

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

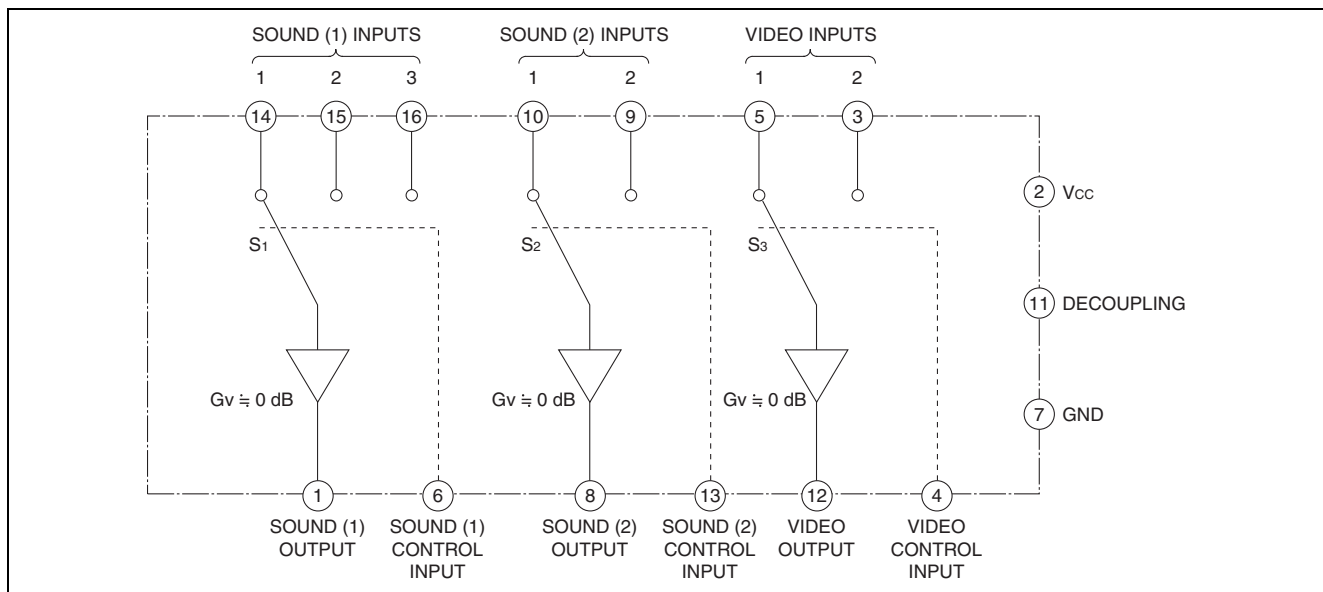
Applications

- Video equipment

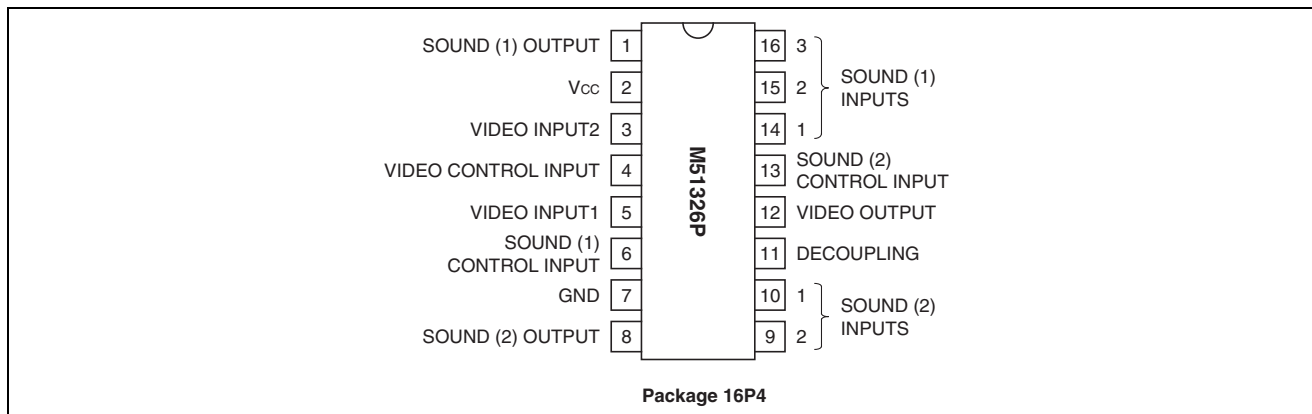
Recommended operating condition

- 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, $T_a = 25^\circ\text{C}$, $V_{cc} = 12\text{ V}$)

