

Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	6.5V
Maximum Input Voltage	42V
Typical Input Voltage	24V
Input Ripple Voltage	0.5V
Input Undervoltage Lockout Level	5.9V
Output Voltage	5V
Load Current	0.05A
Transient Output Ripple Voltage	0.15V
Performance Tradeoff	Balance Efficiency and Size
Cost Tradeoff	Cost
Mode of Operation	PWM
Switching Frequency	520kHz
Soft-start time	5ms
Ambient Temperature	25°C

[illegible]

- 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.

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17531	Maxim Integrated	42V, 50mA, Ultra-Small, High-Efficiency Synchronous Step-Down DC-DC Converter with 22µA No-Load Supply Current
C2	1	C0805C224K5RAC	Kemet	Cap Ceramic 0.22uF 50V X7R 10% SMD 0805 125C Bulk
C3	1	GRM21BR71A106KA73	Murata	Cap Ceramic 10uF 10V 0805 125C
C5	1	CGA2B3X7R1E224K050BB	TDK	Cap Ceramic 0.22uF 25V X7R 10% Pad SMD 0402 125°C Automotive T/R
L1	1	LPS4018-154MRB	Coilcraft	Inductor 150uH 20% 1.8Ohm 0.3A Isat 0.4A Irms
R1	1	CRCW06033M00FKEA	Vishay	Res Thick Film 0603 3M Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ3EKF8063V	Panasonic	Res Thick Film 0603 806K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

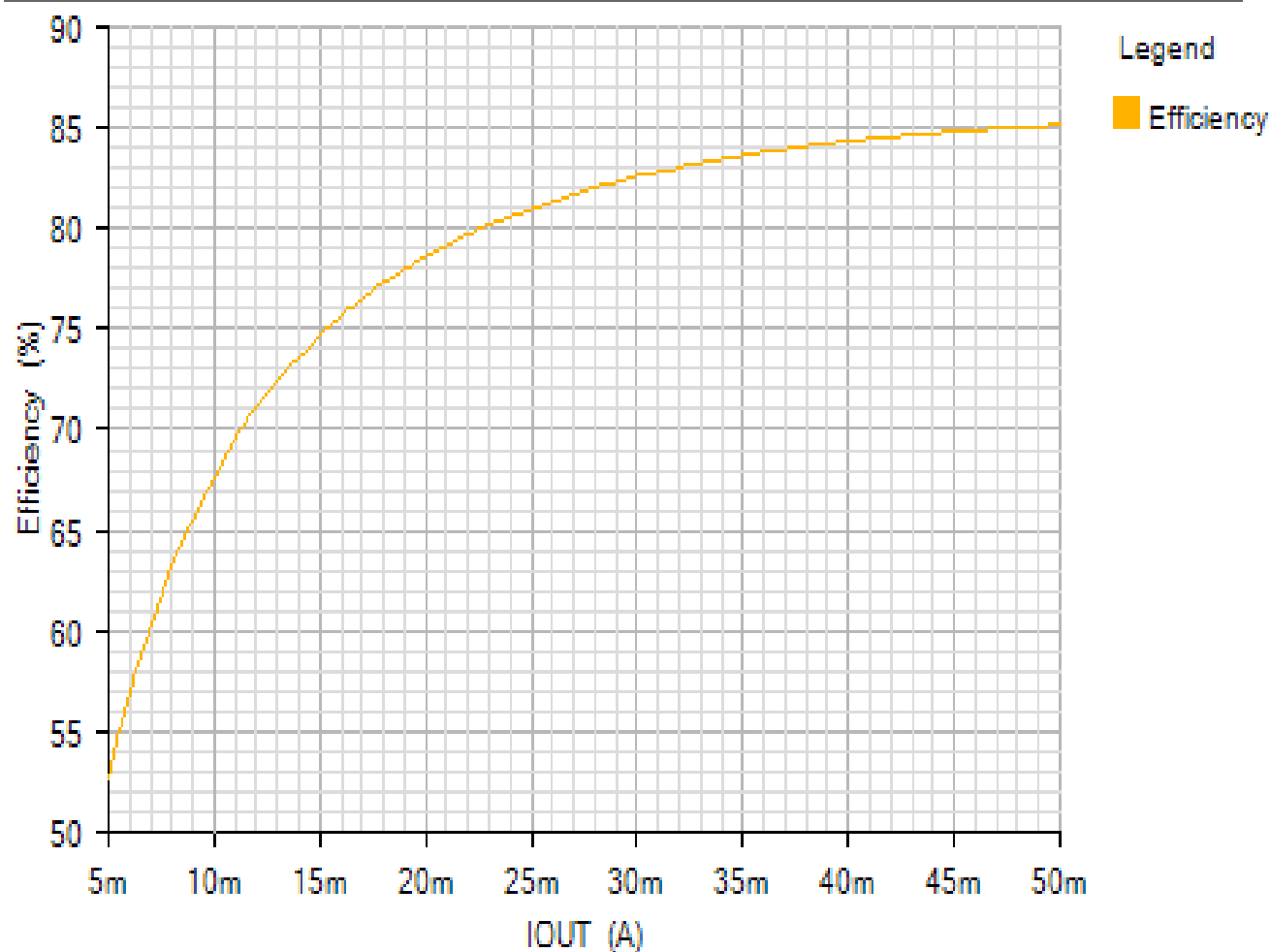
R3	1	ERJ2RKF8062X	Panasonic	Res Thick Film 0402 80.6K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ2RKF2613X	Panasonic	Res Thick Film 0402 261K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF4992X	Panasonic	Res Thick Film 0402 49.9K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF1023X	Panasonic	Res Thick Film 0402 102K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ2RKF22R0X	Panasonic	Res Thick Film 0402 22 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Tue Nov 20 2018 14:59:51

