



Mini-Circuits

COAXIAL SOLID-STATE

High Power Amplifier

RFE-3G33G7100X+

50Ω 100 W 3200 to 3700 MHz SMA to N-Type

THE BIG DEAL

- High output power, 100 W
- 3.2 to 3.7 GHz
- Suitable for CW and pulsed signals
- High gain, 53 dB typical
- Rugged and robust
- Built-in output circulator
- Built-in monitoring and protection for temperature and current
- Survives full reflection at any phase with full output power

APPLICATIONS

- Plasma generation
- High Power test setups
- S-Band Radar



Generic photo used for illustration purposes only

Model No.	RFE-3G33G7100X+
Case Style	VU3571
Connectors	SMA-Input / N-type-Output

+RoHS Compliant

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

PRODUCT OVERVIEW

The RFE-3G33G7100X+ is a Class AB, GaN high-power amplifier providing greater than 100 W saturated power over the 3200 to 3700 MHz band, ideal for a variety of high-power test setups as well as applications including communications, radar and more. This ruggedly-designed GaN amplifier provides unconditional stability and built-in self-protection against reverse polarity, over/under voltage, over-temperature, and being overdriven. The amplifier's output stage is further protected in the event of a fault condition, allowing high-power operation into a full reflection at any phase angle (refer to the maximum input power specifications). Housed in a rugged aluminum alloy case measuring 6.0 x 9.1 x 1.2", the unit features an input SMA female connector and a Type N female output.

KEY FEATURES

Feature	Advantages
High CW Power	100 W minimum output power across the 3.2-3.7 GHz band, pulsed or CW.
High Gain	The typical linear gain is 53 dB. Any commercially available signal generator is sufficient to drive the RFE-3G33G7100X+ to full rated power.
High Efficiency	The RFE-3G33G7100X+ uses state-of-the-art GaN technology to achieve excellent efficiency at S-band.
Built-in protection	Built-in monitoring and protection for temperature, voltage and current as well as internal shutdown circuitry enable the RFE-3G33G7100X+ to remain robust and reliable under the most demanding of operating conditions.
Ruggedness	The RFE-3G33G7100X+ has excellent reverse power isolation and ruggedness due to its onboard circulator. The amplifier can withstand full reflection as long as the proper internal temperature is maintained.
Cooling	This high-power amplifier can utilize forced air or liquid cooling by mounting to a heatsink or cold plate using the mounting holes available on the module.

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ELECTRICAL SPECIFICATIONS AT +25°C¹, +28 V, 50Ω SYSTEM

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Frequency Range	f		3200	—	3700	MHz
Input Power	P _{IN}	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	—	-3	+3	dBm
Output Power	P _{OUT}	f=3200 MHz to 3700 MHz, @P _{IN} =0 dBm	100	—	—	Watts
			50	—	—	dBm
Power Gain	G _P	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	50	53	—	dB
Power Gain Flatness	G _{FLAT}	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	—	±2	±3.5	dB
Efficiency	η	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	—	35	—	%
Input VSWR	I _{VSWR}	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	—	1.5	2.0	:1
Operating Voltage	V _{DC}	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	+27	+28	+31	V
Supply Current ²	I _{DC}	f=3200 MHz to 3700 MHz, @50 dBm P _{OUT}	—	10	12	A

1. Baseplate Temperature.

2. Power supply should be capable of delivering 18 A at start up; . When used in pulsed mode, additional external capacitance may be required to satisfy drop requirements.

ABSOLUTE MAXIMUM RATINGS³

Parameter	Ratings
Operating Temperature ¹	0°C to +65°C
Storage Temperature	-20°C to +100°C
DC Voltage	+31 V
Input RF Power	+5 dBm
Current Supply	18 A

3. The amplifier may operate up to these maximum ratings with no damage, permanent damage may occur if any of these limits are exceeded.

