



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.

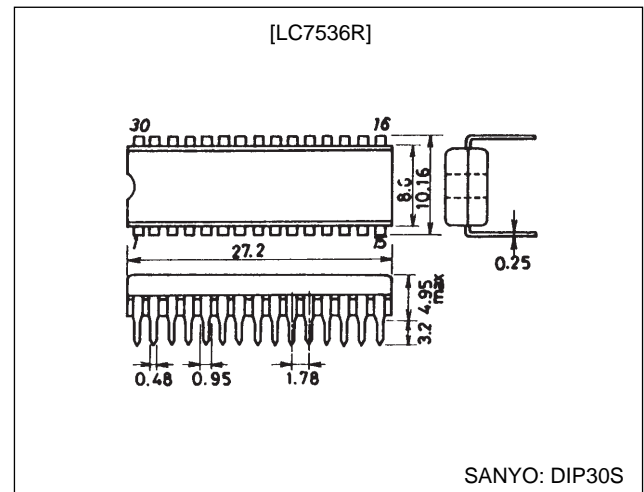
Features

- 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 Ω (typical)
- High breakdown voltage: ± 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} max	$V_{EE} \leq V_{SS} < V_{CC} < V_{DD}$	V_{SS} to $V_{SS} + 18$	V
	V_{EE} max	$V_{EE} \leq V_{SS} < V_{CC} < V_{DD}$	$V_{SS} - 18$ to V_{SS}	V
	V_{CC} 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 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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LC7536R

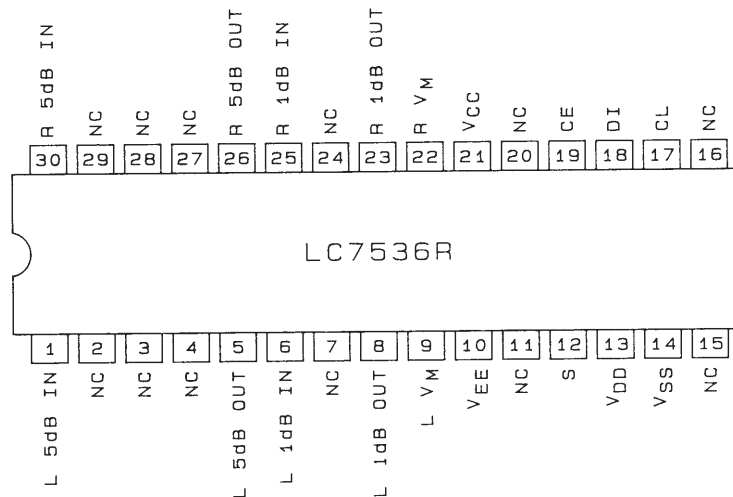
Allowable Operating Ranges at $T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{ V}$

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

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{SS} = 0\text{ V}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	I_{DD}				1	mA
	I_{CC}				1	mA
Output off leakage current	I_{OFF}	IN1, IN2, V_{M1} , V_{M2} , CT1, CT2, OUT1, OUT2, analog switch off	-10		+10	μA
Total harmonic distortion	THD1	$V_{IN} = 1\text{ V}_{\text{rms}}$, $f = 1\text{ kHz}$, $V_{DD} - V_{EE} = 32\text{ V}$, $V_R = \text{max}$		0.004		%
	THD2	$V_{IN} = 0.1\text{ V}_{\text{rms}}$, $f = 1\text{ kHz}$, $V_{DD} - V_{EE} = 32\text{ V}$, $V_R = \text{max}$		0.02		%
Inter-channel crosstalk	C_T	OUT1 and OUT2, with a 20 kHz 1 Vrms input to one channel		-75	-60	dB
Output at maximum attenuation	V_O	$f = 20\text{ kHz}$, $V_{IN} = 1\text{ V}_{\text{rms}}$		-98		dB

