Suspended Substrate Stripline Filters and Multiplexers

50Ω DC to 40 GHz

The Big Deal

- Low insertion loss
- Ultra-wide passband width
- Fast roll-off with wide stopband
- Good power handling and temperature stability
- Passband up to 40 GHz
- Stopband up to 40 GHz

Product Overview

Mini-Circuits' Suspended Substrate Stripline filters offer low insertion loss by implementing printed circuit board suspended between two parallel ground planes, providing high Q. Low insertion loss combined with wide stopband makes them an excellent choice for wideband instruments and systems like ECM, ECCM, ELINT and ultra-broadband receivers.

Low pass, high pass, band pass, band stop, diplexer and multiplexer designs can be realized with this technology. Advanced filter design and construction can achieve stopband width greater than 6x the center frequency, and temperature stability will be better than other printed circuit realizations because the fields are mainly in the air rather than in a dielectric. The inside walls of the housing hold the circuit and prevent movement that could be caused by vibration or mechanical shock, making these designs excellent candidates for harsh operating environments.

Suspended substrate stripline filters can be realized in small form factors with high-quality, precise machining for applications where size is critical. Excellent repeatability across units is achieved through precise tuning and process control.

Key Features

Feature	Advantages
Low insertion loss	Low signal loss results in better SNR in receiver front end and better power delivery to antenna in transmitters
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stopband	Wide, spur-free stop band results in better receiver sensitivity
High power handling	Well suited for transmitter applications
Excellent temperature stability	Ensures minimal variation in electrical performance across temperature

Suspended substrate stripline

Low Pass Filter

ZLSS-A2R8G-S+

50Ω DC to 2800 MHz

Generic photo used for illustration purposes only

CASE STYLE: VA3099

Connectors	Model
SMA-F	ZLSS-A2R8G-S+

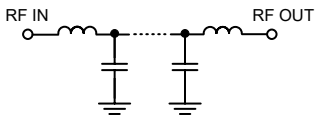
Features

- Low Passband Insertion Loss of 1.2dB
- Low VSWR of 1.5:1 in entire Passband
- Sharp Roll-off of 35dB rejection by the slope factor of 84%
- Suppress up to 6th harmonics (18GHz) with higher rejection of 55dB

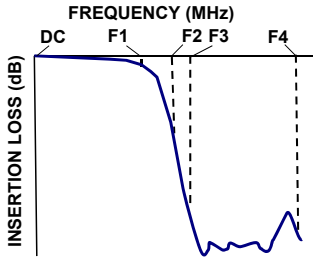
Applications

- Harmonic rejection
- Transmitters / Receivers
- GPS
- 2.5GHz 5G Communication

Functional Schematic



Typical Frequency Response



+RoHS Compliant

The +Suffix identifies RoHS Compliance. See our web site for RoHS Compliance methodologies and qualifications

Electrical Specifications at 25°C

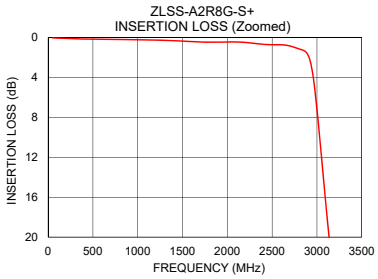
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	DC-F1	DC-2800	—	1.2	2.2	dB
	VSWR	DC-F1	DC-2800	—	1.5	—	:1
Stop Band	Insertion Loss	F2-F3	3350-3600	20	35	—	dB
		F3-F4	3600-18000	40	55	—	dB

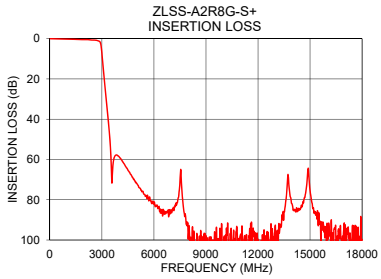
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input at Passband	7.5W max. at 25°C

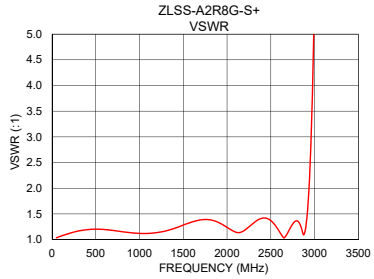
Permanent damage may occur if any of these limits are exceeded.

