

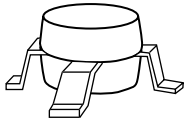
Data Sheet

Description

The MSA-0505 is a high performance medium power silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a low cost, surface mount package. This MMIC is designed for use as a general purpose 50Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial systems.

The MSA-series is fabricated using Avago's 10 GHz f_T , 25 GHz f_{MAX} , silicon bipolar MMIC process which uses nitride self-alignment, ion implantation, and gold metallization to achieve excellent performance, uniformity and reliability. The use of an external bias resistor for temperature and current stability also allows bias flexibility.

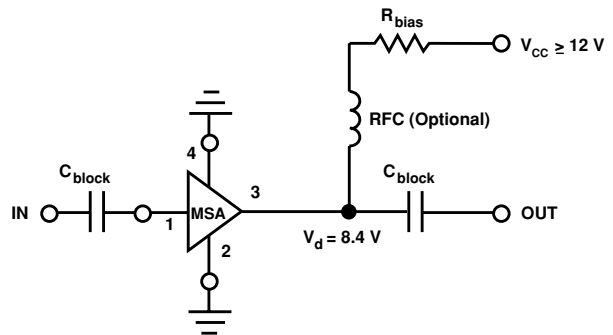
05 Plastic Package



Features

- Cascadable 50 Ω Gain Block
- High Output Power:
18.0 dBm Typical P_1 dB at 1.0 GHz
- Low Distortion:
29.0 dBm Typical IP_3 at 1.0 GHz
- 7.0 dB Typical Gain at 1.0 GHz
- Surface Mount Plastic Package
- Tape-and-Reel Packaging Option Available
- Lead-free Option Available

Typical Biasing Configuration



MSA-0505 Absolute Maximum Ratings

| Parameter | Absolute Maximum ^[1] |
|------------------------------------|---------------------------------|
| Device Current | 135 mA |
| Power Dissipation ^[2,3] | 1.5 W |
| RF Input Power | +25 dBm |
| Junction Temperature | 200°C |
| Storage Temperature | -65 to 150°C |

Thermal Resistance^[2]:

$$\theta_{jc} = 85^{\circ}\text{C/W}$$

Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{\text{CASE}} = 25^{\circ}\text{C}$.
3. Derate at 11.8 mW/°C for $T_{\text{C}} > 73^{\circ}\text{C}$.

Electrical Specifications^[1], $T_{\text{A}} = 25^{\circ}\text{C}$

| Symbol | Parameters and Test Conditions: $I_{\text{d}} = 80 \text{ mA}$, $Z_0 = 50 \Omega$ | Units | Min. | Typ. | Max. | |
|-----------------------|--|---------------------------------------|-------|------|------------|------|
| $P_{1 \text{ dB}}$ | Output Power at 1 dB Gain Compression | $f = 0.5 \text{ GHz}$ | | | 19.0 | |
| | | $f = 1.0 \text{ GHz}$ | dBm | 16.0 | 18.0 | |
| G_{p} | Power Gain ($ S_{21} ^2$) | $f = 0.5 \text{ GHz}$ | | | 7.5 | |
| | | $f = 1.0 \text{ GHz}$ | dB | 6.0 | 7.0 | |
| ΔG_{p} | Gain Flatness | $f = 0.1 \text{ to } 1.5 \text{ GHz}$ | | | ± 0.75 | |
| $f_{3 \text{ dB}}$ | 3 dB Bandwidth ^[2] | | | | 2.3 | |
| VSWR | Input VSWR | $f = 0.1 \text{ to } 1.5 \text{ GHz}$ | | | 1.6:1 | |
| | Output VSWR | $f = 0.1 \text{ to } 1.5 \text{ GHz}$ | | | 2.0:1 | |
| IP_3 | Third Order Intercept Point | $f = 1.0 \text{ GHz}$ | | | 29.0 | |
| NF | 50 Ω Noise Figure | $f = 1.0 \text{ GHz}$ | | | 6.5 | |
| t_{D} | Group Delay | $f = 1.0 \text{ GHz}$ | | | 190 | |
| V_{d} | Device Voltage | | V | 6.7 | 8.4 | 10.1 |
| dV/dT | Device Voltage Temperature Coefficient | | mV/°C | | -16.0 | |

Notes:

1. The recommended operating current range for this device is 60 to 100 mA. Typical performance as a function of current is on the following page.
2. Referenced from 0.1 GHz Gain (GP).

