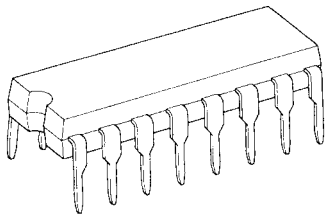
TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC9214AP,TC9214AF,TC9215AP,TC9215AF

High Voltage Analog Switch

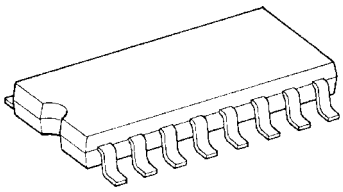
TC9214AP/AF, TC9215AP/AF are analog switch for high voltage audio application.

TC9214AP, TC9215AP



DIP16-P-300-2.54A

TC9214AF, TC9215AF



SOP16-P-300-1.27

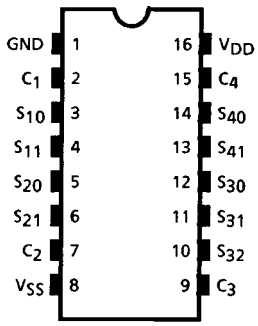
Weight
DIP16-P-300-2.54A: 1.0 g (typ.)
SOP16-P-300-1.27: 0.16 g (typ.)

Features

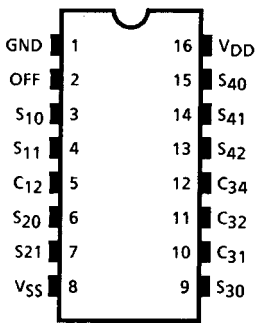
- Analog switch circuit formation
  TC9214AP, TC9214AF: 5 circuits
  TC9215AP, TC9215AF: 6 circuits
- Dual power supply of (+) and (−) can be used.
- Including level shift circuit, this IC can be operated by (+) power supply only under dual power supply operating.
- Setting low input-threshold-voltage in control signal input terminal. 5 V CPU application can control this IC directly.
- Package: DIP-16 pin
  SOP-16 pin

Pin Assignment (top view)

TC9214AP, TC9214AF

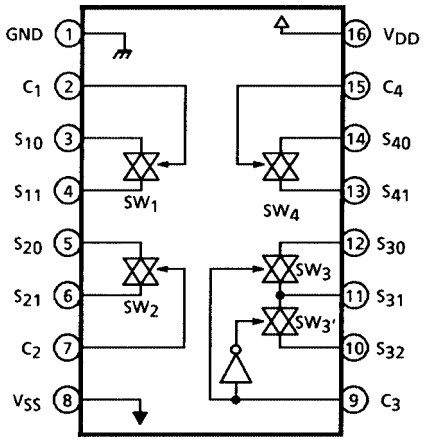


TC9215AP, TC9215AF

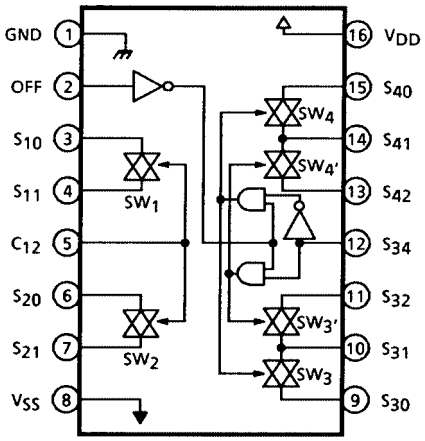


Block Diagram

TC9214AP, TC9214AF

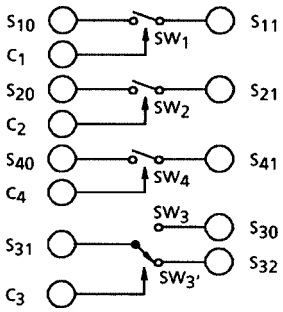


TC9215AP, TC9215AF



Pin Function

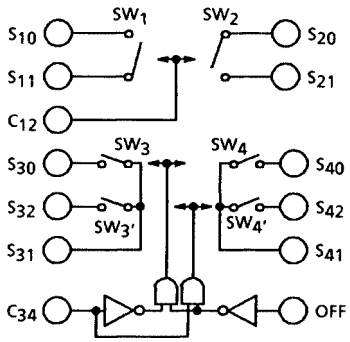
1. TC9214AP, TC9214AF

Pin No.	Symbol	Pin Name	Function	Note
1	GND	Ground Terminal	Dual power supplying: +B → V_{DD} 0 V → GND −B → V_{SS} Single power supplying: +B → V_{DD} 0 V → 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

