

GPIHI10ICDF68

GaN Power IC in DFN6x8 Package

Preliminary Datasheet version: 1.2

Features

BV_{dss}	R_{dson}	V_{bus}
900V	120 mΩ	650V

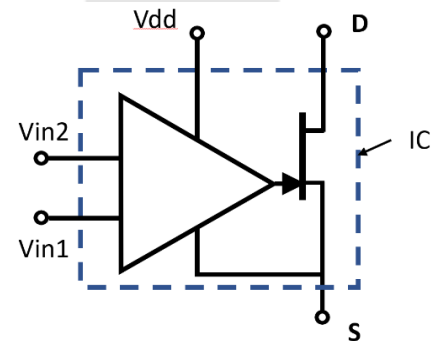
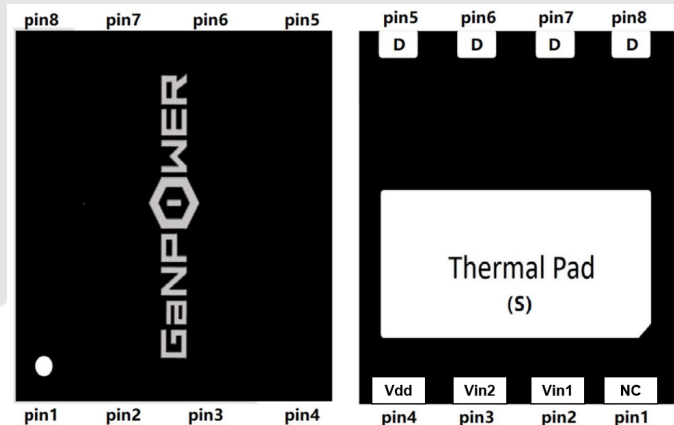
- Edge-triggered high-side power IC
- Small transformer isolation
- Low R_{ds} and high dv/dt capability
- Extremely low input capacitance
- Fast switching and Low Profile

Applications

- High-side switch in switching power applications
- Power adapters and power delivery chargers
- Start-up procedure: Please set V_{dd} to be a normal operation voltage (e.g., 6.5V) before turning on the high voltage power supply or applying high voltage to the drain. V_{dd} is the power supply for the internal gate driver in our GaN Power IC. Only when a normal operation voltage (e.g., 6.5V) is applied to V_{dd} , will the internal driver and GaN HEMT work properly.
- Application configuration: Edge triggered V_{in1} and V_{in2} pulses control the V_{gs} on/off. Device turn-on is achieved when V_{in2} is edge-triggered and device turn-off is achieved when V_{in1} is edge-triggered.

Description

These devices are power IC based on 650V Power GaN HEMTs using proprietary (US patent issued) E-mode GaN on silicon technology. The gate driver is integrated with the main power transistor resulting in fast switching, high system power density and low cost. Edge triggering narrow pulse is used to control device turn-on/off. This results in high noise immunity and a small and inexpensive transformer for isolation and level shifting for the





