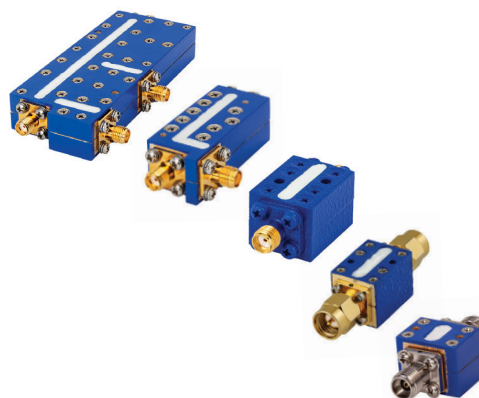


# Suspended Substrate Stripline Filters and Multiplexers

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



# Suspended substrate stripline High Pass Filter

## ZHSS-K18G+

50Ω 18000 to 40000 MHz



Generic photo used for illustration purposes only

CASE STYLE: UJ2936

Connectors	Model
2.92mm-F	ZHSS-K18G+

### Features

- Wider passband up to 40000 MHz
- Low insertion loss of 1 dB typical
- Sharp rejection of 90 dB typical
- Connectorized package

### Applications

- 5G
- Very wideband test and instrumentation
- Satellite communication
- Transmitter / Receiver

### Electrical Specifications at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit	
Stop Band	Rejection Loss	DC-F1	DC - 11700	60	80	-	dB
		F1-F2	11700 - 13600	20	40	-	dB
Pass Band	Insertion Loss	F3-F4	18000 - 40000	-	1.5	2.5	dB
	VSWR	F3-F4	18000 - 40000	-	2	-	:1

### Maximum Ratings

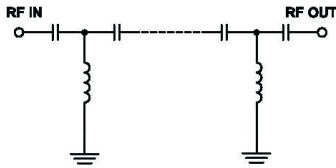
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input	2 W @ 25°C

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

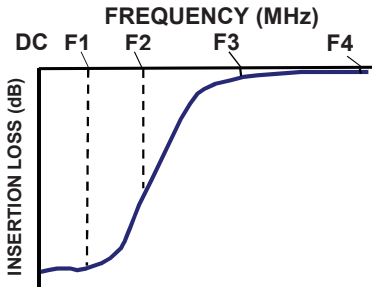
### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (ns)
10	124.21	1007.64	18000	0.29
100	126.64	879.05	19000	0.25
1000	111.42	996.66	20000	0.22
2000	107.09	482.01	21000	0.20
3000	98.31	200.28	22000	0.19
5000	101.41	82.50	23000	0.18
10000	99.66	30.23	24000	0.18
11700	90.59	27.18	25000	0.17
12000	86.58	26.25	26000	0.17
13600	53.34	23.00	27000	0.16
14750	30.96	22.55	28000	0.16
15250	20.85	19.92	29000	0.16
16200	3.28	2.59	30000	0.15
18000	0.99	1.37	31000	0.15
19000	0.90	1.39	32000	0.15
20000	0.91	1.45	33000	0.15
25000	0.65	1.18	34000	0.15
30000	0.67	1.32	35000	0.15
35000	0.69	1.31	36000	0.15
40000	0.94	1.58	40000	0.14

