

# Lightning Series

MIL-DTL-38999 Optical Transceiver,  
RS-422 Applications, Multimode,  
850nm, 3.3VDC

## Quad Port, Receptacle

### FEATURES

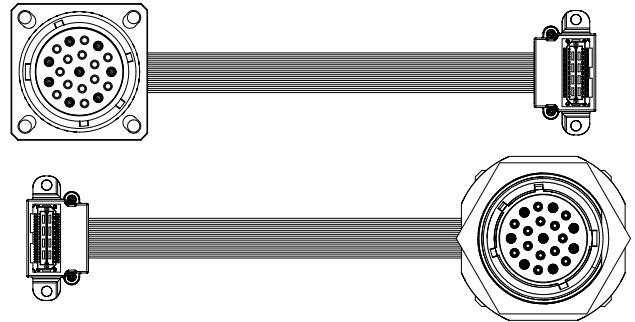
- Suitable for RS-422 applications from 1.0Mbps to 16.0Mbps
- Operating temperature range from -40°C to +85°C
- Shock, vibration and immersion resistant per MIL-STD-810
- Olive drab cadmium over electroless nickel plating meets stringent corrosion resistance specifications
- Aluminum alloy MIL-DTL-38999 housings are strong, durable, and light weight
- MIL-T-29504 compliant optical fiber connector interface
- Samtec EQCD Series electrical connector for SMT interface

### APPLICATIONS

Lightning series bulkhead mounted optical transceivers enable high speed network 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 quadrx copper conductors unacceptable.



4xDuplex RS-422 Channels Operating from 1.0 to 16.0Mbps

### 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 850nm VCSEL lasers. The transmitter input lines are driven with differential RS-422 signals applied to the transmitter (TXD+ and TXD-) lines. Dual loop, temperature compensated, VCSEL drivers convert the transmitter input signals to suitable VCSEL bias and modulation currents.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential RS-422 data signals on the receiver (RXD+ and RXD-) lines.

The electrical interface to the Lightning series optical transceivers is a ribbon coax to Samtec EQCD high density cable assembly enabling SMT interconnection to a customer's backplane, motherboard or daughtercard.

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

### ORDERING INFORMATION

Application	Part Number
1.0Mbps to 16.0Mbps - RS-422, Flange	P38F-8S12-HW-Lxxx
1.0Mbps to 16.0Mbps - RS-422, Jam Nut	P38J-8S12-HW-Lxxx

See page 6 for standard part number / cable length options

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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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
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
Supply Voltage	$V_{cc}$	+3.135		+3.465	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	3.8g <sup>2</sup> /Hz	43G rms
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	
Insert	Thermoplastic	
Interfacial Seal	Elastomer	
Alignment Sleeves	Composite Polymer	
Printed Circuits	Polyimide / FR-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 <sup>-12</sup> )	$P_o$	-9.5		-4.0	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%)	$t_{R,F}$			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 <sup>-12</sup> , ER=9.0)	$P_I$	-18.0		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**