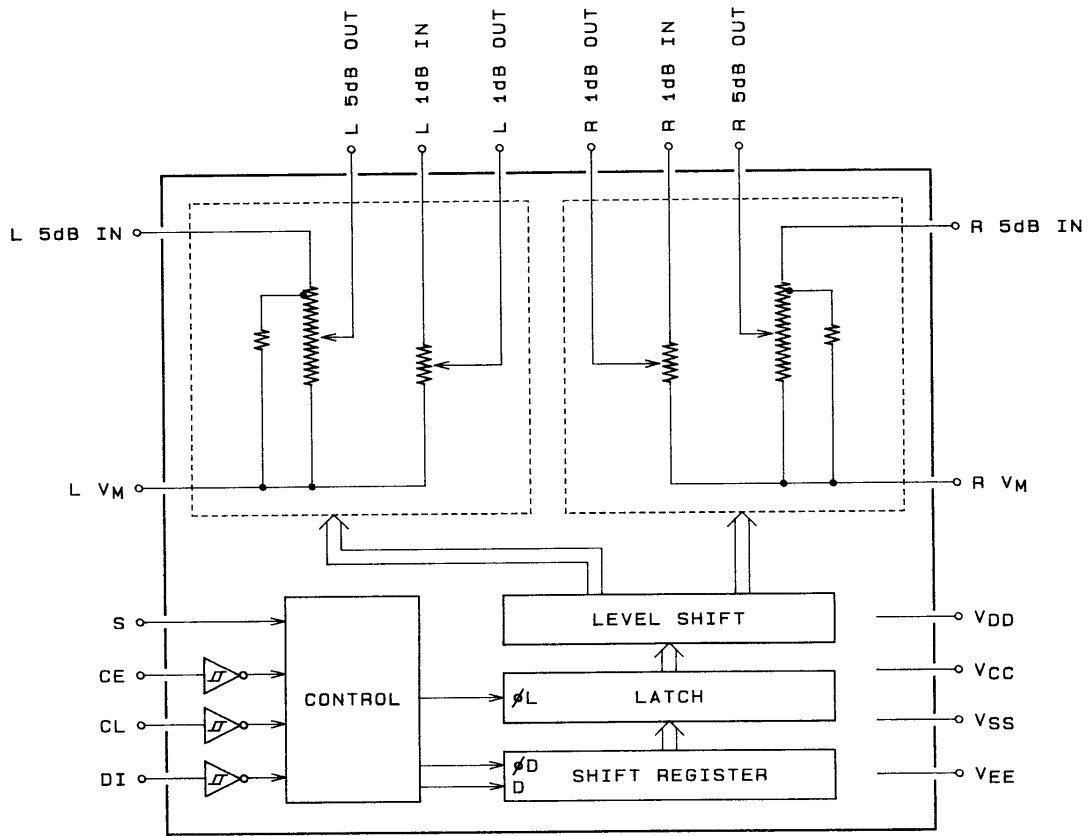
Pin Assignment



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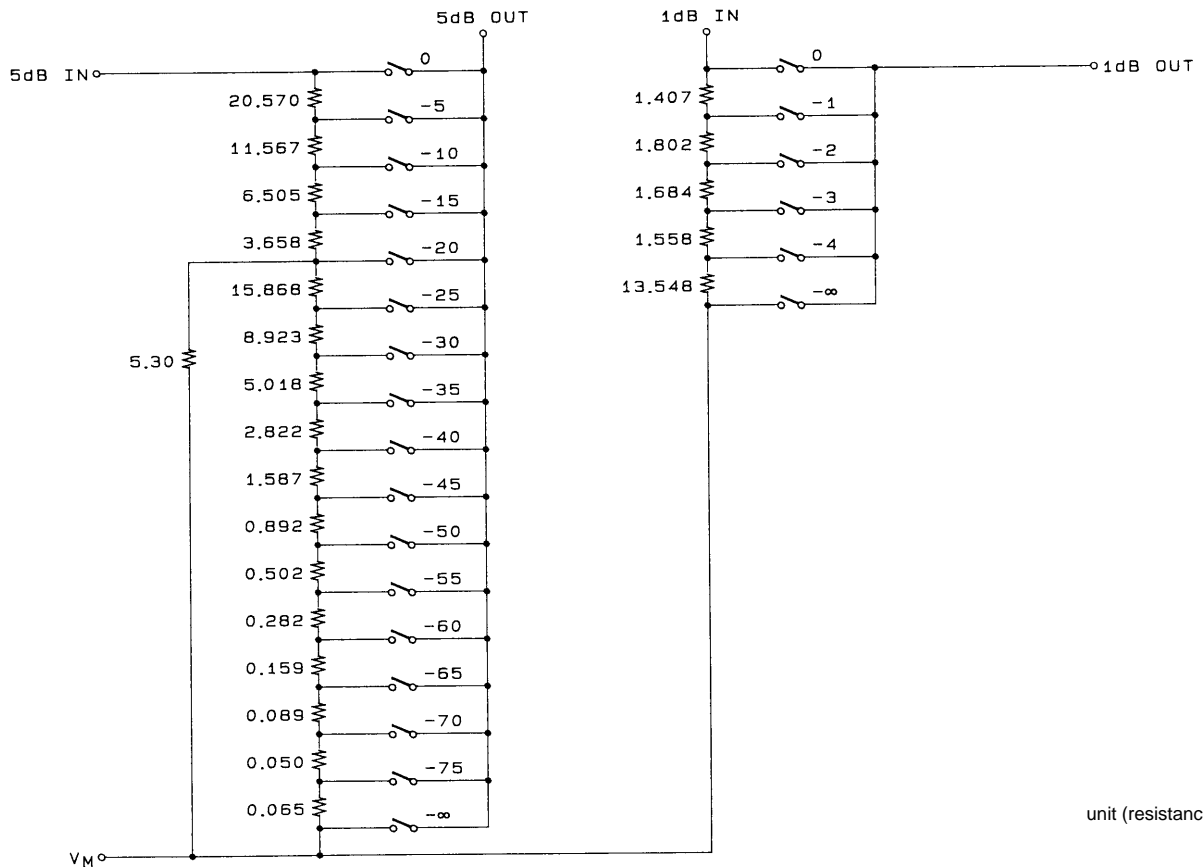
Top view

Equivalent Circuit Block Diagram



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Internal