

Package: QFN, 16-Pin, 3 mm x 3 mm



Product Description

The RFFC0085 is a downconverter designed to be used as an Out-of-Band Tuner for use in CATV set-top box and Digital Cable Ready TV applications. The RFFC0085 consists of an input AGC amplifier, mixer, and a video/AGC amplifier. This device offers optimum performance with low power consumption and low distortion. This product is RoHS compliant.

Features

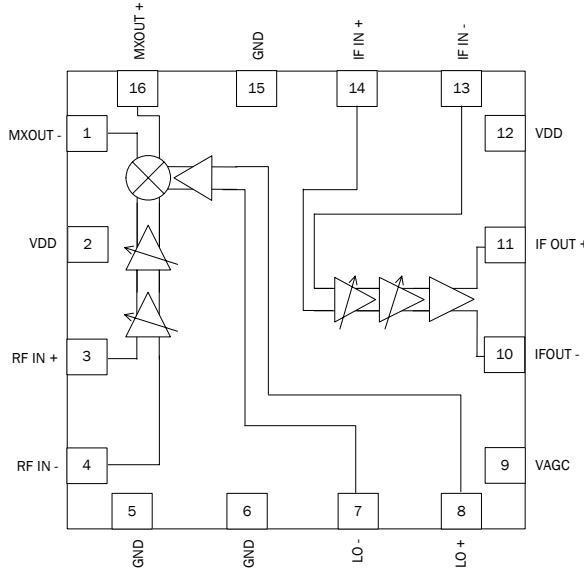
- 3.3V Single Supply Operation
- Low Power Consumption (345 mW)
- Low Distortion: -53dBc at 1V_{pp}
- 77 dB Total Conversion Gain
- 55 dB Total Gain Control Range
- Low LO-RF Leakage

Applications

- Cable Set-Top Boxes
- Digital Cable Ready Televisions

Optimum Technology Matching® Applied

- GaAs HBT
- GaAs MESFET
- InGaP HBT
- SiGe BiCMOS
- Si BiCMOS
- SiGe HBT
- GaAs pHEMT
- Si CMOS
- Si BJT
- GaN HEMT
- InP HBT
- RF MEMS
- LDMOS



| Parameter | Specification | | | Unit | Condition |
|-----------------------------|---------------|------|------|-----------------|--|
| | Min. | Typ. | Max. | | |
| RF Input Frequency Range | 50 | | 150 | MHz | High Side LO |
| LO Input Frequency Range | 80 | | 220 | MHz | High Side LO |
| Maximum Conversion Gain | | 77 | | dB | Includes saw filter loss at V _{AGC} =3.0V |
| AGC Voltage | 0 | | 3 | V | |
| AGC Dynamic Range | 50 | 55 | | dB | V _{AGC} =0V to 3.0V |
| Third Order Intermodulation | 53 | 60 | | dBc | 1V _{pp} Differential Output, 1kΩ load |
| IF Output Level | | 1 | 2 | V _{pp} | Differential Output, 1kΩ load |
| Noise Figure | | 15 | 16.5 | dB | V _{AGC} =3.0V |
| LO Leakage at the RF Port | | | -87 | dB | |
| Supply Voltage | 3.0 | 3.3 | 3.6 | V | |
| Supply Current | | 106 | 123 | mA | V _{AGC} =3.0V |
| | | 104 | 123 | mA | V _{AGC} =0.0V |

Test Conditions: T_A = 25 °C, V_{DD} = 3.3V, unless otherwise specified

Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|--------------|------|
| Supply Voltage (V_{DD}) | -0.3 to +3.6 | V |
| Operating Temperature (T_{OP}) | -40 to +85 | °C |
| Storage Temperature (T_{STG}) | -65 to +150 | °C |
| Junction Temperature (T_j) | 99 | °C |
| RF Input ($V_{AGC}=0V_{DC}$) for an IF OUT=1V _{P-P} | 30 | dBmV |
| RF Input ($V_{AGC}=3V_{DC}$) for an IF OUT=1V _{P-P} | -24 | dBmV |



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.

