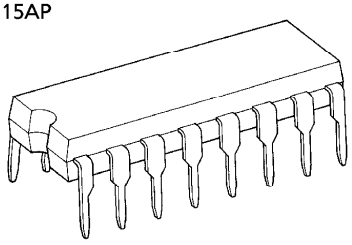
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC9214AP, TC9214AF, TC9215AP, TC9215AF

HIGH VOLTAGE ANALOG SWITCH

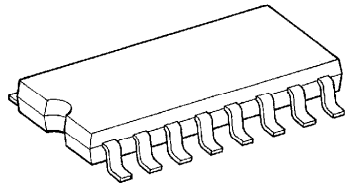
TC9214AP / AF, TC9215AP / AF are Analog Switch for high voltage audio application.

TC9214AP
TC9215AP



DIP16-P-300-2.54A

TC9214AF
TC9215AF



SOP16-P-300-1.27

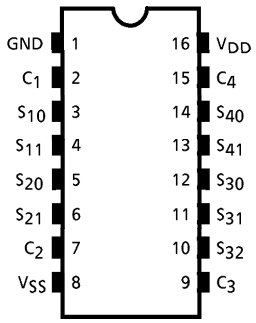
Weight
DIP16-P-300-2.54A : 1.0g (Typ.)
SOP16-P-300-1.27 : 0.16g (Typ.)

FEATURES

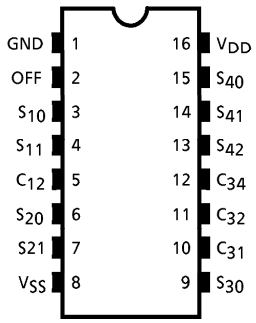
- Analog Switch Circuit Formation
  TC9214AP, TC9214AF : 5 circuits
  TC9215AP, TC9215AF : 6 circuits
- Dual Power Supply of (+) and (−) can be used.
- Including Level Shift Circuit, this IC can be operated by (+) power supply only under dual power supply operating.
- Setting Low Input-threshold-voltage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

PIN CONNECTION (TOP VIEW)

