

# LV8548MC

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



**ON Semiconductor®**  
www.onsemi.com

### Overview

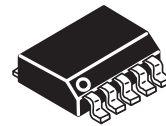
The LV8548MC is a 2-channel low saturation voltage forward/reverse motor driver IC. It is optimal for motor drive in 12V system products and can drive either two DC motors, one DC motor using parallel connection, or it can drive a stepper motor in Full-step and Half-step.

### Features

- DMOS output transistor adoption  
(Upper and lower total  $R_{ON}=1\Omega$  typ)
- $V_{CC}$  max=20V,  $I_O$  max=1A
- 4V to 16V Operating supply voltage range  
(The control system power supply is unnecessary.)
- The compact package (SOIC10) is adopted.
- Pin compatible with LB1948MC
- Current consumption 0 when standby mode
- It is possible to connect in parallel  
(parallel connection of drive channel)
- Built-in brake function

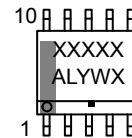
### Typical Applications

- Refrigerator
- Flatbed Scanner, Document Scanner
- POS Printer, Label Printer
- PoE Point of sales Terminal
- Clothes Dryer
- Vacuum cleaner
- Time Recorder



SOIC10

### GENERIC MARKING DIAGRAM\*



XXXXX = Specific Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
■ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G", may or not be present.

### ORDERING INFORMATION

Ordering Code:  
LV8548MC-AH

Package  
SOIC10  
(Pb-Free / Halogen Free)

Shipping (Qty / packing)  
2500 / 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](http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF)

## Specifications

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

| Parameter                    | Symbol              | Conditions                | Ratings     | Unit |
|------------------------------|---------------------|---------------------------|-------------|------|
| Maximum power supply voltage | V <sub>CC</sub> max | VCC                       | -0.3 to +20 | V    |
| Output impression voltage    | V <sub>OUT</sub>    | OUT1 , OUT2 , OUT3 , OUT4 | -0.3 to +20 | V    |
| Input impression voltage     | V <sub>IN</sub>     | IN1 , IN2 , IN3 , IN4     | -0.3 to +6  | V    |
| GND pin outflow current      | IGND                | Per ch                    | 1.0         | A    |
| Allowable Power dissipation  | Pd max              | (Note 2)                  | 1.0         | W    |
| Operating temperature        | Topr                |                           | -30 to +85  | °C   |
| Storage temperature          | Tstg                |                           | -40 to +150 | °C   |

1. Stresses exceeding those listed in the Absolute 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. When mounted on the specified printed circuit board (57.0mm ×57.0mm × 1.6mm), glass epoxy, both sides

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

| Parameter               | Symbol           | Conditions            | Ratings      | Unit |
|-------------------------|------------------|-----------------------|--------------|------|
| Power supply voltage    | V <sub>CC</sub>  | VCC                   | 4.0 to 16    | V    |
| Input "H" level voltage | V <sub>INH</sub> | IN1 , IN2 , IN3 , IN4 | +1.8 to +5.5 | V    |
| Input "L" level voltage | V <sub>INL</sub> |                       | -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.

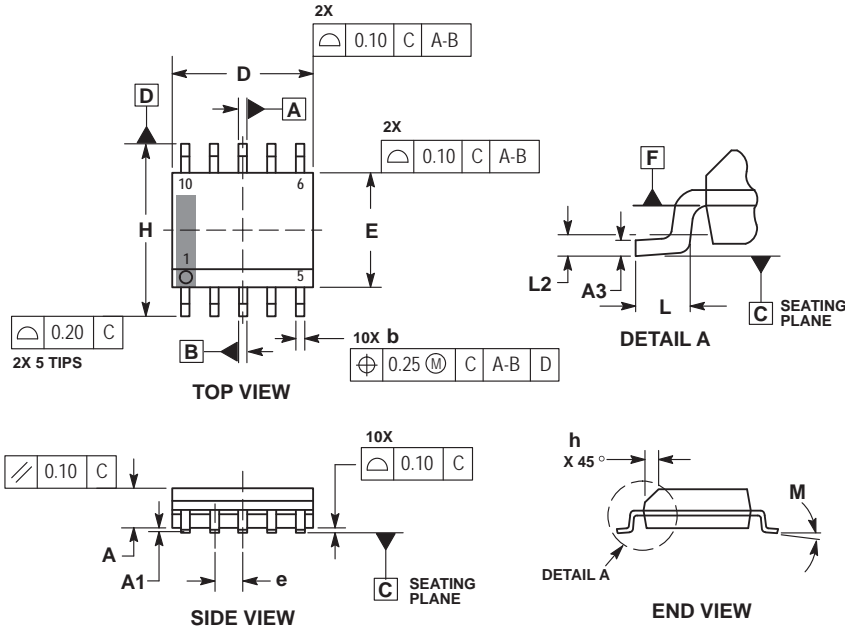
### Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 12V (Note 4)

