

# M51326P

## Analog switch

REJ03F0079-0100Z

Rev.1.0

Sep.22.2003

### Description

The M51326P is a semiconductor integrated circuit for use as an analog switch in image-handling equipment. The IC incorporates two audio switches, one with two and one with three inputs, and one video switch with two inputs. Each switch is independently controllable.

### Features

- Built-in analog switches for use with video signals and stereo audio signals
- Wide video-switch bandwidth: DC to 10 MHz
- Good crosstalk characteristics (for video): 55 dB (typ.) @5 MHz

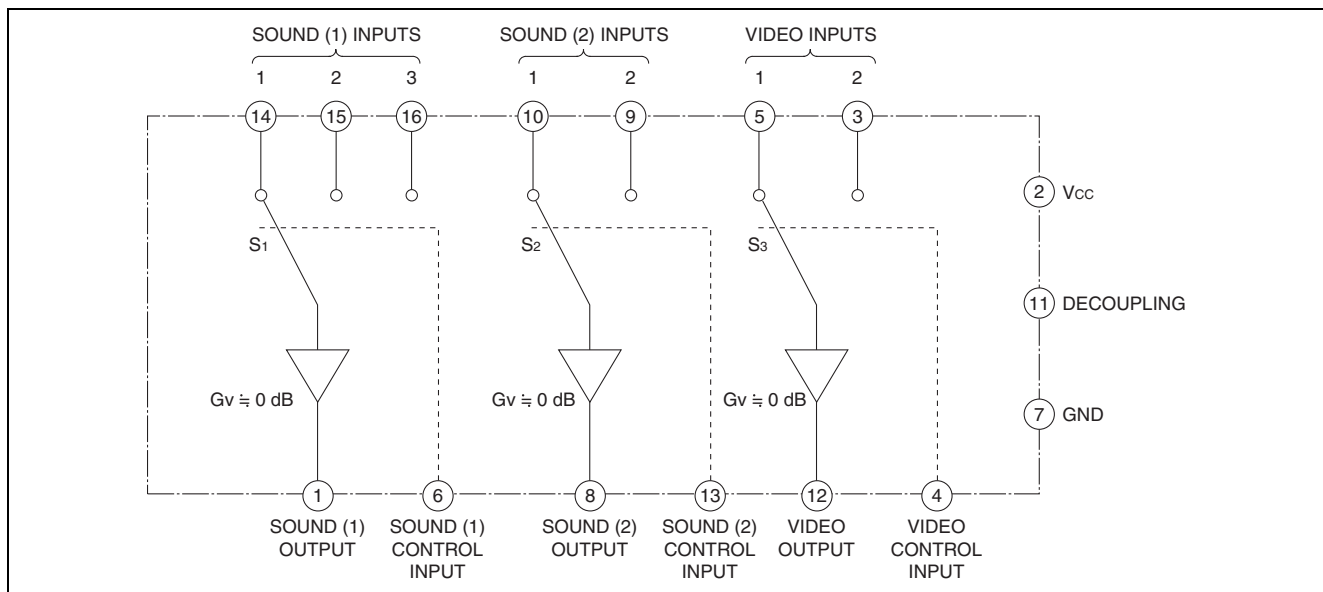
### Applications

- Video equipment

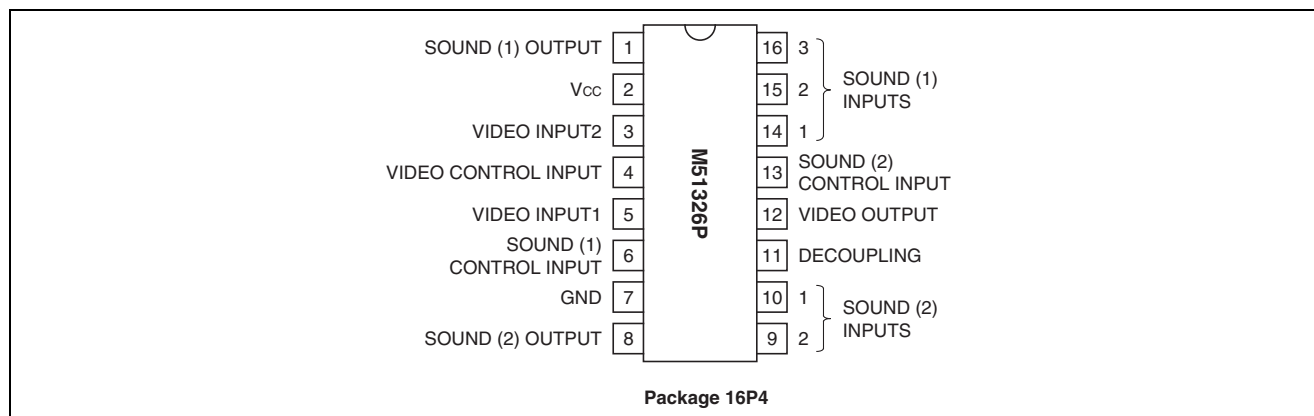
### Recommended operating condition

- Power-supply-voltage range: 5 to 14 V
- Rated power-supply voltage: 9 V, 12 V

### Block diagram



## Pin Configuration



## Absolute maximum ratings

(unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{cc} = 12\text{ V}$ )

