

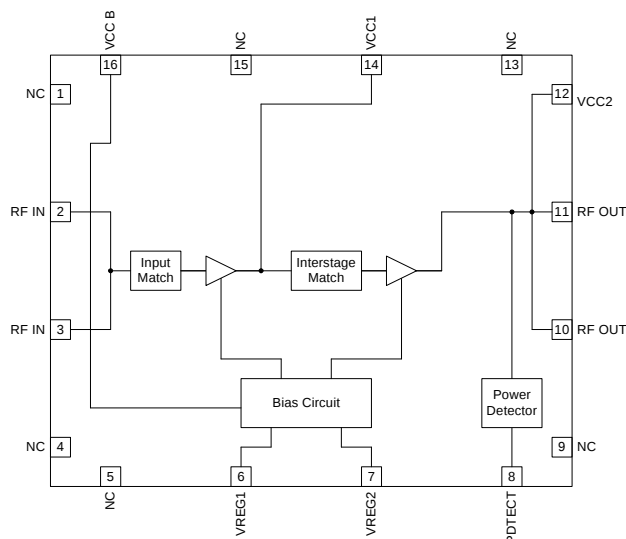


### Features

- Single Power Supply 3.0V to 5V
- +21dBm, <4.0% EVM, 185mA at  $V_{CC}=3.3V$
- +23dBm, <4% EVM, 250mA at  $V_{CC}=5.0V$
- 28dB Typical Small Signal Gain
- 50 $\Omega$  Input and Interstage Matching
- 2400MHz to 2500MHz Frequency Range

### Applications

- IEEE802.11b/g/n WiFi Applications
- 2.5GHz ISM Band Applications
- Commercial and Consumer Systems
- Portable Battery-Powered Equipment
- Spread-Spectrum and MMDS Systems



Functional Block Diagram

### Product Description

The RF5102 is a linear, medium-power, high-efficiency, two-stage amplifier IC designed specifically for battery-powered WiFi applications such as PC cards, mini PCI, and compact flash applications. The device is manufactured on an advanced InGaP Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in 2.5GHz OFDM and other spread-spectrum transmitters. The device is provided in a 3mmx3mmx0.9mm, 16-pin, QFN with a backside ground. The RF5102 is designed to maintain linearity over a wide range of supply voltage and power output.

### Ordering Information

|                   |                                                  |
|-------------------|--------------------------------------------------|
| RF5102            | Standard 25 piece bag                            |
| RF5102SR          | Standard 100 piece reel                          |
| RF5102TR7         | Standard 2500 piece reel                         |
| RF5102PCK-41X     | Fully Assembled Evaluation Board Kit (3.3V tune) |
| RF5102WL50PCK-41X | Fully Assembled Evaluation Board Kit (5.0V Tune) |

### Optimum Technology Matching® Applied

|                                               |                                      |                                     |                                   |
|-----------------------------------------------|--------------------------------------|-------------------------------------|-----------------------------------|
| <input type="checkbox"/> GaAs HBT             | <input type="checkbox"/> SiGe BiCMOS | <input type="checkbox"/> GaAs pHEMT | <input type="checkbox"/> GaN HEMT |
| <input type="checkbox"/> GaAs MESFET          | <input type="checkbox"/> Si BiCMOS   | <input type="checkbox"/> Si CMOS    | <input type="checkbox"/> RF MEMS  |
| <input checked="" type="checkbox"/> InGaP HBT | <input type="checkbox"/> SiGe HBT    | <input type="checkbox"/> Si BJT     | <input type="checkbox"/> LDMOS    |

## Absolute Maximum Ratings

| Parameter                           | Rating      | Unit |
|-------------------------------------|-------------|------|
| Supply Voltage                      | 5           | V    |
| Power Control Voltage ( $V_{REG}$ ) | 3.3         | V    |
| DC Supply Current                   | 500         | mA   |
| Input RF Power                      | +5          | dBm  |
| Operating Ambient Temperature       | -40 to +85  | °C   |
| Storage Temperature                 | -40 to +150 | °C   |
| Moisture Sensitivity                | MSL2        |      |



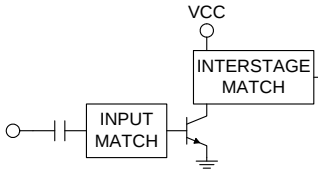
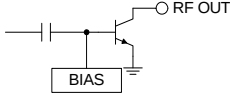
Caution! ESD sensitive device.

