

### FEATURES

- **SUPPLY VOLTAGE**  
V<sub>CC</sub> = 2.4 to 3.3 V
- **OPERATING FREQUENCY**  
f<sub>IN</sub> = 50 to 700 MHz at ÷ 2  
50 to 800 MHz at ÷ 4
- **LOW CURRENT CONSUMPTION**  
3.5 mA at V<sub>CC</sub> = 3.0 V
- **SELECTABLE DIVISION**  
÷ 2, ÷ 4
- **HIGH-DENSITY SURFACE MOUNTING**  
6-pin super minimold

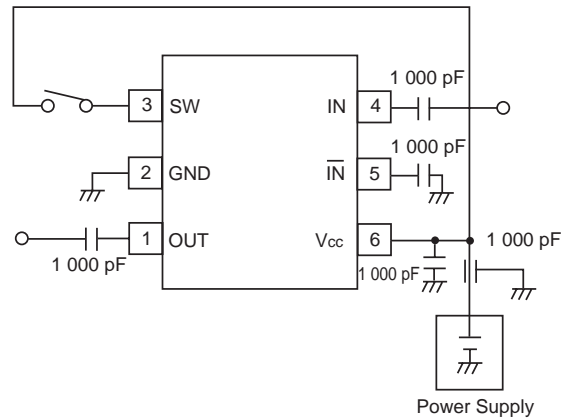
### DESCRIPTION

The UPB1511TB is a silicon monolithic integrated circuit designed as a divide by 2,4 prescaler IC for portable radio systems. This IC is manufactured using NEC's 30 GHz f<sub>MAX</sub> UHS0 (Ultra High Speed Process) silicon bipolar process.

Consequently, this IC is lower circuit current and smaller package than conventional UPB1509GV. The low power makes this device ideally suited for cellular and cordless telephone applications.

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

### TEST CIRCUIT



### APPLICATIONS

- Portable radio systems
- Cellular/cordless telephone 2nd local prescaler

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, V<sub>CC</sub> = 3.0 V)

| PART NUMBER<br>PACKAGE OUTLINE |   |                  | UPB1511TB             |     |                       |
|--------------------------------|---|------------------|-----------------------|-----|-----------------------|
| SYMBOLS                        | PARAMETERS AND CONDITIONS   | UNITS            | MIN                   | TYP | MAX                   |
| I <sub>CC</sub>                | Circuit Current, No Signals   | mA               | 3.1                   | 3.5 | 4.1                   |
| f <sub>IN</sub> (u)1           | Upper Limit Operating Frequency 1, P <sub>IN</sub> = -20 to 0 dBm                 | MHz              | 500                   |     |                       |
| f <sub>IN</sub> (u)2           | Upper Limit Operating Frequency 2, P <sub>IN</sub> = -20 to -5 dBm @ ÷ 2<br>@ ÷ 4 | MHz              | 700<br>800            |     |                       |
| f <sub>IN</sub> (L)1           | Lower Limit Operating Frequency 1, P <sub>IN</sub> = -20 to 0 dBm                 | MHz              |                       |     | 50                    |
| f <sub>IN</sub> (L)2           | Lower Limit Operating Frequency 2, P <sub>IN</sub> = -20 to -5 dBm                | MHz              |                       |     | 500                   |
| P <sub>IN</sub> 1              | Input Power 1, f <sub>IN</sub> = 50 to 800 MHz                                    | dBm              | -20                   |     | -5                    |
| P <sub>IN</sub> 2              | Input Power 2, f <sub>IN</sub> = 50 to 500 MHz                                    | dBm              | -20                   |     | 0                     |
| V <sub>OUT</sub>               | Output Voltage, R <sub>L</sub> = 200 Ω  | V <sub>P-P</sub> | 0.2                   | 0.3 |                       |
| V <sub>IH</sub>                | Divide Ratio Control Input High   | V                | 0.7 x V <sub>CC</sub> |     | V <sub>CC</sub> + 0.5 |
| V <sub>IL</sub>                | Divide Ratio Control Input Low  | V                | -0.5                  |     | V <sub>CC</sub> x 0.3 |

