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

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-K24G+

50Ω DC to 24000 MHz

Generic photo used for illustration purposes only

CASE STYLE: UZ3156

Connectors	Model
2.92mm-F	ZLSS-K24G+

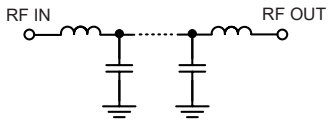
Features

- Wider stopband up to 40000 MHz
- High rejection of 90 dB typical
- Low passband IL 1.5 dB typ.
- Low VSWR of 2:1 typ. in passband

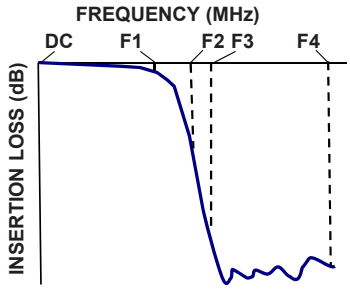
Applications

- 5G
- Test and instrumentation
- Harmonic rejection
- Transmitter / Receiver

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

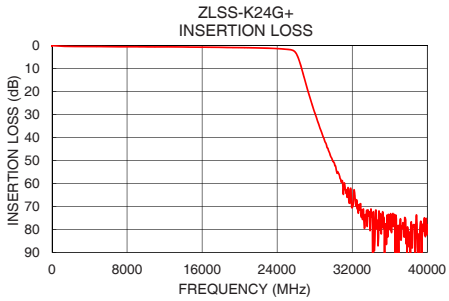
Parameter		F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Insertion Loss	DC-F1	DC - 24000	-	1.5	2.5	dB
	VSWR	DC-F1	DC - 24000	-	2.0	-	:1
Stop Band	Insertion Loss	F2-F3	29000 - 33000	20	40	-	dB
		F3-F4	33000 - 40000	50	70	-	dB

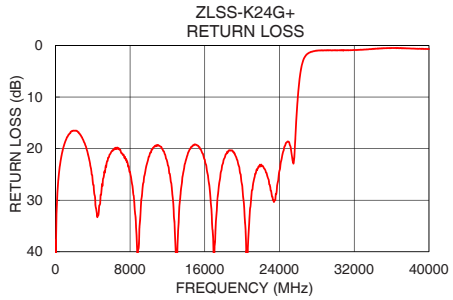
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	2W @ 25°C

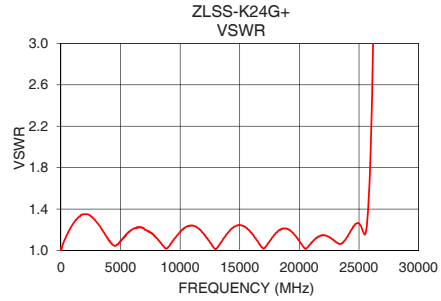
Permanent damage may occur if any of these limits are exceeded.

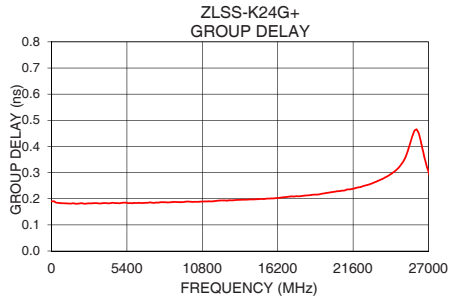
Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
10	0.03	1.00	10	0.19
100	0.01	1.04	500	0.18
1000	0.28	1.25	1000	0.18
2000	0.39	1.35	1500	0.18
5000	0.46	1.13	2000	0.18
10000	0.59	1.18	3000	0.18
20000	0.92	1.06	4000	0.18
21000	0.97	1.06	5000	0.18
24000	1.33	1.12	6000	0.18
26000	3.28	1.96	7000	0.19
27000	15.74	11.03	8000	0.19
27300	20.01	13.65	9000	0.19
28500	35.10	20.58	10000	0.19
29000	40.57	21.82	11000	0.19
29500	45.97	21.49	12000	0.19
30000	50.42	20.48	13000	0.19
33000	74.35	18.59	14000	0.20
35000	73.18	20.72	15000	0.20
38000	80.86	22.43	20000	0.22
40000	78.01	23.06	24000	0.28









