

| | | |
|--------------|--------------------------------------|---------------|
| SANYO | No.2740B | 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 2 right audio output channels

Features

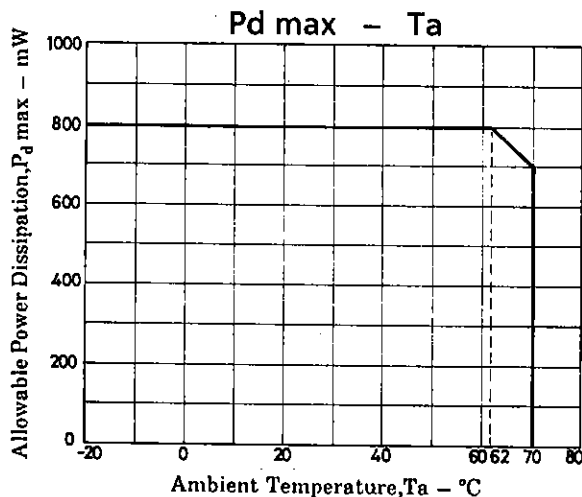
- Separate video and audio pin layouts
- Built-in 6dB video amps
- Wideband characteristics
- Minimal video and audio crosstalk
- 12V power supply
- 20-pin plastic slim DIP

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

| | | | | |
|--------------------------------|--|-------------|------------------|-----------------------------|
| Maximum Supply Voltage | $V_{6\text{max}}$ | 14.4 | V | unit |
| Maximum Control Signal Voltage | $V_{4\text{max}}, V_{8\text{max}}, V_{10\text{max}}$ | 14.4 | V | |
| Allowable Power Dissipation | $P_{d\text{max}}$ | 700 | mW | $T_a \leq 70^\circ\text{C}$ |
| Operating Temperature | T_{opr} | -20 to +70 | $^\circ\text{C}$ | |
| Storage Temperature | T_{stg} | -55 to +125 | $^\circ\text{C}$ | |

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

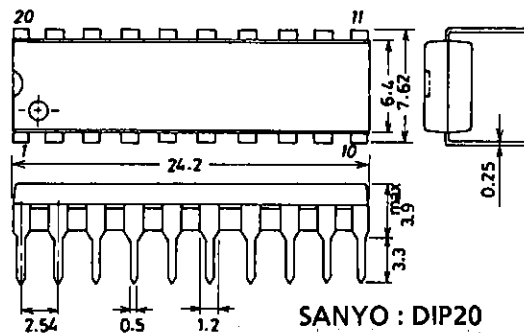
| | | | | |
|--------------------------------|-------------------|-----------|---|------|
| Recommended Supply Voltage | V_{CC} | 12 | V | unit |
| Operating Supply Voltage Range | $V_{CC\text{op}}$ | 8 to 13.2 | V | |



Package Dimensions

(unit : mm)

