

# Coaxial-Ceramic Resonator Filters and Multiplexers

50Ω

DC to 6 GHz



## The Big Deal

- Low insertion loss with excellent power handling
- Passbands up to 6 GHz
- Fractional bandwidth from <1 to 25%
- Excellent temperature stability
- Rugged construction to handle demanding environmental conditions

## Product Overview

Mini-Circuits' *Coaxial-Ceramic Resonator filters* offer low insertion loss in very small form factors, using ceramic material with high dielectric constant and superior Q factor. Bandpass and bandstop filters, diplexer and multiplexer designs can be constructed using this technology. Low insertion loss combined with excellent power handling makes these filters well suited for transmitter and receiver signal chains. Advanced filter design and construction can achieve stopband width greater than 3x the center frequency

All our coaxial-ceramic resonator filters are built with rugged construction. 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 signal chain
Fast roll-off	Higher selectivity results in better adjacent channel rejection and dynamic range
Wide stop band	Wide spur-free stopband results in better receiver sensitivity
Excellent power handling	Well suited for transmitter applications
Rugged Construction	These filter assemblies have been qualified over a wide range of thermal, mechanical and environmental conditions including withstanding the stress of extensive solder reflow cycles
Small Size	Very well suited for high performance applications where size is a constraint.
Temperature stability	Very minimal change in electrical performance across temperature makes these filters suitable for a wide range of operating conditions.

### 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)



# Bandpass Filter

## ZCBP6-416R5-S+

50Ω 403 to 430 MHz



Generic photo used for illustration purposes only  
CASE STYLE: CC1764

### Features

- Low insertion loss, 1.1 dB typ.
- High rejection, 70dB typ.
- Connectorized package

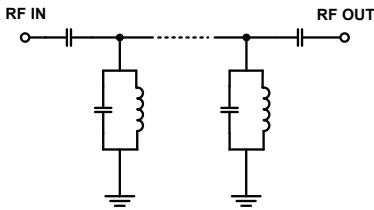
### Electrical Specifications at 25°C

Parameter	F#	Frequency (MHz)	Min.	Typ.	Max.	Unit
Pass Band	Center Frequency	—	—	416.5	—	MHz
	Insertion Loss	F1-F2	403 - 430	1.11	1.7	dB
	VSWR	F1-F2	403 - 430	—	1.23	1.67
Stop Band, Lower	Insertion Loss	DC-F3	DC - 320	65	80	dB
		F3-F4	320 - 382	20	27	dB
Stop Band, Upper	Insertion Loss	F5-F6	451 - 520	20	28	dB
		F6-F7	520 - 800	55	73	dB

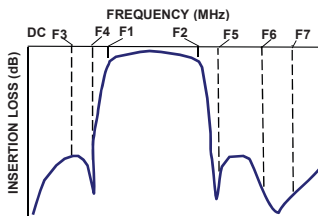
### Applications

- Public safety communication
- Medical radio communication service

### Functional Schematic



### Typical Frequency Response



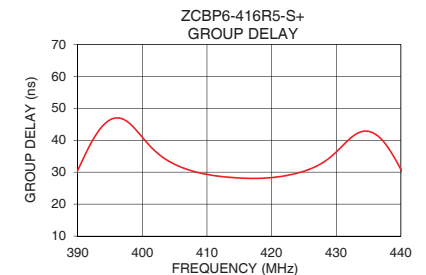
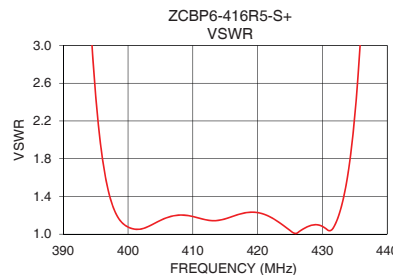
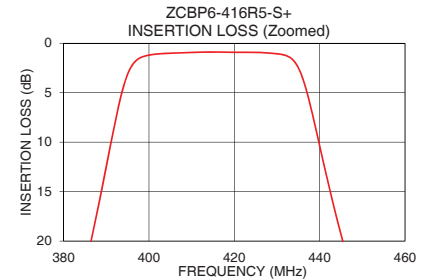
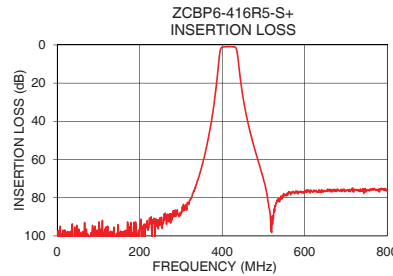
Maximum Ratings	
Operating Temperature	-40°C to 85°C
Storage Temperature	-55°C to 100°C
RF Power Input*	20W at 25°C

