Ordering number : EN5973

Monolithic Linear IC

LA6543

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

Overview

The LA6543 is a 4-channel bridge (BTL) driver developed for CD-ROM applications.

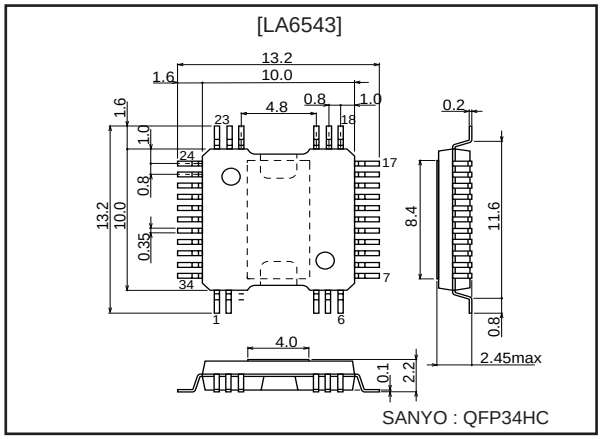
Features and Functions

- Integrated 4-channel power amplifier with bridge circuit (BTL) (two output stage power supply lines)
- $I_O$max: 1A
- Integrated level shift circuit
- Integrated muting circuit
  MUTE: Output OFF at Low, output ON at High.
  MUTE1 is for channels 1 and 2, and MUTE2 for channels 3 and 4.
- Integrated thermal shutdown circuit
- Divided output stage power supply (V_S1: CH1, CH2, CH3; V_S2: CH4)

Package Dimensions

unit: mm

3219-QFP34HC



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
Maximum 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	0.77	W
Operating temperature	Topr		–20 to +75	℃
Storage temperature	Tstg		–55 to +150	℃

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} \geq V_S$1, 2

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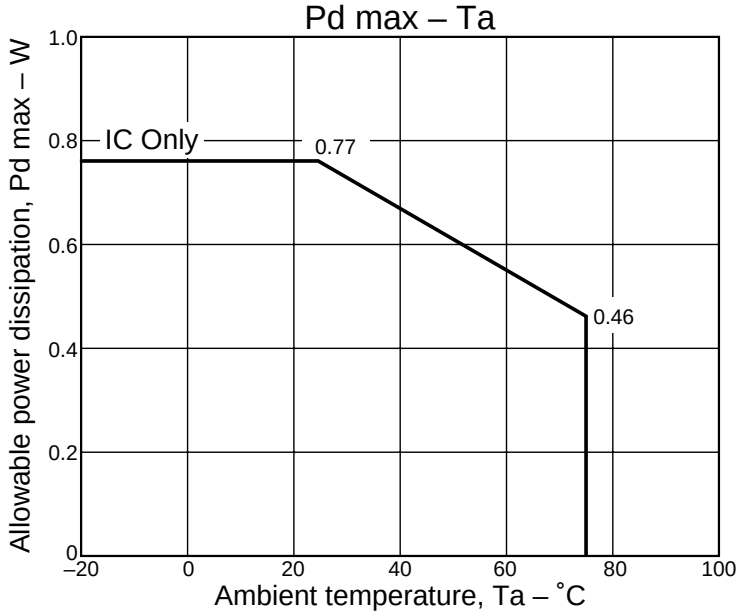
Electrical Characteristics at V_{CC} = 12V, V_S1 = 5V, V_S2 = 12V, Ta = 25˚C

