CEL

NEC's 900 MHz SILICON MMIC DOWN CONVERTER

UPC1686GV

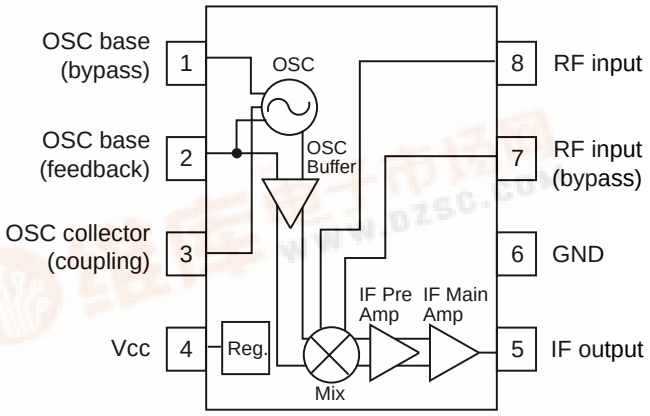
FEATURES

- **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 SSOP

DESCRIPTION

NEC's UPC1686GV 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 SSOP package. The nominal output impedance of the device is 75 ohms.

INTERNAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 5 V)

PART NUMBER / PACKAGE OUTLINE			UPC1686GV 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[1] 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 dB dB dB	 15 15.5 16	 19 19.5 20 20	 22 22.5 23	Fig. 1
NF	Noise Figure[2] at RF = 55 MHz, IF = 44 MHz RF = 200 MHz, IF = 50 MHz RF = 440 MHz, IF = 50 MHz	dB dB dB		11 11 12	14 14 15	Fig. 1
CM	1% Cross modulation[3] at IF = 50 MHz, 75 Ω Open Terminal, RF = 55 to 470 MHz	dBμ		94		Fig. 1
P_{SAT}	Saturated Output Power[4]	dBm		+10		Fig. 1
f_{STB}	Oscillator Frequency Stability at V_{CC} ± 10% OSC f = 100 to 490 MHz	kHz		±100		Fig. 2
f_{DRIFT}	Oscillation Frequency Drift, OSC f = 100 to 490 MHz	kHz		100		Fig. 2
V_{OSC}	Oscillation Start Voltage OSC f = 100 to 490 MHz	V		3.0		Fig. 2
VSWR	IF Output			1.3	1.5	Fig. 1

Notes:
1. P_{RFin} = -40 dBm, P_{OSC} = -5 dBm
2. P_{OSC} = -5 dBm
3. Undesired = Desired ± 12 MHz, 30% 100 kHz AM S/I Ratio = 46 dB
4. P_{RFin} = 0 dBm, P_{OSC} = -5 dBm

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

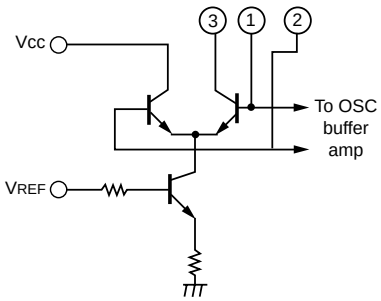
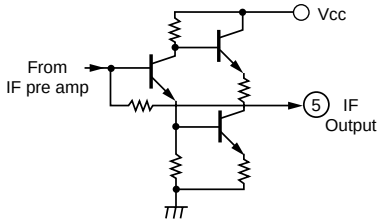
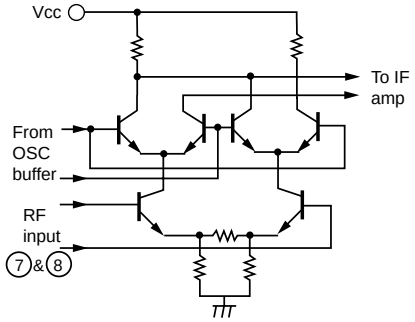
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	6
P_T	Total Power Dissipation[2]	mW	250
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-65 to +150

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).

