

Multilayer Organic (MLO®)



High Pass Filters



The MLO® High Pass Filters are low profile passive devices with best in class performance based on AVX's patented multilayer organic high density interconnect technology. The MLO® High pass filters utilize high dielectric constant and low loss materials to realize high Q passive printed elements, such as inductors and capacitors, in a multilayer stack. This results in a high performance High Pass Filter design. MLO® High Pass Filters can support both a variety of frequency bands and multiple wireless standards, and are less than 1.0mm in thickness. All filters are expansion matched to most organic PCB materials, thereby resulting in improved reliability over standard silicon and ceramic devices.

FEATURES

- Wide Frequency Range
- Excellent Isolation
- Low Loss
- Expansion matched to PCB
- 50Ω Impedance
- Surface Mountable
- RoHS Compliant

APPLICATIONS

- Mobile Communication
- GPS
- Vehicle location systems
- Wireless LANs
- Satellite Receivers
- Instrumentation

LAND GRID ARRAY ADVANTAGES

- Inherent Low Profile
- Excellent Solderability
- Low Parasitics
- Better Heat Dissipation

HOW TO ORDER

HF	OB	A	1550	A	7	00
Series High Pass Filters	Case Size* OA = 2616 OB = 3116 OC = 3416 OD = 4016 OF = 5021	Type	Frequency in MHz	Reliability Level A = Standard	Termination 7 = Gold	Packaging Code 00 = Waffle Pack or Tray



For RoHS compliant products, please select correct termination style.

*Note: Other case sizes and frequencies available upon request.

QUALITY INSPECTION

Finished Parts are 100% electrically tested

TERMINATION

All finishes are compatible with automatic soldering technologies: Pb-free reflow, wave soldering, vapor phase, and manual soldering.

OPERATING TEMPERATURE

-55°C to +85°C

ELECTRICAL SPECIFICATIONS

AVX PN <small>(Click on PN for full part specifications)</small>	Passband (GHz)	Insertion Loss (dB)		Typical -3dB Cutoff Frequency (GHz)	Stopband Rejection Frequency (GHz) (DC - f)			Typ. VSWR	Rated RF Power (W)
		Typ.	Max		-20dB	-30dB	-40dB		
HF0DA0740A700	0.74 - 1.55	0.82	1.20	0.65	0.57	0.55	0.54	1.22:1	2.0
HF0BA0850A700	0.85 - 1.99	0.75	1.20	0.77	0.69	0.66	0.64	1.22:1	2.0
HF0BA0930A700	0.93 - 1.66	0.84	1.20	0.83	0.73	0.71	0.70	1.11:1	2.0
HF0BA0950A700	0.95 - 2.05	0.85	1.20	0.85	0.75	0.73	0.66	1.38:1	2.0
HF0BA1440A700	1.44 - 2.94	0.63	1.20	1.30	1.14	1.12	1.09	1.06:1	2.0
HF0BA1500A700	1.50 - 2.89	0.73	1.20	1.38	1.23	1.20	1.18	1.10:1	2.0
HF0BA1540A700	1.54 - 3.19	0.81	1.20	1.39	1.25	1.22	1.20	1.05:1	2.0
HF0BA1550A700	1.55 - 3.13	0.82	1.20	1.41	1.27	1.24	1.22	1.04:1	2.0
HF0BA1840A700	1.84 - 2.83	0.85	1.20	1.66	1.50	1.46	1.44	1.16:1	2.0

MECHANICAL DIMENSIONS inches (mm)

Case Size	Length	Width	Height
A 2616	0.259±0.010 (6.579±0.254)	0.157±0.010 (3.975±0.254)	Varies - see part specification
B 3116	0.306±0.010 (7.785±0.254)	0.156±0.010 (3.975±0.254)	Varies - see part specification
C 3416	0.342±0.010 (8.674±0.254)	0.157±0.010 (3.975±0.254)	Varies - see part specification
D 4016	0.401±0.010 (10.198±0.254)	0.156±0.010 (3.975±0.254)	Varies - see part specification
F 5021	0.512±0.010 (12.992±0.254)	0.207±0.010 (5.245±0.254)	Varies - see part specification

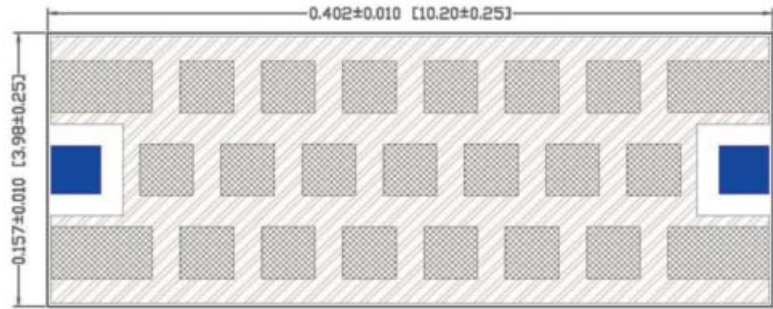
Click here to see detailed mechanical dimensions and pad layout.



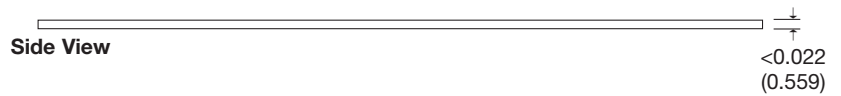
ELECTRICAL SPECIFICATIONS

Passband		
0.74 - 1.55 GHz	1.2 dB	Max
0.74 - 1.55 GHz	0.82 dB	Typ
-3dB Cutoff	0.65 GHz	Typ
VSWR	1.22:1	Typ
Stopband		
20 dB	DC - 0.57 GHz	Min
30 dB	DC - 0.55 GHz	Min
40 dB	DC - 0.54 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE D Inches (mm)



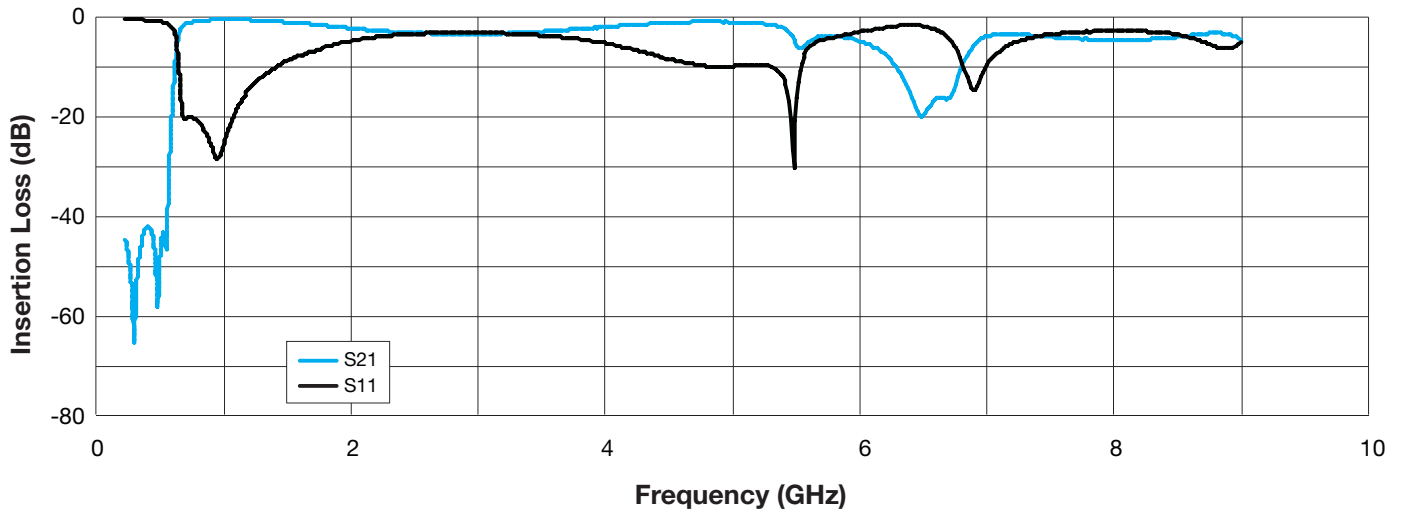
Bottom View



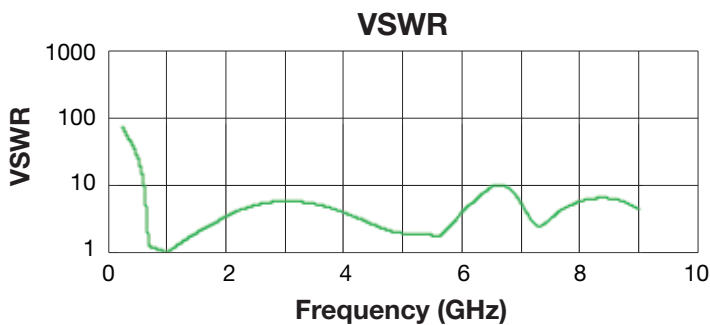
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
0.56	-40.71	15.44	-1.13
0.57	-30.83	13.46	-1.29
0.59	-20.06	10.11	-1.72
0.65	-2.94	1.86	-10.45
0.66	-1.99	1.41	-15.43
0.68	-1.47	1.23	-19.71
0.72	-1.00	1.23	-19.77
0.84	-0.49	1.17	-21.97
1.31	-0.50	1.72	-11.53
1.60	-1.01	2.43	-7.60
1.80	-1.54	3.11	-5.80

Multilayer Organic (MLO®)

