



**THE DATASHEET OF
UPC8163TB-E3-A**





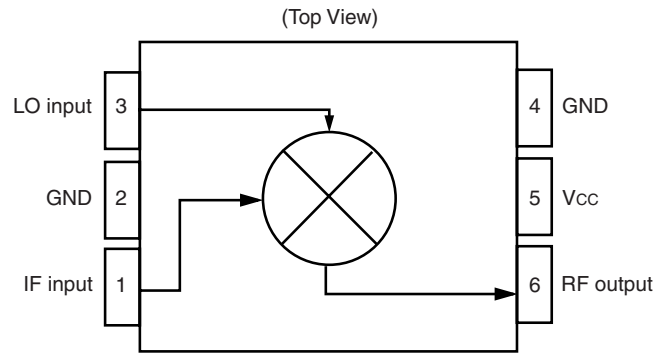
3 V SILICON RFIC FREQUENCY UPCONVERTER

UPC8163TB

FEATURES

- **RECOMMENDED OPERATING FREQUENCY:**
 $f_{RFOUT} = 0.8 \text{ GHz to } 2.0 \text{ GHz}$
 $f_{IFIN} = 50 \text{ MHz to } 300 \text{ MHz}$
- **SUPPLY VOLTAGE:**
 $V_{CC} = 2.7 \text{ to } 3.3 \text{ V}$
- **HIGH DENSITY SURFACE MOUNTING:**
 6-pin super minimold package
- **HIGH IP₃:**
 $OIP_3 = +9.5 \text{ dBm @ } f_{RFOUT} = 900 \text{ MHz}$
- **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 fr 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

($T_A = 25^\circ\text{C}$, $V_{CC} = V_{RFOUT} = 3.0 \text{ V}$, $f_{IFIN} = 240 \text{ MHz}$, $P_{LOIN} = -5 \text{ dBm}$ 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 | $f_{RFOUT} = 0.9 \text{ GHz}$, $P_{IFIN} = -30 \text{ dBm}$ | 6 | 9 | 12 |
| | | $f_{RFOUT} = 1.9 \text{ GHz}$, $P_{IFIN} = -30 \text{ dBm}$ | 4 | 7 | 10 |
| P _{SAT} | Saturated Output Power | $f_{RFOUT} = 0.9 \text{ GHz}$ | -1.5 | 0.5 | |
| | | $f_{RFOUT} = 1.9 \text{ GHz}$ | -4.5 | -2 | |
| OIP ₃ | Output third Order Intercept Point, $f_{IFIN1} = 240 \text{ MHz}$ $f_{IFIN2} = 240.4 \text{ MHz}$ $P_{IFIN} = -20 \text{ dBm}$ | $f_{RFOUT} = 0.9 \text{ GHz}$ | | +9.5 | |
| | | $f_{RFOUT} = 1.9 \text{ GHz}$ | | +6.0 | |
| NF | SSB Noise Figure | $f_{RFOUT} = 0.9 \text{ GHz}$ | | 12.5 | |
| | | $f_{RFOUT} = 1.9 \text{ GHz}$ | | 12.5 | |

UPC8163TB

ABSOLUTE MAXIMUM RATINGS¹ (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 |

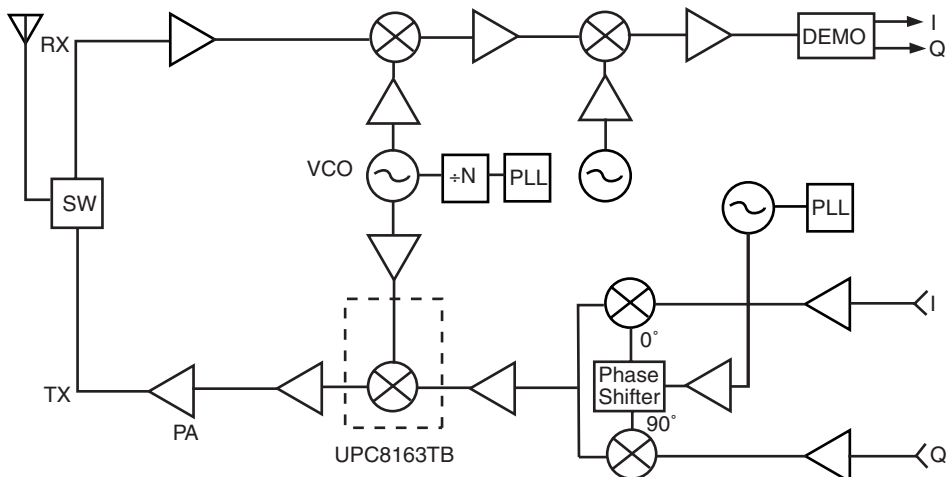
Notes:

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

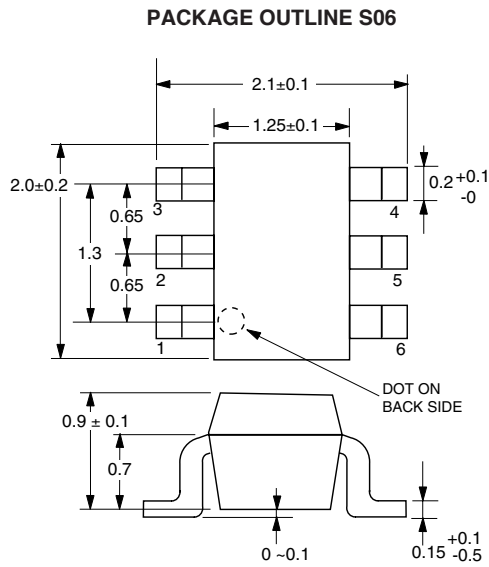
PIN FUNCTIONS

| Pin No. | Pin Name | Applied Voltage | Pin Voltage | Description | Equivalent Circuit |
|---------|-----------------|--|-------------|--|--------------------|
| 1 | IFINPUT | — | 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 | LOINPUT | — | 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 | RFOUTPUT | 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

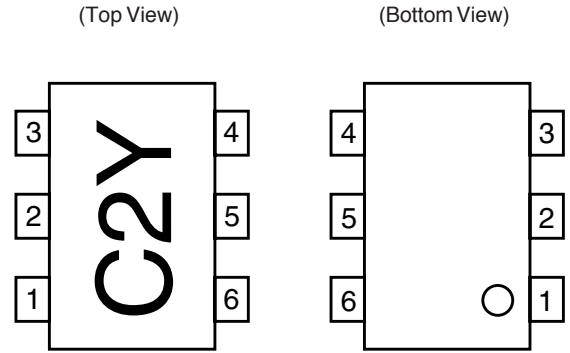


OUTLINE DIMENSIONS (Units in mm)



Note:
All dimensions are typical unless otherwise specified.

LEAD CONNECTIONS



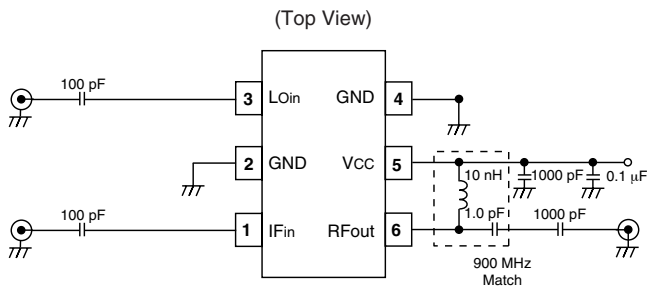
1. IF INPUT
2. GND
3. LO INPUT
4. GND
5. VCC
6. RF OUTPUT

ORDERING INFORMATION

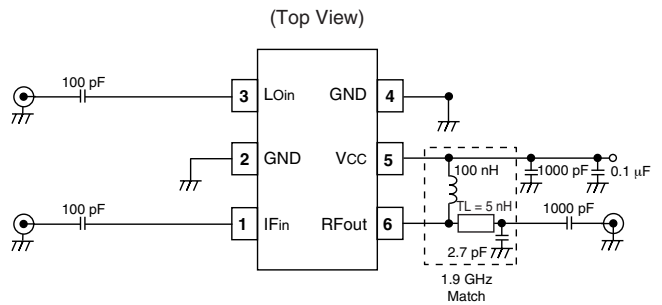
| PART NUMBER | QUANTITY |
|----------------|----------|
| UPC8163TB-E3-A | 3K/Reel |

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

TEST CIRCUIT 1 (RF_{OUT} = 900 MHz)



TEST CIRCUIT 2 (RF_{OUT} = 1.9 GHz)



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| Restricted Substance per RoHS | Concentration Limit per RoHS (values are not yet fixed) | Concentration contained in CEL devices | |
|-------------------------------|---|--|-----|
| | | -A | -AZ |
| Lead (Pb) | < 1000 PPM | Not Detected | (*) |
| Mercury | < 1000 PPM | Not Detected | |
| Cadmium | < 100 PPM | Not Detected | |
| Hexavalent Chromium | < 1000 PPM | Not Detected | |
| PBB | < 1000 PPM | Not Detected | |
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