NEC

HETERO JUNCTION FIELD EFFECT TRANSISTOR

NE429M01

C to Ku BAND SUPER LOW NOISE AMPLIFIER N-CHANNEL HJ-FET

DESCRIPTION

The NE429M01 is a Hetero Junction FET that utilizes the hetero junction to create high mobility electrons. Its excellent low noise and high associated gain make it suitable for DBS, TVRO and another commercial systems.

FEATURES

- Super low noise figure & High associated gain
  NF = 0.9 dB TYP., G_a = 10 dB TYP. @ f = 12 GHz
- 6-pin super minimold package
- Gate width: W_g = 200μm

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
NE429M01-T1	6-pin super minimold	V72	Embossed tape 8 mm wide. 1, 2, 3 pins face to perforation side of the tape Qty 3 kpcs/reel

ABSOLUTE MAXIMUM RATINGS (T_A = +25 °C)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V_{DS}	4.0	V
Gate to Source Voltage	V_{GS}	–3.0	V
Drain Current	I_D	I_{DSS}	mA
Gate Current	I_G	100	μA
Total Power Dissipation	P_{tot}	125	mW
Channel Temperature	T_{ch}	125	°C
Storage Temperature	T_{stg}	–65 to +125	°C

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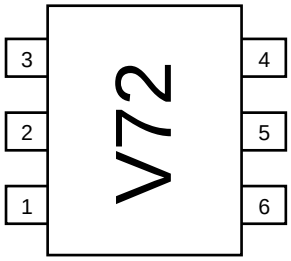
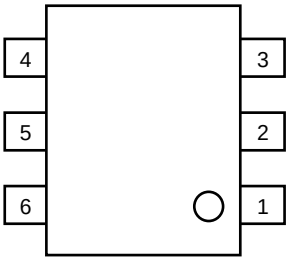
The mark ★ shows major revised points.

PIN CONNECTIONS

(Top View)



(Bottom View)



Pin No.	Pin name
1	Gate
2	Source
3	Source
4	Drain
5	Source
6	Source

RECOMMENDED OPERATING CONDITION (T_A = +25 °C)

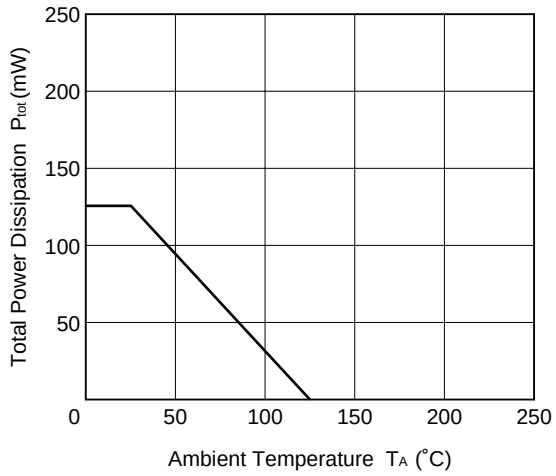
Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}	1	2	3	V
Drain Current	I_D	5	10	20	mA
Input Power	P_{in}	–	–	0	dBm

ELECTRICAL CHARACTERISTICS (T_A = +25 °C)

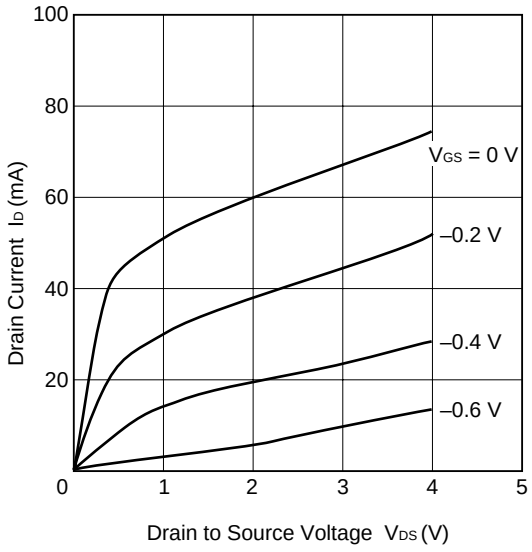
Parameter	Symbol	Test Conditions		MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = –3 V		–	0.5	10	μA
Saturated Drain Current	I_{DSS}	V_{DS} = 2 V, V_{GS} = 0 V		20	60	90	mA
Gate to Source Cutoff Voltage	$V_{GS(off)}$	V_{DS} = 2 V, I_D = 100 μA		–0.2	–0.7	–2.0	V
Transconductance	g_m	V_{DS} = 2 V, I_D = 10 mA		45	60	–	mS
Noise Figure	NF	f = 12 GHz	V_{DS} = 2 V I_D = 10 mA	–	0.9	1.2	dB
		f = 4 GHz		–	0.4	–	
Associated Gain	G_a	f = 12 GHz		9.0	10	–	dB
		f = 4 GHz		–	15.0	–	

