

NE85001 SERIES

1 W C-BAND POWER GaAs FET
N-CHANNEL GaAs MES FET

DESCRIPTION

The NE8500199 Power GaAs FET covers 2 GHz to 10 GHz frequency range for commercial amplifier, oscillator applications and so on.

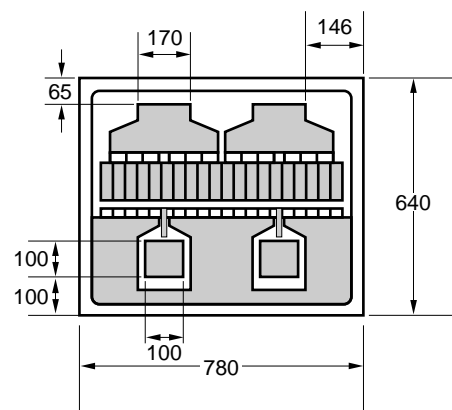
NE8500100 is the two-cells recessed gate chip used in '99' package.

The device incorporates Ti-Al gate and silicon dioxide glassivation. To reduce the thermal resistance, the device has a PHS. (Plated Heat Sink)

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

FEATURES

- Class A operation
- High power output
- High reliability

PHYSICAL DIMENSIONS
NE8500100 (CHIP) (unit: μm)

SELECTION CHART

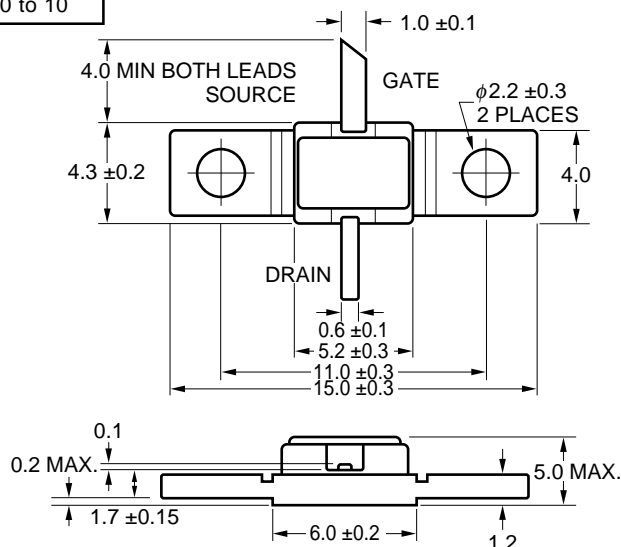
| PART NUMBER | FORM | PERFORMANCE SPECIFIED | | |
|--|---------|-----------------------|-----------------|------------------------------|
| | | Pout (**) (dBm) | GL (**) (dB) | USABLE FREQUENCY (GHz) |
| NE8500100(*) NE8500100-WB NE8500100-RG | chip | 28.5 min | 9.0 typ | 2.0 to 10 |
| NE8500199 | package | 28.5 min | 9.0 typ | 2.0 to 10 |

* WB, RG indicate a type of containers for chips.

WB: black carrier, RG: ring, gel-pack,

** Specified at the condition at the last page.

PACKAGE CODE-99 (unit: mm)



ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

| | | | |
|---------------------------|------------------|------------|----|
| Drain to Source Voltage | V _{DSX} | 15 | V |
| Gate to Drain Voltage | V _{GDX} | −18 | V |
| Gate to Source Voltage | V _{GSX} | −12 | V |
| Total Power Disipation(*) | P _T | 6.0 | W |
| Drain Current | I _D | 1.12 | A |
| Gate Current | I _G | 6.0 | mA |
| Channel Temperature | T _{ch} | 175 | °C |
| Storage Temperature | T _{stg} | −65 to 175 | °C |

*T_C = 25 °C

RECOMMENDING OPERATION RANDGE

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|-------------------------|-------------------|------|------|------|--------------------|
| Drain to Source Voltage | V _{DS} | 9 | − | 10 | V |
| Channel Temperature | T _{ch} | − | − | 130 | °C |
| Input Power | G _{comp} | − | − | 3 | dB _{comp} |
| Gate Resistance | R _g | − | − | 1 | kΩ |

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|-------------------------|------------------|------|------|------|------|---|
| Saturated Drain Current | I _{DSS} | 430 | − | 860 | mA | V _{ds} = 2.5 V, V _{gs} = 0 V |
| Pinch-off Voltage | V _P | −3.0 | − | −1.0 | V | V _{ds} = 2.5 V, I _{ds} = 4 mA |
| Transconductance | g _m | − | 300 | − | mS | V _{ds} = 2.5 V, I _{ds} = I _{DSS} |
| Thermal Resistance | R _{th} | − | − | 30 | °C/W | |

PERFORMANCE SPECIFICATIONS (T_A = 25 °C)

