# RF2310

WIDEBAND GENERAL PURPOSE AMPLIFIER

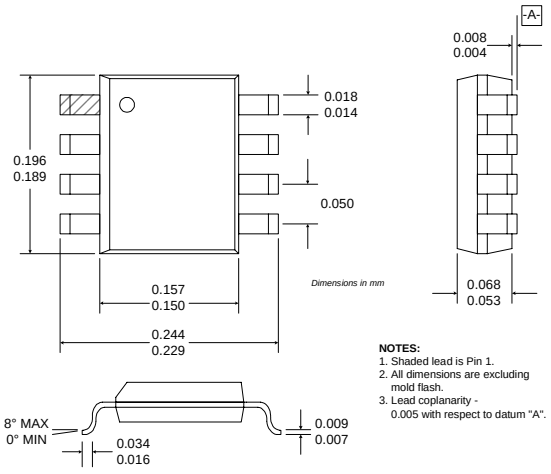
## Typical Applications

- General Purpose High Bandwidth Gain Blocks
- IF or RF Buffer Amplifiers
- Broadband Test Equipment
- Final PA for Medium Power Applications
- Driver Stage for Power Amplifiers



## Product Description

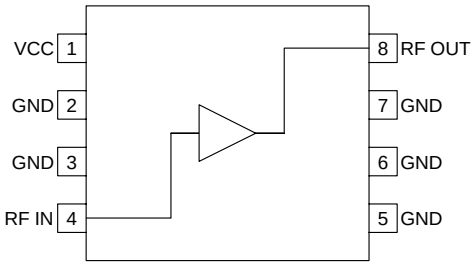
The RF2310 is a general purpose, low-cost, high linearity RF amplifier IC. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as an easily cascadable 50Ω gain block. Applications include IF and RF amplification in wireless voice and data communication products operating in frequency bands up to 2500MHz. The gain flatness over a very wide bandwidth makes the device suitable for many applications. The device is self-contained with 50Ω input and output impedances and requires only two external DC biasing elements to operate as specified.




Package Style: SOIC-8

### Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS




Functional Block Diagram

## Features

- DC to well over 2500MHz Operation
- Internally Matched Input and Output
- 15dB Small Signal Gain
- 5dB Noise Figure
- +19dBm Output Power
- Single 3.5V to 6V Positive Power Supply

## Ordering Information

| | |
|---|---|
| RF2310 | Wideband General Purpose Amplifier |
| RF2310 PCBA | Fully Assembled Evaluation Board |

RF Micro Devices, Inc.
7628 Thorndike Road
Greensboro, NC 27409, USA
Tel (336) 664 1233
Fax (336) 664 0454
http://www.rfmd.com

## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Supply Voltage | -0.5 to +6.0 | $V_{DC}$ |
| Input RF Power | +10 | dBm |
| Storage Temperature | -40 to +150 | °C |
| Junction Temperature | 175 | °C |
| Thermal Resistance, Junction to Case | 179 | °C/W |

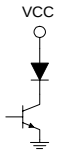
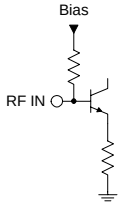
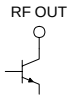
Notes: case reference: pins 5-7, conditions: no signal in and both RF ports terminated in 50Ω; average junction temperature measured at 85°C ambient: 143°C

