

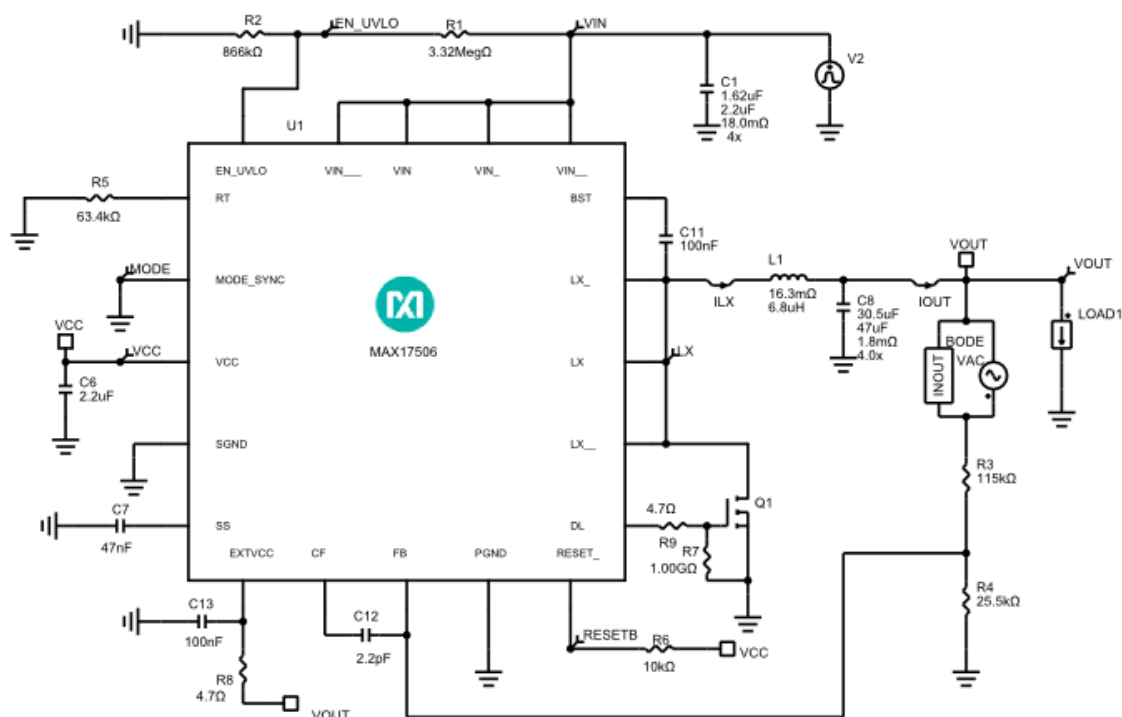
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	7.5V
Maximum Input Voltage	60V
Nominal Input Voltage	24V
Input Undervoltage Lockout	5.9V
Input Ripple Voltage	0.5V
Output Voltage	5V
Load Current	5A
Output Ripple Voltage	0.15V
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Switching Frequency	290KHz
Mode of Operation	PWM
Overload protection method	HICCUP
Current limit	7.8A
Soft-start Time	0.007s
Ambient Temperature	25°C

Schematic



***** Notes *****

- Decreasing the output capacitance below recommended value might degrade the transient response or loop stability.
- If the current level (starting current for Load Steps) is too low, AC, Steady State and Load Step analyses may fail when PFM mode is selected.

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17506	Maxim Integrated	4.5V–60V, 5A, High-Efficiency, Synchronous Step-Down DC-DC Converter with Internal Compensation
C1	4	C1210C225K1RAC	Kemet	Cap Ceramic 2.2uF 100V X7R 10% SMD 1210 125C Bulk
C6	1	C1608X7R1A225K080AC	TDK	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C7	1	CGA2B3X7R1H473K050BB	TDK	Cap Ceramic 0.047uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
C8	4.0	GRM32ER71A476ME15L	Murata	Cap Ceramic 47uF 10V X7R 20% SMD 1210 125C Embossed T/R
C11	1	GCM155R71C104KA55D	Murata Manufacturing	Cap Ceramic 0.1uF 16V X7R 10% Pad SMD 0402 125°C Automotive T/R
C12	1	GJM1555C1H2R2CB01D	Murata Manufacturing	Cap Ceramic 2.2pF 50V C0G 0.25pF Pad SMD 0402 125°C T/R
C13	1	C1005X7R1H104K050BB	TDK	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0402 125°C T/R
L1	1	MSS1048-682NLB	Coilcraft	Inductor 6.8uH 30% 14.67mOhm 5.6A Isat 6.01A Irms
				Trans MOSFET N-CH 80VDS 32mOhm@4.5V 29mOhm@6V 8.7nC

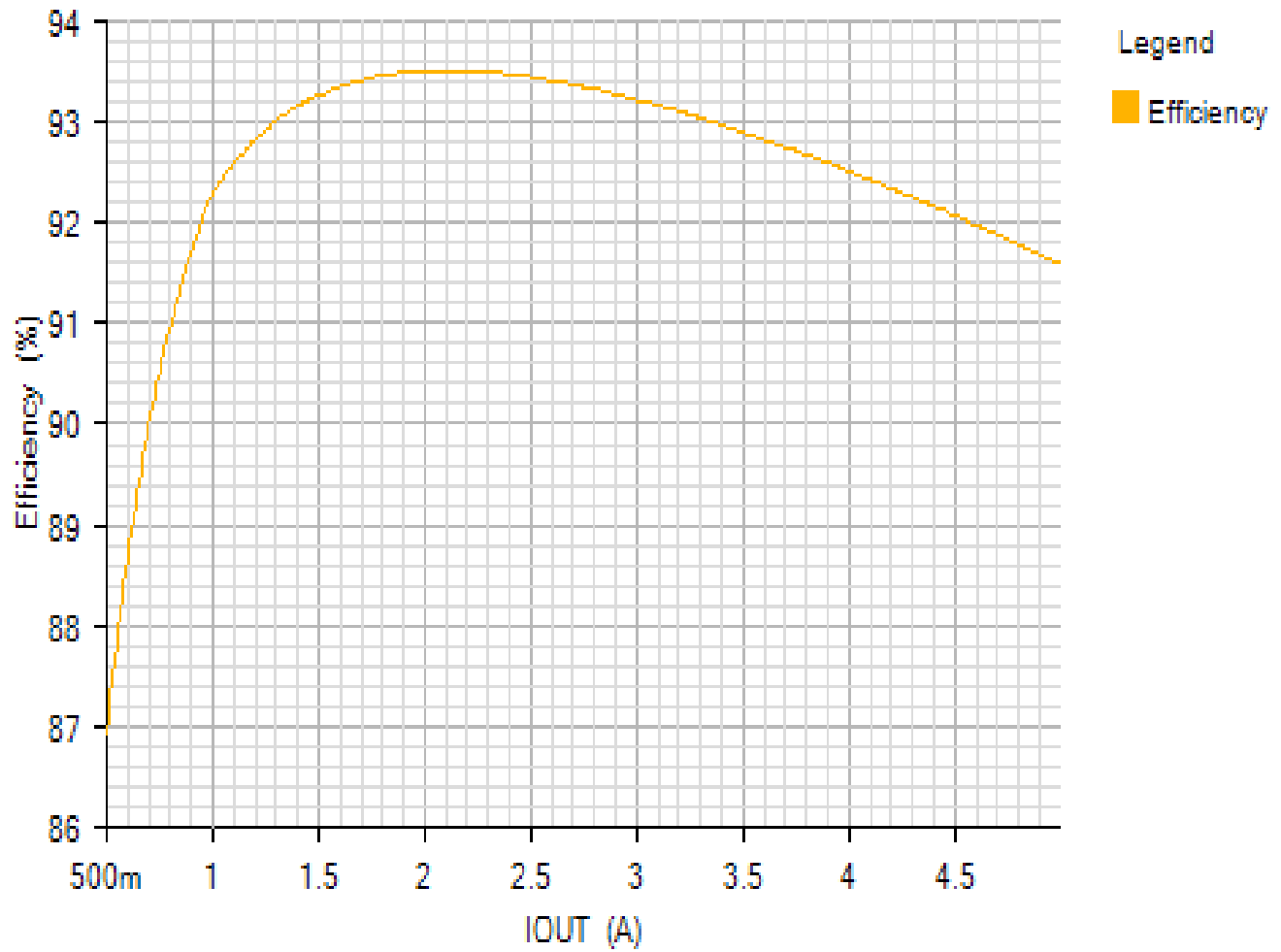
Q1	1	SiS468DN-T1-GE3	Vishay	5.2nC 0.78nF 0.4nF 150°C 30A 52W 2.4°C/W 1.12mm 11.6mm^2 PowerPAK 1212-8
R1	1	CRCW06033M32FKEA	Vishay	Res Thick Film 0603 3.32M Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ2RKF8663X	Panasonic	Res Thick Film 0402 866K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ2RKF1153X	Panasonic	Res Thick Film 0402 115K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ2RKF2552X	Panasonic	Res Thick Film 0402 25.5K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF6342X	Panasonic	Res Thick Film 0402 63.4K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R8	1	CRCW04024R70FKEDHP	Vishay	Res Thick Film 0402 4.7 Ohm 1% 0.2W(1/5W) ±100ppm/°C Pad SMD Automotive T/R
R9	1	RC0402FR-074R7L	Yageo	Res Thick Film 0402 4.7 Ohm 1% 0.063W(1/16W) ±200ppm/°C Epoxy Pad SMD T/R