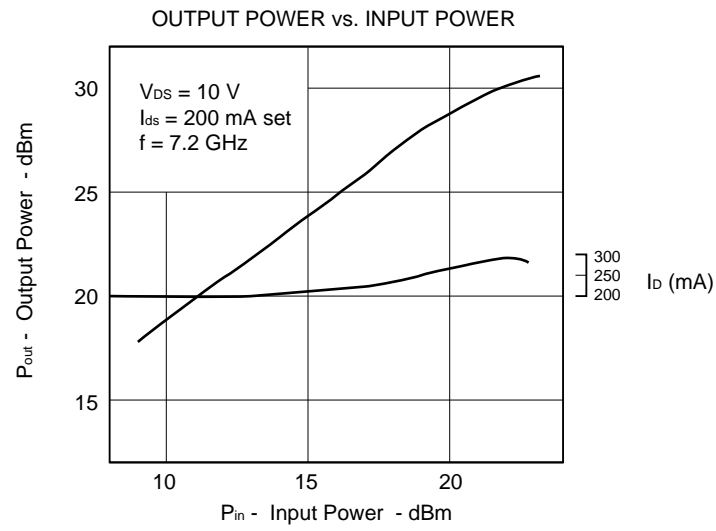
| PART NUMBER | | NE8500100 NE8500100-WG NE8500100-RG | | | NE8500199 | | | UNIT | TEST CONDITIONS |
|------------------------|-----------------|---|------|------|-----------|------|------|------|---|
| PACKAGE CODE | | CHIP | | | 99 | | | | |
| CHARACTERISTIC | SYMBOL | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. | | |
| Output Power | P _o | 28.5 | — | — | 28.5 | — | — | dBm | f = 7.2 GHz V _{ds} = 10 V I _{ds} = 200 mA set R _g = 1 kΩ Pin = 21.0 dBm(*) |
| Gate to source Current | I _{gs} | −2.0 | — | 2.0 | −2.0 | — | 2.0 | mA | |
| Linear Gain | G _L | — | 9 | — | — | 9 | — | dB | Pin ≤ 11 dBm (**) |

* Pin for Pout specification.

** The same conditions as the above except this.

TYPICAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$)

NE8500199



S-PARAMETER

$V_{DS} = 10 \text{ V}$, $I_{DS} = 200 \text{ mA}$, $V_{GS} = -1.260 \text{ V}$, $I_G = 0.0 \text{ mA}$, $R_G = 1 \text{ k}\Omega$