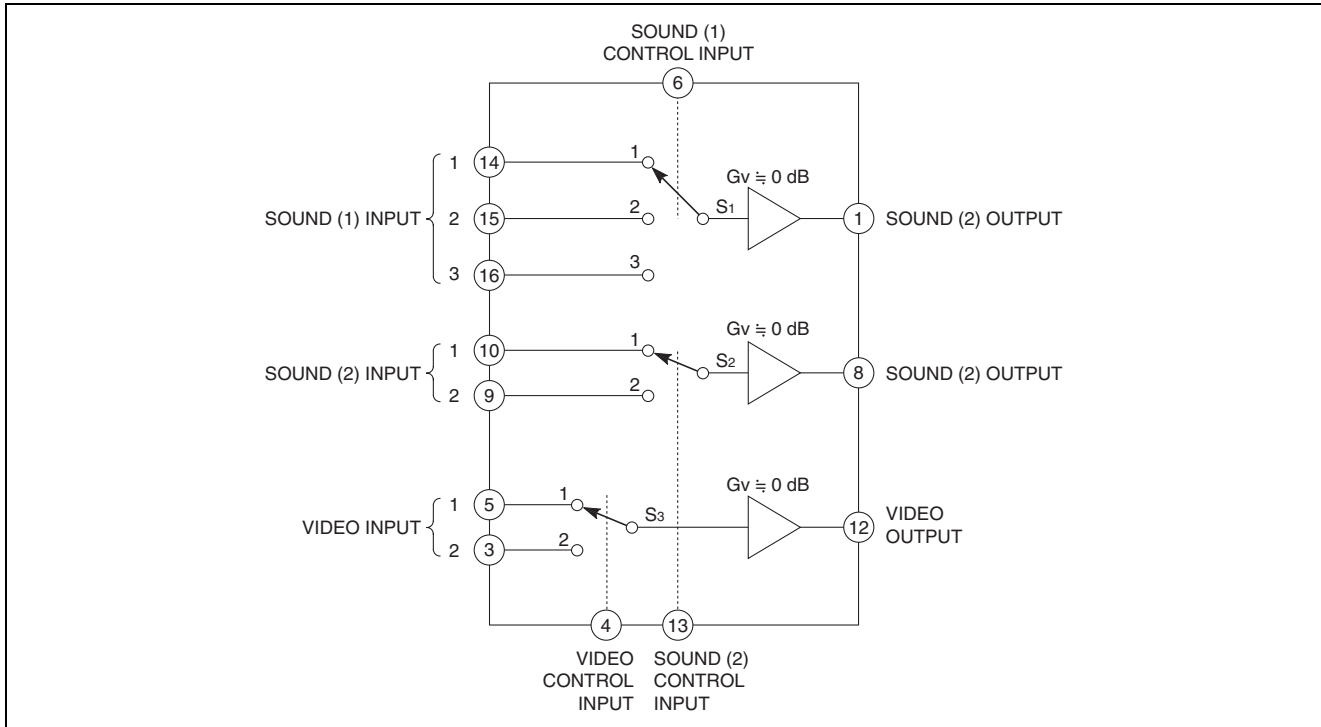
Symbol	Item	Ratings	Unit
V_{cc}	Power-supply voltage	14	V
V_{is}	Input signal voltage	6	V
V_{ic}	Input control voltage	V_{cc}	V
P_d	Power dissipation	1.25	W
$K\theta$	Thermal derating	1.25	mW / $^\circ\text{C}$
T_{opr}	Ambient operating temperature	-20 to +75	$^\circ\text{C}$
T_{stg}	Storage temperature	-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
ΔV_{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, $f = 1\text{ kHz}$, $V_o = 1\text{ Vrms}$	–	0.02	0.2	%
V_N	Output noise voltage	For audio, $R_g = 600\ \Omega$, bandwidth = 15 kHz	–	3	50	μVrms
		For video, $R_g = 75\ \Omega$, bandwidth = 10 MHz	–	0.5	1.0	mVrms
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 ₁	S ₂	S ₃
H	1	1	1
M	2	(Note)	(Note)
L	3	2	2

Note: connect to V_{cc} or GND

Control input voltage (pin 6)

Control input	V _{cc}	
	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

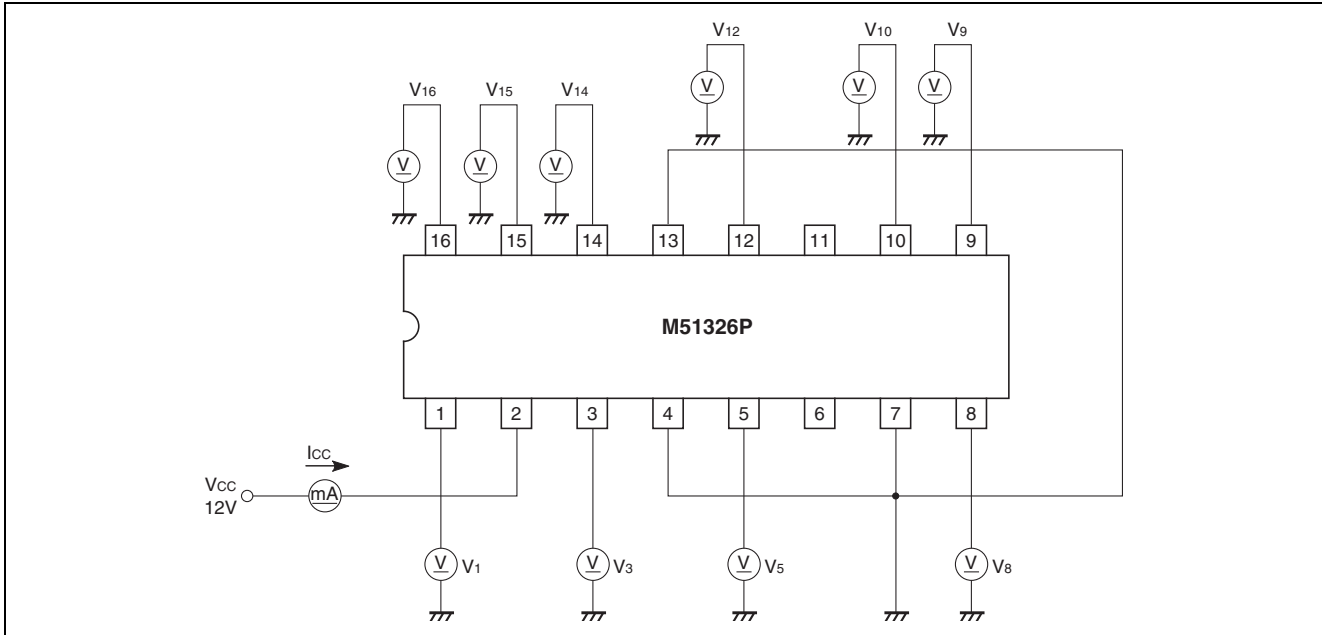
Control input voltage (pins 4, 13)

