

# HIGH VOLTAGE HALL-EFFECT SMART FAN MOTOR CONTROLLER

## Features

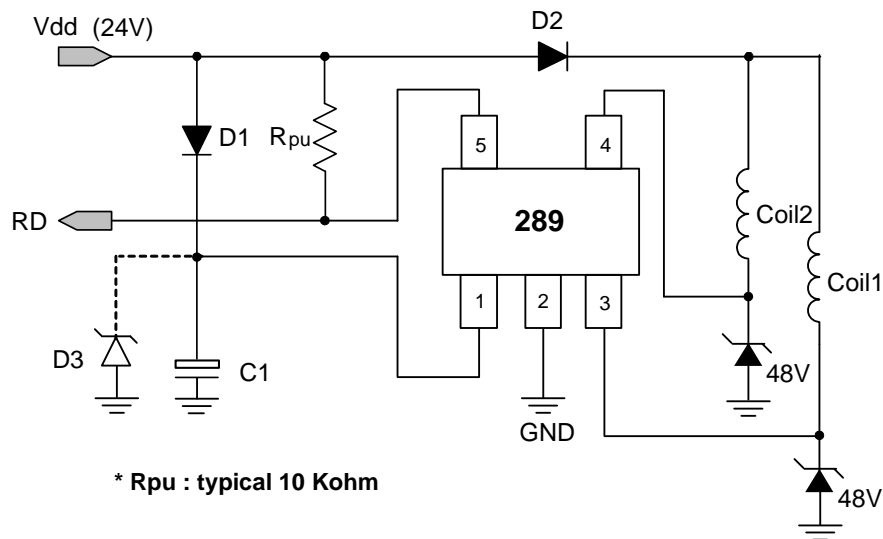
- On Chip Hall Sensor
- Rotor-Locked Shutdown
- Automatically Restart
- Rotor-State Detection (RD) Output
- Built-in Zener Protection for Output Driver
- Operating Voltage: 3.8V~28V
- Output Current:  $I_{O(AVE)} = 400mA$
- Lead Free Package: SOT89-5L (Note 1)
- SOT89-5L: Available in "Green" Molding Compound (No Br, Sb)
- Lead Free Finish/ RoHS Compliant (Note 2)

## General Description

AH289 is a monolithic fan motor controller with Hall sensor's capability. It contains two complementary open-drain transistors for motors coil driving, an automatic lock current shutdown, and recovery protection. In addition, the Rotor-State Detection (RD) output is for Rotor-State Detection.

Rotor-lock shutdown detection circuit turns off the output driver when the rotor is blocked to avoid coil overheat. Then, the automatic recovery circuit will restart the motor. These protected actions are repeated and periodic during the blocked period. Until the blocking is removed, the motor recovers and runs normally.

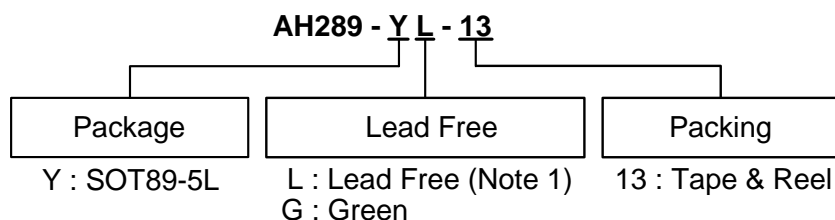
## Typical Application Circuit





Note: The optional Capacitor C1 and Diode D3 are for power stabilization. C1 is recommended to be E-Cap., 1uF/25V; D3 is recommended to be Zener Diode,  $V_Z = 27V$ . Which C1 and D3 value need to be fine tuned to optimize design for different coils and power suppliers.

