

M51320P

ANALOG SWITCH

DESCRIPTION

The M51320P is a semiconductor integrated circuit containing analog switches designed for use in a video system. It contains two audio switches and one video switch. One audio switch has two inputs and the other, three. The video switch has two inputs. Each switch can be independently controlled. In addition, the video switch contains an amplifier with a gain of about 6.7dB.

FEATURES

- Video and stereo sound switches in one package
- Wide frequency range(video switch).....DC~10MHz
- High separation(video).....Crosstalk 55dB(typ.)@5MHz

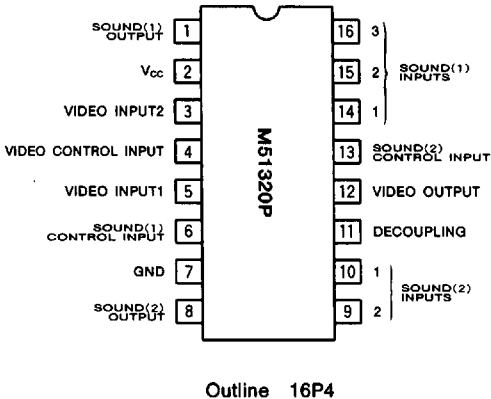
APPLICATION

Video equipment.

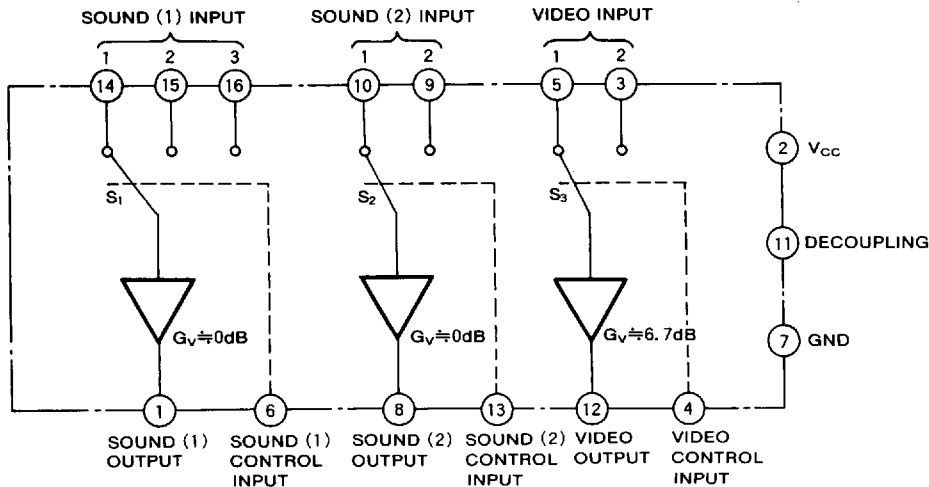
RECOMMENDED OPERATING CONDITION

Supply voltage range.....5 ~ 14V

PIN CONFIGURATION (TOP VIEW)



BLOCK DIAGRAM



ANALOG SWITCH

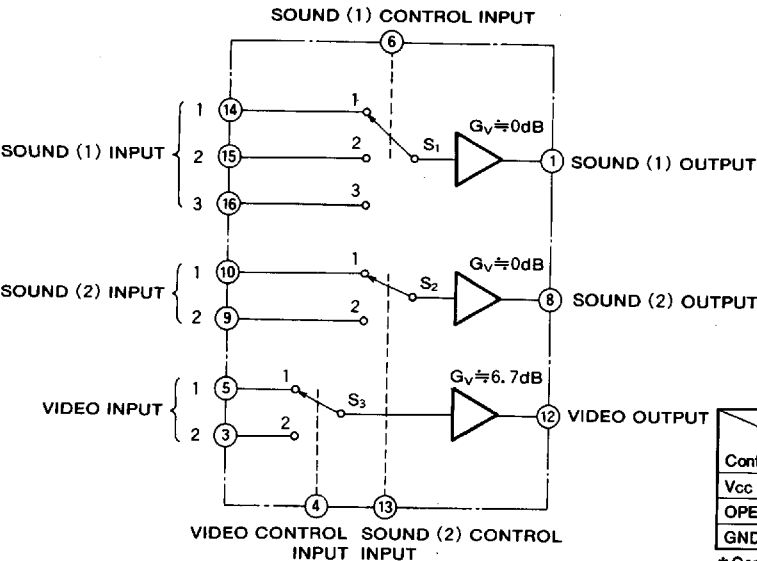
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V _{CC}	Supply voltage	14	V
V _{IS}	Input signal voltage	6	V
V _{IC}	Input control voltage	6	V
P _d	Power dissipation	V _{CC}	W
K _θ	Thermal derating	1.25	mW/°C
T _{opr}	Operating temperature	12.5	°C
T _{stg}	Storage temperature range	-20~75	°C
		-40~125	°C

