Ordering number : ENA2023

LB11861MC

Monolithic Digital IC

Single-Phase Full-Wave Fan Motor Driver

ON Semiconductor®

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Overview

The LB11861MC is a single-phase bipolar drive motor driver that easily implements direct PWM motor drive systems with excellent efficiency. The LB11861MC is optimal for fan motor drive in personal computer power supply systems and CPU cooling fan systems.

Features

- Single-phase full-wave drive (16V, 1.2A transistors are built in)
- External PWM control pin incorporated (f=16k to 50kHz)
  External PWM signal DUTY control to enable speed control to stop, medium speed, and full speed
  Slow-Decay regeneration to enable low power consumption and high-efficiency rotation control
- Soft switching circuit incorporated
  Soft-SW circuit achieving small loss, low noise, and low vibration at a time of phase shift
- Built-in regenerative diode (Di); only requires a minimal number of external components.
- Built-in lock protection and automatic recovery circuits
- FG (speed detection) outputs incorporated
- Built-in thermal shutdown circuit.

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
V_{CC} maximum output voltage	V_{CC} max		18	V
OUT pin maximum output current	I_{OUT} max		1.2	A
OUT pin output voltage	V_{OUT} max		18	V
PWM-IN input pin voltage	VPWM-IN max		V_{CC}	V
FG output pin output voltage	VFG max		18	V
FG output current	IFG max		10	mA
Allowable power dissipation	Pd max	When mounted on a circuit board *1	0.8	W
Operating temperature	Topr		-30 to +90	°C
Storage temperature	Tstg		-55 to +150	°C

*1 Specified circuit board : 114.3 × 76.1 × 1.6mm^3, glass epoxy.

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 Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
V_{CC} supply voltage	V_{CC}		4.5 to 16	V
VPWM-IN input H voltage range	VPWM-IN-H		2.5 to V_{CC}	V
VPWM-IN input L voltage range	VPWM-IN-L		0 to 1	V
Hall sensor input common-mode input voltage range	VICM		0.2 to 3	V

Electrical Characteristics Unless otherwise specified Ta = 25°C, V_{CC} = 12V

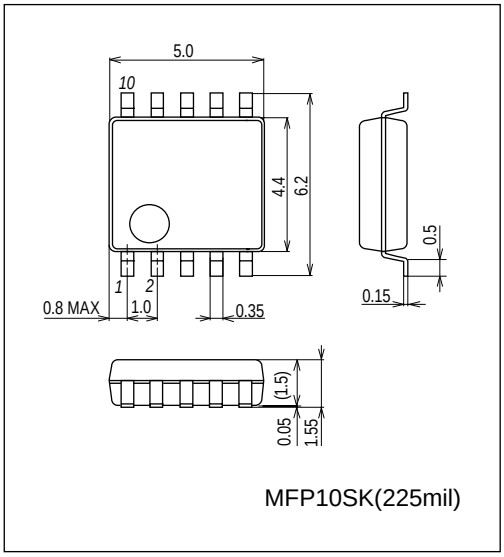
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Circuit current	$I_{CC}1$	Drive mode	15	24.5	29	mA
	$I_{CC}2$	Lock protection mode	6	11	16	μA
CT pin high-level voltage	VCTH		3.45	3.6	3.75	V
CT pin low-level voltage	VCTL		1.4	1.55	1.7	V
ICT charge current	ICT1		1.7	2.2	2.8	μA
ICT discharge current	ICT2		0.17	0.22	0.28	μA
ICT charge/discharge current ratio	RCT		8	10	11.5	
OUT output low saturation voltage	V_{OL}	I_O = 200mA		0.2	0.3	V
OUT output high saturation voltage	V_{OH}	I_O = 200mA		0.9	1.1	V
Hall sensor input sensitivity	VHN	Zero peak value (including offset and hysteresis)		10	20	mV
PWM-IN input current	IPIN	PWM-IN=0V			-10	μA
RD/FG output pin low-level voltage	VRDL/FGL	IRD/FG = 5mA		0.2	0.3	V
RD/FG output pin leakage current	IRDL/FGL	VRD/FG = 7V			30	μA
Heat protection circuit	THD	(*2) Design target			180	°C

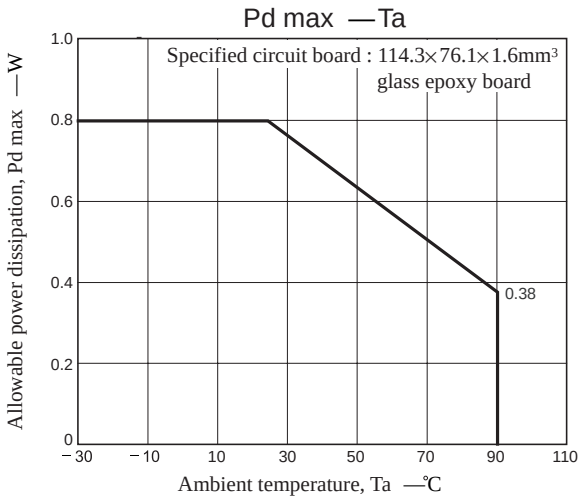
(*2) The standard is a design target value and measurement with the single piece has not been made.

