



# Medium Power Amplifier

**WVA-60903G+**  
**WVA-60903GX+**

60 to 90 GHz  $P_{SAT}$  +21 dBm WR12 UG-387/U

## KEY FEATURES

- Full WR12 Band Coverage
- High Gain, 29.5 dB Typ.
- Excellent Gain Flatness,  $\pm 1.5$  dB Typ.
- High Saturated Output Power, +21 dBm Typ.
- Wide DC Operating Voltage, +10 To +15 V
- Over Voltage And Reverse Voltage Protected

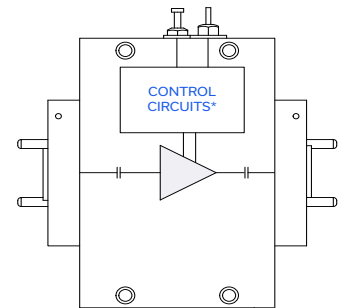


Generic photo used for illustration purposes only

## APPLICATIONS

- Automotive Radar Testing
- Aerospace & Defense
- Test and Measurement
- E-Band Backhaul
- Imaging
- 5G-FR2 Millimeter Wave Testing

## FUNCTIONAL DIAGRAM



\*Voltage Regulation, over-voltage, reverse voltage, and in-rush current protection circuit

## PRODUCT OVERVIEW

Mini-Circuits' WVA-60903G+ is a wideband medium power waveguide amplifier, covering the full WR12 60 to 90 GHz band in a single device. The model operates over a positive supply range of +10 to +15 V, allowing users to choose their desired operating voltage. Internal DC-DC conversion circuitry maintains consistent efficiency over the full input voltage range. The amplifier incorporates several DC-protection features such as over-voltage, reverse voltage, and in-rush current protection to protect from damage in case of unexpected spikes in voltage during operation. The high frequency operation combined with flat gain and medium output power makes this amplifier an ideal choice for automotive, radar/sensing applications, and wireless backhaul testing in millimeter wavebands.

## ELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range	-	60	-	90	GHz
Gain	60 - 90	26	29.5	-	dB
Gain Flatness	60 - 90	-	$\pm 1.5$	-	dB
Output Power at 1dB Compression (P1dB)	60 - 90	+15.0	+17.5	-	dBm
Saturated Output Power ( $P_{SAT}$ ) <sup>2</sup>	60 - 90	+19.0	+21.0	-	dBm
Noise Figure	60 - 90	-	5	-	dB
Input Return Loss	60 - 90	-	15	-	dB
Output Return Loss	60 - 90	-	15	-	dB
DC Supply Voltage (Vs)	-	+10	-	+15	V
DC Current at Vs = +10V	-	-	380	675 <sup>3</sup>	mA

