NEC

BIPOLAR DIGITAL INTEGRATED CIRCUIT
μPB1511TB

800 MHz INPUT DIVIDE BY 2, 4 PRESCALER IC
FOR PORTABLE SYSTEMS

The μPB1511TB 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_{max} UHS0 (<u>U</u>ltra <u>H</u>igh <u>S</u>peed Process) silicon bipolar process.

Consequently, this IC is lower circuit current and smaller package than conventional μPB1509GV.

FEATURES

- Operating frequency : f_{in} = 50 to 700 MHz @ ÷ 2,
  50 to 800 MHz @ ÷ 4
- Low current consumption : 3.5 mA @ V_{CC} = 3.0 V
- High-density surface mounting : 6-pin super minimold
- Supply voltage : V_{CC} = 2.4 to 3.3 V
- Selectable division : ÷ 2, ÷ 4

APPLICATIONS

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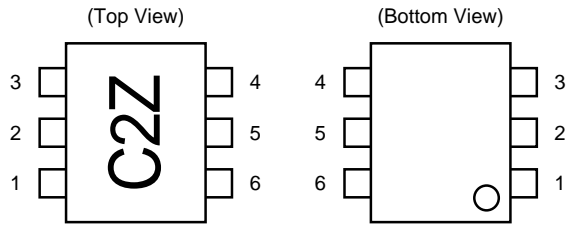- Cellular/cordless telephone 2nd local prescaler

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPB1511TB-E3	6-pin super minimold	C2Z	Embossed tape 8 mm wide. Pin 1, 2, 3 face the tape perforation side. Qty 3 kpcs/reel.

Remark To order evaluation samples, please contact your local NEC sales office. (Part number for sample order: μPB1511TB)

Caution Electro-static sensitive devices

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PIN CONNECTIONS

(Top View)

C2Z

3 ▯ ▯ 4
2 ▯ ▯ 5
1 ▯ ▯ 6

(Bottom View)

4 ▯ ▯ 3
5 ▯ ▯ 2
6 ▯ ○ ▯ 1

Pin No.	Pin Name
1	OUT
2	GND
3	SW
4	IN
5	$\overline{\text{IN}}$
6	V_{CC}

PRODUCT LINE-UP

| Part Number	I_{CC} (mA)	V_{CC} (V)	÷ 2 f_{in} (MHz)	÷ 4 f_{in} (MHz)	÷ 8 f_{in} (MHz)	Package
μPB1509 GV	5.0	2.2 to 5.5	50 to 700	50 to 800	50 to 1 000	8-pin SSOP
μPB1511TB	3.5	2.4 to 3.3	50 to 700	50 to 800	–	6-pin super minimold

Remark This table shows the TYP. values of main parameters. Please refer to ELECTRICAL CHARACTERISTICS.

