COAXIAL

Medium Power Amplifier ZX60-16213+

50Ω 16 to 21 GHz P1dB +23 dBm SMA Female

KEY FEATURES

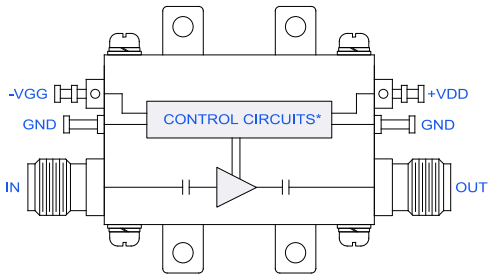
- High gain, 20 dB typ.
- High OIP3, +33 dBm typ.
- High Output Power at 1 dB Compression, +23 dBm typ.
- Voltage regulated internally and reverse voltage protected
- Internal sequencing provided between $+V_{DD}$ & $-V_{GG}$
- Excellent directivity, 25 dB typ.

Generic photo used for illustration purposes only

APPLICATIONS

- Microwave point to point radios
- Military EW and radar
- Satellite Systems
- K-Band Satcom

FUNCTIONAL DIAGRAM



*Voltage Regulation, reverse voltage, and internal sequencing protection circuit

PRODUCT OVERVIEW

Mini-Circuits' ZX60-16213+ is a medium power connectorized amplifier, providing a unique combination of medium output power and high output IP3. It supports a wide range of applications and many systems where high linearity is needed. This design operates on a single positive and single negative supply, and comes in a rugged, compact unibody case (1.2" x 0.75" x 0.46") with SMA connectors, making it an excellent candidate for tough operating conditions and crowded system layouts. The amplifier incorporates several DC protection features such as reverse voltage protection, and internal sequencing which will prevent the amplifier from turning on without the required negative voltage ($-V_{GG}$) present.

ELECTRICAL SPECIFICATIONS AT +25°C

Parameter	Frequency (GHz)	Min.	Typ.	Max.	Units
Frequency Range	—	16	—	21	GHz
Gain	16-21	17.5	20.0	—	dB
Input Return Loss	16-21	—	10.0	—	dB
Output Return Loss	16-21	—	13.0	—	dB
Noise Figure	16-21	—	4.5	—	dB
Output Power at 1dB Compression (P1dB) [1]	16-21	+20.0	+23.0	—	dBm
Output Power at 3dB Compression (P3dB)[1]	16-21	-	+24.0	—	dBm
Output Third Order Intercept Point (OIP3)[2]	16-21	—	+33.0	—	dBm
Positive Device Operating Voltage ($+V_{DD}$)[3]	—	+5.5	—	+6.0	V
Positive Device Operating Current (I_{DD})	—	—	260	350	mA
Negative Device Operating Voltage ($-V_{GG}$)	—	—	-5.0	—	V
Negative Device Operating Current (I_{GG})	—	—	5.0	15.0	mA

1. Current increases at P1dB and P3dB
2. OIP3 measured with 10 dBm tones and 1 MHz
3. See max voltage derating chart on page 3.

REV. A
ECO-023464
ZX60-16213+
MCL NY
241122

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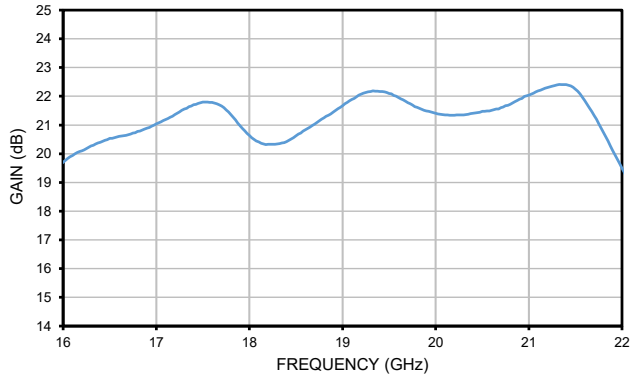
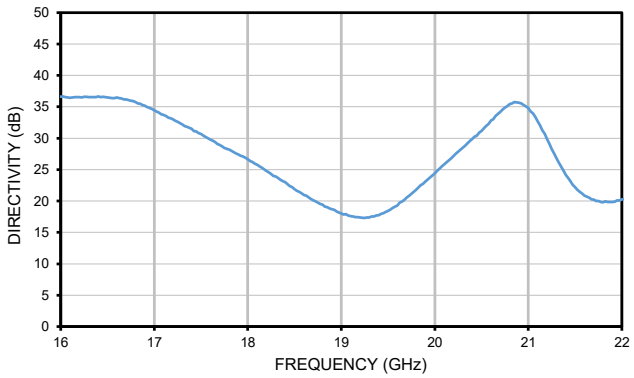
TYPICAL PERFORMANCE GRAPHS

