

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

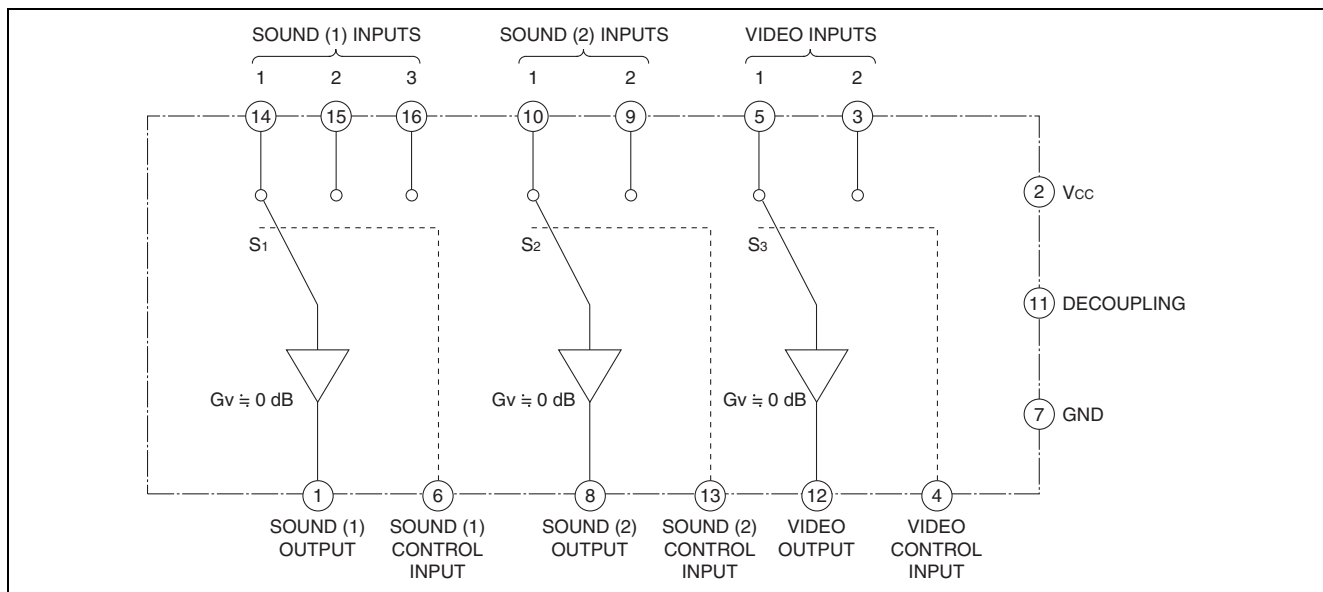
Applications

- Video equipment

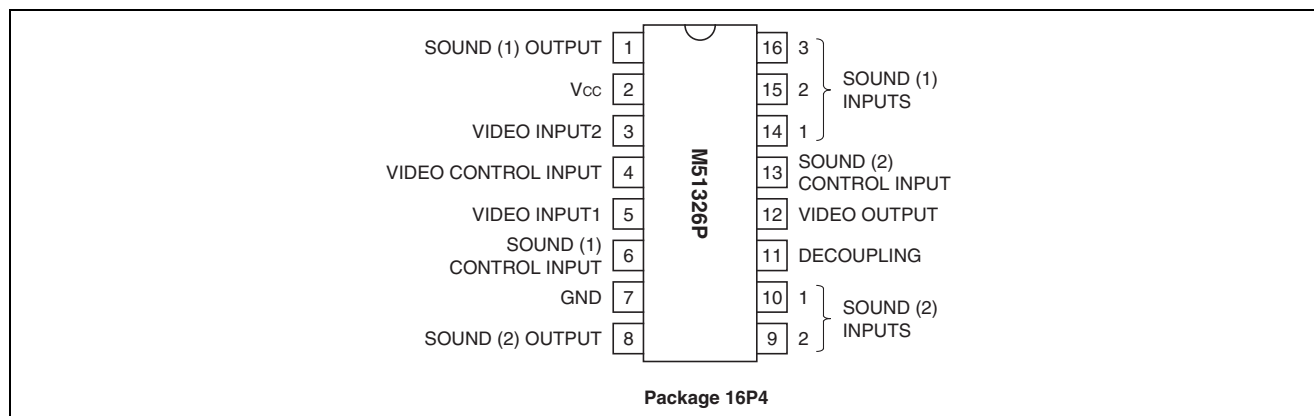
Recommended operating condition

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

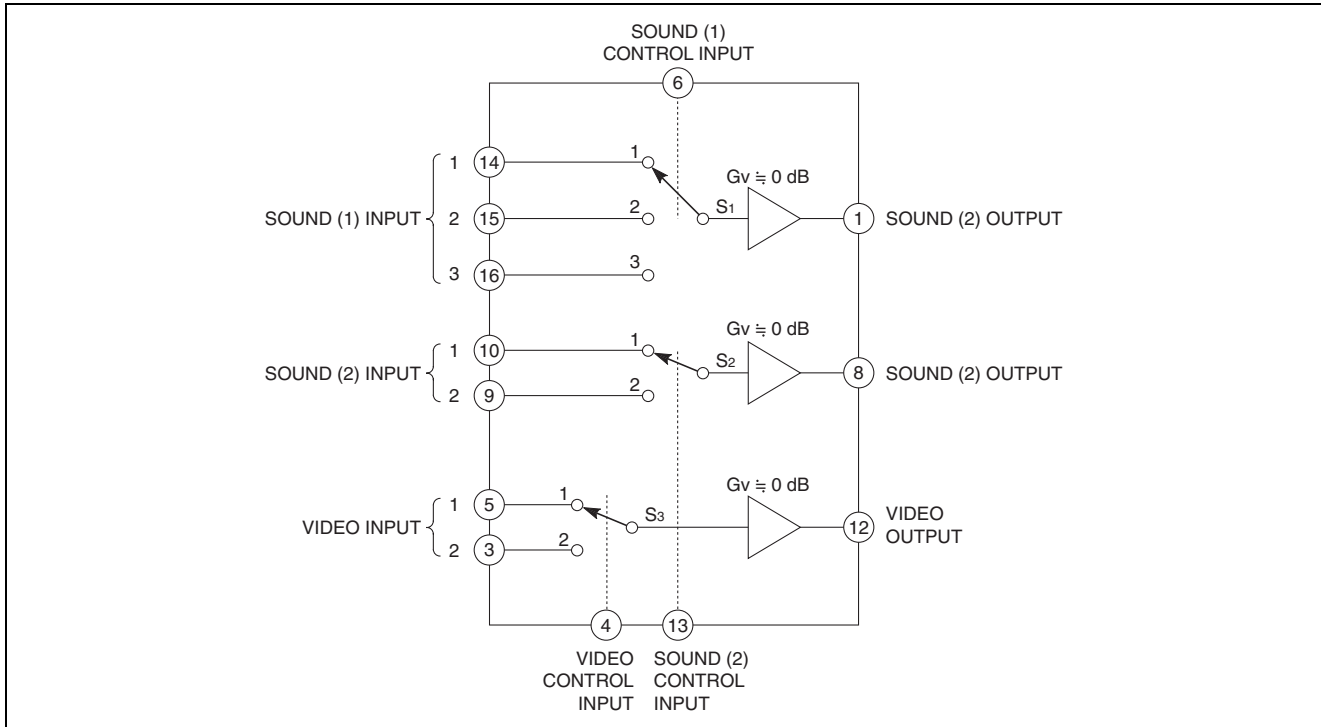
| Symbol | Item | Ratings | Unit |
|-----------|-------------------------------|-------------|-----------------------|
| V_{cc} | Power-supply voltage | 14 | V |
| V_{is} | Input signal voltage | 6 | V |
| V_{ic} | Input control voltage | V_{cc} | V |
| P_d | Power dissipation | 1.25 | W |
| $K\theta$ | 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 |

