COAXIAL

Wideband Amplifier

ZVA-02653G+
ZVA-02653GX+

50Ω 2 to 65 GHz Medium Power High Gain 1.85 mm Female

THE BIG DEAL

- High Gain 21 dB Typ.
- Good Gain Flatness, ±3.0 dB Typ. Up to 60 GHz
- +18 dBm P_{SAT} Typ.
- Wide Operating DC Voltage, +10 to +15 V
- DC Protected Against Over-Voltage, Reverse-Voltage Conditions



Generic photo used for illustration purposes only

Model No.	ZVA-02653G+	ZVA-02653GX+
Option	With Heatsink	Without Heatsink
Case Style	WC3071-6	
Connector	1.85 mm female	

+RoHS Compliant
The +Suffix identifies RoHS Compliance.
See our website for methodologies and qualifications

APPLICATIONS

- 4G, 5G FR1, FR2 & FR2+
- Broadband Telecom
- Satellite Communications
- Test & Measurements
- WiFi6E (2.4, 5.8, 7.2 GHz)
- Aerospace & Defense

PRODUCT OVERVIEW

Mini-Circuits' ZVA-02653G(X)+ is a coaxial ultra-wideband amplifier, operating from 2 to 65 GHz. This model operates over a single positive supply range of +10 to +15 V, allowing users to choose their desired operating voltage. Internal DC-DC conversion circuitry maintains constant efficiency over the full input voltage range. The amplifier incorporates several DC-protection features, such as over-voltage, reverse voltage and in-rush current, that protect the amplifier from damage if mishandled during operation. The wideband operation combined with medium output power makes this amplifier an ideal choice for testing and instrumentation applications.

KEY FEATURES

Features	Advantages
Ultra-Wideband Amplifier, 2 to 65 GHz	A single amplifier serves the need for applications including 5G bands, Broadband Telecom, SATCOM, Test & Instrumentation, etc.
Heatsink Option	Model ZVA-02653G+ comes with a heatsink, keeping the amplifier cool to the touch during normal operation at room temperature.
High Gain Low VSWR Medium RF Power	The amplifier provides 21 dB (typ.) of gain over 2 to 60 GHz, and can deliver over 60 mW of RF power making this amplifier an ideal choice for testing and instrumentation applications.
Wide Operating DC Supply Voltage	The device is capable of operating from +10 to +15 V with consistent DC power consumption.
DC Protection – Over-Voltage Reverse Voltage In-Rush Current	The internal DC circuitry allows the amplifier to be protected from external mishandling, that could lead to catastrophic failures in the field.

ELECTRICAL SPECIFICATIONS AT +25 °C BASEPLATE

Parameter	Condition (GHz)	ZVA-02653G+[1] ZVA-02653GX+[2] Min.	Typ.	Max.	Units
Frequency Range		2		65	GHz
Gain	2-60	18.0	21.0		dB
	60-65		19.0		
Output Power at 1 dB Compression	2-20	+16.0	+19.0		dBm
	20-40	+13.5	+16.5		
	40-60	+9.0	+14.0		
	60-65		+9.50		
Saturated Output Power[3]	2-20	+17.0	+19.5		dBm
	20-40	+14.5	+18.0		
	40-60	+12.0	+16.0		
	60-65		+12.5		
Output IP3 (Output Power = +7 dBm/Tone)	2-65		+23.0		dBm
Input VSWR	2-65		1.5	2.1	:1
Output VSWR[4]	2-65		1.5	2.1	:1
Noise Figure	2-54		5.0		dB
Operating DC Voltage		+10		+15	V
Device Operating Current at +10 V			270	310	mA
Total Power Dissipation at +10 V			2.9[5]		W

1. For units with heatsink, limit ambient temperature to +50 °C.
2. For units without heatsink, limit the maximum baseplate temperature to +60 °C.
3. At P_{SAT}, P_{OUT} changes less than 0.1 dB for a 1 dB change in P_{IN}.
4. Open and short-circuit loads are not recommended at the amplifier output. Ensure proper 50Ω load before turning the amplifier "ON".
5. Device operating power based on current when amplifier is in saturation.

