

LIGHTNING SERIES

MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nM



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 850 nM. 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 inch x 0.100 inch 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

QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nM

Four TX and Four RX Channels Operating from DC to 1.0 Mbps
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°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 lightweight
- 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.

ORDERING INFORMATION

Application	Part Number
DC to 1.0 MHz LVTTTL @ 850 nM	P38F-8SxZ-HW

See Appendix A3 and 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	2200 V
MIL-STD-810	Vibration	30.0 g	18 mS
MIL-STD-810	Shock	40.0 g	6-9 mS
MIL-STD-810	Immersion	1.0 Meter	2.0 Hours
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	< 0.5 dB 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 = OPERATING TEMPERATURE RANGE, V_{CC} = 3.135 V TO 3.465 V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power ¹					
P38F-8S1Z-Hx	P_o	-22.0		-4.0	dBm
P38F-8S3Z-Hx		-8.0		-3.0	
Optical Output Wavelength	λ_{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

RECEIVERS T_A = OPERATING TEMPERATURE RANGE, V_{CC} = 3.135 V TO 3.465 V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity ¹	P_i	-26.0		-3.0	dBm
Optical Wavelength	λ_{IN}	700		900	nM

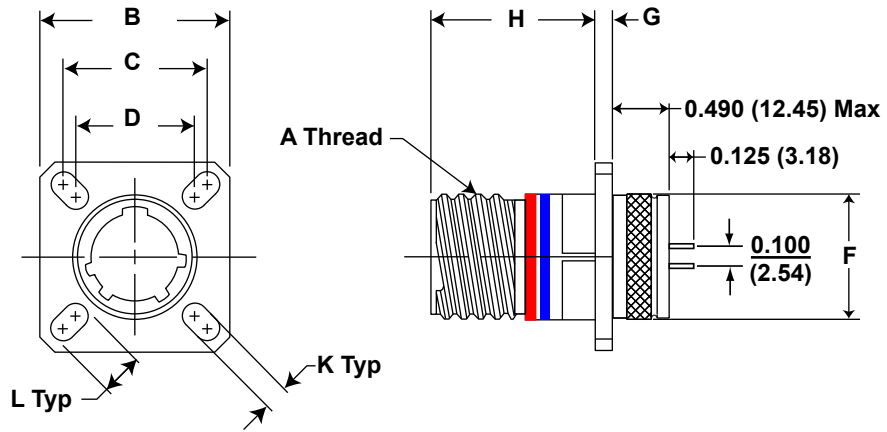
1. BER = 1×10^{-9} @ 1.0 Mbps @ 50% duty factor, tested with 62.5 / 125 μ multimode fiber

SUPPLY CURRENT T_A = OPERATING TEMPERATURE RANGE, V_{CC} = 3.135 V TO 3.465 V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current Per Port	I_{OCT}		125	165	mA

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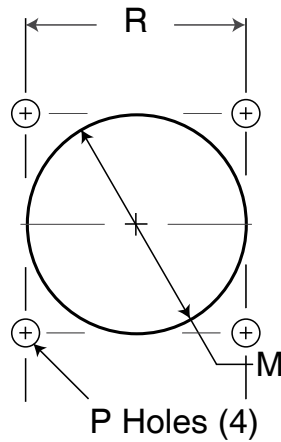
OUTLINE DRAWING



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-3LTS-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)



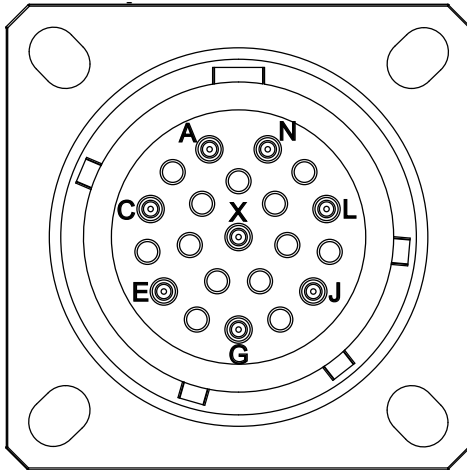
PANEL CUTOUT DIMENSIONS REAR PANEL MOUNTING ONLY

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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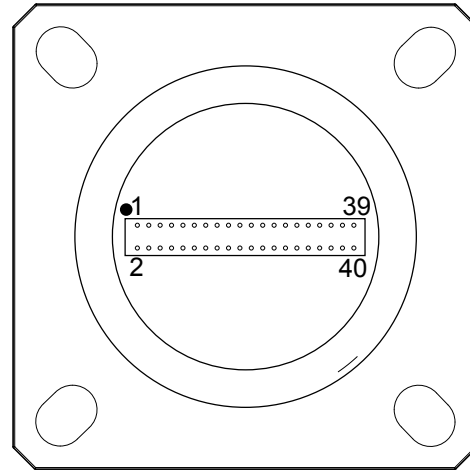
OPTICAL TRANSCEIVER INSERT ARRANGEMENT