PROTECTION LIMITS

Parameter	Shutdown Limits		Units
	Low	High	
Temperature Sense ⁴	—	85	°C
Voltage Supply	26	31.5	V
Current Supply	—	16	A

4. This is the sensed operating temperature measured internally. There is an approximate 15-20degree temperature rise between the internally sensed temperature and the baseplate temperature. The mounting point (baseplate) temperature should be kept below 65C to avoid thermal shutdown.

DC POWER SUPPLY PINOUT AND FUNCTIONALITY

Label	Functionality and Control
V _{DC}	+28 V DC Supply Voltage Input (Pin closest to the Type N RF Output)
GND	Ground



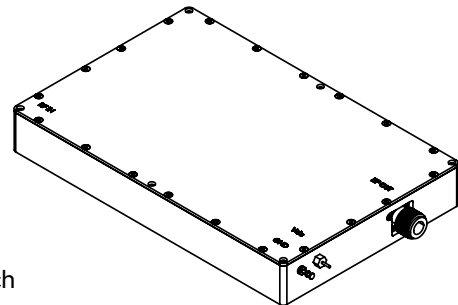


High Power Amplifier **RFE-3G33G7100X+**

RFE-3G33G7100X+

The drawing includes the following dimensions and labels:

- Top View Dimensions:**
 - Overall width: 9.06 [230.0]
 - Distance from left edge to center: 8.780 [223.00]
 - Distance from left edge to RF IN: 4.390 [111.50]
 - Distance from RF IN to center: 1.4 [3.5]
 - Distance from center to RF OUT: 5.630 [143.00]
 - Distance from RF OUT to right edge: 5.91 [150.0]
 - Distance from right edge to N-TYPE CONNECTOR: 0.55 [14.0]
 - Distance from N-TYPE CONNECTOR to center: 1.93 [48.9]
 - Distance from center to POWER TERMINAL: 1.14 [29.1]
 - Distance from POWER TERMINAL to right edge: 0.57 [14.6]
 - Distance from right edge to GROUND TERMINAL: 0.78 [19.8]
- Bottom View Dimensions:**
 - Overall width: 9.99 [253.7]
 - Distance from left edge to SMA CONNECTOR: 1.21 [30.8]
- Side View Dimensions:**
 - Overall height: 0.59 [15.0]
 - Distance from bottom edge to SMA CONNECTOR: 0.54 [13.8]
- Labels:**
 - SMA CONNECTOR RF IN
 - PRODUCT MARKING
 - RF IN
 - RF OUT
 - N-TYPE CONNECTOR RF OUT
 - POWER TERMINAL
 - GROUND TERMINAL
 - 6x Ø .177 [4.5] THRU MOUNTING HOLES



