Data Sheet

12V PWM **speed regulation low noise single coil motor driverÿÿ** ÿÿÿÿ ÿÿ ÿÿ ÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿÿ **SDC9172**

Overview

SDC9172 is a DC motor driver IC designed with mixed analog and digital technology. Suitable for driving single-phase brushless DC motors, PWM speed control cooling fans, etc. It adopts advanced HALL signal compensation technology and high-precision power adjustment model. block, integrated H-bridge output power tube. Highly integrated digital speed regulation, analog It has speed regulation, undervoltage protection and over-temperature protection functions. It is more convenient to install and use.

application

ÿ Single-phase brushless DC motor ÿ Single-coil brushless DC fan ÿ CPU cooling fan

Features

ÿWide operating voltage range (3.5~16V), PWM can be used Speed regulation, MINSP analog signal speed regulation, or DC voltage regulation Fast.

ÿ PWM speed regulation: can be achieved by adjusting the duty cycle of the PWM signal Speed regulation. Wide input frequency range (100Hzÿ100KHz). ÿ With soft start function, it can eliminate the peak current generated during startup.

ÿ The minimum speed output can be set as needed. ÿ The PWM end has an internal pull-up resistor.

ÿ Soft switching function design reduces fan commutation noise. ÿ Complete protection functions: reverse protection, lock protection, undervoltage protection Protection, over temperature protection and the strongest ESD protection. ÿ Built-in FG/RD output

SOP-8

Figure 1. Package type

Pin Description

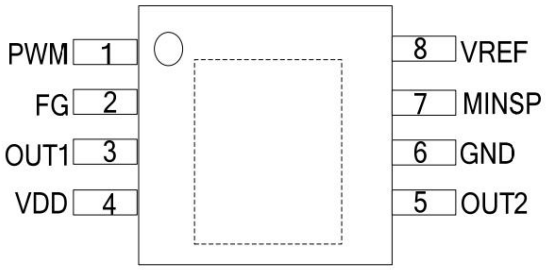


Figure 2. Pin layout

serial number	name	illustrate
1	PWM PWM signal input	
2	FG FG signal output	
3	OUT1 Output 1	
4	VDD Power Supply	
5	OUT2 Output 2	
6	GND Ground terminal	
7	MINSP Minimum speed setting	
8	VREF reference voltage output	

Table 1. Pin Description

Functional Block Diagram

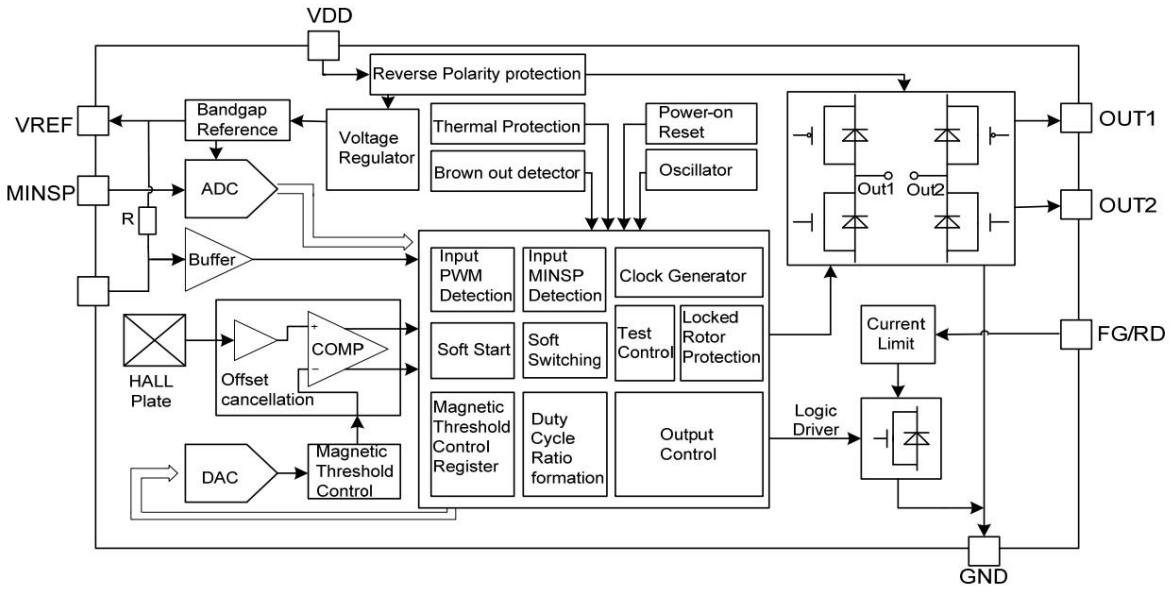
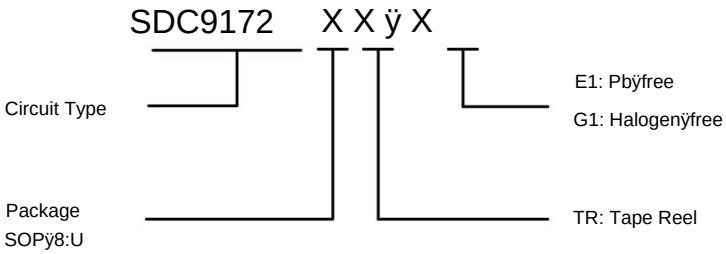


