COAXIAL

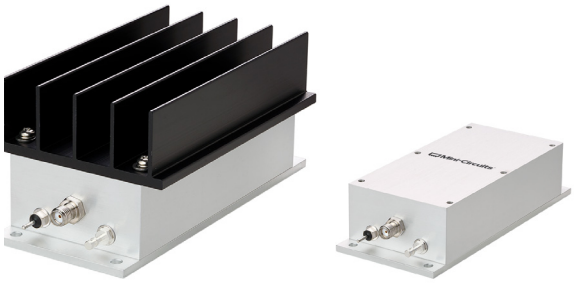
Medium Power Amplifier

ZHL-10M1G01W1+
ZHL-10M1G01W1X+

50Ω 10 to 1000 MHz Broadband 1.3 W SMA Female

KEY FEATURES

- Broadband, 10 to 1000 MHz
- High Gain, 34 dB Typ.
- High P1dB, +31 dBm, Typ.
- High OIP3, +45 dBm Typ.

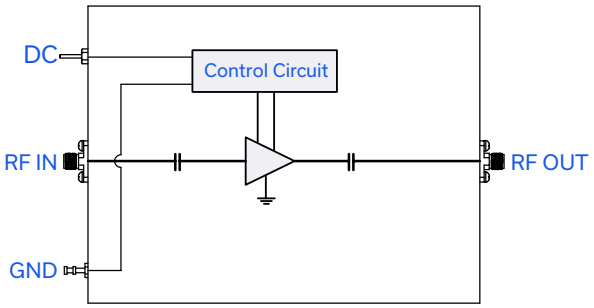


Generic photo used for illustration purposes only

APPLICATIONS

- Communication Systems
- R&D, Production, and Test Systems
- Test & Measurement Equipment
- General Laboratory Applications

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

Mini-Circuits' ZHL-10M1G01W1(X)+ is a medium power broadband amplifier providing more than 1 W of output power with a typical small signal gain of 34 dB over the 10 to 1000 MHz frequency band. The amplifier uses state-of-the-art semiconductor technology and can be used in a wide range of applications. A single supply voltage ensures ease of operation. The amplifier is made with a rugged aluminum housing and can be supplied with or without a heatsink.

ELECTRICAL SPECIFICATIONS AT $T_{MOUNTING\ BASE}$ = +25 °C, V_{DS} = +24 V

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Frequency Range	f		10		1000	MHz
Small Signal Gain	G_{SS}	P_{OUT} = -25 dBm	31	34	39	dB
Small Signal Gain Flatness	$G_{SS-FLAT}$	P_{OUT} = -25 dBm		± 0.2	± 1.3	dB
Output Power at 1 dB Compression	P_{1dB}	$P_{OUT-REF}$ = +15 dBm	+29	+31		dBm
Output Power at 3 dB Compression	P_{3dB}	$P_{OUT-REF}$ = +15 dBm	+31	+32		dBm
Noise Figure	NF			6.3		dB
Output Third Order Intercept Point	OIP3	P_{OUT} = +20 dBm/tone		+45		dBm
Input Return Loss	I-RL	P_{OUT} = -25 dBm	9.5	26		dB
Output Return Loss	O-RL	P_{OUT} = -25 dBm	9	21		dB
DC Supply Voltage	V_{DC}			+24	+25	V
Supply Current	I_{DC}	Without fan at P_{OUT} = +29 dBm With fan at P_{OUT} = +29 dBm		0.6 1.0	0.7 1.1	A

