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

				unit
Maximum Supply Voltage	V_{CC} max		15.0	V
Allowable Power Dissipation	Pd max	Ta = 70°C	400	mW
Operating Temperature	Topg		−10 to +70	°C
Storage Temperature	Tstg		−40 to +125	°C

Operating Conditions at Ta = 25°C

			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

		min	typ	max	unit
Current Dissipation	I_{CC}	11.2	14.5	19.3	mA
Insertion Loss	GL		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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The application circuit diagrams and circuit constants herein are included as an example and provide no guarantee for designing equipment to be mass-produced.
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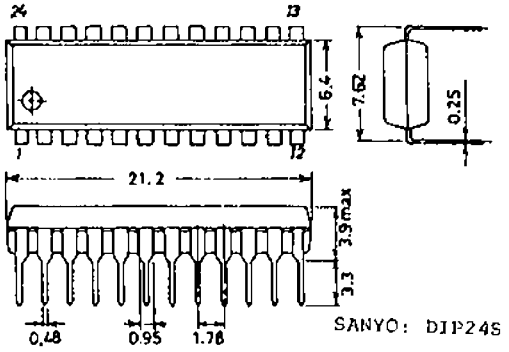
Case Outline 3067-D24SIC
(unit : mm)



SANYO : DIP24S

Specifications and information herein are subject to change without notice.

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		min	typ	max	unit
Signal Switching Input Voltage	V_{FSS}	4.6	5.1	5.6	V
	$V_{T/E}$	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 Input Voltages	$V_{ML\,FSS}$	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 Input Voltages	$V_{MH\,FSS}$	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 Voltage	V_{19}	4.0	4.7	5.2	V
Control Voltage Feed-Through	MP		−52	−40	dB
FSS OUT HIGH-Level Voltage	$V_{FSS\,OUT}$	9.5	10.3	11.0	V
FSS OUT Short-Circuit Current	I_{12}	0.9	1.35	1.9	mA
Frequency Response	$G_{FA(AUDIO)}$	−0.5	0	+1.5	dB
	$G_{FV(VIDEO)}$	−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			Vrms

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
$CT_{A\cdot A}$				ON				0	12	0	0	V_{IN}=0dBm,f=1kHz	20
$CT_{A\cdot A}$				ON				0	0	5	0	V_{IN}=0dBm,f=1kHz	20
$CT_{A\cdot A}$					ON			0	0	0	0	V_{IN}=0dBm,f=1kHz	20
$CT_{A\cdot A}$					ON			0	12	5	0	V_{IN}=0dBm,f=1kHz	20
$CT_{A\cdot A}$						ON		0	0	0	0	V_{IN}=0dBm,f=1kHz	20
$CT_{A\cdot A}$						ON		0	12	0	0	V_{IN}=0dBm,f=1kHz	20
$CT_{V\cdot A}$	ON							0	0	0	0	V_{IN}=2Vp-p,f=5MHz	20
$CT_{V\cdot A}$		ON						0	12	0	0	V_{IN}=2Vp-p,f=5MHz	20
$CT_{V\cdot A}$			ON					0	0	5	0	V_{IN}=2Vp-p,f=5MHz	20
$CT_{V\cdot V}$	ON							0	12	0	0	V_{IN}=2Vp-p,f=5MHz	1
$CT_{V\cdot V}$	ON							0	0	5	0	V_{IN}=2Vp-p,f=5MHz	1
$CT_{V\cdot V}$		ON						0	0	0	0	V_{IN}=2Vp-p,f=5MHz	1
$CT_{V\cdot V}$		ON						0	12	5	0	V_{IN}=2Vp-p,f=5MHz	1
$CT_{V\cdot V}$			ON					0	0	0	0	V_{IN}=2Vp-p,f=5MHz	1
$CT_{V\cdot V}$			ON					0	12	0	0	V_{IN}=2Vp-p,f=5MHz	1

