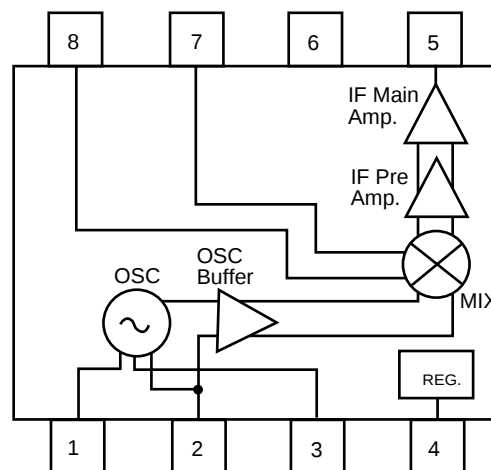


## FEATURES

- **WIDE-BAND OPERATION:** DC to 900 MHz
- **SMALL PACKAGE**
- **DOUBLE BALANCED MIXER:**  
Low Distortion  
Low Oscillator Radiation
- **BALANCED AMPLIFIER FOR VOLTAGE CONTROLLED OSCILLATORS:**  
Up to UHF Frequency
- **SINGLE ENDED PUSH-PULL IF AMPLIFIER:**  
Constant Resistive Impedance
- **SWITCHABLE AS MIXER OR IF AMP**

### BLOCK DIAGRAM



## DESCRIPTION

The UPC1687GV is a silicon RFIC designed as a wide-band mixer/oscillator/IF amp suitable for UHF TV tuners. Device features include: 25 dB gain from 55 to 900 MHz and an output power of +10 dBm at the saturation point. The IC is housed in an 8 pin SSOP package.

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, V<sub>CC</sub> = 5 V)

| PART NUMBER<br>PACKAGE OUTLINE |                                                                                                                                                          |            | UPC1687GV<br>S08 |          |          | TEST             |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------|----------|----------|------------------|
| SYMBOLS                        | PARAMETERS AND CONDITIONS                                                                                                                                | UNITS      | MIN              | TYP      | MAX      | CIRCUIT          |
| I <sub>CC</sub>                | Circuit Current, no input signal                                                                                                                         | mA         | 25               | 38       | 48       | Fig. 1           |
| CG                             | Conversion Gain (RF Input Terminal is not tuned) at<br>IF = 50 MHz, P <sub>RF</sub> = -40 dBm, P <sub>osc</sub> = -5 dBm<br>RF = 500 MHz<br>RF = 900 MHz | dB<br>dB   | 22<br>20         | 26<br>24 | 29<br>27 | Fig. 1<br>Fig. 1 |
| NF                             | Noise Figure at IF = 50 MHz, P <sub>osc</sub> = -5 dBm<br>RF = 500 MHz<br>RF = 900 MHz                                                                   | dB<br>dB   | —<br>—           | 9<br>10  | 12<br>13 | Fig. 1<br>Fig. 1 |
| CM                             | 1% Cross Modulation Distortion <sup>1</sup><br>RF = 500 MHz<br>RF = 900 MHz                                                                              | dBμ<br>dBμ | —<br>—           | 88<br>89 | —<br>—   | Fig. 1<br>Fig. 1 |
| PSAT                           | Output Power (Saturation Point)                                                                                                                          | dBm        | —                | +10      | —        | Fig. 1           |
| f <sub>STB</sub>               | Oscillator Frequency Stability at V <sub>CC</sub> ± 10%<br>OSC f = 550 to 950 MHz                                                                        | kHz        | —                | ±200     | —        | Fig. 2           |
| V <sub>OSC</sub>               | V <sub>CC</sub> at OSC Start<br>OSC f = 550 to 950 MHz                                                                                                   | V          | —                | 3.0      | —        | Fig. 2           |
| V <sub>SWR</sub>               | IF Output                                                                                                                                                |            | —                | —        | 1.5      | Fig. 1           |

Note:

1. Undesired = Desired  $\pm$  12 MHz, 100 kHz, 30% AM Mod, S/I Ratio = 46 dBc.

ABSOLUTE MAXIMUM RATINGS<sup>1</sup> (T<sub>A</sub> = 25°C)

| SYMBOLS          | PARAMETERS                           | UNITS | RATINGS     |
|------------------|--------------------------------------|-------|-------------|
| V <sub>CC</sub>  | Supply Voltage                       | V     | 6           |
| P <sub>T</sub>   | Total Power Dissipation <sup>2</sup> | mW    | 250         |
| T <sub>OP</sub>  | Operating Temperature                | °C    | -40 to +85  |
| T <sub>STG</sub> | Storage Temperature                  | °C    | -65 to +150 |

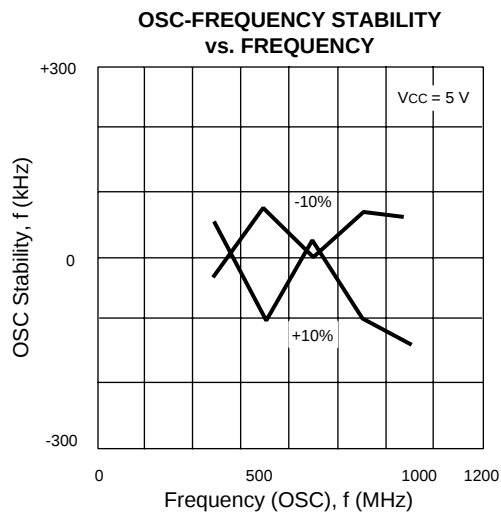
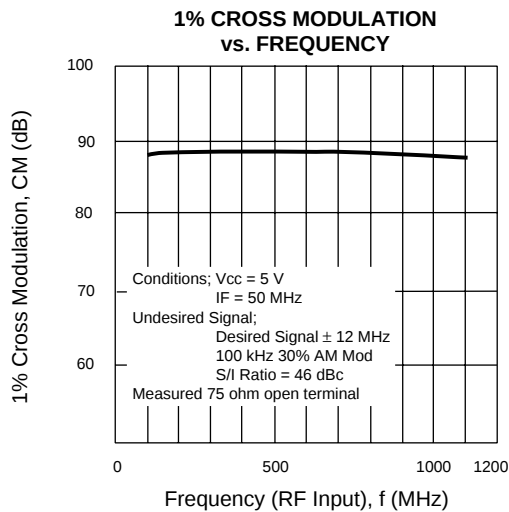
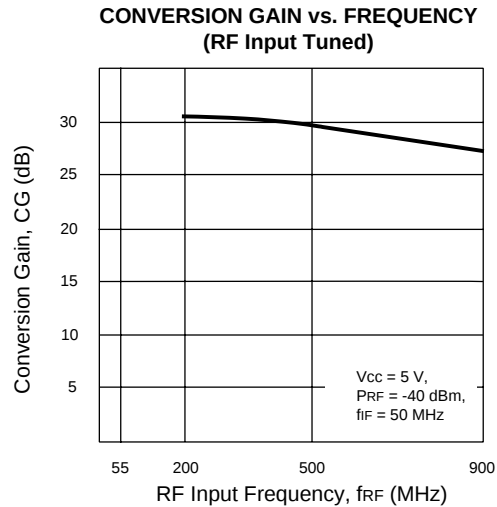
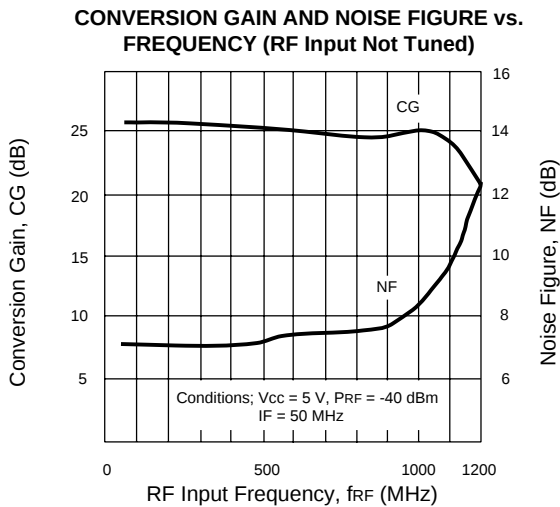
Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. T<sub>A</sub> = 85°C mounted on 50 x 50 x 1.6 (mm) PWB (glass-epoxy).

