

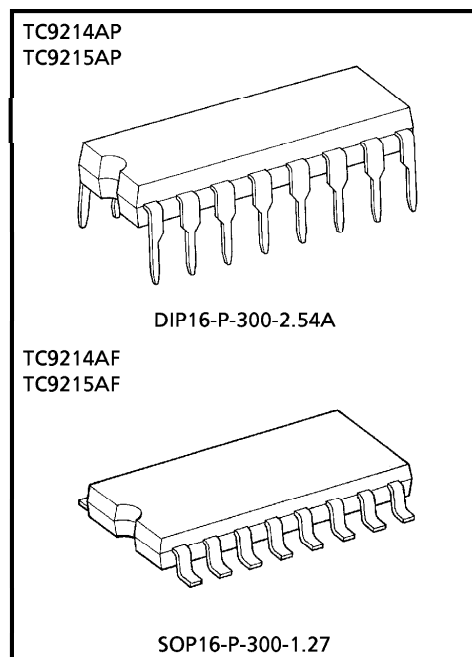
**TC9214AP, TC9214AF, TC9215AP, TC9215AF**

**HIGH VOLTAGE ANALOG SWITCH**

TC9214AP/AF, TC9215AP/AF are Analog Switch for high voltage audio application.

**FEATURES**

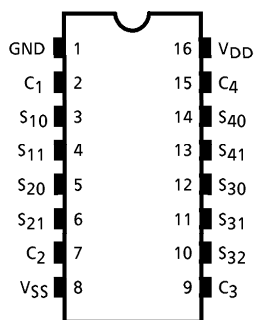
- Analog Switch Circuit Formation  
 TC9214AP, TC9214AF : 5 circuits  
 TC9215AP, TC9215AF : 6 circuits
- Dual Power Supply of (+) and (-) can be used.
- Including Level Shift Circuit, this IC can be operated by (+) power supply only under dual power supply operating.
- Setting Low Input-threshold-voltage in control signal input terminal. 5V CPU application can control this IC directly.
- Package : DIP-16 PIN  
 SOP-16 PIN



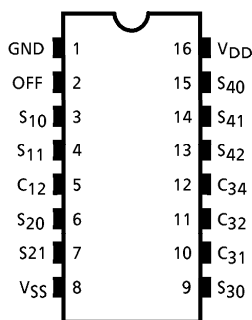
Weight  
 DIP16-P-300-2.54A : 1.0g (Typ.)  
 SOP16-P-300-1.27 : 0.16g (Typ.)

**PIN CONNECTION (TOP VIEW)**

TC9214AP, TC9214AF



TC9215AP, TC9215AF



980508EBA2

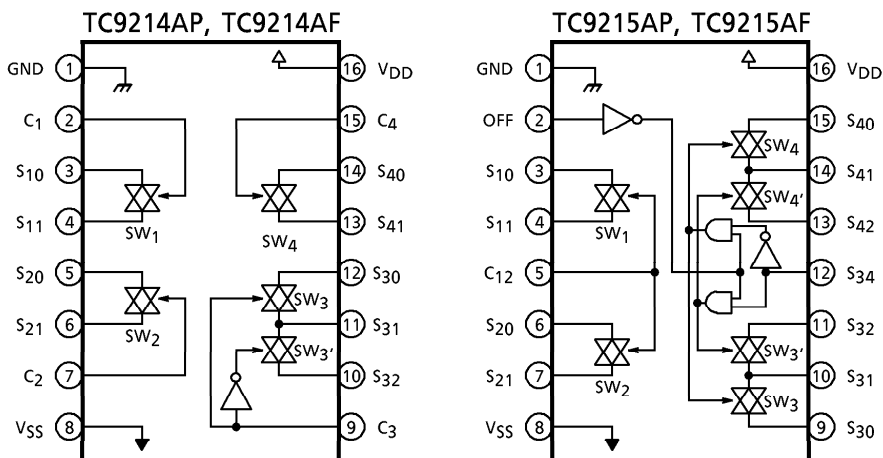
● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing 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.

● The products described in this document are subject to 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.

