M51321P

ANALOG SWITCH

DESCRIPTION

The M51321P is a semiconductor integrated circuit containing an analog switch designed for use in a video system. It contains two audio switches and one video switch. Each switch has three inputs and can be undependently controlled. In addition, the video switch contains an amplifier with again 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)

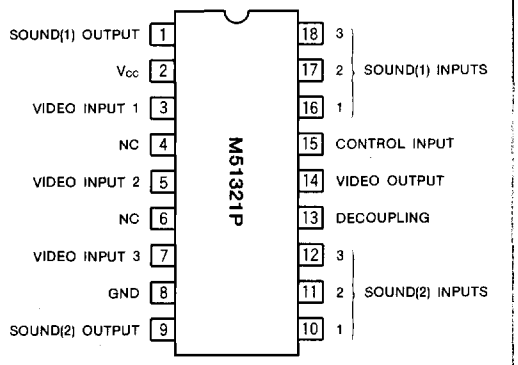
APPLICATION

Video equipment.

RECOMMENDED OPERATING CONDITION

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

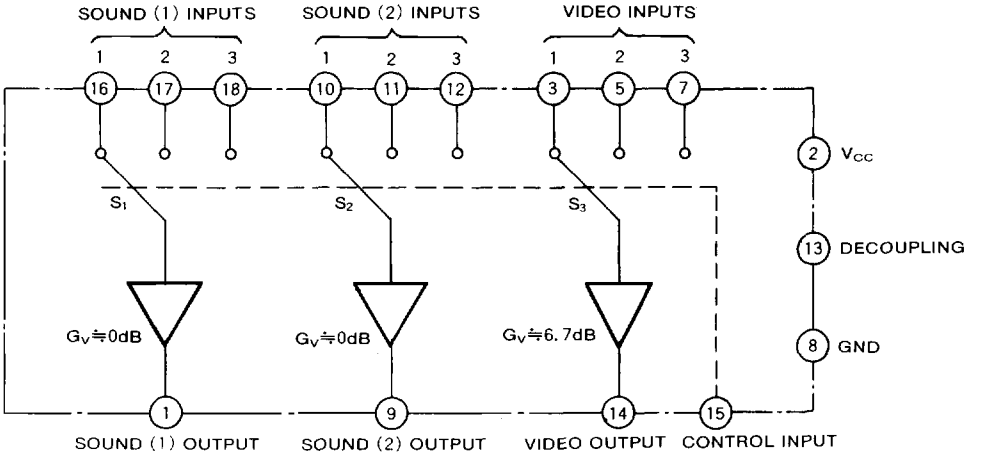
PIN CONFIGURATION (TOP VIEW)



Outline 18P4

NC : No connection

BLOCK DIAGRAM



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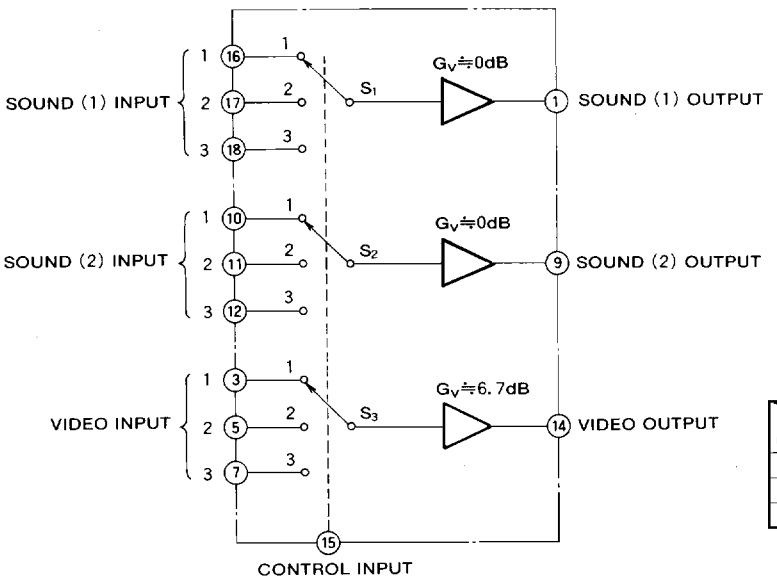
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
V_{CC}	Supply voltage	14	V
V_{IS}	Input signal voltage	6	V
T_{IC}	Input control voltage	V_{CC}	V
Pd	Power dissipation	1.25	W
K_θ	Thermal derating	12.5	mW/℃
Topr	Operating range	−20～75	℃
Tstg	Storage temperature range	−40～125	℃

