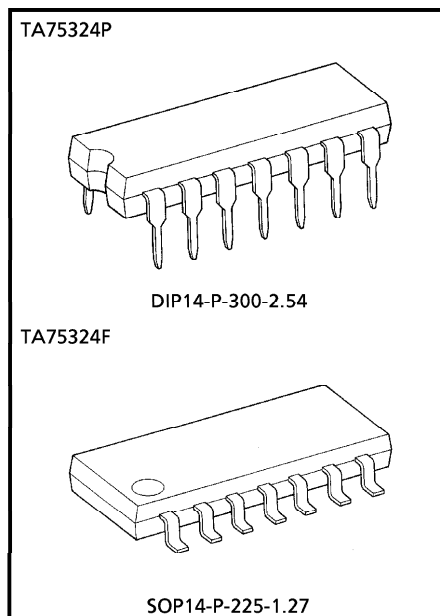


TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

**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.)



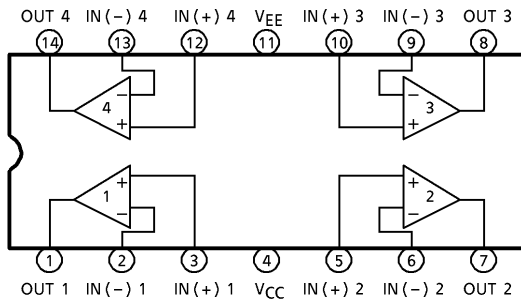
Weight  
 DIP14-P-300-2.54 : 1.0g (Typ.)  
 SOP14-P-225-1.27 : 0.2g (Typ.)

961001EBA1

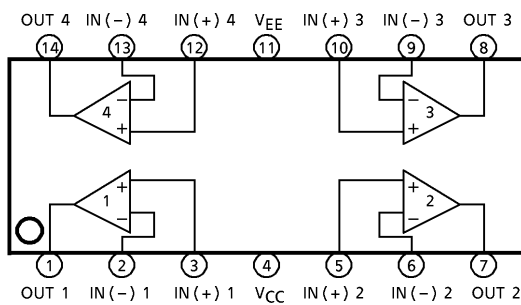
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**PIN CONNECTION (TOP VIEW)**

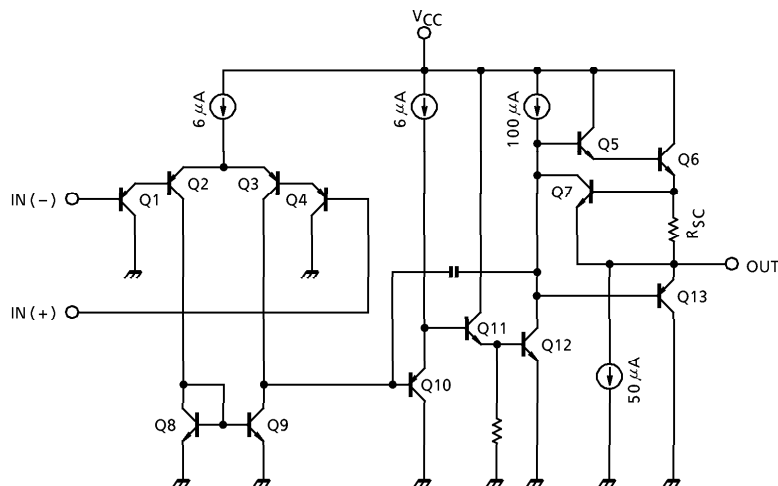
**TA75324P**



**TA75324F**



**EQUIVALENT CIRCUIT**



## MAXIMUM RATINGS (Ta = 25°C)

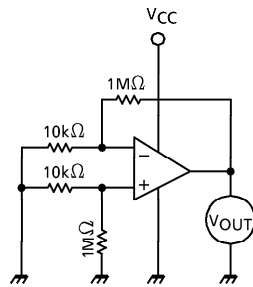
CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V <sub>CC</sub> , V <sub>EE</sub>	± 18 OR 36	V
Differential Input Voltage		DV <sub>IN</sub>	± 36	V
Input Voltage		V <sub>IN</sub>	- 0.3~36	V
Power Dissipation	TA75324P	P <sub>D</sub>	625	mW
	TA75324F		280	
Operating Temperature		T <sub>opr</sub>	- 40~85	°C
Storage Temperature		T <sub>stg</sub>	- 55~125	°C

ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V, V<sub>EE</sub> = GND, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V <sub>IO</sub>	1	R <sub>g</sub> ≤ 10kΩ	—	2	10	mV
Input Offset Current	I <sub>IO</sub>	2	—	—	5	100	nA
Input Bias Current	I <sub>I</sub>	2	—	—	45	250	nA
Common Mode Input Voltage	CMV <sub>IN</sub>	3	V <sub>CC</sub> = 30V, V <sub>EE</sub> = GND	0	—	V <sub>CC</sub> - 1.5	V
Supply Current	I <sub>CC</sub> , I <sub>EE</sub>	4	R <sub>L</sub> = ∞, ALL OF Amps	—	0.7	1.2	mA
Voltage Gain	G <sub>V</sub>	5	R <sub>L</sub> ≥ 2kΩ	86	100	—	dB
Maximum Output Voltage Swing	V <sub>OP-p</sub>	6	R <sub>L</sub> = 2kΩ	0	—	V <sub>CC</sub> - 1.5	V
Common Mode Rejection Ratio	CMRR	3	—	60	85	—	dB
Supply Voltage Rejection Ratio	SVRR	1	R <sub>g</sub> = 10kΩ	60	100	—	dB
Source Current	I <sub>source</sub>	6	IN (-) = 0V <sub>DC</sub> , IN (+) = 1V <sub>DC</sub>	20	40	—	mA
Sink Current	I <sub>sink</sub>	6	IN (-) = 1V <sub>DC</sub> , IN (+) = 0V <sub>DC</sub>	10	20	—	mA

TEST CIRCUIT

(1)  $V_{IO}$ , SVRR



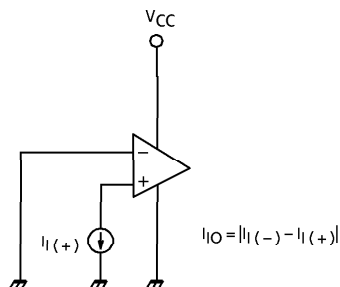
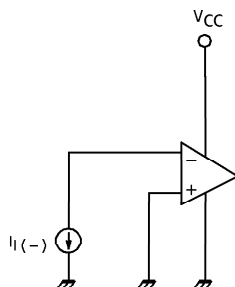
- $V_{IO} = V_{OUT} / 100$
- $SVRR = 20 \log E \text{ (dB)}$

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

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

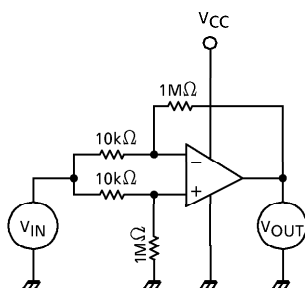
$V_{OUT2}$  :  $V_{OUT}$  ( $V_{CC2} = 10V$ )

(2)  $I_I$ ,  $I_{IO}$



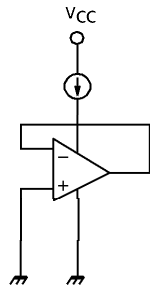
$$I_{IO} = |I_I(-) - I_I(+)|$$

(3)  $CMV_{IN}$ , CMRR



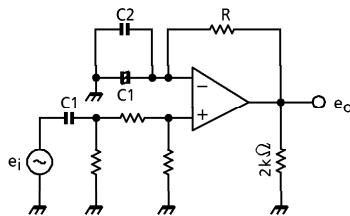
- $CMRR = 20 \log \cdot G_D / G_C \text{ (dB)}$   
 $G_D$  : DIFFERENTIAL VOLTAGE GAIN  
 $G_C$  : COMMON MODE VOLTAGE GAIN
- $CMV_{IN}$  :  $V_{IN} = 0V$ ,  $V_{CC} - 1.5V$  SUPPLES

