

SANYO

No.2738

LA7223

Monolithic Linear IC

Audio/Video Switch for PAL VCR Use

Overview

The LA7223 PAL Audio/Video Switch is specifically designed for PAL VCR applications. It incorporates a set of solid-state switches for selecting one of three pairs of audio and video signals, in addition to built-in audio muting circuitry and a driver for external function select switch (FSS) control. The LA7223 operates on a single 12V power supply, and is available in 24-pin shrink DIPs.

Features

- 3-way audio and video switch
- Function select control output
- Audio muting circuit
- Ripple filter
- High dynamic range

Maximum Rating at Ta = 25°C

| Parameter | Symbol | Value | unit |
|-----------------------------|---------------------|-------------|------|
| Maximum Supply Voltage | V _{CC} max | 15.0 | V |
| Allowable Power Dissipation | P _d max | 400 | mW |
| Operating Temperature | T _{opg} | -10 to +70 | °C |
| Storage Temperature | T _{stg} | -40 to +125 | °C |

Operating Conditions at Ta = 25°C

| Parameter | Symbol | Value | unit |
|----------------------------|--------------------|--------------|------|
| Recommended Supply Voltage | V _{CC} | 12.0 | V |
| Operating Voltage Range | V _{CC op} | 11.5 to 12.5 | V |

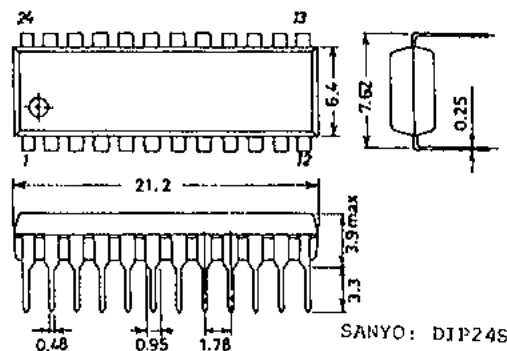
Operating Characteristics at V_{CC} = 12.0V, Ta = 25°C

| Parameter | Symbol | min | typ | max | unit |
|---------------------|-----------------|------|------|------|------|
| Current Dissipation | I _{CC} | 11.2 | 14.5 | 19.3 | mA |
| Insertion Loss | GI | | 0.2 | 0.5 | dB |
| Channel Crosstalk | CT A-A | -71 | -60 | | dB |
| | CT V-A | -55 | -50 | | dB |
| | CT V-V | -60 | -50 | | dB |
| Switch Leakage | LA(AUDIO) | -71 | -60 | | dB |
| | LV(VIDEO) | -60 | -50 | | dB |

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Case Outline 3067-D24SIC

(unit : mm)



The application circuit diagrams and circuit constants herein are included as an example and provide no guarantee for designing equipment to be mass-produced. The information herein is believed to be accurate and reliable. However, no responsibility is assumed by SANYO for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

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| | | min | typ | max | unit |
|---------------------------|------------------------|------|-------|------|------------------|
| Signal Switching | V _{FSS} | 4.6 | 5.1 | 5.6 | V |
| Input Voltage | V _{T/E} | 1.9 | 2.4 | 2.9 | V |
| | V _{PB} | 1.9 | 2.4 | 2.9 | V |
| | V _{VCR} | 1.5 | 2.0 | 2.5 | V |
| Low Mute Threshold | V _{ML FSS} | 2.4 | 2.9 | 3.4 | V |
| | V _{ML T/E} | 0.9 | 1.3 | 1.7 | V |
| | V _{ML PB} | 0.9 | 1.3 | 1.7 | V |
| High Mute Threshold | V _{MH FSS} | 6.9 | 7.4 | 7.9 | V |
| | V _{MH T/E} | 3.2 | 3.7 | 4.2 | V |
| | V _{MH PB} | 3.2 | 3.7 | 4.2 | V |
| Mute Out High-Level | V _{I9} | 4.0 | 4.7 | 5.2 | V |
| Control Voltage | MP | | -52 | -40 | dB |
| Feed-Through | | | | | |
| FSS OUT HIGH-Level | V _{FSS OUT} | 9.5 | 10.3 | 11.0 | V |
| FSS OUT Short-Circuit | I ₁₂ | 0.9 | 1.35 | 1.9 | mA |
| Current | | | | | |
| Frequency Response | G _{FA(AUDIO)} | -0.5 | 0 | +1.5 | dB |
| | G _{PV(VIDEO)} | -0.5 | 0 | +1.5 | dB |
| Input Impedance | Z _{IN} | | 30 | | kΩ |
| Total Harmonic Distortion | THD | | 0.005 | 0.1 | % |
| Maximum Audio Input Level | V _{IN max} | 2.0 | | | V _{rms} |