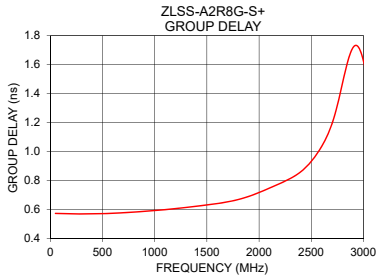
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
25	0.01	1.02	25	0.57
100	0.04	1.07	100	0.57
1000	0.20	1.12	200	0.57
2000	0.43	1.24	400	0.57
2500	0.70	1.37	600	0.57
2600	0.71	1.15	800	0.58
2800	1.12	1.36	1000	0.59
2950	3.45	2.49	1200	0.61
3100	16.74	19.33	1400	0.62
3200	25.82	35.47	1600	0.64
3350	38.88	57.51	1800	0.67
3600	68.06	85.15	2000	0.72
5000	71.75	113.74	2100	0.75
6000	82.23	107.69	2200	0.78
8000	97.10	130.67	2300	0.81
10000	115.57	209.55	2400	0.86
11000	97.06	180.08	2500	0.93
12000	108.51	137.40	2600	1.04
15000	75.22	87.26	2700	1.20
18000	99.68	38.14	2800	1.48









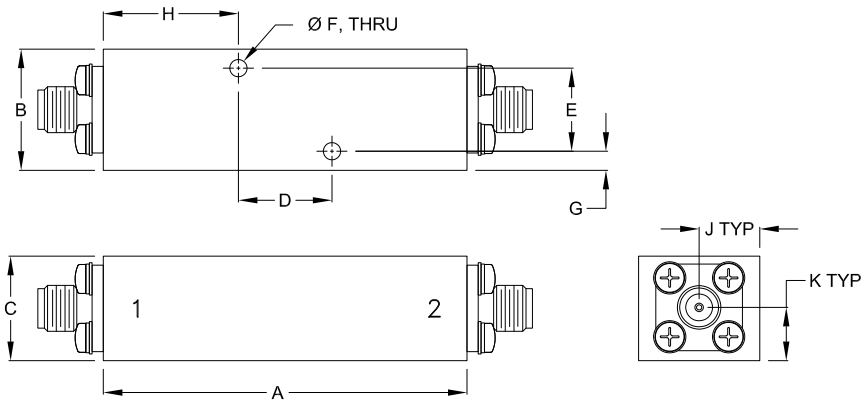
Notes

A. Performance and quality attributes and conditions not expressly stated in this specification document are intended to be excluded and do not form a part of this specification document.
B. Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the Standard Terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/MCLStore/terms.jsp

Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F
2.10	**.70**	**.60**	**.540**	**.480**	**.100**
53.3	17.8	15.3	13.72	12.19	2.54

