



# MIL-SxF-LT11x

## MILITARY SFF OPTICAL TRANSCEIVER

Fast Ethernet Applications

3.3V, 1310nm LED, Multimode, Up to 2.0Km

### FEATURES

- Industry standard MSA 2x5 footprint
- IPC Class III assembly and construction
- Industrial Temp range -40C to +85C operational
- All metal construction for rugged environments
- Optional Parylene C conformal coating
- LVTTTL RX Signal Detect pin
- RX data squelch on RX Signal Detect deassert
- Separate +3.3 V power pins per TX/RX port
- Industry standard duplex multimode LC receptacle
- Full compliance to IEEE and FDDI requirements
- EN-60825/ IEC-825 / CDRH Class 1 Compliant

### APPLICATIONS

The MIL-SxF-LT11x multimode glass optical fiber transceivers provide low profile, cost effective solutions for Fast Ethernet multimode (up to 2.0 Km) optical fiber data links with a duplex LC connector interface.

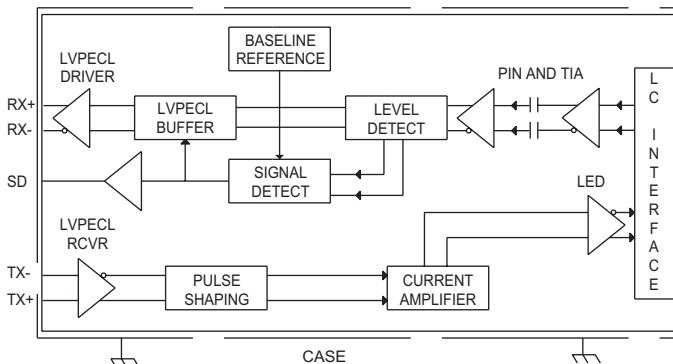
These transceivers are fully compliant with the IEEE 802.3u Fast Ethernet standard but can be used for any other data communications purpose within their operating parameters.

### DESCRIPTION

The optic transceivers consist of transmitter and receiver functions combined in an Low Profile module. The optical transmitter is a high output 1310nm LED. The transmitter input lines are driven with differential LVPECL signals applied to the Transmit (TX+ and TX-) pins. These signals are internally converted to a suitable modulation current by a CMOS integrated circuit.

The optical receivers consist of PIN and Preamplifier assemblies and CMOS limiting post-amplifier integrated circuits. Outputs from the receivers consist of differential LVPECL data signals on the Receive (RX+ and RX-) pins and a single ended LVTTTL signal detect function on the Signal Detect (SD) pin. The RX data is squelched (JAM) upon Signal Detect deassert to prevent garbage data output when no optical signal is present.

### BLOCK DIAGRAM



### ORDERING INFORMATION

**MIL - S X F - L T 1 1 X**

Product Family	Shell Options	Application	Optical Wavelength	Signal Detect	Power Supply	Fiber Type	Temperature and Coating
<b>MIL-S=</b> Military SFF (IPC Class III)	<b>N=</b> No GND Tabs (Flat Shell)	<b>F=</b> Fast Ethernet	<b>L=</b> 1310 nm	<b>T=</b> LVTTTL	<b>1=</b> 3.3 VDC	<b>1=</b> Multimode	<b>H=</b> -40 to 85 C, No Coating
	<b>T=</b> GND Tabs						<b>M=</b> -40 to 85 C, Conformal Coating

**MIL - S \_ F - L T 1 1 \_**

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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
Lead Soldering Temperature	$T_{SOLD}$			+260	°C
Lead Soldering Time	$t_{SOLD}$			10	Seconds
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
Output Current	$I_o$			50	mA

## RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature Limit	$T_A$	-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
RX Data Output Load	$R_L$		50		Ohms

## CONFORMAL COATING (MIL-SNF-LT11M and MIL-STF-LT11M only)

Parameter	Value
Specification	MIL-I-46058C, Type XY
Coating:	Parylene type C
Deposition:	Vacuum deposited
Film Thickness:	1 MIL +/- 0.0002

## LINK DISTANCES

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



7444 West Wilson Avenue, Chicago, IL 60706 USA  
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## TRANSMITTERS

VCCTX = 3.15V to 3.45V,  $T_A$  = Operating Temperature Range

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power <sup>1</sup>	$P_o$	-19.0		-14.0	dBm
Optical Output Center Wavelength	$\lambda_{OUT}$	1285	1310	1355	nm
Spectral Width	$\Delta\lambda_{RMS}$ $\Delta\lambda_{FWHM}$			63 175	nm
Extinction Ratio	ER	13			dB
Supply Current	$I_{CC}$		120	160	mA
Optical Rise / Fall Time	$t_{R,F}$			3.0	ns

1. BER=10<sup>-10</sup> @ 125Mbps, PRBS 2<sup>7</sup>-1, NRZ, Compliant with FDDI PMD ISO / IEC 9314-3 and IEEE-802.3u testing with 62.5 MM Fiber.

