

LV8549MC

Bi-CMOS integrated circuit
12V Low Saturation Voltage Drive
Stepping Motor Driver

Overview

The LV8549MC is a 2-channel low saturation voltage stepping motor driver IC. It is optimal for Full step motor drive in 12V system products.

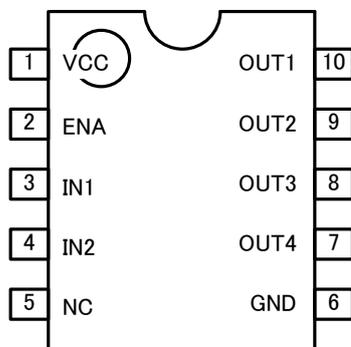
Functions

- DMOS output transistor adoption (Upper and lower total $R_{ON}=1\Omega$ typ)
- The compact package (SOIC10) is adopted.
- V_{CC} max=20v, I_O max=1A
- For one power supply (The control system power supply is unnecessary.)
- Current consumption 0 when standing by

Typical Applications

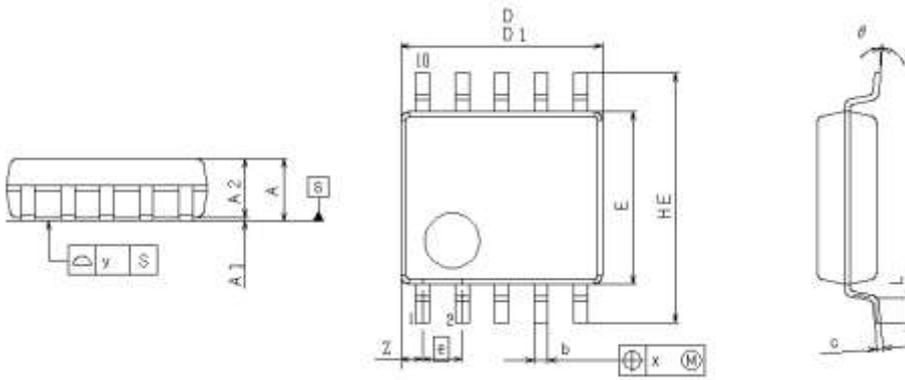
- Refrigerators
- Time Recorder
- Label Printer
- Vacuum cleaner
- POS Printer
- TOY

Pin Assignment

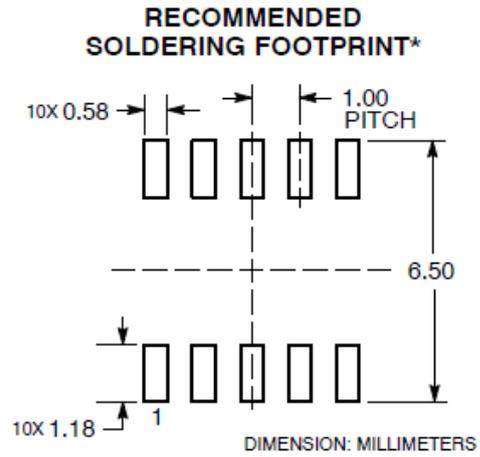


LV8549M
(Top View)

Package Dimensions



symbol	SOIC10		
	MIN.	NOM.	MAX.
D			
D1	4.80	<4.90>	5.00
A			1.75
A1	0.10	<0.175>	0.25
A2	1.25		1.75
e		1.00	
L	0.40	<0.835>	1.27
b	0.31	<0.41>	0.51
c	0.17	<0.21>	0.25
x		0.25	
y		0.10	
HE	5.80	<6.00>	6.20
E	3.80	<3.90>	4.00
Ø	0.00		8.00
Z			



Caution: The package dimension is a reference value, which is not a guaranteed value.

