Ordering number : ENA0706

SANYO Semiconductors
DATA SHEET

# LA6581CL — Monolithic Linear IC Fan Motor Driver BTL Driver Single-Phase Full-Wave

## Overview

The LA6581CL is single-phase bipolar fan motor is driven, through BTL output linear drive, at high efficiency, low power, and low sound by suppressing the reactive power. Lock protection, rotary signal (FG, RD) circuits are incorporated, which is optimum for the notebook PC, consumer equipment power supply, car audio system, CPU cooler, etc. that require high reliability and low noise.

## Functions

- Single-phase full-wave linear drive with BTL output (gain resistance 500-284k, 55dB) : Suitable for the equipment requiring silent operation, such as game equipment, CPU cooler, etc. because of its freedom from switching noise.
- Low-voltage operation possible, with wide operable voltage range (3 to 16V)
- Low saturation output (Upper + lower saturation voltage : $V_O$sat (total) = 0.3V typ, $I_O$ = 100mA) : High coil efficiency with low current drain. IC itself does not generate much heat.
- High impedance of Hall input pin
- FG output (rotation speed detection output : open collector output)
- Heat protection circuit : When the large current flows because of output short-circuit, raising the IC chip temperature above 180°C, the heat protection circuit suppresses the drive current, preventing IC burn and breakdown.
- Ultraminiature package (ECSP2828-10 : 2.8×2.8×0.8mm$^3$ typ) : Small substrate while allowing larger blades.



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# Specifications

## Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Output voltage | $V_{CC}$ max | | 18 | V |
| Allowable dissipation | Pd max | Mounted on a specified board*1 | 450 | mW |
| Output current | $I_{OUT}$ max | *2 | 0.36 | A |
| | $I_{OUT}$ max | T < 200ms | 0.50 | A |
| Output withstand voltage | $V_{OUT}$ max | | 18 | V |
| FG output withstand | $V_{FG}$ max | | 18 | V |
| FG output current | $I_{FG}$ max | | 5 | mA |
| Operating temperature | Topr | | -30 to +100 | °C |
| Storage temperature | Tstg | | -55 to +150 | °C |

*1 ; Mounted on a board (20.0×10.1×0.8mm$^3$ : Paper Phenol)

*2 ; This specifies the starting current. Tj = 150°C max must not be exceeded.

## Recommended Operating Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Supply voltage | $V_{CC}$ | | 2.2 to 16 | V |
| Common-phase input voltage range of Hall input | VICM | | 0.3 to $V_{CC}$-1.5 | V |

## Electrical Characteristics at Ta = 25°C, $V_{CC}$ = 12.0V, unless especially specified.

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Circuit current | $I_{CC}$ | $IN^-$ = 5.8V, $IN^+$ = 6.0V, RL = ∞ | | 14 | 19 | mA |
| OUT output low voltage | $V_{OL}$ | $I_O$ = 100mA | | 0.1 | 0.2 | V |
| OUT output high voltage | $V_{OH}$ | $I_O$ = 100mA | | 0.1 | 0.2 | V |
| Hall bias voltage | VHB | IHB = 5mA | 1.85 | 1.95 | 2.05 | V |
| Hall amplifier gain | Vg | | 52 | 55 | 58 | dB |
| Hall amplifier input current | VINR | | -10 | -2 | 10 | μA |
| Input offset voltage | VOFST | | | 3 | 6 | mV |
| FG output low voltage | $V_{FG}$ | $I_{FG}$ = 3mA | | 0.2 | 0.3 | V |
| FG output leakage current | $I_{FGL}$ | $V_{FG}$ = 7V | | | 30 | μA |
| Thermal protection circuit | Th | * Design guarantee | 150 | 180 | 200 | °C |

* Design guarantee : Design target. Measurement with a single unit not made.

