

## Lightning Series

Mil-Dtl-38999 Optical Transceiver,  
DC to 1.0MHz LVTTTL Applications,  
Multimode, 850nm

### Quad Port

#### FEATURES

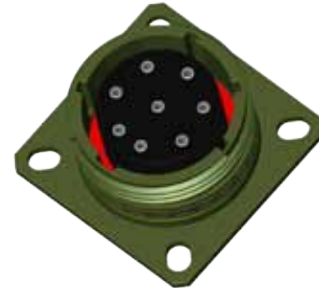
- Multimode optical fiber link distances up to 2.0 kilometers
- Maximum optical channel bit error rate better than  $10^{-8}$
- Case operating temperature range from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Shock, vibration and immersion resistant per Mil-Std-810 and Mil-Std-1344
- Olive Drab Cadmium plating meets stringent EMI / RFI performance specifications
- Aluminum alloy bulkhead housings are strong, durable, corrosion resistant and light weight
- Mil-T-29504/04 compliant optical fiber connector interface
- Connector insert configuration conforms to Mil-Std-1560

#### APPLICATIONS

Lightning series bulkhead mounted optical transceivers enable LVTTTL communications over long distances in harsh environments.

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 quadax copper conductors unacceptable.



Four TX & Four RX Channels Operating from DC to 1.0Mbps

#### DESCRIPTION

Lightning series optical fiber transceivers consist of optoelectronic transmitter and receiver functions integrated into a wall mounted Mil-Dtl-38999, Series III receptacle connector. The optical transmitters operate at 850nm. The transmitter input lines are driven with single ended LVTTTL signals applied to the transmitter input lines. Temperature compensated transmitter drivers convert the transmitter input signals to suitable modulation currents. The optical receivers consist of PIN and preamplifier assemblies and limiting amplifiers. Outputs from the receivers consist of single ended LVTTTL data signals on the receiver output lines.

The electrical interface to the Lightning series optical transceivers is a 0.050" x 0.100" solder pin field enabling direct attachment to a printed circuit assembly.

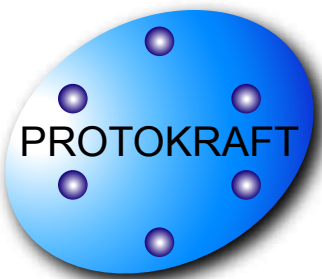
Lightning series optical fiber transceivers are vibration isolated, environmentally hardened components designed for use in harsh environment applications.

- Sealed against liquid and solid contaminants
- Shock and vibration resistant

#### ORDERING INFORMATION

Application	Product Number
DC to 1.0MHz LVTTTL @ 850nm	P38F-8S1Z-HW
See Appendix A3 & A4 for more part number options	

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### 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

### 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
Power Supply Noise (p-p)	$N_p$			200	mV
RX Output Voltage - High	$V_{OH}$	2.4			V
RX Output Voltage - Low	$V_{OL}$			0.4	V
TX Input Voltage - High	$V_{IH}$	2.0			V
TX Input Voltage - Low	$V_{IL}$			0.8	V

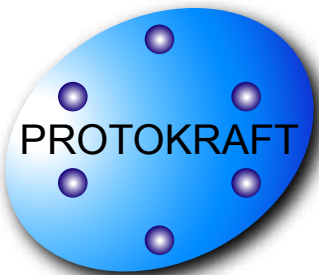
### SPECIFICATIONS COMPLIANCE

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

### 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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### TRANSMITTERS $T_A = \text{Operating Temperature Range, } V_{CC} = 3.135V \text{ to } 3.465V$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power <sup>1</sup>	$P_o$	-15.0		-8.0	dBm
Optical Output Wavelength	$\lambda_{OUT}$	830	850	860	nM
Extinction Ratio	ER	10.0			dB
Optical Rise / Fall Time (10% to 90%)	$t_{R,F}$	0.6		3.0	nS

