

Initial Design

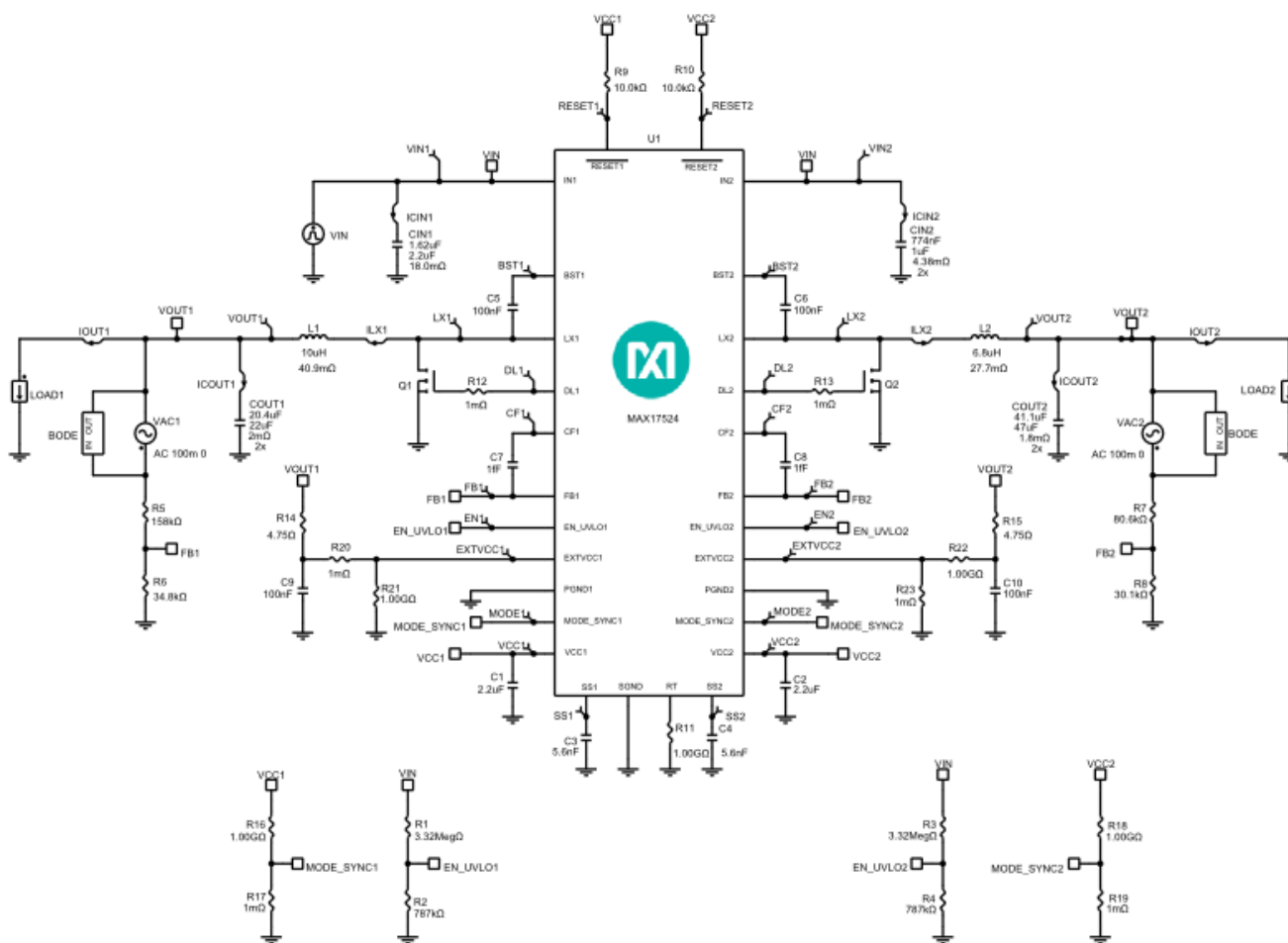
1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	6.5V
Maximum Input Voltage	48V
Nominal Input Voltage	24V
Input Steady-State Ripple	3%
Input Undervoltage Lockout Level	6.4V
Output Voltage 1	5V
Output Voltage 2	3.3V
Load Current 1	3A
Load Current 2	3A
Load 1 Start Current	3A
Load 2 Start Current	3A
Load 1 Pulse Current	1.5A
Load 2 Pulse Current	1.5A
Load 1 Pulse Edge Rate	10A/us
Load 2 Pulse Edge Rate	10A/us
Output Voltage 1 Over/Undershoot	3%
Output Voltage 2 Over/Undershoot	3%
Performance Priority	Design for Small Solution Size
BOM Priority	Low Cost
Switching Frequency	450kHz
Mode of Operation 1	PWM
Mode of Operation 2	PWM
Soft Start time 1	1ms

Parameter	Value
Soft Start Time 2	1ms
Ambient Temperature	25°C

Schematic



BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17524	User-Defined	IC
C1	1	GRM188R71A225KE15D	Murata Manufacturing	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C2	1	GRM188R71A225KE15D	Murata Manufacturing	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C3	1	GRM155R71E562KA01D	Murata Manufacturing	Cap Ceramic 0.0056uF 25V X7R 10% Pad SMD 0402 125°C T/R

C4	1	GRM155R71E562KA01D	Murata Manufacturing	Cap Ceramic 0.0056uF 25V X7R 10% Pad SMD 0402 125°C T/R
C5	1	CC0402KRX7R8BB104	Yageo	Cap Ceramic 0.1uF 25V X7R 10% Pad SMD 0402 125°C T/R
C6	1	CC0402KRX7R8BB104	Yageo	Cap Ceramic 0.1uF 25V X7R 10% Pad SMD 0402 125°C T/R
C9	1	CGA2B3X7R1H104K050BB	TDK	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
C10	1	CGA2B3X7R1H104K050BB	TDK	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
CIN1	1	C1210C225K1RAC	Kemet	Cap Ceramic 2.2uF 100V X7R 10% SMD 1210 125C Bulk
CIN2	2	C3216X7R2A105K160AA	TDK	Cap Ceramic 1uF 100V X7R 10% SMD 1206 125C Plastic T/R
COUT1	2	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
COUT2	2	GRM32ER71A476ME15L	Murata	Cap Ceramic 47uF 10V X7R 20% SMD 1210 125C Embossed T/R
L1	1	MSS1246-103MLB	Coilcraft	Inductor 10uH 20% 36.8mOhm 6.4A Isat 4.2A Irms
L2	1	MSS1246-682MLB	Coilcraft	Inductor 6.8uH 20% 24.9mOhm 7.7A Isat 5.2A Irms
Q1	1	FDD5810_F085	Fairchild Semiconductor	Trans MOSFET N-CH 60VDS N.A.mOhm@4.5V 26mOhm@6V 13nC 7nC 1.42nF 0.15nF 175°C 33A 88W 2.1°C/W 2.39mm 70.1mm^2 TO-252 3L (DPAK)
Q2	1	FDD5810_F085	Fairchild Semiconductor	Trans MOSFET N-CH 60VDS N.A.mOhm@4.5V 26mOhm@6V 13nC 7nC 1.42nF 0.15nF 175°C 33A 88W 2.1°C/W 2.39mm 70.1mm^2 TO-252 3L (DPAK)
R1	1	RC0402FR-073M32L	Yageo	Res Thick Film 0402 3.32M Ohm 1% 0.063W(1/16W) ±100ppm/°C Epoxy Pad SMD T/R
R2	1	ERJ2RKF7873X	Panasonic	Res Thick Film 0402 787K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	RC0402FR-073M32L	Yageo	Res Thick Film 0402 3.32M Ohm 1% 0.063W(1/16W) ±100ppm/°C Epoxy Pad SMD T/R
R4	1	ERJ2RKF7873X	Panasonic	Res Thick Film 0402 787K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF1583X	Panasonic	Res Thick Film 0402 158K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF3482X	Panasonic	Res Thick Film 0402 34.8K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ2RKF8062X	Panasonic	Res Thick Film 0402 80.6K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

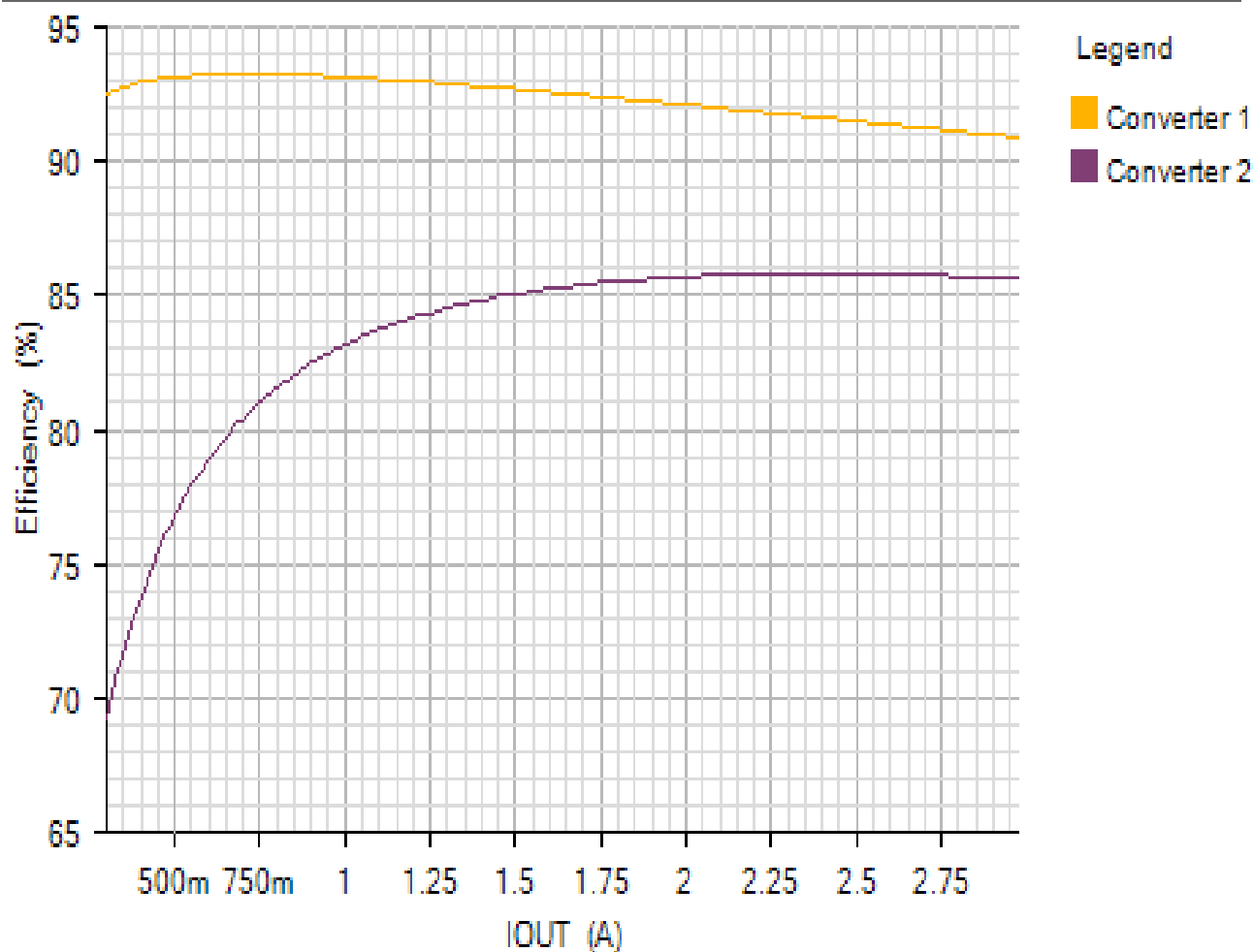
R8	1	ERJ2RKF3012X	Panasonic	Res Thick Film 0402 30.1K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R
R9	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R
R10	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R
R14	1	RC0402FR-074R75L	Yageo	Res Thick Film 0402 4.75 Ohm 1% 0.063W(1/16W) $\pm 200\text{ppm}/^\circ\text{C}$ Epoxy Pad SMD T/R
R15	1	RC0402FR-074R75L	Yageo	Res Thick Film 0402 4.75 Ohm 1% 0.063W(1/16W) $\pm 200\text{ppm}/^\circ\text{C}$ Epoxy Pad SMD T/R