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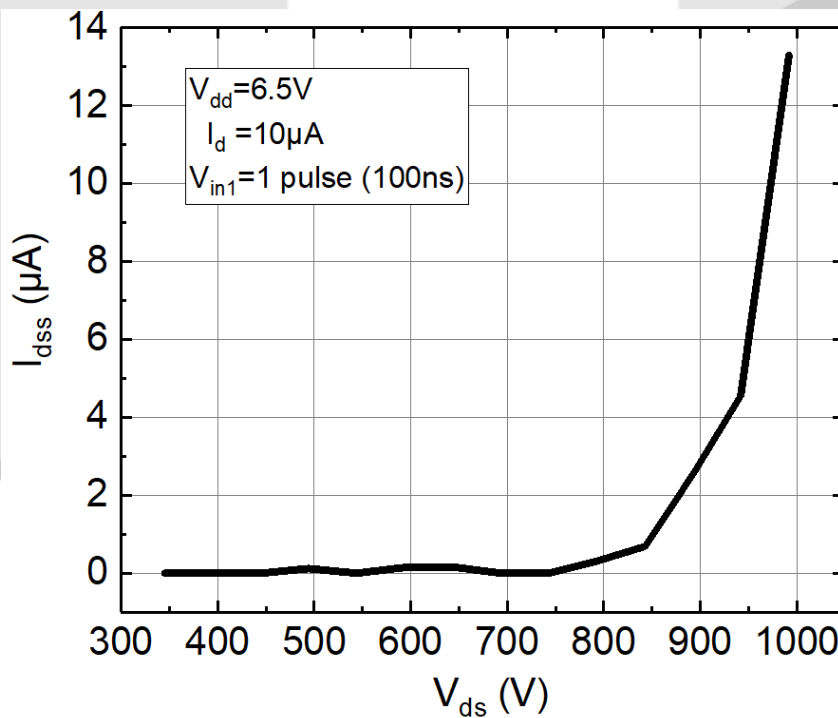
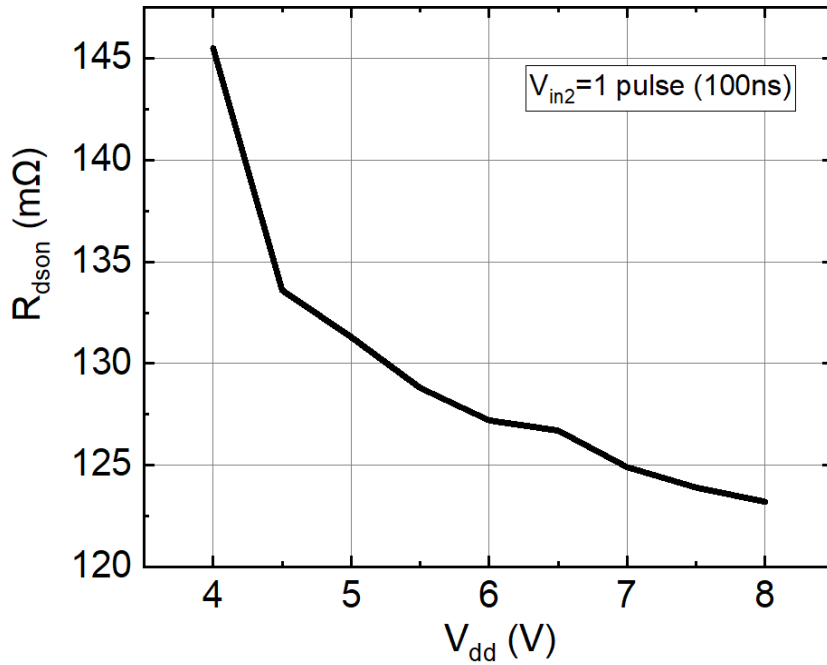
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high-side switch in a half bridge application.

Device Characteristics

Basic Parameters				Test data			
	Parameters		Conditions	Min	Typical	Max	Unit
1	BV_{dss}	Drain-Source breakdown voltage	$V_{dd} = 6.5V$ $I_d = 10\mu A$ $V_{in1} = 1$ pulse (100-300ns)		900		V
2	I_{dss}	Zero gate voltage drain current, $T_c = 25^\circ C$	$V_{dd} = 6.5V$ $V_{ds} = 900V$ $V_{in1} = 1$ pulse (100-300ns)		2.5		μA
3	R_{dson}	Static drain-source on resistance, $T_c = 25^\circ C$	$V_{dd} = 6.5V$ $V_{in2} = 1$ pulse (100-300ns)		120	130	m Ω
4	V_{dd}	Drive supply voltage		5	6.5	8	V
5	I_{dd}	Driver supply current	$V_{dd} = 6.5V$		3	4	mA
6	V_{in1}	Turn-off narrow triggering pulse	Pulse width 100-300ns	2.5	5	8	V
7	V_{in2}	Turn-on narrow triggering pulse	Pulse width 100-300ns	2.5	5	8	V
Switching Performance				Test data			
	Parameters		Conditions	Min	Typical	Max	Unit
1	$t_{d(on)}$	Turn-on delay time	$V_{ds} = 400V$ $I_d = 1A$ $V_{in1/2} = 5V$ $V_{dd} = 6.5V$		20		ns
2	t_r	Rise time			50		ns
3	$t_{d(off)}$	Turn-off delay time			5		ns
4	t_f	Fall time			29		ns