### Functional Schematic

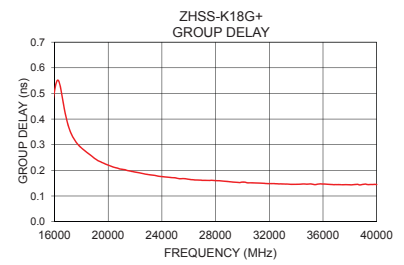
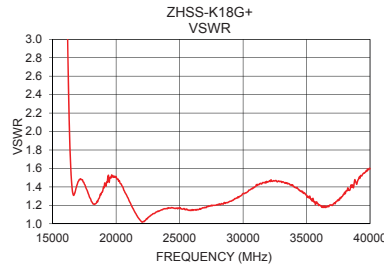
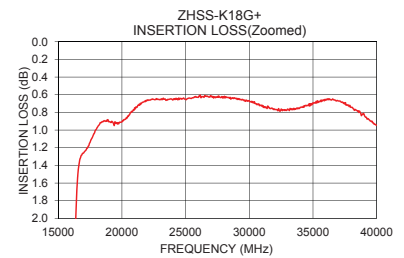
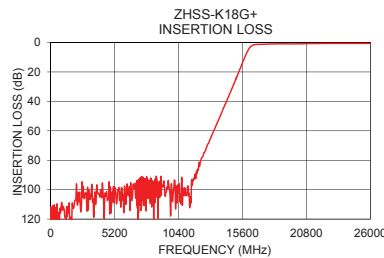


### Typical Frequency Response



### +RoHS Compliant

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



### Notes

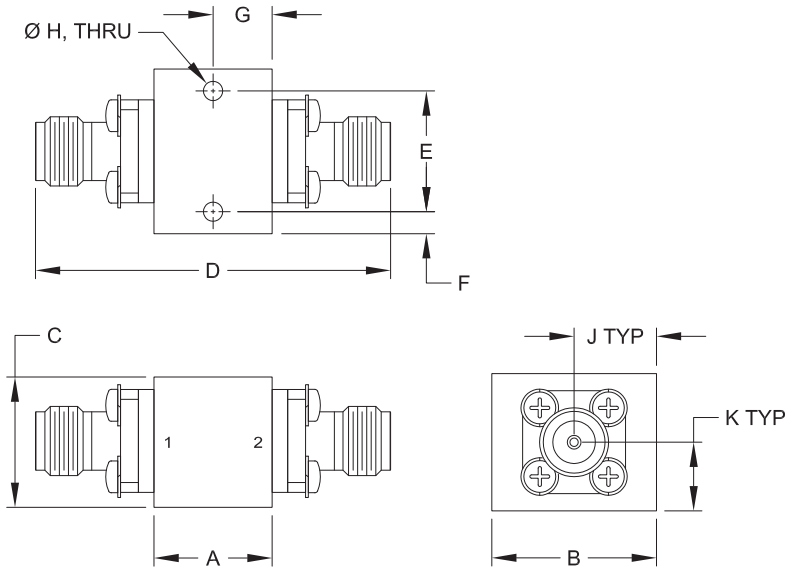
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## Coaxial Connections

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

## Outline Drawing



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

A	B	C	D	E	F
<b>.43</b>	<b>.60</b>	<b>.48</b>	<b>1.30</b>	<b>.440</b>	<b>.08</b>
10.9	15.2	12.1	33.0	11.18	2.0
G	H	J	K		Wt.
<b>.22</b>	<b>.070</b>	<b>.30</b>	<b>.25</b>		grams
5.5	1.78	7.6	6.4		<b>21</b>

Note: Please refer to case style drawing for details

### Notes

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# Suspended substrate stripline

