

# DATA SHEET

# NEC

## SILICON POWER MOS FET NE5520279A

### 3.2 V OPERATION SILICON RF POWER LDMOS FET FOR 1.8 GHz 1.6 W TRANSMISSION AMPLIFIERS

#### DESCRIPTION

The NE5520279A is an N-channel silicon power laterally diffused MOS FET specially designed as the transmission power amplifier for 3.2 V DCS1800 handsets. Dies are manufactured using our NEWMOS2 technology (our WSi gate laterally diffused MOS FET) and housed in a surface mount package. This device can deliver 32.0 dBm output power with 45% power added efficiency at 1.8 GHz under the 3.2 V supply voltage.

#### FEATURES

- High output power :  $P_{out} = 32.0$  dBm TYP. ( $V_{DS} = 3.2$  V,  $I_{Dset} = 700$  mA,  $f = 1.8$  GHz,  $P_{in} = 25$  dBm)
- High power added efficiency :  $\eta_{add} = 45\%$  TYP. ( $V_{DS} = 3.2$  V,  $I_{Dset} = 700$  mA,  $f = 1.8$  GHz,  $P_{in} = 25$  dBm)
- High linear gain :  $G_L = 10$  dB TYP. ( $V_{DS} = 3.2$  V,  $I_{Dset} = 700$  mA,  $f = 1.8$  GHz,  $P_{in} = 5$  dBm)
- Surface mount package :  $5.7 \times 5.7 \times 1.1$  mm MAX.
- ★ • Single supply :  $V_{DS} = 2.8$  to  $6.0$  V

#### APPLICATION

- Digital cellular phones : 3.2 V DCS1800 Handsets

#### ORDERING INFORMATION

| Part Number    | Package | Marking | Supplying Form  |
|----------------|---------|---------|---|
| NE5520279A-T1  | 79A     | A2      | <ul style="list-style-type: none"><li>• 12 mm wide embossed taping</li><li>• Gate pin face the perforation side of the tape</li><li>• Qty 1 kpcs/reel</li></ul> |
| NE5520279A-T1A |         |         | <ul style="list-style-type: none"><li>• 12 mm wide embossed taping</li><li>• Gate pin face the perforation side of the tape</li><li>• Qty 5 kpcs/reel</li></ul> |

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

Part number for sample order: NE5520279A

**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

The information in this document is subject to change without notice. Before using this document, please confirm that this is the latest version.  
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)**

| Parameter                  | Symbol                         | Ratings     | Unit |
|----------------------------|--------------------------------|-------------|------|
| Drain to Source Voltage    | V <sub>DS</sub>                | 15.0        | V    |
| Gate to Source Voltage     | V <sub>GS</sub>                | 5.0         | V    |
| Drain Current              | I <sub>D</sub>                 | 0.6         | A    |
| Drain Current (Pulse Test) | I <sub>D</sub> <sup>Note</sup> | 1.2         | A    |
| Total Power Dissipation    | P <sub>tot</sub>               | 12.5        | W    |
| Channel Temperature        | T <sub>ch</sub>                | 125         | °C   |
| Storage Temperature        | T <sub>stg</sub>               | -55 to +125 | °C   |

**Note** Duty Cycle 50%, T<sub>on</sub> ≤ 1 s

**RECOMMENDED OPERATING CONDITIONS**

| Parameter                 | Symbol          | Test Conditions                       | MIN. | TYP. | MAX.  | Unit |
|---------------------------|-----------------|---------------------------------------|------|------|-------|------|
| ★ Drain to Source Voltage | V <sub>DS</sub> |                                       | 2.8  | 3.0  | 6.0   | V    |
| Gate to Source Voltage    | V <sub>GS</sub> |                                       | 0    | 2.0  | 3.0   | V    |
| Drain Current             | I <sub>D</sub>  | Duty Cycle 50%, T <sub>on</sub> ≤ 1 s | –    | 800  | 1 000 | mA   |
| Input Power               | P <sub>in</sub> | f = 1.8 GHz, V <sub>DS</sub> = 3.2 V  | 24   | 25   | 30    | dBm  |

