AH280

Hall-Effect Smart Fan Driver

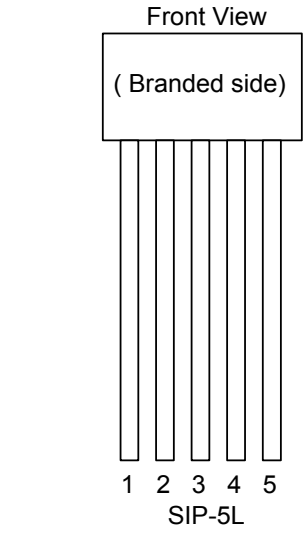
■ Features

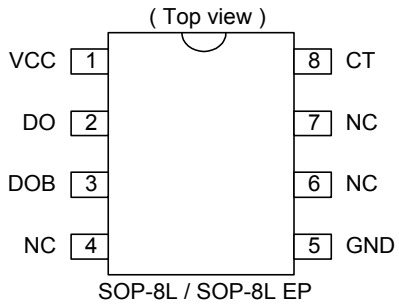
- On chip Hall plate
- Built-in Zener diode protection for output driver
- Built-in protection diode for power reverse connecting
- Rotor-lock detection
- Automatically restart after release of motor locking
- Adjustable auto restart time
- Operating voltage: 3.5~20 V
- Max Output current: $I_{O(AVE)}$ = 500mA
- Packages: SIP-5L, SOP-8L, SOP-8L EP
- Less external component

■ General Description

AH280 is the integrated Hall sensor owned two complementary outputs for motor's coil driving, auto locked shutdown and auto restart functions. Functional block diagram includes that a regulator with temperature-compensated band-gap, an on-chip Hall voltage generator, a comparator, a Schmitt trigger and two current output drivers. The regulator can provide wide operational voltage range. The Hall voltage generator is to amplify the Hall voltage due to Hall effect. A Schmitt trigger is to provide switching Hysteresis for noise rejection. To avoid coil burning, rotor-lock detection circuit will shutdown the output driver if detect rotor-lock status. A rotation recovery circuit is to restart the motor after rotor-lock is removed. In addition, the auto re-start time is flexible by adjusting the capacitance (C_T).

■ Pin Assignments





■ Pin Descriptions

SIP-5L

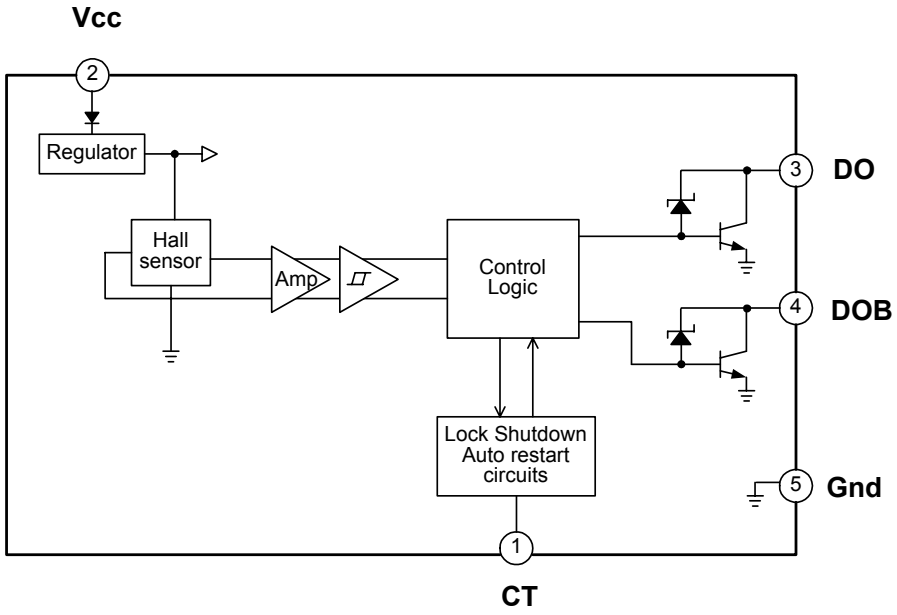
Symbol	P/I/O	Pin #	Description
CT	I	1	Timing cap.
VCC	P	2	Positive power supply
DO	O	3	Driver output
DOB	O	4	Driver inverted output
GND	P	5	Ground

