COAXIAL

High Power Amplifier

ZHL-2G018G010+
ZHL-2G018G010X+

50Ω 2 to 18 GHz 10W SMA

THE BIG DEAL

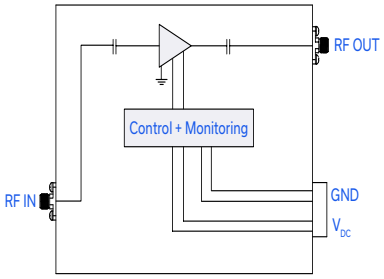
- 2 to 18 GHz Broadband Operation
- Suitable for CW signals
- Saturated Power, 10W (min)
- High gain, 48 dB typical
- Unconditionally stable and rugged design
- Self protected from over heating and reverse polarity
- Built in current limiter

Generic photo used for illustration purposes only

APPLICATIONS

- High power testing
- Burn-in / Life Testing
- Communication
- Radar

FUNCTIONAL DIAGRAM



PRODUCT OVERVIEW

The ZHL-2G018G010+ is a Class AB, solid-state connectorized high-power amplifier module which can be used in a wide range of broadband test applications from 2 to 18 GHz band. This amplifier is capable of amplifying CW signals with 10W minimum saturated output power with 24V supply voltage over the operating bandwidth. The typical small signal gain is 48 dB with a flatness of ±3 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 5W of power at a maximum baseplate temperature of +80°C. The amplifier has a compact size of 130 x 100 x 30 mm and a light weight of 665 grams.

KEY FEATURES

Features	Advantages
Broadband 10W (min), Useable from 2 to 18 GHz	Suitable for a broad range of high-power, wideband applications, including test setups, communications and defense applications.
High Gain, 48 dB	Enables signal amplification to 15W (typ), 10W (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, DC supply turn-on transients, 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 (130mm x 100mm x 30mm) the lightweight (665 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-2G018G010+ is powered by a low voltage of 24V supply.

ELECTRICAL SPECIFICATIONS AT $T_{MOUNTINGBASE}$ = +25°C, V_{DC}= +24 V

Parameter	Symbol	Condition		Min.	Typ.	Max.	Units
Frequency Range	f	–		2	–	18	GHz
Small Signal Gain	G_{SS}	f= 2-18 GHz	P_{IN}= -30 dBm	40	48	–	dB
Small Signal Gain Flatness	$G_{SS-FLAT}$	f= 2-18 GHz	P_{IN}= -30 dBm	–	±2.5	±3.0	dB
Output Power at 1dB compression	P_{1dB}	f= 2-18 GHz		–	6.3	–	Watts
				–	38	–	dBm
Output Power at saturation	P_{SAT}	f= 2-18 GHz		10	15.1	–	Watts
				40	41.8	–	dBm
Noise Figure	NF	f= 2-18 GHz		–	10	–	dB
Output Third Order Intercept Point	OIP3	f= 2-18 GHz	P_{OUT}= 26 dBm/ Tone	–	48	–	dBm
Input Return Loss	I-RL	f= 2-18 GHz	P_{IN}=- 30 dBm	–	10	–	dB
Non-Harmonics Spurious	Spur	f= 2-18 GHz	P_{OUT}= 38 dBm	–	–	-60	dBc
2nd Harmonics	H_N	f= 2-18 GHz	P_{OUT}= 40 dBm	–	-20	-15	dBc
DC Supply Voltage	V_{SUPPLY}	f= 2-18 GHz		–	24	26	V
DC Supply Current	I_{SUPPLY}	f= 2-18 GHz	P_{OUT}= 40 dBm	–	3.5	4.5	A

PROTECTIONS

Parameter	Rating
Mounting Base Temperature	+85±5°C
Electrical Overload	Current Limiting
Over Voltage	27V ± 1V
Output Load Mismatch	No damage with an open or short at P_{OUT}=37dBm (5W) for 1 minute max

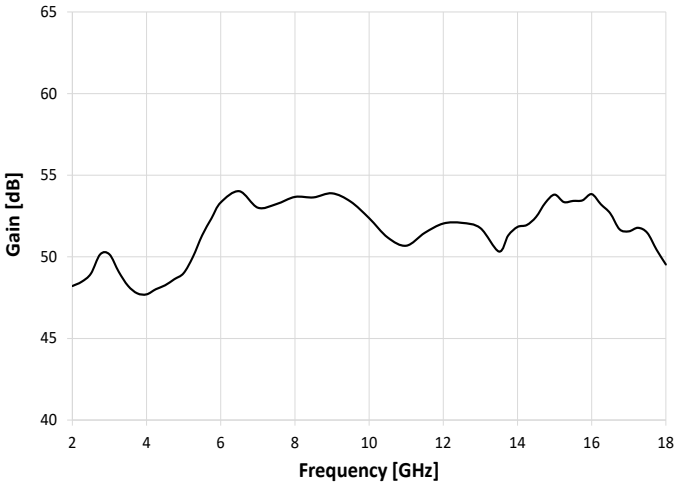
D-SUB9 PIN DESCRIPTION [1]

