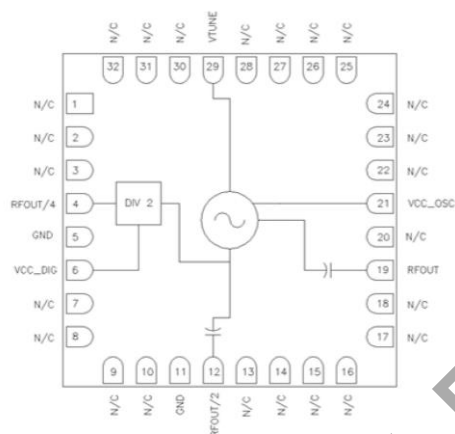


# RFVC1833

## 8.4GHz to 9.6GHz MMIC VCO with Fo/2 and Fo/4 Outputs

RFMD's RFVC1833 is a 5V InGaP MMIC VCO with an integrated frequency divider providing additional Fo/2 and Fo/4 outputs. With an Fo frequency range of 8.4GHz to 9.6GHz its monolithic structure provides excellent temperature, shock, and vibration performance. Output power (Fo) is +8dBm and is flat across the tuning voltage range of 1.5V to 14.5V. Phase noise is typically -114dBc/Hz at 100kHz offset. The device operates from a low supply current of 245mA which can be further reduced to 185mA by disabling the divider functions if not required. The RFVC1833 is available in a low cost 5mm x 5mm surface mount plastic overmolded QFN outline.



Functional Block Diagram

## Ordering Information

|                  |                          |
|------------------|--------------------------|
| RFVC1833S2       | Sample bag with 2 pieces |
| RFVC1833SB       | Sample bag with 5 pieces |
| RFVC1833SQ       | Bag with 25 pieces       |
| RFVC1833SR       | Bag with 100 pieces      |
| RFVC1833TR7      | 7" Reel with 750 pieces  |
| RFVC1833PCBA-410 | Evaluation Board         |



Package: Plastic QFN, 32-pin,  
5mm x 5mm x 0.85mm

## Features

- Multiple Frequency Outputs
  - Fo: 8.40GHz to 9.60GHz
  - Fo/2: 4.20GHz to 4.80GHz
  - Fo/4: 2.10GHz to 2.40GHz
- No External Resonator Required
- Integrated Frequency Divider
- Phase Noise: -114dBc/Hz at 100kHz Offset
- Flat Output Power Over Frequency Tuning Range 1.5V to 14.5V
  - Fo: 8dBm
  - Fo/2: 6dBm
  - Fo/4: -2dBm
- Low Power Consumption
  - 5V/245mA (Divider On)
  - 5V/185mA (Divider Off)
- 32-Lead 5mm x 5mm Plastic Overmolded QFN

## Applications

- Point-to-Point Radio
- Point-to-Multipoint Radio
- Satellite Communications
- Test Equipment
- Military
- Aerospace

## Absolute Maximum Ratings

| Parameter                                                                                           | Rating      | Unit |
|-----------------------------------------------------------------------------------------------------|-------------|------|
| $V_{CC\_OSC}, V_{CC\_DIG}$                                                                          | +5.5        | V    |
| $V_{TUNE}$                                                                                          | 0 to +15    | V    |
| Junction Temperature ( $T_J$ )                                                                      | 135         | °C   |
| Continuous $P_{DISS}$ ( $T_A = 85^\circ\text{C}$ ) (derate 37mW/°C above $T_A = 85^\circ\text{C}$ ) | 1.65        | W    |
| Junction to Case, Thermal Resistance ( $R_{\theta(j-a)}$ )                                          | 30          | °C/W |
| Storage Temperature                                                                                 | -65 to +150 | °C   |
| Operating Temperature                                                                               | -40 to +85  | °C   |
| ESD Sensitivity (HBM)                                                                               | Class 1A    |      |



**Caution!** ESD sensitive device.



RFMD Green: RoHS compliant per EU Directive 2011/65/EU, 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 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.