SOP-8L/SOP-8L EP

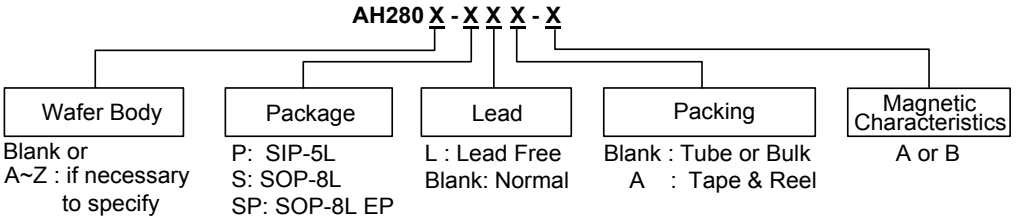
Symbol	Pin #	Description
VCC	1	Positive power supply
DO	2	Driver output
DOB	3	Driver inverted output
NC	4,6,7	Not connected for SOP8
CT	8	Timing cap.
GND	5	Ground

Rev. 0.7 Apr 16, 2004

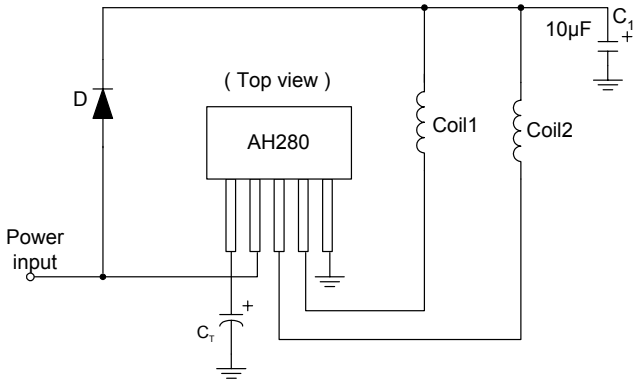
■ Block Diagram



■ Ordering Information



■ Application Circuit



(DC Brush-less Fan)

■ Absolute Maximum Ratings (T_A = 25°C)

Characteristics	Symbol		Rating	Unit
Operating Supply Voltage	V_{CC}		20	V
Output Current	$I_{O\ (AVE)}$		500	mA
	$I_{O\ (PEAK)}$		800	
Power Dissipation	P_D	SIP-5L / SOP-8L	550	mW
		SOP-8L EP	1000	
Operating Temperature	T_{OPR}		-20~85	°C
Storage Temperature	T_{STG}		-55~150	°C
DO(DOB) Vceo D.C. Voltage	Vceo		40	Vdc

■ Electrical Characteristics (T_A=25°C, V_{CC}=12V, C_T=1μF)

Characteristics		Symbol	Test Conditions	Min,	Typ.	Max.	Unit
Internal Zener-protected Voltage		V_Z	-	-	46	-	V
Quiescent current		I_Q	V_{CC}=5V Output1 "ON"	10	15	20	mA
			V_{CC}=12V Output1 "ON"	10	17	20	
Output saturation voltage		DO DOB	I_O=0.2A, T_J=25°C	-	0.4	-	V
			I_O=0.4A, T_J=25°C	-	0.6	-	
			I_O=0.5A, T_J=25°C	-	0.7	-	
Automatic self-rotation recovery circuit	Charge current	I_{CHG}	-	-	2.4	-	μA
	Discharge current	I_{DHG}	-	-	0.5	-	μA
	Limiting voltage	V_{CL}	Clamp Voltage	-	2.0	-	V
		V_{CP}	Comparator Voltage	-	1.0	-	
	On time	T_{ON}	C_T=.47μF	-	250	-	ms
	Duty ratio	D_R	T_{OFF} / T_{ON}	3	5	7	-

■ Magnetic Characteristics

(1mT = 10 Gauss)

