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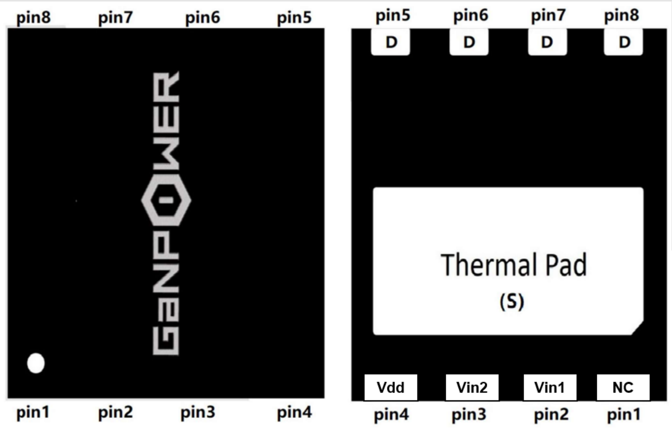
GPIHI8ICDF68

GaN Power IC in DFN6x8 Package

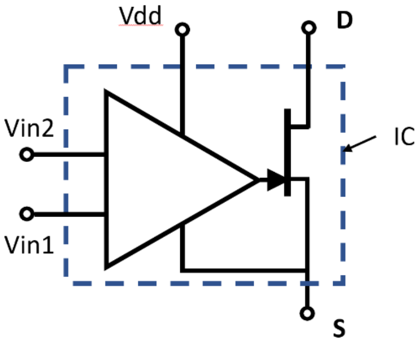
Preliminary Datasheet version: 1.2



Features

BV_{dss}	R_{dson}	Vbus
900V	170 mΩ	650V

- Edge-triggered high-side power IC
- Small transformer isolation
- Low Rds 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 Vdd 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. Vdd 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 Vdd, will the internal driver and GaN HEMT work properly.
- Application configuration: Edge triggered Vin1 and Vin2 pulses control the Vgs on/off. Device turn-on is achieved when Vin2 is edge-triggered and device turn-off is achieved when Vin1 is edge-triggered.

