

<b>SANYO</b>	No. 4863	<b>LC7536R</b>
<b>High Breakdown Voltage Serial Control Electronic Volume Control</b>		

### Overview

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

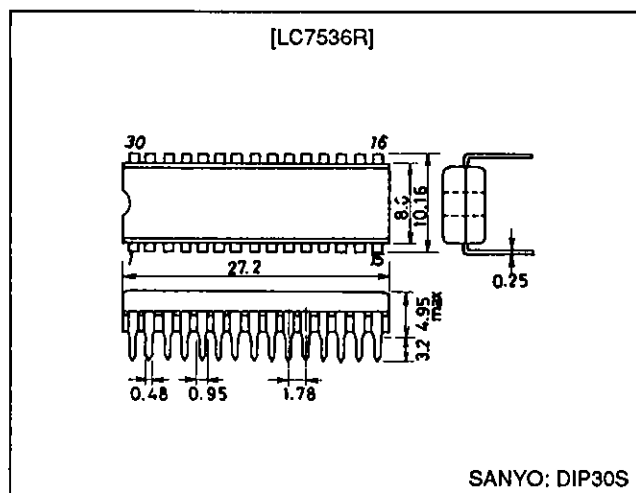
### Features

- 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	$V_{DD}$ 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	$^\circ\text{C}$

## LC7536R

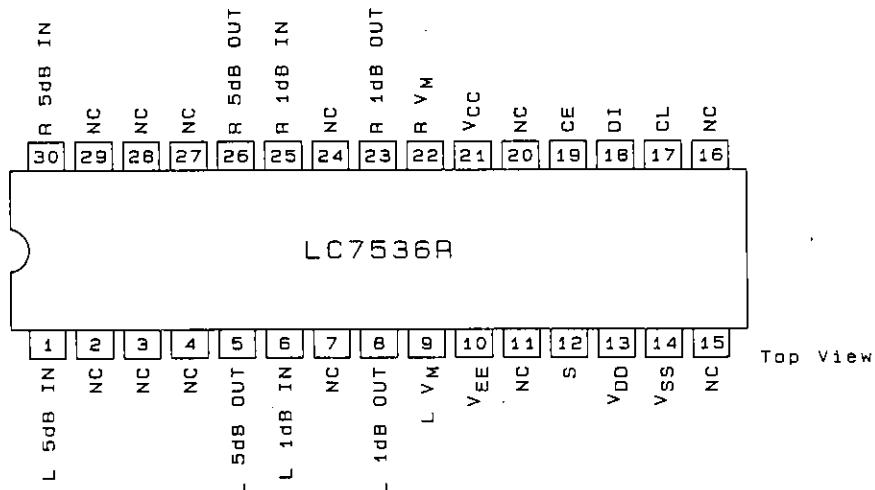
### Allowable Operating Ranges at $T_a = 25^\circ\text{C}$ , $V_{SS} = 0\text{ V}$

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	$t_{\text{pw}}$	CL	1			$\mu\text{s}$
Setup time	$t_{\text{set up}}$	CL, DI, CE	1			$\mu\text{s}$
Hold time	$t_{\text{hold}}$	CL, DI, CE	1			$\mu\text{s}$
Operating frequency	$f_{\text{opg}}$	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	$\mu\text{A}$

