

### FEATURES

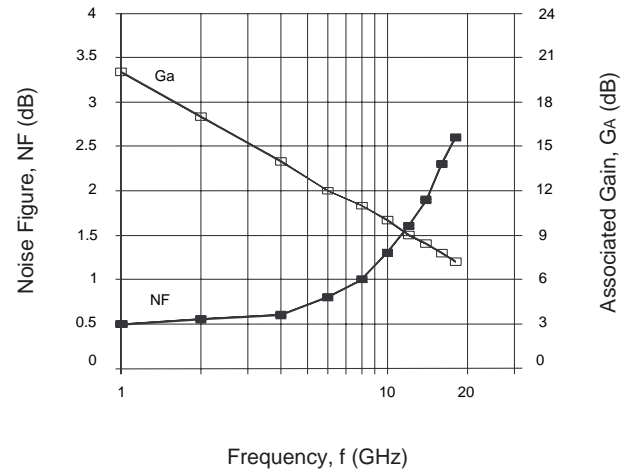
- **LOW NOISE FIGURE**  
NF = 1.6 dB TYP at f = 12 GHz
- **HIGH ASSOCIATED GAIN**  
GA = 9 dB TYP at f = 12 GHz
- **L<sub>G</sub> = 0.3 μm, W<sub>G</sub> = 280 μm**
- **LOW COST METAL/CERAMIC PACKAGE**
- **ION IMPLANTATION**
- **AVAILABLE IN TAPE & REEL**

### DESCRIPTION

The NE76084S provides a low noise figure and high associated gain through 14 GHz. The NE76084S device is fabricated by ion implantation for improved RF and DC performance, reliability, and uniformity. The device features a recessed 0.3 micron gate and triple epitaxial technology.

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

**NOISE FIGURE AND ASSOCIATED GAIN  
vs. FREQUENCY**  
V<sub>DS</sub> = 3 V, I<sub>DS</sub> = 10 mA



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

PART NUMBER PACKAGE OUTLINE			NE76084S <sup>2</sup> 84S		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NFOPT <sup>1</sup>	Optimum Noise Figure at V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 10 mA, f = 12 GHz	dB		1.6	1.8
GA	Associated Gain at V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 10 mA, f = 12 GHz	dB	8.0	9.0	
P <sub>1dB</sub>	Output Power at 1 dB Compression, V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 30 mA, f = 12 GHz	dBm		14.5	
I <sub>DSS</sub>	Saturated Drain Current at V <sub>DS</sub> = 3 V, V <sub>GS</sub> = 0	mA	15	30	50
V <sub>P</sub>	Pinch-off Voltage at V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 0.1 mA	V	-3.0	-0.8	-0.5
g <sub>m</sub>	Transconductance, V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 10 mA	mS	30.0	40.0	70.0
I <sub>GSO</sub>	Gate to Source Leakage Current, V <sub>GS</sub> = -4 V	μA		1.0	10.0
R <sub>TH</sub> (CH-A)	Thermal Resistance (Channel to Ambient)	°C/W			625

Notes:

1. Typical values of noise figures 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.
2. Package type 84S recommended for use below 13 GHz. Refer to NE76083A for use above 13 GHz.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** (TA = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>DS</sub>	Drain to Source Voltage	V	5
V <sub>GD</sub>	Gate to Drain Voltage	V	-5
V <sub>GS</sub>	Gate to Source Voltage	V	-3
I <sub>DS</sub>	Drain Current	mA	I <sub>DSS</sub>
P <sub>IN</sub>	RF Input (CW)	dBm	+15
T <sub>CH</sub>	Channel Temperature	°C	175
T <sub>STG</sub>	Storage Temperature	°C	-65 to +175
P <sub>T</sub>	Total Power Dissipation	mW	240

Notes:

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

**TYPICAL NOISE PARAMETERS<sup>1</sup>**

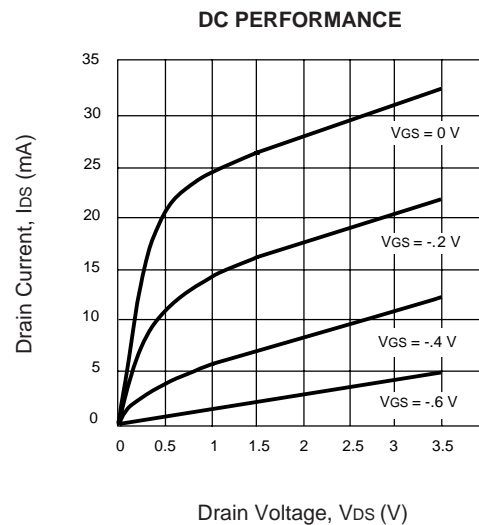
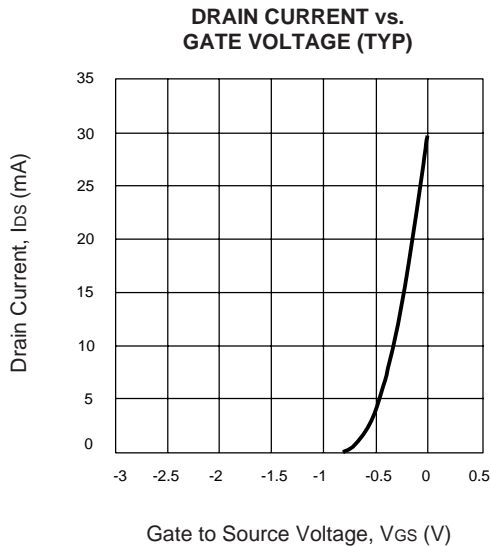
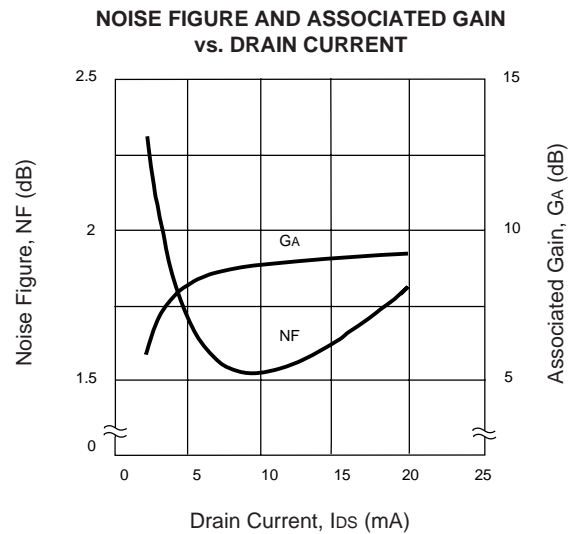
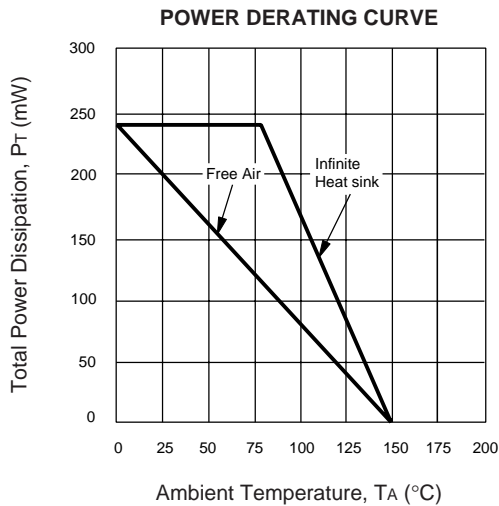
V<sub>DS</sub> = 3 V, I<sub>DS</sub> = 10 mA

FREQ. (GHz)	NF <sub>OPT</sub> (dB)	GA (dB)	Γ <sub>OPT</sub>		Rn/50
			MAG	ANG	
1	0.50	20	.93	15	.58
2	0.55	17	.88	31	.51
4	0.60	14	.72	69	.46
6	0.80	12	.60	107	.37
8	1.00	11	.55	131	.32
10	1.30	10	.50	163	.26
12	1.60	9	.46	-165	.21
14	1.90	8.5	.46	-135	.17
16	2.20	7.9	.44	-100	.15
18	2.50	7.3	.46	-64	.14

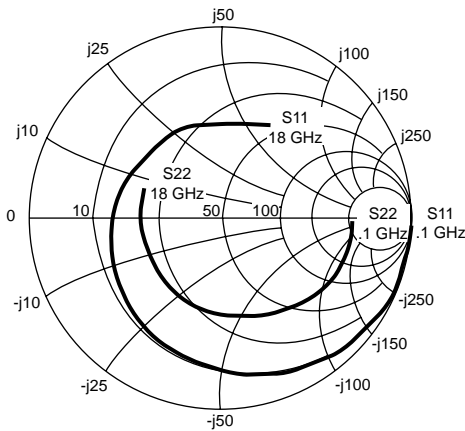
Note:

1. Noise parameters include bond wires:  
 Gate: 2 wires total, 1 per bond pad, 0.0139" long each wire.  
 Drain: 2 wires total, 1 per bond pad, 0.0115" long each wire.  
 Sources: 4 wires total, 2 per side, 0.0066" long each wire.  
 Wire: 0.0007" diameter, gold.

