

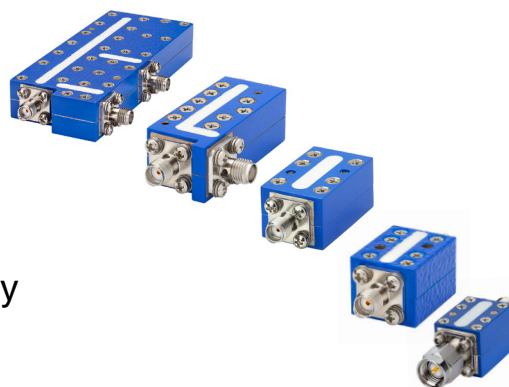
Suspended Substrate Stripline Filters and Multiplexers

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



Suspended substrate stripline Low Pass Filter

50Ω DC to 14000 MHz

ZLSS-14G-S+



Features

- Sharp roll-off
- High rejection of 90 dB typ.
- Low passband IL
- Connectorized package and small size

Generic photo used for illustration purposes only

CASE STYLE: RA2456

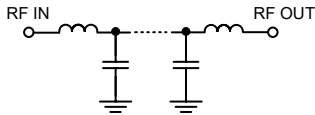
Connectors Model

SMA-F ZLSS-14G-S+

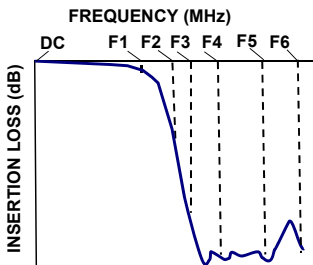
Applications

- Harmonic rejection
- Transmitters / Receivers
- Lab use

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	—	2.0	3.0	dB
	VSWR	DC-F1	—	2.1	—	:1
Stop Band	Insertion Loss	F2-F3	20	30	—	dB
		F3-F4	40	50	—	dB
		F4-F5	60	80	—	dB
		F5-F6	—	80	—	dB
	VSWR	F2-F6	—	20	—	:1

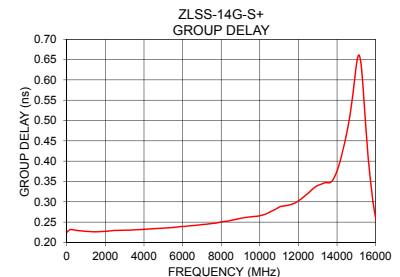
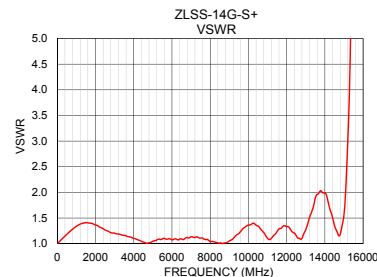
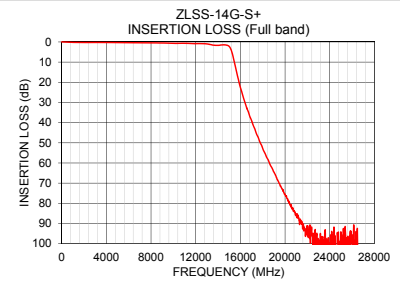
Maximum Ratings

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.

Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nsec)
10	0.01	1.01	10	0.22
100	0.01	1.04	100	0.23
1000	0.20	1.34	250	0.23
4000	0.29	1.10	500	0.23
6000	0.37	1.08	1000	0.23
10000	0.70	1.36	2000	0.23
14000	1.70	1.99	3000	0.23
15000	2.23	1.56	4000	0.23
15100	3.05	2.12	5000	0.24
15500	10.92	7.77	6000	0.24
15900	20.44	16.61	7000	0.24
16500	31.58	27.21	8000	0.25
17000	38.89	29.28	9000	0.26
18000	52.77	54.20	10000	0.27
19000	64.48	103.93	11000	0.29
19700	72.47	90.74	12000	0.30
20000	75.54	106.84	12500	0.32
23000	101.93	40.97	13000	0.34
25000	94.34	14.27	13500	0.35
26500	105.29	14.74	14000	0.38