Figure 3. Functional block diagram

Ordering Information



Package temperature range	Product Number		Identification number		Packaging
	Lead Free	Halogen Free	Lead Free	Halogen Free	
SOP-8 -40ÿ~125ÿ	SDC9172UTR-E1	SDC9172UTR-G1	SDC9172	SDC9172G	Taping

Limit parameters (Note: Do not exceed the maximum value in application to prevent damage. Long-term operation at the maximum value may affect the reliability of the device)

parameter	symbol	maximum	unit
Supply voltage	VDD	+18	V
Supply current	IDD	+20	mA
Supply reverse voltage	VDDREV	-14	V
Supply reverse current	IDDREV	-20	mA
FG output voltage	VFG	+18	V
FG output current	IFG	+30	mA
FG Reverse output current	IFG	-50	mA
PWM Input Voltage	VPWM	+7	V
PWM Reverse Input Voltage	VPWM	-0.3	V
MINSP Input Voltage	VMINSP	+3.6	V
MINSP Reverse input voltage VMINSP		-0.3	V
MINSP or PWM Reverse current IMINSP, IPWM Average output		-10	mA
current Pulse output	IOUT	+550	mA
current Operating	IOUT	+1000	mA
temperature range	FACING	-40to+150	ÿ
Storage temperature	TS	-55to+165	ÿ
range Maximum junction temperature	TJ	+165	ÿ
ESD resistance HBM		6000	V
magnetic flux	B	Unlimited	mT

Table 2. Limit parameters

Recommended Operating

Conditions	symbol	Minimum	Maximum	Unit
Definition Supply	VDD	3.5	16	V
Voltage Average Output	IOUT		+500	mA
Current Operating Temperature Range	FACING	-40	125	ÿ
Minsip input voltage VMINSP		0	VREF	V

Table 3. Recommended operating conditions

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Electrical Characteristics (Unless otherwise specified: Ta = 25°C, VCC = 12V)

Parameter Symbol Test Conditions Supply Voltage Supply Current Reverse			Min.	Typ.	Max.	Unit
Current	VDD		3.5	12	16	V
	IDD			3	6	mA
	IDDREV	VDD = -16V			1	mA
PWM input low level	WILL				0.8	V
PWM input high level	HIV		2.1		5.5	V
PWM Input Frequency	END	-2%<DCERR<2%	0.1		100	KHz
PWM Internal pull-up resistor	ALSO			10	- kÿ	
Full-bridge on-resistance	RDSON	TJ=25ÿ		3.4	7.1	Oh
Full-bridge on-resistance	RDSON	TJ=105ÿ		4.1	9.1	Oh
PWM output range	WRONG	10%<DCIN<100%	26	30		KHz
Output duty cycle range	DCOUT	VMINSP=0V	0		100	%
Output duty cycle range	DCOUT	Resistor R1 between MINSP to VREF, DCIN<10%	10		100	%
Minimum speed setting resistor range RMINSP		DCIN<10%,10%<DCOUT<100%,RREF= 68k	40		100 Kÿ	
Output duty cycle error	DCERR	DCOUT–DCIN,VDD=12V,TA=25°C	-2		2	%
Inertia freewheeling	TFW			1		ms
time Soft start	KSOFT			40		%
acceleration zone	ESOFT			4		edges
Soft start detection Soft start duration	TSOFT			1.3	2	s
FG output saturation voltage drop	VOL	B>BOP,IOUT=5mA		0.2	0.5	V
FG Maximum output current	ICL	B>BOP	20	23	26	mA
FG leakage current	IOFF	VOUT=16V,VDD=12V,B<Brp		0.1	10	uA
magnetic field	MEMBER	BOP=|MEMBER|,BRP= -|MEMBER|		±2 ±4 mT		
sensitivity output switching time	TSLOPE	Total Regulation Range	300		4000	us
range output switching time	SLR RATIO			12.5		%
ratio reference reference	VREF		2.9	3.1	3.4	V
voltage reference reference	IREF				2	mA
current undervoltage	INJECTION		2.8	3.1	3.4	V
protection value	TBOD			8		ms
undervoltage detection delay lock	TON			1.8		s
protection open time lock protection	TOFF			4.5		s
close time over-	TPROT	Junction temperature		170	- ÿ	
protection point overtemperature	Trela	Junction temperature		155	- ÿ	
protection hysteresis point package thermal resistance				150	- ÿ/W	