Permanent damage may occur if any of these limits are exceeded.  
\*Passband rating

### Typical Performance Data at 25°C

Frequency (MHz)	Insertion Loss (dB)	VSWR (:1)	Frequency (MHz)	Group Delay (nSec)
0.5	113.14	10528.35	403.0	34.90
10.5	99.30	6363.29	404.0	33.55
100.5	106.80	1670.36	405.0	32.47
150.5	98.24	883.61	406.0	31.56
320.0	82.56	163.95	407.0	30.82
380.0	31.19	45.89	408.0	30.21
382.0	27.98	39.86	409.0	29.70
395.0	3.12	2.47	410.0	29.29
403.0	1.05	1.08	411.0	28.96
410.0	0.93	1.19	412.0	28.69
416.5	0.90	1.20	413.0	28.47
420.0	0.92	1.23	414.0	28.31
430.0	1.07	1.08	415.0	28.17
436.0	3.53	3.21	416.5	28.07
451.0	28.10	67.81	417.0	28.05
455.0	33.00	85.86	418.0	28.07
520.0	98.12	156.55	420.0	28.30
600.0	76.28	149.40	425.0	30.31
700.0	76.56	125.39	428.0	33.08
800.0	76.62	109.67	430.0	36.34

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



**Notes**

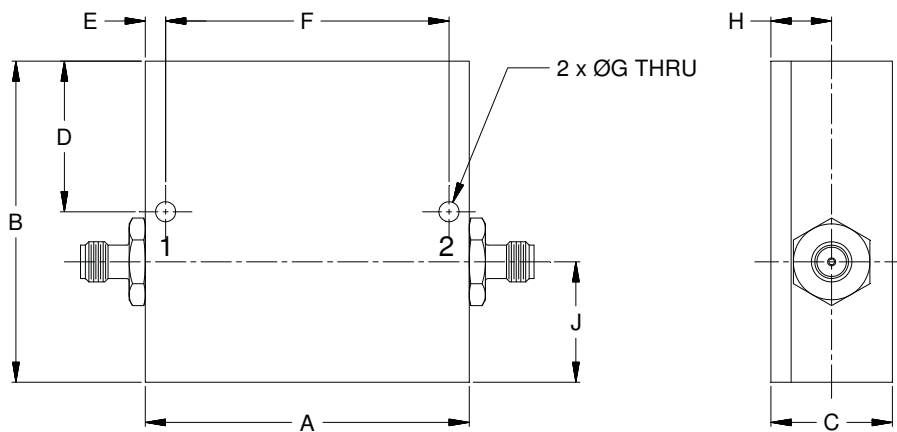
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## Coaxial Connections

PORT - 1	SMA-FEMALE
PORT - 2	SMA-FEMALE

## Outline Drawing



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

A	B	C	D	E
<b>2.000</b>	<b>2.000</b>	<b>.750</b>	<b>.938</b>	<b>.125</b>
50.80	50.80	19.05	23.83	3.18
F	G	H	J	Wt.
<b>1.750</b>	<b>.125</b>	<b>.375</b>	<b>.750</b>	grams
44.45	3.18	9.53	19.05	116

