



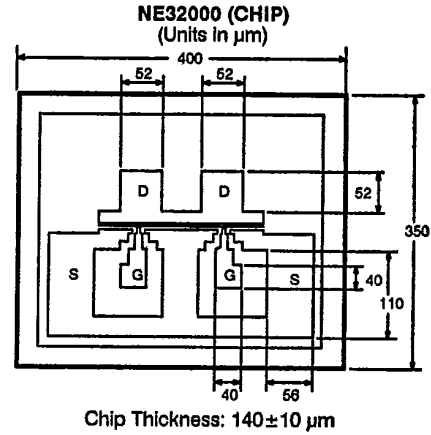
LOW COST/LOW NOISE K-BAND HETERO JUNCTION FET

**NE32000
NE32083A
NE32084**

FEATURES

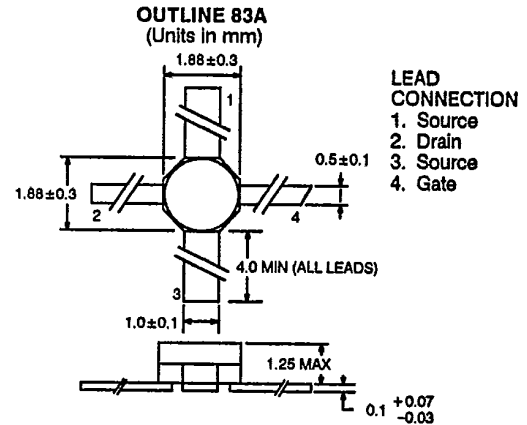
- **LOW NOISE FIGURE**
1.2 dB TYP at $f = 12$ GHz (NE32083A)
1.3 dB TYP at $f = 12$ GHz (NE32084)
- **HIGH ASSOCIATED GAIN**
10 dB TYP at $f = 12$ GHz
- **LOW COST**
- **n+ AlGaAs/UNDOPED GaAs HETERO-JUNCTION STRUCTURE**
- **GATE LENGTH:** $L_g = 0.3$ microns
- **GATE WIDTH:** $W_g = 200$ microns
- **PASSIVATION ON CHIP FOR HIGH RELIABILITY**

OUTLINE DIMENSIONS



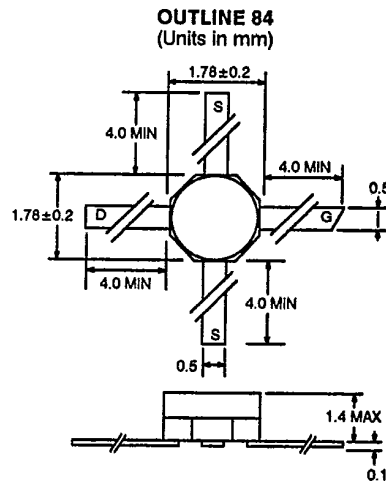
DESCRIPTION AND APPLICATIONS

The NE320 is a Hetero Junction FET that utilizes the hetero-junction between Si-doped AlGaAs and undoped GaAs to create high mobility electrons. Its excellent low noise and high associated gain make it suitable for satellite communications and commercial systems. The NE320 is available as a chip (NE32000) and in two hermetically sealed stripline packages (NE32083A and NE32084).



ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

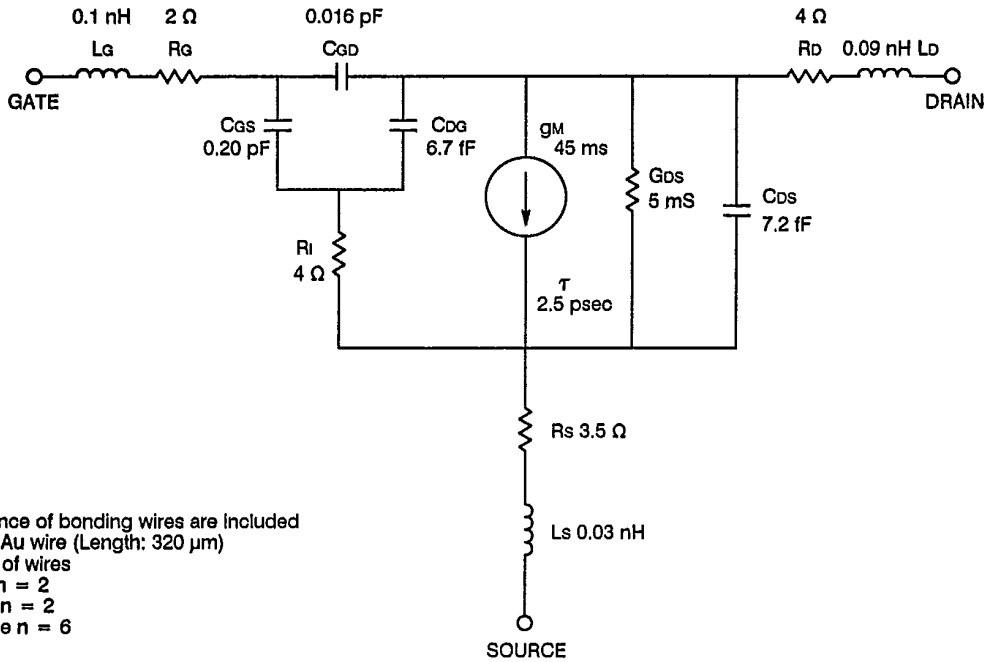
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{DS}	Drain to Source Voltage	V	4
V _{GS}	Gate to Source Voltage	V	-3
I _{DS}	Drain Current	mA	60
I _G	Gate Current	μA	10
P _T	Total Power Dissipation (NE32083A, NE32084)	mW	200
T _{CH}	Channel Temperature	°C	175
T _{STG}	Storage Temperature	°C	-65 to +175
P _{IN}	Input Power	dBm	+5



ELECTRICAL CHARACTERISTICS (TA = 25°C)

PART NUMBER PACKAGE OUTLINE		NE32000 00 (CHIP)			NE32083A 83A			NE32084 84			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
I _{DSX}	Drain to Source Leakage Current at V _{DS} = 4 V, V _{GS} = -2 V	μA			100			100			100
I _{DSS}	Saturated Drain Current at V _{DS} = 2 V, V _{GS} = 0	mA	12	30	60	12	30	60	12	30	60
I _{GSO}	Gate to Source Leakage Current at V _{GS} = -3 V	μA		1	10		1	10		1	10
V _{GS (OFF)}	Gate to Source Cutoff Voltage at V _{DS} = 2 V, I _{DS} = 100 μA	V	-0.3	-0.8	-2	-0.3	-0.8	-2	-0.3	-0.8	-2
g _M	Transconductance at V _{DS} = 2 V, I _{DS} = 10 mA	mS	30	45		30	45		30	45	
NF	Noise Figure at V _{DS} = 2 V, I _{DS} = 10 mA, f = 12 GHz	dB		1.2	1.4		1.2	1.4		1.3	1.5
GA	Associated Gain at V _{DS} = 2 V, I _{DS} = 10 mA, f = 12 GHz	dB	9.5	10		9.5	10		9	10	

EQUIVALENT CIRCUIT (NE32000)



I_{DS} = 10 mA
 V_{DS} = 2 V
 L_G = 0.3 μm
 W_G = 200 μm

NOTE: Inductance of bonding wires are included
 20 μm dia. Au wire (Length: 320 μm)
 n: Number of wires
 Gate n = 2
 Drain n = 2
 Source n = 6