Table 4. Electrical characteristics

Output state VS magnetic field characteristics (unless otherwise specified: Ta = 25°C, VDD = 3.5-16V)

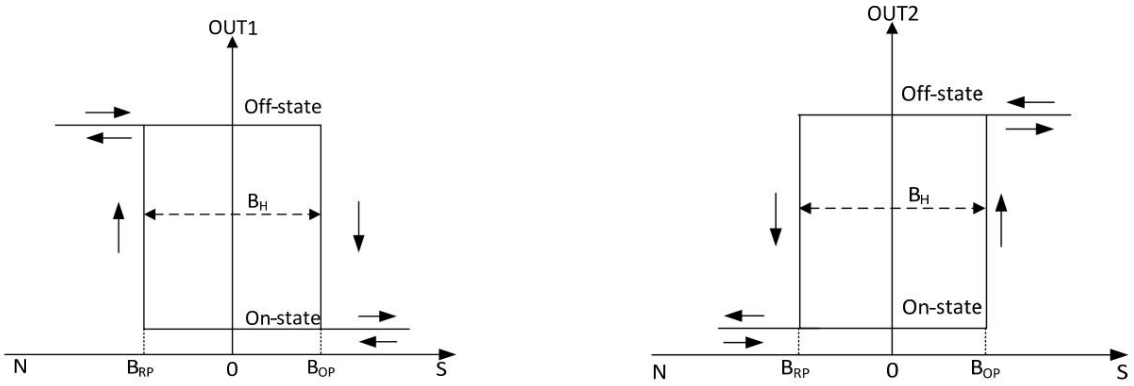

Figure 4. Output vs. Magnetic Field Characteristics

	Test conditions	OUT1	OUT2	FG
South	B>BOP	Low	High	Low
North	B<BRP	High	Low	High

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Functional Description

SDC9172 is a motor designed with mixed-signal technology. Driver IC, dedicated to single-coil fans, single-phase DC motors, etc. This chip integrates many unique functions, internal integrated voltage adjustment module, digital-analog hybrid magnetic field sensitivity compensation system, integrated H-bridge output power tube. 3.5~16V wide operating voltage range, can be provided for different applications. Integrated reverse voltage protection, undervoltage protection, over-temperature protection, soft start, soft commutation, PWM digital speed regulation, thermistor analog signal speed regulation, etc., these functions have high practical value in practical applications.

PWM input has a wide frequency range, which can make the output PWM speed regulation frequency far away from the audio area. PWM speed regulation is to adjust the PWM input duty cycle so that the current duty cycle of the output end through the coil changes proportionally to achieve the purpose of regulating the motor speed. Therefore, in the linear regulation area, it has a very high regulation accuracy, and the regulation error is less than ±2% as shown in the figure below.