| Parameter   | Symbol             | Conditions  | Ratings |     |      | Unit |
|---|--------------------|---|---------|-----|------|------|
|   |                    |   | min     | typ | max  |      |
| Power supply voltage                              | I <sub>CC0</sub>   | Standby mode<br>IN1=IN2=IN3=IN4="LOW"                       |         |     | 1    | μA   |
|   | I <sub>CC1</sub>   | It is "High" from IN1 as for either of IN4.<br>Load opening |         | 1.7 | 2.3  | mA   |
| Input current                                     | I <sub>IN</sub>    | V <sub>IN</sub> =5V   | 35      | 50  | 65   | μA   |
| Thermal shutdown operating temperature            | T <sub>tsd</sub>   | Design certification  | 150     | 180 | 210  | °C   |
| Width of temperature hysteria                     | ΔT <sub>tsd</sub>  | Design certification  |         | 40  |      | °C   |
| Low voltage protection function operation voltage | V <sub>thVCC</sub> |   | 3.3     | 3.5 | 3.65 | V    |
| Release voltage                                   | V <sub>thret</sub> |   | 3.55    | 3.8 | 3.95 | V    |
| Output ON resistance (Upper and lower total)      | R <sub>ON</sub>    | I <sub>OUT</sub> =1.0A                                      | 0.7     | 1   | 1.25 | Ω    |
| Output leak current                               | I <sub>Oleak</sub> | V <sub>O</sub> =16V   |         |     | 10   | μA   |
| Diode forward voltage                             | V <sub>D</sub>     | I <sub>D</sub> =1.0A  |         | 1.0 | 1.2  | 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.

Package Dimensions

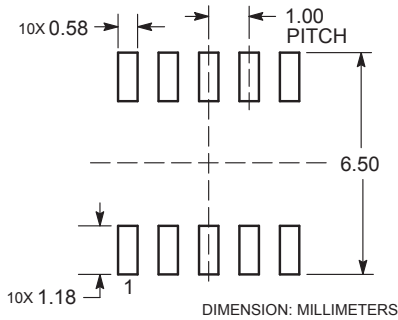
SOIC-10 NB  
CASE 751BQ-01  
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION, ALLOWABLE PROTRUSION SHALL BE 0.10mm TOTAL IN EXCESS OF 'b' AT MAXIMUM MATERIAL CONDITION.
  4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15mm PER SIDE. DIMENSIONS D AND E ARE DETERMINED AT DATUM F.
  5. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM F.
  6. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 1.25        | 1.75 |
| A1  | 0.10        | 0.25 |
| A3  | 0.17        | 0.25 |
| b   | 0.31        | 0.51 |
| D   | 4.80        | 5.00 |
| E   | 3.80        | 4.00 |
| e   | 1.00 BSC    |      |
| H   | 5.80        | 6.20 |
| h   | 0.37 REF    |      |
| L   | 0.40        | 1.27 |
| L2  | 0.25 BSC    |      |
| M   | 0°          | 8°   |