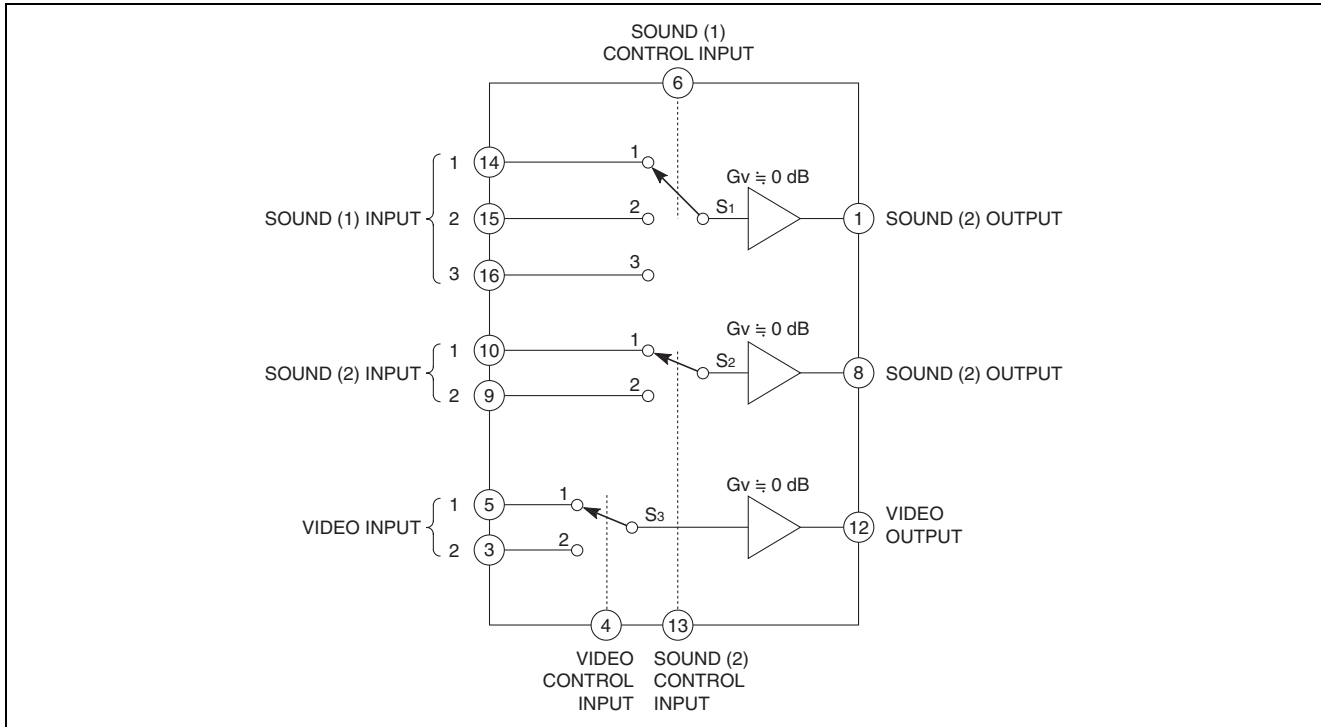
Symbol	Item	Ratings	Unit
$V_{cc}$	Power-supply voltage	14	V
$V_{IS}$	Input signal voltage	6	V
$V_{IC}$	Input control voltage	$V_{cc}$	V
$P_d$	Power dissipation	1.25	W
$K\theta$	Thermal derating	1.25	mW / $^\circ\text{C}$
$T_{opr}$	Ambient operating temperature	-20 to +75	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-40 to +125	$^\circ\text{C}$

## Electrical characteristics

(unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{cc} = 12\text{ V}$ )

Symbol	Item	Measured condition	Limits			Unit
			Min.	Typ.	Max.	
$I_{CC}$	Circuit current		-	28	36	mA
$V_{IDC}$	Input bias voltage		3.8	4.2	4.6	V
$V_{ODC}$	Output bias voltage		3.0	3.6	4.2	V
$\Delta V_{ODC}$	Output DC offset voltage		-	15	100	mV
$V_{ICH}$	Control-pin threshold voltage	For audio (1) (pin 6 tri - state input)	7.0	8.0	9.0	V
$V_{ICL}$		For audio (1) (pin 6 tri - state input)	3.0	4.0	5.0	V
$V_{IC}$		For audio (2) and images (pins 4, 13)	1.7	2.1	2.5	V
$G_v$	Voltage gain	$f = 1\text{ kHz}$ ,	-0.5	-0.1	-	dB
THD	Total harmonic distortion	For audio, $f = 1\text{ kHz}$ , $V_o = 1\text{ V}_{rms}$	-	0.02	0.2	%
$V_N$	Output noise voltage	For audio, $R_g = 600\ \Omega$ , bandwidth = 15 kHz	-	3	50	$\mu\text{V}_{rms}$
		For video, $R_g = 75\ \Omega$ , bandwidth = 10 MHz	-	0.5	1.0	mV $_{rms}$
CT	Crosstalk	$f = 1\text{ kHz}$ (for audio)	65	80	-	dB
		$f = 5\text{ MHz}$ (for video)	45	50	-	

## Switching mode



## Selection of switch settings

Control input*	Switch number		
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>
H	1	1	1
M	2	(Note)	(Note)
L	3	2	2

Note: connect to V<sub>cc</sub> or GND

## Control input voltage (pin 6)

Control input	V <sub>cc</sub>	
	9 V	12 V
H	7.2 to 9 V	9.2 to 12 V
M	4.2 to 4.8 V	5.2 to 6.8 V
L	0 to 1.8 V	0 to 2.8 V

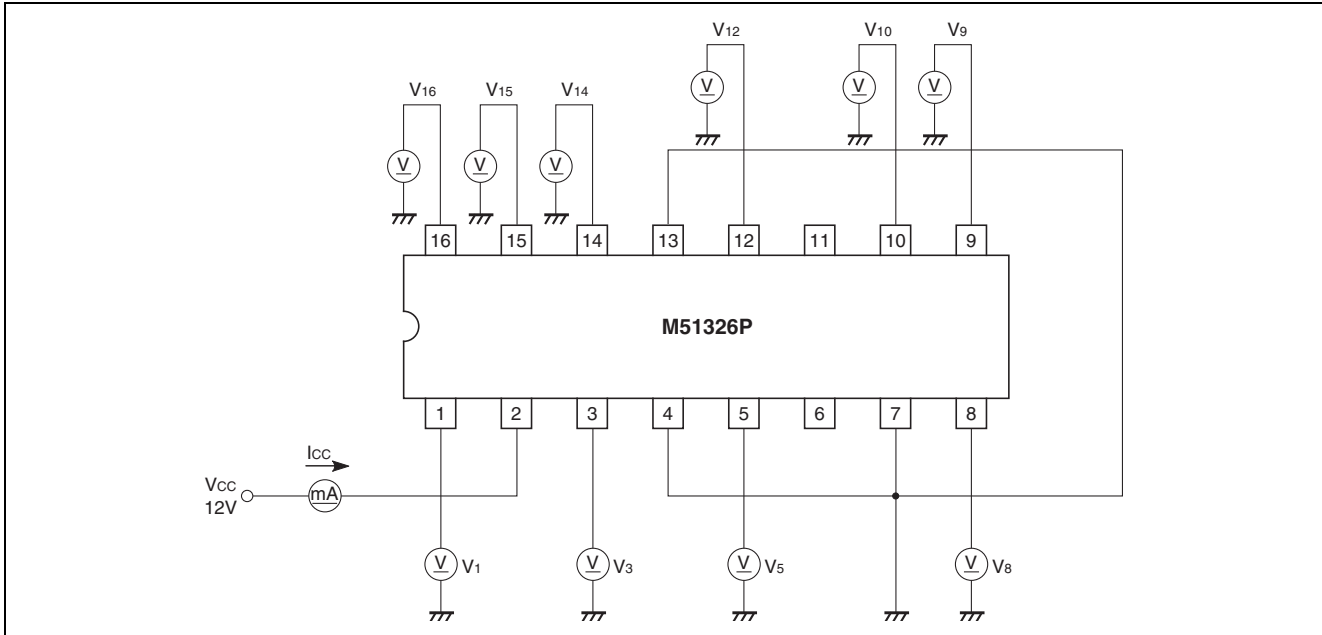
## Control input voltage (pins 4, 13)

