

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Hetero Junction Field Effect transistor

**Phase-out/Discontinued**

**NE38018**

**L to S BAND LOW NOISE AMPLIFIER  
N-CHANNEL HJ-FET**

**FEATURES**

- Super Low noise figure & High Associated Gain  
 NF = 0.55 dB TYP., Ga = 14.5 dB TYP., OIP<sub>3</sub> = 22 dBm (V67), OIP<sub>3</sub> = 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	<ul style="list-style-type: none"> <li>• Embossed tape 8 mm wide</li> <li>• Pin3 (Source), Pin4 (Drain) face to perforation side of the tape</li> <li>• Qty 3 kpcs/reel</li> </ul>

**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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 Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V <sub>DS</sub>	4.0	V
Gate to Source Voltage	V <sub>GS</sub>	-3.0	V
Drain Current	I <sub>D</sub>	I <sub>DSS</sub>	mA
Gate Current	I <sub>G</sub>	100	μA
Total Power Temperature	P <sub>tot</sub>	150 <sup>Note</sup>	mA
Channel Temperature	T <sub>ch</sub>	125	°C
Storage Temperature	T <sub>stg</sub>	-65 to +125	°C

**Note** Mounted on double-sided copper-clad 50 × 50 × 1.6 mm epoxy glass PWB, T<sub>A</sub> = +85°C

**RECOMMENDED OPERATING RENG (T<sub>A</sub> = +25°C)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V <sub>DS</sub>	1	2	3	V
Drain Current	I <sub>D</sub>	2	5	30	mA
Input Power	P <sub>in</sub>	-	-	0	dBm

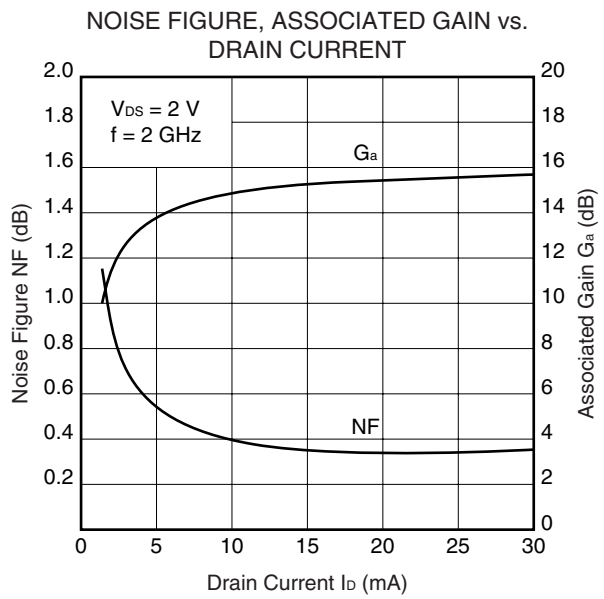
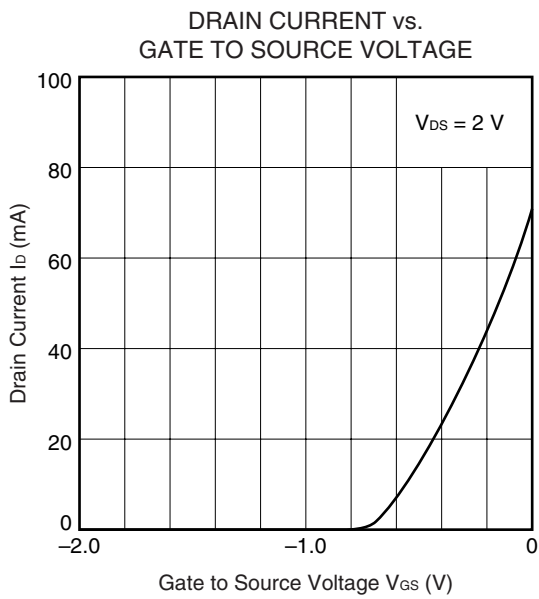
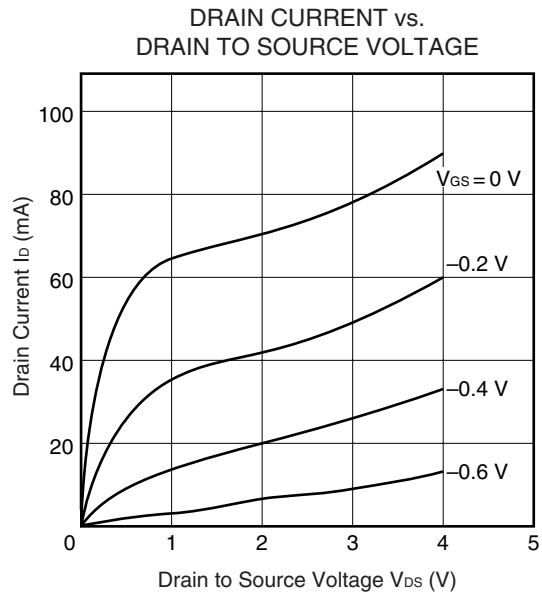
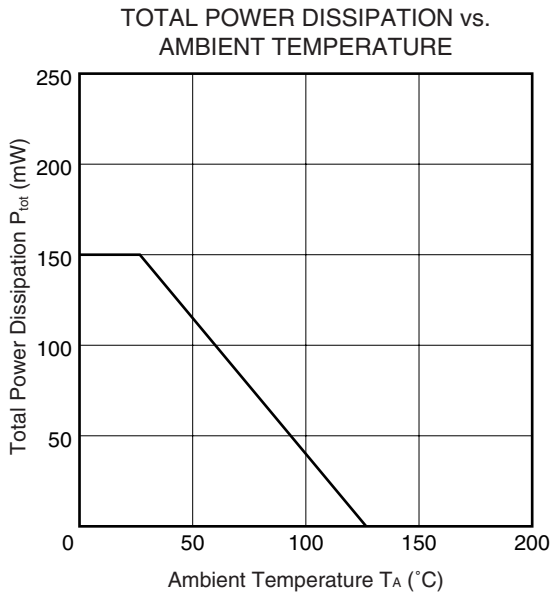
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I <sub>GSO</sub>	V <sub>GS</sub> = -3 V	-	1.0	20	μA
Saturated Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> = 2 V, V <sub>GS</sub> = 0 V	40	-	170	mA
Gate to Source Cut off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 100 μA	-0.1	-	-1.5	V
Transconductance	g <sub>m</sub>	V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 5 mA	50	-	-	mS
Noise Figure	NF	V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 5 mA,	-	0.55	1.0	dB
Associated Gain	G <sub>a</sub>	f = 2 GHz	12.5	14.5	-	dB
Power Gain	G <sub>s</sub>		-	16	-	dB
Output Power at 1 dB Gain	P <sub>0(1 dB)</sub>	V <sub>DS</sub> = 3 V, I <sub>DS</sub> = 30 mA,	-	17 (V67)	-	dBm
Compression Point		f = 2 GHz	-	18 (V68)	-	
Output Third-Order Distortion	OIP <sub>3</sub>	V <sub>DS</sub> = 2 V, I <sub>DS</sub> = 5 mA,	-	22 (V67)	-	dBm
Intercept Point		f = 2 GHz	-	23 (V68)	-	

