Ordering number : EN5904

Monolithic Linear IC

LA6543M

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

Overview

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

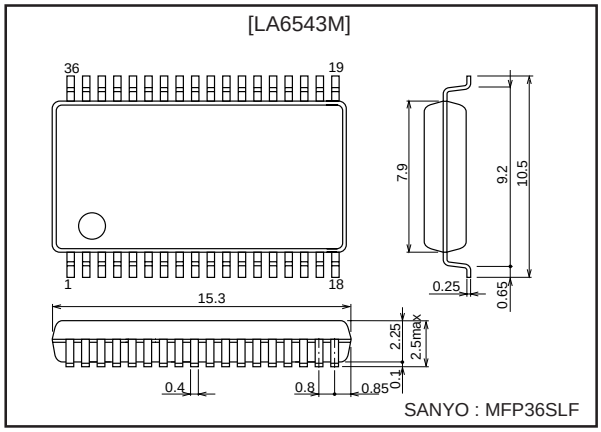
Functions

- 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 Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage 1	V_{CC}max		14	V
Maximum supply voltage 2	$V_S$max	V_S1, 2	14	V
Input voltage	V_{IN}max	Input pins V_{IN}1 to 4	13	V
Mute pin voltage	V_{MUTE}max		13	V
Allowable power dissipation	Pd max	IC only	0.9	W
		Specified substrate Note 1	2.1	W
Operating temperature	Topr		– 20 to +75	℃
Storage temperature	Tstg		– 55 to +150	℃

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

Operating Conditions at Ta = 25°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

SANYO Electric Co., Ltd. Semiconductor Business Headquarters

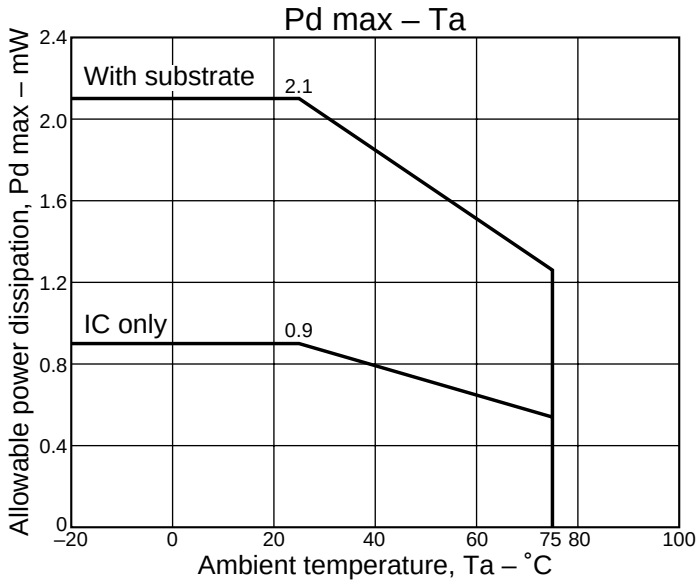
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Electrical Characteristics at V_{CC} = 12V, V_S = 5V, Ta = 25°C

