NEC

BIPOLAR DIGITAL INTEGRATED CIRCUIT

μPB1510GV

3 GHz INPUT DIVIDE BY 4 PRESCALER IC FOR DBS TUNERS

The μPB1510GV is a 3.0 GHz input divide by 4 prescaler IC for DBS tuner applications. The μPB1510GV is suitable for use of frequency divider for PLL synthesizer block. The μPB1510GV is a shrink package version of the μPB585G so that this small package contributes to reduce the mounting space.

The μPB1510GV is manufactured using NEC's high f_T NESAT™ IV silicon bipolar process. This process uses silicon nitride passivation film and gold electrodes. These materials can protect chip surface from external pollution and prevent corrosion/migration. Thus, this IC has excellent performance, uniformity and reliability.

FEATURES

- High toggle frequency : f_{in} = 0.5 GHz to 3.0 GHz
- High-density surface mounting : 8-pin plastic SSOP (175 mil)
- Low current consumption : 5 V, 14 mA TYP.
- Fixed division : ÷4

APPLICATION

- Prescaler between local oscillator and PLL frequency synthesizer included modulus prescaler
- DBS tuners with kit use of VHF/UHF band PLL frequency synthesizer

ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
μPB1510GV-E1	8-pin plastic SSOP (175 mil)	1510	Embossed tape 8 mm wide. Pin 1 is in tape pull-out direction. 1000 p/reel

Remark To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPB1510GV)

Caution Electro-static sensitive devices

The information in this document is subject to change without notice.

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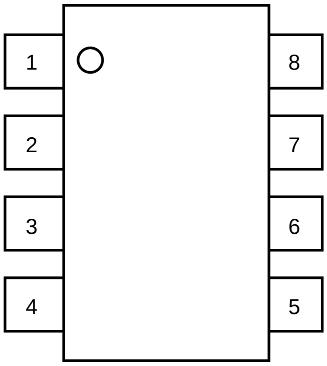
The mark ★ shows major revised points.

PIN CONNECTION (Top View)



Pin No.	Pin name
1	V_{CC}
2	IN
3	$\overline{IN}$
4	GND
5	GND
6	NC
7	OUT
8	NC

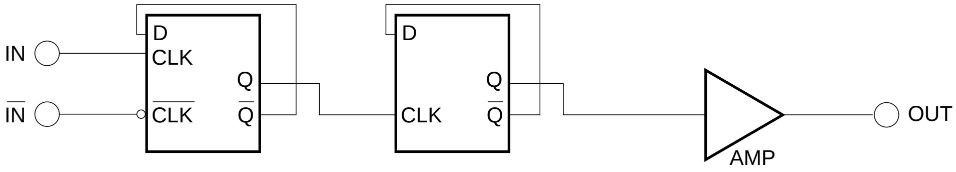
PRODUCT LINE-UP

Features (Division, Frequency)	Part number	I_{CC} (mA)	f_{in} (GHz)	V_{CC} (V)	Package	Pin Connection
÷4, 2.5 GHz input	μPB585G	18	0.5 to 2.5	4.5 to 5.5	8-pin SOP (225 mil)	NEC Original
÷4, 3.0 GHz input	μPB1510GV	14	0.5 to 3.0	4.5 to 5.5	8-pin SSOP (175 mil)	