Simulation Results

Efficiency - Wed Dec 19 2018 17:30:30

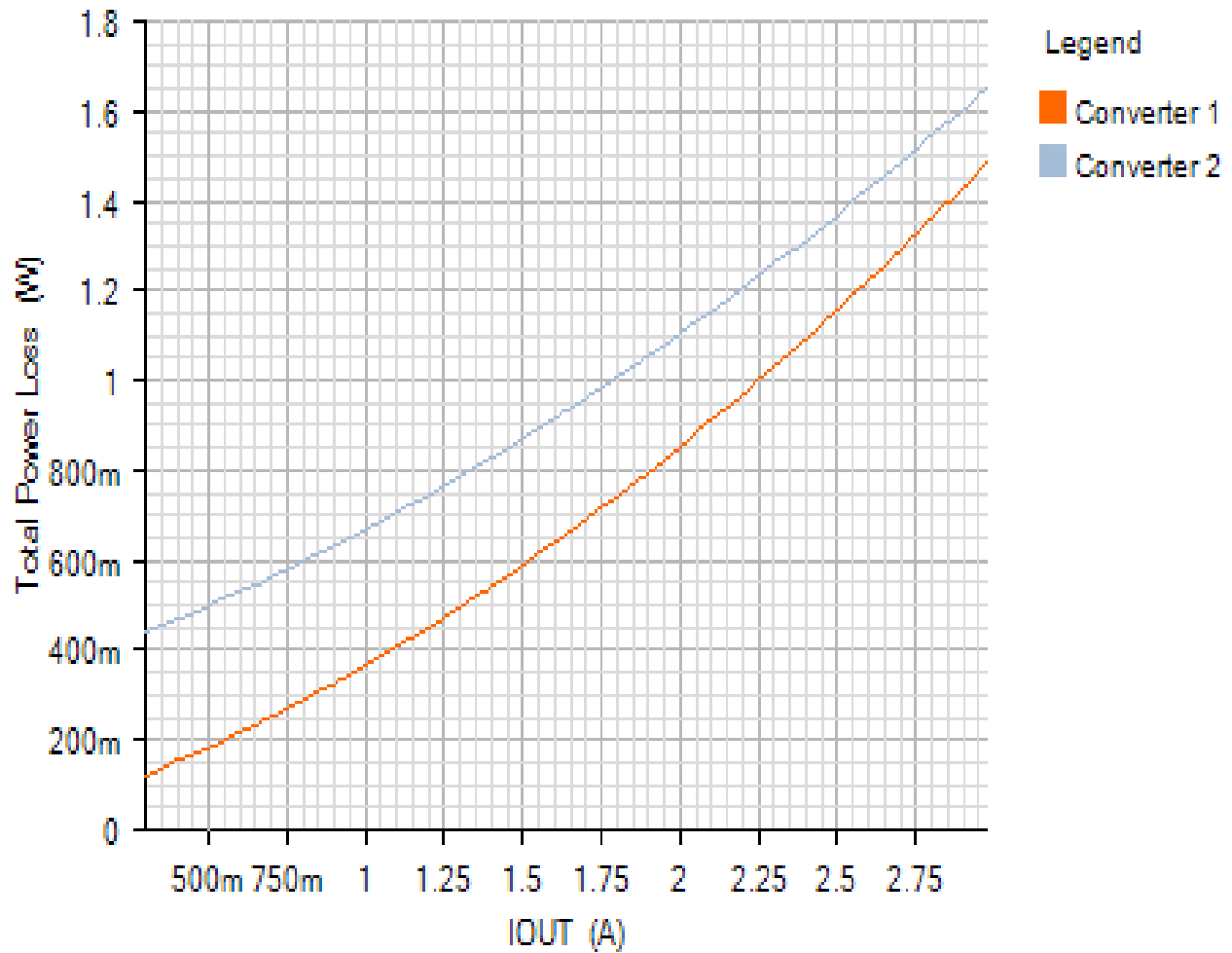
EFFICIENCY_PLOT

Default



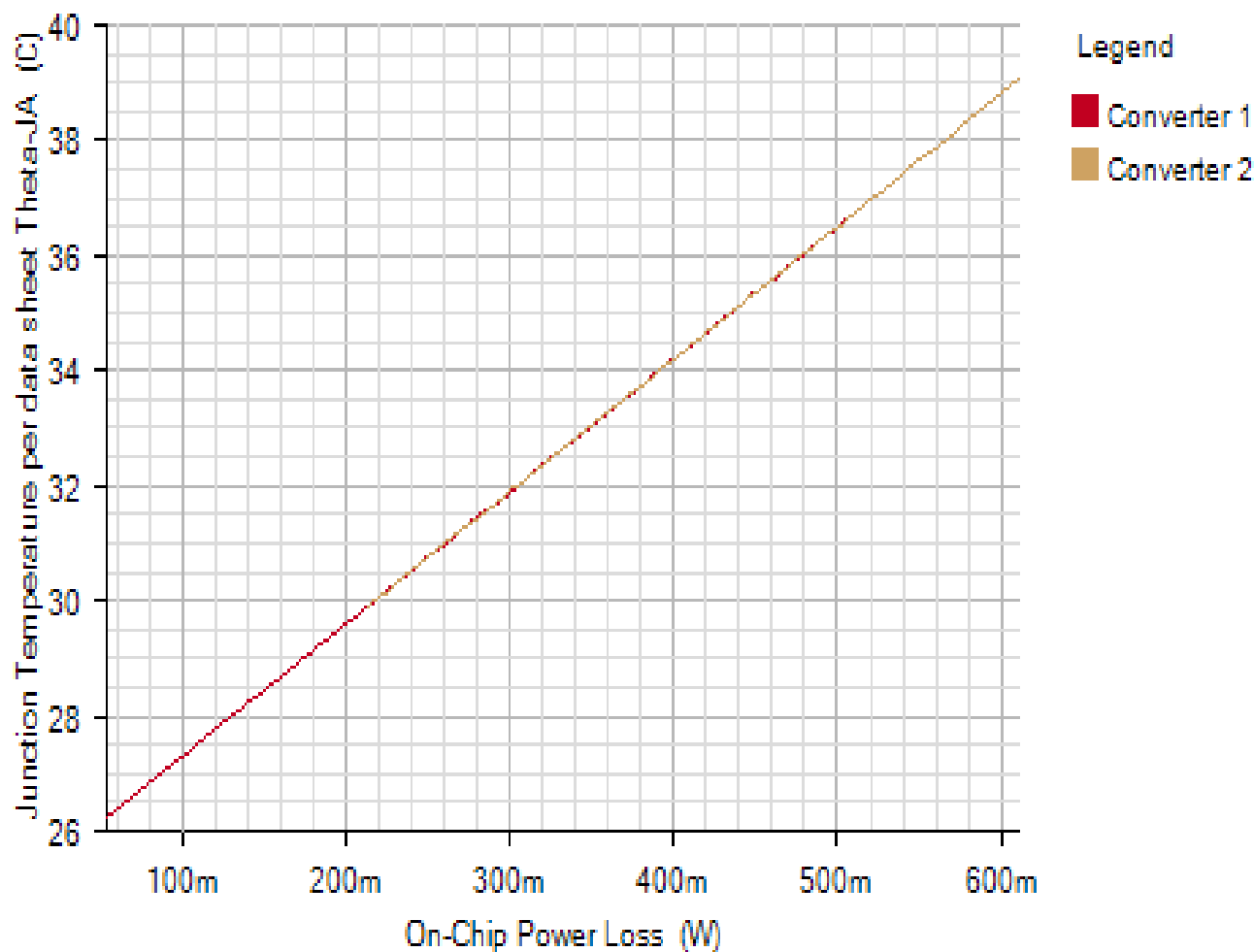
POWER_LOSS_PLOT

Default

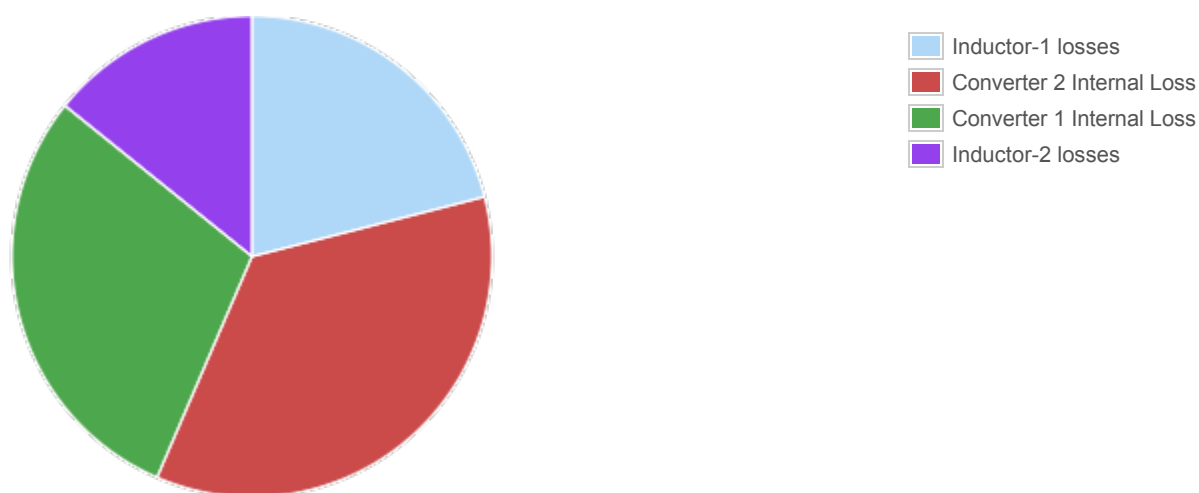


JUNCTION_TEMPERATURE_PLOT

Default



Losses



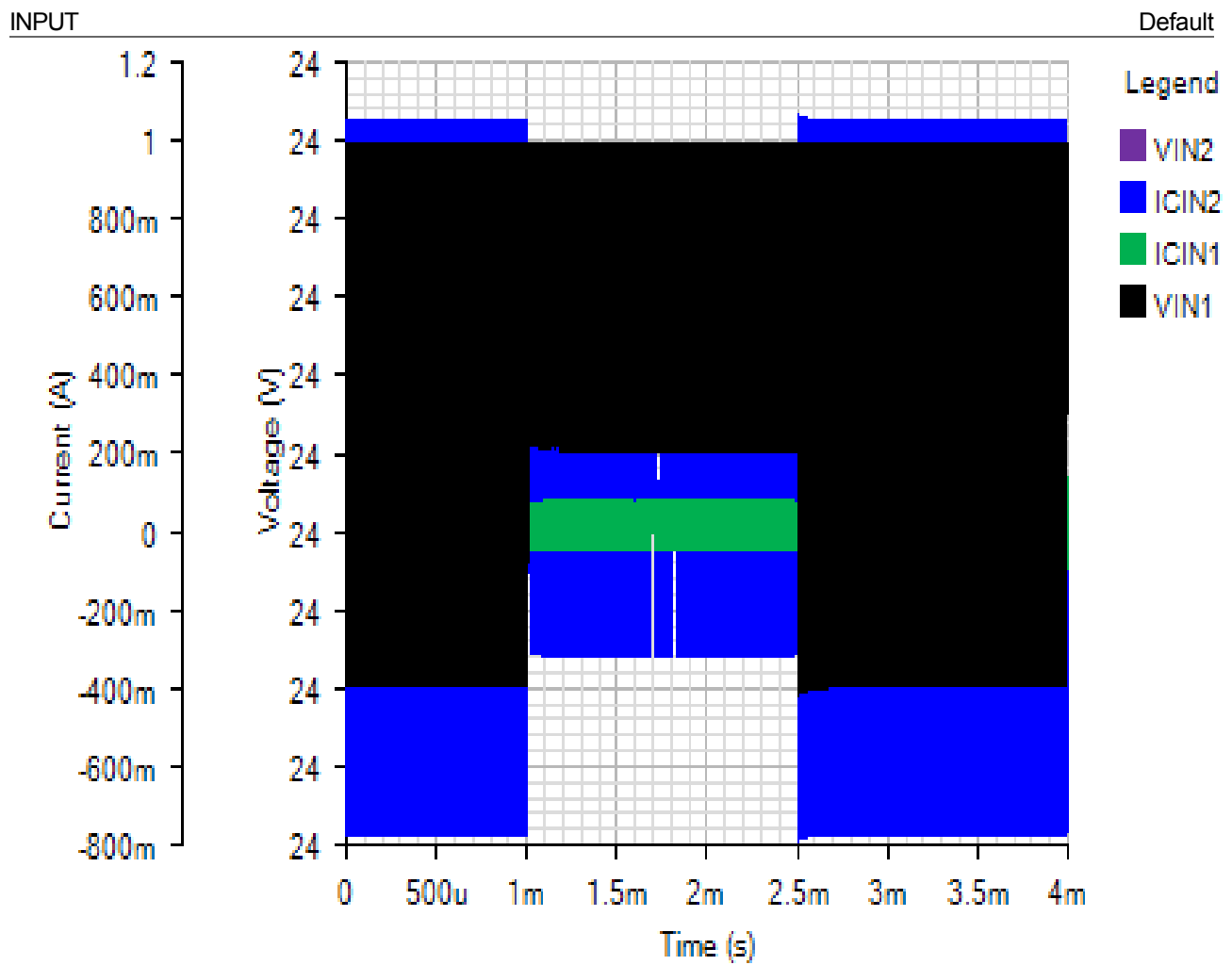
Component

Loss (W)

% of total

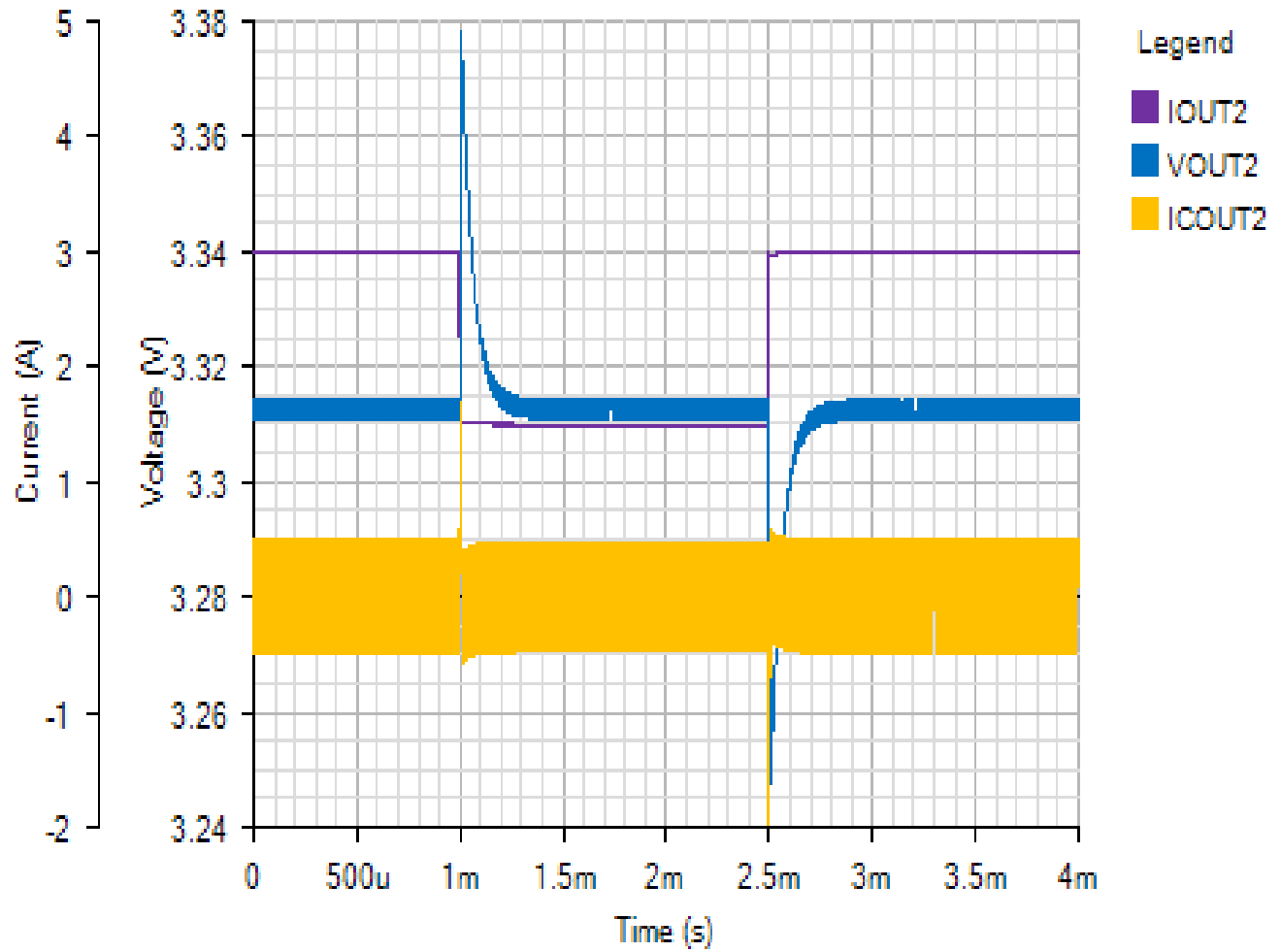
Component	Loss (W)	% of total
Inductor-1 losses	0.362	21
Converter 2 Internal Loss	0.611	35.5
Converter 1 Internal Loss	0.505	29.3
Inductor-2 losses	0.245	14.2
Total	1.723	100

