



# 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

- Any and all SANYO products described or contained herein do not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your SANYO representative nearest you before using any SANYO products described or contained herein in such applications.
- SANYO assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO products described or contained herein.

# LA6568

## 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

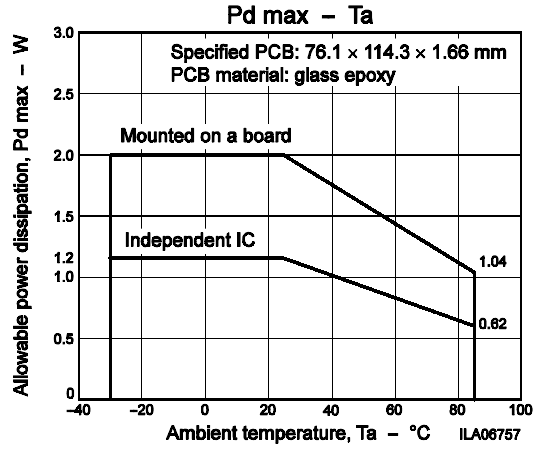
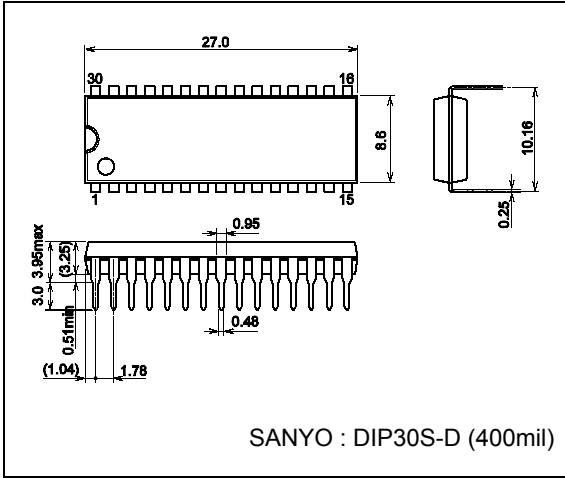
\*2: The voltage difference across the load ( $8\ \Omega$ ) terminals. With the outputs in the saturated state.

\*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	

Continued on next page.

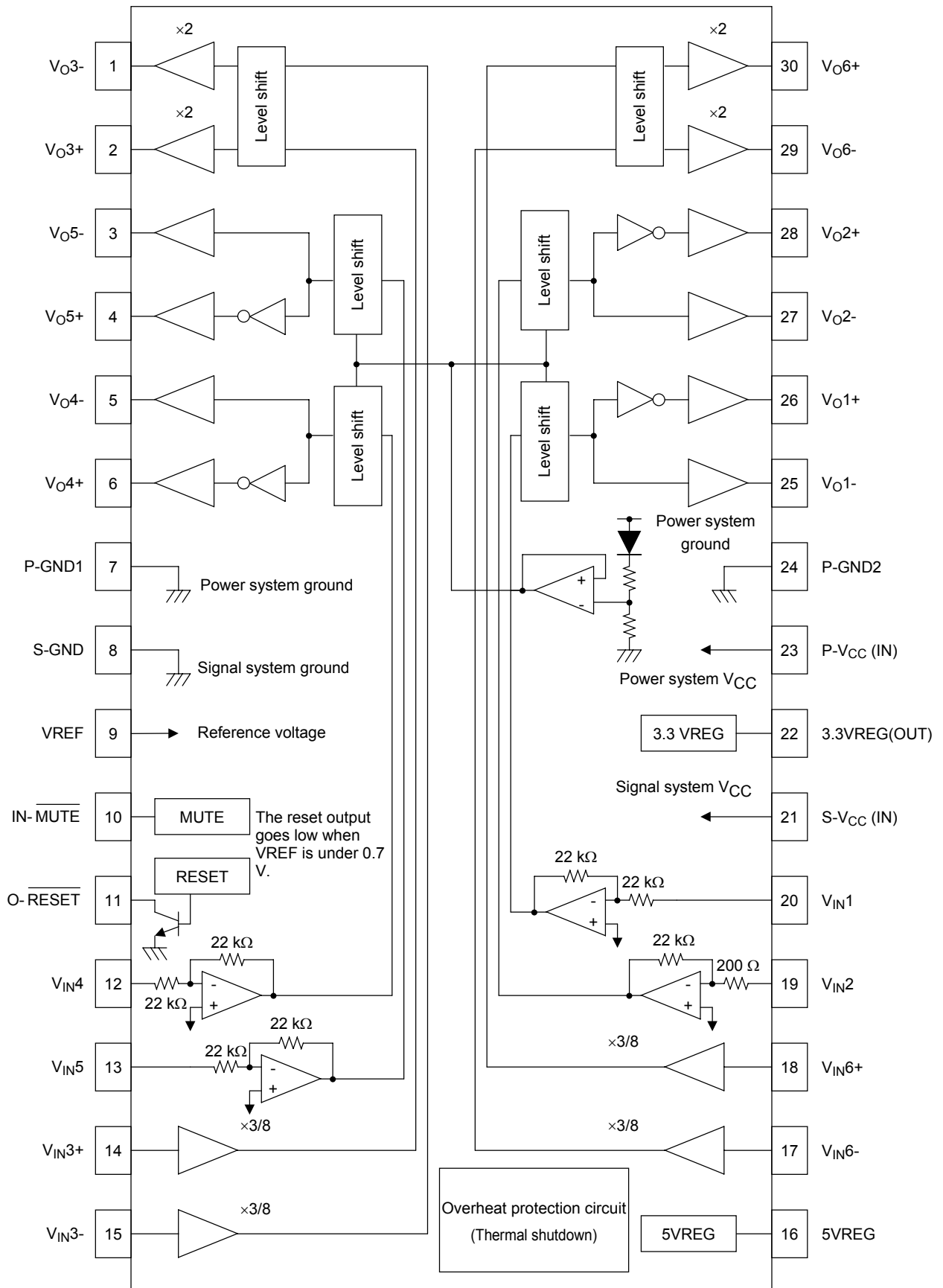
# LA6568

Continued from preceding page.