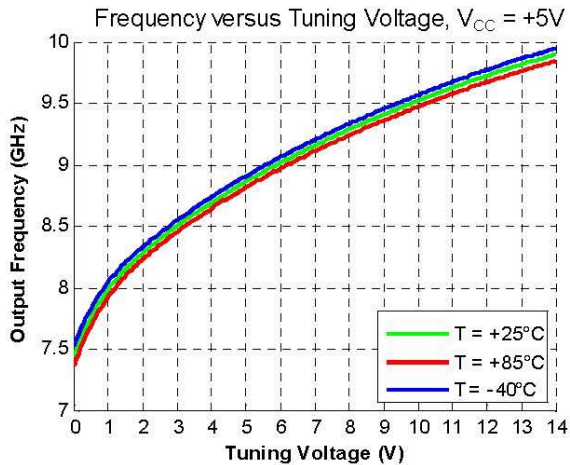
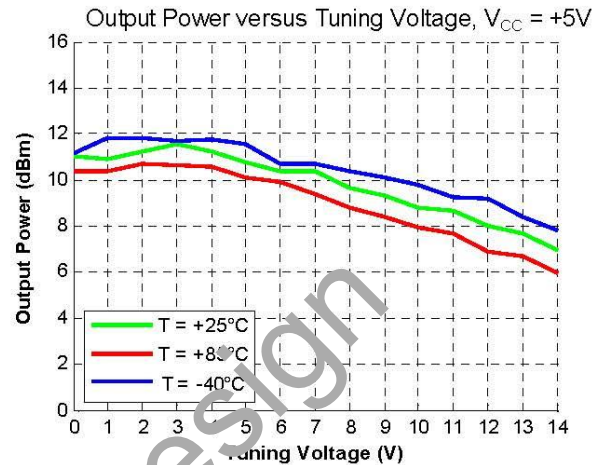
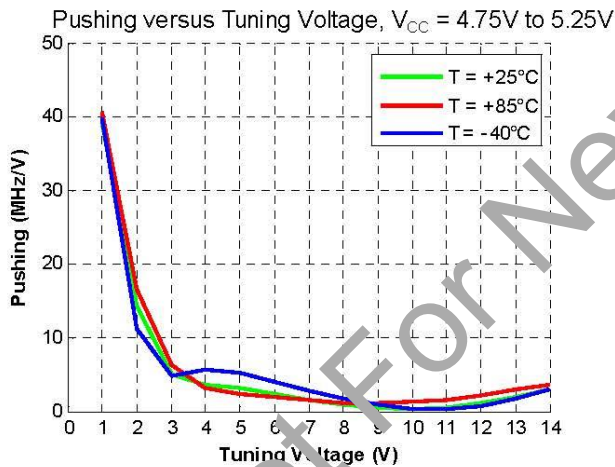
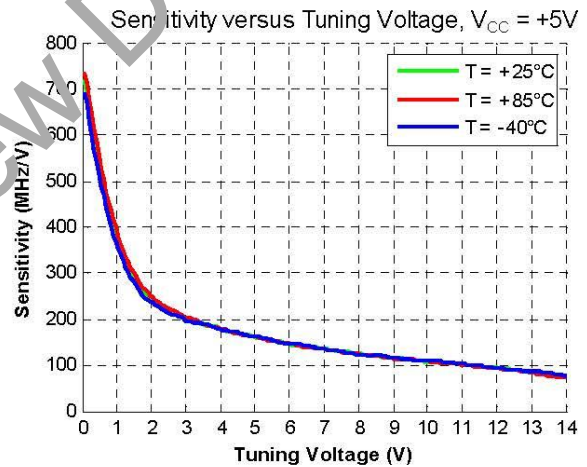
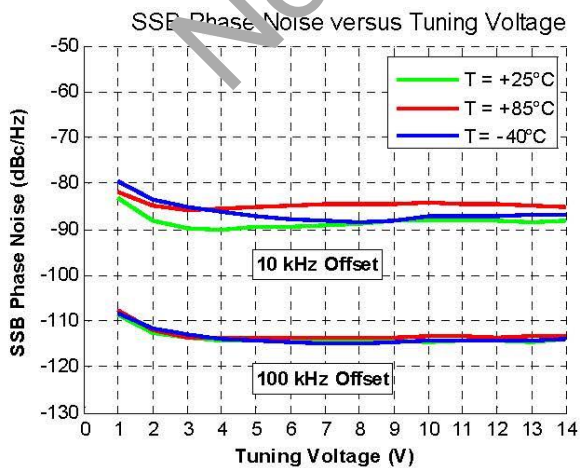
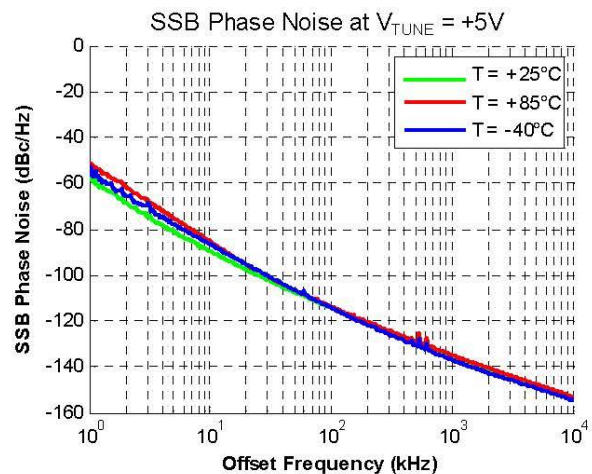
## Nominal Operating Parameters

