



3 V SILICON MMIC L-BAND FREQUENCY DOWN CONVERTER

UPC8112TB

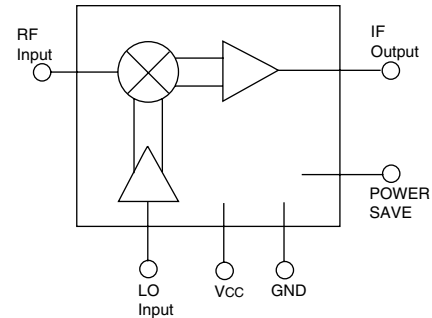
FEATURES

- **HIGH DENSITY SURFACE MOUNTING:**
6 Pin Super Minimold or SOT-363 Package
- **BROADBAND OPERATION:**
RF = 0.8 to 2.0 GHz
IF = 100 to 300 MHz
- **INPUT IP₃:** -7 dBm
- **POWER SAVE FUNCTION**
- **SUPPLY VOLTAGE:** V_{CC} = 2.7 to 3.3 V

DESCRIPTION

NEC's UPC8112TB is a silicon RFIC manufactured using the NESAT III process. This device consists of a mixer, an IF amplifier and a LO buffer amplifier. This device is suitable as a 1st IF downconverter for the receiver stage of cellular and other wireless systems. The UPC8112TB is pin compatible and has comparable performance as the larger UPC8112T, so

INTERNAL BLOCK DIAGRAM



it is suitable for use as a replacement to help reduce system size. The IC is housed in a 6 pin super minimold or SOT-363 package.

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

ELECTRICAL CHARACTERISTICS (T_A = 25 °C, V_{CC} = V_{PS} = 3.0 V, P_{LO} = -10 dBm)

PART NUMBER PACKAGE OUTLINE			UPC8112TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I _{CC}	Circuit Current (no input signal) V _{CC} = 3.0 V V _{PS} = 0.5 V	mA μA	4.9	8.5	11.7 0.1
f _{RFIn}	RF Frequency Response	GHz	0.8	1.9	2.0
f _{IFOut}	IF Frequency Response ¹	MHz	100	250	300
CG	Conversion Gain f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz	dB dB dB	11.5 13 9.5	15 13 13	17.5 13 15.5
NF	Single Side Band Noise Figure (SSB) f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz	dB dB dB		9.0 11 11.2	11 13.2
P _{1dB}	Output Power at 1 dB gain compression, f _{RFIn} = 1.9 GHz f _{LOIn} = 1.66 GHz	dBm		-5	
P _{SAT}	Saturated Output Power f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz (P _{RFIn} = -10 dBm)	dBm dBm	-6.5 -7	-2.5 -3	
IIP ₃	Input 3rd Order Intercept Point, f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz	dBm dBm dBm		-10 -9 -7	
LORF	LO Leakage at RF pin, f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz	dBm dBm dBm		-45 -46 -45	
LOIF	LO Leakage at IF pin, f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz	dBm dBm dBm		-32 -33 -30	
RFLO	RF Leakage at LO Pin f _{RFIn} = 900 MHz, f _{LOIn} = 1000 MHz ² f _{RFIn} = 1.5 GHz, f _{LOIn} = 1.6 GHz ² f _{RFIn} = 1.9 GHz, f _{LOIn} = 1.66 GHz ²	dBm dBm dBm		-80 -57 -55	
R _{TH(JA)}	Thermal Resistance (Junction to Ambient) Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB	°C/W			325

Notes:

1. External matching required.

2. P_{RFIn} = -30 dBm

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25^\circ\text{C}$)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage	V	3.6
I _{CC}	Circuit Current	mA	77.7
P _D	Power Dissipation ²	mW	200
T _{OP}	Operating Temperature	°C	-40 to +85
T _{STG}	Storage Temperature	°C	-55 to +150

