FAN8404D

2 Phase Half Wave BLDC Motor Driver

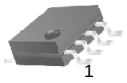
Features

- A wide range of operation voltage: 4V to 15V
- Built-in motor lock detector.
- Automatic restart function
- Alarm output for a motor lock detection
- Built-in thermal shut down circuits
- Built-in reverse current protection diode
- Compact package: 8-SOP-225

Description

The FAN8404D is a monolithic integrated circuit, and suitable for DC cooling fan motors.

8-SOP-225



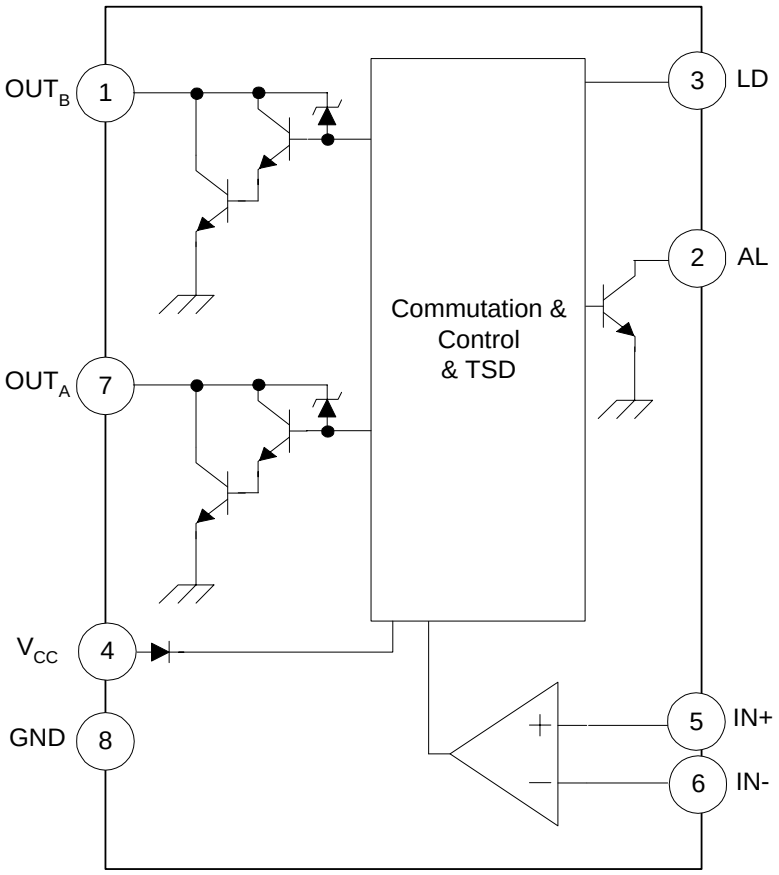
Typical Applications

- DC cooling fan motor

Ordering Information

Device	Package	Operating Temp.
FAN8404D	8-SOP-225	–25°C ~ 85°C
FAN8404DTF	8-SOP-225	–25°C ~ 85°C

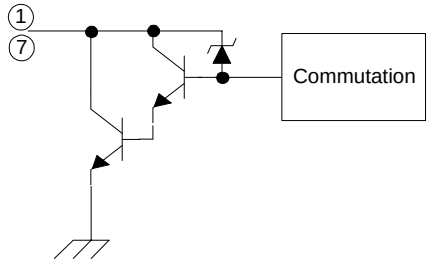
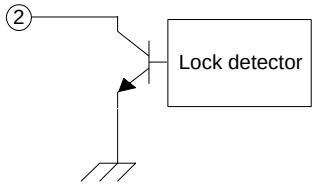
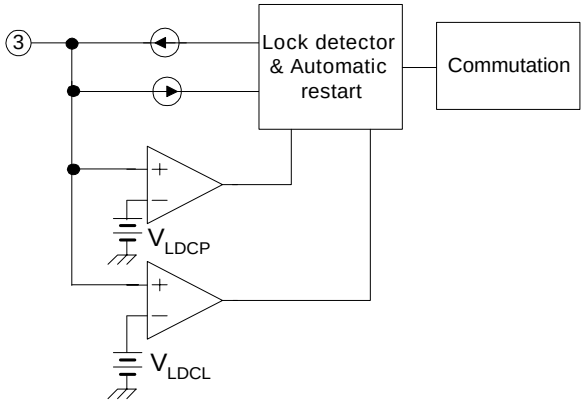
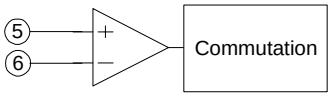
Block Diagram



