NEC

C TO X BAND N-CHANNEL GaAs MESFET

NE722S01

FEATURES

- **HIGH POWER GAIN:** GS = 6 dB TYP at f = 12 GHz
- **OUTPUT POWER** (at 1 dB comprehension)**:** 15 dB TYP at f = 12 GHz
- **LOW NOISE/HIGH GAIN:** NF = 0.9 dB TYP, Ga = 12 dB TYP at f = 4 GHz
- **GATE LENGTH:** L_G = 0.8 µm (recessed gate)
- **GATE WIDTH:** W_G = 400 µm

DESCRIPTION

The NE722S01 is a low cost GaAs MESFET suitable for both amplifier and oscillator applications through X-band. The device features a 0.8 micron recessed gate, triple epitaxial technology and is fabricated using ion implantation for improved RF and DC performance and uniformity. This device's low phase noise and high fT makes it a excellent choice for oscillator applications on a digital LNB (Low Noise Block). The NE722S01 is housed in a low cost plastic package which is available in Tape and Reel.

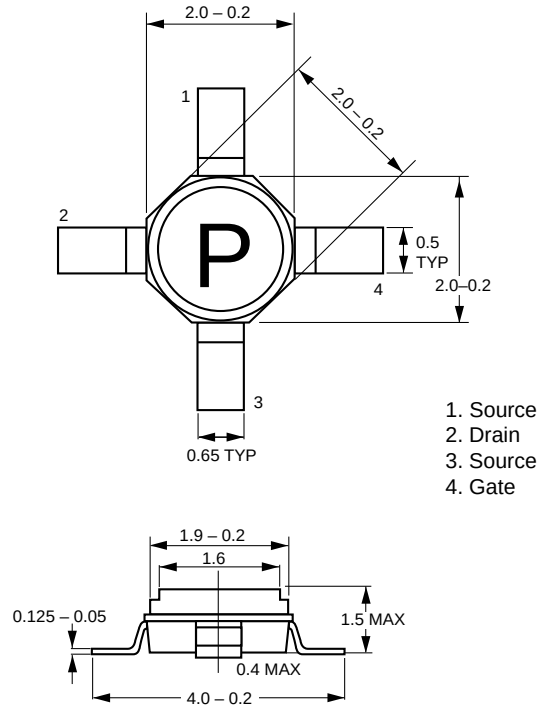
NEC's stringent quality assurance and test procedures ensure the highest reliability performance.

APPLICATIONS

- C to X band low noise amplifiers
- C to X band oscillators

OUTLINE DIMENSION (Units in mm)

PACKAGE OUTLINE SO1



ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER PACKAGE OUTLINE			NE722S01 S01		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{GSO}	Gate to Source Leak Current, V_{GS} = -5 V	mA	–	1.0	10
I_{DSS}	Saturated Drain Current, V_{DS} = 3 V, V_{GS} = 0 V	mA	60	90	120
V_{GS}	Gate to Source Cutoff Voltage, V_{DS} = 3 V, I_D = 100 µA	V	-0.5	–	-4.0
g_m	Transconductance, V_{DS} = 3 V, I_{DS} = 30 mA	mS	20	45	–
G_S	Power Gain, V_{DS} = 3 V, I_{DS} = 30 mA, f = 12 GHz	dB	–	6	–
P1dB	Output Power at 1 dB Gain Compression Point at V_{DS} = 3 V, I_{DS} = 30 mA, f = 12 GHz	dBm		15.0	
NF	Noise Figure, V_{DS} = 3 V, I_{DS} = 10 mA, f = 4 GHz	dB	–	0.9	–
Ga	Associated Gain, V_{DS} = 3 V, I_{DS} = 10 mA, f = 4 GHz	dB	–	12	–

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{DS}	Drain to Source Voltage	V	5.0
V_{GS}	Gate to Source Voltage	V	-5.0
V_{GD}	Gate to Drain Voltage	V	-6.0
I_{DS}	Drain Current	mA	I_{DSS}
P_T	Total Power Dissipation	mW	250
P_{IN}	Input Power	mW	40
T_{CH}	Channel Temperature	°C	125
T_{STG}	Storage Temperature	°C	-65 to +125

Note:
1. Operation in excess of any one of these parameters may result in permanent damage.