Notes

- 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.
- Electrical specifications and performance data contained in this specification document are based on Mini-Circuit's applicable established test performance criteria and measurement instructions.
- 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



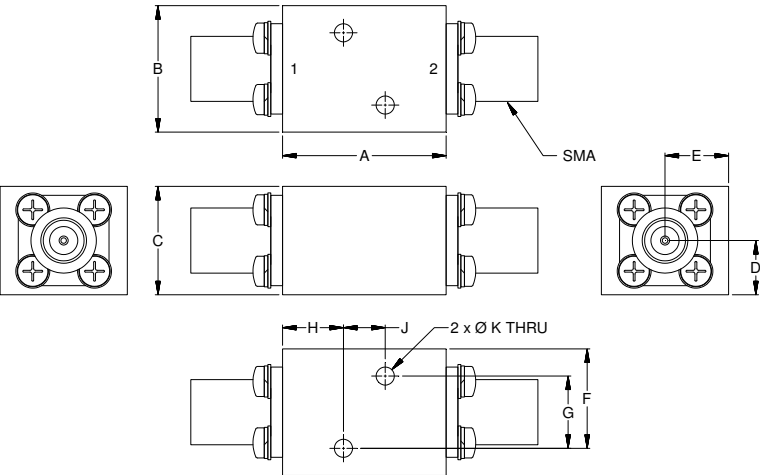
www.minicircuits.com P.O. Box 350166, Brooklyn, NY 11235-0003 (718) 934-4500 sales@minicircuits.com

REV.B
ECO-011269
ZLSS-14G-S+
EDU2958
URJ
220330
Page 2 of 3

Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

Outline Drawing



Outline Dimensions (^{inch}_{mm})