A grade

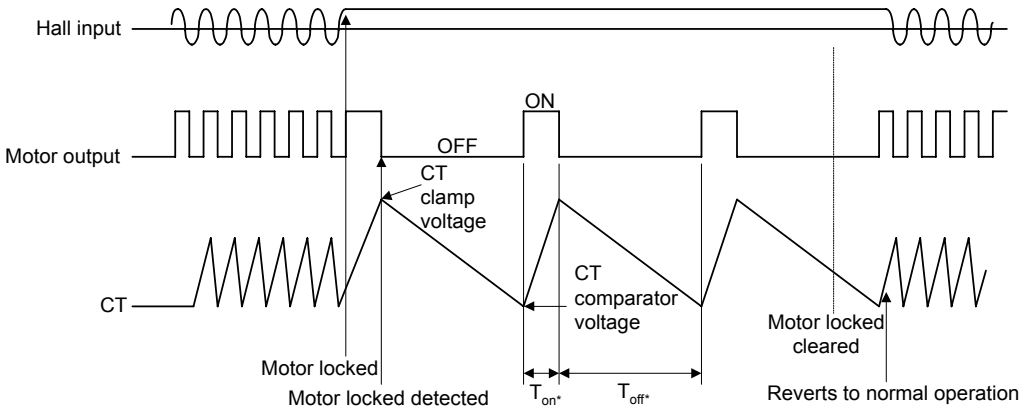
Characteristics	Symbol	T_A= -20°C to +85°C			Unit
		Min.	Typ.	Max.	
Operate Point	B_{OP}	10	-	60	G
Release Point	B_{RP}	-60	-	-10	G
Hysteresis	B_{HYS}	-	100	-	G

B grade

Characteristics	Symbol	T_A= -20°C to +85°C			Unit
		Min.	Typ.	Max.	
Operate Point	B_{OP}	10	-	80	G
Release Point	B_{RP}	-80	-	-10	G
Hysteresis	B_{HYS}	-	100	-	G

■ Rotation detection

The automatic restart circuit detects a motor lock condition and automatically turns off the output current. When the lock condition is cleared, the IC automatically restarts and allows the motor to run. In the AH280, automatic restart is performed in the following manner. A motor lock condition is detected when the Hall signal stops switching. The output is ON when CT pin is being charged, and OFF when CT pin is being discharged.



Output ON time (T_{on}) and OFF time (T_{off})
Determined by the CT pin capacitor
Where

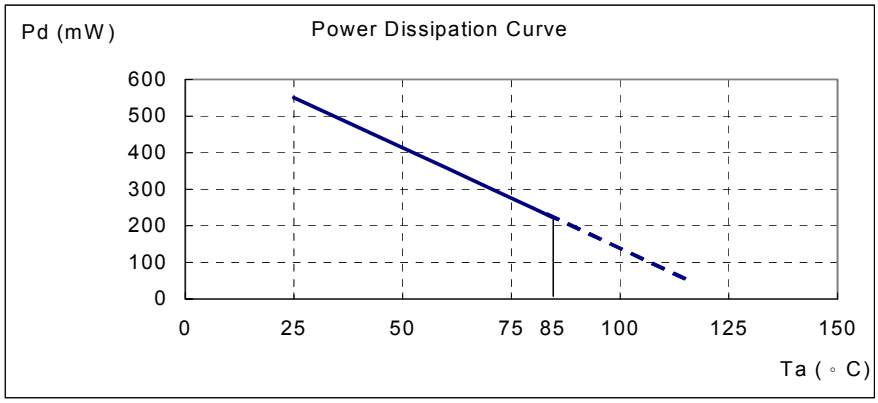
$$T_{on} = \frac{C \times (V_{CL} - V_{CP})}{I_{CHG}} \text{ (sec)}$$

$$T_{off} = \frac{C \times (V_{CL} - V_{CP})}{I_{DHG}} \text{ (sec)}$$

C is the capacitance of the CT pin external capacitor
V_{CL} is the CT pin clamp voltage
V_{CP} is the CT pin comparator voltage
I_{CHG} is the CT pin charge current
I_{DHG} is the CT pin discharge current

