

# M-Pulse Microwave

## Silicon Bipolar MMIC Cascadable Amplifier

# MP4TD0700

V4.00

### Features

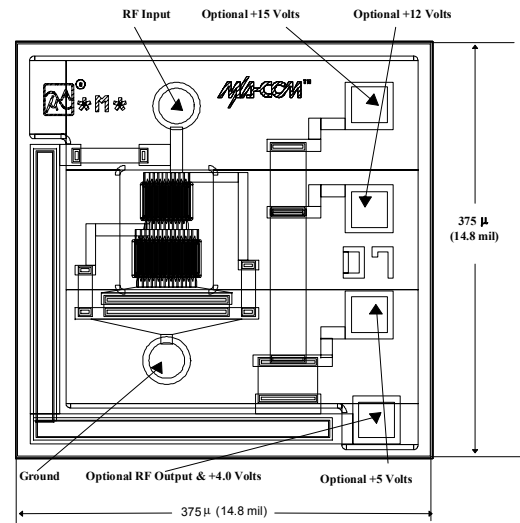
- Cascadable 50Ω Gain Block
- Low Operating Voltage (4.0 V Typical Vd)
- 3dB Bandwidth: DC to 2.0 GHz
- 11.5 dB Typical Gain @ 1.0 GHz
- Unconditionally Stable ( $k > 1$ )

### Description

M-Pulse's MP4TD0700 is a high performance silicon bipolar MMIC chip. The MP4TD0700 is 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 MP4TD0700 is fabricated using a 10 GHz  $f_T$  silicon bipolar technology that features gold metalization and IC passivation for increased performance and reliability.

### Chip Outline Drawing<sup>1,2,3,4</sup>

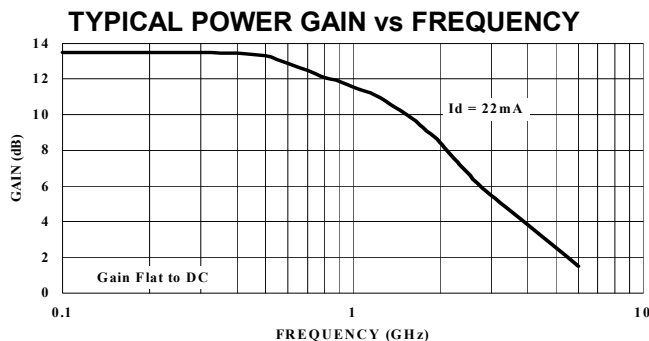


#### Notes: (unless otherwise specified)

1. Chip Thickness is 120 μm; 4.8 mils
2. Bond Pads are 40 μm; 1.6 mils typical in diameter
3. Output Contact & +DC Voltage Is Normally Made On Backside Of Chip At Die Attach
4. Tolerance: μm .xx = ±.13; mil .x = ±.5

### Ordering Information

| Model No.  | Type of Carrier |
|------------|-----------------|
| MP4TD0700G | GEL PACK        |
| MP4TD0700W | Waffle Pack     |



### Electrical Specifications @ $T_A = +25^\circ\text{C}$ , $I_D = 22 \text{ mA}$ ; $Z_0 = 50\Omega$

| Symbol             | Parameters                             | Test Conditions    | Units | Min. | Typ.  | Max. |
|--------------------|--|--------------------|-------|------|-------|------|
| Gp                 | Power Gain ( $ S_{21} ^2$ )            | f = 0.1 GHz        | dB    | -    | 13.5  | -    |
| $\Delta G_p$       | Gain Flatness                          | f = 0.1 to 1.0 GHz | dB    | -    | ± 0.6 | -    |
| $f_{3dB}$          | 3 dB Bandwidth                         | -                  | GHz   | -    | 1.5   | -    |
| SWR <sub>in</sub>  | Input SWR                              | f = 0.1 to 2.0 GHz | -     | -    | 1.6   | -    |
| SWR <sub>out</sub> | Output SWR                             | f = 0.1 to 2.0 GHz | -     | -    | 1.5   | -    |
| P <sub>1dB</sub>   | Output Power @ 1dB Gain Compression    | f = 1.0 GHz        | dBm   | -    | 5.5   | -    |
| NF                 | 50 Ω Noise Figure                      | f = 1.0 GHz        | dB    | -    | 4.5   | -    |
| IP <sub>3</sub>    | Third Order Intercept Point            | f = 1.0 GHz        | dBm   | -    | 19.0  | -    |
| t <sub>p</sub>     | Group Delay                            | f = 1.0 GHz        | ps    | -    | 140   | -    |
| V <sub>d</sub>     | Device Voltage                         | -                  | V     | 3.6  | 4.0   | 4.4  |
| dV/dT              | Device Voltage Temperature Coefficient | -                  | mV/°C | -    | -7.0  | -    |