### 24V DC Brush-Less Fan with RD Output Function

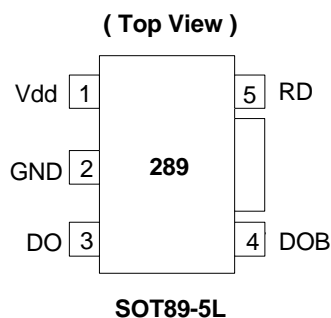
## Ordering Information



Device	Package Code	Packaging (Note 3)	13" Tape and Reel	
			Quantity	Part Number Suffix
 AH289-YL-13	Y	SOT89-5L	2500/Tape & Reel	-13
 AH289-YG-13	Y	SOT89-5L	2500/Tape & Reel	-13

Notes: 1. AH289-YL-13 will be replaced by AH289-YG-13  
 2. EU Directive 2002/95/EC (RoHS). All applicable RoHS exemptions applied. Please visit our website at [http://www.diodes.com/products/lead\\_free.html](http://www.diodes.com/products/lead_free.html).  
 3. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com/datasheets/ap02001.pdf>.  
 4. Reverse taping as shown on Diodes Inc. Surface Mount (SMD) Packaging document AP02007, which can be found on our website <http://www.diodes.com/datasheets/ap02007.pdf>.

## Pin Assignments



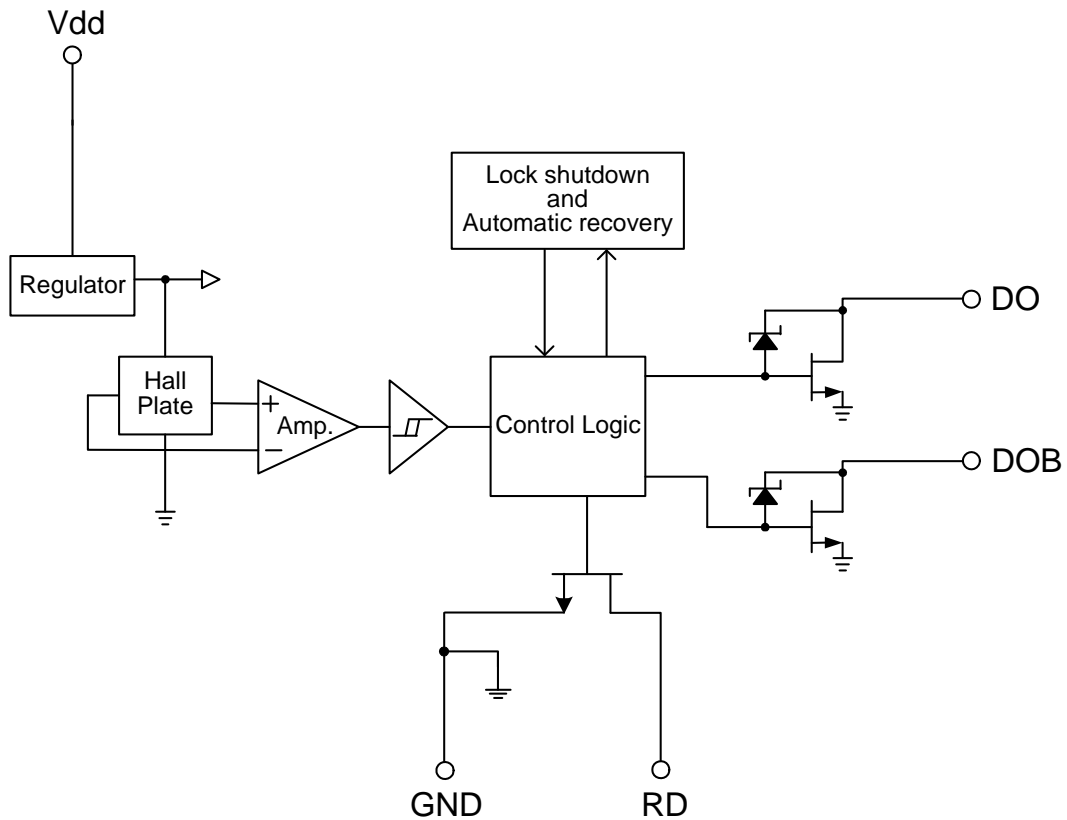
## Pin Descriptions

Pin Name	Pin No.	Description
Vdd	1	Input power
GND	2	Ground
DO	3	Output pin
DOB	4	Output pin
RD	5	Rotor-State Detection