(4)  $I_{CC}$



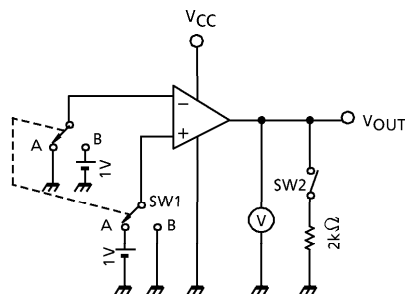
- $I_{CC} : (V_{CC} = 5V)$

(5)  $G_V$



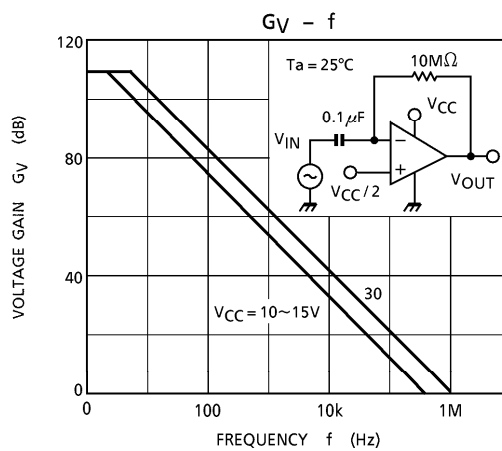
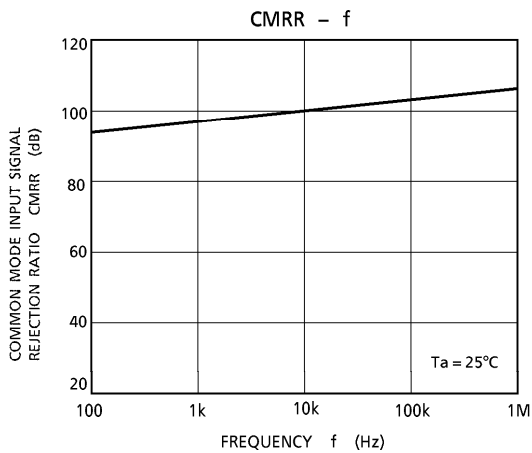
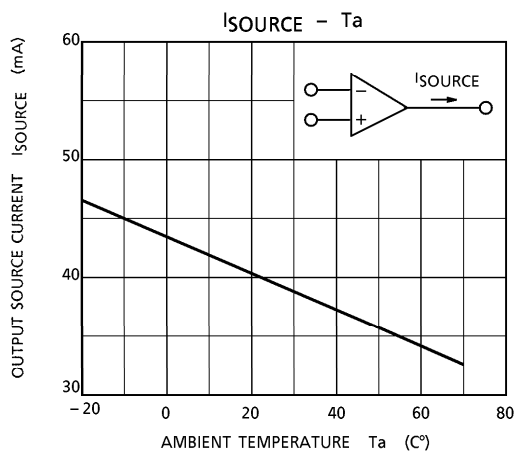
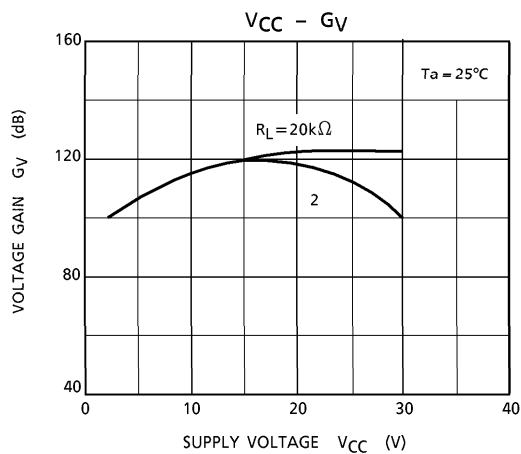
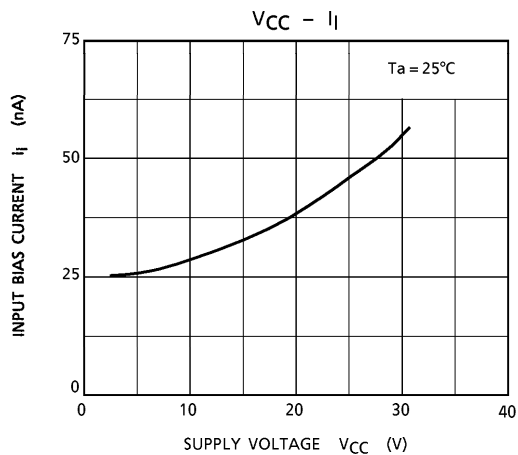
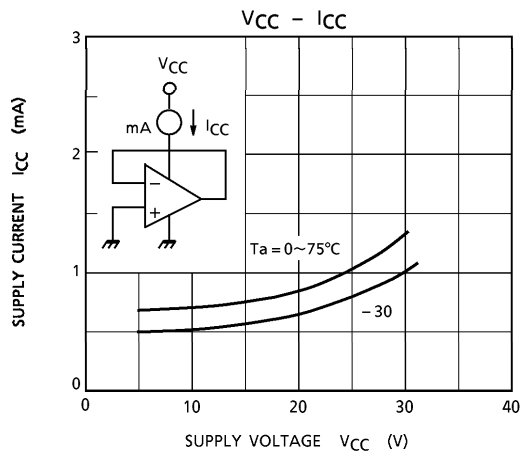
- $G_V = 20 \log e_o / e_i$  (dB)  
 $R \gg 1 / \omega C_1$   
 C1 : COUPLING CONDENSER  
 C2 : HIGH FREQUENCY BYPASS CONDENSER