G	H	J	K		Wt.
.11	**.78**	**.35**	**.31**		grams
2.8	19.8	8.9	7.8		**115**

Note: Please refer to case style drawing for details

Suspended substrate stripline

Low Pass Filter ZLSS-A2R8G-S+

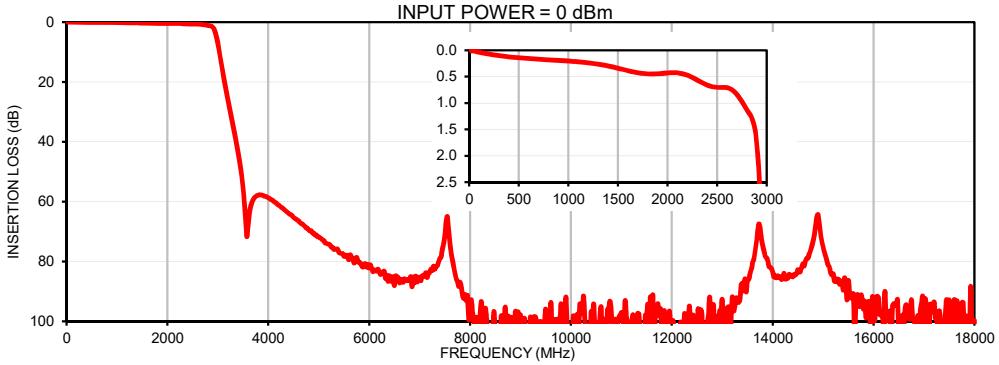
Typical Performance Data

FREQ.	Insertion Loss	Input Return Loss	Output Return Loss
(MHz)	(dB)	(dB)	(dB)
25	0.01	40.80	42.20
50	0.02	35.25	35.86
150	0.05	26.91	26.86
500	0.15	20.75	20.93
750	0.18	22.32	22.54
1000	0.20	24.93	25.05
1150	0.23	24.57	24.91
1200	0.24	23.89	24.34
1250	0.25	23.15	23.59
1275	0.26	22.69	23.18
1300	0.26	22.21	22.68
1400	0.30	20.10	20.45
1475	0.33	18.62	18.96
1500	0.34	18.14	18.47
1800	0.45	15.83	15.87
1900	0.45	16.86	16.85
2000	0.43	19.42	19.54
2100	0.43	23.46	24.99
2200	0.47	21.64	24.07
2300	0.56	17.24	18.30
2400	0.66	15.28	15.94
2500	0.70	16.13	16.57
2800	1.12	16.24	15.43
2950	3.45	7.39	5.95
3000	7.17	3.03	2.41
3150	21.37	0.63	0.48
3200	25.82	0.49	0.38
3300	34.47	0.35	0.28
3350	38.88	0.30	0.25
3500	55.25	0.23	0.20
3600	68.06	0.20	0.18
5000	71.75	0.15	0.16
5500	78.24	0.16	0.17
6000	82.23	0.16	0.17
6500	88.06	0.16	0.17
7000	85.25	0.15	0.16
7500	71.45	0.14	0.15
8000	97.10	0.13	0.12
8500	103.39	0.11	0.11
9000	97.86	0.09	0.10
9500	95.99	0.08	0.07
10000	115.57	0.08	0.06
10500	102.31	0.08	0.03
11000	97.06	0.10	0.03
11500	98.61	0.11	0.02
12000	108.51	0.13	0.05
12500	103.66	0.14	0.07
13000	92.83	0.16	0.11
13500	86.07	0.18	0.17
14000	83.48	0.20	0.19
14500	82.74	0.20	0.21
15000	75.22	0.20	0.24
15500	86.39	0.19	0.25
16000	95.31	0.20	0.28
16500	104.00	0.21	0.30
17000	103.43	0.25	0.33
17100	104.30	0.27	0.35
17200	93.53	0.26	0.35
17500	93.17	0.32	0.37
18000	99.68	0.46	0.40

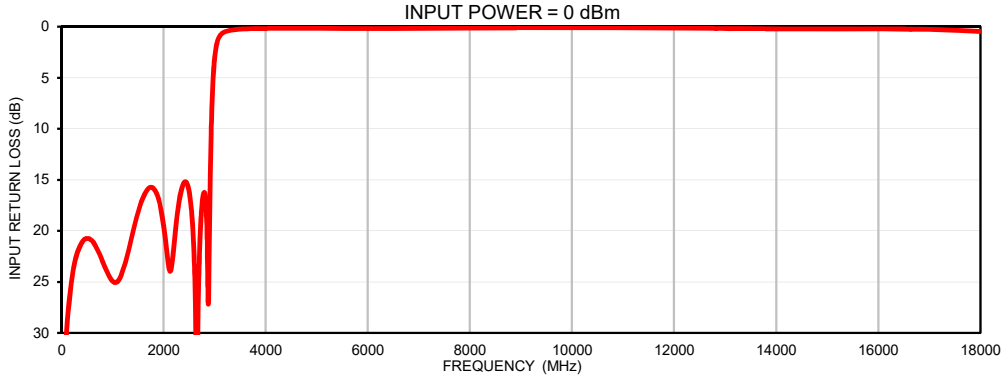
FREQ.	Group Delay
(MHz)	(ns)
25	0.57
50	0.57
75	0.57
100	0.57
125	0.57
150	0.57
175	0.57
200	0.57
225	0.57
250	0.57
300	0.57
350	0.57
400	0.57
450	0.57
500	0.57
550	0.57
600	0.57
650	0.58
700	0.58
750	0.58
800	0.58
850	0.58
900	0.59
950	0.59
1000	0.59
1050	0.60
1100	0.60
1150	0.60
1200	0.61
1250	0.61
1300	0.61
1350	0.62
1400	0.62
1450	0.63
1500	0.63
1550	0.64
1600	0.64
1650	0.65
1700	0.65
1750	0.66
1800	0.67
1850	0.68
1900	0.69
1950	0.70
2000	0.72
2050	0.73
2100	0.75
2150	0.76
2200	0.78
2250	0.80
2300	0.81
2350	0.84
2400	0.86
2450	0.89
2500	0.93
2550	0.98
2600	1.04
2650	1.11
2700	1.20
2800	1.48

