Single Phase Hall Effect Fan Driver

Features

- On-Chip High sensitivity Hall-effect Sensor
- Wide Operating Voltage: 3 V to 24V
- Integrated 2.8Ω H-Bridge Drivers for Single Coil
- Built-in VDD To GND reverse voltage protection
- Thermal Shutdown Protection
- Low Output Switching Current Noise
- Rotor-locked shutdown and automatically restart function
- -40°C to 125°C Operating Temperature
- RoHS Compliant SIP-4L Package

Applications

- Single-coil Brushless DC Motor
- Single-coil Brushless DC Fan
- Single Coil Design Cooling Fans
- Office Automated Equipment

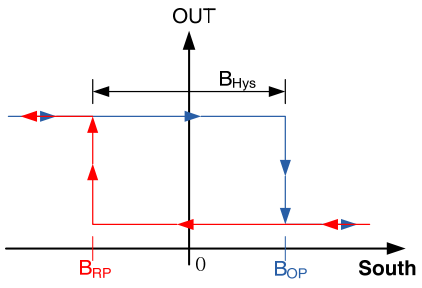
Description

The SD477S is an integrated Hall sensor with H-Bridged output driver designed for brushless DC motor applications. The device includes an on-chip Hall sensor for magnetic sensing, an amplifier that amplifies the Hall voltage, a comparator to provide switching hysteresis for noise rejection, a bi-directional driver for sinking and driving large current load.

Placing the device in a variable magnetic field, if the magnetic flux density is larger than threshold B_{OP}, the DO is turned to sink and DOB is turned to drive. This output state is held until the magnetic flux density reverses and falls below B_{RP}, then causes DO to be turned to drive and DOB turned to sink.

SD477S is available in SIP-4L package and is rated over the -40°C to 125°C.