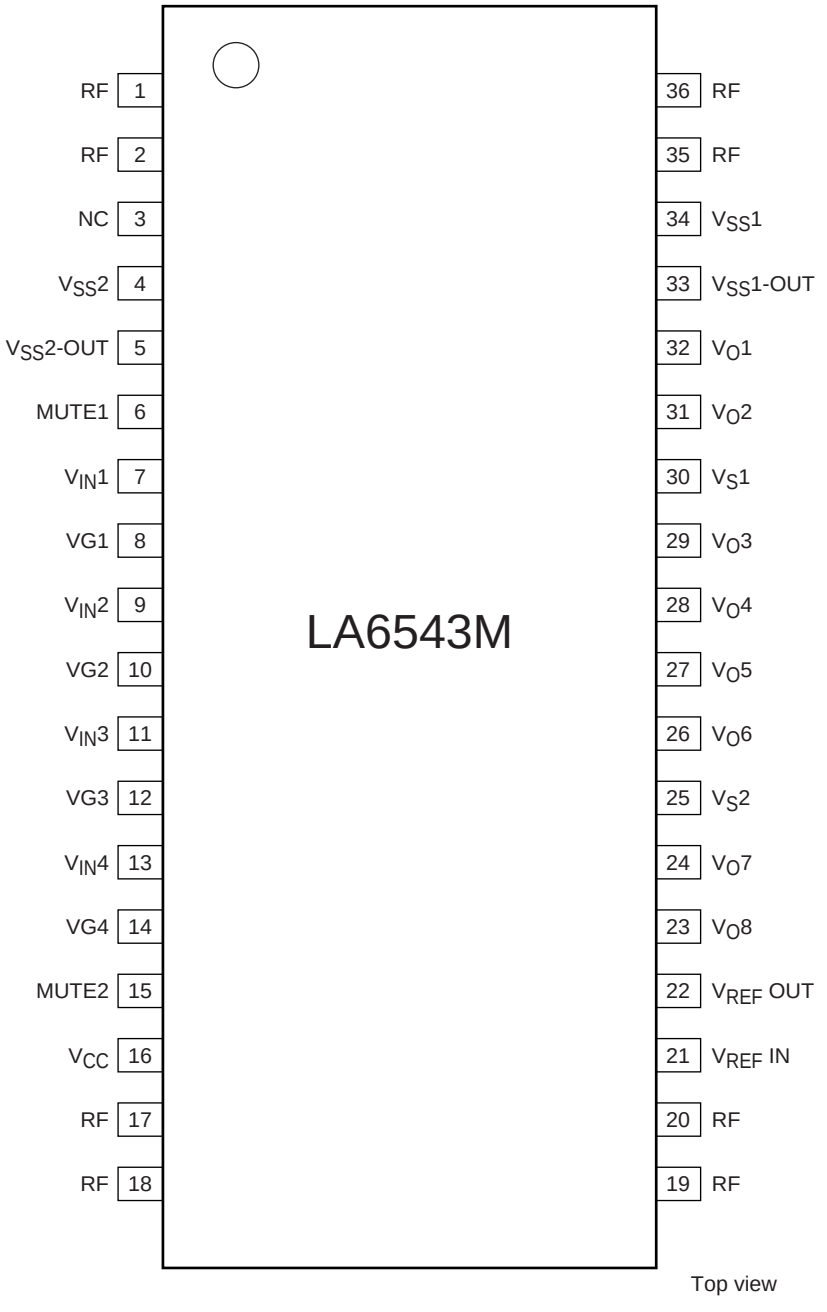
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} no-load current drain	$I_{CC}1$	All outputs ON (MUTE1, MUTE2: High)	5	10	20	mA
	$I_{CC}2$	All outputs OFF (MUTE1, MUTE2: Low)		5	10	mA
V_S1 no-load current drain	I_S1-1	CH1 - CH2 ON (MUTE1, MUTE2: High)		20	30	mA
	I_S1-2	CH1 - CH2 OFF (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	$V_{OF}1$ 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 $V_{IN}1$ to $V_{IN}4$	0.5		5	V
Output voltage (source)	Vsource	Plus and minus outputs at high level	4.4	4.7		V
		I_O = 700 mA				
(sink)	Vsink	Plus and minus outputs at low level		0.3	0.6	V
		I_O = 700 mA				
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/µs
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	µA

