

## EXCALIBUR SERIES

MIL-DTL-38999 OPTICAL TRANSPONDER, XAUI TO 10GBASE-SR  
APPLICATIONS, MULTIMODE, 850 nM VCSELS



Excalibur series optical fiber transponders consist of optoelectronic transmitter and receiver functions integrated into a bulkhead mounted MIL-DTL-38999, series III receptacle connector along with the 10 Gbps / XAUI SerDes functions. The optical transmitters are 850 nM VCSEL lasers.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. The XAUI electrical interface to the Excalibur series optical fiber transponders is a Samtec controlled impedance connector enabling interface to a backplane, module card or motherboard.

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

# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

Single Port, Square Flange  
MIL-DTL-38999 Optical to Samtec SMT Electrical

## FEATURES

- Suitable for 10GBASE-SR / SRL 10G Ethernet applications @ 10.3125 Gbps
- Optical fiber link distances up to 300 meters (50 / 125µ 2,000 MHz\*Km MMF)
- Maximum optical channel bit error rate less than  $1 \times 10^{-12}$
- Operating temperature range from -40° to +70° C
- Shock, vibration and immersion resistant per MIL-STD-810 and MIL-STD-1344
- Aluminum alloy D38999 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

Excalibur series bulkhead mounted optical transponders enable extremely high speed network communications over long distances in harsh environments.

- 10 Gigabit Ethernet switches and peripherals
- Serial data links
- Video displays

The D38999, 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.

### ORDERING INFORMATION

Application	Part Number
Single Port, XAUI to 10GBase-SR	E38F-2SCK-BF-Lxxx

See page 7 for standard part number / cable length 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		+6.0	V

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	$T_A$	-40		+70	°C
Supply Voltage	$V_{cc}$	+4.75		+5.25	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

## CONNECTOR INTERFACE SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883	ESD	Class II	2200 V
MIL-STD-810	Vibration	3.8 g <sup>2</sup> / Hz	43 G rms
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
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

## MATERIALS

Item	Detail	Notes
Housing and Shell	Aluminum Alloy	
Housing and Shell Plating	Electroless Nickel	
Insert	Thermoplastic	
Interfacial Seal	Elastomer	
Optical Ferrules	Ceramic	
Printed Circuits	Polyimide / FR-4	

# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

## OPTICAL TRANSMITTERS $T_A = \text{OPERATING TEMPERATURE RANGE, } V_{CC} = 4.75 \text{ V TO } 5.25 \text{ V}$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power (BER < 10 <sup>-12</sup> )	$P_O$	-5.0		-1.0	dBm
Optical Output Wavelength	$\lambda_{OUT}$	840	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.45	nM
Extinction Ratio	ER	3.0	5.5		dB

## OPTICAL RECEIVERS $T_A = \text{OPERATING TEMPERATURE RANGE, } V_{CC} = 4.75 \text{ V TO } 5.25 \text{ V}$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity (BER < 10 <sup>-12</sup> )	$P_I$	-11.1		0.0	dBm
Optical Wavelength	$\lambda_{IN}$	840		860	nM

## ELECTRICAL AC CHARACTERISTICS $T_A = \text{OPERATING TEMPERATURE RANGE, } V_{CC} = 4.75 \text{ V TO } 5.25 \text{ V}$

Parameter	Symbol	Minimum	Typical	Maximum	Unit
XAUI Input/Output Baud Rate - TXLANE[0..3] and RXLANE[0..3]	$R_{XAUI IN / OUT}$		3.125		Gbit/s
Baud Rate Variation	$R_{XAUI IN / OUT}$	-100		100	ppm
Differential Input / Output Impedance	$Z_{XAUI IN / OUT}$	80	100	120	$\Omega$
Input Differential Skew	$t_{SKEW IN}$			75	ps
Output Differential Skew	$t_{SKEW OUT}$			15	ps

