Ordering number : EN6504A

SANYO Semiconductors
DATA SHEET

Monolithic Lenear IC

# LA6558 — 6-CH Driver for Mini Disk and Compact Disk Applications

## Overview

The LA6558 is a 6-channel driver developed for MD and CD players.

## Features

- Power amplifier 6-channel built-in
- $I_O$ max 700mA
- Level shift circuit built-in (BTL AMP)
- One mute circuit (output ON/OFF) built-in
- 3.3V power supply built-in ($I_O$ max=300mA)
- 5V power supply built-in ($I_O$ max=5mA)
- Overheat protection circuit (thermal shutdown) built-in

## Specifications

### Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ max | | 14 | V |
| Maximum output current | $I_O$ max | | 0.7 | A |
| Maximum input voltage | $V_{IN}B$ | Each CH for CH1 to CH6 | 13 | V |
| Mute pin voltage | $V_{MUTE}$ | | 13 | V |
| Allowable operation | Pd max | Mounted on a board | 2.00 | W |
| | | Independent IC | 1.20 | |
| Operating temperature | Topr | | -30 to +85 | °C |
| Storage temperature | Tstg | | -55 to +150 | °C |


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## Recommended Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Power supply voltage | $V_{CC}$ | | 6 to 13 | V |

## Electrical Characteristics at S-$V_{CC}$ = P-$V_{CC}$ = 8V, VREF = 1.65V, Ta = 25°C, unless especially specified.

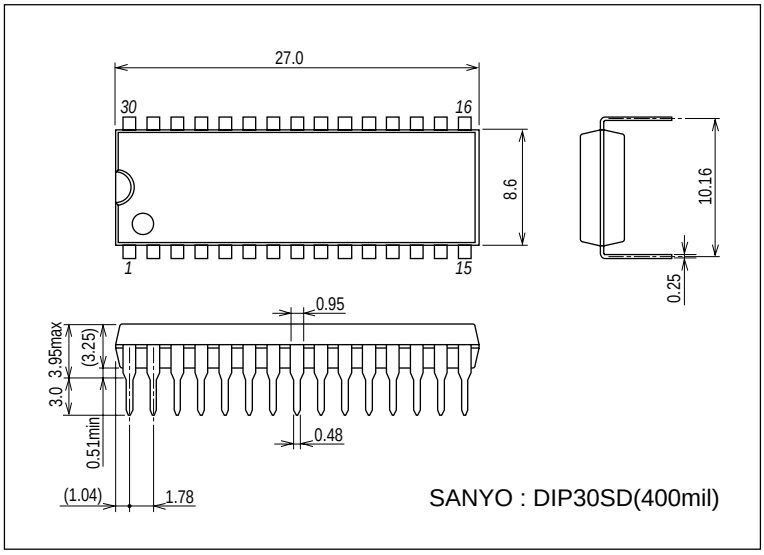
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| **All Blocks** | | | | | | |
| No-load current drain ON | $I_{CC}$-ON | All AMPs output ON *1 | | 30 | 50 | mA |
| No-load current drain OFF | $I_{CC}$-OFF | All AMPs output OFF *1 | | 10 | 20 | mA |
| VREF input voltage range | $V_{REF}$-IN | | 0.5 | | $V_{CC}$-1.5 | V |
| **BTL AMP Block** | | | | | | |
| Output offset voltage | $V_{OFF}$ | Voltage difference between output AMPs, each CH | -50 | | +50 | mV |
| Input voltage range | $V_{IN}$ | | 0 | | $V_{CC}$ | V |
| Output voltage | $V_O$ | Voltage between each $V_O$+ and $V_O$- when $R_L$=8Ω *2 | 4 | 4.5 | | V |
| Closed-circuit voltage gain | VG | Input/output gain Input resistance 11kΩ | | 12 | | dB |
| Slew rate | SR | Multiply 2 between outputs. *3 | | 1 | | V/μs |
| MUTE ON voltage | $V_{MUTE}$-ON | Each MUTE *4 | | | 0.5 | V |
| MUTE OFF voltage | $V_{MUTE}$-OFF | Each MUTE *4 | 2 | | | V |
| **Loading Block** | | | | | | |
| Voltage between outputs F | $V_O$F | $V_{IN}$+=2V, $V_{IN}$-=0V | 2.5 | 2.9 | 3.3 | V |
| Voltage between outputs R | $V_O$R | $V_{IN}$+=0V, $V_{IN}$-=2V | -3.3 | -2.9 | -2.5 | V |
| Output voltage range F | $V_O$MF | $V_{IN}$+=5V, $V_{IN}$-=0 | 5.2 | 5.7 | | V |
| Output voltage range R | $V_O$MR | $V_{IN}$+=0V, $V_{IN}$-=5V | | -5.7 | -5.2 | V |
| Output offset voltage | $V_{OFF}$ | Voltage difference between outputs when brake is applied. | -50 | | +50 | mV |
| Input current | $I_{IN}$ | At $V_{IN}$=3.3V | | | 500 | μA |
| **3.3VREG Block** | | | | | | |
| Output voltage | $V_O$-REG1 | $I_O$=100mA | 3.15 | 3.3 | 3.45 | V |
| Line regulation | ΔV-LIN1 | $V_{CC}$=6 to 12V at $I_O$=100mA | -100 | | +100 | mV |
| Load regulation | ΔV-LOAD1 | $I_O$=0 to 200mA | -100 | | +100 | mV |
| **5VREG Block** | | | | | | |
| Output voltage | $V_O$-REG2 | $I_O$=3mA | 4.75 | 5 | 5.25 | V |
| Line regulation | ΔV-LIN1 | $I_O$=3mA, $V_{CC}$=6 to 12V | | 100 | | mV |
| Load regulation | ΔV-LOAD | $I_O$=1 to 3mA | | 100 | | mV |
| **O-RESET Block** (Operating for Vref) | | | | | | |
| H reset output voltage | $V_{OR}$H | 10kΩ between $V_{CC}$-RESET | 6.5 | | | V |
| L reset output voltage | $V_{OR}$L | 10kΩ between $V_{CC}$ and RESET | | | 0.5 | V |
| O-RESET threshold voltage | $V_{RT}$ | | 0.5 | 0.7 | 0.9 | V |
| O-RESET hysteresis voltage | $V_{hys}$ | | 50 | 100 | 200 | mV |