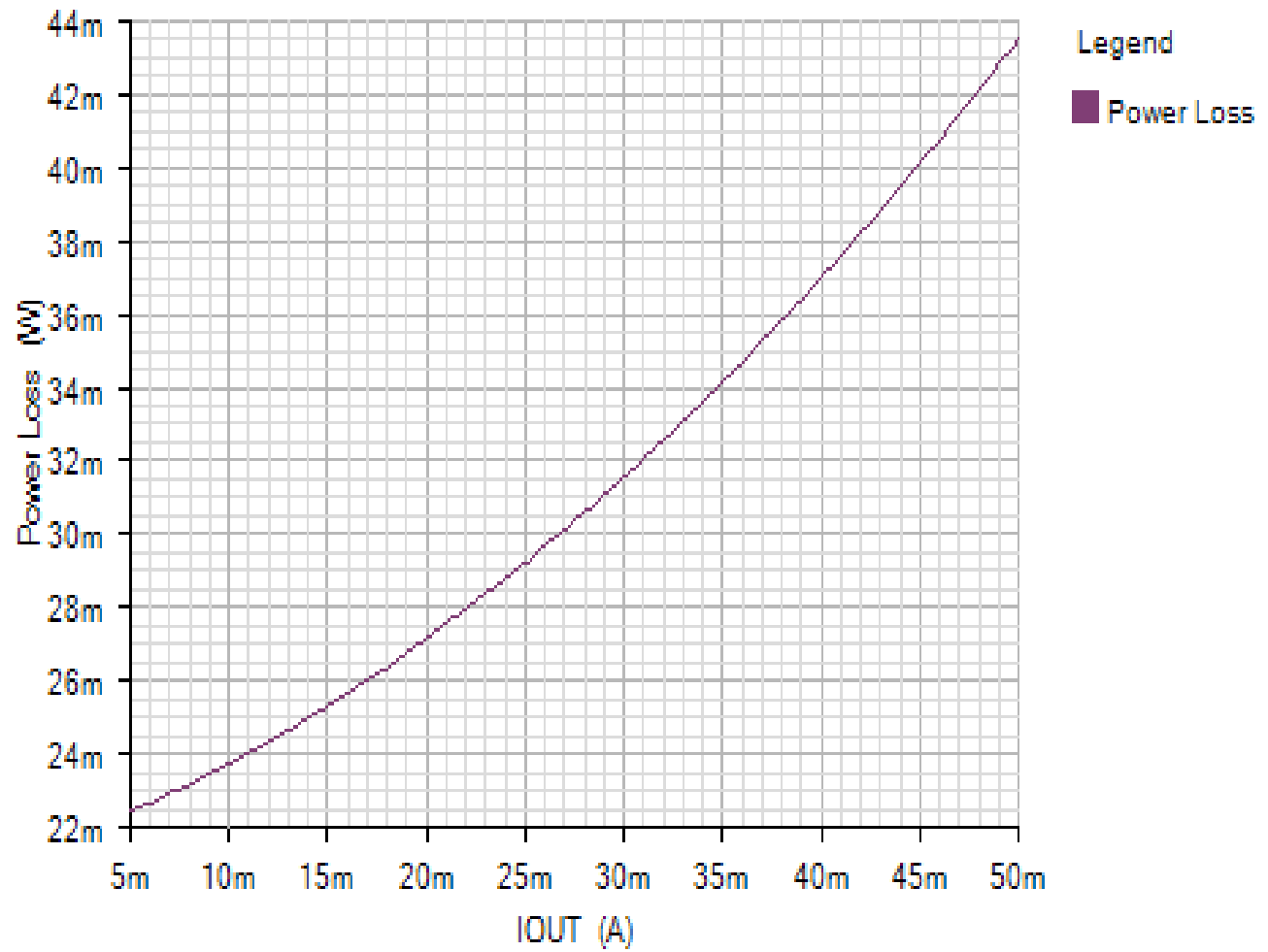
EFFICIENCY_PLOT

Default



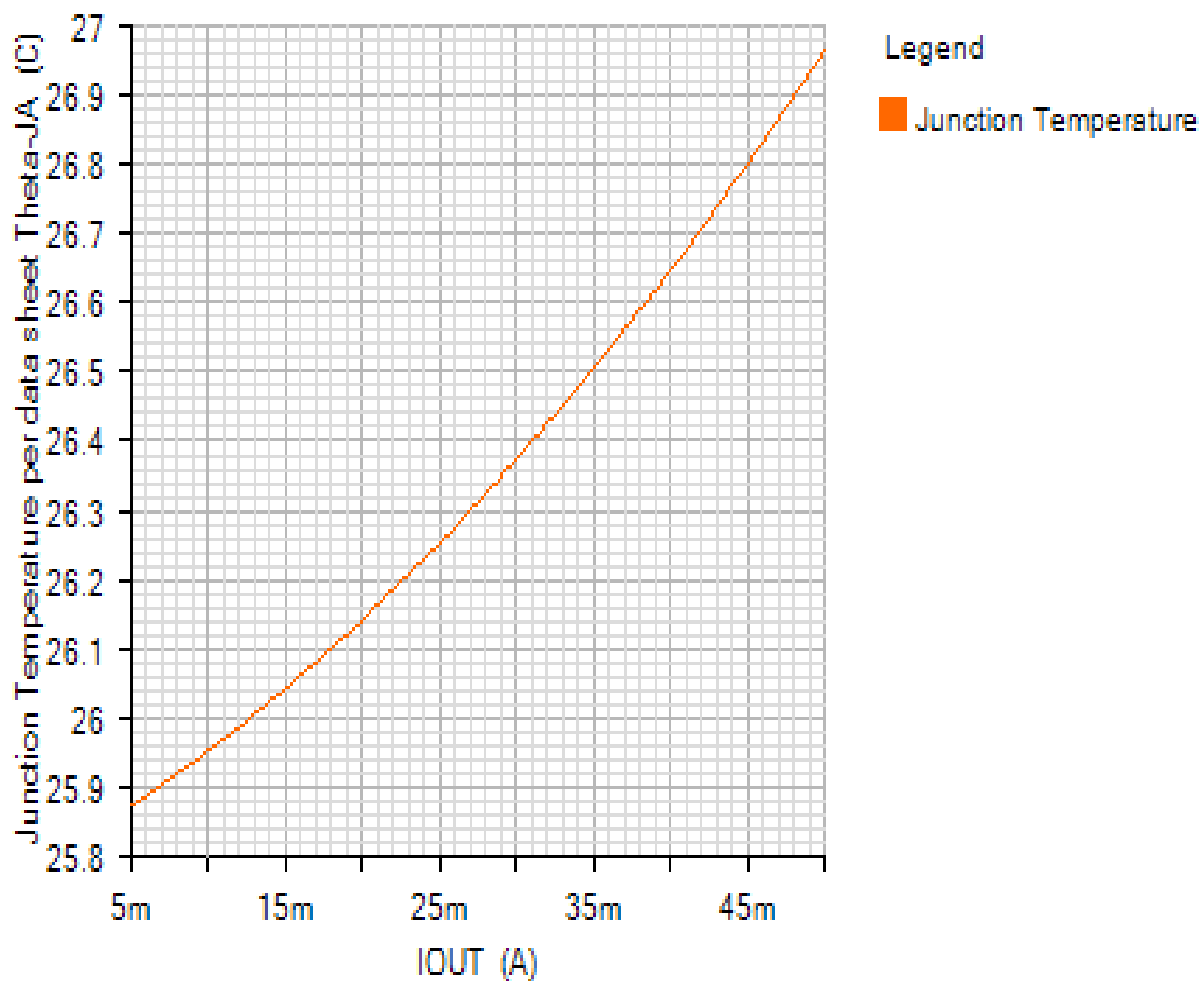
POWER_LOSS_PLOT

Default

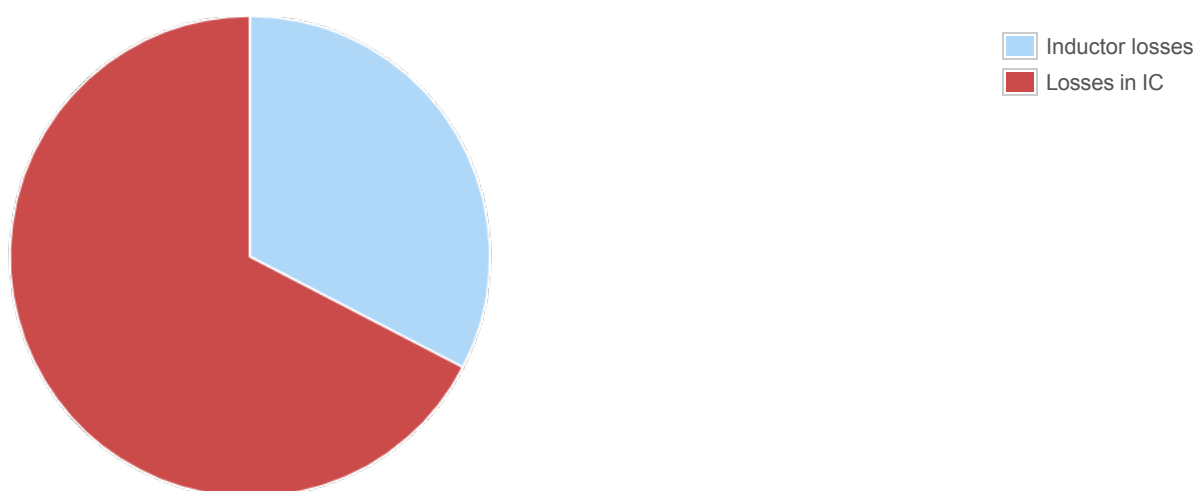


JUNCTION_TEMPERATURE_PLOT

Default



Losses



Component

Loss (W)

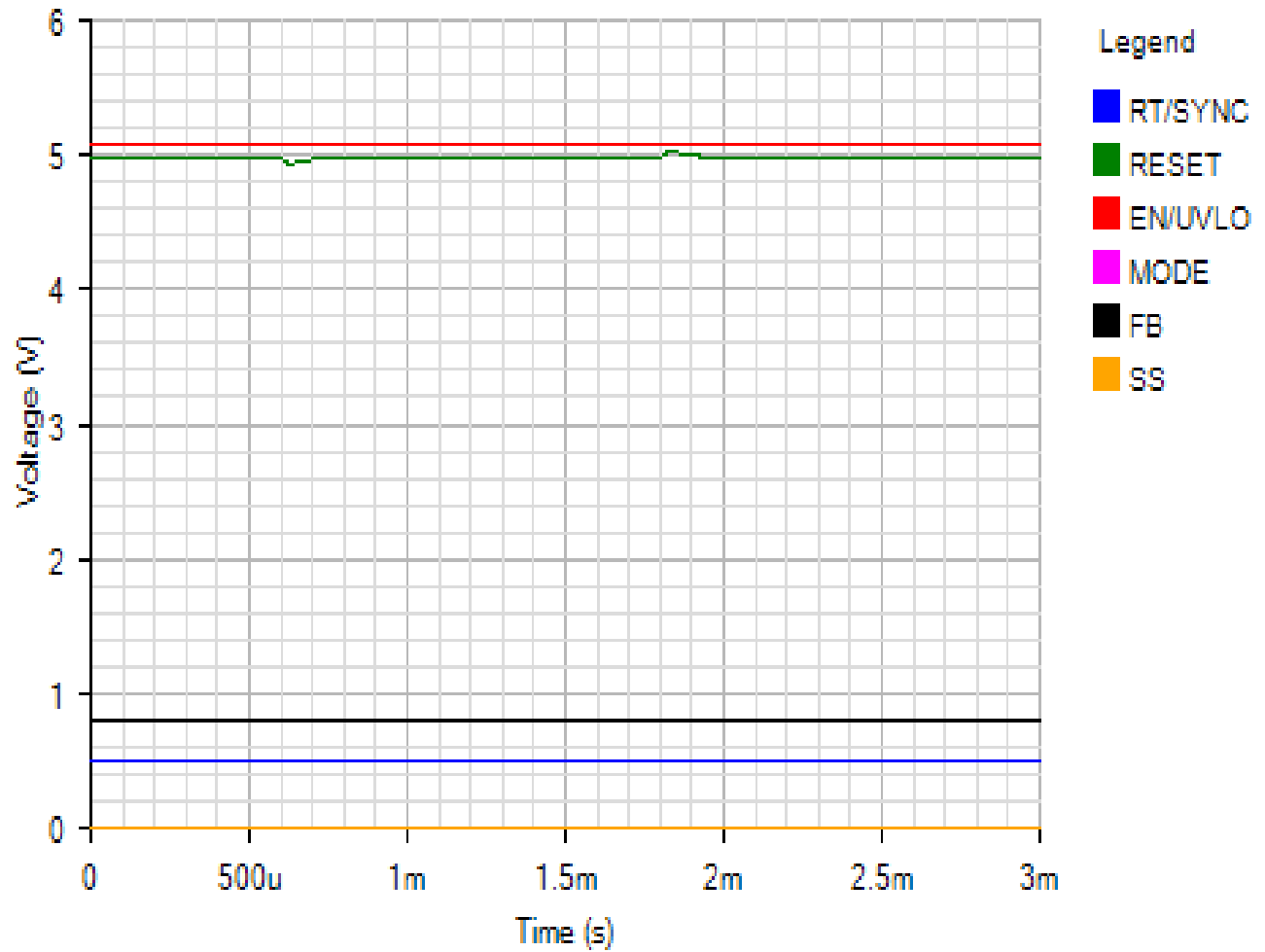
% of total

Component	Loss (W)	% of total
Inductor losses	0.01419	32.6
Losses in IC	0.02931	67.4
Total	0.0435	100

