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Data Sheet

Description

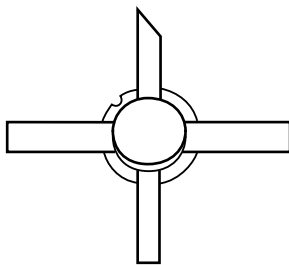
The MSA-0520 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a hermetic, BeO disk package for good thermal characteristics. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and military applications.

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.

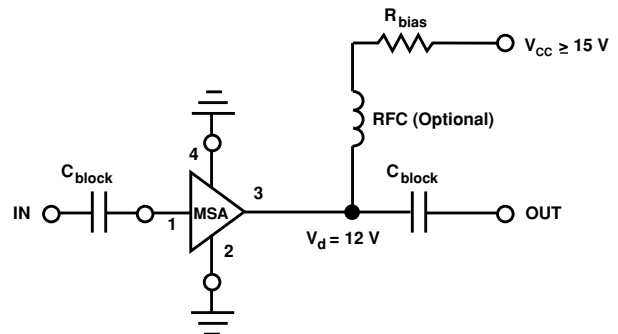
Features

- Cascadable 50 Ω Gain Block
- High Output Power:
+23 dBm Typical $P_{1\text{ dB}}$ at 1.0 GHz
- Low Distortion:
33 dBm Typical IP_3 at 1.0 GHz
- 8.5 dB Typical Gain at 1.0 GHz
- Hermetic Metal/Beryllia Microstrip Package

200 mil BeO Package



Typical Biasing Configuration



MSA-0520 Absolute Maximum Ratings

| Parameter | Absolute Maximum ^[1] |
|------------------------------------|---------------------------------|
| Device Current | 225 mA |
| Power Dissipation ^[2,3] | 3.0 W |
| RF Input Power | +25 dBm |
| Junction Temperature | 200°C |
| Storage Temperature | –65 to 200°C |

Thermal Resistance^[2,4]:

$$\theta_{jc} = 25^{\circ}\text{C/W}$$

Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{\text{CASE}} = 25^{\circ}\text{C}$.
3. Derate at 40 mW/°C for $T_C > 125^{\circ}\text{C}$.
4. The small spot size of this technique results in a higher, though more accurate determination of θ_{jc} than do alternate methods.

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

| Symbol | Parameters and Test Conditions: $I_d = 165 \text{ mA}$, $Z_0 = 50 \Omega$ | Units | Min. | Typ. | Max. |
|--------------------|--|-------|------|------------|------|
| $P_{1 \text{ dB}}$ | Output Power at 1 dB Gain Compression $f = 1.0 \text{ GHz}$ | dBm | 21.0 | 23.0 | |
| G_p | Power Gain ($ S_{21} ^2$) $f = 0.1 \text{ GHz}$ | dB | 7.5 | 8.5 | 9.5 |
| ΔG_p | Gain Flatness $f = 0.1 \text{ to } 2.0 \text{ GHz}$ | dB | | ± 0.75 | |
| $f_{3 \text{ dB}}$ | 3 dB Bandwidth ^[2] | GHz | | 2.8 | |
| VSWR | Input VSWR $f = 0.1 \text{ to } 2.0 \text{ GHz}$ | | | 2.0:1 | |
| | Output VSWR $f = 0.1 \text{ to } 2.0 \text{ GHz}$ | | | 2.5:1 | |
| IP_3 | Third Order Intercept Point $f = 1.0 \text{ GHz}$ | dBm | | 33.0 | |
| $NF_{50 \Omega}$ | 50 Ω Noise Figure $f = 1.0 \text{ GHz}$ | dB | | 6.5 | |
| t_D | Group Delay $f = 1.0 \text{ GHz}$ | psec | | 170 | |
| V_d | Device Voltage | V | 10.5 | 12.0 | 13.5 |
| dV/dT | Device Voltage Temperature Coefficient | mV/°C | | –16.0 | |

Notes:

1. The recommended operating current range for this device is 80 to 200 mA.
Typical performance as a function of current is on the following page.
2. Referenced from 0.1 GHz Gain (GP).