1. BER=1x10<sup>-8</sup> @ 1.0 Mbps @ 50% Duty Factor, tested with 62.5/125 $\mu$  multimode fi ber

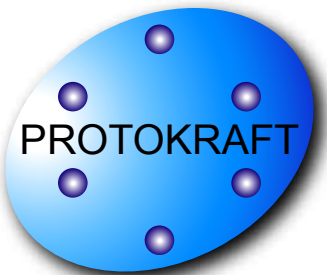
### RECEIVERS $T_A = \text{Operating Temperature Range, } V_{CC} = 3.135V \text{ to } 3.465V$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity <sup>1</sup>	$P_i$	-26.0		-8.0	dBm
Optical Wavelength	$\lambda_{IN}$	700		900	nM

1. BER=1x10<sup>-8</sup> @ 1.0 Mbps @ 50% Duty Factor, tested with 62.5/125 $\mu$  multimode fi ber

### SUPPLY CURRENT $T_A = \text{Operating Temperature Range, } V_{CC} = 3.135V \text{ to } 3.465V$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port	$I_{CCT}$		125	165	mA

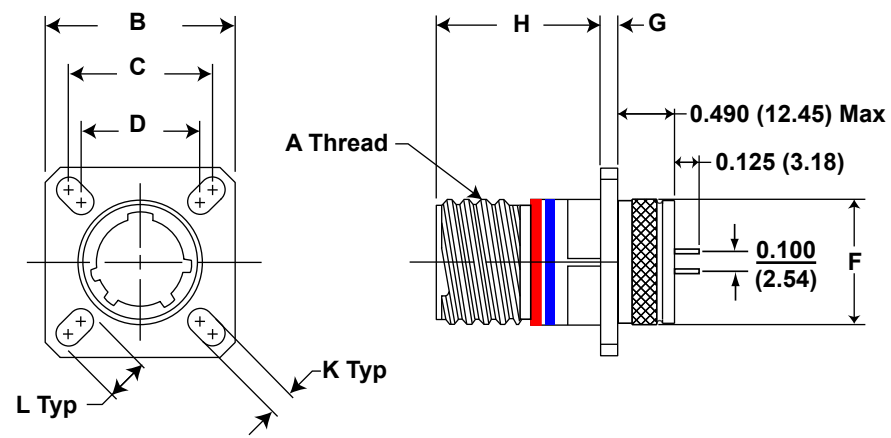


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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,  
DC to 1.0MHz LVTTTL Applications, Multimode, 850nm

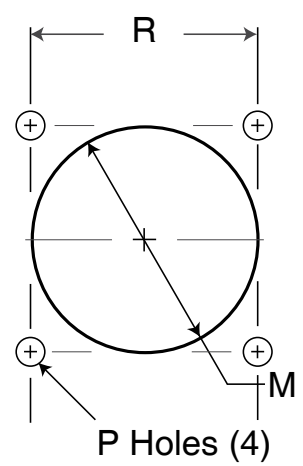
### OUTLINE DRAWING

Dimensions are shown as: inches (mm)



### Outline Dimensions

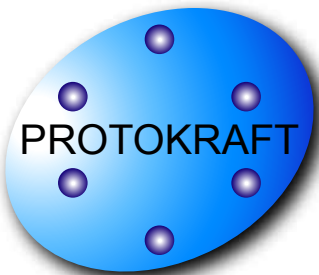
Shell Size Code	Shell Size	A Thread	B Sq Max	C Bsc	D BSC	F Max	G Max	H Max	K	L
H	23	1.5000-.1P-.3L-TS-2A	1.700 (43.2)	1.375 (34.9)	1.250 (31.8)	1.479 (37.57)	0.126 (3.2)	0.790 (20.1)	0.154 (3.9)	0.242 (6.2)



### Panel Cutout Dimensions Rear Panel Mounting Only

Shell Size Code	Shell Size	M Min	P Holes	R Bsc
H	23	1.547 (39.29)	0.159 (4.0) 0.149 (3.8)	1.375 (34.9)

