General Purpose PHEMT Chip

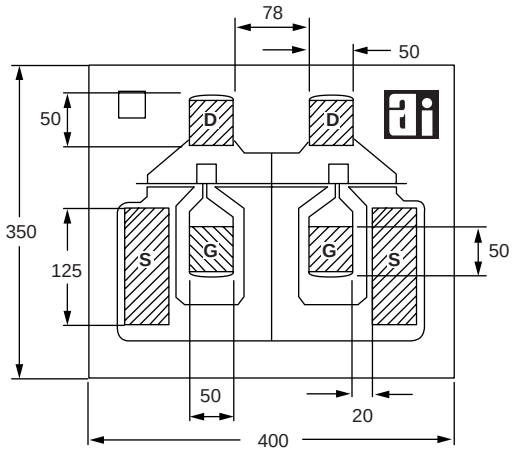
AFP02N8-000

Features

- Low Noise Figure, 1.25 dB @ 4 GHz
- High Associated Gain, 15.0 dB @ 4 GHz
- High MAG, > 18 dB @ 4 GHz
- 0.7 μm Ti/Pd/Au Gates
- Passivated Surface

Description

The AFP02N8-000 general purpose PHEMT chip has excellent gain and noise performance through X band, making it suitable for a wide range of commercial and military applications. The device employs 0.7 μm Ti/Pd/Au gates and surface passivation to ensure a rugged, reliable part.



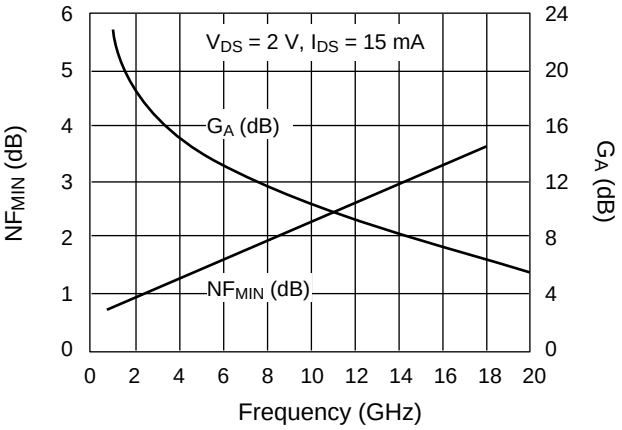
Absolute Maximum Ratings

Characteristic	Value
Drain to Source Voltage (V_{DS})	6 V
Gate to Source Voltage (V_{GS})	-3 V
Drain Current (I_{DS})	I_{DSS}
Gate Current (I_{GS})	10 μA
Total Power Dissipation (P_T)	300 mW
Storage Temperature (T_{ST})	-65 to +150°C
Channel Temperature (T_{CH})	175°C

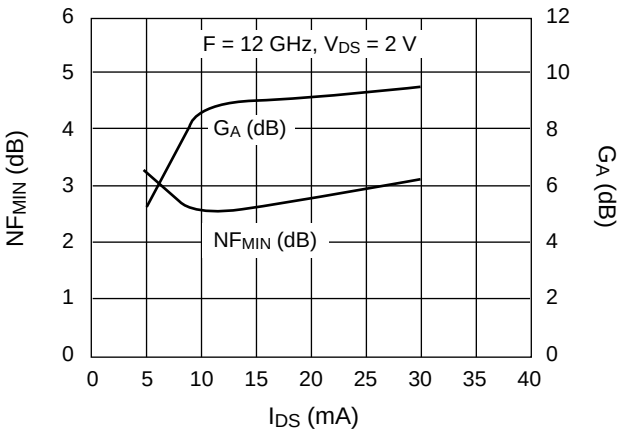
Electrical Specifications at 25°C

Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Saturated Drain Current (I_{DSS})	V_{DS} = 2 V, V_{GS} = 0 V	25.0	45.0	90.0	mA
Transconductance (gm)	V_{DS} = 2 V, I_{DS} = 15 mA	40.0	55.0		mS
Pinch-off Voltage (V_P)	V_{DS} = 2 V, I_{DS} = 0.3 mA	-0.2	-0.6	-2.0	V
Gate to Source Breakdown Voltage (V_{bgs})	I_{GS} = -200 μA	-4.0	-6.0		V
Noise Figure (NF)	V_{DS} = 2 V, I_{DS} = 15 mA, F = 4 GHz		1.25	1.75	dB
Associated Gain (G_A)		14.0	15.0		dB
Noise Figure (NF)	V_{DS} = 2 V, I_{DS} = 15 mA, F = 12 GHz		2.6	3.0	dB
Associated Gain (G_A)		8.5	9.4		dB

