FAN8404D

2 Phase Half Wave BLDC Motor Driver

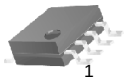
Features

- 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



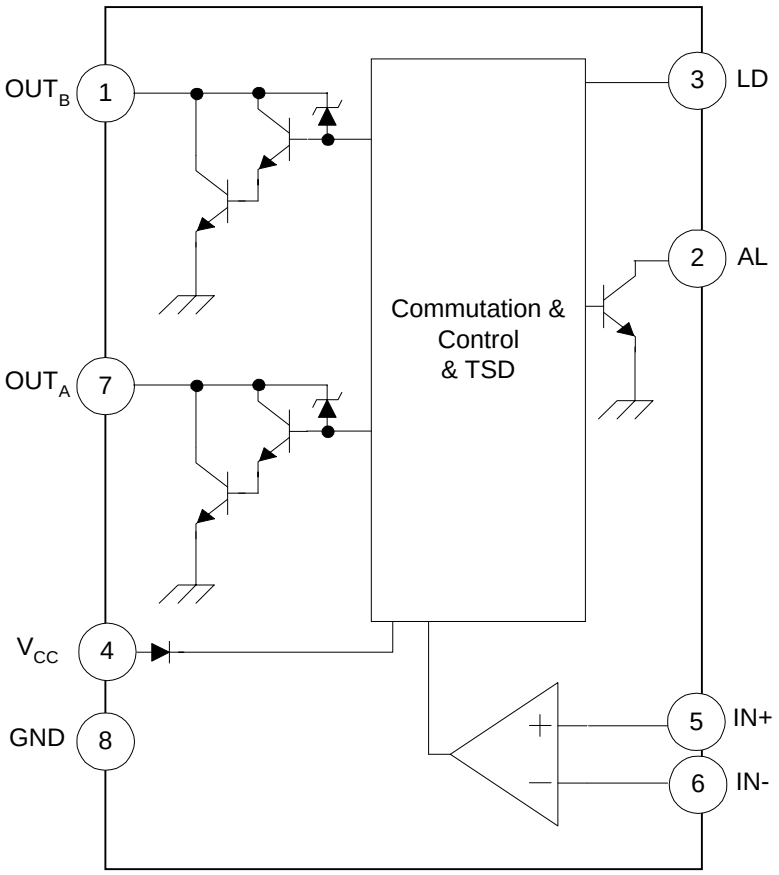
Typical Applications

- 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

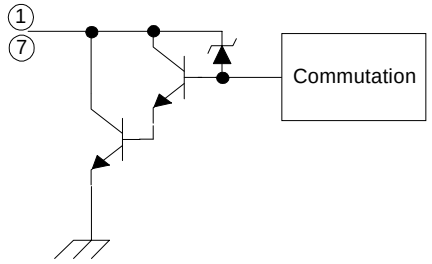
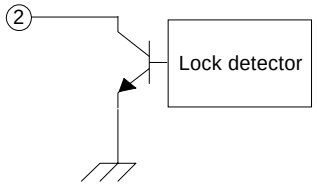
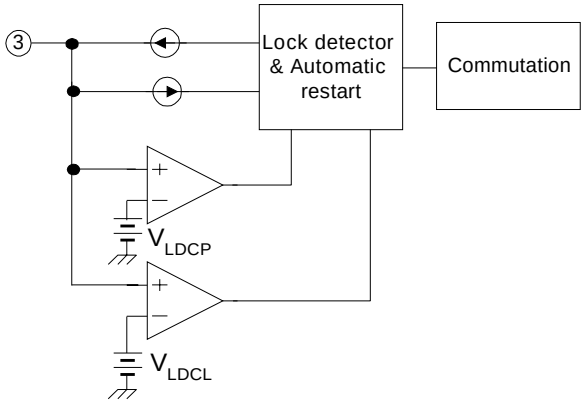
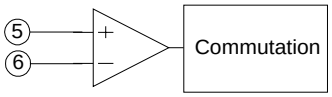
Block Diagram