Simulation Results

Efficiency - Tue Nov 20 2018 11:30:03

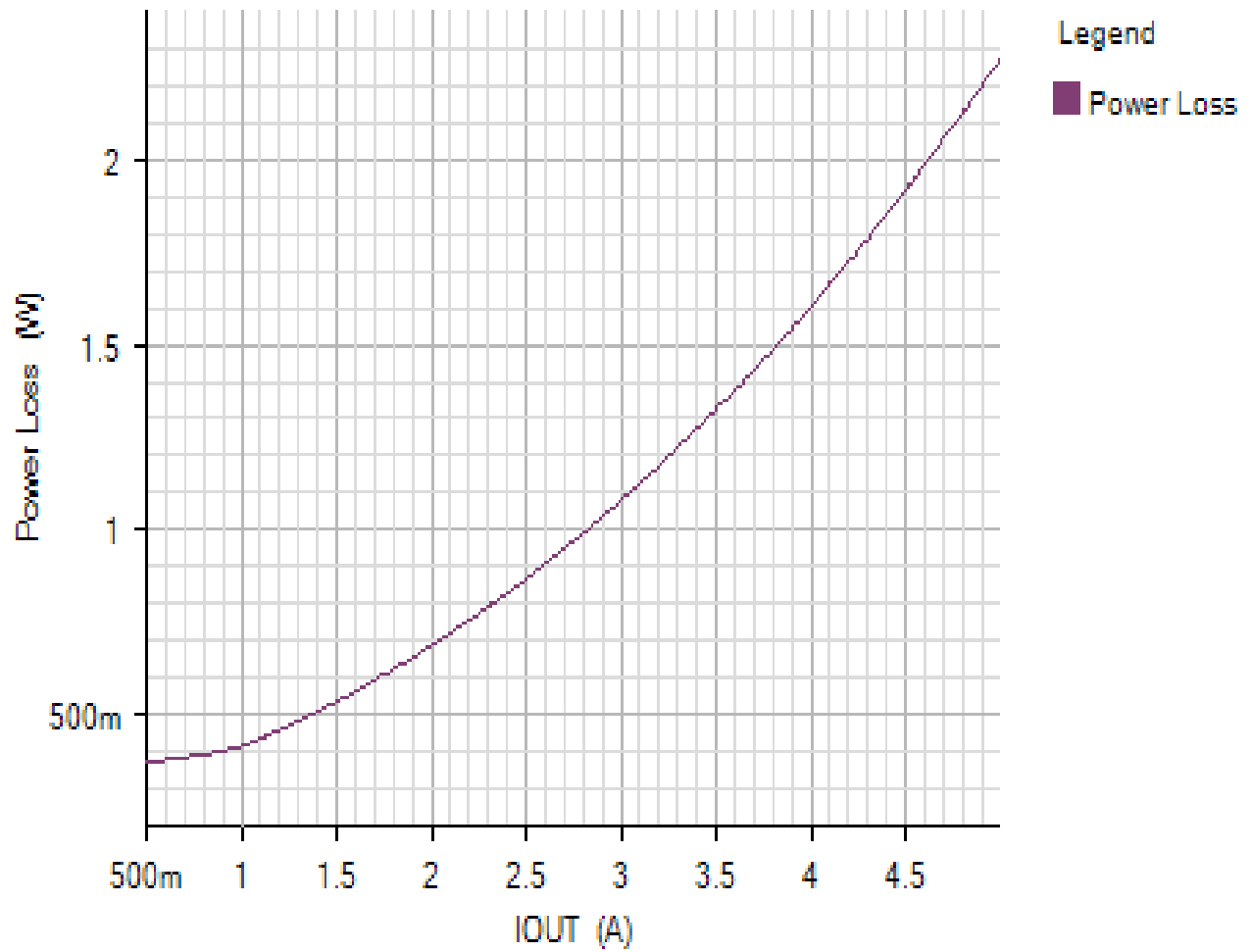
EFFICIENCY_PLOT

Default



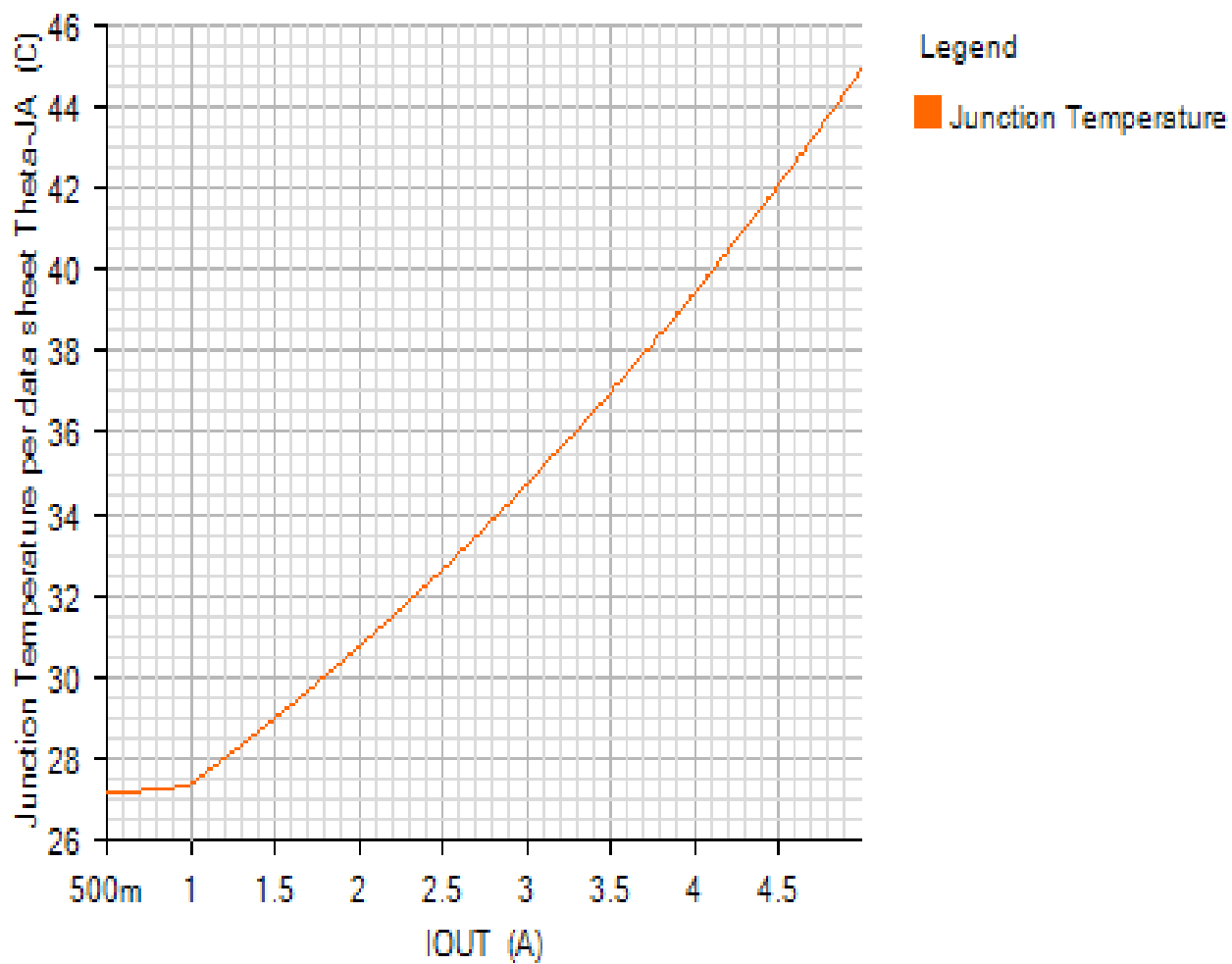
POWER_LOSS_PLOT

Default

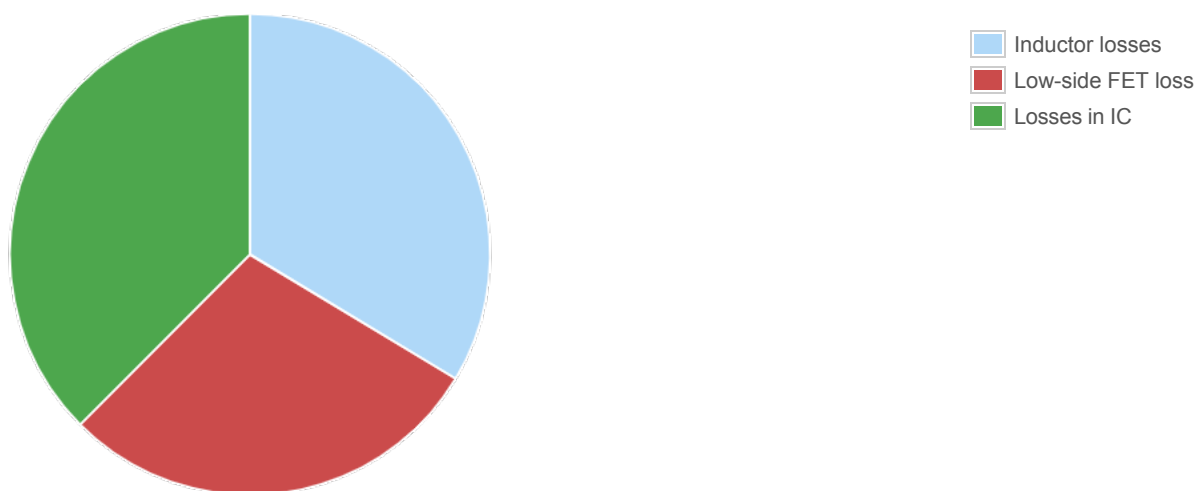


JUNCTION_TEMPERATURE_PLOT

Default



Losses



Component

Loss (W)

