



LV8064TT — Bi-CMOS IC Fan Motor Driver Single-Phase Full-Wave Driver

Overview

The LV8064TT is a single-phase bipolar fan motor driver IC. It features quiet operation that suppresses reactive current through BTL output system. The speed control range can be adjusted to desired values by the external application program, so that it can rotate fan at lower speeds than conventional drivers in the same driver voltage control range. It is optimal for use in applications that require low noise and power saving, including CPU coolers.

Functions

- Single-phase full-wave drive with BTL output (BTL amplifier gain = 43dB)
- Speed control gain adjusted by SET pin
- FG output pin (open collector output)
- Built-in thermal protection circuit
- Constant-voltage output pin for Hall bias (VREG = 1.05V typ)
- Lock protection and auto return circuits built-in

Specifications

Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--------------------------|-----------------------|----------------------------|-------------|------|
| Supply voltage | V _{CC} max | | 7 | V |
| Output current | I _{OUT} max1 | During steady state | 0.7 | A |
| | I _{OUT} max2 | During lock protection | 1 | A |
| Output withstand voltage | V _{OUT} max | | 7 | V |
| FG output withstand | V _{FG} max | | 7 | V |
| FG output current | I _{FG} max | | 5 | mA |
| REG output current | I _{REG} max | | 10 | mA |
| Allowable dissipation | P _d max1 | Independent IC | 0.2 | W |
| | P _d max2 | With specified substrate * | 0.4 | W |
| Junction temperature | T _j max | | +150 | °C |
| Operating temperature | T _{opr} | | -30 to +95 | °C |
| Storage temperature | T _{stg} | | -55 to +150 | °C |

* Specified substrate : 20mm × 10mm × 0.8mm, Paper phenol

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Recommended Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|--|--------------------|------------|-----------------------------|------|
| Supply voltage | V _{CC} | | 2.2 to 6.0 | V |
| Common-phase input voltage range of Hall input | V _{ICM} | | 0.3 to V _{CC} -1.5 | V |
| SET pin input voltage range | V _{SETIN} | | 0.3 to V _{REG} | V |

Electrical Characteristics at Ta = 25°C, V_{CC} = 5V, unless especially specified.

