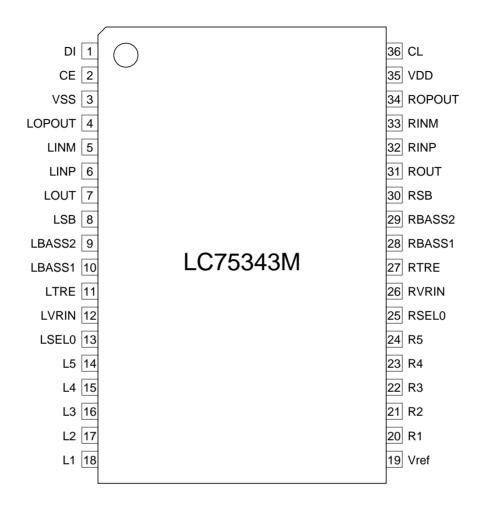
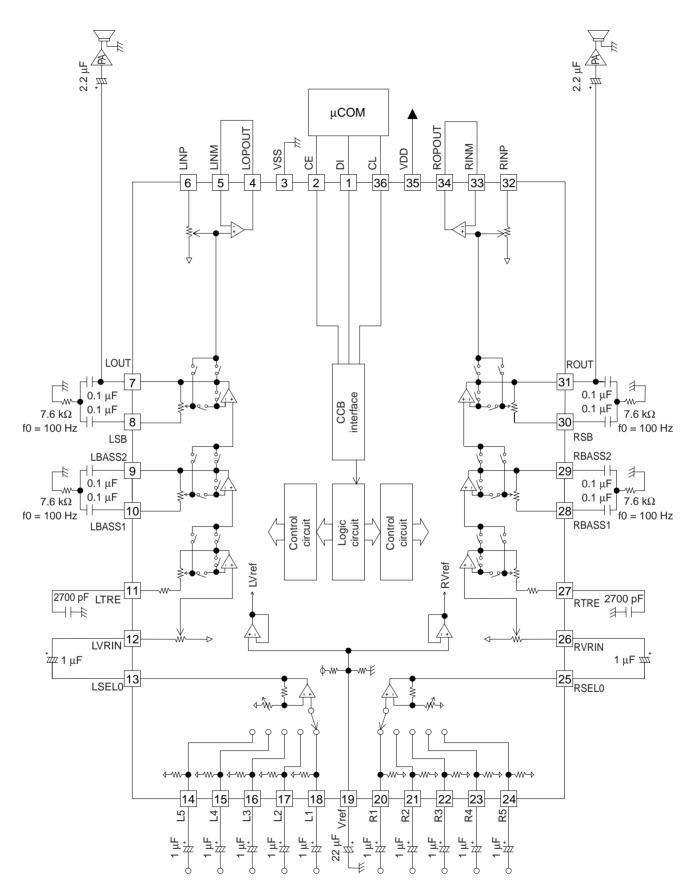
Pin Assignment