ELECTRICAL CHARACTERISTICS (T_a=25°C, V_{CC}=12V, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I _{CC}	Circuit current			40	50	mA
V _{IDC}	Input bias voltage		3.8	4.2	4.6	V
V _{ODC}	Output bias voltage	Video	5.0	5.6	6.2	V
V _{OP}	Output DC offset voltage	Sound	3.0	3.6	4.2	V
V _{ICH}	Control-pin threshold voltage	Sound (1) (pin⑥ 3-state input)	7.0	8.0	9.0	mV
V _{ICL}		Sound (1) (pin⑥ 3-state input)	3.0	4.0	5.0	V
V _{IC}		Sound (2) and video (pin④, ⑬)	1.7	2.1	2.5	V
G _V	Voltage gain	Video, f=1MHz, V _{IN} =1Vrms	5.7	6.7	8.2	dB
THD	Total harmonic distortion	Sound, f=1kHz, V _N =1Vrms	-0.5	-0.1		%
V _N	Output noise voltage	Sound, R _g =600Ω, BW=15kHz		0.02	0.2	μVrms
		Video, R _g =75Ω, BW=10MHz		0.5	1.0	mVrms
CT	Crosstalk	Sound, f=1kHz	65	80		dB
		Video, f=5MHz	45	55		dB

