

LB1948MC

Specifications

Absolute Maximum Ratings at $T_a = 25^{\circ}\text{C}$ (Note 1)

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC\text{ max}}$		-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	$P_d\text{ max}$	Mounted on a specified board (Note 2)	870	mW
Operating temperature	T_{opr}		-20 to +85	$^{\circ}\text{C}$
Storage temperature	T_{stg}		-40 to +150	$^{\circ}\text{C}$

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 $T_a = 25^{\circ}\text{C}$ (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 $T_a = 25^{\circ}\text{C}$, $V_{CC} = 12\text{V}$ (Note 4)

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	I_{CC0}	IN1, 2, 3, 4 = 0V (Standby mode)		0.1	10	μA
	I_{CC1}	(Note 5) (Forward or reverse mode)		15	21	mA
	I_{CC2}	(Note 6) (Brake mode)		30	40	mA
Output saturation voltage	$V_{O(sat)1}$	$I_{OUT} = 200\text{mA}$ (High Side and Low Side)		0.25	0.35	V
	$V_{O(sat)2}$	$I_{OUT} = 400\text{mA}$ (High Side and Low Side)		0.50	0.75	V
Input current	I_{IN}	$V_{IN} = 5\text{V}$		85	110	μA
Spark Killer Diode						
Reverse current	$I_S(\text{leak})$				30	μA
Forward voltage	V_{SF}	$I_{OUT} = 400\text{mA}$			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.

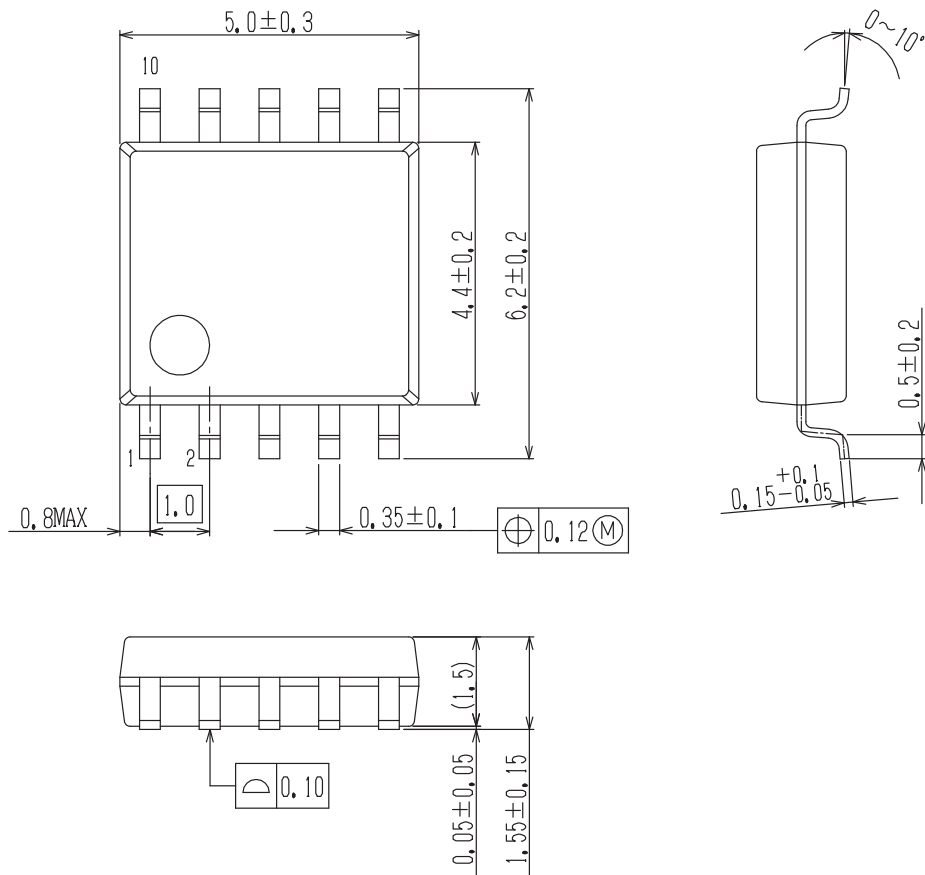
6. IN1/IN2/IN3/IN4=H/H/L/L or L/L/H/H.