Package Dimensions

unit : mm (typ)

3420

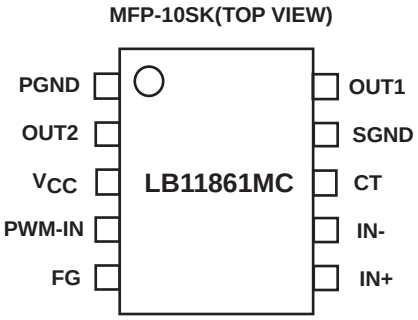




Truth Table

PWM-IN	IN-	IN+	CT	OUT1	OUT2	FG	Mode
High	High	Low	Low	High	Low	Low	During rotation – drive
	Low	High		Low	High	Off	
Low	High	Low		Off	Low	Low	During rotation – regeneration
	Low	High		Low	Off	Off	
-	High	Low	High	High	Off	Low	Lock protection
-	Low	High		Off	High	Off	

Pin Assignment

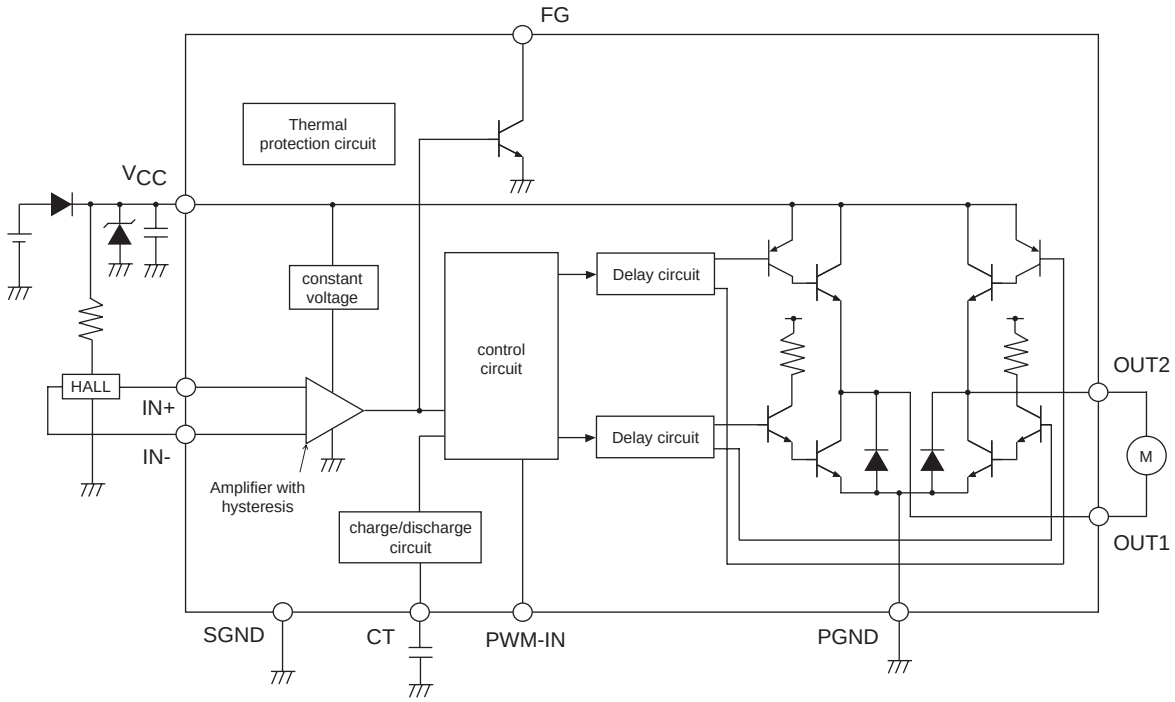


V_{CC}: Common power supply for motor and control systems

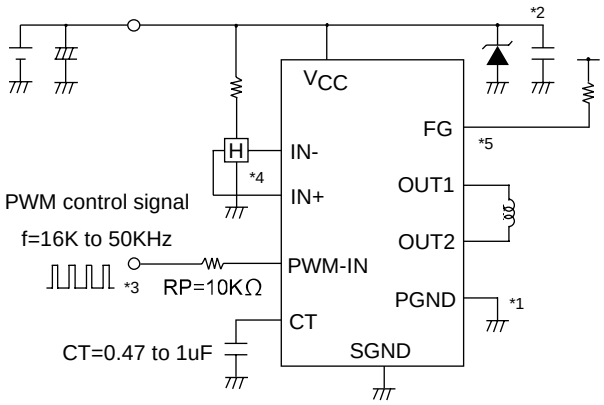
PGND: Motor system GND

SGND: Control system GND

Block Diagram



Application Circuit Example



*1. **Power supply and ground lines**

P-GND is connected to the motor power supply system and S-GND is connected to the control circuit power supply system. These two systems should be formed from separate lines and the control system external components should be connected to S-GND.

*2. **Regeneration power supply stabilization capacitor**

The capacitor CM provides power supply stabilization for both PWM drive and kickback absorption. A capacitor with a value of over 1 to 10μF is used for CM. Insert the zenor diode for kickback protection between VCC and GND. Since this IC adopts a technique in which switching is performed by the high side transistor and regeneration is handled by the low side transistor, the pattern connecting CM to VM and P-GND must be as wide and as short as possible.

*3. **PWM-IN pin**

This is for speed control with the external PWM signal. With driving at the input of “H” and regeneration (Slow-Decay) at the input of “L”, high efficiency rotation control can be made. RP=10kΩ is the current limiting resistor for protection. Though the input signal frequency range is 0 to 50 kHz, 16 k to 50 kHz is recommended. Rotation can be stopped by inputting “L”.

*4. **Hall sensor input**

Lines that are as short as possible must be used to prevent noise from entering the system. The Hall sensor input circuit consists of a comparator with hysteresis (20mV). We recommend that the Hall sensor input level be at least three times this hysteresis, i.e. at least 60mVp-p.

*5. **FG output**

This is an open collector output, and a rotation count detection function can be implemented using this FG output, which corresponds to the phase switching. This pin must be left open if unused.

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