TC9214AP, TC9214AF



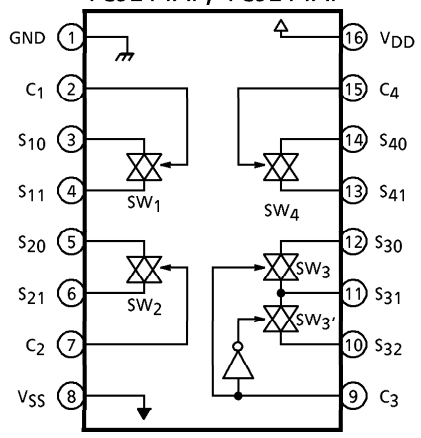
TC9215AP, TC9215AF



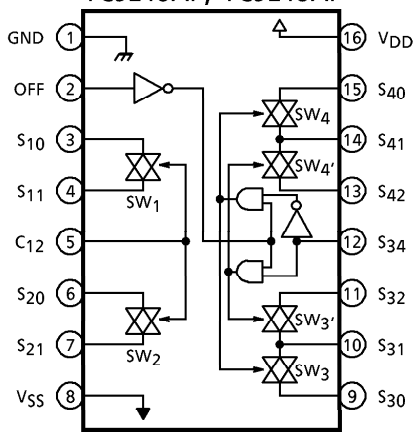
980508EBA2

BLOCK DIAGRAM

TC9214AP, TC9214AF

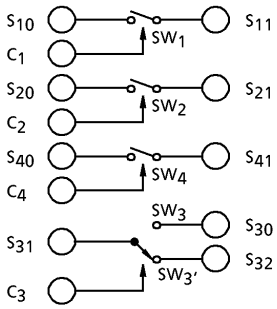


TC9215AP, TC9215AF



PIN FUNCTION

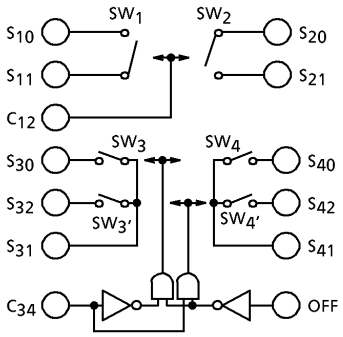
1. TC9214AP, TC9214AF

PIN No.	SYMBOL	PIN NAME	FUNCTION	NOTE
1	GND	Ground Terminal	Dual power supplying : +B →V_{DD} 0V →GND −B →V_{SS} Single power supplying: +B →V_{DD} 0V →GND, V_{SS}	—
8	V_{SS}	(−) Power Supply Terminal		
16	V_{DD}	(+) Power Supply Terminal		
2	C_1	Switch (1) Control Terminal	SWITCH CONNECTION  TRUTH TABLE	—
3	S_{10}	Switch (1) Input / Output Terminal		
4	S_{11}			
5	S_{20}	Switch (2) Input / Output Terminal		
6	S_{21}			
7	C_2	Switch (2) Control Terminal		
9	C_3	Switch (3) Control Terminal		
10	S_{32}	Switch (3) Input / Output Terminal		
11	S_{31}			
12	S_{30}			
13	S_{41}	Switch (4) Input / Output Terminal		
14	S_{40}			
15	C_4	Switch (4) Control Terminal		

C_1, C_2, C_4	SW_1, SW_2, SW_3
H	ON
L	OFF

C_3	S_{30}-S_{31}	S_{31}-S_{32}
H	ON	OFF
L	OFF	ON

2. TC9215AP, TC9215AF

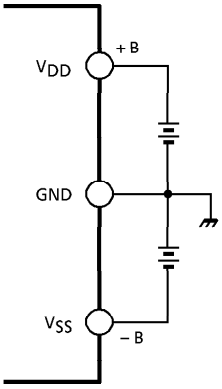
<table>
<tr><th>PIN No.</th><th>SYMBOL</th><th>PIN NAME</th><th>FUNCTION</th><th>NOTE</th></tr>
<tr><td>1</td><td>GND</td><td>Ground Terminal</td><td rowspan="3">Dual power supplying : +B →V_{DD}
0V →GND
−B →V_{SS}
Single power supplying: +B →V_{DD}
0V →GND, V_{SS}</td><td rowspan="3">—</td></tr>
<tr><td>8</td><td>V_{SS}</td><td>(−) Power Supply Terminal</td></tr>
<tr><td>16</td><td>V_{DD}</td><td>(+) Power Supply Terminal</td></tr>
<tr><td>2</td><td>OFF</td><td>Switch (3), (4) OFF Input Terminal</td><td rowspan="14">SWITCH CONNECTION
 

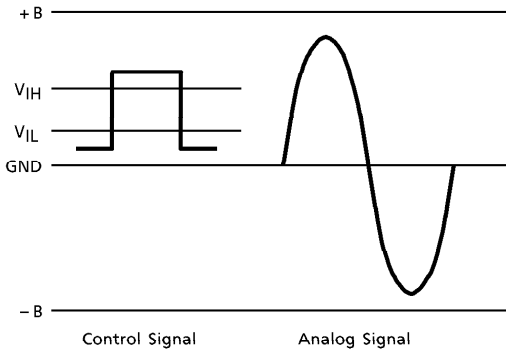
TRUTH TABLE
<table>
<tr><th>C_{12}</th><th>SW_1, SW_2</th></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td>L</td><td>OFF</td></tr>
</table>
<table>
<tr><th>OFF</th><th>C_{34}</th><th>S_{30}-S_{31}
S_{40}-S_{41}</th><th>S_{31}-S_{32}
S_{41}-S_{42}</th></tr>
<tr><td rowspan="2">L</td><td>L</td><td>ON</td><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>
</table>
(※ H or L)</td><td rowspan="14">—</td></tr>
<tr><td>3</td><td>S_{10}</td><td rowspan="2">Switch (1) Input / Output Terminal</td></tr>
<tr><td>4</td><td>S_{11}</td></tr>
<tr><td>5</td><td>C_{12}</td><td>Switch (1), (2) Control Terminal</td></tr>
<tr><td>6</td><td>S_{20}</td><td rowspan="2">Switch (2) Input / Output Terminal</td></tr>
<tr><td>7</td><td>S_{21}</td></tr>
<tr><td>9</td><td>S_{30}</td><td rowspan="3">Switch (3) Input / Output Terminal</td></tr>
<tr><td>10</td><td>S_{31}</td></tr>
<tr><td>11</td><td>S_{32}</td></tr>
<tr><td>12</td><td>C_{34}</td><td>Switch (3), (4) Control Terminal</td></tr>
<tr><td>13</td><td>S_{42}</td><td rowspan="3">Switch (4) Input / Output Terminal</td></tr>
<tr><td>14</td><td>S_{41}</td></tr>
<tr><td>15</td><td>S_{40}</td></tr>
</table>