## High Pass Filter

## ZHSS-K18G+

### Typical Performance Data

FREQ.	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	114.07	124.21	120.22	0.02	0.02	0.02	0.02	0.02	0.02
50	114.43	113.14	101.91	0.02	0.02	0.02	0.01	0.01	0.01
100	118.66	126.64	129.62	0.03	0.02	0.02	0.02	0.02	0.02
500	110.60	109.62	112.00	0.02	0.00	0.01	0.03	0.01	0.00
1000	108.15	111.42	115.75	0.02	0.01	0.03	0.01	0.02	0.04
2000	107.09	100.11	106.02	0.00	0.03	0.07	0.00	0.04	0.07
2500	109.94	98.78	100.26	0.02	0.06	0.10	0.05	0.09	0.13
3000	98.31	104.55	105.24	0.03	0.08	0.12	0.04	0.09	0.13
4000	104.85	102.79	100.94	0.10	0.17	0.21	0.11	0.17	0.22
5000	101.41	111.23	102.65	0.10	0.19	0.23	0.14	0.21	0.26
6000	97.96	97.46	105.81	0.12	0.21	0.26	0.21	0.29	0.34
6500	95.36	94.95	101.67	0.21	0.30	0.36	0.26	0.35	0.40
7000	93.93	105.36	94.82	0.25	0.35	0.40	0.33	0.42	0.48
7500	97.03	101.75	97.28	0.32	0.42	0.48	0.35	0.44	0.50
8000	101.30	95.59	94.46	0.35	0.45	0.51	0.37	0.48	0.52
9000	96.30	93.74	96.63	0.37	0.48	0.55	0.40	0.50	0.57
10000	99.66	97.74	103.56	0.42	0.53	0.61	0.47	0.57	0.64
10500	108.07	105.92	99.09	0.44	0.56	0.64	0.48	0.59	0.66
11000	102.36	100.15	99.75	0.44	0.57	0.66	0.49	0.61	0.67
11500	97.12	98.95	90.37	0.46	0.60	0.69	0.49	0.62	0.68
11700	90.59	101.45	88.08	0.46	0.60	0.70	0.51	0.64	0.70
12000	86.58	86.36	79.00	0.46	0.61	0.71	0.53	0.66	0.72
12500	74.77	74.36	68.46	0.50	0.65	0.75	0.57	0.71	0.78
12800	68.79	68.58	62.77	0.49	0.65	0.76	0.58	0.72	0.79
13000	65.04	64.92	58.91	0.51	0.67	0.77	0.60	0.74	0.81
13600	53.34	53.35	47.26	0.51	0.68	0.79	0.60	0.76	0.84
13700	51.46	51.45	45.28	0.52	0.69	0.80	0.60	0.76	0.84
14000	45.64	45.64	45.99	0.53	0.70	0.82	0.61	0.77	0.86
14750	30.99	30.96	31.43	0.54	0.73	0.86	0.59	0.77	0.89
15000	25.91	25.87	26.36	0.54	0.74	0.88	0.62	0.81	0.93
15250	20.89	20.85	21.39	0.59	0.80	0.95	0.67	0.87	1.01
16000	5.78	5.90	6.43	2.87	3.25	3.25	3.14	3.55	3.56
16200	3.06	3.28	3.72	5.94	6.40	6.17	6.54	7.08	6.88
17000	1.01	1.26	1.44	14.46	14.64	14.94	14.50	14.69	15.26
17200	0.99	1.22	1.39	13.95	14.15	14.46	13.52	13.66	14.09
17600	0.87	1.10	1.26	15.43	15.58	15.93	14.35	14.34	14.62
17900	0.78	1.01	1.17	17.75	17.94	18.28	15.95	15.82	16.01
18000	0.76	0.99	1.15	18.36	18.60	18.96	16.35	16.21	16.37
20000	0.69	0.91	1.05	13.84	13.84	14.16	14.73	14.80	15.23
22000	0.45	0.66	0.81	36.34	38.62	32.75	36.08	37.59	32.54
25000	0.44	0.65	0.80	21.45	22.25	21.86	21.71	21.70	21.15
27000	0.40	0.62	0.76	22.58	21.68	23.32	21.40	20.64	22.20
27500	0.39	0.62	0.75	21.36	20.77	22.49	20.61	20.22	21.81
28000	0.41	0.63	0.77	20.63	20.63	21.85	19.86	20.05	21.18
28500	0.41	0.63	0.77	19.22	19.76	20.17	18.88	19.51	19.90
29000	0.42	0.64	0.79	18.59	19.25	19.30	18.47	19.34	19.12
29500	0.44	0.66	0.81	17.61	18.19	18.14	17.68	18.31	18.08
30000	0.44	0.67	0.82	16.65	17.04	17.09	16.85	17.22	17.11
30500	0.47	0.70	0.85	15.94	16.23	16.49	16.33	16.57	16.62
31000	0.48	0.72	0.87	15.26	15.46	15.92	15.73	15.79	16.14
31500	0.50	0.74	0.89	14.73	14.91	15.45	15.32	15.36	15.86
32000	0.52	0.77	0.91	14.46	14.64	15.17	14.81	14.86	15.36
32500	0.52	0.76	0.92	14.25	14.50	14.84	14.72	14.81	15.27
33000	0.52	0.76	0.93	14.34	14.56	14.83	14.64	14.80	15.14
34000	0.49	0.74	0.93	15.28	15.46	15.32	15.13	15.43	15.53
35000	0.43	0.69	0.88	17.59	17.43	17.17	17.31	17.34	17.64
36000	0.39	0.66	0.87	20.84	20.61	19.98	21.14	21.03	21.13
37000	0.40	0.67	0.91	20.30	20.86	18.96	19.93	20.72	19.94
38000	0.47	0.74	1.01	16.63	16.71	15.50	16.42	16.80	16.76
40000	0.65	0.94	1.23	12.68	12.77	12.56	12.99	12.94	13.15

