NEC

BIPOLAR DIGITAL INTEGRATED CIRCUIT

μPB1508GV

3 GHz INPUT DIVIDE BY 2 PRESCALER IC FOR DBS TUNERS

μPB1508GV is a 3.0 GHz input divide by 2 prescaler IC for DBS tuner applications. μPB1508GV can make VHF/UHF band PLL frequency synthesizer apply to DBS/ECS tuners. μPB1508GV is a shrink package version of μPB584G so that this small package contributes to reduce the mounting space.

μPB1508GV 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, 12 mA
- Fixed division : ÷2

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
μPB1508GV-E1	8 pin plastic SSOP (175 mil)	1508	Embossed tape 8 mm wide. Pin 1 is in tape pull-out direction. 1 000 p/reel.

Remarks To order evaluation samples, please contact your local NEC sales office.
(Part number for sample order: μPB1508GV)

Caution: Electro-static sensitive devices

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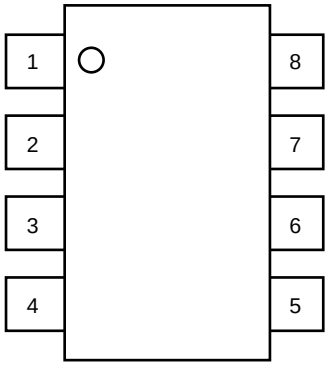
PIN CONNECTION (Top View)



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

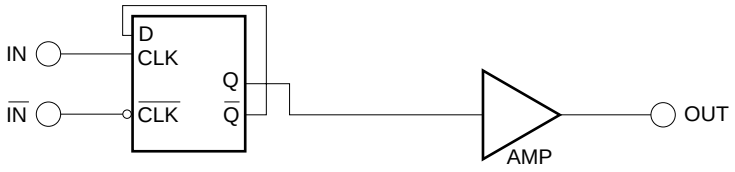
PRODUCT LINE-UP

Product No.	I_{CC} (mA)	f_{in} (GHz)	V_{CC} (V)	Package	Pin Connection
μPB581A	30	0.5 to 2.8	4.5 to 5.5	8 pins CAN	–
μPB581C	30	0.5 to 2.2	4.5 to 5.5	8 pins DIP (300 mil)	NEC Original
μPB584G	18	0.5 to 2.5	4.5 to 5.5	8 pins SOP (225 mil)	NEC Original
μPB1508GV	12	0.5 to 3.0	4.5 to 5.5	8 pins SSOP (175 mil)	

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

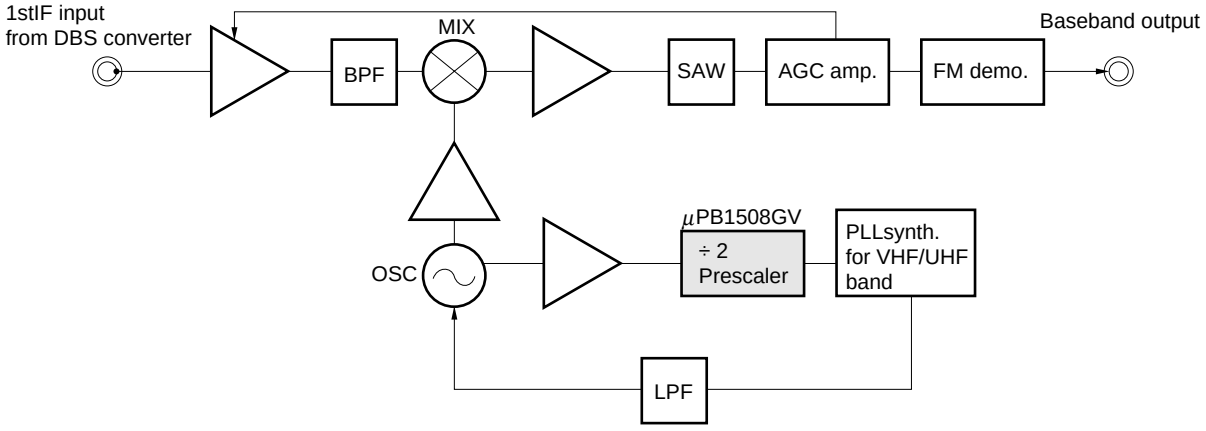
μPB581A, μPB581C and μPB584G are discontinued.

