DATA SHEET

NEC

N-CHANNEL GaAs HJ-FET

NE6510179A

1W L-BAND POWER GaAs HJ-FET

DESCRIPTION

The NE6510179A is a 1W GaAs HJ-FET designed for middle power transmitter applications for mobile communication systems. It is capable of delivering 1 watt of output power (CW) with high linear gain, high efficiency and excellent distortion.

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

FEATURES

- GaAs HJ-FET Structure
- High Output Power : P_O = +31.5 dBm typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 900 MHz, Pin = +20 dBm
  P_O = +32.5 dBm typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 1900 MHz, Pin = +25 dBm
- High Linear Gain : G_L = 15 dB typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 900 MHz, Pin = 0 dBm
  G_L = 10 dB typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 1900 MHz, Pin = 0 dBm
- High Power Added Efficiency: 70% typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 900 MHz, Pin = +20 dBm
  58% typ. @V_{DS} = 3.5 V, I_{Dset} = 200 mA, f = 1900 MHz, Pin = +25 dBm

ORDERING INFORMATION

Part Number	Package	Supplying Form
NE6510179A-T1	79A	12 mm tape width, 1 kpcs/reel

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: NE6510179A)

★ 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}	6	V
Gate to Source Voltage	V_{GSO}	−4	V
Drain Current	I_D	2.8	A
Gate Current	I_G	25	mA
Total Power Dissipation	P_T	15	W
Channel Temperature	T_{ch}	150	°C
Storage Temperature	T_{stg}	−65 to +150	°C

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.

RECOMMENDED OPERATING LIMITS

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V_{DS}			3.5	4.2	V
Gain Compression	Gcomp				5.0	dB
Channel Temperature	T_{ch}				+110	°C

ELECTRICAL CHARACTERISTICS

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

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	I_{DSS}	V_{DS} = 2.5 V, V_{GS} = 0 V		2.4		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		5	8	°C/W
Output Power	P_o	f = 1900 MHz, V_{DS} = 3.5 V	31.5	32.5		dBm
Drain Current	I_D	Pin = +25 dBm, Rg = 100 Ω		0.72		A
Power Added Efficiency	η_{add}	I_{Dset} = 200 mA (RF OFF)	50	58		%
Linear Gain[Note 1]	G_L	**Note 2**		10.0		dB

Notes 1. Pin = 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.

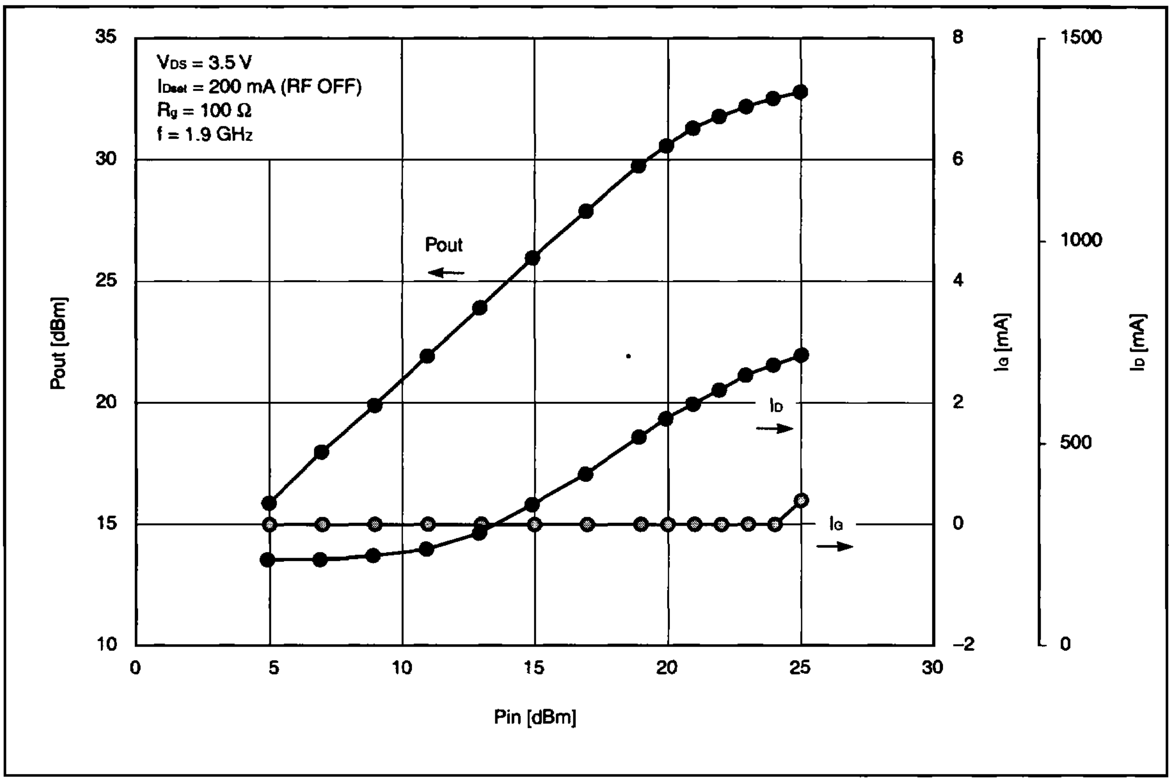
TYPICAL RF PERFORMANCE FOR REFERENCE (NOT SPECIFIED)

