

To our customers,

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## Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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

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**4 W L, S-BAND POWER GaAs FET**  
**N-CHANNEL GaAs MES FET**
**DESCRIPTION**

The NE6500496 is power GaAs FET which provides high gain, high efficiency and high output power in L, S band.

To reduce thermal resistance, the device has a PHS (Plated Heat Sink) structure.

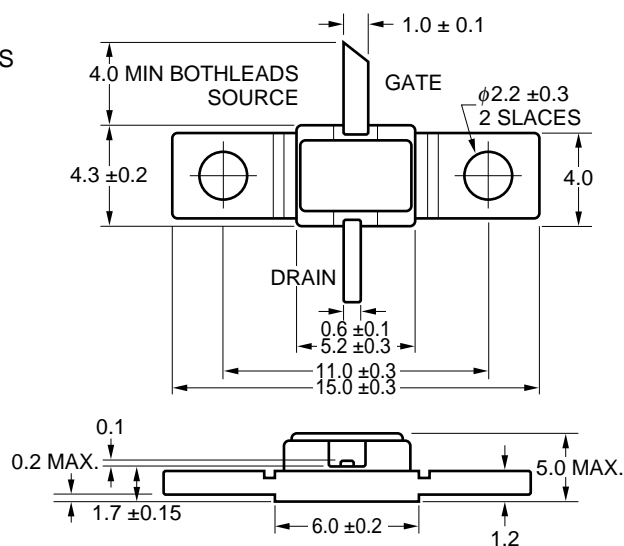
**FEATURES**

- Class A operation
- High output power: 36 dBm (typ)
- High gain: 11.5 dB (typ)
- High power added efficiency: 45 % (typ)
- Hermetically sealed ceramic package

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25 °C)**

|                         |                    |             |    |
|-------------------------|--------------------|-------------|----|
| Drain to Source Voltage | V <sub>DSX</sub>   | 15          | V  |
| Gate to Drain Voltage   | V <sub>GDX</sub>   | -18         | V  |
| Gate to Source Voltage  | V <sub>GSX</sub>   | -12         | V  |
| Drain Current           | I <sub>D</sub>     | 4.5         | A  |
| Gate Current            | I <sub>G</sub>     | 25          | mA |
| Total Power Dissipation | P <sub>T</sub> (*) | 25          | W  |
| Channel Temperature     | T <sub>ch</sub>    | 175         | °C |
| Storage Temperature     | T <sub>stg</sub>   | -65 to +175 | °C |
| Temperature Cycling     | T <sub>∞</sub>     | -40 to +120 | °C |

\* T<sub>c</sub> = 25 °C

**PACKAGE DIMENSION (UNIT: mm)**


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

**MAXIMUM OPERATION RANGE**

| CHARACTERISTIC          | SYMBOL     | MIN. | TYP. | MAX. | UNIT     |
|-------------------------|------------|------|------|------|----------|
| Drain to Source Voltage | $V_{DS}$   | –    | 10   | 10   | V        |
| Channel Temperature     | $T_{ch}$   | –    | –    | 130  | °C       |
| Input Power             | $G_{comp}$ | –    | –    | 3    | dBcomp   |
| Gate Resistance         | $R_g$      | –    | –    | 200  | $\Omega$ |

**ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ °C}$ )**

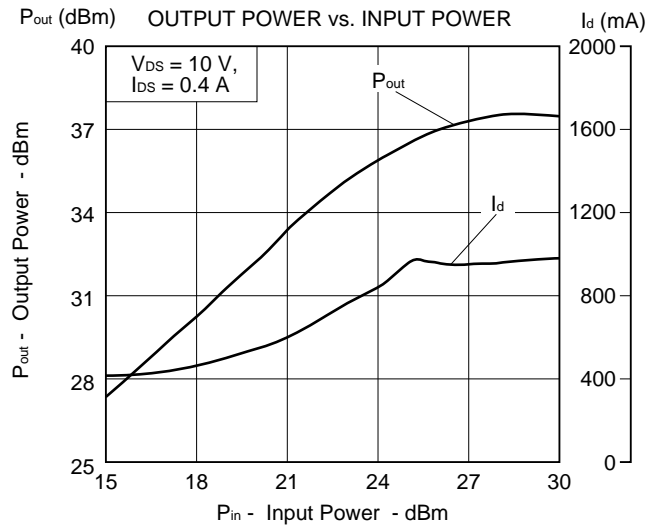
| CHARACTERISTIC          | SYMBOL    | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS                                |
|-------------------------|-----------|------|------|------|------|--|
| Saturated Drain Current | $I_{dss}$ | 1.0  | 2.3  | 3.5  | A    | $V_{ds} = 1.5\text{ V}, V_{gs} = 0\text{ V}$   |
| Pinch-off Voltage       | $V_P$     | –3.5 | –2.0 | –0.5 | V    | $V_{ds} = 2.5\text{ V}, I_{ds} = 15\text{ mA}$ |
| Transconductance        | $g_m$     | –    | 1300 | –    | mS   | $V_{ds} = 2.5\text{ V}, I_{ds} = 1\text{ A}$   |
| Thermal Resistance      | $R_{th}$  | –    | 6.0  | 6.5  | °C/W | channel to case                                |

**PERFORMANCE SPECIFICATIONS ( $T_A = 25\text{ °C}$ )**

| CHARACTERISTIC         | SYMBOL       | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS   |
|------------------------|--------------|------|------|------|------|---|
| Output Power           | $P_{out}$    | 35.5 | 36.0 | –    | dBm  | $f = 2.3\text{ GHz}, V_{ds} = 10\text{ V}$<br>$I_{ds} \leq 0.4\text{ A}, P_{in} = 26.0\text{ dBm}$<br>$R_g = 200\ \Omega$ |
| Gate to Source Current | $I_{gs}$     | –5   | –    | 5    | mA   |   |
| Power Added Efficiency | $\eta_{add}$ | –    | 45   | –    | %    |   |
| Linear Gain            | $G_L$        | 11.0 | 11.5 | –    | dB   | $P_{in} \leq 20\text{ dBm}$ (*)   |

\* The other are the same as the above conditions.

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



**S-PARAMETER**

$V_{DS} = 9.0\text{ V}$ ,  $I_{DS} = 400\text{ mA}$ ,  $V_{GS} = -1.619\text{ V}$ ,  $I_G = 0.0\text{ mA}$