ORDERING INFORMATION

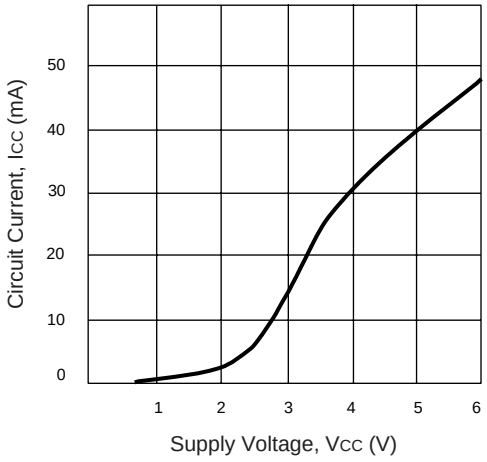
PART NUMBER	QUANTITY
UPC1686GV-E1-A	1000/REEL

PIN DESCRIPTION

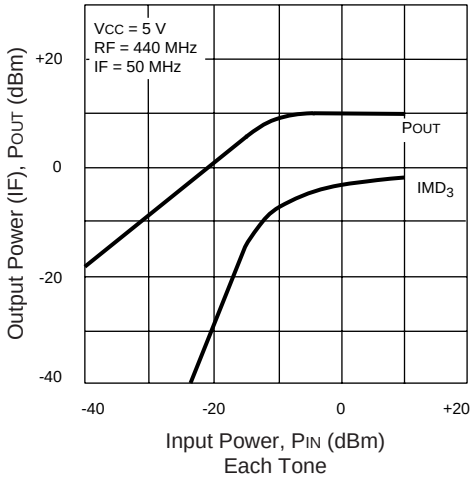
PIN NO.	SYMBOL	FUNCTION AND APPLICATION	EQUIVALENT CIRCUIT
1	OSC Base (Bypass)	Internal oscillator consists of a balanced amplifier. Pins 2 and 3 should be externally equipped with a tank resonator circuit in order to oscillate with feedback loop. Pin 1 should be grounded through a coupling capacitor (~10 pF). 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.	
2	OSC Base (Feedback)		
3	OSC Collector (Coupling)		
4	V_{CC}	Supply voltage pin for the IC.	
5	IF_{OUT}	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)	Pins 7 and 8 are inputs to a double-balance mixer. Either pin can be used for input and bypass.	
8	$RF_{IN}1$		

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

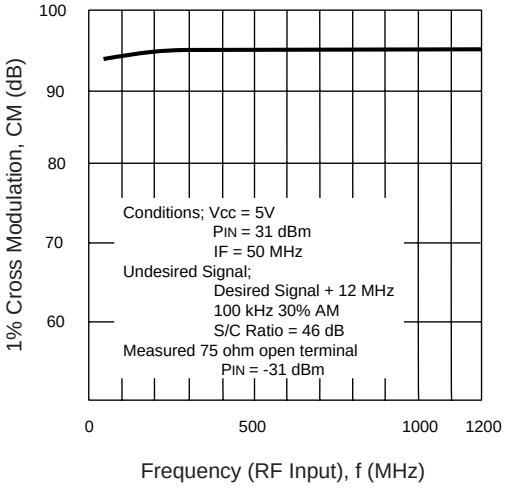
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