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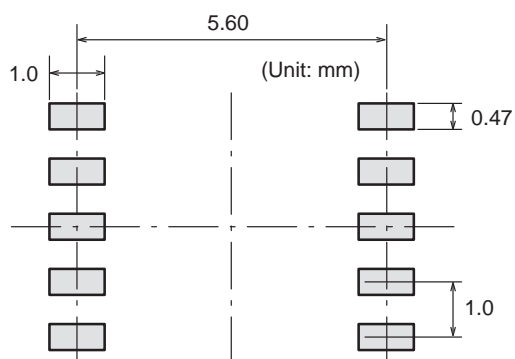
Package Dimensions

unit : mm

MFP10SK (225 mil)
CASE 751DA
ISSUE A



SOLDERING FOOTPRINT*

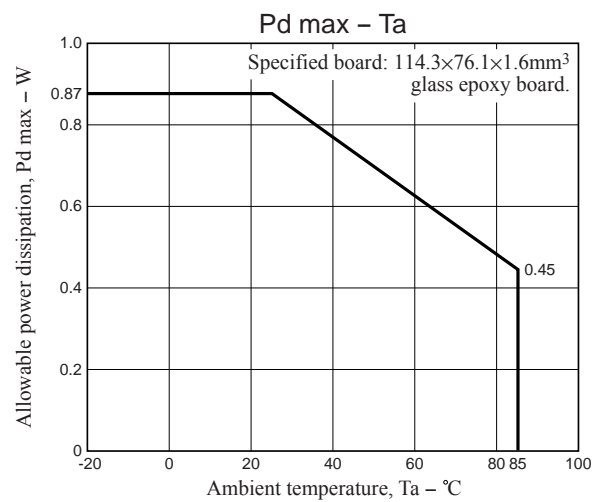


NOTE: The measurements are not to guarantee but for reference only.

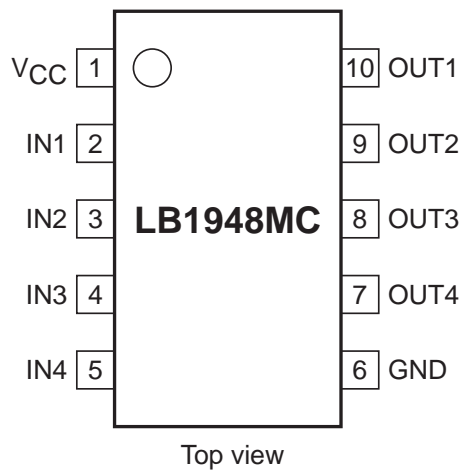
*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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Pdmax-Ta diagram



Pin Assignment

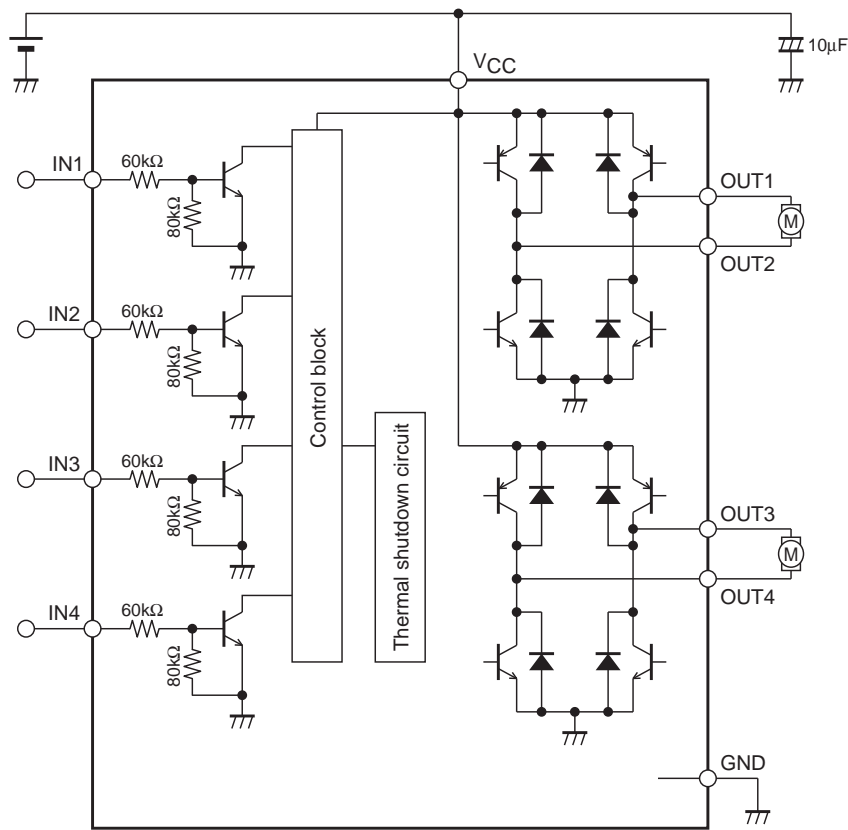


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Truth Table

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			Standby mode
H	L			H	L			Forward
L	H			L	H			Reverse
H	H			L	L			Brake
		L	L			OFF	OFF	Standby mode
		H	L			H	L	Forward
		L	H			L	H	Reverse
		H	H			L	L	Brake

