

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 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 1st, 2010
Renesas Electronics Corporation

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

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N-CHANNEL GaAs HJ-FET
NE651R479A

0.4 W L-BAND POWER GaAs HJ-FET

DESCRIPTION

The NE651R479A is a 0.4 W GaAs HJ-FET designed for middle power transmitter applications for mobile communication and wireless PC LAN systems. It is capable of delivering 0.4 W of output power (CW) with high linear gain, high efficiency and excellent distortion and as a driver amplifier for our NE6510179A and NE6510379A.

Reliability and performance uniformity are assured by NEC's stringent quality and control procedures.

FEATURES

- GaAs HJ-FET structure
- High output power : $P_{out} = +27.0$ dBm TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 900$ MHz, $P_{in} = +13$ dBm
 $P_{out} = +27.0$ dBm TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = +15$ dBm
 $P_{out} = +29.5$ dBm TYP. @ $V_{DS} = 5.0$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = +15$ dBm
- High linear gain : $G_L = 14.0$ dB TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 900$ MHz, $P_{in} = 0$ dBm
 $G_L = 12.0$ dB TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = 0$ dBm
 $G_L = 12.0$ dB TYP. @ $V_{DS} = 5.0$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = 0$ dBm
- High power added efficiency : 60 % TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 900$ MHz, $P_{in} = +13$ dBm
 60 % TYP. @ $V_{DS} = 3.5$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = +15$ dBm
 58 % TYP. @ $V_{DS} = 5.0$ V, $I_{Dset} = 50$ mA, $f = 1.9$ GHz, $P_{in} = +15$ dBm

ORDERING INFORMATION

Part Number	Package	Supplying Form
NE651R479A-T1	79A	<ul style="list-style-type: none"> • 12 mm wide embossed taping • Qty 1 kpcs/reel

Remark To order evaluation samples, contact your nearby sales office.

Part number for sample order: NE651R479A

Caution Please handle this device at static-free workstation, because this is an electrostatic sensitive device.

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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_A = +25 °C)

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

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V _{DS}	8	V
Gate to Source Voltage	V _{GSO}	-4	V
Drain Current	I _D	1.0	A
Gate Forward Current	I _{GF}	10	mA
Gate Reverse Current	I _{GR}	10	mA
Total Power Dissipation	P _{tot}	2.5	W
Channel Temperature	T _{ch}	150	°C
Storage Temperature	T _{stg}	-65 to +150	°C

★ **RECOMMENDED OPERATING CONDITIONS**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V _{DS}		-	3.5	6.0	V
Gain Compression	G _{comp}		-	-	3.0	dB
Channel Temperature	T _{ch}		-	-	+125	°C

ELECTRICAL CHARACTERISTICS

(T_A = +25 °C, unless otherwise specified, using NEC standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I _{DSS}	V _{DS} = 2.5 V, V _{GS} = 0 V	-	0.7	-	A
Pinch-off Voltage	V _p	V _{DS} = 2.5 V, I _D = 5 mA	-2.0	-	-0.4	V
Gate to Drain Break Down Voltage	BV _{gd}	I _{gd} = 5 mA	12	-	-	V
Thermal Resistance	R _{th}	Channel to Case	-	30	50	°C/W
Output Power	P _{out}	f = 1.9 GHz, V _{DS} = 3.5 V,	26.0	27.0	-	dBm
Drain Current	I _D	P _{in} = +15 dBm, R _g = 1 kΩ,	-	220	-	mA
Power Added Efficiency	η _{add}	I _{Dset} = 50 mA (RF OFF)	52	60	-	%
Linear Gain ^{Note 1}	G _L	Note 2	-	12.0	-	dB

Notes 1. P_{in} = 0 dBm

2. DC performance is 100 % testing. RF performance is testing several samples per wafer.

Wafer rejection criteria for standard devices is 1 reject for several samples.

