NEC

3 V, SILICON MMIC FREQUENCY UP-CONVERTER

UPC8109T

FEATURES

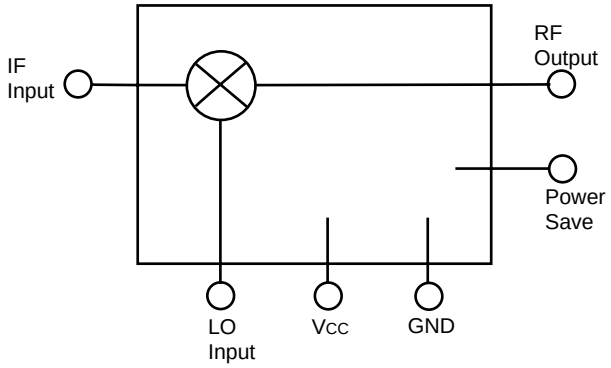
- **WIDE BAND OPERATION:**
  IF Input: 3 dB BW: 50 ~ 400 MHz Typical
  RF Output: 3 dB BW: 0.1~2 GHz Typical
- **LOW VOLTAGE OPERATION:** 2.7 V Minimum
- **LOW POWER CONSUMPTION:** 15 mW
- **POWER SAVE FUNCTION**
- **SUPER SMALL PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

DESCRIPTION

The UPC8109T is an L-Band Frequency Up-Converter manufactured using the NESAT III MMIC process. The UPC8109T was designed for low current consumption. Operation from a 3 volt supply voltage makes this device ideal for handheld cellular, PCN and wireless LAN applications.

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

INTERNAL BLOCK DIAGRAM



ELECTRICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 3 V, f_{IF} = 240 MHz, P_{LO} = -5 dBm, $V_{PS} \geq$ 2.5V)

PART NUMBER PACKAGE OUTLINE			UPC8109T T06		
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
I_{CC}	Circuit Current, $V_{PS} \geq$ 2.5 V	mA	2.5	5	8
CG	Conversion Gain[1], f_{RF} = 900 MHz f_{RF} = 1.9 GHz	dB dB	4 2	7 5	10 8
NF	SSB Noise Figure, f_{RF} = 900 MHz	dB		8.5	
P_{SAT}	Saturated Output Power[2], f_{RF} = 900 MHz f_{RF} = 1.9 GHz	dBm dBm	-7.5 -10	-6 -8	
OIP_3	Output 3rd Order Intercept Point[3], f_{RF} = 900, 900.4 MHz f_{RF} = 1.9, 1.9004 GHz	dBm dBm		+1.5 -1.0	
T_{PS}	Power Save Response Time, $V_{P/S}$: GND→V_{CC} $V_{P/S}$: V_{CC} →GND	µs µs		2.0 2.0	
$R_{TH\ (J-A)}$	Thermal Resistance (Junction to Ambient) Free Air Mounted on a 50 x 50 x 1.6 mm epoxy glass PWB	 °C/W °C/W			 620 230

Notes:
1. P_{IF} = -30 dBm.
2. P_{IF} = -10 dBm.
3. f_{IF1} = 240.0 MHz, f_{IF2} = 240.4 MHz

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

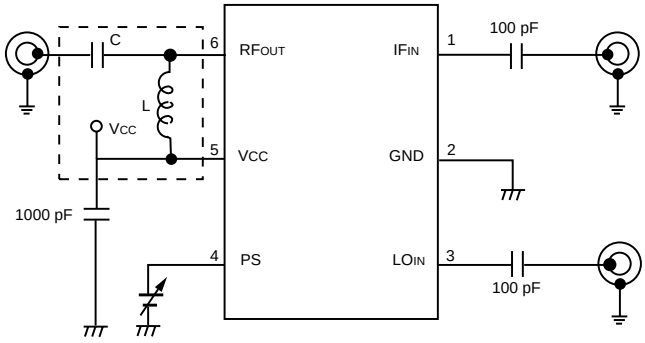
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CC}	Supply Voltage	V	6.0
V_{PS}	Power Save Voltage	V	6.0
P_T	Total Power Dissipation[2]	mW	280
T_{OP}	Operating Temperature	°C	-40 to +85
T_{STG}	Storage Temperature	°C	-55 to +150