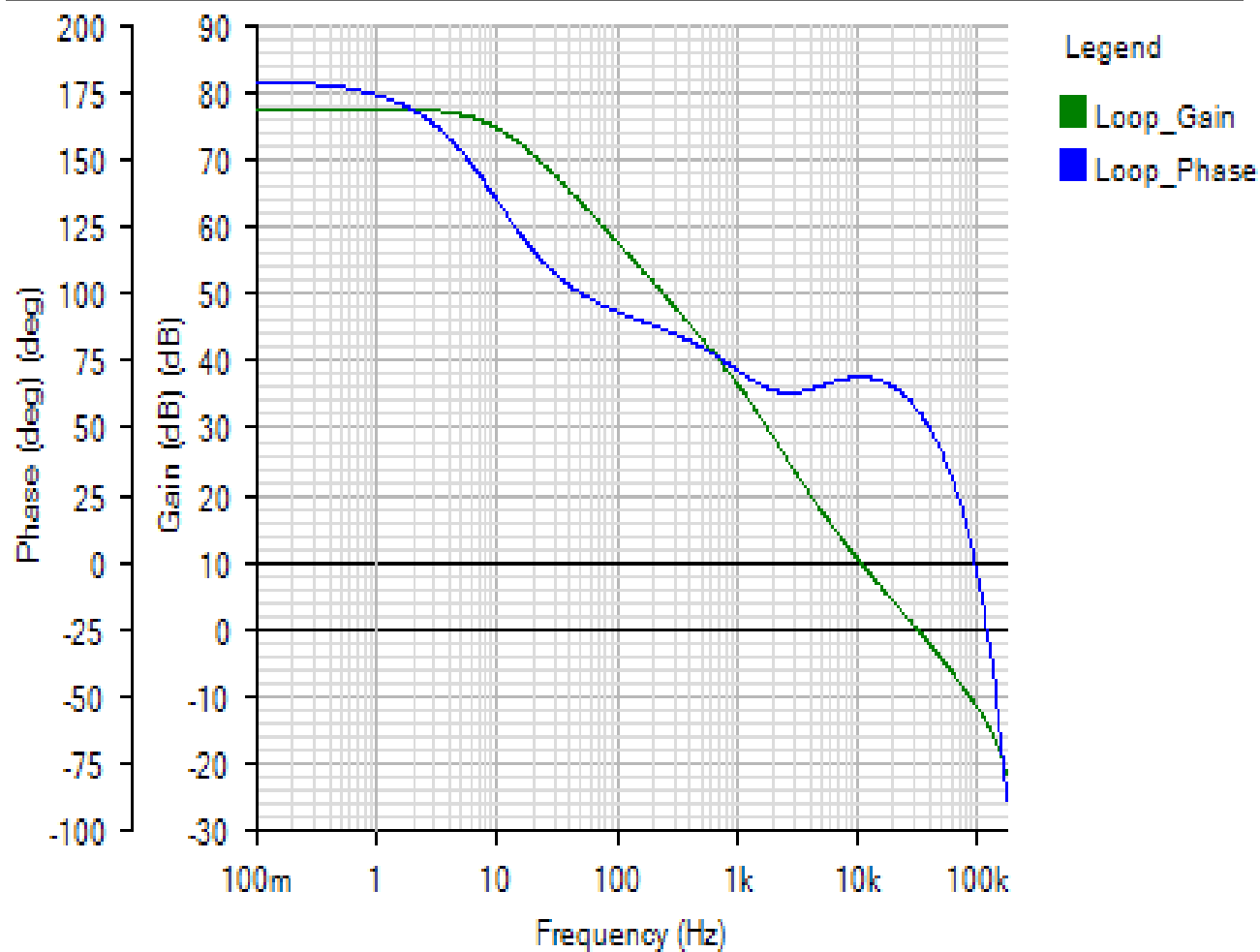
% of total

Component	Loss (W)	% of total
Inductor losses	0.78	33.6
Low-side FET loss	0.67	28.9
Losses in IC	0.87	37.5
Total	2.32	100

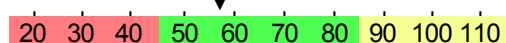
AC Loop - Tue Nov 20 2018 11:30:03

BODE

Default



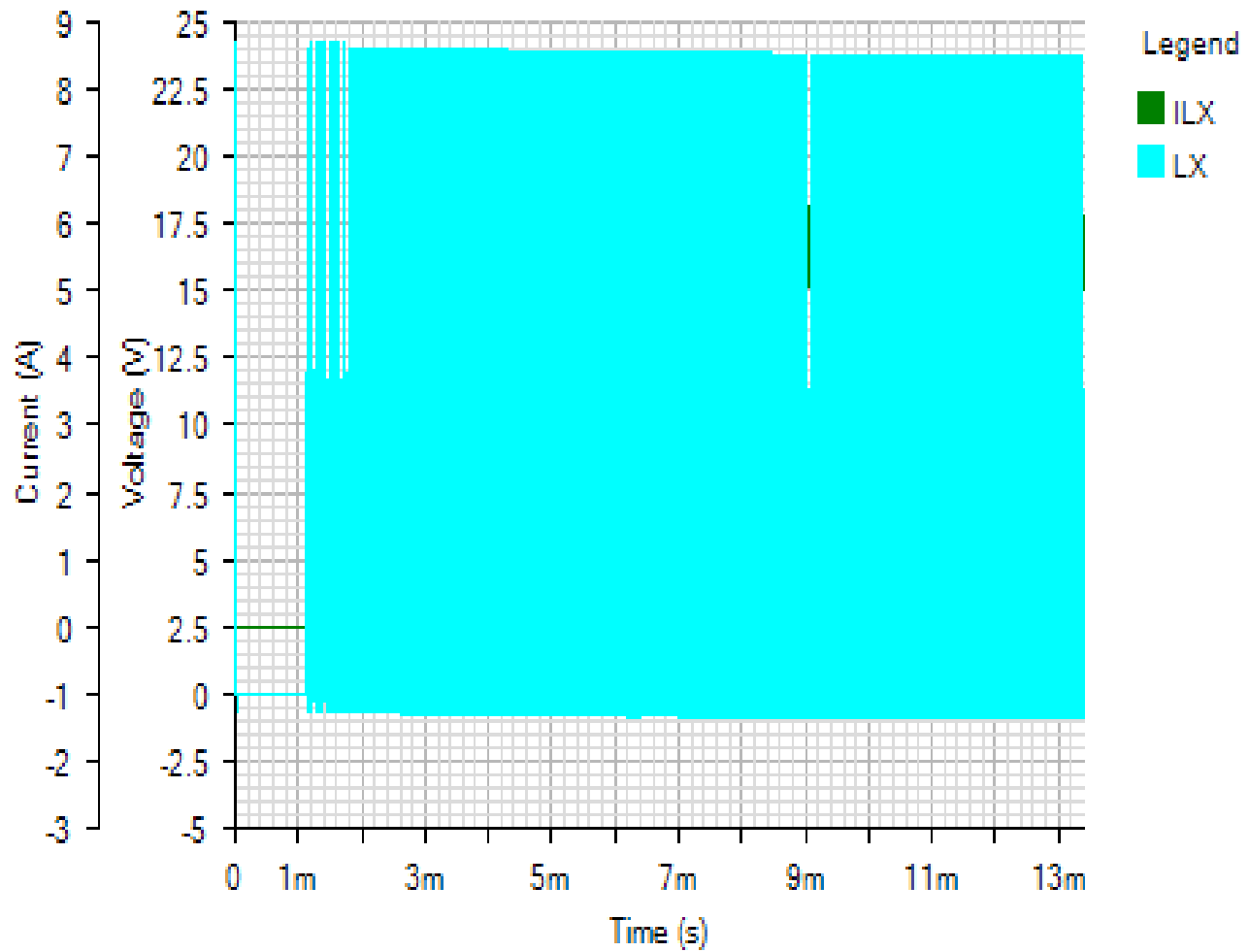
Phase Margin: 57.03° at a crossover frequency of 31.3kHz



