COAXIAL

High Power Amplifier

50Ω 2 to 8 GHz 30W SMA

ZHL-2G08G0030+
ZHL-2G08G0030X+

THE BIG DEAL

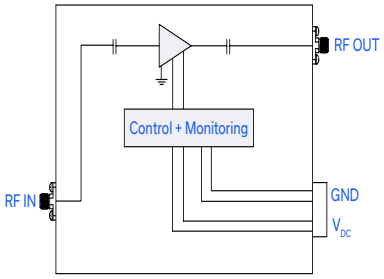
- 2 to 8 GHz Broadband Operation
- Suitable for CW signals
- Saturated Power, 30W (typ)
- High gain, 52 dB typical
- 50-ohm input and output impedance
- Unconditionally stable and rugged design
- Self-protected against excessive drive,high case temp.,reverse polarity and shorting unit DC power

Generic photo used for illustration purposes only

APPLICATIONS

- High Power Testing
- Burn-in / Life Testing
- Communication
- Radar

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

The ZHL-2G08G0030+ is a Class C, solid-state connectorized high-power amplifier module which can be used in a wide range of broadband test applications from 2 to 8 GHz band. This rugged amplifier is capable of amplifying CW signals with 20W minimum saturated output power with 28V supply voltage over the operating bandwidth. The typical small signal gain is 52 dB with a flatness of ±2 dB.

The ruggedly designed amplifier provides unconditional stability and built-in self-protection against reverse polarity, excessive drive and overheating. It is capable of withstanding short and open circuits at output while continuously delivering 10W of power. The amplifier operating baseplate temperature is between -30 to +80°C. The amplifier is designed to have a compact size of 100 x 100 x 30 mm and a light weight of 750 grams.

KEY FEATURES

Features	Advantages
Broadband 30W (typ), Useable from 2 to 8 GHz	Suitable for a broad range of high-power wideband applications, including test setups, communications and defense applications.
High Gain, 52 dB	Enables signal amplification to 30W (typ), 20W (min) output without the need for multiple gain stages.
Built-in self-protection	In instances of potentially damaging excessive drive current, heat buildup within the housing, shorting of DC supply, and short or open loads at the output, an automatic sensing feature signals the unit to power down.
Unconditional stability	Provides reliable performance independent of input and load conditions.
Small and lightweight	With a small footprint (100mm x 100mm x 30mm) the lightweight (515 grams) modular design.
Cooling	The amplifier can either be air or water cooled. Mounting screw holes are available on the amplifier.
Low voltage	The ZHL-2G08G0030+ is powered by a low voltage of 28V supply.

ELECTRICAL SPECIFICATIONS AT $T_{MOUNTINGBASE}$ = +25°C, V_{DC}= +28 V

Parameter	Symbol	Condition		Min.	Typ.	Max.	Units
Frequency Range	f	–		2	–	8	GHz
Small Signal Gain	G_{SS}	f= 2-8 GHz	P_{IN}= -35 dBm	45	52	–	dB
Small Signal Gain Flatness	$G_{SS-FLAT}$	f= 2-8 GHz	P_{IN}= -35 dBm	–	±2.0	±3.0	dB
Efficiency		f= 2-8 GHz	P_{OUT}= P_{SAT}	–	24	–	%
Output Power at 1dB compression	P_{1dB}	f= 2-8 GHz		–	5	–	Watts
				–	39	–	dBm
Output Power at saturation	P_{SAT}	f= 2-8 GHz		20	30	–	Watts
				43	44.8	–	dBm
Noise Figure	NF	f= 2-8 GHz		–	10	–	dB
Output Third Order Intercept Point	OIP3	f= 2-8 GHz	P_{OUT}= 41 dBm	–	44	–	dBm
Input Return Loss	I-RL	f= 2-8 GHz	P_{IN}=- 30 dBm	–	14	–	dB
Non-Harmonics Spurious	Spur	f= 2-8 GHz	P_{OUT}= 41 dBm/ tone	–	–	-60	dBc
2nd Harmonics	H_N	f= 2-8 GHz	P_{OUT}= 41 dBm	–	-20	-10	dBc
DC Supply Voltage	V_{SUPPLY}	f= 2-8 GHz		–	28	30	V
DC Supply Current	I_{SUPPLY}	f= 2-8 GHz	P_{OUT}= 43 dBm	–	4	5	A

PROTECTIONS

Parameter	Rating
Mounting Base Temperature	+85±5°C
Electrical Overload	Current Limiting
Over Voltage	31V ± 1V
Output Load Mismatch	No damage with an open or short at P_{OUT}=40 dBm (10 W) for 1 minute max

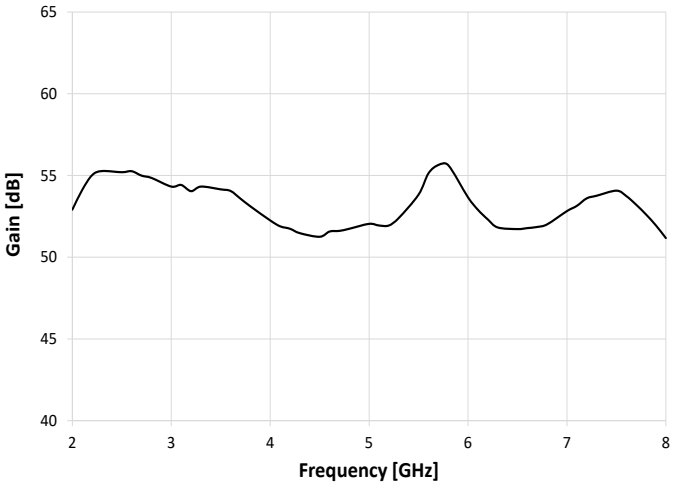
D-SUB9 PIN DESCRIPTION [1]