RECOMMENDED OPERATING CONDITIONS (T_A = 25°C)

PART NUMBER			NE722S01		
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{DS}	Drain to Source Voltage	V		3	4
I_{DS}	Drain Current	mA		30	40

ORDERING INFORMATION

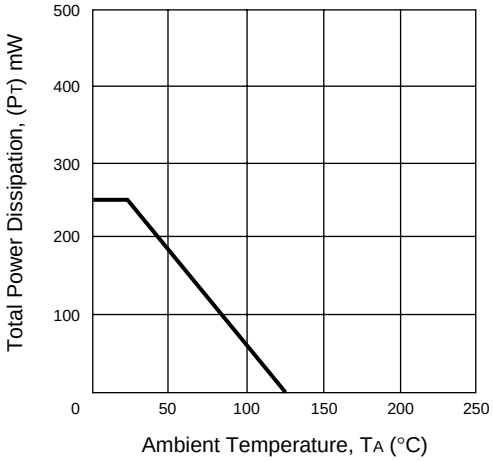
PART NUMBER	SUPPLY FORM	MARKING
NE722S01-T1	Tape & Reel 1000 pcs/reel	P
NE722S01-T1B[1]	Tape & Reel 4000 pcs/reel	

Note:

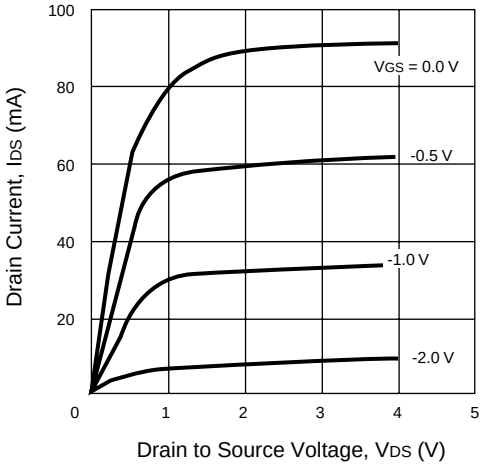
1. Available if quantity is over 100k per month

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

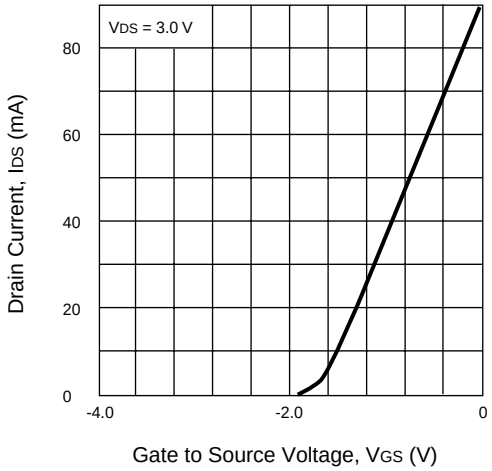
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



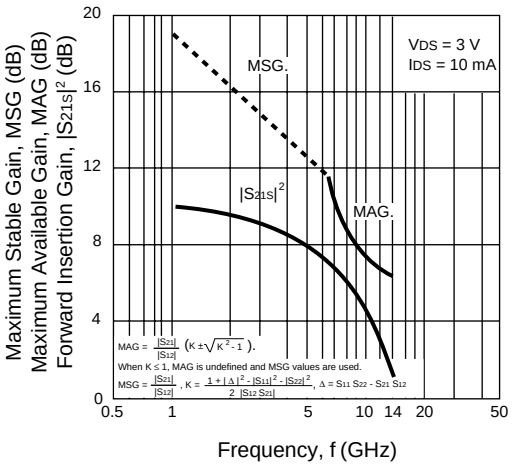
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