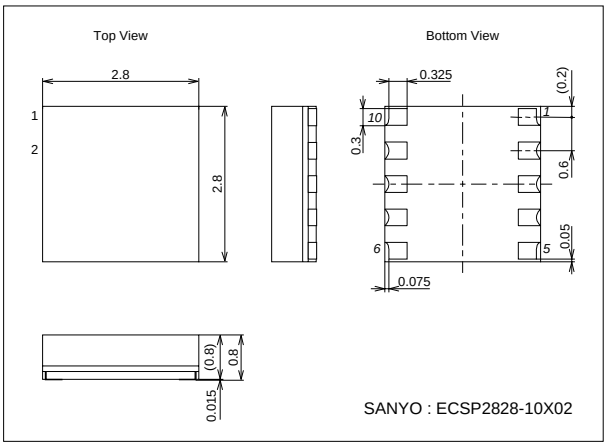
## Truth Table

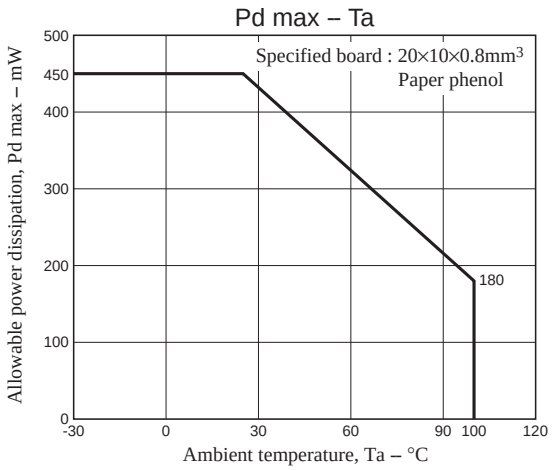
| IN- | IN+ | OUT1 | OUT2 | FG | Mode |
|---|---|---|---|---|---|
| H | L | H | L | L | During rotation |
| L | H | L | H | off | |
| - | - | off | off | - | During overheat protection |

## Package Dimensions

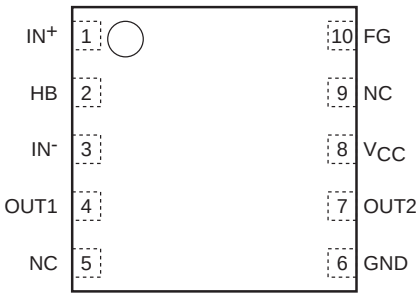
unit : mm (typ)

