



LA6543M

4-Channel Bridge (BTL) Driver for CD-ROM

Overview

The LA6543M is a 4-channel bridge (BTL) driver developed for CD-ROM applications.

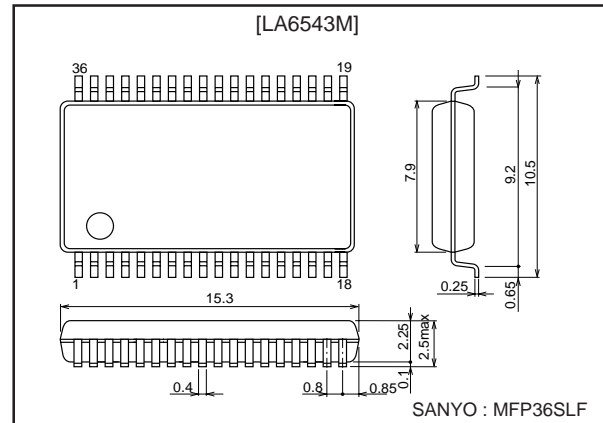
Functions

- 4-channel power amplifier with bridge circuit (BTL)
- I_O max: 1A
- Integrated muting circuit (MUTE: Output OFF at Low, output ON at High. MUTE1 is for channel 1, and MUTE2 for channels 2, 3 and 4.)
- Integrated thermal shutdown circuit
- Divided output stage power supply (VS1: CH1, CH2, CH3; VS2: CH4)

Package Dimensions

unit: mm

3129-MFP36SLF



Specifications

Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage 1	V_{CCmax}		14	V
Maximum supply voltage 2	V_{Smax}	$V_{S1}, 2$	14	V
Input voltage	V_{INmax}	Input pins V_{IN1} to 4	13	V
Mute pin voltage	$V_{MUTEmax}$		13	V
Allowable power dissipation	P_d max	IC only	0.9	W
		Specified substrate Note 1	2.1	W
Operating temperature	T_{opr}		- 20 to +75	$^\circ\text{C}$
Storage temperature	T_{stg}		- 55 to +150	$^\circ\text{C}$

Note 1: Specified substrate 76.1 x 114.3 x 1.6 (t)mm, glass epoxy

Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended operation voltage 1	V_{CC}		4 to 13	V
Recommended operation voltage 2-1	V_{S1}	V_{S1} : CH1 to CH3	4 to 13	V
Recommended operation voltage 2-2	V_{S2}	V_{S2} : CH4 output reference power supply	4 to 13	V

* $V_{CC} > V_{S1, 2}$

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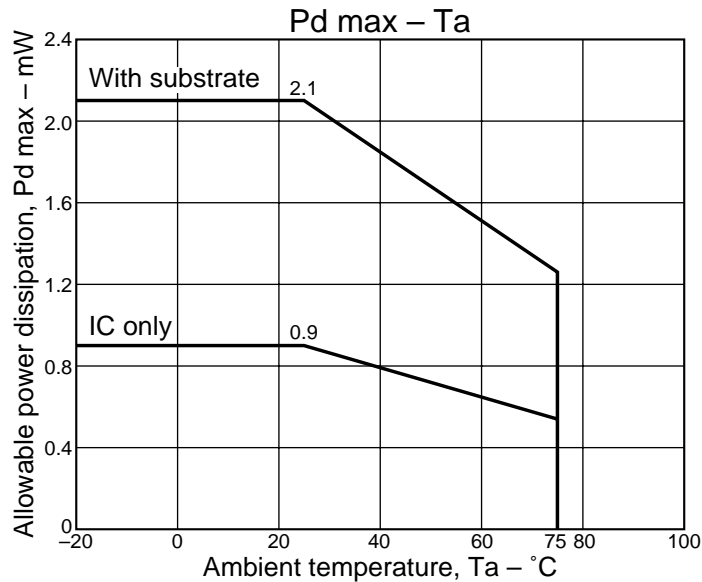
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Electrical Characteristics at $V_{CC} = 12V$, $V_S = 5V$, $T_a = 25^\circ C$