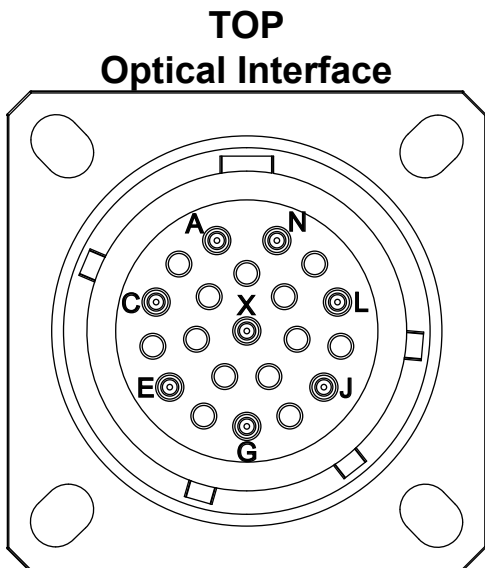
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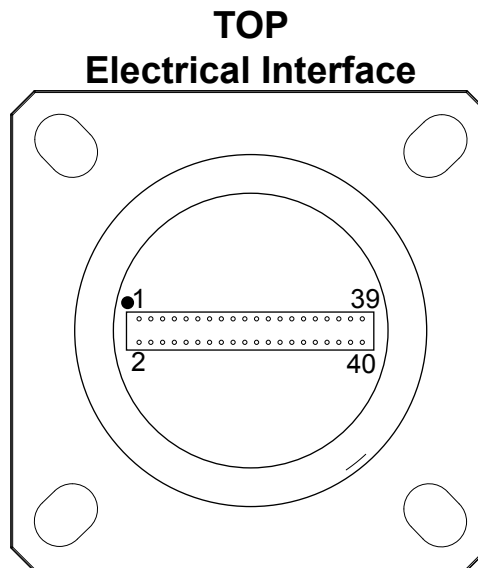
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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,  
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**OPTICAL TRANSCEIVER INSERT ARRANGEMENT**



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**

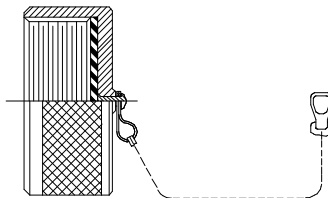
FUNCTION	OPTICAL		ELECTRICAL	
PORT NUMBER	TX	RX	TX	RX
0	N	A	9	5
1	L	C	19	15
2	J	E	29	25
3	G	X	39	35

**RECEPTACLE PROTECTION CAPS**

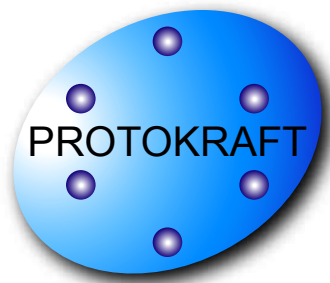
**\*MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS**

MS RECEPTACLE CAP P/N

\*See Appendix A1



\*See DSCC or SAE QPL for Approved Suppliers



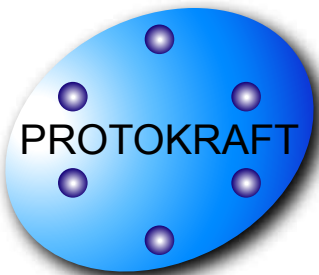
## Facilitating Secure Communications in Harsh Environments

Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,  
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### ELECTRICAL PIN ASSIGNMENTS

Pin	Symbol (Port)	Description	Logic Family
1	GND	Ground	N/A
2	GND	Ground	N/A
3	GND	Ground	N/A
4	GND	Ground	N/A
5	RX (0)	Receiver Data - Output	TTL
6	GND	Ground	N/A
7	GND	Ground	N/A
8	RX VCC (0)	Receiver Power Supply	N/A
9	TX (0)	Transmitter Data - Input	TTL
10	TX VCC (0)	Transmitter Power Supply	N/A
11	GND	Ground	N/A
12	GND	Ground	N/A
13	GND	Ground	N/A
14	GND	Ground	N/A
15	RX (1)	Receiver Data - Output	TTL
16	GND	Ground	N/A
17	GND	Ground	N/A
18	RX VCC (1)	Receiver Power Supply	N/A
19	TX (1)	Transmitter Data - Input	TTL
20	TX VCC (1)	Transmitter Power Supply	N/A
21	GND	Ground	N/A
22	GND	Ground	N/A
23	GND	Ground	N/A
24	GND	Ground	N/A
25	RX (2)	Receiver Data - Output	TTL
26	GND	Ground	N/A
27	GND	Ground	N/A
28	RX VCC (2)	Receiver Power Supply	N/A
29	TX (2)	Transmitter Data - Input	TTL
30	TX VCC (2)	Transmitter Power Supply	N/A
31	GND	Ground	N/A
32	GND	Ground	N/A
33	GND	Ground	N/A
34	GND	Ground	N/A