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

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Power	P_o	f = 900 MHz, V_{DS} = 3.5 V		31.5		dBm
Drain Current	I_D	Pin = +20 dBm, Rg = 100 Ω		0.53		A
Power Added Efficiency	η_{add}	I_{Dset} = 200 mA (RF OFF)		70		%
Linear Gain[Note]	G_L			15.0		dB

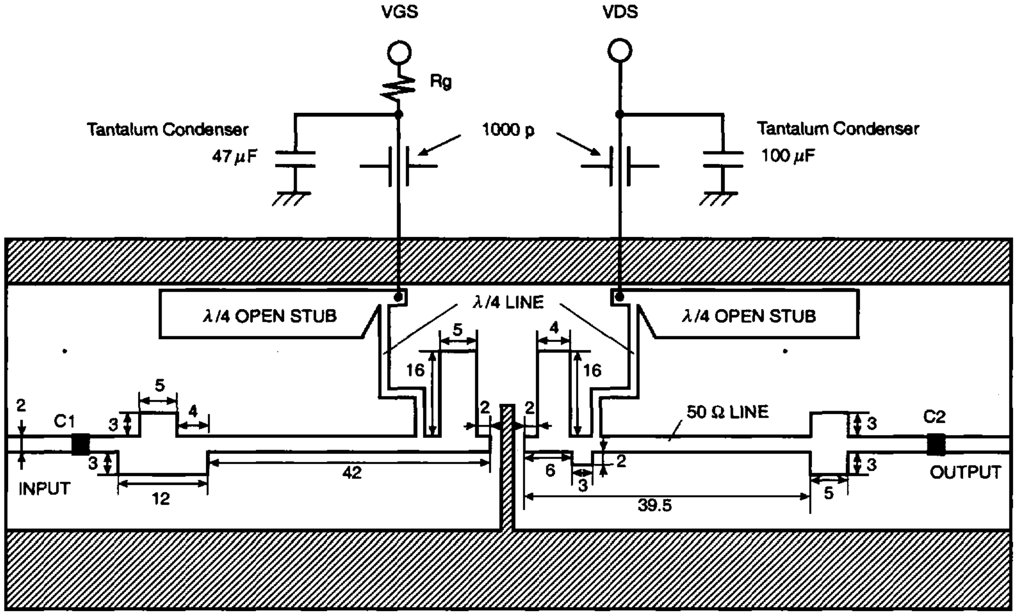
Note Pin = 0 dBm

★ OUTPUT POWER, DRAIN CURRENT AND GATE CURRENT vs. INPUT POWER



★ APPLICATION CIRCUIT EXAMPLE

f = 1.9 GHz (Unit: mm)



▨ GND

f = 1.9 GHz
VDS = 3.5 V
I_{Dset} = 200 mA (RF OFF)