REV. A
ECO-028862
ZHL-10M1G01W1(X)+
MCL NY
260320

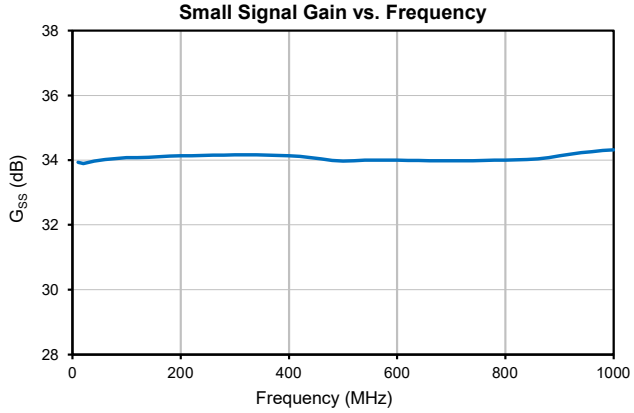
Medium Power Amplifier

ZHL-10M1G01W1+
ZHL-10M1G01W1X+

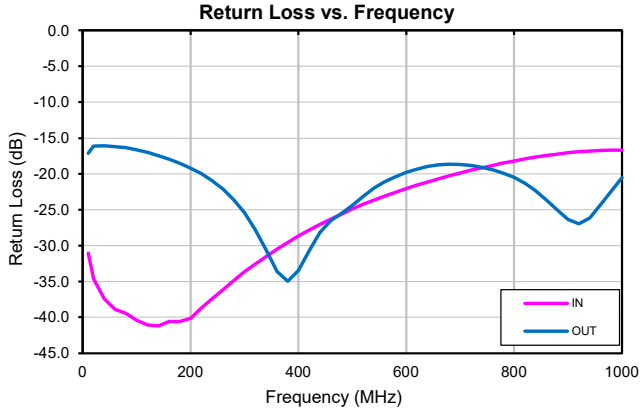
50Ω 10 to 1000 MHz Broadband 1.3 W SMA Female

TYPICAL PERFORMANCE DATA AT $T_{MOUNTINGBASE}$ = +25 °C, V_{DC} = +24 V, 50Ω

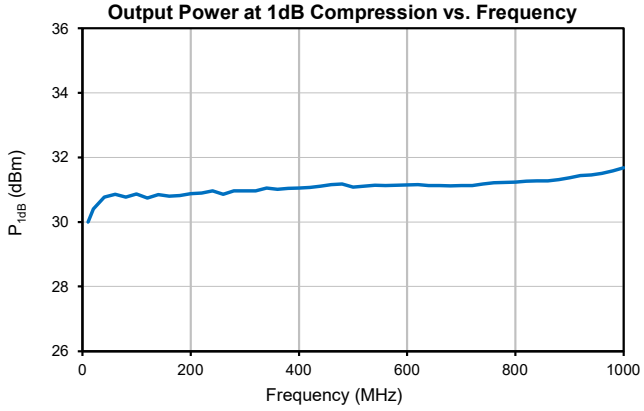
Small Signal Gain vs. Frequency



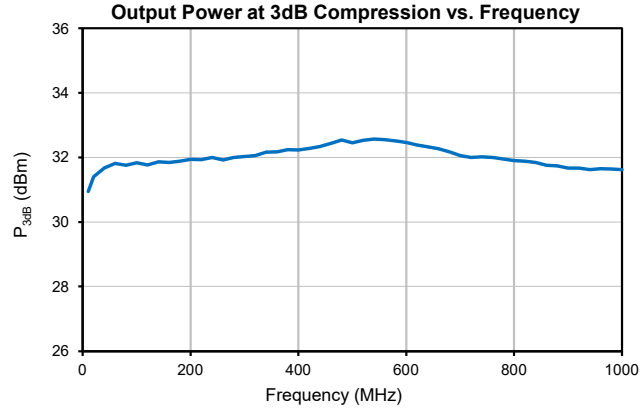
Return Loss vs. Frequency



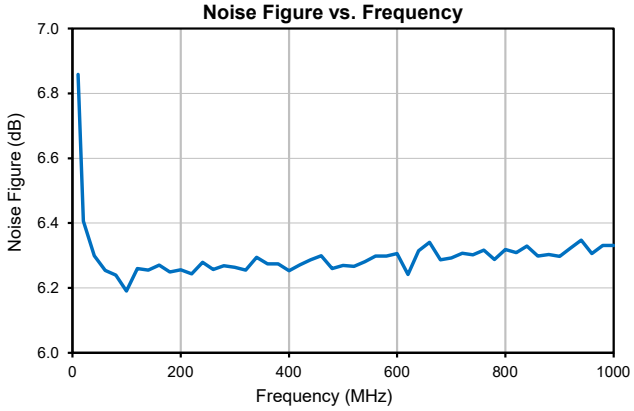
Output Power at 1dB Compression vs. Frequency



