NEC®

LOW NOISE Ku-K BAND GaAs MESFET

NE700 SERIES

FEATURES

- **LOW COST**
- **LOW NOISE FIGURE**
  0.7 dB at 4 GHz
  1.9 dB at 12 GHz
- **HIGH ASSOCIATED GAIN**
  14.0 dB at 4 GHz
  9.0 dB at 12 GHz
- **HIGH MAG**
  16 dB at 8 GHz
  8 dB at 18 GHz
- **0.5 MICRON RECESSED GATE**
- **PROVEN RELIABILITY AND STABILITY**

DESCRIPTION AND APPLICATIONS

The NE700 is a low cost GaAs FET featuring low noise figures and high associated gains thru 18 GHz.

The device is available as a chip, NE70000 and in a hermetically sealed stripline package, NE70083. The NE70083-4 is a selected part with optimum noise characteristics at 4 GHz. The chip's 0.5 µm gate and channel are glassivated with a thin layer of SiO_2 for mechanical protection. All bonding pads use a Ti-Pt-Au metallization system.

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE70000 00 (CHIP)			NE70083 2SK353 83			NE70083-4 83		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**	**MIN**	**TYP**	**MAX**
f_{MAX}	Maximum Frequency of Oscillation at V_{DS} = 3 V, I_{DS} = 30 mA	GHz		80			80			80	
MAG	Maximum Available Gain[2] at V_{DS} = 3 V, I_{DS} = 30 mA										
	f = 8 GHz	dB		16			16			16	
	f = 12 GHz	dB		11			11			11	
	f = 18 GHz	dB		8							
NF_{OPT}	Optimum Noise Figure[3] at V_{DS} = 3 V, I_{DS} = 10 mA										
	f = 4 GHz	dB		0.7	0.9		0.7	0.9		0.7	0.8
	f = 8 GHz	dB		1.2			1.2			1.2	
	f = 12 GHz	dB		1.9	2.4[4]		1.9	2.4		1.9	2.4
G_A	Associated Gain at Optimum Noise Figure at V_{DS} = 3 V, I_{DS} = 10 mA										
	f = 4 GHz	dB		14			14		12	14	
	f = 8 GHz	dB		11			11			11	
	f = 12 GHz	dB		9			9			9	
P_{1dB}	Output Power at 1 dB Compression Point at V_{DS} = 3 V, I_{DS} = 20 mA										
	f = 12 GHz	dBm		15			15			15	

Notes:

1. Electronic Industrial Association of Japan.
2. Gain Calculations: $MAG = \frac{|S_{21}|}{|S_{12}|}(K \pm \sqrt{K^2 - 1})$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{12}||S_{21}|}$, $\Delta = S_{11}S_{22} - S_{21}S_{12}$
3. Typical values of noise figures are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening test with the fixture tuned for the "generic" type but not for each specimen.
4. RF performance is determined by packaging and testing 10 samples per wafer; wafer rejection criteria for standard devices is 2 rejects for 10 samples.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE70000 CHIP			NE70083 83			NE70083-4 83		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
I_{DSS}	Drain Current at V_{DS} = 3 V, V_{GS} = 0	mA	20	50	120	20	50	120	20	50	120
V_P	Pinch-off Voltage at V_{DS} = 3 V, I_{DS} = 0.1 mA	V	-0.5	-1.1	-6	-0.5	-1.1	-6	-0.5	-1.1	-6
g_M	Transconductance at V_{DS} = 3 V, I_{DS} = 10 mA	mS	20	45	100	20	45	100	20	45	100
I_{GS}	Gate to Source Leakage Current at V_{GS} = -5 V	µA		1	10		1	10		1	10
R_{TH}	Thermal Resistance (Channel-to-Ambient)	°C/W			190[1]			450			450
P_T	Total Power Dissipation	mW			400[1,2]			270[3]			270[3]

Notes:

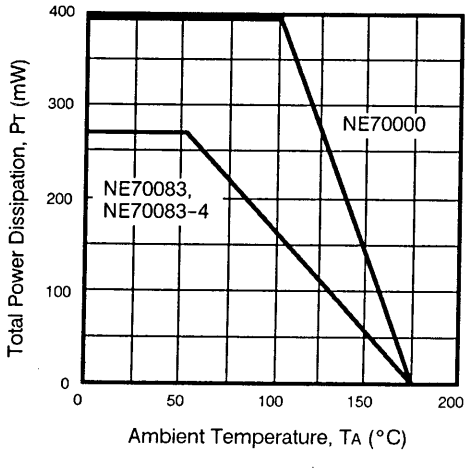
1. R_{TH} (Channel-to-Case) for chips mounted on a copper heatsink.
2. T_A = 100°C
3. T_A = 55°C

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

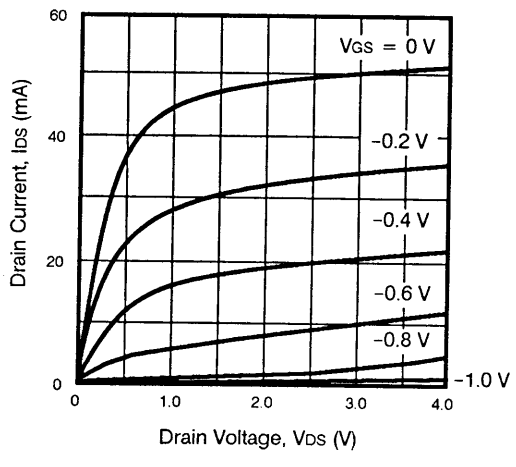
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	5
V_{GS}	Gate to Source Voltage	V	-6
I_{DS}	Drain Current	mA	100
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

TYPICAL DEVICE CHARACTERISTICS (T_A = 25°C)