Block Diagram



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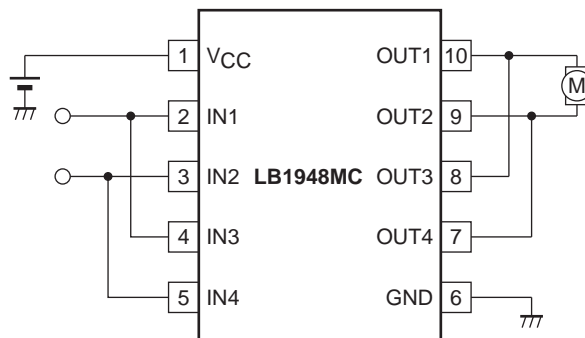
Design Documentation

(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 1A typ per this penetration electric current (1ch, $1\mu s$; 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) \leftrightarrow Brake

(ii) Forward \leftrightarrow Reverse

(iii) Standby \rightarrow Brake

In addition, the penetration electric current disappears when I put a wait mode of $10\mu s$ 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

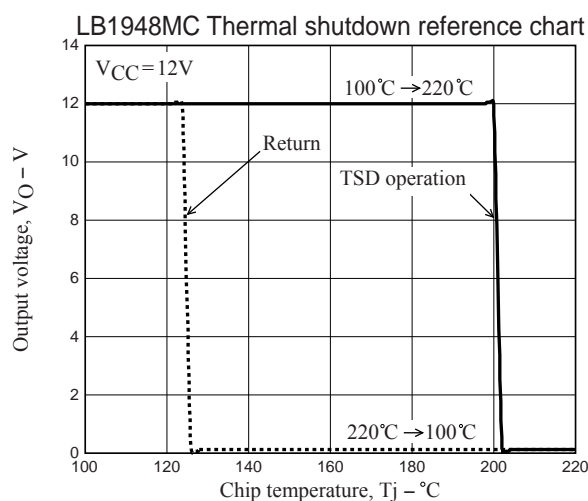
The thermal shutdown temperature T_{sd} is $200 \pm 20^\circ C$ with fluctuations.

(2) Thermal shutdown operation

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

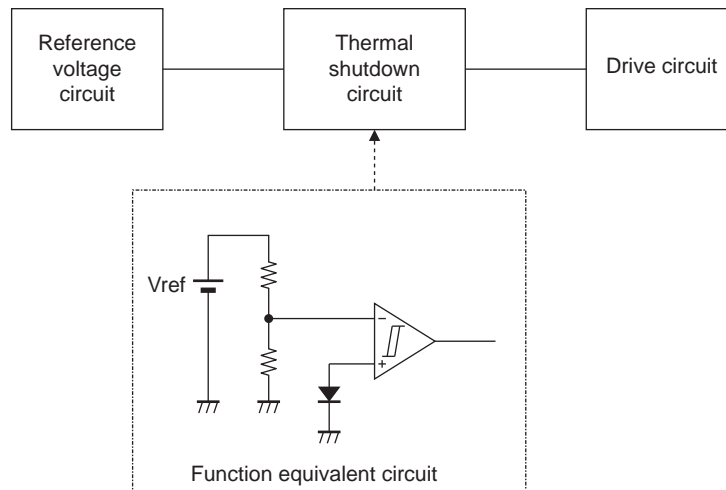
When the chip temperature T_j is in the direction of increasing (solid line), the output turns off at approximately $200^\circ C$.

When the chip temperature T_j is in the direction of decreasing (dotted line), the output turns on (returns) at approximately $125^\circ C$.



