



SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## Monolithic Digital IC

# LB11964FA — Single-Phase Full-Wave Fan Motor Driver

### Overview

The LB11964FA is a single-phase bipolar drive fan motor driver.

### Features

- Single-phase full-wave drive
- Built-in regeneration circuit allows the use of reverse connection prevention diodes
- Built-in thermal shutdown circuit

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum output voltage	$V_{CC\ max}$		15	V
Maximum output current	$I_{OUT\ max}$		0.5	A
Maximum output voltage	$V_{OUT\ max}$		15	V
FG pin maximum output voltage	$V_R\ max$		15	V
FG maximum output current	$I_R\ max$		5	mA
Allowable power dissipation	$P_d\ max$	When mounted on a circuit board *	400	mW
Operating temperature range	$T_{opr}$		-30 to +85	$^\circ\text{C}$
Storage temperature range	$T_{stg}$		-55 to +150	$^\circ\text{C}$

\* Specified circuit board :  $20.0 \times 10.0 \times 0.8\text{mm}^3$ , paper phenol, wiring density: 20%.

Caution 1) Absolute maximum ratings represent the value which cannot be exceeded for any length of time.

Caution 2) Even when the device is used within the range of absolute maximum ratings, as a result of continuous usage under high temperature, high current, high voltage, or drastic temperature change, the reliability of the IC may be degraded. Please contact us for the further details.

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# LB11964FA

## Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		3.5 to 13.8	V
Hall sensor input common-mode input voltage range	V <sub>ICM</sub>		0.2 to V <sub>CC</sub> - 1.5	V

## Electrical Characteristics Unless otherwise specified Ta = 25°C, V<sub>CC</sub> = 5V

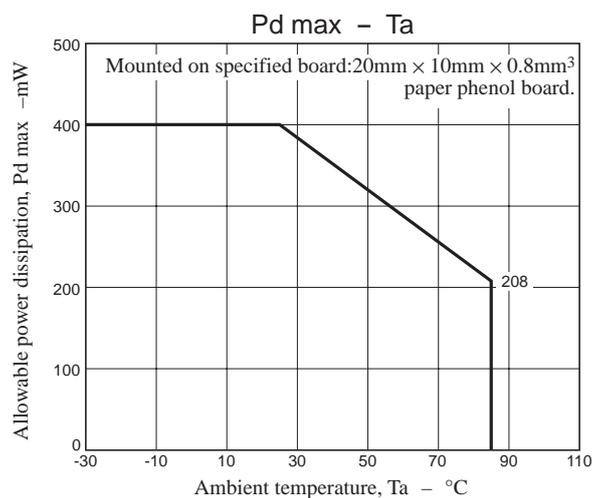
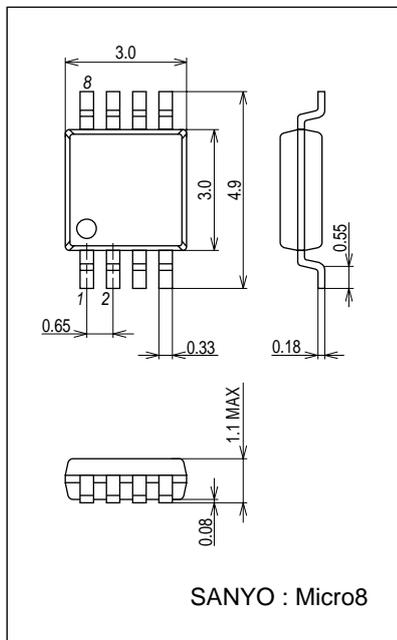
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	I <sub>CC</sub>	Drive mode (CT = L)		9.0	14	mA
		Lock protection mode (CT = H)		3.0	5.0	mA
Lock detection capacitor charge current	I <sub>CT1</sub>	V <sub>CT</sub> = 0.2V	1.1	1.8	2.6	μA
Capacitor discharge current	I <sub>CT2</sub>	V <sub>CT</sub> = 3.2V	0.15	0.25	0.40	μA
Capacitor charge/discharge current ratio	R <sub>CT</sub>	R <sub>CD</sub> = I <sub>CT1</sub> /I <sub>CT2</sub>	5.0	7.0	9.0	-
CT charge current	V <sub>C1</sub>		2.6	2.9	3.2	V
CT discharge current	V <sub>C2</sub>		1.5	1.8	2.1	V
Output low-level voltage	V <sub>OL</sub>	I <sub>O</sub> = 200mA		0.2	0.3	V
Output high-level voltage	V <sub>OH</sub>	I <sub>O</sub> = 200mA	3.9	4.1		V
Hall sensor input sensitivity	V <sub>HN</sub>	Zero peak value (including offset and hysteresis)		7	15	mV
FG output pin low-level voltage	V <sub>RD</sub>	I <sub>RD</sub> = 5mA		0.1	0.3	V
FG output pin leakage current	I <sub>RDL</sub>	V <sub>RD</sub> = 7V			30	μA
Thermal shutdown operating temperature	T <sub>SD</sub>	Design target value*	150	180	210	°C

