Analysis of Boost Converter Performance Attributes from Data Provided by Mamarts on Cadence Forums[1]
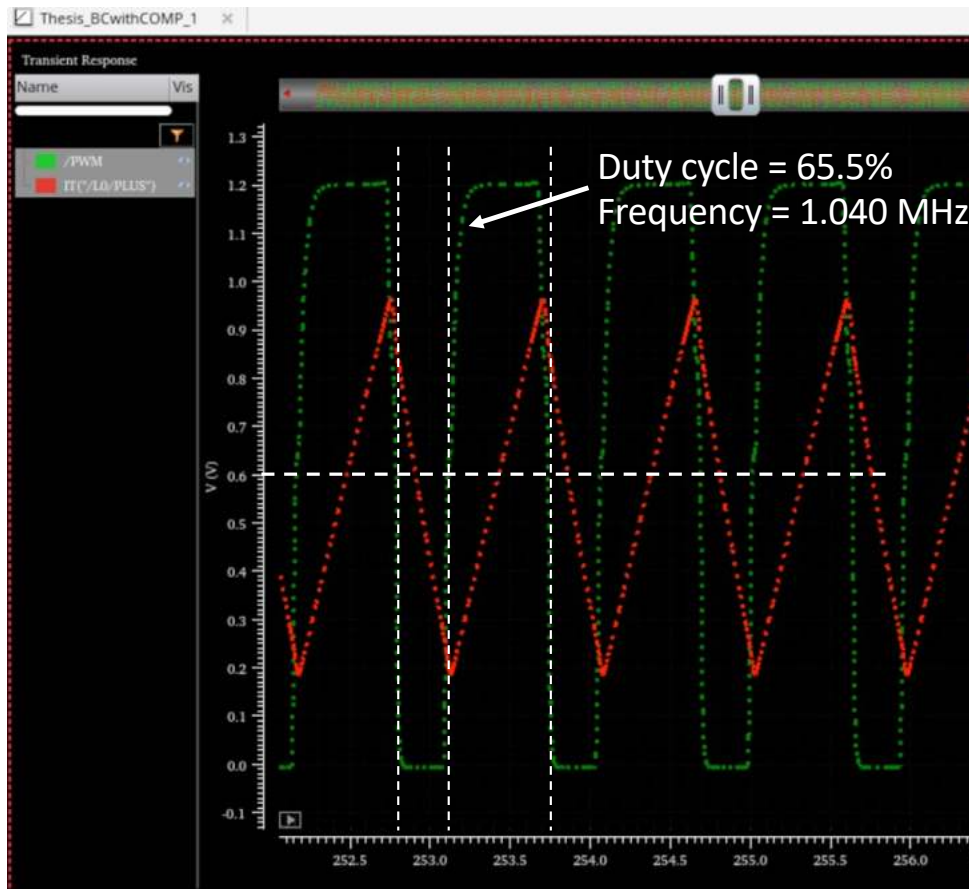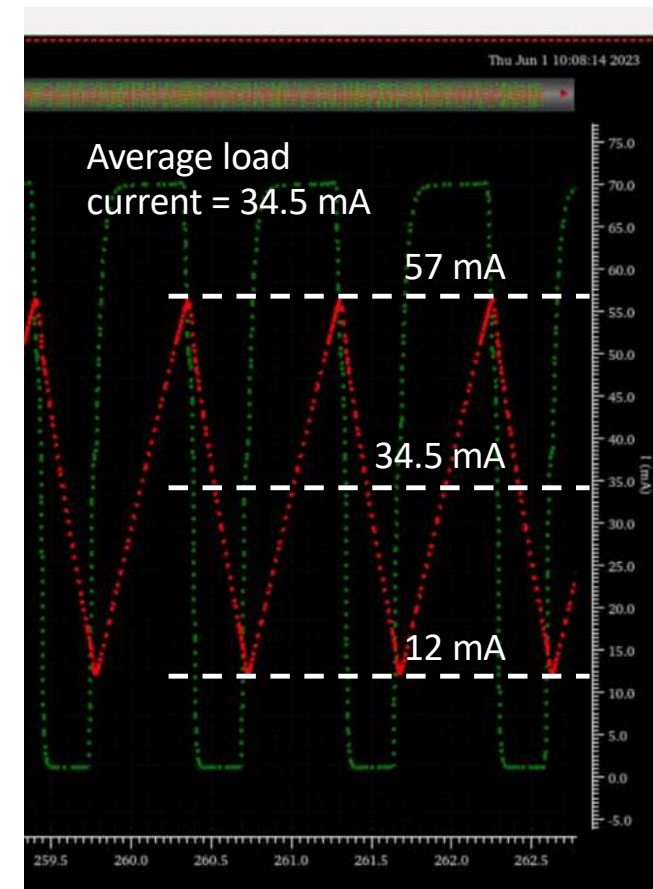
