

12V dual channel H bridge driver

1. Feature description

- Dual-H-Bridge Motor Driver
 - Can Drive Two DC Motors or One Stepper Motor
 - Low MOSFET ON-Resistance: HS + LS 350mΩ
- Output Current (at VM = 5 V, 25°C)
 - 1.5A RMS, 3A Peak per H-Bridge
- two channels can be used in parallel
- Power Supply Voltage Range: 3.8V~12V
- PWM Winding Current Regulation and Current Limiting
- Short to ground protection, short to power protection
- Over Temperature protection, under voltage protection
- Built in 3.3V LDO without stability capacitor
- Standby mode (< 1uA)
 - When EN=0

2. Application area

- POS printer
- Office Automation Machines
- Robotics

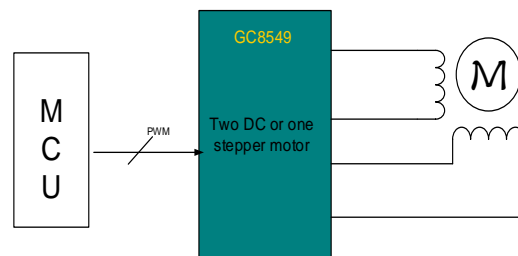
3. Function description

GC8549 is a dual channel, 12V DC motor drive, continuous current 1.5A, peak current 3A, can be used in toys, printers, industrial control and other fields.

The chip can drive a stepper motor or two DC motors, and can also be used to drive other magnetic loads.

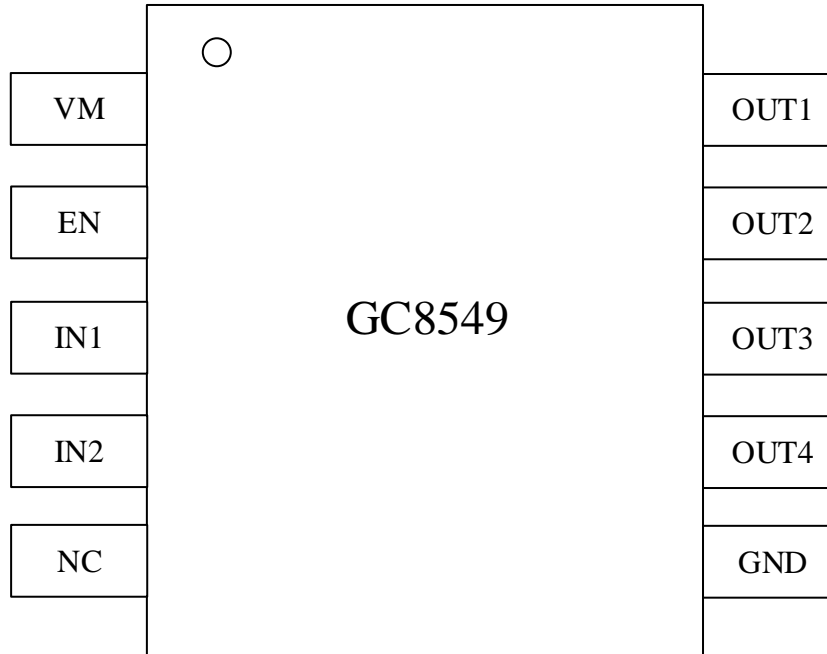
The output H-bridge of the chip integrates OCP circuit, each power MOS transistor is provided with over-current protection and short-circuit protection.

Pow saving mode is enable When logic input 'EN' setting low. power saving current is less than 1uA