1. Case Material/Finish: Aluminum / Clear Conversion Coating
2. M4 Screws recommended for mounting.
3. Weight: 908g





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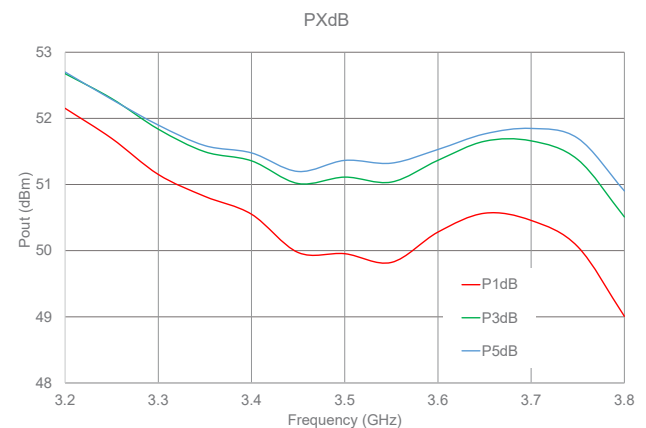
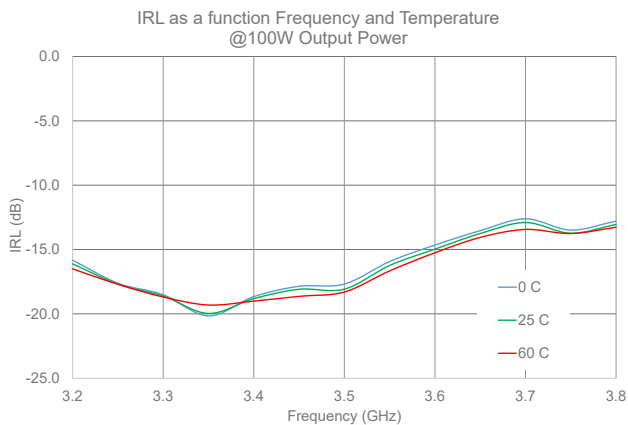
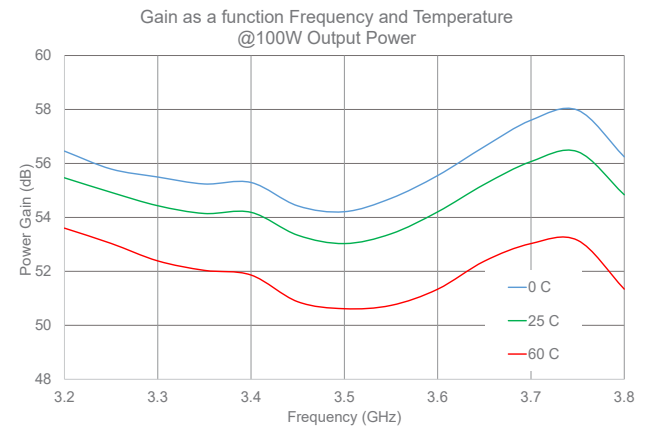
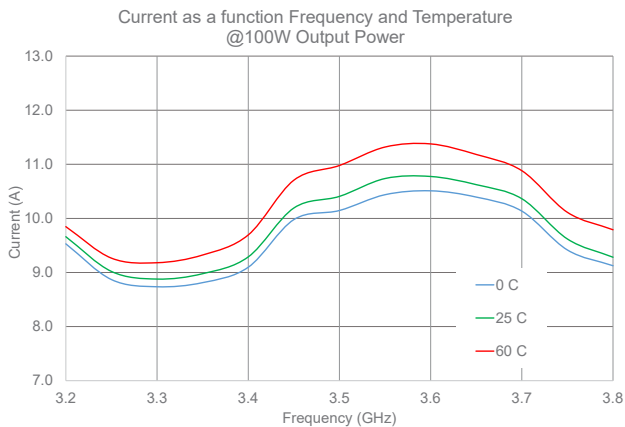
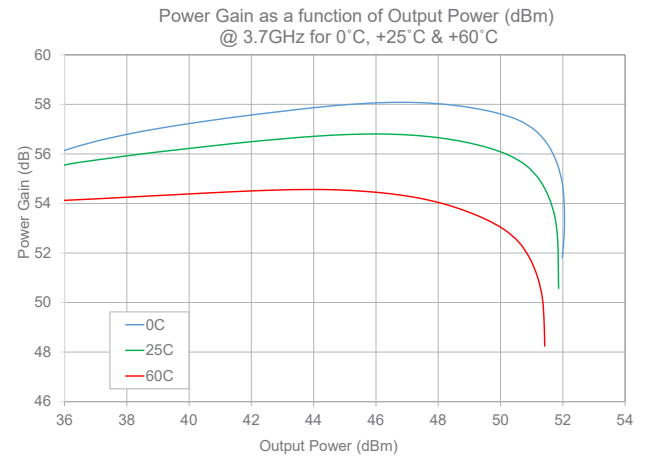
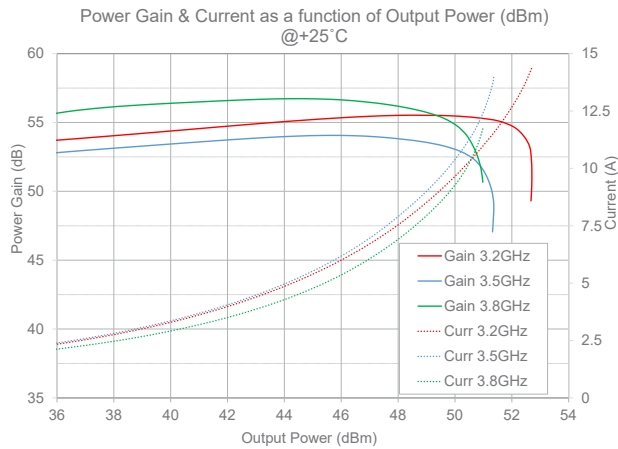
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TYPICAL PERFORMANCE GRAPHS (+28 V, 50Ω SYSTEM)