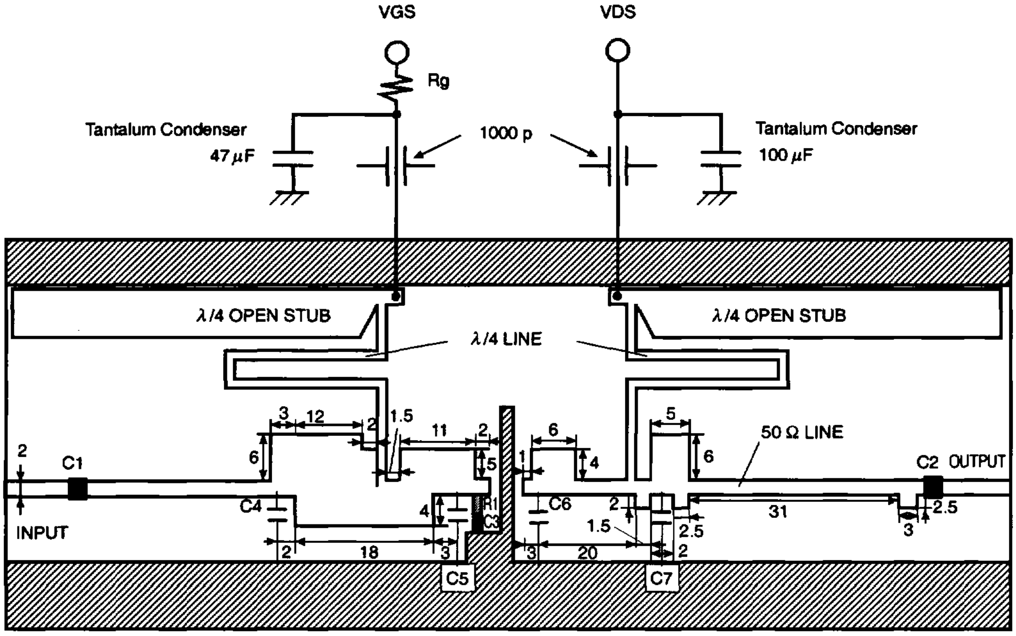
C1 = 30 pF
C2 = 30 pF

Rg = 100 Ω

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

★ APPLICATION CIRCUIT EXAMPLE

f = 900 MHz (Unit: mm)



▨ GND

f = 900 MHz
VDS = 3.5 V
I_{Dset} = 200 mA (RF OFF)

C1 = 30 pF
C2 = 30 pF
C3 = 30 pF
C4 = 3 pF

C5 = 8 pF
C6 = 8 pF
C7 = 4 pF

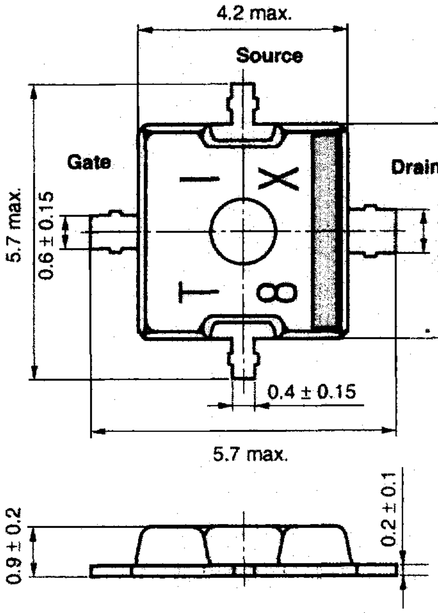
R1 = 30 Ω
Rg = 100 Ω

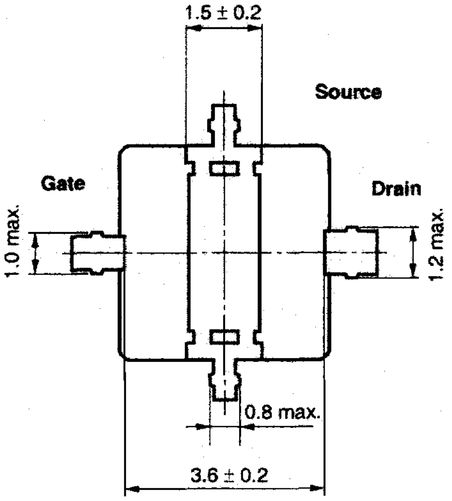
Substrate: Teflon glass (εr = 2.6)
t = 0.8 mm

