

**Product Features**

- GaN on SiC HEMT
- Surface Mount Hybrid Type
- Compact Size & Mass
- High Efficiency
- Low Cost
- Custom design available

**Applications**

- Radar Systems
- Pulse amplifier application



Package Type : NP-36B

**Description**

The HR5459-25C is designed for Radar system application frequencies from 5.4GHz to 5.9GHz and GaN HEMT technology has been used that performs high breakdown voltage, wide bandwidth and high efficiency. HR5459-25C has been designed 2 stages to have higher Gain at the wide frequency range of 5.4GHz ~5.9GHz. GaN HEMT technology has been used to every amplifier in it for better reliability. Since it is high efficiency amplifier, it can perform at max 10% duty cycle and 50us of pulse width.

**Electrical Specifications @  $V_{ds}=28V$ ,  $T_a=25^{\circ}C$**

| PARAMETER         |           | UNIT | MIN  | TYP  | MAX  | CONDITION                        |
|-------------------|-----------|------|------|------|------|----------------------------------|
| Frequency Range   |           | MHz  | 5400 | -    | 5900 | ZS = ZL = 50 ohm                 |
| Power Gain        |           | dB   | -    | 15   | -    | Amp : Idq1 = 10mA<br>Idq2 = 10mA |
| Power Flatness    |           |      | -    | -    | 1    |                                  |
| Input Return Loss |           |      | -    | -6   | -    |                                  |
| Pout @ Psat       |           | W    | 20   | 25   | -    |                                  |
| Harmonics 1 to N  |           | dBc  | -    | -25  | -    | -                                |
| Pulse Droop       |           | dB   | -    | 0.5  | -    | -                                |
| Pulse Response    | Fall Time | ns   | -    | -    | 200  | -                                |
|                   | Rise Time | ns   | -    | -    | 200  | -                                |
| Drain Efficiency  |           | %    | -    | 40   | -    | Pout @ Peak                      |
| Ids               |           | A    | -    | 2.3  | -    |                                  |
| Supply Voltage    |           | V    | -3.5 | -3.3 | -3.0 | Gate Bias (Vgs1 and Vgs2)        |
|                   |           | V    | -    | 28   | -    | Main Bias(Vds)                   |

**Caution**

The drain voltage must be supplied to the device after the gate voltage is supplied

Turn on : Turn on the Gate Voltage supply and last turn On the Drain voltage supplies

Turn off : Turn off the Drain Voltage and last turn off the Gate voltage

Test condition = 50us (pulse width), 10%(duty cycle),  $P_{in}=29\text{dBm}$

**Note**

HR Series have internal DC blocking capacitors at the RF input and output ports

**Mechanical Specifications**

| PARAMETER | UNIT | TYP               | REMARK |
|-----------|------|-------------------|--------|
| Mass      | g    | 2                 | -      |
| Dimension | mm   | 20.5 x 12.5 x 4.8 | -      |

### Absolute Maximum Ratings

| PARAMETER                      | UNIT | RATING    | SYMBOL                               |
|--------------------------------|------|-----------|--------------------------------------|
| Gate-Source Voltage            | V    | -10 ~ 0   | V <sub>gs1</sub><br>V <sub>gs2</sub> |
| Drain-Source Voltage           | V    | 84        | V <sub>ds</sub>                      |
| Gate Current                   | mA   | 9.3       | I <sub>g</sub>                       |
| Operating Junction Temperature | °C   | 225       | T <sub>J</sub>                       |
| Operating Case Temperature     | °C   | -20 ~ 85  | T <sub>C</sub>                       |
| Storage Temperature            | °C   | -40 ~ 100 | T <sub>STG</sub>                     |

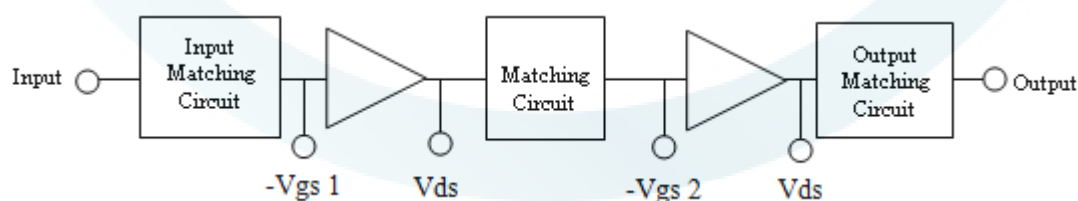
### Operating Voltages

| PARAMETER                | UNIT | MIN | TYP                   | MAX | SYMBOL            |
|--------------------------|------|-----|-----------------------|-----|-------------------|
| Drain Voltage            | V    | -   | 28                    | -   | V <sub>ds</sub>   |
| Gate Voltage (on-stage)  | V    | -   | V <sub>gs1@Idq1</sub> | -2  | V <sub>gs 1</sub> |
| Gate Voltage (on-stage)  | V    | -   | V <sub>gs2@Idq2</sub> | -2  | V <sub>gs 2</sub> |
| Gate Voltage (off-stage) | V    | -   | -8                    | -   | V <sub>gs 1</sub> |
| Gate Voltage (off-stage) | V    | -   | -8                    | -   | V <sub>gs 2</sub> |

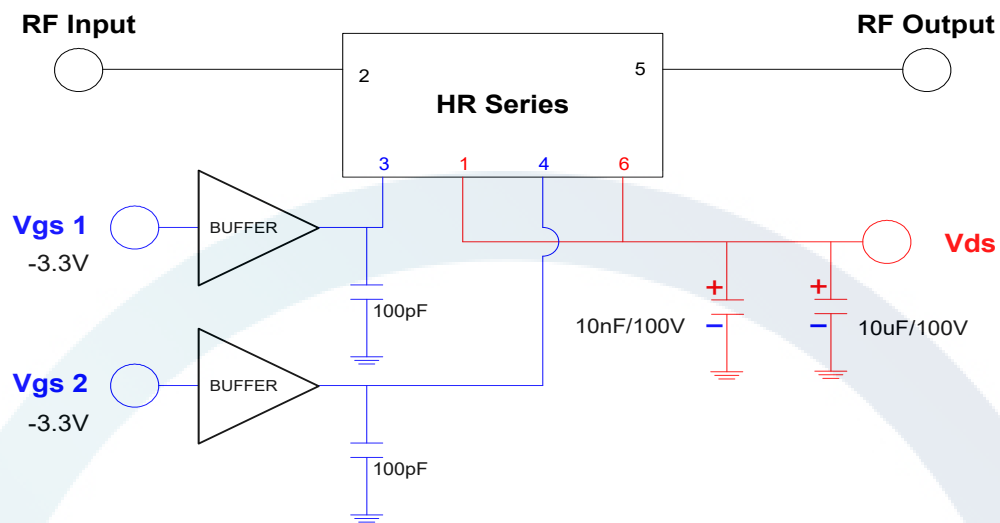
### Power Supply

| PARAMETER                       | UNIT | MIN | TYP | MAX  | SYMBOL          |
|---------------------------------|------|-----|-----|------|-----------------|
| Drain-Source current            | A    | -   | -   | 3.5  | I <sub>ds</sub> |
| Gate-Source Current (on-stage)  | mA   | -   | -   | 20   | I <sub>gs</sub> |
| Gate-Source Current (off-stage) | mA   | -   | -   | 0.04 | I <sub>gs</sub> |

### Block Diagram

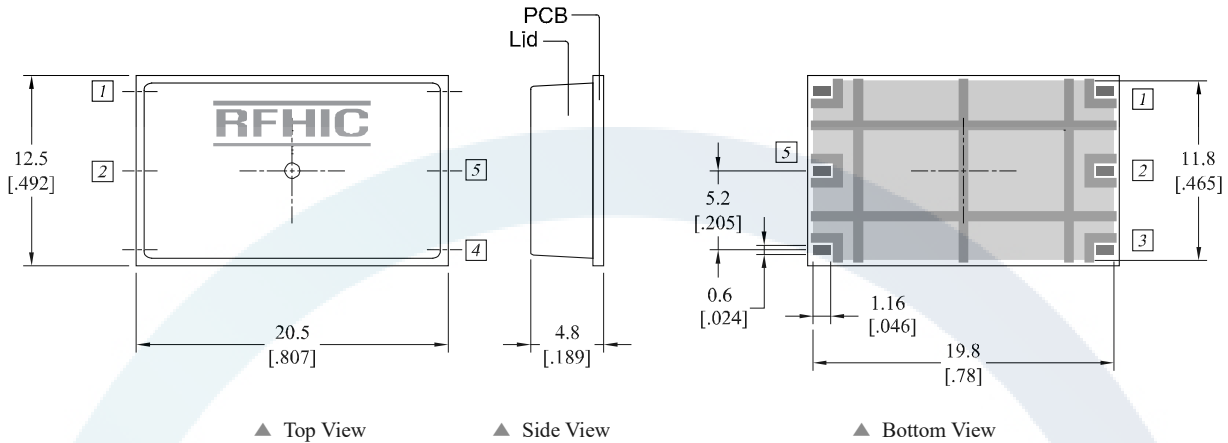


**Application Circuit**



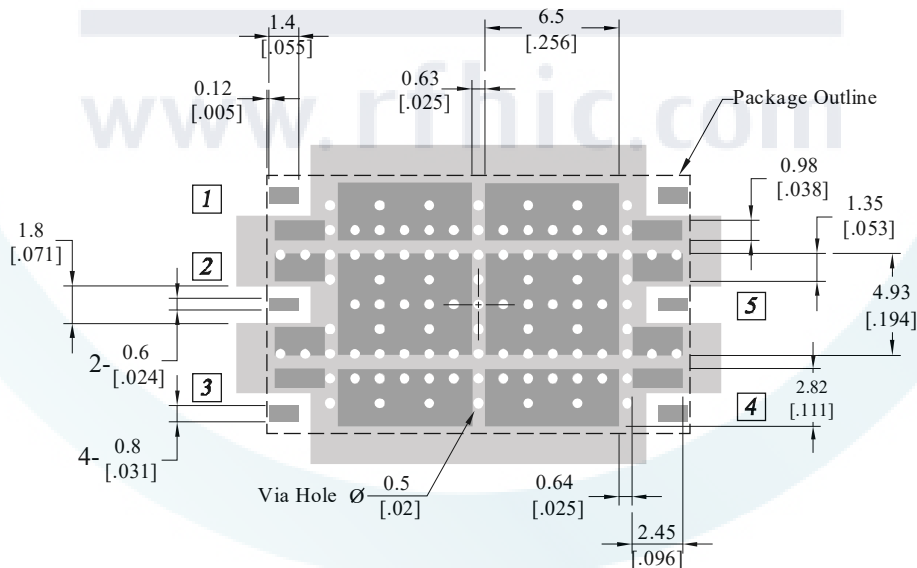
**Package Dimensions (Type: NP-36B)**

\* Unit: mm[inch] | Tolerance:  $\pm 0.15$ [.006]



| Pin No | Function | Pin No | Function  |
|--------|----------|--------|-----------|
| 1      | Vds1     | 6      | Vds2      |
| 2      | RF input | 5      | RF output |
| 3      | Vgs1     | 4      | Vgs2      |

**Recommended Pattern**



**\* Mounting Configuration Notes**

1. For the proper performance of the device, Ground / Thermal via holes must be designed to remove heat.
2. To properly use heatsink, ensure the ground/thermal via hole region to contact the heatsink. We recommend the mounting screws be added near the heatsink to mount the board
3. In designing the necessary RF trace, width will depend upon the PCB material and construction.
4. Use 1 oz. Copper minimum thickness for the heatsink.
5. Do not put solder mask on the backside of the PCB in the region where the board contacts the heatsink
6. We recommend adding as much copper as possible to inner and outer layers near the part to ensure optimal thermal performance.

## Precautions

This product is a Gallium Nitride Transistor.

The Gallium Nitride Transistor requires a Negative Voltage Bias which operates alongside a Positive Voltage Bias. These Biases are applied in accordance to the Sequence during Turn-On and Turn-Off.

The Pallet Amplifier does not have a built-in Bias Sequence Circuit. Therefore, users need to either apply positive voltages and negative voltages in the required sequence, or add an external Bias Circuit to this Amplifier.

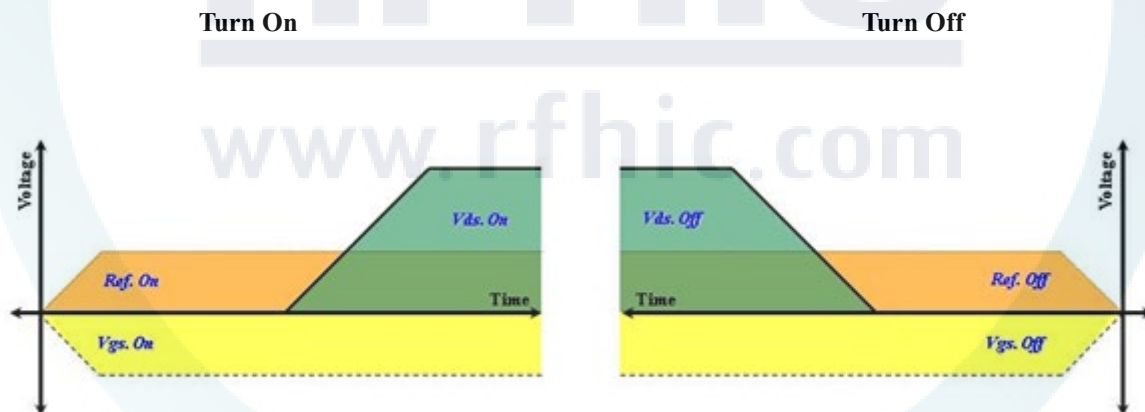
The required sequence for power supply is as follows.

## During Turn-On

1. Connect GND.
2. Apply  $V_{gs1}$  and  $V_{gs2}$ .
3. Apply  $V_{ds}$ .
4. Apply the RF Power.

## During Turn-Off

1. Turn off RF power.
2. Turn off  $V_{ds}$ , and then, turn off the  $V_{gs1}$  and  $V_{gs2}$ .
3. Remove all connections.



- Sequence Timing Diagram -

## Ordering Information

| Part Number | Package Design          |
|-------------|-------------------------|
| HR5459-25C  | -R (Reel)               |
|             | -B (Bulk)               |
|             | -EVB (Evaluation Board) |

## Revision History

| Part Number | Release Date | Version | Modification                           | Data Sheet Status |
|-------------|--------------|---------|--|-------------------|
| HR5459-25C  | 2017.12.01   | 0.3     | Changed recommended pattern & LID Type | Preliminary       |
| HR5459-25C  | 2014.09.03   | 0.2     | Changed Specification                  | Preliminary       |
| HR5459-25C  | 2013.07.10   | 0.1     | The first written document             | Preliminary       |

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