Load Transient - Wed Dec 19 2018 17:30:30



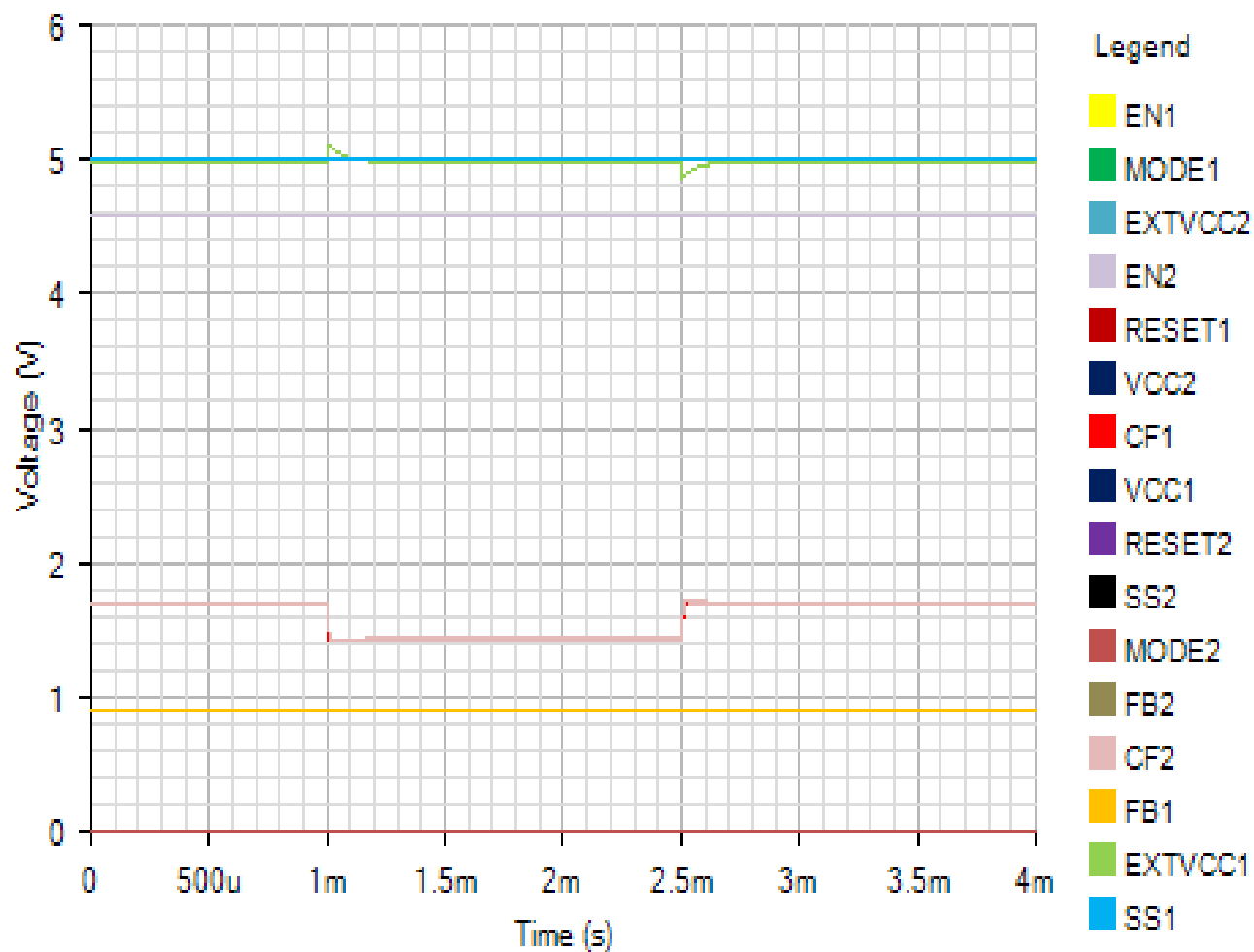
OUTPUT2

Default



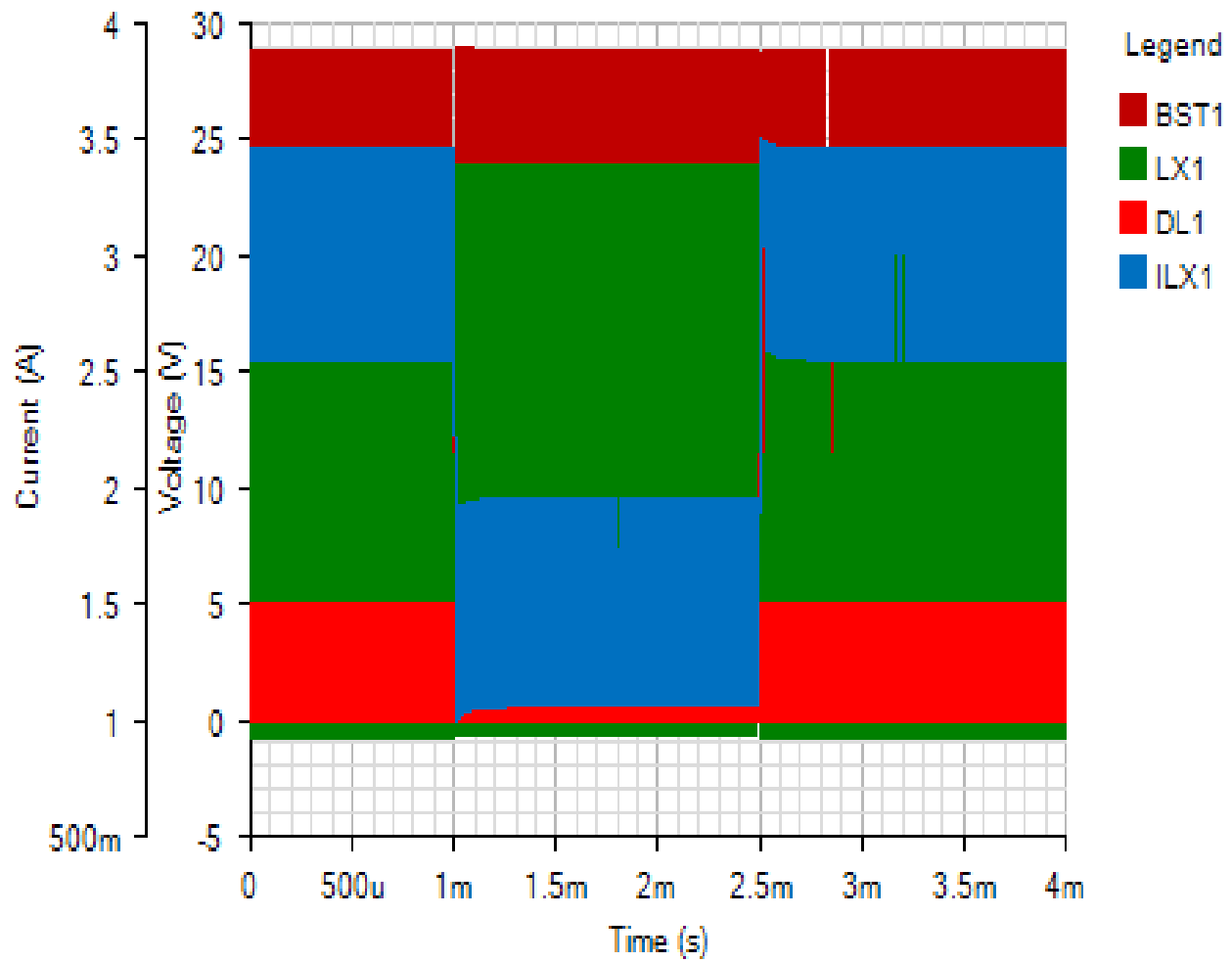
IC

Default



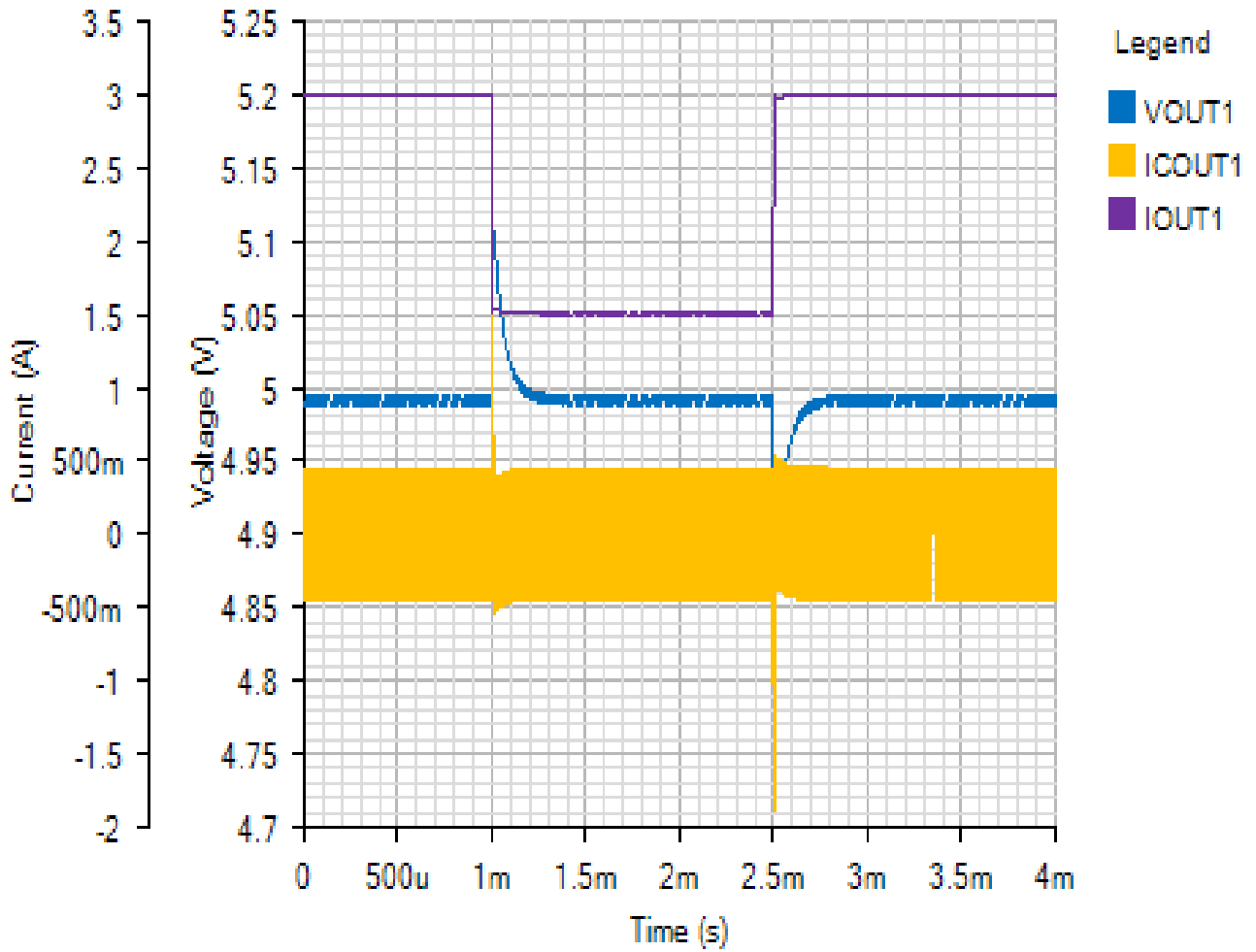
SWITCHING1

Default



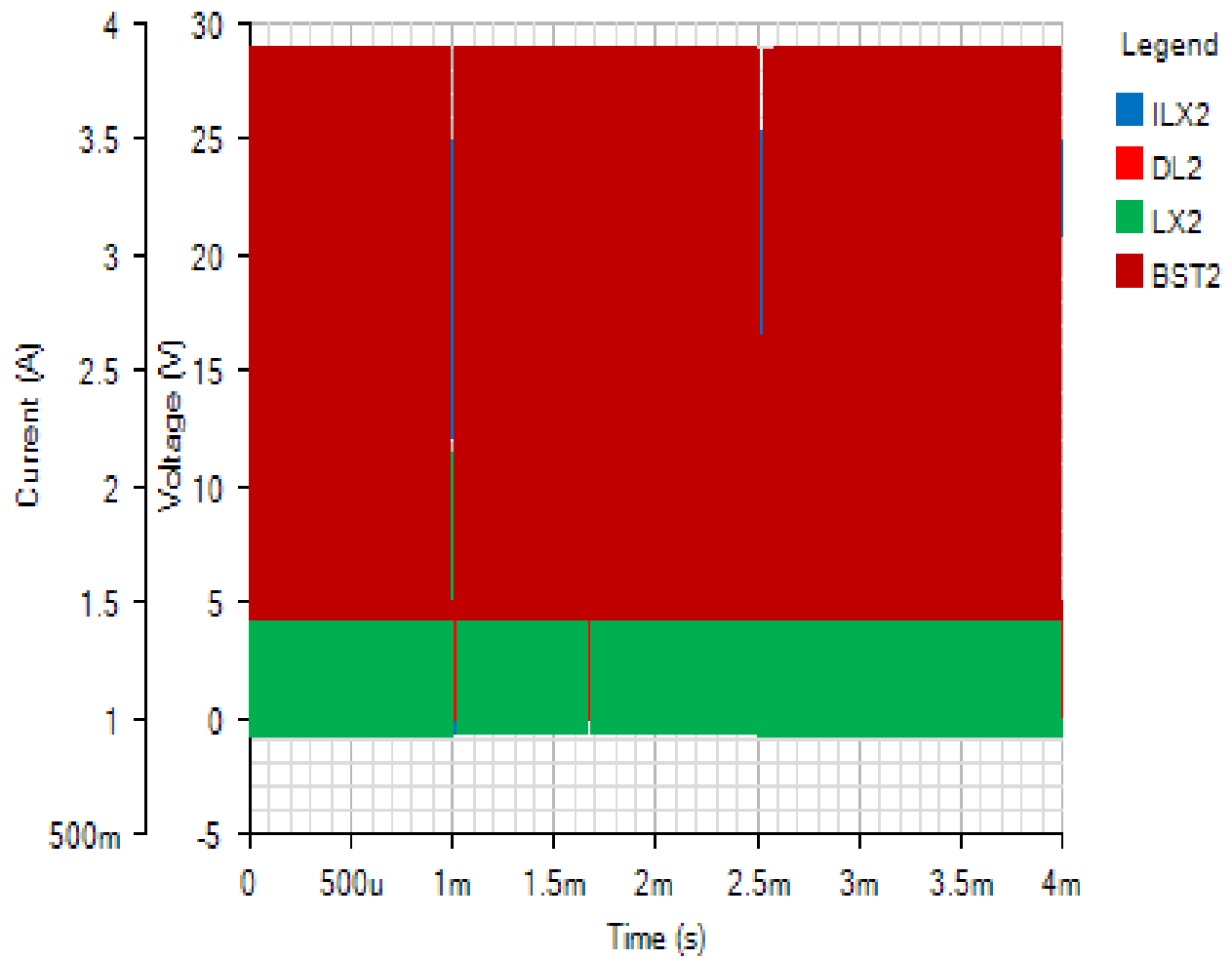
OUTPUT1

Default