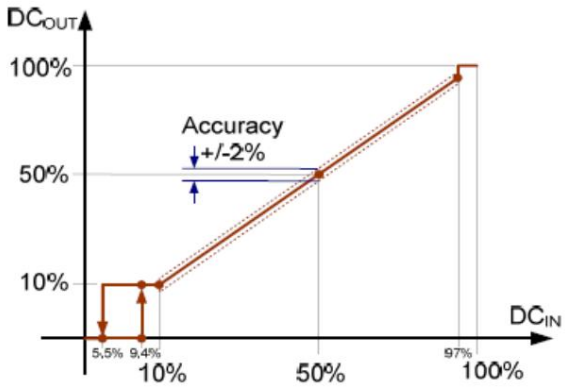

Figure 5. PWM speed regulation

A 10K pull-up resistor is integrated between PWM and Vref, which changes the traditional method of adding an external pull-up resistor, eliminates the need for external devices, and is easier to use. In addition, once the external PWM signal line fails, the motor runs at full speed. The designed soft switching function can automatically

correct the commutation time (target value T*12.5%) without increasing power consumption and is independent of the magnetic field strength of the rotor, so that both high efficiency and low noise performance are best reflected. The soft start function can absorb the peak current generated in the start-up

interval. In addition, it ensures that the input PWM can provide increased torque at a lower duty cycle to ensure that the rotor can start normally. Once the rotor rotation is detected, the output will be linearly adjusted according to the input duty cycle.

The minimum speed setting can be set by adjusting the MINSP resistor value, which is particularly suitable for applications in cooling systems that require a minimum speed (such as: CPU, graphics card, etc.).

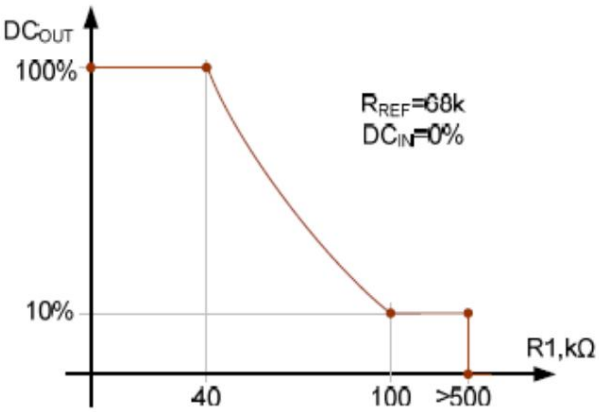

Figure 6.MINSP The resistance speed

tachometer (FG) feeds the motor speed signal back to the control system, monitoring the motor status at any time to prevent the motor from stalling and causing the coil to short-circuit. The internal design has a rotor lock protection function to prevent the rotor from stalling due to external factors, resulting in damage to the chip and motor. There is also an over-temperature protection function. Once the chip temperature is too high, the output is turned off until the temperature returns to the chip's safe operating area.

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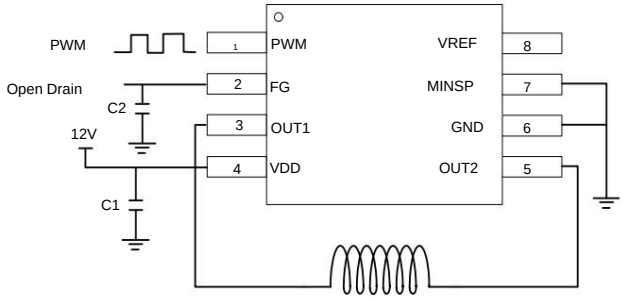
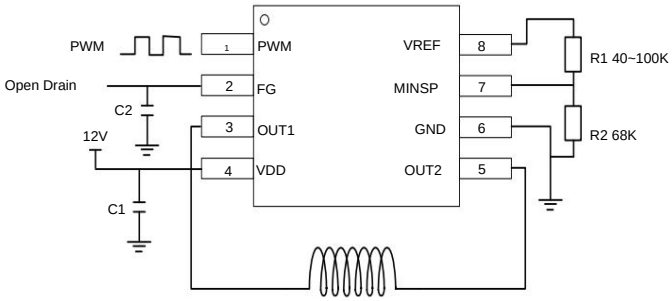
Typical Applications

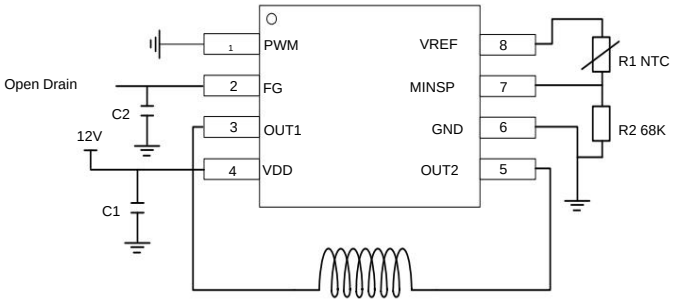
(1) PWM controlled fan (no minimum speed setting)



