



LA7955

Video Switch for TV / VCR Use

Overview

The LA7955 Video Switch IC is used to switch the video and audio signals of TVs, VCRs and similar equipment. Separate pin layouts for the video and audio systems facilitate board design. Two signals can be selected from the three input signals in a symmetrical arrangement using a control signal. Low impedance lines (V_{CC} , GND and control input) between the input and output pins minimize crosstalk caused by the high frequency of the video section. The LA7955 operates on a 12V power supply and is available in 20-pin plastic slim DIPs.

Functions

- Video applications : 3 inputs, 2 outputs
- Audio applications : 3 inputs, 2 outputs \times 2 (L, R) channels
- Built-in muting circuits for 2 left and right audio output channels

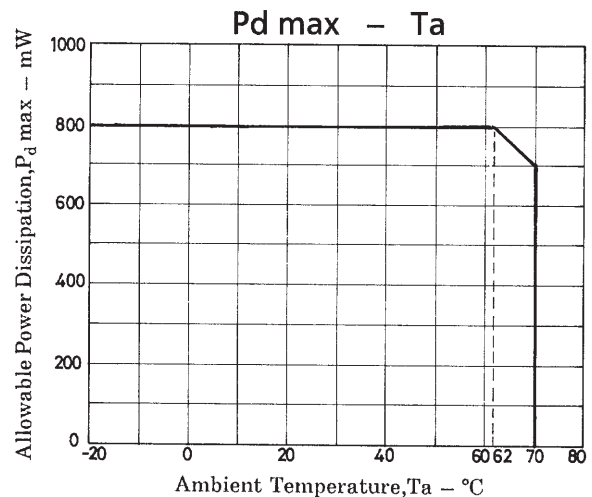
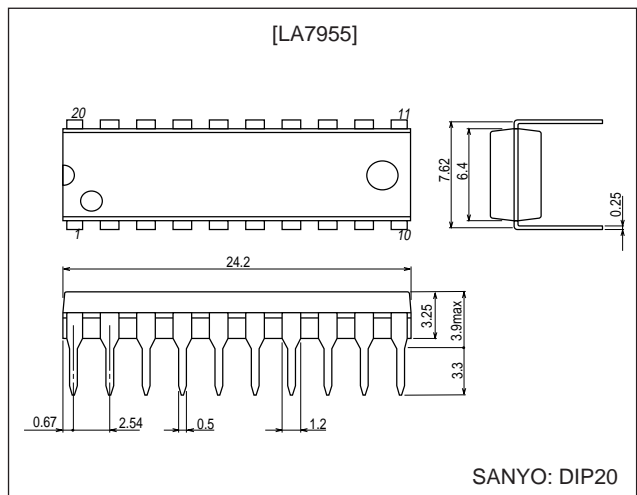
Features

- Separate video and audio pin layouts
- Built-in 6dB video amps
- Wideband characteristics
- Minimal video and audio crosstalk
- 12V power supply
- 20-pin plastic slim DIP

Package Dimensions

unit : mm

3021B-DIP20



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Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	$V_{6\text{max}}$		14.4	V
Maximum Control Signal Voltage	$V_{4\text{max}}$ $V_{6\text{max}}$ $V_{10\text{max}}$		14.4	V
Allowable Power Dissipation	$P_{d\text{max}}$	$T_a \leq 70^\circ\text{C}$	700	mW
Operating Temperature	T_{opr}		-20 to +70	$^\circ\text{C}$
Storage Temperature	T_{stg}		-55 to +125	$^\circ\text{C}$