MAXIMUM AVAILABLE GAIN, FORWARD INSERTION GAIN vs. FREQUENCY



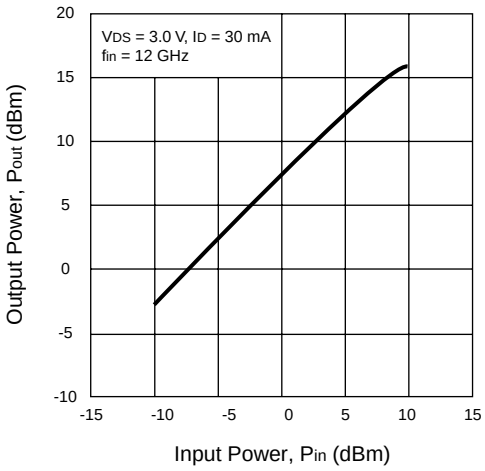
Note:
1. Gain Calculation:

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

MAG = Maximum Available Gain
MSG = Maximum Stable Gain

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

OUTPUT POWER vs. INPUT POWER



TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE722S01
V_{DS} = 3.0 V, I_{DS} = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2.0	0.912	-44.0	3.100	136.2	0.077	59.0	0.659	-30.2
2.5	0.876	-56.1	3.037	124.9	0.091	51.2	0.629	-38.0
3.0	0.828	-68.0	2.935	113.9	0.105	42.9	0.597	-46.4
3.5	0.784	-79.3	2.819	103.7	0.115	36.2	0.570	-53.5
4.0	0.737	-89.5	2.696	94.2	0.124	30.0	0.546	-60.9
4.5	0.699	-99.3	2.589	85.3	0.130	24.7	0.529	-67.2
5.0	0.660	-109.0	2.499	76.6	0.136	19.1	0.514	-73.6
5.5	0.620	-119.0	2.420	67.9	0.140	14.1	0.495	-79.6
6.0	0.583	-130.6	2.355	59.4	0.146	9.1	0.475	-85.2
6.5	0.547	-143.8	2.283	50.1	0.148	3.8	0.447	-91.5
7.0	0.516	-158.5	2.196	41.0	0.151	-1.6	0.408	-97.0
7.5	0.496	-173.7	2.098	32.2	0.149	-6.6	0.366	-103.7
8.0	0.500	172.6	2.016	23.7	0.152	-10.1	0.331	-110.8
8.5	0.510	159.9	1.920	15.3	0.150	-13.6	0.298	-120.4
9.0	0.526	148.4	1.834	7.2	0.151	-17.3	0.274	-133.2
9.5	0.540	138.4	1.749	-0.6	0.151	-20.3	0.265	-147.9
10.0	0.553	129.9	1.676	-7.9	0.152	-23.2	0.275	-160.7
10.5	0.566	120.6	1.608	-15.8	0.156	-26.3	0.297	-172.7
11.0	0.576	111.3	1.542	-23.5	0.157	-29.8	0.312	178.5
11.5	0.592	101.8	1.470	-31.1	0.157	-32.9	0.328	171.0
12.0	0.608	92.8	1.401	-38.4	0.158	-35.7	0.340	163.5
12.5	0.640	85.2	1.325	-45.7	0.159	-38.0	0.339	155.6
13.0	0.665	79.1	1.256	-52.7	0.160	-41.3	0.341	145.5
13.5	0.693	73.3	1.183	-59.7	0.158	-44.5	0.356	133.8
14.0	0.718	69.3	1.111	-66.4	0.162	-47.0	0.386	122.3
14.5	0.744	64.8	1.045	-73.3	0.163	-49.5	0.421	111.6
15.0	0.759	59.6	0.966	-79.7	0.159	-53.4	0.474	104.4
15.5	0.756	55.5	0.893	-85.4	0.159	-55.8	0.516	98.7
16.0	0.750	51.0	0.839	-91.0	0.160	-57.6	0.563	95.8
16.5	0.738	45.4	0.777	-96.7	0.158	-61.4	0.601	92.8
17.0	0.728	40.9	0.714	-101.5	0.158	-63.1	0.624	89.4
17.5	0.721	36.4	0.676	-105.7	0.156	-65.9	0.628	86.9
18.0	0.721	32.5	0.624	-109.8	0.158	-68.4	0.625	82.2