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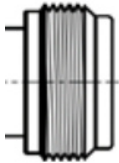


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High Power Amplifier **RFE-3G33G7100X+**

50Ω 100 W 3200 to 3700 MHz SMA to N-Type

INTERFACES AND SUGGESTED MATING HARDWARE*

	Output connector Type-N female Recommended Torque for stainless steel Type-N connector mate is 1.355 N-m (12 in-lbs).
	Input connector SMA female Recommended Torque for stainless steel SMA connector mate is 0.90 N-m (8 in-lbs) for final installation.
	DC input +28V DC Supply Voltage Input (Pin closest to the Type N RF Output) GND (Turret Terminal) Recommend soldering connections to DC Pins using 16AWG stranded wire.

*Mating hardware not included with the RFE-3G33G7100X+. Similar mating hardware available from other manufacturers.



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SAFETY INSTRUCTIONS.

WARNING: FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN BODILY INJURY, DEATH, OR PROPERTY DAMAGE.

For your own safety, this section provides instructions for avoiding potential dangers when using this product.

QUALIFIED PERSONNEL

This product should be operated by qualified personnel only. Qualified personnel are individuals who are familiar with the operation of the product and the hazards involved with such operation.

DAMAGED OR MISSING HARDWARE

Do not operate the product if there is physical damage or hardware is missing.

MAXIMUM RATINGS

The maximum ratings in this data sheet should never be exceeded. Stress above one or more maximum ratings may cause permanent damage to the product and may permanently and irreversibly affect the quality and reliability of the product, which may increase the risk of bodily injury, death, or property damage.

HAZARDOUS RF VOLTAGES

The RF voltages inside the product and on the center pin of the RF output connector can be hazardous. Contact with the internal components of the product or the center pin of the RF output connector may lead to burns or electrical shock. Disconnect power before removing the protective cover from the product. Note that removing the protective cover from the product will void the express warranty specified in Mini-Circuits Standard Terms.

To reduce the risks presented by these hazards:

1. never operate the product without its protective cover,
2. always connect the RF output connector to a load before the power source is applied to the product, and
3. always place the product in a non-operating condition before disconnecting or connecting the load to the RF output connector.

COOLING

RF Power amplifiers always need proper cooling. Failure to properly cool the product may increase the risk of bodily injury, death, or damage to property or the product.

Some products contain water cooling systems to help cool down the product. If this data sheet indicates that the product contains a water cooling system, proper waterflow as specified in this data sheet is required to keep the temperature of the product within the temperature range that is specified in this data sheet.

Some products also contain built-in protection circuitry designed to shut-off the amplifier at excessive high temperatures or at other excessive operating conditions. Even if this data sheet indicates that the product contains protective circuitry, such protective circuitry is not a substitute for proper handling in accordance with these instructions. Accordingly, do not rely on the protective circuitry to prevent injury or damage to property or the product.

MAINTENANCE CAUTION

Maintenance or repair of the product must only be performed by qualified personnel when the product is in a non-operating condition and disconnected from its power source. Note that performance of maintenance or repairs to the product will void the express warranty specified in Mini-Circuits Standard Terms.