Operating Conditions at $T_a = 25^\circ\text{C}$

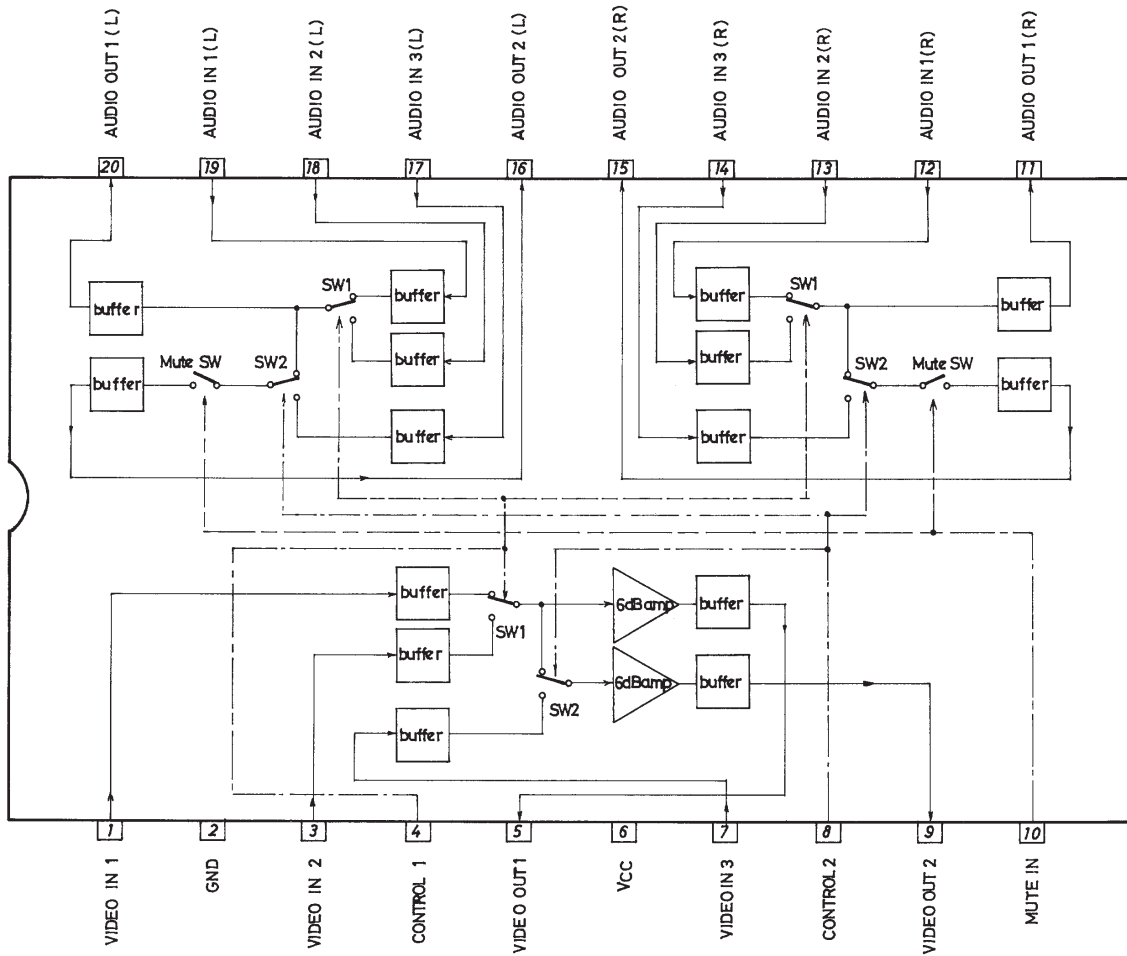
Parameter	Symbol	Conditions	Ratings	Unit
Recommended Supply Voltage	V_{CC}		12	V
Operating Supply Voltage Range	$V_{CC\text{op}}$		8 to 13.2	Vs

Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent Current	I_{CC}		35	43	57	mA
Video Input Bias Voltage	V_1, V_3, V_7		4.4	4.7	5.0	V
Video Output Bias Voltage	V_5, V_9		6.2	6.8	7.4	V
Video Input Impedance	Z_1, Z_3, Z_7	$f = 1\text{ kHz}$	15	21	27	$\text{k}\Omega$
Video Output Impedance	Z_5, Z_9	$f = 1\text{ kHz}$		42		Ω
Video Voltage Gain	G_{VV}	$V_{in} = 1\text{ V}_{p-p}$ (sine wave), $f = 0.1\text{ MHz}$	5.6	6.1	6.6	dB
Video Frequency Bandwidth	BW_V	$V_{in} = 0.7\text{ V}_{p-p}$ (sine wave), -3 dB band for 0.1 MHz	10			MHz
Output Noise Voltage	V_{nV}	$R_g = 75\ \Omega$, 10 MHz band		0.3	1.0	mVrms
Video Crosstalk (between inputs 1 and 2)	CT_{V1}	$R_g = 75\ \Omega$, $f = 3.58\text{ MHz}$	45	50		dB
Video Crosstalk (between inputs 1/2 and 3)	CT_{V2}	$R_g = 75\ \Omega$, $f = 3.58\text{ MHz}$	45	50		dB
Video Output Hum Rejection	HR_V	$f = 50\text{ Hz}$, $R_g = 75\ \Omega$	18	23		dB
Audio Input Bias Voltage	$V_{12}, V_{13},$ $V_{14}, V_{17},$ V_{18}, V_{19}		4.5	5.1	5.7	V
Audio Output Bias Voltage	$V_{11}, V_{15},$ V_{18}, V_{20}		3.2	3.8	4.4	V
Audio Input Impedance (inputs 1 and 2)	$Z_{12}, Z_{13},$ Z_{15}, Z_{19}	$f = 1\text{ kHz}$	47	68	88	$\text{k}\Omega$
Audio Input Impedance (input 3)	Z_{14}, Z_{17}	$f = 1\text{ kHz}$	51	74	95	$\text{k}\Omega$
Audio Output Impedance	$Z_{11}, Z_{15},$ Z_{16}, Z_{20}			75		Ω
Audio Voltage Gain	G_{VA}	$f = 1\text{ kHz}$, $V_{in} = 500\text{ mVrms}$	-0.5	-0.02	+0.5	dB
Audio Frequency Bandwidth	BW_A	-1 dB band ($V_{in} = 500\text{ mVrms}$) for $f = 1\text{ kHz}$ gain	100			kHz
Total Harmonic Distortion	THD	$f = 1\text{ kHz}$, $V_{in} = 500\text{ mVrms}$		0.03	0.2	%
Output Noise Voltage	V_{nA}	$R_g = 600\ \Omega$, 20 Hz to 20 kHz bandwidth		10	50	μVrms
Audio Crosstalk (between inputs 1 and 2)	CT_{A1}	$R_g = \text{less than } 4.7\ \text{k}\Omega$, $f = 1\text{ kHz}$ ($V_{in} = 500\text{ mVrms}$)	75	90		dB
Audio Crosstalk (between inputs 1/2 and 3)	CT_{A2}	$R_g = \text{less than } 4.7\ \text{k}\Omega$, $f = 1\text{ kHz}$ ($V_{in} = 500\text{ mVrms}$)	75	90		dB
Audio Crosstalk (between L and R channels)	CT_{AS}	$R_g = 4.7\ \text{k}\Omega$, $f = 1\text{ kHz}$ ($V_{in} = 500\text{ mVrms}$)	72	82		dB
Mute Noise	V_{OAM}	$f = 1\text{ kHz}$, $V_{in} = 500\text{ mVrms}$		0.02	0.1	mVrms
Audio Hum Rejection 1	HR1	Input $R_g = 4.7\ \text{k}\Omega$	40	46		dB
Audio Hum Rejection 2	HR2	Input open	28	39		dB
Switching Control Signal Input High Threshold Voltage	V_{4TH}, V_{8TH}		1.1	1.4	1.7	V
Switching Control Signal Input Leak Current	I_{4L}, I_{8L}				-3	μA
Mute Input High Threshold Voltage	V_{10TH}		1.1	1.4	1.7	V
Mute Input Leak Current	I_{10L}				-3	μA

Note: The current flowing to the IC is positive and current from the IC is negative.