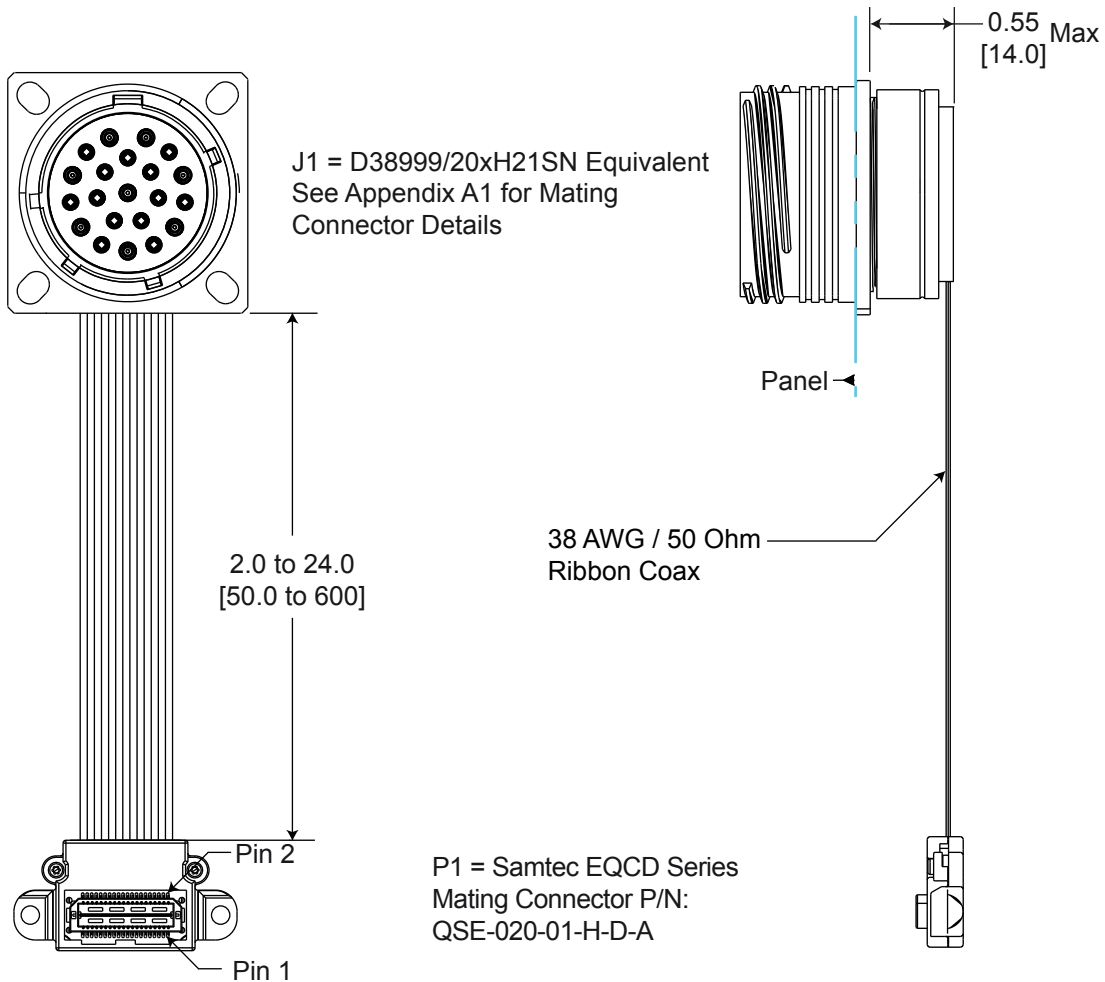
Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per Port	$I_{CCT}$		100	140	mA

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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## OUTLINE DRAWING

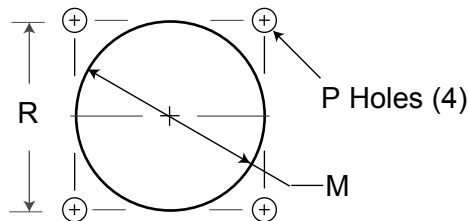
### Flange Mount Option

Dimensions are shown as: inches [mm]