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*Facilitating Secure Communications in Harsh Environments*

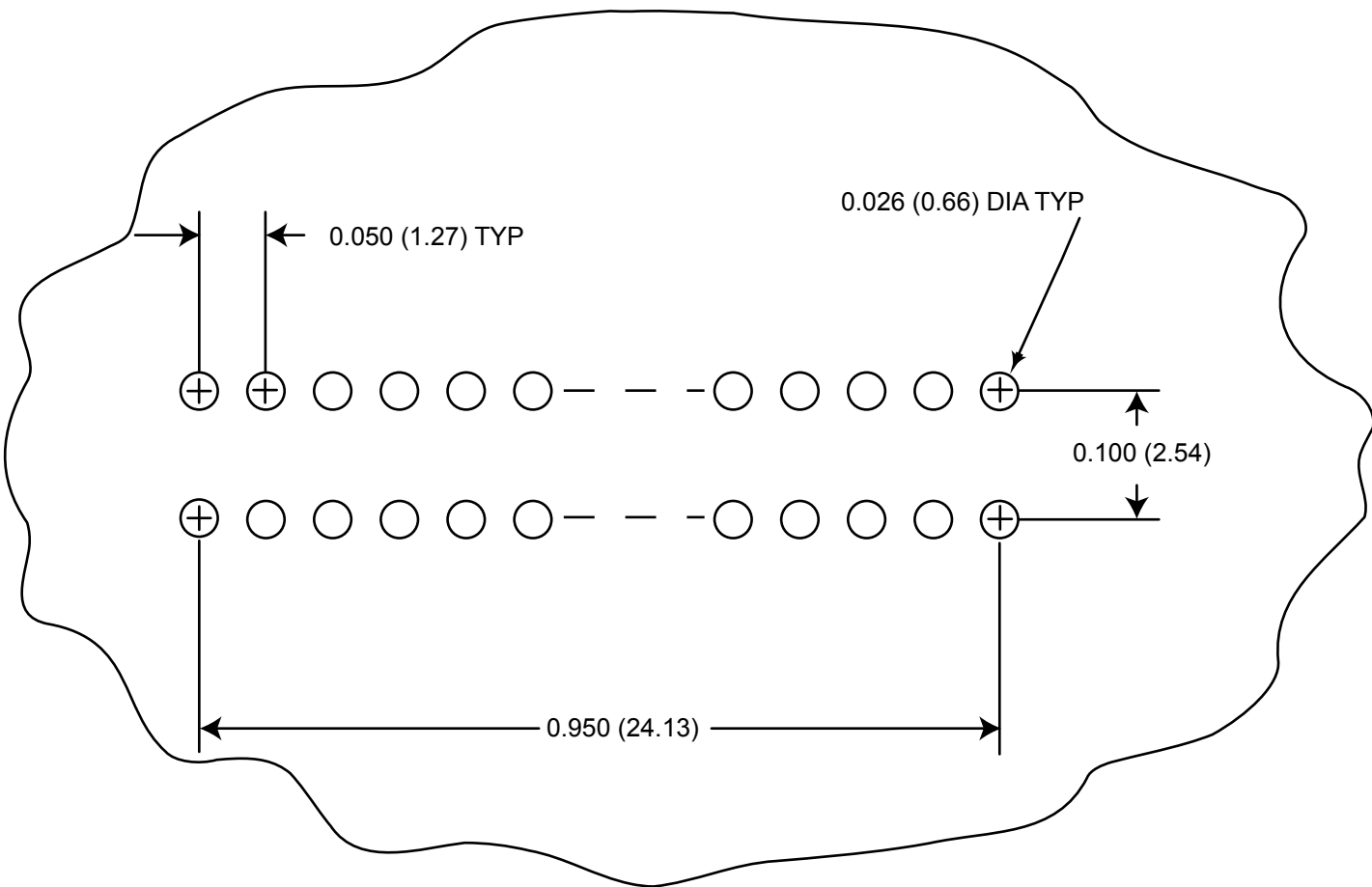
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DC to 1.0MHz LVTTTL Applications, Multimode, 850nM

