

~~LB1663~~~~LB1663M~~~~LB1666~~

Monolithic Digital IC

2-Phase Unipolar

Brushless Motor Drivers

Overview

The LB1663 series are 2-phase unipolar brushless motor (ex. DC brushless fanmotor) drivers.

Features

- Protection against motor lock and automatic return can be provided with a minimum number of external parts.
- The ~~LB1663~~, LB1663M, ~~LB1666~~ can be operated from either 12V or 24V power supply by changing an external resistor.
- Possible to connect a Hall element direct to the ~~LB1663~~, LB1663M, ~~LB1666~~.
- Built-in output transistors with output current 1.5A.
- Built-in rotation detect function (Drive mode : "L", Stop mode : "H").
- Built-in thermal shutdown.
- With radio noise reduction pin.

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input current	I _{CC} max	t ≤ 20ms	200	mA
Output supply voltage	V _O max		-0.3 to +85	V
Maximum output current	I _O max		1.5	A
RD flow-in current	I _{RD}		10	mA
RD supply voltage	V _{RD}		50	V
Allowable power dissipation	Pd max	LB1663	1.2	W
		LB1663M : Independent IC	0.9	W
		LB1663M : *With specified board	1.2	W
		LB1666	2.0	W
Operating temperature	T _{opr}		-30 to +80	°C
Storage temperature	T _{stg}		-55 to +125	°C

* Specified board : 20mm × 30mm × 1.5mm, glass epoxy

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Allowable Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input current range	I _{CC}		6.0 to 50.0	mA
Common-mode input voltage range	V _{ICM}		0 to V _{IN} -1.5	V

Electrical Characteristics at Ta = 25°C, I_{CC} = 10mA

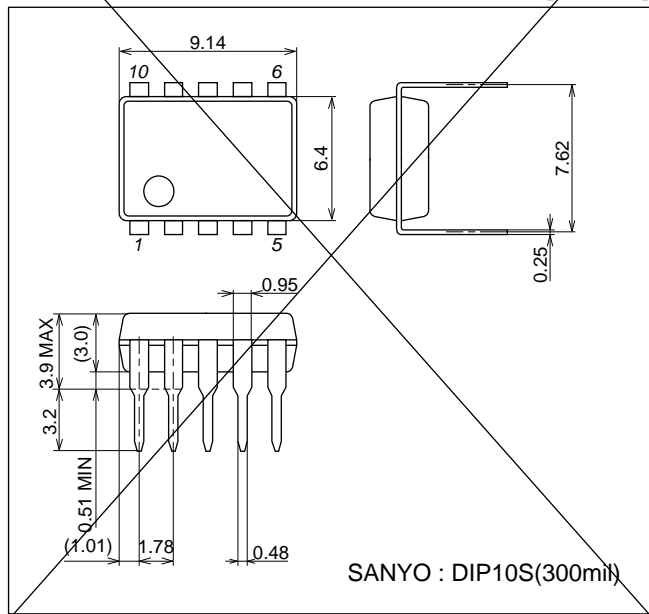
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Output limit voltage	V _{OLM}		80			V
	V _O (sus)	I _O = 0.1A	65			V
Output saturation voltage	V _O (sat)1	I _O = 0.5A		0.95	1.20	V
	V _O (sat)2	I _O = 1.0A		1.15	1.50	V
	V _O (sat)3	I _O = 1.5A		1.40	2.00	V
V _{IN} input voltage	V _{IN}	I _{CC} = 7.0mA	6.4	6.7	7.0	V
Amp input offset voltage	V _{off}		-7	0	+7	mV
Amp input bias current	I _{BA}		-250			nA
RD output saturation voltage	V _{RD} (sat)	I _{RD} = 5mA		0.1	0.2	V
C flow-out current	I _{C1}		2.1	3.0	3.9	μA
C discharge current	I _{C2}	LB 1663 , 1663M	0.31	0.44	0.59	μA
		LB1666	0.21	0.30	0.39	μA
Comparator input threshold voltage	V _{TH1}		0.77	0.8V _{IN}	0.83	V
	V _{TH2}		0.42	0.45V _{IN}	0.48	V

Package Dimensions

unit : mm (typ)

3098D

[LB1663]

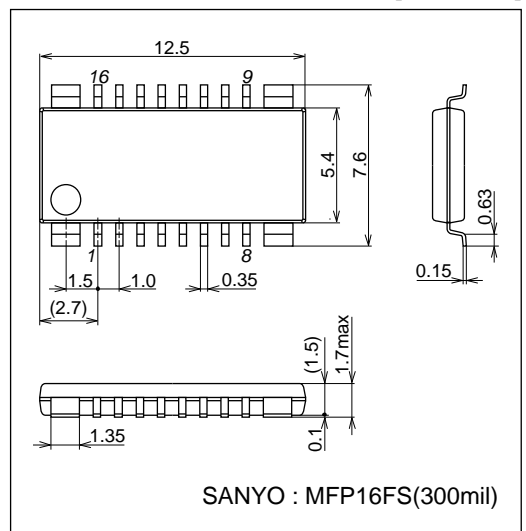


Package Dimensions

unit : mm (typ)