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.

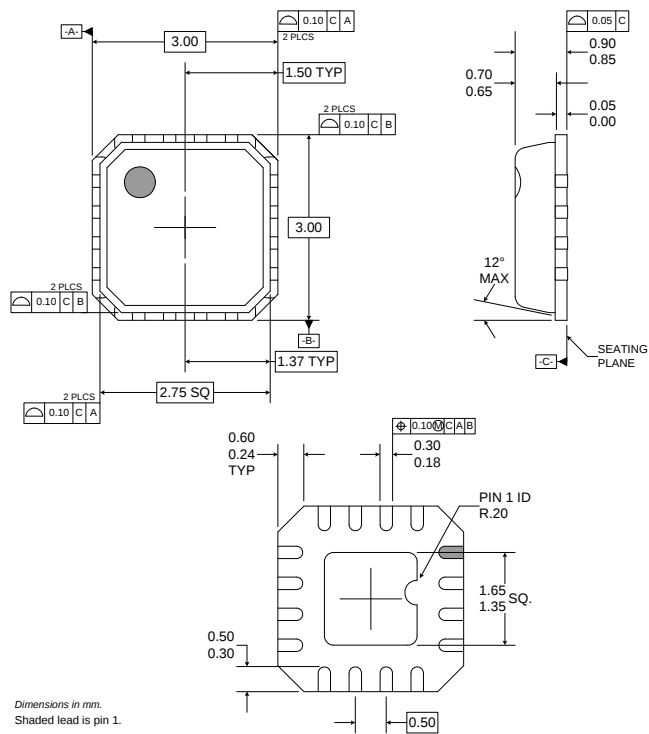
RoHS status based on EUDirective2002/95/EC (at time of this document revision).

