

1 V SILICON MMIC FREQUENCY CONVERTER

UPC8103T
UPC8108T

FEATURES

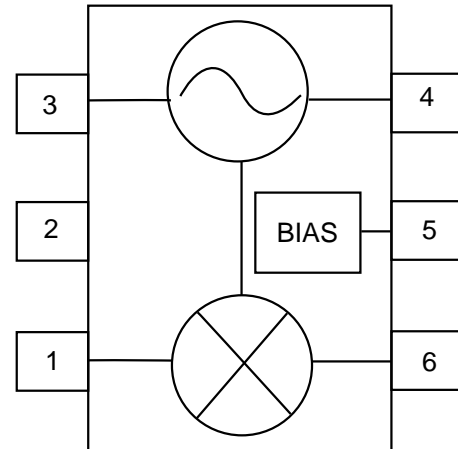
- **1 VOLT SUPPLY VOLTAGE:** $V_{CC} = 1 \sim 2.0 \text{ V}$
- **EXTREMELY LOW CURRENT:**
UPC8103T: $I_{CC} = 1.0 \text{ mA}$ @ 1 V Typical
UPC8108T: $I_{CC} = 1.5 \text{ mA}$ @ 1 V Typical
- **BANDWIDTH UP TO 930 MHz:**
UPC8103T: $f_{RF} = 150 \text{ MHz} \sim 330 \text{ MHz}$
UPC8108T: $f_{RF} = 150 \text{ MHz} \sim 930 \text{ MHz}$
- **SUPER SMALL T06 PACKAGE**
- **TAPE AND REEL PACKAGING AVAILABLE**

DESCRIPTION

The UPC8103T and UPC8108T are VHF and UHF low voltage Frequency Downconverters manufactured using the NESAT III MMIC process. Working off a 1 volt supply, the UPC8103T typically draws only 1 mA, while the UPC8108T typically draws 1.5 mA. The UPC8108T operates in the UHF band while the UPC8103T, drawing less current, operates best in the VHF band. Both devices were designed for low power pager applications.

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

INTERNAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$, $V_{CC} = 1 \text{ V}$, $f_{IF} = 20 \text{ MHz}$, $Z_S = 50 \Omega$)

PART NUMBER PACKAGE OUTLINE			UPC8103T T06			UPC8108T T06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
I_{CC}	Circuit Current (no signal)	mA	0.55	1	1.4	1.0	1.5	2.1
CG^1	Conversion Gain	$f_{RF} = 150 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$	13	16	19	17.5	20.5	23.5
		$f_{RF} = 280 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$	12.5	15.5	18.5	17	20	23
		$f_{RF} = 330 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$	12.5	15.5	18.5	17	20	23
		$f_{RF} = 450 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$				16	19	22
		$f_{RF} = 930 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$				12	15	18
NF^2	Noise Figure	$f_{RF} = 150 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$		13			13	
		$f_{RF} = 150 \text{ MHz}$, $P_{LO} = -10 \text{ dBm}$		9			8.5	
		$f_{RF} = 280 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$		11.5			12	
		$f_{RF} = 280 \text{ MHz}$, $P_{LO} = -10 \text{ dBm}$		8			7	
		$f_{RF} = 330 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$		12			13	
		$f_{RF} = 330 \text{ MHz}$, $P_{LO} = -10 \text{ dBm}$		9			8	
		$f_{RF} = 450 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$					13.5	
		$f_{RF} = 450 \text{ MHz}$, $P_{LO} = -10 \text{ dBm}$					8	
		$f_{RF} = 930 \text{ MHz}$, $P_{LO} = -21 \text{ dBm}$					18	
		$f_{RF} = 930 \text{ MHz}$, $P_{LO} = -10 \text{ dBm}$					11.5	

Notes:

1. $Z_L = 2 \text{ K}\Omega$, measured using test circuit #1.
2. $Z_L = 50 \Omega$, measured using test circuit #2.

