

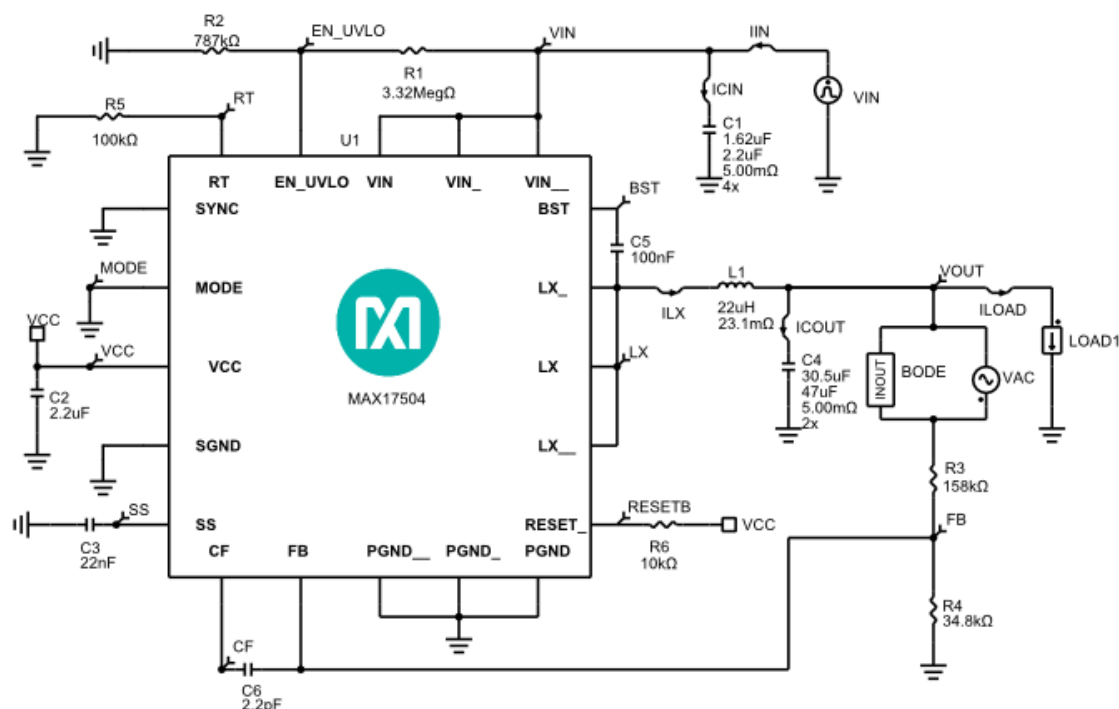
Initial Design

1.0

Design Requirements

Parameter	Value
Part Version	MAX17504
Minimum Input Voltage	7V
Maximum Input Voltage	60V
Nominal Input Voltage	24V
Input Steady-State Ripple	0.5V
Input Undervoltage Lockout Level	6.3V
Output Voltage	5V
Output Current	3.5A
Output Voltage Load Step Over/Undershoot	0.15V
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Mode of Operation	PWM
Switching Frequency	200kHz
Ambient Temperature	25°C
Soft Start time	4.5ms

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	MAX17504	Maxim Integrated	4.5V–60V, 3.5A, 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
C2	1	C1608X7R1A225K080AC	TDK	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C3	1	CGA2B3X7R1H223K050BB	TDK	Cap Ceramic 0.022uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
C4	2	GRM32ER71A476ME15L	Murata	Cap Ceramic 47uF 10V X7R 20% SMD 1210 125C Embossed T/R
C5	1	CGA2B1X7R1C104K050BC	TDK	Cap Ceramic 0.1uF 16V X7R 10% Pad SMD 0402 125°C Automotive T/R
C6	1	UVK105CH2R2JW-F	Taiyo Yuden	Cap Ceramic 2.2pF 50V C0H 5% Pad SMD 0402 125°C T/R
L1	1	SER1390-223MLB	Coilcraft	Inductor 22uH 20% 21mOhm 7.4A Isat 7.7A Irms
R1	1	CRCW06033M32FKEA	Vishay	Res Thick Film 0603 3.32M Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
				Res Thick Film 0603 787K Ohm 1%

