

## Description

The AH286 is a single-chip solution for driving two-coil brushless direct current (BLDC) fans and motors. The device includes a Hall-effect sensor, dynamic offset correction and two complementary open-drain output drivers with internal Zener diode protection.

To help protect the motor coils, the AH286 provides Rotor Lock Protection which shuts down output drives if rotor lock is detected. The device automatically re-starts when the rotor lock is removed. A Rotor-lock Detect (RD) output flag allows external monitoring of any motor locks.

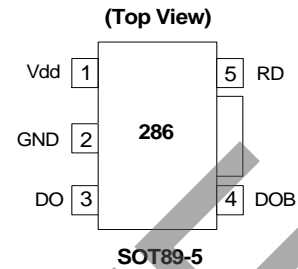
The AH286 is available in SOT89-5 package.

## Features

- Single-chip Solution
- Operating Voltage: 3.8V to 20V
- Built-in Hall Sensor and Input Amplifier
- Rotor-lock Detect (RD) Flag
- Rotor Lock Protection (Lock detection, output shutdown and automatic re-start)
- Built-in Zener Protection For Output Driver
- Average output current up to 500mA
- Packaged in SOT89-5
- Green Molding Compound
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

- Notes:
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## Pin Assignments

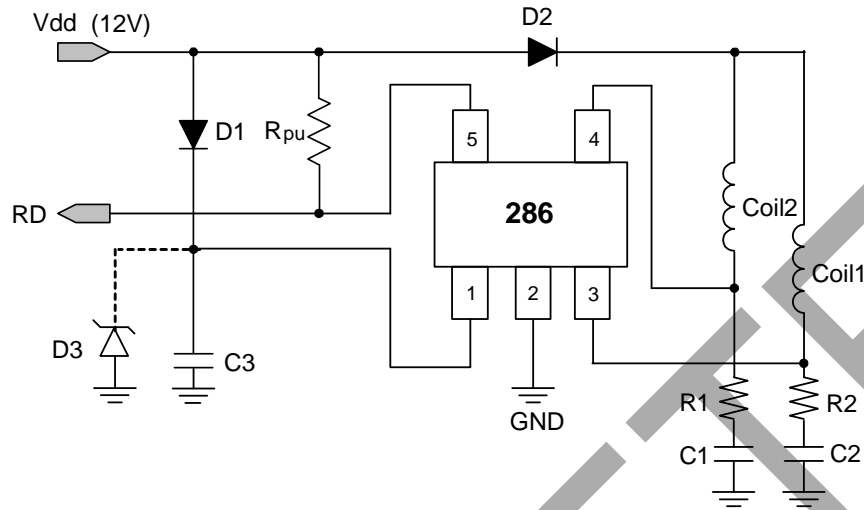


## Applications

- Two-Coil BLDC Cooling Fans
- Low to Medium Voltage, Low Power BLDC Motors

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**Typical Application Circuit** (Note 4)