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

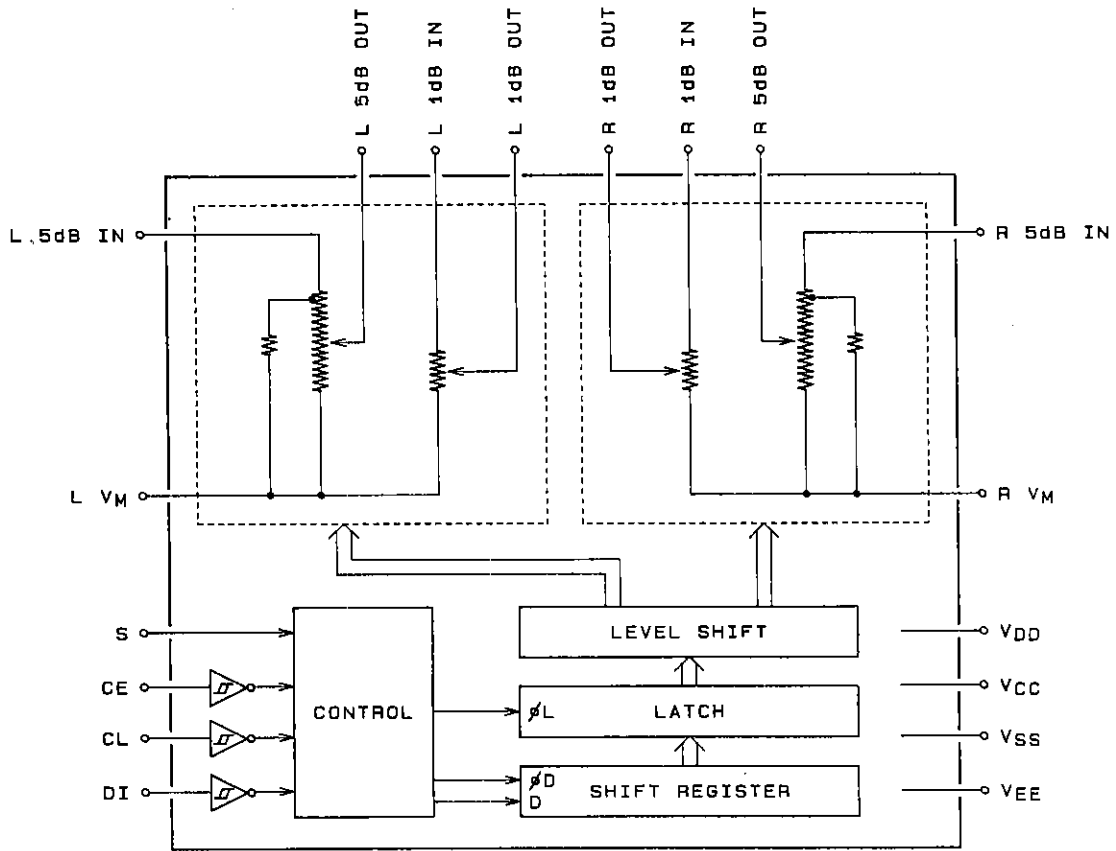
Parameter	Symbol	Conditions	min	typ	max	Unit
Current drain	$I_{DD}$				1	mA
	$I_{CC}$				1	mA
Output off leakage current	$I_{OFF}$	IN1, IN2, $V_{M1}$ , $V_{M2}$ , CT1, CT2, OUT1, OUT2, analog switch off	-10		+10	$\mu\text{A}$
Total harmonic distortion	THD1	$V_{IN} = 1\text{ Vrms}$ , $f = 1\text{ kHz}$ , $V_{DD} - V_{EE} = 32\text{ V}$ , $V_R = \text{max}$		0.004		%
	THD2	$V_{IN} = 0.1\text{ Vrms}$ , $f = 1\text{ kHz}$ , $V_{DD} - V_{EE} = 32\text{ V}$ , $V_R = \text{max}$		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	$V_O$	$f = 20\text{ kHz}$ , $V_{IN} = 1\text{ Vrms}$		-98		dB