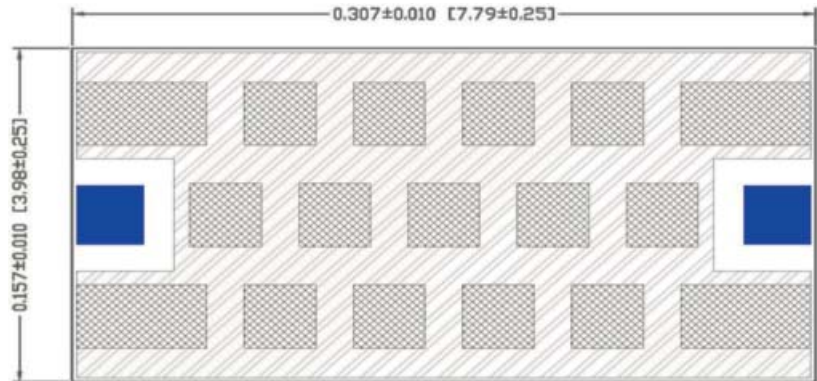


HF0BA0850A700

ELECTRICAL SPECIFICATIONS

Passband		
0.85 - 1.99 GHz	1.2 dB	Max
0.85 - 1.99 GHz	0.75 dB	Typ
-3dB Cutoff	0.77 GHz	Typ
VSWR	1.22:1	Typ
Stopband		
20 dB	DC - 0.69 GHz	Min
30 dB	DC - 0.66 GHz	Min
40 dB	DC - 0.64 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



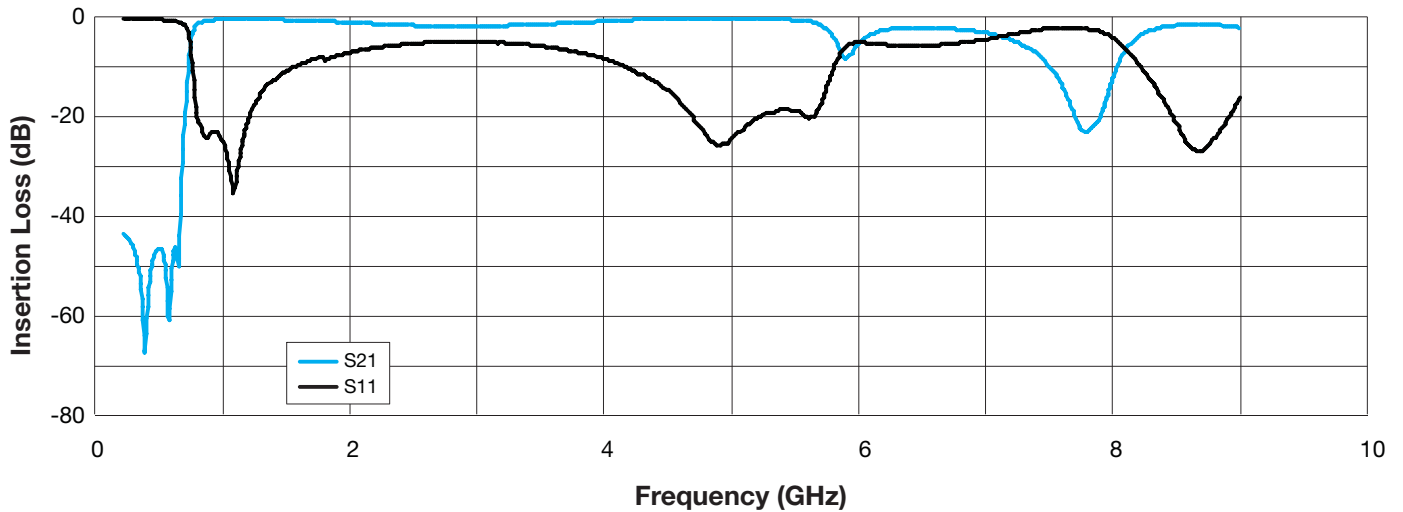
Bottom View



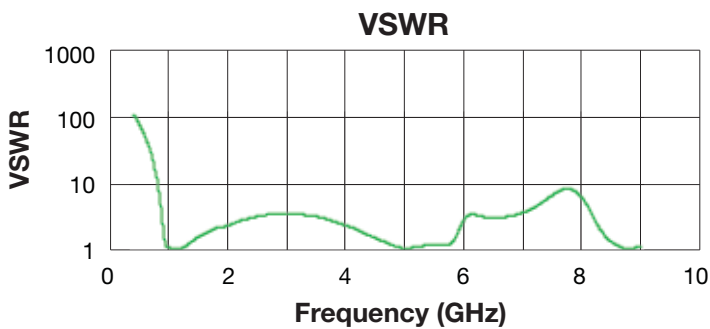
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
0.66	-44.02	18.26	-0.95
0.68	-32.23	15.55	-1.12
0.70	-21.32	11.84	-1.47
0.77	-2.77	1.83	-10.67
0.78	-2.00	1.47	-14.42
0.80	-1.41	1.25	-19.13
0.82	-0.98	1.18	-21.64
0.91	-0.48	1.15	-23.37
1.59	-0.51	2.00	-9.56
2.05	-1.02	2.70	-6.75
2.45	-1.50	3.35	-5.35

Multilayer Organic (MLO®)

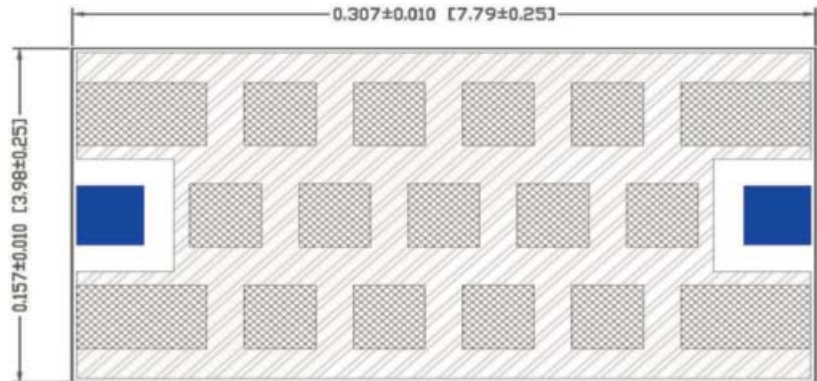


HF0BA0930A700

ELECTRICAL SPECIFICATIONS

Passband		
0.93 - 1.66 GHz	1.2 dB	Max
0.93 - 1.66 GHz	0.84 dB	Typ
-3dB Cutoff	0.83 GHz	Typ
VSWR	1.11:1	Typ
Stopband		
20 dB	DC - 0.73 GHz	Min
30 dB	DC - 0.71 GHz	Min
40 dB	DC - 0.70 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



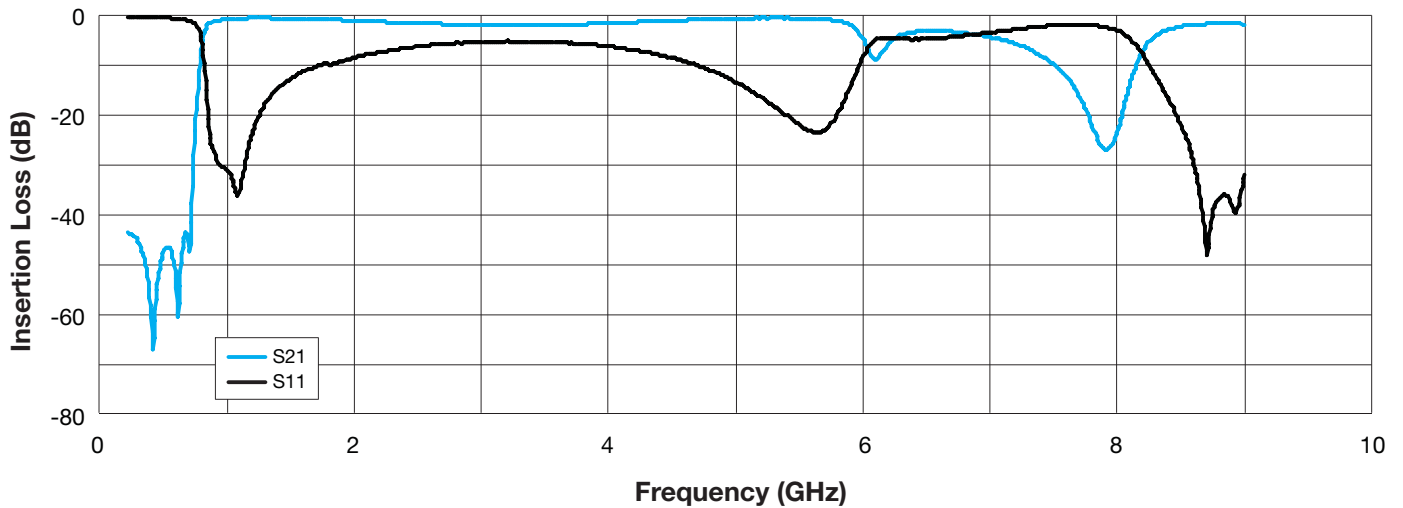
Bottom View



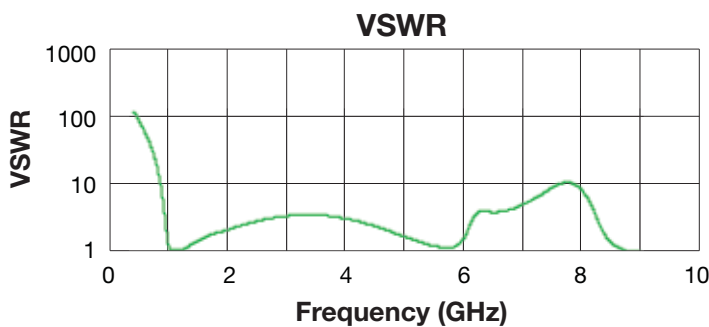
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
0.72	-41.71	16.59	-1.05
0.74	-30.87	13.77	-1.26
0.76	-20.73	10.70	-1.63
0.83	-2.85	1.76	-11.18
0.84	-1.93	1.34	-16.75
0.86	-1.49	1.17	-22.20
0.91	-1.00	1.09	-27.56
1.05	-0.50	1.04	-33.61
1.54	-0.51	1.60	-12.07
2.11	-1.00	2.41	-7.67
2.63	-1.52	3.12	-5.76



