Single-Coil Brushless DC Motor Driver SDC1576

General Description

The SDC1576 is an integrated Hall sensor with H-bridged output driver designed for brushless DC motor applications. The IC includes high sensitivity hall sensor, chopper stabilized amplifier, dynamic offset cancellation, thermal protection and active reverse battery protection. The high sensitivity of Hall-effect sensor is suitable for motors from mini-type CPU coolers to blowers and DC fans. Typical operation current is 300mA and operating voltage range is wide.

Features

- One-chip Hall Sensor
- Wide operating voltage range: 3.2V~18V
- Output current: 300mA(Continuous)
- Output thermal shutdown protection
- Lock protection and auto-restart
- Active reverse battery protection

Applications

- Single Phase BLDC Fans
- Single Phase BLDC Motors

TO-94

Figure 1. Package Type

Pin Configuration

Package: TO-94

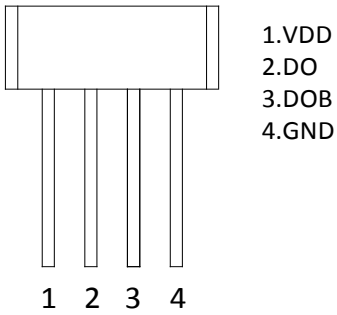


Figure 2. Pin Configuration

Pin Number	Pin Name	Function
1	VDD	Supply voltage pin
2	DO	Output pin
3	DOB	Output pin
4	GND	Ground pin

Table1. Pin Description

Functional Block Diagram

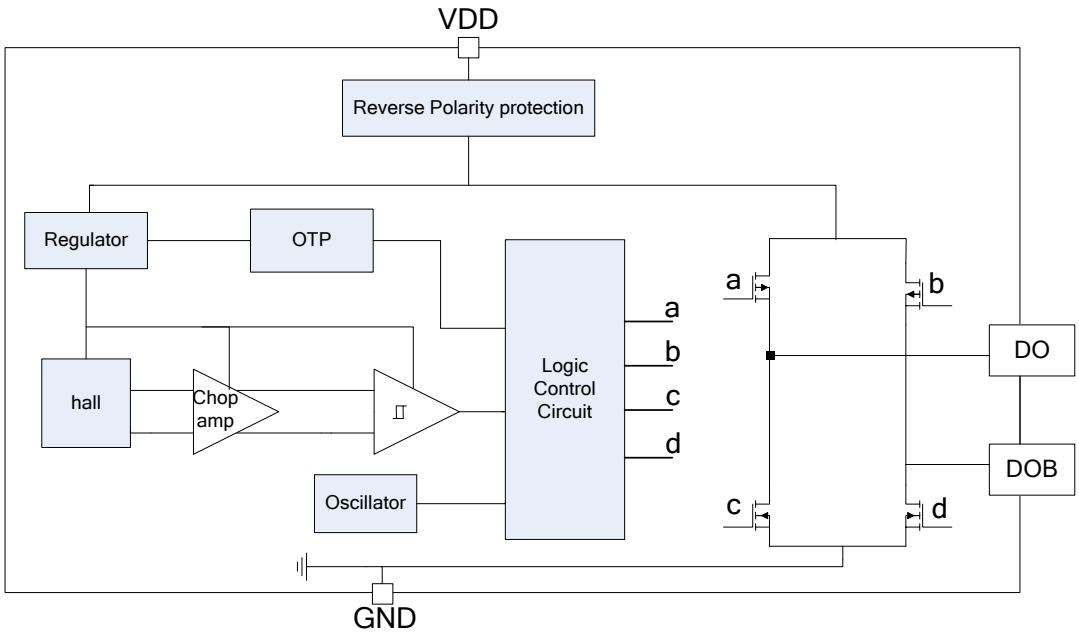
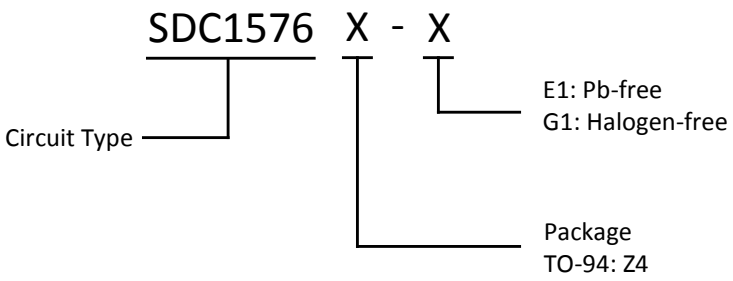