ABSOLUTE MAXIMUM RATINGS[5]

Parameter	Ratings
Operating Temperature	ZVA-02653G+ -40 °C to +50 °C Ambient ZVA-02653GX+ -40 °C to + 60 °C Baseplate
Storage Temperature	-40 °C to +85 °C
RF Input Power[6] (CW)	+8 dBm
DC Operating Voltage	+16 V

5. Continuous operation is not recommended at these extremes. Permanent damage may occur if any of these limits are exceeded.
6. Specified under matched load to 50Ω.

DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

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

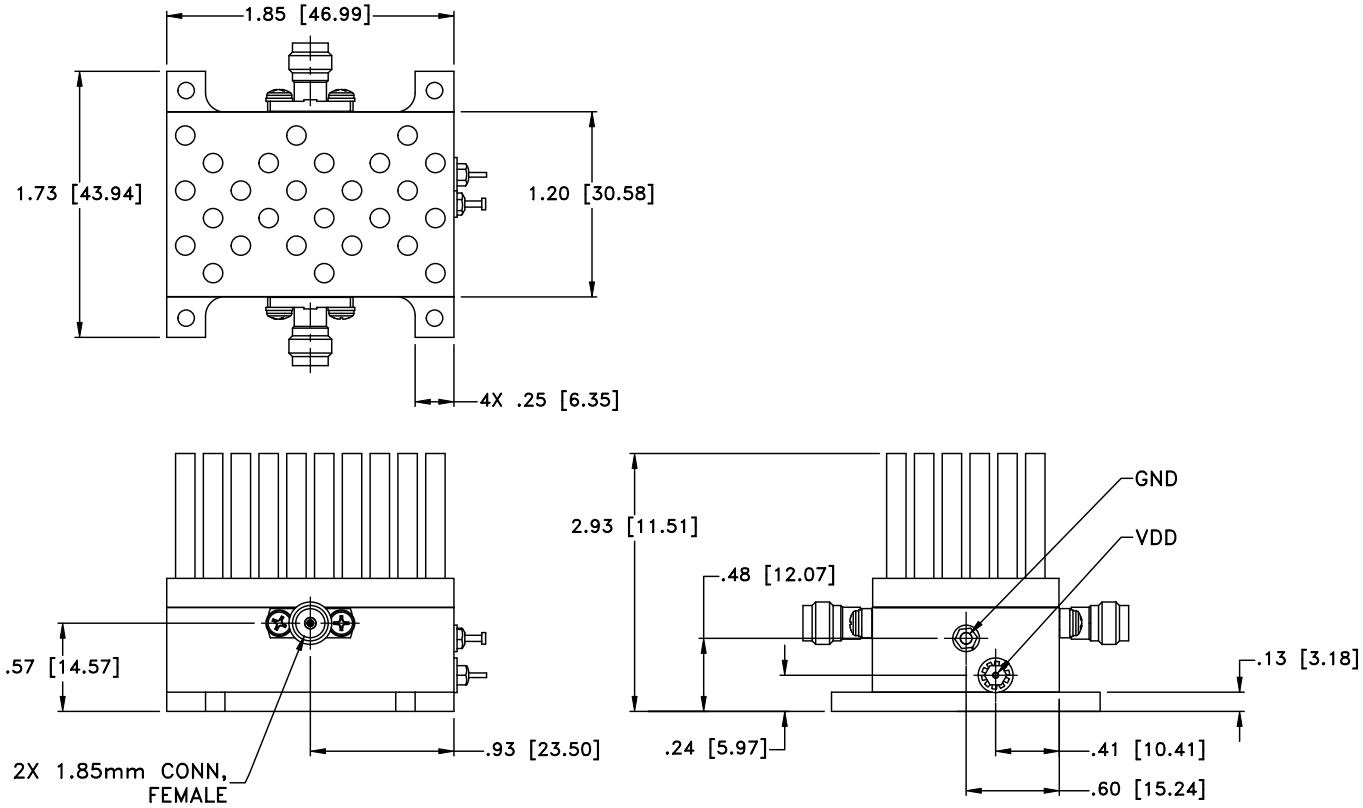
Example:	MAXIMUM OPERATING BASEPLATE TEMP = +60 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +50 °C (USER DEFINED) POWER DISSIPATION = 2.9 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 3.4 °C/W

