



LA7156

Video and Audio Switch for PAL-SECAM 21-Pin Interface

Overview

The LA7156 is a switching IC for use with the PAL and SECAM 21-pin connector interface. The LA7156 integrates video and audio switches in a single chip, and allows significant block reorganization and integration by providing function switching outputs with current limiters, 75 Ω video drivers, muting and other functions. The LA7156 provides a diverse set of functions, including support for single-wire serial bus control that allows complex logic to be handled by microprocessor software.

Functions and Features

- Three audio and three video switching systems
- Audio output and video decoder output muting function
- Video input sync chip clamp
- Two 6 dB video amplifier plus 75 Ω driver systems
- VPS decoder output
- FSS output with current limiting
- 5 V regulator built-in
- Serial control

Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		15	V
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 65^\circ\text{C}$	800	mW
Operating temperature	T_{opr}		-20 to +65	$^\circ\text{C}$
Storage temperature	T_{stg}		-55 to +150	$^\circ\text{C}$

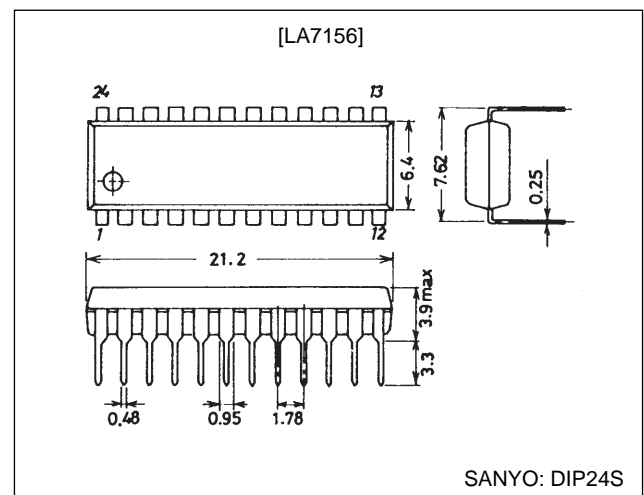
Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		9, 12	V
Operating supply voltage range	$V_{CC \text{ op}}$		8 to 13	V

Package Dimensions

unit: mm

3067-DIP24S



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Operating Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 9\text{ V}$ and 12 V