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

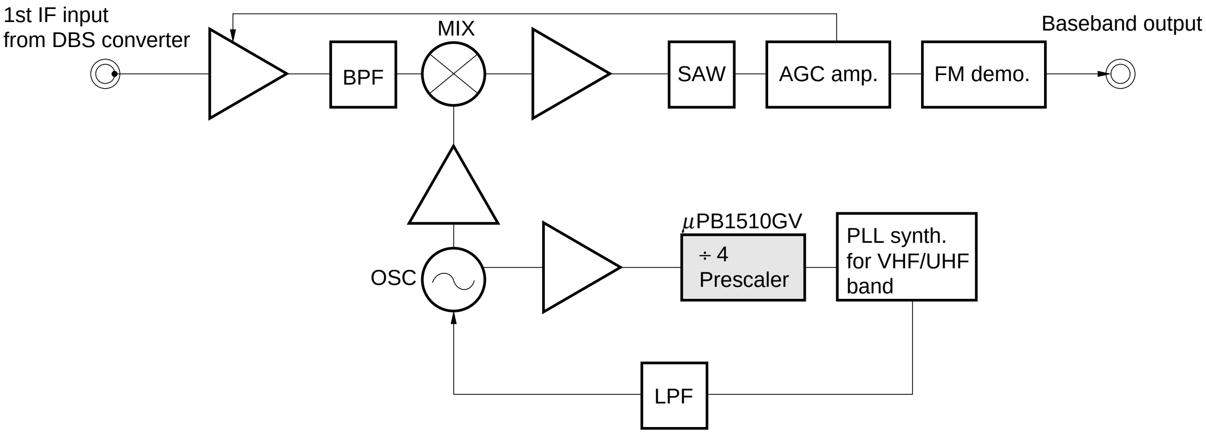
μPB585G is discontinued.

★ INTERNAL BLOCK DIAGRAM



SYSTEM APPLICATION EXAMPLE

RF unit block of DBS tuners



PIN EXPLANATION

Pin No.	Symbol	Applied Voltage (Unit: V)	Pin Voltage (Unit: V)	Functions and Explanation
1	V_{CC}	4.5 to 5.5	—	Supply voltage pin. This pin must be equipped with bypass capacitor (e.g. 1 000 pF) to minimize ground impedance.
2	IN	—	1.7 to 4.95	Signal input pin. This pin should be coupled to signal source with capacitor (e.g. 1 000 pF) for DC cut.
3	$\overline{\text{IN}}$	—	1.7 to 4.95	Signal input bypass pin. This pin must be equipped with bypass capacitor (e.g. 1 000 pF) to minimize ground impedance.
4, 5	GND	0	—	Ground pin. Ground pattern on the board should be formed as wide as possible to minimize ground impedance.
6, 8	NC	—	—	Non connection pins. These pins should be opened.
7	OUT	—	1.0 to 4.7	Divided frequency output pin. This pin is designed as emitter follower output. This pin can be connected to input of prescaler within PLL synthesizer through DC cut capacitor.

★ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}	T_A = +25 °C	6.0	V
Total power dissipation	P_D	Mounted on double sided copper clad 50 × 50 × 1.6 mm epoxy glass PWB (T_A = +85 °C)	250	mW
Operating ambient temperature	T_A		–40 to +85	°C
Storage temperature	T_{stg}		–55 to +150	°C

RECOMMENDED OPERATING CONDITIONS

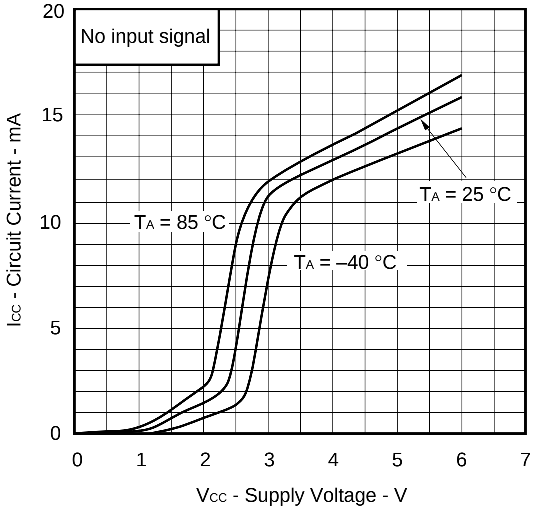
Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Notice
Supply voltage	V_{CC}	4.5	5.0	5.5	V	
Operating ambient temperature	T_A	–40	+25	+85	°C	

ELECTRICAL CHARACTERISTICS (T_A = –40 to +85 °C, V_{CC} = 4.5 to 5.5 V, Z_S = Z_L = 50 Ω)

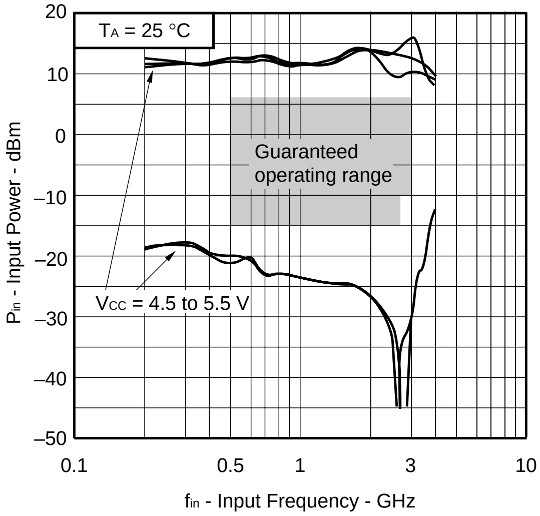
Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Circuit current	I_{CC}	No signals	10.5	14	17	mA
Upper limit operating frequency 1	$f_{in(U)1}$	P_{in} = –10 to +6 dBm	3.0	—	—	GHz
Upper limit operating frequency 2	$f_{in(U)2}$	P_{in} = –15 to +6 dBm	2.7	—	—	GHz
Lower limit operating frequency	$f_{in(L)}$	P_{in} = –15 to +6 dBm	—	—	0.5	GHz
Input power 1	P_{in1}	f_{in} = 2.7 to 3.0 GHz	–10	—	+6	dBm
Input power 2	P_{in2}	f_{in} = 0.5 to 2.7 GHz	–15	—	+6	dBm
Output power	P_{out}	P_{in} = 0 dBm, f_{in} = 2.0 GHz	–12	–7	—	dBm

★ TYPICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 5 V, unless otherwise specified)

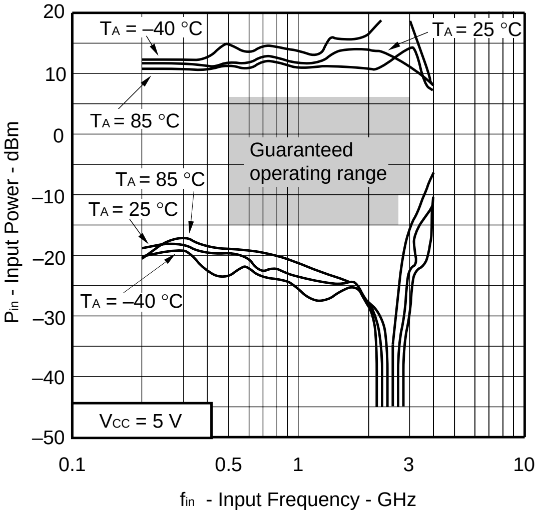
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