Pin #	Description
1, 2, 3, 4, 5	N/C
6, 7	GND
8, 9	V_{DC}

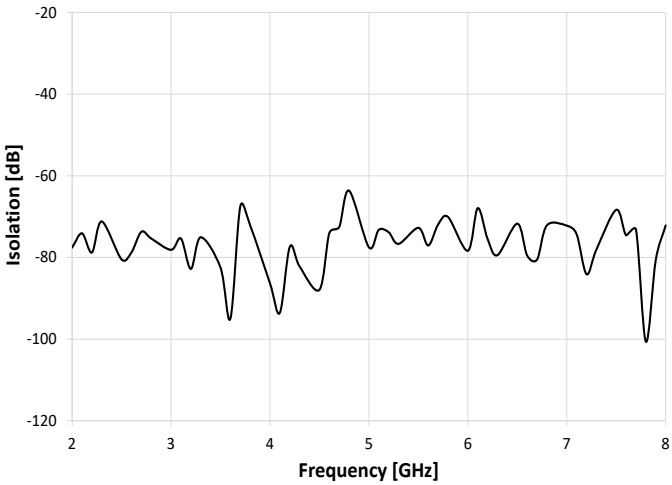
1) Each amplifier is supplied with an additional D-Sub to bare wires 3ft. (0.9m) cable for power and control.