| FREQUENCY<br>GHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |        |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG    |
| 0.100            | 0.978           | -80.0  | 17.314          | 137.4 | 0.010           | 60.2 | 0.612           | -172.8 |
| 0.200            | 0.957           | -118.9 | 11.458          | 116.5 | 0.015           | 36.4 | 0.667           | -175.2 |
| 0.300            | 0.951           | -137.8 | 8.252           | 105.7 | 0.016           | 30.0 | 0.687           | -177.6 |
| 0.400            | 0.949           | -148.5 | 6.388           | 98.8  | 0.016           | 29.0 | 0.695           | -179.7 |
| 0.500            | 0.947           | -155.4 | 5.188           | 93.9  | 0.017           | 29.1 | 0.700           | 178.8  |
| 0.600            | 0.947           | -160.2 | 4.368           | 90.0  | 0.017           | 27.5 | 0.704           | 177.4  |
| 0.700            | 0.946           | -163.9 | 3.769           | 86.6  | 0.017           | 29.5 | 0.705           | 176.2  |
| 0.800            | 0.946           | -166.8 | 3.319           | 83.6  | 0.018           | 31.0 | 0.707           | 175.1  |
| 0.900            | 0.946           | -169.2 | 2.963           | 80.8  | 0.018           | 32.8 | 0.709           | 174.0  |
| 1.000            | 0.945           | -171.2 | 2.679           | 78.2  | 0.019           | 33.7 | 0.710           | 173.0  |
| 1.100            | 0.945           | -173.1 | 2.438           | 75.5  | 0.020           | 34.9 | 0.711           | 172.2  |
| 1.200            | 0.946           | -174.5 | 2.251           | 73.4  | 0.020           | 35.7 | 0.711           | 171.2  |
| 1.300            | 0.945           | -175.9 | 2.087           | 71.2  | 0.021           | 36.8 | 0.714           | 170.3  |
| 1.400            | 0.944           | -177.1 | 1.947           | 69.0  | 0.021           | 38.6 | 0.715           | 169.4  |
| 1.500            | 0.945           | -178.2 | 1.828           | 67.0  | 0.022           | 39.5 | 0.716           | 168.5  |
| 1.600            | 0.944           | -179.4 | 1.720           | 64.7  | 0.023           | 40.5 | 0.715           | 167.5  |
| 1.700            | 0.943           | 179.6  | 1.627           | 62.6  | 0.024           | 41.8 | 0.716           | 166.2  |
| 1.800            | 0.944           | 178.6  | 1.547           | 60.5  | 0.024           | 41.8 | 0.721           | 165.4  |
| 1.900            | 0.943           | 177.7  | 1.468           | 58.7  | 0.025           | 43.8 | 0.718           | 164.5  |
| 2.000            | 0.944           | 176.8  | 1.404           | 56.4  | 0.026           | 43.8 | 0.719           | 163.2  |
| 2.100            | 0.944           | 175.9  | 1.345           | 54.6  | 0.027           | 45.8 | 0.722           | 162.0  |
| 2.200            | 0.945           | 175.2  | 1.296           | 52.7  | 0.028           | 46.4 | 0.728           | 161.1  |
| 2.300            | 0.945           | 174.3  | 1.245           | 50.8  | 0.030           | 47.4 | 0.725           | 160.4  |
| 2.400            | 0.945           | 173.5  | 1.201           | 48.6  | 0.031           | 45.8 | 0.726           | 158.7  |
| 2.500            | 0.944           | 172.7  | 1.163           | 46.8  | 0.031           | 47.2 | 0.734           | 157.4  |
| 2.600            | 0.944           | 172.0  | 1.131           | 45.2  | 0.034           | 49.1 | 0.742           | 156.8  |
| 2.700            | 0.945           | 171.2  | 1.087           | 43.7  | 0.035           | 48.7 | 0.737           | 156.1  |
| 2.800            | 0.947           | 170.4  | 1.054           | 41.6  | 0.036           | 47.5 | 0.738           | 154.5  |
| 2.900            | 0.947           | 169.6  | 1.028           | 39.6  | 0.037           | 46.7 | 0.745           | 153.3  |
| 3.000            | 0.946           | 168.7  | 1.008           | 37.7  | 0.039           | 47.2 | 0.757           | 152.3  |
| 3.500            | 0.947           | 164.9  | 0.901           | 29.5  | 0.046           | 46.8 | 0.766           | 148.8  |
| 4.000            | 0.950           | 160.5  | 0.840           | 20.9  | 0.056           | 41.3 | 0.771           | 144.2  |
| 4.500            | 0.941           | 155.3  | 0.810           | 11.9  | 0.059           | 37.4 | 0.776           | 138.0  |
| 5.000            | 0.933           | 149.6  | 0.795           | 1.5   | 0.069           | 33.4 | 0.792           | 130.8  |

$V_{DS} = 10.0\text{ V}$ ,  $I_{DS} = 400\text{ mA}$ ,  $V_{GS} = -1.662\text{ V}$ ,  $I_G = 0.0\text{ mA}$