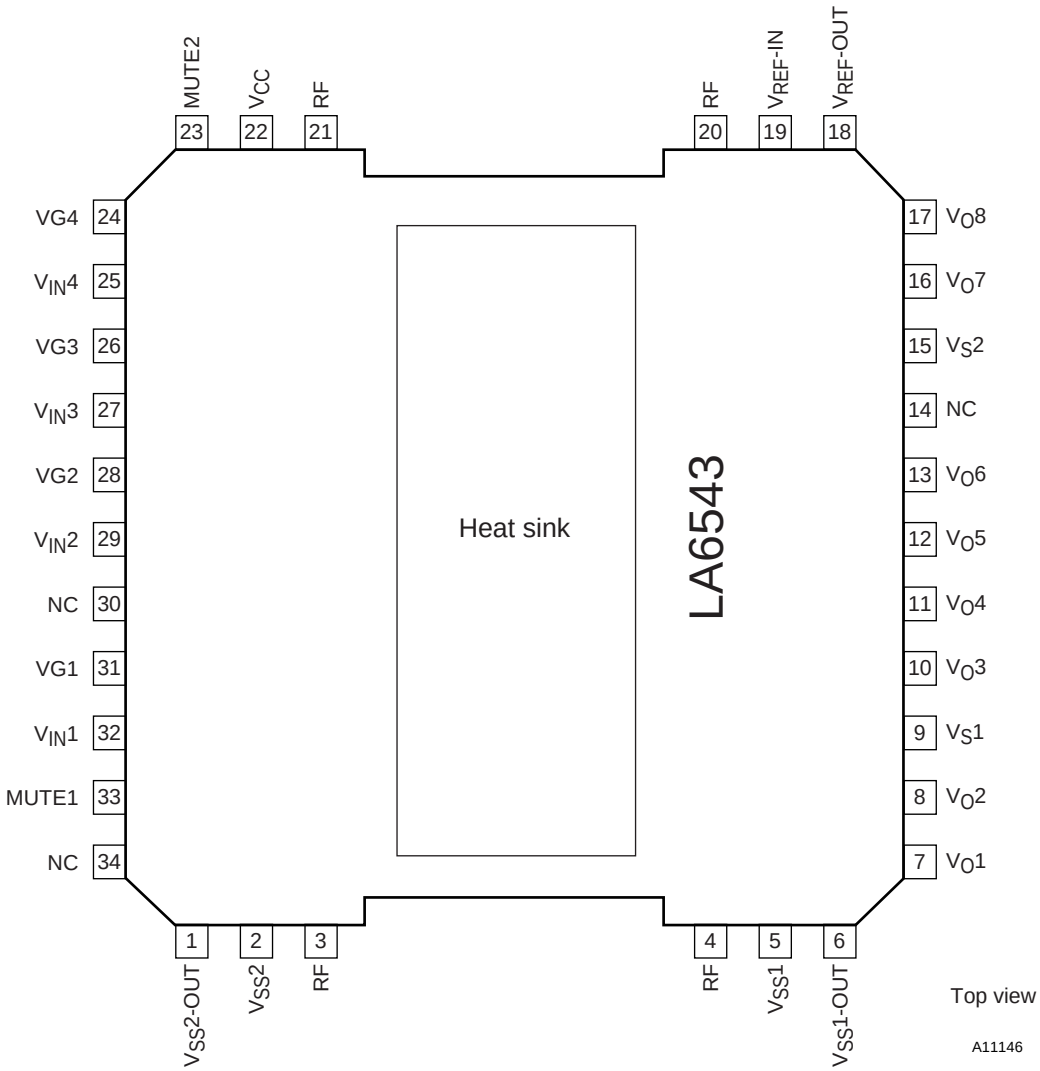
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
V_{CC} no-load current drain	$I_{CC}1$	All outputs ON (MUTE1, MUTE2: High)	5	10	20	mA
	$I_{CC}2$	All outputs OFF (MUTE1, MUTE2: Low)		5	10	mA
V_S1 no-load current drain	I_S1-1	CH1 ON (MUTE1, MUTE2: High)		20	40	mA
	I_S1-2	CH1 OFF (MUTE1, MUTE2: Low)			4	mA
V_S2 no-load current drain	I_S2-1	CH2 to CH4 ON (MUTE1, MUTE2: High)		5	10	mA
	I_S2-2	CH2 to CH4 OFF (MUTE1, MUTE2: Low)			4	mA
Output offset voltage	V_{OFF}1 to4	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)	$V_O$source	Plus and minus outputs at high level	4.4	4.7		V
		I_O = 700 mA				
(sink)	$V_O$sink	Plus and minus outputs at low level		0.3	0.6	V
		I_O = 700 mA				
Closed circuit voltage gain1	VG1	Voltage gain between CH1 to CH3 BTL amplifiers		7		dB
Closed circuit voltage gain2	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 voltage when output is ON (Note 2)		6	10	μA