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

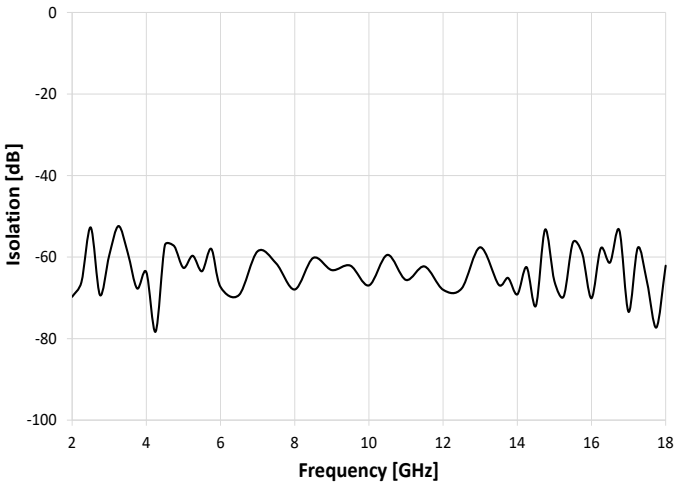
1) Each amplifier is supplied with an additional D-Sub to bare wires 3ft. (0.9m) cable for power and control.

TYPICAL PERFORMANCE GRAPHS

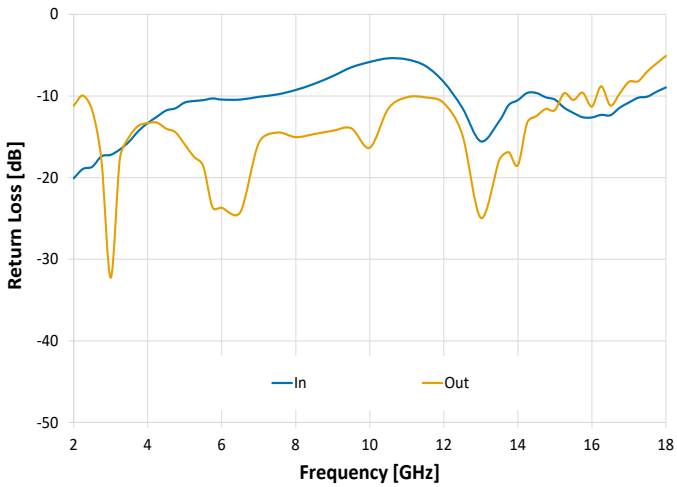
Small Signal Gain vs. Frequency



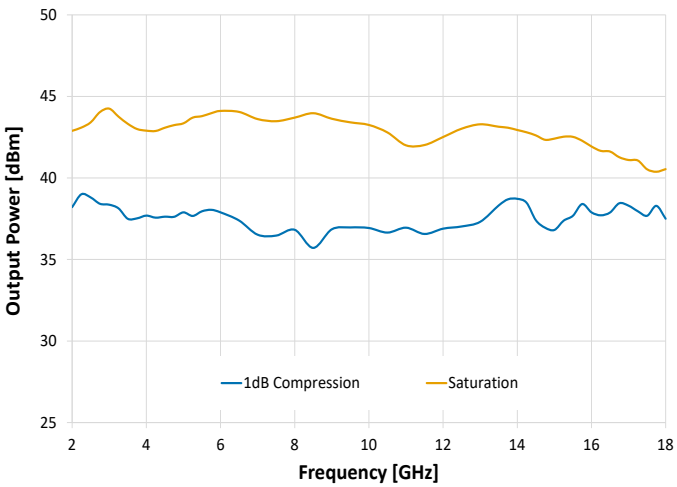
Isolation vs. Frequency



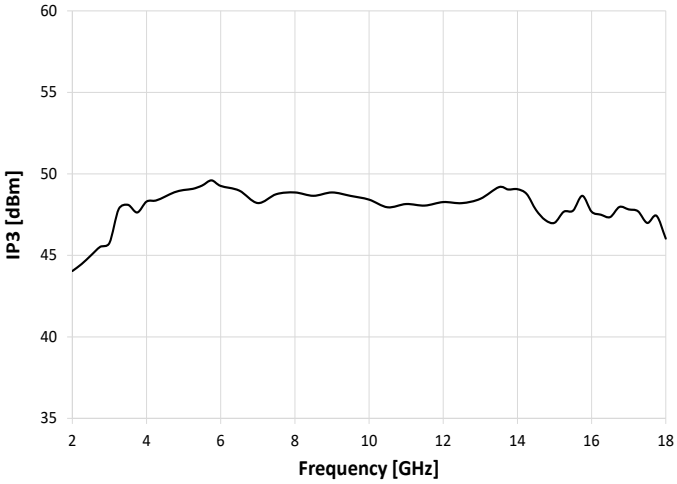
Return Loss vs. Frequency



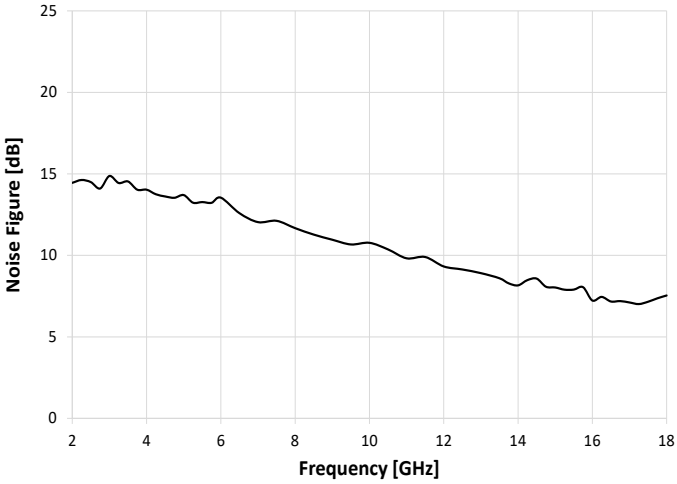
Output Power vs. Frequency



IP3 vs. Frequency



Noise Figure vs. Frequency



ABSOLUTE MAXIMUM RATINGS

Parameter	Ratings	
Operating Temperature	ZHL-2G018G010+	$T_{AMBIENT}$: 0°C to +60°C
	ZHL-2G018G010X+	$T_{MOUNTINGBASE}$: +80°C
Storage Temperature	-55°C to +100°C	
No damage with an open or short at P_{OUT} = +37 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	26 V	

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

DETERMINING MAXIMUM THERMAL RESISTANCE OF USERS' EXTERNAL HEAT SINK

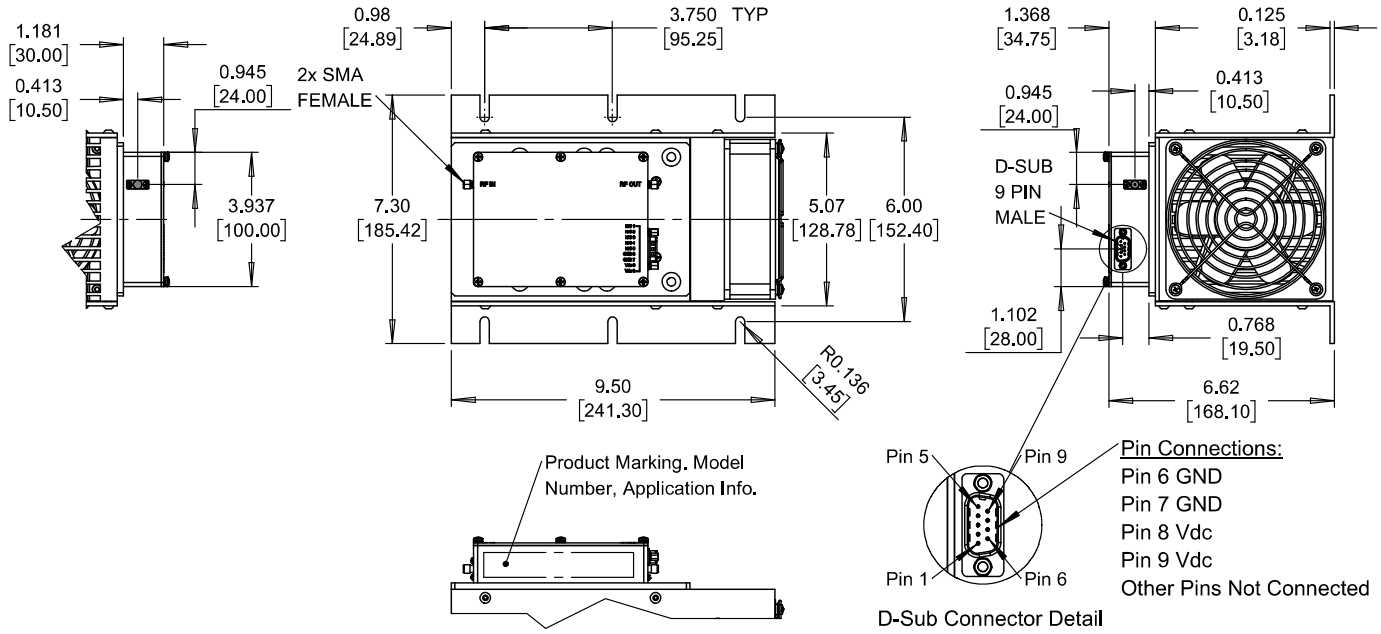
$$\textit{MAXIMUM THERMAL RESISTANCE} = \frac{\textit{MAXIMUM OPERATING CASE TEMP} - \textit{MAXIMUM USER AMBIENT TEMP}}{\textit{POWER DISSIPATION}}$$