| Item | S1 | S2 | S3 | S4 | S5 | S6 | S7 | V1 | V2 | V3 | V4 | Conditions | Test point |
|-------------------|----|----|----|----|----|----|----|----|----|----|----|---|------------|
| I _{CC} | | | | | | | | 0V | 0V | 0V | 0V | | 4 |
| G _L | ON | | | | | | | 0 | 0 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 1 |
| G _L | | ON | | | | | | 0 | 12 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 1 |
| G _L | | | ON | | | | | 0 | 0 | 5 | 0 | V _{IN} =0dBm, f=1kHz | 1 |
| G _L | | | | ON | | | | 0 | 0 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| G _L | | | | | ON | | | 0 | 12 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| G _L | | | | | | ON | | 0 | 0 | 5 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | ON | | | | 0 | 12 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | ON | | | | 0 | 0 | 5 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | | ON | | | 0 | 0 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | | ON | | | 0 | 12 | 5 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | | | ON | | 0 | 0 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{A.A} | | | | | | ON | | 0 | 12 | 0 | 0 | V _{IN} =0dBm, f=1kHz | 20 |
| CT _{V.A} | ON | | | | | | | 0 | 0 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 20 |
| CT _{V.A} | | ON | | | | | | 0 | 12 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 20 |
| CT _{V.A} | | | ON | | | | | 0 | 0 | 5 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 20 |
| CT _{V.V} | ON | | | | | | | 0 | 12 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |
| CT _{V.V} | ON | | | | | | | 0 | 0 | 5 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |
| CT _{V.V} | | ON | | | | | | 0 | 0 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |
| CT _{V.V} | | | ON | | | | | 0 | 12 | 5 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |
| CT _{V.V} | | | ON | | | | | 0 | 0 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |
| CT _{V.V} | | | ON | | | | | 0 | 12 | 0 | 0 | V _{IN} =2V _{p-p} , f=5MHz | 1 |