NOTATION : POWER SUPPLY

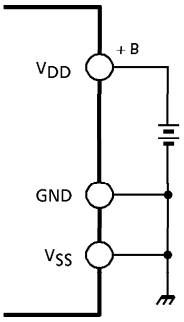
As the power supply is parted between analog switch unit and control unit, the analog switch unit operates in dual power supply of (+) and (−), in which case, the control unit operates in single power supply. Setting a low input-threshold voltage in control input terminal, 5V CPU application can control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

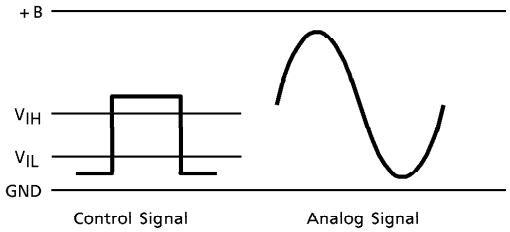
Dual power supply use





Single power supply use





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

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage (1)	V_{DD}-V_{SS}	− 0.3~36	V
Power Supply Voltage (2)	V_{DD}-GND	− 0.3~20	V
GND Input Voltage	V_{IN} (1)	− 0.3~V_{DD} + 0.3	V
V_{SS} Input Voltage	V_{IN} (2)	V_{SS} − 0.3~V_{DD} + 0.3	V
Power Dissipation	P_D	600 (300)	mW
Operating Temperature	T_{opr}	− 40~85	°C
Storage Temperature	T_{stg}	− 65~150	°C

( ) : SOP-16 pin.

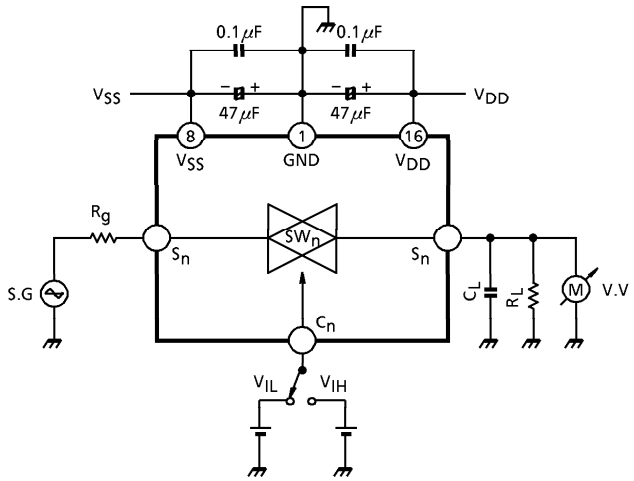
ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{DD} = 15V, V_{SS} = − 15V, GND = 0V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
Operating Supply Voltage (1)		V_{DD}-V_{SS}	—	Dual power supplying		9.0	~	34	V
Operating Supply Voltage (2)		V_{DD}-GND		Single power supplying		4.5	~	18	
Operating Supply Current		I_{DD}	—	No load, No signal		—	0.1	0.5	mA
Input Voltage	"H" Level	V_{IH}	—	Control input terminal V_{DD} = 4.5~18V		4.0	~	V_{DD}	V
	"L" Level	V_{IL}				GND	~	1.0	
Input Current	"H" Level	I_{IH}	—	Control input terminal	V_{IH} = 15V	− 0.1	—	0.1	μA
	"L" Level	I_{IL}			V_{IL} = 0V	− 0.1	—	0.1	
Analog Switch ON Resistance		R_{ON}	—	V_{DD} = 5.0V, V_{SS} = − 5.0V		—	200	300	Ω
				V_{DD} = 9.0V, V_{SS} = − 9.0V		—	80	100	
				V_{DD} = 15V, V_{SS} = − 15V		—	60	80	
Analog Switch OFF Leak		I_{OFF}	—	V_{IN} = V_{DD}~V_{SS}		—	± 0.1	± 100	nA
Total Harmonic Distortion		THD	1	f_{IN} = 1kHz, V_{IN} = 1V_{rms} R_g = 600Ω, R_L = 10kΩ BW = 20Hz~20kHz		—	0.01	0.05	%
Cross Talk		C_T				80	90	—	dB
Output Noise Voltage		V_N				—	2.0	—	μV_{rms}
Maximum Control Frequency		f_{MAX}		V_{IL} = 0V, V_{IH} = 5V		50	100	—	kHz
Maximum Transfer Frequency				R_L = 10kΩ, C_L = 15pF (*1)		—	5	—	MHz
Field Through		F_S		R_L = 10kΩ, C_L = 15pF (*2)		—	300	—	kHz