### 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]



Part Number = \*P38F-xxxx-Hx-Lxxx

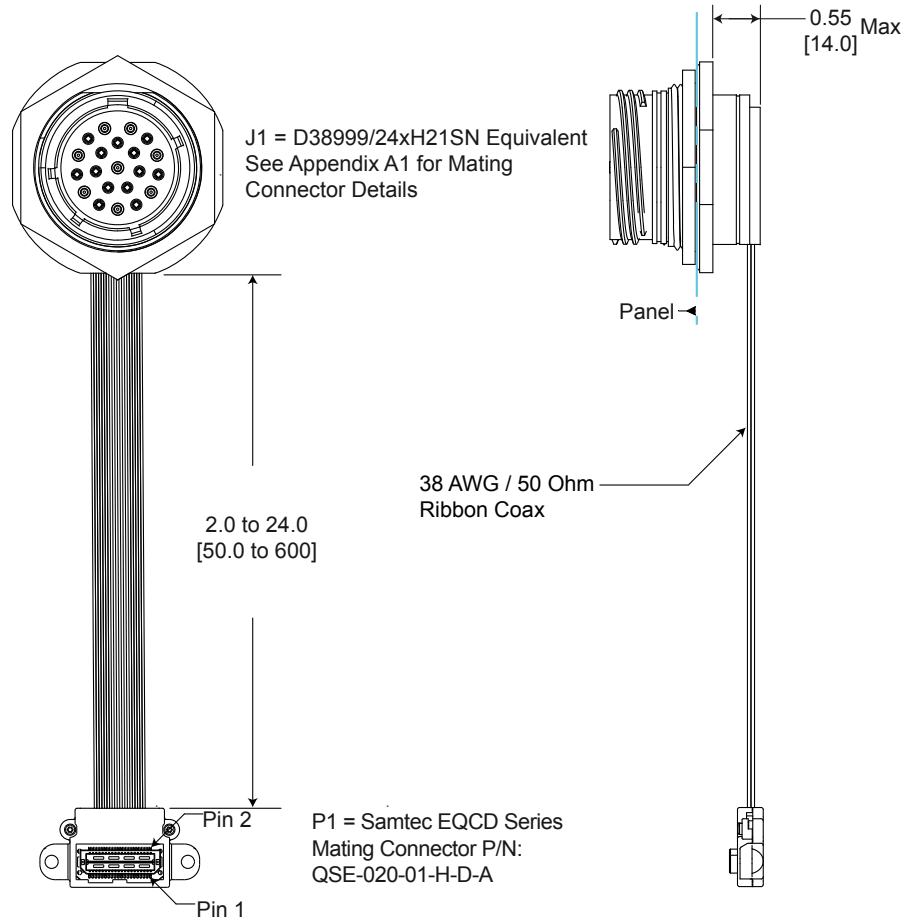
\*see page 6 for part number / cable length options and page 12 for complete ordering options

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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## OUTLINE DRAWING

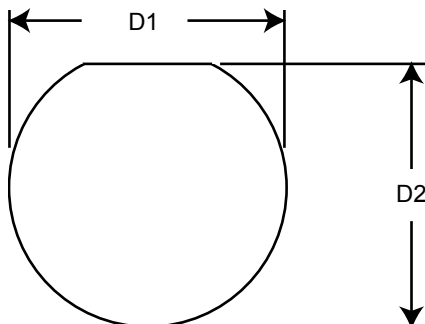
### Jam Nut Option

Dimensions are shown as: inches [mm]



### Panel Cutout Dimensions

Shell Size Code	Shell Size	D1 Min	D2 Min
H	23	1.635 [41.53]	1.585 [40.26]