Output state

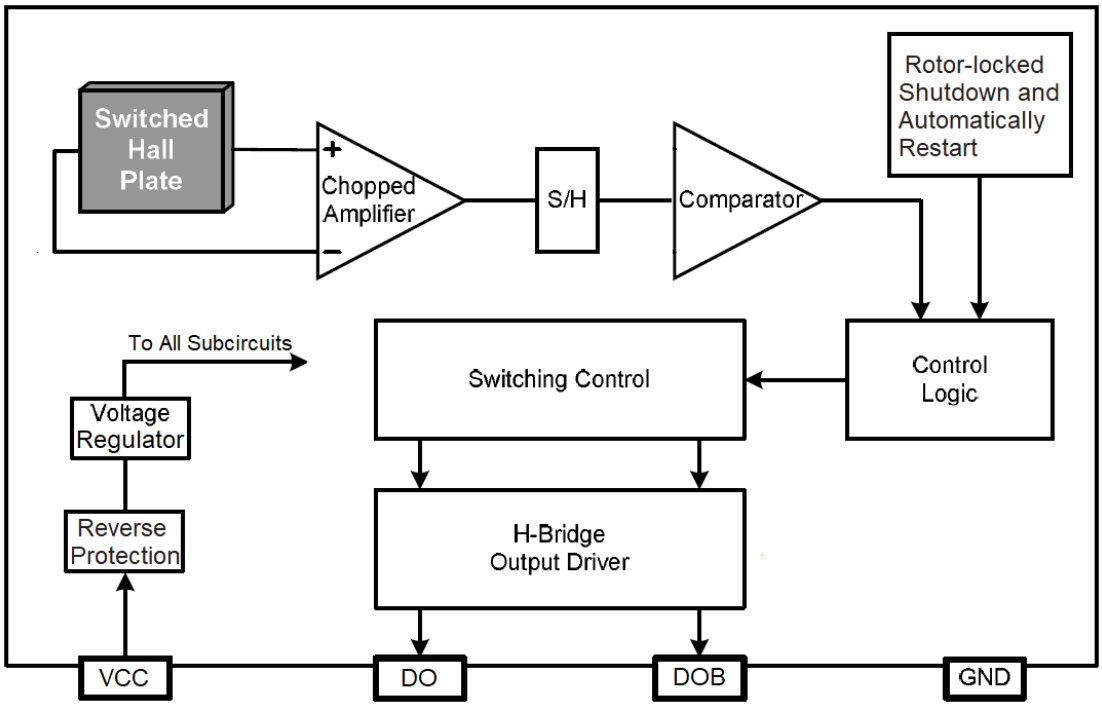


Single Phase Hall Effect Fan Driver

Device Information

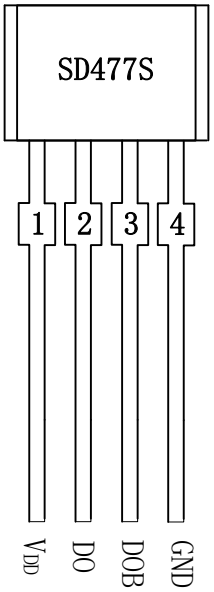
Part Number	Packing	Mounting	Ambient, T_A	Marking ID	Bop(Gauss)	Brp(Gauss)
SD477SVB	Bulk, 1000 pieces/bag	SIP4	-40℃ to 125℃	SD477S	15 (Typ.)	-15 (Typ.)

Functional Block Diagram



Terminal configuration and functions

4-Terminal SIP
VB Package
Top View



Terminal		Type	Description
Name	Number		
VDD	1	PWR	3 V to 24 V power supply
DO	2	Output	Output 1
DOB	3	Output	Output 2
GND	4	Ground	Ground terminal

Absolute Maximum Ratings (TA=25°C, unless otherwise noted)

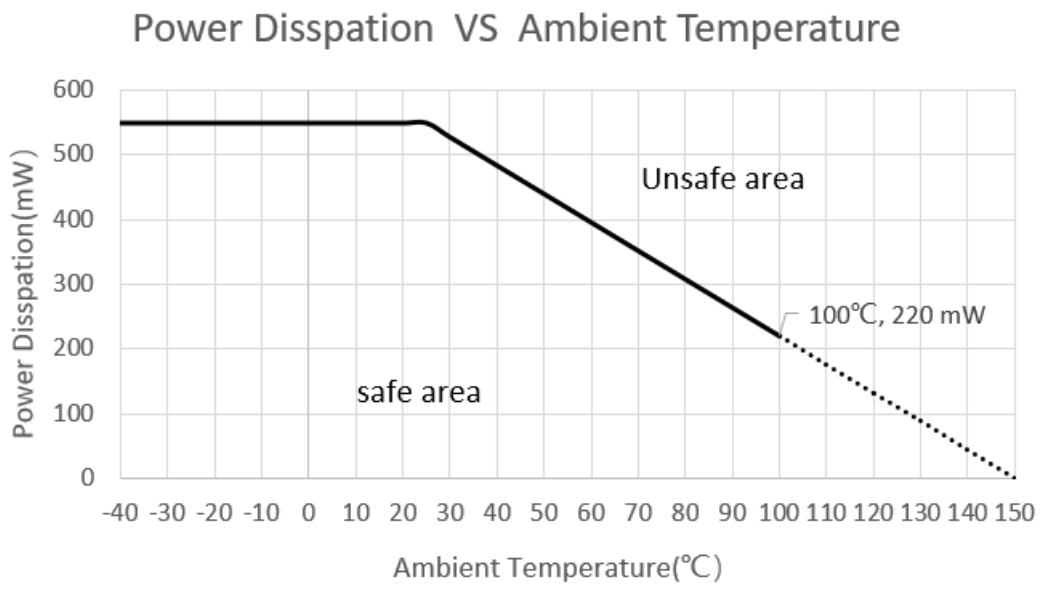
Symbol	Parameter		Value	Unit
VDD	Supply Voltage		30	V
V_{RDD}	Reverse Protection Voltage		-30	V
B	Magnetic Flux Density		Unlimited	Gauss
IO	Output Current	Continuous	350	mA
		Peak	1000	mA
PD	Power Dissipation		550	mW
θ JA	Thermal Resistance	Die to atmosphere	227	℃/W
θ JC		Die to package case	49	℃/W
TSTG	Storage Temperature		-50 to 150	℃
TLEAD	Maximum Soldering Temperature (at leads, 10 sec)		300	℃

Note 1: Stresses greater than those listed under “Absolut Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied. “Absolute Maximum Ratings” for extended period may affect device reliability.