ELECTRICAL CHARACTERISTICS (Ta=25℃, V_{CC}=12V, unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{CC}	Circuit current			40	50	mA
$V_{I\,DC}$	Input bias voltage		3.8	4.2	4.6	V
$V_{O\,DC}$	Output bias voltage	Video	5.0	5.6	6.2	V
		Sound	3.0	3.6	4.2	
V_{OP}	Output DC offset voltage			15	100	mV
$V_{IC\,H}$	Control-pin threshold voltage		7.0	8.0	9.0	V
$V_{IC\,L}$			3.0	4.0	5.0	V
G_V	Voltage gain	Video, f=1MHz	5.7	6.7	7.7	dB
		Sound, f=1kHz	−0.5	−0.1		
THD	Total harmonic distortion	Sound, f=1kHz, V_O=1Vrms		0.02	0.2	%
V_N	Output noise voltage	Sound, Rg=600Ω, BW=15kHz		3	50	μVrms
		Video, Rg=75Ω, BW=10MHz		0.5	1.0	mVrms
CT	Crosstalk	Sound, f=1kHz	65	80		dB
		Video, f=5MHz	45	55		

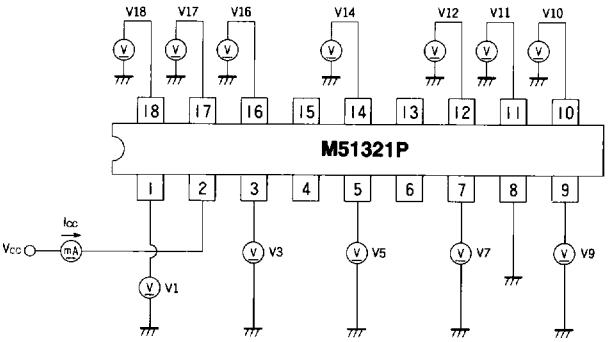
SWITCHING MODE



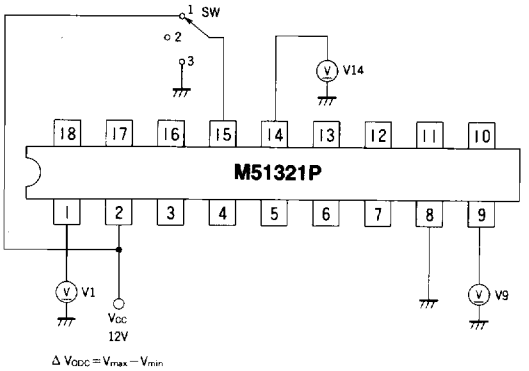
Control input \ Switch No.	S_1	S_2	S_3
V_{CC}	1	1	1
OPEN	2	2	2
GND	3	3	3

TEST CIRCUIT (Ta=25℃, V_{CC}=12V, unless otherwise noted)

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

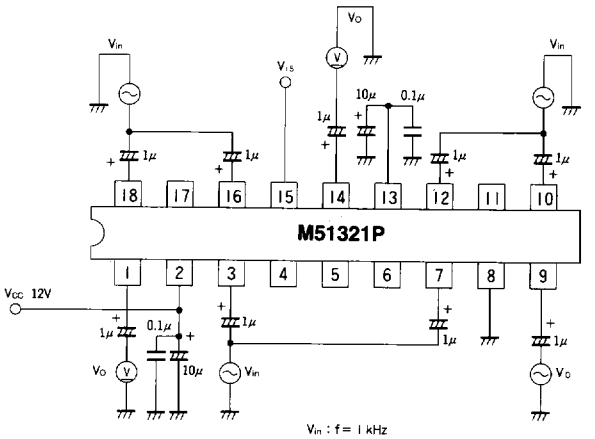


OUTPUT DC OFFSET VOLTAGE TEST CIRCUIT



In video, sound (1), and sound (2) test, measure each DC output voltage of V14, V1, and V9 with SW turned to 1, 2, or 3.