SWITCH MODE

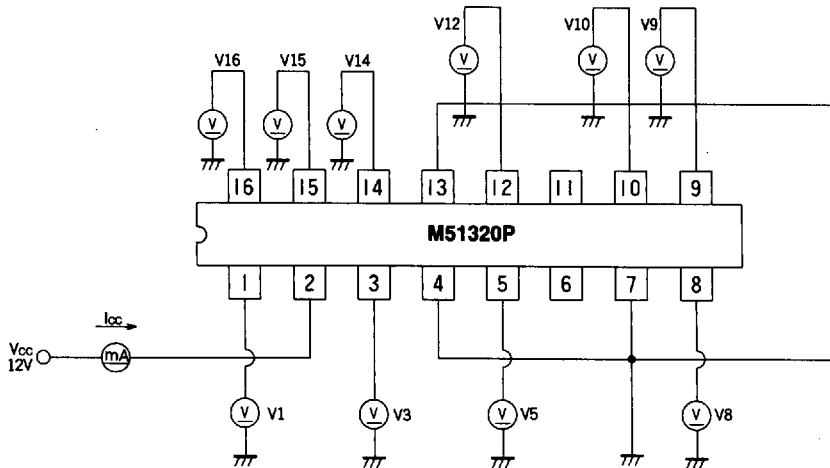


Switch No.	S ₁	S ₂	S ₃
Control Input			
V _{CC}	1	1	1
OPEN	2	*	*
GND	3	2	2

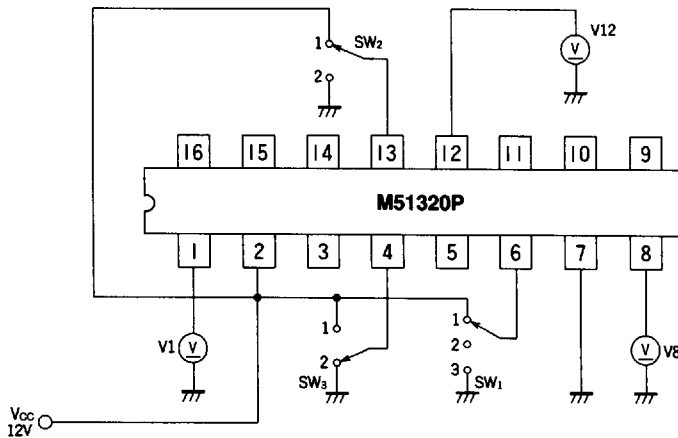
* Connect to V_{CC} or GND

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

CIRCUIT CURRENT I_{CC} , INPUT BIAS VOLTAGE V_{IDC} , OUTPUT BIAS VOLTAGE V_{OODC} TEST CIRCUIT



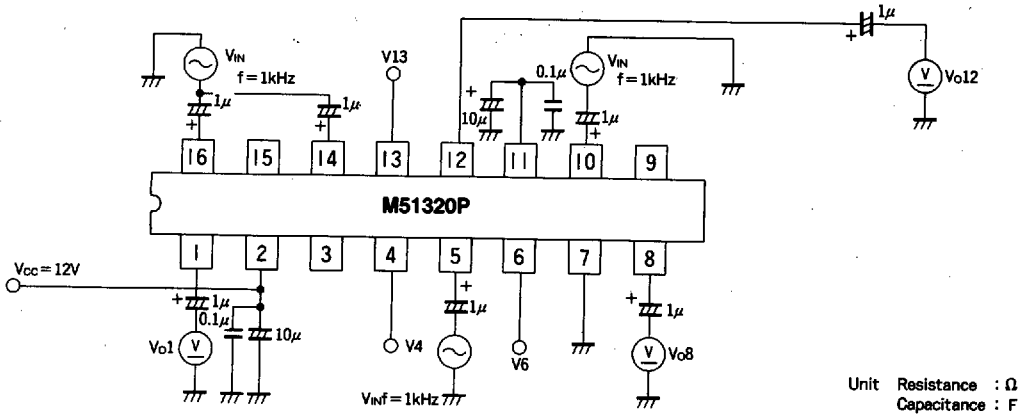
OUTPUT DC OFFSET VOLTAGE TEST CIRCUIT



$$\Delta V_{OODC} = V_{max} - V_{min}$$

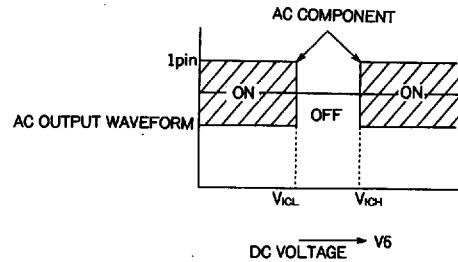
- Video : Measure each DC voltage of V12, when SW₃ is turned to 1 or 2, with SW₁ to 2 and SW₂ to 2.
 Sound (1) : Measure each DC voltage of V1, when SW₁ is turned to 1, 2, or 3, with SW₂ to 2 and SW₃ to 2.
 Sound (2) : Measure each DC voltage of V8, when SW₂ is turned to 1 or 2, with SW₁ to 2 and SW₃ to 2.

CONTROL PIN THRESHOLD VOLTAGE TEST CIRCUIT



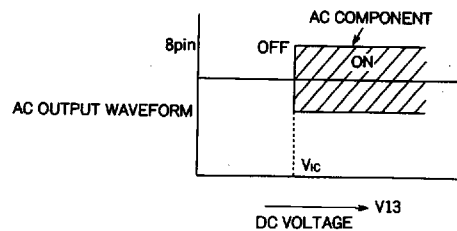
Sound (1) control pin threshold voltage test

V_{ICL} shows the value of V₆ when AC component of ① pin waveform is switched OFF after initially raising DC voltage V₆ to 3-5 V.
V_{ICH} shows the value of V₆ when AC component is switched ON, after initially raising DC voltage V₆ to 7-9 V.



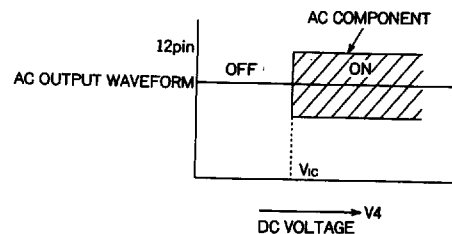
Sound (2) control pin threshold voltage test

V₁₃ shows the value of V_{IC} when the AC component of ⑧ pin waveform is switched ON, after initially raising DC voltage V₁₃ to 1-3 V.