| FREQUENCY<br>GHz | S <sub>11</sub> |        | S <sub>21</sub> |       | S <sub>12</sub> |      | S <sub>22</sub> |        |
|------------------|-----------------|--------|-----------------|-------|-----------------|------|-----------------|--------|
|                  | MAG             | ANG    | MAG             | ANG   | MAG             | ANG  | MAG             | ANG    |
| 0.100            | 0.975           | -80.1  | 17.360          | 137.5 | 0.011           | 55.3 | 0.601           | -172.5 |
| 0.200            | 0.956           | -118.9 | 11.506          | 116.5 | 0.015           | 39.8 | 0.657           | -175.0 |
| 0.300            | 0.951           | -137.7 | 8.292           | 105.6 | 0.016           | 30.2 | 0.678           | -177.5 |
| 0.400            | 0.949           | -148.4 | 6.420           | 98.7  | 0.016           | 28.9 | 0.687           | -179.5 |
| 0.500            | 0.947           | -155.3 | 5.212           | 93.8  | 0.017           | 26.7 | 0.692           | 178.9  |
| 0.600            | 0.946           | -160.1 | 4.388           | 89.8  | 0.017           | 26.5 | 0.695           | 177.7  |
| 0.700            | 0.946           | -163.8 | 3.786           | 86.4  | 0.018           | 28.9 | 0.697           | 176.4  |
| 0.800            | 0.945           | -166.8 | 3.333           | 83.4  | 0.018           | 30.9 | 0.698           | 175.3  |
| 0.900            | 0.945           | -169.1 | 2.977           | 80.5  | 0.018           | 32.2 | 0.700           | 174.2  |
| 1.000            | 0.945           | -171.2 | 2.691           | 77.9  | 0.019           | 32.4 | 0.702           | 173.3  |
| 1.100            | 0.944           | -173.1 | 2.448           | 75.2  | 0.020           | 32.7 | 0.703           | 172.4  |
| 1.200            | 0.945           | -174.5 | 2.260           | 73.0  | 0.020           | 35.5 | 0.703           | 171.4  |
| 1.300            | 0.944           | -175.8 | 2.096           | 70.8  | 0.021           | 36.6 | 0.706           | 170.5  |
| 1.400            | 0.943           | -177.1 | 1.955           | 68.6  | 0.021           | 37.8 | 0.708           | 169.7  |
| 1.500            | 0.944           | -178.2 | 1.834           | 66.5  | 0.022           | 38.5 | 0.708           | 168.9  |
| 1.600            | 0.943           | -179.4 | 1.726           | 64.2  | 0.022           | 40.0 | 0.707           | 167.8  |
| 1.700            | 0.943           | 179.6  | 1.632           | 62.1  | 0.024           | 41.6 | 0.710           | 166.6  |
| 1.800            | 0.943           | 178.6  | 1.552           | 60.0  | 0.024           | 41.7 | 0.714           | 165.7  |
| 1.900            | 0.943           | 177.7  | 1.474           | 58.1  | 0.025           | 44.3 | 0.711           | 164.9  |
| 2.000            | 0.944           | 176.8  | 1.408           | 55.8  | 0.026           | 43.4 | 0.712           | 163.5  |
| 2.100            | 0.943           | 176.0  | 1.348           | 53.9  | 0.027           | 45.6 | 0.716           | 162.4  |
| 2.200            | 0.945           | 175.2  | 1.299           | 52.0  | 0.028           | 46.1 | 0.721           | 161.5  |
| 2.300            | 0.944           | 174.3  | 1.248           | 50.2  | 0.030           | 47.1 | 0.719           | 160.8  |
| 2.400            | 0.944           | 173.5  | 1.203           | 48.0  | 0.031           | 46.0 | 0.720           | 159.1  |
| 2.500            | 0.944           | 172.7  | 1.166           | 46.2  | 0.031           | 46.0 | 0.728           | 157.9  |
| 2.600            | 0.944           | 171.9  | 1.132           | 44.5  | 0.033           | 47.5 | 0.736           | 157.2  |
| 2.700            | 0.945           | 171.2  | 1.089           | 42.9  | 0.034           | 48.6 | 0.733           | 156.6  |
| 2.800            | 0.946           | 170.4  | 1.055           | 40.8  | 0.036           | 46.6 | 0.732           | 155.0  |
| 2.900            | 0.947           | 169.6  | 1.029           | 38.9  | 0.037           | 46.8 | 0.741           | 153.7  |
| 3.000            | 0.945           | 168.7  | 1.008           | 36.9  | 0.039           | 46.7 | 0.753           | 152.9  |
| 3.500            | 0.947           | 165.0  | 0.901           | 28.7  | 0.046           | 47.0 | 0.761           | 149.2  |
| 4.000            | 0.950           | 160.5  | 0.838           | 20.0  | 0.056           | 41.3 | 0.769           | 144.6  |
| 4.500            | 0.940           | 155.3  | 0.806           | 10.9  | 0.059           | 37.3 | 0.775           | 138.6  |
| 5.000            | 0.933           | 149.6  | 0.792           | 0.4   | 0.068           | 34.0 | 0.791           | 131.2  |

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