



# LC7536R

## High Breakdown Voltage Serial Control Electronic Volume Control

### Overview

The LC7536R is an electronic volume control IC that implements volume and balance functions with a minimum number of external components.

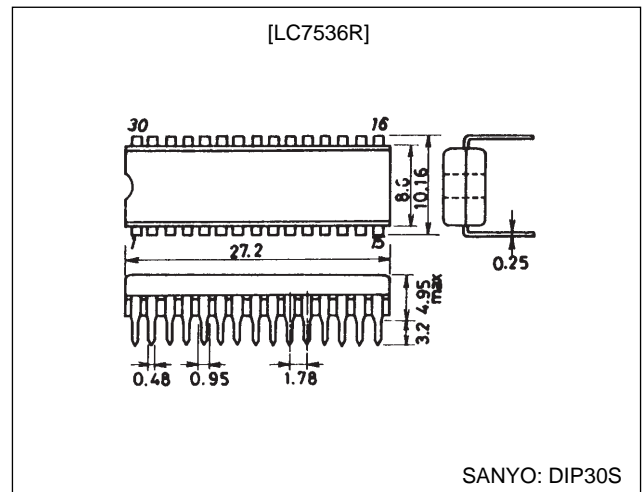
### Features

- The LC7536R is controlled by a 3-wire (DI, CL and CE) serial data control scheme that can be shared with other ICs. Up to two LC7536Rs can be used on the same bus by using the S (select) pin.
- Eighty positions in 1 dB steps plus mute ( $-\infty$ ), maximum attenuation is over 80 dB
- Input impedance (5 dB inputs): 47 k $\Omega$  (typical)
- High breakdown voltage:  $\pm 16$  V

### Package Dimensions

unit: mm

3047A-DIP30S



### Specifications

Absolute Maximum Ratings at  $T_a = 25^\circ\text{C}$ ,  $V_{SS} = 0$  V

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{DD\text{ max}}$	$V_{EE} \leq V_{SS} < V_{CC} < V_{DD}$	$V_{SS}$ to $V_{SS} + 18$	V
	$V_{EE\text{ max}}$	$V_{EE} \leq V_{SS} < V_{CC} < V_{DD}$	$V_{SS} - 18$ to $V_{SS}$	V
	$V_{CC\text{ max}}$	$V_{EE} \leq V_{SS} < V_{CC} < V_{DD}$	$V_{SS}$ to $V_{SS} + 7$	V
Input voltage	$V_{I1}$	CL, DI, CE	0 to $V_{DD} + 0.3$	V
	$V_{I2}$	IN1, IN2	$V_{EE} - 0.3$ to $V_{DD} + 0.3$	V
	$V_{I3}$	S	$V_{CC} - 0.3$ to $V_{DD} + 0.3$	V
Allowable power dissipation	$P_{d\text{ max}}$	$T_a \leq 75^\circ\text{C}$	250	mW
Operating temperature	$T_{opr}$		$-30$ to $+75$	$^\circ\text{C}$
Storage temperature	$T_{stg}$		$-40$ to $+125$	$^\circ\text{C}$

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**SANYO Electric Co.,Ltd. Semiconductor Bussiness Headquarters**