(*1) To supply the V_{IN} = 1.0V_{rms} sign wave. f_{MAX} means 3dB down frequency from f_{IN} = 1kHz.

(*2) To supply the V_{IN} = 1.0V_{rms} sign wave. F_S means frequency for cross-talk 50dB.

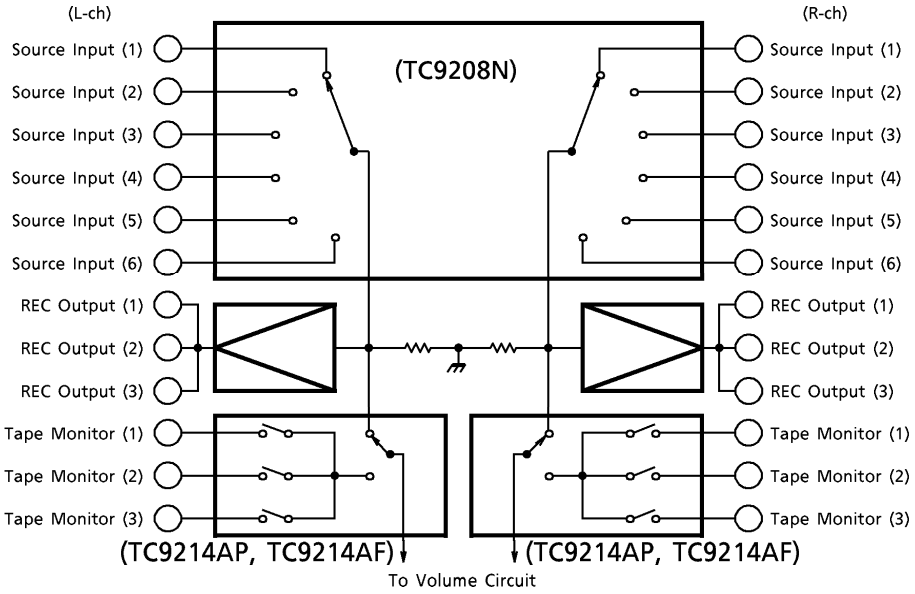
TEST CIRCUIT 1



APPLICATION CIRCUIT

