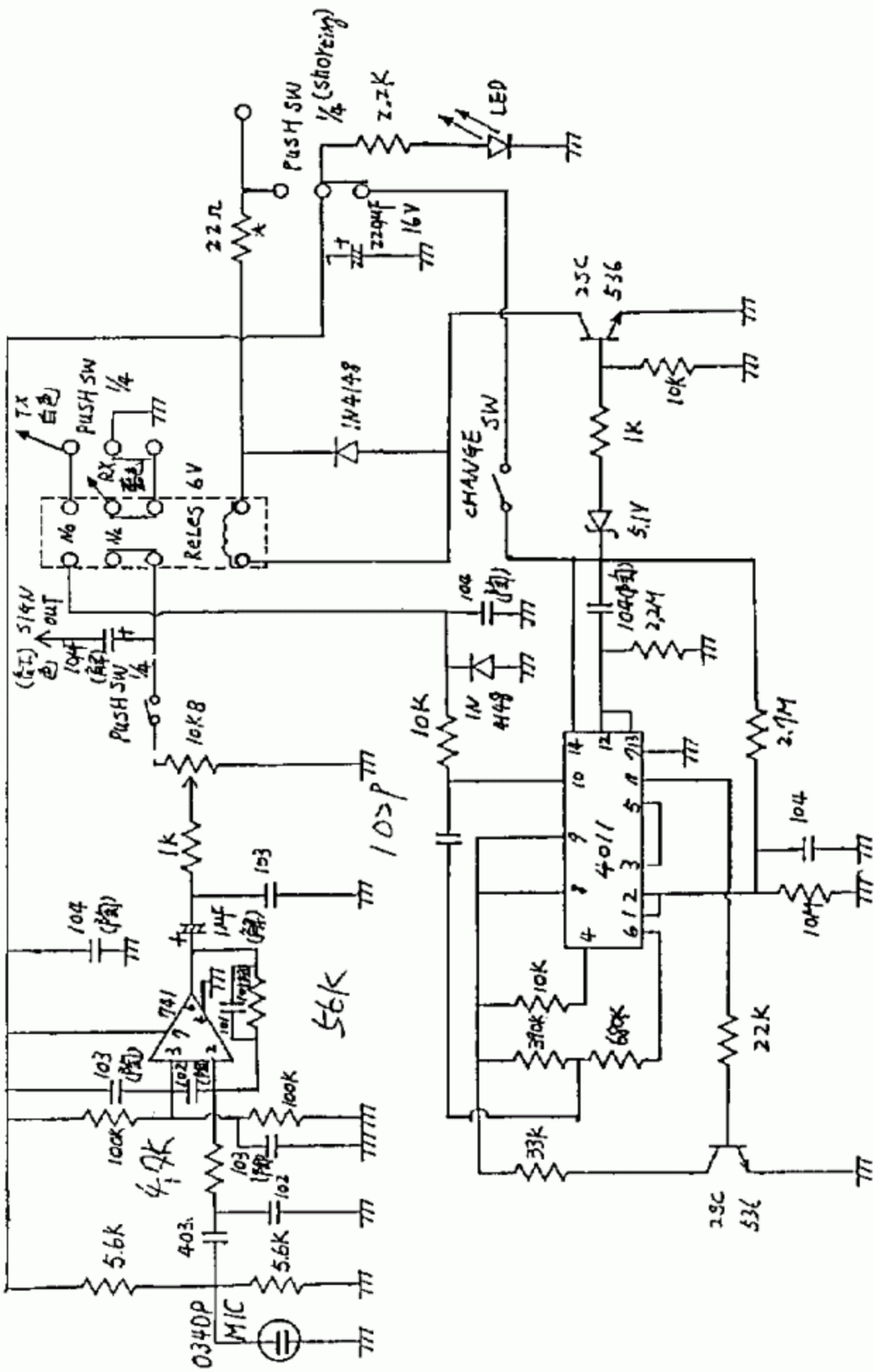


# DM 200 RBP - MICRO MOBILE

**CARACTERISTIQUES :**

Micro préampli + roger beep  
 Type : Electret  
 Impédance : 1 K  $\Omega$ , (Vol. Max) (0dB : 1 V/ $\mu$  Bar)  
 Sensibilité : - 40 dB  
 Réponse de fréquence : 300 Hz - 3 KHz  
 Alimentation : Pile 9 V (type 6 F 22)







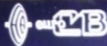
  
**POWER MIKE &  
ROGER BEEP**  
DM-200RBP



MIN

CONTROL

MAX



**POWER MIKE &  
ROGER BEEP**  
DM-200RBP/P4



HA17741  
3M2

TMSIA 9351W  
IC4011BP

KAMISAWA  
R1W-K  
JAPAN 100µF

MIC

D

C

B

A

⏏



off -> on  
roger beep

V.C. DM431A  
01D

# HA17741/PS

General-Purpose Operational Amplifier  
(Frequency Compensated)

# HITACHI

## Description

The HA17741/PS is an internal phase compensation high-performance operational amplifier, that is appropriate for use in a wide range of applications in the test and control fields.

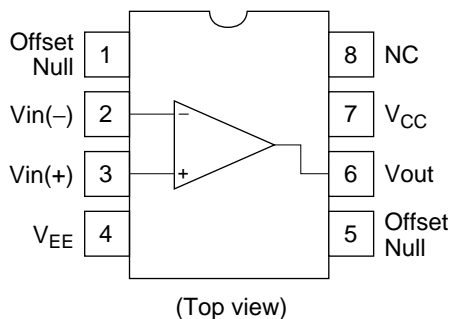
## Features

- High voltage gain : 106 dB (Typ)
- Wide output amplitude :  $\pm 13$  V (Typ) (at  $R_L \geq 2$  k $\Omega$ )
- Shorted output protection
- Adjustable offset voltage
- Internal phase compensation

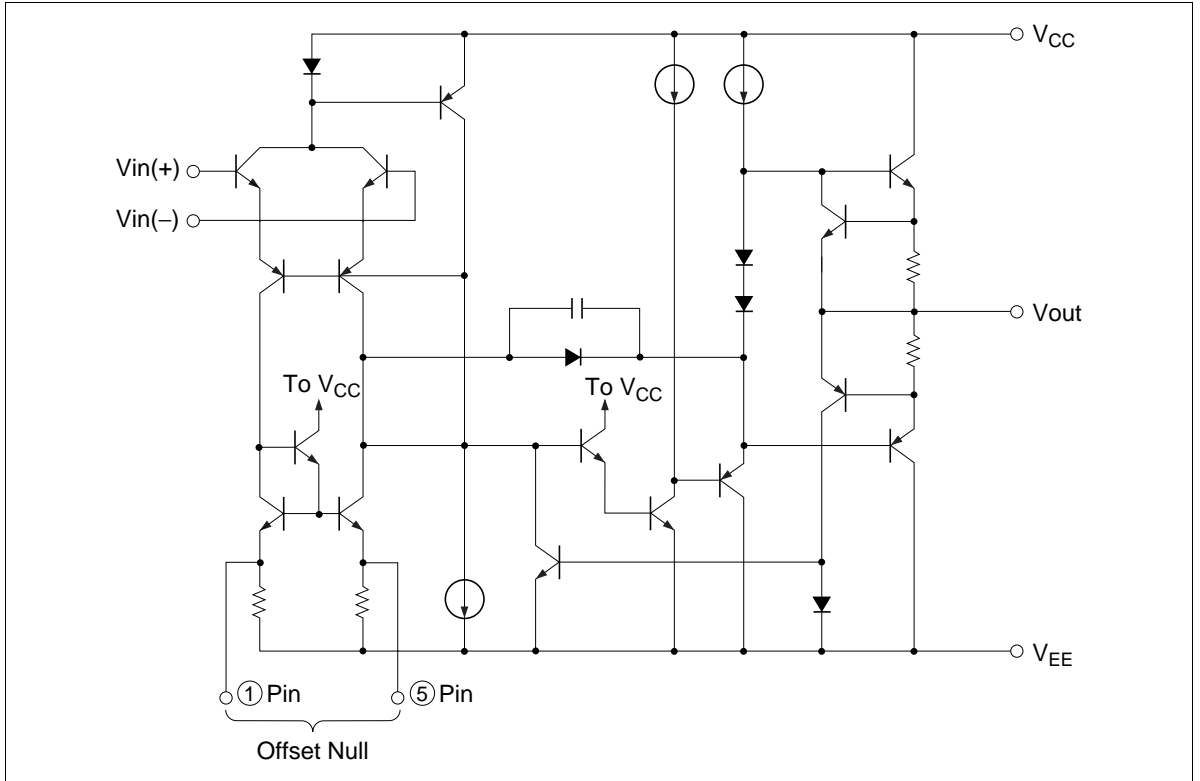
## Ordering Information

Application	Type No.	Package
Industrial use	HA17741PS	DP-8
Commercial use	HA17741	

## Pin Arrangement



## Circuit Structure



## Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings		Unit
		HA17741PS	HA17741	
Power-supply voltage	V <sub>CC</sub>	+18	+18	V
	V <sub>EE</sub>	-18	-18	V
Input voltage	V <sub>in</sub>	±15	±15	V
Differential input voltage	V <sub>in(diff)</sub>	±30	±30	V
Allowable power dissipation	P <sub>T</sub>	670 *	670 *	mW
Operating temperature	T <sub>opr</sub>	-20 to +75	-20 to +75	°C
Storage temperature	T <sub>stg</sub>	-55 to +125	-55 to +125	°C

Note: These are the allowable values up to Ta = 45°C. Derate by 8.3 mW/°C above that temperature.

