NEC

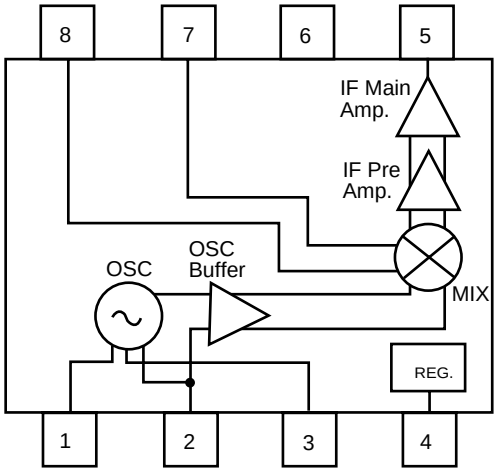
900 MHz SILICON RFIC DOWN CONVERTER

UPC1687GV

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_A = 25°C, V_{CC} = 5 V)

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

Note:
1. Undesired = Desired ± 12 MHz, 100 kHz, 30% AM Mod, S/I Ratio = 46 dBc.

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	6
P_T	Total Power Dissipation[2]	mW	250
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-65 to +150

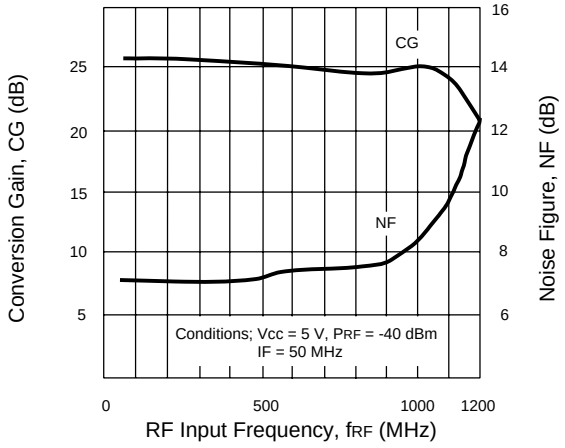
Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. T_A = 85°C mounted on 50 x 50 x 1.6 (mm) PWB (glass-epoxy).

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

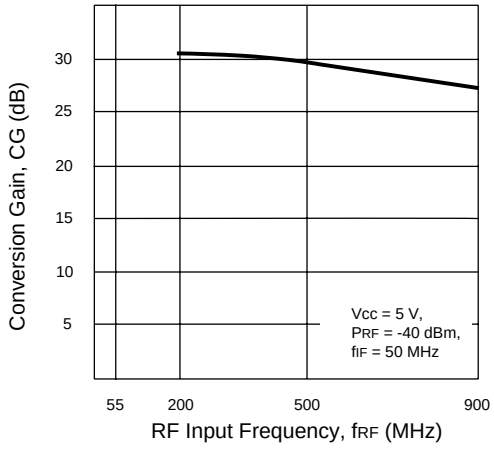
PART NUMBER PACKAGE OUTLINE			UPC1687GV S08	TEST
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	TYP	CIRCUIT
Gs	Small Signal Gain of IF amplifier at f = 50 MHz	dB	29	Fig. 3
NF	Noise Figure of IF amplifier at f = 50 MHz	dB	7	Fig. 3
CM	1% Cross Modulation of IF amplifier (100 kHz, 30% AM Mod, S/I Ratio = 46 dBc)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

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

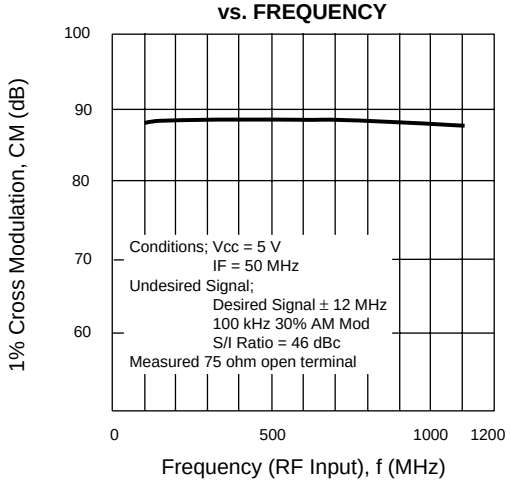
CONVERSION GAIN AND NOISE FIGURE vs. FREQUENCY (RF Input Not Tuned)



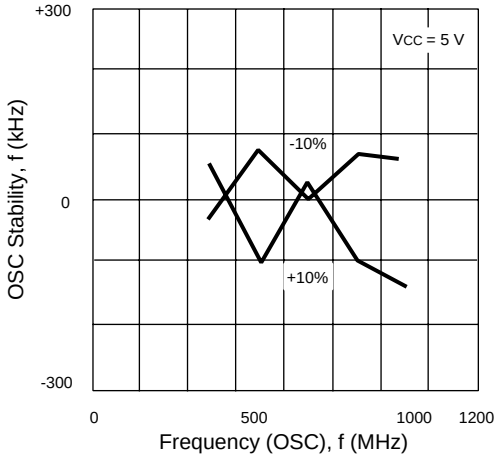
CONVERSION GAIN vs. FREQUENCY (RF Input Tuned)