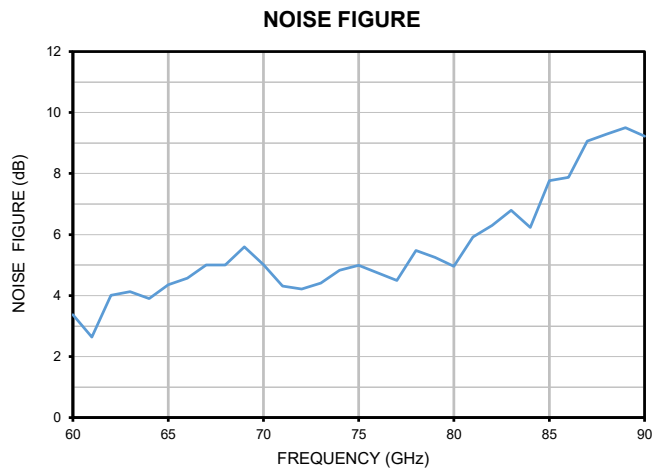
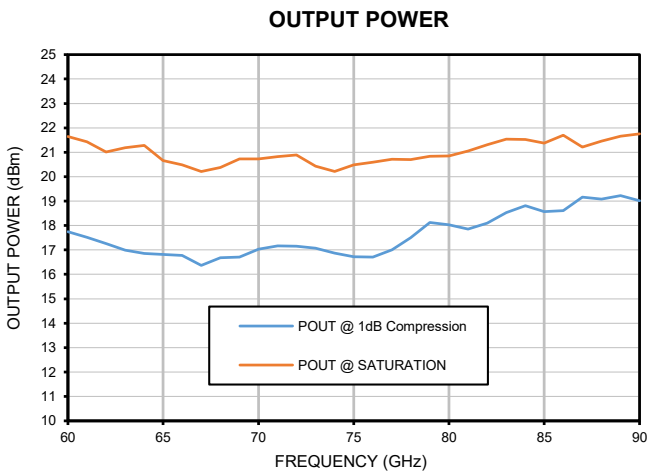
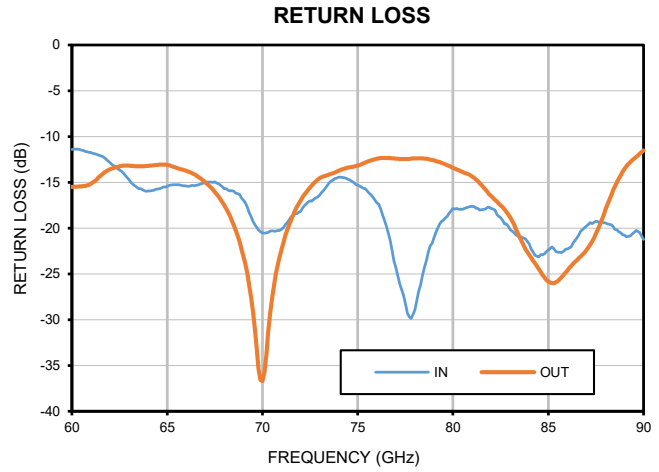
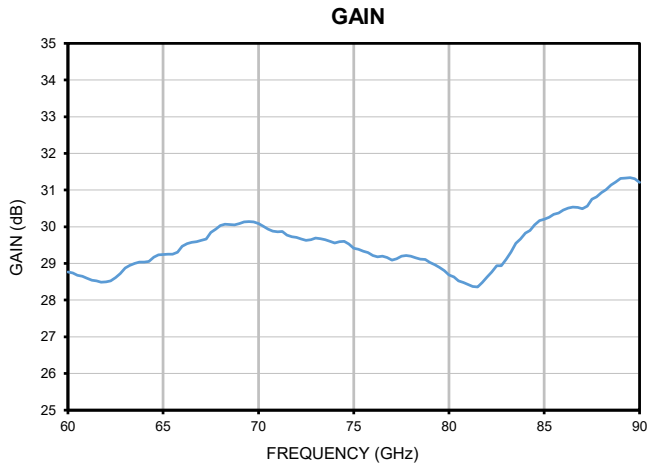
1. Open and short-circuit loads are not recommended at the amplifier output. Ensure proper WR12 load before turning the amplifier on.

2. At  $P_{SAT}$ ,  $P_{OUT}$  changes less than 0.1 dB for a 1 dB change in  $P_{IN}$

3. Typical current measured under small signal condition. Max DC Current at  $P_{SAT}$ . DC current increases as amplifier is driven into compression.



### TYPICAL PERFORMANCE GRAPHS





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### ABSOLUTE MAXIMUM RATINGS<sup>4</sup>

Parameter	Ratings
Operating Temperature	WVA-60903G+ -40 °C to +50 °C Ambient
	WVA-60903GX+ -40 °C to +60 °C Baseplate
Storage Temperature	-40 °C to +85 °C
Total Power Dissipation	6.75 W
RF Input Power <sup>5</sup> (CW)	+15 dBm
DC Operating Voltage (Vs)	+16 V

4. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.