TYPICAL PERFORMANCE GRAPHS

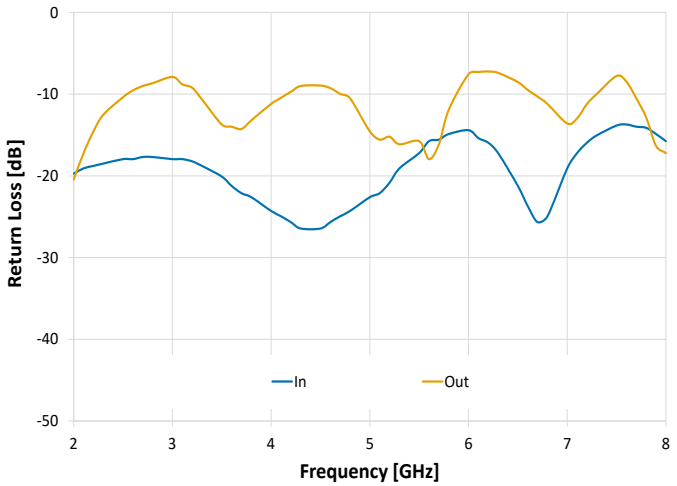
Small Siganl Gain vs. Frequency



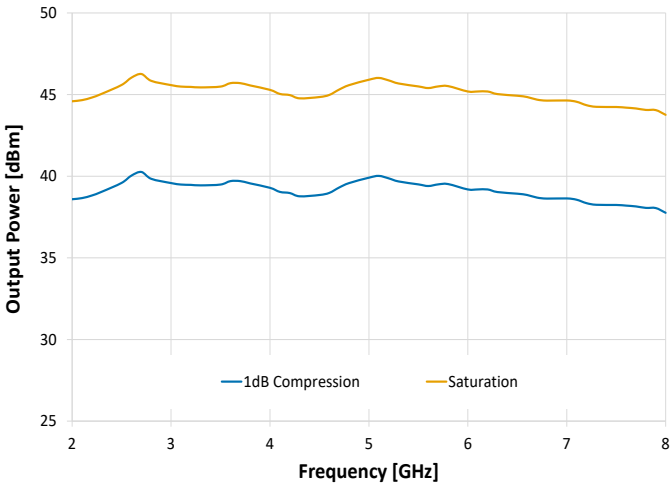
Isolation vs. Frequency



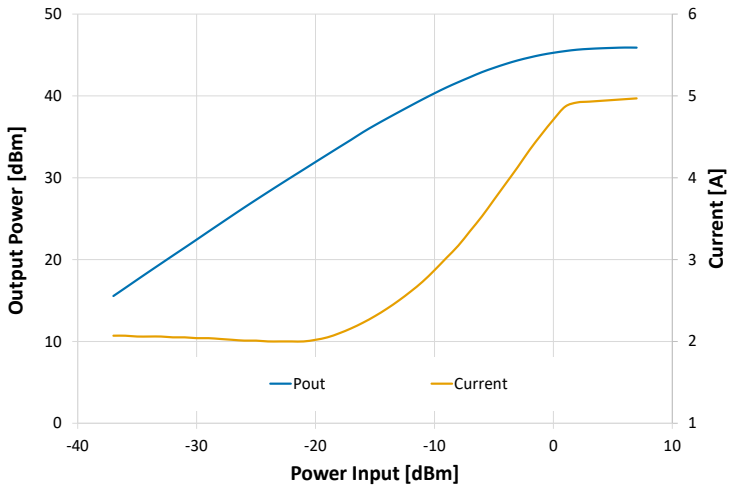
Return Loss vs. Frequency



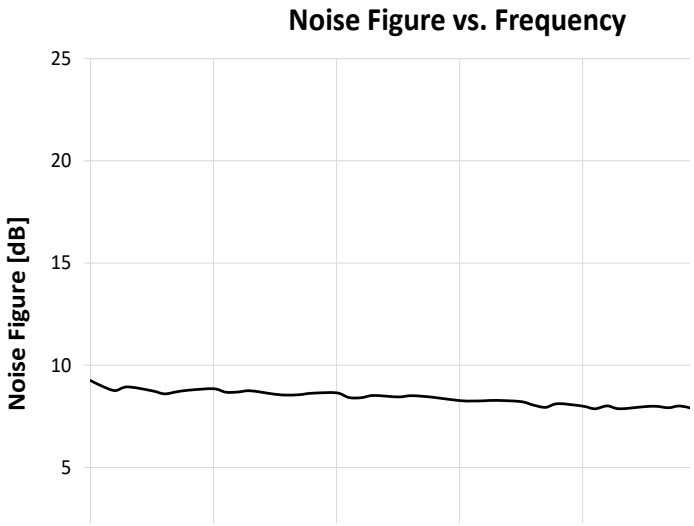
Output Power vs. Frequency

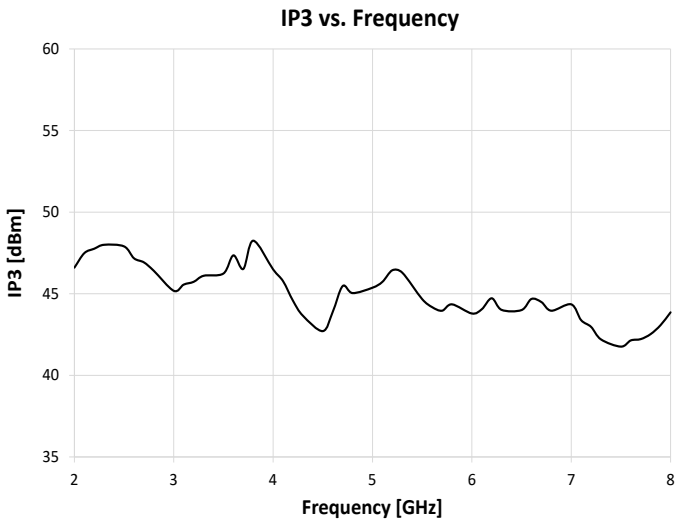


Power Out & Current vs. Power In @ 5000 MHz



TYPICAL PERFORMANCE GRAPHS





ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings	
Operating Temperature	ZHL-2G08G0030+	$T_{AMBIENT}$: 0°C to +60°C
	ZHL-2G08G0030X+	$T_{MOUNTINGBASE}$: +80°C
Storage Temperature	-55°C to +100°C	
No damage with an open or short at P_{OUT} = +40 dBm CW for 1 minute max		
RF Input Power (no damage)	Into 50 ohm load Into open or short for up to 5 minutes	+7 dBm -15 dBm
DC Operating Voltage	30 V	

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

DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

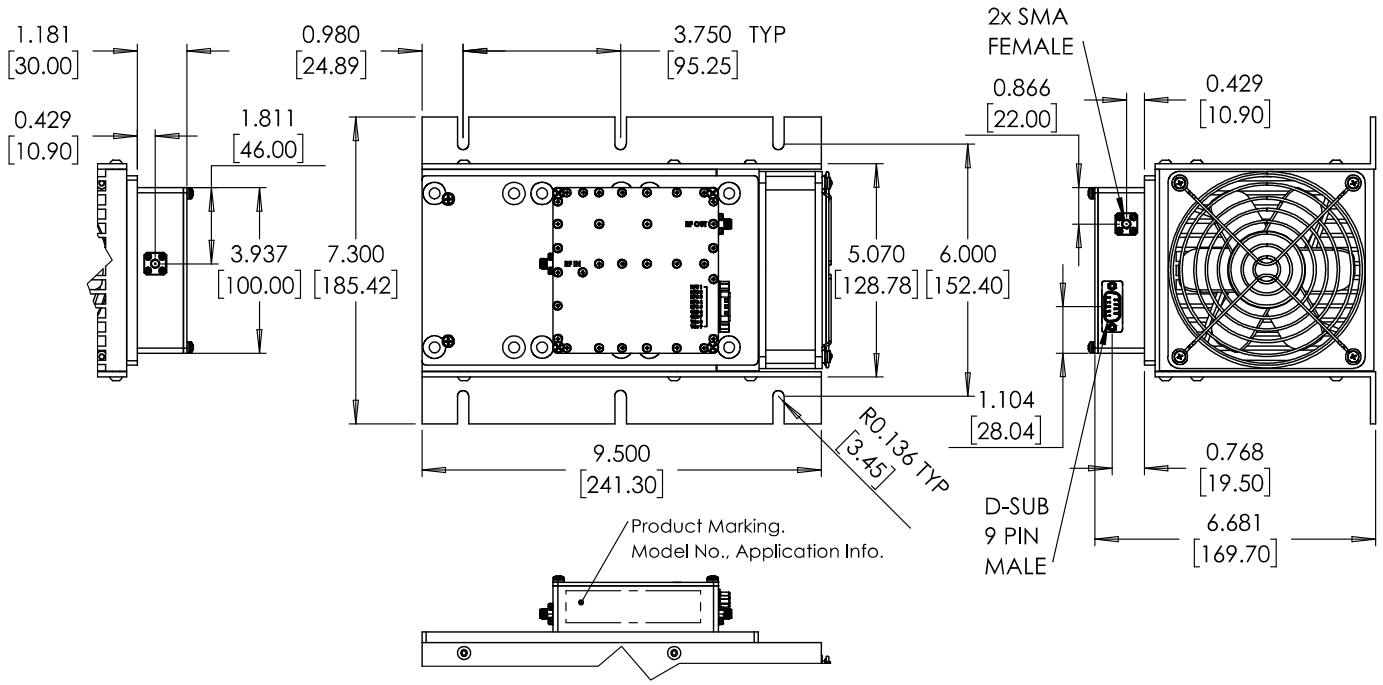
$$\textit{MAXIMUM THERMAL RESISTANCE} = \frac{\textit{MAXIMUM OPERATING CASE TEMP} - \textit{MAXIMUM USER AMBIENT TEMP}}{\textit{POWER DISSIPATION}}$$

Example:	MAXIMUM MOUNTING BASE TEMP = +80 °C (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) MAXIMUM USER AMBIENT TEMP = +60 °C (USER DEFINED) POWER DISSIPATION = 30 WATTS (CHECK MAXIMUM RATINGS TABLE FOR THIS VALUE) THEN MAXIMUM ALLOWABLE THERMAL RESISTANCE = 0.67 °C/W