**ELECTRICAL PIN FUNCTIONS (Continued)**

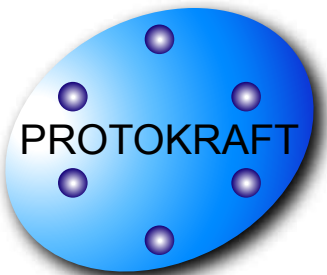
Pin	Symbol (Port)	Description	Logic Family
35	RX (3)	Receiver Data - Input	TTL
36	GND	Ground	N/A
37	GND	Ground	N/A
38	RX VCC (3)	Receiver Power Supply	N/A
39	TX (3)	Transmitter Data - Input	TTL
40	TX VCC (3)	Transmitter Power Supply	N/A

**PRINTED CIRCUIT BOARD FOOTPRINT**

Mil-Dtl-38999 Series III Size 23-21  
Dimensions are shown as: inches (mm)

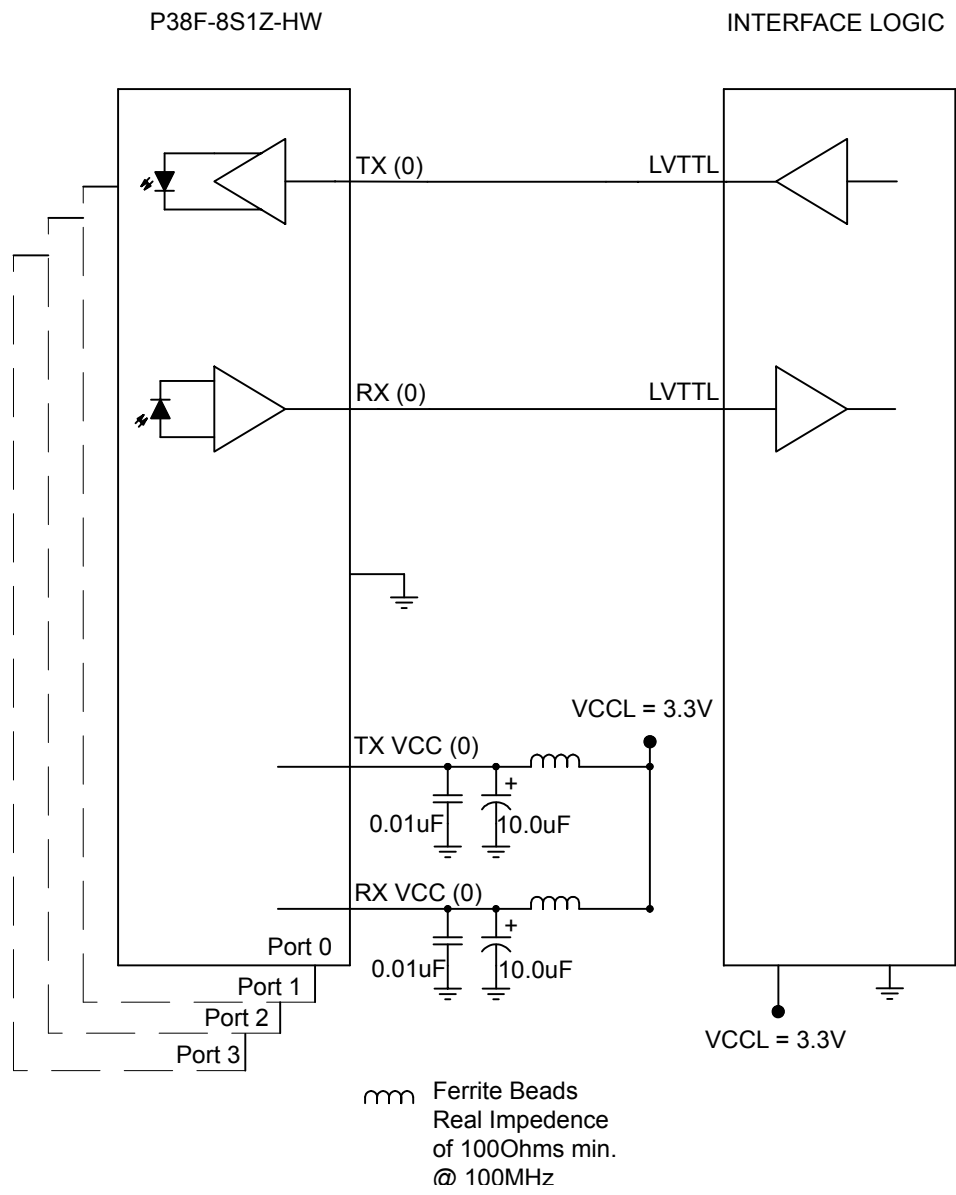


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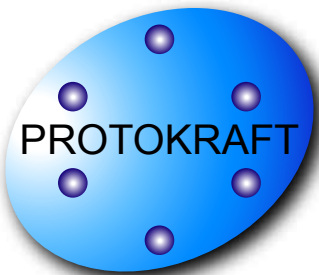
### Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver, DC to 1.0MHz LVTTTL Applications, Multimode, 850nm **APPLICATION SCHEMATIC**



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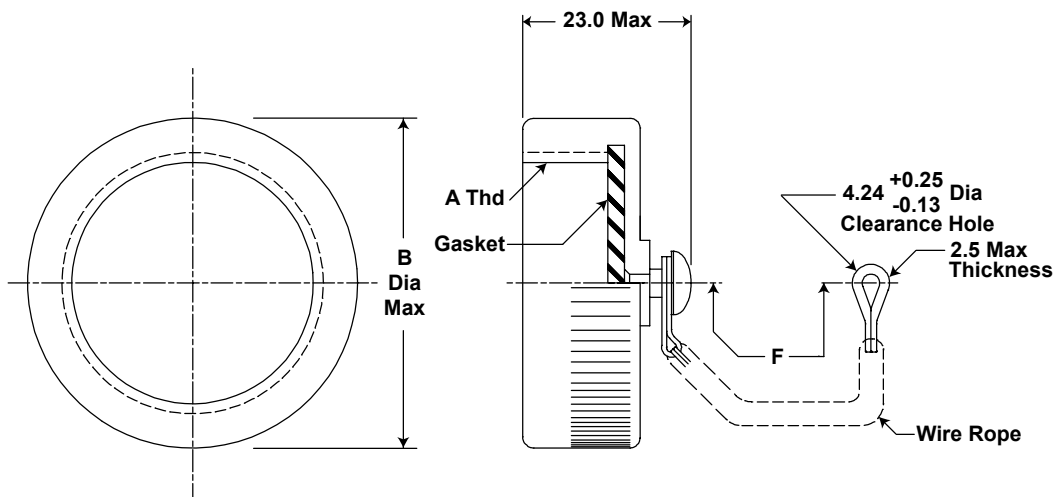
## APPENDIX A1

### RECEPTACLE PROTECTION CAPS

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

MS RECEPTACLE CAP P/N

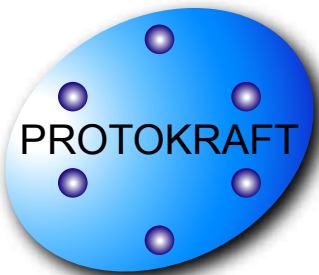
\*D38999/33M23R



\*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
H	23	1.5000-0.1P-0.3L-TS	45.0	+13.0 -7.0