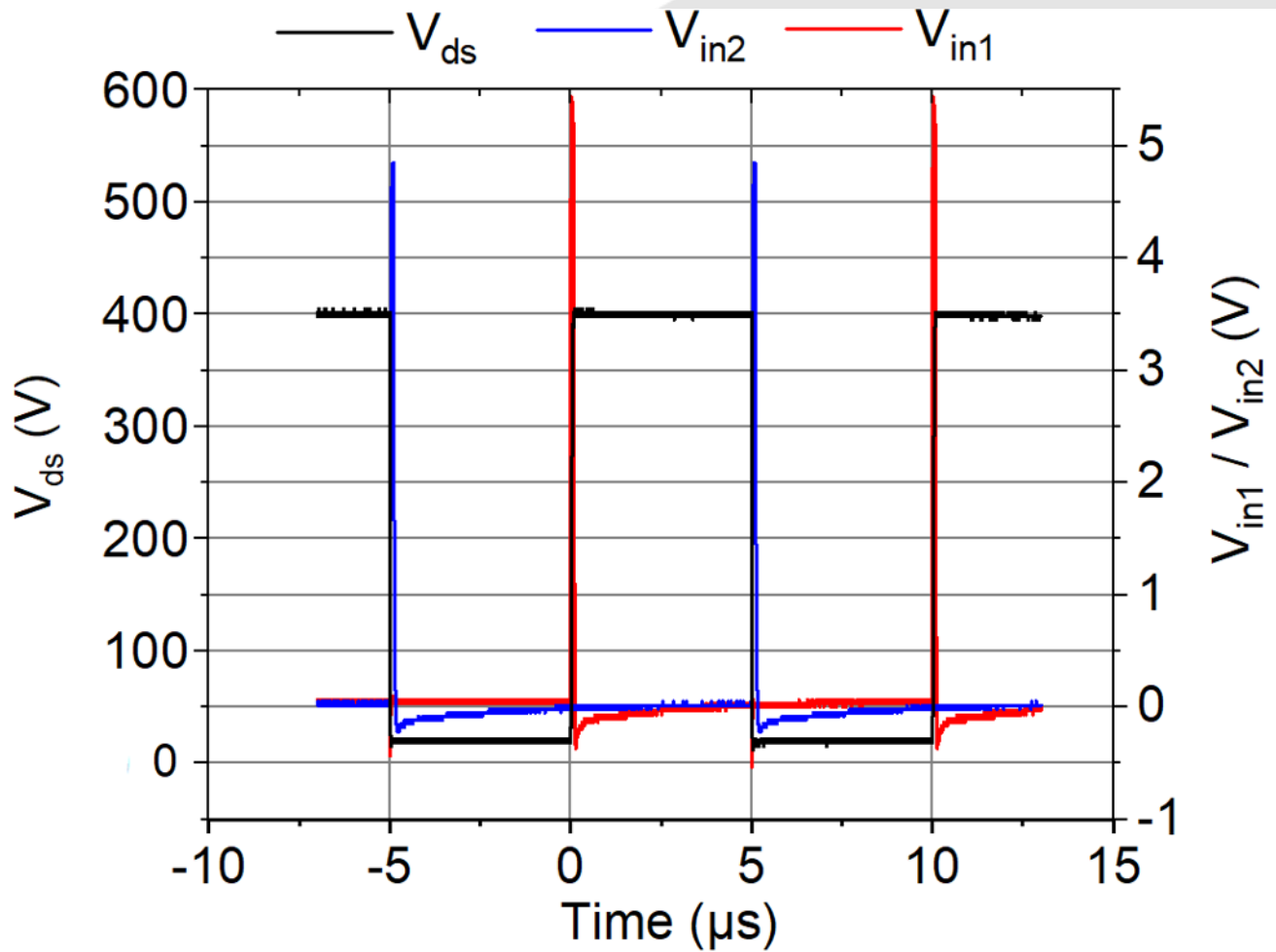
Electrical Performance





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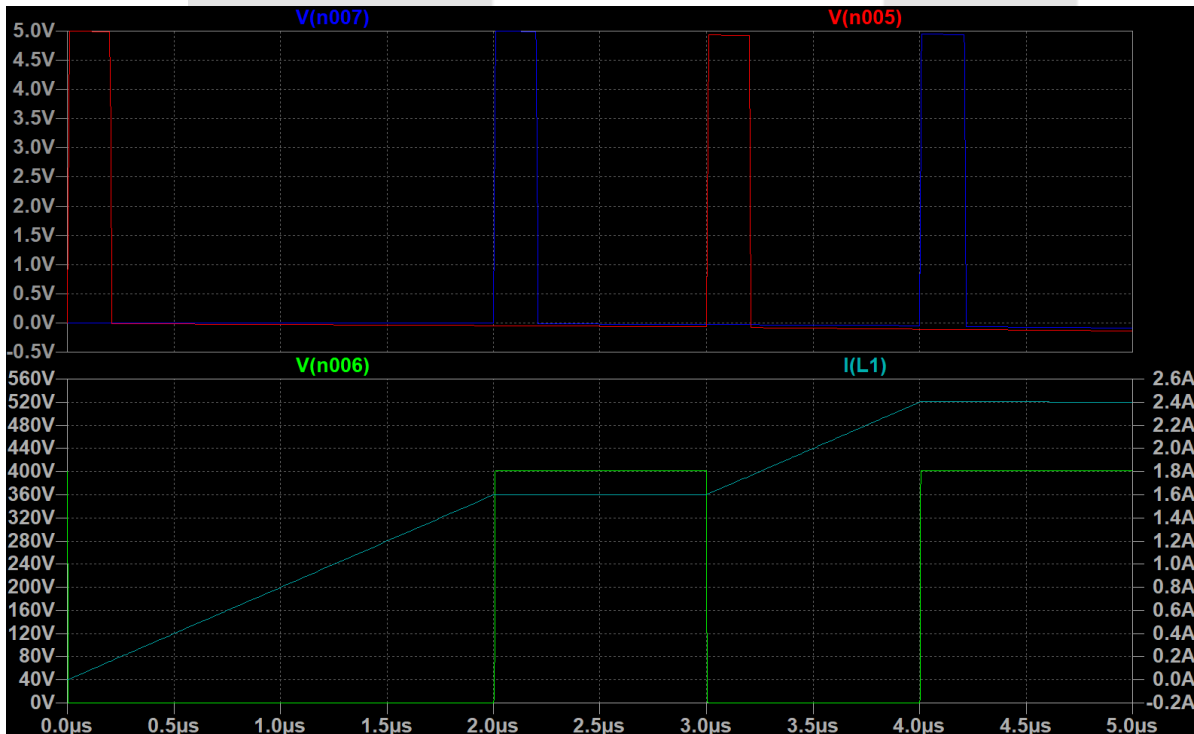