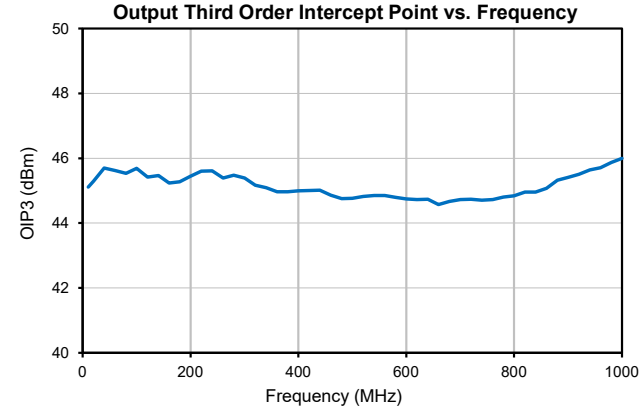
Output Power at 3dB Compression vs. Frequency



Noise Figure vs. Frequency



Output Third Order Intercept Point vs. Frequency



Medium Power Amplifier

50Ω 10 to 1000 MHz Broadband 1.3 W SMA Female

ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings
Operating Temperature	ZHL-10M1G01W1+ $T_{AMBIENT}$: -20 °C to +60 °C ZHL-10M1G01W1X+ $T_{MOUNTINGBASE}$: -20 °C to +85 °C
Storage Temperature	-55 °C to +100 °C
No damage with an open or short at P_{OUT} = +28 dBm CW	
RF Input Power (No Damage)	+5 dBm
DC Operating Voltage	+25 V
Total Power Dissipation (Without Fan at P_{OUT} = +29 dBm)	17.5 W
Total Power Dissipation (With Fan at P_{OUT} = +29 dBm)	27.5 W

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

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 MOUNTING BASE TEMP = +85 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +60 °C (USER DEFINED) POWER DISSIPATION = 16.2 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 1.54 °C/W

