DATA SHEET



NEC

# BIPOLAR ANALOG INTEGRATED CIRCUIT

# μPC2795GV

## GENERAL PURPOSE L-BAND DOWN CONVERTER

### DESCRIPTION

The μPC2795GV is Silicon monolithic IC designed for L-band down converter. This IC consists of double balanced mixer, local oscillator, local oscillation buffer amplifier, IF buffer amplifier, and voltage regulator.

The package is 8-pin SSOP suitable for high-density surface mount.

### FEATURES

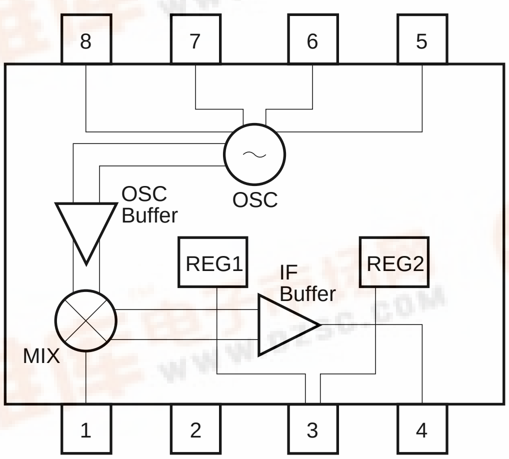
- Wide band operation $f_{RF}$ = 0.95 to 2.15 GHz
- Supply voltage 5 V
- Low distortion $IM_3$ = 55 dBc
- Packaged in 8-pin SSOP suitable for high-density mounting

### ORDERING INFORMATION

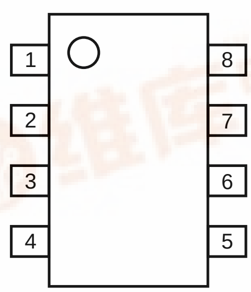
| PART NUMBER | PACKAGE | PACKAGE STYLE |
|---|---|---|
| μPC2795GV-E1 | 8-pin plastic SSOP (175 mil) | Embossed tape 8 mm wide. 1 k/REEL<br>Pin 1 indicates pull-out direction of tape |

For evaluation sample order, please contact your local NEC office. (Part number for sample order: μPC2795GV)

### INTERNAL BLOCK DIAGRAM




### PIN CONFIGURATION (Top View)



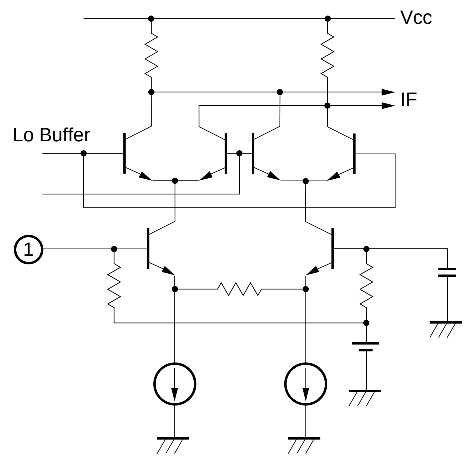
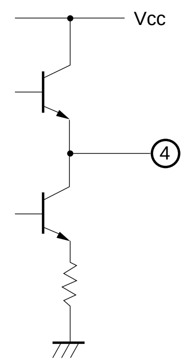
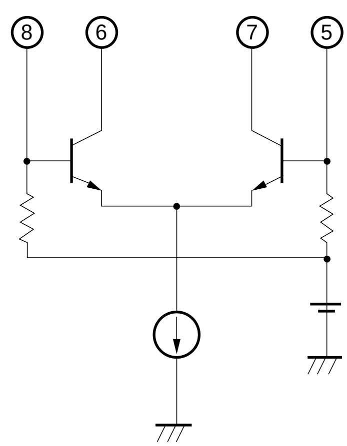

1. RF input
2. GND
3. Vcc
4. IF out
5. OSC Base 2
6. OSC Collector 1
7. OSC Collector 2
8. OSC Base 1

**Caution: Electro-static sensitive devices**



**The information in this document is subject to change without notice.**

## PIN EXPLANATIONS

| Pin NO. | Symbol | Pin Volt (V, TYP.) | Explanation | Equivalent Circuit |
|---|---|---|---|---|
| 1 | RF IN | 2.1 | RF signal input pin.<br>Double balanced mixer with Tr.1 and Tr. 2. |  |
| 2 | GND | 0.0 | Ground pin. | |
| 3 | $V_{CC}$ | 5.0 | Power supply pin. | |
| 4 | IF OUT | 2.3 | IF output pin.<br>This pin is assigned for the emitter follower output with low impedance. |  |
| 5 | OSC Base 2 | 2.8 | Base pin of oscillator with balanced amplifier.<br>Connected to LC resonator through cuppling capacitor. |  |
| 6 | OSC Collector 1 | 5.0 | Collector pin of oscillator with balanced amplifier.<br>Assemble LC resonator with 5 pin through capacitor to oscillate with active feedback loop. Loads should be connected to this pin. | |
| 7 | OSC Collector 2 | 5.0 | Collector pin of oscillator with balanced amplifier.<br>Assemble LC resonator with 8 pin through capacitor to oscillate with active feedback loop. Loads should be connected to this pin. | |
| 8 | OSC Base 1 | 2.8 | Base pin of oscillator with balanced amplifier.<br>Connected to LC resonator through cuppling capacitor. | |