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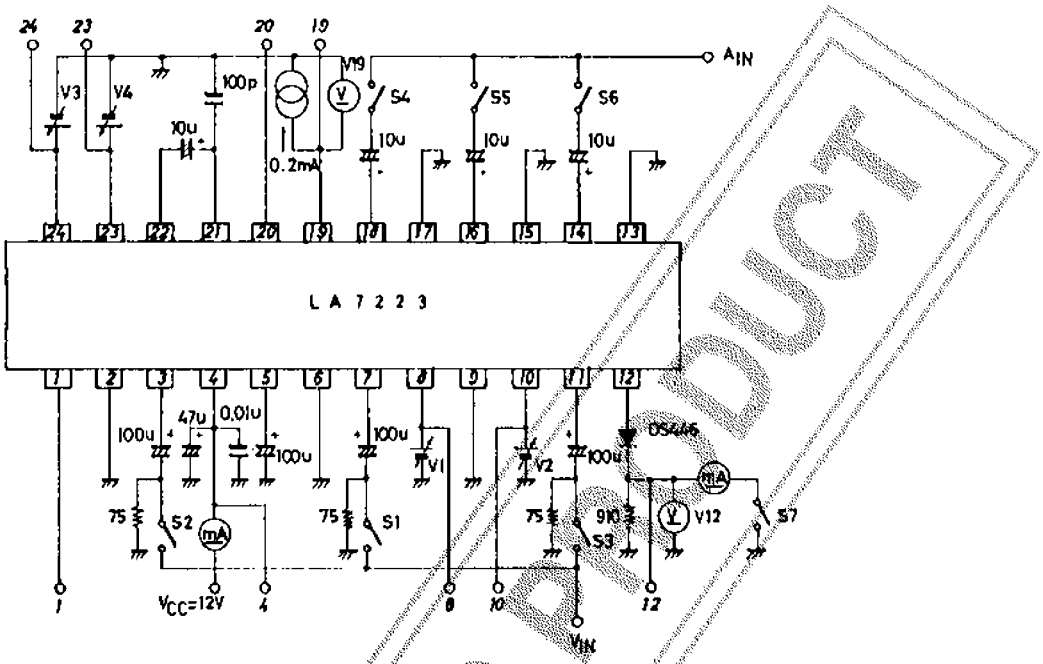
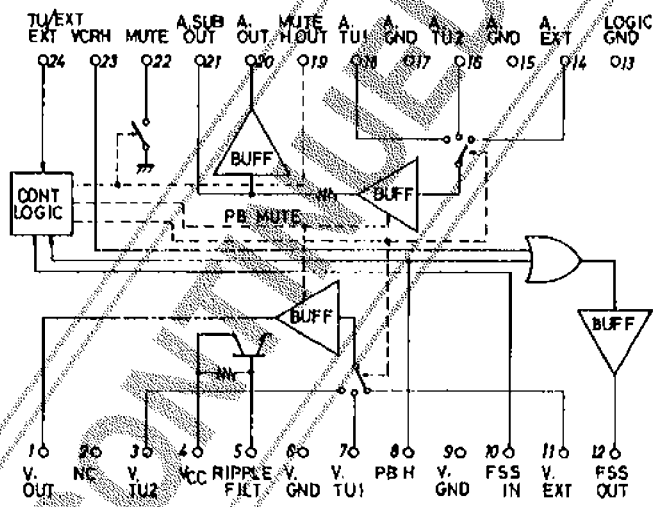
Item	S1	S2	S3	S4	S5	S6	S7	V1	V2	V3	V4	Conditions	Test point
LA				ON				5	0	0	0	V_{IN}=0dBm, f=1kHz	20
LA					ON			5	12	0	0	V_{IN}=0dBm, f=1kHz	20
LA						ON		5	0	5	0	V_{IN}=0dBm, f=1kHz	20
LV	ON							5	0	0	0	V_{IN}=2Vp-p, f=6MHz	1
LV		ON						5	12	0	0	V_{IN}=2Vp-p, f=6MHz	1
LV			ON					5	0	5	0	V_{IN}=2Vp-p, f=6MHz	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 $V_{FSS\ OUT}$ exceeds 9V.	23
$V_{ML\ FSS}$								0	VAR	0	0	V_{FSS} is increased from 0V until $V_{MUTE\ OUT}$ exceeds 4V.	10
$V_{ML\ T/E}$								0	0	VAR	0	$V_{T/E}$ is increased from 0V until $V_{MUTE\ OUT}$ exceeds 4V.	24
$V_{ML\ PB}$								VAR	0	0	0	V_{PB} is increased from 0V until $V_{MUTE\ OUT}$ exceeds 4V.	8
$V_{MH\ FSS}$								0	VAR	0	0	V_{FSS} is increased from 6V until $V_{MUTE\ OUT}$ drops to 0V.	10
$V_{MH\ T/E}$								0	0	VAR	0	$V_{T/E}$ is increased from 2.5V until $V_{MUTE\ OUT}$ drops to 0V.	24
$V_{MH\ PB}$								VAR	0	0	0	V_{PB} is increased from 2.5V until $V_{MUTE\ OUT}$ drops to 0V.	8
V_{10}								0	0	2.5	0	0.2mA output current	19
Mp				ON				0	4	0	0	V_{IN}=0dBm, f=1kHz	20
Mp					ON			0	6	0	0	V_{IN}=0dBm, f=1kHz	20
Mp						ON		0	0	3	0	V_{IN}=0dBm, f=1kHz	20
Mp				ON				2	0	0	0	V_{IN}=0dBm, f=1kHz	20
$V_{FSS\ OUT}$								5	0	0	0		12
I_{12}							ON	5	0	0	0		12
G_{FA}				ON				0	0	0	0	V_{IN}=0dBm V_{OUT}(20kHz)/V_{OUT}(20Hz)	20
G_{FV}	ON							0	0	0	0	V_{IN}=2Vp-p V_{OUT}(6MHz)/V_{OUT}(20Hz)	1
THD				ON				0	0	0	0	f=1kHz, V_{IN}=1.0Vrms	20
THD					ON			0	12	0	0	f=1kHz, V_{IN}=1.0Vrms	20
THD						ON		0	0	5	0	f=1kHz, V_{IN}=1.0Vrms	20
V_{IN} max				ON				0	0	0	0	f=1kHz, THD=3%	20
V_{IN} max					ON			0	12	0	0	f=1kHz, THD=3%	20
V_{IN} max						ON		0	0	5	0	f=1kHz, THD=3%	20