| Parameter                               | Specification |      |      | Unit   | Condition                                    |
|-----------------------------------------|---------------|------|------|--------|----------------------------------------------|
|                                         | Min           | Typ  | Max  |        |                                              |
| Electrical Specifications               |               |      |      |        | V <sub>CC</sub> = 5V, T <sub>A</sub> = +25°C |
| Operating Frequency                     |               |      |      |        |                                              |
| Fo                                      | 8.40          |      | 9.60 | GHz    |                                              |
| Fo/2                                    | 4.20          |      | 4.80 | GHz    |                                              |
| Fo/4                                    | 2.10          |      | 2.40 | GHz    |                                              |
| Output Power                            |               |      |      |        |                                              |
| Fo                                      |               | 8    |      | dBm    |                                              |
| Fo/2                                    |               | 6    |      | dBm    |                                              |
| Fo/4                                    |               | 4    |      | dBm    |                                              |
| SSB Phase Noise                         |               |      |      |        |                                              |
| 10 kHz offset at RF <sub>OUT</sub>      |               | -90  |      | dBc/Hz | V <sub>TUNE</sub> = 5V                       |
| 100 kHz offset at RF <sub>OUT</sub>     |               | -114 |      | dBc/Hz |                                              |
| Tune Voltage                            | 1.5           |      | 14.5 | V      |                                              |
| Supply Voltage (Oscillator and Divider) |               | 5    |      | V      |                                              |
| Supply Current                          |               |      |      |        |                                              |
| V <sub>CC_osc</sub>                     |               | 185  |      | mA     |                                              |
| V <sub>CC_dig</sub>                     |               | 60   |      | mA     |                                              |
| Tune Port Leakage Current               |               | 10   |      | μA     |                                              |
| Output Return Loss                      |               | 6    |      | dB     |                                              |

