DATA SHEET

NEC

Hetero Junction Field Effect transistor

NE38018

L to S BAND LOW NOISE AMPLIFER
N-CHANNEL HJ-FET

FEATURES

- Super Low noise figure & High Associated Gain
  NF = 0.55 dB TYP., Ga = 14.5 dB TYP., OIP_3 = 22 dBm (V67), OIP_3 = 23 dBm (V68) TYP. @ f = 2 GHz
  NF = 0.4 dB TYP., Ga = 20 dB TYP. @ f = 900 MHz
- 4 pins super mini mold package
- Wg = 800 μm

ORDERING INFORMATION

Part Number	Package	Supplying Form
NE38018-T1	4 pins super mini mold package	• Embossed tape 8 mm wide • Pin3 (Source), Pin4 (Drain) face to perforation side of the tape • Qty 3 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: NE38018

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

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 Temperature	P_{tot}	150 Note	mA
Channel Temperature	T_{ch}	125	°C
Storage Temperature	T_{stg}	–65 to +125	°C

Note Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T_A = +85°C

RECOMMENDED OPERATING RENGE (T_A = +25°C)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}	1	2	3	V
Drain Current	I_D	2	5	30	mA
Input Power	P_{in}	–	–	0	dBm

ELECTRICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

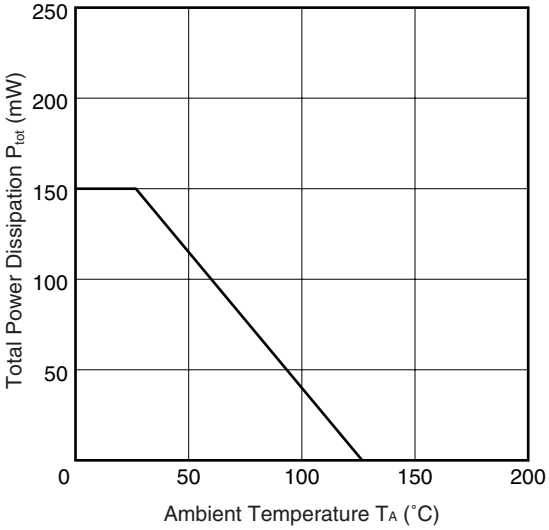
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I_{GSO}	V_{GS} = –3 V	–	1.0	20	μA
Saturated Drain Current	I_{DSS}	V_{DS} = 2 V, V_{GS} = 0 V	40	–	170	mA
Gate to Source Cut off Voltage	$V_{GS(off)}$	V_{DS} = 2 V, I_{DS} = 100 μA	–0.1	–	–1.5	V
Transconductance	g_m	V_{DS} = 2 V, I_{DS} = 5 mA	50	–	–	mS
Noise Figure	NF	V_{DS} = 2 V, I_{DS} = 5 mA,	–	0.55	1.0	dB
Associated Gain	Ga	f = 2 GHz	12.5	14.5	–	dB
Power Gain	Gs		–	16	–	dB
Output Power at 1 dB Gain Compression Point	$P_{0(1\ dB)}$	V_{DS} = 3 V, I_{DS} = 30 mA, f = 2 GHz	–	17 (V67)	–	dBm
			–	18 (V68)	–	
Output Third-Order Distortion Intercept Point	OIP_3	V_{DS} = 2 V, I_{DS} = 5 mA, f = 2 GHz	–	22 (V67)	–	dBm
			–	23 (V68)	–	

I_{DSS} CLASSIFICATIONS

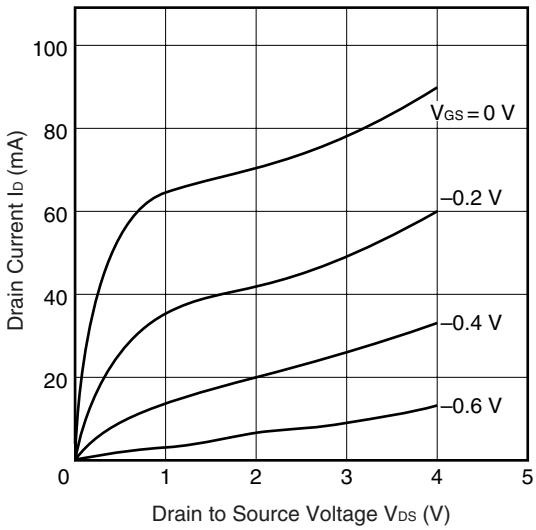
Rank	I_{DSS} (mA)	Marking
67	40 to 90	V67
68	70 to 170	V68