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	5.5
T_{OP}	Operating Temperature	°C	-40	+25	+85
P_{LO}	LO Input Level	dBm	-10	-5	0

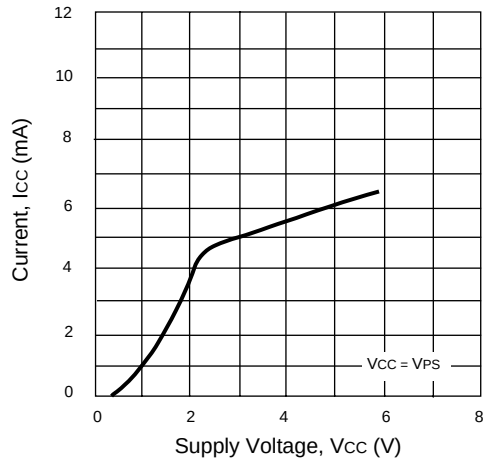
TEST CIRCUIT



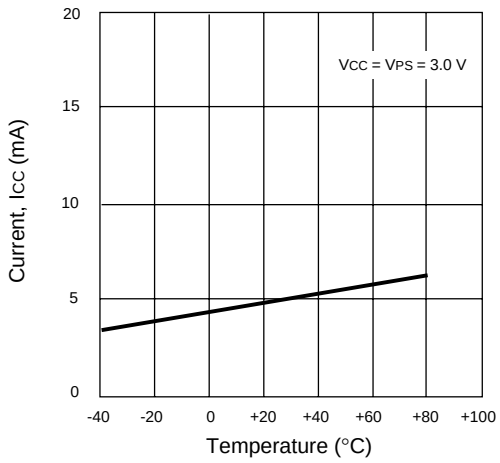
Recommended Values	900 MHz	1.9 GHz
C	1.0 pF	1.8 pF
L	8.2 nH	18 nH

TYPICAL PERFORMANCE CURVES (T_A = 25°C unless otherwise specified)