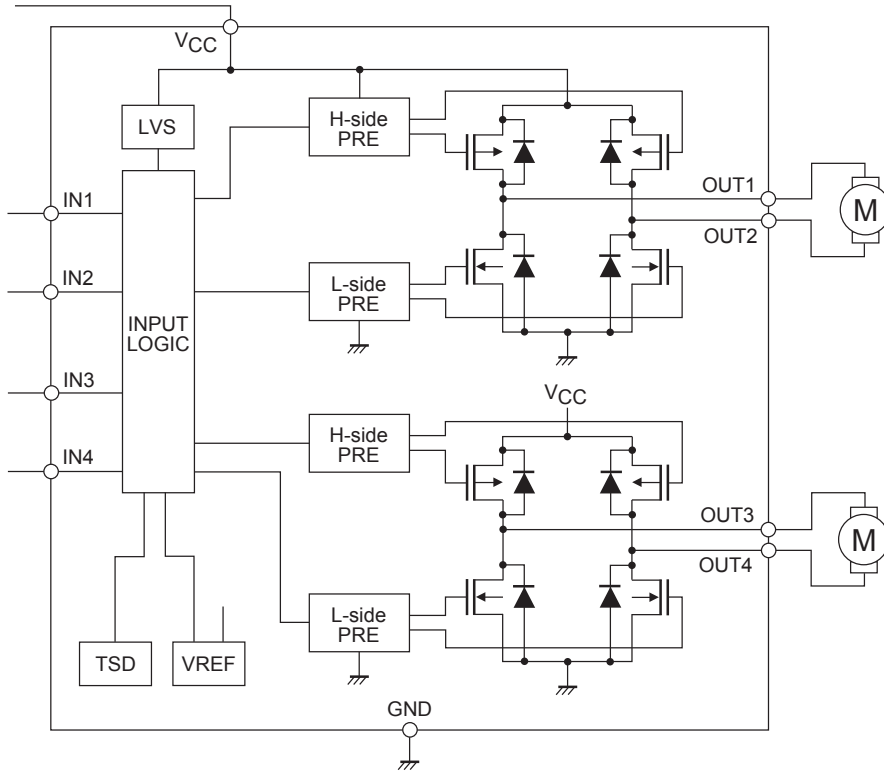
RECOMMENDED SOLDERING FOOTPRINT\*



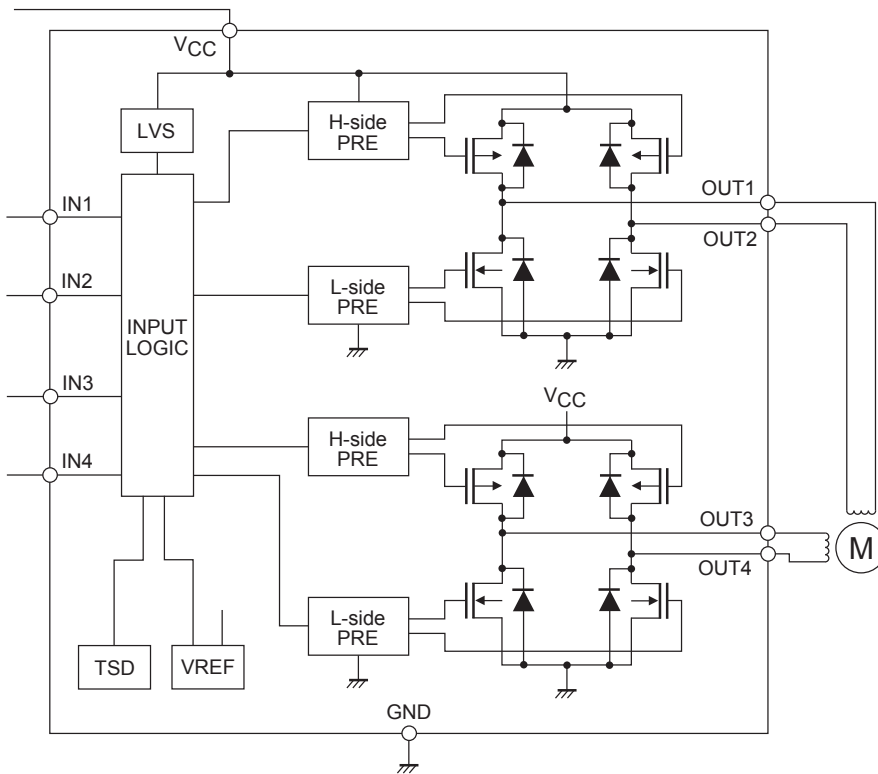
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