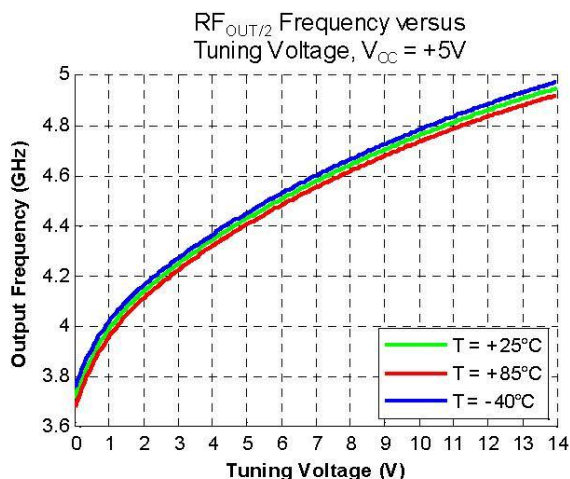
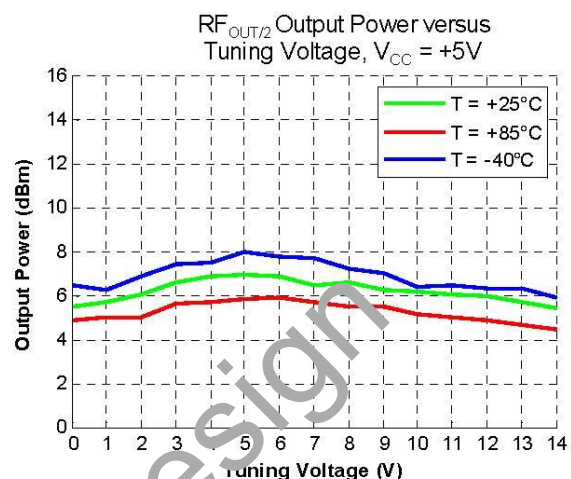
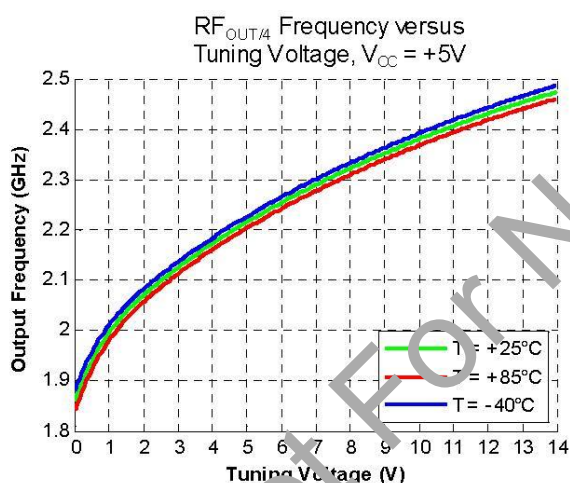
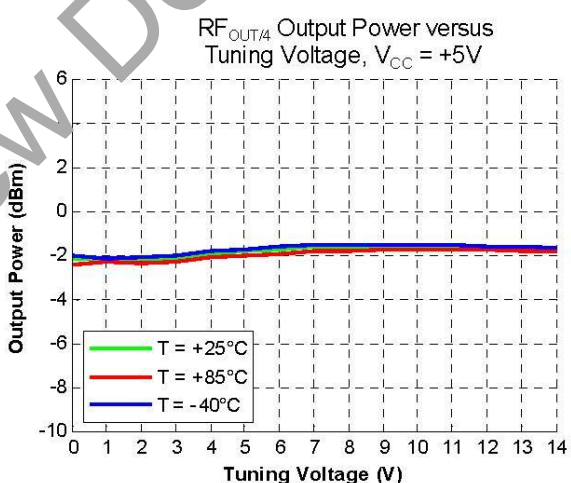
| Parameter                             | Specification |     |     | Unit   | Condition                                                         |
|---------------------------------------|---------------|-----|-----|--------|-------------------------------------------------------------------|
|                                       | Min           | Typ | Max |        |                                                                   |
| Electrical Specifications (continued) |               |     |     |        |                                                                   |
| Harmonics/Sub-harmonics               |               |     |     |        | Measured with RF probes at package, not at SMA connections on EVB |
| 1/2                                   |               | 60  |     | dBc    |                                                                   |
| 3/2                                   |               | 50  |     | dBc    |                                                                   |
| 2 <sup>nd</sup>                       |               | 15  |     | dBc    |                                                                   |
| 3 <sup>rd</sup>                       |               | 25  |     | dBc    |                                                                   |
| Pulling (into a 2.0:1 VSWR)           |               | 5   |     | MHz pp |                                                                   |
| Pushing                               |               | 15  |     | MHz/V  |                                                                   |
| Frequency Drift Rate                  |               | 0.8 |     | MHz/°C |                                                                   |

Not For New Design

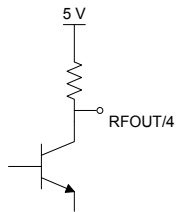
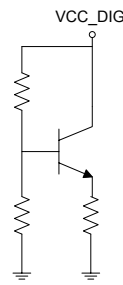
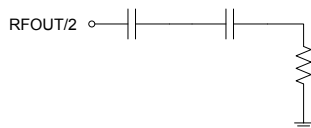
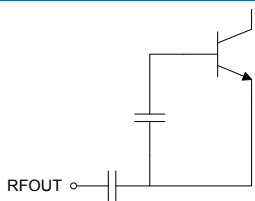
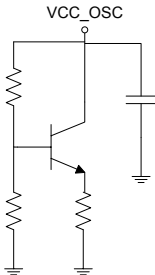
## Typical Performance



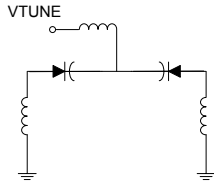
## Typical Performance (continued)



