



SANYO Semiconductors

# DATA SHEET

## LV8063TT — Bi-CMOS IC Fan Motor Driver Single-Phase Full-Wave Driver

### Overview

The LV8063TT is the driver IC with BTL linear output for single-phase fan motor, and that drives at high efficiency, low power, and low noise by suppressing the reactive power.

The BTL output can be combined with the PWM control by an external signal, which is optimum for the note PC, the CPU cooler, etc. that requires low power dissipation and low noise.

### Functions

- Single-phase full-wave operating by BTL output (BTL amplifier gain : +43dB)
- Speed control available by PWM pin
- Built-in Quick Start circuit
- Built-in thermal-shutdown (TSD) circuit
- Hall bias output pin (VHB = 1.05V typ)
- FG(rotation signal) output pin (Open drain output)
- Built-in lock protection and automatic return circuit

### Specifications

#### Absolute Maximum Ratings at Ta = 25°C

| Parameter                       | Symbol                | Conditions             | Ratings     | Unit |
|---------------------------------|-----------------------|------------------------|-------------|------|
| Maximum supply voltage          | V <sub>CC</sub> max   |                        | 7           | V    |
| OUT pin output current          | I <sub>OUT</sub> max1 | In regular mode        | 0.7         | A    |
|                                 | I <sub>OUT</sub> max2 | In lock-detection mode | 1           | A    |
| OUT pin output voltage handling | V <sub>OUT</sub> max  |                        | 7           | V    |
| FG output voltage handling      | V <sub>FG</sub> max   |                        | 7           | V    |
| FG output current               | I <sub>FG</sub> max   |                        | 5           | mA   |
| HB output current               | I <sub>HB</sub> max   |                        | 10          | mA   |
| Allowable power dissipation     | Pd max1               | Independent IC         | 0.2         | W    |
|                                 | Pd max2               | IC on board *          | 0.4         | W    |
| Operating temperature           | T <sub>opr</sub>      |                        | -30 to +95  | °C   |
| Storage temperature             | T <sub>stg</sub>      |                        | -55 to +150 | °C   |

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

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# LV8063TT

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

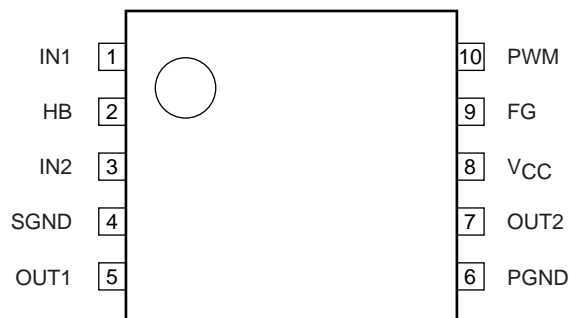
| Parameter                                  | Symbol              | Conditions            | Ratings               | Unit |
|--|---------------------|-----------------------|-----------------------|------|
| Supply voltage                             | $V_{CC\text{ opg}}$ | Active at all circuit | 2.5 to 6.0            | V    |
|  | $V_{CC\text{ min}}$ | Start-up with PWM=H   | 2.2 to 6.0            | V    |
| Hall input common-mode input voltage range | VICM                |                       | $0.3$ to $V_{CC}-1.5$ | V    |

