

### 3 W L-BAND POWER GaAs HJ-FET

#### DESCRIPTION

The NE6510379A is a 3 W GaAs HJ-FET designed for middle power transmitter applications for mobile communication systems. It is capable of delivering 3 watt of output power (1/3 Duty pulse operation) 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 :  $P_o = +35$  dBm typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 900$  MHz,  $P_{in} = +24$  dBm, 1/3 duty  
 $P_o = +32.5$  dBm typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 1.9$  GHz,  $P_{in} = +26$  dBm, 1/3 duty
- High Linear Gain :  $G_L = 13$  dB typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 900$  MHz,  $P_{in} = 0$  dBm, 1/3 duty  
 $G_L = 8$  dB typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 1.9$  GHz,  $P_{in} = 0$  dBm, 1/3 duty
- High Power Added Efficiency: 58% typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 900$  MHz,  $P_{in} = +24$  dBm, 1/3 duty  
52% typ. @  $V_{DS} = 3.5$  V,  $I_{Dset} = 200$  mA,  $f = 1.9$  GHz,  $P_{in} = +26$  dBm, 1/3 duty

#### ORDERING INFORMATION (PLAN)

Part Number	Package	Supplying Form
NE6510379A-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: NE6510379A)

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

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	$V_{GS0}$	-4	V
Drain Current	$I_D$	4.2	A
Gate Forward Current	$I_{GF}$	38	mA
Gate Reverse Current	$I_{GR}$	38	mA
Total Power Dissipation	$P_T$	18	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

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

The information in this document is subject to change without notice.

**RECOMMENDED OPERATING LIMITS**

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	$V_{DS}$			3.5	4.2	V
Operating Duty Cycle	–	Pulse width = 0.577 ms			1/3	–
Gain Compression	Gcomp				5.0	dB
Channel Temperature	$T_{ch}$				+110	°C

**ELECTRICAL CHARACTERISTICS**

( $T_A = 25^\circ\text{C}$ , Unless otherwise specified, using NEC standard test fixture.)

All RF characteristics is measured at 1/3 duty pulse operation, pulse width = 0.577 ms at 4.616 ms/frame)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Saturated Drain Current	$I_{OSS}$	$V_{DS} = 2.5\text{ V}, V_{GS} = 0\text{ V}$		3.7		A
Pinch-off Voltage	$V_P$	$V_{DS} = 2.5\text{ V}, I_D = 21\text{ mA}$	-2.0		-0.4	V
Gate to Drain Break Down Voltage	$BV_{GD}$	$I_{GD} = 21\text{ mA}$	11			V
Thermal Resistance	$R_{th}$	Channel to Case		4	7	°C/W
Output Power	$P_O$	$f = 1.9\text{ GHz}, V_{DS} = 3.5\text{ V}$	31.5	32.5		dBm
Drain Current	$I_D$	$P_{in} = +26\text{ dBm}, R_g = 100\ \Omega$		760		mA
Power Added Efficiency	$\eta_{add}$	$I_{Dset} = 200\text{ mA (RF OFF)}$	44	52		%
Linear Gain <sup>Note 1</sup>	$G_L$	<b>Note 2</b>		8.0		dB

**Notes 1.**  $P_{in} = 0\text{ dBm}$

**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)**

( $T_A = 25^\circ\text{C}$ , Unless otherwise specified, using NEC standard test fixture.)

