

MSA-0711

Cascadable Silicon Bipolar MMIC Amplifier



Data Sheet

Description

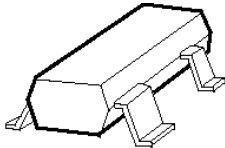
The MSA-0711 is a low cost silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in the surface mount plastic SOT-143 package. This MMIC is designed for use as a general purpose 50 Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in commercial and industrial 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
- 3 dB Bandwidth: DC to 1.9 GHz
- 12.0 dB Typical Gain at 1.0 GHz
- Unconditionally Stable ($k > 1$)
- Low Cost Surface Mount Plastic Package
- Tape-and-Reel Packaging Option Available
- Lead-free Option Available

SOT-143 Package



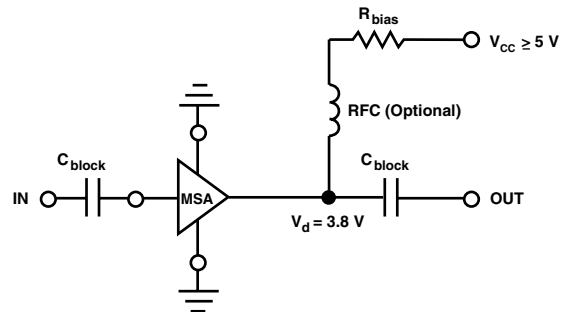
Pin Connections and Package Marking



Notes:

Top View. Package Marking provides orientation and identification.
"x" is the date code.

Typical Biasing Configuration



MSA-0711 Absolute Maximum Ratings

| Parameter | Absolute Maximum ^[1] |
|------------------------------------|---------------------------------|
| Device Current | 50 mA |
| Power Dissipation ^[2,3] | 175 mW |
| RF Input Power | +13 dBm |
| Junction Temperature | 150°C |
| Storage Temperature | -65 to 150°C |

| |
|--|
| Thermal Resistance^[2]: $\theta_{jc} = 505^{\circ}\text{C}/\text{W}$ |
|--|

Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{\text{CASE}} = 25^{\circ}\text{C}$.
3. Derate at 2.0 mW/°C for $T_{\text{C}} > 62^{\circ}\text{C}$.

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

| Symbol | Parameters and Test Conditions: $I_{\text{d}} = 22 \text{ mA}$, $Z_0 = 50 \Omega$ | Units | Min. | Typ. | Max. |
|-----------------------|--|-------|------|--------------|------|
| G_{p} | Power Gain ($ S_{21} ^2$) f = 0.1 GHz f = 1.0 GHz | dB | 10.0 | 13.0 12.0 | |
| ΔG_{p} | Gain Flatness f = 0.1 to 1.3 GHz | dB | | ±0.8 | |
| $f_{3 \text{ dB}}$ | 3 dB Bandwidth | GHz | | 3.2 | |
| VSWR | Input VSWR f = 0.1 to 2.0 GHz | | | 1.5:1 | |
| | Output VSWR f = 0.1 to 2.0 GHz | | | 1.5:1 | |
| NF | 50 Ω Noise Figure f = 1.0 GHz | dB | | 5.0 | |
| $P_{1 \text{ dB}}$ | Output Power at 1 dB Gain Compression f = 1.0 GHz | dBm | | 5.5 | |
| IP_3 | Third Order Intercept Point f = 1.0 GHz | dBm | | 18.0 | |
| t_{D} | Group Delay f = 1.0 GHz | psec | | 145 | |
| V_{d} | Device Voltage $T_{\text{C}} = 25^{\circ}\text{C}$ | V | 3.0 | 3.8 | 4.6 |
| dV/dT | Device Voltage Temperature Coefficient | mV/°C | | -7.0 | |

Note:

1. The recommended operating current range for this device is 15 to 30 mA. Typical performance as a function of current is on the following page.

Ordering Information

| Part Numbers | No. of Devices | Comments |
|---------------|----------------|----------|
| MSA-0711-BLK | 100 | Bulk |
| MSA-0711-BLKG | 100 | Bulk |
| MSA-0711-TR1 | 3000 | 7" Reel |
| MSA-0711-TR1G | 3000 | 7" Reel |
| MSA-0711-TR2 | 10000 | 13" Reel |
| MSA-0711-TR2G | 10000 | 13" Reel |

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

MSA-0711 Typical Scattering Parameters ($Z_0 = 50 \Omega$, $T_A = 25^\circ\text{C}$, $I_d = 22 \text{ mA}$)

