NEC®

LOW COST/LOW NOISE K-BAND HETERO JUNCTION FET

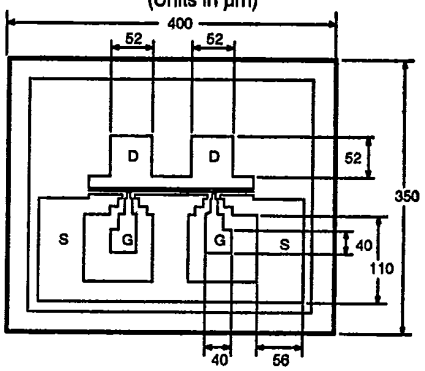
NE32000 NE32083A NE32084

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:** Lg = 0.3 microns
- **GATE WIDTH:** Wg = 200 microns
- **PASSIVATION ON CHIP FOR HIGH RELIABILITY**

OUTLINE DIMENSIONS

NE32000 (CHIP)
(Units in µm)

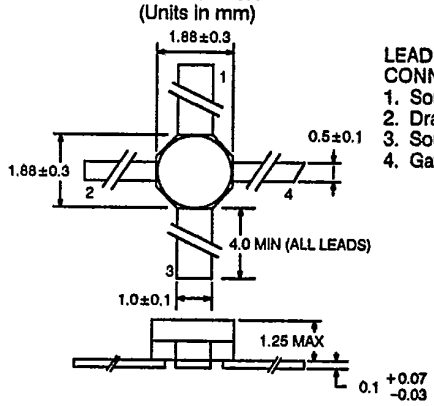


Chip Thickness: 140±10 µm

DESCRIPTION AND APPLICATIONS

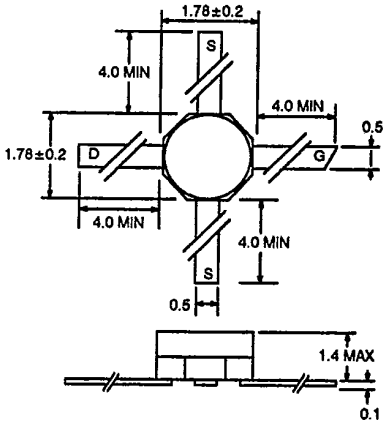
The NE320 is a Hetero Junction FET that utilizes the hetero-junction between Si-doped AlGaAs and undoped GaAs to create high mobility electrons. Its excellent low noise and high associated gain make it suitable for satellite communications and commercial systems. The NE320 is available as a chip (NE32000)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

OUTLINE 83A
(Units in mm)



LEAD CONNECTION
1. Source
2. Drain
3. Source
4. Gate

OUTLINE 84
(Units in mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

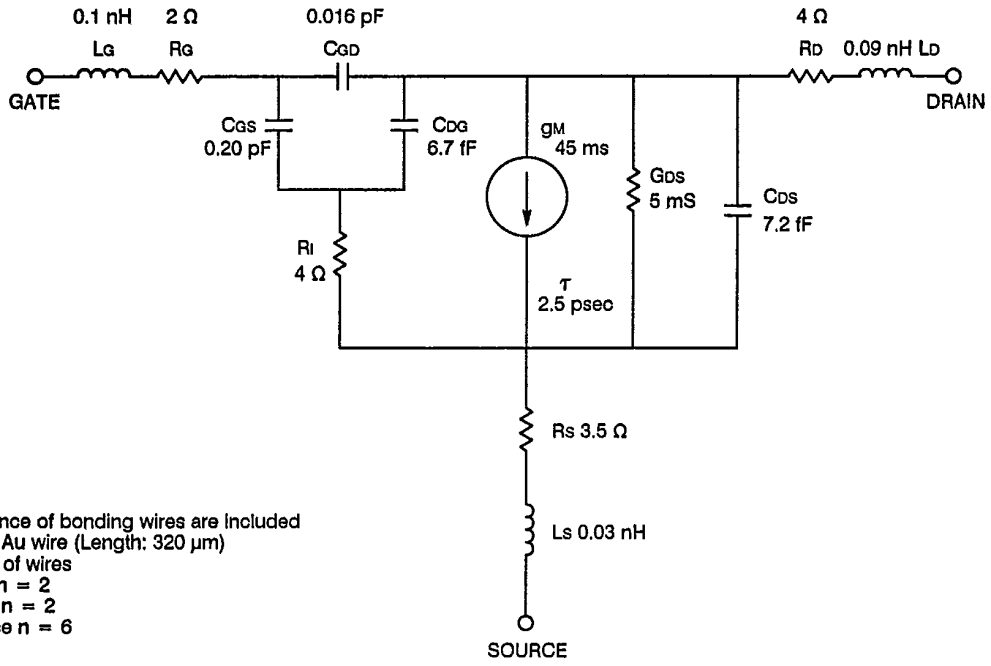
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	4
V_{GS}	Gate to Source Voltage	V	-3
I_{DS}	Drain Current	mA	60
I_G	Gate Current	µA	10
P_T	Total Power Dissipation (NE32083A, NE32084)	mW	200
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175
P_{IN}	Input Power	dBm	+5