Medium Power Amplifier

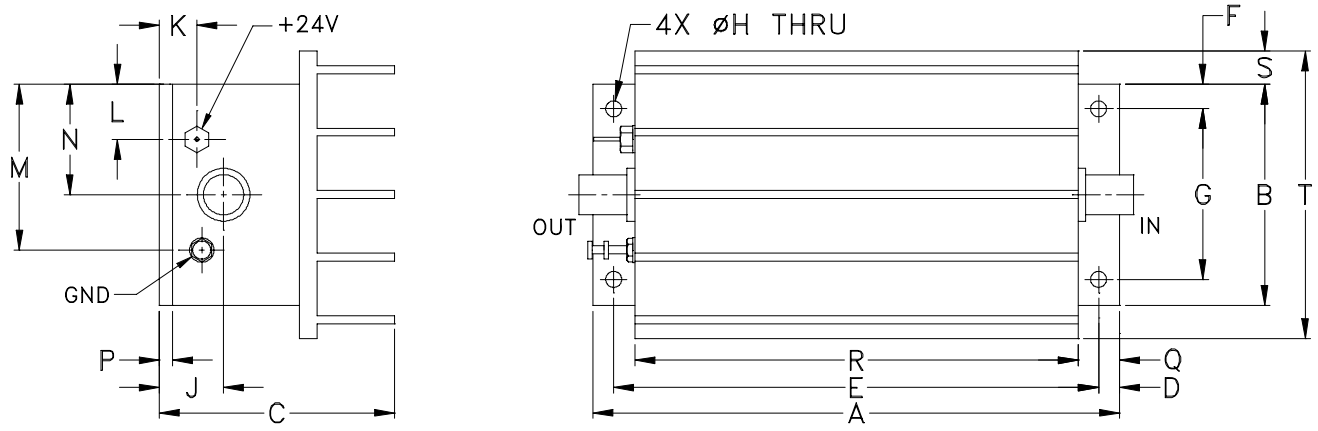
ZHL-10M1G01W1+
ZHL-10M1G01W1X+

50Ω 10 to 1000 MHz Broadband 1.3 W SMA Female

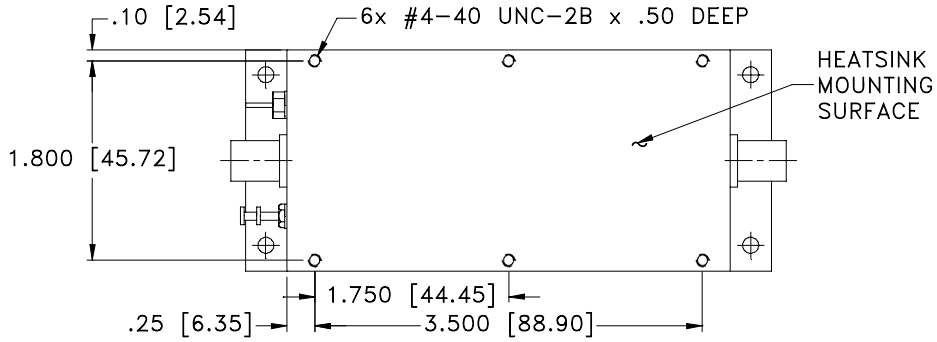
COAXIAL CONNECTIONS

IN (RF-IN)	SMA female
OUT (RF-OUT)	SMA female

CASE STYLE DRAWING WITH HEATSINK (ZHL-10M1G01W1+)



CASE STYLE DRAWING WITHOUT HEATSINK (ZHL-10M1G01W1X+)



OUTLINE DIMENSIONS (Inch / mm)

A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	wt
4.75	2.00	2.12	.19	4.375	.23	1.540	.144	.58	.34	.50	1.50	1.00	.12	.38	4.00	.30	2.60	grams*
120.65	50.80	53.85	4.83	111.13	5.84	39.12	3.66	14.73	8.64	12.70	38.10	25.40	3.05	9.65	101.60	7.62	66.04	440.0

*325 grams without heatsink

Medium Power Amplifier

ZHL-10M1G01W1+
ZHL-10M1G01W1X+

50Ω 10 to 1000 MHz Broadband 1.3 W SMA Female

ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data	Table Graphs S-Parameter (S2P Files) Data Set (.zip file)
RoHS Status	Compliant
Environmental Ratings	ENV23T15

ORDERING INFORMATION

Model No. Links	ZHL-10M1G01W1+	ZHL-10M1G01W1X+
Option	With Heatsink	Without Heatsink
Product Marking	ZHL-10M1G01W1+	ZHL-10M1G01W1X+
Case Style	T34	
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.

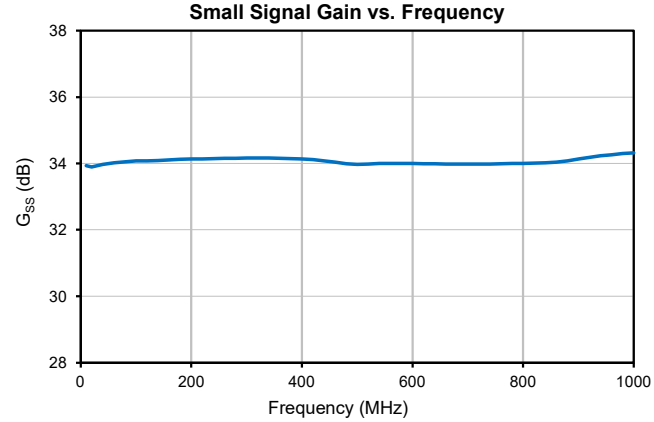
C. The parts covered by this specification document are subject to Mini-Circuits standard limited warranty and terms and conditions (collectively, "Standard Terms"); Purchasers of this part are entitled to the rights and benefits contained therein. For a full statement of the standard terms and the exclusive rights and remedies thereunder, please visit Mini-Circuits' website at www.minicircuits.com/terms/viewterm.html