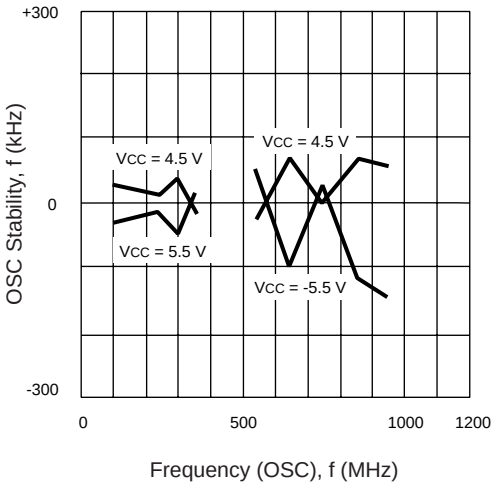
OUTPUT POWER AND INTERMODULATION DISTORTION vs. INPUT POWER



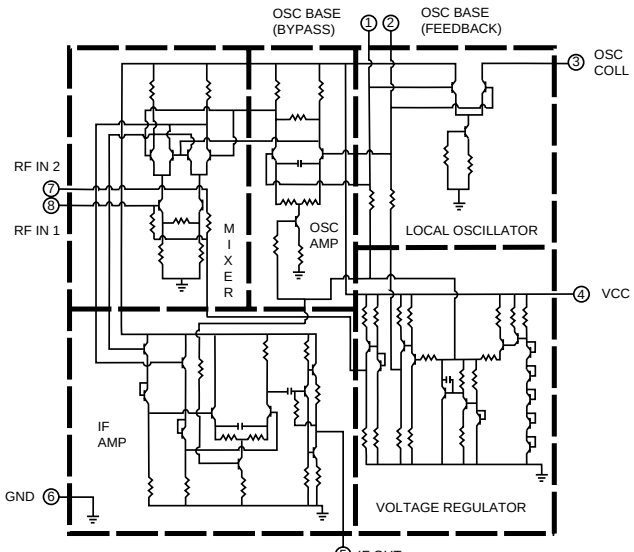
1% CROSS MODULATION vs. FREQUENCY



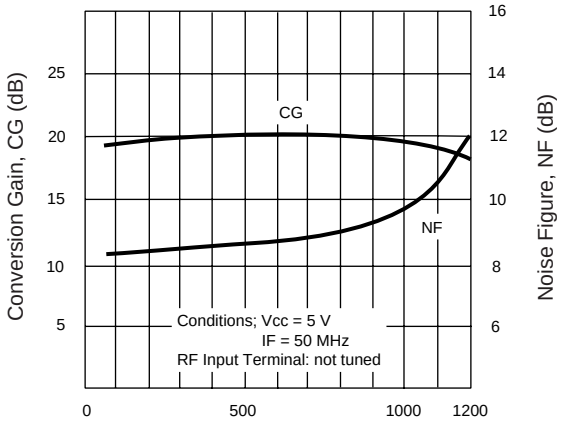
