

50 V Ultra Low Noise FOC Motor Controller

FEATURES AND BENEFITS

- Code-free sensorless field-oriented control (FOC)
- I²C interface for speed control and status readback
- Ultra-quiet low speed operation
- Proprietary non-reverse fast startup
- Soft-On Soft-Off (SOSO) for quiet operation
- Analog / PWM / Clock mode speed control
- Closed-loop speed control
- Configurable current limit
- Windmill startup operation
- Lock detection
- Short-circuit protection (OCP)
- Brake and direction inputs
- Adjustable gate drive

APPLICATIONS

- Ceiling fans
- Pedestal fans
- Bathroom exhaust fans
- Home appliance fans and pumps

DESCRIPTION

The A89301 is a 3-phase, sensorless, brushless DC (BLDC) motor driver (gate driver) which can operate from 5.5 to 50 V.

A field-oriented control (FOC) algorithm is fully integrated to achieve the best efficiency and acoustic noise performance. The device optimizes the motor startup performance in a stationary condition, a windmill condition, and even in a reverse windmill condition.

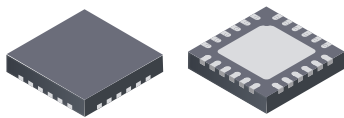
Motor speed is controlled through analog, PWM, or CLOCK input. Closed-loop speed control is optional, and RPM-to-clock frequency ratio is programmable.

A simple I²C interface is provided for setting motor-rated voltage, rated current, rated speed, resistance, and startup profiles. The I²C interface is also used for on/off control, speed control, and speed readback.

The A89301 is available in a 24-contact 4 mm × 4 mm QFN with exposed thermal pad (suffix ES). The package is lead (Pb) free, with 100% matte-tin leadframe plating.



PACKAGE



Not to scale

24-contact QFN
with exposed thermal pad
4 mm × 4 mm × 0.75 mm
(ES package)

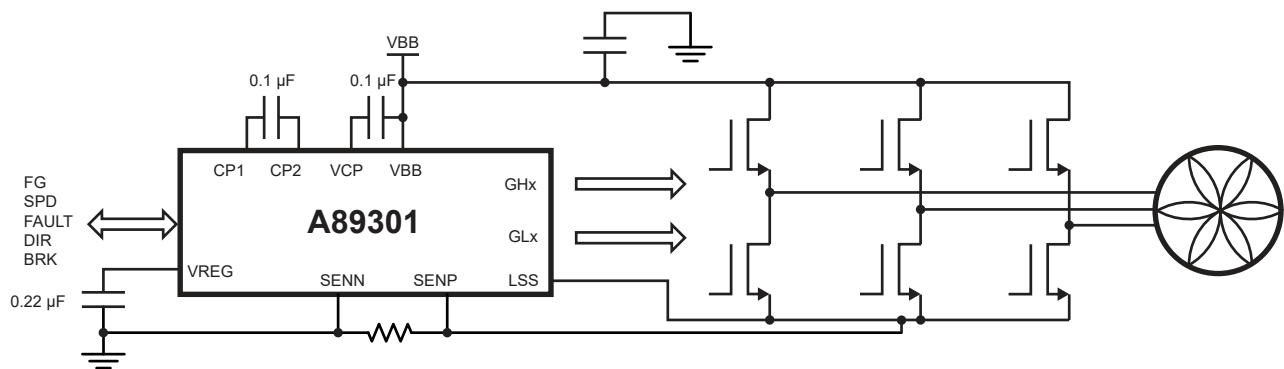


Figure 1: Typical Application

SELECTION GUIDE

Part Number	Ambient Temperature Range (T_A) (°C)	Packaging	Packing
A89301GESSR	-40 to 105	24-contact QFN with exposed thermal pad	6000 pieces per 13-inch reel



ABSOLUTE MAXIMUM RATINGS

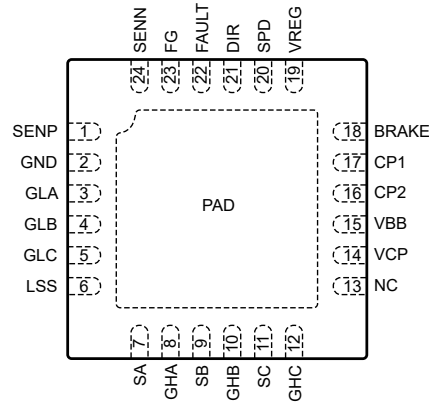
Characteristic	Symbol	Notes	Rating	Unit
Supply Voltage	V_{BB}		50	V
Logic Input Voltage Range	V_{IN}	SPD, BRAKE, DIR	-0.3 to 6	V
Logic Output	V_O	FG, FAULT ($I < 5$ mA)	6	V
LSS	V_{LSS}	DC	± 500	mV
		$t_w < 500$ ns	± 4	V
VREG	V_{REG}		0 to 4	V
SENN, SENP	V_{SENN}, V_{SENP}	DC	± 500	mV
		$t_w < 500$ ns	± 4	V
Output Voltage	V_{OUT}	SA, SB, SC	-2 to $V_{BB} + 2$	V
		SA, SB, SC, $t_w < 50$ ns	-4 to $V_{BB} + 4$	V
GHx	V_{GHx}		$V_{SX} - 0.3$ to $V_{CP} + 0.3$	V
GLx	V_{GLx}		$V_{LSS} - 0.3$ to 8.5	V
VCP	V_{CP}		$V_{BB} - 0.3$ to $V_{BB} + 8$	V
CP1	V_{CP1}		-0.3 to $V_{BB} + 0.3$	V
CP2	V_{CP2}		$V_{BB} - 0.3$ to $V_{CP} + 0.3$	V
Junction Temperature	T_J		150	°C
Storage Temperature Range	T_{stg}		-55 to 150	°C
Operating Temperature Range	T_A	Range G	-40 to 105	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions*	Value	Unit
Package Thermal Resistance	$R_{\theta JA}$	24-contact QFN (package ES), on 2-sided PCB 1-in. ² copper	45	°C/W

*Additional thermal information available on the Allegro website.

PINOUT DIAGRAM AND TERMINAL LIST



ES Package Pinouts

Terminal List Table

Terminal Number	Name	Function
16	CP2	Charge pump
17	CP1	Charge pump
18	BRAKE	Logic input
19	VREG	2.8 V regulator voltage
20	SPD	PWM or clock mode speed control
21	DIR	Direction control
22	FAULT	Fault indicator output
23	FG	Motor speed output
24	SENN	Current sense negative terminal
1	SENP	Current sense positive terminal
2	GND	Ground
3	GLA	Low-side gate drive output
4	GLB	Low-side gate drive output
5	GLC	Low-side gate drive output
6	LSS	Low-side source
7	SA	Motor output
8	GHA	High-side gate drive output
9	SB	Motor output
10	GHB	High-side gate drive output
11	SC	Motor output
12	GHC	High-side gate drive output
13	NC	No connect
14	VCP	Charge pump
15	VBB	Power supply
PAD	PAD	Exposed pad for enhanced thermal dissipation

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