Recommended Operating Conditions (TA=25°C, unless otherwise noted)

Parameter	Symbol	Min	Max	Unit
Supply Voltage	VDD	2.8	24	V
Ambient Temperature	Ta	-40	125	℃

Note 2：In practical application, the effect of fan coil heating on the chip must take into account, with the actual over temperature protection point of actual test of high temperature fan for reference. On the basis of pre leave relatively safe temperature allowance, avoid chip in the critical limit (maximum ratings) for a long time and affects the reliability.



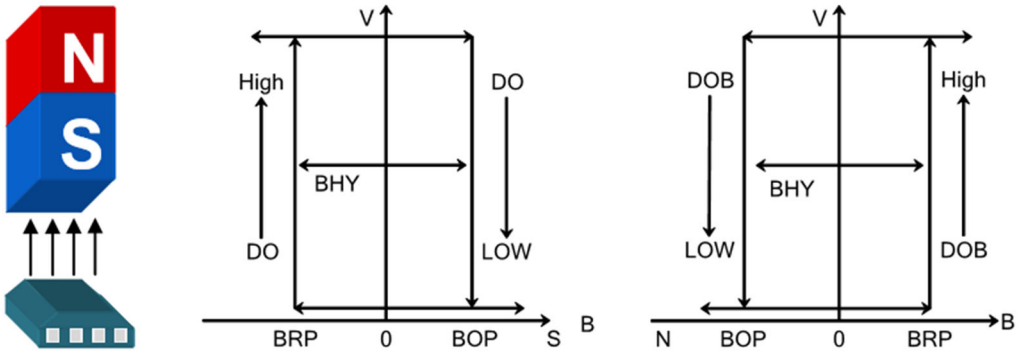
Electrical Characteristics(Typical values are at TA = +25℃, VDD =12V, unless otherwise noted.)

Symbol	Characteristics	Test Conditions	Min.	Typ.	Max.	Unit
V_{DD}	Input Voltage		2.8	-	24	V
I_{DD}	Supply Current	no load	-	2.5	5	mA
$R_{DS(on)}$	Output On-Resistance	300mA	-	2.8	-	Ω
Tlp_on	Locked Protection On Time		-	NA	-	s
Tlp_off	Locked Protection Off Time		-	NA	-	s
Tshut	Thermal Shutdown Threshold		150	155	-	° C
Magnetic Characteristics						
Bop	Operating Point		5	15	40	Gauss
Brp	Releasing Point		-40	-15	-5	Gauss
Bhys	Hysteresis		-	30	-	Gauss

Driver Output VS Magnetic Pole

Parameter	Test Conditions	DO	DOB
North Pole	B<Brp	High	Low
South Pole	B>Bop	Low	High