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

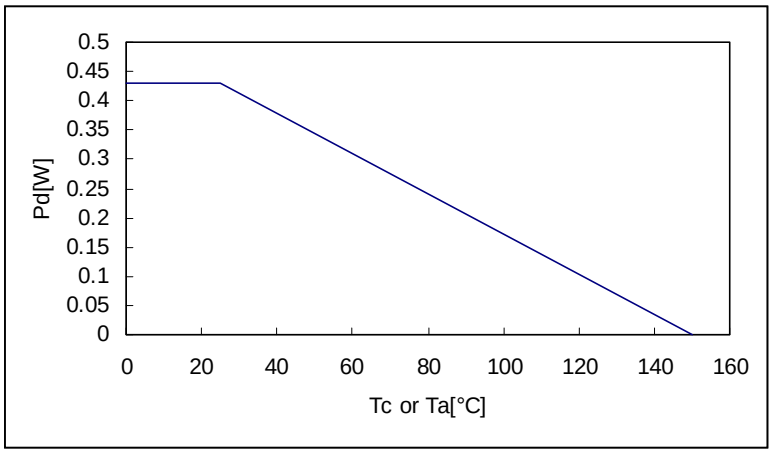
Description	Pin No.	Internal Circuit
OUT_B	1	
OUT_A	7	
AL	2	
LD	3	
IN+	5	
IN-	6	

Absolute Maximum Ratings (Ta = 25°C)

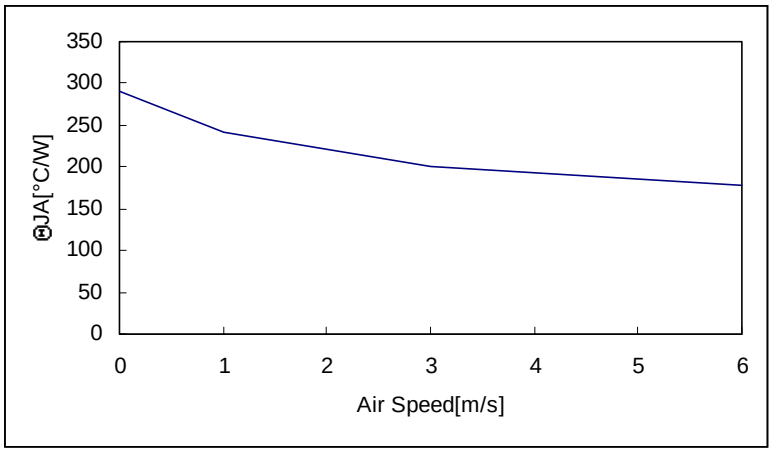
Parameter	Symbol	Value	Unit
Maximum power supply voltage	V_{CCMAX}	18	V
Maximum power dissipation[note1]	P_{DMAX}	429[note2]	mW
		620[note3]	
Thermal resistance[note1]	Θ_{JA}	291.61[note2]	°C/W
		201.52[note3]	
Maximum output voltage	V_{OMAX}	30	V
Maximum output current	I_{OMAX}	1.2[note4]	A
Alarm output 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 & ΘJA



Recommended Operating Conditions (Ta = 25°C)

