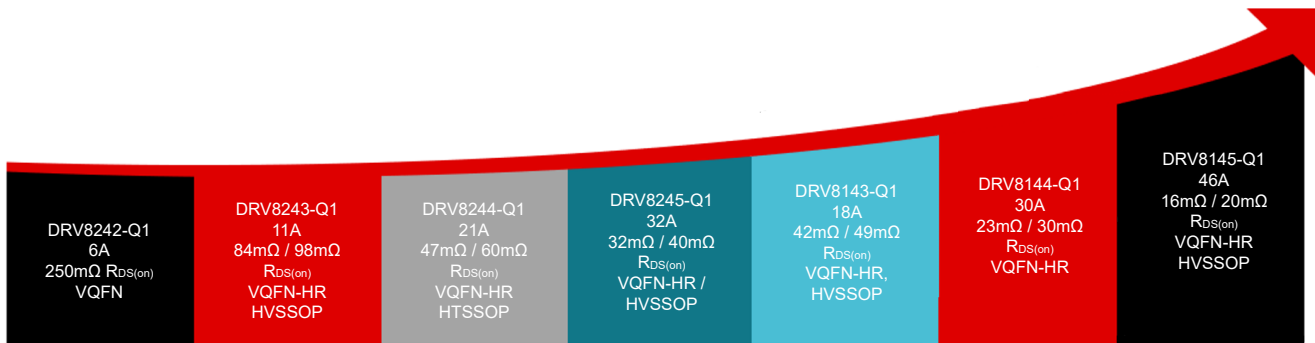


Product Overview

Scalable Integrated H-Bridges for Automotive Applications



Key Features and Benefits

- Protection Suite
 - Load diagnostics in both the off-state and on state to detect open load and short circuit
 - Voltage monitoring on supply (VM)
 - Overcurrent protection (OCP)
 - Overtemperature protection
- Fault indication on nFAULT pin control modes
 - [Single full bridge using PWM or PH/EN mode](#)
 - Two half-bridges using independent mode
- Operation
 - PWM frequency operation up to 25kHz
 - Configurable Slew Rate
 - Spread Spectrum
 - [Daisy Chain SPI](#)
- Current
 - [Integrated Current Sense](#) (eliminates shunt resistor)
 - Proportional Load Current output on IPROPI pin
 - [Configurable Current Regulation](#)
- Packaging
 - 16 (3.5mm × 5.5mm) VQFN-HR (HotRod)
 - To learn more about TI's HotRod Technology see:
 - [Benefits of flip chip on leadframe packaging for motor-drive applications](#)
 - [Package Optimization – HotRod and Enhanced HotRod QFN](#)
 - [Enhanced HotRod QFN Package: Achieving Low EMI Performance in Industry's Smallest 4-A Converter](#)
 - 28 (4.4mm × 9.7mm) HTSSOP
- Variants
 - HW, SPI, P

The DRV824x-Q1 and DRV814X-Q1 family of devices has fully integrated H-bridge and Half-Bridge drivers intended for a wide range of automotive applications. The H-Bridge devices can be configured as a single full-bridge driver or as two independent half-bridge drivers. Designed in a BiCMOS high-power process technology node, this monolithic family of devices in a power package offer excellent power handling and thermal capability while providing compact package size, ease of layout, EMI control, accurate current sense, robustness, and diagnostic capability. This family provides an identical pin function with scalable R_{ON} (current capability) to support different loads.

Key Applications

- Automotive brushed DC motors, Solenoids
- [Door modules](#), [wiper modules](#), [trunk](#), and [seat modules](#)
- [Body control module \(BCM\)](#)
- [E-Shifter](#)
- [Steering systems](#)
- [Gas engine systems](#)
- [Onboard charger](#)

Resources: Software and Product Pages

[Thermal Junction Estimator for H-Bridge \(Download\)](#)

[Thermal Junction Estimator for Half-Bridge \(Download\)](#)

[EVM/GUI](#)

[Packaging Optimization – HotRod and Enhanced HotRod QFN \(Video\)](#)

[How to efficiently drive 12-V and 24-V engine loads in automotive systems](#)

[Protecting Automotive Motor Drive Systems from Reverse Polarity Conditions \(Rev. A\)](#)

Pin and Packaging Options

[TI.com Selection Tool](#)

Variants	(LS + HS) R_{ON}	$I_{OUT\ MAX}$	Package	Body Size
DRV8242-Q1	200m Ω	6A	VQFN (20)	3.5mm × 4.5mm
DRV8243-Q1	84m Ω	12A	VQFN-HR (14)	3mm × 4.5mm
DRV8243-Q1	98m Ω	12A	HVSSOP (28)	3mm × 7.3mm
DRV8244-Q1	47m Ω	21A	VQFN-HR (16)	3mm × 6mm
DRV8244-Q1	60m Ω	21A	HVSSOP (28)	3mm × 7.3mm
DRV8245-Q1	32m Ω	32A	VQFN-HR (16)	3.5mm × 5mm
DRV8245-Q1	40m Ω	32A	HTSSOP (28)	4.4mm × 9.7mm