**12V DC Brush-Less Fan with RD Output Function**

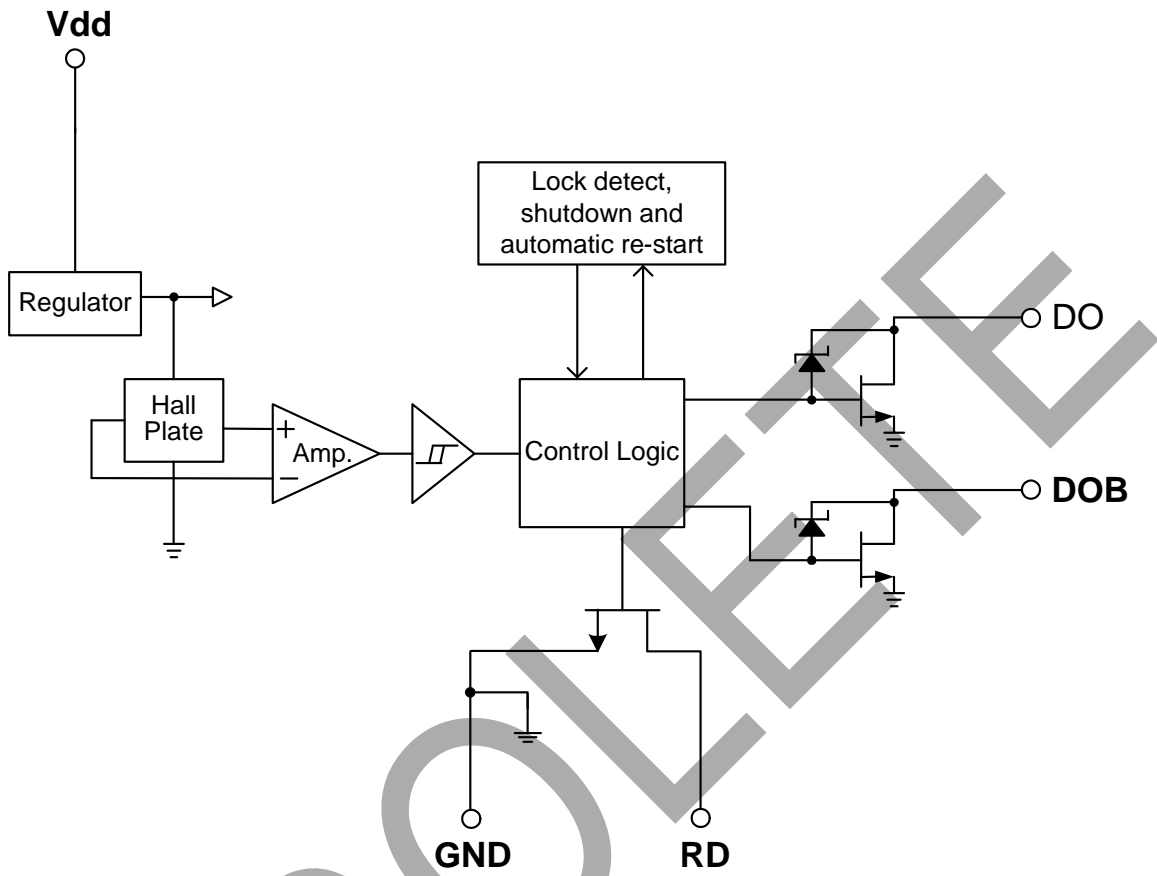
Notes: 4. Typically it is recommended to use a 56 Ohm resistor for R1 and R2 and a 2.2µF E-Cap capacitor for C1, C2 and C3. These values may need to be optimized depending on the coils used.  
To help with IC protection it's advised to add a Zener diode between Vdd and ground. The Zener diode should be chosen to help prevent the supply voltage exceeding the maximum rating of the device.

**Pin Descriptions**

Pin Name	Description
RD	Rotor-state detection
Vdd	Input power
DO	Output pin
DOB	Output pin
GND	Ground

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**Functional Block Diagram**

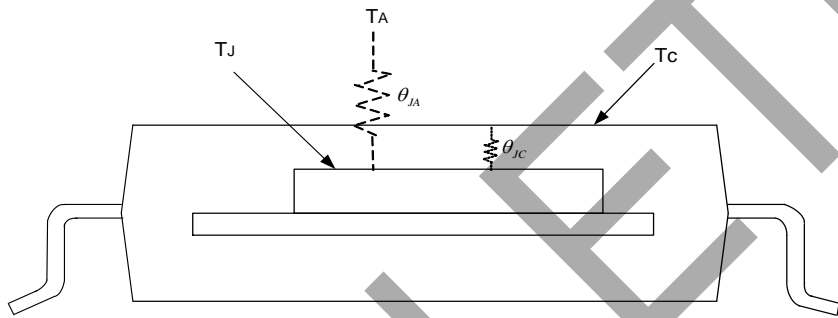


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**Absolute Maximum Ratings ( $T_A = +25^\circ\text{C}$ )**