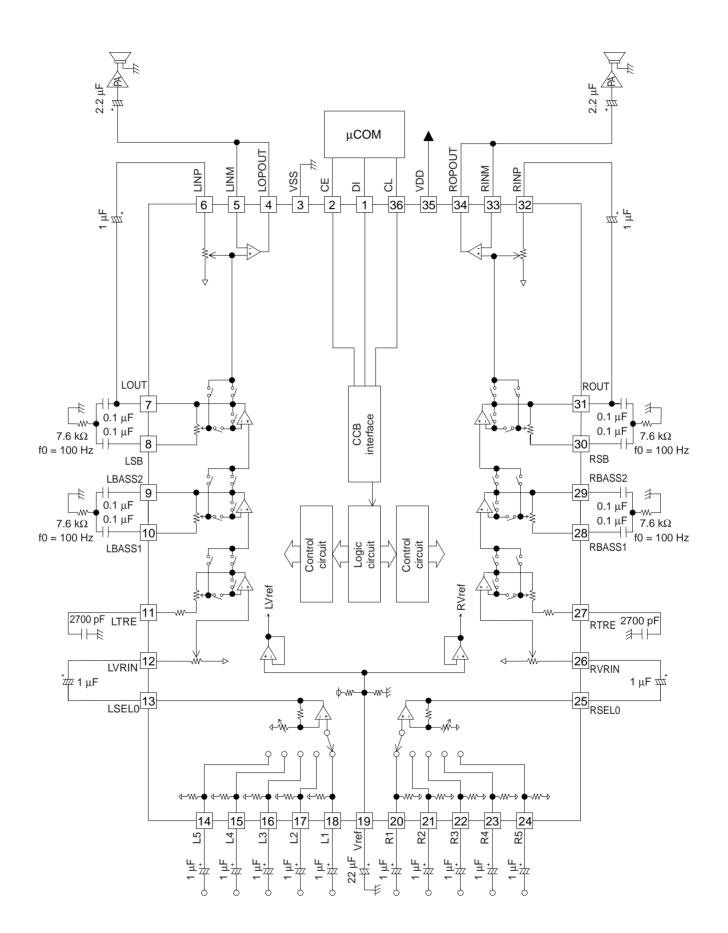


Sample Application Circuit

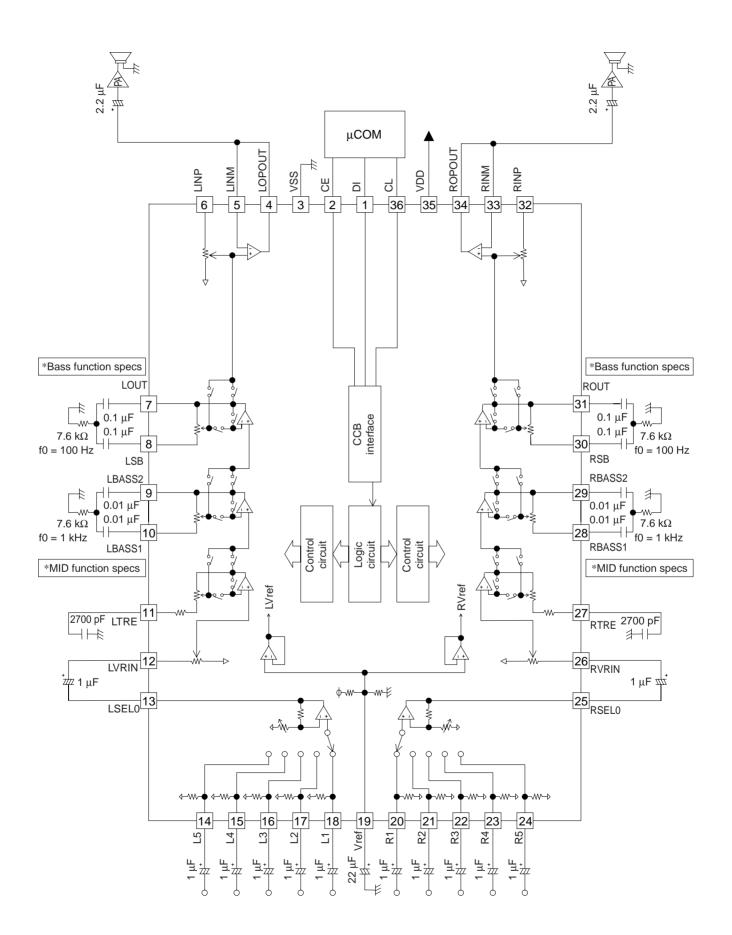
• General-Purpose Op-Amp Specifications)



• ATT Control Specifications



• 3-Band Specifications



Specifications Absolute Maximum Ratings at Ta = 25°C, V_{SS} = 0 V

Parameter	Symbol	Pin Name	Conditions	Ratings	Unit	
Maximum supply voltage	V _{DD} max	V _{DD}		10.5	V	
		CE, DI, CL		-0.3 to +10.5	1	
Maximum input voltage	V _{IN} max	L1 to L5, R1 to R5, LVRIN, RVRIN, LINP, RINP, LINM, RINM		V_{SS} – 0.3 to V_{DD} + 0.3	V	
Allowable power dissipation	Pdmax		Ta \leq 75°C, independent IC	520	mW	
Operating temperature	Topr			-30 to +75	°C	
Storage temperature	Tstg			-40 to +125	°C	

Allowable Operating Ranges at Ta = –30 to +75 $^{\circ}C,$ V_{SS} = 0 V

Parameter	Qumbal	Pin Name	Conditions		Ratings		Unit	
Parameter	Symbol	Pin Name	Conditions	min	typ	max	Unit	
Supply voltage	V _{DD}	V _{DD}		4.5		9	V	
Input high-level voltage	VIH	CL, DI, CE		2.0		9	V	
		CL, DI, CE	$7.5 \le V_{DD} \le 9$	V _{SS}		0.8	V	
Input low-level voltage	VIL		$4.5 \le V_{DD} \le 7.5$	V _{SS}		0.3	v	
Input amplitude voltage	V _{IN}	L1 to L5, R1 to R5, LVRIN, RVRIN, LINP, RINP, LINM, RINM		V _{SS}		V _{DD}	Vp-р	
Input pulse width	tøW	CL		1			μs	
Setup time	tsetup	CL, DI, CE		1			μs	
Hold time	thold	CL, DI, CE		1			μs	
Operating frequency	fopg	CL				500	kHz	

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

Input block

Parameter	Sumbol	Pin Name	Conditions		Ratings		Unit	
Falameter	Parameter Symbol		Conditions	min	typ	max	Unit	
Maximum input gain	Ginmax				+30		dB	
Step resolution	Gstep				+2		dB	
Input resistance	Rin	L1, L2, L3, L4, L5 R1, R2, R3, R4, R5			50		kΩ	
Clipping level	Vcl	LSEL0, RSEL0	THD = 1.0%, f = 1 kHz		2.50		Vrms	
Output load resistance	RI	LSEL0, RSEL0		10			kΩ	

Volume block

Parameter	Symbol	Pin Name	Conditions		Unit		
Falameter	Symbol	FIII Naille	Conditions	min	typ	max	
Input resistance	Rin	LVRIN, RVRIN			50		kΩ

Treble band equalizer control block

Parameter	meter Symbol Pin Name		Conditions		Unit		
Falameter			Conditions	min	typ	max	Offic
Control range	Geq		max. boost/cut	±8	±10	±12	dB
Step resolution	Estep			1	2	3	dB
Internal feedback resistance	Rfeed				51.7		kΩ

LC75343M

Bass (mid) band equalizer control block

Deremeter	Symbol	Pin Name	Conditions		Unit		
Falameter	Parameter Symbol Pin Na		Name Conditions			max	Onit
Control range	Geq		max. boost/cut	±8	±10	±12	dB
Step resolution	Estep			1	2	3	dB
Internal feedback resistance	Rfeed				33.1		kΩ

Super bass (bass) band equalizer control block

Parameter	Symbol	Pin Name	Conditions			Unit	
Falameter	Symbol		Conditions	min	typ	max	Onic
Control range (super bass specs)	Geq		max. boost	+8	+10	+12	dB
Control range (3-band specs)	Geq		max. boost/cut	±8	±10	±12	dB
Step resolution	Estep			1	2	3	dB
Internal feedback resistance	Rfeed				33.1		kΩ