BLOCK DIAGRAM



PIN FUNCTION

1. TC9214AP, TC9214AF

PIN No.	SYMBOL	PIN NAME	FUNCTION	NOTE																		
1	GND	Ground Terminal	Dual power supplying : + B →V <sub>DD</sub> 0V →GND - B →V <sub>SS</sub>	—																		
8	V <sub>SS</sub>	(-) Power Supply Terminal																				
16	V <sub>DD</sub>	(+) Power Supply Terminal																				
2	C <sub>1</sub>	Switch (1) Control Terminal	SWITCH CONNECTION   TRUTH TABLE <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>C<sub>1</sub>, C<sub>2</sub>, C<sub>4</sub></td> <td colspan="2">SW<sub>1</sub>, SW<sub>2</sub>, SW<sub>3</sub></td> </tr> <tr> <td>H</td> <td colspan="2">ON</td> </tr> <tr> <td>L</td> <td colspan="2">OFF</td> </tr> </table>  <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>C<sub>3</sub></td> <td>S<sub>30</sub>-S<sub>31</sub></td> <td>S<sub>31</sub>-S<sub>32</sub></td> </tr> <tr> <td>H</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>L</td> <td>OFF</td> <td>ON</td> </tr> </table>	C <sub>1</sub> , C <sub>2</sub> , C <sub>4</sub>	SW <sub>1</sub> , SW <sub>2</sub> , SW <sub>3</sub>		H	ON		L	OFF		C <sub>3</sub>	S <sub>30</sub> -S <sub>31</sub>	S <sub>31</sub> -S <sub>32</sub>	H	ON	OFF	L	OFF	ON	—
C <sub>1</sub> , C <sub>2</sub> , C <sub>4</sub>	SW <sub>1</sub> , SW <sub>2</sub> , SW <sub>3</sub>																					
H	ON																					
L	OFF																					
C <sub>3</sub>	S <sub>30</sub> -S <sub>31</sub>	S <sub>31</sub> -S <sub>32</sub>																				
H	ON	OFF																				
L	OFF	ON																				
3	S <sub>10</sub>	Switch (1) Input/Output Terminal																				
4	S <sub>11</sub>																					
5	S <sub>20</sub>	Switch (2) Input/Output Terminal																				
6	S <sub>21</sub>																					
7	C <sub>2</sub>	Switch (2) Control Terminal																				
9	C <sub>3</sub>	Switch (3) Control Terminal																				
10	S <sub>32</sub>	Switch (3) Input/Output Terminal																				
11	S <sub>31</sub>																					
12	S <sub>30</sub>																					
13	S <sub>41</sub>	Switch (4) Input/Output Terminal																				
14	S <sub>40</sub>																					
15	C <sub>4</sub>	Switch (4) Control Terminal																				

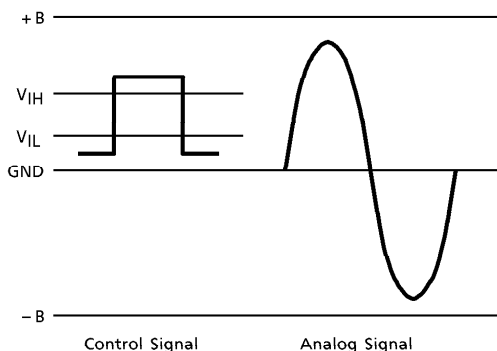
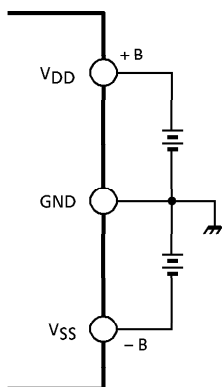
2. TC9215AP, TC9215AF