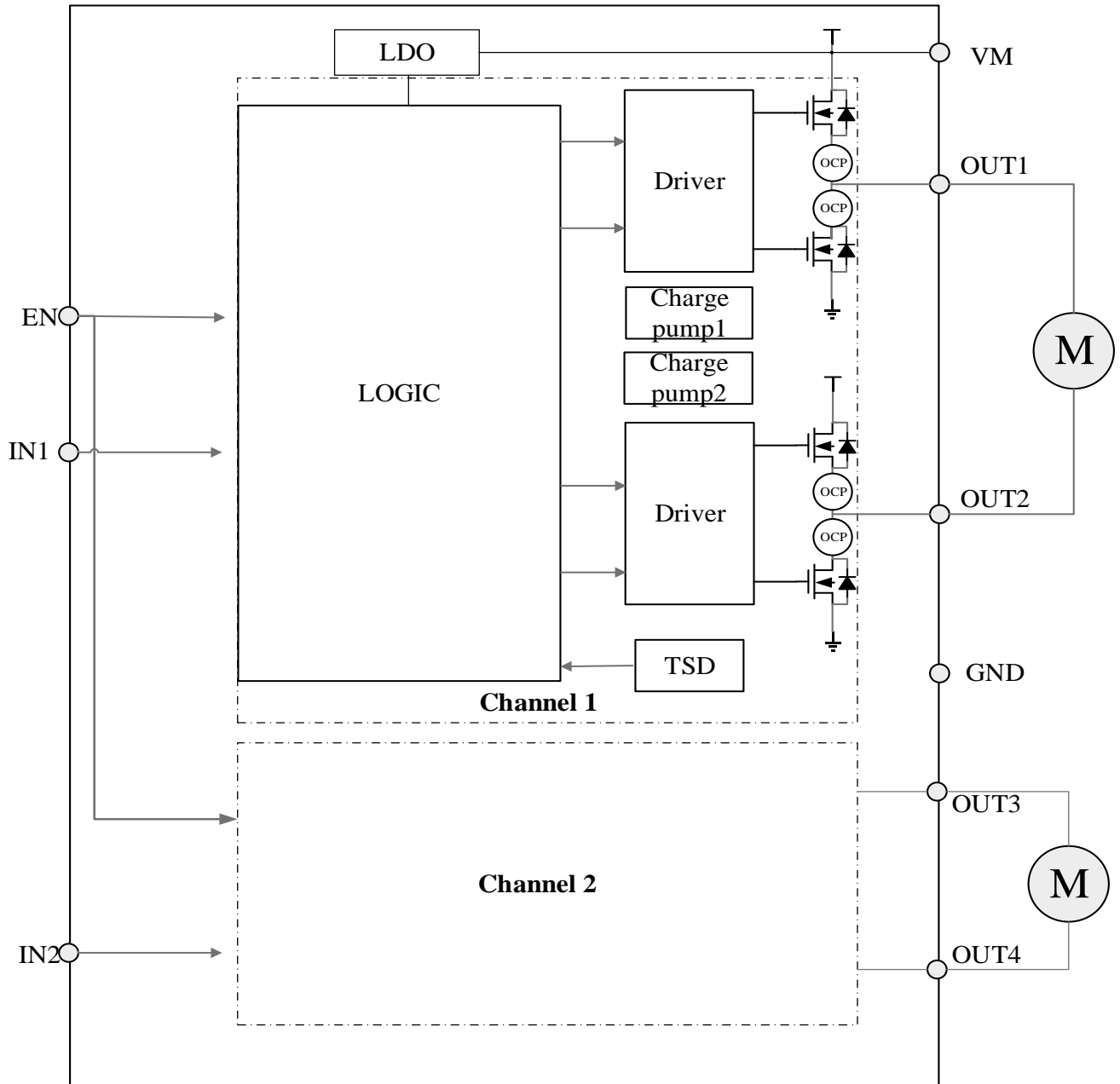
Package Type	Chip Name	Chip Mark
SSOP10L	GC8549	GC8549

4. Pin diagram and description



Pin number	Pin name	I/O	Pin function	External Component
1	VM	POWER	Power	Connect to motor supply. A 10- μ F (minimum) ceramic bypass capacitor to GND is recommended
2	EN	I	SLEEP enable input	Logic low or left open enable sleep mode
3	IN1	I	Channel A input	Logic input, with 100k Ω pull down resistor
4	IN2	I	Channel B input	Logic input, with 100k Ω pull down resistor
5	NC	n.c	No connect	No connect
6	GND	GND	Ground	gnd
7	OUT4	O	Channel 2 output 2	Connected to motor
8	OUT3	O	Channel 2 output 1	Connected to motor
9	OUT2	O	Channel 1 output 2	Connected to motor
10	OUT1	O	Channel1 output 1	Connected to motor

