



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	$VR\ max$		15	V
FG maximum output current	$IR\ max$		5	mA
Allowable power dissipation	$Pd\ max$	When mounted on a circuit board *	400	mW
Operating temperature range	$Topr$		-30 to +85	$^\circ\text{C}$
Storage temperature range	$Tstg$		-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.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment. The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for new introduction or other application different from current conditions on the usage of automotive device, communication device, office equipment, industrial equipment etc. , please consult with us about usage condition (temperature, operation time etc.) prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

# 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

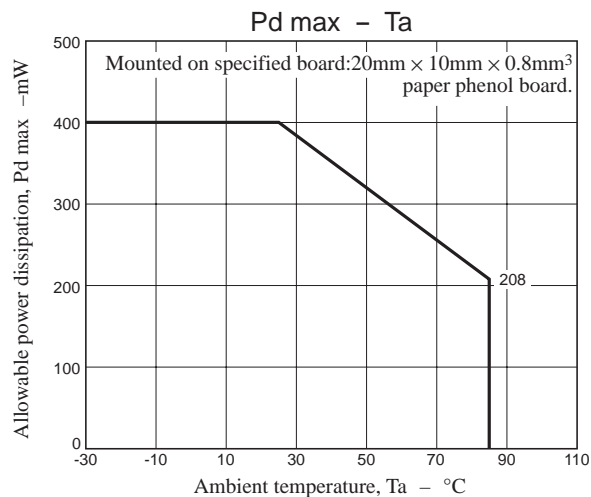
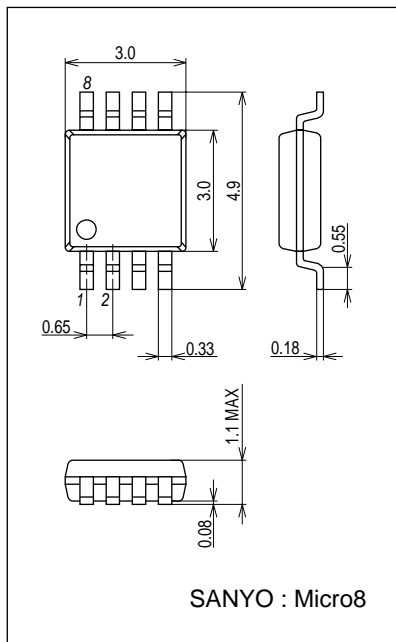
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	I <sub>CC</sub>	Drive mode (CT = L)		9.0	14	mA
		Lock protection mode (CT = H)		3.0	5.0	mA
Lock detection capacitor charge current	I <sub>CT1</sub>	V <sub>CT</sub> = 0.2V	1.1	1.8	2.6	μA
Capacitor discharge current	I <sub>CT2</sub>	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

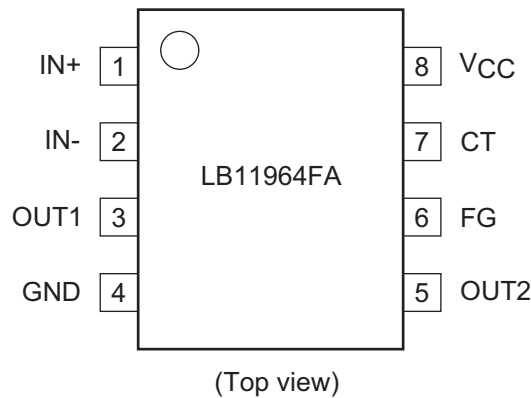
IN+	IN-	CT	OUT1	OUT2	FG	Mode
High	Low	Low	Low	High	Off	When the motor is turning (*1)
Low	High	Low	High	Low	Low	
-	-	High	Off	Off	Off	During lock protection operation (*2)
-	-	-	Off	Off	-	During thermal protection circuit operation

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

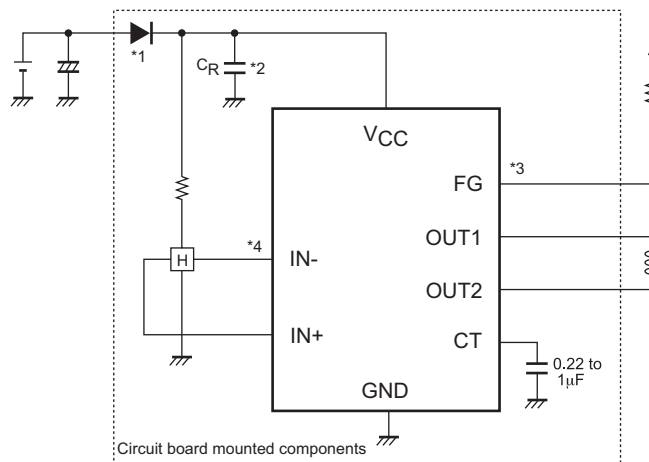
This IC is pin compatible with the LB11963T, which provides a built-in function for dividing the FG output frequency by 2 to handle 8-pole motors.