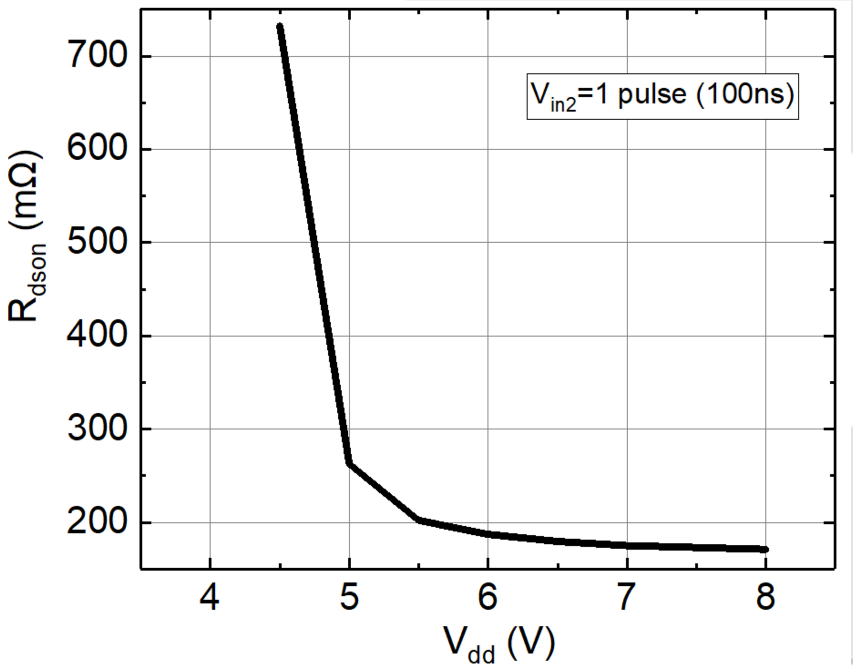
Description

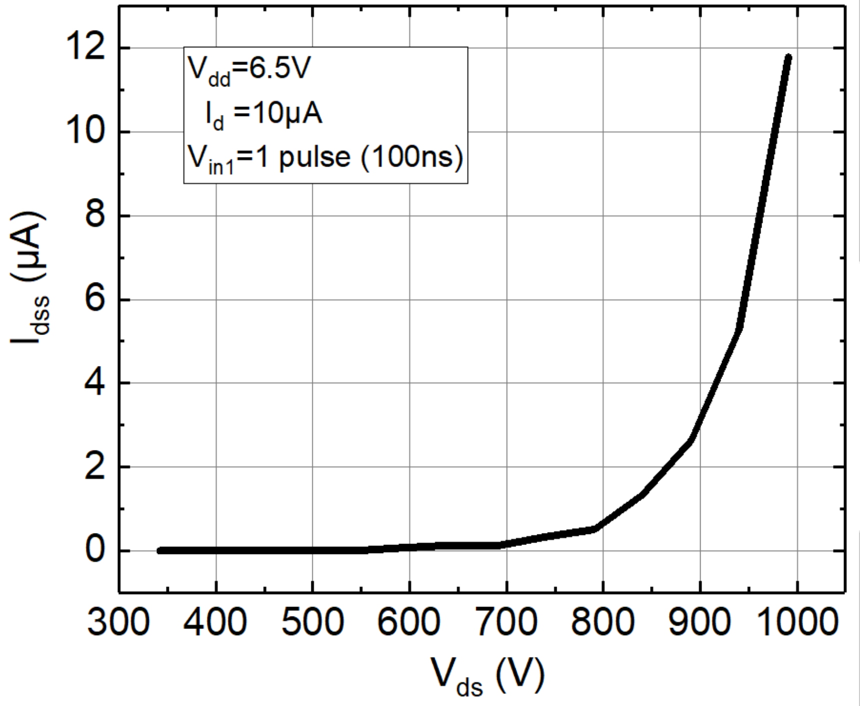
These devices are power IC based on 650V Power GaN HEMTs using proprietary (US patent issued) E-mode GaN on silicon technology. The gate driver is integrated with the main power transistor resulting in fast switching, high system power density and low cost. Edge triggering narrow pulse is used to control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