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

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

Suspended substrate stripline

Low Pass Filter

ZLSS-14G-S+

Typical Performance Data

FREQ.	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
(MHz)	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
10	0.00	0.01	0.01	49.37	47.63	65.49	59.74	42.65	57.43
20	0.00	0.01	0.01	47.01	49.37	45.68	50.78	51.51	46.24
50	0.00	0.01	0.01	43.00	40.79	39.83	43.23	40.54	39.64
100	0.00	0.01	0.01	36.72	34.73	34.29	36.32	34.54	34.02
150	0.01	0.02	0.02	31.93	31.24	30.76	31.92	31.11	30.72
200	0.02	0.03	0.04	29.06	28.82	28.67	28.97	28.78	28.57
250	0.03	0.05	0.05	26.74	27.00	27.02	26.74	26.92	27.00
500	0.08	0.10	0.11	21.24	21.61	21.96	21.14	21.50	21.86
750	0.13	0.15	0.16	18.30	18.59	18.88	18.28	18.55	18.85
1000	0.17	0.20	0.22	16.47	16.77	17.01	16.48	16.77	17.03
1250	0.21	0.25	0.27	15.43	15.73	15.89	15.45	15.74	15.91
1500	0.23	0.27	0.30	15.13	15.37	15.47	15.14	15.37	15.48
1750	0.23	0.28	0.32	15.32	15.58	15.54	15.29	15.54	15.53
2000	0.22	0.28	0.33	16.07	16.22	15.93	16.01	16.17	15.90
2500	0.19	0.27	0.32	18.78	18.59	17.79	18.64	18.45	17.65
3000	0.18	0.27	0.33	21.15	20.64	19.91	21.23	20.61	19.72
3500	0.18	0.28	0.34	22.67	22.55	22.13	23.17	22.81	22.24
4000	0.19	0.29	0.35	25.94	26.05	26.41	26.35	26.38	26.76
4500	0.19	0.30	0.38	37.28	36.01	39.97	36.08	34.60	36.99
5000	0.20	0.33	0.41	33.09	32.54	29.70	34.07	32.17	28.99
6000	0.23	0.37	0.47	30.58	28.65	25.16	28.70	26.99	24.03
7000	0.28	0.43	0.54	23.48	24.03	25.39	23.86	24.74	27.64
8000	0.30	0.47	0.59	30.39	34.28	32.86	29.28	30.76	30.92
9000	0.33	0.53	0.67	31.56	31.54	32.63	28.84	28.67	30.09
10000	0.48	0.70	0.85	15.96	16.25	16.34	16.01	16.27	16.68
11000	0.42	0.67	0.83	28.56	26.16	24.04	26.27	24.85	23.46
12000	0.55	0.85	1.04	17.93	16.91	16.25	18.12	17.22	16.78
13000	0.67	0.99	1.18	18.85	18.46	18.73	17.24	17.08	17.30
14000	1.38	1.70	1.88	9.20	9.58	9.93	8.86	9.23	9.49
14500	1.08	1.45	1.70	16.02	16.39	14.34	15.48	15.52	14.45
15000	1.75	2.23	2.52	12.84	13.21	12.30	14.22	14.29	14.02
15150	2.98	3.66	3.81	7.44	7.20	8.04	7.79	7.70	8.44
16000	21.16	22.58	22.93	0.70	0.97	1.32	0.67	0.96	1.25
16500	30.03	31.58	32.25	0.43	0.64	0.88	0.34	0.66	0.90
17000	37.93	38.89	39.94	0.15	0.59	0.63	0.22	0.56	0.68
17500	45.21	46.27	46.66	0.10	0.39	0.63	0.20	0.43	0.61
18000	51.98	52.77	53.11	0.13	0.32	0.46	0.12	0.34	0.51
18500	58.21	58.58	59.15	0.16	0.26	0.26	0.03	0.32	0.40
19000	63.96	64.48	64.61	0.07	0.17	0.35	0.11	0.06	0.29
19500	70.04	70.33	70.35	0.08	0.15	0.23	0.09	0.12	0.28
19700	72.17	72.47	72.18	0.10	0.19	0.28	0.17	0.02	0.20
20000	76.10	75.54	75.66	0.12	0.16	0.24	0.10	0.09	0.26
21000	86.01	85.49	84.50	0.13	0.11	0.28	0.07	0.04	0.23
21500	92.73	89.12	88.63	0.00	0.19	0.43	0.00	0.19	0.43
22000	94.17	95.68	93.53	0.08	0.26	0.47	0.06	0.27	0.57
22500	95.92	104.45	98.76	0.12	0.42	0.60	0.14	0.45	0.72
22750	97.93	96.93	110.92	0.20	0.48	0.77	0.19	0.46	0.73
23000	108.26	101.93	100.66	0.26	0.42	0.86	0.26	0.49	0.88
23250	94.01	100.05	118.44	0.39	0.53	0.88	0.32	0.55	0.95
23500	100.29	98.58	95.16	0.31	0.62	0.78	0.42	0.70	0.97
23750	92.80	101.42	98.47	0.28	0.80	0.88	0.48	0.87	1.08
24000	110.48	111.66	106.13	0.39	0.88	1.15	0.55	0.93	1.23
24250	97.24	99.77	101.54	0.55	0.91	1.38	0.66	0.96	1.39
24500	101.66	104.85	104.14	0.68	0.93	1.36	0.69	1.06	1.48
24750	101.21	96.78	99.99	0.71	1.04	1.26	0.75	1.17	1.58
25000	98.50	94.34	95.90	0.60	1.22	1.32	0.81	1.28	1.63
25250	95.56	102.37	104.54	0.60	1.29	1.44	0.78	1.33	1.70
25500	96.46	97.13	94.20	0.76	1.41	1.70	0.92	1.49	1.85
26000	92.59	95.79	95.12	0.64	1.32	1.58	0.74	1.31	1.82
26500	94.99	105.29	97.30	0.48	1.18	1.63	0.49	1.07	1.65