## ABSOLUTE MAXIMUM RATINGS ($T_A$ = 25 °C, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITION | RATINGS | UNIT |
|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | | 6.0 | V |
| Power Dissipation | $P_D$ | $T_A$ = 85 °C*1 | 250 | mW |
| Operating Ambient Temperature | $T_A$ | | –40 to +85 | °C |
| Storage Temperature | $T_{stg}$ | | –55 to +150 | °C |

***1** Mounted on 50 × 50 × 1.6 mm double epoxy glass board.

## RECOMMENDED OPERATING RANGE

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 4.5 | 5.0 | 5.5 | V |
| Operating Ambient Temperature | $T_A$ | –40 | +25 | +85 | °C |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C, $V_{CC}$ = 5 V; *1)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| Circuit Current | $I_{CC}$ | 25.5 | 35.0 | 48.0 | mA | no input signal |
| Lower Input Frequency | $f_{RF}1$ | — | — | 0.95 | GHz | |
| Upper Input Frequency | $f_{RF}2$ | 2.15 | — | — | GHz | |
| Conversion Gain 1 | CG1 | 8.0 | 11.0 | 14.0 | dB | $f_{RF}$ = 950 MHz, $P_{RF}$ = –30 dBm, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10dBm |
| Conversion Gain 2 | CG2 | 6.5 | 9.5 | 12.5 | dB | $f_{RF}$ = 2.15 GHz, $P_{RF}$ = –30 dBm, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10 dBm |
| Noise Figure 1 | NF1 | — | 13.5 | 16.0 | dB | $f_{RF}$ = 950 MHz, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10 dBm |
| Noise Figure 2 | NF2 | — | 14.0 | 16.5 | dB | $f_{RF}$ = 2.15 GHz, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10 dBm |
| Maximum Output Power 1 | $P_{O(sat)}$ 1 | 2.0 | 5.0 | — | dBm | $f_{RF}$ = 950 MHz, $P_{RF}$ = 0 dBm, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10 dBm |
| Maximum Output Power 2 | $P_{O(sat)}$ 2 | 0.0 | 3.5 | — | dBm | $f_{RF}$ = 2.15 GHz, $P_{RF}$ = 0 dBm, $f_{IF}$ = 402 MHz, $P_{OSC}$ = –10 dBm |

***1** By measurement circuit.

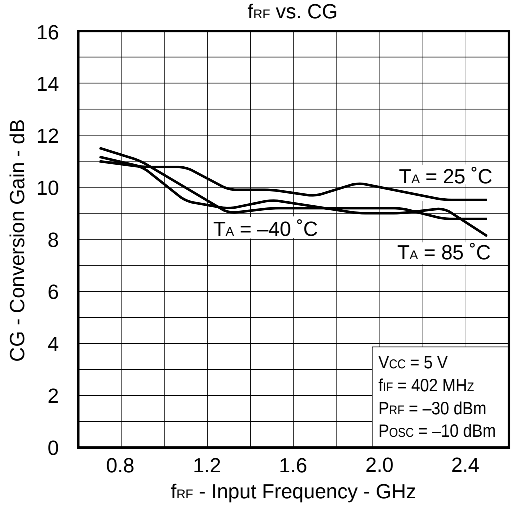
## STANDARD CHARACTERISTICS ($T_A$ = 25 °C, $V_{CC}$ = 5 V; *1)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| 3rd Order Intermodulation Distortion 1 | $IM_31$ | — | 55 | — | dBc | $f_{RF}$ = 950, 980 MHz, $P_{RF}$ = –25 dBm, $f_{OSC}$ = 1430 MHz, $P_{OSC}$ = –10 dBm |
| 3rd Order Intermodulation Distortion 2 | $IM_32$ | — | 55 | — | dBc | $f_{RF}$ = 2.15, 2.18 GHz, $P_{RF}$ = –25 dBm, $f_{OSC}$ = 2.63 GHz, $P_{OSC}$ = –10 dBm |
| Oscillator Frequency | $f_{osc}$ | 1.35 | — | 2.65 | GHz | |

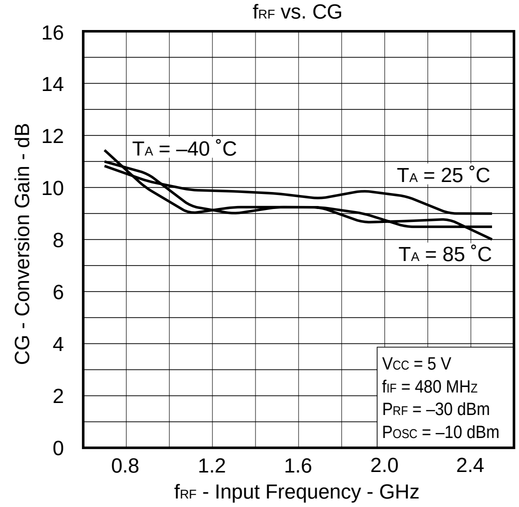
***1** By measurement circuit.