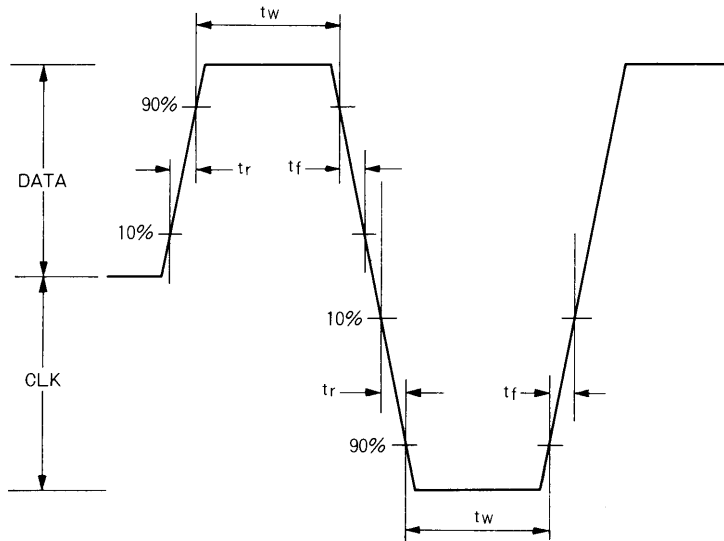
Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I_{CC}	No input	32	40	48	mA
FSS output high level voltage 1	VHFSS1	$V_{CC} = 9\text{ V}$, load resistance: $10\text{ k}\Omega$	7.5	8.9	9.0	V
FSS output low level voltage 1	VLFSS1	$V_{CC} = 9\text{ V}$, load resistance: $10\text{ k}\Omega$		0	0.5	V
FSS output high level voltage 2	VHFSS2	$V_{CC} = 12\text{ V}$, load resistance: $10\text{ k}\Omega$	10.5	11.9	12.0	V
FSS output low level voltage 2	VLFSS2	$V_{CC} = 12\text{ V}$, load resistance: $10\text{ k}\Omega$		0	0.5	V
FSS output cutoff current 1	$I_{CUTOFF1}$	$V_{CC} = 9\text{ V}$, the outflow current when the FSS output is grounded		9.3	40.0	mA
FSS output cutoff current 2	$I_{CUTOFF2}$	$V_{CC} = 12\text{ V}$, the outflow current when the FSS output is grounded		9.8	40.0	mA
[Audio Switch Block]						
Total harmonic distortion	THD	$V_{IN} = 1\text{ V}_{rms}$, $f = 1\text{ kHz}$, $R_{OUT} = \infty$		0.02	1	%
Maximum output voltage	$V_O\text{ max}$	The output level when $f = 1\text{ kHz}$ and $\text{THD} = 2\%$	2	3		V_{rms}
Output noise voltage	V_{NO}	$R_g = 600\ \Omega$, DIN audio filter		-100	-90	dBV
Voltage gain A	V_{GA}	The TP6 and TP8 output levels when $V_{IN} = 1\text{ V}_{rms}$ and $f = 1\text{ kHz}$	1.1	1.8	2.5	dB
Interchannel crosstalk A	CTA	$V_{IN} = 1\text{ V}_{rms}$, $f = 1\text{ kHz}$		-90	-70	dB
Muting attenuation A	V_{muteA}	$V_{IN} = 1\text{ V}_{rms}$, $f = 1\text{ kHz}$		-90	-70	dB
Output offset voltage	V_{of}	The offset voltage when the switch has changed state		0	20	mV
Input impedance A	Z_{INA}		40	50	60	$\text{k}\Omega$
[Video Switch Block]						
Voltage gain V	V_{GV}	The TP2 and TP5 output levels when $V_{IN} = 1\text{ V}_{p-p}$ and $f = 4.43\text{ MHz}$	-1	0	+1	dB
Frequency characteristics	V_f	$V_{IN} = 1\text{ V}_{p-p}$, $f = 100\text{ k}/7\text{ MHz}$	-1.5	-0.5	+0.5	dB
Second harmonic	H2	$V_{IN} = 1\text{ V}_{p-p}$, $f = 4.43\text{ MHz}$		-45	-40	dB
Third harmonic	H3	$V_{IN} = 1\text{ V}_{p-p}$, $f = 4.43\text{ MHz}$		-50	-45	dB
Interchannel crosstalk V	CTV	$V_{IN} = 1\text{ V}_{p-p}$, $f = 4.43\text{ MHz}$		-50	-40	dB
Muting attenuation V	V_{muteV}	$V_{IN} = 1\text{ V}_{p-p}$, $f = 4.43\text{ MHz}$		-50	-40	dB
Output voltage	V_{OUT}	The TP5 DC voltage with no input		0.7	1.0	V
[Control Block]						
Serial control input high level	V_{sh}		4		5	V
Serial control input middle level	V_{sm}		2		3	V
Serial control input low level	V_{sl}		0		1	V
Pin 2 input high level	V_{2H}		4		V_{CC}	V
Pin 2 input low level	V_{2L}	*1	0		2	V
Pin 20 input high level	V_{20H}		4		V_{CC}	V
Pin 20 input middle level	V_{20M}	*2	2		3	V
Pin 20 input low level	V_{20L}		0		1	V
Pin 7 output high level	V_{7H}	The TP9 DC voltage when SW3 is in the A position	4.5	5.0	5.5	V
Pin 7 output low level	V_{7L}	The TP9 DC voltage when SW3 is in the B position	0		1	V

Note: In the operating characteristics listed above, characteristics items that do not differ between $V_{CC} = 9\text{ V}$ and 12 V are listed as the same item.

