

General Description

The SDC281 is a two-phase brushless DC fan motor driver, which is built in Hall effect sensor. The driver includes lock detection and auto-restart functions. The built-in chopper amplifier can dynamically adjust the input offset voltage. It greatly improves the sensitivity of the magnetic. The output uses the soft-switch that greatly reduces the phase-switch noise. The power switch is application in advanced LDMOS technology to effectively reduce the on-resistance. The peak current is highly to 1200mA.

Features

- Widely operating voltage range: 2.5V~20V
- High output peak current to 1200mA
- Continuous output current to 600mA
- High sensitivity Hall effect sensor IC: $\pm 25\text{GS}$
- Soft-switch to reduce phase-switch noise
- Built-in output protection clamping circuit
- Built-in lock detection and auto-restart functions
- Built-in thermal shutdown protection
- Reverse voltage protection

Applications

- Brushless DC fan motors
- Brushless DC motors

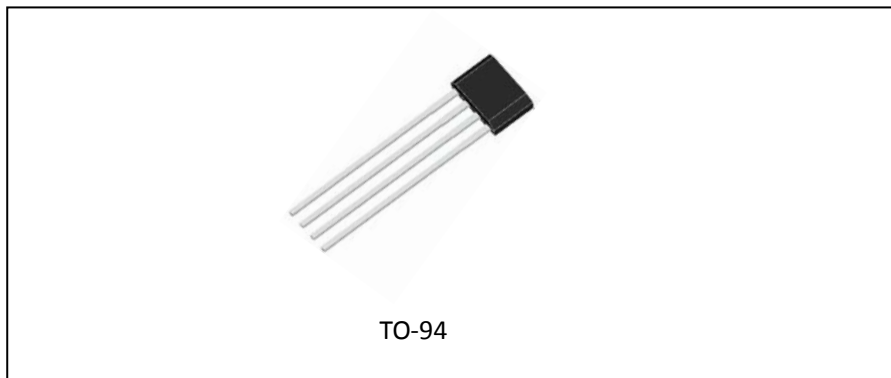


Figure 1. Package Type

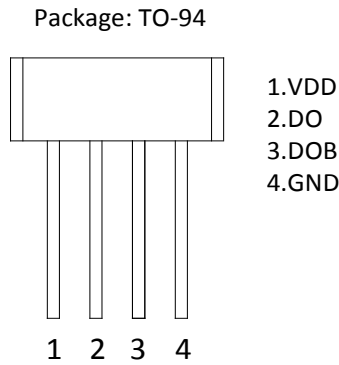
Pin Configuration


Figure 2. Pin Configuration

Pin Number	Pin Name	Functions
1	VDD	Power supply pin
2	DO	Output 1 pin
3	DOB	Output 2 pin
4	GND	Ground pin

Table 1. Pin Description

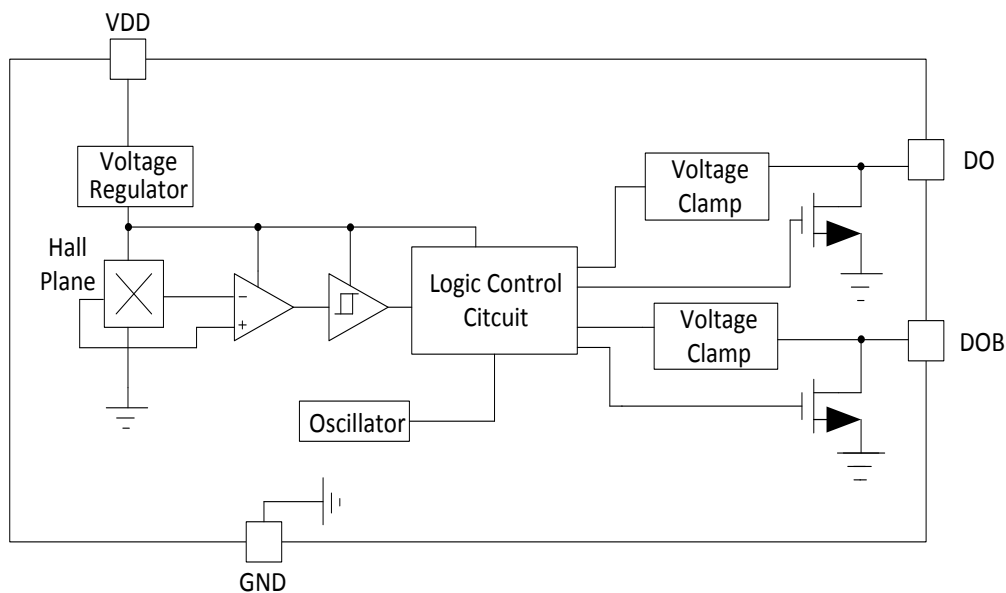
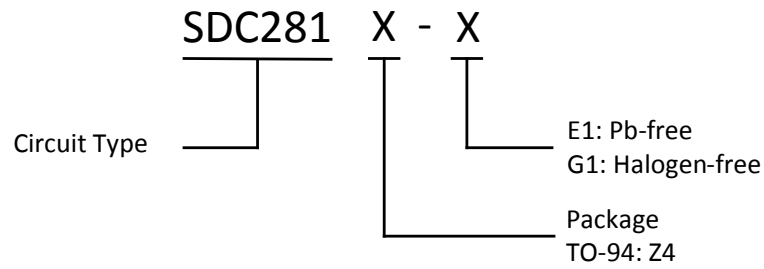
Functional Block Diagram


