

Lightning Series

Mil-Dtl-38999 Optical Transceiver,
Fast Ethernet Applications,
Multimode, 1310nm, LED

Quad Port, Flange Receptacle

FEATURES

- Compliant with IEEE-802.3u/100Base-FX Fast Ethernet
- Optical fiber link distances up to 2.0 Kilometers
- Maximum channel bit error rate less than 2.5×10^{-10}
- RX Signal Detect functions indicate loss of optical signal
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per Mil-Std-810
- Olive drab cadmium over electroless nickel shielding meets stringent EMI / RFI performance requirements
- Mil-T-29504 compliant optical fiber interface
- Connector insert configuration conforms to Mil-Std-1560

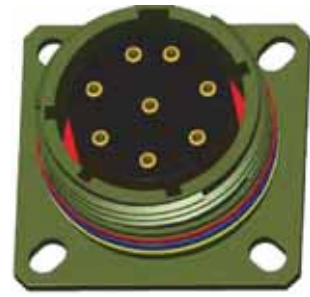
APPLICATIONS

Lightning series bulkhead mounted optical transceivers enable high speed network communications over long distances in harsh environments.

- Fast Ethernet switches, terminals and media converters
- Industrial automation and process control systems
- Traffic control and campus security networks

The Mil-Dtl-38999, Series III aluminum 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 limitations, weight or bulk make the use of twisted pair, coax, twinax or quadax copper conductors unacceptable.



Four TX & Four RX Channels Operating from 1.0 to 200.0Mbps

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 1310nm LED's. The transmitter input lines are driven with differential LVPECL signals applied to the transmitter (TX+ and TX-) lines. Temperature compensated LED drivers convert the transmitter input signals to suitable LED modulation currents. The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential LVPECL data signals on the receiver (RX+ and RX-) lines and single ended LVPECL indicators on the Signal Detect (SD) lines.

The receiver data lines are squelched upon loss of the incoming optical signals, preventing errant data generation when invalid incoming optical inputs are presented to the transceiver.

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

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

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

ORDERING INFORMATION

Application	Product Number
Fast Ethernet	P38F-8L1C-HW

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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
Fast Ethernet / 100Base-FX Applications, Multimode, 1310nm LED

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
Data Input Voltage	V_i	-0.5		V_{CC}	V
Differential Input Voltage (p-p)	V_D			2.0	V
RX Output Current	I_o			50	mA

RECOMMENDED OPERATING CONDITIONS

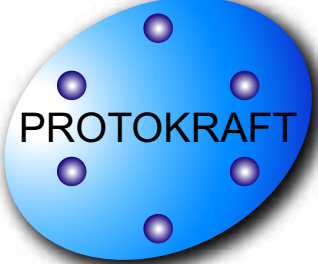
Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-40		+85	°C
Supply Voltage	V_{CC}	+3.135		+3.465	V
TX Common Mode Voltage	V_{CM}		2.0		V
TX Differential Input Voltage (p-p)	V_D	0.35		1.25	V
Power Supply Noise (p-p)	N_P			200	mV

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

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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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
Fast Ethernet / 100Base-FX Applications, Multimode, 1310nm LED

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

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power ¹	P_o	-19.0		-14.0	dBm
Optical Output Wavelength	λ_{OUT}	1260	1310	1380	nM
Extinction Ratio	ER	10.0			dB
Optical Rise / Fall Time (10% to 90%)	$t_{R,F}$	0.6		3.0	nS
Duty Cycle Distortion (p-p)	DCD			1.0	nS
Data Dependent Jitter (p-p)	DDJ			0.6	nS
Random Jitter (p-p)	RJ			0.76	nS

1. BER=2.5x10⁻¹⁰@125Mbps, PRBS 2⁷-1, NRZ, Compliant with FDDI PMD ISO / IEC 9314-3 and IEEE-802.3u tested with 62.5/125μ multimode fiber.

