

# Ka-Band Power GaAs MESFET

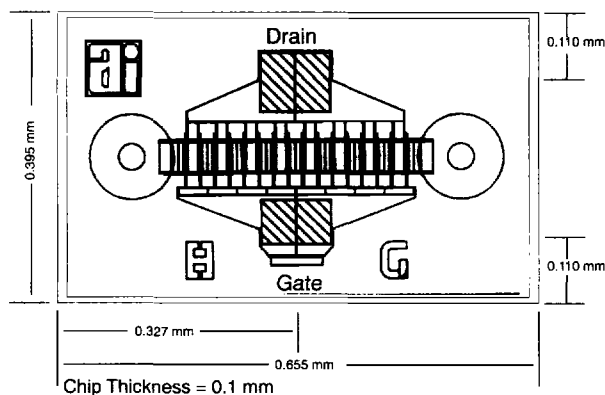


## AFM08P2-00

### Features

- 24 dBm Output Power at 18 GHz
- High Associated Gain, 8.5 dB at 18 GHz
- High Power Added Efficiency, 20%
- Broadband Operation, DC-40 GHz
- 0.25  $\mu\text{m}$  Ti/Pt/Au Gates
- Passivated Surface
- Through-Substrate Via Hole Grounding

### Chip Layout



### Description

Alpha's AFM08P2-00 is a high performance power GaAs MESFET chip having a gate length of 0.25  $\mu\text{m}$  and a total gate periphery of 800  $\mu\text{m}$ . The device has excellent gain and power performance through 30 GHz making it suitable for a wide range of commercial and military applications in oscillator and

amplifier circuits. The device employs Ti/Pt/Au gate metallization and surface passivation to ensure a rugged reliable part. Through-substrate via holes are incorporated into the chip to facilitate low inductance grounding of the source for improved high frequency and high gain performance.

### Electrical Specifications

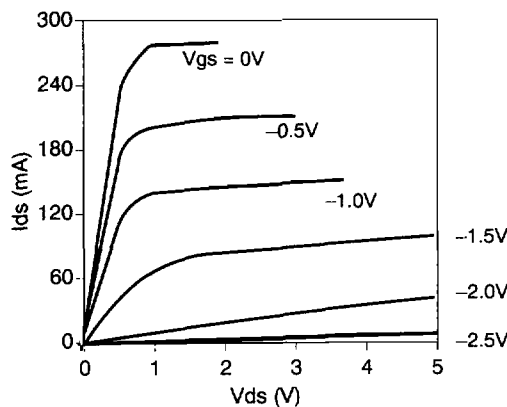
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	$I_{dss}$	$V_{ds} = 2V, V_{gs} = 0V$	175	265	360	mA
Transconductance	$g_m$		120	160	—	mS
Pinch-Off Voltage	$V_p$	$V_{ds} = 5V, I_{ds} = 2.0 \text{ mA}$	1	3	5	-V
Gate to Drain Breakdown Voltage	$V_{bgd}$	$I_{gd} = 800 \mu\text{A}$	8	12	—	-V
Output Power at 1 dB Compression	P1dB	$V_{ds} = 5V, I_{ds} = 140 \text{ mA}, f = 18 \text{ GHz}$	—	24	—	dBm
Gain at 1 dB Compression	G1dB		—	8.5	—	dB
Power Added Efficiency	$\eta_{add}$		—	20	—	%
Output Power at 1 dB Compression	P1dB	$V_{ds} = 5V, I_{ds} = 140 \text{ mA}, f = 30 \text{ GHz}$	—	23	—	dBm
Gain at 1 dB Compression	G1dB		—	4.5	—	dB
Power Added Efficiency	$\eta_{add}$		—	10	—	%
Thermal Resistance	$R_{th}$	$T_{base} = +25^\circ\text{C}$	—	—	120	$^\circ\text{C/W}$