POWER DERATING CURVE

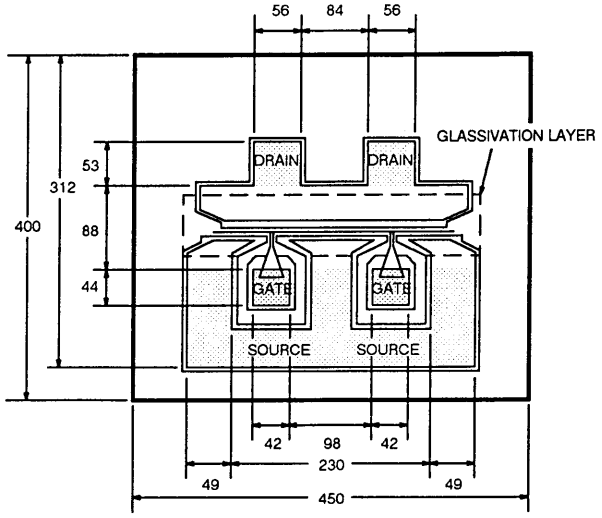


DC PERFORMANCE



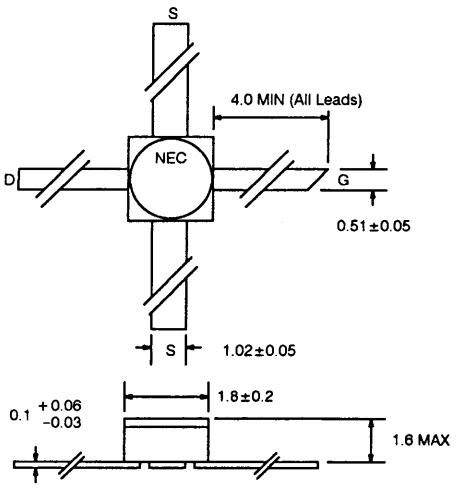
OUTLINE DIMENSIONS

NE70000 (CHIP)
(Units in μm)



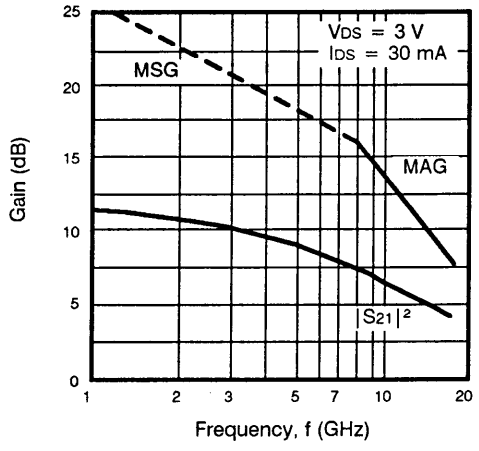
Bonding Pad Area. Chip Thickness: 140 μm

OUTLINE 83
(Units in mm)

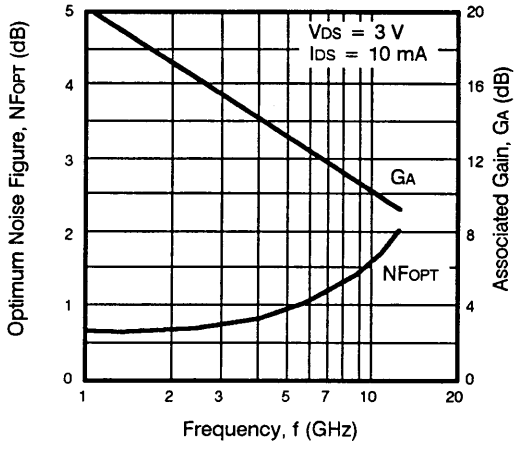


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

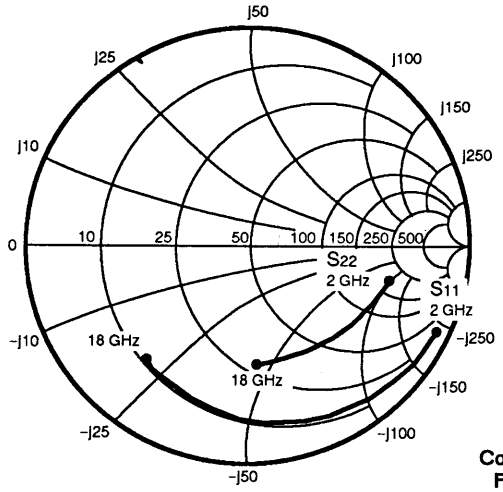
NE70083
GAIN VS. FREQUENCY

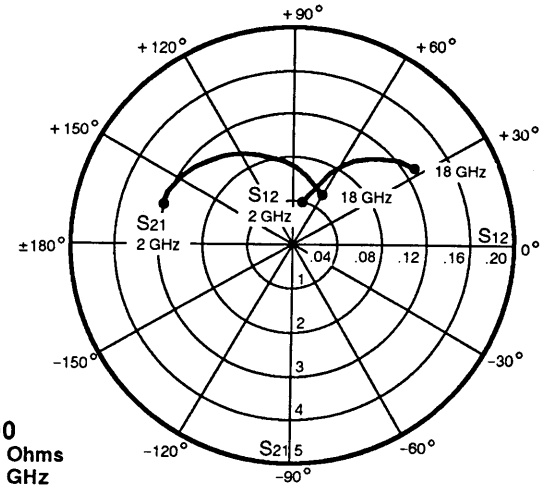


NE70083
NOISE FIGURE AND
ASSOCIATED GAIN vs. FREQUENCY



TYPICAL COMMON SOURCE SCATTERING PARAMETERS





NE70000
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 3 V, I_{DS} = 10 mA)

S-MAGN AND ANGLES:

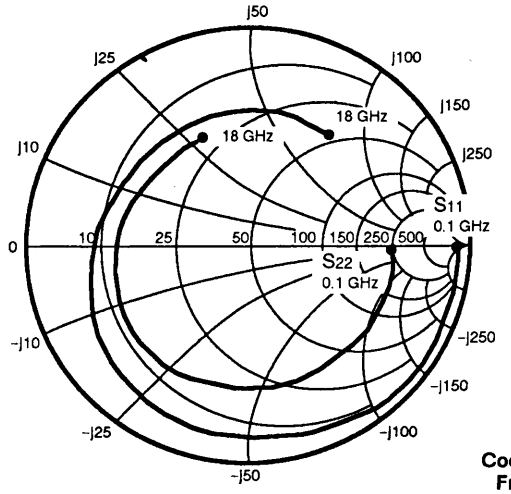
V_{DS} = 3 V, I_{DS} = 10 mA

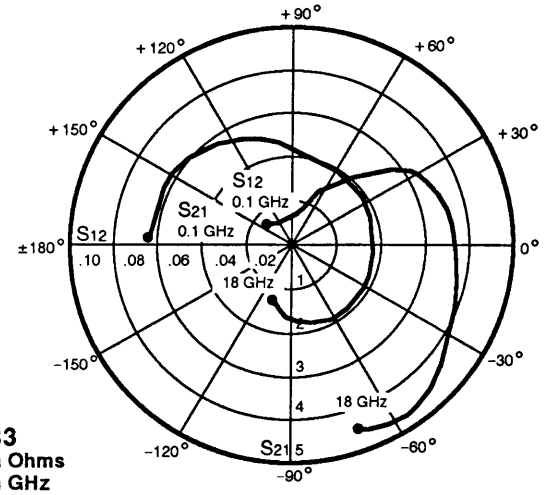
FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
2000	.97	-24	3.02	159	.04	77	.71	-14
3000	.94	-36	2.92	149	.06	69	.70	-20
4000	.91	-48	2.75	138	.07	63	.69	-26
5000	.87	-57	2.64	130	.08	57	.66	-31
6000	.85	-66	2.48	123	.09	55	.66	-36
7000	.81	-74	2.37	115	.10	50	.62	-40
8000	.78	-81	2.23	109	.11	45	.60	-43
9000	.76	-89	2.07	103	.11	43	.59	-47
10000	.73	-96	1.97	97	.12	40	.61	-51
11000	.72	-104	1.88	90	.12	37	.55	-55
12000	.71	-109	1.76	85	.12	36	.54	-59
13000	.70	-114	1.70	80	.12	33	.53	-64
14000	.68	-110	1.62	78	.12	35	.53	-68
15000	.68	-124	1.53	71	.12	31	.53	-73
16000	.67	-126	1.46	68	.13	30	.54	-77
17000	.64	-130	1.42	63	.12	32	.55	-80
18000	.65	-133	1.32	60	.13	33	.57	-82

V_{DS} = 3 V, I_{DS} = 30 mA

2000	.95	-26	3.57	157	.04	76	.66	-14
3000	.93	-40	3.53	147	.05	69	.65	-20
4000	.89	-52	3.23	136	.06	62	.63	-26
5000	.86	-63	3.08	127	.07	56	.60	-31
6000	.83	-71	2.88	121	.08	55	.59	-36
7000	.80	-80	2.70	113	.09	50	.58	-40
8000	.78	-87	2.58	108	.09	47	.57	-42
9000	.75	-95	2.31	101	.09	44	.56	-46
10000	.73	-102	2.23	96	.10	42	.54	-49
11000	.68	-109	2.07	88	.10	41	.51	-52
12000	.70	-116	2.01	84	.10	39	.48	-56
13000	.70	-122	1.84	78	.10	37	.49	-64
14000	.74	-126	1.83	77	.11	40	.51	-70
15000	.68	-129	1.01	68	.10	36	.52	-74
16000	.67	-130	1.62	68	.12	36	.53	-75
17000	.61	-134	1.53	61	.12	38	.51	-76
18000	.65	-136	1.48	57	.11	40	.54	-73

TYPICAL COMMON SOURCE SCATTERING PARAMETERS





NE70083
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 3 V, I_{DS} = 10 mA)

S-MAGN AND ANGLES:

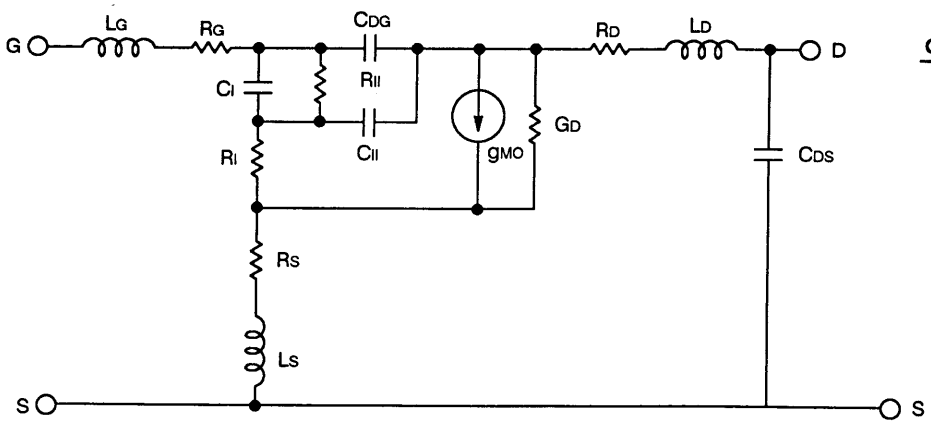
V_{DS} = 3 V, I_{DS} = 10 mA

FREQUENCY (MHz)	S11		S21		S12		S22	
100	1.00	-3	3.07	176	.01	134	.74	-2
500	.99	-11	3.14	167	.01	76	.74	-7
1000	.99	-24	3.05	159	.01	79	.75	-17
1500	.98	-35	2.97	147	.02	60	.74	-23
2000	.97	-44	2.95	137	.03	52	.75	-32
4000	.88	-76	2.40	108	.06	33	.66	-56
6000	.84	-100	2.14	80	.07	19	.68	-76
8000	.77	-124	1.93	54	.07	6	.66	-93
10000	.68	-147	1.83	32	.07	-4	.63	-108
12000	.58	180	1.83	1	.07	-14	.60	-125
14000	.54	134	1.89	-28	.08	-27	.53	-150
16000	.61	87	1.80	-63	.09	-41	.48	167
18000	.65	49	1.36	-102	.09	-68	.50	109

V_{DS} = 3 V, I_{DS} = 30 mA

100	1.00	-3	3.83	176	.02	58	.69	-3
500	.99	-14	3.92	166	.01	75	.69	-6
1000	.99	-25	3.80	158	.01	76	.70	-16
1500	.97	-37	3.69	146	.02	61	.70	-23
2000	.97	-48	3.64	135	.02	64	.70	-32
4000	.89	-80	3.02	105	.04	38	.62	-55
6000	.81	-103	2.62	78	.05	25	.63	-73
8000	.73	-127	2.29	51	.06	16	.63	-90
10000	.64	-148	2.15	29	.06	11	.61	-104
12000	.52	178	2.10	-2	.07	4	.58	-119
14000	.50	131	2.12	-32	.09	-9	.52	-141
16000	.57	84	1.96	-66	.11	-24	.44	179
18000	.64	46	1.48	-104	.11	-54	.44	118