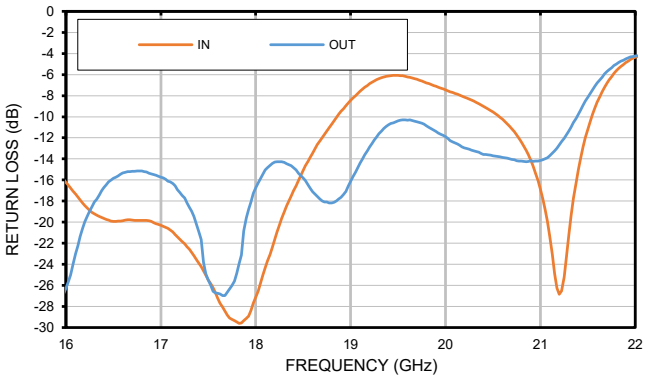
GAIN



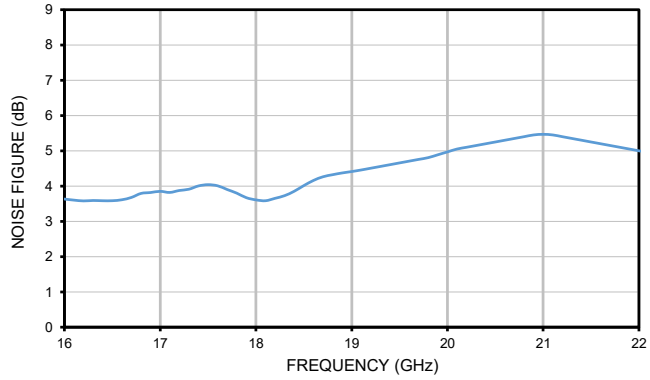
DIRECTIVITY



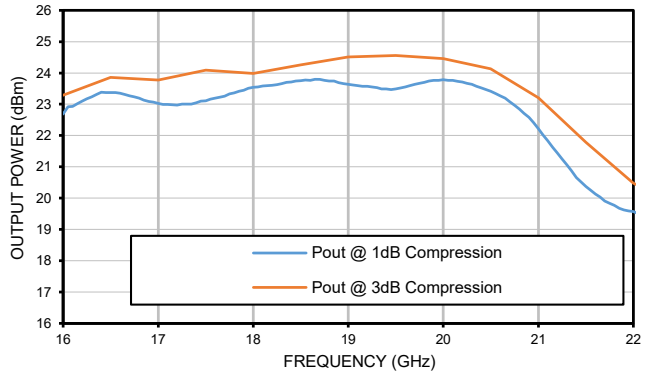
RETURN LOSS



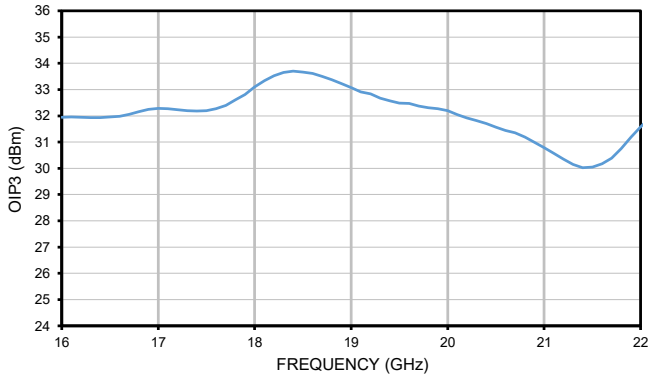
NOISE FIGURE



OUTPUT POWER



OUTPUT IP3



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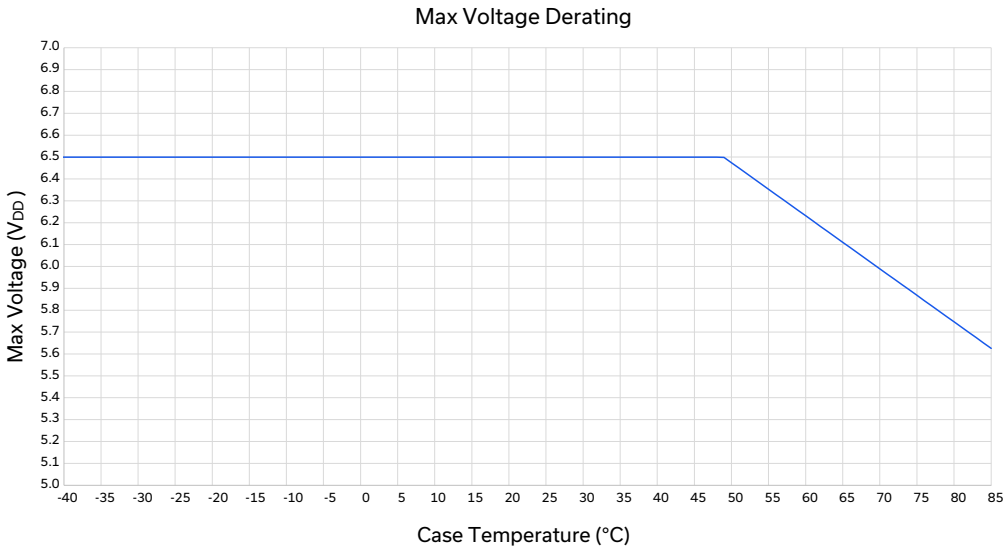
ABSOLUTE MAXIMUM RATINGS[4]

Parameter	Ratings
Operating Temperature (Baseplate)[5]	-40°C to +85°C
Storage Temperature	-55°C to +100°C
Total Power Dissipation	2.4 W
Input Power (CW), V_{DD}=+5.5V	+9 dBm
DC Voltage[3]	+6.5 V

3. See max voltage derating chart below.
4. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.