Note 1: Guaranteed design value

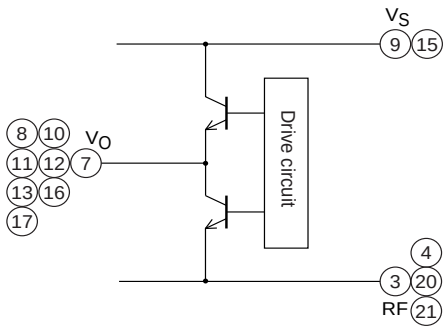
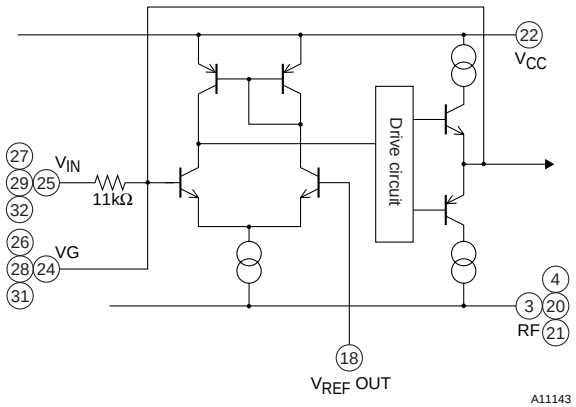
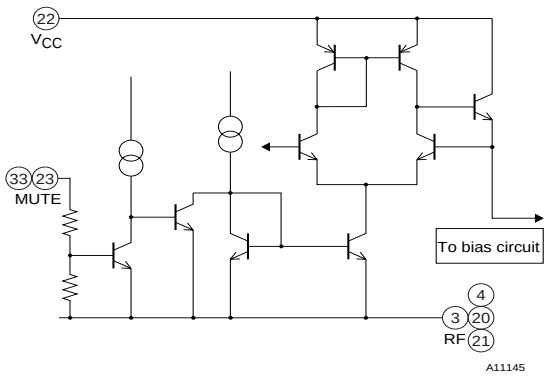
Note 2: MUTE turns amplifier output ON at High and OFF at Low. (At Low, output impedance becomes high.) MUTE1 and MUTE2 operate independently on the respective channels.