[1] https://community.cadence.com/cadence_technology_forums/f/custom-ic-design/57450/boost-converter-design-help
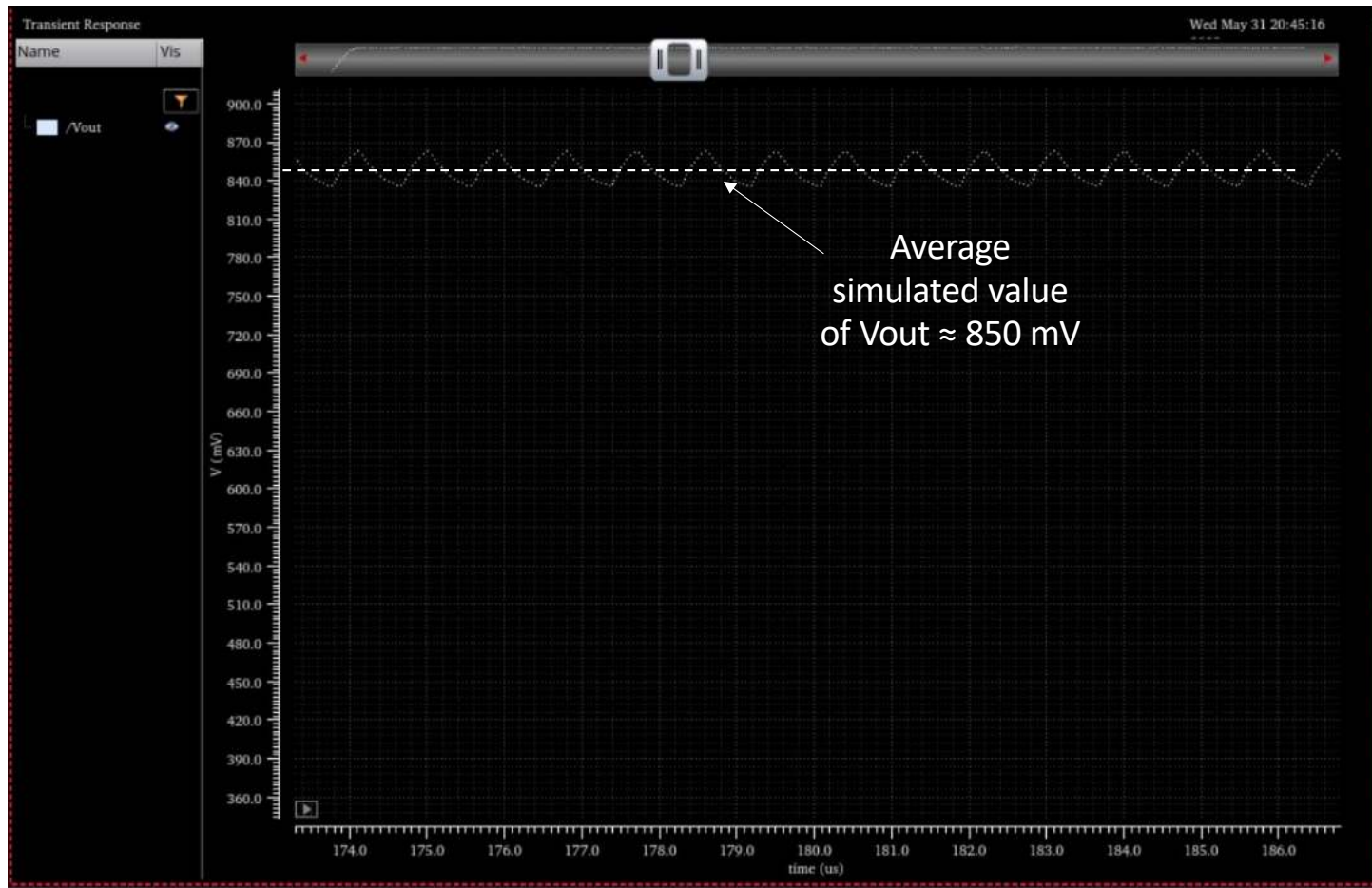
Switching Waveform Analysis