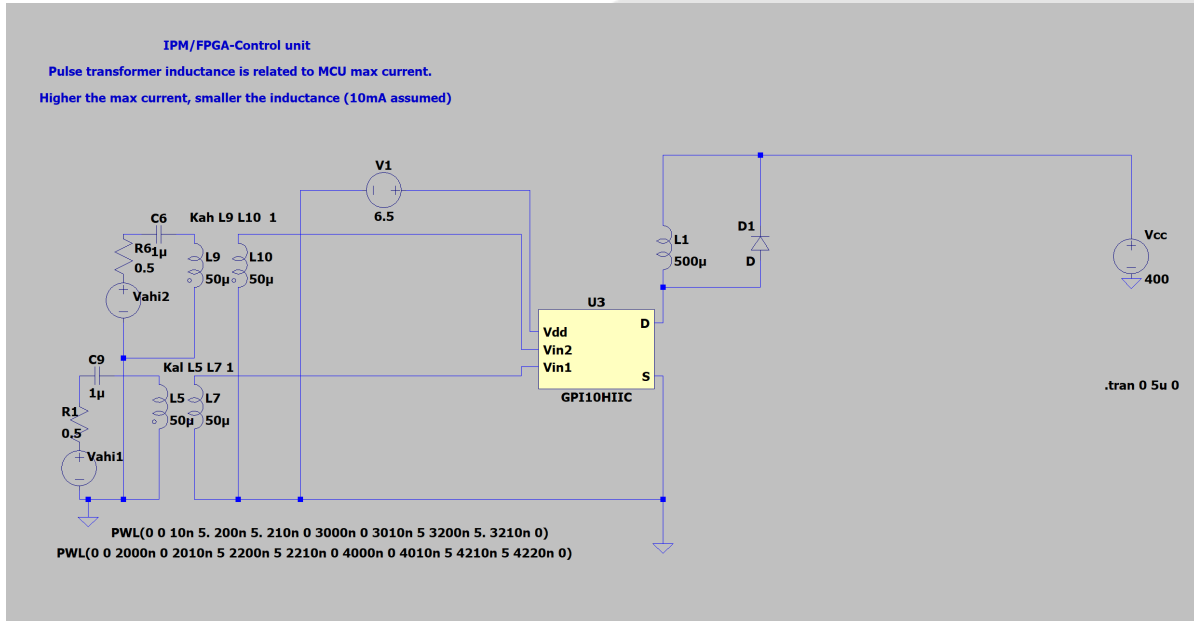
DPT test: V_{bus} = 400V (100kHz), V_{in1}/V_{in2} pulse width = 100ns, R-load = 500Ω



