DIODES
INCORPORATED

SENSORS AND MOTOR CONTROL

www.diodes.com

DIODES INCORPORATED'S PRODUCTS ARE DESIGNED FOR HIGH PERFORMANCE, ACROSS A WIDE RANGE OF EXISTING AND EMERGING APPLICATIONS

COMPANY OVERVIEW

Diodes Incorporated is a leading global provider of Discrete, Logic, and Analog semiconductors.

Its global footprint includes sales offices in 5 countries and manufacturing locations in China, Europe and the USA.

A focus on product innovation, cost reduction, acquisitions and customer service has made Diodes Incorporated an industry leader.

Combining leading silicon and packaging technologies, Diodes provides a broad portfolio of Discrete semiconductors comprising Bipolar Transistors, MOSFETs, Schottky diodes, SBR, switching diodes and functional specific arrays to enable our customers' next generation designs.

The Diodes' Analog IC portfolio consists of 6 main areas: Power Management ICs, Standard Linear, Lighting, Sensors, Direct Broadcast by Satellite and Applications Specific Standard Products.

Diodes' Hall Effect Sensors and Motor Control

Diodes offers a wide and comprehensive product line for Hall Effect switching and Brushless Direct Current (BLDC) fan and motor applications. Combining its superior Hall Effect technology, extensive analog design expertise, leading package technology and manufacturing capability, Diodes can offer the outstanding system solutions across numerous applications.

Hall Effect Switch ICs

Hall Effect switch ICs provide simple and reliable solutions to contactless switching. They are used in many application areas from open and close detection to rotation and flow monitoring. Using core architectures based on a stable patented Hall Effect plate design, Diodes provides three comprehensive Hall Effect switch product families: Omnipolar, Unipolar and Latched Hall Effect switches.

The Diodes' Hall Effect switch portfolio is well suited to meeting the requirements of:

- Cell phones
- Portable PCs
- Still and video cameras
- Metering
- Motor commutation
- Rotation detection
- Level detection
- Contactless switching

All the Diodes' Hall Effect switches are designed with the end application in mind, enabling highly effective system solutions through wide operating ranges, various operate and release points, and ultra small and low profile packaging.

DC Fan and Motor Control

An intelligent approach to electronic system cooling is important. Air movement needs to be optimized, power consumption needs to be closely controlled and the audible noise and electromagnetic interference a motor generates needs to be kept to a minimum.

Diodes offers four controller families and a range of Hall Effect Latches which provides an effective solution to brushless DC fans, motors, blowers and pumps. Ranging from the highly integrated but simple to use "all-in-one" products to the flexible feature rich pre-drivers, the product line suits a wide range of applications from netbooks, notebooks, instrumentation, desktop PCs, servers, cooling of LED light engines to industrial pumps and blowers.

Diodes fully supports the BLDC motor and fan market with Hall Effect drivers and pre-drivers, complemented by world class Bipolar transistors, MOSFETs, full bridge and half bridges, gate drivers and current monitors.

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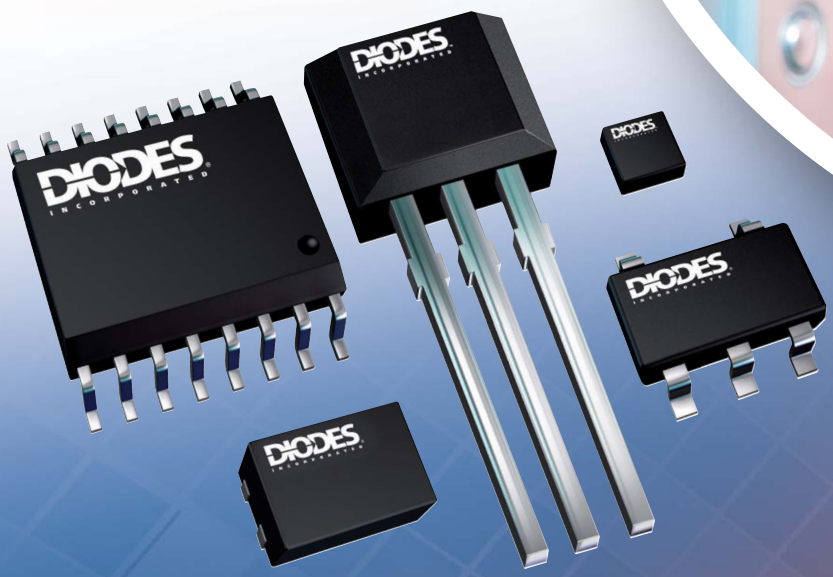
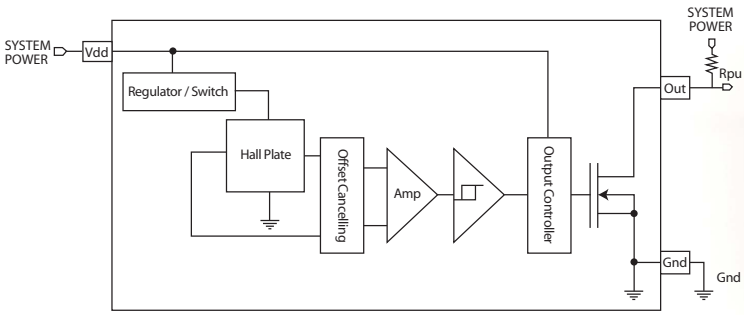