EQUIVALENT CIRCUIT



OPTIMIZED VALUES
(ohm, nH, pF, mS)

COMPONENT	VALUE	
L_G	0.05	nH
R_G	0.05	Ω
C_I	0.238	pF
R_I	1.974	Ω
C_{II}	1.011	pF
R_{II}	1M	Ω
R_S	1.96	Ω
L_S	0.001	nH
C_{DG}	0.031	pF
R_D	1.5	Ω
L_D	0.05	nH
C_{DS}	0.05	pF
g_{MO}	36.0	mS
G_D	4.8	mS

3

NEC®

LOW NOISE Ku-K BAND GaAs MESFET

NE710 SERIES

FEATURES

- **VERY HIGH fMAX:** 90 GHz
- **LOW NOISE FIGURE**
- **HIGH ASSOCIATED GAIN**
- **0.3 MICRON RECESSED GATE**
- **N+ CONTACT LAYER** (Triple Epitaxial Technology)
- **PROVEN RELIABILITY AND STABILITY**

DESCRIPTION AND APPLICATIONS

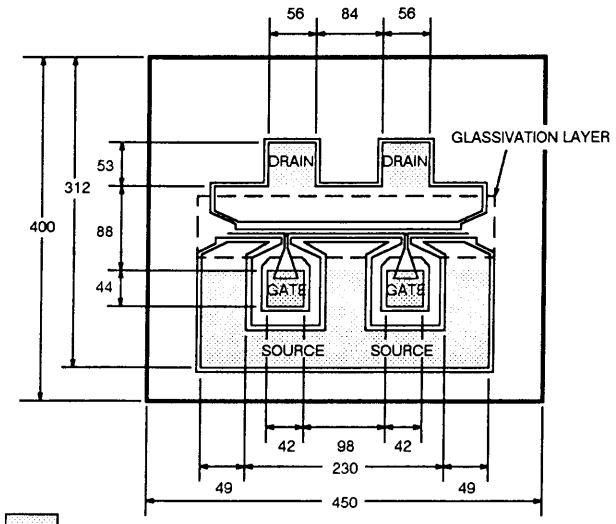
The NE710 series features a low noise figure and high associated gain thru K-band by employing a recessed 0.3 micron gate and triple epitaxial technology.

The device is available in chip form (NE71000). The surface of the device, except for the bonding pads, is passivated with SiO_2 and SiN_4 for scratch protection as well as surface stabilization. The NE71083 is a low cost device for industrial and military applications, and the NE71084 is a low cost device for consumer applications.

Several versions of NE71083 and NE70184 are available. Noise figure and gain of the NE71083 and NE70184 are specified at 12 GHz. The noise figure and gain of the NE71083-06, -07, -08 and the NE71084-06, -08 are specified at 4 GHz.

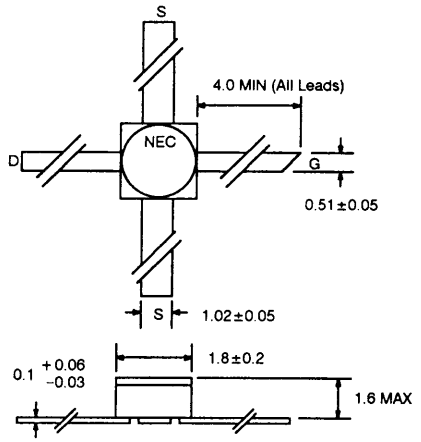
OUTLINE DIMENSIONS

NE71000 (CHIP)
(Units in μm)

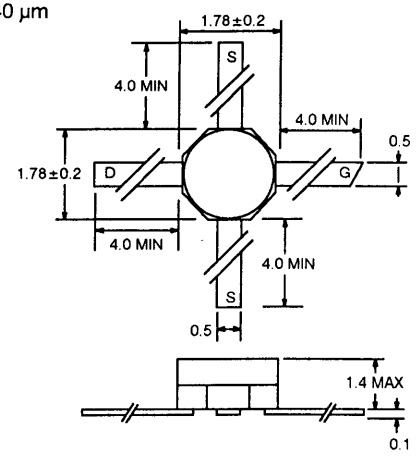


Bonding Pad Area. Chip Thickness: 140 μm

OUTLINE 83
(Units in mm)



OUTLINE 84
(Units in mm)



PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE71000 CHIP			NE71083 2SK406 83			NE71083-06 2SK406-06 83			NE71083-07 2SK406-07 83			NE71083-08 2SK406-08 83			NE71084 2SK609 84			NE71084-06 2SK609-06 84			NE71084-08 2SK609-08 84		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f_{MAX}	Maximum Frequency of Oscillation at V_{DS} = 3 V, I_{DS} = 30 mA	GHz		90			90			90			90			90			90			90			90	
MAG	Maximum Available Gain[2] at V_{DS} = 3 V, I_{DS} = 20 mA																									
	f = 4 GHz	dB		17			17												10			16.5			16.5	
	f = 8 GHz	dB		15			15																			
	f = 12 GHz	dB		12			12																			
	f = 18 GHz	dB		8.5			8.5																			
NF_{OPT}	Optimum Noise Figure[3] at V_{DS} = 3 V, I_{DS} = 10 mA																									
	f = 4 GHz	dB		0.6			0.6	0.7			0.6			0.7			0.8					0.45	0.6		0.6	0.8
	f = 8 GHz	dB		1			1																			
	f = 12 GHz	dB		1.5	1.8		1.5	1.8											1.6	1.8						
	f = 18 GHz	dB		2.1																						
	f = 26 GHz	dB		3.5																						
G_A	Associated Gain at Optimum Noise Figure at V_{DS} = 3 V, I_{DS} = 10 mA																									
	f = 4 GHz	dB		13		11.5	13														13	14		13	14	
	f = 8 GHz	dB		11			11																			
	f = 12 GHz	dB	8	9		8	9											8	9							
	f = 18 GHz	dB		7																						
	f = 26 GHz	dB		5.5																						
P_{1dB}	Output Power at 1 dB Compression Point at V_{DS} = 3 V, I_{DS} = 10 mA																									
	f = 4 GHz	dBm					14.5															14.5			14.5	
	f = 12 GHz	dBm		14.5			14.5												14.5							

