

# Suspended Substrate Stripline Filters and Multiplexers

50Ω DC to 26 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 26 GHz
- Stopband up to 26.5 GHz can extend 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

- 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](http://www.minicircuits.com/MCLStore/terms.jsp)



# Suspended substrate stripline Band Pass Filter

## ZBSS-12G-S+

50Ω 6000 to 18000 MHz



Generic photo used for illustration purposes only

CASE STYLE:WK3305  
Connectors Model  
SMA - F ZBSS-12G-S+

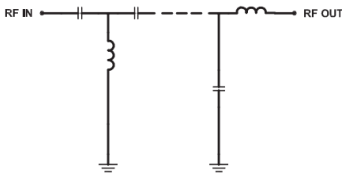
### Features

- Wide fractional bandwidth design of 100%
- 0.8dB typ. Insertion Loss at Center frequency
- Sharp roll-off
- High rejection floor of 90dB typ. up to 3GHz
- Stop band up to 26.5 GHz
- Connectorized package

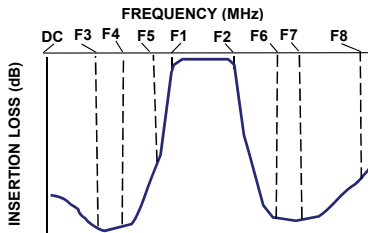
### Applications

- Satellite communications
- Test Equipment
- Radiolocation
- Radio Navigation
- Military and defense
- Electronic warfare receiver
- Wideband receivers
- Space Research

### 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	Center Frequency	Fc	12000	-	0.8	-	dB
	Insertion Loss	F1-F2	6000 - 18000	-	2.0	3.5	dB
	VSWR	F1-F2	6000 - 18000	-	1.5	-	:1
Stop Band, Lower	Insertion Loss	DC-F3	DC - 3000	60	90	-	dB
		F3-F4	3000 - 3600	40	60	-	dB
		F4-F5	3600 - 4000	20	40	-	dB
Stop Band, Upper	Insertion Loss	F6-F7	20500 - 21500	20	40	-	dB
		F7-F8	21500 - 26500	-	40	-	dB

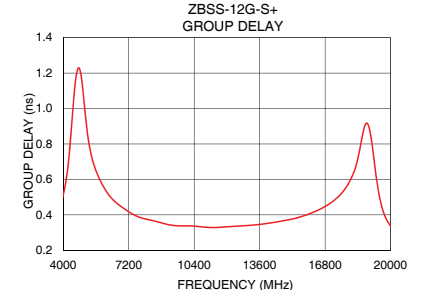
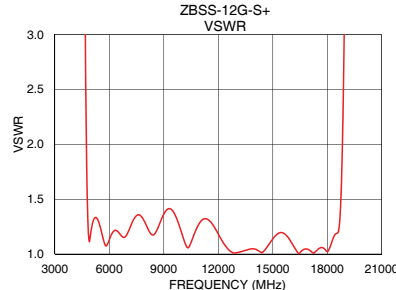
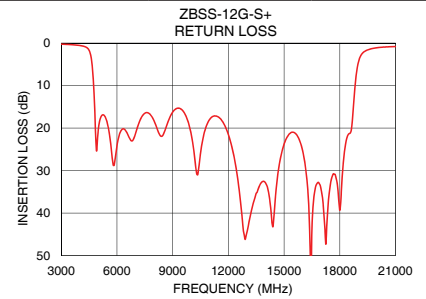
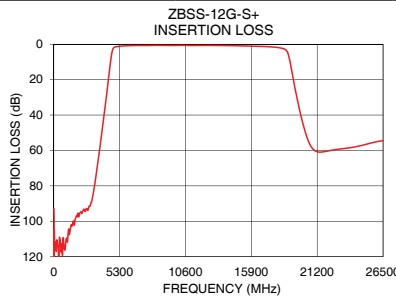
### Maximum Ratings

Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	5W max. @ 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	92.81	14610.41	6000	0.55
1000	109.79	683.93	6500	0.48
3000	89.43	66.66	7000	0.43
3600	63.96	42.96	7500	0.40
4000	42.52	30.03	8000	0.38
4200	31.34	23.15	8500	0.36
4400	19.66	15.00	9000	0.35
4750	2.85	1.84	9500	0.34
6000	0.85	1.13	10000	0.34
9000	0.73	1.36	10500	0.34
12000	0.71	1.18	11000	0.33
15000	0.95	1.14	11500	0.33
18000	1.86	1.02	12000	0.33
18650	3.07	1.24	12500	0.34
19300	20.69	8.38	13000	0.34
19550	29.64	11.38	14000	0.35
20500	54.91	19.30	15000	0.37
21500	60.95	21.72	16000	0.40
23000	59.25	22.85	17000	0.46
26500	54.50	19.81	18000	0.59



### Notes

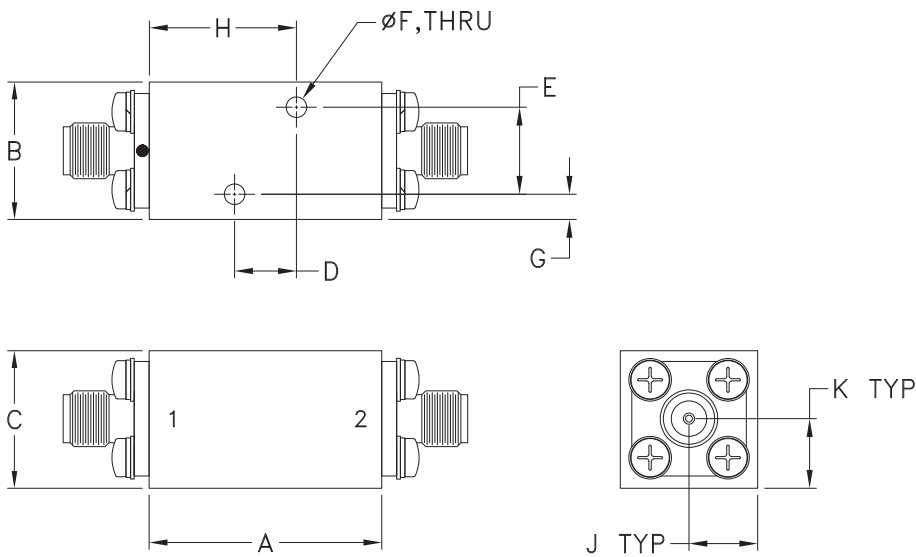
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## Coaxial Connections

PORT - 1	SMA FEMALE
PORT - 2	SMA FEMALE

## Outline Drawing



## Outline Dimensions ( $\frac{\text{inch}}{\text{mm}}$ )

A	B	C	D	E	F
1.02	.60	.60	.270	.380	.090
25.8	15.2	15.2	6.86	9.65	2.29
G	H	J	K		Wt.
.11	.64	.30	.30		grams
2.8	16.3	7.6	7.7		47

Note: Please refer to case style drawing for details

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# Suspended substrate stripline Band Pass Filter