Start Up - Tue Nov 20 2018 11:30:03

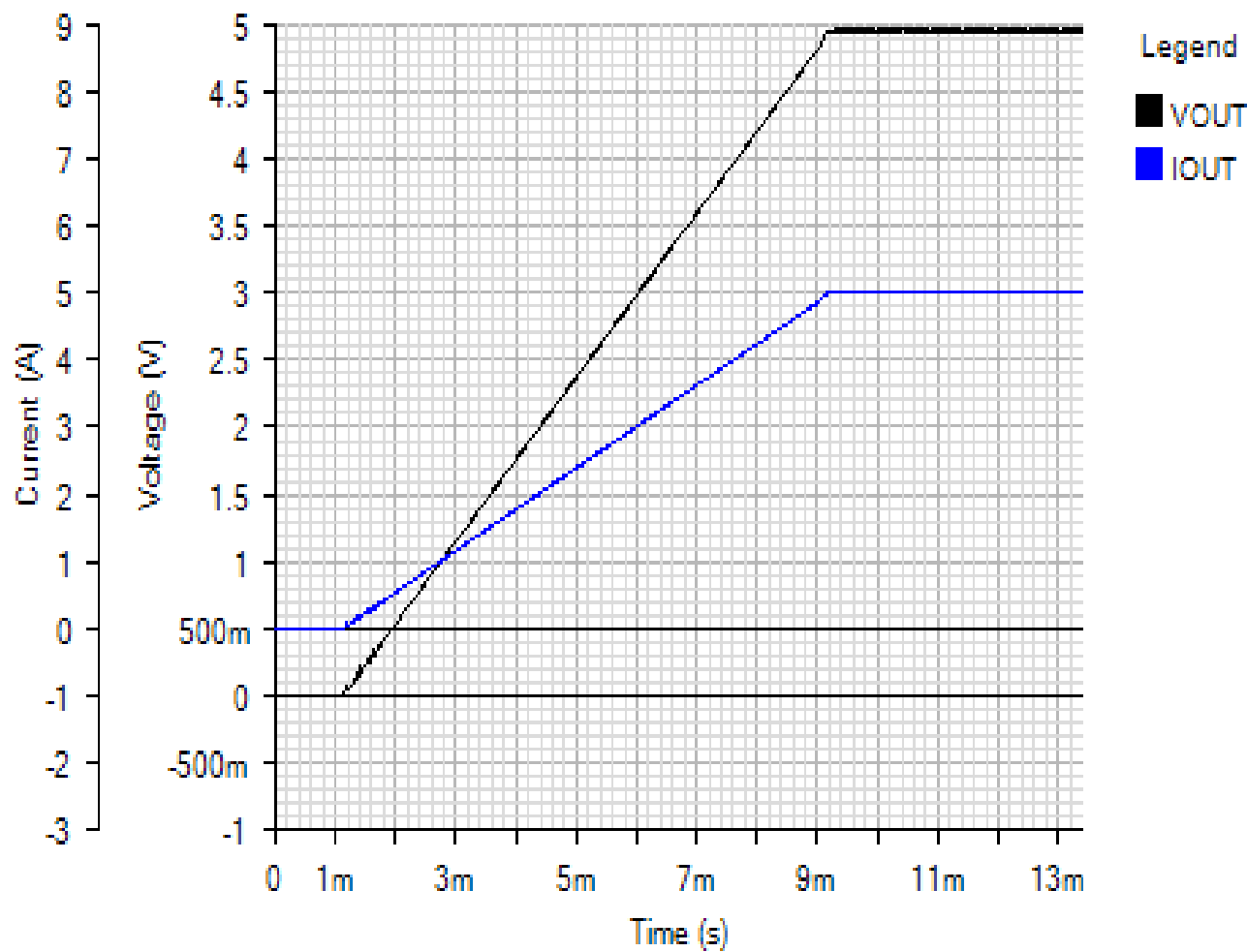
SWITCHING

Default



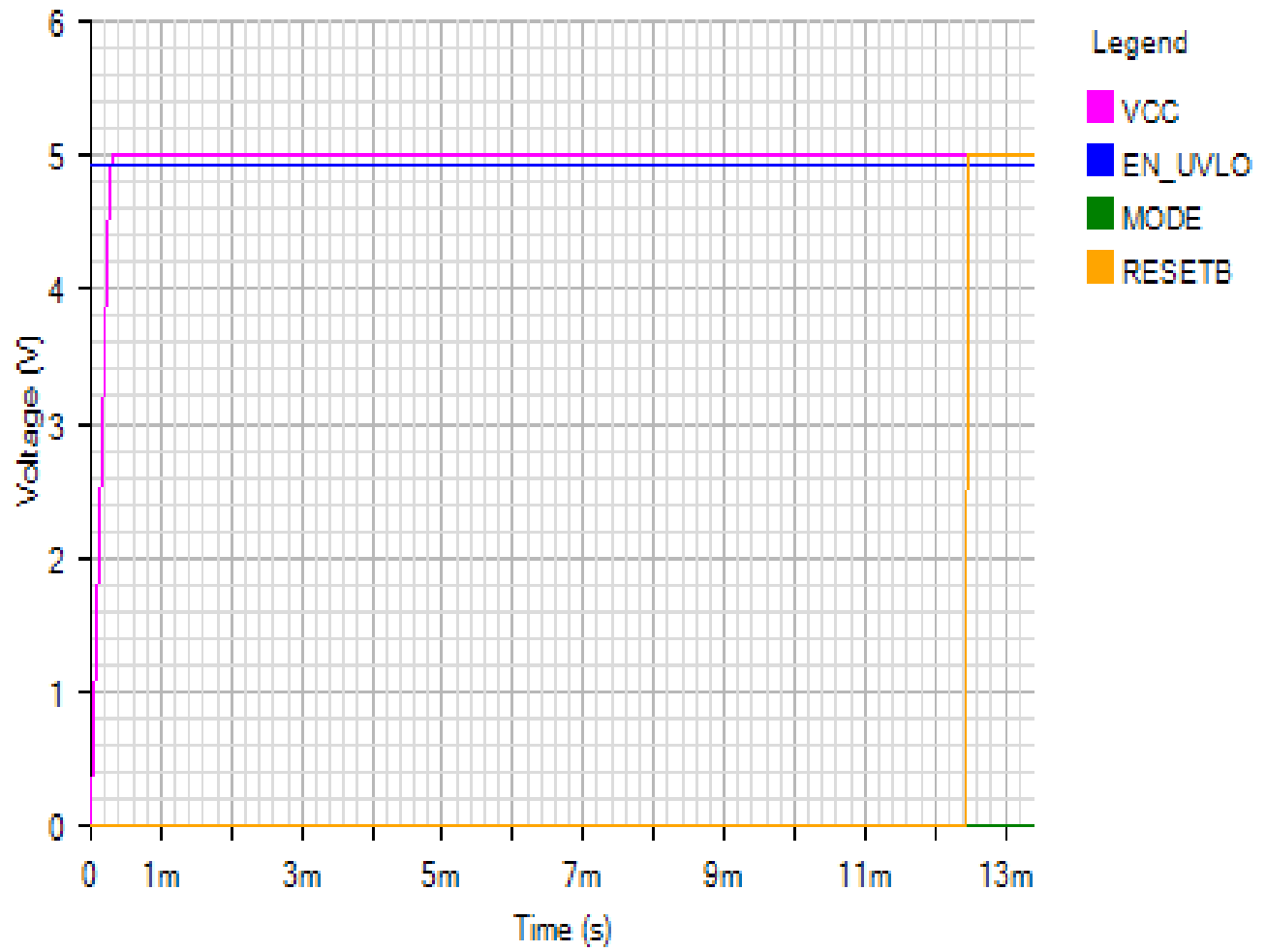
OUTPUT

Default



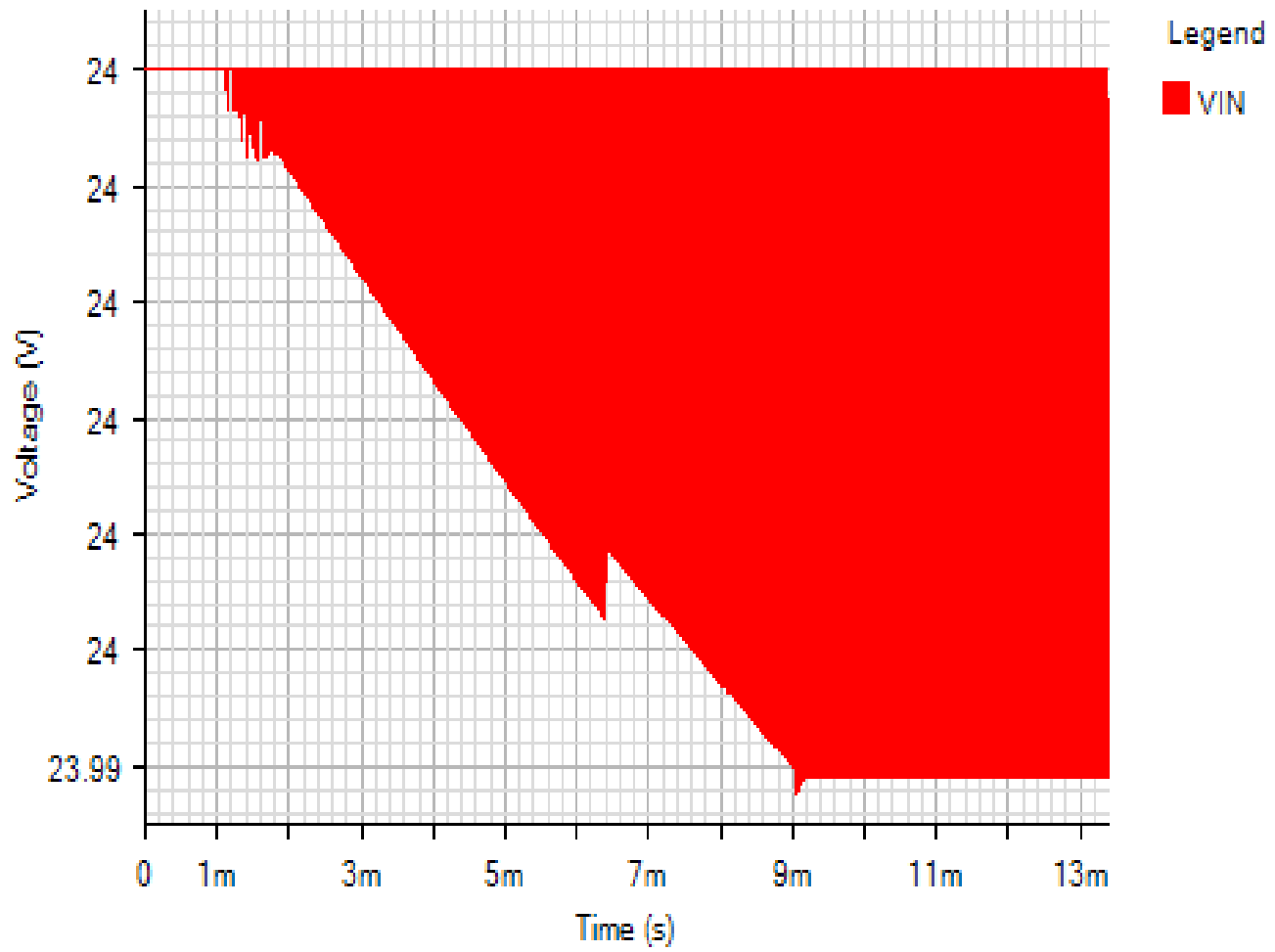
IC