General-purpose/ATT op-amp block

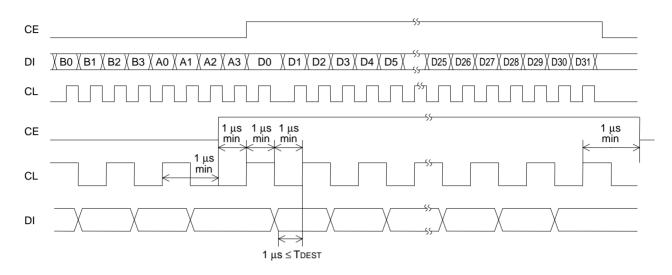
Parameter	Symbol	Pin Name	Conditions	Ratings			
Falameter	Symbol	FillIndille	Conditions	min	typ	max	Unit
Input resistance	Rin	LINP, RINP			50		kΩ

General

Parameter	Cumhal	Conditions		Ratings		Unit
Parameter	Symbol	Conditions	min	typ	max	Unit
Total harmonic distortion (General-purpose op-amp specs)	THD			0.006	0.01	%
Total harmonic distortion (ATT, 3-band specs)	שחו	V _{IN} = 1 Vrms, f = 1 KHz, total flat overall		0.007	0.01	%
Crosstalk (General-purpose op-amp specs)	СТ	V _ 1 Vrmo f _ 1 KHz Rg _ 1 kO total flat overall	80			dB
Crosstalk (ATT, 3-band specs)	CT	V_{IN} = 1 Vrms, f = 1 KHz, Rg = 1 k Ω , total flat overall	80			dB
Output noise voltage (General-purpose op-amp specs)	VN			9.3		μV
Output noise voltage (ATT, 3-band specs)	VIN	Flat overall, 80 kHz L.P.F		10.4		μV
Maximum attenuated output (General-purpose op-amp specs)	Vomin	Flat overall, f = 1 kHz		-90		dB
Maximum attenuated characteristics (ATT, 3-band specs)	Vomin			-90		dB
Curent drain	I _{DD}	$V_{DD} - V_{SS} = +9 V$		40		mA
Input high-level current	I _{IH}	CL, DI, CE: V _{IN} = 9 V			10	μA
Input low-level current	IIL	CL, DI, CE: V _{IN} = 0 V	-10			μA

Control Timing and Data Format

To control the LC75343M, input specified serial data to the CL, DI, and CE pins. The data configuration consists of a total of 40 bits broken down into 8 address bits and 32 data bits.



Address Code (B0 to A3)

The LC75343M has an 8-bit address code and common specifications with a SANYO serial bus CCB IC are possible.

Address code	B0	B1	B2	B3	A0	A1	A2	A3	
(LSB)	0	1	0	0	0	0	0	1	(82HEX)

Control Code Allocation

General-purpose op-amp, ATT control specifications (D3 = 0)

Input switching control

(L1, L2, L3, L4, L5, R1, R2, R3, R4, R5)

D0	D1	D2	D3	Operation
0	0	0	0	L1 (R1) on
1	0	0	0	L2 (R2) on
0	1	0	0	L3 (R3) on
1	1	0	0	L4 (R4) on
0	0	1	0	L5 (R5) on
1	0	1	0	Analog ground connection
0	1	1	0	Test mode
1	1	1	0	Must not be used in normal operation.

3-band specifications (D3 = 1)

Input switching control (L1, L2, L3, L4, L5, R1, R2, R3, R4, R5)

D0	D1	D2	D3	Operation
0	0	0	0	L1 (R1) on
1	0	0	0	L2 (R2) on
0	1	0	0	L3 (R3) on
1	1	0	0	L4 (R4) on
0	0	1	0	L5 (R5) on
1	0	1	0	Analog ground connection
0	1	1	0	Test mode
1	1	1	0	Must not be used in normal operation.

Input gain control

D4	D5	D6	D7	Operation
0	0	0	0	0 dB
1	0	0	0	+2 dB
0	1	0	0	+4 dB
1	1	0	0	+6 dB
0	0	1	0	+8 dB
1	0	1	0	+10 dB
0	1	1	0	+12 dB
1	1	1	0	+14 dB
0	0	0	1	+16 dB
1	0	0	1	+18 dB
0	1	0	1	+20 dB
1	1	0	1	+22 dB
0	0	1	1	+24 dB
1	0	1	1	+26 dB
0	1	1	1	+28 dB
1	1	1	1	+30 dB

Volume control

bbs bbs <th>D8</th> <th>D9</th> <th>D10</th> <th>D11</th> <th>D12</th> <th>D13</th> <th>Operation</th>	D8	D9	D10	D11	D12	D13	Operation
1 0 0 0 0 0 1 dB 0 1 0 0 0 0 2 dB 1 1 0 0 0 1 3 dB 0 0 1 0 0 0 5 dB 0 1 1 0 0 0 5 dB 1 1 1 0 0 0 7 dB 0 0 0 1 0 0 9 dB 1 1 0 0 10 dB 10 dB 1 1 0 0 11 dB 11 dB 0 1 1 0 0 11 dB 1 1 1 0 0 11 dB 0 1 1 0 0 11 dB 1 1 1 0 11 dB 11 dB 1 1 1 0							
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1 1 1 0 1 -47 dB 0 0 0 0 1 1 -48 dB 1 0 0 0 1 1 -49 dB	1	0	1	1	0	1	–45 dB
0 0 0 0 1 1 -48 dB 1 0 0 0 1 1 -49 dB	0	1	1	1	0	1	-46 dB
1 0 0 0 1 1 -49 dB	1	1	1	1	0	1	–47 dB
	0	0	0	0	1	1	-48 dB
0 1 0 0 1 1 -50 dB	1	0	0	0	1	1	–49 dB
	0	1	0	0	1	1	–50 dB