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

## LC7536R

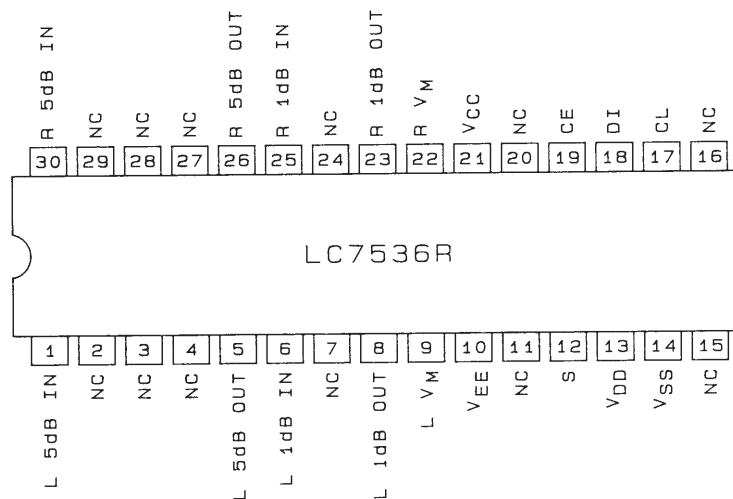
### Allowable Operating Ranges at Ta = 25°C, V<sub>SS</sub> = 0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Supply voltage	V <sub>DD</sub>		V <sub>CC</sub> + 4.5		16	V
	V <sub>EE</sub>		−16		0	V
	V <sub>CC</sub>		4.5	5	5.5	V
Input high level voltage	V <sub>IH1</sub>	CL, DI, CE	0.8 V <sub>CC</sub>		V <sub>CC</sub>	V
Input low level voltage	V <sub>IL1</sub>	CL, DI, CE	V <sub>SS</sub>		0.2 V <sub>CC</sub>	V
Input high level voltage	V <sub>IH2</sub>	S	$0.8 \times (V_{DD} - V_{CC}) + V_{CC}$		V <sub>DD</sub>	V
Input low level voltage	V <sub>IL2</sub>	S	V <sub>CC</sub>		$0.2 \times (V_{DD} - V_{CC}) + V_{CC}$	V
Input pulse width	t <sub>øw</sub>	CL	1			µs
Setup time	t <sub>set up</sub>	CL, DI, CE	1			µs
Hold time	t <sub>hold</sub>	CL, DI, CE	1			µs
Operating frequency	f <sub>opg</sub>	CL			500	kHz
Input signal amplitude	V <sub>IN</sub>	IN1, IN2	V <sub>EE</sub>		V <sub>DD</sub>	V
Input leakage current	I <sub>IN</sub>	CL, DI, CE, S	−10		+10	µA

### Electrical Characteristics at Ta = 25°C, V<sub>SS</sub> = 0 V

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I <sub>DD</sub>				1	mA
	I <sub>CC</sub>				1	mA
Output off leakage current	I <sub>OFF</sub>	IN1, IN2, V <sub>M1</sub> , V <sub>M2</sub> , CT1, CT2, OUT1, OUT2, analog switch off	−10		+10	µA
Total harmonic distortion	THD1	V <sub>IN</sub> = 1 Vrms, f = 1 kHz, V <sub>DD</sub> − V <sub>EE</sub> = 32 V, V <sub>R</sub> = max		0.004		%
	THD2	V <sub>IN</sub> = 0.1 Vrms, f = 1 kHz, V <sub>DD</sub> − V <sub>EE</sub> = 32 V, V <sub>R</sub> = max		0.02		%
Inter-channel crosstalk	C <sub>T</sub>	OUT1 and OUT2, with a 20 kHz 1 Vrms input to one channel		−75	−60	dB
Output at maximum attenuation	V <sub>O</sub>	f = 20 kHz, V <sub>IN</sub> = 1 Vrms		−98		dB

