



# Fan Motor 2-Phase Half-Wave Driver

#### Overview

The LB1967M is a brushless motor driver IC for 2-phase halfwave drive well suited for compact fan motor for communication and office equipment, etc.

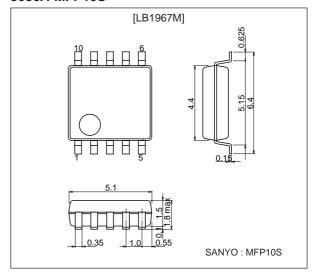
## **Features**

- Dual power supply voltage design (5/12V) and wide voltage handling range
- Built-in Hall amplifier with hysteresis (supports core without auxiliary electrode)
- Built-in lockup protection and automatic recovery circuits (External capacitor for rotation detection need only be 0.1 μF, allowing compact, cost-saving design)
- Built-in FG output (Vosat = 0.2Vtyp at  $I_O = 5$  mA)
- Built-in output transistor with output withstand voltage 24Vmin/output current 500 mA (average), 1.2A (peak)
- · Built-in thermal protection circuit
- Compact, high-temperature resistant MFP-10 package reduces external parts count and mounting space, therefore making this IC support the motors with a wide range of sizes and speeds.

# **Package Dimensions**

unit: mm

## 3086A-MFP10S



# **Specification**

## **Absolute Maximum Ratings at Ta = 25^{\circ}C**

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V <sub>CC</sub> max		18	V
Output current	I <sub>OUT</sub> ave		500	mA
	I <sub>OUT</sub> peak	t ≤ 1 ms	1200	mA
Output withstand voltage	V <sub>OUT</sub> max		Internal	V
FG output current	IFG max		10	mA
FG output withstand voltage	VFG <sub>OUT</sub> max		18	V
Allowable power dissipation	Pd max	With specified substrate *	800	mW
Operating temperature	Topr		-30 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

- Specified substrate (114.3 × 76.1 × 1.5 mm³, glass exposy)
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# Recommended Operating Ranges at $Ta = 25^{\circ}C$

Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage	V <sub>CC</sub> 1		3.6 to 17	V
Common mode input voltage range	V <sub>COM</sub>		0.2 to V <sub>CC</sub> -2.3	V

# Electrical Characteristics at $Ta = 25^{\circ}C$ , $V_{CC} = 12V$

Development	Ch. a.l	Conditions	Ratings			I In:it	
Parameter	Symbol	Conditions	min	typ	max	Unit	
Circuit current I		In drive mode (CT = L)		3	5	mA	
		In lockup protection mode (CT = H)		4	6	mA	
CT capacitor charge current	I <sub>CT</sub> 1	V <sub>CT</sub> = 0.2V	0.8	1.2	2.0	μΑ	
Capacitor discharge current	I <sub>CT</sub> 2	V <sub>CT</sub> = 8V	0.16	0.24	0.4	μΑ	
Capacitor discharge current ratio	R <sub>CT</sub>	$R_{CT} = I_{CT} 1/I_{CT} 2$	4.0	5.0	7.0	_	
CT charge voltage	V <sub>CT</sub> 1		6.8	7.2	7.6	V	
	V <sub>CT</sub> 2		1.4	1.6	1.8	V	
Output limiter withstand voltage	V <sub>OLM</sub>	I <sub>O</sub> = 10 mA	24.0	25.5	27.0	V	
Output saturation voltage	V <sub>OL</sub>	I <sub>O</sub> = 500 mA		1.0	1.3	V	
Hall input sensitivity	V <sub>HN</sub>	Including offset and hysteresis	2	10	18	mV	
FG output saturation voltage	V <sub>FG</sub>	$I_O = 5 \text{ mA}$		0.2	0.5	V	
FG output leak current	$V_{FL}$	V <sub>FG</sub> = 14V		0.1	10	μΑ	
Thermal protection trigger temperature	V <sub>TH</sub> +	Assured design target *	150	180	210	°C	

<sup>\*</sup> Assured design target; Target value, not measured individually

# **Truth Table**

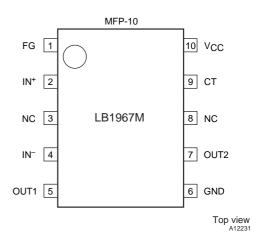
IN <sup>-</sup>	IN <sup>+</sup>	СТ	OUT1	OUT2	FG	Mode
Н	L		L	Н	L	Deteting
L	Н		Н	L	Н	Rotating
_	_	Н	off	off	_	Lockup protection activated

# With specified substrate (114.3×76.1×1.5 mm³, glass exposy) where dissipation of the specified substrate (114.3×76.1×1.5 mm²) and the specified substrate (114.3×76.1×1.5 mm²).

Ambient temperature,  $Ta - {}^{\circ}C$ 

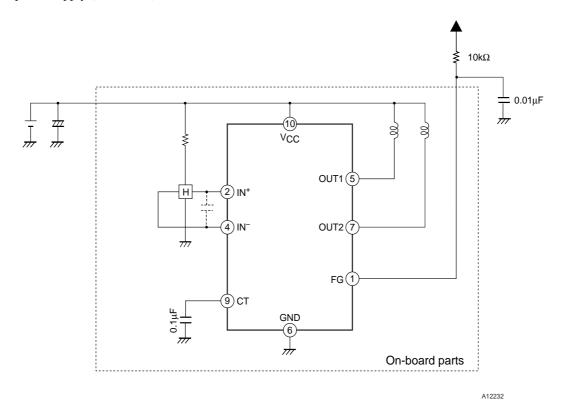
Pd max - Ta

# **Pin Assignment**



## **Sample Application Circuit**

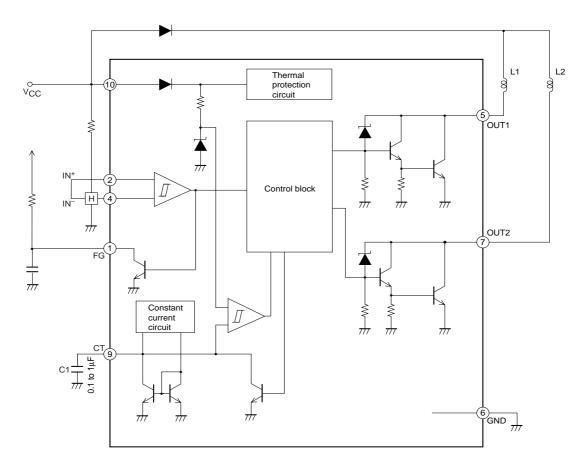
5/12V power supply (3.8 to 17V)



# **Precautions**

- Wiring layout for IN<sup>-</sup> and OUT1 must be designed to prevent interference.
- If the wiring between the Hall element and the IC input is long, noise interference may lead to chattering in the FG output waveform. In this case, insert a capacitor with 0.01 to 0.001 μF between IN<sup>+</sup> and IN<sup>-</sup>.
- If CT pin is connected to GND, the lockup protection and restart functions are disabled.
- In a circuit configuration as shown above, a current-GND reverse connection will cause a current to flow as follows: GND -> OUT -> coil -> power supply. The magnitude of this current is limited by the coil resistance. If it is less than 500 mA, the IC will not be destroyed. If required, insert a diode between  $V_{CC}$  and the coil.

## **Block Diagram and Sample Application Circuit**



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