CEL

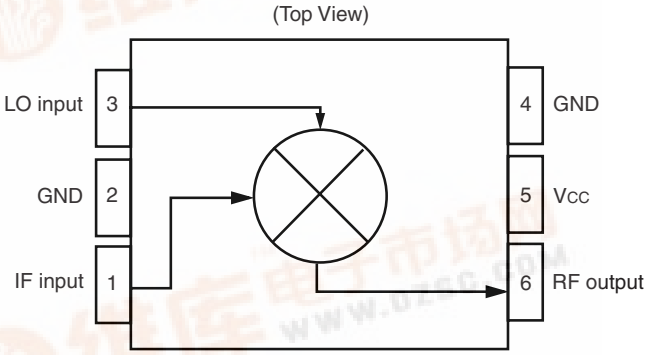
3 V SILICON RFIC FREQUENCY UPCONVERTER

UPC8163TB

FEATURES

- **RECOMMENDED OPERATING FREQUENCY:**
  f_{RFOUT} = 0.8 GHz to 2.0 GHz
  f_{IFIN} = 50 MHz to 300 MHz
- **SUPPLY VOLTAGE:**
  V_{CC} = 2.7 to 3.3 V
- **HIGH DENSITY SURFACE MOUNTING:**
  6-pin super minimold package
- **HIGH IP_3:**
  OIP_3 = +9.5 dBm @ f_{RFOUT} = 900 MHz
- **MINIMIZED CARRIER LEAKAGE:**
  Due to double balanced mixer

BLOCK DIAGRAM



DESCRIPTION

NEC's UPC8163TB is a silicon RFIC designed as a frequency upconverter for cellular/cordless telephone transmitter stages, and features improved intermodulation. This device is housed in a 6 pin super mini mold or SOT-363 package making it ideal for reducing system size. The UPC8106TB is manufactured using NEC's 20 GHz f_T NESAT™ III silicon bipolar process.

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

APPLICATIONS

- Digital Cellular/Cordless Phones

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, V_{CC} = V_{RFOUT} = 3.0 V, f_{IFIN} = 240 MHz, P_{LOIN} = -5 dBm unless otherwise specified)

PART NUMBER PACKAGE OUTLINE			UPC8163TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{CC}	Circuit Current (no signal)	mA	11.5	16.5	23
CG	Conversion Gain f_{RFOUT} = 0.9 GHz, P_{IFIN} = -30 dBm f_{RFOUT} = 1.9 GHz, P_{IFIN} = -30 dBm	dB dB	6 4	9 7	12 10
P_{SAT}	Saturated Output Power f_{RFOUT} = 0.9 GHz f_{RFOUT} = 1.9 GHz	dBm dBm	-1.5 -4.5	0.5 -2	
OIP_3	Output third Order Intercept Point, f_{IFIN1} = 240 MHz f_{IFIN2} = 240.4 MHz f_{RFOUT} = 0.9 GHz P_{IFIN} = -20 dBm f_{RFOUT} = 1.9 GHz	 dBm dBm		 +9.5 +6.0	
NF	SSB Noise Figure f_{RFOUT} = 0.9 GHz f_{RFOUT} = 1.9 GHz	dB dB		12.5 12.5	

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

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage[2]	V	3.6
P_T	Total Power Dissipation[3]	mW	200
P_{IN}	Input Power	dBm	+10
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150

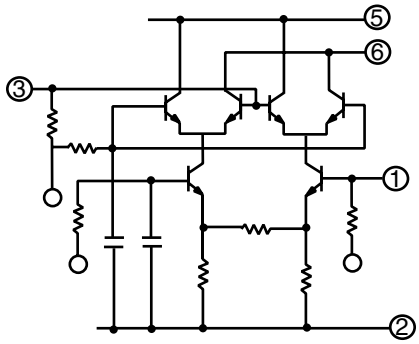
Notes:
1. Operation in excess of any one of these conditions may result in permanent damage.
2. T_A = 25°C, pins 5 and 6.
3. Mounted on a double-sided copperclad 50x50x1.6 mm epoxy glass PWB, T_A = 85°C).

RECOMMENDED OPERATING CONDITIONS

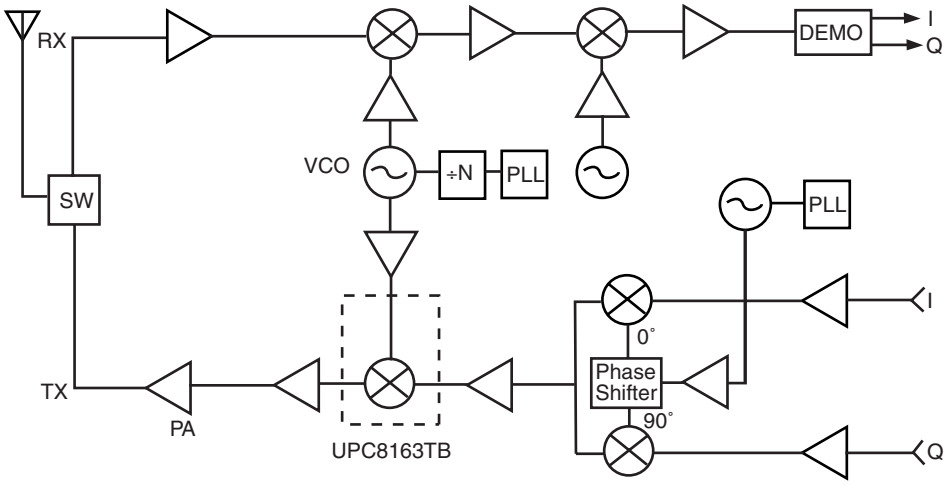
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V_{CC}	Supply Voltage[1]	V	2.7	3.0	3.3
P_{LOIN}	Local Input Level[2]	dBm	-10	-5	0
f_{RFOUT}	RF Output Frequency[3]	GHz	0.8	–	2.0
f_{IFIN}	IF Input Frequency	MHz	50	–	300
T_{OP}	Operating Temperature	°C	-40	+25	+85