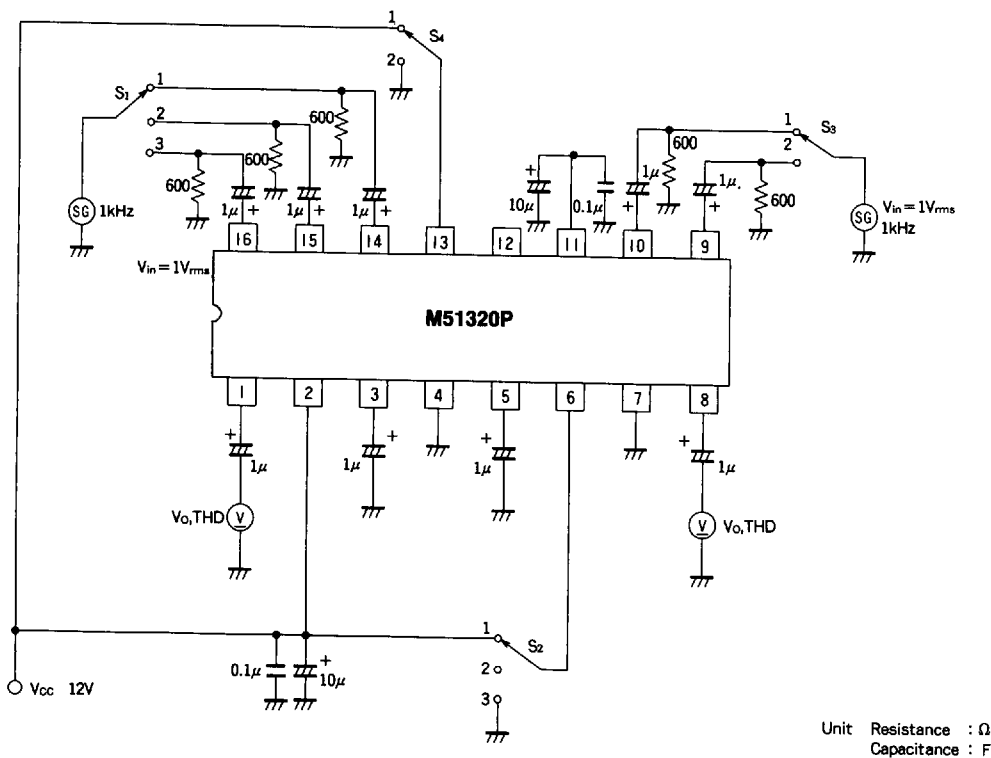


Video control pin threshold voltage test

V₄ shows the value of V_{IC} when AC component of ⑫ pin waveform is switched ON, after initially raising the DC voltage V₄ to 1-3 V.



CROSSTALK AND TOTAL HARMONIC DISTORTION TEST CIRCUIT (SOUND SWITCH)