\* The design specification items are design guarantees and are not measured.

## Package Dimensions

unit : mm (typ)

3427



# LB11964FA

## Truth Table

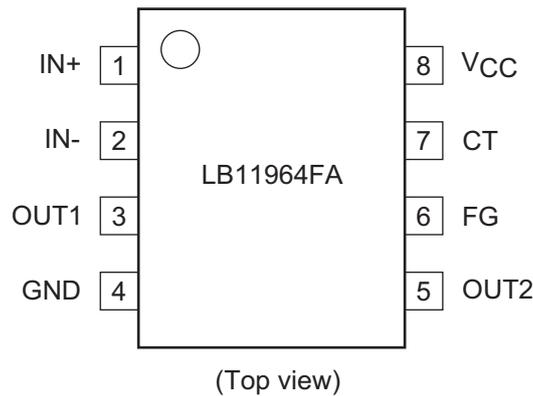
IN+	IN-	CT	OUT1	OUT2	FG	Mode
High	Low	Low	Low	High	Off	When the motor is turning (*1)
Low	High	Low	High	Low	Low	
-	-	High	Off	Off	Off	During lock protection operation (*2)
-	-	-	Off	Off	-	During thermal protection circuit operation

\*1: An FG signal at a frequency corresponding to the phase switching operation is output.

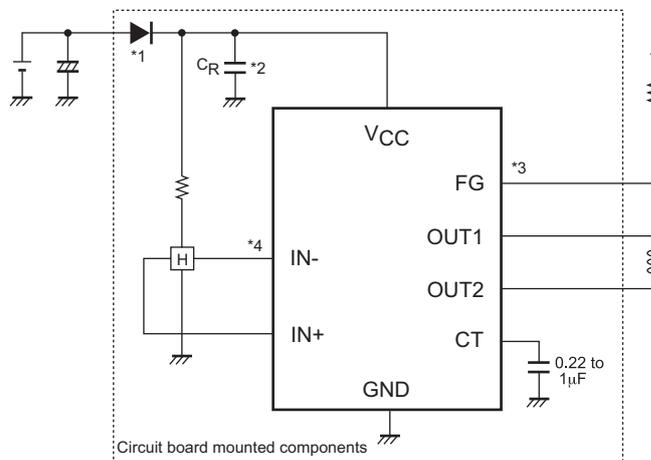
This IC is pin compatible with the LB11963T, which provides a built-in function for dividing the FG output frequency by 2 to handle 8-pole motors.

\*2: In restart mode (output on) when a rotor constrained state was detected, the FG output operates in the same way as during normal operation, and differs depending on the rotor position.

## Pin Assignment



## Application Circuit Example



\*1: The diode  $D_1$  prevents destruction of the IC if the power supply is connected with reverse polarity. Since this IC includes a regeneration circuit, this IC recovers the coil current in the low side pnp output transistors and suppresses kickback, even when the diode  $D_1$  is used.