Control input	V <sub>cc</sub>	
	9 V	12 V
H	2.7 to 9 V	2.7 to 12 V
L	0 to 1.5 V	0 to 1.5 V

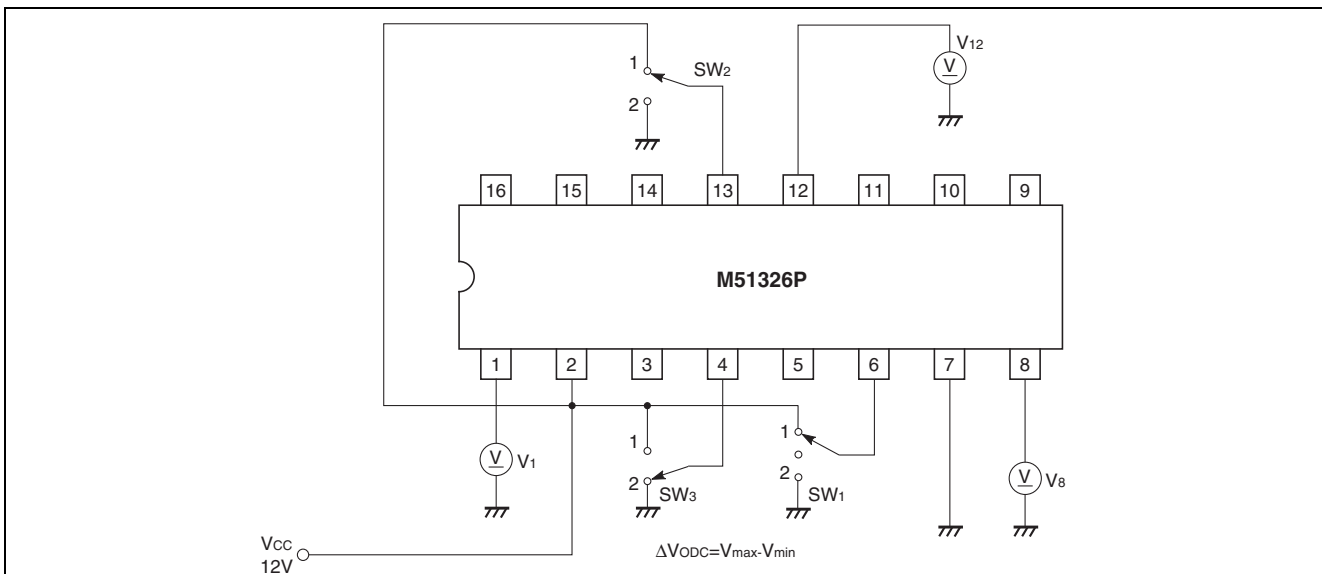
## Measurement circuit

(unless otherwise noted,  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 12\text{ V}$ )

### Measurement circuit for circuit current $I_{CC}$ , input bias voltage $V_{IDC}$ , output bias voltage $V_{ODC}$



### Measurement circuit output DC - offset voltage

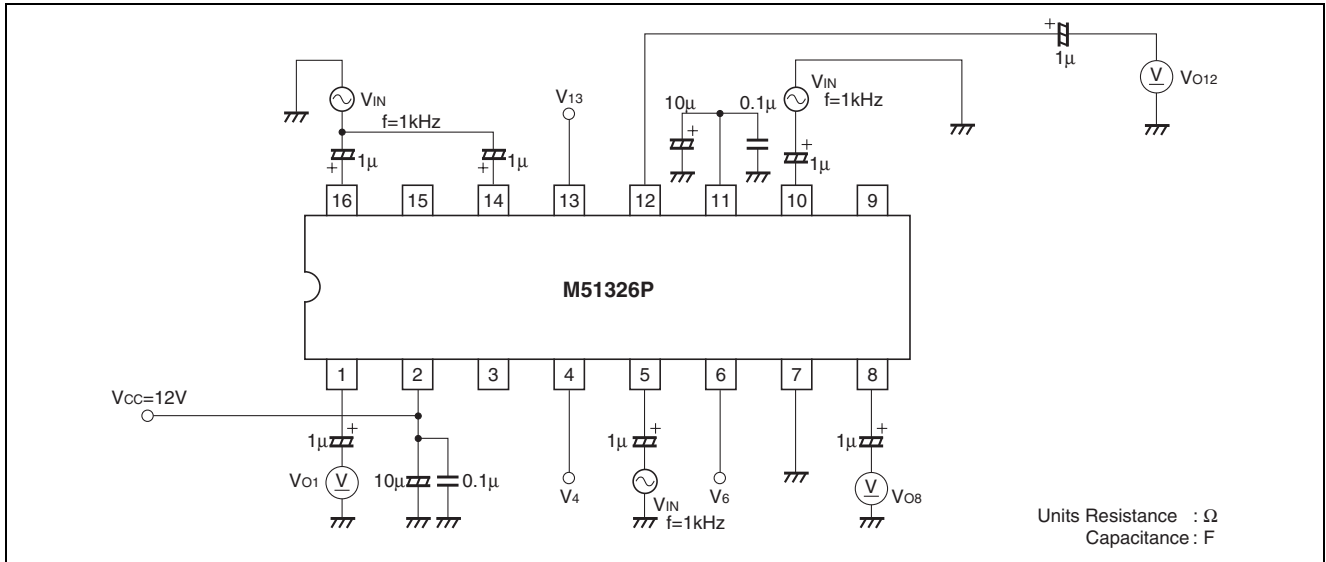


Video : DC voltages on V12 are measured while switch 1 is at setting 2 and switch 2 is at setting 2, before and after switch 3 is turned to setting 1 or 2.