TYPICAL CHARACTERISTICS (T_A = +25 °C)

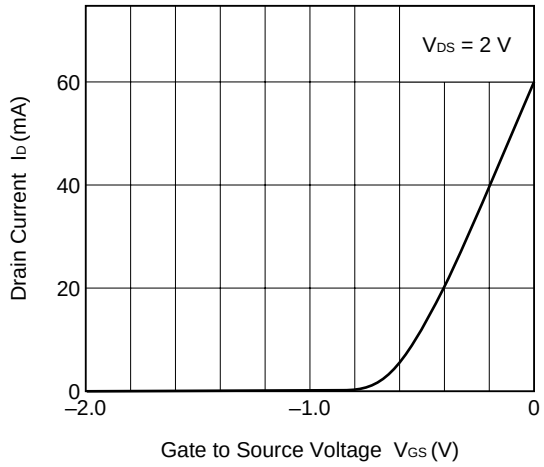
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



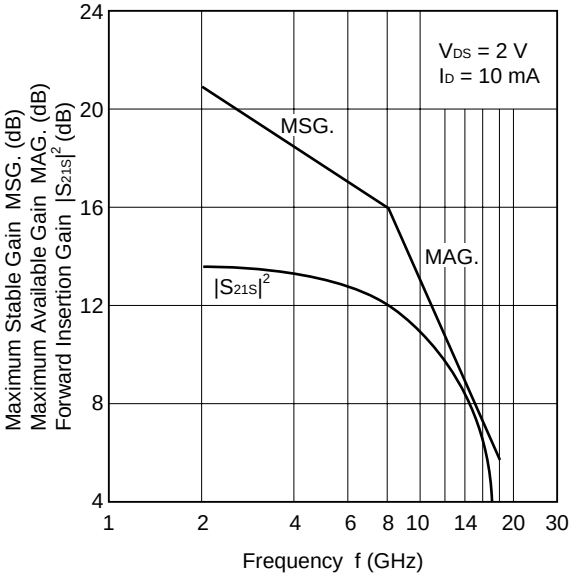
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs.
GATE TO SOURCE VOLTAGE



MAXIMUM AVAILABLE GAIN, FORWARD
INSERTION GAIN vs. FREQUENCY

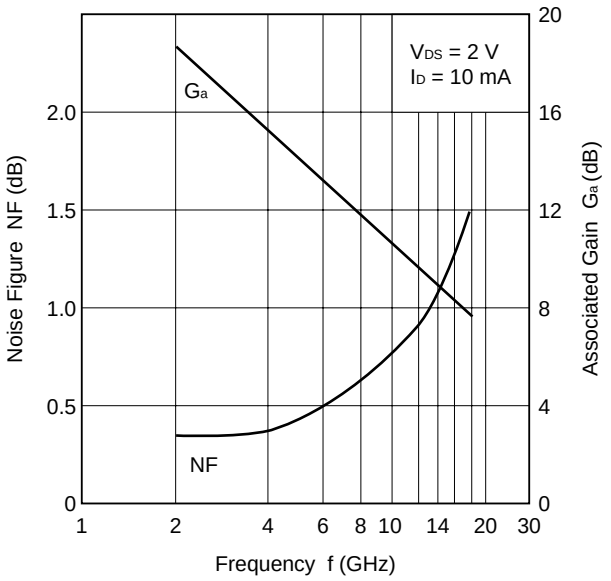


Gain Calculations

$$MSG. = \frac{|S_{21}|}{|S_{12}|} \qquad K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2\,|S_{12}|\,|S_{21}|}$$

$$MAG. = \frac{|S_{21}|}{|S_{12}|} \qquad (K \pm \sqrt{K^2 - 1}) \qquad \Delta = S_{11} \bullet S_{22} - S_{21} \bullet S_{12}$$

NOISE FIGURE, ASSOCIATED GAIN vs. FREQUENCY



★ **S-PARAMETERS**

MAG. AND ANG.

