

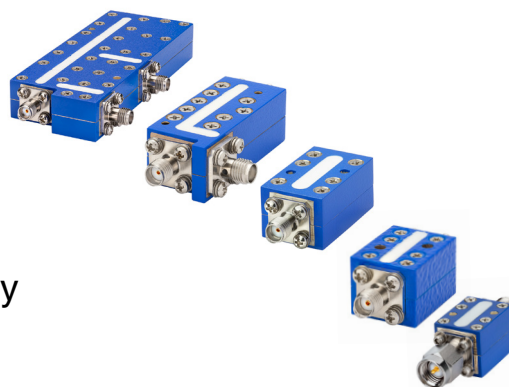
Suspended Substrate Stripline Filters and Multiplexers

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 stop-band 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

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



Low Pass Filter

50Ω DC to 11000 MHz

ZLSS-11G-S+



Generic photo used for illustration purposes only

CASE STYLE: RA2456

Connectors Model

SMA-F ZLSS-11G-S+

Features

- Very sharp roll-off
- High rejection of 90 dB typ.
- Stop band up to 33 GHz
- Low passband IL
- Connectorized package and small size

Applications

- Harmonic rejection
- Transmitters / Receivers
- Lab use

Electrical Specifications at 25°C

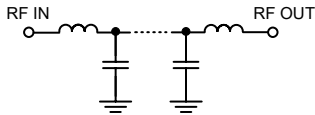
Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	DC-F1	DC-11000	—	2.0	3.0 dB
	VSWR	DC-F1	DC-11000	—	2.0	:1
Stop Band	Insertion Loss	F2-F3	12500-14500	20	30	— dB
		F3-F4	14500-26500	60	90	— dB
	VSWR	F2-F5	12500-33000	—	20	— :1

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.

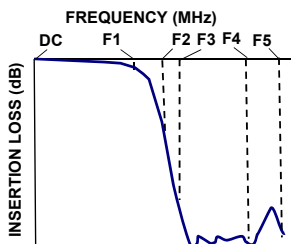
Functional Schematic



Typical Performance Data at 25°C

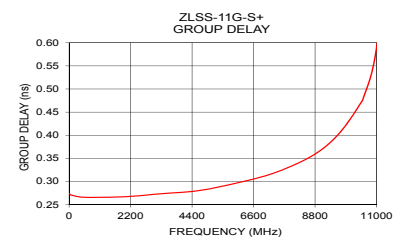
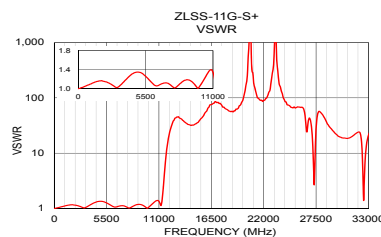
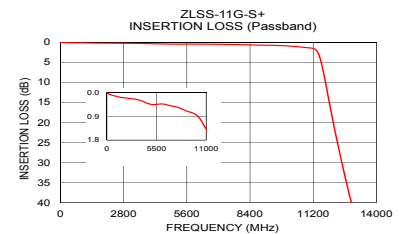
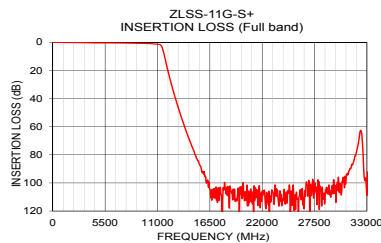
Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
10	0.01	1.00	10	0.27
100	0.03	1.01	100	0.27
1000	0.14	1.10	1000	0.27
5000	0.45	1.34	1500	0.27
11000	1.37	1.35	2000	0.27
11450	3.13	2.31	2500	0.27
11600	6.11	4.82	3000	0.27
11800	11.73	11.07	3500	0.27
12100	20.41	22.88	4000	0.28
12500	30.86	38.08	4500	0.28
13000	42.54	45.43	5000	0.28
14500	71.91	32.30	5500	0.29
15000	80.48	35.27	6000	0.30
17500	103.93	76.97	6500	0.30
20000	99.68	123.97	7000	0.31
25000	114.63	66.62	7500	0.32
26500	105.28	24.47	8000	0.33
30000	95.97	19.59	9000	0.37
31500	87.12	21.39	10000	0.43
33000	108.78	20.96	11000	0.59