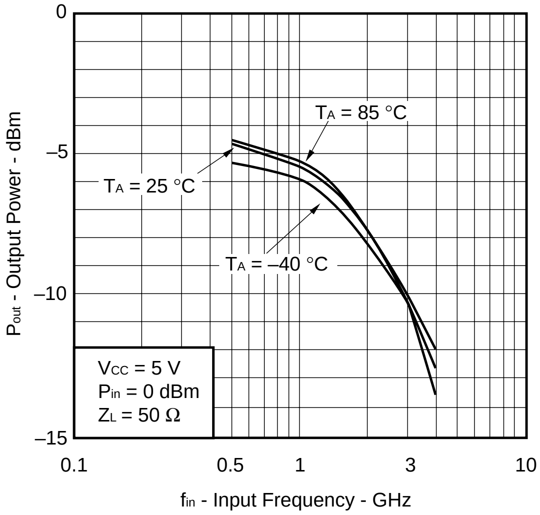
INPUT POWER vs. INPUT FREQUENCY



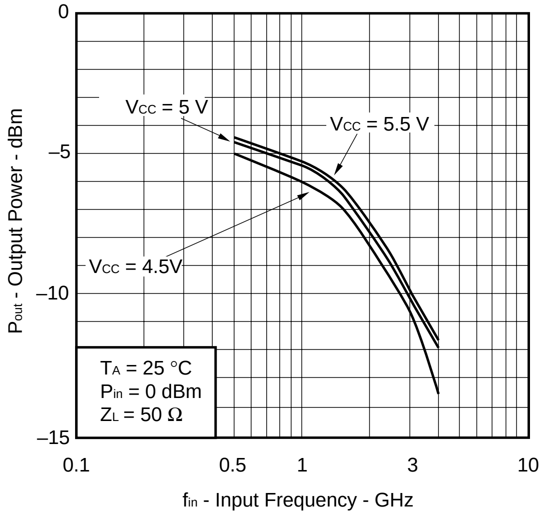
INPUT POWER vs. INPUT FREQUENCY



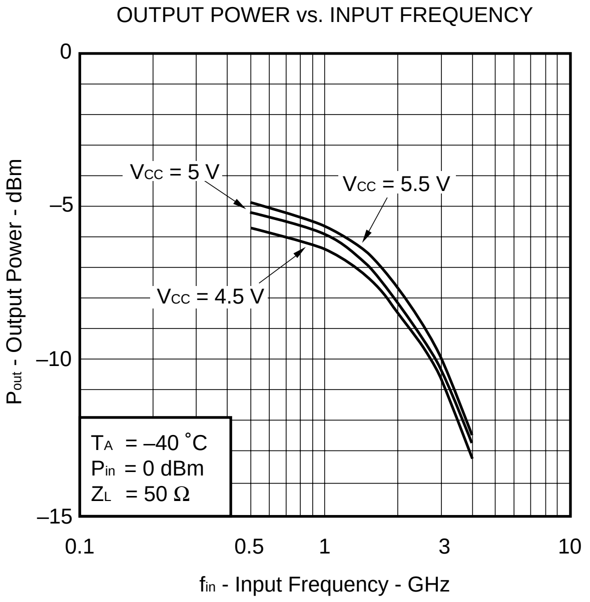
OUTPUT POWER vs. INPUT FREQUENCY

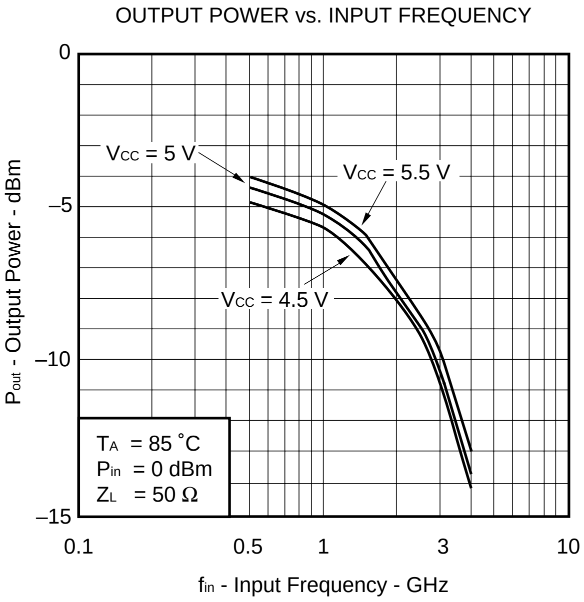


OUTPUT POWER vs. INPUT FREQUENCY



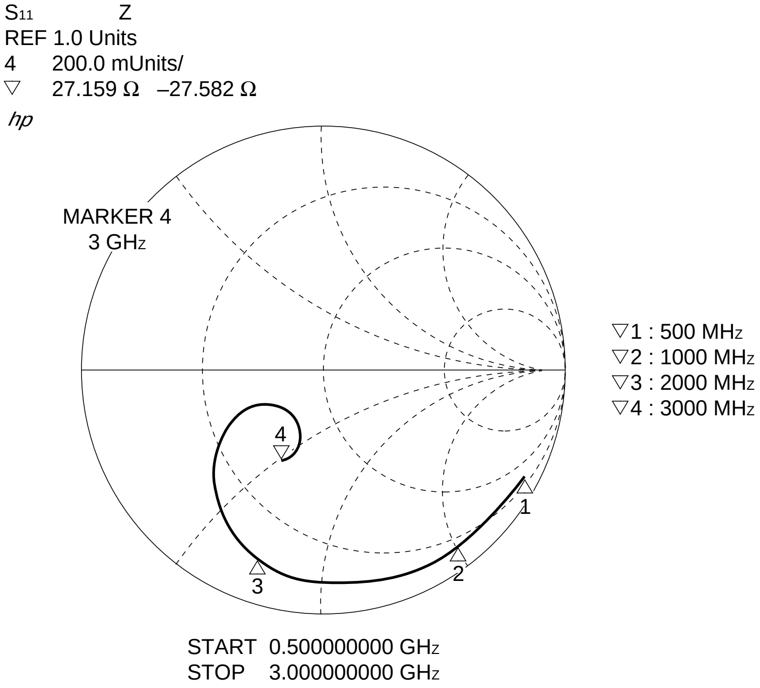
★ TYPICAL CHARACTERISTICS (T_A = 25°C, V_{CC} = 5V, unless otherwise specified)





S_{11} vs. INPUT FREQUENCY

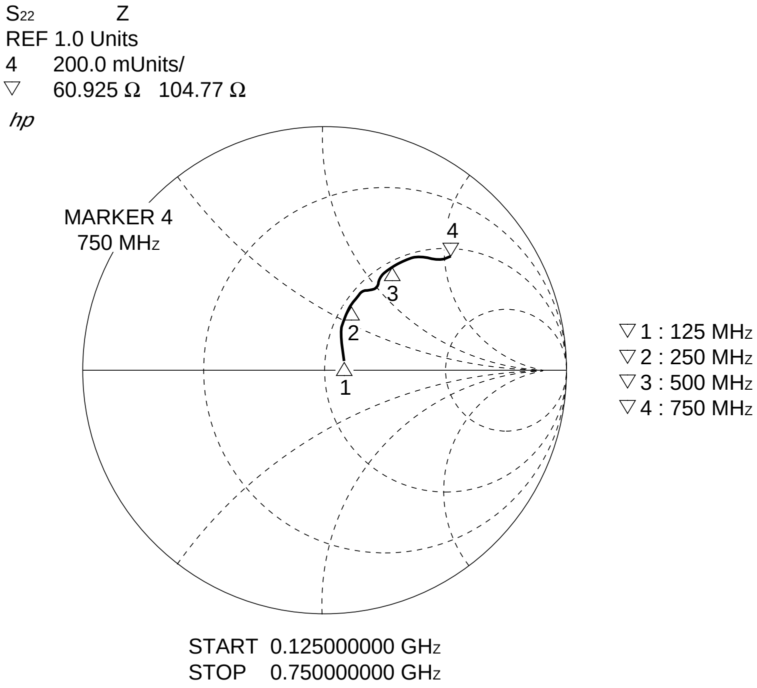
V_{CC} = 5.0 V, T_A = 25°C, Z_O = 50 Ω



Frequency (MHz)	S_{11} (Ω)
500	37.1 – j207.8
1000	14.2 – j105.1
2000	7.9 – j35.8
3000	27.1 – j27.5

S_{22} vs. OUTPUT FREQUENCY

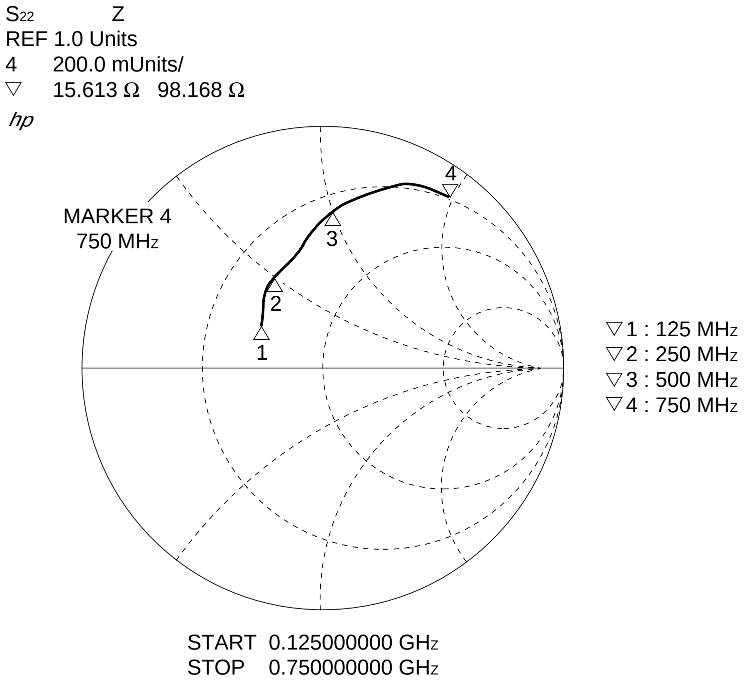
V_{CC} = 5.0V, f_{in} = 500 MHz, T_A = 25°C, Z_O = 50 Ω



Frequency (MHz)	S_{22} (Ω)
125	55.5 + j6.7
250	53.7 + j30.4
500	55.0 + j60.3
750	60.9 + j104.8

S_{22} vs. OUTPUT FREQUENCY

V_{CC} = 5.0V, f_{in} = 3 GHz, T_A = 25°C, Z_O = 50 Ω



Frequency (MHz)	S_{22} (Ω)
125	28.5 + j11.5
250	27.6 + j23.6
500	20.5 + j50.7
750	15.6 + j98.2

