

Automotive, Three-Phase Integrated MOSFET Driver

FEATURES AND BENEFITS

- 3-phase integrated MOSFET driver
- Cross-conduction protection with integrated dead-time
- Charge pump for low supply voltage operation
- 4.5 to 40 V supply voltage operating range
- Integrated logic supply
- High output current capability, up to 4.3 A
- Low MOSFET on-state resistance
 - 240 mΩ (typ) $R_{DS(ON)}$ (high-side + low-side) at $T_A = 25^\circ\text{C}$
- Multiple control interface options
 - 6× PWM control interface
 - 3× PWM control interface
- 2 MHz 16-bit SPI-compatible serial interface
- Automotive AEC-Q100 qualified
- ASIL Compliant: ASIL B (pending assessment) safety element out-of-context (SEooC) developed in accordance with ISO 26262, when used as specified in the safety manual

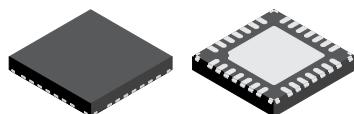
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ISO 26262
ASIL Compliant

PACKAGE

5 mm × 5 mm × 0.9 mm, 28-contact QFN with exposed thermal pad and wettable flank (ET package)



Not to scale

DESCRIPTION

The A89110 is an integrated N-channel power MOSFET driver and is specifically designed for automotive applications with inductive loads, such as BLDC motors and stepper motors.

A unique charge pump regulator provides the supply for full gate drive from 4.5 to 40 V. Gate drive voltage and strength are programmable to improve the EMC performance.

Integrated diagnostics provide indication of multiple internal faults, system faults, and power bridge faults, and can be configured to protect the power MOSFETs under most short-circuit conditions.

Full control is provided over all six power MOSFETs in the three-phase bridge, allowing motors to be driven with block commutation or sinusoidal excitation. The power MOSFETs are protected from shoot-through by integrated crossover control and integrated dead-time.

Detailed diagnostic information can be read through the serial interface.

The A89110 was developed in accordance with ISO 26262 as a hardware safety element out-of-context with ASIL B capability (pending assessment) for use in automotive safety-related systems when integrated and used in the manner prescribed in the applicable safety manual and datasheet.

The A89110 is supplied in a 28-contact wettable flank QFN (ET), with exposed pad for enhanced thermal dissipation. This device is lead (Pb) free, with 100% matte tin leadframe plating.

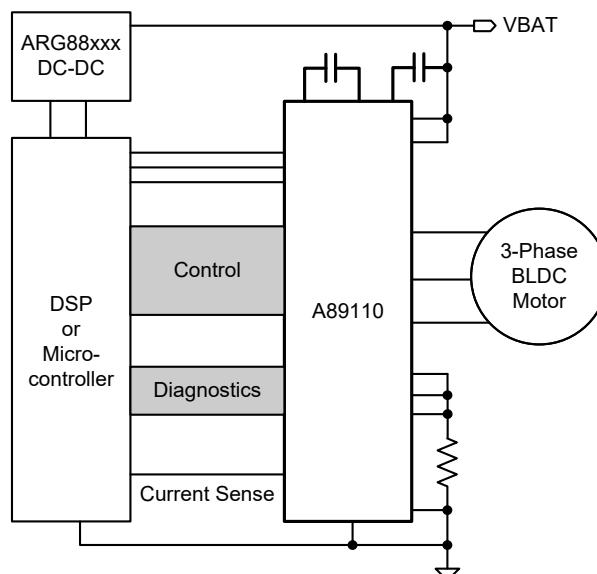


Figure 1: Typical Application

FEATURES AND BENEFITS (continued)

- SPI-compatible serial interface
- Bridge control by direct logic inputs
- Programmable gate drive
- Current sense amplifier
- Programmable diagnostics

SELECTION GUIDE

Part Number	I/O Logic	Packing	Package
A89110KETSR-3	3.3 V	6000 pieces per 13-in. reel	5 mm × 5 mm, 0.9 mm nominal height, 28-contact QFN with exposed thermal pad and wettable flank
A89110KETSR-5	5 V		

ABSOLUTE MAXIMUM RATINGS^[1]

Characteristic	Symbol	Notes	Rating	Unit
Load Supply Voltage	V_{BB}	V_{BB1}, V_{BB2}	-0.3 to 42	V
Pumped Regulator Supply	V_{CP}	V_{CP}	$V_{BB} - 0.3$ to $V_{BB} + 6.6$	V
Charge Pump Capacitor Terminal	V_{CP1}	$CP1$	-0.3 to $V_{BB} + 0.3$	V
Charge Pump Capacitor Terminal	V_{CP2}	$CP2$	$V_{BB} - 0.3$ to $V_{BB} + 6.6$	V
Logic Inputs	V_I	HA, HB, HC, LA, LB, LC, STRn, SCK, SDI, RESETn	-0.3 to 6	V
Logic Outputs	V_O	SDO	-0.3 to 6	V
Diagnostic Output Terminal	V_{DIAG}	DIAG	-0.3 to 6	V
Sense Amplifier Inputs	V_{CSI}	CSP, CSM	-1 to 4	V
Sense Amplifier Outputs	V_{CSO}	CSO	-0.3 to 6	V
Motor Phase Terminals	V_{SX}	OUTA, OUTB, OUTC	$V_{LSSX} - 1$ to $V_{BB} + 1$	V
Bridge Low-Side Source Terminal	V_{LSS}	LSSA, LSSB, LSSC	-0.5 to 1	V
Ambient Operating Temperature Range	T_A	Limited by power dissipation	-40 to 150	°C
Maximum Continuous Junction Temperature	$T_{J(max)}$		165	°C
Transient Junction Temperature	T_{Jt}	Overtemperature event not exceeding 10 seconds; lifetime duration not exceeding 10 hours; guaranteed by design characterization.	180	°C
Storage Temperature Range	T_{stg}		-55 to 150	°C

^[1] With respect to GND. Ratings apply when no other circuit operating constraints are present. Not production tested. Guaranteed by characterization.