Figure 3. Functional Block Diagram

Ordering Information


Package	Temperature Range	Part Number		Marking ID		Packing Type
		Pb-free	Halogen-free	Pb-free	Halogen-free	
TO-94	-40°C~85°C	SDC281Z4-E1	SDC281Z4-G1	281	281G	Bulk

Absolute Maximum Ratings (Note: Stresses greater than those listed under absolute maximum ratings may cause permanent damage to the device.)

Parameter	Symbol	Value	Unit
Supply voltage	V_{DD}	20	V
Magnetic flux density	B	-	mT
Output current	I_{OUT}	Continuous	700
		Hold	900
		Peak	1200
Storage temperature range	T_S	-65 to 150	°C
Package power dissipation	P_D	550	mW
Maximum junction temperature	T_J	150	°C
ESD,HBM model per MIL-STD-883H Method 3015.8	HBM	2000	V
ESD,MM model per JEDEC EIA/JESD22-A115	MM	200	V
Latch-up per JEDEC78	-	200	mA

Table 2. Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Symbol	Conditions	Min	Max	Unit
Supply voltage	V_{DD}	-	2.5	18	V
Operating temperature range	T_a	-	-40	85	°C
Max operating current1	I_{OUT1}	$V_{DD}=5V$	-	600	mA
Max operating current2	I_{OUT2}	$V_{DD}=12V$	-	450	mA
Max operating current3	I_{OUT3}	$V_{DD}=18V$	-	200	mA

Table 3. Recommended Operating Conditions

Electrical Characteristics ($T_a=25^\circ\text{C}$, $V_{DD}=12\text{V}$, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply current	I_{DD1}	$V_{DD}=2.5\text{V}$, output open	-	1	2	mA
	I_{DD2}	$V_{DD}=20\text{V}$, output open	-	2	4	mA
Output saturation voltage	V_{SAT}	$V_{DD}=12\text{V}$, $I_{OUT}=300\text{mA}$	-	200	300	mV
Output clamp voltage	$V_{OUT-CLAMP}$	$V_{DD}=12\text{V}$, output off	20	23	26	V
Leakage current of DO	I_{DOL}	$V_{DO}=12\text{V}$, $B < B_{RP}$	-	120	200	μA
Leakage current of DOB	I_{DOBL}	$V_{DOB}=12\text{V}$, $B > B_{OP}$	-	120	200	μA
Lock detection on time	t_{ON}	-	-	0.45	-	S
Lock detection off time	t_{OFF}	-	-	3.2	-	S
Over temperature shutdown	T_{OTS}	-	-	165	-	$^\circ\text{C}$
Temperature hysteresis	-	-	-	30	-	$^\circ\text{C}$

Table 4. Electrical Characteristics

Magnetic Characteristics ($T_a=25^\circ\text{C}$, $V_{DD}=12\text{V}$, unless otherwise specified)

Parameter	Symbol	Min	Typ	Max	Unit
Operating point	B_{OP}	10	25	40	GS
Release point	B_{RP}	-40	-25	-10	GS
Hysteresis	B_{Hys}	40	50	60	GS