Default



INPUT

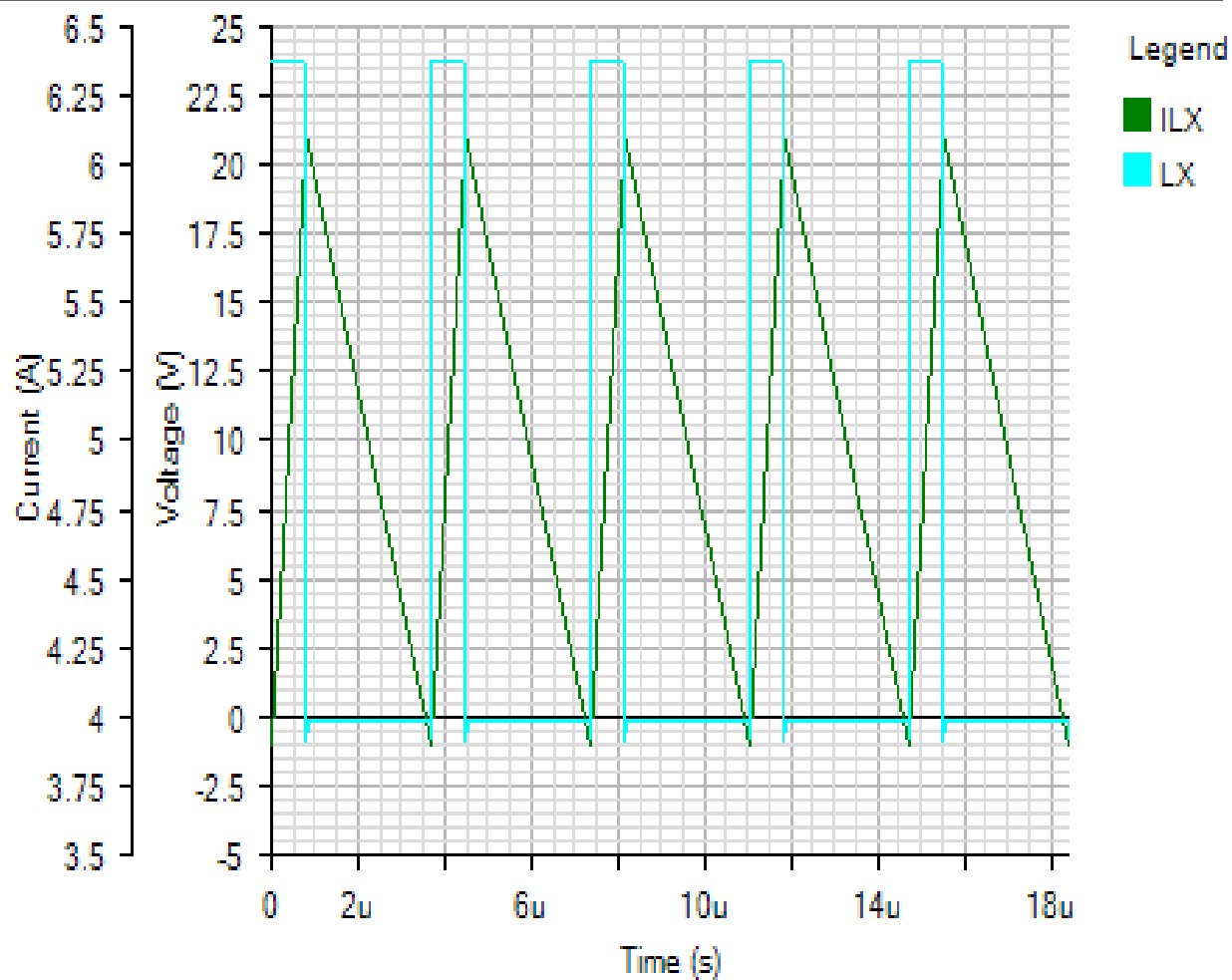
Default



Steady State - Tue Nov 20 2018 11:30:03

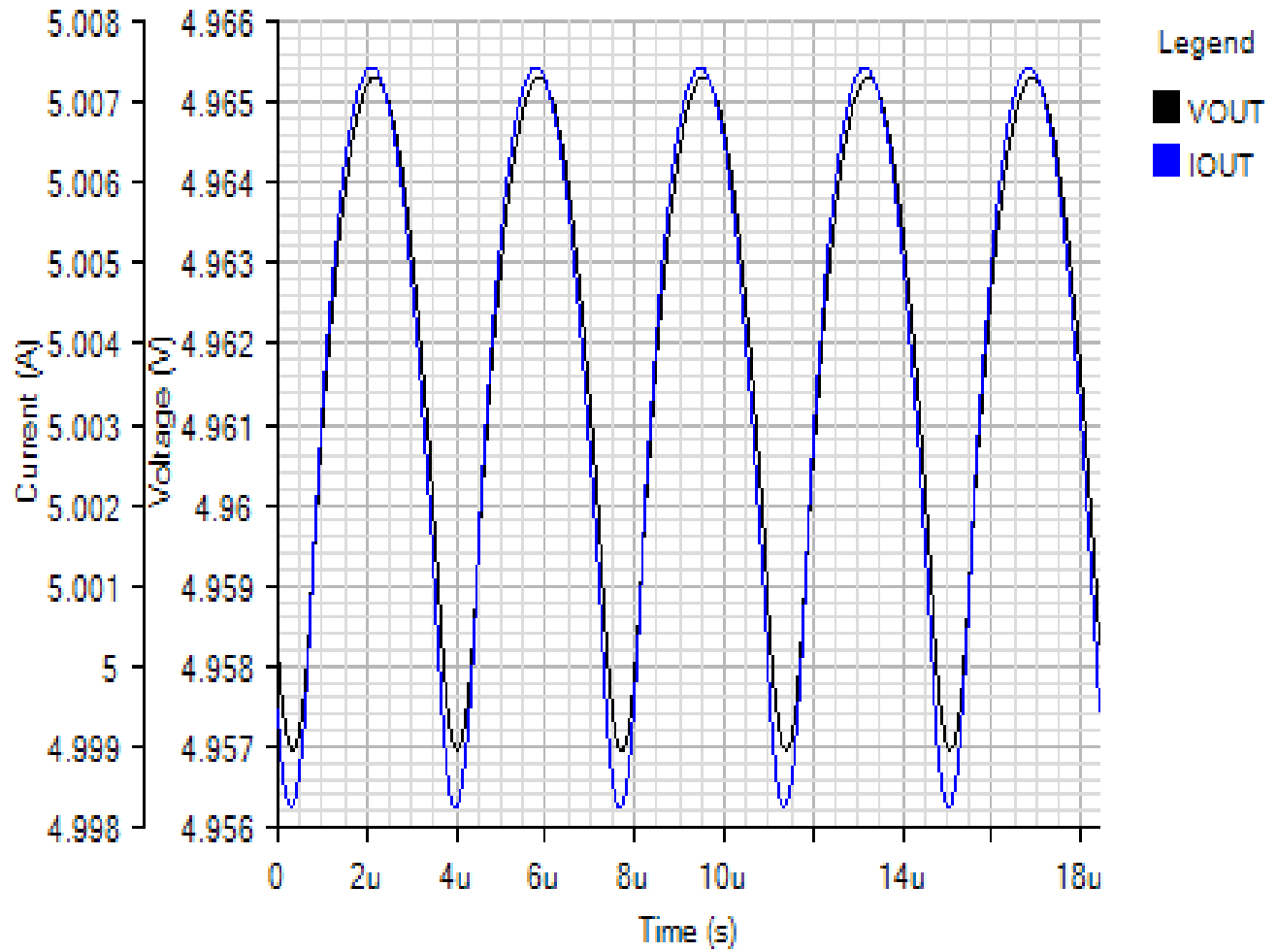
SWITCHING

Default



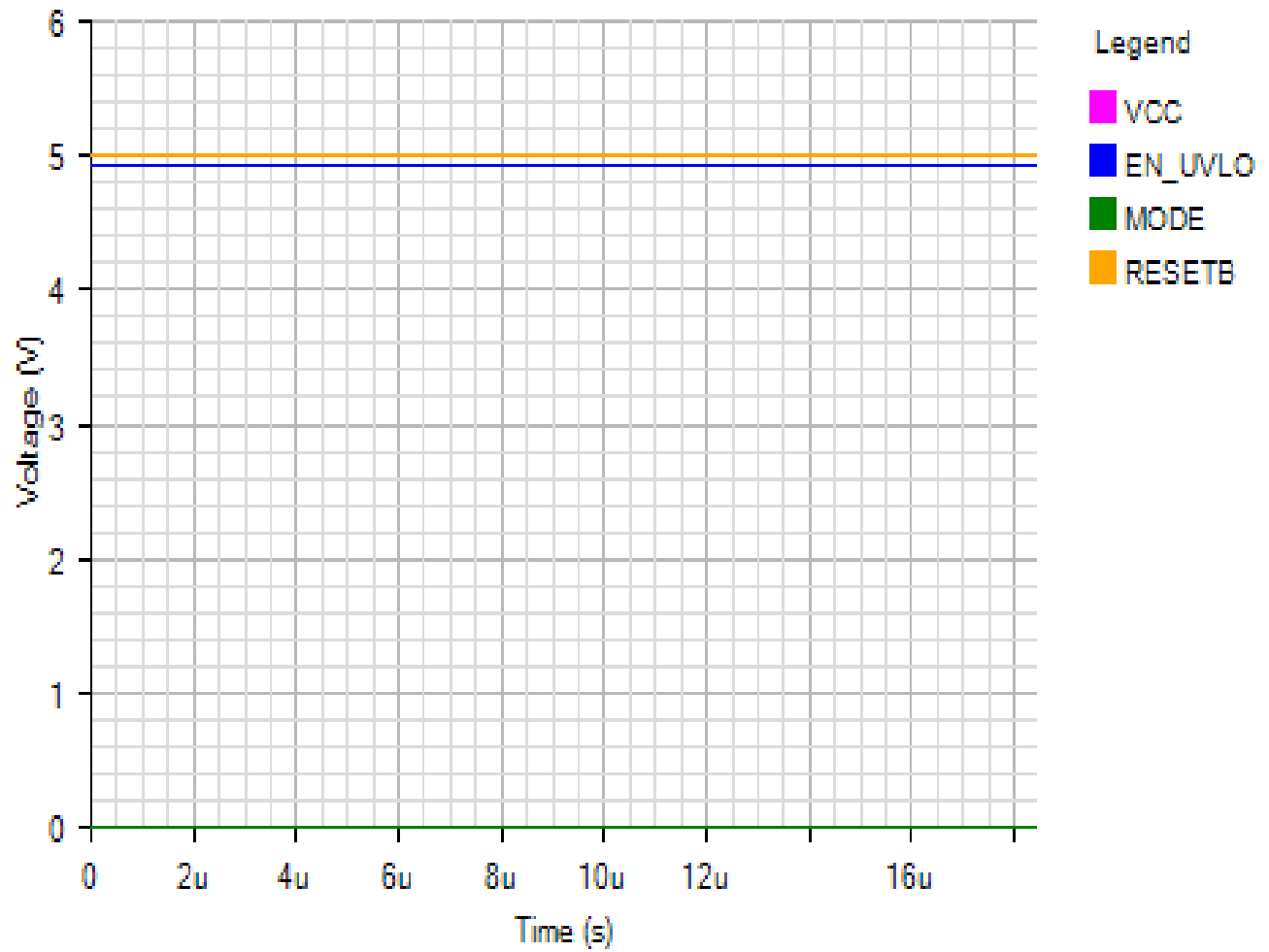