ENVIRONMENTAL CONDITIONS

Unless otherwise stated in this data sheet, this product is designed to be operated under the environmental conditions set forth in this data sheet, as well as the following conditions:

- Indoor use only
- Temperature of 5°C to 40°C (non-condensing)

WARNING SIGNS

In addition to being qualified before operating the product, pay attention to all warning signs and danger symbols. Failure to heed warnings signs and danger symbols, or to follow their associated instructions, may result in bodily injury, death, or property damage.

LEGAL INFORMATION

Disclaimers

Applications that are described herein for any of these products are for illustrative purposes only. Mini-Circuits makes no representation or warranty, whether express or implied, that these products will be suitable for such applications. Each potential system utilizing these products is unique with differing component configurations and attributes and differing requirements and environments. Notwithstanding any information provided by Mini-Circuits herein or otherwise, Purchaser is responsible for consulting with its own engineers and other appropriate professionals who are familiar with the specific systems into which these products are to be incorporated so that the proper selection, use and installation of these products, and the adequacy of the system and back-up systems, can be determined. Accordingly, it is the Purchaser's sole responsibility to determine whether the product is suitable and fit for the planned applications and use. As a result, Purchaser shall be barred from any recovery against Mini-Circuits (including, without limitation, any recovery under the express warranty specified in Mini-Circuits' Standard Terms) by reason of improper selection, use and/or installation of the product and, with respect to the applications and/or systems in which such products are to be utilized, improper system design and/or the inadequacy of back-up systems, and Mini-Circuits shall have no liability on account thereof, and same is hereby waived. Additional exclusions apply. For more information, see Mini-Circuits' Standard Terms.

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

TEST CONDITION: T= 0°C, 25°C,65°C ; 28V 50 Ω SYSTEM

Frequency	Pout	Gain @ 50dBm Pout, 0°C	Current. @ 50dBm Pout, 0°C	IRL@ 50dBm Pout, 0°C
(GHz)	(W)	(dB)	(A)	(dB)
3.20	100	56.5	9.5	-15.80
3.25	100	55.8	8.9	-17.60
3.30	100	55.5	8.7	-18.50
3.35	100	55.2	8.8	-20.20
3.40	100	55.3	9.1	-18.70
3.45	100	54.4	10	-17.90
3.50	100	54.2	10.1	-17.70
3.55	100	54.7	10.4	-15.90
3.60	100	55.6	10.5	-14.70
3.65	100	56.6	10.4	-13.50
3.70	100	57.6	10.1	-12.60
3.75	101	58	9.4	-13.5
3.80	102	56.2	9.1	-12.8

Frequency	Pout	Gain @ 50dBm Pout, 25°C	Current. @ 50dBm Pout, 25°C	IRL@ 50dBm Pout, 25°C
(GHz)	(W)	(dB)	(A)	(dB)
3.20	100	55.5	9.7	-16.10
3.25	100	54.9	9	-17.70
3.30	100	54.4	8.9	-18.60
3.35	100	54.1	9	-20.00
3.40	100	54.2	9.3	-18.80
3.45	100	53.3	10.2	-18.10
3.50	100	53	10.4	-18.10
3.55	100	53.4	10.7	-16.20
3.60	100	54.2	10.8	-15.00
3.65	100	55.2	10.6	-13.80
3.70	100	56.1	10.4	-12.90
3.75	101	56.4	9.6	-13.7
3.80	102	54.8	9.3	-13

Frequency	Pout	Gain @ 50dBm Pout, 60°C	Current. @ 50dBm Pout, 60°C	IRL@ 50dBm Pout, 60°C
(GHz)	(W)	(dB)	(A)	(dB)
3.20	100	53.6	9.8	-16.50
3.25	100	53	9.3	-17.70
3.30	100	52.4	9.2	-18.70
3.35	100	52	9.3	-19.30
3.40	100	51.9	9.7	-19.00
3.45	100	50.9	10.7	-18.60
3.50	100	50.6	11	-18.30
3.55	100	50.7	11.3	-16.70
3.60	100	51.3	11.4	-15.30
3.65	100	52.4	11.2	-14.10
3.70	100	53	10.9	-13.40
3.75	101	53.2	10.1	-13.8
3.80	102	51.3	9.8	-13.3