5. Heatsink not included. Alternative heat sinking and heat removal must be provided by the user to limit maximum base-plate temperature to +85 °C. Refer to calculation below for required thermal resistance of heatsink.



DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

$$\textit{MAXIMUM THERMAL RESISTANCE} = \frac{\textit{MAXIMUM OPERATING CASE TEMP} - \textit{MAXIMUM USER AMBIENT TEMP}}{\textit{POWER DISSIPATION}}$$

Example:	MAXIMUM OPERATING CASE TEMP = +85 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +60 °C (USER DEFINED) POWER DISSIPATION = 2.4 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 10.4 °C/W

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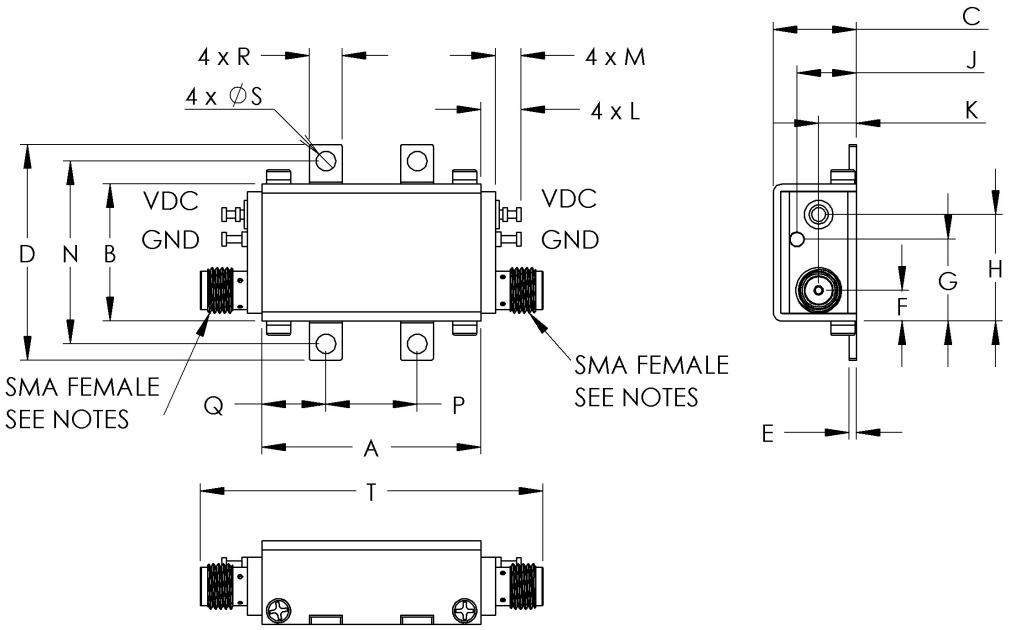
CASE STYLE DRAWING



