DRV3245A-Q1 Three-Phase Automotive Gate Driver With Three Integrated Current Shunt Amplifiers

1 Features

- AEC-Q100 Qualified for Automotive Applications
- Ambient Operating Temperature Range:
  - Temperature Grade 1: –40°C to 125°C
- 4.4-V to 45-V Operating Voltage
- 1.25-A and 1-A Peak Gate Drive Currents
- Programmable High- and Low-Side Slew-Rate Control
- Charge-Pump Gate Driver for 100% Duty Cycle. Reverse protection FET supply
- Three Integrated Current-Shunt Amplifiers
- 3-PWM or 6-PWM Input Control up to 20 kHz
- Single PWM-Mode Commutation Capability
- Supports Both 3.3-V and 5-V Digital Interface
- Serial Peripheral Interface (SPI) for Device Settings and Fault Reporting
- Thermally-Enhanced 48-Pin HTQFP
- Protection Features:
  - Fault Diagnostics
  - DVDD, AVDD, PVDD voltage monitor
  - Clock monitor
  - SPI CRC
  - Analog Built in self test
  - Programmable Dead-Time Control
  - MOSFET Shoot-Through Prevention
  - MOSFET V_{DS} Overcurrent Monitors
  - Gate-Driver Fault Detection
  - Overtemperature Warning and Shutdown

2 Applications

- Three-Phase BLDC and PMSM Motors
- Automotive BLDC Applications

3 Description

The DRV3245A-Q1 device is a gate driver IC for three-phase motor-drive applications. The device provides three high-accuracy and temperature compensated half-bridge drivers, each capable of driving a high-side and low-side N-channel MOSFET. A charge pump driver supports 100% duty cycle and low-voltage operation for cold crank situations. The device can tolerate load dump voltages up to 45 V.

The DRV3245A-Q1 device includes three bidirectional current-shunt amplifiers for accurate low-side current measurements that support variable gain settings and an adjustable offset reference.

The gate driver uses automatic handshaking when switching to prevent current shoot-through. The V_{DS} of both the high-side and low-side MOSFETs is accurately sensed to protect the external MOSFETs from overcurrent conditions. The SPI provides detailed fault reporting, diagnostics, and device configurations such as gain options for the current shunt amplifier, individual MOSFET overcurrent detection, and gate-drive slew-rate control.

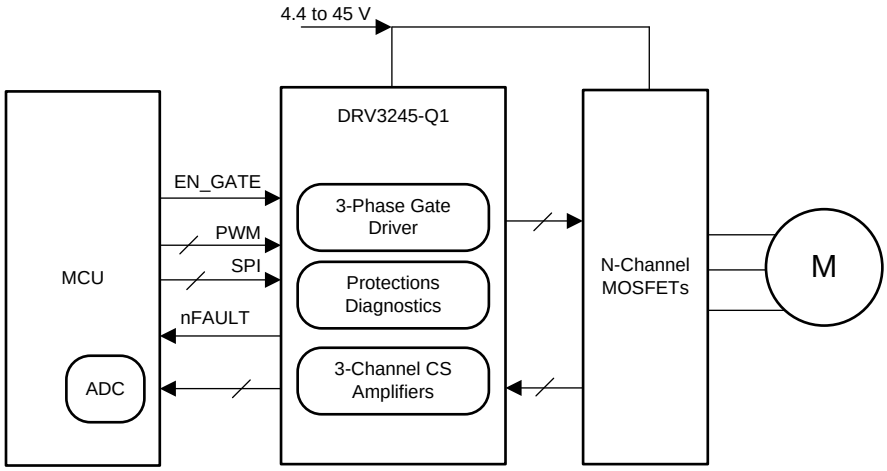
Device Information (1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
DRV3245A-Q1	HTQFP (48)	7.00 mm × 7.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

PRODUCT PREVIEW

Simplified Schematic



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An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCT PREVIEW Information. Product in design phase of development. Subject to change or discontinuance without notice.

4 Device and Documentation Support

4.1 Documentation Support

For related documentation see the following:

- *PowerPAD™ Thermally Enhanced Package*, SLMA002
- *PowerPAD™ Made Easy*, SLMA004
- *Sensored 3-Phase BLDC Motor Control Using MSP430*, SLAA503
- *Understanding IDRIVE and TDRIVE in TI Motor Gate Drivers*, SLVA714.