OSC-FREQUENCY STABILITY vs. FREQUENCY



EQUIVALENT CIRCUIT



CONVERSION GAIN AND NOISE FIGURE vs. FREQUENCY



TEST CIRCUITS

Figure 1

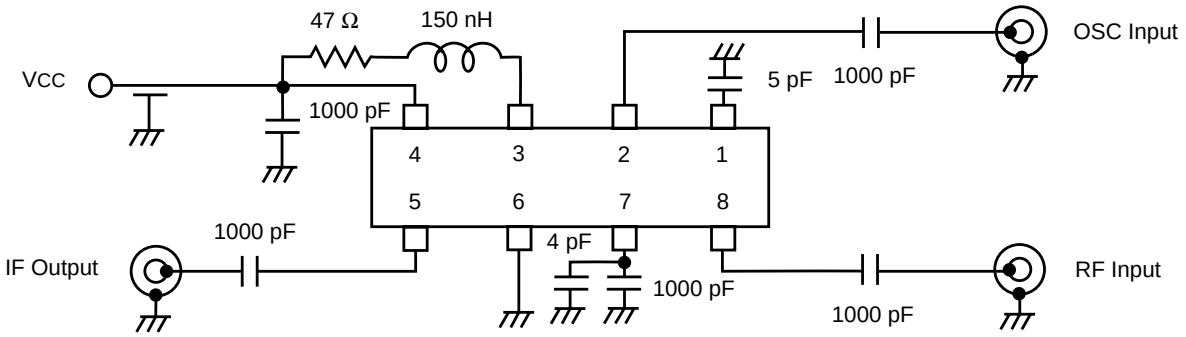
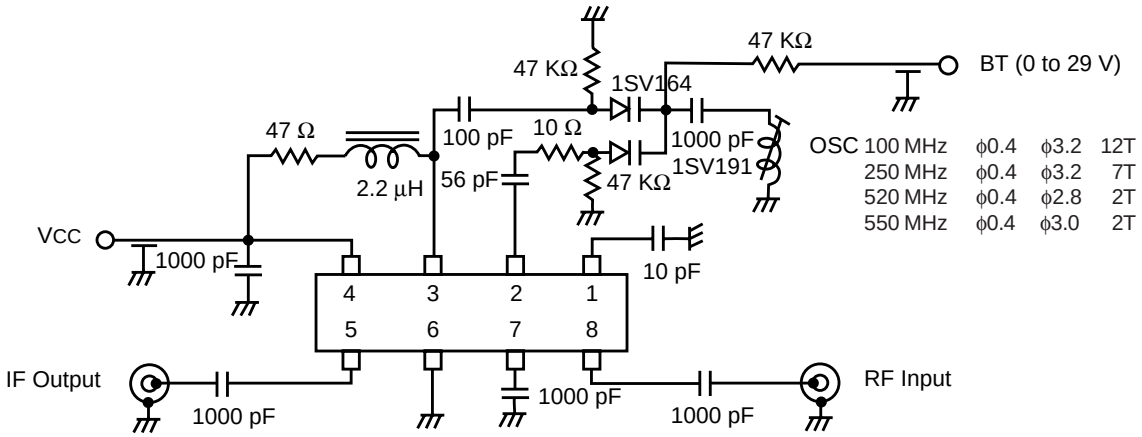
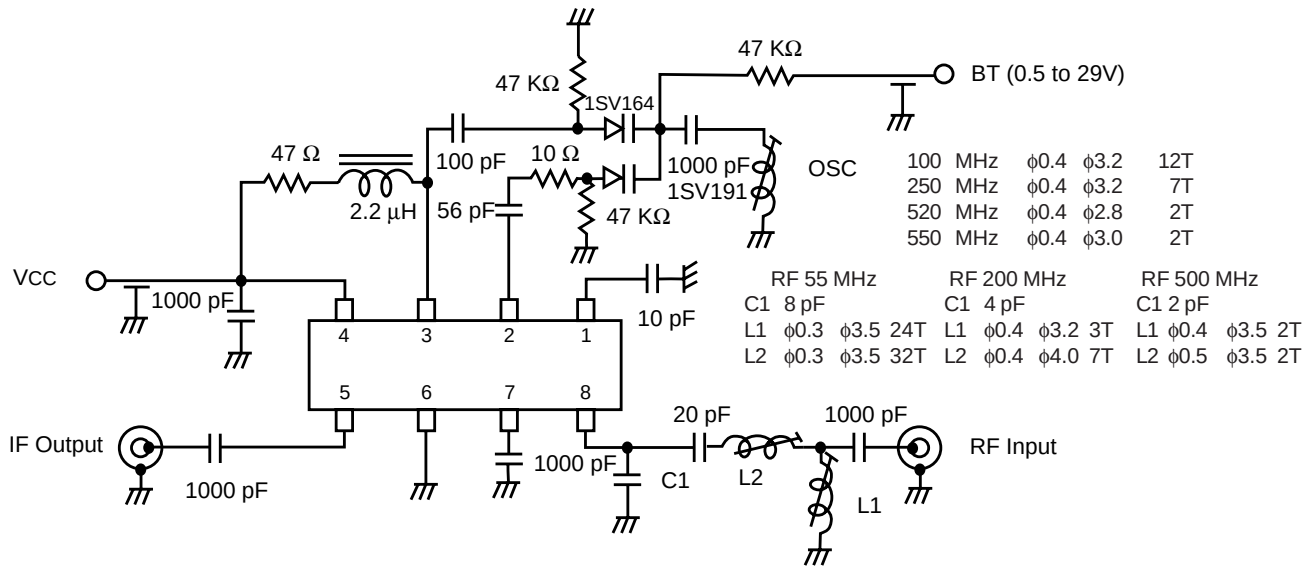


