conbegitnpeaseifantefe.

Functions

Volume control: 0 dB to –50 dB in 1 dB steps, –52 dB to –
steps, and – , for a total of 66 positions.
A balance function can be implemented by
left and right channels independently.

Features

Built-in buffer amplifiers minimize the number of external
required.
Fabricated in a silicon gate CMOS process to minimize the

LC75344MD

Allowable Operating Ranges at Ta = −30 to +75 C, $V_{SS} = 0V$

Parameter	Symbol	Pin Name	Conditions	Ratings min	Ratings typ	Ratings max	Unit
Supply voltage	V_{DD}	V_{DD}		4.5		10	V
High-level input voltage	V_{IH}	CL, DI, CE		2.0		10	V
Low-level input voltage	V_{IL}	CL, DI, CE	7.5 ≤ V_{DD} ≤ 10	V_{SS}		0.8	V
		CL, DI, CE	4.5 ≤ V_{DD} ≤ 7.5	V_{SS}		0.3	V
Input voltage amplitude	V_{IN}	LIN, RIN		V_{SS}		V_{DD}	Vp-p
Input pulse width	tøW	CL		1			s
Setup time	tsetup	CL, DI, CE		1			s
Hold time	thold	CL, DI, CE		1			s
Operating frequency	fopg	CL				500	kHz

Electrical Characterristics at Ta = 25 C, $V_{DD} = 9V$, $V_{SS} = 0V$

Parameter	Symbol	Pin Name	Conditions	Ratings min	Ratings typ	Ratings max	Unit
Input resistance	Rin	LIN, RIN			50		k

Overall Characteristics

Parameter	Symbol	Conditions	Ratings min	Ratings typ	Ratings max	Unit
Total harmonic distortion	THD	V_{IN} = 1 Vrms, f = 1 kHz With all settings flat overall		0.002	0.01	%
		V_{IN} = 1 Vrms, f = 20 kHz With all settings flat overall		0.003		%
Crosstalk	CT	V_{IN} = 1 Vrms, f = 1 kHz, Rg = 1 k With all settings flat overall	90			dB
Output noise voltage	V_N	80 kHz L.P.F, Rg = 1 k With all settings flat overall		6.0		V
Maximum attenuation	Vomin	V_{IN} = 1 Vrms, f = 1 kHz With all settings flat overall		92		dB

LC75344MD
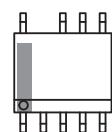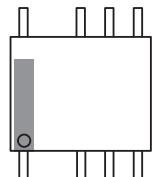
**Package Dimensions**

unit : mm
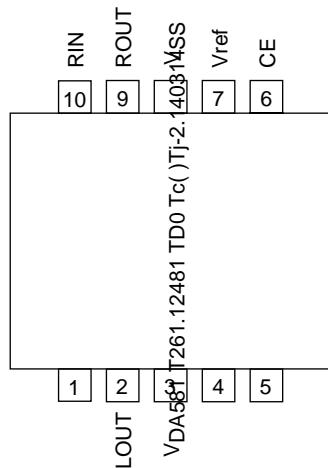
SOIC-10 NB
CASE 751BQ
ISSUE B

LC75344MD

Pin Arrangement
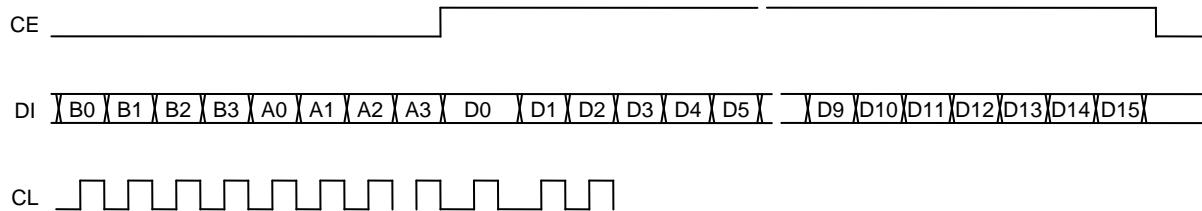
Equivalent Circuit

LC75344MD

Control System Timing and Data Format

The LC75344MD is controlled by inputting the stipulated data serially to the CL, DI, and CE pins. The data consists of a total of 24 bits, of which 8 bits are the address and 16 bits are the data.