CONTROL PIN THRESHOLD VOLTAGE TEST CIRCUIT



Unit Resistance : Ω
Capacitance : F

V_{ICL}: shows the value of V15 when AC component of each output pin is switched OFF after initially raising DC voltage V15 to 3-5V

V_{ICH}: shows the value of V15 when AC component of each output pin is switched ON after initially raising DC voltage V15 to 7-9V

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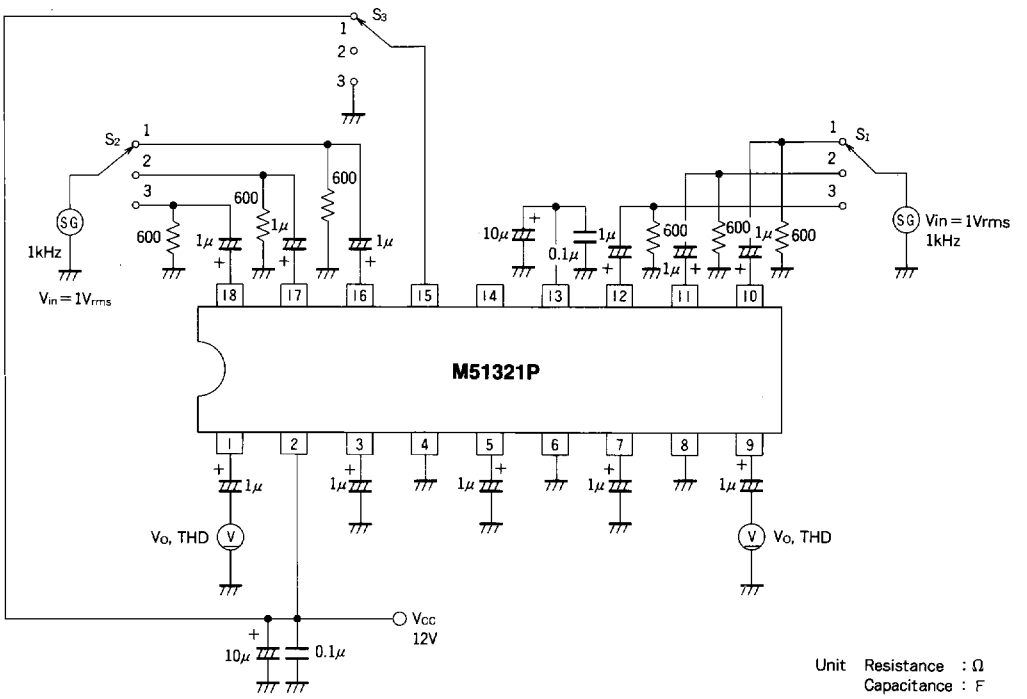
CROSSTALK, VOLTAGE GAIN, TOTAL HARMONIC DISTORTION TEST CIRCUIT (SOUND SWITCH)