## Electrical Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 5\text{V}$

| Parameter                              | Symbol             | Conditions                           | Ratings |          |          | Unit             |
|--|--------------------|--------------------------------------|---------|----------|----------|------------------|
|  |                    |                                      | min     | typ      | max      |                  |
| Circuit current                        | $I_{CC}$           | Active                               |         | 1.5      | 3.0      | mA               |
|  | $I_{CCO}$          | Stand-by                             |         | 200      | 300      | $\mu\text{A}$    |
| HB bias voltage                        | VHB                | IHB = 5mA                            | 0.9     | 1.05     | 1.2      | V                |
| Hall input bias current                | IHIN               |                                      |         |          | 1        | $\mu\text{A}$    |
| Output On voltage                      | $V_O$              | $I_O = 250\text{mA}$ , source + sink |         | 0.25     | 0.35     | V                |
| Hall amplifier output offset voltage   | $V_{IN\text{OFS}}$ |                                      | -6      |          | 6        | mV               |
| Hall amplifier voltage gain            | GH                 |                                      | 39      | 43       | 47       | dB               |
| PWM pin input Low level                | VPWML              |                                      | 0       |          | 0.7      | V                |
| PWM pin input High level               | VPWMH              |                                      | 2.5     |          | $V_{CC}$ | V                |
| PWM input frequency                    | fPWM               | Design guarantee *                   | 20      |          | 50       | kHz              |
| PWM input smallest pulse width         | TPWM               | Design guarantee *                   |         | 5        |          | $\mu\text{s}$    |
| FG output low-level voltag             | $V_{FG}$           | $I_{FG} = 3\text{mA}$                |         |          | 0.3      | V                |
| FG output leakage current              | $I_{FGL}$          | $V_{FG} = 7\text{V}$                 |         |          | 10       | $\mu\text{A}$    |
| FG comparator hysteresis width         | $\Delta V_{HYS}$   |                                      | $\pm 5$ | $\pm 15$ | $\pm 20$ | mV               |
| Output on time in Lock-detection       | TACT               |                                      | 0.45    | 0.6      | 0.75     | sec              |
| Output off time in Lock-detection      | TDET               |                                      | 4.5     | 6        | 7.5      | sec              |
| Output on/off ratio in Lock-detection  | TRTO               | $TRTO = TDET/TACT$                   | 8       | 10       | 11       |                  |
| Thermal shutdown operating temperature | TSD                | Design guarantee *                   |         | 180      |          | $^\circ\text{C}$ |
| Thermal shutdown hysteresis width      | $\Delta TSD$       | Design guarantee *                   |         | 40       |          | $^\circ\text{C}$ |

\* Design guarantee: Indicates a design target value. These parameters are not tested in the independent IC.

## Pin Assignment



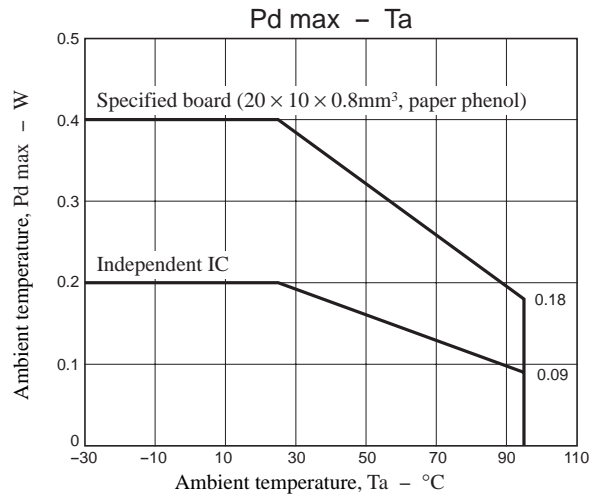
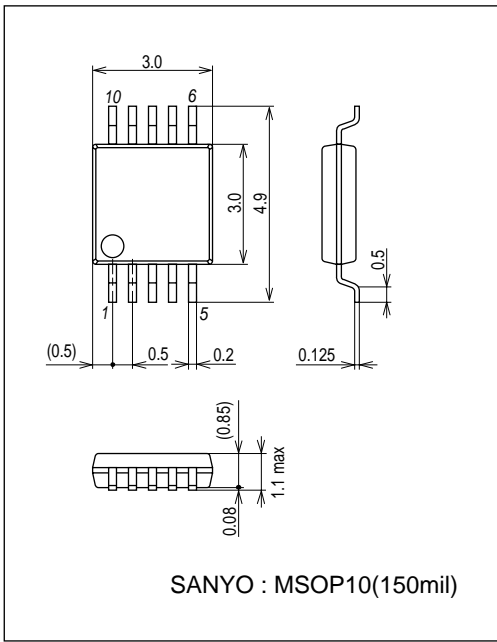
Top view