Figure 3. Functional Block Diagram

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	SDC1576Z4-E1	SDC1576Z4-G1	1576	1576G	Bulk

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

Parameter		Symbol	Value	Units
Supply Voltage		V_{DD}	20	V
Output Voltage		V_{OUT}	20	V
Output current	Continuous	I_{OUT}	300	mA
	Hold		500	
	Peak		700	
Package power dissipation		P_D	550	mW
Storage temperature range		T_S	-65 to 150	°C
Maximum junction temperature		T_J	150	°C
ESD, HBM model per Mil-Std-883, Method 3015		HBM	4000	V
ESD, MM model per JEDEC EIA/JESD22-A115		MM	400	V
Latch-up test per JEDEC 78		-	200	mA

Table 2. Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Power supply	V_{DD}	3.2	18	V
Operation temperature	Ta	-40	85	°C

Table 3. Recommended Operating Conditions

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply voltage	V_{DD}	-	3.2	-	18	V
Quiescent supply current	I_{DD}	other pins are open	-	2	-	mA
Output saturation voltage	V_{SAT} (sink)	I_O= 200mA	-	0.3	-	V
	V_{SAT} (drive)	I_O =200mA	-	0.6	-	V
Lock detection on time	T_{on}	-	-	0.4	-	S
Lock detection off time	T_{off}	-	-	2.8	-	S
Over temperature shutdown threshold	Ta	-	-	160	-	℃
Over temperature shutdown hysteresis	Ta	-	-	20	-	℃

Table 4. Electrical Characteristics

Magnetic Characteristics (V_{DD}=12V, unless otherwise specified)

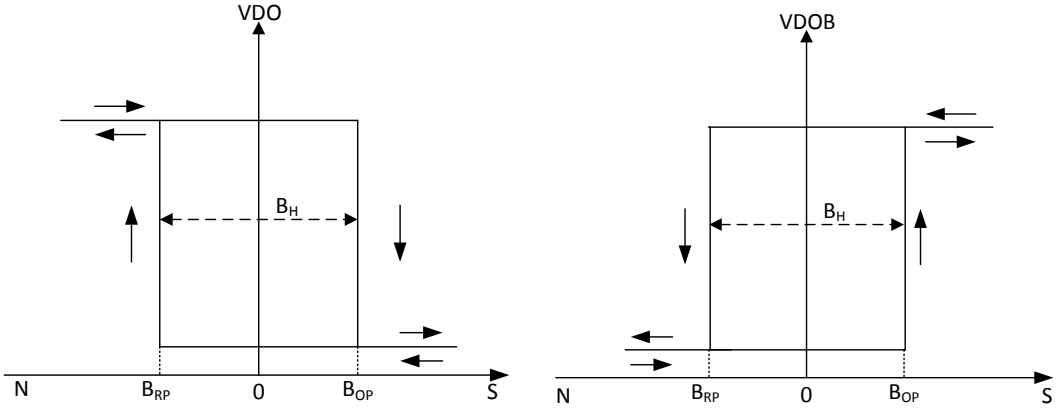


Figure 4. Magnetic Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
Magnetic operate point	B_{OP}	10	20	30	GS
Magnetic release point	B_{RP}	-30	-20	-10	GS
Magnetic hysteresis	Bhys	30	40	50	GS

Table 5. Magnetic Characteristics

Function Description

The figure below is the circuit diagram of H-bridge transistors. The single-phase motor rotation depends on a switching current of coil L1. When the magnetic pole is N pole, Q2, Q3 are turn-off and Q1, Q4 are turn-on, L1 has a current from DO to DOB. And when the magnetic pole is S pole, Q1, Q4 are turn-off and Q2, Q3 are turn-on. There is a current from DOB to DO between L1.