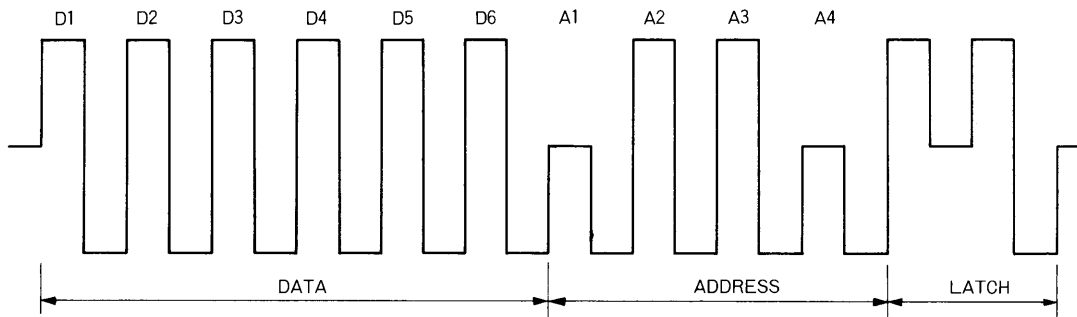
1. Forced to low when pin 2 is open.
2. Forced to the middle level when pin 20 is open.

Timing Characteristics

Parameter	Symbol	Conditions	min	typ	max	Unit
Minimum input pulse width	t_w		2			μs
Rise time	t_r				20	μs
Fall time	t_f				20	μs



Serial Control Input Specifications



LA7156 Command Address

Address	A1	A2	A3	A4
State	L	H	H	L

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Switch Logic Values Table

The LA7156 provides the following switching control with control of pin 20.

1. Normal mode (when pin 20 is high)

In this mode, the LA7156 functions, including switching, FSS output and muting, can be controlled from the six bits of serial data transferred from the microprocessor. However, note that the video and audio system switch operate at the same time in this mode.

DATA1		Switch state	Note	DATA4	Switch state	Note
H		A.SW1-A, V.SW1-A	1, 2	H	A.SW3-A, V.SW3-A, pin 7 high	1, 2
L		A.SW1-B, V.SW1-B	1, 2	L	A.SW3-B, V.SW3-B, pin 7 low	1, 2
DATA2	DATA3	Switch state	Note	DATA5	FSS output state	Note
H	L	A.SW2-A, V.SW2-A	1, 2	H	Output high	
L	L	A.SW2-B, V.SW2-B	1, 2	L	Output low	
—	H	A.SW2-C, V.SW2-C	1, 2	DATA6	Muted state	Note
				H	Muted	
				L	Mute released	

Note: 1. All the audio switch and the video SW3 outputs are forcibly muted when DATA6 is high or in muting mode.
 2. A.SW indicates the audio system switches and V.SW indicates the video system switches.

2. Preset mode (when pin 20 is middle or low)

This mode uses the LA7156 internally set up logic and the six bits of data are allocated to the VCR operating states to allow the switch states to be changed.

Serial Data

DATA No.	Item	H	L
D1	Power on/off	On	Off
D2	VCR/TV	VCR	TV
D3	Pay CH/Normal CH	Pay	Normal
D4	EXT/Tuner	EXT	Tuner
D5	PB/EE	PB	EE
D6	Mute on/off	On	Off

External Input Data

Pin No.	Item	H	L
P2	Decoder in	Scramble	Normal

Truth Table

Pin 20: Open or Middle

D1	D2	D3	D4	D5	P2	A.V.SW1	A.V.SW2	A.V.SW3	FSS out	Pin 7 out
L	—	—	—	—	H	A	C	A	L	H
L	—	—	—	—	L	A	C	A	L	H
H	L	—	L	L	H	A	A	A	L	H
H	L	—	L	L	L	A	C	A	L	H
H	H	—	L	L	H	A	A	A	H	H
H	H	—	L	L	L	A	C	A	H	H
H	L	—	H	L	H	A	B	A	L	H
H	L	—	H	L	L	A	B	A	L	H
H	H	—	H	L	H	A	B	A	H	H
H	H	—	H	L	L	A	B	A	H	H
H	—	—	—	H	H	A	*	A	H	H
H	—	—	—	H	L	A	*	A	H	H

Note: The previous state is retained even if another switch is changed.