# UPB1511TB

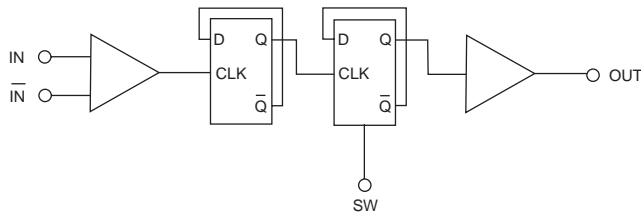
## ABSOLUTE MAXIMUM RATINGS<sup>1</sup>

| SYMBOLS          | PARAMETERS  | UNITS | RATINGS     |
|------------------|---|-------|-------------|
| V <sub>CC</sub>  | Supply Voltage<br>T <sub>A</sub> = +25° C                         | V     | 3.6         |
| V <sub>IN</sub>  | Input Voltage<br>T <sub>A</sub> = +25° C, SW Pin                  | V     | 3.6         |
| P <sub>D</sub>   | Total Power Dissipation <sup>2</sup><br>(T <sub>A</sub> = +85° C) | mW    | 200         |
| T <sub>A</sub>   | Operating Ambient Temp.   | °C    | -40 to +85  |
| T <sub>STG</sub> | Storage Temperature   | °C    | -55 to +150 |

**Notes:**

- Operation in excess of any one of these conditions may result in permanent damage.
- Mounted on double sided copper clad 50 x 50 x 1.6mm epoxy glass PWB

## INTERNAL BLOCK DIAGRAM



## PRODUCT LINE-UP

| PART NUMBER | I <sub>CC</sub> (mA) | V <sub>CC</sub> (V) | ÷2<br>f <sub>IN</sub> (MHz) | ÷4<br>f <sub>IN</sub> (MHz) | ÷8<br>f <sub>IN</sub> (MHz) | PACKAGE              |
|-------------|----------------------|---------------------|-----------------------------|-----------------------------|-----------------------------|----------------------|
| UPB1509 GV  | 5.0                  | 2.2 to 5.5          | 50 to 700                   | 50 to 800                   | 50 to 1000                  | 8-pin SSOP           |
| UPB1511 TB  | 3.5                  | 2.4 to 3.3          | 50 to 700                   | 50 to 800                   | -                           | 6-pin super minimold |

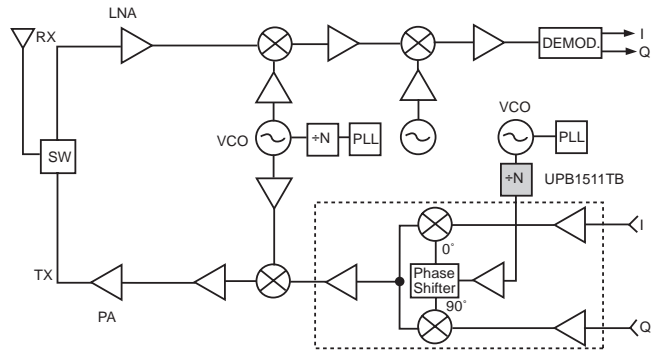
## PIN EXPLANATIONS

| PIN NO.      | SYMBOL          | APPLIED VOLTAGE (V) | FUNCTIONS AND EXPLANATION  |  |    |  |  |   |   |              |     |     |
|--------------|-----------------|---------------------|--|--|----|--|--|---|---|--------------|-----|-----|
| 1            | OUT             | -                   | Divided Frequency Output Pin. This pin is designed as an emitter follower output and can deliver 0.2 V <sub>P-P</sub> minimum into a 200 Ω load. This pin should be coupled to the load device with a capacitor (example: 1000 pF) for DC cut.   |  |    |  |  |   |   |              |     |     |
| 2            | GND             | 0                   | Ground Pin. Ground pattern on the board should be as wide as possible to minimize ground impedance.  |  |    |  |  |   |   |              |     |     |
| 3            | SW              | H/L                 | Divide Ratio Control Pin. Divide ratio can be determined by the following applied level to these pins.<br><table border="1" style="margin: 10px auto;"> <tr> <td></td> <td colspan="2">SW</td> </tr> <tr> <td></td> <td>H</td> <td>L</td> </tr> <tr> <td>Divide ratio</td> <td>1/2</td> <td>1/4</td> </tr> </table> <p>These pins must be each equipped with bypass capacitor to minimize their impedance.</p> |  | SW |  |  | H | L | Divide ratio | 1/2 | 1/4 |
|              | SW              |                     |  |  |    |  |  |   |   |              |     |     |
|              | H               | L                   |  |  |    |  |  |   |   |              |     |     |
| Divide ratio | 1/2             | 1/4                 |  |  |    |  |  |   |   |              |     |     |
| 4            | IN              | -                   | Signal Input Pin. This pin should be coupled to the signal source with a capacitor (example: 1000 pF) for DC cut.  |  |    |  |  |   |   |              |     |     |
| 5            | IN̄             | -                   | Signal Input Bypass Pin. This pin must be equipped with a bypass capacitor (example: 1000 pF) to minimize ground impedance.  |  |    |  |  |   |   |              |     |     |
| 6            | V <sub>CC</sub> | 2.4 TO 3.3          | Power Supply Pin. This pin must be equipped with a bypass capacitor (example: 1000 pF) to minimize ground impedance.   |  |    |  |  |   |   |              |     |     |

