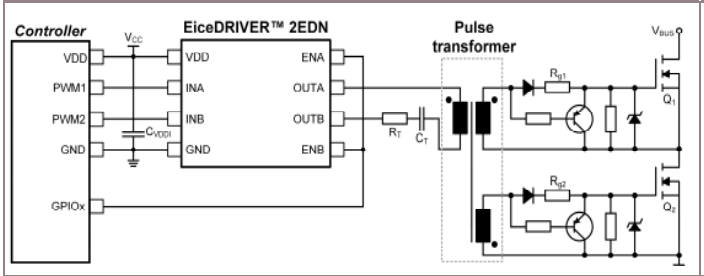
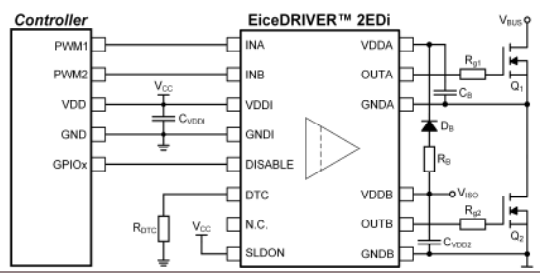
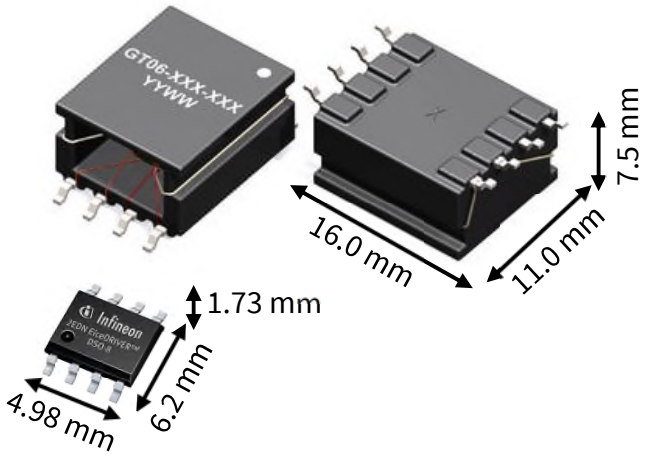
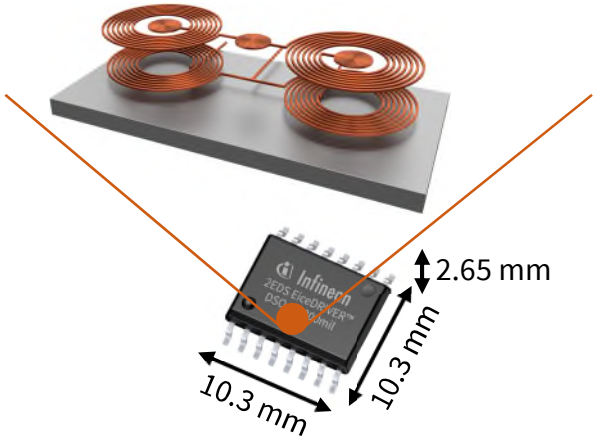
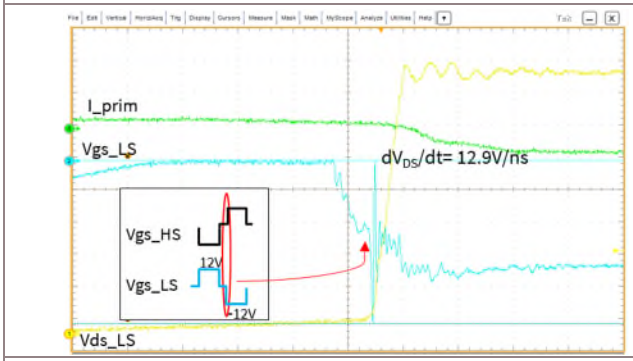
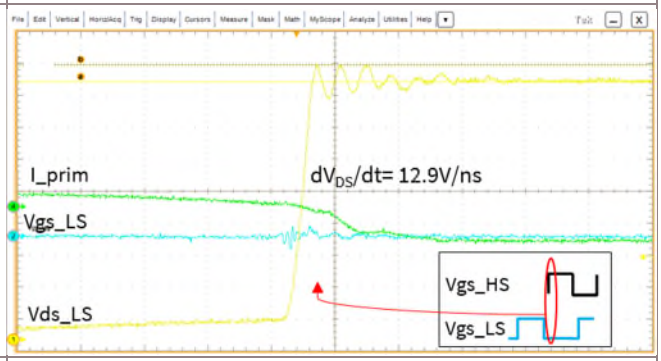
Isolated gate driving solutions - overview