# Suspended substrate stripline High Pass Filter

## ZHSS-K18G+

### Typical Performance Data

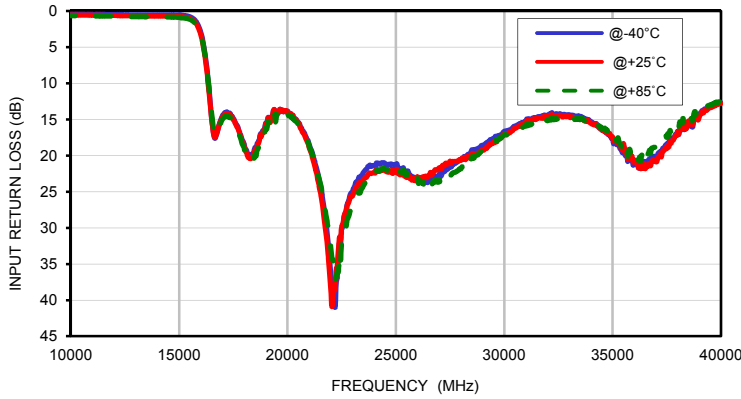
FREQ.  (MHz)	GROUP DELAY		
	(nsec)		
	@-40°C	@+25°C	@+85°C
18000	0.29	0.29	0.29
18500	0.27	0.27	0.27
19000	0.25	0.25	0.25
19500	0.23	0.23	0.23
20000	0.22	0.22	0.22
20500	0.21	0.21	0.21
21000	0.21	0.20	0.21
21500	0.20	0.20	0.20
22000	0.19	0.19	0.20
22500	0.19	0.19	0.19
23000	0.18	0.18	0.18
23500	0.18	0.18	0.18
24000	0.18	0.18	0.18
24500	0.17	0.17	0.17
25000	0.17	0.17	0.17
25500	0.17	0.17	0.17
26000	0.17	0.17	0.17
26500	0.16	0.16	0.16
27000	0.16	0.16	0.16
27500	0.16	0.16	0.16
28000	0.16	0.16	0.16
28500	0.16	0.16	0.16
29000	0.16	0.16	0.16
29500	0.15	0.15	0.15
30000	0.16	0.15	0.16
30500	0.15	0.15	0.15
31000	0.15	0.15	0.15
31500	0.15	0.15	0.15
32000	0.15	0.15	0.15
32500	0.15	0.15	0.15
33000	0.15	0.15	0.15
33500	0.15	0.15	0.15
34000	0.15	0.15	0.15
34500	0.15	0.15	0.15
35000	0.15	0.15	0.15
35500	0.15	0.14	0.15
36000	0.15	0.15	0.15
36500	0.15	0.15	0.15
37000	0.14	0.14	0.15
37500	0.14	0.14	0.14
38000	0.15	0.14	0.14
40000	0.15	0.14	0.15