Table 5. Magnetic Characteristics

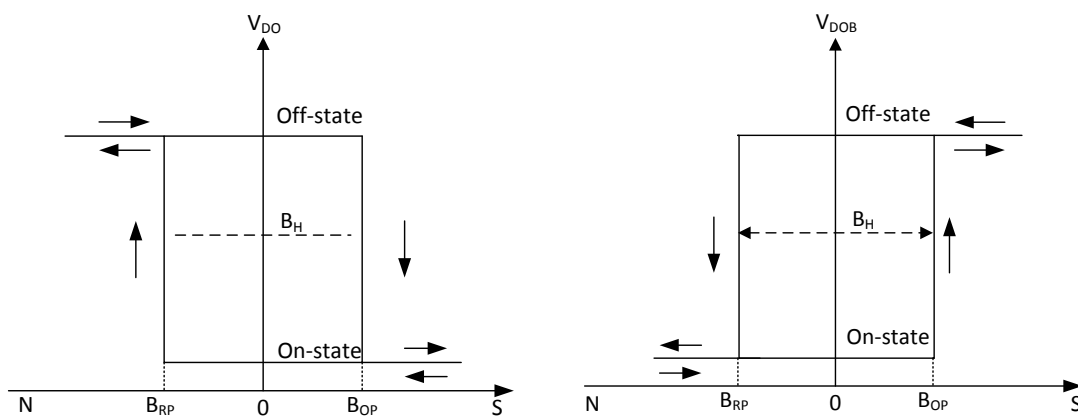


Figure 4. Magnetic Characteristics

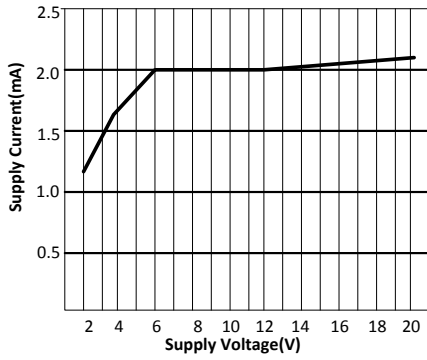
Typical Operating Characteristics


Figure 5. Supply Current vs. Supply Voltage

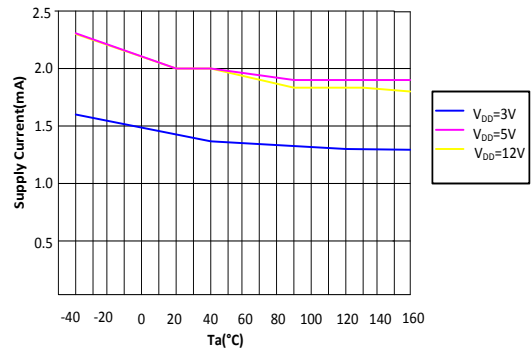


Figure 6. Supply Current vs. Temperature

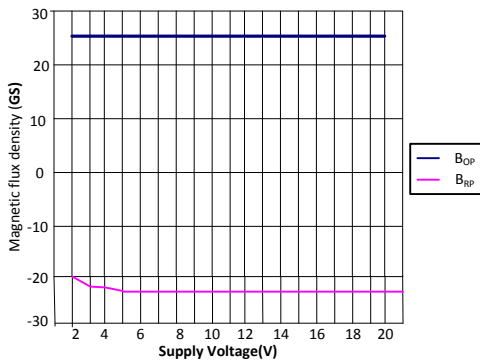


Figure 7. Magnetic Flux Density vs. Supply Voltage

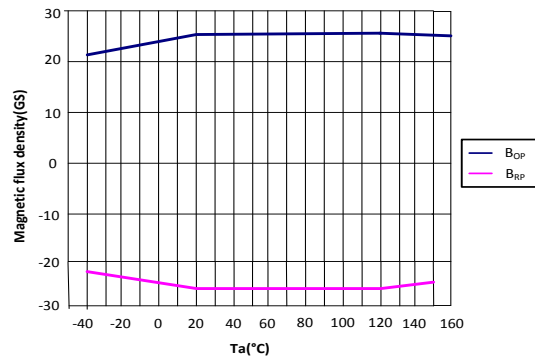


Figure 8. Magnetic Flux Density vs. Temperature

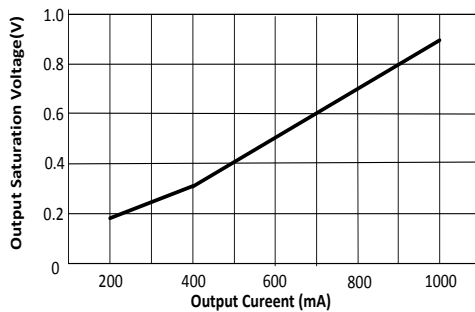


Figure 9. Output Saturation Voltage vs. Output Current

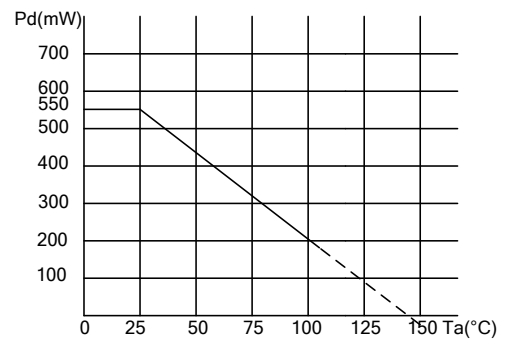


Figure 10. Power Dissipation Curve

Function Description

Lock Detection and Auto-restart

SDC281 detects the rotation of the motor by internal Hall sensor signal, and adjusts lock detection ON time (t_{ON}) and lock detection OFF time (t_{OFF}) by internal counter.

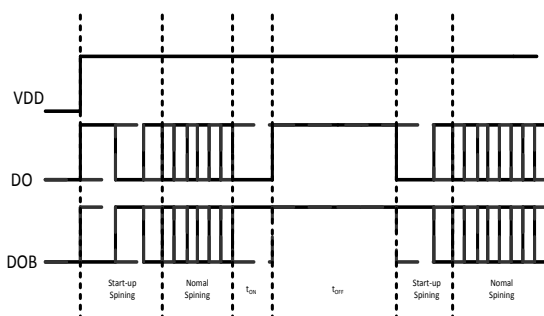


Figure 11. Lock Detection and Auto-restart Waveform

Thermal Protection

SDC281 has a thermal protection. When the internal junction temperature reaches 165°C, the output devices will be switched off. When the IC's junction temperature cools by 30°C, the thermal sensor will turn the output devices on again, resulting in a pulse output during continuous thermal protection.

Output Switch Principle

SDC281 built in a Hall-effect sensor plane to sense the vertical magnetic flux density (B). There are two output drivers in SDC281 to drive two-phase DC brushless motor. When the south pole magnetic field is close to the IC

marking surface and the magnetic flux density higher than operating point (B_{OP}), the DO pin output will turn ON and the DOB pin output will turn OFF. When the south pole magnetic field is far away the IC marking surface and the north pole magnetic field close to the magnetic flux density until the magnetic flux density higher than releasing point (B_{RP}), the DOB pin output will turn ON and the DO pin output will turn OFF.