4.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

4.3 Trademarks

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4.4 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

4.5 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

5 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PRODUCT PREVIEW

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
DRV3245AQPHPRQ1	PREVIEW	HTQFP	PHP	48		TBD	Call TI	Call TI	-40 to 125		
DRV3245AQPHPTQ1	PREVIEW	HTQFP	PHP	48		TBD	Call TI	Call TI	-40 to 125		

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

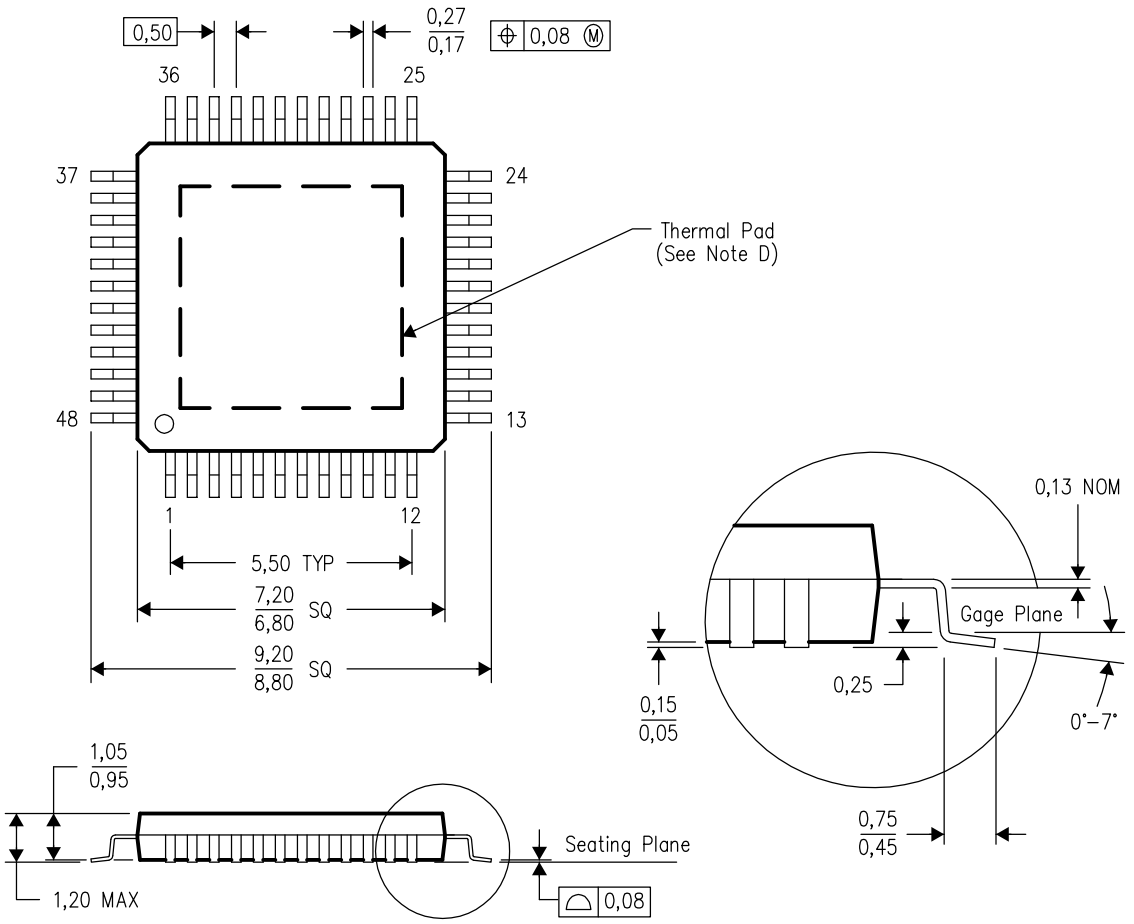
(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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PHP (S–PQFP–G48) PowerPAD™ PLASTIC QUAD FLATPACK



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion
D. This package is designed to be soldered to a thermal pad on the board. Refer to Technical Brief, PowerPad Thermally Enhanced Package, Texas Instruments Literature No. SLMA002 for information regarding recommended board layout. This document is available at www.ti.com <http://www.ti.com>.
E. Falls within JEDEC MS–026

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