# Suspended substrate stripline High Pass Filter

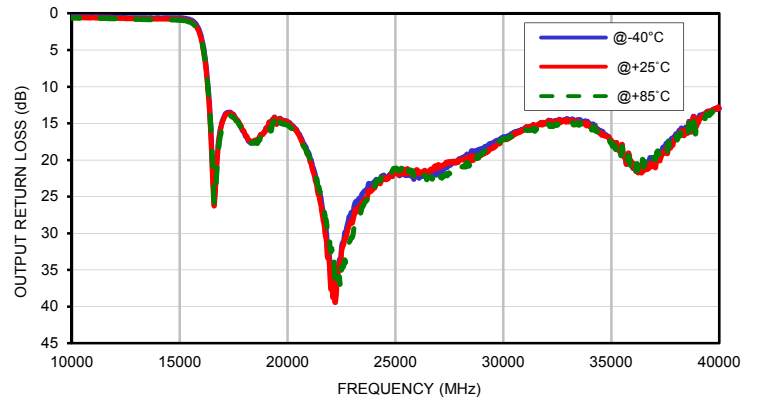
## ZHSS-K18G+

### Typical Performance Curves

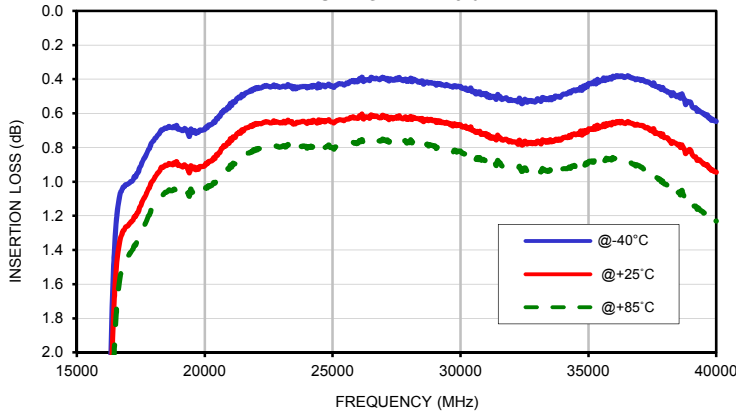
**INPUT RETURN LOSS vs. TEMPERATURE**  
INPUT POWER = 0 dBm



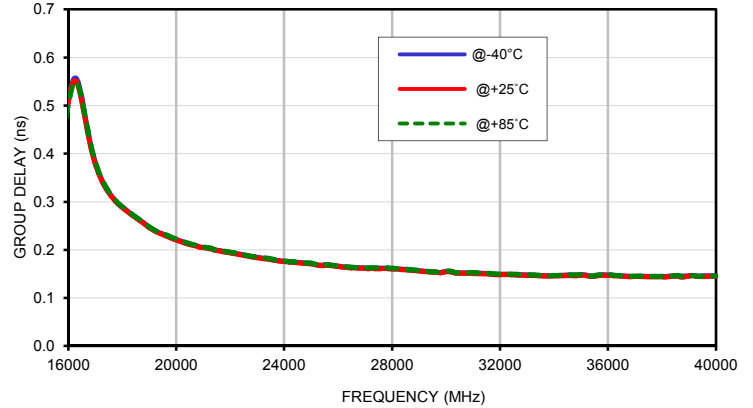
**OUTPUT RETURN LOSS vs. TEMPERATURE**  
INPUT POWER = 0 dBm



