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

GANPOWER INTERNATIONAL

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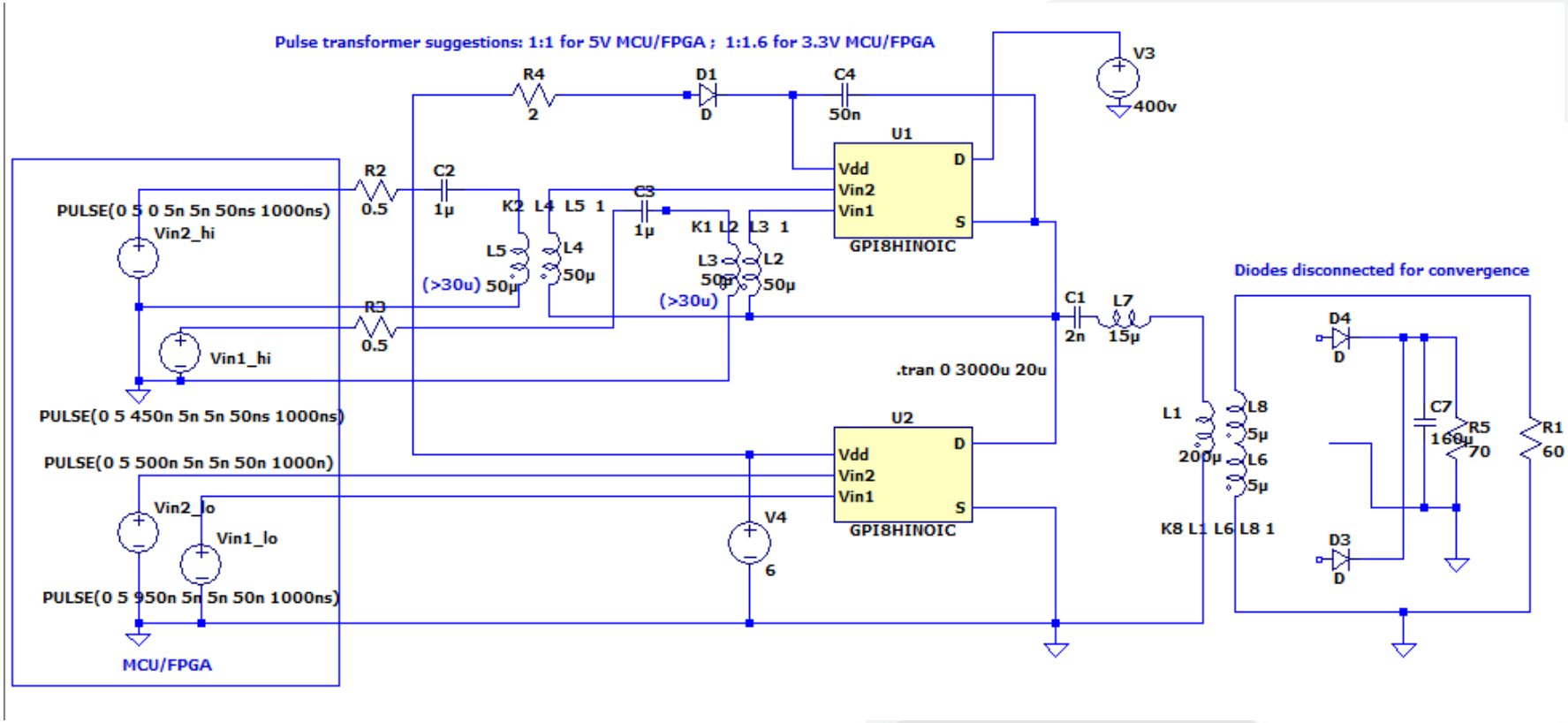
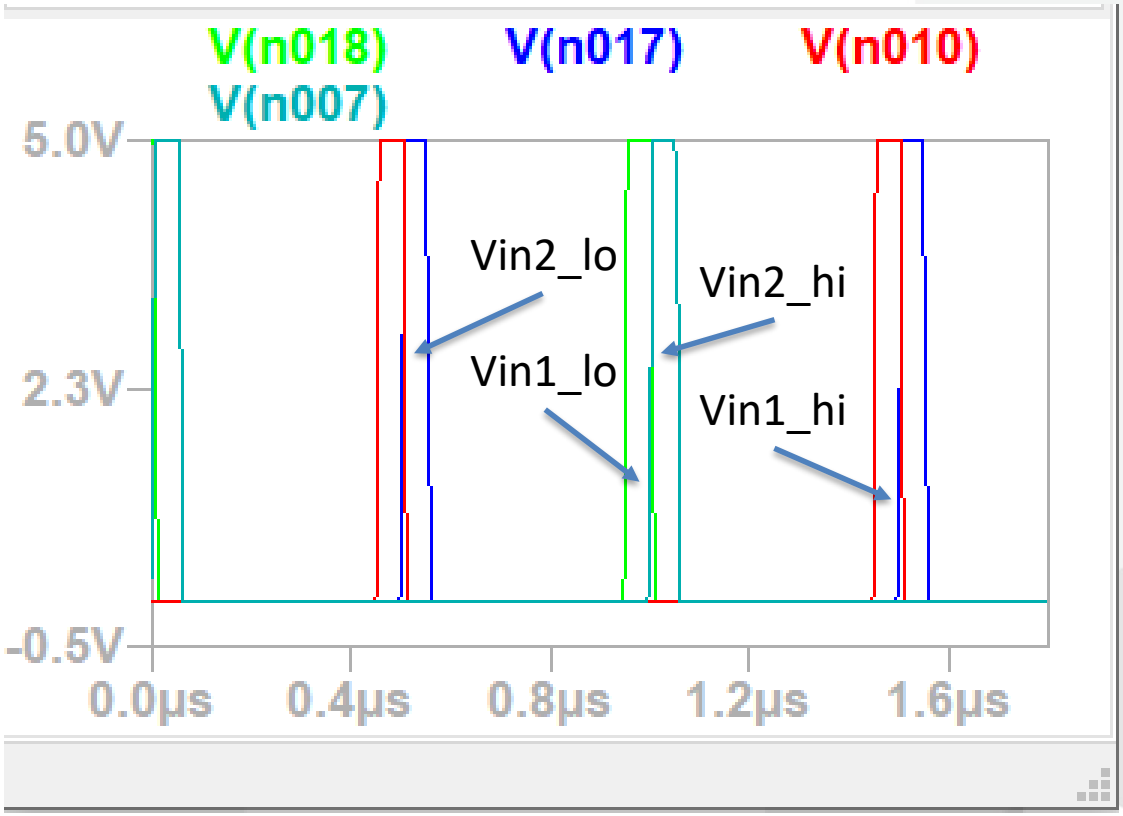
GaNPower GPI8HINOIC Application Note