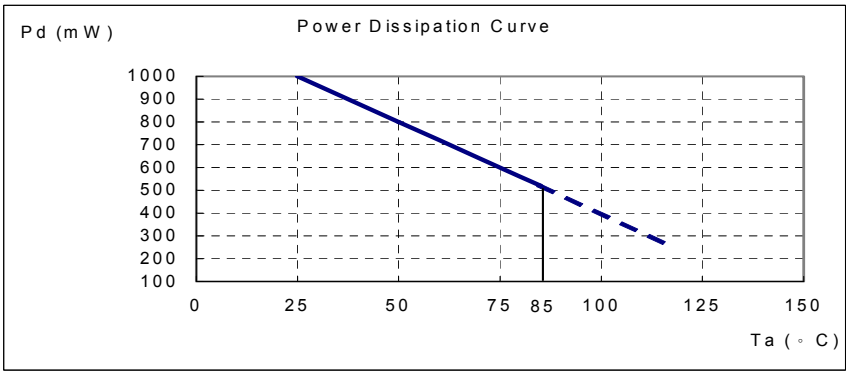
■ Performance Characteristics (SIP-5L / SOP-8L)

Ta (°C)	25	50	60	70	80	85	90	95	100	105	110	115	120
Pd (mW)	550	413	358	303	248	220	193	165	138	110	83	55	28



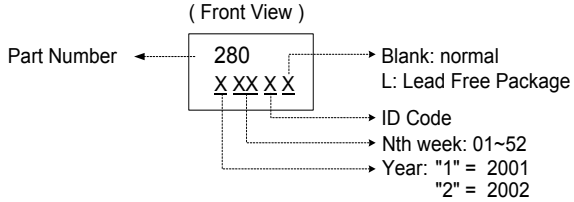
■ Performance Characteristics (SOP-8L EP)

Ta (°C)	25	50	60	70	80	85	90	95	100	105	110	115	120
Pd (mW)	1000	800	720	640	560	520	480	440	400	360	320	280	240