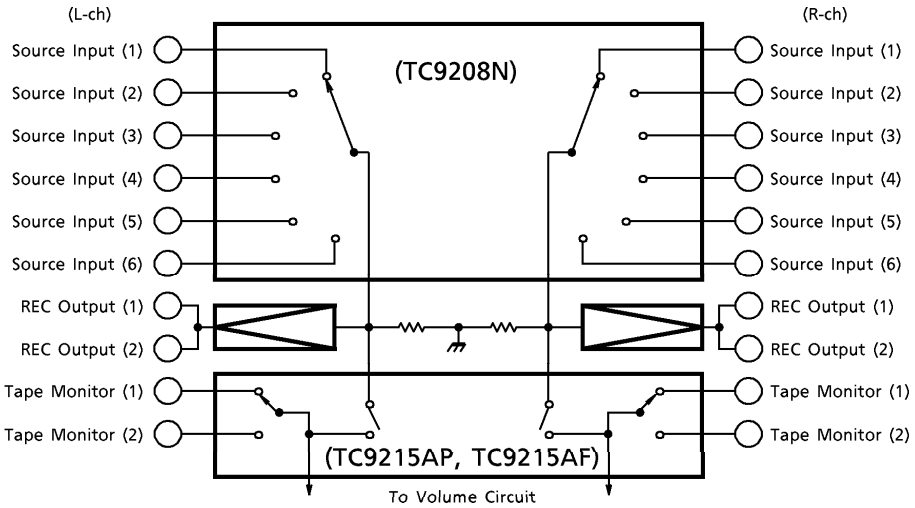
1. TC9208N + TC9214AP, TC9214AF × 2

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



2. TC9208N + TC9215AP, TC9215AF

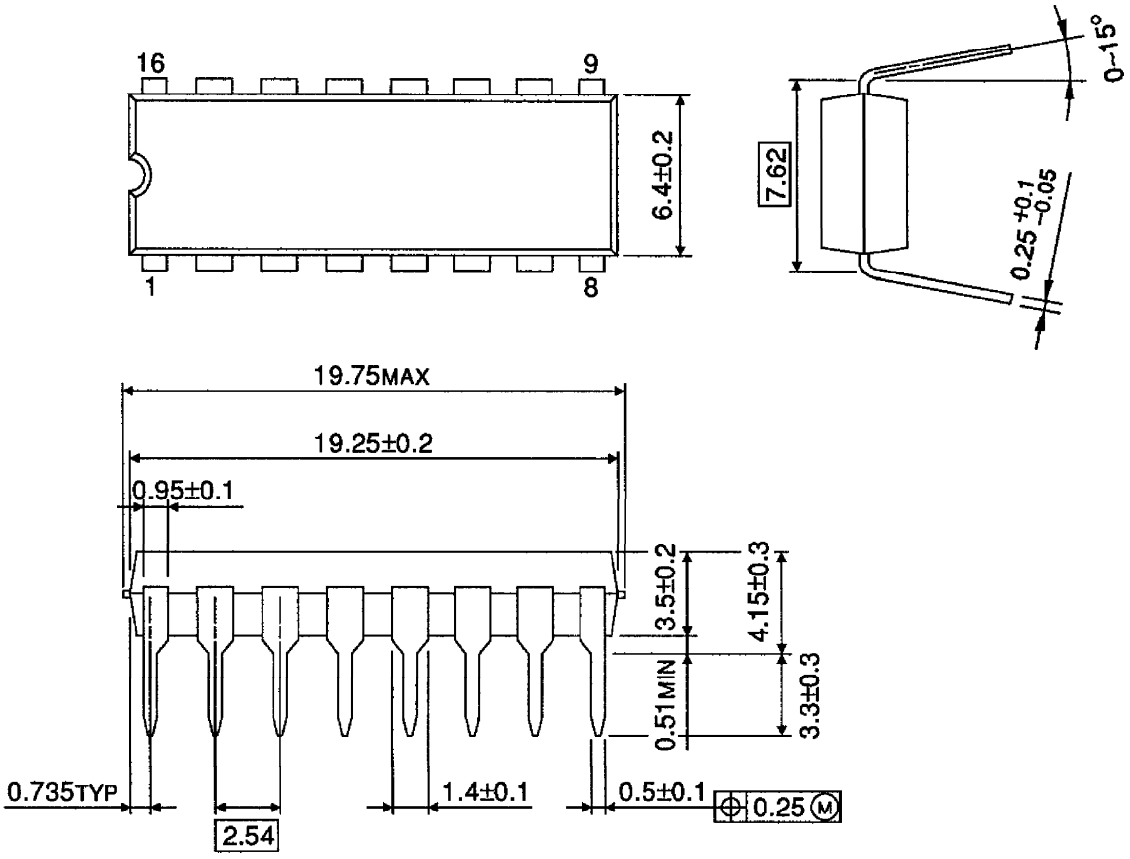
   - Monitor switching for 6 source input circuits and 2 tape-recoder.