HALL EFFECT SWITCHES
Unipolar Hall Effect Switches

The outputs are switched on with a single pole of sufficient magnetic field strength.
The outputs are held until the magnetic flux density drops below the release point.

Part Number	Output	Type	Operating Voltage	Average Supply Current	Operating Point Bop	Release Point Brp	Typical Hysterisis	T Period	Temp Range	Package Outlines
			V	µA	Gauss	Gauss	Gauss	mS	°C	
AH182	Single	Open Drain	2.5 to 5.5	5	60	10	10	50	-40 to 85	SIP-3 SC59
AH183	Single	Open Drain	2.5 to 5.5	280	60	10	10	0.2	-40 to 85	SIP-3 SC59
AH337	Single	Open Drain	4.2 to 28	2000	150	30	60	na	-40 to 125	SIP-3 SC59



THE **DIODES** ADVANTAGE

Product benefits

Providing small and simple contactless switches for applications ranging from battery-powered consumer to industrial

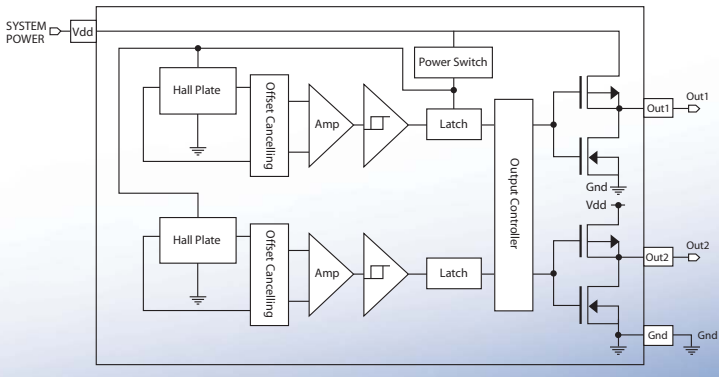
- **Product flexibility**
  - Wide operating range of 2.5V to 28V
  - Surface mount or through hole packaging
  - Sensitivity options to cater to different field strengths
- **Designed for multiple applications**
  - Optional micropower operation with sleep function
  - Constant magnetic field monitoring for time sensitive applications
- **System stability and reliability**
  - Superior temperature stability and minimal switch point drift
  - -40°C to 85°C/125°C operating temperature options
  - High ESD resilience

HALL EFFECT SWITCHES
Omnipolar Hall Effect Switches

The outputs are switched on with either a North or South Pole of sufficient magnetic field strength.
The outputs are held until the magnetic flux density drops below the release point.