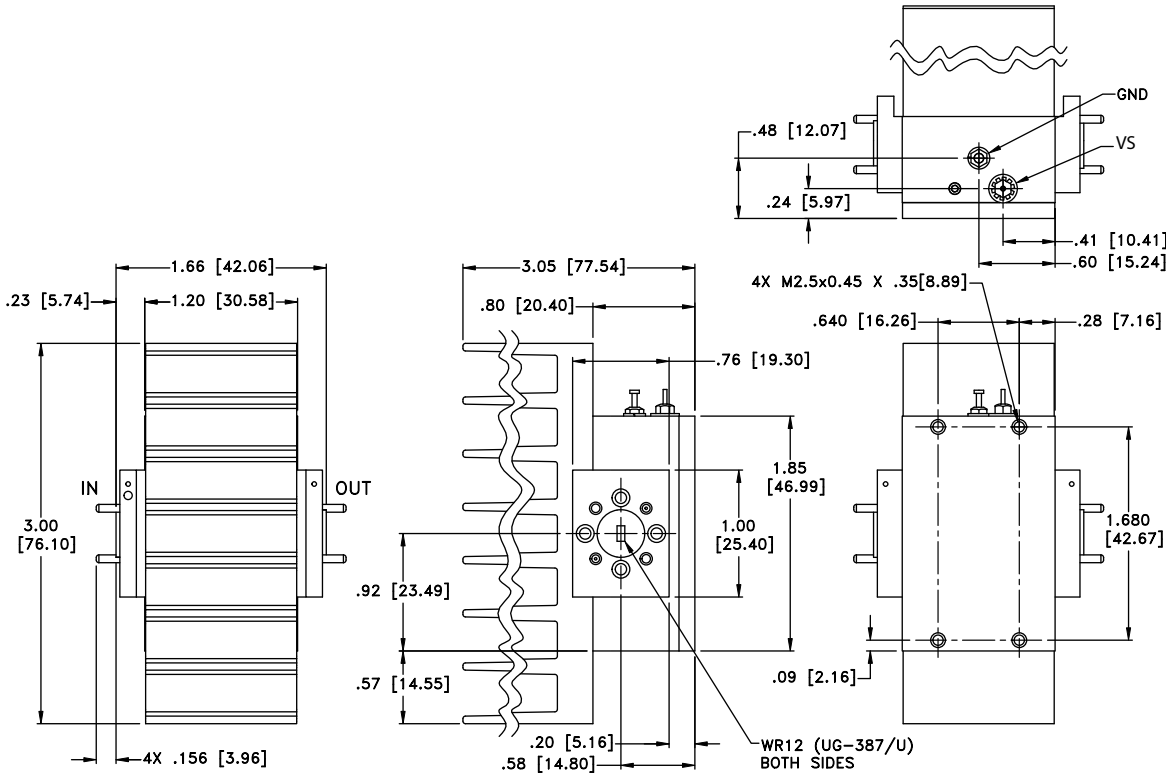
5. Specified under matched WR12 load.

### DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

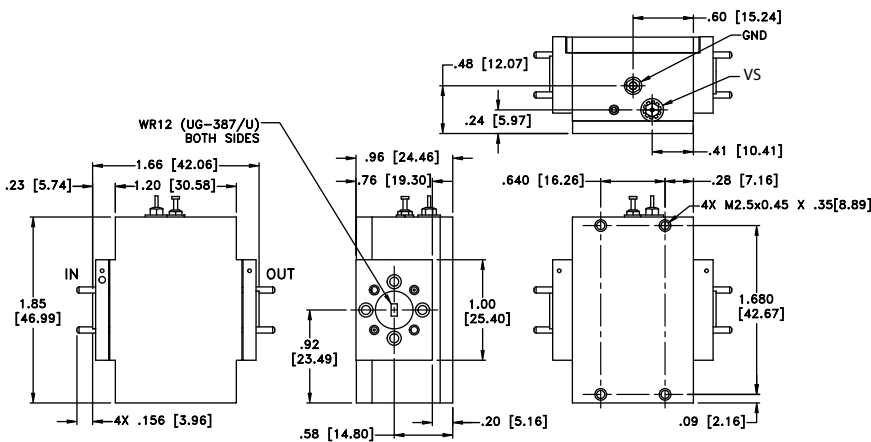
$\text{MAXIMUM THERMAL RESISTANCE} = \frac{\text{MAXIMUM OPERATING CASE TEMP} - \text{MAXIMUM USER AMBIENT TEMP}}{\text{POWER DISSIPATION}}$	
<b>Example:</b>	MAXIMUM OPERATING CASE TEMP = +50 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +30 °C (USER DEFINED) POWER DISSIPATION = 10 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 2 °C/W



### CASE STYLE DRAWING WITH HEATSINK (WVA-60903G+)



### CASE STYLE DRAWING WITHOUT HEATSINK (WVA-60903GX+)



Weight 200 grams; Without Heatsink 100 grams

Dimensions are in inches [mm]. Tolerances: 2 PL±.03; 3 PL ±.015 INCHES



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**ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.**

<b>Performance Data</b>	Data Table Swept Graphs S-Parameter (S2P Files) Data Set (.zip file)
<b>RoHs Status</b>	Compliant
<b>Environmental Ratings</b>	ENV130
<b>Export Information</b>	ECCN #3A001.B.4 This item will require an export license when shipped to certain countries

**ORDERING INFORMATION**

<b>Model No. Links</b>	<a href="#">WVA-60903G+</a>	<a href="#">WVA-60903GX+</a>
<b>Option</b>	With heatsink	Without heatsink
<b>Product Marking</b>	WVA-60903G+	WVA-60903GX+
<b>Case Style</b>	YS3481	
<b>Connector</b>	WR12 UG-387/U	

