

Initial Design

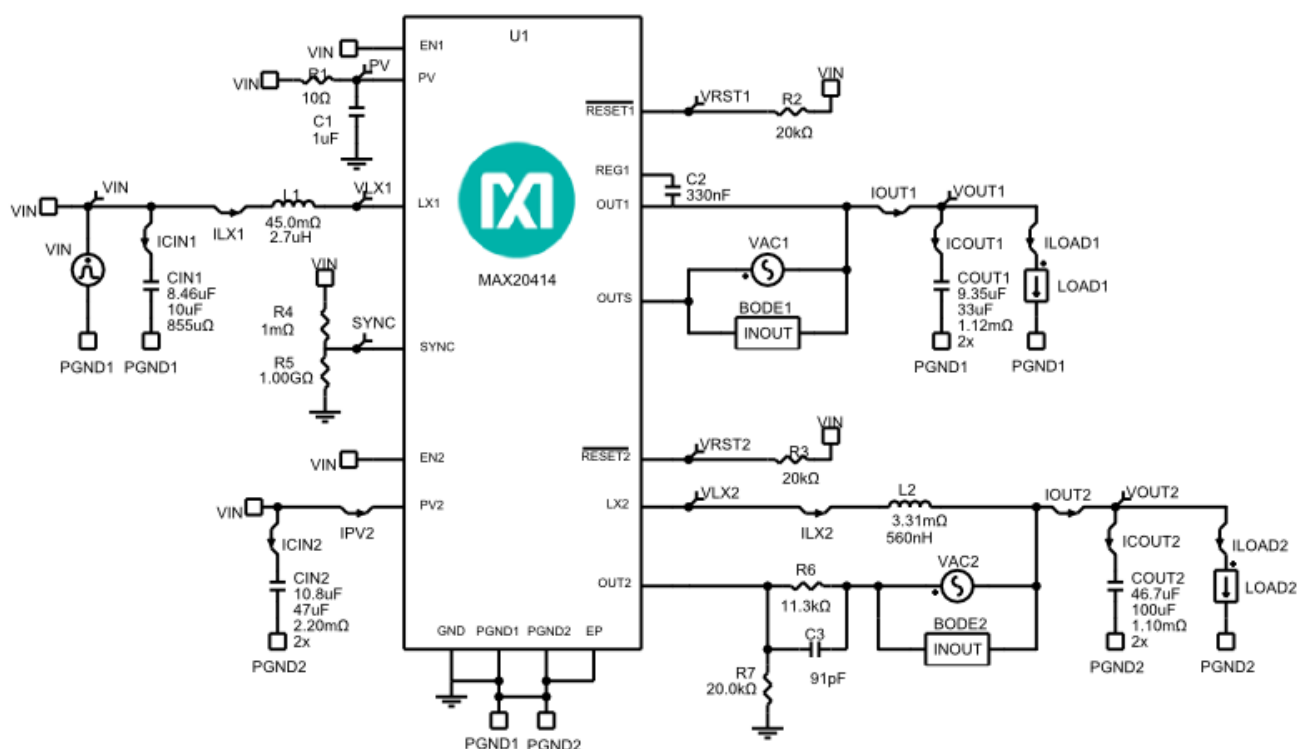
1.0

Design Requirements

Parameter	Value
Min. Input Voltage	3.3V
Max. Input Voltage	3.8V
Typ. Input Voltage	3.6V
Input Voltage Ripple	1%
Boost Output Voltage	5V
Boost Output Current	0.375A
Boost Output Voltage Ripple	1%
Boost Load Step Start Current	0.375A
Boost Load Step Current	0.1875A
Boost Load Step Edge Rate	1A/μs
Boost Output Voltage Overshoot	1%
Boost Output Voltage Undershoot	1%
Buck Output Voltage	1.25V
Buck Output Current	1.5A
Buck Output Voltage Ripple	1%
Buck Load Step Start Current	1.5A
Buck Load Step Current	0.75A
Buck Load Step Edge Rate	1A/μs
Buck Output Voltage Overshoot	1%
Buck Output Voltage Undershoot	1%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Ambient Temperature	25°C

Parameter	Value
Method of Operation	Forced-PWM Mode
Switching Frequency	2.2MHz
Boost Inductor Current Ratio (LIR)	0.3
Buck Inductor Current Ratio (LIR)	0.3

Schematic



Operating Modes

1. SKIP Mode - Connect SYNC I/O pin to GND or leave unconnected
2. FPWM Mode - Connect SYNC I/O pin to PV
3. External PWM - Connect SYNC I/O pin to external clock

Note 1: When Skip mode is selected, AC Loop simulation may fail if the Load Current is low enough to engage Skip mode, because Skip mode is hysteretic and there is no AC Loop
Note 2: OUTS pin is a fictitious pin and therefore does not exist in actual IC package

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX20414ATGA/V+	User-Defined	IC

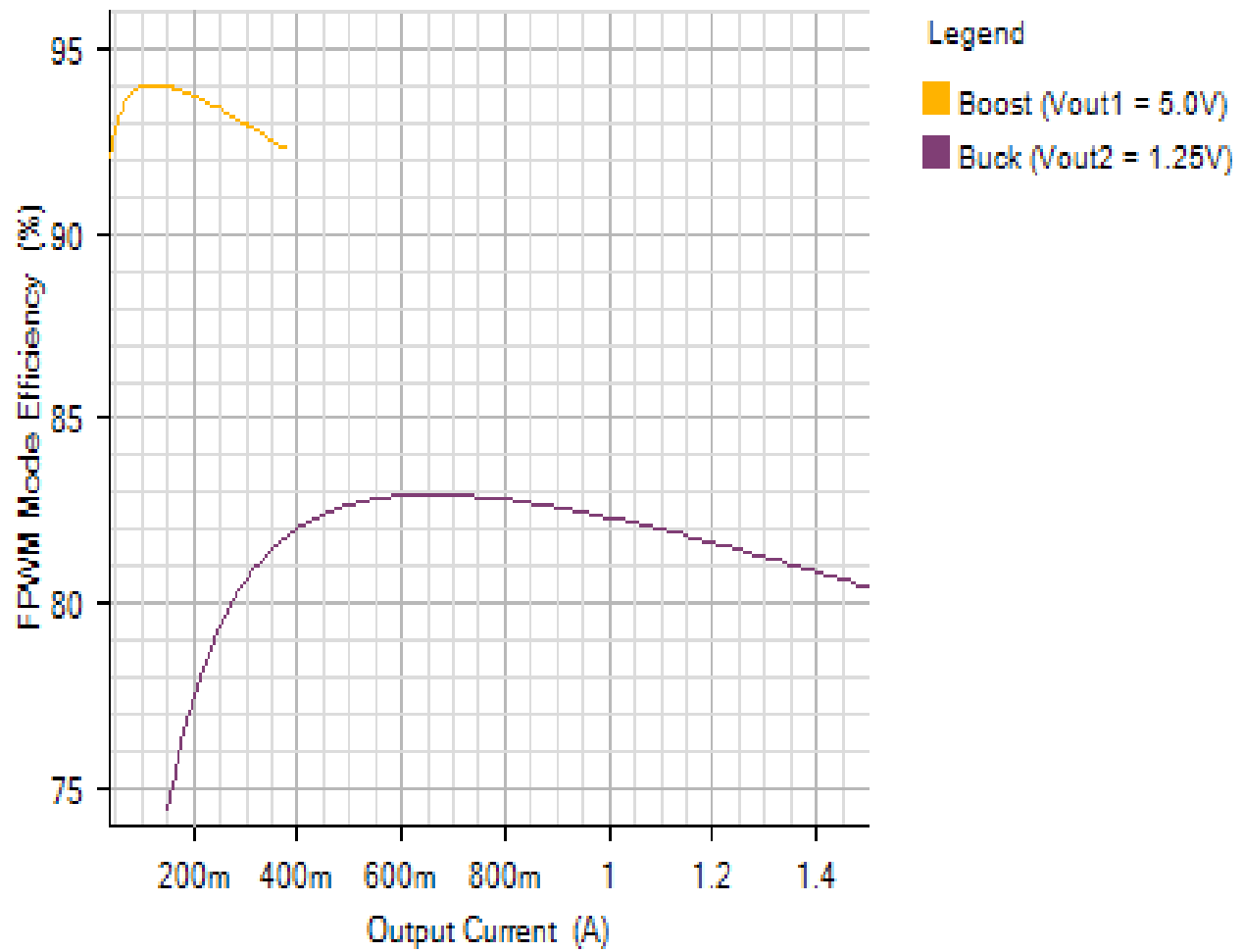
C1	1	CC0603KRX7R7BB105	Yageo	Cap Ceramic 1uF 16V X7R 10% Pad SMD 0603 125°C T/R
C2	1	C0603X334J8RACTU	KEMET Corporation	Cap Ceramic 0.33uF 10V X7R 5% Pad SMD 0603 Flexible Termination 125°C Automotive Medical T/R
C3	1	C0603C910J5GACTU	KEMET Corporation	Cap Ceramic 91pF 50V C0G 5% Pad SMD 0603 125°C T/R
CIN1	1	C2012X7R1A106K125AC	TDK	Cap Ceramic 10uF 10V X7R 10% SMD 0805 125C Plastic T/R
CIN2	2	GRM188R60J476ME15D	Murata	Cap Ceramic 47uF 6.3V 0603 85C
COUT1	2	C2012X5R1A336M125AC	TDK	Cap Ceramic 33uF 10V X5R 20% SMD 0805 85C Plastic T/R
COUT2	2	GRM21BR60J107ME15L	Murata	Cap Ceramic 100uF 6.3V 0805 85C
L1	1	744774027	Würth Electronics	Inductor 2.7uH 20% 32mOhm 8A Isat 4A Irms
L2	1	XAL6030-561MEB	Coilcraft	Ind Power Shielded 560nH 20% 100KHz 22A T/R
R1	1	NTR04F10R0DTRF	NIC Components	Res Thin Film 0402 10 Ohm 1% 0.063W(1/16W) ±50ppm/°C Epoxy Pad SMD T/R
R2	1	CPF0603F20KC1	TE Connectivity	Res Thin Film 0603 20K Ohm 1% 0.063W(1/16W) ±50ppm/°C Epoxy Pad SMD T/R
R3	1	CPF0603F20KC1	TE Connectivity	Res Thin Film 0603 20K Ohm 1% 0.063W(1/16W) ±50ppm/°C Epoxy Pad SMD T/R
R6	1	NTR04F1132DTRF	NIC Components	Res Thin Film 0402 11.3K Ohm 1% 0.063W(1/16W) ±50ppm/°C Epoxy Pad SMD T/R
R7	1	CPF0603F20KC1	TE Connectivity	Res Thin Film 0603 20K Ohm 1% 0.063W(1/16W) ±50ppm/°C Epoxy Pad SMD T/R