Block Diagram

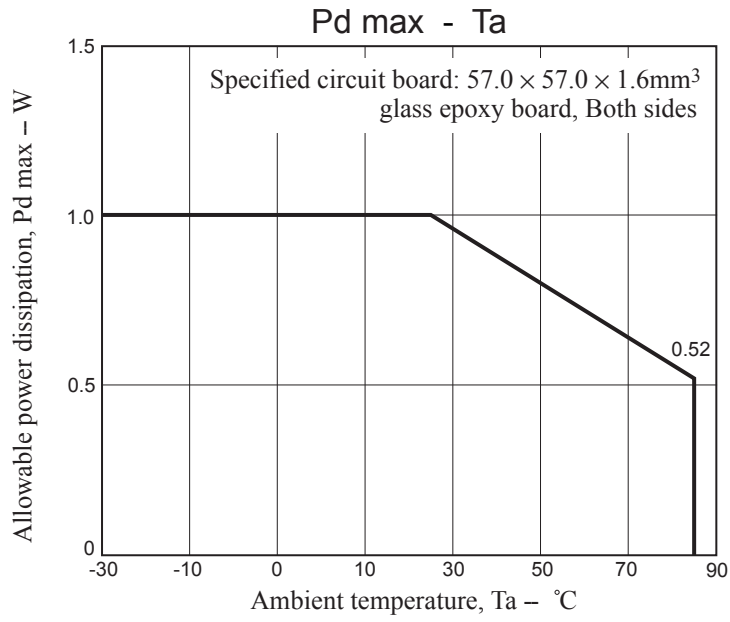
1. At two DC motor drive



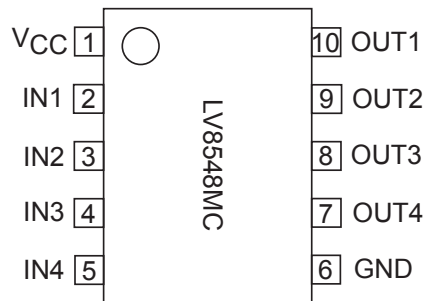
2. At one stepper motor drive



# LV8548MC



## Pin Assignment



## Pin function

| Pin No. | Pin name        | Pin function   | Equivalent Circuit |
|---------|-----------------|--|--------------------|
| 1       | V <sub>CC</sub> | Power-supply voltage pin.<br>V <sub>CC</sub> voltage is impressed. The permissible operation voltage is from 4.0 to 16.0(V). The capacitor is connected for stabilization for GND pin (6pin).  |                    |
| 2       | IN1             | Motor drive control input pin.<br>Driving control input pin of OUT1 (10pin) and OUT2 (9pin). It is used in combination with IN2 pin (3pin). For the digital input, range of the "L" level is 0 to 0.7(V), range of the "H" level is from 1.8 to 5.5(V). PWM can be input. Pull-down resistance 100(kΩ) is built into in the pin. It becomes a standby mode because all IN1, IN2, IN3, and IN4 pins are made "L", and the circuit current can be adjusted to 0. |                    |
| 3       | IN2             | Motor drive control input pin.<br>Driving control input pin of OUT1 (10pin) and OUT2 (9pin). It is used in combination with IN1 pin (2pin). PWM can be input. With built-in pull-down resistance.  |                    |
| 4       | IN3             | Motor drive control input pin.<br>Driving control input pin of OUT3 (8pin) and OUT4 (7pin). It is used in combination with IN4 pin (5pin). PWM can be input. With built-in pull-down resistance.   |                    |
| 5       | IN4             | Motor drive control input pin.<br>Driving control input pin of OUT3 (8pin) and OUT4 (7pin). It is used in combination with IN3 pin (4pin). PWM can be input. With built-in pull-down resistance.   |                    |
| 6       | GND             | Ground pin.  |                    |
| 7       | OUT4            | Driving output pin.<br>The motor coil is connected between terminal OUT3 (8pin).   |                    |
| 8       | OUT3            | Driving output pin.<br>The motor coil is connected between terminal OUT4 (7pin).   |                    |
| 9       | OUT2            | Driving output pin.<br>The motor coil is connected between terminal OUT1 (10pin).  |                    |
| 10      | OUT1            | Driving output pin.<br>The motor coil is connected between terminal OUT2 (9pin).   |                    |

## Operation explanation

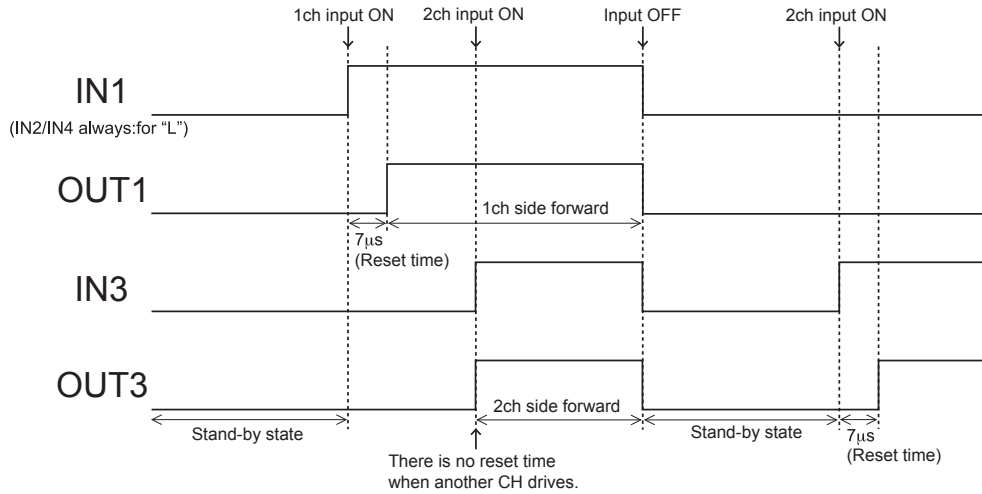
### 1. DCM output control logic

| Input |     |     |     | Output |      |      |      | Remarks  |
|-------|-----|-----|-----|--------|------|------|------|----------|
| IN1   | IN2 | IN3 | IN4 | OUT1   | OUT2 | OUT3 | OUT4 |          |
| L     | L   | L   | L   | OFF    | OFF  | OFF  | OFF  | Stand-by |
| L     | L   |     |     | OFF    | OFF  |      |      | Stand-by |
| H     | L   |     |     | H      | L    |      |      | Forward  |
| L     | H   |     |     | L      | H    |      |      | Reverse  |
| H     | H   |     |     | L      | L    |      |      | Brake    |
|       |     | L   | L   |        |      | OFF  | OFF  | Stand-by |
|       |     | H   | L   |        |      | H    | L    | Forward  |
|       |     | L   | H   |        |      | L    | H    | Reverse  |
|       |     | H   | H   |        |      | L    | L    | Brake    |