PIN No.	SYMBOL	PIN NAME	FUNCTION	NOTE																					
1	GND	Ground Terminal	Dual power supplying : + B →V <sub>DD</sub> 0V →GND - B →V <sub>SS</sub> Single power supplying : + B →V <sub>DD</sub> 0V →GND, V <sub>SS</sub>	—																					
8	V <sub>SS</sub>	(-) Power Supply Terminal																							
16	V <sub>DD</sub>	(+) Power Supply Terminal																							
2	OFF	Switch (3), (4) OFF Input Terminal	<p><b>SWITCH CONNECTION</b></p> <p><b>TRUTH TABLE</b></p> <table border="1"> <thead> <tr> <th>C12</th> <th>SW1, SW2</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>ON</td> </tr> <tr> <td>L</td> <td>OFF</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>OFF</th> <th>C34</th> <th>S30-S31 S40-S41</th> <th>S31-S32 S41-S42</th> </tr> </thead> <tbody> <tr> <td rowspan="2">L</td> <td>L</td> <td>ON</td> <td>OFF</td> </tr> <tr> <td>H</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>H</td> <td>※</td> <td>OFF</td> <td>OFF</td> </tr> </tbody> </table> <p>(※ H or L)</p>	C12	SW1, SW2	H	ON	L	OFF	OFF	C34	S30-S31 S40-S41	S31-S32 S41-S42	L	L	ON	OFF	H	OFF	ON	H	※	OFF	OFF	—
C12	SW1, SW2																								
H	ON																								
L	OFF																								
OFF	C34	S30-S31 S40-S41		S31-S32 S41-S42																					
L	L	ON		OFF																					
	H	OFF		ON																					
H	※	OFF		OFF																					
3	S <sub>10</sub>	Switch (1) Input / Output Terminal																							
4	S <sub>11</sub>	Switch (1), (2) Control Terminal																							
5	C <sub>12</sub>	Switch (2) Input / Output Terminal																							
6	S <sub>20</sub>	Switch (3) Input / Output Terminal																							
7	S <sub>21</sub>																								
9	S <sub>30</sub>	Switch (3), (4) Control Terminal																							
10	S <sub>31</sub>																								
11	S <sub>32</sub>																								
12	C <sub>34</sub>	Switch (4) Input / Output Terminal																							
13	S <sub>42</sub>																								
14	S <sub>41</sub>																								
15	S <sub>40</sub>																								

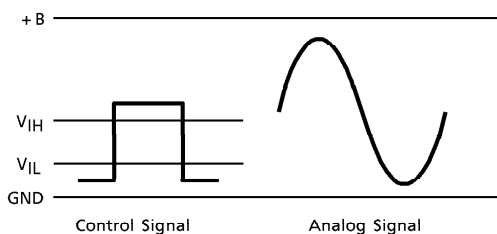
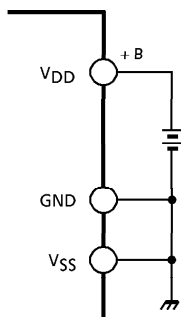
**NOTATION : POWER SUPPLY**

As the power supply is parted between analog switch unit and control unit, the analog switch unit operates in dual power supply of (+) and (-), in which case, the control unit operates in single power supply. Setting a low input-threshold voltage in control input terminal, 5V CPU application can control this IC directly.

**Dual power supply use**



**Single power supply use**



(Note) In case of using single power supply in common with VSS and GND terminal, half voltage of dual power supply must be supplied because of low operating voltage of a control circuit. ( $V_{DD} - GND \leq 18V$ )

**MAXIMUM RATINGS (Ta = 25°C)**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage (1)	V <sub>DD</sub> -V <sub>SS</sub>	-0.3~36	V
Power Supply Voltage (2)	V <sub>DD</sub> -GND	-0.3~20	V
GND Input Voltage	V <sub>IN</sub> (1)	-0.3~V <sub>DD</sub> + 0.3	V
V <sub>SS</sub> Input Voltage	V <sub>IN</sub> (2)	V <sub>SS</sub> - 0.3~V <sub>DD</sub> + 0.3	V
Power Dissipation	P <sub>D</sub>	600 (300)	mW
Operating Temperature	T <sub>opr</sub>	-40~85	°C
Storage Temperature	T <sub>stg</sub>	-65~150	°C

( ) : SOP-16 pin.

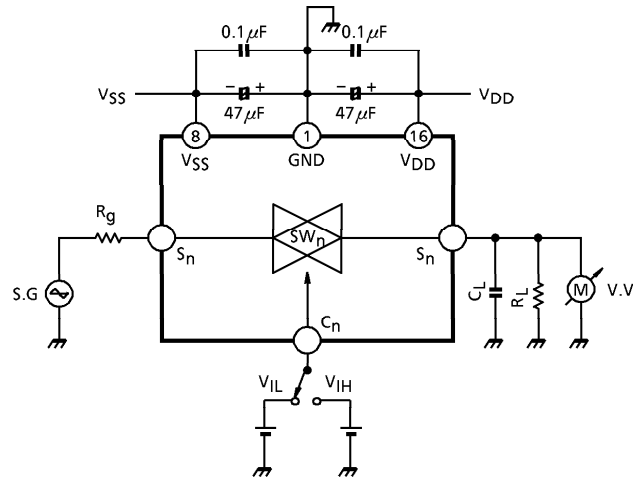
**ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V<sub>DD</sub> = 15V, V<sub>SS</sub> = -15V, GND = 0V, Ta = 25°C)**