Simulation Results

Efficiency - Thu Jan 03 2019 14:07:40

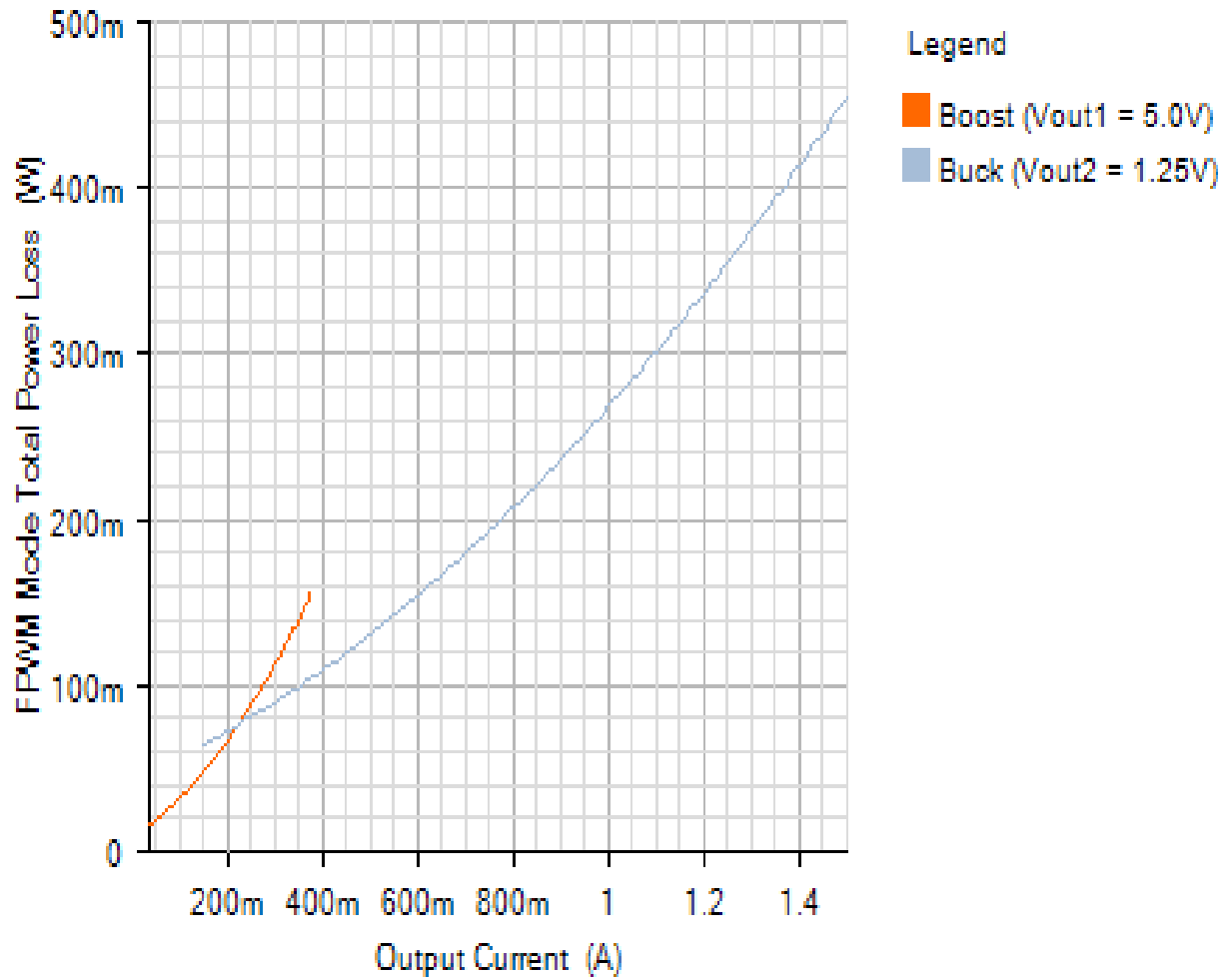
EFFICIENCY

Default



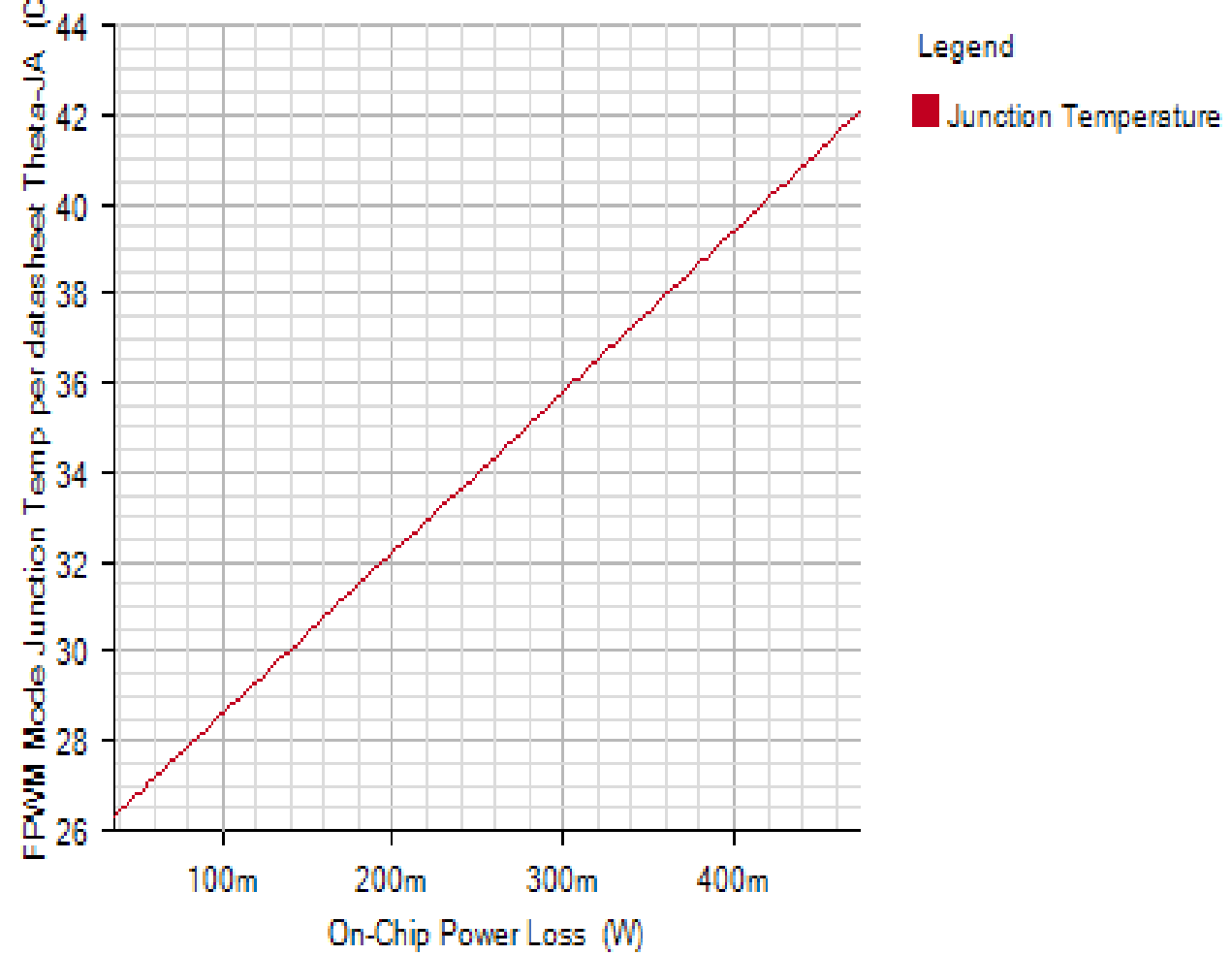
TOTAL_POWER_LOSS

Default



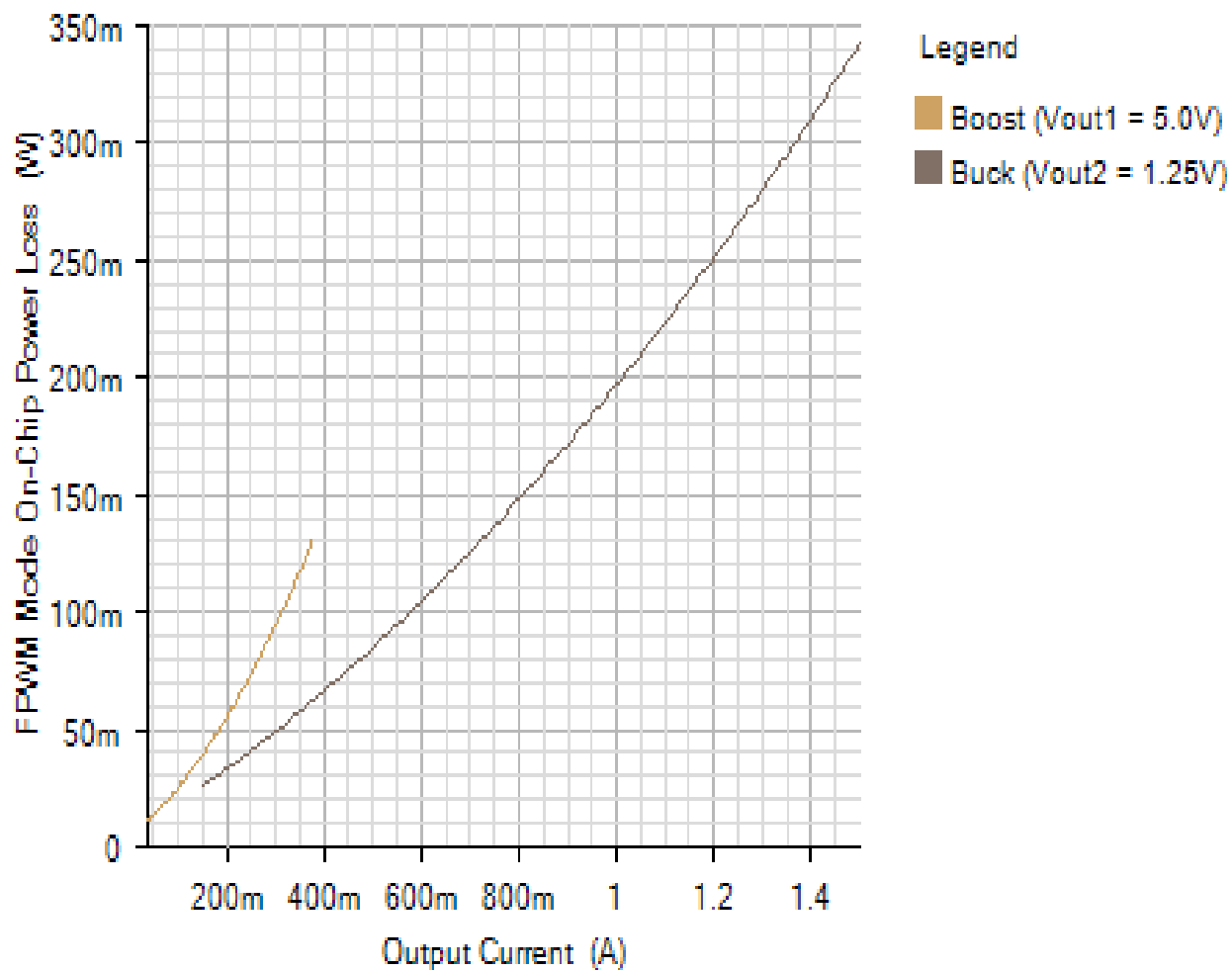
JUNCTION_TEMPERATURE

Default

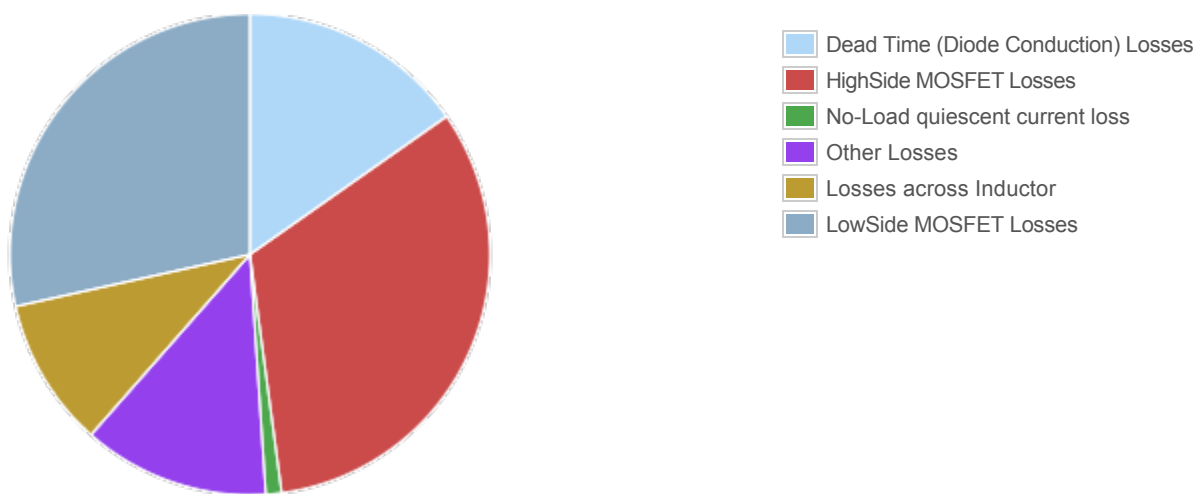


ON-CHIP_POWER_LOSS

Default



Losses



Component

Loss (W)