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

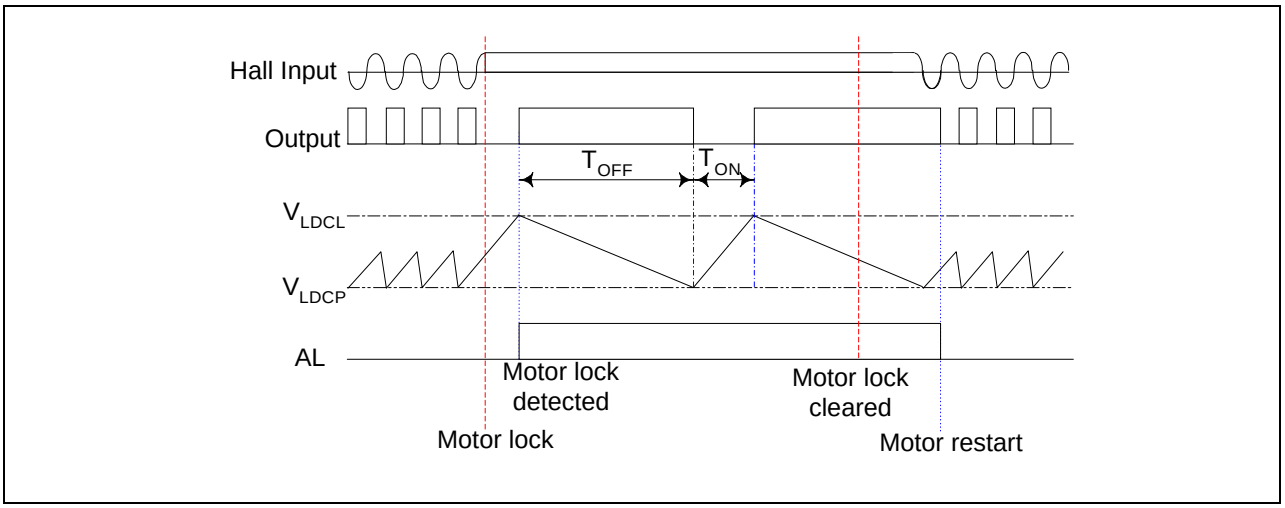
Electrical Characteristics

(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) 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.

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

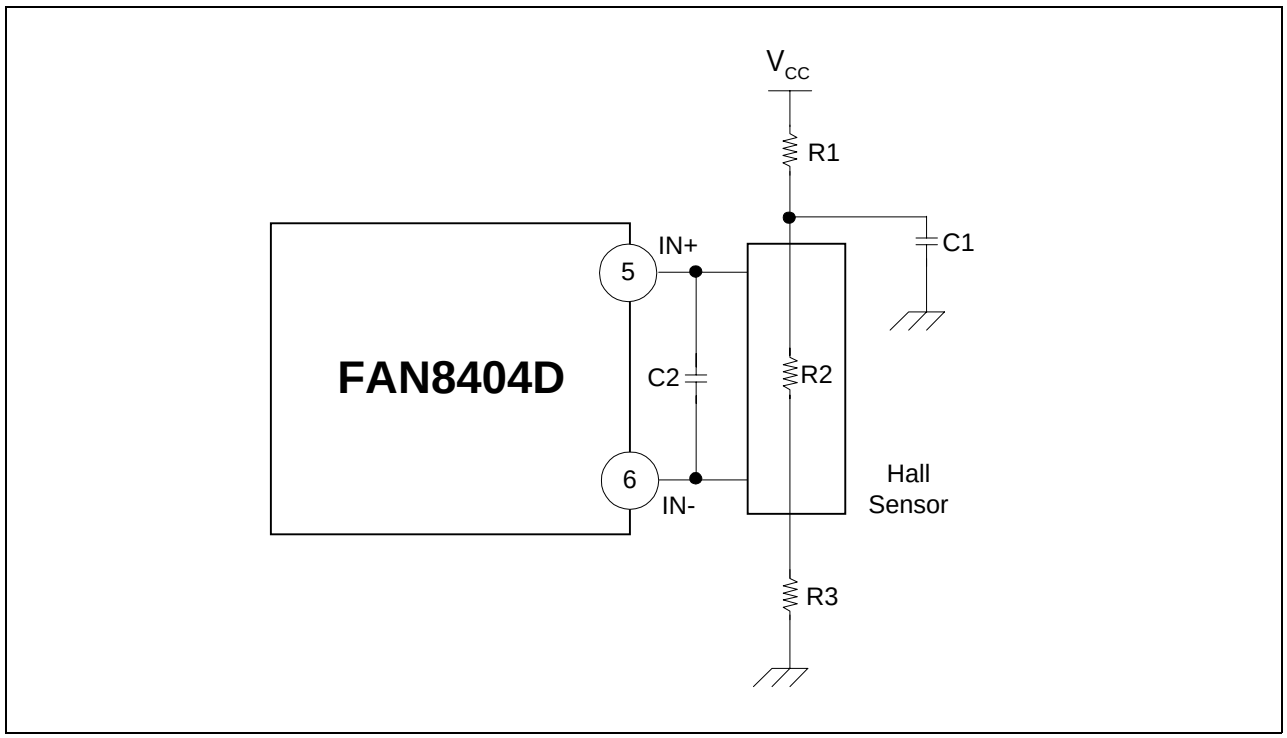
$$T_{OFF} = \frac{C_{LD} \times (V_{LDCL} - V_{LDCP})}{I_{LDD}}$$