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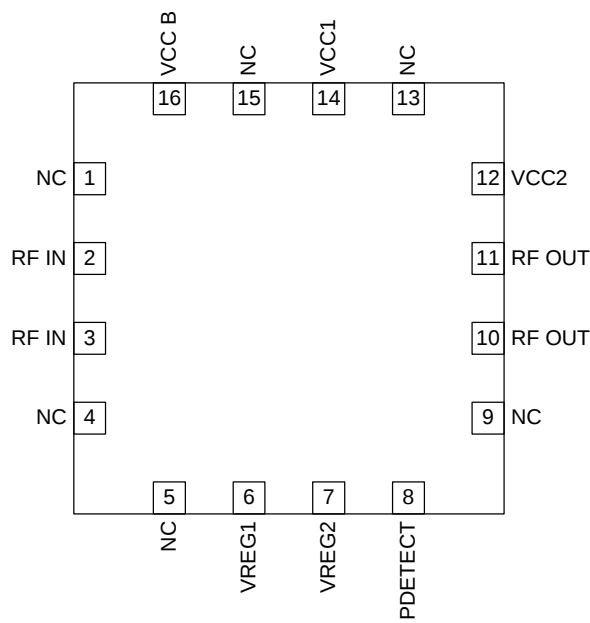
| Parameter                                               | Specification |      |      | Unit     | Condition                                                                                                                                                                                                               |
|---------------------------------------------------------|---------------|------|------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                         | Min.          | Typ. | Max. |          |                                                                                                                                                                                                                         |
| <b>Compliance and Nominal Conditions</b>                |               |      |      |          | IEEE802.11g, IEEE802.11b, FCC CFG 15.247, .205, .209, EN and JDEC<br><br>$V_{CC}=3.3V$ , $V_{REG}=2.85V$ pulsed at 1% to 99% duty cycle, Temp=+25°C, Freq=2.4GHz to 2.5GHz, OFDM 54Mbps signal, unless noted otherwise. |
| Frequency Range                                         | 2400          |      | 2500 | MHz      |                                                                                                                                                                                                                         |
| Linear Output Power                                     |               | 21.0 |      | dBm      | $V_{CC}=3.3V$ . Meets 802.11g spectral mask                                                                                                                                                                             |
|                                                         |               | 23.0 |      | dBm      | $V_{CC}=5.0V$ . Meets 802.11g spectral mask                                                                                                                                                                             |
| EVM                                                     |               | 3.3  | 4.0  | %        | $P_{OUT}=+21dBm$ , 54M OFDM, $V_{CC}=3.3V_{DC}$                                                                                                                                                                         |
|                                                         |               | 3.3  | 4.0  | %        | $P_{OUT}=+23dBm$ , 54M OFDM, $V_{CC}=5.0V_{DC}$                                                                                                                                                                         |
| Gain                                                    | 26            | 28   |      | dB       | Both $P_{OUT}=+21dBm$ and $+23dBm$ . $V_{CC}=3.3V$ and $5.0V$ .                                                                                                                                                         |
| Input Impedance                                         |               | 50   |      | $\Omega$ | Internally Matched Input and Interstage                                                                                                                                                                                 |
| Output VSWR                                             |               |      | 10:1 |          | No spurs above -43dBm                                                                                                                                                                                                   |
| <b>Power Detector (<math>P_{detect}</math>)</b>         |               |      |      |          |                                                                                                                                                                                                                         |
| $P_{OUT}=21dBm$                                         | 0.13          |      | 1.10 | V        | $V_{CC}=3.3V$                                                                                                                                                                                                           |
| $P_{OUT}=23dBm$                                         | 0.13          |      | 2.2  | V        | $V_{CC}=5.0V$                                                                                                                                                                                                           |
| <b>Power Supply</b>                                     |               |      |      |          |                                                                                                                                                                                                                         |
| Operating Voltage                                       | 3.0           | 3.3  | 5.0  | $V_{DC}$ | 5V operation requires output match revision                                                                                                                                                                             |
| $V_{REG}$ (Bias) Voltage<br>( $V_{REG1}$ , $V_{REG2}$ ) | 2.75          | 2.85 | 2.95 | $V_{DC}$ |                                                                                                                                                                                                                         |
| Current Consumption                                     |               | 185  |      | mA       | RF $P_{OUT}=+21dBm$ , $V_{CC}=3.3V$ , 54Mbps OFDM                                                                                                                                                                       |
|                                                         |               | 250  |      |          | RF $P_{OUT}=+23dBm$ , $V_{CC}=5.0V$ , 54Mbps OFDM                                                                                                                                                                       |