**Typical S-Parameters (Vds = 5V, Ids = 140 mA)**

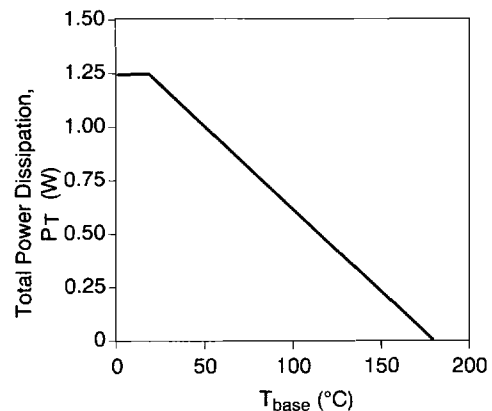
Freq (GHz)	S11		S21		S12		S22		k	s21 (dB)	MAG (dB)
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang			
2.00000	0.922	-60.551	6.183	137.340	0.034	56.434	0.268	-53.648	0.287	15.824	22.614
3.00000	0.886	-83.281	5.297	121.790	0.043	45.053	0.276	-72.863	0.352	14.481	20.875
4.00000	0.858	-100.870	4.511	109.080	0.048	37.488	0.288	-86.395	0.448	13.085	19.764
5.00000	0.846	-114.840	3.873	98.238	0.052	31.412	0.311	-97.508	0.490	11.760	18.726
6.00000	0.833	-125.710	3.349	89.148	0.053	26.013	0.330	-105.520	0.595	10.499	18.038
7.00000	0.830	-134.240	2.937	81.086	0.053	22.971	0.356	-111.660	0.660	9.359	17.440
8.00000	0.827	-141.250	2.594	73.980	0.053	20.266	0.380	-117.070	0.751	8.280	16.937
9.00000	0.826	-146.950	2.320	67.488	0.052	19.130	0.403	-121.090	0.835	7.309	16.522
10.00000	0.826	-151.670	2.099	61.486	0.051	18.861	0.430	-124.530	0.911	6.439	16.156
11.00000	0.826	-155.980	1.912	55.846	0.050	18.901	0.453	-127.950	0.985	5.630	15.794
12.00000	0.826	-159.860	1.757	50.480	0.050	19.638	0.473	-131.070	1.054	4.896	14.032
13.00000	0.826	-163.530	1.626	45.189	0.050	20.670	0.494	-134.390	1.107	4.220	13.123
14.00000	0.827	-167.030	1.511	40.055	0.050	22.571	0.513	-137.680	1.168	3.584	12.349
15.00000	0.827	-170.710	1.412	34.928	0.050	24.590	0.529	-141.300	1.222	2.994	11.674
16.00000	0.828	-174.110	1.319	29.877	0.051	27.112	0.543	-144.910	1.256	2.402	11.108
17.00000	0.827	-177.880	1.238	24.729	0.053	30.441	0.560	-149.190	1.266	1.851	10.612
18.00000	0.830	178.710	1.157	19.509	0.054	29.130	0.579	-153.840	1.234	1.266	10.358
19.00000	0.833	175.150	1.082	14.691	0.055	30.607	0.597	-158.560	1.237	0.681	9.976
20.00000	0.834	171.690	1.006	9.473	0.057	29.948	0.615	-163.450	1.248	0.056	9.504
21.00000	0.833	168.290	0.931	4.393	0.055	29.691	0.634	-168.500	1.375	-0.624	8.613
22.00000	0.826	165.410	0.854	-0.449	0.054	28.928	0.654	-173.410	1.567	-1.375	7.567
23.00000	0.824	164.040	0.774	-2.962	0.055	40.109	0.659	-176.480	1.814	-2.221	6.302
24.00000	0.837	162.480	0.725	-5.707	0.061	41.107	0.685	-178.940	1.477	-2.796	6.695
25.00000	0.841	160.910	0.675	-8.703	0.065	41.668	0.712	178.250	1.317	-3.419	6.786
26.00000	0.851	160.020	0.632	-11.155	0.066	39.422	0.726	176.760	1.190	-3.980	7.168
27.00000	0.861	158.950	0.593	-13.702	0.068	41.344	0.749	175.380	1.036	-4.532	8.244
28.00000	0.869	157.730	0.561	-15.712	0.072	42.416	0.772	174.350	0.864	-5.026	8.934
29.00000	0.873	157.100	0.530	-17.951	0.075	43.221	0.790	173.430	0.742	-5.517	8.481
30.00000	0.876	156.340	0.504	-19.794	0.079	43.832	0.800	172.620	0.665	-5.945	8.038
31.00000	0.878	155.500	0.482	-21.803	0.084	44.410	0.812	171.720	0.574	-6.330	7.595
32.00000	0.879	154.510	0.463	-24.305	0.088	43.920	0.825	170.440	0.492	-6.693	7.197
33.00000	0.875	153.200	0.444	-26.438	0.094	43.615	0.830	169.140	0.473	-7.046	6.729
34.00000	0.875	151.820	0.429	-28.745	0.100	42.418	0.832	167.450	0.439	-7.342	6.340
35.00000	0.873	149.570	0.415	-31.738	0.105	40.012	0.834	164.770	0.420	-7.631	5.960
36.00000	0.870	147.470	0.398	-34.529	0.109	38.334	0.830	162.000	0.476	-8.004	5.642
37.00000	0.869	145.350	0.382	-37.857	0.111	36.215	0.825	158.610	0.519	-8.358	5.349
38.00000	0.866	142.450	0.361	-41.301	0.115	34.590	0.821	154.480	0.610	-8.842	4.983
39.00000	0.865	139.560	0.342	-44.109	0.117	31.940	0.822	150.320	0.666	-9.319	4.655
40.00000	0.859	137.290	0.303	-48.395	0.121	28.969	0.814	145.770	0.846	-10.363	3.978

(S-parameters include the effects of two 0.8 mil diameter bond wires, each 10 mil long, to each of the gate and drain terminals.)

**Typical I-V Curves**



**Power Derating Curve**



**Absolute Extreme Ratings (Ambient Temperature = + 25 °C)**

Parameter	Symbol	Rating	Unit
Drain to Source Voltage	Vds	6	V
Gate to Source Voltage	Vgs	-4	V
Drain Current	Ids	Idss	-
Gate Current	Igs	2	mA
Total Power Dissipation	Pt	1.4	W
Channel Temperature	Tch	175	°C
Storage Temperature	Tst	-65 to +150	°C