Note) All switches are OFF unless ON is specified.

Test Circuit



Equivalent Circuit Block Diagram



Functional Discription

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.

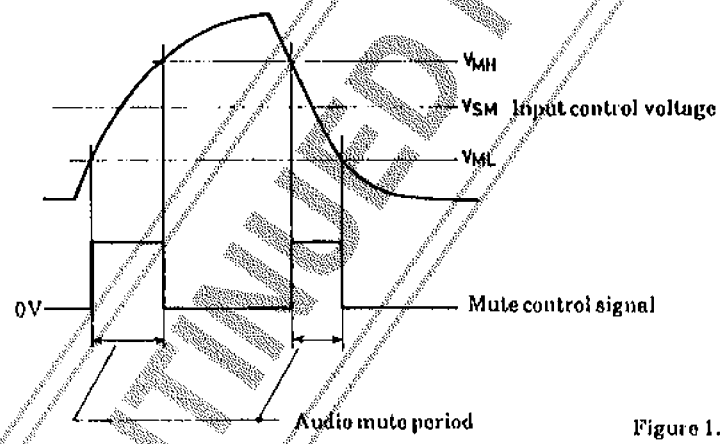


Figure 1. Audio Mute Control

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 on internal switch that connects the MUTE pin to supply ground when it is active.

Sample Application Circuit