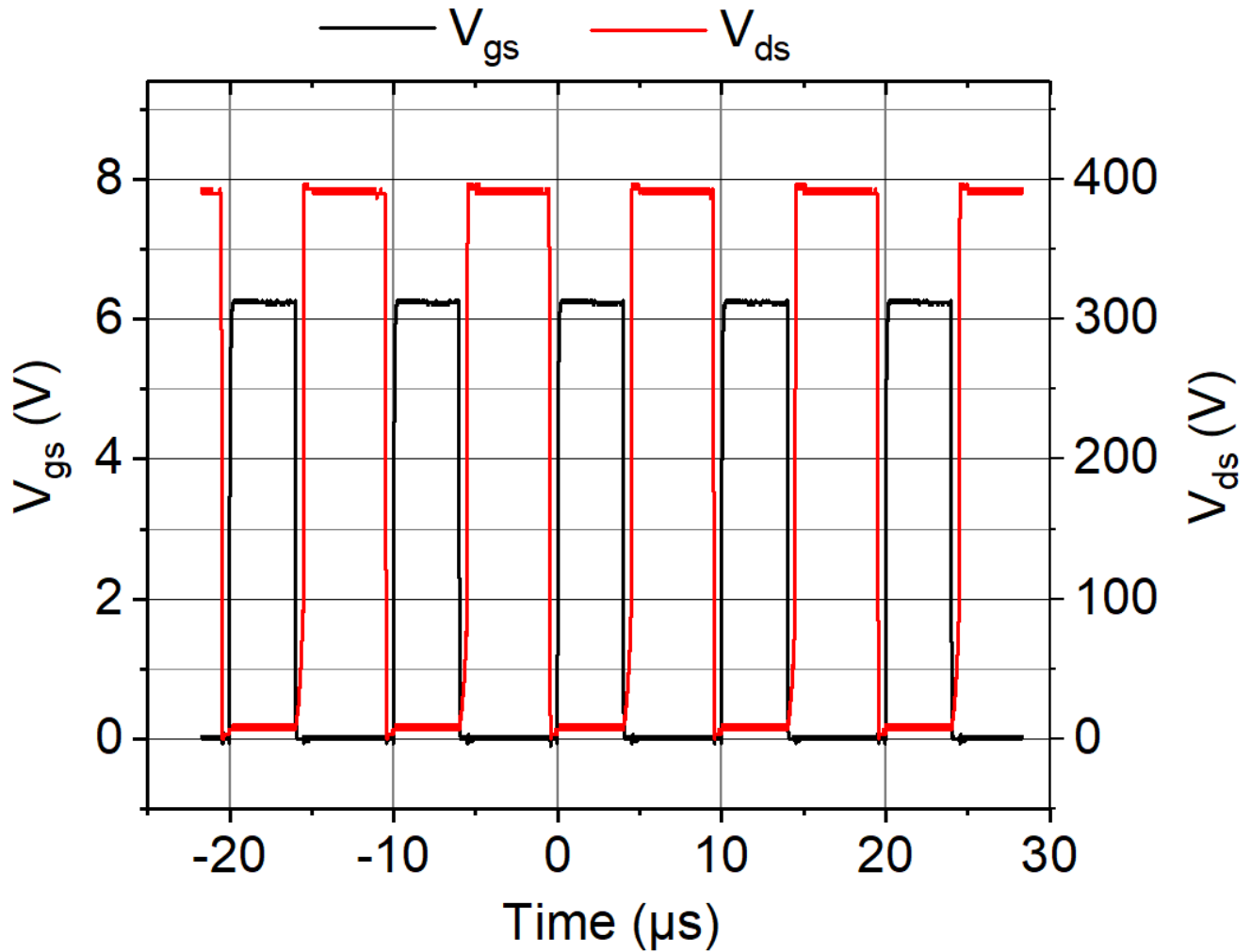
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LTSpice Simulation (DPT with L-load)