[Return to Electrical Specifications](#)

Multilayer Organic (MLO®)

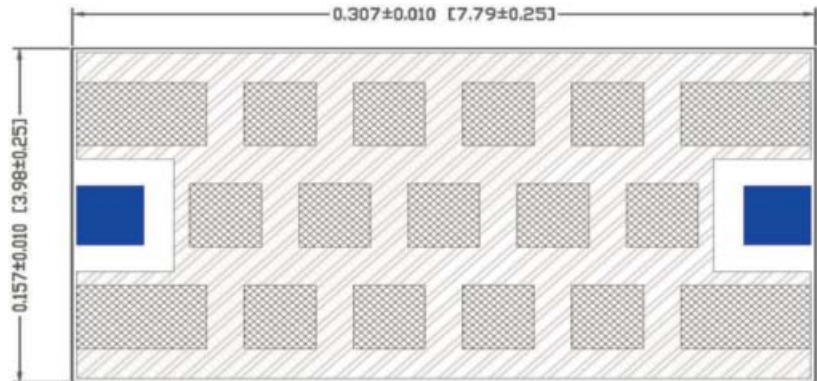


HF0BA0950A700

ELECTRICAL SPECIFICATIONS

Passband		
0.95 - 2.05 GHz	1.2 dB	Max
0.95 - 2.05 GHz	0.85 dB	Typ
-3dB Cutoff	0.85 GHz	Typ
VSWR	1.38:1	Typ
Stopband		
20 dB	DC - 0.75 GHz	Min
30 dB	DC - 0.73 GHz	Min
40 dB	DC - 0.66 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



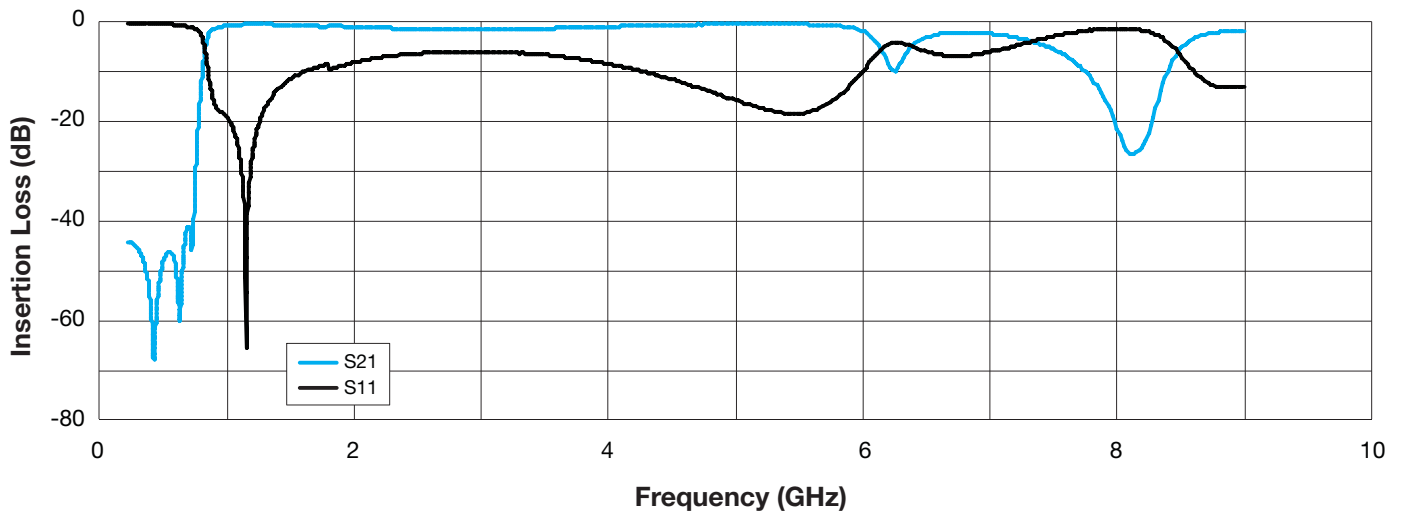
Bottom View



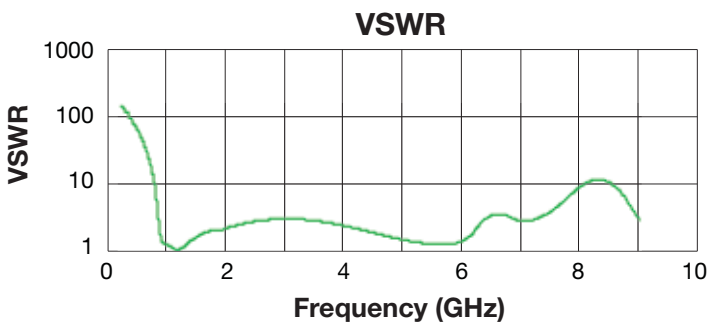
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



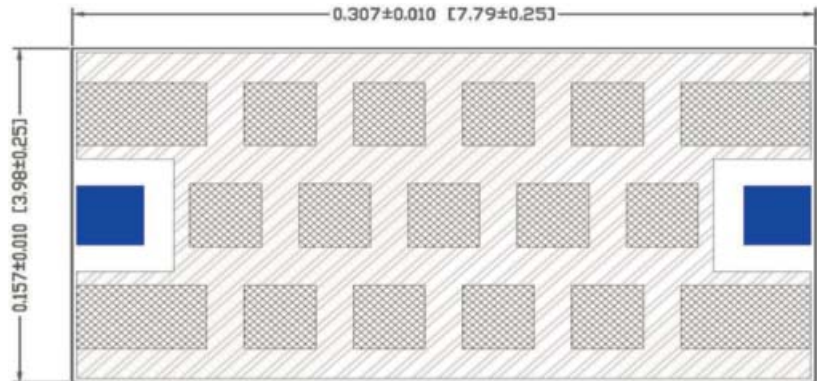
Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
0.74	-40.95	14.80	-1.18
0.75	-30.30	13.06	-1.33
0.78	-20.40	10.06	-1.73
0.85	-2.88	2.06	-9.21
0.86	-2.50	1.88	-10.28
0.87	-1.95	1.64	-12.33
0.89	-1.47	1.44	-14.87
0.93	-1.00	1.32	-17.32
1.06	-0.50	1.17	-21.95
2.11	-1.00	2.48	-7.42
5.98	-1.57	1.89	-10.23



ELECTRICAL SPECIFICATIONS

Passband		
1.44 - 2.94 GHz	1.2 dB	Max
1.44 - 2.94 GHz	0.63 dB	Typ
-3dB Cutoff	1.30 GHz	Typ
VSWR	1.06:1	Typ
Stopband		
20 dB	DC - 1.14 GHz	Min
30 dB	DC - 1.12 GHz	Min
40 dB	DC - 1.09 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)