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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

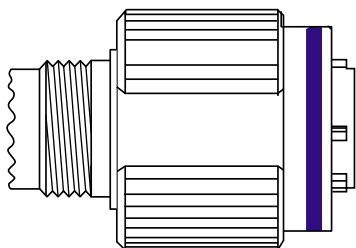
<http://www.dsccl.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

**\*D38999 PLUG - PIN INSERT**

**MIL-DTL-38999 CABLE PLUG**

MS PLUG P/N

\*D38999/26WH21PN

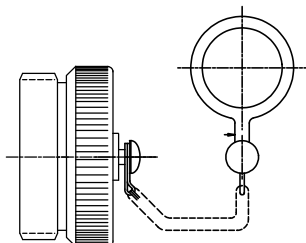


**\*CABLE PROTECTION CAP**

**D38999/32 PLUG PROTECTION CAP**

MS PLUG CAP P/N

\*D38999/32W23N

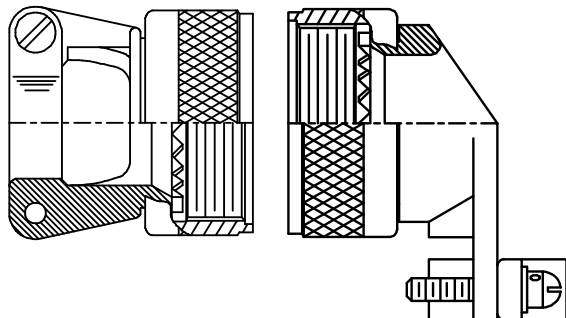


**\*CABLE BACKSHELL**

**MIL-C-85049 CABLE BACKSHELL**

MS BACKSHELL P/N

\*MS85049/xxxxxx\*\*



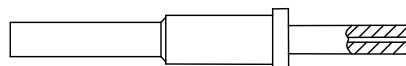
\*\*Straight or angled backshell - defined by application / mounting configuration

**\*FIBER OPTIC PIN TERMINUS**

**MIL-T-29504 PIN TERMINUS**

MS PIN TERMINUS P/N

\*M29504/04-xxxx\*\*

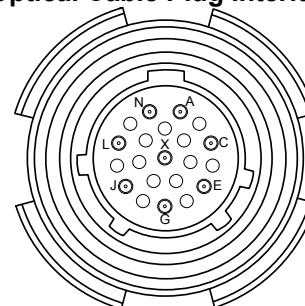


\*\*defined by fiber optic cable configuration

**D38999 PLUG PORT FUNCTIONS**

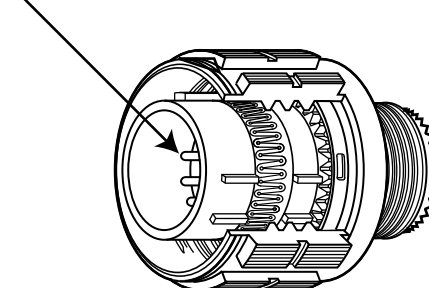
PORT NUMBER	TX	RX
0	N	A
1	L	C
2	J	E
3	G	X

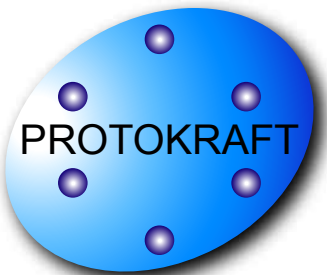
TOP  
Optical Cable Plug Interface



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

Pin Termini





## Facilitating Secure Communications in Harsh Environments

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

**P38 F - 8 S 1 Z - H X X**

Shell Configuration  
P38= 38999 Receptacle

Shell Configuration  
F = Square Flange

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

Wavelength  
S= 850nM

OM3  
1= Multimode

Fiber Optic Interface  
Z = DC - 1.0MHz

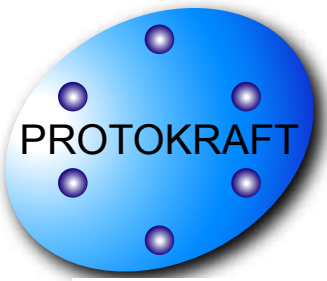
Shell Size Code  
F = 23 - 21

Shell Plating  
F = NI  
W = OD CD / 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.