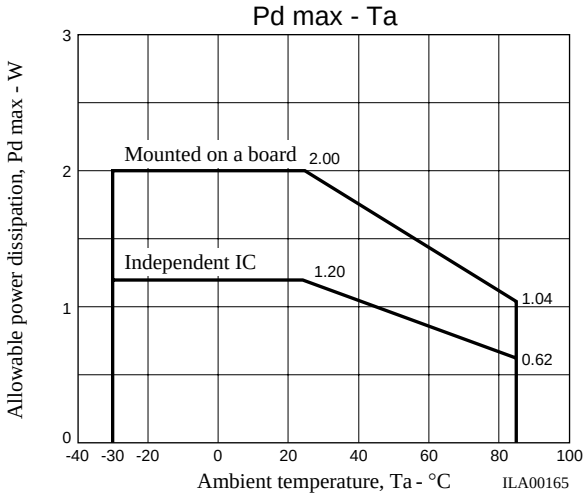
*1. P-$V_{CC}$ and S-$V_{CC}$ total current dissipation under no load.
*2. Voltage difference between both ends of the load(8Ω). Output in the saturated condition.
*3. These values are design guarantee values, and are not tested.
*4. Output is ON with IN-MUTE: [H] and OFF (HI impedance) with IN-MUTE: [L].

## Package Dimensions

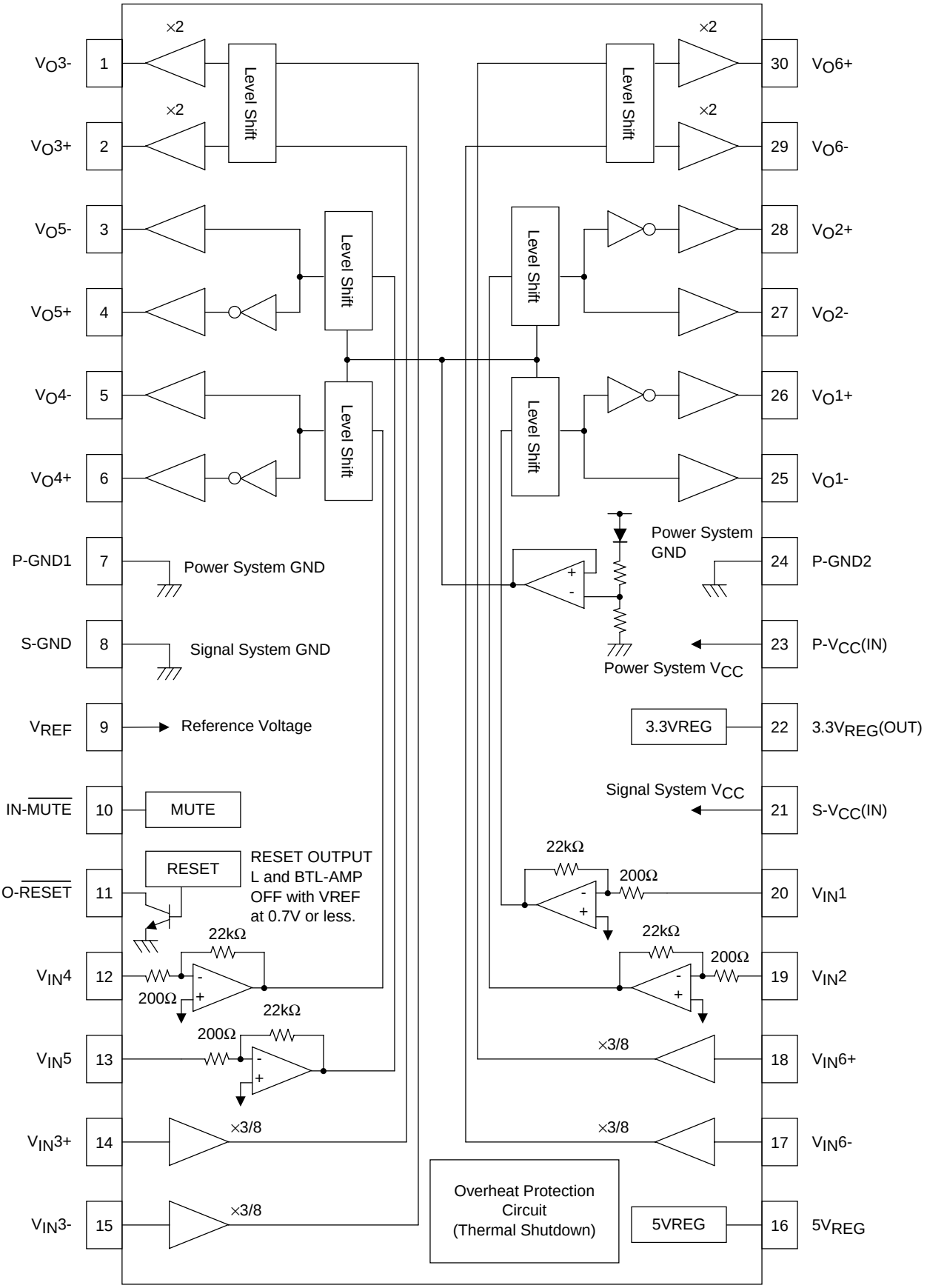
unit : mm (typ)

3196A



## Block Diagram



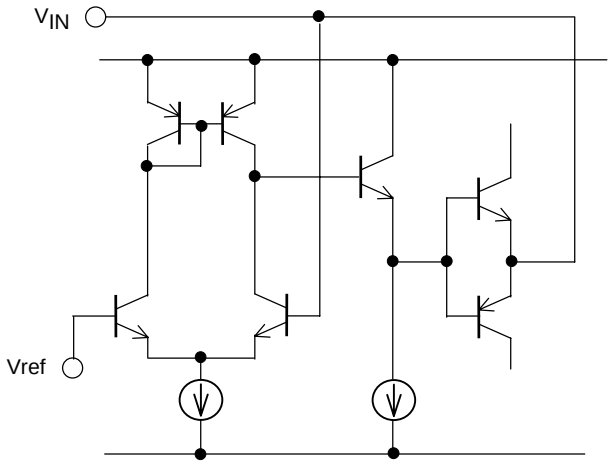
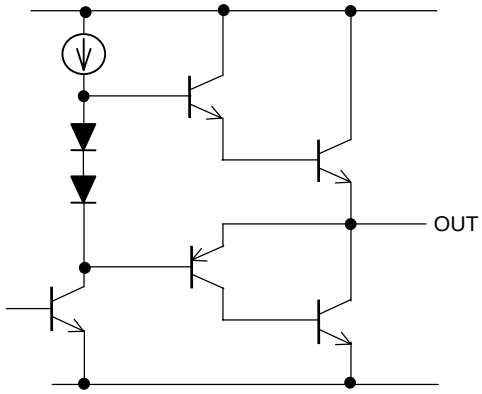
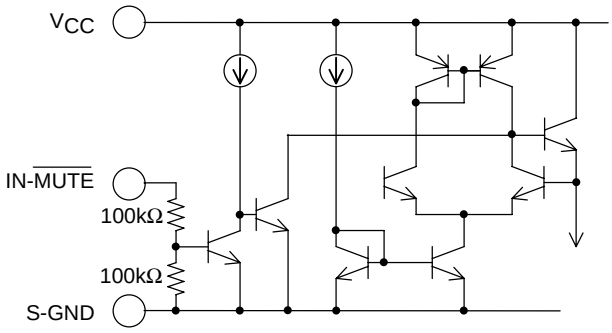
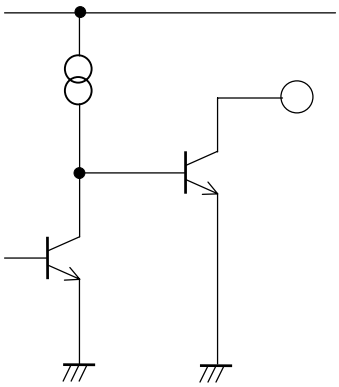
## Pin Functions