Load Step - Tue Nov 20 2018 14:59:51

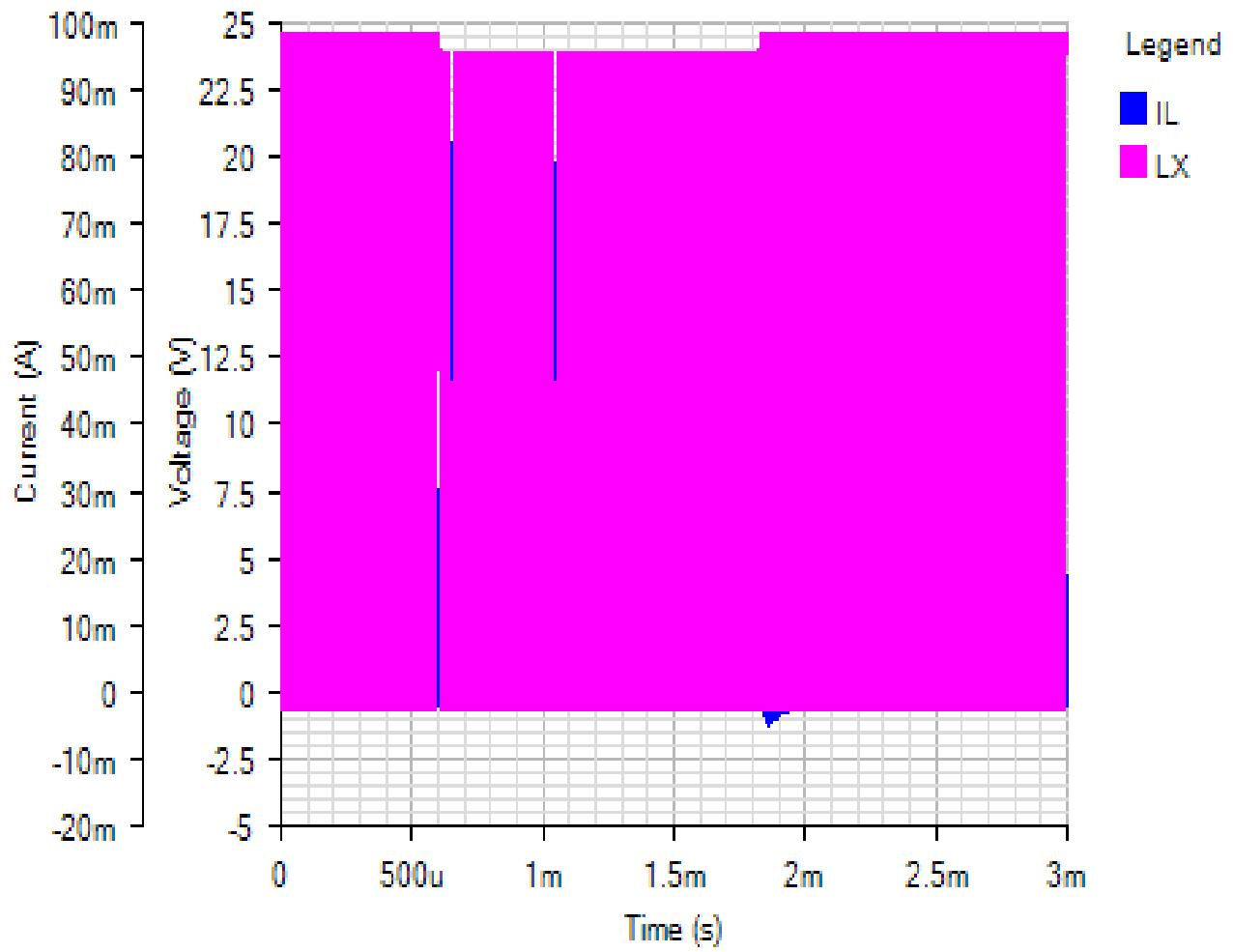
IC

Default



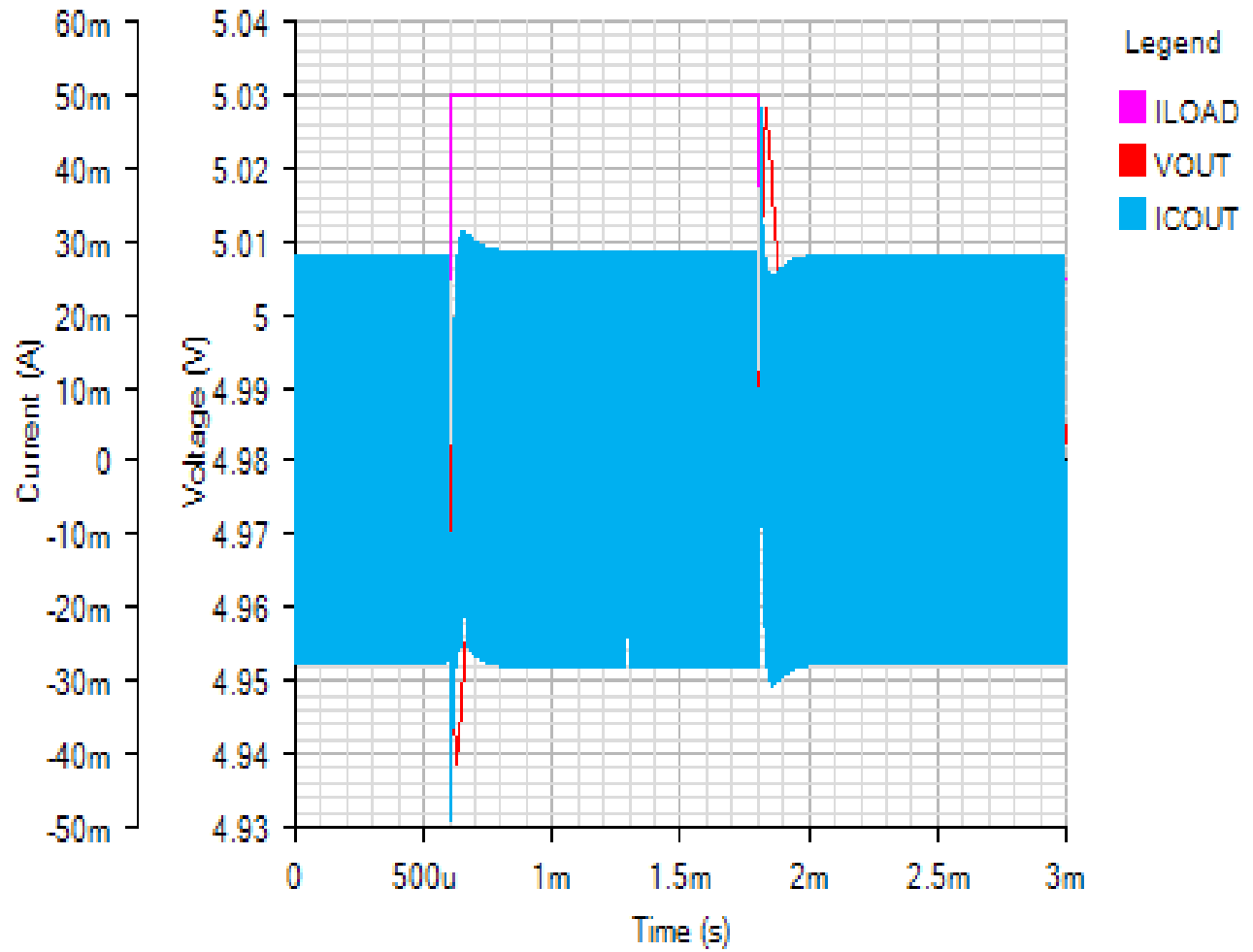
SWITCHING

Default



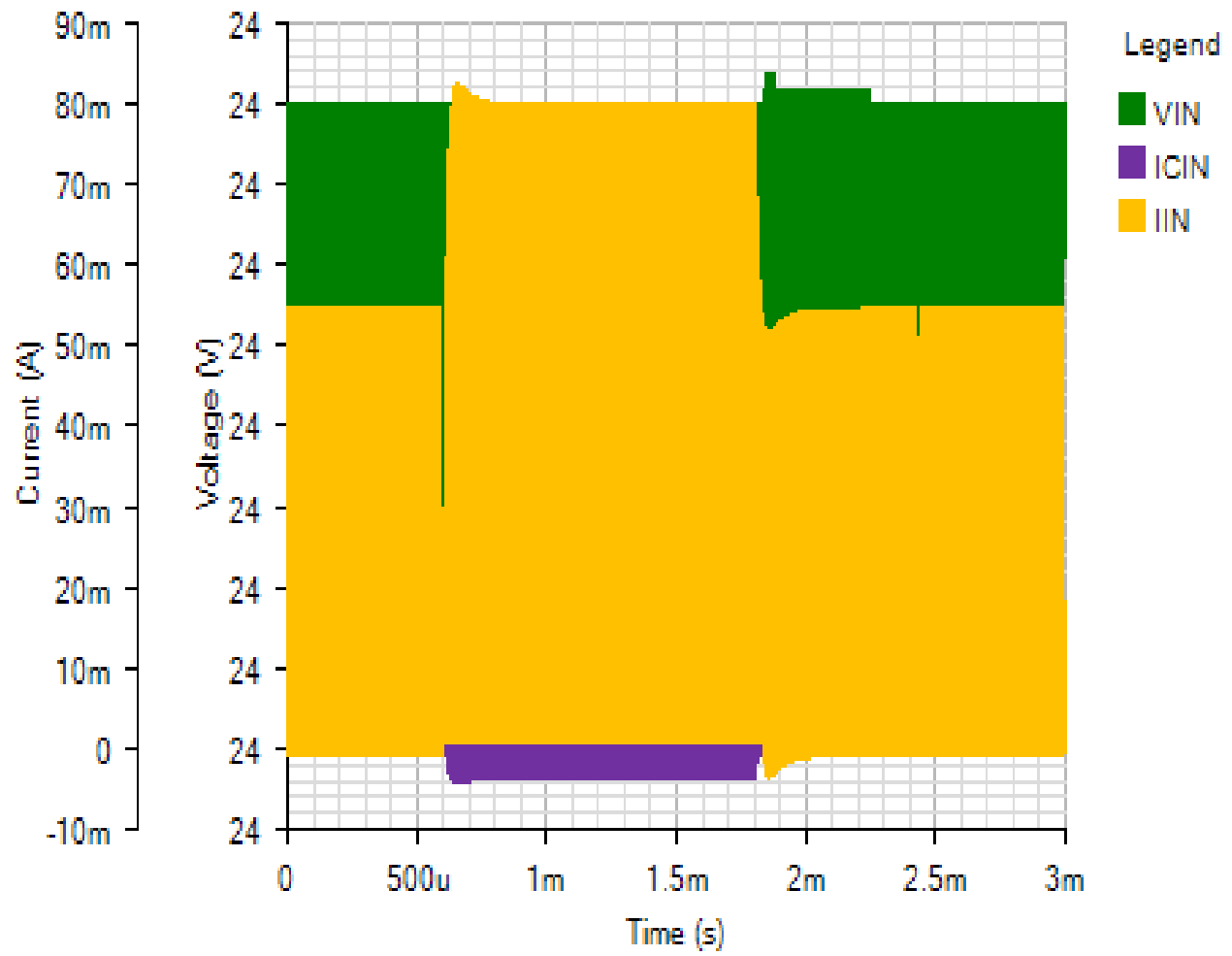