Increasing power density and robustness with isolated gate driver ICs

Higher system efficiency and power density associated with improved robustness and reduced costs, due to better design for manufacturing (DFM) and assembly (DFA), make the isolated gate driver ICs with integrated coreless transformer (CT) technology the best choice for high performance power conversion applications, replacing the common pulse transformers based solutions.

Pulse transformer	Dual-channel isolated gate driver IC
	
	
Volume of main components: 1373 mm³ **PCB area of main components: 207 mm²** GT06-111-100 pulse transformer and EiceDRIVER™ 2EDN7524F	**Volume of main components: 281 mm³** **PCB area of main components: 106 mm²** EiceDRIVER™ 2EDS8265H reinforced isolated gate driver IC
	
Pulse transformer introduces a significant parasitic inductance in the gate loop, creating ringing due to resonance with C_{gs} and C_{gd} capacitances. This increases the **risk of shoot-through of the half-bridge** and for that reason requires the use of bipolar driving voltage.	Dual-channel isolated gate driver IC EiceDRIVER™ 2EDi ensures a safe switching in all operating conditions, which provides margin to speeding up the transients and consequently **improve efficiency** without compromising the system **robustness and reliability**.

Isolated gate driving solutions - overview

Increasing power density and robustness with isolated gate driver ICs

Parameter	Pulse transformer	Dual-channel isolated gate driver IC	Product benefits of isolated gate driver IC	System benefits of isolated gate driver IC
Isolation level	Reinforced, basic or functional	Reinforced, basic or functional	Diversified portfolio with different isolation levels and packages	Safety isolation fulfilling the requirements from the system standards
Propagation delay	≥ 35 ns	≈ 35 ns	Lower switching losses due to precise turn-on and turn-off transitions	**Higher system efficiency** at nominal and light load conditions Best fit with both analog and digital controllers
Parasitic leakage inductance (L_{LK})	≥ 300 nH	n/a	No additional propagation delay due to the di/dt limitation	
Parasitic in-out capacitance (C_{IO})	≥ 10 pF	≤ 2 pF	Robust against switching noise in high power designs with fast switching transients	**Extending service life** Improving safe operation
CMTI	≥ 50 V/ns	≥ 150 V/ns		
Duty-cycle	≤ 50%	0 – 100%	Address a wider range of applications Ensure the same performance and reliability at any operating condition	Enable advanced topologies for better conversion efficiency **Improved reliability** with higher MTBF
Transformer saturation	Yes	No		
Switching frequency	40 kHz - 1 MHz	0 - 10 MHz		
Component size	Bulky	Small	Reduce the volume and weight of components	**Higher power density** Lower electromagnetic interference (EMI) **Reduce costs** with a better design for manufacturing (DFM) and assembly (DFA)
Component thickness	Large	Small	Enabling more effective cooling concepts	
PCB layout flexibility	Poor	Medium	Reduce the parasitic gate loop inductance	
PCB layout compactness	Poor	High	Isolation and driver in one package	
Isolated power supply required	No	Yes, or Bootstrap		

For applications using a fixed 50% duty-cycle and with relatively slow voltage transients, and where the power density and the PCB layout flexibility is not critical, the pulse transformers are still a valid driving solution. However, for applications with fast switching transients **targeting the best in class efficiency**, and where a **high power density** is required to reduce the volume and height of the system, the EiceDRIVER™ isolated gate driver ICs with integrated coreless transformer (CT) technology are the best choice

For more information, please refer to this document: **Gate driver EiceDRIVER™ - Isolated gate driving solutions**

www.infineon.com/2edi