Block Diagram

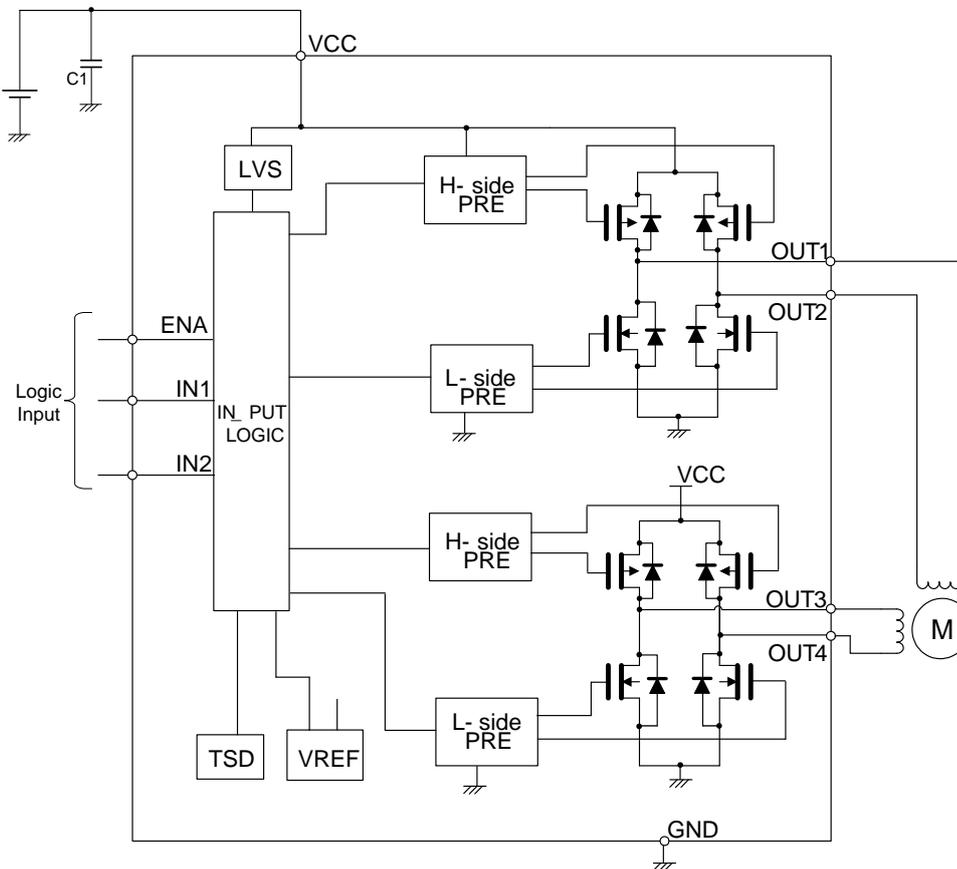


Figure1 One stepping motor drive

LV8549MC

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum power supply	V _{CC} max		-0.3 to +20	V
Output impression	V _{OUT}		-0.3 to +20	V
Input impression voltage	V _{IN}		-0.3 to +6	V
GND pin outflow current	I _{GND}	For ch	1.0	A
Allowable Power	P _d max	*	1.05	W
Operating temperature	T _{opr}		-30 to +85	°C
Storage temperature	T _{stg}		-40 to +150	°C

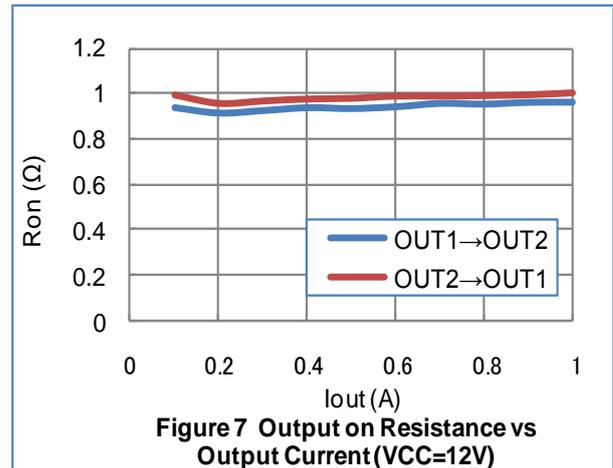
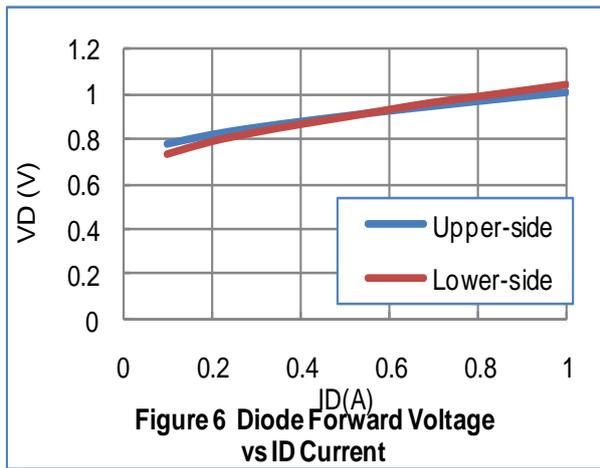
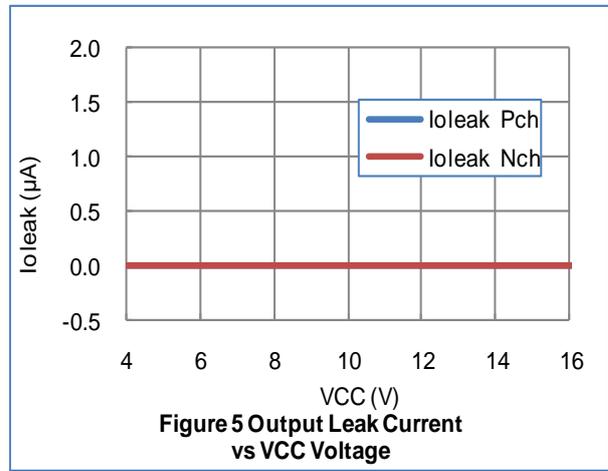
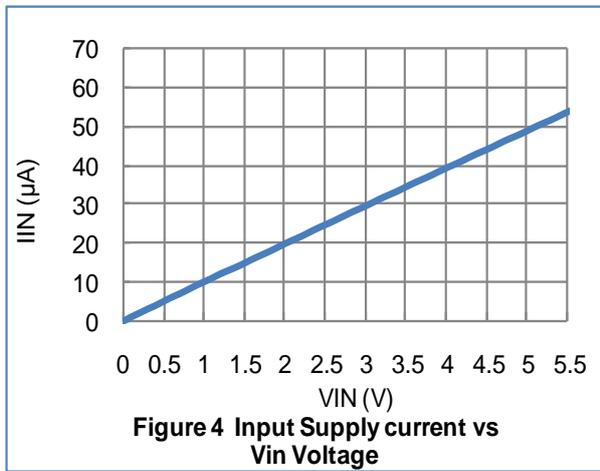
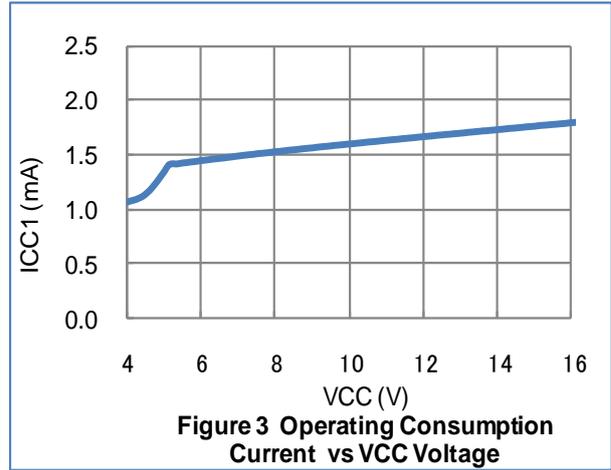
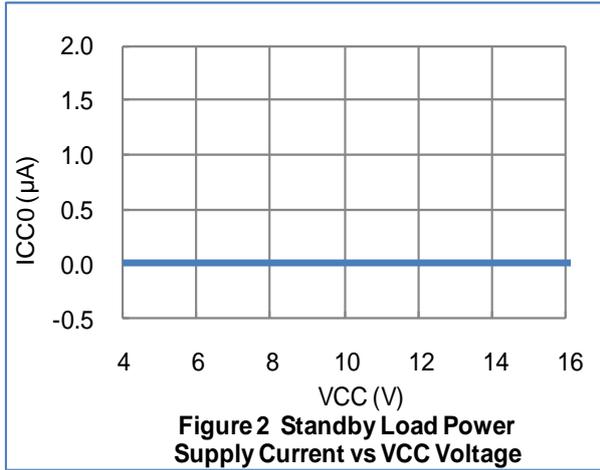
*: When mounted on the specified printed circuit board (57.0mm x57.0mm x 1.6mm), glass epoxy, both sides