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Operating Supply Voltage (1)		V <sub>DD</sub> -V <sub>SS</sub>	—	Dual power supplying	9.0	~	34	V	
Operating Supply Voltage (2)		V <sub>DD</sub> -GND		Single power supplying	4.5	~	18		
Operating Supply Current		I <sub>DD</sub>	—	No load, No signal	—	0.1	0.5	mA	
Input Voltage	"H" Level	V <sub>IH</sub>	—	Control input terminal V <sub>DD</sub> = 4.5~18V	4.0	~	V <sub>DD</sub>	V	
	"L" Level	V <sub>IL</sub>			GND	~	1.0		
Input Current	"H" Level	I <sub>IH</sub>	—	Control input terminal	V <sub>IH</sub> = 15V	-0.1	—	0.1	μA
	"L" Level	I <sub>IL</sub>			V <sub>IL</sub> = 0V	-0.1	—	0.1	
Analog Switch ON Resistance		R <sub>ON</sub>	—	V <sub>DD</sub> = 5.0V, V <sub>SS</sub> = -5.0V	—	200	300	Ω	
				V <sub>DD</sub> = 9.0V, V <sub>SS</sub> = -9.0V	—	80	100		
				V <sub>DD</sub> = 15V, V <sub>SS</sub> = -15V	—	60	80		
Analog Switch OFF Leak		I <sub>OFF</sub>	—	V <sub>IN</sub> = V <sub>DD</sub> ~V <sub>SS</sub>	—	±0.1	±100	nA	
Total Harmonic Distortion		THD	1	f <sub>IN</sub> = 1kHz, V <sub>IN</sub> = 1V <sub>rms</sub> R <sub>g</sub> = 600Ω, R <sub>L</sub> = 10kΩ BW = 20Hz~20kHz	—	0.01	0.05	%	
Cross Talk		C <sub>T</sub>			80	90	—	dB	
Output Noise Voltage		V <sub>N</sub>			—	2.0	—	μV <sub>rms</sub>	
Maximum Control Frequency		f <sub>MAX</sub>			V <sub>IL</sub> = 0V, V <sub>IH</sub> = 5V	50	100	—	kHz
Maximum Transfer Frequency			R <sub>L</sub> = 10kΩ, C <sub>L</sub> = 15pF (*1)	—	5	—	MHz		
Field Through		F <sub>S</sub>	—	R <sub>L</sub> = 10kΩ, C <sub>L</sub> = 15pF (*2)	—	300	—	kHz	

(\*1) To supply the V<sub>IN</sub> = 1.0V<sub>rms</sub> sign wave. f<sub>MAX</sub> means 3dB down frequency from f<sub>IN</sub> = 1kHz.

(\*2) To supply the V<sub>IN</sub> = 1.0V<sub>rms</sub> sign wave. F<sub>S</sub> means frequency for cross-talk 50dB.