| Pin No. | Pin Name | Description (functions) |
|---|---|---|
| 1 | $V_O3-$ | Output for CH3 (-) |
| 2 | $V_O3+$ | Output for CH3 (+) |
| 3 | $V_O5-$ | Output for CH5 (-), inverted relative to input |
| 4 | $V_O5+$ | Output for CH5 (+), not inverted relative to input |
| 5 | $V_O4-$ | Output for CH4 (-), inverted relative to input |
| 6 | $V_O4+$ | Output for CH4 (+), not inverted relative to input |
| 7 | P-GND1 | Power system GND (CH3, 4, 5) |
| 8 | S-GND | Signal system GND |
| 9 | $V_{REF}$ | Reference voltage input pin |
| 10 | $\overline{\text{IN-MUTE}}$ | Output ON/OFF for BTL AMP (CH1, 2, 4, and 5) and 3.3 V, 5 $V_{REG}$. ([H]: Output ON, [L]: Output OFF) |
| 11 | $\overline{\text{O-RESET}}$ | Reset output (Open collector) |
| 12 | $V_{IN}4$ | Input for CH4 |
| 13 | $V_{IN}5$ | Input for CH5 |
| 14 | $V_{IN}3+$ | Input for CH3 (+) |
| 15 | $V_{IN}3-$ | Input for CH3 (-) |
| 16 | $5V_{REG}$ | 5V Power output |
| 17 | $V_{IN}6-$ | Input for CH6 (-) |
| 18 | $V_{IN}6+$ | Input for CH6 (+) |
| 19 | $V_{IN}2$ | Input for CH2 |
| 20 | $V_{IN}1$ | Input for CH1 |
| 21 | S-$V_{CC}$ | Signal system $V_{CC}$ |
| 22 | $3.3V_{REG}$ | 3.3V Power output |
| 23 | P-$V_{CC}$ | Power system power supply |
| 24 | P-GND2 | Power system GND(CH1, 2, 6) |
| 25 | $V_O1-$ | Output for CH1 (-), inverted relative to input |
| 26 | $V_O1+$ | Output for CH1 (+), not inverted relative to input |
| 27 | $V_O2-$ | Output for CH2 (-), inverted relative to input |
| 28 | $V_O2+$ | Output for CH2 (+), not inverted relative to input |
| 29 | $V_O6-$ | Output for CH6 (-) |
| 30 | $V_O6+$ | Output for CH6 (+) |

*1. Connect P-GND and S-GND externally and set both to the lowest potential (sub-straight).

*2. Connect S-$V_{CC}$ and P-$V_{CC}$ externally for use as power supplies.

