



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

NE32500

FEATURES

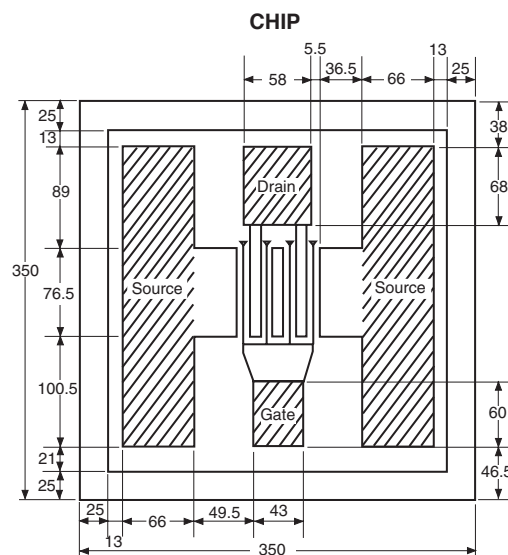
- **SUPER LOW NOISE FIGURE:**
0.45 dB TYP at 12 GHz
- **HIGH ASSOCIATED GAIN:**
12.5 dB TYP at 12 GHz
- **GATE LENGTH:** $L_G = 0.20 \mu\text{m}$
- **GATE WIDTH:** $W_G = 200 \mu\text{m}$

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)



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

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

Note:

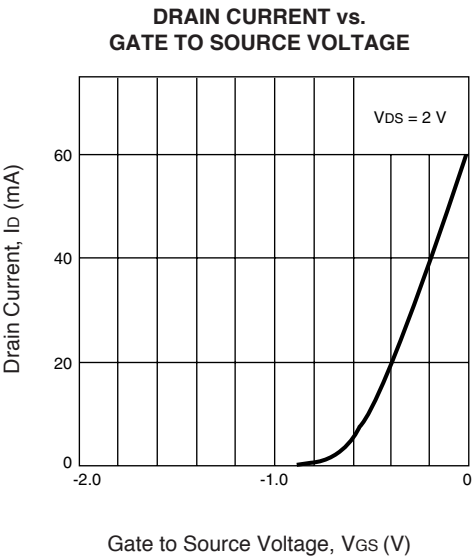
1. RF performance is determined by packaging and testing 10 chips per wafer.
Wafer rejection criteria for standard devices is 2 rejects per 10 samples.

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

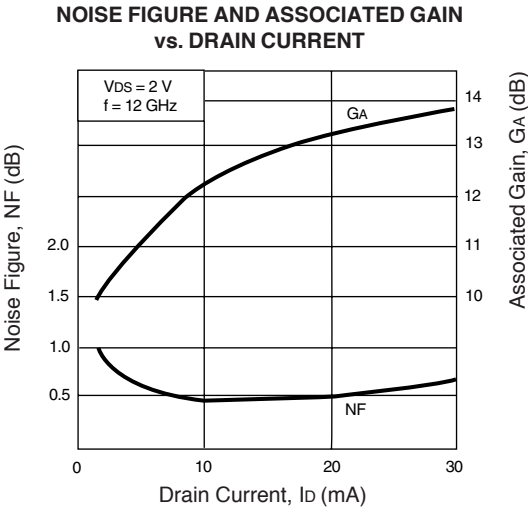
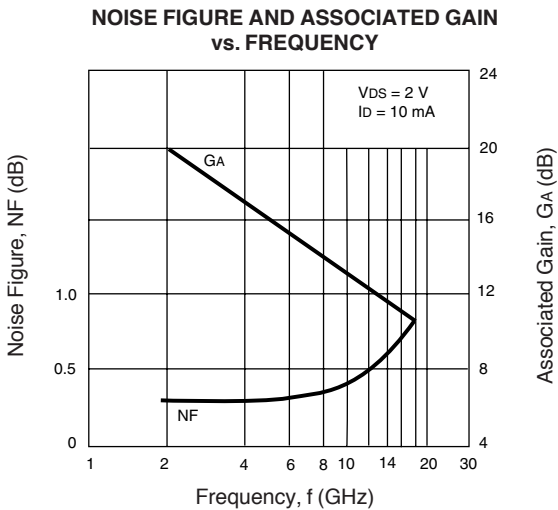
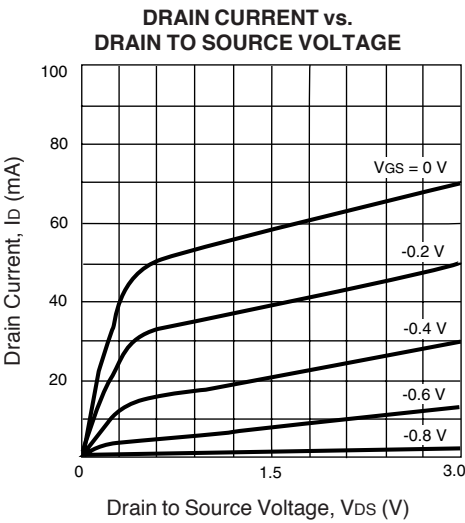
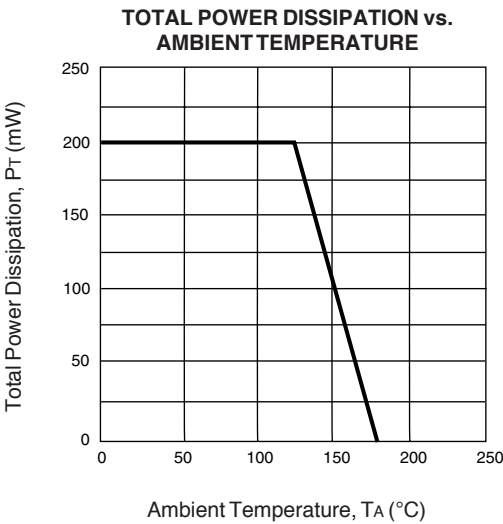
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{DS}	Drain to Source Voltage	V	4.0
V _{GS}	Gate to Source Voltage	V	-3.0
I _{DS}	Drain Current	mA	I _{DSS}
P _T	Total Power Dissipation ²	mW	200
T _{CH}	Channel Temperature	°C	175
T _{STG}	Storage Temperature	°C	-65 to +175

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[†])



TYPICAL PERFORMANCE CURVES (T_A = 25°C)



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE32500

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

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	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:

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

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

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

EXCLUSIVE NORTH AMERICAN AGENT FOR **NEC** RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS
CEL CALIFORNIA EASTERN LABORATORIES • Headquarters • 4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • Telex 34-6393 • FAX (408) 988-0279
 24-Hour Fax-On-Demand: 800-390-3232 (U.S. and Canada only) • Internet: <http://WWW.CEL.COM>

DATA SUBJECT TO CHANGE WITHOUT NOTICE

6/21/2000