Control input	V _{cc}	
	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

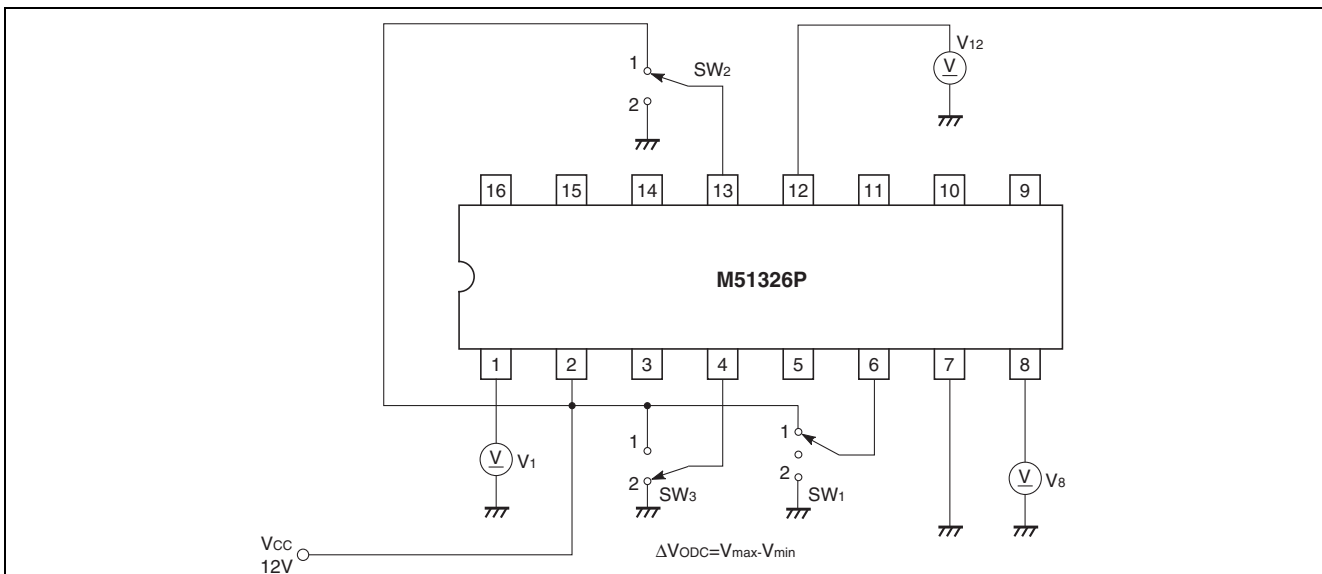
Measurement circuit

(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



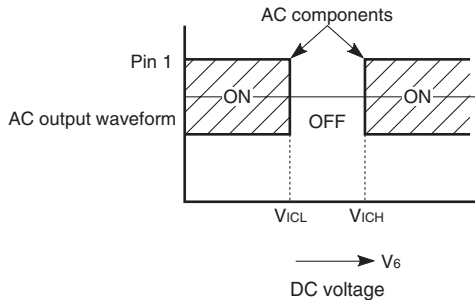
Video : DC voltages on V12 are measured while switch 1 is at setting 2 and switch 2 is at setting 2, before and after switch 3 is turned to setting 1 or 2.

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.

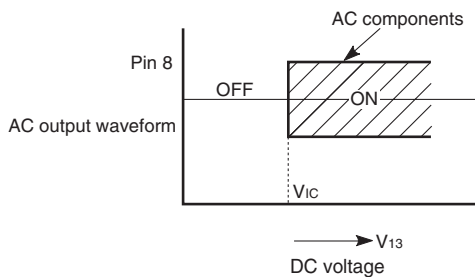
Sound (1) measuring the control-pin threshold-voltage value:

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



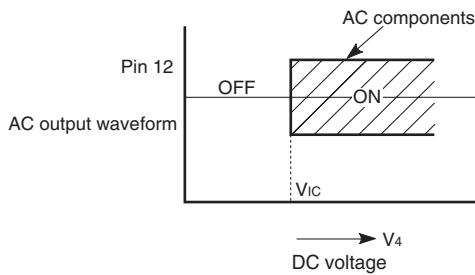
Sound (2) measuring the control-pin threshold-value voltage:

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} .