Specification Subject to Change Without Notice

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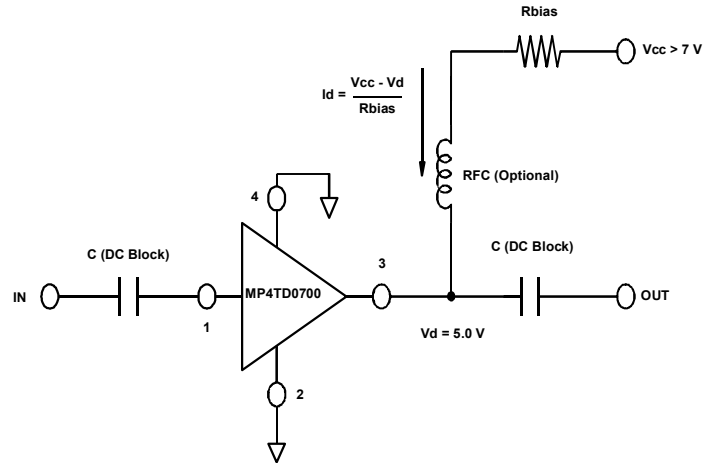
PH (408) 432-1480 FX (408) 432-3440

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

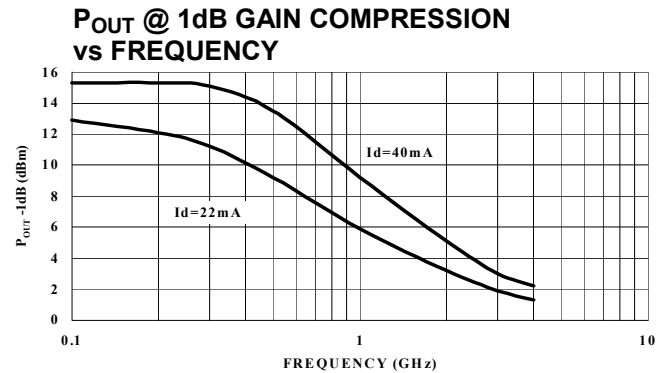
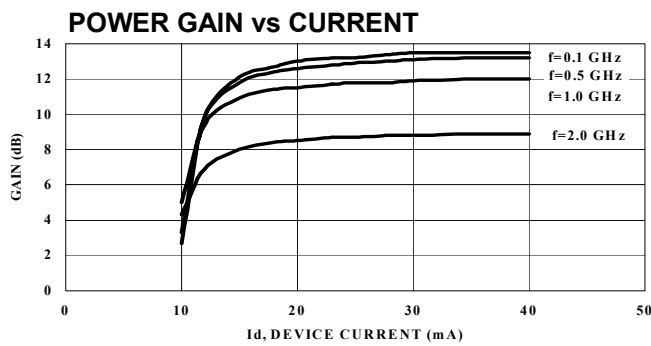
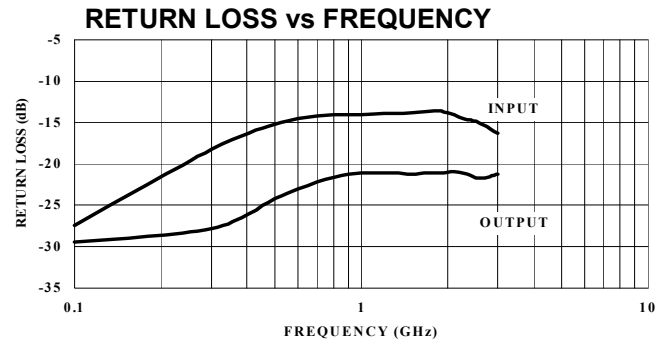
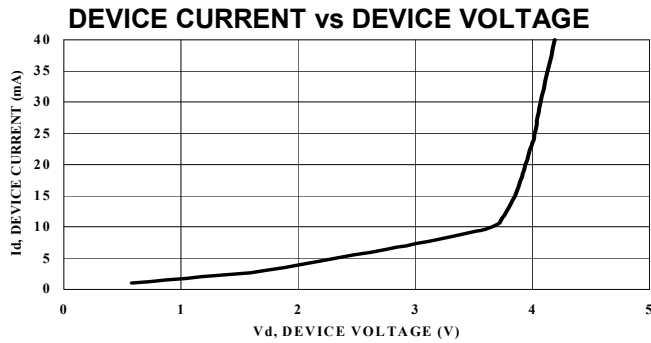
| Parameter   | Absolute Maximum |
|---|------------------|
| Device Current  | 80 mA            |
| Power Dissipation <sup>2,3</sup>                        | 275 mW           |
| RF Input Power  | +13 dBm          |
| Junction Temperature                                    | 200°C            |
| Storage Temperature                                     | -65°C to +200°C  |
| Thermal Resistance: $\theta_{jms} = 50^\circ\text{C/W}$ |                  |

