

# RFFM8550Q

5GHz WiFi Switch + LNA Module  
Tested in Accordance with AEC-Q100

The RFFM8550Q provides an integrated switch + LNA solution in a single Front End Module (FEM) for automotive WiFi 802.11a/n/ac systems. The ultra-small form factor and integrated matching greatly reduces the number of external components and layout area in the customer applications. This simplifies the total front end solution by reducing the bill of materials, system footprint, and manufacturing cost. The RFFM8550Q integrates a Single Pole 2-Throw (SP2T) switch and a Low Noise Amplifier (LNA) with bypass mode. The device is provided in a 1.5mm x 1.5mm x 0.50mm 8-pin DFN package.



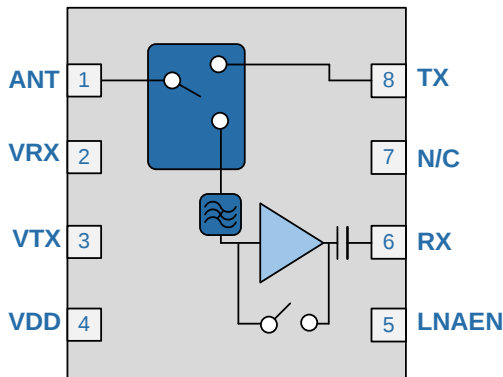
Package: DFN, 8-pin,  
1.5mm x 1.5mm x 0.50mm

## Features

- SP2T T/R Switch
- LNA with Bypass Mode
- Input and Output Matched to 50Ω
- Wide Voltage Supply Range
- Supports WiFi chipsets with Integrated Power Amplifier (iPA)
- Low Profile Package for Module Designs

## Applications

- Automotive WiFi
- WiFi Direct
- Automotive Diagnostics
- WiFi Infotainment
- 5GHz ISM Band Solutions for Automotive



Functional Block Diagram

## Ordering Information

|                  |                                                 |
|------------------|-------------------------------------------------|
| RFFM8550QSB      | Standard 5-piece sample bag                     |
| RFFM8550QSQ      | Standard 25-piece sample bag                    |
| RFFM8550QSR      | Standard 100-piece reel                         |
| RFFM8550QTR7     | Standard 2500-piece reel                        |
| RFFM8550QPCK-410 | Fully assembled evaluation board w/ 5-piece bag |

# RFFM8550Q

## Absolute Maximum Ratings

| Parameter                                         | Rating      | Unit |
|---------------------------------------------------|-------------|------|
| DC Supply Voltage (No RF Applied)                 | -0.5 to 6   | V    |
| DC Supply Current                                 | 100         | mA   |
| Operating Case Temperature                        | -40 to +85  | °C   |
| Storage Temperature                               | -40 to +150 | °C   |
| Maximum TX Input Power for 11b/g/n/ac (No Damage) | +30         | dBm  |
| Maximum RX Input Power (No Damage)                | +12         | dBm  |
| Bypass Mode Maximum RX input power (No damage)    | +25         | dBm  |
| Moisture Sensitivity                              | MSL1        |      |



**Caution!** ESD sensitive device.



RFMD Green: RoHS status based on EU Directive 2011/65/EU (at time of this document revision), halogen free per IEC 61249-2-21, < 1000ppm each of antimony trioxide in polymeric materials and red phosphorus as a flame retardant, and <2% antimony in solder.

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

## Nominal Operating Parameters

| Parameter                      | Specification |     |                 | Unit | Condition                                                                 |
|--------------------------------|---------------|-----|-----------------|------|---------------------------------------------------------------------------|
|                                | Min           | Typ | Max             |      |                                                                           |
| <b>Compliance:</b>             |               |     |                 |      | <b>802.11a / n / ac</b>                                                   |
| Operating Frequency            | 5.18          |     | 5.825           | GHz  |                                                                           |
| Operating Temperature          | -40           | 25  | 85              | °C   |                                                                           |
| Power Supply V <sub>DD</sub>   | 3.0           | 3.6 | 5.0             | V    |                                                                           |
| Control Voltage-high           | 2.8           | 3.1 | V <sub>CC</sub> | V    | VTX, VRX, and LNA_EN Should not exceed V <sub>CC</sub> voltage            |
| Control Voltage-low            |               | 0   | 0.24            | V    |                                                                           |
| <b>Transmit (TX-ANT)</b>       |               |     |                 |      | <b>Over all conditions unless otherwise noted</b>                         |
| Insertion Loss                 |               | 0.6 | 1.2             | dB   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V               |
|                                |               | 0.6 | 1.8             | dB   |                                                                           |
| TX Port Return Loss            | 12            | 25  |                 | dB   |                                                                           |
| ANT Port Return Loss           | 12            | 25  |                 | dB   |                                                                           |
| Input P1dB                     | 26            | 28  |                 | dBm  | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V; CW signal    |
| ANT-RX Isolation               | 28            | 35  |                 | dB   | TX Mode                                                                   |
| <b>Receive (ANT-RX)-LNA On</b> |               |     |                 |      | <b>Over all conditions unless otherwise noted</b>                         |
| Gain                           | 9             | 12  | 14              | dB   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V               |
|                                | 7             | 12  | 16              |      |                                                                           |
| Gain flatness                  | -0.25         |     | +0.25           | dB   | Over any 80MHz BW; Temp =25°C;V <sub>DD</sub> =3.6V; Control Voltage=3.1V |
| Gain flatness across band      | -1            |     | +1              | dB   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V               |
| Noise Figure-Nominal           |               | 2.5 | 3               | dB   |                                                                           |
|                                |               | 2.5 | 4.0             | dB   |                                                                           |
| Rx Port Return Loss            | 8             | 12  |                 | dB   |                                                                           |
| ANT Port Return Loss           | 8             | 10  |                 | dB   |                                                                           |
| Input P1dB                     | -6            | -3  |                 | dBm  | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V               |
| Current Consumption            | 6             | 12  | 14              | mA   |                                                                           |
|                                | 4             | 12  | 16              | mA   |                                                                           |
| LNAEN Control Current          |               | 140 | 250             | µA   |                                                                           |
| LNA Turn On Time               |               | 400 | 600             | nS   |                                                                           |

# RFFM8550Q

| Parameter                                 | Specification |      |     | Unit | Condition                                                   |
|-------------------------------------------|---------------|------|-----|------|-------------------------------------------------------------|
|                                           | Min           | Typ  | Max |      |                                                             |
| <b>Receive (ANT-RX)-Bypass Mode</b>       |               |      |     |      | <b>Over all conditions unless otherwise noted</b>           |
| Insertion Loss                            |               | 7    | 10  | dB   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V |
|                                           |               | 7    | 13  |      |                                                             |
| RX Port Return Loss                       | 8             | 12   |     | dB   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V |
| ANT Port Return Loss                      | 8             | 15   |     | dB   |                                                             |
| Input P1dB                                | 15            | 20   |     | dBm  |                                                             |
| <b>General Specifications</b>             |               |      |     |      |                                                             |
| V <sub>DD</sub> Leakage Current           |               | 1    | 10  | μA   |                                                             |
| Switch Control Current – High - Each Line |               | 2    | 10  | μA   |                                                             |
| Switch Control Current – Low - Each Line  |               | 0.2  | 1   | μA   | Temp = 25°C; V <sub>DD</sub> = 3.6V; Control Voltage = 3.1V |
| Switching Speed                           |               | 100  | 500 | ns   |                                                             |
| ESD – Human Body Model                    |               | 1000 |     | V    |                                                             |
| ESD – Charge Device Model                 |               | 1000 |     | V    |                                                             |

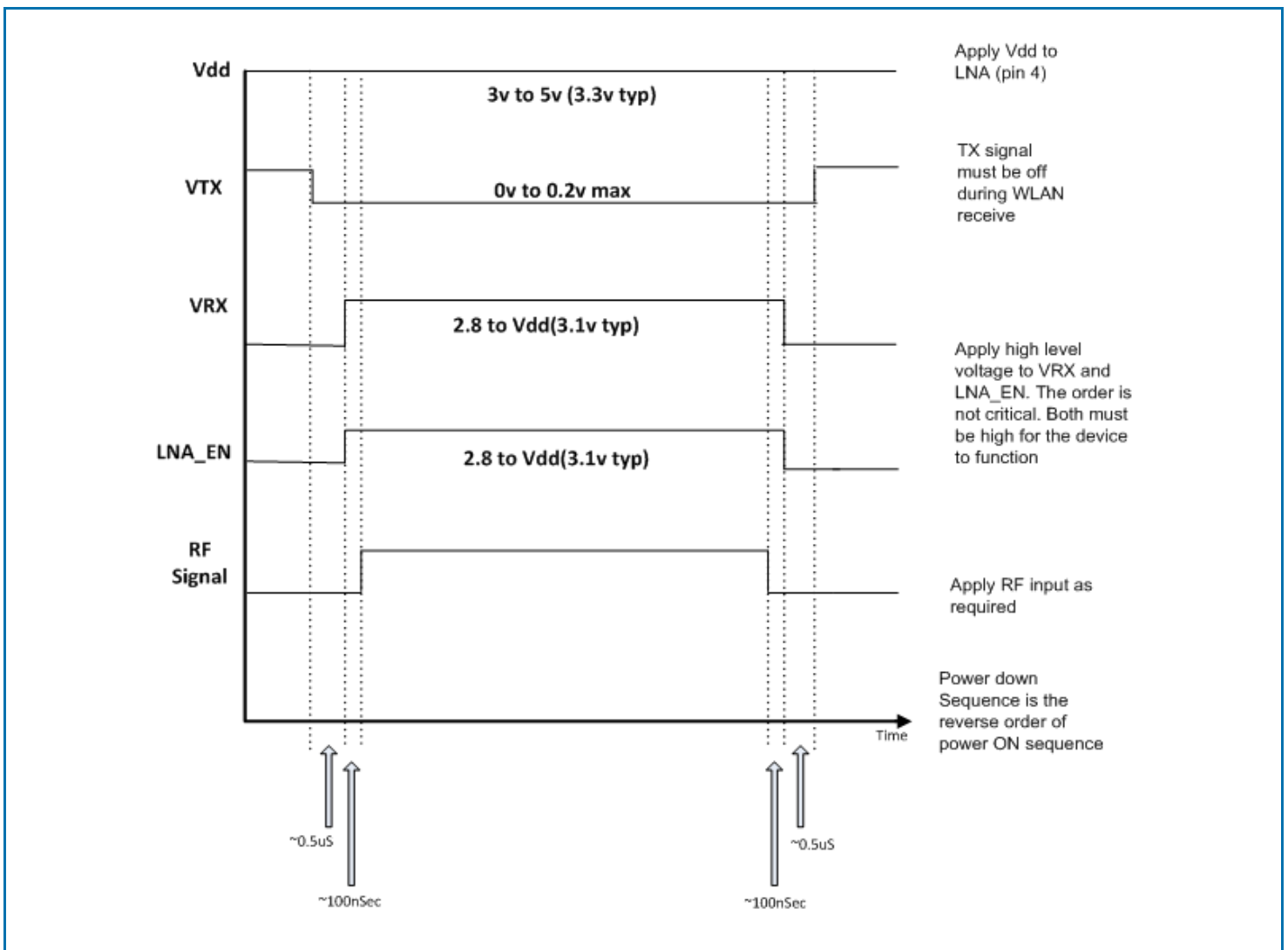
# RFFM8550Q

## Switch Control Logic Truth Table

| Operating Mode         | VTX  | LNAEN | VRX  |
|------------------------|------|-------|------|
| Standby                | Low  | Low   | Low  |
| 802.11a/n/ac TX Mode   | High | Low   | Low  |
| 802.11a/n/ac RX Gain   | Low  | High  | High |
| 802.11a/n/ac RX Bypass | Low  | Low   | High |

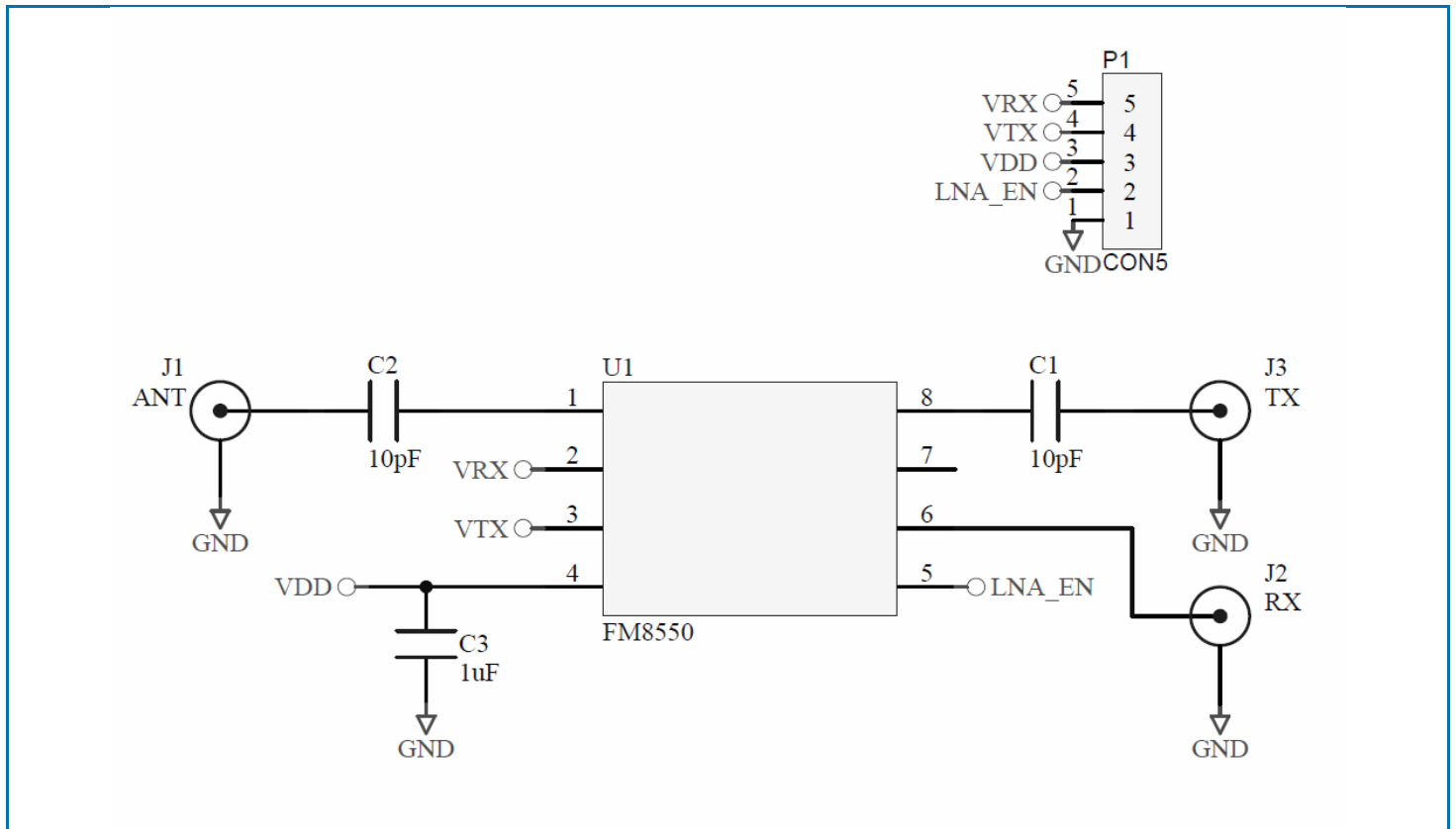
Note: High = 2.8 to  $V_{CC}$ . Low = 0V to 0.2V.

## Timing Diagram



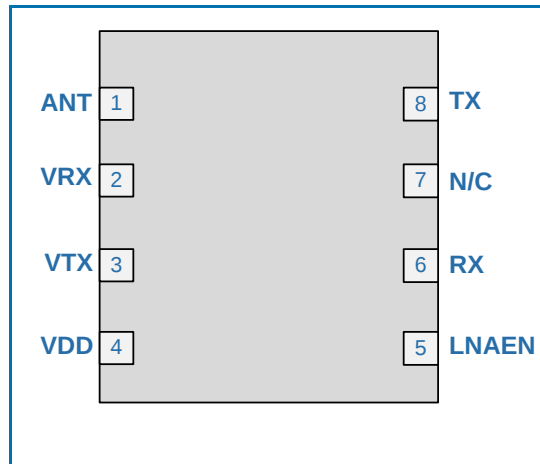
# RFFM8550Q

## Evaluation Board Schematic

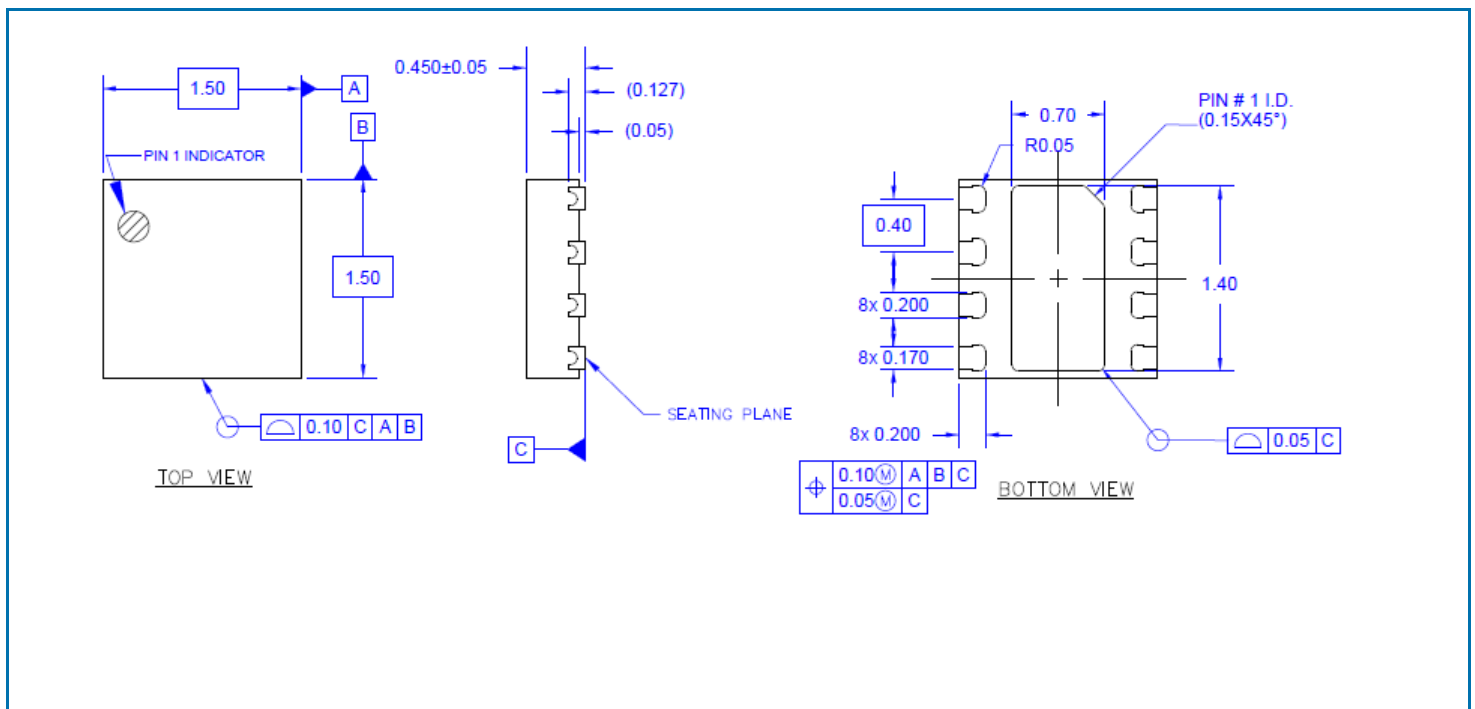


## RFFM8550Q

### Pin Out

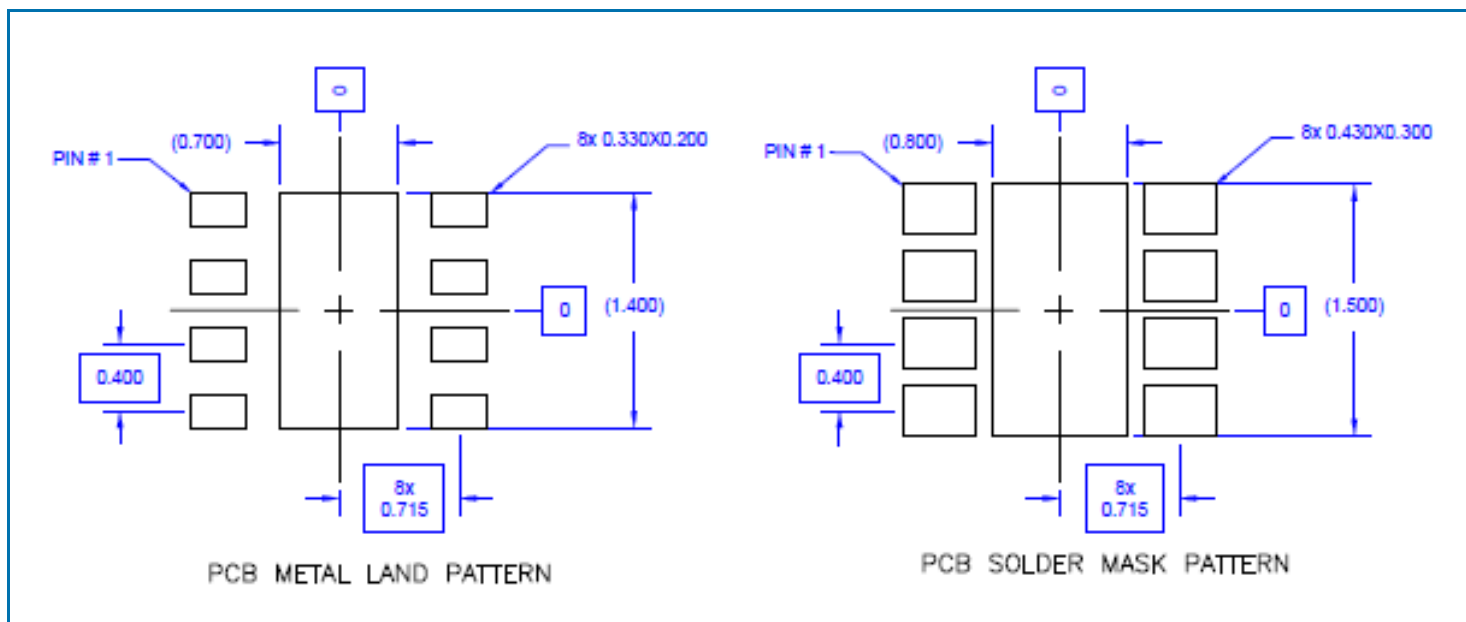


### Package Drawing (dimensions in mm)



## RFFM8550Q

### PCB Patterns (dimensions in mm)



Note: Thermal vias for center slug should be incorporated into the PCB design. The number and size of thermal vias will depend on the application, power dissipation, and electrical requirements. Example of the number and size of vias can be found on the RFMD evaluation board layout (gerber files are available upon request)



## RFFM8550Q

### Pin Names and Descriptions

| Pin      | Name  | Description                                                                                                                                                   |
|----------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1        | ANT   | RF bidirectional antenna port matched to 50Ω. An external DC block is required.                                                                               |
| 2        | VRX   | Receive switch control pin. See switch truth table for proper voltage level.                                                                                  |
| 3        | VTX   | Control voltage for the TX switch. See truth table for proper voltage level.                                                                                  |
| 4        | VDD   | Supply voltage for the LNA. See applications schematic for bypassing components.                                                                              |
| 5        | LNAEN | Control voltage for the LNA. When this pin is set to a LOW logic state, the bypass mode is enabled.                                                           |
| 6        | RX    | RF output port for the 802.11a/n/ac LNA. This port is matched to 50Ω and DC blocked internally                                                                |
| 7        | N/C   | This pin is not connected internally and can be left floating or connected to ground.                                                                         |
| 8        | TX    | RF input port for the TX throw of the T/R switch. An external DC block is required                                                                            |
| Pkg Base | GND   | Ground connection. The backside of the package should be connected to the ground plane through a short path, i.e., PCB vias under the device are recommended. |

### Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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