## POWER SUPPLY CURRENT $T_A = \text{OPERATING TEMPERATURE RANGE, } V_{CC} = 4.75 \text{ V TO } 5.25 \text{ V}$

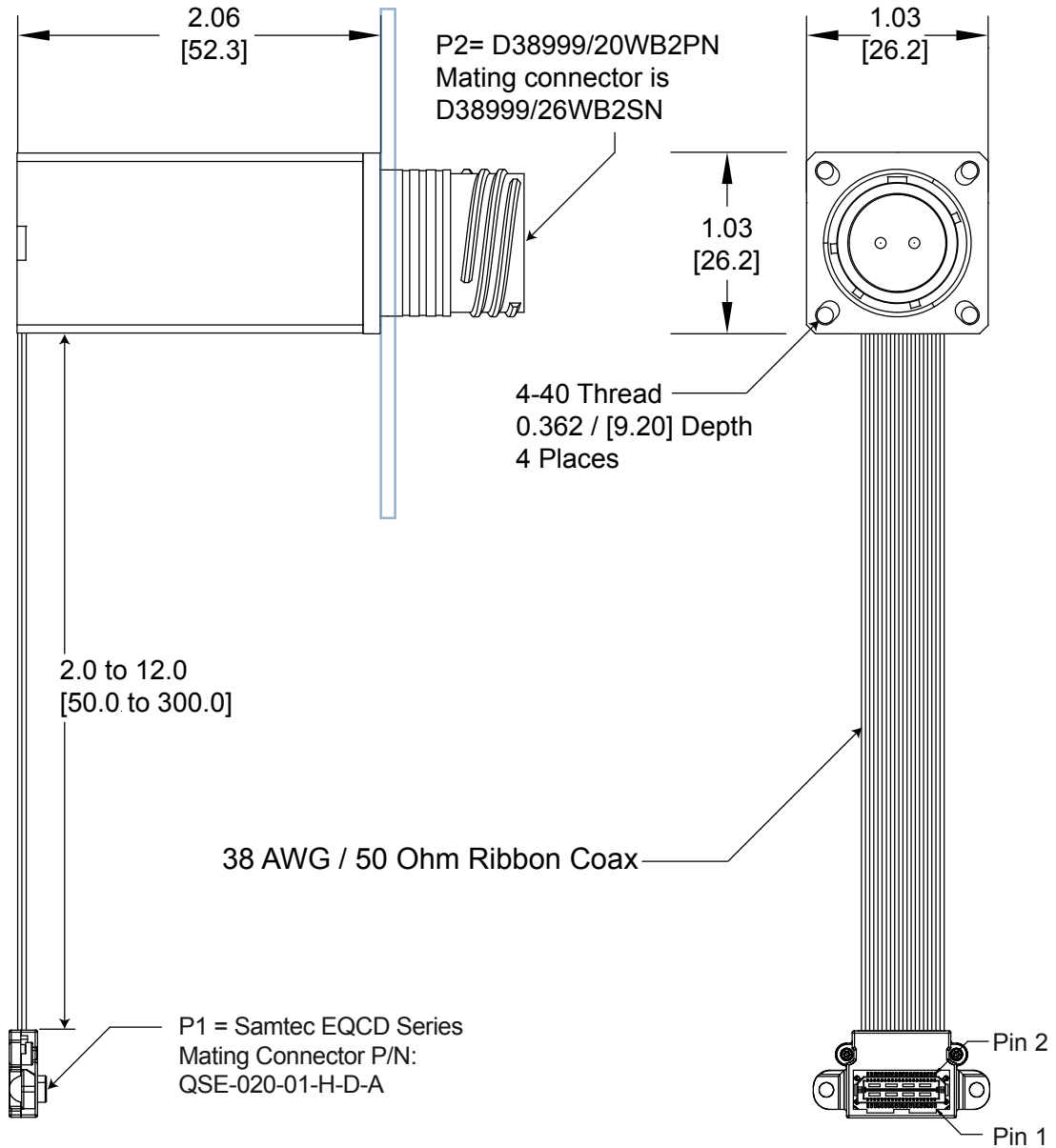
Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current Per Port	$I_{OCT}$		380	450	mA

## OPTICAL LINK DISTANCES

Cable Type	62.5 / 125 $\mu$ 160 MHz*Km	62.5 / 125 $\mu$ 200 MHz*Km	50 / 125 $\mu$ 400 MHz*Km	50 / 125 $\mu$ 500 MHz*Km	50 / 125 $\mu$ 2000 MHz*Km
Maximum Supported Link Distance - Meters	26	33	66	82	300

**SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL  
TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS,  
MULTIMODE, 850 NM VCSELS**

**OUTLINE DRAWING**



Dimensions are shown as: inches [mm]

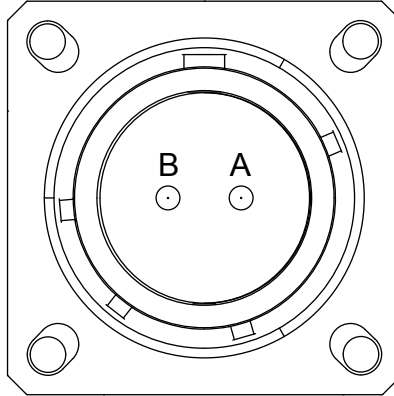
Part Number = \*E38F-2SCK-Bx-Lxxx

\*See page 7 for part number / cable length options and page 11 for complete ordering options.

# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

## OPTICAL TRANSPONDER INSERT ARRANGEMENT

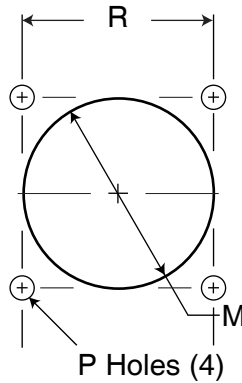
TOP  
Optical Interface



Front face of the optical transponder insert shown, fiber optic cable plug opposite - see Appendix A1 for details.

## OPTICAL TRANSPONDER PORT ASSIGNMENTS

Port Number	TX	RX
0	B	A

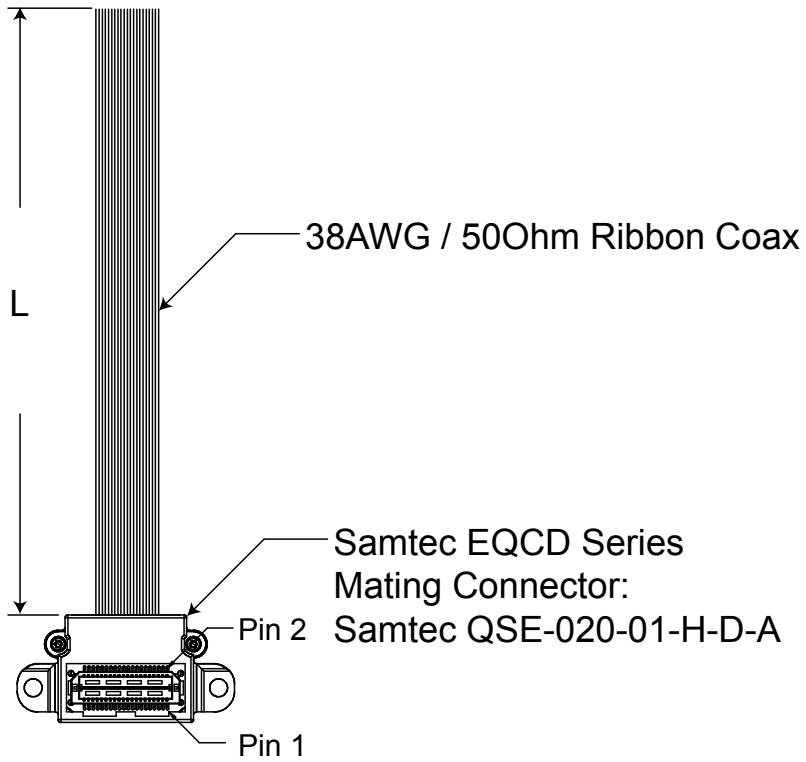


## PANEL CUTOUT DIMENSIONS - REAR PANEL MOUNTING ONLY

Shell Size Code	Shell Size	M Hole	P Holes	R Bsc
B	11	0.812 (20.62)	0.133 (3.4) 0.123 (3.1)	0.812 (20.62)

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**OUTLINE DRAWING CABLE LENGTH OPTIONS**

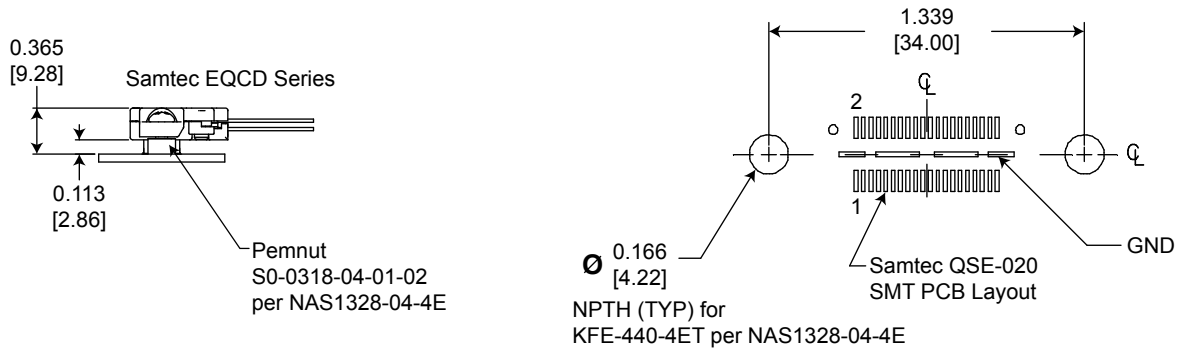


**RIBBON COAX CABLE LENGTH OPTIONS**

L (mm) ± 6.0	Item Number
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

# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

## PRINTED CIRCUIT BOARD FOOTPRINT FOR SAMTEC QSE-020 - CONTINUED ON PAGE 9



Dimensions are shown as: inches [mm]

