Ordering number : EN7714A

SANYO Semiconductors
DATA SHEET

An ON Semiconductor Company

Monolithic Digital IC

LB1948M — 12V Low Saturation Voltage Drive Forward/Reverse Motor Driver

Overview

The LB1948M is a 2-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 2-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: 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	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 max1	Independent IC	350	mW
	Pd max2	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 × 76.1mm × 1.6mm, glass epoxy board.

Allowable Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V_{CC}		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

Electrical Characteristics at Ta = 25°C, V_{CC} = 5V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Current drain	$I_{CC}0$	IN1, 2, 3, 4 = 0V (Standby mode)		0.1	10	μA
	$I_{CC}1$	*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	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

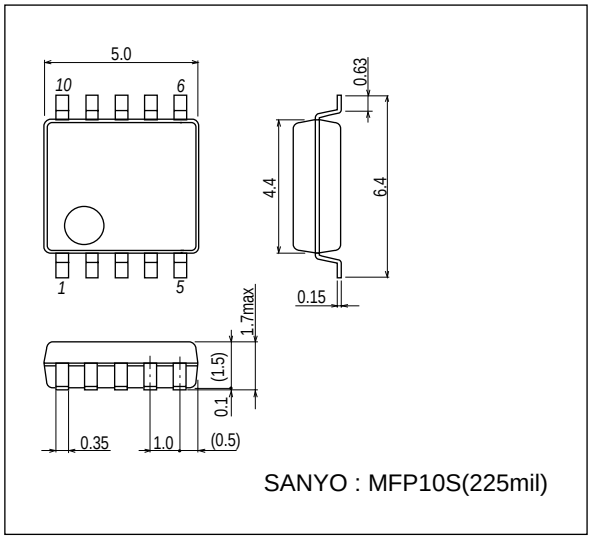
*1:IN1/IN2/IN3/IN4=H/L/L/L or L/H/L/L or L/L/H/L or L/L/L/H.

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

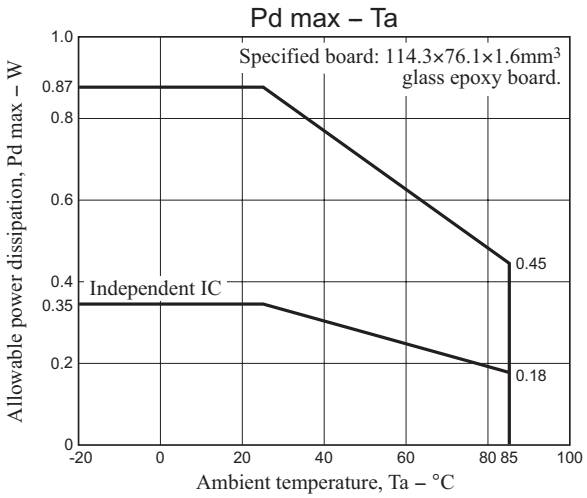
Package Dimensions

unit : mm (typ)

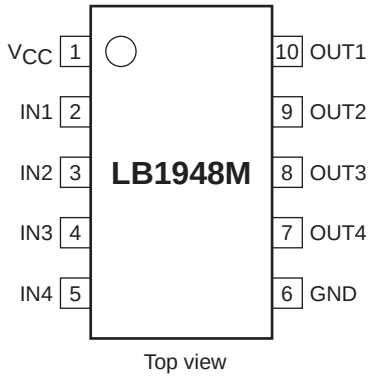
3086B



SANYO : MFP10S(225mil)