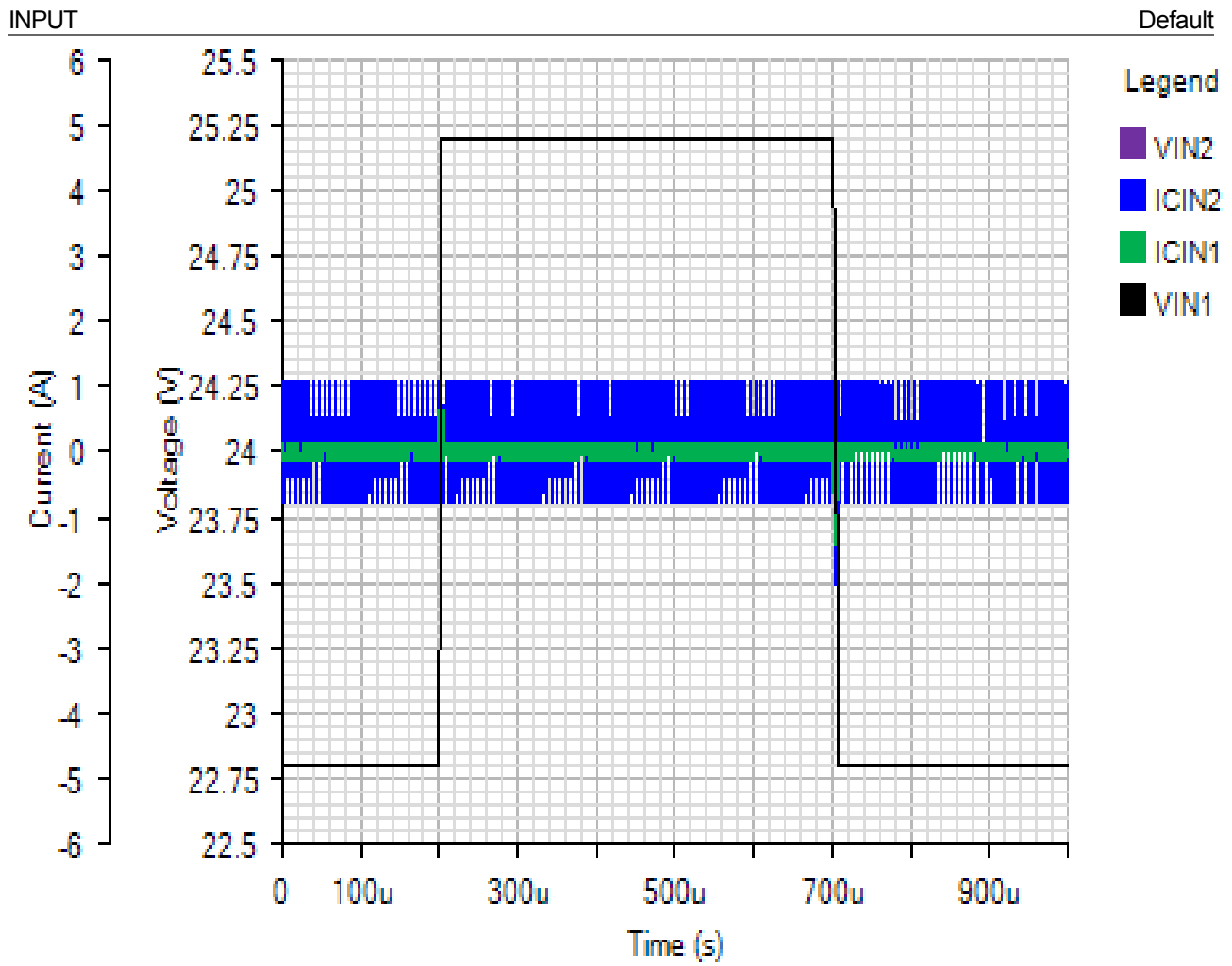


SWITCHING2

Default

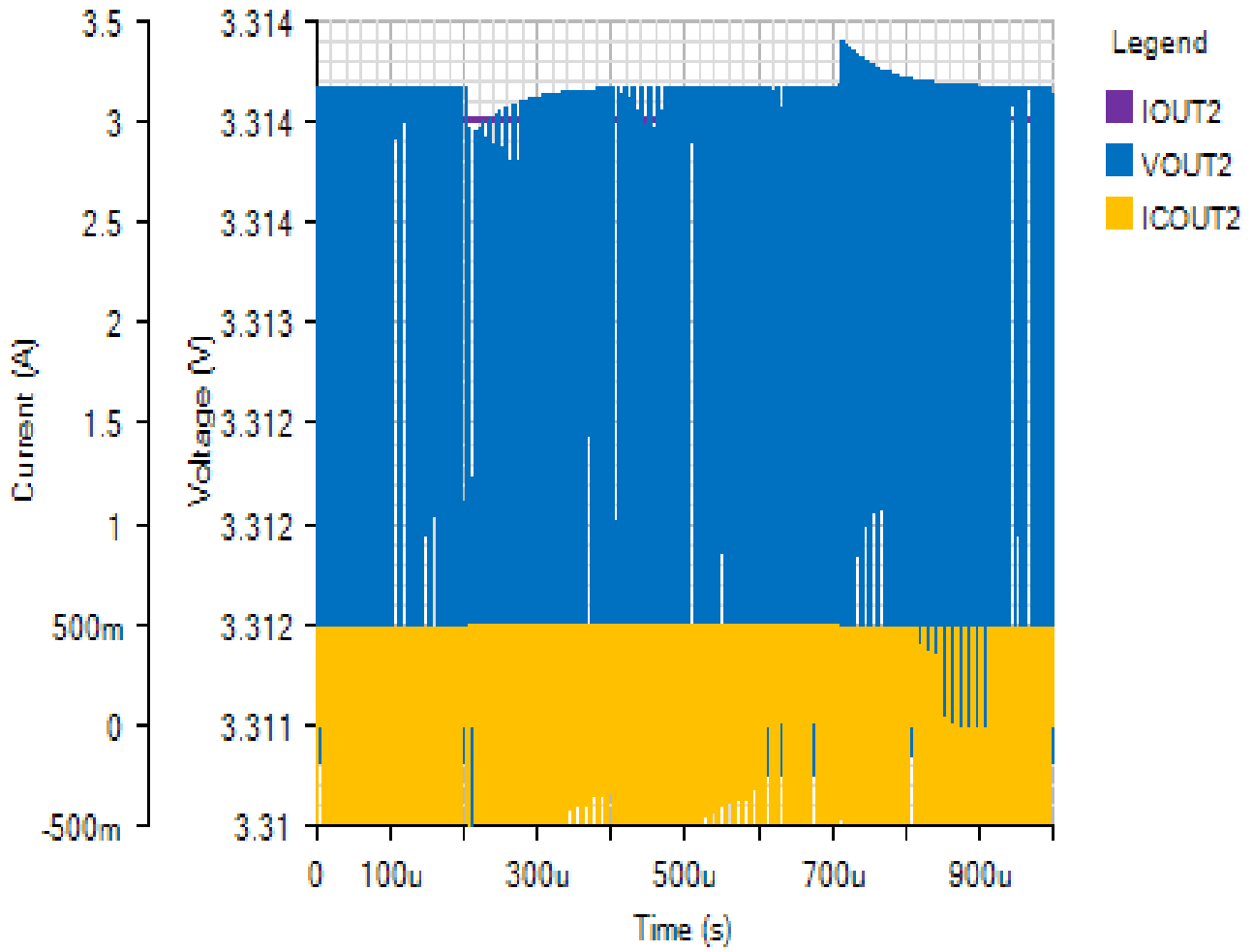


Line Transient - Wed Dec 19 2018 17:30:30



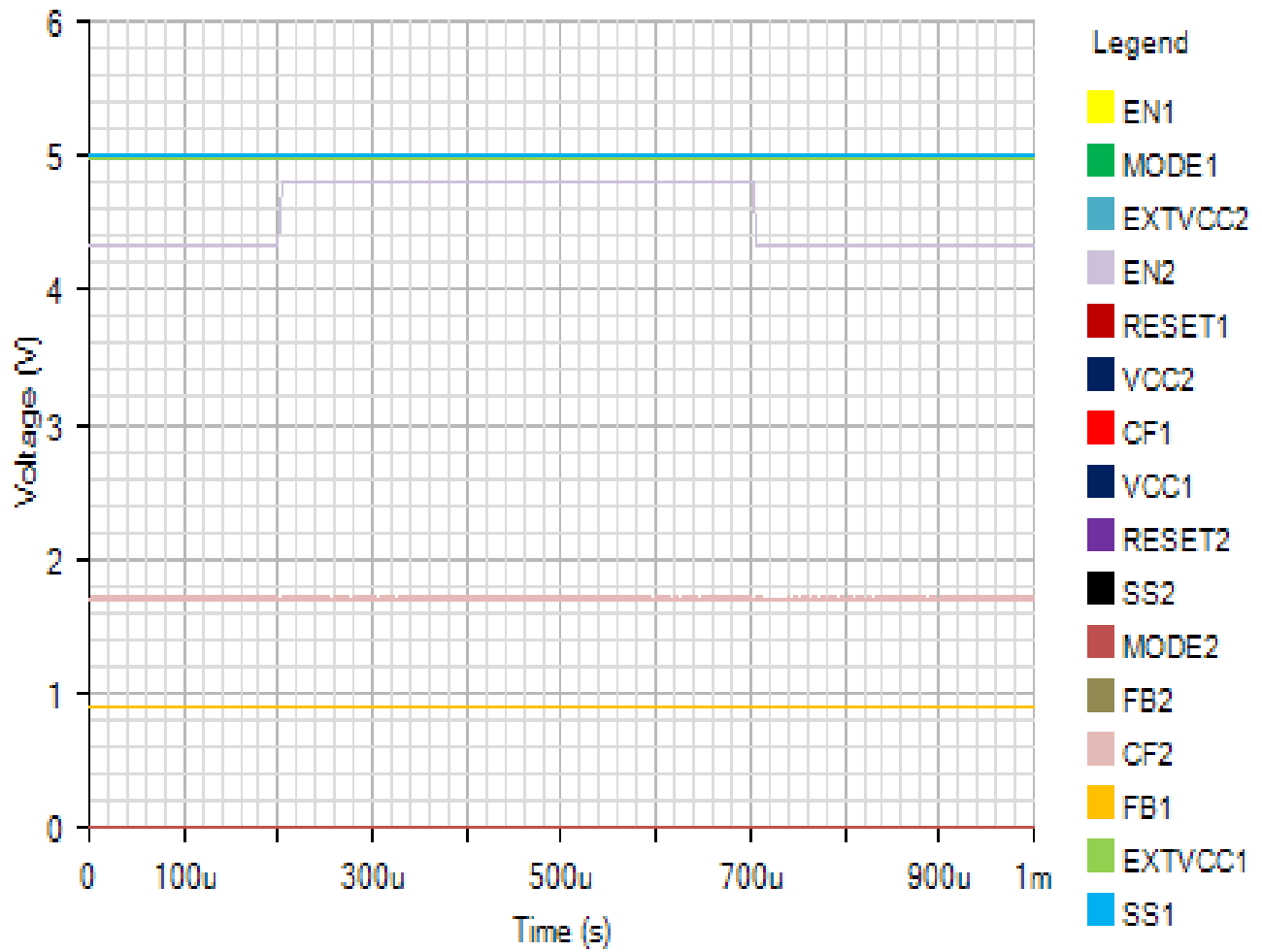
OUTPUT2

Default



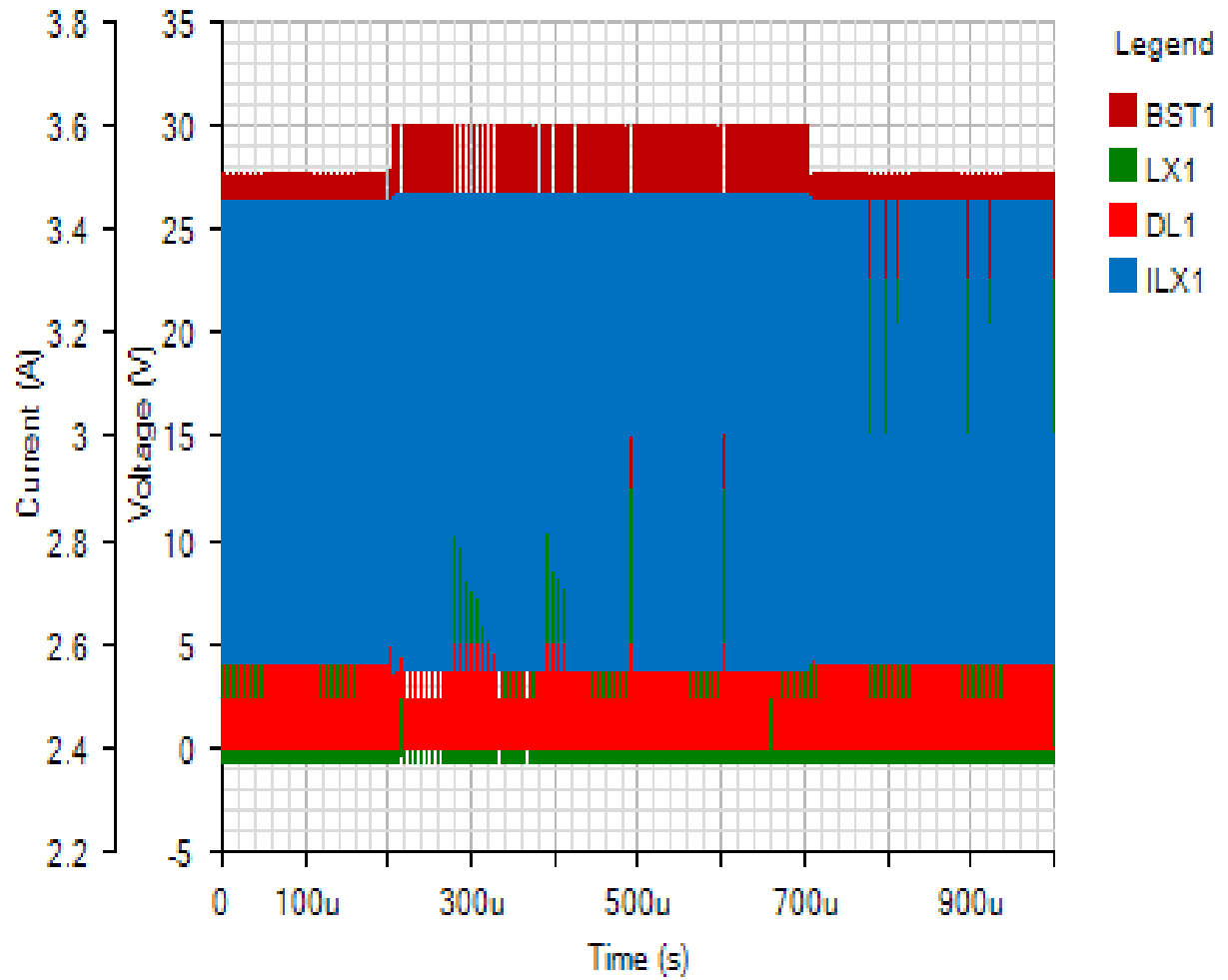
IC

Default



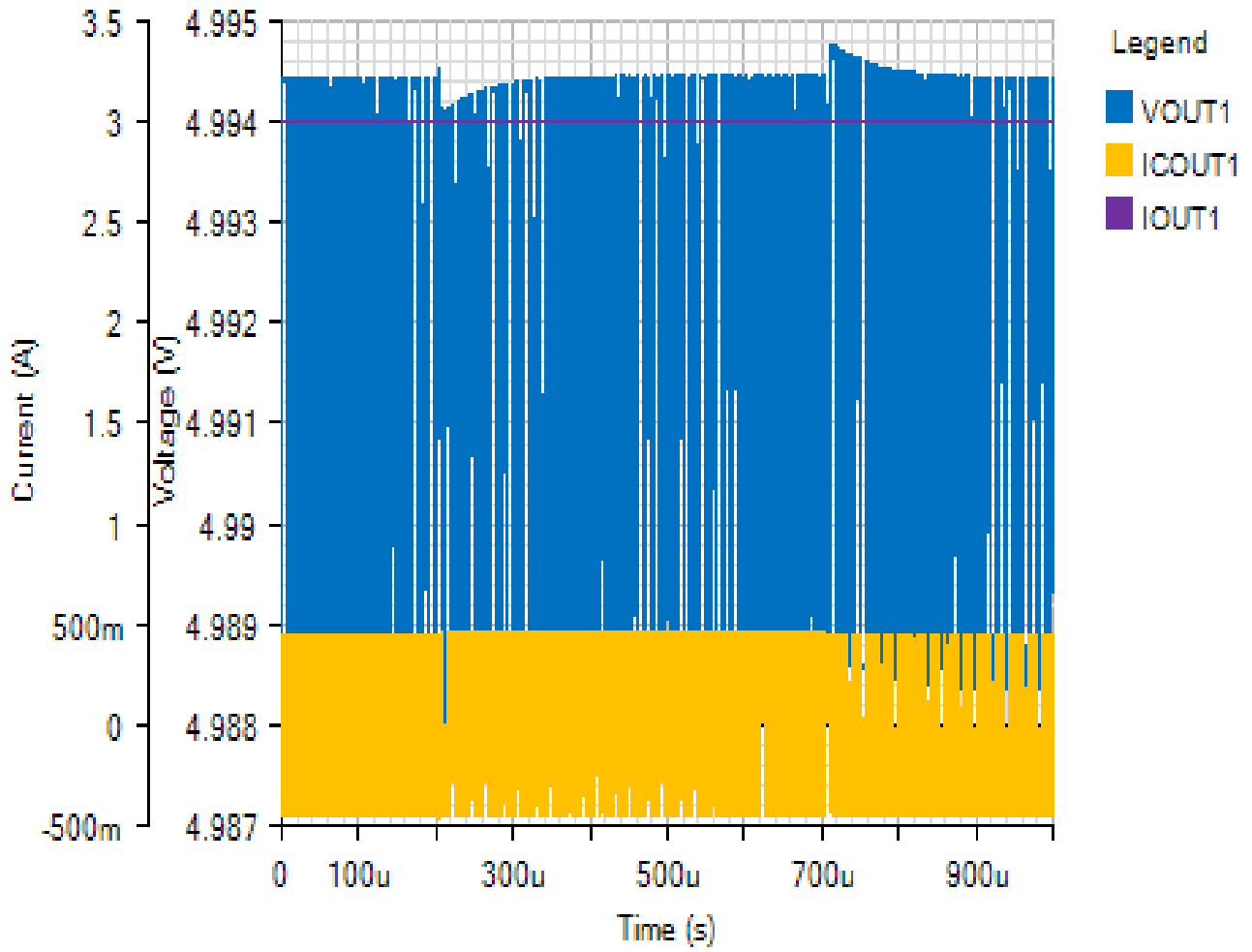