### Pin Assignment



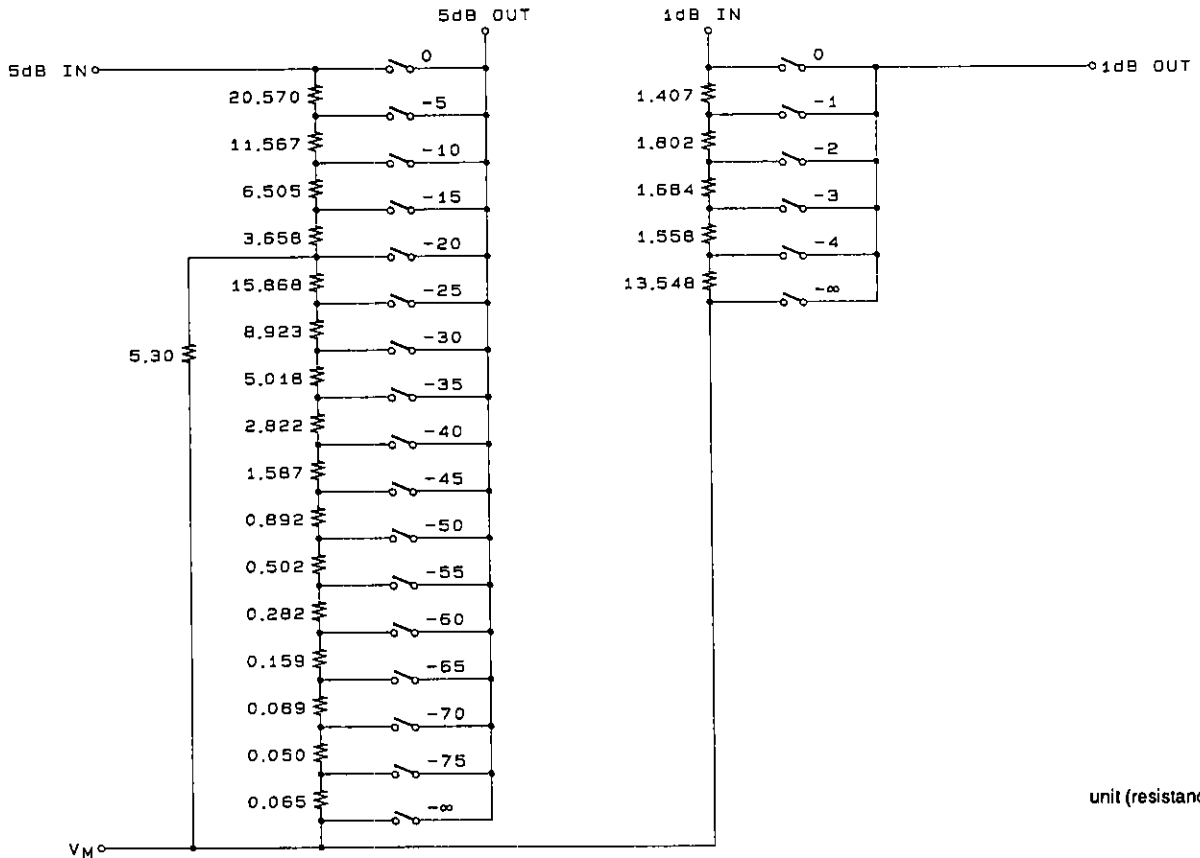
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Equivalent Circuit Block Diagram



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Internal Resistor Equivalent Circuit Diagram

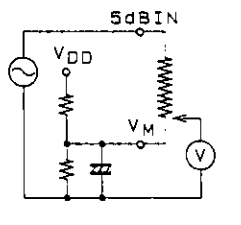


unit (resistance: KΩ)

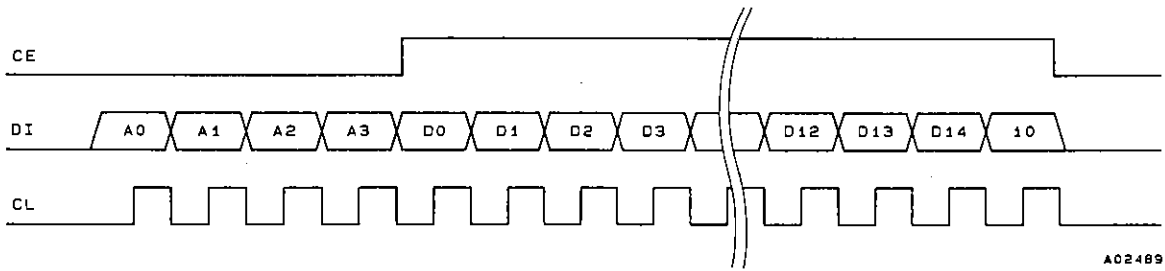
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## LC7536R

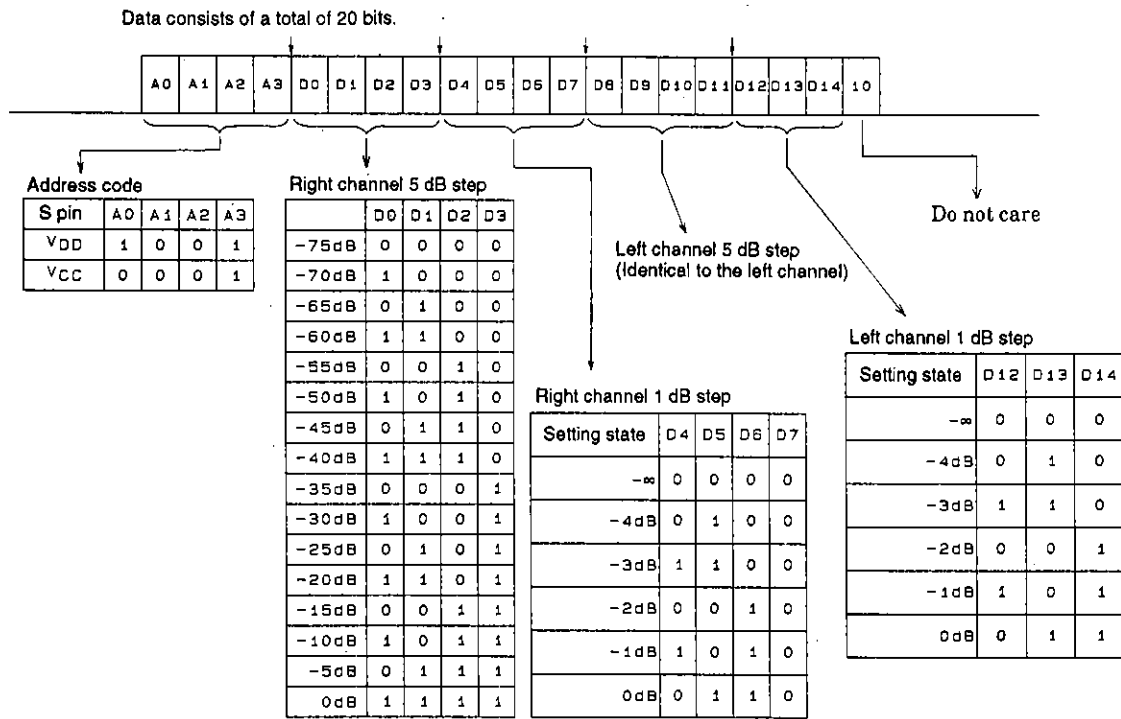
### Pin Functions

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		
4	NC		
28	NC		
27	NC	No connection	
5	L 5dBOUT	Outputs from the 5 dB step attenuator. Outputs should be received by a load of about 1 MΩ.	
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 kΩ to 1 MΩ.	
23	R 1dBOUT		
9	L V <sub>M</sub>	Volume control common connections. The impedance of the pattern connected to these pins should be lowered as far as possible. Since LV <sub>M</sub> , RV <sub>M</sub> and V <sub>SS</sub> 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 <sub>M</sub> and V <sub>SS</sub> appears as the residual resistance when the volume is attenuated. Thus care is required when selecting the value for this capacitor.	
22	R V <sub>M</sub>		
12	S	Selection pin for the address code in the data format. When this pin is connected to V <sub>DD</sub> , the LC7536R will accept data when the address code is 9 and when connected to V <sub>CC</sub> , 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 <sub>EE</sub>	Power supply connections. Do not bring up the V <sub>CC</sub> voltage before the V <sub>DD</sub> voltage when powering up the LC7536R.	
13	V <sub>DD</sub>		
14	V <sub>SS</sub>		
21	V <sub>CC</sub>		
2, 7, 11, 15, 16, 20, 24, 29	NC	No connection	