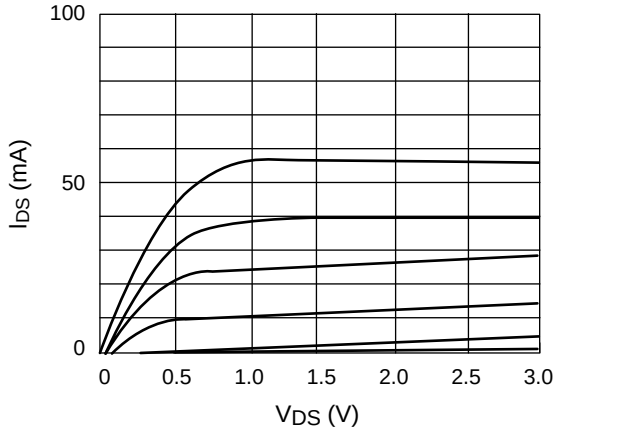
Typical Performance Data



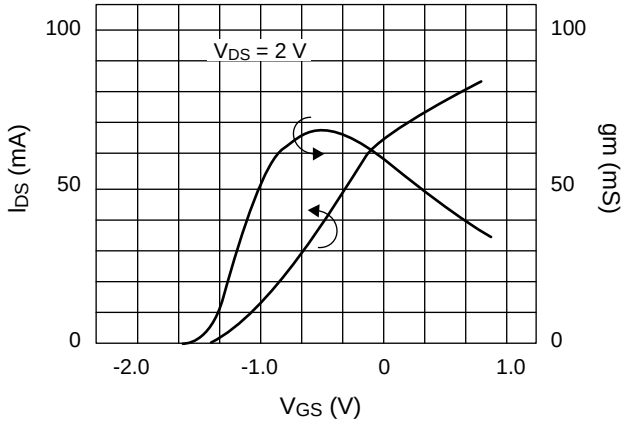
RF Minimum Noise Figure (NF_{MIN}) and Associated Gain (G_A) vs. Frequency (GHz)



RF Minimum Noise Figure (NF_{MIN}) and Associated Gain (G_A) vs. Drain Current (I_{DS})



DC Drain Current (I_{DS}) vs. Drain Voltage (V_{DS}) as a Function of Gate to Source Voltage (V_{GS})



DC Drain Current (I_{DS}) and Transconductance (gm) vs. Gate to Source Voltage (V_{GS})

Typical Noise Parameters (V_{DS} = 2 V, I_{DS} = 15 mA)

Freq. (GHz)	NF_{MIN} (dB)	Γ_{opt} Mag.	Γ_{opt} Ang.	$R_N/50$	G_A (dB)
1	0.70	0.88	13.30	0.01	23.00
2	0.88	0.78	27.30	0.13	18.30
4	1.22	0.62	53.60	0.27	15.35
6	1.59	0.52	77.60	0.31	13.22
8	1.95	0.46	99.40	0.31	11.67
10	2.30	0.44	119.20	0.29	10.30
12	2.63	0.44	136.90	0.25	9.24
14	3.00	0.46	152.80	0.21	8.25
16	3.35	0.50	166.90	0.17	7.49
18	3.70	0.54	179.30	0.15	6.59
20	4.00	0.57	-169.90	0.16	5.46
22	4.37	0.59	-160.60	0.20	5.05
24	4.73	0.60	-152.70	0.28	4.85
26	5.10	0.57	-146.20	0.39	4.86

Both noise and S-parameters include bond wires. Two gate bond wires and two drain wires are each approximately 325 μm (13 mil) long. Four source bond wires (2 each side) are each approximately 200 μm (8 mil) long. All wire is 17 μm (0.7 mil) diameter gold.