Note: Please refer to case style drawing for details

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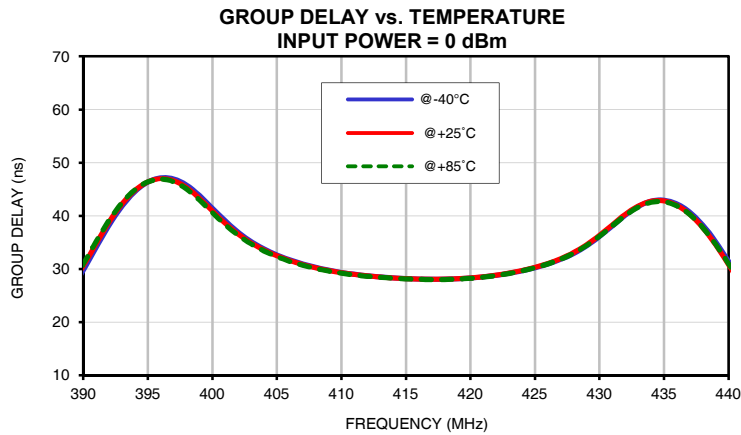
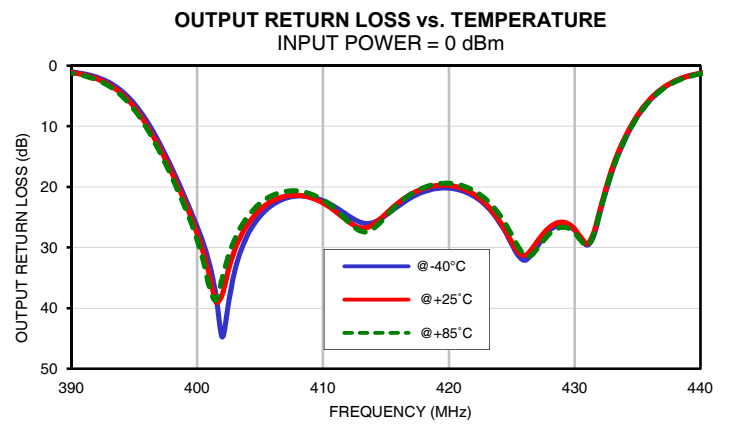
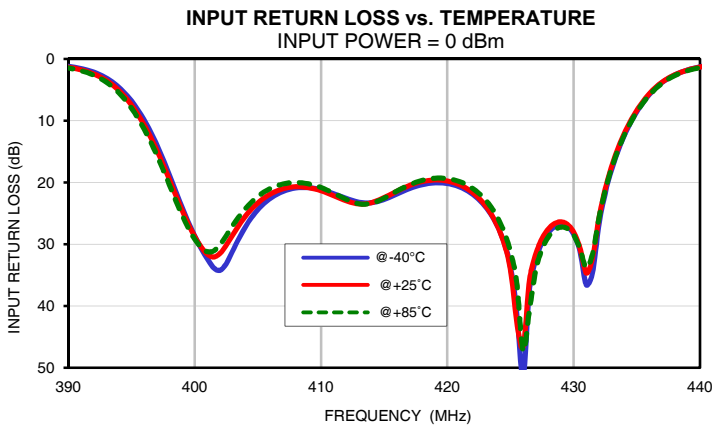
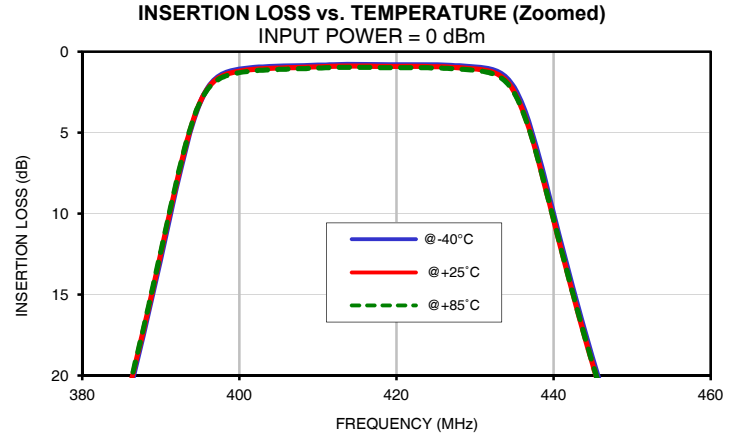
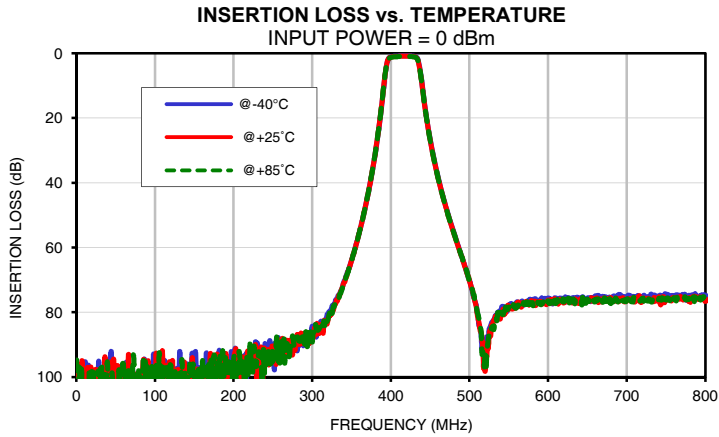
*Typical Performance Data*