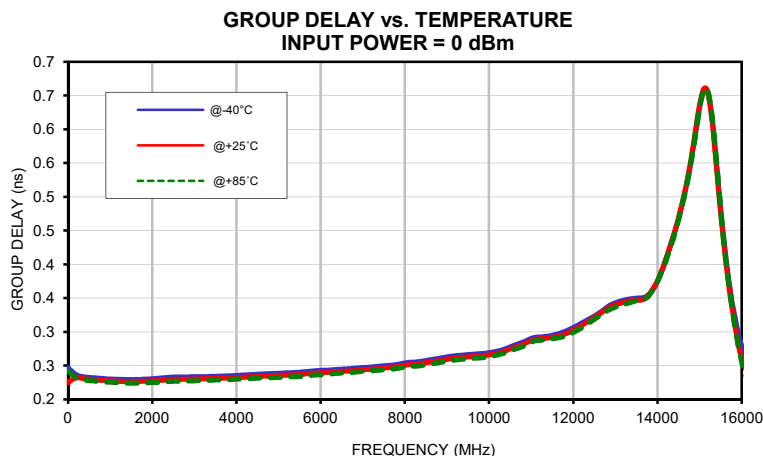
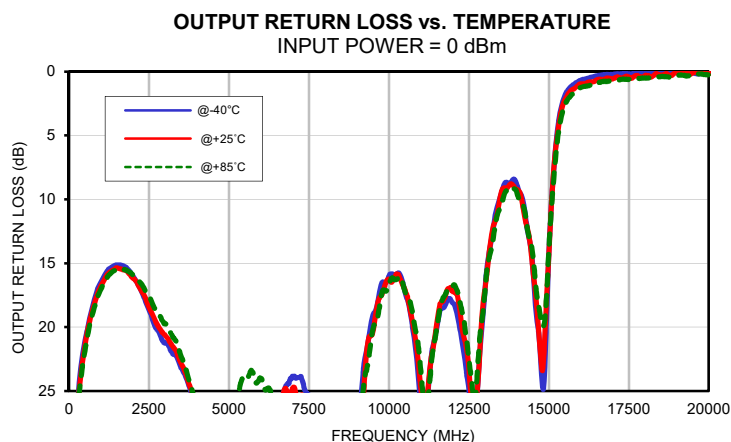
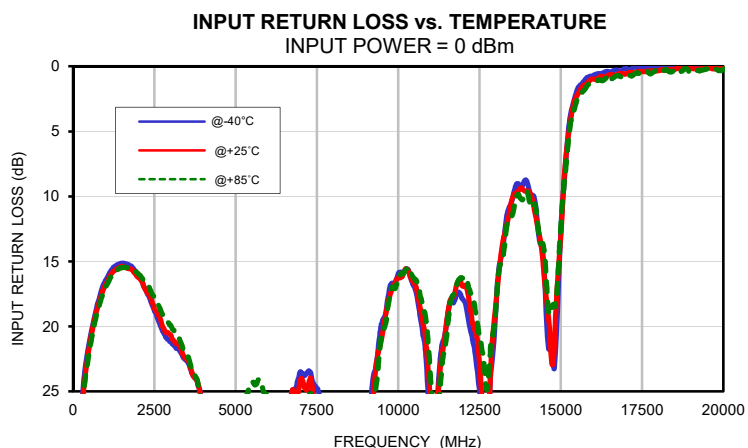
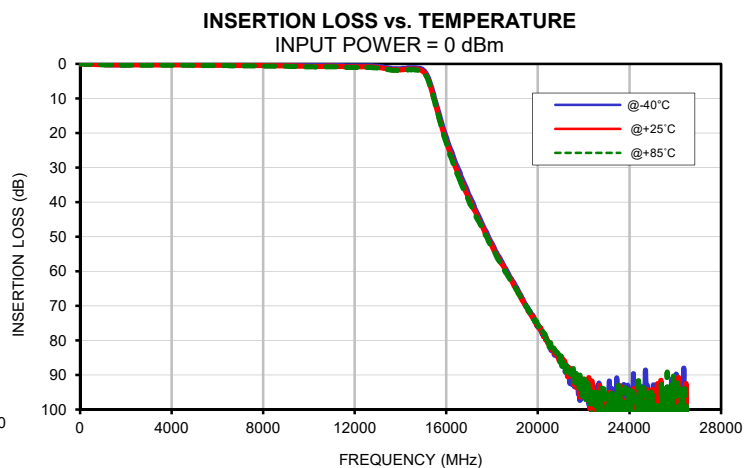
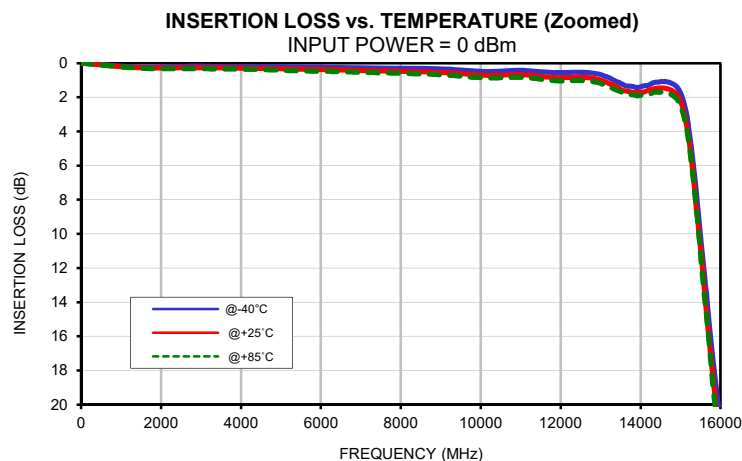
Suspended substrate stripline