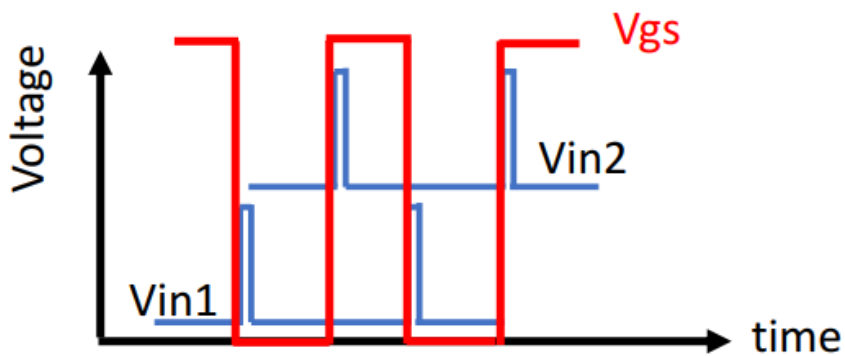
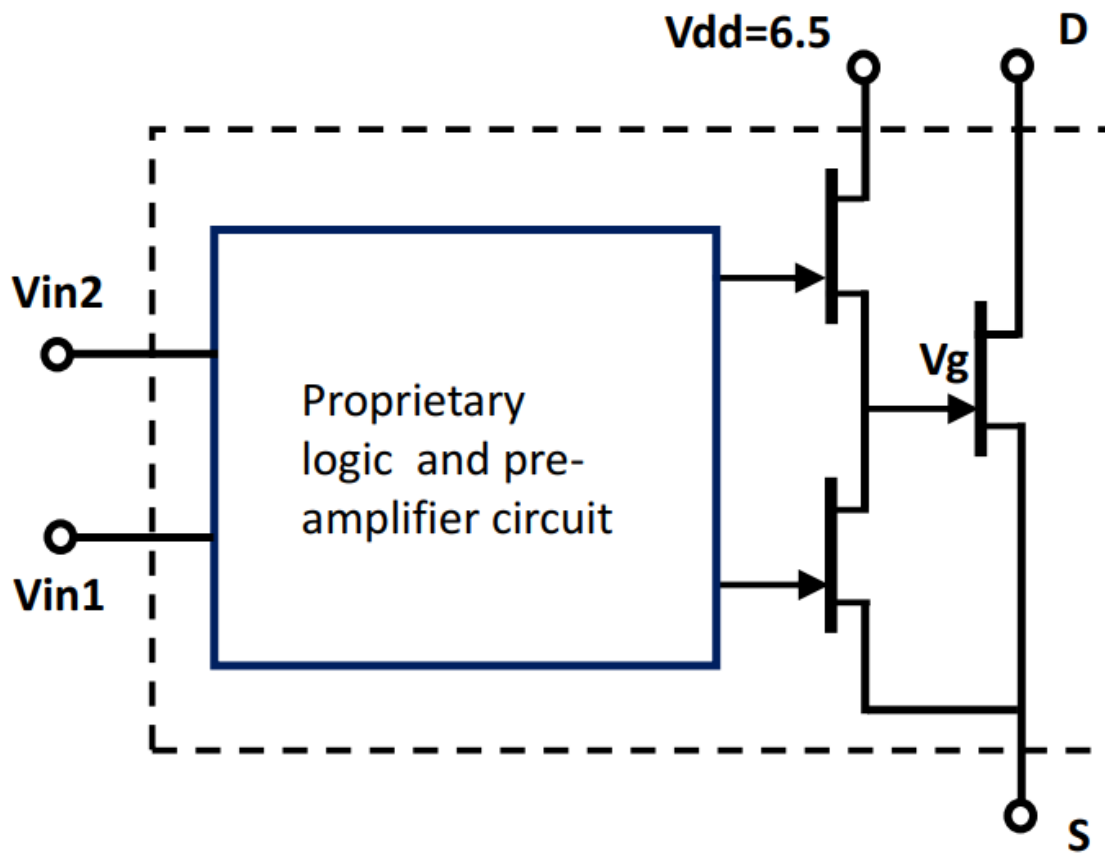


