DRV10970 Three-Phase Brushless DC Motor Driver

1 Features

- Three-Phase Brushless DC Motor Driver
- Integrated FETs: 1-A RMS, 1.5-A Peak Output Current per Half-Bridge
- Total Driver H + L Rdson: 400 mΩ
- Wide Power Supply Voltage Range: 5 to 18 V
- Embedded 180° Sine-Wave Commutation
- Ultra-Low Power Consumption in Sleep Mode (35 µA)
- Adaptive Drive Angle Adjustment
- Single Hall Sensor Option to Minimize System Cost
- Motor Spin Direction Control
- Motor Speed Control
- Differential Hall Sensor Inputs
- Trapezoidal Output Option Provides Higher Power
- Configurable for 30° Hall Placement or 0° Hall Placement
- Selectable Motor Parking Condition – Braking Mode or Coasting Mode
- Adjustable Retry Timing after Motor Lock
- Programmable Current-Limit Function
- Tachometer – Motor Speed Information on Open-Drain FG Pin
- Motor Lock Report on Open-Drain RD Pin
- Protection Features
  - Supply (VM) Undervoltage Lockout
  - Cycle-by-Cycle Current Limit
  - Overcurrent Protection (OCP)
  - Thermal Shutdown
  - Motor Lock Detect and Report

2 Applications

- White Goods Cooling Fan
- Small Appliances
- General-Purpose BLDC Motor Driver

3 Description

The DRV10970 is an integrated three-phase BLDC motor driver for home appliance, cooling fans, and other general-purpose motor control applications. The embedded intelligence, small form factor, and simple pinout structure reduce the design complexity, board space, and system cost. The integrated protections improve the system robustness and reliability.

The output stage of DRV10970 consists of three half-bridges with Rds(on) of 400 mΩ. Each half-bridge is capable of driving up to 1-A RMS and 1.5-A peak output current. When the device enters sleep mode, it consumes typical 35-µA of current.

The advanced 180° sine-wave commutation algorithm is embedded into the device and achieves high efficiency, low torque ripple, and superior acoustic performance. The adaptive driving angle adjustment function achieves the most optimized efficiency regardless of the motor parameters and load conditions.

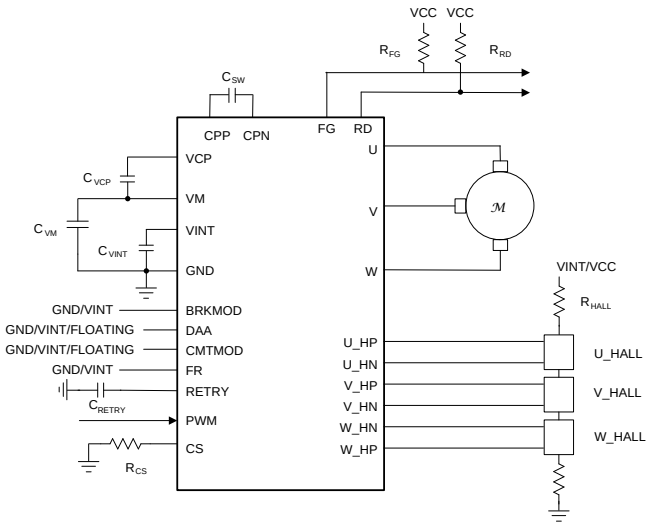
The DRV10970 is designed for Hall sensor based applications. The differential Hall signal inputs are detected by the integrated comparators. The device supports three Hall and single Hall based applications; the single Hall sensor mode reduces the system cost by eliminating two Hall sensors.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
DRV10970	TSSOP (24)	7.80 mm × 6.40 mm

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

Application Circuit



PRODUCT PREVIEW

4 Description (continued)

The device implements a standard control interface which includes PWM input (speed command), FG output (speed feedback), FR input (forward and reverse direction control), and RD output (motor lock indicator).

The DRV10970 device supports both 30° and 0° Hall placements (with respect to the corresponding phase BEMF). The device implements trapezoidal drive mode to address higher power requirement.

The DRV10970 device determines the rotor lock condition based on the absence of Hall input switching. The device will try again to spin the motor after an adjustable auto-retry time which can be configured by a capacitor connected to the RETRY pin.

The device incorporates multiple protection features: over current, undervoltage, over temperature, and locked rotor conditions to improve the system robustness.

The DRV10970 is packaged in a thermally-enhanced 24-pin TSSOP package (Eco-friendly: RoHS and no Sb/Br).