Wideband Amplifier

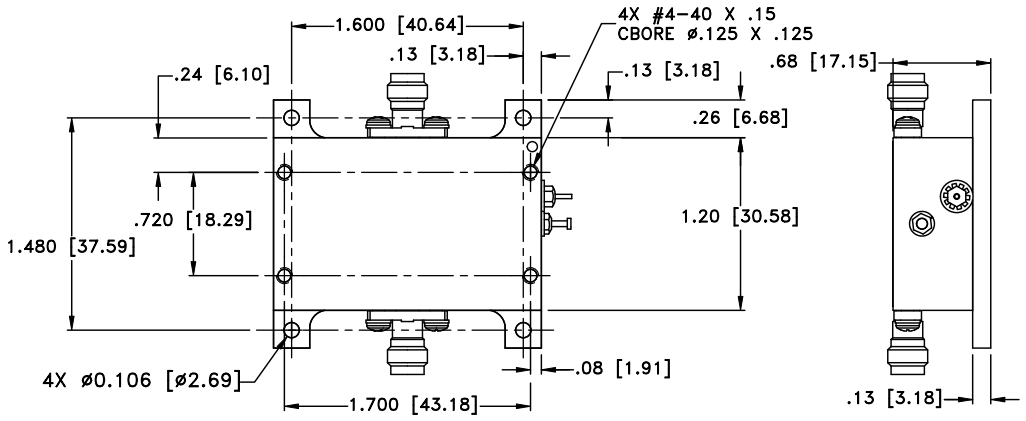
ZVA-02653G+
ZVA-02653GX+

50Ω 2 to 65 GHz Medium Power High Gain 1.85 mm Female

OUTLINE DRAWING FOR MODELS WITH HEATSINK (ZVA-02653G+)



MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK (ZVA-02653GX+)



WT. GRAMS 90 grams; WITHOUT HEATSINK GRAMS 60 grams
Dimensions are in inches [mm]. Tolerances: 2 Pl.±.03; 3 Pl. ±.015

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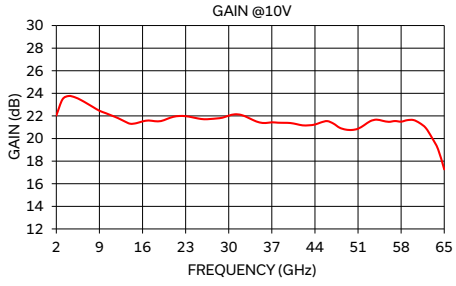
Wideband Amplifier

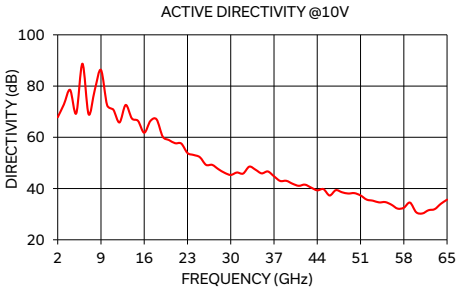
ZVA-02653G+
ZVA-02653GX+

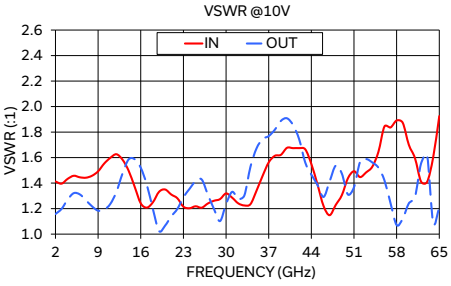
50Ω 2 to 65 GHz Medium Power High Gain 1.85 mm Female

