

# M-Pulse Microwave

## Silicon Bipolar MMIC Cascadable Amplifier

## MP4TD4135, MP4TD4136

### Features

- Cascadable 50Ω Gain Block
- 3dB Bandwidth: DC to 1.0 GHz
- 15.0 dB Typical Gain @ 0.5 GHz
- Unconditionally Stable ( $k > 1$ )
- 3.3 Volt Operation
- Cost Effective Ceramic Microstrip Package
- Tape and Reel Packaging Available

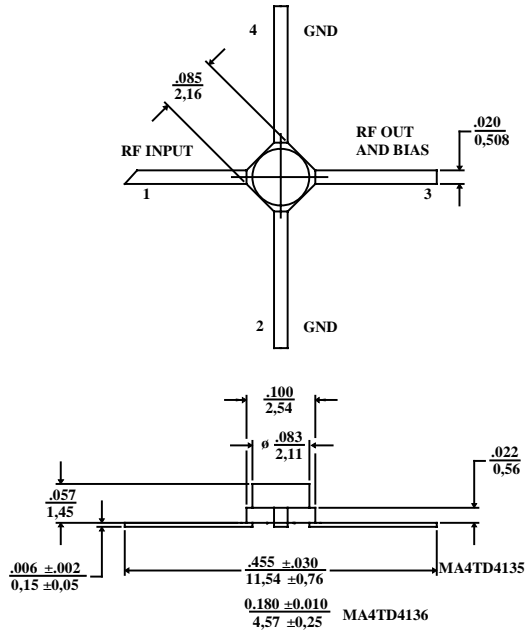
### Description

M-Pulse's MP4TD4135 and MP4TD4136 are high performance silicon bipolar MMICs housed in a cost effective ceramic microstrip packages. The MP4TD4135 and MP4TD4136 are designed for use where a general purpose 50Ω gain block is required. Typical applications include narrow and wide band IF and RF amplifiers in industrial and military applications.

The MP4TD4135 and MP4TD4136 are fabricated using a 10 GHz  $f_T$  silicon bipolar technology that features gold metalization and IC passivation for increased performance and reliability.

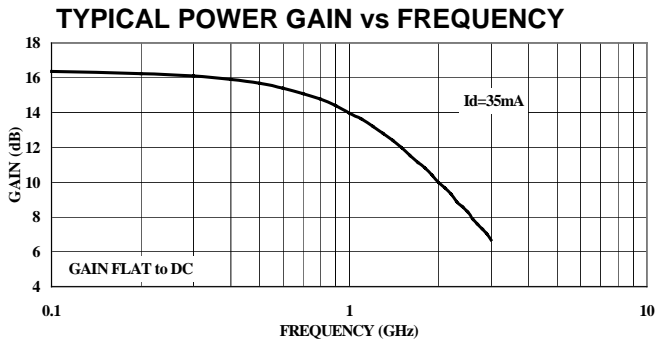
### Ceramic Microstrip Case Style Outlines<sup>1,2,3</sup>

Available in short lead version as MP4TD4136.



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



### Pin Configuration

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

### Electrical Specifications @ $T_A = +25^\circ\text{C}$ , $I_d = 35 \text{ mA}$ , $Z_0 = 50\Omega$

| Symbol             | Parameters                             | Test Conditions                       | Units | Min. | Typ.      | Max. |
|--------------------|--|---------------------------------------|-------|------|-----------|------|
| $G_p$              | Power Gain ( $ S_{21} ^2$ )            | $f = 0.1 \text{ GHz}$                 | dB    | 15.5 | 16.0      | 17.0 |
| $\Delta G_p$       | Gain Flatness                          | $f = 0.1 \text{ to } 0.9 \text{ GHz}$ | dB    | -    | $\pm 1.0$ | -    |
| $f_3 \text{ dB}$   | 3 dB Bandwidth                         | -                                     | GHz   | -    | 1.2       | -    |
| $\text{SWR}_{in}$  | Input SWR                              | $f = 0.1 \text{ to } 1.5 \text{ GHz}$ | -     | -    | 1.5       | -    |
| $\text{SWR}_{out}$ | Output SWR                             | $f = 0.1 \text{ to } 1.5 \text{ GHz}$ | -     | -    | 1.5       | -    |
| $P_{1\text{dB}}$   | Output Power @ 1dB Gain Compression    | $f = 1.0 \text{ GHz}$                 | dBm   | -    | 8.5       | -    |
| NF                 | 50 Ω Noise Figure                      | $f = 1.0 \text{ GHz}$                 | dB    | -    | 4.2       | -    |
| $\text{IP}_3$      | Third Order Intercept Point            | $f = 1.0 \text{ GHz}$                 | dBm   | -    | 19.0      | -    |
| $t_p$              | Group Delay                            | $f = 1.0 \text{ GHz}$                 | ps    | -    | 200       | -    |
| $V_d$              | Device Voltage                         | -                                     | V     | 2.8  | 3.3       | 3.7  |
| $dV/dT$            | Device Voltage Temperature Coefficient | -                                     | mV/°C | -    | -5.0      | -    |