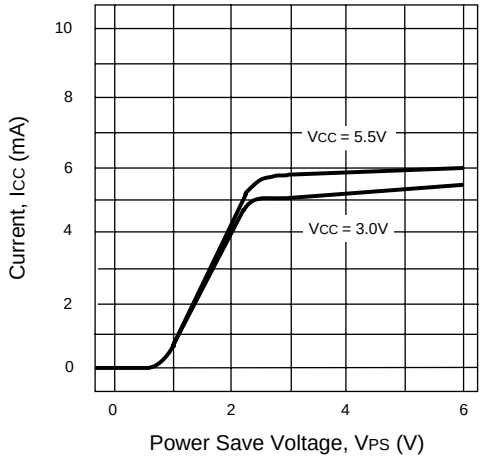
CURRENT vs. VOLTAGE



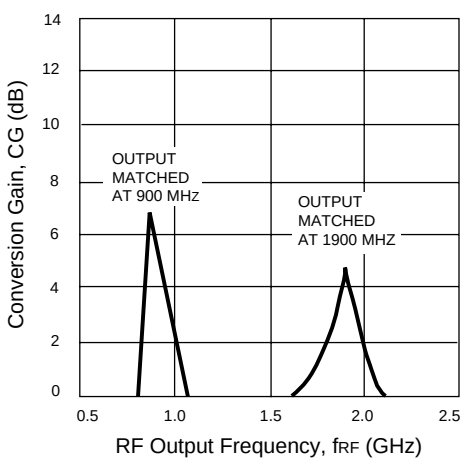
CURRENT vs. TEMPERATURE



CURRENT vs. POWER SAVE PIN INPUT VOLTAGE

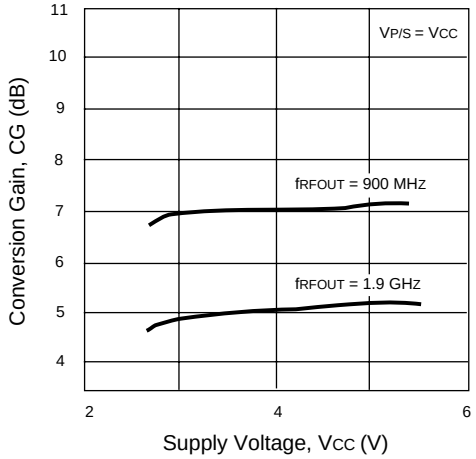


CONVERSION GAIN vs. OUTPUT FREQUENCY

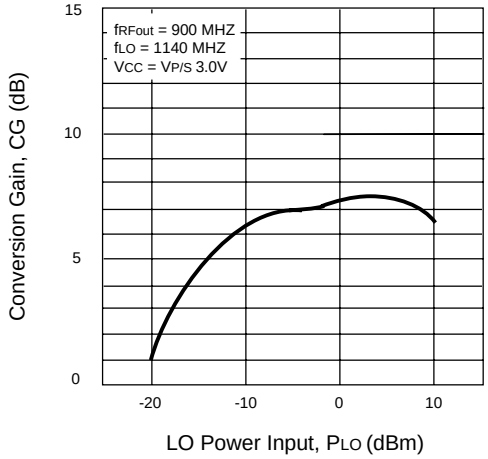


TYPICAL PERFORMANCE CURVES (TA = 25°C)

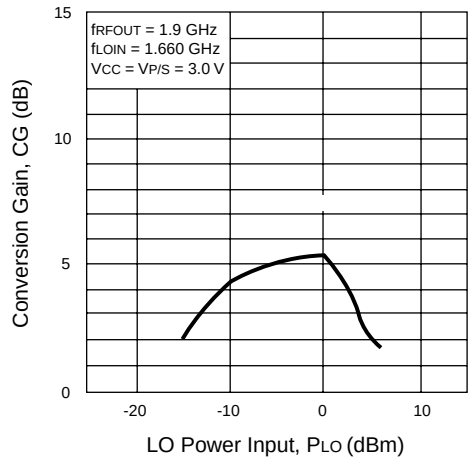
CONVERSION GAIN vs. VOLTAGE AND FREQUENCY



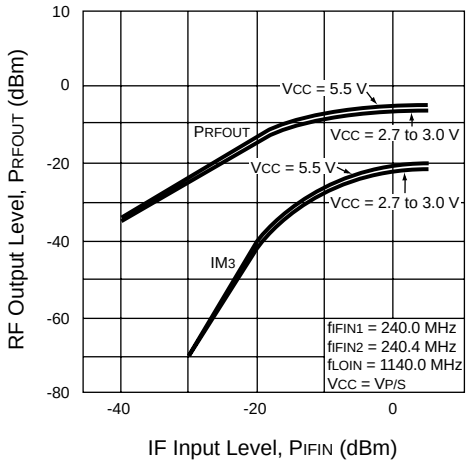
CONVERSION GAIN vs. INPUT LEVEL AT RF = 900 MHz



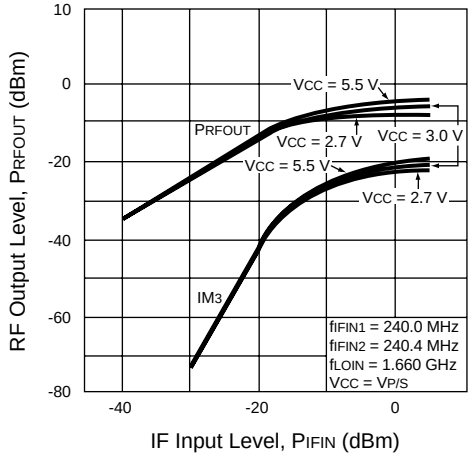
CONVERSION GAIN vs. INPUT LEVEL AT RF = 1.9 GHz



