CEL

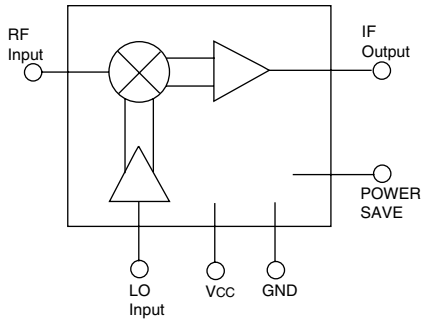
3 V SILICON MMIC L-BAND FREQUENCY DOWN CONVERTER

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

INTERNAL BLOCK DIAGRAM



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 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	mA	4.9	8.5	11.7
	V_{PS} = 0.5 V	μA			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	dB	11.5	15	17.5
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz	dB		13	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz	dB	9.5	13	15.5
NF	Single Side Band Noise Figure (SSB)				
	f_{RFin} = 900 MHz, f_{LOin} = 1000 MHz	dB		9.0	11
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz	dB		11	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz	dB		11.2	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	dBm	-6.5	-2.5	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz (P_{RFin} = -10 dBm)	dBm	-7	-3	
IIP_3	Input 3rd Order Intercept Point, f_{RFIN} = 900 MHz, f_{LOIN} = 1000 MHz	dBm		-10	
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz	dBm		-9	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz	dBm		-7	
LO_{RF}	LO Leakage at RF pin, f_{RFin} = 900 MHz, f_{LOin} = 1000 MHz	dBm		-45	
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz	dBm		-46	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz	dBm		-45	
LO_{IF}	LO Leakage at IF pin, f_{RFin} = 900 MHz, f_{LOin} = 1000 MHz	dBm		-32	
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz	dBm		-33	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz	dBm		-30	
RF_{LO}	RF Leakage at LO Pin f_{RFin} = 900 MHz, f_{LOin} = 1000 MHz[2]	dBm		-80	
	f_{RFin} = 1.5 GHz, f_{LOin} = 1.6 GHz[2]	dBm		-57	
	f_{RFin} = 1.9 GHz, f_{LOin} = 1.66 GHz[2]	dBm		-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 RATINGS[1] (T_A = 25°C)

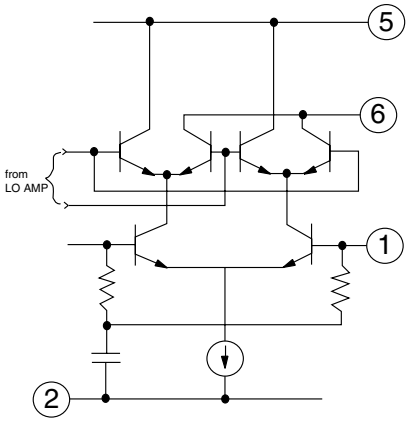
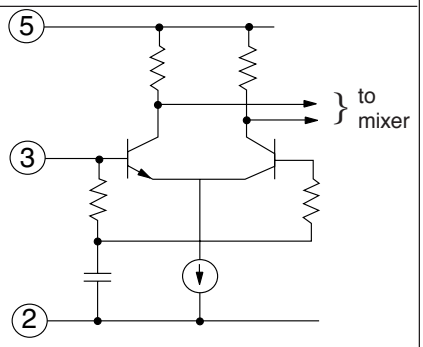
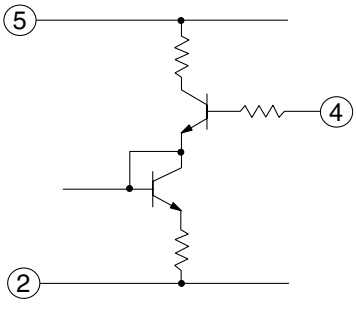
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	3.6
I_{CC}	Circuit Current	mA	77.7
P_D	Power Dissipation[2]	mW	200
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150

Notes:
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_A = +85°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