Symbol	Characteristics	Rating	Unit
V <sub>DD</sub>	Supply Voltage	24	V
I <sub>O</sub>	Output Current	I <sub>O</sub> (AVE)	500 mA
		I <sub>O</sub> (PEAK)	700 mA
P <sub>D</sub>	Power Dissipation	800	mW
T <sub>ST</sub>	Storage Temperature	-55 to +150	°C
T <sub>J</sub>	Maximum Junction Temperature	+150	°C
$\theta_{JA}$	Thermal Resistance Junction to Case (Note 5)	156	°C/W



Note: 5.  $\theta_{JA}$  should be confirmed with heat sink thermal resistance. If there is no heat sink contact,  $\theta_{JA}$  will almost be the same as  $\theta_{JC}$ .

**Recommended Operating Conditions**

Symbol	Characteristic	Conditions	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage	Operating	3.8	20	V
T <sub>A</sub>	Operating Ambient Temperature	Operating	-40	+100	°C

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

Symbol	Characteristics	Conditions	Min	Typ.	Max	Unit
I <sub>DD</sub>	Supply Current	Operating	-	2.0	4.0	mA
I <sub>OFF</sub>	Output Leakage Current	V <sub>OUT</sub> = 24V	-	< 0.1	10	μA
t <sub>RLP-ON</sub>	Rotor Lock Protection On Time	-	0.4	0.5	0.6	Sec
t <sub>RLP-OFF</sub>	Rotor Lock Protection Off Time	-	2.4	3	3.6	Sec
V <sub>OUT(SAT)</sub>	Output Saturation Voltage	I <sub>O</sub> = 300mA	-	375	500	mV
		I <sub>O</sub> = 500mA	-	625	900	
R <sub>DS(ON)</sub>	Output On Resistance	I <sub>O</sub> = 300mA	-	1.25	1.67	Ω
V <sub>OL</sub>	RD Output Vds	I <sub>O</sub> = 10mA	-	0.5	-	V
V <sub>Z</sub>	Output Zener-Breakdown Voltage	-	35	42	60	V

**Truth Table** (Note 6)

IN-	IN+	CT	OUT1	OUT2	RD	Mode
H	L	L	H	L	L	Rotating
L	H	L	L	H	L	Rotating
-	-	H	Off	Off	H	Lockup protection activated

Note: 6. Latch-type RD output is low during rotor rotation and high when the rotor is locked (not rotating).

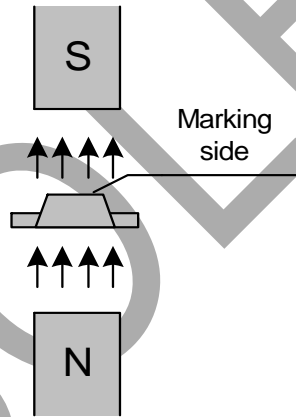
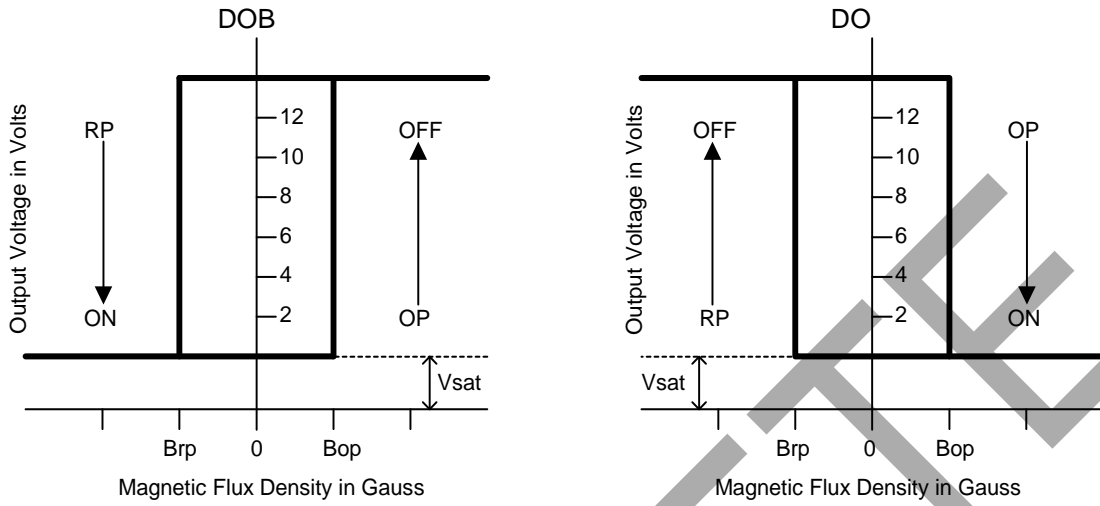
**Magnetic Characteristics** ( $T_A = +25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$ , unless otherwise specified, Note 7)