Downloaded from Elcodis.com electronic components distributor

ELECTRICAL CHARACTERISTICS (T_A = 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
G_A	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)

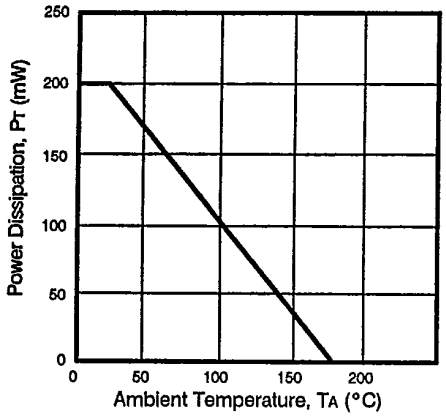
1) Die Attaching:
Solder : AuSn
Temperature : 300 ±10°C
Atmosphere : N_2
Within 10 seconds

2) Bonding:
Wire : 20µm Dia. Au
Method : Thermocompression Bonding
Temperature : 260 ±10°C
Atmosphere : N_2
Within 5 minutes

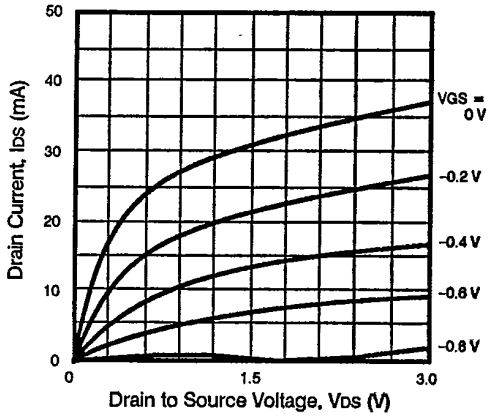
Downloaded from Elcodis.com electronic components distributor

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

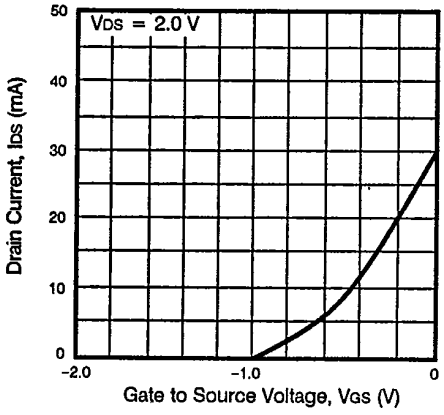
NE32083A
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



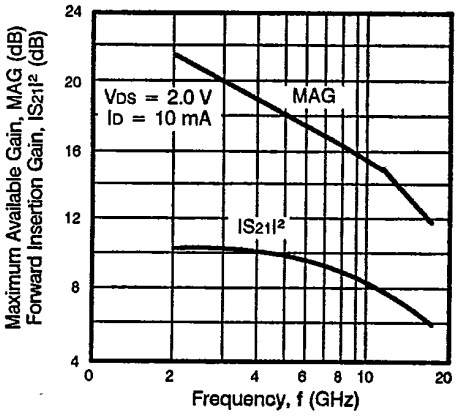
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



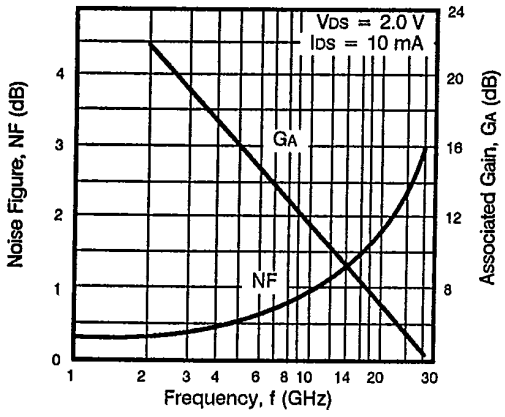
DRAIN CURRENT vs.
GATE TO SOURCE VOLTAGE