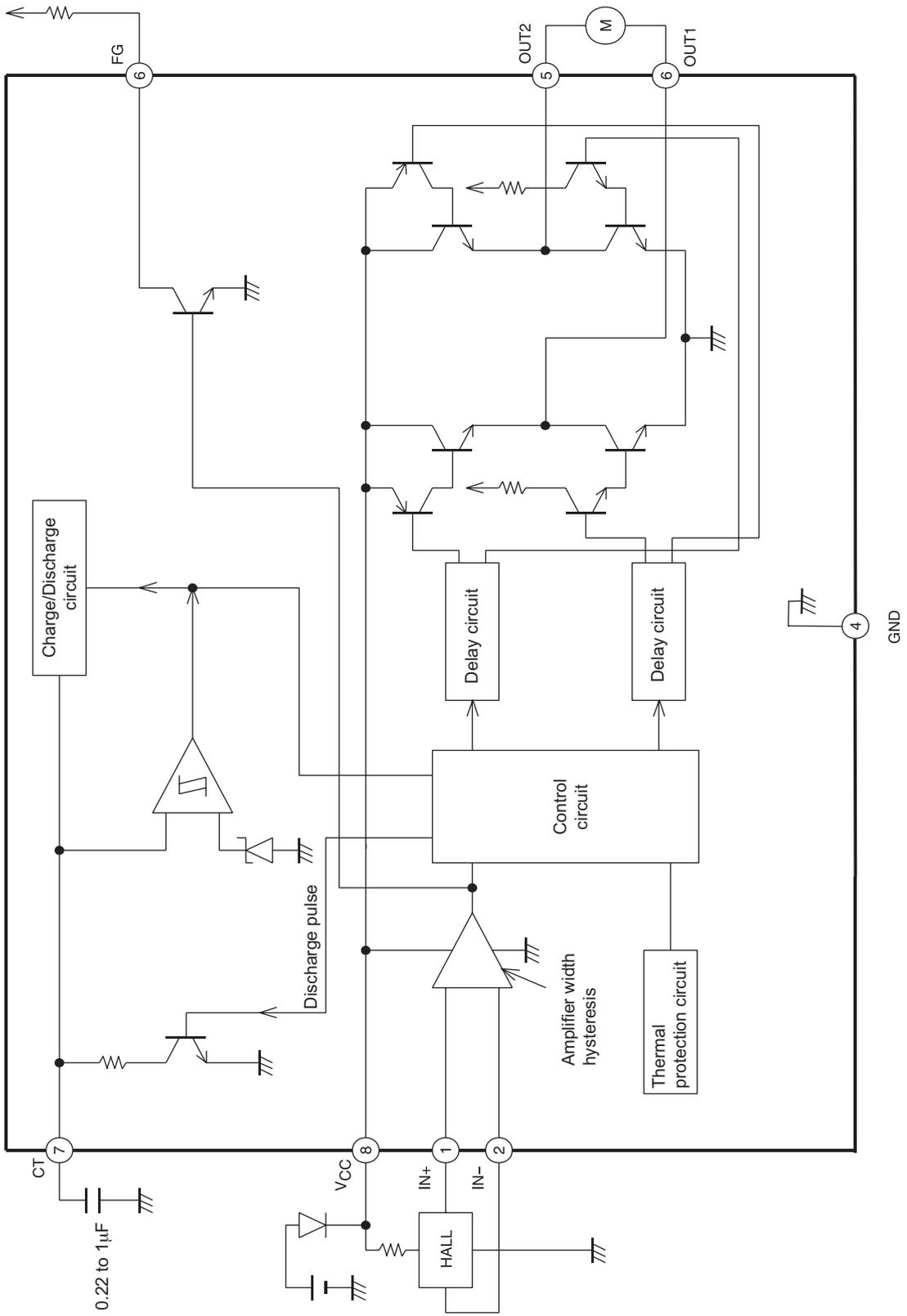
This diode may be omitted if there is no chance of reverse connection problems occurring, for example, if a power supply connector is used.

\*2: This capacitor is required for rectification if power supply PWM is used for speed control.

\*3: This pin must be left open if unused.

\*4: Although chattering prevention measures, such as adopting a non-interfering pin assignment and providing hysteresis in the Hall sensor amplifier, these lines must be made as short as possible to make the circuit more resistant to noise.

Block Diagram



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