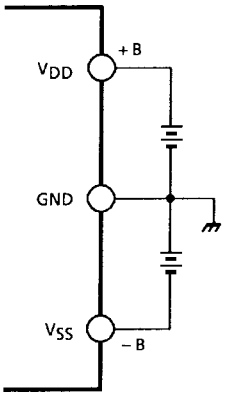
<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Pin Name</th><th>Function</th><th>Note</th></tr>
<tr><td>1</td><td>GND</td><td>Ground Terminal</td><td rowspan="3">Dual power supplying: +B → V_{DD}
0 V → GND
−B → V_{SS}
Single power supplying: +B → V_{DD}
0 V → GND, V_{SS}</td><td rowspan="3">—</td></tr>
<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="15">SWITCH CONNECTION
 

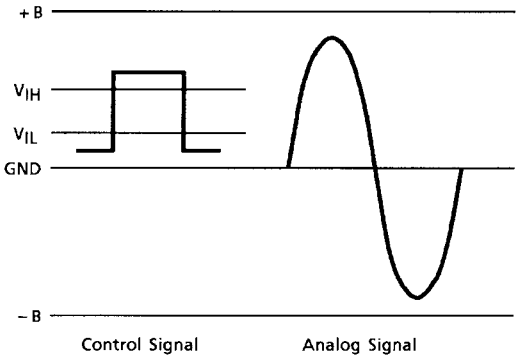
TRUTH TABLE
<table>
<tr><th>C_{12}</th><th>SW_1, SW_2</th></tr>
<tr><td>H</td><td>ON</td></tr>
<tr><td>L</td><td>OFF</td></tr>
</table>
<table>
<tr><th>OFF</th><th>C_{34}</th><th>S_{30}-S_{31}
S_{40}-S_{41}</th><th>S_{31}-S_{32}
S_{41}-S_{42}</th></tr>
<tr><td rowspan="2">L</td><td>L</td><td>ON</td><td>OFF</td></tr>
<tr><td>H</td><td>OFF</td><td>ON</td></tr>
<tr><td>H</td><td>(Note 1)</td><td>OFF</td><td>OFF</td></tr>
</table>
Note 1: H or L</td><td rowspan="15">—</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

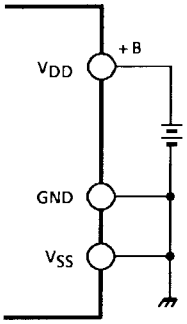
As the power supply is parted between analog switch unit and control unit, the analog switch unit operates in dual power supply of (+) and (−), in which case, the control unit operates in single power supply. Setting a low input-threshold voltage in control input terminal, 5 V CPU application can control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

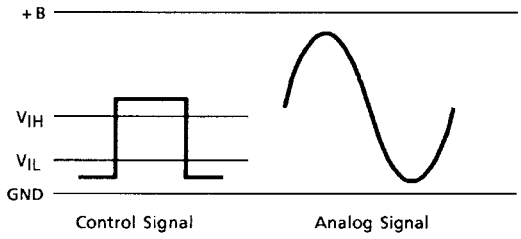
Dual Power Supply Use





Single Power Supply Use





Note 2: 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 ≦ 18 V)

Maximum Ratings (Ta = 25°C)

Characteristics	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.

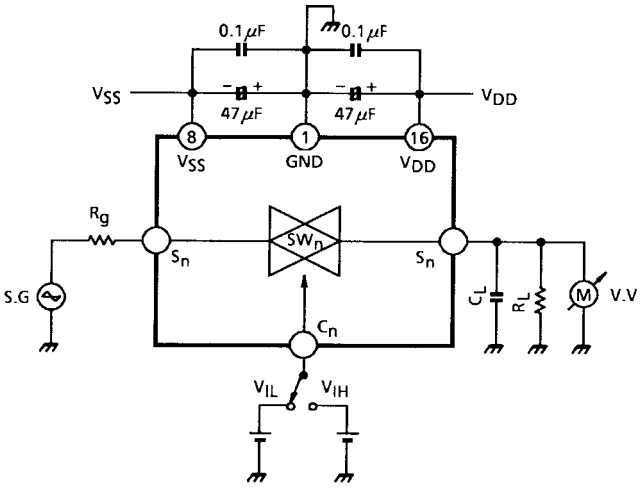
Electrical Characteristics
(unless otherwise specified, V_{DD} = 15 V, V_{SS} = −15 V, GND = 0 V, Ta = 25°C)