SWITCHING1

Default



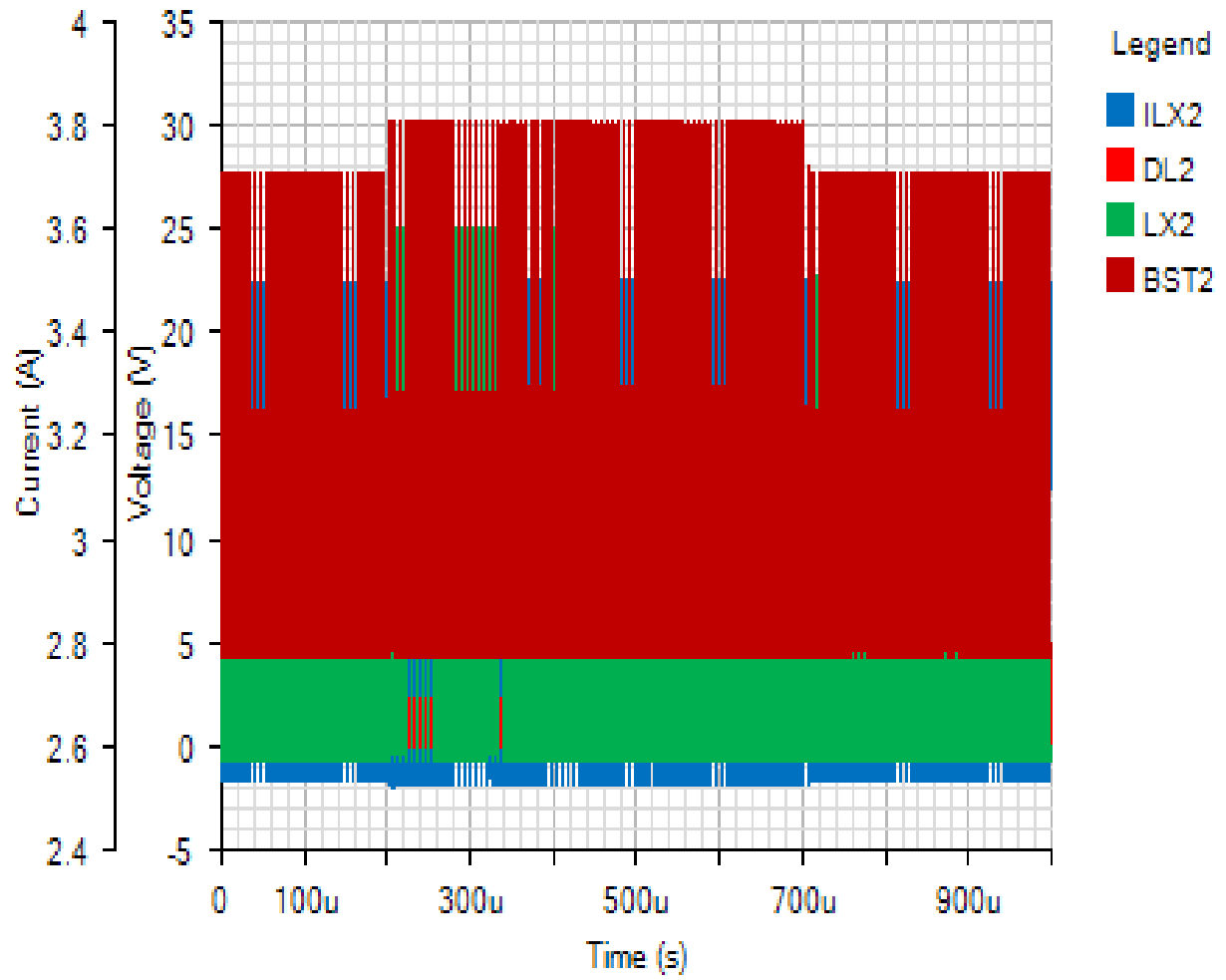
OUTPUT1

Default



SWITCHING2

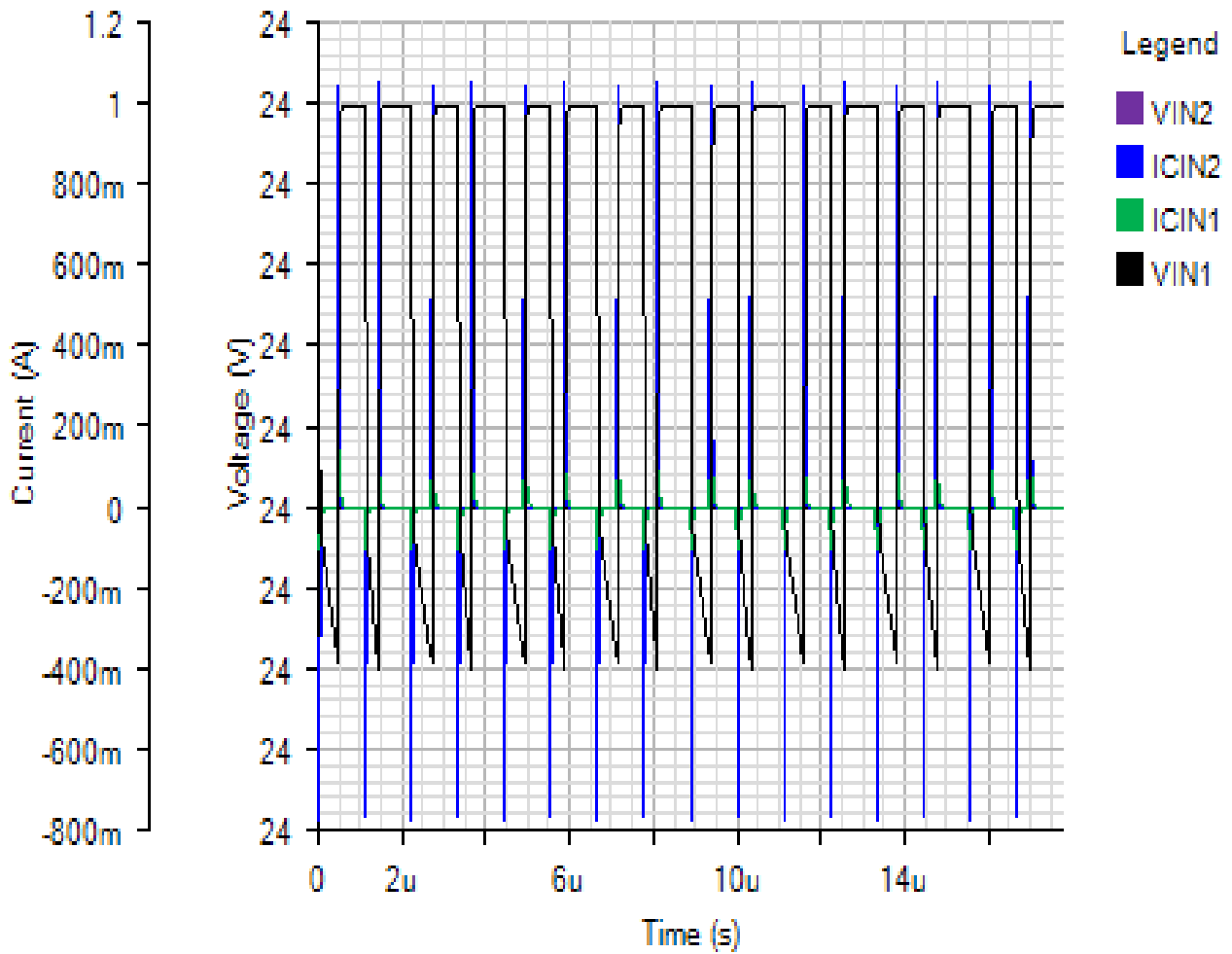
Default



Steady State - Wed Dec 19 2018 17:30:30

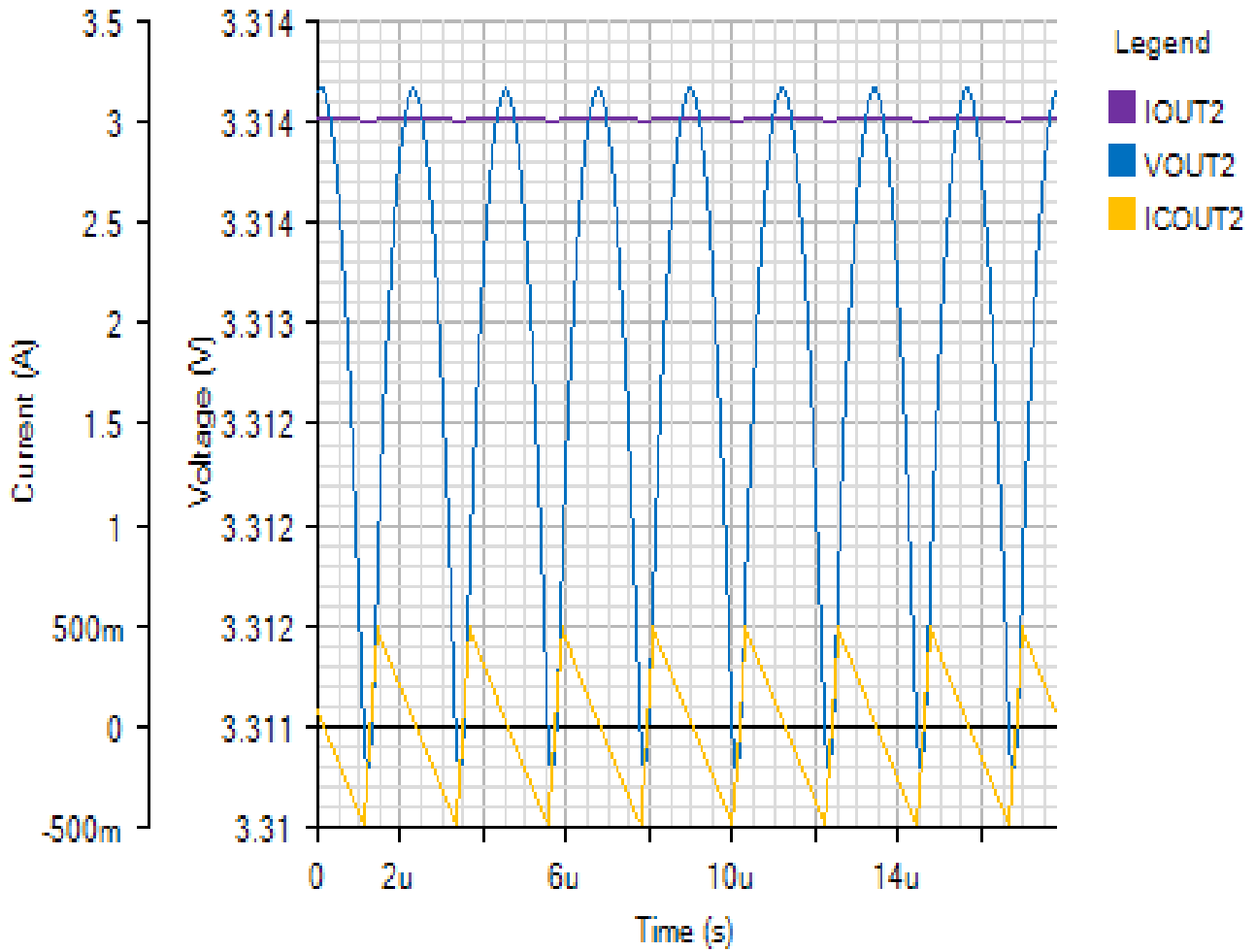
INPUT

Default



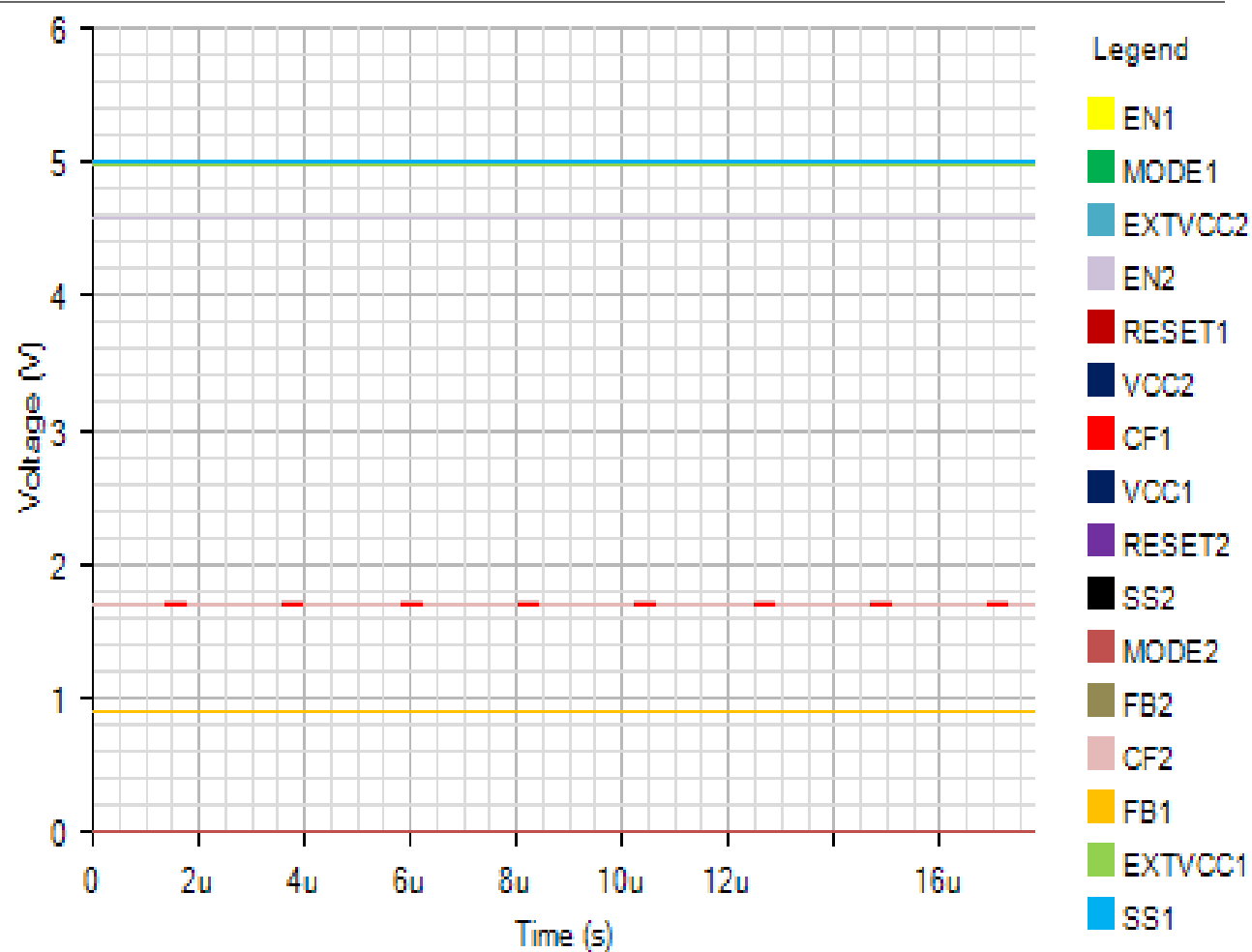
