

### FEATURES

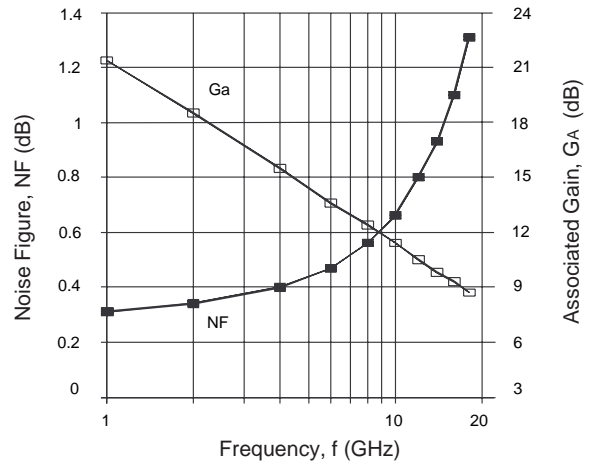
- **VERY LOW NOISE FIGURE:**  
0.8 dB TYP at 12 GHz
- **HIGH ASSOCIATED GAIN:**  
10.5 dB TYP at 12 GHz
- **L<sub>G</sub> = 0.35 μm, W<sub>G</sub> = 200 μm**
- **LOW COST METAL CERAMIC PACKAGE**
- **TAPE & REEL PACKAGING OPTION AVAILABLE**

### DESCRIPTION

The NE42484A is a pseudomorphic Hetero-Junction FET that uses the junction between Si-doped AlGaAs and undoped InGaAs to create very high mobility electrons. The device features mushroom shaped TiAl gates for decreased gate resistance and improved power handling capabilities. The mushroom gate also results in lower noise figure and high associated gain. This device is housed in an epoxy-sealed, metal/ceramic package and is intended for high volume consumer and industrial applications.

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

**NOISE FIGURE & ASSOCIATED GAIN vs. FREQUENCY**  
V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 10 mA



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

PART NUMBER PACKAGE OUTLINE			NE42484A 84AS		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NFOPT <sup>1</sup>	Optimum Noise Figure, V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 10 mA, f = 12 GHz	dB		0.8	1.2
GA <sup>1</sup>	Associated Gain, V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 10 mA, f = 12 GHz	dB	9.0	10.5	
P <sub>1dB</sub>	Output Power at 1 dB Gain Compression Point, f = 12 GHz V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 20 mA	dBm dBm		9.7 10.2	
G <sub>1dB</sub>	Gain at P <sub>1dB</sub> , f = 12 GHz V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 20 mA	dB dB		10.3 10.5	
I <sub>DSS</sub>	Saturated Drain Current, V <sub>DS</sub> = 2.0 V, V <sub>GS</sub> = 0 V	mA	15	40	70
V <sub>P</sub>	Pinch-off Voltage, V <sub>DS</sub> = 2.0 V, I <sub>DS</sub> = 0.1 mA	V	-2.0	-0.8	-0.2
g <sub>m</sub>	Transconductance, V <sub>DS</sub> = 2.0 V, I <sub>D</sub> = 10 mA	mS	45	60	
I <sub>GSO</sub>	Gate to Source Leakage Current, V <sub>GS</sub> = -3.0 V	μA		0.5	10.0
R <sub>TH</sub> (CH-A)	Thermal Resistance (Channel to Ambient)	°C/W		750	
R <sub>TH</sub> (CH-C) <sup>2</sup>	Thermal Resistance (Channel to Case)	°C/W			350

**Notes:**

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 tuned for the "generic" type but not for each specimen.
2. R<sub>TH</sub> (channel to case) for package mounted on an infinite heat sink.

