



SANYO Semiconductors

# DATA SHEET

Monolithic Linear IC

## LA5688H — Multi power supply regulator+1.5ch forward/reverse motor driver

### Overview

The LA5688H is Multi power supply regulator+1.5ch forward/reverse motor driver.

### Functions

- One circuit of 2.6V regulator ( $I_O = 100\text{mA}$ )
- 3.1V regulator-2 circuit ( $I_O = 50\text{mA}$ )
- One circuit of 3.3V regulator ( $I_O = 150\text{mA}$ )
- Independent ON/OFF of each regulator
- 1.5ch forward/reverse motor driver incorporated

### Specifications

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

| Parameter                   | Symbol               | Conditions  | Ratings     | Unit             |
|-----------------------------|----------------------|---|-------------|------------------|
| Maximum supply voltage      | $V_{CC\text{ max}}$  |   | -0.3 to 9   | V                |
| Input voltage               | $V_{IN\text{ max}}$  |   | -0.3 to 9   | V                |
| Allowable power dissipation | $P_d\text{ max}$     | $T_a \leq 25^\circ\text{C}$ Independent IC                  | 0.79        | W                |
|                             |                      | $T_a \leq 25^\circ\text{C}$ Mounted on a specified board. * | 1.8         | W                |
| OUT pin output current      | $I_{OUT\text{ max}}$ |   | $\pm 1$     | A                |
| Operating temperature       | $T_{opr}$            |   | -20 to +85  | $^\circ\text{C}$ |
| Storage temperature         | $T_{stg}$            |   | -55 to +150 | $^\circ\text{C}$ |

\* Mounted on a board :  $76.1 \times 114.3 \times 1.6\text{mm}^3$ , glass epoxy board.

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**SANYO Semiconductor Co., Ltd.**

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

# LA5688H

## Operating Conditions at Ta = 25°C

| Parameter                | Symbol            | Conditions | Ratings                    | Unit |
|--------------------------|-------------------|------------|----------------------------|------|
| Supply voltage 1         | V <sub>CC1</sub>  |            | 4.1 to 7.5                 | V    |
| Supply voltage 1'        | V <sub>CC1'</sub> | *          | 3.5 to 7.5                 | V    |
| Supply voltage 2         | V <sub>CC2</sub>  |            | 0 to 7.5                   | V    |
| Supply voltage 3         | V <sub>CC3</sub>  |            | 3.5 to 7.5                 | V    |
| VREF voltage             | VREF              |            | 0.3 to V <sub>CC3</sub> -1 | V    |
| REG2.6 output current    | REG2.6            |            | 0 to 100                   | mA   |
| REG3.1A•B output current | REG3.1A•B         |            | 0 to 50                    | mA   |
| REG3.3 output current    | REG3.3            |            | 0 to 150                   | mA   |
| Input "H" level voltage  | V <sub>IH</sub>   |            | 2.0 to 7.5                 | V    |
| Input "L" level voltage  | V <sub>IL</sub>   |            | -0.3 to 0.7                | V    |