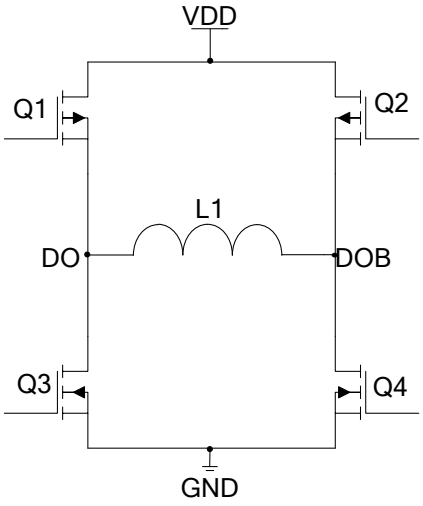
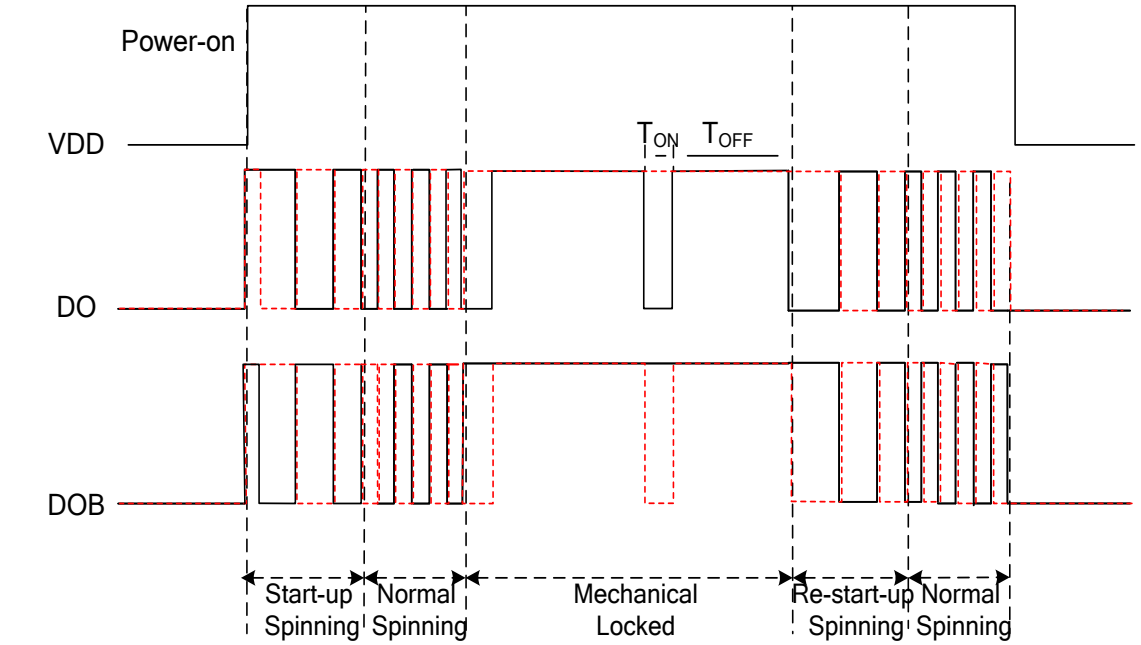


Figure 5. H-Bridge Transistors Output

Lock protection and auto-restart

The SDC1576 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.



Note1: ——North pole face to the hall IC marking surface at power on.
Note2: – – –South pole face to the hall IC marking surface at power on.

Figure 6. Operation Sequence

Thermal protection

The SDC1576 has a thermal protection. When the internal junction temperature reaches 160℃, the output devices will be switched off. When the IC's junction temperature cools by 20℃, the thermal sensor will turn the output devices on again, resulting in a pulsed output during continuous thermal protection.