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D8	D9	D10	D11	D12	D13	Operation
1	1	0	0	1	1	–52 dB
0	0	1	0	1	1	–54 dB
1	0	1	0	1	1	–56 dB
0	1	1	0	1	1	–58 dB
1	1	1	0	1	1	-60 dB
0	0	0	1	1	1	–62 dB
1	0	0	1	1	1	–64 dB
0	1	0	1	1	1	–66 dB
1	1	0	1	1	1	–68 dB
0	0	1	1	1	1	–70 dB
1	0	1	1	1	1	–74 dB
0	1	1	1	1	1	–78 dB
1	1	1	1	1	1	–∞ dB

Channel selection

D14	D15	Operation
1	0	Right channel
0	1	Left channel
1	1	L/R simultaneous

Treble control

D16	D17	D18	D19	Operation
010		010	013	Operation
1	0	1	0	+10 dB
0	0	1	0	+8 dB
1	1	0	0	+6 dB
0	1	0	0	+4 dB
1	0	0	0	+2 dB
0	0	0	0	0 dB
1	0	0	1	-2 dB
0	1	0	1	-4 dB
1	1	0	1	6 dB
0	0	1	1	–8 dB
1	0	1	1	-10 dB

Bass control

(Mid control)

D20	D21	D22	D23	Operation
1	0	1	0	+10 dB
0	0	1	0	+8 dB
1	1	0	0	+6 dB
0	1	0	0	+4 dB
1	0	0	0	+2 dB
0	0	0	0	0 dB
1	0	0	1	-2 dB
0	1	0	1	-4 dB
1	1	0	1	6 dB
0	0	1	1	–8 dB
1	0	1	1	-10 dB

Super bass control (bass control)

* Control is possible only for 3-band specifications for the cut side (-)

D24	D25	D26	D27	Operation
1	0	1	0	+10 dB
0	0	1	0	+8 dB
1	1	0	0	+6 dB
0	1	0	0	+4 dB
1	0	0	0	+2 dB
0	0	0	0	0 dB
1	0	0	1	–2 dB
0	1	0	1	4 dB
1	1	0	1	6 dB
0	0	1	1	–8 dB
1	0	1	1	-10 dB

General-purpose op-amp specifications

(D28 to D31 fixed to 0)

D28	D29	D30	D31	Operation
0	0	0	0	

ATT control specifications

				1
D28	D29	D29	D30	Operation
0	0	0	0	0 dB
1	0	0	0	–2 dB
0	1	0	0	-4 dB
1	1	0	0	6 dB
0	0	1	0	–8 dB
1	0	1	0	-10 dB
0	1	1	0	-12 dB
1	1	1	0	-14 dB
0	0	0	1	-16 dB
1	0	0	1	-18 dB
0	1	0	1	–∞ dB

3-band specifications (fixed to the values below) (Switch all off)

D28	D29	D30	D31	Operation
1	1	0	1	

Pin Functions

Pin No.	Pin Name	Function	Equivalent circuit
18 17	L1 L2		
16	L3		
15	L4		
14	L5	Input signal pins	
20	R1		
21	R2		
22	R3		Rn 🛓 🛓 👘 🗍
23	R4		Vref 777
24	R5		7/7
13	LSEL0	Input selector output pins	
25	RSEL0		
10 9 28 29 8 30	LBASS1 LBASS2 RBASS1 RBASS2 LSB RSB	Capacitor and resistor connection pins for configuring filter, used for bass and super bass band, or for mid and bass	BASS1 BASS1 BASS2
7 31	LOUT ROUT	 ATT + equalizer output pins/capacitor connection pins used to configure super bass filter 	
12 26	LVRIN RVRIN	• Volume input pins	
11 27	LTRE RTRE	Capacitor connection pins for configuring treble band filter	