| Quiescent Current                                       |               | 95   |      | mA       | RF=OFF                                                                                                                                                                                                                  |
| Leakage Current                                         |               |      | 10   | uA       | $V_{CC}=ON$ ; RF In=OFF; $V_{REG}$ OFF                                                                                                                                                                                  |
| $V_{REG}$ (Bias) Current (Total)                        |               |      | 3    | mA       | $V_{CC}=3.3V$                                                                                                                                                                                                           |
|                                                         |               |      | 3    | mA       | $V_{CC}=5.0V$                                                                                                                                                                                                           |

| Pin      | Function          | Description                                                                                                                                                      | Interface Schematic                                                                 |
|----------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1        | NC                | Not connected. May be connected to ground (GND).                                                                                                                 |                                                                                     |
| 2        | RF IN             | RF input. See evaluation board schematic for details.                                                                                                            |  |
| 3        | RF IN             | RF input. See evaluation board schematic for details.                                                                                                            | See pin 2.                                                                          |
| 4        | NC                | Not connected. May be connected to ground (GND).                                                                                                                 |                                                                                     |
| 5        | NC                | Do not connect.<br>Note: VCC voltage may be applied to this pin without damage to, or affecting the performance of, the RF5102.                                  |                                                                                     |
| 6        | VREG1             | Bias current control voltage for the first stage.                                                                                                                |                                                                                     |
| 7        | VREG2             | Bias current control voltage for the second stage. The VREG2 pin may be connected to VREG1 through an external resistor bridge.                                  |                                                                                     |
| 8        | PDETECT (or N/C*) | Provides an output voltage proportional to the output RF level.<br>*In applications where the PDETECT function is not desired, this pin may be left unconnected. |                                                                                     |
| 9        | NC                | No-connect.                                                                                                                                                      |                                                                                     |
| 10       | RF OUT            | RF output.                                                                                                                                                       |  |
| 11       | RF OUT            | Same as pin 10.                                                                                                                                                  | See pin 10.                                                                         |
| 12       | VCC2              | Power supply for second stage amplifier. Connect as shown on evaluation board schematic.                                                                         |                                                                                     |
| 13       | NC                | Not connected. May be connected to ground (GND).                                                                                                                 |                                                                                     |
| 14       | VCC1              | Power supply for first stage amplifier. Connect as shown on evaluation board schematic.                                                                          |                                                                                     |
| 15       | NC                | Not connected. May be connected to ground (GND).                                                                                                                 |                                                                                     |
| 16       | VCC B             | Supply voltage for the bias reference and control circuits. May be connected with VC1 and VC2 (single-supply voltage).                                           |                                                                                     |
| Pkg Base | GND               | The center metal base of the QFN package provides DC and RF ground as well as heat sink for the amplifier.                                                       |                                                                                     |