OUTLINE DRAWING

DIP16-P-300-2.54A

Unit : mm

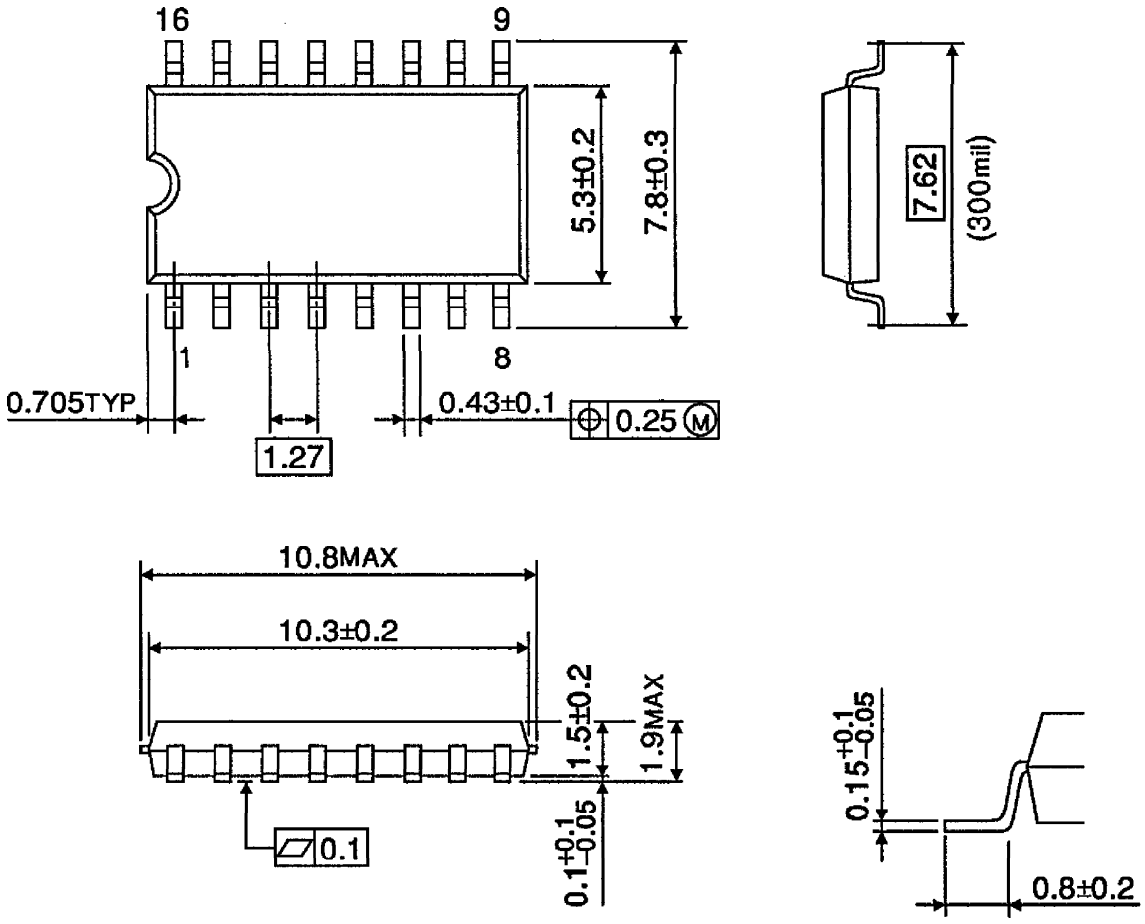


Weight : 1.0g (Typ.)

OUTLINE DRAWING

SOP16-P-300-1.27

Unit : mm



Weight : 0.16g (Typ.)