



Package Type : PP-1S

## Product Features

- TD-LTE band 3400~3600MHz
- Power gain 27dB, Psat 100W
- Main Doherty amp. efficiency 45% @ Pavg=16W
- Input/Output Impedance 50ohm
- 2-Stage Doherty Amplifier
- GaN on SiC Technology
- Copper clad laminates board
- 13x17x2.2mm size SMD package

## Applications

- Massive MIMO
- 4G/5G LTE Technology
- TDD or FDD- LTE system
- AAS(Active Antenna System)
- Small cell

## Description

The RPAM35016-25 is a fully integrated micro-strip Doherty GaN Hybrid power amplifier module designed for applications in 5G Massive MIMO systems, small cells, and low power remote radio heads. RPAM Series is an integrated 2-stage power amplifier module, 50ohm input and output impedance matched device can deliver up to 100W of saturation power and operating drain voltage 48V. This device is size 13x17x2.2mm and is packaged in a plastic surface mount package.

## Electrical Specifications @ Vds=48V, Ta=25°C

| PARAMETER                               | UNIT | MIN  | TYP  | MAX  | CONDITION                           |
|---|------|------|------|------|-------------------------------------|
| Frequency Range                         | MHz  | 3400 | 3500 | 3600 | ZS = ZL = 50 ohm                    |
| Power Gain                              | dB   | -    | 27   | -    | -                                   |
| Gain Flatness                           |      | -1.5 | -    | +1.5 |                                     |
| Input Return Loss                       |      | -    | -12  | -    |                                     |
| Pout @ Average                          | dBm  | -    | 42   | -    | 16W                                 |
| Pout @ Saturation                       | dBm  | -    | 50   | -    | Pulse Width=20us,<br>Duty cycle 10% |
| ACLR @ BW 20MHz 1FA<br>LTE (PAPR 7.5dB) | dBc  | -    | -28  | -25  | Non DPD                             |
|   |      | -    | -54  | -    | With DPD                            |
| Drain Efficiency                        | %    | -    | 45   | -    | 16W                                 |
| Supply Voltage                          | V    | -4.9 | -2.8 | -2.0 | Vgd                                 |
|   |      | -4.9 | -2.8 | -2.0 | Vgc                                 |
|   |      | -4.9 | -4.8 | -3.0 | Vgp                                 |
|   |      | -    | 48   | -    | 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

### Note

1. ACLR Measured Pout=42dBm @ fc± 20MHz / 18.03MHz

LTE 20MHz 1FA PAPR=7.5dB @ 0.01% probability on CCDF

## Mechanical Specifications

| PARAMETER | UNIT | TYPICAL       | RATING |
|-----------|------|---------------|--------|
| Mass      | g    | 4.0           | -      |
| Dimension | mm   | 13 x 17 x 2.2 | ±0.15  |

## Absolute Maximum Ratings

| PARAMETER                           | UNIT | RATING            | SYMBOL  | CONDITION            |
|-------------------------------------|------|-------------------|---|----------------------|
| Gate-Source Voltage                 | V    | -10 ~ 0           | V <sub>gd</sub><br>V <sub>gc</sub><br>V <sub>gp</sub> | T <sub>c</sub> =25°C |
| Drain-Source Voltage                | V    | 100               | V <sub>ds</sub>                                       | T <sub>c</sub> =25°C |
| Gate Current                        | mA   | 1.2<br>3.6<br>7.2 | Drive<br>Carrier<br>Peaking                           | T <sub>c</sub> =25°C |
| Power Dissipation                   | W    | 45                | P <sub>b</sub>  | T <sub>c</sub> =85°C |
| Operating Junction Temperature      | °C   | 225               | T <sub>j</sub>  | -                    |
| Operating Case Temperature          | °C   | -30 ~ 85          | T <sub>c</sub>  | -                    |
| Storage Temperature                 | °C   | -40 ~ 100         | T <sub>STG</sub>                                      | -                    |
| Soldering Temperature <sup>*1</sup> | °C   | 260               | T <sub>s</sub>  | 30s Max.             |
| RF Input Level (Pulse)              | dBm  | 33                | Pin   | T <sub>c</sub> =25°C |

\*1 Reflow cycle limit : 1time

## Operating Voltages &amp; Input level

| PARAMETER                | UNIT | MIN  | TYP                           | MAX  | SYMBOL          |
|--------------------------|------|------|-------------------------------|------|-----------------|
| Drain Voltage            | V    | 47.5 | 48                            | 48.5 | V <sub>ds</sub> |
| Gate Voltage (on-state)  | V    | -4.9 | V <sub>gd</sub> <sup>*2</sup> | -2.0 | V <sub>gd</sub> |
| Gate Voltage (on-state)  | V    | -4.9 | V <sub>gc</sub> <sup>*3</sup> | -2.0 | V <sub>gc</sub> |
| Gate Voltage (on-state)  | V    | -4.9 | V <sub>gp</sub> <sup>*4</sup> | -3.0 | V <sub>gp</sub> |
| Gate Voltage (off-state) | V    | -    | -8                            | -    | V <sub>gd</sub> |
| Gate Voltage (off-state) | V    | -    | -8                            | -    | V <sub>gc</sub> |
| Gate Voltage (off-state) | V    | -    | -8                            | -    | V <sub>gp</sub> |
| RF Input Level (Pulse)   | dBm  | -    | -                             | 30   | Pin             |

\*2 V<sub>gd</sub>(Pin#28) set : Drive amp. Idq 30mA

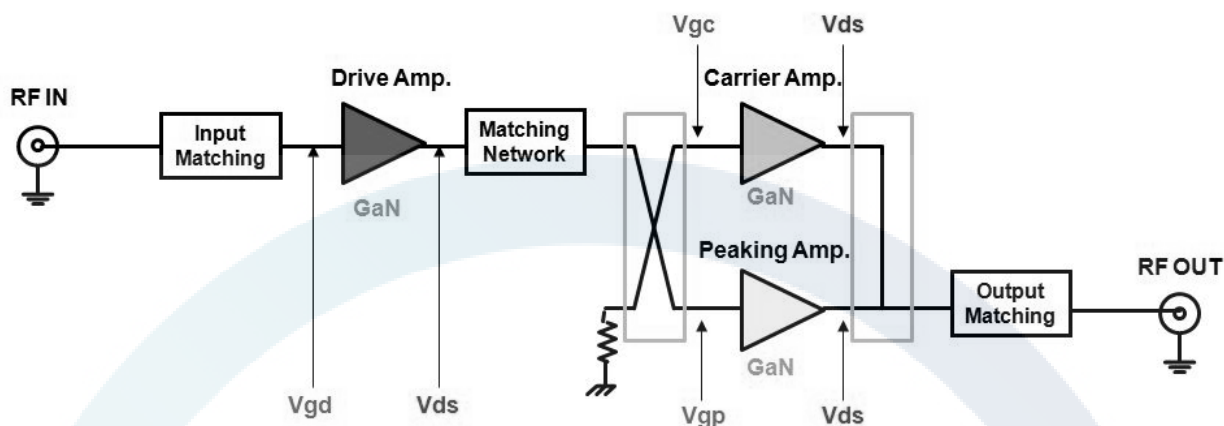
\*3 V<sub>gc</sub>(Pin#25) set: Carrier Idq 100mA±5%

\*4 V<sub>gp</sub>(Pin#8) set: Lower V<sub>gp</sub> of Δ-1.9V at Peaking Idq 10mA

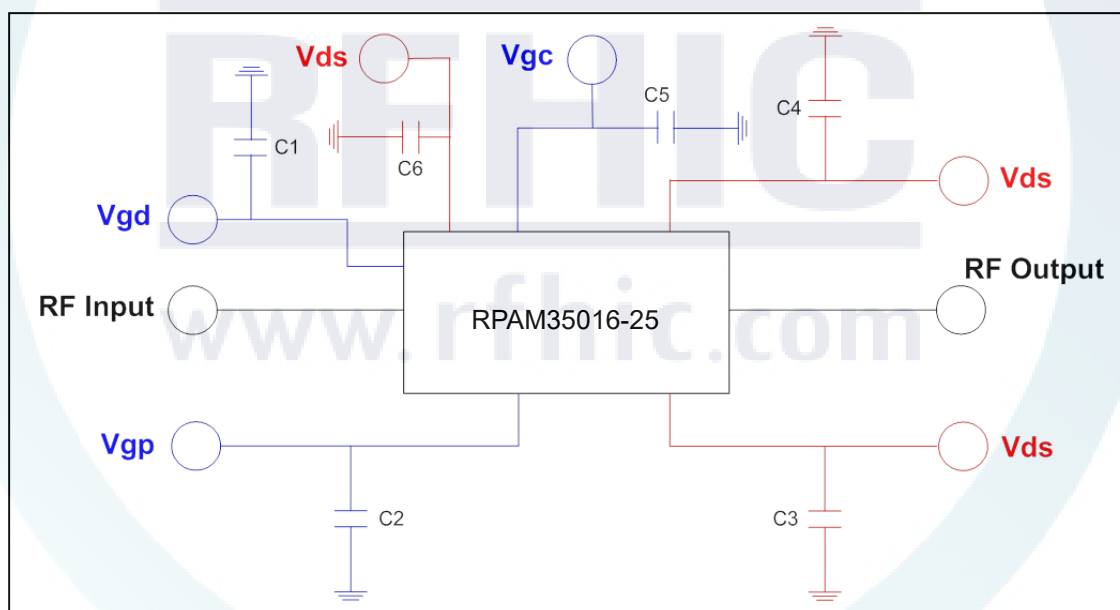
## ESD Level

| PARAMETER | STANDARD     | RESULT                        |
|-----------|--------------|-------------------------------|
| HBM       | JESD22-A114E | Class 1A/ passed Voltage 500V |
| MM        | JESD22-A115C | Class A/ passed Voltage 100V  |

**Block Diagram**



**Application Circuit**



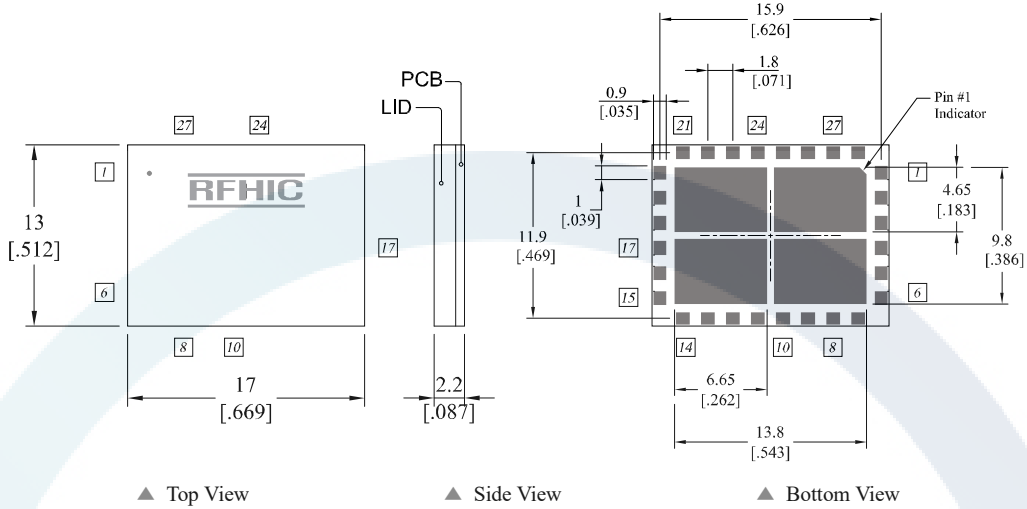
**Bill of Material (Evaluation board)**

| LOCATION   | Part Number        | Value              | Manufacturer |
|------------|--------------------|--------------------|--------------|
| C3, C4, C6 | 1812B225K101CT     | 2.2uF / 100V       | WALSIN       |
| C1, C2, C5 | GRM1885C1H101JA01D | 100pF / 50V        | MURATA       |
| PCB        | RO4350B            | 2Layer, 20mil, 1oz | ROGERS       |

**Package Dimensions (Type: PP-1R)**

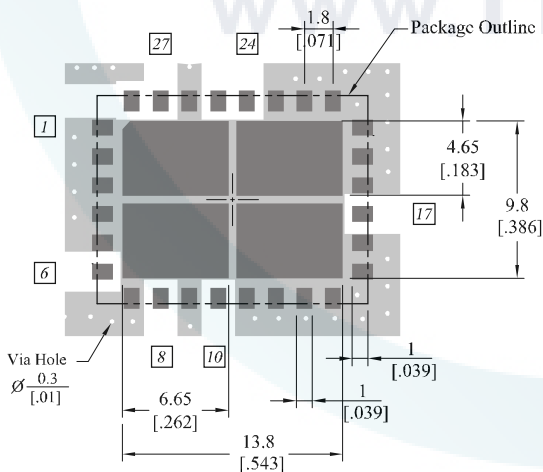
\* Unit: mm[inch] | Tolerance: ±0.15[.006]

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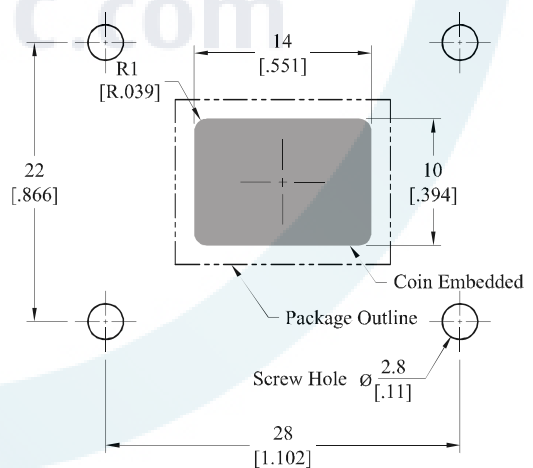


| Pin Description       |          |        |          |        |          |        |          |
|-----------------------|----------|--------|----------|--------|----------|--------|----------|
| Pin No                | Function | Pin No | Function | Pin No | Function | Pin No | Function |
| 6                     | RF In    | 10     | Vds      | 24     | Vds      | 27     | Vds      |
| 8                     | Vgp      | 17     | RF Out   | 25     | Vgc      | 28     | Vgd      |
| All other pins Ground |          |        |          |        |          |        |          |

**Recommended Pattern**



**Mounting Configuration & Coin Embedded**



**\* 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.
7. We recommend that the PCB with the RF device in a hybrid package is not washed to remove the flux.

**Ordering Information**

| Part Number  | Package Design          |
|--------------|-------------------------|
| RPAM35016-25 | -R (Reel)               |
|              | -B (Bulk)               |
|              | -EVB (Evaluation Board) |

**Revision History**

| Part Number  | Release Date | Version | Modification    | Data Sheet Status |
|--------------|--------------|---------|-----------------|-------------------|
| RPAM35016-25 | 2019.04.09   | 0.1     | Initial release | Preliminary       |
|              |              |         |                 | -                 |
|              |              |         |                 | -                 |



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