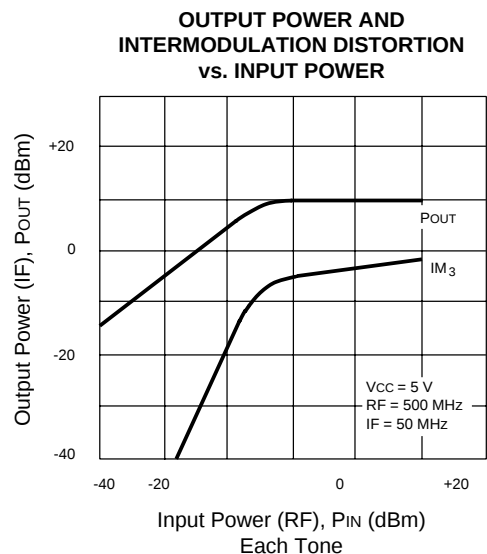
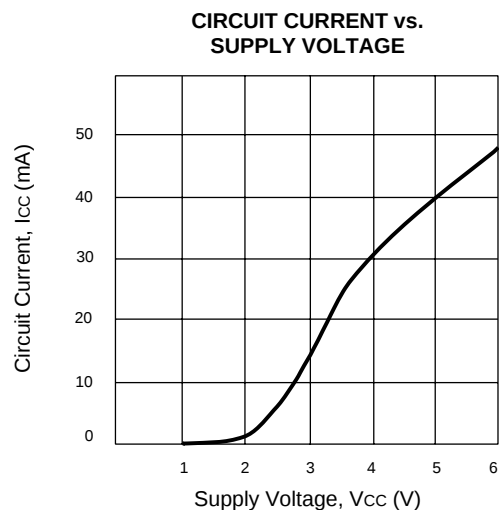
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)

| PART NUMBER<br>PACKAGE OUTLINE |                                                                                                                            |       | UPC1687GV<br>S08 | TEST<br>CIRCUIT |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------|------------------|-----------------|
| SYMBOLS                        | PARAMETERS AND CONDITIONS                                                                                                  | UNITS | TYP              |                 |
| G <sub>s</sub>                 | Small Signal Gain of IF amplifier at f = 50 MHz                                                                            | dB    | 29               | Fig. 3          |
| NF                             | Noise Figure of IF amplifier at f = 50 MHz                                                                                 | dB    | 7                | Fig. 3          |
| CM                             | 1% Cross Modulation of IF amplifier<br>(100 kHz, 30% AM Mod, S/I Ratio = 46 dBc)<br>Desired = 50 MHz<br>Undesired = 62 MHz | dBμ   | 87               | Fig. 3          |

TYPICAL PERFORMANCE CURVES (T<sub>A</sub> = 25°C)