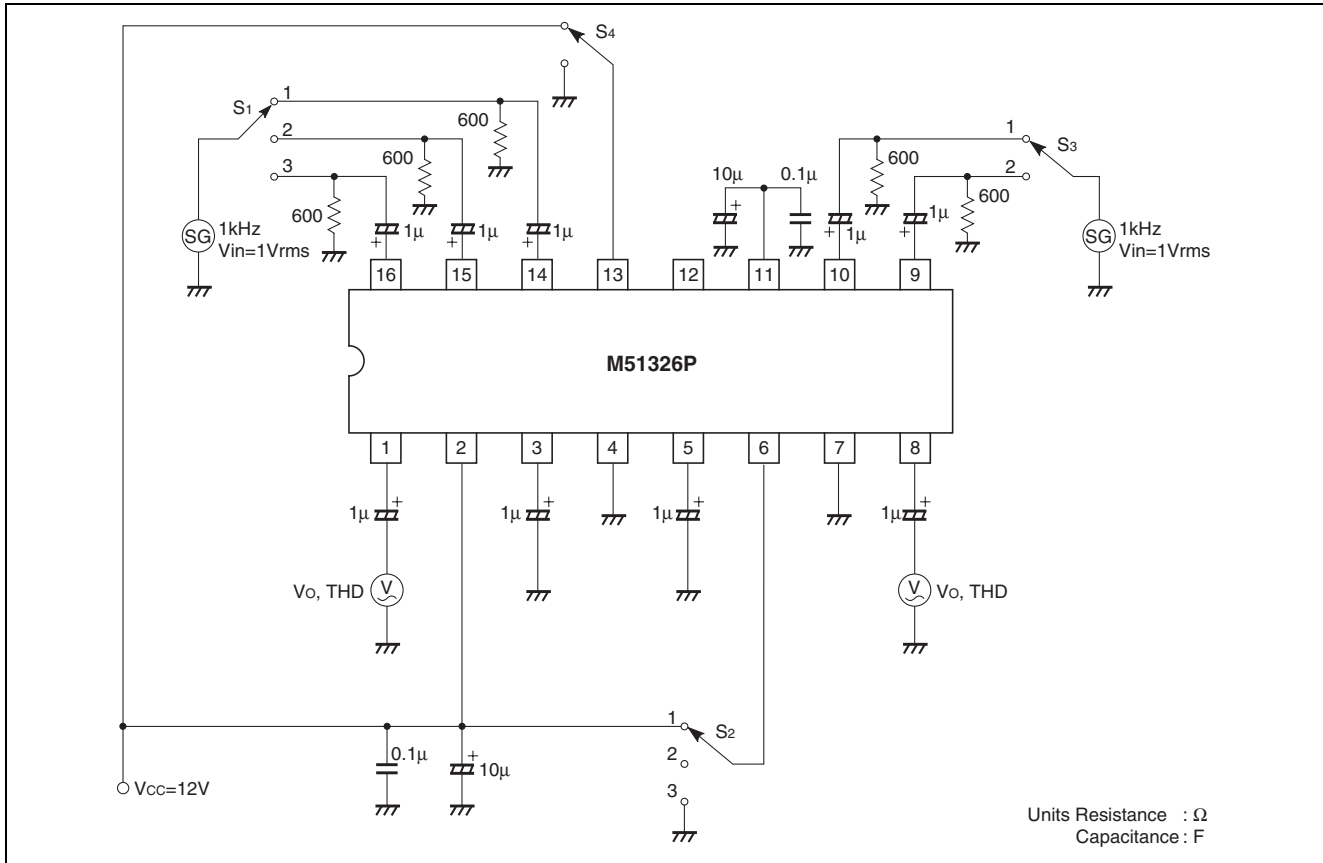


Measuring the image control pin threshold value voltage:

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 ₁	S ₂	Pin 1 output
1	1	V _{os} , THD
	2,3	V _{oc}
2	2	V _{os} , THD
	1,3	V _{oc}
3	3	V _{os} , THD
	1,2	V _{oc}