*Typical Performance Data*TEST CONDITION: T= 25°C ; 28V, 50 Ω SYSTEM

Frequency	Pout at P1dB , 25°C	Pout at P3dB , 25°C	Pout at P5dB , 25°C
(GHz)	(dBm)	(dBm)	(dBm)
3.20	52.2	52.7	52.7
3.25	51.7	52.3	52.3
3.30	51.2	51.8	51.9
3.35	50.8	51.5	51.6
3.40	50.6	51.4	51.5
3.45	50.0	51.0	51.2
3.50	50.0	51.1	51.4
3.55	49.8	51.0	51.3
3.60	50.3	51.4	51.5
3.65	50.6	51.7	51.8
3.70	50.5	51.7	51.8
3.75	50.1	51.4	51.7
3.80	49.0	50.5	50.9

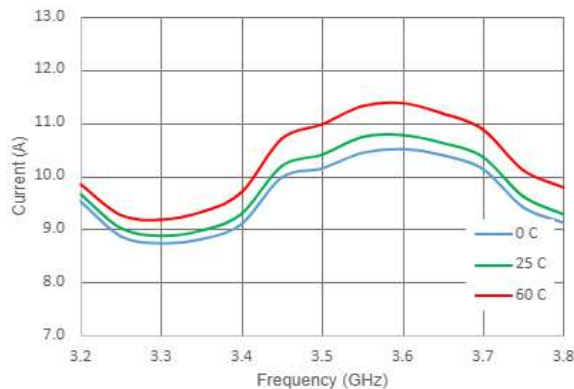
High Power Amplifier

RFE-3G33G7100X+

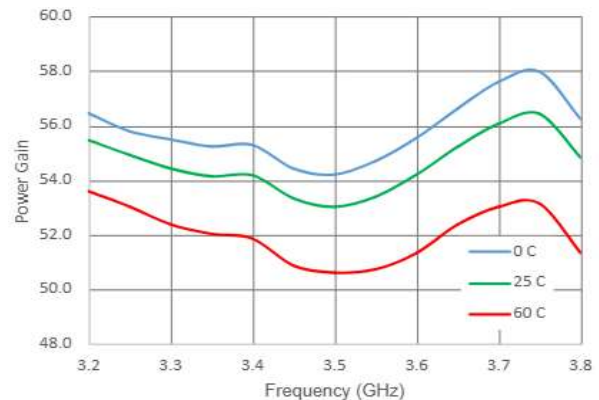
Typical Performance Curves

CONDITION: 28V 50Ω SYSTEM

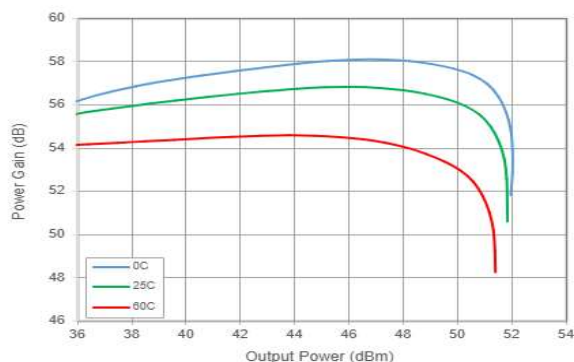
Current (A) as a function of Frequency (GHz) and $T_{\text{BASEPLATE}}$ (°C) @100W Output Power