OUTPUT

Default

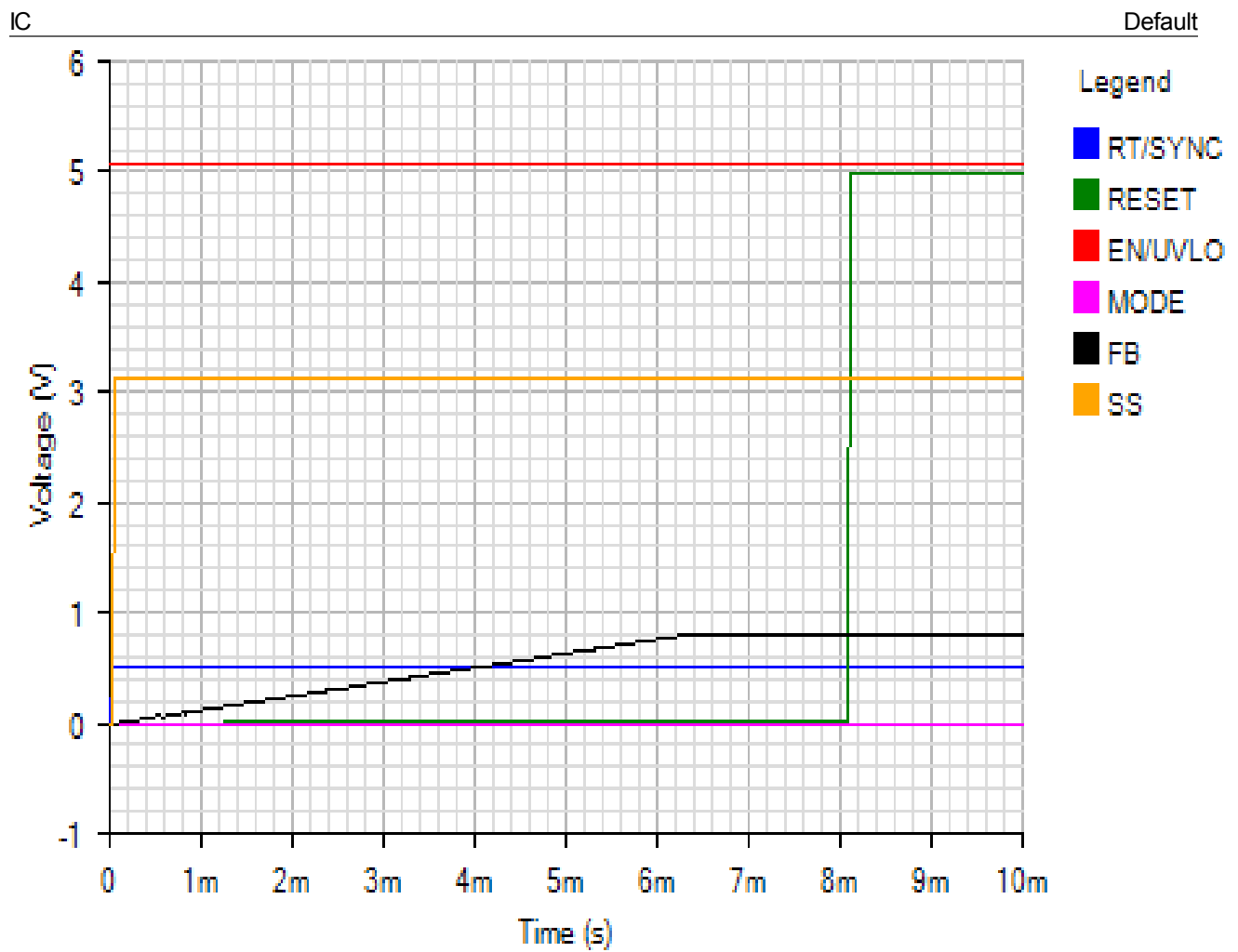


INPUT

Default

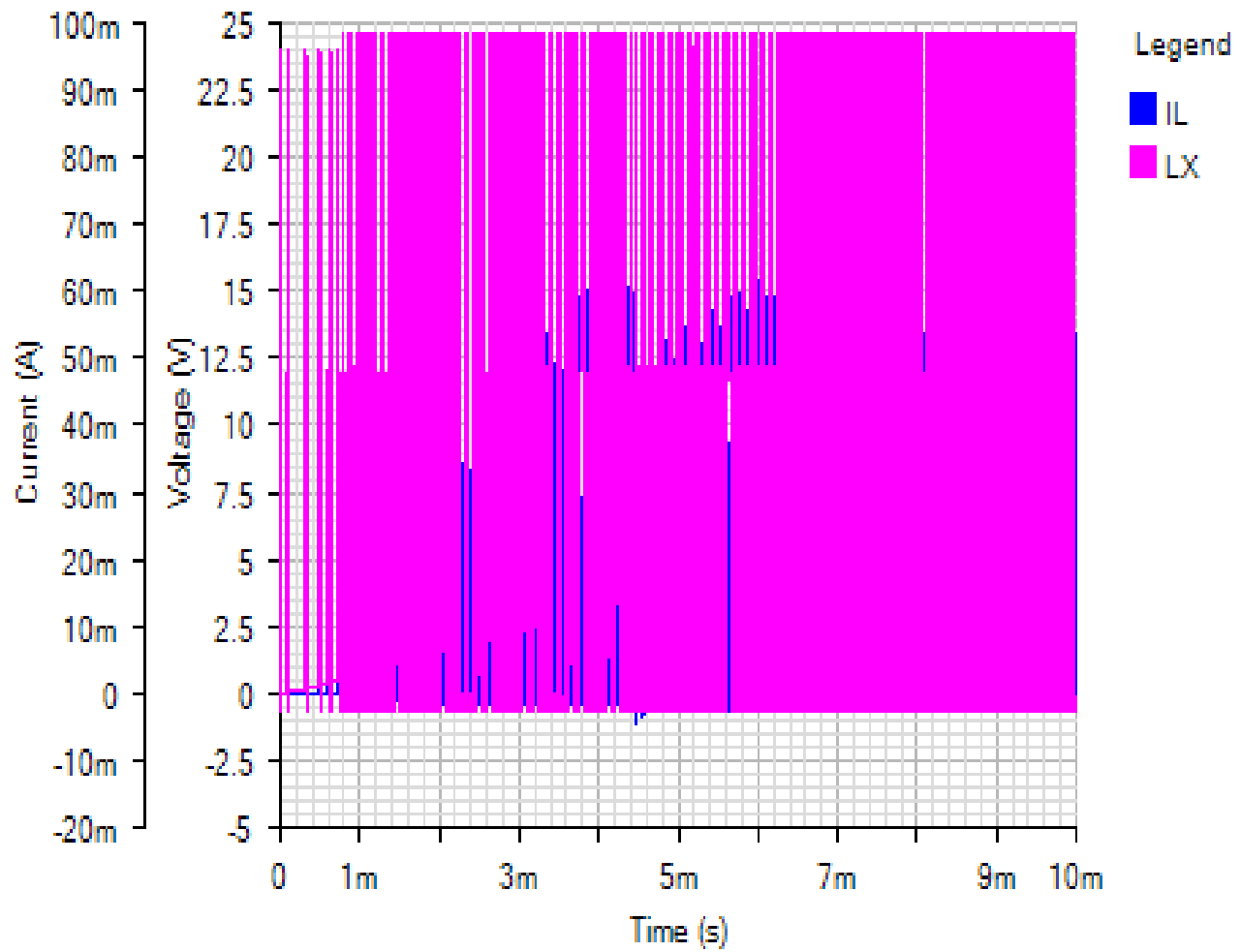


Start Up - Tue Nov 20 2018 14:59:51



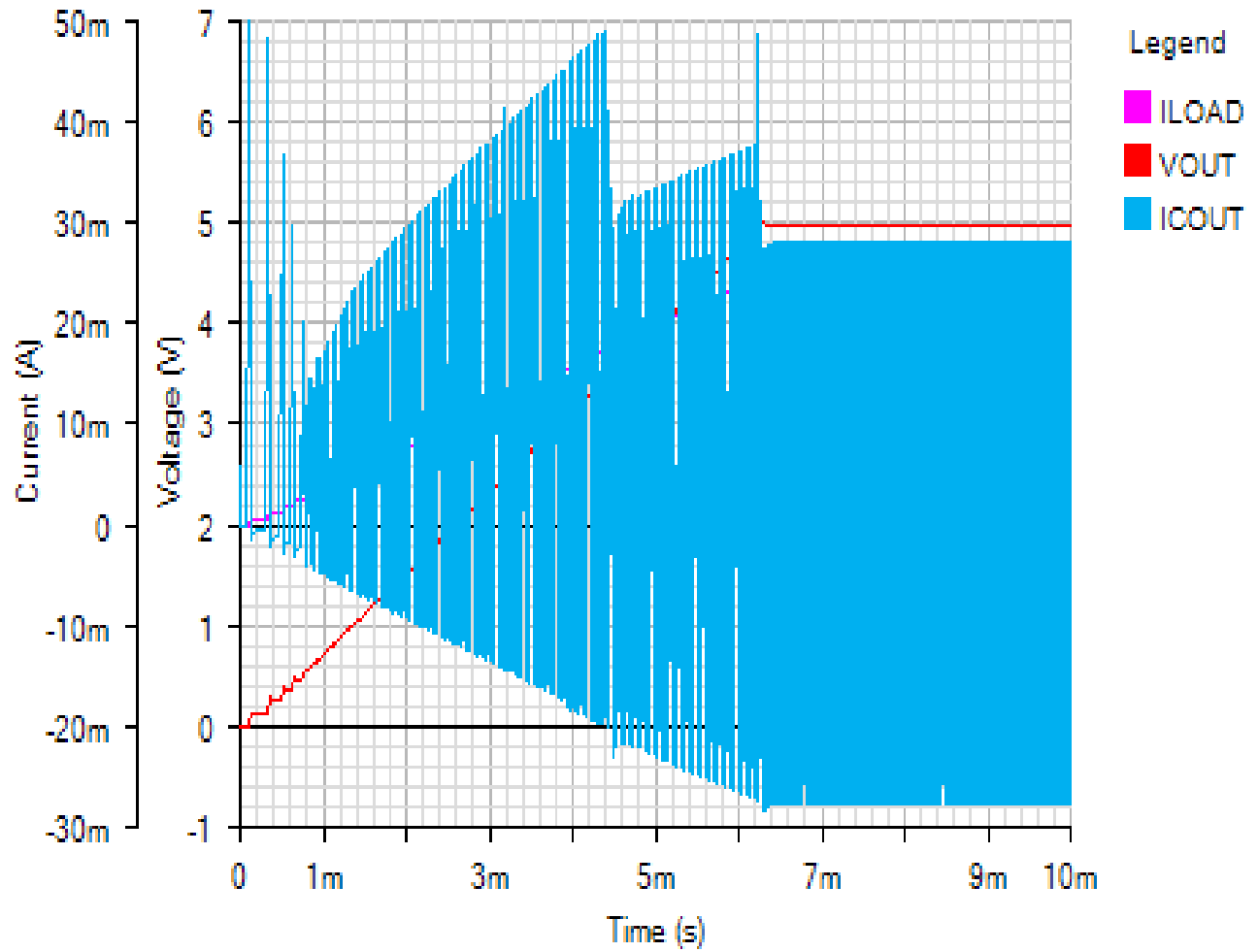