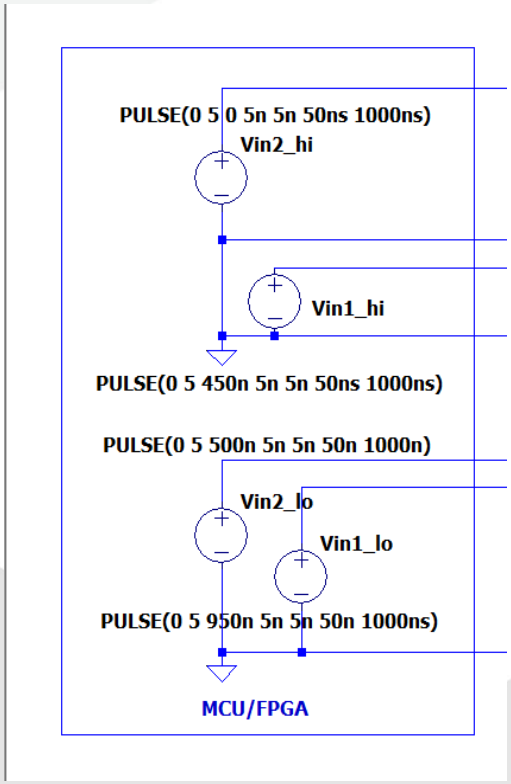
LLC DC-DC Converter (400-40V) (1MHz)

CCM Buck Converter (400-40V) (500KHz)

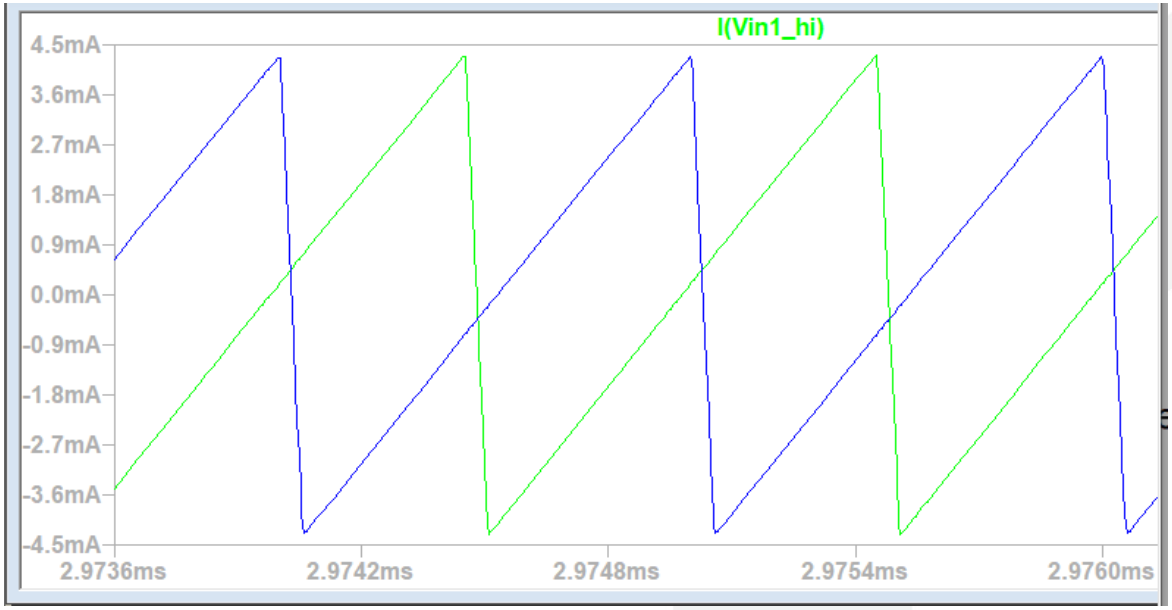


Input pulse width is fixed at 50ns regardless switching frequency. No need to adjust input coupling/level-shifting transformer when changing switching frequency.

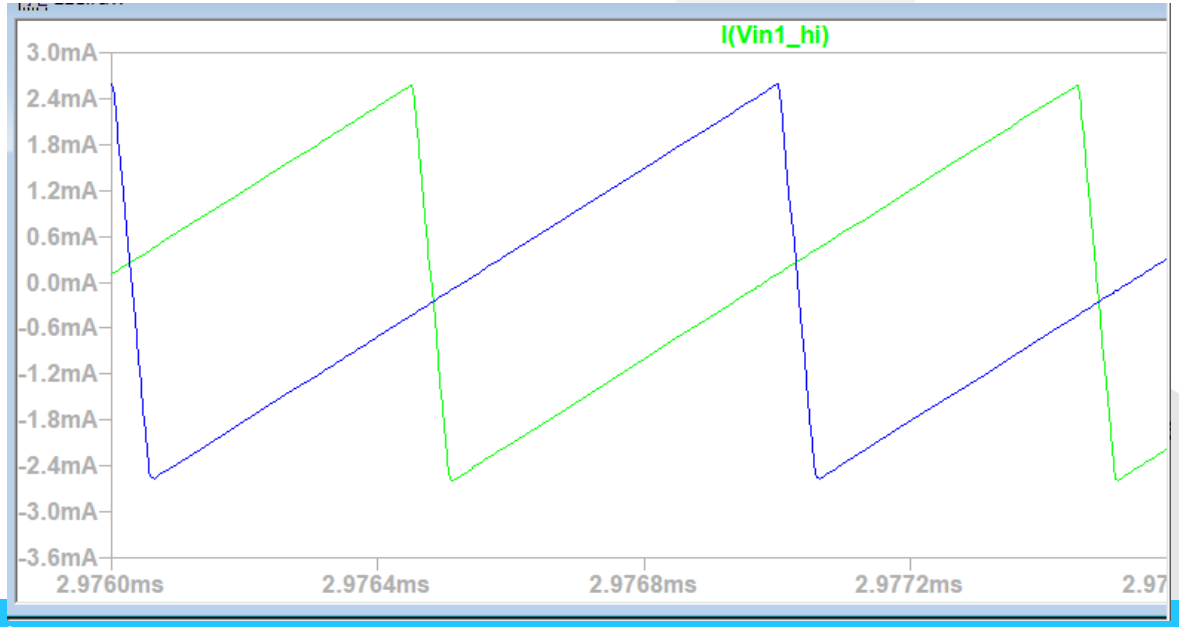




Primary transformer current needed from MCU/FPGA

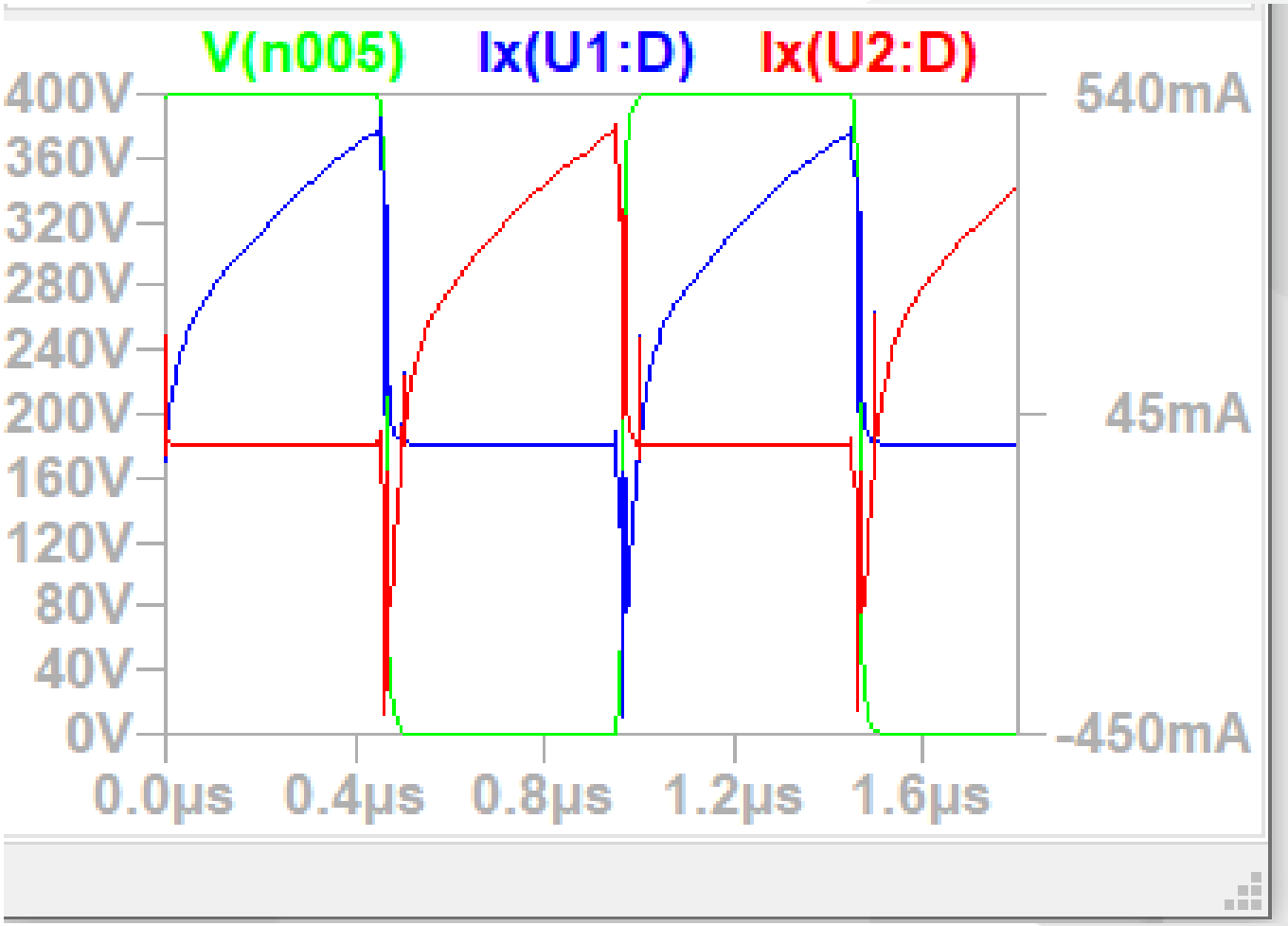


30uH:30uH

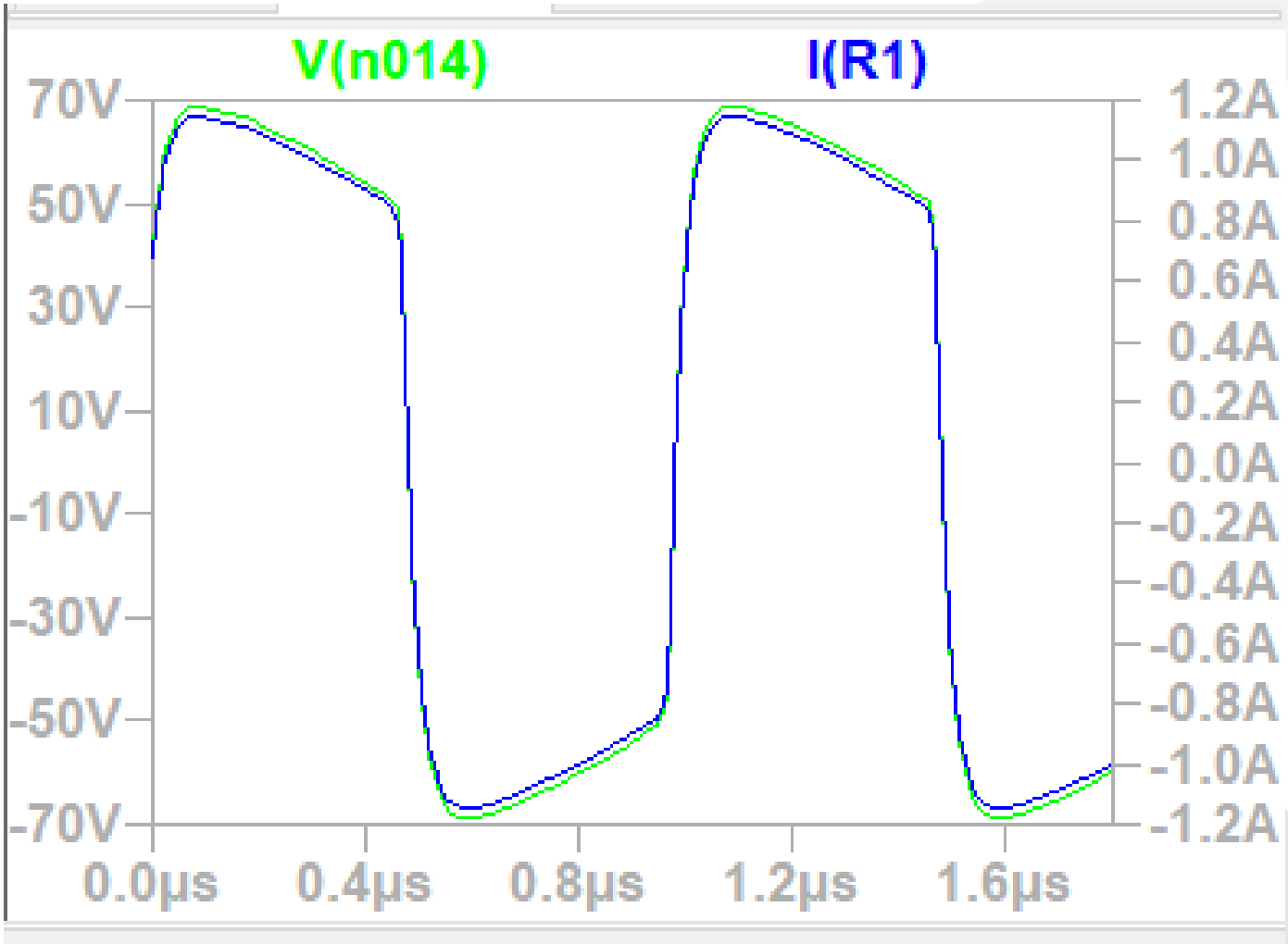


50uH:50uH

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_ltspice.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)=  1.4630420726491 82E-005
Power loss for hi side (W)=  8.5094891707524 62E-004
Average load power (W)=   58.8793278629851
Percent power loss=  1.4700903852299 09E-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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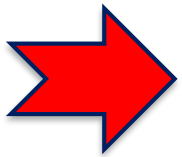
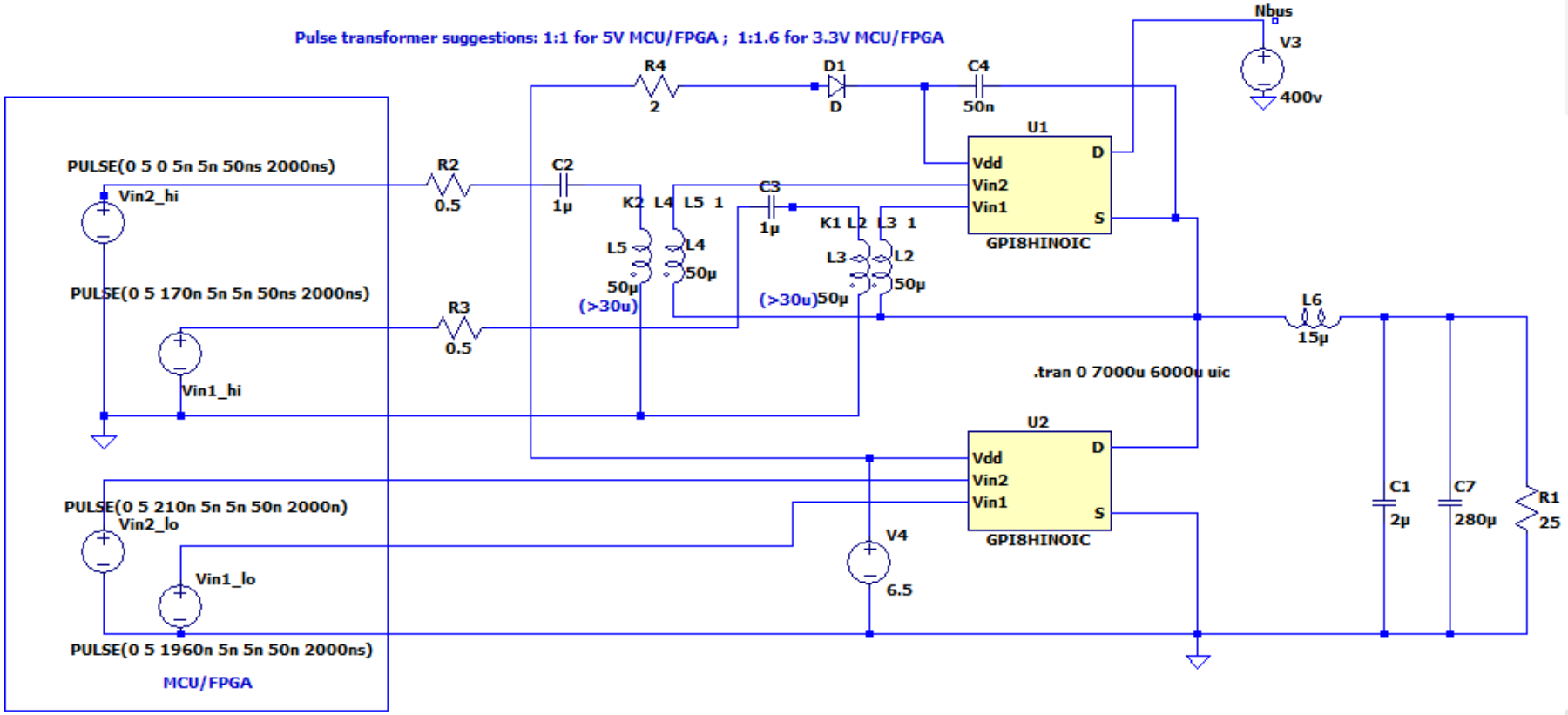
LLC DC-DC Converter (400-40V)(1MHz)



CCM Buck Converter (400-40V)(500KHz)



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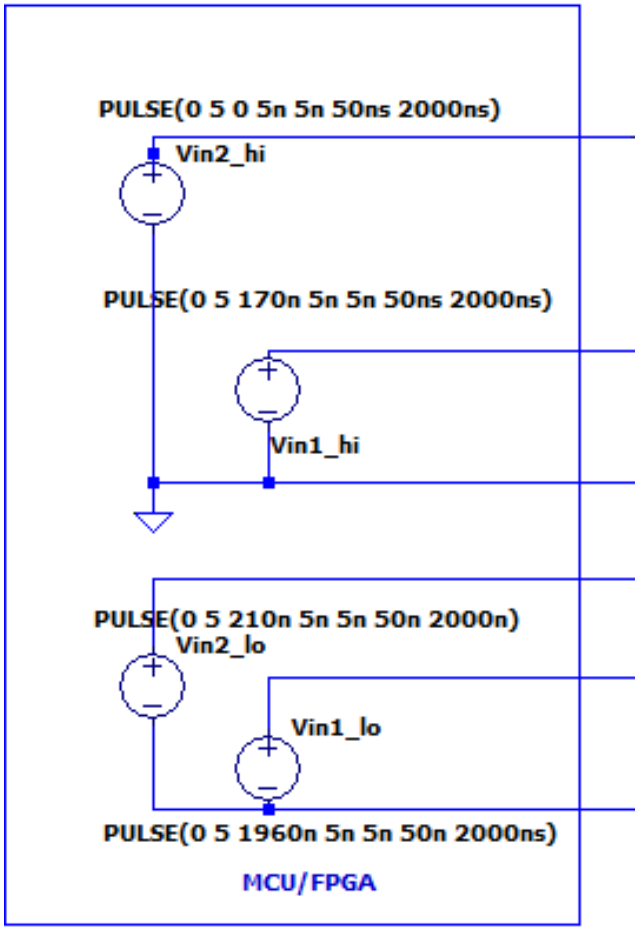
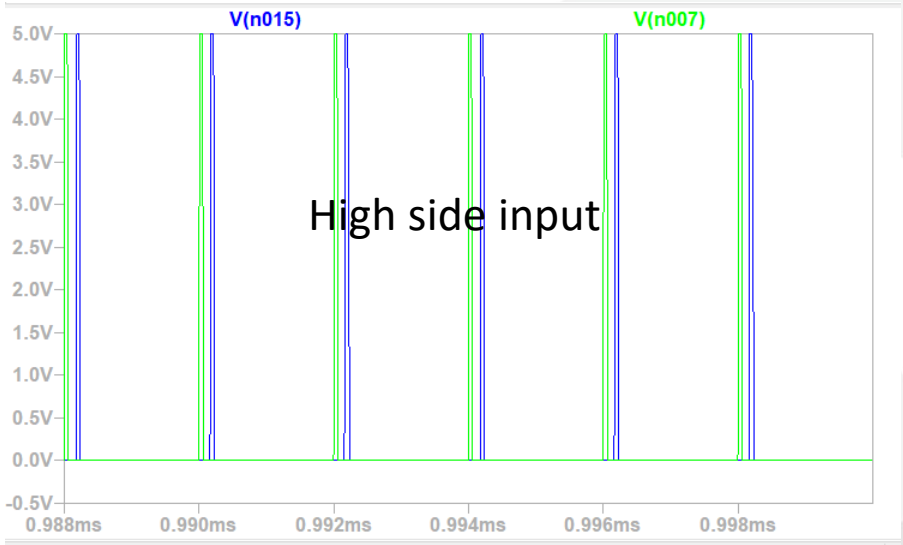
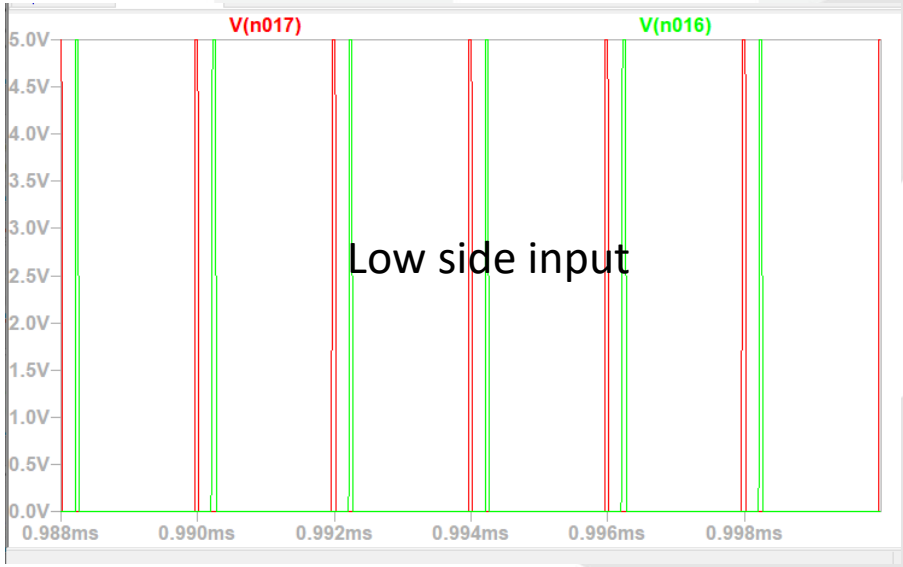
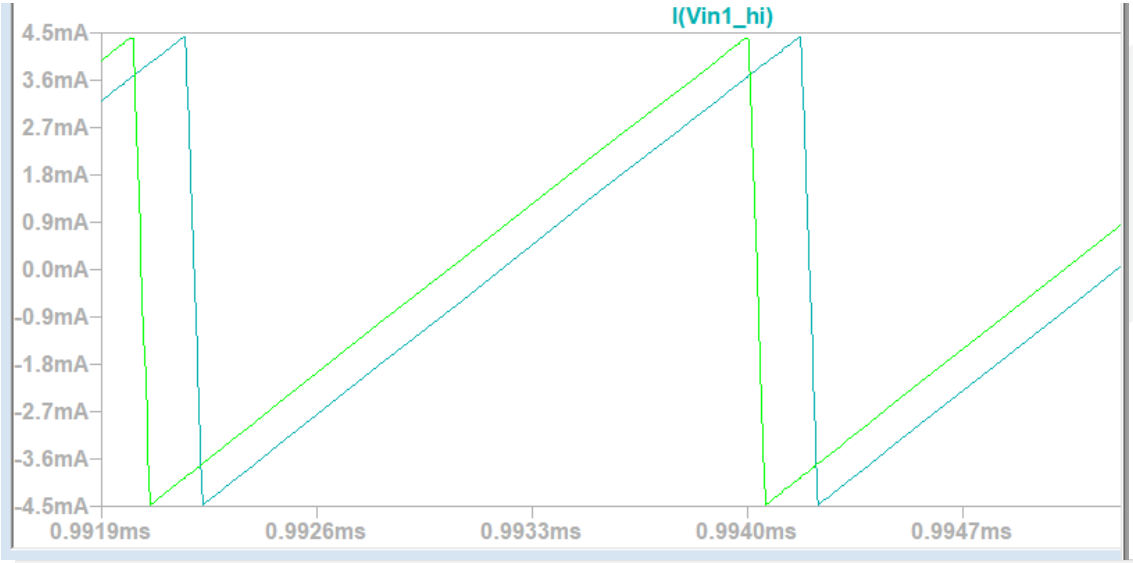


