



# NEC's 1.5W GaAs MMIC POWER AMPLIFIER

## UPG2118K

### FEATURES

- **E-MODE HJ-FET TECHNOLOGY**
- **SINGLE +3.2V POWER SUPPLY**
- **HIGH EFFICIENCY:** PAE = 42% MIN
- **HIGH SATURATED POWER:** P<sub>out</sub> = +31.5 dBm MIN
- **FLEXIBLE FREQUENCY RANGE**
- **20-PIN QFN PACKAGE:**  
(4.15 x 4.15 x 0.9 mm)

### DESCRIPTION

NEC's UPG2118K is a 1.5W, 3 stage power amplifier developed primarily for DCS/PCS1800 applications. With modified external matching the UPG2118K can be tuned from 800 to 2500 MHz.

Use of E-mode FET technology delivers high efficiency and high linearity with a single positive low voltage supply.

### APPLICATIONS

- **1800 MHz DCS/PCS**
- **915 AND 2450 ISM BAND USAGE**
- **AUTOMATIC METER READERS**
- **WIRELESS SECURITY**
- **SATELLITE UPLINK**

### ORDERING INFORMATION

| PART NUMBER   | MARKING | PACKAGE    | SUPPLYING FORM                                                                                     |
|---------------|---------|------------|----------------------------------------------------------------------------------------------------|
| UPG2118K-E3-A | 2118    | 20-pin QFN | <ul style="list-style-type: none"><li>• Embossed tape 12mm wide</li><li>• 4.5 K pcs/reel</li></ul> |

### ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C, unless otherwise specified)

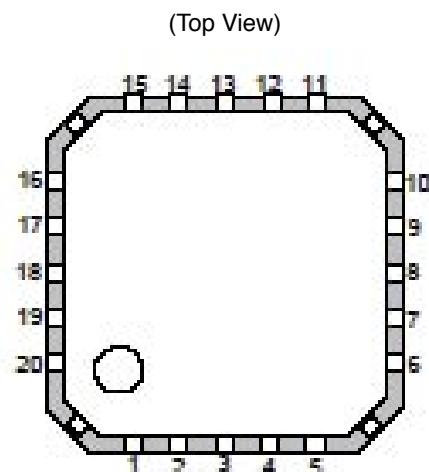
| PARAMETERS                      | SYMBOL              | RATINGS    | UNIT |
|---------------------------------|---------------------|------------|------|
| Storage Temperature             | T <sub>stg</sub>    | -45 to +85 | °C   |
| Operating Temperature           | T <sub>opt</sub>    | -45 to +85 | °C   |
| Supply Voltage <sup>1,2,3</sup> | V <sub>D1,2,3</sub> | 8.0        | V    |
| Active Bias Circuit Voltage     | V <sub>ABC</sub>    | 8.0        | V    |
| Reference Voltage               | V <sub>ref</sub>    | 5.0        | V    |
| Junction Temperature            | T <sub>j</sub>      | 150        | °C   |
| Input Power                     | P <sub>in</sub>     | 15         | dBm  |
| Total Power Dissipation         | P <sub>tot</sub>    | 4.0        | W    |

**Caution** This device is ESD sensitive. Please take ESD precautions.

The information contained in this document is being issued in advance of the production cycle for the device. The parameters for the device may change before final production or NEC Corporation, at its own discretion, may withdraw the device prior to its production.

## PIN CONNECTIONS

| PIN NO. | CONNECTION      | PIN NO. | CONNECTION |
|---------|-----------------|---------|------------|
| 1       | $V_{G1,2}$      | 11      | GND        |
| 2       | $V_{ref1,2}$    | 12      | NC         |
| 3       | $V_{ABC}$       | 13      | NC         |
| 4       | $V_{ref3}$      | 14      | GND        |
| 5       | $V_{G3}$        | 15      | $V_{D2}$   |
| 6       | GND             | 16      | $V_{D1}$   |
| 7       | $V_{D3}/RF$ OUT | 17      | GND        |
| 8       | $V_{D3}/RF$ OUT | 18      | GND        |
| 9       | $V_{D3}/RF$ OUT | 19      | $V_{attn}$ |
| 10      | $V_{D3}/RF$ OUT | 20      | RF IN      |



