# THE DATASHEET OF

# MSA-0736-BLKG

# MSA-0736

## Cascadable Silicon Bipolar MMIC Amplifier

# Data Sheet

## Description

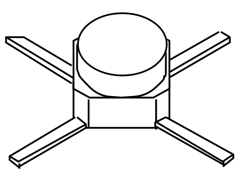
The MSA-0736 is a high performance silicon bipolar Monolithic Microwave Integrated Circuit (MMIC) housed in a cost effective, microstrip package. This MMIC is designed for use as a general purpose 50Ω gain block. Typical applications include narrow and broad band IF and RF amplifiers in industrial and 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.

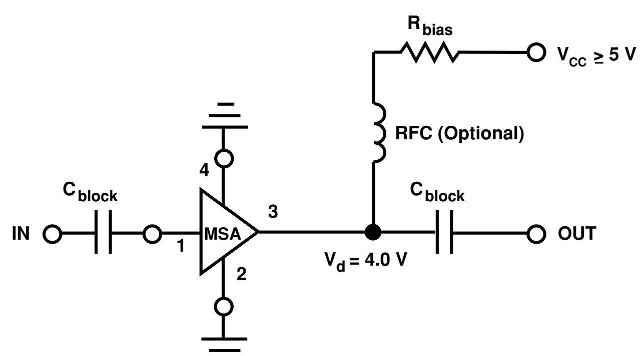
## Features

- Cascadable 50Ω Gain Block
- Low Operating Voltage: 4.0 V Typical $V_d$
- 3 dB Bandwidth: DC to 2.4 GHz
- 13.0 dB Typical Gain at 1.0 GHz
- Unconditionally Stable (k>1)
- Cost Effective Ceramic Microstrip Package

## 36 micro-X Package



## Typical Biasing Configuration



## MSA-0736 Absolute Maximum Ratings

| Parameter | Absolute Maximum[1] |
|---|---|
| Device Current | 60 mA |
| Power Dissipation[2,3] | 275 mW |
| RF Input Power | +13 dBm |
| Junction Temperature | 150°C |
| Storage Temperature | –65 to 150°C |

| Thermal Resistance[2,5]: |
|---|
| $\theta_{jc}$ = 155°C/W |

**Notes:**

1. Permanent damage may occur if any of these limits are exceeded.
2. $T_{CASE}$ = 25°C.
3. Derate at 6.5 mW/°C for $T_C$ > 157°C.
4. Storage above +150°C may tarnish the leads of this package making it difficult to solder into a circuit.
5. Ths small spot size of this technique results in a higher, though more accurate determination of $\theta_{jc}$ than do alternate methods.

## Electrical Specifications[1], $T_A$ = 25°C

| Symbol | Parameters and Test Conditions: $I_d$ = 22 mA, $Z_O$ = 50 Ω | | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|---|
| $G_P$ | Power Gain ($\|S_{21}\|^2$) | f = 0.1 GHz | dB | 12.5 | 13.5 | 14.5 |
| $\Delta G_P$ | Gain Flatness | f = 0.1 to 1.3 GHz | dB | | ±0.6 | ±1.0 |
| $f_{3\ dB}$ | 3 dB Bandwidth | | GHz | | 2.4 | |
| VSWR | Input VSWR | f = 0.1 to 2.5 GHz | | | 2.0:1 | |
| | Output VSWR | f = 0.1 to 2.5 GHz | | | 1.8:1 | |
| NF | 50 Ω Noise Figure | f = 1.0 GHz | dB | | 4.5 | |
| $P_{1\ dB}$ | 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 | | 19.0 | |
| $t_D$ | Group Delay | f = 1.0 GHz | psec | | 140 | |
| $V_d$ | Device Voltage | | V | 3.6 | 4.0 | 4.4 |
| dV/dT | Device Voltage Temperature Coefficient | | mV/°C | | –7.0 | |

**Note:**

1. The recommended operating current range for this device is 15 to 40 mA. Typical performance as a function of current is on the following page.

## Ordering Information

| Part Numbers | No. of Devices | Comments |
|---|---|---|
| MSA-0736-BLKG | 100 | Bulk |
| MSA-0736-TR1G | 1000 | 7" Reel |

## MSA-0736 Typical Scattering Parameters ($Z_0$ = 50 Ω, $T_A$ = 25°C, $I_d$ = 22 mA)

| Freq. GHz | $S_{11}$ | | $S_{21}$ | | | $S_{12}$ | | | $S_{22}$ | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Mag | Ang | dB | Mag | Ang | dB | Mag | Ang | Mag | Ang |
| 0.1 | .13 | –3 | 13.5 | 4.71 | 175 | –19.0 | .112 | 2 | .29 | –7 |
| 0.2 | .13 | –6 | 13.4 | 4.69 | 170 | –18.5 | .119 | 3 | .29 | –12 |
| 0.4 | .14 | –13 | 13.4 | 4.68 | 160 | –18.6 | .118 | 6 | .29 | –24 |
| 0.6 | .16 | –20 | 13.3 | 4.64 | 150 | –18.4 | .120 | 7 | .28 | –35 |
| 0.8 | .19 | –29 | 13.2 | 4.60 | 140 | –18.1 | .125 | 8 | .28 | –47 |
| 1.0 | .21 | –40 | 12.9 | 4.42 | 129 | –17.6 | .131 | 10 | .27 | –58 |
| 1.5 | .27 | –71 | 12.2 | 4.07 | 104 | –16.5 | .149 | 10 | .24 | –83 |
| 2.0 | .32 | –107 | 11.5 | 3.74 | 79 | –15.6 | .165 | 7 | .19 | –103 |
| 2.5 | .37 | –134 | 10.3 | 3.26 | 62 | –15.3 | .173 | 5 | .15 | –113 |
| 3.0 | .43 | –160 | 8.8 | 2.76 | 44 | –15.4 | .171 | 0 | .14 | –120 |
| 3.5 | .47 | –179 | 7.5 | 2.37 | 27 | –15.3 | .173 | –4 | .16 | –120 |
| 4.0 | .49 | 167 | 6.2 | 2.05 | 12 | –15.2 | .168 | –6 | .21 | –121 |
| 5.0 | .51 | 134 | 4.0 | 1.59 | –15 | –15.2 | .173 | –11 | .28 | –135 |
| 6.0 | .60 | 96 | 2.1 | 1.27 | –42 | –14.6 | .185 | –16 | .29 | –167 |