Sound (1): DC voltages on V1 are measured while switch 2 is at setting 2 and switch 3 is at setting 2, and switch 3 is turned to setting 1, 2, or 3.

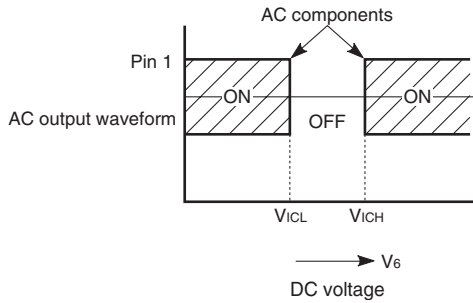
Sound (2): DC voltages on V8 are measured while switch 1 is at setting 2 and switch 3 is at setting 2, before and after switch 2 is turned from to setting 1 or 2.

Measurement circuit for control - pin threshold - voltage values



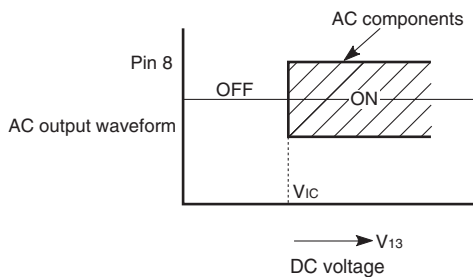
Sound (1) measuring the control-pin threshold-voltage value:

Firstly, DC voltage  $V_6$  is increased from 3 V to 5 V. Here, we take  $V_{ICL}$  as the  $V_6$  value at which the AC component in the output waveform from pin 1 is turned off. Then, DC voltage  $V_6$  is increased from 7 V to 9 V. Here, we take  $V_{ICH}$  as the  $V_6$  value at which the AC component in the output waveform from pin 1 is turned on



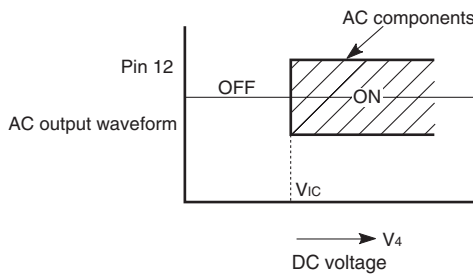
Sound (2) measuring the control-pin threshold-value voltage:

DC voltage  $V_{13}$  is increased from 1 V to 3 V. Here, we take the  $V_{13}$  value at which the AC component in the output waveform from pin 8 is turned on as  $V_{IC}$ .

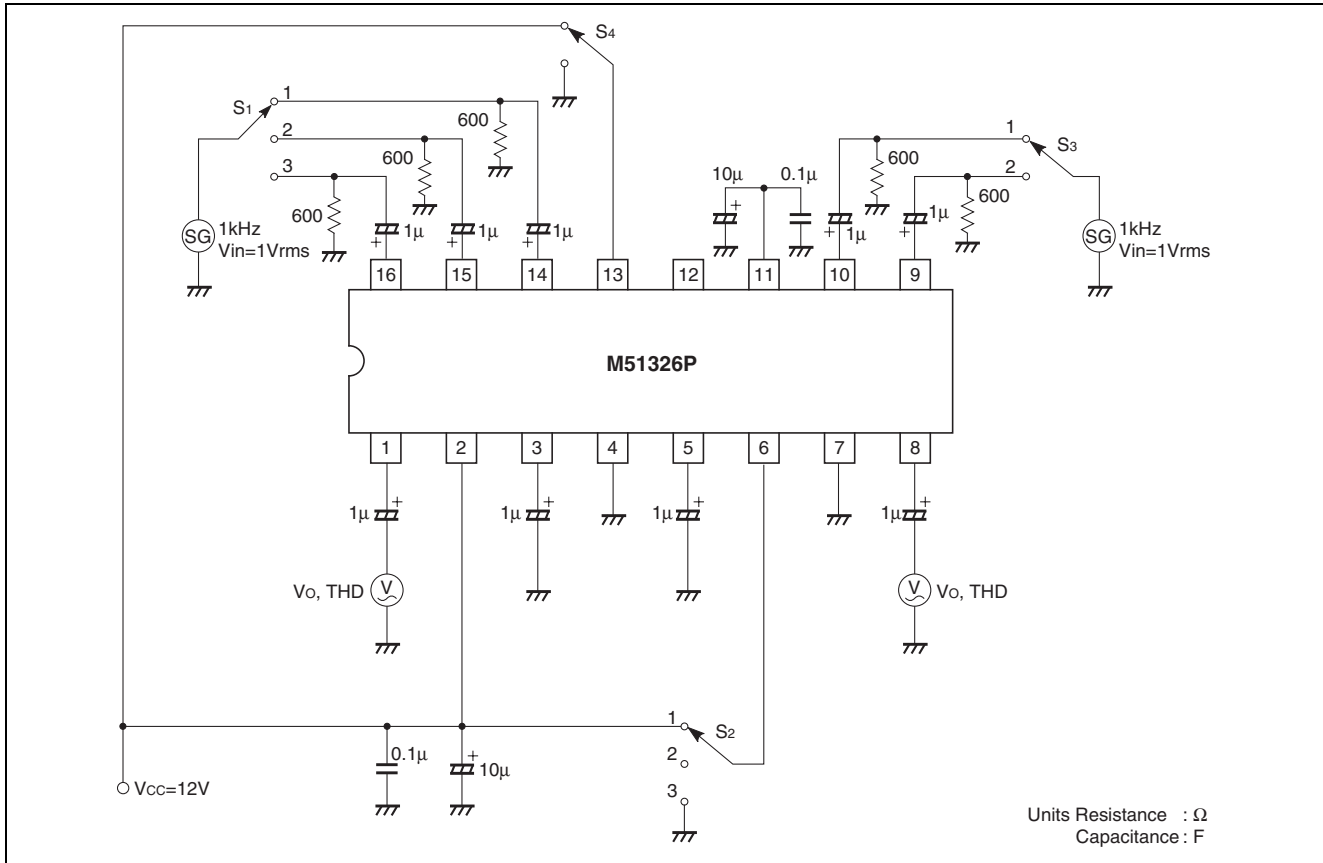


Measuring the image control pin threshold value voltage:

DC voltage  $V_4$  is increased from 1 V to 3 V. This time, we take the  $V_{14}$  value at which the AC component in the output waveform from pin 12 is turned on as  $V_{IC}$ .



Measurement circuit for crosstalk and total harmonic distortion rate (switches for audio)



Relation between the switch states and the monitor output

Switch state

S <sub>1</sub>	S <sub>2</sub>	Pin 1 output
1	1	V <sub>os</sub> , THD
	2,3	V <sub>oc</sub>
2	2	V <sub>os</sub> , THD
	1,3	V <sub>oc</sub>
3	3	V <sub>os</sub> , THD
	1,2	V <sub>oc</sub>

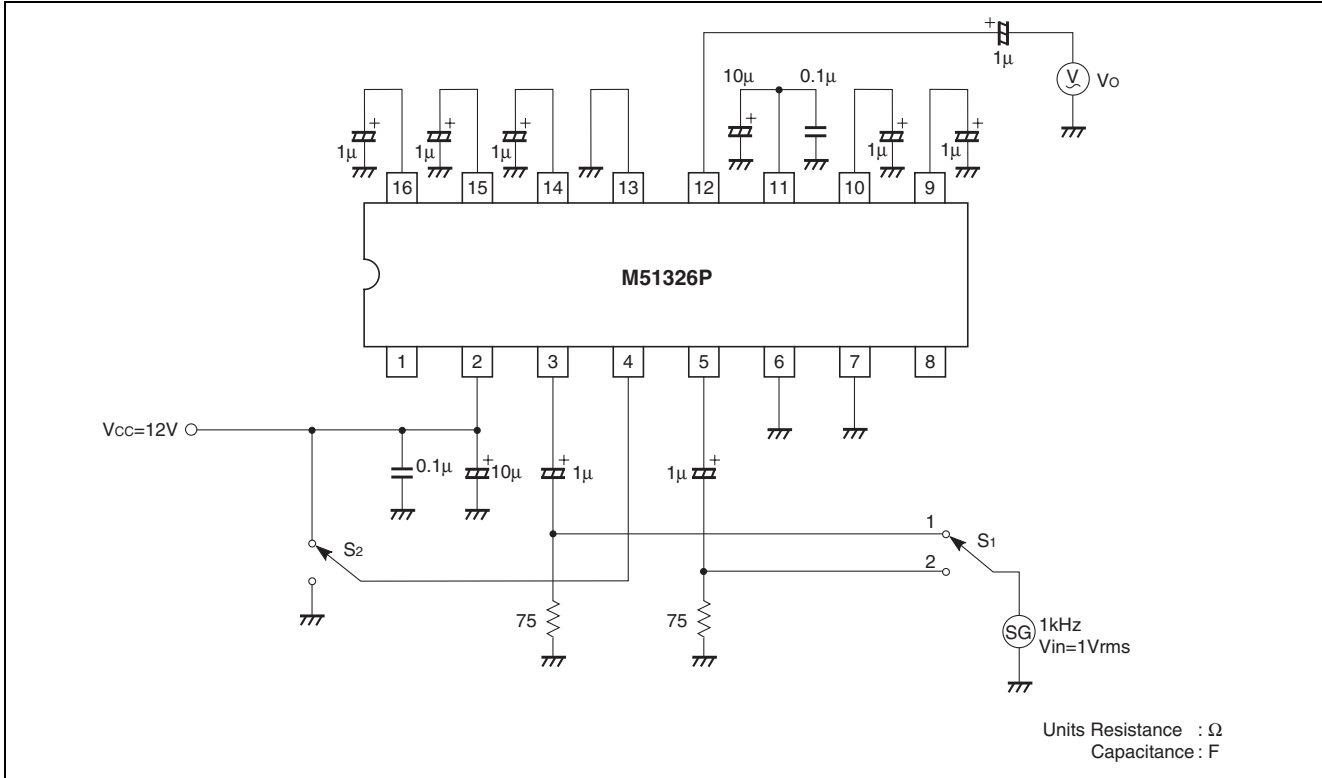
Switch state

S <sub>3</sub>	S <sub>4</sub>	Pin 8 output
1	1	V <sub>oc</sub>
	2	V <sub>oc</sub>
2	1	V <sub>oc</sub>
	2	V <sub>oc</sub> , THD

Crosstalk: CT = 20log (V<sub>os</sub>/V<sub>oc</sub>) (dB)

Voltage gain: GV = 20log (V<sub>os</sub>/V<sub>in</sub>) (dB)

Measurement circuit for crosstalk and voltage gain (video switch)



