

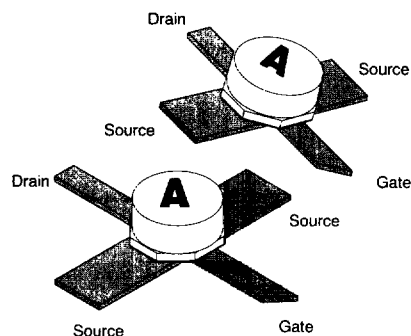
Low Noise Packaged PHEMT



AFP02N2-55, AFP02N2-56

Features

- Low Noise Figure, 0.75 dB at 12 GHz
- High Associated Gain, 9.5 dB at 12 GHz
- High MAG, > 10.0 dB at 12 GHz
- 0.25 μm Ti/Pt/Au gates
- Passivated Surface
- Low Cost Metal Ceramic Package
- Available with Two Lead Lengths
- Available in Tape & Reel



Description

Alpha's low noise packaged PHEMT has excellent gain and noise performance through Ku-band, making it suitable for a wide range of commercial applications. The devices employ 0.25 μm Ti/Pt/Au "mushroom" gates and surface passivation to ensure

a rugged, reliable part. The device is available in a metal-ceramic package with a choice of two lead lengths. The components are also available in tape & reel ready for automatic insertion equipment.

Electrical Specifications (Ambient Temperature = +25 °C)

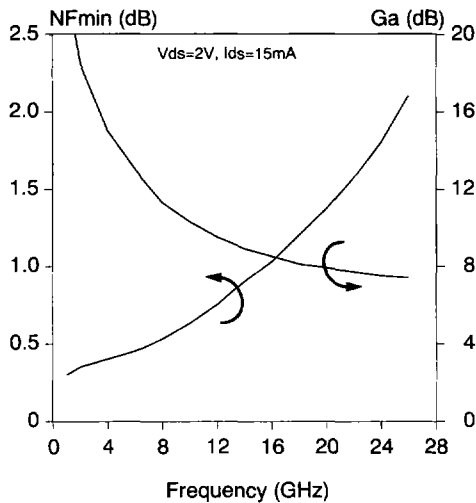
Parameter	Symbol	Test Conditions	Value			Unit
			Min.	Typ.	Max.	
Saturated Drain Current	I_{dss}	$V_{ds} = 2V, V_{gs} = 0V$	25	45	90	mA
Transconductance	g_m	$V_{ds} = 2V, I_{ds} = 15 \text{ mA}$	40	55	—	mS
Pinch-off Voltage	V_p	$V_{ds} = 2V, I_{ds} = 0.3 \text{ mA}$	-0.2	-0.6	-2.0	V
Gate to Source Breakdown Voltage	V_{bgs}	$I_{gs} = -200 \mu\text{A}$	-4	-6	—	V
Noise Figure	NF	$V_{ds} = 2V, I_{ds} = 15 \text{ mA}, f = 4 \text{ GHz}$	—	0.4	0.5	dB
Associated Gain	G_a		15.5	15.0	—	dB
Noise Figure	NF	$V_{ds} = 2V, I_{ds} = 15 \text{ mA}, f = 12 \text{ GHz}$	—	0.75	0.95	dB
Associated Gain	G_a		8.5	9.5	—	dB

Noise Parameters ($V_{ds} = 2V, I_{ds} = 15\text{ mA}$)