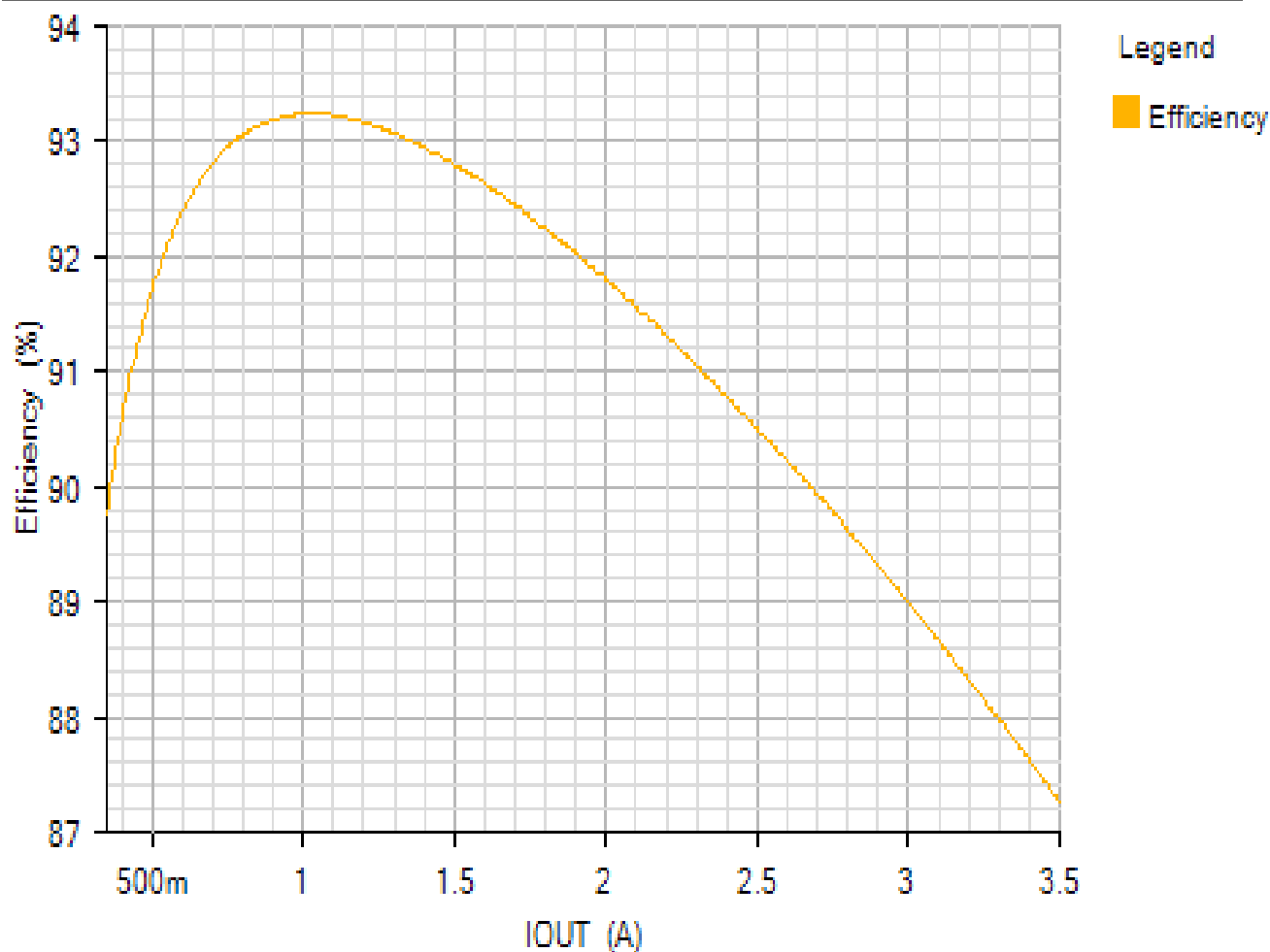
R2	1	ERJ3EKF7873V	Panasonic	0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ2RKF1583X	Panasonic	Res Thick Film 0402 158K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ2RKF3482X	Panasonic	Res Thick Film 0402 34.8K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF1003X	Panasonic	Res Thick Film 0402 100K 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

