H-Bridge Motor Driver 4~24V, 0.6Ω, Peak current limiting protection:3A

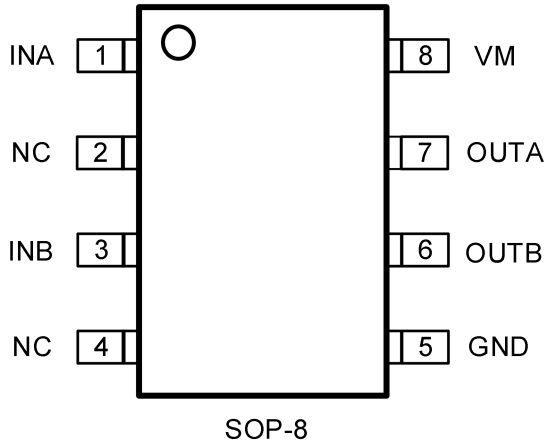
1 Description

The AL878 is a H-bridge motor driver used for driving reversible motors, which can drive one DC motor, a stepper motor, or other loads.

The AL878 operates on a motor power supply voltage from 4V to 24V, With 3A current limit.

The AL878 is controlled by two input pins. The two logic level inputs determine the output mode: forward, reverse, coast, or brake. Very low standby circuit current can be achieved when the two inputs are both at a low level.

The AL878 is available with SOP-8 package.



SOP-8

2 Features

- Wide Power Range: 4V to 24V
- Peak current limiting protection:3A
- Low MOSFET On Resistance: Rhs=0.4Ω, Rls=0.2Ω
- Forward, Reverse, Coast, or Brake Output Modes
- Suitable for wide range MCU control logic
- Input logic hysteresis
- Thermal Shutdown

3 Applications

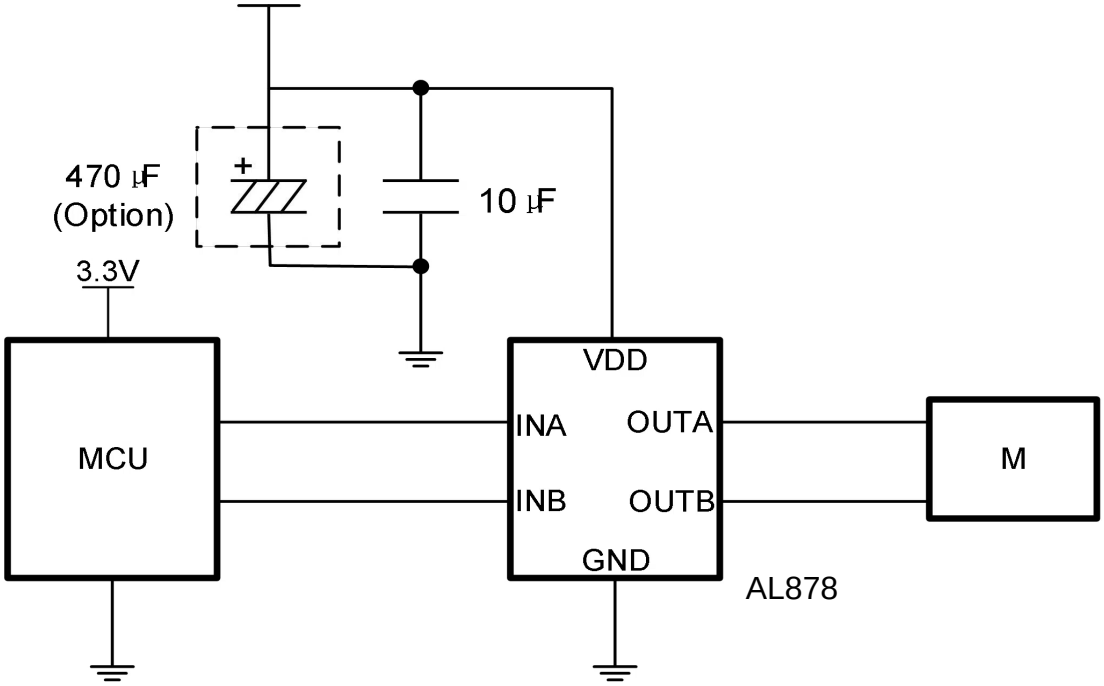
- Smart Meter
- Smart Locks
- Smart Water/Gas Meter

4 Pinout

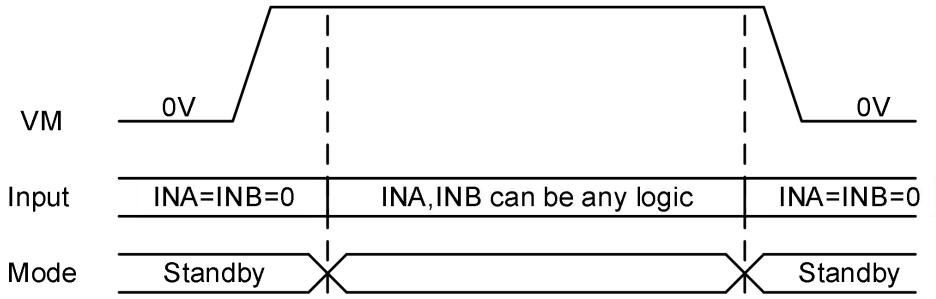
5 Ordering information

Product Number	Package	Quantity/Tape
AL878	SOP-8	4000/Reel

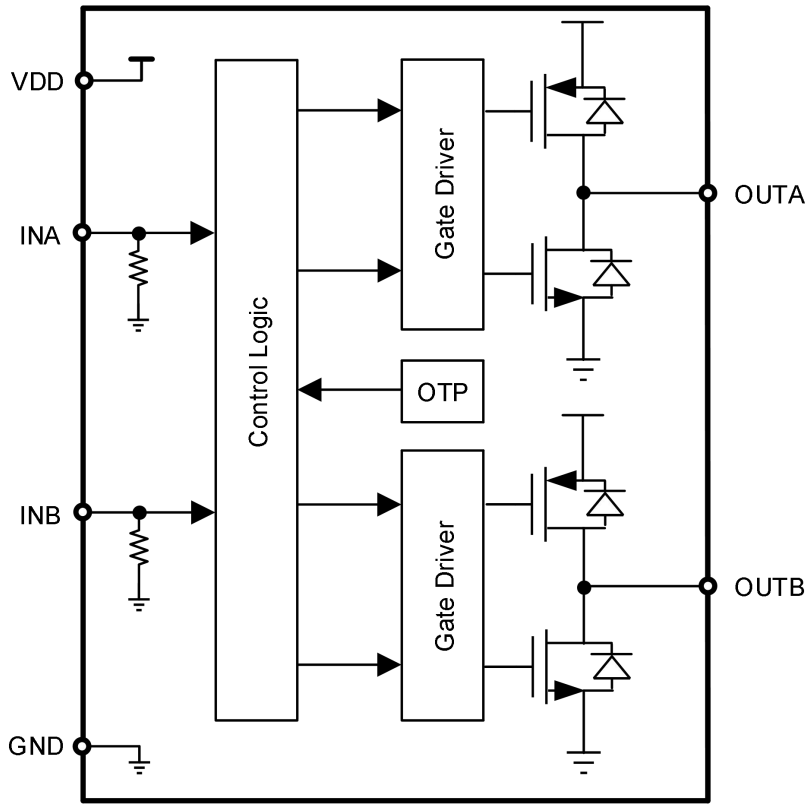
6 Typical Application



Please make sure that the input pins INA and INB remain low during power-up and power-down.



7 Block Diagram



8 Logic Function Table

INA	INB	OUTA	OUTB
0	0	Hi-Z	Hi-Z
0	1	0	1
1	0	1	0
1	1	0	0

9 Pin Descriptions

Pin No.	Symbol	Description
7	OUTA	Output, connect this pin to the motor winding.
8	VM	Supply Voltage. A capacitor is required to prevent large voltage spikes.
6	OUTB	Output, connect this pin to the motor winding.
5	GND	Ground.
1	INA	Logic input with a 1.2MΩ pull-down resistor.
3	INB	Logic input with a 1.2MΩ pull-down resistor.
2/4	NC	Recommended to be connected to GND.

