

# M-Pulse Microwave

## Silicon Bipolar MMIC Cascadable Amplifier

## MP4TD1135, MP4TD1136

### Features

- High Dynamic Range Cascadable  
50Ω/75Ω Gain Block
- 3dB Bandwidth: 50 MHz to 1.0 GHz
- 17 dBm Typical  $P_{1dB}$  @ 0.7 GHz
- 11 dB Typical Gain @ 0.5 GHz
- 4.0 dB Typical Noise Figure @ 0.7 GHz
- Cost Effective Ceramic Microstrip Package
- Tape and Reel Packaging Available

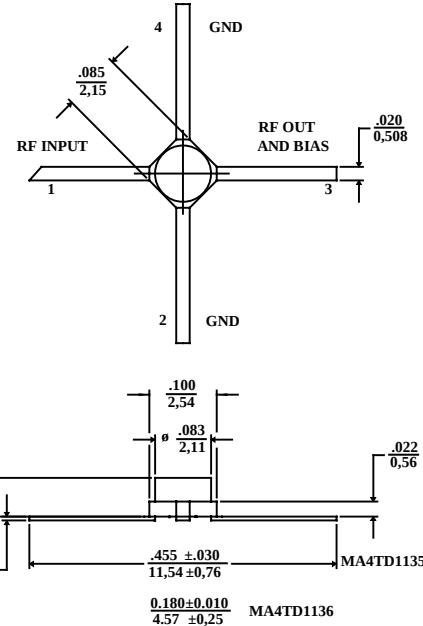
### Description

M-Pulse's MP4TD1135 and MP4TD1136 are high performance silicon bipolar MMICs housed in cost effective ceramic microstrip packages. The MP4TD1135 and MP4TD1136 are designed for use in 50Ω or 75Ω systems where a high dynamic range gain block is required. Typical applications include narrow and wide band IF and RF amplifiers in industrial and military applications.

The MP4TD1135 and MP4TD1136 are fabricated using a 10 GHz  $f_T$  silicon bipolar technology that features gold metallization and IC passivation for increased performance and reliability.

### Ceramic Microstrip Case Style Outlines<sup>1,2,3</sup>

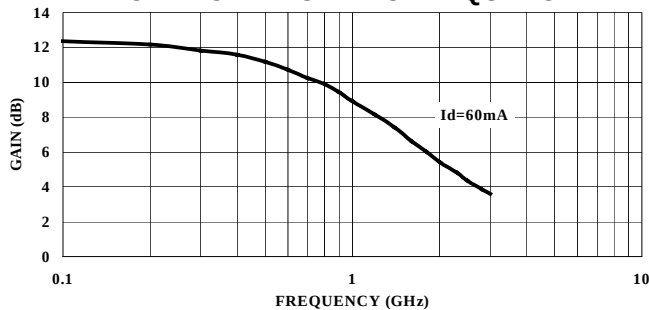
Available in short lead version as MP4TD1136.



Notes: (unless otherwise specified)

1. Dimensions are in / mm
2. Tolerance: in .xxx = ±.005; mm .xx = ±.13
3. See last page of data sheet for short lead Micro-X

### TYPICAL POWER GAIN vs FREQUENCY



### Pin Configuration

| Pin Number | Pin Description       |
|------------|-----------------------|
| 1          | RF Input              |
| 2 & 4      | AC/DC Ground          |
| 3          | RF Output and DC Bias |