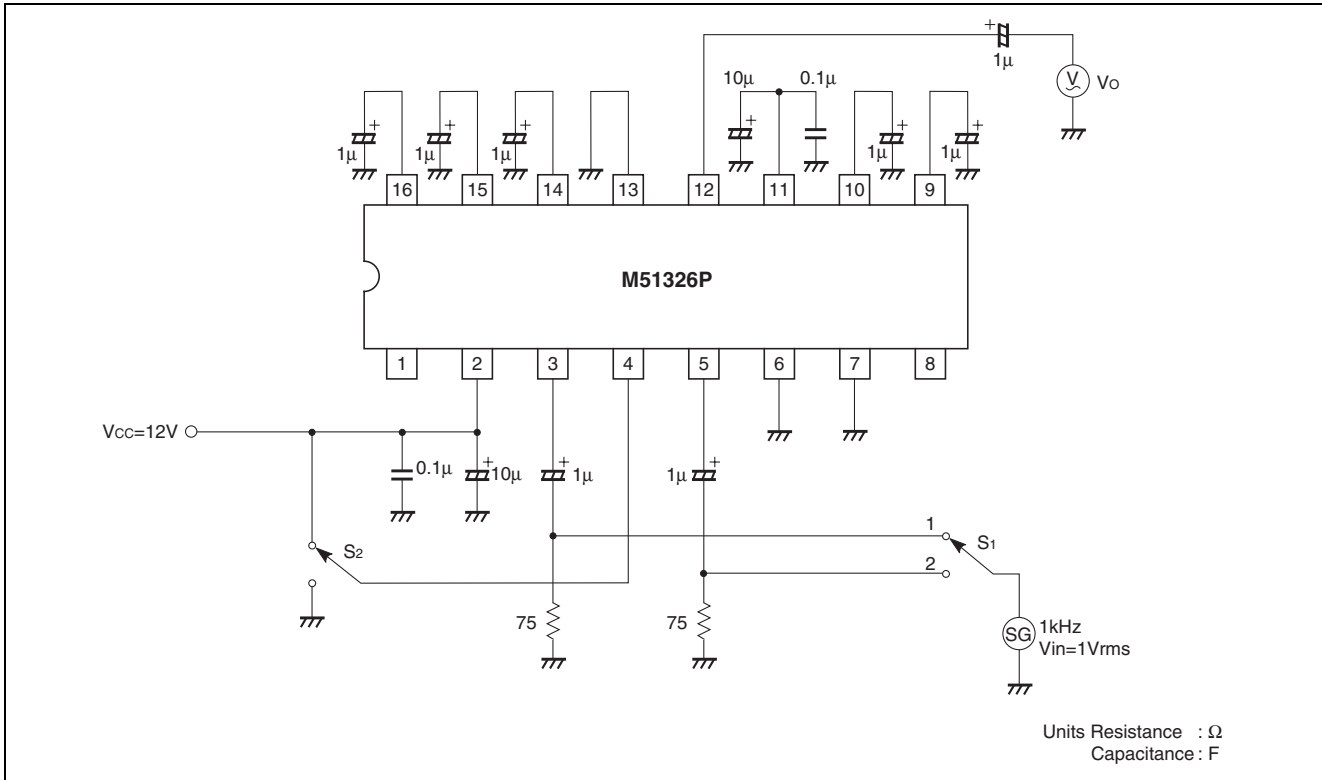
Switch state

S ₃	S ₄	Pin 8 output
1	1	V _{oc}
	2	V _{oc}
2	1	V _{oc}
	2	V _{oc} , THD

Crosstalk: CT = 20log (V_{os}/V_{oc}) (dB)

Voltage gain: GV = 20log (V_{os}/V_{in}) (dB)

Measurement circuit for crosstalk and voltage gain (video switch)

