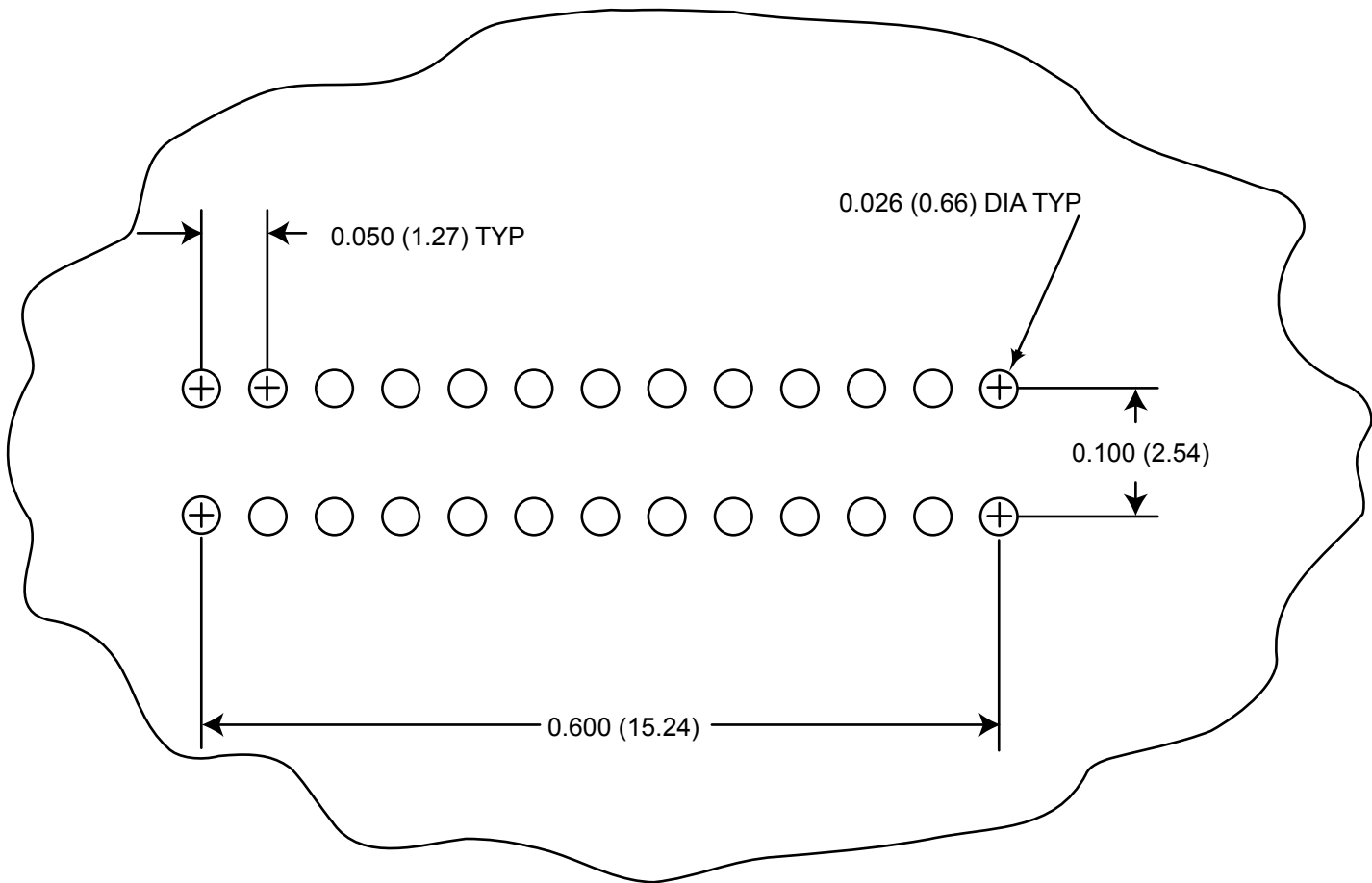


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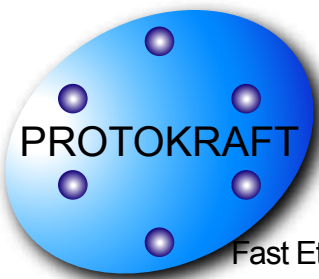
Dual Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
Fast Ethernet, GbE, 1x/2xFC or Serial FPDP Applications, Multimode, 850nM VCSELs

PRINTED CIRCUIT BOARD FOOTPRINT

Mil-Dtl-38999 Series III Size 19-11
Dimensions are shown as: inches (mm)