Resistor Equivalent Circuit Diagram

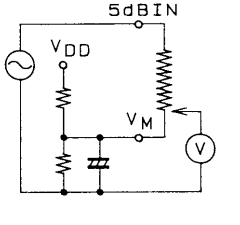


unit (resistance: KΩ)

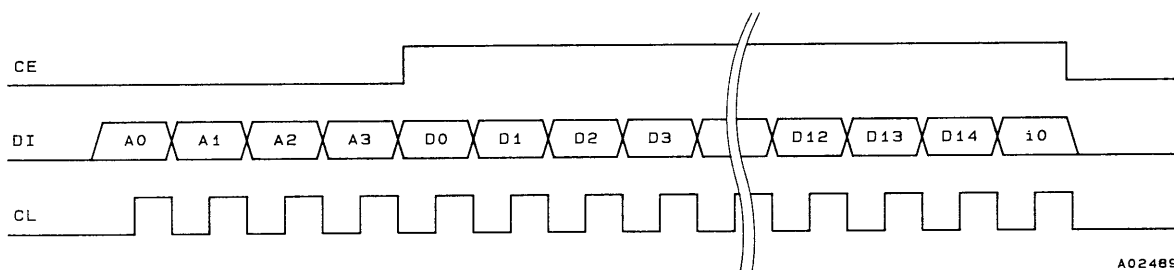
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Pin Functions