Example:	MAXIMUM MOUNTING BASE TEMP = +85 °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 = 0.83 °C/W

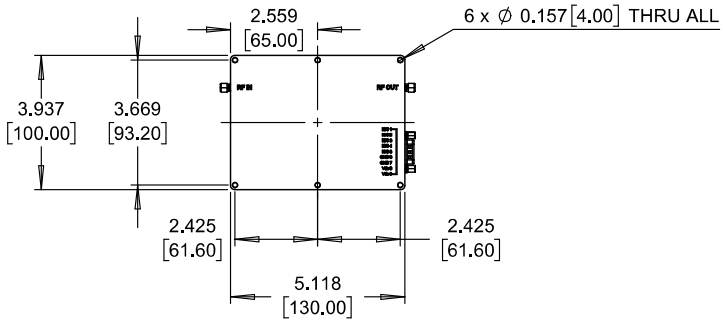
COAXIAL CONNECTIONS

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

CASE STYLE DRAWING WITH HEATSINK (ZHL-2G018G010+)



CASE STYLE DRAWING WITHOUT HEATSINK (ZHL-2G018G010X+)



NOTES:
1. Case material: Aluminum alloy.
2. Case Finish: Clear Chemical conversion coating, non-chrome or trivalent chrome based.
3. Weight: 665 grams / 4600 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.

High Power Amplifier

50Ω 2 to 18 GHz 10W SMA

ADDITIONAL INFORMATION IS AVAILABLE ON OUR DASHBOARD.

Performance Data	Table Graphs S-Parameter (S2P Files) Data Set (.zip file)
RoHS Status	Compliant
Environmental Ratings	ENV156

ORDERING INFORMATION

Model No. Links	ZHL-2G018G010+	ZHL-2G018G010X+
Option	With heatsink	Without heatsink
Case Style	BT3788	
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