All RF characteristics is measured at 1/3 duty pulse operation, pulse width = 0.577 ms at 4.616 ms/frame)

Characteristics	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Output Power	$P_O$	$f = 900\text{ MHz}, V_{DS} = 3.5\text{ V}$		35.0		dBm
Drain Current	$I_D$	$P_{in} = +24\text{ dBm}, R_g = 100\ \Omega$		1.40		A
Power Added Efficiency	$\eta_{add}$	$I_{Dset} = 200\text{ mA (RF OFF)}$		58		%
Linear Gain <sup>Note</sup>	$G_L$			13.0		dB

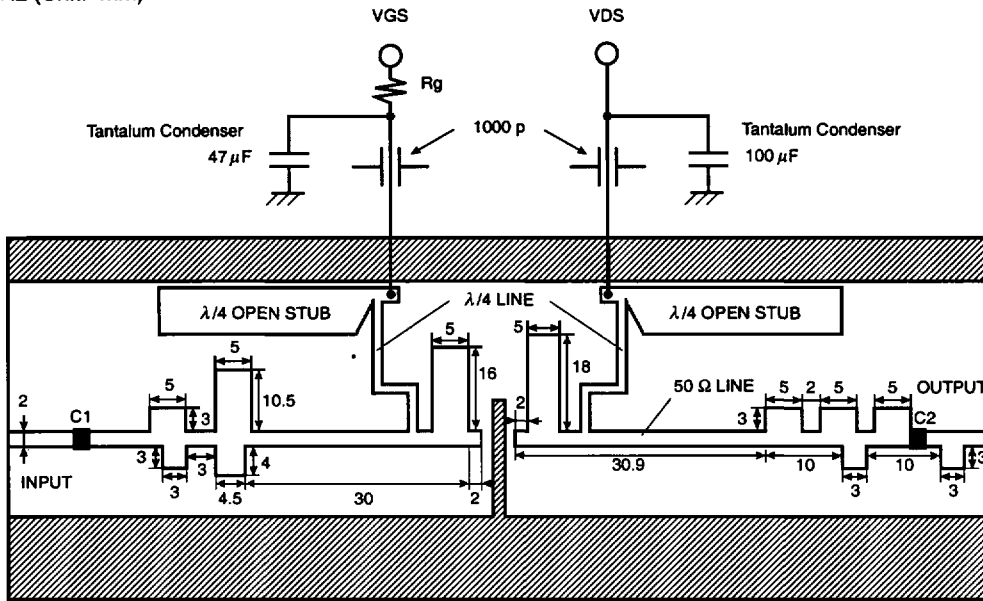
**Note**  $P_{in} = 0\text{ dBm}$

**NE6510379A S-PARAMETERS TEST CONDITIONS:  $V_{DS} = 3.5\text{ V}$ ,  $I_{Dset} = 200\text{ mA}$  (Preliminary Data)**

freq. (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)	MAG.	ANG. (deg.)
600	0.958	178.7	1.601	91.9	0.017	23.4	0.848	177.3
700	0.956	178.1	1.374	91.8	0.017	26.2	0.847	176.6
800	0.954	177.1	1.210	90.7	0.017	29.7	0.845	176.1
900	0.956	176.0	1.087	90.8	0.017	33.6	0.846	175.3
1000	0.953	175.3	0.966	89.9	0.018	36.6	0.847	174.6
1100	0.952	174.4	0.869	89.7	0.018	41.0	0.848	173.8
1200	0.951	173.9	0.818	89.5	0.018	43.9	0.849	172.9
1300	0.949	173.2	0.747	88.9	0.019	45.9	0.848	172.1
1400	0.949	172.2	0.694	89.7	0.020	47.4	0.846	171.3
1500	0.952	170.6	0.656	90.0	0.020	50.2	0.846	170.4
1600	0.954	169.4	0.625	88.9	0.020	53.1	0.844	169.6
1700	0.945	168.3	0.584	90.7	0.021	56.1	0.844	168.5
1800	0.947	166.9	0.595	89.0	0.022	57.9	0.844	167.4
1900	0.949	165.0	0.570	86.1	0.022	60.3	0.846	166.1
2000	0.946	163.5	0.515	86.3	0.022	61.6	0.846	164.9
2100	0.947	161.2	0.505	85.2	0.022	64.2	0.846	163.7
2200	0.949	160.1	0.479	92.7	0.023	67.0	0.842	162.1

**APPLICATION CIRCUIT EXAMPLE**

f = 1.9 GHz (Unit: mm)



f = 1.9 GHz  
 VDS = 3.5 V  
 I<sub>DSAT</sub> = 200 mA (RF OFF)

