

C to X BAND AMPLIFIER
C to X BAND OSC
N-CHANNEL GaAs MES FET

FEATURES

- High Power Gain: $G_s = 7$ dB TYP. @ $f = 12$ GHz
- Gate Length: $L_g = 0.8 \mu\text{m}$ (recessed gate)
- Gate Width: $W_g = 330 \mu\text{m}$
- Plastic package

ORDERING INFORMATION

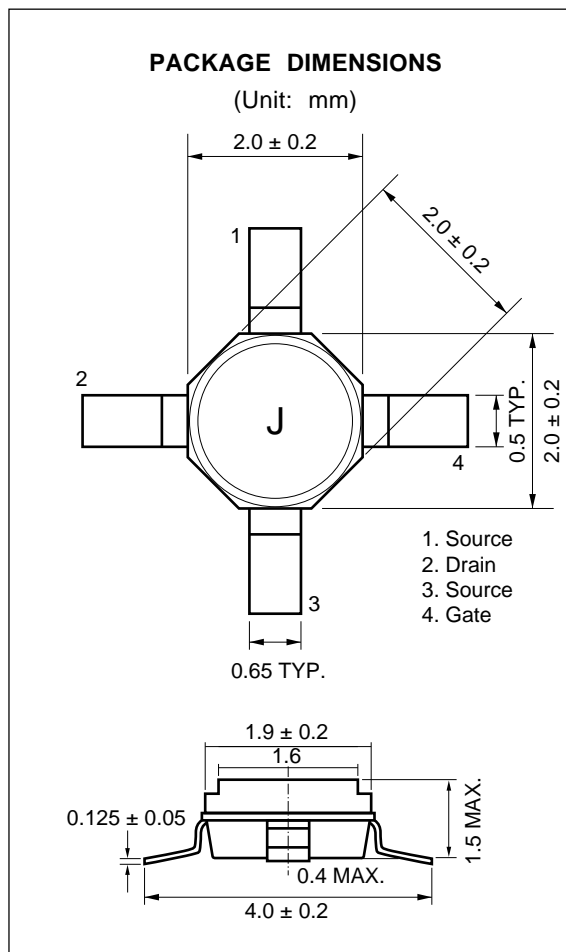
PART NUMBER	SUPPLYING FORM	MARKING
NE721S01-T1	Tape & reel 1000 pcs./reel	J
NE721S01-T1B	Tape & reel 4000 pcs./reel	

ABSOLUTE MAXIMUM RATINGS ($T_A = 25 \text{ }^\circ\text{C}$)

Drain to Source Voltage	V_{DS}	5.0	V
Gate to Source Voltage	V_{GS}	-6.0	V
Gate to Drain Voltage	V_{GD}	-6.0	V
Drain Current	I_D	I_{DSS}	mA
Total Power Dissipation	P_{tot}	250	mW
Channel Temperature	T_{ch}	125	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +125	$^\circ\text{C}$

