LB1948MC

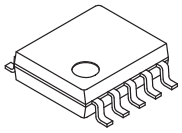
Motor Driver, Forward/Reverse, Low Saturation Voltage Drive, 12V

ON Semiconductor®
www.onsemi.com

Overview
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.

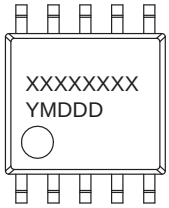
Features
- Supports 12V power supply systems
- Low saturation voltage: V_O(sat) = 0.5V (typical) at I_O = 400mA
- Zero current drawn in standby mode
- Braking function
- Supports parallel connection: I_O max = 1.6A, V_O(sat) = 0.6V (typical) at I_O = 800mA
- Built-in spark killer diode
- Built-in thermal shutdown circuit
- Miniature package: MFP10SK (6.4mm × 5.0mm)

Typical Applications
- Refrigerator
- Thermal printers
- POS terminal
- Hot-water supplies
- Time Recorder



MFP10SK (225mil)

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
Y = Year
M = Month
DDD = Additional Traceability Data

ORDERING INFORMATION

Ordering Code:
LB1948MC-AH (MSL3)
LB1948MC-BH (MSL1)

Package
MFP10SK
(Pb-Free / Halogen Free)

Shipping (Qty / packing)
1000 / Tape & Reel

† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF

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Specifications

Absolute Maximum Ratings at Ta = 25°C (Note 1)

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V_{CC} max		-0.3 to +20	V
Output voltage	V_{OUT}		-0.3 to +20	V
Input voltage	V_{IN}		-0.3 to +18	V
Ground pin source current	I_{GND}	Per channel	800	mA
Allowable power dissipation	Pd max	Mounted on a specified board (Note 2)	870	mW
Operating temperature	Topr		-20 to +85	°C
Storage temperature	Tstg		-40 to +150	°C

1. Stresses exceeding those listed in the Maximum Rating table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.
2. Specified board: 114.3mm x 76.1mm x 1.6mm, glass epoxy board

Recommendation Operating Condition at Ta = 25°C (Note 3)

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	VCC		2.5 to 16	V
Input high-level voltage	V_{IH}		1.8 to 10	V
Input low-level voltage	V_{IL}		-0.3 to +0.7	V

3. Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Electrical Characteristics at Ta = 25°C, V_{CC} = 12V (Note 4)