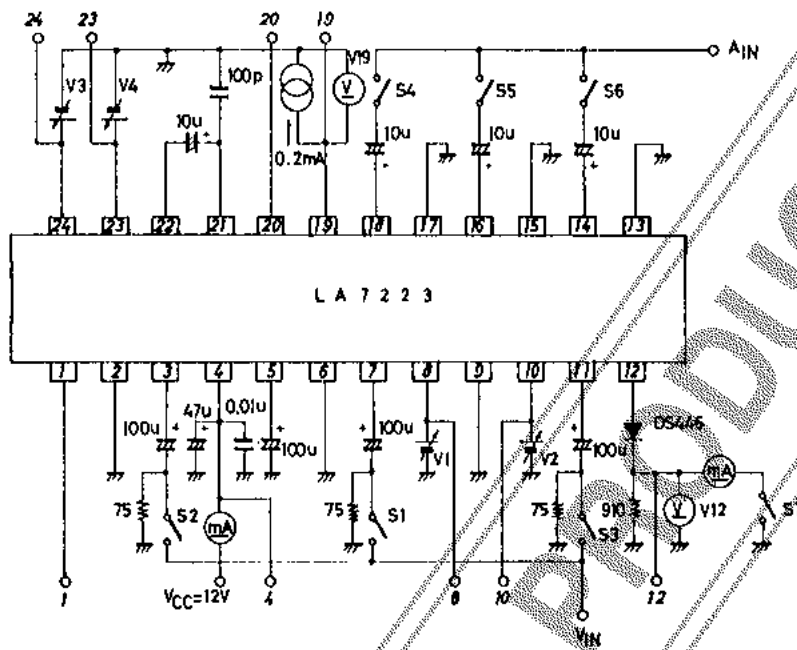
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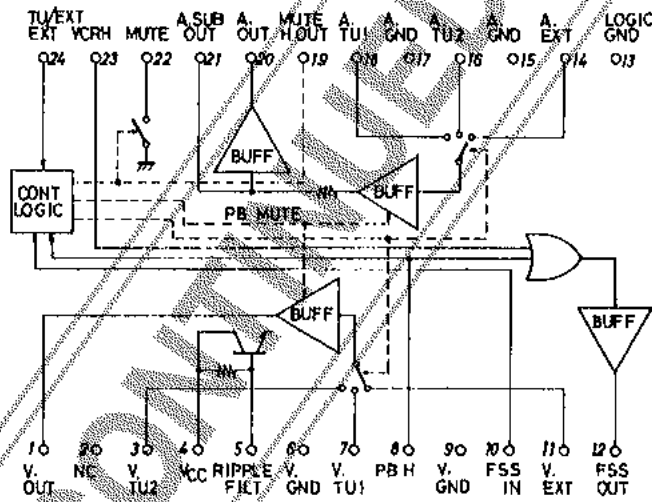
| Item | S1 | S2 | S3 | S4 | S5 | S6 | S7 | V1 | V2 | V3 | V4 | Conditions | Test point |
|----------------------|----|----|----|----|----|----|----|-----|-----|-----|-----|---|------------|
| LA | | | | ON | | | | 5 | 0 | 0 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| LA | | | | | ON | | | 5 | 12 | 0 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| LA | | | | | | ON | | 5 | 0 | 5 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| LV | ON | | | | | | | 5 | 0 | 0 | 0 | $V_{IN} = 2\text{V}_{p-p}$, $f = 5\text{MHz}$ | 1 |
| LV | | ON | | | | | | 5 | 12 | 0 | 0 | $V_{IN} = 2\text{V}_{p-p}$, $f = 5\text{MHz}$ | 1 |
| LV | | | ON | | | | | 5 | 0 | 5 | 0 | $V_{IN} = 2\text{V}_{p-p}$, $f = 5\text{MHz}$ | 1 |
| V_{FSS} | | ON | | | | | | 0V | VAR | 0V | 0V | V_{FSS} is increased from 0V until an output signal appears at Pin 1. | 10 |
| $V_{T/E}$ | | | ON | | | | | 0 | 0 | VAR | 0 | $V_{T/E}$ is increased from 0V until an output signal appears at Pin 1. | 24 |
| V_{PB} | | | | | | | | VAR | 0 | 0 | 0 | V_{PB} is increased from 0V until the output signal at Pin 1 is disabled. | 8 |
| V_{VCR} | | | | | | | | 0 | 0 | 0 | VAR | V_{VCR} is increased from 0V until $V_{FSS\text{ OUT}}$ exceeds 9V. | 23 |
| V_{MLFSS} | | | | | | | | 0 | VAR | 0 | 0 | V_{FSS} is increased from 0V until $V_{MUTE\text{ OUT}}$ exceeds 4V. | 10 |
| $V_{MLT/E}$ | | | | | | | | 0 | 0 | VAR | 0 | $V_{T/E}$ is increased from 0V until $V_{MUTE\text{ OUT}}$ exceeds 4V. | 24 |
| V_{MLPB} | | | | | | | | VAR | 0 | 0 | 0 | V_{PB} is increased from 0V until $V_{MUTE\text{ OUT}}$ exceeds 4V. | 8 |
| V_{MHFSS} | | | | | | | | 0 | VAR | 0 | 0 | V_{FSS} is increased from 6V until $V_{MUTE\text{ OUT}}$ drops to 0V. | 10 |
| $V_{MHT/E}$ | | | | | | | | 0 | 0 | VAR | 0 | $V_{T/E}$ is increased from 2.5V until $V_{MUTE\text{ OUT}}$ drops to 0V. | 24 |
| V_{MHPB} | | | | | | | | VAR | 0 | 0 | 0 | V_{PB} is increased from 2.5V until $V_{MUTE\text{ OUT}}$ drops to 0V. | 8 |
| V_{I_9} | | | | | | | | 0 | 0 | 2.5 | 0 | 0.2mA output current | 19 |
| Mp | | | | ON | | | | 0 | 4 | 0 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| Mp | | | | | ON | | | 0 | 6 | 0 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| Mp | | | | | | ON | | 0 | 0 | 3 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| Mp | | | | ON | | | | 0 | 0 | 0 | 0 | $V_{IN} = 0\text{dBm}$, $f = 1\text{kHz}$ | 20 |
| $V_{FSS\text{ OUT}}$ | | | | | | | | 5 | 0 | 0 | 0 | | 12 |
| I_{12} | | | | | | | ON | 5 | 0 | 0 | 0 | | 12 |
| G_{FA} | | | | ON | | | | 0 | 0 | 0 | 0 | $V_{IN} = 0\text{dBm}$ $V_{OUT}(20\text{kHz})/V_{OUT}(201\text{Hz})$ | 20 |
| G_{FV} | ON | | | | | | | 0 | 0 | 0 | 0 | $V_{IN} = 2\text{V}_{p-p}$ $V_{OUT}(6\text{MHz})/V_{OUT}(201\text{Hz})$ | 1 |
| THD | | | | ON | | | | 0 | 0 | 0 | 0 | $f = 1\text{kHz}$, $V_{IN} = 1.0\text{V}_{rms}$ | 20 |
| THD | | | | | ON | | | 0 | 12 | 0 | 0 | $f = 1\text{kHz}$, $V_{IN} = 1.0\text{V}_{rms}$ | 20 |
| THD | | | | | | ON | | 0 | 0 | 5 | 0 | $f = 1\text{kHz}$, $V_{IN} = 1.0\text{V}_{rms}$ | 20 |
| $V_{IN\text{ max}}$ | | | | ON | | | | 0 | 0 | 0 | 0 | $f = 1\text{kHz}$, THD = 3% | 20 |
| $V_{IN\text{ max}}$ | | | | | ON | | | 0 | 12 | 0 | 0 | $f = 1\text{kHz}$, THD = 3% | 20 |
| $V_{IN\text{ max}}$ | | | | | | ON | | 0 | 0 | 5 | 0 | $f = 1\text{kHz}$, THD = 3% | 20 |