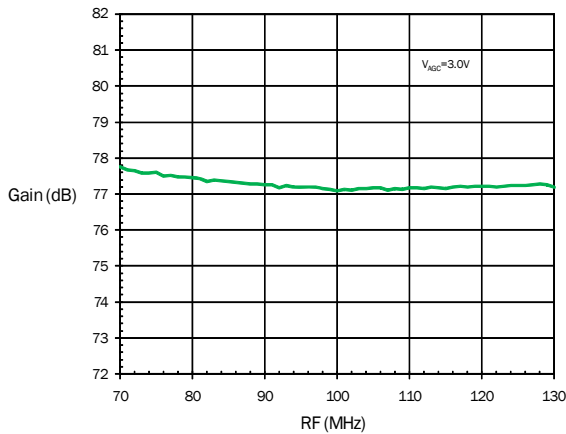
RoHS status based on EU Directive 2002/95/EC (at time of this document revision).

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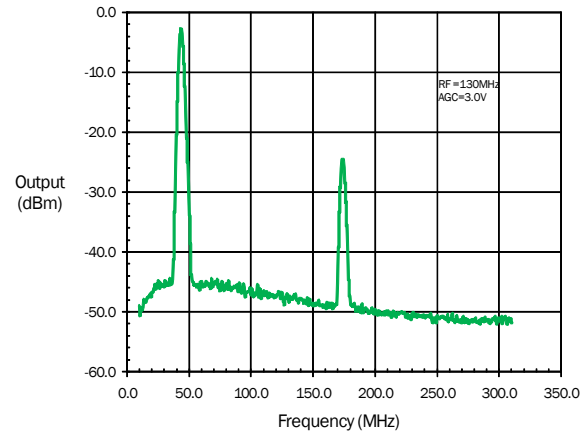
Operation of this device beyond any one of these limits may cause permanent damage. For reliable continuous operation, the device voltage and current must not exceed the maximum operating values specified in the table on page one.