Amplifier

ZHL-2G018G010(X)+

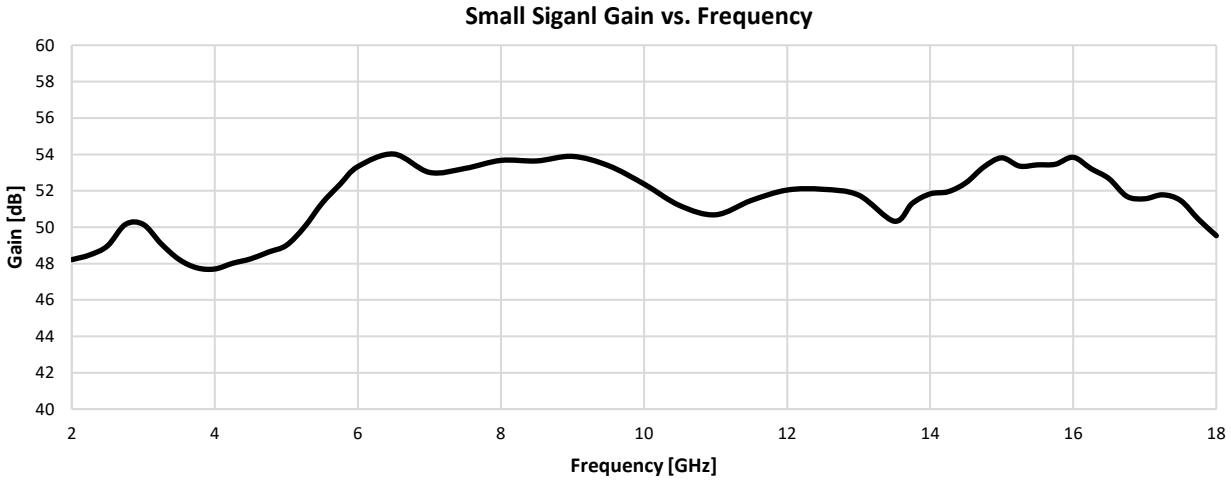
Typical Performance Data

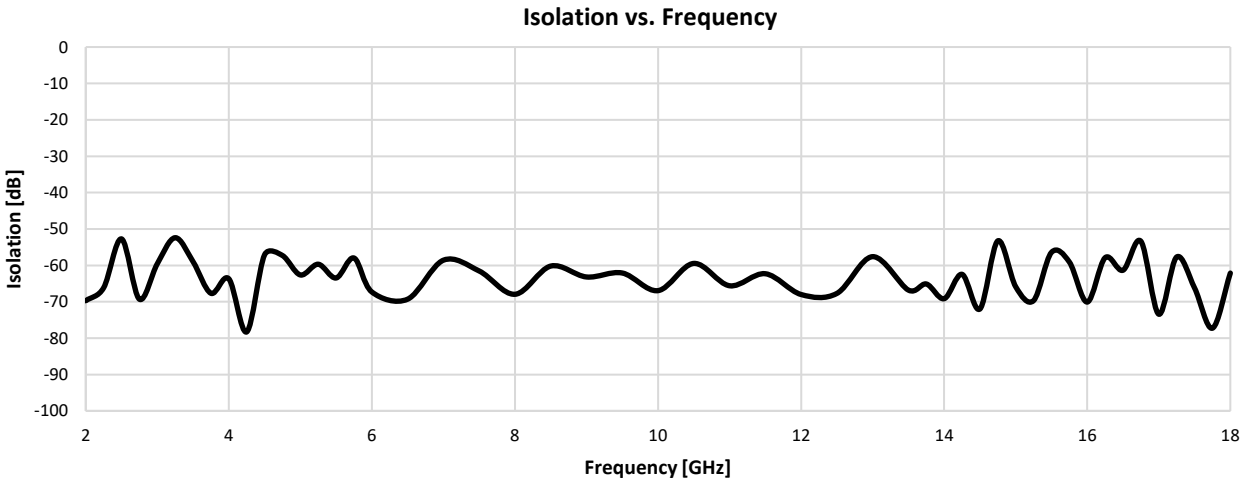
Test Conditions: Temperature = +25°C, DC Supply Voltage = 24 V, Supply Current = 3500 mA.

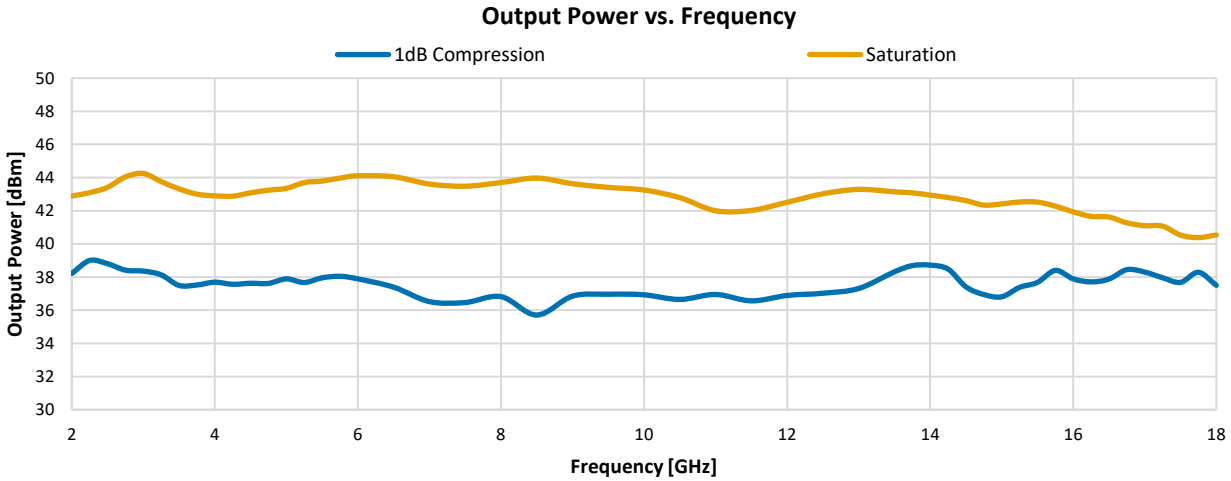
Freq. (GHz)	Small Sig.Gain (dB)	Isolation (dB)	P1dB Comp. (dBm)	Pout Satur. (dBm)	IP3 Output (dBm)	Noise Figure (dB)	Return Loss In (dB)	Return Loss Out (dB)
2.00	48.21	-69.73	38.21	42.89	44.04	14.45	-20.08	-11.20
2.25	48.47	-66.17	39.00	43.09	44.47	14.63	-18.94	-9.95
2.50	48.97	-52.73	38.81	43.41	45.00	14.50	-18.68	-11.78
2.75	50.15	-69.31	38.42	44.04	45.52	14.10	-17.40	-17.91
3.00	50.15	-59.57	38.36	44.25	45.76	14.87	-17.21	-32.26
3.25	49.09	-52.40	38.14	43.76	47.84	14.44	-16.55	-17.60
3.50	48.23	-59.00	37.50	43.32	48.10	14.54	-15.58	-15.01
3.75	47.76	-67.68	37.52	43.00	47.63	14.03	-14.29	-13.65
4.00	47.70	-63.70	37.69	42.90	48.30	14.03	-13.32	-13.32
4.25	48.02	-78.29	37.57	42.88	48.36	13.75	-12.53	-13.26
4.50	48.26	-57.09	37.63	43.08	48.61	13.62	-11.77	-14.01
4.75	48.63	-57.30	37.62	43.24	48.87	13.53	-11.50	-14.45
5.00	49.00	-62.64	37.89	43.35	49.01	13.70	-10.80	-15.94
5.25	50.00	-59.69	37.67	43.70	49.08	13.23	-10.62	-17.45
5.50	51.32	-63.47	37.96	43.79	49.29	13.27	-10.51	-18.59
5.75	52.35	-57.99	38.05	43.97	49.60	13.23	-10.30	-23.64
6.00	53.33	-67.33	37.89	44.11	49.26	13.54	-10.44	-23.69
6.50	54.02	-69.29	37.39	44.05	48.98	12.59	-10.44	-24.25
7.00	53.01	-58.58	36.52	43.61	48.21	12.04	-10.10	-15.75
7.50	53.23	-61.55	36.47	43.48	48.76	12.12	-9.81	-14.48
8.00	53.67	-67.95	36.82	43.70	48.86	11.67	-9.26	-15.04