## TYPICAL CHARACTERISTICS

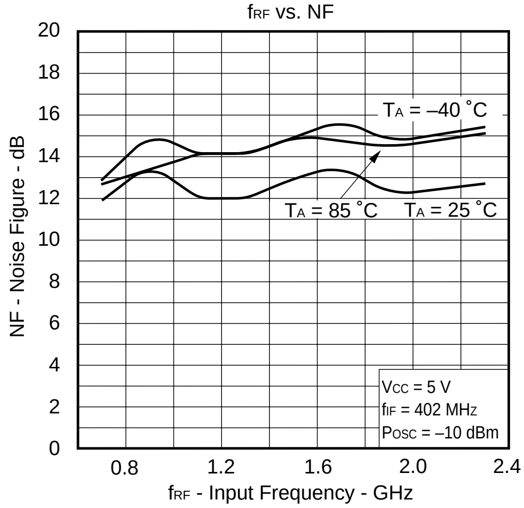
fRF vs. CG



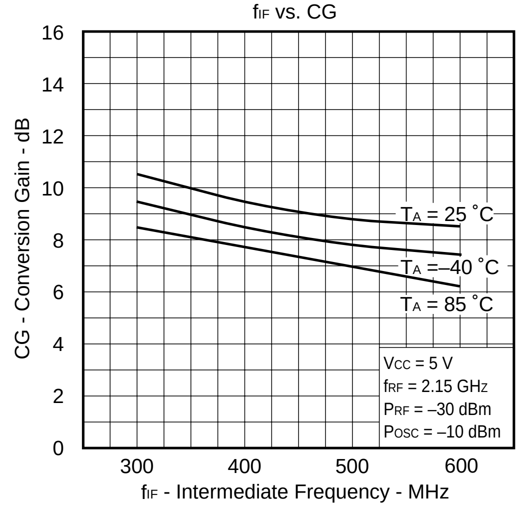

fRF vs. CG



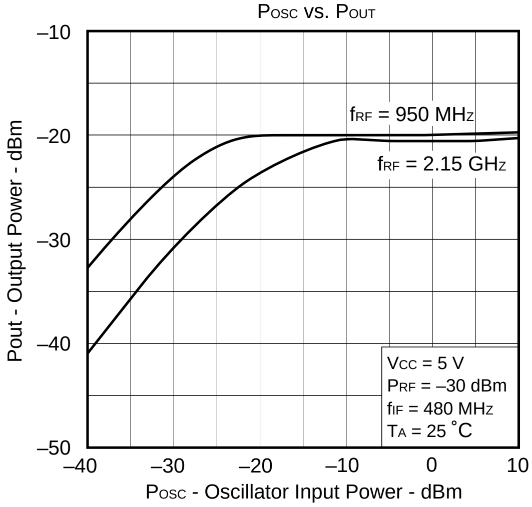

fRF vs. NF



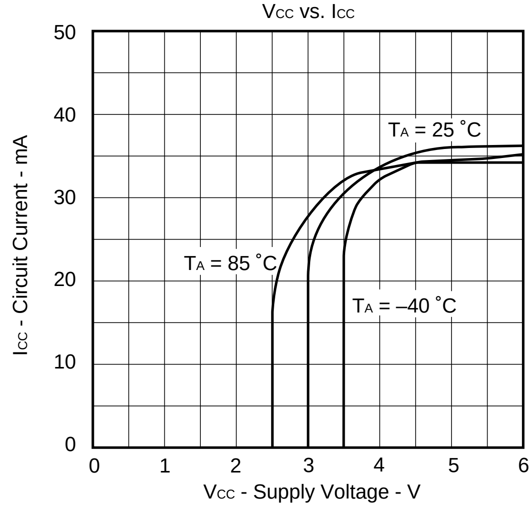

fIF vs. CG



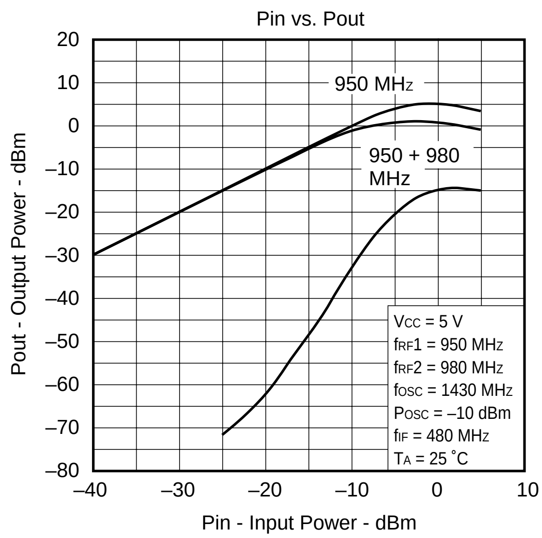

POSC vs. POUT

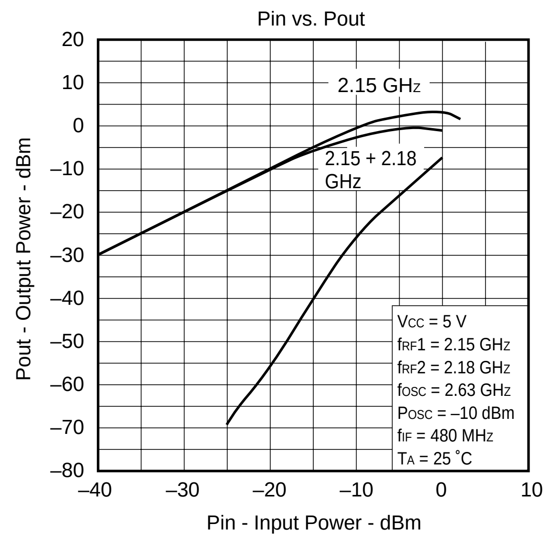


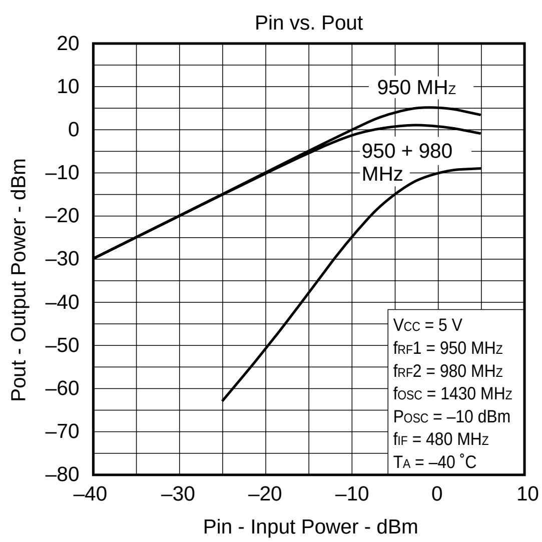

VCC vs. ICC

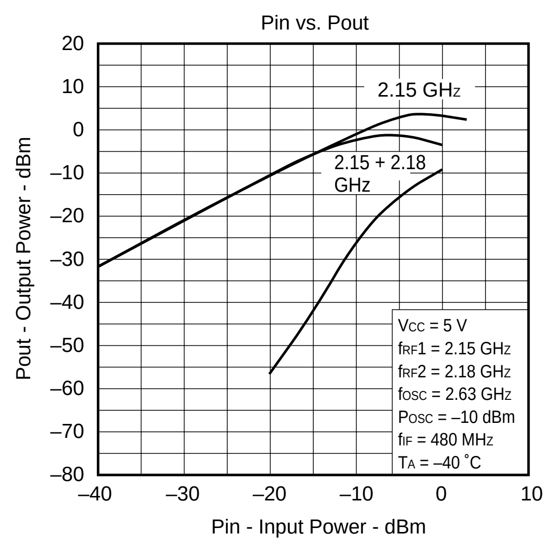