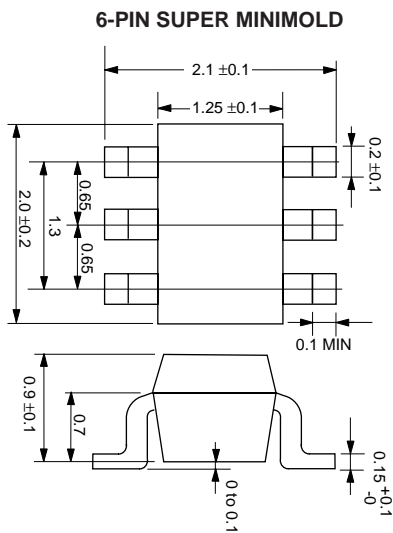
## RECOMMENDED OPERATING CONDITIONS

| SYMBOLS         | PARAMETERS              | UNITS | MIN | TYP | MAX |
|-----------------|-------------------------|-------|-----|-----|-----|
| V <sub>CC</sub> | Supply Voltage          | V     | 2.4 | 3.0 | 3.3 |
| T <sub>A</sub>  | Operating Ambient Temp. | °C    | -40 | +25 | +85 |

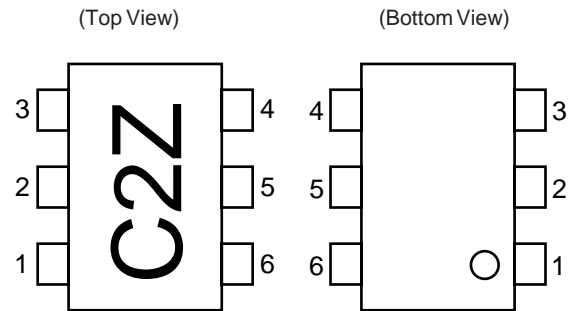
## SYSTEM APPLICATION EXAMPLE



**OUTLINE DIMENSIONS** (Units in mm)



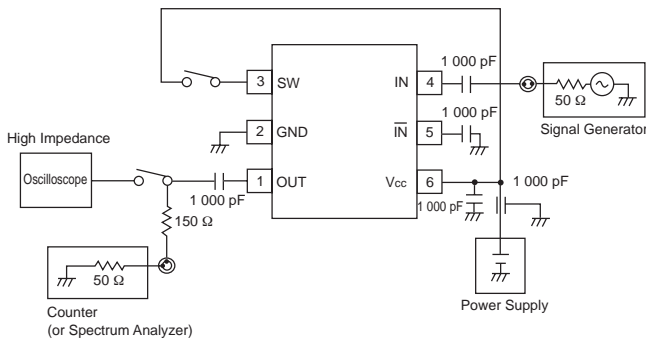
**PIN CONNECTIONS**



**PIN CONNECTION**

1. OUT
2. GND
3. SW
4. IN
5. IN
6. Vcc

**TEST CIRCUIT**



**Divide Ratio Setting**

|    |   |     |
|----|---|-----|
| SW | H | 1/2 |
|    | L | 1/4 |

**ORDERING INFORMATION**

| PART NUMBER  | PACKAGE              | QUANTITY         |
|--------------|----------------------|------------------|
| UPB1511TB-E3 | 6-pin super minimold | Qty 3 kpcs/reel. |

**Notes:**

1. Embossed tape 8 mm wide. Pin 1, 2, 3 face the tape perforation side.

**Life Support Applications**

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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