Simulation Results

Efficiency - Fri Nov 16 2018 09:48:01

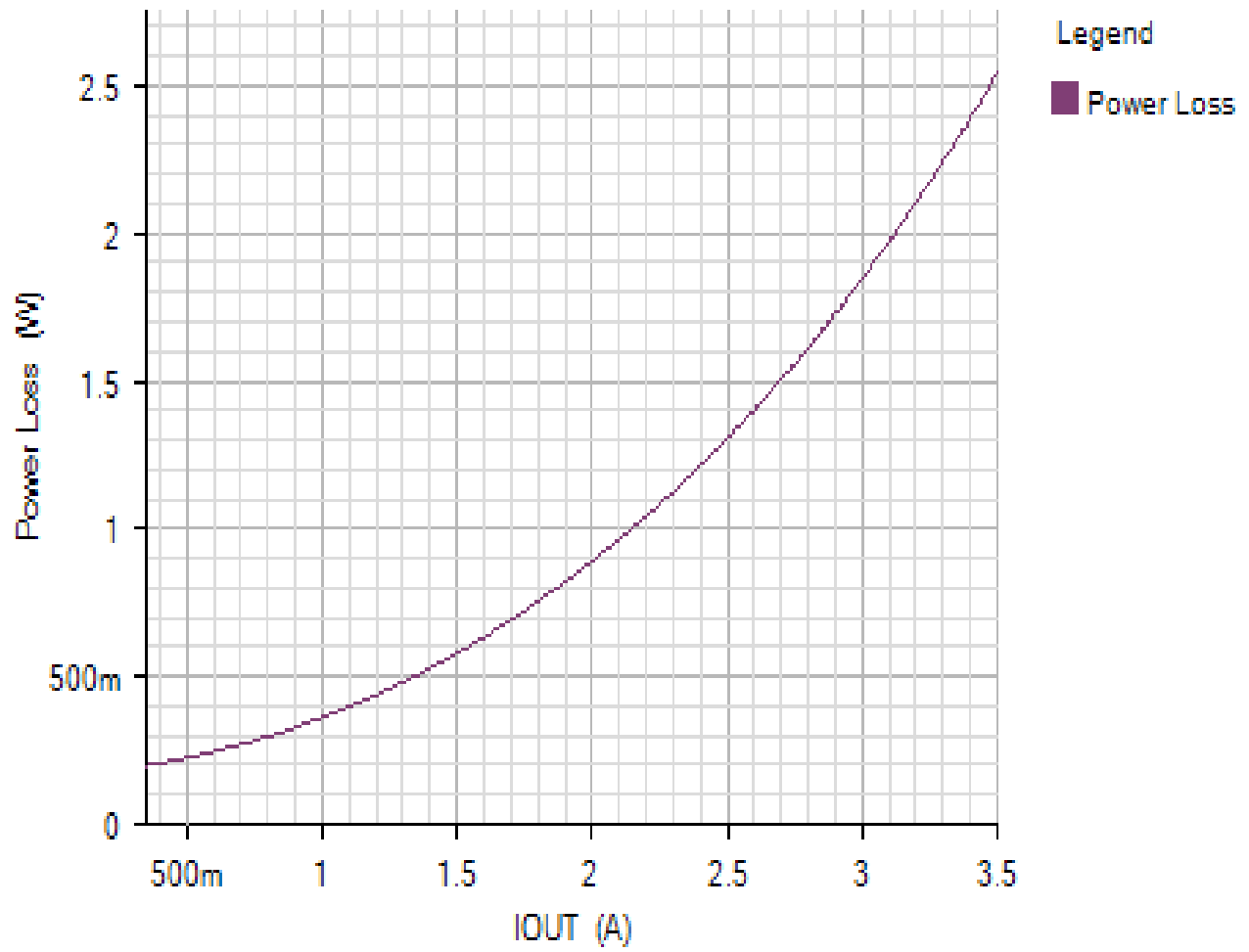
EFFICIENCY_PLOT