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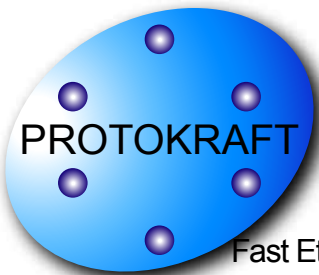
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Dual Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
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ELECTRICAL PIN FUNCTIONS

Pin Number	Symbol (Port)	Description	Logic Family
1	GND	Ground	N/A
2	RX Vcc (0)	Receiver Power Supply	N/A
3	RX+ (0)	Receiver Data Output	CML (Internally AC Coupled)
4	TX Vcc (0)	Transmitter Power Supply	N/A
5	RX- (0)	Receiver Data Output	CML (Internally AC Coupled)
6	LOS (0)	Loss of Signal - Output Satisfactory Optical Input: Logic "0" Output Unsatisfactory Optical Input: Logic "1" Output	Open Drain CMOS
7	GND	Ground	N/A
8	TX Dis (0)	Transmit Disable - Input Logic 1: Disable Optical Output Logic 0: Enable Optical Output	CMOS Internal 4.7KΩ to 10.0KΩ pullup
9	TX- (0)	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
10	TX Fault (0)	Transmitter Fault - Output	Open Drain CMOS
11	TX+ (0)	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
12	GND	Ground	N/A
13	GND	Ground	N/A
14	GND	Ground	N/A
15	RX+ (1)	Receiver Data Output	CML (Internally AC Coupled)
16	GND	Transmitter Signal Ground	N/A
17	RX- (1)	Receiver Data Output	CML (Internally AC Coupled)
18	TX Fault (1)	Transmitter Fault - Output	Open Drain CMOS
19	GND	Ground	N/A
20	TX Dis (1)	Transmit Disable - Input Logic 1: Disable Optical Output Logic 0: Enable Optical Output	CMOS Internal 4.7KΩ to 10.0KΩ pullup
21	TX- (1)	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
22	LOS (1)	Loss of Signal - Output Satisfactory Optical Input: Logic "0" Output Unsatisfactory Optical Input: Logic "1" Output	Open Drain CMOS
23	TX+ (1)	Transmitter Data Input	CML (Internally AC Coupled) Internal 100Ω differential termination
24	RX Vcc (1)	Receiver Power Supply	N/A
25	GND	Ground	N/A
26	TX Vcc (1)	Transmitter Power Supply	N/A

P38F-4S1x-FW-DS - July 22, 2010 - Released



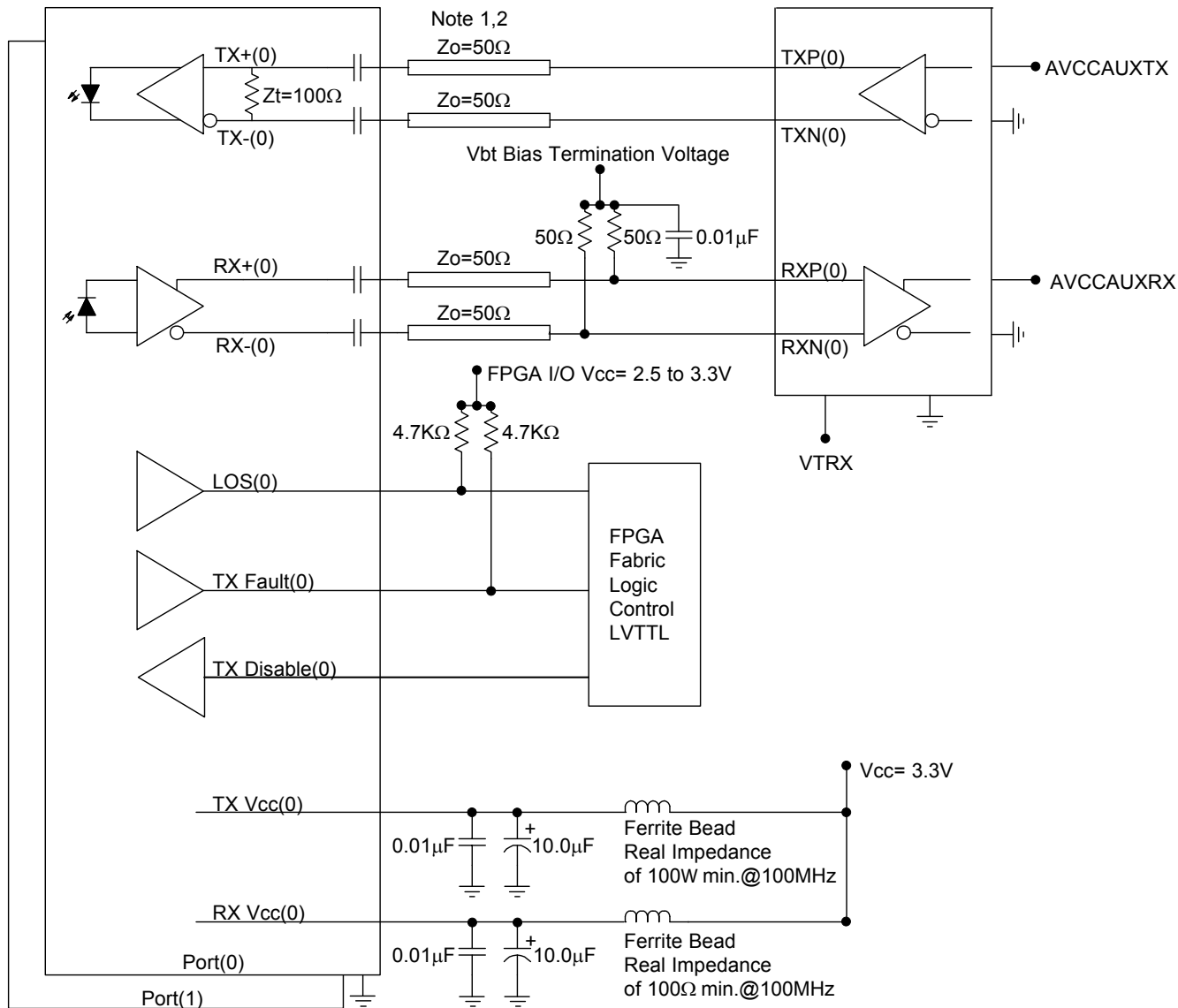
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APPLICATION SCHEMATIC