Notes:

1. Electronic Industrial Association of Japan.

2. Gain Calculations: $MAG = \frac{|S_{21}|}{|S_{12}|}(K \pm \sqrt{k^2 - 1})$, $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{12}||S_{21}|}$, $\Delta = S_{11}S_{22} - S_{21}S_{12}$

3. Typical values of noise figures are those obtained when 50% of the devices from a large number of lots were individually measured in a circuit with the input individually tuned to obtain the minimum value. Maximum values are criteria established on the production line as a "go-no-go" screening test with the fixture tuned for the "generic" type but not for each specimen.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE71000 CHIP			NE71083 2SK406 83			NE71084 2SK609 84		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
I_{DSS}	Drain Current at V_{DS} = 3 V, V_{GS} = 0	mA	20	40	120	20	40	120	20	40	120
V_P	Pinch-off Voltage at V_{DS} = 3 V, I_{DS} = 0.1 mA	V	-0.5	-1.1	-3.5	-0.5	-1.1	-3.5	-0.5	-1.1	-3.5
g_m	Transconductance at V_{DS} = 3 V, I_{DS} = 10 mA	mS	20	50	100	20	50	100	20	50	100
I_{GS}	Gate to Source Leakage Current at V_{GS} = -5 V	µA		1	10		1	10		1	10
R_{TH}	Thermal Resistance (Channel-to-Case)	°C/W			190[2]			450			450
P_T	Total Power Dissipation	mW			400			270			270

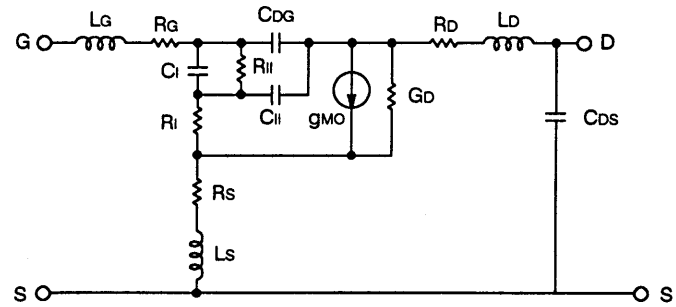
Notes:

1. Electronic Industrial Association of Japan.
2. R_{TH} for chip mounted on a copper heatsink.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	5
V_{GS}	Gate to Source Voltage	V	-6
I_{DS}	Drain Current	mA	120
P_{IN}	RF Input Power	mW	40
T_{CH}	Channel Temperature	°C	175
T_{STG}	Storage Temperature	°C	-65 to +175

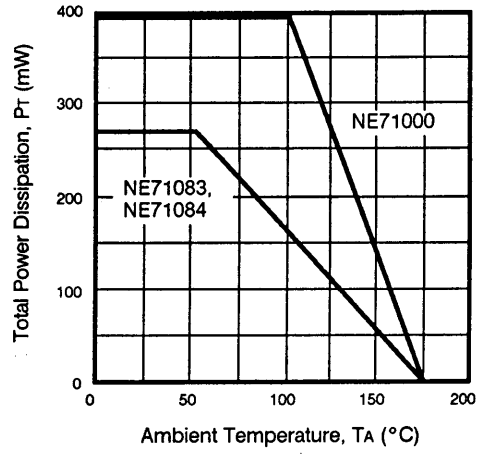
EQUIVALENT CIRCUIT



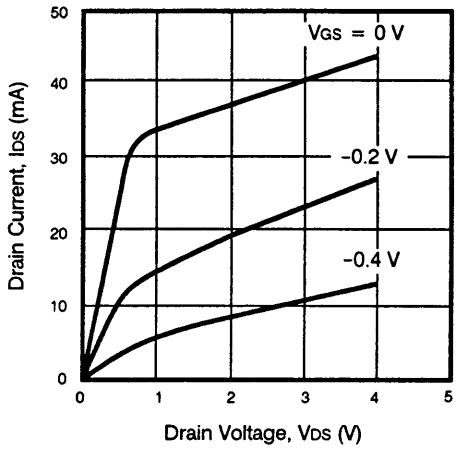
COMPONENT	VALUE
L_G	0.005 nH
R_G	2.00 Ω
C_I	0.28 pF
R_I	1.6 Ω
C_{II}	0.064 pF
R_{II}	1 M Ω
R_S	1.5 Ω
L_S	0.001 nH
C_{DG}	0.033 pF
R_D	1.5 Ω
L_D	0.005 nH
C_{DS}	0.03 pF
g_{MO}	48.0 mS
G_D	1.5 mS

TYPICAL DEVICE CHARACTERISTICS (T_A = 25°C)