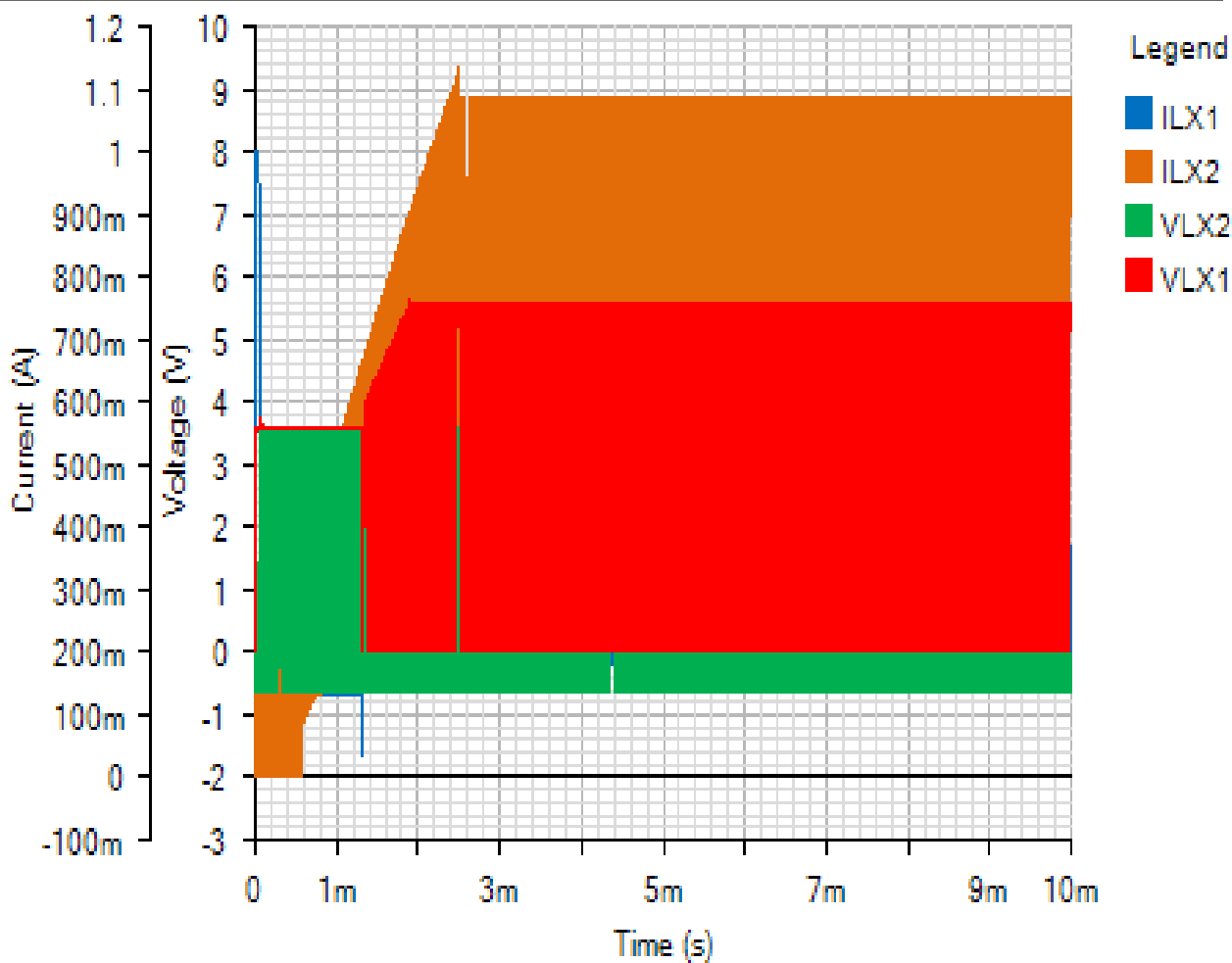
% of total

Component	Loss (W)	% of total
Dead Time (Diode Conduction) Losses	0.093362	15.3
HighSide MOSFET Losses	0.199343	32.6
No-Load quiescent current loss	0.00648	1.1
Other Losses	0.076807	12.6
Losses across Inductor	0.061238	10
LowSide MOSFET Losses	0.173996	28.5
Total	0.611226	100