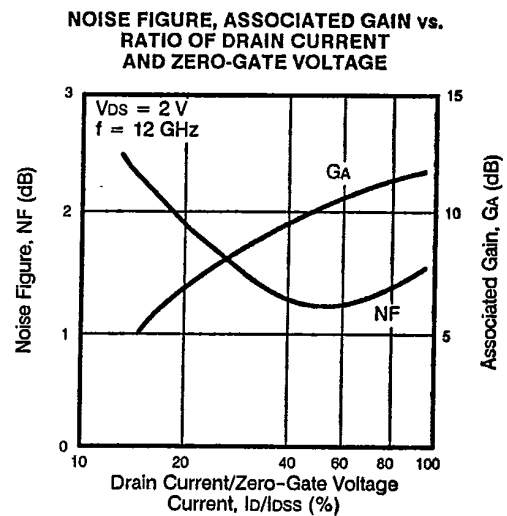
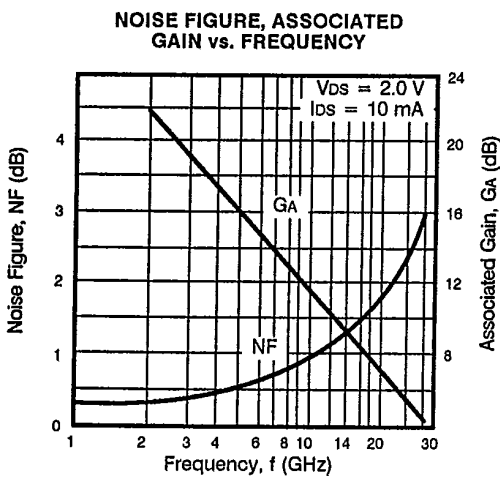
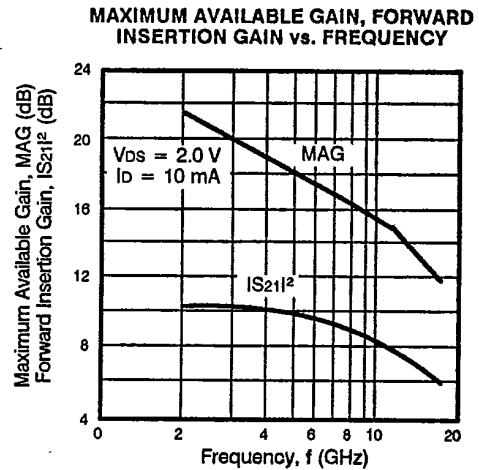
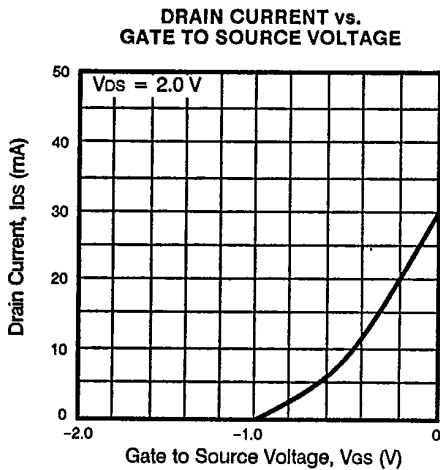
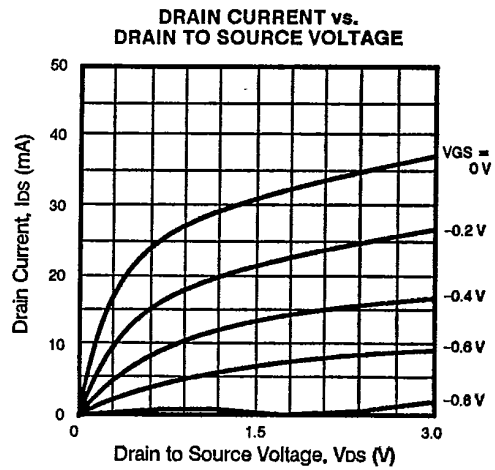
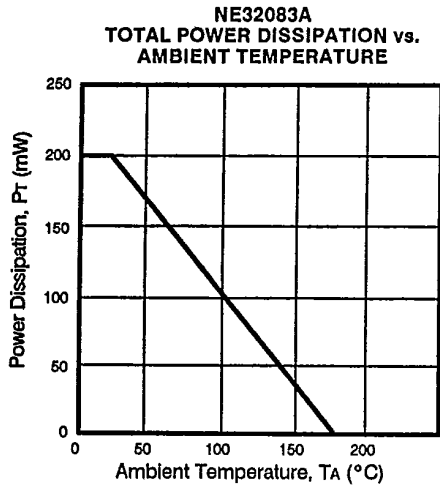