Part Number	Output	Type	Operating Voltage	Average Supply Current	Operating Point Bop	Release Point Brp	Typical Hysterisis	T Period	Temp Range	Package Outlines
			V	µA	Gauss	Gauss	Gauss	mS	°C	
AH180	Single	Open Drain	2.5 to 5.5	8	±60	±10	15	75	-40 to 85	DFN2020-3 DFN2020-6 SC59 SIP-3
AH180N	Single	Open Drain	2.5 to 5.5	8	±50	±10	10	75	-40 to 85	SC59 TSOT23 (1) SOT553 (1)
AH1801	Single	Open Drain	2.5 to 5.5	8	±60	±10	10	75	-40 to 85	DFN2020-3 DFN2020-6 SC59
AH1802	Single	Open Drain	2.5 to 5.5	8	±40	±10	8	75	-40 to 85	DFN2020-3 DFN2020-6 SC59
AH1803	Single	Push / Pull	2.4 to 5.5	8	±40	±10	10	75	-40 to 85	DFN2020-6 SC59
AH1822	Single	Open Drain	2.5 to 5.5	8	±55	±10	8	75	-40 to 85	DFN2015-6 DFN3020-6
AH1883	Single	Push / Pull	1.65 to 3.3	7	±55	±6	8	50	-40 to 85	SOT553
AH1884	Dual	Push / Pull	1.65 to 3.3	7	±55	±15	8	50	-40 to 85	SOT553
AH1885	Dual	Push / Pull	1.65 to 3.3	7	±59	±15	8	50	-40 to 85	SOT553
AH1886	Dual	Push / Pull	1.65 to 3.3	7	±55	±6	8	50	-40 to 85	SOT553
AH1887	Dual	Push / Pull	1.65 to 3.3	7	±50	±6	15	50	-40 to 85	SOT553
AH1888	Single Standard Single Inverted Dual	Push / Pull	1.65 to 3.3	7	±79	±35	8	50	-40 to 85	DFN2020-3 SOT553 DFN2020R-3
AH1870(2)	Single	Push / Pull	1.6 to 3.3	4	±60	±20	10	50	-40 to 85	DFN1612-6 TSOT23
AH1872(2)	Dual	Push / Pull	1.6 to 3.3	4	±60	±20	10	50	-40 to 85	DFN1612-6 SOT553
AH1891(2)	Dual	Push / Pull	1.8 to 3.3	8	±40	±10	10	50	-40 to 85	WL-CSP0808H5-4

(1) New product development: please contact Diodes sales availability.
(2) Advanced information: please refer to Diodes for product updates and availability.



THE **DIODES** ADVANTAGE

Product benefits

Providing small and low power contactless switches for portable and battery powered applications

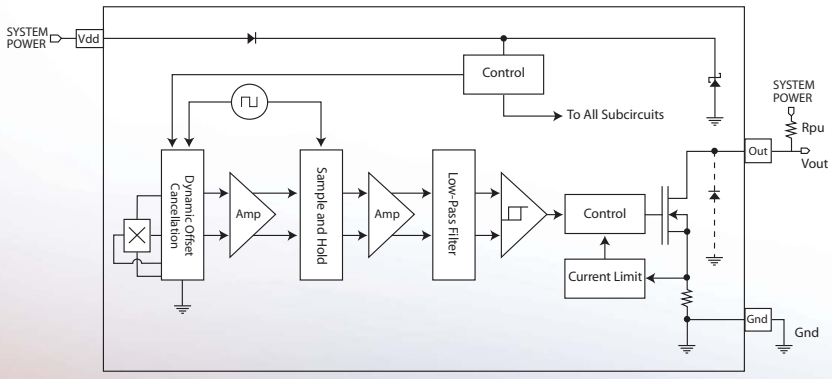
- **Product flexibility**
  - North or South pole operation
  - Single or Dual outputs with a choice of open drain or push/pull switches
- **Designed for battery and portable applications**
  - Micropower operation
  - Low operating supply voltage
  - Ultra small packaging with minimal height
- **System stability and reliability**
  - Superior temperature stability and minimal switch point drift
  - -40°C to 85°C operating temperature
  - High ESD resilience

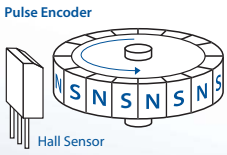
HALL EFFECT SWITCHES
Latched Hall Effect Switches

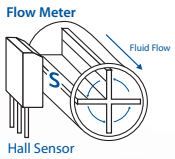
The outputs are switched on with either a North or South pole of sufficient magnetic field strength. The outputs are held until the opposite pole is detected.