Characteristics		Symbol	Test Circuit	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	V
Operating supply current		I_{DD}	—	No load, No signal		—	0.1	0.5	mA
Input voltage	"H" level	V_{IH}	—	Control input terminal		4.0	~	V_{DD}	V
	"L" level	V_{IL}		V_{DD} = 4.5~18 V		GND	~	1.0	
Input current	"H" level	I_{IH}	—	Control input terminal	V_{IH} = 15 V	−0.1	~	0.1	μA
	"L" level	I_{IL}			V_{IL} = 0 V	−0.1	~	0.1	
Analog switch ON resistance		R_{ON}	—	V_{DD} = 5.0 V, V_{SS} = −5.0 V		—	200	300	Ω
				V_{DD} = 9.0 V, V_{SS} = −9.0 V		—	80	100	
				V_{DD} = 15 V, V_{SS} = −15 V		—	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} = 1 kHz, V_{IN} = 1 V_{rms}		—	0.01	0.05	%
Cross talk		C_T		R_g = 600 Ω, R_L = 10 kΩ		80	90	—	dB
Output noise voltage		V_N		BW = 20 Hz~20 kHz		—	2.0	—	μV_{rms}
Maximum control frequency		f_{max}		V_{IL} = 0 V, V_{IH} = 5 V		50	100	—	kHz
Maximum transfer frequency				R_L = 10 kΩ, C_L = 15 pF (Note 3)		—	5	—	MHz
Field through		F_S		R_L = 10 kΩ, C_L = 15 pF (Note 4)		—	300	—	kHz

Note 3: To supply the V_{IN} = 1.0 V_{rms} sign wave. f_{max} means 3dB down frequency from f_{IN} = 1 kHz.

Note 4: To supply the V_{IN} = 1.0 V_{rms} sign wave. F_S means frequency for cross-talk 50dB.

