

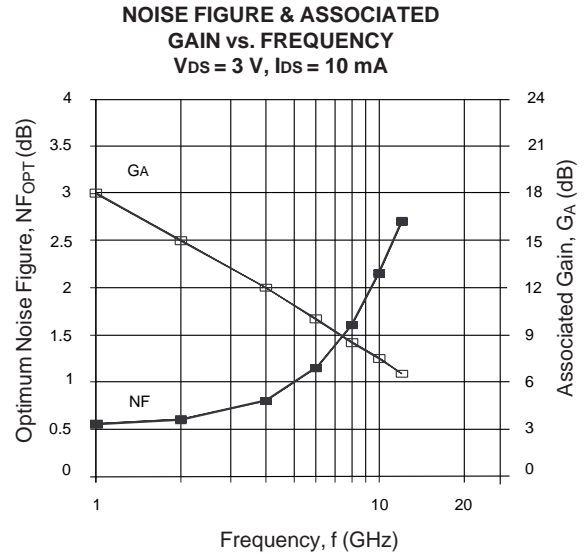
### FEATURES

- **LOW NOISE FIGURE:**  
0.8 dB typical at 4 GHz
- **HIGH ASSOCIATED GAIN:**  
12 dB typical at 4 GHz
- **L<sub>G</sub> = 1.0 μm, W<sub>G</sub> = 400 μm**
- **LOW COST METAL/CERAMIC PACKAGE**
- **TAPE & REEL PACKAGING OPTION AVAILABLE**

### DESCRIPTION

NE76184AS is a high performance gallium arsenide metal semiconductor field effect transistor housed in an epoxy-sealed, metal/ceramic package. Its low noise figure makes this device appropriate for use in the second or third stages of low noise amplifiers operating in the 1-12 GHz frequency range. The device is fabricated using ion implantation for improved RF and DC performance, reliability, and uniformity. The NE76184AS is suitable for DBS, TVRO, GPS and other commercial applications.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.



### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

PART NUMBER PACKAGE OUTLINE			NE76184AS 84AS		
SYMBOL	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF <sup>1</sup>	Noise Figure at V <sub>DS</sub> = 3 V, I <sub>D</sub> = 10 mA, f = 4 GHz	dB		0.8	1.4
G <sub>A</sub> <sup>1</sup>	Associated Gain at V <sub>DS</sub> = 3 V, I <sub>D</sub> = 10 mA, f = 4 GHz	dB		12.0	
P <sub>1dB</sub>	Output Power at 1 dB Gain Compression Point, f = 4 GHz V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 30 mA	dBm		12.5	
		dBm		15.0	
G <sub>1dB</sub>	Gain at P <sub>1dB</sub> , f = 4 GHz V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 30 mA	dB		11.5	
		dB		13.5	
I <sub>DSS</sub>	Saturated Drain Current at V <sub>DS</sub> = 3 V, V <sub>GS</sub> = 0	mA	30	60	100
V <sub>P</sub>	Pinch Off Voltage at V <sub>DS</sub> = 3 V, I <sub>D</sub> = 100 μA	V	-3.0	-1.1	-0.5
g <sub>m</sub>	Transconductance at V <sub>DS</sub> = 3 V, I <sub>D</sub> = 10 mA	mS	20	45	
I <sub>GSO</sub>	Gate to Source Leak Current at V <sub>GS</sub> = -5 V	μA			10
R <sub>TH</sub>	Thermal Resistance	°C/W			300

Note:

1. Typical values of noise figures and associated gain are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening test with the fixture tuned for the "generic" type but not for each specimen.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>DS</sub>	Drain to Source Voltage	V	5
V <sub>GDO</sub>	Gate to Drain Voltage	V	-5
V <sub>GSO</sub>	Gate to Source Voltage	V	-6
I <sub>DS</sub>	Drain Current	mA	I <sub>DSS</sub>
T <sub>CH</sub>	Channel Temperature	°C	150
T <sub>STG</sub>	Storage Temperature	°C	-65 to +150
P <sub>T</sub>	Total Power Dissipation	mW	300