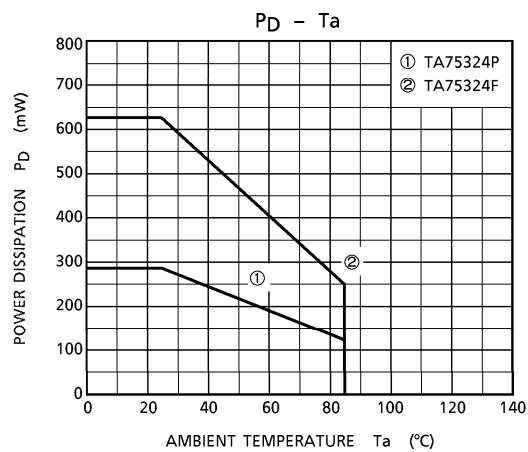
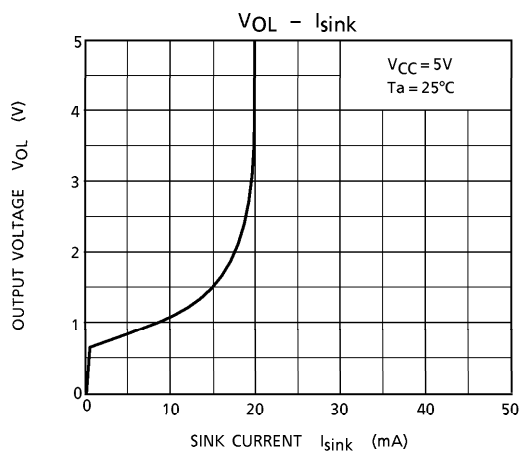
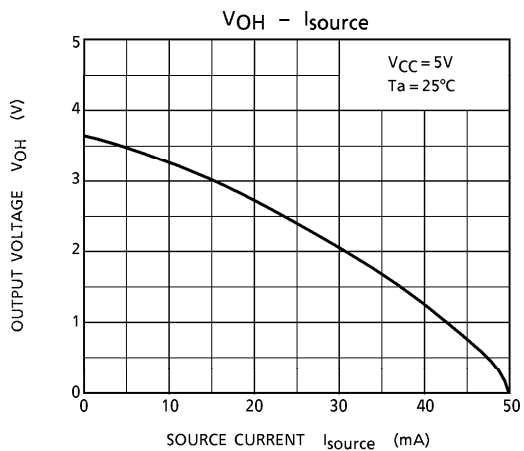
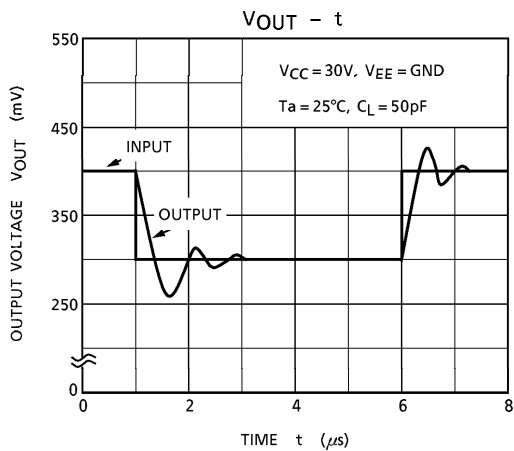
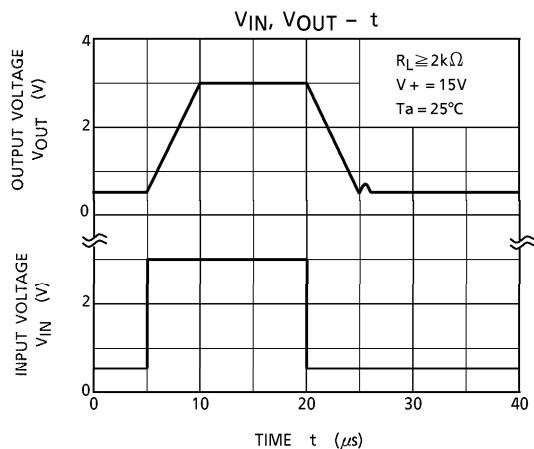
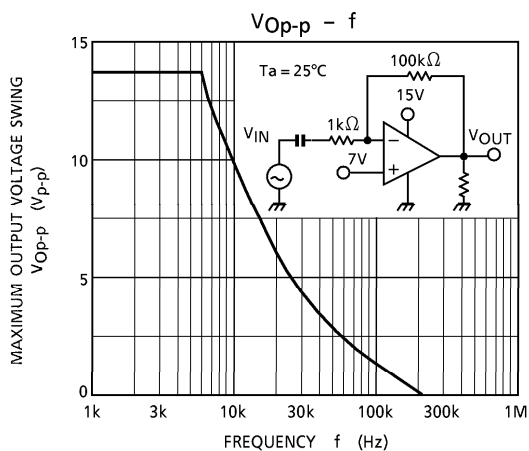
(6)  $V_{Op-p}$ ,  $I_{source}$ ,  $I_{sink}$