OUTPUT2

Default



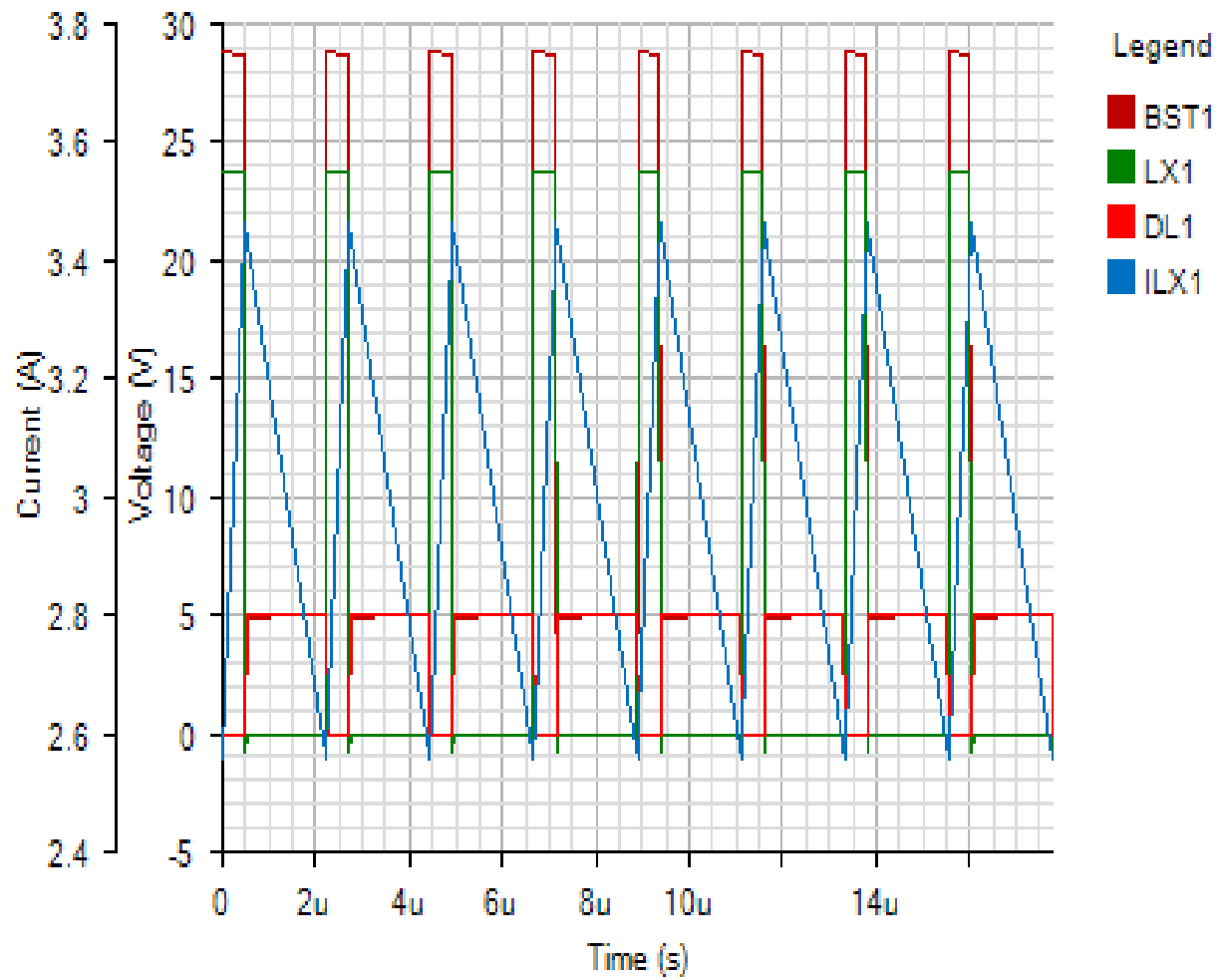
IC

Default



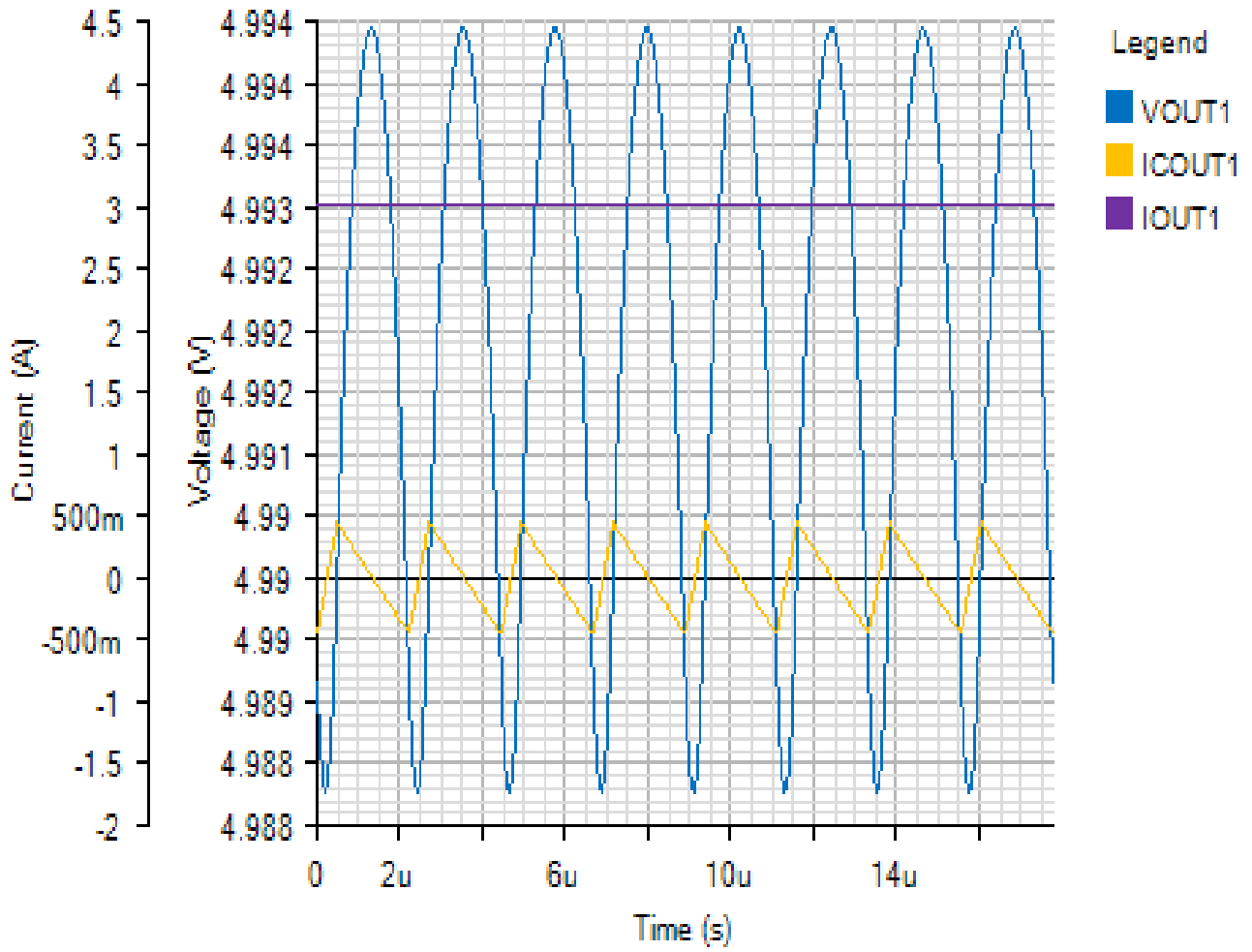
SWITCHING1

Default



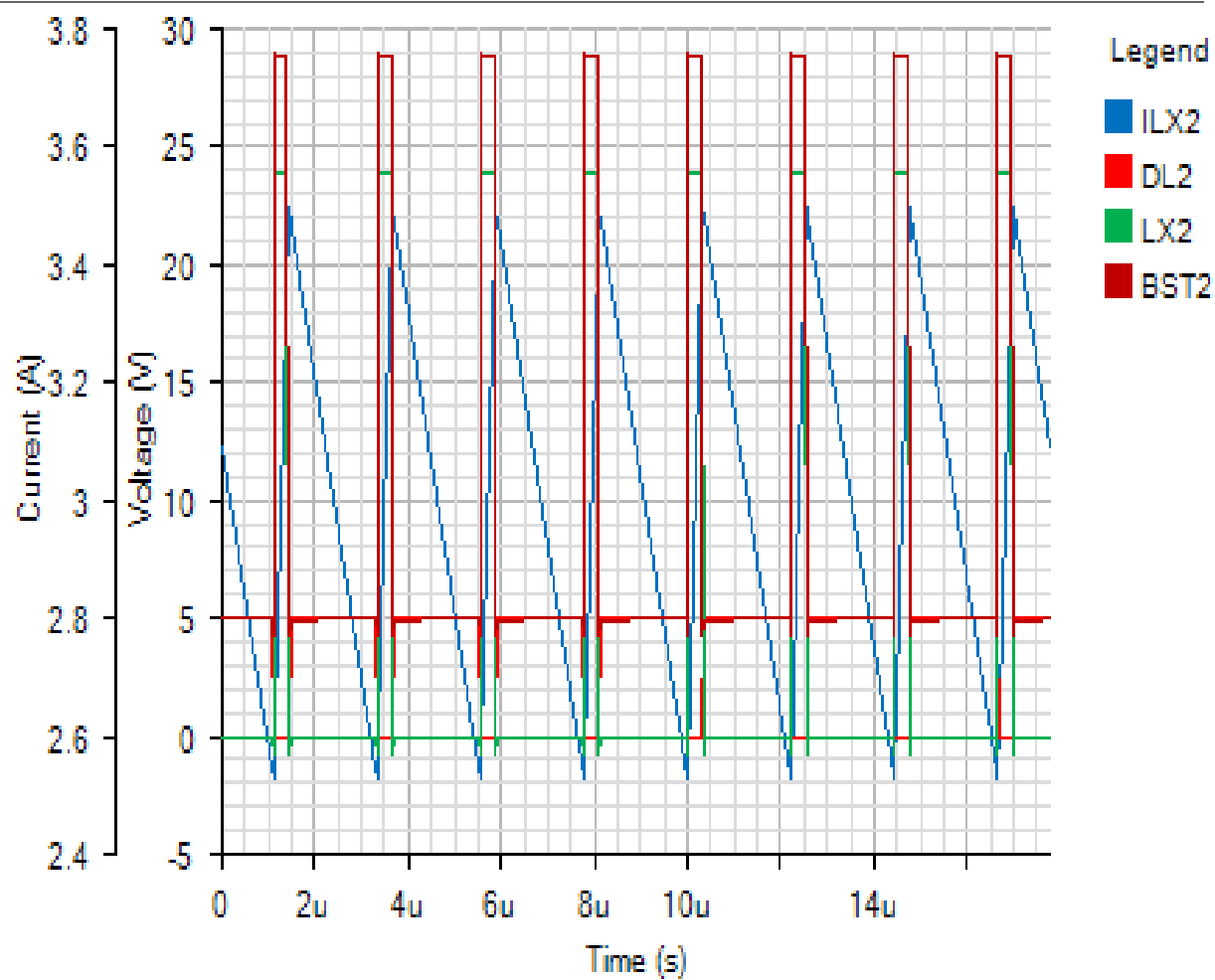
OUTPUT1

Default



SWITCHING2

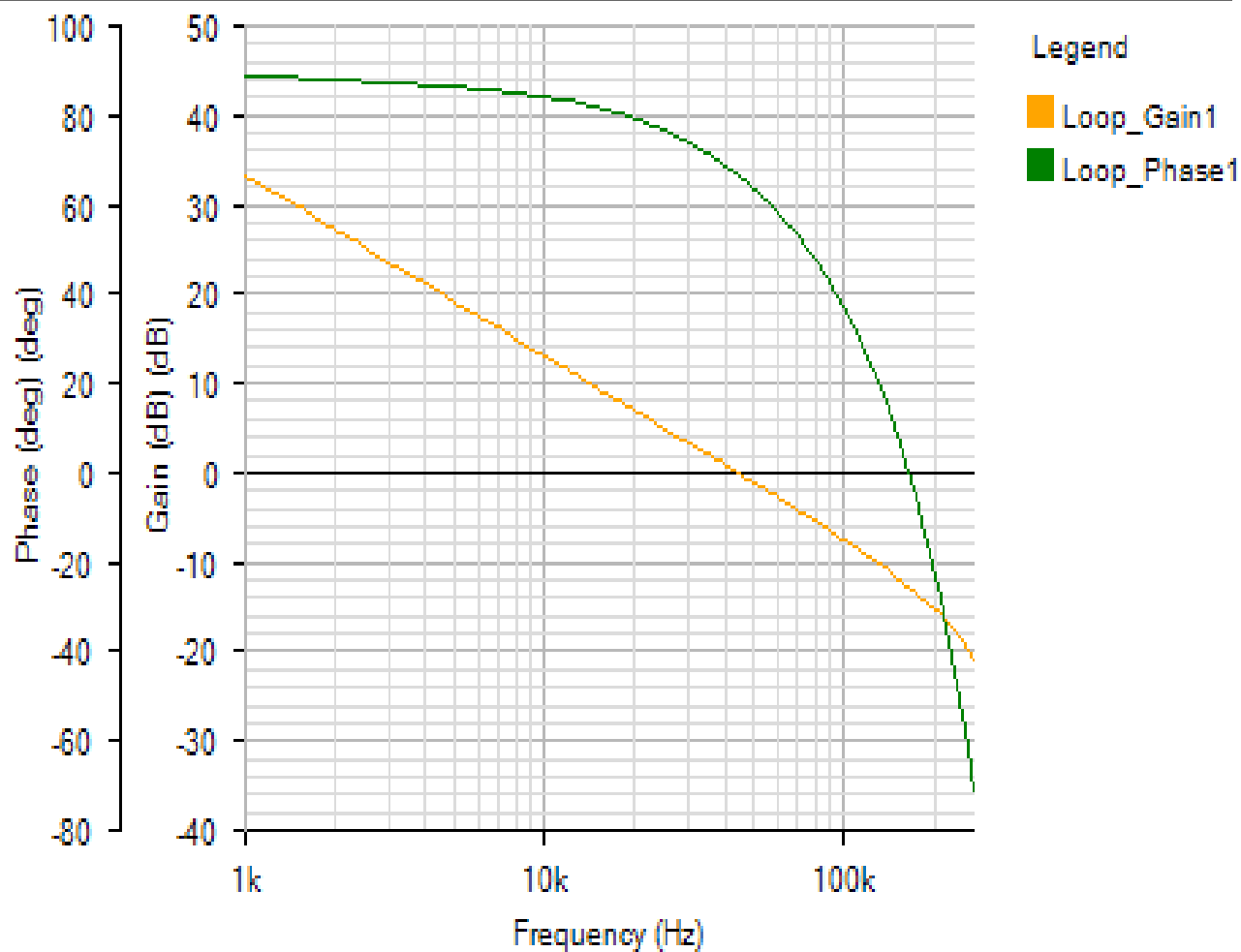
Default