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

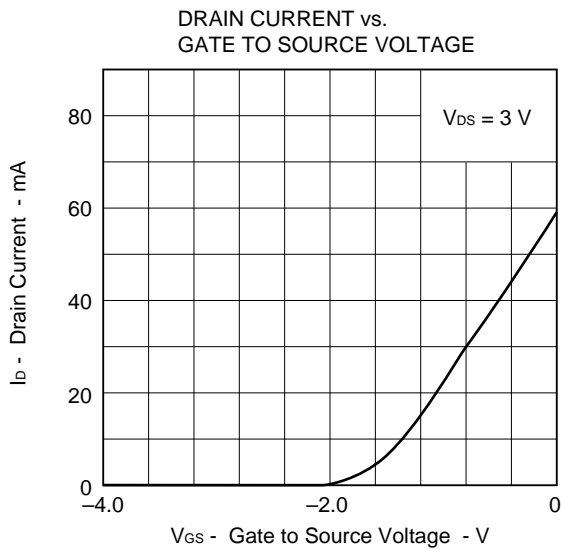
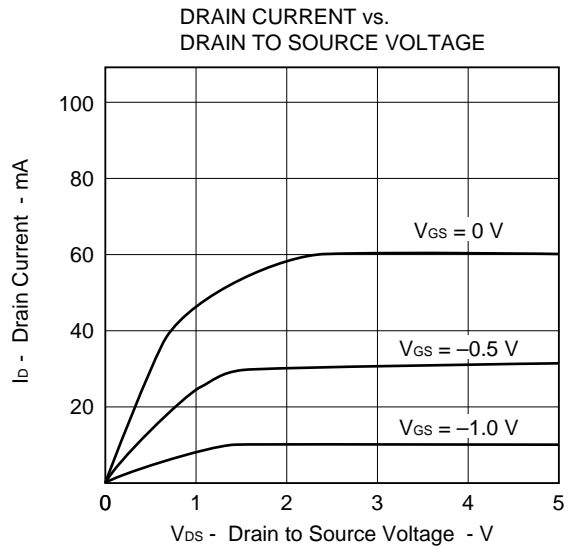
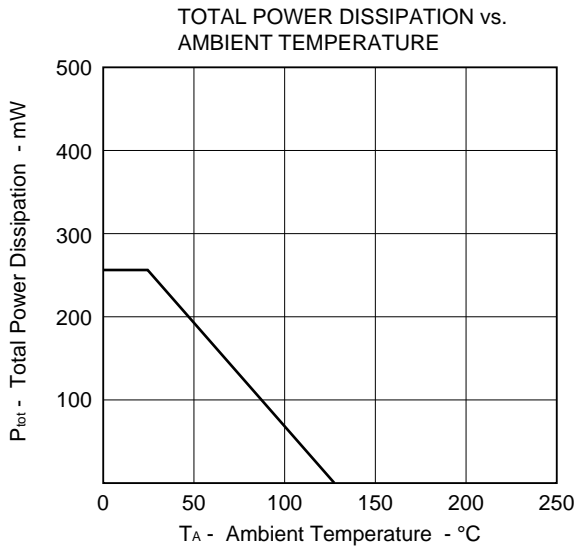
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Gate to Source Leak Current	I_{GSO}		1.0	10	μA	$V_{GS} = -5$ V
Saturated Drain Current	I_{DSS}	30	60	100	mA	$V_{DS} = 3$ V, $V_{GS} = 0$ V
Gate to Source Cut off Voltage	$V_{GS(off)}$	-0.5	-2.0	-4.0	V	$V_{DS} = 3$ V, $I_D = 100 \mu\text{A}$
Transconductance	g_m	20	40		mS	$V_{DS} = 3$ V, $I_D = 30$ mA
Phase Noise	PN		-110		dBc/Hz	$V_{DS} = 3$ V, $I_D = 30$ mA, $f = 11$ GHz 100 kHz offset
			-85		dBc/Hz	$V_{DS} = 3$ V, $I_D = 30$ mA, $f = 11$ GHz 10 kHz offset
Power Gain	G_s		7.0		dB	$V_{DS} = 3$ V, $I_D = 30$ mA, $f = 12$ GHz
Output Power at 1 dB Gain Compression point	$P_{O(1\text{ dB})}$		15.0		dBm	$V_{DS} = 3$ V, $I_D = 30$ mA, $f = 12$ GHz



I_{DSS} CLASSIFICATION

Rank	I _{DSS} (mA)
K	30 to 100
M	55 to 100
N	30 to 65

TYPICAL CHARACTERISTICS (T_A = 25 °C)



S-PARAMETER

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 10\text{ mA}$

FREQUENCY MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	.936	-48.8	2.501	135.8	.070	57.1	.700	-26.5
3000	.877	-71.9	2.387	115.2	.096	41.9	.662	-40.8
4000	.813	-95.7	2.271	95.2	.115	26.4	.619	-53.4
5000	.743	-119.4	2.153	75.6	.127	12.5	.568	-66.2
6000	.691	-144.7	2.063	56.5	.135	-1.1	.518	-77.4
7000	.649	-174.6	1.931	36.8	.136	-14.2	.448	-86.4
8000	.639	158.2	1.765	18.4	.129	-24.8	.370	-95.5
9000	.659	136.5	1.609	1.2	.122	-33.4	.305	-111.4
10000	.683	115.8	1.480	-15.7	.117	-39.8	.257	-132.8
11000	.710	95.8	1.351	-32.9	.113	-46.8	.234	-159.5
12000	.748	78.1	1.215	-49.8	.107	-52.8	.226	-173.4
13000	.776	64.2	1.073	-65.3	.102	-54.7	.235	143.9
14000	.805	53.9	.954	-79.8	.101	-59.5	.288	113.0
15000	.839	45.8	.837	-93.9	.103	-61.9	.388	89.1
16000	.859	36.4	.722	-106.6	.104	-67.1	.485	75.7
17000	.858	25.5	.614	-118.9	.100	-70.8	.576	66.0
18000	.877	18.5	.522	-130.0	.100	-77.8	.628	55.5