Unit Resistance : Ω
Capacitance : F

SWITCH MODE LIST

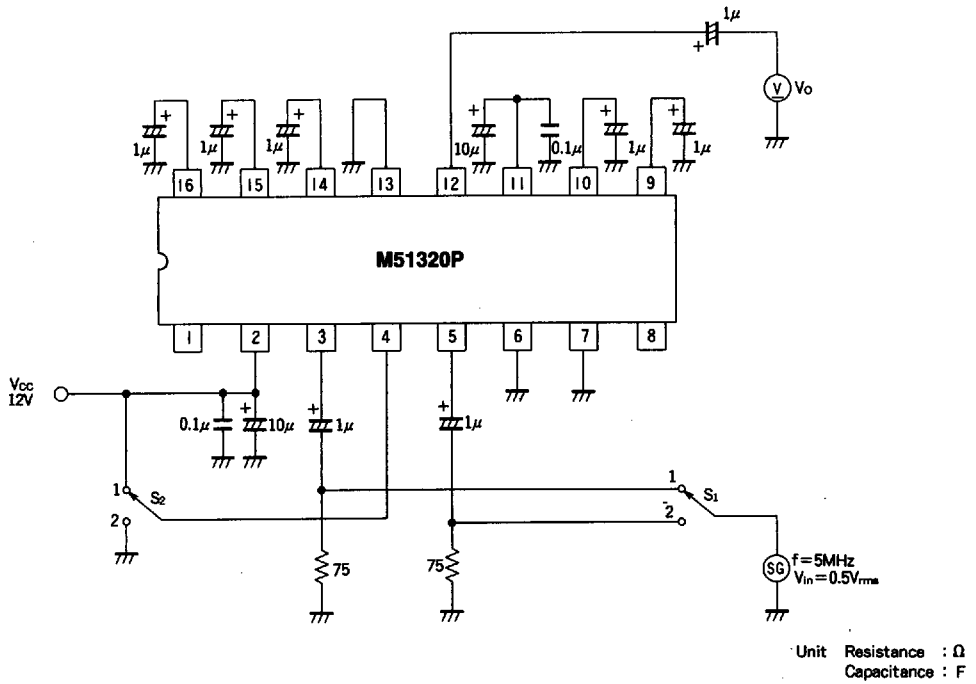
S1	S2	OUTPUT(①pin)
1	1	Vos, THD
	2, 3	Voc
2	2	Vos, THD
	1, 3	Voc
3	3	Vos, THD
	1, 2	Voc

S3	S4	OUTPUT(⑧pin)
1	1	Vos, THD
	2	Voc
2	1	Voc
	2	Vos, THD

Crosstalk $CT = 20 \log \left(\frac{V_{os}}{V_{oc}} \right)$ dB

Voltage gain $GV = 20 \log \left(\frac{V_{os}}{V_{in}} \right)$ dB

CROSSTALK, VOLTAGE GAIN (VIDEO SWITCH)