OUTPUT

Default



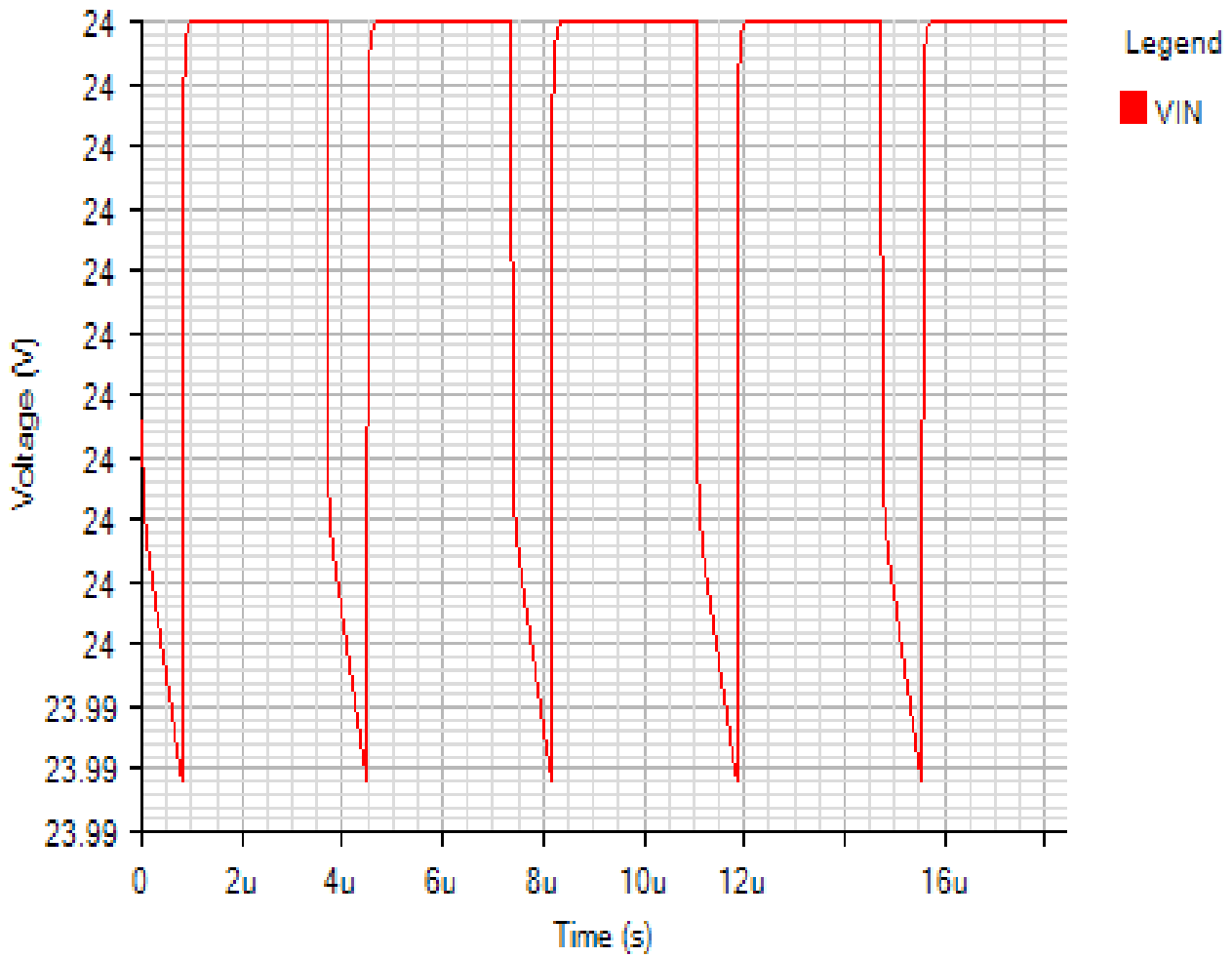
IC

Default



INPUT

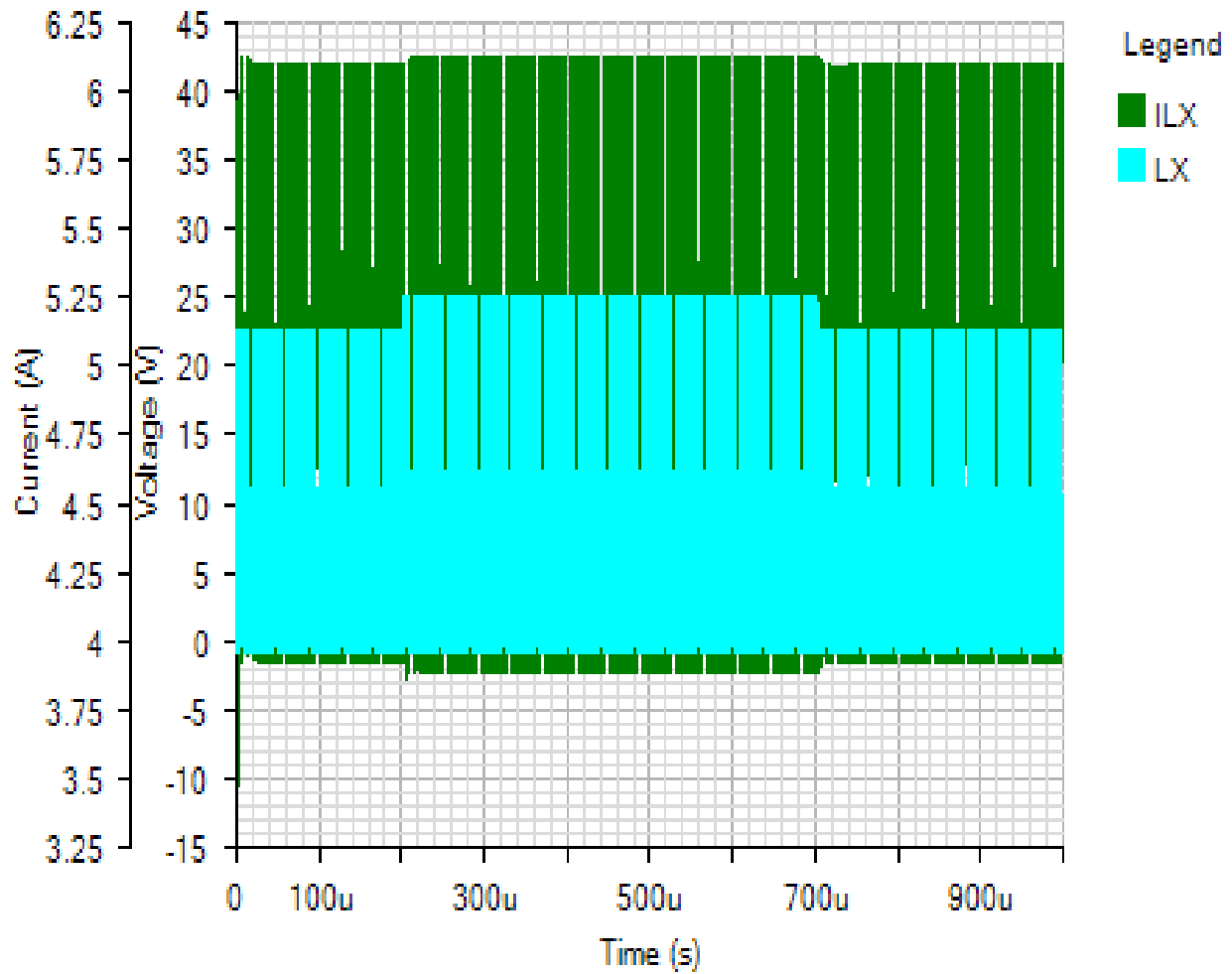
Default



Line Transient - Tue Nov 20 2018 11:30:03