SWITCHING

Default



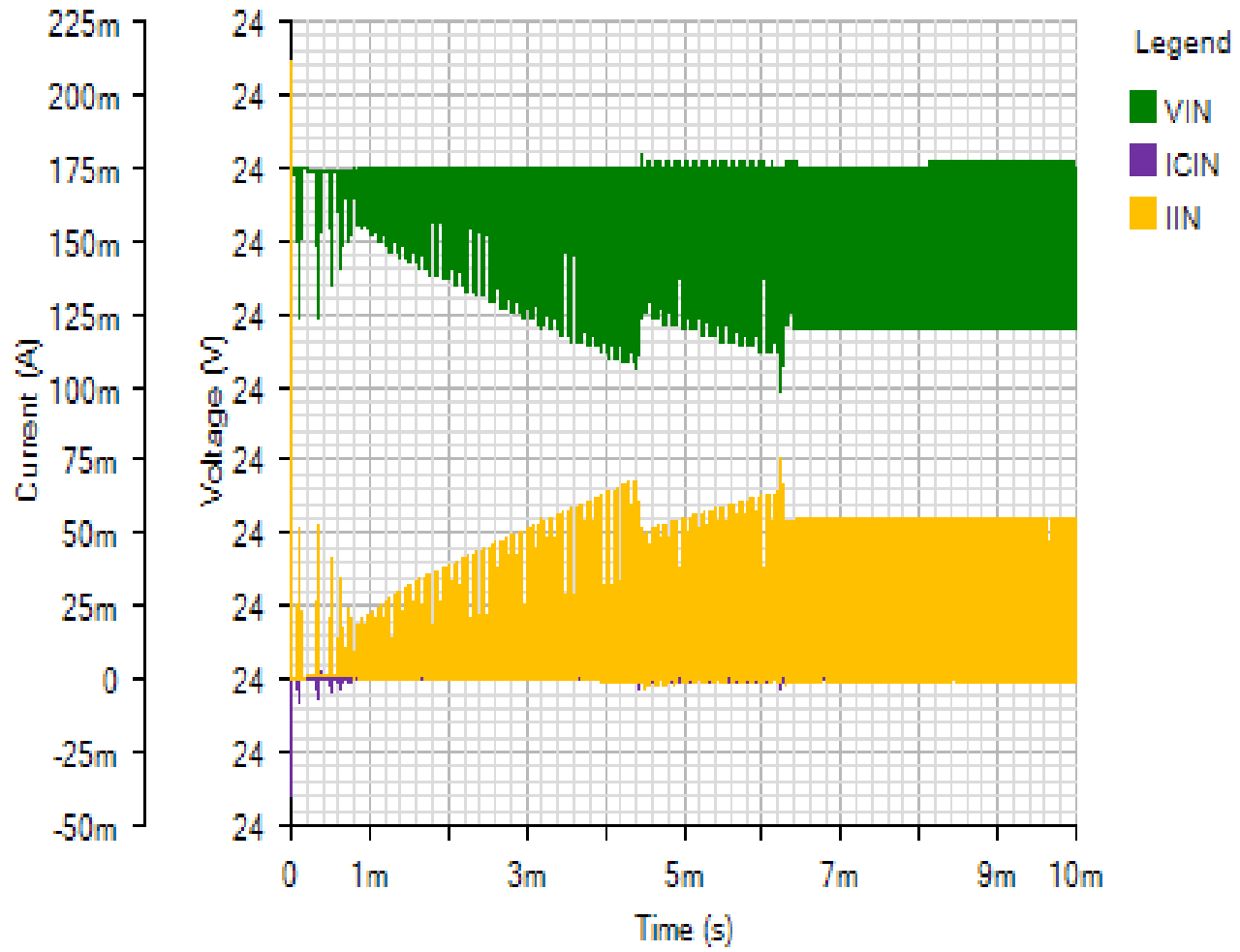
OUTPUT

Default

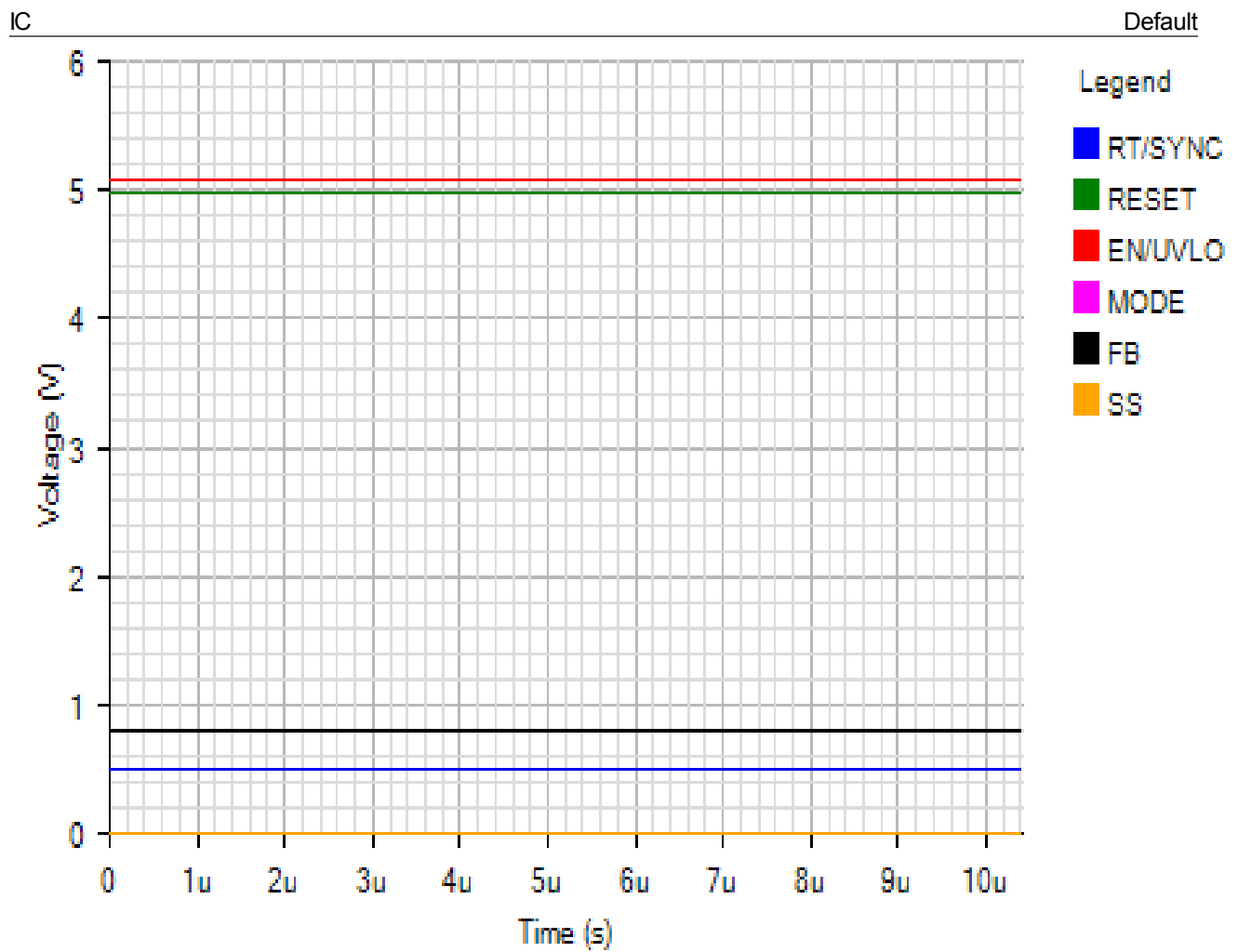


INPUT

Default

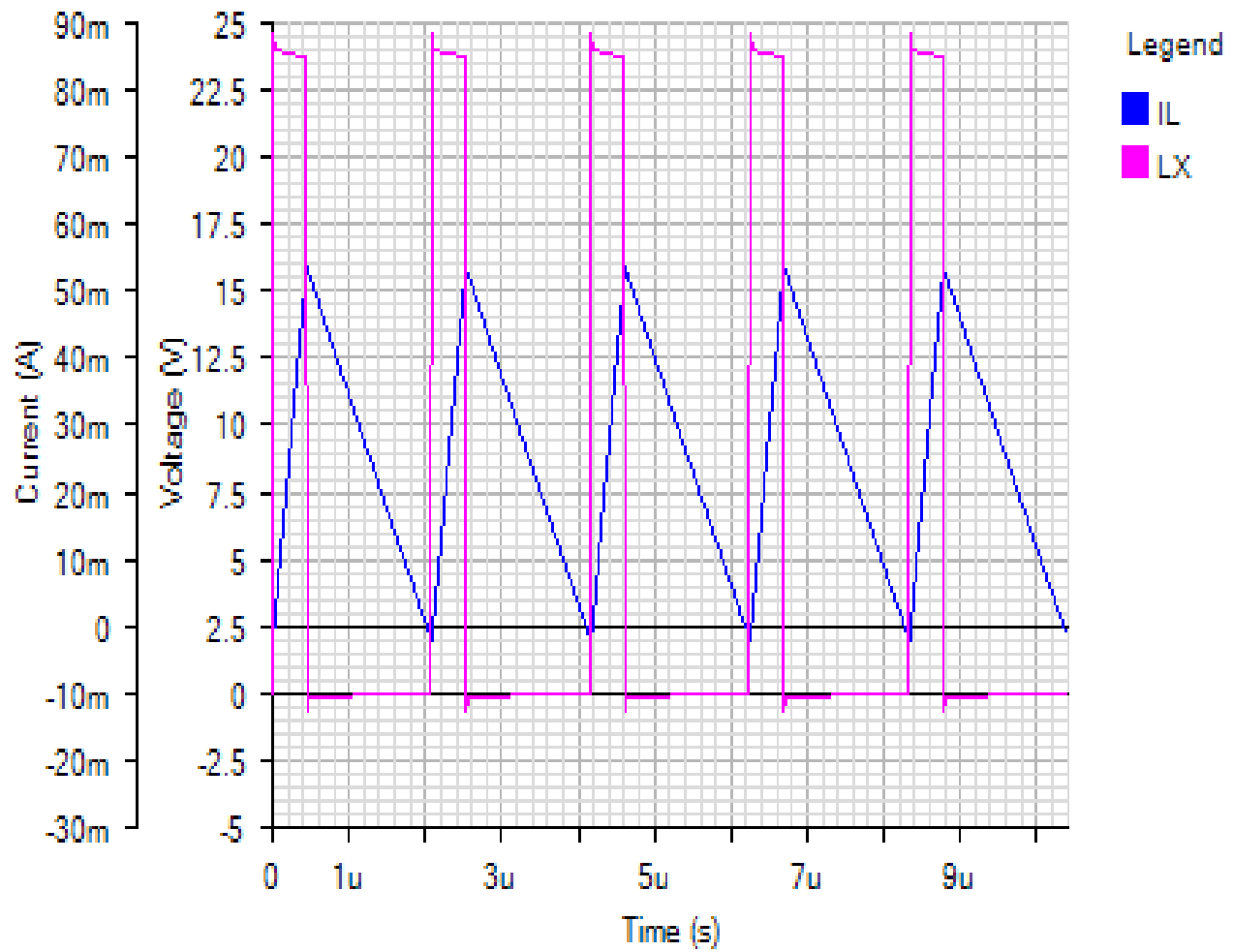