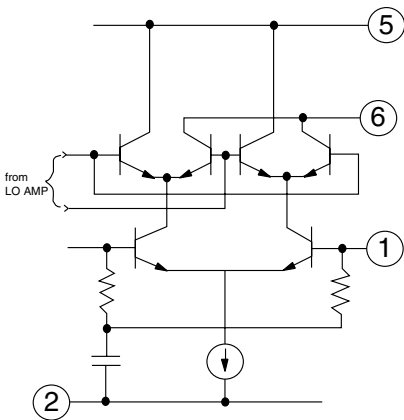
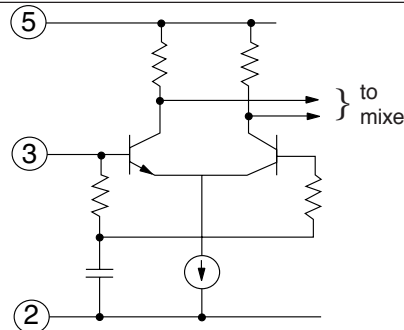
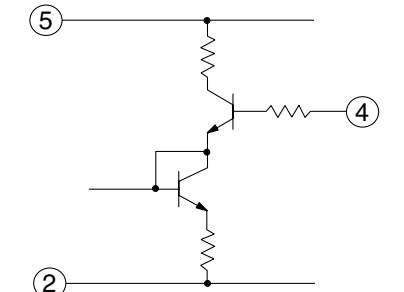
Notes:

- Operation in excess of any one of these parameters may result in permanent damage.
- Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB ($T_A = +85^\circ\text{C}$).

RECOMMENDED OPERATING CONDITIONS

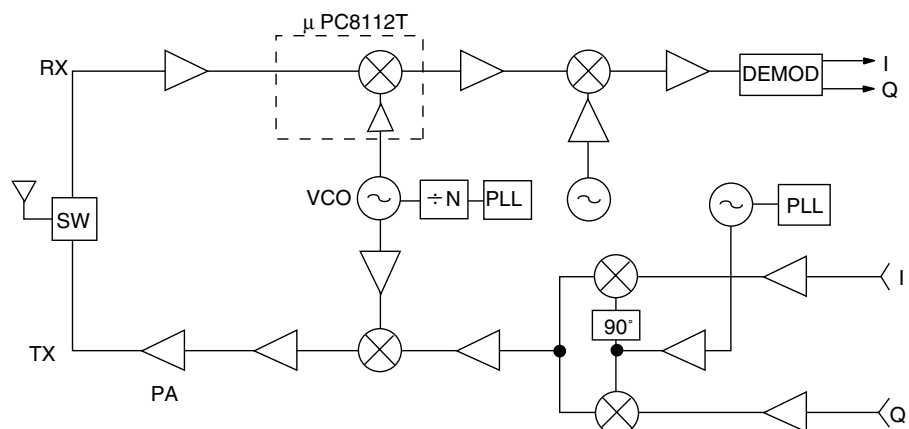
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	2.7	3.0	3.3
T _{OP}	Operating Temperature	°C	-40	+25	+85
P _{LOin}	LO Input Level	dBm	-15	-10	0
f _{RFin}	RF Input Frequency	GHz	0.8	1.9	2.0
f _{IFout}	IF Output Frequency	MHz	100	250	300