NE6510179A S-PARAMETERS TEST CONDITIONS: V_{DS} = 3.5 V, I_{Dset} = 200 mA

FREQUENCY	S_{11}		S_{21}		S_{12}		S_{22}	
MHz	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
550	0.940	179.9	2.859	92.3	0.020	21.9	0.803	177.2
600	0.938	178.6	2.699	92.6	0.020	24.3	0.808	177.2
650	0.943	177.5	2.440	91.9	0.020	25.3	0.806	176.5
700	0.940	176.9	2.316	91.5	0.021	26.7	0.807	176.3
750	0.939	175.8	2.098	91.2	0.020	28.0	0.802	175.3
800	0.948	175.1	2.008	90.3	0.021	29.6	0.796	175.5
850	0.949	174.9	1.826	92.0	0.020	31.2	0.802	173.7
900	0.938	174.1	1.772	90.5	0.022	32.0	0.804	174.5
950	0.940	173.2	1.691	92.5	0.020	36.4	0.808	173.7
1000	0.940	172.4	1.579	90.2	0.022	34.6	0.807	173.5
1050	0.940	171.9	1.545	92.7	0.021	39.3	0.806	172.8
1100	0.938	171.7	1.447	91.4	0.022	37.3	0.805	172.3
1150	0.940	171.1	1.432	91.0	0.022	40.5	0.807	171.9
1200	0.936	170.4	1.342	90.6	0.023	40.4	0.803	171.4
1250	0.935	170.1	1.325	91.3	0.022	42.5	0.803	171.3
1300	0.935	169.4	1.224	89.2	0.023	42.3	0.800	170.8
1350	0.933	169.9	1.232	90.2	0.023	47.0	0.806	171.4
1400	0.934	168.0	1.140	90.0	0.023	45.5	0.795	169.9
1450	0.937	167.5	1.105	88.5	0.024	46.1	0.804	169.5
1500	0.938	167.0	1.075	90.0	0.023	49.5	0.801	168.8
1550	0.938	166.4	1.045	90.3	0.024	49.6	0.803	168.7
1600	0.934	167.1	1.019	91.1	0.024	52.3	0.803	169.5
1650	0.936	165.1	0.997	89.7	0.025	53.3	0.803	167.6
1700	0.933	164.6	0.982	91.0	0.025	54.8	0.800	166.7
1750	0.934	163.7	0.936	89.6	0.026	54.6	0.803	166.6
1800	0.934	162.9	0.961	87.4	0.026	57.7	0.799	165.3
1850	0.934	162.1	0.905	90.9	0.026	55.6	0.804	165.4
1900	0.935	161.7	0.875	85.8	0.028	58.5	0.798	164.1
1950	0.931	160.7	0.855	89.3	0.026	58.2	0.800	164.1
2000	0.929	160.4	0.807	87.2	0.028	59.5	0.797	163.2
2050	0.929	158.8	0.796	89.3	0.027	58.0	0.802	162.6
2100	0.933	158.1	0.772	85.5	0.028	63.2	0.797	161.1
2150	0.928	156.6	0.769	92.6	0.027	60.2	0.792	160.5
2200	0.934	156.5	0.729	87.0	0.028	65.2	0.793	159.9
2250	0.930	155.5	0.716	92.2	0.027	65.6	0.795	159.9

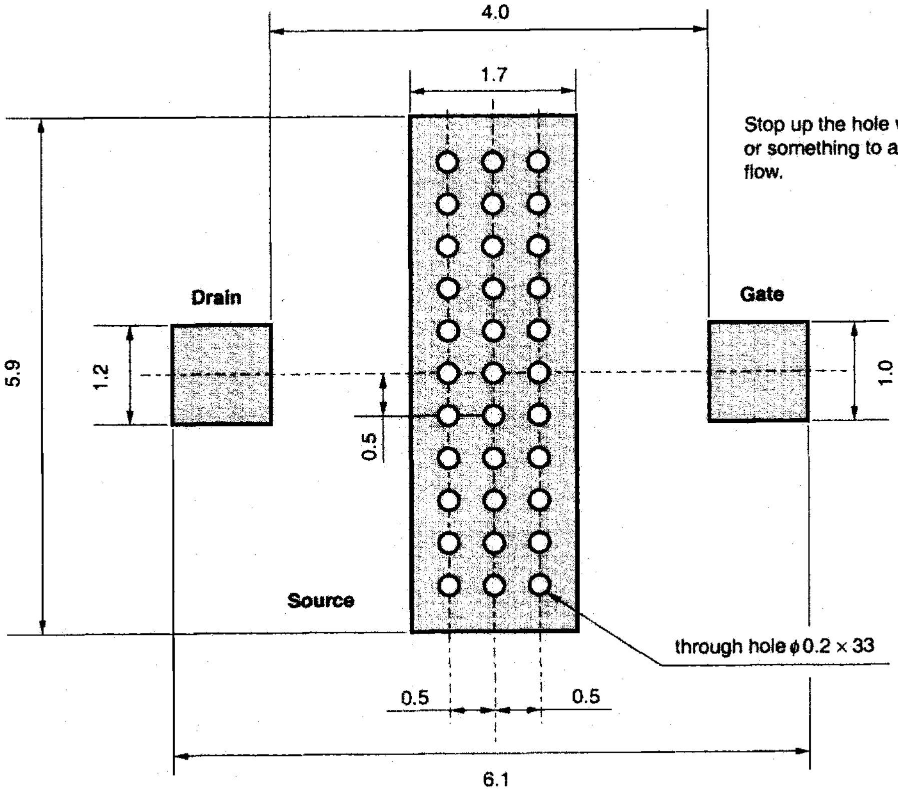
79A Package Dimensions (Unit: mm)





Bottom View

79A Package Recommended P.C.B. Layout (Unit: mm)



Stop up the hole with a rosin or something to avoid solder flow.

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: 2, Exposure limit[Note]: None	IR35-00-2
Partial Heating	Pin temperature: 260°C Time: 5 seconds or less (per pin row) Exposure limit[Note]: None	–

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).

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.**

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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"Standard", "Special", and "Specific". The Specific quality grade applies only to devices developed based on a customer designated "quality assurance program" for a specific application. The recommended applications of a device depend on its quality grade, as indicated below. Customers must check the quality grade of each device before using it in a particular application.

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)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.

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