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

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

NE722S01
V_{DS} = 3.0 V, I_{DS} = 30 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2.0	0.896	-48.3	3.721	134.0	0.063	59.9	0.547	-29.6
2.5	0.851	-61.5	3.606	122.4	0.077	53.2	0.519	-37.4
3.0	0.799	-74.1	3.449	111.3	0.086	45.1	0.489	-45.4
3.5	0.753	-86.1	3.275	101.1	0.095	39.6	0.464	-52.6
4.0	0.705	-97.0	3.102	91.6	0.102	34.1	0.443	-59.5
4.5	0.666	-107.3	2.957	82.7	0.106	29.5	0.431	-65.5
5.0	0.625	-117.5	2.834	74.0	0.111	24.9	0.419	-71.5
5.5	0.586	-128.3	2.724	65.3	0.115	20.6	0.406	-76.9
6.0	0.553	-140.6	2.627	56.8	0.122	17.0	0.390	-82.2
6.5	0.521	-154.2	2.522	47.7	0.125	12.6	0.366	-88.2
7.0	0.497	-169.4	2.402	39.0	0.128	8.5	0.334	-93.4
7.5	0.489	175.8	2.281	30.5	0.128	5.0	0.296	-99.7
8.0	0.501	162.9	2.176	22.5	0.131	1.8	0.267	-106.8
8.5	0.519	151.0	2.062	14.5	0.135	-1.2	0.234	-117.8
9.0	0.540	140.4	1.963	6.8	0.139	-3.4	0.209	-132.7
9.5	0.562	131.2	1.865	-0.7	0.142	-6.8	0.206	-150.0
10.0	0.575	123.2	1.786	-7.8	0.146	-9.9	0.221	-164.3
10.5	0.589	114.3	1.709	-15.4	0.151	-12.8	0.246	-177.2
11.0	0.602	105.5	1.637	-22.9	0.156	-16.7	0.265	173.7
11.5	0.619	96.4	1.554	-30.2	0.161	-20.5	0.285	166.1
12.0	0.633	88.0	1.480	-37.4	0.163	-23.9	0.299	158.1
12.5	0.666	80.9	1.400	-44.5	0.168	-27.4	0.303	149.9
13.0	0.690	75.2	1.321	-51.1	0.171	-30.5	0.307	139.1
13.5	0.715	70.0	1.241	-57.9	0.173	-33.9	0.326	127.4
14.0	0.740	66.4	1.169	-64.2	0.173	-37.3	0.358	116.2
14.5	0.769	62.0	1.101	-70.8	0.174	-41.0	0.396	106.2
15.0	0.780	57.0	1.021	-77.1	0.178	-45.3	0.450	99.5
15.5	0.778	52.5	0.945	-82.6	0.175	-48.6	0.494	94.8
16.0	0.774	48.2	0.888	-88.0	0.176	-51.4	0.540	92.0
16.5	0.759	42.7	0.824	-93.4	0.176	-56.1	0.578	89.4
17.0	0.750	38.1	0.767	-98.3	0.174	-58.3	0.601	86.3
17.5	0.739	33.9	0.721	-102.3	0.175	-61.1	0.604	84.0
18.0	0.741	30.2	0.672	-106.6	0.176	-63.3	0.599	79.2

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