## RECEIVERS

VCCR<sub>X</sub> = 3.15V to 3.45V,  $T_A$  = Operating Temperature Range

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Sensitivity <sup>1</sup>	$P_i$	-32.0		-8.0	dBm
Optical Wavelength	$\lambda_{IN}$	1260		1380	nm
Supply Current	$I_{CC}$		70	120	mA
Signal Detect Assert Time	$t_{SDAS}$		<10	100	$\mu$ S
Signal Detect Deassert Time	$t_{SDDA}$		<10	350	$\mu$ S
Signal Detect Threshold <sup>2</sup>					
Decreasing Light	LSTD	-45.0		-32.5	dBm
Increasing Light	LSTI	-45.0		-32.0	dBm
Signal Detect Hysteresis	HYS	0.5	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

1. BER=10<sup>-10</sup> @ 125Mbps, PRBS 2<sup>7</sup>-1, NRZ, Compliant with FDDI PMD ISO / IEC 9314-3 and IEEE-802.3u testing with 62.5 MM Fiber

2. RX Data outputs are squelched when Signal Detect is deasserted to prevent garbage data output when no optical signal is present. .

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Fast Ethernet Applications

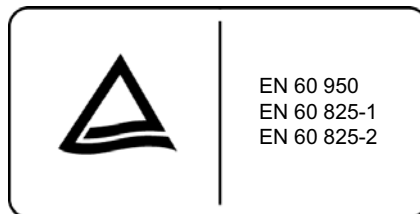
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## REGULATORY COMPLIANCE

Requirement	Feature	Condition	Notes
MIL-STD-883-3015.7	ESD	Class II	2200V
IEC-801-2	ESD	Human Body Model	25KV
IEC-801-3	EMI	Immunity	10V/M
FCC	EMI	Class B	>20dB
EN 55022 (CISPR 22A)	EMI	Class B	10V/M
IEC-825 Issue 1993-11	Eye Safety	Class 1	TUV Certificate Number PENDING
FDA CDRH 21-CFR 1040	Eye Safety	Class 1	CDRH Accession Number PENDING



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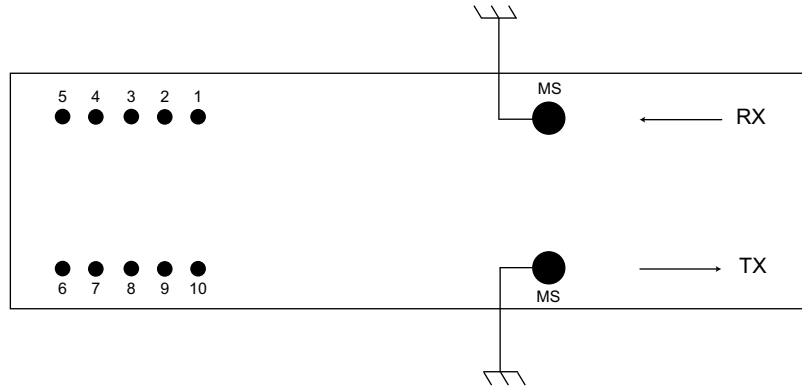
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## MILITARY SMALL FORM FACTOR TRANSCEIVER PIN NUMBER ASSIGNMENTS TOP VIEW SHOWN



