M-Pulse Microwave

Silicon Bipolar MMIC
## Cascadable Amplifier   MP4TD0920

Features
• Cascadable 50Ω Gain Block
• 3dB Bandwidth: DC to 4.0 GHz
• 7.5 dB Typical Gain @ 1.0 GHz
• Low SWR: <1.6:1 from 0.1 to 3.0 GHz
• Hermetic Gold-BeO Microstrip Package
• The 20 package allows higher power operation

Description
M-Pulse's MP4TD0920 is a high performance silicon bipolar MMIC housed in a hermetic high reliability package. The MP4TD0920 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 20 style package is a superior thermal dissipation package. This allows larger DC Current and the resultant improvement in ouput power and P_{1dB} performance than that available from the packages for this chip.

The MP4TD0920 is fabricated using a 10 GHz f_T silicon bipolar technology that features gold metalization and IC passivation for increased performance and reliability.

TYPICAL POWER GAIN vs FREQUENCY
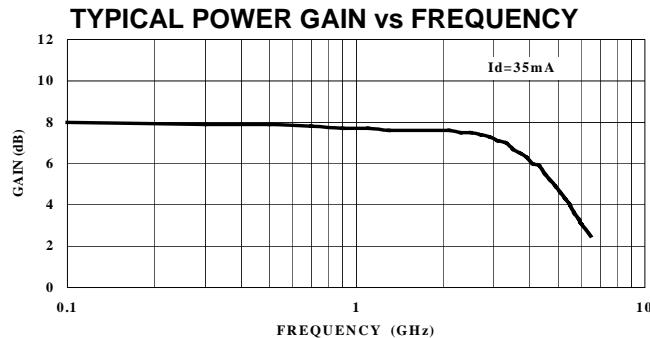
Gold-BeO Microstrip Package Outline[1,2]
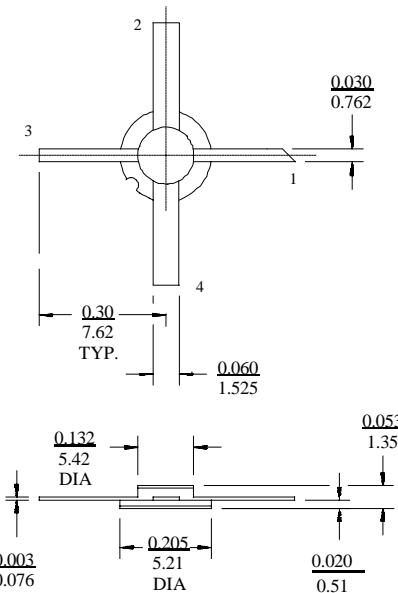
Notes: (unless otherwise specified)
1.   Dimensions are in / mm
2.   Tolerance: in .xxx = ±.005; mm .xx = ±.13

Pin Configuration

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

Ordering Information

Model No.	Package
MP4TD0920	BeO Ceramic

Electrical Specifications @ T_A = +25°C, I_d = 35 mA, Z_0 = 50Ω

Symbol	Parameters	Test Conditions	Units	Min.	Typ.	Max.
Gp	Power Gain ($|S_{21}|^2$)	f = 0.1 GHz	dB	6.5	7.5	8.5
ΔGp	Gain Flatness	f = 0.1 to 2.0 GHz	dB	-	±0.5	±0.7
$f_{3\,dB}$	3 dB Bandwidth	-	GHz	-	4.0	-
SWR_{in}	Input SWR	f = 0.1 to 3.0 GHz	-	-	1.4	-
SWR_{out}	Output SWR	f = 0.1 to 3.0 GHz	-	-	1.6	-
$P_{1\,dB}$	Output Power @ 1 dB Gain Compression	f = 1.0 GHz	dBm	-	11.5	-
NF	50 Ω Noise Figure	f = 1.0 GHz	dB	-	6.0	-
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm	-	23.0	-
t_D	Group Delay	f = 1.0 GHz	ps	-	100	-
V_d	Device Voltage	-	V	7.0	7.8	8.6
dV/dT	Device Voltage Temperature Coefficient	-	mV/°C	-	-16.0	-

Absolute Maximum Ratings[1]

Parameter	Absolute Maximum
Device Current	80 mA
Power Dissipation[2],[3]	750 mW
RF Input Power	+20 dBm
Junction Temperature	200°C
Storage Temperature	-65°C to +150°C
Thermal Resistance: θ_{jc} = 145°C/W	

1. Exceeding these limits may cause permanent damage.
2. Case Temperature (Tc) = 25 °C.
3. Derate at 6.9 mW/°C for Tc > 91°C.