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

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity ¹	P_i	-31.5		-8.0	dBm
Optical Wavelength	λ_{IN}	1100		1590	nM
Contributed Duty Cycle Distortion (p-p)	DCD			0.4	nS
Contributed Data Dependent Jitter (p-p)	DDJ			1.0	nS
Contributed Random Jitter (p-p)	RJ			2.14	nS
Signal Detect Assert Time	t_{SDAS}		<10	100	μS
Signal Detect Deassert Time	t_{SDDA}		<10	350	μS
Signal Detect Threshold Decreasing Light	LSTD	-45.0		-32.5	dBm
Increasing Light	LSTI	-45.0		-32.0	
Signal Detect Hysteresis	HYS	1.5	2.25	3.5	dB
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

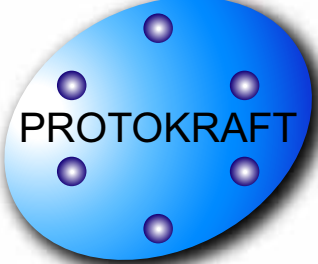
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SUPPLY CURRENT $T_A = \text{Operating Temperature Range, } V_{CC} = 3.135V \text{ to } 3.465V$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port	I_{CCT}		160	245	mA

OPTICAL FIBER LINK DISTANCES

Application	Fiber Specification	Distance
Fast Ethernet - IEEE 802.3u FDDI PMD ISO / IEC 9314-3	62.5/125μ - 500MHz*Km or 50/125μ - 500MHz*Km	2.0Km

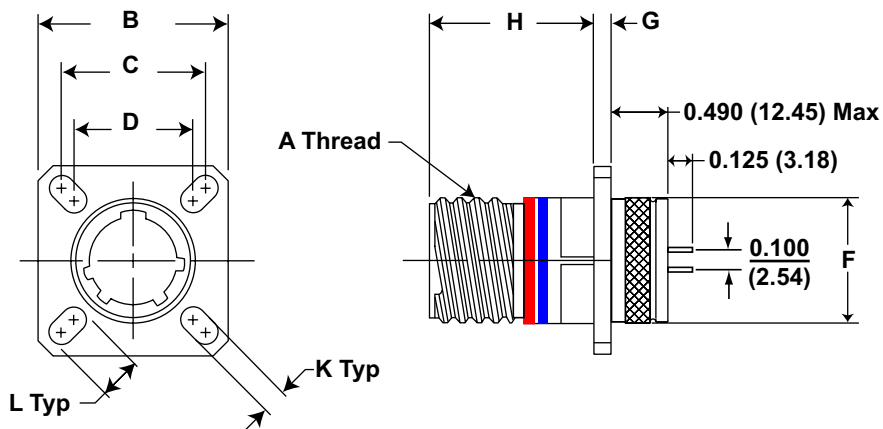


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Fast Ethernet / 100Base-FX Applications, Multimode, 1310nm LED

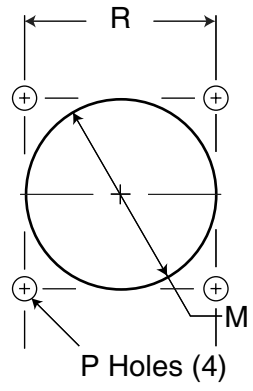
OUTLINE DRAWING

Dimensions are shown as: inches (mm)



Outline Dimensions

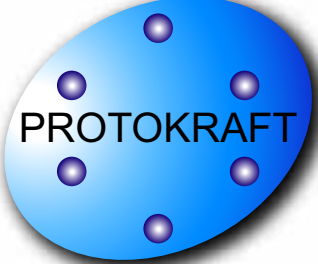
Shell Size Code	Shell Size	A Thread	B Sq Max	C Bsc	D BSC	F Max	G Max	H Max	K	L
H	23	1.5000-.1P-.3L-TS-2A	1.700 (43.2)	1.375 (34.9)	1.250 (31.8)	1.479 (37.57)	0.126 (3.2)	0.790 (20.1)	0.154 (3.9)	0.242 (6.2)



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)