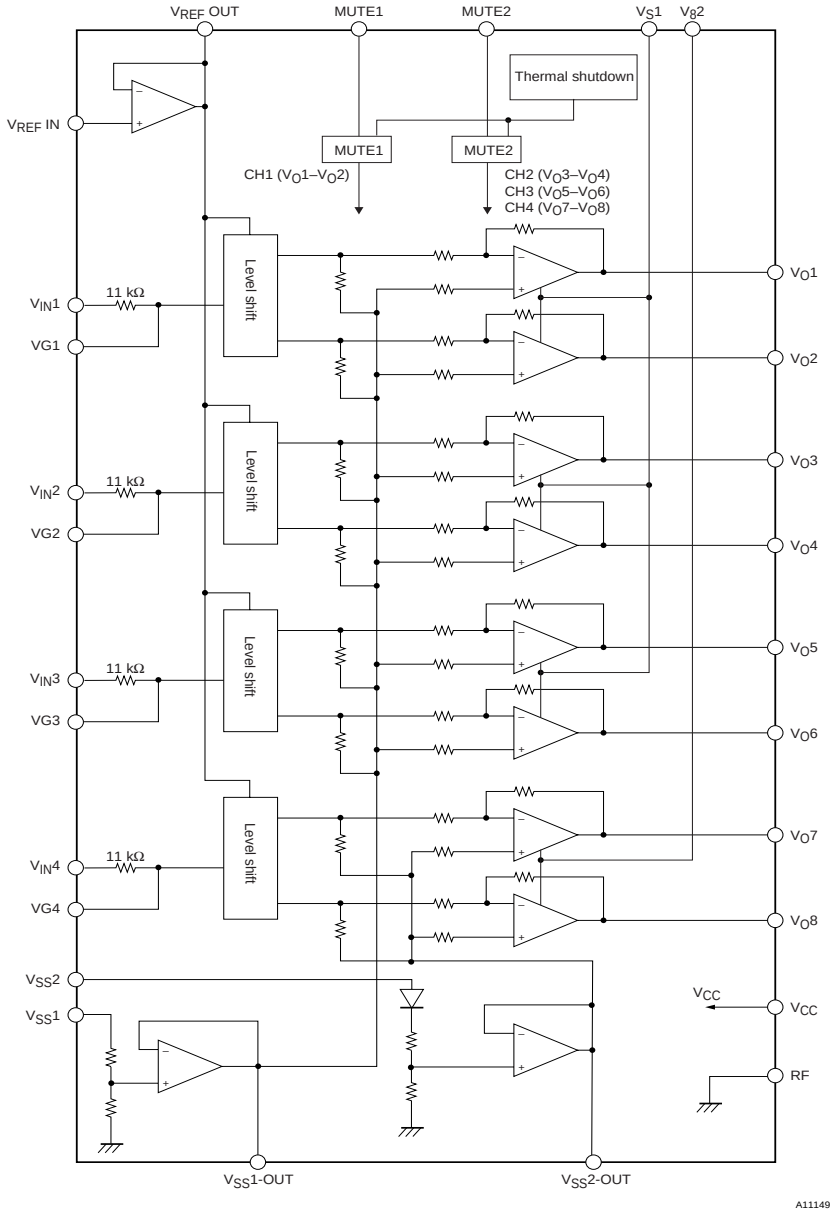
Pin Assignment



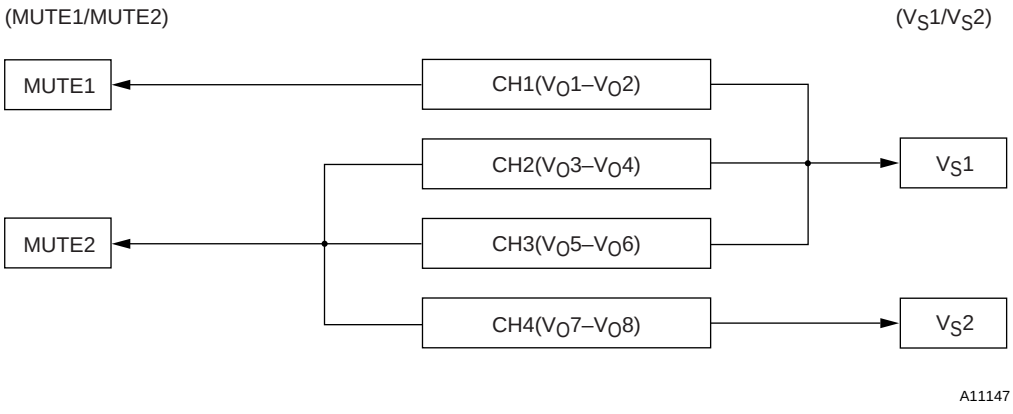
Pin Function

Pin number	Pin name	Equivalent circuit	Pin function
1	$V_{SS}2$-OUT		Output stage reference voltage ($V_{SS}2$-V_{BE})/2: typ)
2	$V_{SS}2$		Connect to V_S2
3,4 20,21	RF		Substrate (minimum potential)
7	V_O1		CH1 non-inverted output (CH1+)
8	V_O2		CH1 inverted output (CH1-)
10	V_O3		CH2 non-inverted output (CH2+)
11	V_O4		CH2 inverted output (CH2-)
12	V_O5		CH3 non-inverted output (CH3+)
13	V_O6		CH3 inverted output (CH3-)
16	V_O7		CH4 non-inverted output (CH4+)
17	V_O8		CH4 inverted output (CH4-)
9	V_S1		Power supply for output stage (CH1 to CH3)
15	V_S2		(CH4)
5	$V_{SS}1$		Connect to V_S1
6	$V_{SS}1$-OUT		Output reference voltage ($V_{SS}1$/2: typ)
14,30 34	NC		May not be used.
18	V_{REF}-OUT		Output reference voltage (V_{REF} buffer amplifier output)
24	VG4		Input pin for CH4 (gain adjustment)
26	VG3		Input pin for CH3 (gain adjustment)
28	VG2		Input pin for CH2 (gain adjustment)
31	VG1		Input pin for CH1 (gain adjustment)
25	$V_{IN}4$		Input pin for CH4 (fixed gain)
27	$V_{IN}3$		Input pin for CH3 (fixed gain)
29	$V_{IN}2$		Input pin for CH2 (fixed gain)
32	$V_{IN}1$		Input pin for CH1 (fixed gain)
19	V_{REF}-IN		Reference voltage input (V_{REF} buffer amplifier input)
22	V_{CC}		Power supply
23	MUTE2		CH2-CH4 amplifier output ON/OFF
33	MUTE1		CH1 amplifier output ON/OFF