Typical Performance Curves

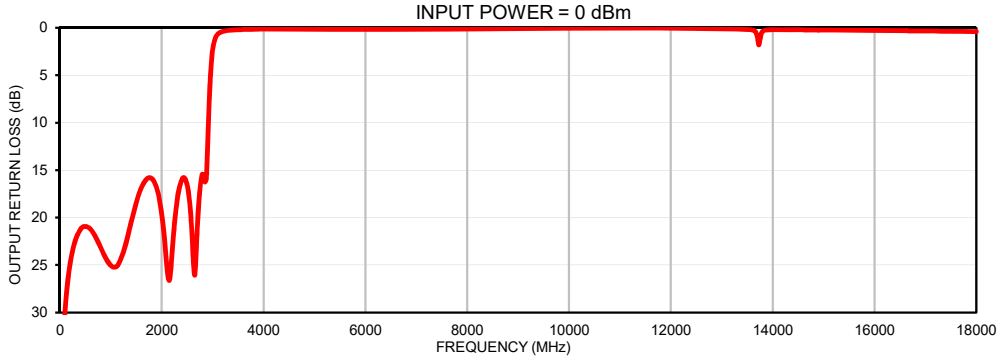
INSERTION LOSS
INPUT POWER = 0 dBm



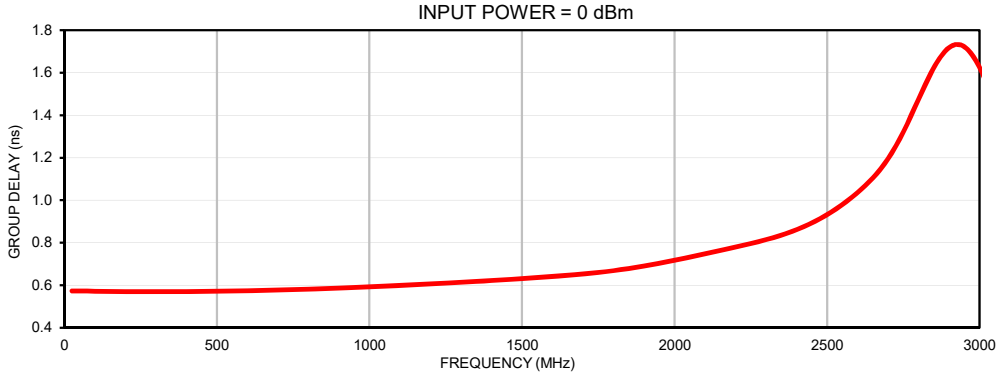
INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm



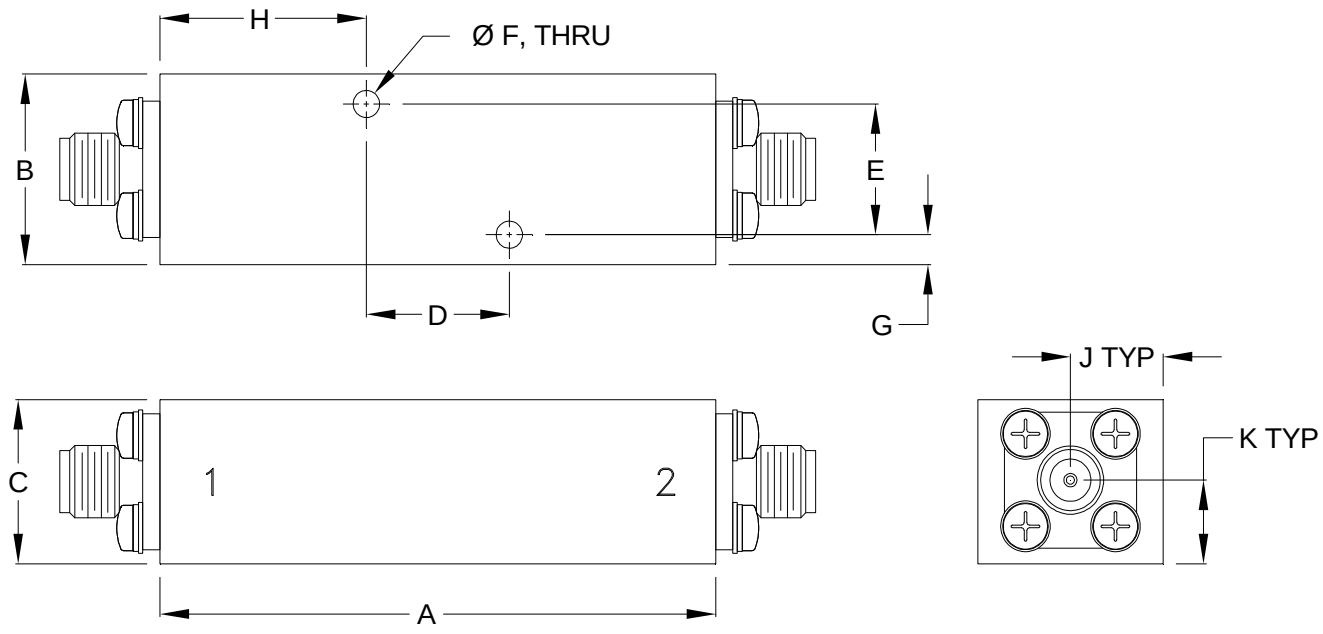
GROUP DELAY
INPUT POWER = 0 dBm



Case Style VA

Outline Dimensions

VA3099



CASE#	A	B	C	D	E	F
VA3099	2.10 (53.3)	.70 (17.8)	.60 (15.3)	.540 (13.72)	.480 (12.19)	.100 (2.54)

CASE#	G	H	J	K	WT.GRAMS
VA3099	.11 (2.8)	.78 (19.8)	.35 (8.9)	.31 (7.8)	115

Dimensions are in inches (mm). Tolerances: 2 Pl. ± .100; 3 Pl. ± .015

Notes:

1. Case material: Brass.
2. Case Finish: Powder coated over silver plating.
3. Refer to the individual model data sheet for the type of connectors available.

Mini-Circuits

Environmental Specifications ENV46

All Mini-Circuits products are manufactured under exacting quality assurance and control standards, and are capable of meeting published specifications after being subjected to any or all of the following physical and environmental test.

Specification	Test/Inspection Condition	Reference/Spec
Operating Temperature	-55° to 100°C Ambient Environment	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Humidity	90 to 95% RH, 40°C, 96 hours; Units may require bake-out after humidity to restore full performance.	MIL-STD-202, Method 103, Condintion B
Thermal Shock	-55° to 100°C, 100 cycles	MIL-STD-202, Method 107, Condition A-3, except +100°C
Vibration (High Frequency)	20g peak, 10-2000 Hz, 12 times in each of three perpendicular directions (total 36)	MIL-STD-202, Method 204, Condition D
Mechanical Shock	50g, 11ms half-sine, 3 shocks each direction 3 axes (total 18)	MIL-STD-202, Method 213, Condition A