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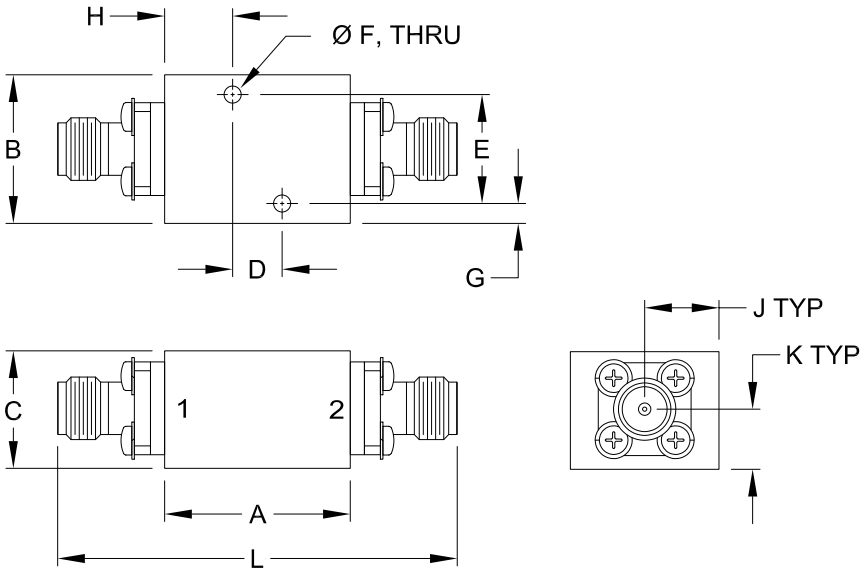
Coaxial Connections

PORT - 1	2.92mm-Female
PORT - 2	2.92mm-Female

Outline Drawing



Outline Dimensions (inch / mm)

A	B	C	D	E	F	G
.75	**.60**	**.48**	**.200**	**.440**	**.070**	**.08**
19.1	15.2	12.1	5.08	11.18	1.78	2.0

H	J	K	L			Wt.
.28	**.30**	**.24**	**1.61**			grams
7.0	7.6	6.2	41.0			35

Note: Please refer to case style drawing for details

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Suspended substrate stripline