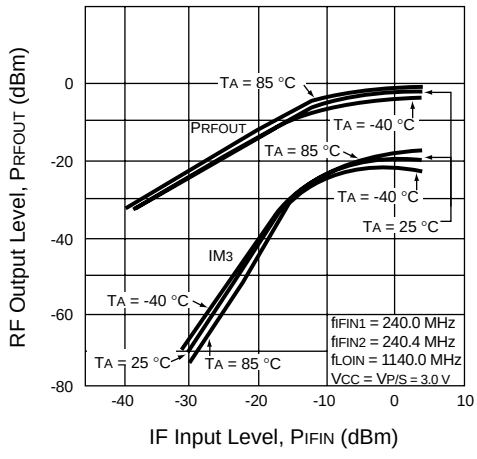
IM3 AND RF OUTPUT LEVEL vs. IF INPUT LEVEL AND VOLTAGE AT RF = 900 MHz



IM3 AND RF OUTPUT LEVEL vs. IF INPUT LEVEL AND VOLTAGE AT RF = 1.9 GHz

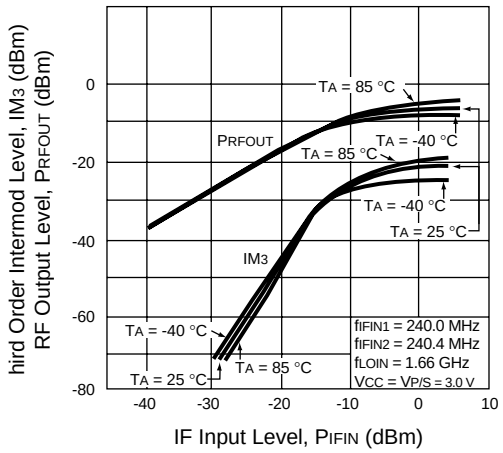


IM3 AND RF OUTPUT LEVEL vs. IF INPUT LEVEL AND TEMPERATURE AT RF = 900 MHz

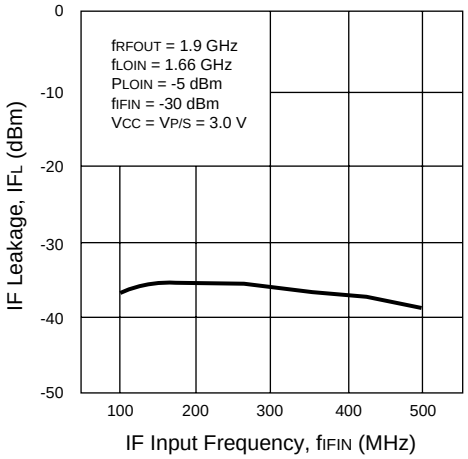


TYPICAL PERFORMANCE CURVES (TA = 25°C)

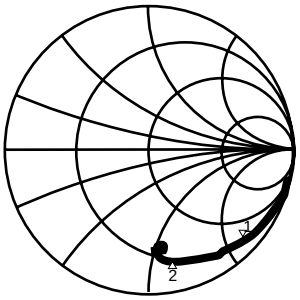
IM3 AND RF OUTPUT LEVEL vs. IF INPUT LEVEL AND TEMPERATURE AT RF = 1.9 GHz



IF LEAKAGE AT RF PIN vs. IF INPUT FREQUENCY AT RF = 1.9 GHz



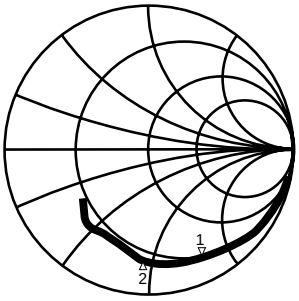
S11 - RF OUTPUT PORT



Start 500 MHz Stop 2300 MHz

2: 13.845 Ω -77.34 Ω 1.0850 pF
1: 20.633 Ω -144.74 Ω 1.2218 pF
Marker 1 - 900 MHz
Marker 2 - 1.9 GHz