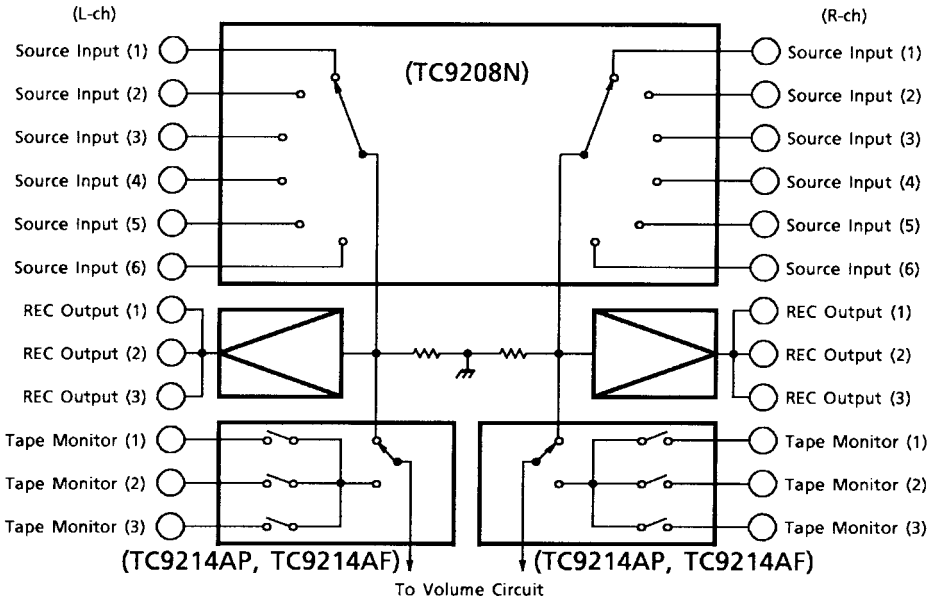
Test Circuit 1



Application Circuit

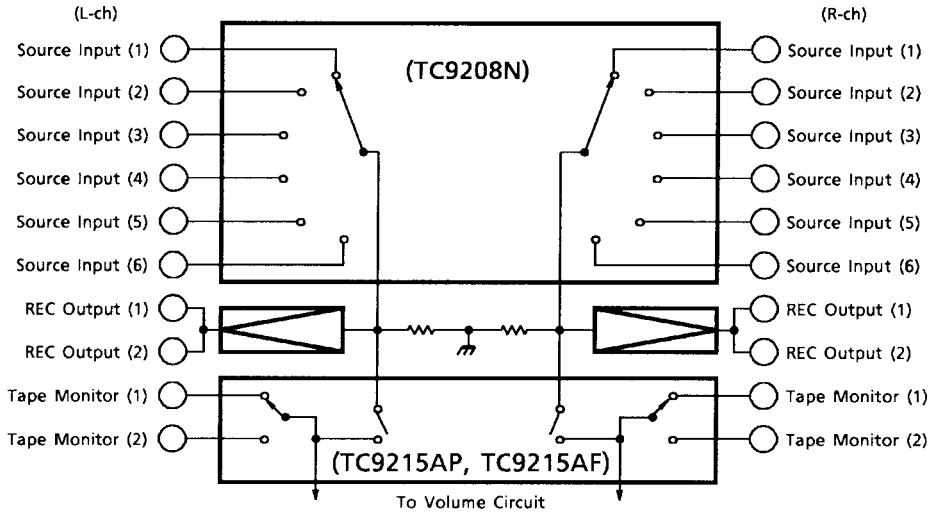
1. TC9208N + TC9214AP, TC9214AF × 2

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



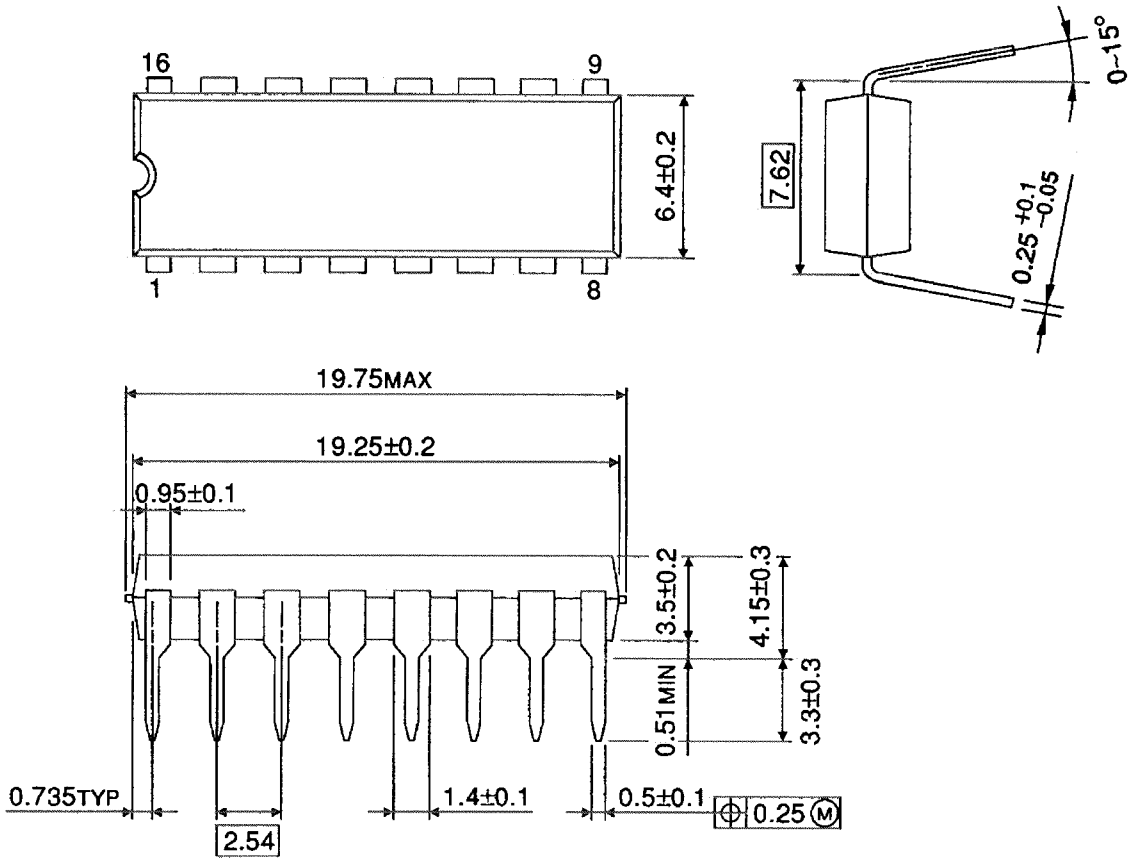
2. TC9208N + TC9215AP, TC9215AF