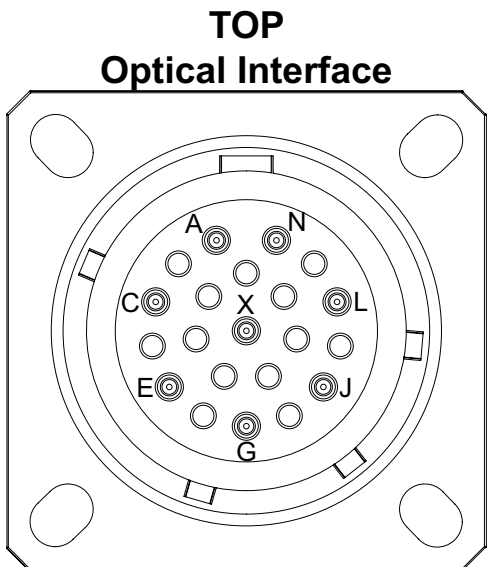
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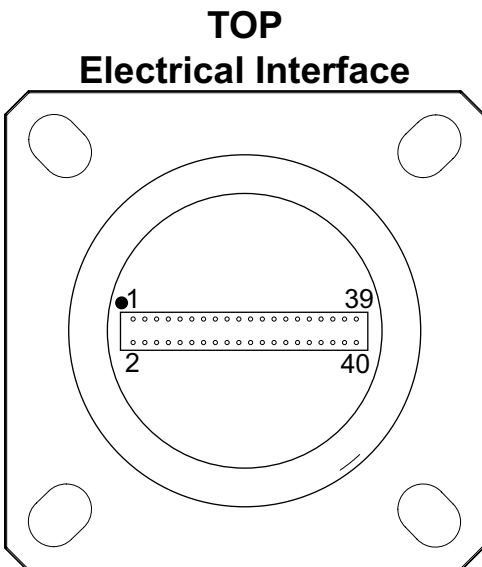
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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
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OPTICAL TRANSCEIVER INSERT ARRANGEMENT



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

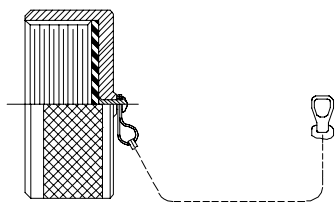
FUNCTION	OPTICAL		ELECTRICAL	
PORT NUMBER	TX	RX	TX (-,+)	RX (-,+)
0	N	A	7,9	3,5
1	L	C	17,19	13,15
2	J	E	27,29	23,25
3	G	X	37,39	33,35

RECEPTACLE PROTECTION CAPS

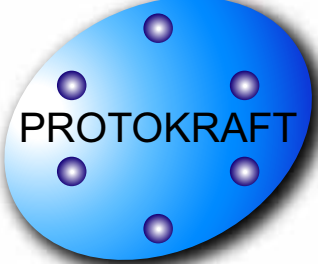
***MIL-DTL-38999/33 PROTECTION CAP PART NUMBERS**

MS RECEPTACLE CAP P/N

*See Appendix A1



*See DSCC or SAE QPL for Approved Suppliers



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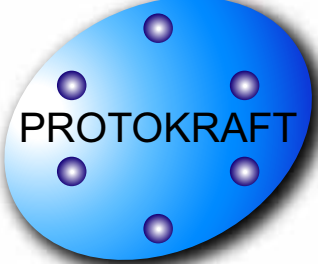
Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
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ELECTRICAL PIN FUNCTIONS

For All Signal Detect Functions: Satisfactory Optical Input: Logic "1" Output / Unsatisfactory Optical Input: Logic "0" Output