Pin Definitions

Pin Number	Pin Name	I/O	Pin Function Description	Remark
1	OUT_B	O	Motor output B	-
2	AL	O	Alarm output	Open Collector
3	LD	-	Triangle pulse generator for lock detector and automatic restart	-
4	V_{CC}	-	Supply voltage	-
5	IN+	I	Hall input +	-
6	IN–	I	Hall input –	-
7	OUT_A	O	Motor output A	-
8	GND	-	Ground	-

Equivalent Circuits

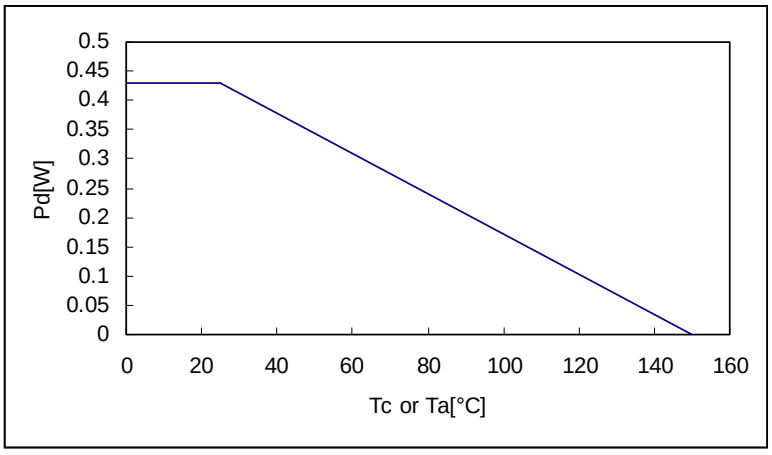
Description	Pin No.	Internal Circuit
OUT_B	1	
OUT_A	7	
AL	2	
LD	3	
IN+	5	
IN-	6	

Absolute Maximum Ratings (Ta = 25°C)

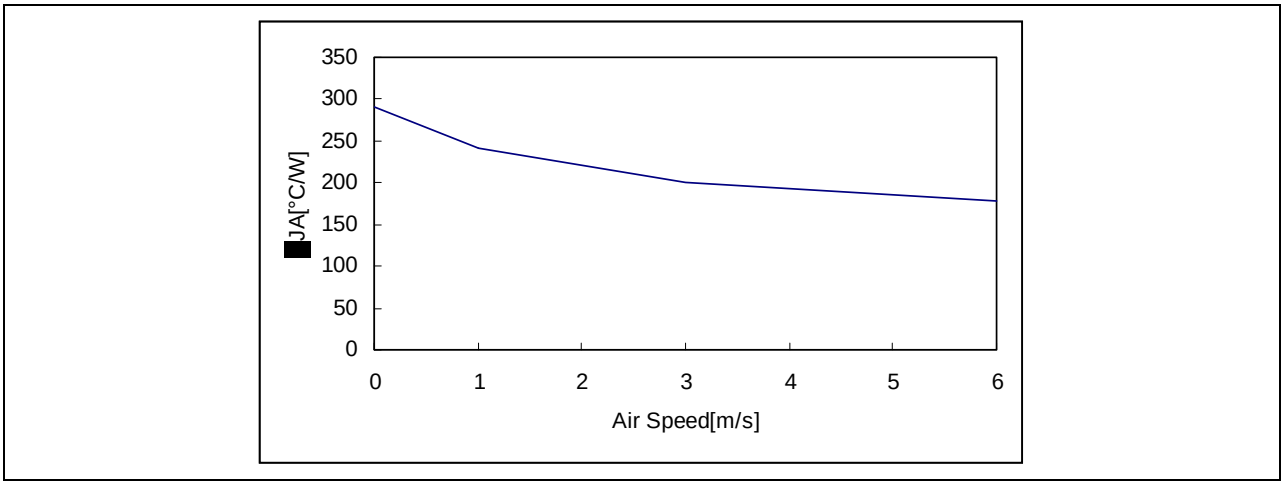
Parameter	Symbol	Value	Unit
Maximum power supply voltage	V_{CCMAX}	18	V
Maximum power dissipation[note1]	P_{DMAX}	429[note2]	mW
		620[note3]	
Thermal resistance[note1]	Θ_{JA}	291.61[note2]	°C/W
		201.52[note3]	
Maximum output voltage	V_{OMAX}	30	V
Maximum output current	I_{OMAX}	1.2[note4]	A
Alarm output current	I_{AL}	10	mA
Alarm output withstanding voltage	V_{AL}	36	V
Maximum hall input AC level	V_{HACMAX}	6	V
Operating temperature	T_{OPR}	–25 ~ 85	°C
Storage temperature	T_{STG}	–55 ~ 150	°C