Address Code (B0 to A3)

The data has an 8-bit address field, and conforms to the CCB serial bus specifications.

Address code	B0	B1	B2	B3	A0	A1	A2	A3	
(LSB)	0	0	0	1	0	0	0	1	(88HEX)

Control Code Allocations

Volume control

D0	D1	D2	D3	D4	D5	D6	D7	Operation
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
0	1	1	1	0	0	0	0	14dB
1	1	1	1	0	0	0	0	15dB
0	0	0	0	1	0	0	0	16dB
1	0	0	0	1	0	0	0	17dB
0	1	0	0	1	0	0	0	18dB
1	1	0	0	1	0	0	0	19dB
0	0	1	0	1	0	0	0	20dB
1	0	1	0	1	0	0	0	21dB
0	1	1	0	1	0	0	0	22dB
1	1	1	0	1	0	0	0	23dB
0	0	0	1	1	0	0	0	24dB
1	0	0	1	1	0	0	0	25dB
0	1	0	1	1	0	0	0	26dB
1	1	0	1	1	0	0	0	27dB
0	0	1	1	1	0	0	0	28dB
1	0	1	1	1	0	0	0	29dB
0	1	1	1	1	0	0	0	30dB
1	1	1	1	1	0	0	0	31dB
0	0	0	0	0	1	0	0	32dB
1	0	0	0	0	1	0	0	33dB
0	1	0	0	0	1	0	0	34dB
1	1	0	0	0	1	0	0	35dB
0	0	1	0	0	1	0	0	36dB
1	0	1	0	0	1	0	0	37dB
0	1	1	0	0	1	0	0	38dB
1	1	1	0	0	1	0	0	39dB
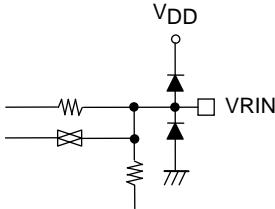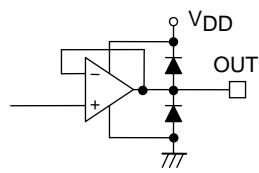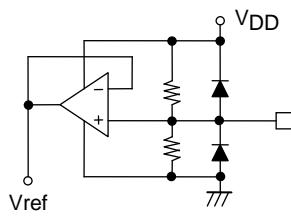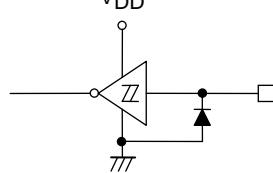
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Volume control