Unit Resistance : Ω
Capacitance : F

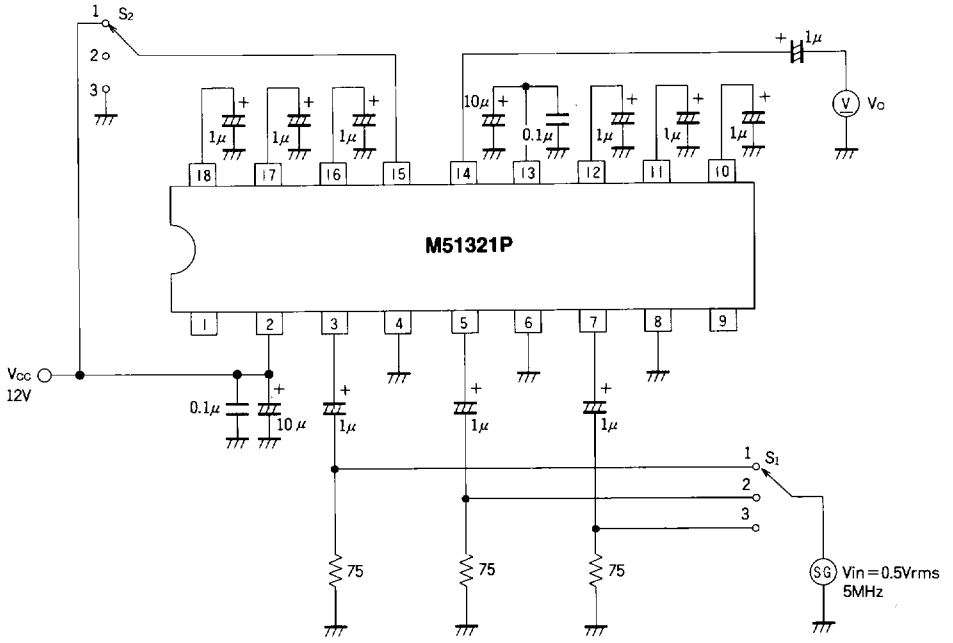
SWITCH MODE LIST

Switch conditions		Output mode
S1 and S2	S3	
1	1	Vos, THD
	2, 3	Voc
2	2	Vos, THD
	1, 3	Voc
3	3	Vos, THD
	1, 2	Voc

Crosstalk $CT=20\log\left(\frac{Vos}{Voc}\right)$ dB

Voltage gain $Gv=20\log\left(\frac{Vos}{Vin}\right)$ dB

CROSSTALK, VOLTAGE GAIN TEST CIRCUIT (VIDEO SWITCH)