3021B

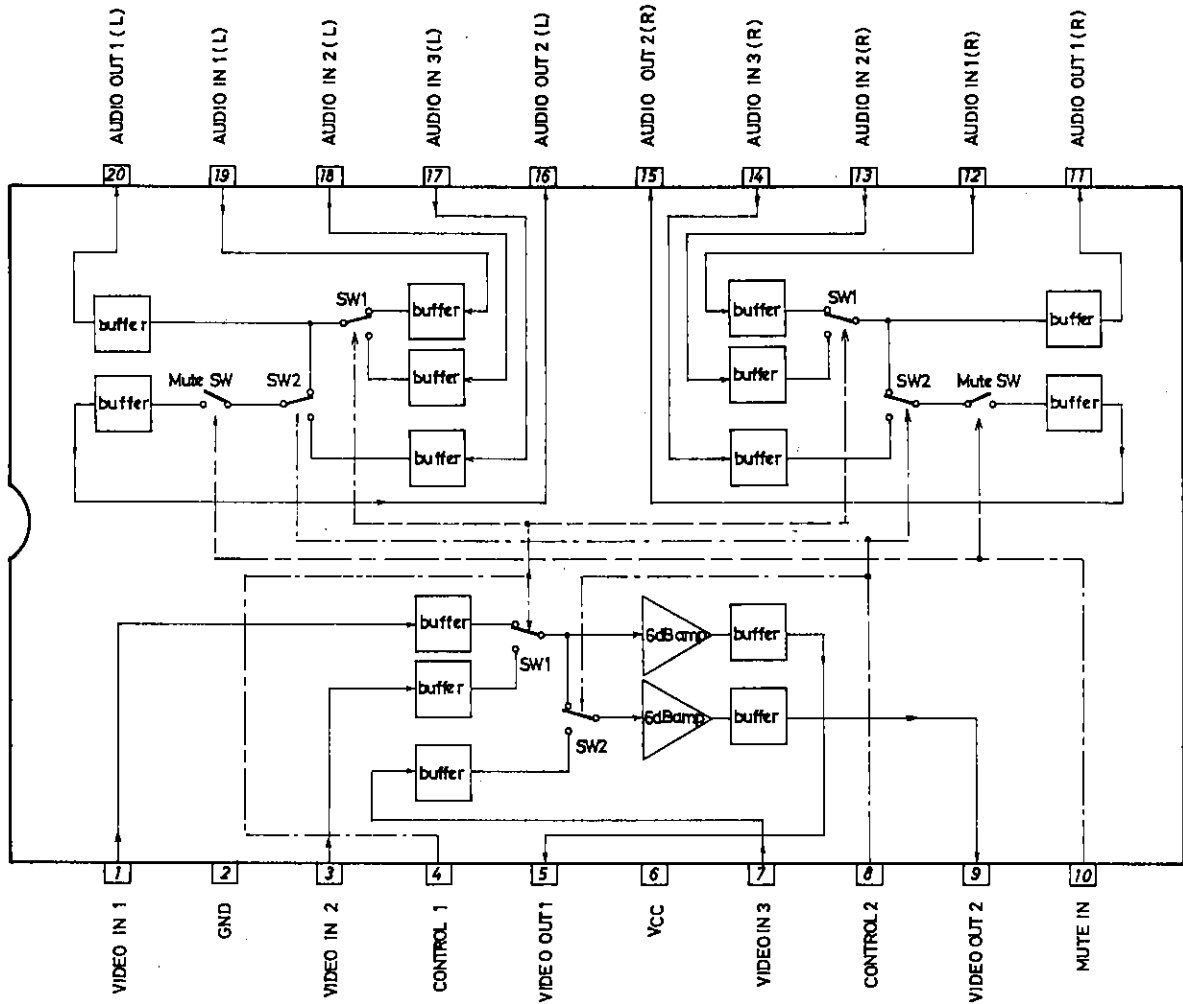


LA7955

| Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 12\text{V}$ | | | | min | typ | max | unit |
|---|--|---|--|------|-------|------|------------------|
| 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 | k Ω |
| 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) - 3dB band for 0.1MHz | | 10 | | | MHz |
| Output Noise Voltage | V_{NV} | $R_g = 75\Omega, 10\text{MHz}$ 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 | k Ω |
| Audio Input Impedance (input 3) | Z_{14}, Z_{17} | $f = 1\text{kHz}$ | | 51 | 74 | 95 | k Ω |
| Audio Output Impedance | $Z_{11}, Z_{15}, Z_{16}, Z_{20}$ | | | | 75 | | Ω |
| Audio Voltage Gain | G_{VA} | $f = 1\text{kHz}, V_{in} = 500\text{mVrms}$ - 1dB band | | -0.5 | -0.02 | +0.5 | dB |
| Audio Frequency Bandwidth | BW_A | ($V_{in} = 500\text{mVrms}$) 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} | $R_g = 600\Omega, 20\text{Hz}$ to 20kHz 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.