AMP. PARAMETER

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

FREQUENCY MHz	GUmax dB	GAmax dB	S ₂₁ ² dB	S ₁₂ ² dB	K	Delay ns	Mason's U dB	G1 dB	G2 dB
2000	19.96		7.96	-23.16	.29	.069	22.782	9.07	2.93
3000	16.41		7.56	-20.40	.40	.057	20.365	6.36	2.50
4000	13.91		7.12	-18.76	.53	.056	17.662	4.69	2.10
5000	11.84		6.66	-17.90	.66	.054	15.804	3.49	1.69
6000	10.46		6.29	-17.40	.78	.053	14.654	2.82	1.36
7000	9.06		5.72	-17.36	.95	.055	13.141	2.37	.98
8000	7.85	9.00	4.93	-17.81	1.15	.051	11.620	2.28	.64
9000	7.02	7.93	4.13	-18.27	1.30	.048	10.876	2.47	.42
10000	6.43	7.30	3.40	-18.66	1.39	.047	10.564	2.73	.30
11000	5.90	6.79	2.61	-18.92	1.45	.048	10.222	3.05	.25
12000	5.47	6.35	1.69	-19.38	1.50	.047	9.707	3.56	.23
13000	4.87	5.63	.62	-19.87	1.62	.043	8.343	4.01	.25
14000	4.51	5.26	-.41	-19.95	1.59	.040	7.714	4.54	.38
15000	4.44	5.37	-1.55	-19.76	1.39	.039	7.797	5.28	.71
16000	4.14	5.33	-2.83	-19.67	1.26	.035	7.518	5.81	1.16
17000	3.30	4.26	-4.24	-19.98	1.37	.034	5.503	5.79	1.75
18000	2.89	4.14	-5.65	-20.02	1.26	.031	5.140	6.37	2.18

S-PARAMETER

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 20\text{ mA}$

FREQUENCY MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	.925	-51.4	2.988	134.5	.064	56.9	.676	-26.8
3000	.858	-75.6	2.819	113.5	.087	41.3	.636	-40.9
4000	.786	-100.2	2.641	93.4	.102	26.7	.591	-53.1
5000	.715	-124.5	2.472	73.9	.112	13.6	.540	-65.4
6000	.662	-150.4	2.335	55.0	.118	1.7	.493	-75.9
7000	.625	179.8	2.155	35.8	.117	-10.9	.425	-84.3
8000	.622	153.4	1.950	17.9	.111	-19.1	.352	-92.9
9000	.647	132.5	1.773	1.4	.109	-26.1	.286	-107.5
10000	.675	112.7	1.625	-15.1	.106	-30.7	.236	-128.9
11000	.703	93.2	1.480	-31.8	.107	-36.3	.212	-156.0
12000	.742	76.3	1.332	-48.4	.105	-41.6	.204	175.1
13000	.776	62.7	1.178	-63.7	.105	-45.5	.212	143.6
14000	.806	52.7	1.051	-77.6	.108	-50.7	.266	111.8
15000	.833	44.8	.925	-91.5	.108	-54.8	.360	88.4
16000	.859	35.4	.804	-104.2	.112	-59.3	.458	75.1
17000	.855	24.7	.686	-116.6	.109	-65.3	.553	65.9
18000	.876	17.9	.586	-127.6	.108	-74.0	.610	55.5

