

### FEATURES

- **VERY LOW NOISE FIGURE:**  
0.6 dB TYP at 12 GHz
- **HIGH ASSOCIATED GAIN:**  
11.0 dB TYP at 12 GHz
- **GATE LENGTH:** 0.25  $\mu\text{m}$
- **GATE WIDTH:** 200  $\mu\text{m}$
- **HERMETIC METAL/CERAMIC PACKAGE**

### DESCRIPTION

The NE24283B 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 a solder sealed hermetic, metal ceramic package for high reliability in space applications.

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

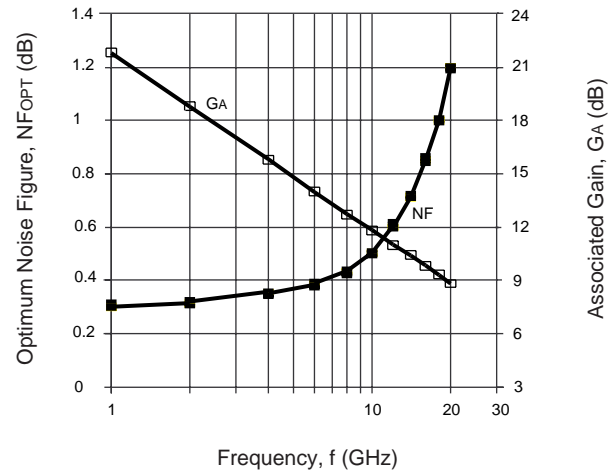
### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

PART NUMBER PACKAGE OUTLINE			NE24283B 83B		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF <sub>OPT</sub> <sup>1</sup>	Optimum Noise Figure at V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 10 mA f = 4 GHz f = 12 GHz	dB dB		0.35 0.6	0.7
GA <sup>1</sup>	Associated Gain at V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 10 mA f = 4 GHz f = 12 GHz	dB dB	10.0	16.0 11.0	
P <sub>1dB</sub>	Output Power at 1 dB Gain Compression Point, f = 12 GHz V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 20 mA	dBm dBm		9.5 11.0	
G <sub>1dB</sub>	Gain at P <sub>1dB</sub> , f = 12 GHz V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 10 mA V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 20 mA	dB dB		11.8 12.8	
I <sub>DSS</sub>	Saturated Drain Current at V <sub>DS</sub> = 2 V, V <sub>GS</sub> = 0 V	mA	15	40	70
V <sub>P</sub>	Pinch-off Voltage at V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 100 $\mu\text{A}$	V	-2.0	-0.8	-0.2
g <sub>m</sub>	Transconductance at V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 10 mA	mS	45	60	
I <sub>GSO</sub>	Gate to Source Leakage Current at V <sub>GS</sub> = -3 V	$\mu\text{A}$		0.5	10
R <sub>TH</sub> (CH-A)	Thermal Resistance (Channel-to-Ambient)	°C/W		750	
R <sub>TH</sub> (CH-C)	Thermal Resistance (Channel-to-Case)	°C/W			350

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 of the production line as a "go-no-go" screening tuned for the "generic" type but not for each specimen.

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



**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** ( $T_A = 25^\circ\text{C}$ )

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>DS</sub>	Drain to Source Voltage	V	4.0
V <sub>GSO</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	μA	100
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	165

Note:  
 1. Operation in excess of any one of these conditions may result in permanent damage.

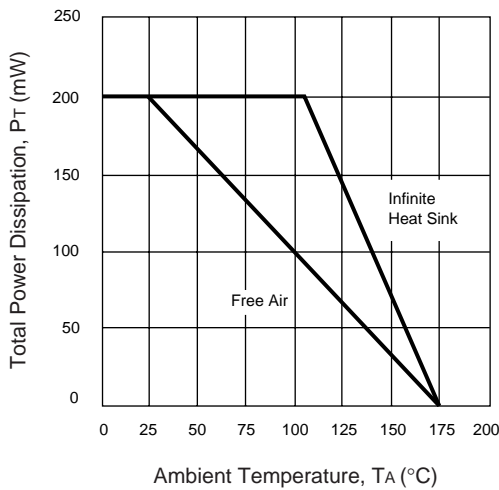
**TYPICAL NOISE PARAMETERS** ( $T_A = 25^\circ\text{C}$ )