Typical Performance Curves

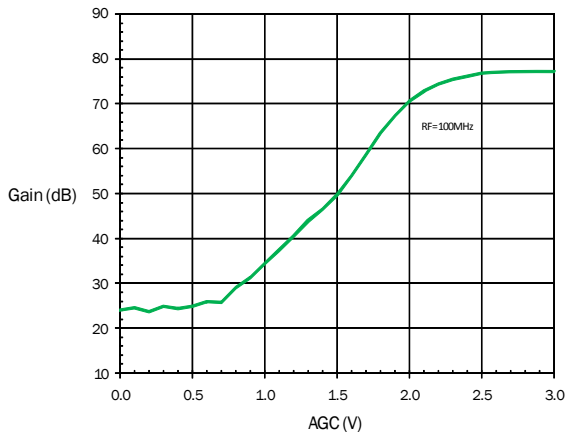
Conversion Gain versus RF



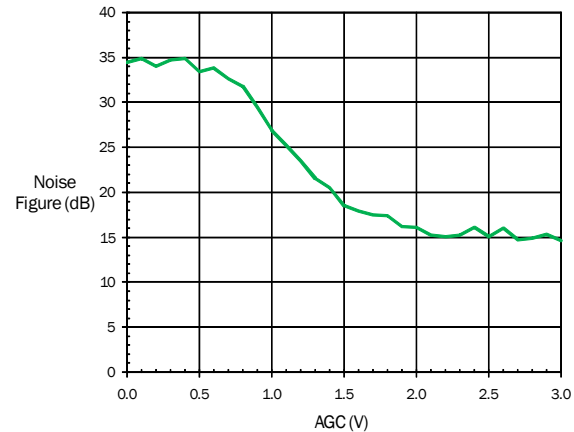
IF Output versus Frequency



Conversion Gain versus AGC

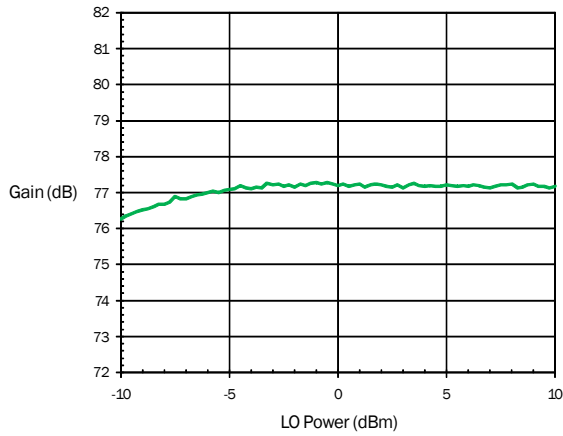


Noise Figure versus AGC

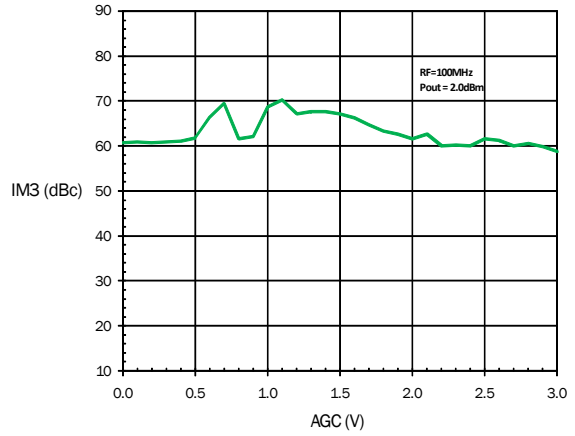


Typical Performance Curves (Continued)

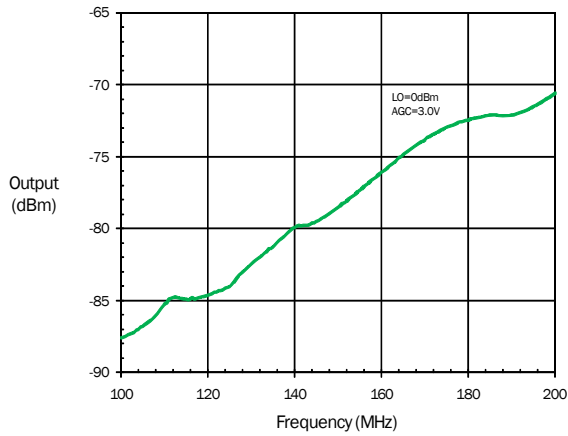
Conversion Gain versus LO Power



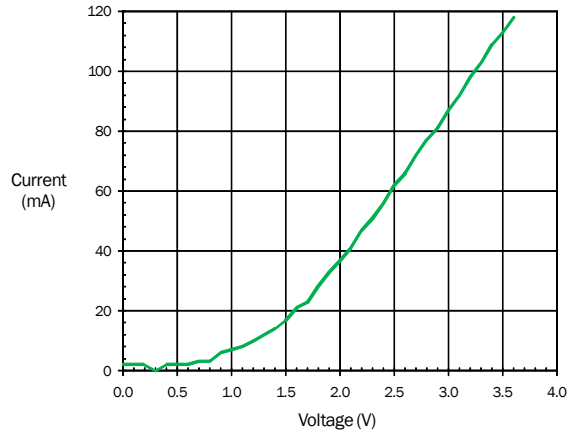
IM3 versus AGC



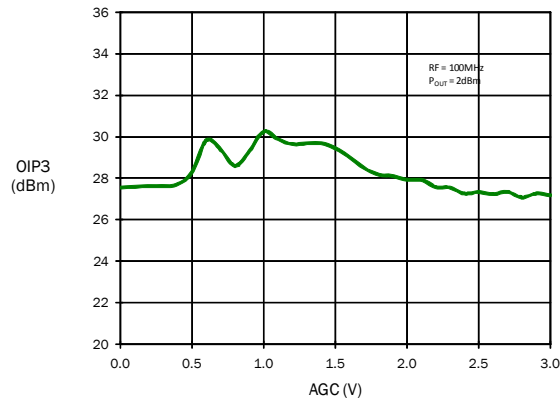
LO Leakage at RF versus LO Frequency



Input Voltage versus Current

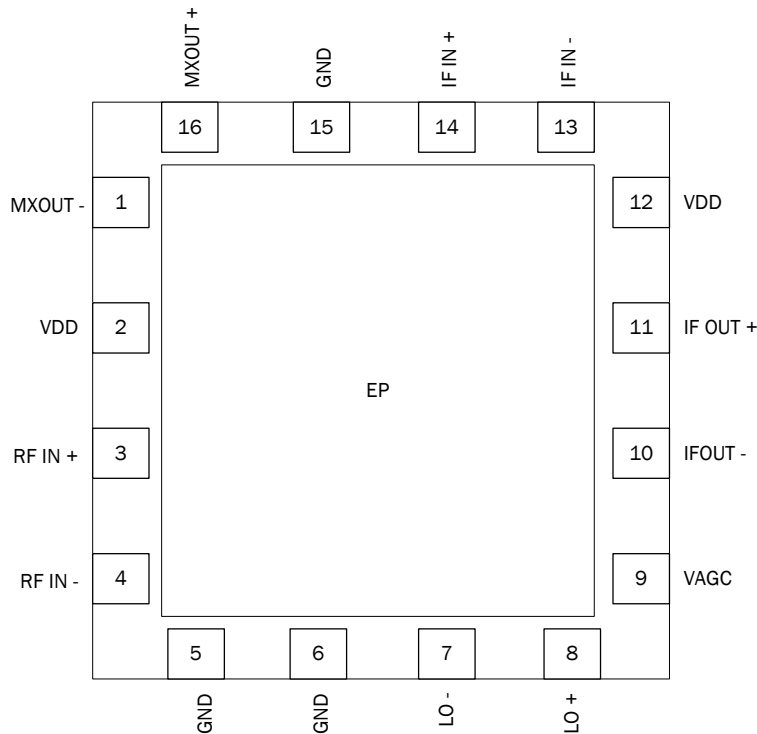


Output IP3 versus AGC



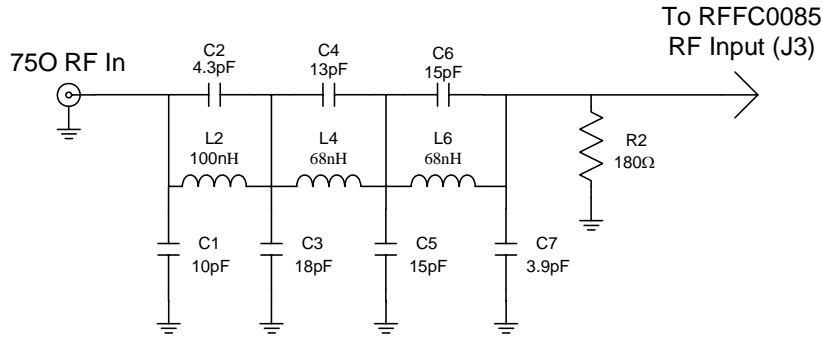
| Pin | Function | Description |
|----------|------------|--|
| 1 | MX OUT (-) | MIXER Negative Output. Open Drain. See APPLICATION on Page 5. |
| 2, 12 | VDD | Supply Voltage, +3.3V |
| 3 | RF IN (+) | RF AMP Positive Input. Input impedance, 1K Ω single ended. See APPLICATION on Page 5. |
| 4 | RF IN(-) | RF AMP Negative Input. See APPLICATION on Page 5. |
| 5, 6, 15 | GND RF | Ground pins. Connect to ground plane with shortest possible length to minimize inductance. |
| 7 | LO IN (-) | LO Buffer Negative Input. |
| 8 | LO IN (+) | LO Buffer Positive Input. |
| 9 | AGC | Automatic Gain Control, Min Gain at AGC=0V, Max Gain at AGC=3.0V. |
| 10 | IF OUT (-) | VIDEO AMP Negative Output. This pin and IF OUT 2 form a 1K Ω output impedance. Open Drain. See APPLICATION on Page 5. |
| 11 | IF OUT (+) | VIDEO AMP Positive Output. See IF OUT (+). |
| 13 | IF IN (-) | VIDEO AMP Negative Input. |
| 14 | IF IN (+) | VIDEO AMP Positive Input. |
| 16 | MX OUT (+) | MIXER Positive Output. Open Drain. See APPLICATION on Page 5. |