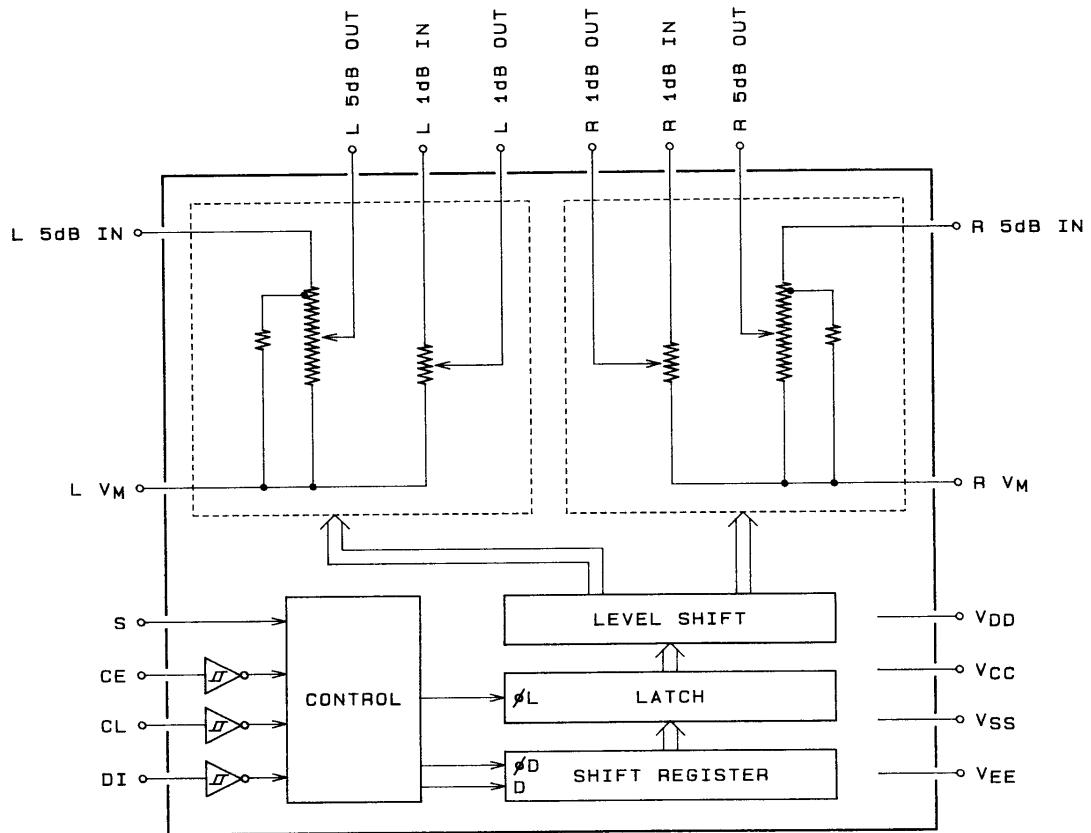
### Pin Assignment



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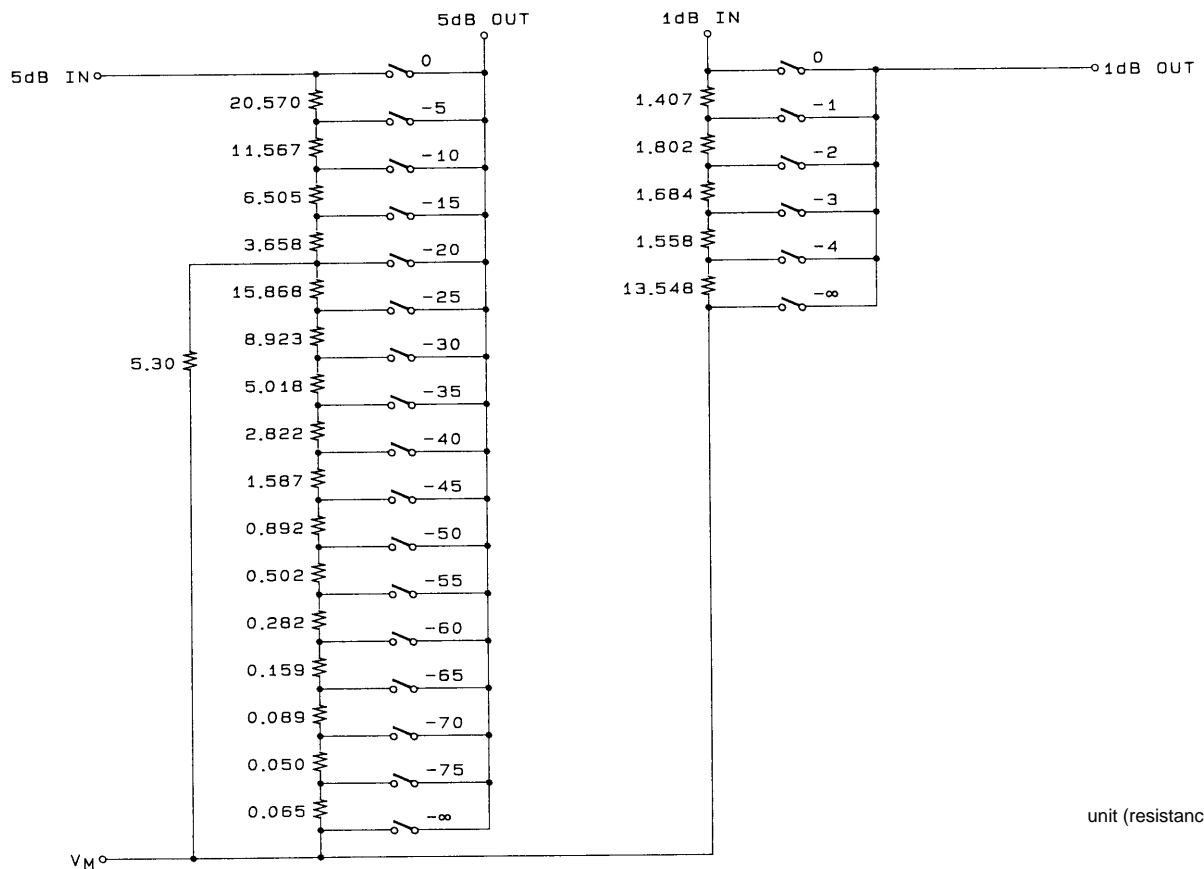
Top view