**Caution!** ESD sensitive device.



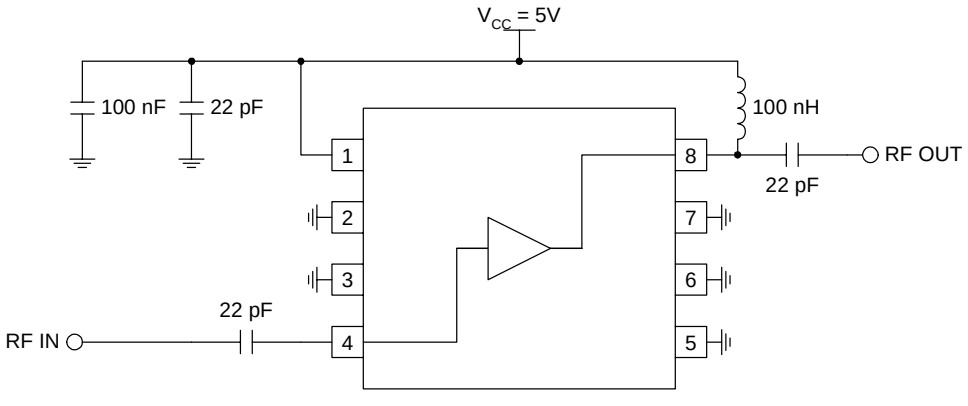


| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **Operating Range** | | | | | |
| Overall Frequency Range | 100 | | 2500 | MHz | |
| Supply Voltage | 3.5 | | 6.0 | V | |
| Operating Current ($I_{CC}$) | | 20 | 25 | mA | $V_{CC}$=3.6V, Temp=27°C |
| | 40 | 50 | 65 | mA | $V_{CC}$=5V, Temp=27°C |
| Operating Ambient Temperature | -40 | | +85 | °C | |
| **3.6V Performance** | | | | | |
| Gain | | 16.2 | | dB | Freq=300MHz, $V_{CC}$=3.6V, Temp=27°C |
| Gain | | 15.3 | | dB | Freq=900MHz, $V_{CC}$=3.6V, Temp=27°C |
| Noise Figure | | 2.5 | | dB | |
| Output IP3 | | +22.0 | | dBm | |
| OP1dB | | +10 | | dBm | |
| Gain | | 15 | | dB | Freq=1950MHz, $V_{CC}$=3.6V, Temp=27°C |
| Noise Figure | | 2.7 | | dB | |
| Output IP3 | | +23.0 | | dBm | |
| OP1dB | | +10 | | dBm | |
| Gain | | 16 | | dB | Freq=2450MHz, $V_{CC}$=3.6V, Temp=27°C |
| Noise Figure | | 2.4 | | dB | |
| Output IP3 | | +21.0 | | dBm | |
| OP1dB | | +10 | | dBm | |
| **5V Performance** | | | | | |
| Gain | | 17 | | dB | Freq=300MHz, $V_{CC}$=5V, Temp=27°C |
| Gain | 14.0 | 16.5 | | dB | Freq=900MHz, $V_{CC}$=5V, Temp=27°C |
| Noise Figure | | 3 | | dB | |
| Output IP3 | +28.0 | +31.0 | | dBm | |
| OP1dB | | +17 | | dBm | |
| Gain | | 15.6 | | dB | Freq=1950MHz, $V_{CC}$=5V, Temp=27°C |
| Noise Figure | | 3.5 | | dB | |
| Output IP3 | | +33.0 | | dBm | |
| OP1dB | | +18 | | dBm | |
| Gain | | 15 | | dB | Freq=2450MHz, $V_{CC}$=5V, Temp=27°C |
| Noise Figure | | 2.8 | | dB | |
| Output IP3 | | +26.0 | | dBm | |
| OP1dB | | +17 | | dBm | |

| Pin | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | VCC | Power supply pin. An external bypass capacitor is recommended. The total supply current is shared between this pin and pin 8 (through the inductor). |  |
| 2 | GND | Ground connection. For best performance, keep traces physically short and connect immediately to ground plane.<br>To achieve the performance as specified, and to minimize instability, it is recommended to have a local ground plane under the device, as shown in the evaluation board layout. | |
| 3 | GND | Same as pin 2. | |
| 4 | RF IN | RF input pin. This pin is NOT internally DC-blocked. A DC-blocking capacitor, suitable for the frequency of operation, should be used in most applications. DC-coupling of the input is not allowed, because this will override the internal feedback loop and cause temperature instability. |  |
| 5 | GND | Same as pin 2. | |
| 6 | GND | Same as pin 2. | |
| 7 | GND | Same as pin 2. | |
| 8 | RF OUT | RF output and bias pin. Biasing is accomplished with an external choke inductor to $V_{CC}$ that provides high impedance at the operating frequency. Because DC is present on this pin, a DC-blocking capacitor, suitable for the frequency of operation, should be used in most applications. The supply side of the bias network should also be well bypassed. |  |