Pin Configuration



***Important Application Note**

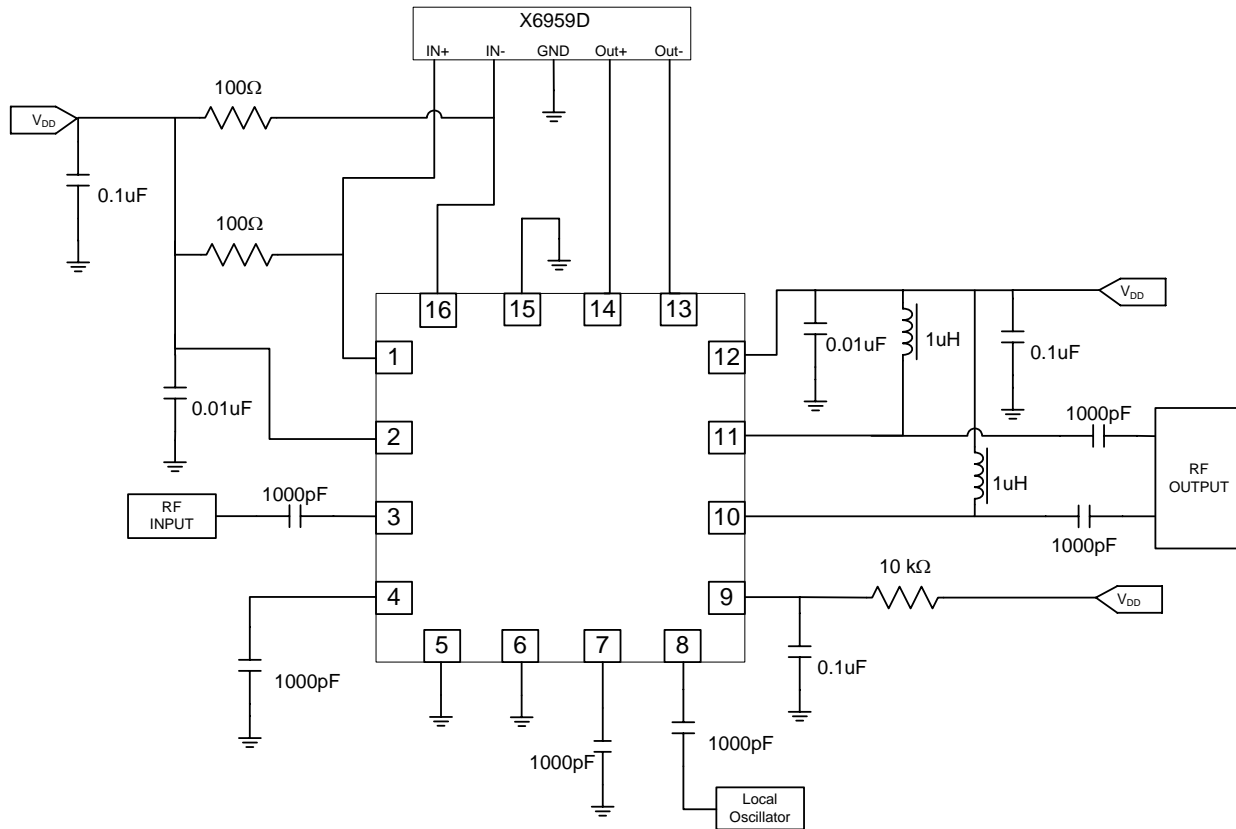
The following low pass filter should proceed the RFFC0085 in all applications. This filter is used to reduce down stream interference. This low pass filter is not included on the RFFC0085 evaluation board.