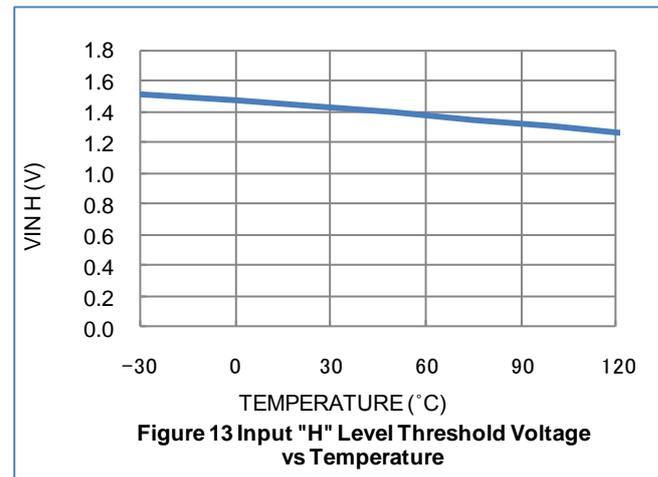
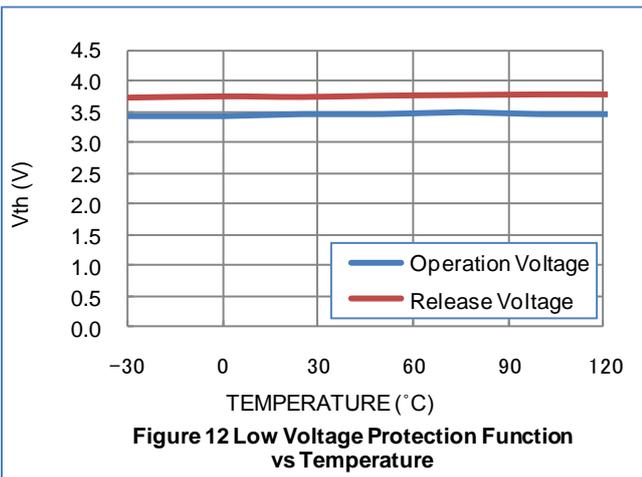
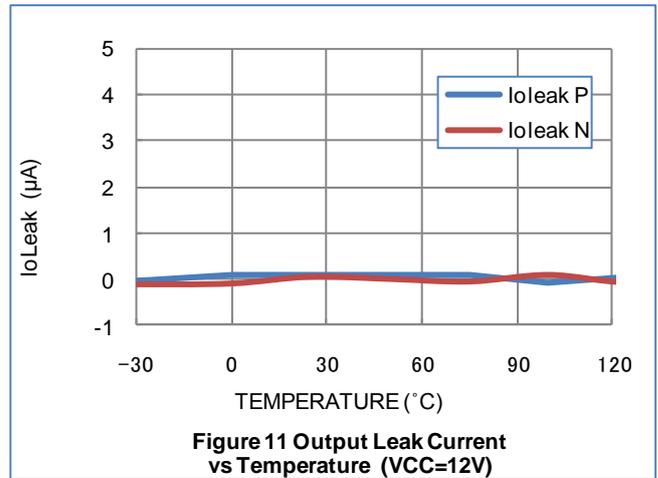
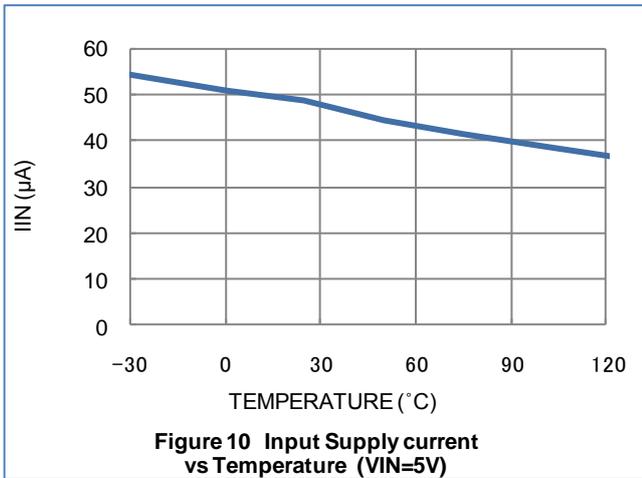
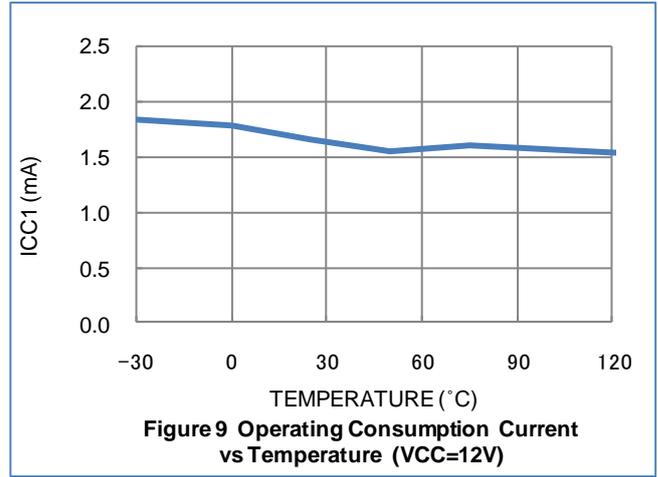
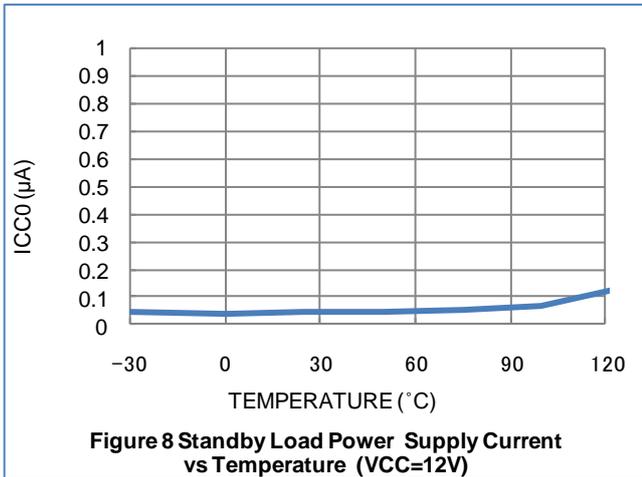
Recommended Operating Range at Ta = 25°C