Typical Application

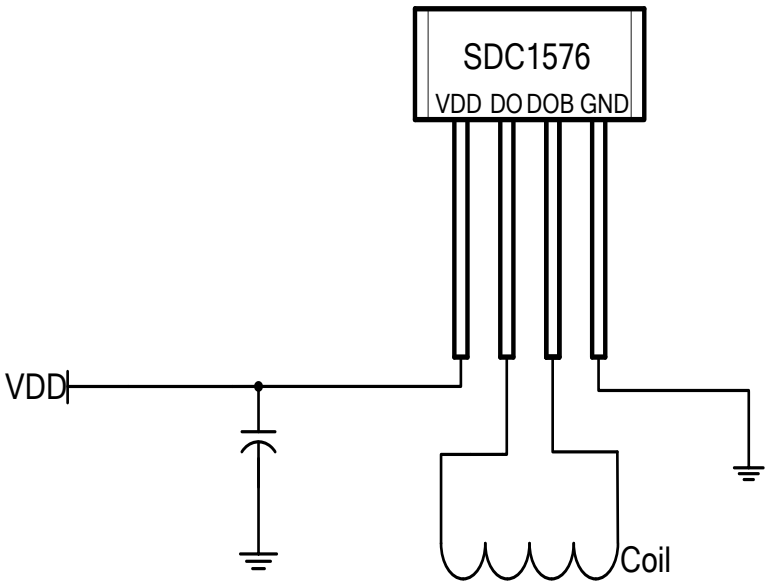
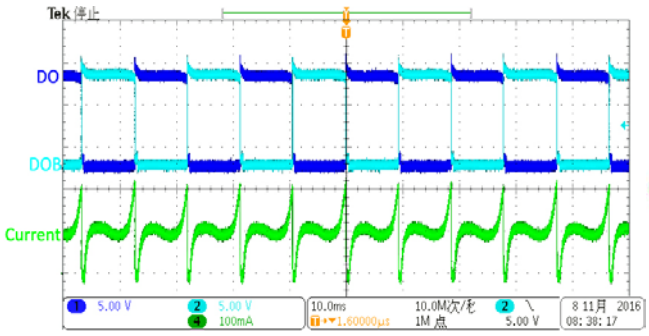
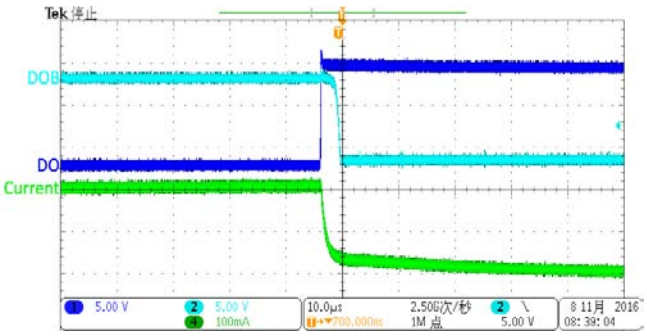


Figure7. Typical Application

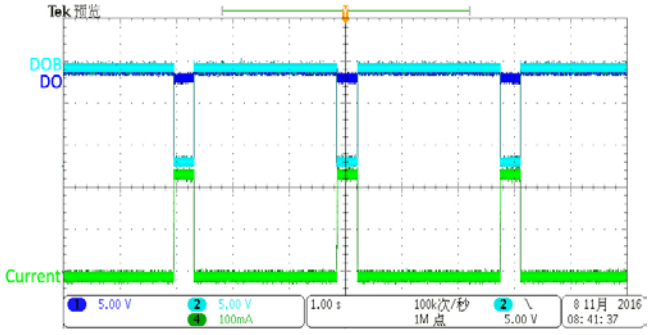
Operation Waveforms



Normal Spinning@VDD=12V

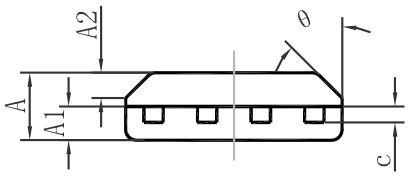


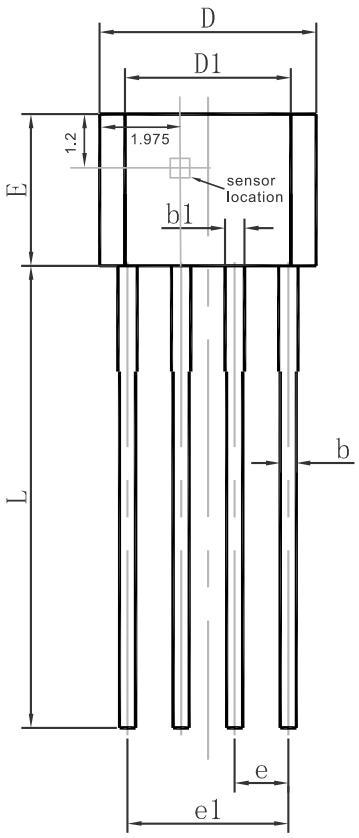
Commutation@VDD=12V



Mechanical Locked@VDD=12V

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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