

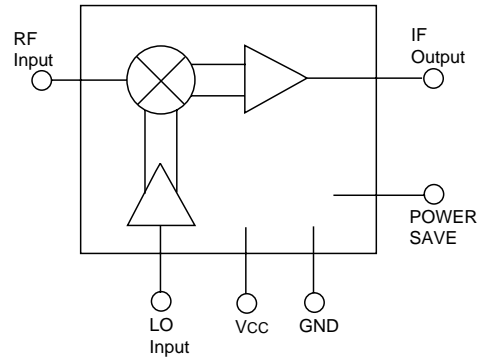
### FEATURES

- **BROADBAND OPERATION:**  
RF Input: 800 - 2000 MHz  
IF Output: 100 - 300 MHz
- **INPUT IP<sub>3</sub>:** -7 dBm
- **LOW VOLTAGE OPERATION:** 2.7~3.3 V
- **LOW CURRENT CONSUMPTION:** 8.5 mA
- **POWER SAVE FUNCTION**
- **SUPER SMALL T06 PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

### DESCRIPTION

The UPC8112T is a silicon Monolithic Microwave Integrated Circuit which is manufactured using the NESAT III process. The NESAT III process produces transistors with  $f_t$  approaching 20 GHz. This device consists of a double balance mixer, an IF amplifier, and a LO buffer amplifier. The device was designed to be used as the first down converter for GPS and

### INTERNAL BLOCK DIAGRAM



wireless communications such as cellular, PCS, and 900 MHz cordless phones. Operating on a 3 volt supply, this IC is ideally suited for hand held portable designs.

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, V<sub>CC</sub> = V<sub>PS</sub> = 3.0 V, P<sub>LOin</sub> = -10 dBm, Z<sub>L</sub> = Z<sub>S</sub> = 50 Ω unless otherwise specified )

PART NUMBER PACKAGE OUTLINE			UPC8112T T06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I <sub>CC</sub>	Circuit Current (no input signal)	mA	4.9	8.5	11.7
I <sub>CC</sub> (PS)	Circuit Current at Power Save Mode, V <sub>CC</sub> = 3.0 V, V <sub>PS</sub> = 0.5 V	μA			0.1
f <sub>RFIn</sub>	RF Frequency Response	GHz	0.8	1.9	2.0
f <sub>IFout</sub>	IF Frequency Response <sup>1</sup>	MHz	100	250	300
CG	Conversion Gain f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz	dB	11.5	15	17.5
				13	
			9.5	13	15.5
NF	Single Side Band Noise Figure (SSB) f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz	dB		9.0	11
				11	
				11.2	13.2
P <sub>1dB</sub>	Output Power at 1 dB gain compression, f <sub>RFIn</sub> = 1.9 GHz f <sub>LOin</sub> = 1.66 GHz	dBm		-5	
P <sub>SAT</sub>	Saturated Output Power f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz (P <sub>RFIn</sub> = -10 dBm)	dBm	-6.5	-2.5	
			-7	-3	
IIP <sub>3</sub>	Input 3rd Order Intercept Point, f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz	dBm		-10	
				-9	
				-7	
LORF	LO Leakage at RF pin, f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz	dBm		-45	
				-46	
				-45	
LOIF	LO Leakage at IF pin, f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz	dBm		-32	
				-33	
				-30	
RFLO	RF Leakage at LO Pin f <sub>RFIn</sub> = 900 MHz, f <sub>LOin</sub> = 1000 MHz <sup>2</sup> f <sub>RFIn</sub> = 1.5 GHz, f <sub>LOin</sub> = 1.6 GHz <sup>2</sup> f <sub>RFIn</sub> = 1.9 GHz, f <sub>LOin</sub> = 1.66 GHz <sup>2</sup>	dBm		-80	
				-57	
				-55	

Notes:

1. External matching required.

2. P<sub>RFIn</sub> = -30 dBm

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CC</sub>	Supply Voltage	V	3.6
I <sub>CC</sub>	Circuit Current	mA	77.7
P <sub>D</sub>	Power Dissipation <sup>2</sup>	mW	280
T <sub>OP</sub>	Operating Temperature	°C	-40 to +85
T <sub>STG</sub>	Storage Temperature	°C	-55 to +150

Notes:

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

**RECOMMENDED OPERATING CONDITIONS**

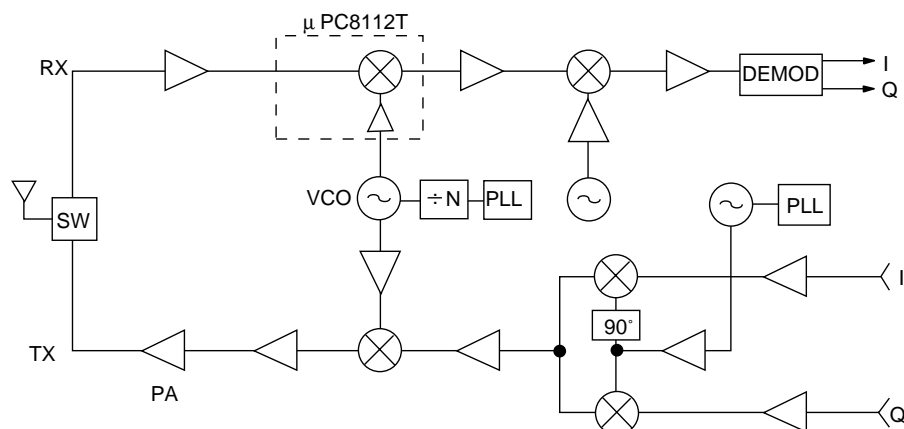
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V <sub>CC</sub>	Supply Voltage	V	2.7	3.0	3.3
T <sub>OP</sub>	Operating Temperature	°C	-40	+25	+85
P <sub>LOin</sub>	LO Input Level	dBm	-15	-10	0
f <sub>RFin</sub>	RF Input Frequency	GHz	0.8	1.9	2.0
f <sub>IFout</sub>	IF Output Frequency	MHz	100	250	300

**PIN FUNCTIONS**

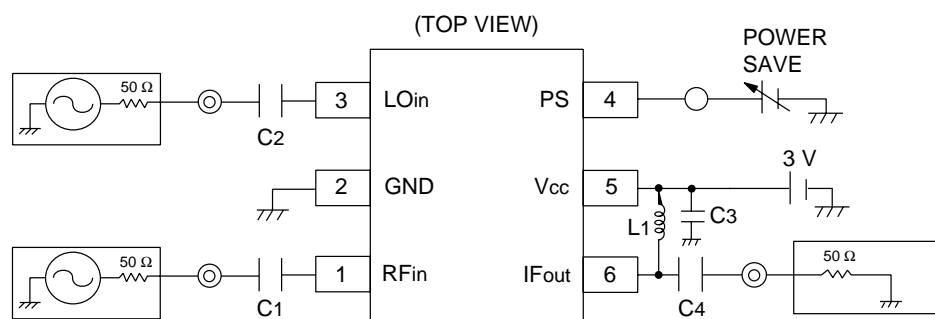
Pin No.	Symbol	Pin Voltage	Description	Internal Equivalent Circuit						
5	V <sub>CC</sub>	2.7 ~ 3.3	Supply Voltage pin. Connect a bypass capacitor (e.g., 1000 pF) to minimize ground impedance.							
6	I <sub>FOUT</sub>	Same as V <sub>CC</sub> voltage through external inductor	IF output pin is an open collector with high impedance. External LC matching circuit is required.							
1	R <sub>FIN</sub>	1.2	RF input pin to mixer. Mixer is a double balanced Gilbert cell type. Input RF signal to the pin with a 50 Ω source impedance through a coupling capacitor.							
2	GND	0	Ground pin. Must be connected to the system ground with minimum inductance. Ground pattern on the board should be formed as wide as possible to minimize ground impedance.							
3	L <sub>OIN</sub>	1.4	LO input pin to a differential buffer amplifier. Input LO signal through a coupling capacitor. Recommended input level: -15 to 0 dBm.							
4	PS	V <sub>CC</sub> or GND	Power-save control pin. Voltage on this pin controls ON/OFF operation as follows: <table border="1" style="margin: 10px auto;"> <thead> <tr> <th>Operation</th> <th>V<sub>PS</sub></th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>⊕2.5 V</td> </tr> <tr> <td>OFF</td> <td>0-0.5 V</td> </tr> </tbody> </table>	Operation	V <sub>PS</sub>	ON	⊕2.5 V	OFF	0-0.5 V	
Operation	V <sub>PS</sub>									
ON	⊕2.5 V									
OFF	0-0.5 V									