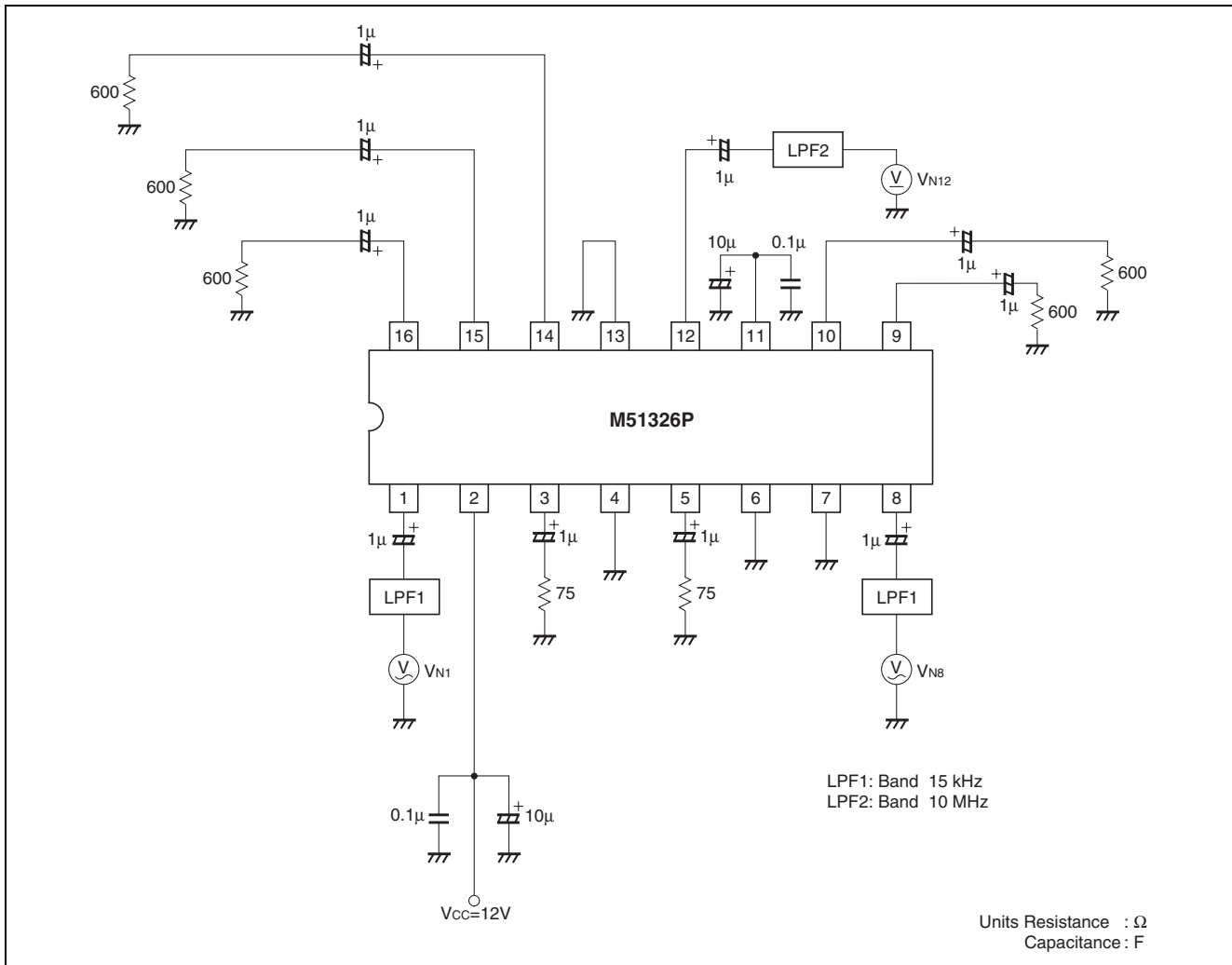
Switch state		Pin 12 output
S1	S2	
1	1	Vos
	2	Voc
2	1	Voc
	2	Vos

Crosstalk:  $CT = 20\log (Vos/Voc)$  (dB)

Voltage gain:  $GV = 20\log (Vos/Vin)$  (dB)