### Electrical Specifications @ $T_A = +25^\circ\text{C}$ , $I_d = 60 \text{ mA}$ , $Z_0 = 50\Omega$

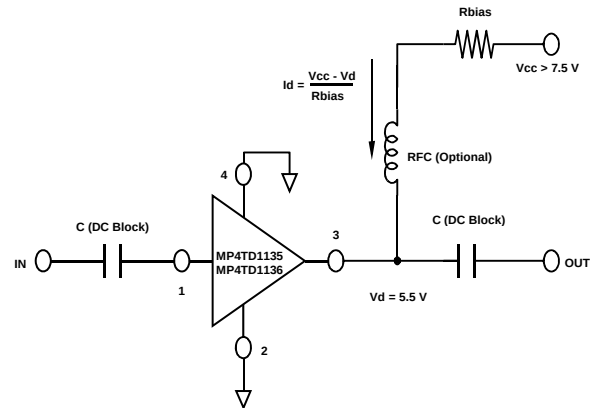
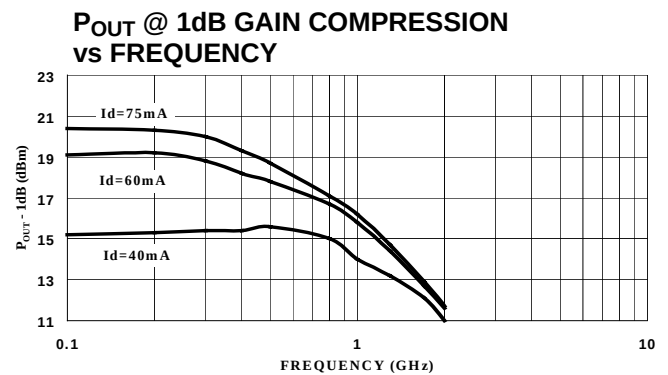
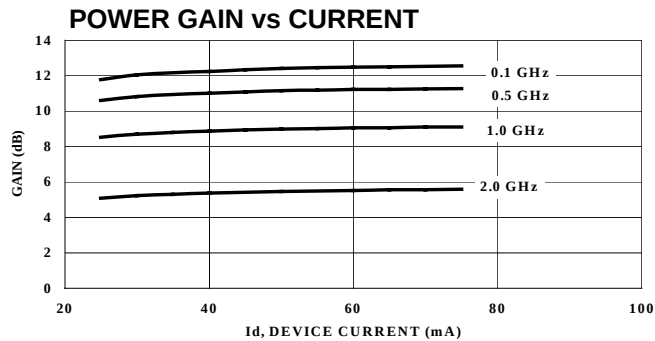
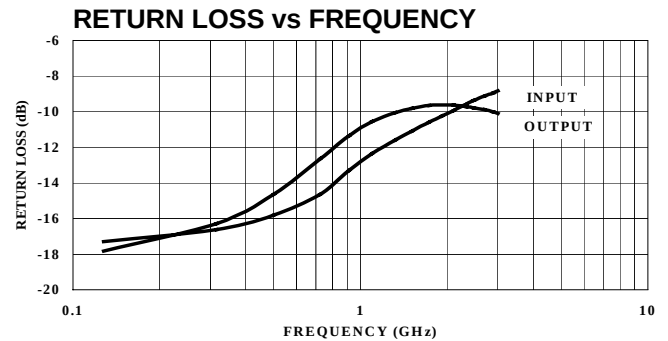
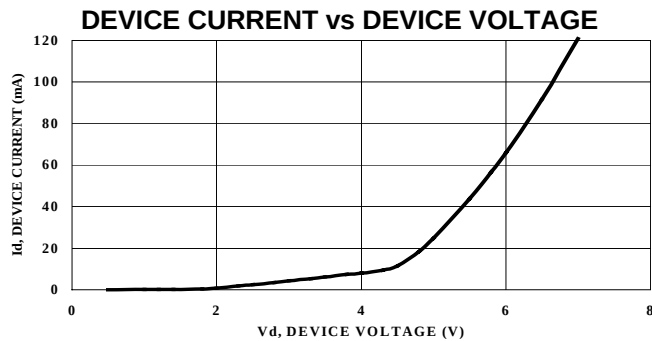
| Symbol       | Parameters                             | Test Conditions                       | Units | Min. | Typ.  | Max.  |
|--------------|----------------------------------------|---------------------------------------|-------|------|-------|-------|
| $G_p$        | Power Gain ( $ S_{21} ^2$ )            | $f = 0.1 \text{ GHz}$                 | dB    | 11.5 | 12.5  | 13.5  |
| $\Delta G_p$ | Gain Flatness                          | $f = 0.1 \text{ to } 0.7 \text{ GHz}$ | dB    | -    | ± 0.9 | ± 1.1 |
| $f_{3dB}$    | 3 dB Bandwidth                         | ref 50 MHz Gain                       | GHz   | -    | 1.0   | -     |
| $SWR_{in}$   | Input SWR                              | $f = 0.1 \text{ to } 2.0 \text{ GHz}$ | -     | -    | 2.0   | -     |
| $SWR_{out}$  | Output SWR                             | $f = 0.1 \text{ to } 2.0 \text{ GHz}$ | -     | -    | 1.9   | -     |
| $P_{1dB}$    | Output Power @ 1dB Gain Compression    | $f = 0.7 \text{ GHz}$                 | dBm   | 16.0 | 17.0  | -     |
| NF           | 50 Ω Noise Figure                      | $f = 0.7 \text{ GHz}$                 | dB    | -    | 4.0   | 4.5   |
| $IP_3$       | Third Order Intercept Point            | $f = 1.0 \text{ GHz}$                 | dBm   | -    | 30.0  | -     |
| $t_D$        | Group Delay                            | $f = 1.0 \text{ GHz}$                 | ps    | -    | 160   | -     |
| $V_d$        | Device Voltage                         | -                                     | V     | 4.5  | 5.5   | 6.5   |
| $dV/dT$      | Device Voltage Temperature Coefficient | -                                     | mV/°C | -    | -8.0  | -     |