V_{DS} = 2 V, I_D = 10 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
2000	0.939	–33.5	4.728	146.1	0.040	69.6	0.597	–22.6
2500	0.916	–42.1	4.643	138.0	0.049	63.3	0.571	–28.5
3000	0.889	–50.7	4.546	130.0	0.055	59.2	0.557	–34.1
3500	0.856	–58.1	4.405	122.7	0.062	54.4	0.535	–39.4
4000	0.822	–65.2	4.279	115.1	0.066	50.2	0.510	–44.7
4500	0.790	–71.6	4.165	108.4	0.071	46.5	0.488	–48.9
5000	0.768	–77.9	4.099	102.2	0.075	41.6	0.478	–53.8
5500	0.736	–84.2	4.024	95.9	0.080	37.9	0.459	–56.9
6000	0.709	–91.2	4.013	89.3	0.082	36.9	0.441	–61.0
6500	0.679	–99.0	4.018	82.5	0.086	32.2	0.418	–65.5
7000	0.651	–109.1	4.007	74.7	0.091	27.4	0.386	–71.9
7500	0.626	–120.5	3.978	66.7	0.097	23.4	0.341	–78.7
8000	0.598	–132.6	3.940	58.6	0.099	17.0	0.296	–86.2
8500	0.576	–144.9	3.862	50.2	0.097	12.1	0.252	–94.9
9000	0.551	–157.4	3.775	42.3	0.100	6.6	0.212	–106.2
9500	0.527	–169.6	3.686	34.2	0.102	1.2	0.185	–121.8
10000	0.504	177.7	3.585	25.6	0.101	–6.1	0.166	–139.1
10500	0.494	163.6	3.475	17.8	0.101	–12.3	0.155	–157.3
11000	0.495	149.1	3.367	9.4	0.098	–16.5	0.149	178.4
11500	0.529	134.8	3.282	0.5	0.096	–22.3	0.148	158.4
12000	0.563	120.1	3.167	–8.6	0.095	–30.6	0.165	134.2
12500	0.608	106.2	3.011	–18.5	0.092	–38.8	0.194	109.4
13000	0.637	95.3	2.773	–27.7	0.085	–46.3	0.237	91.2
13500	0.645	86.6	2.562	–35.9	0.079	–50.2	0.279	80.9
14000	0.668	78.8	2.398	–43.8	0.072	–54.7	0.321	76.2
14500	0.689	70.0	2.231	–52.3	0.073	–60.3	0.372	74.3
15000	0.702	63.1	2.028	–59.7	0.072	–71.7	0.411	71.4
15500	0.713	57.1	1.917	–66.9	0.067	–79.5	0.427	71.5
16000	0.743	51.9	1.772	–75.6	0.065	–81.8	0.462	69.3
16500	0.766	46.1	1.633	–83.4	0.064	–83.1	0.500	62.6
17000	0.785	41.7	1.508	–92.0	0.063	–90.1	0.533	57.5
17500	0.802	37.4	1.335	–101.3	0.059	–104.7	0.580	50.0
18000	0.814	34.3	1.140	–108.9	0.053	–106.3	0.596	43.2