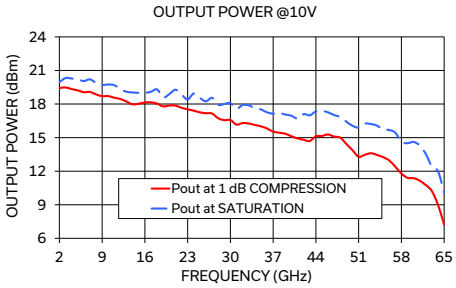
TYPICAL PERFORMANCE DATA / GRAPHS

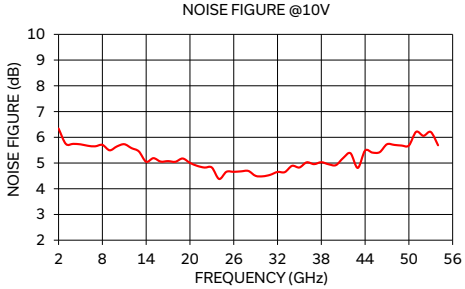
Frequency (GHz)	Gain (dB) +10 V	Active Directivity (dB) +10 V	VSWR (:1) +10 V IN	VSWR (:1) +10 V OUT	P_{OUT} at 1 dB Compression (dBm) +10 V	P_{OUT} at Saturation (dBm) +10 V	Output IP3 (dBm) +10 V	Noise Figure (dB) +10 V
2	22.0	67.8	1.4	1.2	19.4	20.0	31.5	6.3
6	23.4	88.7	1.4	1.3	19.1	20.1	30.6	5.7
10	22.3	72.5	1.6	1.2	18.7	19.7	29.2	5.6
14	21.3	67.4	1.5	1.6	18.0	19.0	27.8	5.0
18	21.5	67.0	1.3	1.2	18.0	19.3	27.4	5.0
22	22.0	57.6	1.3	1.2	17.7	18.8	25.9	4.8
26	21.7	49.2	1.2	1.4	17.2	18.2	25.2	4.7
30	22.0	45.3	1.3	1.2	16.6	18.1	24.0	4.5
34	21.6	47.4	1.2	1.5	16.1	17.6	23.6	4.9
38	21.4	43.0	1.6	1.8	15.4	17.2	23.1	5.0
42	21.2	41.5	1.7	1.7	14.8	17.1	22.3	5.4
46	21.5	37.3	1.2	1.3	15.3	17.3	22.4	5.4
50	20.8	38.2	1.4	1.3	13.9	16.1	20.5	5.7
54	21.7	34.6	1.5	1.6	13.5	16.1	20.5	5.7
58	21.5	32.5	1.9	1.1	11.8	14.6	18.8	
62	20.9	31.5	1.4	1.6	10.8	13.5	18.1	
65	17.3	35.7	1.9	1.2	7.2	10.1	16.7	