# LV8063TT

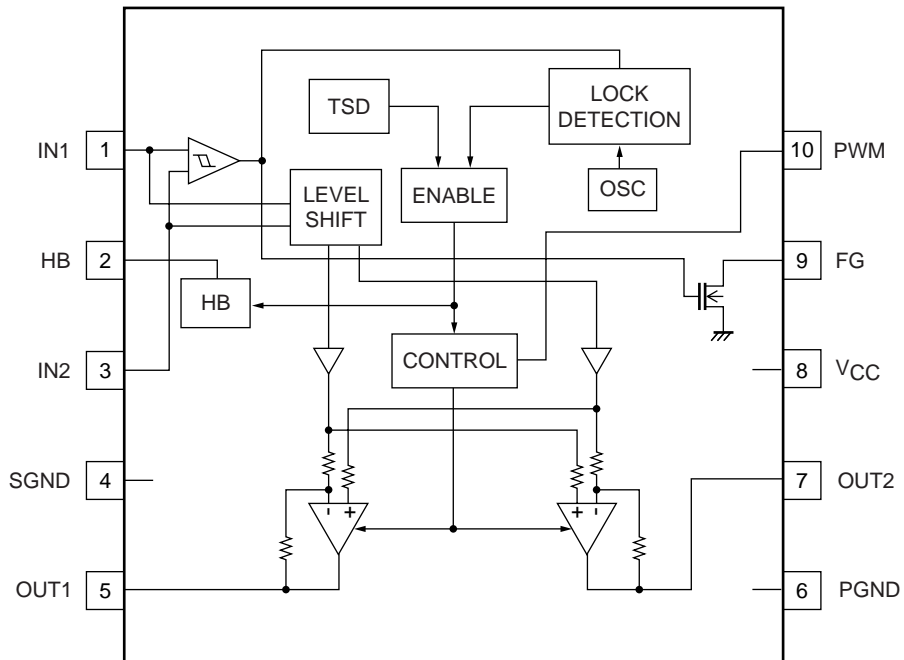
## Package Dimensions

unit : mm (typ)

3297

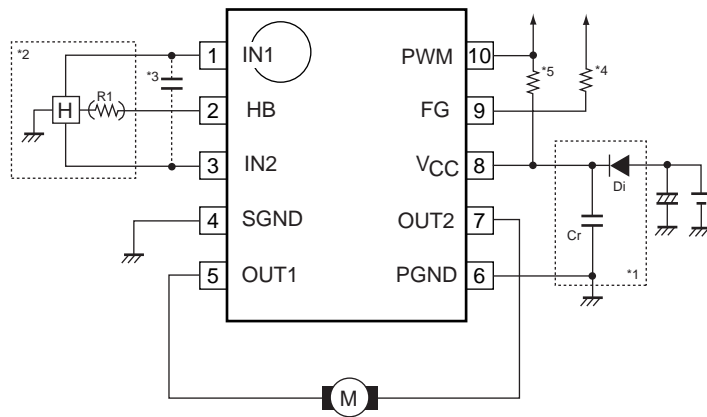


## Block Diagram



# LV8063TT

## Sample Application Circuit



- \*1 When the diode  $D_i$  is used to prevent device destruction from reverse connection, the capacitor  $C_r$  must be inserted to assure a path for regenerative currents.  
Similarly, if there no nearby capacitors on the fan power supply line, the capacitor  $C_r$  is also required to increase reliability.
- \*2 The Hall element is biased at a constant voltage of approximately 1.05V from the HB pin.  
Thus LV8063TT provides a stable Hall output with excellent temperature characteristics.  
If the Hall output is needed to adjust the amplitude, use the resistor  $R_1$  as shown in the figure.
- \*3 When the wiring from the Hall output to IC Hall input is long, noise may be carried through the wiring. In this case, insert the capacitor as shown in the figure.
- \*4 This pin must be left open if unused.
- \*5 When a PWM signal seems to be the open collector (a drain) output, please connect suitable pulling up resistance so that a H/L level is decided.

