rfmd.com

# RF5187

## LOW POWER LINEAR AMPLIFIER

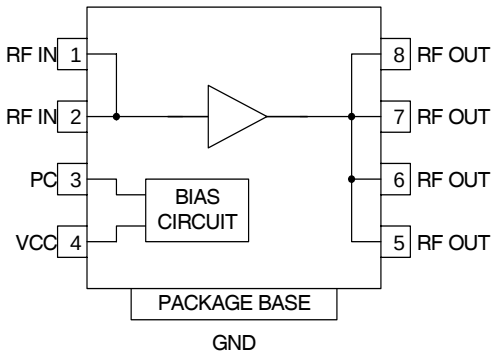
RoHS Compliant & Pb-Free Product
Package Style: SOIC-8 Slug


## Features

- Single 3V to 6V Supply
- 10dBm to 20dBm Ultra Linear Output Power
- 14dB Gain at 2.14GHz
- Power Down Mode
- 800MHz to 2500MHz Operation

## Applications

- 2.14GHz UMTS Systems
- Digital Communication Systems
- PCS Communication Systems
- Commercial and Consumer Systems




Functional Block Diagram

## Product Description

The RF5187 is a highly-linear, low-power amplifier IC. It has been designed for use as the driver RF amplifier in applications such as W-CDMA basestations. The RF5187 requires an input and output matching network and power supply feed line. The device is manufactured on an advanced Gallium Arsenide HBT process, and is packaged in a 8-pin plastic package with a backside ground.

### Ordering Information

| | |
|---|---|
| RF5187 | Low Power Linear Amplifier |
| RF5187PCBA-41X | Fully Assembled Evaluation Board |

### Optimum Technology Matching® Applied

| | | | |
|---|---|---|---|
| ☑ GaAs HBT | ☐ SiGe BiCMOS | ☐ GaAs pHEMT | ☐ GaN HEMT |
| ☐ GaAs MESFET | ☐ Si BiCMOS | ☐ Si CMOS | |
| ☐ InGaP HBT | ☐ SiGe HBT | ☐ Si BJT | |





7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Supply Voltage ($V_{CC}$) | -0.5 to +6.5 | $V_{DC}$ |
| Power Control Voltage ($V_{PC}$) | -0.5 to +5V | V |
| DC Supply Current | 300 | mA |
| Input RF Power | +20 | dBm |
| Output Load VSWR | 20:1 | |
| Operating Ambient Temperature | -40 to +85 | °C |
| Storage Temperature | -40 to +100 | °C |

**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).



| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **Overall** | | | | | T=25°C, $V_{CC}$=5.0V, $I_{CC}$=240mA, Freq=2140MHz, $P_{OUT}$=13dBm |
| Frequency Range | 800 | | 2500 | MHz | |
| Output Power | | 13 | | dBm | |
| OP1dB | | 29 | | dBm | |
| Small Signal Gain | 13 | | 15 | dB | |
| Input VSWR | | 1.5:1 | | | With external matching network. |
| **Two-Tone Specification** | | | | | |
| Output IP3 | 41 | 43 | 45 | dBm | 13dBm per tone. |
| **Power Control** | | | | | |
| $V_{PC}$ | 2.7 | 3.1 | 3.7 | V | To obtain 240mA idle current. |
| Power Control "OFF" | 0.2 | 0.5 | | V | Threshold voltage at device input. |
| **Power Supply** | | | | | |
| Power Supply Voltage | 5 | | 6 | V | |
| Supply Current | | | 240 | mA | |
| Power Down Current | | 2 | 10 | µA | $V_{PC}$=0.2V |

Note: For infrastructure class operation, the maximum allowable current over all operating conditions is 260mA. This implies the need for an external active bias control network to control $I_{CC}$ over temperature and normal process variation. A recommended active bias control circuit is included in the datasheet.

The maximum continuous allowable dissipated power ($I_{CC}$ * $V_{CC}$-$P_{RF}$) for this part is 1.3W. For $V_{CC}$=5.0V, this implies an $I_{CC}$ limit of 260mA. A $V_{CC}$ of 6.0V would have an $I_{CC}$ limit of 215mA.

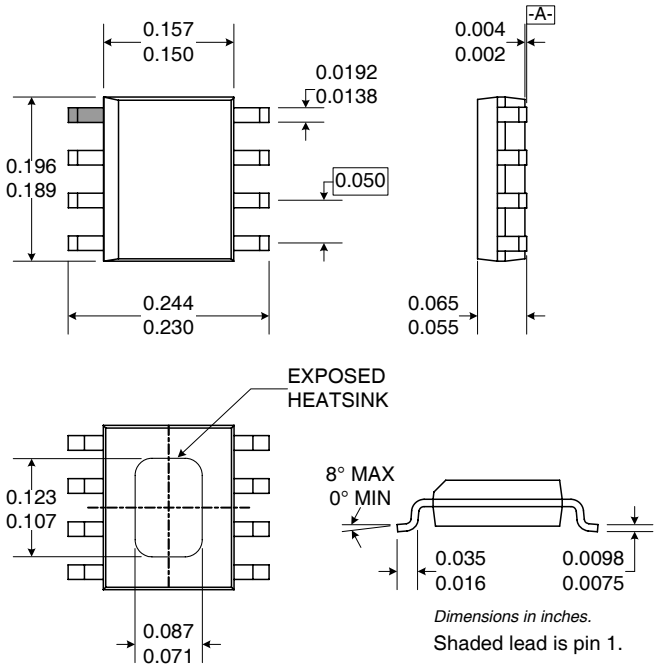
A constant $I_{CC}$ of 180mA to 220mA provides an excellent combination of high linearity and low power dissipation. Refer to W-CDMA ACP curves at bottom of datasheet.



7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

| Pin | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | RF IN | RF input. This input is DC-coupled, so an external blocking capacitor is required if this pin is connected to a DC path. An optimum match to 50Ω is obtained by providing an external series capacitor of 2.4pF and then a shunt capacitor of 2.4pF. Those values are typical for 2140MHz; other values may be required for other frequencies. | |
| 2 | RF IN | Same as pin 1. | |
| 3 | PC | Power control pin. For obtaining maximum performance, the voltage on this pin can be used to set correct bias level. For low power linear applications, it is recommended that a constant bias control loop be used (see datasheet evaluation board schematic). A voltage of 0.5V or less at $V_{PC}$ brings the part into Power Down State. | |
| 4 | VCC | Power supply pin for the bias circuits. External low frequency bypass capacitors should be connected if no other low frequency decoupling is nearby. | |
| 5 | RF OUT | RF output and bias for the output stage. The power supply for the output transistor needs to be supplied to this pin. This can be done through a quarter-wavelength microstrip line that is RF-grounded at the other end, or through an RF inductor that supports the required DC currents. Optimum load impedance is achieved by providing a shunt capacitor of 1.8pF and a series capacitor of 3.3pF. Those values are typical for 2140MHz; other values may be required for other frequencies. Since there are several output pins available (which are internally connected), one pin can be used for connecting the bias, another for connecting a (third) harmonic trap filter, and the other pins for the RF output. | |
| 6 | RF OUT | Same as pin 5. | |
| 7 | RF OUT | Same as pin 5. | |
| 8 | RF OUT | Same as pin 5. | |
| Pkg Base | GND | Ground connection. The backside of the package should be connected to the ground plane through a short path (i.e., vias under the device may be required). | |

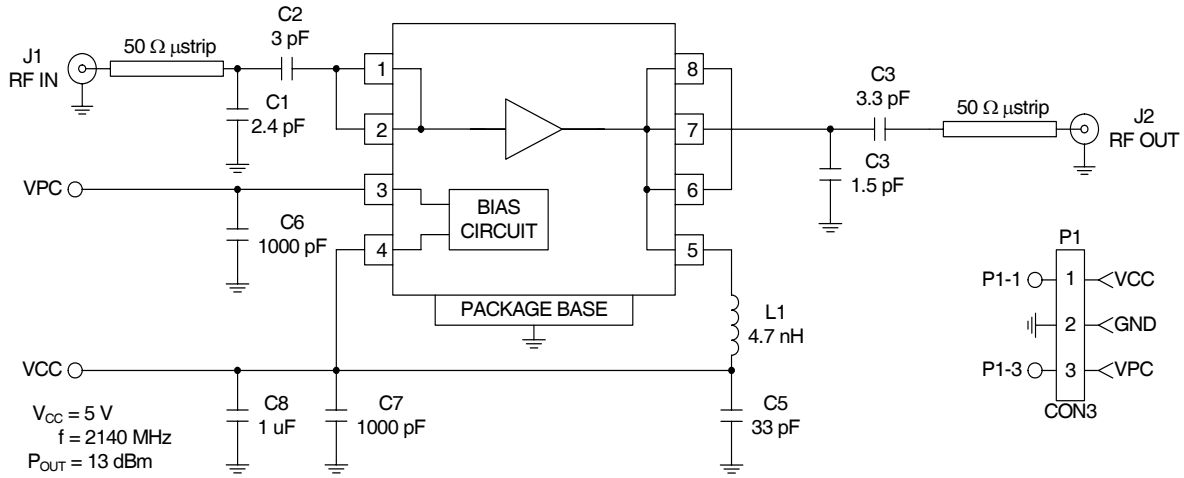
## Package Drawing



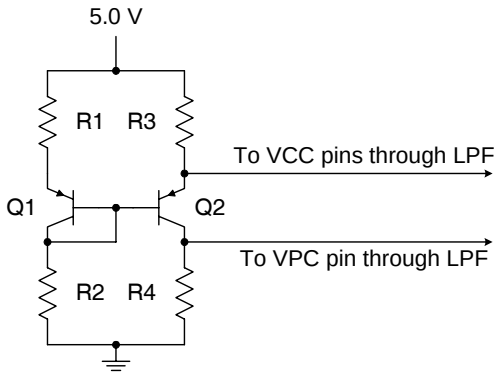

*Dimensions in inches.*
Shaded lead is pin 1.


7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

## Evaluation Board Schematic
## 2140 MHz Operation



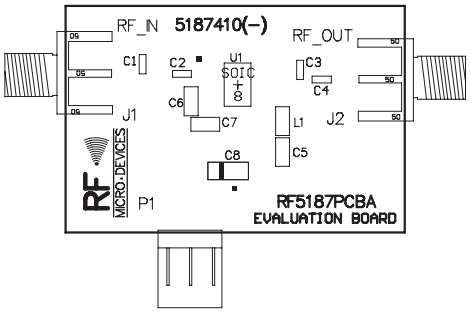

## Constant Bias Circuit

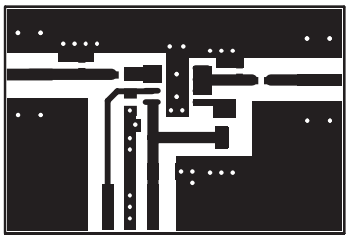


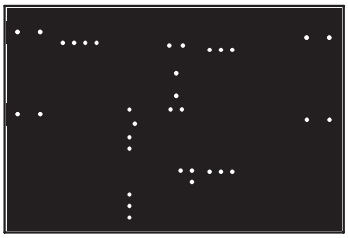

| Bias Point | R1 | R2 | R3 | R4 |
|---|---|---|---|---|
| mA | Ω | Ω | Ω | Ω |
| 100 | 120 | 1200 | 3.6 | 820 |
| 120 | 120 | 1200 | 3.0 | 820 |
| 150 | 120 | 1200 | 2.5 | 820 |
| 180 | 120 | 1200 | 2.0 | 820 |
| 200 | 120 | 1200 | 1.8 | 820 |
| 220 | 120 | 1200 | 1.7 | 820 |
| 240 | 120 | 1200 | 1.6 | 820 |

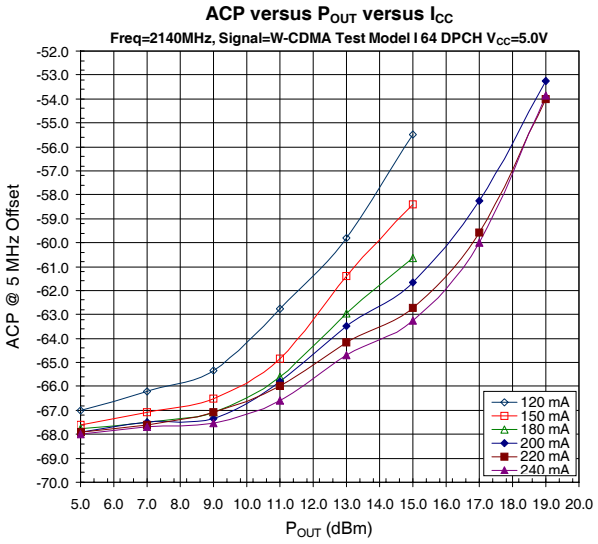

7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

## Evaluation Board Layout
## Board Size 1.5” x 1.0”
### Board Thickness 0.031”, Board Material FR-4










7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.

7628 Thorndike Road, Greensboro, NC 27409-9421 · For sales or technical support, contact RFMD at (+1) 336-678-5570 or sales-support@rfmd.com.