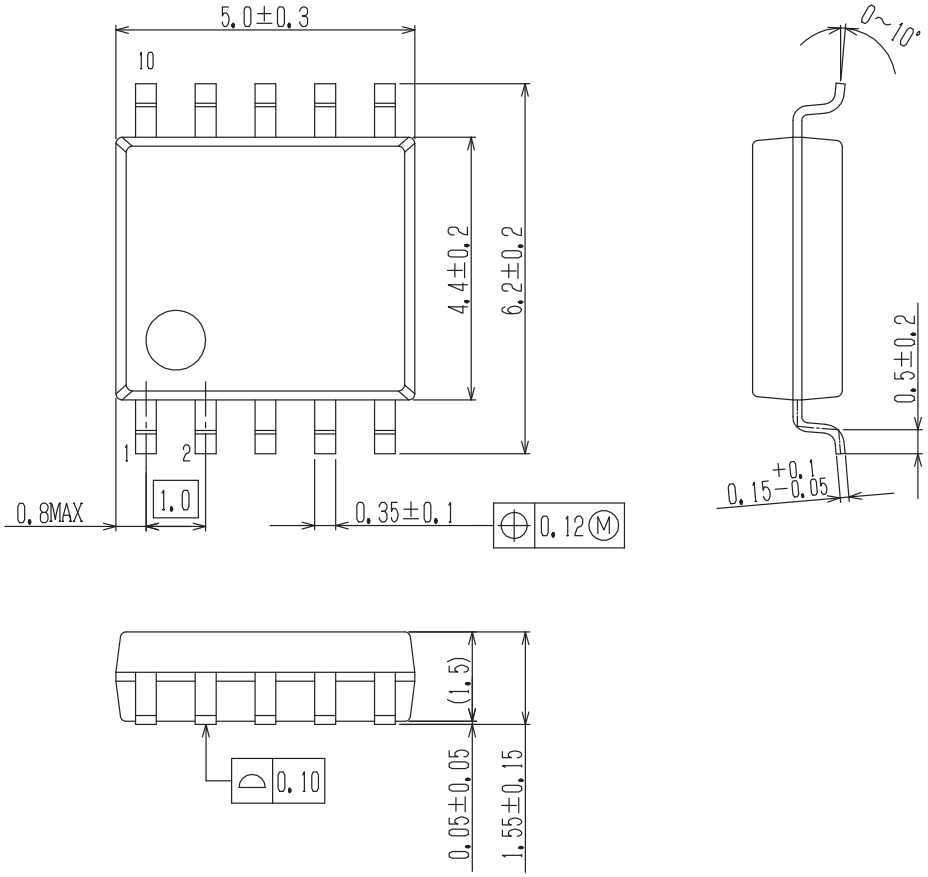
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC}0$	IN1, 2, 3, 4 = 0V (Standby mode)		0.1	10	μA
	$I_{CC}1$	(Note 5) (Forward or reverse mode)		15	21	mA
	$I_{CC}2$	(Note 6) (Brake mode)		30	40	mA
Output saturation voltage	V_O(sat)1	I_{OUT} = 200mA (High Side and Low Side)		0.25	0.35	V
	V_O(sat)2	I_{OUT} = 400mA (High Side and Low Side)		0.50	0.75	V
Input current	I_{IN}	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

4. Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
5. IN1/IN2/IN3/IN4=H/L/L/L or L/H/L/L or L/L/H/L or L/L/L/H.
6. IN1/IN2/IN3/IN4=H/H/L/L or L/L/H/H.