Note:

1. Operation in excess of any one of these parameters may result in permanent damage.

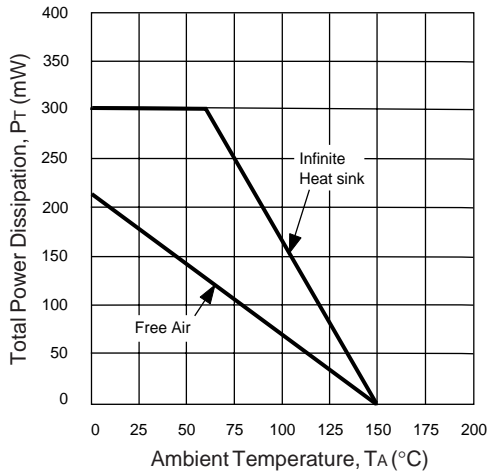
**TYPICAL NOISE PARAMETERS** (T<sub>A</sub> = 25°C)

V<sub>DS</sub> = 3 V, I<sub>DS</sub> = 10 mA

FREQ. (GHz)	NF <sub>OPT</sub> (dB)	G <sub>A</sub> (dB)	Γ <sub>OPT</sub>		Rn/50
			MAG	ANG	
1.0	0.55	18.0	0.92	19	0.60
2.0	0.60	15.0	0.81	40	0.55
4.0	0.80	12.0	0.66	82	0.35
6.0	1.15	10.0	0.54	125	0.25
8.0	1.60	8.5	0.46	167	0.10
10.0	2.15	7.5	0.41	-152	0.25
12.0	2.70	6.5	0.41	-108	0.48

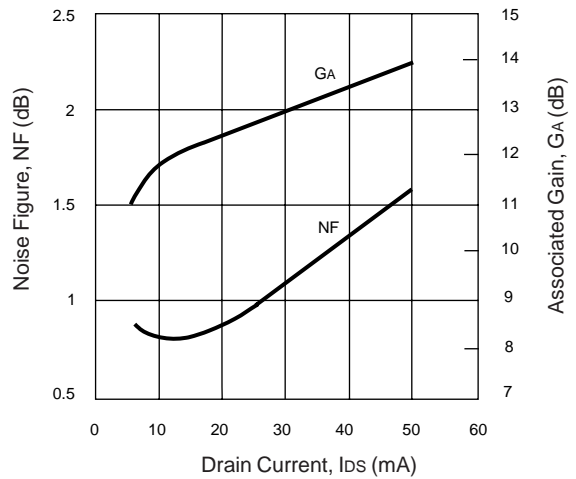
**TYPICAL PERFORMANCE CURVES** (T<sub>A</sub> = 25°C)