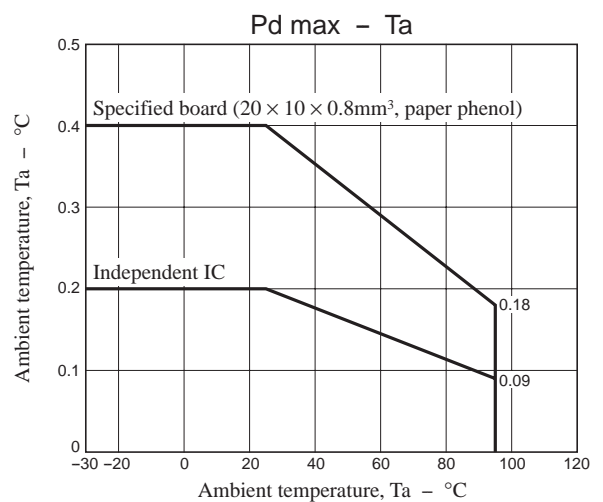
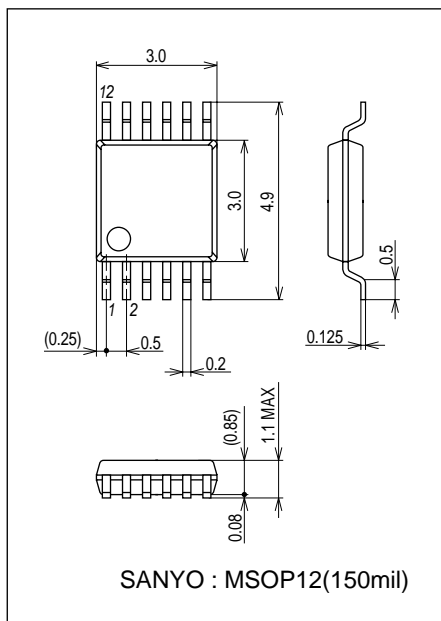
| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---------------------|---|---------|------|------|------|
| | | | min | typ | max | |
| Circuit current | I _{CC} | | | 3 | 5 | mA |
| REG pin output voltage | V _{REG} | When I _{REG} = 5mA | 0.9 | 1.05 | 1.2 | V |
| Hall input bias current | I _{HIN} | | | | 1 | μA |
| Output On voltage | V _O | I _O = 250mA, source + sink | | 0.44 | 0.54 | V |
| Hall amplifier input offset voltage | V _{IN} OFS | | -10 | | 10 | mV |
| Hall amplifier voltage gain | GH | | 40 | 43 | | dB |
| CPWM pin charge current | I _{CPC} | V _{SET} = 0.5V | | 4.5 | 8 | μA |
| CPWM pin discharge current | I _{CPD} | V _{SET} = 0.5V | | 4.5 | 8 | μA |
| CPWM pin charge/discharge current ratio | I _{CPRTO} | I _{CPRTO} = I _{CPC} /I _{CPD} | 0.7 | 1 | 1.2 | |
| CPWM pin high voltage | V _{CPH} | | | 1.3 | 1.5 | V |
| CPWM pin oscillation amplitude | V _{CPA} | V _{SET} = 0.5V | 0.4 | 0.5 | 0.6 | V |
| SET pin input bias current | I _{SET} | | | | 1 | μA |
| FG output pin low voltage | V _{FG} | I _{FG} = 3mA | | | 0.3 | V |
| FG output pin leakage current | I _{FGL} | V _{FG} = 5V | | | 10 | μA |
| FG comparator hysteresis width | ΔV _{FG} | | ±5 | ±15 | ±20 | mV |
| Output on time during lock protection | T _{ACT} | V _{SET} = 0.5V, CPWM = 100pF | 0.3 | 0.5 | 0.65 | sec |
| Output off time during lock protection | T _{DET} | V _{SET} = 0.5V, CPWM = 100pF | 3.0 | 5 | 6.5 | sec |
| Lock protection on/off ratio | T _{RTO} | T _{RTO} = T _{DET} /T _{ACT} | 8 | 10 | 11 | |
| Thermal shutdown operating temperature | T _{SD} | Design guarantee * | | 180 | | °C |
| Thermal shutdown hysteresis width | ΔT _{SD} | Design guarantee * | | 40 | | °C |

* Design guaranteed value (No measurement is performed.)

Package Dimensions

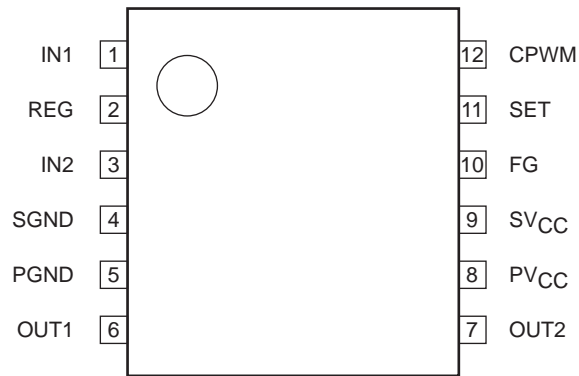
unit : mm (typ)