(1mT = 10 Gauss)

Symbol	Characteristics	Min	Typ.	Max	Unit
B <sub>op</sub>	Operate Point	10	30	60	Gauss
B <sub>rp</sub>	Release Point	-60	-30	-10	Gauss
B <sub>hy</sub>	Hysteresis	-	60	-	Gauss

Note: 7. The magnetic characteristics may vary with supply voltage, operating temperature and after soldering.

**Operating Characteristics**



( SOT89-5 )

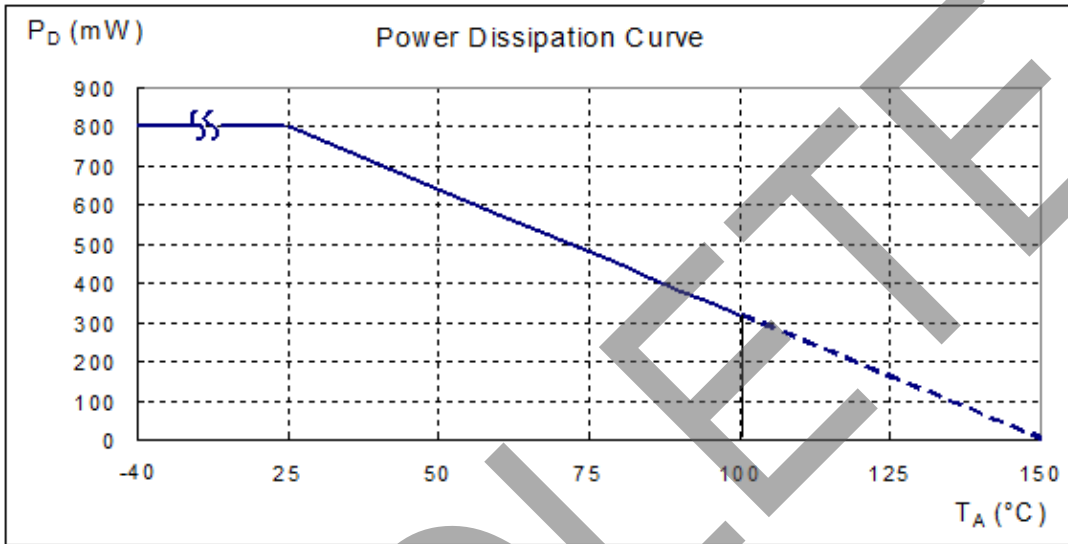
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**Performance Characteristics**

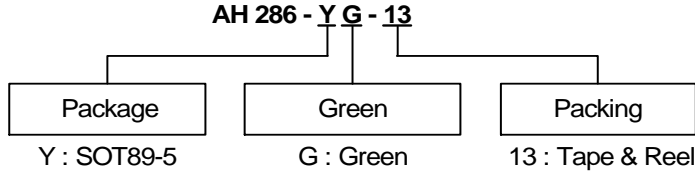
$T_A$ (°C)	25	50	60	70	75	80	85	90	95	100
$P_D$ (mW)	800	640	576	512	480	448	416	384	352	320
$T_A$ (°C)	<b>105</b>	<b>110</b>	<b>115</b>	<b>120</b>	<b>125</b>	<b>130</b>	<b>135</b>	<b>140</b>	<b>145</b>	<b>150</b>
$P_D$ (mW)	288	256	224	192	160	128	96	64	32	0