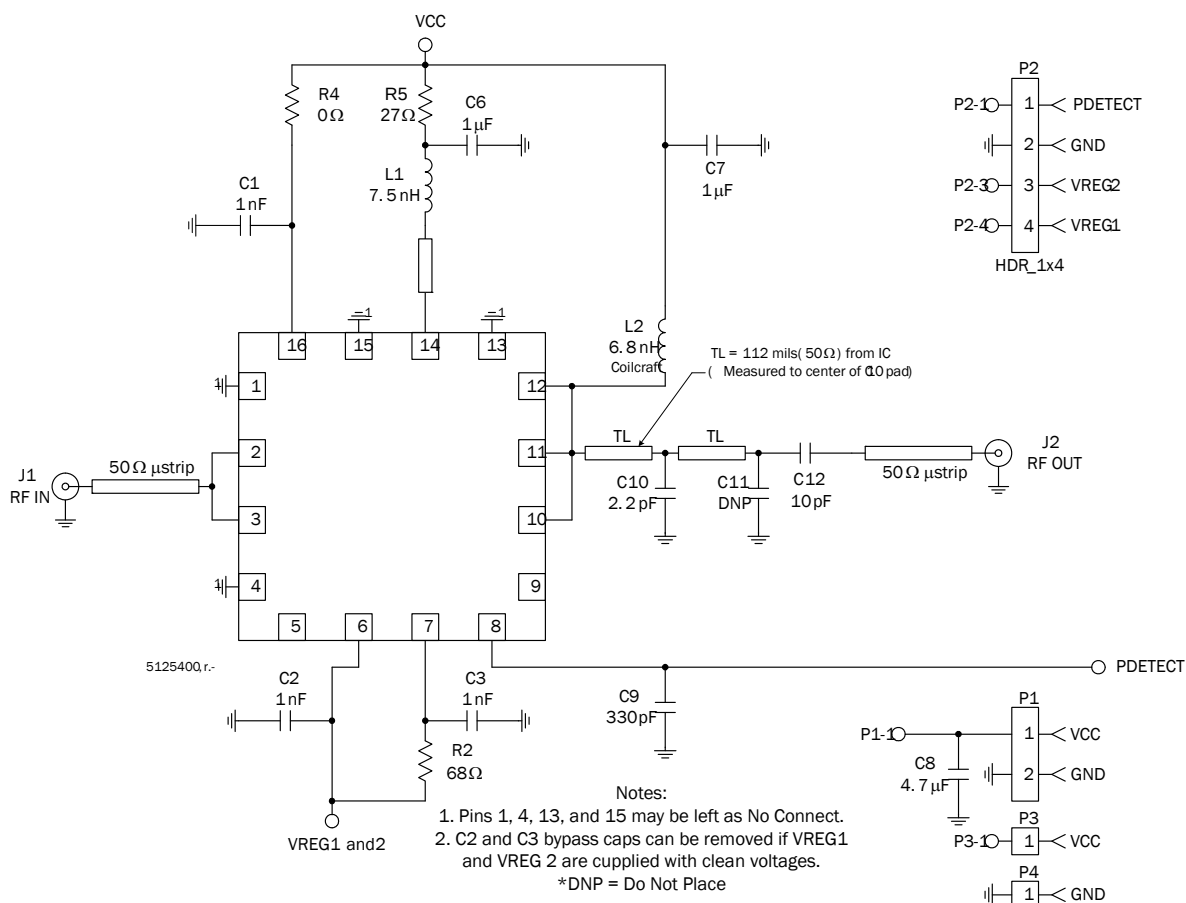
Package Drawing



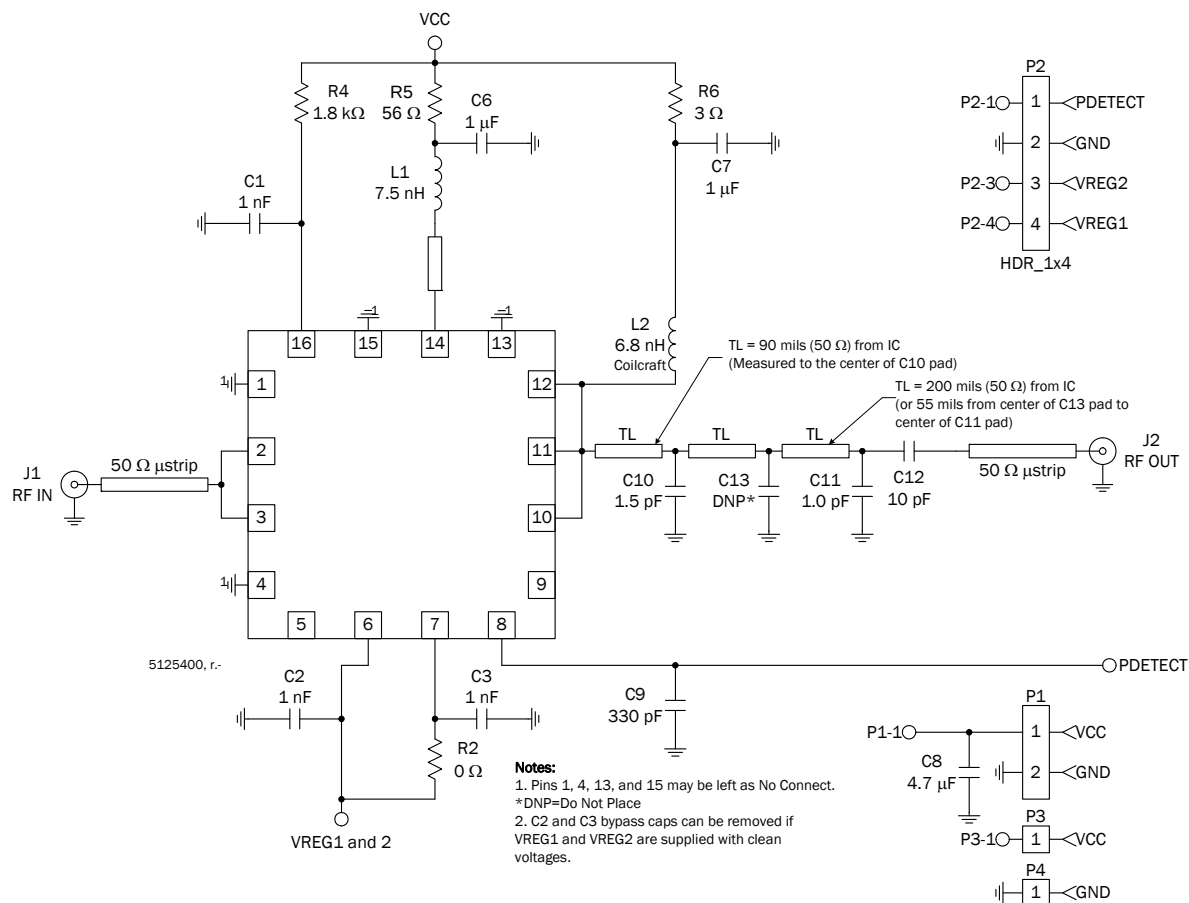
Pin Out



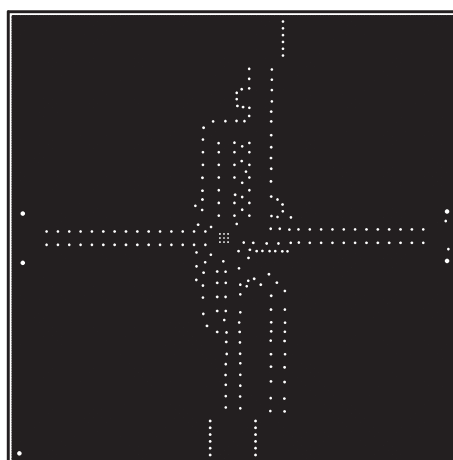
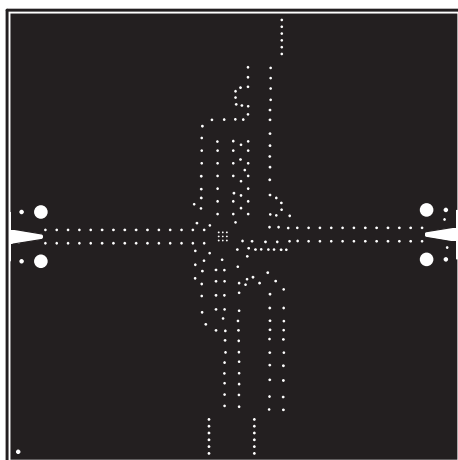
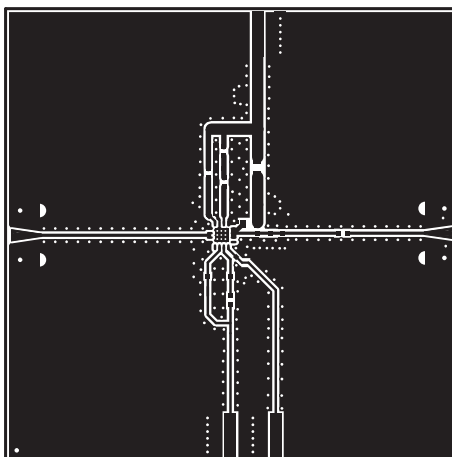
## Evaluation Board Schematic - 3.3V



## Evaluation Board Schematic - 5V

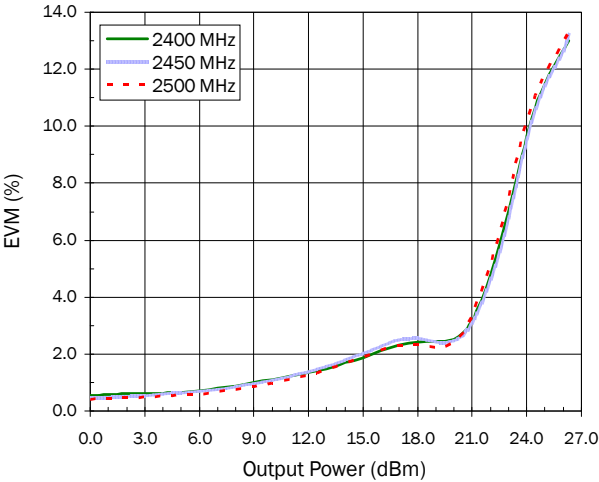


**Evaluation Board Layout**  
**Board Size 2.0" x 2.0"**  
**Board Thickness 0.031", Board Material FR-4, Multi-Layer**

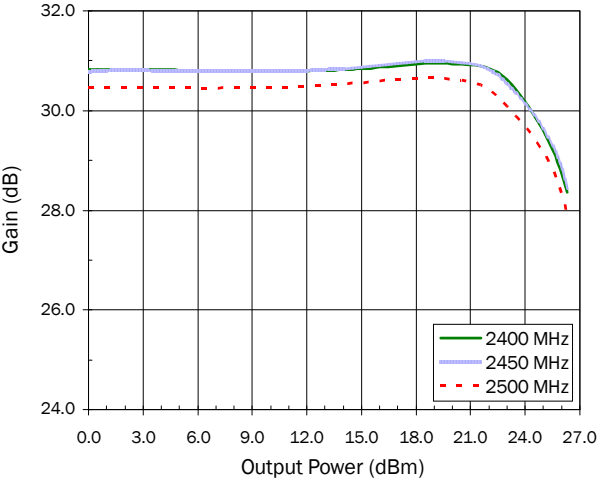


3.3V Operation Typical Performance

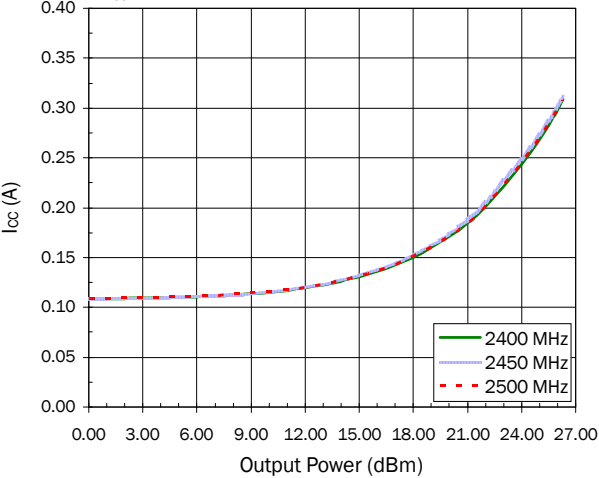
EVM versus Output Power versus Frequency  
V<sub>cc</sub>=3.3V, OFDM 54Mbps, 50% Duty Cycle, Temp=25 °C



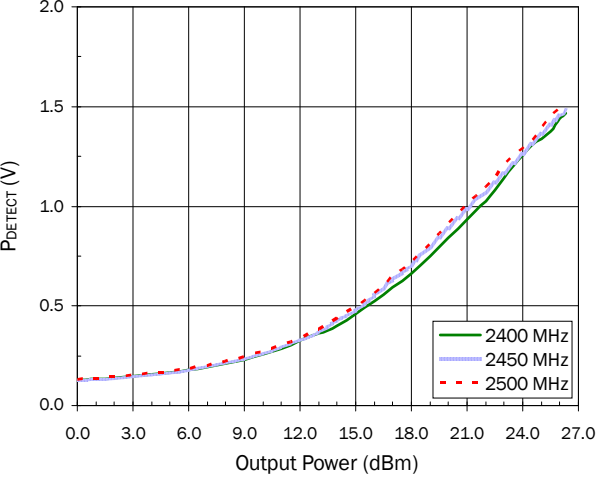
Gain versus Output Power versus Frequency  
V<sub>cc</sub>=3.3V, OFDM 54Mbps, 50% Duty Cycle, Temp=25 °C



I<sub>cc</sub> versus Output Power versus Frequency  
V<sub>cc</sub>=3.3V, OFDM 54Mbps, 50% Duty Cycle, Temp=25 °C



P<sub>DETECT</sub> versus Output Power versus Frequency  
V<sub>cc</sub>=3.3V, OFDM 54Mbps, 50% Duty Cycle, Temp=25 °C



## PCB Design Requirements

### PCB Surface Finish

The PCB surface finish used for RFMD's qualification process is electroless nickel, immersion gold. Typical thickness is 3μinch to 8μinch gold over 180μinch nickel.

### PCB Land Pattern Recommendation

PCB land patterns for RFMD components are based on IPC-7351 standards and RFMD empirical data. The pad pattern shown has been developed and tested for optimized assembly at RFMD. The PCB land pattern has been developed to accommodate lead and package tolerances. Since surface mount processes vary from company to company, careful process development is recommended.

### PCB Metal Land Pattern

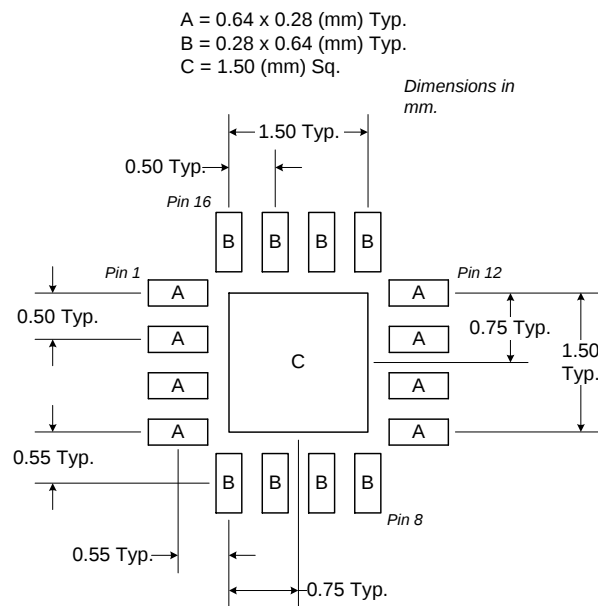


Figure 1. PCB Metal Land Pattern (Top View)

## PCB Solder Mask Pattern

Liquid Photo-Imageable (LPI) solder mask is recommended. The solder mask footprint will match what is shown for the PCB metal land pattern with a 2mil to 3mil expansion to accommodate solder mask registration clearance around all pads. The center-grounding pad shall also have a solder mask clearance. Expansion of the pads to create solder mask clearance can be provided in the master data or requested from the PCB fabrication supplier.

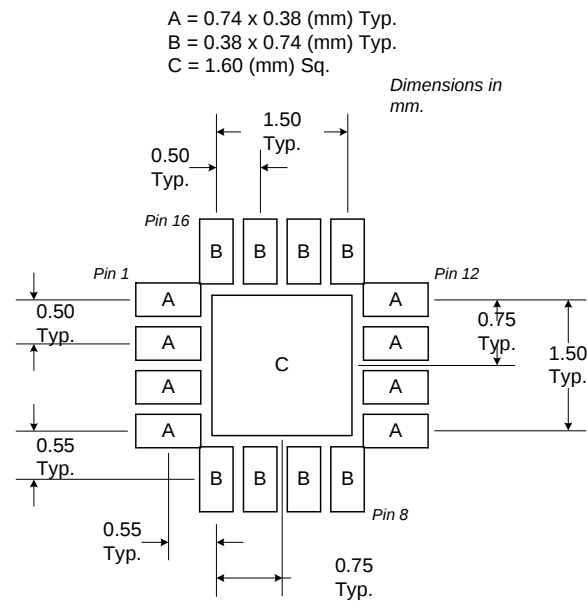


Figure 2. PCB Solder Mask Pattern (Top View)

## Thermal Pad and Via Design

The PCB land pattern has been designed with a thermal pad that matches the die paddle size on the bottom of the device.

Thermal vias are required in the PCB layout to effectively conduct heat away from the package. The via pattern has been designed to address thermal, power dissipation and electrical requirements of the device as well as accommodating routing strategies.

The via pattern used for the RFMD qualification is based on thru-hole vias with 0.203mm to 0.330mm finished hole size on a 0.5mm to 1.2mm grid pattern with 0.025mm plating on via walls. If micro vias are used in a design, it is suggested that the quantity of vias be increased by a 4:1 ratio to achieve similar results.

## RoHS\* Banned Material Content

RoHS Compliant: Yes  
 Package total weight in grams (g): 0.015  
 Compliance Date Code: N/A  
 Bill of Materials Revision: -  
 Pb Free Category: e3

| Bill of Materials | Parts Per Million (PPM) |    |    |       |     |      |
|-------------------|-------------------------|----|----|-------|-----|------|
|                   | Pb                      | Cd | Hg | Cr VI | PBB | PBDE |
| Die               | 0                       | 0  | 0  | 0     | 0   | 0    |
| Molding Compound  | 0                       | 0  | 0  | 0     | 0   | 0    |
| Lead Frame        | 0                       | 0  | 0  | 0     | 0   | 0    |
| Die Attach Epoxy  | 0                       | 0  | 0  | 0     | 0   | 0    |
| Wire              | 0                       | 0  | 0  | 0     | 0   | 0    |
| Solder Plating    | 0                       | 0  | 0  | 0     | 0   | 0    |

This RoHS banned material content declaration was prepared solely on information, including analytical data, provided to RFMD by its suppliers, and applies to the Bill of Materials (BOM) revision noted above.

\* DIRECTIVE 2002/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

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- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
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- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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