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	

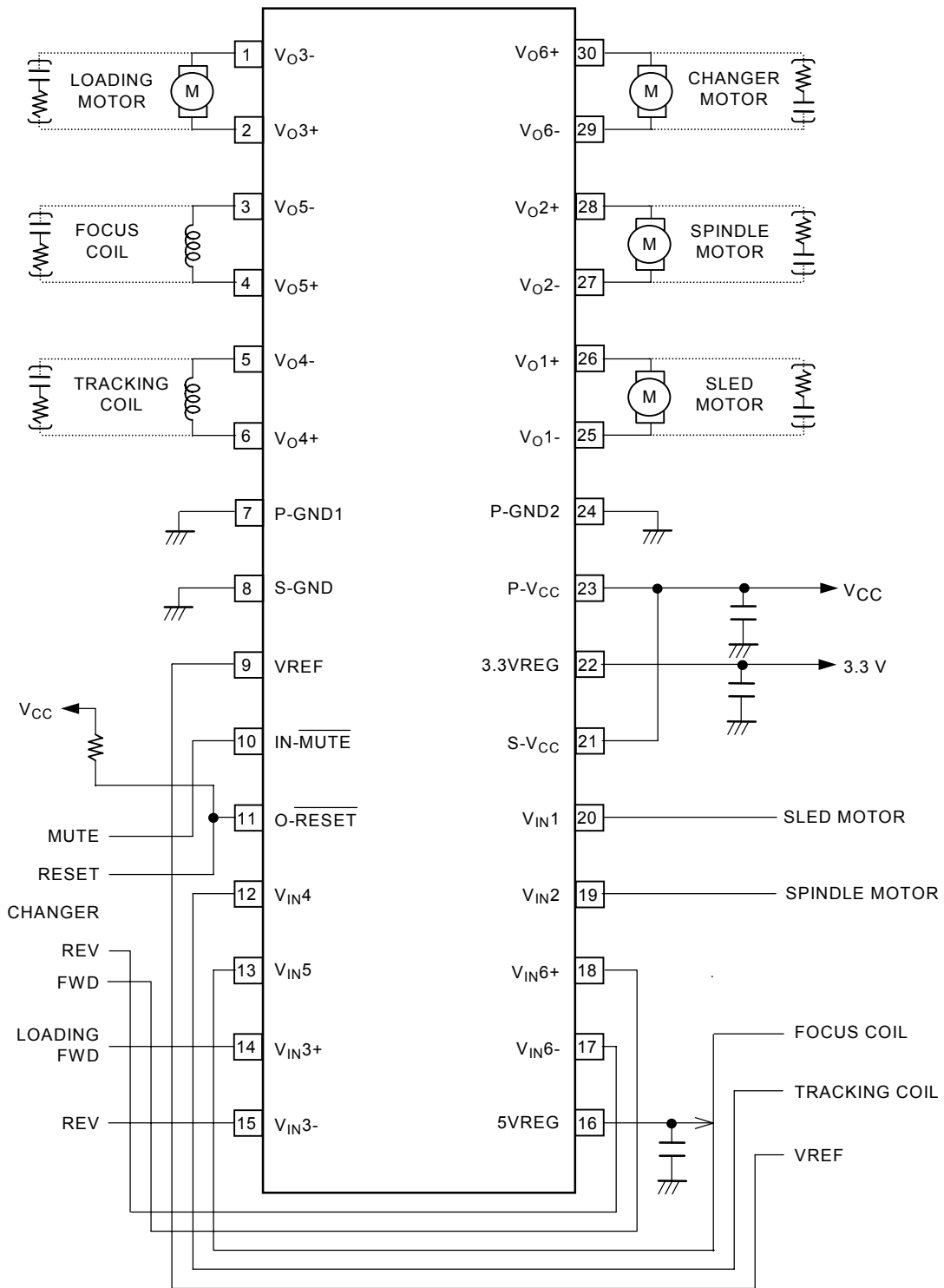
# LA6568

## Block Diagram

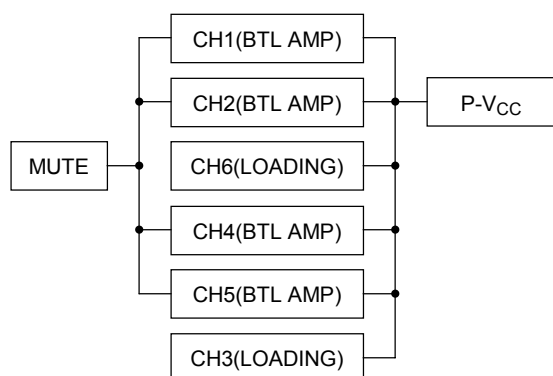


# LA6568

## 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-

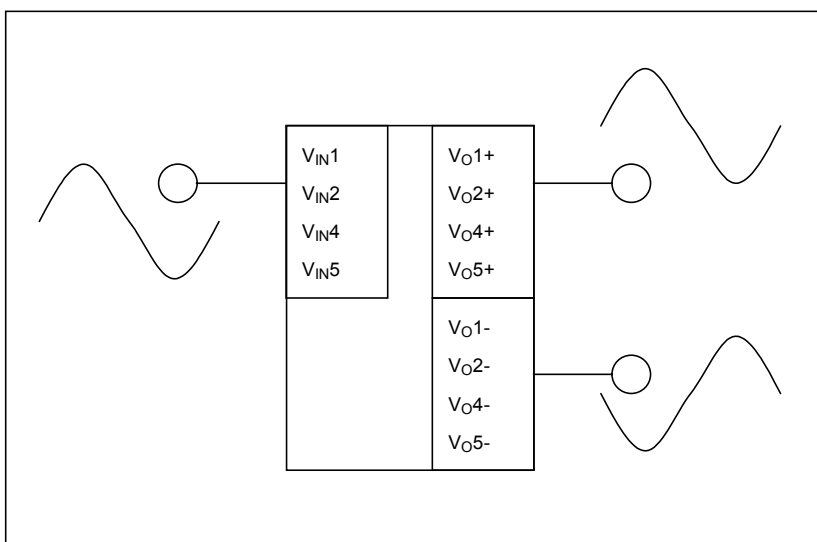
- Note:
- In brake mode, the + and - output voltages both go to V<sub>CC</sub>/2.
  - The "L" voltage level is any level less than V<sub>F</sub> (approximately 0.6 V).
  - The loading circuit (channels 3 and 6) gain is 3.5 dB (typical).

**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**



- Specifications of any and all SANYO products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Electric Co., Ltd. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO products (including technical data, services) described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, of otherwise, without the prior written permission of SANYO Electric Co., Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production. SANYO believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or

This catalog provides information as of August, 2004. Specifications and information herein are subject to change without notice.