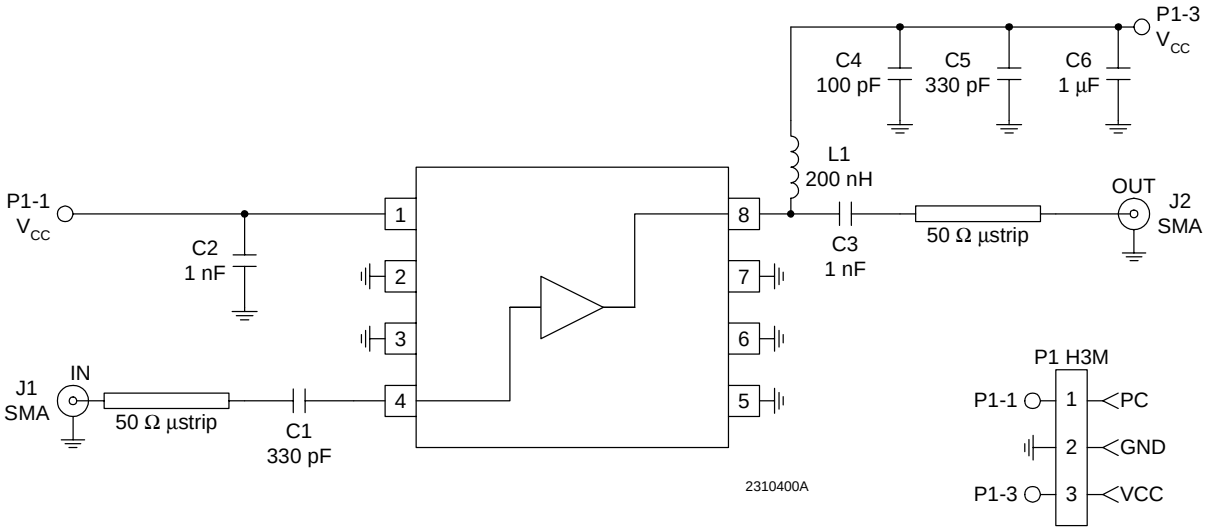


## Application Schematic

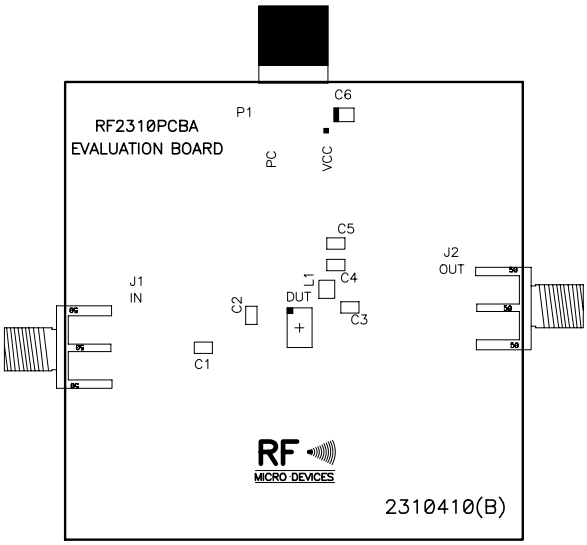


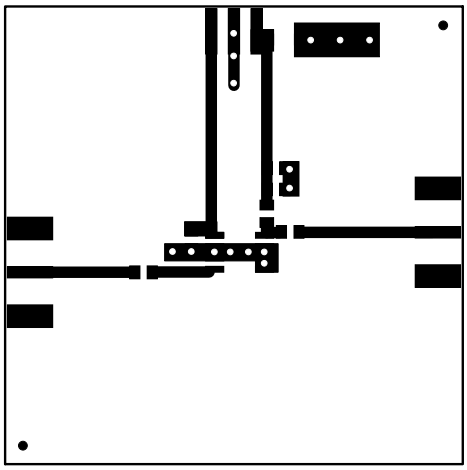
## Evaluation Board Schematic

(Download Bill of Materials from www.rfmd.com.)