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

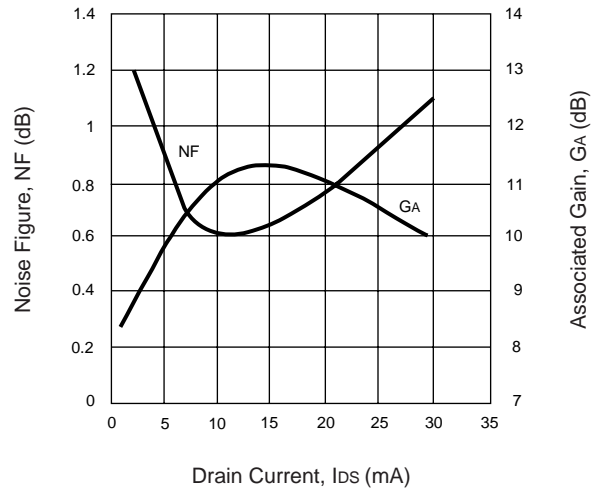
FREQ. (GHz)	NF <sub>OPT</sub> (dB)	G <sub>A</sub> (dB)	Γ <sub>OPT</sub>		R <sub>n</sub> /50
			MAG	ANG	
1	0.30	22.0	0.88	13	0.33
2	0.31	19.0	0.82	30	0.31
4	0.35	16.0	0.73	57	0.26
6	0.38	14.0	0.67	83	0.20
8	0.43	12.5	0.63	105	0.13
10	0.50	11.5	0.57	128	0.09
12	0.60	11.0	0.52	156	0.06
14	0.71	10.3	0.46	-176	0.05
16	0.85	9.8	0.40	-155	0.04
18	1.00	9.2	0.36	-134	0.04
20	1.20	9.0	0.33	-109	0.05

**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )

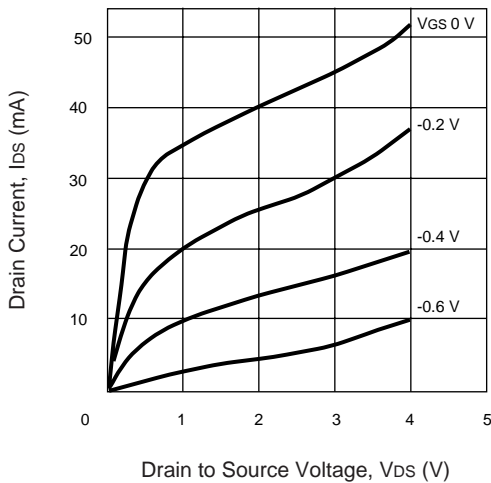
**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE**



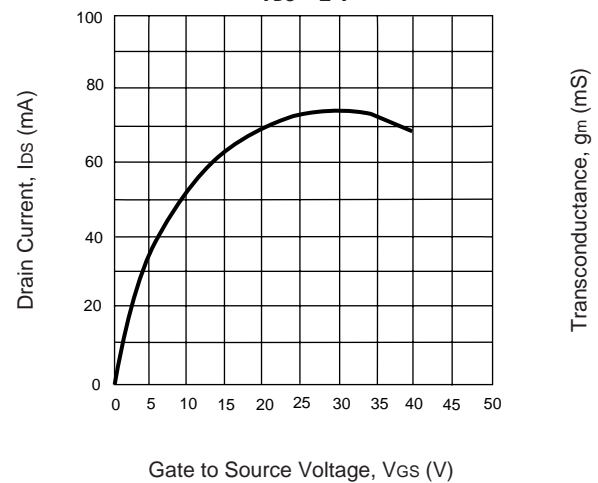
**NOISE FIGURE AND ASSOCIATED GAIN vs. DRAIN CURRENT**  
 V<sub>DS</sub> = 2 V, f = 12 GHz