Part Number	Output	Output Type	Operating Voltage	Supply Current	Typical Output Current	Operating Point Bop	Release Point Brp	Typical Hysterisis	Reverse Protection	Short Circuit Protection	Zener Clamp	Grade	Temp Range	Package Outlines
			V	mA	mA	Gauss	Gauss	Gauss			V		°C	
AH173[1]	Single	Internal Pull-up Resistor	3 to 20	3.5	25	60 80	-60 -80	80	No	No	No	A B	-40 to 125	SC59 SIP-3
AH175[1]	Single	Open Collector	3.5 to 20	3.5	25	60 80	-60 -80	80	Yes	No	No	A B	-40 to 150	SC59 SIP-3
AH1751	Single	Open Collector	3.5 to 20	3.5	50	70	-70	75	Yes	No	No	-	-40 to 125	SC59 SC59R SIP-3
AH266[1]	Dual	Open Collector	4 to 28	5.0	400	70 100	-70 -100	80	Yes	No	Yes	A B	-20 to 85	SIP-4
AH276Q[1]	Dual	Open Collector	3.5 to 20	16.0	400	50 70 100	-50 -70 -100	75	Yes	No	Yes	A B C	-20 to 85	SIP-4
AH342	Dual	Push/Pull	4.5 to 28	4.5	10	120	-120	150	Yes	No	No	-	-40 to 125	SIP-4
AH373	Single	Internal Pull-up Resistor	2.5 to 20	2.0	25	60	-60	60	No	No	No	-	-40 to 125	SC59 SIP-3
AH375	Single	Open Drain	2.5 to 20	2.0	25	60	-60	60	No	No	No	-	-40 to 125	SC59 SIP-3
AH3761	Single	Open Drain	3 to 28	4.0	50	60	-60	60	Yes	Yes	Yes	-	-40 to 125	SC59 SIP-3

(1) Refer to Diodes for switch point grade availability







THE **DIODES** ADVANTAGE

Product benefits

Providing small and flexible contactless latched switches for BLDC motors, metering and industrial applications

- **Product flexibility**
  - Single or dual outputs with a choice of open drain or push/pull switches
  - Reverse battery protection
- **Designed for a wide range of applications**
  - Wide operating range of 2.5V to 28V
  - Optimized design for low current operation
  - -40°C to 85°C/125°C/150°C operating temperature options
- **Designed for system stability and reliability**
  - High ESD protection and internal protection
  - Superior temperature stability and minimal switch point drift

SPECIAL FUNCTION SENSORS

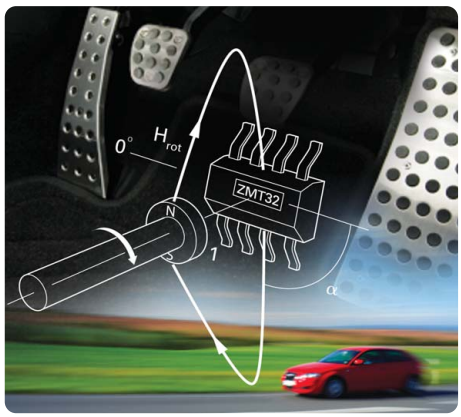
Anisotropic Magnetoresistive (AMR) Sensors

Anisotropic magnetoresistive (AMR) sensors are created from thin permalloy strips to form a Wheatstone bridge where the output voltage is proportional to the magnetic field component Hy. An auxiliary magnetic field, Hx, perpendicular to Hy is necessary to bias the sensor into its linear region. Sensors with a single Wheatstone bridge are available with or without an internal auxiliary magnet for the Hx field bias. The number of sensors required is dependant on the application; proximity and magnetic sensing only requires one sensor where as linear and angular position sensing requires two sensors to provide the necessary output signals.

Part Number	Number of Sensors	Type	Maximum Operating Voltage	Typical Bridge Resistance	Typical Output Voltage	Sensitivity	Maximum Offset voltage	Typical Length Resolution or Angular accuracy	Hy or Hrot	Hx Bias (Auxiliary) Magnet	Maximum Operating Frequency	Temp Range	Package Outlines
			V	(kΩ)	(mV/V)	(mV/V)/ (kA/m)	(mV/V)		(kA/m)		(MHz)	°C	
ZMY20	Single	Field Sensor	12	1.7	20	4.7	±1	-	<2.0	External Hx=3kA/m	1	-40 to 125	SOT223S
ZMY20M	Single	Field Sensor	12	1.7	18	5.5	±1.5	-	<2.0	Internal Hx=2kA/m	1	-40 to 125	SOT223S
ZMZ20	Single	Field Sensor	12	1.7	20	4.7	±1	-	<2.0	External Hx=3kA/m	1	-40 to 125	E-line
ZMZ20M	Single	Field Sensor	12	1.7	18	5.5	±1.5	-	<2.0	Internal Hx=2.5kA/m	1	-40 to 125	E-line
ZMT32	Dual	Angle Sensor	8.5	3.0	20	0.35/°	±1	<0.2°	>8.0	No	1	-40 to 150	SM8
ZMX40M(1)	Dual	Linear Position Sensor	12	1.8	18	4	±1.5	10um	<2.7	Internal Hx=3kA/m	1	-40 to 125	SM8