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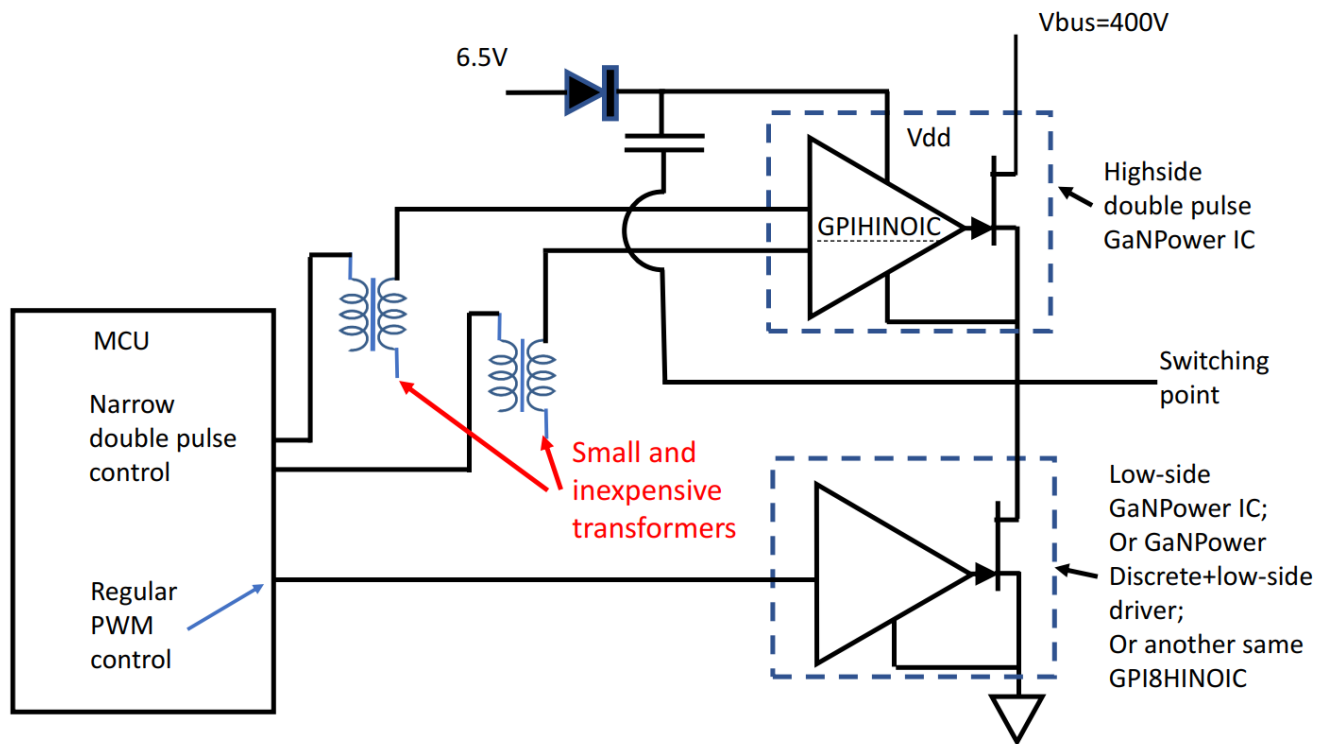