Ordering Information

| Part Numbers | No. of Devices | Comments |
|---------------|----------------|----------|
| MSA-0505-STR | 10 | Bulk |
| MSA-0505-STRG | 100 | Bulk |
| MSA-0505-TR1 | 500 | 7" Reel |
| MSA-0505-TR1G | 500 | 7" Reel |

Note: Order part number with a "G" suffix if lead-free option is desired.

MSA-0505 Typical Scattering Parameters ($T_A = 25^\circ\text{C}$, $I_d = 80\text{ mA}$)

| Freq. MHz | S_{11} | | | S_{21} | | | S_{12} | | S_{22} | | k |
|--------------|----------|------|------|----------|-----|-------|----------|-----|----------|------|------|
| | Mag | Ang | dB | Mag | Ang | dB | Mag | Ang | Mag | Ang | |
| 5 | .56 | -39 | 14.9 | 5.56 | 161 | -18.5 | .120 | 39 | .65 | -36 | 0.60 |
| 25 | .24 | -103 | 9.7 | 3.05 | 156 | -13.9 | .202 | 12 | .25 | -90 | 0.97 |
| 50 | .15 | -130 | 8.2 | 2.57 | 163 | -13.7 | .207 | 7 | .15 | -116 | 1.15 |
| 100 | .13 | -155 | 7.8 | 2.45 | 165 | -13.7 | .207 | 3 | .11 | -132 | 1.21 |
| 200 | .12 | -170 | 7.7 | 3.43 | 161 | -13.5 | .211 | 1 | .11 | -145 | 1.21 |
| 400 | .12 | 178 | 7.5 | 2.37 | 148 | -13.6 | .209 | -1 | .14 | -146 | 1.23 |
| 600 | .13 | 172 | 7.4 | 2.34 | 134 | -13.6 | .209 | -2 | .17 | -151 | 1.23 |
| 800 | .13 | 168 | 7.2 | 2.29 | 119 | -13.6 | .209 | -3 | .21 | -157 | 1.23 |
| 1000 | .14 | 166 | 7.0 | 2.24 | 105 | -13.4 | .213 | -4 | .25 | -164 | 1.21 |
| 1500 | .21 | 159 | 6.4 | 2.09 | 72 | -13.3 | .217 | -6 | .34 | 176 | 1.16 |
| 2000 | .30 | 148 | 5.2 | 1.82 | 42 | -13.1 | .222 | -9 | .42 | 159 | 1.12 |
| 2500 | .40 | 136 | 4.1 | 1.60 | 17 | -12.9 | .227 | -11 | .48 | 146 | 1.05 |
| 3000 | .52 | 121 | 2.7 | 1.36 | -7 | -12.6 | .234 | -16 | .55 | 133 | 0.92 |

Typical Performance, $T_A = 25^\circ\text{C}$

(unless otherwise noted)

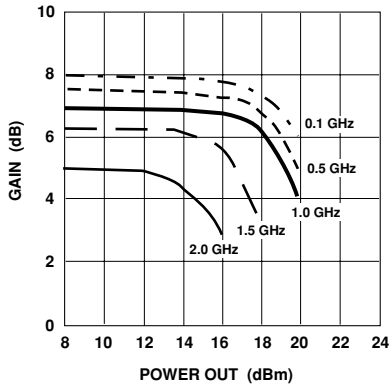


Figure 1. Typical Gain vs. Power Out, $T_A = 25^\circ\text{C}$, $I_d = 80\text{ mA}$.