(1) Advance information: please refer to Diodes for product updates and availability

THE **DIODES** ADVANTAGE



Product benefits

Providing precision magnetic field sensing for contactless proximity, linear and angular position measurements

- **Product flexibility**
  - With and without internal bias (auxiliary) Hx magnet
  - Single or dual sensors for field strength, linear and angular position sensing
- **Designed for a wide range of applications**
  - High accuracy and resolution for wide range of external magnetic field measurements
  - -40°C to 125°C/150°C operating temperature options
- **Designed for system stability and reliability**
  - Superior temperature stability
    - low temperature coefficient of bridge resistance and matching
  - Insensitive to magnetic fields vertical to the chip

Nickel Temperature Sensors

Part Number	Maximum steady state measurement current	Resistance at 0°C	Resistance at 100°C	Tolerance -55°C or -40°C to 0°C	Tolerance 0°C to 150°C or 160°C	Temp Range	Package Outlines
	(mA)	(Ω)	(Ω)	(°C)	(°C)	(°C)	
ZNI1000	3	1000	1618	±(0.4+0.028*I T I)	±(0.4+0.007*I T I)	-55 to 150	SOT23
ZNI1000B(1)	3	1000	1618	±(0.8-0.028*I T I)	±(0.8)	-40 to 165	SOT23

(1) Advance information: please refer to Diodes for product updates and availability

Product benefits

Temperature sensors with a wide operating range and high accuracy in a small package

- **Product flexibility**
  - Low drive current measurement
- **Designed for a wide range of applications**
  - High accuracy
  - -55°C to 150°C/165°C operating temperature ranges
- **Designed for system stability and reliability**
  - Superior long term temperature stability

COOLING FAN AND MOTOR CONTROL

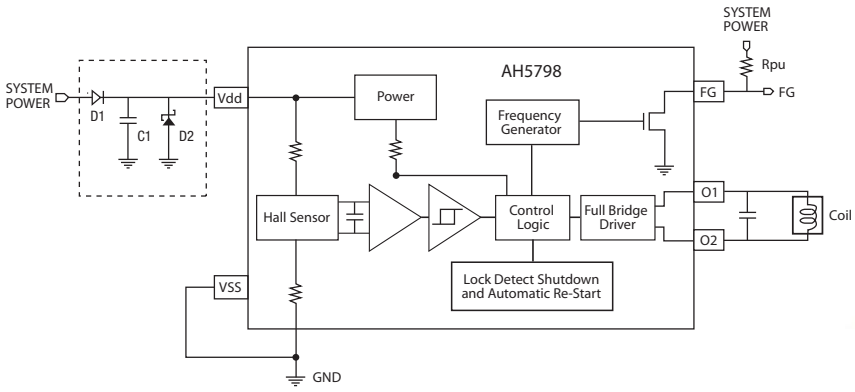
Single Phase All-In-One Smart Fan and Motor Drivers

Single phase all-in-one Smart fan and motor drivers integrate the Hall sensor, motor control functions, protection and power drive required for single coil BLDC motors. Providing an easy to use small, reliable, integrated and cost effective solution.

Part Number	Output	Operating Voltage	Supply Current (No load)	Average Output Drive Current at 100C	Peak Current	Soft-switch	Rotor Lock Protection	Lock Detect Ton	Retry Duty Ton/Toff Ratio	Tachometer (FG)	Speed Control	Operating Point Bop	Release Point Brp	Temp Range	Package Outlines
		V	mA	mA	mA			ms				Gauss	Gauss	°C	
AH5771	H-Bridge	2.5 to 15	3.5	200	400	-	Yes	220	10	-	-	<50	>-50	-40 to 100	SIP-4
AH5792	H-Bridge	1.8 to 5	3.5	200 300	400 500	-	Yes	215	10	Yes	-	<50	>-50	-40 to 100	SOT553 SOT89-5
AH5798	H-Bridge	1.8 to 5.5	5	300 250	800 800	Yes	Yes	500	10	Yes	-	<50	>-50	-40 to 105	SOT89-5 TSOT25
AH5799 (1)	H-Bridge	1.8 to 5.5	5	300	800	Yes	Yes	500	10	Yes	PWM	<50	>-50	-40 to 105	SOT89-5 TSOT23-6 DFN2020C-6

(1) Advanced information: please refer to Diodes for product updates and availability.