**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/terms/viewterm.html](http://www.minicircuits.com/terms/viewterm.html)



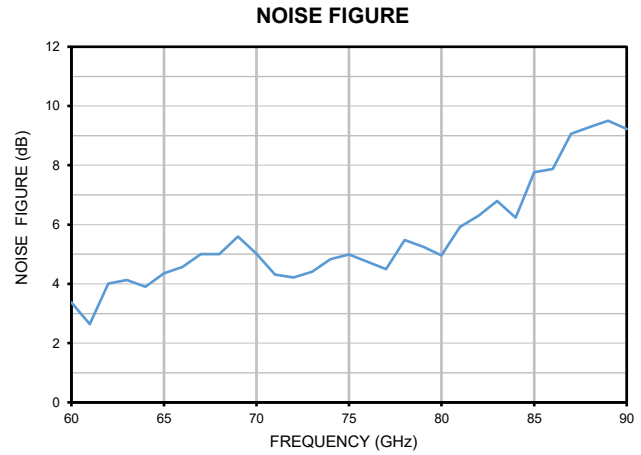
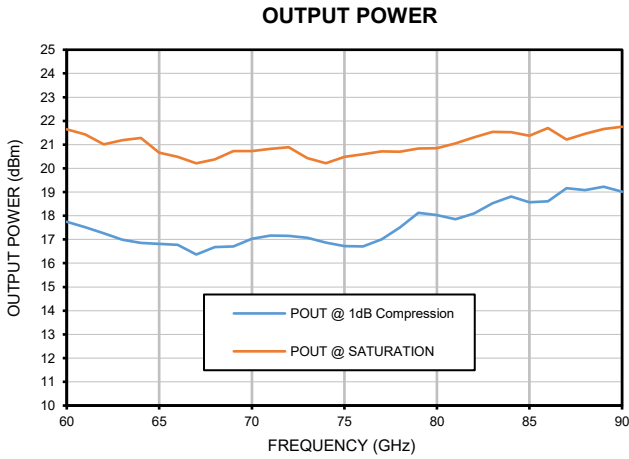
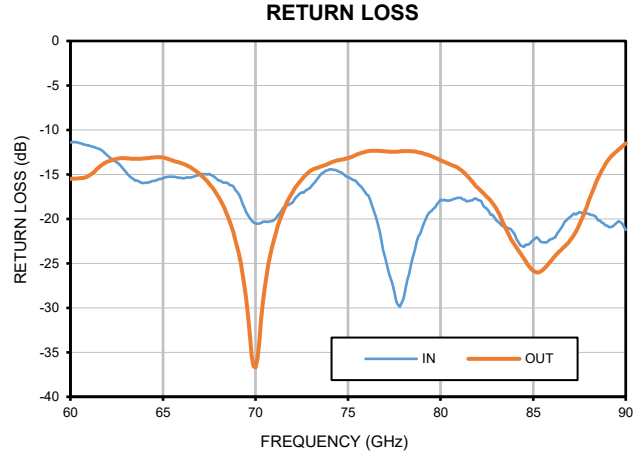
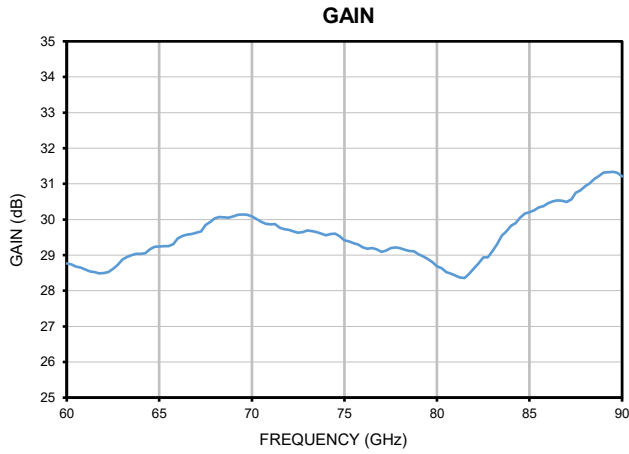
# WR12 Amplifier