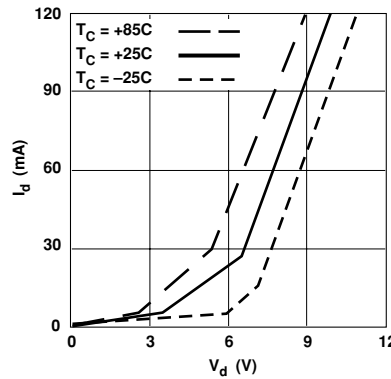


Figure 2. Device Current vs. Voltage.

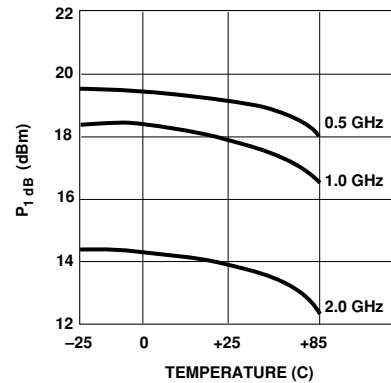


Figure 3. Output Power at 1 dB Gain Compression, vs. Case Temperature, $I_d = 80\text{ mA}$.

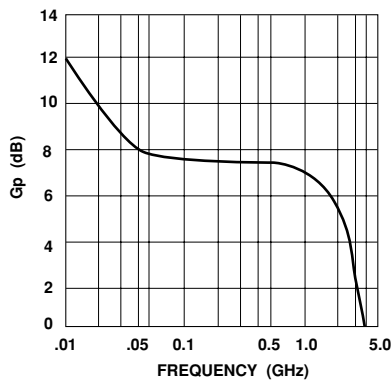


Figure 4. Gain vs. Frequency, $I_d = 80$ to 100 mA .

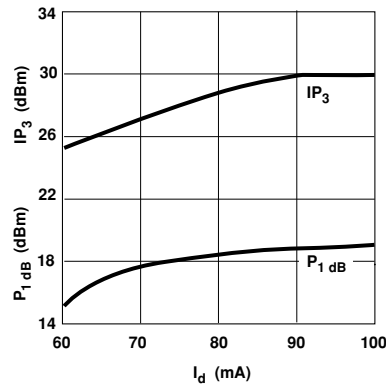
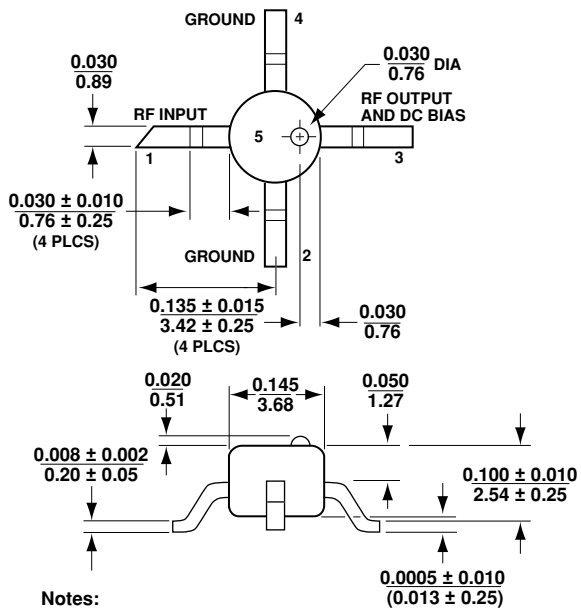


Figure 5. Output Power at 1 dB Gain Compression, Third Order Intercept vs. Case Temperature, $f = 1.0\text{ GHz}$.

05 Plastic Package Dimensions



Notes:

(unless otherwise specified)

1. Dimensions are $\frac{\text{in}}{\text{mm}}$
2. Tolerances
in .xxx = 0.005
mm .xx = 0.13

For product information and a complete list of distributors, please go to our web site: www.avagotech.com

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