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

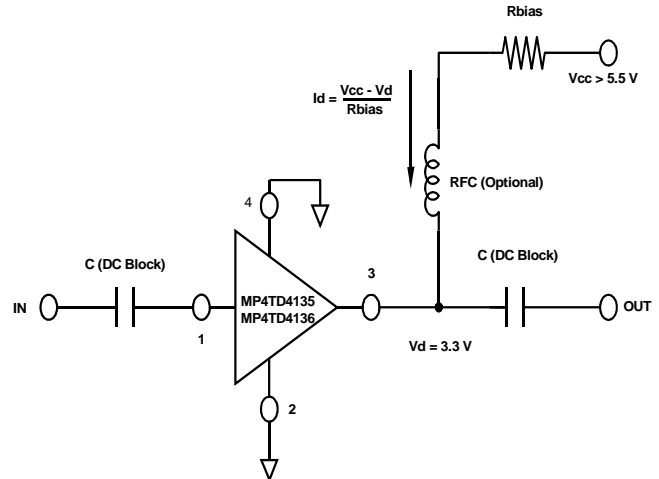
| Parameter | Absolute Maximum |
|-----------|------------------|
|-----------|------------------|

Specification Subject to Change Without Notice

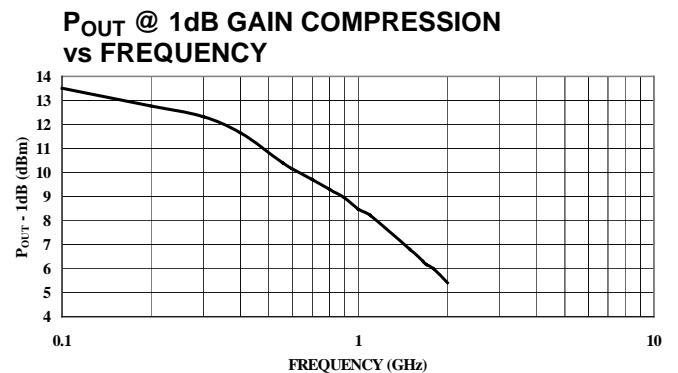
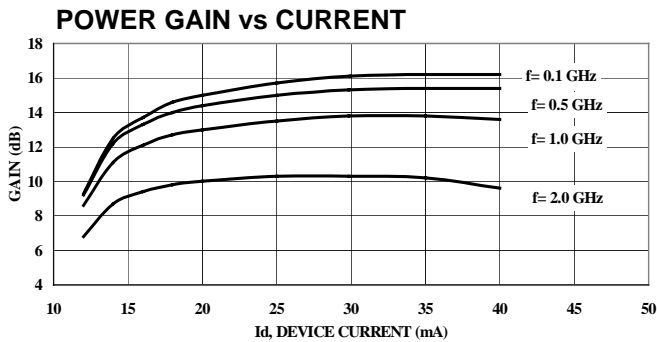
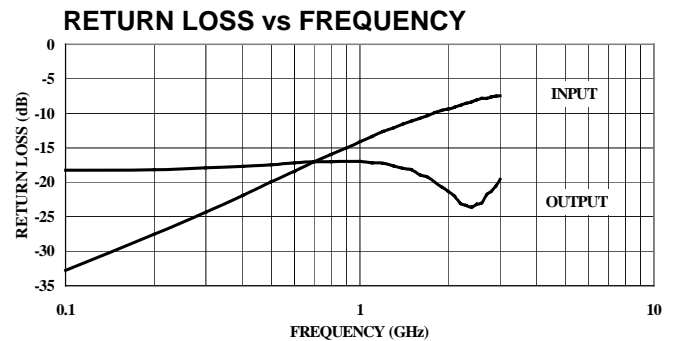
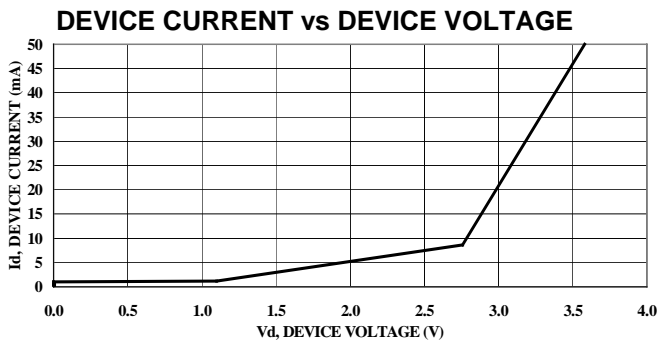
|  |                 |
|--|-----------------|
| Device Current   | 75 mA           |
| Power Dissipation <sup>2,3</sup>                                 | 200 mW          |
| RF Input Power   | +13 dBm         |
| Junction Temperature   | 200°C           |
| Storage Temperature  | -65°C to +200°C |
| Thermal Resistance: $\theta_{jc} = 150 \text{ }^\circ\text{C/W}$ |                 |

1. Exceeding these limits may cause permanent damage.
2. Case Temperature ( $T_c$ ) = 25 °C.
3. Derate at 6.7 mW/°C for  $T_c > 170^\circ\text{C}$ .