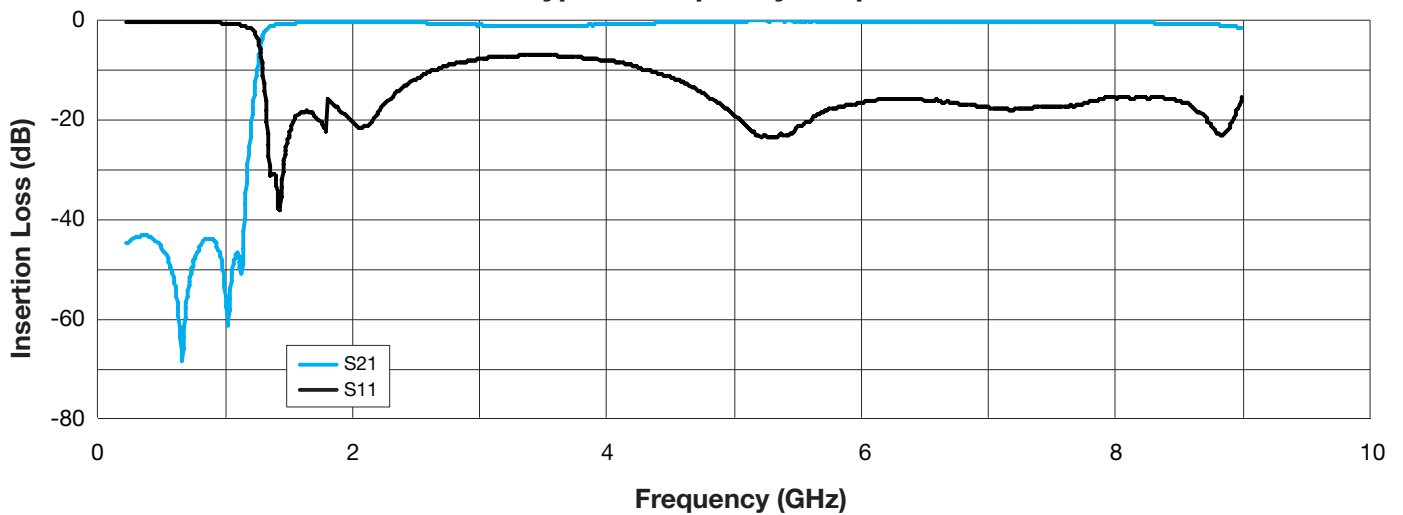


Bottom View

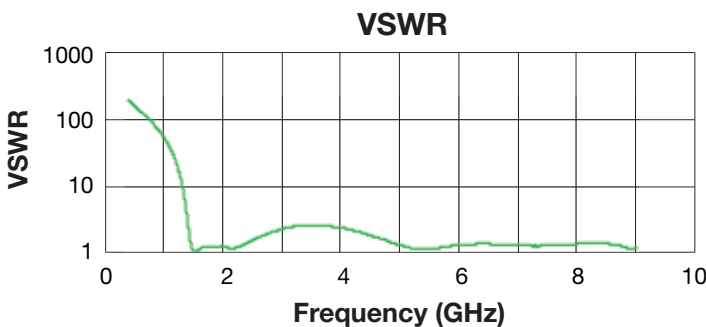


[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C

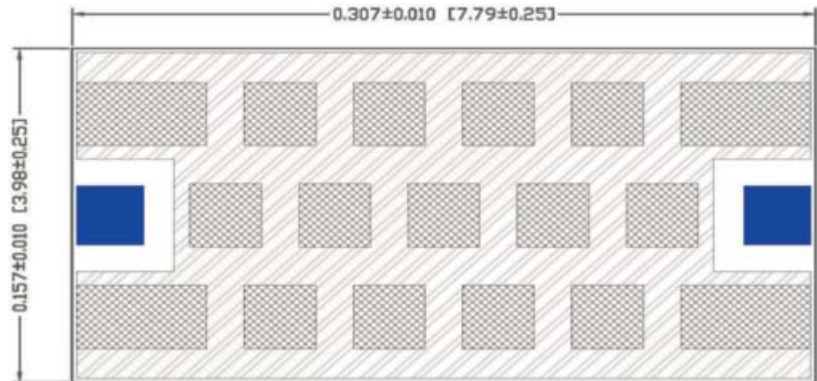


Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
1.15	-42.44	19.73	-0.88
1.17	-30.50	15.68	-1.11
1.20	-20.36	11.34	-1.54
1.30	-2.90	1.78	-11.01
1.31	-2.24	1.48	-14.20
1.32	-1.80	1.29	-17.99
1.34	-1.39	1.12	-24.83
1.40	-0.99	1.06	-30.83
1.49	-0.49	1.13	-24.50
2.66	-0.50	1.97	-9.72
3.03	-0.81	2.45	-7.54

ELECTRICAL SPECIFICATIONS

Passband		
1.50 - 2.89 GHz	1.2 dB	Max
1.50 - 2.89 GHz	0.73 dB	Typ
-3dB Cutoff	1.38 GHz	Typ
VSWR	1.10:1	Typ
Stopband		
20 dB	DC - 1.23 GHz	Min
30 dB	DC - 1.20 GHz	Min
40 dB	DC - 1.18 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



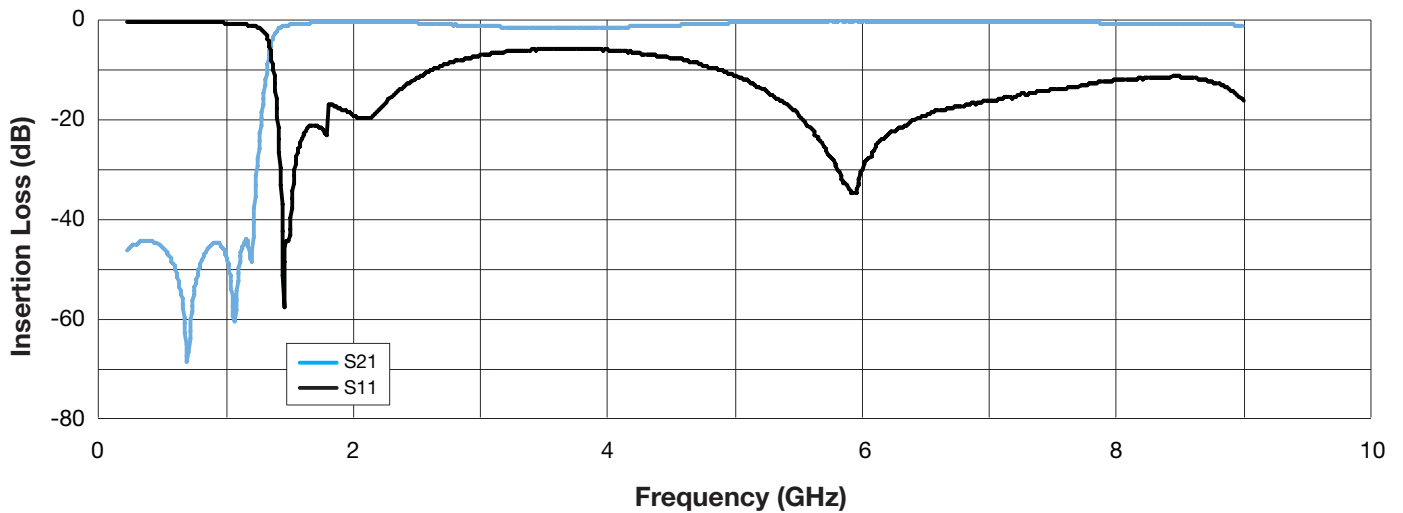
Bottom View



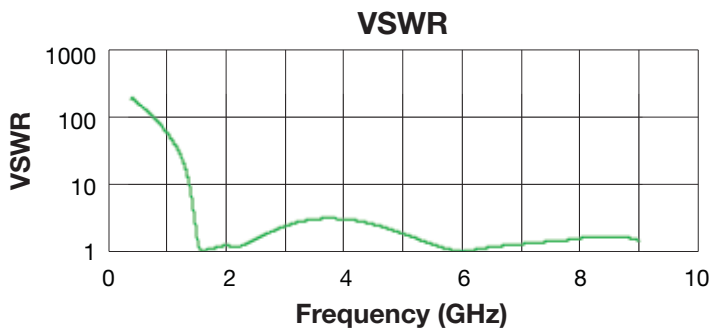
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
1.22	-40.43	18.30	-0.95
1.24	-31.14	15.19	-1.15
1.27	-21.08	11.42	-1.53
1.38	-2.78	1.76	-11.20
1.39	-2.47	1.61	-12.57
1.40	-2.00	1.39	-15.68
1.42	-1.54	1.18	-21.55
1.46	-0.96	1.01	-48.69
1.59	-0.50	1.13	-24.03
2.58	-0.51	1.88	-10.31
2.98	-1.00	2.57	-7.14

Multilayer Organic (MLO®)

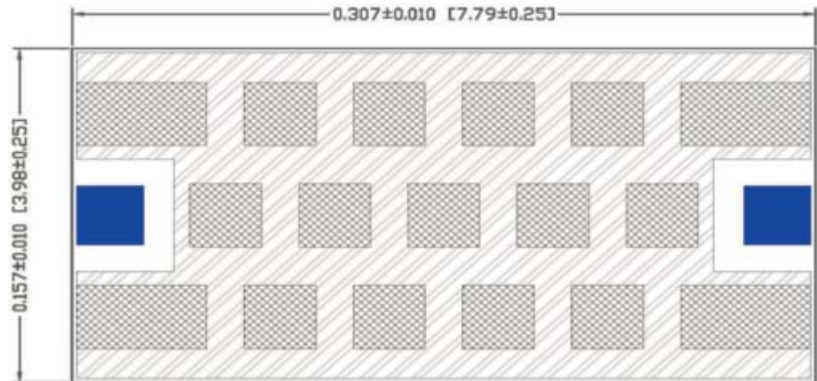


HF0BA1540A700

ELECTRICAL SPECIFICATIONS

Passband		
1.54 - 3.19 GHz	1.2 dB	Max
1.54 - 3.19 GHz	0.81 dB	Typ
-3dB Cutoff	1.39 GHz	Typ
VSWR	1.05:1	Typ
Stopband		
20 dB	DC - 1.25 GHz	Min
30 dB	DC - 1.22 GHz	Min
40 dB	DC - 1.20 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



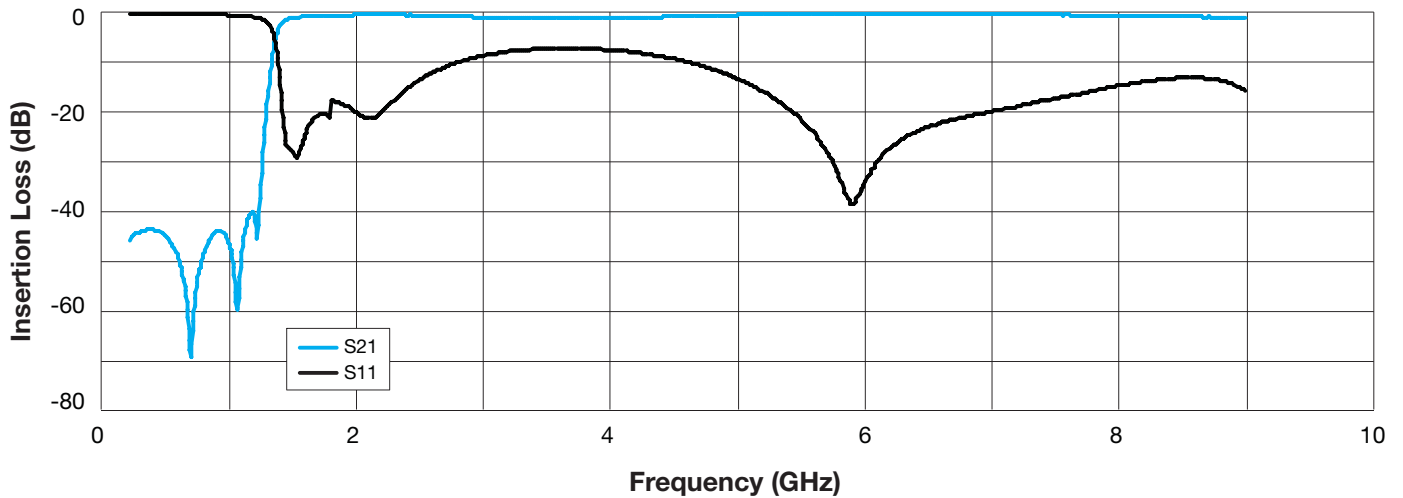
Bottom View



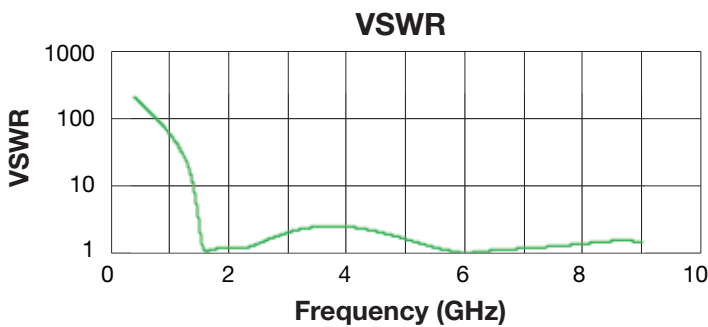
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
1.24	-40.05	17.32	-1.00
1.26	-30.13	14.67	-0.83
1.29	-21.26	11.80	-1.48
1.39	-2.76	1.72	-11.51
1.40	-2.48	1.58	-12.93
1.42	-1.90	1.30	-17.73
1.44	-1.47	1.13	-24.33
1.50	-0.98	1.08	-28.20
1.74	-0.50	1.21	-20.41
2.58	-0.49	1.64	-12.28
3.29	-1.00	2.45	-7.53