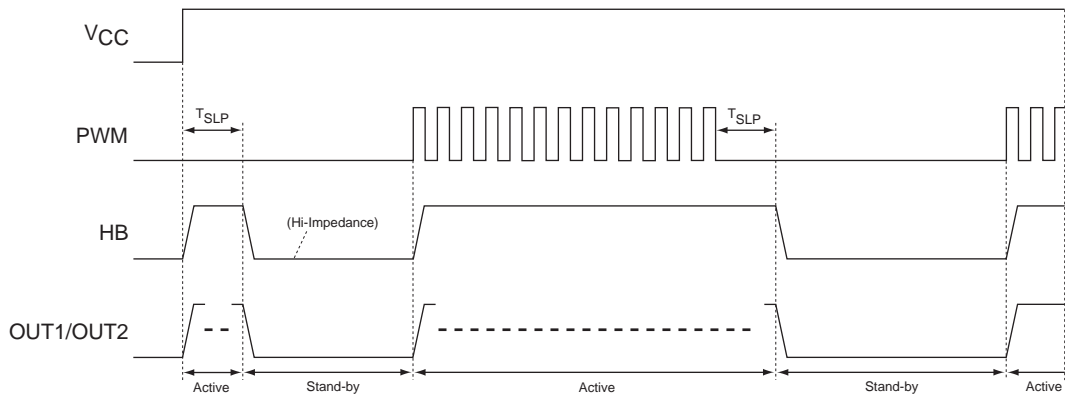
# LV8063TT

## Pin Description

| Pin No. | Pin name        | Pin voltage  | Description            | Equivalent circuit |
|---------|-----------------|--------------|------------------------|--------------------|
| 1       | IN1             | -            | Hall input pin (+)     |                    |
| 3       | IN2             |              | Hall input pin (-)     |                    |
| 2       | HB              | 1.05V (typ)  | Hall bias output pin   |                    |
| 4       | SGND            | 0V           | Signal ground pin      |                    |
| 5       | OUT1            | -            | Motor drive output pin |                    |
| 7       | OUT2            |              |                        |                    |
| 6       | PGND            | 0V           | Power ground pin       |                    |
| 8       | V <sub>CC</sub> | 2.5V to 6.0V | Voltage supply pin     |                    |
| 9       | FG              | -            | FG pulse output pin    |                    |
| 10      | PWM             | -            | PWM control input pin  |                    |

## Timing Chart

### Stand-by/Start-up

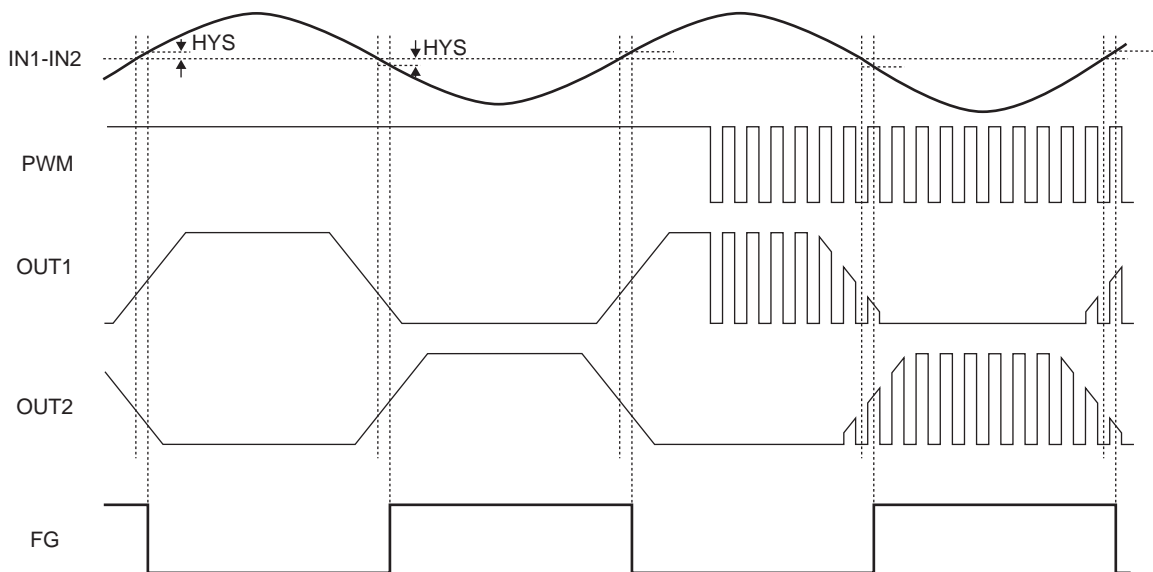


\* $T_{SLP}=800\mu s$ (typ)

\*When PWM signal is input "L" level for continuousness  $T_{SLP}$ , it becomes the Stand-by mode by detecting above situation.