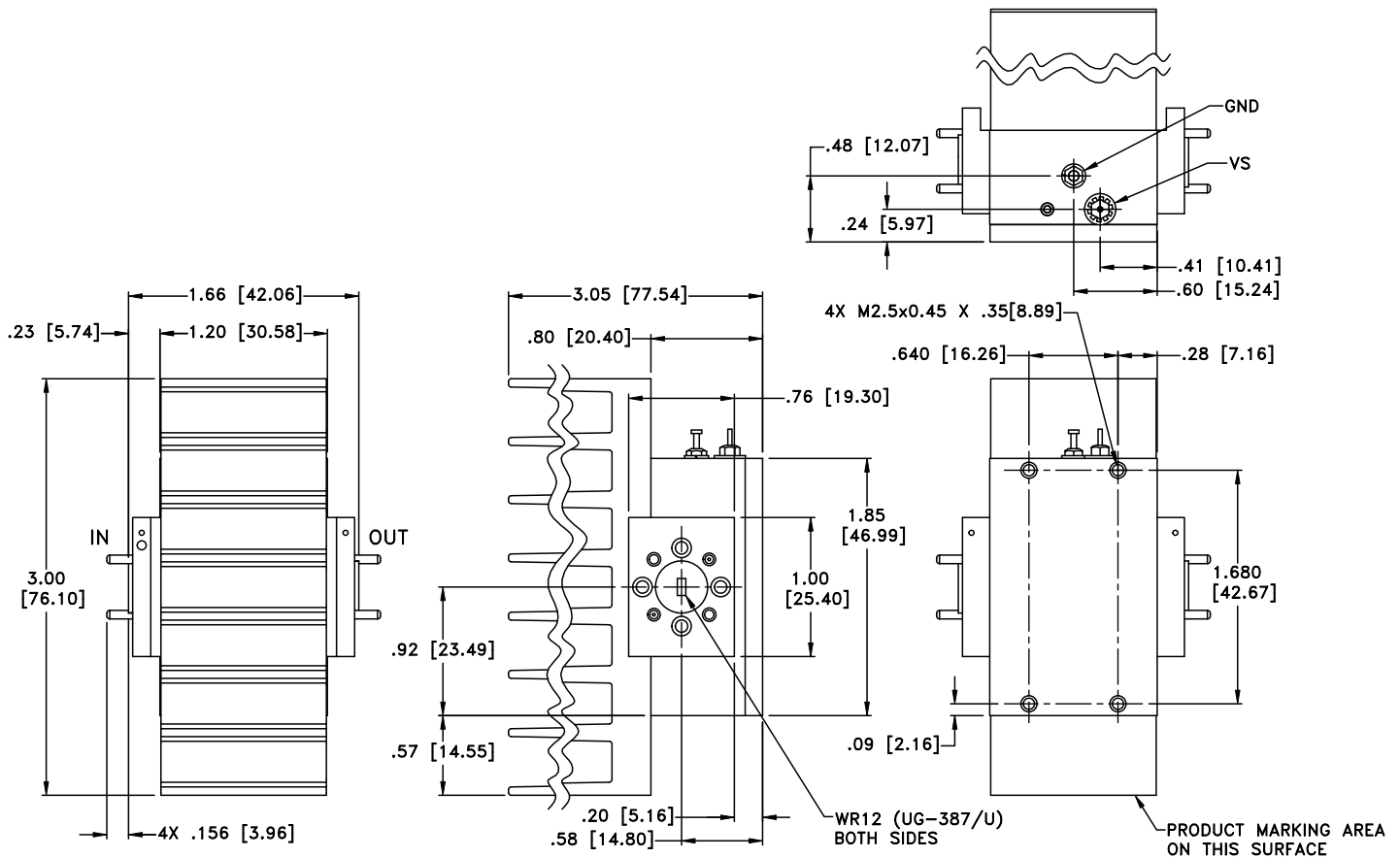
# WVA-60903G(X)+

## Typical Performance Data

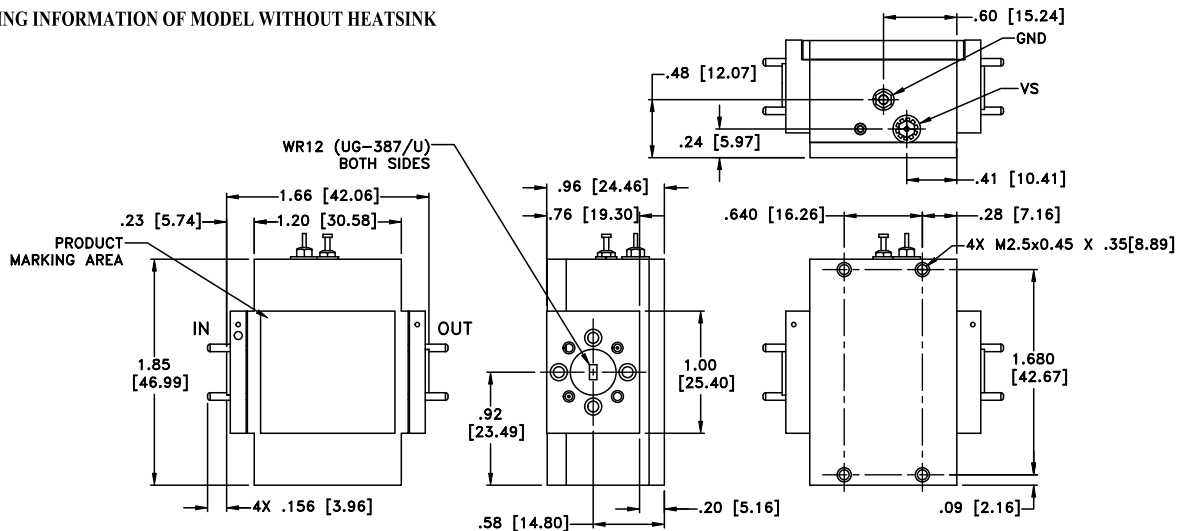
FREQUENCY (GHz)	GAIN (dB)	ACTIVE DIRECTIVITY (dB)	RETURN LOSS (dB)		Pout @ 1 dB COMPRESSION (dBm)	Pout at SATURATION (dBm)
			IN	OUT		
60.0	28.8	49.1	11.4	15.5	17.7	21.6
61.0	28.6	50.1	11.7	15.2	17.5	21.4
62.0	28.5	51.5	12.8	13.6	17.3	21.0
63.0	28.9	53.8	14.7	13.2	17.0	21.2
64.0	29.0	58.5	15.9	13.2	16.9	21.3
65.0	29.2	53.5	15.4	13.1	16.8	20.7
66.0	29.5	55.5	15.4	13.7	16.8	20.5
67.0	29.6	52.3	15.0	15.0	16.4	20.2
68.0	30.0	68.5	15.7	17.5	16.7	20.4
69.0	30.1	49.8	17.0	23.1	16.7	20.7
70.0	30.1	46.6	20.5	36.7	17.0	20.7
71.0	29.9	49.2	20.1	22.3	17.2	20.8
72.0	29.7	67.7	18.2	17.0	17.1	20.9
73.0	29.7	47.1	16.4	14.6	17.1	20.4
74.0	29.6	56.7	14.4	13.7	16.9	20.2
75.0	29.4	50.8	15.3	13.2	16.7	20.5
76.0	29.2	58.2	17.2	12.4	16.7	20.6
77.0	29.1	50.7	24.3	12.4	17.0	20.7
78.0	29.2	44.5	28.9	12.4	17.5	20.7
79.0	29.0	55.4	21.0	12.6	18.1	20.8
80.0	28.7	51.7	17.9	13.4	18.0	20.9
81.0	28.4	40.3	17.6	14.4	17.9	21.1