Start Up - Thu Jan 03 2019 14:07:40

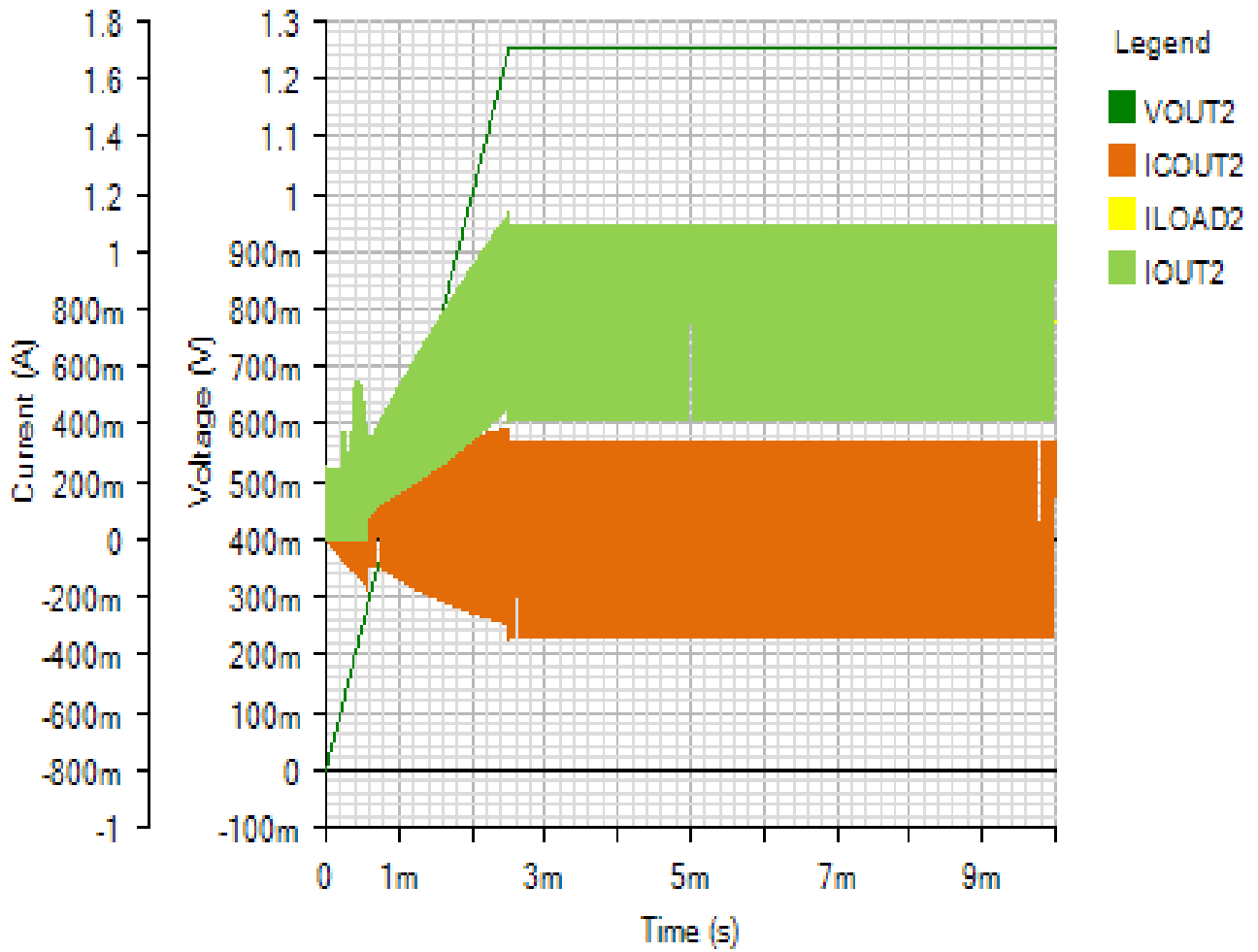
SWITCHING

Default



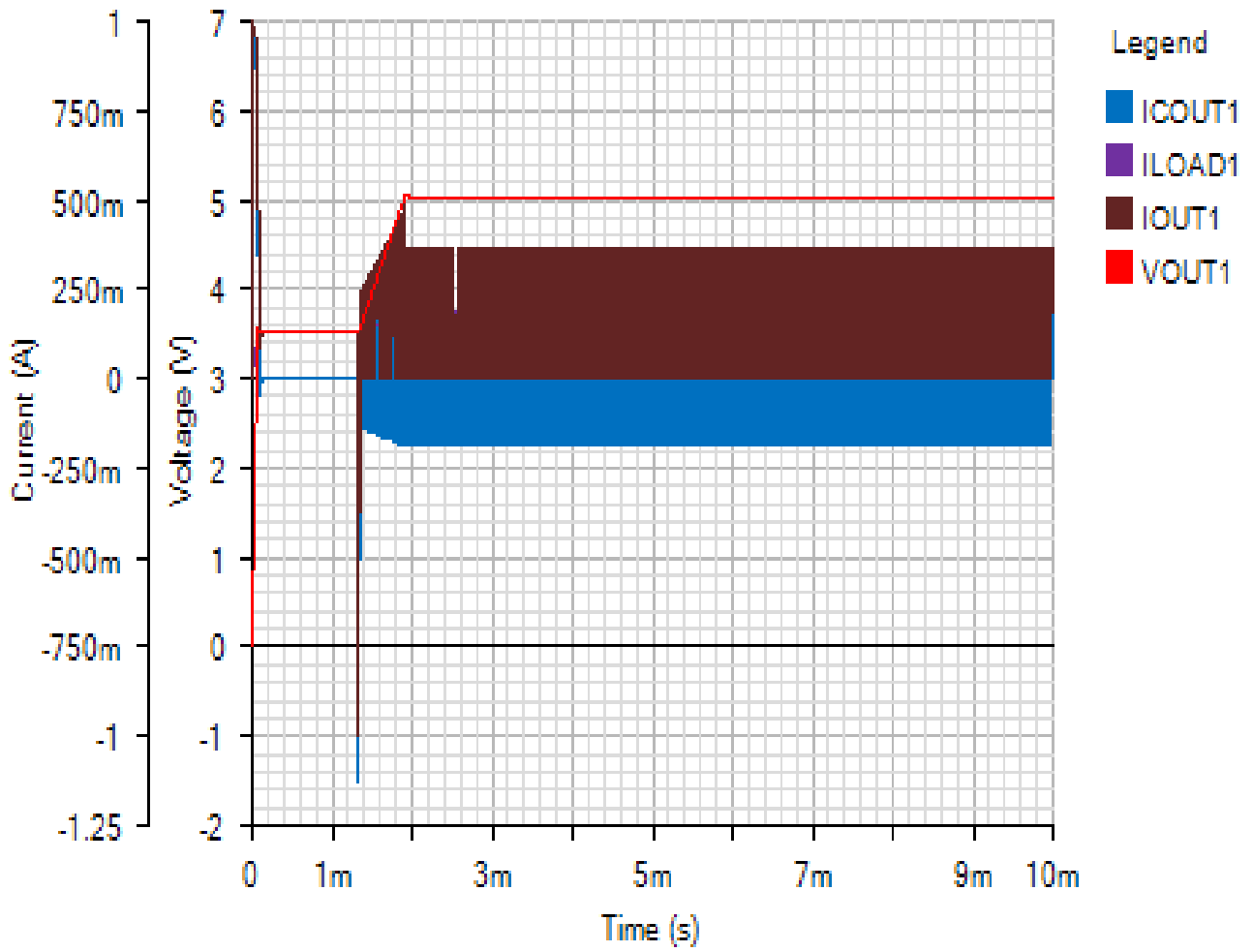
BUCK_OUTPUT

Default



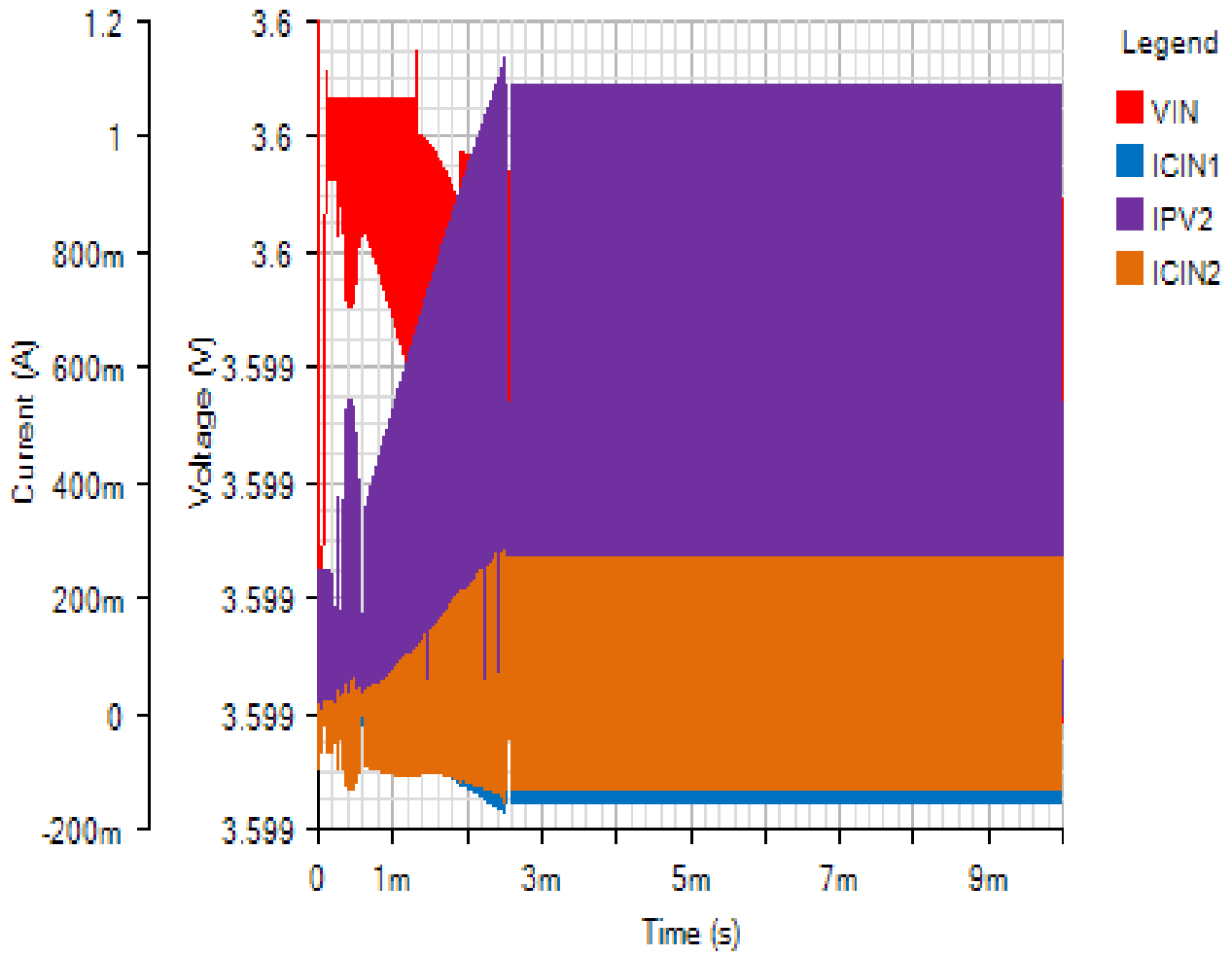
BOOST_OUTPUT

Default



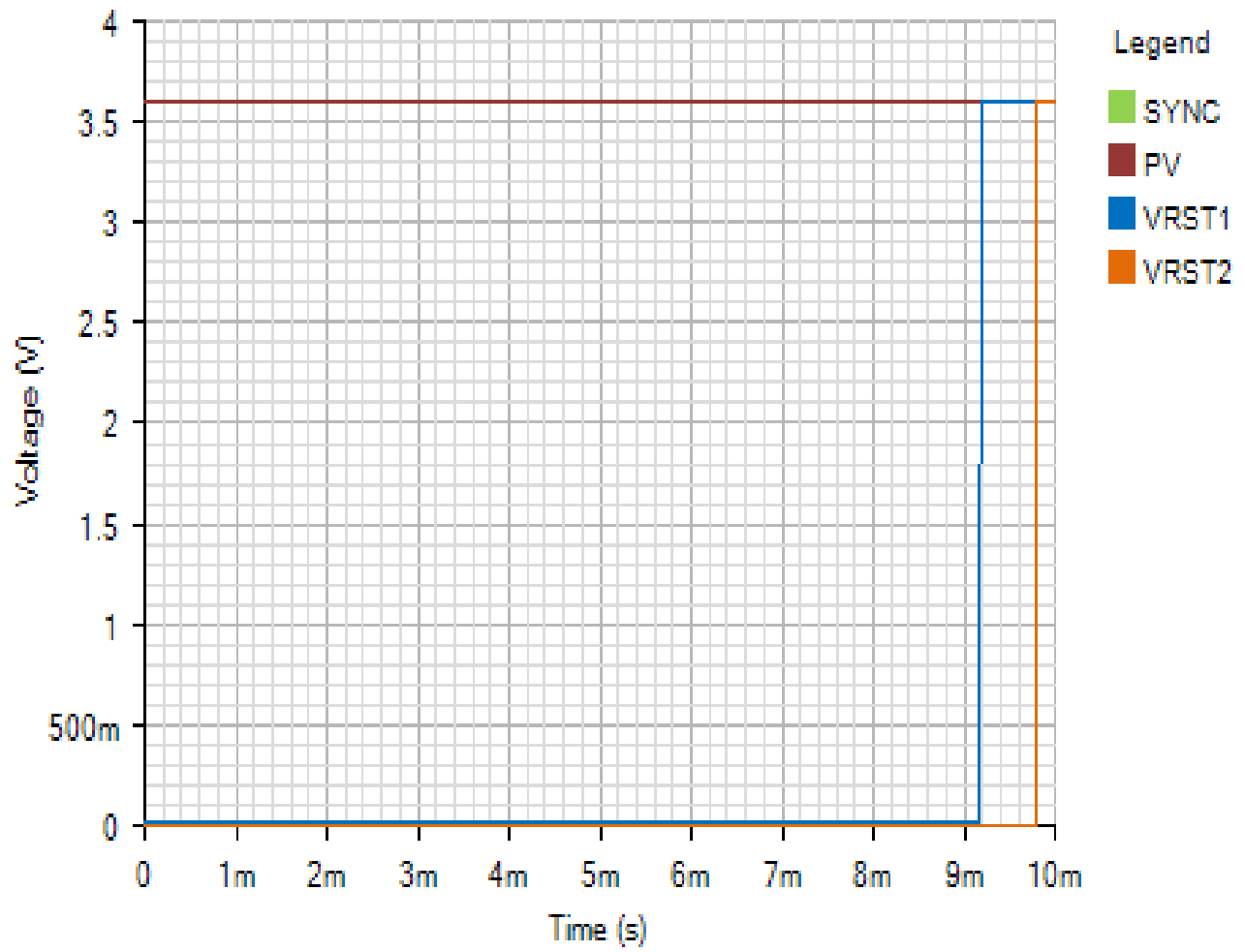
INPUT

Default



IC

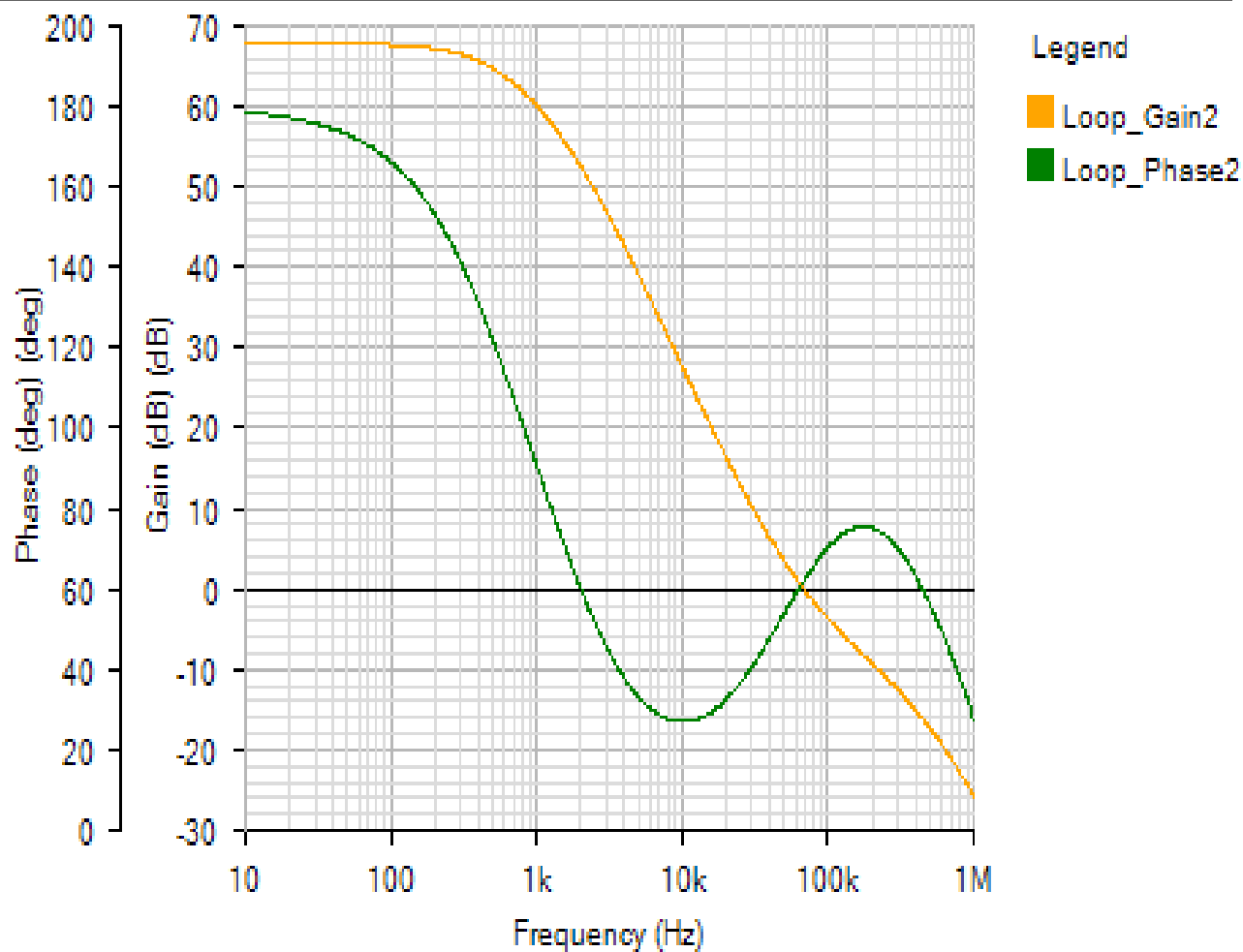
Default