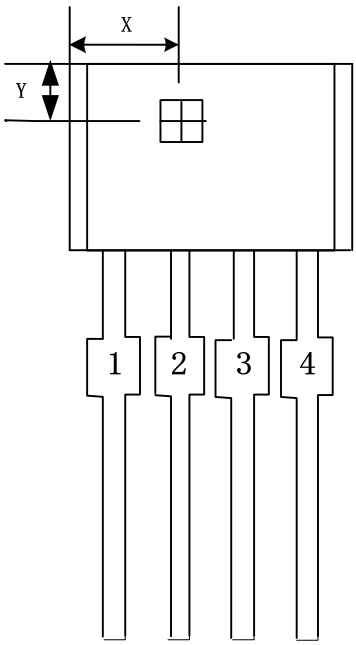
Operating Characteristics



Output Switch Principle

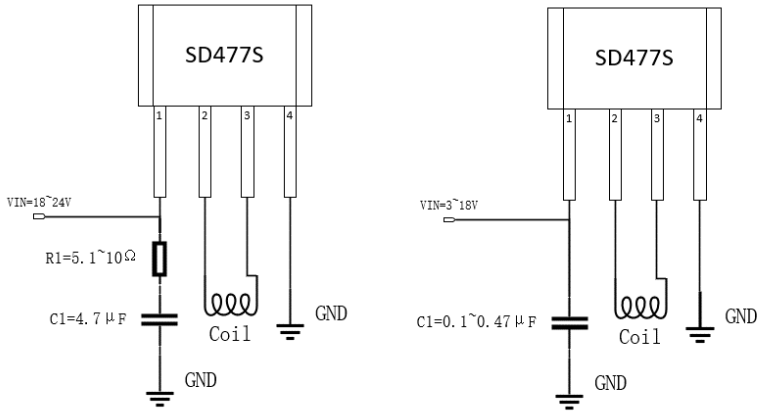
The SD477S built in a Hall-effect sensor plane to sense the vertical magnetic flux density (B). There are two output drivers in SD477S to drive Single-phase DC brushless fan or motor. When the South pole magnetic field is close to the IC marking surface and the magnetic flux density higher than operate point (Bop), the DO pin output will turn to Low and the DOB pin output will turn to High. When the South pole magnetic field far away the IC marking surface and North pole magnetic field close to the IC marking surface until the magnetic flux density higher than release point (Brp), the DO pin output will turn to High and the DOB pin output will turn to low.

Hall Sensor Location



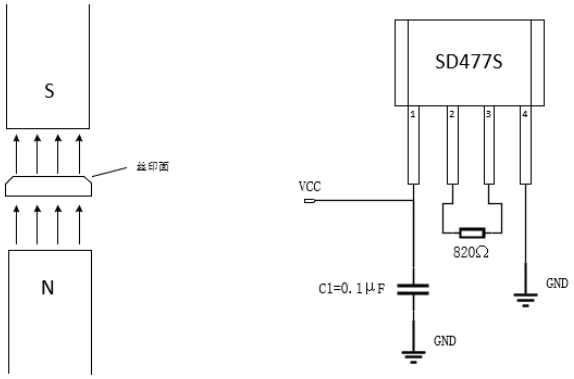
Orientation	Value	Unit
X	1.9	mm
Y	1.2	mm

Typical Application Circuit



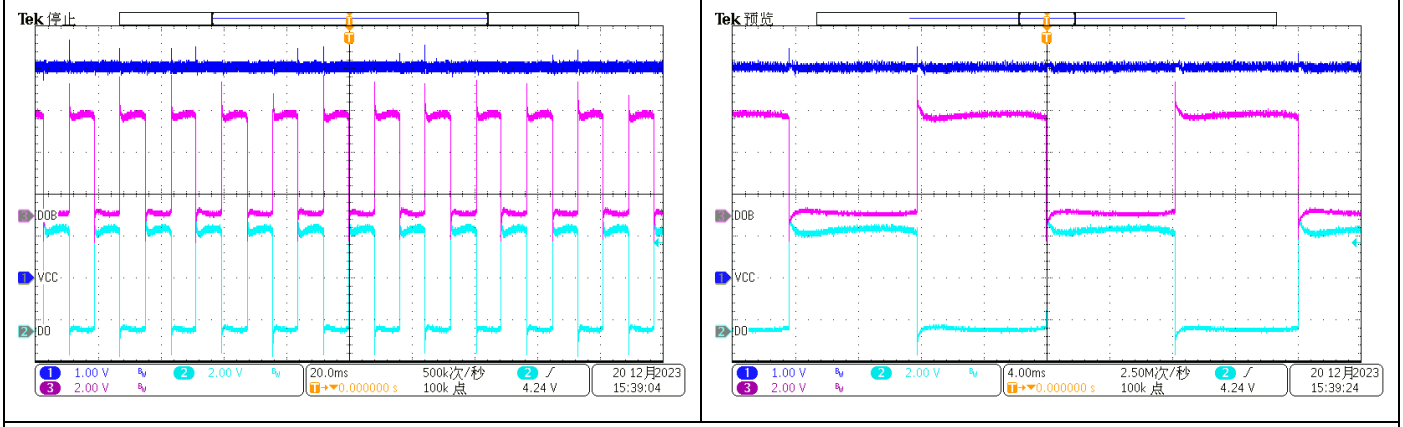
Note 3: When the power pulse is relatively large，Must use least C1=4.7μF(ceramic capacitor) capacitor & R1=5.1~10Ω for the decoupling between VIN and GND and place the capacitor as close to the IC as Possible. C1 is an optional capacitor, which can enhance the reliability during hot swap.