8.50	53.64	-60.20	35.71	43.97	48.66	11.28	-8.51	-14.67
9.00	53.89	-63.20	36.85	43.63	48.86	10.96	-7.56	-14.26
9.50	53.39	-62.11	36.97	43.41	48.65	10.67	-6.49	-13.96
10.00	52.37	-66.95	36.93	43.25	48.42	10.77	-5.83	-16.33
10.50	51.19	-59.47	36.65	42.79	47.95	10.37	-5.39	-11.55
11.00	50.68	-65.61	36.95	42.00	48.15	9.82	-5.52	-10.16
11.50	51.47	-62.31	36.57	42.02	48.06	9.90	-6.31	-10.17
12.00	52.04	-68.02	36.89	42.51	48.27	9.32	-8.30	-10.88
12.50	52.08	-67.72	37.03	43.02	48.21	9.14	-11.46	-14.75
13.00	51.76	-57.61	37.31	43.29	48.47	8.91	-15.56	-24.94
13.50	50.33	-66.80	38.32	43.14	49.19	8.60	-13.05	-17.83
13.75	51.31	-65.12	38.69	43.08	49.04	8.28	-11.12	-16.89
14.00	51.83	-69.16	38.72	42.94	49.06	8.16	-10.51	-18.49
14.25	51.95	-62.47	38.48	42.80	48.77	8.48	-9.63	-13.29
14.50	52.44	-71.99	37.41	42.61	47.79	8.58	-9.63	-12.47
14.75	53.31	-53.26	36.95	42.34	47.17	8.08	-10.16	-11.60
15.00	53.81	-65.89	36.81	42.41	47.00	8.03	-10.44	-11.73
15.25	53.36	-69.68	37.38	42.53	47.68	7.90	-11.44	-9.67
15.50	53.43	-56.43	37.68	42.52	47.75	7.90	-12.08	-10.49
15.75	53.46	-59.09	38.40	42.28	48.65	8.05	-12.60	-9.60
16.00	53.84	-70.09	37.89	41.93	47.68	7.23	-12.63	-11.29
16.25	53.21	-57.89	37.71	41.66	47.50	7.45	-12.31	-8.81
16.50	52.67	-61.34	37.88	41.62	47.35	7.17	-12.36	-11.17
16.75	51.69	-53.39	38.45	41.27	47.97	7.20	-11.44	-9.70
17.00	51.56	-73.43	38.30	41.10	47.82	7.11	-10.80	-8.26
17.25	51.78	-57.70	37.96	41.07	47.71	7.01	-10.21	-8.19
17.50	51.47	-66.22	37.68	40.53	46.99	7.16	-10.08	-6.98
17.75	50.43	-77.27	38.29	40.38	47.43	7.37	-9.47	-6.01
18.00	49.53	-62.13	37.50	40.54	46.03	7.54	-8.95	-5.09

