DRV8378 Three-Phase Integrated FET Motor Driver

1 Features

- Three-phase BLDC motor driver
- 4.5V to 65V operating voltage (70V abs max)
- High output current capability: 16A Peak
- Low MOSFET on-state resistance
  - 58mΩ $R_{DS(ON)}$ (HS + LS) at T_A = 25°C
- Advanced MOSFET switching technique to reduce switching loss with 1.1V/ns @24V slew rate and negligible reverse recovery loss
- Ultra-low dead time < 50ns, and propagation delay < 200ns, to minimize current distortion in motor drives enabling lower audible noise and improved control accuracy
- Low power sleep mode
- Multiple control interface options
  - 6x PWM control interface
  - 3x PWM control interface
- Does not require external current sense resistors, built-in current sensing
- Integrated charge pump supporting 100% duty cycle
- Active demagnetization and automatic synchronous rectification to reduce power losses
- Ultra-small package option of 6x4mm, 5x7mm
- Built-in 5V (5%), 30mA LDO regulator (GVDD), for internal predrivers and external load
- Flexible device configuration options
  - DRV8378S: 5MHz 16bit SPI for device configuration and fault status, with internal GVDD regulator
  - DRV8378G: 5MHz 16bit SPI for device configuration and fault status, with external 5V for predrivers
  - DRV8378H: Hardware pin based configuration, with internal GVDD regulator
- Supports 1.8V, 3.3V, and 5V logic inputs
- Integrated protection features
  - Supply under voltage lockout (UVLO)
  - Charge pump under voltage (CPUV)
  - Overcurrent protection (OCP)
  - Thermal warning and shutdown (OTW/OTSD)
  - Fault condition indication pin (nFAULT)

2 Applications

- Brushless-DC (BLDC) Motor Modules
- Printers
- Office automation machines
- Robotics and Humanoids
- Factory automation

3 Description

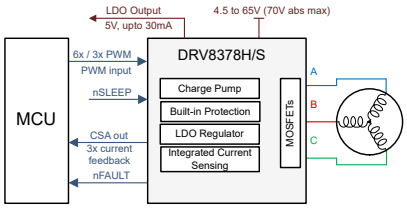
The DRV8378 provides a single-chip integrated FET power stage for driving brushless-DC motors. The DRV8378 integrates three 1/2-H bridges with 70V absolute maximum capability and a very low $R_{DS(ON)}$ of 58mΩ (high-side plus low-side) to enable high power drive capability. Current is sensed using an integrated current sensing feature which eliminates the need for external sense resistors. An integrated LDO generate the necessary voltage rails for the device and can be used to power external circuits. Each output driver channel consists of N-channel power MOSFETs configured in a half-bridge configuration.

DRV8378 implements a 6x or 3x PWM control scheme which can be used to implement sensored or sensorless field-oriented control (FOC), sinusoidal control, or trapezoid control using an external microcontroller. The DRV8378 is capable of driving a PWM frequency up to 200kHz.

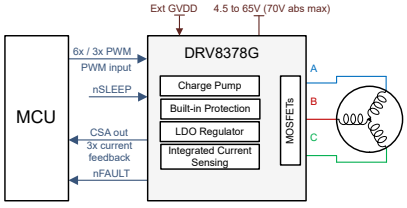
Device Information

PART NUMBER	PACKAGE	BODY SIZE (NOM)
PDRV8378GHVERR(1)	VQFN (23)	6.00mm × 4.00mm

(1) Device available for preview only.