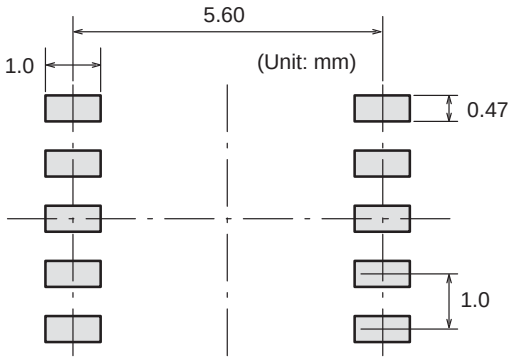
Package Dimensions

unit : mm

MFP10SK (225 mil)
CASE 751DA
ISSUE A



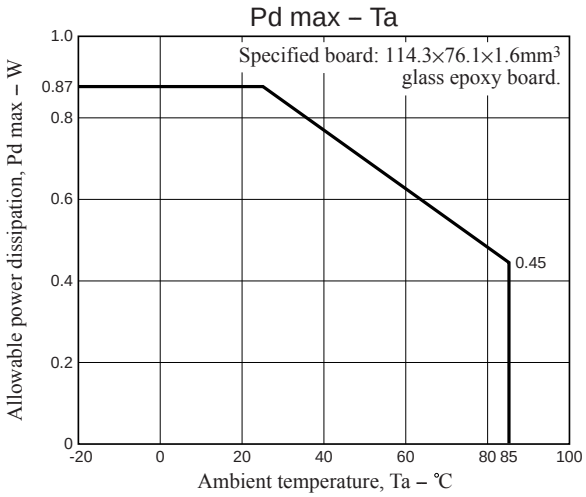
SOLDERING FOOTPRINT*



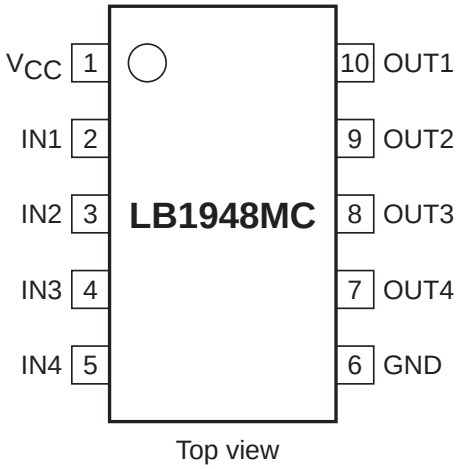
NOTE: The measurements are not to guarantee but for reference only.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

Pdmax-Ta diagram



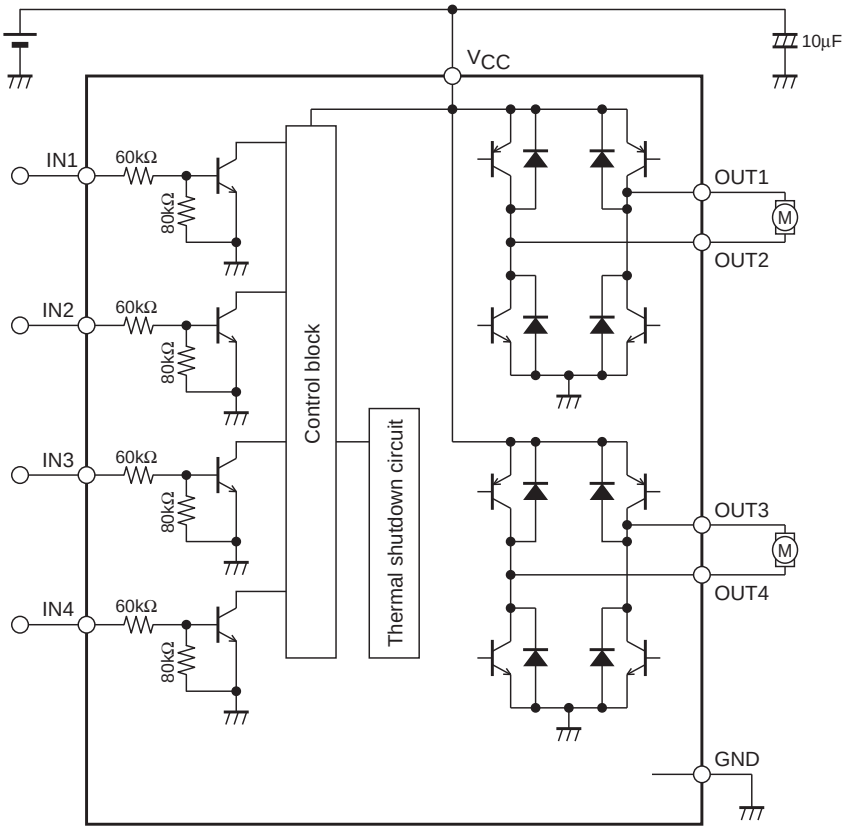
Pin Assignment



Truth Table

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

Block Diagram



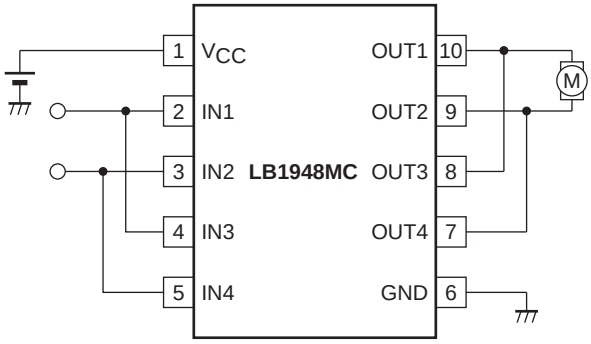
Design Documentation

(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. ($I_O$max = 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 10KΩ 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, 1μs; but for the stabilization of the power supply line of the IC is most recent, and, please can enter with a condenser.