## ZBSS-12G-S+

### Typical Performance Data

FREQ.  (MHz)	INSERTION LOSS			INPUT RETURN LOSS			OUTPUT RETURN LOSS		
	(dB)			(dB)			(dB)		
	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C	@-40°C	@+25°C	@+85°C
10	103.15	92.81	109.96	0.00	0.00	0.01	0.00	0.00	0.01
50	104.66	107.63	100.95	0.00	0.00	0.01	0.00	0.00	0.00
100	113.87	116.46	110.35	0.00	0.00	0.01	0.00	0.00	0.00
200	121.53	117.06	124.71	0.01	0.00	0.01	0.01	0.00	0.01
300	117.90	113.47	120.56	0.01	0.00	0.01	0.01	0.01	0.01
400	112.03	122.30	114.86	0.01	0.00	0.02	0.00	0.02	0.02
500	117.23	110.15	108.69	0.01	0.01	0.02	0.01	0.03	0.03
600	111.88	117.60	117.58	0.01	0.01	0.02	0.02	0.04	0.05
700	115.86	119.28	111.68	0.01	0.01	0.03	0.03	0.05	0.06
800	115.99	112.53	112.29	0.01	0.02	0.03	0.04	0.07	0.08
900	113.15	116.26	111.34	0.01	0.02	0.04	0.06	0.09	0.11
1000	110.32	109.79	109.89	0.00	0.03	0.04	0.08	0.12	0.13
1500	99.84	101.81	101.57	0.02	0.06	0.08	0.18	0.22	0.24
2000	97.50	97.52	97.69	0.06	0.11	0.13	0.21	0.27	0.29
2500	93.27	94.35	94.33	0.12	0.18	0.20	0.20	0.26	0.29
3000	89.89	89.43	89.71	0.19	0.26	0.29	0.22	0.30	0.33
3300	79.30	78.89	78.97	0.25	0.32	0.36	0.29	0.38	0.42
3600	64.36	63.96	63.80	0.32	0.40	0.45	0.43	0.52	0.57
3800	53.79	53.35	53.18	0.38	0.48	0.53	0.54	0.66	0.71
4000	42.96	42.52	42.35	0.47	0.58	0.64	0.68	0.81	0.87
4200	31.78	31.34	31.16	0.61	0.75	0.83	0.83	0.99	1.06
4400	20.09	19.66	19.49	0.95	1.16	1.27	1.09	1.29	1.39
4550	11.16	10.80	10.68	1.88	2.26	2.46	1.86	2.21	2.37
4750	2.79	2.85	2.92	9.32	10.56	11.08	9.09	10.30	10.80
6000	0.70	0.85	0.92	23.66	24.14	24.20	21.47	21.73	21.74
7000	0.58	0.71	0.77	20.88	21.26	21.19	20.46	20.69	20.63
8000	0.56	0.70	0.75	18.14	18.33	18.82	18.40	18.65	19.05
9000	0.58	0.73	0.78	16.13	16.25	16.73	16.03	16.18	16.68
10000	0.50	0.65	0.73	21.43	21.48	20.64	22.51	22.62	21.79
12000	0.54	0.71	0.79	21.06	21.56	20.93	21.20	21.71	21.01
14000	0.61	0.81	0.91	33.89	32.90	30.07	35.67	33.84	31.31
15000	0.72	0.95	1.05	23.90	23.76	22.86	22.87	22.53	21.77
16000	0.84	1.10	1.22	25.40	25.34	26.21	24.08	23.74	24.72
17000	1.04	1.33	1.48	42.30	34.61	34.34	35.76	31.06	31.64
18000	1.46	1.86	2.04	35.59	39.33	35.24	36.71	36.28	36.05
18650	2.40	3.07	3.40	21.49	19.43	18.48	29.40	28.34	27.36
19000	7.62	9.48	10.24	4.84	4.53	4.56	4.94	4.73	4.70
19300	18.73	20.69	21.47	1.84	2.08	2.24	1.80	2.01	2.12
19550	27.90	29.64	30.39	1.24	1.53	1.66	1.21	1.42	1.54
20000	42.19	43.59	44.21	0.82	1.10	1.22	0.79	0.98	1.08
20500	53.94	54.91	55.29	0.63	0.90	1.01	0.56	0.74	0.84
20800	58.07	58.76	58.96	0.60	0.86	0.97	0.48	0.66	0.75
21000	59.60	60.12	60.22	0.57	0.82	0.93	0.43	0.61	0.71
21300	60.56	60.90	60.93	0.57	0.81	0.92	0.37	0.56	0.63
21500	60.63	60.95	60.96	0.56	0.80	0.89	0.35	0.53	0.61
21700	60.52	60.79	60.81	0.55	0.78	0.86	0.32	0.51	0.59
22000	60.18	60.42	60.44	0.56	0.79	0.86	0.29	0.47	0.56
22300	59.85	60.00	59.97	0.54	0.78	0.84	0.26	0.45	0.53
22500	59.63	59.74	59.72	0.53	0.78	0.83	0.25	0.43	0.52
22700	59.48	59.52	59.49	0.52	0.78	0.82	0.23	0.42	0.50
23000	59.25	59.25	59.10	0.50	0.76	0.81	0.21	0.40	0.48
23300	58.96	58.98	58.80	0.47	0.73	0.81	0.21	0.40	0.47
23500	58.83	58.82	58.59	0.45	0.71	0.79	0.19	0.38	0.46
23700	58.66	58.61	58.35	0.42	0.68	0.76	0.17	0.36	0.44
24000	58.33	58.34	58.05	0.40	0.65	0.76	0.17	0.36	0.44
24300	57.94	57.93	57.73	0.36	0.62	0.73	0.16	0.35	0.42
24500	57.61	57.60	57.46	0.35	0.61	0.72	0.16	0.35	0.42
25000	56.73	56.78	56.77	0.38	0.64	0.74	0.14	0.33	0.41
25500	55.69	55.89	55.95	0.47	0.72	0.82	0.15	0.33	0.41
26500	54.12	54.50	54.49	0.63	0.88	1.01	0.16	0.34	0.42