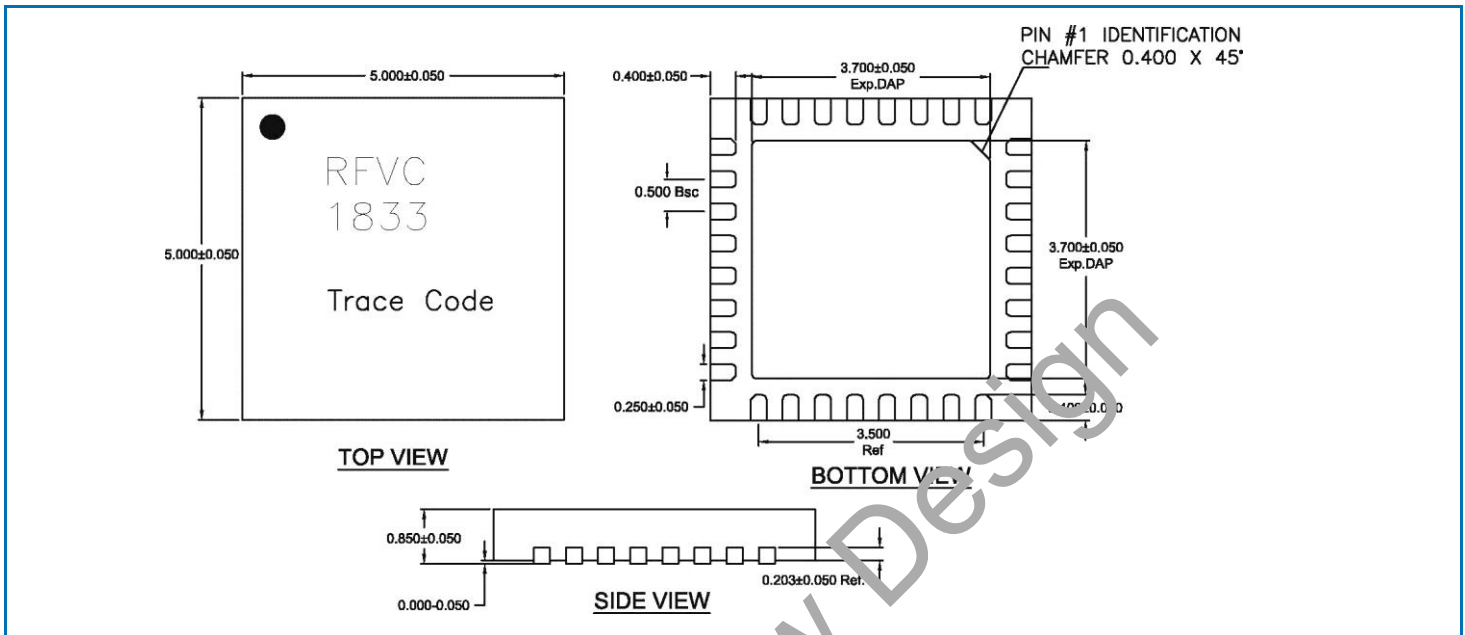
## Pin Names and Descriptions

| Pin   | Name    | Description                                                                                                                                                | Interface Schematic                                                                   |
|-------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1-3   | N/C     | No internal connection.                                                                                                                                    |                                                                                       |
| 4     | RFOUT/4 | VCO RF output at $F_o/4$ . Externally DC-blocked.                                                                                                          |    |
| 5     | GND     | Connect to PCB ground.                                                                                                                                     |    |
| 6     | VCC_DIG | Supply voltage input for the integrated frequency divider. Typical +5V. Ground this pin to disable digital divider and reduce current consumption by 60mA. |   |
| 7-10  | N/C     | No internal connection.                                                                                                                                    |                                                                                       |
| 11    | GND     | Connect to PCB ground.                                                                                                                                     | See Pin 5 interface schematic                                                         |
| 12    | RFOUT/2 | VCO RF output at $F_o/2$ . Internally DC-blocked.                                                                                                          |  |
| 13-18 | N/C     | No internal connection.                                                                                                                                    |                                                                                       |
| 19    | RFOUT   | VCO RF output at $F_o$ . Internally DC-blocked.                                                                                                            |  |
| 20    | N/C     | No internal connection.                                                                                                                                    |                                                                                       |
| 21    | VCC_OSC | Supply voltage input for the VCO. Typical +5V.                                                                                                             |  |