Low Pass Filter ZLSS-K24G+

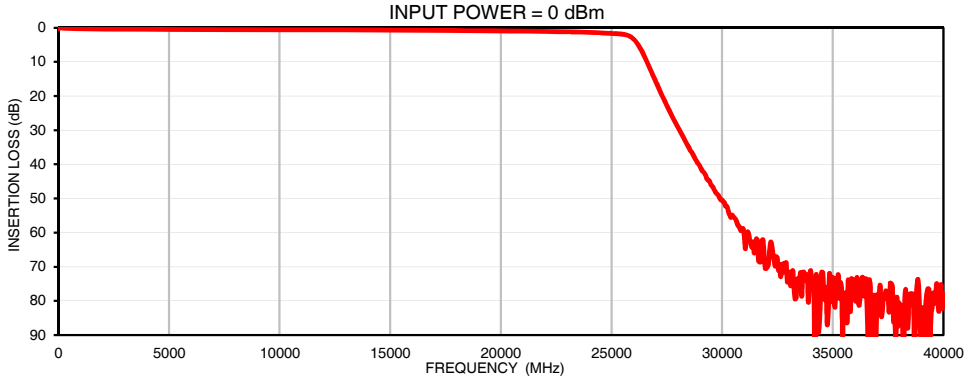
Typical Performance Data

FREQ. (MHz)	Insertion Loss (dB)	Input Return Loss (dB)	Output Return Loss (dB)
10	0.03	51.44	52.25
50	0.06	42.17	41.68
100	0.01	34.69	34.73
500	0.18	23.23	23.28
1000	0.28	18.95	19.02
2000	0.39	16.52	16.61
2500	0.42	16.85	17.01
3000	0.42	18.37	18.54
4000	0.45	26.24	25.12
5000	0.46	26.91	24.59
6000	0.52	20.62	20.51
6500	0.53	19.82	20.02
7000	0.55	20.54	21.09
7500	0.54	21.92	22.45
8000	0.55	24.54	24.56
9000	0.55	35.61	28.84
10000	0.59	21.58	21.53
10500	0.61	19.80	19.83
11000	0.62	19.30	19.72
11500	0.62	20.21	20.63
11700	0.62	21.01	21.42
12000	0.61	22.74	23.26
12400	0.59	26.61	26.40
12500	0.60	28.24	27.43
13000	0.61	46.14	29.87
13600	0.62	25.61	24.08
15000	0.70	19.21	20.02
16000	0.73	22.14	23.17
20000	0.92	27.04	30.75
24000	1.33	24.27	25.15
26000	3.28	9.23	9.75
26500	8.49	3.12	3.17
27000	15.74	1.61	1.58
27300	20.01	1.33	1.27
27500	22.75	1.19	1.14
27700	25.35	1.09	1.02
27900	27.97	1.05	0.98
28000	29.05	0.99	0.95
28300	32.78	0.98	0.87
28500	35.10	0.93	0.84
28700	37.34	0.98	0.81
28900	39.67	0.97	0.83
29000	40.57	0.93	0.80
29300	44.04	0.91	0.84
29500	45.97	0.93	0.81
29700	48.13	0.96	0.86
29900	49.96	0.95	0.86
30000	50.42	0.96	0.85
30300	54.10	0.94	0.85
32000	70.48	0.91	0.93
32500	67.55	0.87	0.93
33000	74.35	0.81	0.94
33500	74.67	0.77	0.91
34000	71.10	0.69	0.88
34500	71.62	0.64	0.84
35000	73.18	0.57	0.84
35500	77.94	0.51	0.81
36000	77.80	0.52	0.81
39000	91.25	0.63	0.74
40000	78.01	0.70	0.75

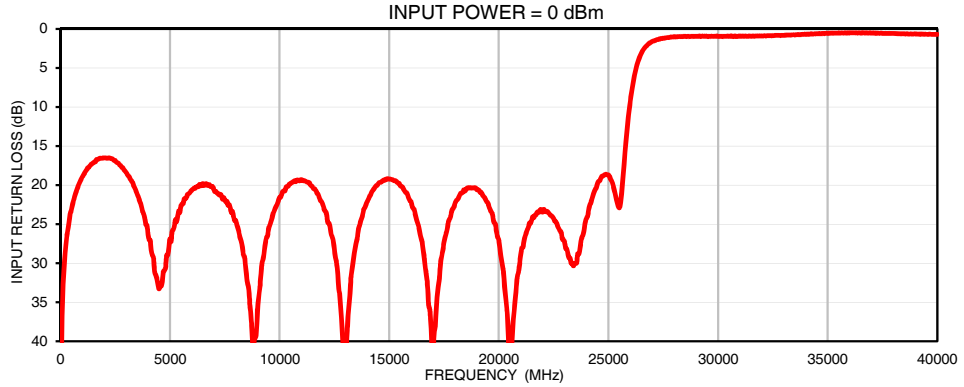
FREQ. (MHz)	Group Delay (ns)
10	0.19
50	0.19
100	0.19
300	0.19
500	0.18
700	0.18
900	0.18
1100	0.18
1300	0.18
1500	0.18
1700	0.18
1900	0.18
2100	0.18
2300	0.18
2500	0.18
2700	0.18
2900	0.18
3100	0.18
3300	0.18
3500	0.18
3700	0.18
3900	0.18
4100	0.18
4300	0.18
4500	0.18
4700	0.18
4900	0.18
5100	0.18
5300	0.18
5500	0.18
5700	0.18
5900	0.18
6100	0.18
6300	0.18
6500	0.18
6700	0.18
6900	0.18
7000	0.19
7500	0.19
8000	0.19
8500	0.19
9000	0.19
9500	0.19
10000	0.19
10500	0.19
11000	0.19
11500	0.19
12000	0.19
12500	0.19
13000	0.19
13500	0.20
14000	0.20
14500	0.20
15000	0.20
16000	0.20
17000	0.21
20000	0.22
21000	0.23
22000	0.24
24000	0.28