[Return to Electrical Specifications](#)

Multilayer Organic (MLO®)

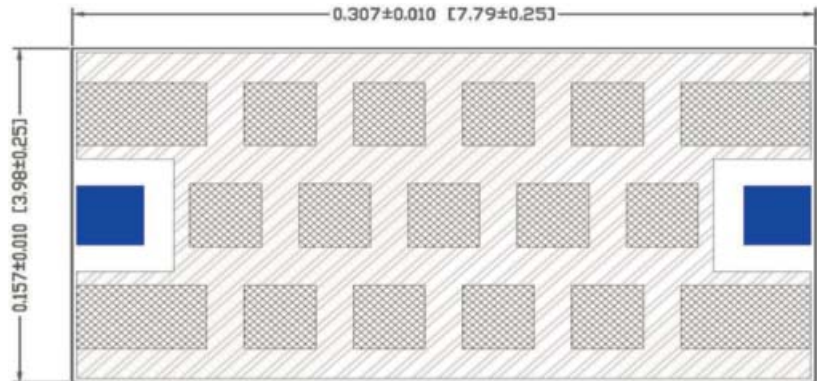


HF0BA1550A700

ELECTRICAL SPECIFICATIONS

Passband		
1.55 - 3.13 GHz	1.2 dB	Max
1.55 - 3.13 GHz	0.82 dB	Typ
-3dB Cutoff	1.41 GHz	Typ
VSWR	1.04:1	Typ
Stopband		
20 dB	DC - 1.27 GHz	Min
30 dB	DC - 1.24 GHz	Min
40 dB	DC - 1.22 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



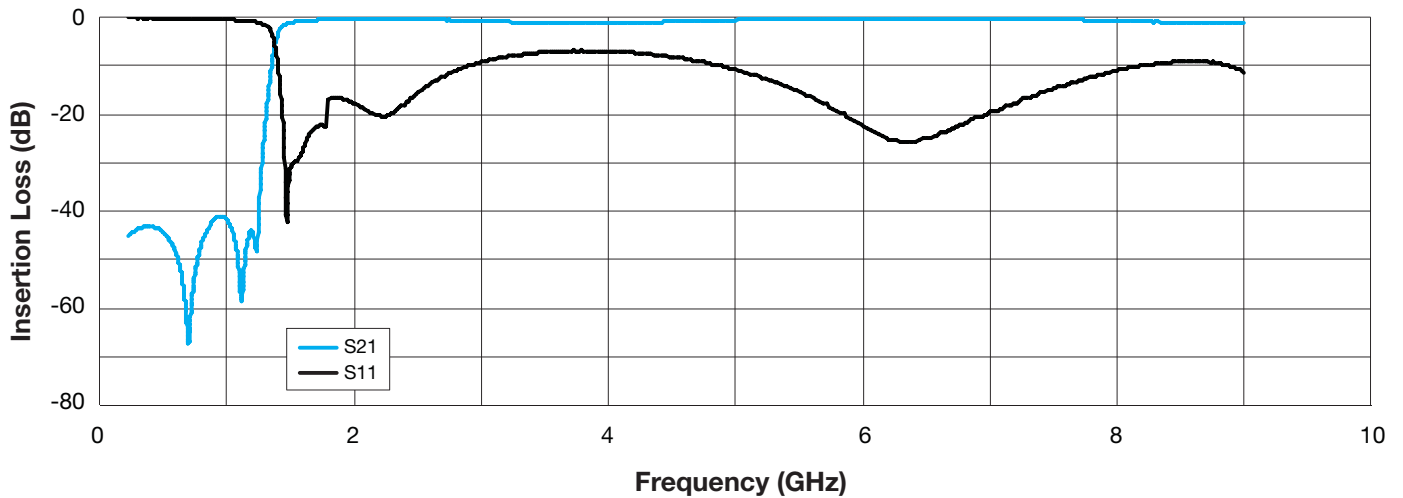
Bottom View



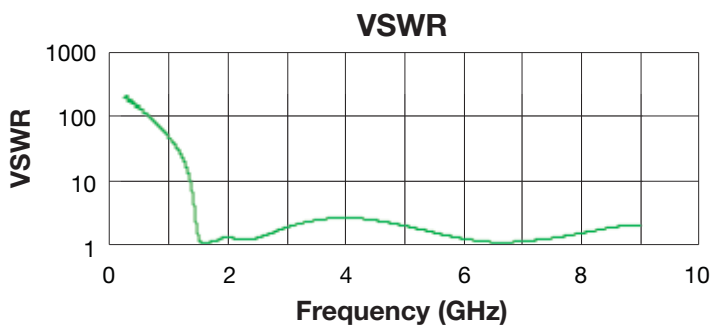
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C



Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
1.25	-41.30	15.75	-1.10
1.27	-31.03	14.03	-1.24
1.31	-20.16	10.15	-1.72
1.41	-2.91	1.76	-11.22
1.42	-2.40	1.51	-13.82
1.43	-1.92	1.29	-17.98
1.45	-1.45	1.07	-28.85
1.51	-0.99	1.06	-30.28
1.72	-0.49	1.16	-22.40
2.71	-0.49	1.67	-11.98
3.36	-1.00	2.45	-7.52

Multilayer Organic (MLO®)

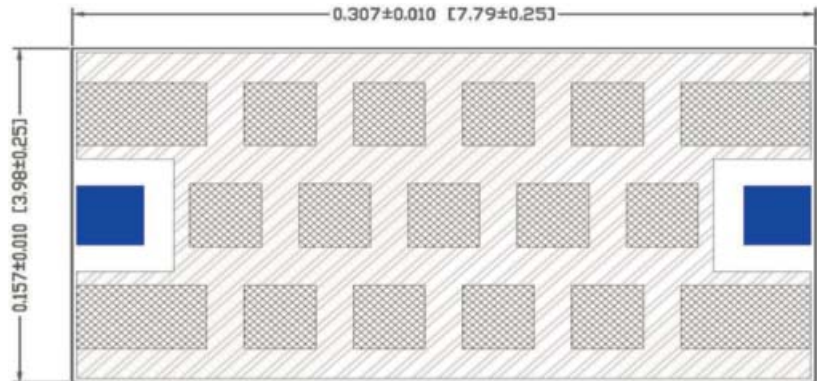


HF0BA1840A700

ELECTRICAL SPECIFICATIONS

Passband		
1.84 - 2.83 GHz	1.2 dB	Max
1.84 - 2.83 GHz	0.85 dB	Typ
-3dB Cutoff	1.66 GHz	Typ
VSWR	1.16:1	Typ
Stopband		
20 dB	DC - 1.50 GHz	Min
30 dB	DC - 1.46 GHz	Min
40 dB	DC - 1.44 GHz	Min
Dimension		
Thickness	<0.022 Inches	Max
Rated RF Power		
Power	2 Watts	Max

DIMENSIONS – CASE SIZE B Inches (mm)