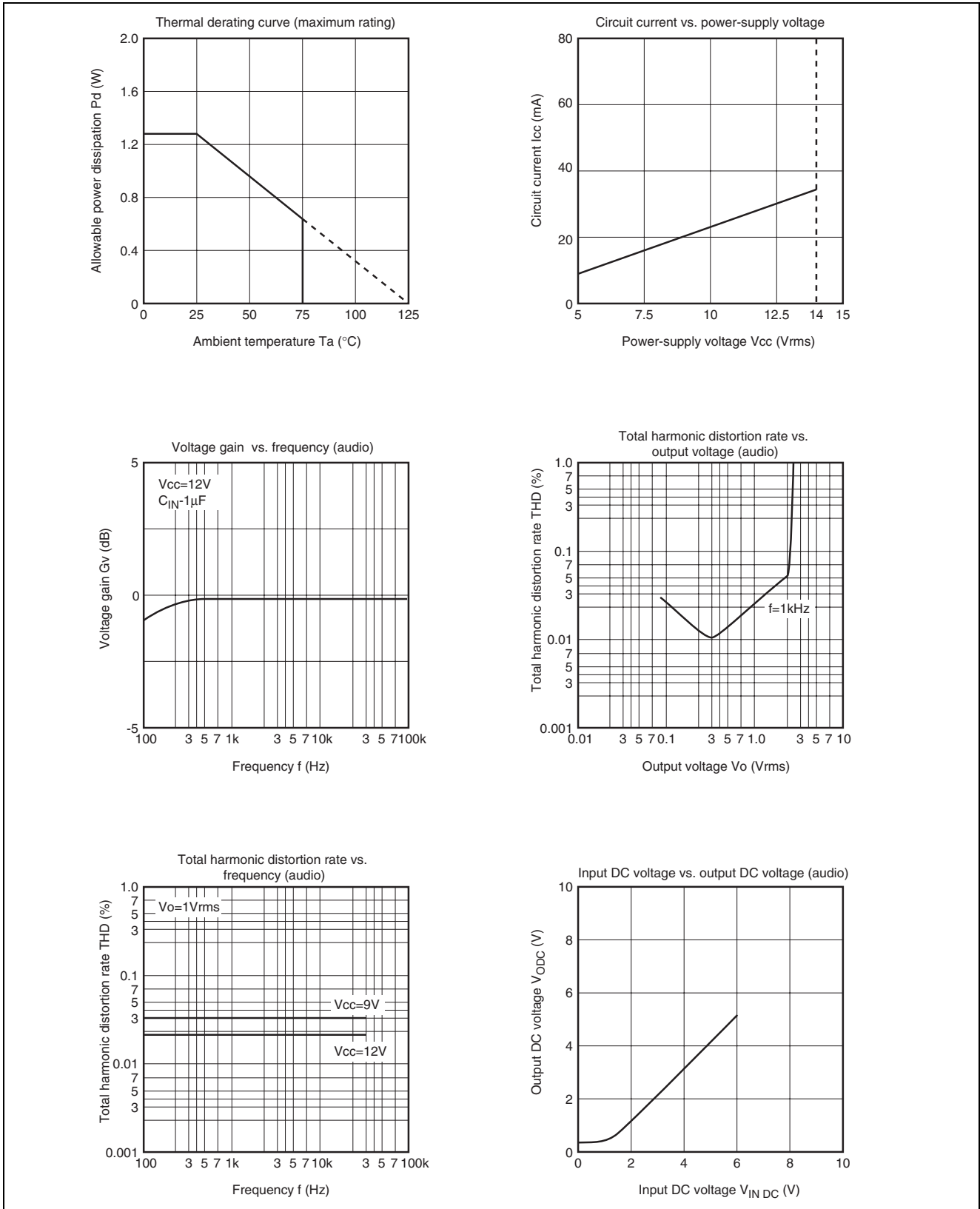


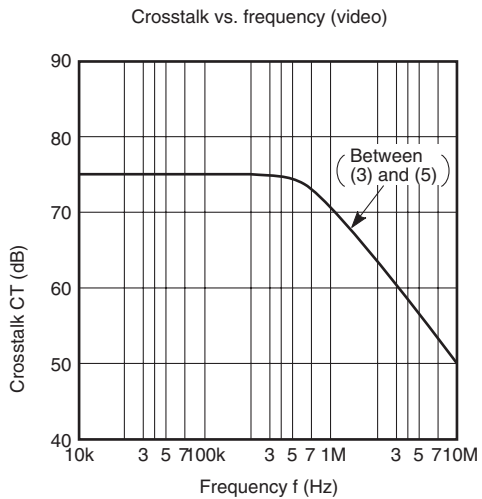
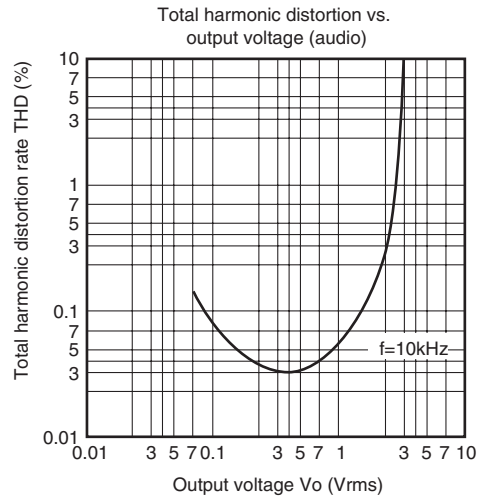
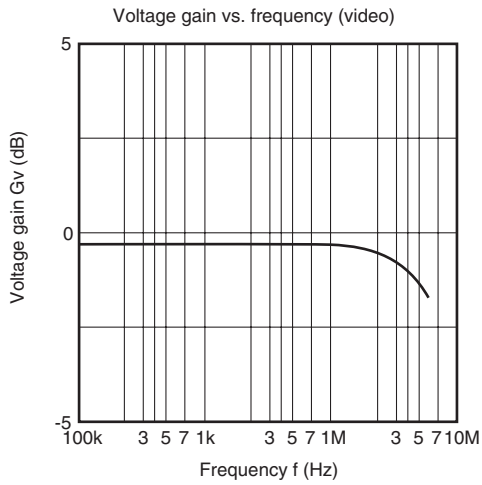
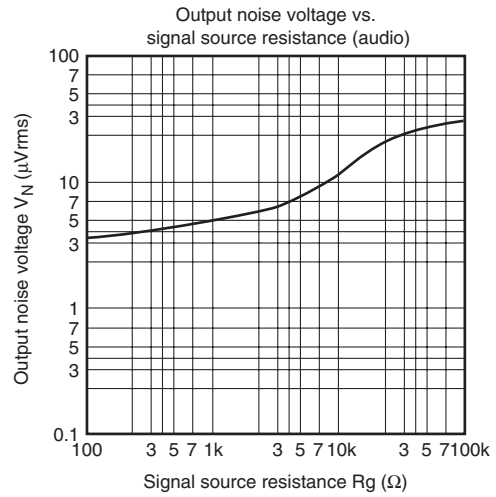
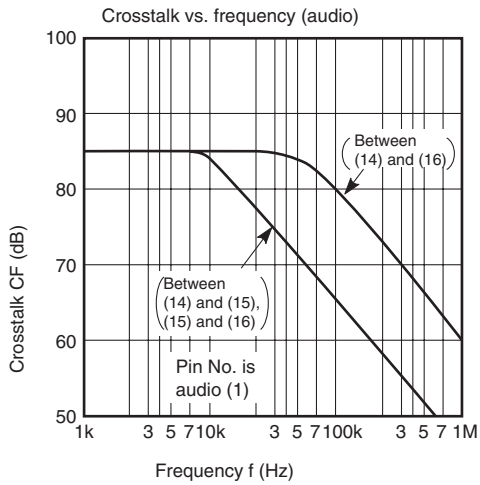
Measurement circuit for output noise voltage