Note) All switches are OFF unless ON is specified.

Test Circuit



Equivalent Circuit Block Diagram



Functional Description

1. Audio/Video Switching

The LA7223 can select one of three pairs of audio and video input signals, and output these signals on A.OUT and V.OUT respectively. The input signals are:

- A.TU1, V.TU1 Audio and video signals from internal VCR tuner
- A.TU2, V.TU2 Audio and video signals from the VCR channel decoder
- A.EXT, V.EXT External inputs

Both outputs are buffered, and are muted using the internal PB MUTE signal to suppress switching noise when the selected inputs are changed.

The audio and video switches have high maximum input signal levels of 2Vrms at 1kHz, and 2Vp-p at 5 MHz, respectively.

2. Control Circuitry

The external control inputs to the LA7223 and their input voltage ranges are:

- TU/EXT Selects between the internal (TU1, TU2) and external (EXT) input signals. 0V to 5V
- FSS Selects between the TU1 and TU2 input signals. 0V to 12V
- PBH Audio/video output enable. The output is disabled for PBH = HIGH. 0V to 5V

The table below summarizes the functions of the control inputs:

| | | | | | | |
|----------------|--------|-----|-----|---|-----------|---|
| Control Signal | PB H | L | | | | H |
| | TU/EXT | L | | H | | - |
| | FSS IN | L | H | L | H | - |
| Output Signal | TU1 | TU2 | EXT | | No output | |

The FSS, TU/EXT and PBH signals activate the muting circuitry when they change state. Each input has low and high muting thresholds V_{ML} and V_{MH} , between which the muting circuitry is active. The switching voltage for the signal switches V_{SM} lies between these, as shown in Figure 1, ensuring that the muting circuitry is active when the switches are activated.

An RC circuit needs to be inserted before these signal inputs to ensure that the muting circuitry is active for an appropriate length of time. This is set using the value of the RC time constant.

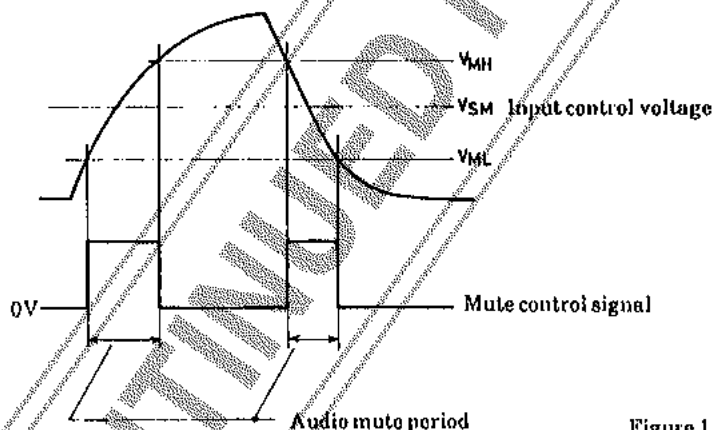


Figure 1. Audio Mute Control

The control outputs from the LA7223 are:

- FSS OUT Control output for driving the function select switch of the connected TV set. HIGH selects video input. FSS OUT is the ORed value of VCRH and PBH.
- MUTE H OUT Active HIGH control output to mute external audio amplifier. This signal also drives an internal switch that connects the MUTE pin to supply ground when it is active.

Sample Application Circuit