10 Specifications

10.1 Absolute Maximum Ratings

Parameter	Symbol	Value	Units
VM Supply Voltage Range	V_M	-0.4 ~ +25	V
INA/INB Supply Voltage Range	V_{IN}	-0.4 ~ +7	V
OUTA/OUTB Supply Voltage Range	V_{OUT}	-0.4 ~ +25	V
Storage Temperature Range	T_{STG}	-55~150	°C
Welding Temperature	T_{LEAD}	260（soldering,10s）	°C

10.2 ESD Ratings

Discharge mode	Value	Units
HBM	±4000	V
CDM	±2000	V

10.3 Recommended Operating Range

Parameter	Symbol	Min.	Max.	Units
Input Voltage	V_M	3.5	24	V
Input Logic Level	V_{INx}	0	7	V
Operating Ambient Temperature Range	T_A^*	-40	105	°C

*Note: Calculate the maximum ambient temperature based on the specific thermal resistance.

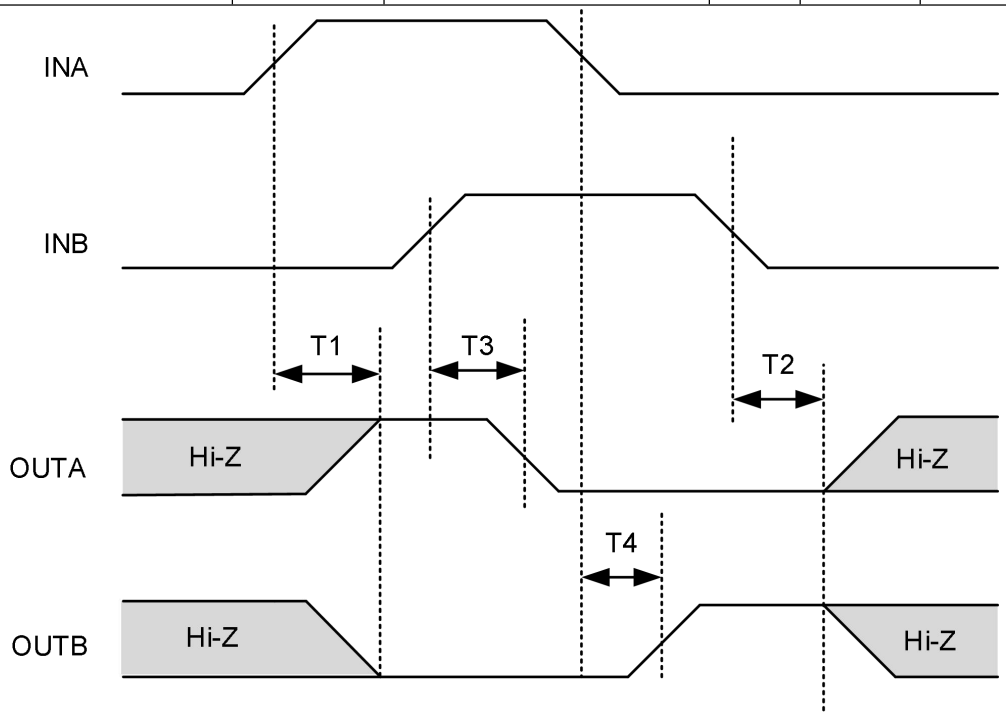
10.4 Thermal Information

Parameter	Package	Value	Unit
θ_{JA}	SOP-8	160	°C/W

10.5 Electrical Characteristics

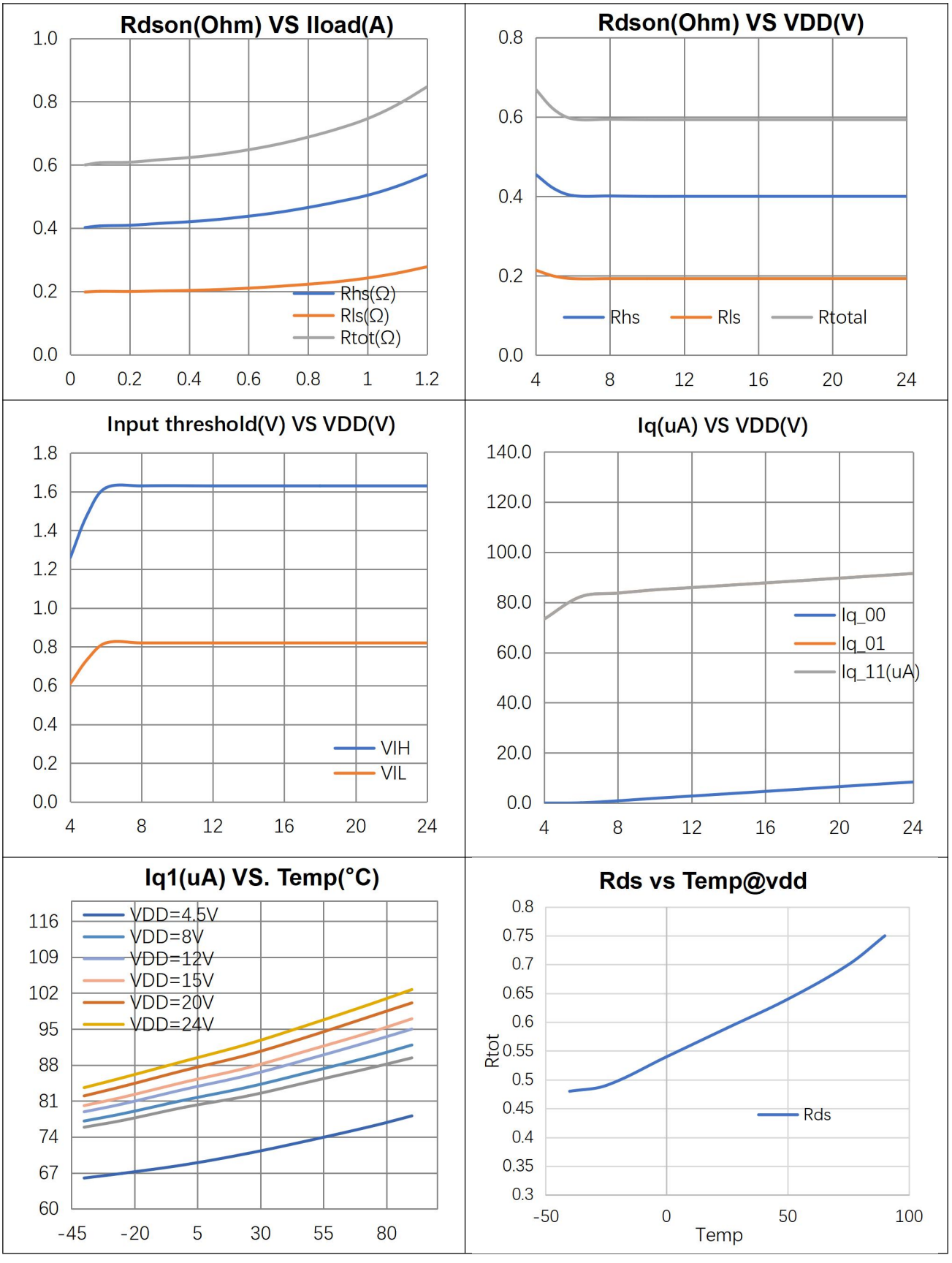
Test conditions: T_A = 25°C, VDD=12V, unless otherwise noted.

