NEC's C TO KA BAND
SUPER LOW NOISE AMPLIFIER
N-CHANNEL HJ FET CHIP

NE32500

FEATURES

- **SUPER LOW NOISE FIGURE:** 0.45 dB TYP at 12 GHz
- **HIGH ASSOCIATED GAIN:** 12.5 dB TYP at 12 GHz
- **GATE LENGTH: L_G = 0.20 μm**
- **GATE WIDTH: W_G = 200 μm**

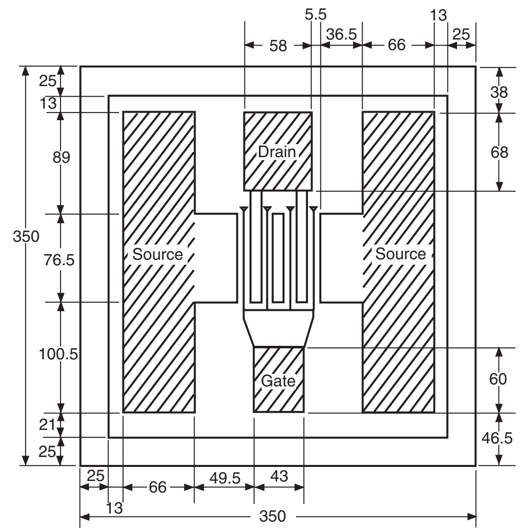
DESCRIPTION

NEC's NE32500 is a Hetero-Junction FET chip that uses the junction between Si-doped AlGaAs and undoped InGaAs to create very high mobility electrons. Its excellent low noise figure and high associated gain make it suitable for commercial systems and industrial applications.

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

OUTLINE DIMENSIONS (Units in μm)

CHIP



Thickness = 140 μm

Bonding Area

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE32500 00 (Chip)		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
NF	Noise Figure, V_{DS} = 2 V, I_{DS} = 10 mA, f = 12 GHz	dB		0.45	0.55
G_A	Associated Gain, V_{DS} = 2 V, I_{DS} = 10 mA, f = 12 GHz	dB	11.0	12.5	
I_{DSS}	Saturated Drain Current, V_{DS} = 2 V, V_{GS} = 0 V	mA	20	60	90
g_m	Transconductance, V_{DS} = 2 V, I_D = 10 mA	mS	45	60	
I_{GSO}	Gate to Source Leakage Current, V_{GS} = -3 V	μA		0.5	10.0
V_{GS}(off)	Gate to Source Cutoff Voltage, VDS = 2 V, ID = 100 μA	V	-0.2	-0.7	-2.0
$R_{TH\ (CH-C)}$	Thermal Resistance[1] (Channel to Case)	°C/W			260

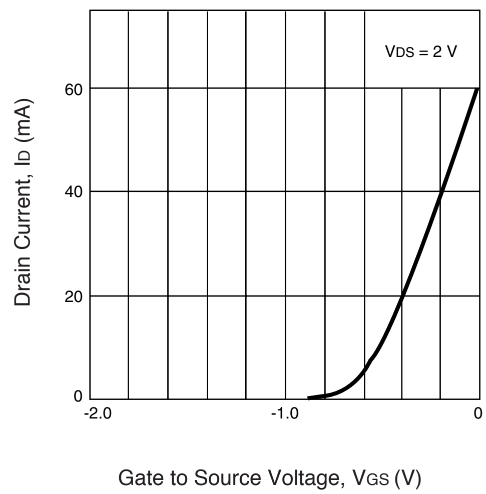
Note:
1. RF performance is determined by packaging and testing 10 chips per wafer.
Wafer rejection criteria for standard devices is 2 rejects per 10 samples.

ABSOLUTE MAXIMUM RATINGS[1] (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_{DS}	Drain Current	mA	I_{DSS}
P_T	Total Power Dissipation[2]	mW	200
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

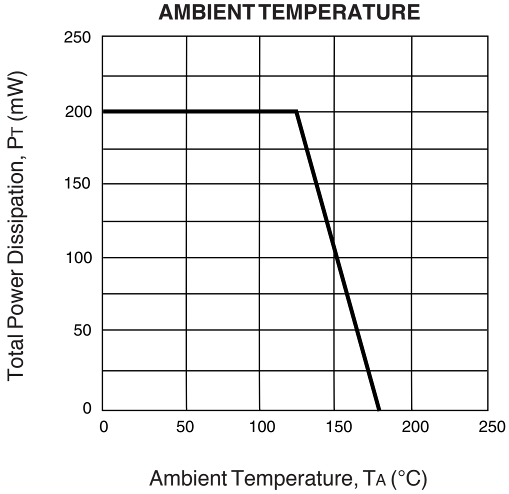
Note:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Chip mounted on Alumina heatsink (size: 3 x 3 x 0.6[t])

DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE

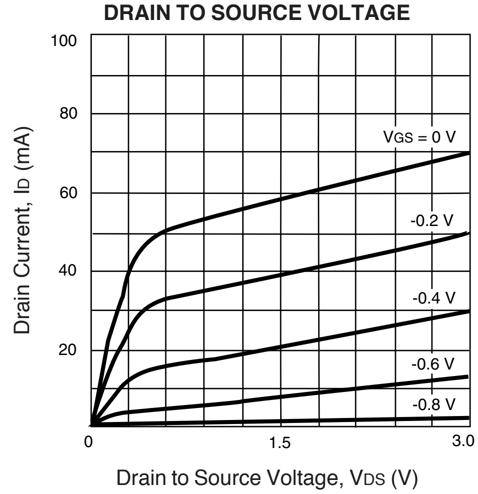


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

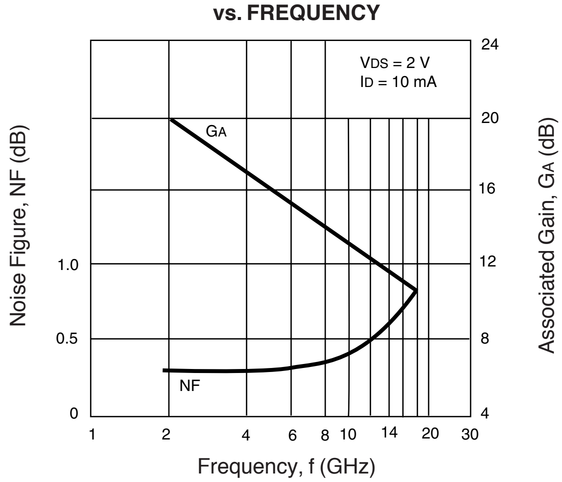
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



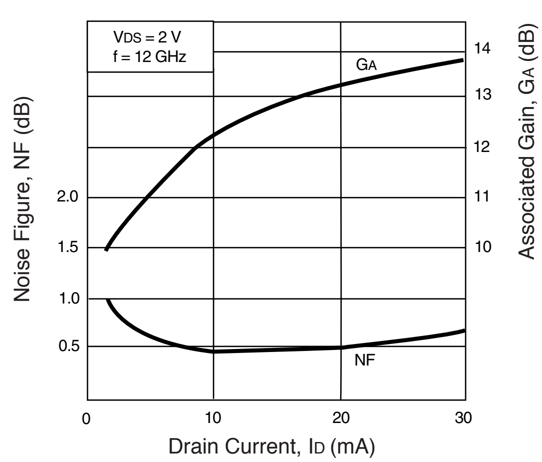
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



NOISE FIGURE AND ASSOCIATED GAIN vs. FREQUENCY



NOISE FIGURE AND ASSOCIATED GAIN vs. DRAIN CURRENT



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE32500
V_{DS} = 2 V, I_{DS} = 10 mA

FREQUENCY	S11		S21		S12		S22	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.5	0.999	-4	4.34	177	0.006	82	0.564	-3
1.0	0.998	-7	4.33	174	0.012	84	0.562	-6
2.0	0.996	-14	4.28	168	0.025	81	0.559	-11
3.0	0.992	-20	4.24	163	0.037	76	0.557	-17
4.0	0.976	-28	4.169	158	0.048	71	0.551	-23
5.0	0.962	-36	4.11	152	0.060	66	0.546	-29
6.0	0.962	-42	4.06	148	0.070	62	0.539	-34
7.0	0.943	-48	3.95	143	0.079	58	0.533	-40
8.0	0.928	-55	3.83	139	0.087	55	0.526	-44
9.0	0.920	-60	3.73	134	0.095	51	0.519	-49
10.0	0.900	-67	3.58	129	0.104	47	0.508	-54
11.0	0.881	-72	3.46	126	0.109	43	0.503	-58
12.0	0.869	-77	3.334	122	0.114	40	0.494	-62
13.0	0.856	-82	3.23	118	0.120	37	0.488	-66
14.0	0.839	-86	3.11	115	0.123	34	0.483	-69
15.0	0.831	-91	3.01	112	0.127	32	0.476	-72
16.0	0.818	-96	2.88	108	0.131	29	0.472	-76
17.0	0.804	-99	2.78	105	0.134	27	0.468	-79
18.0	0.796	-103	2.68	103	0.137	24	0.464	-81
19.0	0.784	-106	2.59	100	0.0141	22	0.460	-84
20.0	0.782	-111	2.49	96	0.142	20	0.456	-88

Note:
1. Gain Calculation:

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

ORDERING INFORMATION

PART	I_{DSS} SELECTION (mA)
NE32500	20 to 90 (Standard)
NE32500N	0 to 60
NE32500M	50 to 90

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 6/21/2000