

Ultra Low Noise MMIC Amplifier

PSA-5455+

50Ω 0.05 to 4 GHz

The Big Deal

- Ultra Low Noise Figure, 0.8 dB
- High IP3/Low Current, 40mA at +5V
- Wideband, up to 4 GHz



CASE STYLE: CA1389

Product Overview

Mini-Circuits PSA-5455+ is a E-PHEMT based Ultra-Low Noise MMIC Amplifier operating from 50 MHz to 4 GHz with a unique combination of low noise and high IP3 making this amplifier ideal for sensitive receiver applications. This design operates on a single 5V supply at only 40mA and is internally matched to 50 ohms.

| Feature | Advantages |
|-------------------------|--|
| Ultra Low Noise, 0.8 dB | Outstanding Noise Figure, measured in a 50 Ohm environment without any external matching |
| High IP3, 31 dBm | Combining Low Noise and High IP3 makes this MMIC amplifier ideal for Low Noise Receiver Front End (RFE) because it gives the user advantages at both ends of the dynamic range: sensitivity & two-tone spur-free dynamic range |
| Low Current, 40 mA | At only 40 mA, the PSA-5455+ is ideal for remote applications with limited available power or densely packed applications where thermal management is critical. |
| Broad Band | Operating over a broadband the PSA-5455+ covers the primary wireless communications bands: Cellular, PCS, LTE, WiMAX |
| Internally Matched | No external matching elements required to achieve the advertised noise and output power over the full band |
| SOT-363 Package | Small size, industry standard package |
| Max Input Power, +15dBm | Ruggedized design operates up to input powers of +15dBm without the need of an external limiter |
| High Reliability | Low, small signal operating current of 30 mA nominal maintains junction temperatures typically below 120°C at 85°C ground lead temperature |



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IF/RF MICROWAVE COMPONENTS

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Low Noise, High IP3

Monolithic Amplifier

0.05-4 GHz

Product Features

- Single Positive Supply Voltage, +5V, Id=40mA
- Ultra Low Noise Figure, 0.8 dB typ. at 1GHz
- High IP3, 31 dBm typ. 1GHz
- Gain, 19 dB typ. at 1GHz
- Output Power, up to +19 dBm typ.
- Micro-miniature size SOT-363 package
- Aqueous washable

Typical Applications

- Cellular
- ISM
- GSM
- WCDMA
- LTE
- WiMAX
- WLAN
- UNII and HIPERLAN



PSA-5455+

CASE STYLE: CA1389
PRICE: \$1.45 ea. QTY. (50)

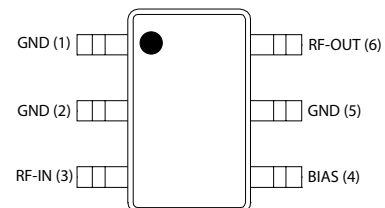
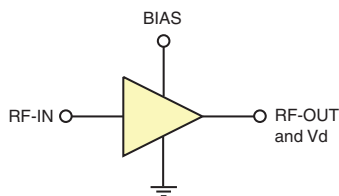
+ RoHS compliant in accordance
with EU Directive (2002/95/EC)

The +Suffix has been added in order to identify RoHS
Compliance. See our web site for RoHS Compliance
methodologies and qualifications.

General Description

PSA-5455+ is an advanced wideband, high dynamic range, low noise, high IP3, high output power, monolithic amplifier. Manufactured using E-PHEMT* technology enables it to work with a single positive supply voltage.

simplified schematic and pin description



| Function | Pin Number | Description (See Application Circuit, Fig. 3) |
|-------------|------------|---|
| RF IN | 3 | RF input pin (connect to RF-IN via blocking cap C1 and Pin 4 via L2) |
| RF-OUT & Vd | 6 | RF output pin (connected to RF-out via blocking cap C2 and supply voltage Vd via RF Choke L1) |
| BIAS | 4 | Connected to Vs via Rbias. (Connect to ground via C4 & R1) |
| GND | 1,2,5 | Connections to ground |

* Enhancement mode pseudomorphic High Electron Mobility Transistor.