(i) Forward (Reverse) ↔ Brake

(ii) Forward ↔ Reverse

(iii) Standby → Brake

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

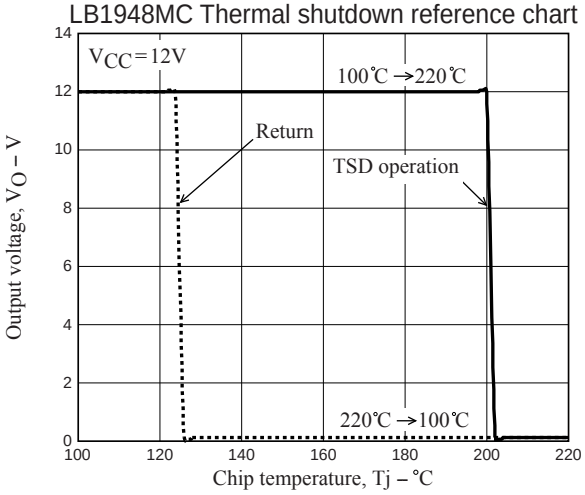
The thermal shutdown temperature Ttsd is 200 ± 20°C with fluctuations.

(2) Thermal shutdown operation

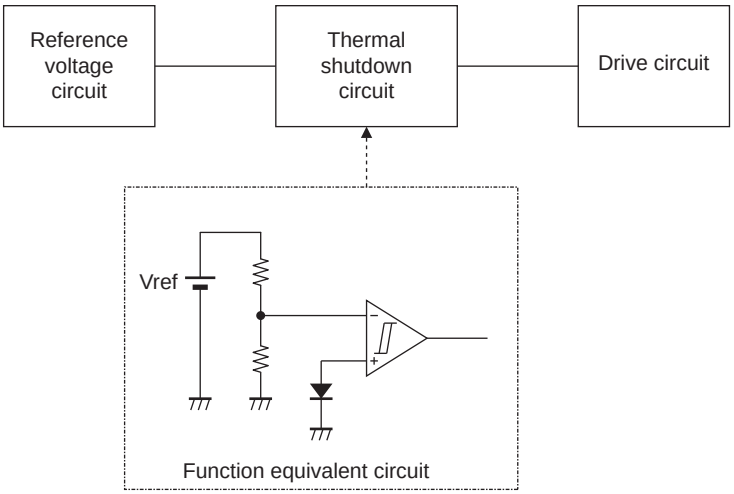
The operation of the thermal shutdown circuit is shown in the figure below.

When the chip temperature Tj 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.