### PIN FUNCTIONS

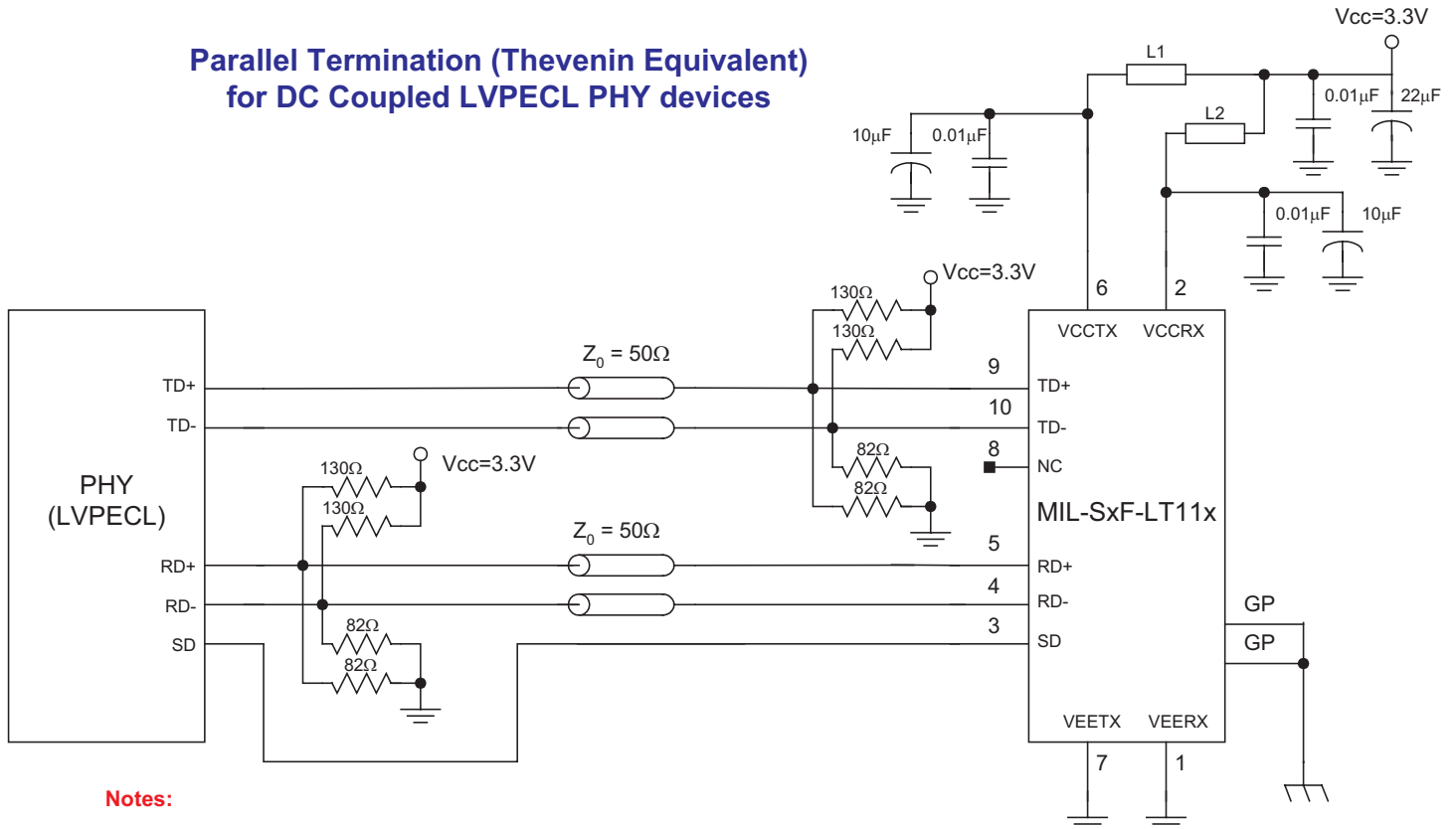
Pin Number	Symbol	Description	Logic Family
MS	MS	Mounting Studs Connect to chassis ground	N/A
1	VEERX	Receiver Signal Ground	N/A
2	VCCR <sub>X</sub>	Receiver Power Supply	N/A
3	SD	Signal Detect (1= detect, 0= no signal)	LVTTTL
4	RD-	Receive Data Out -	LVPECL
5	RD+	Receive Data Out +	LVPECL
6	VCCT <sub>X</sub>	Transmit Power Supply	N/A
7	VEET <sub>X</sub>	Transmit Signal Ground	N/A
8	N/C	No Connect	N/A
9	TD+	Transmit Data In +	LVPECL
10	TD-	Transmit Data In -	LVPECL

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## Parallel Termination (Thevenin Equivalent) for DC Coupled LVPECL PHY devices



**Notes:**

- 1) L1 and L2 = MuRata BLM21A601S or equivalent (600Ω at 100MHz or better).
- 2) Place LVPECL termination resistors (130 / 82 ohms) as close as possible to termination points.
- 3) Route the differential pairs (TD +/- and RD +/-) together using 50 ohm impedance matched traces.
- 4) Other DC coupled LVPECL termination techniques are also valid.
- 5) Use separate power supply filtering for VCCRX and VCCTX, as shown.
- 6) Ground Posts (GP) are isolated from Signal Ground (Vee), and may be connected to Chassis Ground (as shown) or to Signal Ground if a Chassis Ground is not available.