TYPICAL RF PERFORMANCE FOR REFERENCE (NOT SPECIFIED)

(T_A = +25 °C, unless otherwise specified, using NEC standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Power	P _{out}	f = 900 MHz, V _{DS} = 3.5 V,	–	27.0	–	dBm
Drain Current	I _D	P _{in} = +13 dBm, R _g = 1 kΩ,	–	230	–	mA
Power Added Efficiency	η _{add}	I _{Dset} = 50 mA (RF OFF)	–	60	–	%
Linear Gain ^{Note}	G _L		–	14.0	–	dB

Note P_{in} = 0 dBm

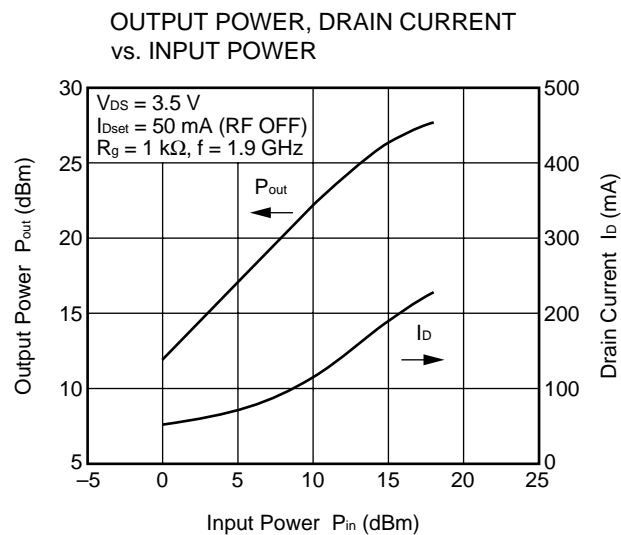
TYPICAL RF PERFORMANCE FOR REFERENCE (NOT SPECIFIED)

(T_A = +25 °C, unless otherwise specified, using NEC standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Power	P _{out}	f = 1.9 GHz, V _{DS} = 5.0 V,	–	29.5	–	dBm
Drain Current	I _D	P _{in} = +15 dBm, R _g = 1 kΩ,	–	350	–	mA
Power Added Efficiency	η _{add}	I _{Dset} = 50 mA (RF OFF)	–	58	–	%
Linear Gain ^{Note}	G _L		–	12.0	–	dB

Note P_{in} = 0 dBm

TYPICAL CHARACTERISTICS (T_A = +25 °C)



Remark The graph indicates nominal characteristics.