Default



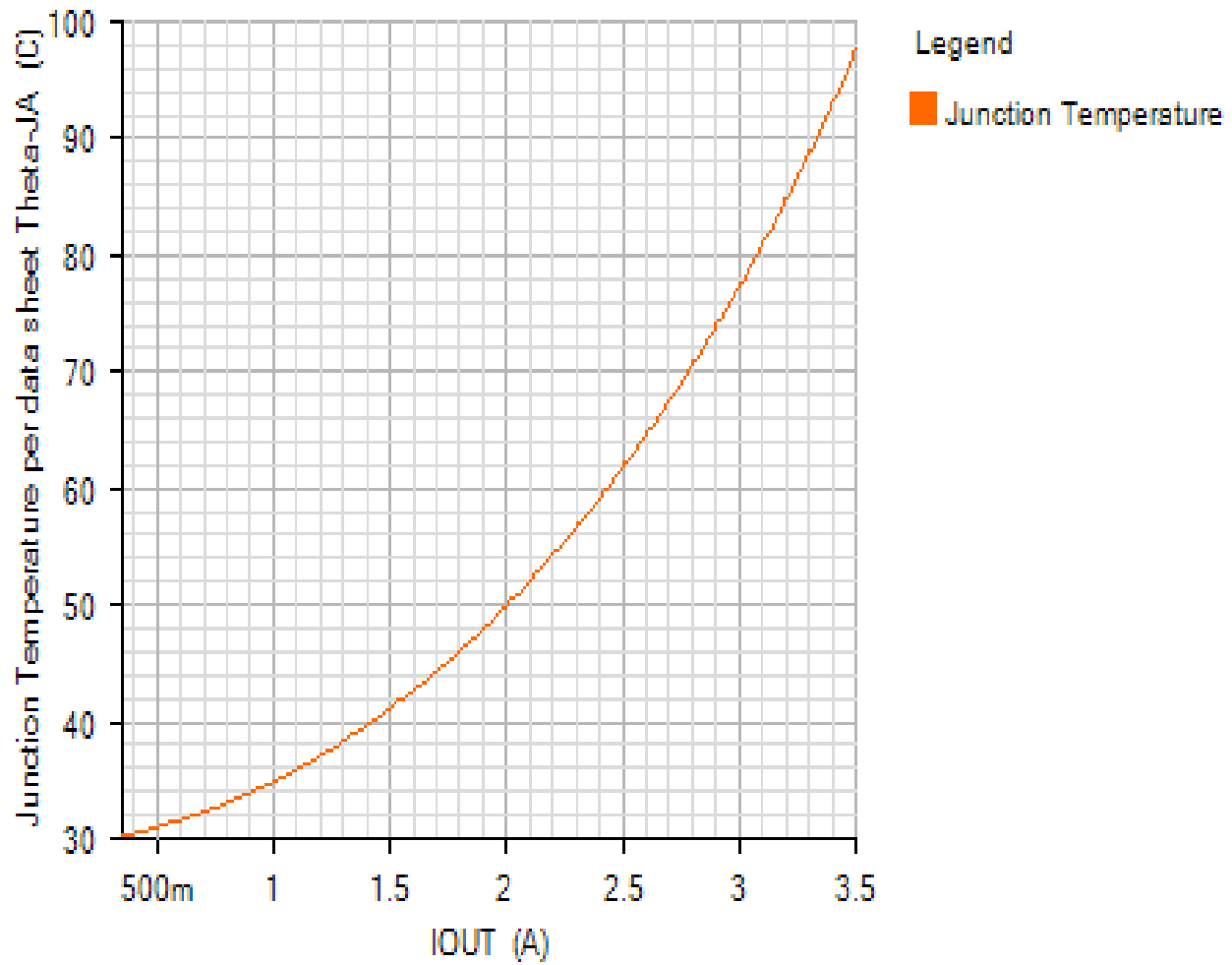
POWER_LOSS_PLOT

Default

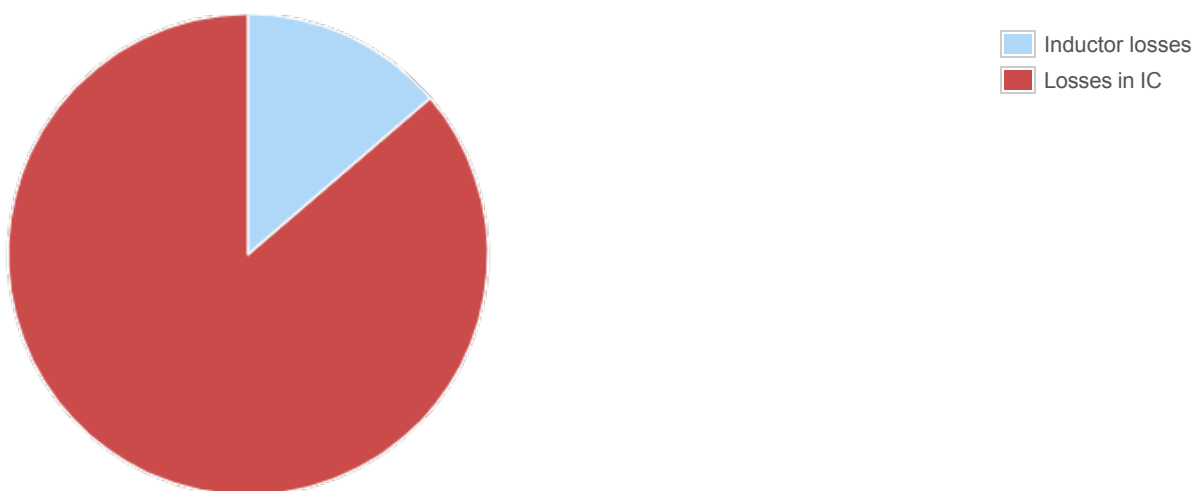