PIN FUNCTIONS

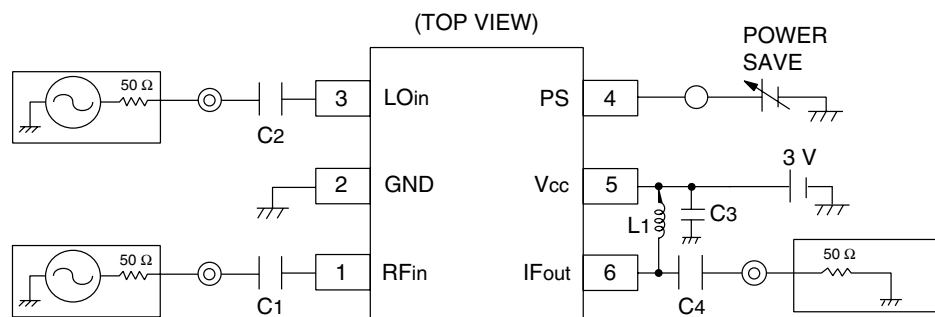
Pin No.	Symbol	Pin Voltage	Description	Internal Equivalent Circuit						
5	V _{CC}	2.7 ~ 3.3	Supply Voltage pin. Connect a bypass capacitor (e.g., 1000 pF) to minimize ground impedance.							
6	I _{FOUT}	Same as V _{CC} voltage through external inductor	IF output pin is an open collector with high impedance. External LC matching circuit is required.							
1	R _{FIN}	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 _{OIN}	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	V _{PS}	V _{CC} or GND	Power-save control pin. Voltage on this pin controls ON/OFF operation as follows: <table border="1" data-bbox="719 1625 950 1724"><thead><tr><th>Operation</th><th>V_{PS}</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 _{PS}	ON	≥2.5 V	OFF	0-0.5 V	
Operation	V _{PS}									
ON	≥2.5 V									
OFF	0-0.5 V									

TYPICAL APPLICATION EXAMPLE

PCS or DIGITAL CELLULAR

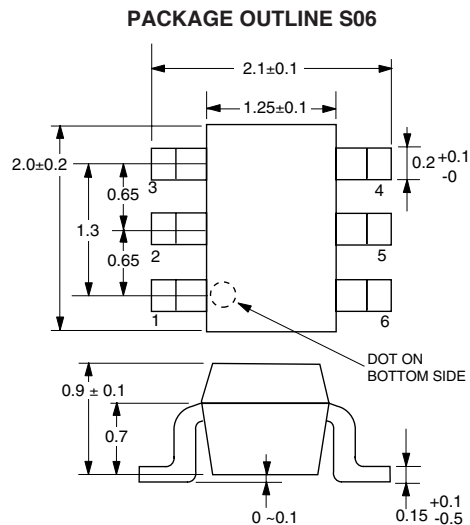


TEST CIRCUIT



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

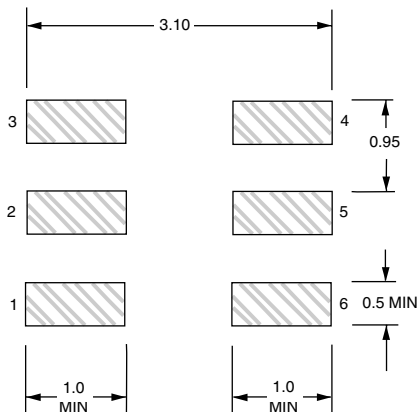
OUTLINE DIMENSIONS (Units in mm)



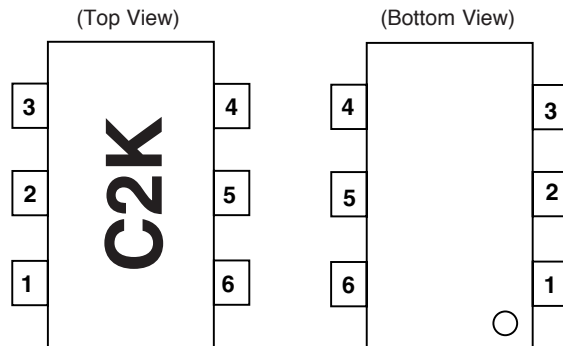
RECOMMENDED P.C.B. LAYOUT (Units in mm)

Note:

All dimensions are typical unless otherwise specified.



LEAD CONNECTIONS



ORDERING INFORMATION

PART NUMBER	QTY
UPC8112TB-E3-A	3K/Reel

Note:

Embossed tape, 8 mm wide. Pins 1, 2, 3 are in tape pull-out direction.

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		Not Detected	(*)
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Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

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