Pin Assignment

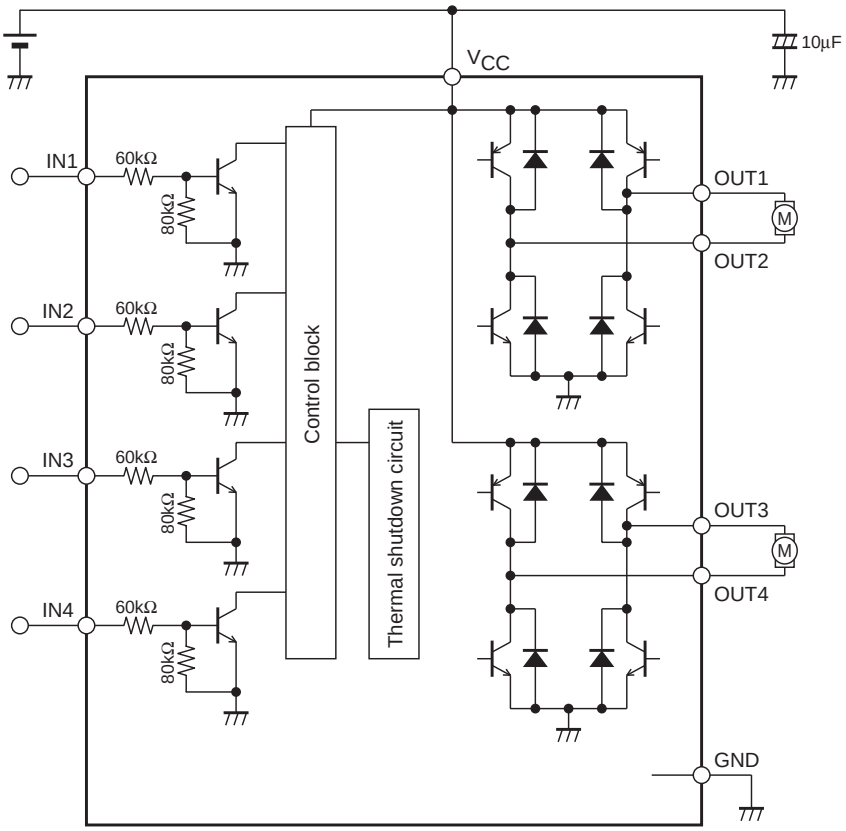


Top view

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				Forward
L	H			L	H				Reverse
H	H			L	L				Brake
		L	L			OFF	OFF	2CH	Standby mode
		H	L			H	L		Forward
		L	H			L	H		Reverse
		H	H			L	L		Brake

Block Diagram



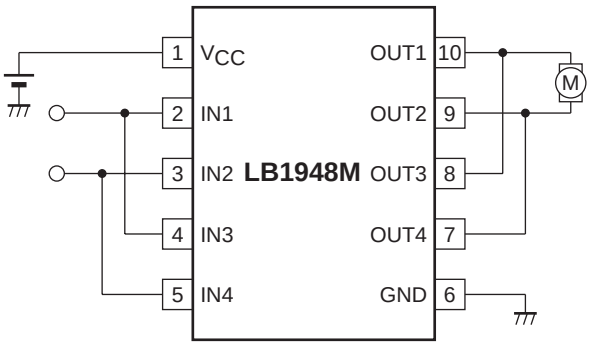
Design Documentation

(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 LB1948M 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 LB1948M are mounted on different printed circuit boards and the ground potentials differ significantly.

Thermal Shutdown Temperature

(1) Thermal shutdown temperature

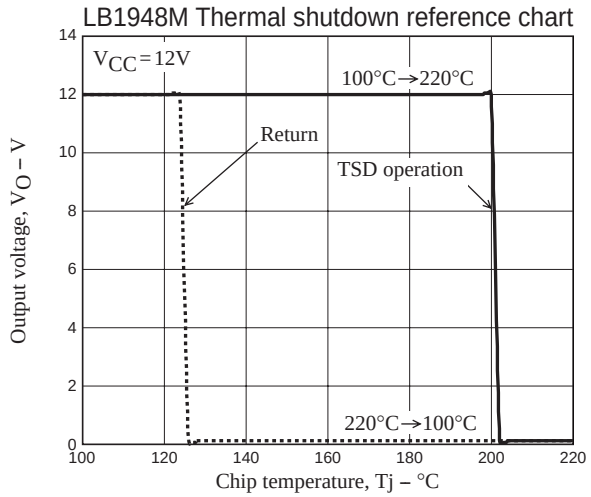
The thermal shutdown temperature Ttsd is 200 ± 20°C with fluctuations.

(2) Thermal shutdown operation

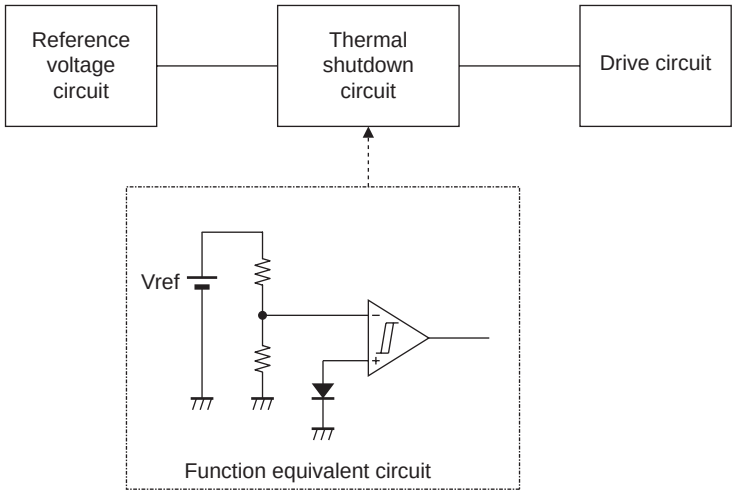
The operation of the thermal shutdown circuit is shown in the figure below.

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.