

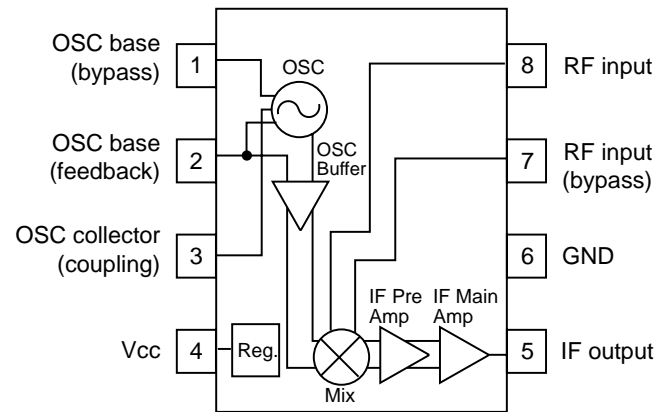
### FEATURES

- **WIDE-BAND OPERATION:** DC to 890 MHz
- **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**
- **SMALL PACKAGE:** 8 Pin SOP

### DESCRIPTION

The UPC1686 is a silicon monolithic integrated circuit designed as a wide-band mixer/oscillator/IF amp suitable for VHF TV/CATV tuners. Device features include: 20 dB gain from 55 to 890 MHz and an output power of +10 dBm at saturation. The device is available in an 8 pin SOP package. The nominal output impedance of the device is 75 ohms.

### INTERNAL BLOCK DIAGRAM



### ELECTRICAL CHARACTERISTICS (TA = 25°C, VCC = 5 V)

PART NUMBER PACKAGE OUTLINE			UPC1686G G08			TEST CIRCUIT
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	
I <sub>CC</sub>	Circuit Current, no input signal	mA	25	38	48	Fig. 1
CG	Conversion Gain <sup>1</sup> RF = 55 MHz, IF = 44 MHz RF = 200 MHz, IF = 50 MHz RF = 440 MHz, IF = 50 MHz RF = 890 MHz, IF = 50 MHz	dB	15	19	22	Fig. 1
			15.5	19.5	22.5	
			16	20	23	
				20		
NF	Noise Figure <sup>2</sup> at RF = 55 MHz, IF = 44 MHz RF = 200 MHz, IF = 50 MHz RF = 440 MHz, IF = 50 MHz	dB	11	11	14	Fig. 1
			11	11	14	
				12	15	
CM	1% Cross modulation <sup>3</sup> at IF = 50 MHz, 75 Ω Open Terminal, RF = 55 to 470 MHz	dBμ		94		Fig. 1
PSAT	Saturated Output Power <sup>4</sup>	dBm		+10		Fig. 1
f <sub>STB</sub>	Oscillator Frequency Stability at V <sub>CC</sub> ± 10% OSC f = 100 to 490 MHz	kHz		±100		Fig. 2
f <sub>DRIFT</sub>	Oscillation Frequency Drift, OSC f = 100 to 490 MHz	kHz		100		Fig. 2
V <sub>OSC</sub>	Oscillation Start Voltage OSC f = 100 to 490 MHz	V		3.0		Fig. 2
V <sub>SWR</sub>	IF Output			1.3	1.5	Fig. 1

Notes:

1. P<sub>RFIn</sub> = -40 dBm, P<sub>OSC</sub> = -5 dBm
2. P<sub>OSC</sub> = -5 dBm
3. Undesired = Desired ± 12 MHz, 30% 100 kHz AM S/I Ratio = 46 dB
4. P<sub>RFIn</sub> = 0 dBm, P<sub>OSC</sub> = -5 dBm

**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	280
T <sub>OP</sub>	Operating Temperature	°C	-40 to +85
T <sub>STG</sub>	Storage Temperature	°C	-65 to +150

Notes:

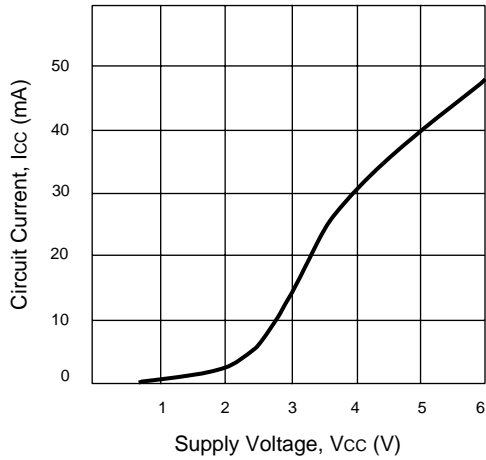
1. Operation in excess of any one of these parameters may result in permanent damage.
2. T<sub>A</sub> = 85°C mounted on 50 x 50 x 1.6 (mm) PWB (glass-epoxy).

**PIN DESCRIPTION**

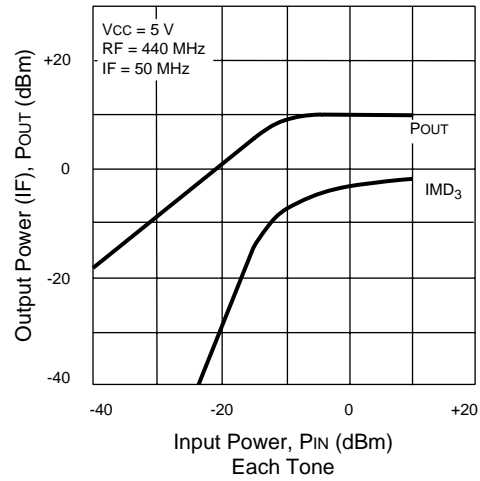
PIN NO.	SYMBOL	FUNCTION AND APPLICATION	EQUIVALENT CIRCUIT
1	OSC Base (Bypass)	<p>Internal oscillator consists of a balanced amplifier. Pins 2 and 3 should be externally equipped with a tank resonator circuit in order to oscillate with feedback loop.</p> <p>Pin 1 should be grounded through a coupling capacitor (~10 pF).</p> <p>Pin 3 is an open collector. This pin should be coupled through resistor or choke coil in order to adjust Q and connect to supply voltage. In case of unstable oscillation, lowering the Q will help to stabilize the operation.</p>	
2	OSC Base (Feedback)		
3	OSC Collector (Coupling)		
4	V <sub>CC</sub>	Supply voltage pin for the IC.	
5	IFOUT	IF output pin. IF amplifier is designed as a single-ended push-pull amplifier. This pin is an emitter follower output with a wideband 50 Ω impedance.	
6	GND	GND pin for the IC.	
7	RF IN2 (Bypass)	<p>Pins 7 and 8 are inputs to a double-balance mixer. Either pin can be used for input and bypass.</p>	
8	RF IN1		