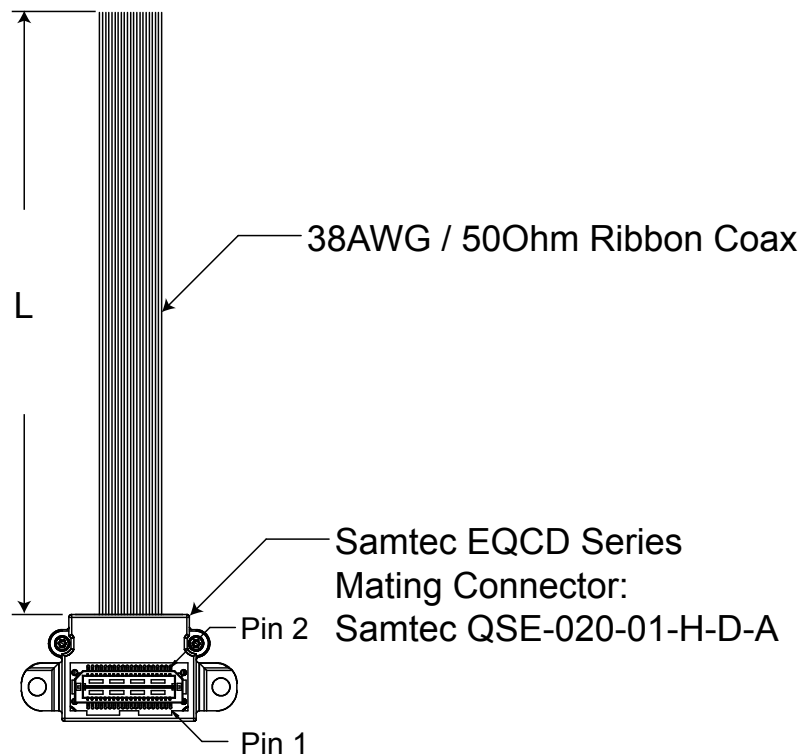
Part Number = \*P38J-xxxx-Hx-Lxxx

\*see page 6 for part number / cable length options and page 12 for complete ordering options

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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## OUTLINE DRAWING

Cable Length Options



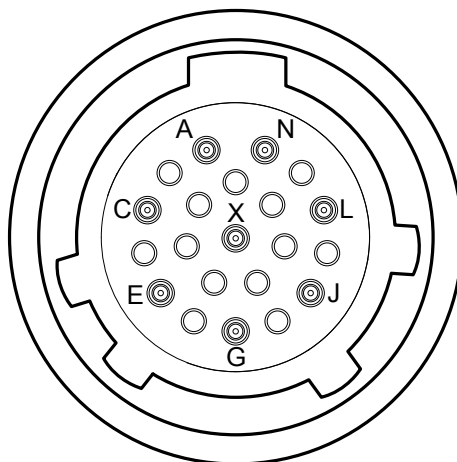
### Ribbon Coax Cable Length Options

L (mm) +/- 6.0	ITEM #
50	xxxx-xxxx-xx-L050
100	xxxx-xxxx-xx-L100
150	xxxx-xxxx-xx-L150
200	xxxx-xxxx-xx-L200
250	xxxx-xxxx-xx-L250

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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## J1 D38999 PIN and PORT ASSIGNMENTS

### TOP Optical Interface



Front view of the D38999 optical insert shown, fiber optic cable plug opposite - see Appendix A1 for details

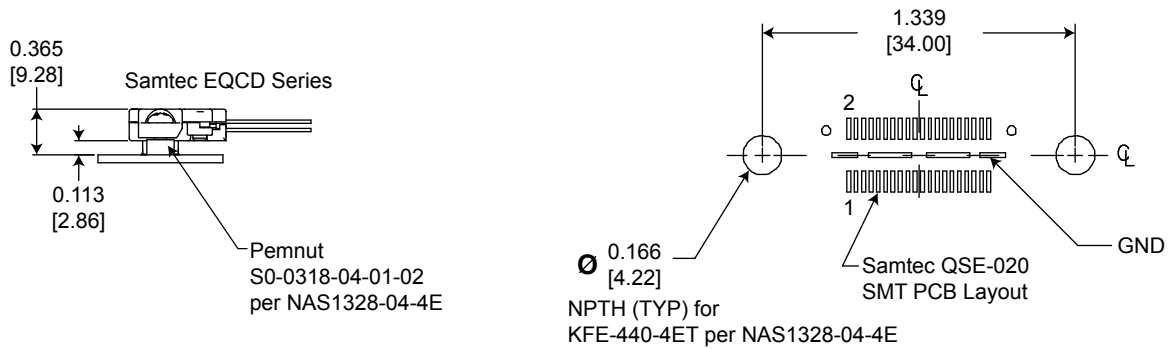
### MIL-DTL-38999 OPTICAL INTERFACE

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

Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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**PRINTED CIRCUIT BOARD FOOTPRINT**

All dimensions shown are for reference only: inches [mm]