**INSERTION LOSS vs. TEMPERATURE (Zoomed)**  
INPUT POWER = 0 dBm

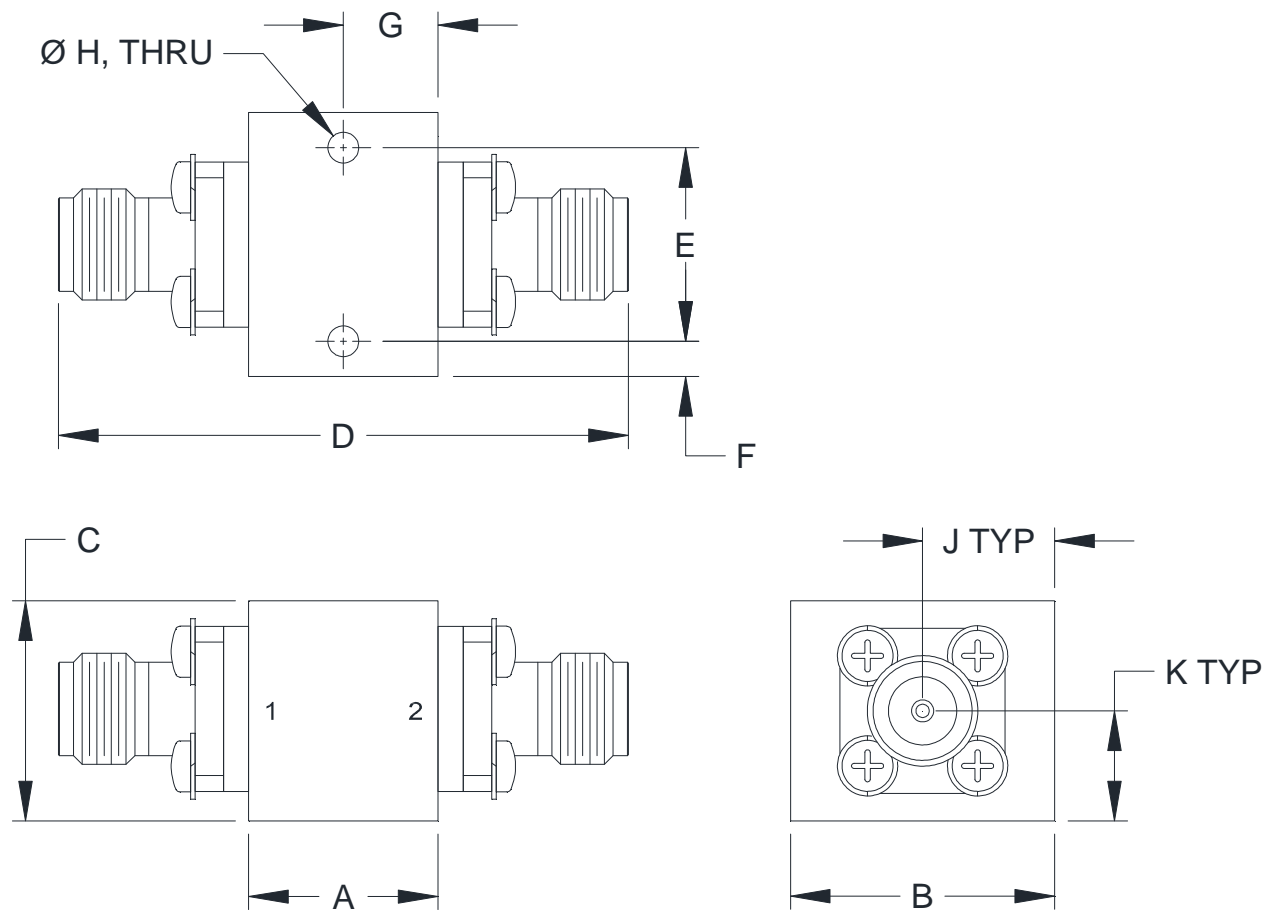


**GROUP DELAY vs. TEMPERATURE**  
INPUT POWER = 0 dBm



## Outline Dimensions

UJ2936



CASE#	A	B	C	D	E	F
UJ2936	.43 (10.9)	.60 (15.2)	.48 (12.1)	1.30 (33.0)	.440 (11.18)	.08 (2.0)

CASE#	G	H	J	K	WT. GRAMS
UJ2936	.22 (5.5)	.070 (1.78)	.30 (7.6)	.25 (6.4)	21

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

### Notes:

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



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



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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.

<b>Specification</b>	<b>Test/Inspection Condition</b>	<b>Reference/Spec</b>
Operating Temperature	-40° to 85° C Ambient Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet