



## MSA-1000 Absolute Maximum Ratings

| Parameter                          | Absolute Maximum <sup>[1]</sup> |
|------------------------------------|---------------------------------|
| Device Current                     | 425 mA                          |
| Power Dissipation <sup>[2,3]</sup> | 7.0 W                           |
| RF Input Power                     | +25 dBm                         |
| Junction Temperature               | 200°C                           |
| Storage Temperature                | -65 to 200°C                    |

**Thermal Resistance<sup>[2,4]</sup>:**

$$\theta_{jc} = 10^{\circ}\text{C/W}$$

### Notes:

1. Permanent damage may occur if any of these limits are exceeded.
2.  $T_{\text{Mounting Surface}} (T_{\text{MS}}) = 25^{\circ}\text{C}$ .
3. Derate at 100 mW/°C for  $T_{\text{Mounting Surface}} > 130^{\circ}\text{C}$ .
4. The small spot size of this technique results in a higher, though more accurate determination of  $\theta_{jc}$  than do alternate methods.

## Electrical Specifications<sup>[1]</sup>, $T_A = 25^{\circ}\text{C}$

| Symbol             | Parameters and Test Conditions <sup>[2]</sup> : $I_d = 325 \text{ mA}$ , $Z_o = 25 \Omega$ | Units | Min. | Typ.      | Max. |
|--------------------|--|-------|------|-----------|------|
| $G_P$              | Power Gain ( $ S_{21} ^2$ )<br>f = 1.0 GHz   | dB    |      | 8.5       |      |
| $\Delta G_P$       | Gain Flatness<br>f = 0.1 to 2.0 GHz  | dB    |      | $\pm 0.6$ |      |
| $f_{3 \text{ dB}}$ | 3 dB Bandwidth <sup>[3]</sup>  | GHz   |      | 2.6       |      |
| VSWR               | Input VSWR<br>f = 0.1 to 2.0 GHz   |       |      | 2.0:1     |      |
|                    | Output VSWR<br>f = 0.1 to 2.0 GHz  |       |      | 2.5:1     |      |
| NF                 | 25 $\Omega$ Noise Figure<br>f = 1.0 GHz  | dB    |      | 7.0       |      |
| $P_{1 \text{ dB}}$ | Output Power at 1 dB Gain Compression<br>f = 1.0 GHz                                       | dBm   |      | 27.0      |      |
| $IP_3$             | Third Order Intercept Point<br>f = 1.0 GHz   | dBm   |      | 37.0      |      |
| $t_D$              | Group Delay<br>f = 1.0 GHz   | psec  |      | 175       |      |
| $V_d$              | Device Voltage   | V     | 13.5 | 15.0      | 16.5 |
| dV/dT              | Device Voltage Temperature Coefficient   | mV/°C |      | -18.0     |      |

### Notes:

1. The recommended operating current range for this device is 150 to 400 mA. Typical performance as a function of current is on the following page.
2. RF performance of the chip is determined by packaging and testing 10 devices per wafer.
3. Referenced from 0.1 GHz gain ( $G_P$ ).

## Part Number Ordering Information

| Part Number  | Devices Per Tray |
|--------------|------------------|
| MSA-1000-GP4 | 100              |

**MSA-1000 Typical Scattering Parameters<sup>[1,2]</sup> ( $Z = 50 \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $I_d = 325 \text{ mA}$ )**

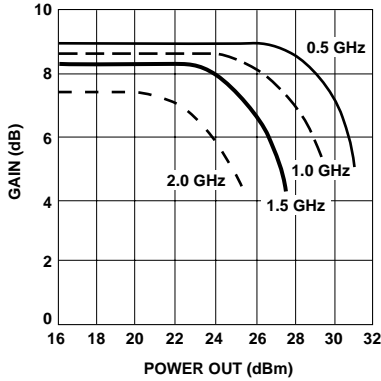
| Freq.<br>GHz | S <sub>11</sub> |      | S <sub>21</sub> |      |     | S <sub>12</sub> |      |     | S <sub>22</sub> |      | k    |
|--------------|-----------------|------|-----------------|------|-----|-----------------|------|-----|-----------------|------|------|
|              | Mag             | Ang  | dB              | Mag  | Ang | dB              | Mag  | Ang | Mag             | Ang  |      |
| 0.001        | .41             | -121 | 15.5            | 5.95 | 149 | -17.7           | .130 | 22  | .43             | -99  | 0.68 |
| 0.005        | .52             | -167 | 8.7             | 2.73 | 156 | -15.7           | .164 | 6   | .48             | -161 | 1.02 |
| 0.010        | .54             | -174 | 7.7             | 2.41 | 166 | -15.6           | .166 | 3   | .46             | -171 | 1.12 |
| 0.050        | .54             | -179 | 7.3             | 2.31 | 174 | -15.7           | .165 | 1   | .46             | -178 | 1.17 |
| 0.100        | .55             | 179  | 7.2             | 2.30 | 173 | -15.7           | .165 | -1  | .46             | -179 | 1.17 |
| 0.200        | .55             | 178  | 7.2             | 2.30 | 168 | -15.7           | .165 | -1  | .47             | 177  | 1.16 |
| 0.400        | .54             | 176  | 7.2             | 2.29 | 157 | -15.7           | .165 | -3  | .48             | 176  | 1.16 |
| 0.600        | .52             | 174  | 7.2             | 2.30 | 146 | -15.8           | .163 | -4  | .48             | 174  | 1.16 |
| 0.800        | .51             | 174  | 7.2             | 2.29 | 134 | -15.8           | .161 | -5  | .48             | 173  | 1.15 |
| 1.000        | .50             | 172  | 7.2             | 2.29 | 121 | -15.9           | .160 | -5  | .49             | 172  | 1.12 |
| 1.200        | .48             | 173  | 7.2             | 2.28 | 108 | -16.0           | .158 | -6  | .49             | 172  | 1.10 |
| 1.400        | .47             | 175  | 7.1             | 2.26 | 96  | -16.2           | .155 | -7  | .50             | 174  | 1.05 |
| 1.600        | .46             | 178  | 6.8             | 2.20 | 83  | -16.3           | .153 | -7  | .51             | 175  | 1.00 |
| 1.800        | .46             | 179  | 6.4             | 2.09 | 62  | -16.5           | .150 | -8  | .53             | 176  | 0.94 |
| 2.000        | .48             | -177 | 6.0             | 1.99 | 56  | -16.6           | .148 | -10 | .65             | -179 | 0.68 |
| 2.500        | .56             | -170 | 4.4             | 1.65 | 35  | -17.0           | .141 | -1  | .54             | 178  | .91  |
| 3.000        | .61             | -171 | 2.7             | 1.36 | 12  | -16.7           | .147 | 1   | .69             | -176 | .52  |

**Notes:**

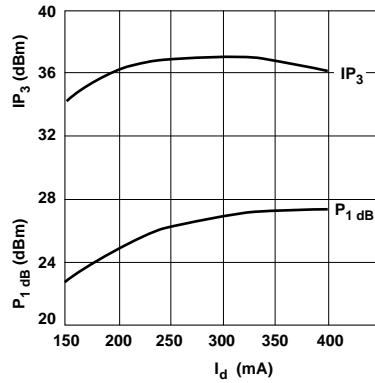
1. S-parameters are de-embedded from 100 mil BeO package measured data using the package model found in the DEVICE MODELS section.
2. S-parameter data assumes an external 80 pF capacitor. Low frequency performance can be extended using a larger valued capacitor.

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

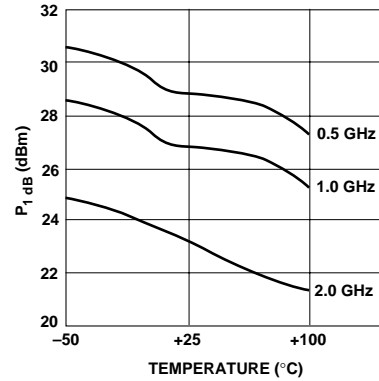
(unless otherwise noted)



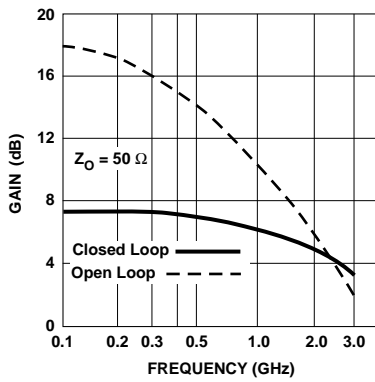
**Figure 1. Typical Gain vs. Power Out,  $Z_0 = 25 \Omega$ ,  $I_d = 325 \text{ mA}$ .**



**Figure 2. Output Power at 1 dB Gain Compression, Third Order Intercept Point vs. Current,  $Z_0 = 25 \Omega$ ,  $f=1.0\text{GHz}$ .**

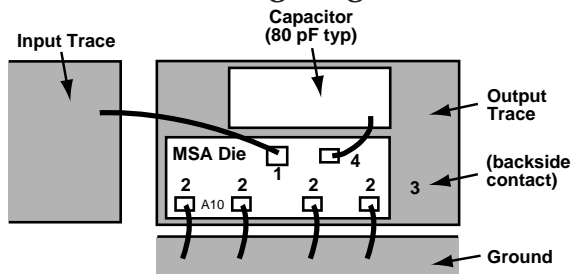


**Figure 3. Output Power at 1 dB Gain Compression vs. Case Temperature,  $Z_0 = 25 \Omega$ ,  $I_d = 325 \text{ mA}$ .**



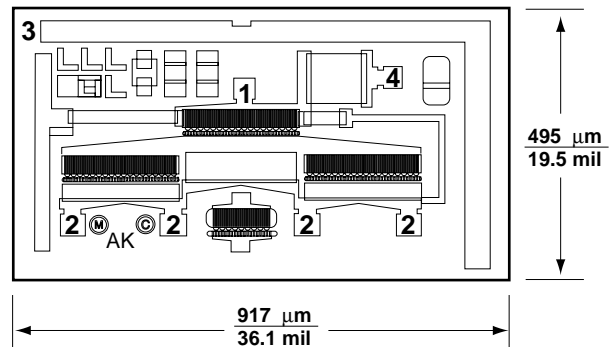
**Figure 4. Gain vs. Frequency,  $I_d = 325 \text{ mA}$ .**

## MSA-1000 Bonding Diagram



Numbers refer to pin contacts listed on the Chip Outline.

## MSA-1000 Chip Dimensions



Unless otherwise specified, tolerances are  $\pm 13 \mu\text{m}/\pm 0.5 \text{ mils}$ . Chip thickness is  $114 \mu\text{m}/4.5 \text{ mil}$ . Bond Pads are  $41 \mu\text{m}/1.6 \text{ mil}$  typical on each side.

Note 1: Output contact is made by die attaching the backside of the die.