**ELECTRICAL CHARACTERISTICS**

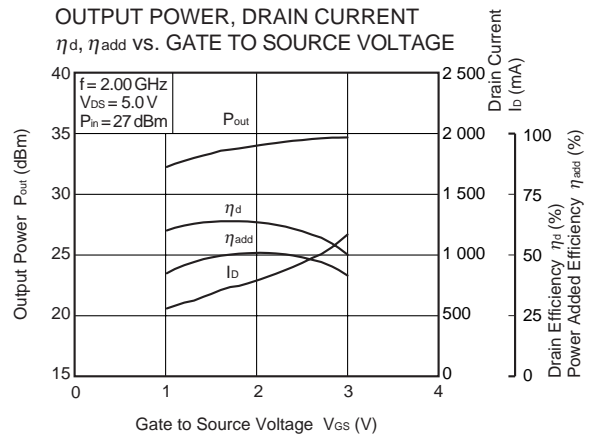
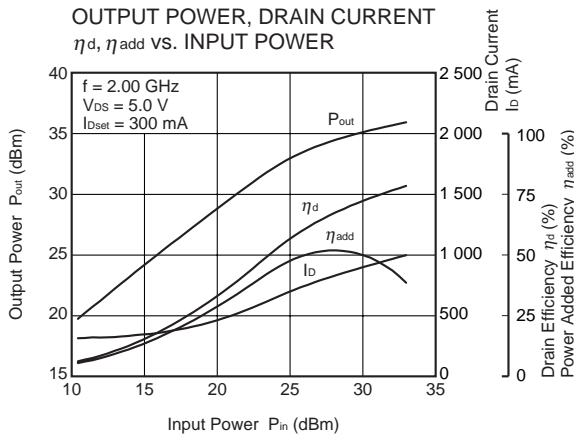
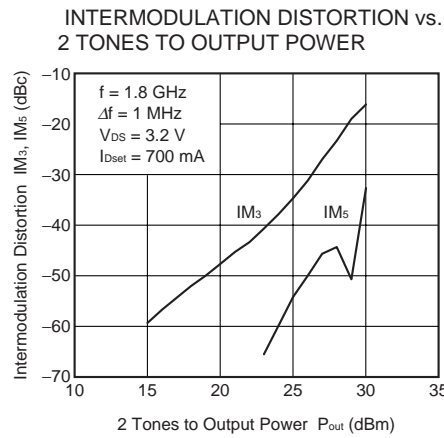
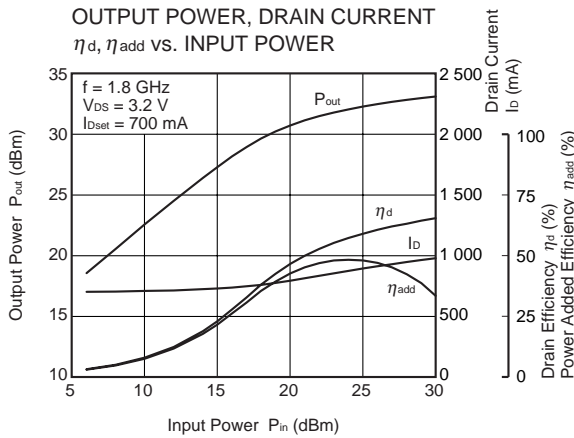
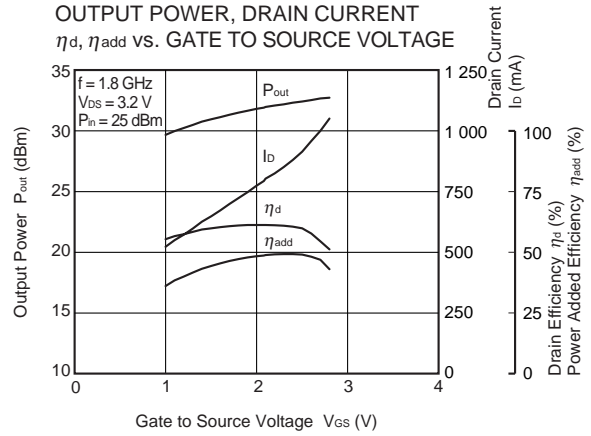
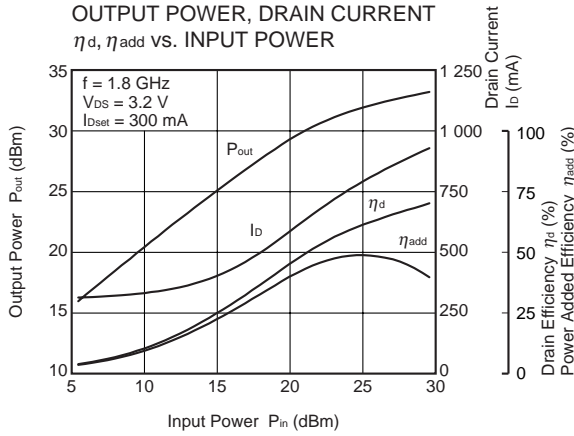
(T<sub>A</sub> = +25°C, unless otherwise specified, using NEC standard test fixture)