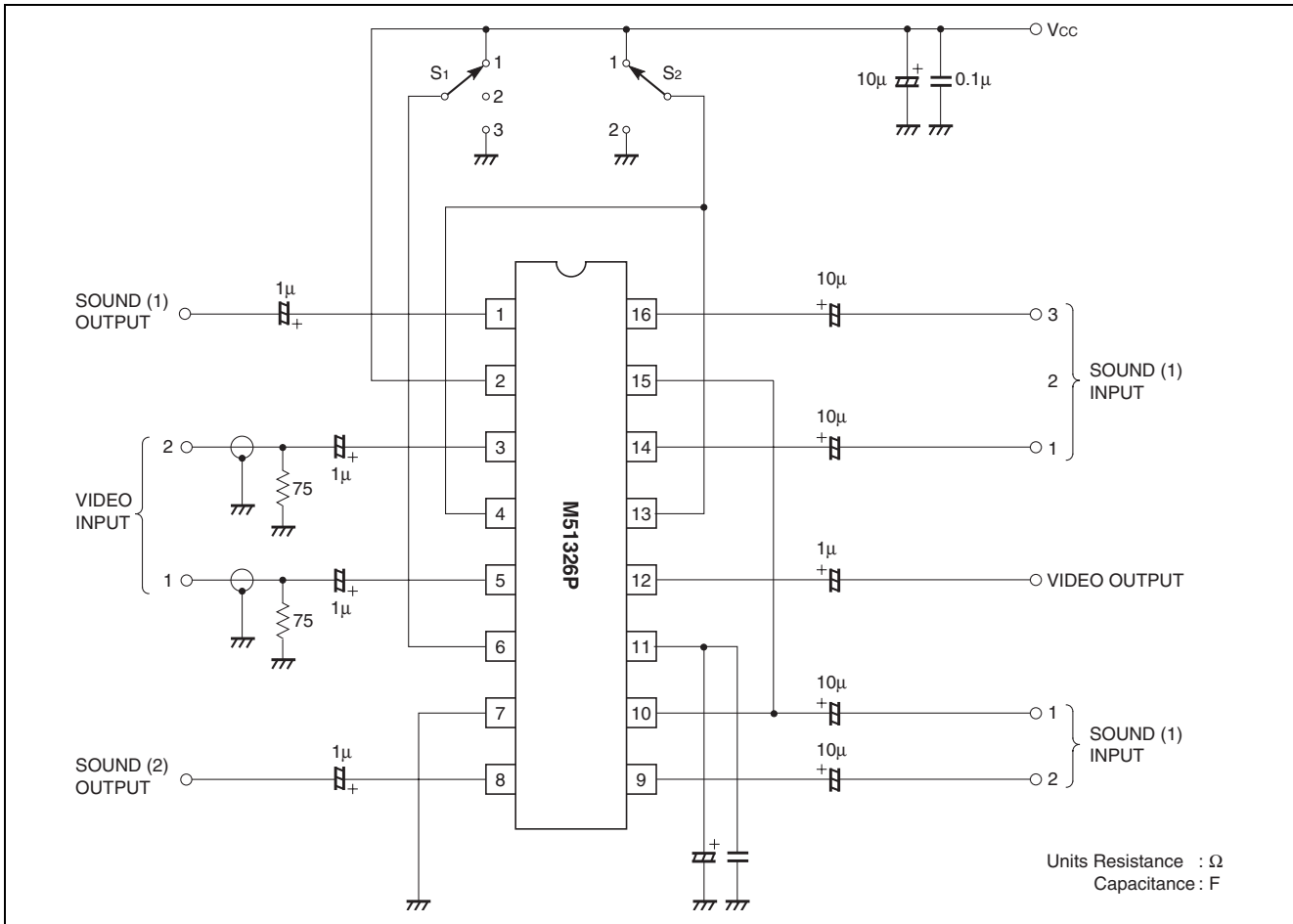
Characteristic curves

(unless otherwise noted,  $T_a = 25^\circ\text{C}$ )





Application Example



Precautions on usage

Both the video and audio outputs are emitter follower. Accordingly, when the external wiring is long or a capacitive load is added, add a resistor with a value of the tens of ohms order in series near the position of the output pin.

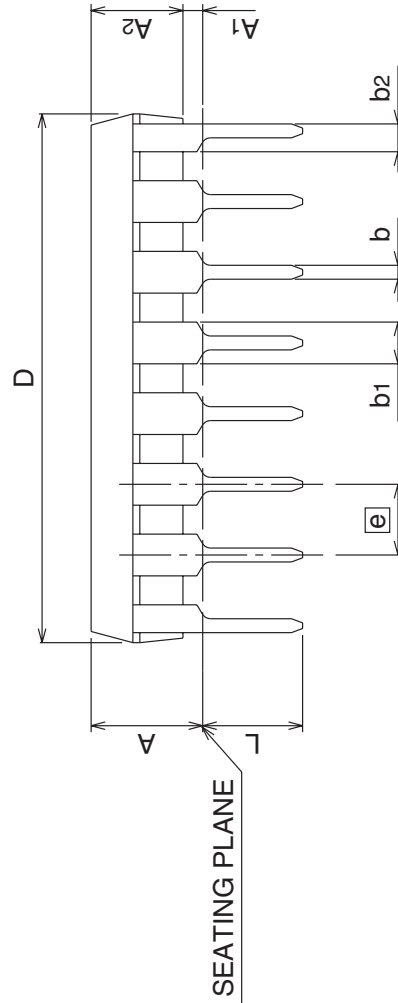
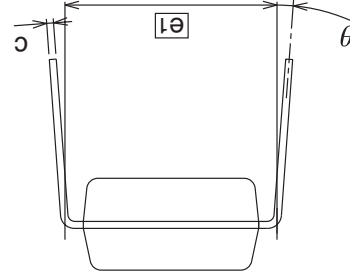
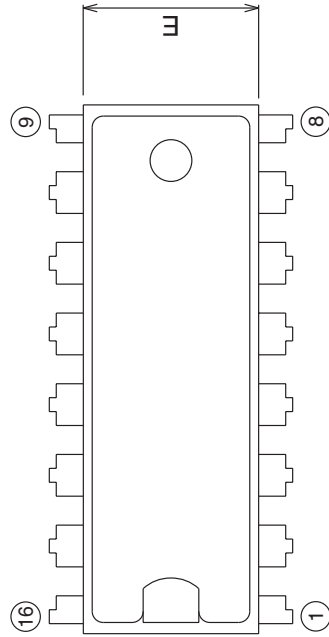
Package Dimension

**16P4**

**MMP**

**Plastic 16pin 300mil DIP**

EIAJ Package Code DIP16-P-300-2.54	JEDEC Code -	Weight(g) 1.0	Lead Material Alloy 42/Cu Alloy
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Symbol	Dimension in Millimeters		
	Min	Norm	Max
A	-	-	4.5
A1	0.51	-	-
A2	-	3.3	-
b	0.4	0.5	0.59
b1	1.4	1.5	1.8
b2	0.9	1.0	1.3
c	0.22	0.27	0.34
D	18.8	19.0	19.2
E	6.15	6.3	6.45
e	-	2.5	-
ei	-	7.62	-
L	3.0	-	-
θ	0°	-	15°

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