DATA SHEET

NEC

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	• 12 mm wide embossed taping • Qty 1 kpcs/reel

Remark To order evaluation samples, consult your NEC sales representative (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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The mark ★ shows major revised points.

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	5.5	V
Gain Compression	Gcomp		–	–	5.0 Note	dB
Channel Temperature	T_{ch}		–	–	+110	°C

★ **Note** Recommended maximum Gain Compression is 3.0 dB at V_{DS} > 4.2 V

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 = 14 mA	–2.0	–	–0.4	V
★ Gate to Drain Break Down Voltage	BV_{gd}	I_{gd} = 14 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)**

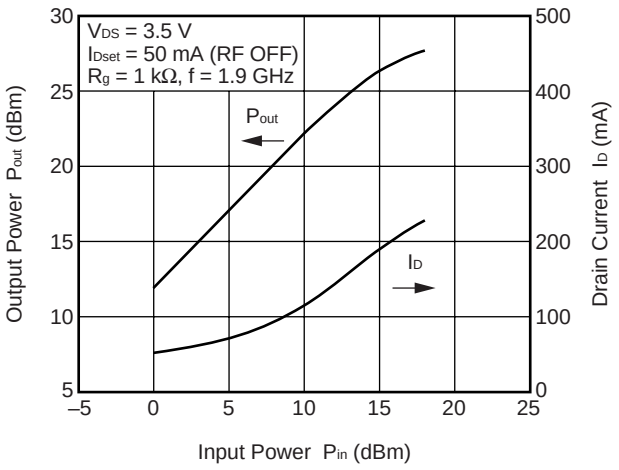
(T_A = +25 °C, unless otherwise specified, using NEC standard test fixture.)

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)**

OUTPUT POWER, DRAIN CURRENT
vs. INPUT POWER



Remark The graph indicates nominal characteristics.

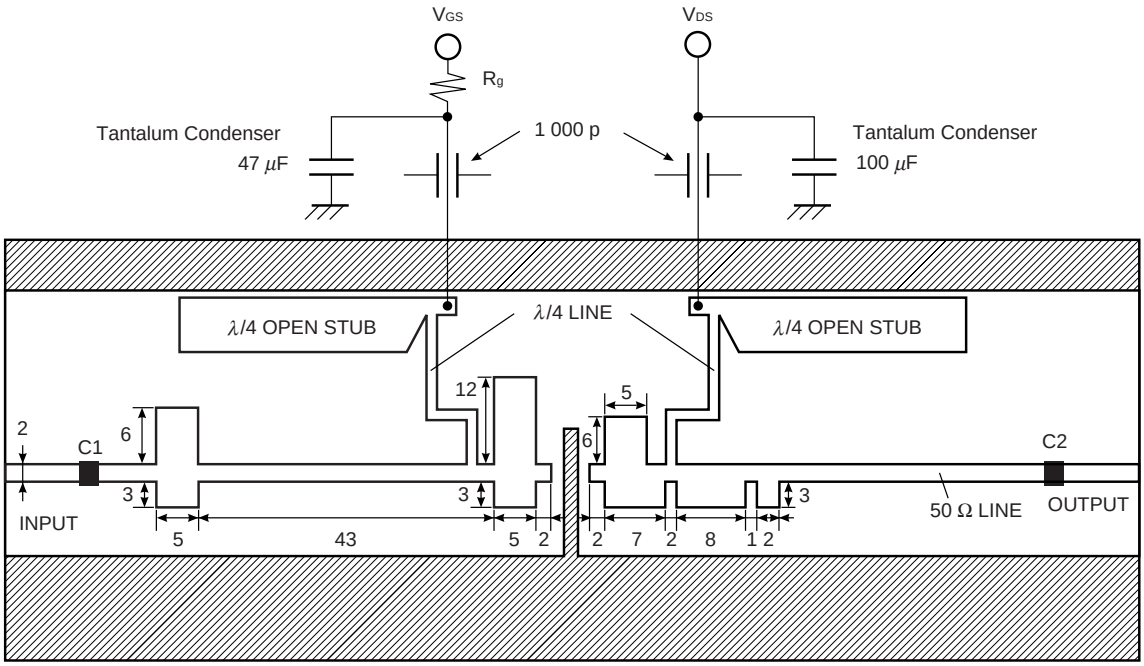
S-PARAMETERS

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

Frequency	S_{11}		S_{21}		S_{12}		S_{22}	
GHz	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 V
I_{Dset} = 50 mA (RF OFF)