1% CROSS MODULATION vs. FREQUENCY

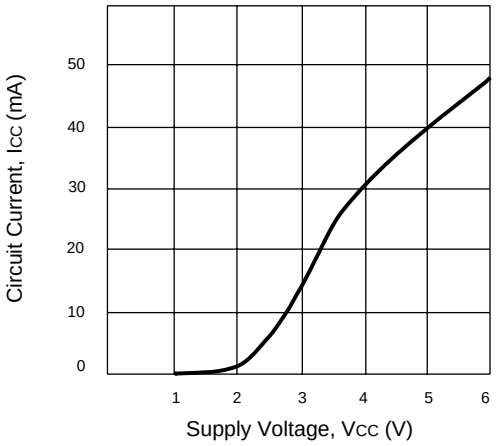


OSC-FREQUENCY STABILITY vs. FREQUENCY

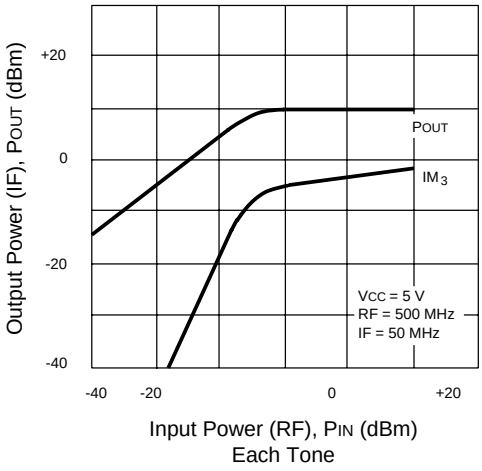


TYPICAL PERFORMANCE CURVES (T_A = 25°C)

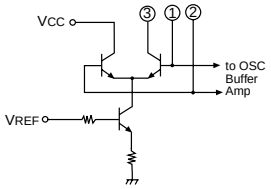
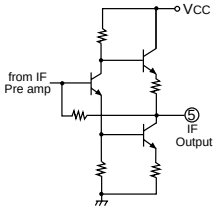
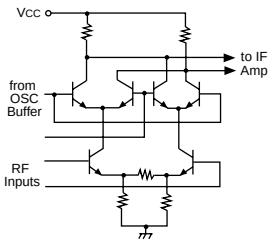
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



OUTPUT POWER AND INTERMODULATION DISTORTION vs. INPUT POWER



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	VCC	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		