**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	4.0
V <sub>GS</sub>	Gate to Source Voltage	V	-3.0
I <sub>DS</sub>	Drain Current	mA	I <sub>DSS</sub>
I <sub>GRF</sub>	Gate Current (RF Drive)	μA	200
P <sub>IN</sub>	RF Input (CW)	dBm	15
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	165

Note:

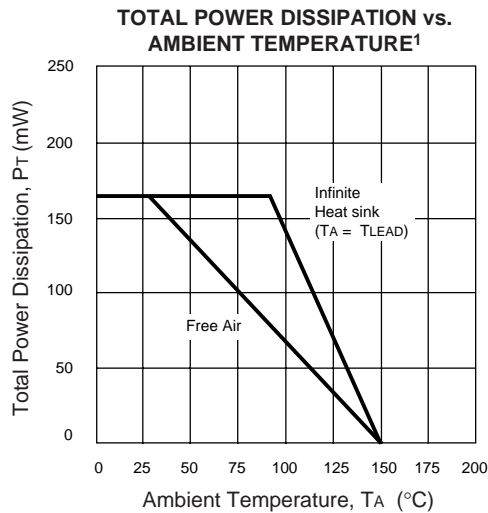
1. Operation in excess of any one of these parameters may result in permanent damage.

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

V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 10 mA

FREQ. (GHz)	NF <sub>OPT</sub> (dB)	GA (dB)	Γ <sub>OPT</sub>		Rn/50
			MAG	ANG	
1.0	0.31	21.4	0.78	10	0.43
2.0	0.34	18.5	0.76	28	0.38
4.0	0.40	15.5	0.72	58	0.28
6.0	0.47	13.6	0.65	84	0.21
8.0	0.56	12.4	0.57	113	0.15
10.0	0.66	11.4	0.50	141	0.10
12.0	0.80	10.5	0.44	173	0.09
14.0	0.93	9.8	0.39	-157	0.08
16.0	1.10	9.3	0.36	-125	0.08
18.0	1.31	8.7	0.35	-90	0.08

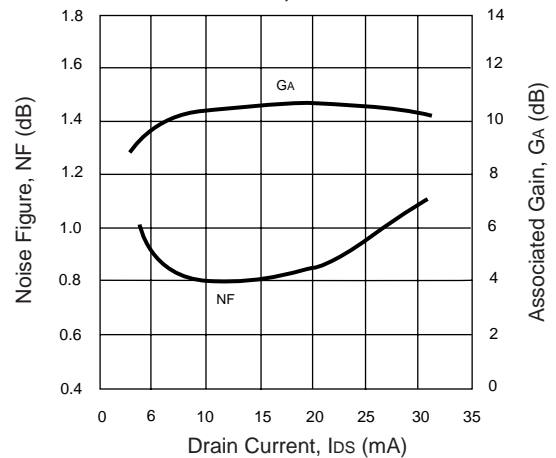
**TYPICAL PERFORMANCE CURVES** (T<sub>A</sub> = 25°C)



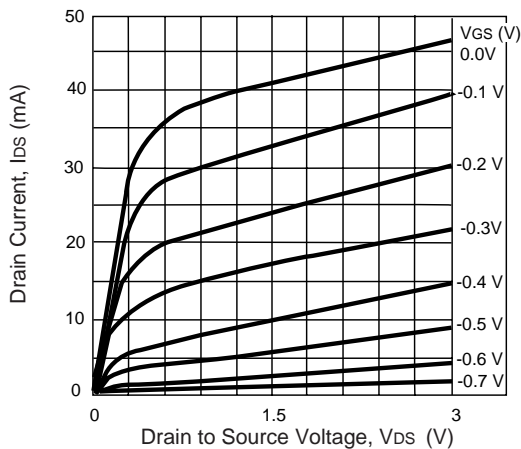
Note

1. If P<sub>T</sub> exceeds the Free Air Value, reliable operation can be assured by measuring the worst-case temperature, T<sub>(LEAD)</sub>, at the lead where heat flow is maximum (usually the source lead) and limiting T<sub>A</sub>, P<sub>T</sub> or R<sub>TH</sub> (CKT)