3301



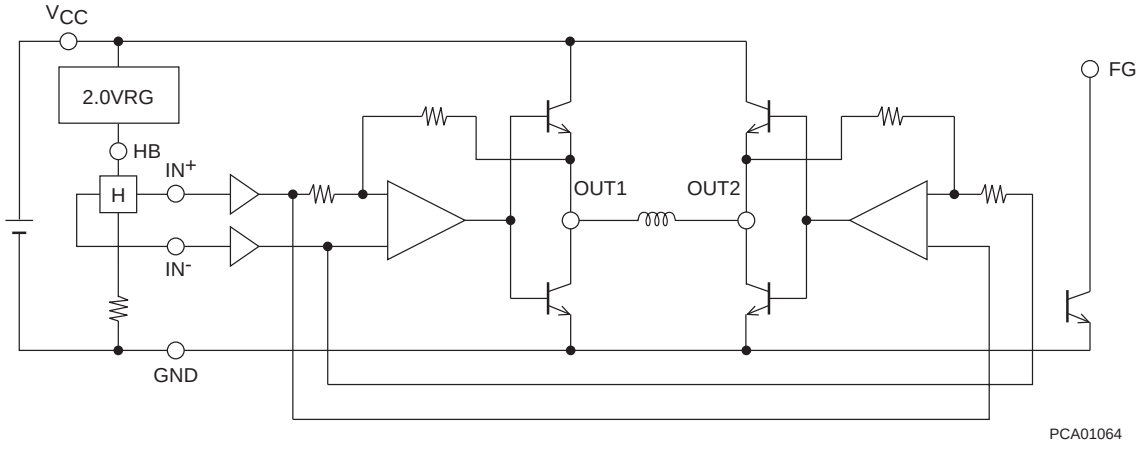




## Pin Assignment

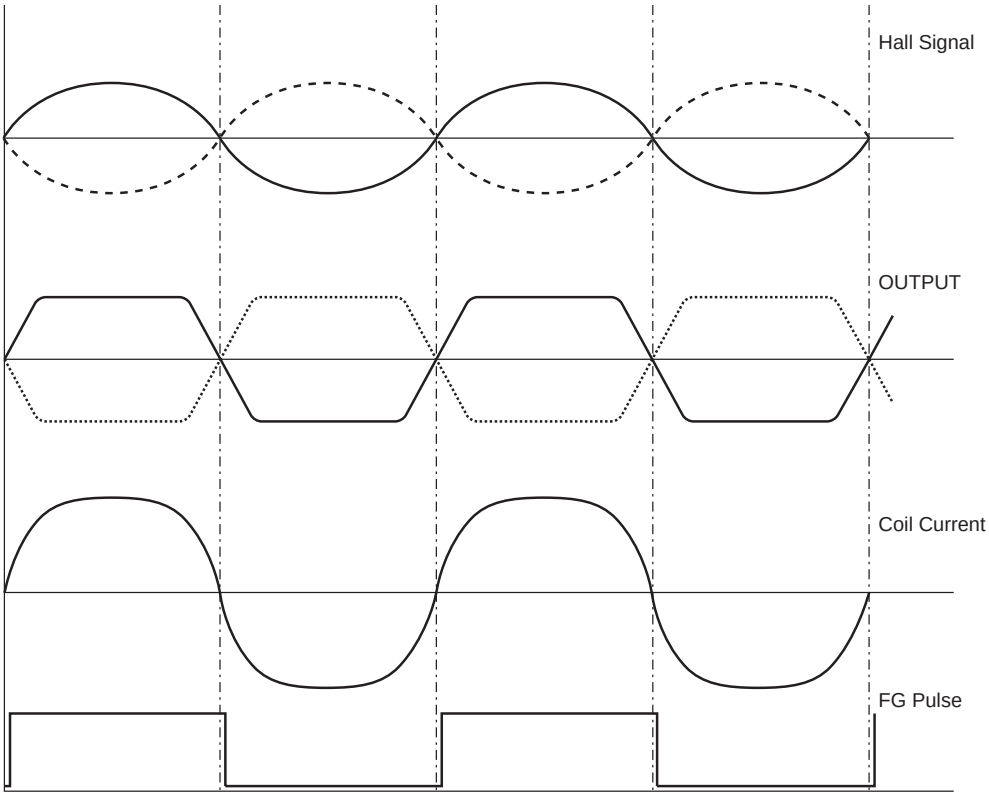



Top view

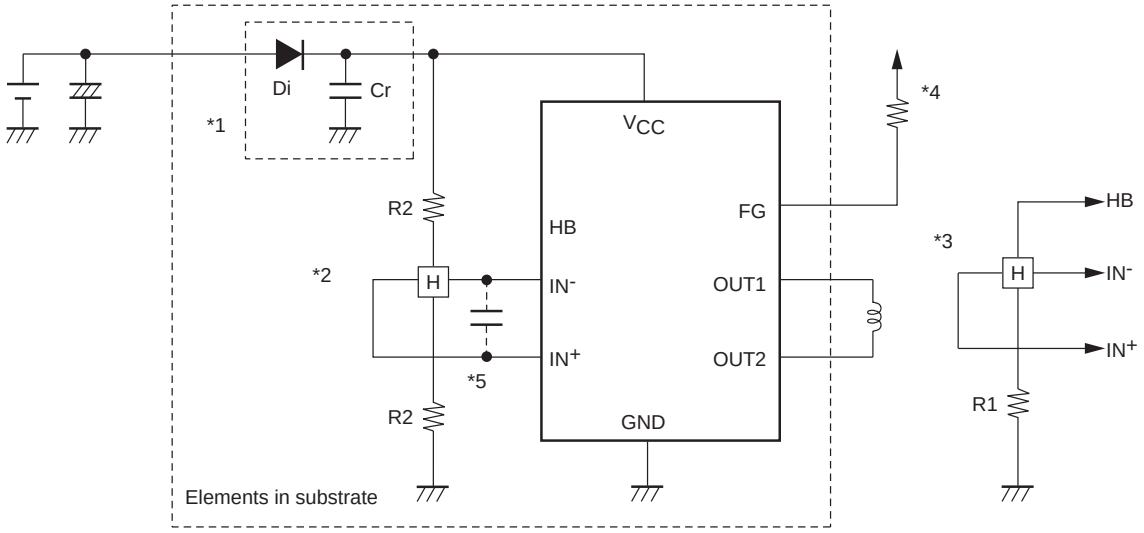
## Block Diagram



## Timing Chart



## Sample Application Circuit




*1 : When Di to prevent breakdown in case of reverse connection is used, it is necessary to insert a capacitor Cr to secure the regenerative current route. Similarly, Cr is necessary to enhance the reliability when there is no capacitor near the fan power line.

*2 : To obtain Hall bias from $V_{CC}$, carry out $1/2 \times V_{CC}$ bias as shown in the figure. Linear driving is made through voltage control of the coil by amplifying the Hall output. When the Hall element output is large, the startup performance and efficiency are improved. Adjustment of the Hall element can reduce the noise further.

*3 : When the Hall bias is taken from the HB pin, constant-voltage bias is made with about 2.0V. Therefore, the Hall element can provide the output satisfactory in temperature characteristics. Adjustment of the Hall output amplitude is made with R1. (When $V_{CC}$ = 12V, the step *2 above proves advantageous for IC heat generation.)

*4 : Keep this open when not used.

*5 : When the wiring from the Hall output to IC Hall input is long, noise may be carried through the wiring.