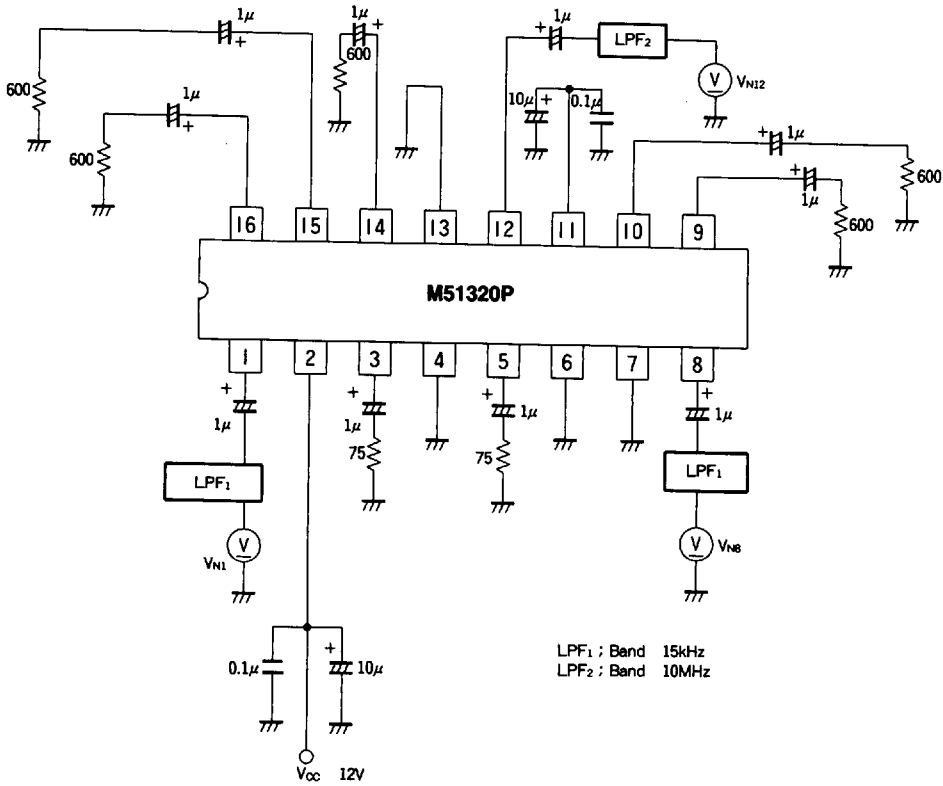
SWITCH MODE LIST

S ₁	S ₂	OUTPUT(⑫pin)
1	1	V _{oc}
	2	V _{os}
2	1	V _{os}
	2	V _{oc}

Crosstalk $CT = 20 \log \left(\frac{V_{os}}{V_{oc}} \right)$ dB

Voltage gain $GV = 20 \log \left(\frac{V_{os}}{V_{in}} \right)$ dB

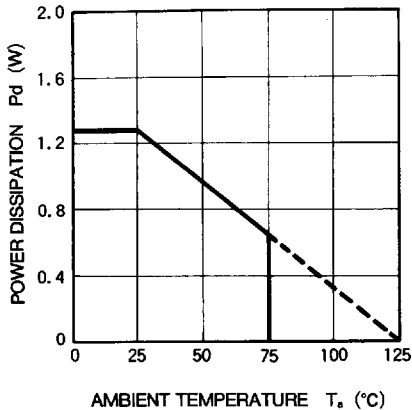
OUTPUT NOISE VOLTAGE



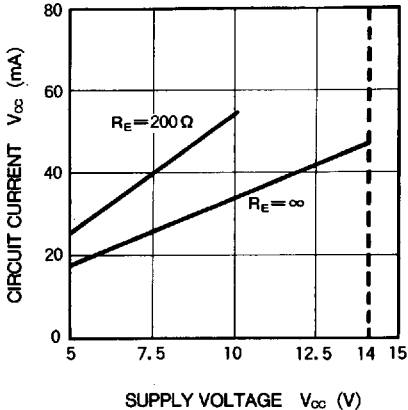
Unit Resistance : Ω
Capacitance : F

TYPICAL CHARACTERISTICS (Ta=25°C, unless otherwise noted)

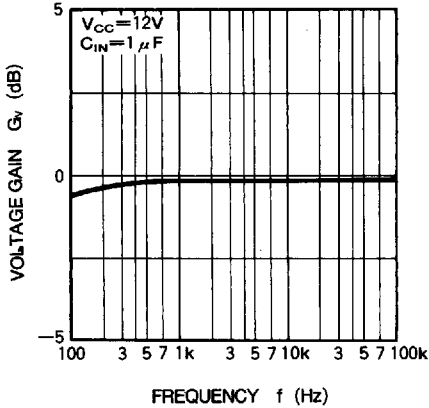
THERMAL DERATING (MAXIMUM RATING)



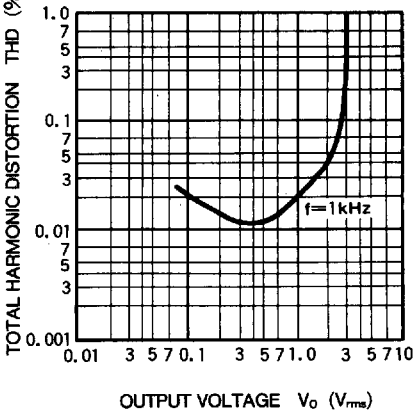
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



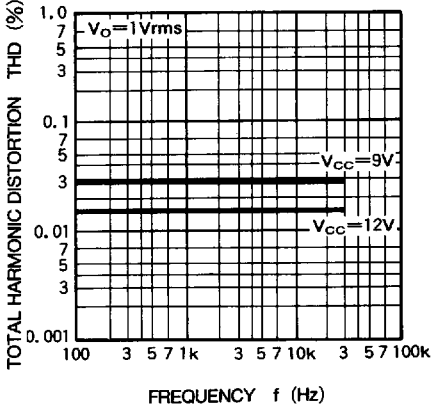
VOLTAGE GAIN VS. FREQUENCY (SOUND)