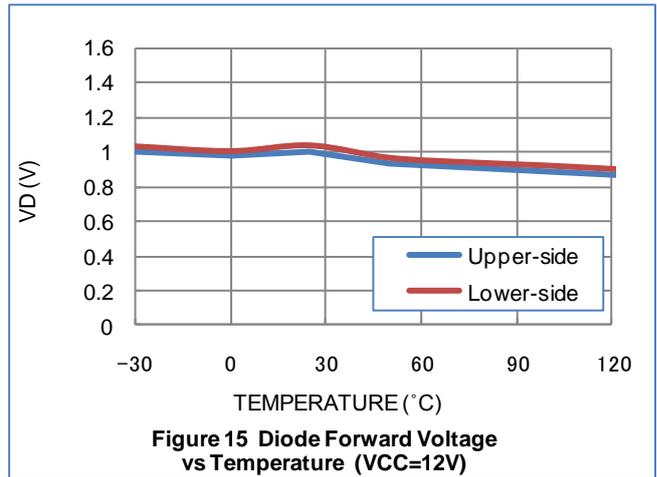
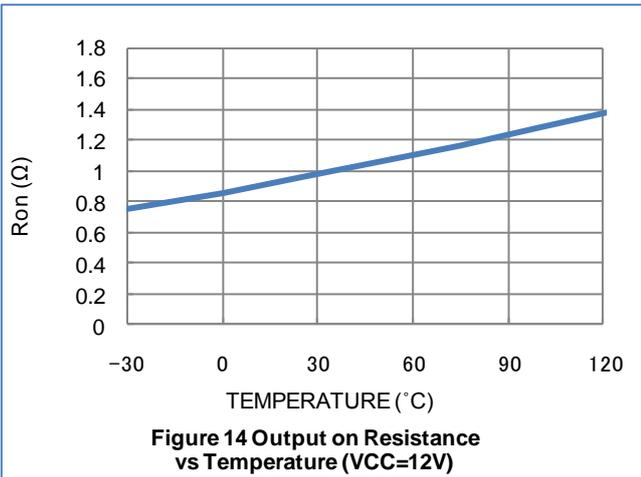
Parameter	Symbol	Conditions	Ratings	Unit
Power supply voltage	V _{CC}		4.0 to 16	V
Input "H" level voltage	V _{INH}		+1.8 to +5.5	V
Input "L" level voltage	V _{INL}		-0.3 to +0.7	V