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

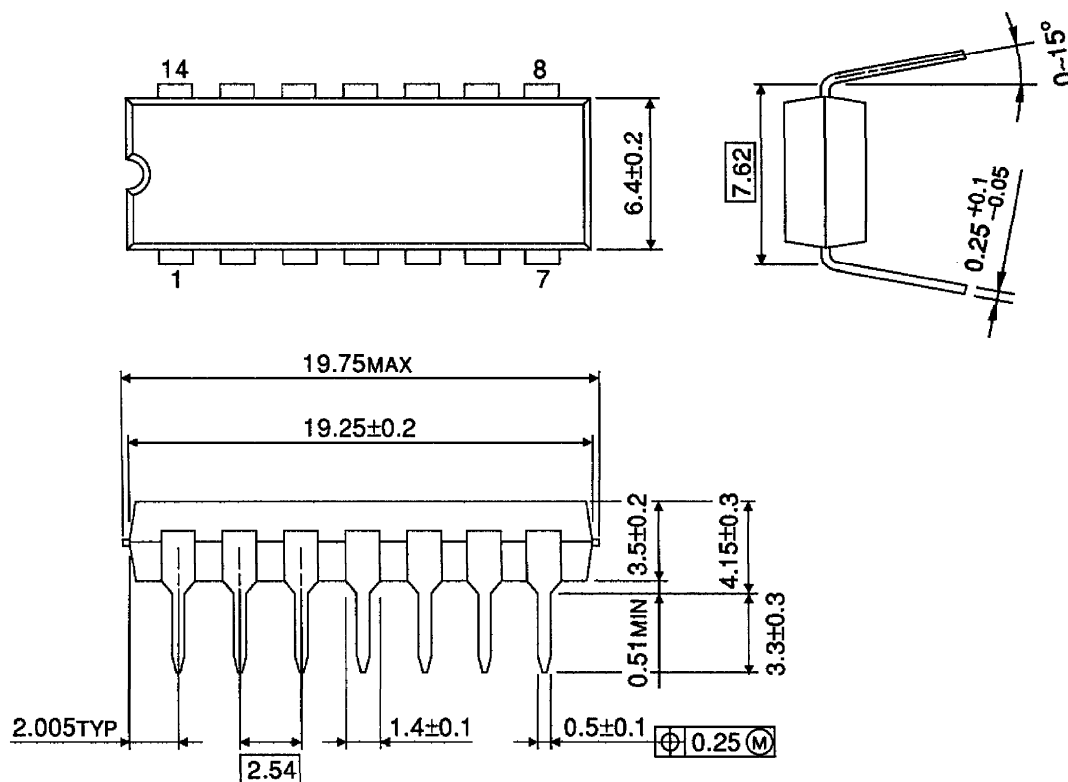
CHARACTERISTICS





OUTLINE DRAWING  
DIP14-P-300-2.54