Typical circuit example - AH5798



THE **DIODES** ADVANTAGE

Product benefits

Single chip all-in-one Smart Driver for a cost-effective solution to single phase BLDC cooling fan and motor control applications

- **Built-in Hall Effect sensor, motor control functions and output H-Bridge drive**
- **Soft-switching to minimize audible switching noise and electromagnetic interference (EMI)**
- **Provides system and IC protection**
- **Space saving low profile package options**
- **Small and integrated with a minimal component count**
- **Simple and cost effective for low power applications**

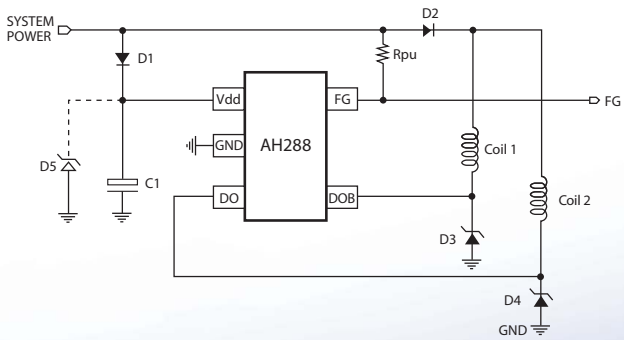
COOLING FAN AND MOTOR CONTROL

Two Phase All-In-One Smart Fan and Motor Drivers

The two phase all-in-one Smart fan and motor drivers integrate the Hall sensor, motor control functions, protection and power drive required for two coil BLDC motors. Provides cost-effective integrated solutions that are compact and reliable.

Part Number	Output	Operating Voltage	Supply Current (No load)	Average Output Drive Current	Peak Current	Min Output Zener Breakdown Voltage	Rotor Lock Protection	Lock Detect Ton	Retry Duty Ton/Toff	Tachometer (FG)	Rotor-lock Detect (RD)	Operating Point Bop	Release Point Brp	Temp Range	Package Outlines
		V	mA	mA	mA	V		ms				Gauss	Gauss	°C	
AH284	Complementary Open Drain	3.8 to 20	2	500	700	35	Yes	500	6	-	-	<60	>-60	-40 to 100	SIP-4 SOT89-5
AH285	Complementary Open Drain	3.8 to 20	2	500	700	35	Yes	500	6	Yes	-	<60	>-60	-40 to 100	SOT89-5
AH286	Complementary Open Drain	3.8 to 20	2	500	700	35	Yes	500	6	-	Yes	<60	>-60	-40 to 100	SOT89-5
AH287	Complementary Open Drain	3.8 to 28	2	400	700	42	Yes	460	6	-	-	<60	>-60	-40 to 100	SIP-4 SOT89-5
AH288	Complementary Open Drain	3.8 to 28	2	400	700	42	Yes	460	6	Yes	-	<60	>-60	-40 to 100	SOT89-5
AH289	Complementary Open Drain	3.8 to 28	2	400	700	42	Yes	460	6	-	Yes	<60	>-60	-40 to 100	SOT89-5
AH2984	Complementary Open Drain	2.5 to 15	3.5	500	800	24	Yes	250	13	-	-	<60	>-60	-40 to 105	SIP-4 SOT89-5
AH291	Complementary Open Drain	1.8 to 5.75	2.6	400	700	15 (typ)	Yes	400	7.5	-	-	<60	>-60	-20 to 100	SIP-4 SOT89-5
AH292	Complementary Open Drain	1.8 to 5.75	2.6	400	700	15 (typ)	Yes	400	7.5	Yes	-	<60	>-60	-20 to 100	SOT89-5
AH293	Complementary Open Drain	1.8 to 5.75	2.6	400	700	15 (typ)	Yes	400	7.5	-	Yes	<60	>-60	-20 to 100	SOT89-5

Typical circuit example - AH288

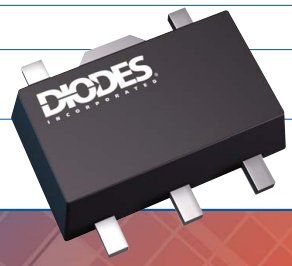


THE **DIODES** ADVANTAGE

Product benefits

Single chip all-in-one Smart Drivers for a cost-effective solution to two phase BLDC cooling fan and motor control applications