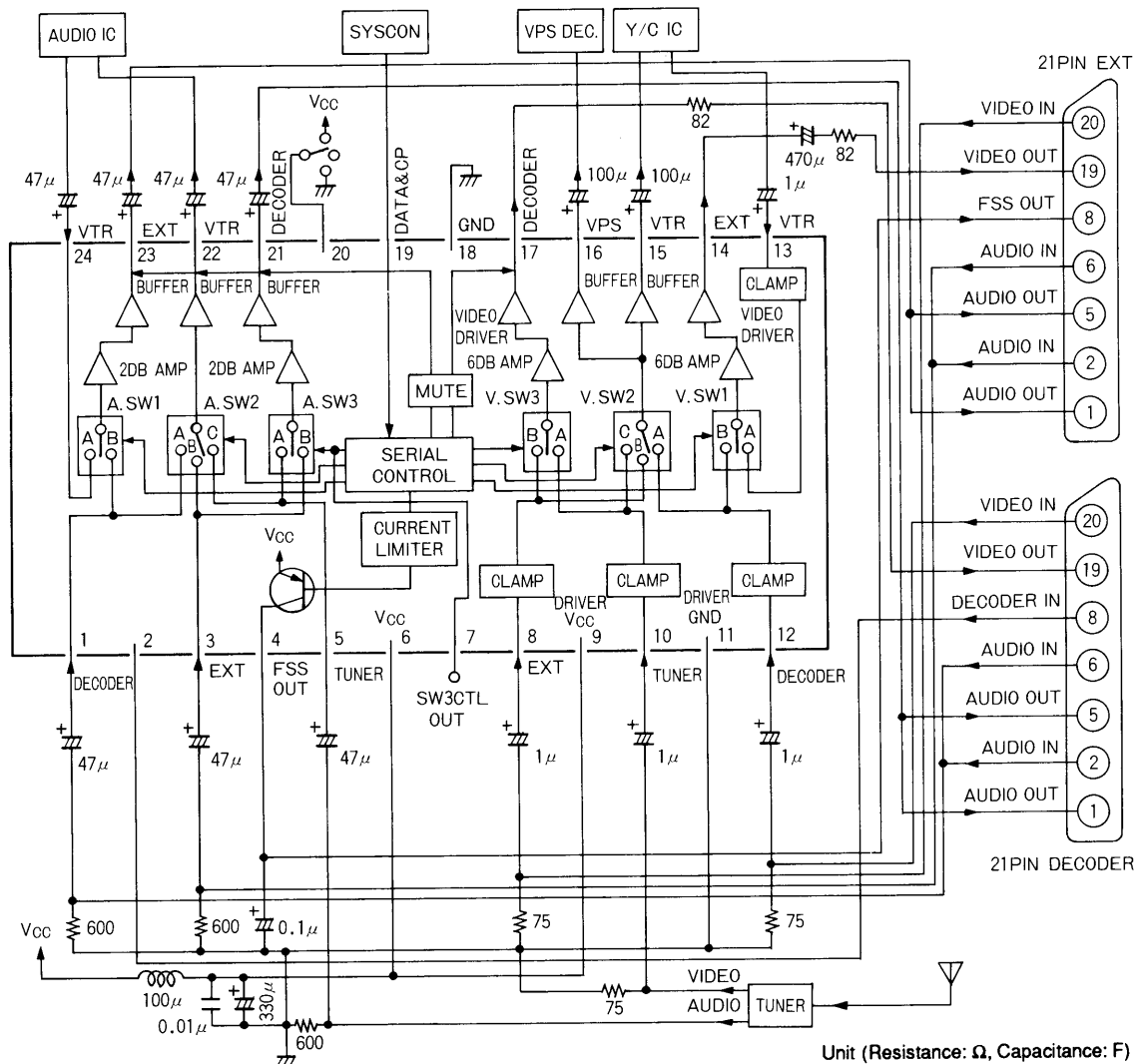
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Pin 20: Low

D1	D2	D3	D4	D5	P2	A.V.SW1	A.V.SW2	A.V.SW3	FSS out	Pin 7 out
L	—	—	—	—	H	B	A	B	H	L
L	—	—	—	—	L	B	A	B	L	L
H	L	L	L	L	H	B	C	B	H	L
H	L	L	L	L	L	A	C	B	L	L
H	H	L	L	L	H	A	C	A	H	H
H	H	L	L	L	L	A	C	A	H	H
H	L	H	L	L	H	A	A	A	L	H
H	L	H	L	L	L	A	C	A	L	H
H	H	H	L	L	H	A	A	A	H	H
H	H	H	L	L	L	A	C	A	H	H
H	L	—	H	L	H	A	A	B	H	L
H	L	—	H	L	L	A	B	B	L	L
H	H	—	H	L	H	A	A	B	H	L
H	H	—	H	L	L	A	B	B	H	L
H	—	—	—	H	H	A	*	*	H	*
H	—	—	—	H	L	A	*	*	H	*