5 Device and Documentation Support

5.1 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.

5.2 Trademarks

E2E is a trademark of Texas Instruments.
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5.3 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.

5.4 Glossary

SLYZ022 — *TI Glossary*.

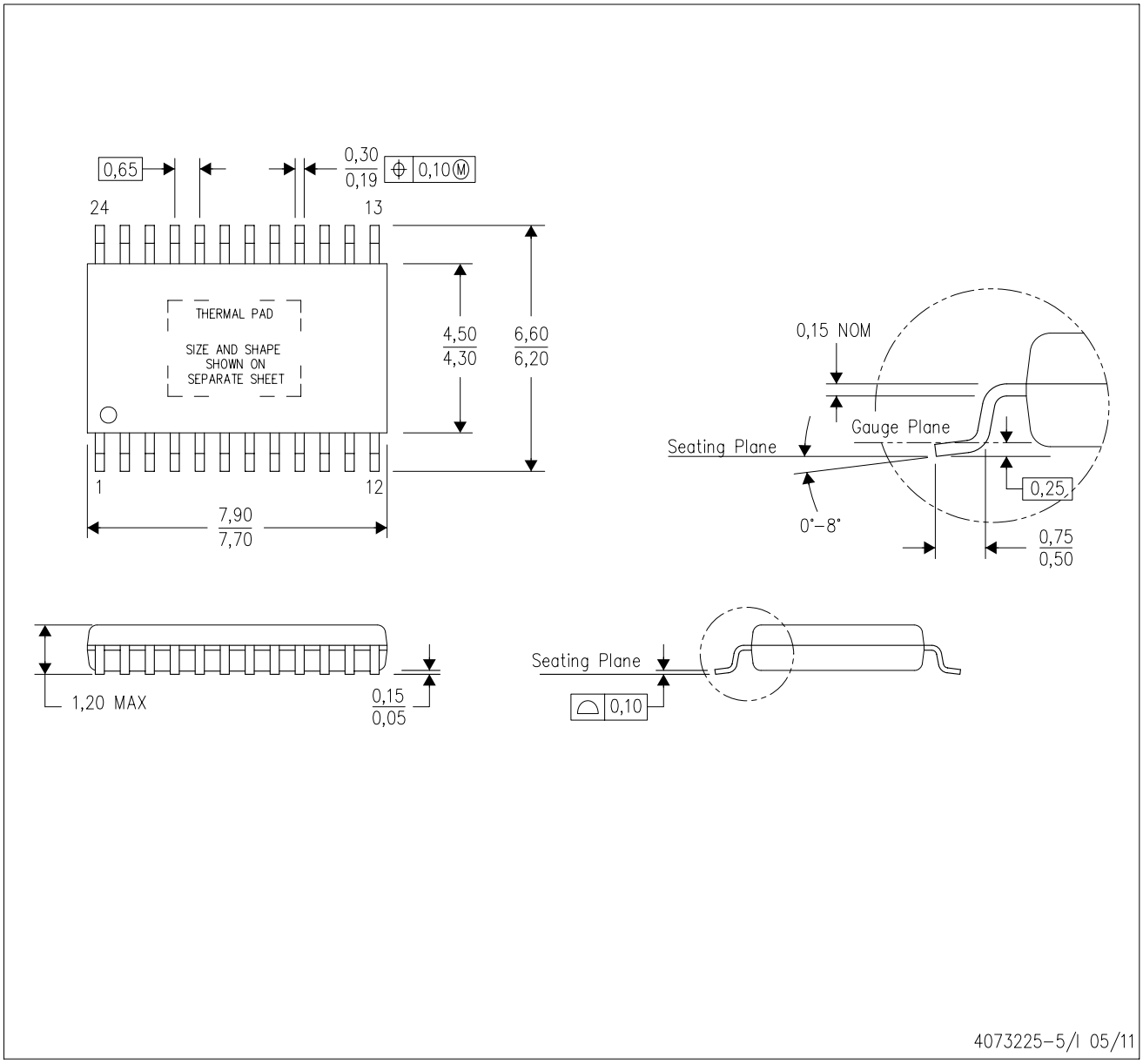
This glossary lists and explains terms, acronyms, and definitions.

6 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

PWP (R–PDSO–G24) PowerPAD™ PLASTIC SMALL OUTLINE



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 protrusions. Mold flash and protrusion shall not exceed 0.15 per side.
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. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
E. Falls within JEDEC MO–153

PowerPAD is a trademark of Texas Instruments.

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