\*When "H" level is input, it becomes the Active mode at once.

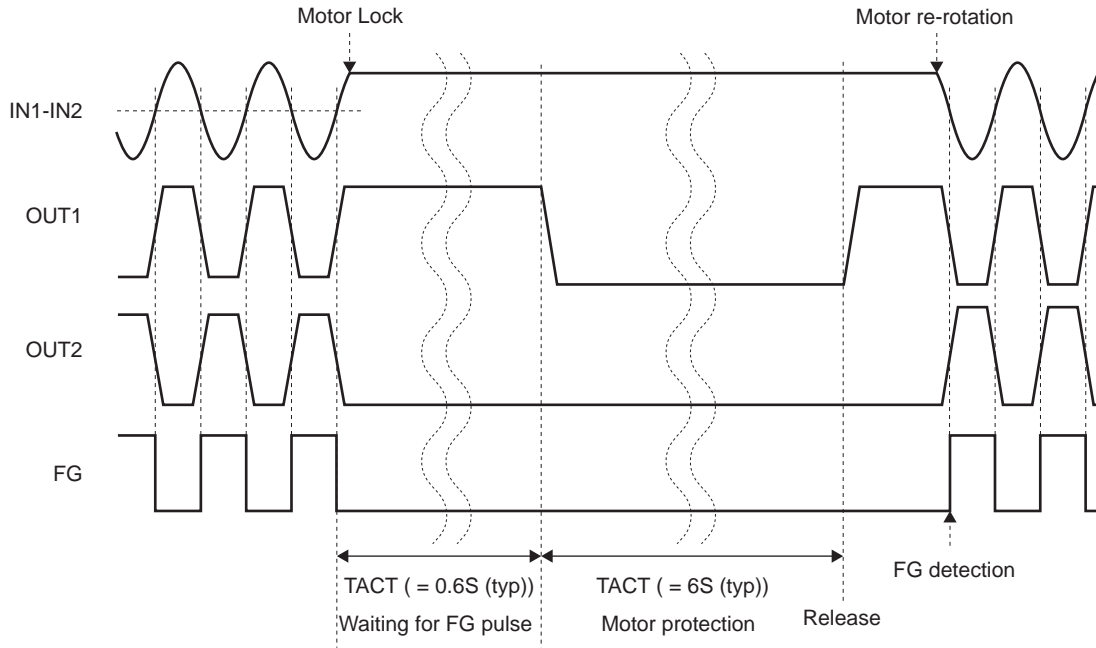
### In Regular-Rotation



\*Truth Table When Steady Rotation

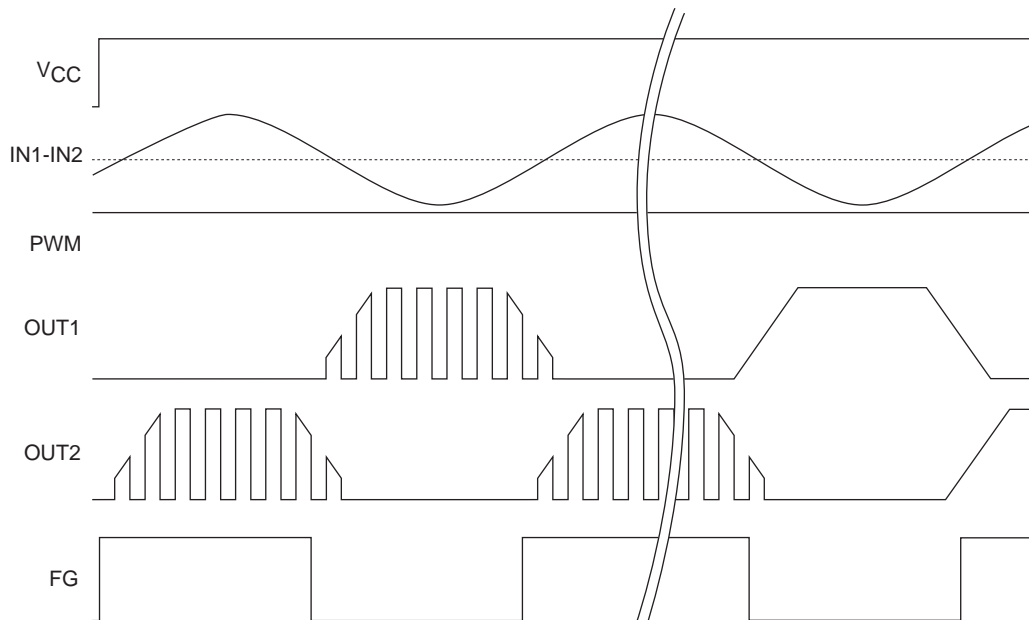
| IN1 | IN2 | *PWM | OUT1 | OUT2 | FG  | Mode         |
|-----|-----|------|------|------|-----|--------------|
| H   | L   | H    | H    | L    | L   | drive        |
|     |     | L    | L    | L    |     | regeneration |
| L   | H   | H    | L    | H    | OFF | drive        |
|     |     | L    |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