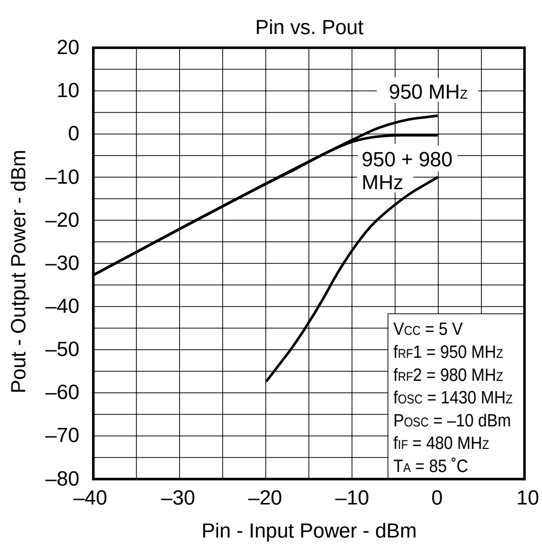
## STANDARD CHARACTERISTICS

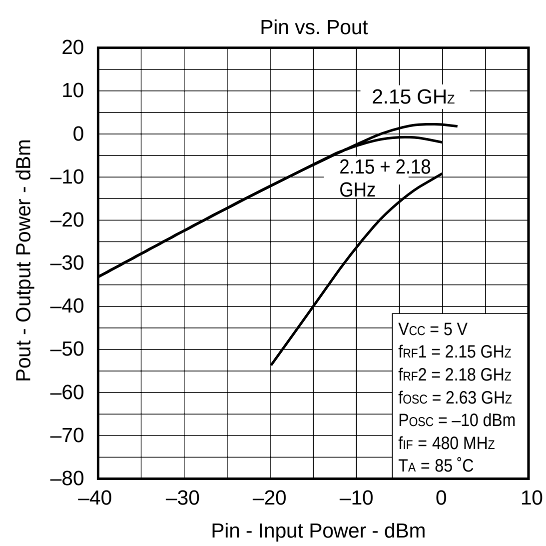


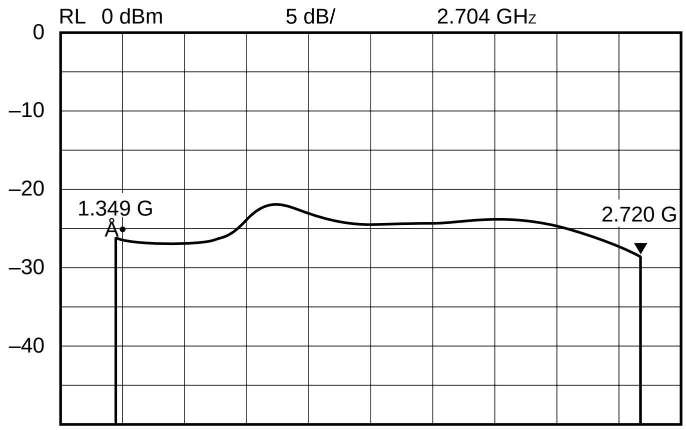



## STANDARD CHARACTERISTICS ($V_{CC}$ = 5 V, $T_A$ = 25 °C)

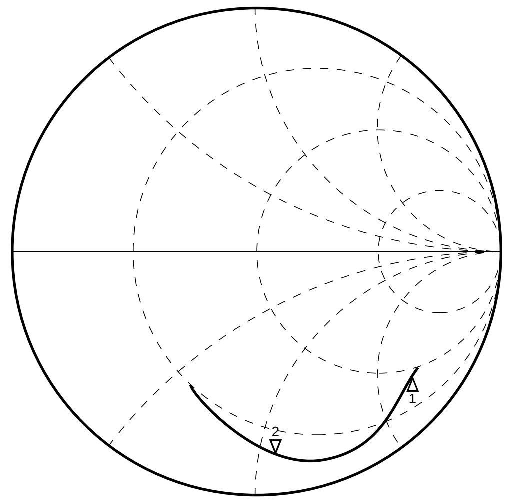
### OSC Frequency Range*1




CENTER 2.000 GHz
RBW 1.0 MHz VBW 1.0 MHz
SPAN 1.600 GHz
SWP 50 ms

***1** Measured at IF output pin (4 pin)

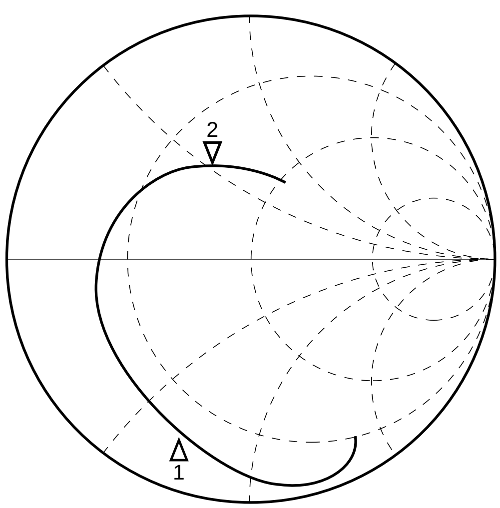