INTERNAL BLOCK DIAGRAM

IN ○

$\overline{\text{IN}}$ ○

D Q

CLK

$\overline{Q}$

D Q

CLK

$\overline{Q}$

○ OUT

SW
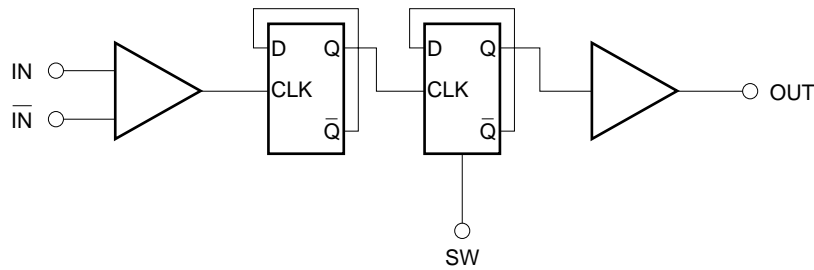
SYSTEM APPLICATION EXAMPLE

One of the example for usage

Quadulator Modulator
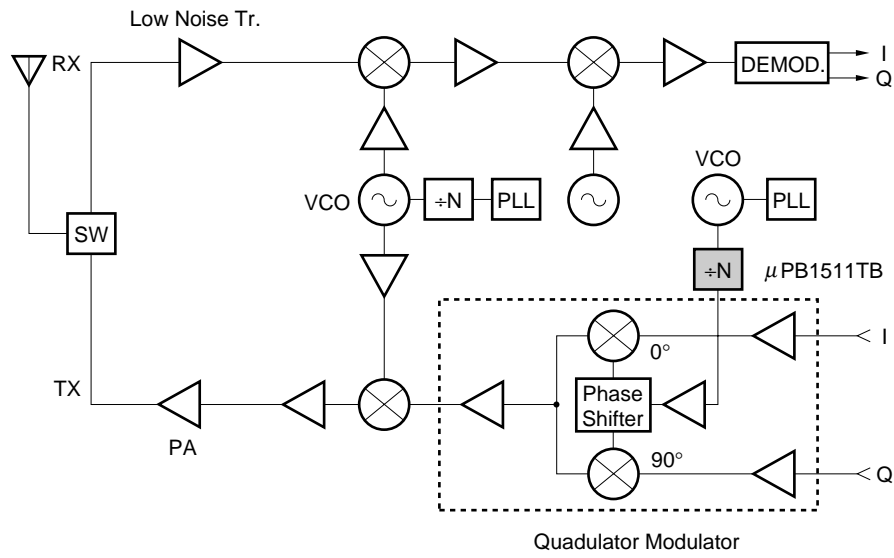
    This block diagram schematically shows the μPB1511TB's location in one of the example application system. The other applications are also acceptable for divider use.

PIN EXPLANATIONS

Pin No.	Symbol	Applied Voltage (V)	Functions and Explanation
1	OUT	—	Divided frequency output pin. This pin is designed as emitter follower output. This pin can output 0.2 V_{P-P} MIN. with 200 Ω load. This pin should be coupled to load device with capacitor (example: 1 000 pF) for DC cut.
2	GND	0	Ground pin. Ground pattern on the board should be formed as widely as possible to minimize ground impedance.
3	SW	H/L	Divide ratio control pin. Divide ratio can be determined by following applied level to these pins. <table><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> These pins must be each equipped with bypass capacitor to minimize their impedance.
4	IN	—	Signal input pin. This pin should be coupled to signal source with capacitor (example: 1 000 pF) for DC cut.
5	$\overline{\text{IN}}$	—	Signal input bypass pin. This pin must be equipped with bypass capacitor (example: 1 000 pF) to minimize ground impedance.
6	V_{CC}	2.4 to 3.3	Power supply pin. This pin must be equipped with bypass capacitor (example: 1 000 pF) to minimize ground impedance.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply Voltage	V_{CC}	T_A = +25°C	3.6	V
Input Voltage	V_{in}	T_A = +25°C, SW pin	3.6	V
Total Power Dissipation	P_D	Mounted on double sided copper clad 50 × 50 × 1.6 mm epoxy glass PWB (T_A = +85°C)	200	mW
Operating Ambient Temperature	T_A		−40 to +85	°C
Storage Temperature	T_{stg}		−55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	V_{CC}	2.4	3.0	3.3	V
Operating Ambient Temperature	T_A	−40	+25	+85	°C

ELECTRICAL CHARACTERISTICS (T_A = +25°C, V_{CC} = 3.0 V)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit Current	I_{CC}	No signals	3.1	3.5	4.1	mA
Upper Limit Operating Frequency 1	$f_{in(U)1}$	P_{in} = −20 to 0 dBm	500	—	—	MHz
Upper Limit Operating Frequency 2	$f_{in(U)2}$	P_{in} = −20 to −5 dBm @ ÷ 2 @ ÷ 4	700 800	— —	— —	MHz
Lower Limit Operating Frequency 1	$f_{in(L)1}$	P_{in} = −20 to 0 dBm	—	—	50	MHz
Lower Limit Operating Frequency 2	$f_{in(L)2}$	P_{in} = −20 to −5 dBm	—	—	500	MHz
Input Power 1	P_{in1}	f_{in} = 50 to 800 MHz	−20	—	−5	dBm
Input Power 2	P_{in2}	f_{in} = 50 to 500 MHz	−20	—	0	dBm
Output Voltage	V_{out}	R_L = 200 Ω	0.2	0.3	—	V_{P-P}
Divide Ratio Control Input High	V_{IH}		$0.7 \times V_{CC}$	—	V_{CC} + 0.5	V
Divide Ratio Control Input Low	V_{IL}		−0.5	—	$V_{CC} \times 0.3$	V

TEST CIRCUIT
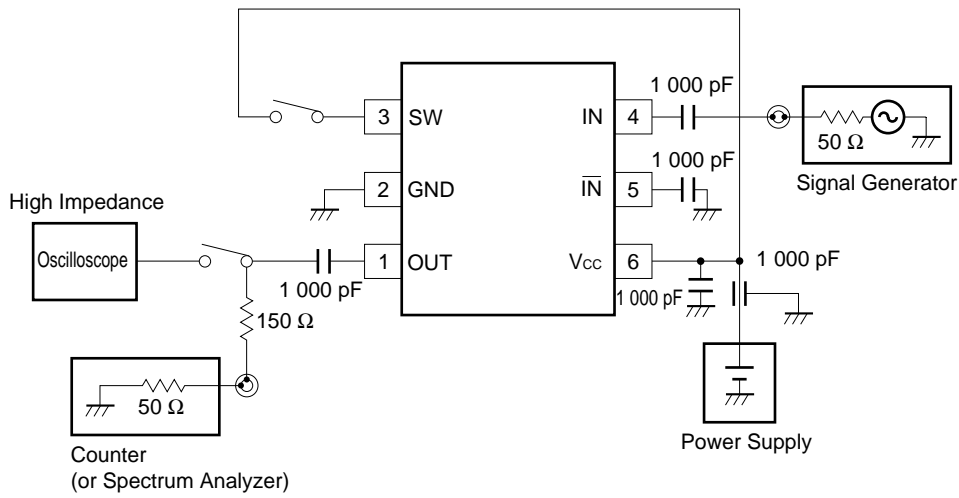
Divide Ratio Setting

SW	H	1/2
	L	1/4

PACKAGE DIMENSIONS

6-pin super minimold (Unit: mm)
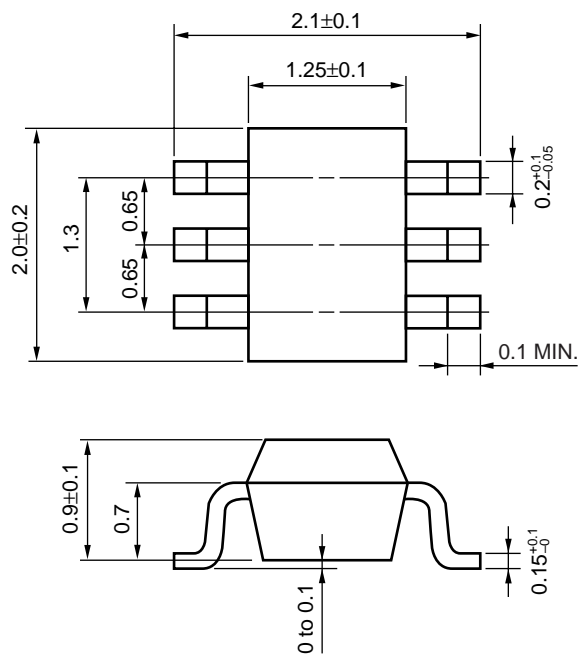
NOTE ON CORRECT USE

(1) Observe precautions for handling because of electrostatic sensitive devices.

(2) Form a ground pattern as widely as possible to minimize ground impedance (to prevent undesired oscillation). Keep the track length of the ground pins as short as possible.

(3) Connect a bypass capacitor (example: 1 000 pF) to the Vcc pin.

RECOMMENDED SOLDERING CONDITIONS

This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared Reflow	Package peak temperature: 235°C or below Time: 30 seconds or less (at 210°C) Count: 3, Exposure limit: None[Note]	IR35-00-3
VPS	Package peak temperature: 215°C or below Time: 40 seconds or less (at 200°C) Count: 3, Exposure limit: None[Note]	VP15-00-3
Wave Soldering	Soldering bath temperature: 260°C or below Time: 10 seconds or less Count: 1, Exposure limit: None[Note]	WS60-00-1
Partial Heating	Pin temperature: 300°C Time: 3 seconds or less (per side of device) Exposure limit: None[Note]	–

Note After opening the dry pack, keep it in a place below 25°C and 65% RH for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

For details of recommended soldering conditions for surface mounting, refer to information document SEMICONDUCTOR DEVICE MOUNTING TECHNOLOGY MANUAL (C10535E).
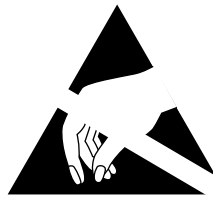
ATTENTION

OBSERVE PRECAUTIONS
FOR HANDLING
ELECTROSTATIC
SENSITIVE
DEVICES

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