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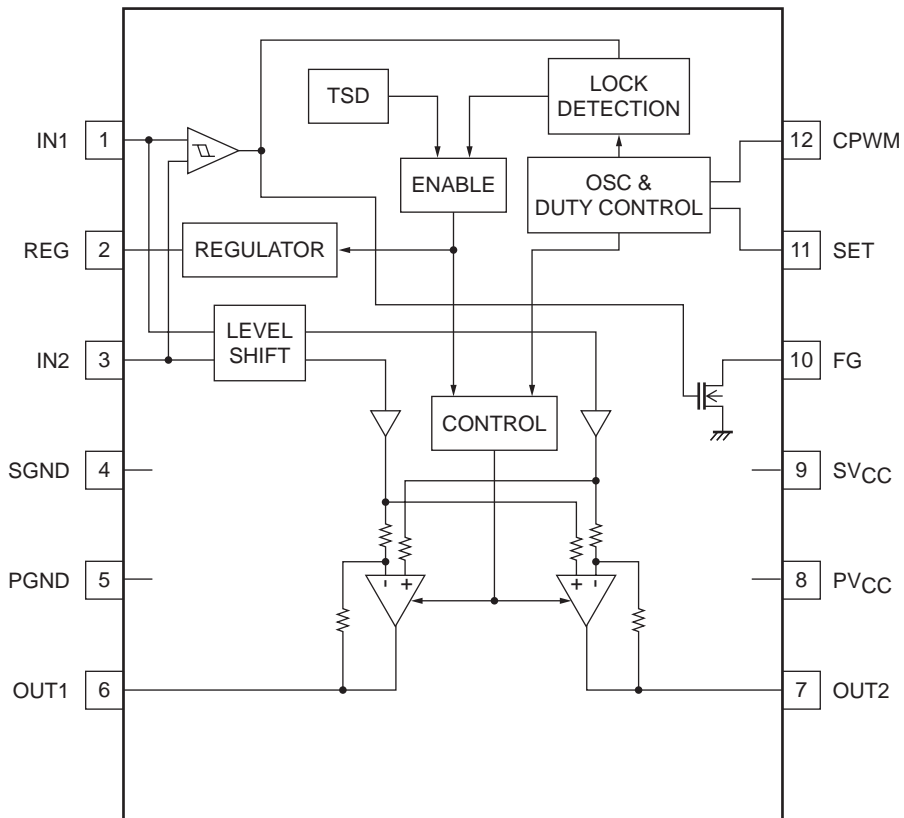
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Pin Assignment



Top view

Block Diagram



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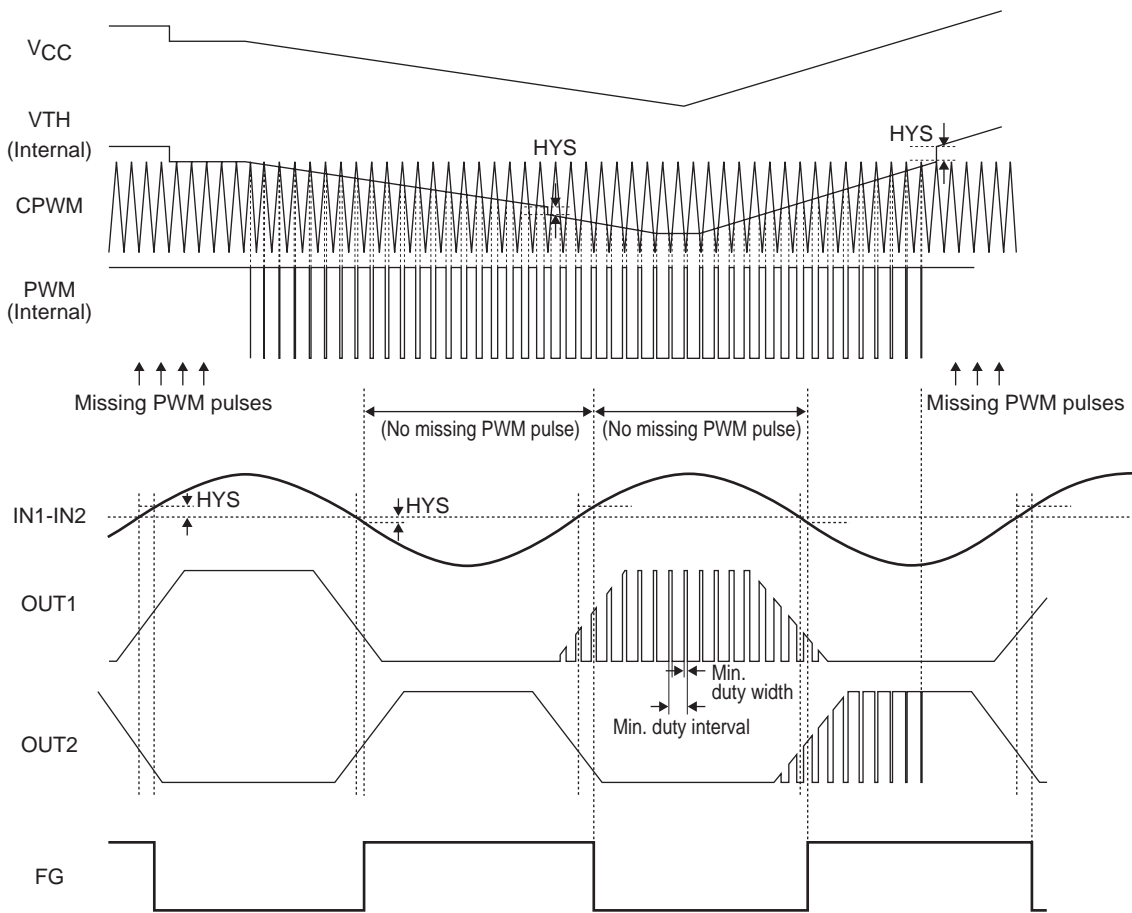
Pin Description