RECOMMENDED DIE ATTACHING AND BONDING CONDITIONS (NE32000)

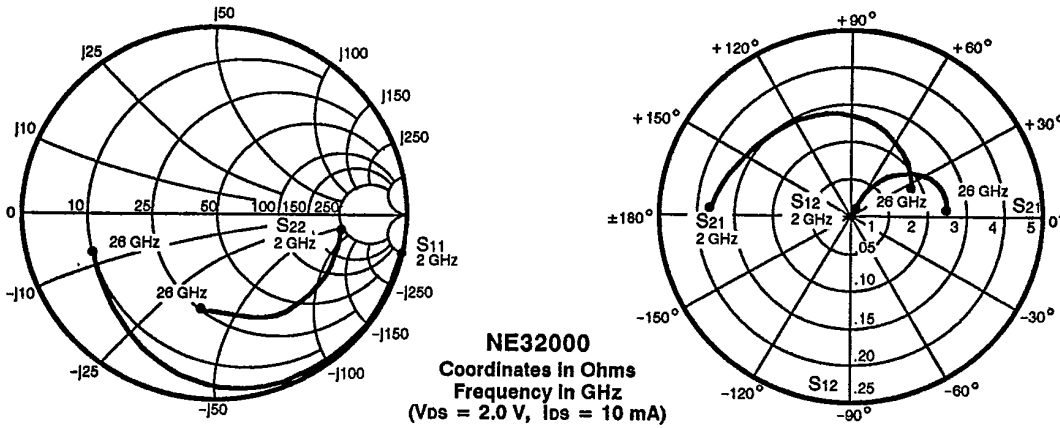
- | | |
|-----------------------------|------------------------------------|
| 1) Die Attaching: | 2) Bonding: |
| Solder : AuSn | Wire : 20μm Dia. Au |
| Temperature : 300 ± 10°C | Method : Thermocompression Bonding |
| Atmosphere : N ₂ | Temperature : 260 ± 10°C |
| Within 10 seconds | Atmosphere : N ₂ |
| | Within 5 minutes |

NE32000, NE32083A, NE32084

TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)



TYPICAL COMMON SOURCE SCATTERING PARAMETERS



S-MAGN AND PHASE:

VDS = 2.0 V, IDS = 10 mA

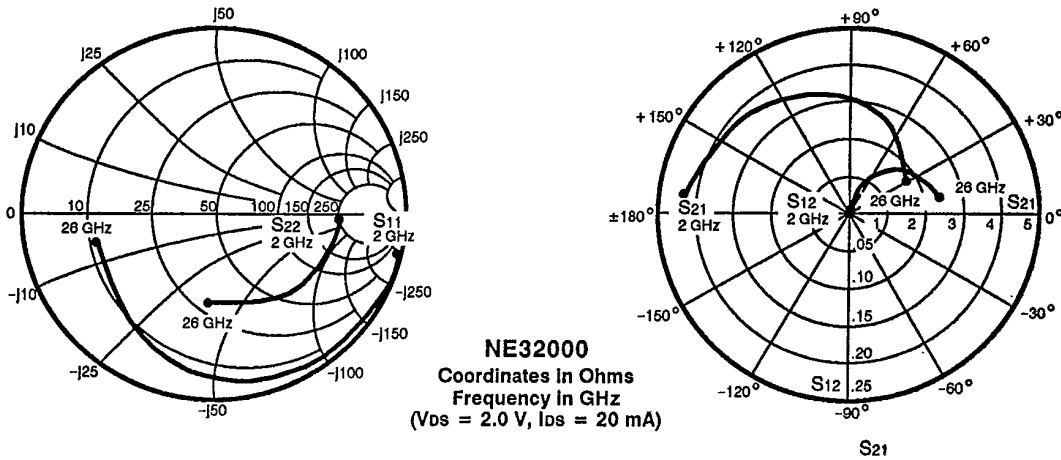
FREQUENCY (MHz)	S11	S21	S12	S22	k	MAG (dB)
2000	.996 -16	3.455 165	.024 81	.680 -10	.04	21.6
3000	.985 -27	3.425 155	.035 73	.664 -15	.13	19.9
4000	.972 -34	3.373 150	.047 70	.658 -19	.15	18.6
5000	.957 -41	3.301 144	.058 64	.651 -23	.21	17.5
6000	.952 -48	3.245 138	.068 61	.658 -26	.20	16.8
7000	.942 -56	3.213 131	.076 53	.640 -32	.24	16.3
8000	.915 -62	3.101 124	.080 50	.626 -36	.31	15.9
9000	.913 -68	3.000 118	.086 46	.623 -39	.33	15.4
10000	.929 -75	2.984 113	.091 44	.633 -43	.23	15.2
11000	.887 -83	2.925 105	.097 40	.613 -47	.34	14.8
12000	.871 -89	2.857 98	.102 40	.614 -48	.36	14.5
13000	.852 -96	2.773 91	.108 36	.611 -53	.39	14.1
14000	.823 -103	2.724 86	.114 33	.605 -54	.43	13.8
15000	.787 -110	2.631 79	.118 29	.601 -60	.48	13.5
16000	.778 -117	2.602 74	.120 26	.579 -62	.51	13.4
17000	.734 -123	2.454 69	.124 21	.562 -65	.62	13.0
18000	.705 -128	2.396 65	.124 17	.543 -69	.69	12.9
19000	.680 -133	2.256 62	.123 15	.521 -71	.79	12.6
20000	.679 -138	2.248 58	.122 12	.515 -74	.79	12.6
21000	.663 -141	2.107 53	.119 13	.509 -76	.87	12.5
22000	.688 -144	2.077 49	.120 12	.506 -78	.83	12.4
23000	.672 -149	1.920 44	.124 9	.500 -81	.92	11.9
24000	.655 -150	1.829 38	.122 8	.504 -83	1.01	11.1
25000	.655 -152	1.761 36	.129 12	.515 -86	.95	11.4
26000	.662 -159	1.719 29	.137 11	.505 -92	.89	11.0

NOTE: Bond wires are not de-embedded.
 Gate: Total 2 wires, 1 per Bond Pad, 0.013" long each wire.
 Drain: Total 2 wires, 1 per Bond Pad, 0.015" long each wire.
 Source: Total 4 wires, 2 per side, 0.007" long each wire.
 Wire: 0.0008" dia., gold.



NE32000, NE32083A, NE32084

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



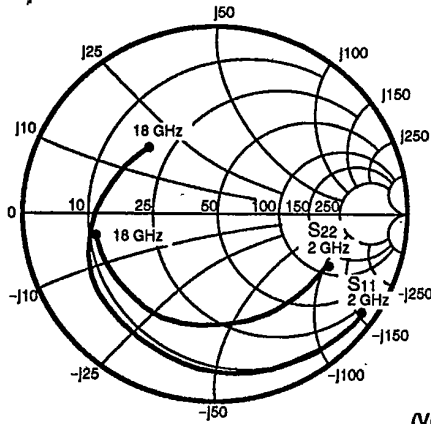
S-MAGN AND PHASE:

VDS = 2.0 V, IDS = 20 mA

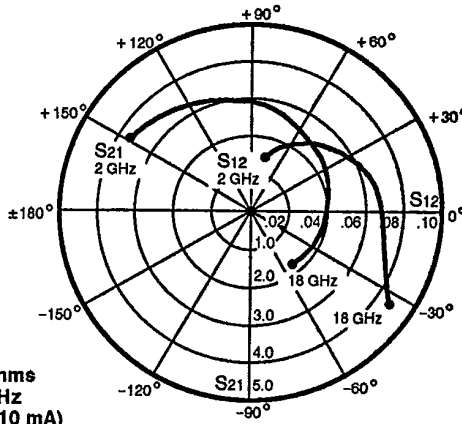
FREQUENCY (MHz)	S11		S21		S12		S22		k	MAG (dB)
2000	.989	-19	4.060	162	.023	79	.668	-11	.10	22.5
3000	.980	-29	3.998	154	.033	72	.654	-16	.14	20.8
4000	.964	-36	3.917	149	.043	70	.642	-19	.16	19.6
5000	.946	-44	3.812	142	.055	64	.636	-23	.23	18.4
6000	.944	-51	3.729	137	.064	61	.643	-26	.21	17.7
7000	.930	-59	3.684	129	.070	52	.622	-32	.26	17.2
8000	.897	-66	3.540	123	.074	49	.606	-36	.34	16.8
9000	.894	-71	3.414	116	.077	45	.603	-39	.36	16.4
10000	.906	-79	3.373	111	.083	45	.611	-43	.27	16.1
11000	.864	-87	3.289	103	.087	40	.592	-47	.37	15.8
12000	.849	-93	3.197	97	.092	41	.594	-48	.38	15.4
13000	.823	-101	3.079	90	.098	37	.591	-52	.42	15.0
14000	.800	-108	3.014	84	.101	35	.583	-53	.46	14.7
15000	.762	-115	2.894	77	.106	30	.582	-58	.52	14.4
16000	.751	-122	2.857	72	.110	28	.560	-60	.54	14.1
17000	.708	-128	2.685	68	.109	25	.544	-64	.65	13.9
18000	.684	-133	2.619	64	.112	21	.527	-66	.71	13.7
19000	.658	-137	2.462	61	.110	19	.503	-69	.82	13.5
20000	.663	-142	2.458	58	.111	16	.500	-73	.80	13.5
21000	.647	-145	2.299	53	.109	16	.502	-75	.88	13.2
22000	.669	-148	2.244	49	.111	18	.490	-76	.85	13.1
23000	.653	-153	2.092	43	.116	15	.487	-79	.92	12.6
24000	.632	-155	1.987	38	.112	12	.491	-80	1.05	11.1
25000	.634	-157	1.906	36	.121	17	.509	-83	.95	12.0
26000	.637	-162	1.870	29	.124	14	.490	-90	.96	11.8

NOTE: Bond wires are not de-embedded.
 Gate: Total 2 wires, 1 per Bond Pad, 0.013" long each wire.
 Drain: Total 2 wires, 1 per Bond Pad, 0.015" long each wire.
 Source: Total 4 wires, 2 per side, 0.007" long each wire.
 Wire: 0.0008" dia., gold.

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



NE32083A
Coordinates in Ohms
Frequency in GHz
($V_{DS} = 2.0\text{ V}$, $I_{DS} = 10\text{ mA}$)