3097B

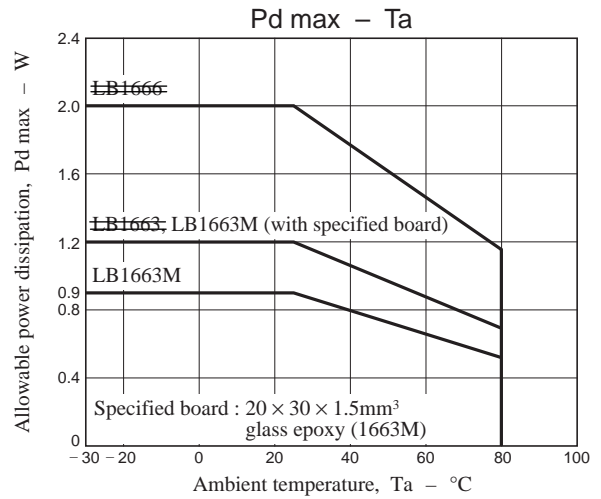
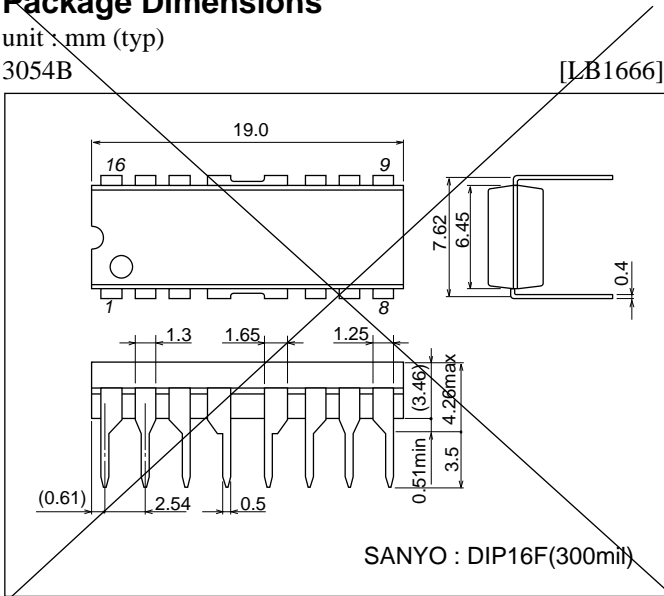
[LB1663M]



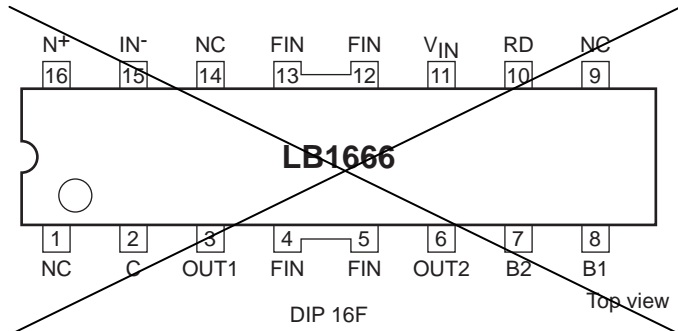
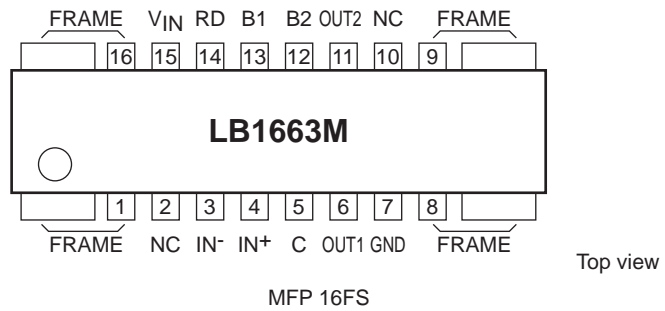
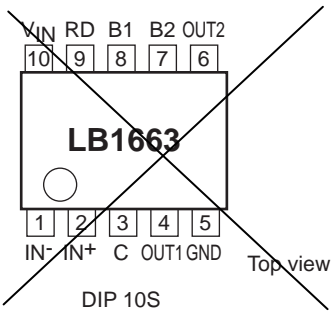
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Package Dimensions