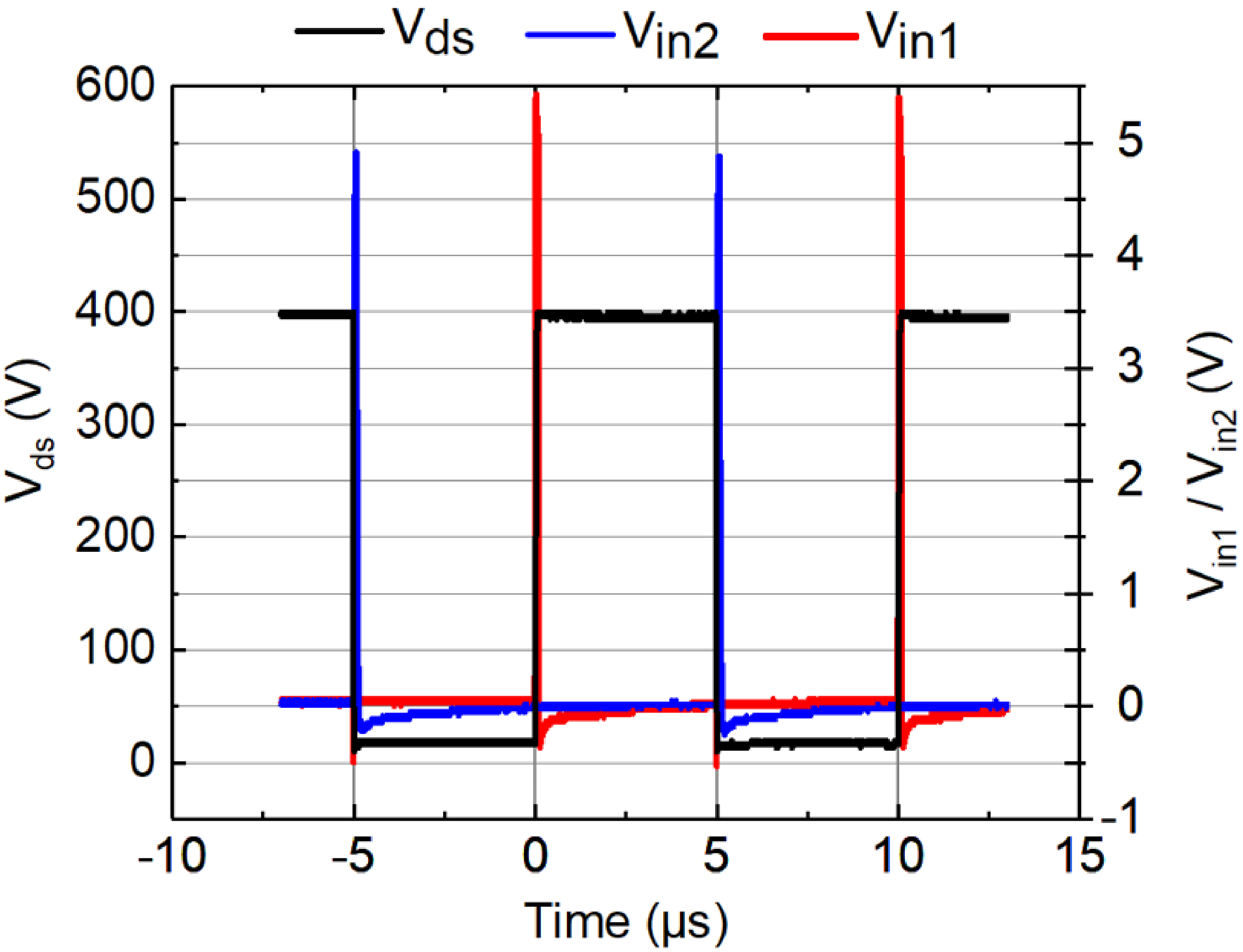
Device Characteristics

Basic Parameters				**Test data**			
	Parameters		**Conditions**	**Min**	**Typical**	**Max**	**Unit**
1	BV_{dss}	Drain-Source breakdown voltage	V_{dd} = 6.5V I_d=10µA V_{in1} = 1 pulse (100-300ns)		900		V
2	I_{dss}	Zero gate voltage drain current, T_c = 25℃	V_{dd} = 6.5V V_{ds}=900V V_{in1} = 1 pulse (100-300ns)		2.6		µA
3	R_{dson}	Static drain-source on resistance, T_C = 25℃	V_{dd} = 6.5V V_{in2} = 1 pulse (100-300ns)		170	180	mΩ
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		11		ns
2	t_r	Rise time			29		ns
3	$t_{d(off)}$	Turn-off delay time			8		ns
4	t_f	Fall time			34		ns