Optical Transceiver

Xilinx Rocket I/O



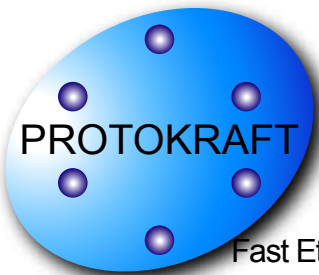
Typical application schematic shown
For alternate applications or termination
techniques, please consult the Factory

Note: 1
When using controlled impedance cable
(Coaxial cable) and Pre_Emphasis,
lengths of 1.0meter are obtainable.

Note: 2
50 Ohm impedance termination shown.
For alternate impedance requirements,
please consult the Factory.

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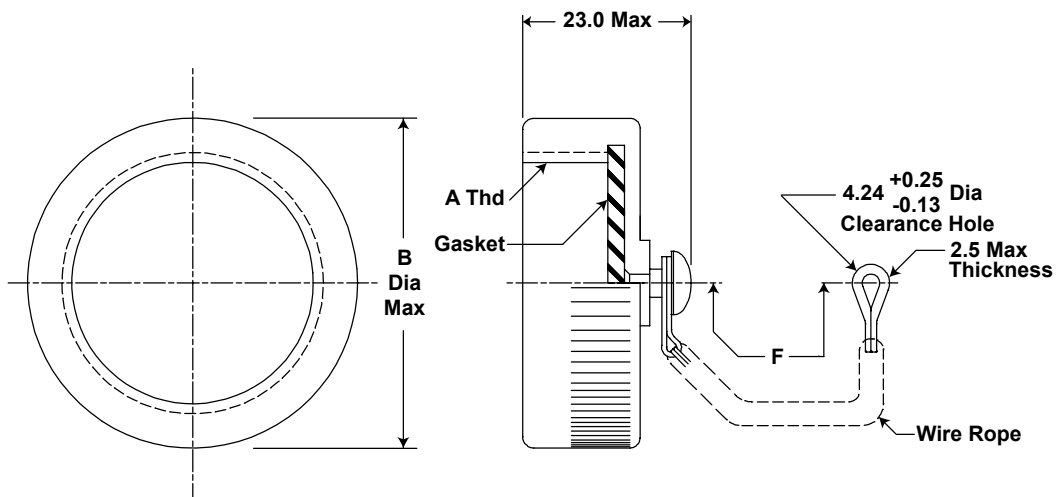
APPENDIX A1

RECEPTACLE PROTECTION CAPS

***MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS**

MS RECEPTACLE CAP P/N

*D38999/33W19R

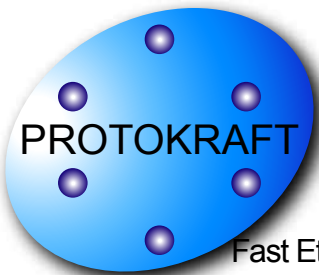


*See DSCC or SAE QPL for Approved Suppliers
<http://www.dscclia.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