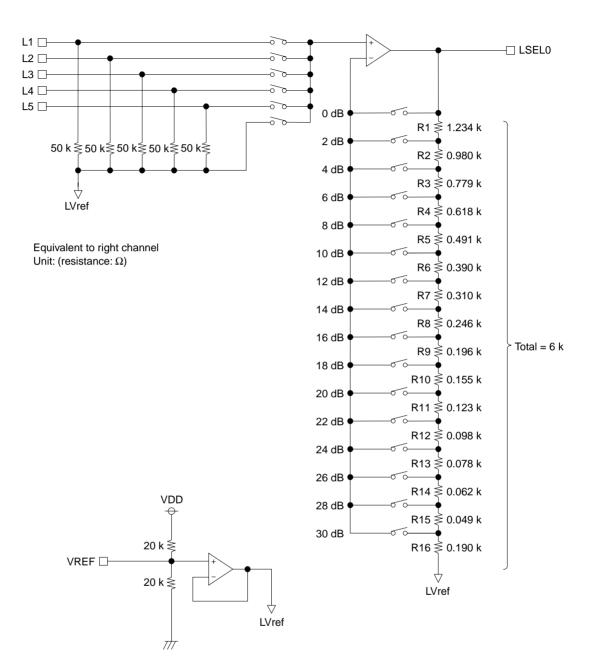
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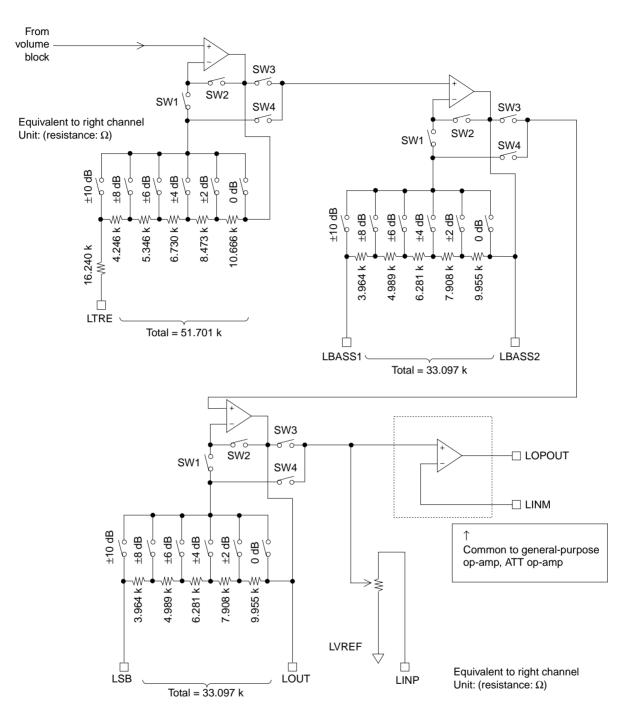
Pin No.	Pin Name	Function	Equivalent circuit
19	Vref	• Connect a capacitor of a few tens of μF between Vref and $AV_{SS}~(V_{SS})$ as a analog ground 0.5 \times V_{DD} voltage generator, current ripple countermeasure.	VDD Vref 7/7
3	V _{SS}	Ground pin	
35	V _{DD}	Power supply pin	
2	CE	Chip enable pin Data is written to the internal latch and the analog switches are operated when the level changes from high to low. Data transfer is enabled when the level is high.	VDD
1 36	DI CL	Serial data pins and clock input pin for control	
6 32	LINP RINP	General-purpose op-amp specifications Non-inverted input pins of general-purpose op-amp When not used, leave open. ATT control specifications Non-inverted input pins for ATT. 3-band specifications Non-inverted input pins for ATT. Always leave these pins open.	VDD INP Vref 777
5 33	LINM RINM	 General-purpose op-amp specifications Non-inverted input pins of general-purpose op-amp. When not used, connect these pins to the L(R) OPOUT pins. (Connected between pin 5 and pin 4) (Connected between pin 33 and pin 34) ATT control specifications Op-amp inverted input pins for ATT. Connected to L(R) OPOUT pins. (Connected between pin 5 and pin 4) (Connected between pin 33 and pin 34) 3-band specifications Inverted input pins of ATT op-amp. Connected to L(R) OPOUT pins. (Connected between pin 5 and pin 4) (Connected between pin 33 and pin 34) 	
4 34	LOPOUT ROPOUT	 General-purpose op-amp specifications General-purpose op-amp output pins. When not used, connect these pins to the L(R) INM pins. (Connected between pin 5 and pin 4) (Connected between pin 33 and pin 34) ATT control specifications Op-amp output pins for ATT. Connected to L(R) INM pins. (Connected between pin 5 and pin 4) (Connected between pin 33 and pin 34) 3-band specifications ATT op-amp output pins. (Connected to L(R) INM pins. (Connected to L(R) INM pins. (Connected between pin 5 and pin 4) (Connected between pin 5 and pin 4) 	VDD + + 7/7

Equivalent Circuit

Selector Block/Reference Voltage Generator



• Treble/Bass/Super Bass Band



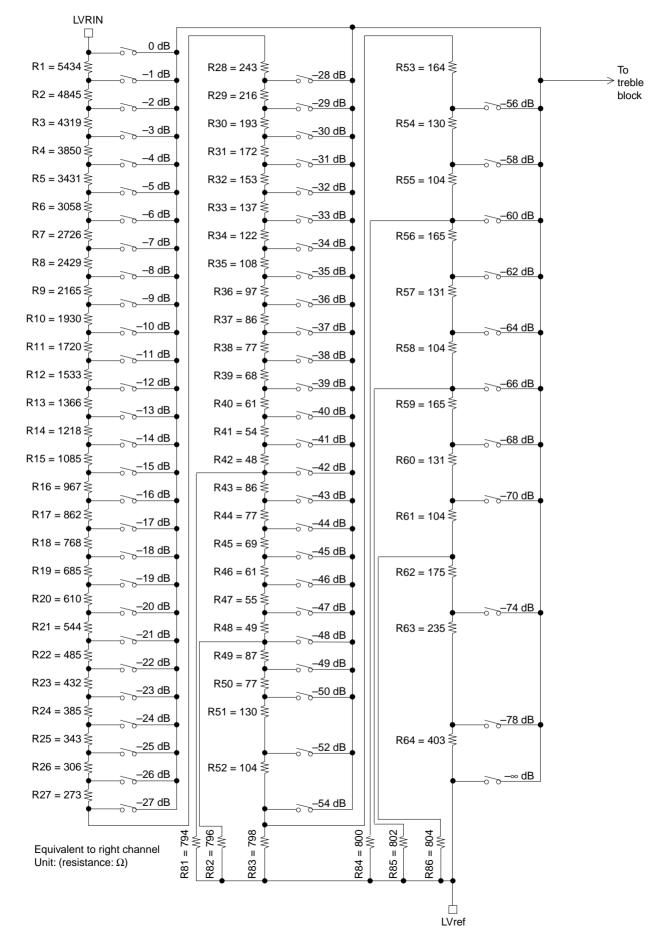
During boost, SW1 and SW3 are on, during cut, SW2 and SW4 are on, when 0 dB, 0dBSW and SW2 and SW3 are on.

For the super bass block:

- In case of general-purpose op-amp specifications, ATT control specifications ("0" set to D3) SW3, SW4 are off, and only boost side operates (only SW1 is on).
- In case of 3-band specifications ("1" set to D3)

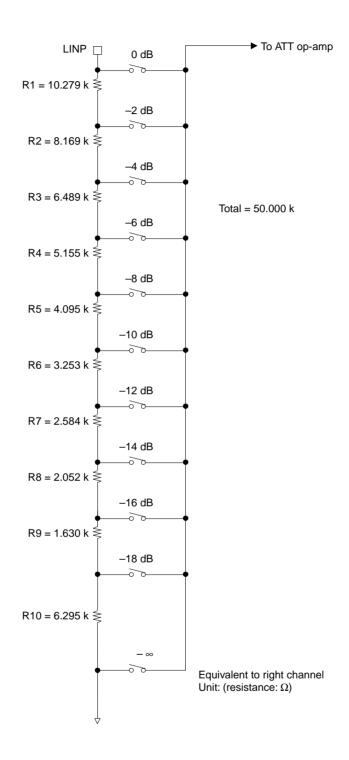
During boost, SW1 and SW3 are on, during cut, SW2 and SW4 are on, when 0 dB, 0dBSW and SW2 and SW3 are on.

Volume Block



• ATT Block Equivalent Circuit

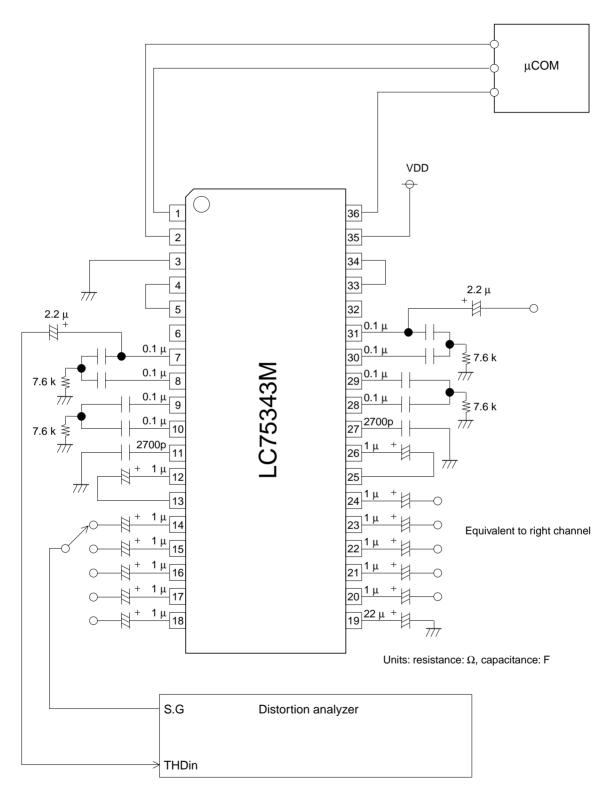
(during ATT control)



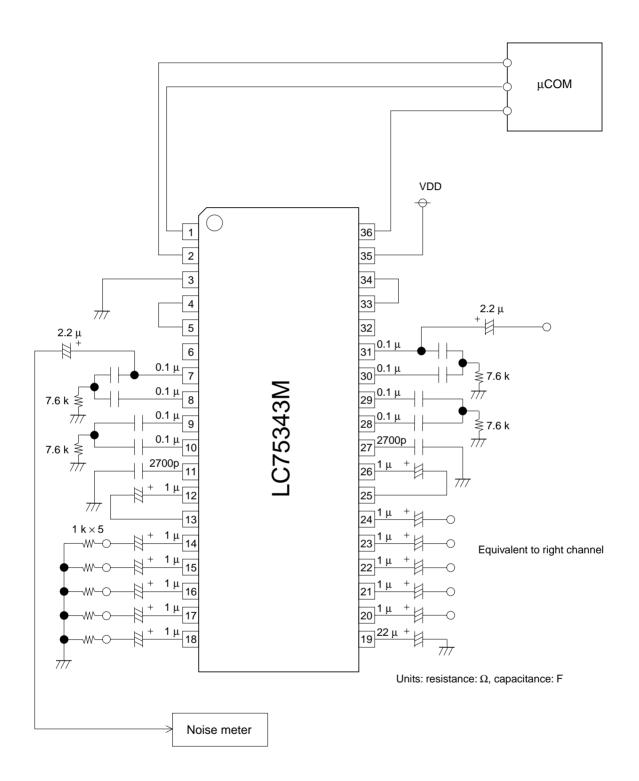
Test Circuit

General-Purpose Op-amp Specifications

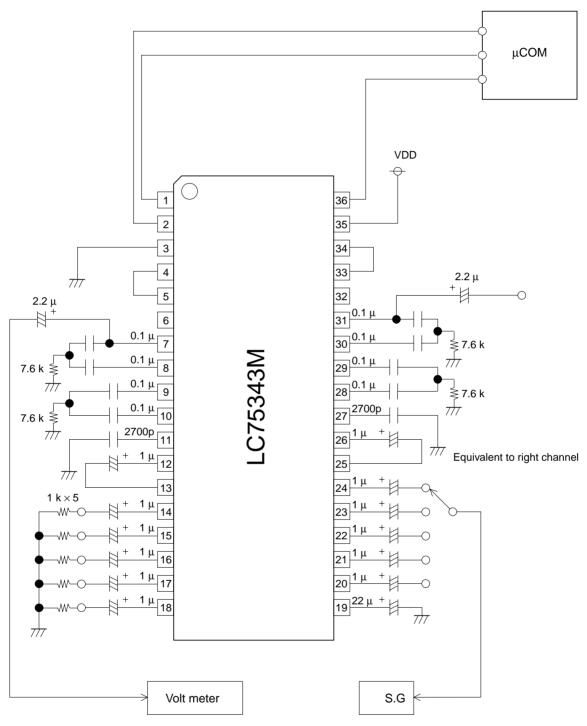
• Total Harmonic Distortion



• Output Noise Voltage



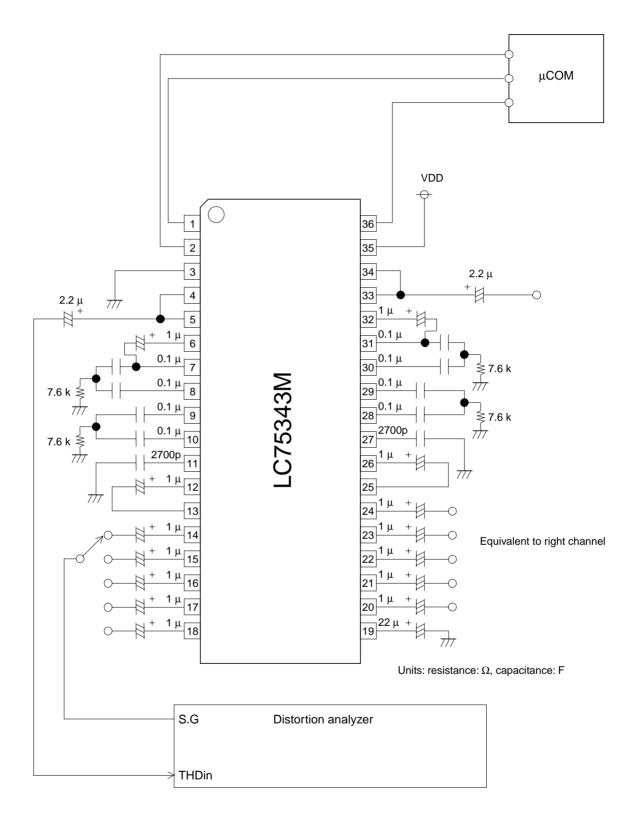
• Crosstalk



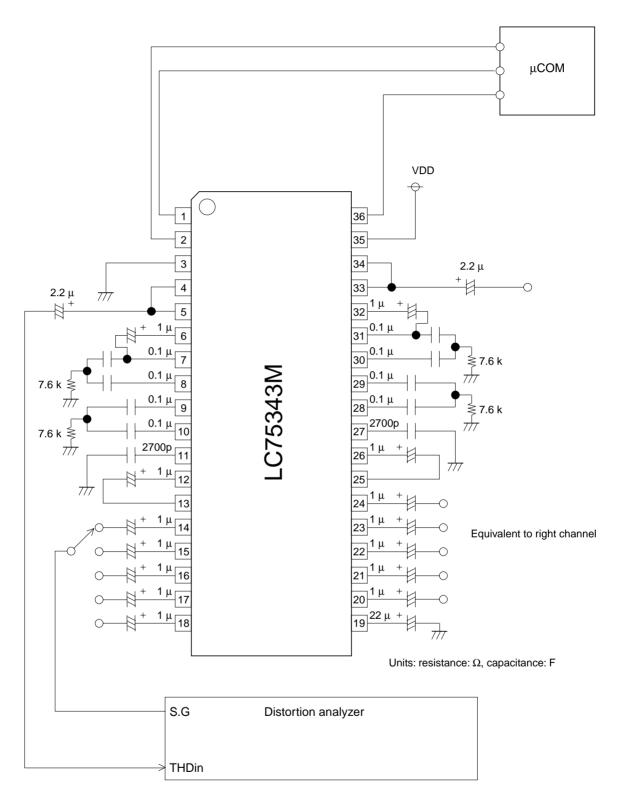
Units: resistance: Ω , capacitance: F

ATT Control Specifications and 3-Band Specifications

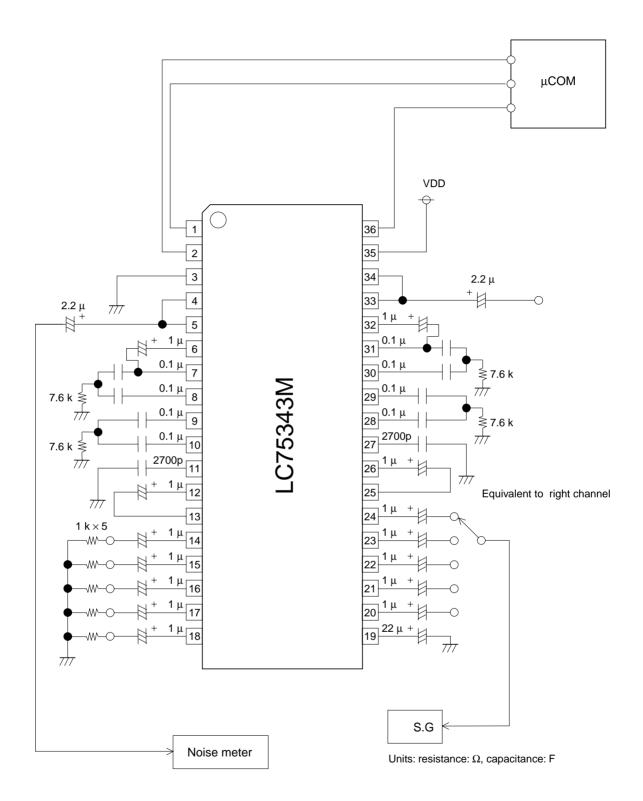
• Total Harmonic Distortion



• Output Noise Voltage



• Crosstalk

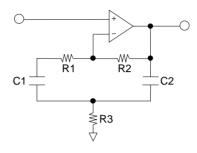


Calculation of External Equalizer Constant

Bass/Super Bass Circuit

The equivalent circuit and the formula for calculating the external RC with a mean frequency of 1000 Hz are shown below.