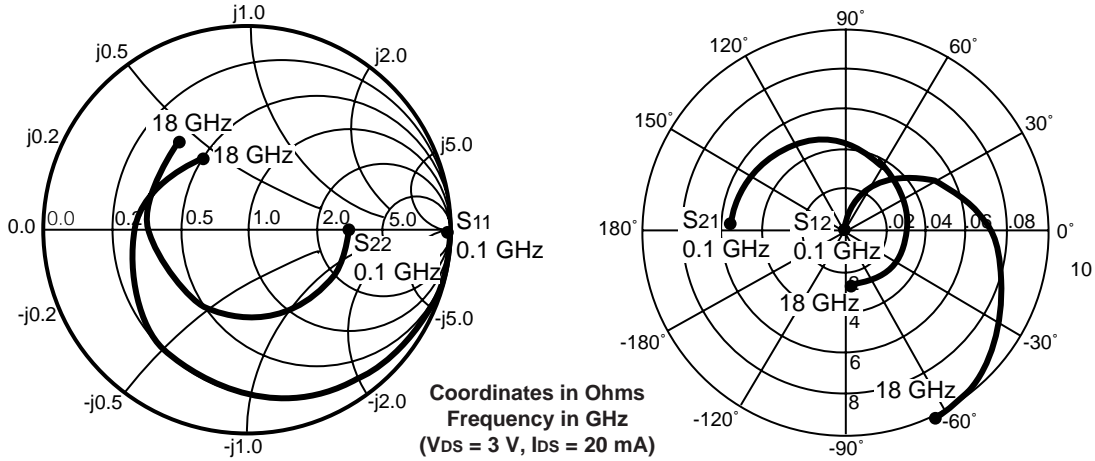
**DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE**



**TRANSCONDUCTANCE AND DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE**  
 V<sub>DS</sub> = 2 V



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



NE24283B

Vds = 3 V, Ids = 20 mA

FREQUENCY GHz	S11		S21		S12		S22		K	MAG <sup>1</sup> (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.10	0.999	-1.9	5.596	177.8	0.001	89.7	0.494	-1.1	0.134	37.479
0.20	0.999	-3.8	5.570	176.0	0.002	88.4	0.493	-2.7	0.066	34.448
0.50	0.998	-9.5	5.550	170.2	0.005	86.5	0.493	-6.7	0.043	30.453
1.00	0.989	-18.8	5.497	160.9	0.010	78.0	0.490	-13.3	0.170	27.401
1.50	0.976	-27.8	5.405	151.8	0.015	73.2	0.485	-19.8	0.243	25.567
2.00	0.960	-36.7	5.304	142.9	0.021	68.7	0.482	-26.1	0.290	24.024
2.50	0.940	-45.3	5.188	134.1	0.025	62.7	0.477	-32.4	0.376	23.171
3.00	0.920	-53.6	5.048	125.6	0.030	57.7	0.471	-38.5	0.430	22.260
3.50	0.900	-61.6	4.899	117.3	0.033	53.4	0.466	-44.5	0.491	21.716
4.00	0.878	-69.7	4.749	109.2	0.037	48.8	0.459	-50.2	0.547	21.084
4.50	0.852	-77.4	4.580	101.4	0.041	44.7	0.452	-55.9	0.612	20.481
5.00	0.828	-84.5	4.411	93.6	0.043	40.0	0.444	-61.7	0.698	20.111
5.50	0.806	-91.6	4.255	86.3	0.046	37.6	0.438	-67.6	0.741	19.661
6.00	0.784	-97.9	4.150	79.4	0.048	33.7	0.430	-73.9	0.801	19.368
6.50	0.769	-104.3	4.022	72.2	0.051	29.6	0.425	-79.9	0.829	18.969
7.00	0.753	-110.3	3.883	65.3	0.053	26.3	0.423	-85.9	0.869	18.649
7.50	0.739	-115.8	3.757	58.5	0.055	23.2	0.425	-91.8	0.899	18.345
8.00	0.728	-121.3	3.644	52.0	0.055	20.9	0.428	-97.1	0.945	18.212
8.50	0.710	-126.7	3.537	45.6	0.059	18.4	0.432	-102.4	0.950	17.778
9.00	0.692	-131.7	3.448	39.3	0.062	15.5	0.435	-107.3	0.974	17.452
9.50	0.675	-136.3	3.391	32.9	0.064	11.5	0.436	-112.1	1.010	16.621
10.00	0.661	-141.0	3.319	26.8	0.066	8.7	0.437	-116.9	1.035	15.875
10.50	0.644	-146.5	3.269	20.4	0.067	5.6	0.435	-122.4	1.075	15.214
11.00	0.623	-152.1	3.209	13.7	0.071	2.8	0.431	-128.6	1.085	14.778
11.50	0.604	-158.0	3.161	7.2	0.073	-1.7	0.428	-135.3	1.115	14.301
12.00	0.586	-163.6	3.101	0.9	0.076	-4.7	0.426	-142.6	1.124	13.963
12.50	0.573	-169.2	3.047	-5.6	0.078	-8.6	0.432	-150.2	1.125	13.764
13.00	0.559	-174.9	2.992	-12.3	0.079	-12.4	0.441	-157.5	1.139	13.520
13.50	0.547	-179.7	2.936	-19.0	0.081	-16.3	0.452	-164.1	1.135	13.358
14.00	0.535	-174.7	2.880	-25.7	0.083	-20.9	0.467	-170.1	1.130	13.209
14.50	0.524	-169.8	2.832	-32.5	0.085	-24.6	0.480	-175.8	1.122	13.102
15.00	0.511	-164.4	2.806	-39.2	0.088	-29.1	0.490	-178.1	1.102	13.090
15.50	0.498	-158.6	2.777	-46.2	0.091	-33.8	0.497	-171.4	1.088	13.040
16.00	0.481	-152.4	2.752	-53.4	0.093	-39.6	0.500	-164.1	1.098	12.804
16.50	0.463	-145.9	2.727	-60.9	0.097	-45.5	0.505	-155.8	1.082	12.738
17.00	0.445	-138.9	2.702	-68.8	0.099	-50.9	0.512	-146.7	1.080	12.639
17.50	0.425	-131.8	2.663	-76.5	0.102	-56.6	0.525	-137.7	1.064	12.621
18.00	0.409	-125.1	2.602	-84.2	0.102	-63.8	0.546	-129.4	1.069	12.461