MSA-0520 Typical Scattering Parameters ($T_A = 25^\circ\text{C}$, $I_d = 165\text{ mA}$)

| Freq. MHz | S_{11} | | | S_{21} | | | S_{12} | | | S_{22} | | | k |
|--------------|----------|------|------|----------|-----|-------|----------|-----|-----|----------|------|----|---|
| | Mag | Ang | dB | Mag | Ang | dB | Mag | Ang | dB | Mag | Ang | dB | |
| 5 | .57 | -38 | 14.4 | 5.25 | 165 | -19.4 | .107 | 38 | .67 | -35 | 0.57 | | |
| 25 | .25 | -90 | 10.7 | 3.42 | 160 | -14.9 | .180 | 17 | .29 | -81 | 0.93 | | |
| 50 | .15 | -111 | 9.5 | 2.97 | 163 | -14.4 | .190 | 9 | .18 | -97 | 1.10 | | |
| 100 | .11 | -138 | 8.9 | 2.80 | 166 | -14.2 | .195 | 3 | .11 | -113 | 1.16 | | |
| 200 | .10 | -152 | 8.8 | 2.75 | 163 | -14.1 | .197 | 1 | .10 | -125 | 1.17 | | |
| 400 | .10 | -152 | 8.7 | 2.72 | 152 | -14.1 | .198 | -2 | .14 | -123 | 1.16 | | |
| 600 | .11 | -147 | 8.6 | 2.70 | 140 | -14.0 | .199 | -4 | .18 | -123 | 1.14 | | |
| 800 | .13 | -142 | 8.5 | 2.67 | 128 | -14.1 | .199 | -6 | .22 | -127 | 1.12 | | |
| 1000 | .15 | -140 | 8.4 | 2.64 | 115 | -14.1 | .198 | -8 | .27 | -131 | 1.09 | | |
| 1500 | .22 | -142 | 8.0 | 2.52 | 85 | -13.7 | .206 | -12 | .34 | -143 | 0.98 | | |
| 2000 | .30 | -156 | 7.4 | 2.36 | 55 | -13.3 | .216 | -16 | .43 | -158 | 0.85 | | |
| 2500 | .37 | -170 | 6.7 | 2.16 | 33 | -12.9 | .227 | -18 | .48 | -166 | 0.75 | | |
| 3000 | .41 | 170 | 5.6 | 1.91 | 8 | -12.7 | .232 | -23 | .51 | -177 | 0.70 | | |
| 3500 | .45 | 149 | 4.5 | 1.68 | -16 | -12.1 | .249 | -31 | .55 | 173 | 0.63 | | |
| 4000 | .46 | 124 | 3.3 | 1.45 | -40 | -11.7 | .259 | -39 | .56 | 162 | 0.66 | | |

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

(unless otherwise noted)

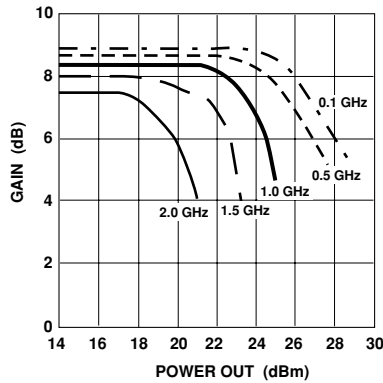


Figure 1. Typical Gain vs. Power Out, $T_A = 25^\circ\text{C}$, $I_d = 165\text{ mA}$.

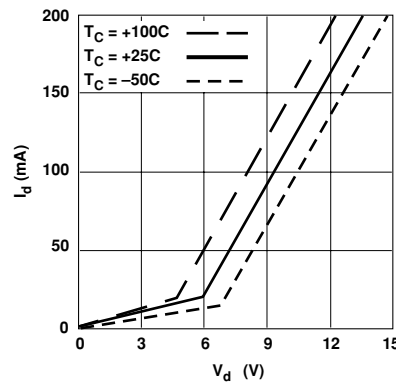


Figure 2. Device Current vs. Voltage.