TYPICAL CHARACTERISTICS (T_A = +25°C)

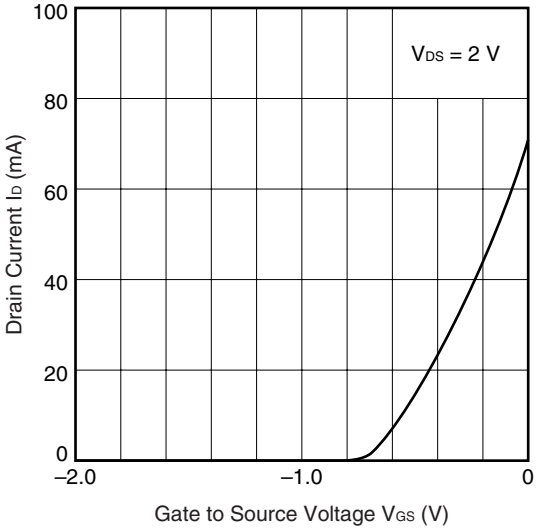
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



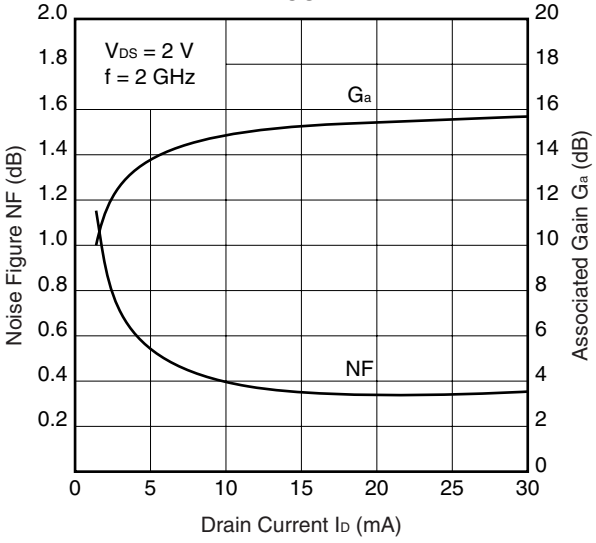
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



DRAIN CURRENT vs. GATE TO SOURCE VOLTAGE



NOISE FIGURE, ASSOCIATED GAIN vs. DRAIN CURRENT



Remark The graphs indicate nominal characteristics.

S-PARAMETER

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

URL http://www.csd-nec.com/

AMP. PARAMETERS

V_{DS} = 2 V

I_D = 5 mA

FREQUENCY MHz	$\|S_{21}\|^2$ dB	$\|S_{12}\|^2$ dB	K
500	15.22	–27.52	.13
600	15.22	–26.00	.14
700	15.04	–24.89	.15
800	14.94	–23.88	.17
900	14.84	–23.08	.19
1000	14.62	–22.34	.20
1100	14.48	–21.85	.23
1200	14.32	–21.30	.24
1300	14.14	–20.75	.26
1400	13.95	–20.29	.28
1500	13.76	–19.92	.30
1600	13.60	–19.56	.31
1700	13.41	–19.23	.33
1800	13.24	–18.91	.35
1900	13.04	–18.63	.37
2000	12.52	–18.81	.53
2100	12.34	–18.53	.55
2200	12.12	–18.37	.58
2300	11.93	–18.18	.60
2400	11.76	–18.01	.62
2500	11.54	–17.84	.65
2600	11.41	–17.75	.66
2700	11.16	–17.54	.70
2800	11.00	–17.51	.73
2900	10.78	–17.34	.75
3000	10.59	–17.24	.78