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
0.5	95.01	113.14	94.75	0.00	0.00	0.00	0.01	0.00	0.01
10.5	96.82	99.30	105.04	0.01	0.00	0.00	0.01	0.01	0.01
20.5	107.49	110.77	102.44	0.01	0.00	0.00	0.01	0.01	0.01
30.5	97.93	105.90	96.57	0.01	0.00	0.00	0.01	0.01	0.01
50.5	96.94	104.27	116.33	0.01	0.01	0.01	0.01	0.01	0.01
100.5	105.77	106.80	99.14	0.01	0.01	0.01	0.01	0.01	0.02
120.5	109.59	102.63	96.56	0.01	0.01	0.02	0.01	0.01	0.02
150.5	99.43	98.24	98.30	0.01	0.02	0.03	0.02	0.03	0.03
200.0	98.69	96.60	95.07	0.02	0.04	0.05	0.03	0.04	0.05
210.0	96.61	96.33	96.46	0.02	0.04	0.05	0.03	0.04	0.05
220.0	95.16	97.07	95.98	0.03	0.05	0.05	0.04	0.05	0.06
230.0	89.78	103.33	93.86	0.03	0.05	0.06	0.04	0.05	0.06
240.0	89.67	92.60	93.15	0.03	0.05	0.06	0.04	0.06	0.07
250.0	90.54	92.97	96.28	0.04	0.06	0.07	0.05	0.06	0.07
260.0	90.43	91.58	89.15	0.05	0.06	0.07	0.06	0.07	0.08
270.0	91.28	92.54	91.36	0.05	0.07	0.08	0.06	0.08	0.09
280.0	89.33	88.69	88.89	0.06	0.07	0.08	0.07	0.08	0.09
300.0	84.33	87.68	89.28	0.07	0.09	0.10	0.08	0.09	0.11
320.0	81.66	82.56	82.24	0.08	0.11	0.12	0.09	0.11	0.13
350.0	64.06	64.15	64.12	0.12	0.15	0.17	0.13	0.15	0.17
360.0	55.34	55.35	55.35	0.15	0.18	0.20	0.16	0.18	0.20
370.0	44.78	44.71	44.66	0.20	0.24	0.26	0.21	0.23	0.26
380.0	31.38	31.19	31.13	0.33	0.38	0.42	0.31	0.35	0.39
382.0	28.18	27.98	27.91	0.37	0.44	0.48	0.36	0.40	0.44
386.0	21.05	20.80	20.70	0.56	0.64	0.70	0.51	0.58	0.63
395.0	3.15	3.12	3.13	6.81	7.45	7.97	6.27	6.84	7.28
400.0	1.09	1.20	1.29	28.68	28.75	29.16	26.52	27.63	28.71
403.0	0.94	1.05	1.14	31.16	28.54	27.05	33.77	30.39	28.57
405.0	0.90	1.01	1.10	24.42	23.32	22.29	24.83	23.76	22.72
408.0	0.86	0.96	1.05	20.90	20.70	20.01	21.50	21.39	20.69