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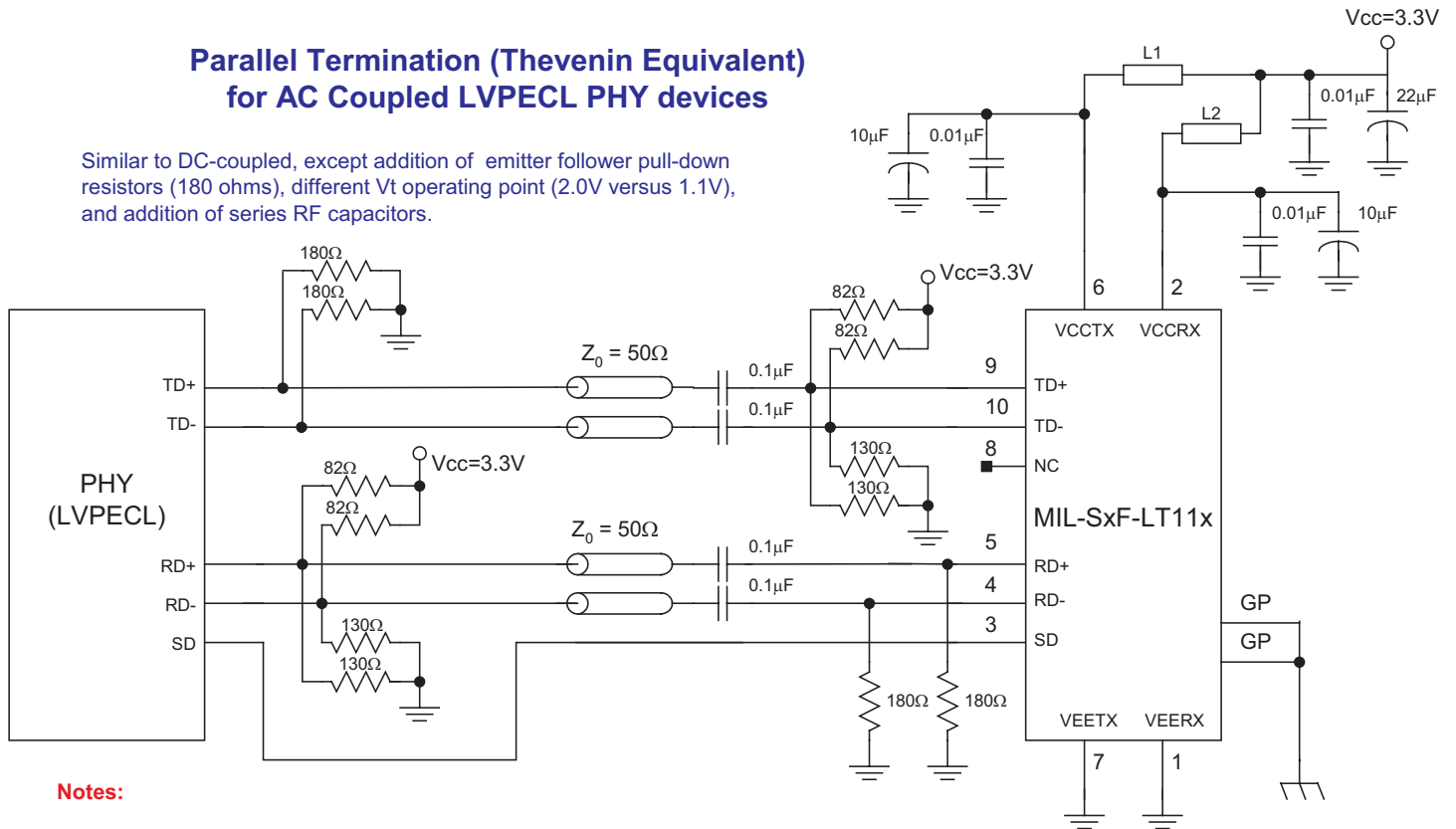
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## Parallel Termination (Thevenin Equivalent) for AC Coupled LVPECL PHY devices

Similar to DC-coupled, except addition of emitter follower pull-down resistors (180 ohms), different  $V_t$  operating point (2.0V versus 1.1V), and addition of series RF capacitors.