Note1:
PCB Condition: Thickness (1.6mm), Dimension (76.2mm * 114.3mm)
Refer: EIA/J SED 51-3 & EIA/J SED 51-7
Note2: Air condition (0m/s)
Note3: Air condition (3m/s)
Note4: Should not exceed P_D or ASO value

Power Dissipation Curve (Air condition = 0m/s)



Air Speed & Θ_{JA}



Recommended Operating Conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Function compensation operating voltage	V_{CC}	4.0	–	15.0	V

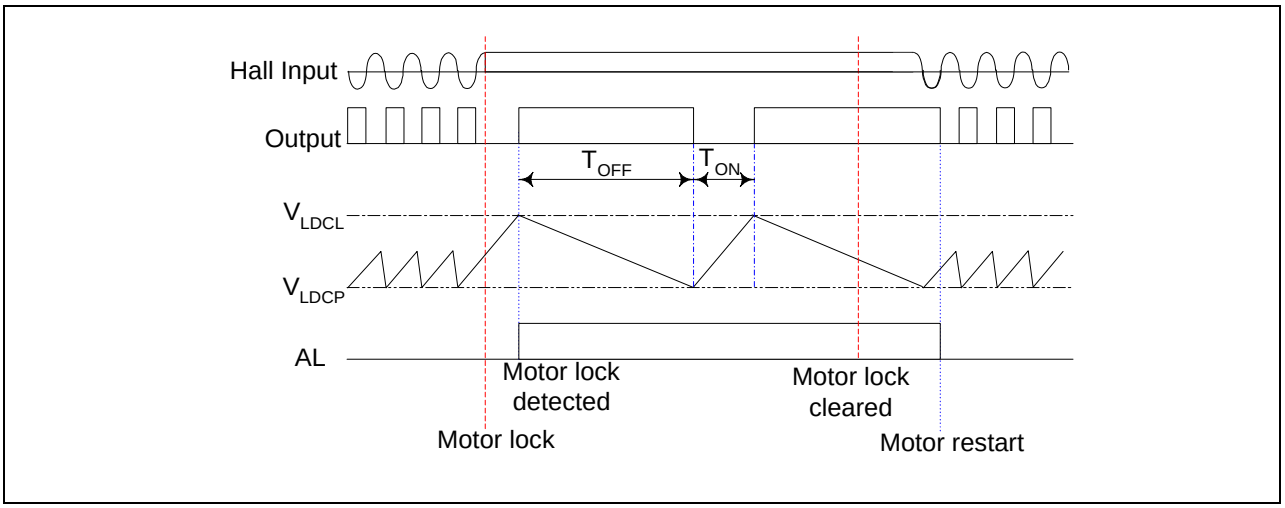
Electrical Characteristics

(Ta=25°C, V_{CC}=12V unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply current	I_{CC}	When output is off.	-	-	3.0	mA
Lock detector charging current	I_{LDC}	V_{LD}=1.8V	2.38	3.40	4.42	µA
Lock detector discharging current	I_{LDD}	V_{LD}=1.8V	0.48	0.68	0.88	µA
Lock detector charging/discharging ratio	R_{CD}	$R_{CD}=I_{LDC}/I_{LDD}$	3.0	5.0	7.0	–
Lock detector capacitor clamp voltage	V_{LDCL}	-	2.4	2.85	3.3	V
Lock detector capacitor comparator voltage	V_{LDCP}	-	0.7	0.99	1.2	V
Output low level voltage	V_{OL}	I_O=200mA	-	0.9	1.2	V
Output leakage current	I_{OL}	-	-	0	10	µA
Output zener voltage	V_{OZ}	Clamp current=10mA	28	30	32	V
Alarm output pin low level voltage	V_{ALL}	I_O=10mA	-	0.2	0.5	V
Alarm output pin leakage current	I_{ALL}	-	-	0	10	µA
Hall input DC range	V_{HDC}	-	1	-	V_{CC}-2V	V
Hall Input Offset	V_{HOF}	V_{REF}=6V	-10	-	10	mV

Application Information

1. Lock Detection & Automatic Restart



FAN8404D features a lock detection and an automatic restart. The functions can be operated as follows.