Test Circuit



Typical Performance Characteristics

TA=25℃，VCC=5V



TA=25℃，VCC=12V

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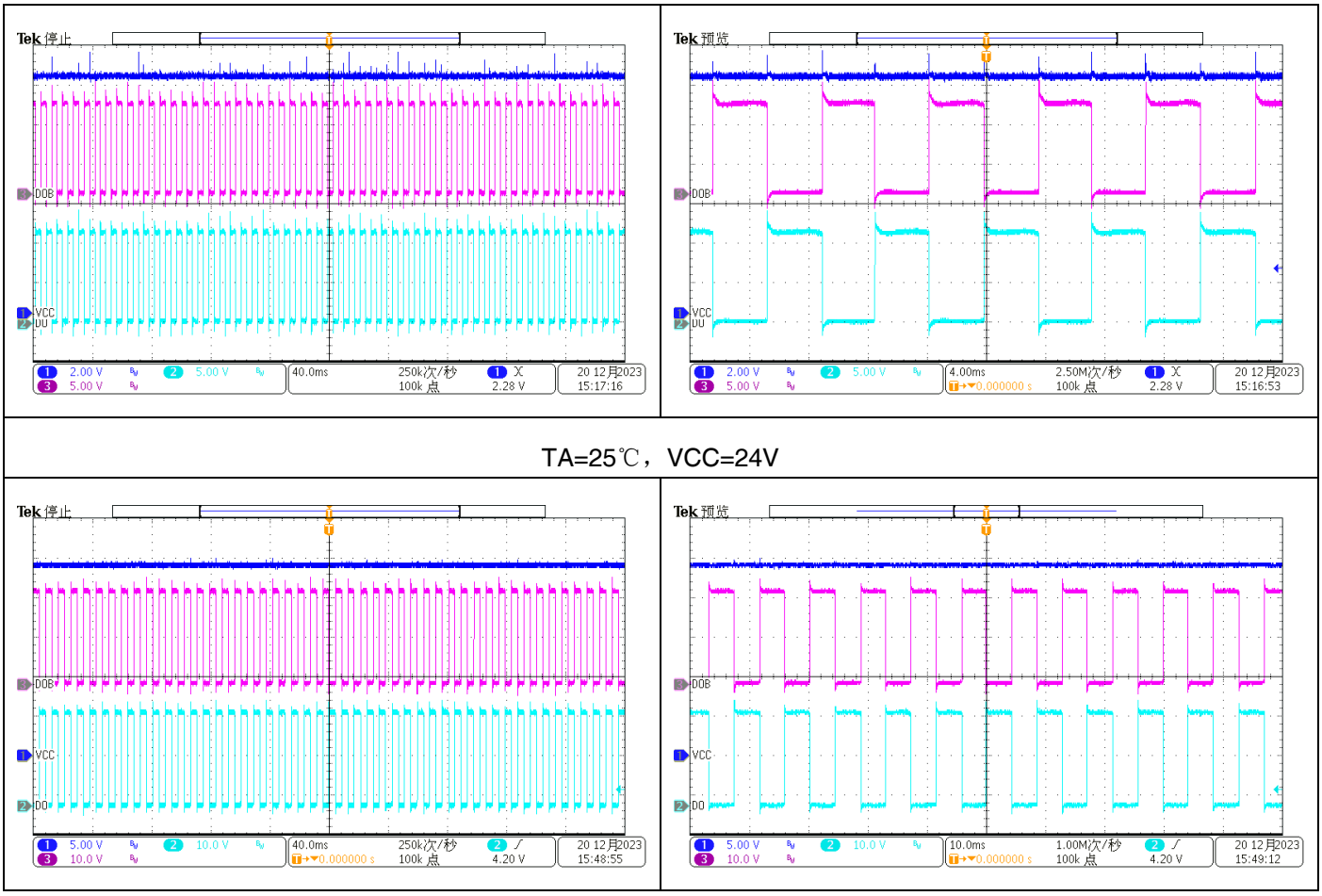
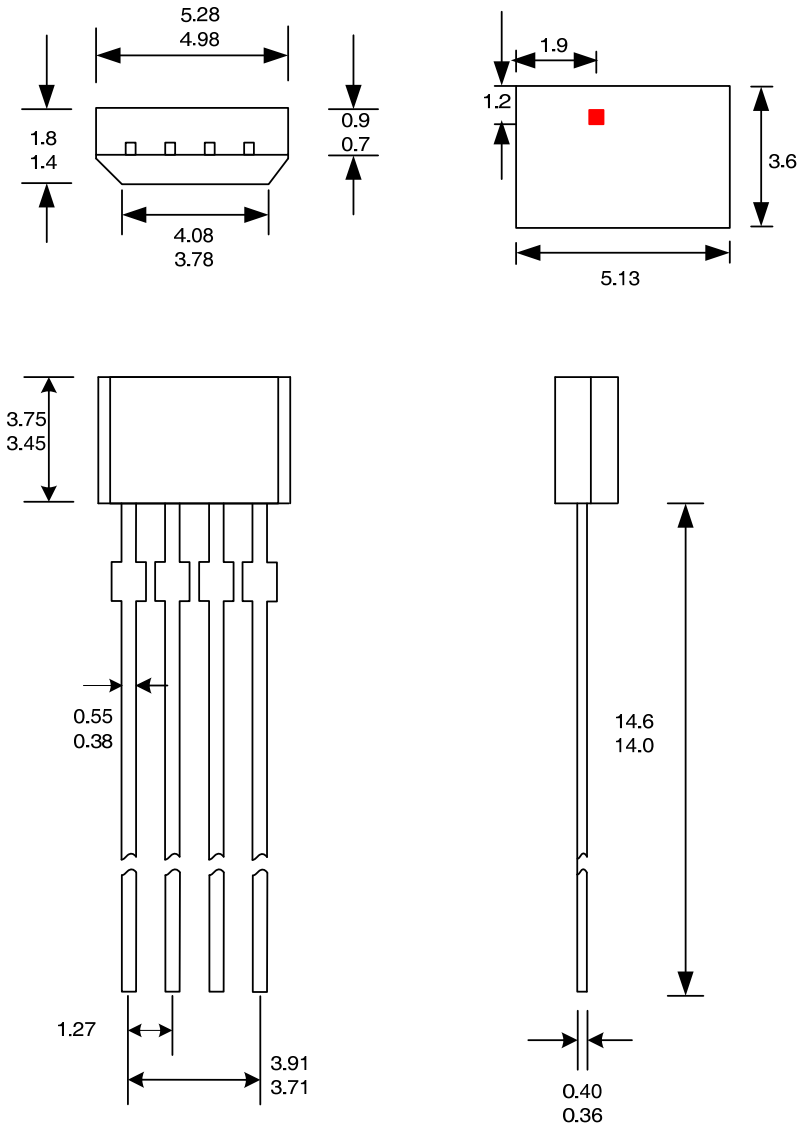


Package Information

Single Phase Hall Effect Fan Driver

4-Terminal
VB Package

Dimension:mm



Notes:

1. *Exact body and lead configuration at vendor's option within limits shown.*
2. *Height does not include mold gate flash.*

Where no tolerance is specified, dimension is nominal.

REVISION HISTORY

Revision	Date	Description
RevE1.0	2023-12-25	Preliminary Datasheet
RevA1.0	2024-03-21	Final Datasheet