## Pin Description

| Pin Name | Pin Name | Pin No | Description | Equivalent Circuit Diagram |
|---|---|---|---|---|
| Input (BTL AMP) | $V_{IN}1$<br>$V_{IN}2$<br>$V_{IN}4$<br>$V_{IN}5$ | 20<br>19<br>12<br>13 | Each input pin |  |
| Output (BTL AMP) | $V_O1+$<br>$V_O1-$<br>$V_O2+$<br>$V_O2-$<br>$V_O4+$<br>$V_O4-$<br>$V_O5+$<br>$V_O5-$ | 26<br>25<br>28<br>27<br>6<br>5<br>4<br>3 | Each output |  |
| Mute | IN-$\overline{\text{MUTE}}$ | 10 | Output ON/OFF.<br>IN-$\overline{\text{MUTE}}$: H output ON<br>IN-$\overline{\text{MUTE}}$: L output OFF |  |
| Reset | O-$\overline{\text{RESET}}$ | 11 | Open collector |  |

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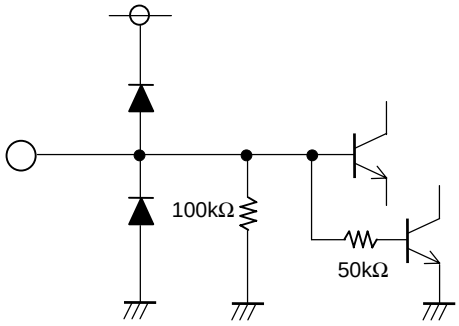
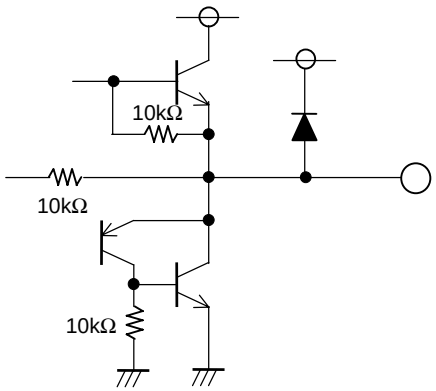
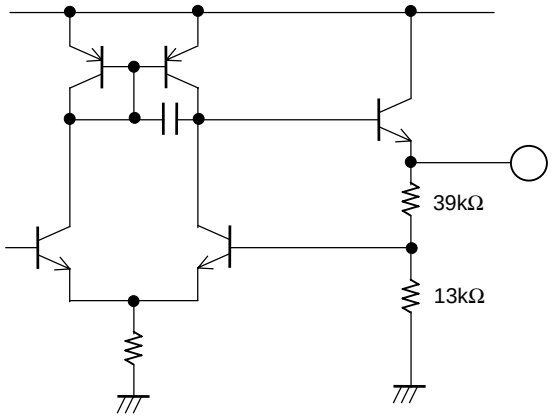
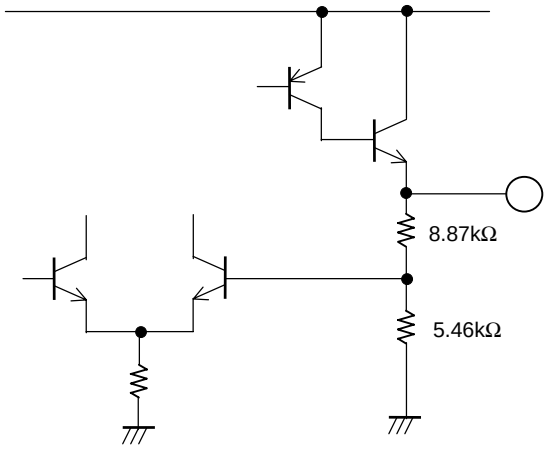