1) When the hall signal stop switching, a motor can be locked.
2) The voltage, V_{LD} on pin 3, is increasing until it reaches V_{LDCL}.
3) When the voltage, V_{LD} reaches V_{LDCL}, the alarm output (AL) becomes high as a motor lock has been detected.
4) If LD pin is connected to GND, the lockup protection is disabled.
5) While a motor is locked, the output repeats switching ON / OFF, but the other output is always OFF. The switching time can be determined by an external capacitor on charging / discharging time of the capacitor, switching ON / OFF time can be calculated as follows.

$$T_{ON} = \frac{C_{LD} \times (V_{LDCL} - V_{LDCP})}{I_{LDC}}$$

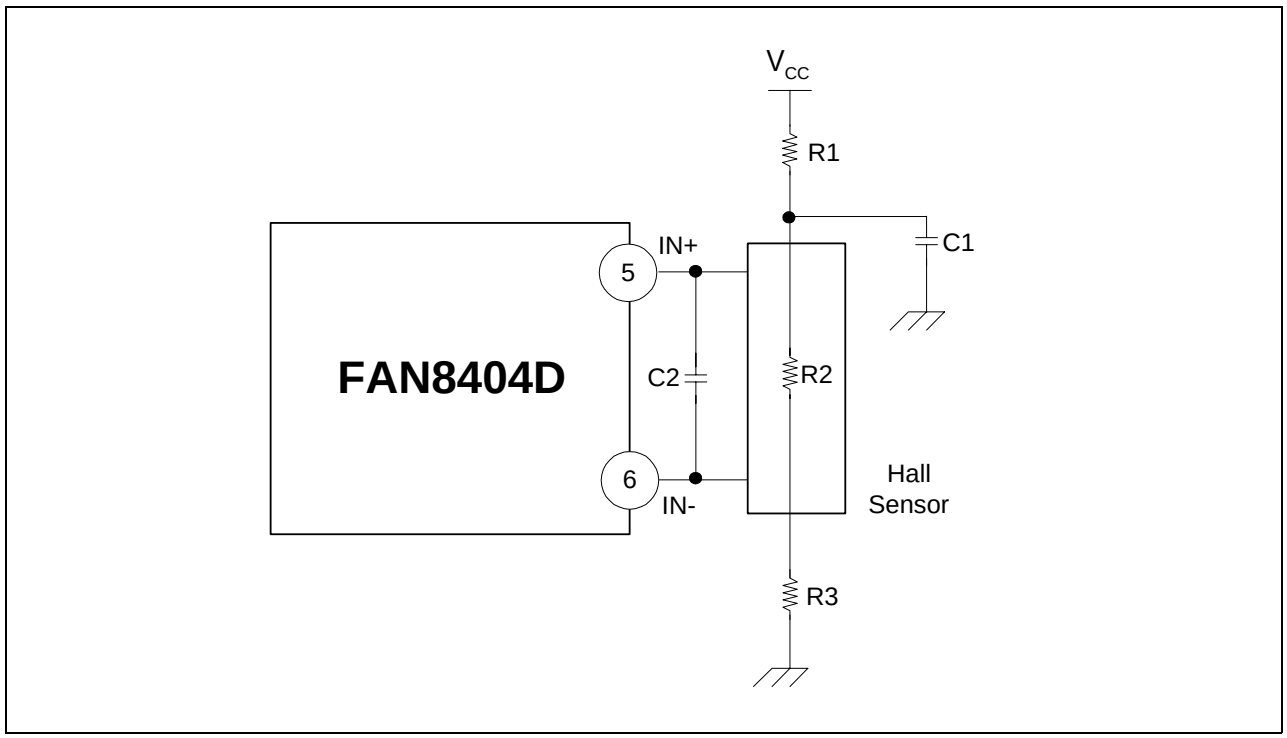
$$T_{OFF} = \frac{C_{LD} \times (V_{LDCL} - V_{LDCP})}{I_{LDD}}$$

Where, The C_{LD} is an external capacitor connected to pin 3, LD.
The V_{LDCL} is the clamp voltage on pin 3, LD.
The V_{LDCP} is the comparator voltage on pin 3, LD.
The I_{LDC} is the charging current on pin 3, LD.
The I_{LDD} is the dischaging current on pin 3, LD.

