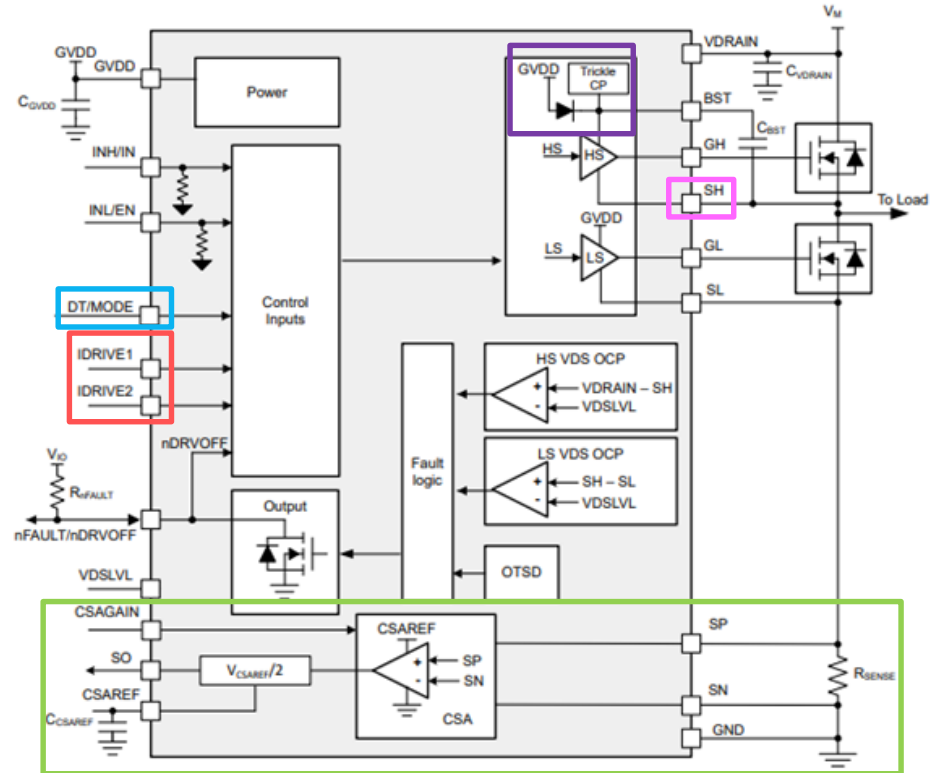


Traditional Half-Bridge Driver VS BLDC Smart Half-Bridge Driver

Akshay Rajeev Menon

Advantages of BLDC Driver

- Smart Gate Drive
- Integrated Current Sense Amplifier
 - Adjustable Gain
- Adjustable Deadtime
 - 20ns - 900ns
- Integrated Trickle Charge-pump
- Robust design for motor phase (SH) switching
 - Slow rate 50V/ns
 - Negative transient voltage -20V (1us)
 - 2A strong gate pull down
- Protection Features
 - GVDD Undervoltage
 - Bootstrap Undervoltage
 - Mosfet Overcurrent Protection
 - Shoot through protection
 - Thermal shutdown
 - Fault Indicator



System Benefits with BLDC Drivers

*Component reduction assuming a 3-phase solution
**compared to similar traditional ½ bridge driver

Feature	System Benefits
<u>Smart Gate Drive</u>	Allows MOSFET slew rate (EMI) control w/o need for gate current limit resistors – BOM Reduction (12-24 components*) and PCB Space Saving
Integrated Current Sense Amplifier	Integration helps eliminate external current sense circuitry – BOM Reduction (3 components*) and PCB Space Savings
Adjustable Deadtime	Allows for reduction in deadtime to help reduce body diode conduction losses – Power Saving/ Increase Efficiency (20-900ns adjustable)
Integrated Trickle Charge-pump	Allows for 100% duty cycle operation (higher power output) with bootstrap architecture
Robust design for motor phase (SH) switching	High power applications like robotics, power tools and e-bikes are susceptible to voltage transients on source node due to inductance/body diode conduction etc. – BLDC solution places high transient tolerance on these pins to increase robustness (42% higher tolerance for 10x longer duration**)
Protection Features	Advanced protection features help eliminate external voltage sense circuitry and help reduce part damage due to common MOSFET failure modes as overcurrent, shoot-through etc. – BOM reduction and PCB size savings while increasing robustness

Smart Gate Drive – Enabling smaller and robust BLDC solution

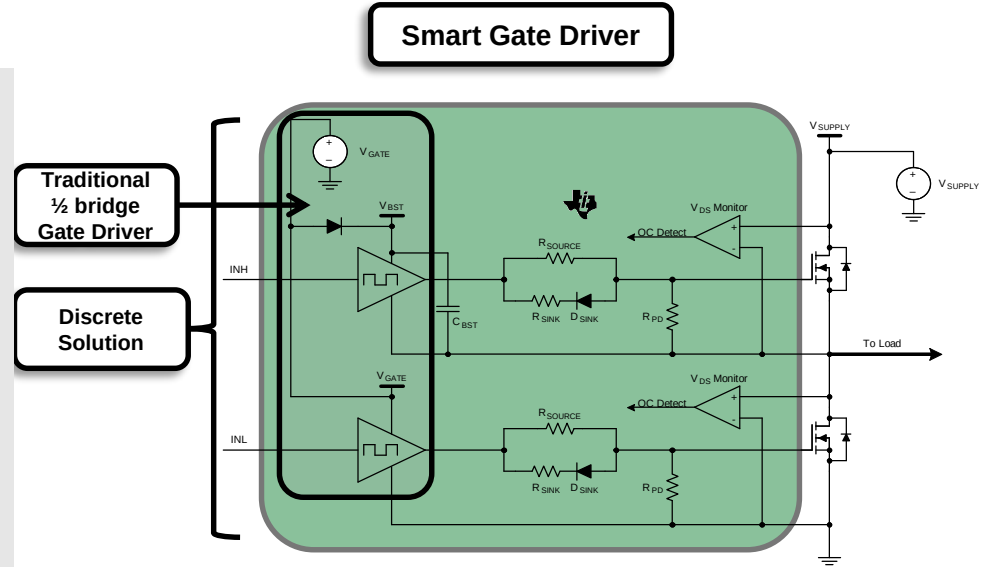
Smart Gate Driver Technology: Reduces up to **12-24** passive components on the board

- Gate drive strength adjustability
- dV/dt protection, strong pull down
- Gate drive fault protection
- Smart fault response
- Closed-loop dead time

Benefits to customer:

- Removes external gate drive components **(cost)**
- Gate driver short and dV/dt protection **(robustness)**
- High gate drive current and minimized dead time **(efficiency)**
- Easy, adjustable slew rate control **(flexibility)**

Tech article: Smart Gate Drive



Technology Available on several BLDC Drivers today:

- DRV835x
- DRV832x
- DRV834x
- DRV8306
- DRV8304
- DRV816x

Transient Source Node Robustness

Electrical Specification	DRV816x	Similar UCC driver	Percent Improvement
SHx Abs MIN transient voltage	-20V	-14V	42.86%
SHx Abs MIN transient duration	1us	100ns	1000%

Resources

- BLDC Half-Bridge Drivers
 - [DRV8161](#)
 - [DRV8162](#)
- TI Application notes
 - [Understanding Smart Gate Drive](#)
 - [Three-Phase vs Three-Single Half-Bridge Gate Drivers](#)
 - Layout Review Tips
 - [App Note](#)
 - [E2E FAQ](#)