Unit : mm

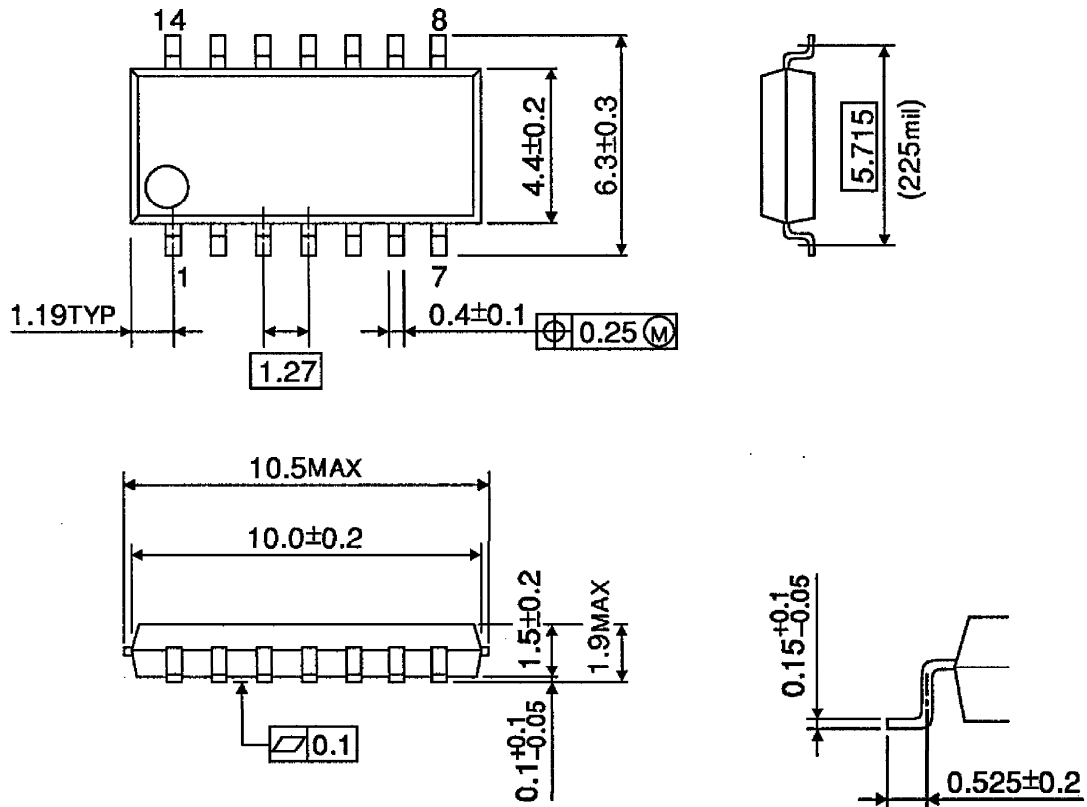


Weight : 1.0g (Typ.)



OUTLINE DRAWING  
SOP14-P-225-1.27

Unit : mm



Weight : 0.2g (Typ.)