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



Top view

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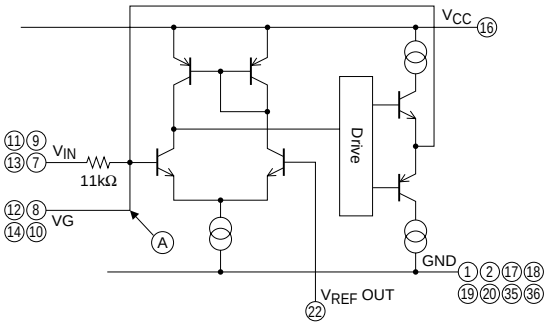
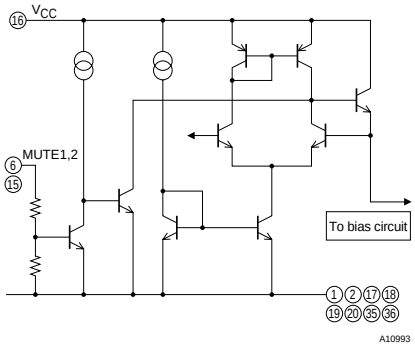
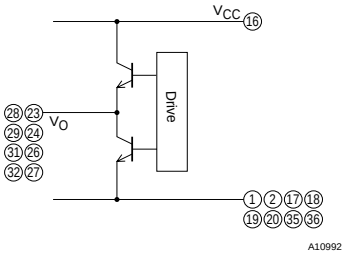
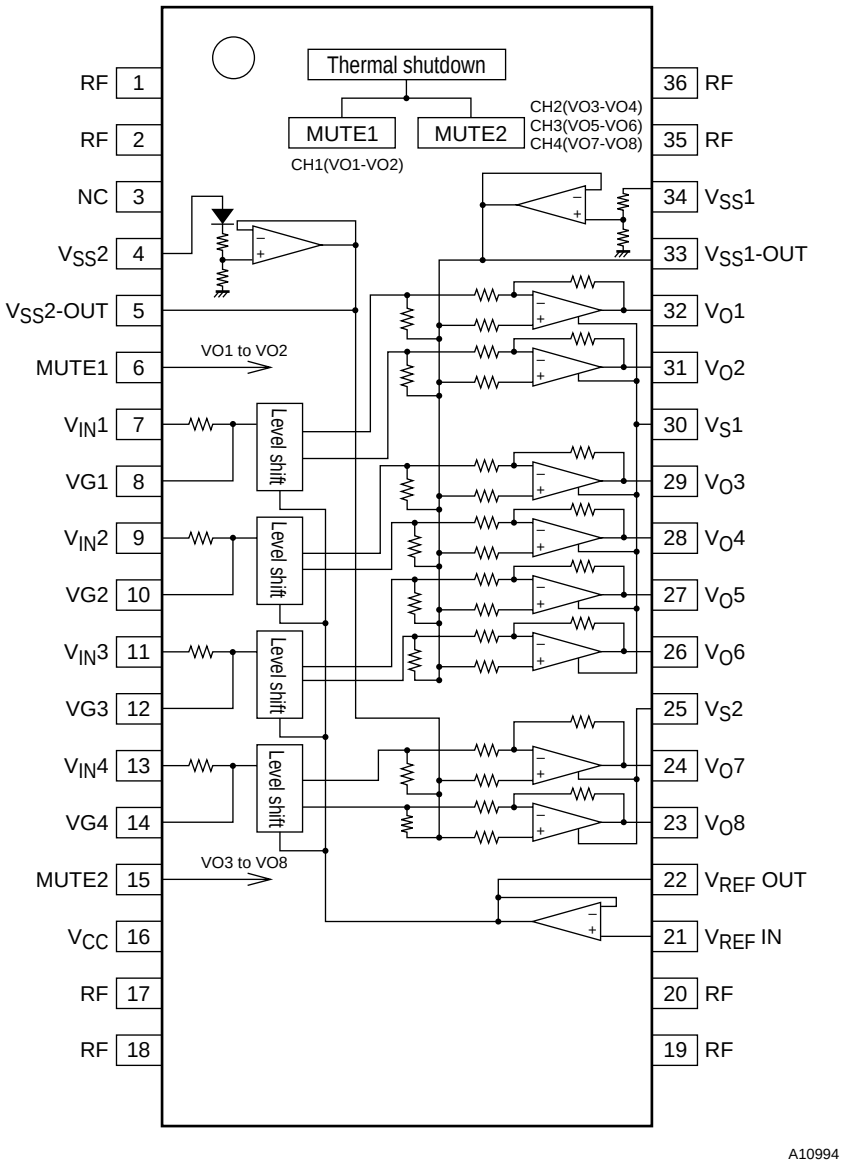
Pin Function

Pin number	Pin name	Equivalent circuit	Pin function
1, 2 17, 18 19, 20 35, 36	RF		Substrate (minimum potential)
7	$V_{IN}1$		Input pin for CH1
9	$V_{IN}2$		Input pin for CH2
11	$V_{IN}3$		Input pin for CH3
13	$V_{IN}4$		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 ($V_{REF}1$ buffer amplifier output)
3	NC		May not be used.
4	$V_{SS}2$		Connect to V_S2
5	$V_{SS}2$-OUT		Output stage reference voltage output (V_S2-V_{BE})/2: typ)
6 15	MUTE1 MUTE2		CH1 output ON/OFF CH2 to CH4 output ON/OFF
21	V_{REF}IN		Level shift circuit reference voltage input ($V_{REF}1$ 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	$V_{SS}1$-OUT		Output stage reference voltage ($V_{SS}1$/2:typ) ($V_{REF}2$ buffer amplifier input)
34	$V_{SS}1$		Connect to VS1 (resistance split to generate $V_{SS}1$-OUT)

Block Diagram



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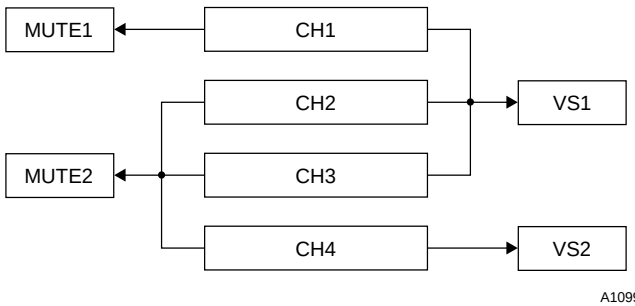
System Diagram (relationship between power supply and MUTE)



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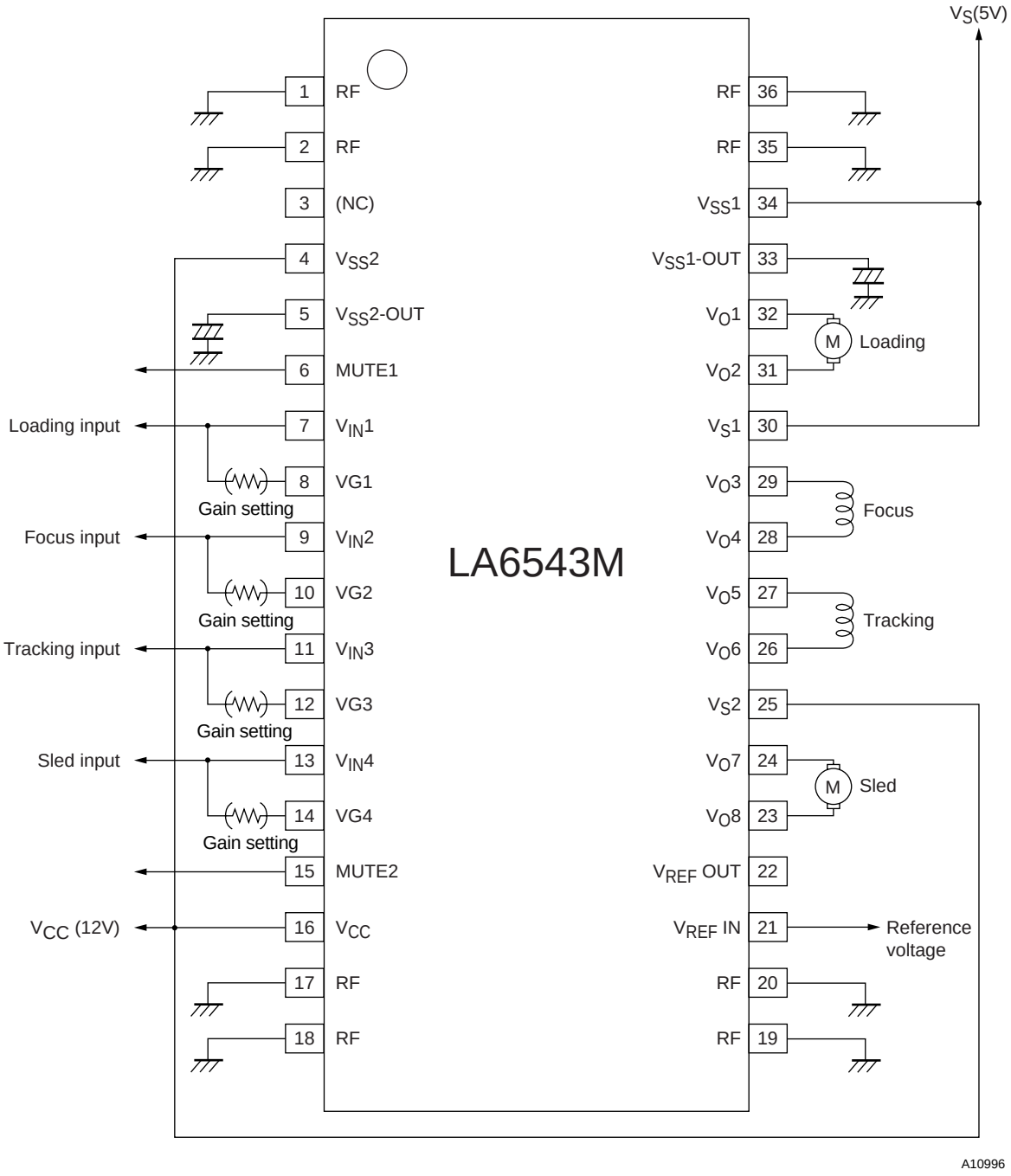
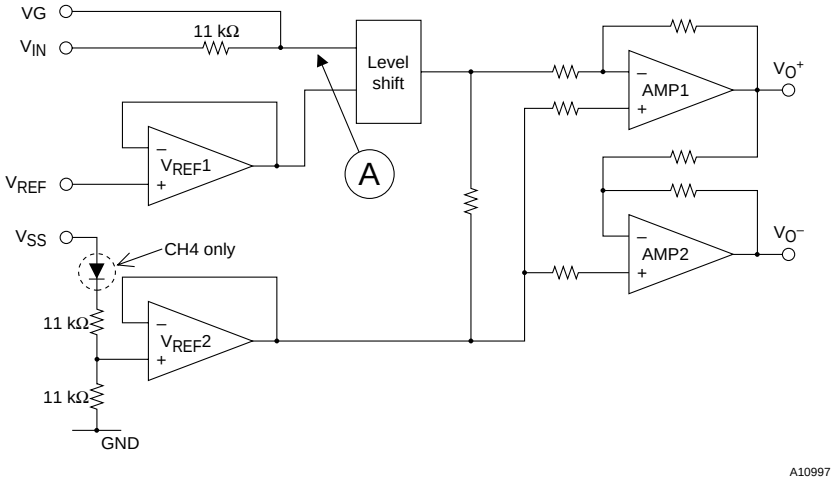
Sample Application Circuit



Gain Setting (input pins and adjustment pins)

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

1) Consider an 11 kΩ (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 kΩ 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 kΩ/R) + 6 dB.
   When an 11 kΩ resistor is inserted between V_{IN} and VG, and input is via V_{IN}, the combined resistance Rz as seen from point A is Rz = 5.5 kΩ. Gain is
   20 log (11 kΩ/5.5 kΩ) + 6 dB = 12 dB.



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.