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PSA-5455+
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Electrical Specifications⁽¹⁾ at 25°C, Zo=50Ω, (refer to characterization circuit, Fig. 1)

| Parameter | Condition (GHz) | Min. | Typ. | Max. | Units |
|---|-----------------|------|--------|------|-------|
| Frequency Range | | 0.05 | | 4.0 | GHz |
| DC Voltage (V _d) | | | 5.0 | | V |
| DC Current (I _d) | | 30 | 40 | 60 | mA |
| DC Current (I _{Rbias}) | | | 1.2 | | mA |
| Noise Figure | 0.05 | | 2.7 | 1.3 | dB |
| | 0.5 | | 0.8 | | |
| | 1.0 | | 0.8 | | |
| | 2.0 | | 1.0 | | |
| | 3.0 | | 1.3 | | |
| | 4.0 | | 1.6 | | |
| Gain | 0.05 | 12.6 | 23.2 | 15.4 | dB |
| | 0.5 | | 22.8 | | |
| | 1.0 | | 19.2 | | |
| | 2.0 | | 14.4 | | |
| | 3.0 | | 11.6 | | |
| | 4.0 | | 10.0 | | |
| Input Return Loss | 0.05-1.0 | | 8.0 | | dB |
| | 1.0-4.0 | | 7.0 | | |
| Output Return Loss | 0.05-1.0 | | 10.0 | | dB |
| | 1.0-4.0 | | 21.0 | | |
| Output IP3 | 0.05 | | 27.8 | | dBm |
| | 0.5 | | 30.3 | | |
| | 1.0 | | 31.0 | | |
| | 2.0 | | 32.2 | | |
| | 3.0 | | 32.2 | | |
| | 4.0 | | 31.8 | | |
| Output Power @ 1 dB compression (P1dB) ⁽²⁾ | 0.05 | | 14.9 | | dBm |
| | 0.5 | | 18.8 | | |
| | 1.0 | | 19.2 | | |
| | 2.0 | | 18.5 | | |
| | 3.0 | | 18.3 | | |
| | 4.0 | | 19.1 | | |
| DC Current Variation vs. Temperature ⁽³⁾ | | | -0.097 | | mA/°C |
| Thermal Resistance | | | 165 | | °C/W |

Absolute Maximum Ratings⁽⁴⁾

| Parameter | Ratings |
|--------------------------------------|----------------|
| Operating Temperature ⁽⁵⁾ | -40°C to 85°C |
| Storage Temperature | -65°C to 150°C |
| Channel Temperature | 150°C |
| DC Voltage (Pin 6) | 6V |
| Power Dissipation | 390 mW |
| DC Current (Pin 6) | 78mA |
| Bias Current (Pin 4) | 10mA |
| Input Power (CW) | 15dBm |

- ⁽¹⁾ Measured on Mini-Circuits Characterization test board TB-533+ See Characterization Test Circuit (Fig. 1)
- ⁽²⁾ Specified with external current limiting of 50 mA. Capable of higher P1dB at higher currents (see Fig. 2)
- ⁽³⁾ Current at 85°C - Current at -45°C)/130
- ⁽⁴⁾ Permanent damage may occur if any of these limits are exceeded. These maximum ratings are not intended for continuous normal operation.
- ⁽⁵⁾ Defined with reference to ground pad temperature.