Notes:
1. Same voltage applied to pins 5 and 6
2. Z_S = 50 Ω (without matching)
3. With external matching circuit

PIN FUNCTIONS

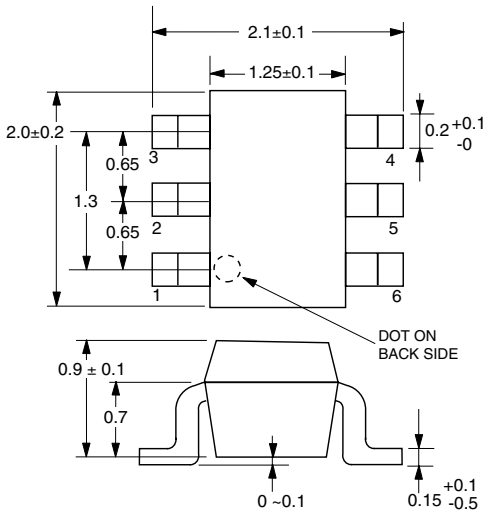
Pin No.	Pin Name	Applied Voltage	Pin Voltage	Description	Equivalent Circuit
1	IF_{INPUT}	—	1.2	This pin is the IF input to double balanced mixer. The input is a high impedance.	
2 4	GND	0	—	GND pin. Ground pattern on the board should be as wide as possible. Trace length should be kept as short as possible to minimize ground impedance.	
3	LO_{INPUT}	–	2.1	LO input pin. Recommended input level is -10 to 0 dBm.	
5	V_{CC}	2.7 to 3.3	—	Supply voltage pin.	
6	RF_{OUTPUT}	Same bias as V_{CC} through external inductor	—	This pin is the RF output. This pin is designed as an open collector. Due to the high impedance output, this pin requires an external LC matching circuit.	

APPLICATION EXAMPLE



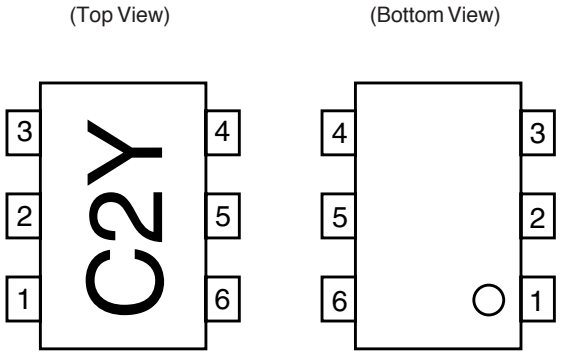
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE S06



Note:
All dimensions are typical unless otherwise specified.

LEAD CONNECTIONS



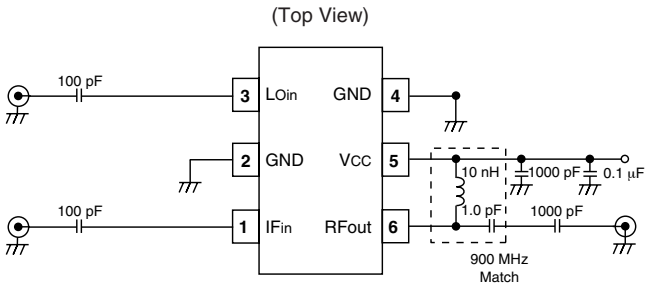
1. IF INPUT
2. GND
3. LO INPUT
4. GND
5. VCC
6. RF OUTPUT

ORDERING INFORMATION

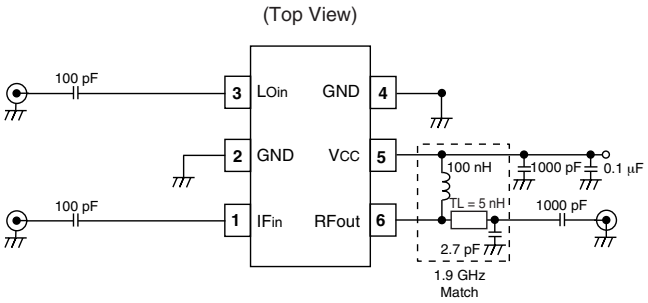
PART NUMBER	QUANTITY
UPC8163TB-E3-A	3K/Reel

Note: Embossed tape 8 mm wide. Pins 1,2,3 face tape perforation side.

TEST CIRCUIT 1 (RFOUT = 900 MHz)



TEST CIRCUIT 2 (RFOUT = 1.9 GHz)



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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.