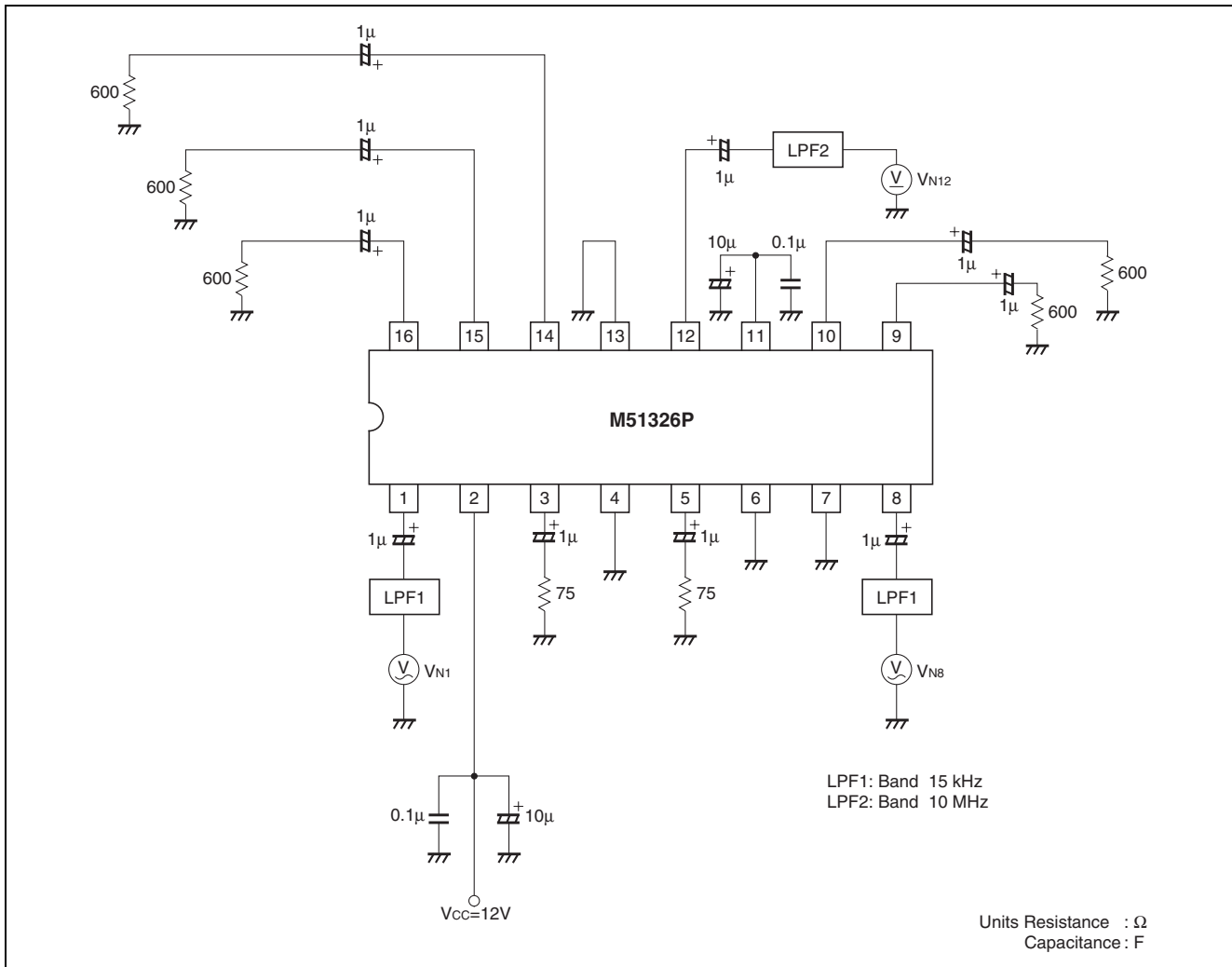


Switch state		Pin 12 output
S1	S2	
1	1	Vos
	2	Voc
2	1	Voc
	2	Vos

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

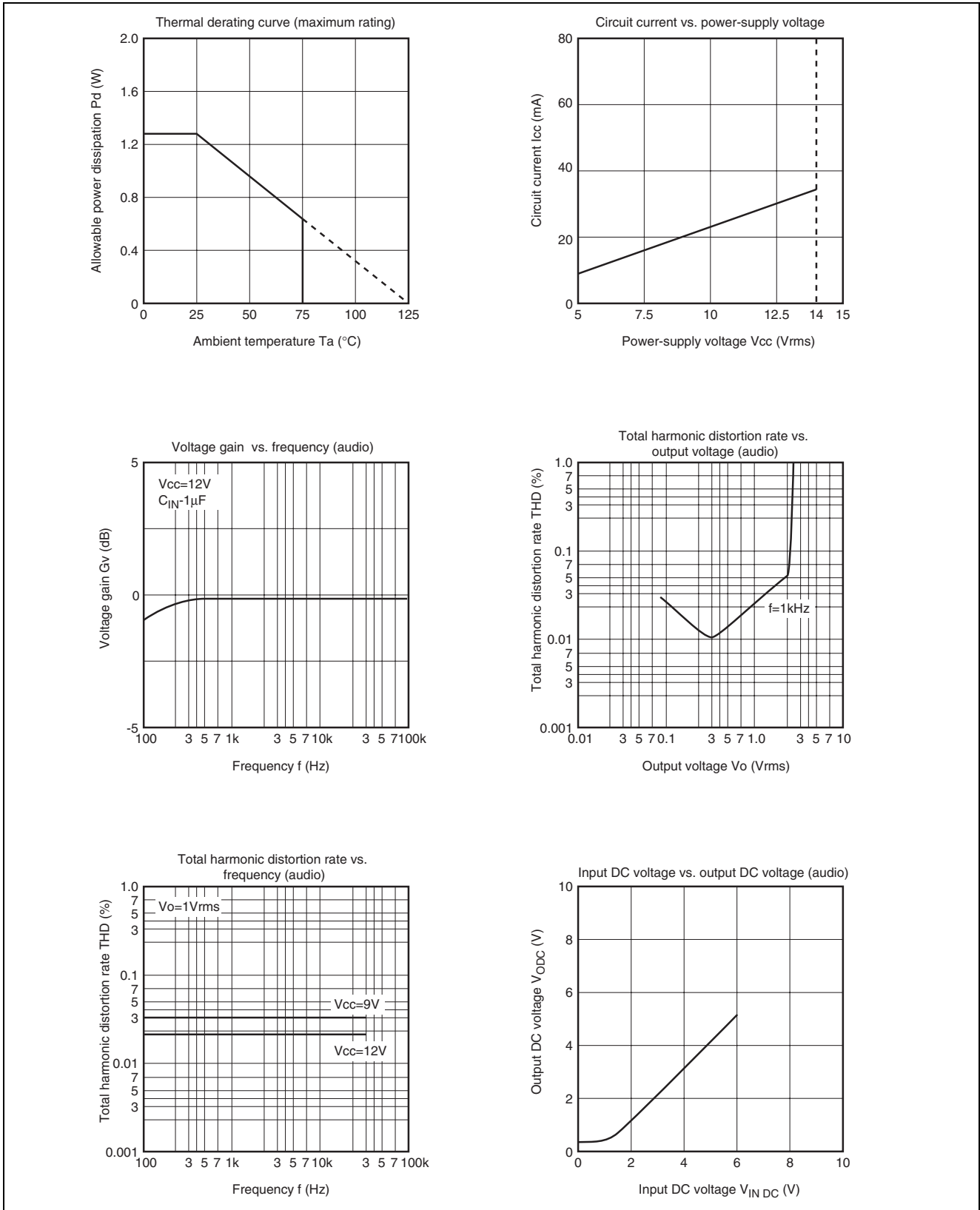
Voltage gain: $GV = 20\log (Vos/Vin)$ (dB)