410.0	0.83	0.93	1.01	21.17	21.34	20.82	22.29	22.67	22.15
416.5	0.80	0.90	0.97	21.42	20.93	20.87	22.41	21.86	21.92
418.0	0.81	0.91	0.98	20.37	19.88	19.67	20.81	20.27	20.13
420.0	0.81	0.92	1.00	20.17	19.77	19.37	20.21	19.77	19.41
425.0	0.82	0.92	1.00	33.66	34.12	31.18	29.44	29.09	27.91
430.0	0.94	1.07	1.15	28.40	28.02	28.52	27.15	26.95	27.58
436.0	3.22	3.53	3.58	5.75	5.60	5.83	5.66	5.50	5.73
440.0	9.97	10.37	10.35	1.28	1.31	1.39	1.26	1.28	1.37
446.0	20.61	20.95	20.92	0.36	0.40	0.43	0.36	0.40	0.43
450.0	26.47	26.77	26.75	0.23	0.27	0.30	0.24	0.27	0.30
454.0	31.56	31.84	31.83	0.18	0.21	0.23	0.19	0.22	0.24
459.0	37.13	37.39	37.38	0.14	0.17	0.19	0.15	0.18	0.20
500.0	70.21	70.38	70.29	0.08	0.11	0.13	0.10	0.12	0.13
510.0	80.17	80.55	79.98	0.08	0.11	0.13	0.09	0.12	0.13
520.0	91.94	98.12	92.23	0.08	0.11	0.13	0.10	0.12	0.14
540.0	80.28	81.08	80.27	0.08	0.11	0.13	0.10	0.12	0.14
560.0	76.91	77.21	78.38	0.08	0.12	0.14	0.10	0.12	0.14
580.0	76.45	77.16	77.03	0.08	0.12	0.14	0.10	0.13	0.15
600.0	75.60	76.28	76.46	0.08	0.12	0.14	0.11	0.13	0.15
620.0	76.23	77.15	76.85	0.09	0.12	0.14	0.11	0.13	0.15
640.0	76.05	77.20	76.25	0.09	0.13	0.15	0.11	0.14	0.16
660.0	74.97	76.43	76.54	0.10	0.13	0.15	0.12	0.14	0.16
680.0	75.60	75.68	77.77	0.10	0.13	0.16	0.12	0.15	0.17
700.0	75.74	76.56	76.32	0.11	0.14	0.16	0.13	0.15	0.17
720.0	75.29	75.70	76.30	0.11	0.14	0.16	0.13	0.15	0.18
740.0	75.63	76.52	76.21	0.11	0.15	0.17	0.13	0.16	0.18
760.0	75.13	75.45	75.31	0.11	0.15	0.17	0.14	0.16	0.18
770.0	75.16	75.49	76.34	0.12	0.15	0.17	0.14	0.16	0.19
780.0	75.09	75.50	76.26	0.12	0.15	0.18	0.14	0.17	0.19
800.0	75.29	76.62	76.18	0.12	0.16	0.18	0.14	0.17	0.19