AC Loop - Thu Jan 03 2019 14:07:40

BODE2

Default

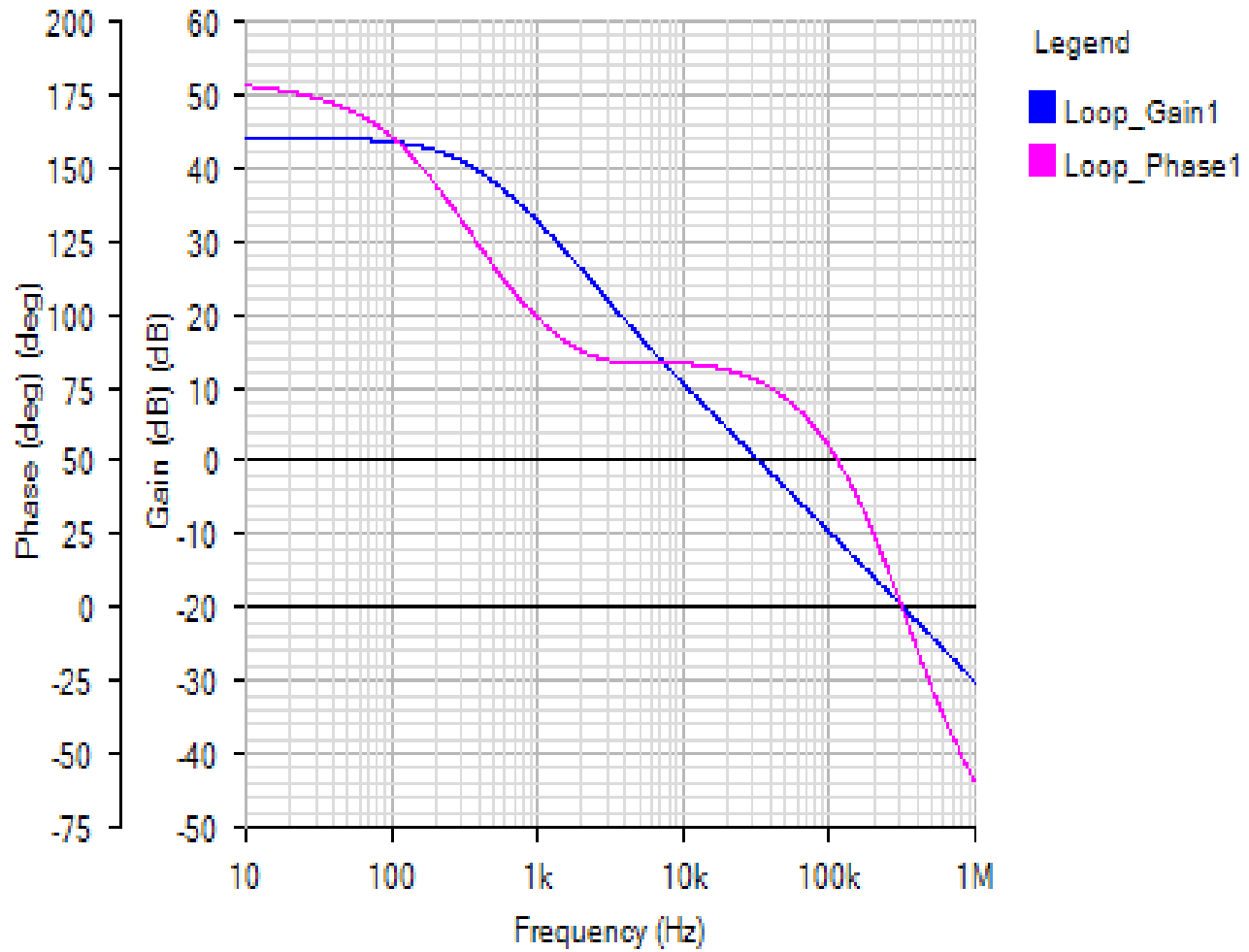


Phase Margin (output #2): 62.15° at a crossover frequency of 68.5kHz

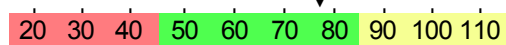


BODE1

Default



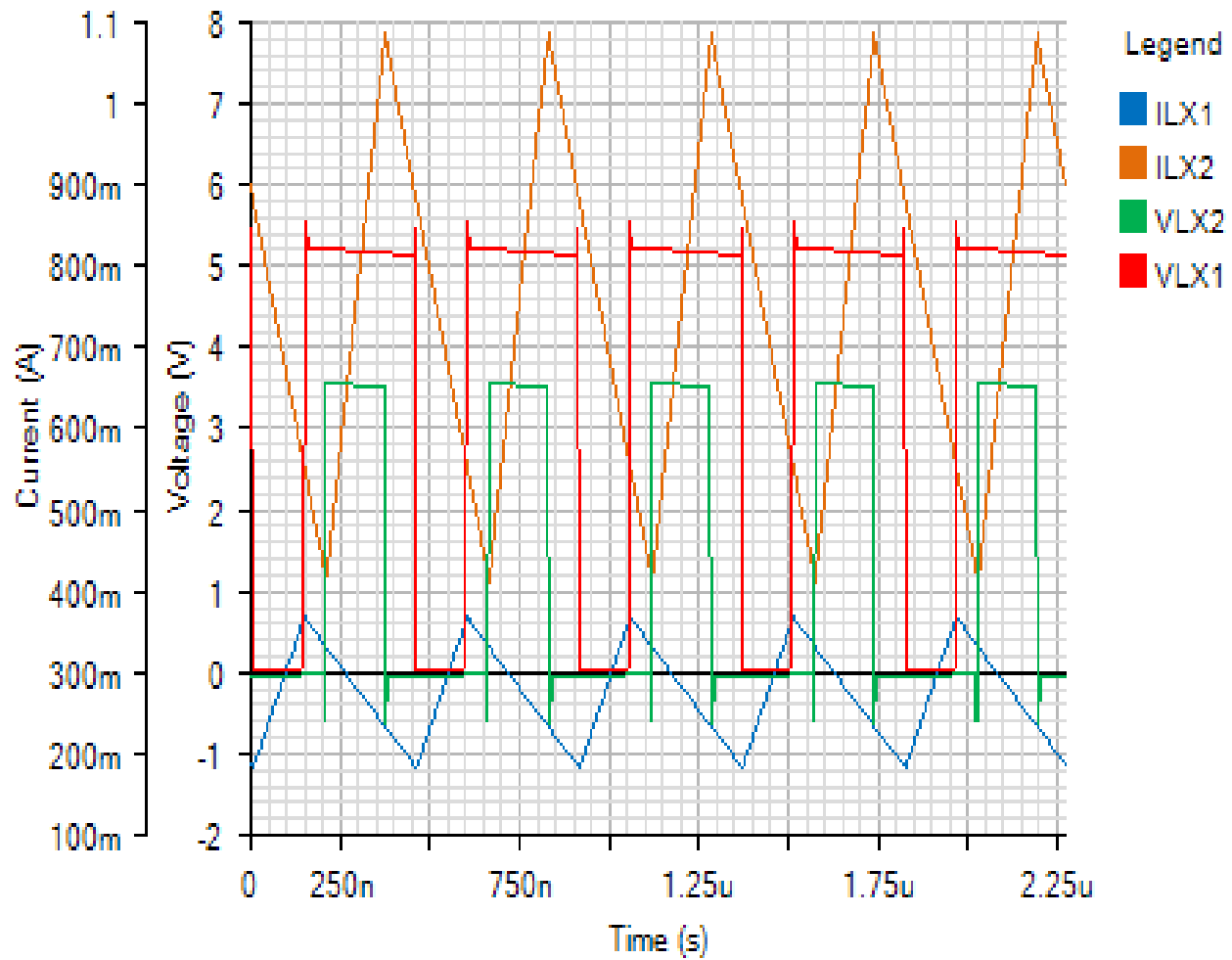
Phase Margin (output #1): 77.11° at a crossover frequency of 33kHz