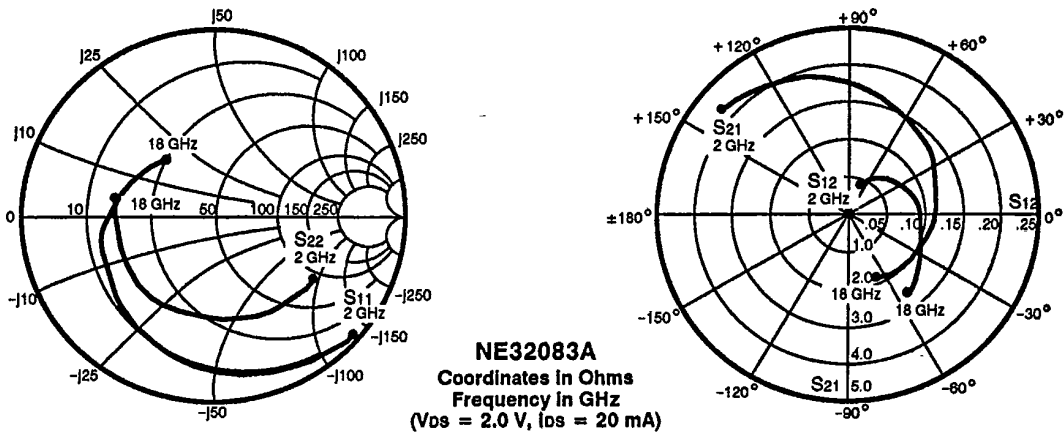
S-MAGN AND PHASE:
 $V_{DS} = 2.0\text{ V}$, $I_{DS} = 10\text{ mA}$
FREQUENCY (GHz)

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
2.00	.98	-34	3.55	148	.03	68	.65	-25
3.00	.94	-50	3.39	131	.04	55	.64	-37
4.00	.91	-65	3.22	116	.05	45	.63	-48
5.00	.88	-81	3.09	102	.06	34	.62	-60
6.00	.84	-95	2.91	87	.06	25	.61	-71
7.00	.82	-109	2.83	75	.07	18	.61	-81
8.00	.78	-120	2.63	62	.07	11	.60	-91
9.00	.76	-132	2.52	50	.07	5	.61	-100
10.00	.73	-144	2.36	40	.07	1	.61	-109
11.00	.71	-153	2.22	29	.07	-3	.61	-116
12.00	.69	-164	2.22	18	.07	-7	.62	-124
13.00	.66	-174	2.24	6	.08	-12	.62	-131
14.00	.62	176	2.09	-6	.07	-16	.61	-138
15.00	.60	166	2.01	-18	.08	-18	.61	-146
16.00	.58	156	2.00	-24	.08	-24	.62	-154
17.00	.55	145	2.00	-37	.08	-37	.63	-162
18.00	.51	133	2.00	-49	.09	-49	.63	-170



NE32000, NE32083A, NE32084

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



**S-MAGN AND PHASE:
VDS = 2.0 V, IDS = 20 mA**

FREQUENCY (GHz)	S11		S21		S12		S22	
2.00	.95	-40	4.31	140	.04	62	.61	-32
3.00	.90	-57	3.97	124	.06	50	.59	-46
4.00	.86	-75	3.77	106	.07	38	.57	-60
5.00	.79	-91	3.43	91	.08	27	.54	-74
6.00	.75	-105	3.21	75	.09	18	.52	-86
7.00	.71	-119	2.98	62	.09	10	.52	-97
8.00	.68	-130	2.77	50	.09	4	.51	-106
9.00	.65	-141	2.59	37	.09	-3	.52	-115
10.00	.63	-152	2.43	26	.09	-6	.52	-125
11.00	.61	-161	2.28	15	.09	-12	.52	-133
12.00	.57	-172	2.22	2	.10	-19	.52	-141
13.00	.54	-180	2.12	-8	.10	-22	.52	-148
14.00	.50	-171	2.03	-19	.10	-27	.51	-155
15.00	.48	-161	2.00	-32	.11	-33	.51	-163
16.00	.45	-150	1.98	-40	.12	-36	.51	-172
17.00	.43	-139	1.95	-54	.12	-45	.51	-179
18.00	.39	-127	1.95	-66	.13	-53	.51	-169