Low Pass Filter

ZLSS-14G-S+

Typical Performance Data

FREQ.	GROUP DELAY		
(MHz)	(nsec)		
	@-40°C	@+25°C	@+85°C
10	0.25	0.22	0.24
20	0.25	0.23	0.24
50	0.24	0.23	0.24
100	0.24	0.23	0.24
200	0.24	0.23	0.23
400	0.23	0.23	0.23
600	0.23	0.23	0.23
800	0.23	0.23	0.23
1000	0.23	0.23	0.23
1250	0.23	0.23	0.22
1500	0.23	0.23	0.22
1750	0.23	0.23	0.22
2000	0.23	0.23	0.22
2250	0.23	0.23	0.23
2500	0.23	0.23	0.23
2750	0.23	0.23	0.23
3000	0.23	0.23	0.23
3250	0.23	0.23	0.23
3500	0.23	0.23	0.23
3750	0.23	0.23	0.23
4000	0.24	0.23	0.23
4250	0.24	0.23	0.23
4500	0.24	0.23	0.23
5000	0.24	0.24	0.23
5500	0.24	0.24	0.23
6000	0.24	0.24	0.24
6500	0.24	0.24	0.24
7000	0.25	0.24	0.24
7500	0.25	0.25	0.24
8000	0.25	0.25	0.25
8500	0.26	0.25	0.25
9000	0.26	0.26	0.26
9500	0.27	0.26	0.26
10000	0.27	0.27	0.26
10500	0.28	0.27	0.27
11000	0.29	0.29	0.28
11500	0.29	0.29	0.29
12000	0.31	0.30	0.30
12500	0.32	0.32	0.32
13000	0.34	0.34	0.34
13500	0.35	0.35	0.35
14000	0.37	0.38	0.37





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