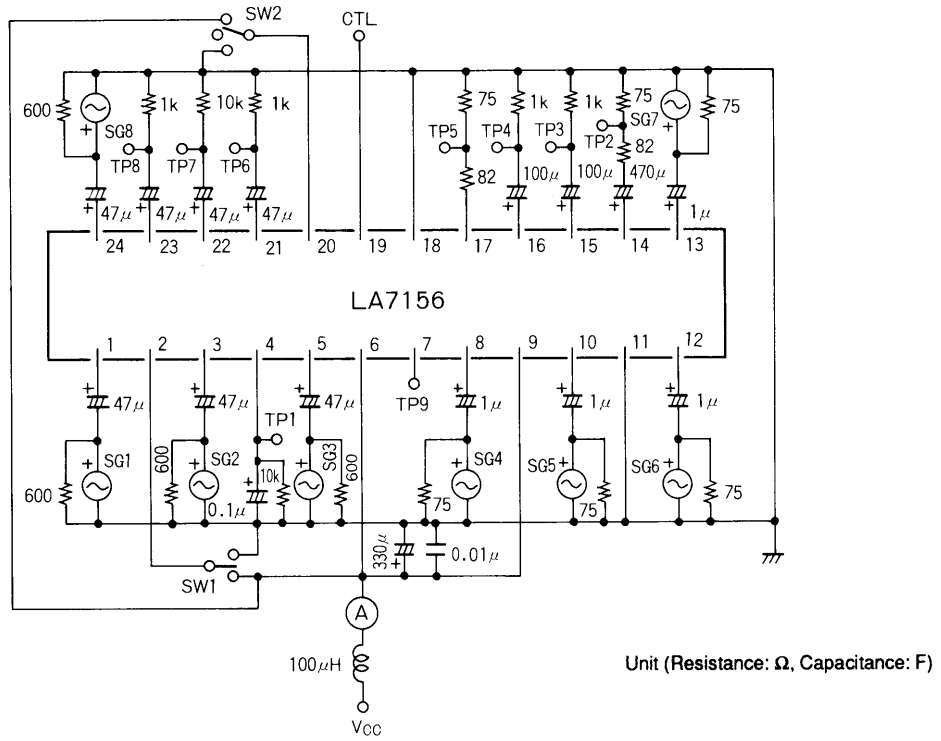
Note: The previous state is retained even if another switch is changed.

Block Diagram and Recommended Circuit Diagram



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Test Circuit



Input and Output Pin Circuit Diagrams

Unit (Resistance: Ω, Current source: A)

Pin No.	Symbol	I/O circuit	DC voltage	Note
1 3 5 24	A_{IN1} A_{IN2} A_{IN3} A_{IN4}		$1/2 V_{CC} + 0.7 V$	
2	DEC IN			
4	FSS OUT		$V_{CC} - 0.2 V$	
6	V_{CC}			

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Unit (Resistance: Ω , Current source: A)

Pin No.	Symbol	I/O circuit	DC voltage	Note
7	SW3 CTL OUT		H: 5.0 V L: 0 V	
8 10 12 13	V_{IN1} V_{IN2} V_{IN3} V_{IN4}		2.5 V	
9	DRIVER V_{CC}			
11	DRIVER GND			
14	V_{OUT1}		1.6 V	External connection
17	V_{OUT2}			
15	V_{OUT3}		1.6 V	Signal processing IC connection
16	V_{OUT4}		1.6 V	Signal processing IC connection
18	GND			

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Pin No.	Symbol	I/O circuit	DC voltage	Note
19	D/C IN		2.5 V	
20	MODE CTL IN		2.5 V	
21	A _{OUT1}		1/2 V _{CC}	External connection
23	A _{OUT2}			
22	A _{OUT3}		1/2 V _{CC}	Signal processing IC connection

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