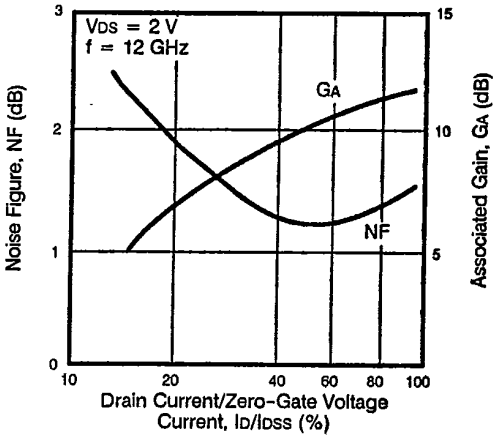
MAXIMUM AVAILABLE GAIN, FORWARD
INSERTION GAIN vs. FREQUENCY



NOISE FIGURE, ASSOCIATED
GAIN vs. FREQUENCY

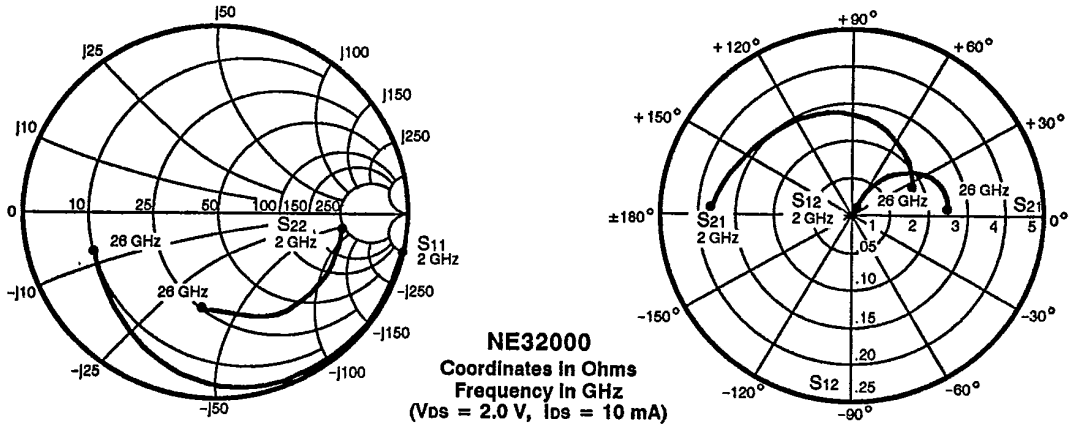


NOISE FIGURE, ASSOCIATED GAIN vs.
RATIO OF DRAIN CURRENT
AND ZERO-GATE VOLTAGE



Downloaded from Elcodis.com electronic components distributor

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



NE32000
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 2.0 V, I_{DS} = 10 mA)

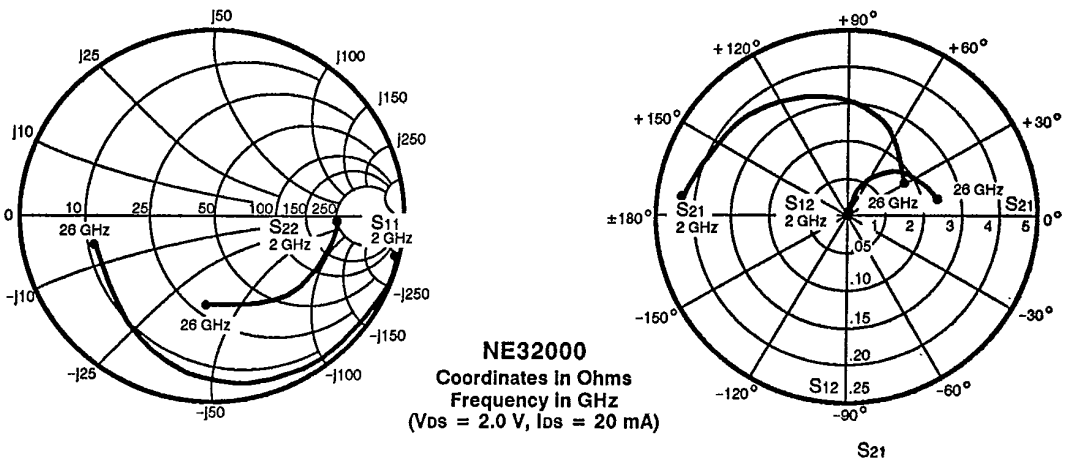
S-MAGN AND PHASE:
V_{DS} = 2.0 V, I_{DS} = 10 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		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.