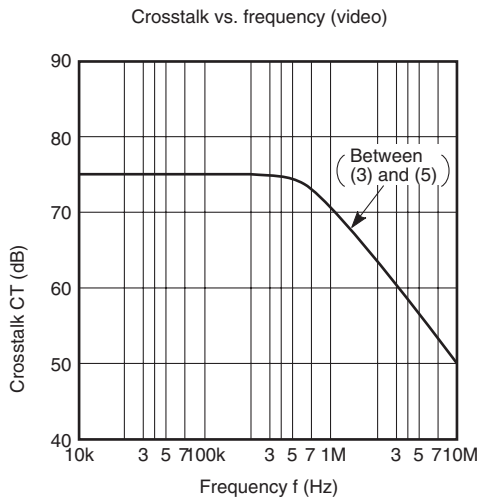
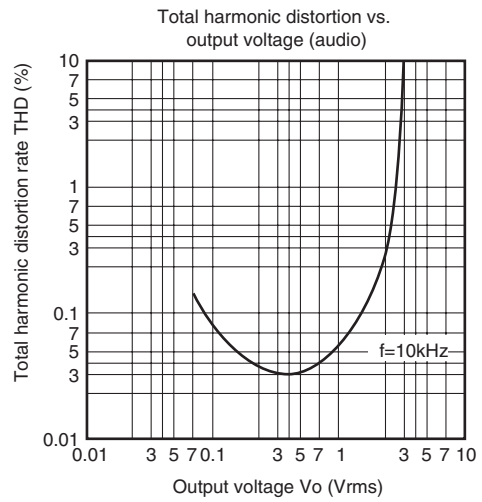
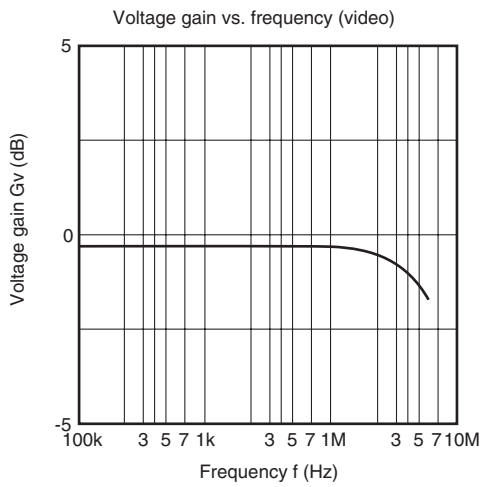
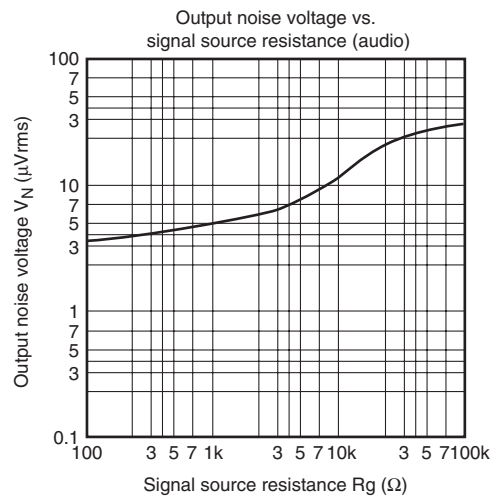
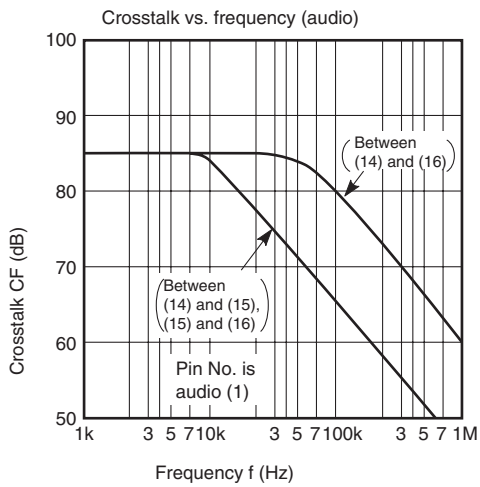
Measurement circuit for output noise voltage