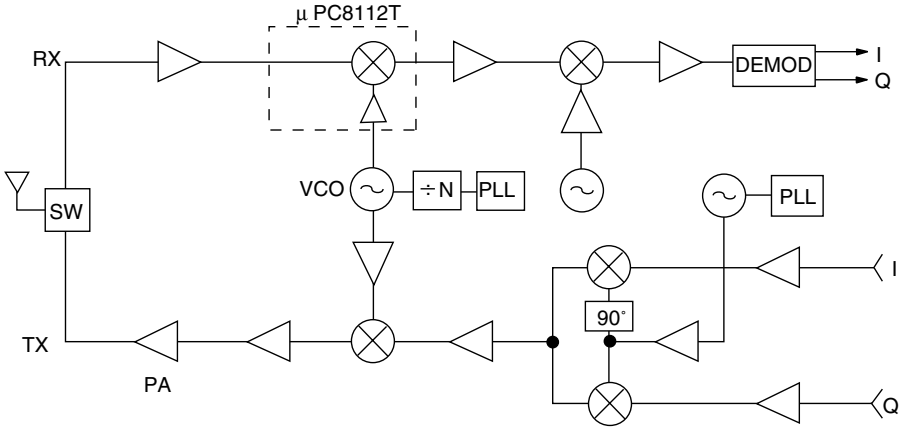
PIN FUNCTIONS

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	IF_{OUT}	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	RF_{IN}	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	LO_{IN}	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:	

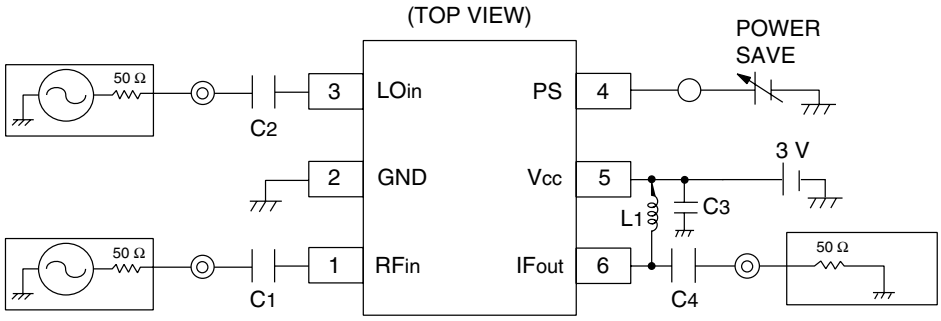
Operation	V_{PS}
ON	≥2.5 V
OFF	0-0.5 V

TYPICAL APPLICATION EXAMPLE

PCS or DIGITAL CELLULAR



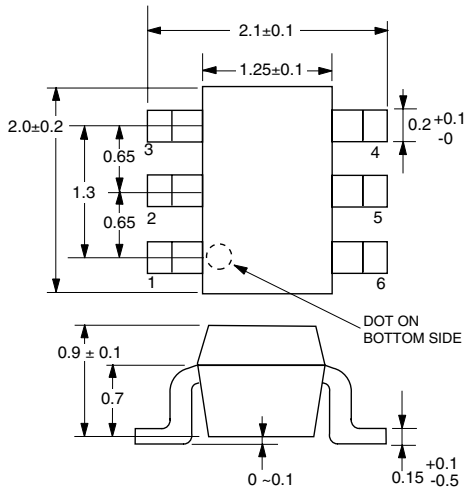
TEST CIRCUIT



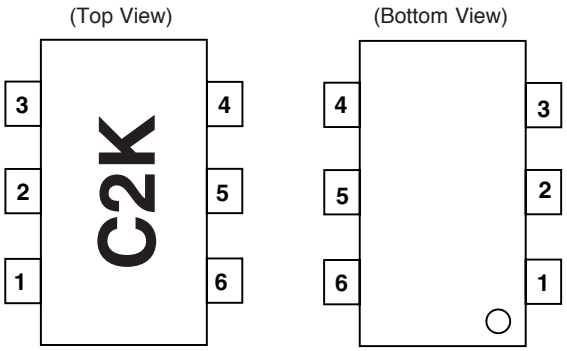
Note: 1. C1, C2, C3 are 1,000 pF capacitors.
2. L1 and C4 are matching elements.
L1 = 100nH and C4 = 2.7 pF for f_{IF} = 240 MHz

OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S06



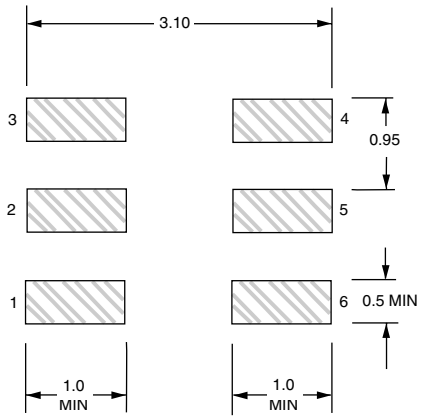
LEAD CONNECTIONS



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
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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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.