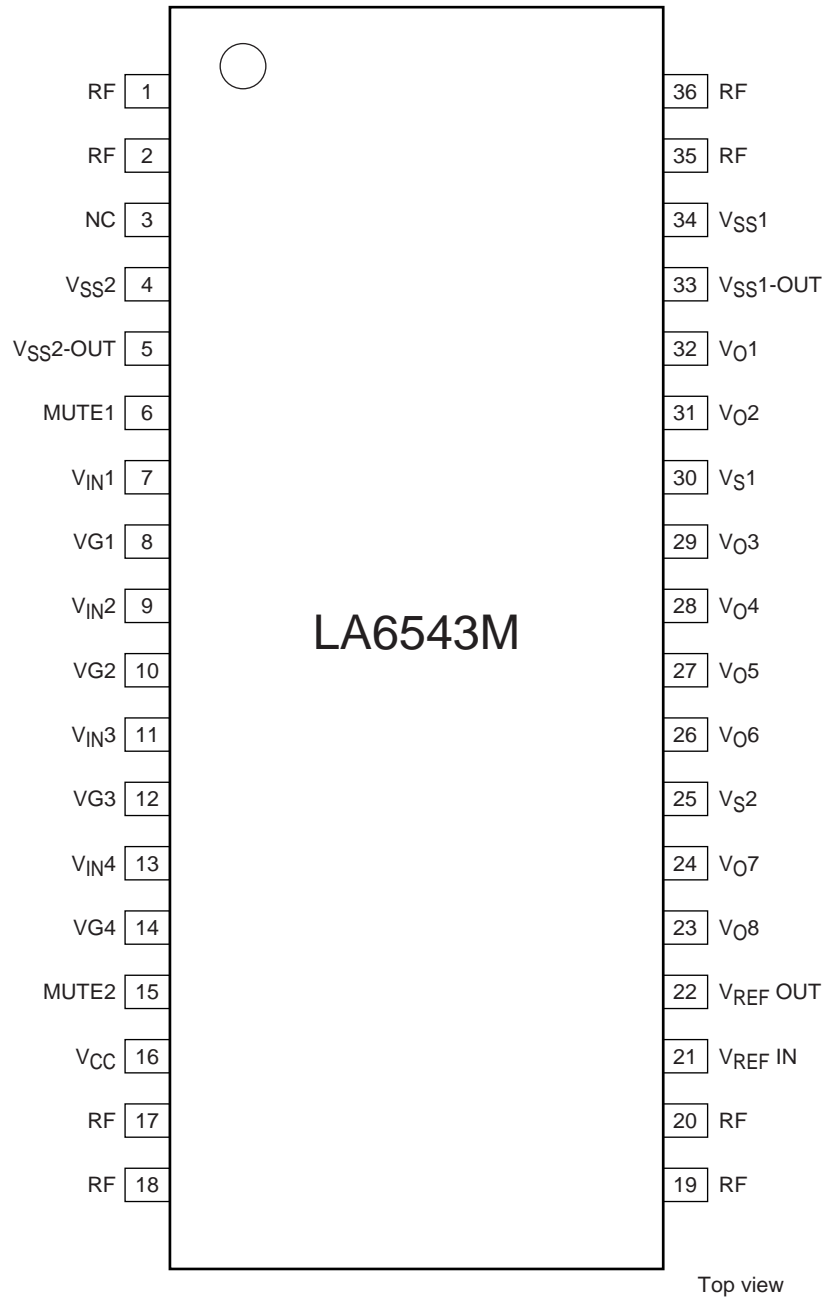
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} no-load current drain	I_{CC1}	All outputs ON (MUTE1, MUTE2: High)	5	10	20	mA
	I_{CC2}	All outputs OFF (MUTE1, MUTE2: Low)		5	10	mA
V_S1 no-load current drain	I_{S1-1}	CH1 - CH2 ON (MUTE1, MUTE2: High)		20	30	mA
	I_{S1-2}	CH1 - CH2 OFF (MUTE1, MUTE2: Low)			4	mA
V_S2 no-load current drain	I_{S2-1}	CH3 - CH4 ON (MUTE1, MUTE2: High)		5	10	mA
	I_{S2-2}	CH3 - CH4 OFF (MUTE1, MUTE2: Low)			4	mA
Output offset voltage	V_{OF1} to 4	Potential difference between plus and minus outputs for CH1 to CH4	-50		+50	mV
Input voltage range	V_{IN}	Input voltage range for V_{IN1} to V_{IN4}	0.5		5	V
Output voltage (source) (sink)	V_{source}	Plus and minus outputs at high level $I_O = 700$ mA	4.4	4.7		V
		Plus and minus outputs at low level $I_O = 700$ mA		0.3	0.6	V
Closed circuit voltage gain	VG1	Voltage gain between CH1 to CH3 BTL amplifiers		7		dB
	VG2	Voltage gain between CH4 BTL amplifiers		14		dB
Slew rate	SR	(Note 1)		0.5		V/ μ s
Mute ON voltage	V_{MUTE}	MUTE1, MUTE2 voltage when output is ON (Note 2)		1.5	2	V
Mute ON current	I_{MUTE}	MUTE1, MUTE2 current when output is ON (Note 2)		6	10	μ A

