LV3311PNM

Electronic Volume IC for Car Audio System

ON Semiconductor®

www.onsemi.com

Overview

The LV3311PNM is an electronic volume IC implements a rich set of audio control functions with a minimal number of external components. Functions include input selection switching function, an input gain, volume, loudness, balance, fader, bass/mid/treble and subwoofer control.

Features

It is possible to eliminate from the external components of equalizer control block by SCF technology.

Zero-cross switching circuits (Volume control block and Fader control block), soft step (3 band equalizer control and Suboofer control) and soft mute circuits used for low noise even when input signals are present.

Low power consumption due to the use of BiCMOS process.

All functions are controlled using serial data (CCB*).

Features

* Computer Control Bus (CCB) is an ON Semiconductor's original bus format and the bus addresses are controlled by ON Semiconductor.

ORDERING INFORMATION

See detailed ordering and shipping information on page 21 of this data sheet.

December 2013 - Rev. 0

Publication Order Number :
LV3311PNM/D

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Middle control :

The middle control gain can be maximum boost +12 dB position and maximum cut 12 dB position.
(+12 dB to 12 dB in 2 dB steps.)

The middle control center frequency 700 Hz / 1 kHz / 1.2 kHz can be selected.

The middle control quality factor 1.0/2.0 can be selected.

Treble control :

The treble control gain can be maximum boost +12 dB position and maximum cut 12 dB position.
(+12 dB to 12 dB in 2 dB steps.)

The treble control center frequency 7 kHz / 10 kHz / 12 kHz can be selected.

The treble control quality factor 1.0/2.0 can be selected.

Fader control :

The fader volume can be attenuations by one of 16 levels. Independent control each four channels.
(A total of 16 settings with attenuations of 0 to –2 dB in 1dB steps, 2 to 20 dB in 2 dB steps, and
30, 45, 60, and dB settings.)

Subwoofer control :

A total of 81 positions from 0 to 79 dB in 1 dB steps and dB.

The low pass filter 80 Hz / 120 Hz / 160 Hz can be selected. Fedar two channels output only of rear or either of the subwoofer output is selected.

Mute

Specifications

Absolute Maximum Ratings at Ta = 25

Electrical Characteristics at Ta = 25°C, V_{DD} = 8 V, V_{SS} = 0 V

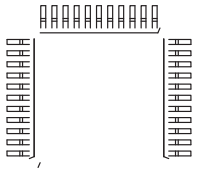
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Input block						
Input resistance	Rin	L1-L4, R1-R4		50		kΩ
Minimum input gain	Gin min	L1-L4, R1-R4	1.0	0	+1.0	dB
Maximum input gain	Gi max		+17	+18	+19	dB
Inter-step setting error	ATerr		1.0		+1.0	dB
Left/Right balance	BAL		0.5		+0.5	dB
Volume block						
Input resistance	Rvr	LVRIN, RVRIN		50		kΩ
Inter-step setting error	ATerr	+10 dB to 40 dB	0.5		+0.5	dB
Left/Right balance	BAL		0.5		+0.5	dB
Bass block						
Bass control range	Gb max	max. boost/cut	10	12	14	dB
Inter-step setting error	ATerr	10 dB to +10 dB	1.0		+1.0	dB
Left/Right balance	BAL		1.0		+1.0	dB
Center frequency	f01	GAIN = 12 dB		70		Hz
	f02			100		Hz
	f03			120		Hz
Quality Factor	Q01	GAIN = 12 dB		1.0		
	Q02			2.0		
Mid block						
Mid control range	Gb max	max. boost/cut	10	12	14	dB
Inter-step setting error	ATerr	10 dB to +10 dB	1.0		+1.0	dB
Left/Right balance	BAL		1.0		+1.0	dB
Center frequency	f01	GAIN = 12 dB		700		Hz
	f02			1		kHz
	f03			1.2		kHz
Quality Factor	Q01	GAIN = 12 dB		1.0		
	Q02			2.0		
Treble block						
Treble control range	Gb max	max. boost/cut	10	12	14	dB
Inter-step setting error	ATerr	10 dB to +10 dB	1.0		+1.0	dB
Left/Right balance	BAL		1.0		+1.0	dB
Center frequency	f01	GAIN = 12 dB		7		kHz
	f02			10		kHz
	f03			12		kHz
Quality Factor	Q01	GAIN = 12 dB		1.0		
	Q02			2.0		
Subwoofer block						
Sub volume inter-step setting error	ATerr	0dB to 40 dB	0.5		+0.5	dB
LPF center frequency	f0			80		Hz
	f1			120		Hz
	f2			160		Hz
Fader block						
Input resistance	Rfed			50		kΩ
Inter-step setting error	ATerr	0 dB to 2 dB	0.5		+0.5	dB
		4 dB to 20 dB	1.0		+1.0	dB
		30 dB	2.0		+2.0	dB
		45 dB	3.0		+3.0	dB
Left/Right balance	BAL	0 dB to 30 dB	0.5		+0.5	dB