Electrical Characteristics at Ta = 25°C, V_{CC} = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Power supply voltage	I _{CC0}	Standby mode ENA=L			1	μA
	I _{CC1}	ENA=H		1.7	2.3	mA
Input current	I _{IN}	V _{IN} =5V	30	50	65	μA
Thermal shutdown operating temperature	T _{tsd}	Design certification	150	180	210	°C
Width of temperature hysteria	ΔT _{tsd}	Design certification		40		°C
Low voltage protection function operation voltage	V _{thV_{CC}}		3.3	3.5	3.65	V
Release voltage	V _{thret}		3.55	3.8	3.95	V
Output ON resistance (Upper and lower total)	R _{ON}	I _{OUT} =1.0A	0.7	1	1.25	Ω
Output leak current	I _{Oleak}	V _O =16V			10	μA
Diode forward voltage	V _D	I _D =1.0A		1.0	1.2	V







LV8549MC

Pin function

Pin No.	Pin name	Pin function	Equivalent Circuit
1	VCC	Power-supply voltage pin. VCC 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	ENA	Motor drive control input pin. It shifts from the stand-by state to a prescribed output operation corresponding to the state of the input when the ENA pin becomes a standby mode by L, the circuit current can be adjusted to 0, and it makes it to H. It is a digital input, and the range of L level input is 0 to 0.7(V) and the range of H level input are 1.8 to 5.5(V). PWM can be input. Pull-down resistance 100(kΩ) is built into in the terminal.	
3	IN1	Motor drive control input pin. Driving control input pin of OUT1 (10pin) and OUT2 (9pin). PWM can be input. With built-in pull-down resistance.	
4	IN2	Motor drive control input pin. Driving control input pin of OUT3 (8pin) and OUT4 (7pin). PWM can be input. With built-in pull-down resistance.	
5	NC		
6	GND	Ground pin.	
7	OUT4	Driving output pin. The motor coil is connected between terminal OUT3 (8pin).	
8	OUT3	Driving output pin. The motor coil is connected between terminal OUT4 (7pin).	
9	OUT2	Driving output pin. The motor coil is connected between terminal OUT1 (10pin).	
10	OUT1	Driving output pin. The motor coil is connected between terminal OUT2 (9pin).	

Operation explanation

1. STM output control logic

Input			Output				Function
ENA	IN1	IN2	OUT1	OUT2	OUT3	OUT4	
L	-	-	OFF	OFF	OFF	OFF	Standby
H	L	L	H	L	H	L	Step 1
	H	L	L	H	H	L	Step 2
	H	H	L	H	L	H	Step 3
	L	H	H	L	L	H	Step 4

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

When ENA pin are "L", this IC has completely stopped operating. After the time of reset (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 ENA pin.