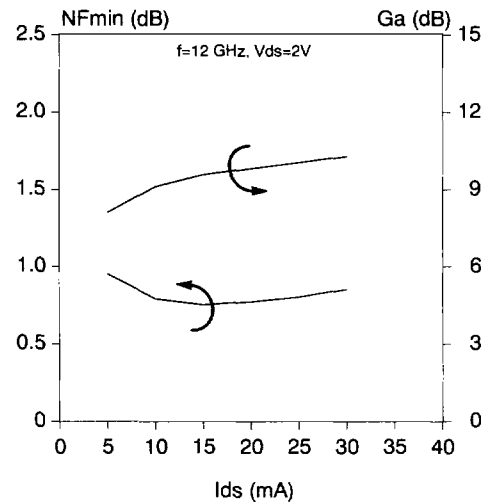
Freq. (GHz)	Γ_{opt}		$R_n (\Omega)$	NFmin (dB)	Ga (dB)
	Mag	Ang			
1	0.93	14.10	0.25	0.30	22.50
2	0.85	28.30	0.24	0.35	18.50
4	0.73	56.70	0.20	0.40	15.00
6	0.64	8.560	0.15	0.45	13.00
8	0.56	115.20	0.09	0.53	11.30
10	0.51	145.50	0.05	0.63	10.30
12	0.48	176.50	0.04	0.75	9.50
14	0.46]	-152.10	0.06	0.90	8.90
16	0.46	-120.80	0.12	1.03	8.50
18	0.46	-90.40	0.21	1.20	8.10
20	0.47	-61.70	0.31	1.37	7.90
22	0.49	-35.90	0.40	1.57	7.70
24	0.50	-14.10	0.47	1.80	7.50
26	0.52	2.00	0.52	2.10	7.40

3

Typical RF Performance



Minimum Noise Figure (NFmin) and Associated Gain (dB) vs. Frequency (GHz)



Minimum Noise Figure (NFmin) and Associated Gain (Ga) versus Drain Current (I_{ds})

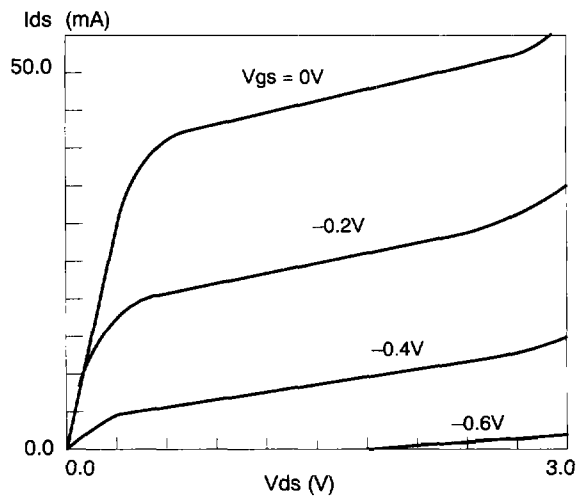
Typical S-Parameters (Vds = 2 V, Ids = 10 mA)