5. Block diagram of chip



6. Specifications

6.1 Absolute Maximum Ratings

Parameter	MIN	MAX	UNIT
VM Power supply voltage	-	17	V
INx Digital input pin voltage	-0.5	7	V
Ipeak Peak motor drive output current	Internally	OCP limited (3A Typ.)	A
Topr Operating junction temperature	-40	100	°C
Tstg Storage junction temperature	-60	150	°C
ESD Human body model (HBM)	-4000	+4000	V

6.2 Recommended Operating Conditions

Parameter	MIN	MAX	UNIT
VM Motor power supply voltage range	3.8	12	V
Digital input pin voltage range	-0.5	5.5	V
Irms continuous output current		1.5	A

6.3 Electrical Characteristics

VM=12V, T=25 °C (unless otherwise noted)

PARAMETER	Parameter description	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Supply						
I _{VM}	VM working current	No PWM, no load	-	0.8	1.0	mA
I _{VMQ}	VM sleep mode current	EN=0 or left open	-	-	1.0	uA
H-bridge OUT						
R _{DS(on)}	High side mosfet + Low side mosfet	VM=12V, T=25°, I _{out} =0.5A	-	0.35	-	Ω
	Low side mosfet	VM=12V, T=125°, I _{out} =0.5A	-	0.53	-	Ω
I _{OFF}	Off-state leakage current	Output "Z"	-10	-	-10	uA
Logic input						
V _{IL}	Input low level threshold	Inx, EN input pin		1.28		V
V _{IH}	Input high level threshold	Inx, EN input pin		1.58	-	V
V _{HYS}	Input hysteresis	Input hysteresis	-	0.30	-	V
R _{INX}	Input pull down	Input pull down resistance		108		K Ω
PROTECTION CIRCUITS						
I _{OCP}	Overcurrent protection trip level	Overcurrent protection trip level	1.9	3	-	A
t _{DEG}	Overcurrent protection period	OCP Deglitch time	-	2.3	-	us
t _{OCP}	Overcurrent protection period	Overcurrent protection period	-	1.5	-	ms
Thermal shutdown temperature						
T _{TSD}	OTP trigger point	Temperature rise	-	169	-	°C
T _{TSDth}	OTP trigger hysteresis	Thermal shutdown hysteresis	-	26	-	°C
VM undervoltage protection						
V _{Muvlo}	VM under voltage protection	VM down threshold		3.64		V
V _{HYS}	VM under voltage protection hysteresis		-	0.24	-	V

6.4 Electrical Characteristics

Timing parameters and curves

TA = 25°C, VM = 5 V, RL = 20 Ω

Para	Test condition	Range		Unit
		MIN	MAX	
t1	Delay Time, IN1/2 High To OUT1/3 Low		160	ns
t2	Delay Time, IN1/2 High To OUT2/4 High		200	ns
t3	Delay Time, IN1/2 Low To OUT1/3 High		200	ns
t4	Delay Time, IN1/2 Low To OUT2/4 Low		160	ns
t5	Wake up Time, EN High To OUT1/3 High		30	us
t6	Delay Time, EN Low To OUT2/4 Low		160	ns
t7	OUTx rise time	30	188	ns
t8	OUTx fall time	30	188	ns