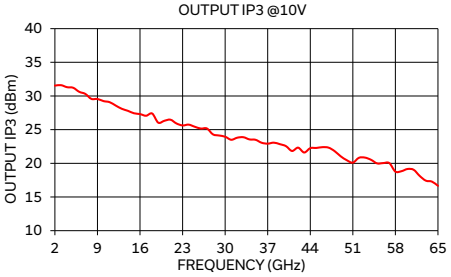












NOTES

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 ZVA-02653GX+

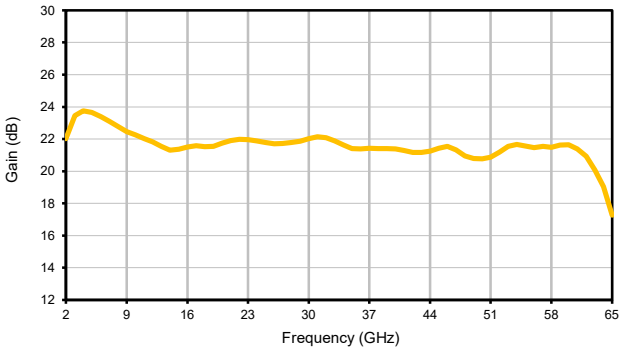
Typical Performance Data

FREQUENCY (GHz)	GAIN (dB) 10V	DIRECTIVITY (dB) 10V	VSWR (:1) IN 10V	VSWR (:1) OUT 10V	Pout @ 1 dB COMPRESSION (dBm) 10V	OIP3 (dBm) 10V	Pout at SATURATION (dBm) 10V
2.0	22.04	67.83	1.41	1.16	19.42	31.54	20.0
3.0	23.46	72.83	1.40	1.20	19.48	31.61	20.3
4.0	23.76	78.52	1.43	1.27	19.33	31.31	20.3
5.0	23.65	69.34	1.46	1.32	19.22	31.22	20.2
6.0	23.41	88.74	1.45	1.31	19.06	30.62	20.1
7.0	23.10	69.00	1.44	1.27	19.08	30.31	20.2
8.0	22.77	78.50	1.46	1.22	18.86	29.57	19.9
9.0	22.46	86.28	1.49	1.18	18.70	29.56	19.7
10.0	22.25	72.52	1.55	1.19	18.71	29.24	19.7
11.0	22.03	70.79	1.60	1.24	18.56	29.08	19.7
12.0	21.81	65.80	1.63	1.33	18.45	28.58	19.3
13.0	21.54	72.63	1.58	1.47	18.22	28.10	19.1
14.0	21.31	67.37	1.50	1.59	17.97	27.80	19.0
15.0	21.36	66.40	1.37	1.59	18.03	27.44	19.0
16.0	21.52	61.79	1.24	1.52	18.14	27.31	19.0
17.0	21.60	66.38	1.21	1.39	18.15	27.07	19.1
18.0	21.53	66.99	1.25	1.20	18.03	27.40	19.3
19.0	21.55	60.23	1.33	1.02	17.79	26.04	18.6
20.0	21.74	58.93	1.35	1.07	17.86	26.32	18.9
21.0	21.92	57.69	1.31	1.14	17.86	26.48	19.3
22.0	22.00	57.55	1.28	1.20	17.66	25.92	18.8
23.0	21.98	53.87	1.22	1.29	17.53	25.63	18.4
24.0	21.89	53.10	1.20	1.35	17.41	25.75	18.9
25.0	21.78	52.24	1.22	1.42	17.26	25.43	18.5
26.0	21.71	49.25	1.21	1.43	17.18	25.16	18.2
27.0	21.73	49.24	1.24	1.31	17.15	25.18	18.6
28.0	21.78	47.57	1.26	1.20	16.73	24.30	17.9
29.0	21.85	46.15	1.27	1.10	16.56	24.13	18.0
30.0	22.03	45.31	1.32	1.24	16.57	23.95	18.1
31.0	22.14	46.26	1.29	1.33	16.16	23.50	17.6
32.0	22.09	45.85	1.24	1.28	16.30	23.81	17.9
33.0	21.88	48.55	1.22	1.30	16.26	23.88	17.9
34.0	21.62	47.36	1.23	1.53	16.13	23.55	17.6
35.0	21.42	45.92	1.34	1.67	16.01	23.50	17.5
36.0	21.37	46.67	1.46	1.75	15.81	23.06	17.26
37.0	21.44	44.78	1.56	1.77	15.54	22.92	17.14
38.0	21.40	42.96	1.61	1.82	15.44	23.07	17.18
39.0	21.39	43.02	1.62	1.89	15.35	22.85	17.06
40.0	21.37	41.87	1.68	1.91	15.12	22.56	16.95
41.0	21.28	41.07	1.67	1.85	14.93	21.84	16.71
42.0	21.17	41.52	1.67	1.74	14.80	22.33	17.10
43.0	21.17	40.38	1.66	1.56	14.70	21.61	16.99
44.0	21.24	39.30	1.55	1.47	15.11	22.25	17.34
45.0	21.43	39.77	1.39	1.39	15.15	22.28	17.38
46.0	21.54	37.29	1.22	1.29	15.28	22.40	17.26
47.0	21.32	39.37	1.15	1.41	15.09	22.33	17.01
48.0	20.96	38.55	1.23	1.54	14.99	21.82	16.84
49.0	20.79	38.06	1.30	1.48	14.43	21.05	16.42
50.0	20.76	38.21	1.44	1.31	13.87	20.47	16.06
51.0	20.87	37.31	1.49	1.37	13.28	20.10	15.90
52.0	21.19	35.68	1.45	1.57	13.46	20.82	16.25
53.0	21.54	35.26	1.48	1.59	13.60	20.85	16.22
54.0	21.67	34.59	1.53	1.56	13.45	20.52	16.07
55.0	21.57	34.72	1.64	1.52	13.25	19.99	15.73
56.0	21.48	33.69	1.84	1.42	12.96	20.04	15.67
57.0	21.55	32.17	1.84	1.24	12.40	20.04	15.44
58.0	21.49	32.50	1.89	1.07	11.79	18.77	14.62
59.0	21.63	34.52	1.87	1.12	11.40	18.83	14.50
60.0	21.64	30.77	1.70	1.24	11.38	19.16	14.61
61.0	21.37	30.27	1.60	1.29	11.15	19.04	14.30
62.0	20.94	31.54	1.41	1.55	10.75	18.13	13.53
63.0	20.07	31.96	1.41	1.62	10.22	17.43	12.42
64.0	19.05	34.05	1.60	1.09	8.98	17.29	11.99
65.0	17.27	35.65	1.93	1.21	7.23	16.67	10.10