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**Block Diagram**

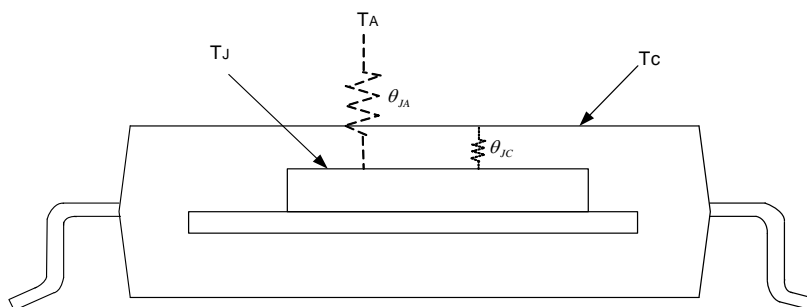
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## Absolute Maximum Ratings $(T_A = 25^{\circ}\text{C})$

Symbol	Parameter	Rating	Unit
V <sub>DD</sub>	Supply Voltage	30	V
I <sub>O</sub>	Output Current	I <sub>O (AVE)</sub>	400 mA
		I <sub>O (PEAK)</sub>	700 mA
P <sub>D</sub>	Power Dissipation	800	mW
T <sub>ST</sub>	Storage Temperature	-55 ~ 150	°C
T <sub>J</sub>	Maximum Junction Temperature	150	°C
θ <sub>JA</sub>	Thermal Resistance Junction-to-Case (Note 5)	156	°C/W



Notes: 5. θ<sub>JA</sub> should be confirmed with what heat sink thermal resistance. If no heat sink contacting, θ<sub>JA</sub> is almost the same as θ<sub>JC</sub>.

## Recommended Operating Conditions

Symbol	Characteristic	Conditions	Min	Max	Unit
V <sub>DD</sub>	Supply Voltage (Note 6)	Operating	3.8	28	V
T <sub>A</sub>	Operating Ambient Temperature	Operating	-40	100	°C

Notes: 6. Please watch the current limit issue when the operation voltage is over 26.4V, because of the different efficiency in the coil.

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### Electrical Characteristics (T<sub>A</sub> = 25 °C, V<sub>dd</sub> = 24V, unless otherwise specified)

Symbol	Parameter	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>LRP-ON</sub>	Locked Protection On		0.4	0.46	0.6	Sec
T <sub>LRP-OFF</sub>	Locked Protection Off		2.4	2.76	3.6	Sec
V <sub>OUT(SAT)</sub>	Output Saturation Voltage	I <sub>O</sub> = 200mA	-	450	700	mV
		I <sub>O</sub> = 300mA	-	680	800	
R <sub>DS(ON)</sub>	Output On Resistance	I <sub>O</sub> = 200mA	-	2.25	3.5	ohm
V <sub>OL</sub>	RD Output V <sub>ds</sub>	I <sub>O</sub> = 10mA	-	0.3	0.5	V
V <sub>Z</sub>	Output Zener-Breakdown Voltage		42	55	65	V

### Truth Table (Note 7)

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

Notes: 7. Latch-type RD output is low during rotation and high during stop.