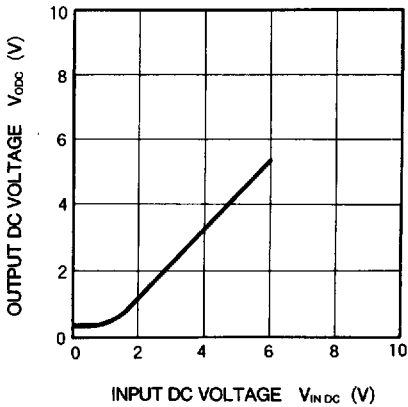
TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (SOUND)



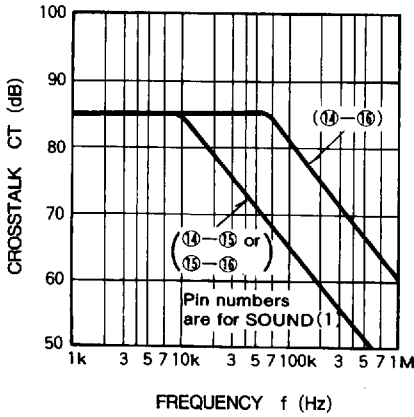
TOTAL HARMONIC DISTORTION VS. FREQUENCY (SOUND)



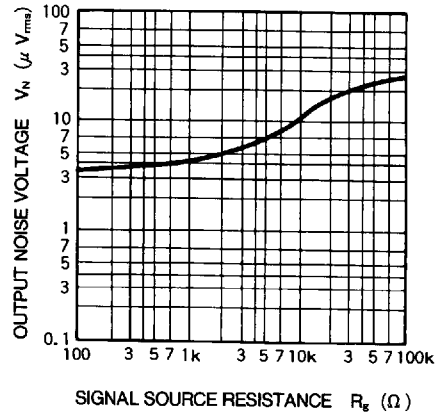
OUTPUT DC VOLTAGE VS. INPUT DC VOLTAGE (SOUND)



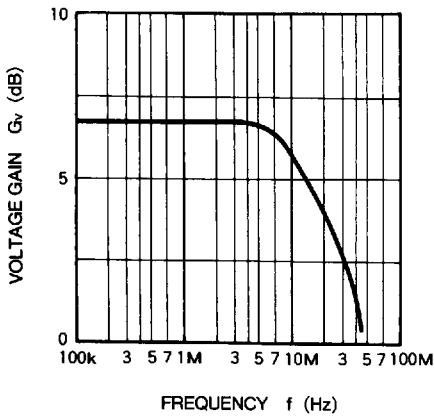
CROSSTALK, VS. FREQUENCY (SOUND)



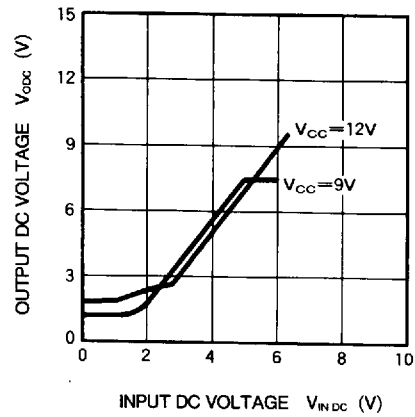
OUTPUT NOISE VOLTAGE VS. SIGNAL SOURCE RESISTANCE (SOUND)



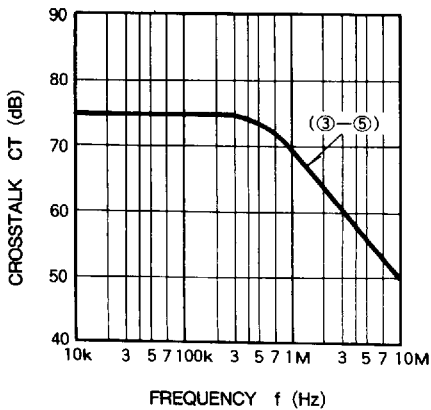
VOLTAGE GAIN VS. FREQUENCY (VIDEO)



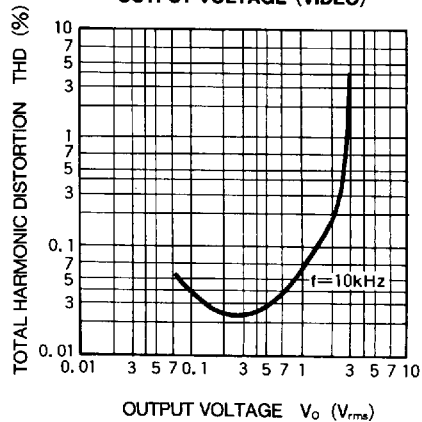
OUTPUT DC VOLTAGE VS. INPUT DC VOLTAGE (VIDEO)