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

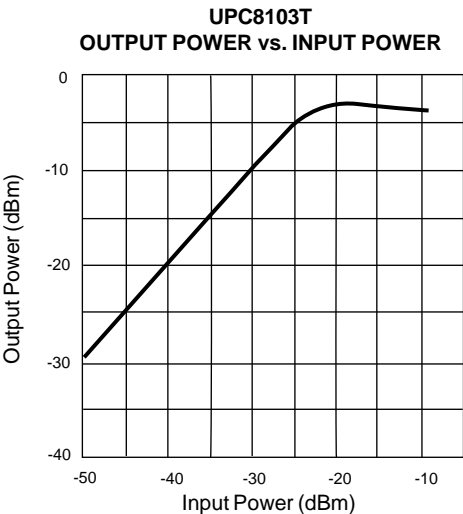
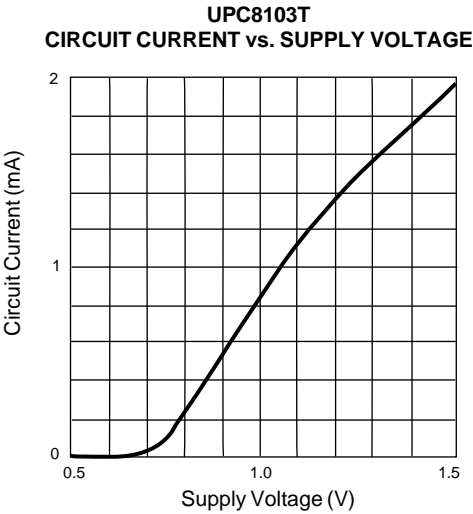
SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage	V	4.0
P _D	Power Dissipation ²	mW	280
T _{OP}	Operating Temperature	°C	-25 to +75
T _{STG}	Storage Temperature	°C	-55 to +150
P _{RF}	Maximum RF Input Power	dBm	-25

- 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

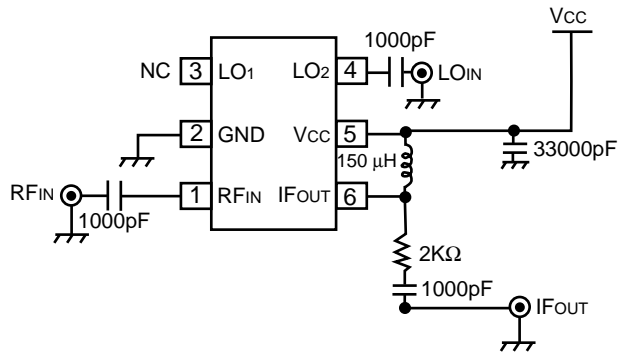
SYMBOLS	PARAMETERS	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	1.0	1.05	2.0
T _{OP}	Operating Temperature	°C	-25	+25	+75
f _{RF}	RF range for UPC8103T UPC8108T	MHz MHz	150 150	- -	330 930

TYPICAL PERFORMANCE CURVES (T_A = 25°C, APPLICATION CIRCUIT)

