

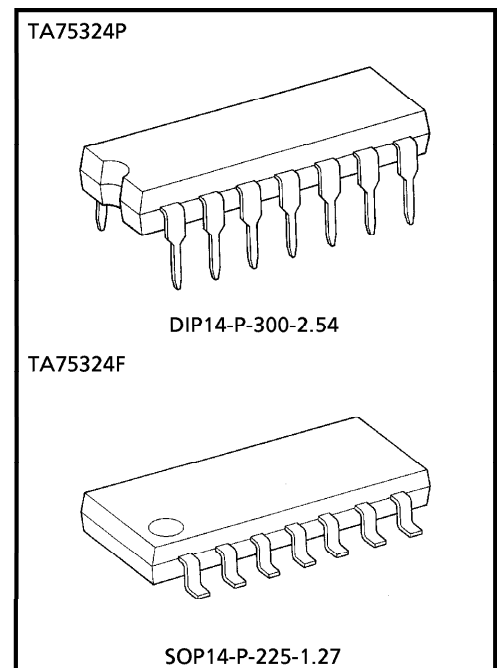
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA75324P, TA75324F

QUAD OPERATIONAL AMPLIFIER

FEATURES

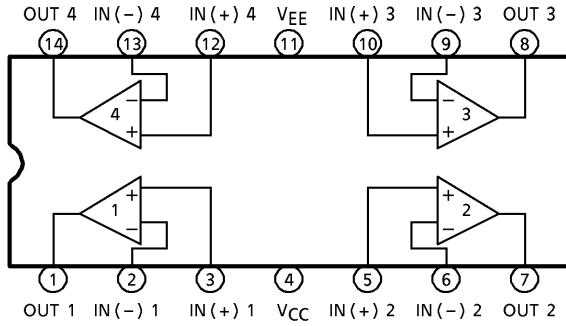
- In the Linear Mode the Input Common Mode Voltage Range Includes Ground.
- Four Internally Compensated OP Amp is Single Package.
- Low power Dissipation and Power Drain Suitable for Battery Operation.
- Differential Input Voltage Range Equal to the Power Supply Voltage.
- Wide Power Supply Voltage Range and Signal Power Supply.
- Large Output Voltage Swing : $0V \sim V_{CC} - 1.5V$
- Low Input Biasing Current : $I_I = 45nA$ (Typ.)



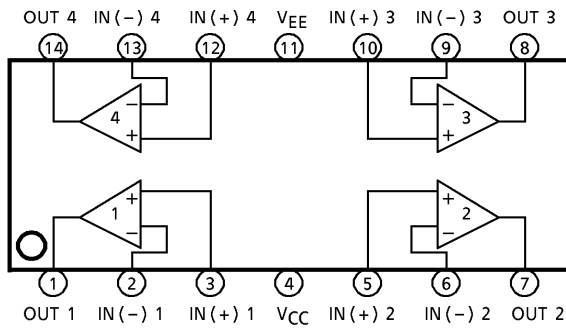
Weight
DIP14-P-300-2.54 : 1.0g (Typ.)
SOP14-P-225-1.27 : 0.2g (Typ.)

PIN CONNECTION (TOP VIEW)

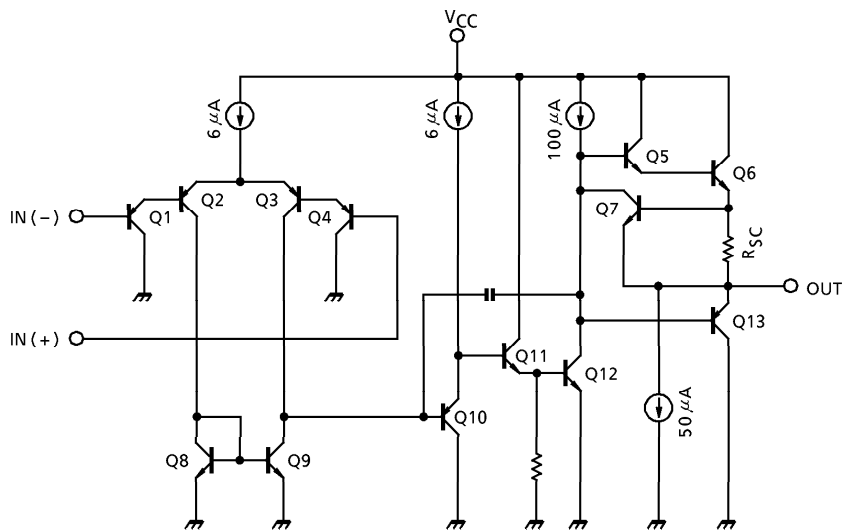
TA75324P



TA75324F



EQUIVALENT CIRCUIT



MAXIMUM RATINGS (Ta = 25°C)

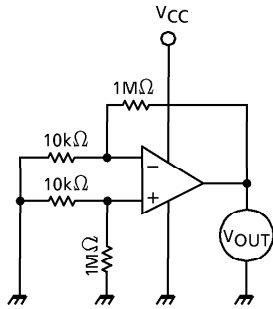
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}, V_{EE}	± 18 OR 36	V
Differential Input Voltage	DV_{IN}	± 36	V
Input Voltage	V_{IN}	- 0.3~36	V
Power Dissipation	TA75324P	625	mW
	TA75324F	280	
Operating Temperature	T_{opr}	- 40~85	°C
Storage Temperature	T_{stg}	- 55~125	°C

ELECTRICAL CHARACTERISTICS ($V_{CC} = 5V, V_{EE} = GND, Ta = 25^\circ C$)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	1	$R_g \leq 10k\Omega$	—	2	10	mV
Input Offset Current	I_{IO}	2	—	—	5	100	nA
Input Bias Current	I_I	2	—	—	45	250	nA
Common Mode Input Voltage	CMV_{IN}	3	$V_{CC} = 30V, V_{EE} = GND$	0	—	$V_{CC} - 1.5$	V
Supply Current	I_{CC}, I_{EE}	4	$R_L = \infty, ALL\ OF\ Amps$	—	0.7	1.2	mA
Voltage Gain	G_V	5	$R_L \geq 2k\Omega$	86	100	—	dB
Maximum Output Voltage Swing	V_{Op-p}	6	$R_L = 2k\Omega$	0	—	$V_{CC} - 1.5$	V
Common Mode Rejection Ratio	CMRR	3	—	60	85	—	dB
Supply Voltage Rejection Ratio	SVRR	1	$R_g = 10k\Omega$	60	100	—	dB
Source Current	I_{source}	6	$IN(-) = 0V_{DC}, IN(+) = 1V_{DC}$	20	40	—	mA
Sink Current	I_{sink}	6	$IN(-) = 1V_{DC}, IN(+) = 0V_{DC}$	10	20	—	mA

TEST CIRCUIT

(1) V_{IO} , SVRR

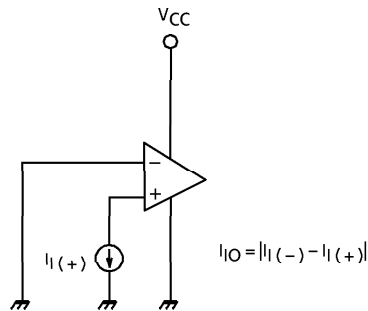
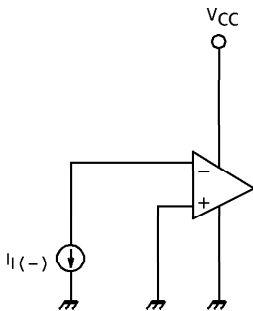


- $V_{IO} = V_{OUT} / 100$
- $SVRR = 20 \log E$ (dB)

$$E = \left| \frac{V_{OUT1} - V_{OUT2}}{V_{CC1} - V_{CC2}} \right| \times \frac{1}{100}$$

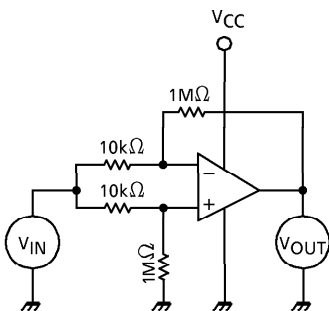
V_{OUT1} : V_{OUT} ($V_{CC1} = 5V$)
 V_{OUT2} : V_{OUT} ($V_{CC2} = 10V$)

(2) I_I , I_{IO}



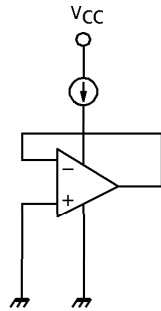
$$I_{IO} = |I_1(-) - I_1(+)|$$

(3) CMV_{IN} , CMRR



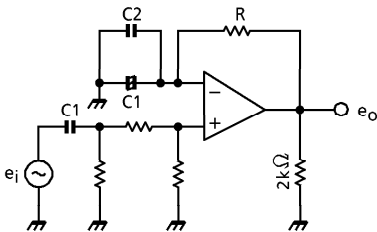
- $CMRR = 20 \log \cdot G_D / G_C$ (dB)
 G_D : DIFFERENTIAL VOLTAGE GAIN
 G_C : COMMON MODE VOLTAGE GAIN
- CMV_{IN} : $V_{IN} = 0V$, $V_{CC} - 1.5V$ SUPPLIES

(4) I_{CC}



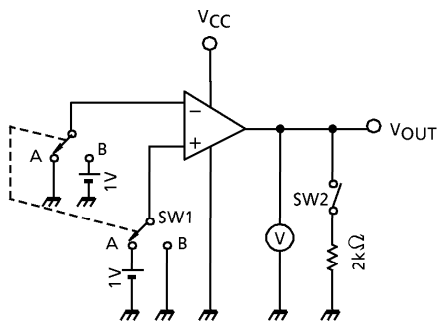
- $I_{CC} : (V_{CC} = 5V)$

(5) G_V



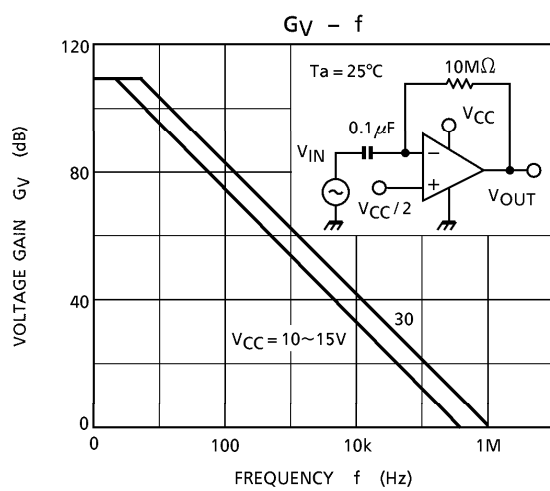
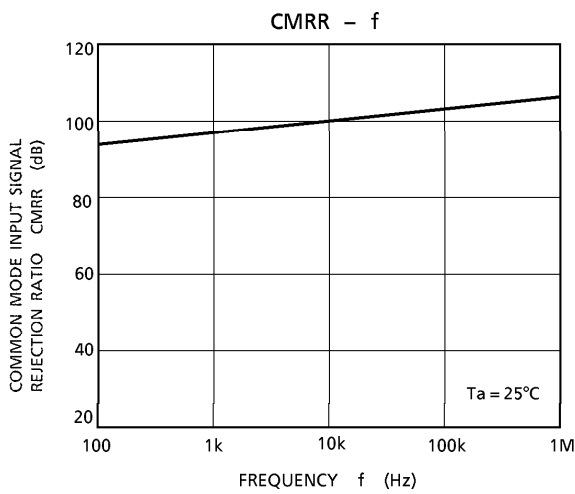
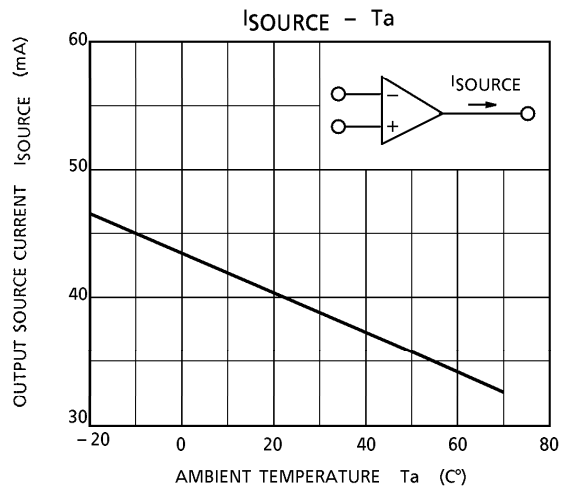
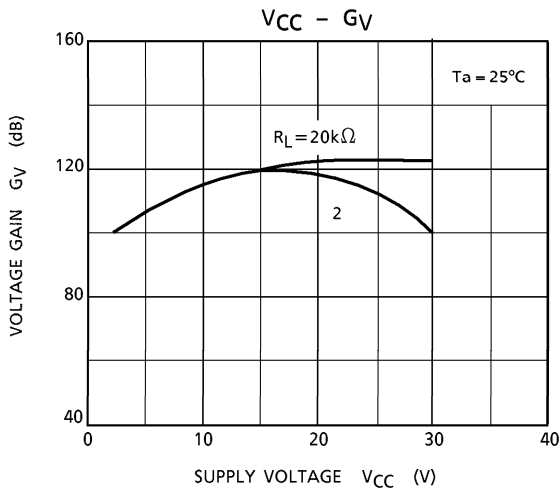
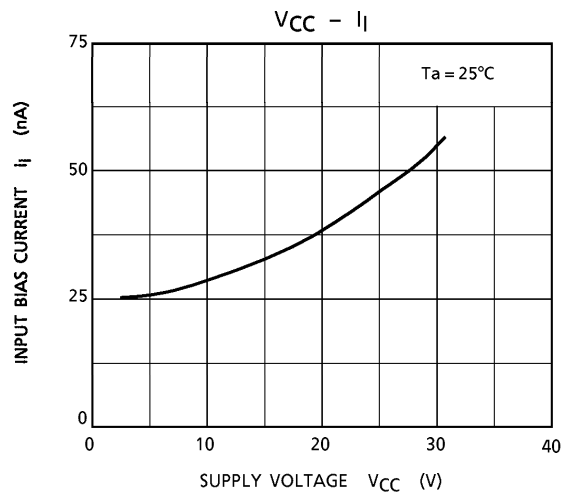
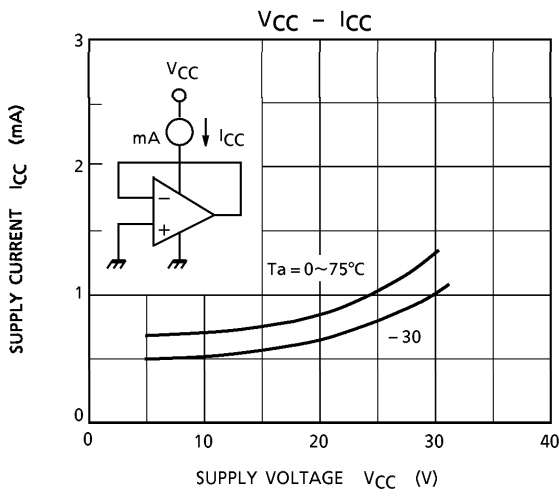
- $G_V = 20 \log e_o / e_i$ (dB)
 $R \gg 1 / \omega C_1$
 C1 : COUPLING CONDENSER
 C2 : HIGH FREQUENCY BYPASS CONDENSER

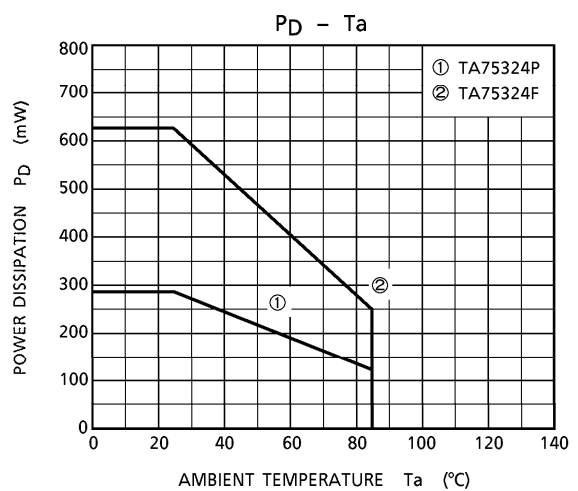
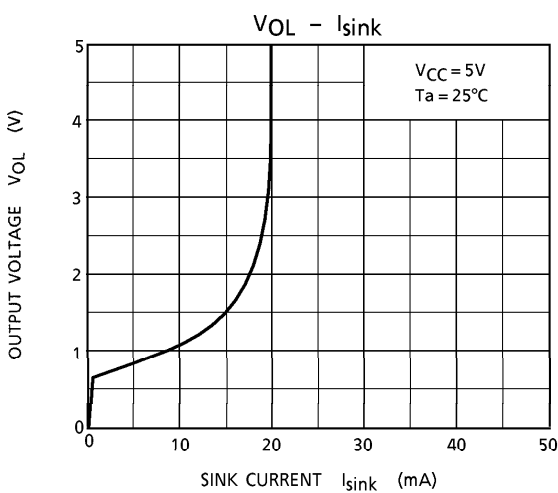
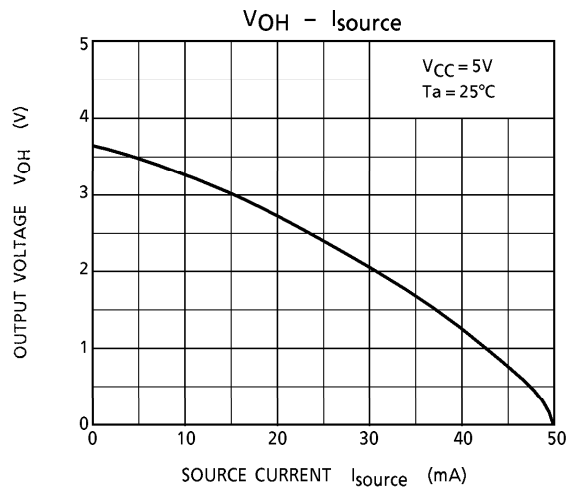
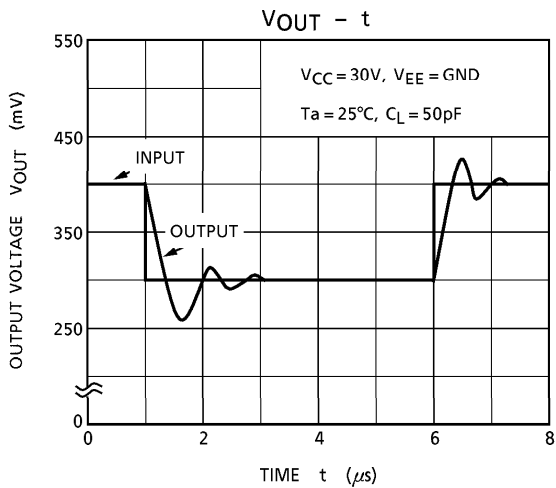
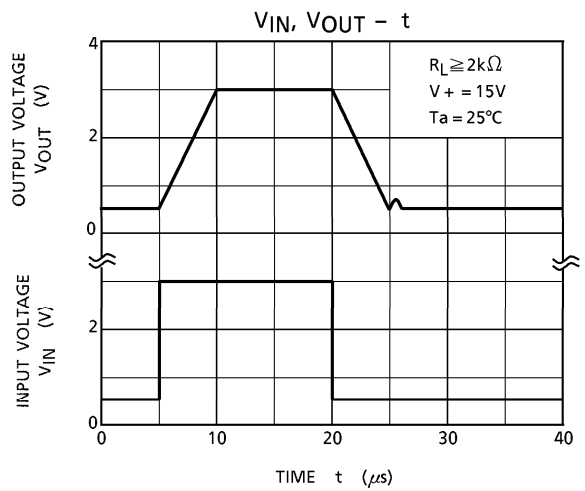
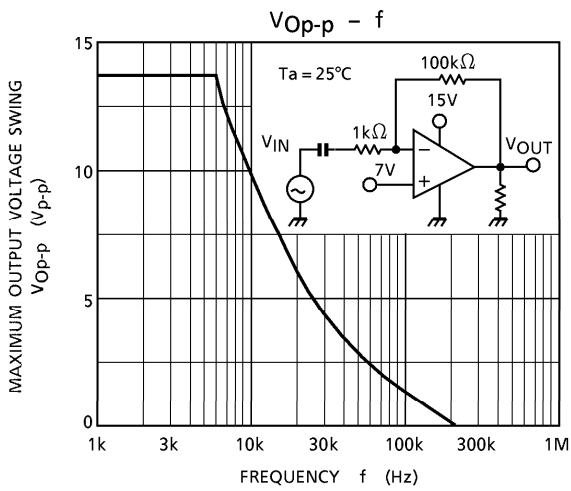
(6) V_{Op-p} , I_{source} , I_{sink}



- V_{Op-p}
 $V_{OH} : SW1 \text{ IS SIDE A, } SW2 \text{ ON}$
 $V_{OL} : SW1 \text{ IS SIDE B, } SW2 \text{ ON}$
- I_{source}
 $SW1 \text{ IS SIDE A, } SW2 \text{ OFF}$
 $V_{OUT} \rightarrow 0V \text{ MEASURE}$
- I_{sink}
 $SW1 \text{ IS SIDE B, } SW2 \text{ OFF}$
 $V_{OUT} \rightarrow 5V \text{ MEASURE}$

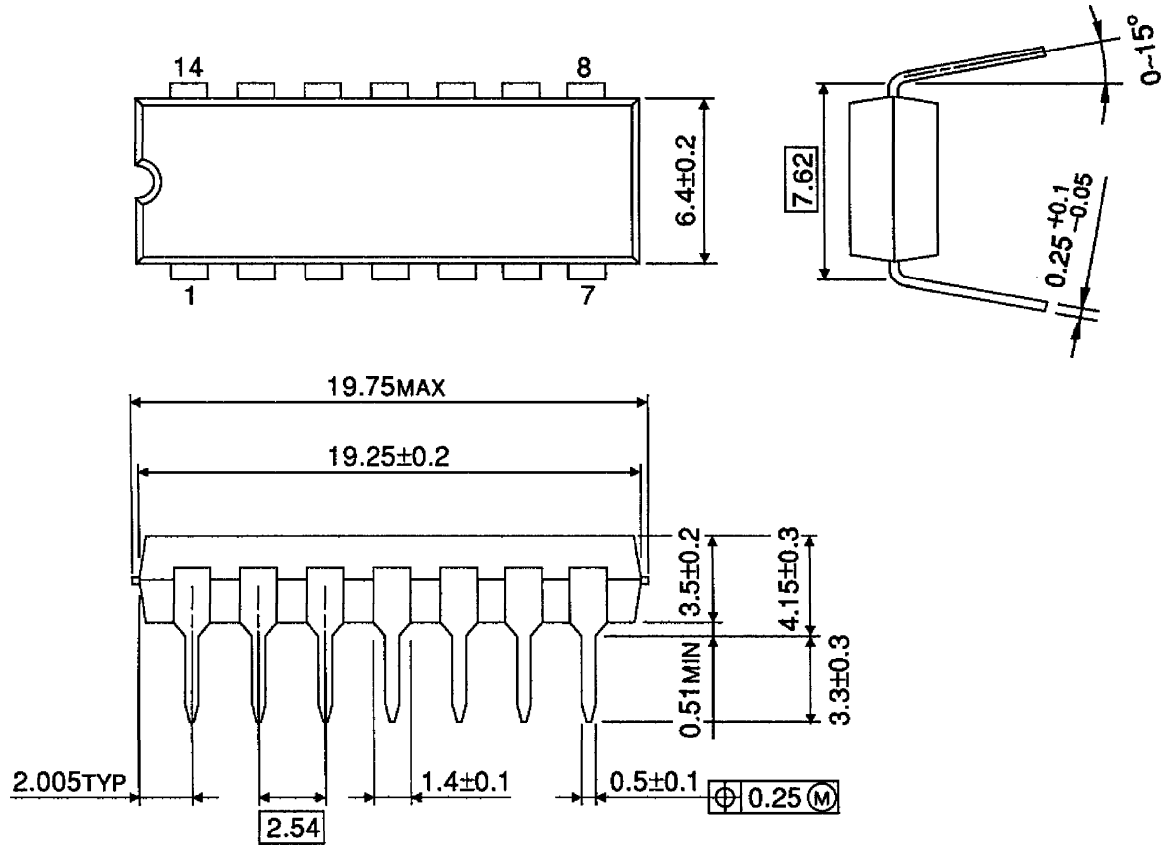
CHARACTERISTICS





PACKAGE DIMENSIONS
DIP14-P-300-2.54

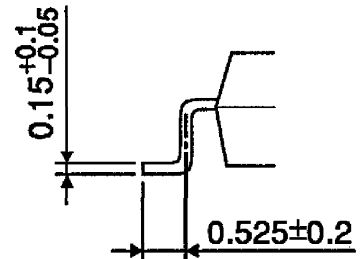
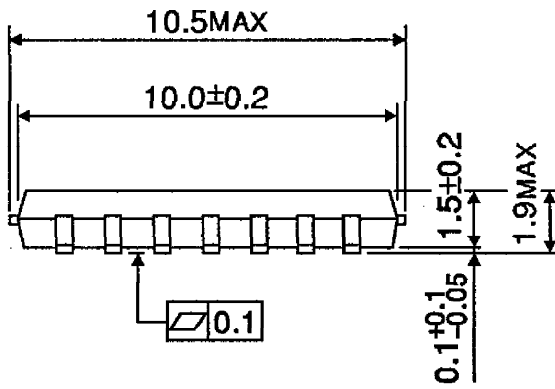
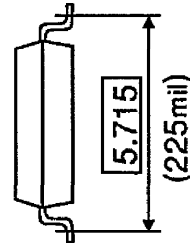
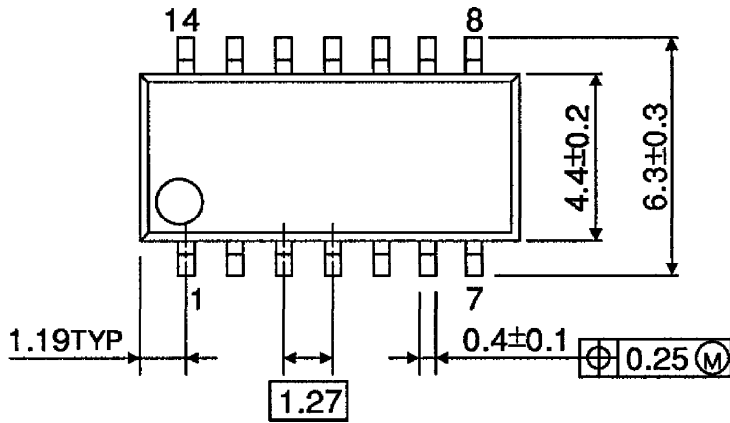
Unit : mm



Weight : 1.0g (Typ.)

PACKAGE DIMENSIONS
SOP14-P-225-1.27

Unit : mm



Weight : 0.2g (Typ.)

RESTRICTIONS ON PRODUCT USE

000707EBA

- TOSHIBA is continually working to improve the quality and 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 comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products 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 TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- 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.