## 2. About the switch time from the stand-by state to the state of operation

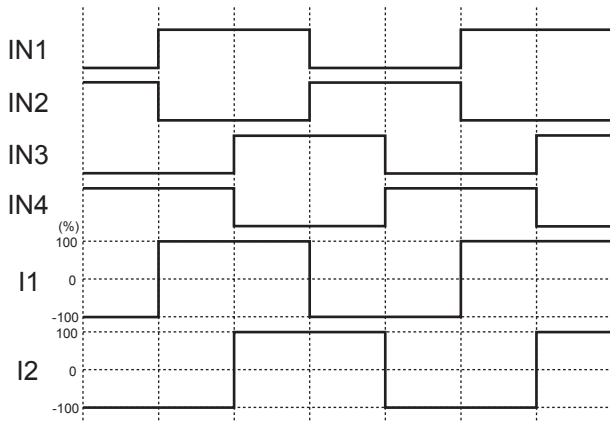
When IN1, IN2, IN3, IN4 are "L", this IC has completely stopped operating. After the time of reset of about 7μs of an internal setting, it shifts to a prescribed output status corresponding to the state of the input when the signal enters the input terminal.

Reset of about 7μs doesn't hang even if the motor is driven from the stand-by state when either CH drives and the output becomes an output status corresponding to the state of the input. As for full power TR between the reset time, turning off is maintained.

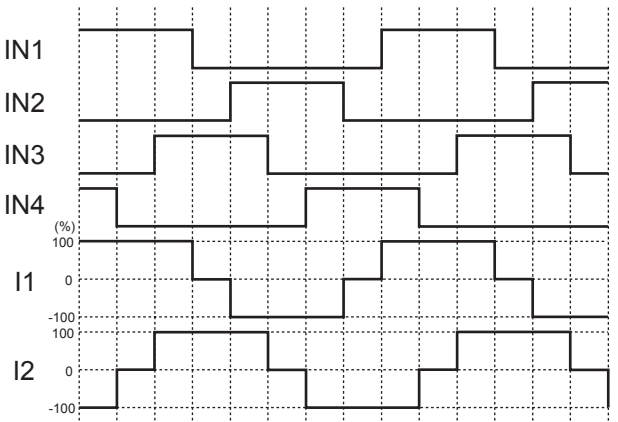


## 3. Example of current wave type in each excitation mode when stepper motor parallel input is controlled.

### • Full-step mode



### • Half-step mode



## 4. Thermal shutdown function

The thermal shutdown circuit is incorporated and the output is turned off when junction temperature  $T_j$  exceeds 180°C. As the temperature falls by hysteresis, the output turned on again (automatic restoration).

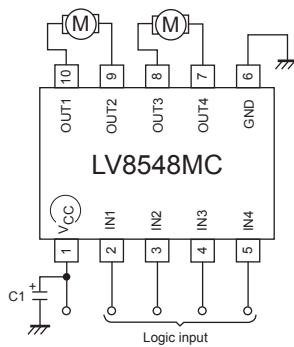
The thermal shutdown circuit does not guarantee the protection of the final product because it operates when the temperature exceed the junction temperature of  $T_{jmax}=150^\circ\text{C}$ .

$TSD = 180^\circ\text{C}$  (typ)

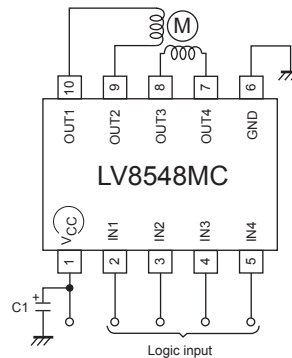
$\Delta TSD = 40^\circ\text{C}$  (typ)

## Application Circuit Example

1. Example of applied circuit when two DC motor driving

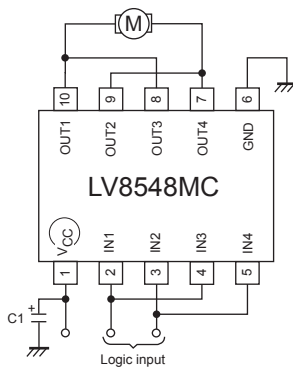


2. Example of applied circuit when one stepper motor driving



3. Example of applied circuit when connecting it in parallel

The use likened to H bridge 1ch is shown possible in the figure below by connecting IN1 with IN3, IN2 with IN4, OUT1 with OUT3, OUT2, and OUT4. ( $I_O \text{ max}=2.0\text{A}$ , Upper and lower total  $R_{ON}=0.5\Omega$ )



\* Bypass capacitor (C1) connected between VCC-GND of all examples of applied circuit recommends the electric field capacitor of  $0.1\mu\text{A}$  to  $10\mu\text{A}$ .