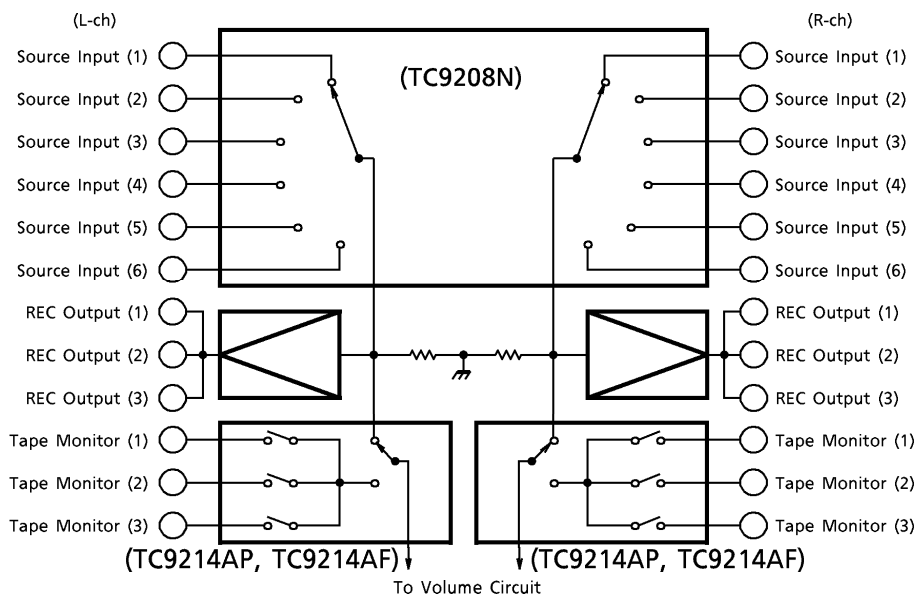
TEST CIRCUIT 1



**APPLICATION CIRCUIT**

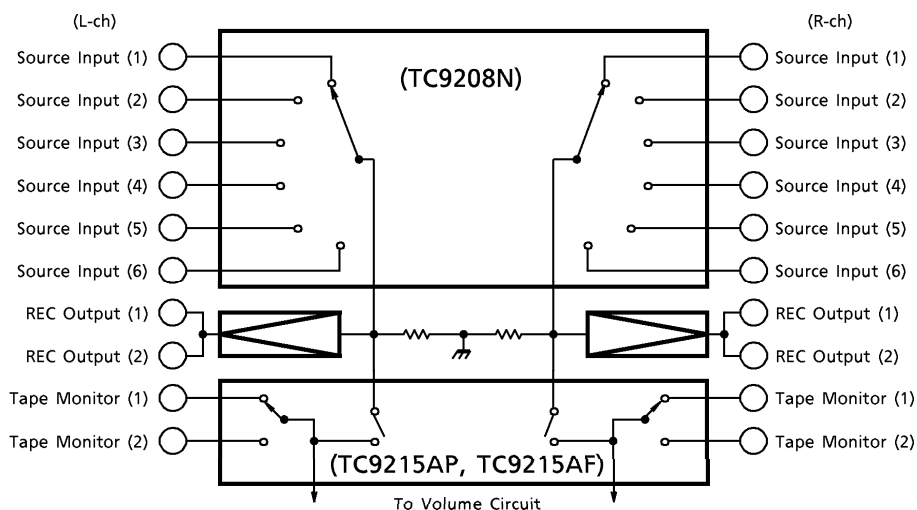
**1. TC9208N + TC9214AP, TC9214AF × 2**

- Monitor switching for 6 source input circuits and 3 tape-recorder.