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

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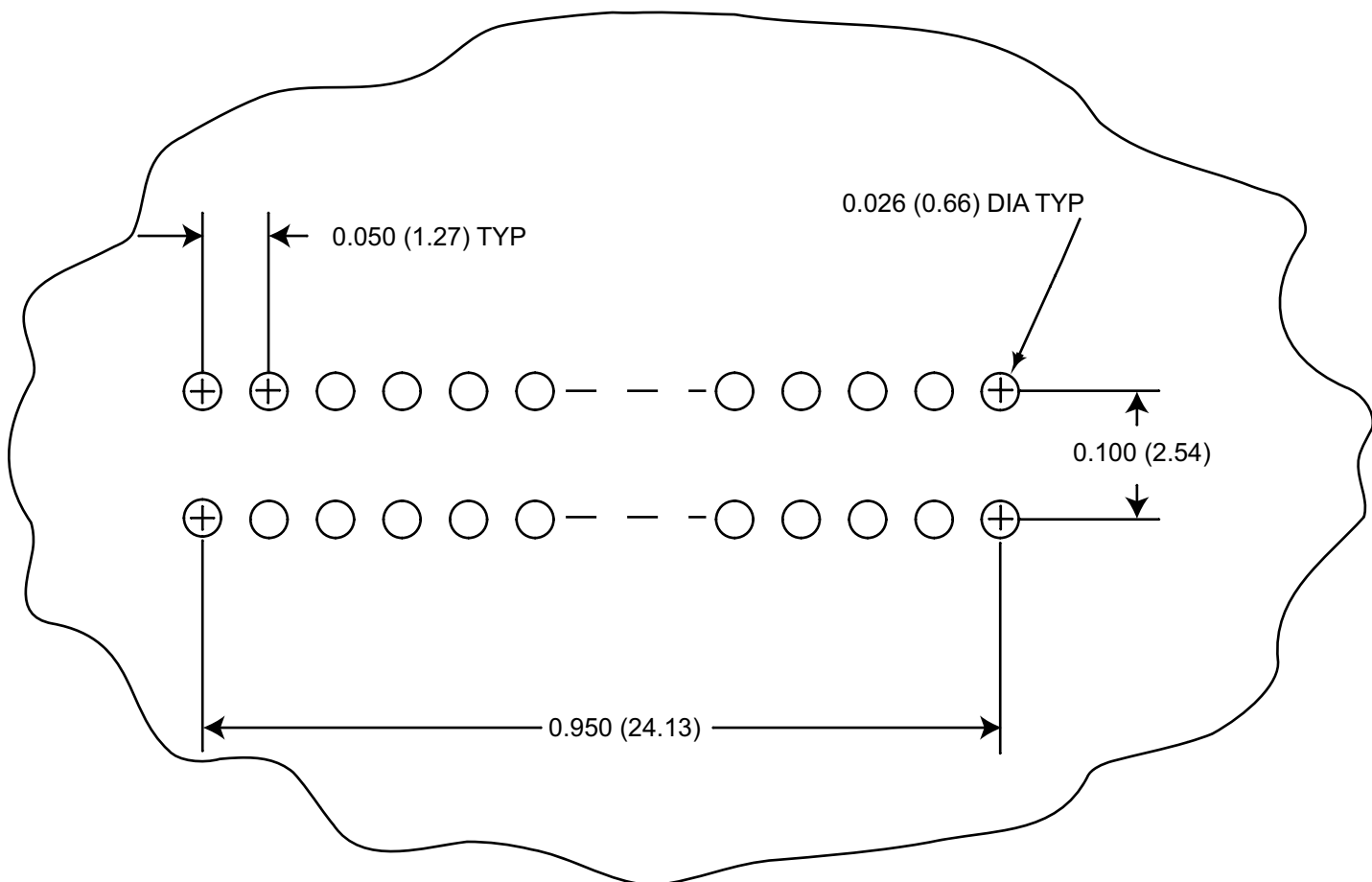
Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
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ELECTRICAL PIN FUNCTIONS (Continued)

For All Signal Detect Functions: Satisfactory Optical Input: Logic "1" Output / Unsatisfactory Optical Input: Logic "0" Output

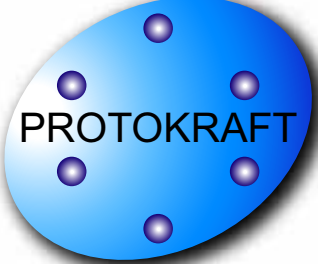
Pin Number	Symbol (Port)	Description	Logic Family
35	RX+ (3)	Receiver Data Output	LVPECL
36	GND	Ground	N/A
37	TX- (3)	Transmitter Data Input	LVPECL
38	RX Vcc (3)	Receiver Power Supply	N/A
39	TX+ (3)	Transmitter Data Input	LVPECL
40	TX Vcc (3)	Transmitter Power Supply	N/A