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

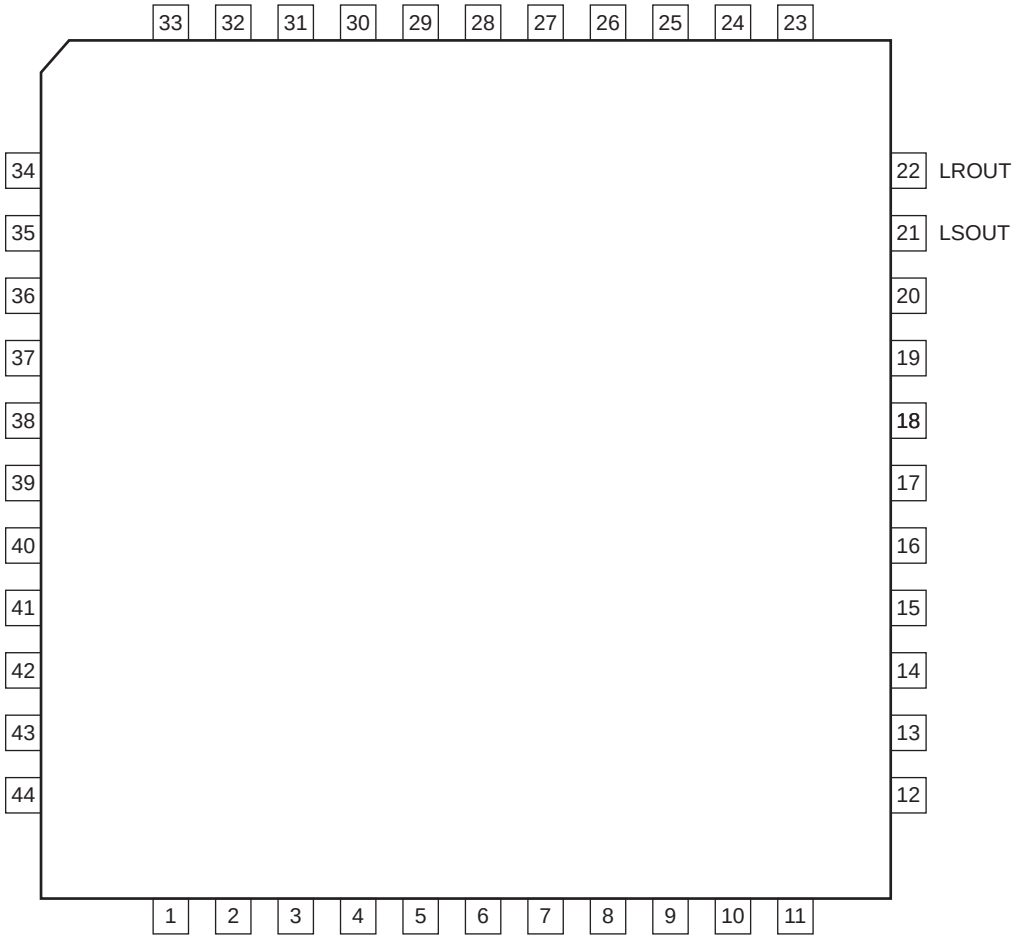
Overall Characteristics at Ta = 25°C, V_{DD} = 8 V, V_{SS} = 0 V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
A loss of insertion	ATT		1.0		+1.0	dB
Total harmonic distortion	THD	V_{IN} = 1 Vrms, f = 1 kHz		0.01		%
Inter-input crosstalk	CT	V_{IN} = 1 Vrms, f = 1 kHz		80		dB
Left/Right channel crosstalk	CT	V_{IN} = 1 Vrms, f = 1 kHz		80		dB
Maximum attenuation	V_O min	V_{IN} = 1 Vrms, f = 1 kHz		80		dB
Output noise voltage	VN			25		V
Current drain	I_{DD}			20		mA
Input high-level current	I_{IH}	CL, DI, CE, V_{IN} = 5.5 V			10	A
Input low-level current	I_{IL}	CL, DI, CE, V_{IN} = 0 V	10			A
Maximum input voltage	VCL	THD = 1% RL = 10 km				