THERMAL CHARACTERISTICS: May require derating at maximum conditions; see application information

Characteristic	Symbol	Test Conditions ^[1]	Value	Unit
ET Package Thermal Resistance	$R_{\theta JA}$	4-layer PCB based on JEDEC standard	30	°C/W
		2-layer PCB with 3.8 in ² copper each side	44	°C/W
			2	°C/W

^[1] Additional thermal information are available on the Allegro website.

RECOMMENDED OPERATING CONDITIONS

Characteristic	Symbol	Notes	Min	Typ	Max	Units
Supply Voltage	V_{BB}		4.5	12	40	V
RMS Phase Current	I_{OUT}		–	–	1.5 [1]	A
Logic Voltage Range	V_I		–0.3	–	5.5	V
Operating Ambient Temperature Range	T_A		–40	–	125	°C
Operating Junction Temperature Range	T_J		–40	–	150	°C
Motor PWM Frequency	f_{PWM}		–	24	–	kHz

[1] Power dissipation and thermal limits must be observed.

PACKAGE OUTLINE DRAWING

For Reference Only – Not For Tooling Use

(Reference Allegro DWG-0000378, Rev. 3 or JEDEC MO-220VHHD-1)

NOT TO SCALE

Dimensions in millimeters

Exact case and lead configuration at supplier discretion within limits shown

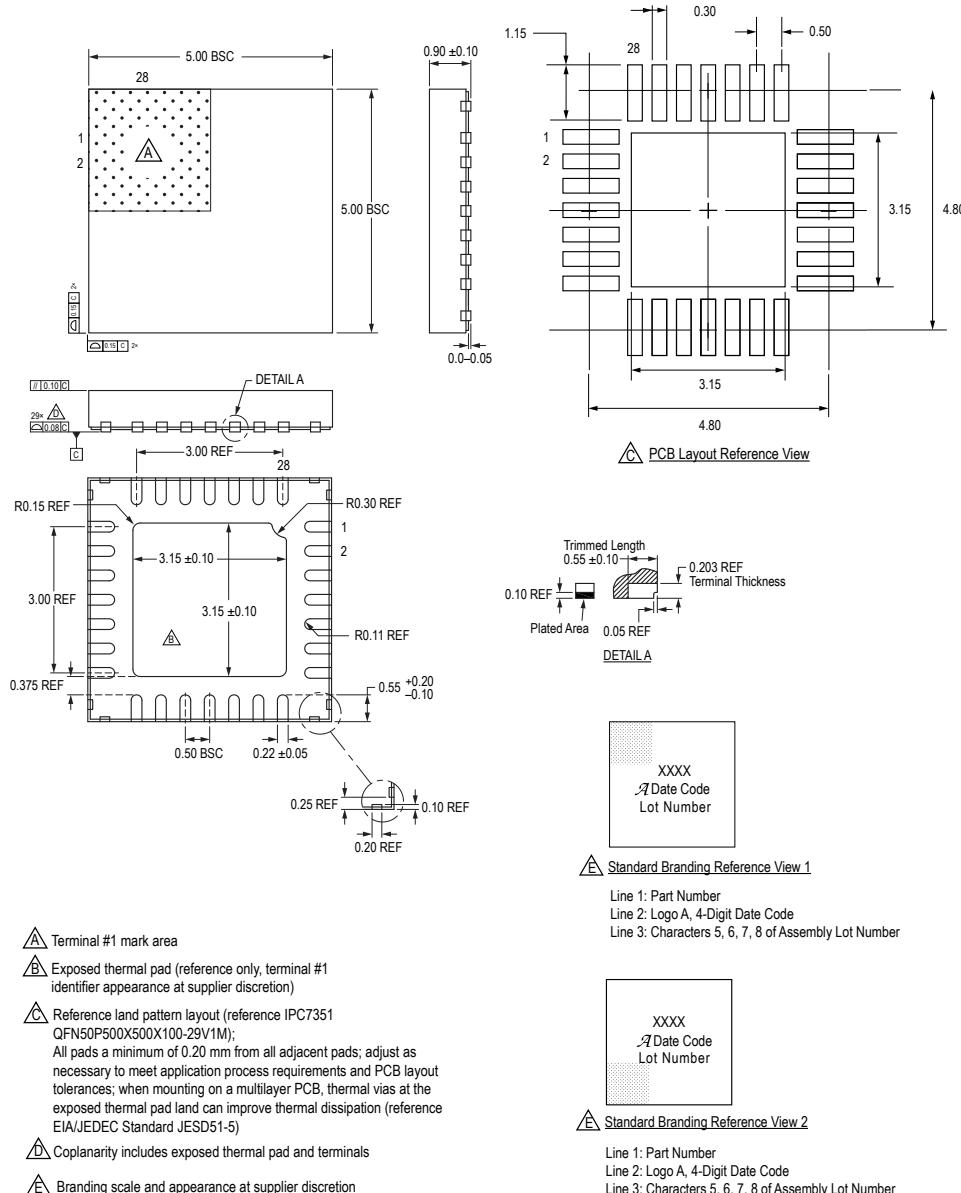


Figure 2: Package ET, 28-Contact QFN with Exposed Pad and Wettable Flank

REVISION HISTORY

Number	Date	Description
–	September 24, 2025	Initial release
1	November 13, 2025	Modified packaging information (page 2), upper ambient temperature (page 3), and VBB quiescent current electrical characteristic (page 6)

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