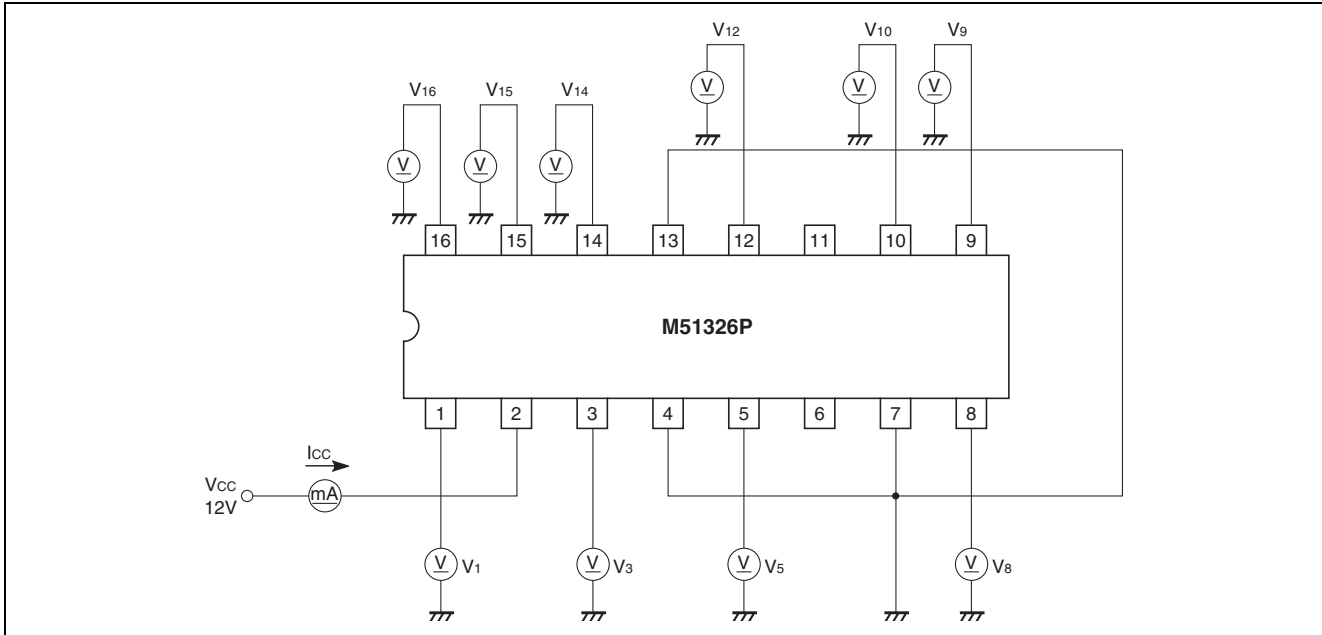
Control input voltage (pins 4, 13)

| 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 |

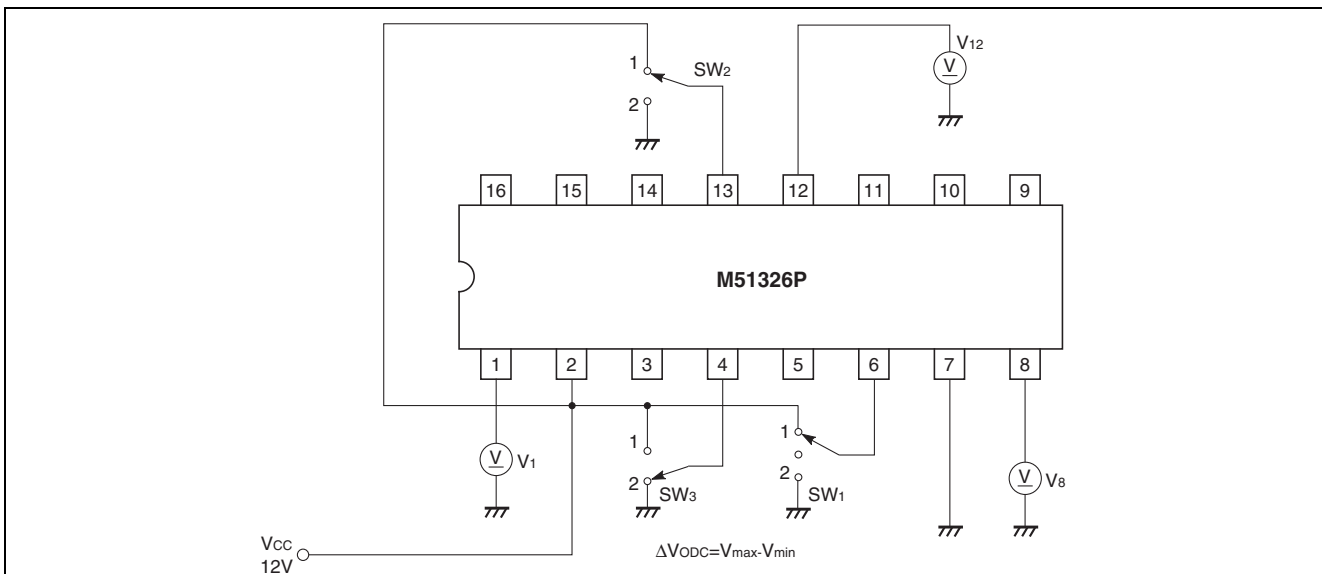
Measurement circuit

(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



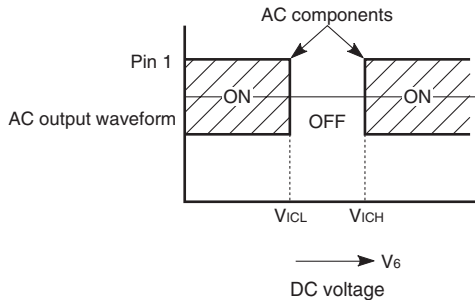
Video : DC voltages on V₁₂ are measured while switch 1 is at setting 2 and switch 2 is at setting 2, before and after switch 3 is turned to setting 1 or 2.