Typical Performance Graphs

Test Conditions: Temperature = +25°C, DC Supply Voltage = 24 V, Supply Current = 3500 mA.







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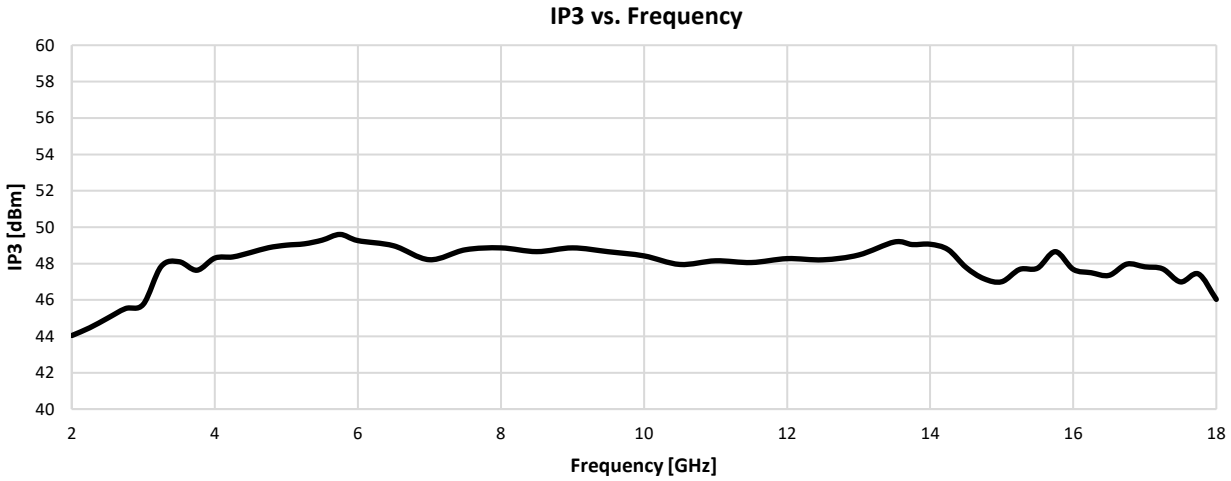
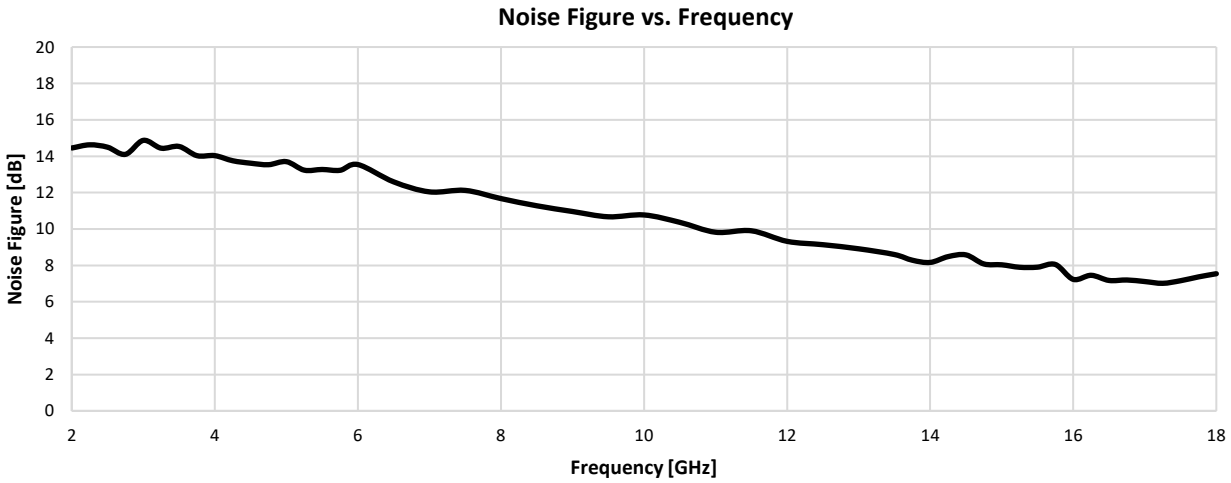
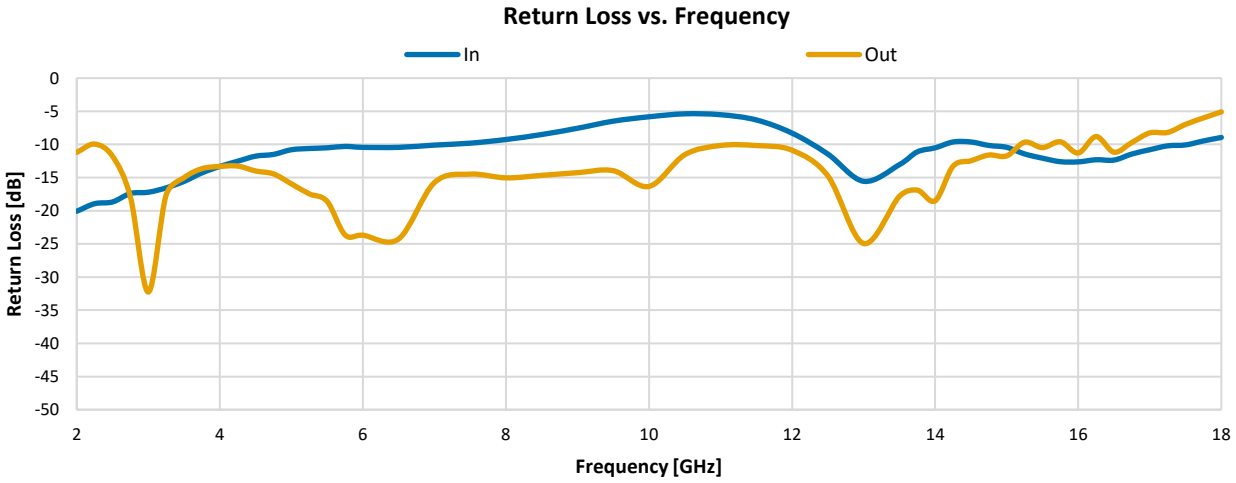
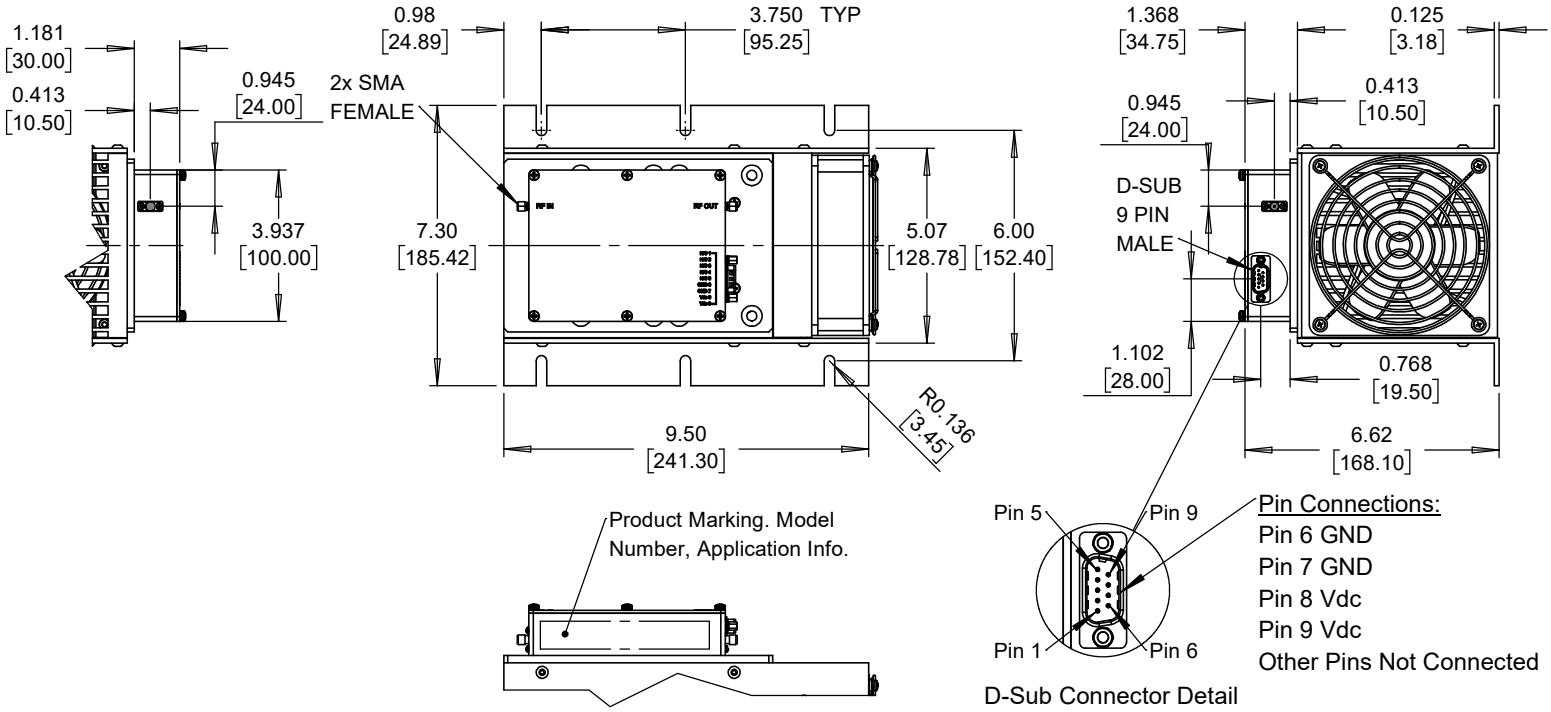