Note:

1. Gain Calculations:

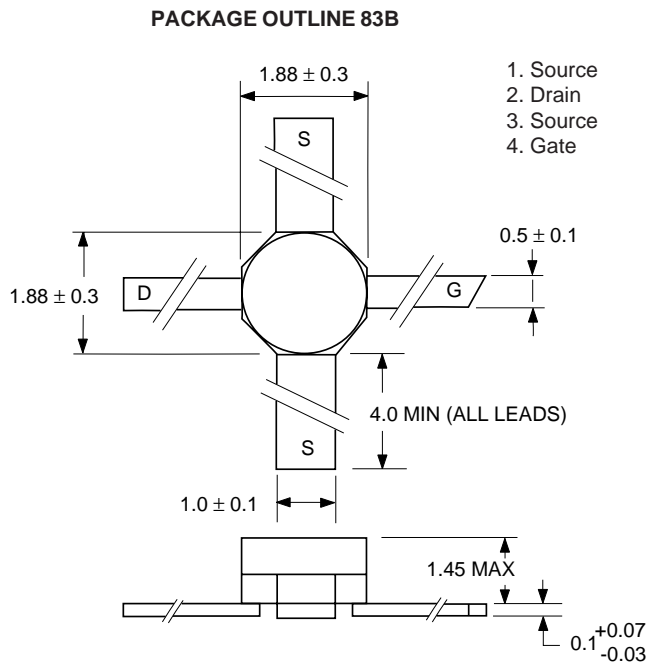
$$MAG = \frac{|S_{21}|}{|S_{12}|} \left( K \pm \sqrt{K^2 - 1} \right). \text{ When } K \leq 1, \text{ MAG is undefined and MSG values are used. } MSG = \frac{|S_{21}|}{|S_{12}|}, K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2 |S_{12} S_{21}|}, \Delta = S_{11} S_{22} - S_{21} S_{12}$$

MAG = Maximum Available Gain  
MSG = Maximum Stable Gain

**OUTLINE DIMENSIONS** (Units in mm)

**ORDERING INFORMATION**

PART NUMBER	AVAILABILITY	PACKAGE OUTLINE
NE24283B	Bulk	83B



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