\* When only the motor driver is used without using the regulator

## Electrical Characteristics at Ta = 25°C

| Parameter  | Symbol                      | Conditions                         | Ratings |      |      | Unit |
|--|-----------------------------|------------------------------------|---------|------|------|------|
|  |                             |                                    | min     | typ  | max  |      |
| <b>All regulator blocks Power dissipation V<sub>CC1</sub> = 6V IREG2.6 = 100mA, IREG3.3A•B = 50mA, IREG3.3 = 150mA</b> |                             |                                    |         |      |      |      |
| V <sub>CC1</sub> power dissipation   | I <sub>CC1</sub>            |                                    |         | 30   | 47   | mA   |
| <b>REG2.6 Regulator block V<sub>CC1</sub> = 6V, IREG2.6 = 100mA</b>  |                             |                                    |         |      |      |      |
| Output voltage 1   | V <sub>O_REG2.6</sub>       |                                    | 2.55    | 2.6  | 2.65 | V    |
| Dropout voltage  | V <sub>DROP_REG2.6</sub>    |                                    |         | 0.25 | 0.5  | V    |
| Line regulation  | ΔVOLN_REG2.6                | V <sub>CC1</sub> = 4.1 to 7.5V     |         |      | 200  | mV   |
| Load regulation  | ΔVOLD_REG2.6                | I <sub>REG2.6</sub> = 5 to 100mA   |         |      | 200  | mV   |
| Peak output current  | I <sub>OP_REG2.6</sub>      |                                    | 100     | 140  |      | mA   |
| Output short-circuit current   | I <sub>OSC_REG2.6</sub>     |                                    |         | 50   | 100  | mA   |
| Input "H" level voltage  | V <sub>IH_EN2.6</sub>       |                                    | 2.0     |      |      | V    |
| Input "L" level voltage  | V <sub>IL_EN2.6</sub>       |                                    |         |      | 0.7  | V    |
| "H" level input current  | I <sub>IH_EN2.6</sub>       | V <sub>EN2.6</sub> = 2V            |         | 50   | 70   | μA   |
| <b>REG3.1A•B Regulator block V<sub>CC1</sub> = 6V, IREG3.1A•B = 50mA</b>   |                             |                                    |         |      |      |      |
| Output voltage   | V <sub>O_REG3.1A•B</sub>    |                                    | 3.04    | 3.1  | 3.16 | V    |
| Dropout voltage  | V <sub>DROP_REG3.1A•B</sub> |                                    |         | 0.25 | 0.5  | V    |
| Line regulation  | ΔVOLN_REG3.1A•B             | V <sub>CC1</sub> = 4.1 to 7.5V     |         |      | 200  | mV   |
| Load regulation  | ΔVOLD_REG3.1A•B             | I <sub>REG3.1A•B</sub> = 5 to 50mA |         |      | 200  | mV   |
| Peak output current  | I <sub>OP_REG3.1A•B</sub>   |                                    | 50      | 70   |      | mV   |
| Output short-circuit current   | I <sub>OSC_REG3.1A•B</sub>  |                                    |         | 25   | 50   | mA   |
| Input "H" level voltage  | V <sub>IH_ENB3.1A•B</sub>   |                                    | 2.0     |      |      | V    |
| Input "L" level voltage  | V <sub>IL_ENB3.1A•B</sub>   |                                    |         |      | 0.7  | V    |
| "H" level input current  | I <sub>IH_ENB3.1A•B</sub>   | V <sub>EN3.1A•B</sub> = 2V         |         | 50   | 70   | μA   |
| <b>REG3.3 Regulator block V<sub>CC1</sub> = 6V, IREG3.3 = 150mA</b>  |                             |                                    |         |      |      |      |
| Output voltage   | V <sub>O_REG3.3</sub>       |                                    | 3.23    | 3.3  | 3.37 | V    |
| Dropout voltage  | V <sub>DROP_REG3.3</sub>    |                                    |         | 0.25 | 0.5  | V    |
| Line regulation  | ΔVOLN_REG3.3                | V <sub>CC1</sub> = 4.1 to 7.5V     |         |      | 200  | mV   |
| Load regulation  | ΔVOLD_REG3.3                | I <sub>REG3.3</sub> = 5 to 150mA   |         |      | 200  | mV   |
| Peak output current  | I <sub>OP_REG3.3</sub>      |                                    | 150     | 210  |      | mA   |
| Output short-circuit current   | I <sub>OSC_REG3.3</sub>     |                                    |         | 75   | 150  | mA   |
| Input "H" level voltage  | V <sub>IH_EN3.3</sub>       |                                    | 2.0     |      |      | V    |
| Input "L" level voltage  | V <sub>IL_EN3.3</sub>       |                                    |         |      | 0.7  | V    |
| "H" level input current  | I <sub>IH_EN3.3</sub>       | V <sub>EN3.3</sub> = 2V            |         | 50   | 70   | μA   |

Continued on next page.