AMP. PARAMETER

$V_{DS} = 3\text{ V}$, $I_D = 20\text{ mA}$

FREQUENCY MHz	GUmax dB	GAmax dB	$ S_{21} ^2$ dB	$ S_{12} ^2$ dB	K	Delay ns	Mason's U dB	G1 dB	G2 dB
2000	20.56		9.51	-23.85	.31	.071	24.046	8.40	2.65
3000	17.05		9.00	-21.24	.43	.058	21.040	5.79	2.25
4000	14.48		8.44	-19.84	.57	.056	18.604	4.18	1.86
5000	12.47		7.86	-19.03	.71	.054	16.864	3.11	1.50
6000	11.08		7.37	-18.56	.84	.052	15.914	2.51	1.21
7000	9.69	11.68	6.67	-18.60	1.02	.053	14.009	2.15	.87
8000	8.50	9.46	5.80	-19.11	1.25	.050	12.531	2.13	.57
9000	7.70	8.53	4.97	-19.28	1.36	.046	11.854	2.35	.37
10000	7.11	7.91	4.22	-19.53	1.45	.046	11.468	2.64	.25
11000	6.57	7.41	3.41	-19.39	1.45	.046	11.162	2.96	.20
12000	6.15	6.99	2.49	-19.58	1.47	.046	10.559	3.47	.19
13000	5.62	6.39	1.42	-19.55	1.48	.042	9.477	4.00	.20
14000	5.31	6.09	.43	-19.35	1.41	.039	8.926	4.56	.32
15000	5.05	5.86	-.68	-19.30	1.33	.038	8.222	5.13	.60
16000	4.95	6.11	-1.90	-19.00	1.16	.036	8.119	5.83	1.02
17000	4.03	4.90	-3.27	-19.28	1.27	.034	6.100	5.72	1.58
18000	3.71	5.10	-4.64	-19.30	1.14	.031	6.092	6.33	2.02

S-PARAMETER

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 30\text{ mA}$

FREQUENCY MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	.922	-52.5	3.250	134.0	.060	56.7	.672	-26.7
3000	.853	-77.0	3.048	112.9	.082	41.7	.632	-40.6
4000	.780	-102.0	2.842	92.9	.097	27.8	.586	-52.6
5000	.706	-126.7	2.645	73.4	.105	14.8	.538	-64.6
6000	.652	-152.7	2.483	54.6	.110	2.9	.488	-74.8
7000	.618	177.5	2.283	35.6	.110	-8.2	.426	-82.8
8000	.618	151.5	2.057	18.1	.102	-16.3	.354	-90.8
9000	.648	131.0	1.871	1.8	.100	-20.7	.288	-105.1
10000	.676	111.6	1.713	-14.5	.102	-26.3	.239	-126.2
11000	.707	92.3	1.559	-31.1	.104	-31.1	.214	-153.1
12000	.747	75.5	1.403	-47.5	.104	-35.9	.204	178.3
13000	.779	62.3	1.241	-62.7	.106	-40.8	.209	146.7
14000	.814	52.3	1.109	-76.6	.109	-44.5	.260	113.7
15000	.845	44.3	.980	-90.6	.114	-49.5	.356	89.5
16000	.868	35.3	.855	-103.2	.116	-54.7	.457	76.4
17000	.866	24.3	.727	-115.4	.114	-63.3	.547	66.7
18000	.888	17.6	.621	-127.2	.112	-67.9	.610	56.1

AMP. PARAMETER

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

FREQUENCY MHz	GUmax dB	GAmx dB	S ₂₁ ² dB	S ₁₂ ² dB	K	Delay ns	Mason's U dB	G1 dB	G2 dB
2000	21.08		10.24	-24.40	.31	.071	24.822	8.24	2.61
3000	17.53		9.68	-21.70	.43	.059	22.238	5.64	2.21
4000	14.97		9.07	-20.30	.56	.056	19.998	4.07	1.83
5000	12.92		8.45	-19.61	.72	.054	17.821	2.99	1.48
6000	11.49		7.90	-19.19	.86	.052	16.558	2.41	1.18
7000	10.13	12.03	7.17	-19.21	1.04	.053	14.918	2.09	.87
8000	8.94	9.86	6.26	-19.84	1.28	.049	13.087	2.09	.58
9000	8.18	9.04	5.44	-19.96	1.38	.045	12.692	2.36	.38
10000	7.59	8.46	4.67	-19.81	1.40	.045	12.441	2.66	.26
11000	7.08	8.00	3.86	-19.66	1.40	.046	12.139	3.01	.20
12000	6.68	7.62	2.94	-19.66	1.38	.046	11.585	3.55	.18
13000	6.12	6.98	1.88	-19.49	1.39	.042	10.357	4.05	.19
14000	5.92	6.80	.90	-19.24	1.30	.039	9.791	4.72	.30
15000	5.84	6.97	-.18	-18.84	1.15	.039	9.564	5.43	.59
16000	5.73	7.48	-1.36	-18.72	1.04	.035	9.160	6.08	1.02
17000	4.81	6.16	-2.77	-18.85	1.10	.034	7.398	6.03	1.55
18000	4.64	7.24	-4.14	-19.05	1.00	.033	6.825	6.76	2.02

S-PARAMETER

MAG. AND ANG.

