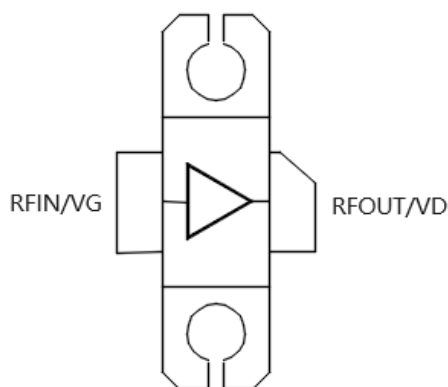


## DC-4.0GHz, 50W, 28V, GaN RF Transistor

### General Description

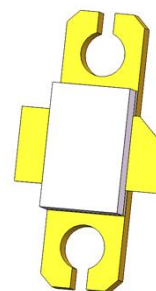
The GNNT4147H is a wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT), The device operates from DC to 4.0GHz with a 28V supply rail. Its typical saturated power is 60W@2.5GHz ( $P_{sat}$ ). The  $P_{sat}$  gain is 10.5dB@2.5GHz above, and drain efficiency is 60% above. The device is in an industry standard YJ201 ceramic package.

### Block diagram



### Features

- Operating Frequencies: DC-4.0GHz
- Output Power ( $P_{sat}$ ): 60W@2.5GHz
- Power Gain: 10.5dB@2.5GHz
- $DE@P_{sat}$ : 60%@2.5GHz
- Operating Voltage: 28 V
- Support CW & Pulse mode



### Typical Application Data

- 2.4GHz-2.5GHz:  $P_{sat} \geq 48\text{dBm}$
- 0.4GHz-1.1GHz:  $P_{sat} \geq 47.1\text{dBm}$
- 0.4GHz-0.5GHz:  $P_{sat} \geq 47.5\text{dBm}$
- 0.1GHz-0.4GHz:  $P_{sat} \geq 47\text{dBm}$

### Recommended Operating Conditions

| Parameter                      | Value         |
|--------------------------------|---------------|
| Drain-Source Voltage ( $V_D$ ) | 28 V (Typ)    |
| Quiescent Current ( $I_{DQ}$ ) | 100 mA (Typ)  |
| Gate-Source Voltage ( $V_G$ )  | -2.65 V (Typ) |

Note:

1. All the RF spec tested under recommended conditions.
2. Bias-up Procedure: Set  $V_G$  to the pinch-off ( $V_P$ ) voltage, typically -5 V, then turn on  $V_D$  to nominal supply voltage (28V)
3. Bias-down Procedure: Turn off RF signal, then turn off  $V_D$  and wait 1 second to allow drain capacitor dissipation, turn off  $V_G$ .

## Absolute Maximum Ratings

Note:

1. Operating outside the rated range may cause irreversible damage to the device.

| Parameter                                                       | Range Value  |
|-----------------------------------------------------------------|--------------|
| Drain-Source Breakdown Voltage ( $BV_{DS}$ )                    | 120 V        |
| Drain-Source Voltage Range, ( $V_D$ )                           | 20 to 32 V   |
| Gate-Source Voltage Range, ( $V_G$ )                            | -10 to +1 V  |
| Operating Temperature Range                                     | -40 to 125°C |
| Storage Temperature Range                                       | -65 to 150°C |
| Maximum Input Power, CW ( $P_{in}$ ), $T_A = 25^\circ \text{C}$ | 40 dBm       |

## RF Characteristics, 2.4GHz-2.5GHz EVB

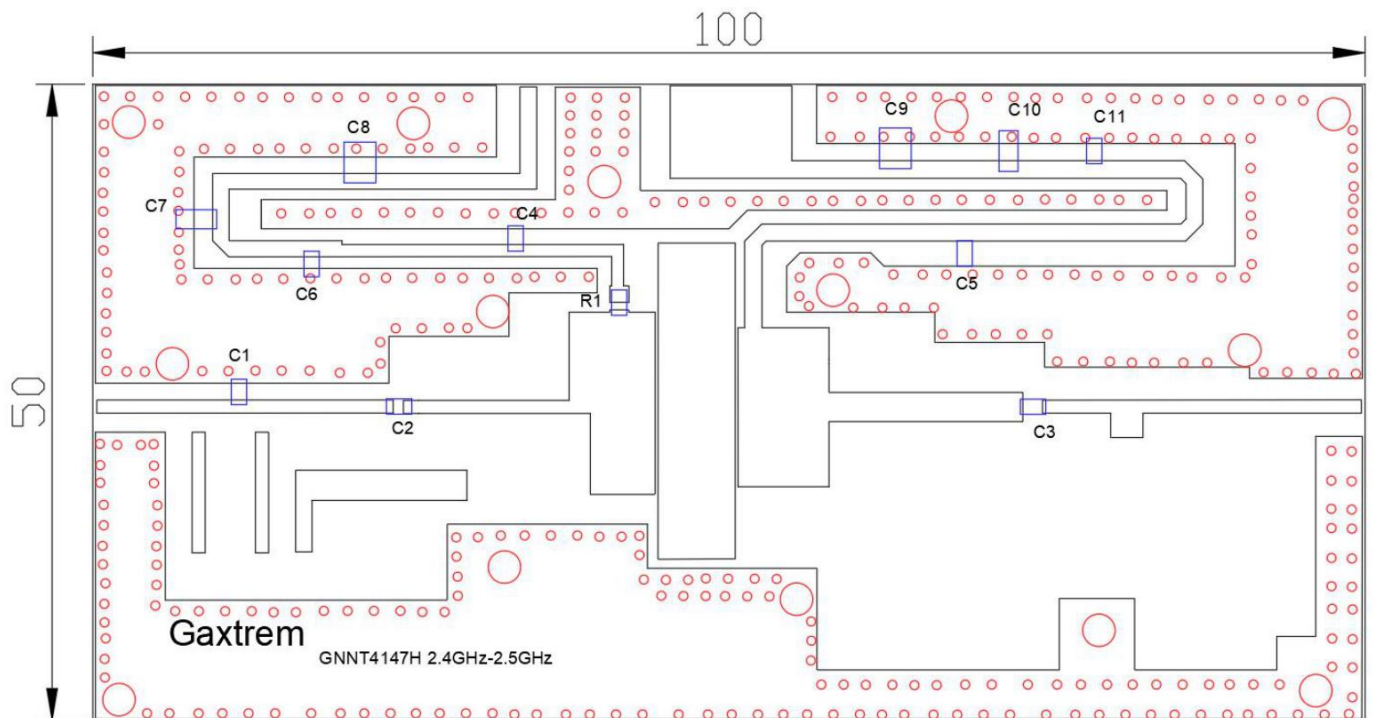
Note:

1. Test condition:  $T_A = 25^\circ \text{C}$ ,  $V_D = 28\text{V}$ ,  $I_{DQ} = 200 \text{mA}$ , CW

| Symbol     | Parameter        | Min | Typ  | Max | Unit |
|------------|------------------|-----|------|-----|------|
| $G_{LIN}$  | Linear Gain      | -   | 13.5 | -   | dB   |
| $P_{sat}$  | Output Power     | -   | 60   | -   | W    |
| $DE_{sat}$ | Drain Efficiency | -   | 60   | -   | %    |
| $G_{sat}$  | Gain             | -   | 10.5 | -   | dB   |

## Thermal Characteristics

| Symbol          | Parameter          | Min | Typ | Max | Unit |
|-----------------|--------------------|-----|-----|-----|------|
| $R_{\theta JC}$ | Thermal Resistance | -   | 1.8 | -   | °C/W |

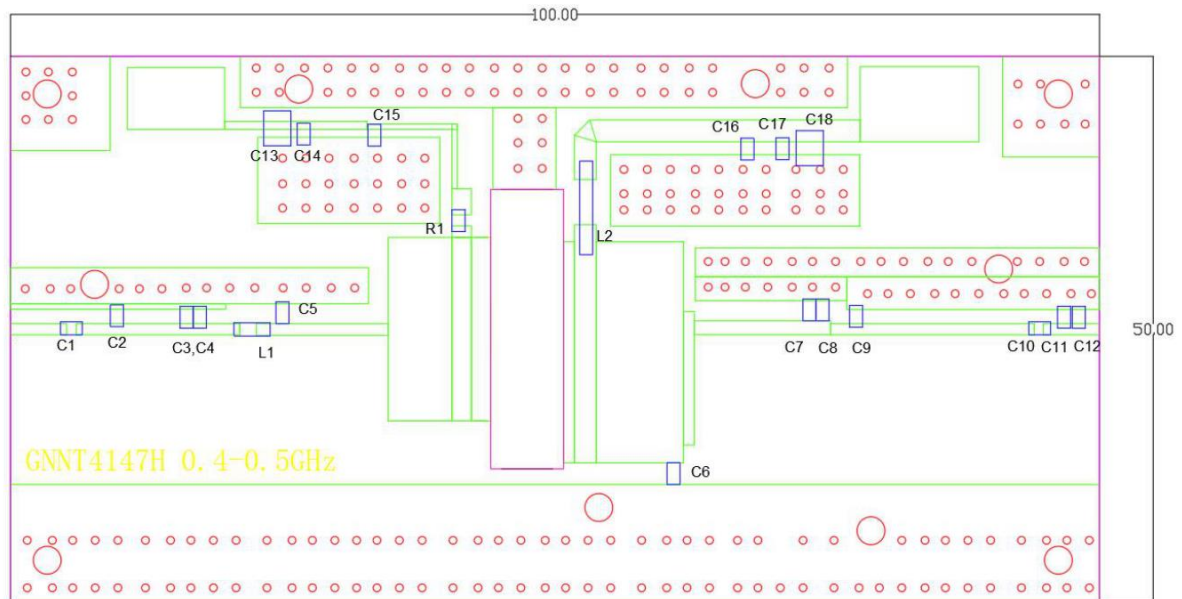


## Note:

1. The board material used for the EVB is RO4350B with a thickness of 508  $\mu\text{m}$  (20 mil).
2. Matching circuit dimensions about 72.2mm\*29.1mm

## 2.4GHz-2.5GHz EVB BOM list

| Location | Value       | Brand  | Size  |
|----------|-------------|--------|-------|
| C1       | 0.5pF       | ATC    | 600F  |
| C2,C4,C5 | 10pF        | ATC    | 600F  |
| C3       | 15pF        | ATC    | 600F  |
| C6,C11   | 1000pF      | Murata | 0805  |
| C7,C10   | 100nF       | Murata | 1206  |
| C8,C9    | 10uF        | Murata | 1210  |
| R1       | 36 $\Omega$ | YAGEO  | 0805  |
| PCB      | RO4350B     |        | 20mil |



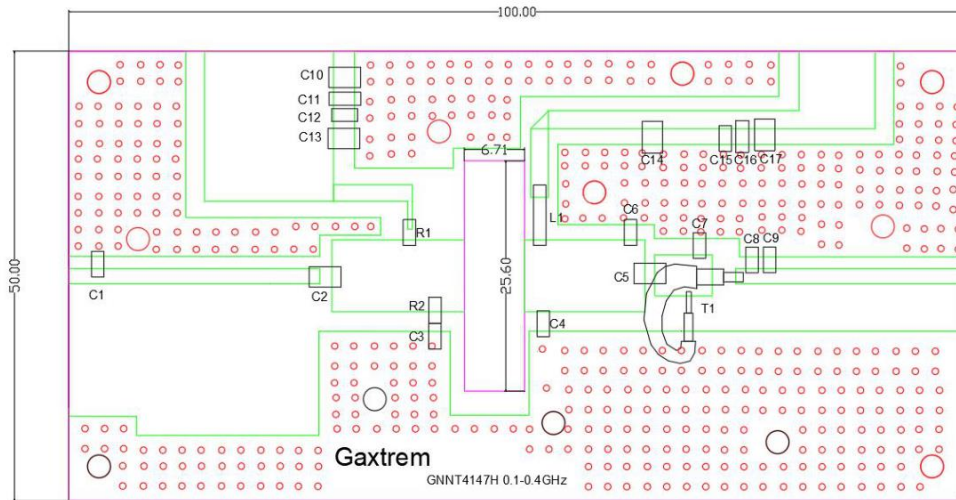
## Note:

- The board material used for the EVB is RO4350B with a thickness of 762  $\mu\text{m}$  (30 mil).
- Matching circuit dimensions about 93.6mm\*31.5mm.

## 0.4GHz-0.5GHzEVB BOM list

| Location       | Value                                                           | Brand  | Size  |
|----------------|-----------------------------------------------------------------|--------|-------|
| C1,C10,C15,C16 | 100pF                                                           | ATC    | 600F  |
| C2             | 0.8pF                                                           | ATC    | 600F  |
| C3,C4,C7       | 5.6pF                                                           | ATC    | 600F  |
| C5             | 3.9pF                                                           | ATC    | 600F  |
| C6             | 1.0pF                                                           | ATC    | 600F  |
| C8             | 0.3pF                                                           | ATC    | 600F  |
| C9,C11         | 6.8pF                                                           | ATC    | 600F  |
| C12            | 2.0pF                                                           | ATC    | 600F  |
| C13,C18        | 10uF                                                            | Murata | 1210  |
| C14,C17        | 1000pF                                                          | Murata | 0805  |
| L1             | Wire Diameter 0.5mm                                             |        |       |
| L2             | Wire Diameter 0.5mm, Winding<br>Outer Diameter<br>4.35mm,3turns |        |       |
| R1             | 17 $\Omega$                                                     | YAGEO  | 0805  |
| PCB            | RO4350B                                                         |        | 30mil |

## 0.1GHz-0.4GHzEVB PCB Layout



Note:

1. The board material used for the EVB is RO4350B with a thickness of 762  $\mu\text{m}$  (30 mil).
2. Matching circuit dimensions about 76.3mm\*35.2mm.

## 0.4GHz-0.5GHzEVB BOM list

| Location      | Value                                                     | Brand  | Size  |
|---------------|-----------------------------------------------------------|--------|-------|
| C1            | 20pF                                                      | ATC    | 600F  |
| C2,C5,C13,C14 | 470pF                                                     | ATC    | 100B  |
| C4            | 47pF                                                      | ATC    | 600F  |
| C6            | 3.9pF                                                     | ATC    | 600F  |
| C7            | 56pF                                                      | ATC    | 600F  |
| C8            | 6.8pF                                                     | ATC    | 600F  |
| C9            | 1.5pF                                                     | ATC    | 600F  |
| C10,C17       | 10uF                                                      | Murata | 1210  |
| C11,C16       | 100nF                                                     | Murata | 1206  |
| C3,C12,C15    | 1000pF                                                    | Murata | 0805  |
| T1            | 25ohm,60mm                                                |        |       |
| L1            | Wire Diameter 0.7mm, Winding<br>Outer Diameter 3mm,8turns |        |       |
| R1            | 47 $\Omega$                                               | YAGEO  | 0805  |
| R2            | 27 $\Omega$                                               | YAGEO  | 0805  |
| PCB           | RO4350B                                                   |        | 30mil |

## Test Data, 2.4GHz-2.5GHz EVB

Test Condition: TA = 25 °C, VD = 28 V, IDQ = 200mA, CW

| Freq(GHz) | Psat(dBm) | Psat(W) | Power Gain(dB) | ID(A) | DE(%)  |
|-----------|-----------|---------|----------------|-------|--------|
| 2.4       | 48        | 63.10   | 10.5           | 3.74  | 60.25% |
| 2.45      | 48        | 63.10   | 10.5           | 3.75  | 60.09% |
| 2.5       | 48        | 63.10   | 10.5           | 3.66  | 61.57% |

## Test Data, 0.4GHz-1.1GHz EVB

Test Condition: TA = 25 °C, VD = 28 V, IDQ = 100mA, CW

| Freq(MHz) | Psat(dBm) | Psat(W) | Power Gain(dB) | ID(A) | DE(%)  |
|-----------|-----------|---------|----------------|-------|--------|
| 400       | 48.0      | 63.10   | 13.20          | 4.00  | 56.34% |
| 500       | 48.4      | 69.18   | 14.50          | 4.30  | 57.46% |
| 600       | 48.2      | 66.07   | 11.10          | 4.28  | 55.13% |
| 700       | 47.9      | 61.66   | 10.30          | 3.60  | 61.17% |
| 800       | 47.9      | 61.66   | 13.20          | 3.20  | 68.82% |
| 900       | 48.1      | 64.57   | 11.20          | 3.30  | 69.88% |
| 1000      | 47.9      | 61.66   | 12.10          | 3.27  | 67.34% |
| 1100      | 47.1      | 51.29   | 10.90          | 3.27  | 56.01% |

## Test Data, 0.4GHz-0.5GHz EVB

| Freq(MHz) | Psat(dBm) | Psat(W) | Power Gain(dB) | ID(A) | DE(%)  |
|-----------|-----------|---------|----------------|-------|--------|
| 400       | 47.5      | 56.23   | 18.5           | 3.47  | 57.88% |
| 420       | 48.0      | 63.10   | 19.8           | 3.65  | 61.74% |
| 440       | 47.5      | 56.23   | 17.6           | 3.07  | 65.42% |
| 460       | 47.5      | 56.23   | 18.7           | 3.07  | 65.42% |
| 480       | 47.5      | 56.23   | 17.7           | 3.13  | 64.16% |
| 500       | 47.5      | 56.23   | 17.2           | 3.00  | 66.95% |

## Test Data, 0.1GHz-0.4GHz EVB

| Freq(MHz) | Psat(dBm) | Psat(W) | Power Gain(dB) | I <sub>D</sub> (A) | DE(%)  |
|-----------|-----------|---------|----------------|--------------------|--------|
| 100       | 47.04     | 50.58   | 14.8           | 2.90               | 62.29% |
| 150       | 47.16     | 52.00   | 14.7           | 2.50               | 74.29% |
| 200       | 48.37     | 68.71   | 15.9           | 3.30               | 74.36% |
| 250       | 48.05     | 63.83   | 14.5           | 3.46               | 65.88% |
| 300       | 47.45     | 55.59   | 13.8           | 3.70               | 53.66% |
| 350       | 48.20     | 66.07   | 15.0           | 3.96               | 59.59% |
| 400       | 47.35     | 54.33   | 14.2           | 3.73               | 52.02% |

## ESD Protection Characteristics

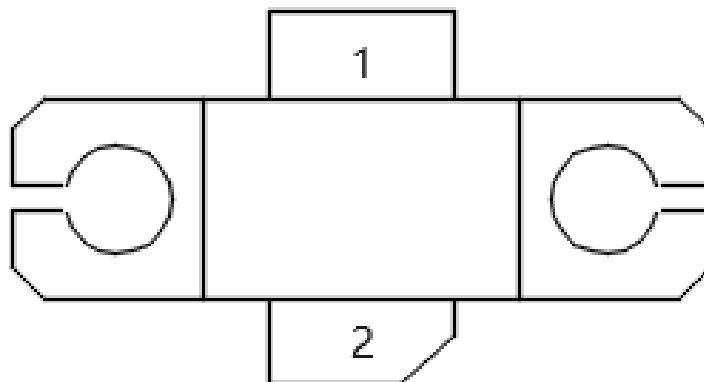
| Test Methodology    | Class  | Standard                   |
|---------------------|--------|----------------------------|
| Human Body Model    | ±225V  | JEDEC Standard JS-001-2017 |
| Charge Device Model | ±1000V | JEDEC Standard JS-002-2018 |

## Solderability

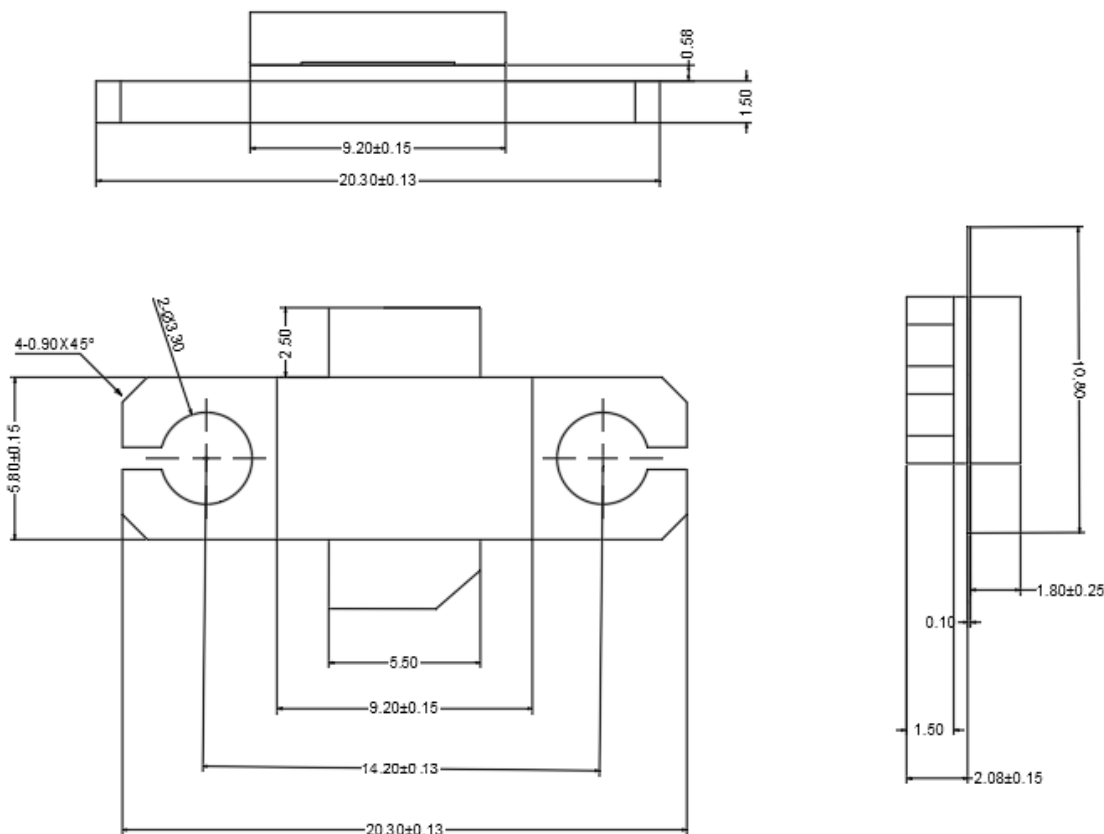
This package is lead-free/RoHS-compliant. The plating material on the leads is NiAu. It is compatible with both lead-free (maximum 260 °C reflow temperature) and tin-lead (maximum 245°C reflow temperature) soldering processes.

## RoHS Compliance

This part is compliant with 2015/863/ and EU 2011/65/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).



| PIN | Symbol         | Description                                                                                  |
|-----|----------------|----------------------------------------------------------------------------------------------|
| 1   | $V_G$ / RF IN  | Gate voltage / RF Input to be matched to 50 ohms;                                            |
| 2   | $V_D$ / RF OUT | Drain voltage / RF Output to be matched to 50 ohms                                           |
| --  | Source         | Source connected to ground, It needs to be welded onto the substrate under the window of PCB |



YJ201

Note:

1. All dimensions are in millimeters.
2. All dimension tolerances are +/- 0.10 or +/- 0.20 mm.

## Revision History

| Data      | Revision | Datasheet Status      |
|-----------|----------|-----------------------|
| 2024/7/19 | 1.0      | Preliminary Datasheet |
| 2024/7/29 | 1.1      | Update data           |
| 2025/2/18 | 1.2      | Add PCB layout        |