| Pin No. | Pin name | Pin voltage | Description | Equivalent circuit |
|---------|----------|--------------|---|--------------------|
| 1 | IN1 | - | Hall input pin (+) | |
| 3 | IN2 | | Hall input pin (-) | |
| 2 | REG | 1.05V (typ) | Hall bias output pin | |
| 4 | SGND | 0V | Signal GND | |
| 5 | PGND | | Power GND | |
| 6 | OUT1 | - | Motor drive output pin | |
| 7 | OUT2 | | | |
| 8 | SVCC | 2.2V to 6.0V | Signal power source | |
| 9 | PVCC | | Power source | |
| 10 | FG | - | FG pulse output pin | |
| 11 | SET | 0.3V to VREG | PWM voltage control pin | |
| 12 | CPWM | - | PWM oscillator capacitor connection pin | |

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Timing Chart

When motor is steady-state rotation



* $V_{TH} = 0.5V + V_{CC}/6$ (typ)

* Check for the presence or absence of PWM pulses at intervals of 1/2 FG period, and if there are missing pulses, immediately turn off the PWM pulse output. If there are no missing pulses at 1/2 FG period intervals, restart generating PWM pulses at the next interval.

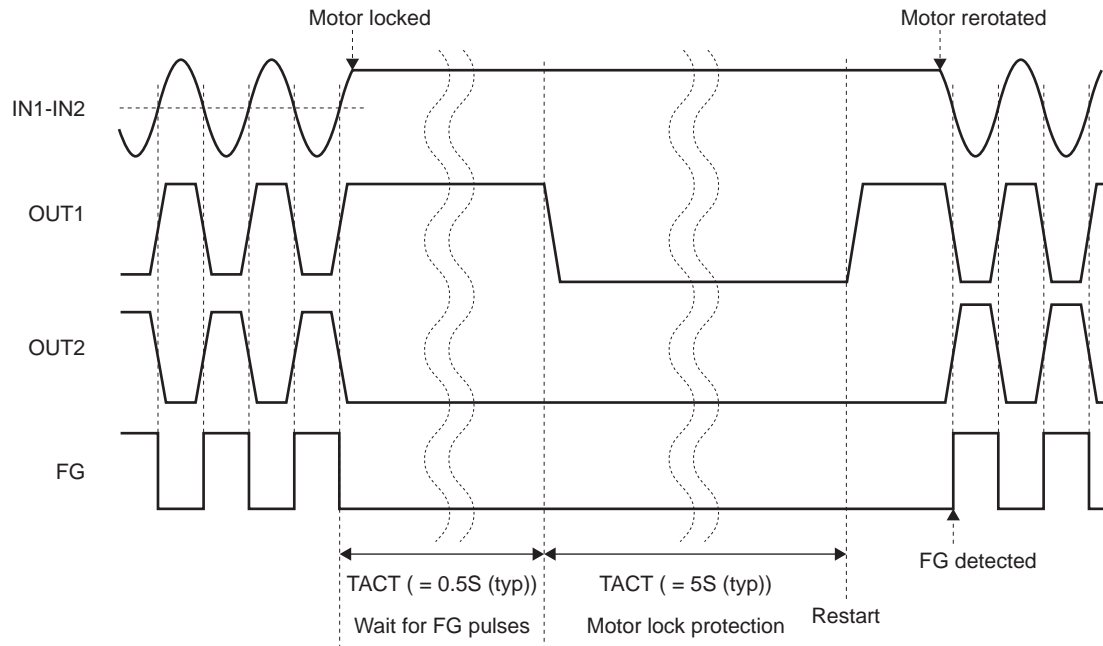
*Truth Table When Steady Rotation

| IN1 | IN2 | *PWM | OUT1 | OUT2 | FG | Mode |
|-----|-----|------|------|------|-----|--------------------------------|
| H | L | H | H | L | L | During rotation - drive |
| | | L | L | L | | During rotation - regeneration |
| L | H | H | L | H | OFF | During rotation - drive |
| | | L | L | L | | During rotation - regeneration |

