Ordering number: ENA2092

LB11851FA

Monolithic Digital IC

Microprocessor Fan Motor Interface Driver

ON Semiconductor®

http://onsemi.com

Overview

The LB11851FA provides an interface between a microcontroller motor control signal and external MOS transistors. This device can implement a microprocessor fan driver with a minimal number of external components. The LB11851FA is optimal for server and personal computer microprocessor fan drive in response to temperature or other external signals when high precision and high air flow are required.

Features

- Fan motor interface driver function (FGIN)
  ⇒ This IC accepts a signal from a microcontroller and interfaces to external power transistors (PMOS and NMOS) to provide high-efficiency low-power single-phase full-wave drive.
- Variable speed input pin (PWMIN)
  ⇒ PMOS side PWM control
  NMOS side current regeneration using slow decay is used to achieve quite high-speed control.
- Built-in kickback absorption circuit (OUT1P/2P)
  ⇒ This circuit absorbs the kickback current that is generated at phase switching or power on/off to achieve smooth current regeneration and protect the external transistors against destruction or degradation.
- Built-in current limiter circuit (SENSE)
  ⇒ This circuit implements a chopper-type current limiting control that operates at startup and during lock protection mode.
  The current detection voltage is set to a fixed 0.2V internally.
- Built-in microcontroller power supply (5VREG)

May, 2013

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		18	V
OUTN pin maximum output current	IOUTN max		20	mA
OUTP pin maximum output current	IOUTP max		20	mA
OUT pin voltage handling capacity	VOUT max		18	V
5VREG maximum output current	I5VREG max		20	mA
Allowable power dissipation	Pd max	When mounted on the specified circuit board *1	400	mW
Operating temperature	Topr	*2	-40 to +90	°C
Storage temperature	Tstg		-55 to +150	°C

*1 Specified substrate :20.0mm ×10.0mm ×0.8mm, Paper phenol board.

*2 Do not exceed Tj max = 150°C

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.

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

Recommended Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage - V_{CC}	V_{CC}		6 to 16	V
PWM high-level input voltage range	VPWMINH		2.1 to 5.0	V
PWM low-level input voltage range	VPWMINL		0 to 0.4	V
FGIN high-level input voltage range	VFGINH		2.1 to 5.0	V
FGIN low-level input voltage range	VFGINL		0 to 0.3	V
SENSE input voltage range	VSENop		0 to 5.0	V

Electrical Characteristics at Ta = 25°C, V_{DD} = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	$I_{CC}1$	With no load	3.5	5	6.5	mA
5VREG voltage	5VREG	5VREG = 10mA	4.8	5	5.2	V
SENSE pin detection voltage	VSENth		0.15	0.19	0.23	V
FGIN high-level input current	FGIhi	V_{IN} = 3V	60	80	100	µA
FGIN low-level input current	FGIlow	V_{IN} = 0V	-27	-21	-15	µA
PWMIN high-level current	PWMIhi	V_{IN} = 3V	35	45	55	µA
PWMIN low-level current	PWMIlow	V_{IN} = 0V	-27	-21	-14	µA
OUT1P, OUT2P high-level output voltage	V_O12PH	I_O = 10mA *2	10	11	11.9	V
		I_O = 1mA *2	11	11.3		V
OUT1P, OUT2P low-level output voltage	V_O12PL	I_O = 10mA *2	3	4	5	V
		I_O = 1mA *2		1.2	1.5	V
OUT1N, OUT2N high-level output voltage	V_O12NH	I_O = 10mA *1	9	10	11.9	V
		I_O = 1mA *1	10.8	11.1		V
OUT1N, OUT2N low-level output voltage	V_O12NL	I_O = 10mA *1	0.1	1	2	V
		I_O = 1mA *1		0.7	1	V

*1 : There is a built-in 100Ω gate protection resistor. *2 : There is a built-in 300Ω gate protection resistor.

Truth Table

FGIN	PWMIN	SENSE	OUT1P	OUT1N	OUT2P	OUT2N	Mode
L	L	L	L	L	H	H	OUT1 → 2 drive
H			H	H	L	L	OUT2 → 1 drive
L	H	L	H	L	H	H	Regeneration mode (low side regeneration)
H			H	H	H	L	
L	L	H	H	L	H	H	Current limiter (low side regeneration)
H			H	H	H	L	

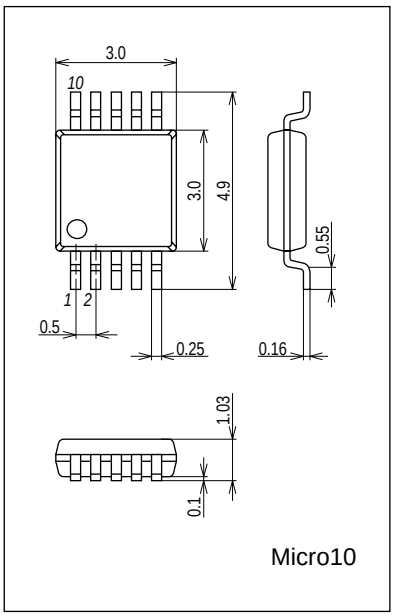
Note 1 : For the SENSE pin, the "H" state is 0.2V or higher.