MIL-DTL-38999/33 Outline Dimensions - mm

Shell Size Code	Shell Size	A Thread (inches)	B Max Dia	F +13.0 -7.0
F	19	1.2500-0.1P-0.3L-TS	39.0	127.00

P38F-4S1x-FW-DS - July 22, 2010 - Released



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APPENDIX A2

MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 PIN TERMINI

*See DSCC or SAE QPL for Approved Suppliers

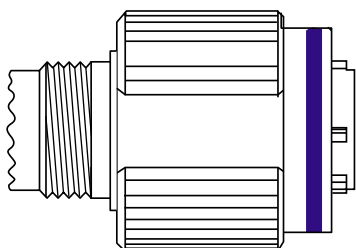
<http://www.dsccl.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

*D38999 PLUG - PIN INSERT

MIL-DTL-38999 CABLE PLUG

MS PLUG P/N

*D38999/26WF11PN

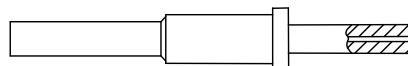


*FIBER OPTIC PIN TERMINUS

MIL-T-29504 PIN TERMINUS

MS PIN TERMINUS P/N

*M29504/04-xxxx**



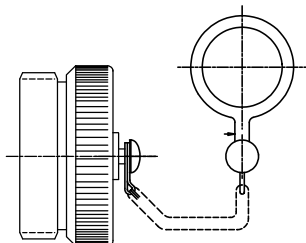
**defined by fiber optic cable configuration

*CABLE PROTECTION CAP

D38999/32 PLUG PROTECTION CAP

MS PLUG CAP P/N

*D38999/32W19N

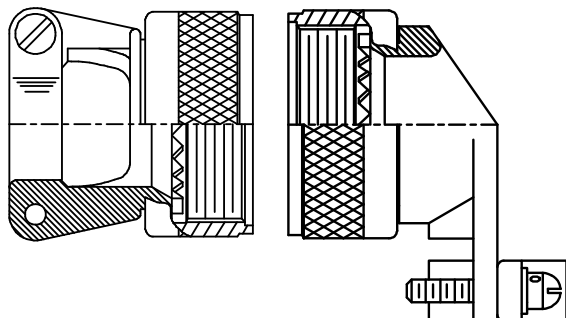


*CABLE BACKSHELL

MIL-C-85049 CABLE BACKSHELL

MS BACKSHELL P/N

*MS85049/xxxxxx**

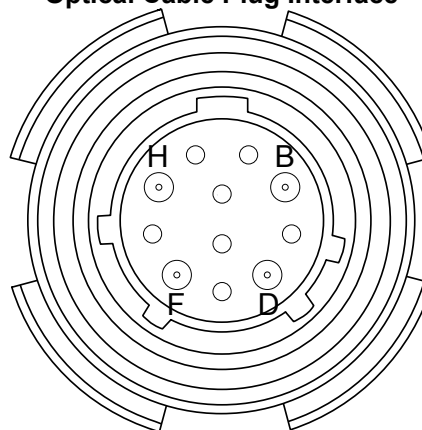


**Straight or angled backshell - defined by application / mounting configuration

D38999 PLUG PORT FUNCTIONS

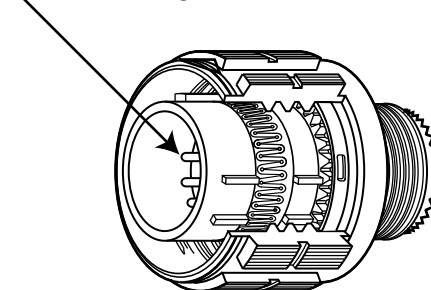
PORT NUMBER	TX	RX
0	H	F
1	B	D

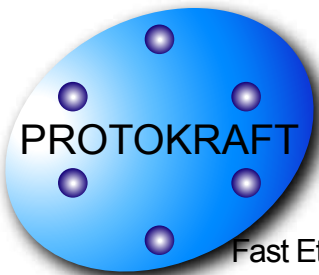
TOP
Optical Cable Plug Interface



Front face of the optical cable plug pin insert shown. Transceiver insert opposite.