Typical Performance Data

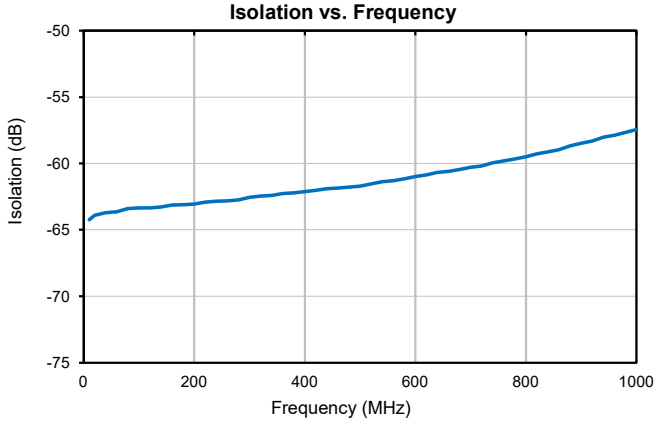
Frequency (MHz)	Gain (dB)	Isolation (dB)	Return Loss (dB)		P_{OUT} @ 1dB Compression (dBm)	P_{OUT} @ 3dB Compression (dBm)	P_{OUT} @ Saturation (dBm)	OIP3 (dBm)	Noise Figure (dB)
			IN	OUT					
	24V	24V	24V	24V	24V	24V	24V	24V	24V
10	33.93	64.25	31.06	17.11	30.00	30.95	31.26	45.10	6.86
20	33.90	63.91	34.63	16.12	30.40	31.40	31.67	45.29	6.41
40	33.97	63.70	37.41	16.07	30.77	31.68	31.85	45.70	6.30
60	34.02	63.64	38.87	16.19	30.86	31.82	32.08	45.63	6.25
80	34.05	63.40	39.46	16.36	30.77	31.76	32.14	45.54	6.24
100	34.08	63.37	40.44	16.63	30.87	31.84	32.23	45.69	6.19
120	34.08	63.34	41.07	17.00	30.74	31.76	32.20	45.42	6.26
140	34.09	63.28	41.20	17.45	30.84	31.87	32.28	45.46	6.25
160	34.11	63.13	40.59	17.96	30.80	31.85	32.28	45.24	6.27
180	34.12	63.11	40.59	18.54	30.82	31.88	32.31	45.27	6.25
200	34.13	63.06	40.14	19.20	30.88	31.94	32.34	45.45	6.26
220	34.14	62.91	38.68	19.99	30.90	31.93	32.29	45.60	6.24
240	34.15	62.84	37.38	20.94	30.97	32.00	32.34	45.61	6.28
260	34.15	62.79	36.13	22.12	30.86	31.93	32.26	45.39	6.26
280	34.16	62.74	34.87	23.59	30.97	32.00	32.31	45.48	6.27
300	34.16	62.56	33.61	25.46	30.97	32.03	32.31	45.40	6.26
320	34.16	62.45	32.60	27.79	30.97	32.06	32.32	45.17	6.26
340	34.16	62.42	31.50	30.62	31.05	32.17	32.43	45.09	6.29
360	34.16	62.25	30.48	33.64	31.01	32.18	32.45	44.97	6.27
380	34.15	62.20	29.54	34.98	31.05	32.24	32.52	44.97	6.27
400	34.14	62.11	28.68	33.47	31.05	32.24	32.52	44.99	6.25
420	34.11	62.03	27.85	30.71	31.07	32.27	32.57	45.00	6.27
440	34.08	61.89	27.04	28.20	31.11	32.34	32.62	45.02	6.29