**I<sub>DSS</sub> CLASSIFICATIONS**

Rank	I <sub>DSS</sub> (mA)	Marking
67	40 to 90	V67
68	70 to 170	V68

**TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**



**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**

$V_{DS} = 2\text{ V}$

$I_D = 5\text{ mA}$

$I_D = 10\text{ mA}$

FREQUENCY	$ S_{21} ^2$	$ S_{12} ^2$	K	FREQUENCY	$ S_{21} ^2$	$ S_{12} ^2$	K
MHz	dB	dB		MHz	dB	dB	
500	15.22	-27.52	.13	500	18.60	-28.57	.20
600	15.22	-26.00	.14	600	18.45	-27.27	.23
700	15.04	-24.89	.15	700	18.21	-26.12	.25
800	14.94	-23.88	.17	800	17.99	-25.11	.28
900	14.84	-23.08	.19	900	17.74	-24.37	.31
1000	14.62	-22.34	.20	1000	17.47	-23.65	.33
1100	14.48	-21.85	.23	1100	17.16	-23.10	.37
1200	14.32	-21.30	.24	1200	16.93	-22.55	.39
1300	14.14	-20.75	.26	1300	16.62	-22.08	.43
1400	13.95	-20.29	.28	1400	16.32	-21.72	.45
1500	13.76	-19.92	.30	1500	16.05	-21.25	.47
1600	13.60	-19.56	.31	1600	15.78	-20.81	.49
1700	13.41	-19.23	.33	1700	15.51	-20.58	.52
1800	13.24	-18.91	.35	1800	15.26	-20.23	.54
1900	13.04	-18.63	.37	1900	15.00	-19.89	.56
2000	12.52	-18.81	.53	2000	14.41	-20.05	.70
2100	12.34	-18.53	.55	2100	14.16	-19.71	.73
2200	12.12	-18.37	.58	2200	13.88	-19.48	.75
2300	11.93	-18.18	.60	2300	13.63	-19.24	.77
2400	11.76	-18.01	.62	2400	13.40	-19.05	.79
2500	11.54	-17.84	.65	2500	13.15	-18.84	.81
2600	11.41	-17.75	.66	2600	12.92	-18.55	.82
2700	11.16	-17.54	.70	2700	12.65	-18.44	.86
2800	11.00	-17.51	.73	2800	12.41	-18.36	.88
2900	10.78	-17.34	.75	2900	12.17	-18.10	.90
3000	10.59	-17.24	.78	3000	11.94	-17.97	.92