CASE #	A	B	C	D	E	F	G	H	J	K	L	M	N
GD958	1.20 (30.48)	.75 (19.05)	.46 (11.61)	1.18 (29.97)	.04 (1.02)	.17 (4.27)	.45 (11.35)	.58 (14.81)	.33 (8.31)	.21 (5.28)	.22 (5.59)	.14 (3.56)	1.00 (25.40)

CASE #	P	Q	R	S	T	WT GRAMS
GD958	.50 (12.70)	.35 (8.89)	.18 (4.57)	.106 (2.69)	1.88 (47.70)	35

Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015
Tolerance on hole size and interaxes dimensions to be ± .005.

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ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data & Graphs	Data Graphs S-Parameter (S2P Files) Data Set (.zip file)
RoHS Status	Compliant
Environmental Ratings	ENV23T10

ORDERING INFORMATION

Model No. Link	ZX60-16213+
Case Style	GD958
Connector	IN SMA/Female / OUT SMA/Female

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

Coaxial Amplifier ZX60-16213+

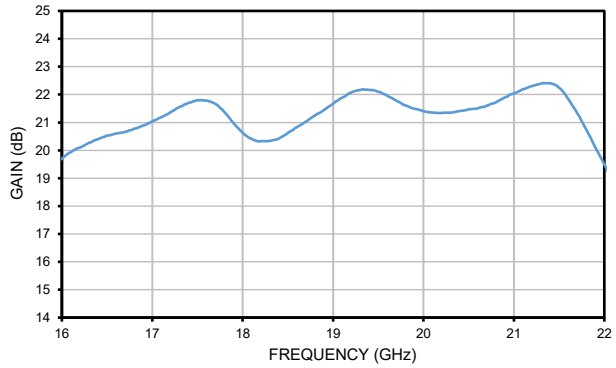
Typical Performance Data

FREQUENCY (GHz)	GAIN (dB)	DIRECTIVITY (dB)	RETURN LOSS (dB)		Pout @ 1 dB COMPRESSION (dBm)	NOISE FIGURE (dB)	OIP3 dBm
			IN	OUT			
16.0	19.70	36.58	16.22	26.25	22.7	3.6	31.95
16.5	20.53	36.50	19.93	15.83	23.5	3.6	31.88
17.0	21.04	34.45	20.29	15.73	23.0	3.9	32.39
17.5	21.80	30.65	25.46	25.45	23.2	4.0	32.18
18.0	20.63	26.67	27.16	16.77	23.5	3.6	33.24
18.5	20.62	21.88	15.10	15.79	23.7	4.0	33.86
19.0	21.67	18.02	8.45	16.15	23.6	4.4	33.27
19.5	22.10	18.43	6.08	10.39	23.5	4.7	32.47
20.0	21.41	24.41	7.46	11.90	23.8	5.0	32.14
20.5	21.47	31.21	9.55	13.69	23.4	5.3	31.62
21.0	22.04	34.82	16.88	14.14	22.4	5.5	30.85
21.5	22.24	22.20	11.18	8.14	20.2	5.3	29.83
22.0	19.50	20.25	4.36	4.24	19.6	5.0	31.60