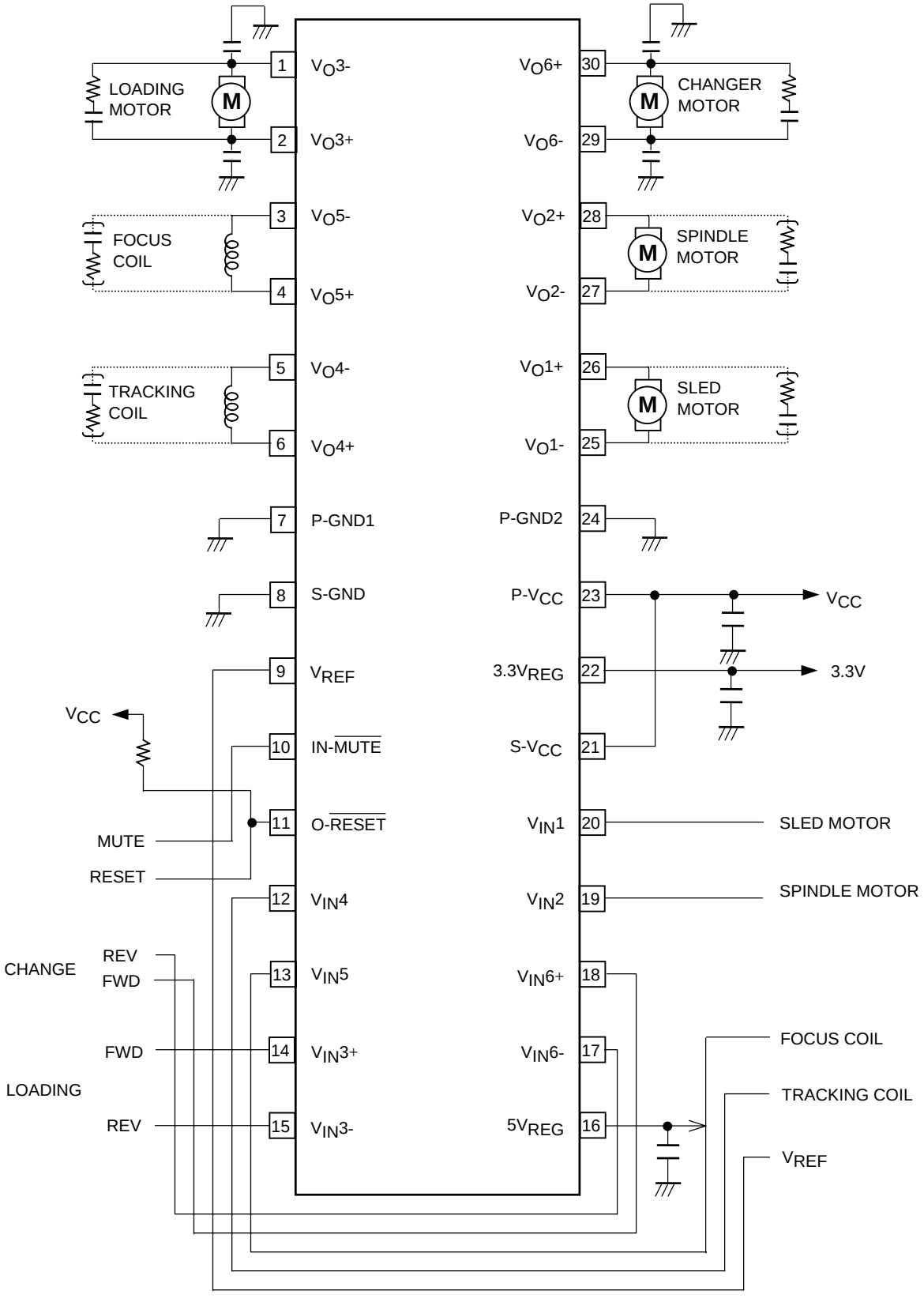
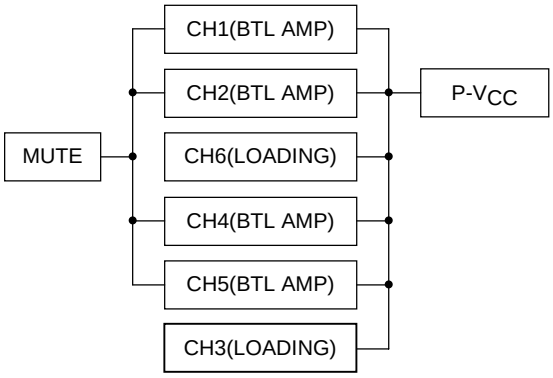
| Pin Name | Pin Name | Pin No | Description | Equivalent Circuit Diagram |
|---|---|---|---|---|
| Input (Loading block) | $V_{IN}3-$<br>$V_{IN}3+$<br>$V_{IN}6-$<br>$V_{IN}6+$ | 15<br>14<br>17<br>18 | Each input pin |  |
| Output (Loading block) | $V_O3+$<br>$V_O3-$<br>$V_O6+$<br>$V_O6-$ | 2<br>1<br>30<br>29 | Each output |  |
| $5V_{REG}$ | $5V_{REG}$ | 16 | Output for $5V_{REG}$ |  |
| $3.3V_{REG}$ | $3.3V_{REG}$ | 22 | Output for $3.3V_{REG}$ |  |

## Sample Application Circuit




Note: When connecting a load to CH3 and CH6, set the output capacitor to 0.56μF or more and select the capacitor according to the setting. The capacitor to be used should be less in capacity fluctuation due to temperature.