Note 2 : The IC goes to regeneration mode (no motor drive applied) when the microcontroller is reset (the output high-impedance state).

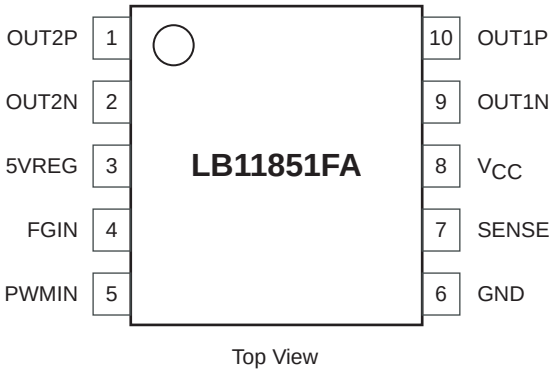
Package Dimensions

unit : mm (typ)

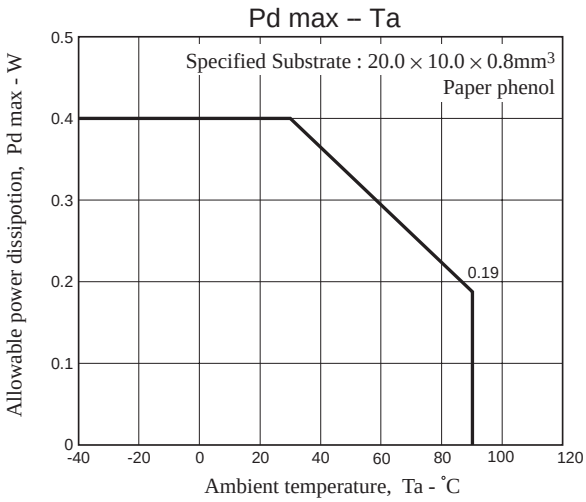
3428



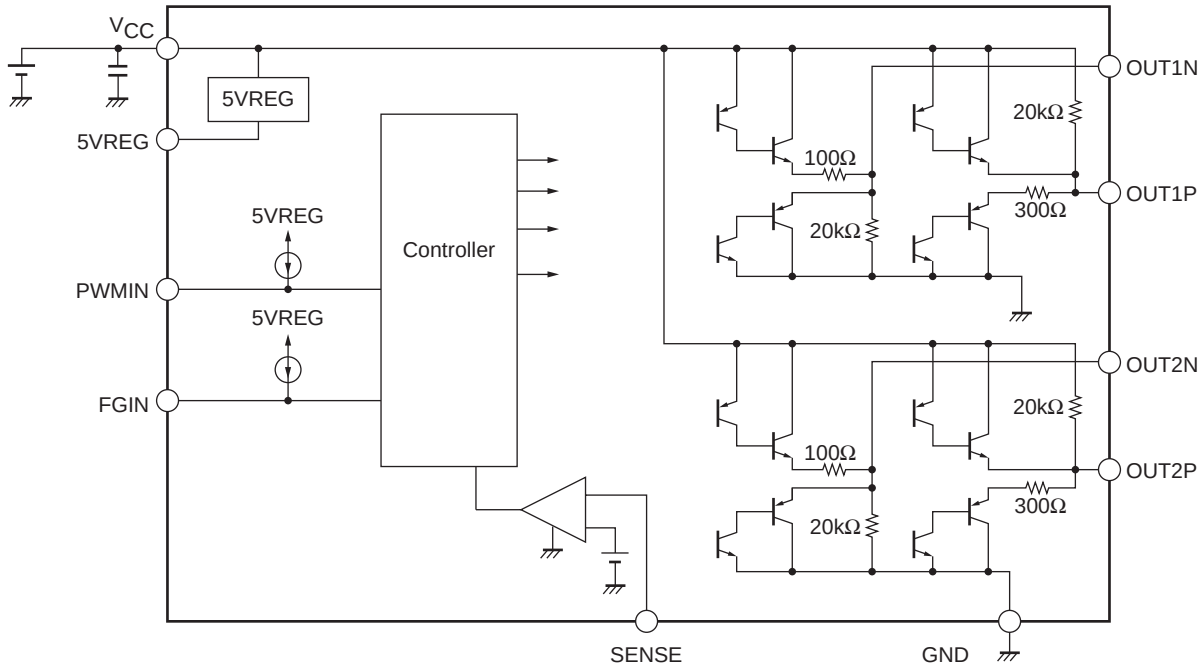
Pin Assignment



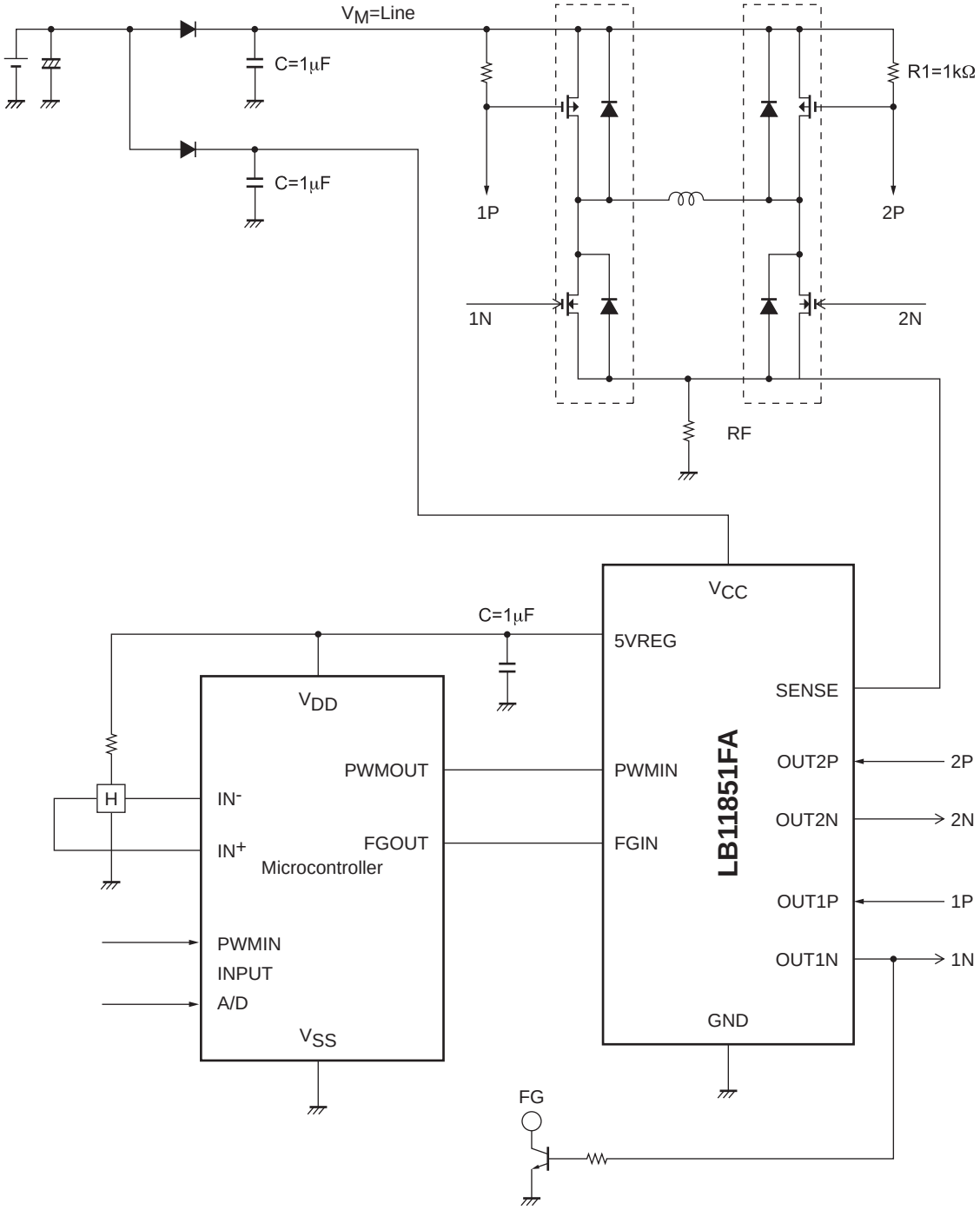
Top View



Block Diagram



Application Circuit Example (12V)



1. Power supply (V_{CC} and V_M) and ground
   The wiring is separated into the control IC side (V_{CC} line) and the motor output side (V_M line) by the diode DI, which protects the IC from destruction on reverse connection. The application circuit uses 1μF capacitors to prevent line oscillation when kickback occurs. Similarly, 1μF capacitors are also used on the V_{CC} line for power supply line stabilization.

2. PWMIN
   The LB11851M accepts an open-drain output signal from the microcontroller with this pin and controls the on/off states of the PMOS transistor (OUT1P and OUT2P) outputs accordingly. A constant-current bias is provided from 5VREG internally to the IC.

3. FGIN
   The LB11851M accepts a CMOS output from the microcontroller with this pin and determines the drive phase output (OUT1P, OUT2P, OUT1N, or OUT2N).

4. 5VREG
   This is the power supply for the microcontroller, Hall effect sensors, and other circuits. A capacitor with a value of 1μF is used for output stabilization. This pin has an output current capacity of 20mA.

5. SENSE
   A sensing resistor is used for current detection. If the SENSE pin voltage exceeds 0.2V, the PMOS transistors are turned off and only low side regeneration is performed.

*<OUT1, 2P output H voltage / OUT1, 2N output L voltage>
Output L voltage of OUT1 and 2 sticks in GND when FET is put up outside like the example of applied circuit by internal pull-down resistor (20KΩ), and there is no what turns on FET.
Output H voltage of OUT1 and 2 sticks in VCC with internal pull-up resistor (20kΩ) as the Pch side is also similar.