Pin Termini





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APPENDIX A3 PART NUMBER OPTIONS Quad Port, Square Flange, VCSEL

P38 F - 4 S 1 X - H X X

Shell Configuration
P38= 38999 Receptacle

Shell Configuration
F = Square Flange

Channels (TX+RX)
8= 4TX + 4RX

Wavelength
S= 850nM

Cable Mode
1= Multimode

Fiber Optic Interface
D = 125Mbps-2.125Gbps
E = 2.5-3.2Gbps

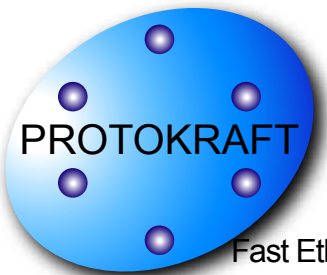
Shell Size Code
F = 19-11

Shell Plating
F = NI
W = OD CD / NI
Z = ZN - NI

Polarization
(leave blank) _ = N
A = A
B = B
C = C
D = D

Other wavelength, mounting and port count options are available.
Please consult the Protokraft website for alternate configurations.

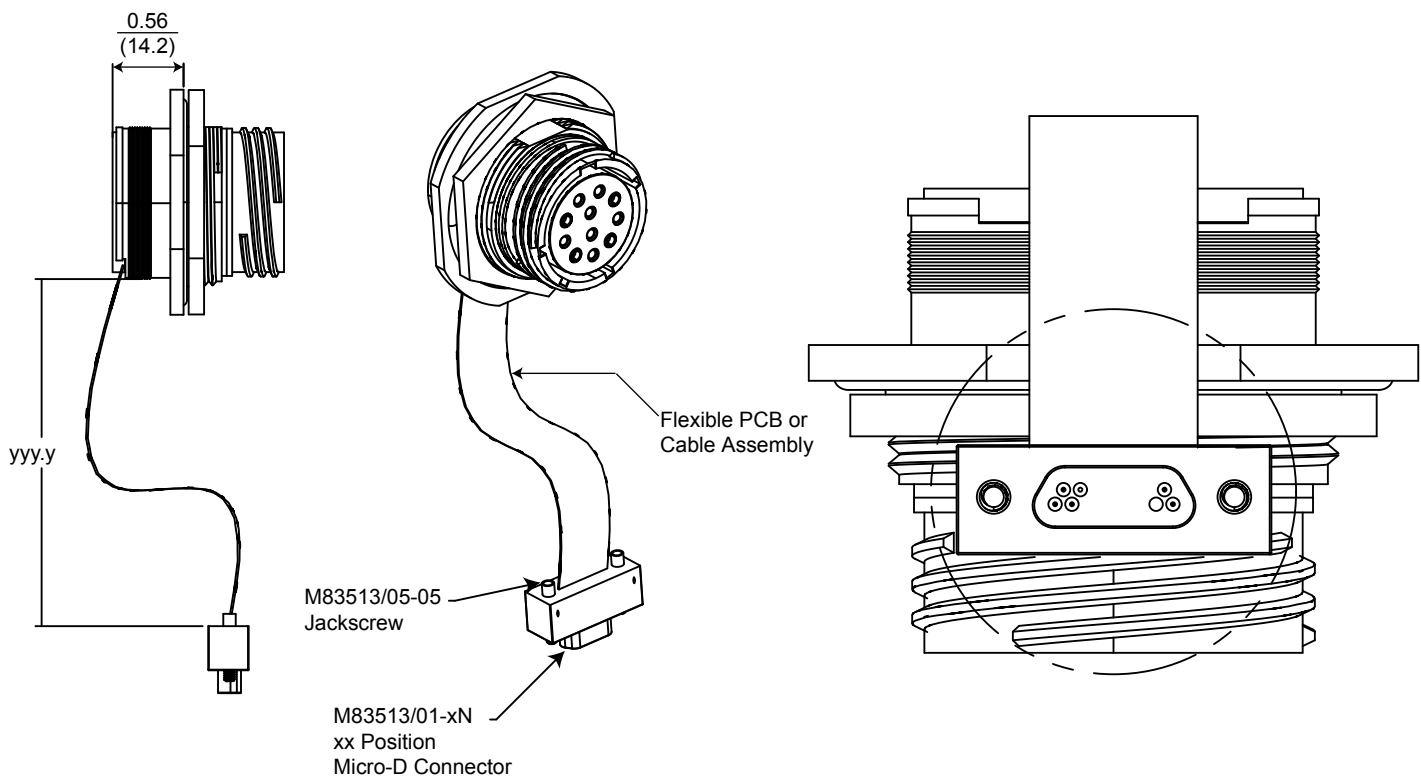
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APPENDIX A4 CABLE ASSEMBLY PART NUMBER OPTIONS



P38x-xxxx-xxx-Cxxx
xxx = ID # assigned by Protokraft

Contact Protokraft for more details

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