Inductor Current Analysis

Duty cycle = 65.5%
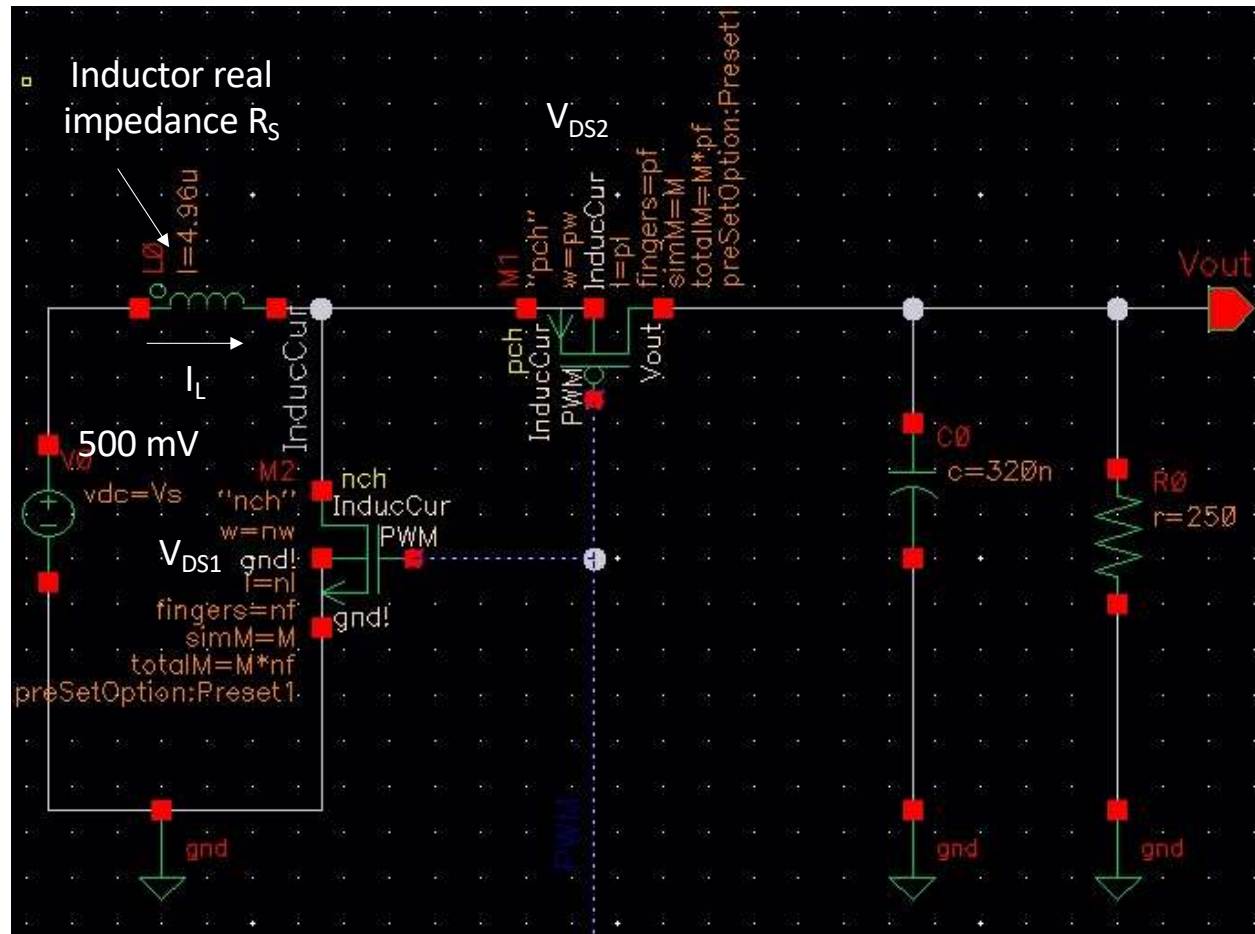Frequency = 1.040 MHz

Average load
current = 34.5 mA

57 mA

34.5 mA

12 mA

Analysis of Boost Converter Simulated Output Voltage Waveform

Boost Converter Component Values used in Deriving Output Voltage in Continuous Mode of Operation

Expected Boost Converter Output Voltage in Continuous Mode of Operation for Chosen Parameters

$$V_{out} = \frac{V_{in} - I_L R_s}{1 - D_u} - V_{DS2} - V_{DS1} \frac{D_u}{1 - D_u}$$

Equation (1) derived
from reference [2]

Case 1:
Your components with my estimates
for vds and rs

Parameter	Value	Units
vin	0.5000	Volts
iload	0.0345	A
rs	2.0000	ohms
duty_cycle	0.6550	
vds1	0.1000	Volts
vds2	0.1000	Volts

vout	**0.9594**	**Volts**

Value of 959 mV is somewhat close
to your measured value of ≈ 850 mV

Case 2:
"ideal" components
(vds = 0, rs = 0)

Parameter	Value	Units
vin	0.5000	Volts
iload	0.0345	A
rs	0.0000	ohms
duty_cycle	0.6550	
vds1	0.0000	Volts
vds2	0.0000	Volts

vout	**1.4493**	**Volts**

Case 3:
Your components,
optimized duty cycle, with my estimates
for vds and rs

Parameter	Value	Units
vin	0.5000	Volts
iload	0.0345	A
rs	2.0000	ohms
duty_cycle	0.8680	
vds1	0.1000	Volts
vds2	0.1000	Volts

vout	**2.5076**	**Volts**

Increasing duty cycle to 86.8% sets
value close to desired value of 2.50 V

On-line Boost Converter Design Example: 0.50 V input/2.50 V output, 37.5 mV Inductor current and 100 mV VDS[3]

Topology: Boost

Inductance based on the specified minimum load current.

Item	Value	Units
Volts In	0.50	V
Volts Out	2.50	V
Load Current	37.5e-03	A
Freq.	1000	KHz
Vripple	0.025	V
Duty Cycle	84	%
Ipp Inductor	0.00375	A
Ipk Inductor	0.039375	A
Irms	0.035641443573458	A
L	89.6	uH
C	1.26	uF

Duty cycle to of 84% is quite close to computed value of 86.8% on Page 4 to set vout close to desired value of 2.50 V

[3] https://www.daycounter.com/Calculators/Switching-Converter-Calculator2.phtml