**TYPICAL PERFORMANCE CURVES** ( $T_A = 25^\circ\text{C}$ )

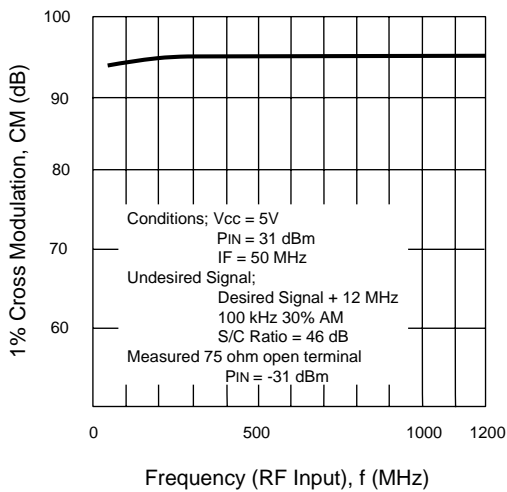
**CIRCUIT CURRENT vs. SUPPLY VOLTAGE**



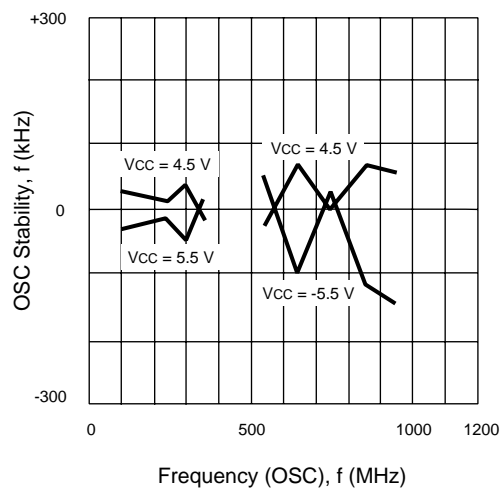
**OUTPUT POWER & INTERMODULATION DISTORTION vs. INPUT POWER**



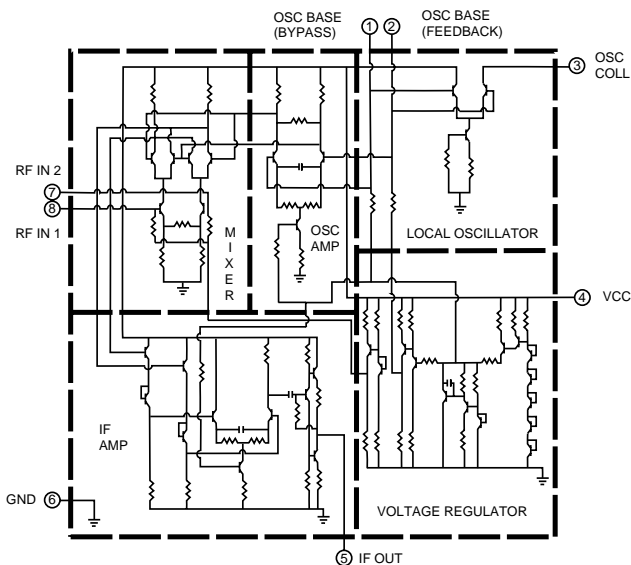
**1% CROSS MODULATION vs. FREQUENCY**



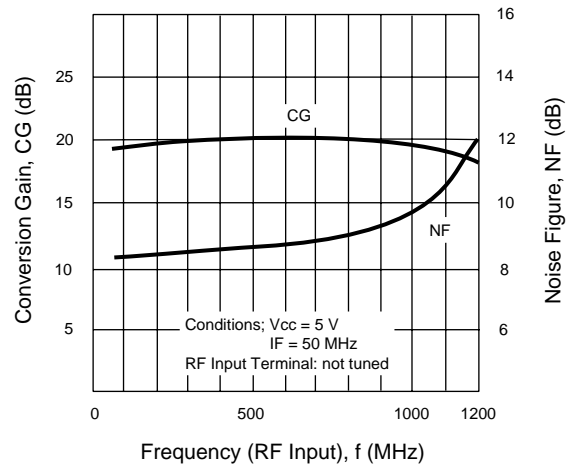
**OSC-FREQUENCY STABILITY vs. FREQUENCY**