Variants	(LS + HS) R_{ON}	$I_{OUT\ MAX}$	Package	Body Size
DRV8143-Q1	42m Ω	20A	VQFN-HR (14)	3mm × 4.5mm
DRV8143-Q1	49m Ω	20A	HVSSOP (28)	3mm × 7.3mm
DRV8144-Q1	23.6m Ω	30A	VQFN-HR (16)	3mm × 6mm
DRV8145-Q1	16m Ω	46A	VQFN-HR (16)	3mm × 5.5mm
DRV8145-Q1	19m Ω	46A	HTSSOP (28)	4.4mm × 9.7mm

SPI Variant vs HW Variant Comparison

Function	HW (H) Variant	SPI (S) Variant	SPI (P) Variant
Bridge control	Pin only	Individual pin "and/or" register bit with pin status indication (Refer to Register Pin control)	
Sleep function	Available through nSLEEP pin		Not available
External logic supply to the device	Not supported	Not supported	Supported through VDD pin
Clear fault command	Reset pulse on nSLEEP pin	SPI CLR_FAULT command	
Slew rate	6 levels	8 levels	
Overcurrent protection (OCP)	Fixed at the highest setting	3 choices for thresholds, 4 choices for filter time	
ITRIP regulation	5 levels with disable and fixed TOFF time	7 levels with disable and indication, with programmable TOFF time	
Individual fault reaction configuration between retry or latched behavior	Not supported, either all latched or all retry	Supported	
Detailed fault logging and device status feedback	Not supported, nFAULT pin monitoring necessary	Supported, nFAULT pin monitoring optional	
VM overvoltage	Fixed	4 threshold choices	
On-state (Active) diagnostics	Not supported	Supported for high-side loads	
Spread spectrum clocking (SSC)	Not supported	Supported	
Additional driver states in PWM mode	Not supported	Supported	
Hi-Z for individual half-bridge in Independent mode	Not supported	Supported (SPI register only)	

Transient Current Capability

The DRV824X-Q1 and DRV814x-Q1 families are scalable by current. TI's multiple drivers allow for the scalability to meet needs of your system loads. The following [table](#) shows the driver capability over time both with and without switching loss.

The current capability below is based on thermal simulations using a 40mm × 40mm × 1.6mm, 4-layer PCB for 85°C ambient temperature.

Part Number	Package	TYP LS + HS R _{DS(on)}	Thermal Impedance R _{θJA}				Current Capability – no Switching Loss				With Switching Loss	
			0.1 s	1 s	10 s	DC	0.1 s	1 s	10 s	DC	10 s	DC
			MΩ	(deg C/W)	(deg C/W)	(deg C/W)	(deg C/W)	(A)	(A)	(A)	(A)	(A)
DRV8242-Q1	VQFN (20)	250.0	15.7	23.9	28.5	54.3	3.2	2.6	2.4	2.1	2.0	1.6
DRV8243-Q1	VQFN-HR (14)	84.0	7.3	13	17.5	34.2	7.5	5.6	4.8	3.5	4.4	3.0
DRV8243-Q1	HVSSOP	98.0	5.8	10.5	15.3	32.4	7.8	5.8	4.8	3.3	4.4	2.9
DRV8244-Q1	VQFN-HR (16)	47.0	5.1	10	14.4	31.2	11.9	8.5	7.1	4.8	6.3	4.0
DRV8244-Q1	HVSSOP	60.0	4.2	8.7	13.5	30.3	11.7	8.1	6.5	4.3	5.8	3.7
DRV8245-Q1	VQFN-HR (16)	32.0	4.3	9.2	13.6	30.3	15.8	10.8	8.9	5.9	7.7	4.8
DRV8245-Q1	HTSSOP	40.0	3.3	7.1	12.2	29.1	16.1	11.0	8.4	5.4	7.4	4.5
DRV8143-Q1	VQFN-HR (14)	42.0	6.6	12.4	16.9	33.4	15.7	11.5	9.8	7.0	8.0	5.3
DRV8143-Q1	HVSSOP	49.0	5.0	9.8	14.7	31.7	16.7	11.9	9.7	6.6	8.2	5.2
DRV8144-Q1	VQFN-HR (16)	23.5	4.6	9.5	13.9	30.5	25.2	17.5	14.5	9.8	11.4	6.8
DRV8144-Q1	HVSSOP	30.0	3.6	8.1	13.0	29.6	25.2	16.8	13.2	8.8	10.8	6.4
DRV8145-Q1	VQFN-HR	16.0	3.8	8.8	13.1	29.7	33.5	22.0	18.1	12.0	13.6	7.9
DRV8145-Q1	HTSSOP	20.0	2.6	6.5	11.5	28.3	36.3	22.9	17.2	11.0	13.6	7.6

Note

1. Driver OCP minimum current limit is about $2.5 \times I$ at 0.1s, so OCP is not triggered by capacitive load transients
2. PWM adds switching losses (depending on VM voltage, PWM frequency, slew rates) that reduce the current capability
3. Switching losses approximately $VM \times I(\text{load}) \times \frac{VM}{SR} \times f(\text{PWM})$

where

- a. $VM = 13.5V$
- b. $f(\text{PWM}) = 20kHz$
- c. $SR = 23V/\mu\text{sec}$

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated