M-Pulse Microwave

Silicon Bipolar MMIC Cascadable Amplifier

MP4TD0470

Features

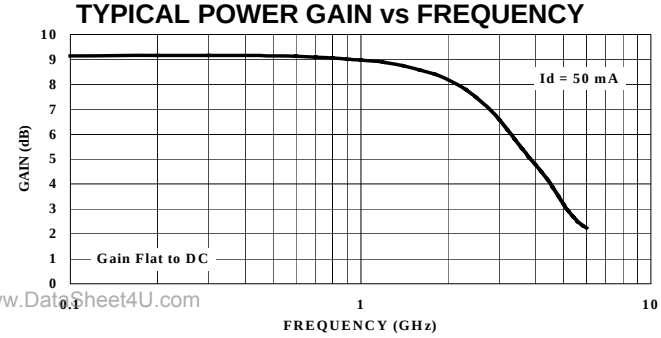
- Cascadable 50Ω Gain Block
- 3dB Bandwidth: DC to 3.0 GHz
- 9.0 dB Typical Gain @ 1.0 GHz
- Unconditionally Stable (k>1)
- Hermetic Gold-Ceramic Microstrip Package
- Tape and Reel Packaging Available

Description

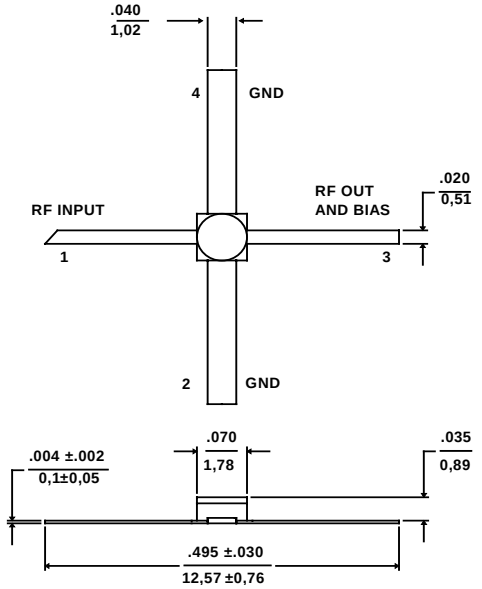
M-Pulse's MP4TD0470 is a high performance silicon bipolar MMIC housed in a hermetic high reliability package for surface mount usage. The MP4TD0470 is useful where a general purpose 50Ω gain block with moderate (+16dBm) gain compression is required. Typical applications include narrow and wide band IF and RF amplifiers in industrial and military applications.

The MP4TD0470 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-Ceramic 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
MP4TD0470	Hermetic Ceramic
MP4TD0470T	Tape and Reel

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

Symbol	Parameters	Test Conditions	Units	Min.	Typ.	Max.
Gp	Power Gain ($\|S_{21}\|^2$)	f = 0.1 GHz	dB	8.0	9.0	9.5
ΔGp	Gain Flatness	f = 0.1 to 2.0 GHz	dB	-	±0.6	±1.0
$f_{3\ dB}$	3 dB Bandwidth	-	GHz	-	3.0	-
SWRin	Input SWR	f = 0.1 to 3.0 GHz	-	-	1.6	-
SWRout	Output SWR	f = 0.1 to 3.0 GHz	-	-	1.7	-
P_{1dB}	Output Power @ 1 dB Gain Compression	f = 1.0 GHz	dBm	-	12.5	-
NF	50 Ω Noise Figure	f = 1.0 GHz	dB	-	6.3	-
IP_3	Third Order Intercept Point	f = 1.0 GHz	dBm	-	25.5	-
t_D	Group Delay	f = 1.0 GHz	ps	-	125	-
Vd	Device Voltage	-	V	4.75	5.25	5.75
dV/dT	Device Voltage Temperature Coefficient	-	mV/°C	-	-8.0	-

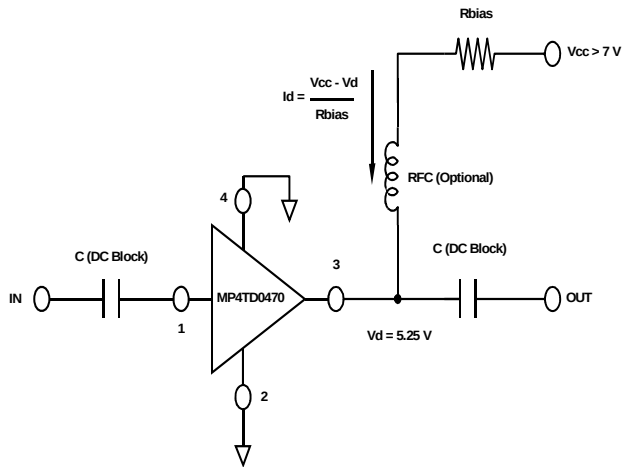
PH (408) 432-1480 FX (408) 432-3440

Absolute Maximum Ratings[1]

Parameter	Absolute Maximum
Device Current	100 mA
Power Dissipation[2,3]	650 mW
RF Input Power	+13 dBm
Junction Temperature	150°C
Storage Temperature	-65°C to +200°C
Thermal Resistance: θ_{jc} = 140 °C/W	

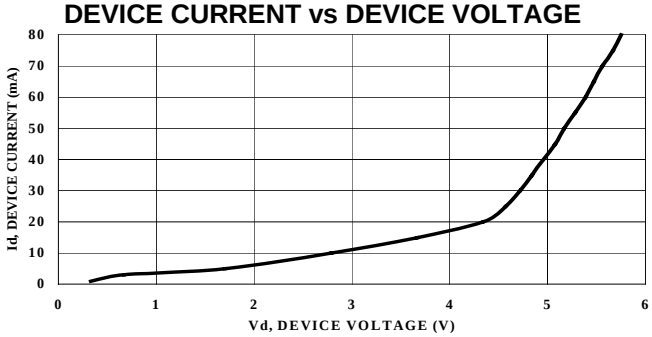
1. Exceeding these limits may cause permanent damage.
2. Case Temperature (Tc) = 25 °C.
3. Derate at 7.1 mW/°C for Tc > 109°C.

Typical Bias Configuration

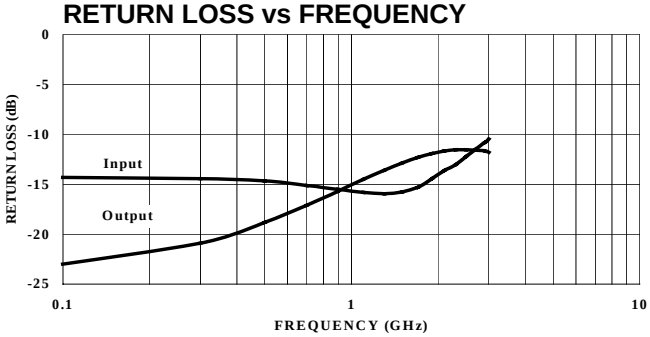


Typical Performance Curves @ I_d = 50 mA, T_A = +25°C (unless otherwise noted)