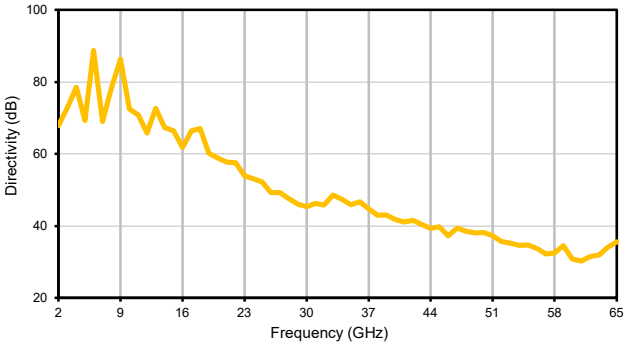
FREQUENCY (GHz)	Noise Figure (dB) 10V
2.0	6.34
3.0	5.74
4.0	5.74
5.0	5.73
6.0	5.67
7.0	5.65
8.0	5.70
9.0	5.49
10.0	5.64
11.0	5.73
12.0	5.58
13.0	5.45
14.0	5.05
15.0	5.19
16.0	5.05
17.0	5.07
18.0	5.05
19.0	5.17
20.0	5.01
21.0	4.89
22.0	4.82
23.0	4.83
24.0	4.38
25.0	4.66
26.0	4.66
27.0	4.67
28.0	4.69
29.0	4.50
30.0	4.48
31.0	4.54
32.0	4.65
33.0	4.65
34.0	4.89
35.0	4.83
36.0	5.03
37.0	4.96
38.0	5.03
39.0	4.95
40.0	4.92
41.0	5.19
42.0	5.38
43.0	4.81
44.0	5.48
45.0	5.41
46.0	5.42
47.0	5.73
48.0	5.70
49.0	5.68
50.0	5.68
51.0	6.21
52.0	6.06
53.0	6.21
54.0	5.69