PRINTED CIRCUIT BOARD FOOTPRINT

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



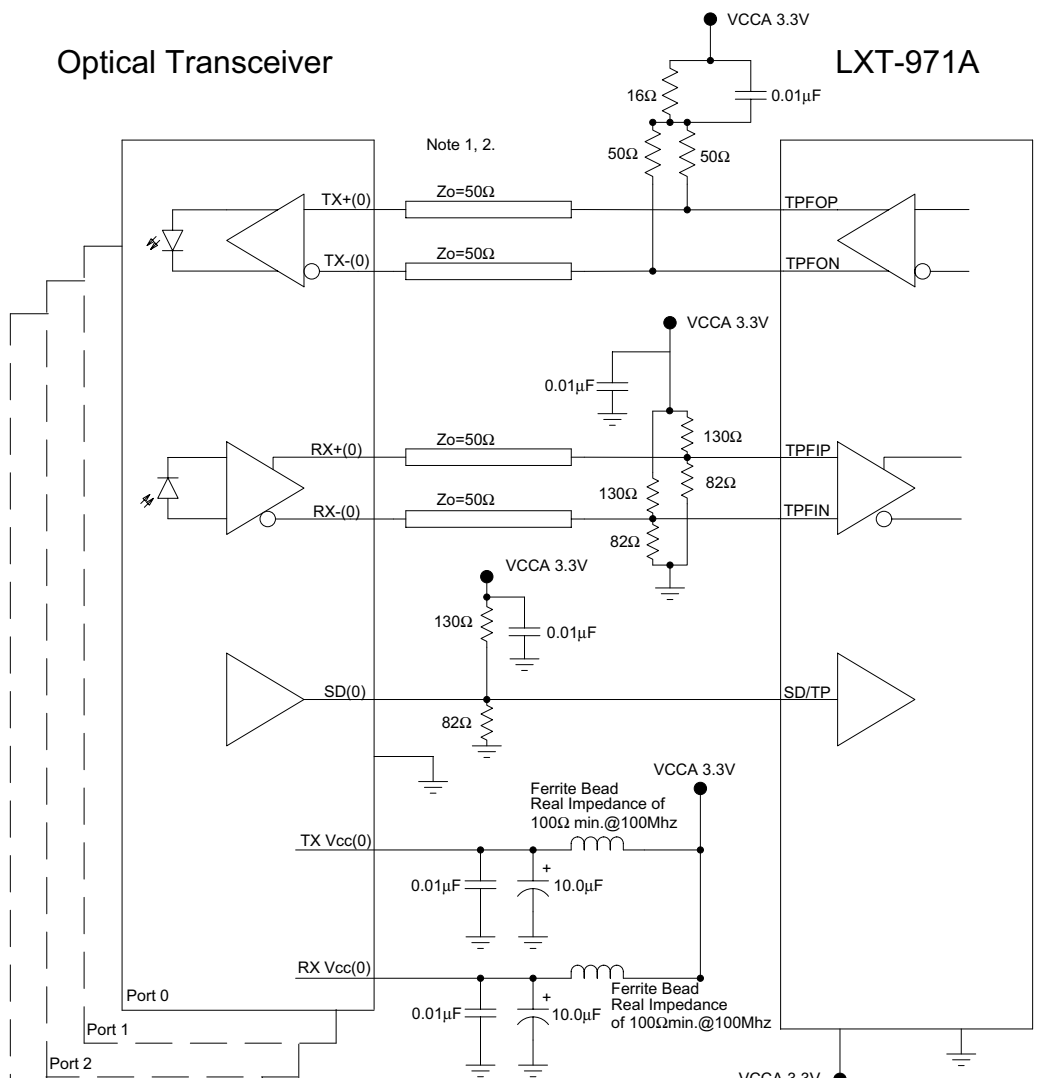
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APPLICATION SCHEMATIC
For +3.3V LVPECL PHY Circuits



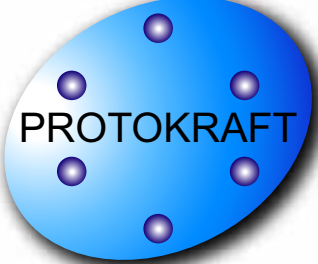
Typical application schematic shown.
For Alternative applications or termination techniques
Please consult the Factory

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

Note: 2
50 ohm impedance termination shown.
For other impedance requirements please consult the factory