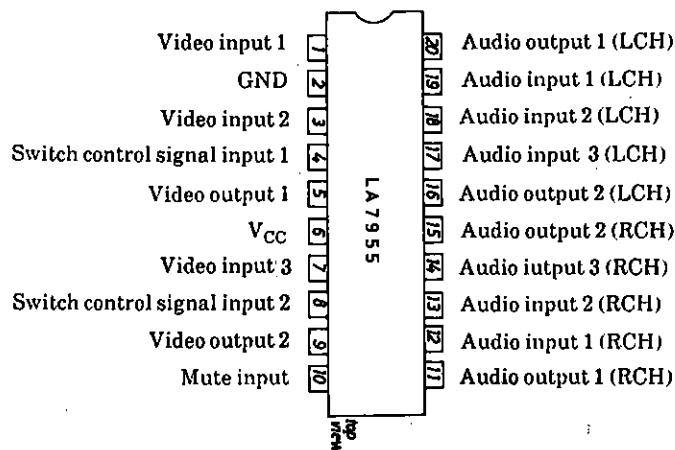
Equivalent Circuit Block Diagram



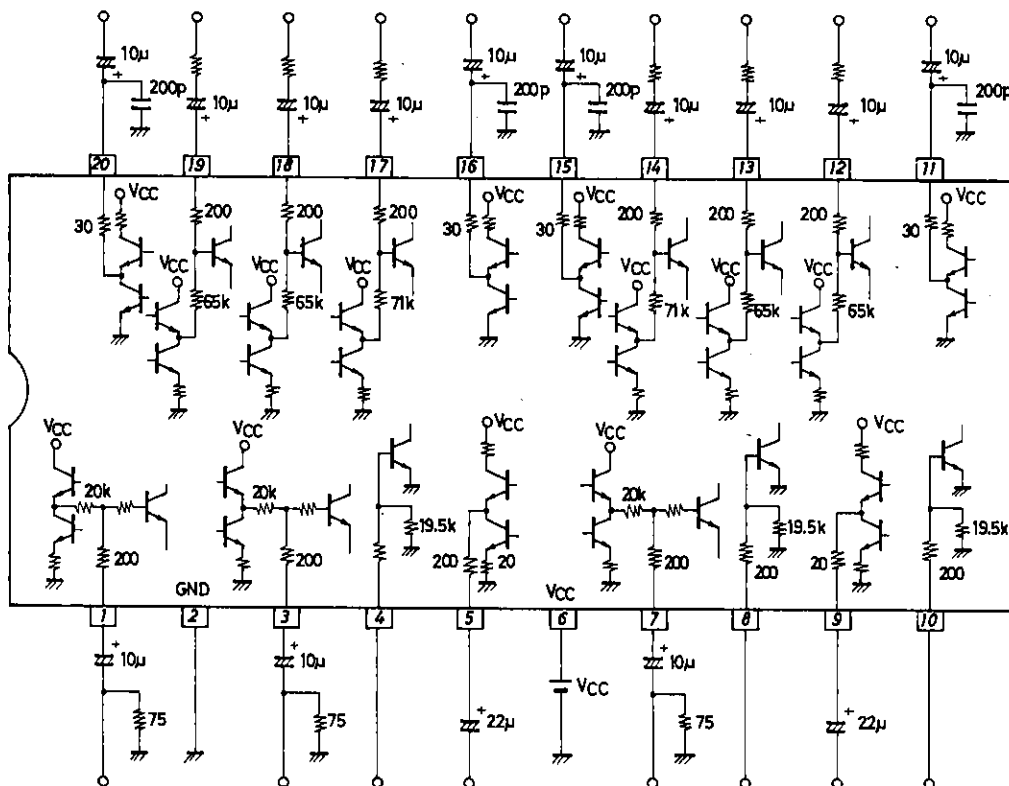
Switching Truth Table

| CONTROL 1 (PIN 4) | CONTROL 2 (PIN 8) | MUTE IN (PIN 10) | 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 | — |

Pinouts



Sample Application Circuit

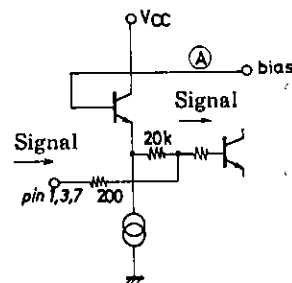


Unit (resistance:Ω, capacitance:F)

Circuit and Operational Description

1. Video input circuit

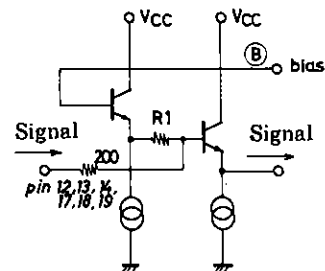
The video input circuit shown in the figure on the right has an input impedance of approximately 20kΩ. The input bias voltage is determined by the bias at point A, however, the voltage at this point fluctuates according to VCC.