Typical Performance Curves

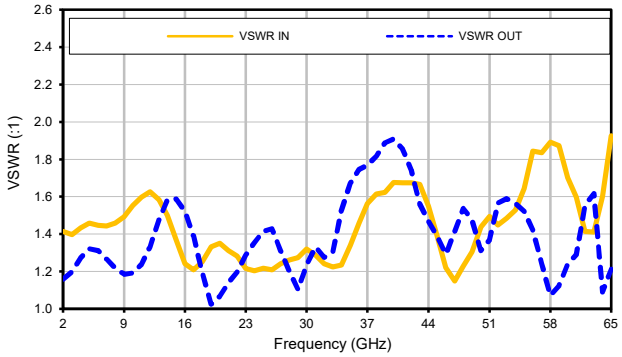
GAIN @10V



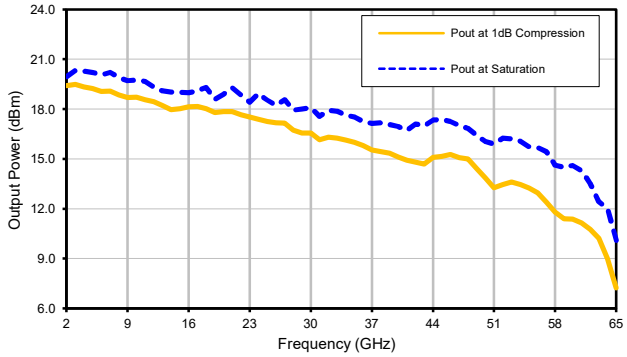
DIRECTIVITY @10V



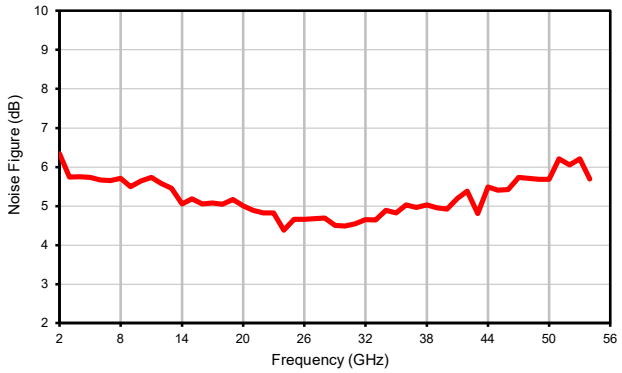
VSWR @10V



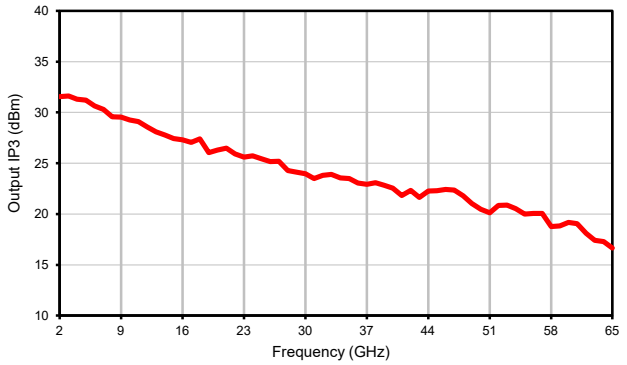
Pout @10V



Noise Figure @ 10V

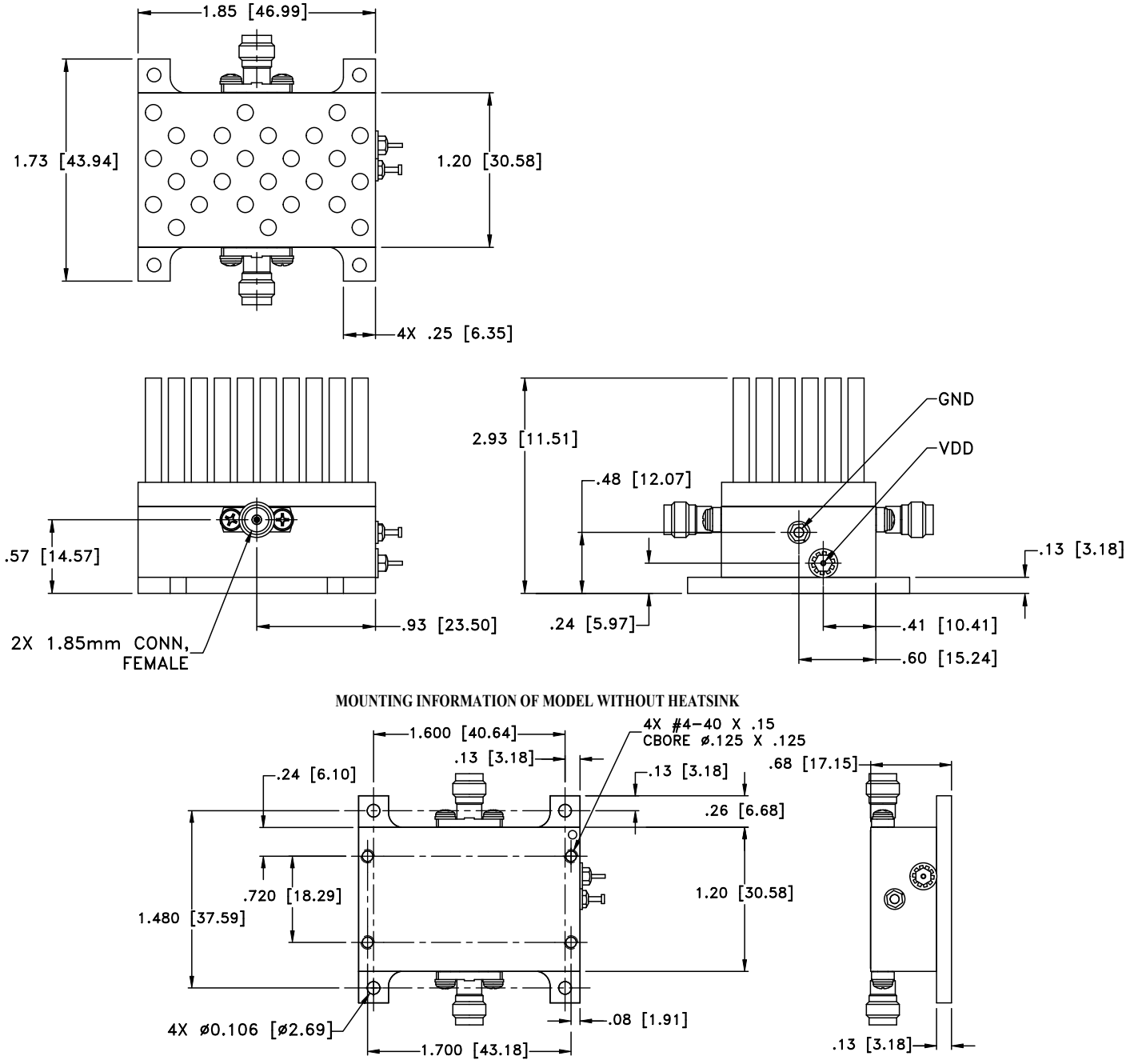


Output IP3 @ 10V



Outline Dimensions

WC3071-6



MOUNTING INFORMATION OF MODEL WITHOUT HEATSINK

WT. WT. GRAMS 160 grams; WITHOUT HEATSINK GRAMS 60 grams

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

Notes:
1. Case material: Aluminum.
2. Case finish: Gold plating;
3. Heat sink finish: Black anodize.
4. Refer to the individual model data sheet for the type of connectors available.
5. Shape of connector flange may vary.

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Mini-Circuits

Environmental Specifications ENV130

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

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