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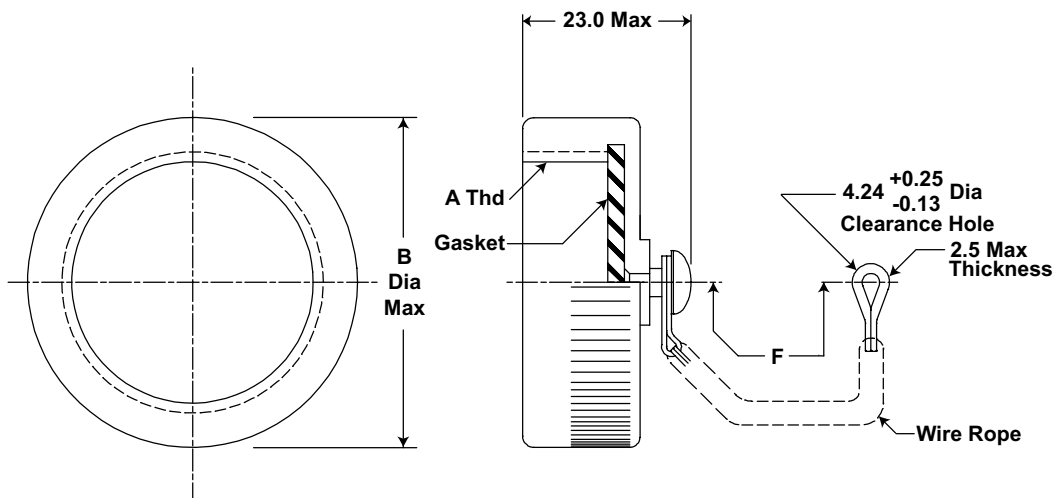
APPENDIX A1

RECEPTACLE PROTECTION CAPS

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

MS RECEPTACLE CAP P/N

*D38999/33W23R

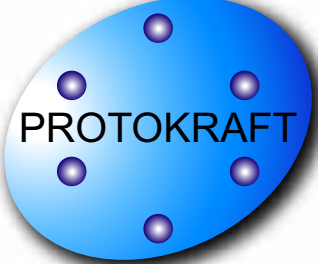


*See DSCC or SAE QPL for Approved Suppliers
<http://www.dsccl.dla.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

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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Quad Port Lightning Series Mil-Dtl-38999 Optical Transceiver,
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APPENDIX A2

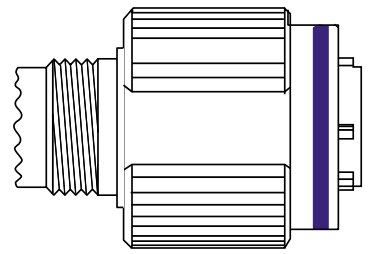
MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 PIN TERMINI

*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

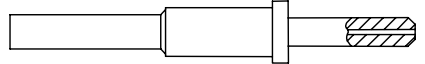
MS PLUG P/N | *D38999/26WH21PN



*FIBER OPTIC PIN TERMINUS

MIL-T-29504 PIN TERMINUS

MS PIN TERMINUS P/N | *M29504/04-xxxx**

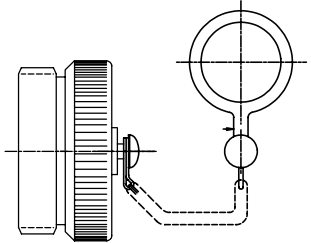


**defined by fiber optic cable configuration

*CABLE PROTECTION CAP

D38999/32 PLUG PROTECTION CAP

MS PLUG CAP P/N | *D38999/32W23N



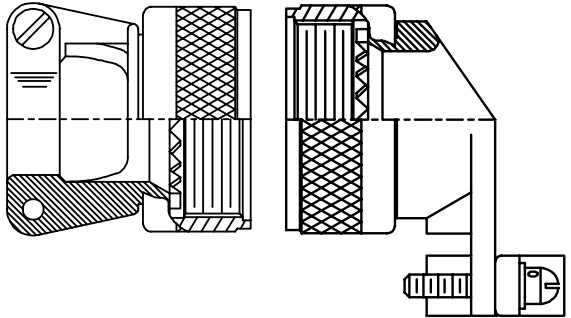
D38999 PLUG PORT FUNCTIONS

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

*CABLE BACKSHELL

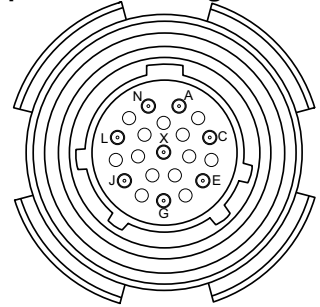
MIL-C-85049 CABLE BACKSHELL

MS BACKSHELL P/N | *MS85049/xxxxxx**



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

TOP
Optical Cable Plug Interface



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

Pin Termini