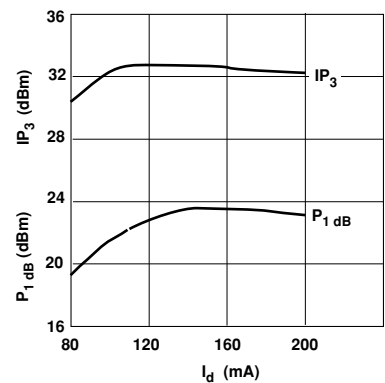


Figure 3. Output Power at 1 dB Gain Compression, Third Order Intercept vs. Current, $f = 1.0\text{ GHz}$.

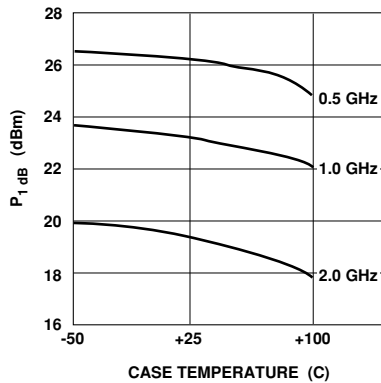


Figure 4. Output Power @ 1 dB Gain Compression vs. Temperature, $I_d = 165\text{ mA}$.

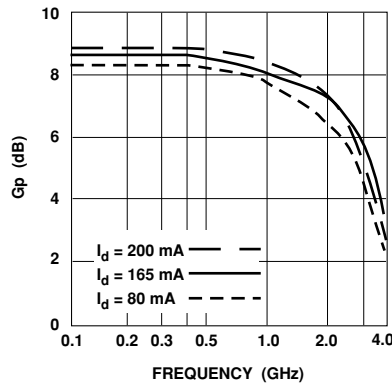


Figure 5. Gain vs. Frequency.

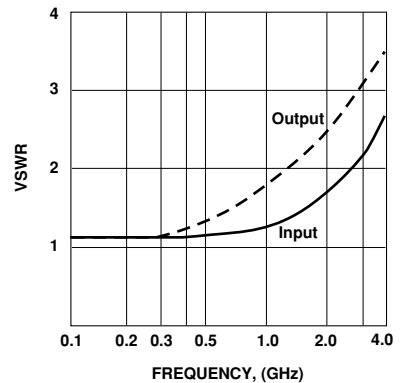
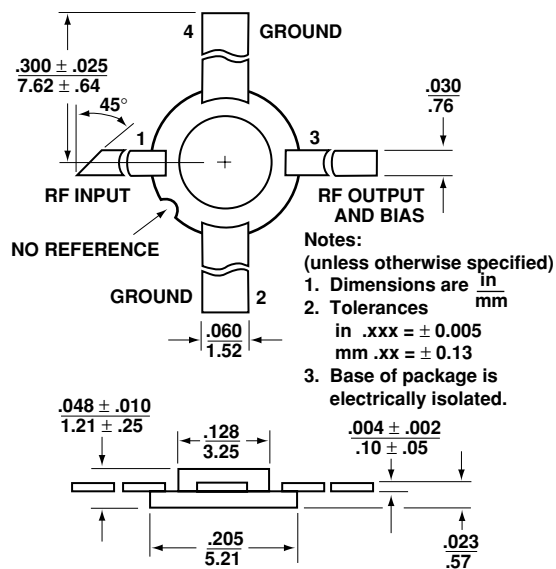


Figure 6. VSWR vs. Frequency, $I_d = 165\text{ mA}$.

Ordering Information

| Part Numbers | No. of Devices | Comments |
|--------------|----------------|----------|
| MSA-0520 | 100 | Bulk |

200 mil BeO Package Dimensions



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

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