Electrical Performance

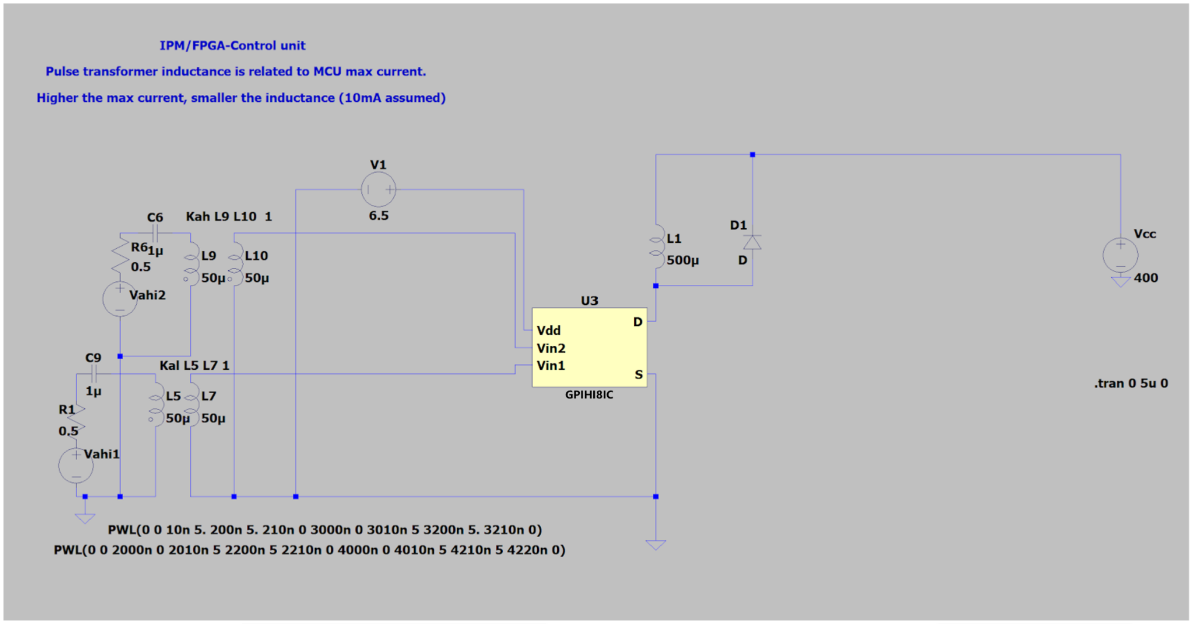






DPT test: V_{bus} = 400V (100kHz), V_{in1}/V_{in2} pulse width = 100ns, R-load = 500Ω

LTSpice Simulation (DPT with L-load)



IPM/FPGA-Control unit

Pulse transformer inductance is related to MCU max current.

Higher the max current, smaller the inductance (10mA assumed)