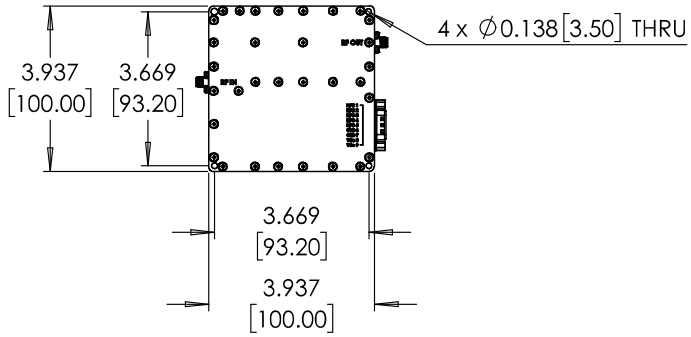
COAXIAL CONNECTIONS

IN (RF IN)	SMA
OUT (RF OUT)	SMA

CASE STYLE DRAWING WITH HEATSINK (ZHL-2G08G0030+)



CASE STYLE DRAWING WITHOUT HEATSINK (ZHL-2G08G0030X+)



NOTES:
1. Case material: Aluminum alloy.
2. Case Finish: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
3. Weight: 515 grams / 4450 grams with Heatsink.
4. Dimensions: Inches [mm].
   Tolerances 2 Pl. ±.03 inch; 3 Pl. ±.015 inch
5. Marking may contain other features or characters for internal lot control.

ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data	Table Graphs S-Parameter (S2P Files) Data Set (.zip file)
RoHS Status	Compliant
Environmental Ratings	ENV158

ORDERING INFORMATION

Model No. Links	ZHL-2G08G0030+	ZHL-2G08G0030X+
Option	With heatsink	Without heatsink
Case Style	BT3831	
Connector	IN (SMA) / OUT (SMA)	

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

ZHL-2G08G0030(X)+

Typical Performance Data

Test Conditions: Temperature = +25°C, DC Supply Voltage = 28 V, Supply Current = 4000 mA.

Freq. (GHz)	Small Sig.Gain (dB)	Isolation (dB)	P1dB Comp. (dBm)	Pout Satur. (dBm)	IP3 Output (dBm)	Noise Figure (dB)	Return Loss In (dB)	Return Loss Out (dB)
2.0	52.91	-77.57	38.59	44.59	46.60	9.25	-19.73	-20.44
2.1	54.12	-74.10	38.66	44.66	47.49	8.96	-19.08	-17.21
2.2	55.02	-78.79	38.82	44.82	47.76	8.76	-18.78	-14.56
2.3	55.27	-71.19	39.05	45.05	48.00	8.94	-18.49	-12.52
2.5	55.20	-80.49	39.59	45.59	47.90	8.75	-17.95	-10.37
2.6	55.26	-78.76	40.04	46.04	47.17	8.60	-17.95	-9.54
2.7	54.99	-73.72	40.26	46.26	46.92	8.70	-17.69	-9.00
2.8	54.85	-75.36	39.84	45.84	46.40	8.78	-17.69	-8.66
3.0	54.32	-78.13	39.58	45.58	45.18	8.85	-17.95	-7.89
3.1	54.42	-75.37	39.49	45.49	45.56	8.68	-17.95	-8.80
3.2	54.04	-82.81	39.47	45.47	45.73	8.69	-18.22	-9.21
3.3	54.32	-75.06	39.44	45.44	46.10	8.75	-18.78	-10.65
3.5	54.15	-82.50	39.49	45.49	46.24	8.58	-20.08	-13.71
3.6	54.05	-94.97	39.70	45.70	47.35	8.54	-21.23	-13.98
3.7	53.58	-67.49	39.70	45.70	46.52	8.56	-22.12	-14.26
3.8	53.11	-72.18	39.56	45.56	48.25	8.63	-22.61	-13.20
4.0	52.25	-86.34	39.29	45.29	46.49	8.65	-24.29	-11.20
4.1	51.89	-93.55	39.04	45.04	45.77	8.42	-24.94	-10.44
4.2	51.74	-77.43	38.97	44.97	44.57	8.41	-25.66	-9.72
4.3	51.47	-82.23	38.77	44.77	43.65	8.52	-26.44	-9.00
4.5	51.25	-87.93	38.85	44.85	42.71	8.45	-26.44	-8.95
4.6	51.57	-74.03	38.98	44.98	43.89	8.51	-25.66	-9.26
4.7	51.61	-72.55	39.31	45.31	45.47	8.48	-24.94	-9.97
4.8	51.74	-63.65	39.58	45.58	45.04	8.42	-24.29	-10.51
5.0	52.04	-77.51	39.91	45.91	45.37	8.27	-22.61	-14.56
5.1	51.94	-73.24	40.02	46.02	45.73	8.25	-22.12	-15.56
5.2	51.94	-73.83	39.87	45.87	46.44	8.26	-20.83	-15.21
5.3	52.40	-76.67	39.68	45.68	46.29	8.28	-19.08	-16.13
5.5	53.83	-72.75	39.50	45.50	44.67	8.22	-17.21	-15.75
5.6	55.13	-77.07	39.40	45.40	44.18	8.05	-15.75	-17.95
5.7	55.64	-71.93	39.50	45.50	43.96	7.94	-15.56	-16.13
5.8	55.63	-70.09	39.52	45.52	44.35	8.12	-14.88	-11.91
6.0	53.66	-78.36	39.19	45.19	43.79	8.00	-14.41	-7.56
6.1	52.90	-67.94	39.19	45.19	44.05	7.87	-15.38	-7.29
6.2	52.31	-75.47	39.19	45.19	44.72	8.01	-15.94	-7.23
6.3	51.82	-79.43	39.03	45.03	44.01	7.87	-17.21	-7.39
6.5	51.72	-71.72	38.93	44.93	44.00	7.97	-21.23	-8.52
6.6	51.78	-79.54	38.85	44.85	44.68	7.99	-23.69	-9.48
6.7	51.85	-80.52	38.69	44.69	44.49	7.92	-25.66	-10.30
6.8	52.01	-72.12	38.63	44.63	43.96	8.00	-24.94	-11.20
7.0	52.82	-72.21	38.64	44.64	44.35	7.74	-19.08	-13.58
7.1	53.14	-74.31	38.56	44.56	43.38	7.74	-17.21	-12.96
7.2	53.60	-84.10	38.35	44.35	42.97	7.37	-15.94	-11.20
7.3	53.76	-78.07	38.25	44.25	42.20	7.52	-15.04	-9.97
7.5	54.07	-68.34	38.24	44.24	41.76	7.37	-13.84	-7.78
7.6	53.74	-74.56	38.20	44.20	42.14	7.69	-13.71	-8.47
7.7	53.21	-73.17	38.15	44.15	42.22	7.40	-13.98	-10.51
7.8	52.61	-100.63	38.06	44.06	42.53	7.12	-14.12	-12.85
7.9	51.94	-80.63	38.05	44.05	43.08	7.46	-14.88	-16.33
8.0	51.17	-72.17	37.76	43.76	43.86	7.23	-15.75	-17.21