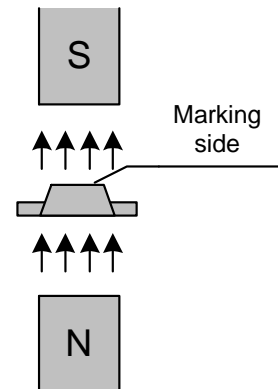
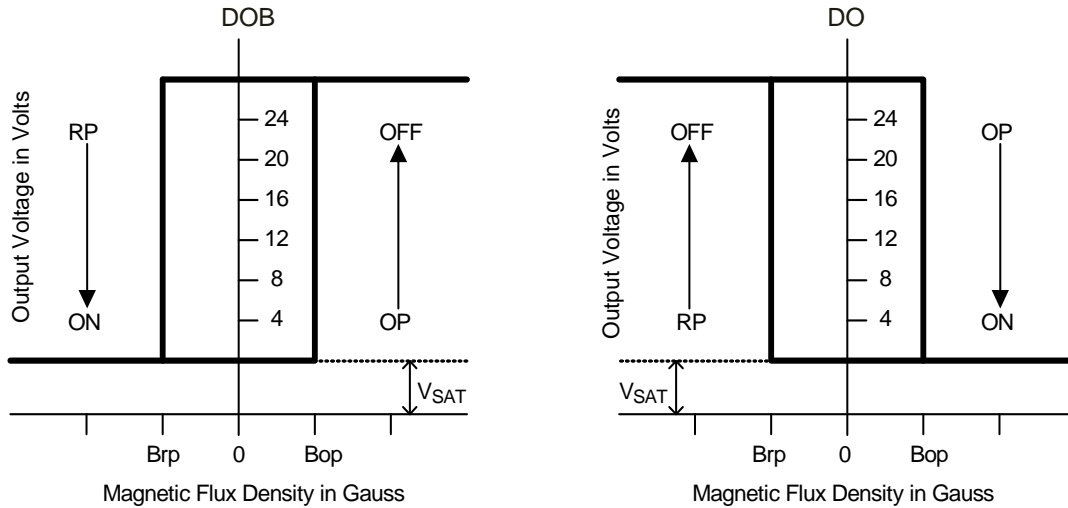
### Magnetic Characteristics (T<sub>A</sub> = 25 °C, V<sub>dd</sub> = 24V, unless otherwise specified, Note 8)

(1mT = 10 Gauss)

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

Notes: 8. Magnetic characteristics are for design information, which will vary with supply voltage, operating temperature and after soldering.

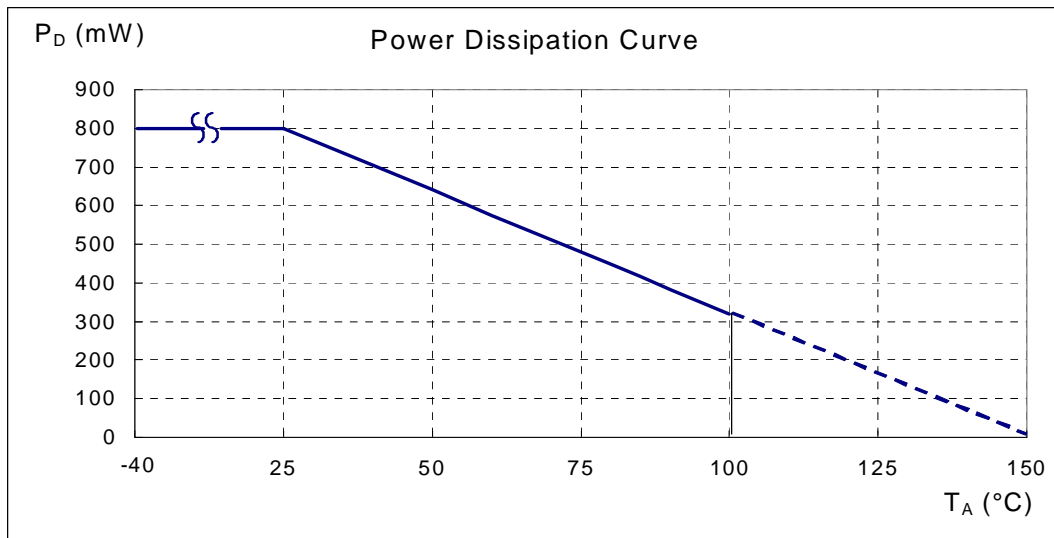
## Operating Characteristics



( SOT89-5L )

