

Low Noise, High IP3

Monolithic Amplifier

PSA-545+

50Ω 0.05 to 4 GHz

The Big Deal

- Ultra Low Noise Figure, 0.8 dB
- High IP3
- Wideband, up to 4 GHz



CASE STYLE: CA1389

Product Overview

Mini-Circuits PSA-545+ 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 3V supply at only 80mA and is internally matched to 50 ohms.

Key Features

| Feature | Advantages |
|----------------------------|--|
| Ultra Low Noise, 0.8 dB | Outstanding Noise Figure, measured in a 50 Ohm environment without any external matching |
| High IP3, 36 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 |
| High Output Power, +20 dBm | The PSA-545+ provides up to +20dBm output power at 1dB compression enabling this amplifier to support high linear dynamic range requirements.- |
| Broad Band | Operating over a broadband the PSA-545+ 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 80mA nominal maintains junction temperatures typically below 125°C at 85°C ground lead temperature |

Notes

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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/MCLStore/terms.jsp



Low Noise, High IP3

Monolithic Amplifier

0.05-4 GHz

Product Features

- Single Positive Supply Voltage, +3V, Id=80mA
- Ultra Low Noise Figure, 0.8 dB typ. at 1 GHz
- High IP3, up to 35 dBm typ. at 1 GHz
- Output Power at 1dB comp., up to +20 dBm typ.
- Gain, 20 dB typ. at 1GHz
- Micro-miniature size SOT-363 package
- Aqueous washable



PSA-545+

CASE STYLE: CA1389

Typical Applications

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

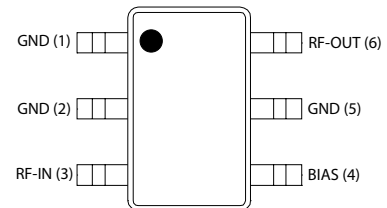
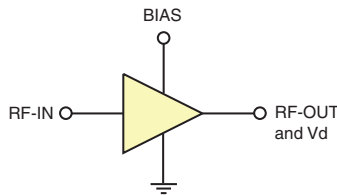
+RoHS Compliant

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

General Description

PSA-545+ is an advanced wide band, 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. 2) |
|-------------|------------|---|
| RF IN | 3 | RF input pin (connect to 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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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 |
| at DC Volts (Vd) | | | 3.0 | | V |
| DC Current (Id) ⁽⁶⁾ | | 60 | 80 | 100 | mA |
| Bias Current (I _{Rbias}) | | | 5.6 | | mA |
| Noise Figure | 0.05 | | 2.1 | — | dB |
| | 0.5 | | 0.7 | — | |
| | 1.0 | | 0.8 | 1.3 | |
| | 2.0 | | 1.0 | — | |
| | 3.0 | | 1.3 | — | |
| | 4.0 | | 1.7 | — | |
| Gain | 0.05 | — | 24.8 | — | dB |
| | 0.5 | — | 23.5 | — | |
| | 1.0 | 17.8 | 19.8 | 21.8 | |
| | 2.0 | — | 14.9 | — | |
| | 3.0 | — | 12.1 | — | |
| | 4.0 | — | 10.4 | — | |
| Input Return Loss | 0.05-0.5 | | 8 | | dB |
| | 0.5-4.0 | | 6 | | |
| Output Return Loss | 0.05-0.2 | | 12 | | dB |
| | 0.2-4.0 | | 18 | | |
| Output IP3 | 0.05 | | 34.4 | | dBm |
| | 0.5 | | 34.9 | | |
| | 1.0 | | 35.4 | | |
| | 2.0 | | 36.2 | | |
| | 3.0 | | 36.3 | | |
| | 4.0 | | 35.4 | | |
| Output Power @ 1dB compression ⁽²⁾ | 0.05 | | 19.6 | | dBm |
| | 0.5 | | 19.6 | | |
| | 1.0 | | 19.5 | | |
| | 2.0 | | 20.2 | | |
| | 3.0 | | 20.5 | | |
| | 4.0 | | 20.5 | | |
| DC Current Variation Vs. Temperature ⁽³⁾ | | | -0.064 | | mA/°C |
| Thermal Resistance ⁽⁵⁾ | | | 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) | 5V |
| Device Current (Pin 6) | 130 mA |
| Power Dissipation | 390 mW |
| Bias Reference Current (Pin 4) | 10 mA |
| Input Power (CW) (Pin 3) ⁽⁷⁾ | 15 dBm |

- ⁽¹⁾ Measured on Mini-Circuits Characterization test board TB-533+.
See Characterization Test Circuit (Fig. 1)
- ⁽²⁾ Current increases at P1dB
- ⁽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.
- ⁽⁶⁾ Specified DC current consumption is under small signal conditions.
Current will increase with input RF Power. To maintain maximum current consumption, external DC current limiting circuits are required on Vd line.
- ⁽⁷⁾ Maximum input power is specified based upon external Vd current limiting of 100 mA.
Maximum input power will degrade without external current limiting.