## RECOMMENDED OPERATING CONDITIONS (TA = 25°C)

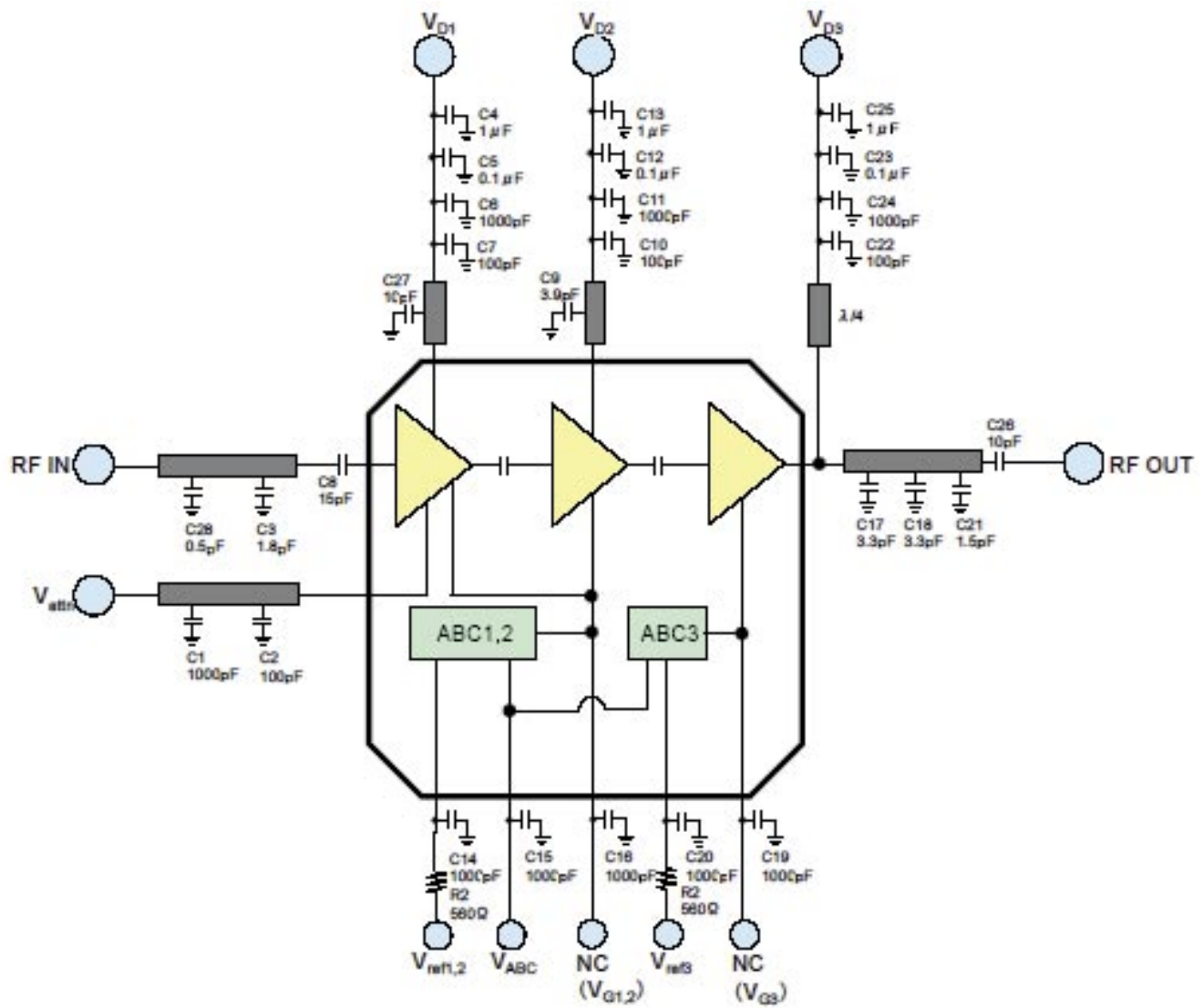
| PARAMETERS                  | SYMBOL       | MIN   | TYP  | MAX  | UNIT |
|-----------------------------|--------------|-------|------|------|------|
| Supply Voltage              | $V_{D1,2,3}$ | +2.8  | +3.2 | +5.5 | V    |
| Reference Voltage           | $V_{ref}$    | +0.04 | -    | +1.8 | V    |
| Active Bias Circuit Voltage | $V_{ABC}$    | 0     | 2.6  | 5.5  | V    |
| Input Power                 | $P_{in}$     | 5     | -    | 10   | dBm  |

## ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, TA = +25°C, f = 1880 MHz,  $V_D = +3.2V$ ,  $V_{ABC} = +2.6V$ ,  $V_{ref} = V_{attn} = 1.8V$ ,  $P_{in} = +5dBm$ )