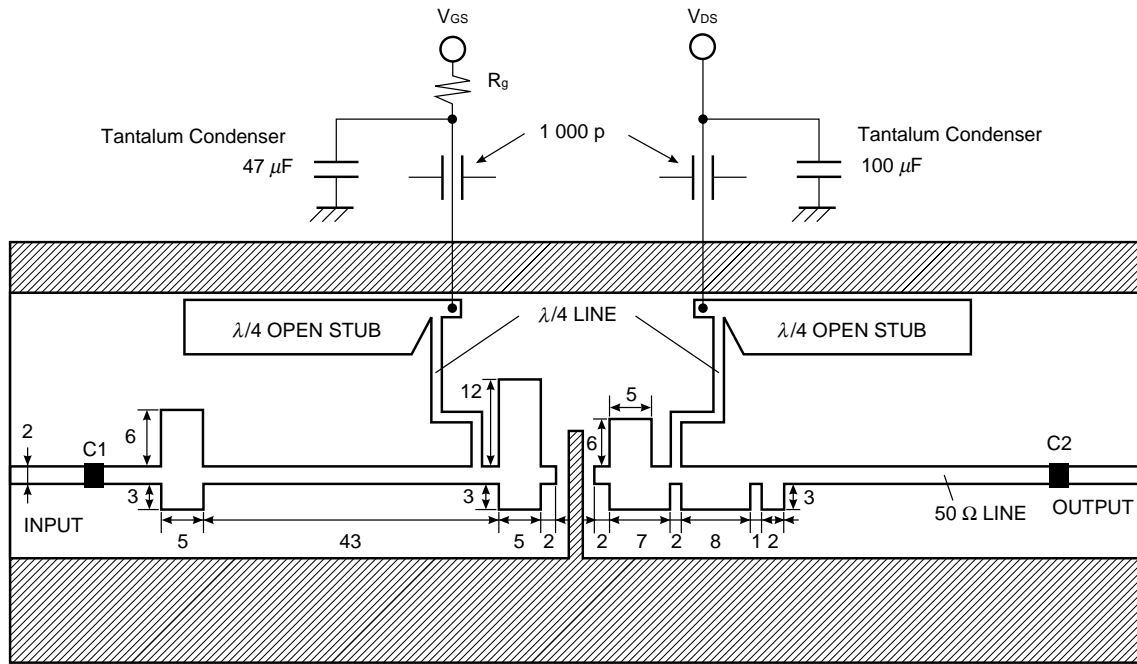
S-PARAMETERS

Test Conditions: $V_{DS} = 3.5\text{ V}$, $I_{Dset} = 50\text{ mA}$ (RF OFF)

Frequency GHz	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
600	0.868	-168.8	6.120	96.9	0.046	15.7	0.536	-170.3
700	0.866	-172.7	5.225	95.0	0.046	14.9	0.537	-173.9
800	0.864	-176.9	4.641	93.0	0.045	14.8	0.541	-177.1
900	0.863	-179.4	4.145	91.6	0.045	15.4	0.540	-179.6
1000	0.868	176.6	3.730	89.4	0.045	15.8	0.541	178.0
1100	0.862	173.6	3.359	88.3	0.045	16.6	0.542	175.5
1200	0.860	170.8	3.152	87.5	0.046	16.6	0.542	173.4
1300	0.861	168.3	2.894	85.8	0.047	15.7	0.535	171.9
1400	0.859	165.4	2.695	85.2	0.047	15.5	0.533	170.1
1500	0.861	162.2	2.527	84.2	0.046	16.1	0.533	167.8
1600	0.862	159.3	2.387	82.9	0.046	17.0	0.533	165.9
1700	0.857	156.7	2.261	82.8	0.047	17.1	0.532	163.8
1800	0.855	153.5	2.229	80.9	0.046	17.0	0.537	161.1
1900	0.856	150.0	2.093	77.8	0.046	16.6	0.538	158.4
2000	0.860	146.7	1.946	76.9	0.045	16.3	0.537	156.0
2100	0.860	142.9	1.884	75.5	0.045	16.9	0.533	154.0
2200	0.863	140.1	1.785	73.6	0.045	18.4	0.533	149.6


APPLICATION CIRCUIT EXAMPLE

f = 1.9 GHz (Unit: mm)