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.

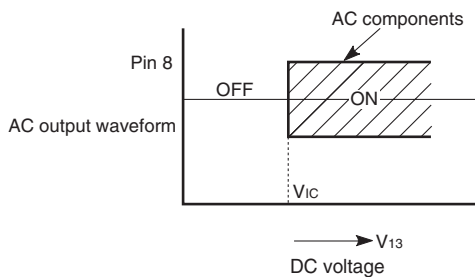
Sound (1) measuring the control-pin threshold-voltage value:

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



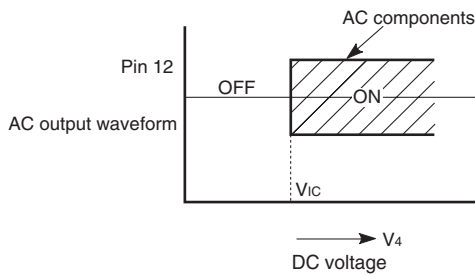
Sound (2) measuring the control-pin threshold-value voltage:

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} .

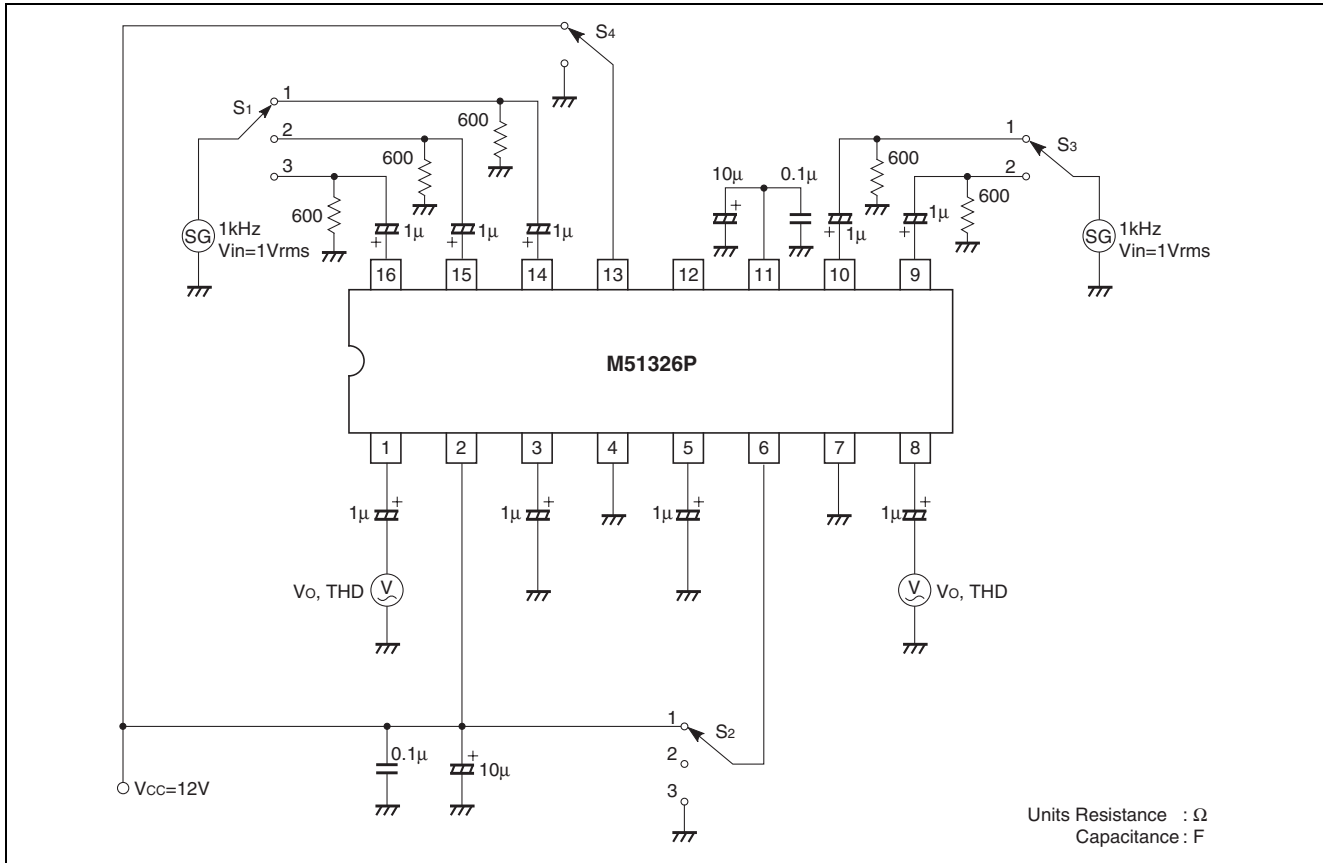


Measuring the image control pin threshold value voltage:

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)



Units Resistance : Ω
Capacitance : F

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} |

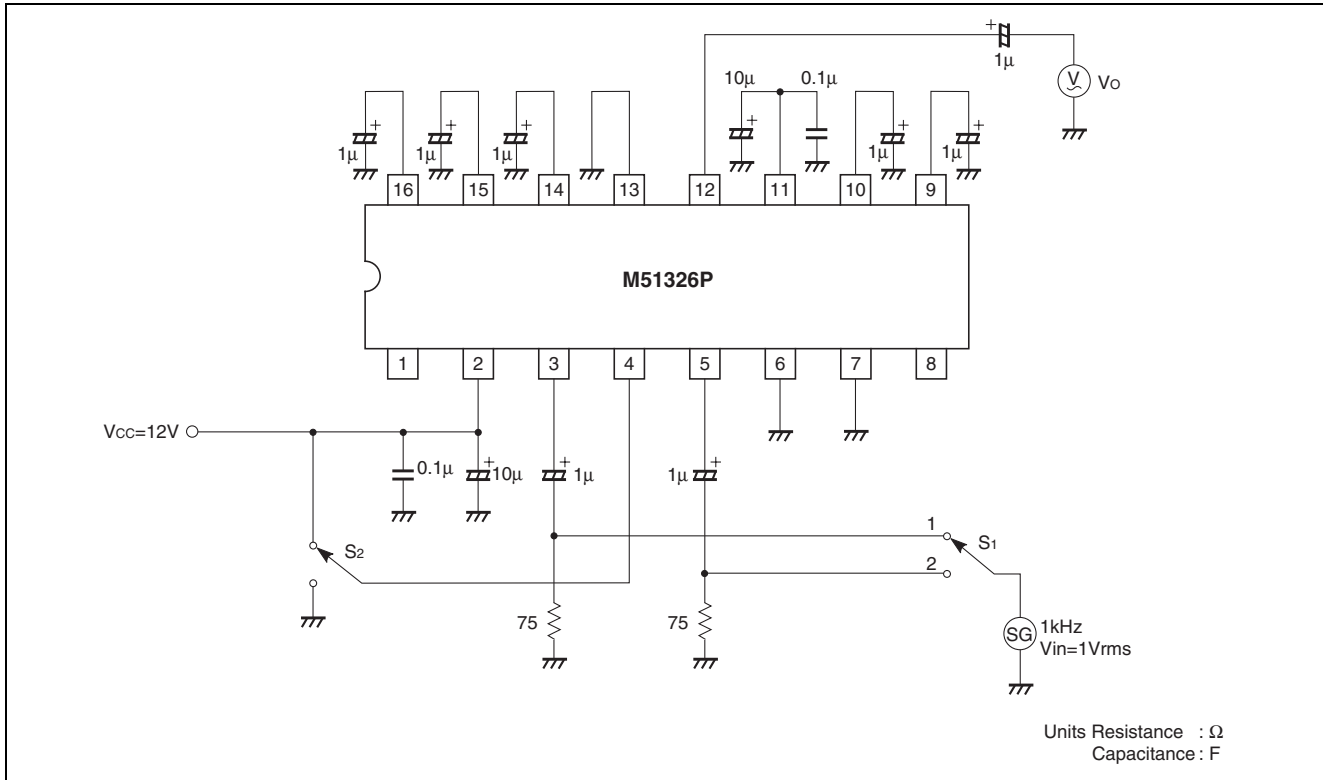
Switch state

| 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)