Note 1: Guaranteed design value

Note 2: MUTE turns amplifier output ON at High and OFF at Low. (Output impedance becomes high.) This applies to MUTE1 and MUTE2.



Pin Assignment



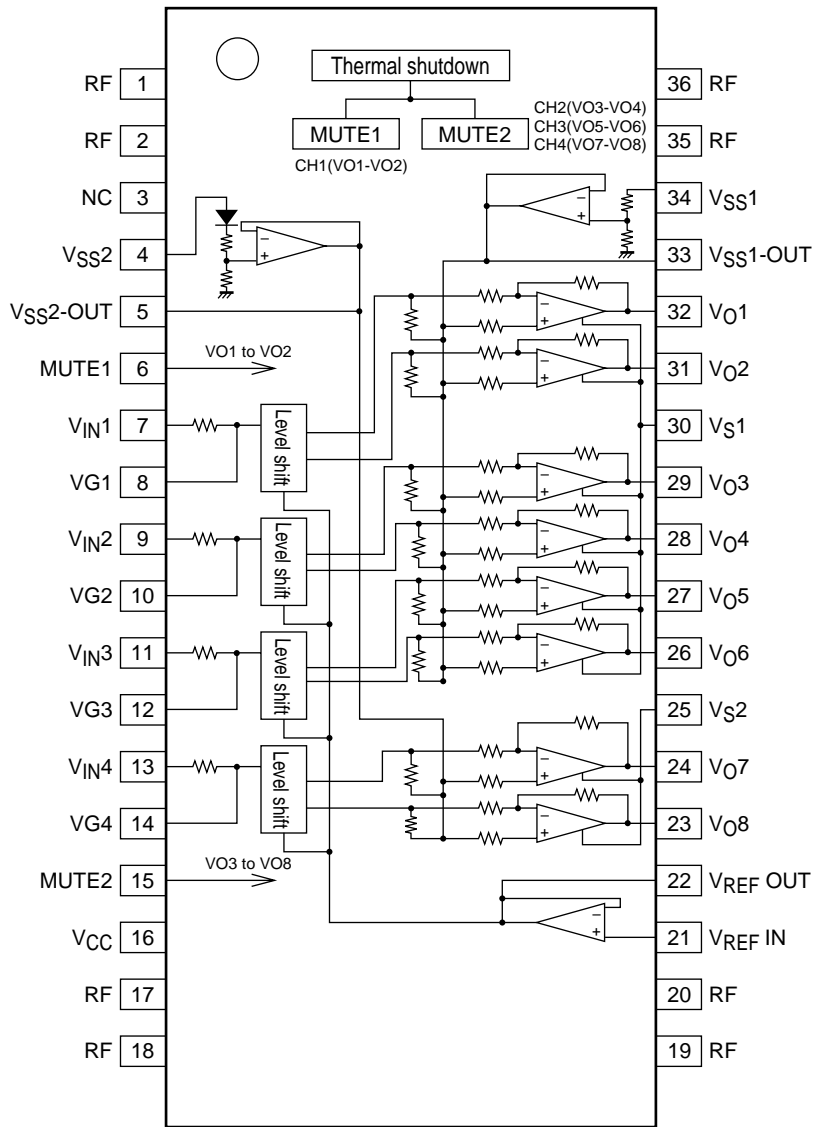
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Pin Function