**SAMTEC EQCD PIN ASSIGNMENTS - Continued on the next page**

ELECTRICAL			PORT #	OPTICAL	
PIN #	FUNCTION	LOGIC FAMILY		PIN #	FUNCTION
1	NC	N/A	N/A	N/A	N/A
2	GND	NA	0-3	ALL	NA
3	RXD-	RS-422	0	A	RX
4	NC	NA	NA	NA	NA
5	RXD+	RS-422	0	A	RX
6	NC	N/A	N/A	N/A	N/A
7	TXD-	RS-422	0	N	TX
8	V <sub>cc</sub>	NA	0-3	ALL	NA
9	TXD+	RS-422	0	N	TX
10	V <sub>cc</sub>	NA	0-3	ALL	NA
11	NC	N/A	N/A	N/A	N/A
12	GND	NA	0-3	ALL	NA
13	RXD-	RS-422	1	C	RX
14	NC	NA	NA	NA	NA
15	RXD+	RS-422	1	C	RX
16	NC	NA	NA	NA	NA
17	TXD-	RS-422	1	L	TX
18	V <sub>cc</sub>	NA	0-3	ALL	NA
19	TXD+	RS-422	1	L	TX
20	V <sub>cc</sub>	NA	0-3	ALL	NA

Center slug is Ground.

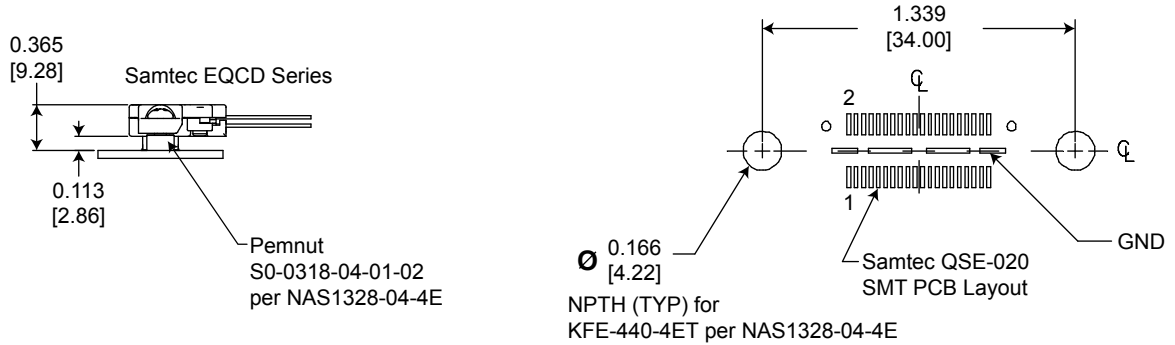
All RS-422 functions are internally AC coupled with 100Ω differential terminations.



Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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**PRINTED CIRCUIT BOARD FOOTPRINT**

All dimensions shown are for reference only: inches [mm]