$V_{DS} = 3\text{ V}$, $I_D = 40\text{ mA}$

FREQUENCY MHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	.921	-53.1	3.386	133.7	.055	57.6	.690	-25.9
3000	.850	-78.0	3.166	112.6	.076	41.4	.650	-39.4
4000	.774	-103.0	2.944	92.4	.087	27.8	.606	-50.9
5000	.701	-127.9	2.732	73.2	.094	15.7	.560	-62.5
6000	.647	-153.9	2.556	54.5	.098	5.7	.517	-72.1
7000	.615	176.2	2.344	35.7	.097	-5.6	.457	-79.7
8000	.617	150.6	2.116	18.3	.092	-11.4	.393	-87.4
9000	.645	130.4	1.926	2.1	.091	-14.8	.332	-101.3
10000	.678	111.1	1.768	-14.1	.094	-19.4	.282	-120.5
11000	.708	92.0	1.612	-30.7	.096	-22.1	.254	-144.2
12000	.750	75.3	1.453	-47.1	.101	-27.1	.238	-170.8
13000	.784	62.3	1.292	-62.2	.106	-33.1	.231	159.5
14000	.820	52.6	1.157	-76.6	.113	-37.0	.269	125.6
15000	.853	44.3	1.026	-90.5	.118	-43.9	.361	98.1
16000	.875	34.9	.890	-103.7	.121	-50.7	.462	81.9
17000	.872	24.2	.754	-116.4	.118	-58.0	.556	71.2
18000	.893	17.5	.648	-127.8	.119	-65.5	.619	59.7

AMP. PARAMETER

$V_{DS} = 3\text{ V}$, $I_D = 40\text{ mA}$

FREQUENCY MHz	GUmax dB	GAmx dB	S ₂₁ ² dB	S ₁₂ ² dB	K	Delay ns	Mason's U dB	G1 dB	G2 dB
2000	21.57		10.59	-25.13	.30	.072	26.877	8.17	2.81
3000	17.95		10.01	-22.39	.44	.059	22.358	5.56	2.39
4000	15.33		9.38	-21.20	.59	.056	20.087	3.96	1.99
5000	13.30		8.73	-20.52	.74	.053	18.311	2.94	1.63
6000	11.85		8.15	-20.19	.88	.052	17.413	2.35	1.35
7000	10.48	12.06	7.40	-20.26	1.08	.052	15.342	2.06	1.02
8000	9.32	10.29	6.51	-20.74	1.31	.048	13.824	2.08	.73
9000	8.54	9.44	5.69	-20.86	1.42	.045	13.252	2.34	.51
10000	7.99	8.96	4.95	-20.56	1.41	.045	13.124	2.67	.36
11000	7.46	8.48	4.15	-20.31	1.40	.046	12.583	3.03	.29
12000	7.09	8.22	3.25	-19.94	1.32	.046	12.242	3.59	.25
13000	6.61	7.75	2.22	-19.53	1.27	.042	11.234	4.15	.24
14000	6.45	7.79	1.26	-18.97	1.15	.040	10.694	4.85	.33
15000	6.47	8.97	.22	-18.57	1.00	.039	10.690	5.64	.61
16000	6.33		-1.02	-18.31	.90	.037	10.234	6.31	1.04
17000	5.37		-2.45	-18.58	.97	.035	7.867	6.22	1.60
18000	5.26		-3.77	-18.49	.85	.032	7.912	6.93	2.10

RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales offices in case other soldering process is used, or in case soldering is done under different conditions.

<TYPES OF SURFACE MOUNT DEVICE>

For more details, refer to our document "SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL" (C10535E).

Soldering process	Soldering conditions	Symbol
Infrared ray reflow	Peak package's surface temperature: 230 °C or below, Reflow time: 30 seconds or below (210 °C or higher), Number of reflow process: 1, Exposure limit*: None	IR30-00
Partial heating method	Terminal temperature: 230 °C or below, Flow time: 10 seconds or below, Exposure limit*: None	

*: Exposure limit before soldering after dry-pack package is opened.

Storage conditions: 25 °C and relative humidity at 65 % or less.

Note: Do not apply more than a single process at once, except for "Partial heating method".

PRECAUTION Avoid high static voltage and electric fields, because this device is MES FET with GaAs shottky barrier gate.

CAUTION

**The Great Care must be taken is dealing with the devices in this guide.
The reason is that the material of the devices is GaAs (Gallium Arsenide), which is
designated as harmful substance according to the law concerned.
Keep the law concerned and so on, especially in case of removal.**

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

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Anti-radioactive design is not implemented in this product.