## Typical Performance Data

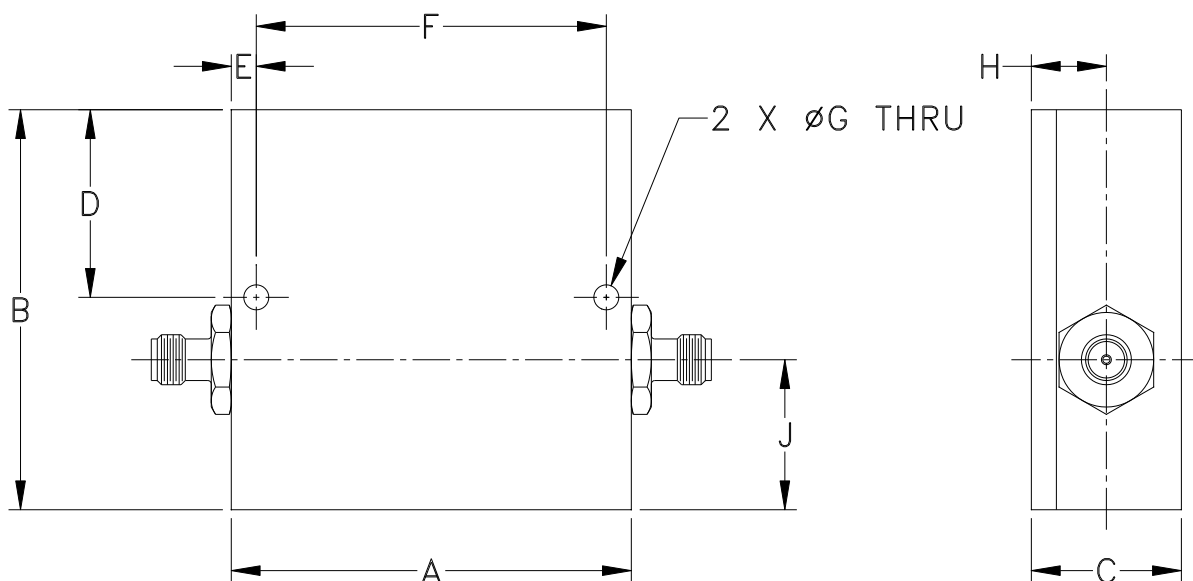
FREQ.  (MHz)	GROUP DELAY		
	(ns)		
	@-40°C	@+25°C	@+85°C
397.0	46.94	46.62	46.42
398.0	45.78	45.32	45.04
399.0	43.83	43.30	42.97
400.0	41.44	40.92	40.60
401.0	39.04	38.60	38.31
402.0	36.93	36.57	36.33
403.0	35.19	34.90	34.71
404.0	33.78	33.55	33.39
405.0	32.65	32.47	32.32
406.0	31.71	31.56	31.43
407.0	30.95	30.82	30.70
408.0	30.31	30.21	30.10
409.0	29.78	29.70	29.60
410.0	29.35	29.29	29.20
411.0	29.00	28.96	28.88
412.0	28.72	28.69	28.62
413.0	28.50	28.47	28.41
414.0	28.33	28.31	28.25
415.0	28.19	28.17	28.12
416.5	28.08	28.07	28.01
417.0	28.07	28.05	28.00
418.0	28.08	28.07	28.01
419.0	28.15	28.15	28.09
420.0	28.29	28.30	28.23
421.0	28.51	28.54	28.46
422.0	28.80	28.84	28.76
423.0	29.18	29.24	29.16
424.0	29.65	29.72	29.64
425.0	30.21	30.31	30.23
426.0	30.91	31.03	30.94
427.0	31.79	31.93	31.84
428.0	32.90	33.08	32.97
429.0	34.33	34.55	34.42
430.0	36.09	36.34	36.16
431.0	38.09	38.34	38.13
432.0	40.09	40.29	40.06
433.0	41.74	41.85	41.63
434.0	42.75	42.74	42.54
435.0	42.94	42.79	42.64
436.0	42.25	41.97	41.86
437.0	40.68	40.28	40.24

## Typical Performance Curves



## Outline Dimensions

CC1764



CASE#	A	B	C	D	E	F	G	H	J	WT. GRAMS
CC1764	2.000 (50.80)	2.000 (50.80)	0.750 (19.05)	0.938 (23.83)	0.125 (3.18)	1.750 (44.45)	0.125 (3.18)	0.375 (9.53)	0.750 (19.05)	116

Dimensions are in inches (mm). Tolerances: 2 Pl.  $\pm .03$ ; 3 Pl.  $\pm .015$

### Notes:

1. Case material: Aluminum alloy.
2. Case finish:  
For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
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



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: [www.minicircuits.com](http://www.minicircuits.com)

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