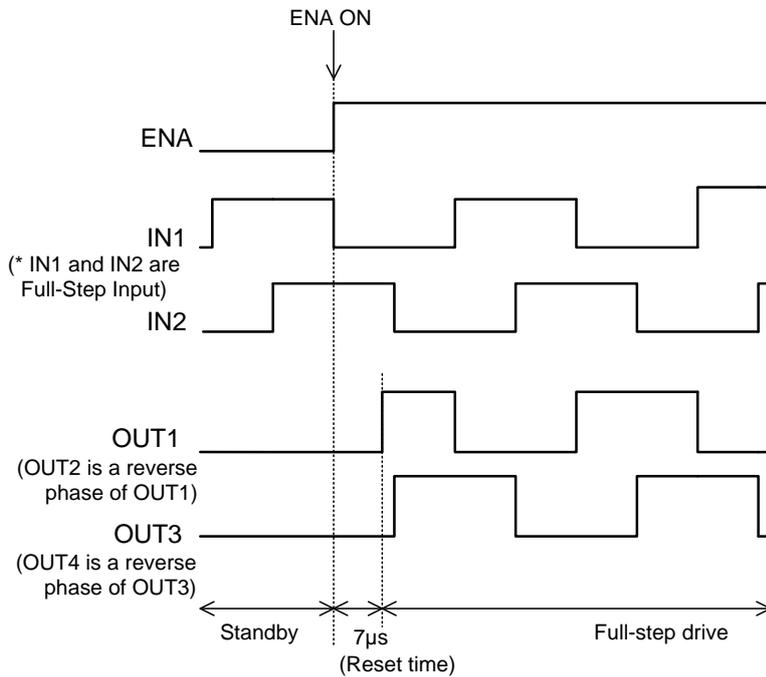


Figure16 Switch time from the stand-by to the operation

3. Thermal shutdown function

The thermal shutdown circuit is incorporated and the output is turned off when junction temperature Tj 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 Tjmax=150°C.

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

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

4. Low voltage protection function

When the power supply voltage is as follows typical 3.5V, the output does OFF.

When the power supply voltage is as above typical 3.8V, the IC outputs a set state.

Operation principal

- Full-Step Drive
Motor advances 90 degree by inputting 1 step.

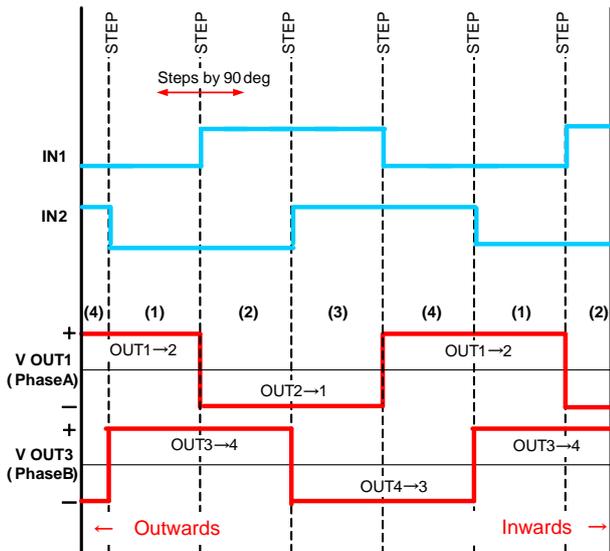


Figure 17. Full-Step Timing

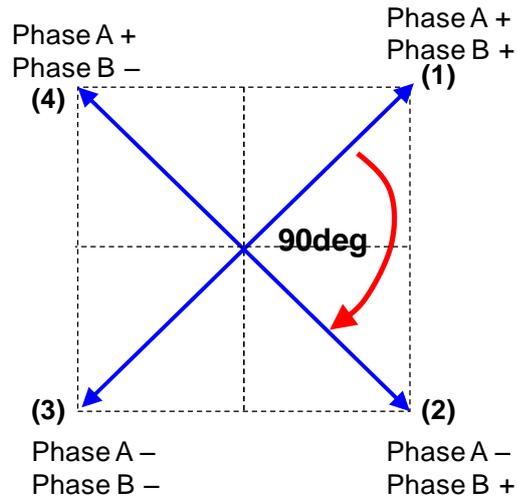
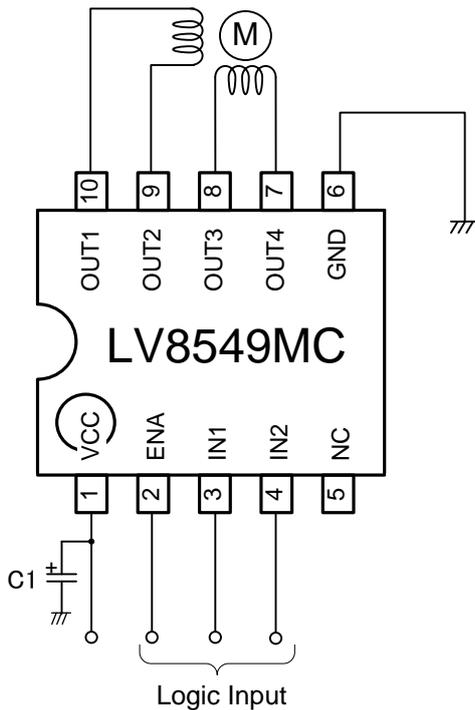


Figure 18. Motor electric angle (Full Step Drive)