**EQUIVALENT CIRCUIT**



**CONVERSION GAIN AND NOISE FIGURE vs. FREQUENCY**



TEST CIRCUITS

Figure 1

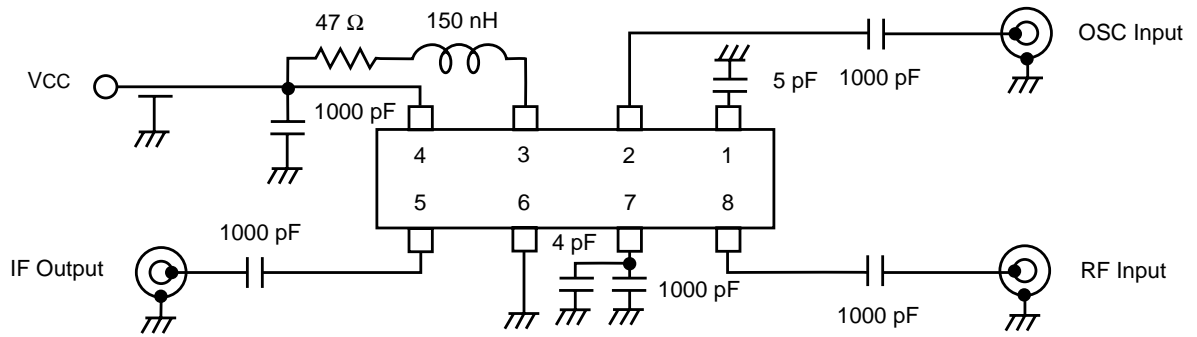
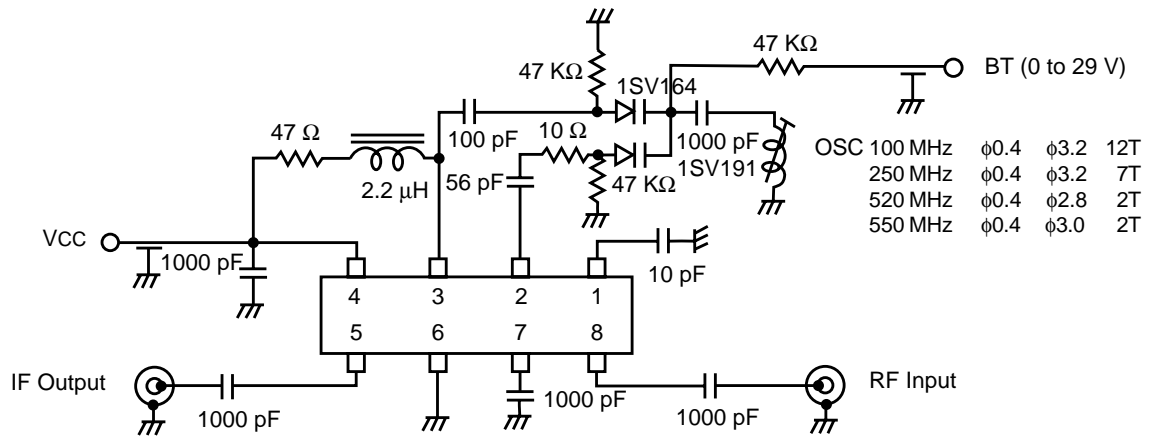
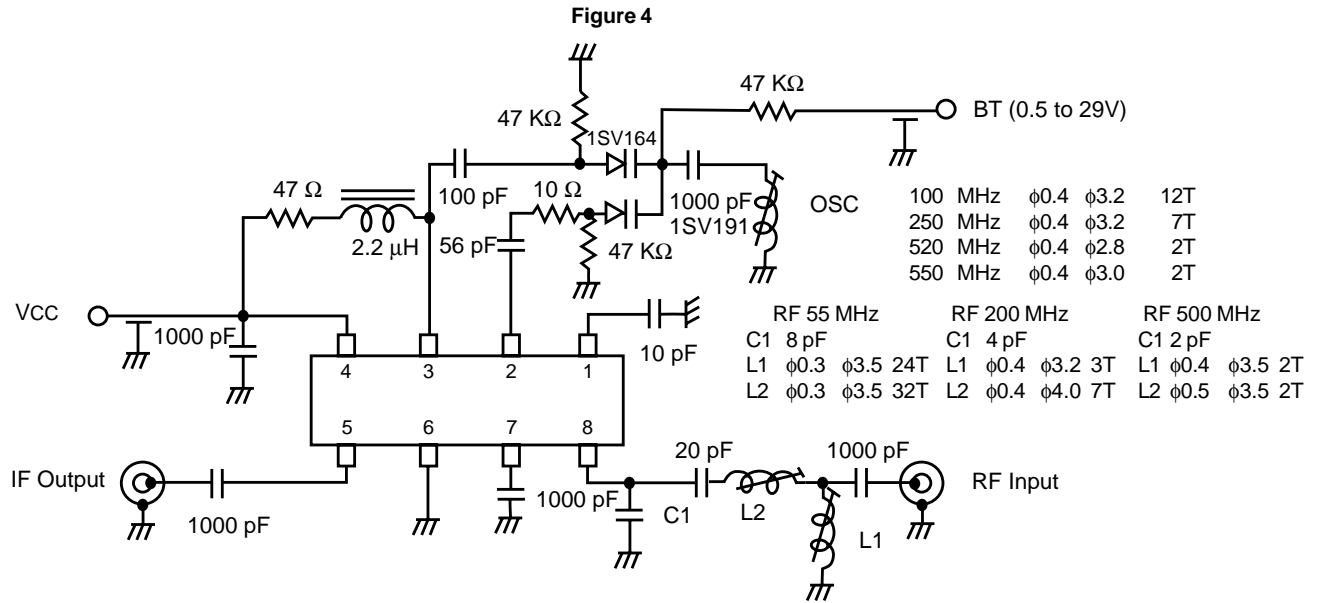