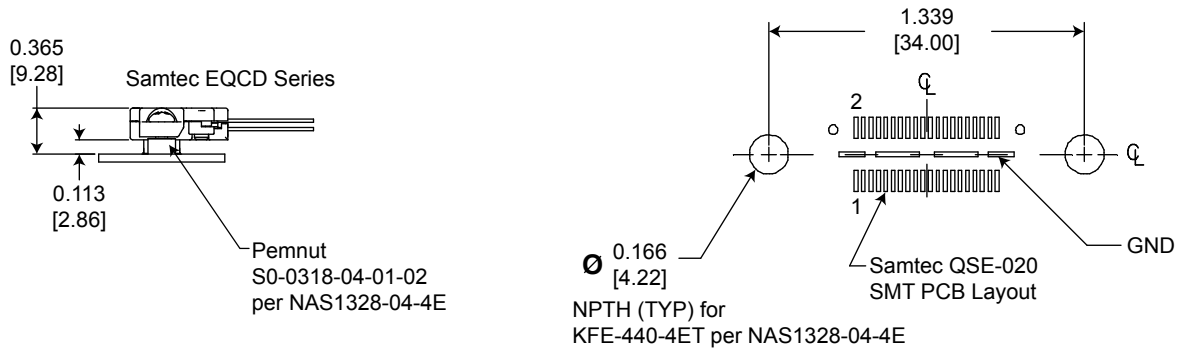
## ELECTRICAL PIN ASSIGNMENTS - CONTINUED ON PAGE 9

Pin	Symbol	Port	Lane	I/O	+/-	Description	Logic Family
1	XAUI(0)_IN(0)_P	0	0	I	+	XAUI TX Lane 0 +	AC-Coupled, Internally Biased Differential XAUI
2	XAUI(0)_OUT(0)_P	0	0	O	+	XAUI TX Lane 0 +	AC-Coupled, Internally Biased Differential XAUI
3	XAUI(0)_IN(0)_N	0	0	I	-	XAUI TX Lane 0 -	AC-Coupled, Internally Biased Differential XAUI
4	XAUI(0)_OUT(0)_N	0	0	O	-	XAUI TX Lane 0 -	AC-Coupled, Internally Biased Differential XAUI
5	XAUI(0)_IN(1)_P	0	1	I	+	XAUI TX Lane 1 +	AC-Coupled, Internally Biased Differential XAUI
6	XAUI(0)_OUT(1)_P	0	1	O	+	XAUI TX Lane 1 +	AC-Coupled, Internally Biased Differential XAUI
7	XAUI(0)_IN(1)_N	0	1	I	-	XAUI TX Lane 1 -	AC-Coupled, Internally Biased Differential XAUI
8	XAUI(0)_OUT(1)_N	0	1	O	-	XAUI TX Lane 1 -	AC-Coupled, Internally Biased Differential XAUI
9	XAUI(0)_IN(2)_P	0	2	I	+	XAUI TX Lane 2 +	AC-Coupled, Internally Biased Differential XAUI
10	XAUI(0)_OUT(2)_P	0	2	O	+	XAUI TX Lane 2 +	AC-Coupled, Internally Biased Differential XAUI
11	XAUI(0)_IN(2)_N	0	2	I	-	XAUI TX Lane 2 -	AC-Coupled, Internally Biased Differential XAUI
12	XAUI(0)_OUT(2)_N	0	2	O	-	XAUI TX Lane 2 -	AC-Coupled, Internally Biased Differential XAUI
13	XAUI(0)_IN(3)_P	0	3	I	+	XAUI TX Lane 3 +	AC-Coupled, Internally Biased Differential XAUI
14	XAUI(0)_OUT(3)_P	0	3	O	+	XAUI TX Lane 3 +	AC-Coupled, Internally Biased Differential XAUI
15	XAUI(0)_IN(3)_N	0	3	I	-	XAUI TX Lane 3 -	AC-Coupled, Internally Biased Differential XAUI
16	XAUI(0)_OUT(3)_N	0	3	O	-	XAUI TX Lane 3 -	AC-Coupled, Internally Biased Differential XAUI
17	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
18	VPX_5VDC	N/A	N/A	I	+	+4.75 to +5.25 VDC	N/A
19	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
20	VPX_5 VDC	N/A	N/A	I	+	+4.75 to +5.25 VDC	N/A
21	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
22	TX_DIS	0	N/A	I	+	TX_Dis Port 0	Open Drain CMOS, 3.3 VDC = TX_OFF / Low=TX_ON
23	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
24	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
25	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
26	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
27	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
28	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
29	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
30	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A



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## PRINTED CIRCUIT BOARD FOOTPRINT FOR SAMTEC QSE-020 - CONTINUED FROM PAGE 8



Dimensions are shown as: inches [mm]

## ELECTRICAL PIN ASSIGNMENTS - CONTINUED FROM PAGE 8

Pin	Symbol	Port	Lane	I/O	+/-	Description	Logic Family
31	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
32	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
33	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
34	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
35	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
36	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
37	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
38	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
39	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A
40	GND	N/A	N/A	N/A	N/A	Isolated Signal Ground	N/A

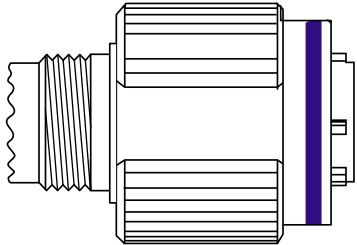
# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

## APPENDIX A1 MIL-DTL-38999 FIBER OPTIC CABLE PLUG / MIL-T-29504 RECEPTACLE TERMINI

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

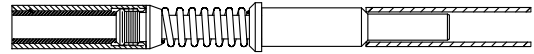
### \*D38999 PLUG - RECEPTACLE INSERT MIL-DTL-38999 CABLE PLUG

MS Plug P/N \*D38999 / 26WB02SN



### \*FIBER OPTIC TERMINUS M29504 RECEPTACLE TERMINUS

Receptacle \*M29504 / 05-xxxx\*\*



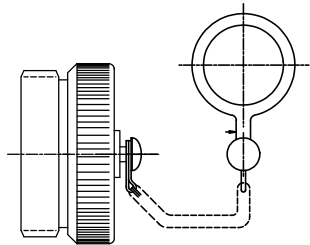
\*\*Defined by fiber optic cable configuration

### D38999 PLUG PORT FUNCTIONS

Port Number	TX	RX
0	B	A

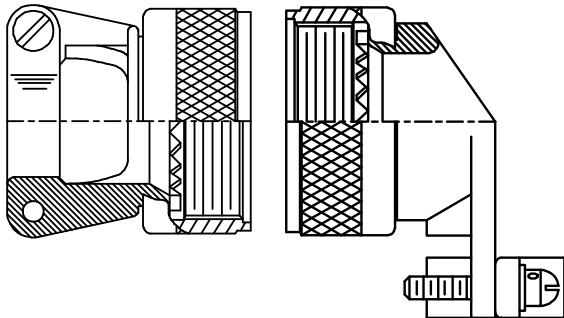
### \*CABLE PROTECTION CAP D38999 / 32 PLUG PROTECTION CAP

MS Plug Cap P/N \*D38999 / 32W11N



### \*CABLE BACKSHELL MIL-C-85049 CABLE BACKSHELL

MS Backshell P/N \*MS85049 / XXXXXX\*\*



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

# SINGLE PORT EXCALIBUR SERIES MIL-DTL-38999 OPTICAL TRANSPONDER, 10GBASE-SR ETHERNET APPLICATIONS, MULTIMODE, 850 NM VCSELS

## APPENDIX A2 PART NUMBER OPTIONS

### SINGLE PORT, SQUARE FLANGE, VCSEL

**E38 F - 2 S C K - B x x - L**

PRODUCT CONFIGURATION

**E38** = Excalibur Series

SHELL CONFIGURATION

**F** = Square Flange

# CHANNELS (TX + RX)

**2** = 1 TX + 1 RX

WAVELENGTH

**S** = 850 nM

POWER SUPPLY

**C** = +5 VDC

FIBER OPTIC INTERFACE

**K** = 10 Gbps

SHELL SIZE CODE

**B** = 11-02

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

Other wavelength, mounting and port count options are available.

Please consult the Protokraft website for alternate configurations.



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