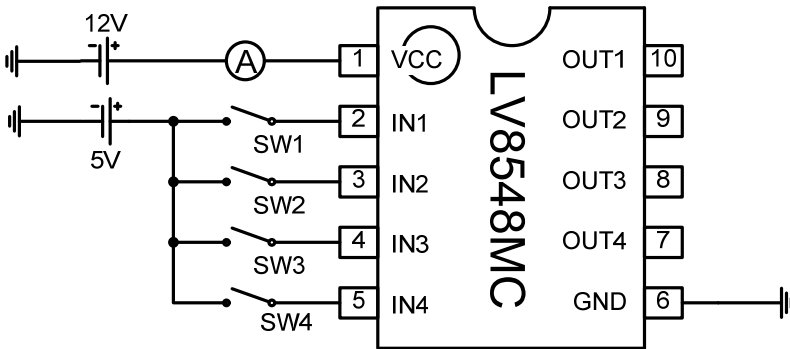
Confirm there is no problem in operation in the state of the motor load including the temperature property about the value of the capacitor.

Mount the position where the capacitor is mounted on nearest IC.



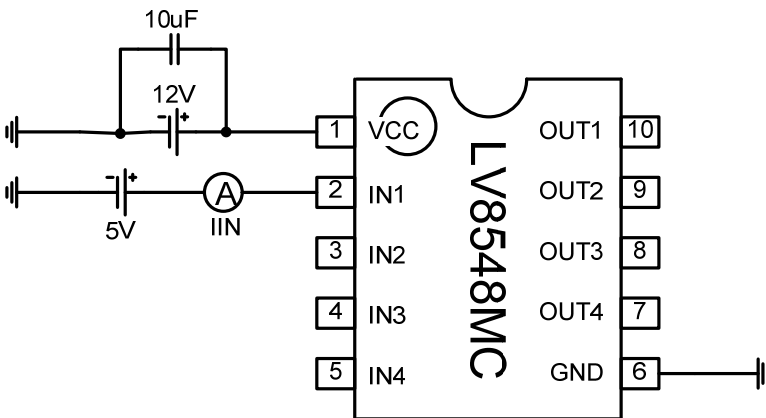
**Measurement connection diagram**

- (1) Current consumption when standing by  $I_{CC0}$   
 Current consumption  $I_{CC1}$



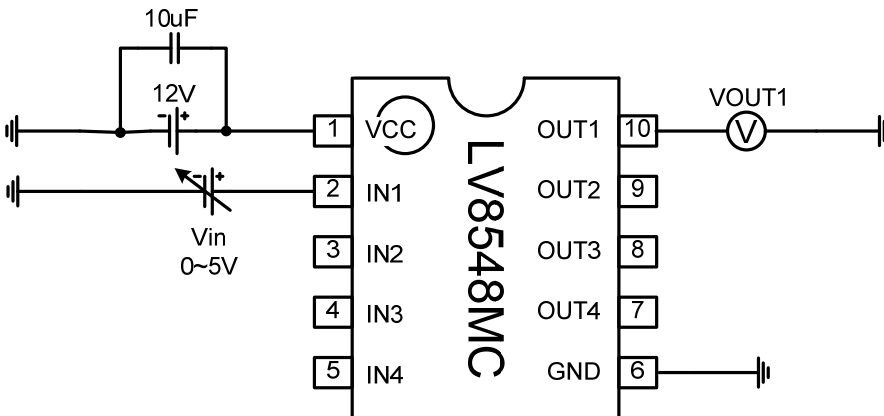
Measure  $I_{CC0}$  with all SW OFF.  
 Measure  $I_{CC1}$  with any of the SW1-4 ON.

- (2) Input current  $I_{IN}$



This is about the measurement of IN1 pin. Measure the other IN2-4 pins as is this case.

