



# LA6568 — Monolithic Linear IC Six-Channel Driver for Optical Disc Drives

## Overview

The LA6568 is a six-channel driver for optical disc drives that includes built-in 3.3 V and 5 V regulators.

## Functions

- Six power amplifier channels
- $I_{Omax}$ : 700 mA
- Built-in level shifter circuits (for the BTL amplifiers)
- Muting circuit (output on/off control) for one channel
- Built-in 3.3 V power supply ( $I_{Omax} = 300$  mA)
- Built-in 5 V power supply ( $I_{Omax} = 5$  mA)
- Thermal protection circuit (thermal shutdown circuit)

## Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\ max}$		14	V
Maximum output current	$I_O\ max$		0.7	A
Maximum input voltage	$V_{INB\ max}$	Each channel for Ch.1 to Ch.6	13	V
Mute pin voltage	$V_{MUTE}$		13	V
Allowable power dissipation	$P_d\ max$	Mounted on a board *1	2.00	W
		Independent IC	1.20	
Operating temperature	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

Note \*1: Mounted on a board (76.1 × 114.3 × 1.66 mm) Material: glass epoxy

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

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}$		6 to 13	V

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## Electrical Characteristics

(Unless specified otherwise, the conditions are  $T_a = 25^\circ\text{C}$ ,  $S-V_{CC} = P-V_{CC} = 8\text{ V}$ ,  $V_{REF} = 1.65\text{ V}$ )

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[Overall]						
No load current drain - outputs on	$I_{CC-ON}$	All outputs on *1		30	50	mA
No load current drain - outputs off	$I_{CC-OFF}$	All outputs off *1		10	20	mA
VREF input voltage range	VREF-IN		0.5		$V_{CC}-1.5$	V
[BTL Amplifier Block]						
Output offset voltage	VOFF	The voltage difference between the output amplifier outputs, for each channel	-50		+50	mV
Input voltage range	$V_{IN}$		0		$V_{CC}$	V
Output voltage	$V_O$	The voltage between the $V_{O+}$ and $V_{O-}$ outputs when $R_L = 8\ \Omega$ *2	4	4.5		V
Closed circuit voltage gain 1	VG1	The gain between input and output for channels 1, 4, and 5	1.6	2	2.4	Multiplier
Closed circuit voltage gain 2	VG2	The gain between input and output for channel 2. Input resistance: 11 k $\Omega$	3.5	4	4.5	Multiplier
Slew rate	SR	Twice the value between each output pair *3		1		V/ $\mu\text{s}$
Muting on voltage	VMUTE-ON	For each of the muting functions *4			0.5	V
Muting off voltage	VMUTE-OFF	For each of the muting functions *4	2			V
[Loading Block]						
Voltage between outputs: F	VOF	$V_{IN+} = 2\text{ V}$ , $V_{IN-} = 0\text{ V}$	2.5	2.9	3.3	V
Voltage between outputs: R	VOR	$V_{IN+} = 0\text{ V}$ , $V_{IN-} = 2\text{ V}$	-3.3	-2.9	-2.5	V
Output voltage range: F	VOMF	$V_{IN+} = 5\text{ V}$ , $V_{IN-} = 0$	4.5	5.0		V
Output voltage range: R	VOMR	$V_{IN+} = 0\text{ V}$ , $V_{IN-} = 5\text{ V}$		-5.0	-4.5	V
Output offset voltage	VOFF	Potential difference between the outputs when braking is applied	-50		+50	mV
Input current	I-IN	When $V_{IN} = 3.3\text{ V}$			500	$\mu\text{A}$
[3.3 V Regulator Block]						
Output voltage	$V_{O-REG1}$	$I_O = 100\text{ mA}$	3.15	3.3	3.45	V
Line regulation	$\Delta V-LIN1$	When $I_O = 100\text{ mA}$ , $V_{CC} = 6\text{ to }12\text{ V}$	-100		+100	mV
Load regulation	$\Delta V-LOAD1$	When $I_O = 0\text{ to }200\text{ mA}$	-100		+100	mV
[5 V Regulator Block]						
Output voltage	$V_{O-REG2}$	When $I_O = 3\text{ mA}$	4.75	5	5.25	V
Line regulation	$\Delta V-LIN1$	When $I_O = 3\text{ mA}$ , $V_{CC} = 6\text{ to }12\text{ V}$		100		mV
Load regulation	$\Delta V-LOAD$	When $I_O = 1\text{ to }3\text{ mA}$		100		mV
[0-RESET Block] (Operating for $V_{REF}$ )						
High-level reset output voltage	VORH	With a 10 k $\Omega$ resistor between $V_{CC}$ and RESET	6.5			V
Low-level reset output voltage	VORL	With a 10 k $\Omega$ resistor between $V_{CC}$ and RESET			0.5	V
0-RESET threshold voltage	VRT		0.5	0.7	0.9	V
0-RESET hysteresis	VHYS		50	100	200	mV