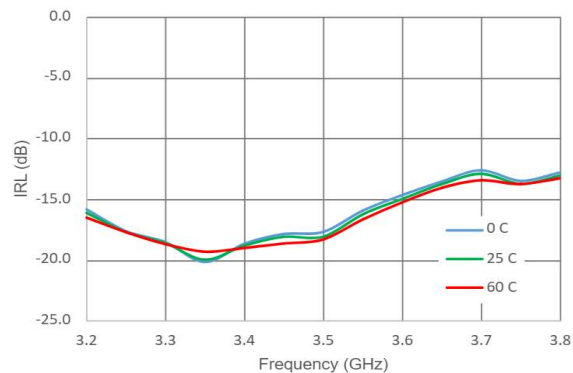
Power Gain (dB) as a function of Frequency (GHz) and $T_{\text{BASEPLATE}}$ (°C) @100W Output Power



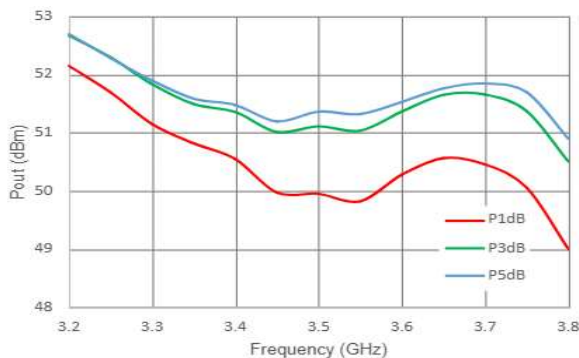
Power Gain (dB) as a function of Output Power (dBm) and $T_{\text{BASEPLATE}}$ (°C) @ 3.7GHz for 0°C, +25°C & +65°C



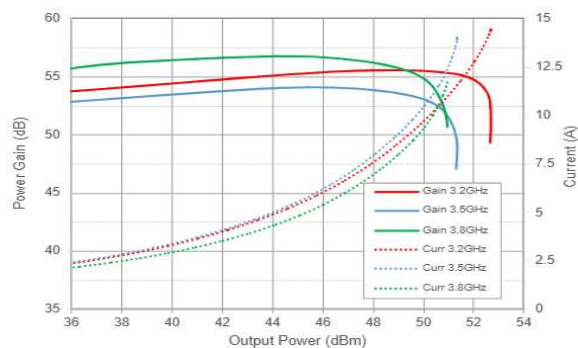
Input Return loss (dB) as a function of Frequency (GHz) and $T_{\text{BASEPLATE}}$ (°C) @100W Output Power