POWER DERATING CURVE

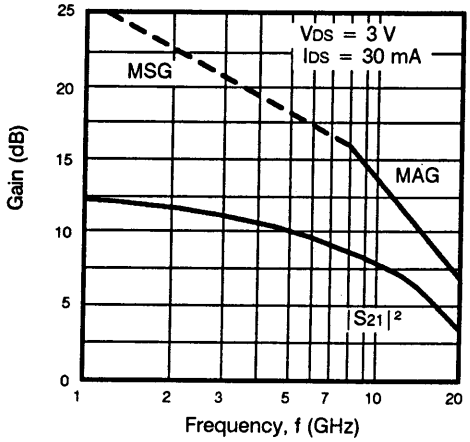


DC PERFORMANCE

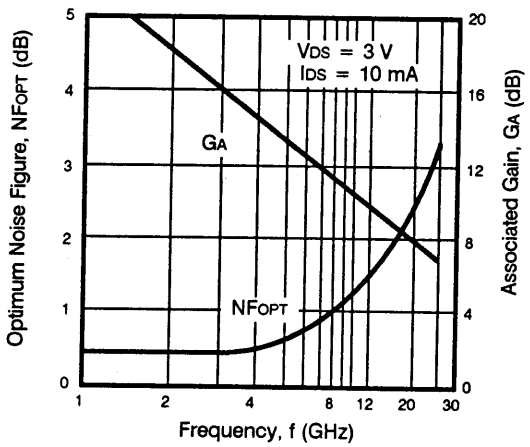


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

NE71083
GAIN vs. FREQUENCY



NE71083
NOISE FIGURE AND
ASSOCIATED GAIN FREQUENCY



TYPICAL NOISE PARAMETERS

NE71000 VDS = 3 V, IDS = 10 mA

FREQUENCY (GHz)	MIN NF (dB)	Γ_{OPT}	Rn/50 Ω
1.0	0.50	.90 ∠ 12	0.57
2.0	0.55	.85 ∠ 21	0.51
4.0	0.60	.75 ∠ 40	0.44
6.0	0.80	.69 ∠ 55	0.38
8.0	1.00	.62 ∠ 70	0.33
10.0	1.30	.56 ∠ 85	0.28
12.0	1.60	.52 ∠ 99	0.24
14.0	1.90	.49 ∠ 114	0.20
16.0	2.20	.47 ∠ 127	0.18
18.0	2.50	.45 ∠ 140	0.16

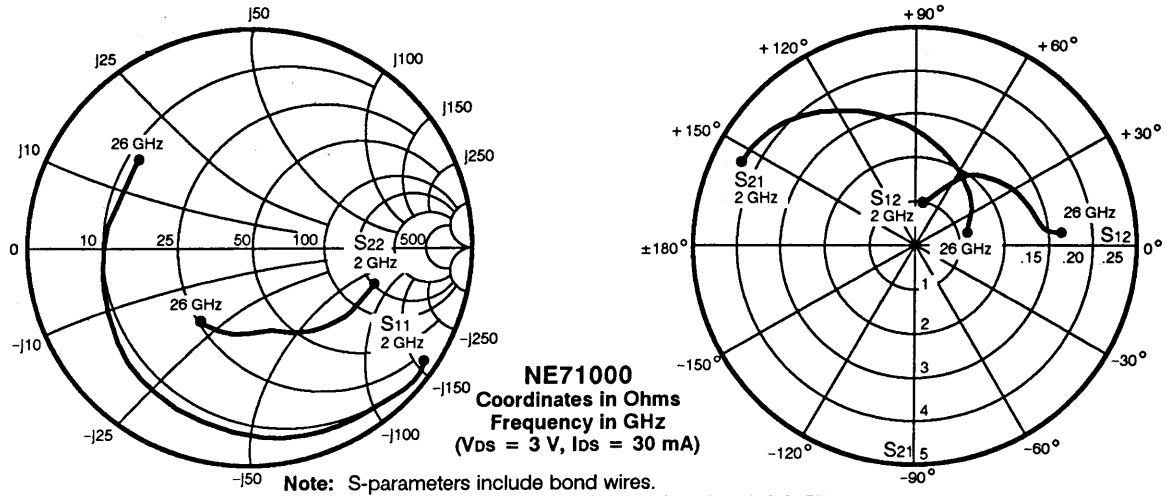
NE71083 VDS = 3 V, IDS = 10 mA

FREQUENCY (GHz)	MIN NF (dB)	Γ_{OPT}	Rn/50 Ω
1.0	0.45	.90 ∠ 17	0.65
2.0	0.55	.84 ∠ 40	0.57
4.0	0.60	.72 ∠ 79	0.48
6.0	0.80	.62 ∠ 112	0.39
8.0	1.00	.56 ∠ 143	0.33
10.0	1.35	.50 ∠ 168	0.28
12.0	1.60	.46 ∠ -165	0.24
14.0	1.90	.43 ∠ -140	0.20
16.0	2.10	.40 ∠ -112	0.18
18.0	2.70	.40 ∠ -84	0.16

NE71084 VDS = 3 V, IDS = 10 mA

FREQUENCY (GHz)	MIN NF (dB)	Γ_{OPT}	Rn/50 Ω
1.0	0.50	.90 ∠ 17	0.50
2.0	0.55	.85 ∠ 37	0.47
4.0	0.60	.71 ∠ 85	0.43
6.0	0.80	.61 ∠ 127	0.35
8.0	1.00	.54 ∠ 165	0.30
10.0	1.30	.52 ∠ -158	0.25
12.0	1.60	.51 ∠ -124	0.20

TYPICAL COMMON SOURCE SCATTERING PARAMETERS



NE71000
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 3 V, I_{DS} = 30 mA)

Note: S-parameters include bond wires.
Gate: Total 2 wire (s), 1 per bond pad, 0.015" long each wire.
Drain: Total 2 wire (s), 1 per bond pad, 0.011" long each wire.
Source: Total 4 wire (s), 2 per side, 0.008" long each wire.
Wire: 0.0008" Diameter, Gold.

S-MAGN AND ANGLES:

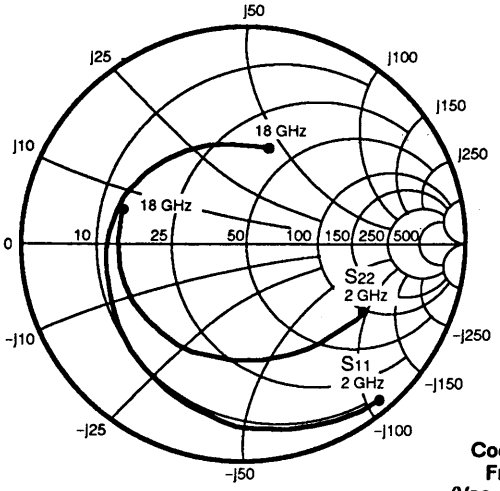
V_{DS} = 3 V, I_{DS} = 10 mA

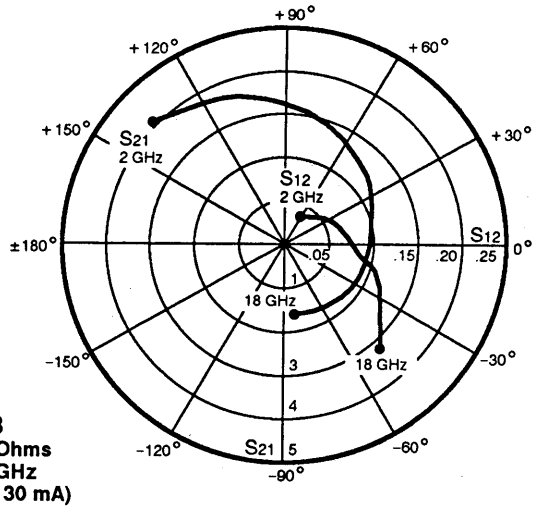
FREQUENCY (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
2.0	.98	-29	3.23	157	.06	72	.65	-16
3.0	.94	-43	3.14	145	.08	65	.64	-24
4.0	.92	-57	3.00	135	.10	56	.60	-32
5.0	.90	-70	2.84	125	.12	49	.59	-38
6.0	.89	-80	2.67	117	.14	43	.58	-44
7.0	.87	-91	2.53	108	.15	36	.57	-50
8.0	.84	-100	2.39	99	.16	30	.54	-55
9.0	.83	-107	2.23	92	.16	26	.54	-58
10.0	.82	-116	2.12	86	.17	23	.53	-64
11.0	.78	-124	2.01	78	.17	18	.50	-67
12.0	.77	-130	1.92	72	.17	17	.50	-70
13.0	.74	-138	1.82	65	.18	13	.48	-74
14.0	.73	-146	1.73	59	.18	10	.47	-78
15.0	.71	-154	1.68	54	.19	6	.48	-83
16.0	.69	-161	1.60	47	.19	4	.47	-90
17.0	.67	-167	1.51	43	.19	-1	.47	-96
18.0	.67	-172	1.47	39	.19	-3	.47	-99
19.0	.66	-176	1.41	35	.18	-6	.46	-103
20.0	.66	180	1.37	31	.18	-8	.47	-104
21.0	.66	176	1.32	26	.17	-7	.47	-106
22.0	.65	171	1.27	22	.17	-8	.48	-107
23.0	.64	167	1.21	19	.17	-7	.47	-109
24.0	.63	162	1.19	15	.18	-7	.47	-112
25.0	.63	155	1.14	11	.18	-7	.47	-115
26.0	.64	148	1.10	6	.19	-9	.46	-123

V_{DS} = 3 V, I_{DS} = 30 mA

2.0	.97	-34	4.35	155	.05	70	.58	-18
3.0	.92	-50	4.14	142	.07	63	.56	-26
4.0	.90	-65	3.88	131	.09	55	.53	-35
5.0	.87	-79	3.61	121	.10	48	.51	-40
6.0	.87	-90	3.36	114	.12	42	.50	-47
7.0	.85	-101	3.14	105	.12	34	.49	-53
8.0	.81	-110	2.93	97	.12	30	.46	-57
9.0	.80	-118	2.71	89	.13	27	.46	-59
10.0	.80	-126	2.55	84	.13	24	.46	-65
11.0	.76	-134	2.40	77	.13	21	.43	-67
12.0	.74	-140	2.28	70	.13	20	.43	-70
13.0	.73	-148	2.14	64	.14	17	.41	-74
14.0	.71	-156	2.02	59	.14	16	.40	-78
15.0	.70	-163	1.94	54	.14	14	.42	-83
16.0	.69	-170	1.86	48	.15	12	.41	-90
17.0	.67	-176	1.74	44	.15	9	.41	-96
18.0	.66	-180	1.69	40	.15	6	.41	-99
19.0	.66	176	1.62	37	.15	5	.41	-103
20.0	.66	172	1.58	33	.15	5	.42	-104
21.0	.66	168	1.52	29	.14	5	.42	-106
22.0	.65	164	1.47	25	.15	5	.43	-106
23.0	.64	159	1.38	21	.14	7	.42	-109
24.0	.63	155	1.37	18	.16	8	.42	-111
25.0	.63	149	1.30	13	.16	8	.41	-114
26.0	.65	142	1.25	8	.17	4	.42	-122

TYPICAL COMMON SOURCE SCATTERING PARAMETERS





NE71083
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 3 V, I_{DS} = 30 mA)

S-MAGN AND ANGLES:

V_{DS} = 3 V, I_{DS} = 10 mA

FREQUENCY (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
2.0	.96	-45	3.20	138	.05	59	.68	-31
3.0	.92	-64	2.95	121	.06	46	.66	-45
4.0	.88	-84	2.77	101	.07	33	.64	-59
5.0	.82	-102	2.56	86	.08	21	.61	-72
6.0	.79	-118	2.37	69	.09	11	.60	-84
7.0	.75	-134	2.20	54	.09	2	.60	-96
8.0	.73	-148	2.04	41	.09	-3	.60	-106
9.0	.71	-160	1.92	27	.09	-10	.60	-116
10.0	.68	-173	1.78	17	.09	-12	.60	-126
11.0	.67	176	1.70	5	.09	-17	.61	-134
12.0	.64	163	1.65	-9	.09	-22	.61	-143
13.0	.61	152	1.56	-20	.09	-24	.61	-152
14.0	.59	140	1.51	-31	.10	-27	.61	-160
15.0	.57	128	1.47	-45	.10	-33	.61	-169
16.0	.54	114	1.47	-54	.11	-35	.61	-178
17.0	.52	99	1.45	-69	.12	-45	.60	172
18.0	.50	85	1.41	-81	.14	-52	.59	160