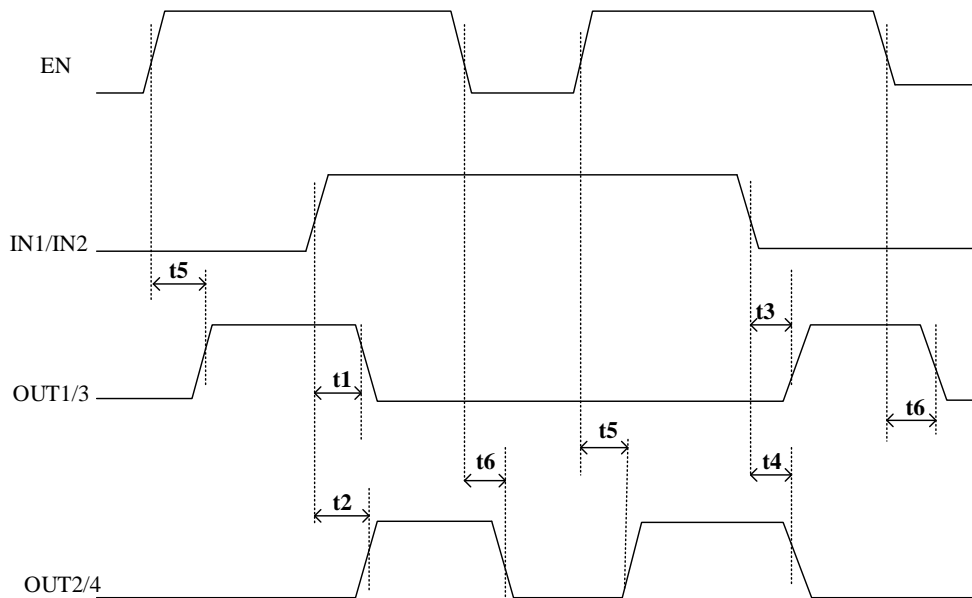


Chart2 GC8549 Input and Output Timing 1

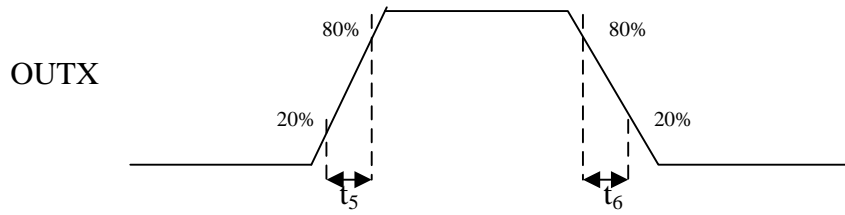


Chart3 GC8549 GC8549 Input and Output Timing 2

7. Function description

GC8549 is an integrated motor driver, which can drive two DC motors or a bidirectional stepping motor. The working voltage range is 3.8V ~ 12V, and the output long-time continuous current can be up to 1.5A. Only four external input are needed to realize the control of DC or stepper motor. The chip contains sleep mode. When EN=0 or left open, the current of the chip is less than 1uA.

7.1 DC Motor Bridge Control

When driving DC Motor, Logic control function is as below:

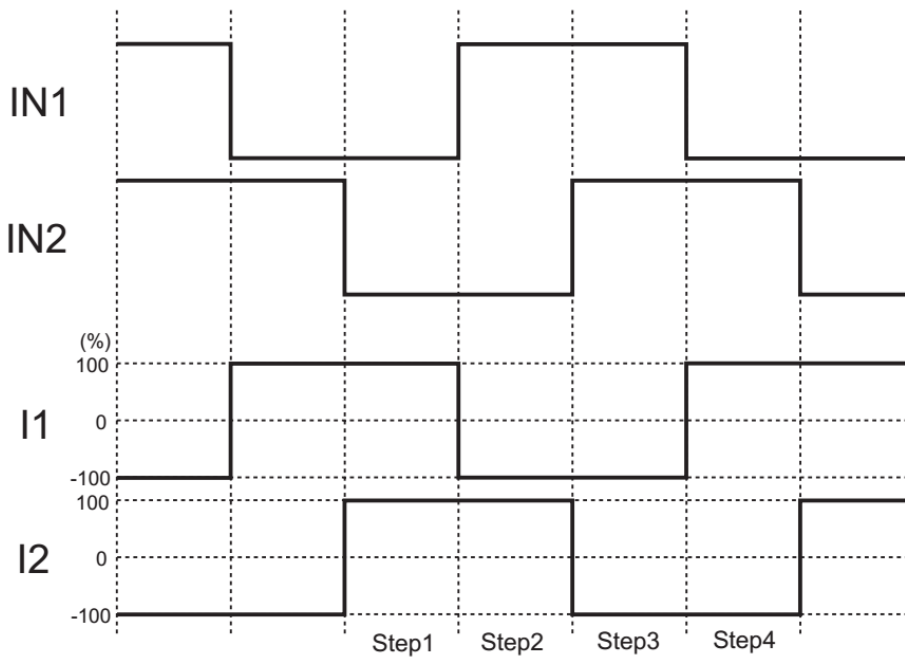
EN	IN1/2	OUT1/3	OUT2/4	FUNCTION
0	X	Z	Z	Sleep
1	1	L	H	Reverse
1	0	H	L	Forward