### Pin Names and Descriptions (continued)

| Pin      | Name  | Description                | Interface Schematic                                                                 |
|----------|-------|----------------------------|-------------------------------------------------------------------------------------|
| 22-28    | N/C   | No internal connection.    |                                                                                     |
| 29       | VTUNE | VCO control voltage input. |  |
| 30-32    | N/C   | No internal connection.    |                                                                                     |
| PKG BASE | GND   | Connect to PCB ground.     | See Pin 5 interface schematic                                                       |

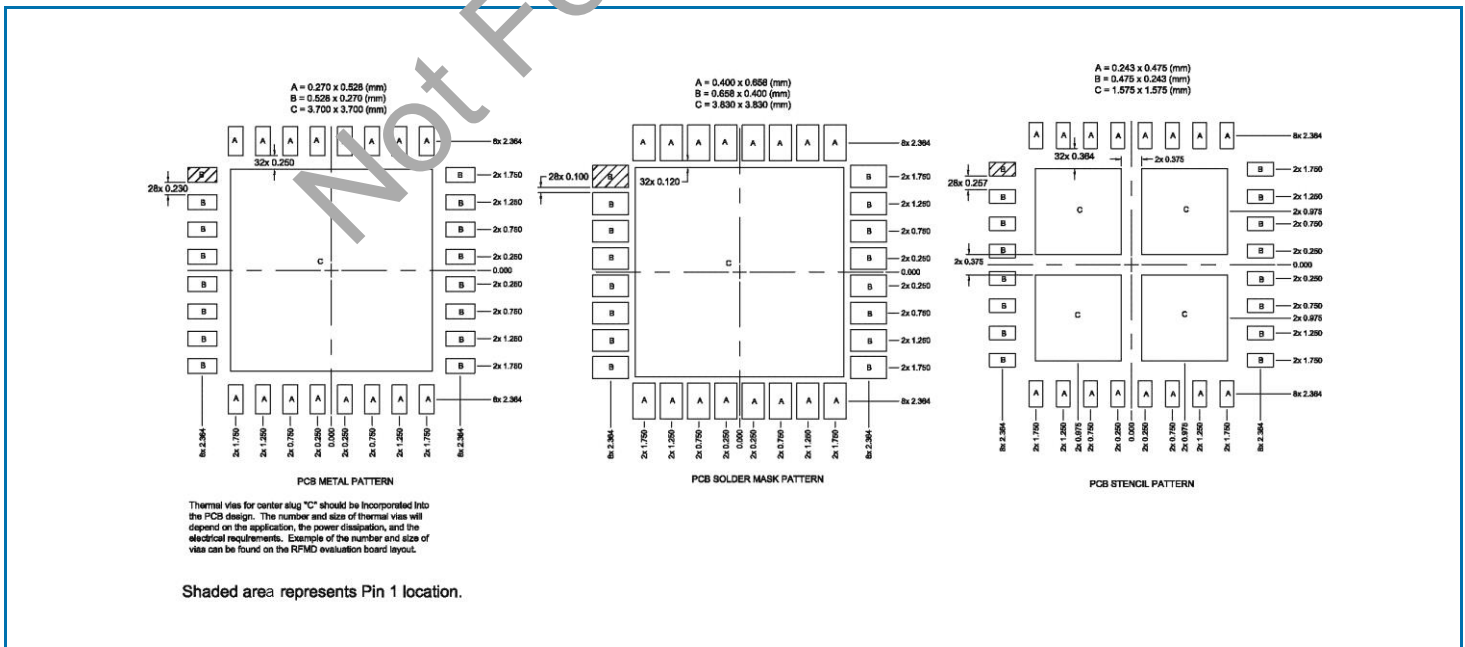
## Package Drawing (all dimensions in mm)