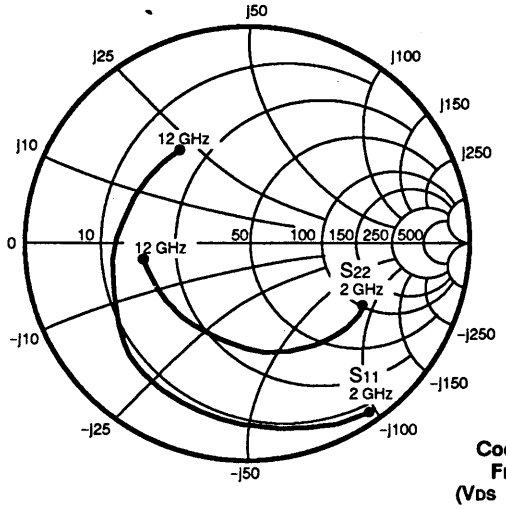
V_{DS} = 3 V, I_{DS} = 20 mA

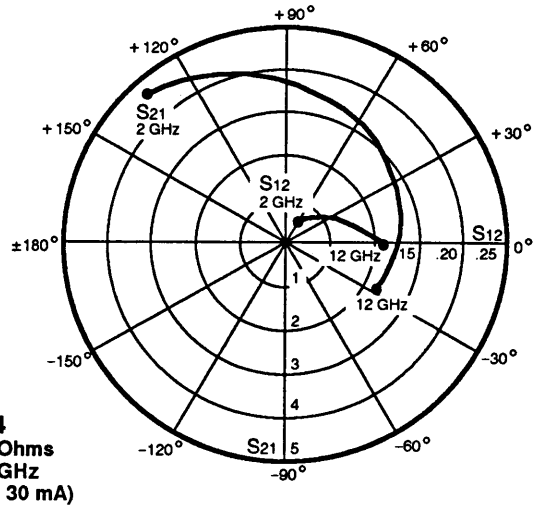
2.0	.95	-48	3.88	136	.04	59	.63	-32
3.0	.90	-68	3.52	119	.05	47	.61	-45
4.0	.85	-88	3.29	99	.07	35	.59	-59
5.0	.79	-106	2.98	84	.07	24	.56	-72
6.0	.76	-123	2.74	67	.08	16	.55	-84
7.0	.72	-138	2.53	52	.08	8	.55	-97
8.0	.70	-151	2.33	40	.08	4	.55	-107
9.0	.67	-164	2.17	26	.08	-2	.56	-117
10.0	.65	-176	2.01	16	.08	-3	.56	-128
11.0	.63	173	1.92	4	.08	-7	.57	-136
12.0	.60	160	1.84	-10	.09	-12	.57	-146
13.0	.57	149	1.75	-21	.09	-15	.58	-155
14.0	.55	137	1.69	-31	.10	-20	.58	-164
15.0	.53	125	1.63	-45	.11	-26	.59	-173
16.0	.50	111	1.64	-55	.12	-31	.59	178
17.0	.48	96	1.60	-69	.14	-42	.59	167
18.0	.47	82	1.58	-82	.15	-50	.59	155

V_{DS} = 3 V, I_{DS} = 30 mA

2.0	.95	-49	4.18	136	.04	59	.62	-31
3.0	.89	-70	3.78	118	.05	47	.60	-45
4.0	.84	-91	3.49	98	.06	35	.58	-58
5.0	.78	-109	3.15	83	.07	26	.55	-71
6.0	.74	-126	2.91	66	.07	17	.55	-82
7.0	.71	-141	2.66	51	.07	11	.55	-94
8.0	.68	-155	2.45	39	.08	6	.55	-104
9.0	.66	-168	2.27	25	.08	2	.56	-114
10.0	.63	-180	2.10	15	.08	1	.56	-123
11.0	.62	169	2.00	3	.08	-3	.57	-131
12.0	.59	156	1.93	-11	.09	-8	.57	-140
13.0	.56	145	1.82	-22	.09	-10	.58	-149
14.0	.54	133	1.75	-33	.10	-16	.58	-157
15.0	.52	121	1.69	-47	.11	-22	.59	-165
16.0	.49	107	1.67	-56	.12	-27	.59	-174
17.0	.47	92	1.64	-70	.14	-38	.58	176
18.0	.46	78	1.61	-82	.15	-45	.58	164

TYPICAL COMMON SOURCE SCATTERING PARAMETERS





NE71084
Coordinates in Ohms
Frequency in GHz
(V_{DS} = 3 V, I_{DS} = 30 mA)

S-MAGN AND ANGLES:

V_{DS} = 3 V, I_{DS} = 10 mA

FREQUENCY (GHz)	S_{11}		S_{21}		S_{12}		S_{22}	
2.0	.94	-49	3.48	136	.04	59	.65	-31
3.0	.94	-70	3.36	118	.06	45	.64	-45
4.0	.86	-92	2.99	97	.07	33	.61	-61
5.0	.81	-108	2.71	82	.07	25	.57	-73
6.0	.79	-126	2.56	64	.08	15	.57	-86
7.0	.71	-142	2.40	48	.08	7	.53	-100
8.0	.66	-155	2.28	36	.08	4	.51	-110
9.0	.61	-171	2.19	23	.09	2	.49	-123
10.0	.59	172	2.17	8	.09	-3	.48	-139
11.0	.57	154	2.08	-9	.10	-11	.49	-157
12.0	.55	137	1.94	-23	.10	-11	.51	-173

V_{DS} = 3 V, I_{DS} = 20 mA

2.0	.93	-52	4.29	134	.04	60	.60	-31
3.0	.92	-75	4.03	115	.05	47	.59	-45
4.0	.83	-97	3.51	94	.06	35	.55	-60
5.0	.78	-113	3.16	79	.06	29	.52	-73
6.0	.75	-131	2.94	62	.07	21	.52	-85
7.0	.67	-147	2.74	47	.07	16	.49	-98
8.0	.62	-161	2.58	34	.08	14	.47	-108
9.0	.57	-176	2.47	21	.08	12	.44	-119
10.0	.56	166	2.41	6	.09	8	.44	-135
11.0	.54	148	2.30	-11	.10	-1	.46	-154
12.0	.52	130	2.10	-24	.11	-3	.47	-169

V_{DS} = 3 V, I_{DS} = 30 mA

2.0	.92	-54	4.67	133	.03	60	.59	-31
3.0	.90	-77	4.40	114	.05	47	.57	-45
4.0	.81	-100	3.83	93	.05	37	.54	-60
5.0	.75	-116	3.43	77	.06	31	.51	-72
6.0	.72	-134	3.19	60	.06	24	.51	-84
7.0	.65	-150	2.93	44	.07	19	.48	-96
8.0	.60	-164	2.75	32	.07	18	.46	-105
9.0	.55	-180	2.60	19	.08	16	.45	-118
10.0	.54	163	2.52	4	.09	11	.44	-134
11.0	.53	145	2.38	-12	.10	1	.46	-153
12.0	.50	127	2.25	-26	.10	-1	.46	-168