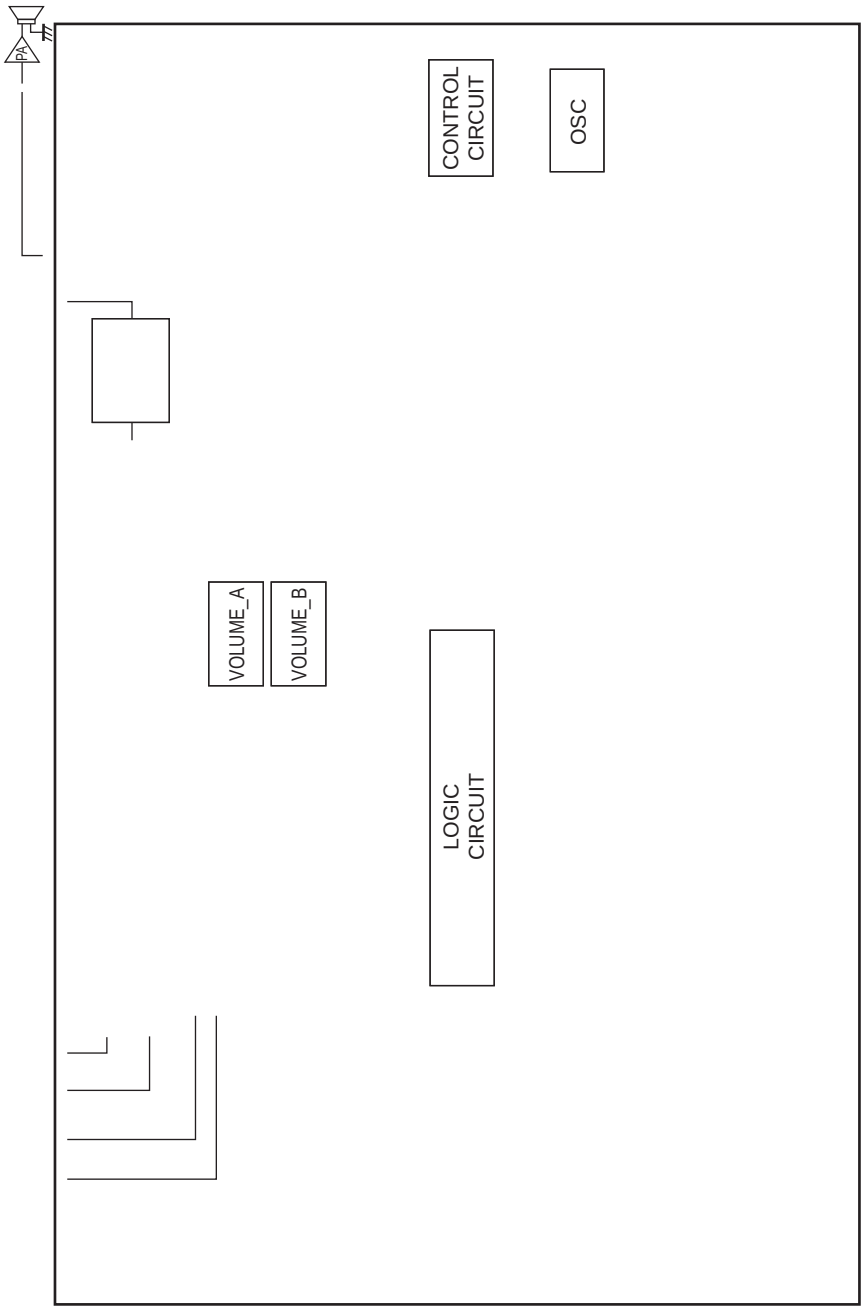
Package Dimensions
unit : mm



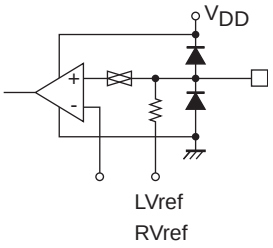
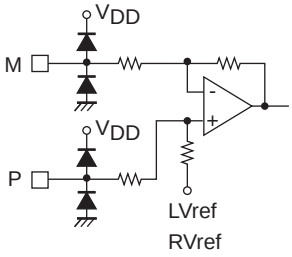
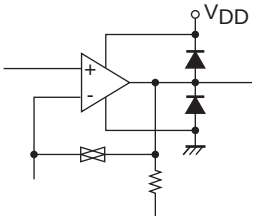
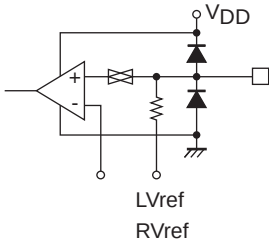
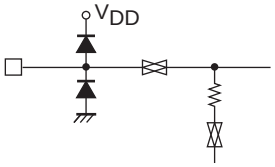
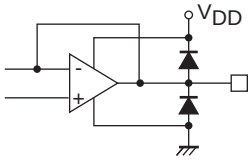
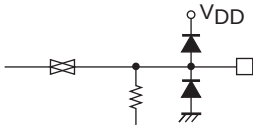
Pin Assignment



Block Diagram



Pin Functions

Pin No.	Pin	Function	Equivalent Circuit
35 34 33 32 43 44 1 2	L1 L2 L3 L4 R1 R2 R3 R4	Single end input pins.	
31 30 3 4	L5M L5P R5M R5P	Differential input pins.	
29 5	LSELO RSELO	Input selector output pins.	
28 6	LVRIN RVRIN	Main volume input pins.	
27 7	LCT RCT	Loudness function pins.	
25 9	LVROUT RVROUT	Tone output pins.	
24 10	LFIN RFIN	Fader block input pins. Drive at low impedance.	
23 22 11 12	LFOUT LROUT RFOUT RROUT	Fader output pins.Attenuation is possible separately for the front end and rear end.	

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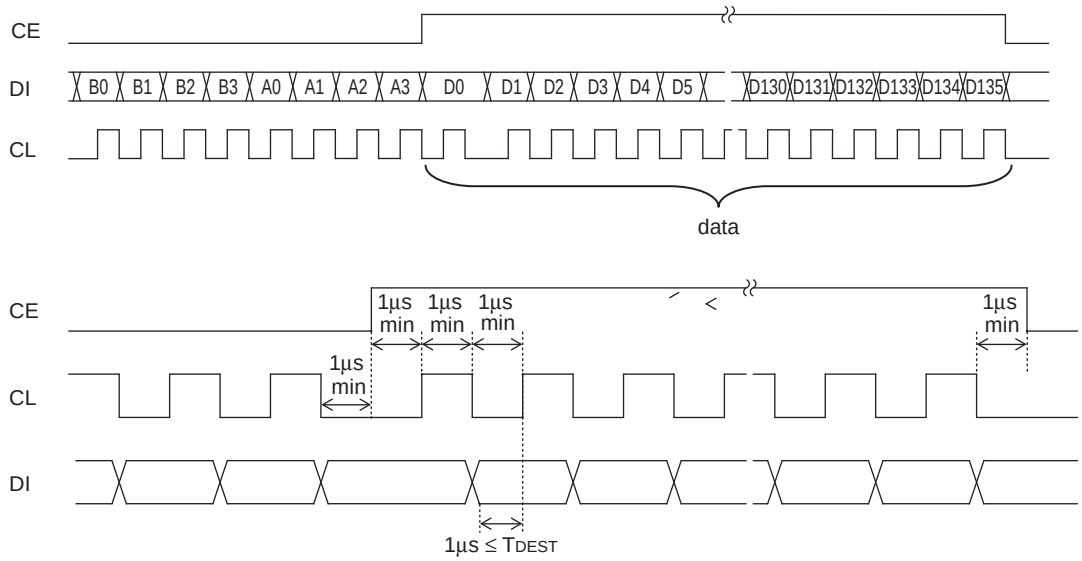
Pin No.	Pin	Function	Equivalent Circuit
42			

Control System Timing and Data Format

The LV3311PNM is controlled by applying the stipulated data to the CL, DI and CE pins. The data consists of a total of 144 bits, of which 8 bits are the device address, 136 bits are the control data.



Send to data

Address code

B0	B1	B2	B3	A0	A1	A2	A3
1	0	0	0	0	0	0	1

Data setting

Input switching control

D0	D1	D2	Operation
0	0	0	INIT
1	0	0	L1 (R1)
0	1	0	L2 (R2)
1	1	0	L3 (R3)
0	0	1	L4 (R4)
1	0	1	L5 (R5)

Volume control (10dB to -43dB)

D13	D14	D15	D16	D17	D18	D19	D20	Lch
D21	D22	D23	D24	D25	D26	D27	D28	Rch
0	1	1	0	1	1	1	0	10dB
1	1	1	0	1	1	1	0	9dB
0	0	0	1	1	1	1	0	8dB
1	0	0	1	1	1	1	0	7dB
0	1	0	1	1	1	1	0	6dB
1	1	0	1	1	1	1	0	5dB
0	0	1	1	1	1	1	0	4dB
1	0	1	1	1	1	1	0	3dB
0	1	1	1	1	1	1	0	2dB
1	1	1	1	1	1	1	0	1dB
0	0	0	0	0	0	0	0	0dB
1	0	0	0	0	0	0	0	-1dB
0	1	0	0	0	0	0	0	-2dB
1	1	0	0	0	0	0	0	-3dB
0	0	1	0	0	0	0	0	-4dB
1	0	1	0	0	0	0	0	-5dB
0	1	1	0	0	0	0	0	-6dB
1	1	1	0	0	0	0	0	-7dB
0	0	0	1	0	0	0	0	-8dB
1	0	0	1	0	0	0	0	-9dB
0	1	0	1	0	0	0	0	-10dB
1	1	0	1	0	0	0	0	-11dB
0	0	1	1	0	0	0	0	-12dB
1	0	1	1	0	0	0	0	-13dB

Tone block

Bass

GAIN	D29	D30	D31	D32	Lch	f0	D33	D34	Lch
	D37	D38	D39	D40	Rch		D41	D42	Rch

Sub volume control (-55dB to -)

D77	D78	D79	D80	D81	D82	D83	D84	Operation
1	1	1	0	1	1	0	0	-55dB
0	0	0	1	1	1	0	0	-56dB
1	0	0	1	1	1	0	0	-57dB
0	1	0	1	1	1	0	0	-58dB
1	1	0	1	1	1	0	0	-59dB
0	0	1	1	1	1	0	0	-60dB
1	0	1	1	1	1	0	0	-61dB
0	1	1	1	1	1	0	0	-62dB
1	1	1	1	1	1	0	0	-63dB
0	0	0	0	0	0	1	0	-64dB
1	0	0	0	0	0	1	0	-65dB
0	1	0	0	0	0	1	0	-66dB
1	1	0	0	0	0	1	0	-67dB
0	0	1	0	0	0	1	0	-68dB
1	0	1	0	0	0	1	0	-69dB
0	1	1	0	0	0	1	0	-70dB
1	1	1	0	0	0	1	0	-71dB
0	0	0	1	0	0	1	0	-72dB
1	0	0	1	0	0	1	0	-73dB
0	1	0	1	0	0	1	0	-74dB
1	1	0	1	0	0	1	0	-75dB
0	0	1	1	0	0	1	0	-76dB
1	0	1	1	0	0	1	0	-77dB
0	1	1	1	0	0	1	0	-78dB
1	1	1	1	0	0	1	0	-79dB
0	0	0	0	1	0	1	0	-

LPF

D85	D86	Operation
0	0	80Hz
1	0	120Hz
0	1	160Hz
1	1	OFF

Sub output select

D87	D88	Operation
0	0	FADER_REAR OUTPUT (LCH/RCH together)
1	0	LCH : FADER_REAR OUTPUT, RCH : SUBWOOFER OUTPUT
0	1	RCH : FADER_REAR OUTPUT, LCH : SUBWOOFER OUTPUT
1	1	SUBWOOFER OUTPUT (LCH/RCH together)