| Parameter   | Symbol            | Test Conditions                                   | MIN. | TYP. | MAX. | Unit |
|---|-------------------|---|------|------|------|------|
| Gate to Source Leak Current                                       | I <sub>GSS</sub>  | V <sub>GS</sub> = 5.0 V                           | –    | –    | 100  | nA   |
| Drain to Source Leakage Current (Zero Gate Voltage Drain Current) | I <sub>DSS</sub>  | V <sub>DS</sub> = 6.0 V                           | –    | –    | 100  | nA   |
| Gate Threshold Voltage  | V <sub>th</sub>   | V <sub>DS</sub> = 3.5 V, I <sub>D</sub> = 1 mA    | 1.0  | 1.4  | 1.9  | V    |
| Thermal Resistance  | R <sub>th</sub>   | Channel to Case                                   | –    | –    | 8    | °C/W |
| Transconductance  | G <sub>m</sub>    | V <sub>DS</sub> = 3.2 V, I <sub>D</sub> = 700 mA  | –    | 1.3  | –    | S    |
| Drain to Source Breakdown Voltage                                 | BV <sub>DSS</sub> | I <sub>DSS</sub> = 10 μA                          | 15   | 18   | –    | V    |
| Output Power  | P <sub>out</sub>  | f = 1.8 GHz, V <sub>DS</sub> = 3.2 V,             | 30.5 | 32.0 | –    | dBm  |
| Drain Current   | I <sub>D</sub>    | P <sub>in</sub> = 25 dBm,                         | –    | 800  | –    | mA   |
| Power Added Efficiency  | η <sub>add</sub>  | I <sub>Dset</sub> = 700 mA (RF OFF), <b>Note1</b> | 40   | 45   | –    | %    |
| Linear Gain <sup>Note2</sup>                                      | G <sub>L</sub>    |   | –    | 10   | –    | dB   |

**Notes** 1. 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.

2. P<sub>in</sub> = 5 dBm

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



**Remark** The graphs indicate nominal characteristics.

**S-PARAMETERS**

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]