C1 = 30 pF
C2 = 30 pF

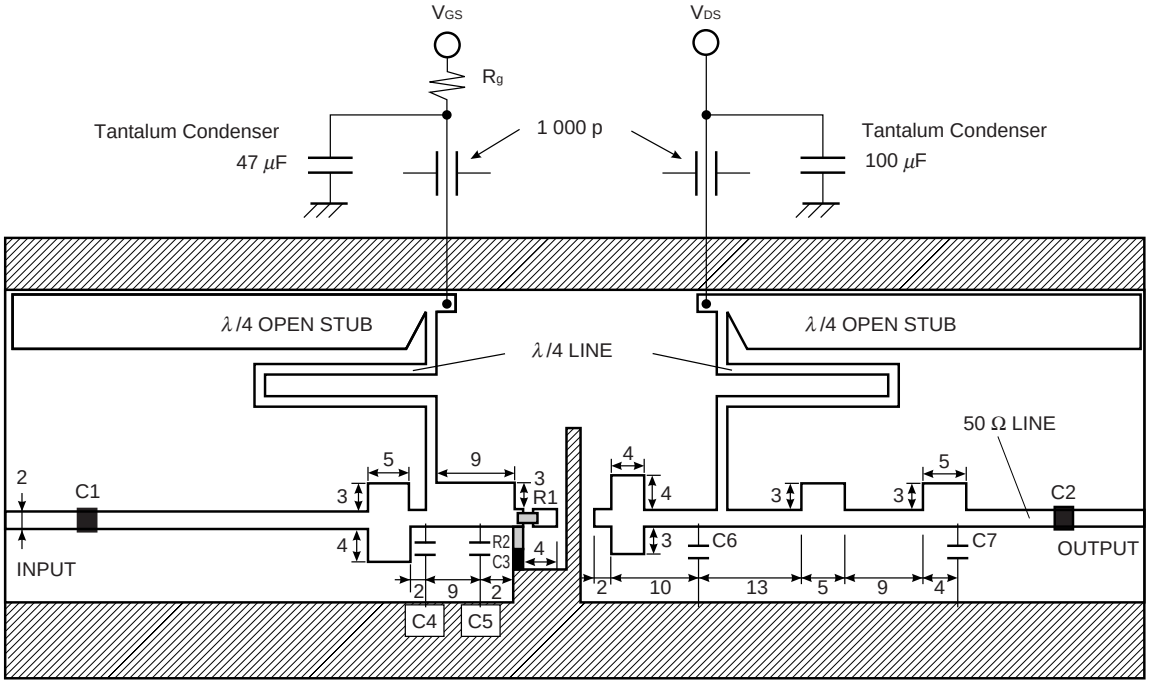
R_g = 1 kΩ

GND

Substrate: Teflon glass (εr = 2.6)
t = 0.8 mm

APPLICATION CIRCUIT EXAMPLE

f = 900 MHz (Unit: mm)