Typical Performance Curves

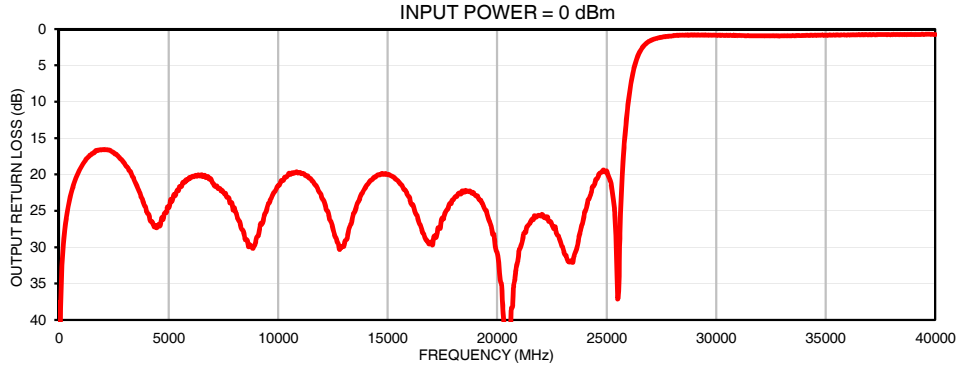
INSERTION LOSS
INPUT POWER = 0 dBm



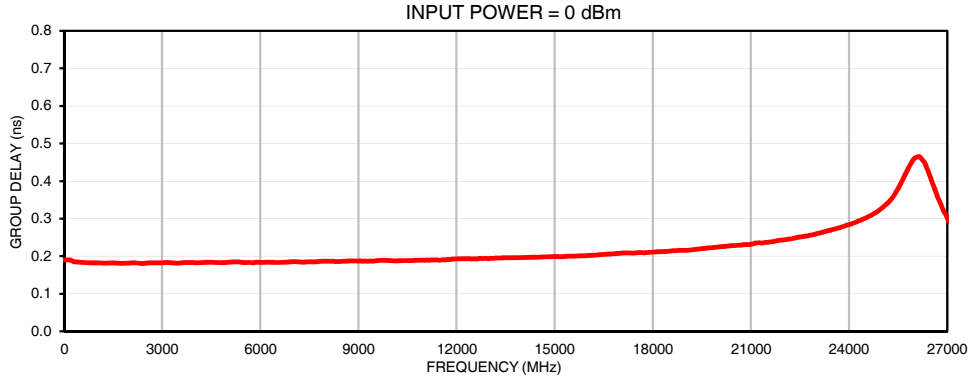
INPUT RETURN LOSS
INPUT POWER = 0 dBm



OUTPUT RETURN LOSS
INPUT POWER = 0 dBm



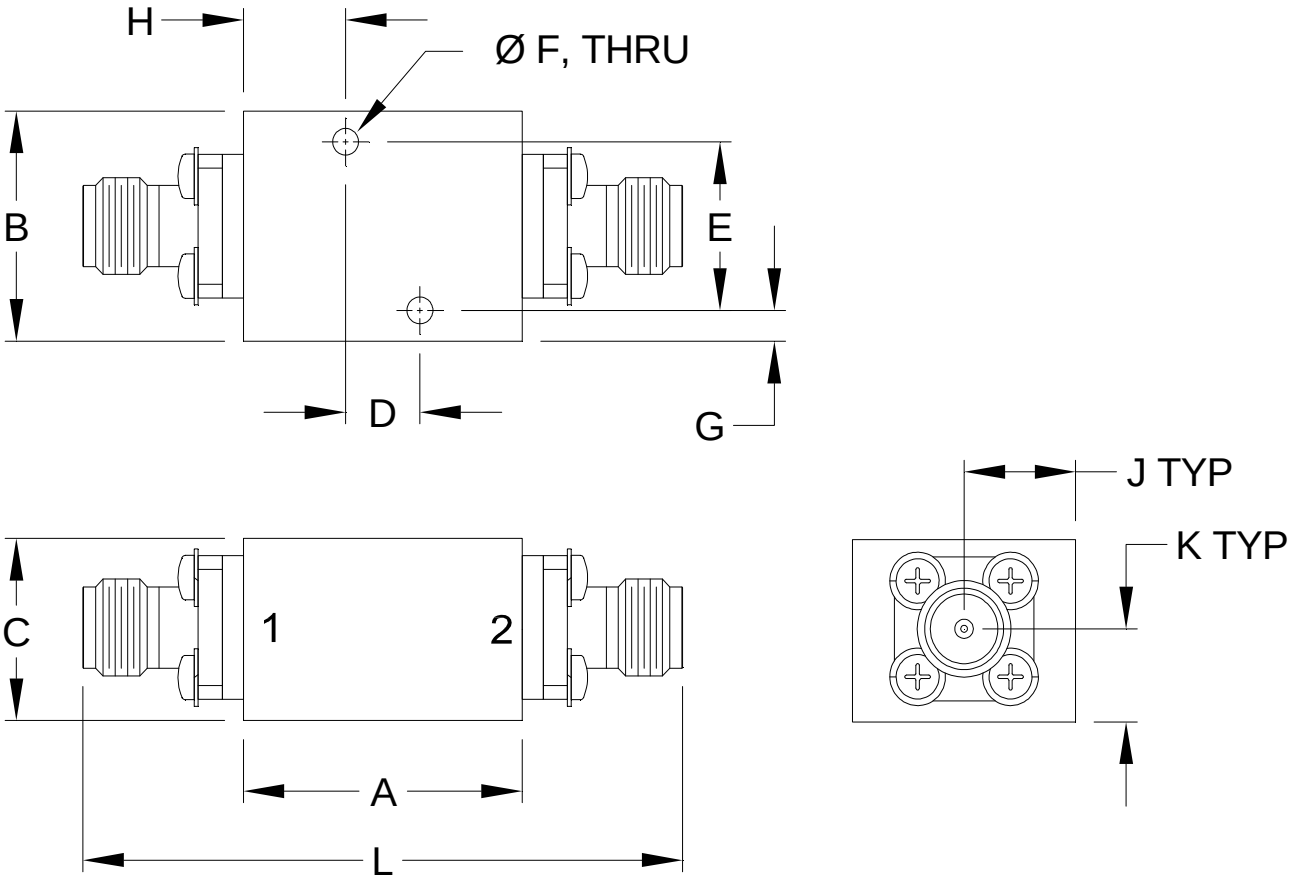
GROUP DELAY
INPUT POWER = 0 dBm



Case Style UZ

Outline Dimensions

UZ3156



CASE#	A	B	C	D	E	F	G
UZ3156	.75 (19.1)	.60 (15.2)	.48 (12.1)	.200 (5.08)	.440 (11.18)	.070 (1.78)	.08 (2.0)

CASE#	H	J	K	L	WT. GRAMS
UZ3156	.28 (7.0)	.30 (7.6)	.24 (6.2)	1.61 (41.0)	35

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.

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RF/IF MICROWAVE COMPONENTS

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Environmental Specifications ENV001

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	-40° to 85° C Ambient Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet

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