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IF/RF MICROWAVE COMPONENTS

REV. OR  
ZBSS-12G-S+  
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# Suspended substrate stripline Band Pass Filter

## ZBSS-12G-S+

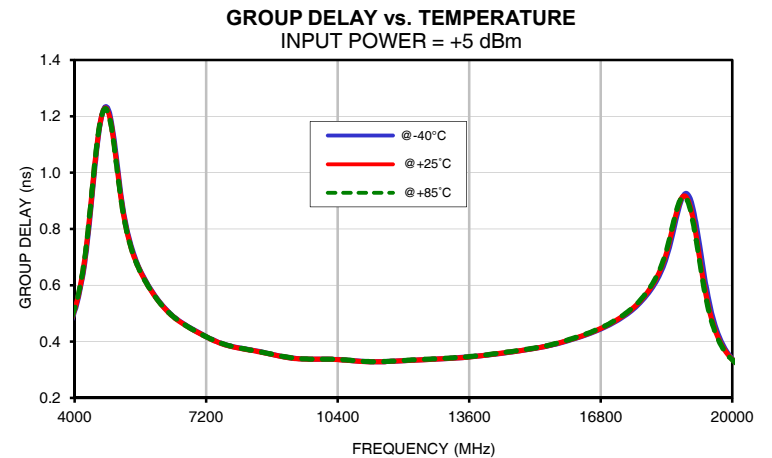
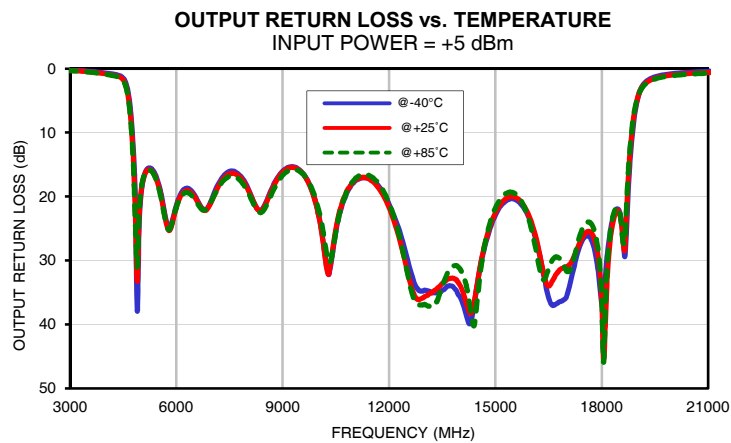
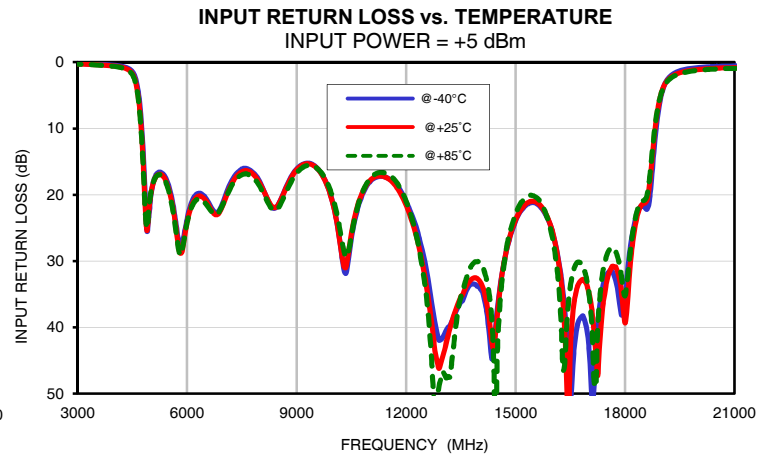
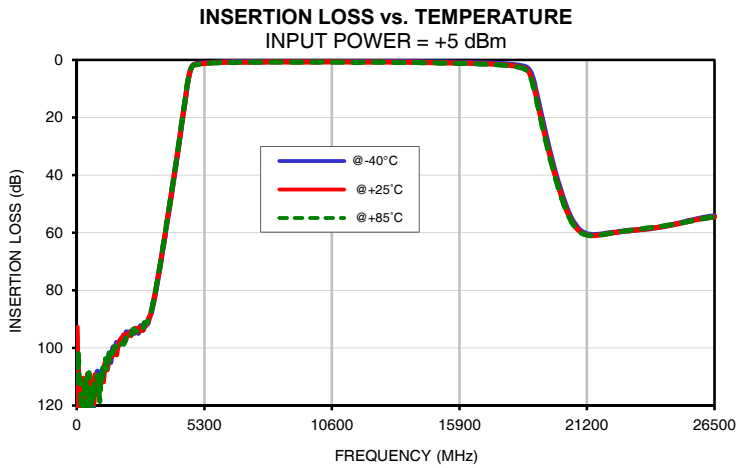
### Typical Performance Data

FREQ.  (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
6000	0.55	0.55	0.55
6300	0.50	0.50	0.50
6600	0.47	0.47	0.47
6900	0.44	0.44	0.44
7200	0.42	0.42	0.42
7500	0.40	0.40	0.40
7800	0.38	0.38	0.38
8100	0.38	0.37	0.38
8400	0.37	0.37	0.37
8700	0.36	0.36	0.36
9000	0.35	0.35	0.35
9300	0.34	0.34	0.34
9600	0.34	0.34	0.34
9900	0.34	0.34	0.34
10200	0.34	0.34	0.34
10500	0.34	0.34	0.34
10800	0.33	0.33	0.33
11100	0.33	0.33	0.33
11400	0.33	0.33	0.33
11700	0.33	0.33	0.33
12000	0.33	0.33	0.33
12300	0.33	0.33	0.34
12600	0.34	0.34	0.34
12900	0.34	0.34	0.34
13200	0.34	0.34	0.34
13500	0.34	0.34	0.35
13800	0.35	0.35	0.35
14100	0.35	0.35	0.35
14400	0.36	0.36	0.36
14700	0.36	0.37	0.37
15000	0.37	0.37	0.37
15300	0.38	0.38	0.38
15600	0.39	0.39	0.39
15900	0.40	0.40	0.40
16200	0.41	0.41	0.42
16500	0.43	0.43	0.43
16800	0.44	0.45	0.45
17100	0.47	0.47	0.47
17400	0.49	0.50	0.50
17700	0.53	0.53	0.54
18000	0.58	0.59	0.59