Note \*1: The combined current drain for P- $V_{CC}$  and S- $V_{CC}$  with no load

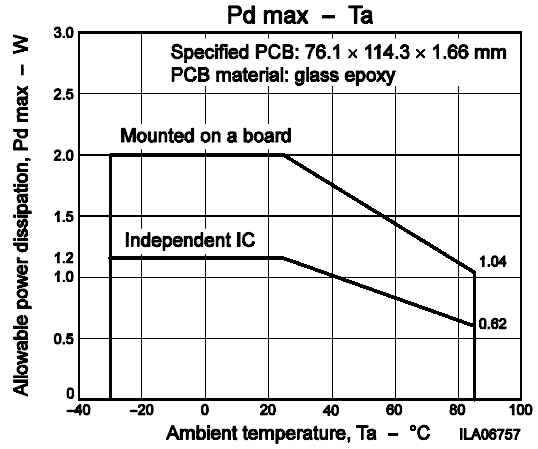
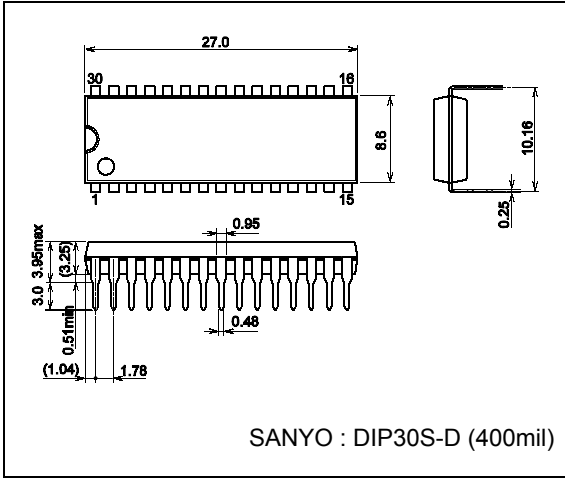
\*2: The voltage difference across the load ( $8\ \Omega$ ) terminals. With the outputs in the saturated state.

\*3: Design target value. Parameters are not tested.

\*4: When IN-MUTE is high: output on, when IN-MUTE is low: output off (high-impedance state)

Package Dimensions

unit: mm  
3196A



Pin Functions

Pin No.	Symbol	Pin name	Pin description	Equivalent circuit
20 19 12 13	$V_{IN1}$ $V_{IN2}$ $V_{IN4}$ $V_{IN5}$	Input	Inputs	
26 25 28 27 6 5 4 3 2 1 30 29	$V_{O1+}$ $V_{O1-}$ $V_{O2+}$ $V_{O2-}$ $V_{O4+}$ $V_{O4-}$ $V_{O5+}$ $V_{O5-}$ $V_{O3+}$ $V_{O3-}$ $V_{O6+}$ $V_{O6-}$	Output	Outputs	
10	$\overline{IN-MUTE}$	Mute	Controls the on/off state of the outputs. $\overline{IN-MUTE}$ high: outputs on $\overline{IN-MUTE}$ low: outputs off	