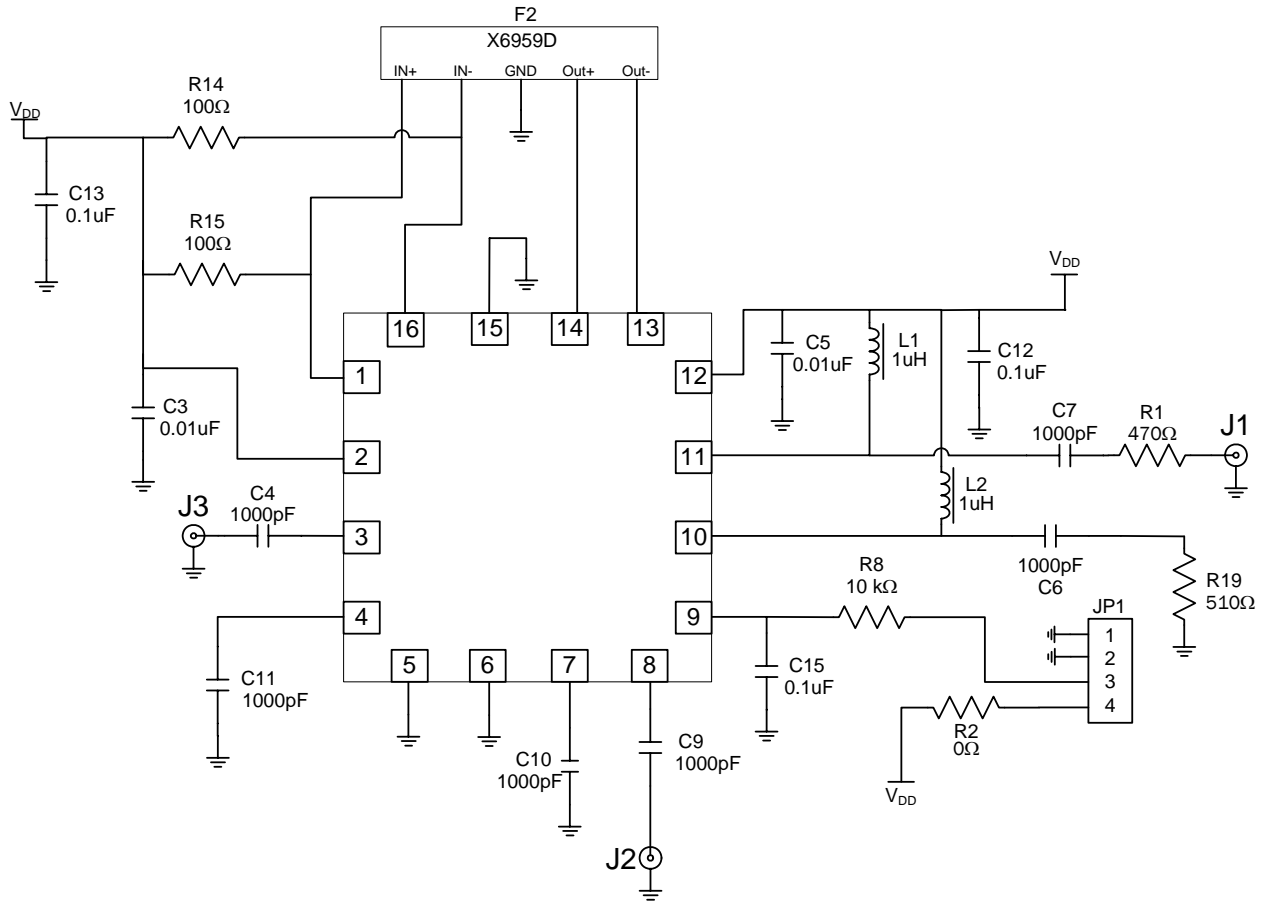
Component List for Low Pass Filter:

| Circuit Symbol | Value |
|----------------|---------|
| C7 | 3.9pF |
| C2 | 4.3pF |
| C1 | 10pF |
| C4 | 13pF |
| C5, C6 | 15pF |
| C3 | 18pF |
| L4, L6 | 68nH |
| L2 | 100nH |
| R2 | 180 ohm |