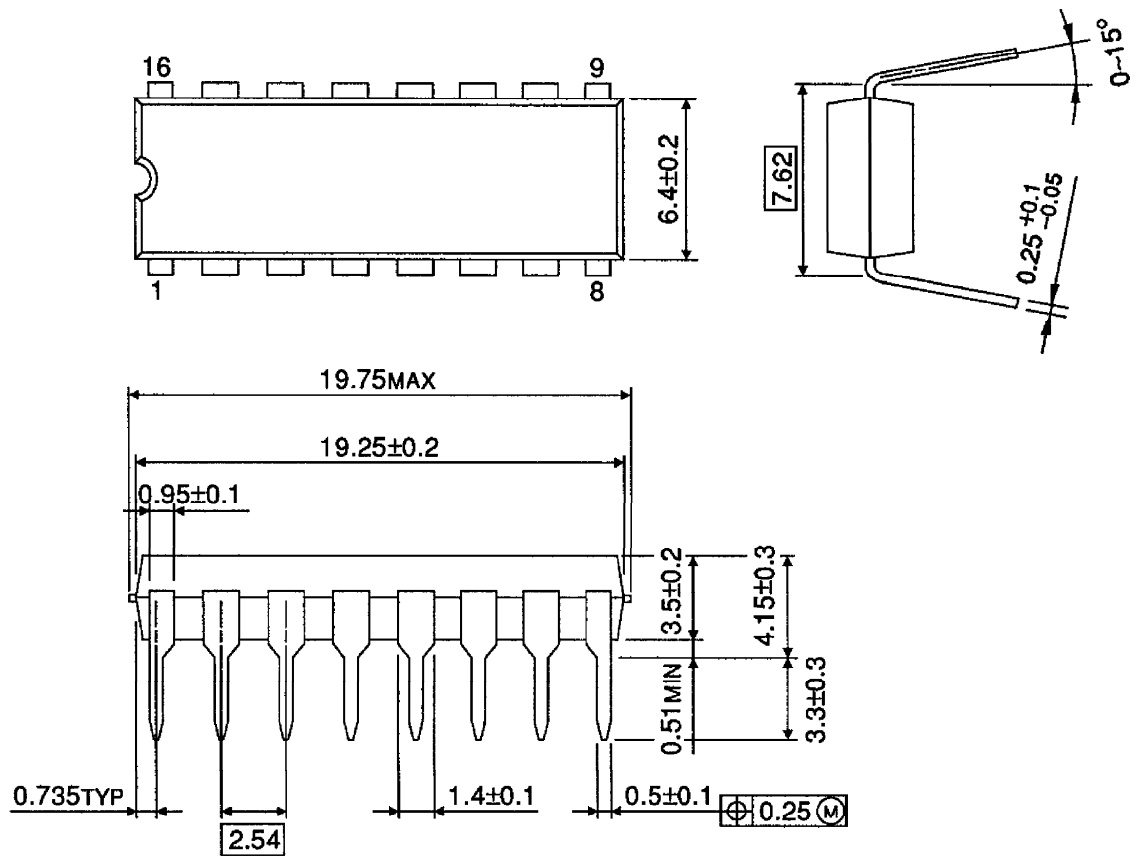
**2. TC9208N + TC9215AP, TC9215AF**

- Monitor switching for 6 source input circuits and 2 tape-recorder.



**OUTLINE DRAWING**  
DIP16-P-300-2.54A

Unit : mm

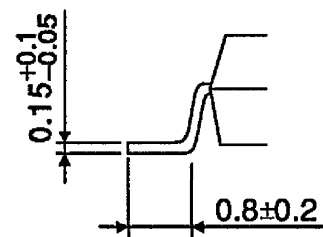
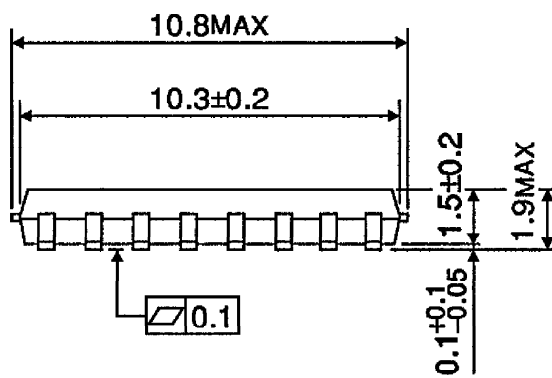
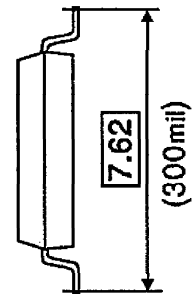
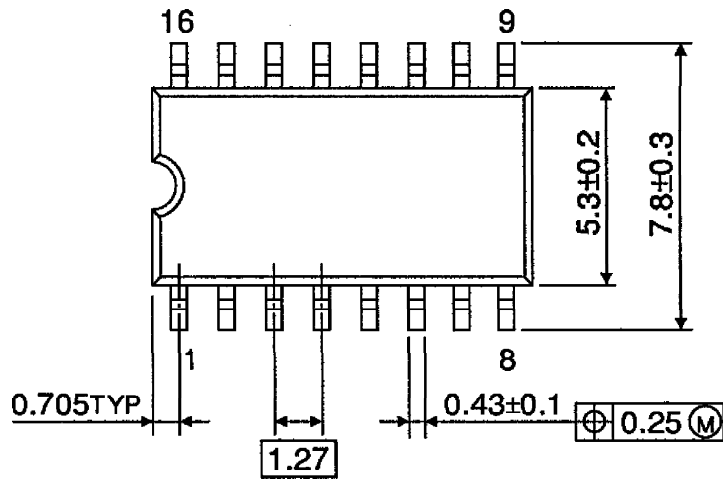


Weight : 1.0g (Typ.)



**OUTLINE DRAWING**  
SOP16-P-300-1.27

Unit : mm



Weight : 0.16g (Typ.)