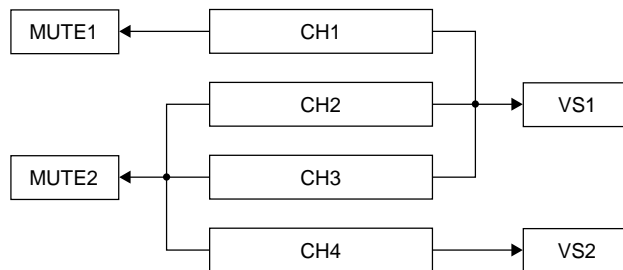
Pin number	Pin name	Equivalent circuit	Pin function
1, 2 17, 18 19, 20 35, 36	RF		Substrate (minimum potential)
7	V _{IN1}		Input pin for CH1
9	V _{IN2}		Input pin for CH2
11	V _{IN3}		Input pin for CH3
13	V _{IN4}		Input pin for CH4
8	VG1	Input pin for CH1 (gain adjustment)	
10	VG2	Input pin for CH2 (gain adjustment)	
12	VG3	Input pin for CH3 (gain adjustment)	
14	VG4	Input pin for CH4 (gain adjustment)	
16	V _{CC}	Power supply	
22	V _{REF-OUT}	Level shift circuit reference voltage (V _{REF1} buffer amplifier output)	
3	NC	May not be used.	
4	V _{SS2}	Connect to V _{S2}	
5	V _{SS2-OUT}	Output stage reference voltage output (V _{S2} -V _{BE})/2: typ)	
6	MUTE1		CH1 output ON/OFF
15	MUTE2		CH2 to CH4 output ON/OFF
21	V _{REFIN}	Level shift circuit reference voltage input (V _{REF1} buffer amplifier input)	
23	V _{O8}		CH4 inverted output (AMP8 output)
24	V _{O7}		CH4 non-inverted output (AMP7 output)
26	V _{O6}		CH3 inverted output (AMP6 output)
27	V _{O5}		CH3 non-inverted output (AMP5 output)
28	V _{O4}		CH2 inverted output (AMP4 output)
29	V _{O3}		CH2 non-inverted output (AMP3 output)
31	V _{O2}		CH1 inverted output (AMP2 output)
32	V _{O1}		CH1 non-inverted output (AMP1 output)
25	VS2		CH3 (AMP5, AMP6), CH4 (AMP7, AMP8) output stage power supply
30	VS1		CH1 (AMP1, AMP2), CH2 (AMP3, AMP4) output stage power supply
33	V _{SS1-OUT}	Output stage reference voltage (V _{SS1/2} :typ) (V _{REF2} buffer amplifier input)	
34	V _{SS1}	Connect to VS1 (resistance split to generate V _{SS1-OUT})	

Block Diagram



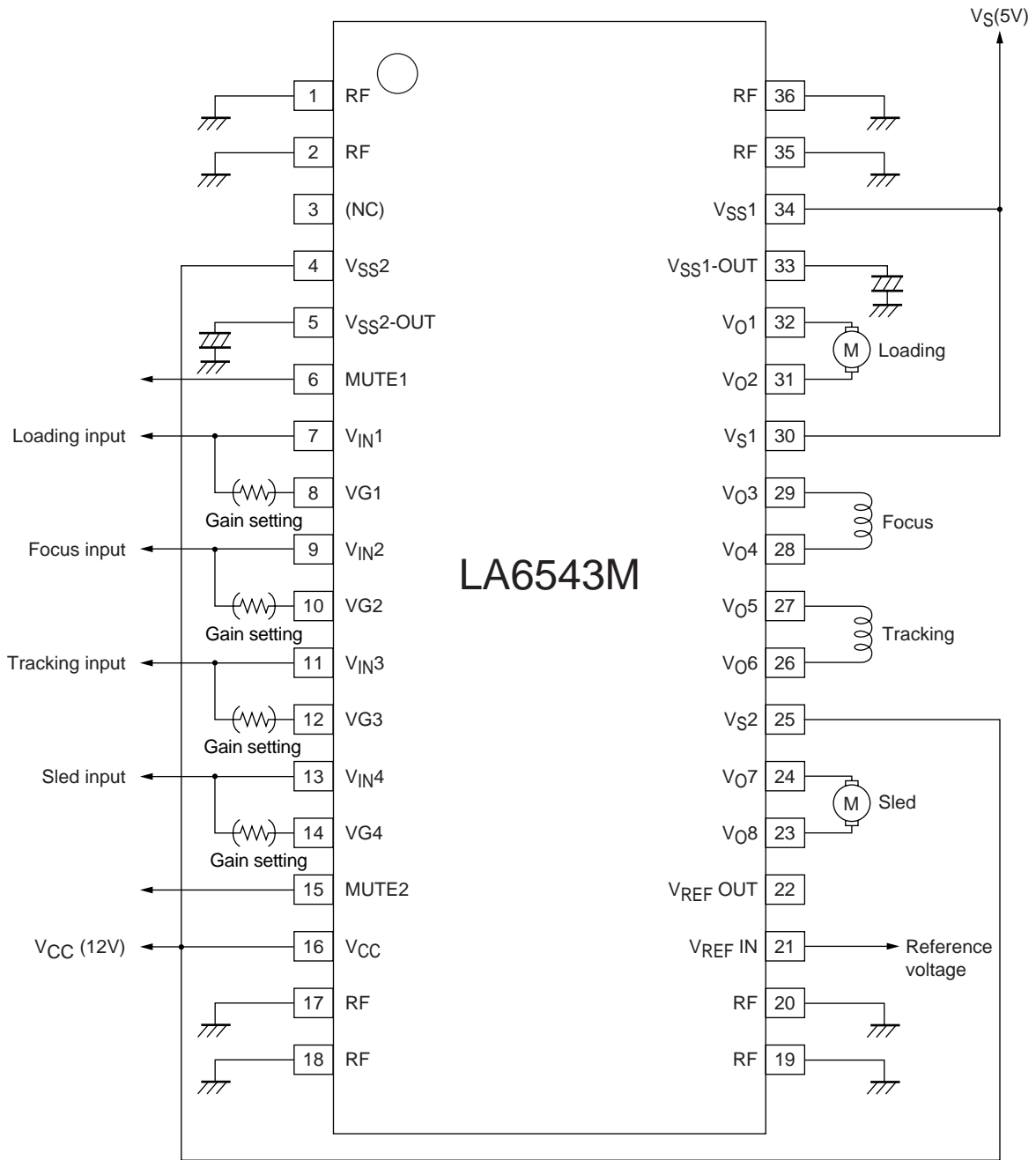
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System Diagram (relationship between power supply and MUTE)