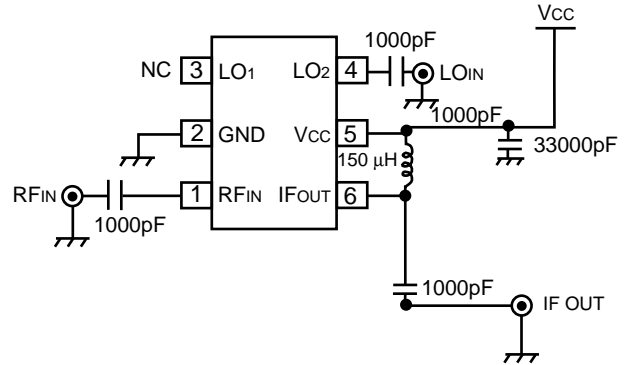


TEST CIRCUITS

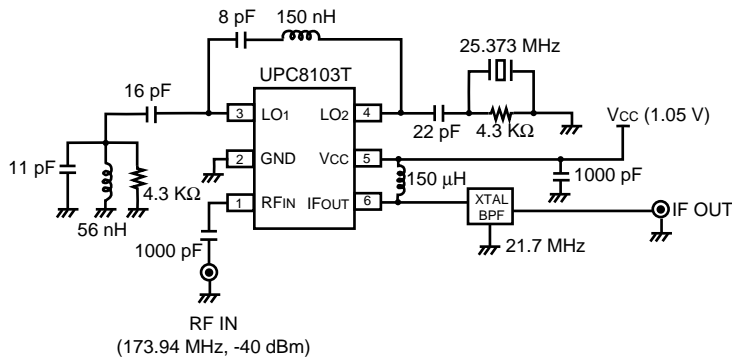
1. $R_L = 2\text{ K}\Omega$



2. $R_L = 50\ \Omega$



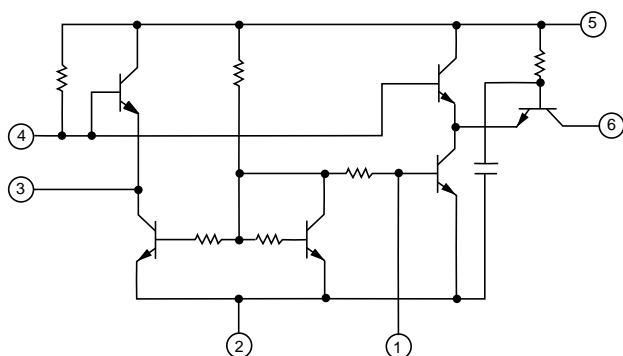
APPLICATION CIRCUIT (UPC8103T ~ 170 MHZ)



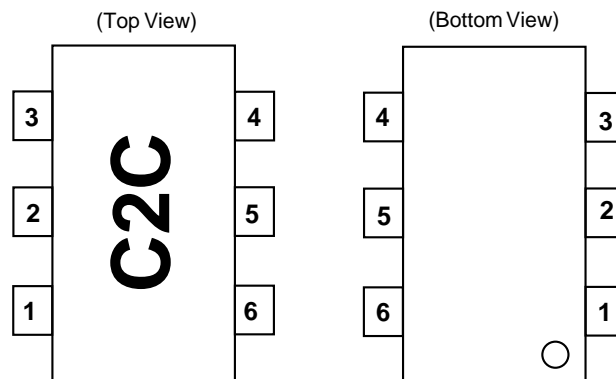
Notes:

1. LO Frequency is the 6th overtone of the crystal.
2. Series resonant circuit between pins 3 and 4 is at the desired LO frequency.
3. 4.3 kΩ parallel resistor with the crystal, suppresses the fundamental oscillation.

EQUIVALENT CIRCUIT



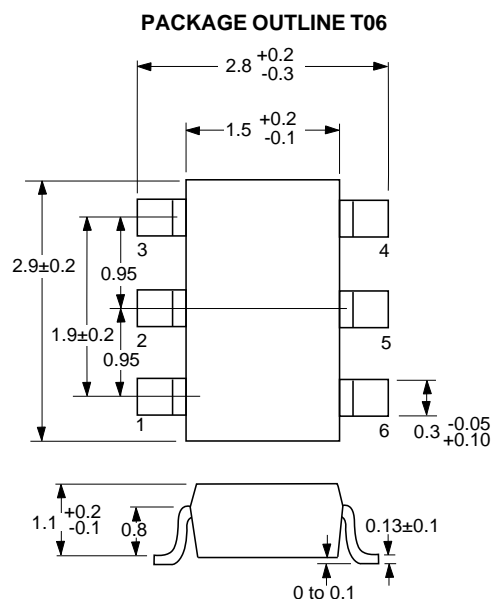
LEAD CONNECTIONS



1. RF INPUT
2. GND
3. LO1
4. LO2
5. Vcc
6. IF OUTPUT

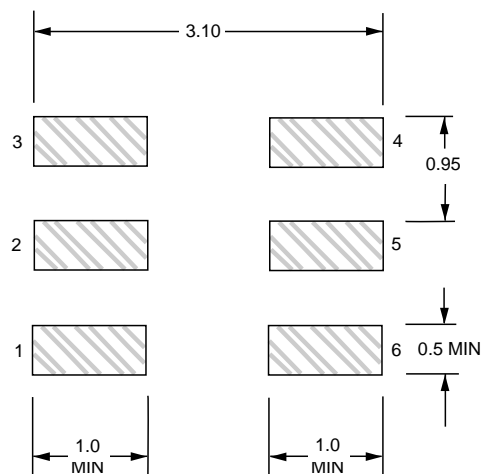
Note: Package Markings
C2C: UPC8103T
C2F: UPC8108T

OUTLINE DIMENSIONS (Units in mm)



Note:
All dimensions are typical unless otherwise specified.

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



ORDERING INFORMATION

PART NUMBER	QTY
UPC8103T-E3	3K/Reel
UPC8108T-E3	3K/Reel

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

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