7.1 Stepper Motor sequence Control

When driving Stepper motor, full step sequence is as below:

EN	IN1	IN2	OUT1	OUT2	OUT3	OUT4	状态
0	X	X	Z	Z	Z	Z	休眠
1	0	0	H	L	H	L	STEP1
1	1	0	L	H	H	L	STEP2
1	1	1	L	H	L	H	STEP3
1	0	1	H	L	L	H	STEP4

Full step control logic and current chart is as below:



7.3 Standby mode

The power-Standby mode is integrated in the chip. When logic input pin EN = 0, the chip will be powered off, the chip current is less than 1uA.

It takes around 7us to resume normal work from sleep mode

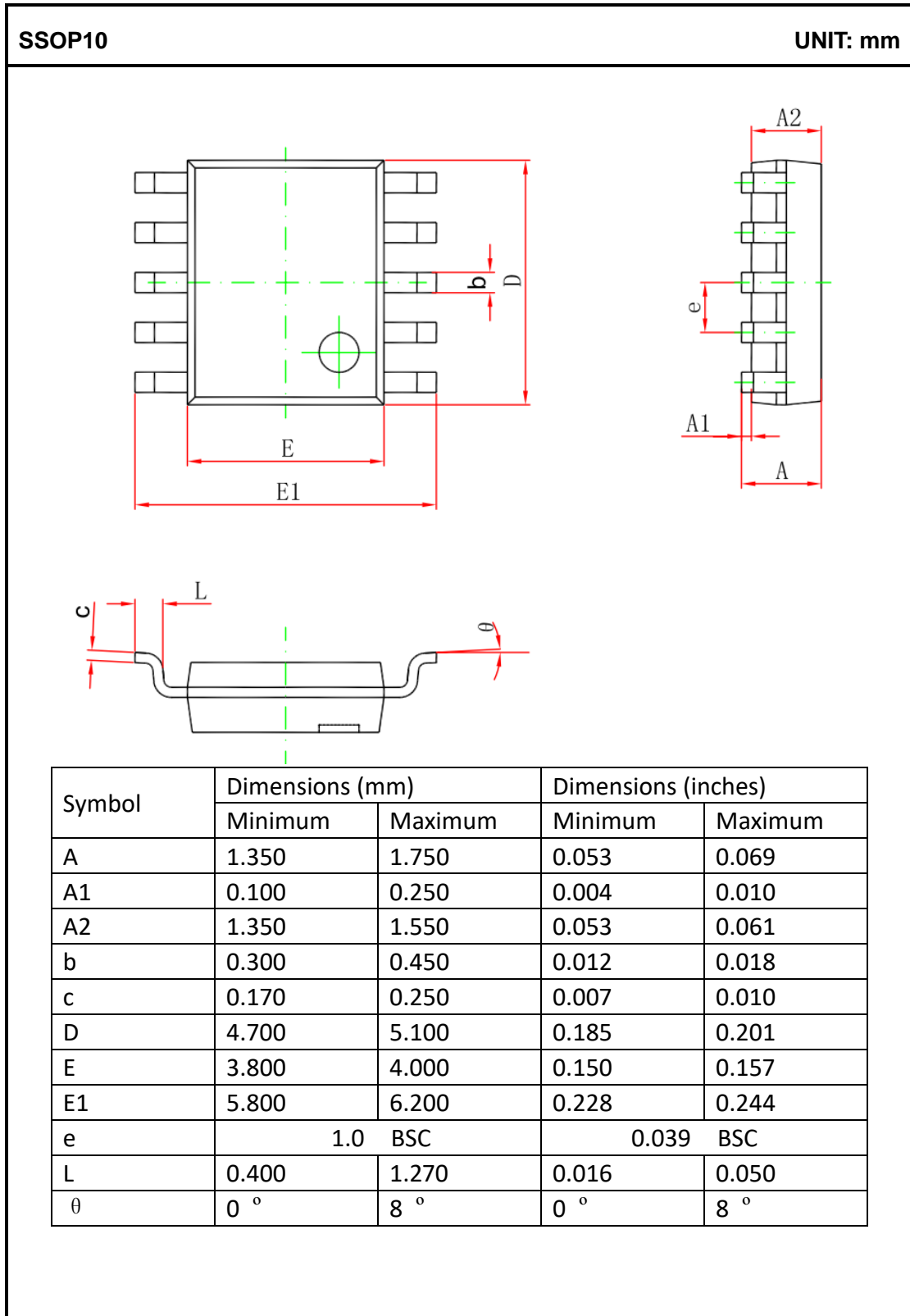
7.4 Over temperature protection and under voltage protection

The chip is integrated with over temperature protection circuit. When the temperature exceeds 169 °C, the chip turns off the outputs; When the temperature returns to 143 °C, the chip output driver automatically turns on again.