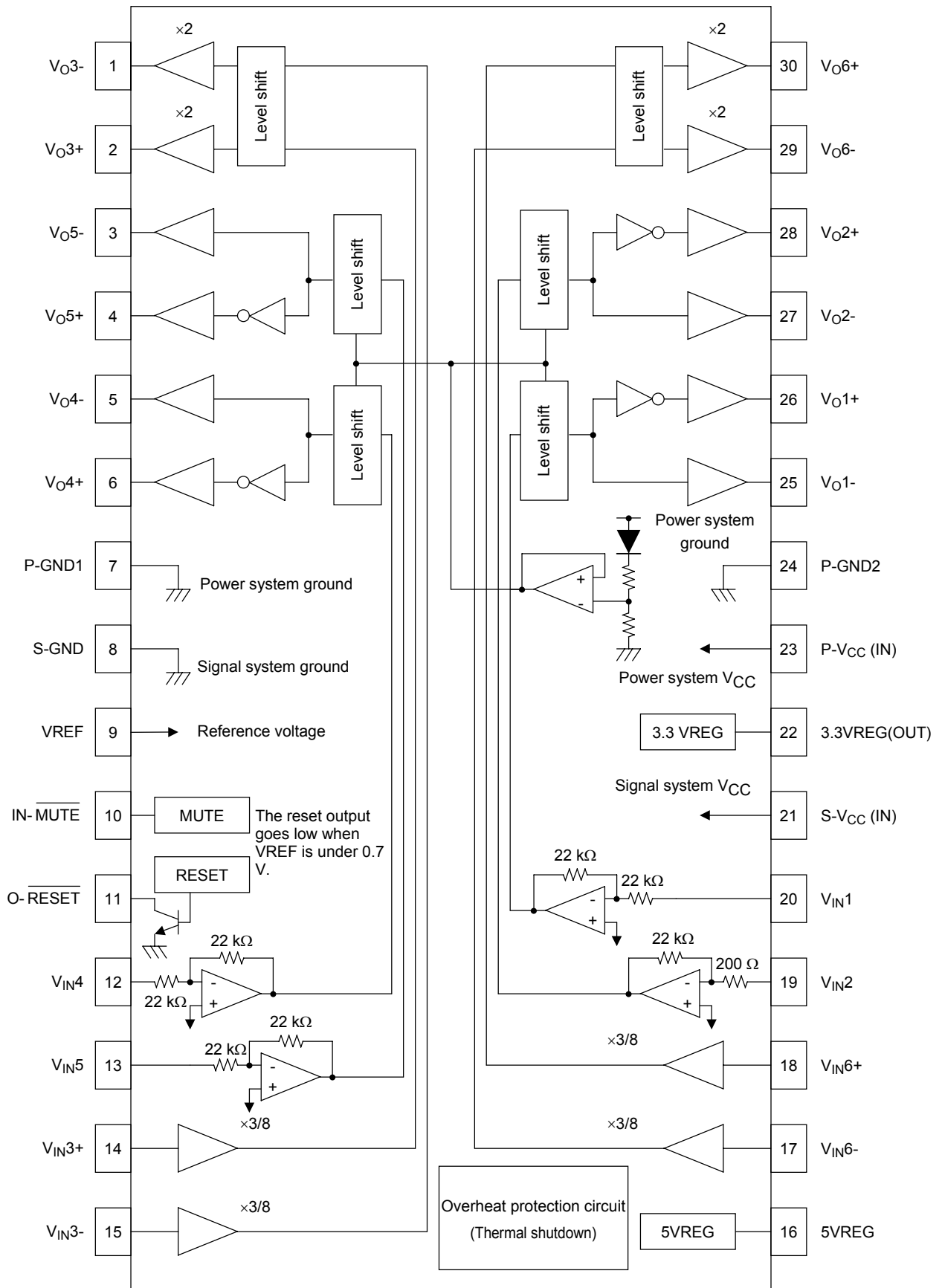
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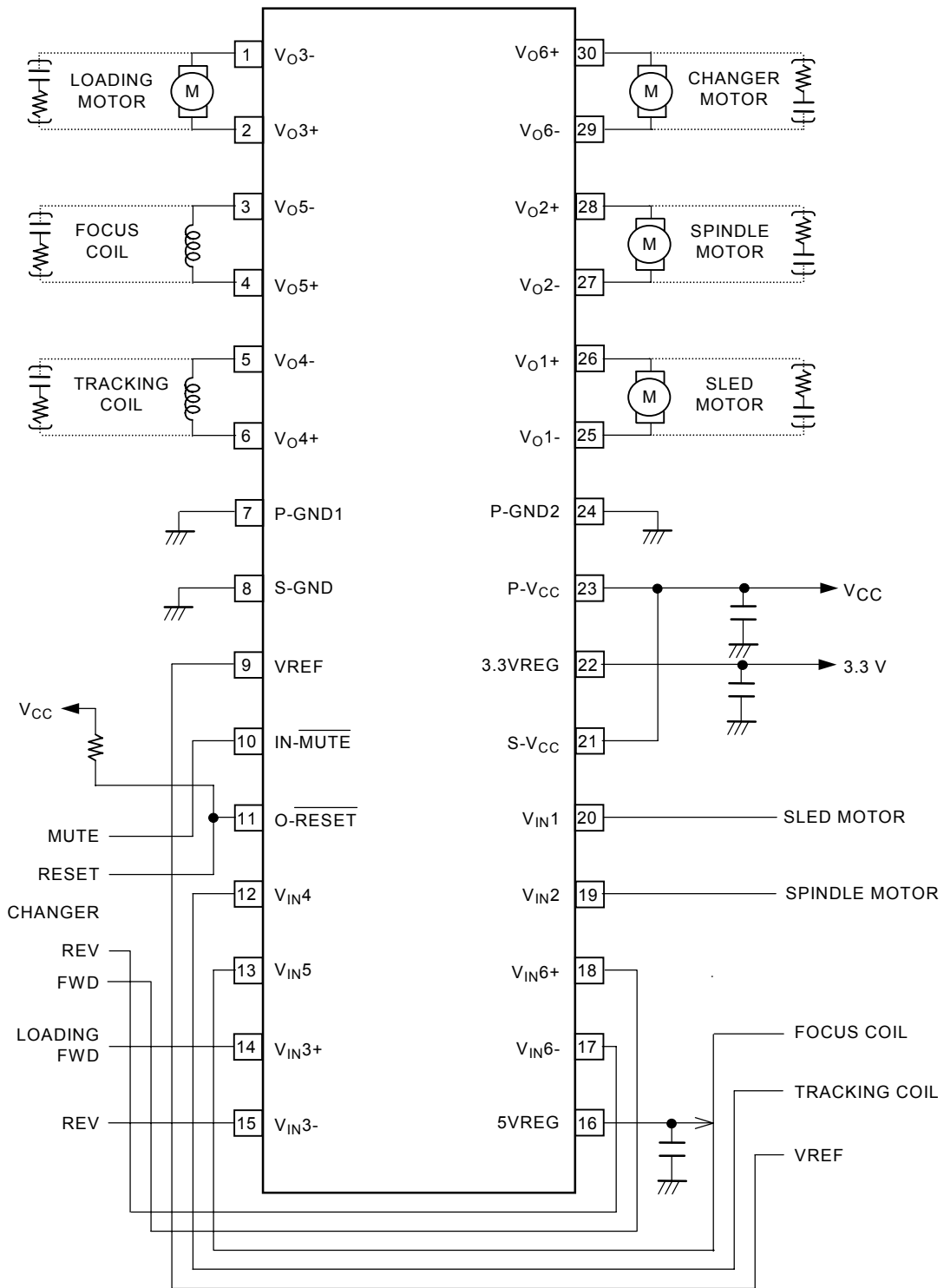
Pin No.	Symbol	Pin name	Pin description	Equivalent circuit
11	O-RESET	Reset	Open-collector output	
15 14 17 18	V <sub>IN3-</sub> V <sub>IN3+</sub> V <sub>IN6-</sub> V <sub>IN6+</sub>	Input (Loading block)	Inputs	
16	5VREG	5VREG	5 V regulator output	
22	3.3VREG	3.3VREG	3.3 V regulator output	