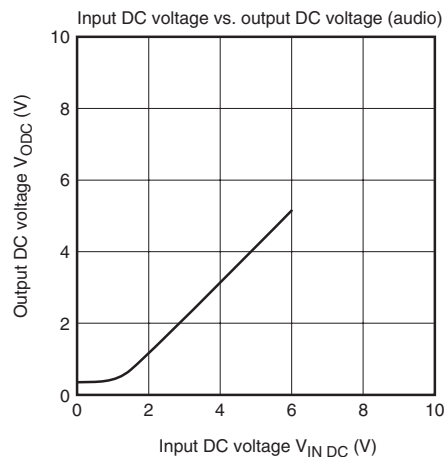
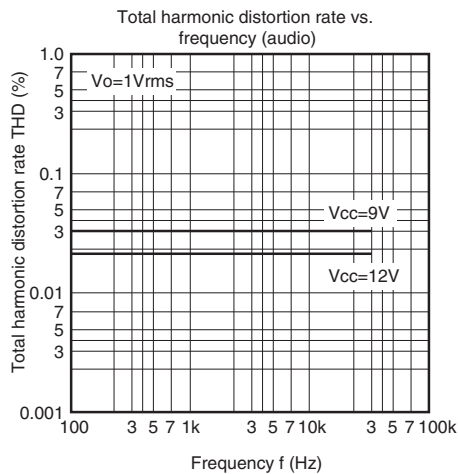
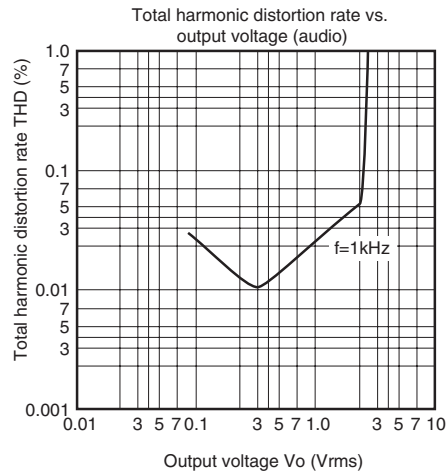
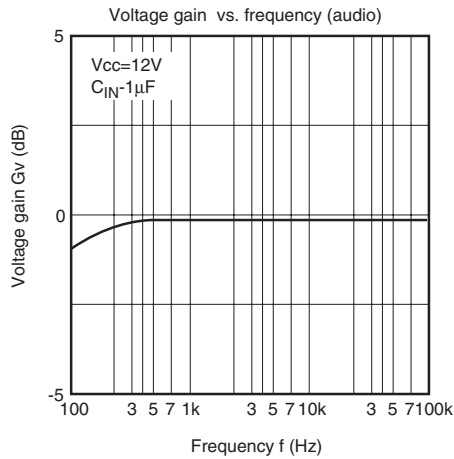
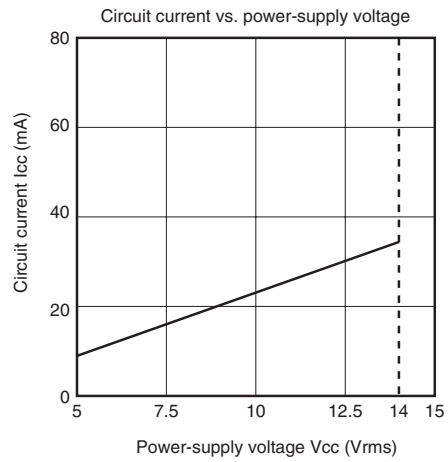
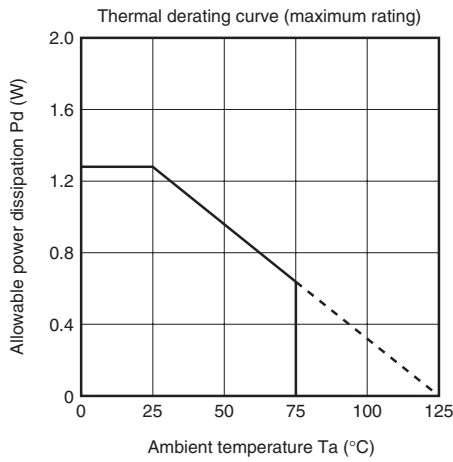
| Switch state | | Pin 12 output |
|--------------|----|---------------|
| S1 | S2 | |
| 1 | 1 | Vos |
| | 2 | Voc |
| 2 | 1 | Voc |
| | 2 | Vos |