TEST CIRCUITS

Figure 1

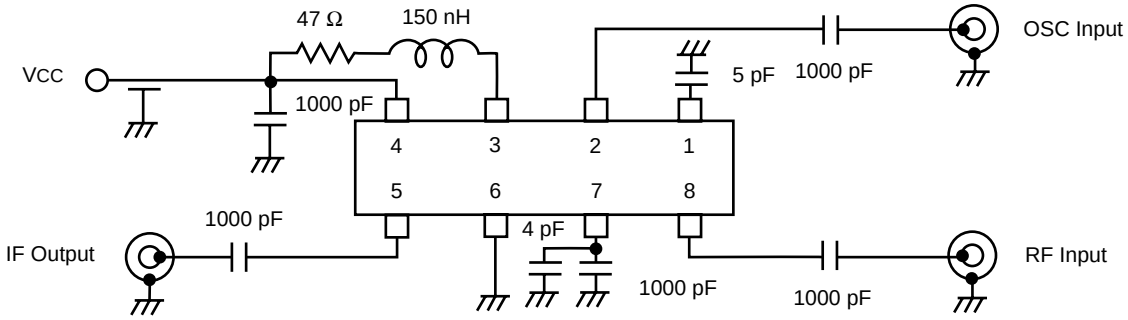


Figure 2

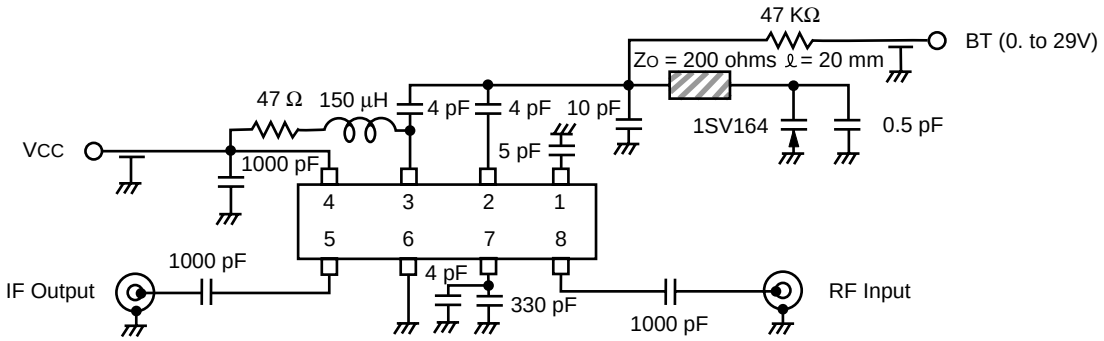
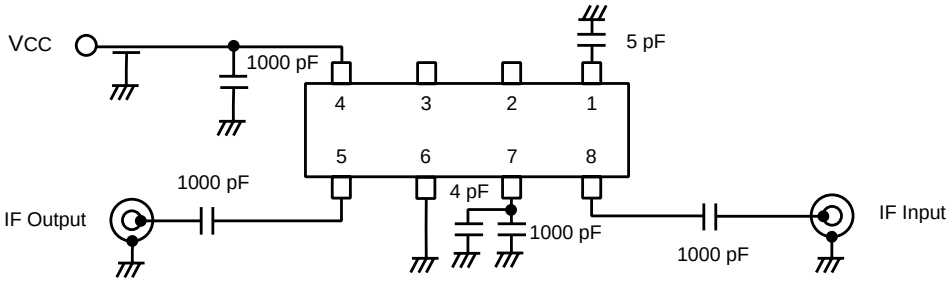
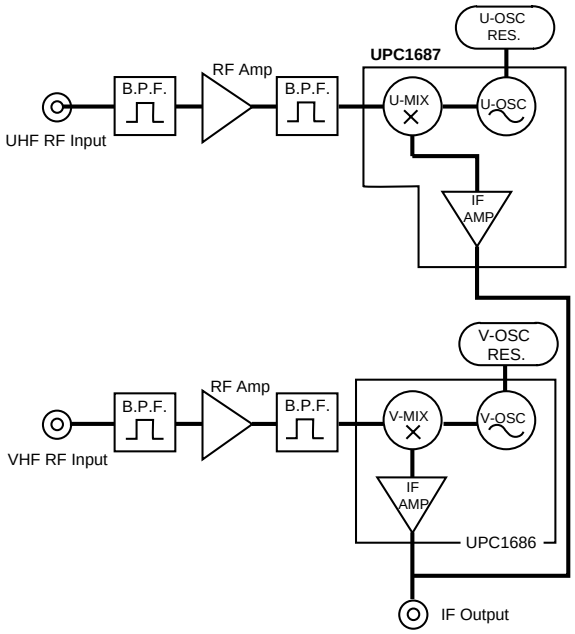


Figure 3

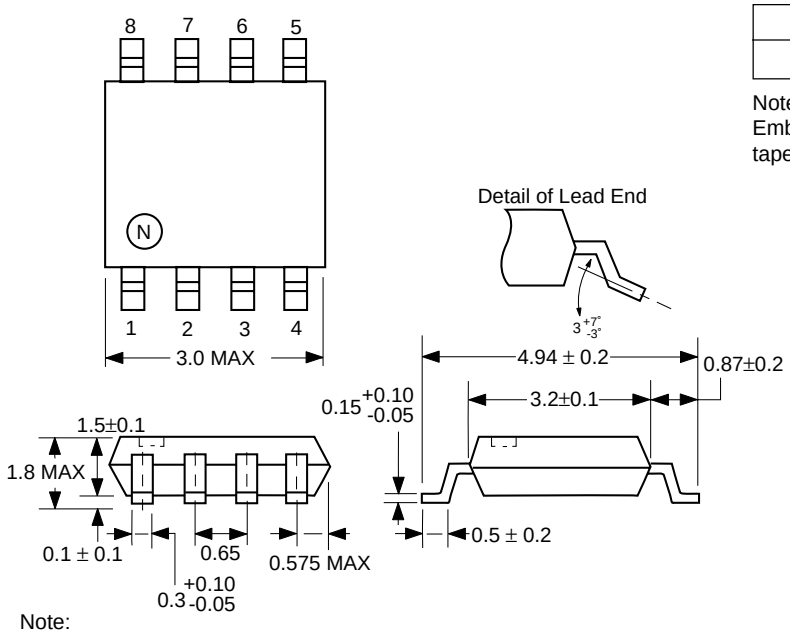


APPLICATION BLOCK DIAGRAM FOR T.V. TUNER



OUTLINE DIMENSIONS (Units in mm)

UPC1687GV
PACKAGE OUTLINE S08



Note:
All dimensions are typical unless otherwise specified.

PIN CONNECTION

1. OSC-Base (Bypass)
2. OSC-Base (Feedback)
3. OSC-Collector (Coupling)
4. V_{CC}
5. IF OUT
6. GND
7. RF IN1 (Bypass)
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.