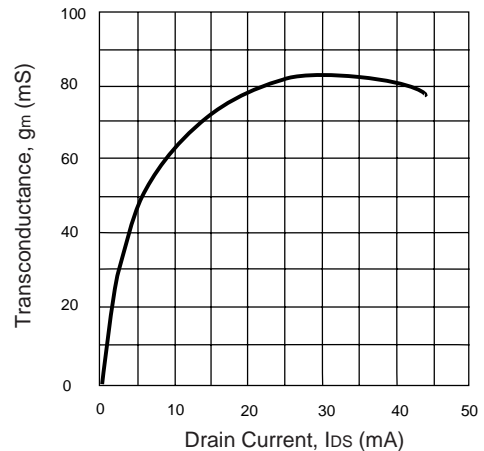
**NOISE FIGURE AND ASSOCIATED GAIN vs. DRAIN CURRENT**  
V<sub>DS</sub> = 2 V, f = 12 GHz



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

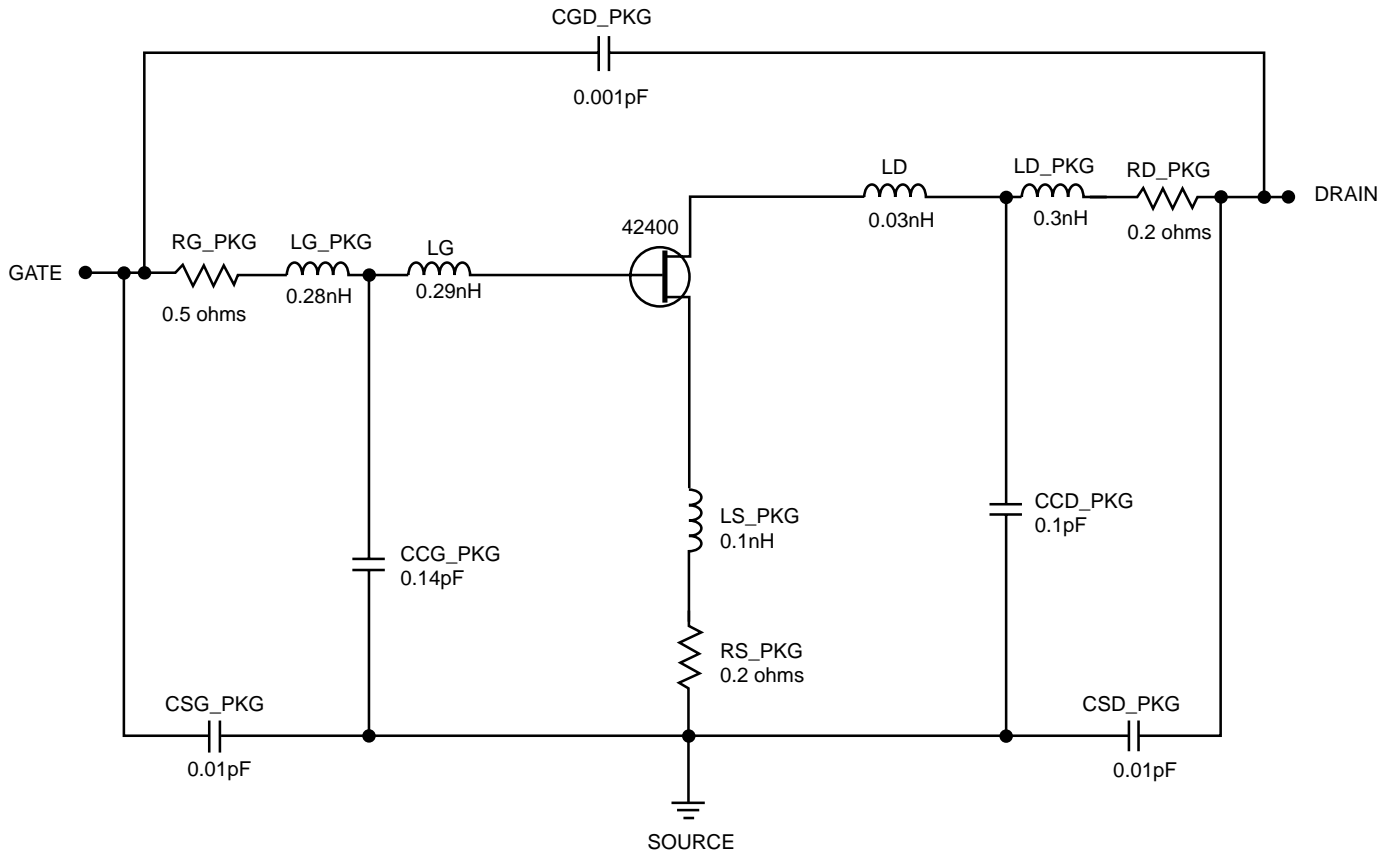


**TRANSCONDUCTANCE vs. DRAIN CURRENT**  
V<sub>DS</sub> = 2.0 V





## SCHEMATIC



## MODEL RANGE

Frequency: 0.1 to 16 GHz

Bias:  $V_{DS} = 1\text{ V to }3.5\text{ V}$ ,  $I_D = 10\text{ mA to }40\text{ mA}$ 

Date: 11/15/96

**TYPICAL COMMON SOURCE SCATTERING PARAMETERS** (T<sub>A</sub> = 25°C)

V<sub>DS</sub> = 2 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	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.10	1.000	-1.6	4.599	178.2	0.003	97.8	0.543	-1.3	-0.077	31.855
0.20	1.002	-3.2	4.611	176.6	0.003	75.5	0.541	-2.5	0.019	31.867
0.50	1.000	-8.2	4.611	171.5	0.008	85.5	0.540	-5.9	0.008	27.607
1.00	0.992	-16.3	4.577	163.2	0.015	79.3	0.537	-11.5	0.114	24.845
2.00	0.964	-32.0	4.468	147.4	0.030	69.9	0.527	-22.4	0.242	21.730
3.00	0.930	-47.2	4.336	132.0	0.044	61.2	0.512	-32.9	0.329	19.936
4.00	0.884	-62.4	4.173	116.8	0.057	53.4	0.496	-43.6	0.418	18.646