**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**

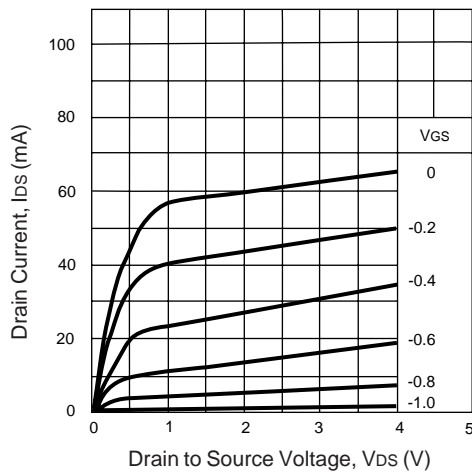


**NOISE FIGURE & ASSOCIATED GAIN vs. DRAIN CURRENT**

V<sub>DS</sub> = 3 V, f = 4 GHz

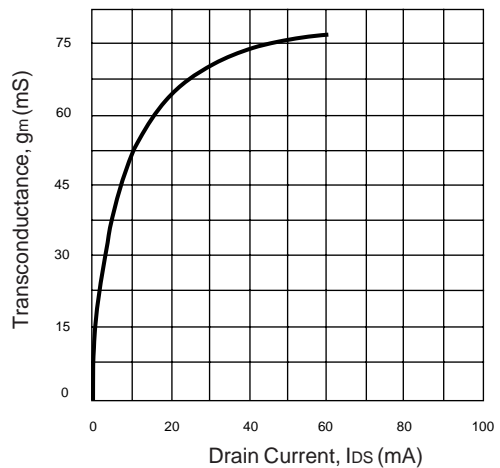


**DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE**



**TRANSCONDUCTANCE vs. DRAIN CURRENT**

V<sub>DS</sub> = 3 V



TYPICAL SCATTERING PARAMETERS<sup>1</sup> (T<sub>A</sub> = 25°C)V<sub>DS</sub> = 3 V, I<sub>DS</sub> = 10 mA

FREQUENCY (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	S <sub>21</sub> (dB)	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG			
0.1	0.999	-3.0	3.859	176.0	0.003	87.0	0.770	-2.0	0.06	11.7	31.0
0.2	0.999	-7.0	3.837	174.0	0.007	84.0	0.763	-4.0	0.04	11.6	27.3
0.5	0.990	-16.0	3.815	165.0	0.024	75.0	0.756	-10.0	0.14	11.6	22.0
1.0	0.970	-31.0	3.754	152.0	0.040	69.0	0.741	-19.0	0.15	11.4	19.7
1.5	0.932	-46.0	3.626	138.0	0.058	59.0	0.720	-28.0	0.24	11.1	17.9
2.0	0.884	-61.0	3.494	126.0	0.076	49.0	0.696	-36.0	0.32	10.8	16.6
3.0	0.784	-89.0	3.179	101.0	0.097	34.0	0.638	-52.0	0.47	10.0	15.1
4.0	0.695	-118.0	2.873	78.0	0.114	20.0	0.574	-67.0	0.60	9.1	14.0
5.0	0.620	-145.0	2.595	57.0	0.121	8.0	0.517	-82.0	0.75	8.2	13.3
6.0	0.571	-172.0	2.329	37.0	0.124	-3.0	0.472	-98.0	0.90	7.3	12.7
7.0	0.545	163.0	2.099	19.0	0.124	-11.0	0.440	-113.0	1.04	6.4	11.0
8.0	0.535	139.0	1.903	1.0	0.124	-17.0	0.423	-129.0	1.15	5.5	9.4
9.0	0.543	117.0	1.740	-16.0	0.127	-23.0	0.413	-146.0	1.21	4.8	8.5
10.0	0.569	96.0	1.586	-33.0	0.131	-29.0	0.411	-166.0	1.22	4.0	7.9
11.0	0.604	77.0	1.433	-50.0	0.138	-34.0	0.419	173.0	1.19	3.1	7.4
12.0	0.641	61.0	1.295	-66.0	0.142	-41.0	0.447	153.0	1.15	2.2	7.2
13.0	0.667	47.0	1.162	-81.0	0.153	-49.0	0.486	136.0	1.06	1.3	7.3
14.0	0.680	33.0	1.049	-97.0	0.160	-57.0	0.525	119.0	1.03	0.4	7.0
15.0	0.692	20.0	0.970	-111.0	0.171	-67.0	0.566	103.0	0.94	-0.2	7.5
16.0	0.700	6.0	0.884	-127.0	0.181	-79.0	0.603	88.0	0.88	-1.0	6.8
17.0	0.696	-8.0	0.799	-142.0	0.191	-90.0	0.639	73.0	0.87	-1.9	6.2
18.0	0.677	-20.0	0.730	-157.0	0.199	-102.0	0.666	61.0	0.88	-2.7	5.6