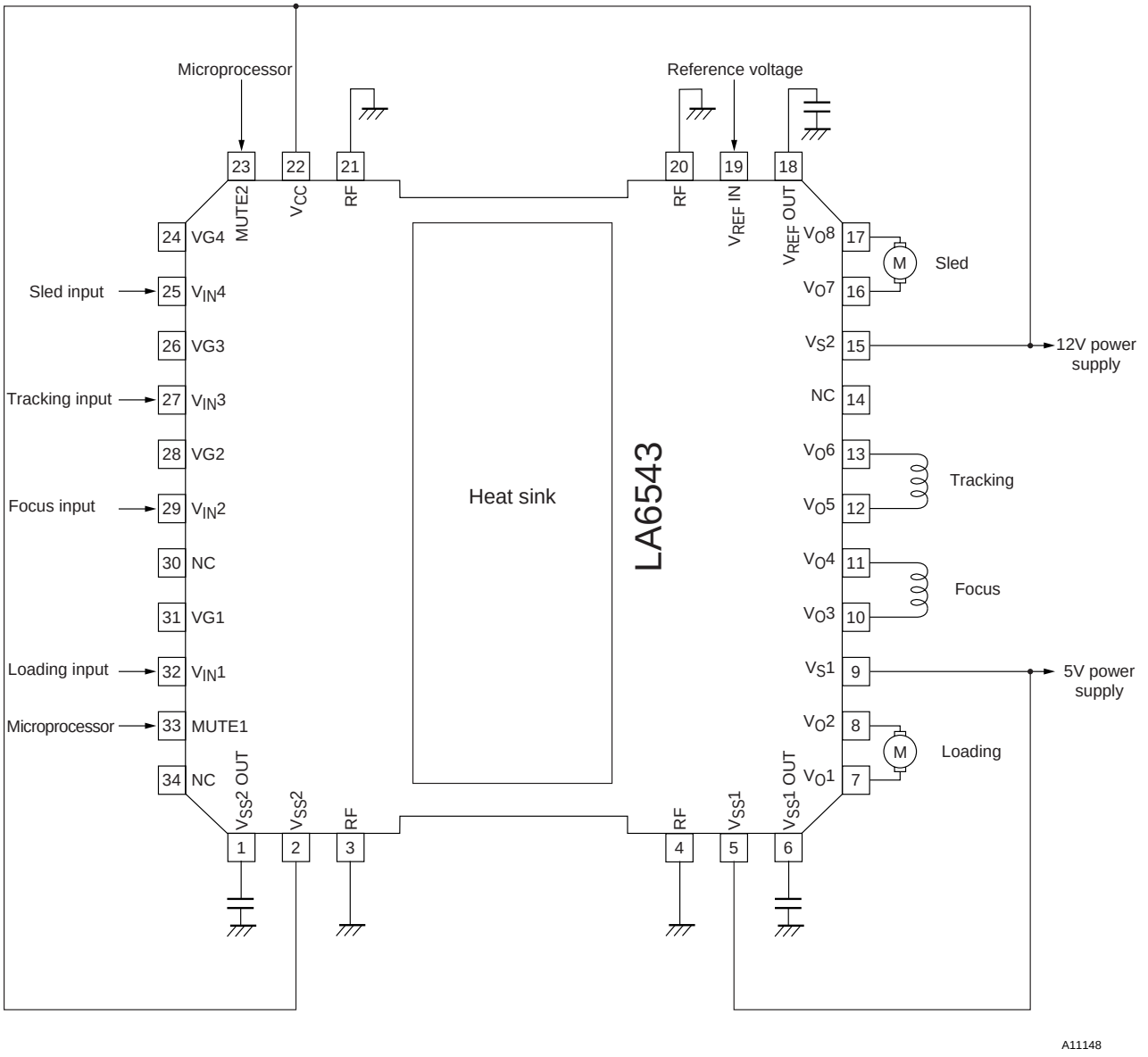
Block Diagram



System Diagram (relationship between power supply and MUTE)



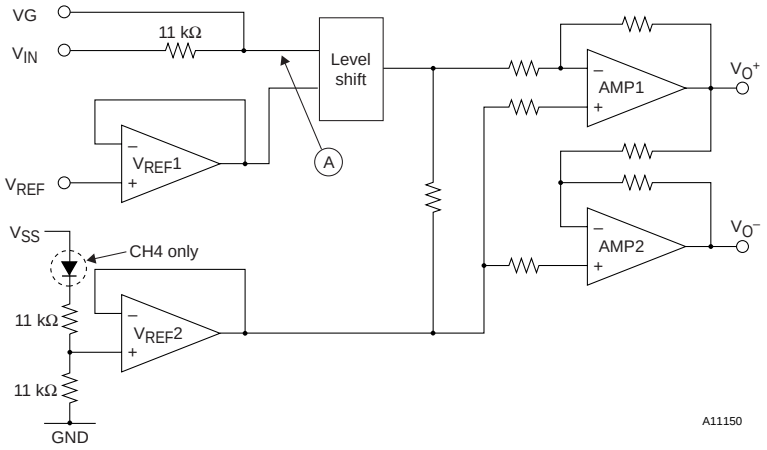
Sample Application Circuit



Gain Setting (input pins and adjustment pins)

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

1) Consider an 11 kΩ (typ.) resistor inserted between V_{IN} and VG.
2) When not the pin VG but the pin V_{IN} is used alone, the BTL gain (between V_O^+ and V_O^-) is set to 7 dB for CH1 to CH3 (1 dB for AMP only). For CH4, it is 14 dB (8 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) + 14 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
   CH1 to CH3 : 20 log (11 kΩ/5.5 kΩ) + 7 dB = 13 dB
   CH4 : 20 log (11 kΩ/5.5 kΩ) + 14 dB = 20 dB.



Offset Voltage

This IC incorporates a level shifter circuit. The input references the voltage V_{REF} to be applied and references the voltage ($V_{SS}1$)/2V for channels 1 to 3 or the voltage ($V_{SS}2$–V_{BE} (0.7))/2V for channel 4 to be output.