INTERNAL BLOCK DIAGRAM



SYSTEM APPLICATION EXAMPLE

RF unit block of DBS tuners



PIN EXPLANATION

Pin No.	Symbol	Applied voltage	PIN voltage	Functions and explanation
1	V_{CC}	4.5 to 5.5	—	Power supply pin. This pin must be equipped with bypass capacitor (eg 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 (eg 1 000 pF) for DC cut.
3	$\overline{IN}$	—	1.7 to 4.95	Signal input bypass pin. This pin must be equipped with bypass capacitor (eg 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	CONDITION	RATINGS	UNIT
Supply voltage	V_{CC}	T_A = +25 °C	6.0	V
Input voltage	V_{in}	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

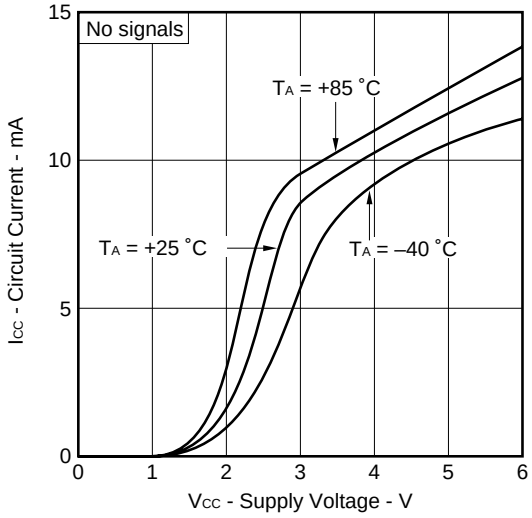
PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARKS
Supply voltage	V_{CC}	4.5	5.0	5.5	V	
Operating ambient temperature	T_A	–40	+25	+85	°C	

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

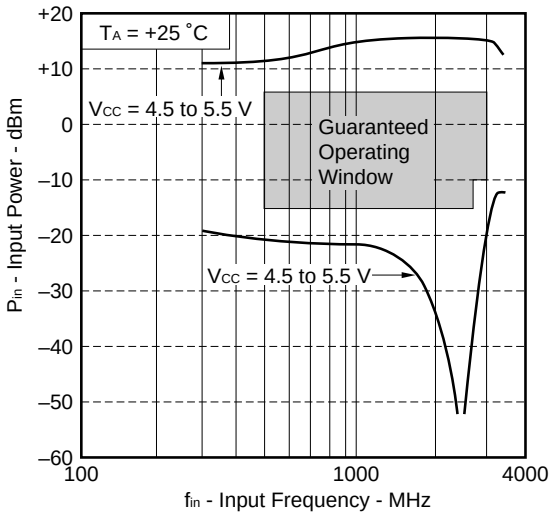
PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Circuit current	I_{CC}	No signals	7.6	12	14.5	mA
Upper limit operating frequency 1	$f_{in(U)1}$	P_{in} = –10 to +6 dBm	3.0	—	—	GHz
Upper limit operating frequency 2	$f_{in(U)2}$	P_{in} = –15 to +6 dBm	2.7	—	—	GHz
Lower limit operating frequency	$f_{in(L)}$	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 GHz	–12	–7	—	dBm

TYPICAL CHARACTERISTICS (unless otherwise specified T_A = +25°C)

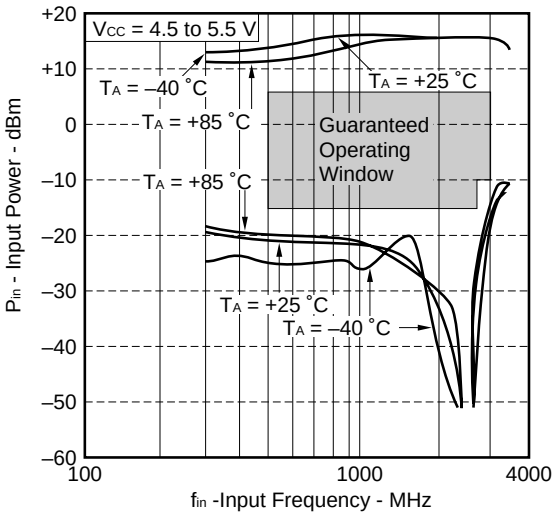
CIRCUIT CURRENT vs. SUPPLY VOLTAGE



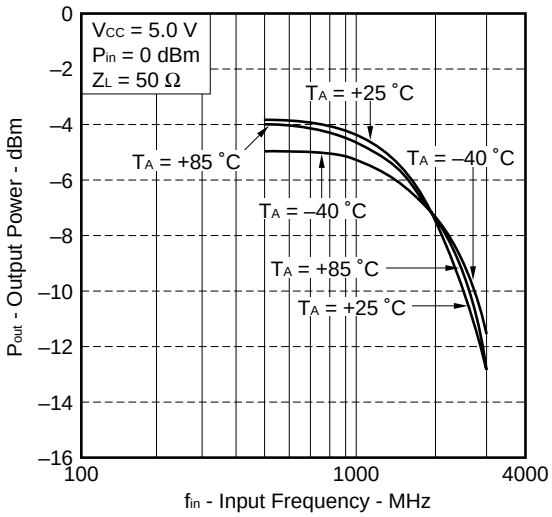
INPUT POWER vs. INPUT FREQUENCY



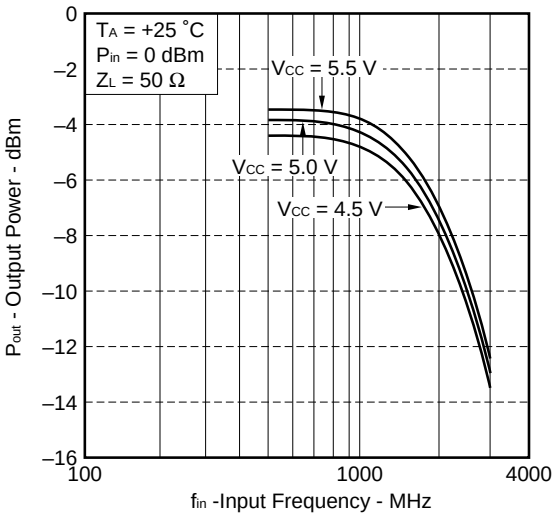
INPUT POWER vs. INPUT FREQUENCY



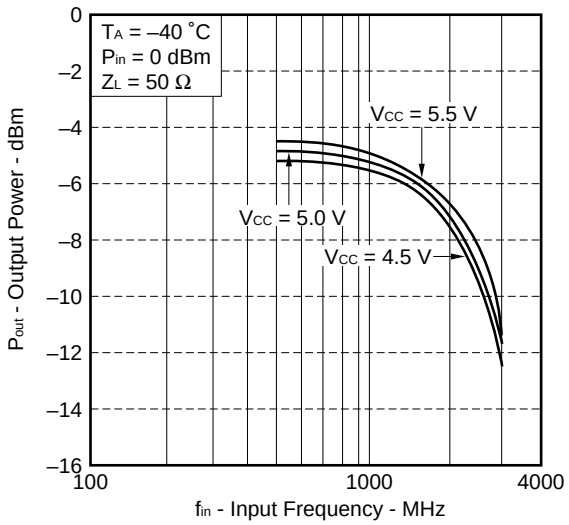
OUTPUT POWER vs. INPUT FREQUENCY



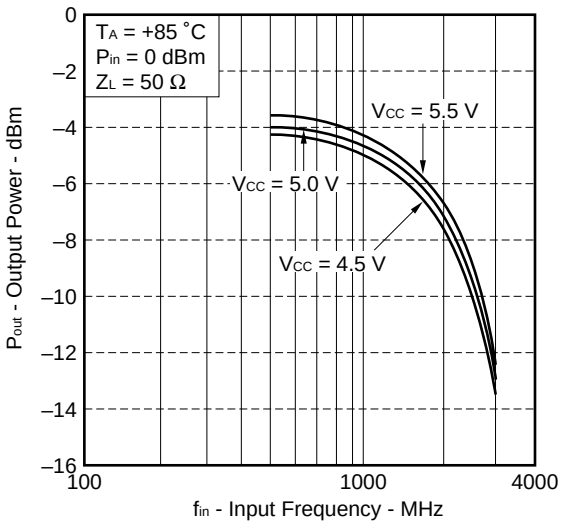
OUTPUT POWER vs. INPUT FREQUENCY



OUTPUT POWER vs. INPUT FREQUENCY

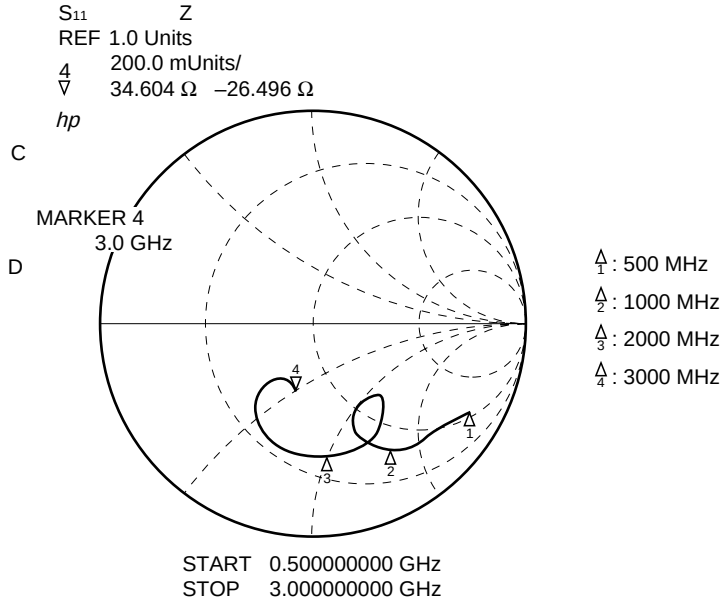


OUTPUT POWER vs. INPUT FREQUENCY



S11 vs. INPUT FREQUENCY

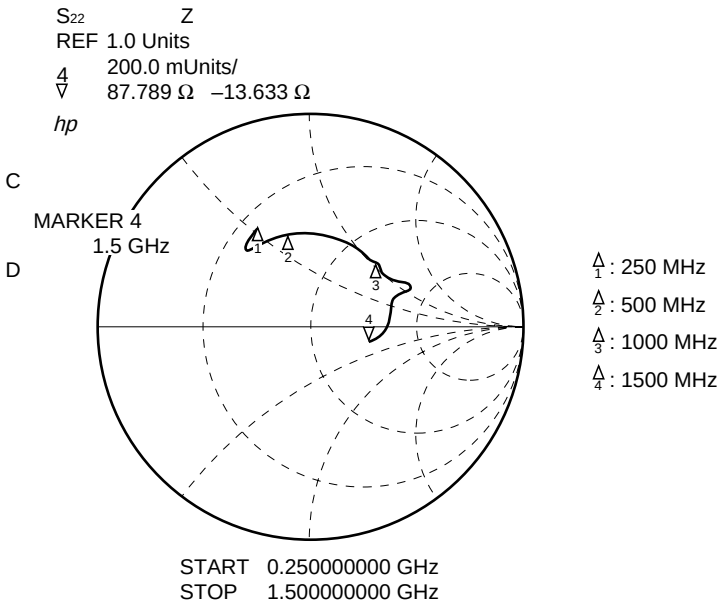
VCC = 5.0 V



FREQUENCY MHz	S11 MAG	S11 ANG
500.0000	.850	–30.2
600.0000	.796	–37.8
700.0000	.790	–39.2
800.0000	.754	–45.2
900.0000	.766	–53.7
1000.0000	.701	–57.6
1100.0000	.660	–62.3
1200.0000	.606	–67.2
1300.0000	.571	–70.3
1400.0000	.521	–70.6
1500.0000	.495	–68.3
1600.0000	.441	–60.6
1700.0000	.479	–45.1
1800.0000	.602	–62.3
1900.0000	.595	–74.2
2000.0000	.608	–82.9
2100.0000	.603	–89.8
2200.0000	.599	–97.3
2300.0000	.588	–107.7
2400.0000	.532	–122.0
2500.0000	.396	–132.0
2600.0000	.325	–127.1
2700.0000	.270	–123.6
2800.0000	.232	–122.7
2900.0000	.258	–105.8
3000.0000	.351	–103.7

S_{22} vs. OUTPUT FREQUENCY

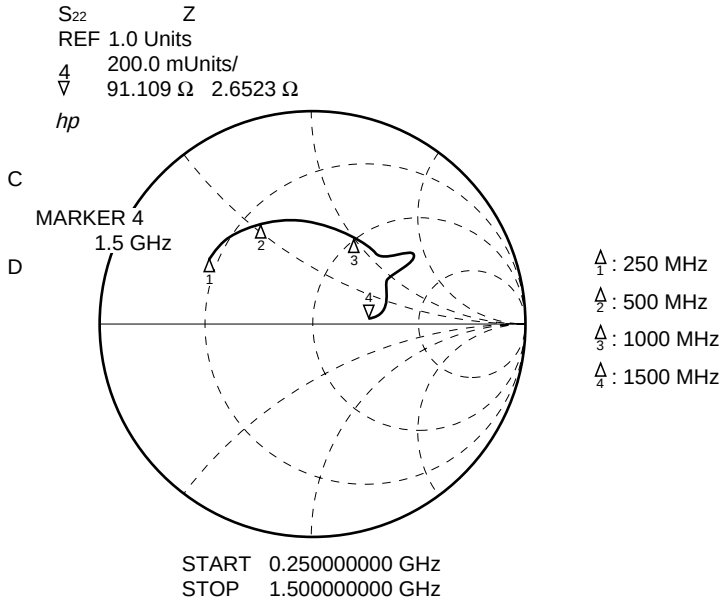
V_{CC} = 5.0 V, f_{in} = 498 MHz



FREQUENCY MHz	S_{22} MAG	S_{22} ANG
250.0000	.526	118.9
300.0000	.463	131.2
350.0000	.466	124.7
400.0000	.460	117.1
450.0000	.441	110.2
500.0000	.456	103.0
550.0000	.353	94.8
600.0000	.438	91.1
650.0000	.444	83.9
700.0000	.436	78.3
750.0000	.435	71.8
800.0000	.431	65.9
850.0000	.431	60.3
900.0000	.431	53.7
950.0000	.408	49.2
1000.0000	.445	44.9
1050.0000	.428	41.0
1100.0000	.429	33.7
1150.0000	.355	42.7
1200.0000	.418	20.0
1250.0000	.403	17.1
1300.0000	.392	9.6
1350.0000	.368	3.3
1400.0000	.343	–3.4
1450.0000	.319	–9.2
1500.0000	.289	–14.1

S_{22} vs. OUTPUT FREQUENCY

V_{CC} = 5.0 V, f_{in} = 3002 MHz



FREQUENCY MHz	S_{22} MAG	S_{22} ANG
250.0000	.555	146.6
300.0000	.545	139.9
350.0000	.571	136.1
400.0000	.529	127.9
450.0000	.521	122.4
500.0000	.515	116.9
550.0000	.510	104.5
600.0000	.492	106.6
650.0000	.487	100.9
700.0000	.482	95.3
750.0000	.473	89.9
800.0000	.461	83.8
850.0000	.454	78.4
900.0000	.449	72.3
950.0000	.430	69.6
1000.0000	.443	64.3
1050.0000	.444	58.8
1100.0000	.440	52.3
1150.0000	.438	46.0
1200.0000	.501	37.5
1250.0000	.408	32.9
1300.0000	.388	25.1
1350.0000	.359	16.3
1400.0000	.335	9.7
1450.0000	.304	3.1
1500.0000	.285	4.6

TEST CIRCUIT

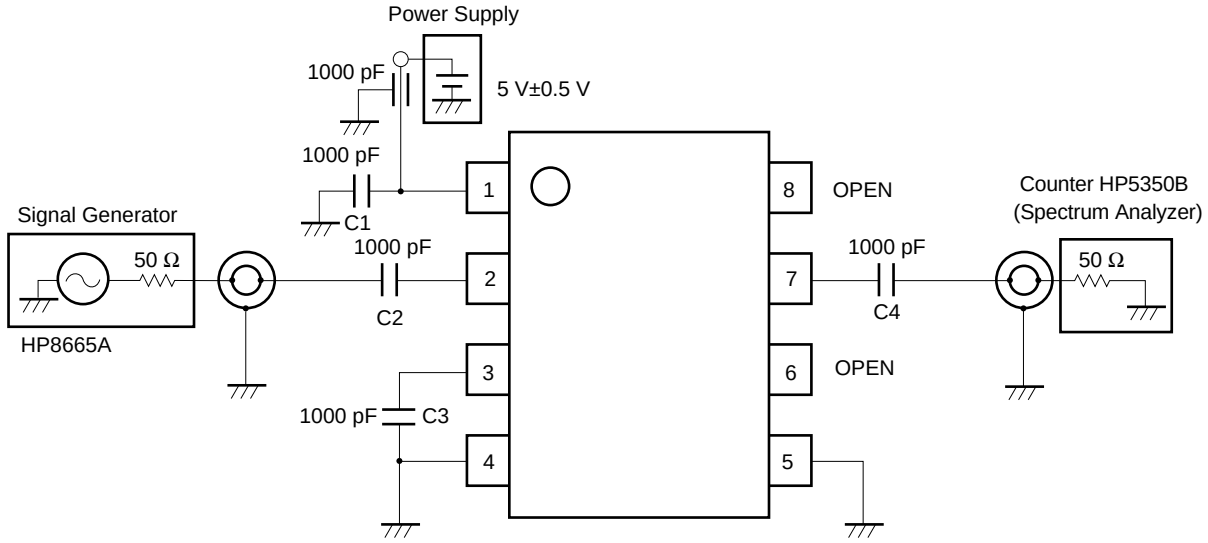
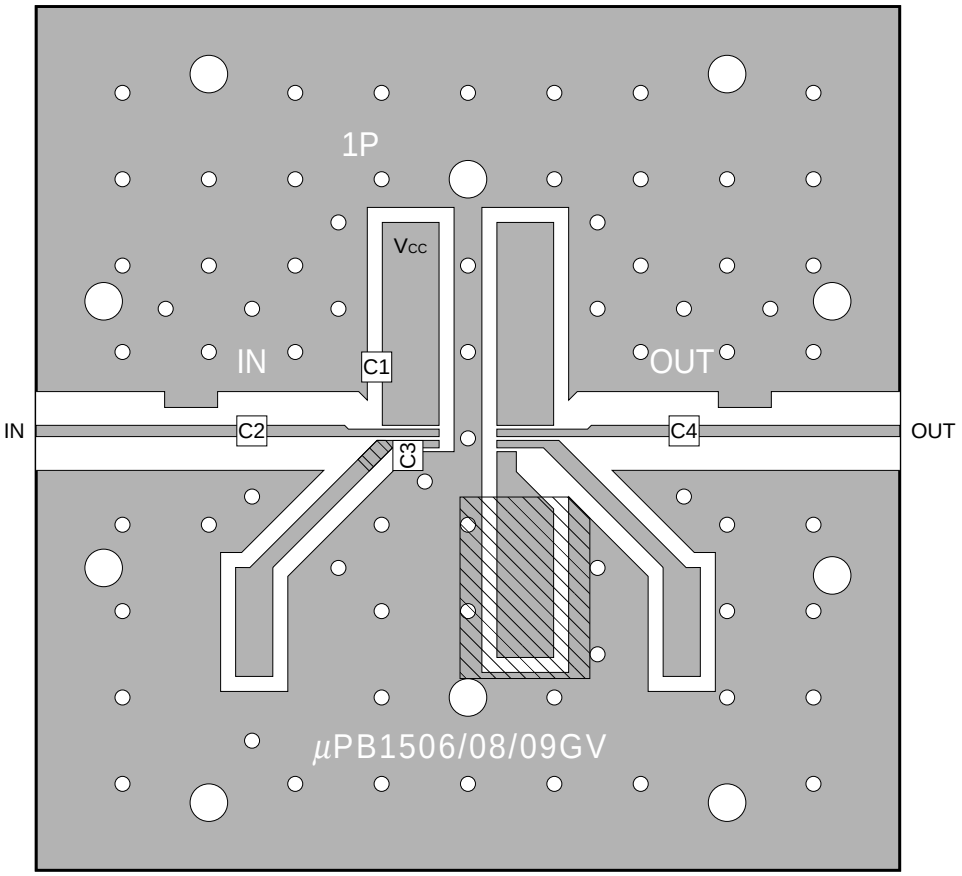


ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD



COMPONENT LIST

SYMBOL	VALUE
C1 to C4	1000 pF

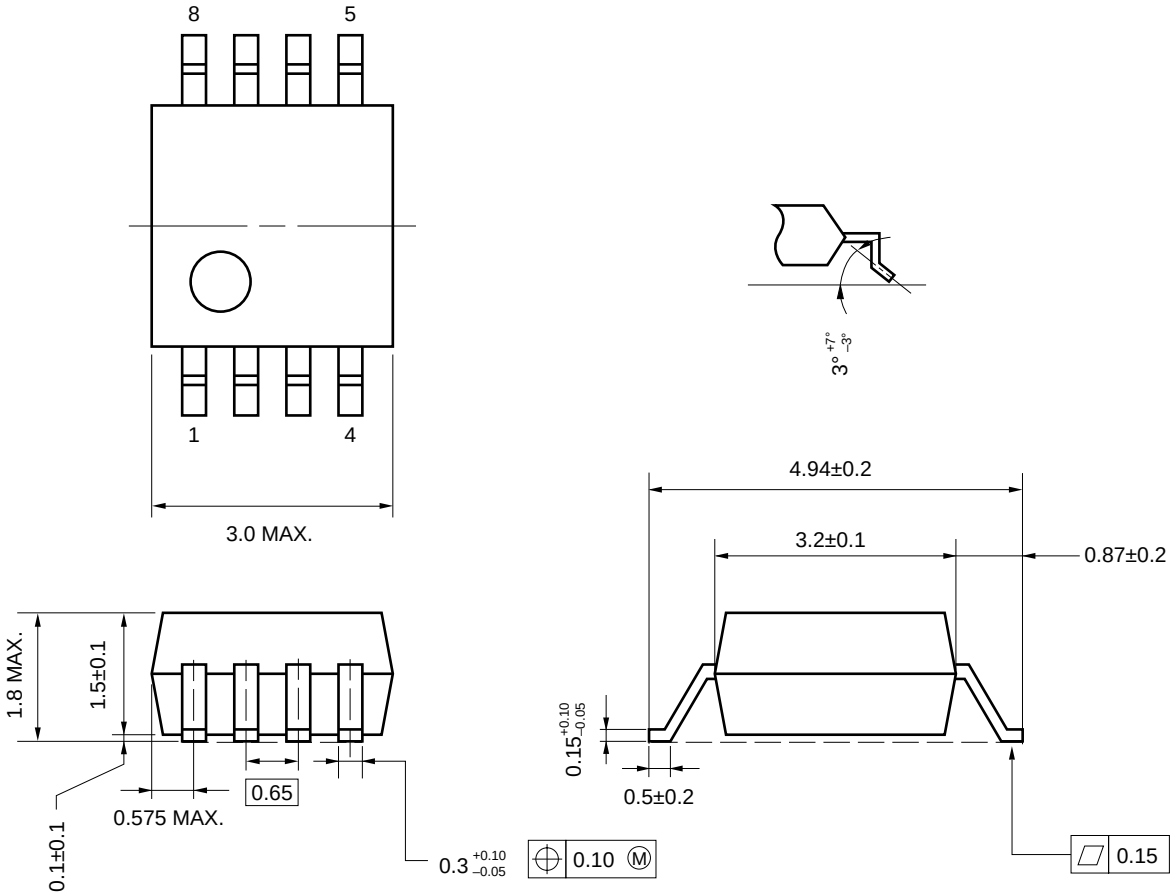
EVALUATION BOARD CHARACTERS

(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 in the following recommended conditions. Other soldering methods and conditions than the recommended conditions are to be consulted with our sales representatives.

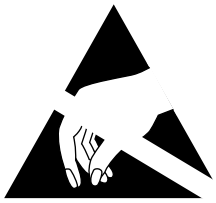
μPB1508GV

Soldering method	Soldering conditions	Recommended condition symbol
Infrared ray reflow	Package peak temperature: 235 °C, Hour: within 30 s. (more than 210 °C), Time: 3 times, Limited days: no.*	IR35-00-3
VPS	Package peak temperature: 215 °C, Hour: within 40 s. (more than 200 °C), Time: 3 times, Limited days: no.*	VP15-00-3
Wave soldering	Soldering tub temperature: less than 260 °C, Hour: within 10 s., Time: 1 time, Limited days: no.	WS60-00-1
Pin part heating	Pin area temperature: less than 300 °C, Hour: within 3 s./pin, Limited days: no.*	

***** It is the storage days after opening a dry pack, the storage conditions are 25 °C, less than 65 % RH.

Caution The combined use of soldering method is to be avoided (However, except the pin area heating method).

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

M4 96.5