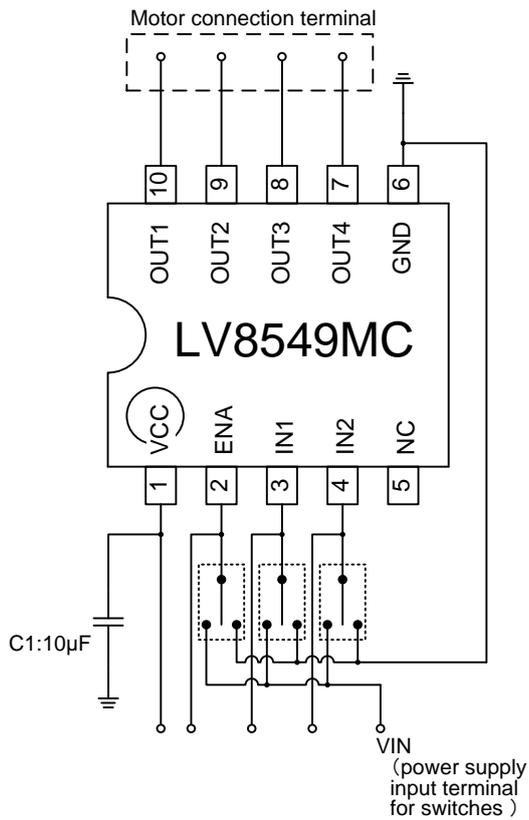
Application Circuit Example



* Bypass capacitor (C1) connected between VCC-GND of all examples of applied circuit recommends the electric field capacitor of 0.1μA to 10μA. 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.

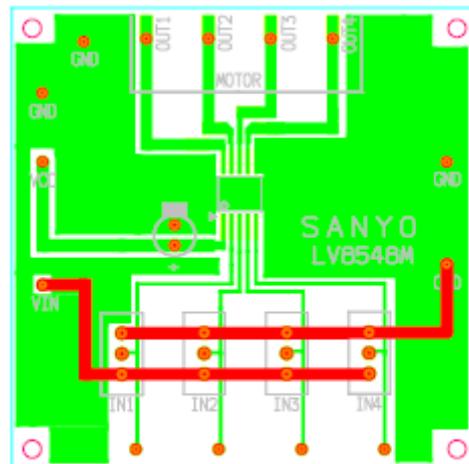
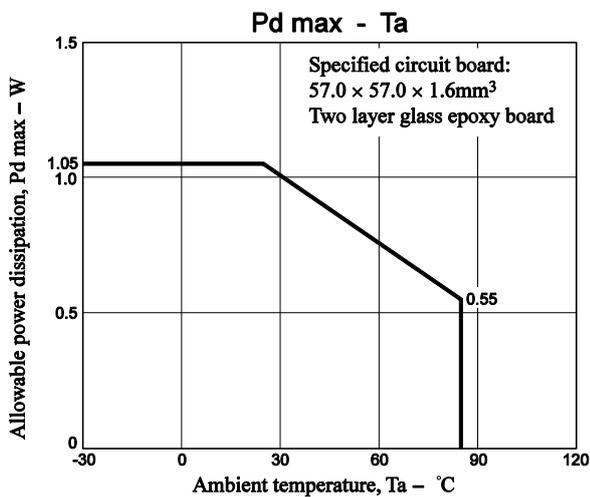
Eva-Board Manual

1. Eva-Board circuit diagram



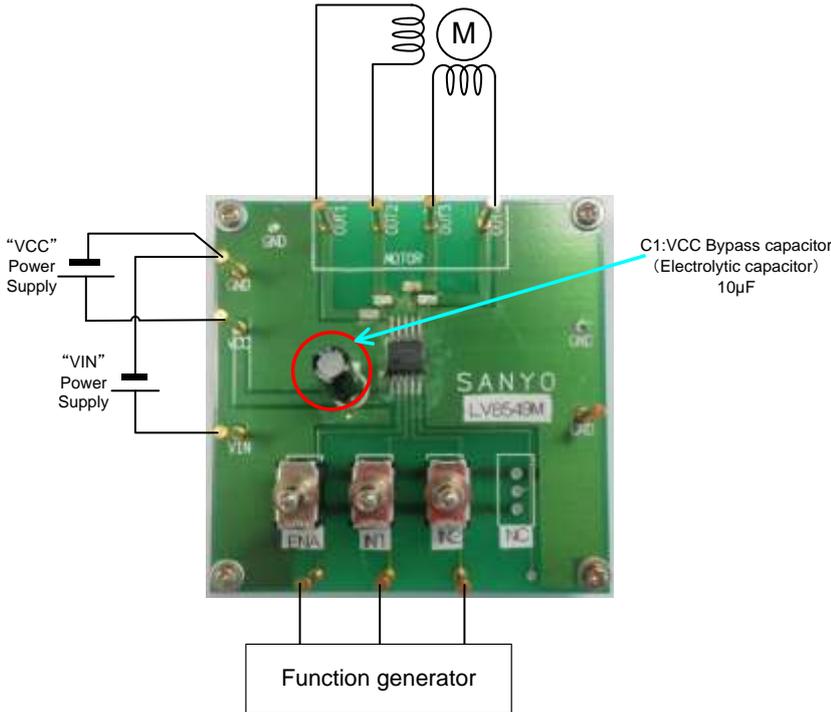
Bill of Materials for LV8549MC Evaluation Board