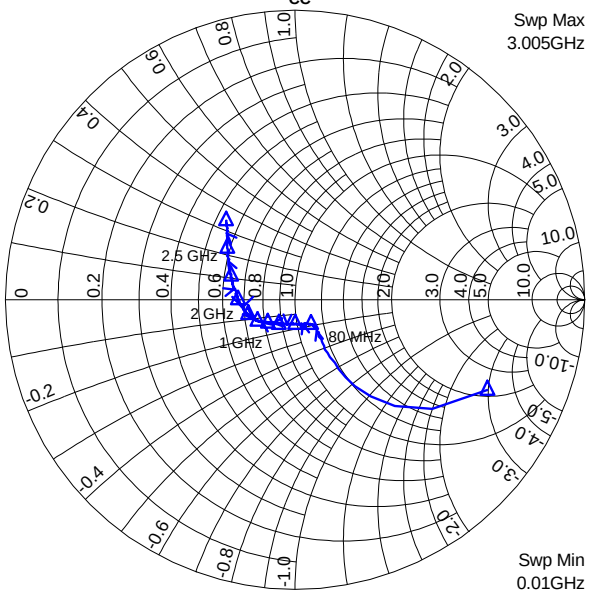


# Evaluation Board Layout
## Board Size 2.02” x 2.02”
Board Thickness 0.031”, Board Material FR-4

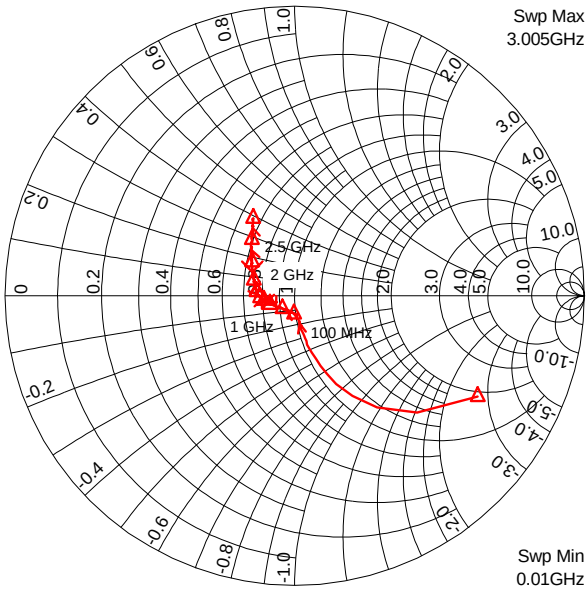


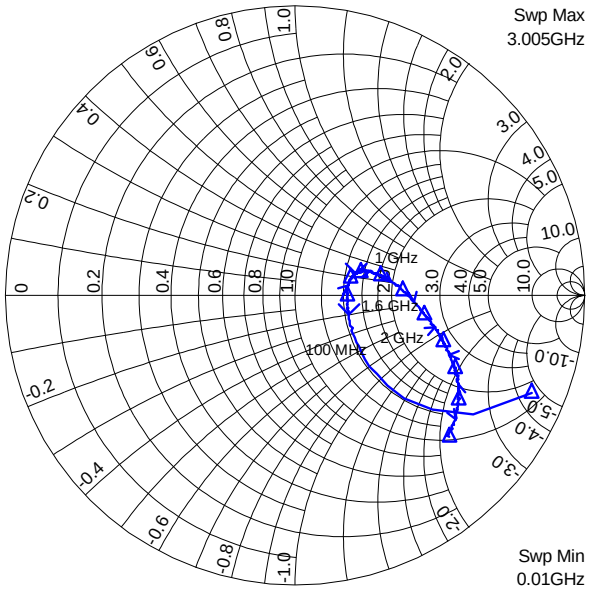
**S11 $V_{CC}$ = 3V**



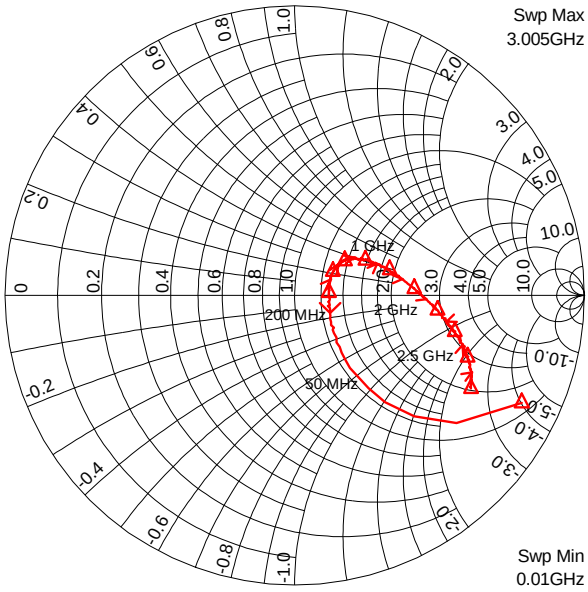

**S11 $V_{CC}$ = 5V**




**S22 $V_{CC}$ = 3V**



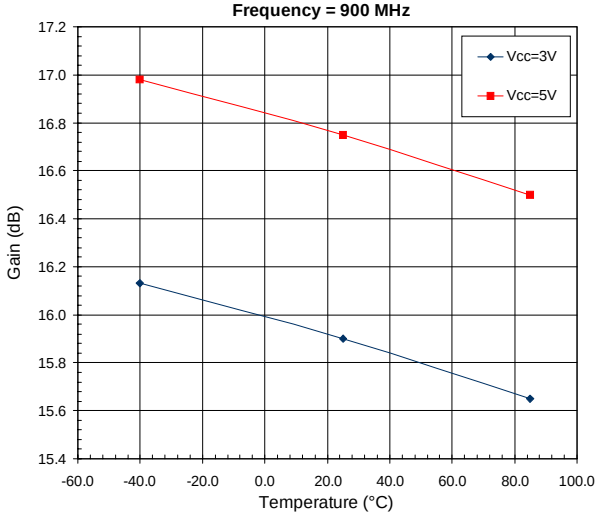