TEST CIRCUIT

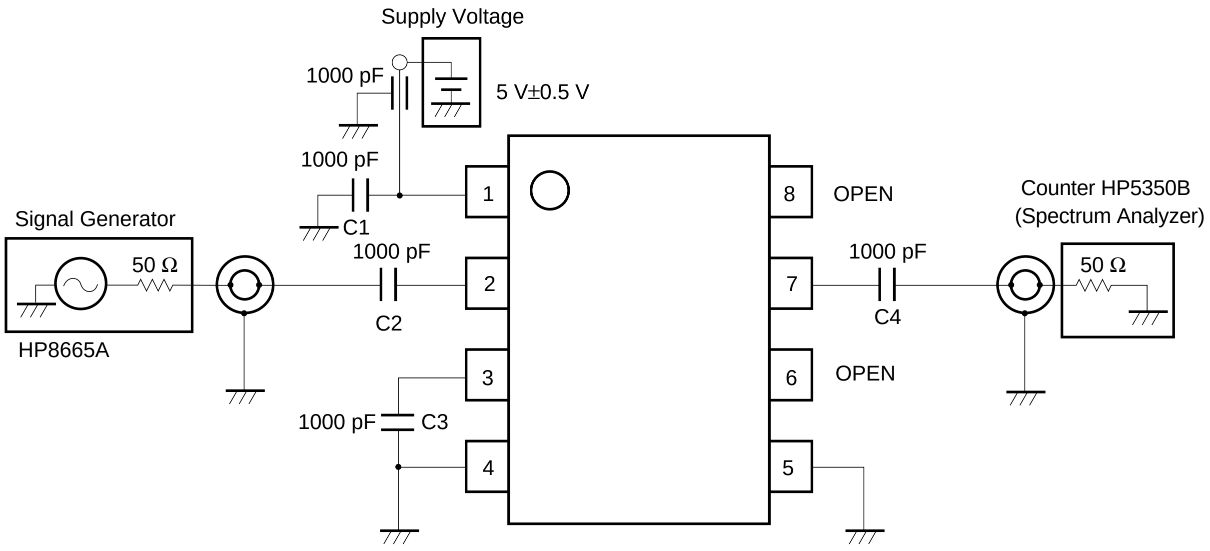
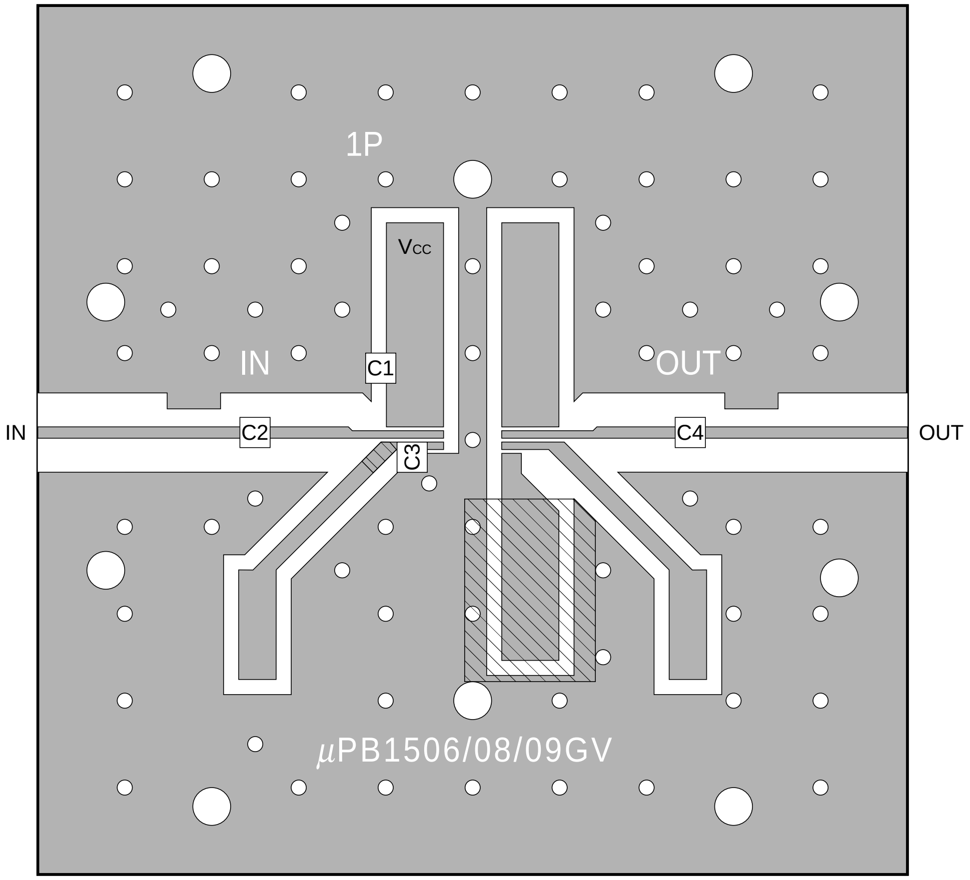


ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

Symbol	Value
C1 to C4	1000 pF

EVALUATION BOARD CHARACTERS

(1) 35 μm thick double-sided copper clad 50 × 50 × 0.4 mm polyimide board

(2) Back side: GND pattern

(3) Solder plated patterns

(4) ∘ ○ : Through holes

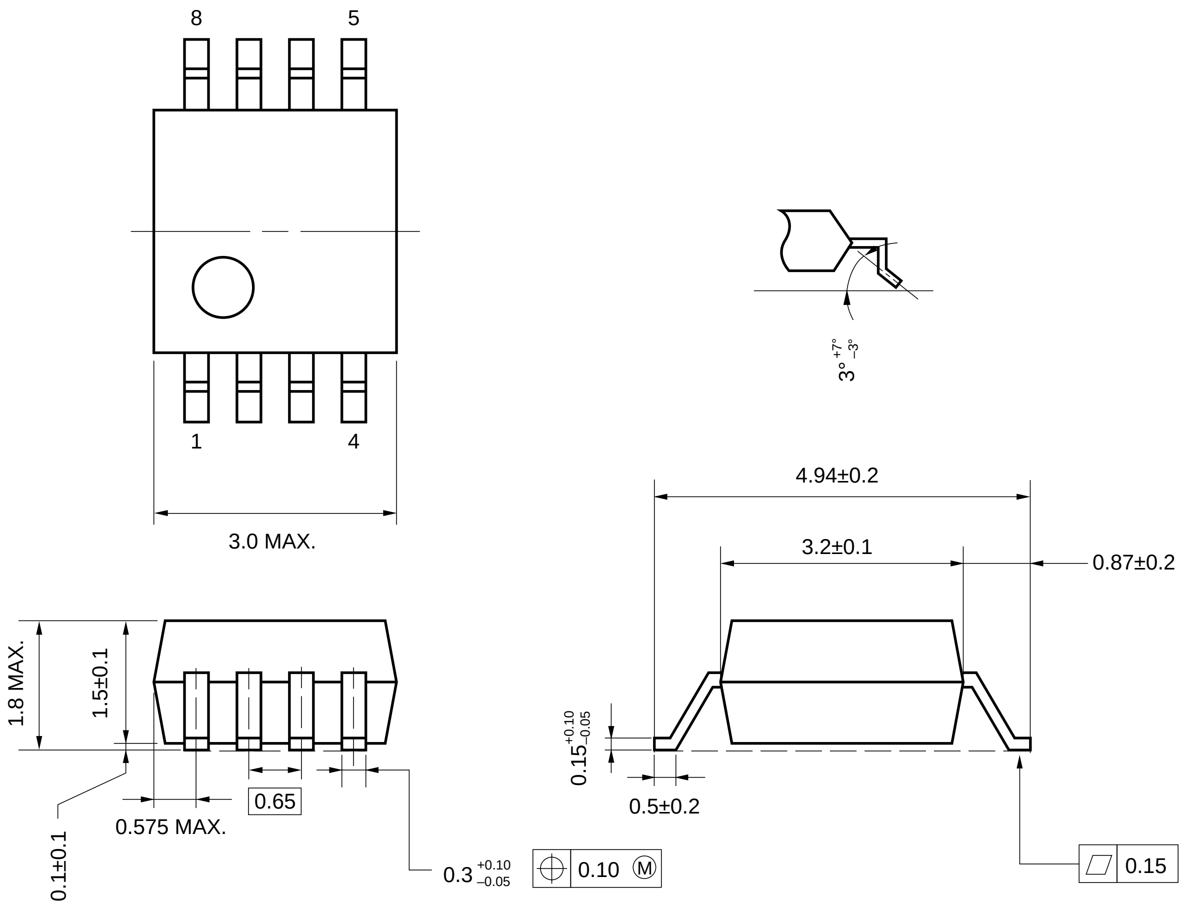
(5) ▨ of pin 3 : partern should be removed.

(6) ▨ of pin 5 : short chip must be attached to be grounded.

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

PACKAGE DIMENSIONS

8 PIN PLASTIC SSOP (175 mil) (UNIT: mm)



NOTE CORRECT USE

(1) Observe precautions for handling because of electro-static sensitive devices.
(2) Form a ground pattern as wide as possible to minimize ground impedance (to prevent undesired operation).
(3) Keep the wiring length of the ground pins as short as possible.
(4) Connect a bypass capacitor (e.g. 1 000 pF) to the V_{CC} pin.

RECOMMENDED SOLDERING CONDITIONS

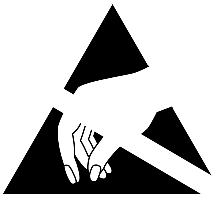
This product should be soldered under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your NEC sales representative.

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

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

The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

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Standard: Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots

Special: Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)

Specific: Aircrafts, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems or medical equipment for life support, etc.

The quality grade of NEC devices is "Standard" unless otherwise specified in NEC's Data Sheets or Data Books. If customers intend to use NEC devices for applications other than those specified for Standard quality grade, they should contact an NEC sales representative in advance.

Anti-radioactive design is not implemented in this product.

M4 96.5