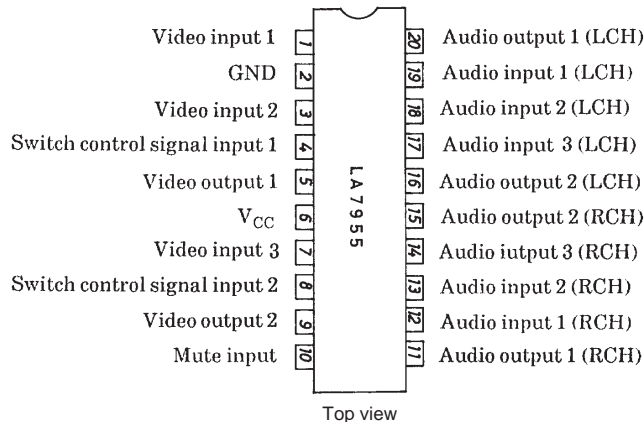
Equivalent Circuit Block Diagram



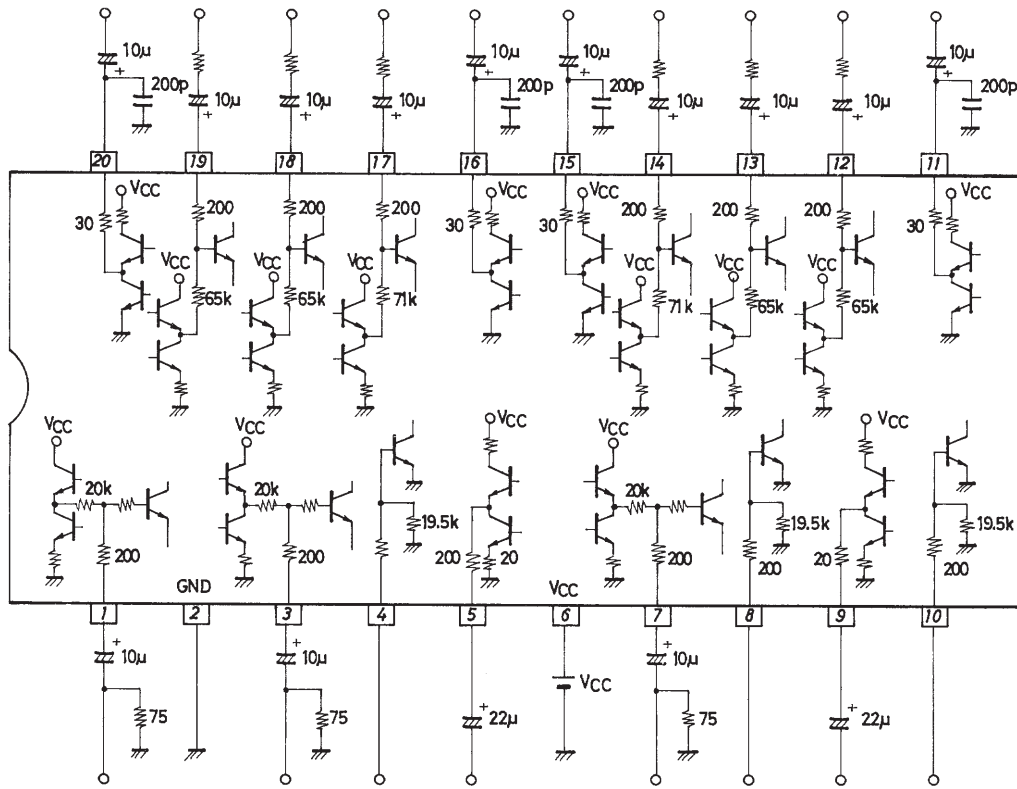
Switching Truth Table

CONTROL 1 (PIN 4)	CONTROL 2 (PIN 8)	MUTE IN (PIN10)	VIDEO OUT		AUDIO OUT			
			1	2	1 L	2 L	1 R	2 R
L	L	L	IN 1	IN 1	IN 1	IN 1	IN 1	IN 1
L	H	L	IN 1	IN 3	IN 1	IN 3	IN 1	IN 3
H	L	L	IN 2	IN 2	IN 2	IN 2	IN 2	IN 2
H	H	L	IN 2	IN 3	IN 2	IN 3	IN 2	IN 3
L	L	H	IN 1	IN 1	IN 1	—	IN 1	—
L	H	H	IN 1	IN 3	IN 1	—	IN 1	—
H	L	H	IN 2	IN 2	IN 2	—	IN 2	—
H	H	H	IN 2	IN 3	IN 2	—	IN 2	—

Pin Assignments



Sample Application Circuit

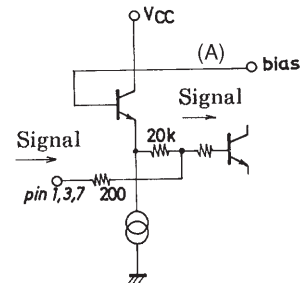


Unit (resistance:Ω, capacitance:F)

Circuit and Operational Description

1. Video Input circuit

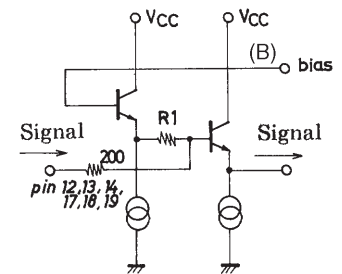
The video input circuit shown in the figure on the right has an input impedance of approximately 20 kΩ. The input bias voltage is determined by the bias at point (A), however, the voltage at this point fluctuates according to V_{CC}.