unit : mm (typ)
3054B



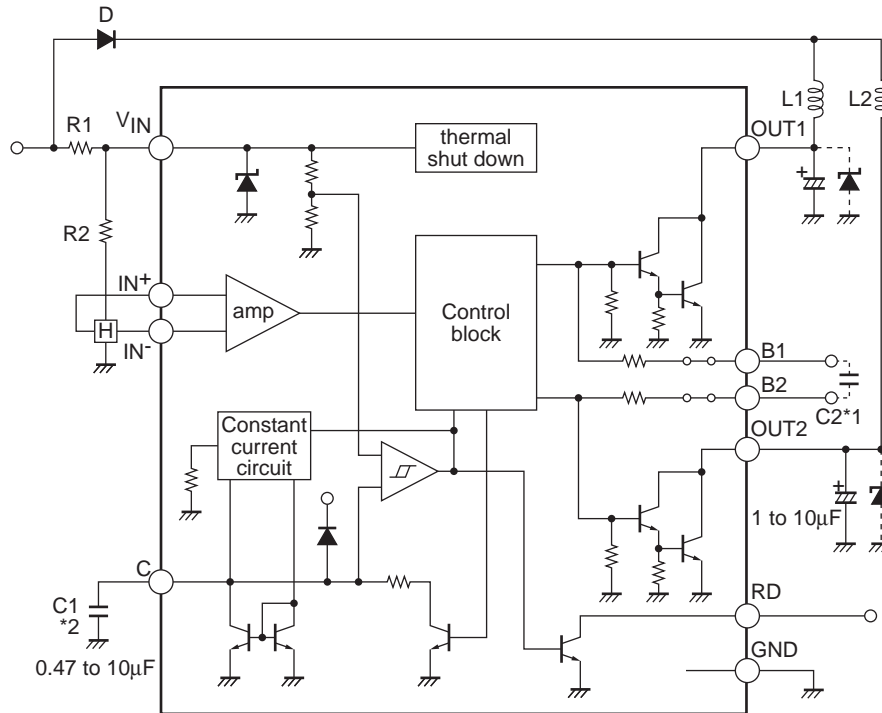
Pin Assignment



Truth Table

IN ⁺	IN ⁻	C	OUT1	OUT2
H	L	L	H	L
L	H	L	L	H
H	L	H	H	H
L	H	H	H	H

Block Diagram and Sample Application Circuit



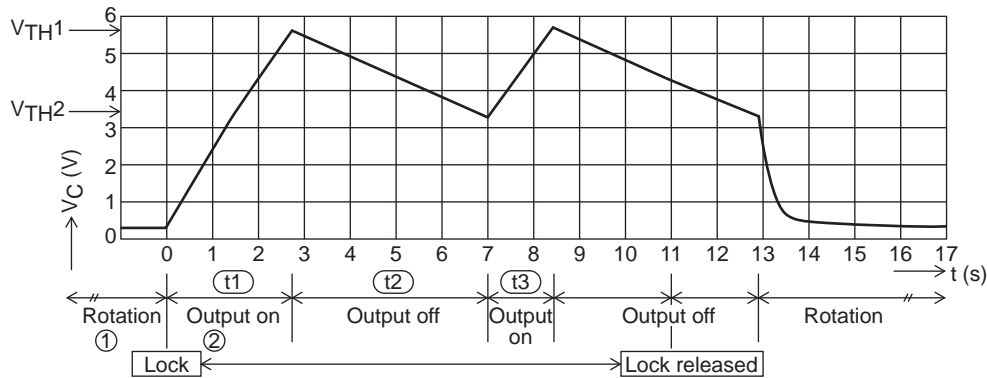
(Note) *1 : Radio noise reduction capacitor : 0.01 to 0.1μF.
 *2 : Use a less leaky capacitor.

Output Protection

For C marked with 1μF	Lock detect time	Approximately 2s
	Lock detect time (output on)	Approximately 1s
	Lock detect time (output off)	Approximately 6s

Pin Functions

Pin name	Function
V _{IN}	A limiting resistor is connected across V _{CC} and V _{IN} to adjust the current flowing into V _{IN} to be 6mA to 50mA, which generates a voltage (6.7V) on this pin and supplies a regulated voltage to the IC system and a Hall element.
IN ⁻ IN ⁺	Pins for accepting output from Hall element. Common-mode input voltage range : 0 to V _{IN} -1.5V Offset voltage : ±7mV
OUT1 OUT2	Output transistors of output pins are Darlington-connected. External capacitors or Zener diodes must be connected to protect output transistors.
RD	Open collector output. (Drive mode : "L", Stop mode : "H").
B1 B2	Base pins for output transistors of Darlington connection. A capacitor must be connected in an application where radio noise becomes a problem.
C	Capacitor pin for automatic return function. When the rotation is stopped by an overload, the voltage on this pin is increased, turning OFF the output. Automatic return from output "stop" to "drive" occurs by making the load proper. The lock detect time can be set by changing the capacitor constant.
GND	Ground.



Automatic return circuit C pin voltage

- 1) When a fan is rotating, the capacitor is charged at $3\mu\text{A}$ (typ) and discharged through the C with pulses according to the rotational speed.
- 2) When a fan is locked, no discharge occurs through the C and the C voltage rises, turning OFF the output at $0.8 \times V_{\text{IN}}$.
- 3) When the output is turned OFF, discharge occurs through the C at $0.44\mu\text{A}$ (typ). If the lock is not released when the C voltage drops to V_{TH2} , the capacitor is charged to V_{TH1} again. (At this moment, the output is turned ON.) These operations 2), 3) repeated on a cycle of approximately $t_{\text{ON}} : t_{\text{OFF}} = 1 : 6$ protect a motor.
- 4) If the lock is released when the C voltage drops to V_{TH2} , the output is turned ON, starting rotation.

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