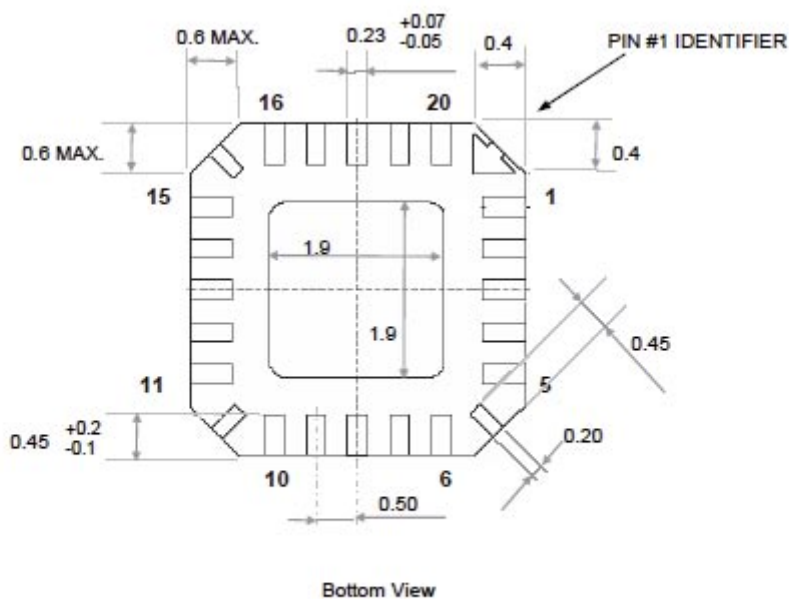
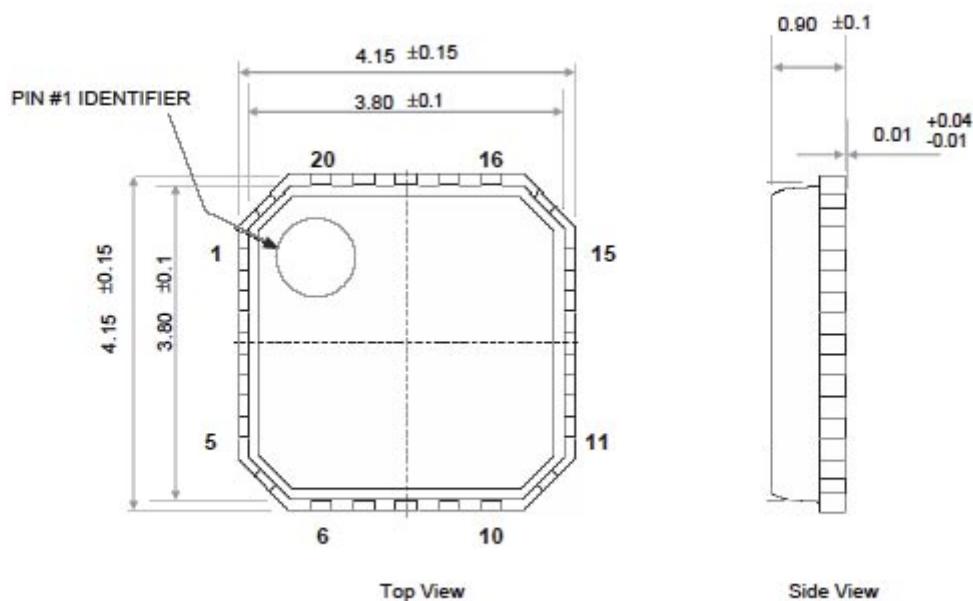
| CHARACTERISTICS             | SYMBOL      | TEST CONDITIONS                                                          | MIN   | TYP | MAX  | UNIT          |
|-----------------------------|-------------|--------------------------------------------------------------------------|-------|-----|------|---------------|
| Active Bias Circuit Current | $I_{ABC}$   | $P_{out} = +31.5dBm$ , $V_{ABC} = \text{Arbitrary}$                      | -     | -   | 30   | mA            |
| Reference Current           | $I_{ref}$   | $V_{ref} = V_{attn} = 0.04$ to $1.8V$                                    | -     | -   | 10   | mA            |
| RF Leakage Current          | $I_{leak}$  | $V_{ref} = V_{attn} = 0.04V$<br>$V_{ABC} = 10K\text{ ohm} + \text{Load}$ | -     | -   | 50   | mA            |
| Output Power                | $P_{out}$   |                                                                          | +31.5 | -   | -    | dBm           |
| Power Added Efficiency      | PAE         |                                                                          | 42.0  | -   | -    | %             |
| Power Control Slope         | $P_{slope}$ | $V_{ref} = V_{attn} = 0.04V$ to $1.8V$<br>$\Delta V_{ref} = 0.01V$       | -     | -   | 50:1 | Vrms/<br>Vref |
| Minimum Output Power        | $M_{Pout}$  | $V_{ref} = V_{attn} = 0.04V$                                             | -     | -   | -20  | dBc           |

## TEST CIRCUIT



NC (VG1,2 VG3) These pins must be connected to ground via a 1000pF capacitor for stability.

## PACKAGE DIMENSIONS (UNIT: mm)



### Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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**NEC**

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (\*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

| Restricted Substance<br>per RoHS | Concentration Limit per RoHS<br>(values are not yet fixed) | Concentration contained<br>in CEL devices |     |
|----------------------------------|------------------------------------------------------------|-------------------------------------------|-----|
|                                  |                                                            | -A                                        | -AZ |
| Lead (Pb)                        | < 1000 PPM                                                 | Not Detected                              | (*) |
| Mercury                          | < 1000 PPM                                                 | Not Detected                              |     |
| Cadmium                          | < 100 PPM                                                  | Not Detected                              |     |
| Hexavalent Chromium              | < 1000 PPM                                                 | Not Detected                              |     |
| PBB                              | < 1000 PPM                                                 | Not Detected                              |     |
| PBDE                             | < 1000 PPM                                                 | Not Detected                              |     |

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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