### RF Input Impedance (@1 pin)




START 900 MHz
STOP 3 GHz

| MARKER | Re [Ω] | Im [Ω] |
|---|---|---|
| 1 : 950 MHz | 41.5 | –152 (1.10 pF) |
| 2 : 2150 MHz | 11.2 | –54.9 (1.35 pF) |

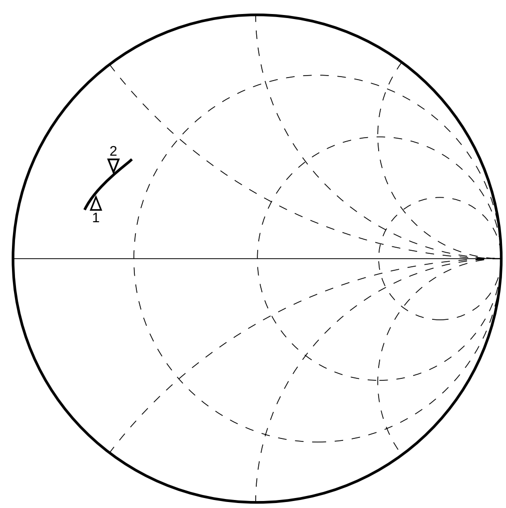
### OSC Input Impedance (@8 pin)




START 900 MHz
STOP 3 GHz

| MARKER | Re [Ω] | Im [Ω] |
|---|---|---|
| 1 : 1350 MHz | 9.22 | –36.1 (3.27 pF) |
| 2 : 2630 MHz | 31.5 | 26.9 (1.63 nH) |