Half-bridge buck at $V_{bus} = 400V$ (100kHz), $R_{load} = 350\Omega$

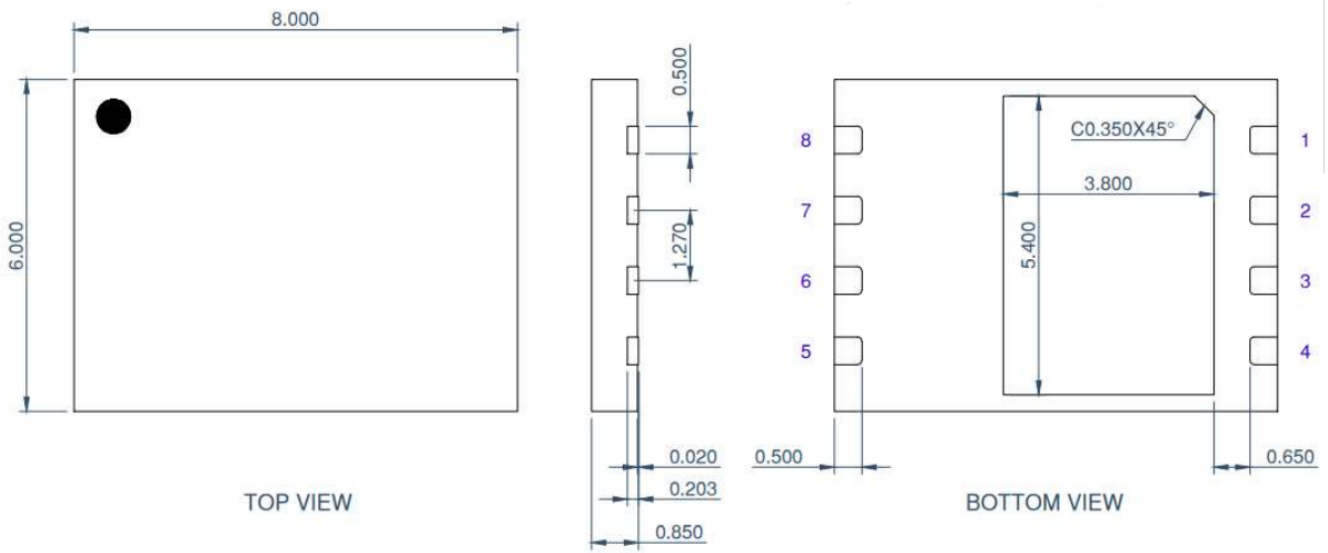
Internal Schematic and waveforms



Typical Application Circuit (Conceptual)



Package Information



PKG nom. thickness : 0.85mm (Y type)
LF THICKNESS : 0.203±0.008 THK



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GaN HEMT Frequently Asked Questions

1	<p>Q: Can we do pin to pin switch for silicon MOSFET or IGBT?</p> <p>A: The short answer is no. GaN HEMT power devices are far superior than the best silicon devices such as super junction MOSFETs. However, due to different requirements of gate driving voltage and extremely high dv/dt slew rate, special drivers and optimized PCB layouts are recommended to minimize the impact from circuit parasitics. Some packaging forms such as GaNPower’s DFN packaged devices offer both sense and force for the source terminal. Also, for traditional TO220 packages, please be advised that the pins are arranged as Gate – Source -Drain, and the thermal pad is connected to the source instead of drain.</p>
2	<p>Q: Are GaN power devices reliable?</p> <p>A: GaN power HEMTs have been tested by GaNPower and many other vendors, users and testing facilities to be as reliable (if not better than) silicon counterparts.</p>
3	<p>Q: How do GaN power devices compare with SiC?</p> <p>A: Currently GaN power HEMT devices are most suitable for low to medium voltage ($\leq 1200V$) and power (<50KW) applications.</p>
4	<p>Q: Do we need to parallel an FRD for applications such as inverters?</p> <p>A: GaN devices are different from silicon MOSFET or IGBT in that they have no inherent PN junction diodes that cause reverse recovery issue. User do not need to parallel an FRD for the purpose of suppressing the body diode reverse recovery effect, since GaN HEMT can operate in both first and third quadrants. However, care should be taken for the dead time power loss since the Vsd voltage of GaN HEMT is usually close to 2V. This is especially true when a negative gate voltage is applied.</p>
5	<p>Q: Can we parallel GaN HEMT devices?</p> <p>A: Yes, GaN HEMT is ideal for paralleling, due to the positive temperature coefficient of Rds(on) and slightly positive temperature coefficient of threshold voltage.</p>