Block Diagram

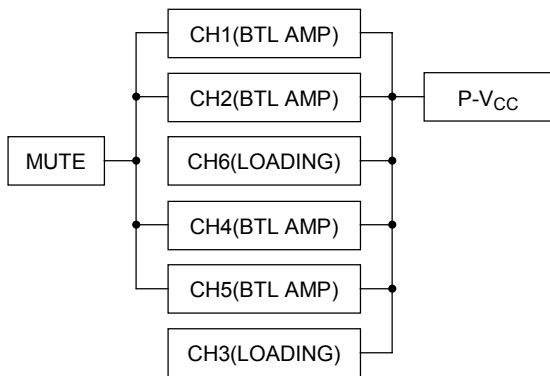


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## Sample Application Circuit



**Relationship Between Muting and the P-V<sub>CC</sub> Power Supply**



- Note:
- Connect both S-V<sub>CC</sub> and P-V<sub>CC</sub> to the power supply system externally.
  - Connect both S-GND and P-GND to the ground system externally.

**Muting Functions vs. Outputs and 3.3 V Regulator Operating States**

	CH1, 2, 4, 5 (BTL-AMP)	CH3, 6 (LOADING)	3.3VREG 5VREG
When $\overline{\text{IN-MUTE}}$ is low	OFF	–	OFF
When the thermal shutdown circuit has operated	OFF	OFF	OFF
When VREF has fallen below 0.7 V	OFF	–	–

- Note:
- A dash (–) indicates no operation for functions to which muting, thermal shutdown, or VREF fall protection apply.
  - The IN-MUTE pin applies to the BTL amplifiers (channels 1, 2, 4, and 5) and the 3.3 V and 5 V regulators.
  - The VREF fall protection function only applies to the BTL amplifiers.

The muting function applies to the BTL amplifiers (channels 1, 2, 4, and 5) and the 3.3 V and 5 V regulators.

IN-MUTE state	BTL-AMP (CH1, 2, 4, 5)	3.3VREG 5 VREG
H	ON	
L	OFF	

The VREF fall protection function only applies to the BTL amplifiers.

VREF state	BTL-AMP (CH1, 2, 4, 5)
VREF > 0.7 (V)	ON
VREF < 0.7 (V)	OFF

**Loading Block**

V <sub>IN</sub> *+ (FWD)	V <sub>IN</sub> *- (REV)	Loading output
L	L	Brake
	H	Reverse (V <sub>O</sub> = -1.5 × REV) *1
H	L	Forward (V <sub>O</sub> = 1.5 × FWD) *1
	H	(V <sub>O</sub> = 1.5 × (FWD - REV))

Note \*1: FWD: V<sub>IN</sub>6+, V<sub>IN</sub>3+, REV: V<sub>IN</sub>6-, V<sub>IN</sub>3-

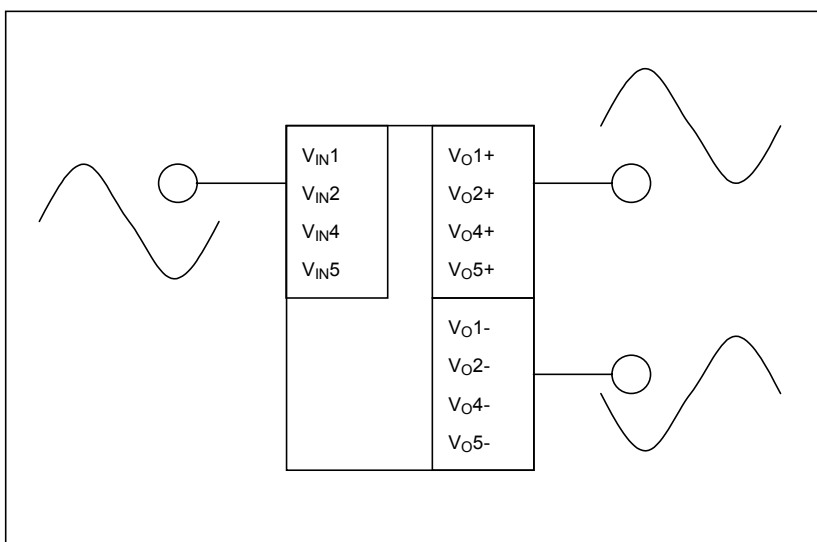
- Note:
- In brake mode, the + and - output voltages both go to V<sub>CC</sub>/2.
  - The "L" voltage level is any level less than V<sub>F</sub> (approximately 0.6 V).
  - The loading circuit (channels 3 and 6) gain is 3.5 dB (typical).

**Reset Function**

IN-MUTE	VREF	O-RESET
L	VREF < 0.7 V	L
	VREF > 0.7 V	L
H	VREF < 0.7 V	L
	VREF > 0.7 V	H

Note: The O-RESET output is an open-collector output (NPN). The O-RESET low state is when the NPN transistor output is on, and the O-RESET high state is when the NPN transistor output is off.

**Relationship Between the BTL Amplifier Inputs and Outputs**



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