D0	D1	D2	D3	D4	D5	D6	D7	Operation
1	0	0	1	0	1	0	0	41dB
0	1	0	1	0	1	0	0	42dB
1	1	0	1	0	1	0	0	43dB
0	0	1	1	0	1	0	0	44dB
1	0	1	1	0	1	0	0	45dB
0	1	1	1	0	1	0	0	46dB
1	1	1	1	0	1	0	0	47dB
0	0	0	0	1	1	0	0	48dB
1	0	0	0	1	1	0	0	49dB
0	1	0	0	1	1	0	0	50dB
0	0	1	0	1	1	0	0	52dB
0	1	1	0	1	1	0	0	54dB
0	0	0	1	1	1	0	0	56dB
0	1	0	1	1	1	0	0	58dB
0	0	1	1	1	1	0	0	60dB
0	1	1	1	1	1	0	0	62dB
0	0	0	0	0	0	1	0	
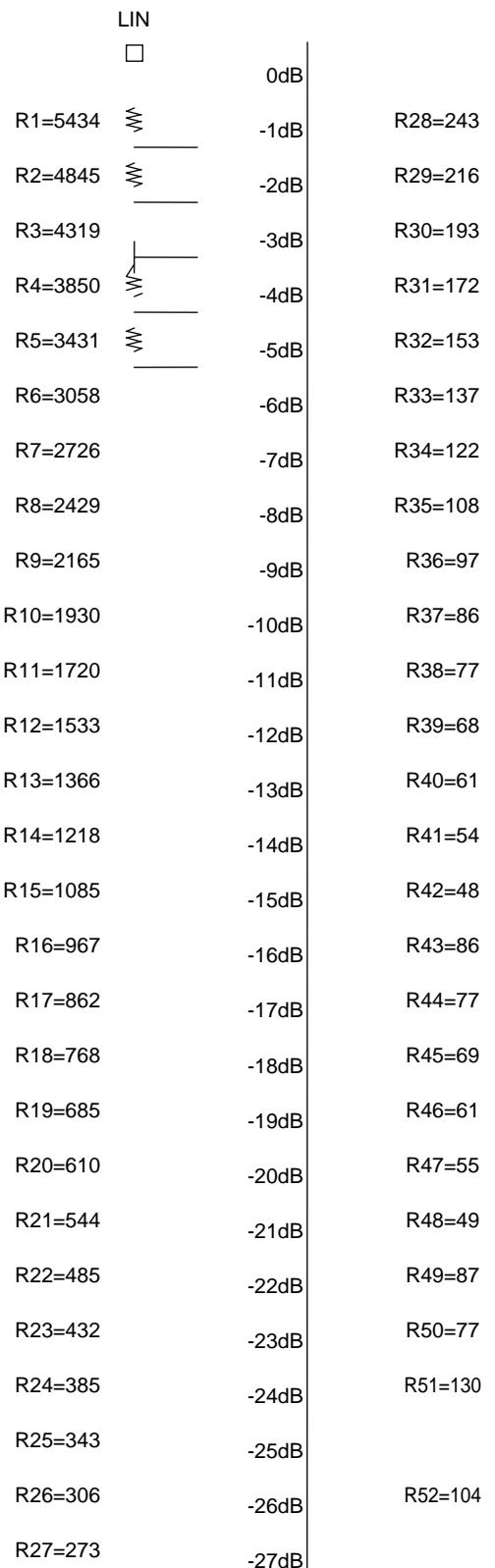
LC75344MD

Pin Functions

Pin name	Pin No.	Function	Notes
LIN RIN	1 10	Volume control inputs	
LOUT ROUT	2 9	Volume control outputs	
Vref	7	VDD 0.5 voltage generator block for the analog ground level. A capacitor with a value a few times 10 F must be inserted between Vref and AVSS (VSS) to minimize power supply ripple.	
V$_{SS}$	8	Ground	
V$_{DD}$	3	Power supply	
CE	6	Chip enable The internal latch data is written and the analog switches operate at the point this pin goes from high to low. Data transfer is enabled when this pin is at the high level.	
DI CL	4 5	Serial data and clock inputs for IC control.	

Equivalent Circuit

LIN

0dB

R1=5434	-1dB	R28=243
R2=4845	-2dB	R29=216
R3=4319	-3dB	R30=193
R4=3850	-4dB	R31=172
R5=3431	-5dB	R32=153
R6=3058	-6dB	R33=137
R7=2726	-7dB	R34=122
R8=2429	-8dB	R35=108
R9=2165	-9dB	R36=97
R10=1930	-10dB	R37=86
R11=1720	-11dB	R38=77
R12=1533	-12dB	R39=68
R13=1366	-13dB	R40=61
R14=1218	-14dB	R41=54
R15=1085	-15dB	R42=48
R16=967	-16dB	R43=86
R17=862	-17dB	R44=77
R18=768	-18dB	R45=69
R19=685	-19dB	R46=61
R20=610	-20dB	R47=55
R21=544	-21dB	R48=49
R22=485	-22dB	R49=87
R23=432	-23dB	R50=77
R24=385	-24dB	R51=130
R25=343	-25dB	
R26=306	-26dB	R52=104
R27=273	-27dB	

LC75344MD

Reference Voltage Generator Equivalent Circuit

V_DD

20k

VREF

20k

+
−

The right channel is identical.

LVref
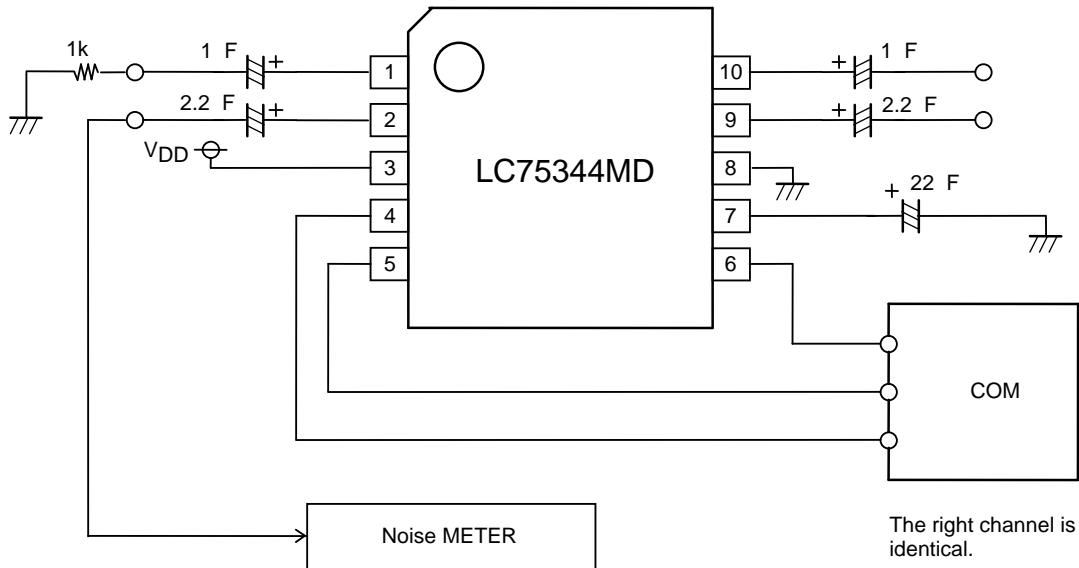
Test Circuit

 Total harmonic distortion

1 F +

2.2 F +

V_DD

LC75344MD

1
2
3
4
5

10
9
8
7
6

+ 1 F

+ 2.2 F

+ 22 F

COM

The right channel is identical.

THDin

DISTORTION ANALYZER

S.G
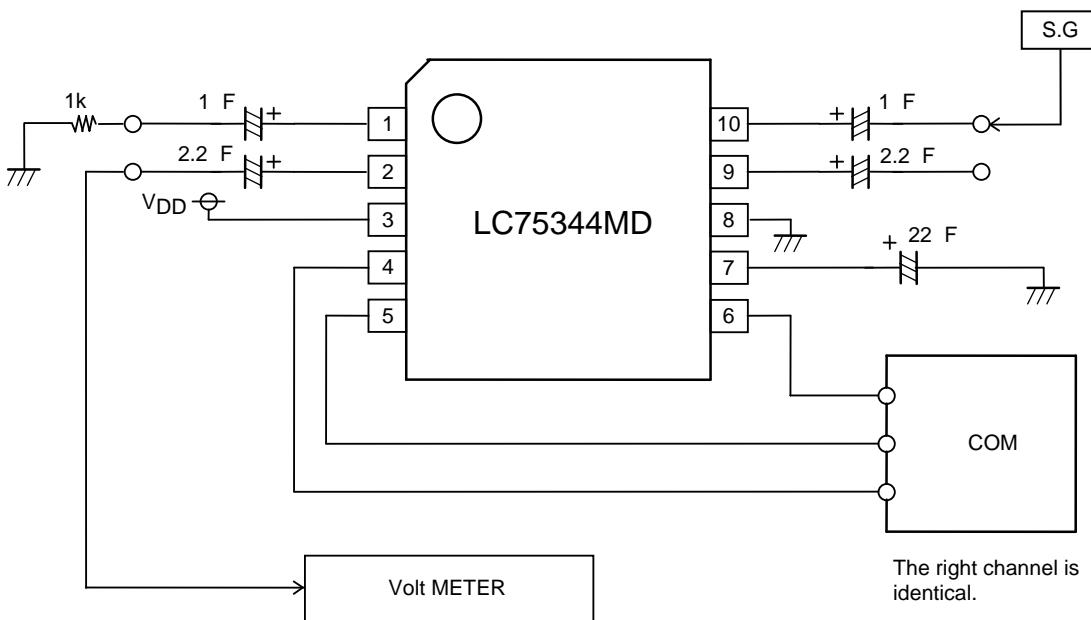
LC75344MD

Output noise voltage

Crosstalk
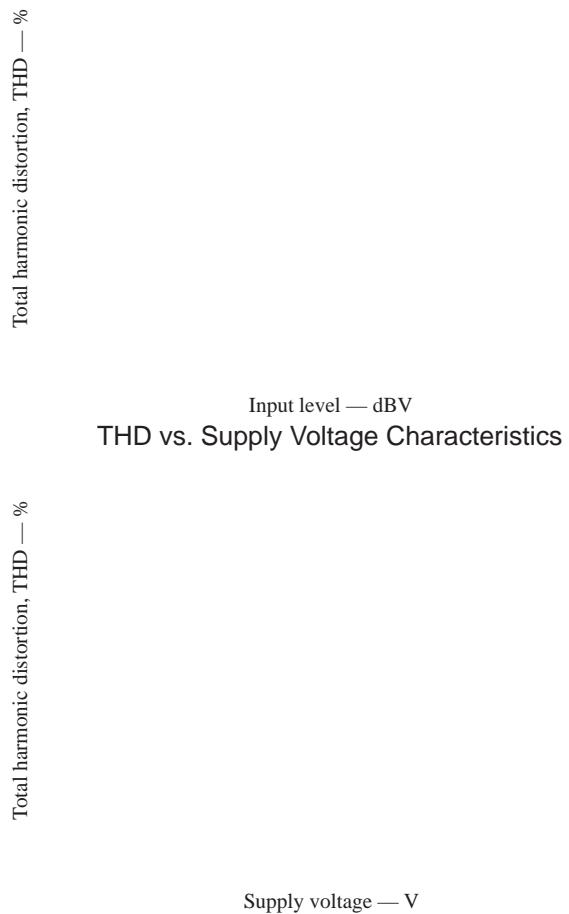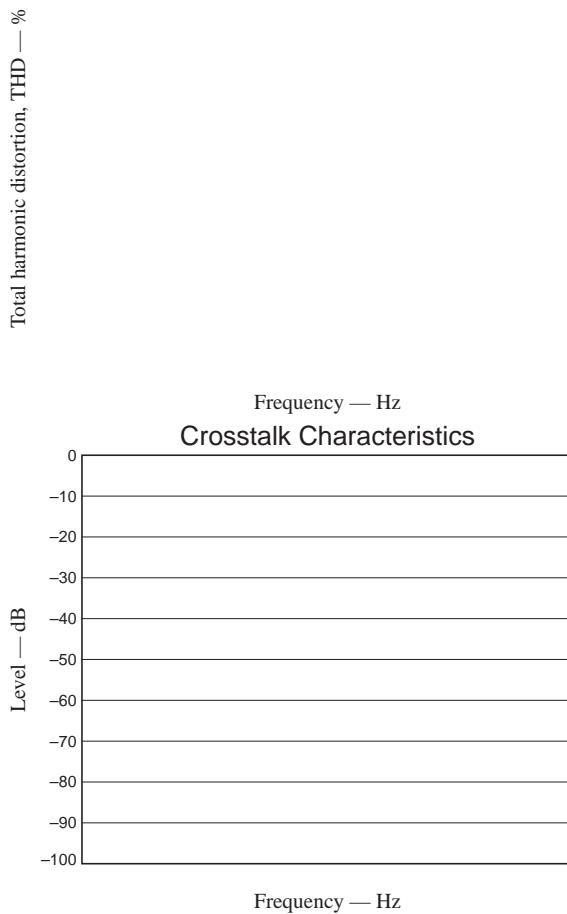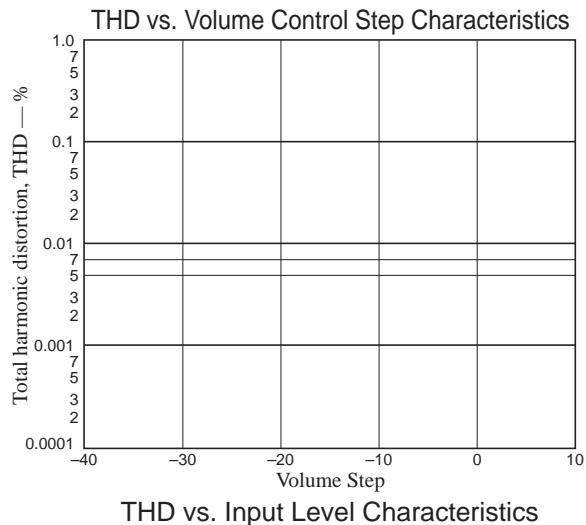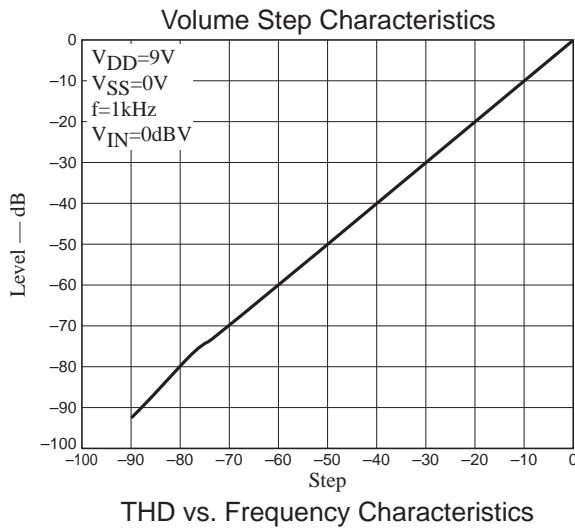
Usage Notes

The states of the internal analog switches are undefined after power is first applied. Muting must be applied externally until the control data has been sent.

When performing the initial settings after power is first applied, both the left and right channel initial settings data must be sent before releasing the external mute.

Either cover the CL, DI, and CE lines with the ground pattern or use shielded lines to prevent high-frequency digital noise from entering the analog signal system from these lines.

LC75344MD

Volume Step Characteristics

V_{DD}=9V
V_{SS}=0V
f=1kHz
V_{IN}=0dBV

Level — dB

Step

THD vs. Volume Control Step Characteristics

Total harmonic distortion, THD — %

Volume Step

THD vs. Frequency Characteristics

Total harmonic distortion, THD — %

Frequency — Hz

THD vs. Input Level Characteristics

Total harmonic distortion, THD — %

Input level — dBV

Crosstalk Characteristics

Level — dB

Frequency — Hz

THD vs. Supply Voltage Characteristics

Total harmonic distortion, THD — %

Supply voltage — V

LC75344MD