Steady State - Thu Jan 03 2019 14:07:40

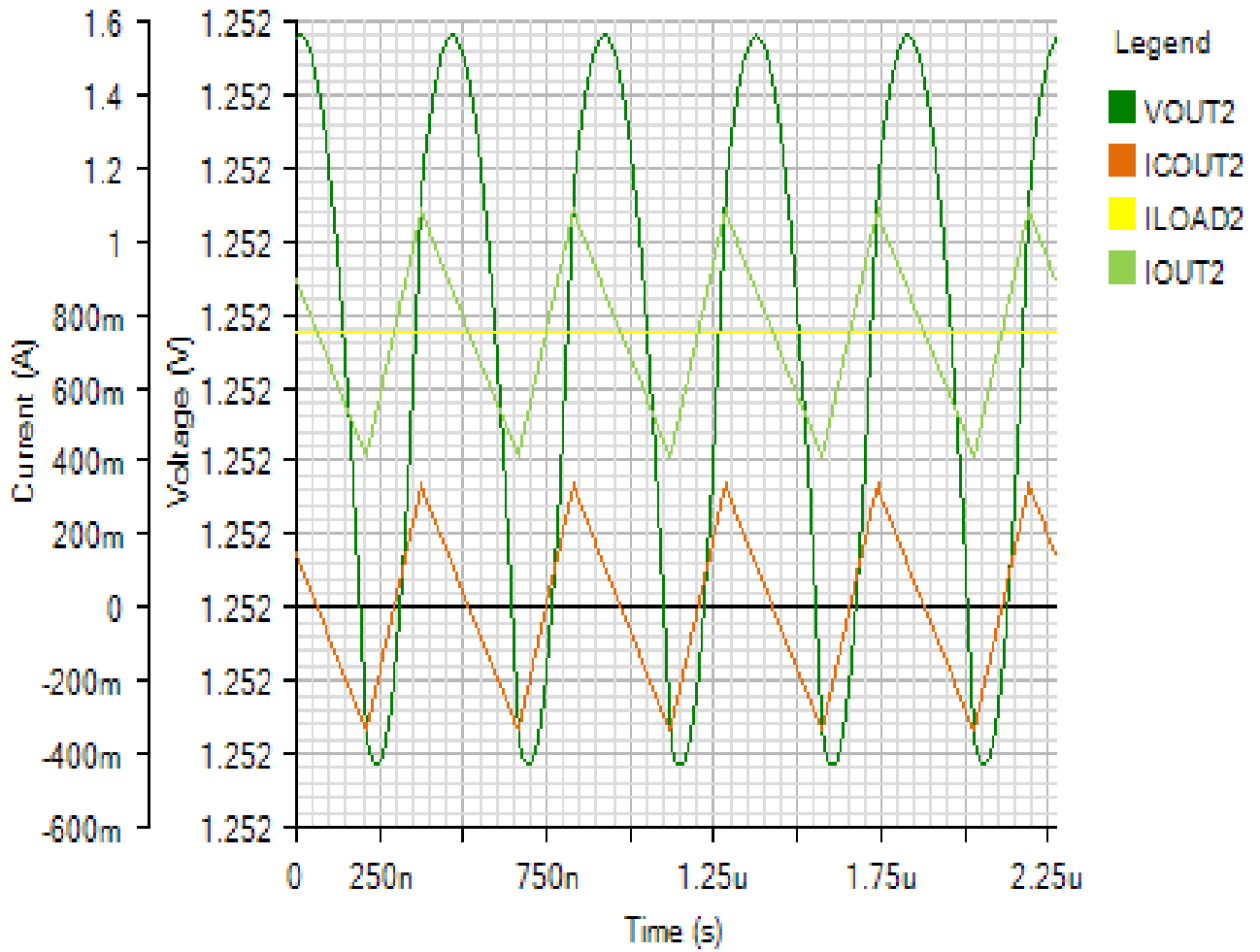
SWITCHING

Default



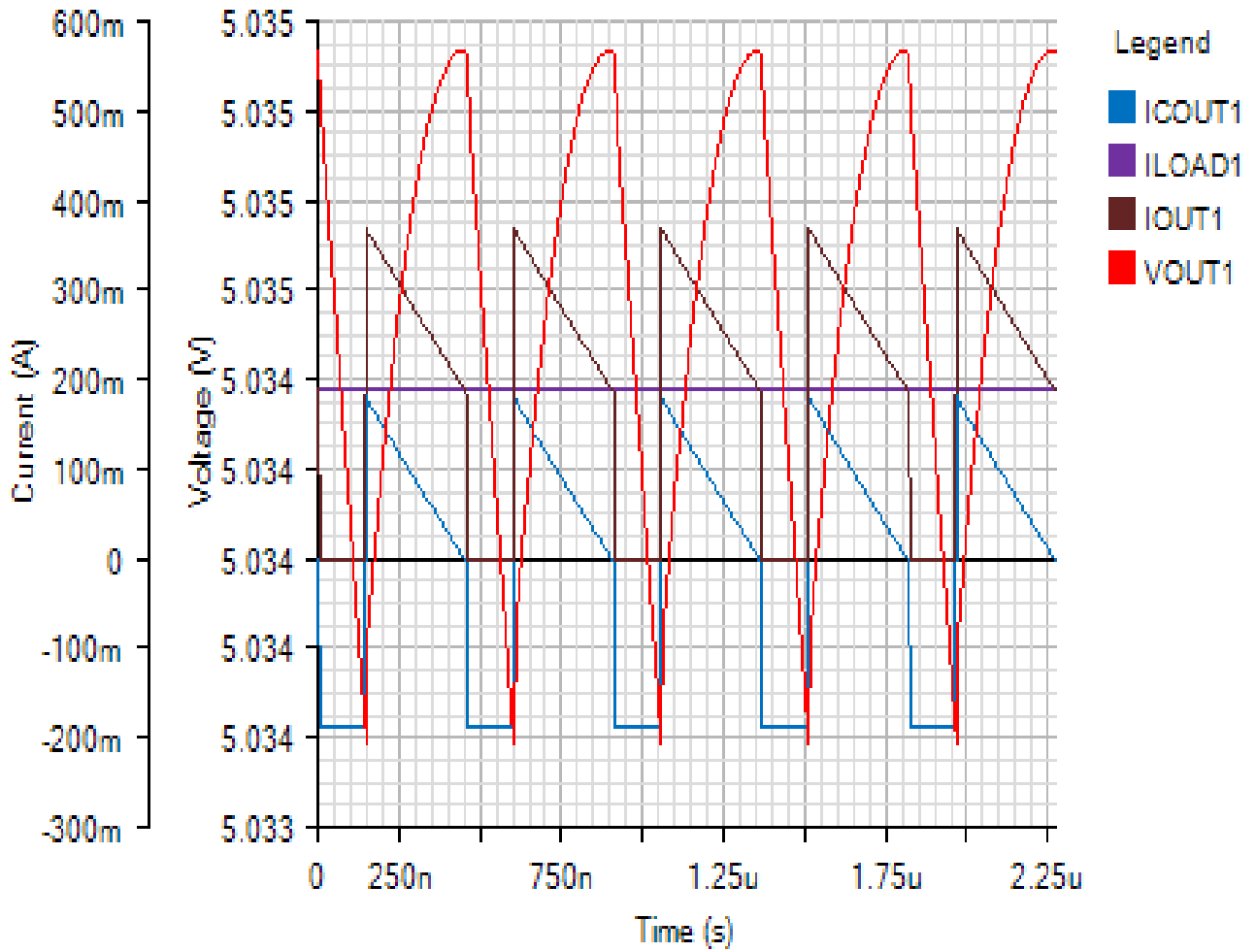
BUCK_OUTPUT

Default



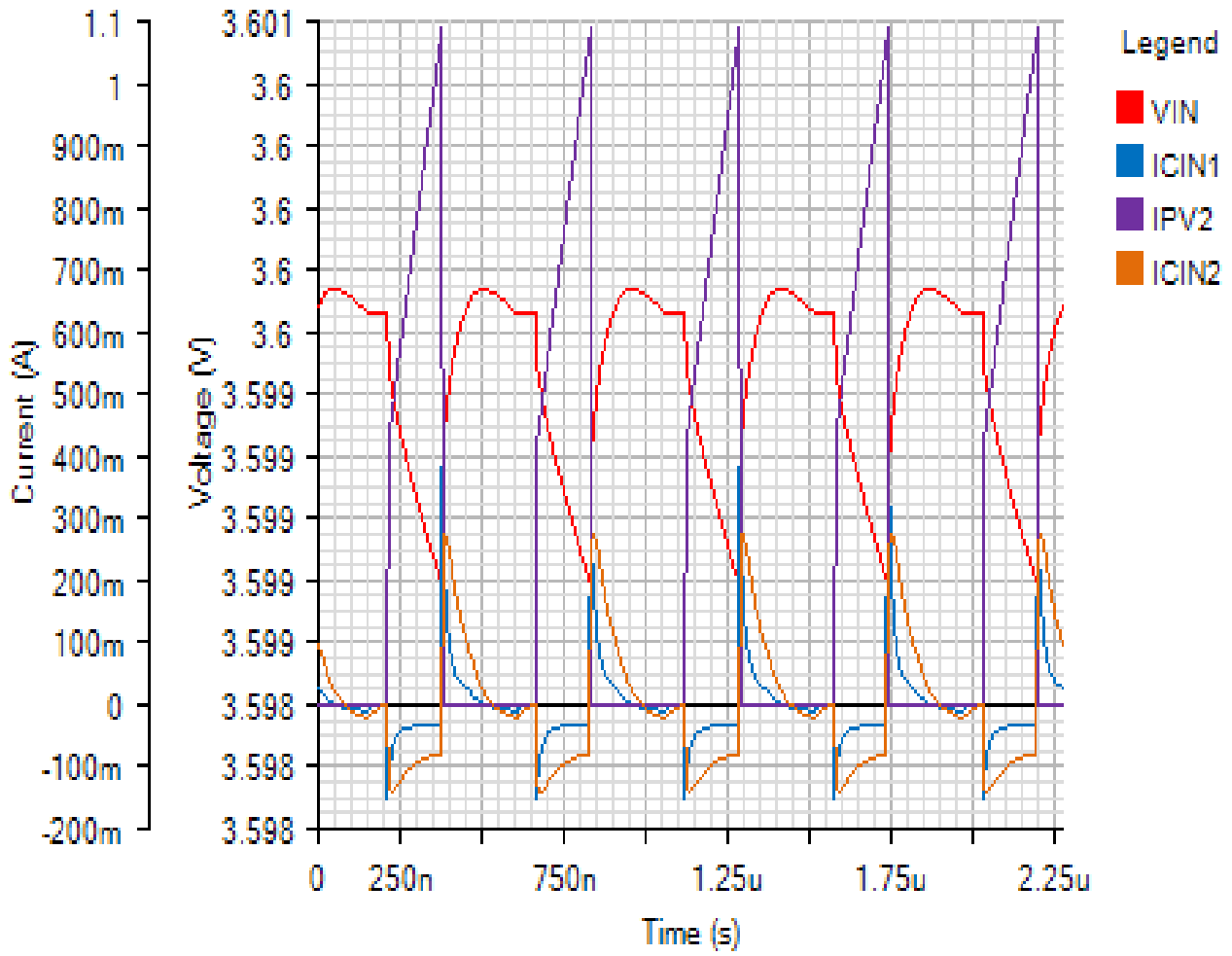
BOOST_OUTPUT

Default



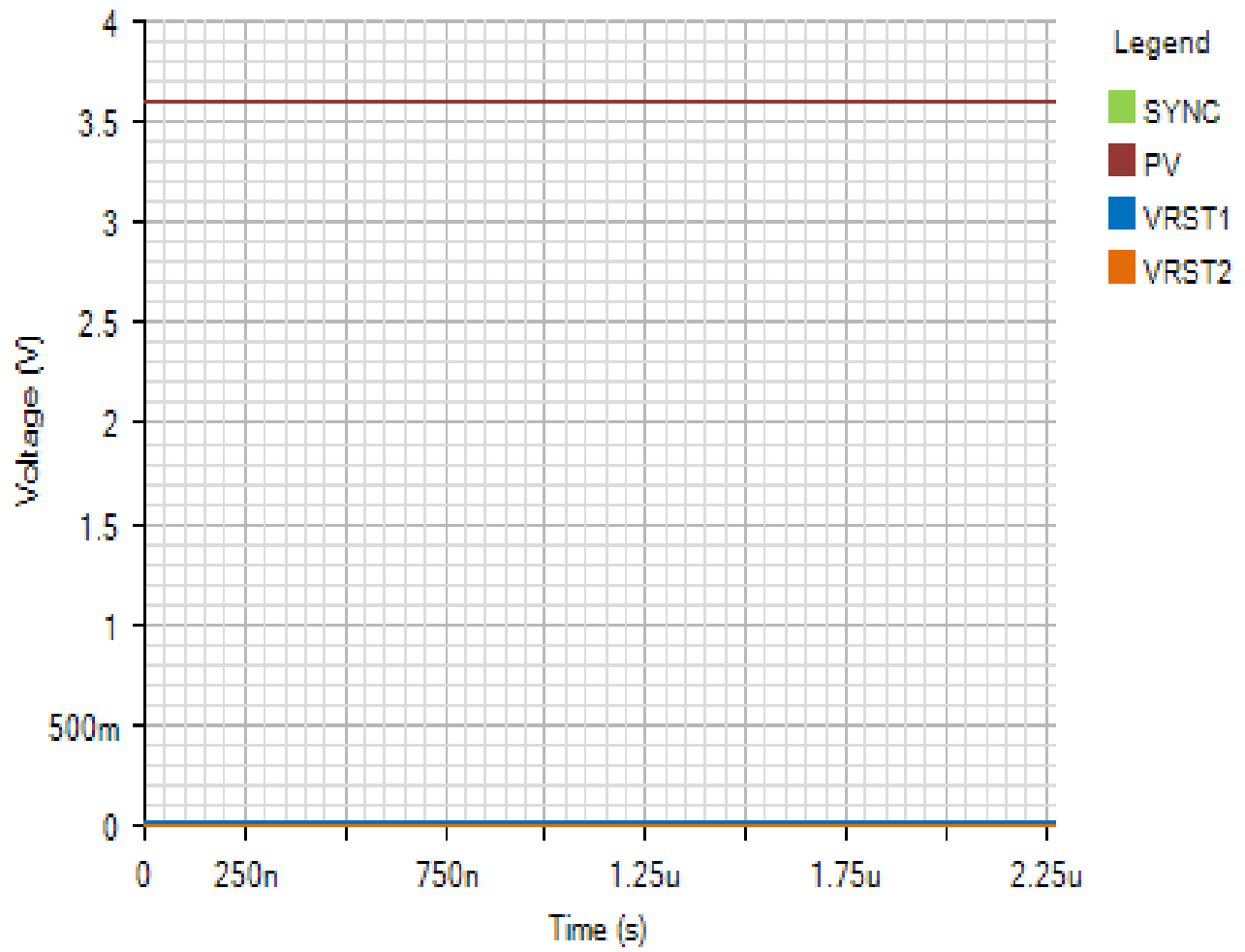
INPUT

Default



IC

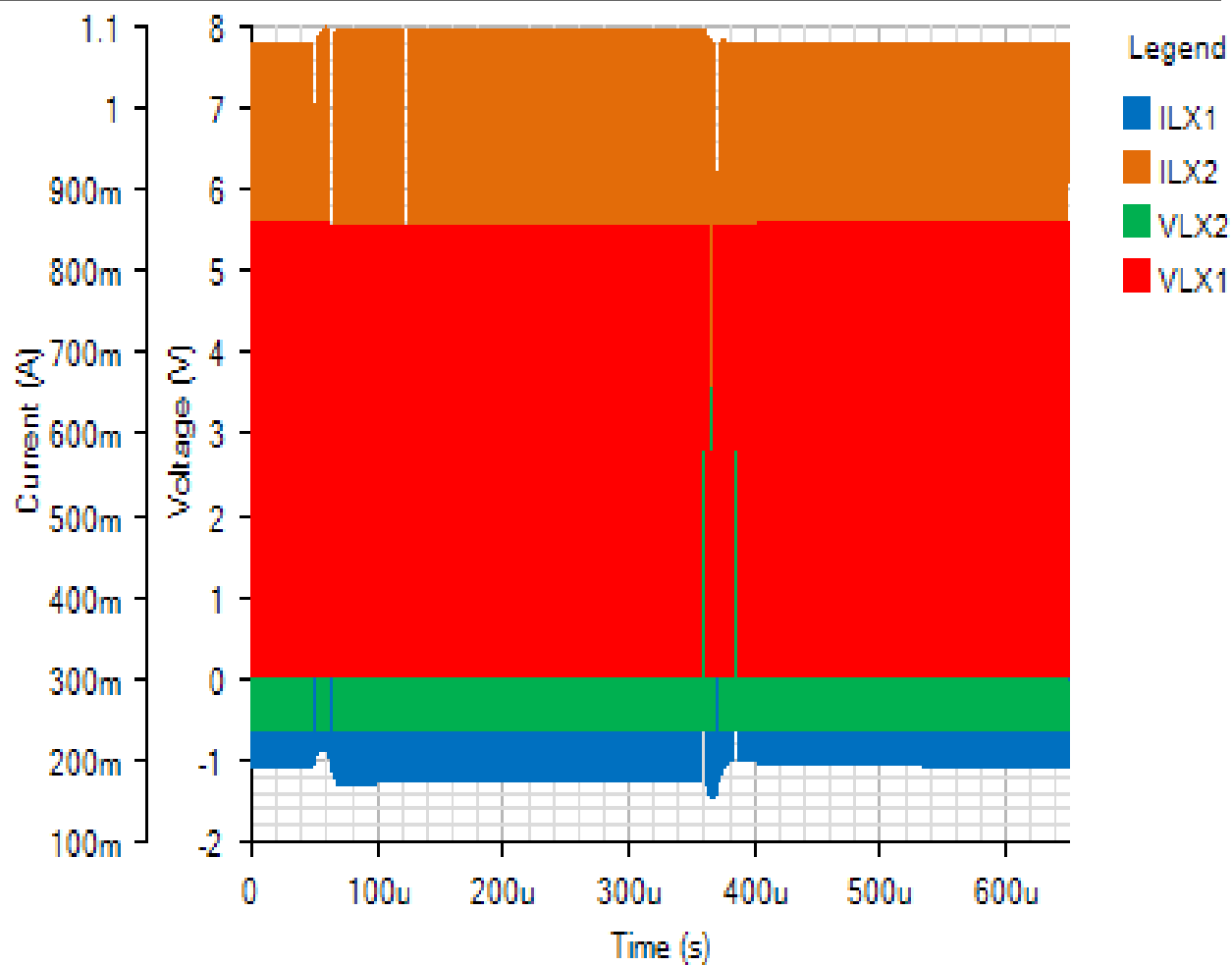