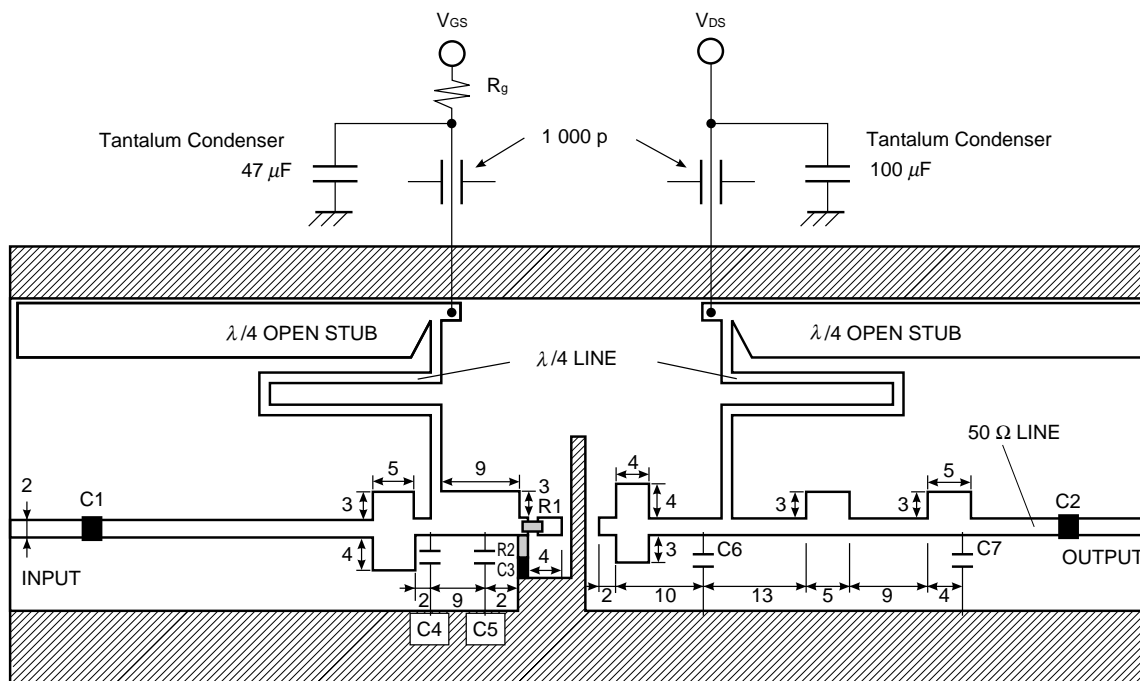
f = 1.9 GHz
 $V_{DS} = 3.5\text{ V}$
 $I_{Dset} = 50\text{ mA (RF OFF)}$

C1 = 30 pF
 C2 = 30 pF
 $R_g = 1\text{ k}\Omega$

 GND
 Substrate: Teflon glass ($\epsilon_r = 2.6$)
 $t = 0.8\text{ mm}$


APPLICATION CIRCUIT EXAMPLE

f = 900 MHz (Unit: mm)



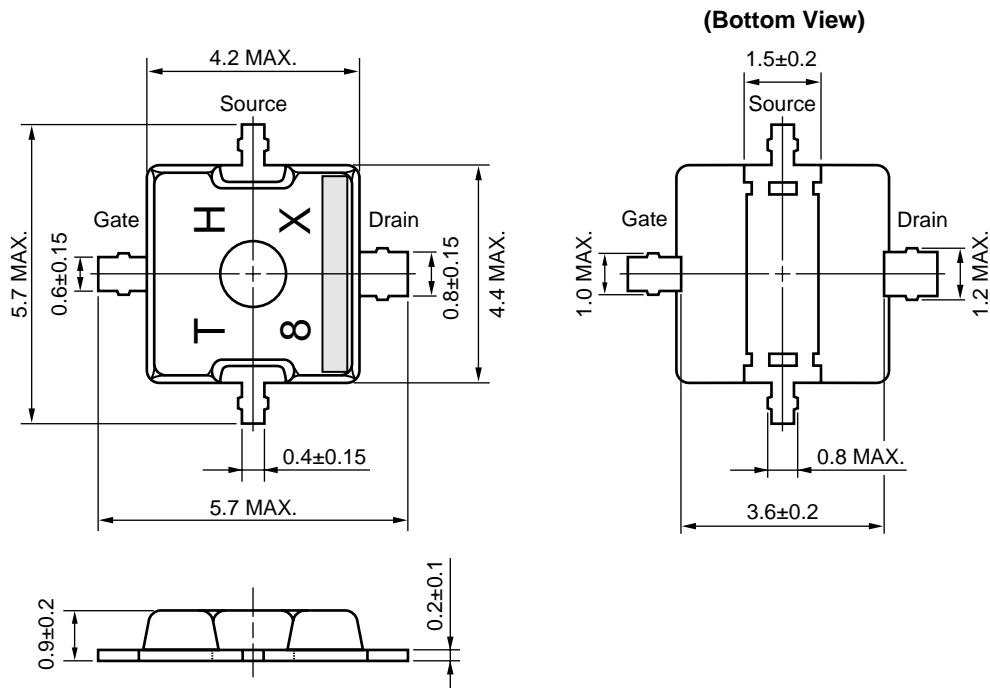
f = 900 MHz
 $V_{DS} = 3.5\text{ V}$
 $I_{Dset} = 50\text{ mA (RF OFF)}$