If at any time the voltage on the VM pin falls below the under voltage lockout threshold voltage, all circuit in the device will be disabled, and all internal logic will be reset. Operation will resume when VM rises above the UVLO threshold.

7.5 Overcurrent Protection (OCP): short to power, short to ground protection

An analog current limit circuit on each FET limits the current through the FET by limiting the gate driver. If this analog current limit persists for longer than the OCP deglitch time (t_{ocp}), all FETs in the H-bridge will be disabled. The driver will be re-enabled after the OCP retry period (t_{OCP}) has passed. If the fault condition is still present, the cycle repeats. If the fault is no longer present, normal operation resumes.

8. Package block diagram


9. Typical application diagram

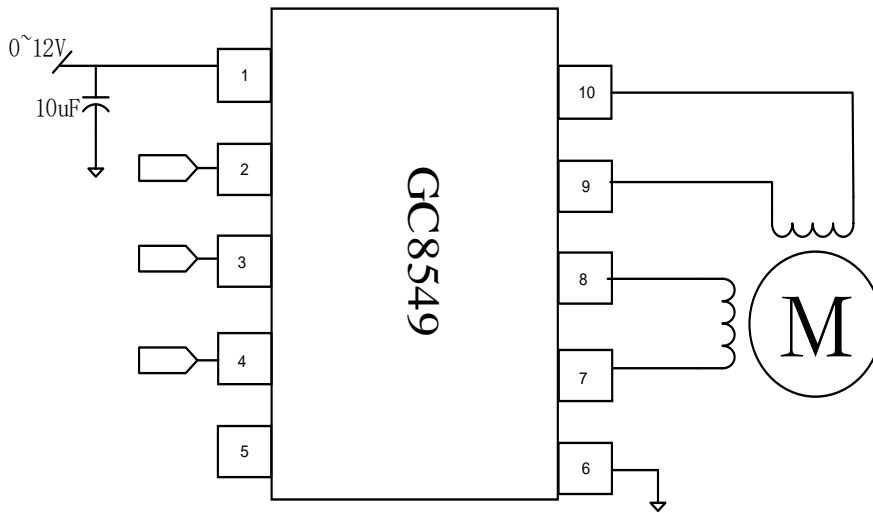


Chart4 GC8549 driving stepper motor

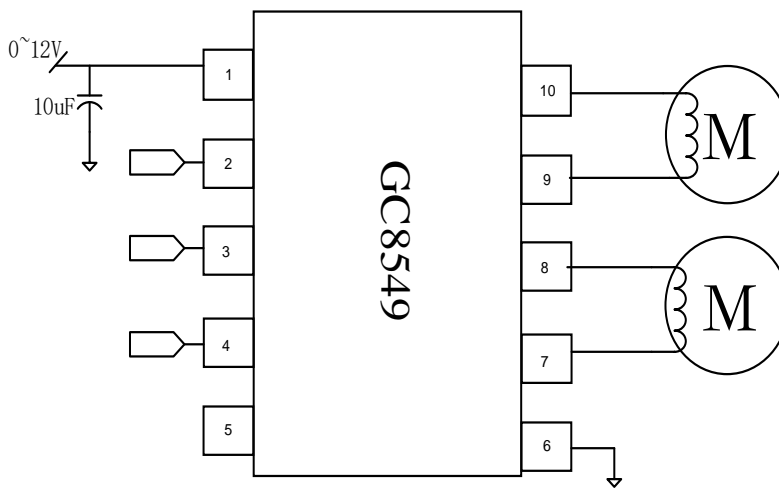


Chart5 GC8549 driving two DC motor