| Freq. GHz | S_{11} | | S_{21} | | | S_{12} | | | S_{22} | |
|-----------|----------|------|----------|------|-----|----------|------|-----|----------|------|
| | Mag | Ang | dB | Mag | Ang | dB | Mag | Ang | Mag | Ang |
| 0.1 | .03 | 1 | 13.0 | 4.47 | 174 | -18.6 | .118 | 1 | .19 | -8 |
| 0.2 | .04 | 1 | 12.9 | 4.42 | 168 | -18.5 | .119 | 2 | .19 | -18 |
| 0.4 | .04 | -4 | 12.8 | 4.38 | 157 | -18.4 | .120 | 4 | .19 | -36 |
| 0.6 | .05 | -19 | 12.6 | 4.28 | 146 | -18.1 | .125 | 9 | .19 | -52 |
| 0.8 | .07 | -32 | 12.3 | 4.14 | 135 | -17.7 | .130 | 10 | .20 | -68 |
| 1.0 | .08 | -44 | 12.0 | 3.99 | 123 | -17.4 | .135 | 12 | .19 | -82 |
| 1.5 | .13 | -88 | 10.9 | 3.52 | 98 | -16.1 | .157 | 13 | .19 | -113 |
| 2.0 | .18 | -130 | 9.8 | 3.08 | 75 | -15.2 | .173 | 8 | .18 | -138 |
| 2.5 | .25 | -155 | 8.6 | 2.68 | 61 | -14.7 | .184 | 9 | .18 | -151 |
| 3.0 | .32 | -178 | 7.2 | 2.30 | 42 | -14.7 | .185 | 5 | .17 | -158 |
| 3.5 | .38 | 165 | 5.8 | 1.96 | 26 | -14.8 | .181 | 3 | .17 | -150 |
| 4.0 | .42 | 152 | 4.5 | 1.68 | 12 | -14.7 | .184 | 1 | .20 | -142 |

Typical Performance, $T_A = 25^\circ\text{C}$
(unless otherwise noted)

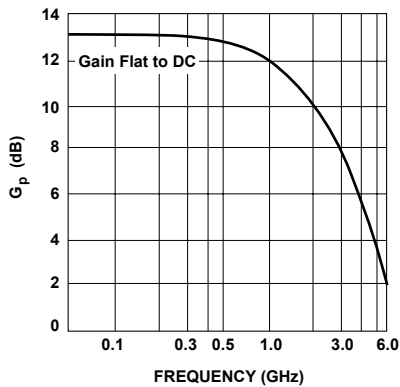


Figure 1. Power Gain vs. Frequency, $I_d = 22 \text{ mA}$.

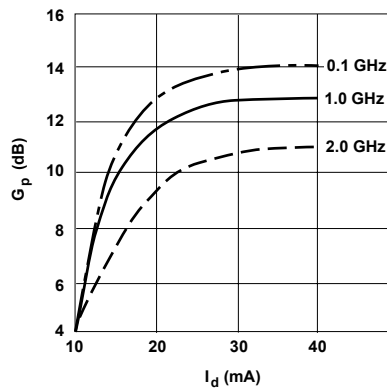


Figure 2. Power Gain vs. Current.

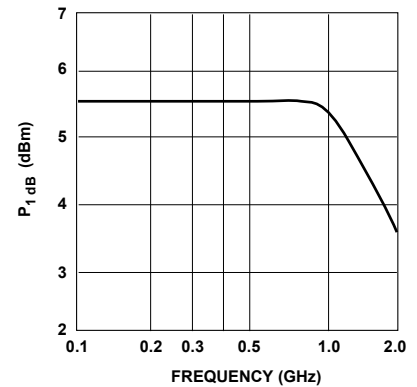


Figure 3. Output Power at 1 dB Gain Compression vs. Frequency, $I_d = 22 \text{ mA}$.

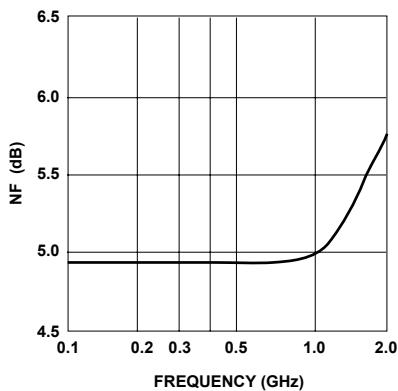
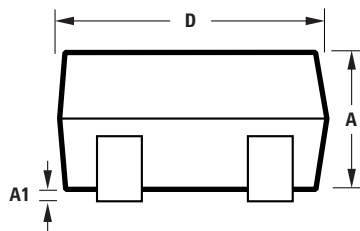
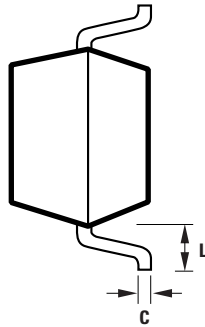
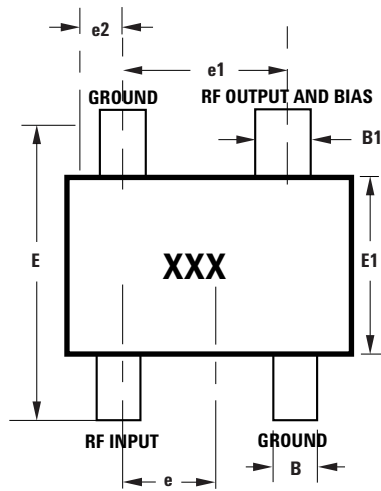


Figure 4. Noise Figure vs. Frequency, $I_d = 22 \text{ mA}$.

SOT-143 Package Dimensions



Notes:
 XXX-package marking
 Drawings are not to scale

| SYMBOL | DIMENSIONS (mm) | |
|--------|-----------------|-------|
| | MIN. | MAX. |
| A | 0.79 | 1.097 |
| A1 | 0.013 | 0.10 |
| B | 0.36 | 0.54 |
| B1 | 0.76 | 0.92 |
| C | 0.086 | 0.152 |
| D | 2.80 | 3.06 |
| E1 | 1.20 | 1.40 |
| e | 0.89 | 1.02 |
| e1 | 1.78 | 2.04 |
| e2 | 0.45 | 0.60 |
| E | 2.10 | 2.65 |
| L | 0.45 | 0.69 |

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

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