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

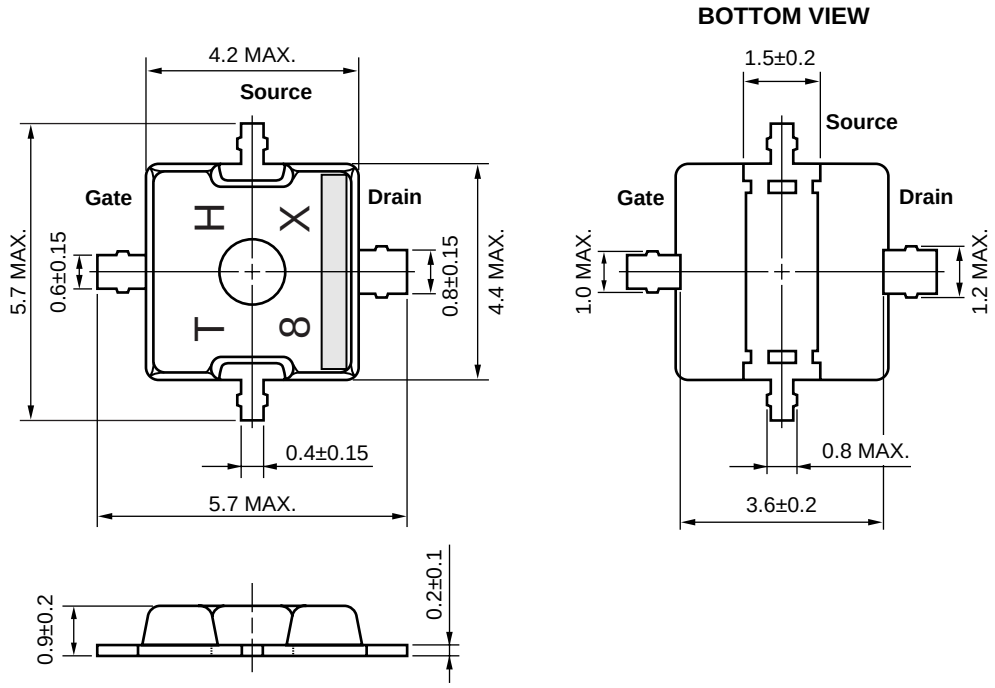
C1 = 30 pF
C2 = 30 pF
C3 = 1 000 pF
C4 = 6 pF
C5 = 3 pF
C6 = 6 pF
C7 = 1 pF

R1 = 5.1 Ω
R2 = 30 Ω
R_g = 1 kΩ

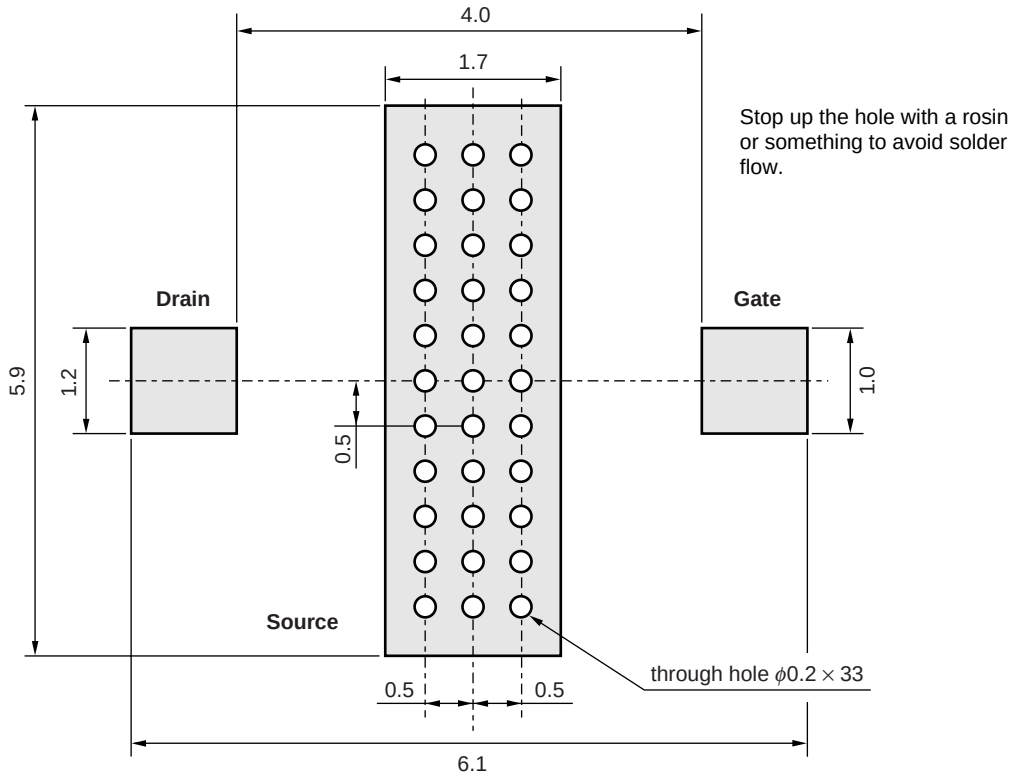
GND

Substrate: Teflon glass (εr = 2.6)
t = 0.8 mm

79A PACKAGE DIMENSIONS (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 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 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).

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.