- **Built-in Hall Effect sensor, motor control functions and output drive**
- **System and IC protection**
- **Wide operating voltage and temperature range**
- **Small and integrated with a minimal external component count**



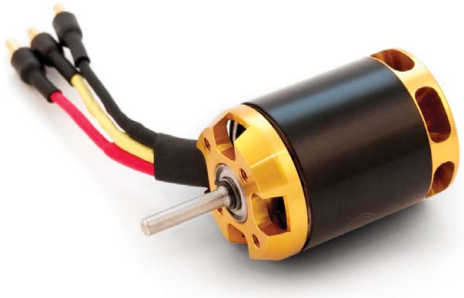
COOLING FAN AND MOTOR CONTROL

Single Phase BLDC Fan and Motor Control Pre-drivers

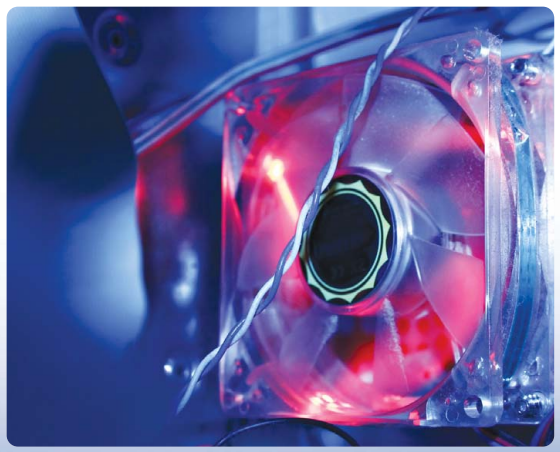
The ZXBM single phase pre-driver family provides a flexible, high performance and feature rich solution for BLDC motor, fan and blower applications. An internally generated Hall bias allows direct connection to an external Hall element catering to different sensitivity requirements. The internal output drive allows the external power stage to be a full bridge, two half bridges or a discrete solution using Bipolar transistors or MOSFETs to achieve higher power performance over a variety of supply ranges.

Part Number	Output	Operating Voltage	Supply Current (No load)	High-side Switch Drive Sink Current (mA)	Low-side Switch Drive Source/Sink Current (mA)	Reference Voltage Output	Rotor Lock Protection	Tachometer (FG)	Rotor-lock Detect (RD)	Speed Control	Min Speed	Adjustable Current Limit	Tail-End Current Control	Temp Range	Package Outlines
		V	mA	mA	mA	V								°C	
ZXBM1004	Complementary high and low-side output drive for external H-Bridge	4.7 to 18	6	100	80/16	3	Yes	Yes	Yes	Yes	Yes	-	-	-40 to 110	QSOP16
ZXBM1015	Complementary high and low-side output drive for external H-Bridge	4.7 to 18	11	100	80/32	3	Yes	Yes	Yes	Yes	Yes	Yes	-	-40 to 110	TSSOP20
ZXBM1016	Complementary high and low-side output drive for external H-Bridge	6.7 to 18	15	100	80/80	5	Yes	Yes		Yes	Yes	Yes	Yes	-40 to 85	TSSOP20
ZXBM1017	Complementary high and low-side output drive for external H-Bridge	4.7 to 18	11	100	80/32	5	Yes	Yes	Yes	Yes	Yes	Yes	-	-40 to 110	TSSOP20
ZXBM1018 (1)	Complementary high and low-side output drive for external H-Bridge	6.7 to 18	11	100	80/16	5	Yes	Yes		Yes	Yes	Yes	-	-40 to 110	TSSOP20

(1) Advanced information: please refer to Diodes for product updates and availability.



