

NEC SUPER LOW NOISE AMPLIFIER

N-CHANNEL HJ FET (SPACE QUALIFIED)

NE23383B

FEATURES

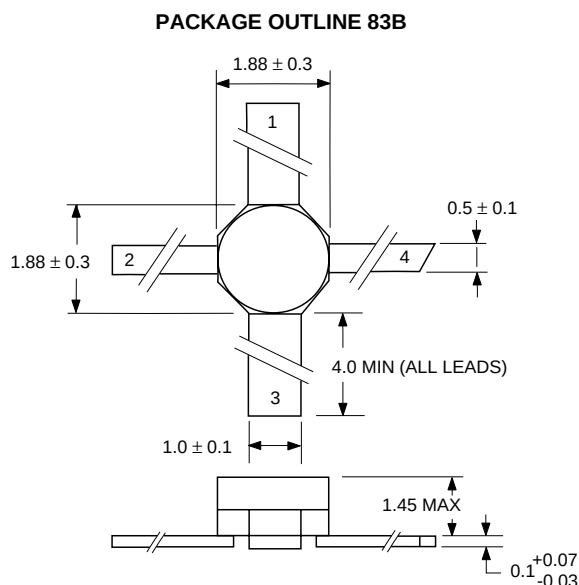
- **SUPER LOW NOISE FIGURE:**
NF = 0.35 dB TYP at f = 4 GHz
- **HIGH ASSOCIATED GAIN:**
GA = 15.0 dB TYP at f = 4 GHz
- **GATE LENGTH** = $L_G = 0.3 \mu\text{m}$
- **GATE WIDTH** = $W_G = 280 \mu\text{m}$
- **HERMETIC SEALED CERAMIC PACKAGE**
- **HIGH RELIABILITY**

DESCRIPTION

The NE23383B is a heterojunction FET that utilizes the heterojunction to create high mobility electrons. The device features mushroom shaped gate for decreased gate resistance and improved power handling capabilities. The mushroom gate structure also results in low noise figure and high associated gain. The device is housed in a rugged hermetically sealed metal ceramic stripline package selected for industrial and space applications.

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

OUTLINE DIMENSIONS (Units in mm)



APPLICATION

- **BEST SUITED FOR LOW NOISE AMPS STAGE AT C AND X BAND**

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

PART NUMBER PACKAGE OUTLINE			NE23383B		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
NF	Noise Figure at $V_{DS} = 2 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 4 \text{ GHz}$	dB		0.35	0.45
GA	Associated Gain at $V_{DS} = 2 \text{ V}$, $I_D = 10 \text{ mA}$, $f = 4 \text{ GHz}$	dB	13.0	15.0	
I_{DSS}	Saturated Drain Current at $V_{DS} = 2 \text{ V}$, $V_{GS} = 0 \text{ V}$	mA	15	40	80
$V_{GS(off)}$	Gate to Source Cut off Voltage at $V_{DS} = 2 \text{ V}$, $I_D = 100 \mu\text{A}$	V	-0.2	-0.8	-2.0
gm	Transconductance at $V_{DS} = 2 \text{ V}$, $I_D = 10 \text{ mA}$	ms	45	70	
I_{GDO}	Gate to Drain Leakage Current at $V_{GD} = -3 \text{ V}$	μA		0.5	10
I_{GSO}	Gate to Source Leakage Current at $V_{GS} = -3 \text{ V}$	μA		0.5	10