460	34.04	61.83	26.29	26.52	31.16	32.43	32.69	44.86	6.30
480	33.99	61.78	25.58	25.47	31.19	32.54	32.76	44.76	6.26
500	33.98	61.71	24.88	24.40	31.08	32.46	32.69	44.76	6.27
520	33.99	61.54	24.24	23.13	31.11	32.53	32.75	44.82	6.27
540	34.00	61.37	23.64	21.99	31.14	32.57	32.77	44.86	6.28
560	34.00	61.29	23.08	21.09	31.13	32.56	32.71	44.86	6.30
580	34.00	61.14	22.55	20.37	31.14	32.52	32.65	44.80	6.30
600	34.00	60.99	22.05	19.80	31.15	32.47	32.54	44.75	6.31
620	34.00	60.85	21.55	19.34	31.15	32.39	32.44	44.73	6.24
640	33.99	60.67	21.11	18.98	31.13	32.33	32.38	44.74	6.32
660	33.98	60.59	20.66	18.75	31.13	32.27	32.31	44.57	6.34
680	33.98	60.45	20.25	18.65	31.12	32.18	32.20	44.67	6.29
700	33.98	60.29	19.87	18.68	31.13	32.07	32.07	44.73	6.29
720	33.98	60.18	19.50	18.83	31.14	32.00	32.01	44.74	6.31
740	33.99	59.95	19.16	19.08	31.18	32.02	32.03	44.71	6.30
760	33.99	59.82	18.82	19.43	31.21	32.00	32.01	44.73	6.32
780	34.00	59.66	18.49	19.89	31.23	31.96	31.97	44.81	6.29
800	34.00	59.48	18.18	20.50	31.24	31.91	31.92	44.84	6.32
820	34.01	59.27	17.91	21.30	31.26	31.88	31.91	44.96	6.31
840	34.02	59.13	17.65	22.35	31.27	31.85	31.87	44.96	6.33
860	34.04	58.95	17.43	23.63	31.28	31.76	31.80	45.08	6.30
880	34.08	58.67	17.22	25.05	31.31	31.74	31.80	45.32	6.30
900	34.13	58.48	17.06	26.38	31.38	31.66	31.76	45.41	6.30
920	34.18	58.29	16.92	26.95	31.44	31.67	31.78	45.51	6.32
940	34.23	58.04	16.82	26.11	31.47	31.62	31.78	45.64	6.35
960	34.27	57.86	16.73	24.32	31.51	31.65	31.82	45.72	6.31
980	34.30	57.67	16.69	22.37	31.59	31.64	31.84	45.87	6.33
1000	34.32	57.45	16.68	20.53	31.68	31.63	31.85	46.00	6.33