## Equivalent Circuit Block Diagram



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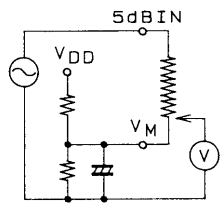
## Internal Resistor Equivalent Circuit Diagram



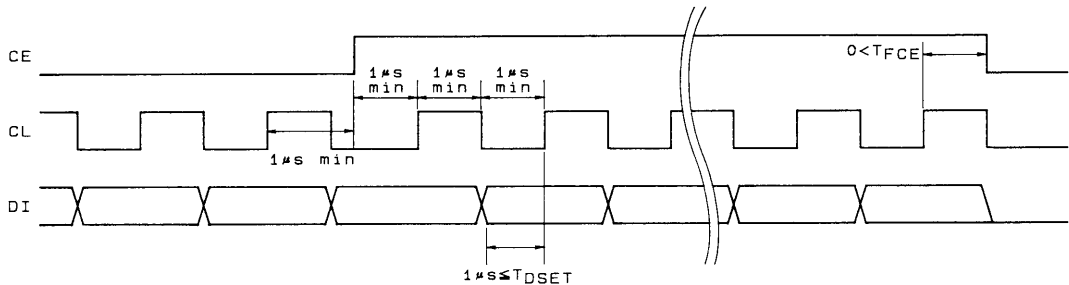
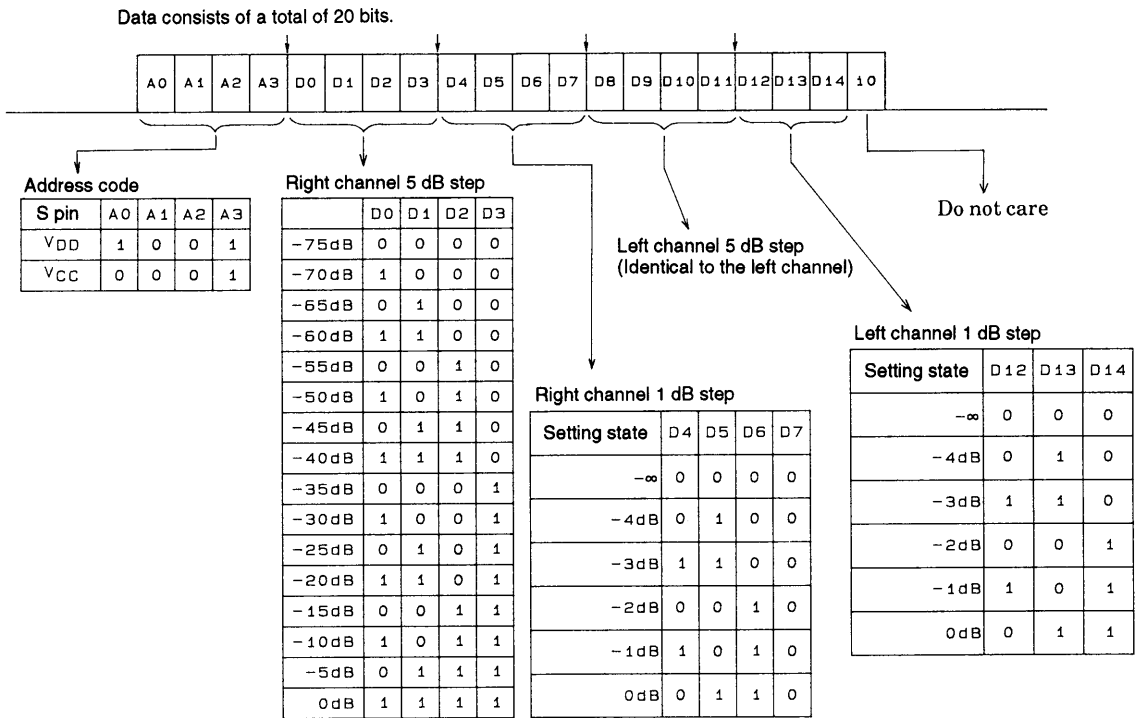
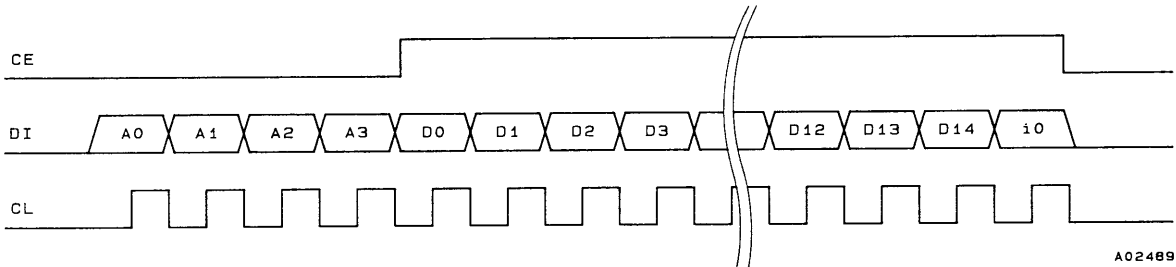
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## LC7536R