### Notes:

- 1) L1 and L2 = MuRata BLM21A601S or equivalent (600Ω at 100MHz or better).
- 2) Place LVPECL termination resistors (82 / 130 ohms) as close as possible to termination points. Place LVPECL emitter follower pull-down (180 ohms) as close as possible to source points.
- 3) Route the differential pairs (TD +/- and RD +/-) together using 50 ohm impedance matched traces.
- 4) Other AC coupled LVPECL termination techniques are also valid.
- 5) Use separate power supply filtering for VCCTX and VCCR, as shown.
- 6) Ground Posts (GP) are isolated from Signal Ground (Vee), and may be connected to Chassis Ground (as shown) or to Signal Ground if a Chassis Ground is not available.
- 7) Use low ESR capacitors, such as NPO or COG, for AC coupling of TD+/- and RD+/- signals.

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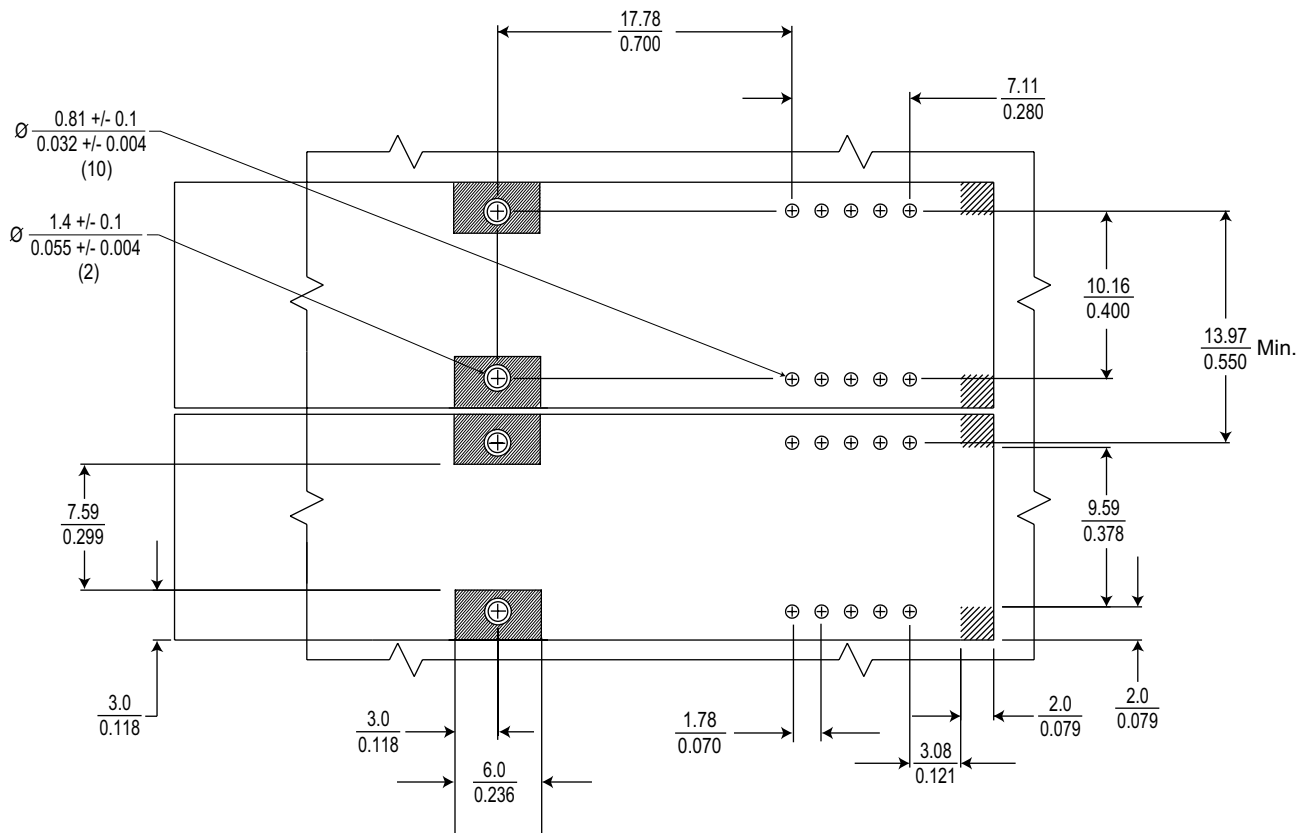
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## MSA 2x5 SFF TRANSCEIVER PRINTED CIRCUIT BOARD LAYOUT