| FREQUENCY GHz | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|------------------|-----------------|--------|-----------------|--------|-----------------|--------|-----------------|--------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.100 | 0.990 | -22.7 | 14.418 | 165.5 | 0.007 | 70.1 | 0.065 | -64.6 |
| 0.500 | 0.916 | -91.1 | 10.211 | 123.3 | 0.024 | 47.7 | 0.175 | -126.4 |
| 1.000 | 0.869 | -132.1 | 6.444 | 94.8 | 0.031 | 33.6 | 0.221 | -149.1 |
| 1.500 | 0.851 | -152.9 | 4.610 | 76.6 | 0.034 | 29.0 | 0.241 | -159.2 |
| 2.000 | 0.840 | -166.1 | 3.591 | 61.9 | 0.038 | 28.1 | 0.260 | -165.6 |
| 2.500 | 0.831 | -175.9 | 2.975 | 49.1 | 0.042 | 26.7 | 0.278 | -170.8 |
| 3.000 | 0.826 | 176.0 | 2.601 | 37.3 | 0.047 | 25.4 | 0.296 | -174.6 |
| 3.500 | 0.824 | 168.8 | 2.341 | 26.0 | 0.053 | 27.4 | 0.313 | -177.8 |
| 3.600 | 0.825 | 167.5 | 2.291 | 23.4 | 0.055 | 27.0 | 0.317 | -179.2 |
| 3.700 | 0.825 | 166.0 | 2.253 | 20.7 | 0.056 | 26.5 | 0.323 | 179.8 |
| 3.800 | 0.827 | 164.4 | 2.230 | 18.1 | 0.059 | 26.8 | 0.333 | 179.4 |
| 3.900 | 0.829 | 162.8 | 2.187 | 16.1 | 0.063 | 26.5 | 0.340 | 178.7 |
| 4.000 | 0.829 | 161.0 | 2.127 | 13.4 | 0.066 | 25.4 | 0.345 | 176.3 |
| 4.200 | 0.821 | 157.2 | 2.053 | 8.6 | 0.072 | 20.1 | 0.353 | 171.0 |
| 4.400 | 0.808 | 153.9 | 1.976 | 5.6 | 0.074 | 16.8 | 0.343 | 167.3 |
| 4.500 | 0.803 | 152.5 | 1.963 | 3.4 | 0.075 | 15.2 | 0.337 | 166.2 |
| 4.600 | 0.799 | 151.0 | 1.970 | 0.8 | 0.077 | 13.9 | 0.340 | 164.8 |
| 4.800 | 0.790 | 147.9 | 1.944 | -3.1 | 0.080 | 12.6 | 0.341 | 163.2 |
| 5.000 | 0.784 | 144.7 | 1.929 | -8.6 | 0.084 | 9.3 | 0.340 | 159.8 |
| 5.200 | 0.777 | 141.4 | 1.923 | -12.8 | 0.089 | 7.4 | 0.349 | 158.6 |
| 5.400 | 0.771 | 137.7 | 1.897 | -18.5 | 0.093 | 4.5 | 0.347 | 155.6 |
| 5.500 | 0.767 | 135.9 | 1.916 | -20.7 | 0.097 | 3.1 | 0.358 | 154.2 |
| 5.600 | 0.764 | 133.9 | 1.916 | -22.7 | 0.100 | 1.8 | 0.363 | 154.5 |
| 5.800 | 0.758 | 130.1 | 1.887 | -28.5 | 0.105 | -1.9 | 0.358 | 151.6 |
| 6.000 | 0.751 | 125.8 | 1.928 | -33.5 | 0.113 | -4.8 | 0.381 | 149.5 |
| 6.200 | 0.742 | 121.3 | 1.896 | -39.1 | 0.116 | -8.0 | 0.369 | 146.8 |
| 6.400 | 0.731 | 116.6 | 1.951 | -44.8 | 0.126 | -11.6 | 0.397 | 144.2 |
| 6.500 | 0.726 | 114.1 | 1.951 | -47.2 | 0.130 | -13.2 | 0.396 | 144.2 |
| 6.600 | 0.721 | 111.6 | 1.936 | -50.6 | 0.133 | -15.9 | 0.387 | 141.8 |
| 6.800 | 0.707 | 106.1 | 1.973 | -56.8 | 0.143 | -20.4 | 0.411 | 138.6 |
| 7.000 | 0.689 | 100.2 | 1.957 | -62.4 | 0.149 | -23.9 | 0.402 | 137.1 |
| 7.200 | 0.676 | 93.9 | 2.004 | -69.1 | 0.163 | -28.9 | 0.424 | 133.8 |
| 7.400 | 0.657 | 87.1 | 2.002 | -74.9 | 0.171 | -33.3 | 0.425 | 132.3 |
| 7.500 | 0.649 | 83.4 | 2.013 | -78.8 | 0.177 | -36.8 | 0.431 | 129.4 |
| 7.600 | 0.640 | 79.9 | 2.045 | -82.4 | 0.185 | -39.6 | 0.448 | 127.2 |
| 7.800 | 0.621 | 71.8 | 2.042 | -88.6 | 0.195 | -45.0 | 0.452 | 123.8 |
| 8.000 | 0.604 | 63.2 | 2.067 | -96.6 | 0.206 | -51.8 | 0.465 | 117.2 |
| 8.200 | 0.590 | 53.4 | 2.078 | -103.5 | 0.216 | -57.8 | 0.478 | 112.7 |
| 8.400 | 0.584 | 42.7 | 2.088 | -112.0 | 0.227 | -65.4 | 0.492 | 104.8 |
| 8.500 | 0.577 | 37.0 | 2.102 | -115.5 | 0.232 | -68.0 | 0.500 | 102.7 |
| 8.600 | 0.574 | 31.2 | 2.083 | -119.1 | 0.237 | -71.2 | 0.501 | 100.1 |
| 8.800 | 0.570 | 18.8 | 2.088 | -127.8 | 0.246 | -78.3 | 0.519 | 93.0 |
| 9.000 | 0.571 | 5.9 | 2.072 | -135.7 | 0.253 | -84.7 | 0.534 | 87.2 |
| 9.200 | 0.583 | -7.6 | 2.044 | -144.6 | 0.264 | -92.3 | 0.545 | 80.1 |
| 9.400 | 0.599 | -21.4 | 2.040 | -153.1 | 0.274 | -99.3 | 0.568 | 73.6 |
| 9.500 | 0.611 | -28.5 | 2.030 | -157.9 | 0.277 | -103.2 | 0.577 | 69.7 |
| 9.600 | 0.619 | -35.9 | 2.008 | -162.9 | 0.281 | -107.4 | 0.583 | 65.8 |
| 9.800 | 0.631 | -50.4 | 1.943 | -173.2 | 0.284 | -115.9 | 0.600 | 56.3 |
| 10.000 | 0.631 | -62.9 | 1.812 | 177.3 | 0.280 | -123.6 | 0.587 | 47.0 |

CHIP HANDLING**DIE ATTACHMENT**

Die attach can be accomplished with a Au-Sn (300 ± 10 °C) performs in a forming gas environment. Epoxy die attach is not recommended.

BONDING

Gate and drain bonding wires should be minimum length, semi-hard gold wire (3 - 8 % elongation) 30 microns or less in diameter.

Bonding should be performed with a wedge tip that has a taper of approximately 15 %.

Die attach and bonding time should be kept to a minimum. As a general rule, the bonding operation should be kept within a 280 °C _ 5 minute curve. If longer periods are required, the temperature should be lowered.

PRECAUTIONS

The user must operate in a clean, dry environment.

The chip channel is glassivated for mechanical protection only and does not preclude the necessity of a clean environment.

The bonding equipment should be periodically checked for sources of surge voltage and should be properly grounded at all times. In fact, all test and handling equipment should be grounded to minimize the possibilities of static discharge.

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