Steady State - Tue Nov 20 2018 14:59:51



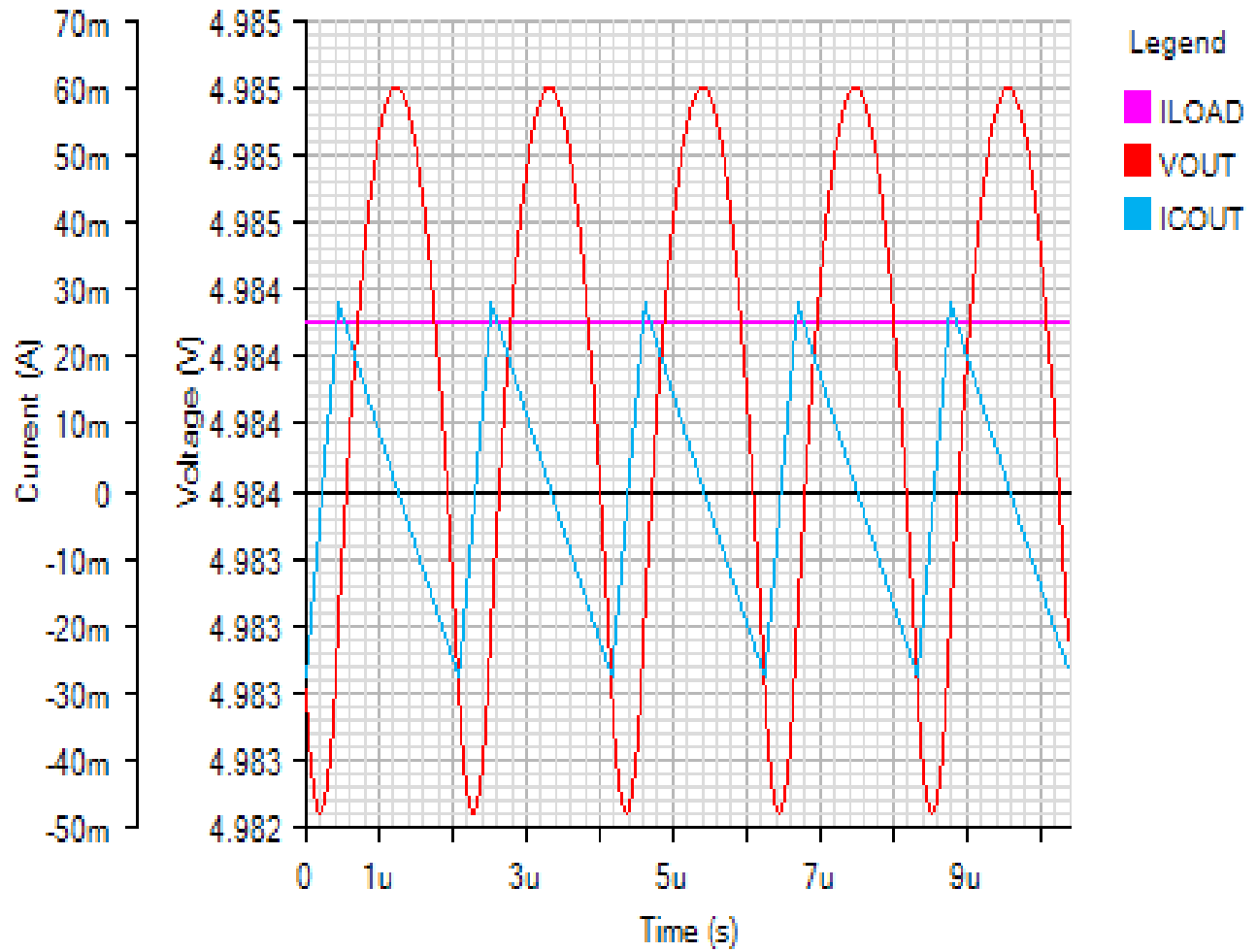
SWITCHING

Default



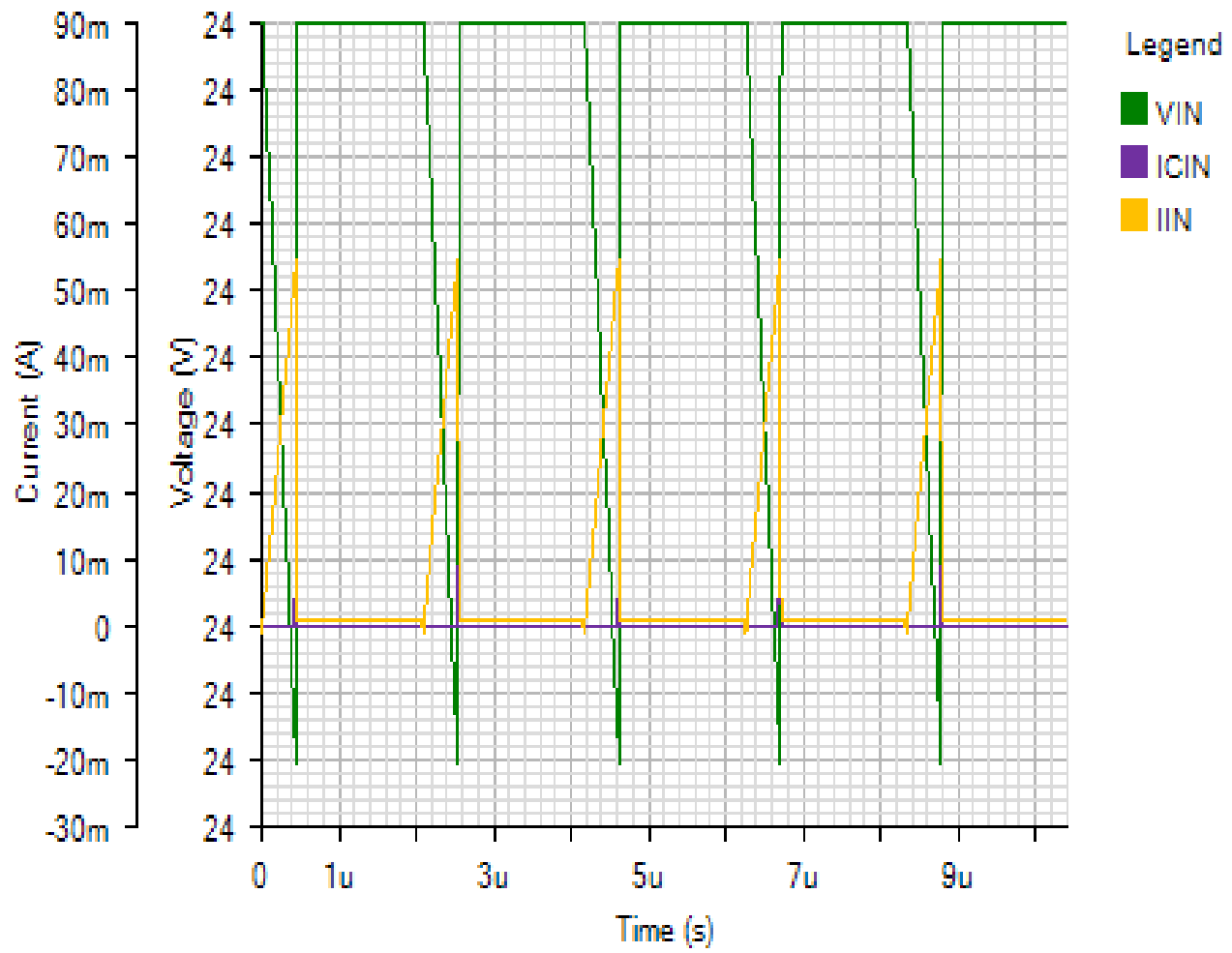
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Default