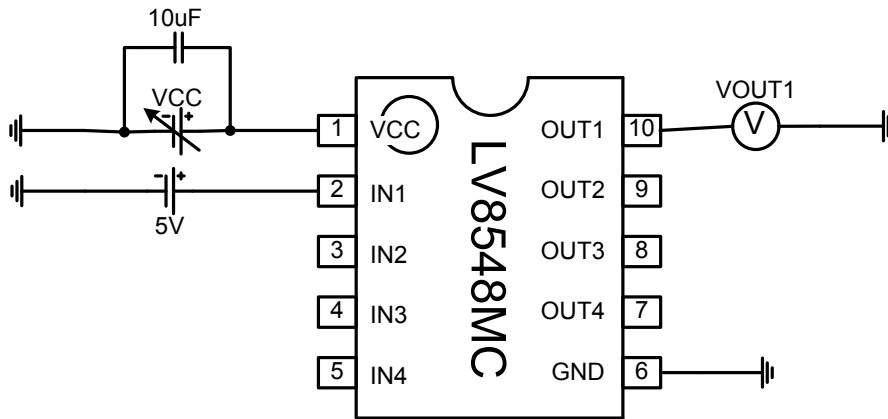
- (3) Input "H" level voltage  $V_{INH}$



Measure the  $V_{in}$  value at the time  $V_{OUT1}$  changes to "H" while varying  $V_{in}$  0-5V.  
 This is about the measurement of IN1 pin. Measure the other IN2-4 pins as is this case.

## LV8548MC

(4) Low voltage protection function operation voltage  $V_{thVCC}$  / Release voltage  $V_{thret}$

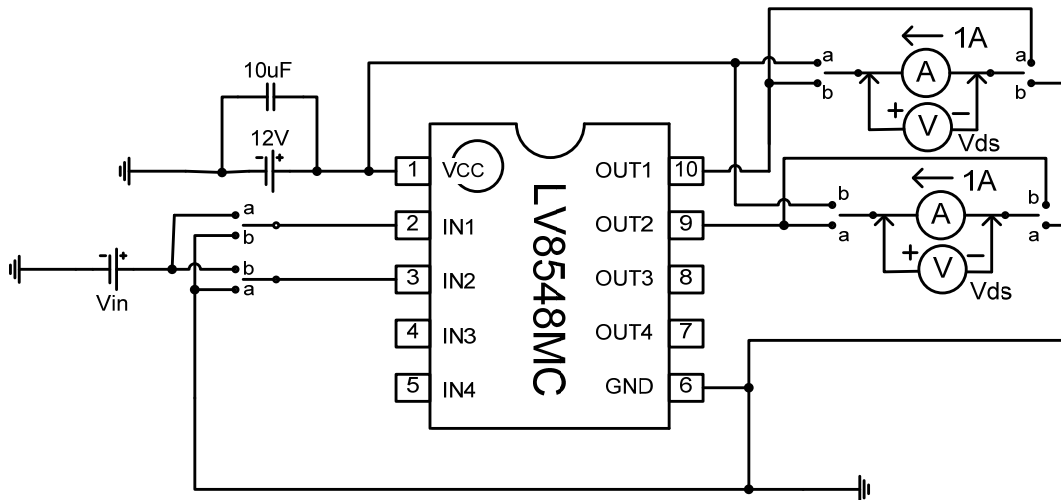


Low voltage protection function  
 Operation voltage :  $V_{CC}=12V$  to  $0V$   
 Release voltage :  $V_{CC}=0V$  to  $12V$

To measure the operating voltage of the reduced voltage protection, measure the  $V_{CC}$  value at the time  $V_{OUT1}$  becomes "L" while varying  $V_{CC}$  from  $12V$  to  $0V$ .

To measure the release voltage of the reduced voltage protection, measure the  $V_{CC}$  value at the time  $V_{OUT1}$  becomes "H" while varying  $V_{CC}$  from  $0V$  to  $12V$ .

(5) Output ON resistance  $R_{on}$



SW\_a side :  
 OUT1 Upper-side/OUT2 Lower-side  
 OUT3 Upper-side/OUT4 Lower-side  
 SW\_b side :  
 OUT1 Lower-side/OUT2 Upper-side  
 OUT3 Lower-side/OUT4 Upper-side

Measure OUT1 upper side and OUT2 lower side FET with the SW set to "a".

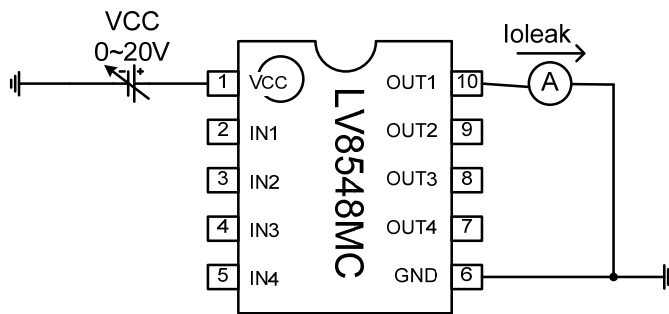
Measure OUT1 lower side and OUT2 upper side FET with the SW set to "b".

Measure OUT3 and OUT4 as are the cases of OUT1 and OUT2.