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

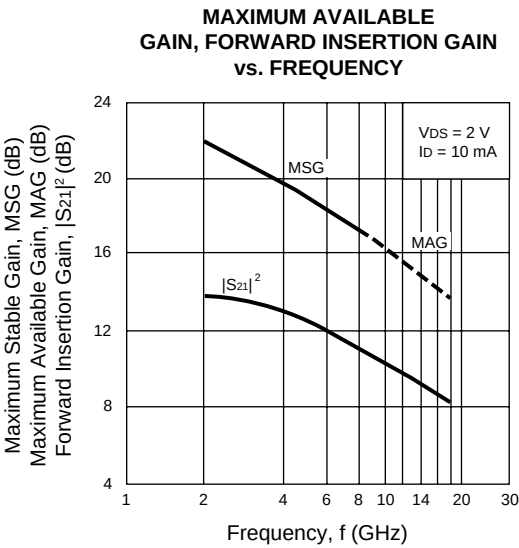
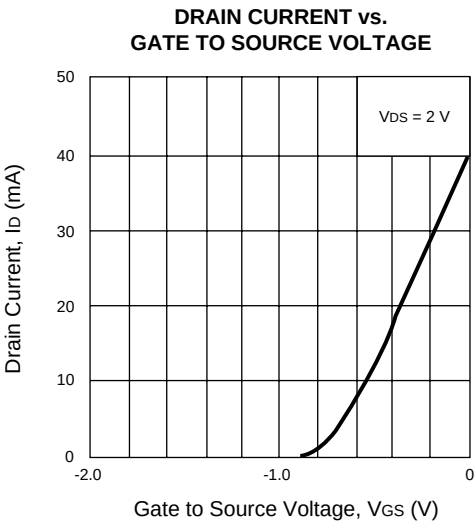
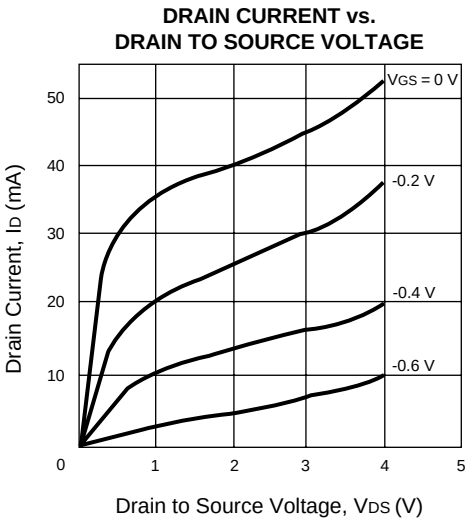
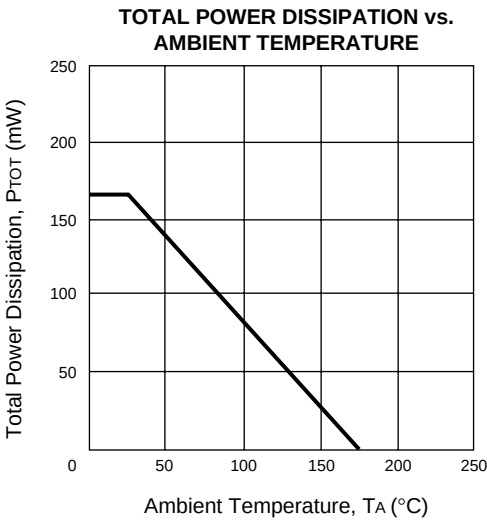
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{DS}	Drain to Source Voltage	V	4.0
V _{GS}	Gate to Source Voltage	V	−3.0
I _D	Drain Current	mA	I _{DSS}
P _{TOT}	Total Power Dissipation	mW	165
T _{CH}	Channel Temperature	°C	175
T _{STG}	Storage Temperature	°C	−65 to +175

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

RECOMMENDED
OPERATING CONDITIONS (T_A = 25°C)

PART NUMBER			NE23383B		
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{DS}	Drain to Source Voltage	V		2	3
I _D	Drain Current	mA		10	20
P _{IN}	Input Power	dBm			0

TYPICAL PERFORMANCE CURVES (T_A = 25°C)



TYPICAL NOISE PARAMETERS ($T_A = 25^\circ\text{C}$) $V_{DS} = 2\text{ V}$, $I_D = 10\text{ mA}$

FREQ. (GHz)	NF _{min} (dB)	GA (dB)	Γ_{OPT}		Rn/50
			MAG	ANG	
2.0	0.32	16.0	0.90	26	0.35
4.0	0.35	15.0	0.80	51	0.29
6.0	0.41	13.7	0.70	75	0.22
8.0	0.50	12.6	0.61	101	0.15
10.0	0.62	11.5	0.53	127	0.09
12.0	0.75	10.5	0.48	154	0.05
14.0	0.88	9.6	0.45	-178	0.05
16.0	1.02	8.8	0.44	-147	0.07
18.0	1.15	8.0	0.48	-115	0.14

TYPICAL SCATTERING PARAMETERS ($T_A = 25^\circ\text{C}$)**NE23383B** $V_{DS} = 2\text{ V}$, $I_D = 10\text{ mA}$

FREQUENCY	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
2.0	0.96	-39.94	5.00	141.49	0.03	66.70	0.52	-25.96	0.22
3.0	0.91	-53.81	4.54	125.98	0.04	58.07	0.54	-38.70	0.36
4.0	0.88	-64.11	4.07	113.15	0.05	52.54	0.54	-44.90	0.46
5.0	0.80	-74.58	3.85	100.67	0.05	47.00	0.57	-51.85	0.67
6.0	0.77	-85.67	3.73	88.48	0.06	42.12	0.51	-57.28	0.76
7.0	0.69	-98.42	3.71	75.46	0.07	36.19	0.46	-66.10	0.90
8.0	0.63	-115.67	3.64	60.60	0.08	28.39	0.41	-80.09	0.98
9.0	0.59	-132.86	3.44	46.21	0.08	21.00	0.40	-95.43	1.07
10.0	0.57	-145.83	3.18	32.90	0.08	13.97	0.41	-109.27	1.12
11.0	0.55	-154.21	2.97	22.06	0.08	7.90	0.43	-115.64	1.26
12.0	0.54	-164.09	2.91	10.84	0.08	6.58	0.46	-120.71	1.24
13.0	0.53	-179.26	2.88	-2.27	0.08	3.61	0.47	-131.41	1.15
14.0	0.53	169.19	2.78	-16.05	0.08	-4.59	0.46	-146.02	1.20
15.0	0.53	157.02	2.65	-29.31	0.08	-9.21	0.49	-156.04	1.18
16.0	0.53	149.49	2.69	-41.55	0.08	-10.08	0.55	-166.37	0.98
17.0	0.52	136.67	2.69	-57.64	0.09	-17.82	0.58	-177.96	0.85
18.0	0.50	117.26	2.59	-76.16	0.09	-30.52	0.61	-159.46	0.81

Note:

1. Gain Calculations:

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

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