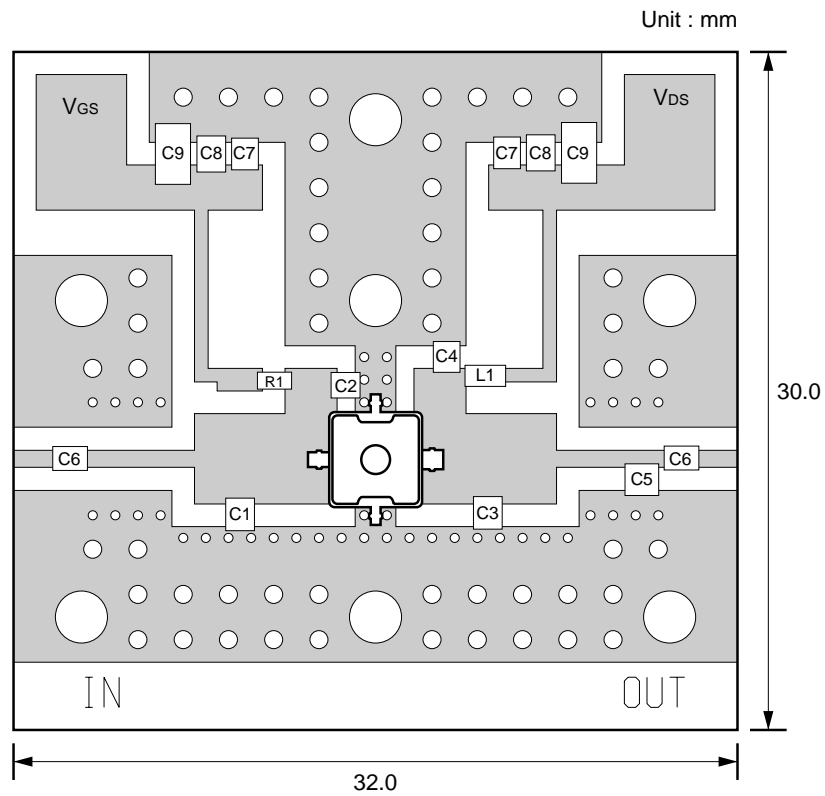
URL <http://www.csd-nec.com/>

**LARGE SIGNAL IMPEDANCE ( $V_{DS} = 3.2$  V,  $I_D = 700$  mA,  $f = 1.8$  GHz)**

| f (GHz) | $Z_{in}$ ( $\Omega$ ) | $Z_{OL}$ ( $\Omega$ ) <sup>Note</sup> |
|---------|-----------------------|---------------------------------------|
| 1.8     | 1.77 -j6.71           | 1.25 -j5.73                           |

**Note**  $Z_{OL}$  is the conjugate of optimum load impedance at given voltage, idling current, input power and frequency.