**Performance Characteristics (SOT89-5L)**

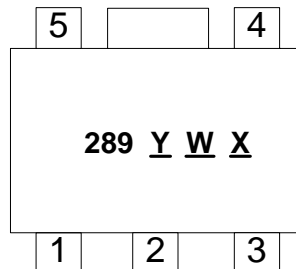
T <sub>A</sub> (°C)	25	50	60	70	75	80	85	90	95	100
P <sub>D</sub> (mW)	800	640	576	512	480	448	416	384	352	320
T <sub>A</sub> (°C)	105	110	115	120	125	130	135	140	145	150
P <sub>D</sub> (mW)	288	256	224	192	160	128	96	64	32	0



**Marking Information**

(1) SOT89-5L

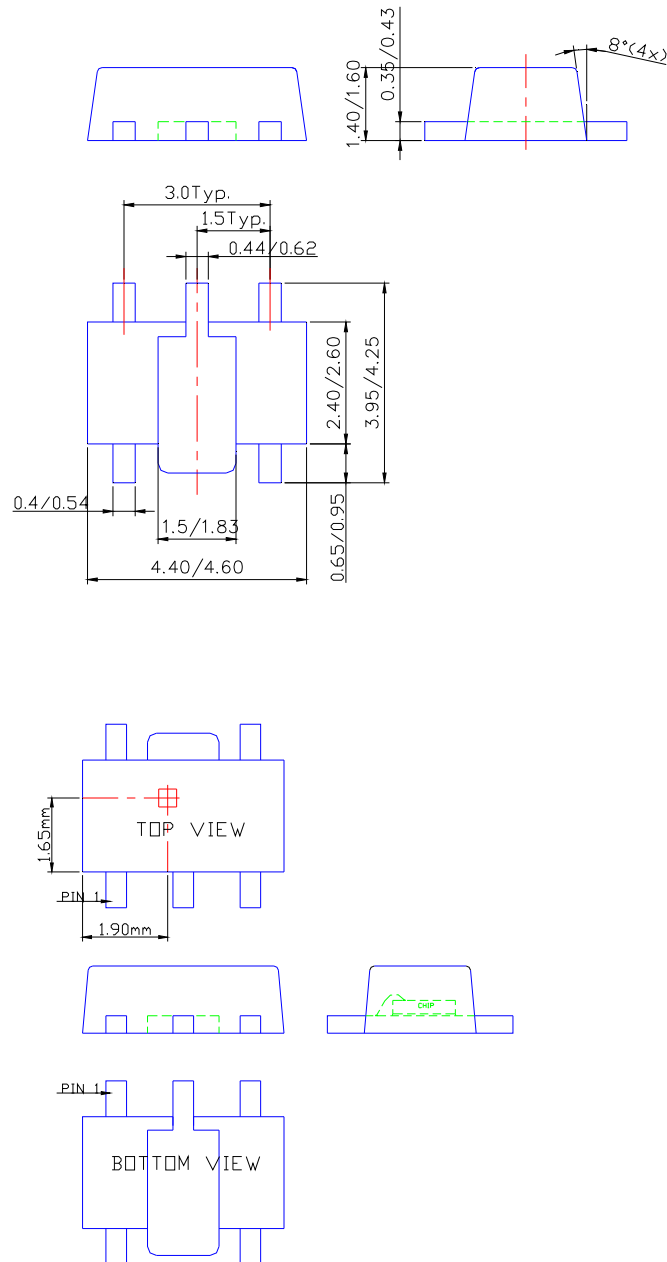
( Top View )



Y : Year : 0~9  
W : Week : A~Z : 1~26 week;  
           a~z : 27~52 week;  
           z represents 52 and 53 week  
X : Internal code  
           A~Z : Green  
           a~z : Lead Free

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

**(1) Package type: SOT89-5L**



**Sensor Location**



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