S11 - LO INPUT PORT

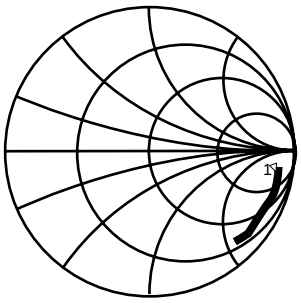


Start 0.3 MHz Stop 3000 MHz

2: 12.050 Ω -45.695 Ω 2.1780 pF
1: 13.961 Ω -76.158 Ω 1.8332 pF
Marker 1 - 1.14 GHz
Marker 2 - 1.66 GHz

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

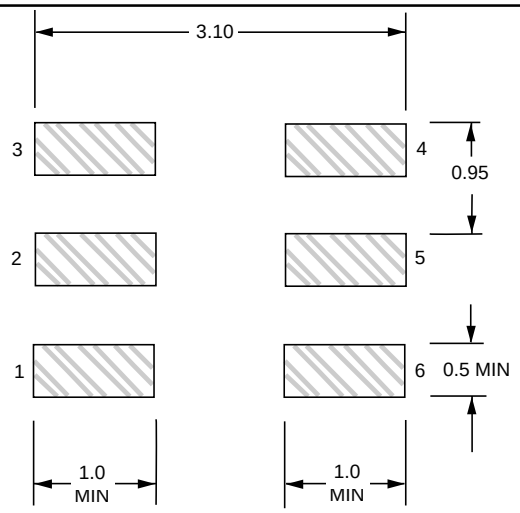
S_{11} - IF INPUT PORT



Start 50 MHz Stop 1000 MHz

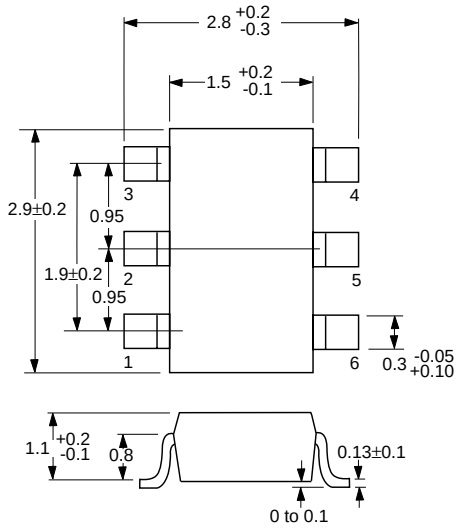
1: 154.64 Ω -494.41 Ω 1.2876 pF
Marker 1 - 250 MHz

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



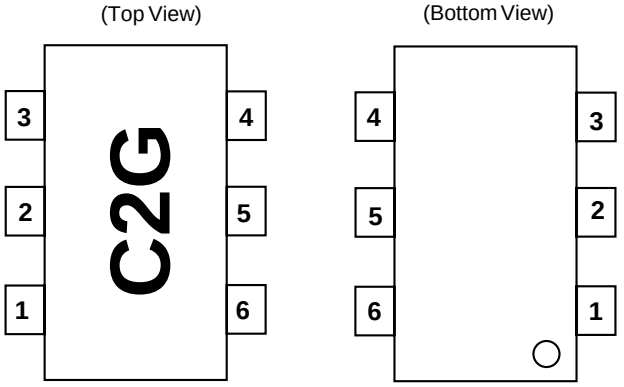
OUTLINE DIMENSIONS (Units in mm)

PACKAGE OUTLINE T06



Note:
All dimensions are typical unless otherwise specified.

LEAD CONNECTIONS



1. IF INPUT
2. GND
3. LO INPUT
4. POWER SAVE
5. V_{CC}
6. RF OUTPUT

ORDERING INFORMATION

PART NUMBER	QTY
UPC8109T-E3	3K/Reel

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