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Sample Application Circuit



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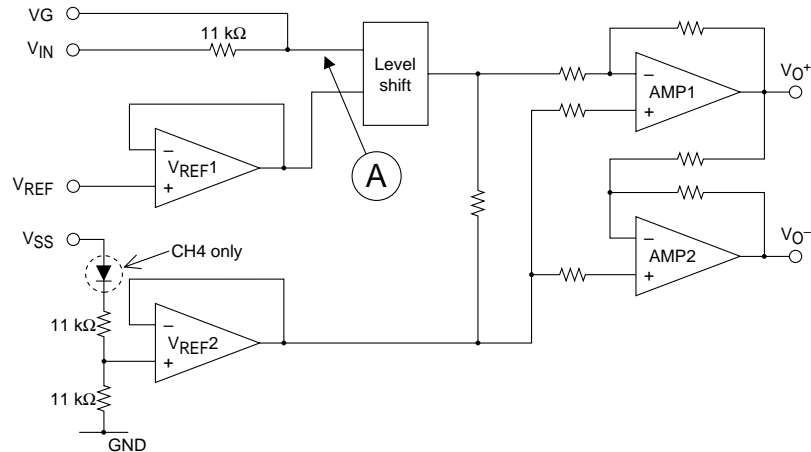
Gain Setting (input pins and adjustment pins)

A simplified diagram of V_{IN} and VG is shown below.

- 1) Consider an 11 k Ω (typ.) inserted between V_{IN} and VG .
- 2) When only V_{IN} and not VG is used, the BTL gain (between V_{O+} and V_{O-}) is set to 6 dB (0 dB for AMP only). This also applies for the case when V_{IN} is not used and an 11 k Ω external resistor is connected to VG for input.
- 3) Gain is set by the input impedance as seen from point A.

When VG only is used and the external resistor is R , the BTL gain (between V_{O+} and V_{O-}) is $20 \log (11 \text{ k}\Omega/R) + 6 \text{ dB}$.

When an 11 k Ω resistor is inserted between V_{IN} and VG , and input is via V_{IN} , the combined resistance R_z as seen from point A is $R_z = 5.5 \text{ k}\Omega$. Gain is $20 \log (11 \text{ k}\Omega/5.5 \text{ k}\Omega) + 6 \text{ dB} = 12 \text{ dB}$.



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Offset Voltage

This IC incorporates a level shifter circuit. The input references the voltage V_{REF} to be applied and references the voltage $(V_{SS} - V_{BE} (0.7))/2V$ to be output.

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