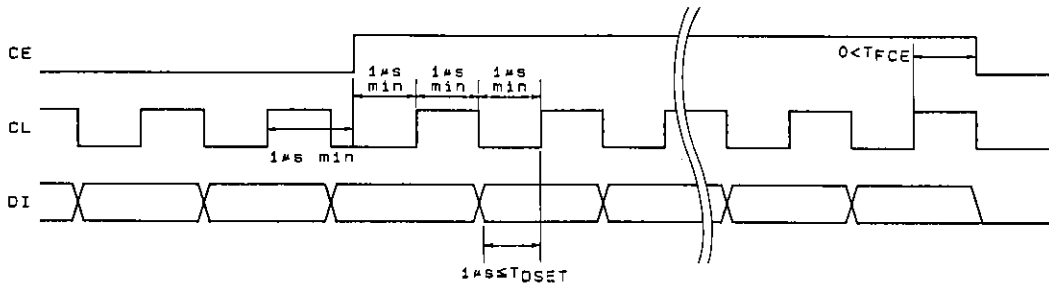
Data Format



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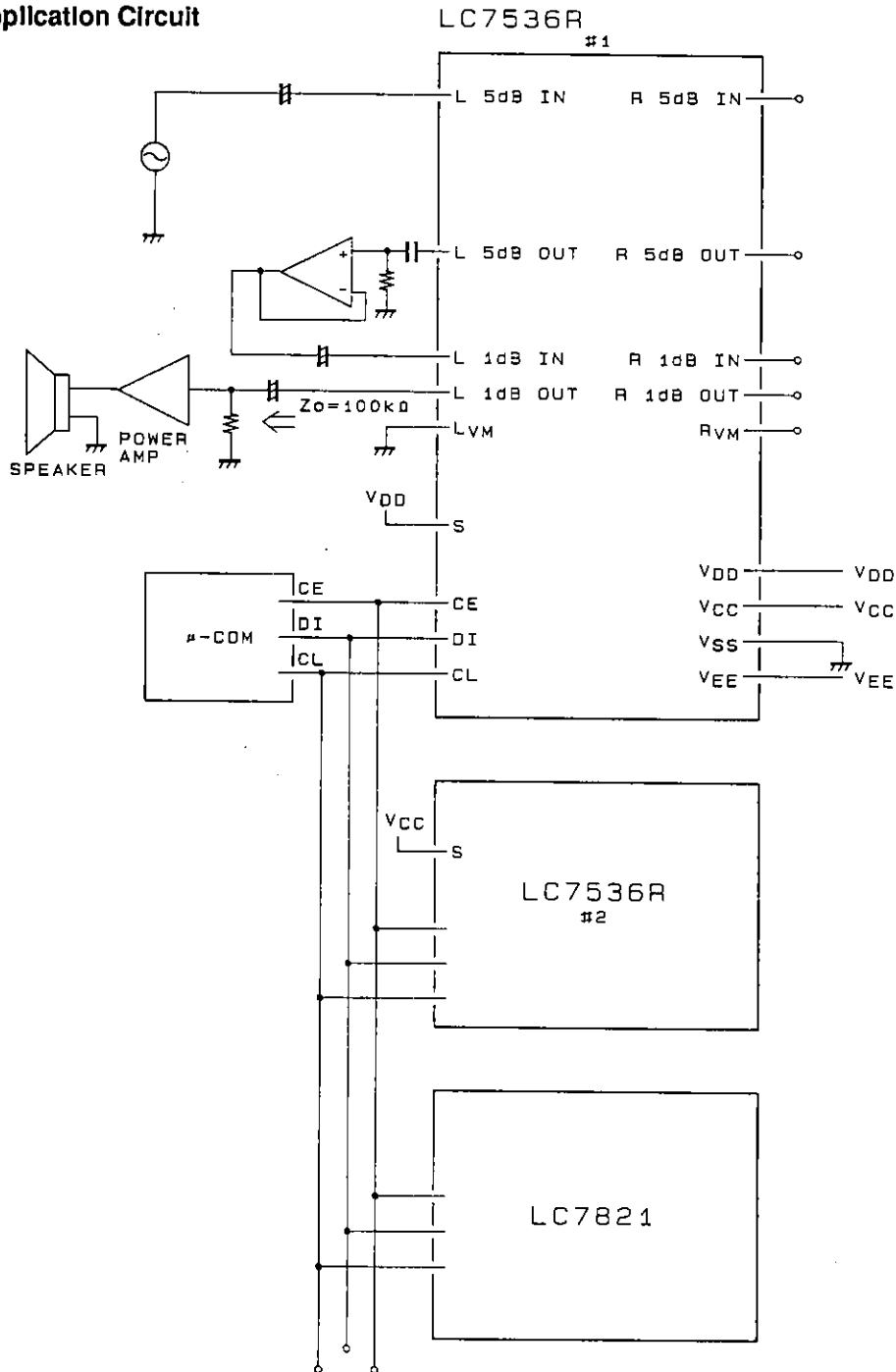
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# LC7536R

## Sample Application Circuit



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