• Bass/super bass band equivalent circuit block diagram



• Calculation example

We obtain R2 from G = 10 dB.

$$G_{+10 \, dB} = 20 \times LOG_{10} \left(1 + \frac{R^2}{2R^3} \right)$$
$$R^3 = \frac{R^2}{2 \left(10^{G+10 dB/20} - 1 \right)} = \frac{33097}{2 \times (3.162 - 1)} \neq 7.6 \, K\Omega$$

We obtain C from mean frequency f0 = 1000 Hz.

$$f0 = \frac{1}{2\pi\sqrt{R3R2C1C2}}$$
$$C = \frac{1}{2\pi f0\sqrt{R3R2}} = \frac{1}{2\pi \times 1000\sqrt{33097 \times 7600}} \neq 0.01 \,\mu F$$

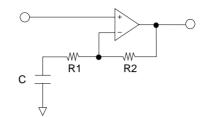
We obtain Q.

$$Q = \frac{R3R2}{2R3} \quad \frac{1}{\sqrt{R3R2}} \neq 1.04$$

Treble Band Circuit

The shelving characteristics can be obtained for the treble band.

The equivalent circuit and calculation formula during boost are indicated below.



• Calculation example

Specification Set frequency: f = 26000 Hz

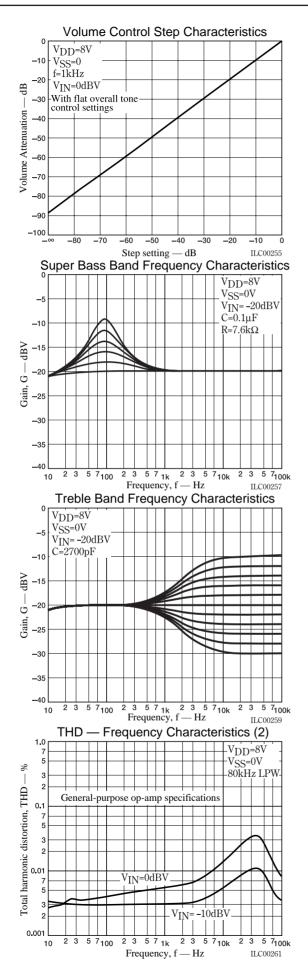
Gain during maximum boost: $G_{+10 \text{ dB}} = 10 \text{ dB}$

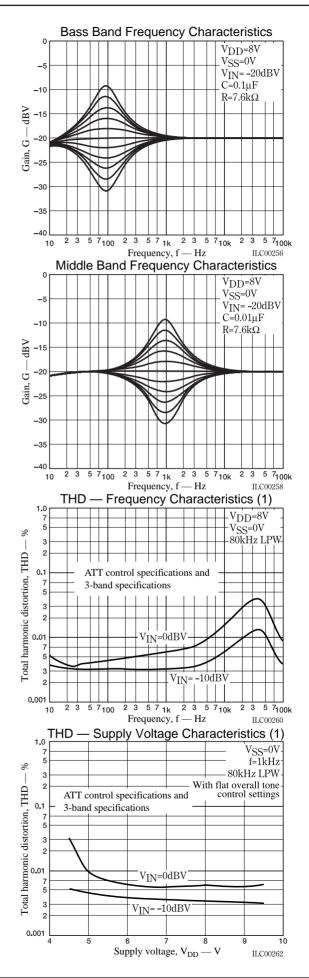
Using R1 = 16.240 k Ω and R2 = 35.461 k Ω , and inserting the above values in the following formula, we obtain:

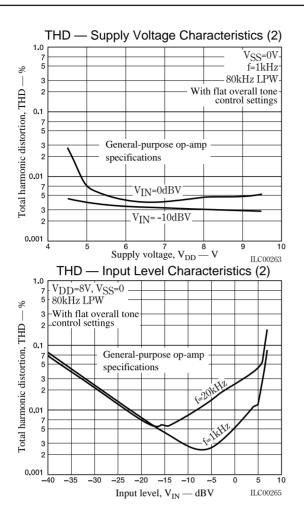
$$G = 20 \times LOG_{10} \left(1 + \frac{R2}{\sqrt{R1^2 + (1/\omega C)^2}} \right)$$
$$C = \frac{1}{2\pi f \sqrt{(\frac{R2}{10^{G/20} - 1})^2 - R1^2}}$$
$$= \frac{1}{2\pi 26000 \sqrt{(\frac{35461}{3.16 - 1})^2 - 16240^2}} \neq 2700(pF)$$

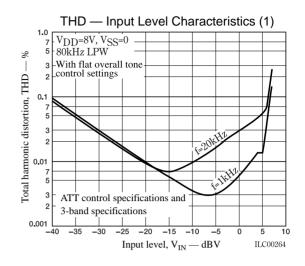
Usage Cautions

- Upon power application, the internal analog switch status is undefined. Use an external countermeasure such as muting until data is set.
- When performing initial setting after applying power, send the initial setting data for the left and right channels prior to canceling mute.
- To ensure that the high-frequency digital signals sent to the CL, DI, and CE pins do not spill over to the analog signal block, either guard these signal lines with a ground pattern, or perform transmission using shielded wires.









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