Figure 2

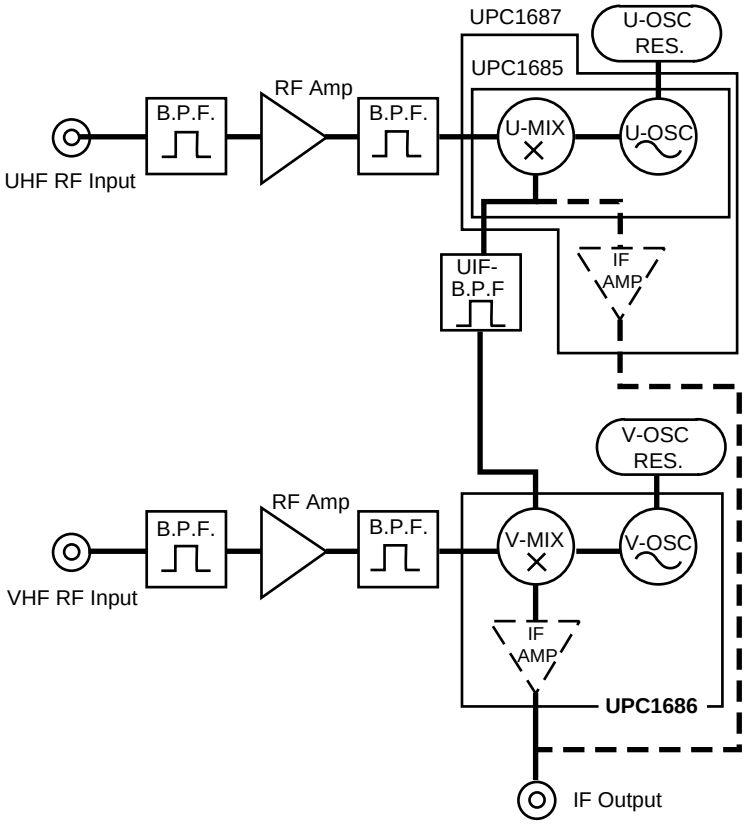


TYPICAL APPLICATION CIRCUIT

Figure 4



APPLICATION BLOCK DIAGRAM FOR T.V. TUNER



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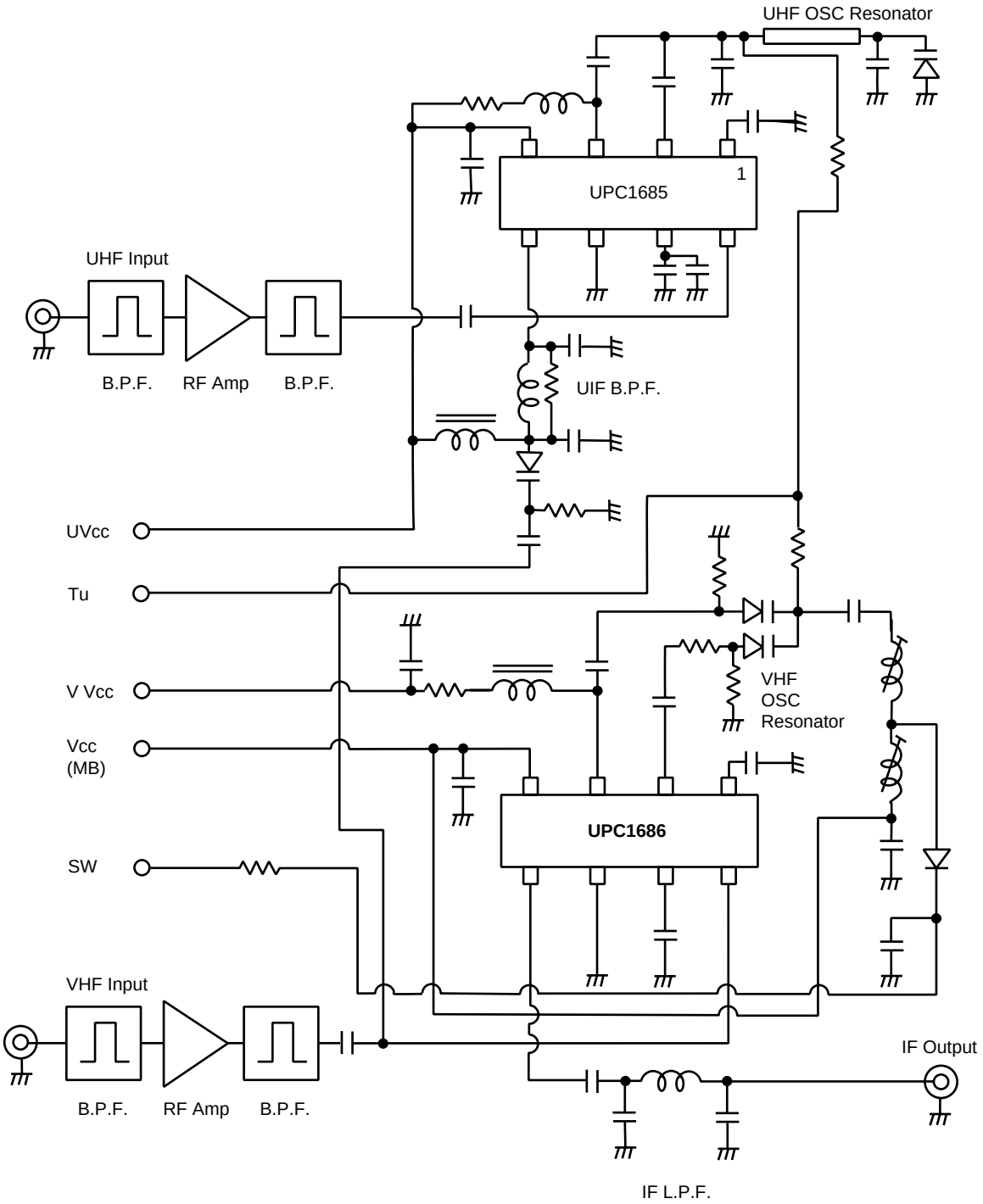
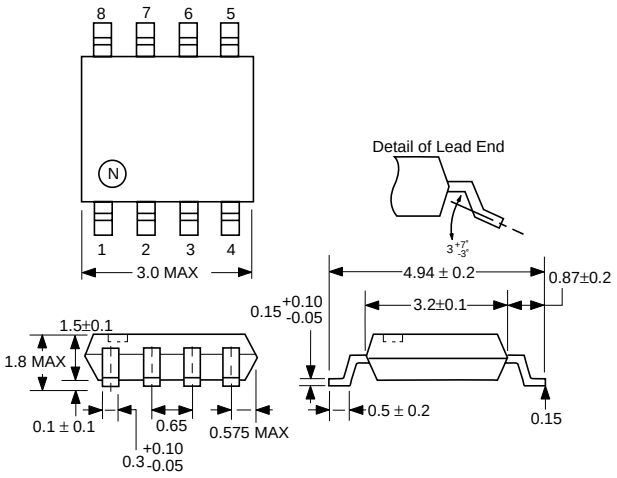


OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S08



PIN CONNECTION

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

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
Lead (Pb)	< 1000 PPM	-A	-AZ
		Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.