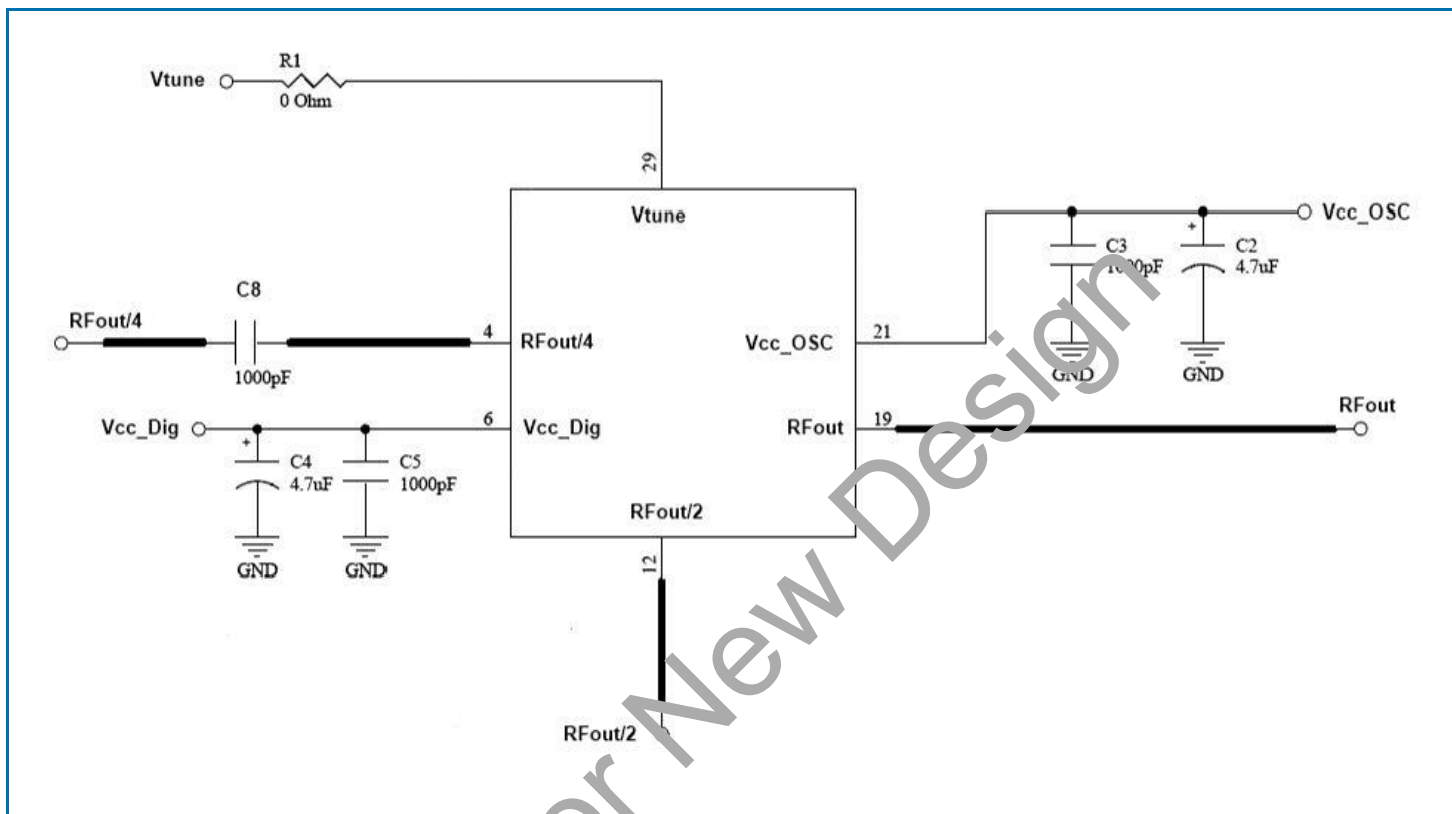
### Notes:

1. Dimensions are for reference only.
2. Package body material: Plastic.
3. Lead and paddle plating: 8µm minimum of Sn over Cu leadframe.