AC Analysis - Wed Dec 19 2018 17:30:30

BODE1

Default

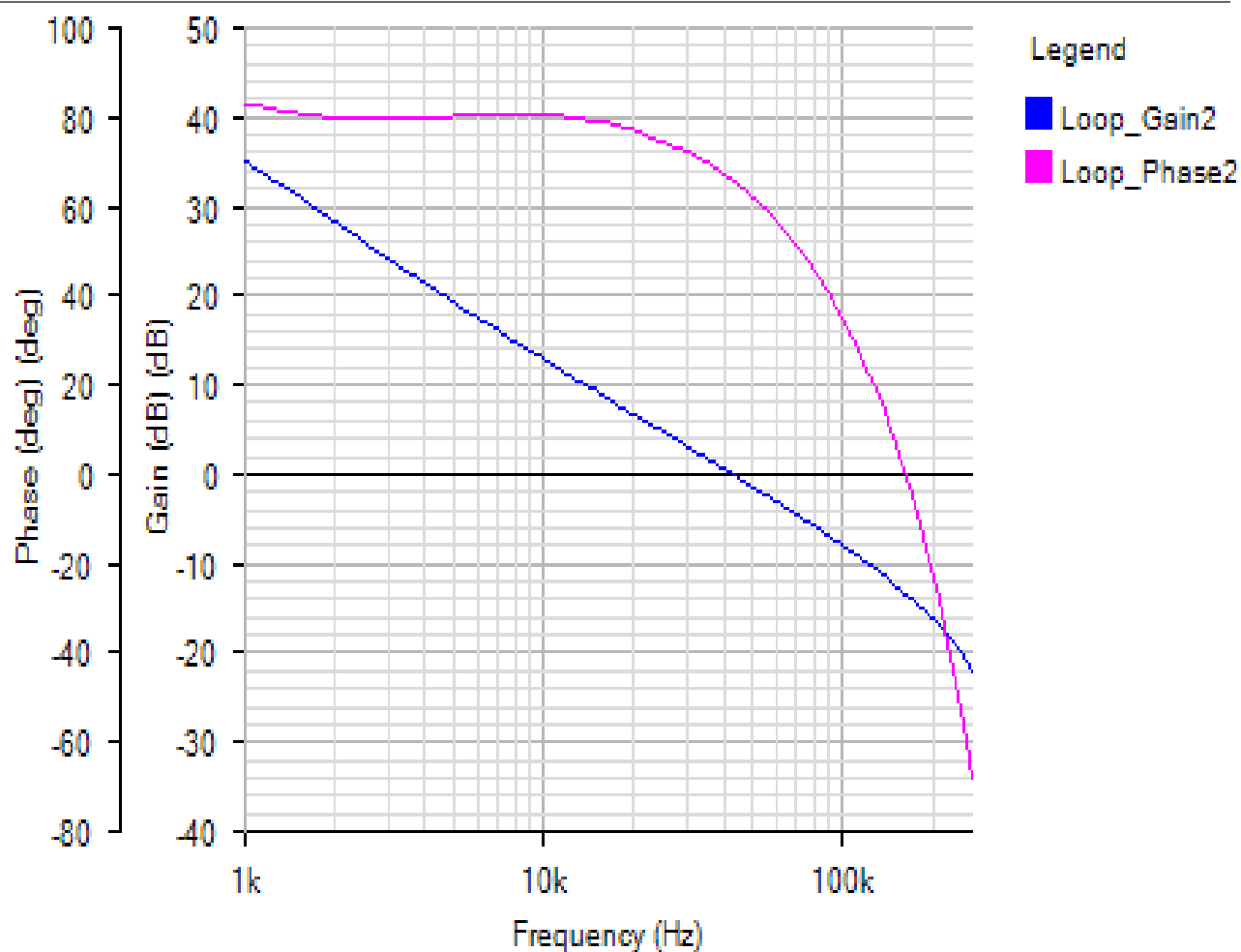


Phase Margin (output #1): 66.57° at a crossover frequency of 44.3kHz



BODE2

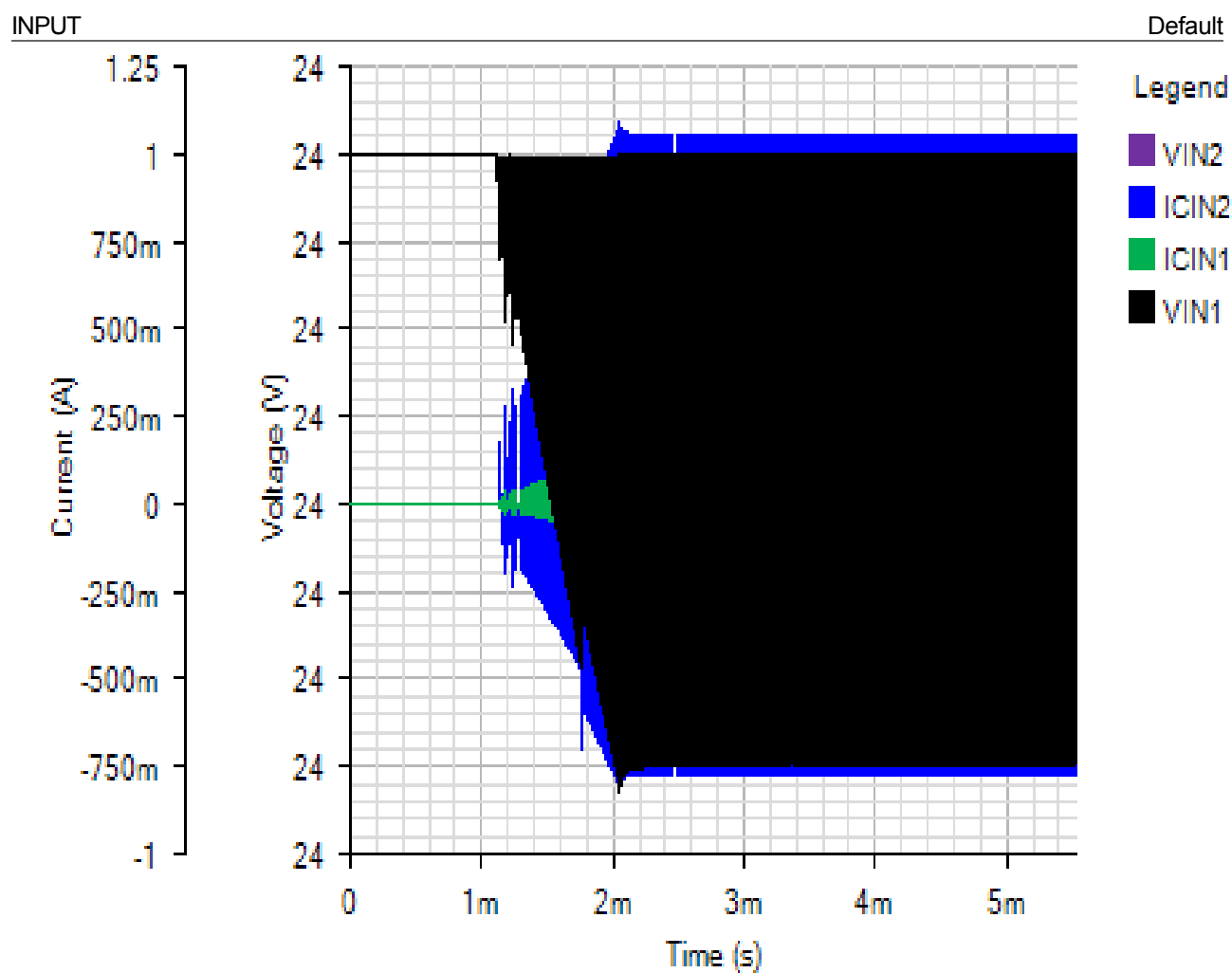
Default



Phase Margin (output #2): 65.78° at a crossover frequency of 42.7kHz