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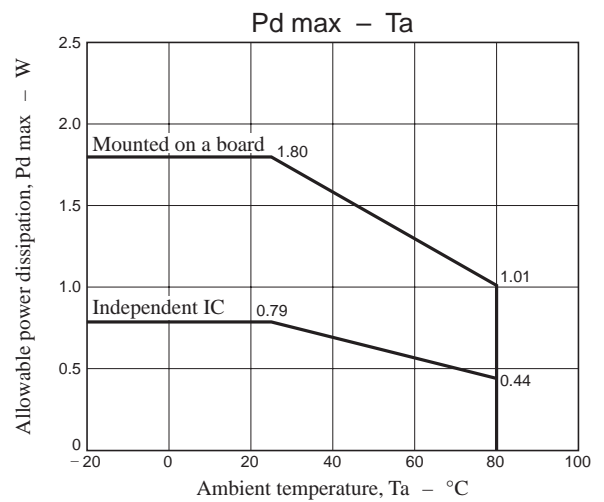
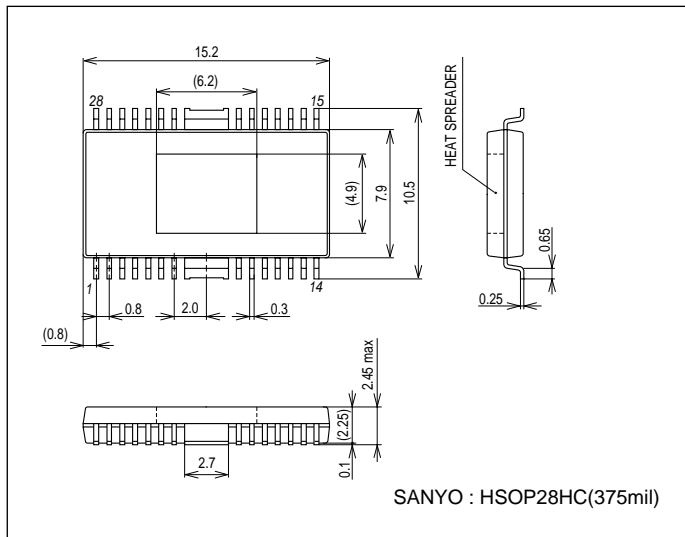
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| Parameter   | Symbol          | Conditions   | Ratings |     |     | Unit    |
|---|-----------------|--|---------|-----|-----|---------|
|   |                 |  | min     | typ | max |         |
| <b>Motor driver block <math>V_{CC1} = V_{CC2} = V_{CC3} = 6V</math></b> |                 |  |         |     |     |         |
| $V_{CC3}$ power dissipation 1   | $I_{CC3\_1}$    | Forward/Reversed, $V_{REF} = V_{CC3}$                                |         | 38  | 58  | mA      |
| $V_{CC3}$ power dissipation 2   | $I_{CC3\_2}$    | Brake  |         | 48  | 68  | mA      |
| $V_{CC3}$ power dissipation 3   | $I_{CC3\_3}$    | Standby  |         |     | 15  | $\mu A$ |
| Output saturation voltage   | $V_{SAT\_OUT}$  | $I_{OUT} = 200mA$ , $V_{REF} = V_{CC3}$<br>(Upper side + Lower side) |         | 1.0 | 1.5 | V       |
| $V_{REF}$ pin outflow current   | $I_{REF}$       | $V_{REF} = 2.5V$<br>(Forward/Reversed)                               |         | 1.3 | 3.5 | $\mu A$ |
| $V_{OUT}$ - $V_{REF}$ offset  | $V_{OF}$        | $V_{REF} = 2.5V$ , $I_O = 100mA$                                     | -200    |     | 200 | mV      |
| Output TR current capacity 1  | $I_{OUT\ max1}$ | $V_{CC3} = 3.5V$ , $V_{REF} = V_{CC3}$<br>Lower side Tr VCE = 1V     | 900     |     |     | mA      |
| Output TR current capacity 2  | $I_{OUT\ max2}$ | $V_{CC3} = 4.0V$ , $V_{REF} = V_{CC3}$<br>Lower side Tr VCE = 1V     | 1000    |     |     | mA      |
| Input "H" level voltage   | $V_{IH\_IN}$    |  | 2.0     |     |     | V       |
| Input "L" level voltage   | $V_{IL\_IN}$    |  |         |     | 0.7 | V       |
| "H" level input current   | $I_{IH\_IN}$    | $V_{IN} = 2V$  |         | 50  | 70  | $\mu A$ |