Simplified Schematics for DRV8378H/S



Simplified Schematics for DRV8378G

Table of Contents

ADVANCE INFORMATION

4 Device Comparison Table

DEVICE	PACKAGES	INTERFACE
DRV8378H	23-pin VQFN (6x4 mm)	Hardware, Internal GVDD supply
DRV8378GH	23-pin VQFN (6x4 mm)	Hardware, External GVDD supply
DRV8378S	29-pin VQFN (7x5 mm)	SPI, Internal GVDD supply
DRV8378H		Hardware, Internal GVDD supply
DRV8378GS		SPI, External GVDD supply

Table 4-1. DRV8378S (29 pin SPI variant) vs. DRV8378H (29 pin Hardware variant) vs.DRV8378G (29 pin SPI variant, Extrenal GVDD) configuration comparison

Parameters	DRV8378S & DRV8378G (SPI variant 29 pin)	DRV8378H (Hardware variant 29 pin)	DRV8378H (Hardware variant 23 pin)
PWM mode settings	PWM_MODE (4 settings)	MODE_SR pin (4 settings)	Not Applicable
Slew rate settings	SLEW_RATE (4 settings)	SLEW pin (4 settings)	Fixed Slew Rate 1.1V/ns
CSA gain settings	CSA_GAIN (4 settings)	GAIN pin (4 settings)	Fixed GAIN, 0.1mA/A
SDO pin configuration: mode, voltage	SDO_ODEN (2 settings), SDO_MD (2 settings)	Not Applicable	Not Applicable
Current Limit configuration: Mode, reporting on nFAULT, Blanking time, 100% duty PWM frequency	ILIMFLT_MODE (2 settings), ILIM_MODE (2 settings), ILIM_BLANK_SEL (4 settings), PWM_100_FREQ_SEL (4 settings)	Current limit reporting on nFAULT is enabled, fixed to coast mode, blanking time set to 5.6µs for slew rate of 50V/µs and 1.8µs for all other slew rates, the 100% duty input PWM cycle is fixed to 20kHz	Not Applicable
Over voltage protection mode	OVP_MODE (2 settings), OVP_SEL (2 settings)	Over voltage protection is disabled	Over voltage protection is disabled
OCP configuration: Mode, level, deglitch	OCP_MODE (4 settings), OCP_LVL (2 settings),OCP_DEG (4 settings) and OCP_RETRY (2 settings)	Enabled with automatic retry mode, level is fixed to 20A with 1.4µs deglitch time, 5ms retry time	Enabled with automatic retry mode, level is fixed to 20A with 1.4µs deglitch time, 5ms retry time
Active demagnetization: Enable, comparator threshold, comparator mask time, behaviour during fault	EN_ASR (2 settings), EN_AAR (2 settings), AD_COMP_TH_HS & AD_COMP_TH_LS	MODE_SR (2 settings), active demag comparator threshold set to 100mA, comparator mask time set to 5.6µs for slew rate of 50 and 1.8 us for all other slew rates. ADMAG_TMARGIN set to 1.6 us, active demag is disabled during OCP.	Active demag comparator threshold set to 100mA, comparator mask time set to 1.8 us. ADMAG_TMARGIN set to 1.6 us, active demag is disabled during OCP.
Over temperature warning	OTW_MODE (2 settings)	Reported on nFAULT	Reported on nFAULT

ADVANCE INFORMATION

5 Device and Documentation Support

5.1 Documentation Support

5.1.1 Related Documentation

For related documentation, see the following:

- *Visit the DRV8316R EVM Tool Page*
- *Read the Delay and Dead Times in Integrated MOSFET Drivers application note*
- *Download the BLDC Integrated MOSFET Thermal Calculator tool*
- *Calculating Motor Driver Power Dissipation*, SLVA504
- *PowerPAD™ Thermally Enhanced Package*, SLMA002
- *PowerPAD™ Made Easy*, SLMA004
- *Sensored 3-Phase BLDC Motor Control Using MSP430*, SLAA503
- *Understanding Motor Driver Current Ratings*, SLVA505

5.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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5.3 Trademarks

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5.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

5.5 Glossary

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

6 Revision History

DATE	REVISION	NOTES
May 2026	*	Initial release.

7 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 device. This data is subject to change without notice and without revision of this document. For browser-based versions of this data sheet, see the left-hand navigation pane.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
PDRV8378HVERR	Active	Preproduction	VQFN-FCRLF (VER) | 23	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 150	

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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