1. Exceeding these limits may cause permanent damage.
2. Mounting Surface Temperature ( $T_{MS}$ ) = 25 °C.
3. Derate at 20 mW/°C for  $T_{MS} > 186^\circ\text{C}$

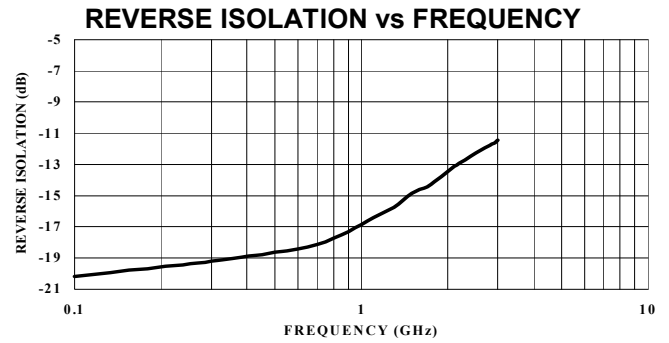
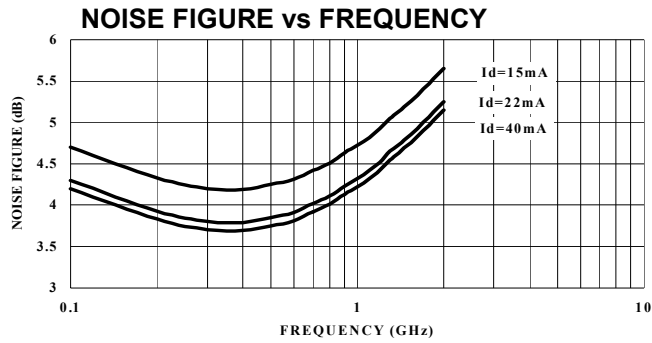
**Typical Bias Configuration**



**Typical Performance Curves @  $I_d = 22\text{ mA}$ ,  $T_A = +25^\circ\text{C}$  (unless otherwise noted)**



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**Typical Scattering Parameters**

Z<sub>0</sub> = 50Ω, T<sub>A</sub> = +25°C, I<sub>d</sub> = 22 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  |
| 0.1                | 0.042           | 96.5  | 4.73            | 171.5 | 0.098           | 9.3   | 0.033           | -52.9  |
| 0.2                | 0.082           | 97.3  | 4.72            | 164.3 | 0.104           | 6.2   | 0.034           | -56.2  |
| 0.4                | 0.153           | 107.3 | 4.70            | 150.9 | 0.116           | 15.6  | 0.051           | -80.9  |
| 0.6                | 0.185           | 116.5 | 4.27            | 136.9 | 0.121           | 20.6  | 0.071           | -103.6 |
| 0.8                | 0.198           | 128.5 | 4.03            | 122.4 | 0.132           | 25.7  | 0.083           | -115.6 |
| 1.0                | 0.200           | 139.6 | 3.85            | 110.7 | 0.143           | 29.0  | 0.087           | -123.9 |
| 1.5                | 0.203           | 165.4 | 3.24            | 86.3  | 0.180           | 34.7  | 0.086           | -138.1 |
| 2.0                | 0.200           | 173.6 | 2.64            | 60.3  | 0.215           | 35.7  | 0.088           | -150.0 |
| 2.5                | 0.180           | 174.2 | 2.16            | 46.9  | 0.243           | 33.0  | 0.082           | -163.7 |
| 3.0                | 0.152           | 162.8 | 1.86            | 33.5  | 0.267           | 31.8  | 0.087           | -163.6 |
| 3.5                | 0.123           | 144.0 | 1.69            | 20.5  | 0.296           | 30.3  | 0.119           | -166.8 |
| 4.0                | 0.149           | 101.8 | 1.50            | 114.8 | 0.318           | 27.9  | 0.139           | -171.4 |
| 4.5                | 0.250           | 84.1  | 1.45            | 4.7   | 0.355           | 25.8  | 0.183           | -170.8 |
| 5.0                | 0.337           | 79.6  | 1.34            | -2.9  | 0.389           | 21.7  | 0.229           | -175.4 |
| 6.0                | 0.485           | 72.4  | 1.19            | -12.9 | 0.456           | 16.5  | 0.272           | 178.3  |

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