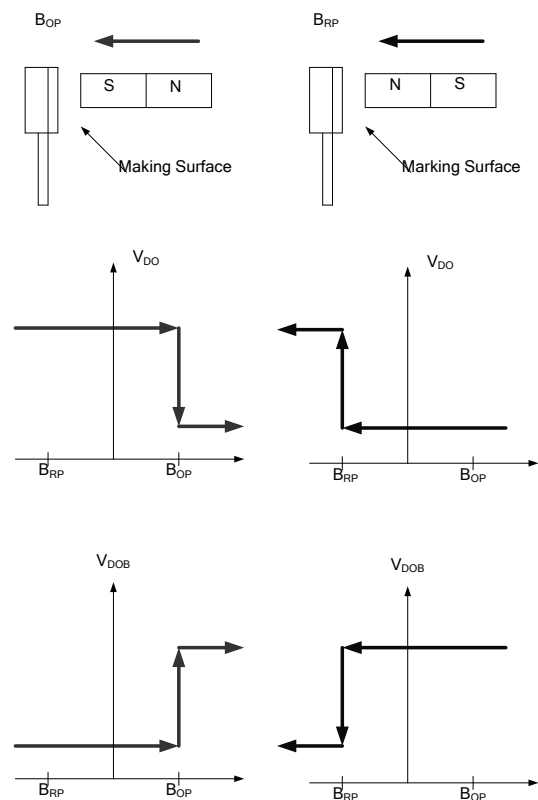
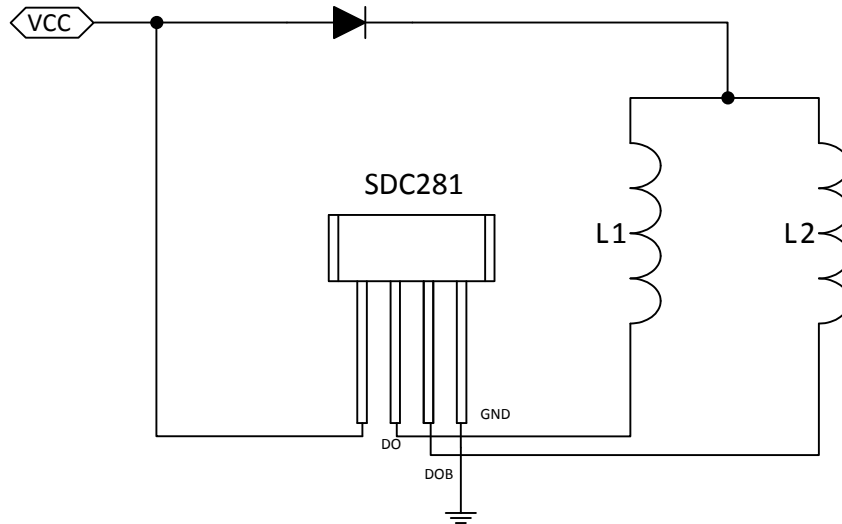
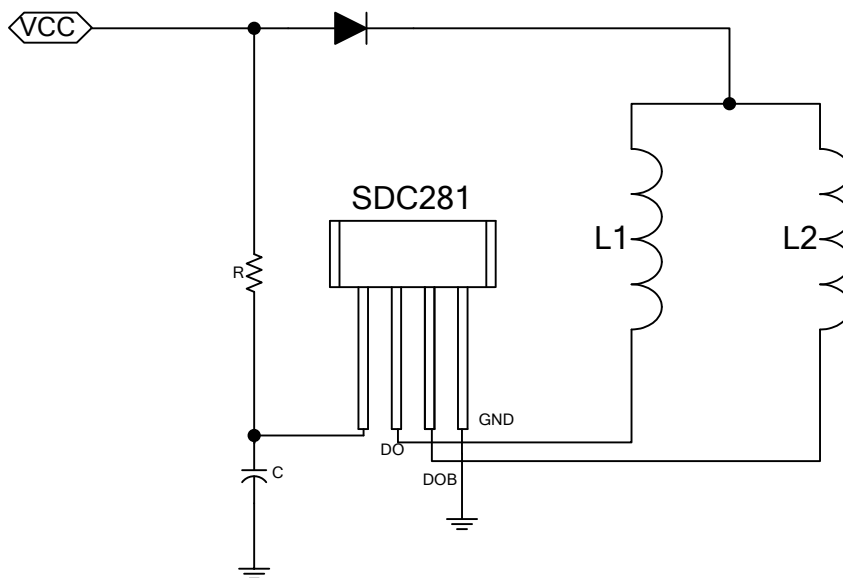
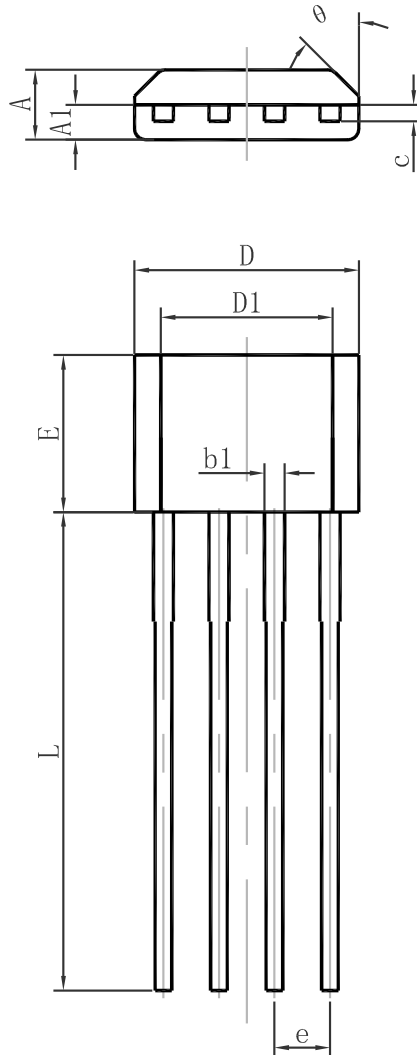


Figure 12. Output Switch Principle

Typical Application

 Figure 13. Typical Application at $V_{DD}=12V$

 Figure 14. Recommended Typical Application at $V_{DD}=12V$

Note: the typical R is 5Ω , and the typical C is $2.2\mu F$.

Package Dimension
TO-94


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.400	1.800	0.055	0.071
A1	0.700	0.900	0.028	0.035
b1	0.380	0.550	0.015	0.022
C	0.360	0.510	0.014	0.020
D	5.050	5.350	0.202	0.214
D1	4.550	4.850	0.128	0.194
E	3.450	3.750	0.136	0.148
e	1.270 TYP.		0.050 TYP.	
L	14.300	14.700	0.572	0.588
θ	10°TYP.		10°TYP.	



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