2. Thermal Shut Down

TSD On: All the outputs are off.(Typ. 175°C)
TSD Off: The circuit can be reactivated and begin to operate in a normal condition. (Typ. 150°C)

3. Hall Amplifier Input Block



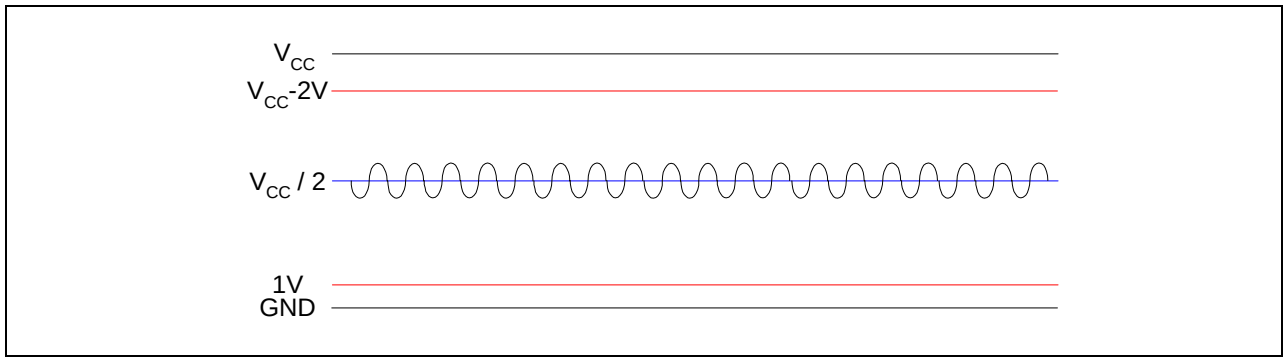
The hall current (I_H) is determined by R1, R2 and R3.

$$I_H = \frac{V_{CC}}{R1 + R2 + R3}$$

Where, the R2 is the impedance of hall sensor.

An external capacitor, C1, can be used to reduce a power supply noise. In addition, C2 is to remove a noise which is caused in case the line is long from the hall sensor output to the hall input (pin 5 / 6) of the device.

The input bias voltage of hall amplifier is between 1V and V_{CC}-2V as following figure.