**Samtec EQCD PIN ASSIGNMENTS - Continued from the previous page**

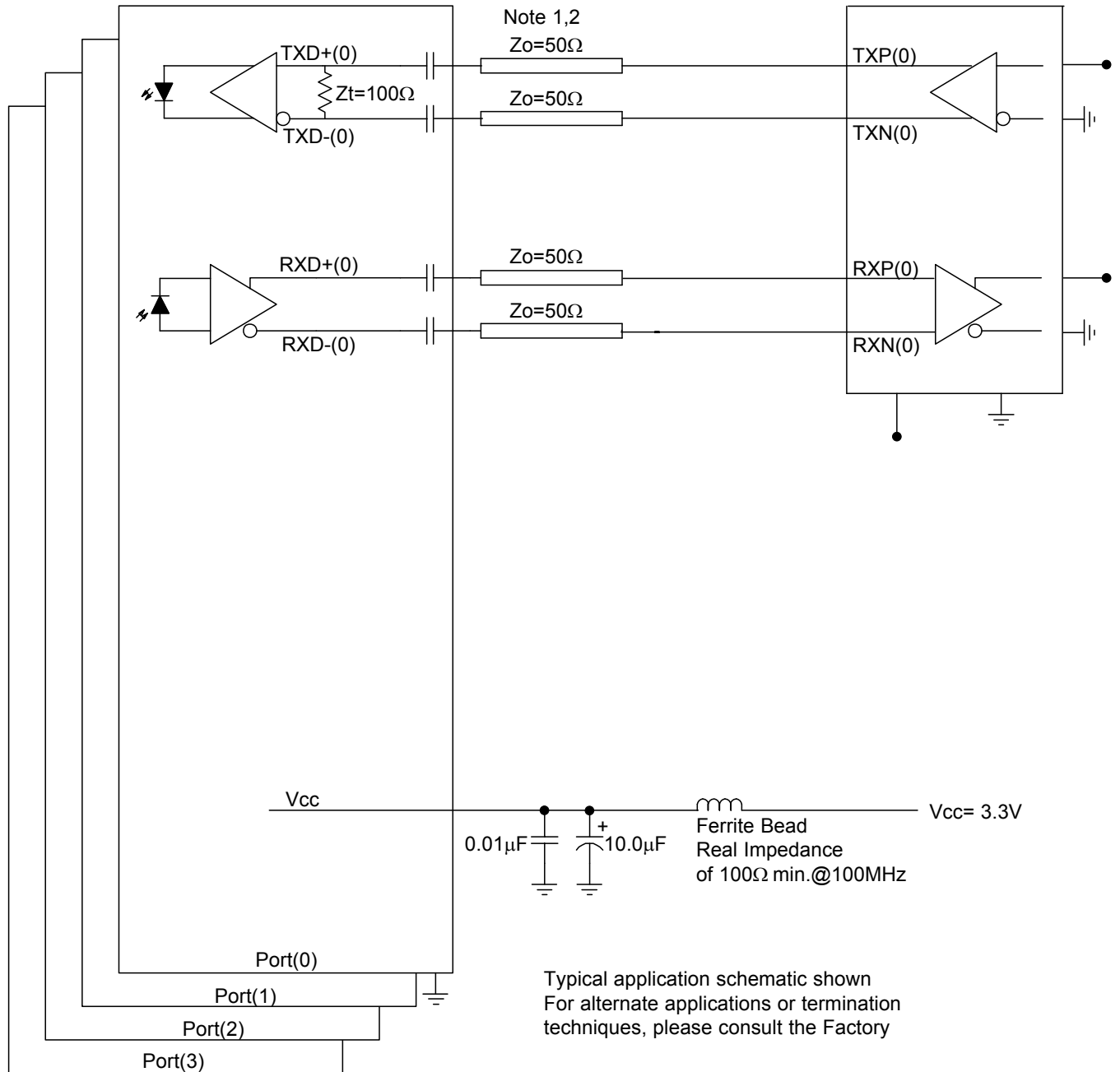
ELECTRICAL			PORT #	OPTICAL	
PIN #	FUNCTION	LOGIC FAMILY		PIN #	FUNCTION
21	NC	NA	NA	NA	NA
22	GND	NA	0-3	ALL	ALL
23	RXD-	RS-422	2	E	RX
24	NC	NA	NA	NA	NA
25	RXD+	RS-422	2	E	RX
26	NC	NA	NA	NA	NA
27	TXD-	RS-422	2	J	TX
28	V <sub>cc</sub>	NA	0-3	ALL	ALL
29	TXD+	RS-422	2	J	TX
30	V <sub>cc</sub>	NA	0-3	ALL	All
31	NC	NA	NA	NA	NA
32	GND	NA	0-3	ALL	ALL
33	RXD-	RS-422	3	X	RX
34	NC	NA	NA	NA	NA
35	RXD+	RS-422	3	X	RX
36	NC	NA	NA	NA	NA
37	TXD-	RS-422	3	G	TX
38	V <sub>cc</sub>	NA	0-3	ALL	ALL
39	TXD+	RS-422	3	G	TX
40	V <sub>cc</sub>	NA	0-3	ALL	ALL

Center slug is Ground.

All RS-422 functions are internally AC coupled with 100Ω differential terminations.