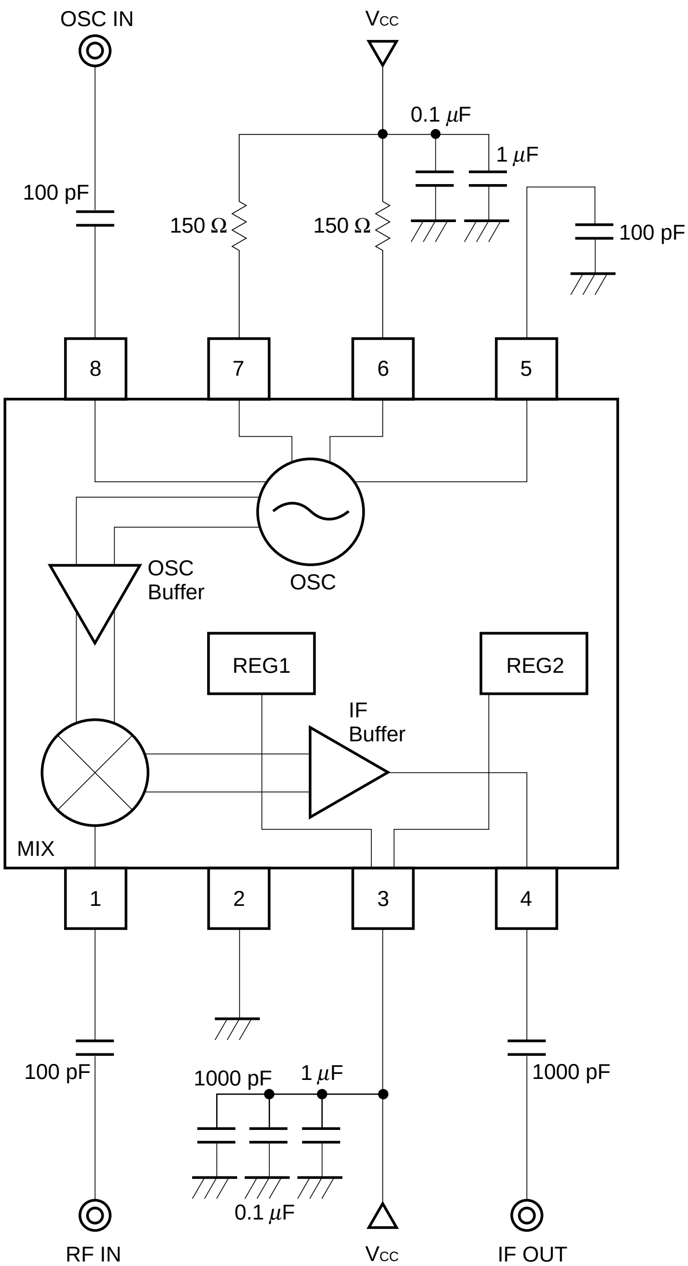
### IF Output Impedance



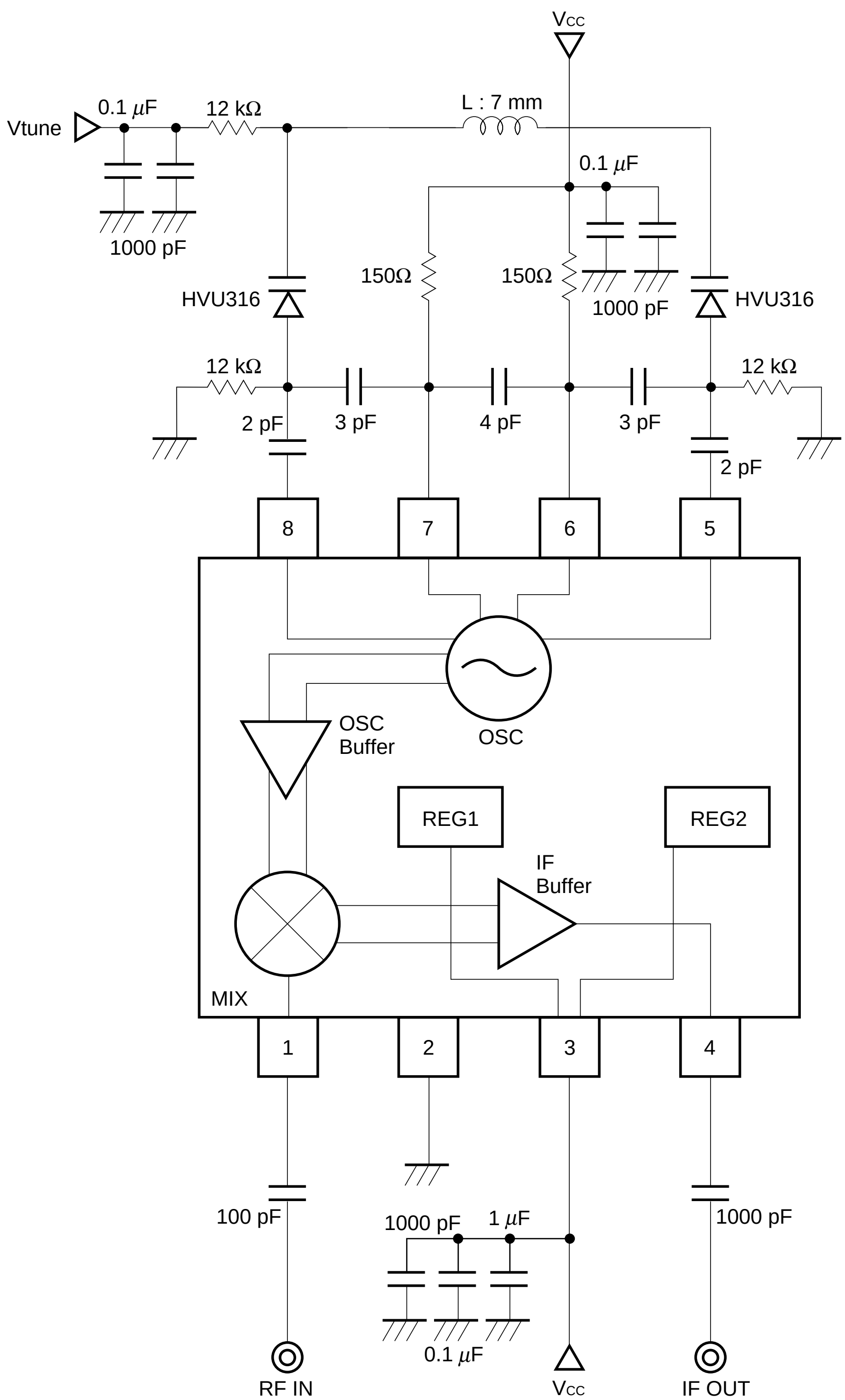

START 300 MHz
STOP 600 MHz

| MARKER | Re [Ω] | Im [Ω] |
|---|---|---|
| 1 : 402.8 MHz | 9.48 | 11.2 (9.40 nH) |
| 2 : 479.5 MHz | 10.4 | 13.4 (4.46 nH) |