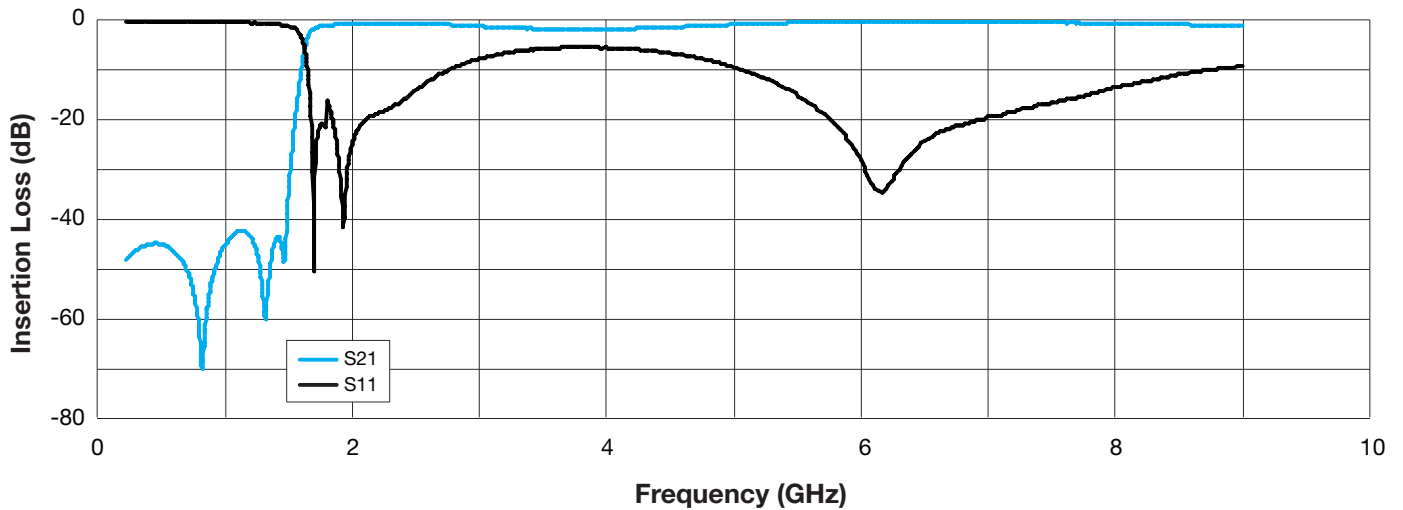
Bottom View



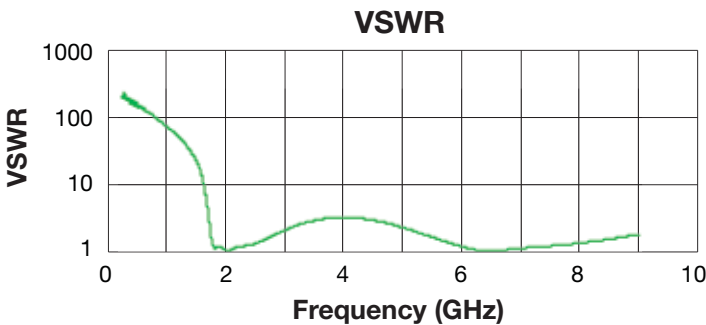
Side View

[Click here to see detailed physical dimensions and pad layout.](#)

Typical Frequency Response



TYPICAL PERFORMANCE AT 25°C

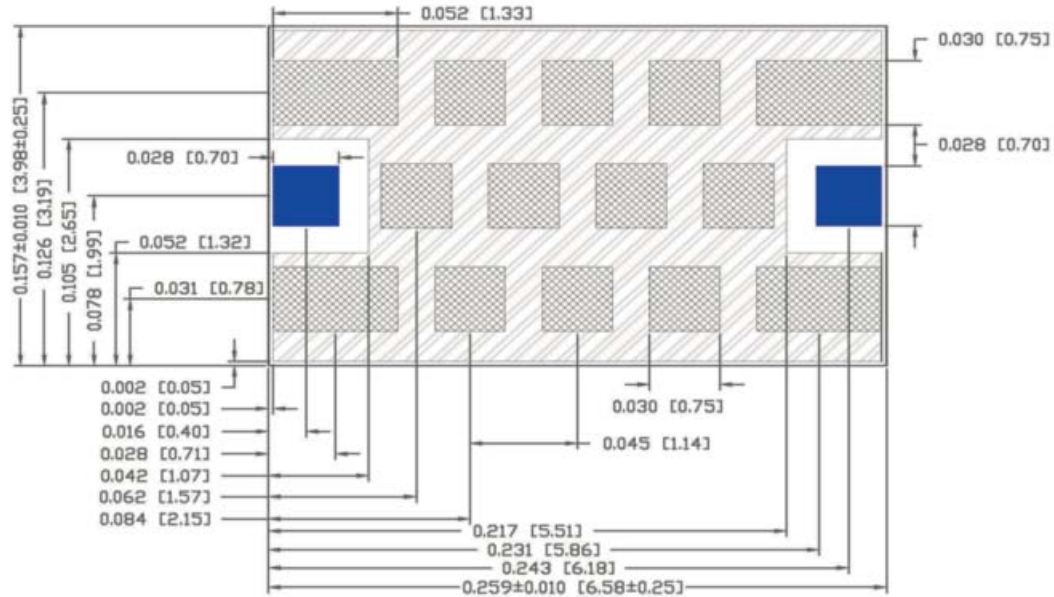


Frequency (GHz)	Insertion Loss (dB)	VSWR (:1)	Return Loss (dB)
1.49	-40.48	18.71	-0.93
1.51	-30.10	14.76	-1.18
1.55	-20.49	11.54	-1.51
1.66	-2.96	1.68	-11.96
1.67	-2.40	1.39	-15.74
1.68	-1.91	1.14	-23.43
1.71	-1.47	1.08	-28.50
1.78	-0.99	1.19	-21.24
2.05	-0.50	1.18	-21.65
2.52	-0.51	1.53	-13.64
2.92	-1.01	2.25	-8.31

Multilayer Organic (MLO[®]) Filters

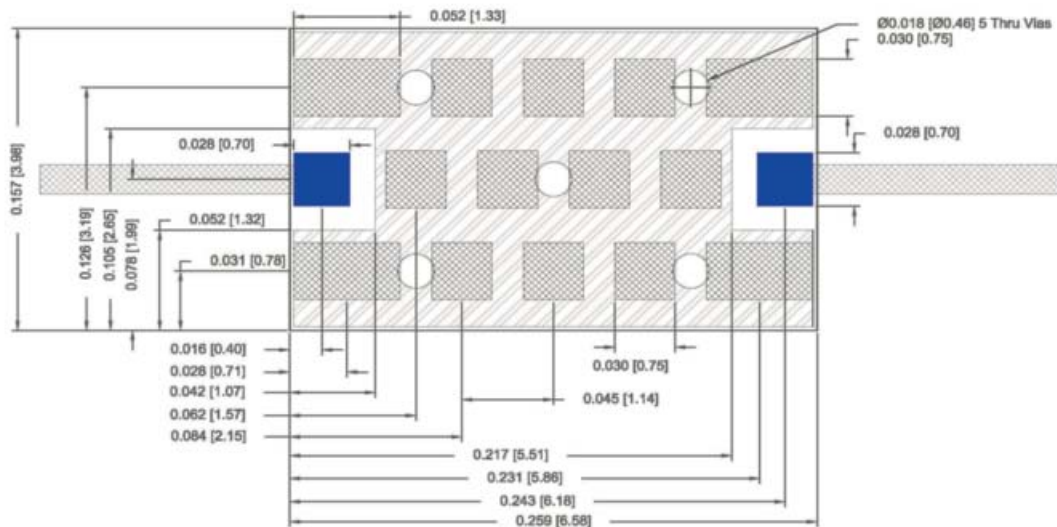
Detailed Mechanical Specifications,
Pad Layout and Mounting
Recommendations

MECHANICAL SPECIFICATIONS – CASE SIZE A



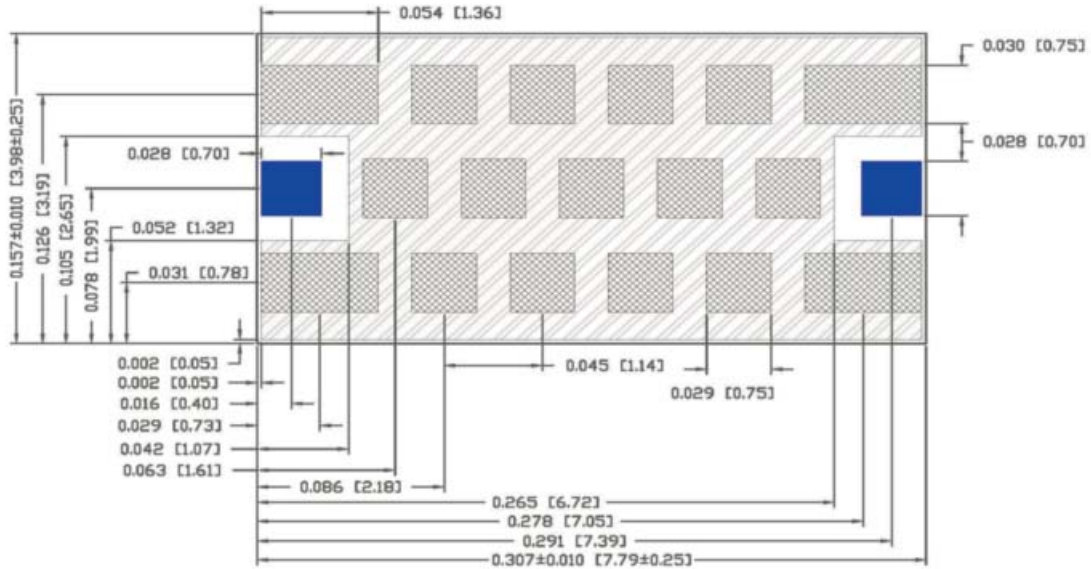
Dimensions in inches (mm)
 Tolerances are ± 0.002 (0.05), unless noted.
 All contact areas are gold plated, including I/O pads.
 Blue pads denote I/O pads, gray pads denote ground pads

RECOMMENDED PCB LAYOUT



Dimensions in inches (mm).
 Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.
 Grounding is solid copper under solder mask, with solder mask defined pads for ground openings. I/O pads are not shorted to ground.
 Blue pads denote I/O pads, gray pads denote ground pads.
 DXF Files available upon request.