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Characterization Test Circuit

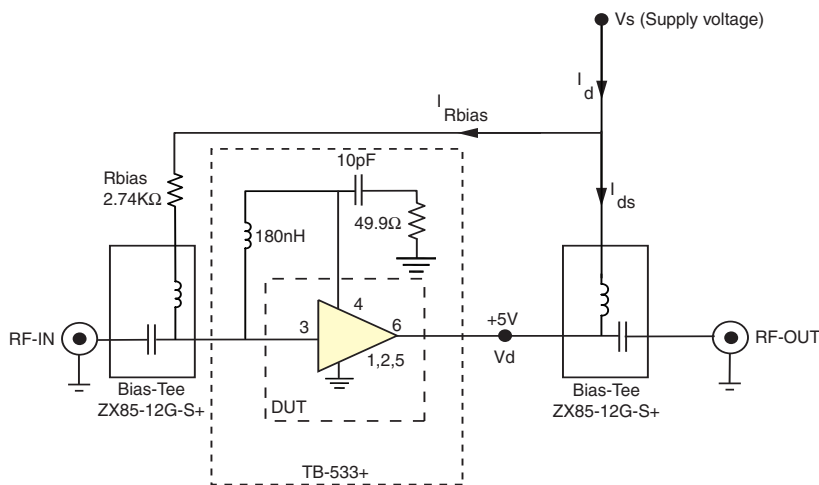


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-533+) Gain, Output power at 1dB compression (P1 dB), output IP3 (OIP3) and Noise Figure measured using Agilent’s N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 0 dBm/tone at output.
3. Vs adjusted for 5V at device (Vd), compensating loss of bias tee.

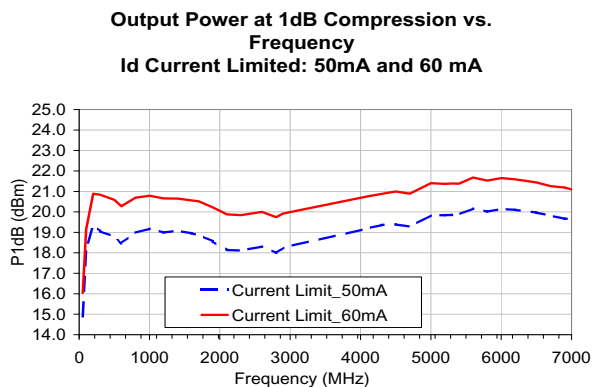
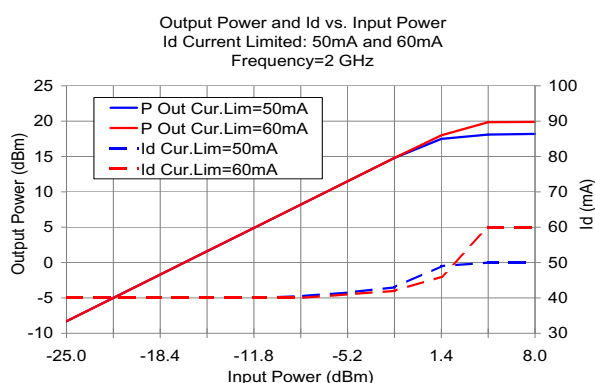


Fig 2. Output Power and Id vs. Input Power and Frequency.

Performance measured on Mini-Circuits Characterization test board TB-533+. See Characterization Test Circuit (Fig. 1) Measurements performed with current (Id) limited as noted.

Recommended Application Circuit

(refer to evaluation board for PCB Layout and component values)

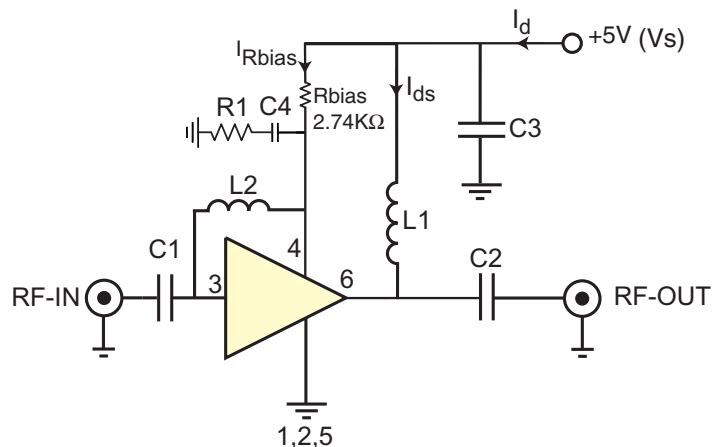


Fig 3. Recommended Application Circuit
 Note: Resistance of L1, 0.1-0.2Ω typically