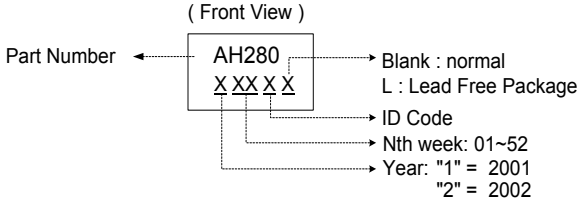


■ Marking Information

(1) SIP-5L

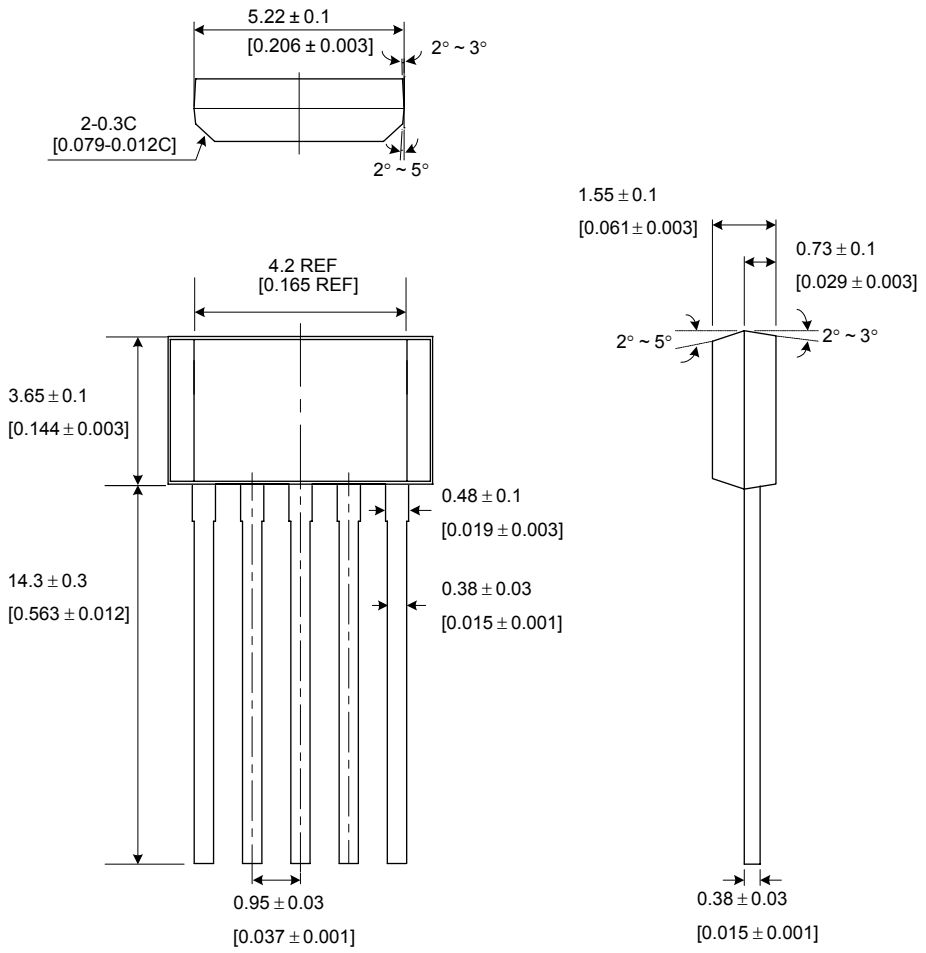


(2) SOP-8L / SOP-8L EP

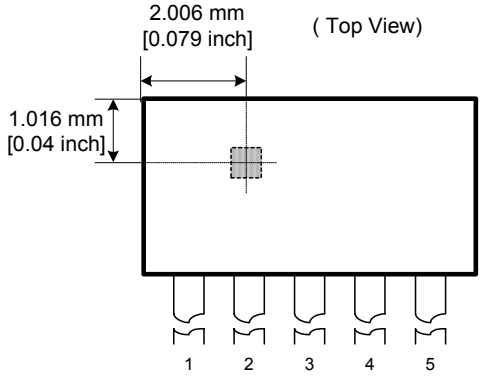


■ Package Information

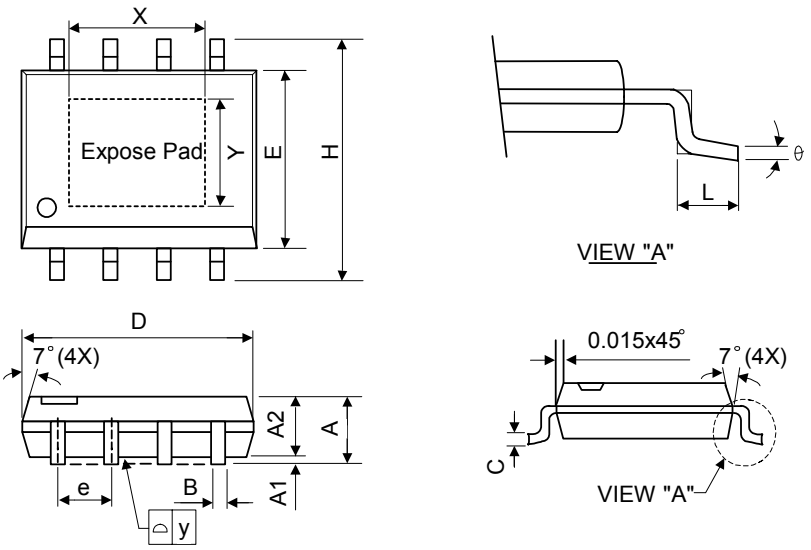
(1) Package Type: SIP-5L unit: mm / [inch]



■ Location of sensing point



(2) Package Type: SOP-8L (Normal / Expose Pad)



Symbol	Dimensions In Millimeters			Dimensions In Inches		
	Min.	Nom.	Max.	Min.	Nom.	Max.
A	1.40	1.60	1.75	0.055	0.063	0.069
A1	0.10	-	0.25	0.040	-	0.100
A2	1.30	1.45	1.50	0.051	0.057	0.059
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.19	0.20	0.25	0.0075	0.008	0.010
D	4.80	5.05	5.30	0.189	0.199	0.209
E	3.70	3.90	4.10	0.146	0.154	0.161
e	-	1.27	-	-	0.050	-
H	5.79	5.99	6.20	0.228	0.236	0.244
L	0.38	0.71	1.27	0.015	0.028	0.050
y	-	-	0.10	-	-	0.004
θ	0°	-	8°	0°	-	8°
(Expose pad)						
X	-	2.92	-	-	0.115	-
Y	-	2.34	-	-	0.092	-

■ Sensor location