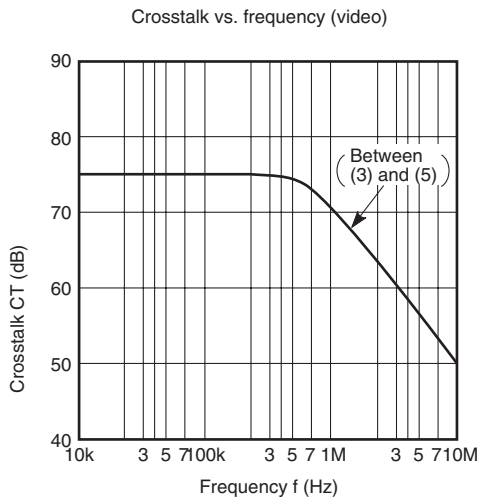
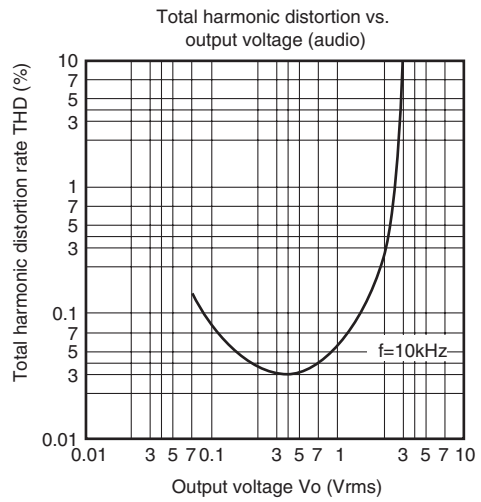
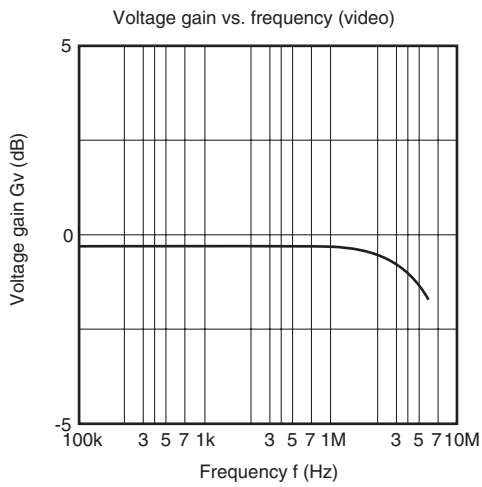
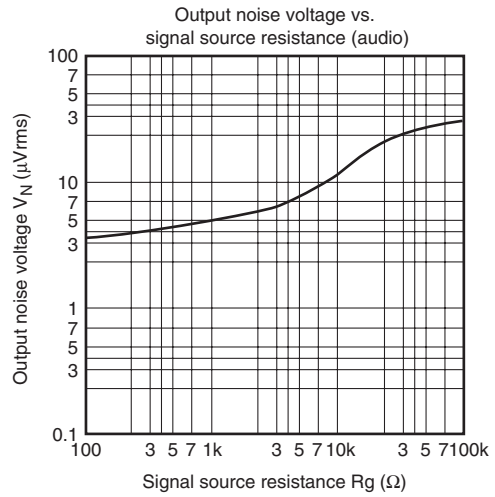
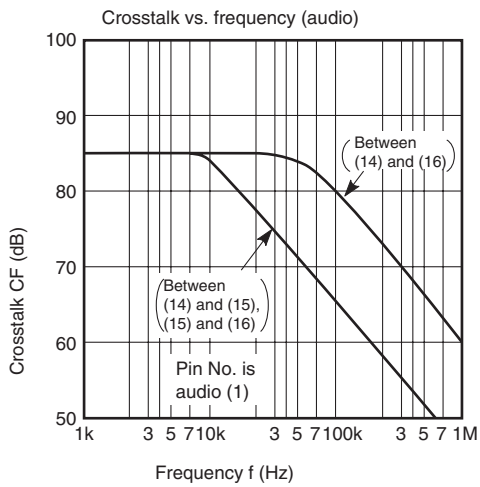
Crosstalk: $CT = 20\log (Vos/Voc)$ (dB)