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



Package Dimensions

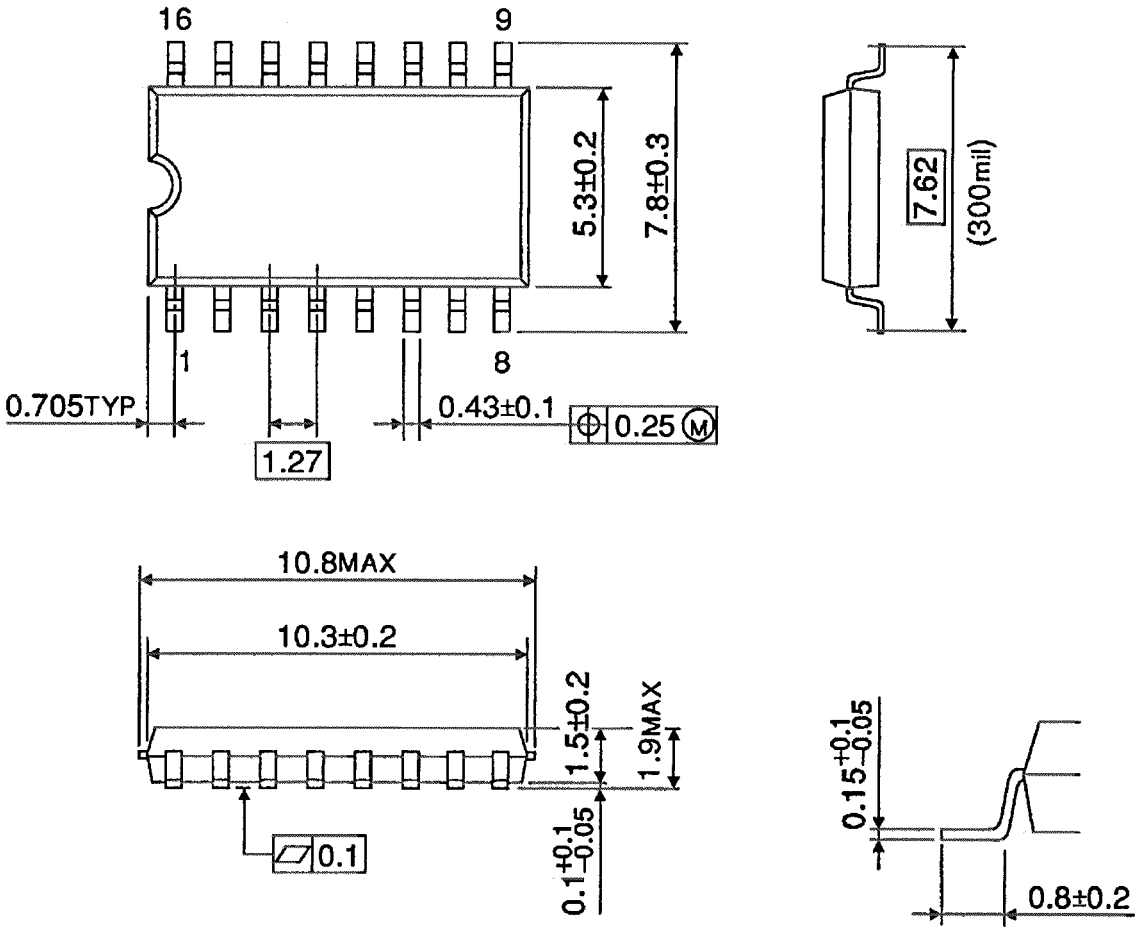
DIP16-P-300-2.54A Unit : mm



Weight: 1.0 g (typ.)

Package Dimensions

SOP16-P-300-1.27 Unit : mm



Weight: 0.16 g (typ.)

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