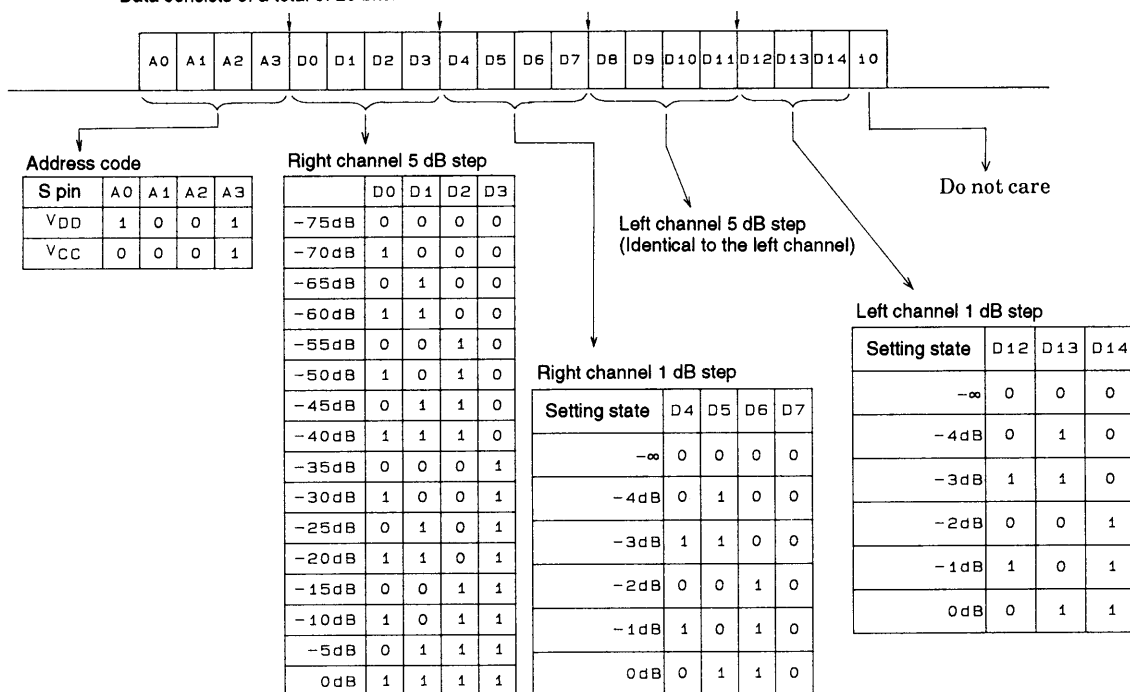
Pin No.	Symbol	Function	Note
1	L 5dBIN	Inputs to the 5 dB step attenuator. Must be driven by low impedance outputs.	
30	R 5dBIN		
3	NC	No connection	
4	NC		
28	NC		
27	NC		
5	L 5dBOUT	Outputs from the 5 dB step attenuator. Outputs should be received by a load of about 1 M Ω .	
26	R 5dBOUT		
6	L 1dBIN	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 Ω to 1 M Ω .	
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 $L V_M$, $R V_M$ 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.	
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

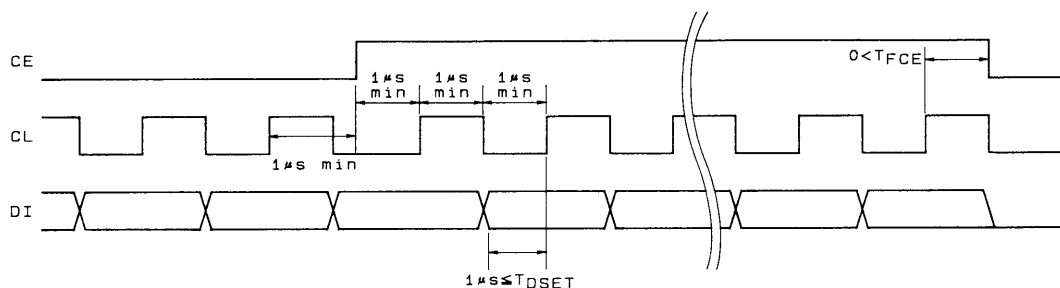


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Data consists of a total of 20 bits.