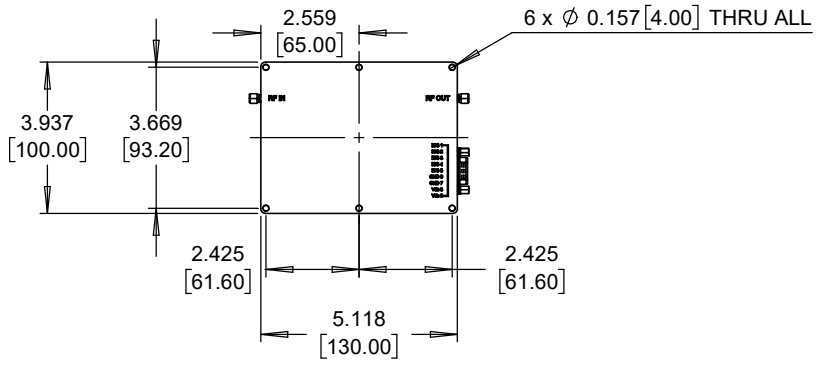


Case Style BT

Outline Dimensions BT3788



MOUNTING INFORMATION FOR MODELS WITHOUT HEATSINK



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5. Marking may contain other features or characters for internal lot control.

Mini-Circuits

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Mini-Circuits

Environmental Specifications **ENV156**

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	37 dBm Output Power
Open at Output	1 minute Operating at 60°C Ambient	37 dBm Output Power