Unit Resistance : Ω
Capacitance : F

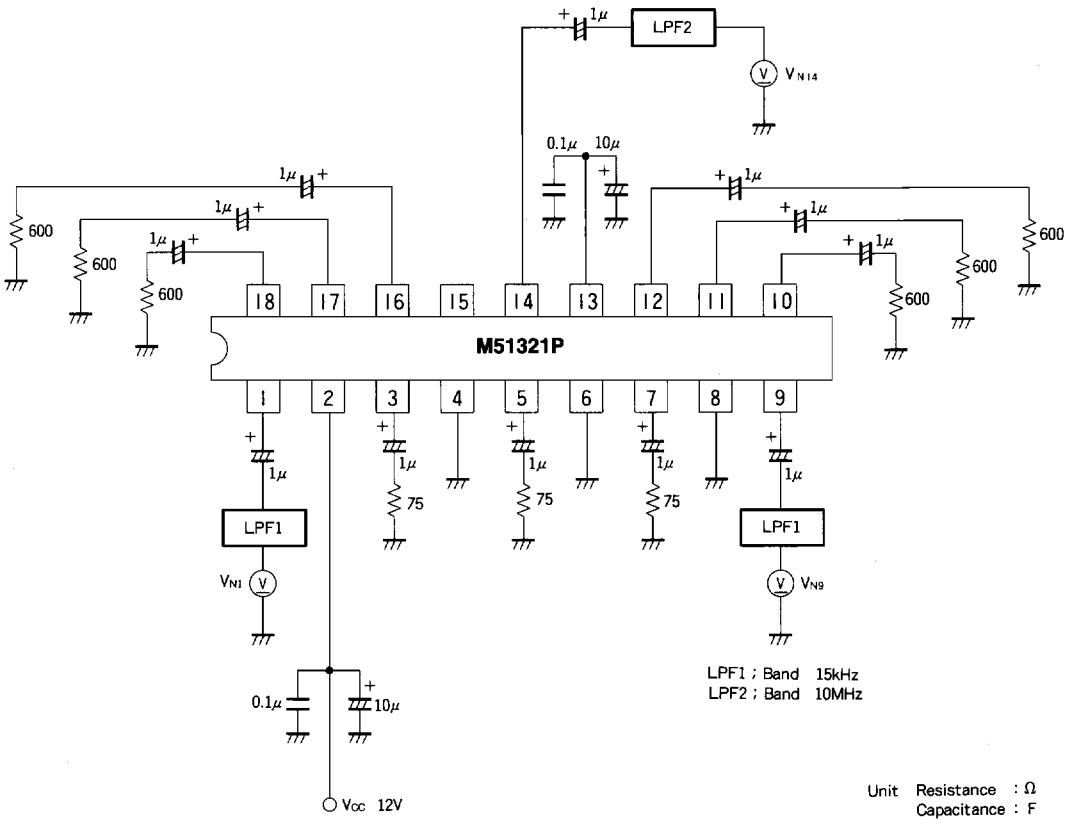
SWITCH MODE LIST

S1	S2	Vo
1	1	Vos
	2, 3	Voc
2	2	Vos
	1, 3	Voc
3	3	Vos
	1, 2	Voc

Crosstalk $CT=20\log\left(\frac{Vos}{Voc}\right)$ dB

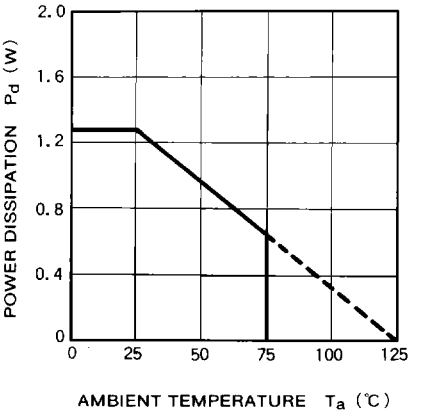
Voltage gain $Gv=20\log\left(\frac{Vos}{Vin}\right)$ dB

OUTPUT NOISE VOLTAGE

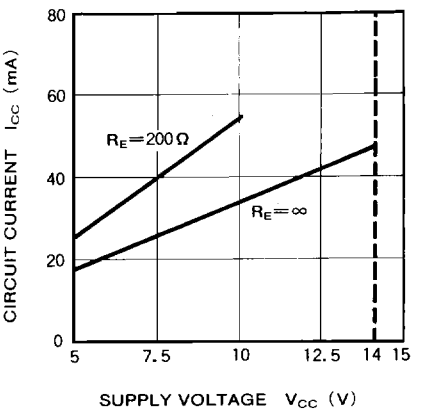


TYPICAL CHARACTERISTICS (Ta=25℃, unless otherwise noted)

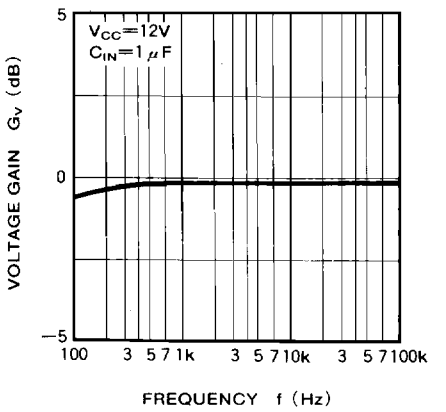
THERMAL DERATING (MAXIMUM RATING)



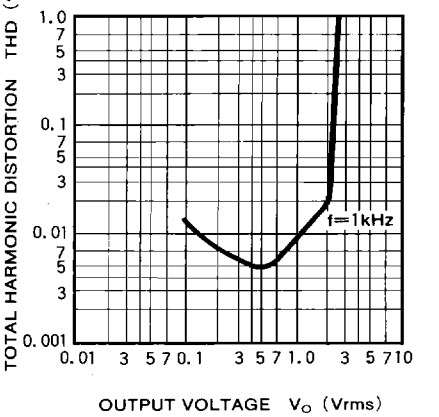
CIRCUIT CURRENT VS. SUPPLY VOLTAGE



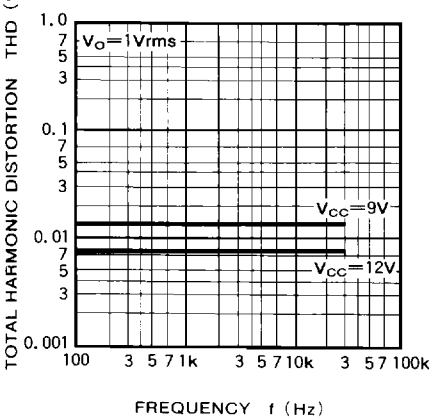
VOLTAGE GAIN VS. FREQUENCY (SOUND)