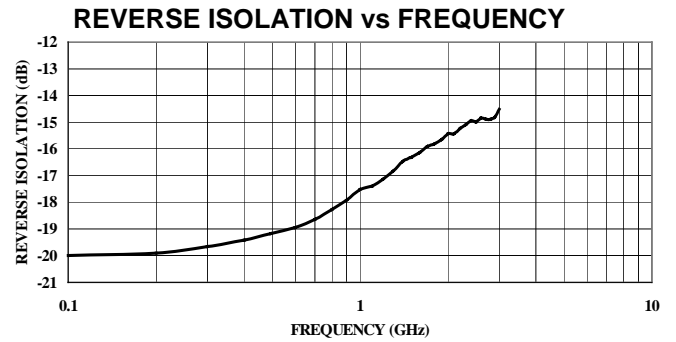
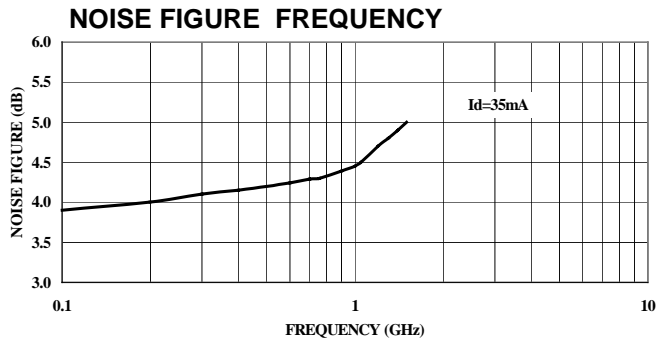
Typical Bias Configuration



Typical Performance Curves @  $I_d = 35 \text{ mA}$ ,  $T_A = +25^\circ\text{C}$  (unless otherwise noted)



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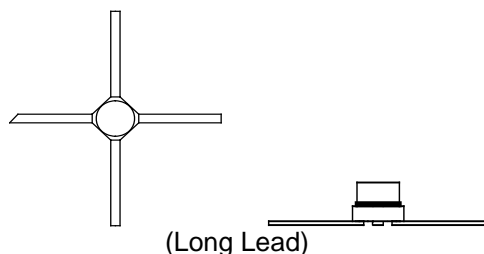
**Typical Scattering Parameters**  
 $Z_0 = 50\Omega$ ,  $T_A = +25^\circ\text{C}$ ,  $I_d = 35\text{ mA}$

| Frequency (GHz) | S11   |        | S21  |       | S12   |       | S22   |        |
|-----------------|-------|--------|------|-------|-------|-------|-------|--------|
|                 | Mag.  | Angle  | Mag. | Angle | Mag.  | Angle | Mag   | Angle  |
| 0.1             | 0.023 | -59.7  | 6.58 | 172.2 | 0.100 | 3.3   | 0.122 | -15.0  |
| 0.2             | 0.042 | -80.2  | 6.49 | 164.7 | 0.101 | 6.1   | 0.123 | -30.9  |
| 0.3             | 0.061 | -90.0  | 6.38 | 157.4 | 0.104 | 9.0   | 0.127 | -43.7  |
| 0.4             | 0.080 | -98.0  | 6.24 | 150.2 | 0.107 | 11.3  | 0.130 | -59.2  |
| 0.5             | 0.101 | -102.5 | 6.08 | 143.4 | 0.110 | 13.2  | 0.134 | -72.1  |
| 0.6             | 0.120 | -107.1 | 5.89 | 136.6 | 0.113 | 15.3  | 0.138 | -85.3  |
| 0.7             | 0.141 | -111.9 | 5.68 | 129.8 | 0.117 | 17.2  | 0.141 | -96.9  |
| 0.8             | 0.159 | -115.8 | 5.49 | 123.5 | 0.122 | 18.2  | 0.141 | -107.6 |
| 0.9             | 0.177 | -120.8 | 5.25 | 117.6 | 0.127 | 19.2  | 0.142 | -114.8 |
| 1.0             | 0.196 | -124.6 | 4.99 | 111.6 | 0.133 | 19.8  | 0.142 | -124.8 |
| 1.5             | 0.278 | -144.6 | 3.97 | 86.7  | 0.153 | 19.9  | 0.123 | -152.7 |
| 2.0             | 0.338 | -161.6 | 3.15 | 66.8  | 0.169 | 18.0  | 0.086 | -165.2 |
| 2.5             | 0.394 | -175.3 | 2.60 | 51.1  | 0.178 | 16.3  | 0.069 | -146.3 |
| 3.0             | 0.424 | 172.6  | 2.16 | 38.3  | 0.188 | 14.3  | 0.105 | -133.6 |

**Ordering Information**

| Long Lead Model No. | Short Lead Model No. | Package                  |
|---------------------|----------------------|--------------------------|
| MP4TD4135           | MP4TD4136            | Ceramic<br>Tape and Reel |
| MP4TD4135T          | MP4TD4136T           |                          |

**Mico-X Case Styles**



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