GaNPower GPI8HINOIC Application Note: LLC-DCDC & CCM Buck Converter
GaNPower GPI8HINOIC Application Note

LLC DC-DC Converter (400-40V) (1MHz)

CCM Buck Converter (400-40V) (500KHz)
Pulse transformer suggestions: 1:1 for 5V MCU/FPGA; 1:1.6 for 3.3V MCU/FPGA

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Input pulse width is fixed at 50ns regardless switching frequency. No need to adjust input coupling/level-shifting transformer when changing switching frequency.
Primary transformer current needed from MCU/FPGA

30uH:30uH

50uH:50uH
Switching point voltage and IC drain currents
Output/load voltage and current without rectifier. Unfortunately, LTSpice does not converge with rectifier. Hope future versions of LTSpice will converge with rectifier.
GaNPower provides a half-bridge switching loss calculator program:

halfbridge_power_ltspace.exe

Welcome to GaNPower Half Bridge Power Loss Calculator
Input control is input.txt
Please hit return to run the calculator or enter i for information on the calculator

-->> Average Vd*Id power loss:
Power loss for low side (W)= 1.463042072649182E-005
Power loss for hi side (W)= 8.509489170752462E-004
Average load power (W)= 58.8793278629851
Percent power loss= 1.470090385229909E-003
-->>
Please enter again to close the program
Summary

• GaNPower IC can be programmed using small transformer for coupling and level shifting for the high side and low side.

• Since the same narrow pulses are used for all switching frequencies, there is no need to change the transformer when changing the switching frequency.

• GaNPower IC has very low switching loss for resonant topology using half-bridge.

Thanks for your attention!
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LLC DC-DC Converter (400-40V)(1MHz)

CCM Buck Converter (400-40V)(500KHz)
Pulse transformer suggestions: 1:1 for 5V MCU/FPGA; 1:1.6 for 3.3V MCU/FPGA

PULSE(0 5 0 5ns 5ns 50ns 2000ns)

PULSE(0 5 170n 5ns 50ns 2000ns)

PULSE(0 5 210n 5ns 50ns 2000ns)

PULSE(0 5 1960n 5ns 50ns 2000ns)

MCU/FPGA
Input pulse width is fixed at 50ns regardless of switching frequency. No need to adjust input coupling/level-shifting transformer when changing switching frequency.
Primary transformer current needed from MCU/FPGA

- 30uH:30uH
- 50uH:50uH
Switching point voltage and IC drain currents
Output/load voltage and current
GaNPower provides a half-bridge switching loss calculator program:

`halfbridge_power_ltspeice.exe`

Welcome to GaNPower Half Bridge Power Loss Calculator
Input control is input.txt
Please hit return to run the calculator or enter i for information on the calculator

-->> Average Vd*Id power loss:
Power loss for low side (W)= 0.917120156146314
Power loss for hi side (W)= 7.299486461626646E-002
Average load power (W)= 64.7583131274734
Percent power loss= 1.52893886969167
-->>
Please enter again to close the program
Summary

• GaNPower IC can be programmed using small transformer for coupling and level shifting for the high side and low side.

• Since the same narrow pulses are used for all switching frequencies, there is no need to change the transformer when changing the switching frequency.

• GaN in general has higher switching loss for non-resonant / hard switching as compared with resonant topology. Special technics such as deadtime sensing/control maybe needed for high frequency switching, or lower switching frequency is advivsable.

Thanks for your attention!