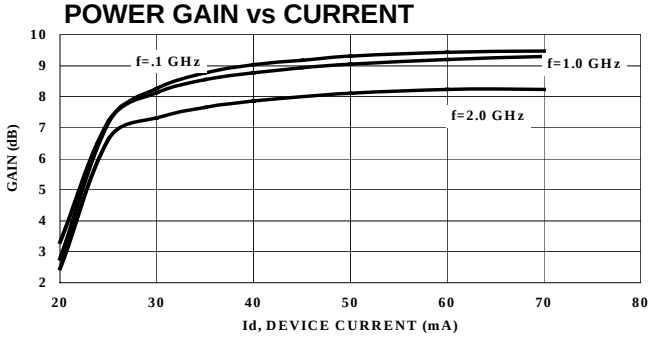
DEVICE CURRENT vs DEVICE VOLTAGE



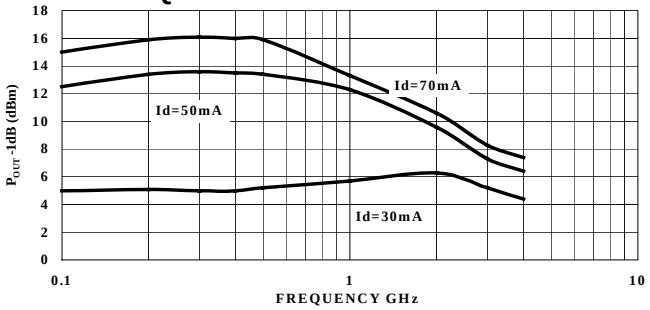
RETURN LOSS vs FREQUENCY



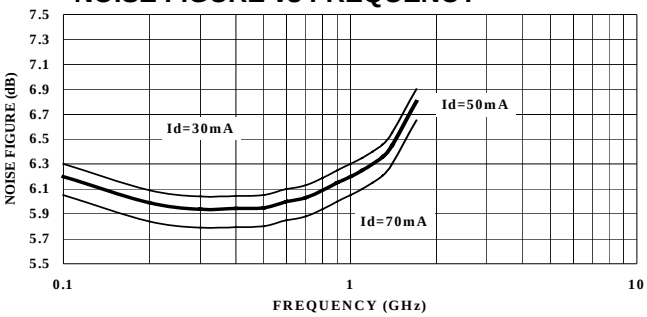
POWER GAIN vs CURRENT



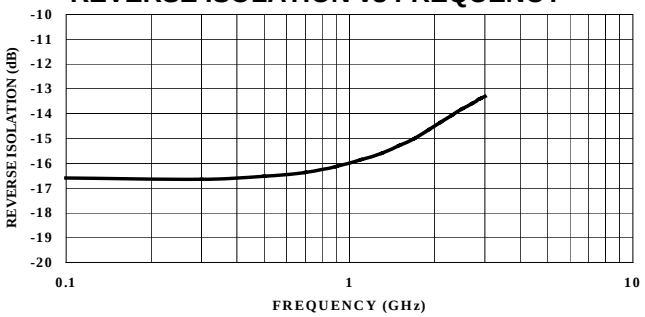
P_{OUT} @ -1DB GAIN COMPRESSION vs FREQUENCY



NOISE FIGURE vs FREQUENCY



REVERSE ISOLATION vs FREQUENCY



Typical Scattering Parameters

Z_0 = 50Ω, T_A = +25°C, I_d = 50 mA

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
(GHz)	Mag.	Angle	Mag.	Angle	Mag.	Angle	Mag	Angle
0.1	0.192	169.4	2.86	174.6	0.148	4.9	0.070	3.8
0.2	0.191	170.2	2.86	171.9	0.147	5.4	0.079	-12.4
0.4	0.188	171.7	2.86	164.9	0.147	7.3	0.102	-47.9
0.6	0.180	170.6	2.85	157.3	0.150	10.4	0.128	-73.9
0.8	0.171	169.6	2.83	149.8	0.154	13.8	0.153	-90.2
1.0	0.165	170.1	2.80	142.4	0.158	17.0	0.177	-102.2
1.5	0.163	176.1	2.71	124.2	0.172	24.0	0.228	-126.3
2.0	0.199	-178.6	2.57	106.6	0.188	28.6	0.258	-146.0
2.5	0.245	179.8	2.37	88.7	0.204	31.4	0.266	-161.5
3.0	0.300	173.3	2.14	75.6	0.216	33.8	0.258	-171.2
3.5	0.355	163.9	1.91	64.4	0.228	35.5	0.253	-177.6
4.0	0.407	153.3	1.73	55.0	0.234	37.2	0.251	178.5
4.5	0.456	142.3	1.58	46.2	0.241	40.3	0.262	176.4
5.0	0.508	131.2	1.44	39.1	0.252	42.8	0.279	173.8