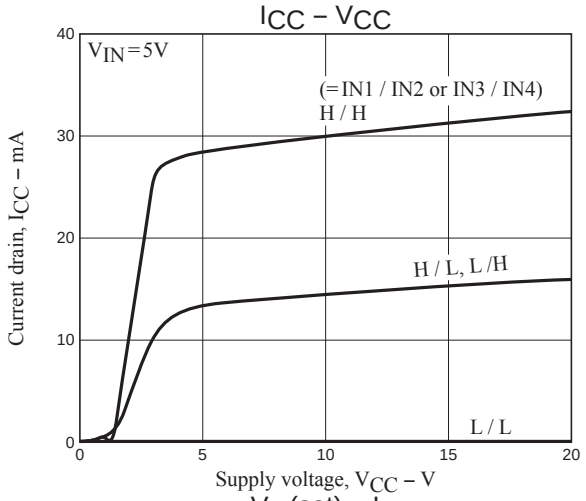
Thermal Shutdown Circuit Block Diagram

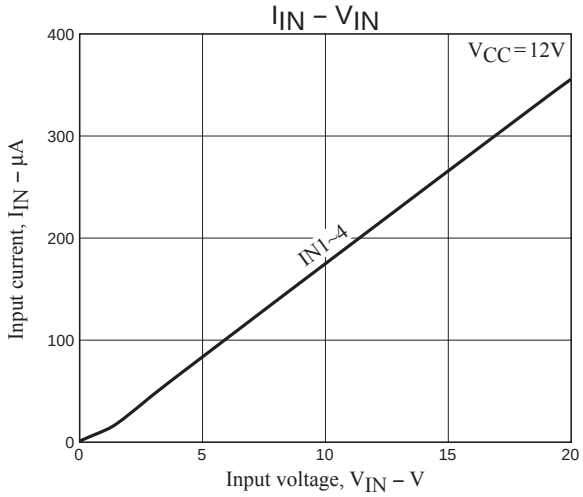


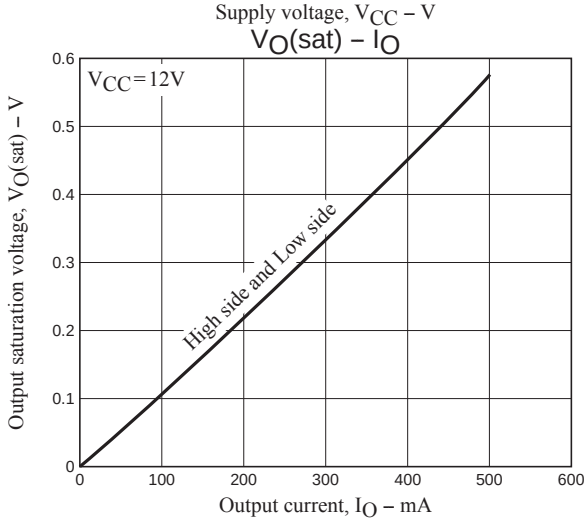
Note: The above is an example of thermal shutdown circuits although there are some differences from the actual internal circuit.

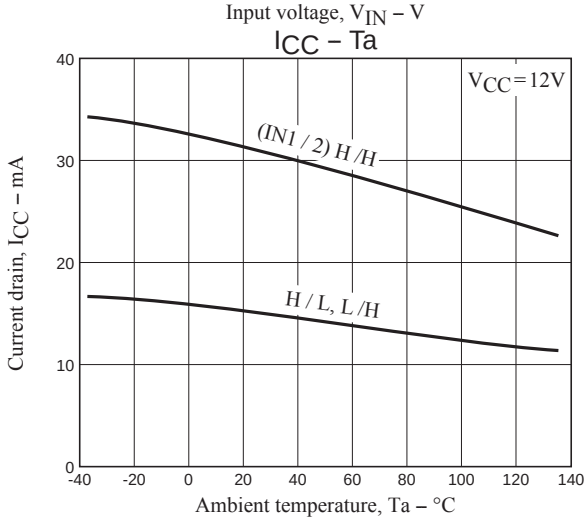
Thermal Shutdown Operation

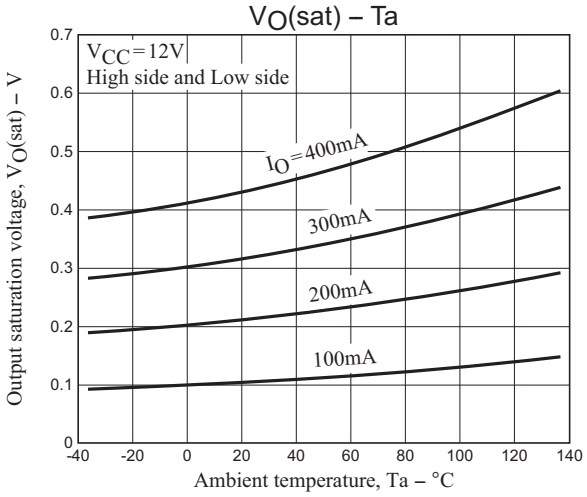
The thermal shutdown circuit compares the voltage of the heat sensitive element (diode) with the reference voltage and shuts off the drive circuit at a certain temperature to protect the IC chip from overheating.











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