**MEASUREMENT CIRCUIT**

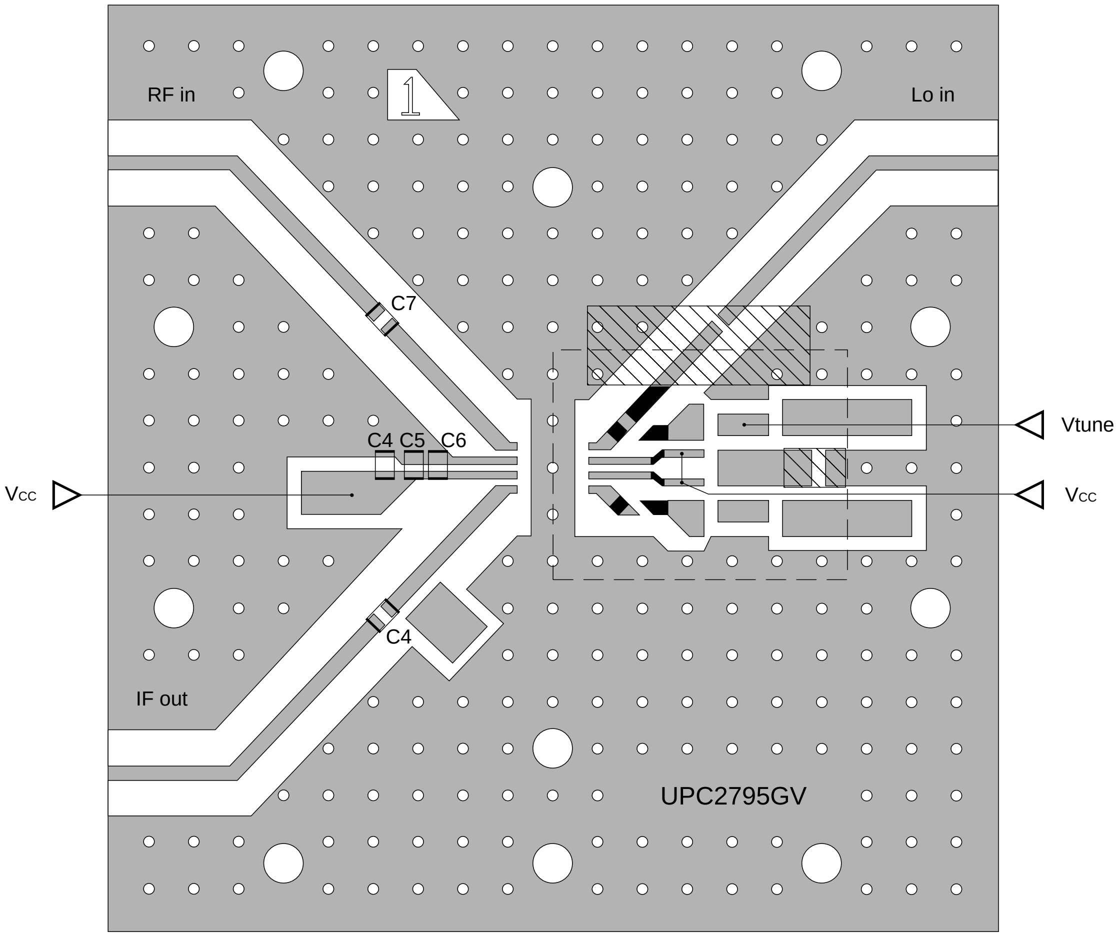


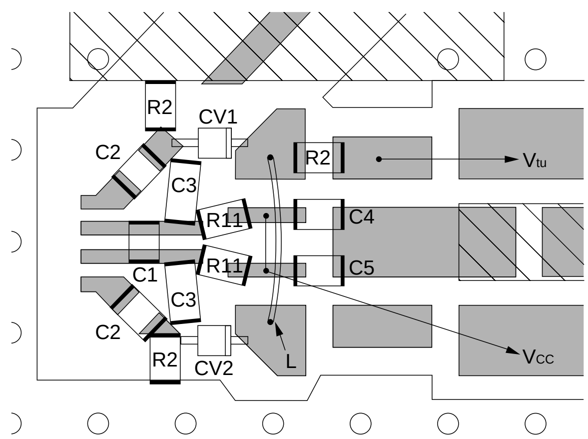
**APPLICATION CIRCUIT EXAMPLE**




The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

**Illustration of the application circuit assembled on evaluation board**



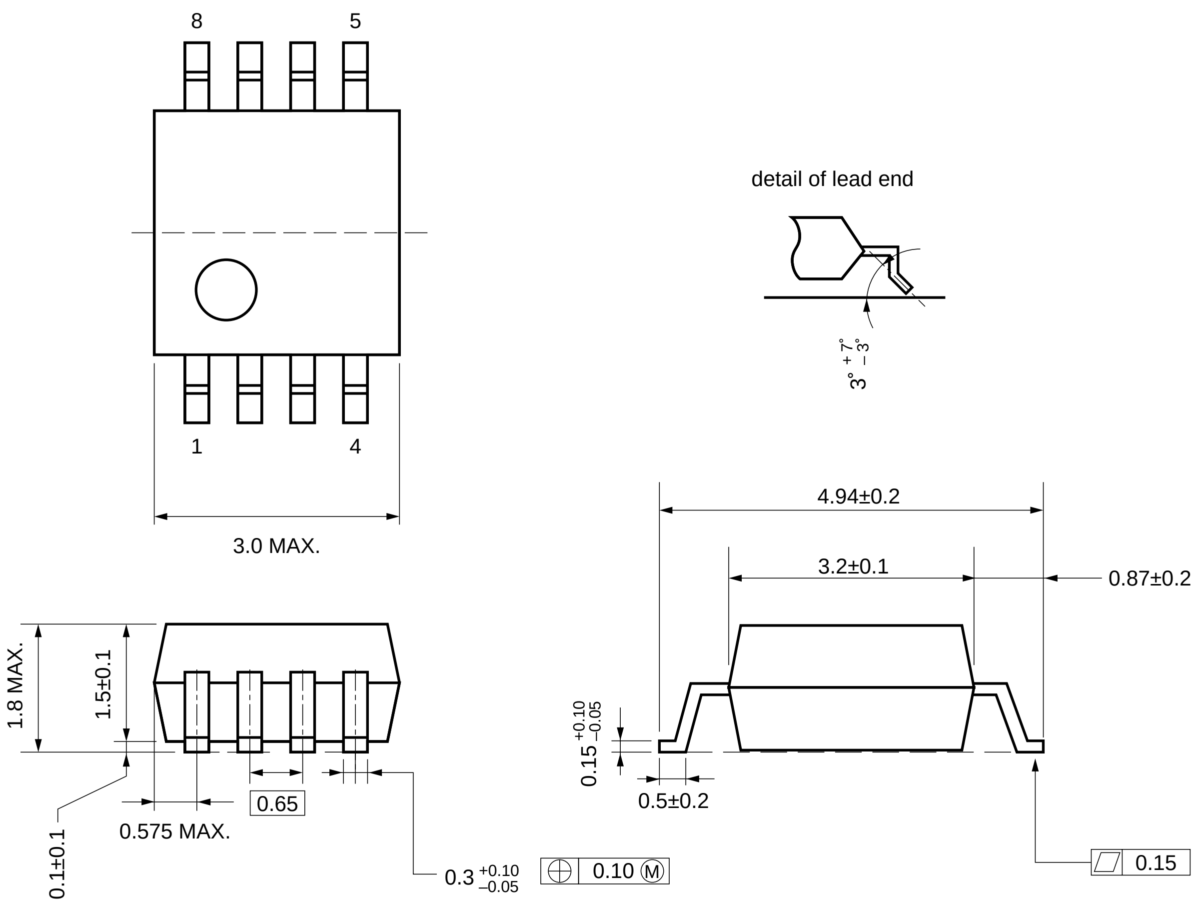

| | |
|---|---|
| Cv1 = Cv2 : HVU316 | C5 : 0.1 μF |
| C1 : 4 pF | C6 : 1 μF |
| C2 : 2 pF | C7 : 100 pF |
| C3 : 3 pF | R1 : 150 Ω |
| C4 : 1000 pF | R2 : 12 kΩ |

(hatched) shows short circuited strip for ground

(black) shows cutout

## PACKAGE DIMENSIONS

### 8 PIN PLASTIC SSOP (unit : mm)



## NOTES ON CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.
(2) Form a ground pattern as wide as possible to minimize ground impedance (to prevent undesired oscillation).
(3) Keep the track length of the ground pins as short as possible.
(4) A low pass filter must be attached to $V_{CC}$ line.
(5) A matching circuit must be externally attached to output port.

## RECOMMENDED SOLDERING CONDITIONS

The following conditions (see table below) must be met when soldering this product.

Please consult with our sales officers in case other soldering process is used or in case soldering is done under different conditions.

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).

**μPC2795GV**

| Soldering process | Soldering conditions | Symbol |
|---|---|---|
| Infrared ray reflow | Peak package's surface temperature: 235 °C or below,<br>Reflow time: 30 seconds or below (210 °C or higher),<br>Number of reflow process: 3, Exposure limit[Note]: None | IR35-00-3 |
| VPS | Peak package's surface temperature: 215 °C or below,<br>Reflow time: 40 seconds or below (200 °C or higher),<br>Number of reflow process: 3, Exposure limit[Note]: None | VP15-00-3 |
| Wave soldering | Solder temperature: 260°C or below,<br>Reflow time: 10 seconds or below,<br>Number of reflow process: 1, Exposure limit[Note]: None | WS60-00-1 |
| Partial heating method | Terminal temperature: 300 °C or below,<br>Flow time: 3 seconds or below,<br>Exposure limit[Note]: None | |

**Note** Exposure limit before soldering after dry-pack package is opened.
Storage conditions: 25 °C and relative humidity at 65 % or less.

**Caution Do not apply more than single process at once, except for "Partial heating method".**

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