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PWL(0 0 10n 5. 200n 5. 210n 0 3000n 0 3010n 5 3200n 5. 3210n 0)
PWL(0 0 2000n 0 2010n 5 2200n 5 2210n 0 4000n 0 4010n 5 4210n 5 4220n 0)
.tran 0 5u 0
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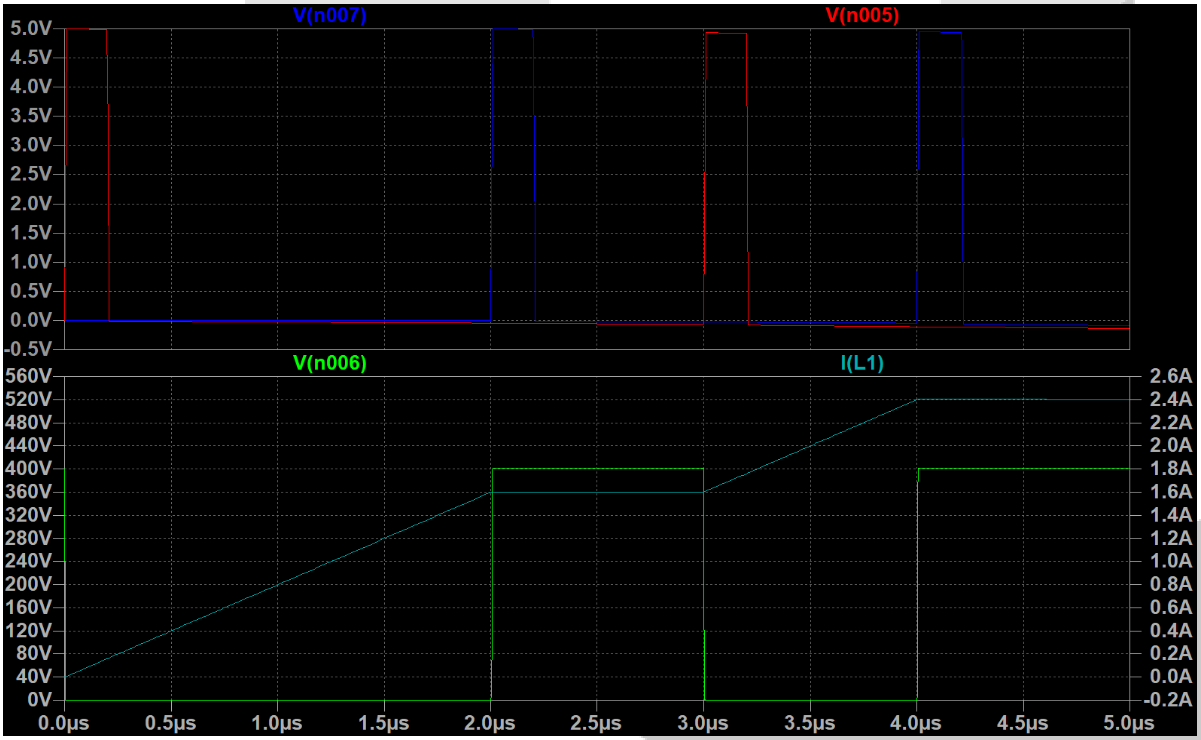
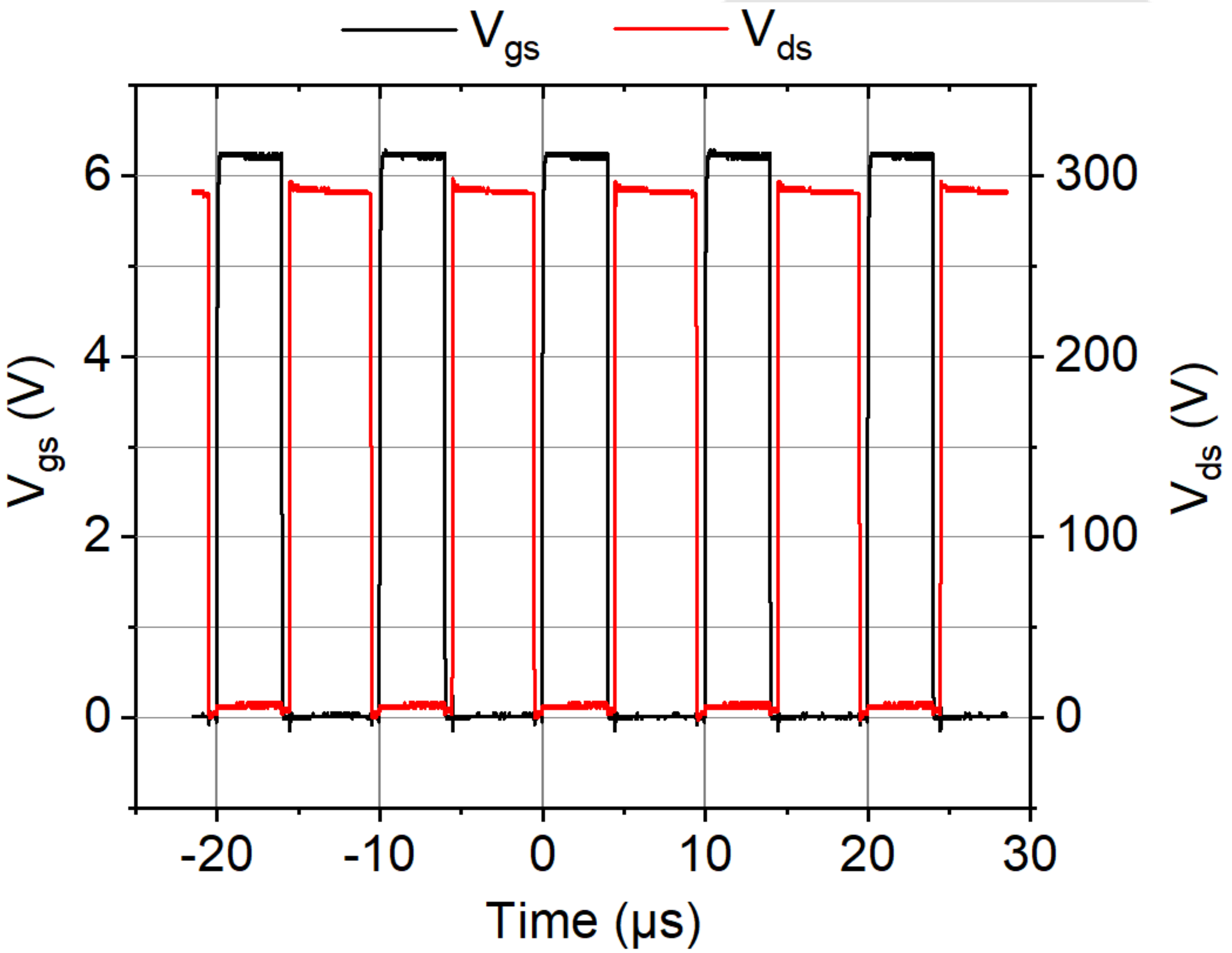
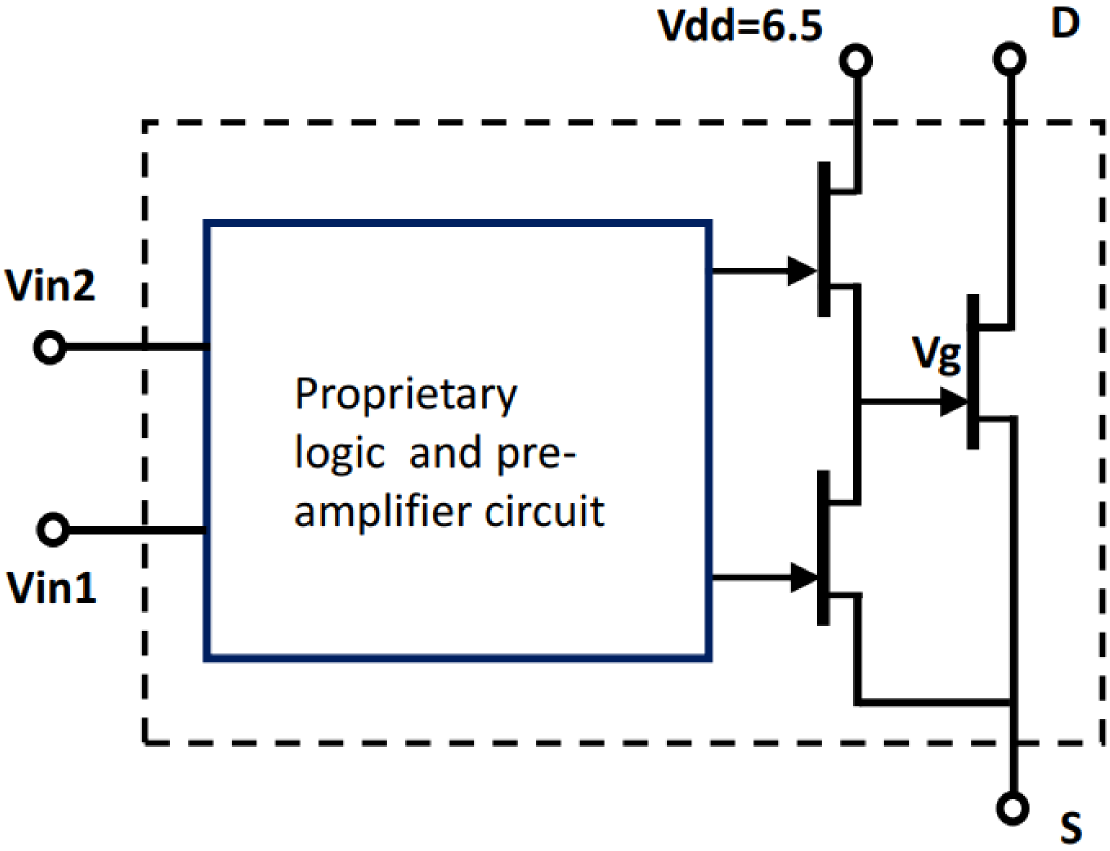
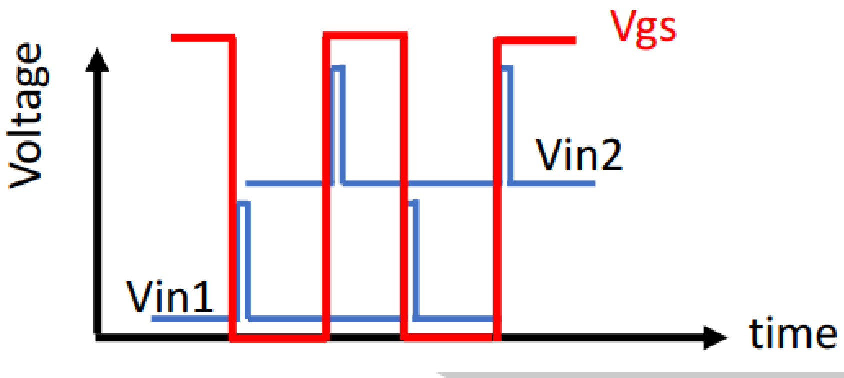