Application Circuit

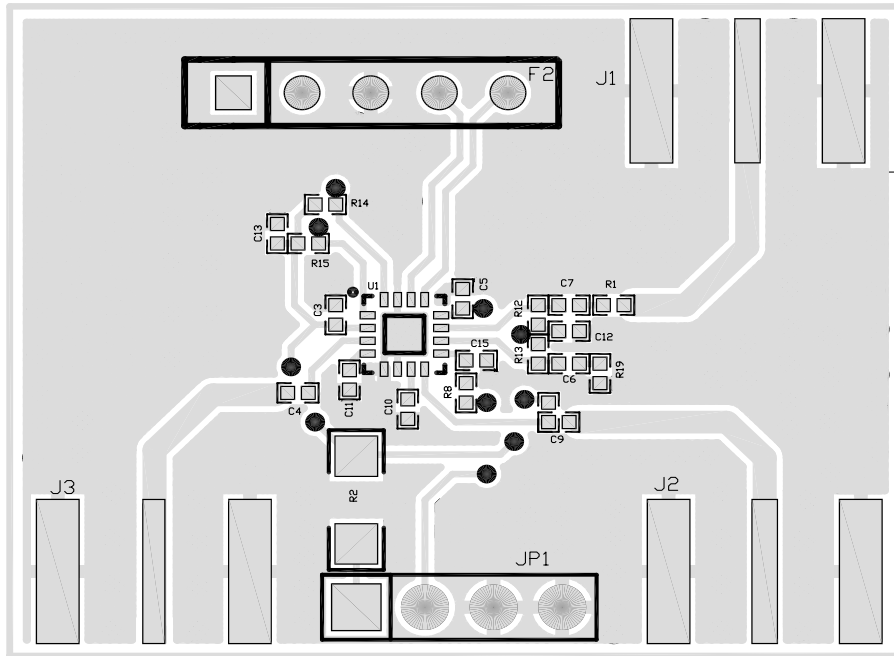


Evaluation Board Schematic



| Designator | Component Type | Value | Manufacturer | Manufacturer's P/N |
|--------------------------|----------------|----------|--------------------|--------------------|
| C3, C5 | Capacitor | 0.01uF | Murata Electronics | GRM155R71E103KA01D |
| C4, C6, C7, C9, C10, C11 | Capacitor | 1000pF | Murata Electronics | GRM155R71H102KA01E |
| C12, C13, C15 | Capacitor | 0.1uF | Murata Electronics | GRM155R71C104KA88D |
| R1 | Resistor | 470 ohms | Panasonic | ERJ-2GEJ471 |
| R2 | Resistor | 0 ohms | Panasonic | ERJ-8GEYOR00 |
| R14, R15 | Resistor | 100 ohms | Panasonic | ERJ-2GEJ101 |
| R19 | Resistor | 510 ohms | Panasonic | ERJ-2GEJ511 |
| R8 | Resistor | 10K ohms | Panasonic | ERJ-2GEJ103 |
| L1, L2 | Chip Bead | 1uH | Steward | HZ0402B102R-10 |
| F2 | SAW Filter | 44MHz | Epcos | B39440-X6959-N201 |
| JP1 | Connector | DC | Samtec | TSW-104-08-S-S |
| J1, J2, J3 | Connector | SMA | Gigalane | PAF-S05-008 |

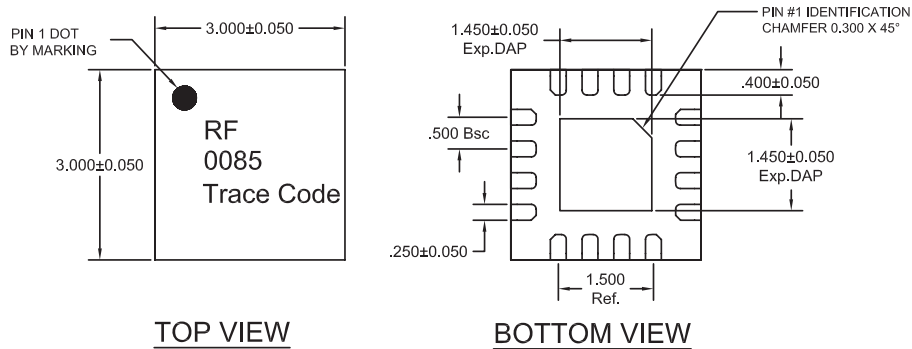
Evaluation Board Layout



Package Drawing

Dimensions in inches (millimeters)

Refer to drawing posted at www.rfmd.com for tolerances.



Ordering Information

| Part Number | Description |
|-----------------|---|
| RFFC0085 | 25 pc Sample Bag |
| RFFC0085SB | 5 pc Sample Bag |
| RFFC0085SR | 100 pc Tape and Reel |
| RFFC0085TR7 | 2500 pc Tape and Reel |
| RFFC0085PCK-410 | RFFC0085 Evaluation Board and 5 pc Sample Bag |

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