Typical Performance Curves

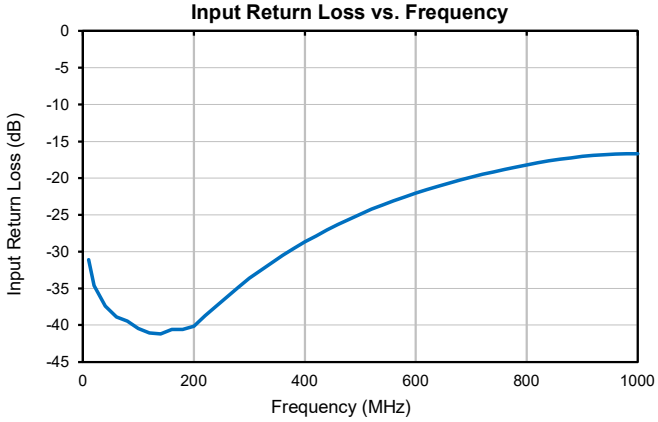
Small Signal Gain vs. Frequency



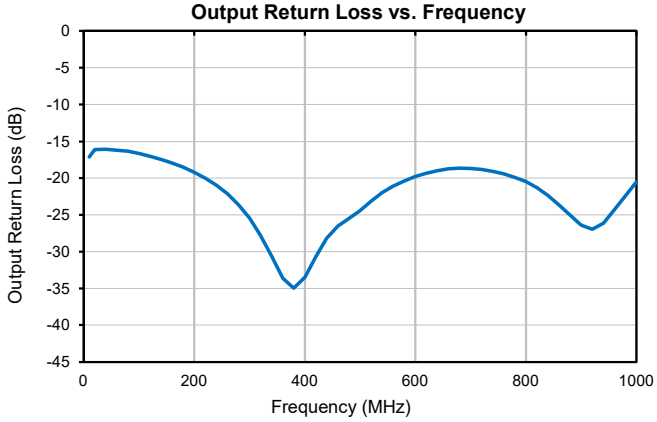
Isolation vs. Frequency



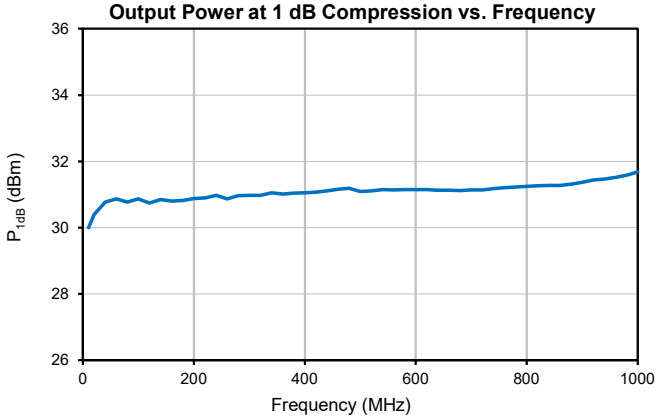
Input Return Loss vs. Frequency



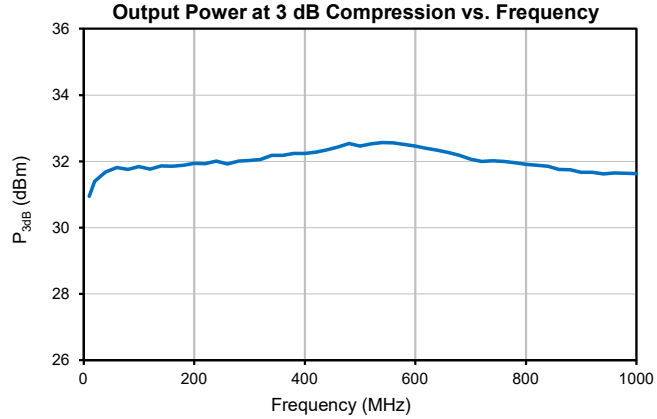
Output Return Loss vs. Frequency



Output Power at 1 dB Compression vs. Frequency

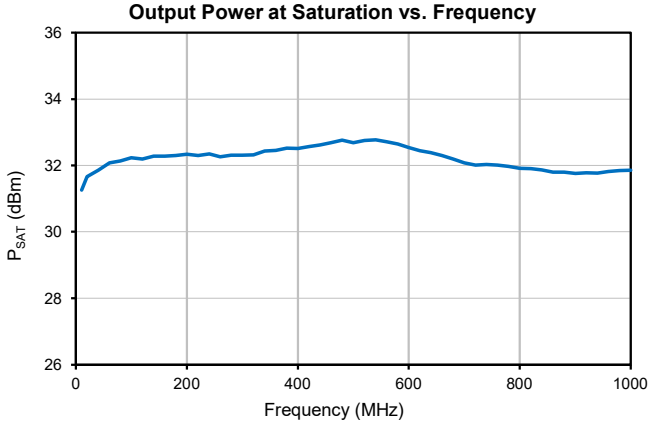


Output Power at 3 dB Compression vs. Frequency

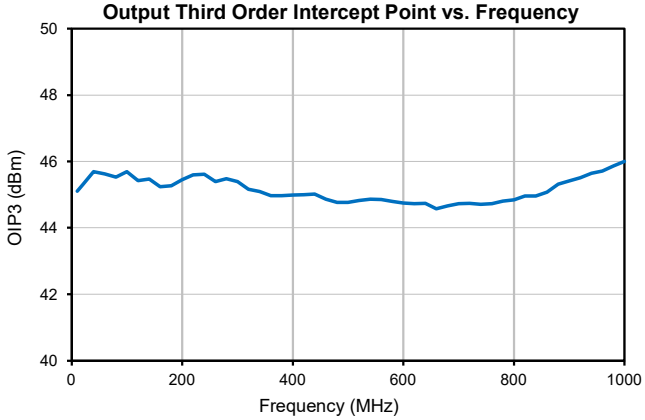


Typical Performance Curves

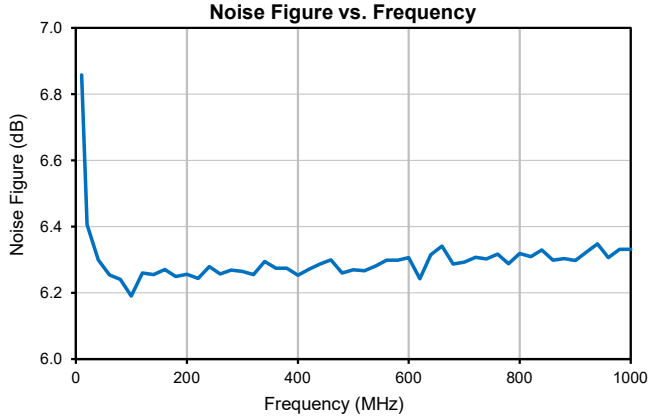
Output Power at Saturation vs. Frequency



Output Third Order Intercept Point vs. Frequency



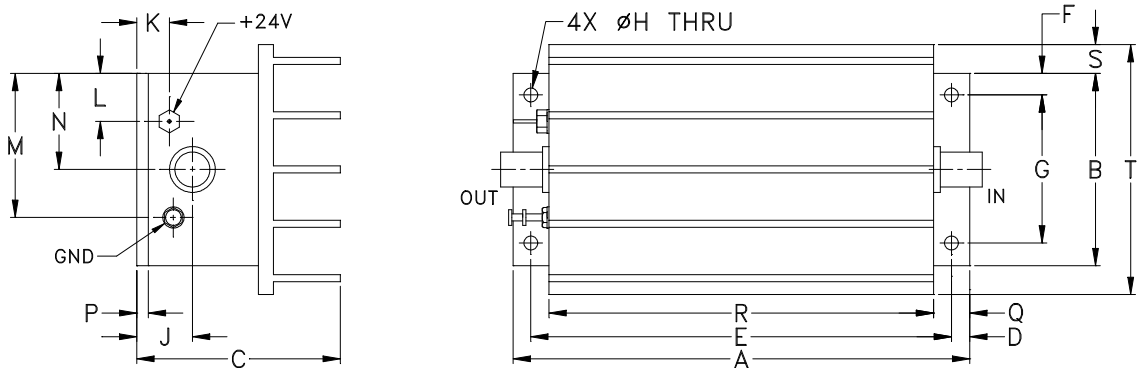
Noise Figure vs. Frequency



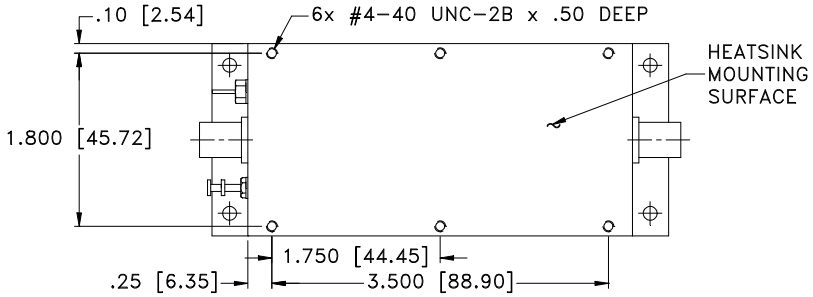
Case Style T

T34

Outline Dimensions



MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK



CASE#	A	B	C	D	E	F	G	H	J	K	L	M	N
T34	4.75 (120.65)	2.00 (50.80)	2.12 (53.85)	.19 (4.83)	4.375 (111.13)	.23 (5.84)	1.540 (39.12)	.144 (3.66)	.58 (14.73)	.34 (8.64)	.50 (12.70)	1.50 (38.10)	1.00 (25.40)

CASE#	P	Q	R	S	T	WT. GRAMS	WT. WITHOUT HEATSINK GRAMS
T34	.12 (3.05)	.38 (9.65)	4.00 (101.60)	.30 (7.62)	2.60 (66.04)	440.0	325.0

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

Notes:

1. Case material: Aluminum alloy.
2. Case finish and mounting bracket finish:
   For RoHS Case Styles: Clear chemical conversion coating, non-chrome or trivalent chrome based.
3. Heat sink finish: Black anodize.

Mini-Circuits

Environmental Specifications ENV23T3

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	-20° to 65° C Ambient Environment	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