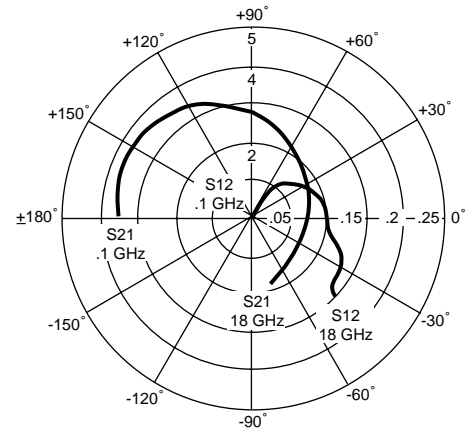
**TYPICAL PERFORMANCE CURVES** (TA = 25 °C)



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



Coordinates in Ohms  
Frequency in GHz  
(Vds = 3 V, Ids = 10 mA)



**NE76084S**

Vds = 3 V, Id = 10 mA

FREQUENCY (GHz)	S11		S21		S12		S22		K	S21 (dB)	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG			
0.1	0.999	-2.2	3.623	178.1	0.003	87.8	0.682	-1.4	0.06	11.1	30.8
0.2	0.999	-4.1	3.607	176.1	0.005	86.6	0.682	-2.7	0.04	11.1	28.5
0.5	0.999	-10.4	3.599	170.3	0.014	83.8	0.688	-6.5	0.02	11.1	24.1
1.0	0.989	-20.6	3.546	160.5	0.023	73.9	0.682	-13.8	0.12	10.9	21.8
1.5	0.978	-30.6	3.508	151.8	0.033	68.7	0.674	-20.0	0.14	10.9	20.2
2.0	0.955	-40.0	3.428	142.5	0.043	63.8	0.667	-26.0	0.21	10.7	19.0
3.0	0.915	-58.5	3.288	125.4	0.061	50.8	0.643	-38.1	0.31	10.3	17.3
4.0	0.859	-76.1	3.091	109.4	0.073	40.1	0.611	-49.4	0.43	9.8	16.2
5.0	0.804	-92.5	2.936	94.4	0.085	31.3	0.581	-60.3	0.52	9.3	15.3
6.0	0.757	-108.9	2.770	79.3	0.091	22.1	0.554	-71.0	0.63	8.8	14.8
7.0	0.714	-124.2	2.604	65.7	0.099	14.8	0.529	-80.7	0.71	8.3	14.2
8.0	0.673	-138.0	2.448	52.9	0.097	9.5	0.512	-90.0	0.84	7.7	14.0
9.0	0.639	-152.2	2.323	40.0	0.099	4.6	0.497	-99.3	0.94	7.3	13.7
10.0	0.607	-166.3	2.237	27.5	0.101	-0.3	0.489	-108.3	1.02	6.9	12.5
11.0	0.570	-178.4	2.148	15.4	0.107	-5.9	0.483	-118.2	1.06	6.6	11.4
12.0	0.544	-162.6	2.061	2.7	0.107	-10.1	0.466	-128.3	1.17	6.2	10.3
13.0	0.532	146.7	2.009	-9.4	0.111	-12.6	0.447	-138.5	1.19	6.0	9.9
14.0	0.527	131.9	1.947	-20.9	0.116	-15.5	0.430	-149.6	1.20	5.7	9.5
15.0	0.515	114.9	1.892	-34.0	0.125	-19.6	0.421	-162.6	1.18	5.5	9.2
16.0	0.500	98.0	1.824	-47.2	0.136	-26.1	0.429	-176.3	1.14	5.2	8.9
17.0	0.511	80.1	1.764	-60.0	0.133	-35.1	0.435	170.0	1.17	4.9	8.6
18.0	0.544	63.7	1.709	-73.2	0.146	-43.0	0.433	159.0	1.05	4.6	9.2