Top View Shown

Dimensions Are Shown As:  $\frac{\text{mm}}{\text{inches}}$



CROSS-HATCHED AREAS SHOULD HAVE NO SIGNAL TRACES ON THE TOP LAYER



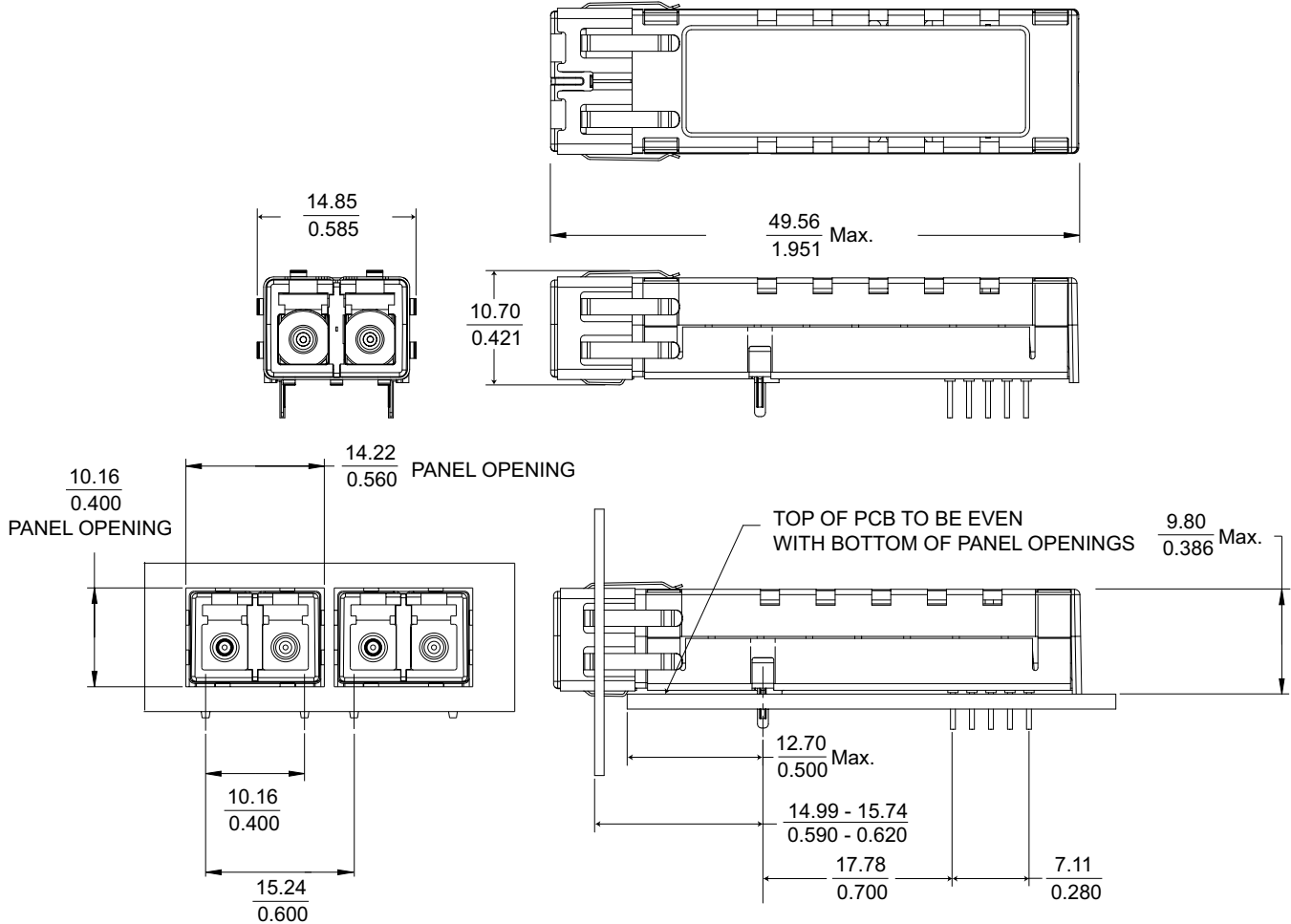
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## MSA 2 x 5 OUTLINE DIMENSIONS For 0.600" Center to Center Mounting Dimensions Are Shown As: $\frac{\text{mm}}{\text{inches}}$



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