**S22 $V_{CC}$ = 5V**



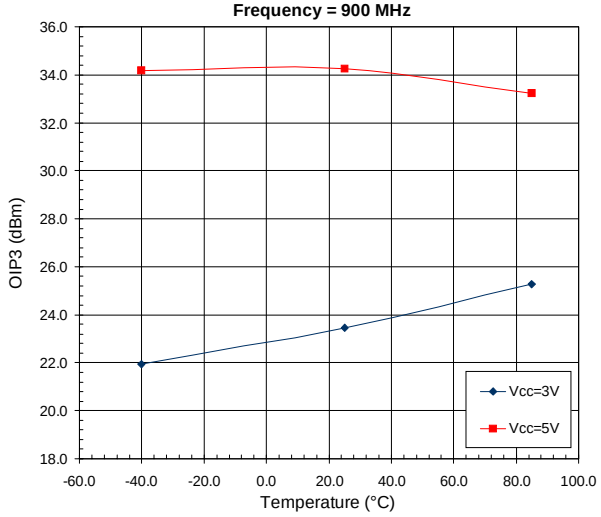

S-Parameter Conditions:
All plots are taken at ambient temperature = 25°C.

NOTE:
All S11 and S22 plots shown were taken from an RF2310 evaluation board with external input and output tuning components removed and the reference points at the RF IN and RF OUT pins.

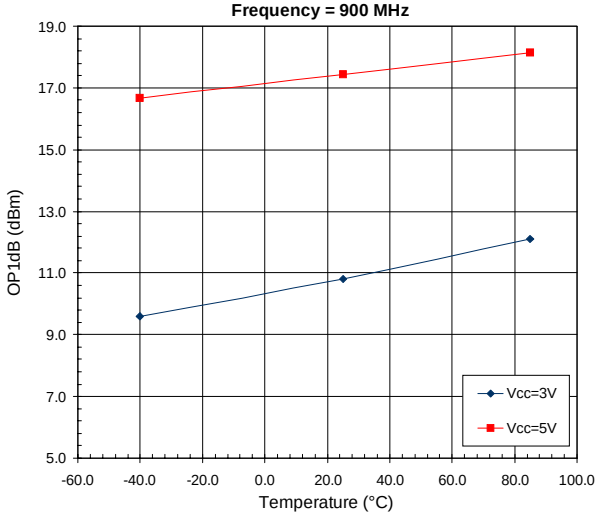
**Gain versus Temperature**
**Frequency = 900 MHz**