Freq (GHz)	S11		S21		S12		S22		k	S21 (dB)	MAG/MSG (dB)
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang			
2.00000	0.921	-46.250	4.642	136.280	0.061	58.950	0.466	-41.790	0.253	13.334	18.814
3.00000	0.855	-68.220	4.214	116.770	0.082	45.040	0.436	-59.870	0.361	12.494	17.109
4.00000	0.799	-85.800	3.788	99.860	0.097	33.810	0.413	-74.120	0.460	11.568	15.916
5.00000	0.749	-101.300	3.456	84.760	0.109	24.050	0.387	-84.860	0.561	10.771	15.011
6.00000	0.700	-116.010	3.208	70.800	0.120	15.080	0.355	-93.750	0.664	10.125	14.271
7.00000	0.650	-132.750	3.030	56.320	0.131	5.110	0.311	-104.740	0.758	9.629	13.642
8.00000	0.596	-149.840	2.768	42.120	0.134	-5.780	0.252	-116.310	0.919	8.843	13.151
9.00000	0.566	-163.050	2.544	30.040	0.132	-13.980	0.219	-124.700	1.062	8.110	11.324
10.0000	0.554	-172.990	2.429	19.020	0.134	-18.670	0.211	-132.340	1.112	7.709	10.548
11.0000	0.532	173.920	2.372	6.820	0.143	-25.380	0.183	-141.740	1.129	7.502	10.011
12.0000	0.518	155.440	2.322	-6.700	0.151	-33.600	0.129	-158.730	1.148	7.317	9.534
13.0000	0.523	135.620	2.210	-20.530	0.153	-42.540	0.077	159.660	1.197	6.888	8.916
14.0000	0.539	123.370	2.096	-32.680	0.155	-48.800	0.089	118.530	1.207	6.428	8.561
15.0000	0.559	112.170	2.012	-44.850	0.160	-55.920	0.127	106.200	1.158	6.073	8.586
16.0000	0.541	101.020	1.948	-57.300	0.164	-64.090	0.158	100.400	1.171	5.792	8.242
17.0000	0.532	84.330	1.885	-70.940	0.169	-73.090	0.198	78.080	1.178	5.506	7.921
18.0000	0.561	65.110	1.772	-84.880	0.167	-83.010	0.245	56.050	1.191	4.969	7.611
19.0000	0.588	55.770	1.642	-96.680	0.162	-90.410	0.276	43.040	1.225	4.307	7.199
20.0000	0.610	52.230	1.549	-106.260	0.170	-94.780	0.299	39.520	1.147	3.801	7.272
21.0000	0.572	42.440	1.601	-116.300	0.178	-104.360	0.295	47.040	1.111	4.088	7.508
22.0000	0.536	27.500	1.610	-130.240	0.182	-114.650	0.306	46.910	1.124	4.137	7.323
23.0000	0.553	14.020	1.544	-145.050	0.178	-125.960	0.297	33.290	1.166	3.773	6.911
24.0000	0.614	2.490	1.487	-157.870	0.172	-135.800	0.278	21.130	1.126	3.446	7.208
25.0000	0.591	0.480	1.500	-169.440	0.174	-143.360	0.257	20.050	1.159	3.522	6.938
26.0000	0.559	-6.450	1.595	176.610	0.186	-154.350	0.231	27.870	1.116	4.055	7.259

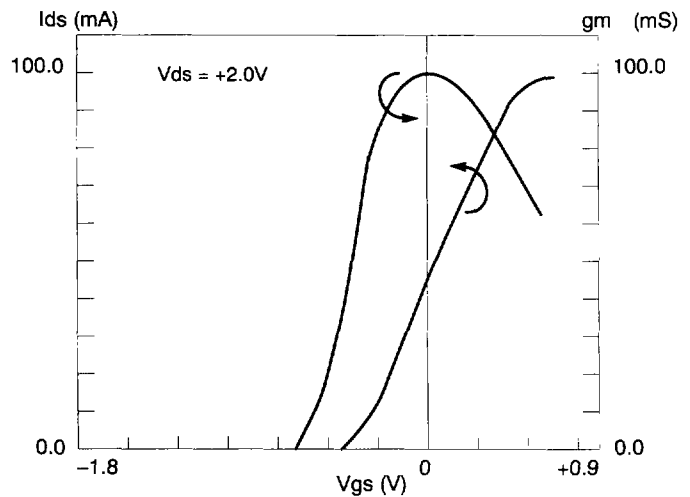
Typical S-Parameters (Vds = 2V, Ids = 30 mA)

