



ON Semiconductor®

<http://onsemi.com>

LB1909MC

Monolithic Digital IC

Stepping Motor Driver IC

Overview

The LB1909MC is motor driver IC that can operate on a wide supply voltage range (2.5V to 16V). The IC is ideal for use in 2-phase excitation drive of general-purpose 2-phase bipolar stepping motors including dampers for refrigerators.

Features

- Wide supply voltage range : 2.5V to 16V
- Low saturation voltage : $V_{O(sat)} = 0.25V$ typ at $I_O = 200mA$.
- Built-in shoot-through current protection circuit.
- No standby current consumption (or zero).
- Built-in thermal shutdown circuit.
- Small package : SOIC10

Specifications

Absolute Maximum Ratings at $T_a = 25^\circ C$

| Parameter | Symbol | Conditions | Ratings | Unit |
|------------------------------|---------------|----------------------------------|-------------|------------|
| Maximum power source voltage | V_{CC} max | | -0.3 to +20 | V |
| Applied output voltage | V_{OUT} max | | -0.3 to +20 | V |
| Applied input voltage | V_{IN} max | | -0.3 to +18 | V |
| GND pin outflow current | I_{GND} | | 800 | mA |
| Allowable power consumption | P_d max | Mounted on the specified board * | 820 | mW |
| Operating temperature | T_{opr} | | -30 to +85 | $^\circ C$ |
| Storage temperature | T_{stg} | | -40 to +150 | $^\circ C$ |

* Specified board: 114.3mm × 76.1mm × 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.

LB1909MC

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} | Pins ENA, IN1, IN2 | 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} = 12V

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|--|----------------------|--------------------------|---------|------|------|------|
| | | | min | typ | max | |
| Power source current | I _{CC0} | ENA = L | | 0.1 | 10 | μA |
| | I _{CC1} | ENA = H | | 25 | 35 | mA |
| Output saturation voltage | V _{OUT1} | I _{OUT} = 200mA | | 0.25 | 0.35 | V |
| | V _{OUT2} | I _{OUT} = 400mA | | 0.50 | 0.75 | V |
| Input current | I _{IN} | V _{IN} = 5V | | 120 | 160 | μA |
| Thermal protection block *1 | | | | | | |
| Thermal shutdown operation temperature | T _{tSD} | Design guarantee *2 | | 180 | | °C |
| Temperature hysteresis width | ΔT _{tSD} | | | 60 | | °C |
| Spark killer diode | | | | | | |
| Reverse current | I _{S(leak)} | | | | 30 | μA |
| Forward voltage | V _{SF} | I _{OUT} = 400mA | | | 1.7 | V |

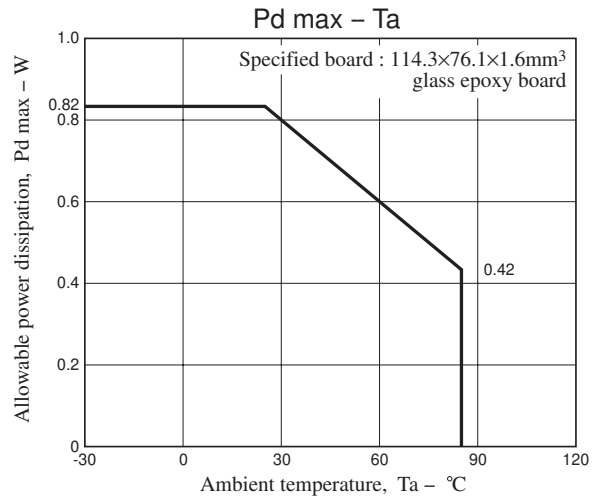
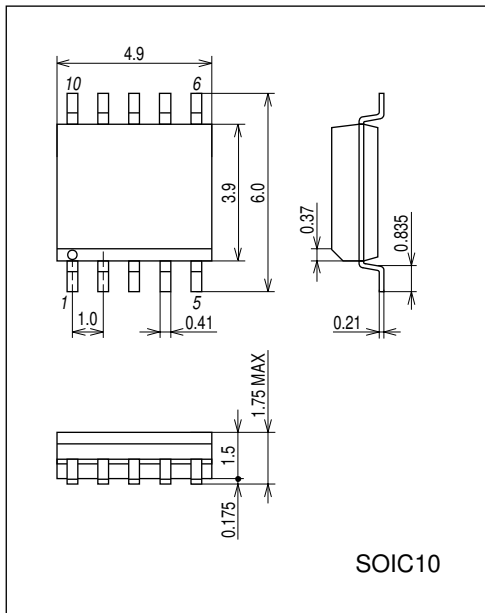
*1 The thermal protection function is a feature to prevent the product from smoking and firing under unusual conditions. It is not intended to guarantee operation of the product under an ambient temperature exceeding the operating temperature range.

*2 Design guarantee is not tested in individual units.