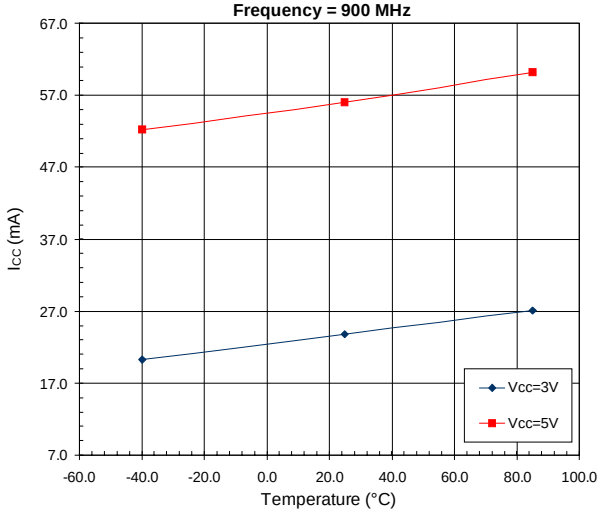

**OIP3 versus Temperature**
**Frequency = 900 MHz**



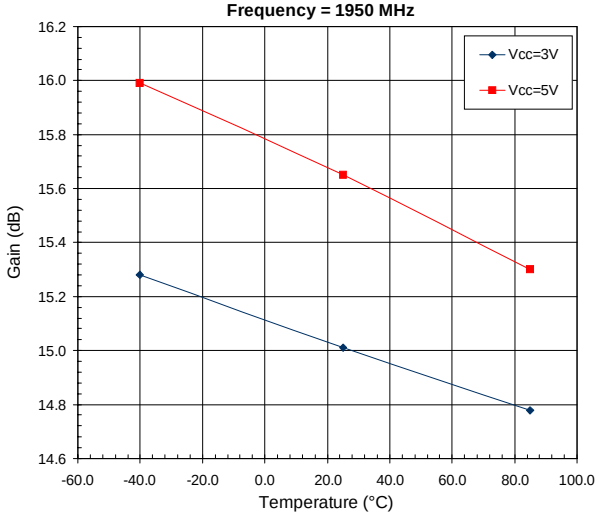

**OP1dB versus Temperature**
**Frequency = 900 MHz**



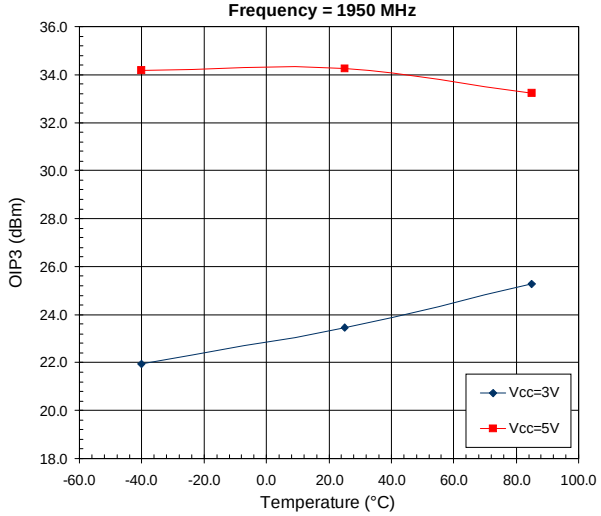

**$I_{CC}$ versus Temperature**
**Frequency = 900 MHz**



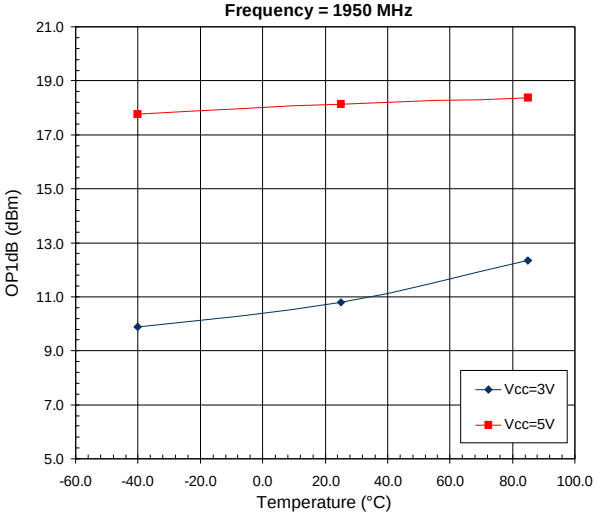

**Gain versus Temperature**
**Frequency = 1950 MHz**



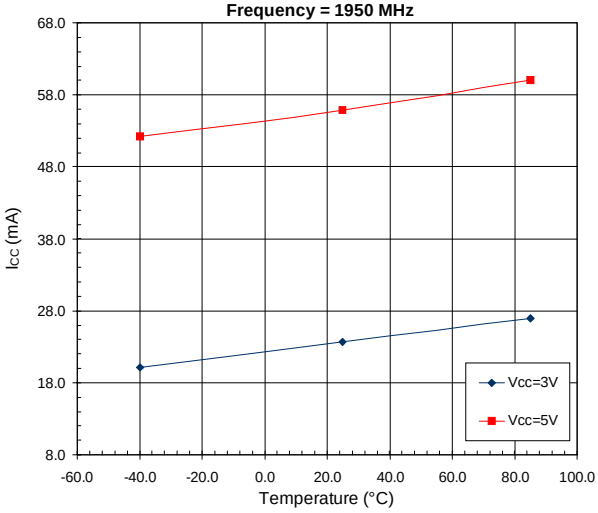