★ **AMP. PARAMETERS**

V_{DS} = 2 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	24.65		13.49	–28.05	0.28	0.045	30.977	9.24	1.91
2500	22.98		13.34	–26.28	0.34	0.045	28.134	7.92	1.72
3000	21.55		13.15	–25.19	0.38	0.044	29.097	6.79	1.61
3500	20.08		12.88	–24.16	0.45	0.041	26.443	5.74	1.46
4000	18.83		12.63	–23.67	0.53	0.042	24.821	4.89	1.31
4500	17.83		12.39	–22.94	0.59	0.038	23.707	4.26	1.18
5000	17.25		12.25	–22.49	0.63	0.034	22.719	3.87	1.13
5500	16.50		12.09	–21.93	0.69	0.035	21.774	3.39	1.03
6000	16.04		12.07	–21.76	0.73	0.037	23.007	3.03	0.94
6500	15.60		12.08	–21.30	0.77	0.038	22.393	2.69	0.83
7000	15.16		12.06	–20.81	0.80	0.043	22.558	2.40	0.70
7500	14.69		11.99	–20.30	0.82	0.044	23.290	2.16	0.54
8000	14.24		11.91	–20.13	0.87	0.045	21.787	1.93	0.40
8500	13.77		11.74	–20.25	0.94	0.047	20.820	1.75	0.29
9000	13.31		11.54	–20.01	0.99	0.044	20.035	1.57	0.20
9500	12.90	14.49	11.33	–19.80	1.03	0.045	19.527	1.42	0.15
10000	12.48	13.54	11.09	–19.91	1.10	0.048	18.251	1.27	0.12
10500	12.14	13.01	10.82	–19.92	1.15	0.043	17.588	1.21	0.11
11000	11.87	12.56	10.55	–20.15	1.21	0.046	17.140	1.22	0.10
11500	11.84	12.51	10.32	–20.35	1.22	0.049	17.344	1.42	0.10
12000	11.79	12.42	10.01	–20.42	1.21	0.051	17.372	1.66	0.12
12500	11.74	12.27	9.57	–20.73	1.23	0.055	17.250	2.00	0.17
13000	11.37	11.68	8.86	–21.43	1.34	0.051	15.992	2.26	0.25
13500	10.86	11.00	8.17	–22.01	1.48	0.045	14.752	2.33	0.35
14000	10.64	10.73	7.60	–22.90	1.59	0.044	14.134	2.57	0.47
14500	10.41	10.56	6.97	–22.73	1.53	0.047	14.250	2.80	0.65
15000	9.90	10.19	6.14	–22.83	1.53	0.041	13.739	2.95	0.81
15500	9.61	10.00	5.65	–23.48	1.60	0.040	13.276	3.08	0.87
16000	9.51	10.05	4.97	–23.75	1.53	0.048	13.699	3.49	1.05
16500	9.35	9.90	4.26	–23.84	1.49	0.044	13.763	3.84	1.25
17000	9.17	9.97	3.57	–23.99	1.41	0.048	14.262	4.15	1.45
17500	8.77	9.96	2.51	–24.61	1.36	0.051	14.537	4.48	1.78
18000	7.76	8.62	1.14	–25.57	1.66	0.042	11.758	4.72	1.91

NOISE PARAMETERS

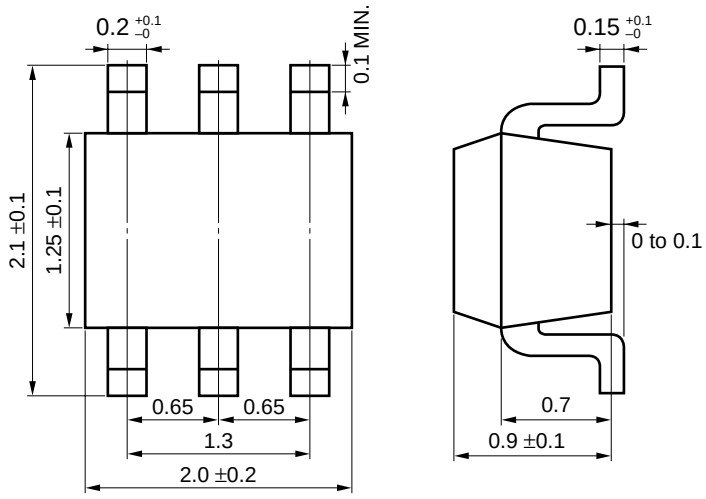
V_{DS} = 2 V, I_D = 10 mA

Freq. (GHz)	$NF_{min.}$ (dB)	G_a (dB)	$\Gamma_{opt.}$		$R_n/50$
			MAG.	ANG. (deg.)	
4.0	0.40	15.5	0.51	75	0.18
6.0	0.49	13.9	0.49	103	0.11
8.0	0.60	12.5	0.44	145	0.06
10.0	0.74	11.3	0.32	–162	0.06
12.0	0.90	10.0	0.23	–73	0.16
14.0	1.08	8.9	0.45	–5	0.36
16.0	1.30	7.8	0.60	42	0.58
18.0	1.53	6.8	0.76	78	0.68

The information in this data is subject to change without notice.

PACKAGE DIMENSIONS

6 PIN SUPER MINIMOLD (UNIT: mm)



PRECAUTION

Avoid high static voltage and electric fields, because this device is Hetero Junction field effect transistor with shottky barrier gate.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235 °C or below Time: 30 seconds or less (at 210 °C) Count: 3, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215 °C or below Time: 40 seconds or less (at 200 °C) Count: 3, Exposure limit: None[Note]	VP15-00-3
Wave Soldering	Soldering bath temperature: 260 °C or below Time: 10 seconds or less Count: 1, Exposure limit: None[Note]	WS60-00-1
Partial Heating	Pin temperature: 300 °C Time: 3 seconds or less (per side of device) Exposure limit: None[Note]	–

Note After opening the dry pack, keep it in a place below 25 °C and 65 % RH for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For details of recommended soldering conditions for surface mounting, refer to information document **SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).**

[MEMO]

[MEMO]

CAUTION

The Great Care must be taken in 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)
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