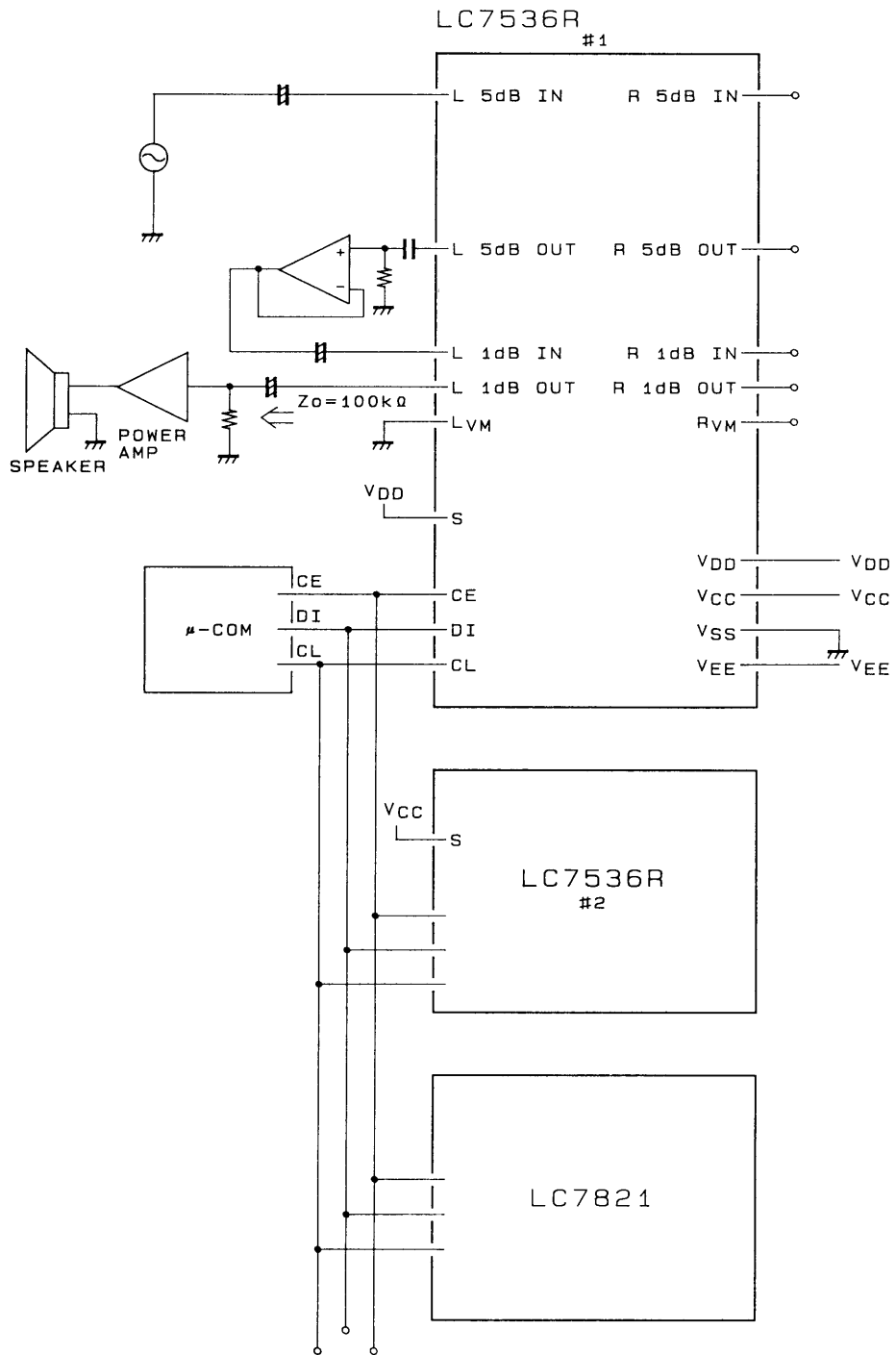
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LC7536R

Sample Application Circuit



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