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**APPLICATION SCHEMATIC**

**Optical Transceiver**



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Quad Port Lightning Series MIL-DTL-38999 Optical Transceiver,  
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## APPENDIX A1

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

\*See DSCC or SAE QPL for Approved Suppliers

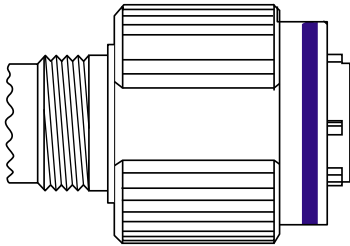
<http://www.dscclia.mil/programs/qmlqpl/QPLdetail.asp?QPL=38999>

#### \*D38999 PLUG - PIN INSERT

##### MIL-DTL-38999 CABLE PLUG

MS PLUG P/N

\*D38999/26WH21PN

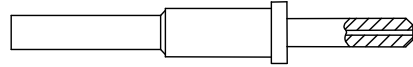


#### \*FIBER OPTIC PIN TERMINUS

##### MIL-T-29504 PIN TERMINUS

MS PIN TERMINUS P/N

\*M29504/04-xxxx\*\*



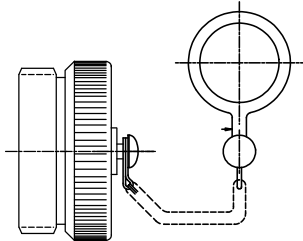
\*\*defined by fiber optic cable configuration

#### \*CABLE PROTECTION CAP

##### D38999/32 PLUG PROTECTION CAP

MS PLUG CAP P/N

\*D38999/32W23N



#### D38999 PLUG PORT FUNCTIONS

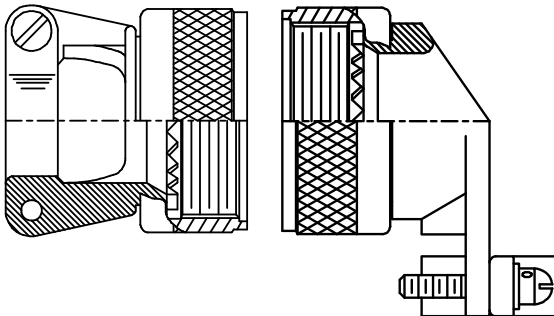
PORT NUMBER	TX	RX
0	J	L
1	N	G
2	X	A
3	E	C

#### \*CABLE BACKSHELL

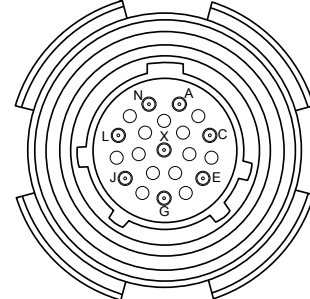
##### MIL-C-85049 CABLE BACKSHELL

MS BACKSHELL P/N

\*MS85049/xxxxxx\*\*

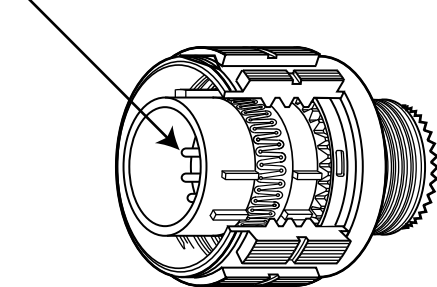


TOP  
Optical Cable Plug Interface



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

Pin Termini



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

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## APPENDIX A2

### PART NUMBER OPTIONS

Quad Port, Square Flange, 850nm

**P38** **X** - **8** **S** **1** **2** - **H** **X** **X** - **L**

Shell Configuration

P38= 38999 Receptacle

Shell Configuration

F = Square Flange

J = Jam Nut

# Channels (TX+RX)

8= 4TX + 4RX

Wavelength

S= 850nm

Cable Mode

1= Multimode

Fiber Optic Interface

2 = 1.0Mbps - 16.0Mbps

Shell Size Code

H = 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

Electrical Interface

L = Ribbon Coax to  
Samtec EQCD Series  
- Cable Length TBD



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