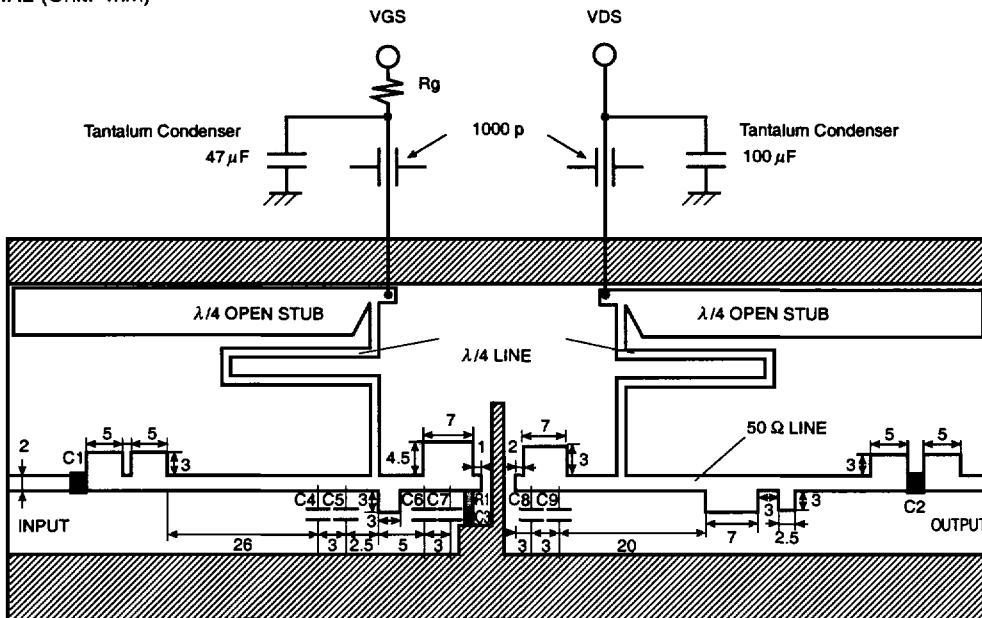
C1 = 30 pF  
 C2 = 30 pF

Rg = 100 Ω

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

**APPLICATION CIRCUIT EXAMPLE**

f = 900 MHz (Unit: mm)



f = 900 MHz  
 VDS = 3.5 V  
 I<sub>DSAT</sub> = 200 mA (RF OFF)

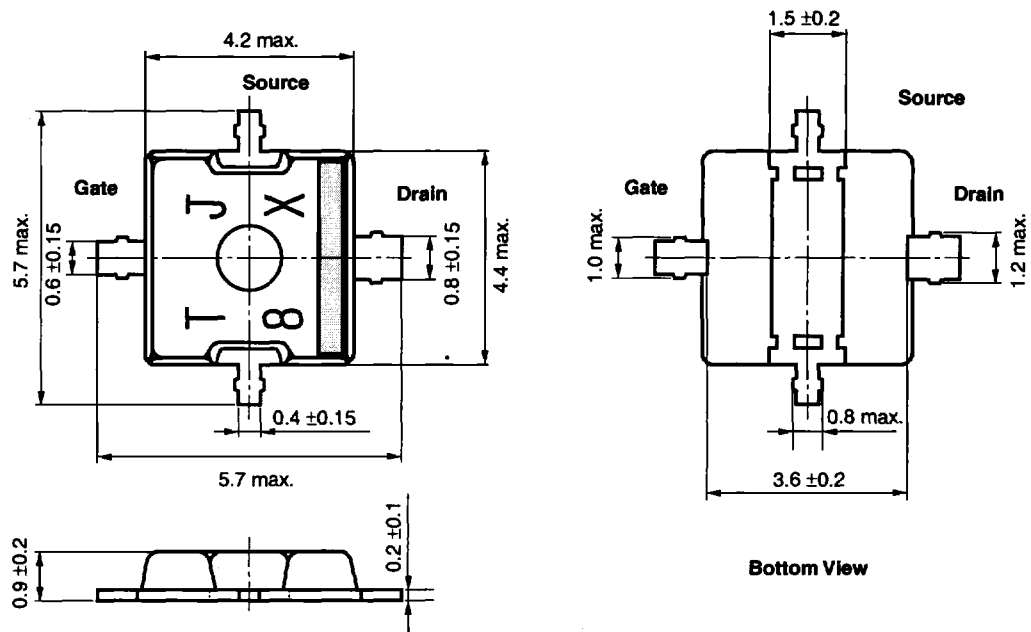
C1 = 30 pF  
 C2 = 30 pF  
 C3 = 1000 pF  
 C4 = 2 pF  
 C5 = 3 pF