### Pin Functions

Pin No.	Symbol	Function	Note
1	L 5dBIN	Inputs to the 5 dB step attenuator. Must be driven by low impedance outputs.	
30	R 5dBIN		
3	NC	No connection	
4	NC		
28	NC		
27	NC		
5	L 5dBOUT	Outputs from the 5 dB step attenuator. Outputs should be received by a load of about 1 M $\Omega$ .	
26	R 5dBOUT		
6	L 1dBIN	Inputs to the 1 dB step attenuator. Must be driven by low impedance outputs.	
25	R 1dBIN		
8	L 1dBOUT	Outputs from the 1 dB step attenuator. Outputs should be received by a load in the range 47 k $\Omega$ to 1 M $\Omega$ .	
23	R 1dBOUT		
9	L $V_M$	Volume control common connections. The impedance of the pattern connected to these pins should be lowered as far as possible. Since $LV_M$ , $RV_M$ and $V_{SS}$ are not connected internally, they should be connected externally according to their respective specifications. In particular, when a single-sided power supply is used, the capacitor connected between $V_M$ and $V_{SS}$ appears as the residual resistance when the volume is attenuated. Thus care is required when selecting the value for this capacitor.	 <p style="text-align: right;">A00461</p>
22	R $V_M$		
12	S	Selection pin for the address code in the data format. When this pin is connected to $V_{DD}$ , the LC7536R will accept data when the address code is 9 and when connected to $V_{CC}$ , the LC7536R will accept data when the address code is 8.	
17	CL	Inputs for controlling the LC7536R from serial data. Signals should have an amplitude of 0 to 5 V.	
18	DI		
19	CE		
10	$V_{EE}$	Power supply connections. Do not bring up the $V_{CC}$ voltage before the $V_{DD}$ voltage when powering up the LC7536R.	
13	$V_{DD}$		
14	$V_{SS}$		
21	$V_{CC}$		
2, 7, 11, 15, 16, 20, 24, 29	NC	No connection	

Data Format





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