TOP
Optical Interface



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

TOP
Electrical Interface



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

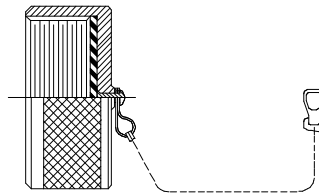
Function Port Number	Optical		Electrical	
	TX	RX	TX	RX
0	N	A	9	5
1	L	C	19	15
2	J	E	29	25
3	G	X	39	35

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

QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nM

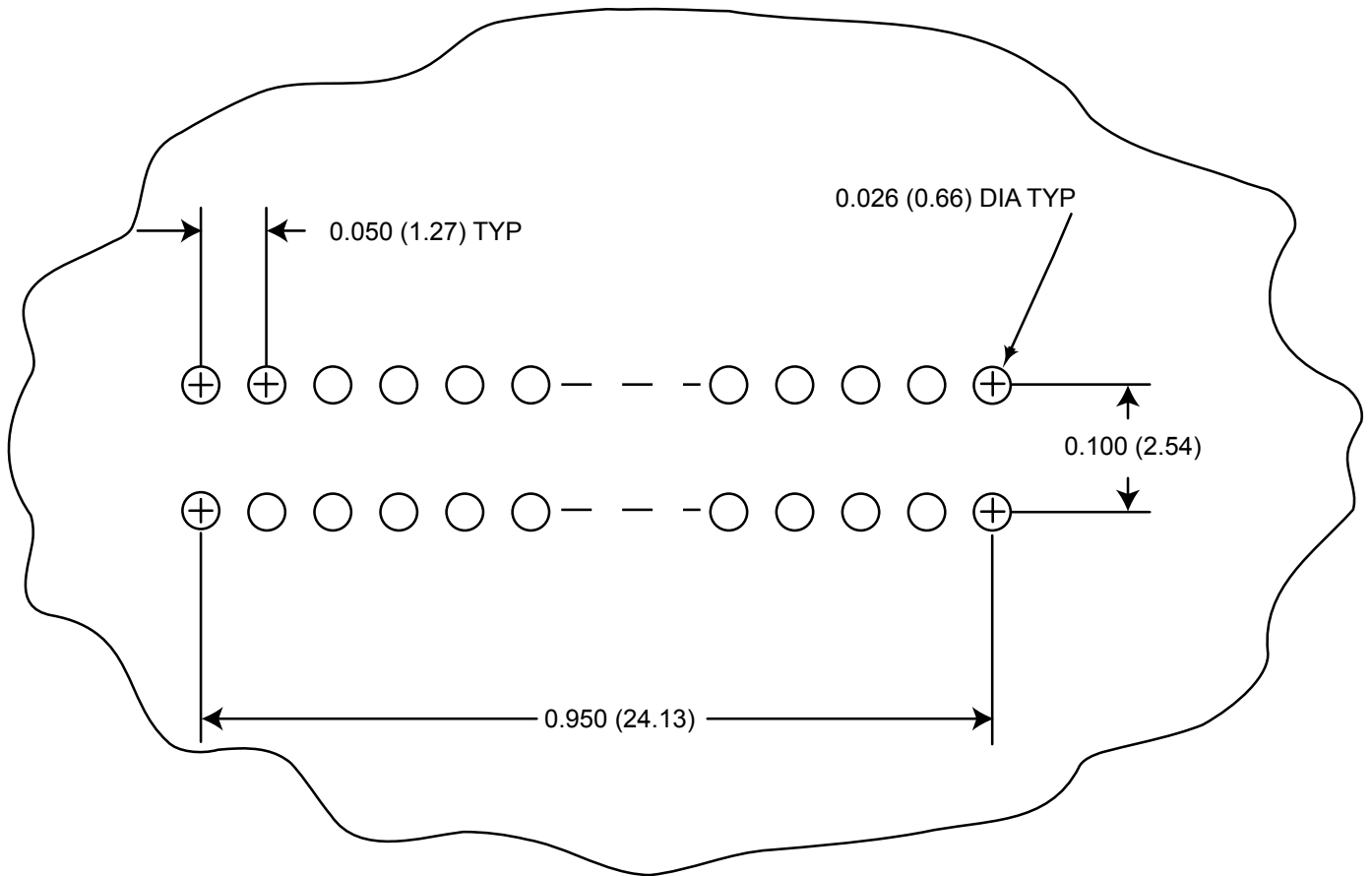
ELECTRICAL PIN ASSIGNMENTS

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	N/A
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
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

QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nM

PRINTED CIRCUIT BOARD FOOTPRINT

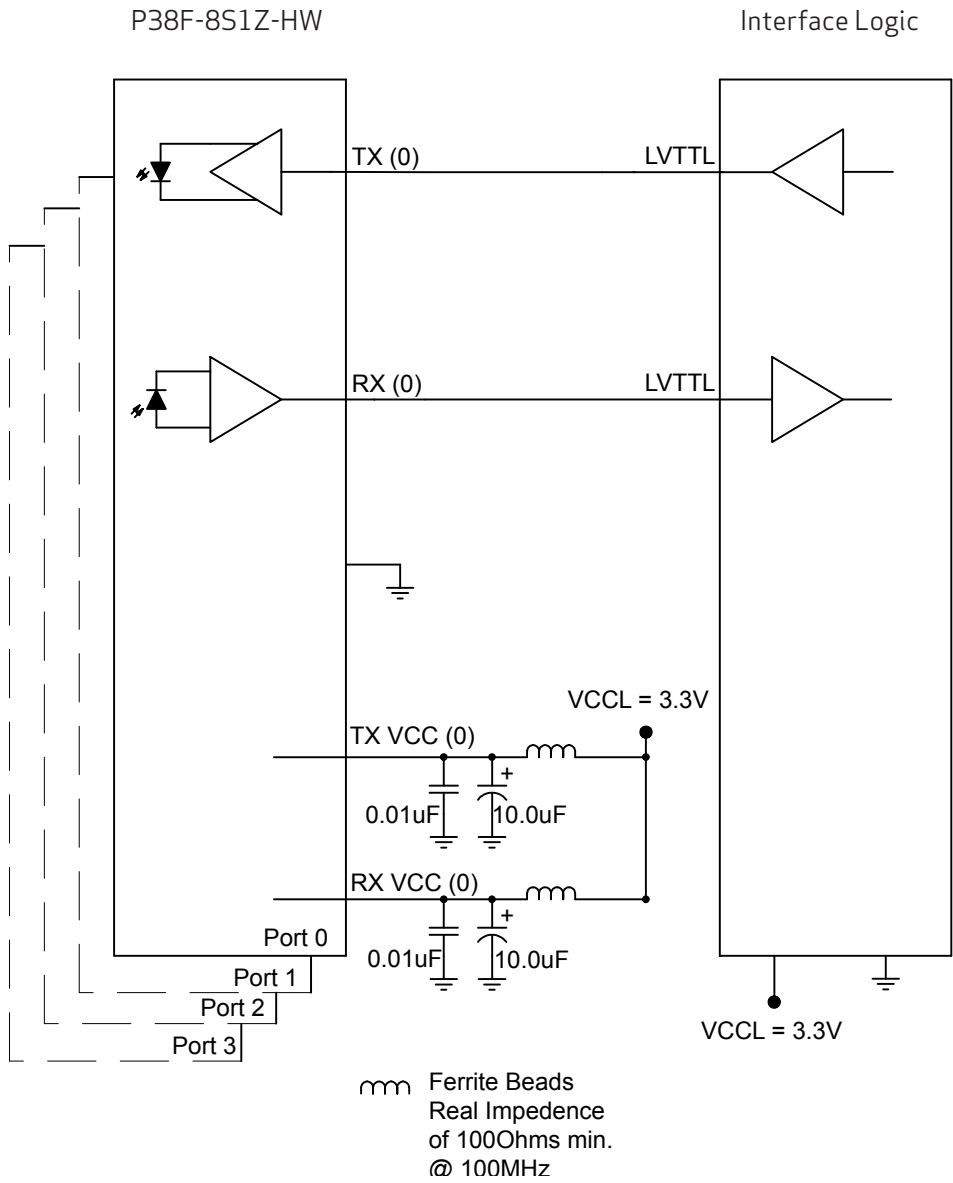
MIL-DTL-38999 SERIES III SIZE 23-21



Dimensions are shown as: inches (mm)

QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nm

APPLICATION SCHEMATIC



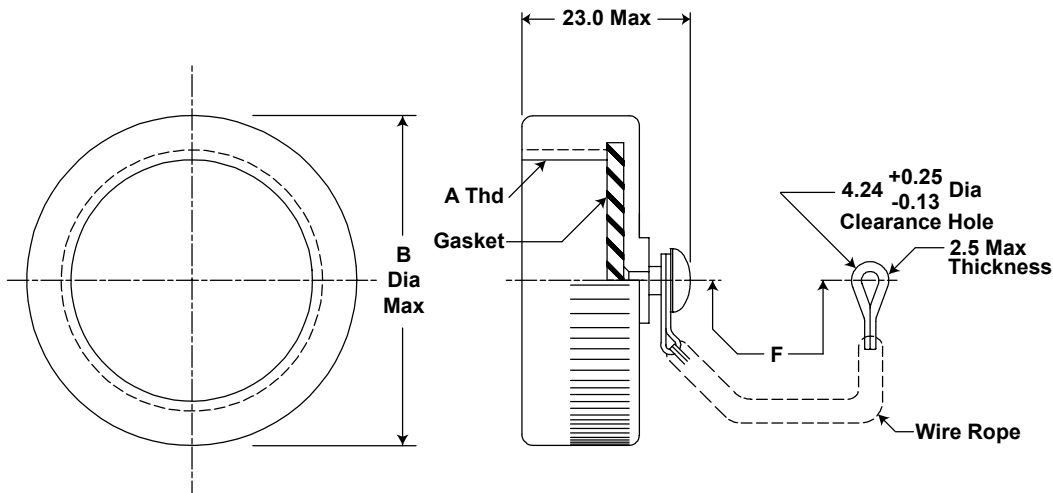
QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nm

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.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 +13.0 -7.0
H	23	1.5000-0.1P-0.3L-TS	45.0	127.00

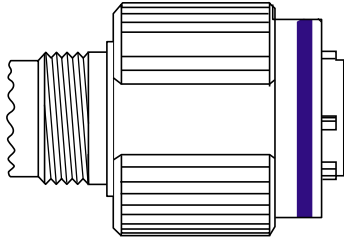
QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz LVTTTL APPLICATIONS, MULTIMODE, 850 nM

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>

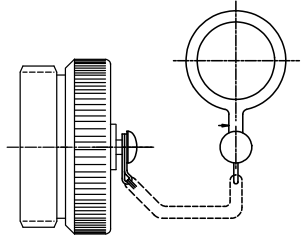
*D38999 PLUG - PIN INSERT MIL-DTL-38999 CABLE PLUG

MS Plug P/N *D38999 / 26WH21PN



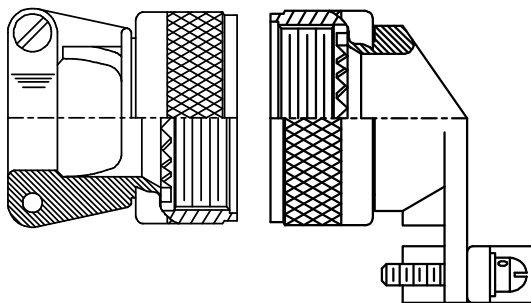
*CABLE PROTECTION CAP D38999 / 32 PLUG PROTECTION CAP

MS Plug Cap P/N *D38999 / 32W23N



*CABLE BACKSHELL MIL-C-85049 CABLE BACKSHELL

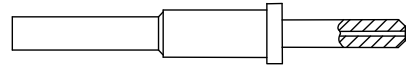
MS Backshell P/N *MS85049 / XXXXXX**



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

*FIBER OPTIC PIN TERMINUS MIL-T-29504 PIN TERMINUS

MS Pin Terminus P/N *MS29504 / 04-xxxx**

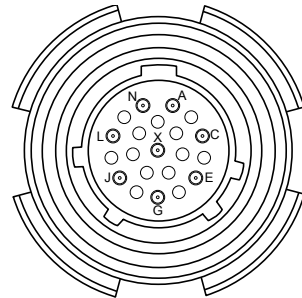


**Defined by fiber optic cable configuration

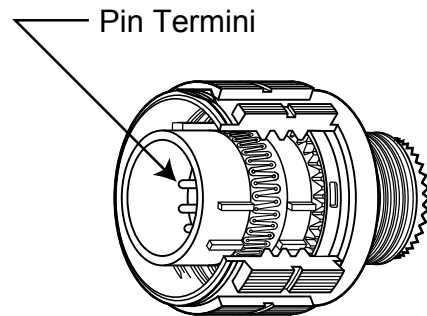
D38999 PLUG PORT FUNCTIONS

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.



QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz / RS-485 APPLICATIONS, MULTIMODE, 850 nM

APPENDIX A3 PART NUMBER OPTIONS

QUAD PORT, SQUARE FLANGE

P38 F - 8 S x Z - H x x

SHELL CONFIGURATION
P38 = 38999 Receptacle

SHELL CONFIGURATION
F = Square Flange

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

WAVELENGTH
S = 850 nM

LAUNCH POWER
1 = -22 to -4 dBm
3 = -8 to -3 dBm

FIBER OPTIC INTERFACE
Z = DC to 1.0 MHz

SHELL SIZE CODE
F = 23 - 21

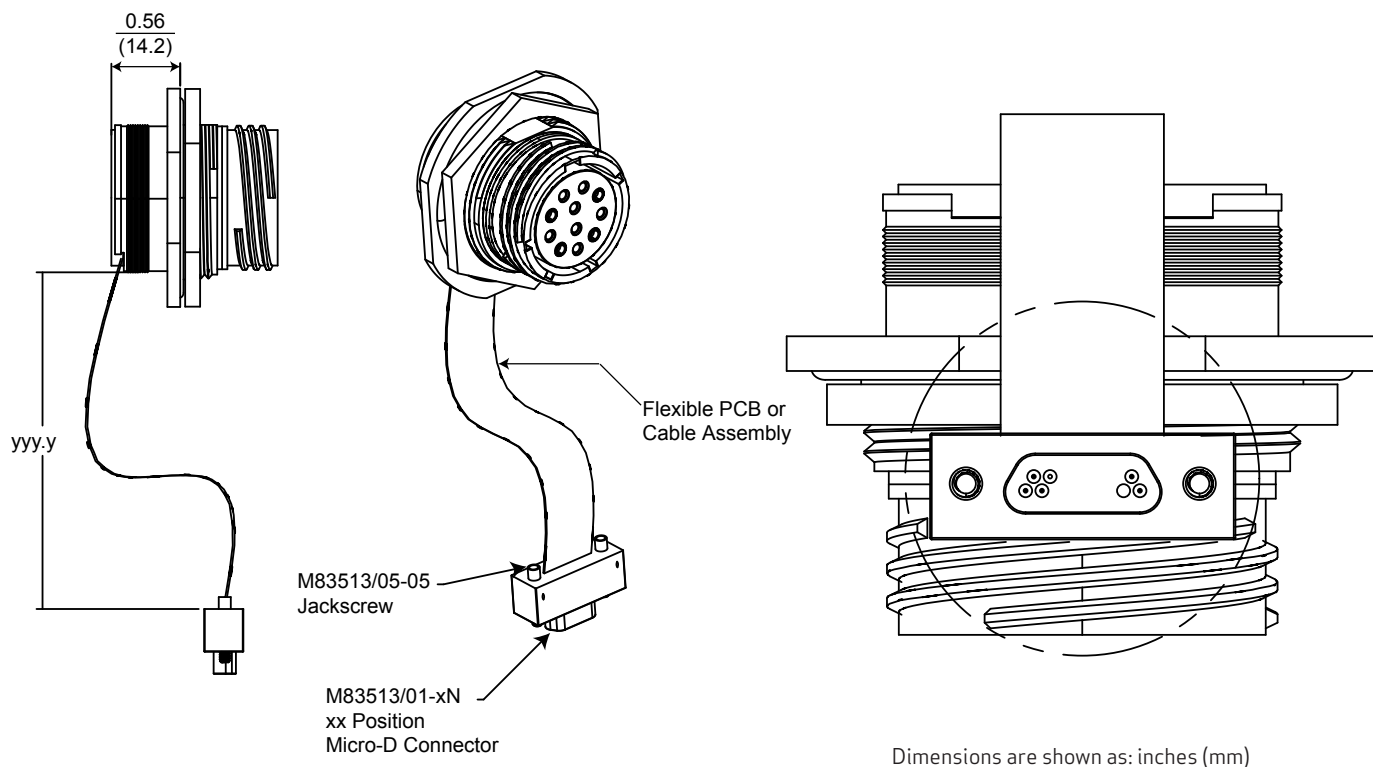
SHELL PLATING
F = NI
W = OD CD / NI
Z = ZN / NI

POLARIZATION
 (Leave blank) = N
A = A
B = B
C = C
D = D

Other wavelength, mounting and port count options are available.

QUAD PORT LIGHTNING SERIES MIL-DTL-38999 OPTICAL TRANSCEIVER, DC TO 1.0 MHz / RS-485 APPLICATIONS, MULTIMODE, 850 nM

APPENDIX A4 CABLE ASSEMBLY PART NUMBER OPTIONS



P38x-xxxx-xxx-Lxxx
 xxx = ID # Assigned by Protokraft



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