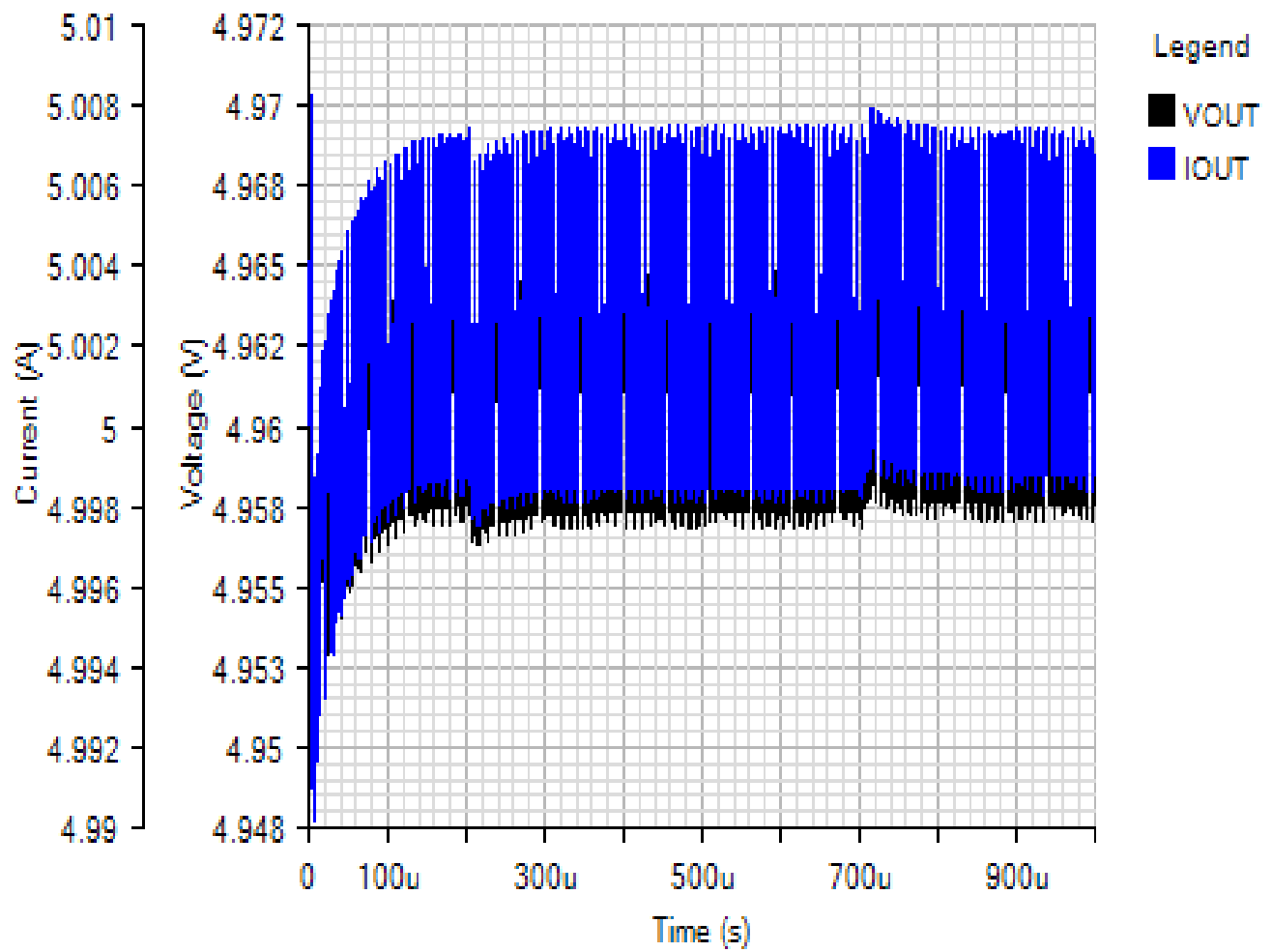
SWITCHING

Default



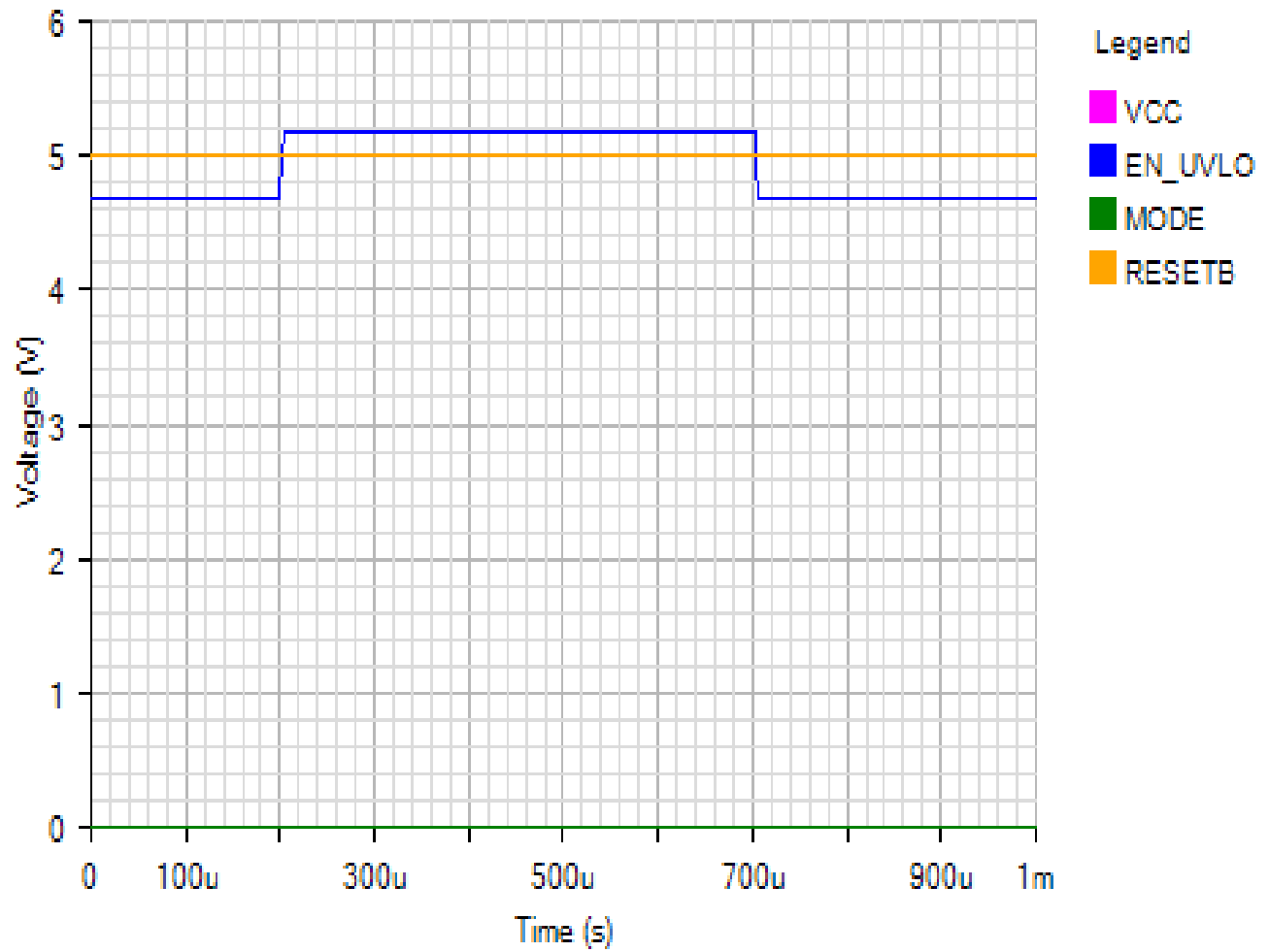
OUTPUT

Default



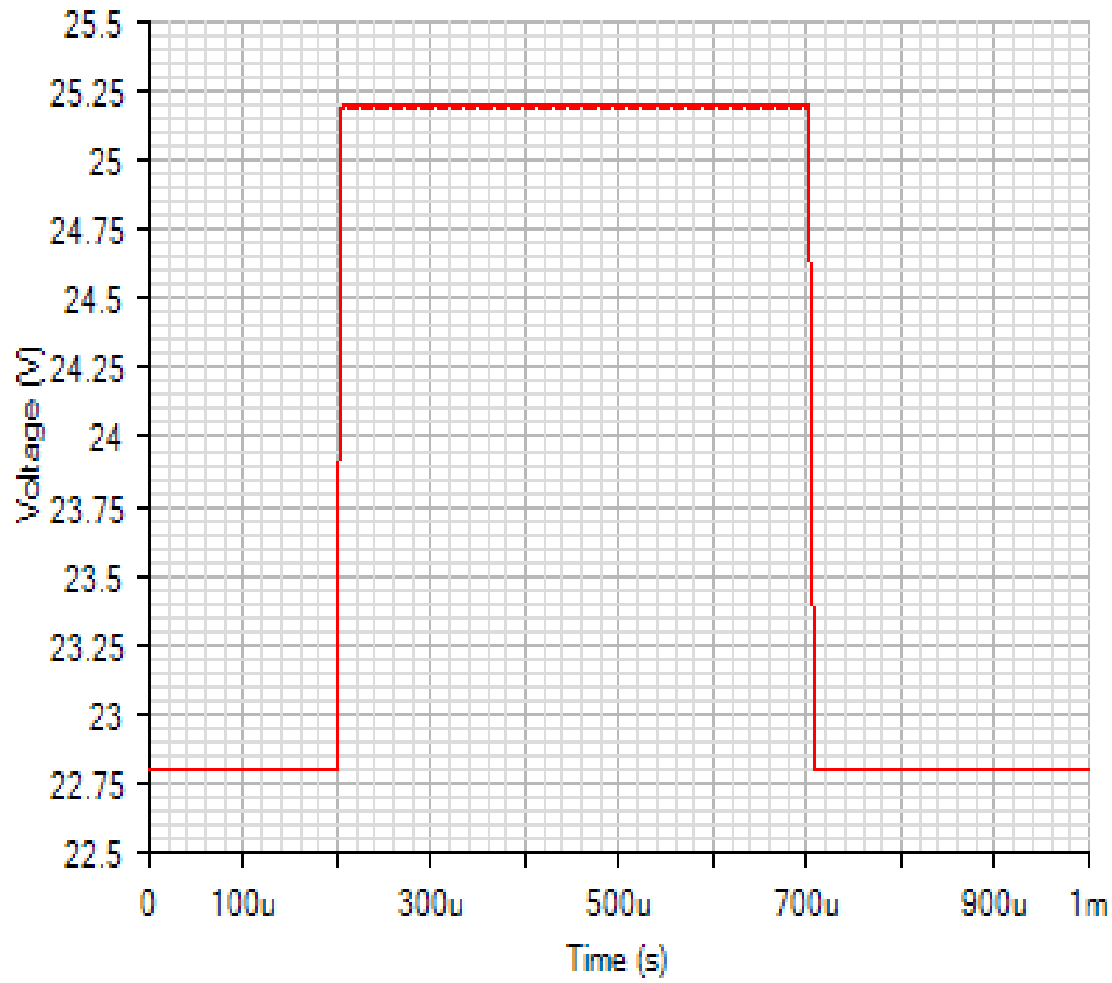
IC

Default



INPUT

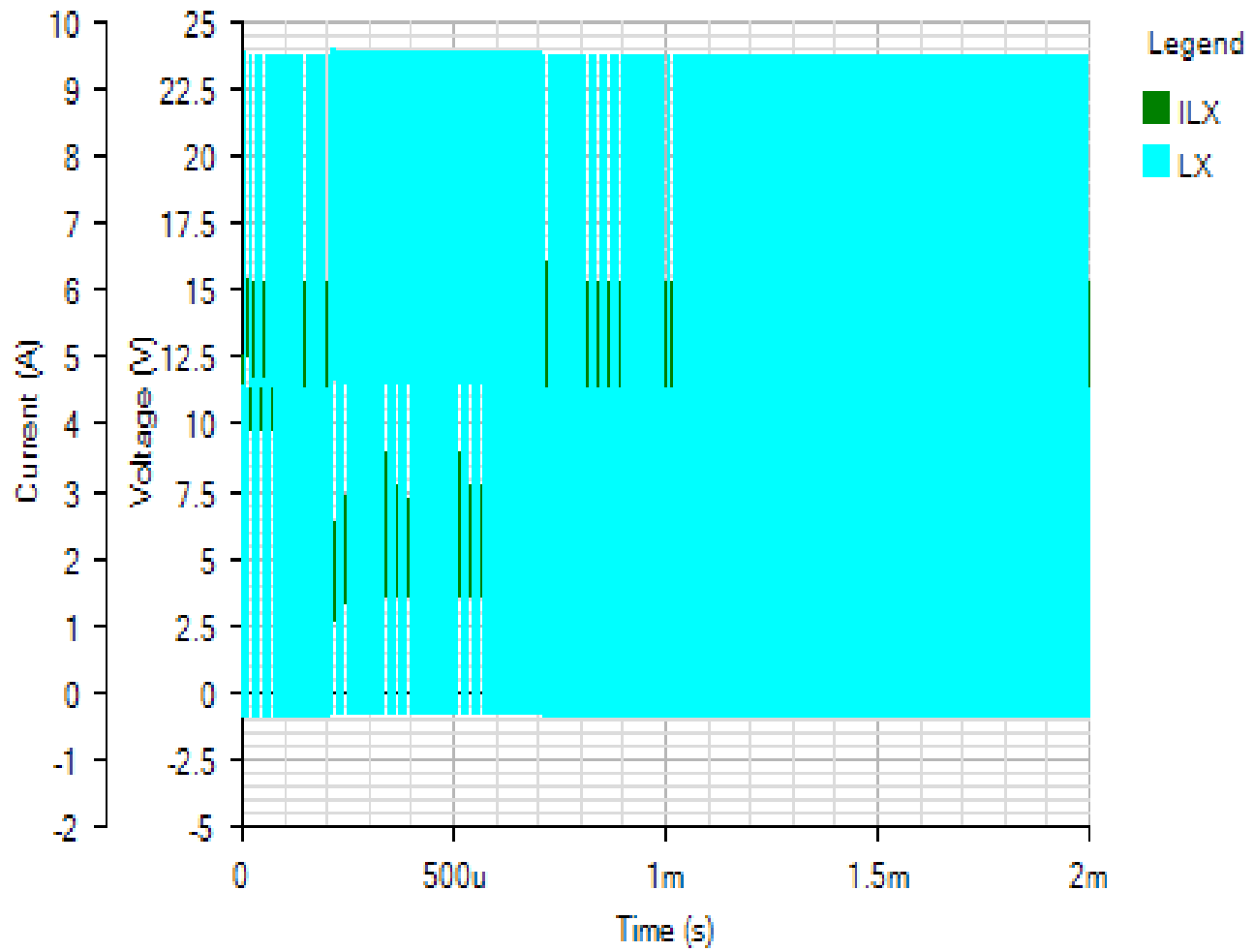