MECHANICAL SPECIFICATIONS – CASE SIZE B



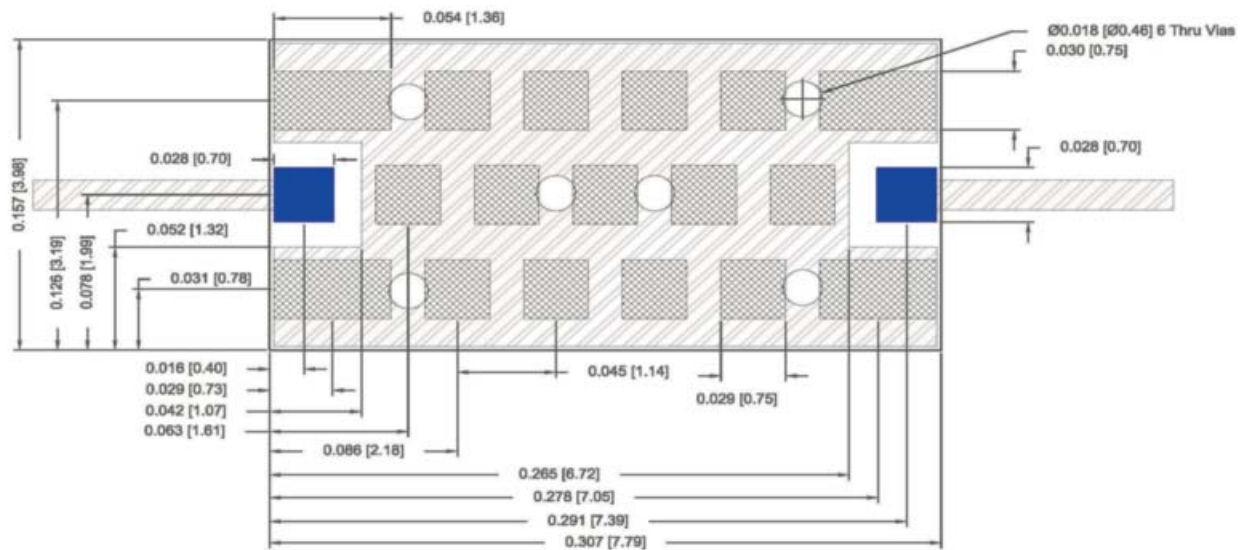
Dimensions in inches (mm)

Tolerances are ±0.002 (0.05), unless noted.

All contact areas are gold plated, including I/O pads.

Blue pads denote I/O pads, gray pads denote ground pads

RECOMMENDED PCB LAYOUT



Dimensions in inches (mm).

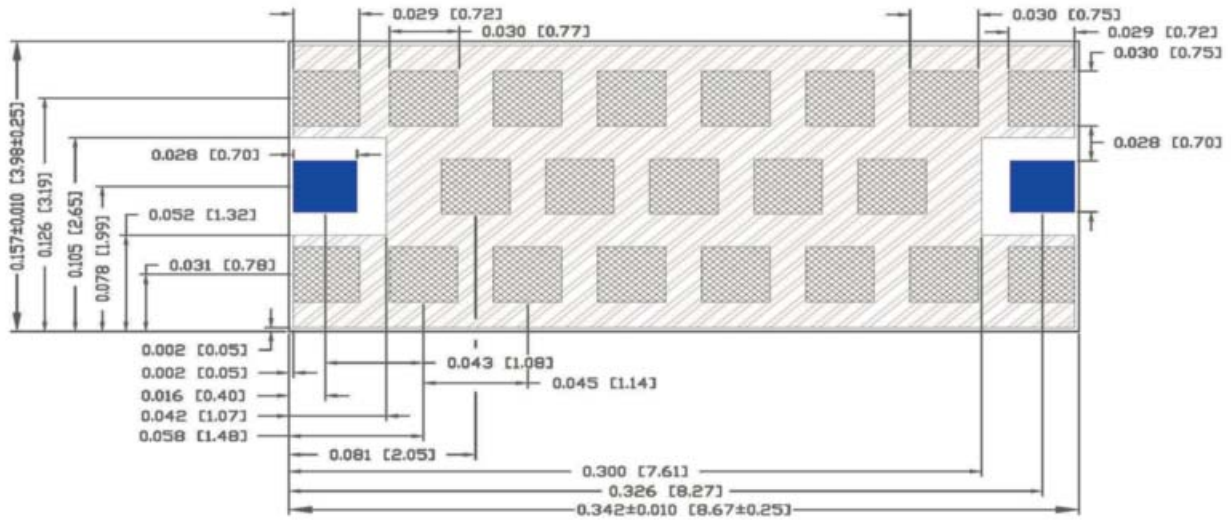
Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.

Grounding is solid copper under solder mask, with solder mask defined pads for ground openings. I/O pads are not shorted to ground.

Blue pads denote I/O pads, gray pads denote ground pads.

DXF Files available upon request.

MECHANICAL SPECIFICATIONS – CASE SIZE C



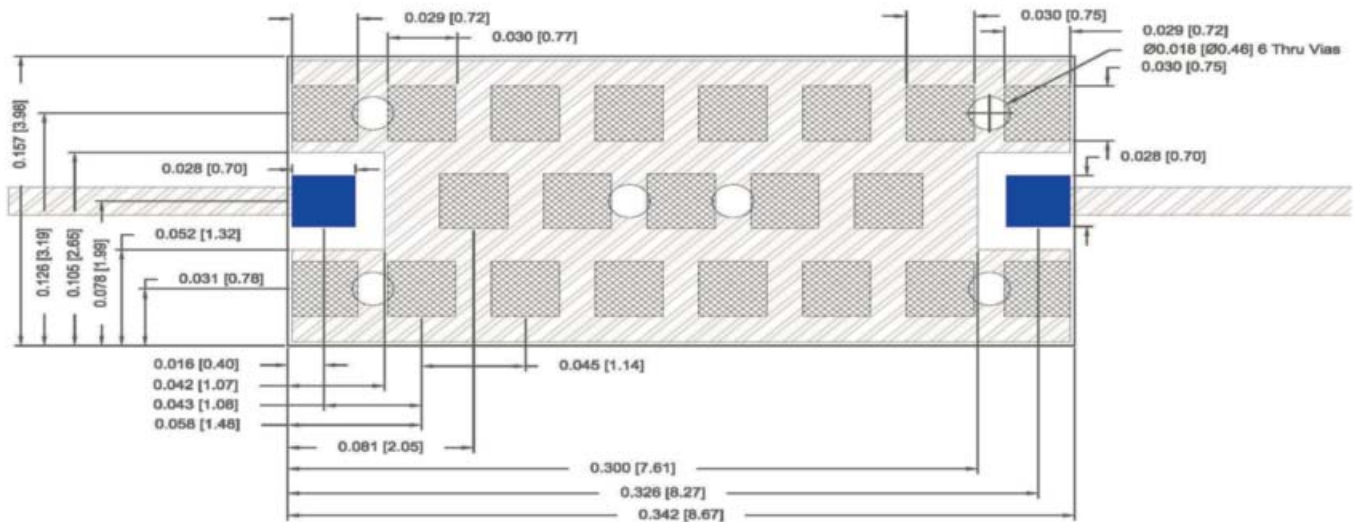
Dimensions in inches (mm)

Tolerances are ± 0.002 (0.05), unless noted.

All contact areas are gold plated, including I/O pads.

Blue pads denote I/O pads, gray pads denote ground pads

RECOMMENDED PCB LAYOUT



Dimensions in inches (mm).

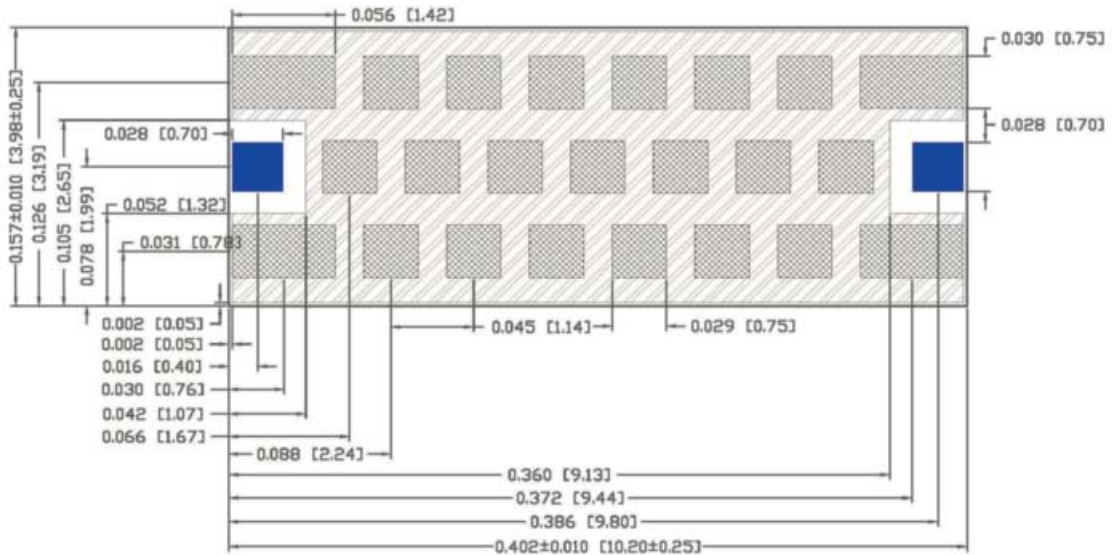
Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.

Grounding is solid copper under solder mask, with solder mask defined pads for ground openings. I/O pads are not shorted to ground.

Blue pads denote I/O pads, gray pads denote ground pads.