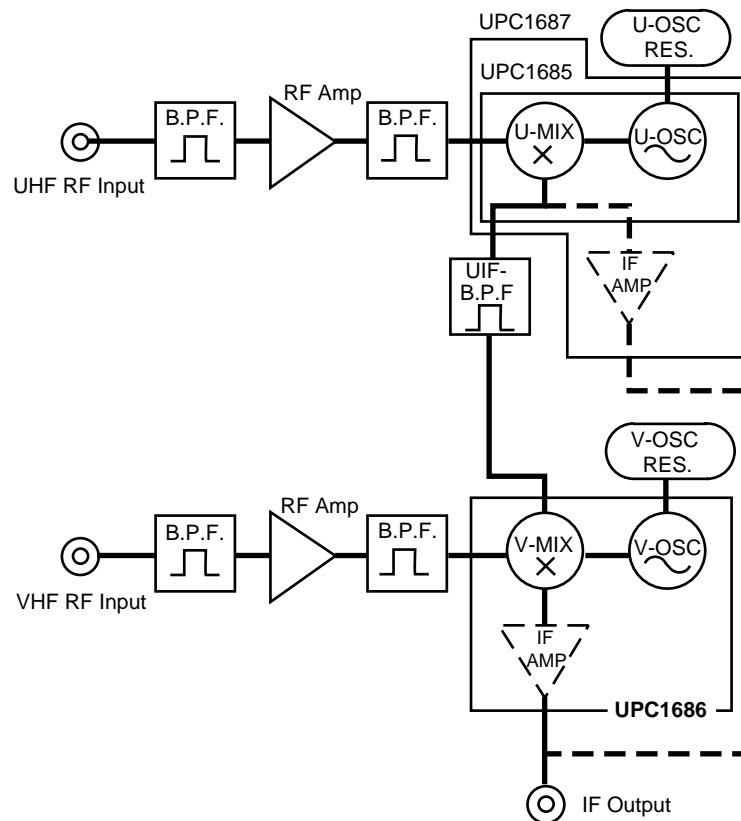
Figure 2



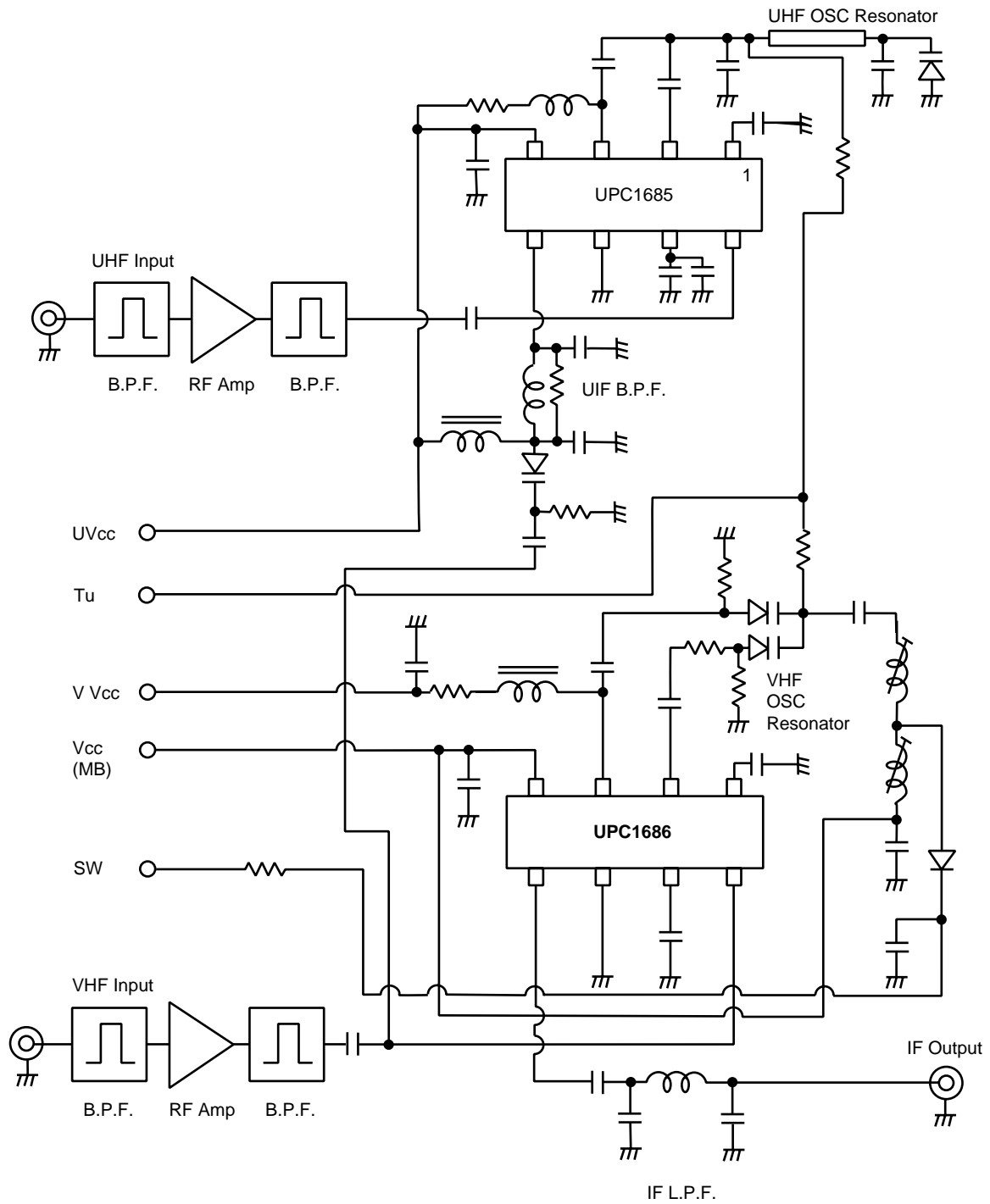
TYPICAL APPLICATION CIRCUIT



APPLICATION BLOCK DIAGRAM FOR T.V. TUNER

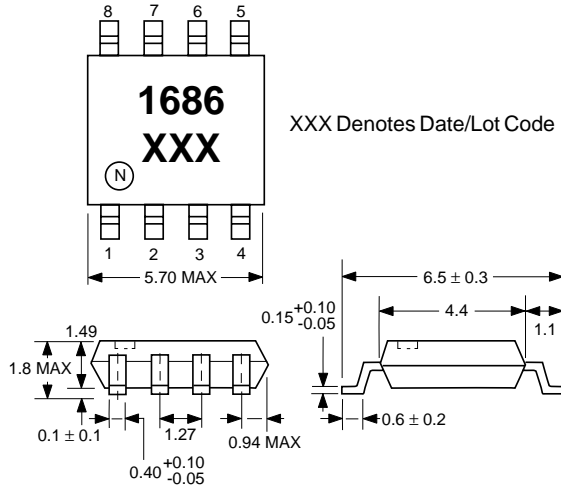


APPLICATION CIRCUIT FOR T.V. TUNER



## OUTLINE DIMENSIONS (Units in mm)

### UPC1686G PACKAGE OUTLINE G08



#### PIN CONNECTION

1. OSC-Base (Bypass)
2. OSC-Base (Feedback)
3. OSC-Collector (Coupling)\*
4. Vcc
5. IF OUT
6. GND
7. RF IN (Bypass)
8. RF IN

#### Note:

All dimensions are typical unless otherwise specified.

#### ORDERING INFORMATION

PART NUMBER	QUANTITY
UPC1686G-E1	2500/REEL

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