82.0	28.6	55.8	17.8	16.5	18.1	21.3
83.0	29.1	57.4	20.1	18.8	18.5	21.5
84.0	29.8	46.2	21.8	22.9	18.8	21.5
85.0	30.2	47.5	22.4	25.8	18.6	21.4
86.0	30.5	44.7	22.3	24.6	18.6	21.7
87.0	30.5	41.0	19.8	22.4	19.2	21.2
88.0	30.9	49.6	19.4	18.0	19.1	21.5
89.0	31.3	55.4	20.8	13.5	19.2	21.7
90.0	31.2	52.8	21.2	11.5	19.0	21.8

## Typical Performance Curves





### MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK



### Notes:

1. Case material: Aluminum
2. Case finish: Gold plating
3. Heat sink finish: Black anodize

Weight: 200 grams; Without Heatsink 100 grams

Dimensions are in inches [mm]. Tolerances: 2 PL±.03; 3 PL ±.015 INCHES



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 +60° C Baseplate Temp	Individual Model Data Sheet
Storage Temperature	-40° to +85° C Ambient Environment	Individual Model Data Sheet
Burn-in	(DC on) 72 hours at 25°C	----
Thermal Shock	-40° C to +85°C, 100 cycles	Transition time = 5 mins, Dwell time = 30 mins
Vibration	Random Vibration (non-operating)	MIL-STD-883K, Method 2025, Cond. 1A