C1 = 30 pF
 C2 = 30 pF
 C3 = 1 000 pF
 C4 = 6 pF
 C5 = 3 pF
 C6 = 6 pF
 C7 = 1 pF
 $R_1 = 5.1\ \Omega$
 $R_2 = 30\ \Omega$
 $R_g = 1\text{ k}\Omega$

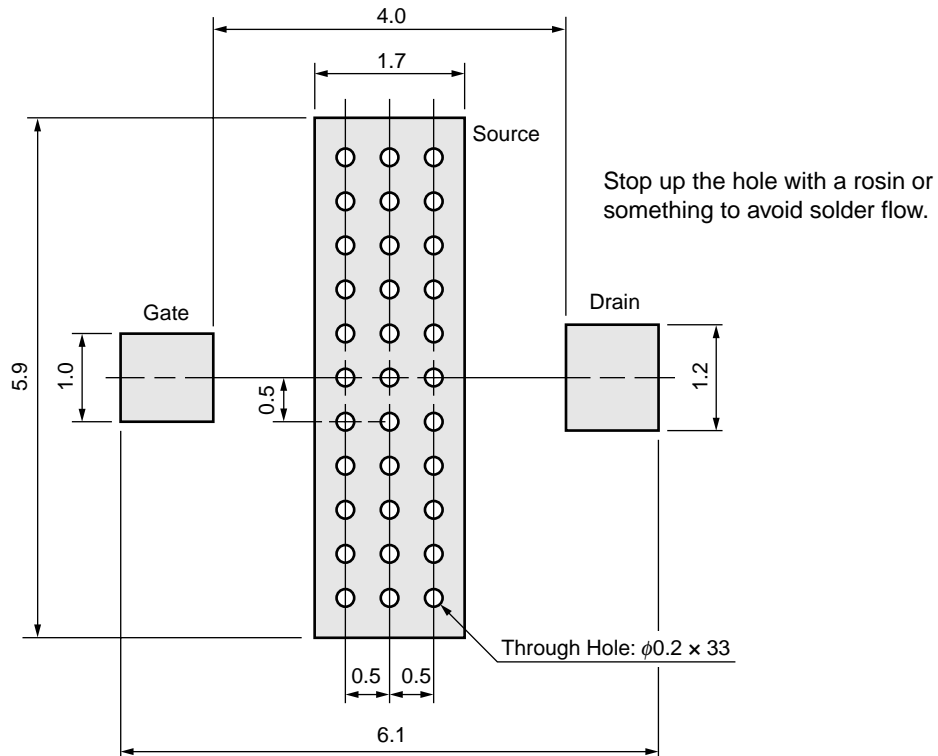
 GND
 Substrate: Teflon glass ($\epsilon_r = 2.6$)
 $t = 0.8\text{ mm}$

PACKAGE DIMENSIONS

79A (UNIT: mm)



79A PACKAGE RECOMMENDED P.C.B. LAYOUT (UNIT: mm)



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	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235 °C or below, Time: 30 seconds or less (at 210 °C or higher), Count: 2 times or less, Exposure: limit: None ^{Note}	IR35-00-2
Partial Heating	Pin temperature: 260 °C or below, Time: 5 seconds or less (per pin row) Exposure: limit: None ^{Note}	—

Note After opening the dry pack, store it at 25 °C or less and 65 % RH or less for the allowable storage period.

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

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"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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M8E 00.4-0110

SAFETY INFORMATION ON THIS PRODUCT

<div style="border: 1px solid black; padding: 2px; display: inline-block;">Caution</div>	<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"> • 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. <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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