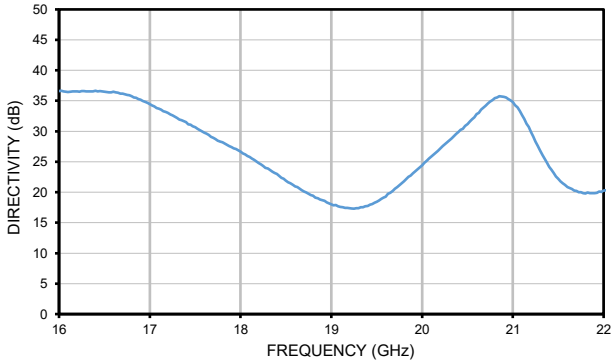
Coaxial Amplifier ZX60-16213+

Typical Performance Curves

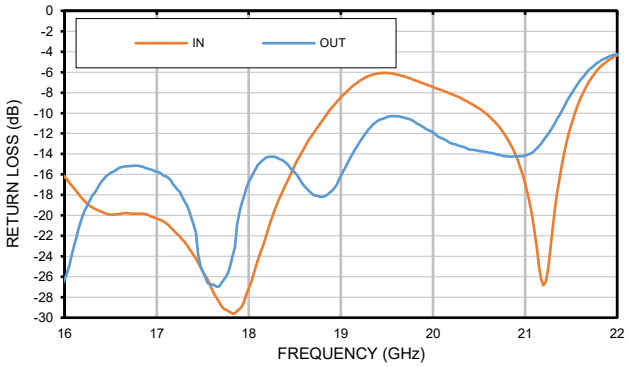
GAIN



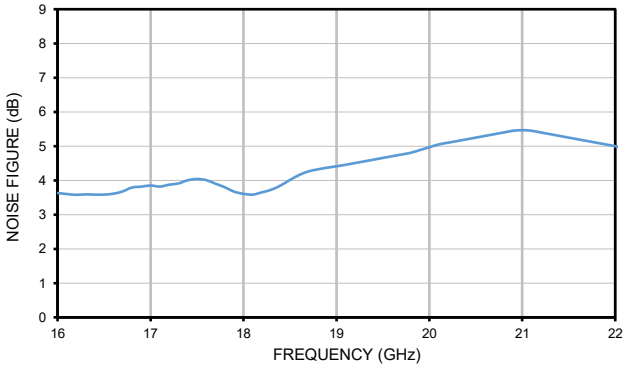
DIRECTIVITY



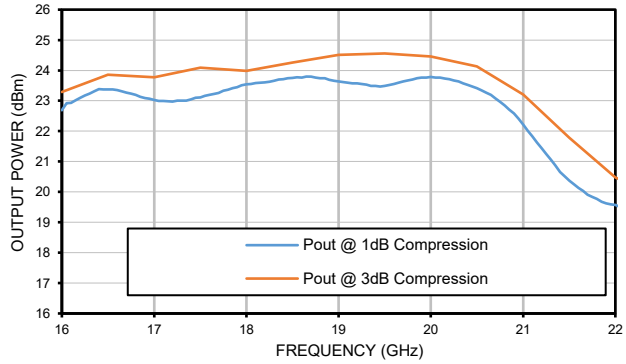
RETURN LOSS



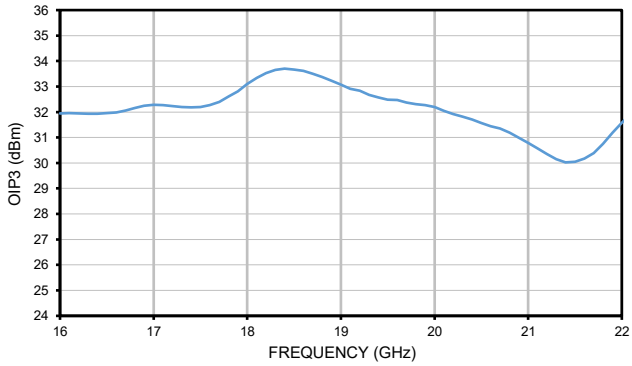
NOISE FIGURE



OUTPUT POWER



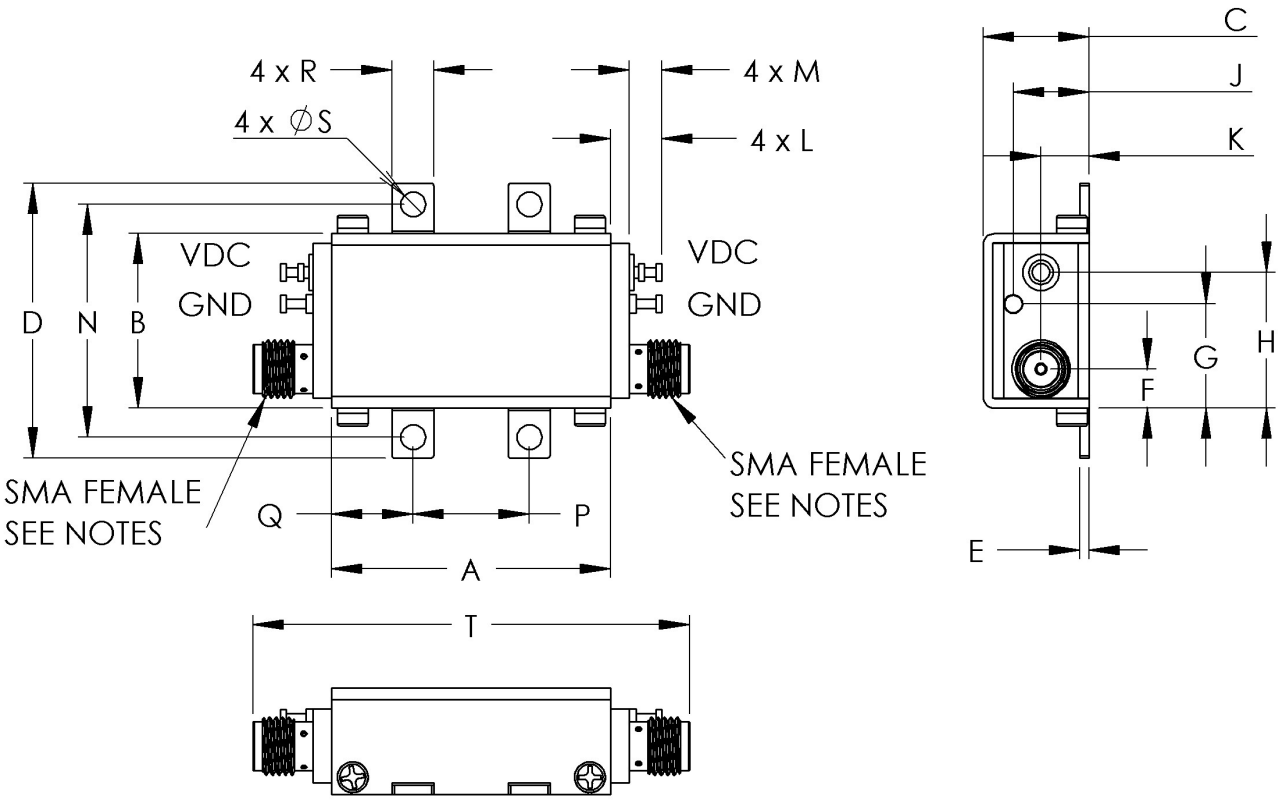
OUTPUT IP3



Case Style GD

Outline Dimensions

GB958



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Dimensions are in inches (mm). Tolerances: 2Pl. ± .03; 3Pl. ± .015
Tolerance on hole size and interaxes dimensions to be ± .005.

Note:

1. Case material: Brass
2. Case finish: Nickel plate
3. For RF Ports and DC voltages designation, refer to individual model data sheet.

Mini-Circuits®
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Environmental Specifications ENV23T10

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 Case Temperature	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Stabilization Bake	(non-operating) 125°C, 24 hours	- - -
Burn-in at Elevated Temp.	(DC on) 160 hours at 85° C	MIL-STD-202, Method 108
Thermal Shock	-55° to 100°C, 5 cycles	MIL-STD-202, Method 107, Condition A, except 100°C