Typical Bias Configuration

$$Id = \frac{Vcc - Vd}{Rbias}$$

Vcc > 10 V

Rbias

RFC (Optional)

C (DC Block)

C (DC Block)

IN

MP4TD0920

OUT

Vd = 7.8 V

1

2

3

4
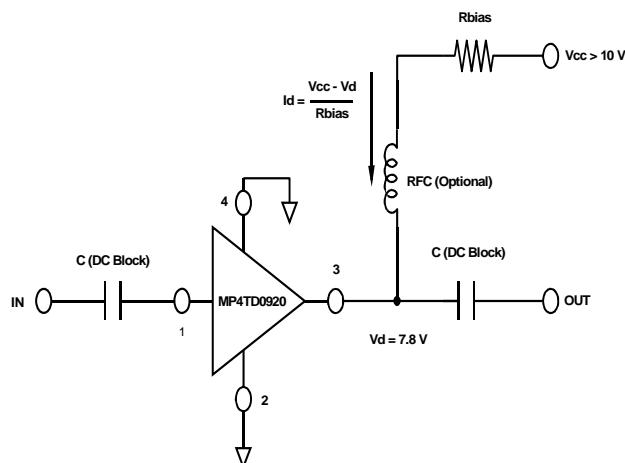
Typical Performance Curves @ I_d = 35 mA, T_A = +25°C (unless otherwise noted)

DEVICE CURRENT DEVICE VOLTAGE

RETURN LOSS vs FREQUENCY

POWER GAIN vs CURRENT

P_{OUT} @ 1dB GAIN COMPRESSION vs FREQUENCY

NOISE FIGURE vs FREQUENCY

REVERSE ISOLATION vs FREQUENCY
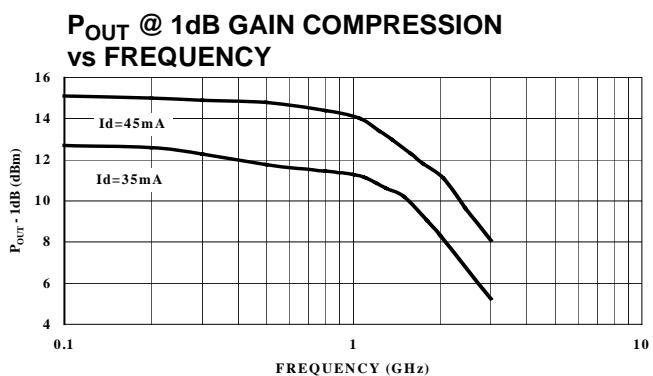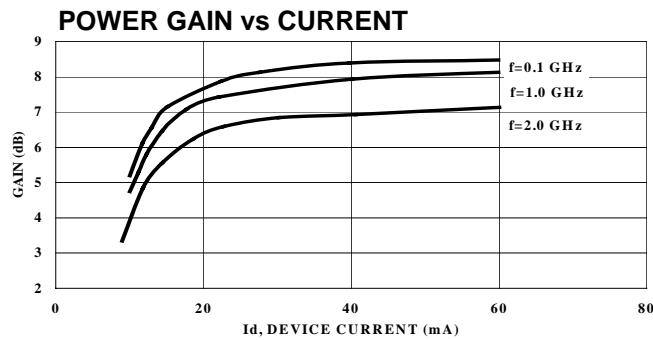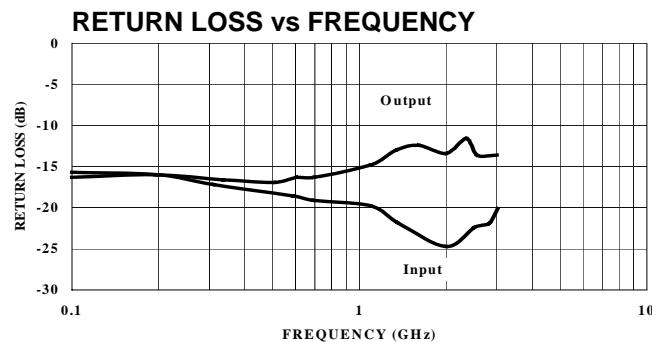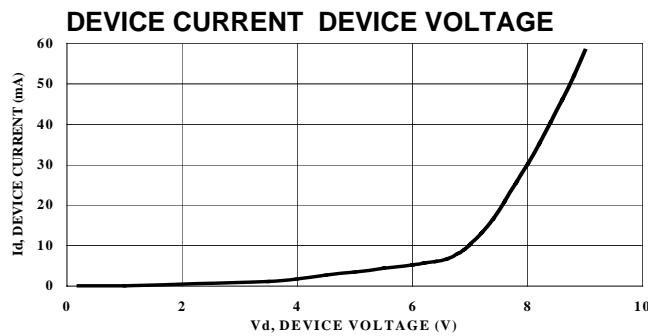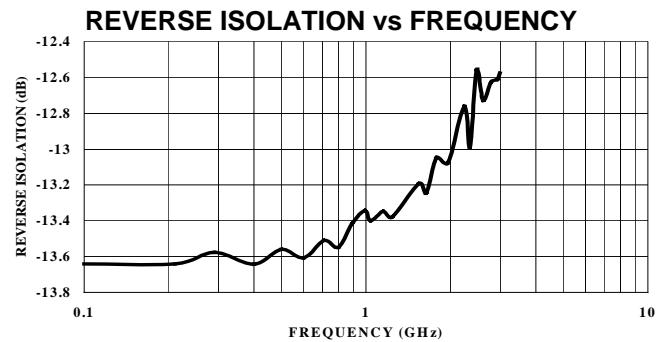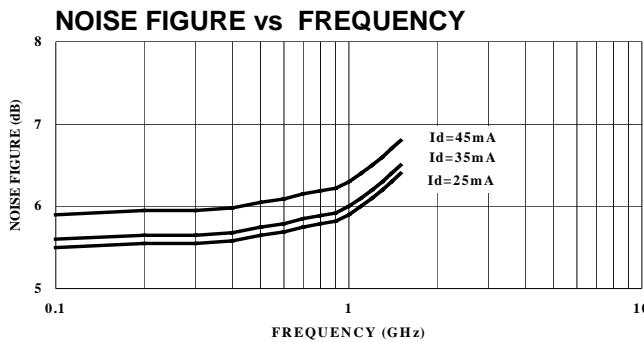
Typical Scattering Parameters