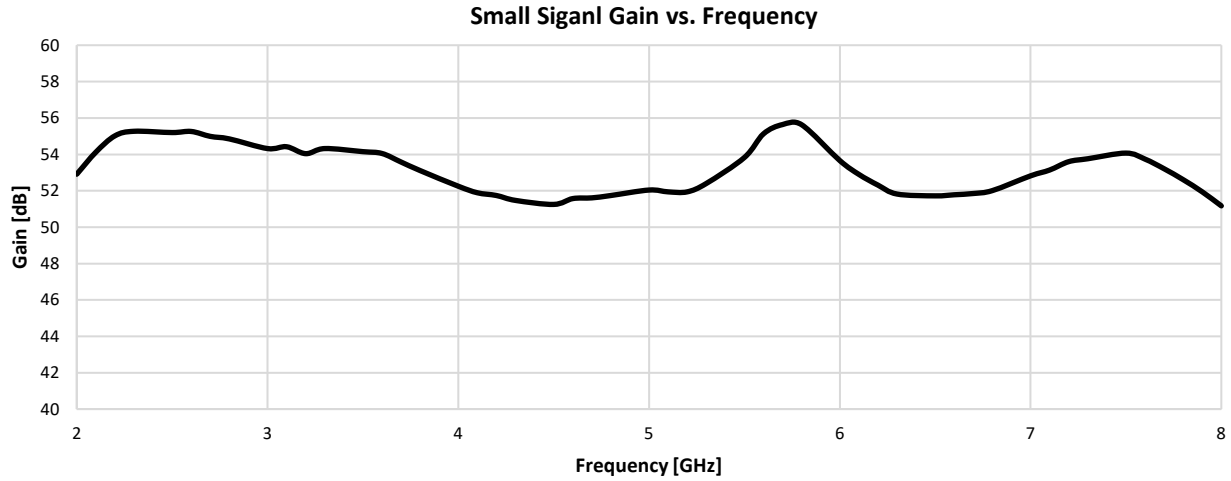
Typical Performance Data

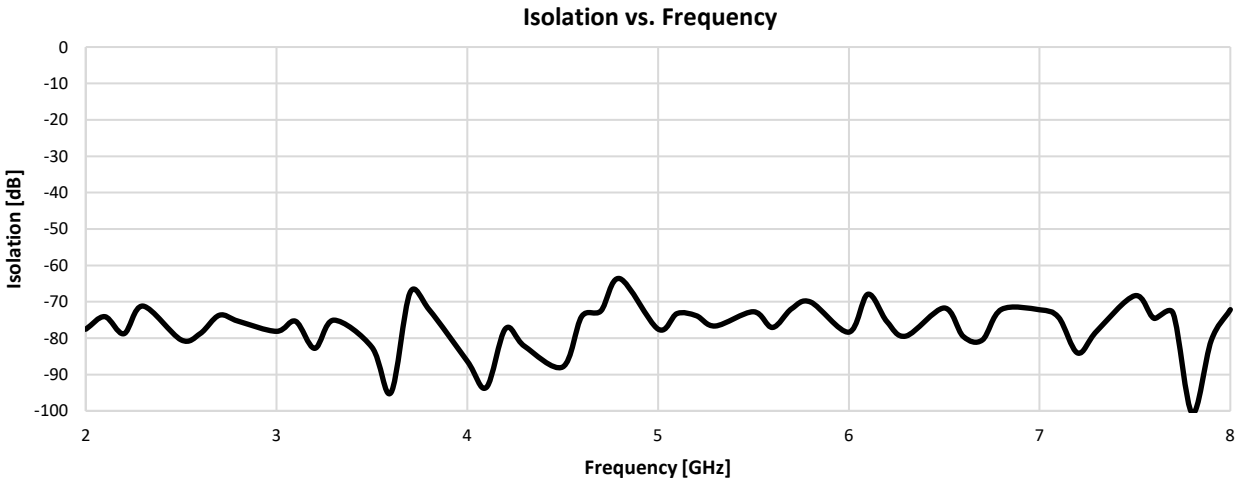
Test Conditions: Temperature = +25°C, DC Supply Voltage = 28 V, Supply Current = 4000 mA.