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

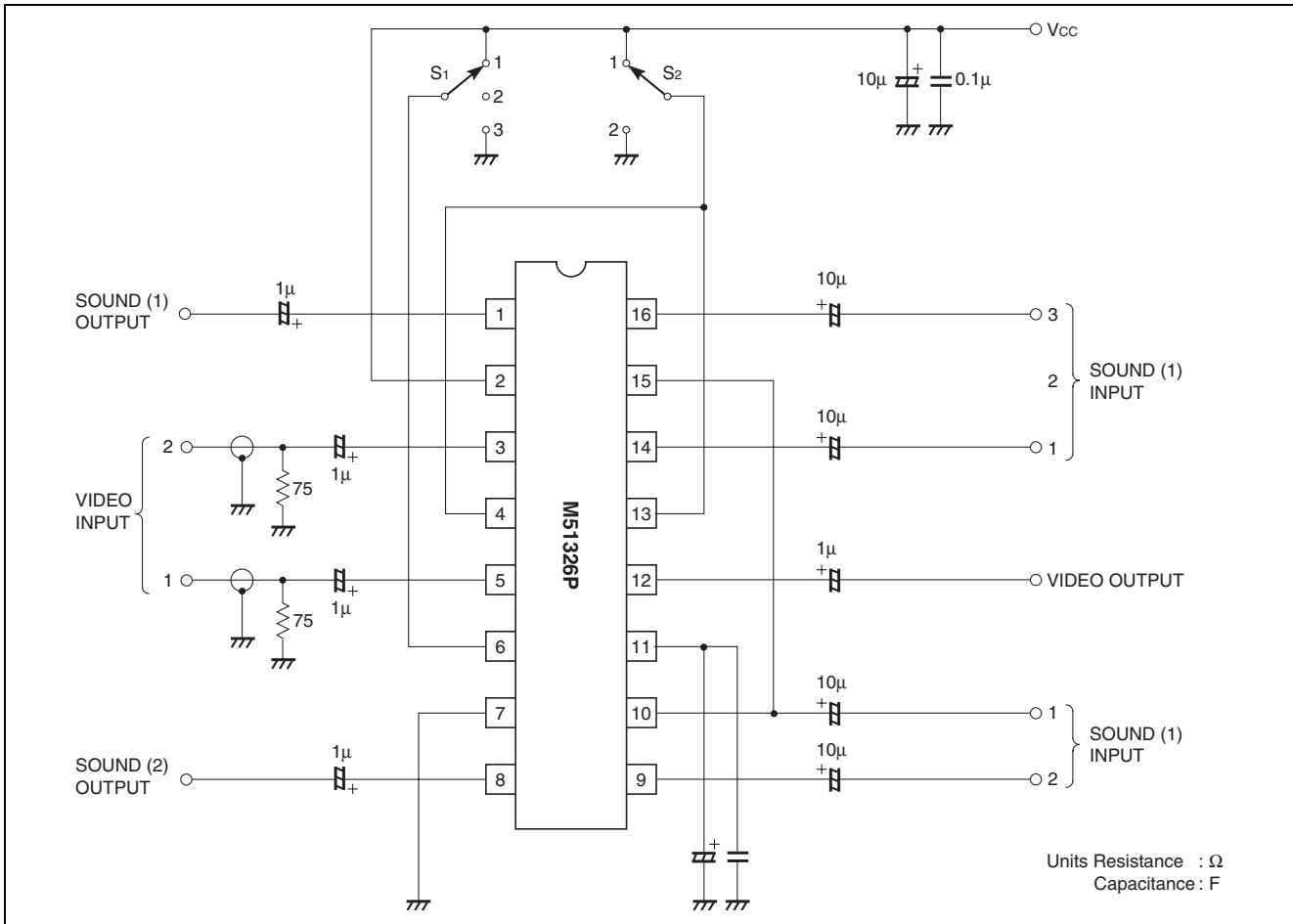
Characteristic curves

(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.

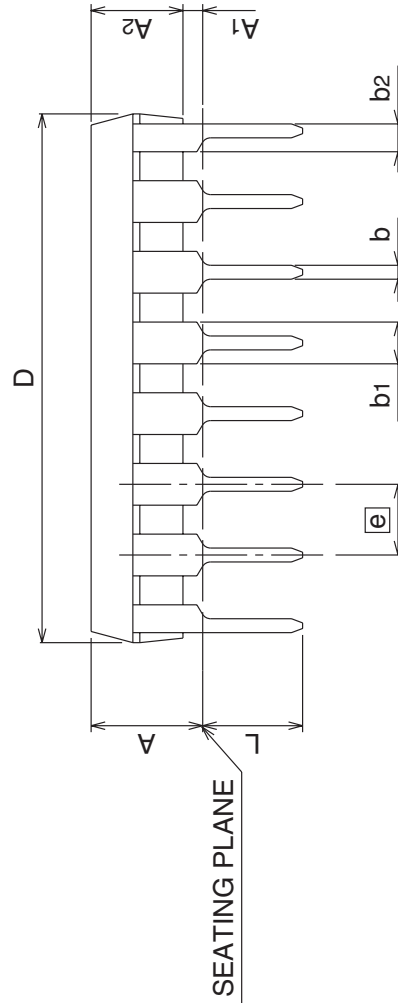
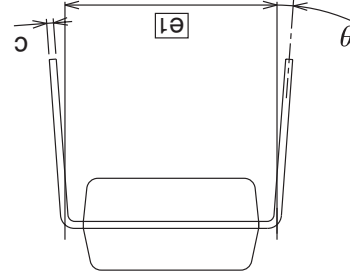
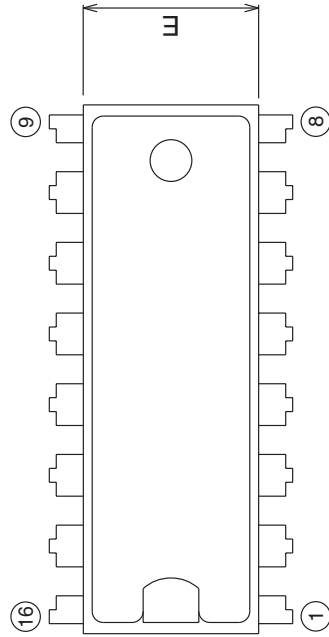
Package Dimension

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 |
|---------------------------------------|-----------------|------------------|------------------------------------|



| 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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