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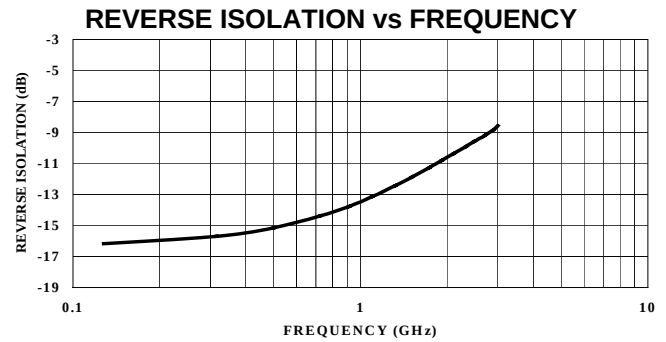
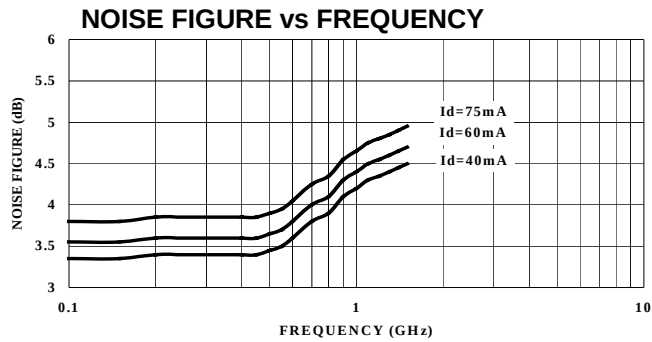
**Absolute Maximum Ratings<sup>1</sup>**

| Parameter                                                 | Absolute Maximum |
|-----------------------------------------------------------|------------------|
| Device Current                                            | 90 mA            |
| Power Dissipation <sup>2,3</sup>                          | 560 mW           |
| RF Input Power                                            | +20 dBm          |
| Junction Temperature                                      | 200°C            |
| Storage Temperature                                       | -65°C to +200°C  |
| Thermal Resistance: $\theta_{jC} = 135^{\circ}\text{C/W}$ |                  |

- Exceeding these limits may cause permanent damage.
- Case Temperature ( $T_C$ ) = 25 °C.
- Derate at 6.9 mW/°C for  $T_C > 124^{\circ}\text{C}$ .

**Typical Bias Configuration****Typical Performance Curves @  $I_D = 60\text{ mA}$ ,  $T_A = +25^{\circ}\text{C}$  (unless otherwise noted)**

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### Typical Scattering Parameters

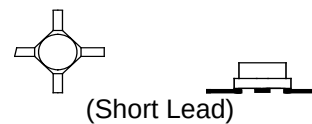
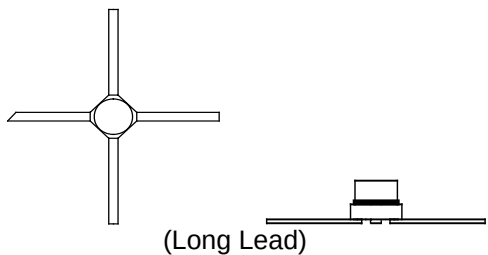
$Z_0 = 50\Omega$ ,  $T_A = +25^\circ\text{C}$ ,  $I_d = 60\text{ mA}$

| Frequency<br>(GHz) | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |       | S <sub>22</sub> |        |
|--------------------|-----------------|--------|-----------------|-------|-----------------|-------|-----------------|--------|
|                    | Mag.            | Angle  | Mag.            | Angle | Mag.            | Angle | Mag.            | Angle  |
| 0.05               | 0.133           | -104.9 | 4.23            | 157.5 | 0.152           | 14.4  | 0.120           | -98.7  |
| 0.1                | 0.134           | -106.7 | 4.19            | 156.2 | 0.154           | 14.8  | 0.124           | -100.6 |
| 0.2                | 0.140           | -112.4 | 4.05            | 151.7 | 0.158           | 16.2  | 0.137           | -106.6 |
| 0.3                | 0.148           | -118.6 | 3.90            | 146.8 | 0.164           | 17.7  | 0.153           | -113.1 |
| 0.4                | 0.153           | -123.0 | 3.79            | 143.2 | 0.168           | 18.8  | 0.165           | -120.2 |
| 0.5                | 0.162           | -129.9 | 3.62            | 137.8 | 0.174           | 20.5  | 0.185           | -125.1 |
| 0.6                | 0.172           | -137.3 | 3.44            | 131.2 | 0.182           | 22.4  | 0.208           | -132.8 |
| 0.7                | 0.185           | -144.4 | 3.25            | 124.7 | 0.190           | 24.6  | 0.233           | -140.8 |
| 0.8                | 0.198           | -148.7 | 3.12            | 120.4 | 0.196           | 26.3  | 0.249           | -145.3 |
| 0.9                | 0.216           | -154.6 | 2.95            | 114.4 | 0.205           | 28.4  | 0.271           | -151.4 |
| 1.0                | 0.232           | -159.8 | 2.79            | 108.8 | 0.214           | 30.3  | 0.287           | -156.8 |
| 1.5                | 0.279           | -179.0 | 2.23            | 89.4  | 0.254           | 35.8  | 0.323           | -175.4 |
| 2.0                | 0.314           | 164.8  | 1.88            | 74.3  | 0.294           | 38.7  | 0.331           | 169.7  |

### Ordering Information

| Long Lead Model No.     | Short Lead Model No.    | Package                  |
|-------------------------|-------------------------|--------------------------|
| MP4TD1135<br>MP4TD1135T | MP4TD1136<br>MP4TD1136T | Ceramic<br>Tape and Reel |

### Mico-X Case Styles



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