# Suspended substrate stripline Band Pass Filter

## ZBSS-12G-S+

### Typical Performance Curves

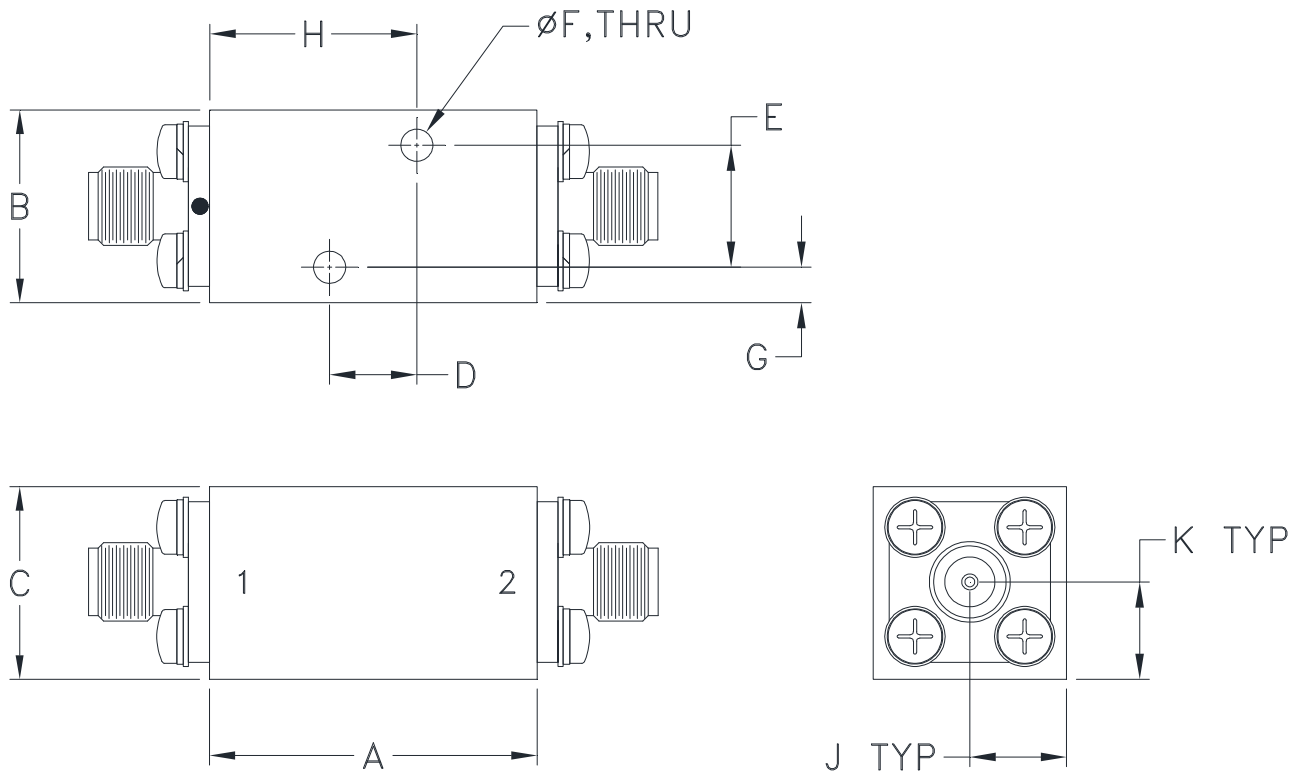


# Case Style

# WK

## Outline Dimensions

### WK3305



CASE#	A	B	C	D	E	F
WK3305	1.02 (25.8)	.60 (15.2)	.60 (15.2)	.270 (6.86)	.380 (9.65)	.090 (2.29)

CASE#	G	H	J	K	WT. GRAMS
WK3305	.11 (2.8)	.64 (16.3)	.30 (7.6)	.30 (7.7)	47

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

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