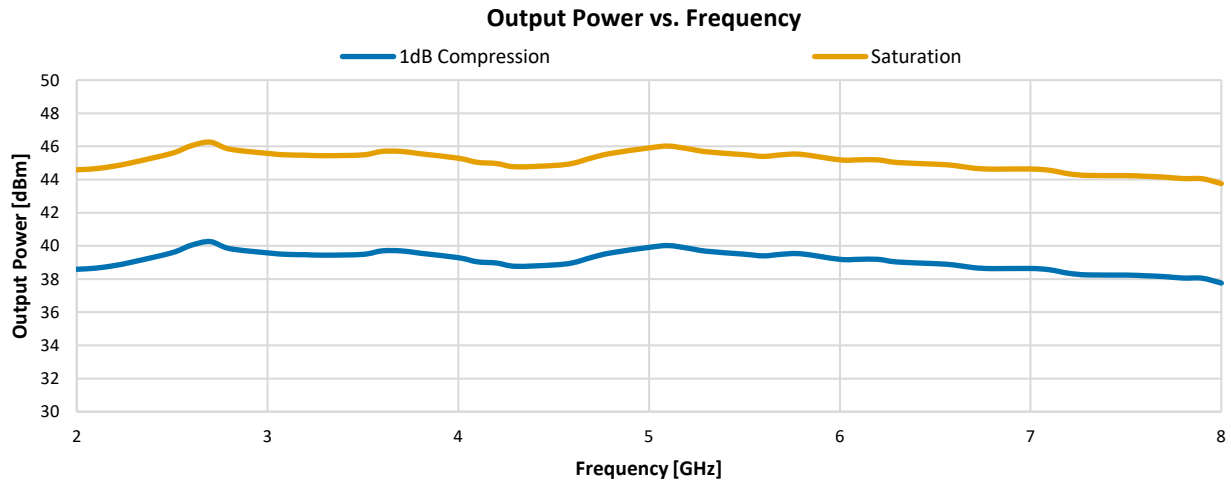
Pin (dBm)	Pout (dBm)	Current (A)
-37.0	15.55	2.07
-36.0	16.54	2.07
-35.0	17.54	2.06
-34.0	18.53	2.06
-33.0	19.51	2.06
-32.0	20.49	2.05
-31.0	21.46	2.05
-30.0	22.44	2.04
-29.0	23.43	2.04
-28.0	24.41	2.03
-27.0	25.39	2.02
-26.0	26.36	2.01
-25.0	27.31	2.01
-24.0	28.25	2.00
-23.0	29.18	2.00
-22.0	30.10	2.00
-21.0	31.01	2.00
-20.0	31.93	2.02
-19.0	32.84	2.05
-18.0	33.75	2.10
-17.0	34.65	2.16
-16.0	35.58	2.23
-15.0	36.43	2.31
-14.0	37.24	2.40
-13.0	38.03	2.50
-12.0	38.81	2.61
-11.0	39.58	2.73
-10.0	40.32	2.87
-9.0	41.03	3.02
-8.0	41.68	3.17
-7.0	42.30	3.35
-6.0	42.91	3.53
-5.0	43.43	3.73
-4.0	43.91	3.93
-3.0	44.34	4.13
-2.0	44.70	4.34
-1.0	45.02	4.53
0.0	45.27	4.71
1.0	45.48	4.87
2.0	45.65	4.92
3.0	45.75	4.93
4.0	45.82	4.94
5.0	45.87	4.95
6.0	45.91	4.96
7.0	45.90	4.97

Typical Performance Graphs

Test Conditions: Temperature = +25°C, DC Supply Voltage = 28 V, Supply Current = 4000 mA.