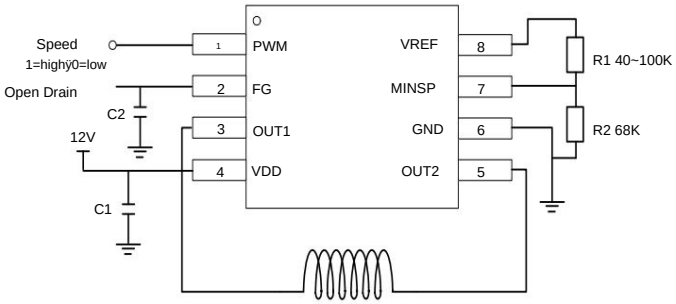
(2) PWM controlled fan (with minimum speed setting)



(3) Thermistor controlled fan



(4) PWM and R dual control speed regulation mode



Application Note:

The decoupling capacitor C1 from VDD to GND should be larger than 6.8uF and as close to the chip VDD Pin as possible to eliminate the influence of external noise and power supply fluctuations and improve system

When FG is used, a 10K pull-up resistor should be connected to VCC or other power supply below 12V, and a 4.7nF capacitor C2 should be connected to GND.

Leave it unconnected when not in use.

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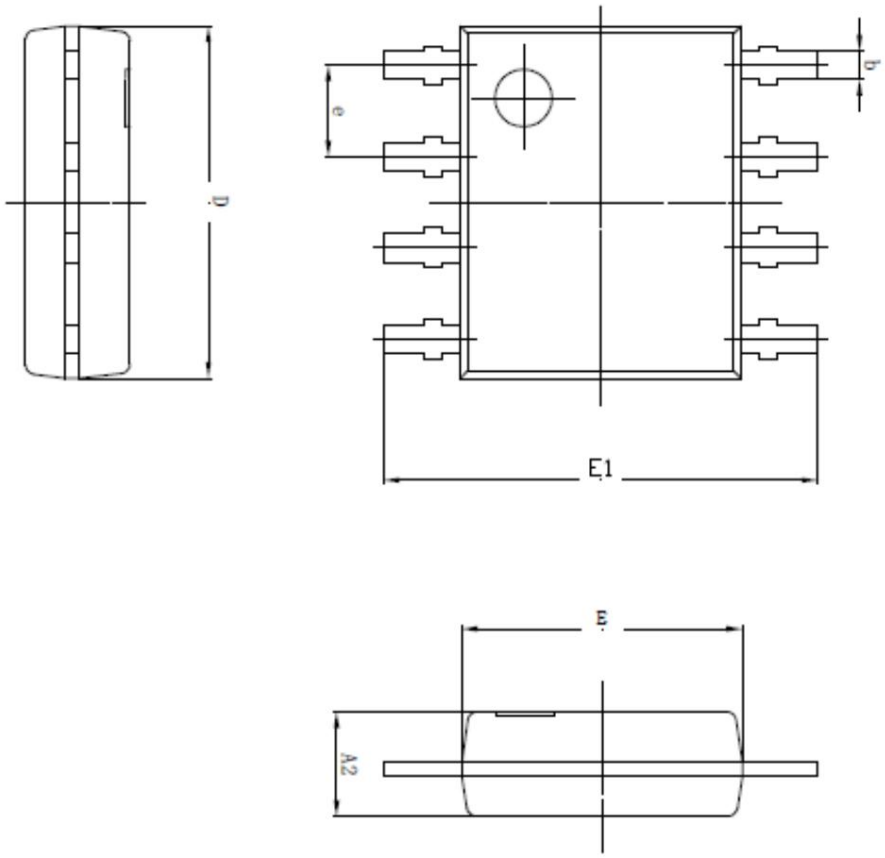
Package size (SOP-8)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A2	1.425	1.475	0.056	0.058
b	0.400		0.157	
D	4.850	4.950	0.191	0.195
and	1.270(BSC)		0.050(BSC)	
AND	3.870	3.930	0.152	0.155
E1	5.800	6.200	0.228	0.244

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