## Recommended PCB Layout

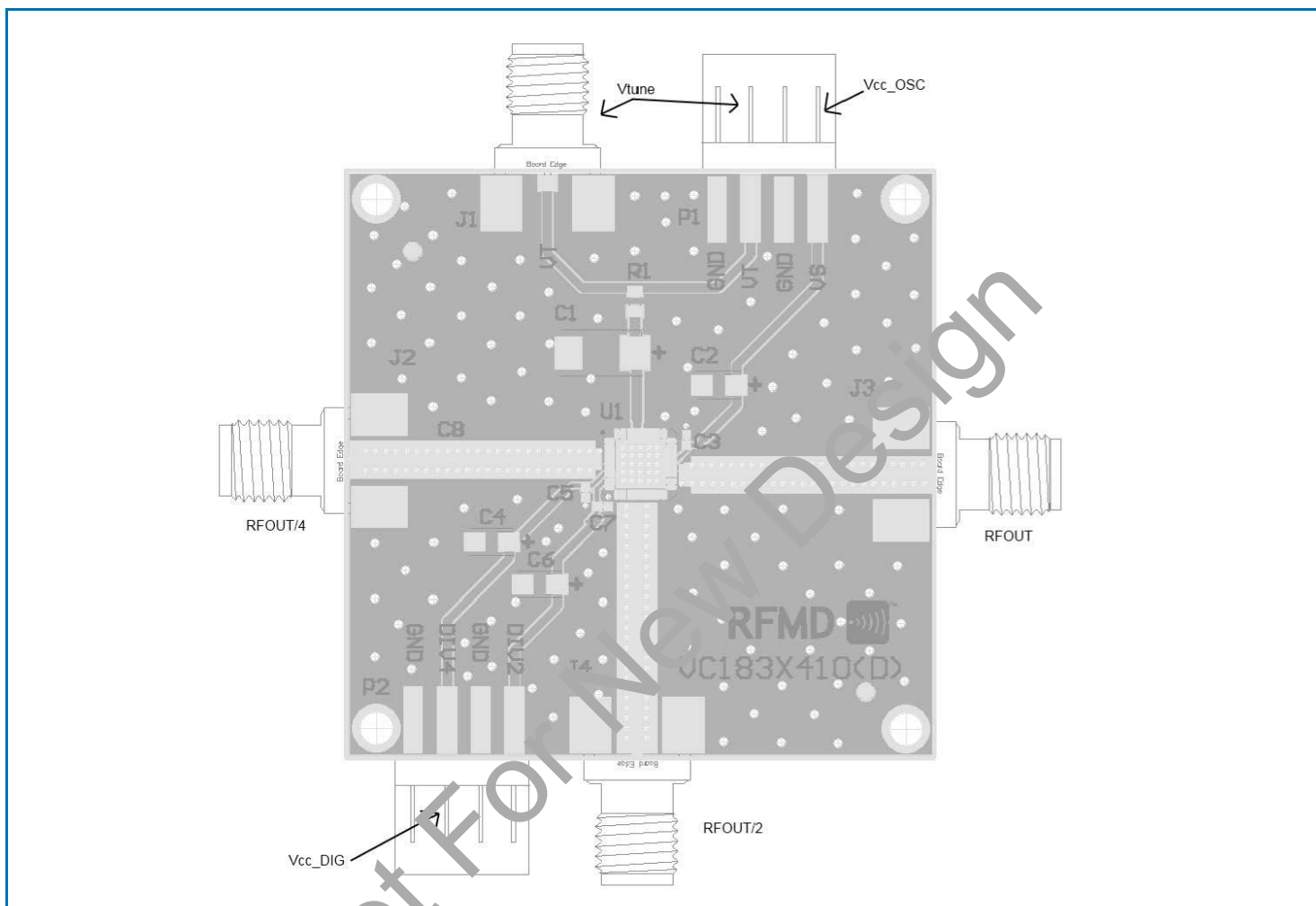


## Sample Application Circuit Schematic



| Bias Conditions    | Output                 |
|--------------------|------------------------|
| $V_{CC\_OSC} = 5V$ | $F_{OUT} = 8.9GHz$     |
| $V_{CC\_DIG} = 5V$ | $F_{OUT/2} = 4.45GHz$  |
| $V_{TUNE} = 5V$    | $F_{OUT/4} = 2.225GHz$ |

## Evaluation Board Layout



## Evaluation Board Bill of Materials (BOM)

| Item           | Description                    |
|----------------|--------------------------------|
| U1             | RFVC1833 VCO                   |
| C3, C5, C7, C8 | 1000pF Capacitor, 0402 Package |
| C2, C4, C6     | 4.7μF Tantalum Capacitor       |
| C1             | 68μF Tantalum Capacitor        |
| R1             | 0Ω Resistor, 0603 Package      |
| P1, P2         | 4-PIN DC connector             |
| J1, J2, J3, J4 | PCB mount SMA connector        |
| PCB            | VC183x410(D)                   |