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Characterization Test Circuit

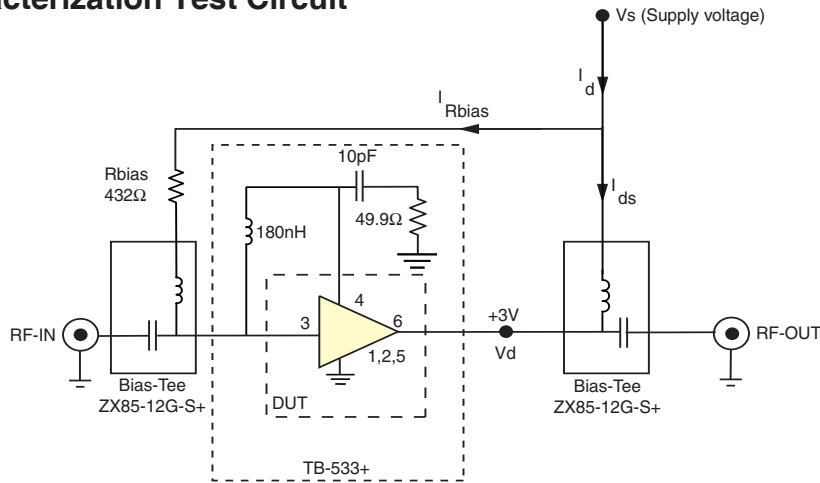


Fig 1. Block Diagram of Test Circuit used for characterization. (DUT soldered on Mini-Circuits Characterization Test Board TB-533+) Gain, Return loss, Output power at 1dB compression (P1 dB), Output IP3 (OIP3) and Noise Figure measured using Agilent's N5242A PNA-X microwave network analyzer.

Conditions:

1. Gain: Pin= -25dBm
2. Output IP3 (OIP3): Two tones, spaced 1 MHz apart, 5 dBm/tone at output.

Recommended Application Circuit

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

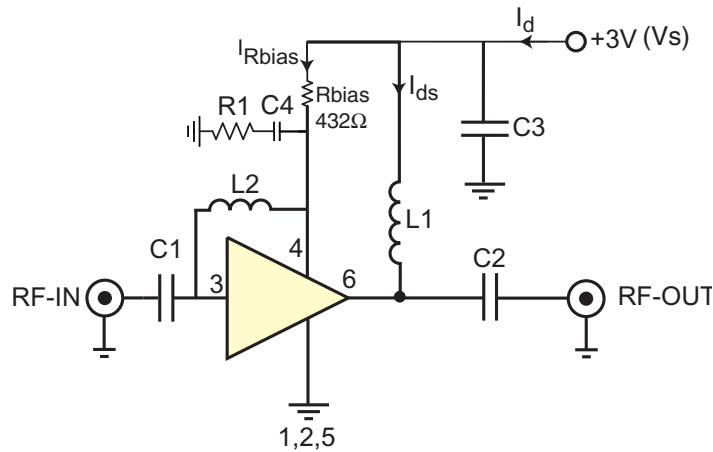


Fig 2. Recommended Application Circuit

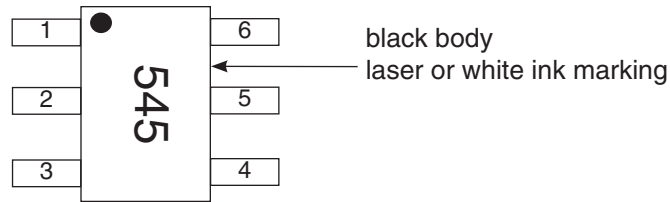
Note: Resistance of L1, 0.1-0.2Ω typically

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Product Marking



Marking may contain other features or characters for internal lot control

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

Standard quantities available on reel: 7" reels with 20, 50, 100, 200, 500, 1K, or 2K devices.

Suggested Layout for PCB Design: PL-311

Evaluation Board: TB-534+

Environmental Ratings: ENV08T2

ESD Rating

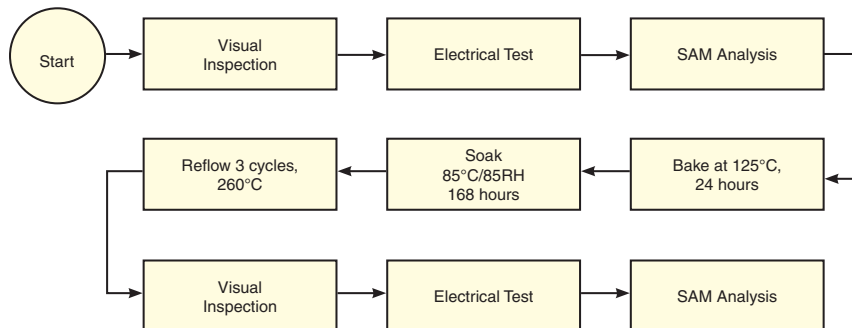
Human Body Model (HBM): Class 1A (250 to <500V) in accordance with ANSI/ESD STM 5.1 - 2001

Machine Model (MM): Class M1 (<100V) in accordance with ANSI/ESD STM5.2-1999; passes 40V

MSL Rating

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

MSL Test Flow Chart



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