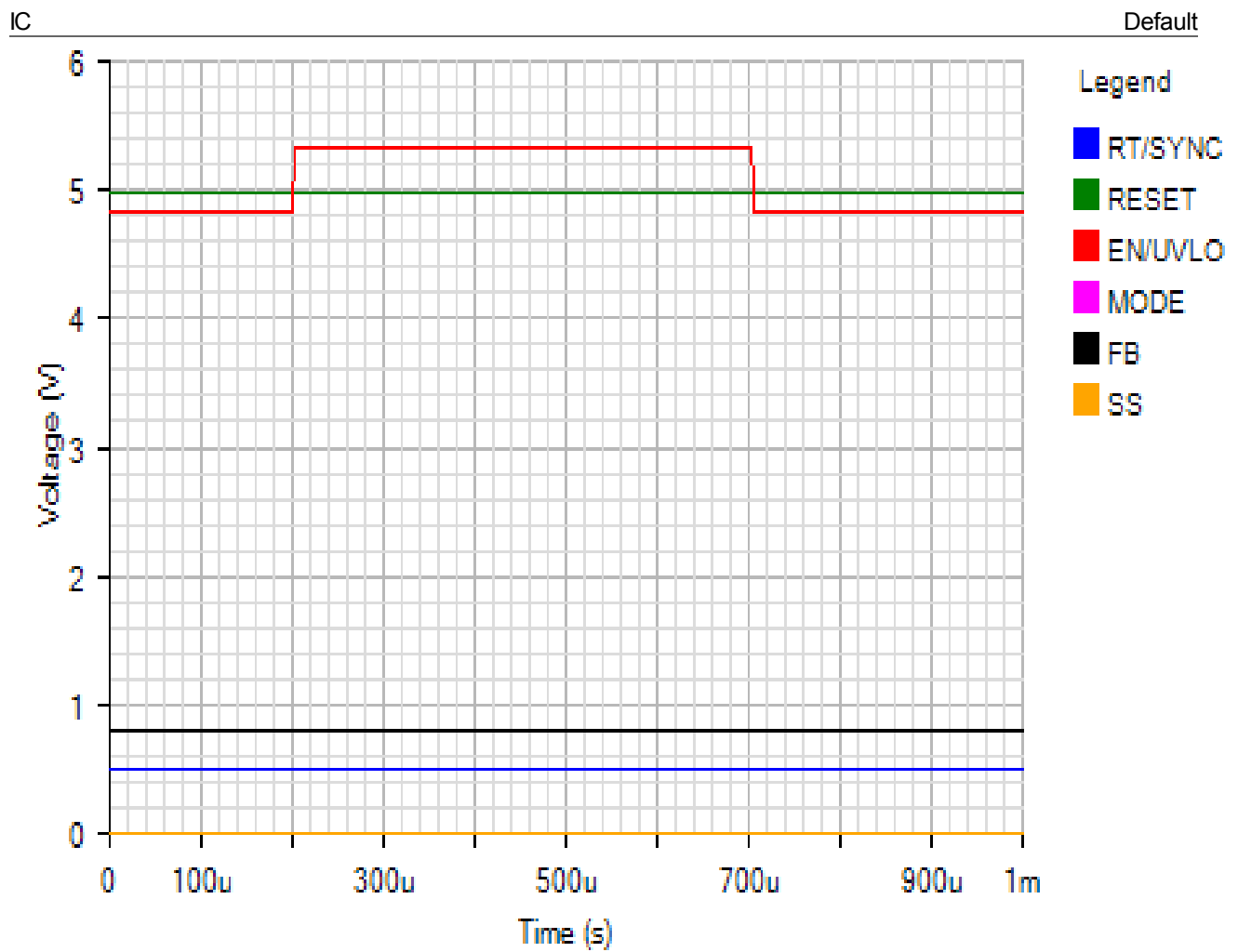


INPUT

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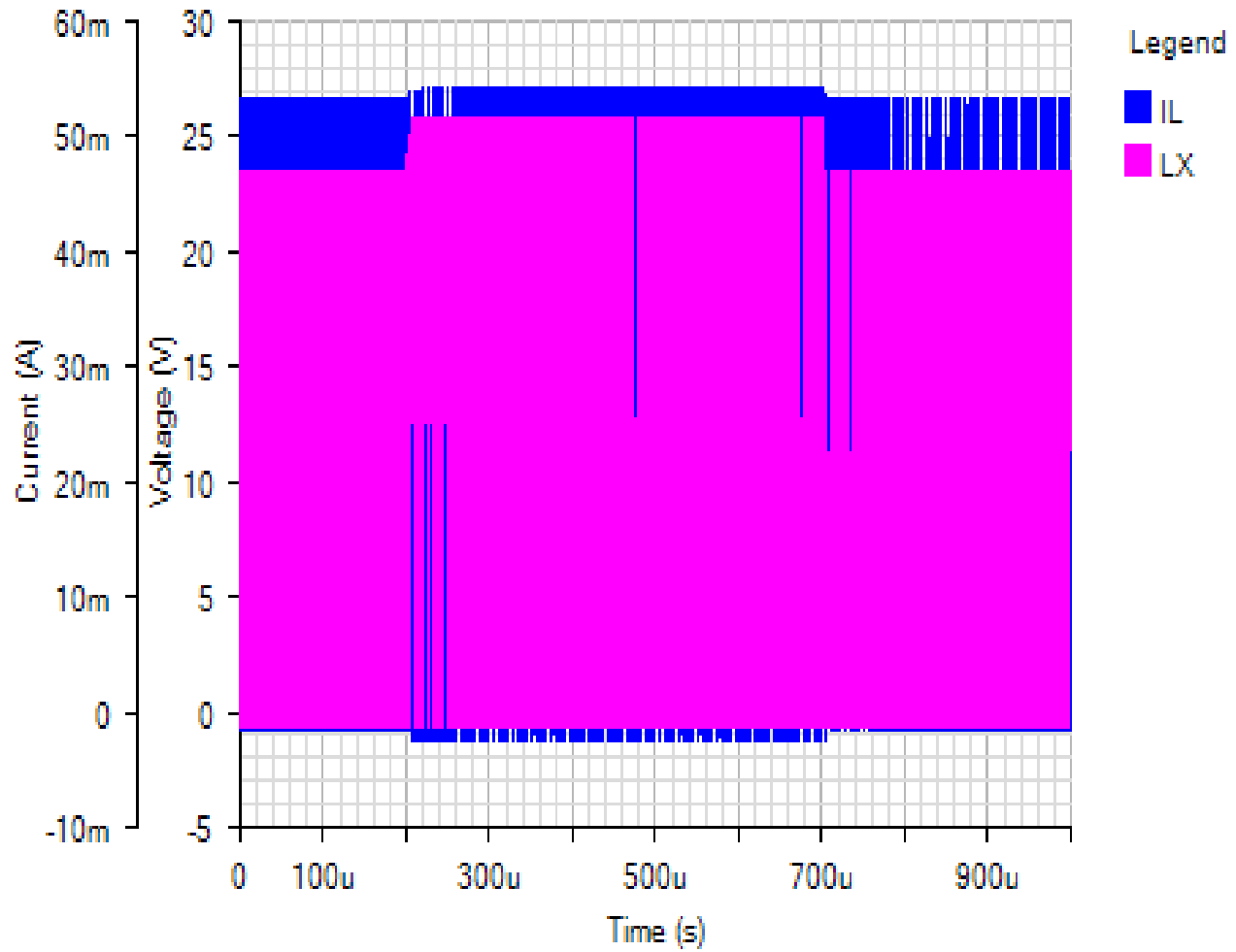