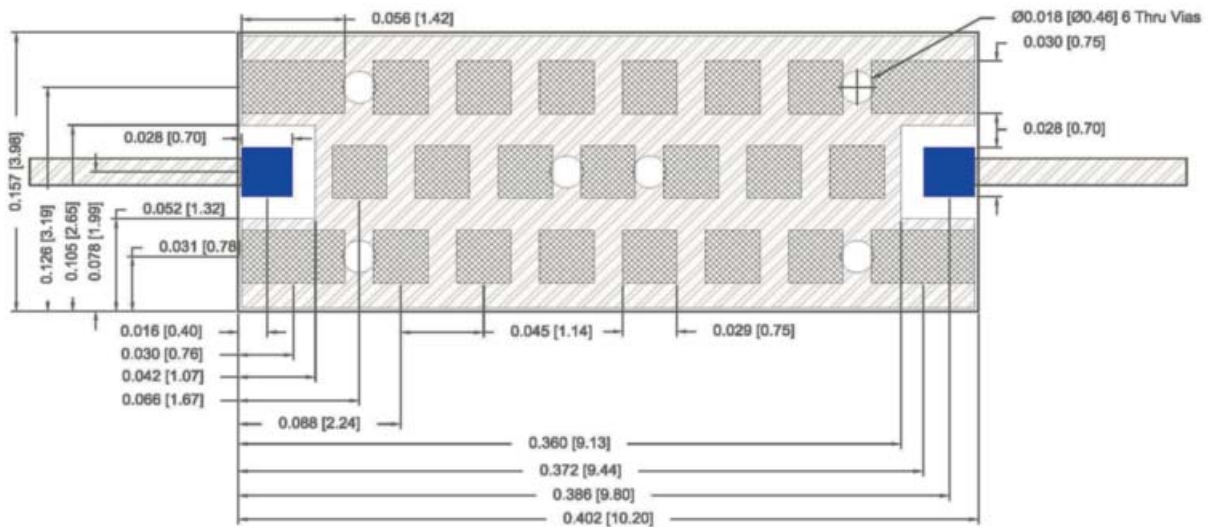
DXF Files available upon request.

MECHANICAL SPECIFICATIONS – CASE SIZE D



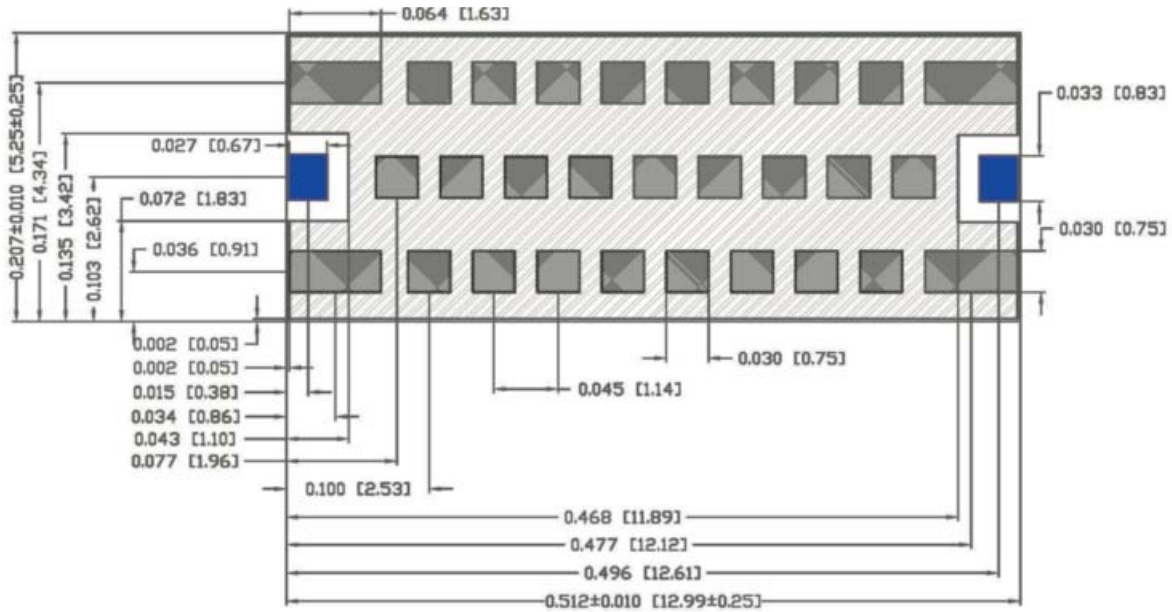
Dimensions in inches (mm)
 Tolerances are ± 0.002 (0.05), unless noted.
 All contact areas are gold plated, including I/O pads.
 Blue pads denote I/O pads, gray pads denote ground pads

RECOMMENDED PCB LAYOUT



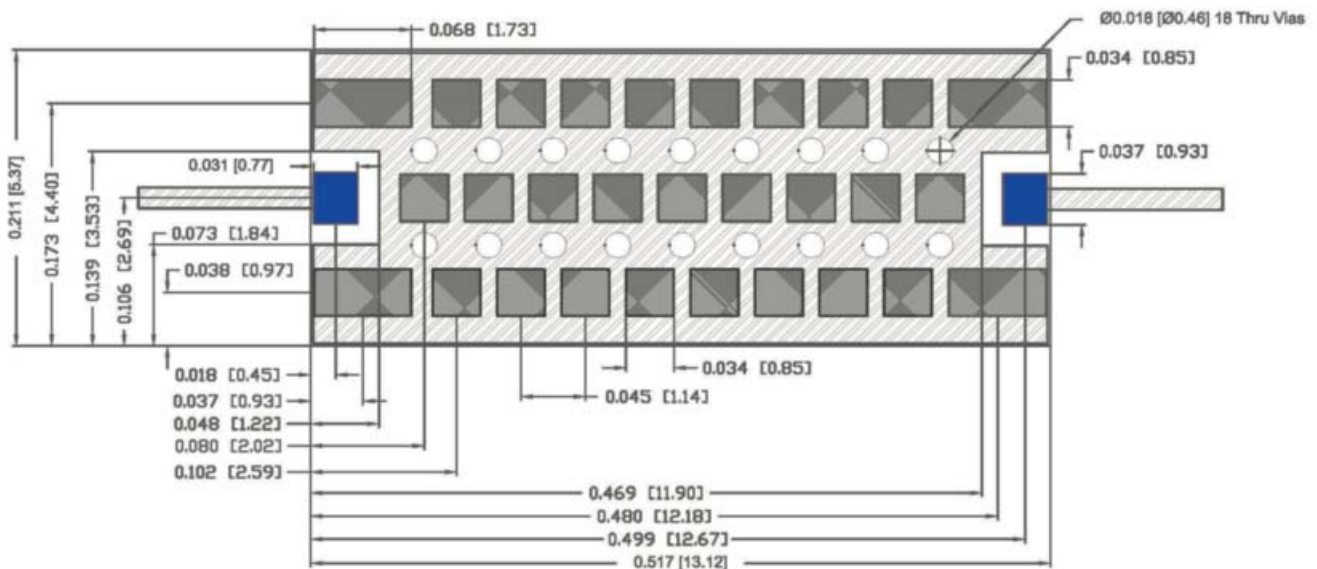
Dimensions in inches (mm).
 Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.
 Grounding is solid copper under solder mask, with solder mask defined pads for ground openings. I/O pads are not shorted to ground.
 Blue pads denote I/O pads, gray pads denote ground pads.
 DXF Files available upon request.

MECHANICAL SPECIFICATIONS – CASE SIZE F



Dimensions in inches (mm)
 Tolerances are ± 0.002 (0.05), unless noted.
 All contact areas are gold plated, including I/O pads.
 Blue pads denote I/O pads, gray pads denote ground pads

RECOMMENDED PCB LAYOUT



Dimensions in inches (mm).
 Line width should be designed to match 50ohm characteristic impedance, depending on PCB material and thickness.
 Grounding is solid copper under solder mask, with solder mask defined pads for ground openings. I/O pads are not shorted to ground.
 Blue pads denote I/O pads, gray pads denote ground pads.
 DXF Files available upon request.

MOUNTING RECOMMENDATIONS

AUTOMATED SMT ASSEMBLY

The following section describes the guidelines for automated SMT assembly of MLO® RF devices which are typically Land Grid Array (LGA) packages or side termination SMT packages. Control of solder and solder paste volume is critical for surface mount assembly of MLO® RF devices onto the PCB.

Stencil thickness and aperture openings should be adjusted according to the optimal solder volume. The following are general recommendations for SMT mounting of MLO® devices onto the PCB.

SMT REFLOW PROFILE

Common IR or convection reflow SMT processes shall be used for the assembly. Standard SMT reflow profiles, for eutectic and Pb free solders, can be used to surface mount the MLO® devices onto the PCB. In all cases, a temperature gradient of 3°C/sec, or less, should be maintained to prevent warpage of the package and to ensure that all joints reflow properly. Additional soak time and slower preheating time

may be required to improve the out-gassing of solder paste. In addition, the reflow profile depends on the PCB density and the type of solder paste used. Standard no-clean solder paste is generally recommended. If another type of flux is used, complete removal of flux residual may be necessary. Example of a typical lead free reflow profile is shown below.

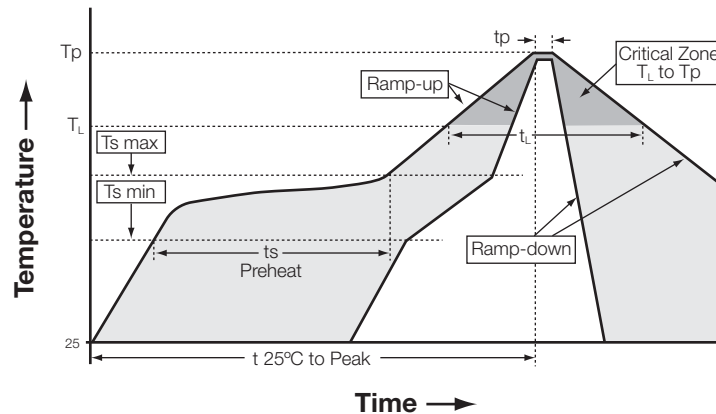


Figure A. Typical Lead Free Profile and Parameters

Profile Parameter	Pb free, Convection, IR/Convection
Ramp-up rate (T _{smax} to T _p)	3°C/second max.
Preheat temperature (T _{s min} to T _{s max})	150°C to 200°C
Preheat time (t _s)	60 – 180 seconds
Time above T _L , 217°C (t _L)	60 – 120 seconds
Peak temperature (T _p)	260°C
Time within 5°C of peak temperature (t _p)	10 – 20 seconds
Ramp-down rate	4°C/second max.
Time 25°C to peak temperature	6 minutes max.