Package Dimensions

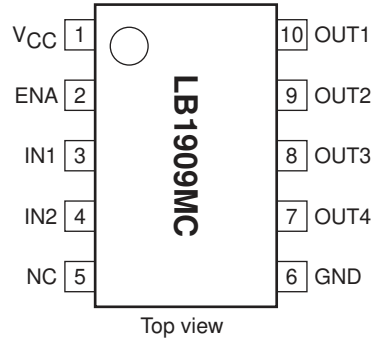
unit : mm (typ)

3426A



LB1909MC

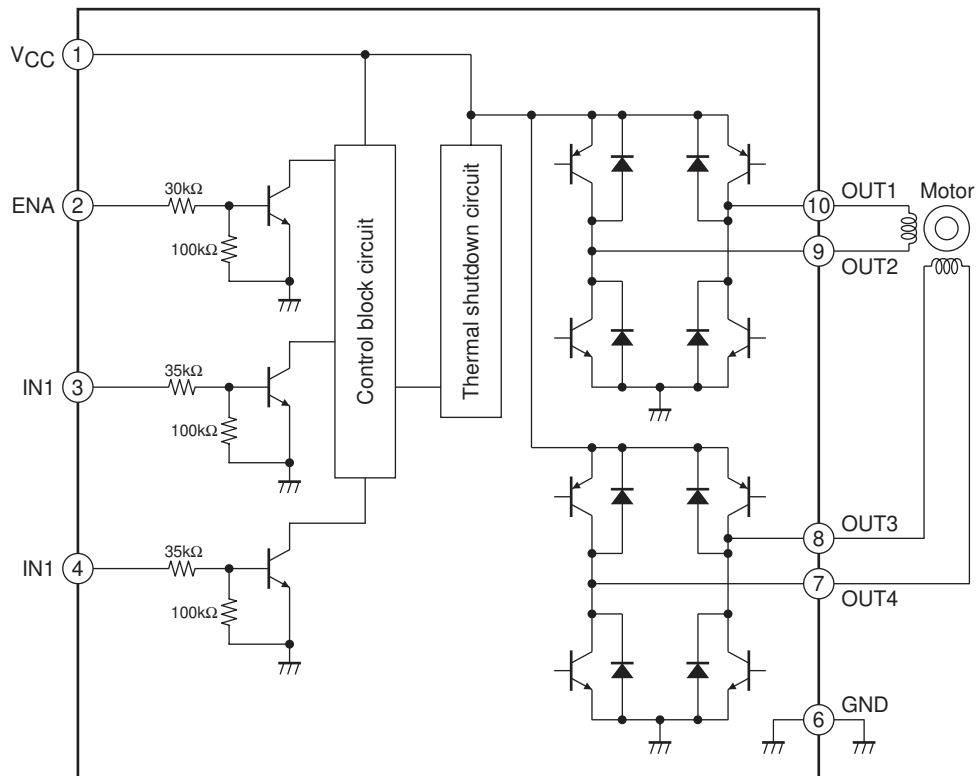
Pin Assignment



Truth table

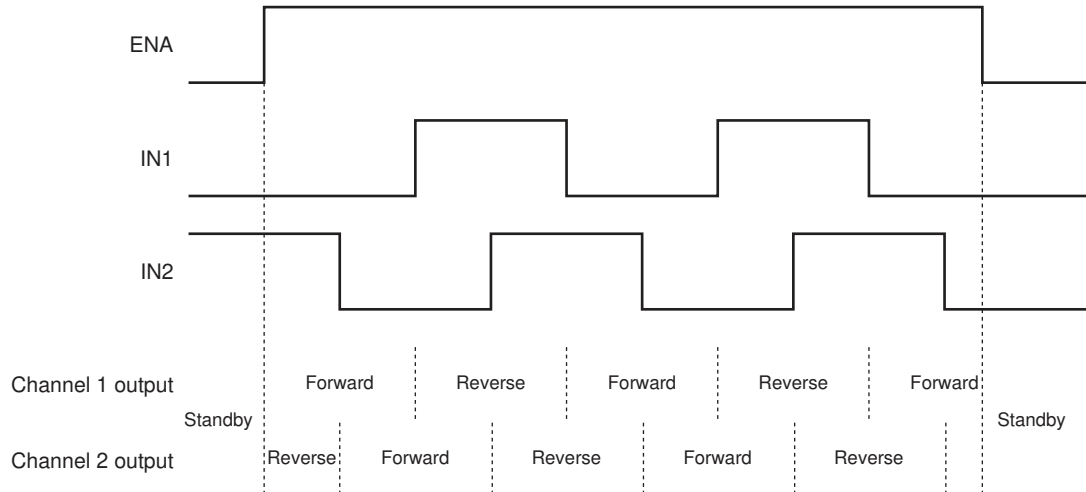
| Input | | | Output | | | | Remarks | |
|-------|-----|-----|--------|------|------|------|--------------|---------|
| ENA | IN1 | IN2 | OUT1 | OUT2 | OUT3 | OUT4 | | |
| L | x | x | OFF | OFF | OFF | OFF | Standby mode | |
| H | L | | H | L | | | Channel 1 | Forward |
| | H | | L | H | | | | Reverse |
| | | L | | | H | L | Channel 2 | Forward |
| | | H | | | L | H | | Reverse |

Block Diagram



LB1909MC

Timing Chart (2 phase excitation drive)



ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.