Line Transient - Tue Nov 20 2018 14:59:51



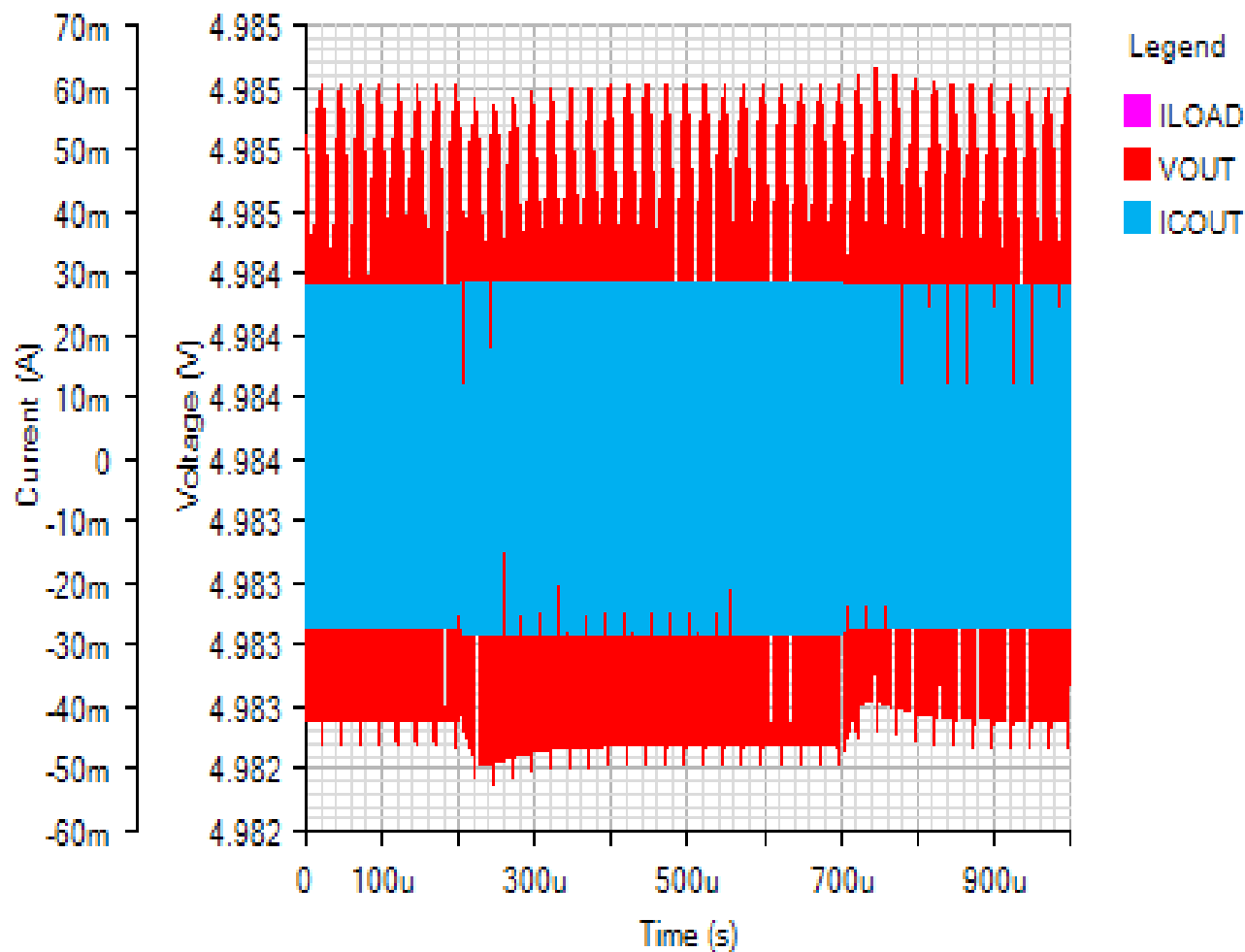
SWITCHING

Default



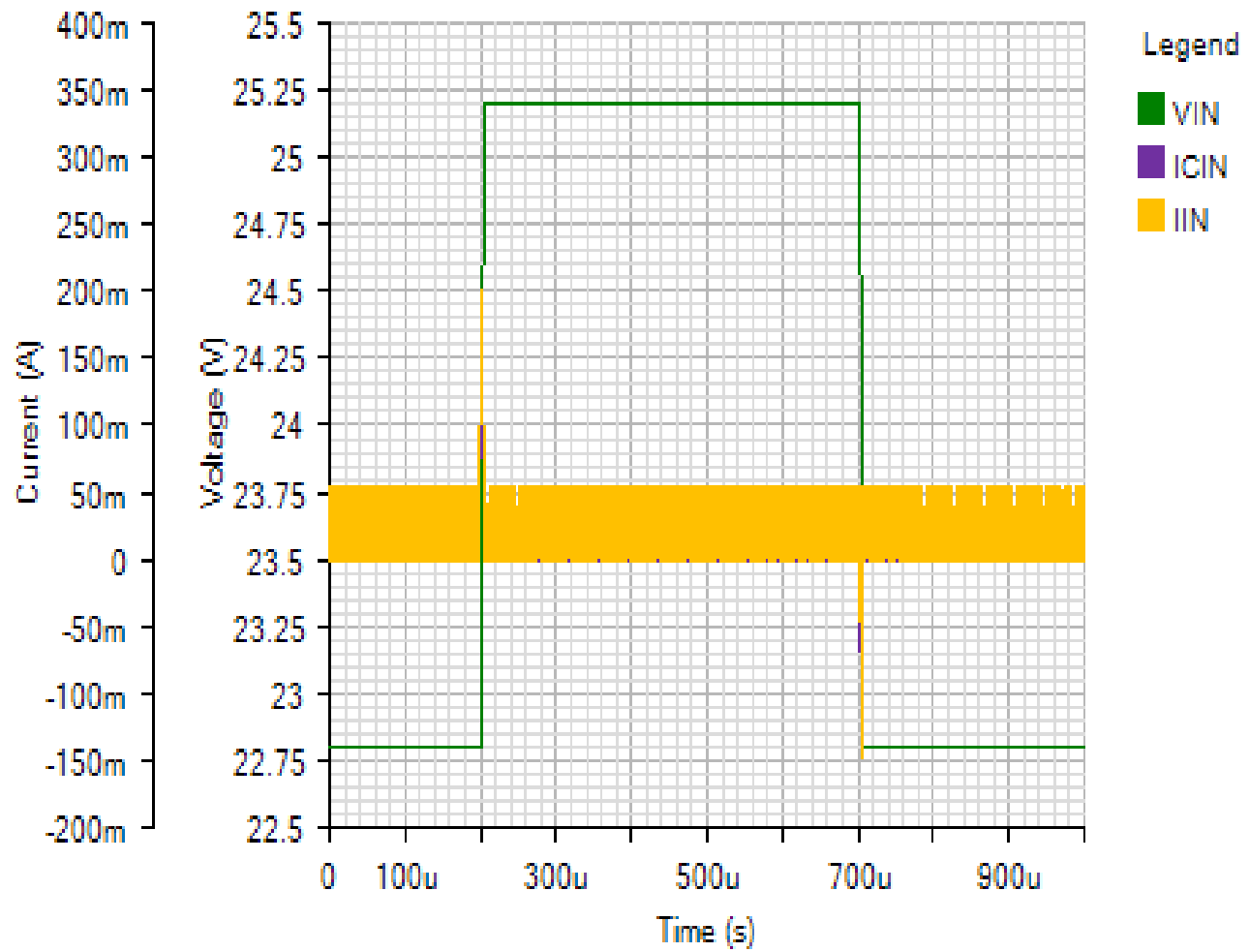
OUTPUT

Default



INPUT

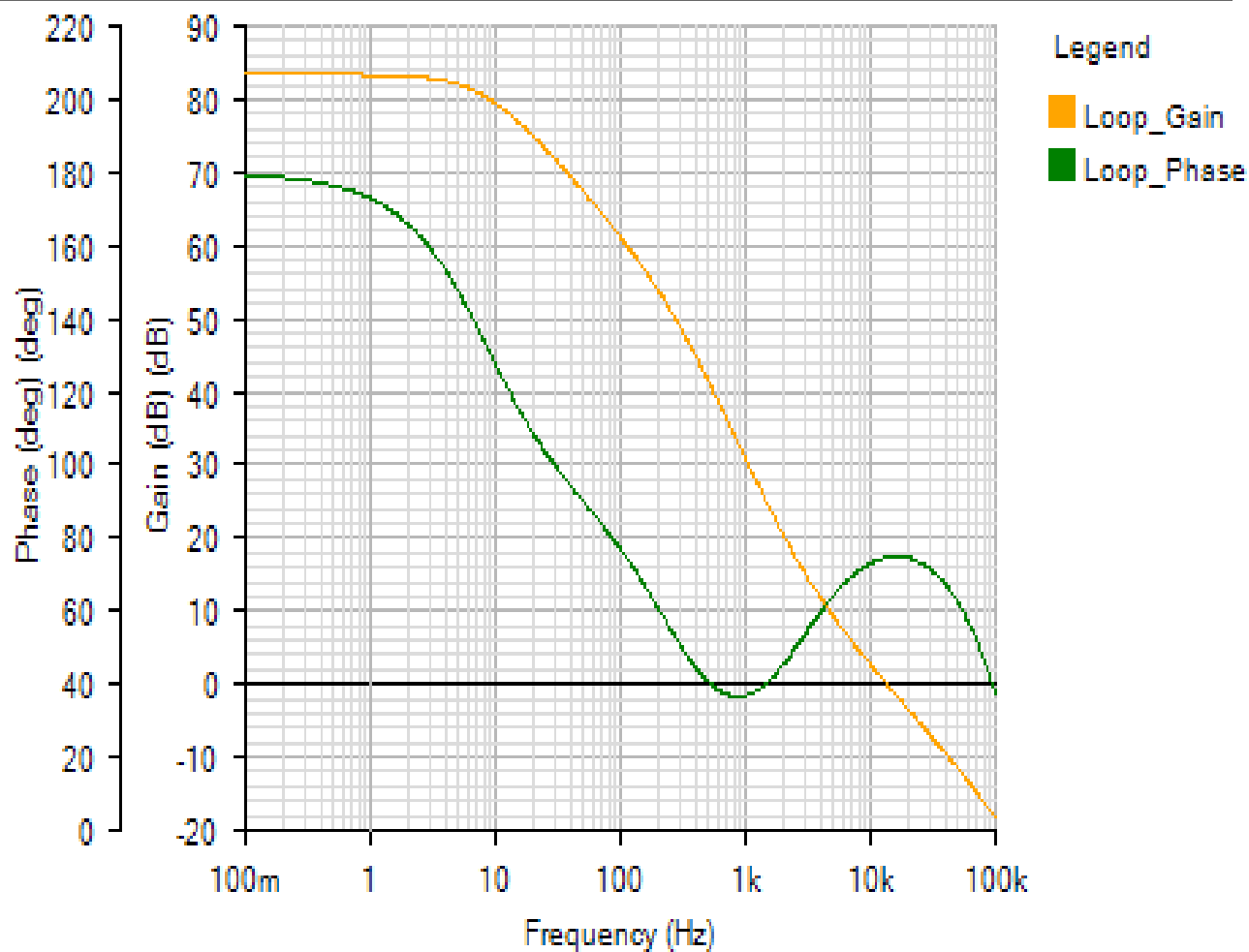
Default



AC Loop - Tue Nov 20 2018 14:59:51

BODE

Default



Phase Margin: 74.66° at a crossover frequency of 13.5kHz