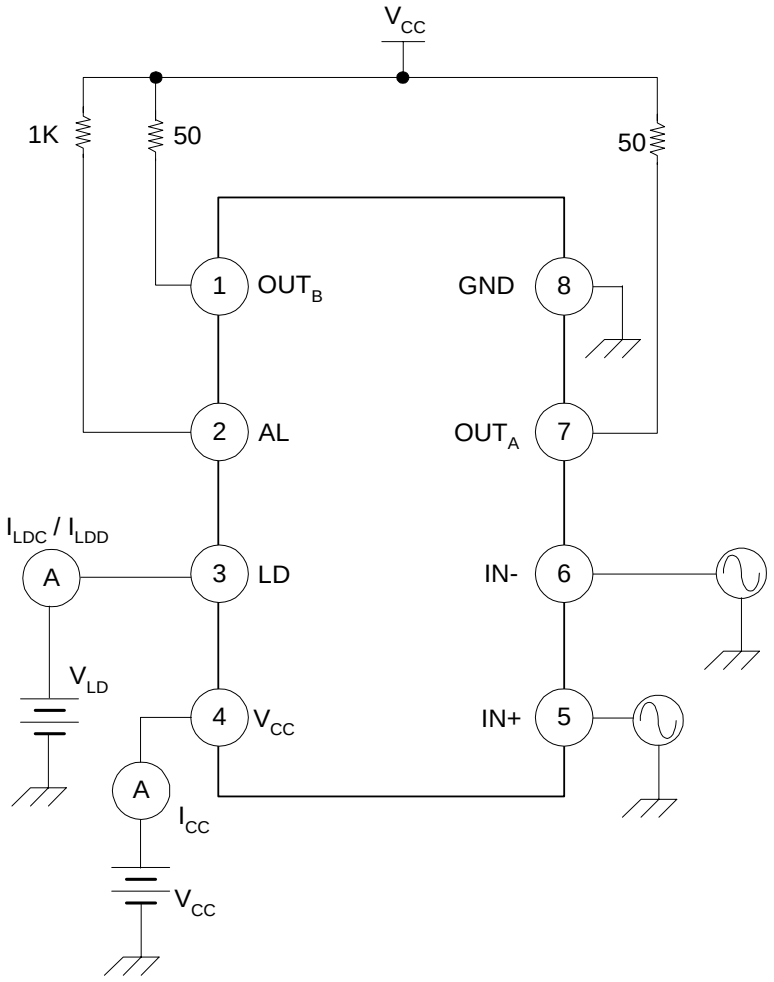


It is recommended that R1 and R3 should have the same value to make the output signal of hall sensor centered as $V_{CC}/2$.

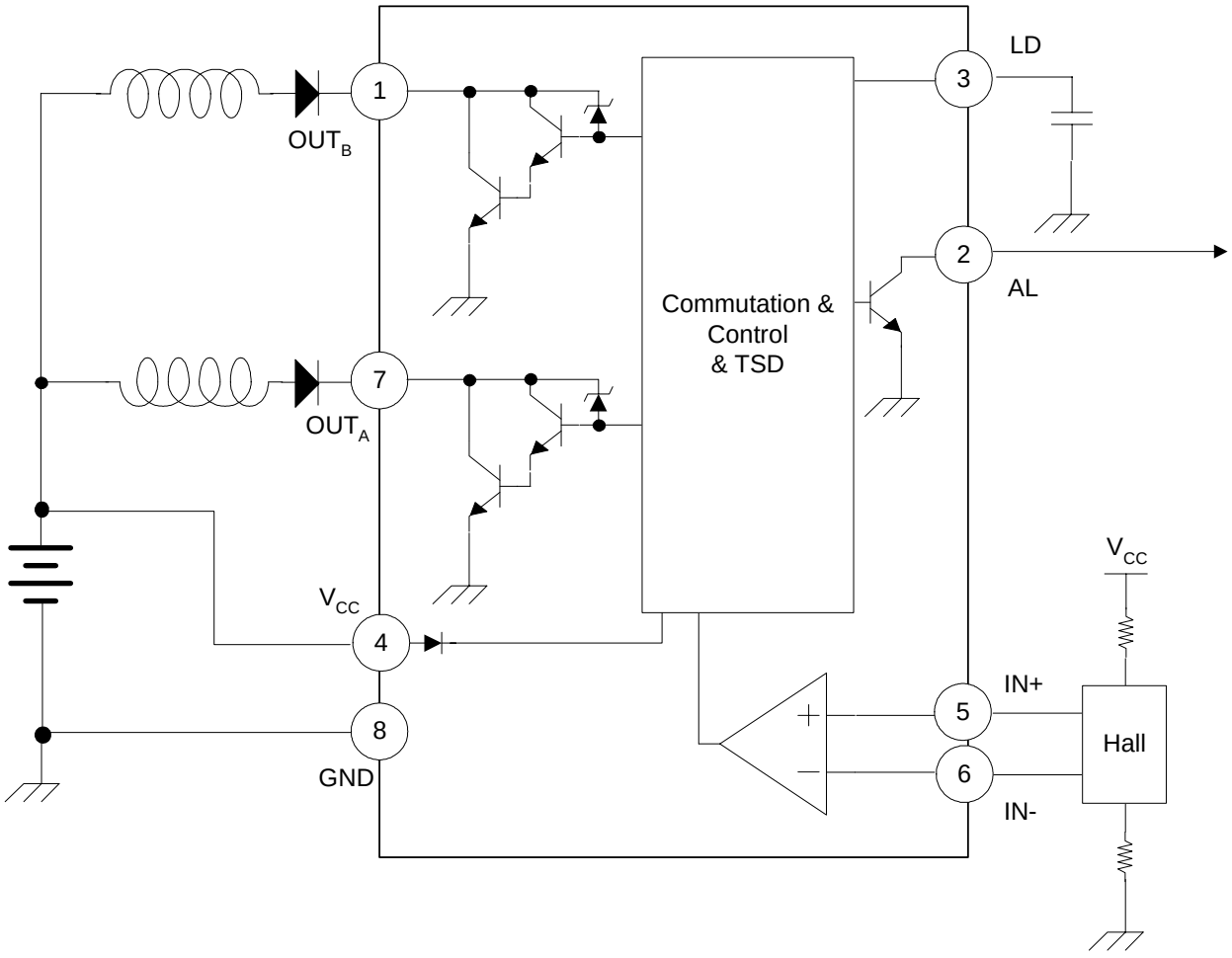
Operation Truth Table

IN+	IN-	OUT_A	OUT_B
High	Low	High	Low
Low	High	Low	High

Test Circuits



Typical Application Circuits

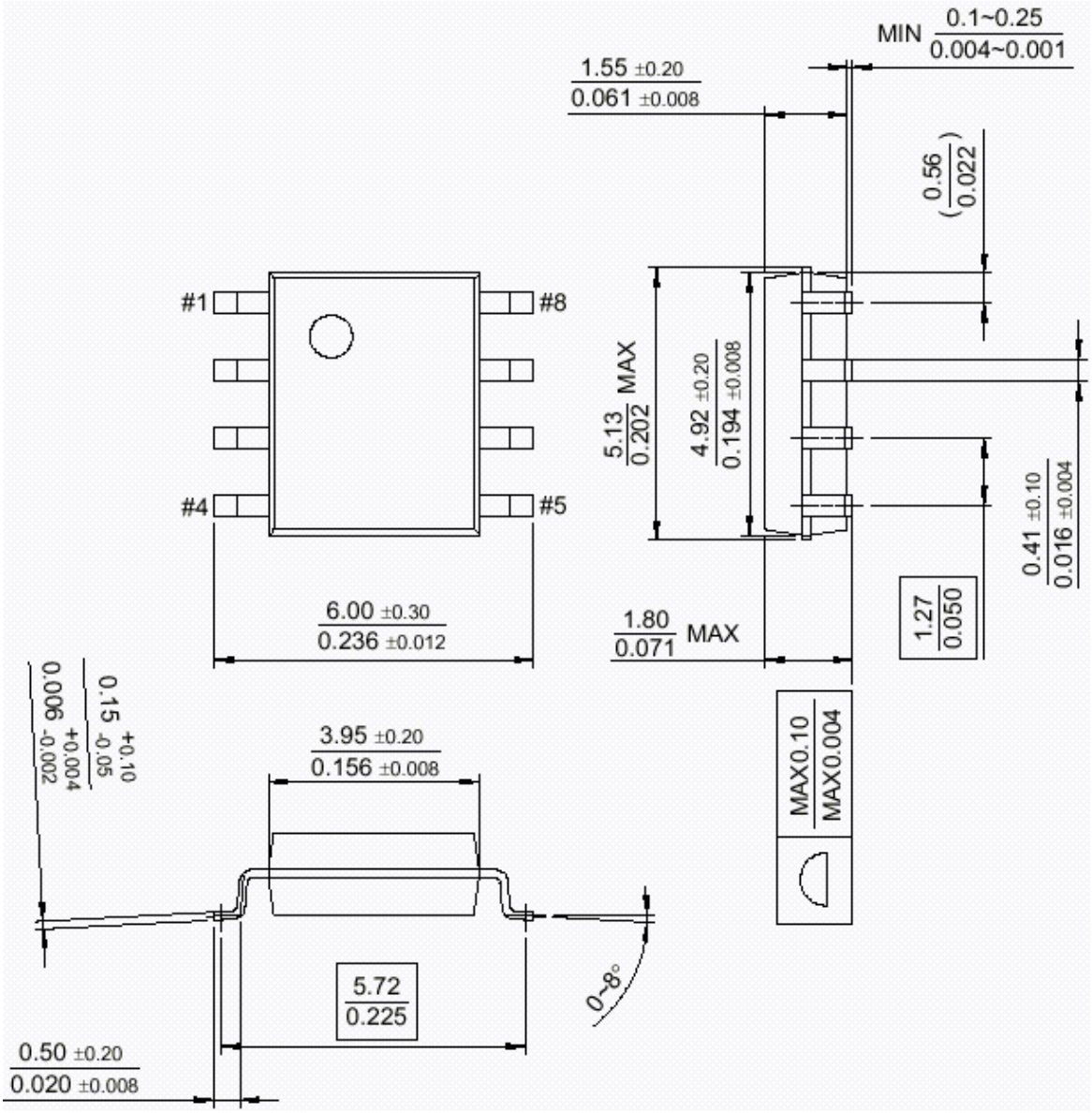


Precaution

In case of improper connection (change between power and ground), diodes are required to protect motor.

Package Dimensions (Unit: mm)

8-SOP-225



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