Unit (resistance:Ω)

2. Audio input circuit

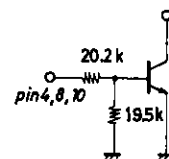
The audio input circuit is shown in the figure on the right. The impedance of audio inputs 1 and 2 (Pins 12, 13, 18, and 19) is approximately 65kΩ, and that of audio input 3 (Pins 14 and 17), approximately 71kΩ. Although the input bias voltage is determined by the bias at point B, the voltage at point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



Unit (resistance:Ω)

3. Control signal input circuit

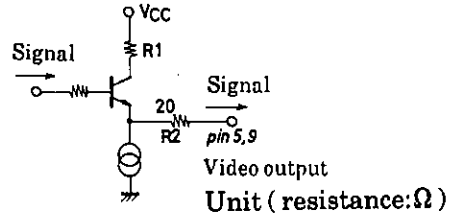
The circuit at input pins for the switching and muting circuits are shown in the figure on the right. The threshold voltage is approximately 1.4V.



Unit (resistance:Ω)

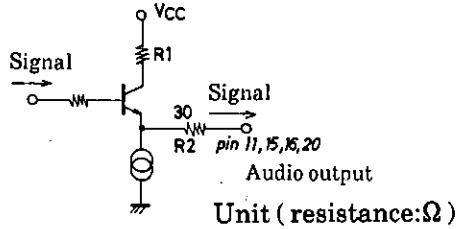
4. Video output circuit

The video output is emitter follower output.

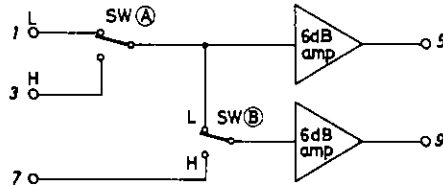


5. Audio output circuit

The audio output is emitter follower output.



6. Video switch operation

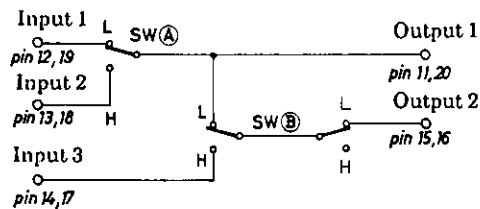


SW Ⓐ is switched by the voltage of switching control input signal 1 (Pin 4), and SW Ⓑ, by the voltage of switching control input signal 2 (Pin 8). In addition, there are amplifiers (with 75Ω terminating output pins) with a gain of 6dB at the pre-output stages of Pins 5 and 9. However, an external buffer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

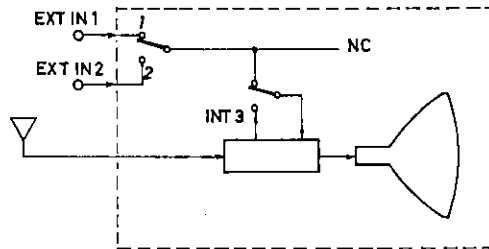
7. Audio switch operation

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

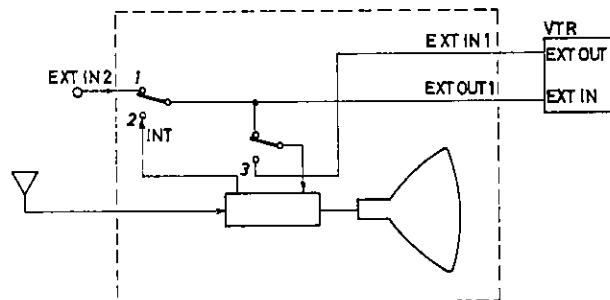
Two pairs of audio switches are built in, allowing use in equipment designs for multiplex broadcast systems.



• 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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