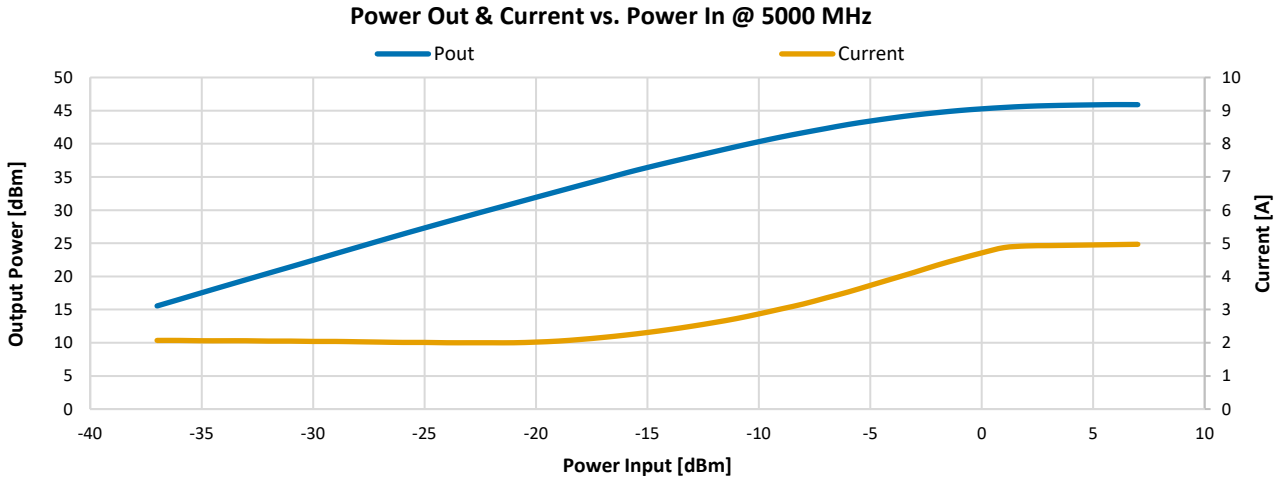


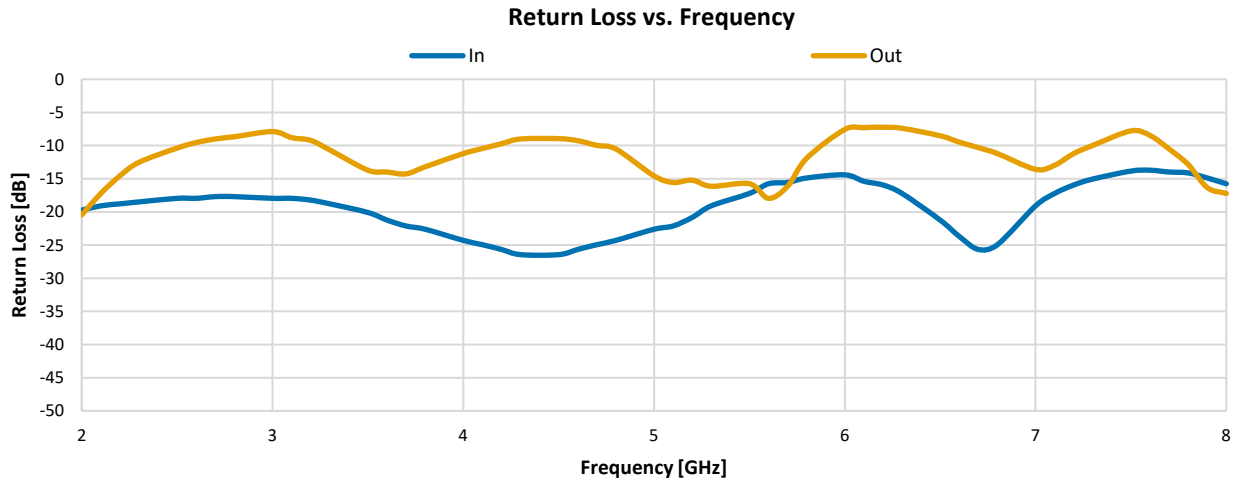




Typical Performance Graphs

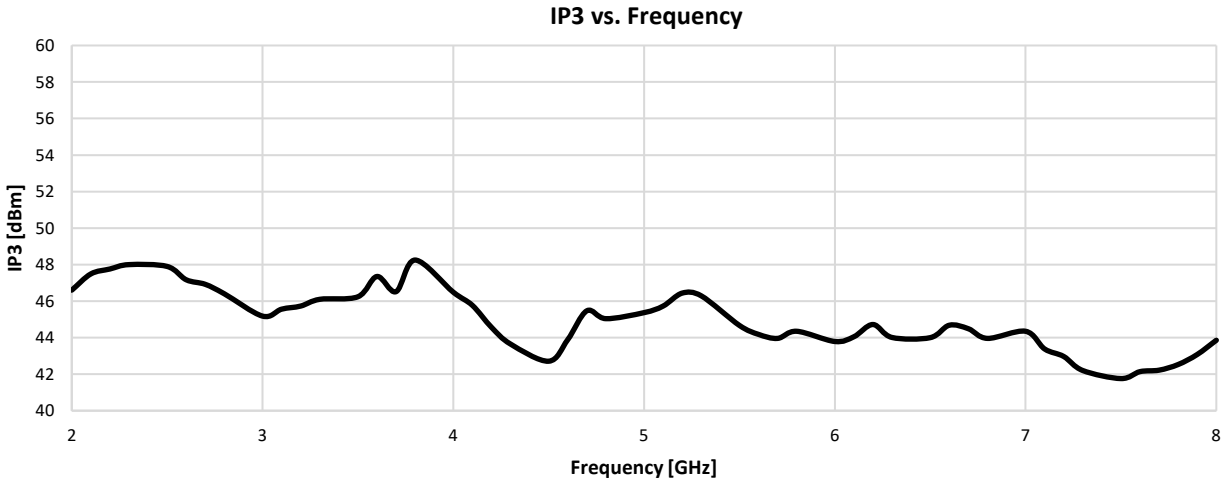
Test Conditions: Temperature = +25°C, DC Supply Voltage = 28 V, Supply Current = 4000 mA.

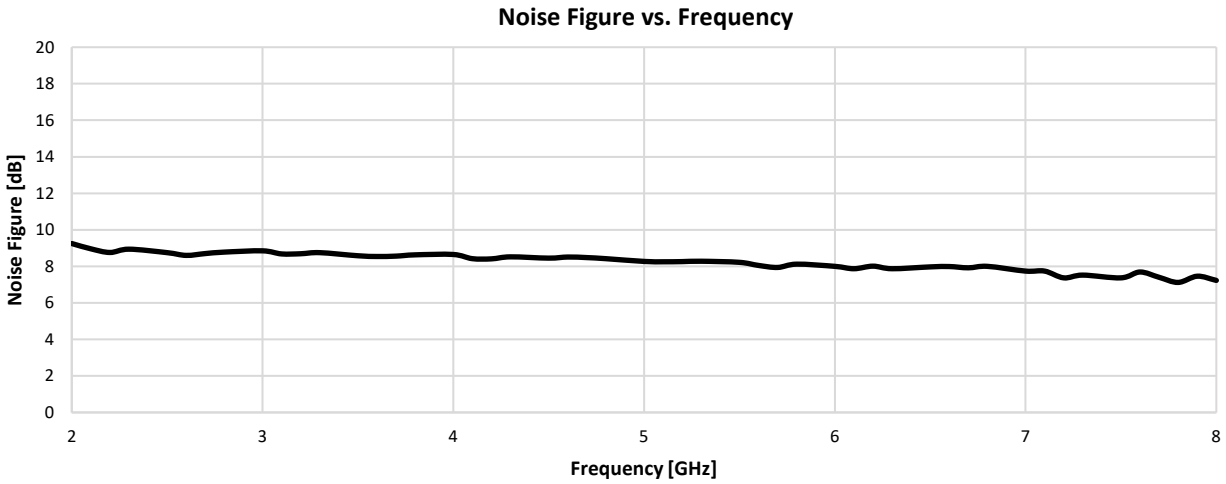




Typical Performance Graphs

Test Conditions: Temperature = +25°C, DC Supply Voltage = 28 V, Supply Current = 4000 mA.