5.00	0.828	-76.9	3.945	102.3	0.067	44.0	0.473	-53.8	0.546	17.700
6.00	0.775	-90.7	3.748	88.5	0.075	37.1	0.453	-63.7	0.644	16.987
7.00	0.727	-103.8	3.551	75.8	0.083	30.7	0.439	-72.9	0.720	16.313
8.00	0.684	-116.2	3.373	63.2	0.090	24.7	0.427	-81.3	0.791	15.738
9.00	0.643	-128.2	3.225	51.3	0.097	19.1	0.419	-89.5	0.846	15.218
10.00	0.606	-140.5	3.110	39.7	0.103	14.0	0.411	-97.3	0.890	14.799
11.00	0.565	-153.4	2.983	27.6	0.109	7.5	0.395	-106.1	0.953	14.372
12.00	0.530	-166.7	2.871	16.3	0.114	2.3	0.381	-115.0	1.001	13.832
13.00	0.506	-179.8	2.788	5.0	0.120	-3.3	0.371	-124.2	1.017	12.872
14.00	0.487	167.0	2.711	-6.6	0.126	-9.4	0.365	-133.3	1.024	12.385
15.00	0.467	153.9	2.638	-18.1	0.133	-15.4	0.366	-141.9	1.021	12.093
16.00	0.453	140.3	2.575	-29.8	0.142	-22.5	0.362	-151.5	1.004	12.214
17.00	0.444	125.6	2.547	-41.4	0.147	-30.4	0.351	-162.4	1.000	12.387
18.00	0.440	110.1	2.498	-53.6	0.154	-37.8	0.339	-174.2	0.987	12.101
19.00	0.438	94.8	2.459	-66.0	0.161	-46.6	0.332	174.8	0.971	11.839
20.00	0.431	80.9	2.406	-78.8	0.166	-56.2	0.322	163.8	0.983	11.612

Note:

1. Gain Calculations:

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

MAG = Maximum Available Gain

MSG = Maximum Stable Gain

## TYPICAL COMMON SOURCE SCATTERING PARAMETERS (TA = 25°C)

V<sub>DS</sub> = 2 V, I<sub>DS</sub> = 20 mA

FREQUENCY (GHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		K	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.10	1.002	-1.7	5.727	178.1	0.001	-61.7	0.464	-1.3	-0.043	37.579
0.20	1.001	-3.4	5.741	176.3	0.003	82.0	0.463	-2.4	0.011	32.819
0.50	1.000	-8.6	5.723	171.0	0.007	84.5	0.462	-5.6	0.022	29.125
1.00	0.989	-17.1	5.663	162.3	0.014	79.9	0.459	-10.9	0.147	26.069
2.00	0.955	-33.3	5.479	145.7	0.027	72.3	0.450	-21.2	0.292	23.073
3.00	0.910	-48.9	5.251	129.8	0.040	64.2	0.438	-31.1	0.408	21.182
4.00	0.856	-64.4	4.987	114.3	0.052	57.4	0.424	-41.1	0.507	19.818
5.00	0.792	-78.9	4.657	99.7	0.062	48.4	0.406	-50.3	0.643	18.757
6.00	0.734	-92.5	4.374	86.0	0.070	42.6	0.390	-59.7	0.738	17.958
7.00	0.682	-105.3	4.100	73.4	0.079	36.3	0.381	-68.4	0.808	17.152
8.00	0.636	-117.4	3.863	61.1	0.086	30.7	0.375	-76.2	0.873	16.524
9.00	0.594	-128.9	3.664	49.3	0.096	24.9	0.372	-83.9	0.904	15.817
10.00	0.557	-140.7	3.507	38.0	0.103	19.4	0.368	-91.4	0.938	15.321
11.00	0.517	-153.2	3.347	26.2	0.111	12.8	0.356	-99.8	0.978	14.793
12.00	0.483	-166.3	3.207	15.3	0.118	7.1	0.347	-108.6	1.003	13.985
13.00	0.460	-179.1	3.100	4.3	0.125	1.1	0.340	-117.6	1.010	13.321
14.00	0.440	168.1	3.006	-7.0	0.132	-5.5	0.337	-126.4	1.012	12.891
15.00	0.422	155.4	2.919	-18.2	0.141	-12.5	0.339	-134.9	1.000	13.160
16.00	0.408	142.2	2.846	-29.6	0.149	-19.8	0.338	-144.7	0.988	12.810
17.00	0.400	127.6	2.809	-41.1	0.154	-28.7	0.330	-155.1	0.984	12.610
18.00	0.396	112.2	2.750	-53.0	0.162	-36.6	0.317	-166.6	0.971	12.298
19.00	0.395	97.0	2.711	-65.1	0.168	-45.2	0.310	-177.6	0.959	12.078
20.00	0.391	83.2	2.653	-77.6	0.173	-55.4	0.303	171.6	0.963	11.857

Note:

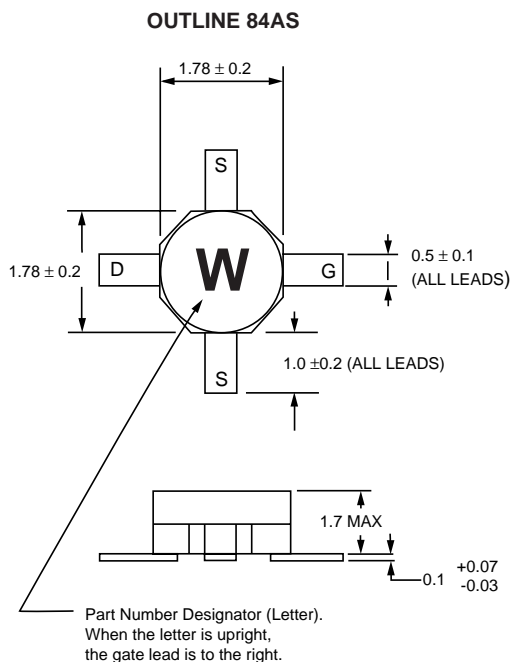
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MAG = Maximum Available Gain

MSG = Maximum Stable Gain

## OUTLINE DIMENSIONS (Units in mm)



## ORDERING INFORMATION<sup>1</sup>

PART NUMBER	AVAILABILITY	PACKAGE
NE42484AS	Bulk up to 1K	84AS
NE42484A-T1	1K/Reel	84AS

Note:

Not available in long lead, 84A package.

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