Typical Current (I_d) as a function of R_{bias}
 ($V_s = 5V$)

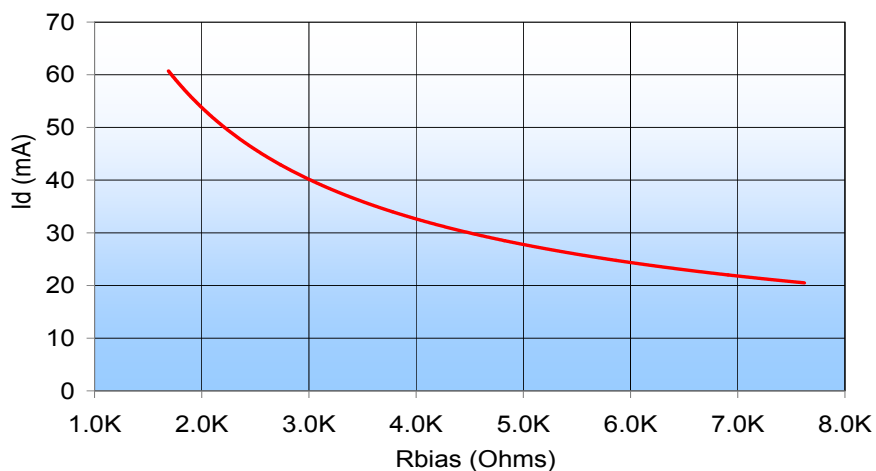


Fig 4. I_d varies as a function of R_{bias} . The I_d current range is defined based upon the specific R_{bias} value noted in the Application Circuit (Fig 3). R_{bias} may be adjusted to optimize I_d for a customers' application. RF performance will vary accordingly.

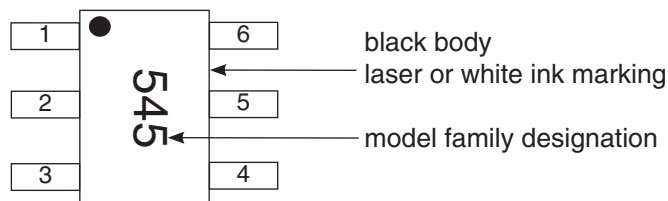


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Product Marking



Additional Detailed Technical Information

Additional information is available on our web site www.minicircuits.com. To access this information enter the model number on our web site home page.

Performance data, graphs, s-parameter data set (.zip file)

Case Style: CA1389

Plastic molded SOT-363 package, lead finish: matte tin

Tape & Reel: F101

Suggested Layout for PCB Design: PL-311

Evaluation Board: TB-534-5+

Environmental Ratings: ENV08T2

ESD Rating

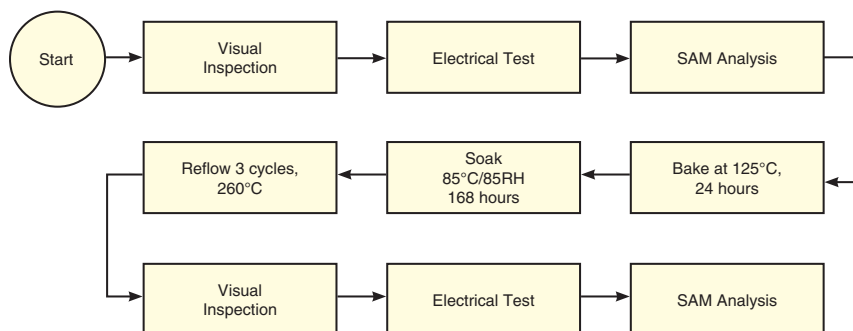
Human Body Model (HBM): Class 1A (250 to 500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (40V) in accordance with ANSI/ESD STM5.2-1999

MSL Rating

Moisture Sensitivity: MSL1 in accordance with IPC/JEDEC J-STD-020D

MSL Test Flow Chart



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