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



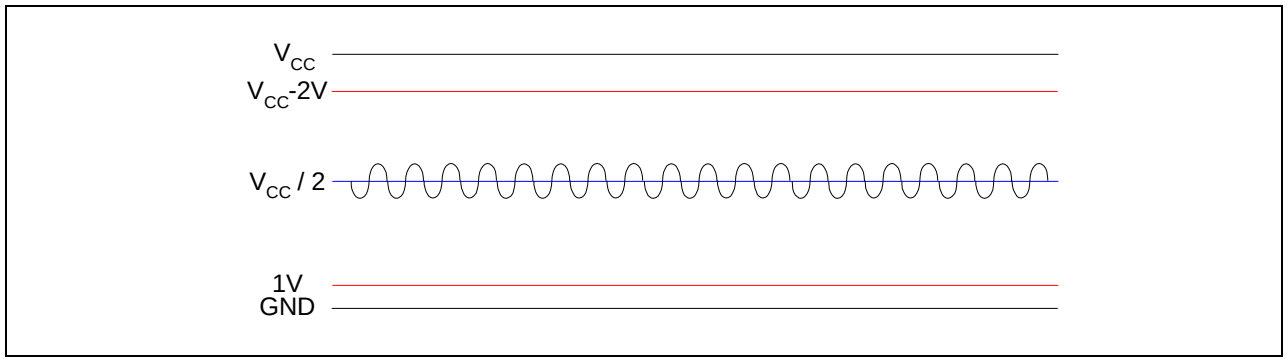
The hall current (I_H) is determined by R1, R2 and R3.

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

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.