I_D = 10 mA

FREQUENCY MHz	$\|S_{21}\|^2$ dB	$\|S_{12}\|^2$ dB	K
500	18.60	–28.57	.20
600	18.45	–27.27	.23
700	18.21	–26.12	.25
800	17.99	–25.11	.28
900	17.74	–24.37	.31
1000	17.47	–23.65	.33
1100	17.16	–23.10	.37
1200	16.93	–22.55	.39
1300	16.62	–22.08	.43
1400	16.32	–21.72	.45
1500	16.05	–21.25	.47
1600	15.78	–20.81	.49
1700	15.51	–20.58	.52
1800	15.26	–20.23	.54
1900	15.00	–19.89	.56
2000	14.41	–20.05	.70
2100	14.16	–19.71	.73
2200	13.88	–19.48	.75
2300	13.63	–19.24	.77
2400	13.40	–19.05	.79
2500	13.15	–18.84	.81
2600	12.92	–18.55	.82
2700	12.65	–18.44	.86
2800	12.41	–18.36	.88
2900	12.17	–18.10	.90
3000	11.94	–17.97	.92

AMP. PARAMETERS

V_{DS} = 3 V

I_D = 5 mA

FREQUENCY MHz	$\|S_{21}\|^2$ dB	$\|S_{12}\|^2$ dB	K
500	15.23	–27.70	.13
600	15.23	–26.26	.14
700	15.04	–25.03	.15
800	14.94	–23.98	.17
900	14.85	–23.30	.18
1000	14.64	–22.55	.20
1100	14.48	–21.98	.23
1200	14.34	–21.31	.23
1300	14.18	–20.82	.26
1400	13.97	–20.39	.28
1500	13.77	–20.15	.29
1600	13.62	–19.70	.31
1700	13.43	–19.42	.33
1800	13.27	–19.08	.35
1900	13.08	–18.75	.37
2000	12.56	–18.89	.52
2100	12.37	–18.62	.54
2200	12.15	–18.50	.57
2300	11.98	–18.31	.59
2400	11.80	–18.13	.61
2500	11.60	–17.93	.64
2600	11.45	–17.80	.66
2700	11.22	–17.72	.69
2800	11.05	–17.60	.72
2900	10.83	–17.49	.75
3000	10.64	–17.39	.78

I_D = 10 mA

FREQUENCY MHz	$\|S_{21}\|^2$ dB	$\|S_{12}\|^2$ dB	K
500	18.63	–28.83	.18
600	18.47	–27.37	.22
700	18.22	–26.30	.24
800	18.00	–25.37	.26
900	17.76	–24.41	.29
1000	17.48	–23.80	.32
1100	17.22	–23.30	.35
1200	16.95	–22.72	.37
1300	16.67	–22.17	.40
1400	16.39	–21.74	.42
1500	16.10	–21.40	.45
1600	15.85	–21.06	.47
1700	15.57	–20.69	.50
1800	15.34	–20.40	.52
1900	15.07	–20.11	.54
2000	14.51	–20.08	.68
2100	14.27	–19.92	.71
2200	13.99	–19.60	.73
2300	13.75	–19.40	.75
2400	13.52	–19.21	.77
2500	13.28	–19.00	.80
2600	13.08	–18.80	.81
2700	12.81	–18.64	.84
2800	12.58	–18.42	.86
2900	12.34	–18.31	.89
3000	12.12	–18.15	.91

NOISE PARAMETERS

V_{DS} = 2 V, I_{DS} = 5 mA

Frequency (GHz)	NF_{min} (dB)	Ga (dB)	Γopt		Rn/50
			MAG.	ANG. (deg)	
0.9	0.41	21.1	0.65	25.1	0.18
1.0	0.42	20.3	0.63	27.2	0.18
1.5	0.48	16.9	0.55	42.4	0.17
1.9	0.54	15.0	0.48	58.0	0.16
2.0	0.55	14.7	0.46	62.1	0.15
2.5	0.62	13.4	0.38	81.3	0.13