**AMP. PARAMETERS**

$V_{DS} = 3\text{ V}$

$I_D = 5\text{ mA}$

$I_D = 10\text{ mA}$

FREQUENCY MHz	$ S_{21} ^2$ dB	$ S_{12} ^2$ dB	K	FREQUENCY MHz	$ S_{21} ^2$ dB	$ S_{12} ^2$ dB	K
500	15.23	-27.70	.13	500	18.63	-28.83	.18
600	15.23	-26.26	.14	600	18.47	-27.37	.22
700	15.04	-25.03	.15	700	18.22	-26.30	.24
800	14.94	-23.98	.17	800	18.00	-25.37	.26
900	14.85	-23.30	.18	900	17.76	-24.41	.29
1000	14.64	-22.55	.20	1000	17.48	-23.80	.32
1100	14.48	-21.98	.23	1100	17.22	-23.30	.35
1200	14.34	-21.31	.23	1200	16.95	-22.72	.37
1300	14.18	-20.82	.26	1300	16.67	-22.17	.40
1400	13.97	-20.39	.28	1400	16.39	-21.74	.42
1500	13.77	-20.15	.29	1500	16.10	-21.40	.45
1600	13.62	-19.70	.31	1600	15.85	-21.06	.47
1700	13.43	-19.42	.33	1700	15.57	-20.69	.50
1800	13.27	-19.08	.35	1800	15.34	-20.40	.52
1900	13.08	-18.75	.37	1900	15.07	-20.11	.54
2000	12.56	-18.89	.52	2000	14.51	-20.08	.68
2100	12.37	-18.62	.54	2100	14.27	-19.92	.71
2200	12.15	-18.50	.57	2200	13.99	-19.60	.73
2300	11.98	-18.31	.59	2300	13.75	-19.40	.75
2400	11.80	-18.13	.61	2400	13.52	-19.21	.77
2500	11.60	-17.93	.64	2500	13.28	-19.00	.80
2600	11.45	-17.80	.66	2600	13.08	-18.80	.81
2700	11.22	-17.72	.69	2700	12.81	-18.64	.84
2800	11.05	-17.60	.72	2800	12.58	-18.42	.86
2900	10.83	-17.49	.75	2900	12.34	-18.31	.89
3000	10.64	-17.39	.78	3000	12.12	-18.15	.91

**NOISE PARAMETERS**

$V_{DS} = 2\text{ V}$ ,  $I_{DS} = 5\text{ mA}$

Frequency (GHz)	NF <sub>min</sub> (dB)	Ga (dB)	Γ <sub>opt</sub>		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

$V_{DS} = 2\text{ V}$ ,  $I_{DS} = 10\text{ mA}$

Frequency (GHz)	NF <sub>min</sub> (dB)	Ga (dB)	Γ <sub>opt</sub>		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

$V_{DS} = 3\text{ V}$ ,  $I_{DS} = 5\text{ mA}$

Frequency (GHz)	NF <sub>min</sub> (dB)	Ga (dB)	Γ <sub>opt</sub>		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



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

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

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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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  - (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

**SAFETY INFORMATION ON THIS PRODUCT**

<p><b>Caution</b></p>	<p>GaAs Products</p>	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"> <li>• Do not destroy or burn the product.</li> <li>• Do not cut or cleave off any part of the product.</li> <li>• Do not crush or chemically dissolve the product.</li> <li>• Do not put the product in the mouth.</li> </ul> <p>Follow related laws and ordinances for disposal. The product should be excluded from general industrial waste or household garbage.</p>
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► **Business issue**

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► **Technical issue**

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