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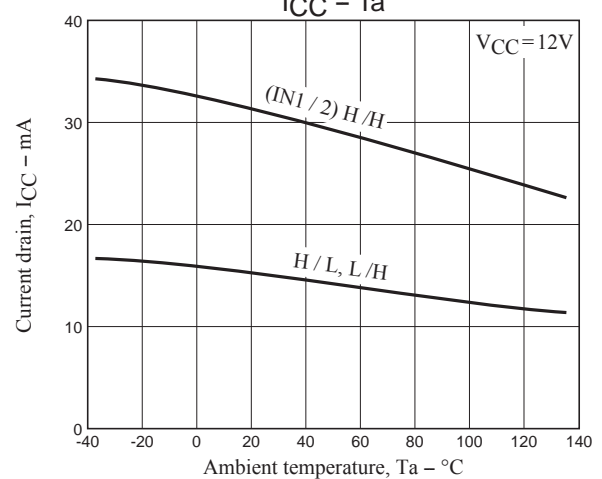
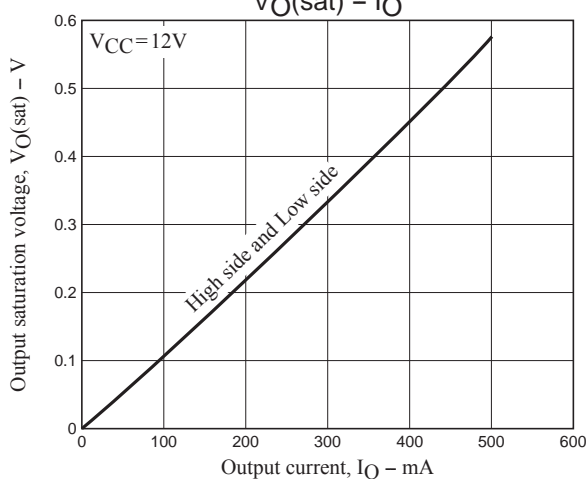
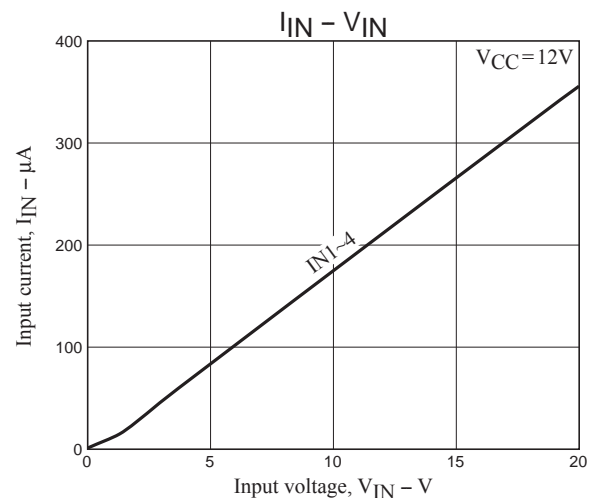
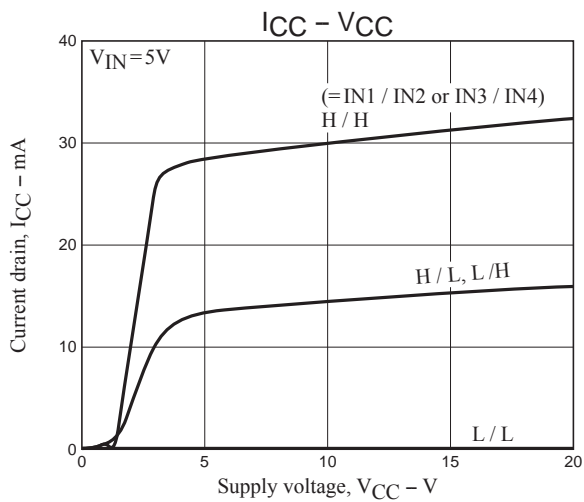
Thermal Shutdown Circuit Block Diagram



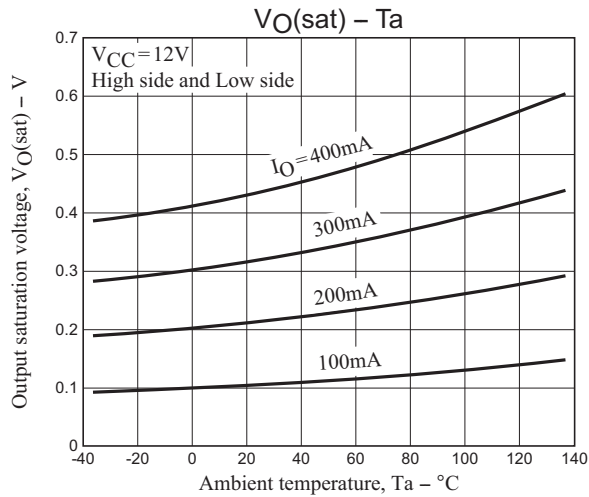
Note: The above is an example of thermal shutdown circuits although there are some differences from the actual internal circuit.

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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