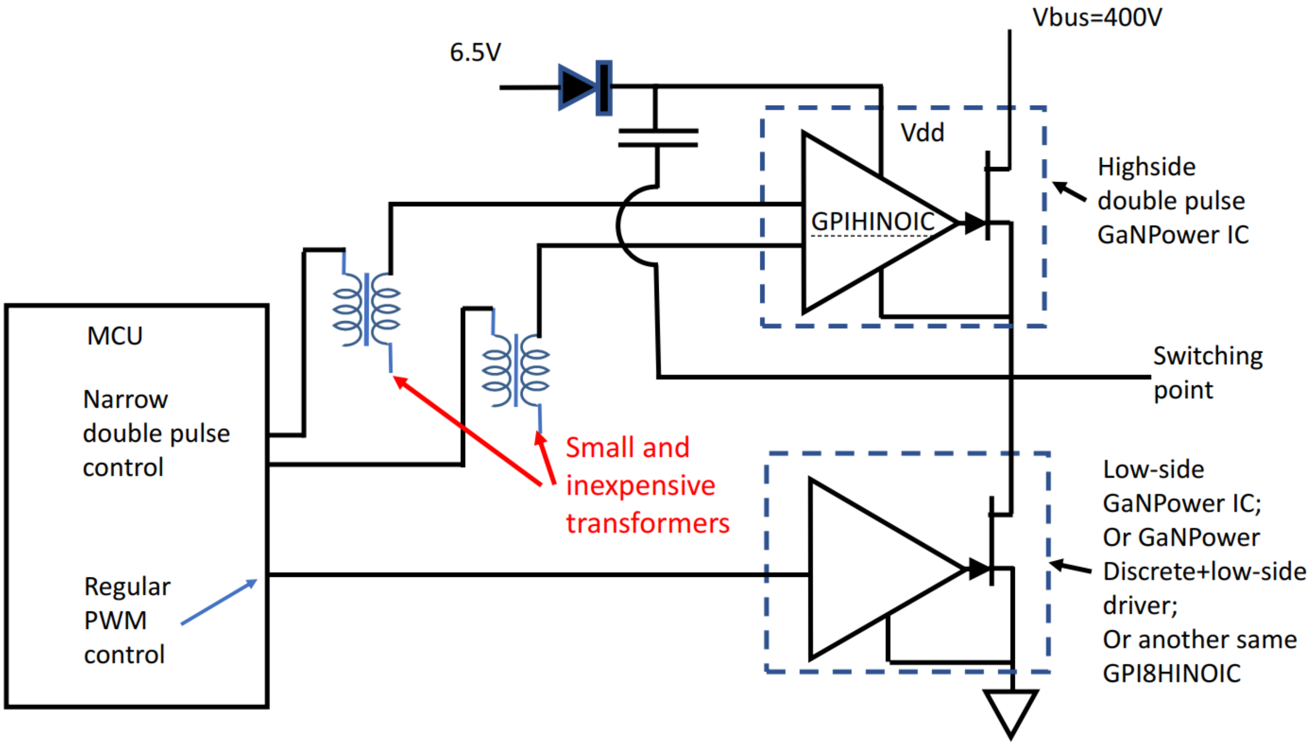
Half-bridge buck at V_{bus} = 300V (100kHz), R-load = 160Ω

Internal Schematic and waveforms

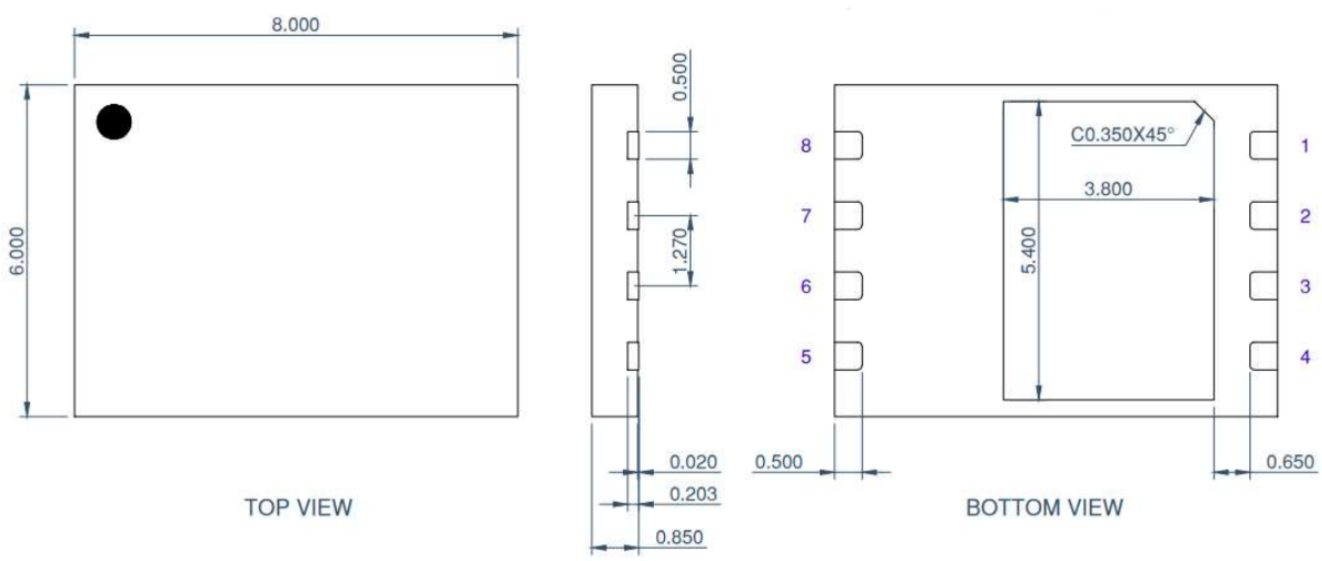




Typical Application Circuit (Conceptual)



Package Information



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

GaN HEMT Frequently Asked Questions

1	Q: Can we do pin to pin switch for silicon MOSFET or IGBT? 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.
2	Q: Are GaN power devices reliable? 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.
3	Q: How do GaN power devices compare with SiC? A: Currently GaN power HEMT devices are most suitable for low to medium voltage (≤1200V) and power (<50KW) applications.
4	Q: Do we need to parallel an FRD for applications such as inverters? 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.
5	Q: Can we parallel GaN HEMT devices? A: Yes, GaN HEMT is ideal for paralleling, due to the positive temperature coefficient of Rdson and slightly positive temperature coefficient of threshold voltage.