Default



Line Transient - Thu Jan 03 2019 14:07:40

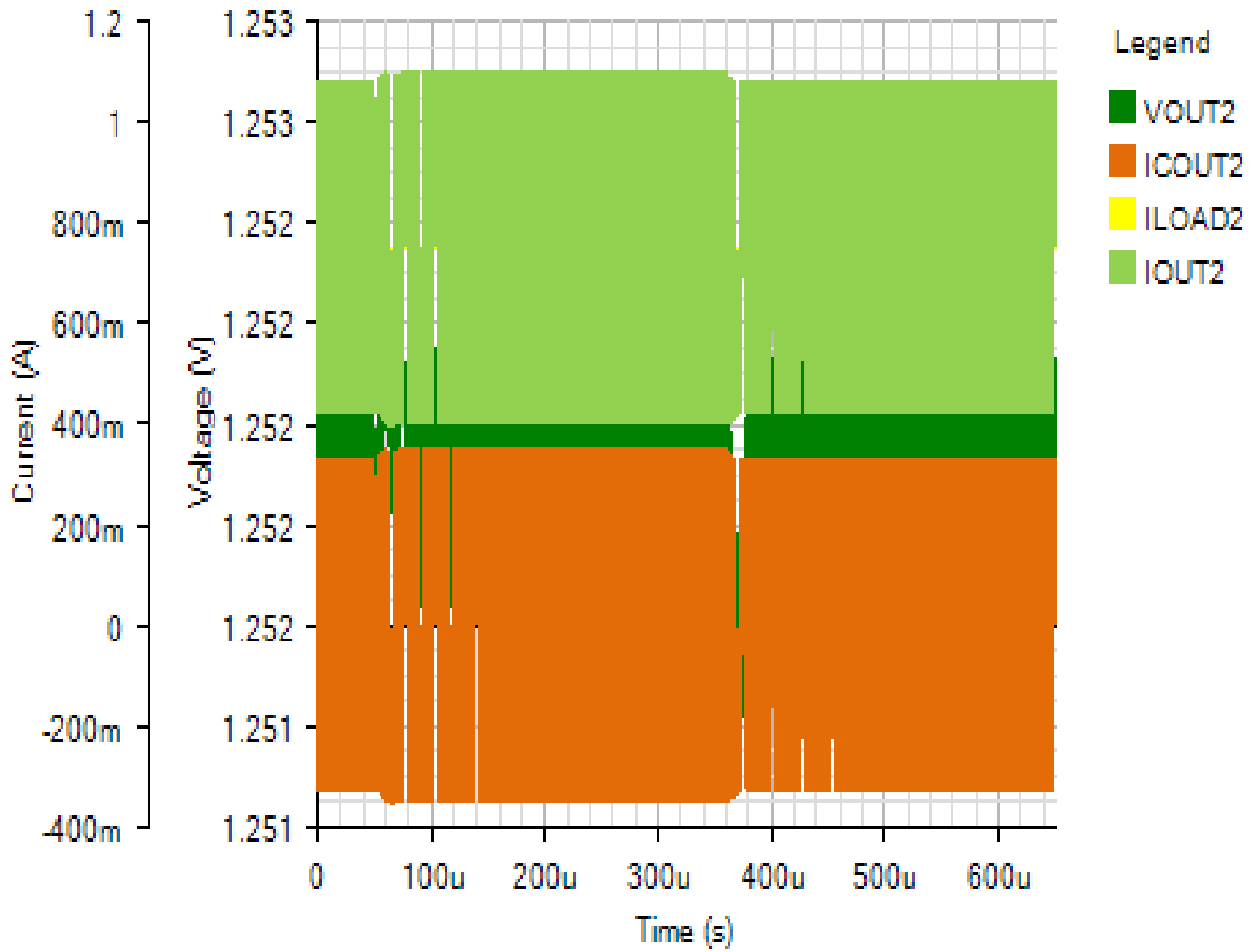
SWITCHING

Default



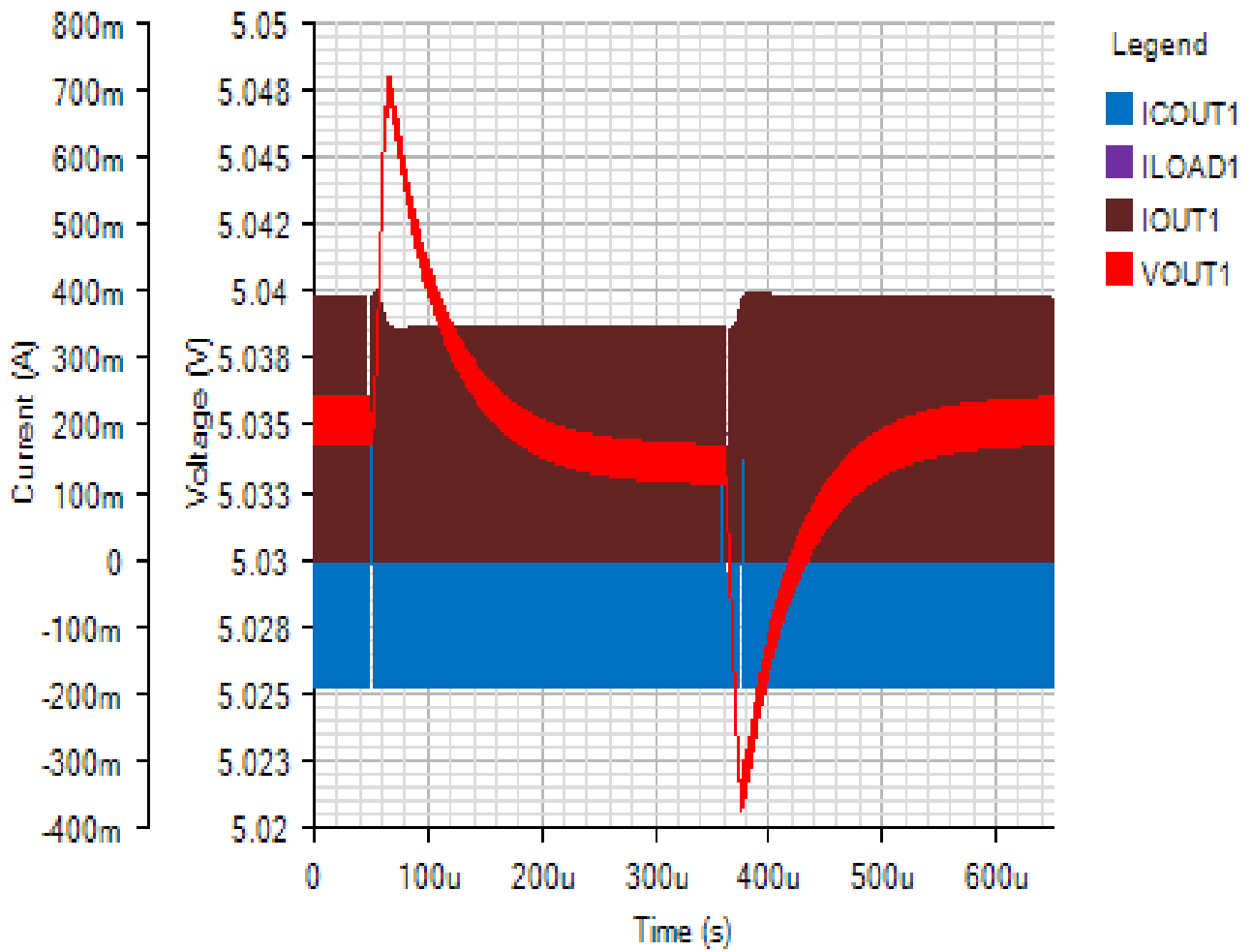
BUCK_OUTPUT

Default



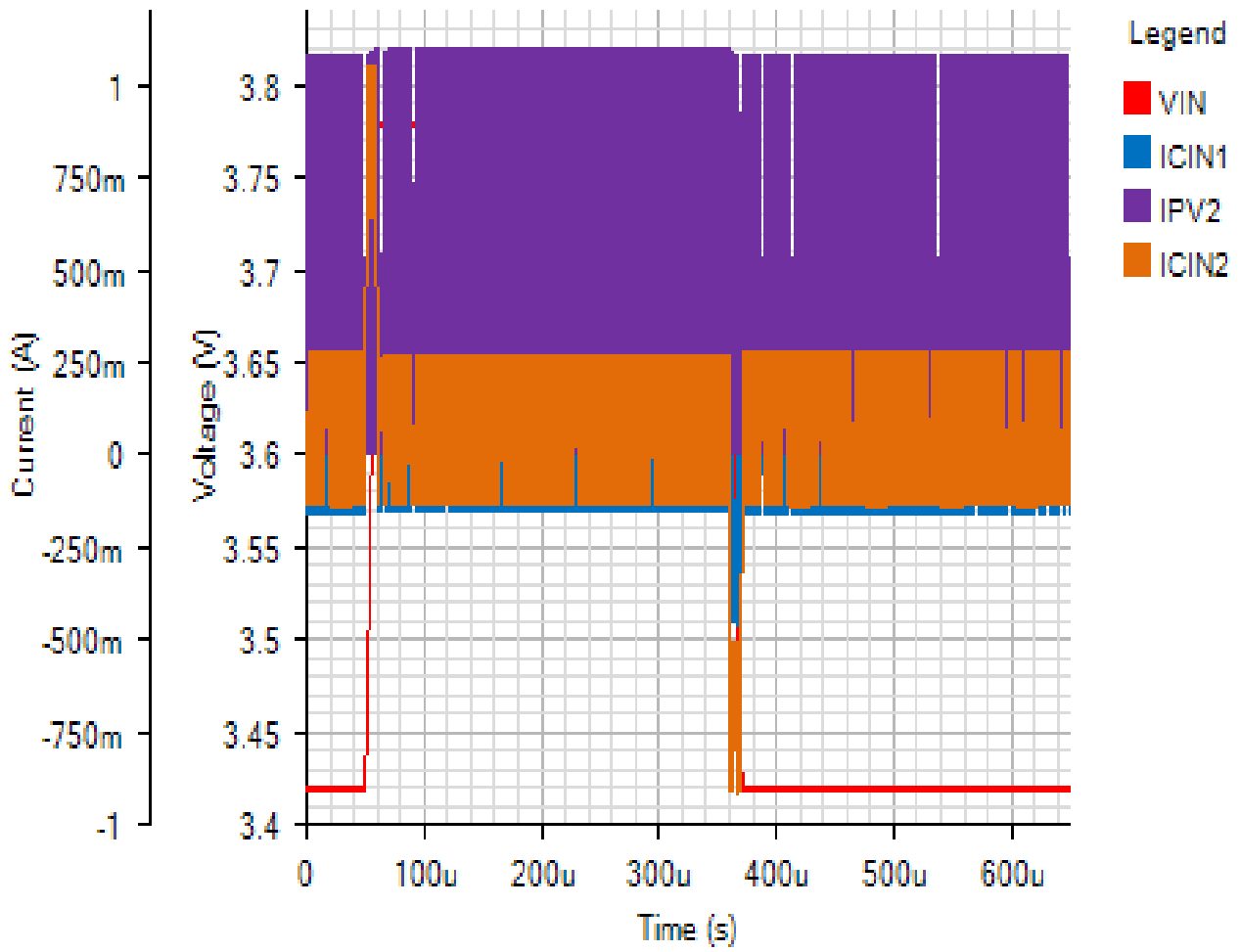
BOOST_OUTPUT

Default



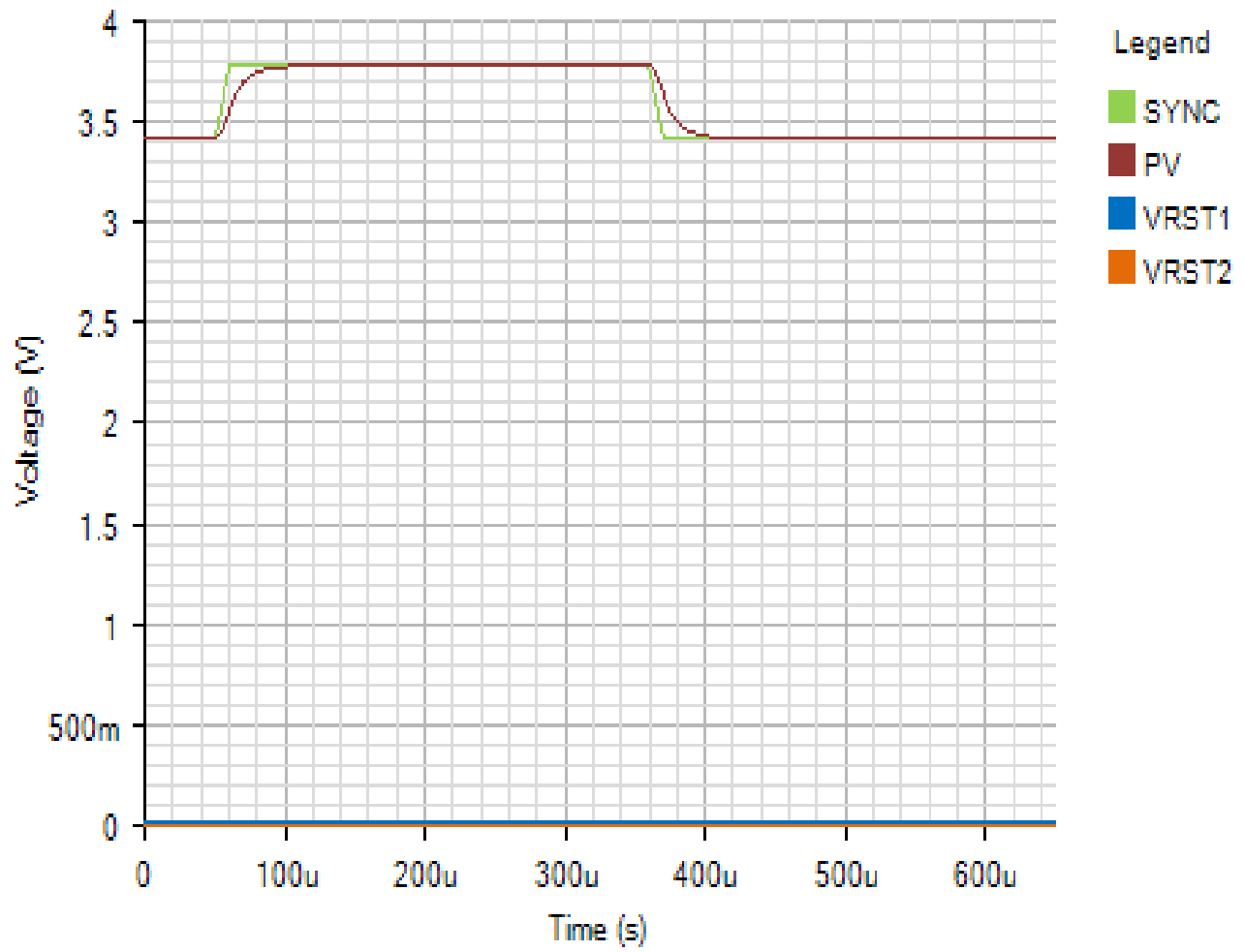
INPUT

Default