## TYPICAL APPLICATION EXAMPLE

PCS or DIGITAL CELLULAR

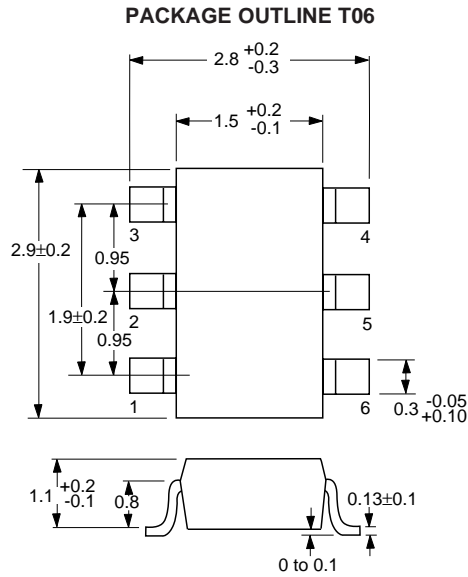


## TEST CIRCUIT

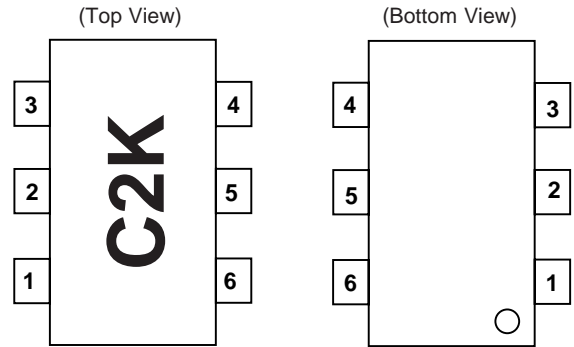


- Note: 1. C1, C2, C3 are 1,000 pF capacitors.  
 2. L1 and C4 are matching elements.  
 L1 = 100nH and C4 = 2.7 pF for  $f_{IF} = 240$  MHz

**OUTLINE DIMENSIONS** (Units in mm)



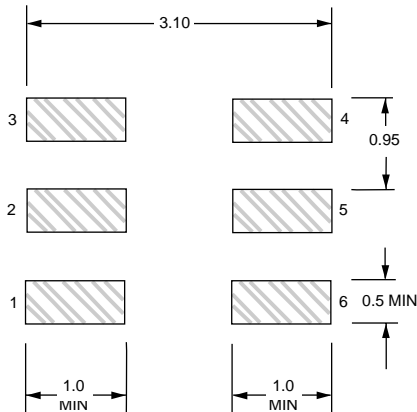
**LEAD CONNECTIONS**



- 1. RFIN
- 2. GND
- 3. LOIN
- 4. PS
- 5. VCC
- 6. IFOUT

**RECOMMENDED P.C.B. LAYOUT** (Units in mm)

Note:  
All dimensions are typical unless otherwise specified.



**ORDERING INFORMATION**

PART NUMBER	QTY
UPC8112T-E3	3K/Reel

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