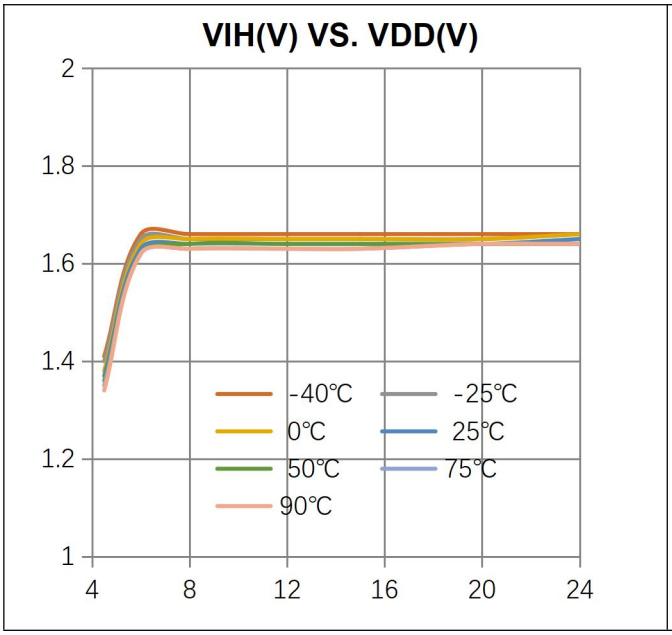
Parameters	Symbol	Condition	Min.	Typ.	Max.	Units
Operating supply voltage	VDD		4		24	V
Standby mode supply current	Iq0	INA=INB=0V		3		μA
Operating supply current	Iq1			85		μA
UVLO threshold rising				4.0	4.4	V
UVLO hysteresis				0.15		V
Input high voltage	VIH		1.7			V
Input low voltage	VIL				0.8	V
Input high current	IIH	VIN=3.3V		3.5		μA
Input pull-down resistance	RIN			1.2		MΩ
HS switch on resistance	Rhs	ILOAD=300mA	0.4	0.45	0.6	Ω
LS switch on resistance	Rls	ILOAD=300mA	0.2	0.25	0.4	Ω
Output enable time	T1			1000		ns
Delay time	T3	INx high to OUTx high		200		ns
	T4	INx low to OUTx low		300		ns
Dead time				200		ns
Thermal shutdown threshold				155		°C
Thermal shutdown hysteresis				25		°C
Current limit				3.5		A

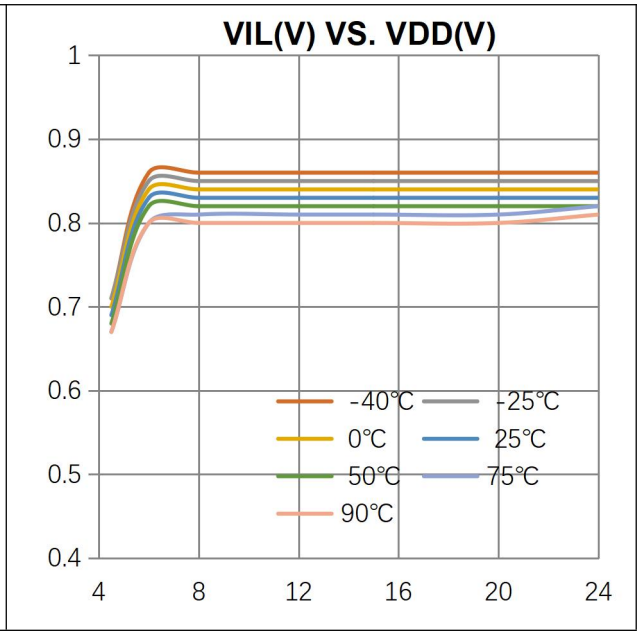


10.6 Characteristics Curve

Test conditions: VDD=12V, TA=25°C, unless otherwise noted.




VIH(V) VS. VDD(V)
2
1.8
1.6
1.4
1.2
1
4
8
12
16
20
24
-40℃
-25℃
0℃
25℃
50℃
75℃
90℃


VIL(V) VS. VDD(V)
1
0.9
0.8
0.7
0.6
0.5
0.4
4
8
12
16
20
24
-40℃
-25℃
0℃
25℃
50℃
75℃
90℃

11 Detailed Description

11.1 Overview

The AL878 is an H-bridge driver that can drive a DC motor or other devices such as solenoid valves. Outputs can be controlled via the AL878's PWM interfaces (INA and INB). These devices integrate the necessary driver FETs and FET control circuits, thereby greatly reducing the number of components in a motor driver system. In addition, the AL878 adds protection functions that go beyond conventional discrete implementations: overcurrent protection and thermal shutdown.

11.2 Rotation Speed Adjustment

PWM (Pulse Width Modulation) technology achieves precise control of motor speed by adjusting the duty cycle of the pulse signal. This technique regulates the average value of the motor input voltage and thus controls the motor speed by changing the duty cycle of the PWM signal, i.e., the ratio of the pulse width to the pulse period. Specifically, the larger the duty cycle of the PWM signal, the higher the average value of the motor input voltage and the faster the motor speed; on the contrary, the smaller the duty cycle, the slower the motor speed.