V<sub>DS</sub> = 3 V, I<sub>DS</sub> = 30 mA

FREQUENCY (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	S <sub>21</sub> (dB)	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG			
0.1	0.999	-4.0	5.192	176.0	0.003	86.8	0.702	-3.0	0.04	14.3	32.3
0.2	0.998	-7.0	5.148	174.0	0.007	83.6	0.686	-4.0	0.06	14.2	28.6
0.5	0.988	-18.0	5.088	164.0	0.017	75.0	0.676	-10.0	0.15	14.1	24.7
1.0	0.958	-35.0	4.937	149.0	0.034	68.0	0.656	-19.0	0.21	13.8	21.6
1.5	0.909	-52.0	4.698	135.0	0.049	60.0	0.633	-28.0	0.29	13.4	19.8
2.0	0.850	-68.0	4.446	122.0	0.062	51.0	0.607	-36.0	0.39	12.9	18.5
3.0	0.738	-99.0	3.901	97.0	0.078	38.0	0.550	-51.0	0.56	11.8	16.9
4.0	0.646	-129.0	3.407	74.0	0.091	26.0	0.494	-65.0	0.73	10.6	15.7
5.0	0.579	-157.0	2.996	54.0	0.098	16.0	0.444	-79.0	0.90	9.5	14.8
6.0	0.544	176.0	2.648	35.0	0.104	8.0	0.408	-94.0	1.03	8.4	12.9
7.0	0.530	152.0	2.359	17.0	0.110	3.0	0.382	-110.0	1.12	7.4	11.1
8.0	0.531	129.0	2.120	0.0	0.117	-2.0	0.371	-126.0	1.17	6.5	10.0
9.0	0.550	108.0	1.928	-16.0	0.126	-9.0	0.365	-144.0	1.16	5.7	9.3
10.0	0.581	88.0	1.748	-33.0	0.138	-16.0	0.365	-164.0	1.12	4.8	8.9
11.0	0.617	71.0	1.574	-49.0	0.149	-23.0	0.374	174.0	1.08	3.9	8.4
12.0	0.658	56.0	1.427	-64.0	0.159	-32.0	0.405	153.0	1.00	3.0	9.0
13.0	0.681	42.0	1.287	-80.0	0.170	-41.0	0.445	135.0	0.95	2.1	8.7
14.0	0.695	29.0	1.168	-95.0	0.181	-50.0	0.487	119.0	0.90	1.3	8.0
15.0	0.703	16.0	1.079	-109.0	0.193	-63.0	0.526	103.0	0.85	0.6	7.4
16.0	0.706	2.0	0.987	-125.0	0.202	-75.0	0.565	88.0	0.82	-0.1	6.8
17.0	0.704	-11.0	0.899	-140.0	0.210	-87.0	0.602	74.0	0.80	-0.9	6.3
18.0	0.676	-25.0	0.811	-154.0	0.218	-101.0	0.634	60.0	0.86	-1.8	5.7

Note:

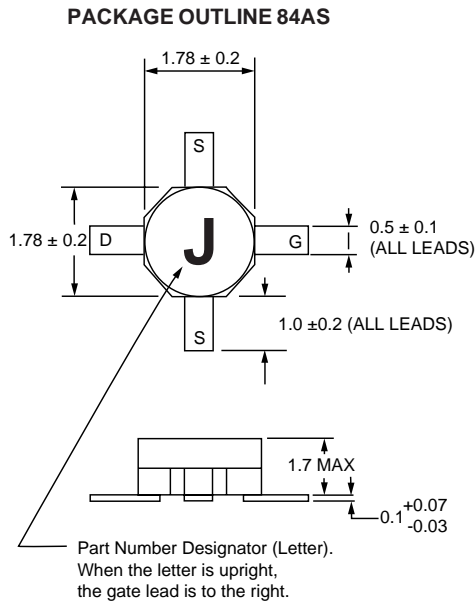
1. Gain Calculations:

$$\text{MAG} = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } \text{MSG} = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12} S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

**OUTLINE DIMENSIONS** (Units in mm)



**ORDERING INFORMATION**

PART NUMBER	QTY	PACKAGE	LEAD LENGTH
NE76184AS	Bulk	84AS	1.0 mm
NE76184A-TI	1K/Reel	84AS	1.0 mm
NE76184A-SL	Bulk/up to 1K	84A-SL	1.7 mm

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