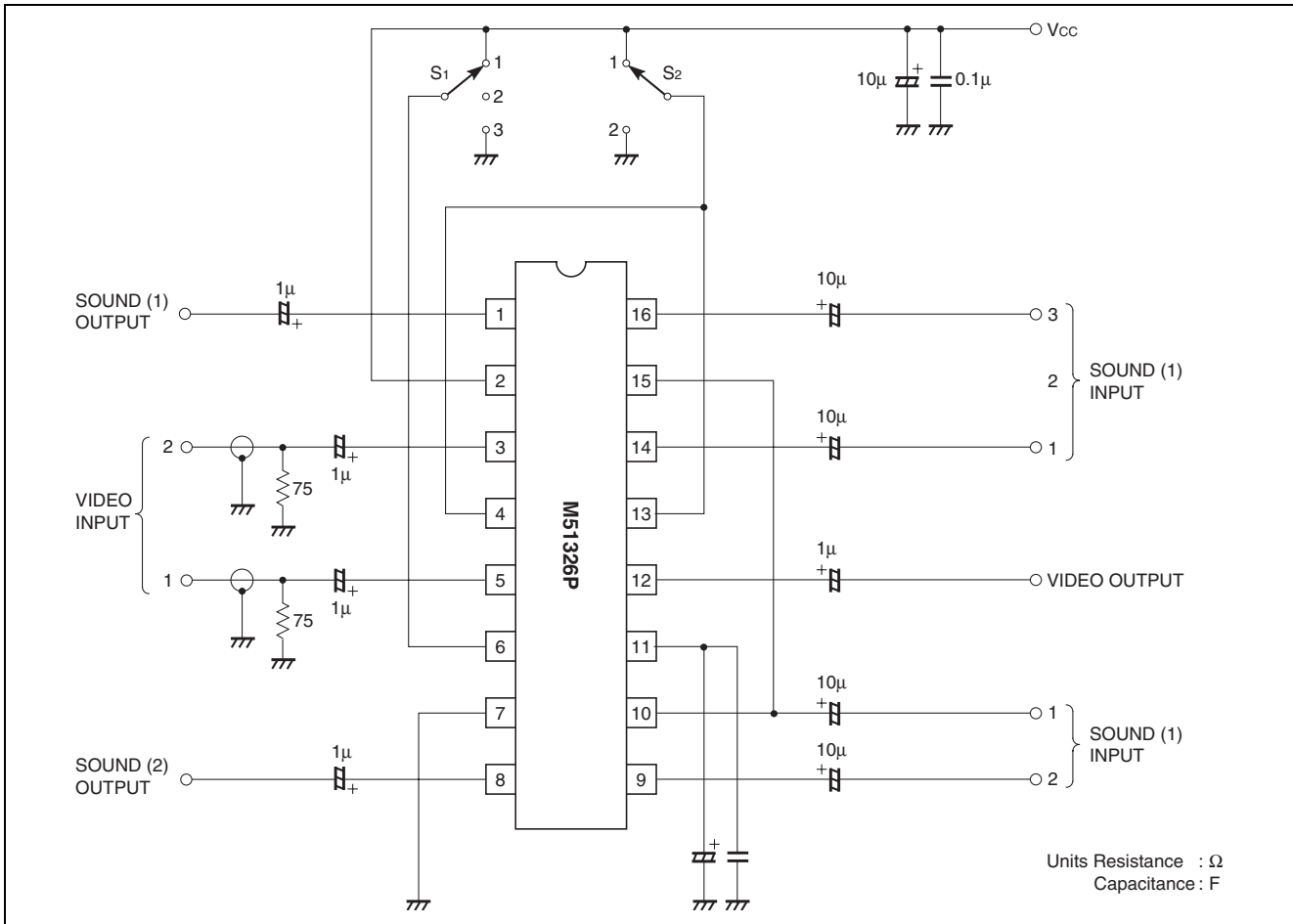
Characteristic curves

(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.

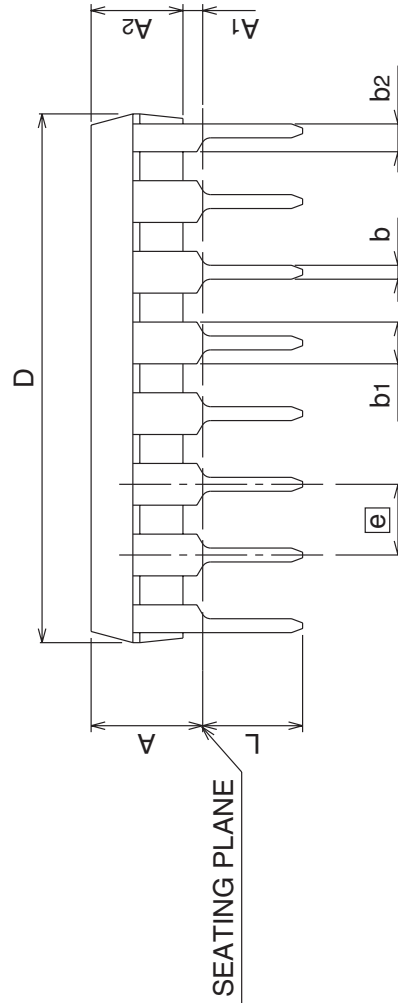
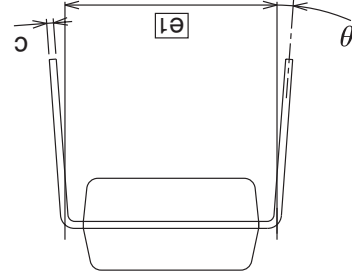
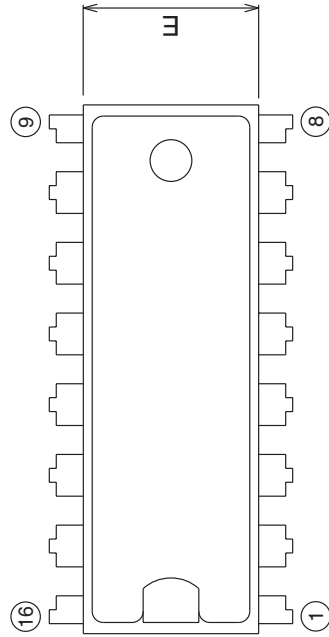
Package Dimension

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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