\*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  $D_i$  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  $D_i$  is used.

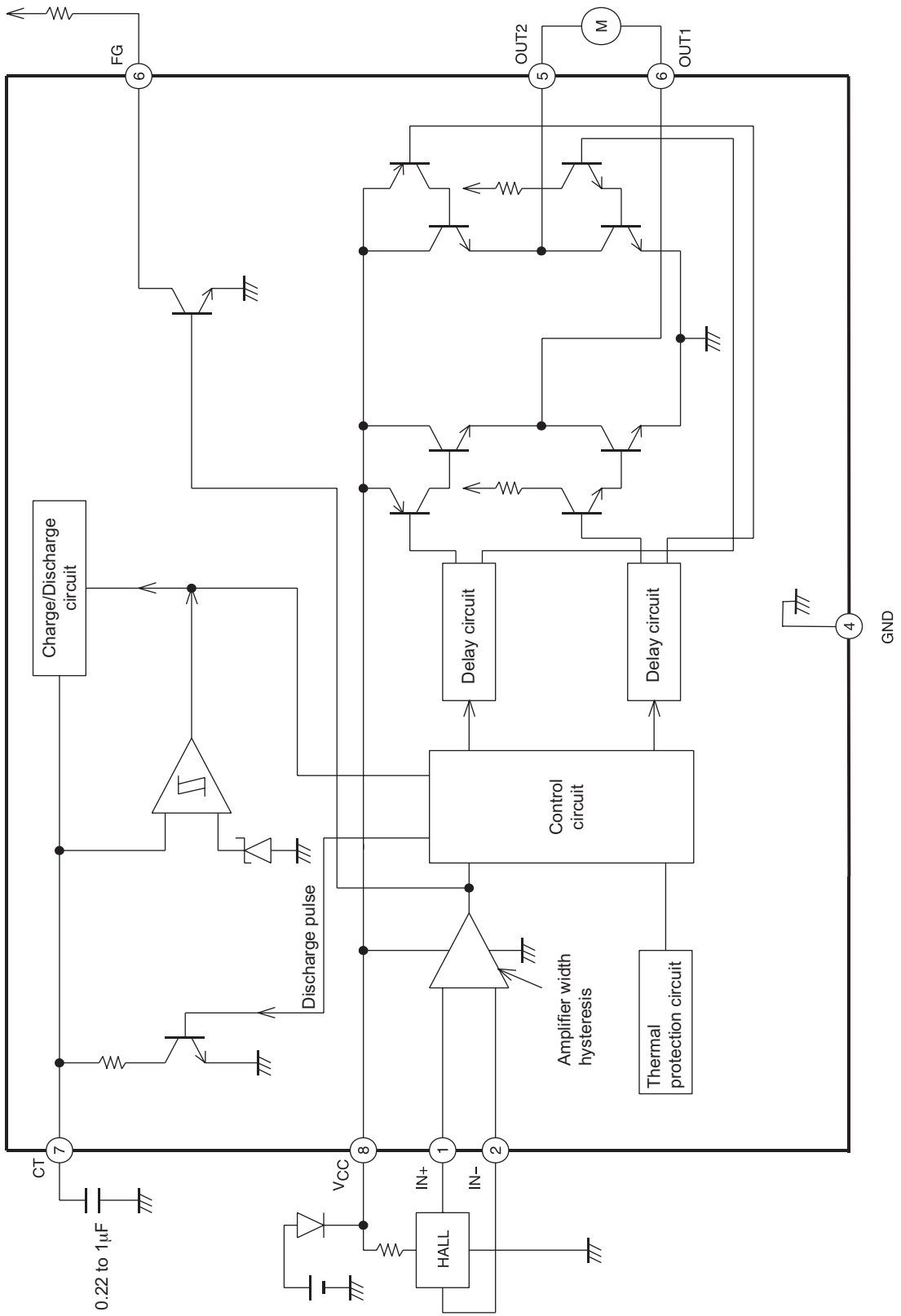
This diode may be omitted if there is no chance of reverse connection problems occurring, for example, if a power supply connector is used.

\*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



- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- Regarding monolithic semiconductors, if you should intend to use this IC continuously under high temperature, high current, high voltage, or drastic temperature change, even if it is used within the range of absolute maximum ratings or operating conditions, there is a possibility of decrease reliability. Please contact us for a confirmation.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of July, 2012. Specifications and information herein are subject to change without notice.



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.