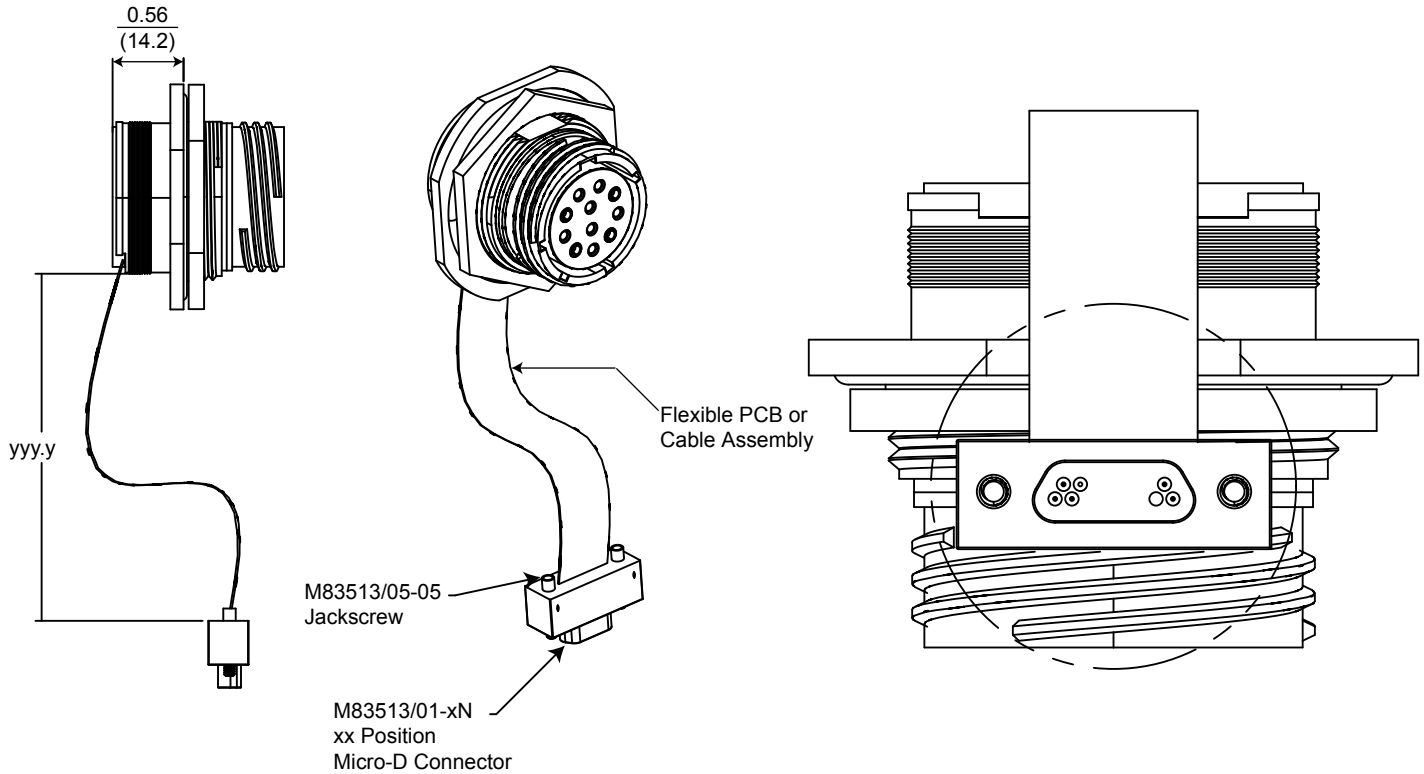
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### APPENDIX A4 CABLE ASSEMBLY PART NUMBER OPTIONS



P38x-xxxx-xxx-Cxxx

xxx = ID # assigned by Protokraft

See Appendix A5 for Micro D-Subminiature Electrical Pin Assignments

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