**OIP3 versus Temperature**
**Frequency = 1950 MHz**



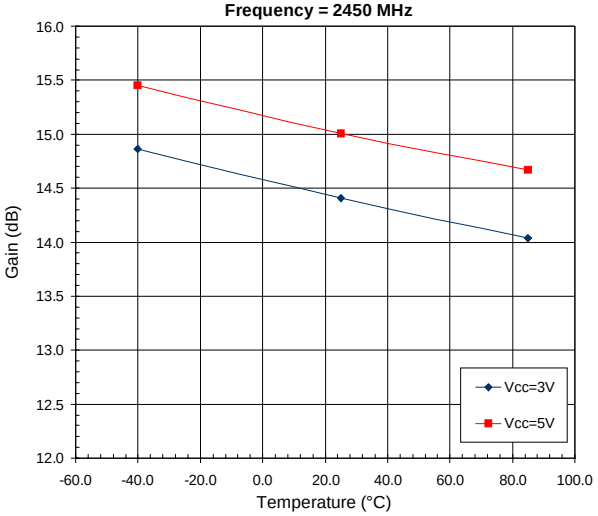
**OP1dB versus Temperature**
**Frequency = 1950 MHz**



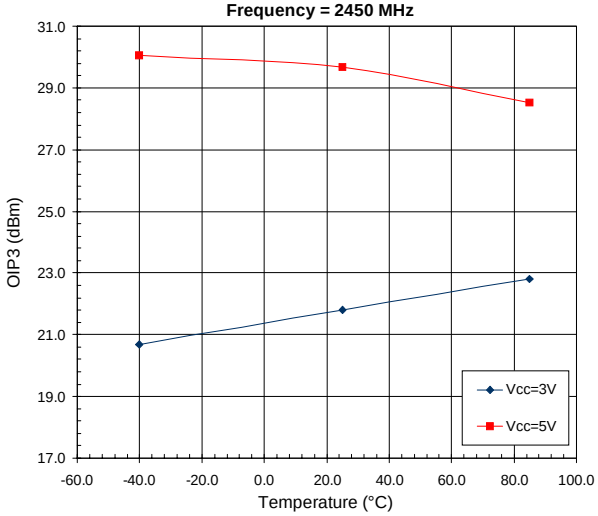

**$I_{CC}$ versus Temperature**
**Frequency = 1950 MHz**



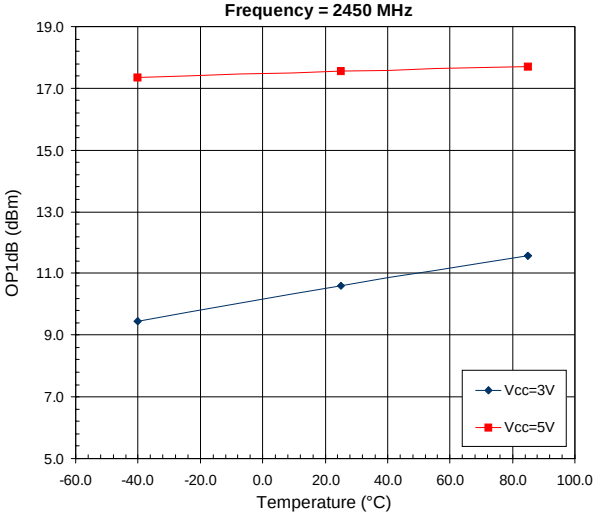

**Gain versus Temperature**
**Frequency = 2450 MHz**




**OIP3 versus Temperature**
**Frequency = 2450 MHz**




**OP1dB versus Temperature**
**Frequency = 2450 MHz**




**$I_{CC}$ versus Temperature**
**Frequency = 2450 MHz**