## Relation of MUTE and Power (P-$V_{CC}$)




* Connect S-$V_{CC}$ and P-$V_{CC}$ externally.
* Connect P-GND and S-GND externally.

## Various MUTE functions and output, 3.3V REG operation condition

| | CH1, 2, 4, 5 (BTL-AMP) | CH3, 6 (LOADING) | $3.3V_{REG}$ $5V_{REG}$ |
|---|---|---|---|
| With IN-$\overline{\text{MUTE}}$: L | OFF | - | OFF |
| With thermal shutdown operating | OFF | OFF | OFF |
| With VREF lowering (0.7V or less) | OFF | - | - |

* (-) indicates no-operation for functions to which MUTE, thermal shutdown, and $V_{REF}$ lowering correspond.
* IN-$\overline{\text{MUTE}}$ operates for BTL-AMP (CH1, 2, 4, and 5) and $3.3V_{REF}$ and 5 $V_{REF}$.
* $V_{REF}$ lowering is effective for BTL-AMP only.

### Operative for ((MUTE operation)) to BTL-AMP(CH1, 2, 4, 5) and $3.3V_{REF}$, $5V_{REF}$

| IN-MUTE condition | BTL-AMP (CH1, 2, 4, 5) | $3.3V_{REG}$ $5V_{REG}$ |
|---|---|---|
| H | ON | |
| L | OFF | |

### Operative for (($V_{REF}$ lowering)) to BTL-AMP

| $V_{REF}$ condition | BTL-AMP (CH1, 2, 4, 5) |
|---|---|
| $V_{REF}$ > 0.7(V) | ON |
| $V_{REF}$ < 0.7(V) | OFF |

### LOADING Block

| $V_{IN}$*+ (FWD) | $V_{IN}$*- (REV) | Loading output |
|---|---|---|
| L | L | Brake |
| | H | Reversed ($V_O$=-1.5×REV) *1 |
| H | L | Forward ($V_O$= 1.5×FWD) *1 |
| | H | ($V_O$=1.5×(VFO-VRE)) |

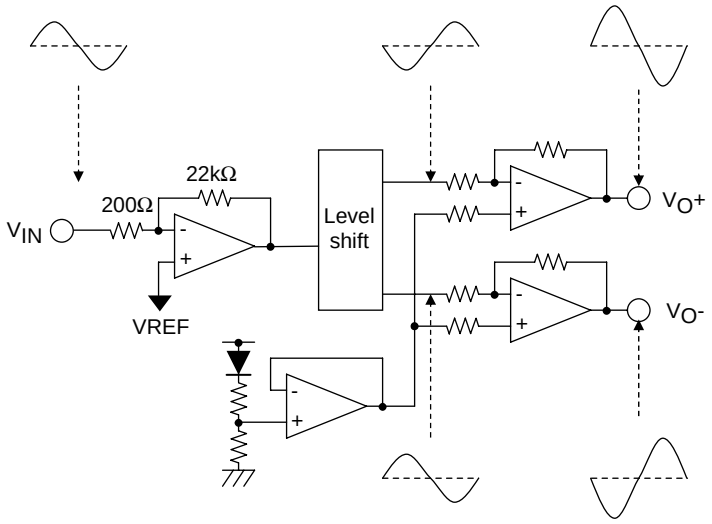
* When the brake is applied, each "+" and "-" output voltage becomes $V_{CC}/2$.
*1 FWD: $V_{IN}6+$, $V_{IN}3+$, REV: $V_{IN}6-$, $V_{IN}3-$.
* L voltage is L<$V_F$(≈0.6V).
* Gain of loading (CH3, 6) is 3.5dB(TYP).

### Reset function

| IN-$\overline{\text{MUTE}}$ | $V_{REF}$ | O-$\overline{\text{RESET}}$ |
|---|---|---|
| L | $V_{REF}$ < 0.7V | L |
| | $V_{REF}$ > 0.7V | L |
| H | $V_{REF}$ < 0.7V | L |
| | $V_{REF}$ > 0.7V | H |

* O-$\overline{\text{RESET}}$ is an open collector output (NPN).
* O-$\overline{\text{RESET}}$: L indicates that the NPN output is ON while O-$\overline{\text{RESET}}$: H indicates that this output is OFF.

## Relation of input and output (BTL-AMP)





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