## Package Dimensions

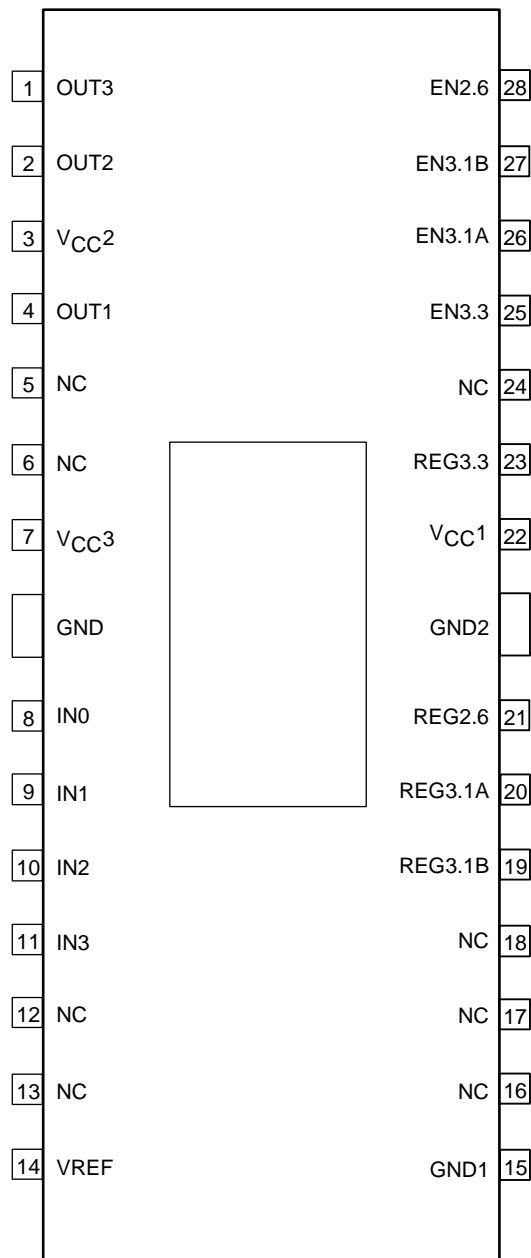
unit : mm (typ)