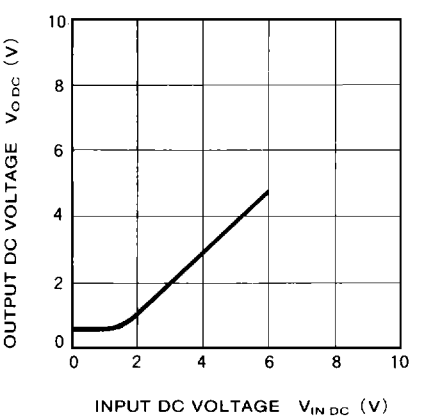
TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (SOUND)



TOTAL HARMONIC DISTORTION VS. FREQUENCY (SOUND)



OUTPUT DC VOLTAGE VS. INPUT DC VOLTAGE (SOUND)



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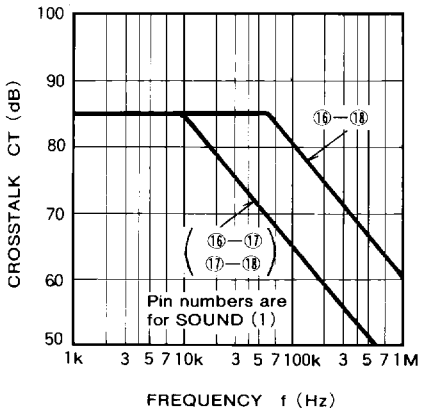
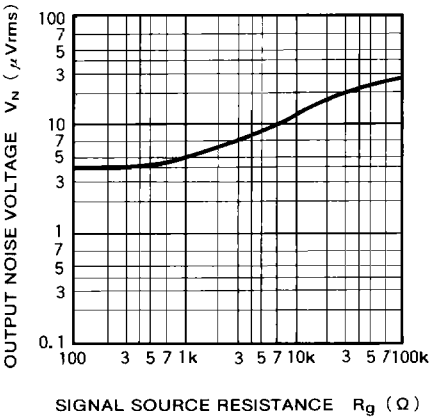
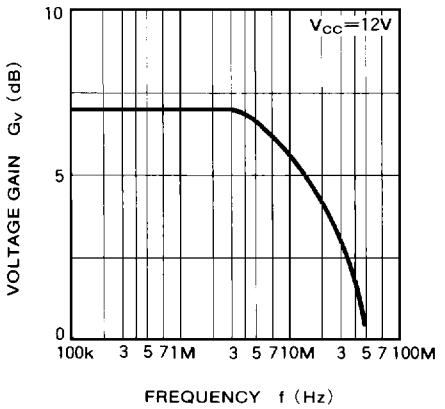
CROSSTALK VS. FREQUENCY (SOUND)



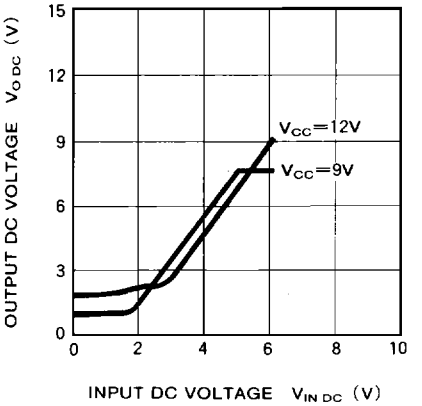
OUTPUT NOISE VOLTAGE VS. SIGNAL SOURCE RESISTANCE (SOUND)



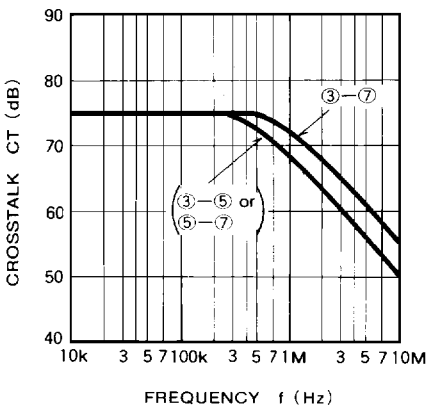
VOLTAGE GAIN VS. FREQUENCY (VIDEO)