## In Motor-Lock



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

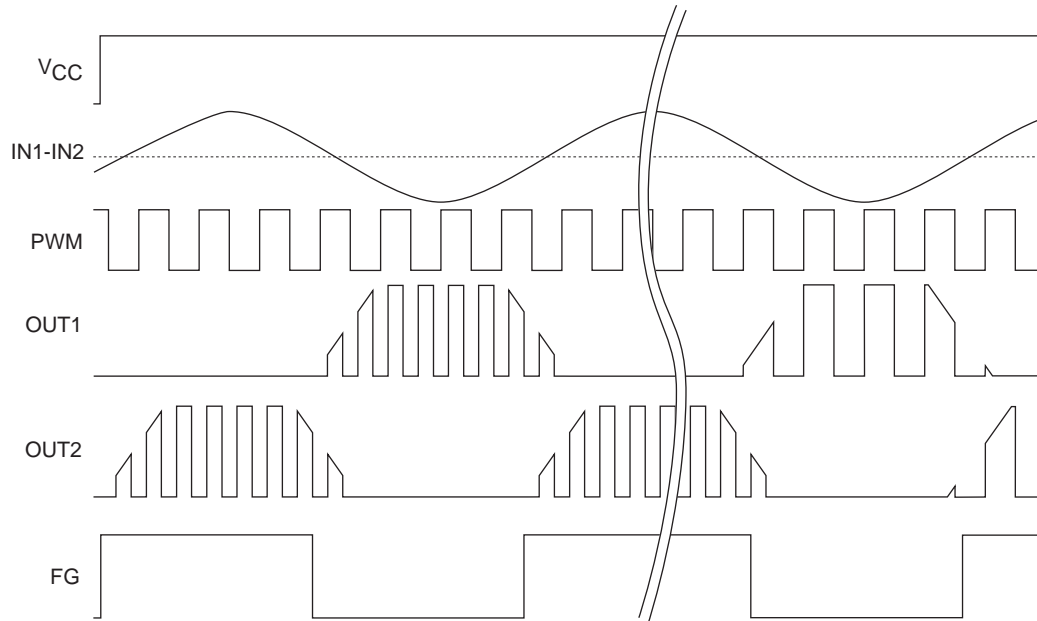
When the circuit operates making amends starting (PWM pin = H)



When the power supply is turned on, the standby release (quick start), and the lock protection is released, the start amends operation is done.

## LV8063TT

When the circuit operates making amends starting (PWM pin = PWM signal input)



When the power supply is turned on, the standby release (quick start), and the lock protection is released, the start amends operation is done.

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