Note:

1. Gain Calculations:

$$MAG = \frac{|S_{21}|}{|S_{12}|} (K \pm \sqrt{K^2 - 1})$$

When  $K \leq 1$ , 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)

Vds = 3 V, Ids = 30 mA

FREQUENCY (GHz)	S11		S21		S12		S22		K	S21 (dB)	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG			
0.1	0.999	-2.3	4.439	177.8	0.003	88.1	0.635	-1.3	0.05	12.9	31.7
0.2	0.999	-4.5	4.431	175.9	0.005	86.8	0.634	-2.8	0.03	12.9	29.4
0.5	0.996	-11.1	4.417	169.9	0.011	81.9	0.638	-6.6	0.07	12.9	26.0
1.0	0.985	-22.0	4.351	159.6	0.021	73.4	0.630	-14.0	0.15	12.7	23.1
1.5	0.969	-32.7	4.278	150.3	0.029	69.5	0.626	-19.9	0.18	12.6	21.6
2.0	0.945	-42.5	4.159	140.9	0.038	63.1	0.617	-26.0	0.26	12.3	20.3
3.0	0.898	-61.8	3.931	123.3	0.053	50.9	0.593	-37.9	0.36	11.8	18.7
4.0	0.836	-80.0	3.666	107.0	0.064	43.0	0.560	-48.9	0.48	11.2	17.5
5.0	0.776	-97.7	3.413	91.4	0.074	33.7	0.531	-58.8	0.60	10.6	16.6
6.0	0.719	-113.9	3.180	76.9	0.080	27.5	0.504	-69.7	0.72	10.0	15.9
7.0	0.674	-129.5	2.968	63.2	0.085	19.8	0.484	-79.0	0.83	9.4	15.4
8.0	0.632	-143.4	2.767	50.7	0.088	17.3	0.470	-87.4	0.93	8.8	14.9
9.0	0.599	-158.2	2.612	38.2	0.092	12.8	0.459	-96.8	1.01	8.3	13.8
10.0	0.557	-171.7	2.491	25.8	0.096	7.8	0.450	-105.8	1.10	7.9	12.1
11.0	0.527	-172.9	2.378	14.0	0.102	4.4	0.445	-115.0	1.13	7.5	11.4
12.0	0.506	156.4	2.275	1.6	0.105	0.8	0.434	-124.9	1.19	7.1	10.7
13.0	0.499	141.0	2.204	-10.3	0.115	-3.9	0.418	-134.2	1.15	6.8	10.4
14.0	0.493	125.7	2.130	-21.9	0.120	-9.2	0.405	-145.5	1.17	6.5	9.9
15.0	0.485	109.0	2.064	-34.6	0.131	-12.1	0.400	-158.7	1.12	6.2	9.7
16.0	0.479	92.5	1.976	-47.4	0.143	-20.7	0.408	-172.5	1.08	5.9	9.6
17.0	0.492	74.8	1.919	-60.3	0.146	-29.6	0.422	173.4	1.05	5.6	9.7
18.0	0.526	59.4	1.860	-73.4	0.152	-38.1	0.411	162.7	1.01	5.3	10.2

Note:

1. Gain Calculations:

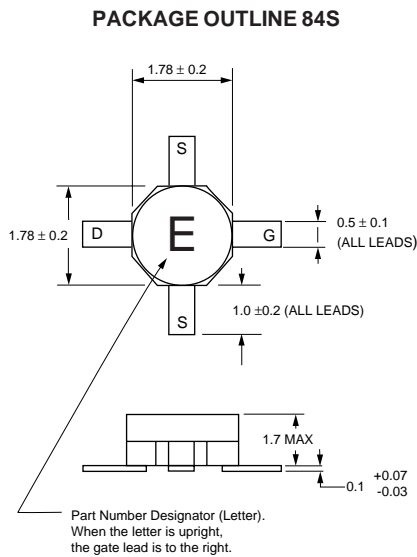
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MAG = Maximum Available Gain

MSG = Maximum Stable Gain

OUTLINE DIMENSIONS (Units in mm)



ORDERING INFORMATION

PART NUMBER	AVAILABILITY	PACKAGE OUTLINE
NE76084S	Bulk up to 1 K	84S
NE76084-T1	1 K/Reel	84S

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