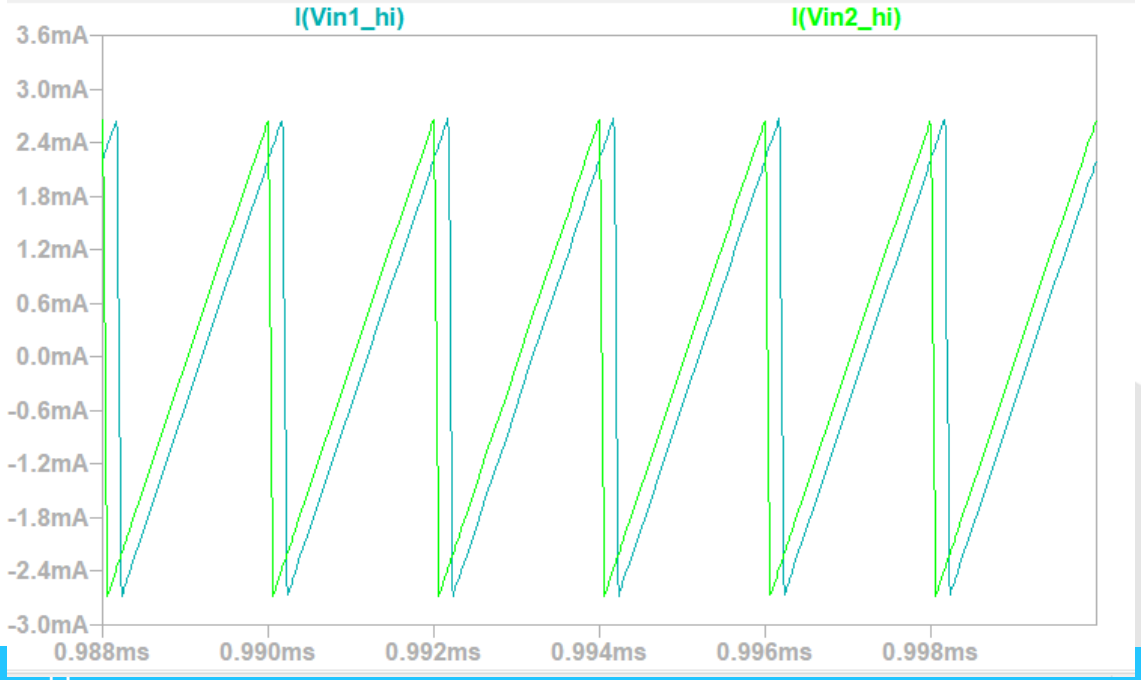




Primary transformer current needed from MCU/FPGA

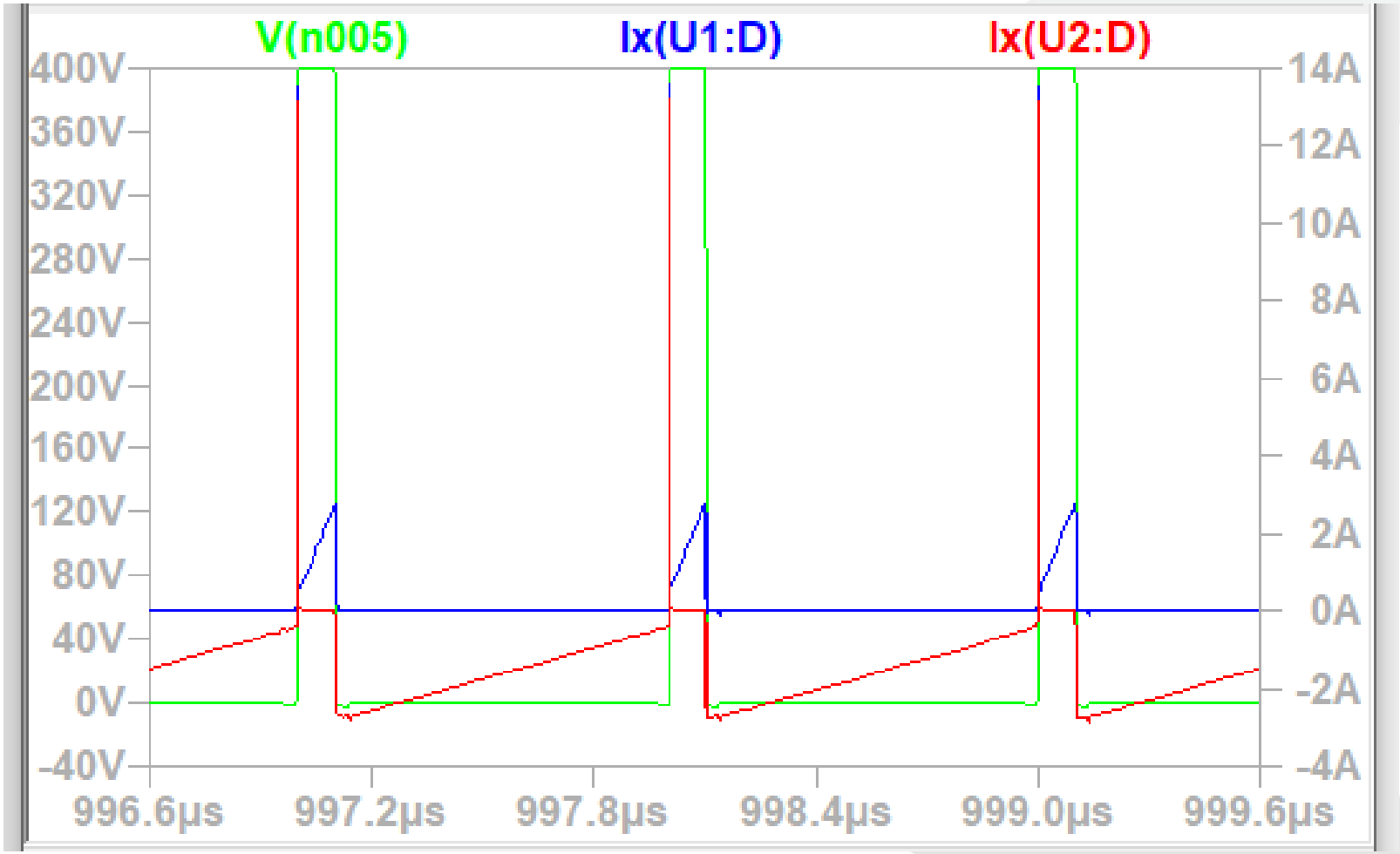


30uH:30uH

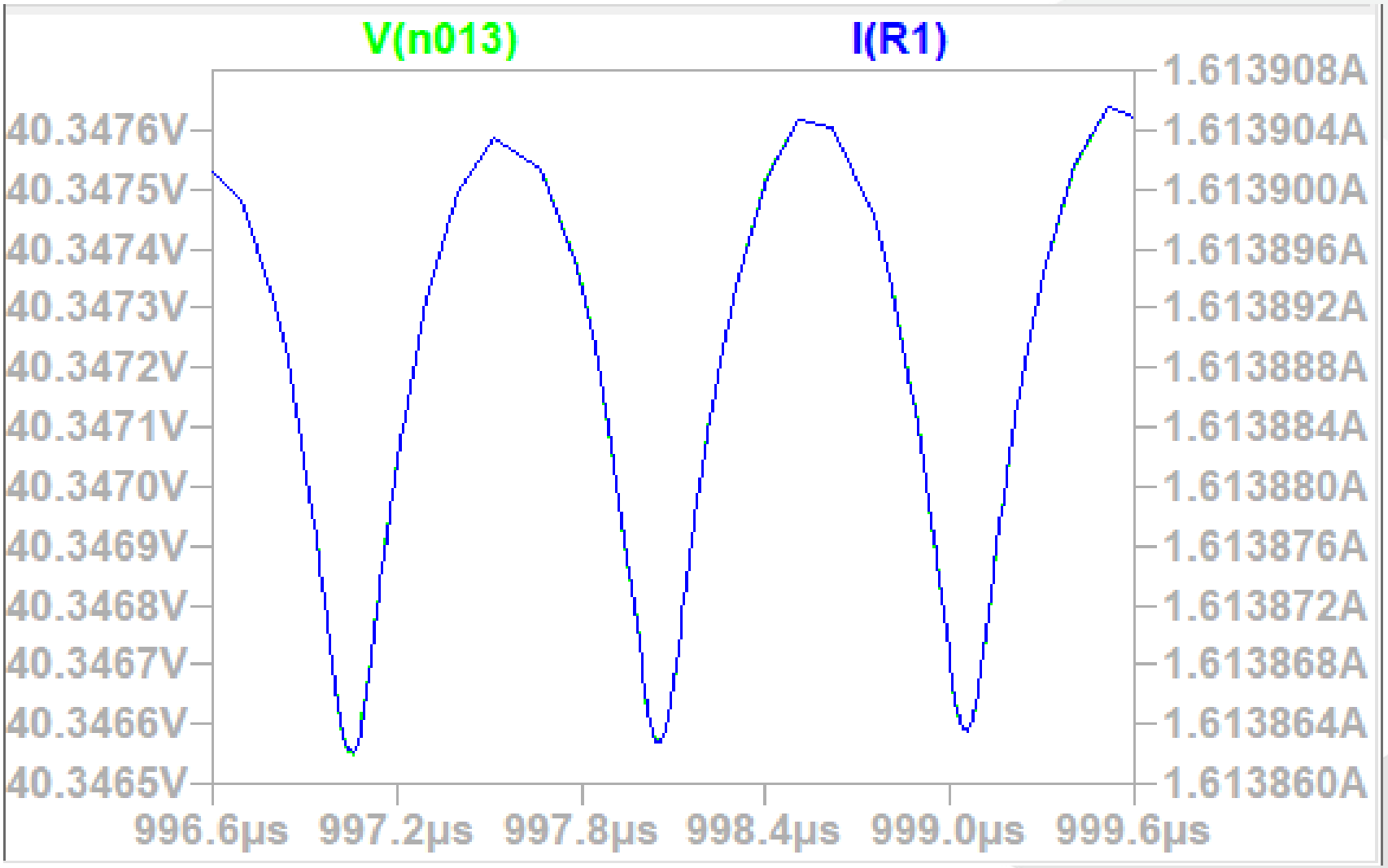


50uH:50uH

Switching point voltage and IC drain currents



Output/load voltage and current



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Welcome to GaNPower Half Bridge
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-->> 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!