3234B



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## Pin Assignment

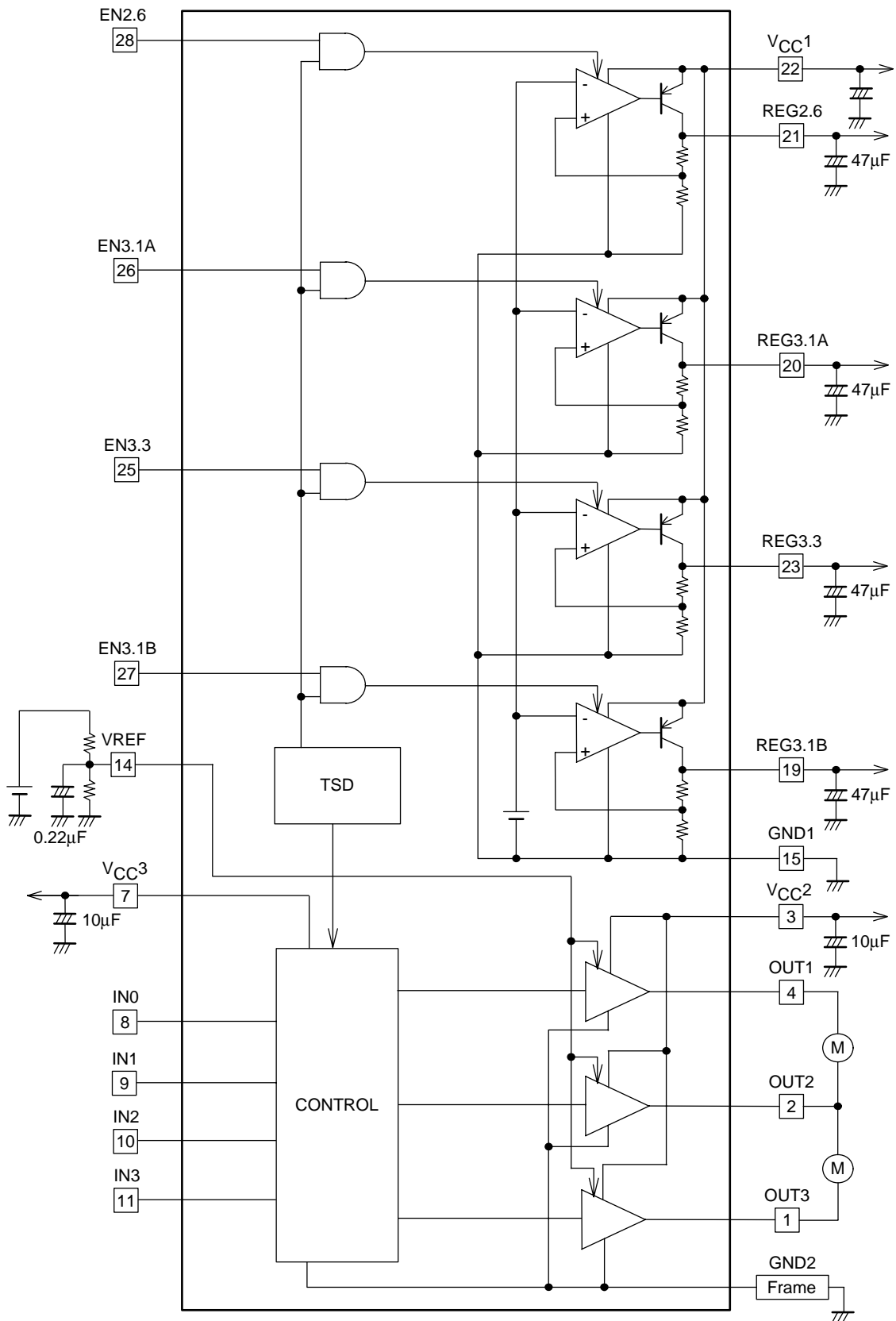


Top view

NC for no contact

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## Block Diagram



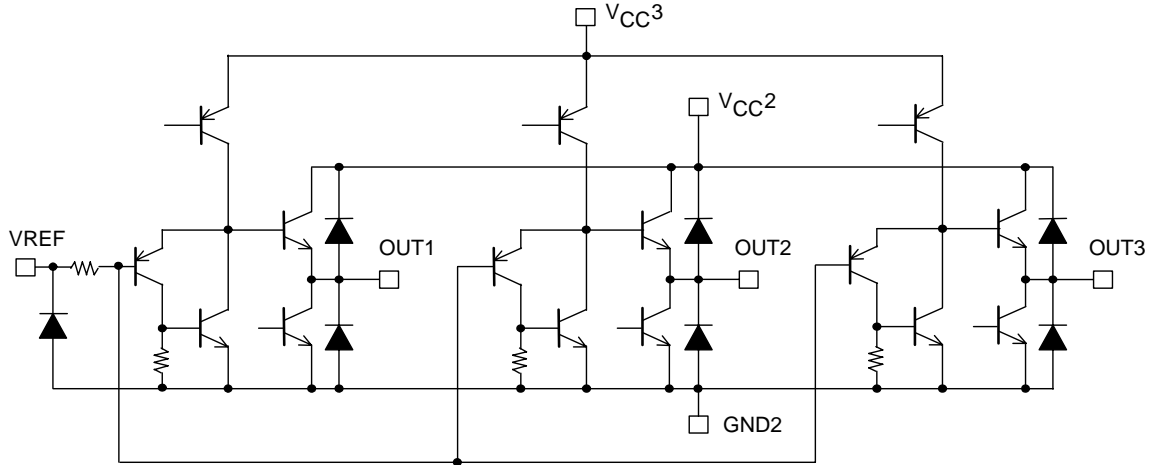
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Truth table for 1.5ch forward/reverse motor driver