## Electrical Characteristics

### Electrical Characteristics-1 ( $V_{CC} = -V_{EE} = 15\text{ V}$ , $T_a = 25^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Input offset voltage	$V_{IO}$	—	1.0	6.0	mV	$R_S \leq 10\text{ k}\Omega$
Input offset current	$I_{IO}$	—	18	200	nA	
Input bias current	$I_{IB}$	—	75	500	nA	
Power-supply rejection ratio	$\Delta V_{IO}/\Delta V_{CC}$	—	30	150	$\mu\text{V}/\text{V}$	$R_S \leq 10\text{ k}\Omega$
	$\Delta V_{IO}/\Delta V_{EE}$	—	30	150	$\mu\text{V}/\text{V}$	$R_S \leq 10\text{ k}\Omega$
Voltage gain	$A_{VD}$	86	106	—	dB	$R_L \geq 2\text{ k}\Omega$ , $V_{out} = \pm 10\text{ V}$
Common-mode rejection ratio	CMR	70	90	—	dB	$R_S \leq 10\text{ k}\Omega$
Common-mode input voltage range	$V_{CM}$	$\pm 12$	$\pm 13$	—	V	$R_S \leq 10\text{ k}\Omega$
Maximum output voltage amplitude	$V_{OP-P}$	$\pm 12$	$\pm 14$	—	V	$R_L \geq 10\text{ k}\Omega$
		$\pm 10$	$\pm 13$	—	V	$R_L \geq 2\text{ k}\Omega$
Power dissipation	$P_d$	—	65	100	mW	No load
Slew rate	SR	—	1.0	—	$\text{V}/\mu\text{s}$	$R_L \geq 2\text{ k}\Omega$
Rise time	$t_r$	—	0.3	—	$\mu\text{s}$	$V_{in} = 20\text{ mV}$ , $R_L = 2\text{ k}\Omega$ ,
Overshoot	$V_{over}$	—	5.0	—	%	$C_L = 100\text{ pF}$
Input resistance	$R_{in}$	0.3	1.0	—	M $\Omega$	

### Electrical Characteristics-2 ( $V_{CC} = -V_{EE} = 15\text{ V}$ , $T_a = -20\text{ to }+75^\circ\text{C}$ )

Item	Symbol	Min	Typ	Max	Unit	Test Condition
Input offset voltage	$V_{IO}$	—	—	9.0	mV	$R_S \leq 10\text{ k}\Omega$
Input offset current	$I_{IO}$	—	—	400	nA	
Input bias current	$I_{IB}$	—	—	1,100	nA	
Voltage gain	$A_{VD}$	80	—	—	dB	$R_L \geq 2\text{ k}\Omega$ , $V_{out} = \pm 10\text{ V}$
Maximum output voltage amplitude	$V_{OP-P}$	$\pm 10$	—	—	V	$R_L \geq 2\text{ k}\Omega$



IC Operational Amplifier Application Examples

Multivibrator

A multivibrator is a square wave generator that uses an RC circuit charge/discharge operation to generate the waveform. Multivibrators are widely used as the square wave source in such applications as power supplies and electronic switches.

Multivibrators are classified into three types, astable multivibrators, which have no stable states, monostable multivibrators, which have one stable state, and bistable multivibrators, which have two stable states.

1. Astable Multivibrator

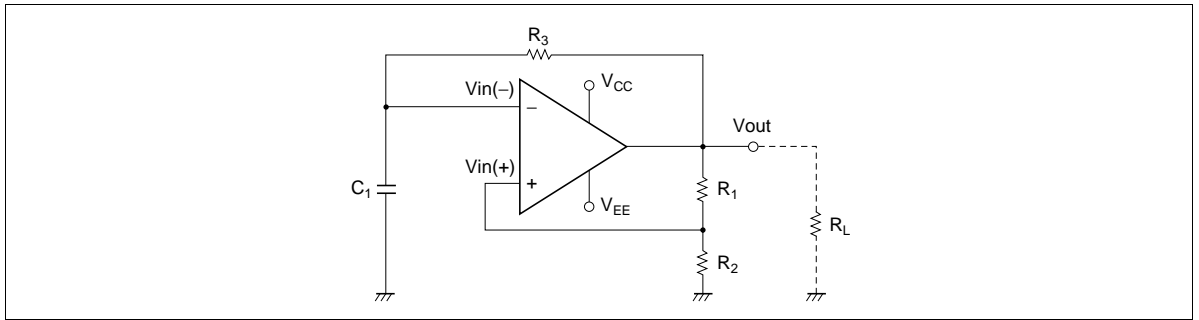


Figure 1 Astable Multivibrator Operating Circuit

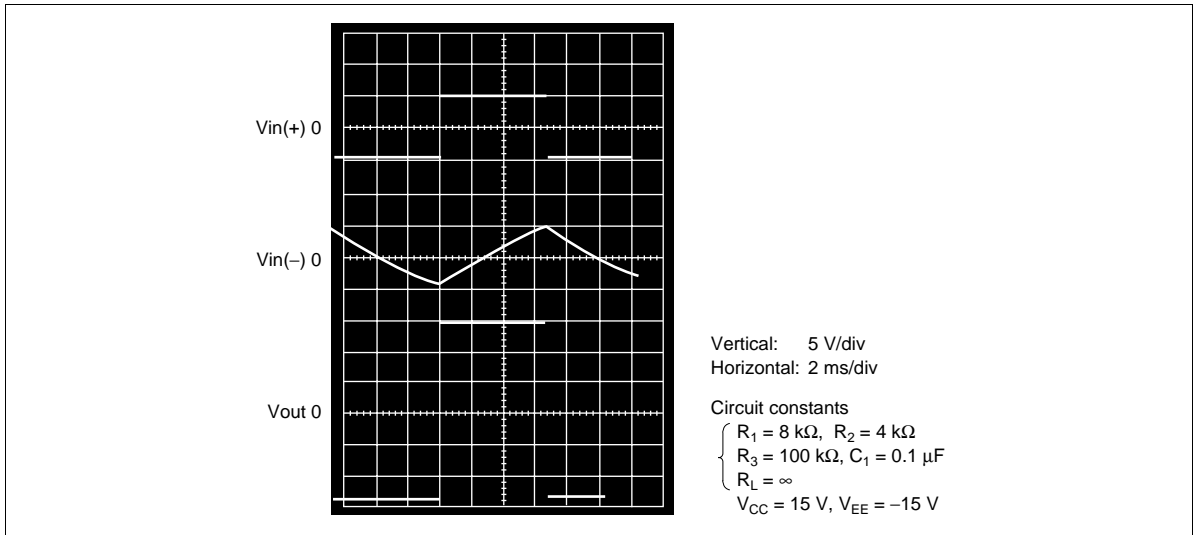


Figure 2 HA17741 Astable Multivibrator Operating Waveform

2. Monostable Multivibrator

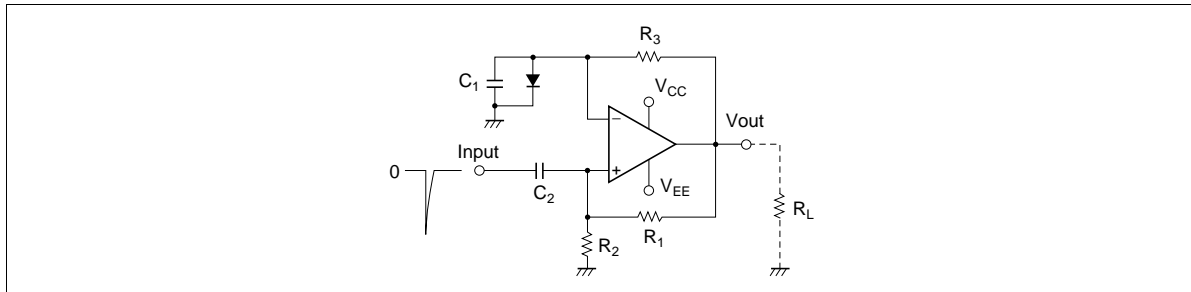


Figure 3 Monostable Multivibrator Operating Circuit

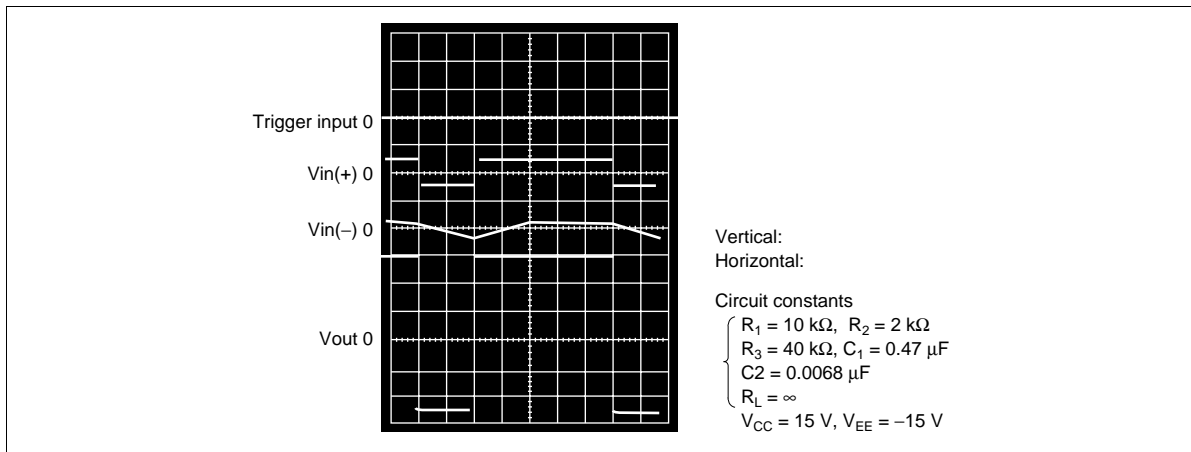


Figure 4 HA17741 Monostable Multivibrator Operating Waveform

3. Bistable Multivibrator

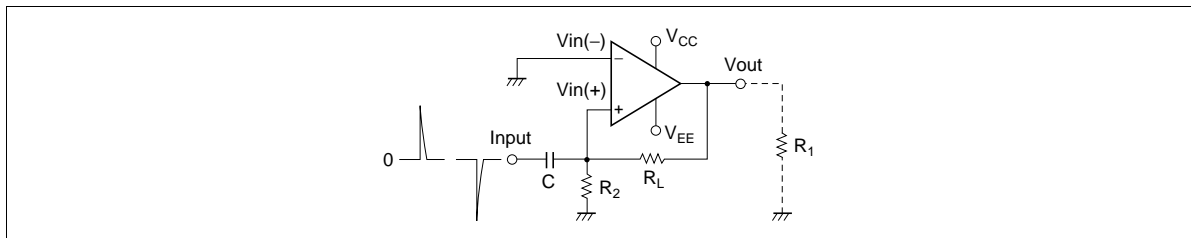


Figure 5 Bistable Multivibrator Operating Circuit



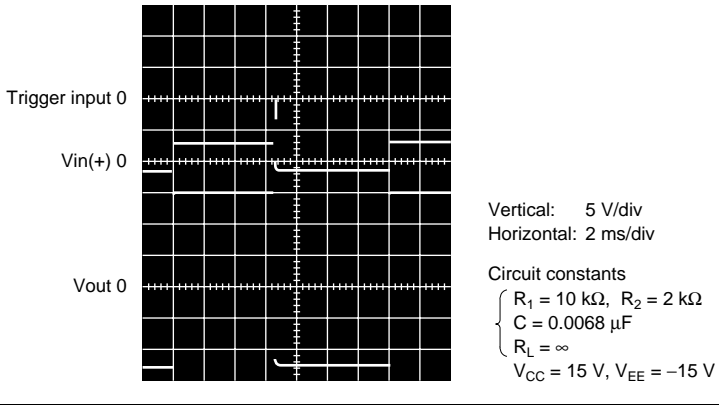


Figure 6 HA17741 Bistable Multivibrator Operating Waveform

Wien Bridge Sine Wave Oscillator

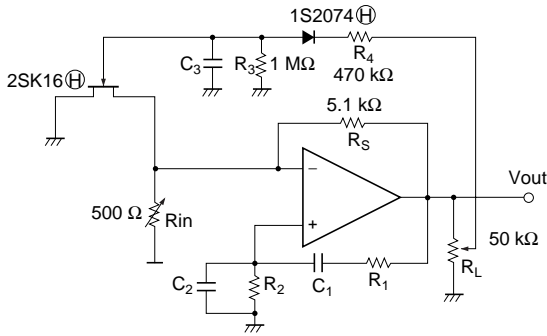


Figure 7 Wien Bridge Sine Wave Oscillator

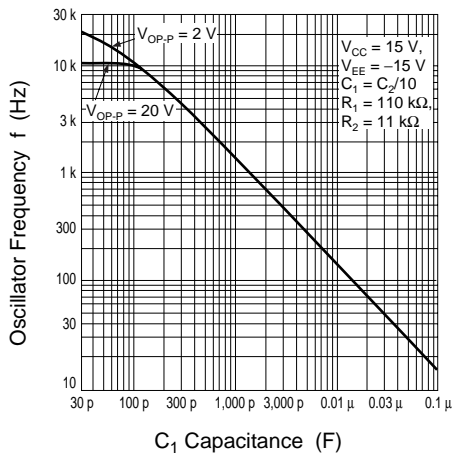


Figure 8 HA17741 Wien Bridge Sine Wave Oscillator  $f$ - $C$  Characteristics

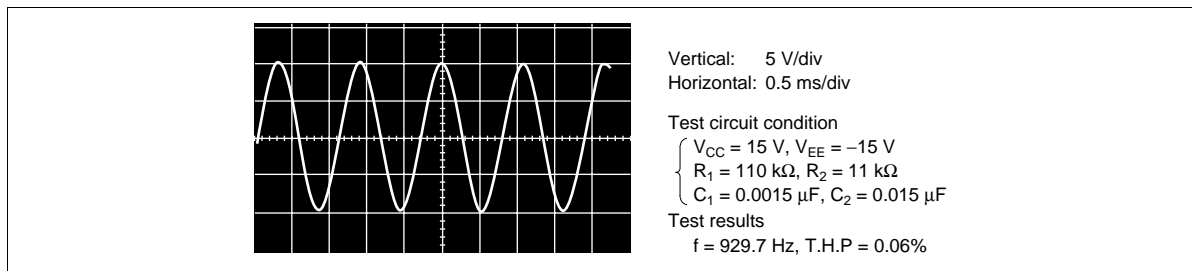


Figure 9 HA17741 Wien Bridge Sine Wave Oscillator Operating Waveform

Quadrature Oscillator

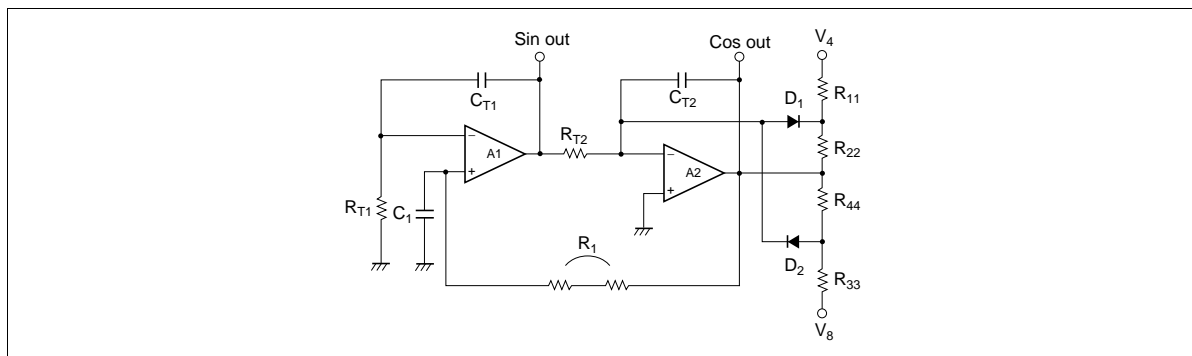


Figure 10 Quadrature Sine Wave Oscillator

Figure 10 shows the circuit diagram for a quadrature sine wave oscillator. This circuit consists of two integrators and a limiter circuit, and provides not only a sine wave output, but also a cosine output, that is, it also supplies the waveform delayed by 90°. The output amplitude is essentially determined by the limiter circuit.



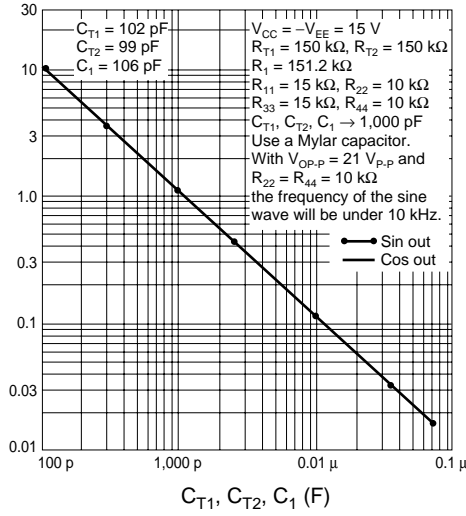
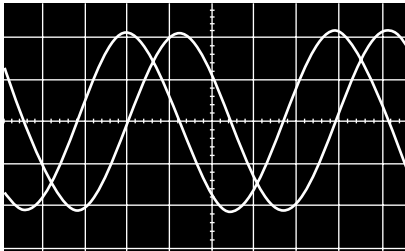


Figure 11 HA17741 Quadrature Sine Wave Oscillator

f- $C_{T1}, C_{T2}, C_1$  Characteristics



Vertical: 5 V/div  
 Horizontal: 0.2 ms/div  
 Circuit constants

$C_{T1} = 1000 \text{ pF (990)}, C_{T2} = 1000 \text{ pF (990)}$   
 $R_{T1} = 150 \text{ k}\Omega, R_{T2} = 150 \text{ k}\Omega$   
 $C_1 = 1000 \text{ pF (990)}, R_1 = 160 \text{ k}\Omega$   
 $R_{11} = 15 \text{ k}\Omega, R_{22} = 10 \text{ k}\Omega$   
 $R_{33} = 16 \text{ V}, R_{44} = 10 \text{ k}\Omega$   
 $V_{CC} = 15 \text{ V}, V_{EE} = -15 \text{ V}$

Figure 12 Sine and Cosine Output Waveforms

Triangular Wave Generator

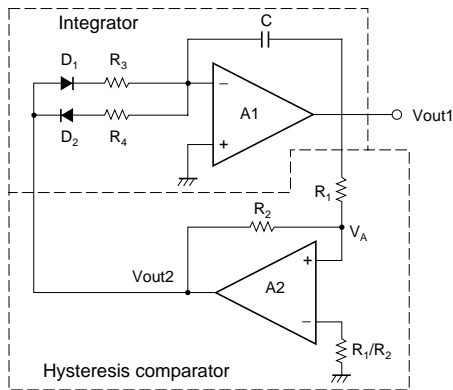


Figure 13 Triangular Wave Generator Operating Circuit

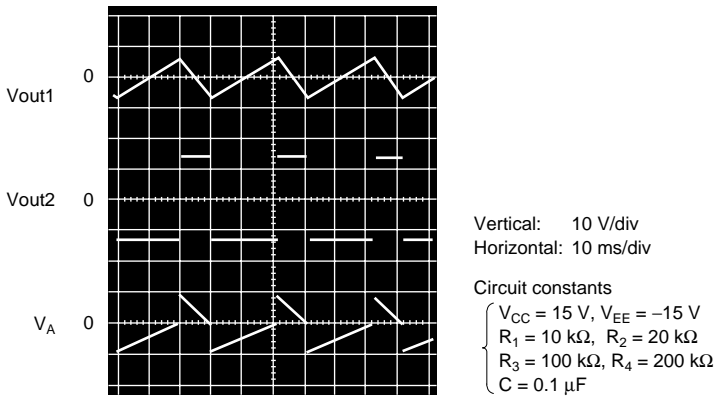


Figure 14 HA17741 Triangular Wave Generator Operating Waveform

Sawtooth Waveform Generator

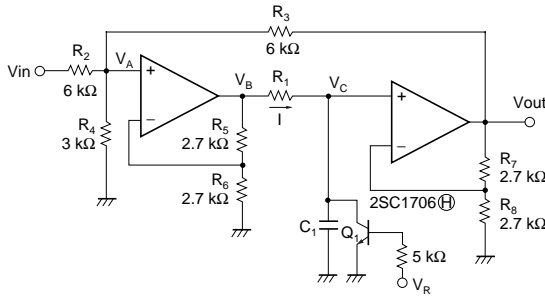


Figure 15 Sawtooth Waveform Generator

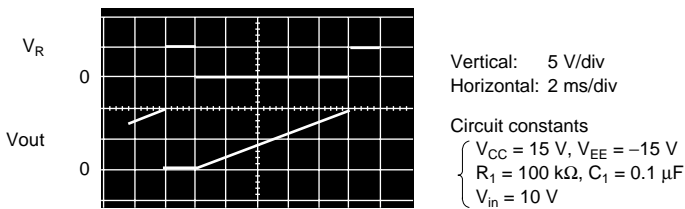
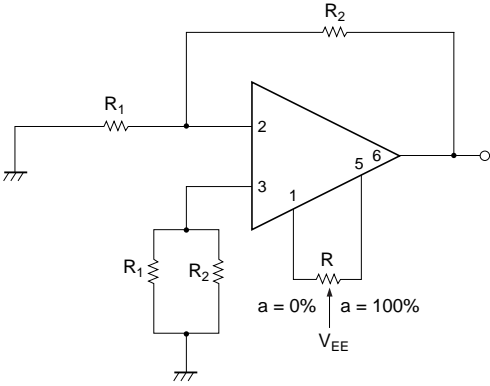


Figure 16 HA17741 Sawtooth Waveform Generator Operating Waveform

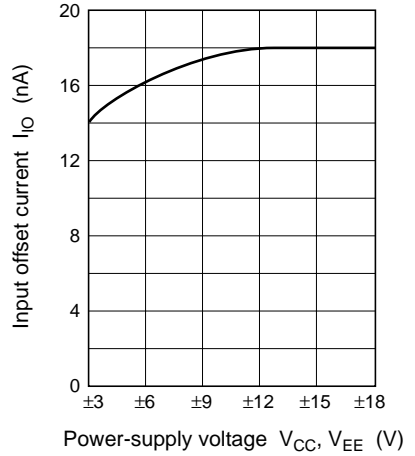


Characteristic Curves

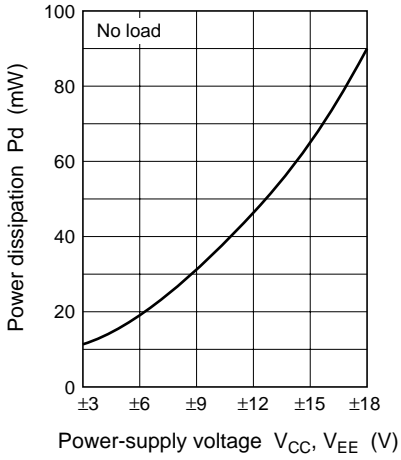
Voltage Offset Adjustment Circuit



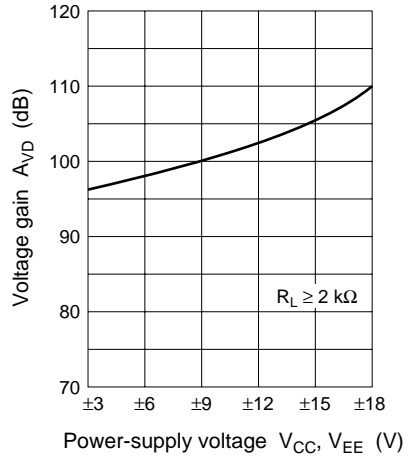
Input Offset Current vs. Power-Supply Voltage Characteristics



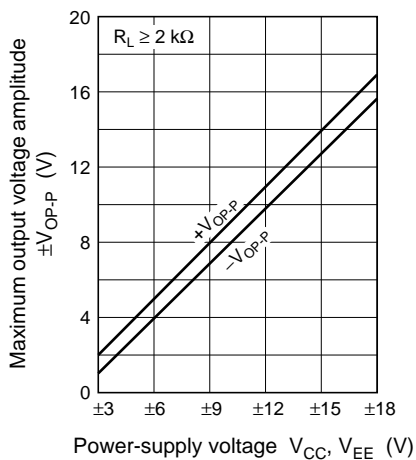
Power Dissipation vs. Power-Supply Voltage Characteristics



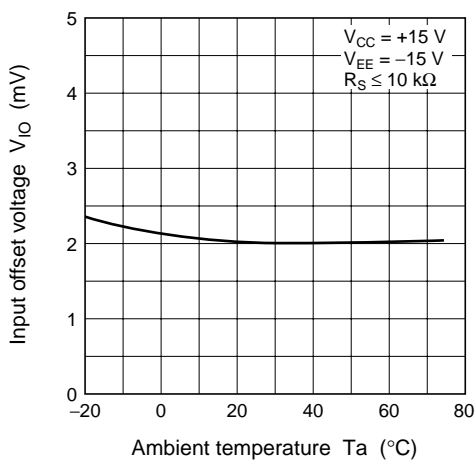
Voltage Gain vs. Power-Supply Voltage Characteristics



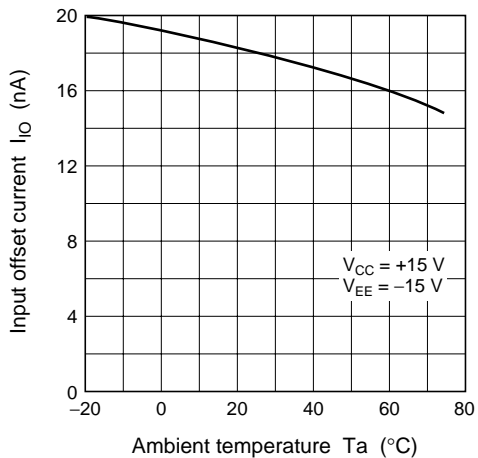
**Maximum Output Voltage Amplitude vs. Power-Supply Voltage Characteristics**



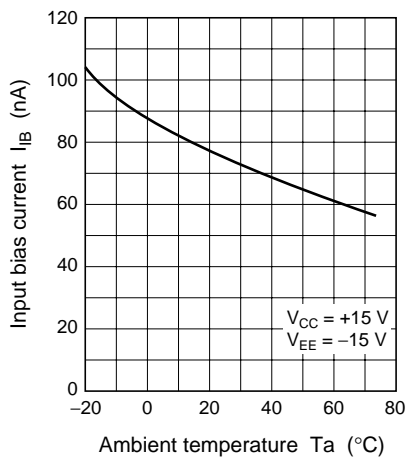
**Input Offset Voltage vs. Ambient Temperature Characteristics**



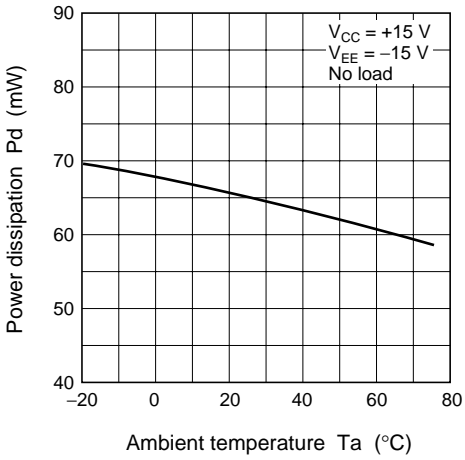
**Input Offset Current vs. Ambient Temperature Characteristics**



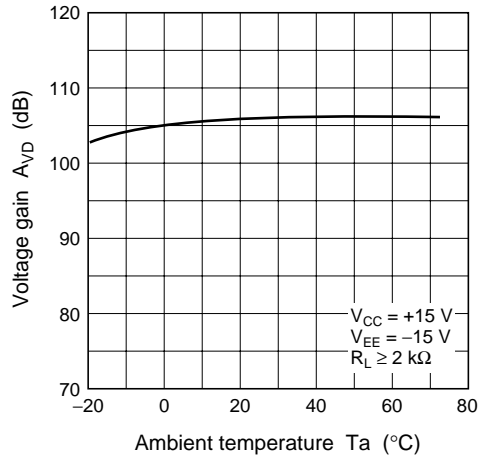
**Input Bias Current vs. Ambient Temperature Characteristics**



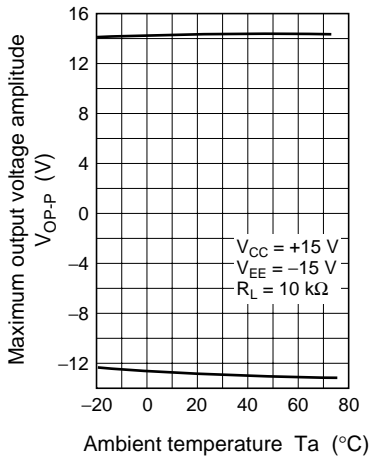
**Power Dissipation vs. Ambient Temperature Characteristics**



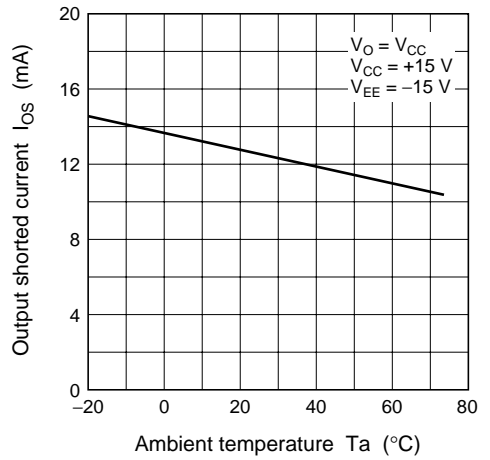
**Voltage Gain vs. Ambient Temperature Characteristics**



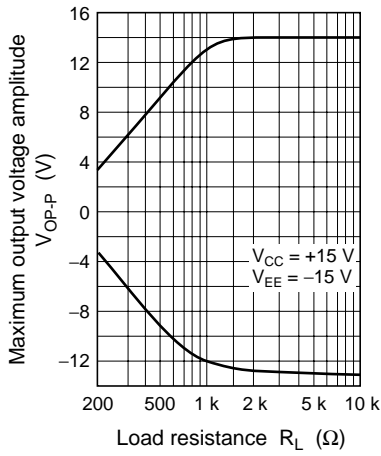
**Maximum Output Voltage Amplitude vs. Ambient Temperature Characteristics**



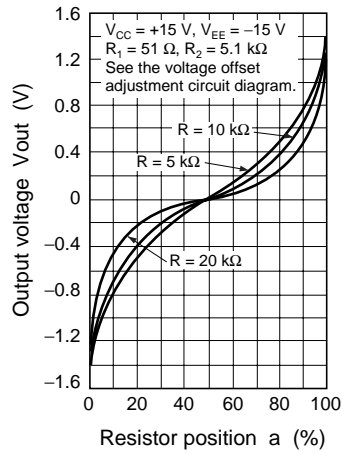
**Output Shorted Current vs. Ambient Temperature Characteristics**



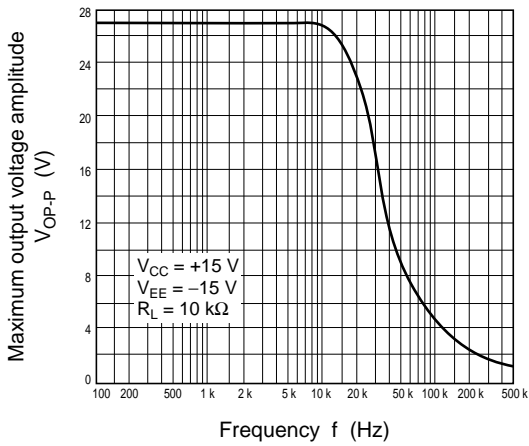
**Maximum Output Voltage Amplitude vs. Load Resistance Characteristics**



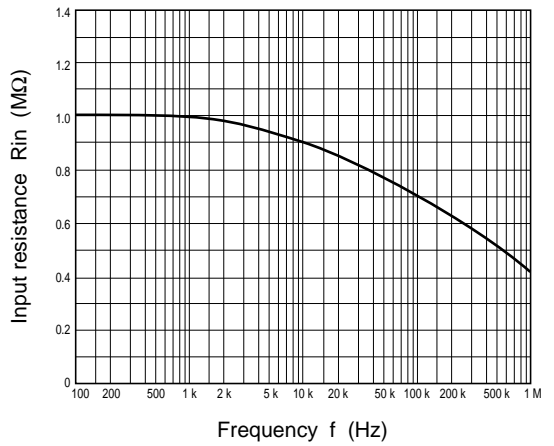
**Offset Adjustment Characteristics**



**Maximum Output Voltage Amplitude vs. Frequency Characteristics**

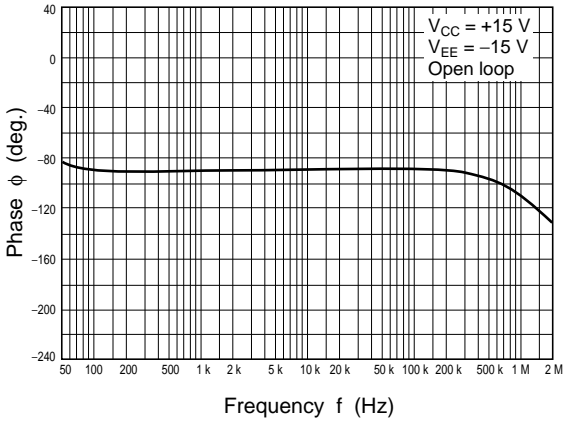


**Input Resistance vs. Frequency Characteristics**

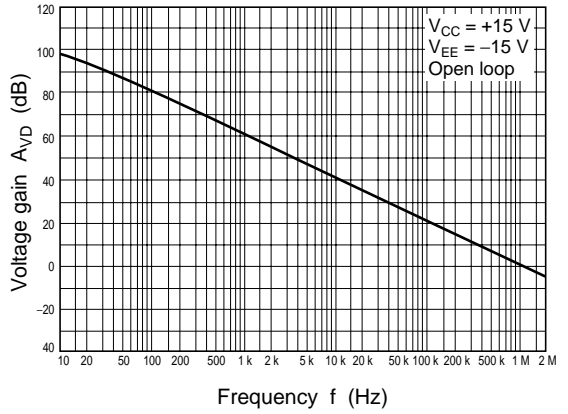




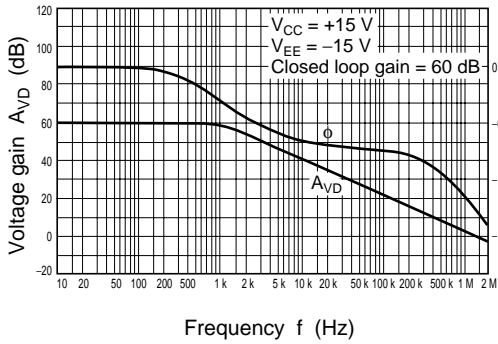
Phase vs. Frequency Characteristics



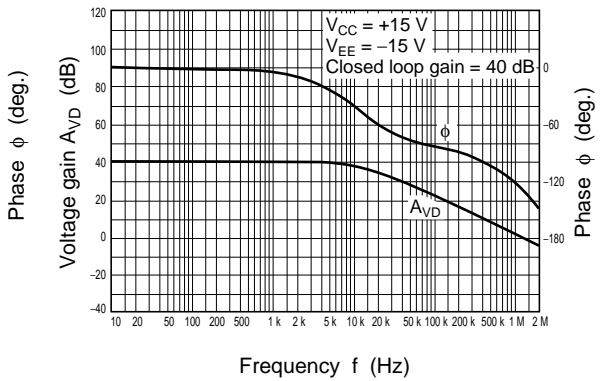
Voltage Gain vs Frequency Characteristics



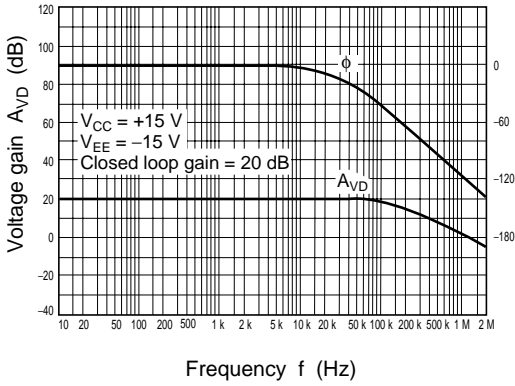
Voltage Gain and Phase vs. Frequency Characteristics (1)



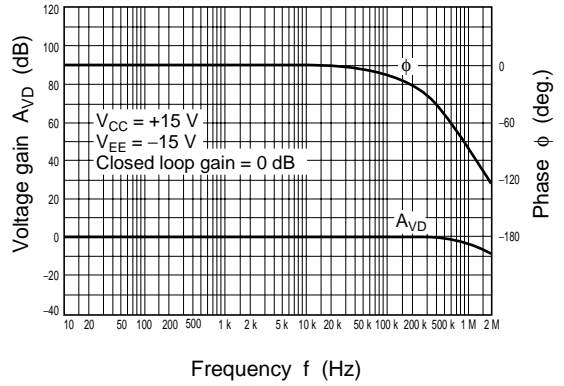
Voltage Gain and Phase vs. Frequency Characteristics (2)



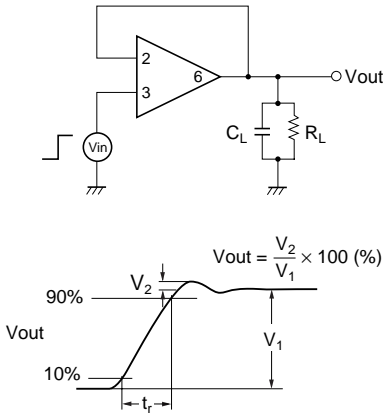
Voltage Gain and Phase vs. Frequency Characteristics (3)



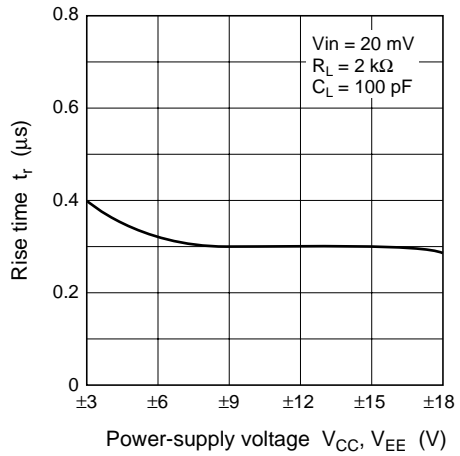
Voltage Gain and Phase vs. Frequency Characteristics (4)



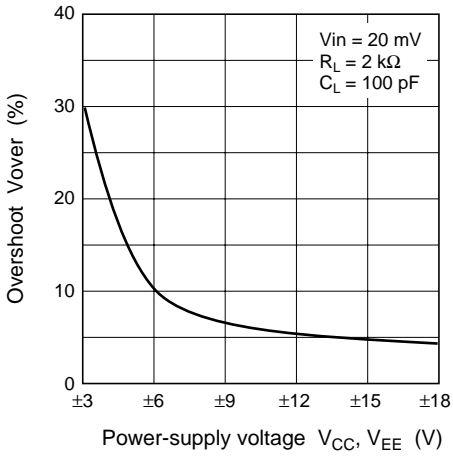
Impulse Response Characteristics Test Circuit



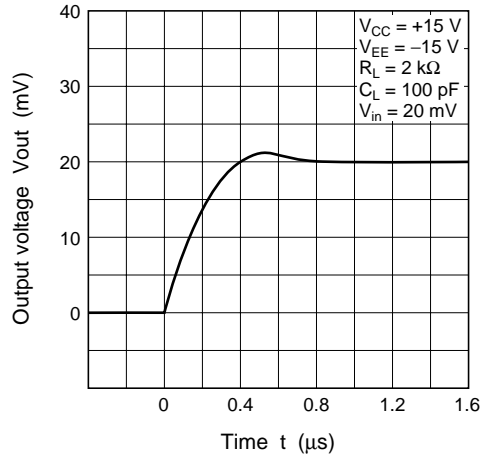
Rise time vs. Power-Supply Voltage Characteristics



**Overshoot vs.  
Power-Supply Voltage Characteristics**

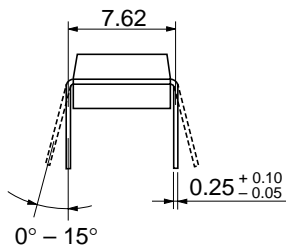
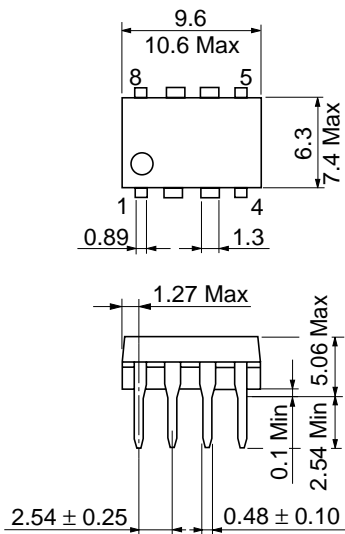


**Impulse Response  
Characteristics**



Package Dimensions

Unit: mm



Hitachi Code	DP-8
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.54 g



**Cautions**

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

# HITACHI

**Hitachi, Ltd.**

Semiconductor &amp; Integrated Circuits.

Nippon Bldg., 2-6-2, Ohite-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      NorthAmerica      : <http://semiconductor.hitachi.com/>  
 Europe                    : <http://www.hitachi-eu.com/hel/ecg>  
 Asia (Singapore)        : <http://www.has.hitachi.com.sg/grp3/sicd/index.htm>  
 Asia (Taiwan)            : [http://www.hitachi.com.tw/E/Product/SICD\\_Frame.htm](http://www.hitachi.com.tw/E/Product/SICD_Frame.htm)  
 Asia (HongKong)        : <http://www.hitachi.com.hk/eng/bo/grp3/index.htm>  
 Japan                      : <http://www.hitachi.co.jp/Sicd/indx.htm>

**For further information write to:**

Hitachi Semiconductor  
 (America) Inc.  
 179 East Tasman Drive,  
 San Jose, CA 95134  
 Tel: <1> (408) 433-1990  
 Fax: <1> (408) 433-0223

Hitachi Europe GmbH  
 Electronic components Group  
 Dornacher Straße 3  
 D-85622 Feldkirchen, Munich  
 Germany  
 Tel: <49> (89) 9 9180-0  
 Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
 Electronic Components Group.  
 Whitebrook Park  
 Lower Cookham Road  
 Maidenhead  
 Berkshire SL6 8YA, United Kingdom  
 Tel: <44> (1628) 585000  
 Fax: <44> (1628) 778322

Hitachi Asia Pte. Ltd.  
 16 Collyer Quay #20-00  
 Hitachi Tower  
 Singapore 049318  
 Tel: 535-2100  
 Fax: 535-1533

Hitachi Asia Ltd.  
 Taipei Branch Office  
 3F, Hung Kuo Building, No.167,  
 Tun-Hwa North Road, Taipei (105)  
 Tel: <886> (2) 2718-3666  
 Fax: <886> (2) 2718-8180

Hitachi Asia (Hong Kong) Ltd.  
 Group III (Electronic Components)  
 7/F., North Tower, World Finance Centre,  
 Harbour City, Canton Road, Tsim Sha Tsui,  
 Kowloon, Hong Kong  
 Tel: <852> (2) 735 9218  
 Fax: <852> (2) 730 0281  
 Telex: 40815 HITEC HX

Copyright ' Hitachi, Ltd., 1998. All rights reserved. Printed in Japan.

**HITACHI**

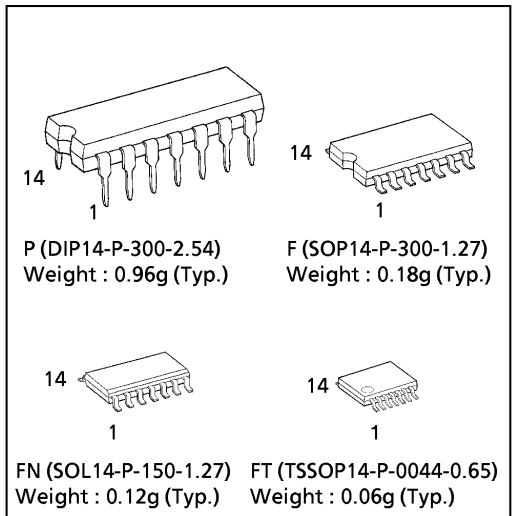
**TC4011BP, TC4011BF, TC4011BFN, TC4011BFT**

**TC4011B QUAD 2 INPUT NAND GATE**

The TC4011B is 2-input positive logic NAND gate respectively.

Since all the outputs of these gates are provided with the inverters as buffers, the input/output characteristics have been improved and the variation of propagation delay time due to the increase in load capacity is kept down to the minimum.

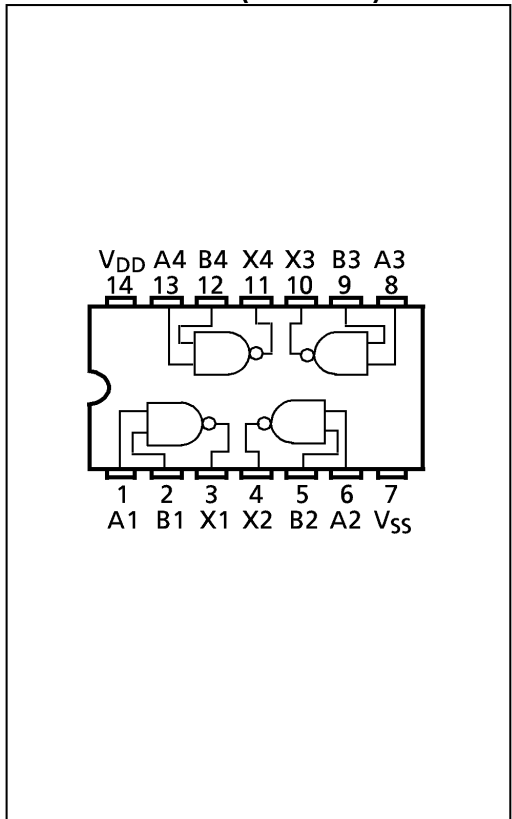
(Note) The JEDEC SOP (FN) is not available in Japan.



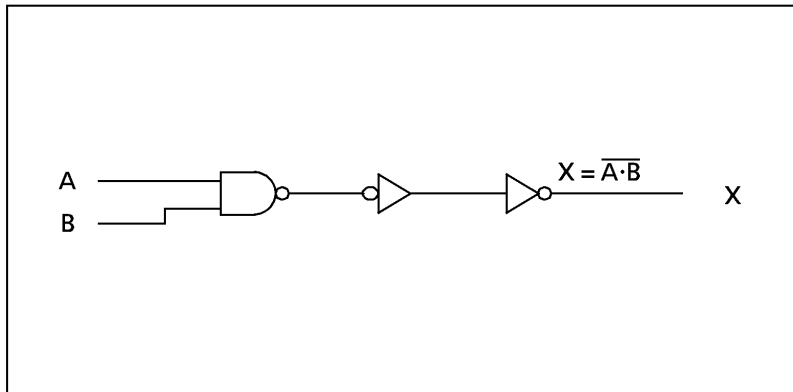
**MAXIMUM RATINGS**

CHARACTERISTIC	SYMBOL	RATING	UNIT
DC Supply Voltage	$V_{DD}$	$V_{SS} - 0.5 \sim V_{SS} + 20$	V
Input Voltage	$V_{IN}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
Output Voltage	$V_{OUT}$	$V_{SS} - 0.5 \sim V_{DD} + 0.5$	V
DC Input Current	$I_{IN}$	$\pm 10$	mA
Power Dissipation	$P_D$	300 (DIP) / 180 (SOIC)	mW
Operating Temperature Range	$T_{opr}$	$-40 \sim 85$	$^{\circ}C$
Storage Temperature Range	$T_{stg}$	$-65 \sim 150$	$^{\circ}C$

**PIN ASSIGNMENT (TOP VIEW)**



**LOGIC DIAGRAM**



980910EBA2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

RECOMMENDED OPERATING CONDITIONS ( $V_{SS} = 0V$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
DC Supply Voltage	$V_{DD}$		3	—	18	V
Input Voltage	$V_{IN}$		0	—	$V_{DD}$	V

STATIC ELECTRICAL CHARACTERISTICS ( $V_{SS} = 0V$ )

CHARACTERISTIC	SYM-BOL	TEST CONDITION	$V_{DD}$ (V)	-40°C		25°C			85°C		UNIT
				MIN.	MAX.	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Output Voltage	$V_{OH}$	$ I_{OUT}  < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	4.95	—	4.95	5.00	—	4.95	—	V
			10	9.95	—	9.95	10.00	—	9.95	—	
			15	14.95	—	14.95	15.00	—	14.95	—	
Low-Level Output Voltage	$V_{OL}$	$ I_{OUT}  < 1\mu A$ $V_{IN} = V_{SS}, V_{DD}$	5	—	0.05	—	0.00	0.05	—	0.05	V
			10	—	0.05	—	0.00	0.05	—	0.05	
			15	—	0.05	—	0.00	0.05	—	0.05	
Output High Current	$I_{OH}$	$V_{OH} = 4.6V$ $V_{OH} = 2.5V$ $V_{OH} = 9.5V$ $V_{OH} = 13.5V$ $V_{IN} = V_{SS}, V_{DD}$	5	-0.61	—	-0.51	-1.0	—	-0.42	—	mA
			5	-2.50	—	-2.10	-4.0	—	-1.70	—	
			10	-1.50	—	-1.30	-2.2	—	-1.10	—	
			15	-4.00	—	-3.40	-9.0	—	-2.80	—	
Output Low Current	$I_{OL}$	$V_{OL} = 0.4V$ $V_{OL} = 0.5V$ $V_{OL} = 1.5V$ $V_{IN} = V_{DD}$	5	0.61	—	0.51	1.2	—	0.42	—	mA
			10	1.50	—	1.30	3.2	—	1.10	—	
			15	4.00	—	3.40	12.0	—	2.80	—	
Input High Voltage	$V_{IH}$	$V_{OUT} = 0.5V$ $V_{OUT} = 1.0V$ $V_{OUT} = 1.5V$ $ I_{OUT}  < 1\mu A$	5	3.5	—	3.5	2.75	—	3.5	—	V
			10	7.0	—	7.0	5.50	—	7.0	—	
			15	11.0	—	11.0	8.25	—	11.0	—	
Input Low Voltage	$V_{IL}$	$V_{OUT} = 4.5V$ $V_{OUT} = 9.0V$ $V_{OUT} = 13.5V$ $ I_{OUT}  < 1\mu A$	5	—	1.5	—	2.25	1.5	—	1.5	V
			10	—	3.0	—	4.50	3.0	—	3.0	
			15	—	4.0	—	6.75	4.0	—	4.0	
Input Current	"H" Level	$I_{IH}$	$V_{IH} = 18V$	18	—	0.1	—	$10^{-5}$	0.1	—	$\mu A$
	"L" Level	$I_{IL}$	$V_{IL} = 0V$	18	—	-0.1	—	$-10^{-5}$	-0.1	—	
Quiescent Supply Current	$I_{DD}$	$V_{IN} = V_{SS}, V_{DD}^*$	5	—	0.25	—	0.001	0.25	—	7.5	$\mu A$
			10	—	0.50	—	0.001	0.50	—	15.0	
			15	—	1.00	—	0.002	1.00	—	30.0	

\* All valid input combinations.

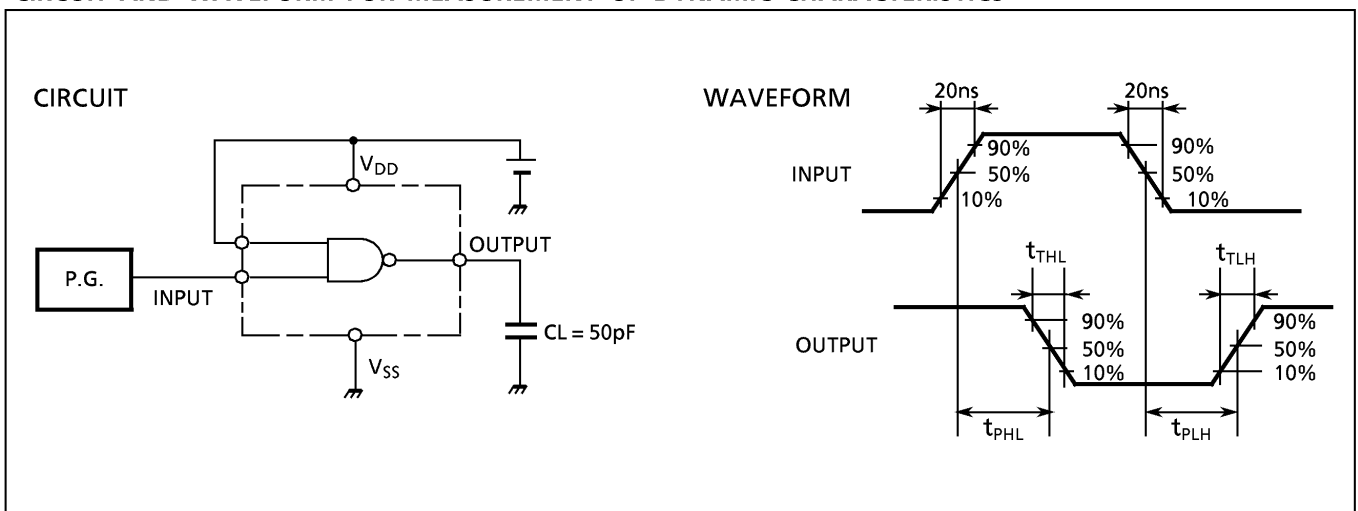
980910EBA2'

- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

**DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)**

CHARACTERISTIC	SYMBOL	TEST CONDITION	V <sub>DD</sub> (V)	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t <sub>TLH</sub>		5	—	70	200	ns
			10	—	35	100	
			15	—	30	80	
Output Transition Time	t <sub>THL</sub>		5	—	70	200	
			10	—	35	100	
			15	—	30	80	
Propagation Delay Time	t <sub>pLH</sub>		5	—	65	200	
			10	—	30	100	
			15	—	25	80	
Propagation Delay Time	t <sub>pHL</sub>		5	—	65	200	
			10	—	30	100	
			15	—	25	80	
Input Capacitance	C <sub>IN</sub>			—	5	7.5	pF

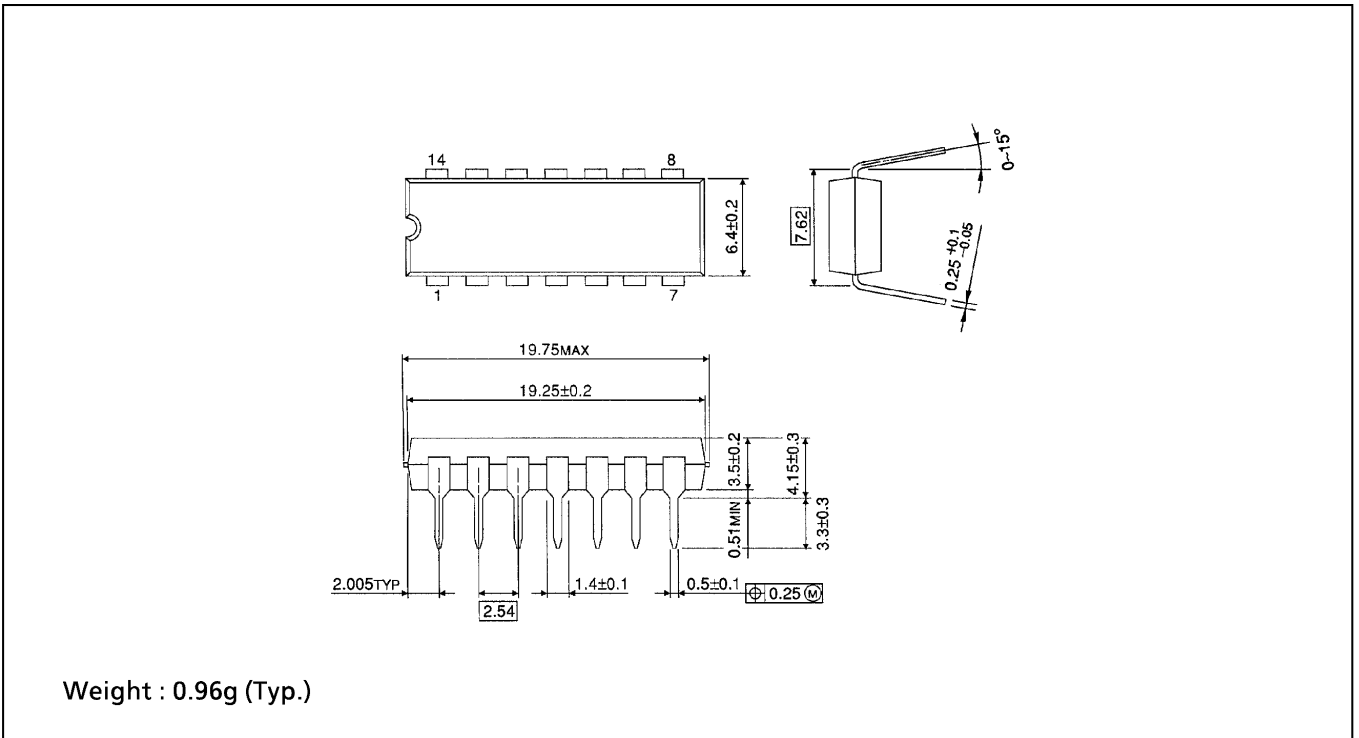
**CIRCUIT AND WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS**





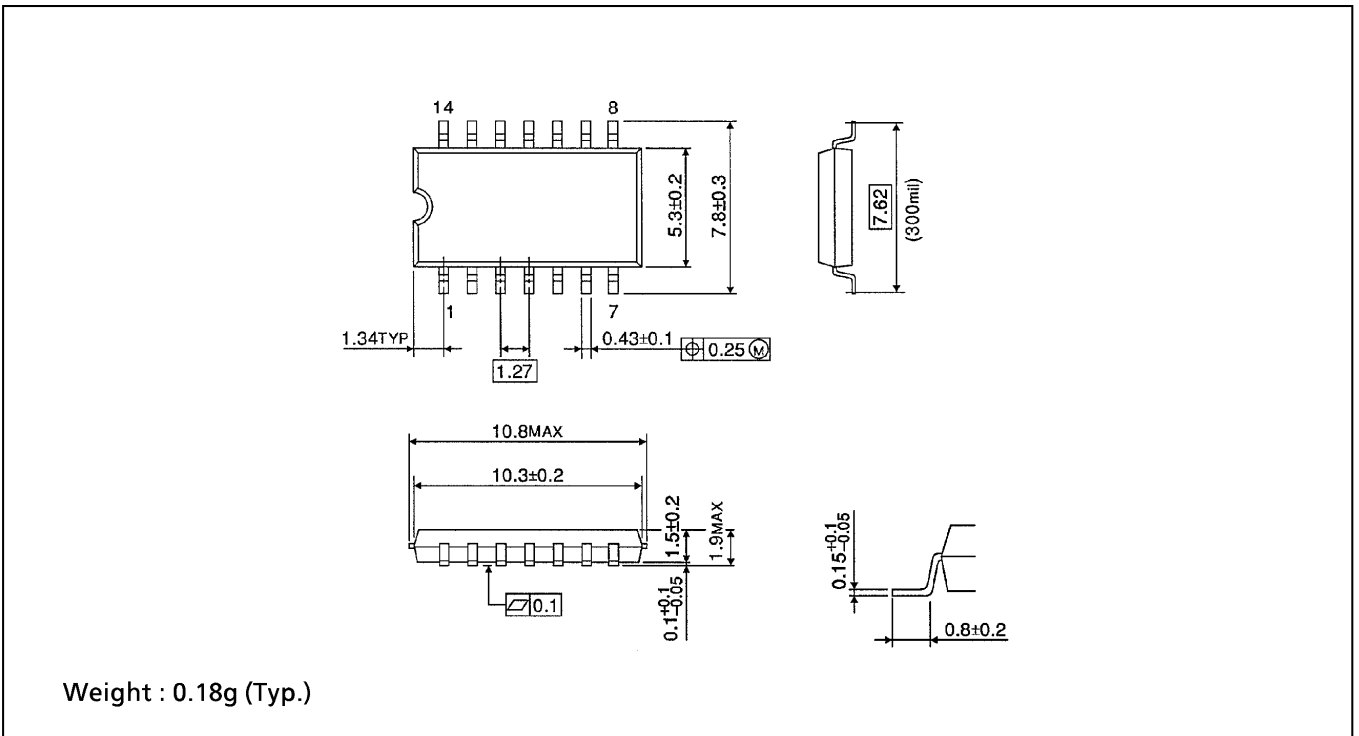
**DIP 14PIN OUTLINE DRAWING (DIP14-P-300-2.54)**

Unit in mm



**SOP 14PIN (200mil BODY) OUTLINE DRAWING (SOP14-P-300-1.27)**

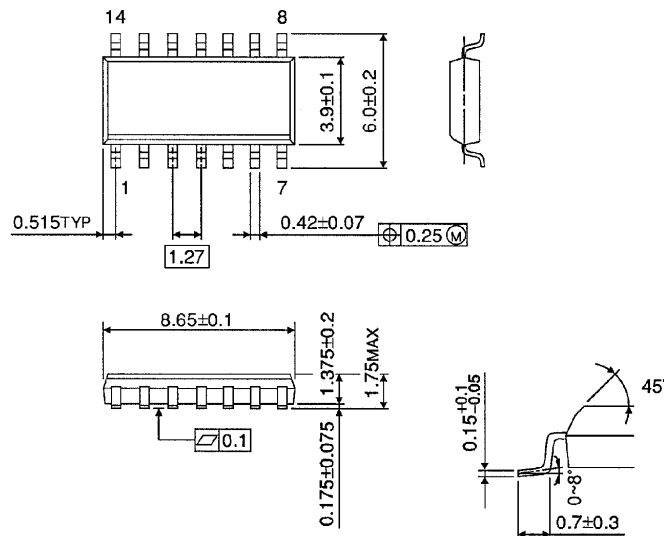
Unit in mm



**SOP 14PIN (150mil BODY) OUTLINE DRAWING (SOL14-P-150 -1.27)**

Unit in mm

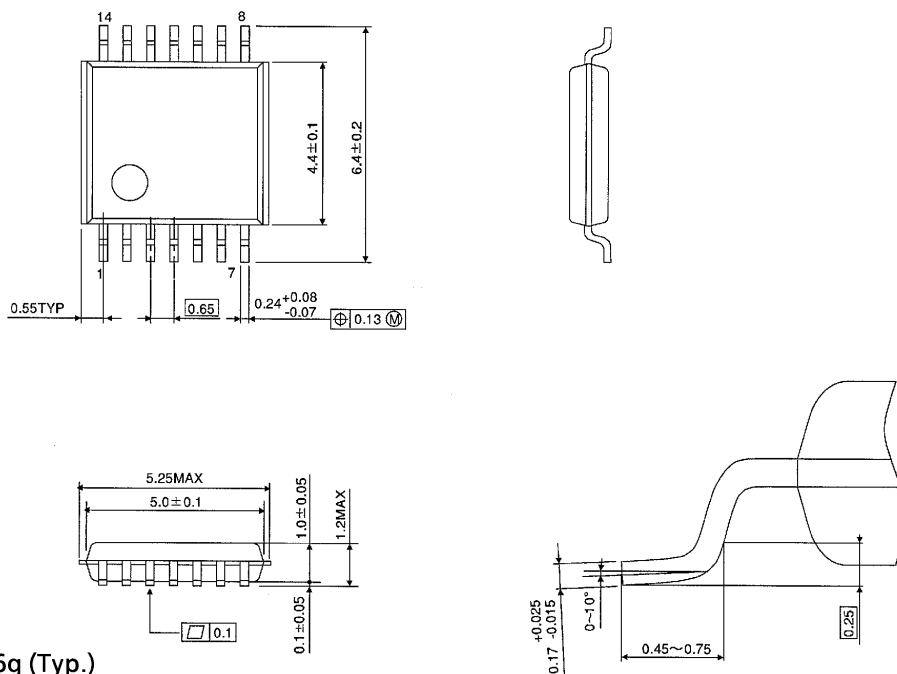
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

**TSSOP 14PIN (170mil BODY) OUTLINE DRAWING (TSSOP14-P-0044-0.65)**

Unit in mm



Weight : 0.06g (Typ.)