C6 = 2 pF  
 C7 = 8 pF  
 C8 = 8 pF  
 C9 = 3 pF

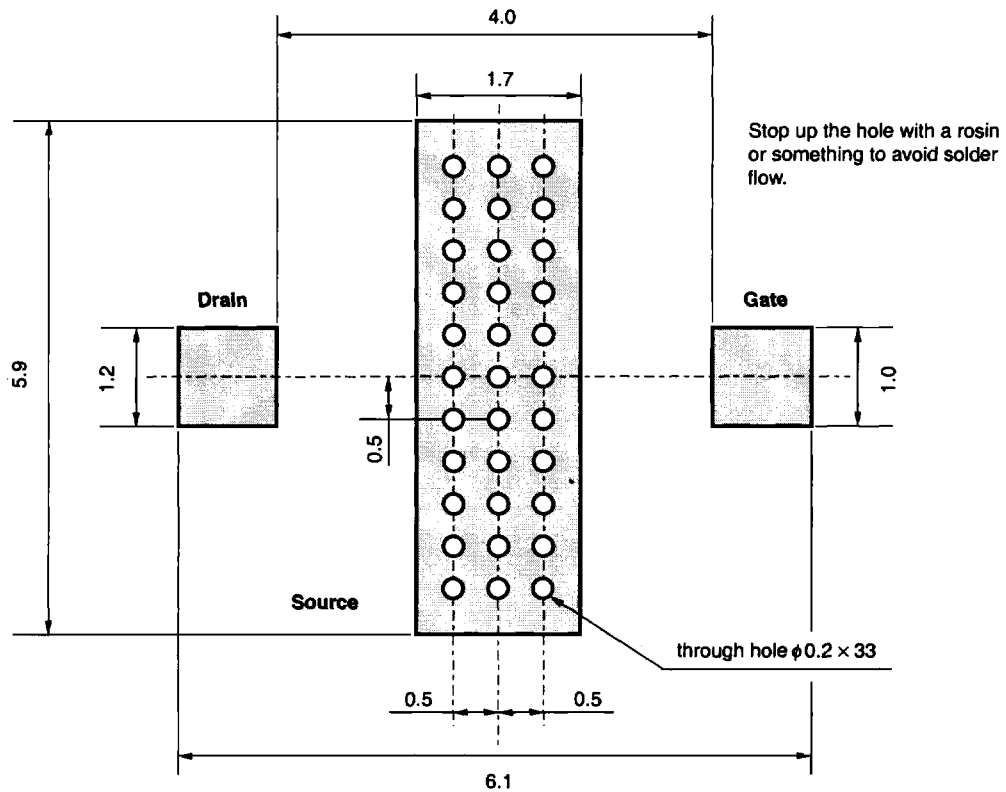
R1 = 270 Ω  
 Rg = 100 Ω

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 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 <sup>Note</sup> : None	IR35-00-2
Partial Heating	Pin temperature: 260°C Time: 5 seconds or less (per pin row) Exposure limit <sup>Note</sup> : 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).

**[MEMO]**

### 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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NEC devices are classified into the following three quality grades:

"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.