THE **DIODES** ADVANTAGE



Product benefits

Highly featured motor control pre-drivers for a high performance and reliable solution, ideal for single phase BLDC cooling fan and advanced feature-set motor control applications with various voltage and current requirements

- **Built-in motor control functions and output drive for external H-Bridge**
- **Speed control via DC or PWM signal with minimum speed setting**
- **Adjustable motor current limit**
- **Tail-end current control significantly minimizes audible switching noise and electro magnetic interference**
- **Wide operating temperature range**

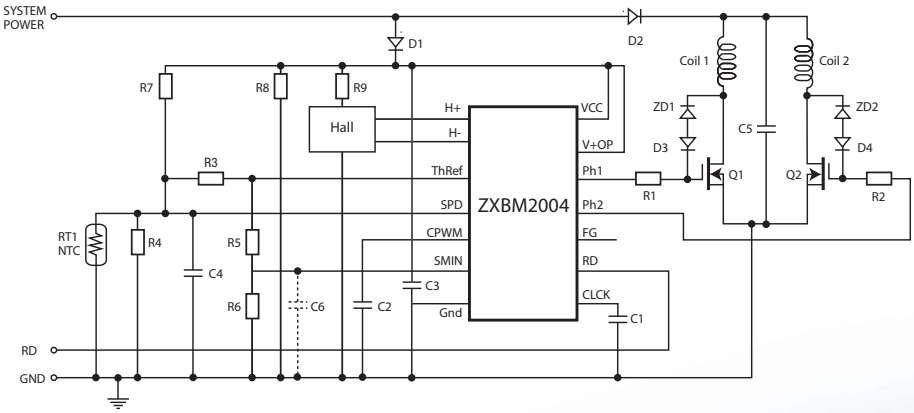
COOLING FAN AND MOTOR CONTROL

Two Phase BLDC Fan and Motor Control Pre-drivers

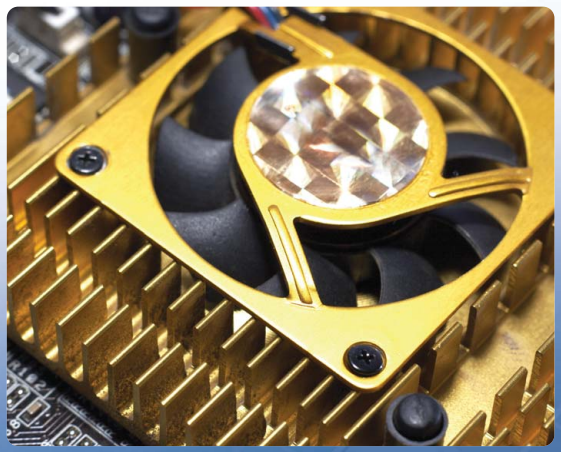
The ZXBM two phase pre-driver family provides a flexible, high performance and feature rich solution for BLDC motor, fan and blower applications. The internal output drive allows the external power stage to be a discrete solution using Bipolar transistors or MOSFETs to achieve high power capability across a range of supply voltages.

Part Number	Output	Operating Voltage V	Supply Current (No load) mA	Low-side Switch Drive Source Current (mA) mA	Low-side Switch Drive Sink Current (mA) mA	Reference Voltage Output V	Rotor Lock Protection	Tachometer (FG)	Rotor-lock Detect (RD)	Speed Control	Min Speed	Temp Range °C	Package Outlines
ZXBM2001	Complementary, Open Darlington Emitter	4.5 to 18	2.2	80	-	-	Yes	Yes	-	Yes	-	-40 to 85	MSOP10
ZXBM2002	Complementary, Open Darlington Emitter	4.5 to 18	2.2	80	-	-	Yes	Yes	-	Yes	-	-40 to 85	MSOP10
ZXBM2003	Complementary, Open Darlington Emitter	4.5 to 18	2.2	80	-	-	Yes	-	Yes	Yes	-	-40 to 85	MSOP10
ZXBM2004	Complementary, Push-pull	4.5 to 18	2.2	80	16	2.96	Yes	Yes	Yes	Yes	Yes	-40 to 110	QSOP16

Typical circuit example - ZXBM2004



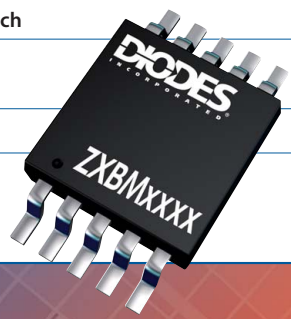
THE **DIODES** ADVANTAGE



Product benefits

Reliable, high-performance motor control pre-drivers with extended feature sets developed for use across two phase BLDC cooling fan and motor applications with various voltage and current requirements.

- **Built-in motor control functions and output drive for external power switch**
- **Speed control via DC or PWM signal with minimum speed setting**
- **Wide operating temperature range**
- **Small and reliable solution**



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