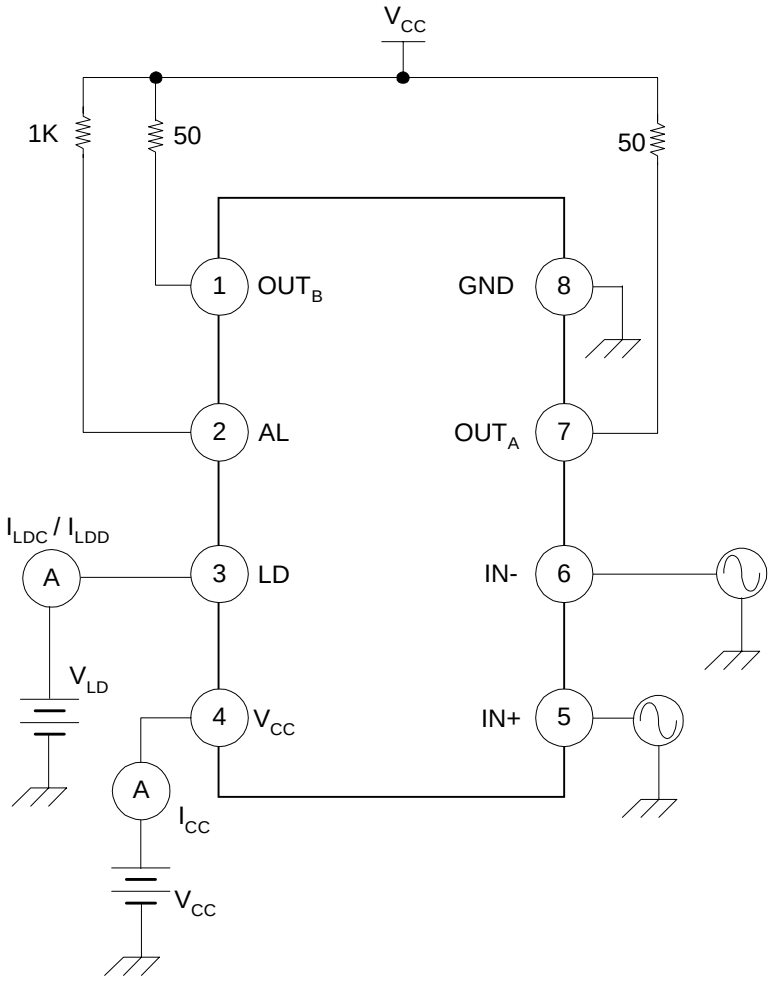


It is recommended that R1 and R3 should have the same value to make the output signal of hall sensor centered as $V_{CC}/2$.

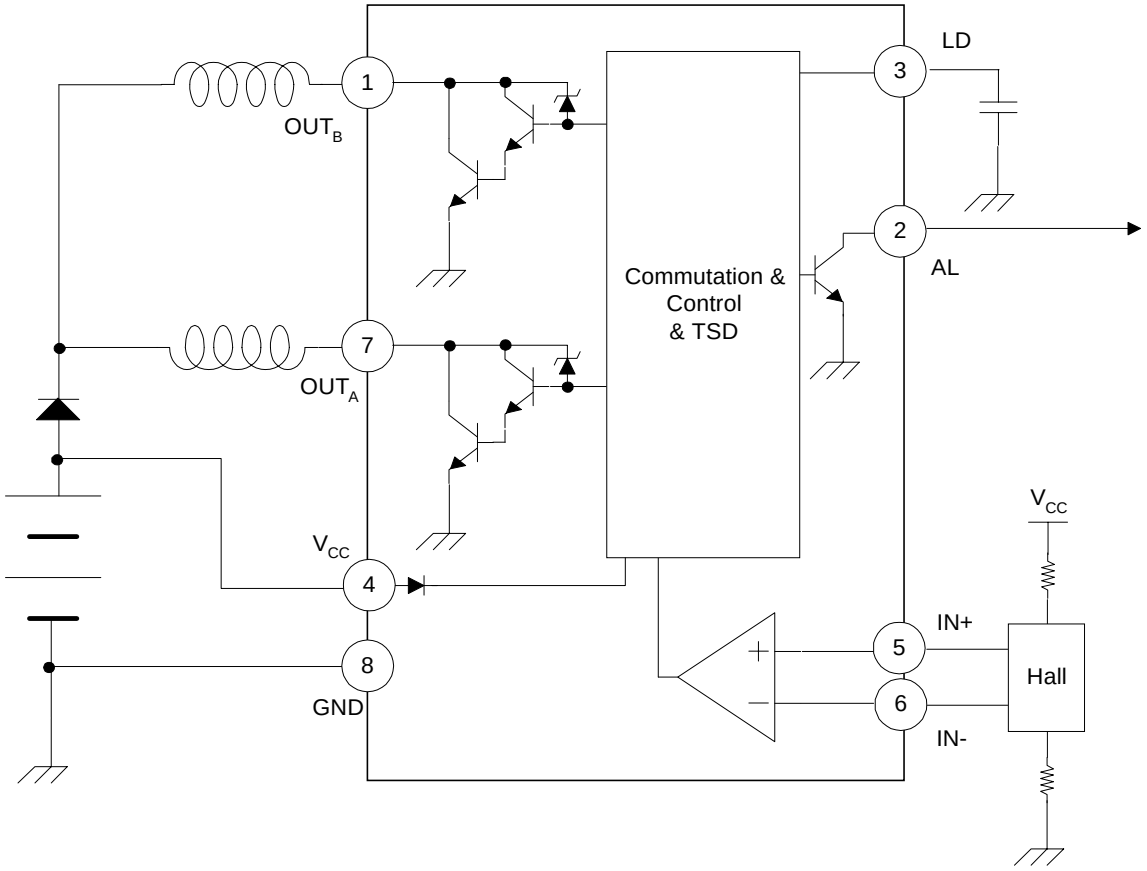
Operation Truth Table

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

Test Circuits

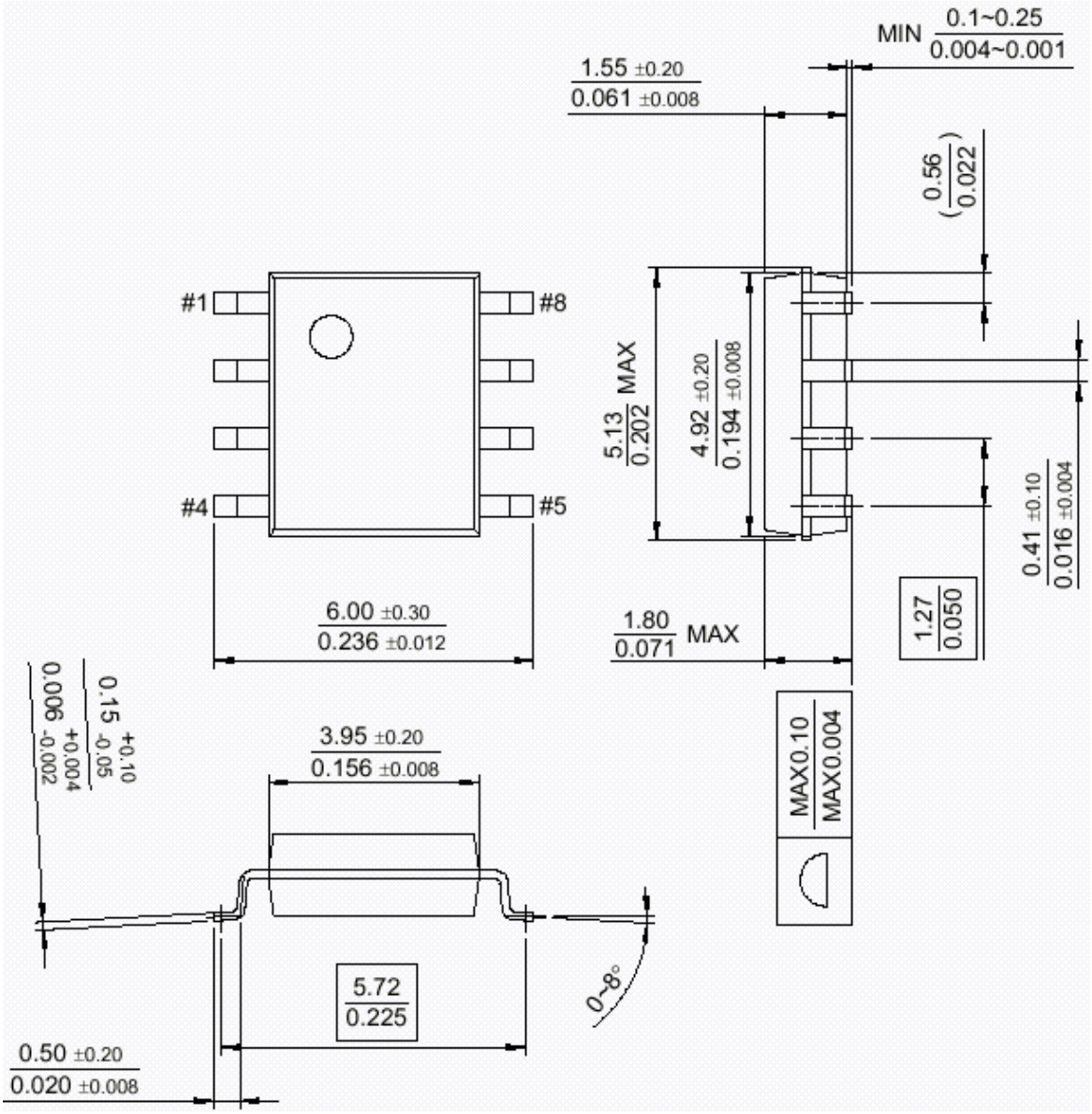


Typical Application Circuits



Package Dimensions (Unit: mm)

8-SOP-225



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