## TYPICAL PERFORMANCE CURVES (T<sub>A</sub> = 25°C)

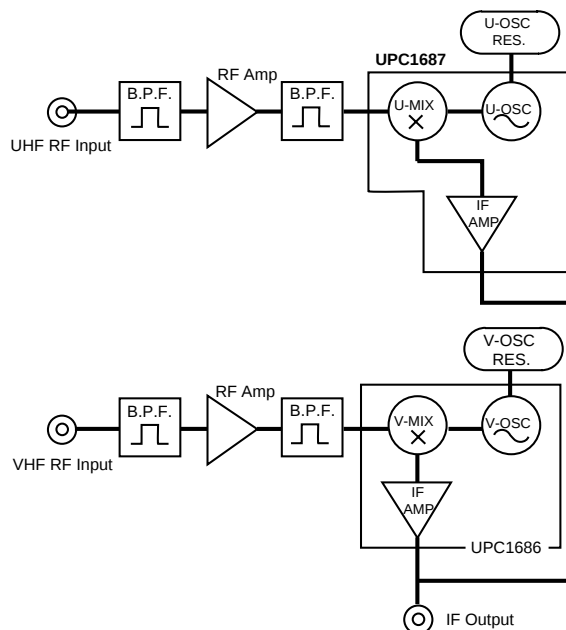


## PIN DESCRIPTION

| Pin No. | Pin Name                 | Description                                                                                                                                                                                                                                                                                                            | Internal Equivalent Circuit |
|---------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1       | OSC Base (bypass)        | Input pins for the internal oscillator which consists of a balanced amplifier. Pin 1 should be bypassed to ground through a capacitor. Pins 2 and 3 should be externally equipped with a tank resonator. Note that pin 3 is an open collector and must be supplied voltage through an external resistor or choke coil. |                             |
| 2       | OSC Base (feedback)      |                                                                                                                                                                                                                                                                                                                        |                             |
| 3       | OSC Collector (Coupling) |                                                                                                                                                                                                                                                                                                                        |                             |
| 4       | V <sub>CC</sub>          | Supply voltage pin. This pin should be externally equipped with a bypass capacitor to minimize ground impedance.                                                                                                                                                                                                       |                             |
| 5       | IF Output                | IF output pin from the single-ended push-pull amplifier. This pin is an emitter follower output with a constant resistive impedance of 50 Ω.                                                                                                                                                                           |                             |
| 6       | GND                      | Ground pin. This pin must be connected to system ground. Form ground pattern as wide as possible to minimize ground impedance.                                                                                                                                                                                         |                             |
| 7       | RF Input 1 (bypass)      | RF input pins. Pins 7 and 8 are each base inputs to a double balanced mixer. Either pin can be assigned as the input. The unused pin should be bypassed to ground through a capacitor.                                                                                                                                 |                             |
| 8       | RF Input 2               |                                                                                                                                                                                                                                                                                                                        |                             |

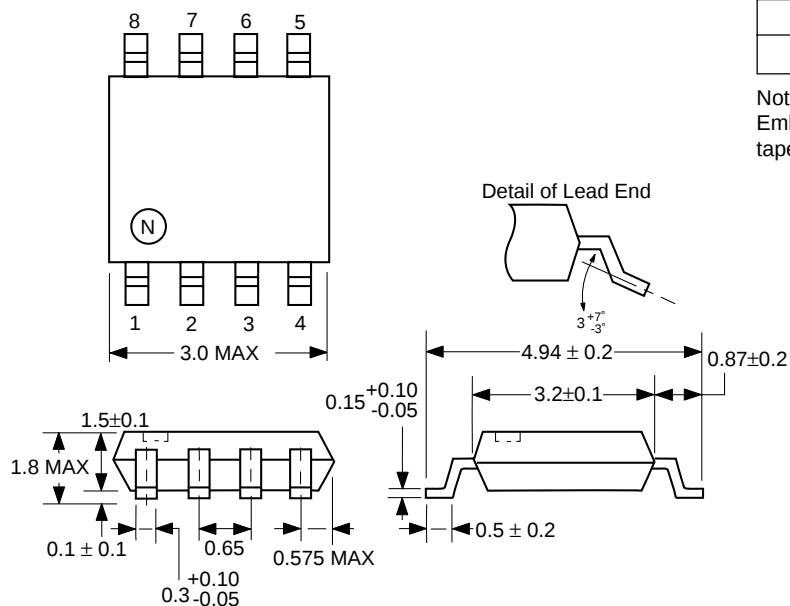


## APPLICATION BLOCK DIAGRAM FOR T.V. TUNER



## OUTLINE DIMENSIONS (Units in mm)

UPC1687GV  
PACKAGE OUTLINE S08



Note:  
All dimensions are typical unless otherwise specified.

### PIN CONNECTION

- |                             |                    |
|-----------------------------|--------------------|
| 1. OSC-Base (Bypass)        | 5. IF OUT          |
| 2. OSC-Base (Feedback)      | 6. GND             |
| 3. OSC-Collector (Coupling) | 7. RF IN1 (Bypass) |
| 4. Vcc                      | 8. RF IN2          |

## ORDERING INFORMATION

| PART NUMBER  | QUANTITY  |
|--------------|-----------|
| UPC1687GV-E1 | 1000/REEL |

Note:  
Embossed Tape, 8 mm wide. Pin 1 indicates pull-out direction of tape.

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