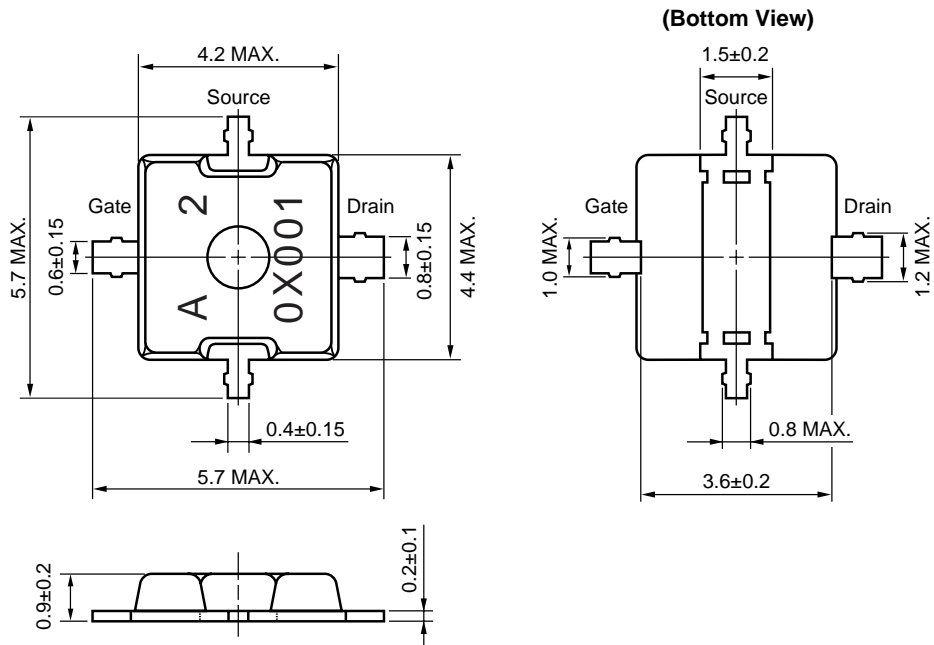
★ EVALUATION BOARD FOR 1.8 GHz



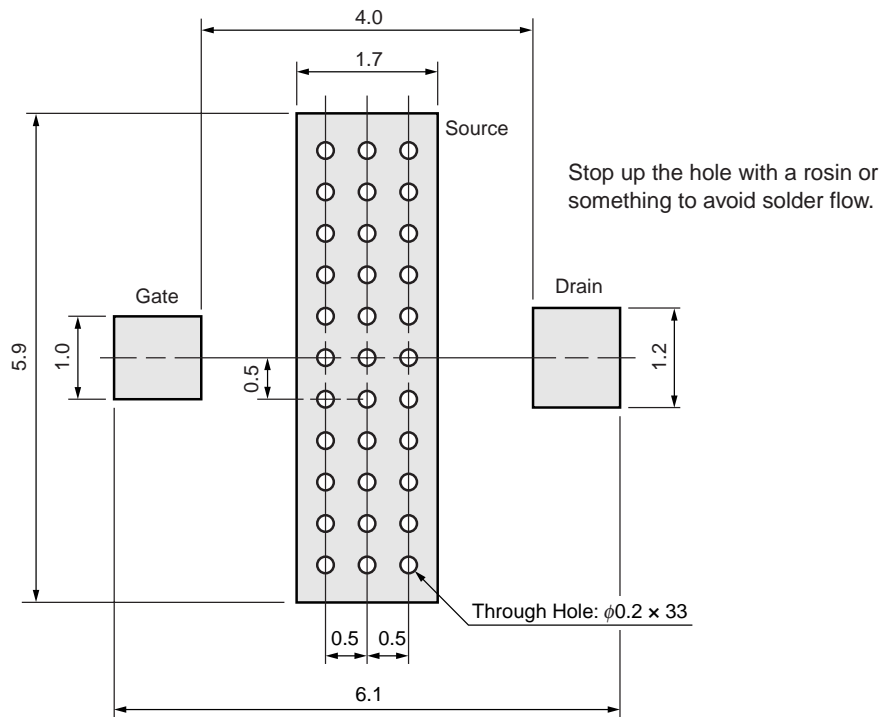
| Symbol        | Value                          | Comment |
|---------------|--------------------------------|---------|
| C1, C3        | 4.7 pF                         |         |
| C2            | 2.4 pF                         |         |
| C4            | 2.2 pF                         |         |
| C5            | 0.8 pF                         |         |
| C6            | 10 pF                          |         |
| C7            | 1 000 pF                       |         |
| C8            | 0.22 $\mu$ F                   |         |
| C9            | 3.3 $\mu$ F - 16V              |         |
| R1            | 1 000 $\Omega$                 |         |
| L1            | 22 nH                          |         |
| Circuit Board | t = 0.4 mm, $\epsilon r = 4.5$ | R4775   |

★ 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  | Condition Symbol |
|------------------|---|------------------|
| Infrared Reflow  | Peak temperature (package surface temperature) : 260°C or below<br>Time at peak temperature : 10 seconds or less<br>Time at temperature of 220°C or higher : 60 seconds or less<br>Preheating time at 120 to 180°C : 120±30 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below | IR260            |
| VPS              | Peak temperature (package surface temperature) : 215°C or below<br>Time at temperature of 200°C or higher : 25 to 40 seconds<br>Preheating time at 120 to 150°C : 30 to 60 seconds<br>Maximum number of reflow processes : 3 times<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below  | VP215            |
| Wave Soldering   | Peak temperature (molten solder temperature) : 260°C or below<br>Time at peak temperature : 10 seconds or less<br>Preheating temperature (package surface temperature) : 120°C or below<br>Maximum number of flow processes : 1 time<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below  | WS260            |
| Partial Heating  | Peak temperature (pin temperature) : 350°C or below<br>Soldering time (per pin of device) : 3 seconds or less<br>Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below   | HS350-P3         |

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

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