Unit (resistance:Ω)

2. Audio input circuit

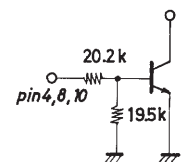
The audio input circuit is shown in the figure on the right. The impedance of audio inputs 1 and 2 (Pins 12, 13, 18, and 19) is approximately 65 kΩ, and that of audio input 3 (Pins 14 and 17), approximately 71 kΩ. Although the input bias voltage is determined by the bias at point (B), the voltage at point (B) is supplied from a low-noise Zener diode voltage regulator circuit and is not dependent on V_{CC}.



Unit (resistance:Ω)

3. Control signal input circuit

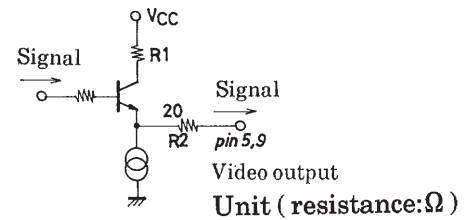
The circuit at input pins for the switching and muting circuits are shown in the figure on the right. The threshold voltage is approximately 1.4 V.



Unit (resistance:Ω)

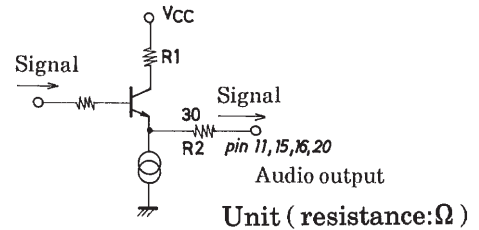
4. Video Output Circuit

The video output is emitter follower output.

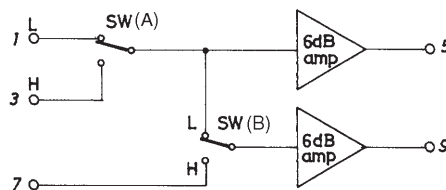


5. Audio output circuit

The audio output is emitter follower output.



6. Video switch operation

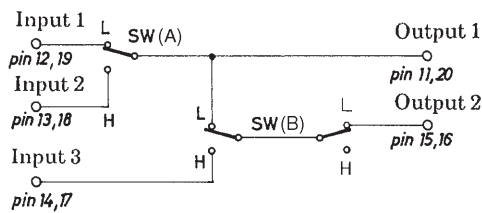


SW (A) is switched by the voltage of switching control input signal 1 (Pin 4), and SW (B), by the voltage of Switching control input signal 2 (Pin 8). In addition, there are amplifiers (with 75 Ω terminating output pins) with a gain of 6 dB at the pre-output stages of Pins 5 and 9. However, an external buffer is required when shorted with a 75 Ω resistor.

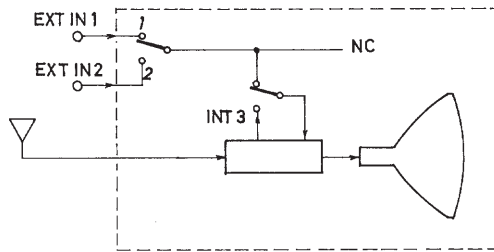
7. Audio switch operation

SW (A) is switched by the voltage of switching control input signal 1 (Pin 4), and SW (B), by the voltage of switching control input signal 2 (Pin 8). Setting the must input voltage (Pin 10) to H turns the muting switch ON and cutting output 2.

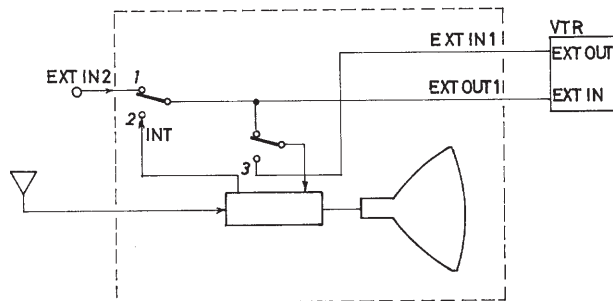
Two pairs of audio switches are built in, allowing use in equipment designs for multiplex broadcast systems.



- Application Example 1 (TV with two video inputs)



- Application Example 2 (TV with video inputs and VCR)



※ Audio output 2 is ideal for TV outputs as it has a built-in muting switch.

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