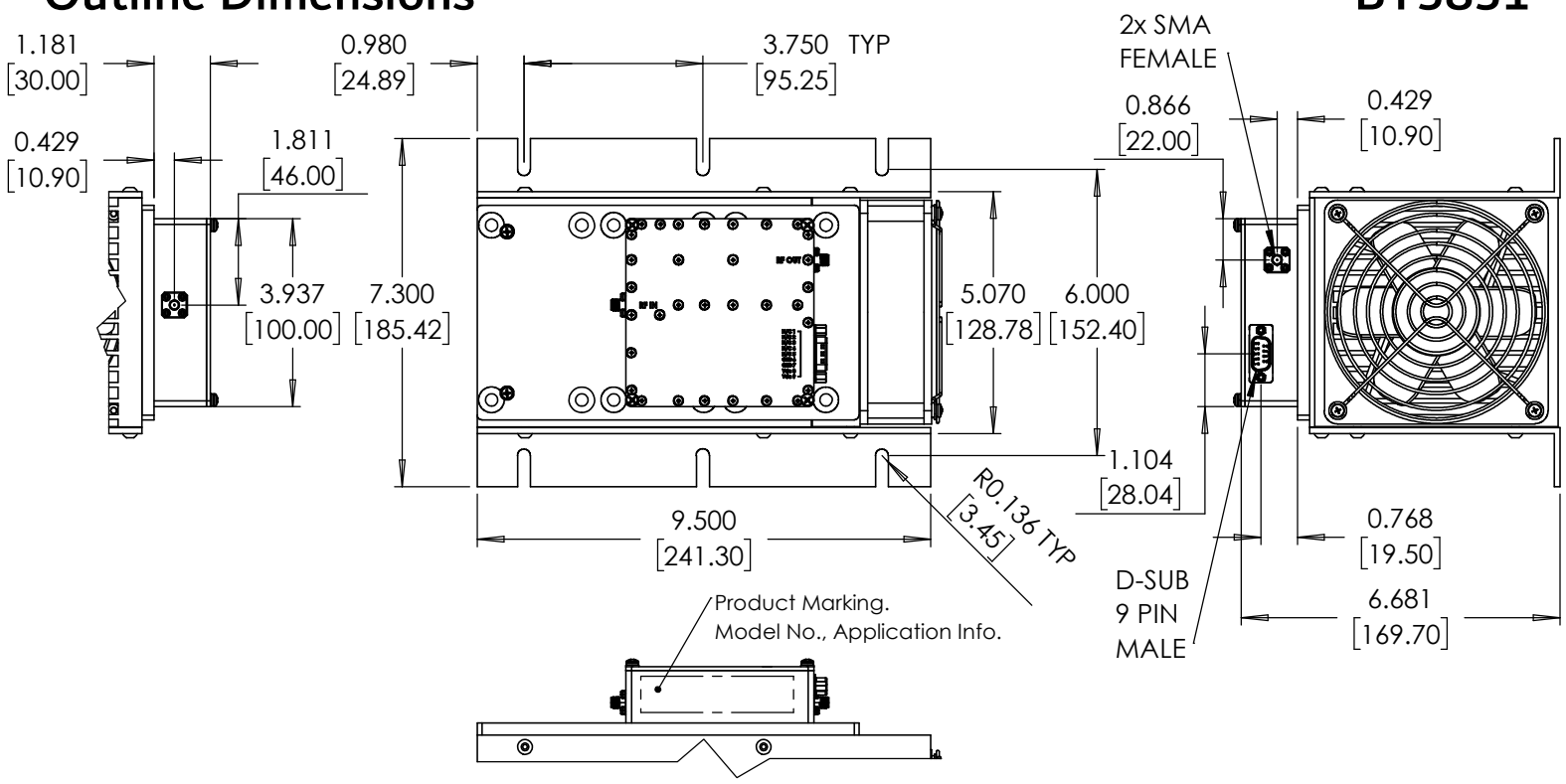




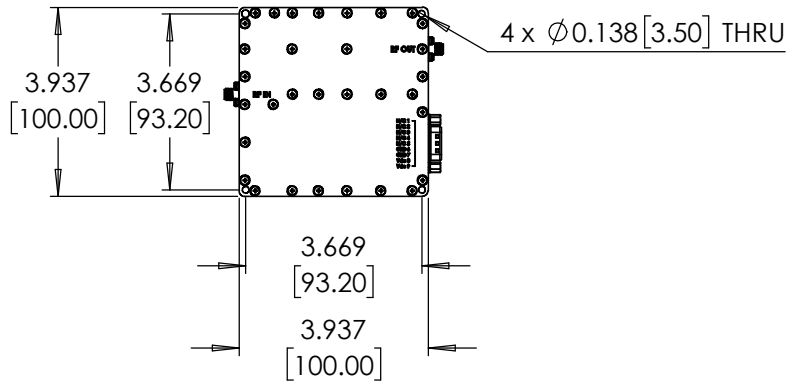
Case Style BT

Outline Dimensions

BT3831



MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK



NOTES:

1. Case material: Aluminum alloy.
2. Case Finish: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
3. Weight: 515 grams / 4450 grams with Heatsink.
4. Dimensions: Inches [mm].
   Tolerances 2 Pl. ±.03 inch; 3 Pl. ±.015 inch
5. Marking may contain other features or characters for internal lot control.

Mini-Circuits

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Mini-Circuits

Environmental Specifications **ENV158**

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	0° to 60° C Baseplate Temperature 80° C maximum	Individual Model Data Sheet
Storage Temperature	-55° to 100° C Ambient Environment	Individual Model Data Sheet
Short at Output	1 minute Operating at 60°C Ambient	+40 dBm Output Power
Open at Output	1 minute Operating at 60°C Ambient	+40 dBm Output Power

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