* IC's internal signal

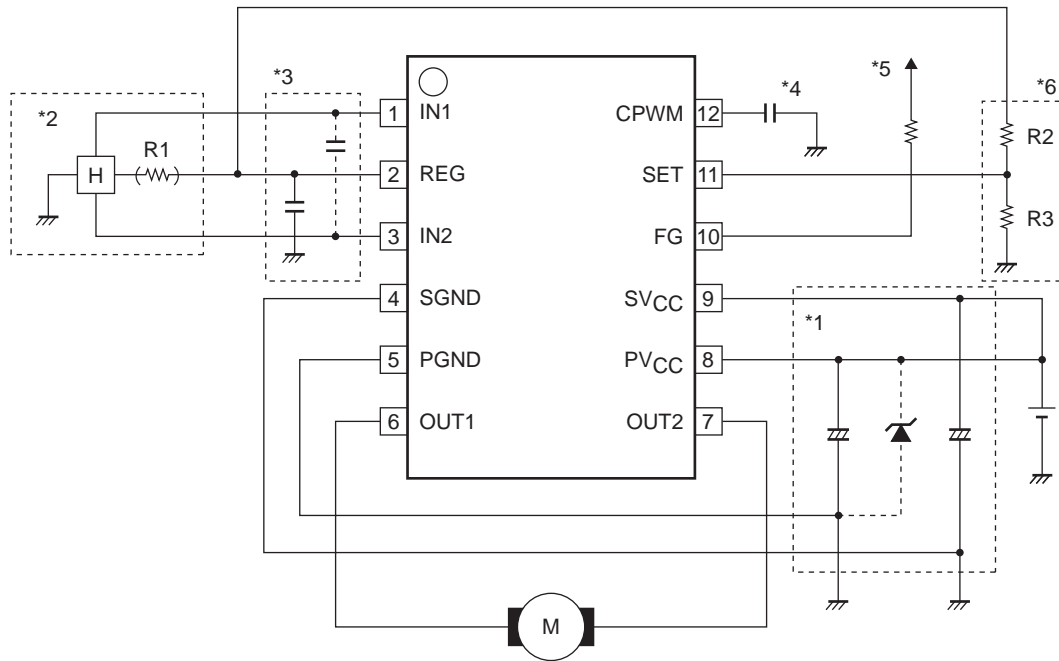
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When motor is locked



* When motor protection is activated, both OUT1 and OUT2 output low level.

Application Circuit Example



- *1 Capacitors with capacitances adequate to stabilize the power-supply voltage must be inserted between the PV_{CC} pin and PGND pin and between the SV_{CC} pin and SGND pin as close as possible to each pin. An excessive increase of the power supply voltage due to the regeneration current of the motor can cause a fatal damage to the IC. Be sure to use a zener diode if such a condition is likely to occur.
- *2 The REG pin outputs a constant voltage of 1.05V (typ). Stable Hall output of excellent temperature characteristics is obtained by providing a bias to the Hall element from the REG pin. Insert R1 when adjusting the Hall amplitude. When this pin is not to be used, pull it down to GND with a resistor of 1k to 10kΩ.
- *3 Insert a capacitor of an adequate capacitance between the REG pin and GND pin to stabilize the Hall signal and SET pin input voltage. When the wiring from the Hall output to the Hall input is long, noise may be carried through the wiring. Insert a capacitor close to the IN1 and IN2 pins as shown in the figure.
- *4 A capacitor for PWM oscillation. A 120pF capacitor provides an oscillation frequency of approx. 33kHz (typ).
- *5 Must be held open when this pin is not to be used.
- *6 The SET pin is used to determine the amplitude of the triangle waves generated at the CPWM pin. The same voltage level input to this pin determines the amplitude of the triangle wave. To make the amplitude of the triangle waves constant regardless of possible power voltage fluctuations, apply to the SET pin the register-divided voltage from the REG pin as shown in the figure.

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