$Z_0 = 50\Omega$, $T_A = +25°C$, $I_d = 35$ mA

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
0.1	0.164	-148.8	2.60	164.8	0.208	4.9	0.17	-143.6
0.2	0.149	-164.2	2.53	165.5	0.208	2.9	0.15	-156.2
0.3	0.144	-170.5	2.52	162.8	0.209	2.4	0.15	-159.6
0.4	0.139	-173.4	2.50	159.2	0.208	2.7	0.15	-160.4
0.5	0.135	-174.2	2.49	155.5	0.210	3.2	0.15	-161.5
0.6	0.128	-177.0	2.48	151.6	0.209	3.1	0.16	-161.2
0.7	0.124	-178.1	2.47	147.4	0.211	3.2	0.16	-161.5
0.8	0.120	-178.9	2.46	143.4	0.211	2.8	0.17	-161.8
0.9	0.113	-178.8	2.45	139.4	0.214	3.9	0.17	-162.4
1.0	0.109	179.5	2.45	135.2	0.215	3.9	0.18	-162.5
1.1	0.098	178.6	2.42	131.1	0.214	3.5	0.18	-163.2
1.2	0.095	178.2	2.40	127.3	0.216	4.1	0.19	-164.6
1.3	0.094	179.5	2.39	123.5	0.215	4.2	0.20	-165.0
1.4	0.094	-178.4	2.38	119.1	0.216	4.2	0.21	-165.5
1.5	0.090	-174.7	2.36	114.9	0.219	4.2	0.21	-164.7
1.6	0.082	-170.0	2.33	110.9	0.218	4.0	0.21	-166.3
1.7	0.074	-162.9	2.32	107.7	0.220	4.3	0.20	-165.5
1.8	0.068	-160.2	2.32	103.8	0.223	4.2	0.19	-167.6
1.9	0.066	-157.2	2.28	99.8	0.223	4.6	0.19	-170.1
2.0	0.060	-163.8	2.25	96.9	0.223	5.0	0.19	-174.4
2.1	0.060	-162.5	2.26	93.1	0.224	5.1	0.20	-177.7
2.2	0.065	-162.8	2.21	89.1	0.226	4.6	0.21	-178.0
2.3	0.070	-166.2	2.17	85.9	0.230	4.7	0.22	-177.9
2.4	0.078	-165.8	2.15	83.1	0.224	4.0	0.22	-177.2
2.5	0.076	-162.0	2.16	79.5	0.229	4.3	0.20	-177.1
2.6	0.080	-161.5	2.13	75.6	0.236	4.0	0.19	-177.7
2.7	0.084	-162.4	2.08	92.1	0.230	3.7	0.19	-177.3
2.8	0.077	-166.0	2.04	70.1	0.234	3.8	0.19	-179.4
2.9	0.087	-166.4	2.05	66.6	0.234	4.6	0.19	-177.4
3.0	0.104	-169.4	2.01	63.1	0.236	3.4	0.20	-177.4