LB1948MC

Monolithic Digtal IC 12V Low Saturation Voltage Drive Forward/Reverse Motor Driver



The LB1948MC is a two-channel low saturation voltage forward/reverse motor driver IC. It is optimal for motor drive in 12V system products and can drive either two DC motors, one DC motor using parallel connection, or a two-phase bipolar stepping motor with 1-2 phase excitation mode drive.

Features

- Supports 12V power supply systems
- Low saturation voltage: $V_O(sat) = 0.5V$ (typical) at $I_O = 400$ mA
- Zero current drawn in standby mode
- Braking function
- Supports parallel connection: I_O max = 1.6A, V_O(sat) = 0.6V (typical) at I_O = 800mA
- Built-in spark killer diode
- Built-in thermal shutdown circuit
- Miniature package: MFP-10S (6.4mm × 5.0mm)

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter Symbol		Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		-0.3 to +20	V
Output voltage	VOUT		-0.3 to +20	V
Input voltage	VIN		-0.3 to +18	V
Ground pin source current	IGND	Per channel	800	mA
Allowable power dissipation	Pd max	Mounted on a specified board*	870	mW
Operating temperature	Topr		-20 to +85	°C
Storage temperature	Tstg		-40 to +150	°C

* Specified board: 114.3mm \times 76.1mm \times 1.6mm, glass epoxy board.

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.



LB1948MC

Allowable Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	VCC		2.5 to 16	V
Input high-level voltage	VIH		1.8 to 10	V
Input low-level voltage	VIL		-0.3 to +0.7	V

Electrical Characteristics at $Ta = 25^{\circ}C$, $V_{CC} = 5V$

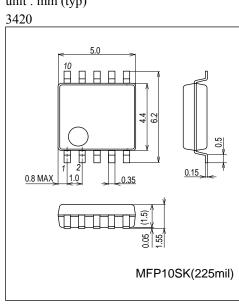
Devenueter	Querra ha a l	Oraditions		Ratings					
Parameter	Symbol	Conditions	min	typ	max	Unit			
Current drain	ICC0	IN1, 2, 3, 4 = 0V (Standby mode)		0.1	10	μA			
	I _{CC} 1	*1 (Forward or reverse mode)		15	21	mA			
	I _{CC} 2	*2 (Brake mode)		30	40	mA			
Output saturation voltage	V _O (sat)1	I _{OUT} = 200mA (High Side and Low Side)		0.25	0.35	V			
	V _O (sat)2	I _{OUT} = 400mA (High Side and Low Side)		0.50	0.75	V			
Input current	IIN	V _{IN} = 5V		85	110	μA			
Spark Killer Diode									
Reverse current	I _S (leak)				30	μA			
Forward voltage	V _{SF}	I _{OUT} = 400mA			1.7	V			

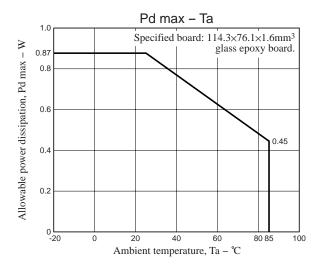
*1:IN1/IN2/IN3/IN4=H/L/L/L or L/H/L/L or L/L/H/L or L/L/L/H.

*2:IN1/IN2/IN3/IN4=H/H/L/L or L/L/H/H.

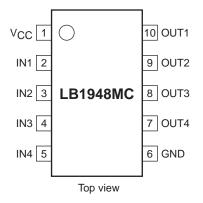
Package Dimensions

unit : mm (typ)





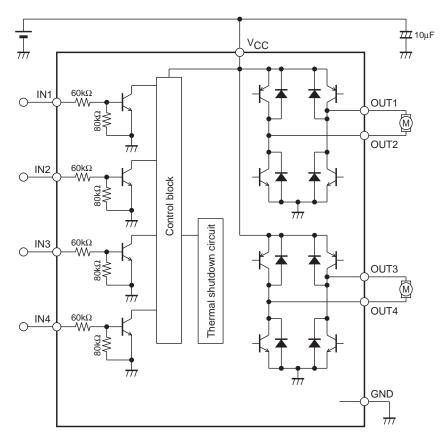
Pin Assignment



Truth Table

Input			Output			Natas			
IN1	IN2	IN3	IN4	OUT1	OUT2	OUT3	OUT4	Notes	
L	L	L	L	OFF	OFF	OFF	OFF	Standby mode	
L	L			OFF	OFF				Standby mode
н	L			Н	L			1CH	Forward
L	Н			L	Н				Reverse
н	Н			L	L				Brake
		L	L L OFF OFF		OFF		Standby mode		
		Н	L			Н	L	0011	Forward
		L	н			L	н	2CH	Reverse
		Н	Н			L	L		Brake