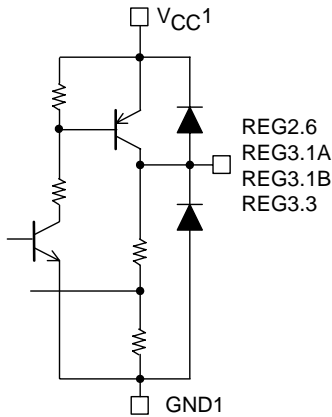
| Input |     |     |     | Output |      |      | Mode    |          |
|-------|-----|-----|-----|--------|------|------|---------|----------|
| IN0   | IN1 | IN2 | IN3 | OUT1   | OUT2 | OUT3 |         |          |
| L     | L   | L   | L   |        |      |      | Standby |          |
| L     | L   | H   | L   | H      | L    |      | ch1     |          |
| L     | L   | L   | H   | L      | H    |      |         | Forward  |
| L     | L   | H   | H   | L      | L    |      |         | Reversed |
| H     | L   | L   | L   |        | L    | H    | ch2     |          |
| L     | H   | L   | L   |        | H    | L    |         | Forward  |
| H     | H   | L   | L   |        | L    | L    |         | Reversed |

Blank column is for OFF.

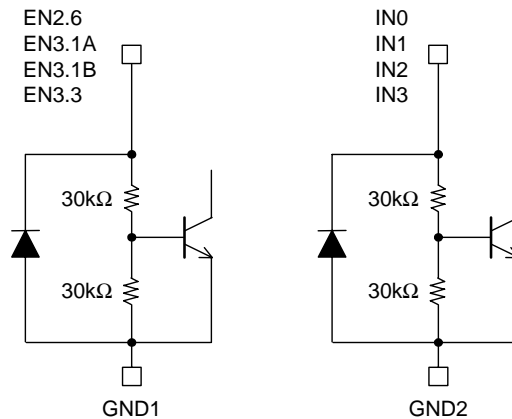
1.5ch forward/reverse motor driver output circuit



Each regulator output circuit



EN2.6, EN3.1A, EN3.1B, EN3.3, IN0 to IN3 input circuit



\*Resistance values are TYP values.

## Cautions for Use

### (1) GND1 and GND2

When using, short-circuit GND1 and GND2 externally.

### (2) Supply voltage when only the motor driver is used without using the regulator

As the reference power supply in IC is taken from  $V_{CC1}$ , apply the voltage also to  $V_{CC1}$ .

In this case, the operation condition of  $V_{CC1}$  ranges from 3.5 to 7.5V.

(Refer to page 2. Operation Conditions, Supply Voltage 1')

### (3) Supply voltage when only the regulator is used without using the motor driver

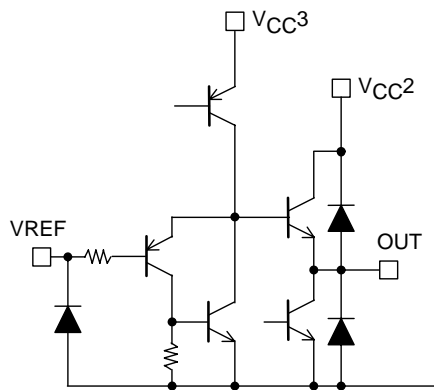
The regulator operates with  $V_{CC1}$  (without need of applying voltage to  $V_{CC2}$ ,  $V_{CC3}$ , and  $V_{REF}$ )

### (4) $V_{REF}$ pin

Application of the voltage to  $V_{REF}$  pin enables setting of each OUT Hi voltage.

In this case, the input to  $V_{REF}$  ranges from 0.3 to  $(V_{CC3}-1)$  V.

(Refer to page 2. Operation conditions,  $V_{REF}$  voltage)



VREF pin equivalent circuit

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