Designator	Qty	Description	Value	Tol	Footprint	Manufacturer	Manufacturer Part Number	Substitution Allowed	Lead Free
IC1	1	Motor Driver			SOIC10	SANYO semiconductor	LV8549MC	No	Yes
C1	1	VCC Bypass capacitor	10µF 50V	±20%		SUN Electronic Industries	50ME10HC	Yes	Yes
SW1-SW4	3	Switch				MIYAMA	MS-621-A01	Yes	Yes
TP1-TP11	11	Test points				MAC8	ST-1-3	Yes	Yes



LV8549MC

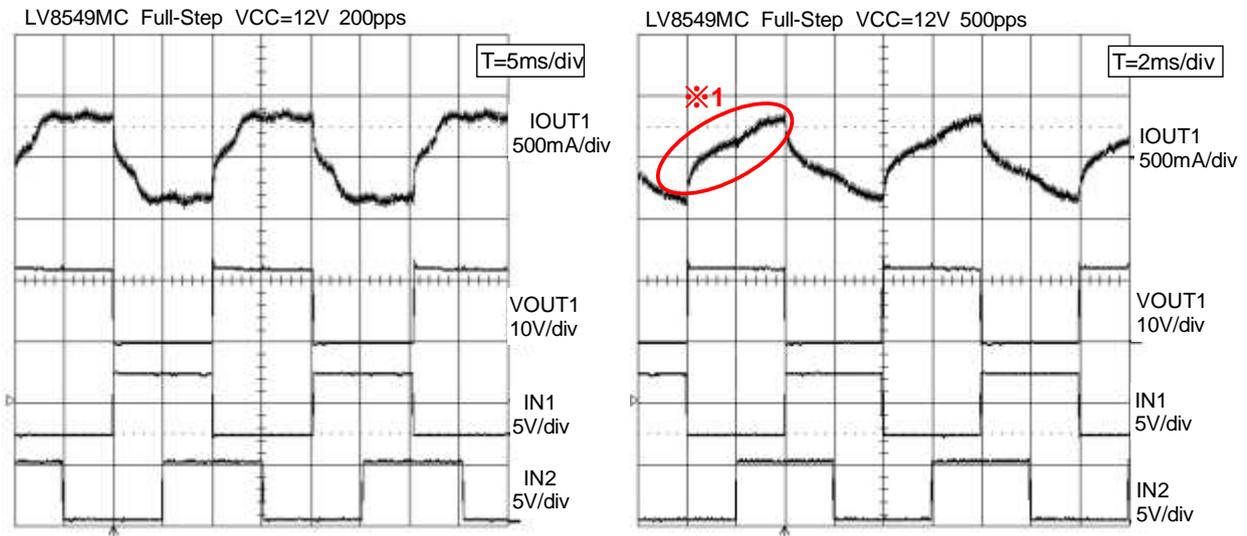
2. One stepping motor drive



- Connect a stepping motor with OUT1, OUT2, OUT3 and OUT4.
- Connect the motor power supply with the terminal VCC, the control power supply with the terminal VIN. Connect the GND line with the terminal GND.
- STP motor drives it in a Full step, by inputting an input signal such as follows into IN1/IN2.
- For input signal to function generator, refer to p.9.
To reverse motor rotation, make sure to input signal to outward direction.

Waveform of LV8549MC evaluation board when driving stepping motor

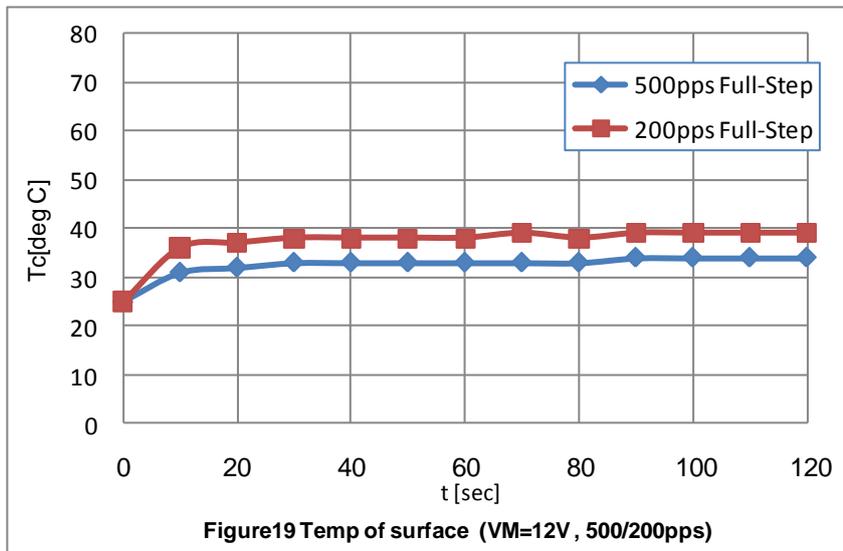
- Full-Step Drive



*1. When the motor rotation is at a high speed, current gradient increases by the inductance of motor (L).

LV8549MC

- IC surface temperature when a motor is in operation (reference)



[Stepping motor driven by LV8549MC]
Motor diameter: 20.5mm
Coil resistance: 30.8Ω

- Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.
- Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.
- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.