Typical S-Parameters (V_{DS} = 2 V, I_{DS} = 10 mA)

Freq. (GHz)	S_{11} Mag.	S_{11} Ang.	S_{21} Mag.	S_{21} Ang.	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.	k	S_{21} (dB)	MAG/ MSG (dB)
2	0.946	-37.71	3.892	150.07	0.041	67.60	0.739	-15.73	0.216	11.803	19.774
3	0.909	-54.69	3.615	138.06	0.057	58.11	0.714	-22.39	0.273	11.162	18.022
4	0.866	-70.13	3.322	126.96	0.068	50.39	0.688	-27.24	0.350	10.428	16.889
5	0.830	-84.40	3.016	116.85	0.078	42.85	0.658	-32.95	0.426	9.589	15.873
6	0.801	-96.78	2.747	108.11	0.084	36.92	0.640	-37.16	0.494	8.777	15.146
7	0.776	-107.46	2.504	100.24	0.088	32.24	0.621	-40.57	0.577	7.973	14.542
8	0.760	-117.10	2.285	93.26	0.091	28.30	0.607	-44.11	0.643	7.178	13.998
9	0.746	-125.45	2.098	86.79	0.093	25.09	0.599	-47.10	0.715	6.436	13.533
10	0.733	-131.77	1.937	81.28	0.095	22.67	0.589	-50.14	0.795	5.743	13.094
11	0.723	-138.16	1.805	75.95	0.096	20.83	0.589	-52.95	0.855	5.130	12.742
12	0.714	-143.64	1.687	70.89	0.097	19.25	0.585	-55.52	0.929	4.542	12.403
13	0.702	-148.82	1.586	66.16	0.097	17.91	0.583	-58.82	1.014	4.006	11.418
14	0.696	-153.98	1.502	61.42	0.098	16.87	0.581	-61.53	1.071	3.533	10.232
15	0.689	-158.65	1.424	56.91	0.098	16.14	0.577	-64.16	1.152	3.070	9.259
16	0.681	-163.77	1.359	52.41	0.098	15.37	0.579	-67.35	1.214	2.664	8.625
17	0.671	-168.77	1.300	47.92	0.099	15.16	0.574	-70.36	1.291	2.279	7.944
18	0.666	-173.79	1.243	43.61	0.099	14.58	0.570	-73.60	1.367	1.889	7.373

Typical S-Parameters (V_{DS} = 2 V, I_{DS} = 30 mA)

Freq. (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		k	S_{21} (dB)	MAG/ MSG (dB)
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.			
2	0.942	-41.56	4.452	148.27	0.034	67.38	0.630	-16.20	0.27	12.97	21.17
3	0.904	-59.91	4.086	135.96	0.047	58.52	0.606	-22.82	0.33	12.23	19.39
4	0.863	-76.17	3.703	124.86	0.056	51.14	0.585	-27.90	0.42	11.37	18.20
5	0.829	-90.97	3.328	114.87	0.064	44.47	0.559	-33.10	0.50	10.44	17.16
6	0.804	-103.55	3.007	106.34	0.069	39.39	0.545	-37.24	0.58	9.56	16.39
7	0.783	-114.26	2.717	98.74	0.072	35.51	0.530	-40.37	0.68	8.68	15.77
8	0.770	-123.73	2.467	92.01	0.075	32.58	0.522	-43.96	0.74	7.84	15.17
9	0.759	-131.90	2.253	85.83	0.076	30.08	0.517	-47.08	0.83	7.06	14.72
10	0.747	-138.10	2.075	80.51	0.078	28.62	0.509	-50.12	0.92	6.34	14.25
11	0.741	-144.38	1.928	75.43	0.079	27.69	0.512	-52.73	0.98	5.70	13.88
12	0.731	-149.68	1.797	70.53	0.080	27.07	0.512	-55.37	1.07	5.09	11.96
13	0.721	-154.66	1.684	65.99	0.082	26.39	0.510	-58.89	1.14	4.53	10.86
14	0.716	-159.81	1.594	61.39	0.084	26.21	0.509	-61.45	1.19	4.05	10.17
15	0.711	-164.36	1.508	57.05	0.085	26.37	0.508	-64.01	1.25	3.57	9.45
16	0.703	-169.44	1.437	52.71	0.086	26.37	0.511	-67.45	1.32	3.15	8.86
17	0.696	-174.29	1.371	48.36	0.088	26.51	0.507	-70.47	1.38	2.74	8.26
18	0.690	-179.19	1.308	44.18	0.090	26.72	0.504	-73.67	1.44	2.33	7.69