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

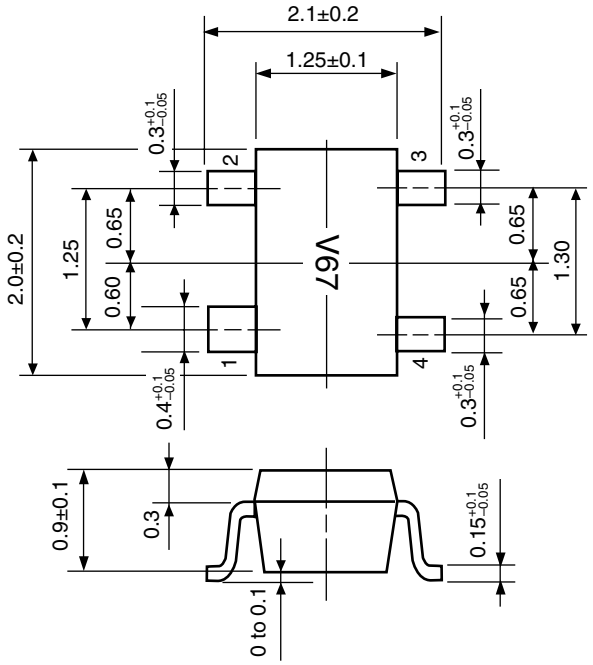
Frequency (GHz)	NFmin (dB)	Ga (dB)	Γopt		Rn/50
			MAG.	ANG. (deg)	
0.9	0.37	22.0	0.59	29.2	0.13
1.0	0.38	21.8	0.50	38.0	0.12
1.5	0.44	17.6	0.50	39.6	0.12
1.9	0.49	15.6	0.38	45.1	0.11
2.0	0.50	15.5	0.39	54.4	0.11
2.5	0.56	13.9	0.38	70.3	0.10

V_{DS} = 3 V, I_{DS} = 5 mA

Frequency (GHz)	NFmin (dB)	Ga (dB)	Γopt		Rn/50
			MAG.	ANG. (deg)	
0.9	0.41	21.8	0.67	24.9	0.18
1.0	0.42	20.8	0.65	26.9	0.18
1.5	0.48	16.9	0.54	42.1	0.17
1.9	0.54	14.8	0.47	57.8	0.16
2.0	0.55	14.4	0.45	61.8	0.15
2.5	0.62	13.3	0.38	80.7	0.13

PACKAGE DIMENSIONS

4-PIN SUPER MINI MOLD (UNIT: mm)



PIN CONNECTIONS
1. Source
2. Gate
3. Source
4. Drain

PRECAUTION

(1) Because this device is a HJ-FET with a Schottky barrier gate structure, it is necessary that sufficient care be taken regarding static electricity and strong electric fields.
Take measures against static electricity and make sure the body is earthed when mounting the device.

(2) Follow the procedure below when operating the device by a gate-and-drain-independent dual power supply.
Directly ground both the source pins.
Fix V_{GS} to approximately –2 V.
Increase V_{DS} to a predetermined voltage level (within the recommended operation range of V_{DS}).
Adjust V_{GS} in line with a predetermined I_D.

(3) It is recommended that the bias application circuit be able to have a fixed voltage and current.

(4) Adjust the I/O matching circuit after turning the bias OFF.

RECOMMENDED SOLDERING CONDITIONS

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

Soldering Method	Soldering Conditions		Condition Symbol
Infrared Reflow	Peak temperature (package surface temperature) Time at peak temperature Time at temperature of 220°C or higher Preheating time at 120 to 180°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 60 seconds or less : 120±30 seconds : 3 times : 0.2%(Wt.) or below	IR260
VPS	Peak temperature (package surface temperature) Time at temperature of 200°C or higher Preheating time at 120 to 150°C Maximum number of reflow processes Maximum chlorine content of rosin flux (% mass)	: 215°C or below : 25 to 40 seconds : 30 to 60 seconds : 3 times : 0.2%(Wt.) or below	VP215
Wave Soldering	Peak temperature (molten solder temperature) Time at peak temperature Preheating temperature (package surface temperature) Maximum number of flow processes Maximum chlorine content of rosin flux (% mass)	: 260°C or below : 10 seconds or less : 120°C or below : 1 time : 0.2%(Wt.) or below	WS260
Partial Heating	Peak temperature (pin temperature) Soldering time (per side of device) Maximum chlorine content of rosin flux (% mass)	: 350°C or below : 3 seconds or less : 0.2%(Wt.) or below	HS350

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

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M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

Caution GaAs Products	The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested. • Do not destroy or burn the product. • Do not cut or cleave off any part of the product. • Do not crush or chemically dissolve the product. • Do not put the product in the mouth. Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.

▶**Business issue**

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▶**Technical issue**

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