Default



Load Step - Tue Nov 20 2018 11:30:03

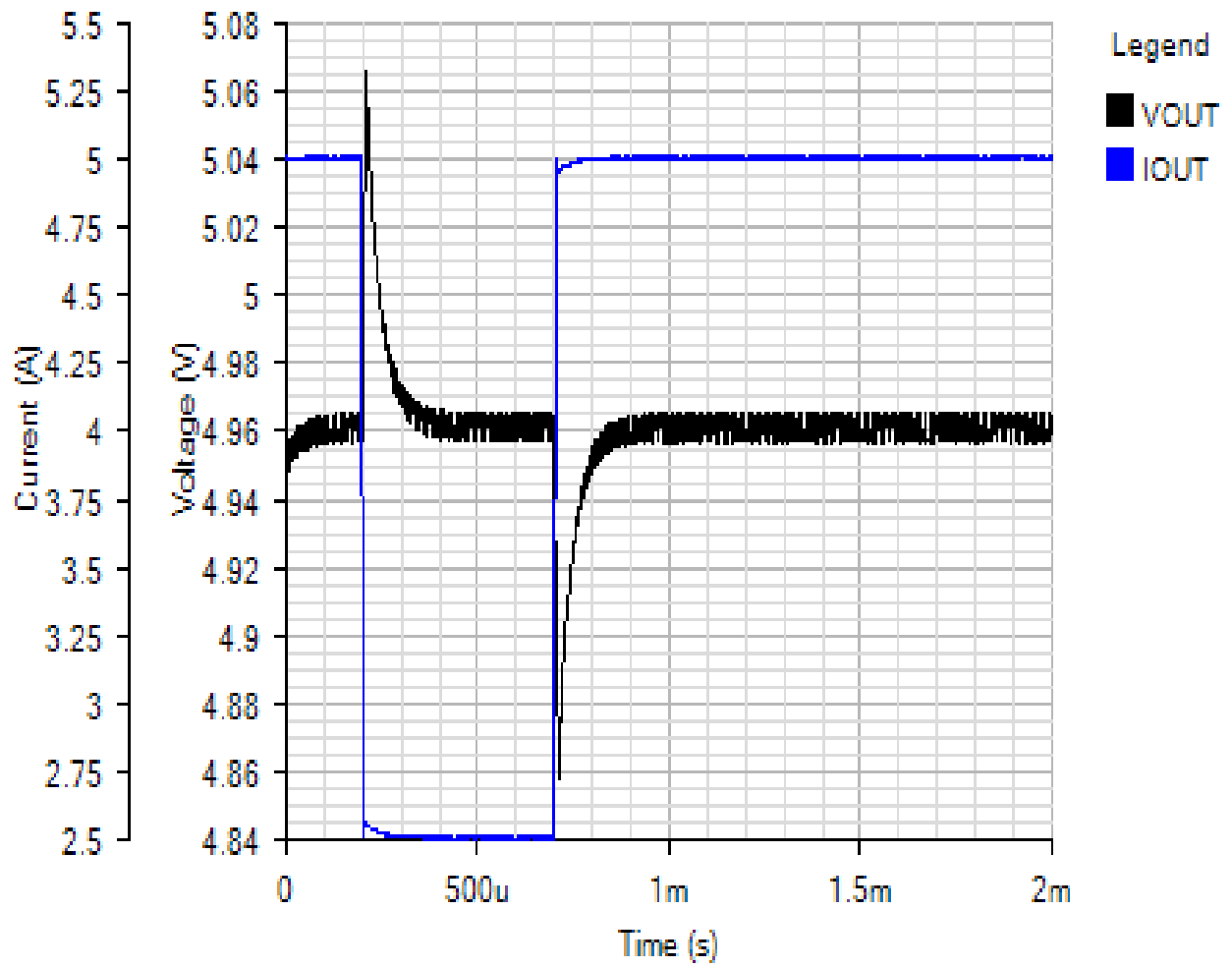
SWITCHING

Default



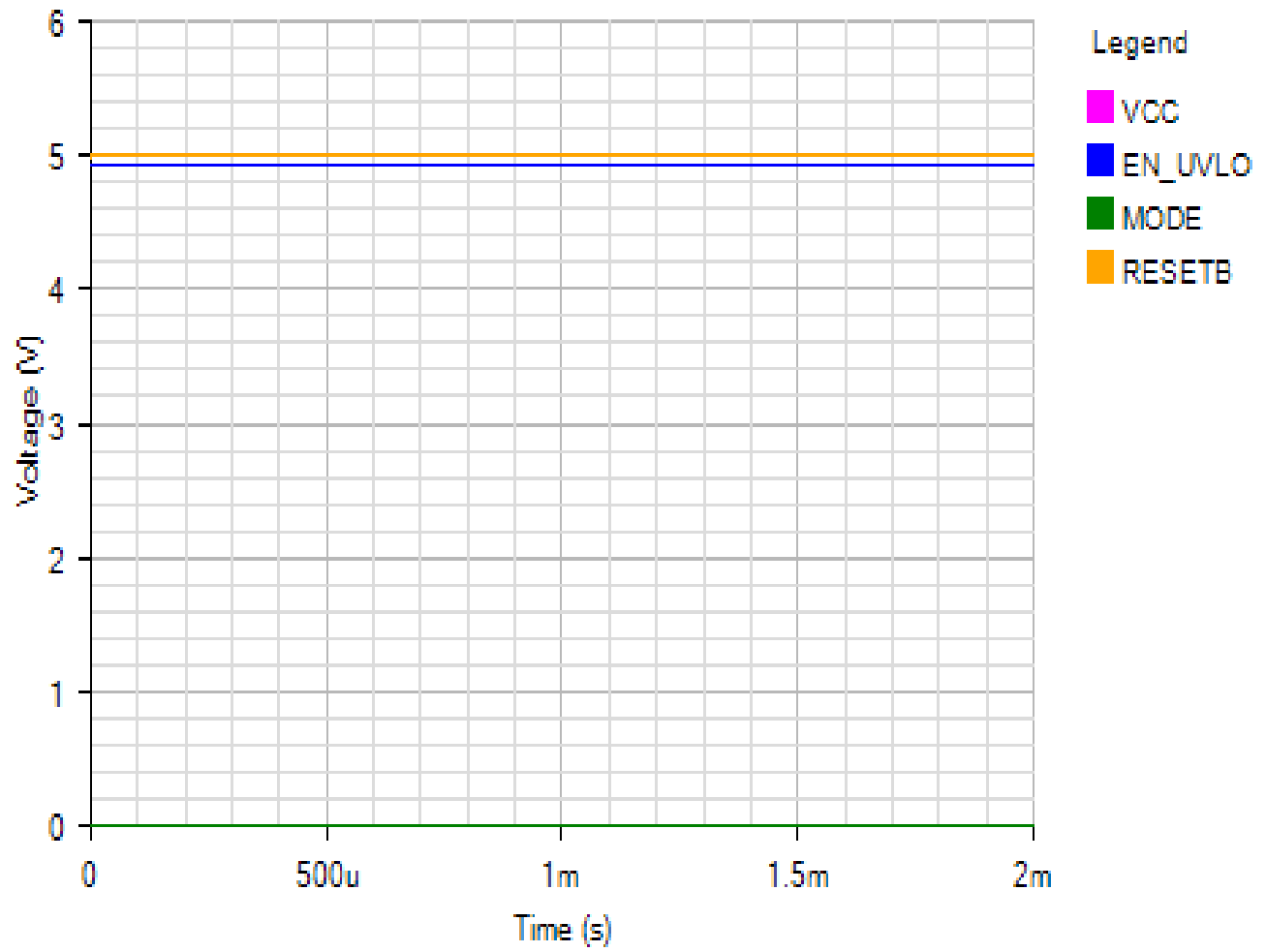
OUTPUT

Default



IC

Default



INPUT

Default