Typical Frequency Response



+RoHS Compliant

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



Notes

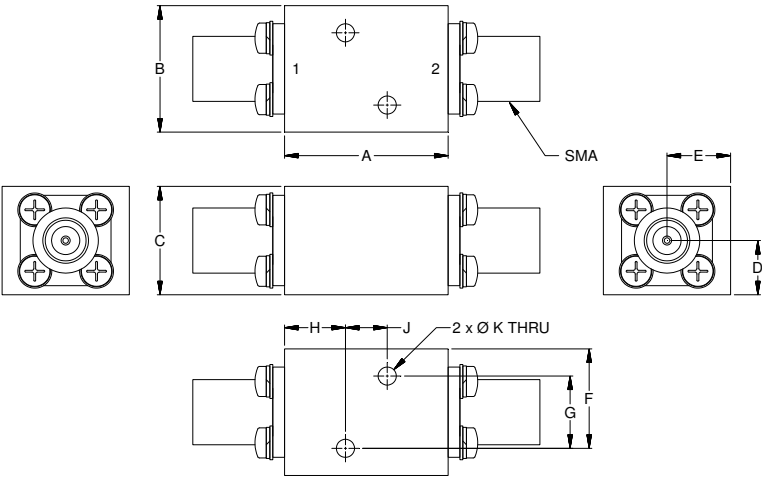
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Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

Outline Drawing



Outline Dimensions (inch)

A	B	C	D	E	F	G	H	J	K	Wt.
.90	.70	.60	.30	.35	.55	.400	.34	.230	.100	grams
22.86	17.78	15.24	7.62	8.89	13.97	10.16	8.51	5.84	2.54	55

Note: Please refer to case style drawing for details

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Suspended substrate stripline

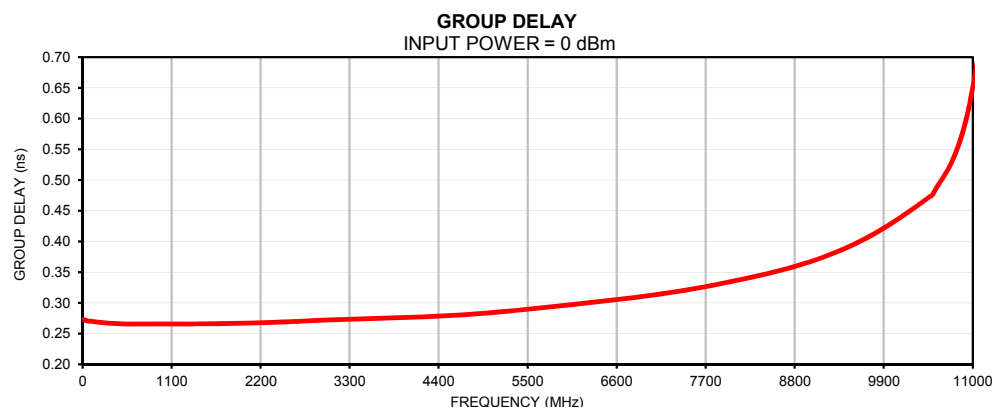
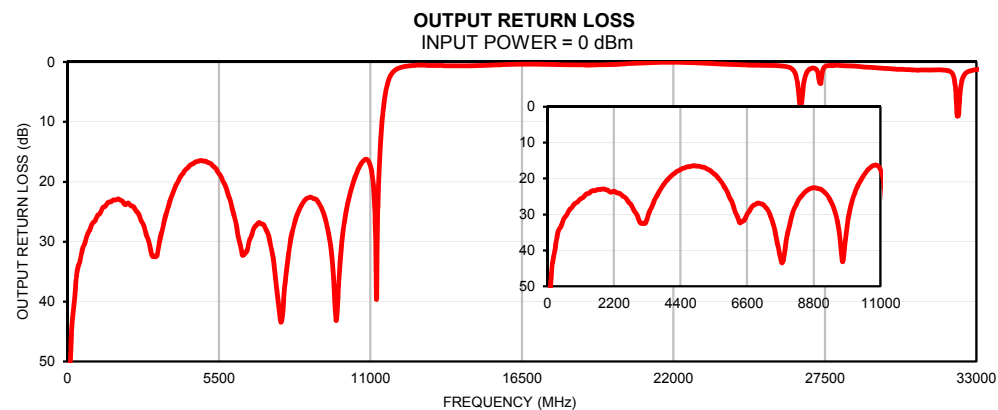
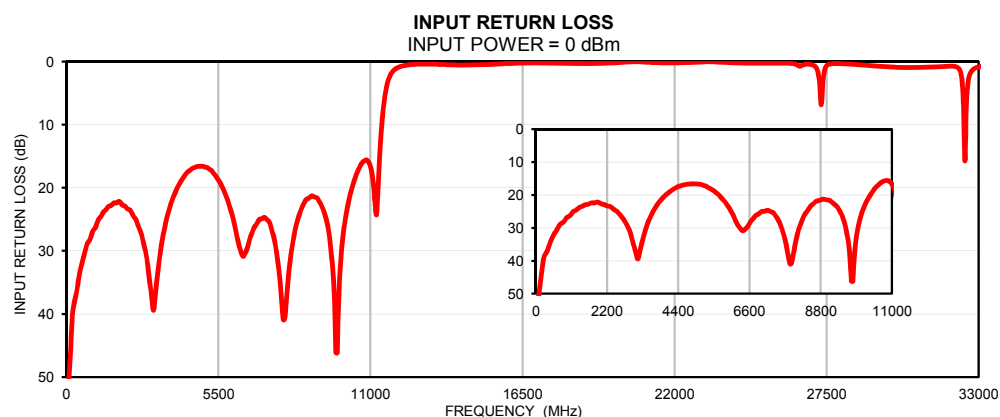
Low Pass Filter

ZLSS-11G-S+

Typical Performance Data

FREQ.	Insertion Loss	Input Return Loss	Output Return Loss	FREQ.	Group Delay
(MHz)	(dB)	(dB)	(dB)	(MHz)	(ns)
10	0.01	61.93	56.62	10	0.27
50	0.02	53.24	55.73	20	0.27
150	0.05	46.13	44.79	50	0.27
250	0.06	39.00	39.93	100	0.27
750	0.12	28.95	28.54	250	0.27
1250	0.16	24.58	24.59	500	0.27
1500	0.18	23.08	23.37	750	0.27
2500	0.23	24.91	24.93	1000	0.27
5000	0.45	16.68	16.54	1250	0.27
7500	0.53	27.74	33.78	1500	0.27
10000	0.87	27.96	28.56	1750	0.27
11000	1.37	16.63	17.36	2000	0.27
11200	1.52	24.19	32.71	2250	0.27
11300	1.81	17.71	19.69	2500	0.27
11450	3.13	8.03	8.60	2750	0.27
11500	3.93	6.16	6.59	3000	0.27
11900	14.68	1.17	1.34	3250	0.27
12000	17.59	0.93	1.08	3500	0.27
12100	20.41	0.76	0.91	3750	0.28
12200	23.14	0.65	0.78	4000	0.28
12400	28.36	0.51	0.65	4250	0.28
12500	30.86	0.46	0.60	4500	0.28
13000	42.54	0.38	0.55	4750	0.28
13500	53.16	0.44	0.58	5000	0.28
14000	62.98	0.52	0.64	5250	0.29
14500	71.91	0.54	0.64	5500	0.29
15000	80.48	0.49	0.59	5750	0.29
15500	88.00	0.40	0.49	6000	0.30
16000	95.51	0.30	0.41	6250	0.30
16500	104.45	0.23	0.35	6500	0.30
17000	104.00	0.21	0.36	6750	0.31
17500	103.93	0.23	0.38	7000	0.31
18000	104.07	0.27	0.45	7250	0.32
18500	108.62	0.31	0.47	7500	0.32
19000	111.71	0.30	0.50	7750	0.33
19500	105.18	0.24	0.45	8000	0.33
20000	99.68	0.14	0.39	8250	0.34
20500	105.54	0.01	0.25	8500	0.35
21000	114.90	0.10	0.15	8750	0.36
21500	107.52	0.18	0.06	9000	0.37
22000	105.88	0.19	0.04	9250	0.38
22500	107.83	0.14	0.08	9500	0.39
23000	105.00	0.05	0.16	9750	0.41
23500	104.01	0.06	0.27	9800	0.41
24000	108.09	0.16	0.39	9850	0.42
24500	109.73	0.23	0.46	9900	0.42
25000	114.63	0.26	0.51	10000	0.43
25500	118.96	0.26	0.56	10050	0.43
26000	104.76	0.26	0.69	10100	0.44
26500	105.28	0.71	3.44	10150	0.44
27000	122.32	0.55	1.07	10200	0.45
27500	107.40	0.64	0.78	10250	0.45
28000	118.95	0.32	0.56	10300	0.46
28500	107.45	0.44	0.68	10350	0.46
29000	101.48	0.61	0.87	10400	0.47
30000	95.97	0.89	1.16	10500	0.48
31000	93.02	0.92	1.34	10600	0.50
32000	75.15	0.72	1.48	10700	0.52
32500	68.41	15.74	2.69	10800	0.55
33000	108.78	0.83	1.26	11000	0.65

Typical Performance Curves





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, Condition 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