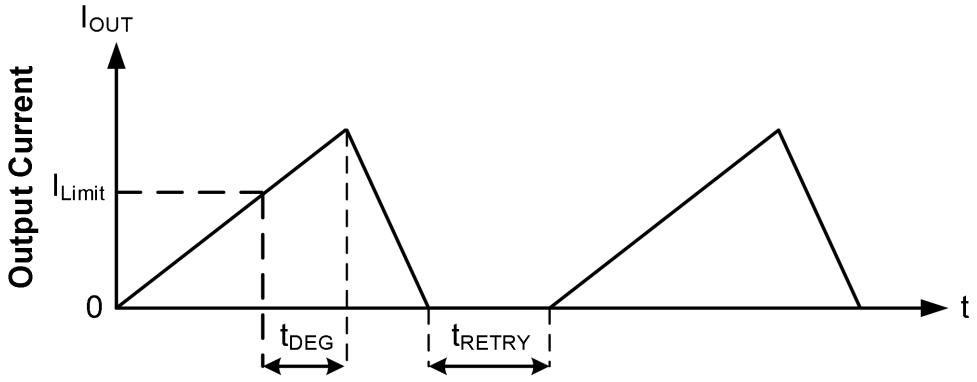
11.3 Motor Controls

The AL878 is controlled via PWM input connectors (INA and INB connectors). Each output is controlled by the corresponding input pin.

INA	INB	OUTA	OUTB	Functions (DC motors)
L	L	Hi-Z	Hi-Z	Inertia or parking
L	H	L	H	Reverse
H	L	H	L	Forward
H	H	L	L	Braking

11.4 Over Current Protection

There is an analog current limit circuit on each field effect transistor that limits the current through the field effect transistor by eliminating gate drive. If the analog current limit analog current limit lasts longer than t_{DEG}, all field effect transistors in the H-bridge are disabled. Operation is automatically resumed after t_{RETRY}. Overcurrent of the field effect transistors is detected by both the high voltage side and the low voltage side FETs. overcurrent can be caused by a short circuit between the OUTA pin and the OUTB pin or by grounding the OUTB pin.

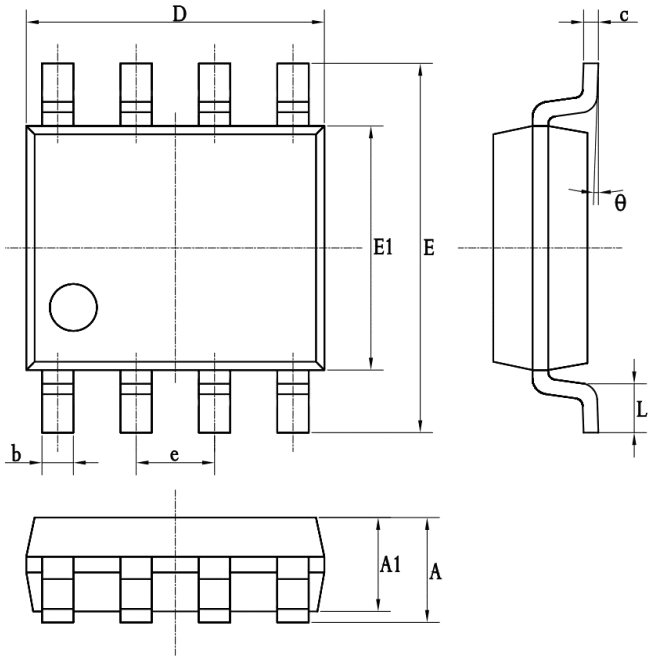


11.5 Over Temperature Protection

If the chip temperature exceeds 155°C, all field effect tubes in the H-bridge are disabled. Operation is automatically resumed when the chip temperature drops below 130°C.

12 Package Information

SOP-8



Dimension / Symbol	Min (mm)	Nom (mm)	Max (mm)
A	-	-	1.75
A1	1.25	-	1.55
b	0.33	-	0.51
c	0.17	-	0.26
D	4.70	-	5.10
E	5.80	-	6.20
E1	3.70	-	4.10
e	-	1.27	-
L	0.50	-	0.80
θ	0	-	8°