## Typical Performance, $T_A$ = 25°C

(unless otherwise noted)

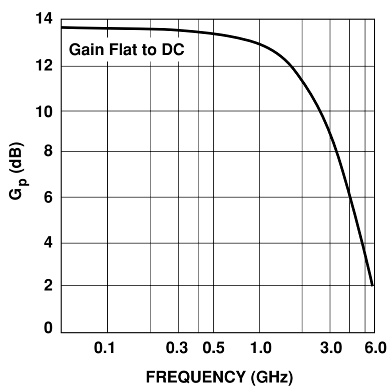



**Figure 1. Typical Power Gain vs. Frequency, $I_d$ = 22 mA.**

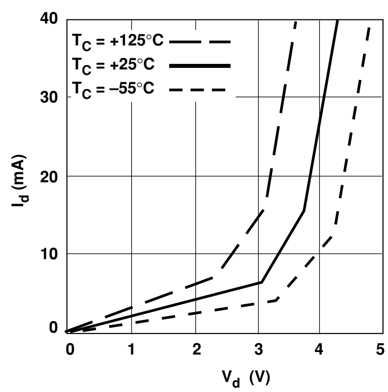



**Figure 2. Device Current vs. Voltage.**

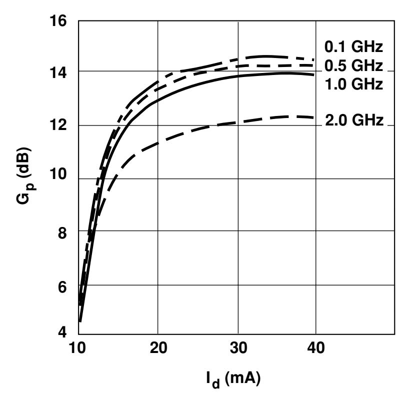



**Figure 3. Power Gain vs. Current.**

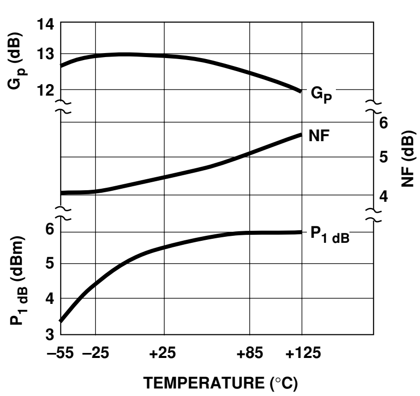



**Figure 4. Output Power at 1 dB Gain Compression, NF and Power Gain vs. Case Temperature, f = 1.0 GHz, $I_d$ = 22 mA.**

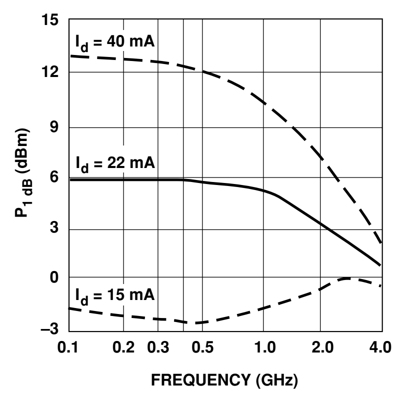



**Figure 5. Output Power at 1 dB Gain Compression vs. Frequency.**

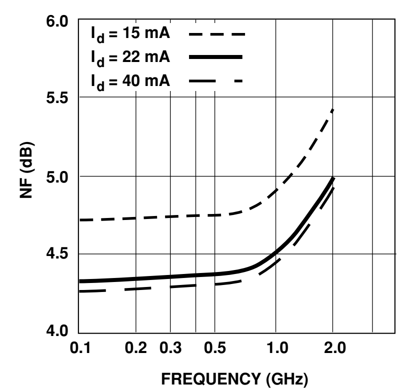
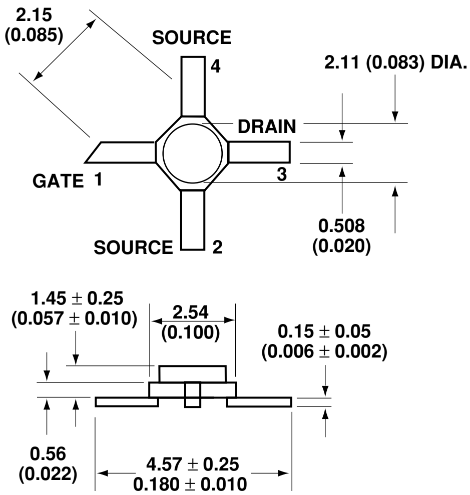



**Figure 6. Noise Figure vs. Frequency.**

## 36 micro-X Package Dimensions




Notes:
1. Dimensions are in millimeters (inches)
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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