IC

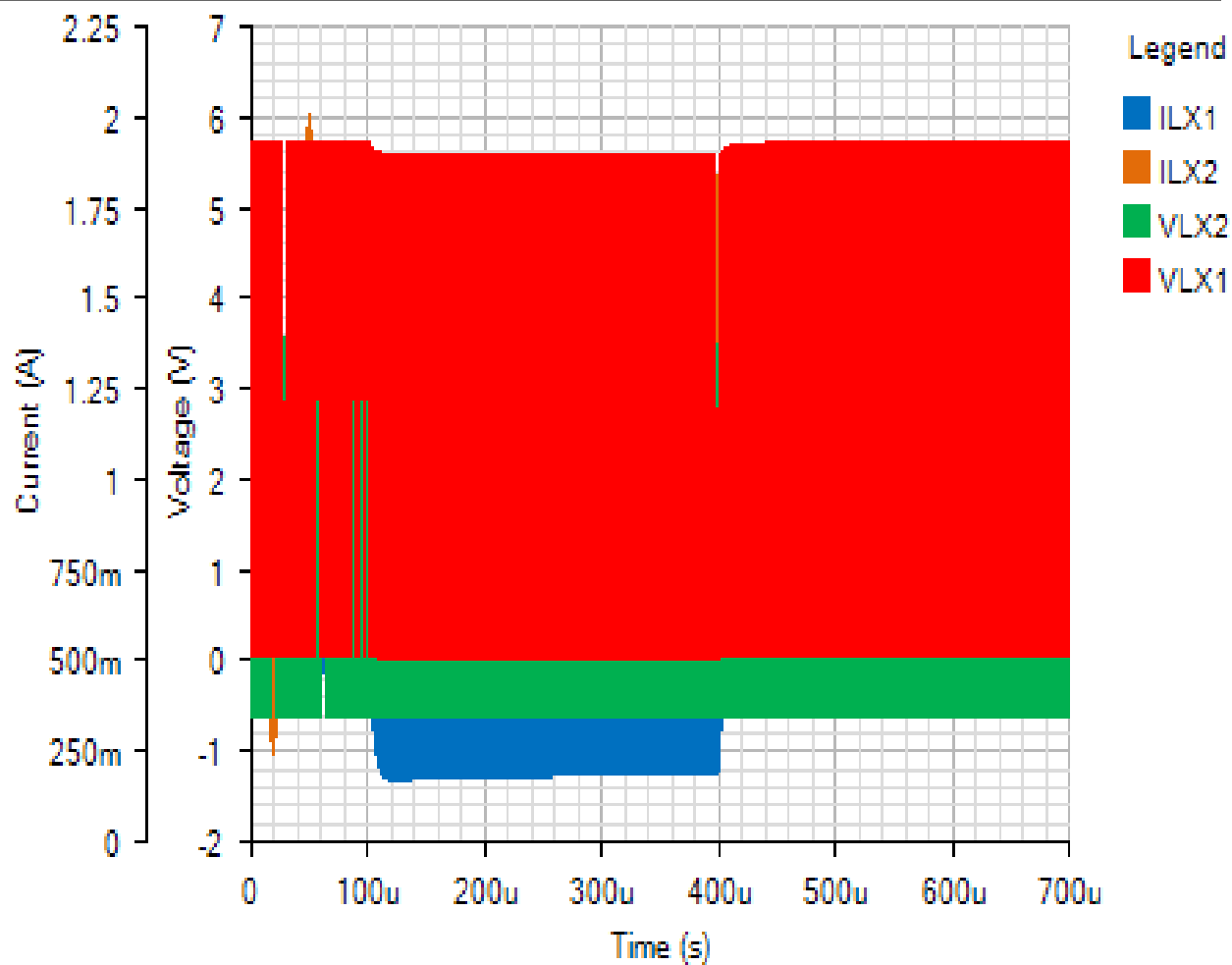
Default



Load Step - Thu Jan 03 2019 14:07:40

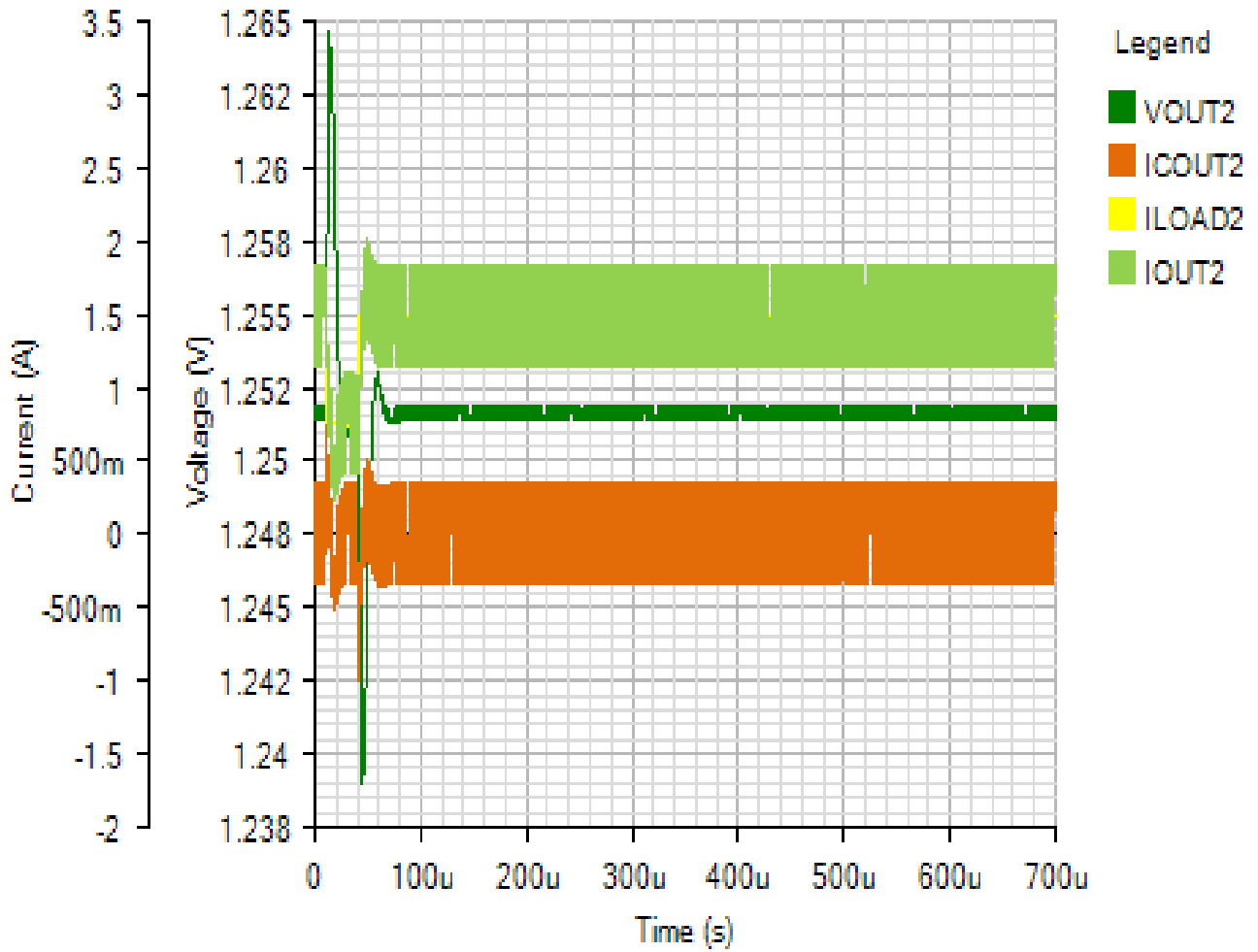
SWITCHING

Default



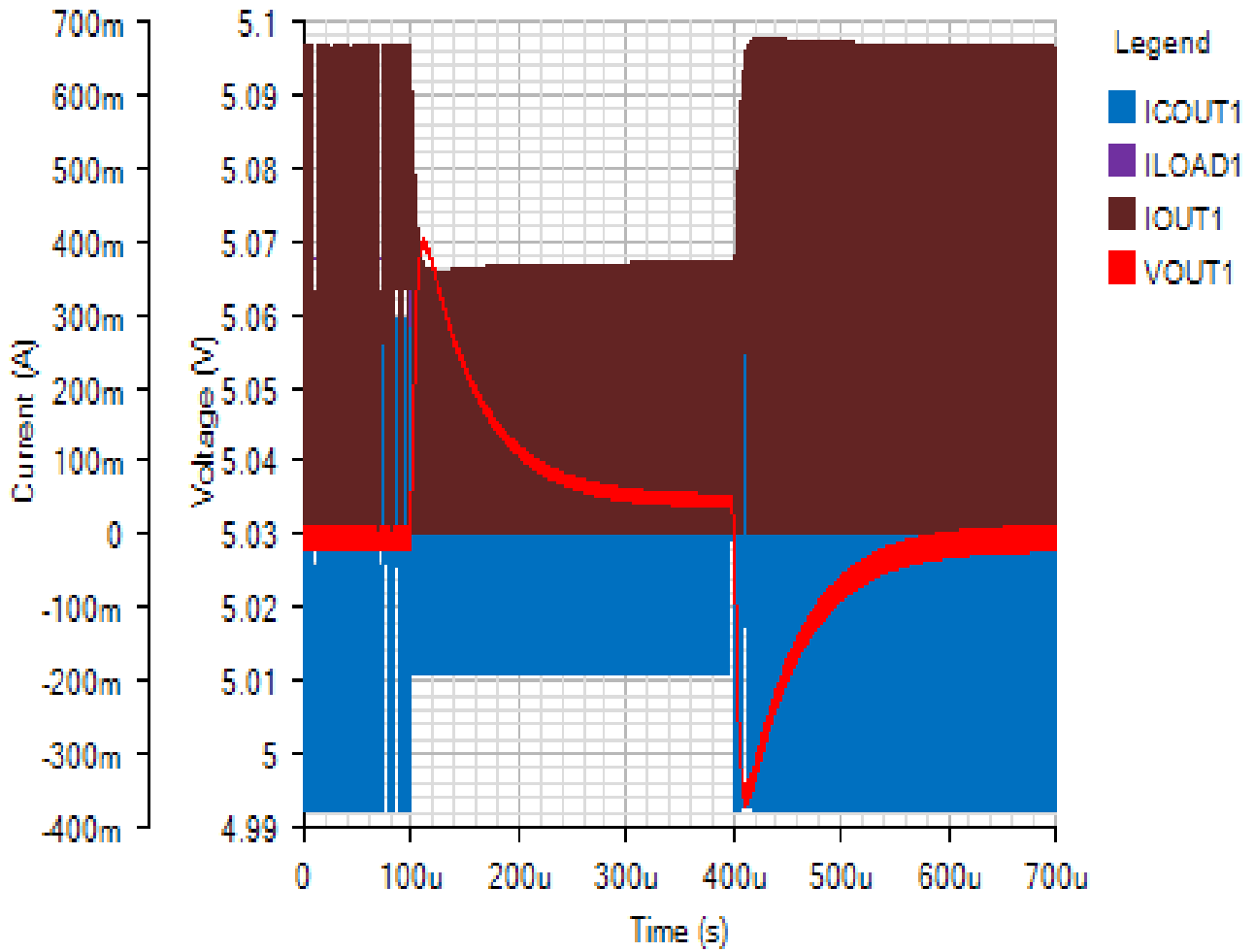
BUCK_OUTPUT

Default



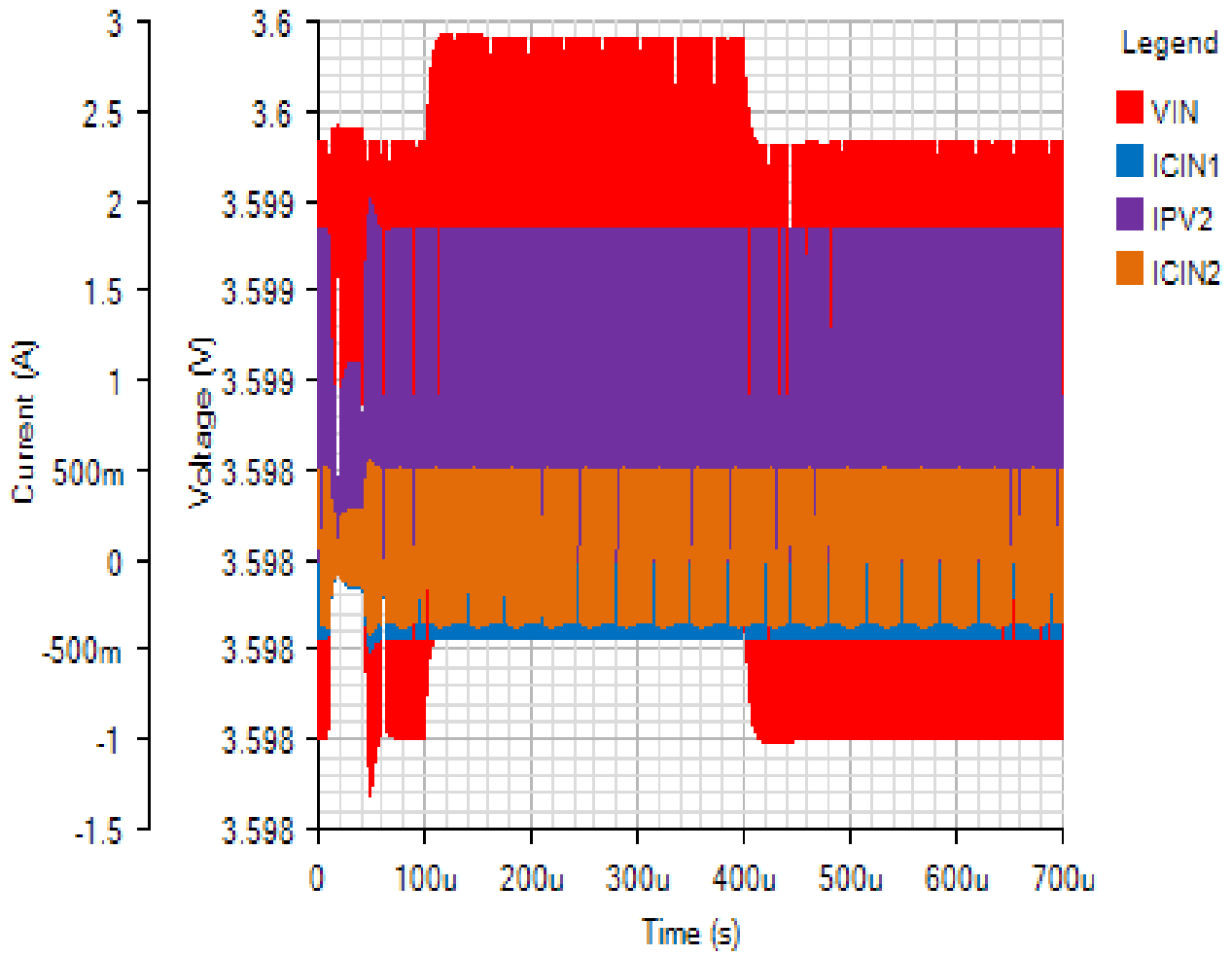
BOOST_OUTPUT

Default



INPUT

Default



IC

Default