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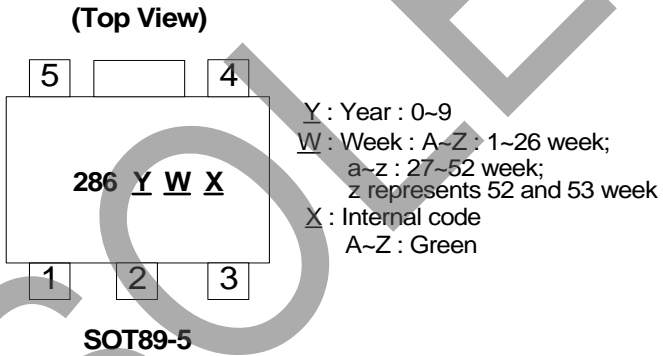
**Ordering Information**



Device	Package Code	Packaging (Note 8, 9)	Bulk		13" Tape and Reel	
			Quantity	Part Number Suffix	Quantity	Part Number Suffix
AH286-YG-13	Y	SOT89-5	NA	NA	2500/Tape & Reel	-13

Notes: 8. Pad layout as shown on Diodes Incorporated's suggested pad layout document, which can be found on our website at <http://www.diodes.com/package-outlines.html>.  
 9. Reverse taping as shown on Diodes Incorporated's Surface Mount (SMD) Packaging document AP02007, which can be found on our website <http://www.diodes.com/datasheets/ap02007.pdf>.

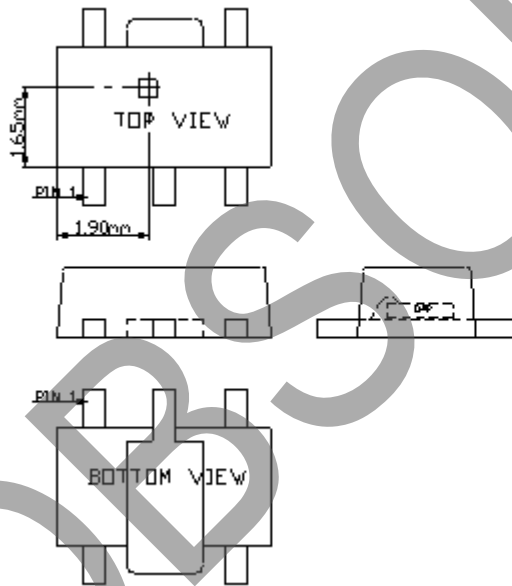
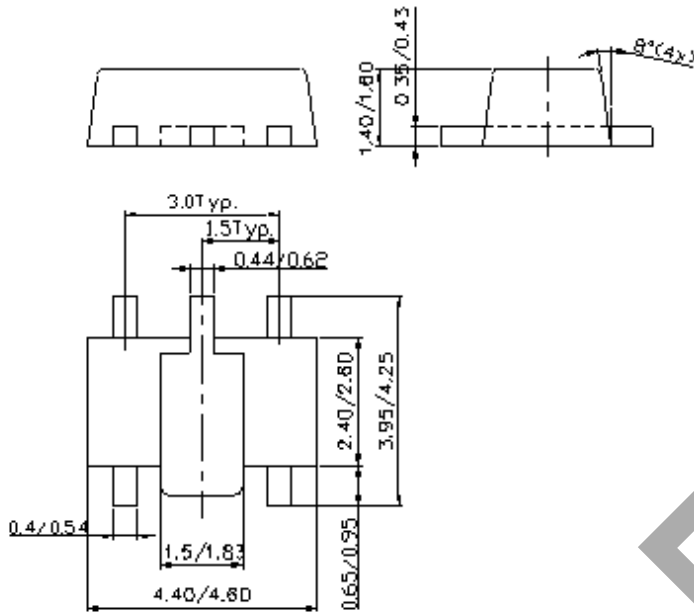
**Marking Information**





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**Package Outline Dimensions (All Dimensions in mm)**



**Sensor Location**

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