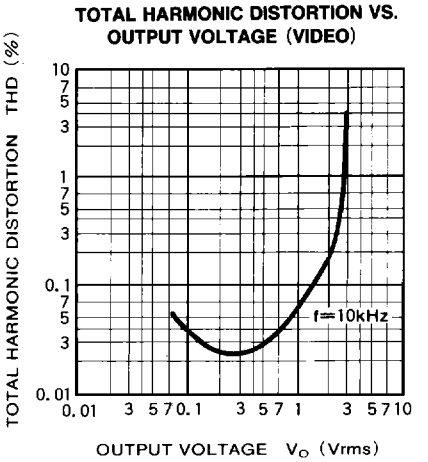
OUTPUT DC VOLTAGE VS. INPUT DC VOLTAGE (VIDEO)



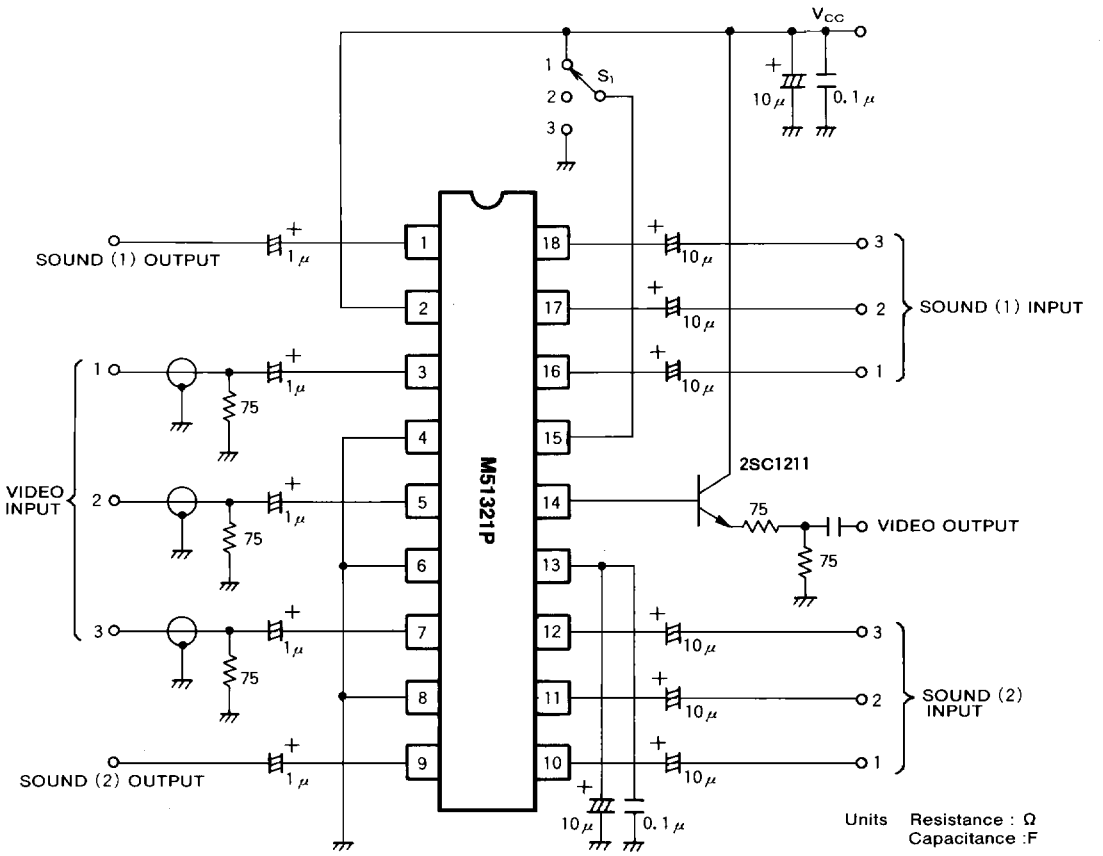
CROSSTALK VS. FREQUENCY (VIDEO)



TOTAL HARMONIC DISTORTION VS. OUTPUT VOLTAGE (VIDEO)



APPLICATION EXAMPLE



PRECAUTIONS FOR APPLICATION

When video output is sent through a 75Ω output and 12V supply voltage 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.