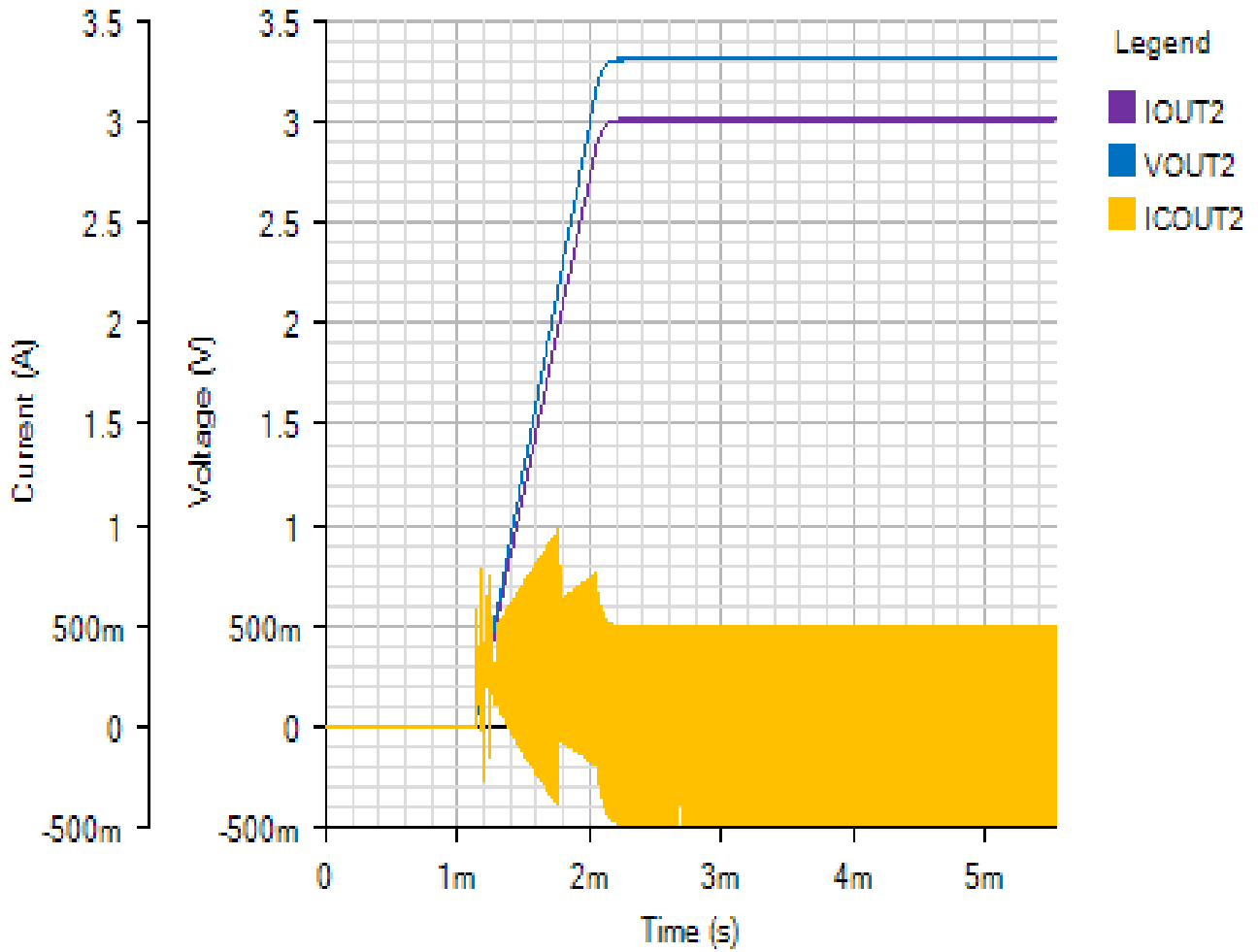


Start Up - Wed Dec 19 2018 17:30:30



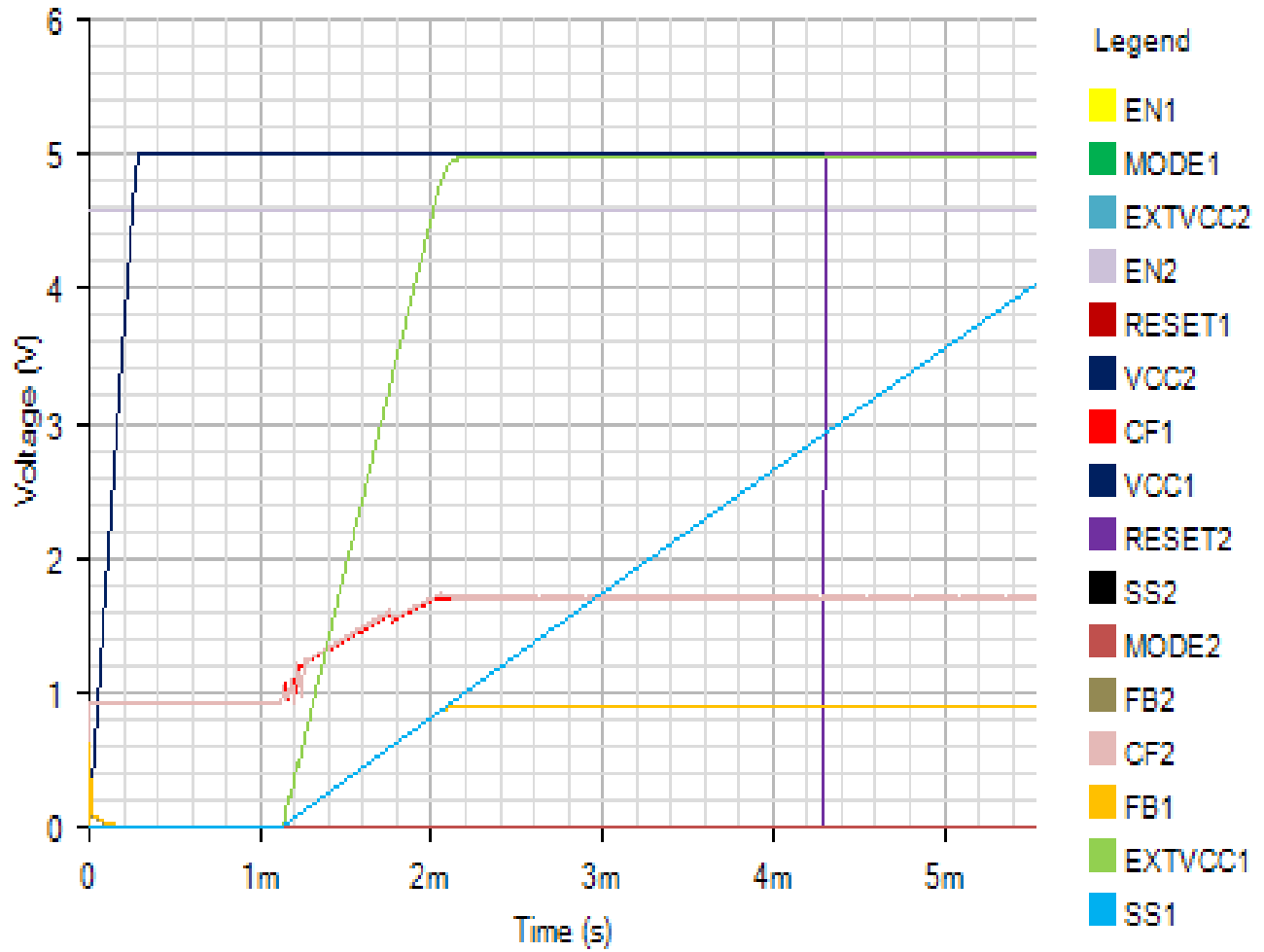
OUTPUT2

Default



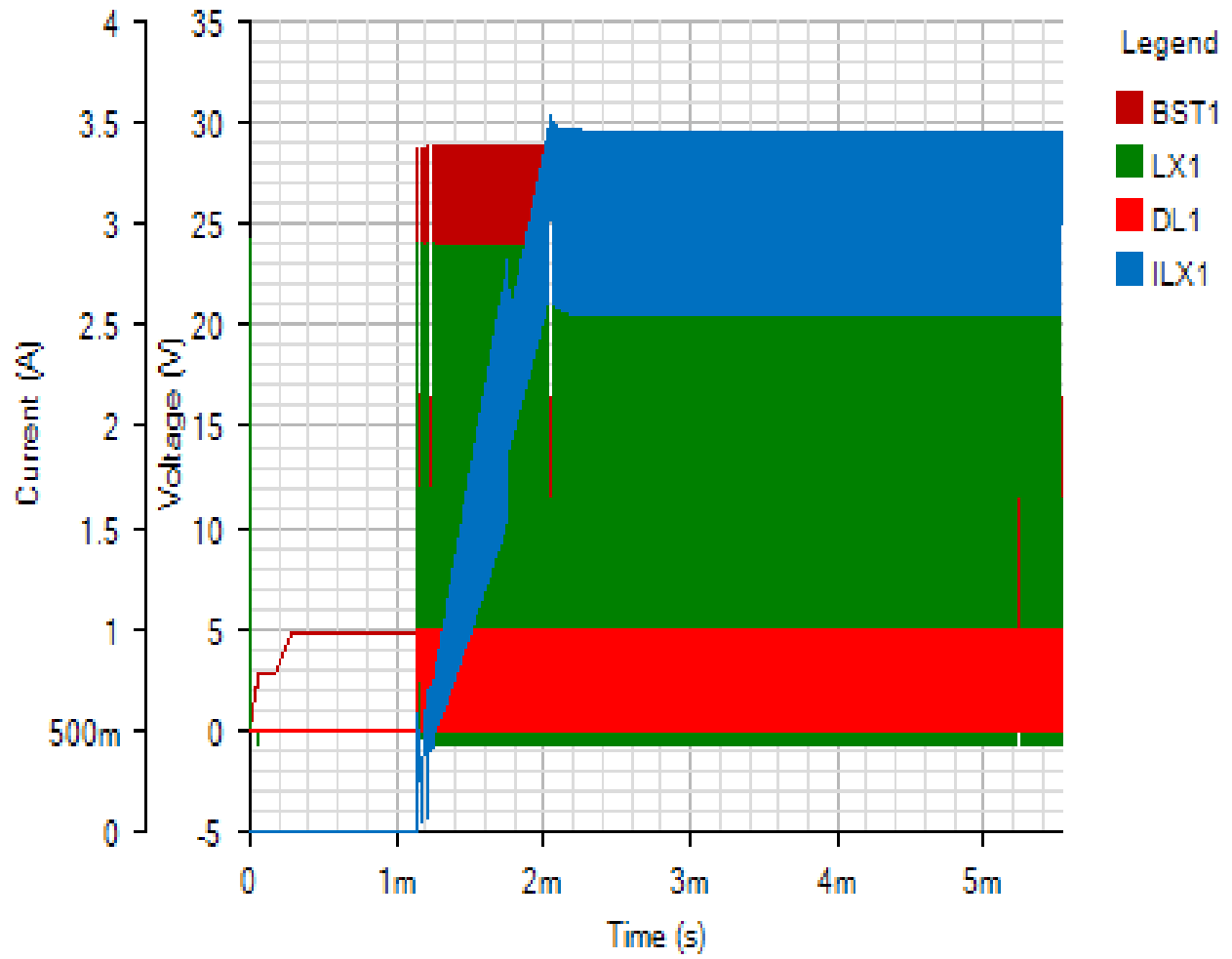
IC

Default



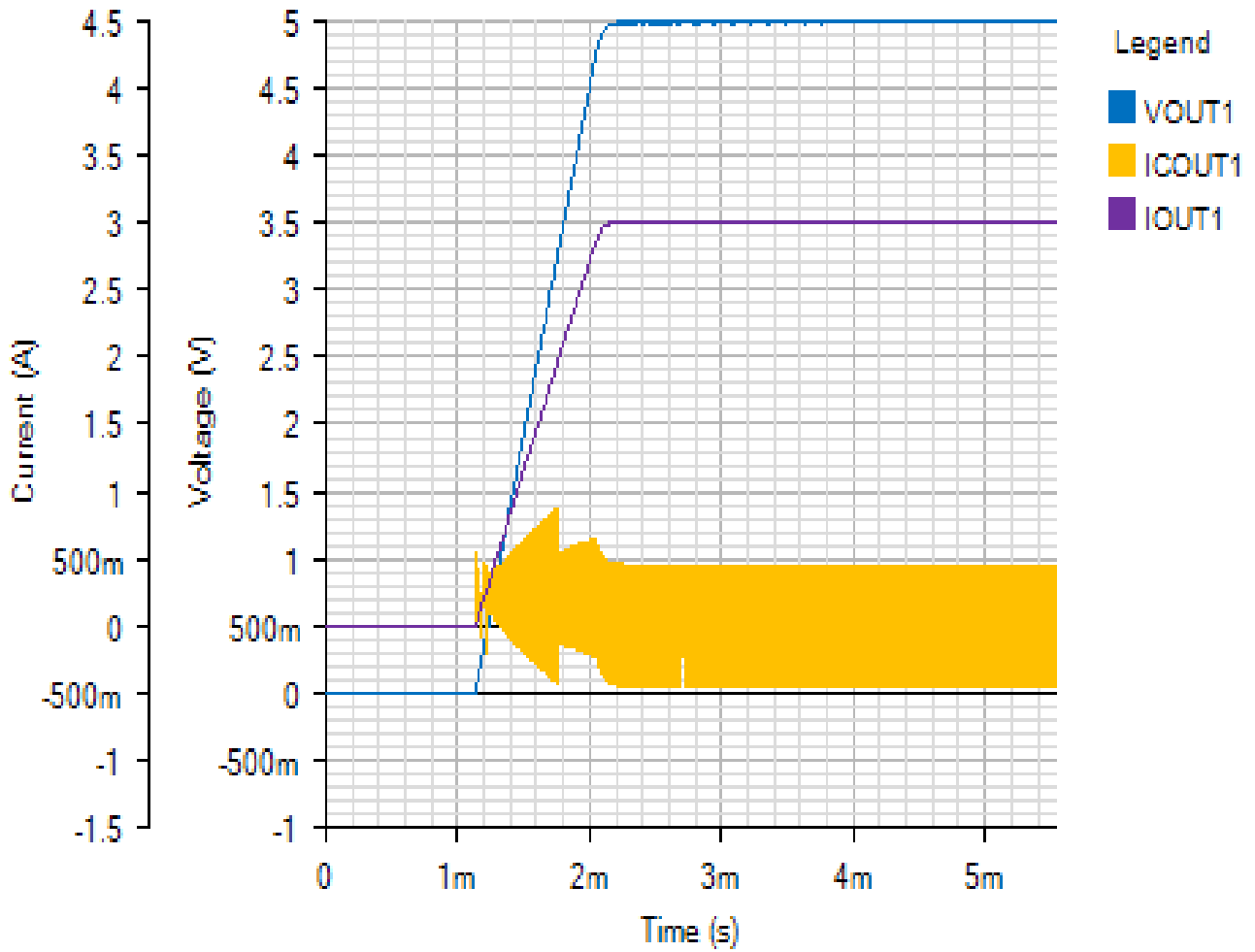
SWITCHING1

Default



OUTPUT1

Default



SWITCHING2

Default