Downloaded from Elcodis.com electronic components distributor

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



NE32000
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 2.0 V, I_{DS} = 20 mA)

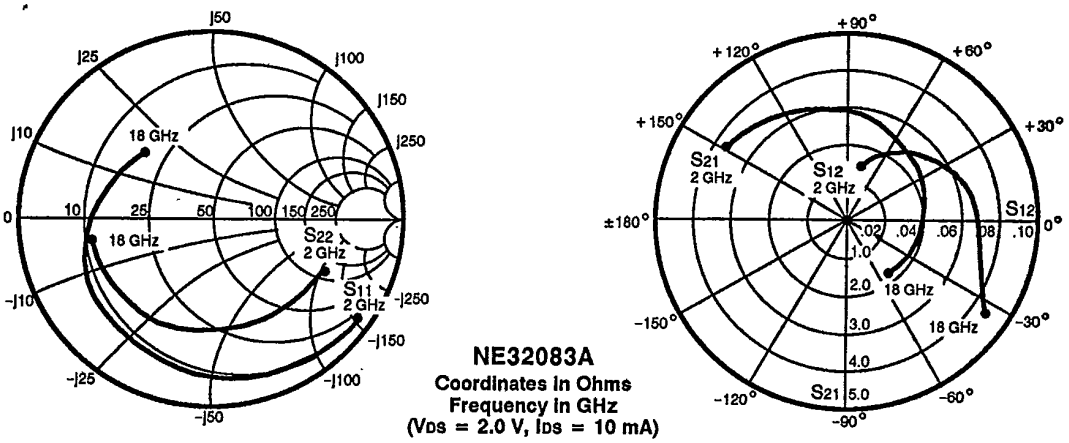
S-MAGN AND PHASE:
V_{DS} = 2.0 V, I_{DS} = 20 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}		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.

Downloaded from Elcodis.com electronic components distributor

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



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

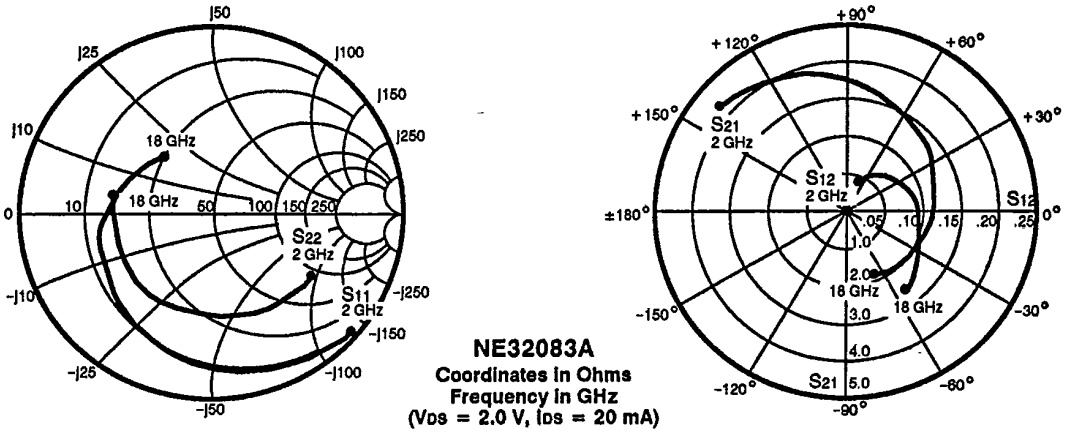
S-MAGN AND PHASE:
V_{DS} = 2.0 V, I_{DS} = 10 mA

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

3

Downloaded from Elcodis.com electronic components distributor

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



NE32083A
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 2.0 V, I_{DS} = 20 mA)

S-MAGN AND PHASE:
V_{DS} = 2.0 V, I_{DS} = 20 mA

FREQUENCY (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
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

Downloaded from Elcodis.com electronic components distributor