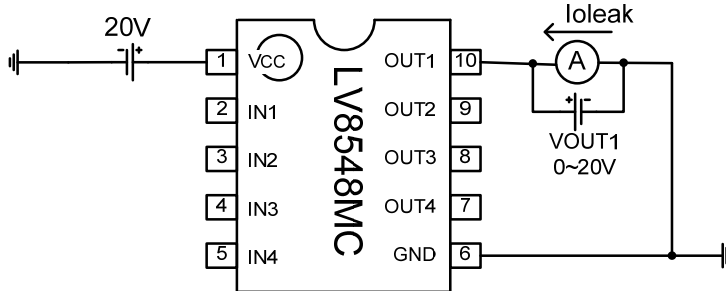
# LV8548MC

## (6) Output leak current $I_{leak}$

<Each OUT Upper-side>



<Each OUT Lower-side>

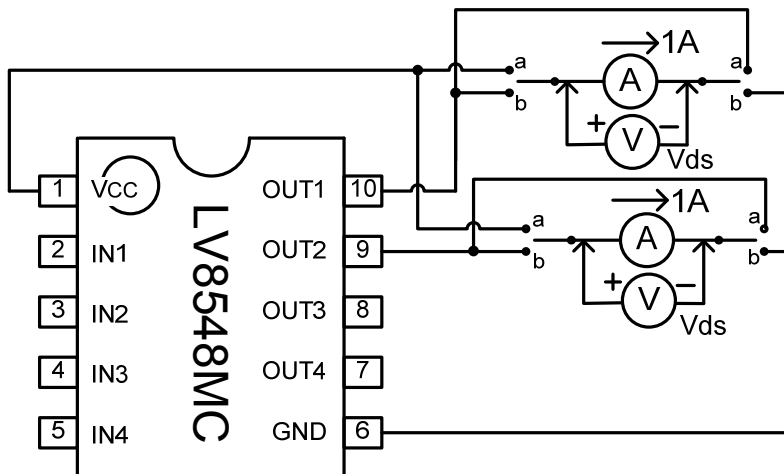


To measure the upper FET output leak current, set the OUT to 0V and measure the OUT current while varying VCC from 0 to 20V.

To measure the lower FET output leak current, set the VCC to 20V and measure the OUT current while varying OUT from 0 to 20V.

This is about the measurement of OUT1 pin. Measure the other OUT2-4 pins as is this case.

## (7) Diode forward voltage $V_D$



SW\_a side : Each OUT Upper-side

SW\_b side : Each OUT Lower-side

Measure OUT1 and OUT2 upper FET with the SW set to "a".

Measure OUT1 and OUT2 lower FET with the SW set to "b".

Measure OUT3 and OUT4 as are the cases/connections of OUT1 and OUT2.

ON Semiconductor and the ON logo are registered trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries. 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](http://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.

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [Motor/Motion/Ignition Controllers & Drivers](#) category:*

*Click to view products by [ON Semiconductor](#) manufacturer:*

Other Similar products are found below :

[LV8133JA-ZH](#) [LV8169MUTBG](#) [LV8774Q-AH](#) [LV8860PV-TLM-H](#) [MC33931EKR2](#) [MC34GD3000EP](#) [FSB50250UTD](#) [FSB50550TB2](#)  
[FSBF15CH60BTH](#) [MP6507GR-P](#) [MP6508GF](#) [MSVCPM2-63-12](#) [MSVGW45-14-2](#) [MSVGW54-14-5](#) [NTE7043](#) [CAT3211MUTAG](#)  
[LA6245P-CL-TLM-E](#) [LA6245P-TLM-E](#) [LA6565VR-TLM-E](#) [LB11650-E](#) [LB1694N-E](#) [LB1837M-TLM-E](#) [LB1845DAZ-XE](#) [LC898111AXB-](#)  
[MH](#) [LC898300XA-MH](#) [SS30-TE-L-E](#) [STK531-345A-E](#) [STK581U3A0D-E](#) [STK58AUNP0D-E](#) [STK621-068C-E](#) [STK621-140C](#) [STK621-](#)  
[728S-E](#) [STK625-728-E](#) [STK672-400B-E](#) [STK672-432AN-E](#) [STK672-432BN-E](#) [STK672-440AN-E](#) [STK672-442AN-E](#) [AMIS30621AUA](#)  
[FSB50550ASE](#) [26700](#) [LV8161MUTAG](#) [LV8281VR-TLM-H](#) [LV8702V-TLM-H](#) [LV8734VZ-TLM-H](#) [LV8773Z-E](#) [LV8807QA-MH](#)  
[MC33932EK](#) [MCP8024T-H/MP](#) [TND027MP-AZ](#)