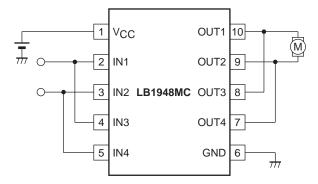
Block Diagram



Design Documentation

- (1) Voltage magnitude relationship
- There are no restrictions on the magnitude relationships between the voltages applied to V_{CC} and IN1 to IN4.
- (2) Parallel connection

The LB1948MC can be used as a single-channel H-bridge power supply by connecting IN1 to IN3, IN2 to IN4, OUT1 to OUT3, and OUT2 to OUT4 as shown in the figure. (I_Omax = 1.6A, V_O(sat) = 0.6V (typical) at I_O = 800mA)



(3) Observe the following points when designing the printed circuit board pattern layout.

- Make the V_{CC} and ground lines as wide and as short as possible to lower the wiring inductance.
- Insert bypass capacitors between V_{CC} and ground mounted as close as possible to the IC.

• Resistors of about $10K\Omega$ must be inserted between the CPU output ports and the IN1 to IN4 pins if the microcontroller and the LB1948MC are mounted on different printed circuit boards and the ground potentials differ significantly.

(4) Penetration electric current

At the time of the next mode shift, a penetration electric current is generated in V_{CC}-GND. There are not the deterioration of the IC by), the destruction as follows 1Atyp per this penetration electric current (1ch, 1 μ s; but for the stabilization of the power supply line of the IC is most recent, and, please can enter with a condenser.

- Forward (Reverse) \leftrightarrow Brake (i)
- Forward ↔ Reverse (ii)
- Standby \rightarrow Brake (iii)

In addition, the penetration electric current disappears when I put a wait mode of 10µs at the time of the change of the Forward \leftrightarrow Reverse.

(5) Supplementary matter of the penetration electric current

According to (4), a penetration electric current cannot influence IC life.

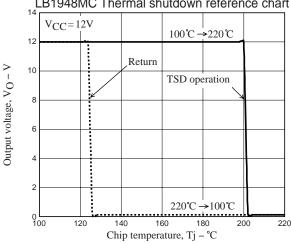
Thermal Shutdown Temperature

(1) Thermal shutdown temperature The thermal shutdown temperature Ttsd is $200 \pm 20^{\circ}$ C with fluctuations.

(2) Thermal shutdown operation

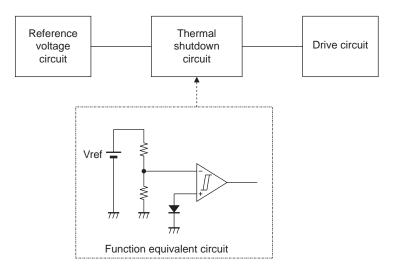
The operation of the thermal shutdown circuit is shown in the figure below.

When the chip temperature T_j is in the direction of increasing (solid line), the output turns off at approximately 200°C. When the chip temperature Tj is in the direction of decreasing (dotted line), the output turns on (returns) at approximately 125°C.



B1948MC Thermal shutdown reference chart

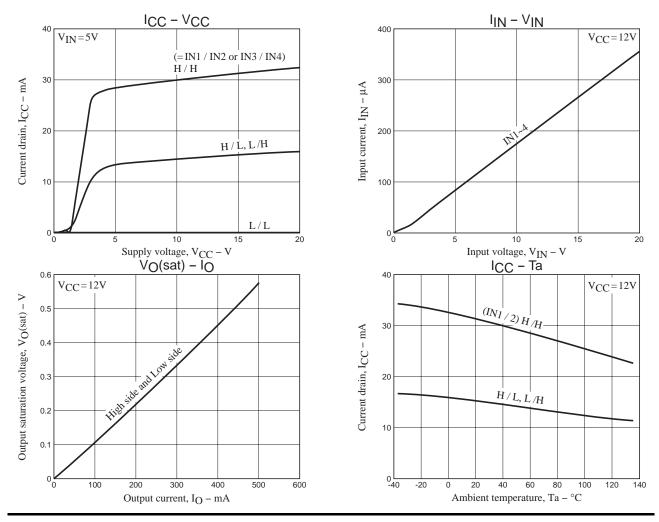
Thermal Shutdown Circuit Block Diagram

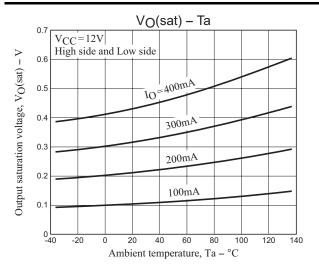


Note: The above is an example of thermal shutdown circuits although there are some differences from the actual internal circuit.

Thermal Shutdown Operation

The thermal shutdown circuit compares the voltage of the heat sensitive element (diode) with the reference voltage and shuts off the drive circuit at a certain temperature to protect the IC chip from overheating.





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