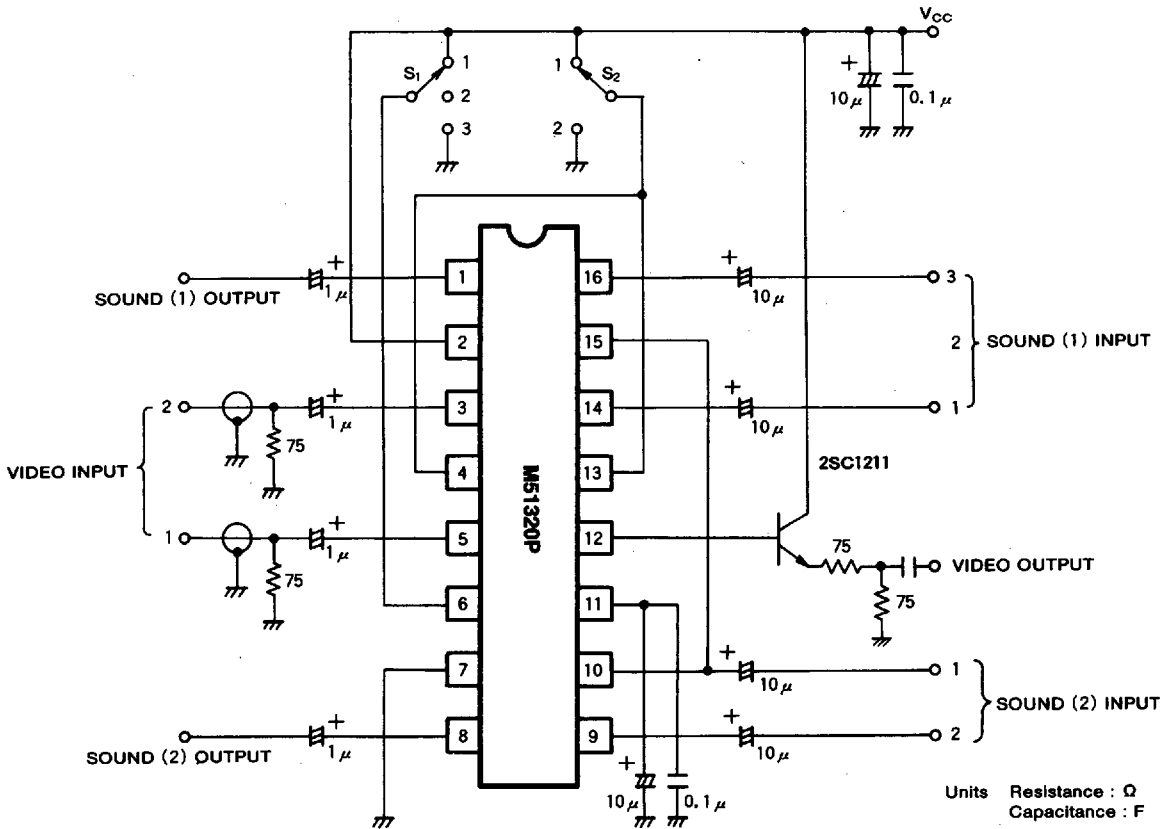
CROSSTALK VS. FREQUENCY (VIDEO)



TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (VIDEO)



APPLICATION EXAMPLE



PRECAUTIONS FOR APPLICATION

When video output is sent through a 75Ω output and 12V supply is used, an external transistor buffer, such as the one shown in the above diagram, should be connected to maintain a balance with the power dissipation of the package. Should 9V be the sole supply voltage, a direct drive arrangement can be used as in the diagram at right by connecting resistor R_E between the output pin and ground. Since an emitter-follower output is used in video and sound outputs, when external wiring is long or a capacitive load is connected, a resistor with a value of several tens of ohms should be connected at a position near the output pin.