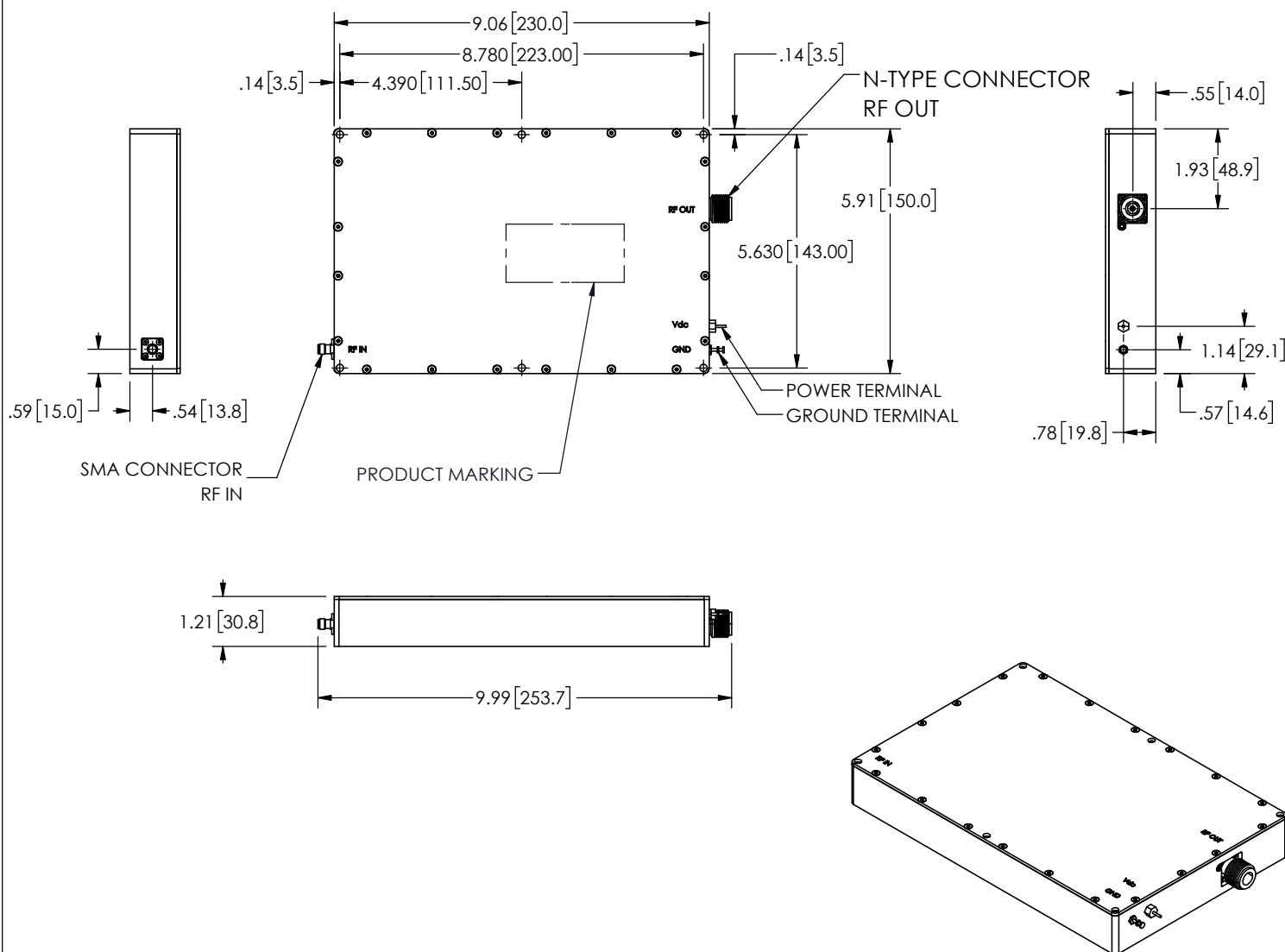


Output Power (dBm) at P1dB, P3dB and P5dB as a function of Frequency (GHz) at $T_{\text{BASEPLATE}} = 25^\circ\text{C}$



Power Gain (dB) & Current (A) as function of Output Power (dBm) at $T_{\text{BASEPLATE}} = 25^\circ\text{C}$





Dimensions are in inches [mm]. Tolerances: 2 Pl. ± 0.03 inch; 3 Pl. ± 0.015 inch

Notes:

1. Case Material: Aluminum
2. Case Finish: Polished Aluminum
3. Recommended screws for mounting model : Use M4 button head.
4. Weight: 908 grams



P.O. Box 350166, Brooklyn, New York 11235-0003 (718) 934-4500 Fax (718) 332-4661 For detailed performance specs & shopping online see Mini-Circuits web site



The Design Engineers Search Engine Provides ACTUAL Data Instantly From MINI-CIRCUITS At: www.minicircuits.com

RF/IF MICROWAVE COMPONENTS



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°C to +65°C	----
Storage Temperature	-20°C to +85°C	----
Stabilization Bake	125°C, 24 hours (Non-operating)	----
Thermal Shock	-20°C to +85°C 60 min dwell at extreme temperatures, 1 min transfer 250 cycles.	MIL-STD-202, Method 107
ESD Gun Contact	Contact: ±8.0 kV. Non-operating Condition 10 positive & 10 negative charges at each location	IEC 61000-4-2
ESD HBM Test	Tested up to ± 1000V	JS-001
FedEx Transit Test (Packaging)	Test performed on packaged unit. Pre-conditioning + Shock (10 drops, 30 inches) + Compression + random Vibration	ISTA 6-FEDEX-A TEST