Freq (GHz)	S11		S21		S12		S22		k	S21 (dB)	MAG/MSG (dB)
	Mag	Ang	Mag	Ang	Mag	Ang	Mag	Ang			
2.00000	0.883	-52.080	6.594	131.970	0.052	60.720	0.329	-47.150	0.349	16.383	21.031
3.00000	0.793	-75.290	5.795	111.780	0.070	48.460	0.299	-66.160	0.495	15.261	19.180
4.00000	0.723	-93.200	5.068	94.830	0.083	39.090	0.278	-79.570	0.614	14.097	17.858
5.00000	0.663	-108.610	4.518	79.860	0.095	30.680	0.257	-88.360	0.721	13.099	16.772
6.00000	0.608	-123.140	4.113	66.090	0.106	22.930	0.230	-94.770	0.819	12.283	15.889
7.00000	0.558	-140.120	3.800	51.990	0.118	13.680	0.190	-103.760	0.897	11.596	15.079
8.00000	0.508	-157.420	3.418	38.510	0.123	4.150	0.135	-112.550	1.030	10.675	13.376
9.00000	0.481	-169.830	3.112	27.180	0.125	-2.970	0.109	-115.830	1.137	9.861	11.712
10.0000	0.470	-178.640	2.948	16.610	0.132	-8.070	0.110	-119.200	1.153	9.391	11.118
11.0000	0.452	168.610	2.848	4.810	0.143	-15.450	0.092	-122.450	1.149	9.091	10.646
12.0000	0.446	149.850	2.754	-8.110	0.154	-24.190	0.040	-125.930	1.145	8.799	10.213
13.0000	0.463	129.920	2.605	-21.150	0.159	-33.300	0.033	43.730	1.165	8.316	9.685
14.0000	0.485	118.180	2.473	-32.570	0.164	-40.320	0.075	47.300	1.159	7.864	9.363
15.0000	0.506	107.260	2.376	-44.340	0.172	-48.240	0.094	58.970	1.116	7.517	9.333
16.0000	0.489	96.000	2.300	-56.440	0.179	-57.240	0.102	67.480	1.114	7.235	9.033
17.0000	0.487	78.850	2.216	-69.480	0.185	-66.880	0.151	53.550	1.116	6.911	8.714
18.0000	0.524	59.840	2.089	-82.780	0.185	-77.290	0.214	35.590	1.117	6.399	8.448
19.0000	0.553	50.920	1.953	-94.200	0.181	-85.310	0.242	24.360	1.136	5.814	8.088
20.0000	0.567	48.210	1.846	-104.340	0.190	-90.950	0.252	25.160	1.085	5.325	8.101
21.0000	0.520	38.310	1.914	-114.080	0.200	-101.300	0.223	35.630	1.059	5.639	8.329
22.0000	0.480	23.220	1.927	-127.900	0.205	-112.700	0.223	41.060	1.062	5.698	8.210
23.0000	0.497	10.390	1.863	-142.460	0.201	-124.380	0.211	26.870	1.089	5.404	7.850
24.0000	0.557	-0.160	1.805	-155.320	0.194	-135.040	0.186	13.800	1.068	5.130	8.095
25.0000	0.532	-0.850	1.820	-167.290	0.195	-143.770	0.159	23.330	1.086	5.201	7.909
26.0000	0.501	-5.610	1.909	178.490	0.204	-155.470	0.159	47.280	1.057	5.616	8.258

DC Characteristics



Drain Current (I_{ds}) versus Drain Voltage (V_{ds}) as a Function of Gate to Source Voltage (V_{gs})



Drain Current (I_{ds}) and Transconductance (g_m) versus Gate to Source Voltage (V_{gs})

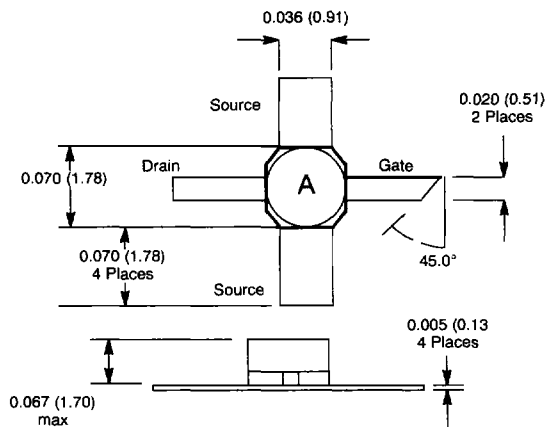
3

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

Parameter	Symbol	Rating	Unit
Drain to Source Voltage	V_{ds}	4	V
Gate to Source Voltage	V_{gs}	-2.0	V
Drain Current	I_{ds}	I_{dss}	-
Gate Current	I_{gs}	10	μA
Total Power Dissipation	P_t	200	mW
Channel Temperature	T_{ch}	+175	$^{\circ}C$
Storage Temperature	T_{st}	-65 to +150	$^{\circ}C$

Package Outlines

-55 Package



-56 Package