JUNCTION_TEMPERATURE_PLOT

Default



Losses



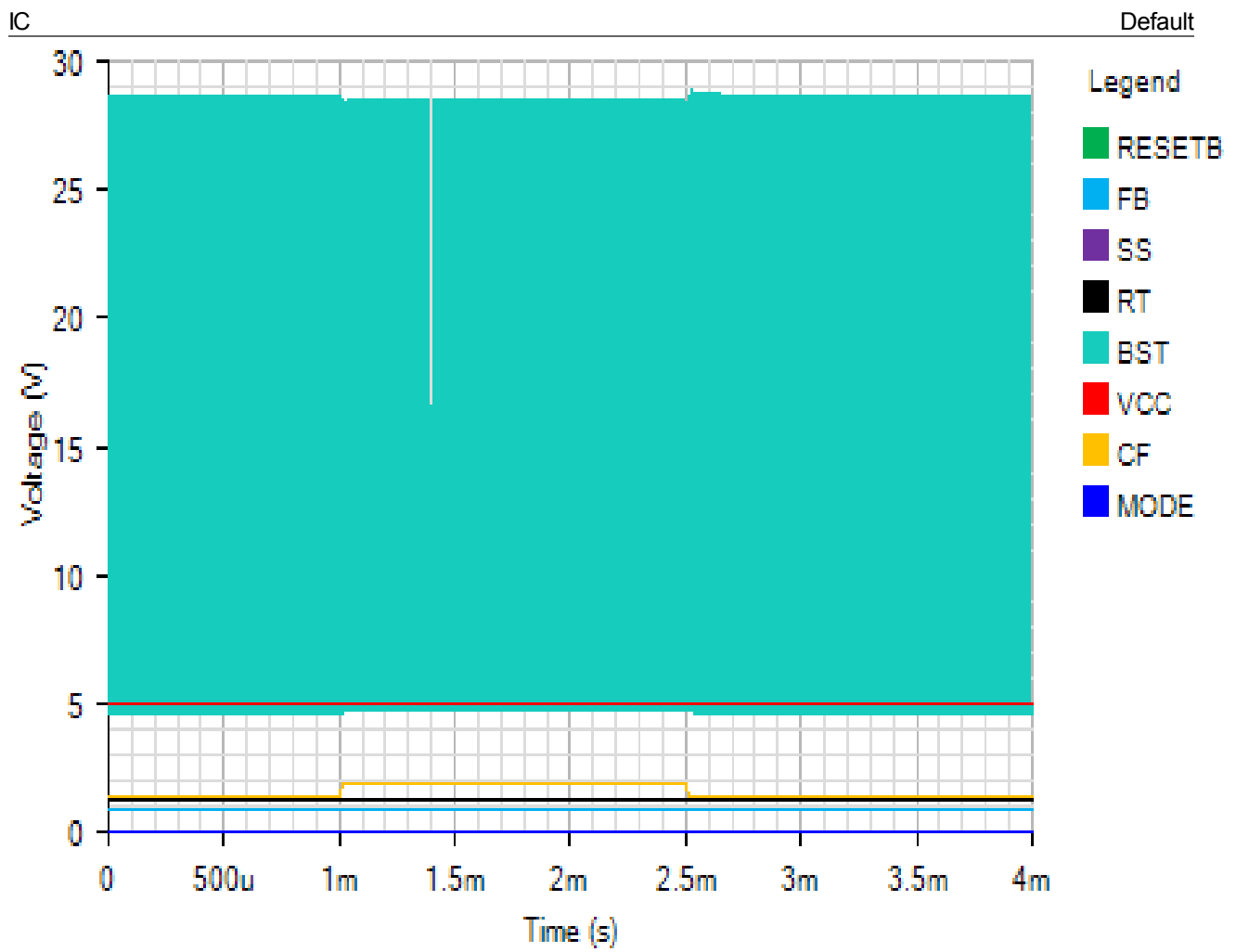
Component

Loss (W)

% of total

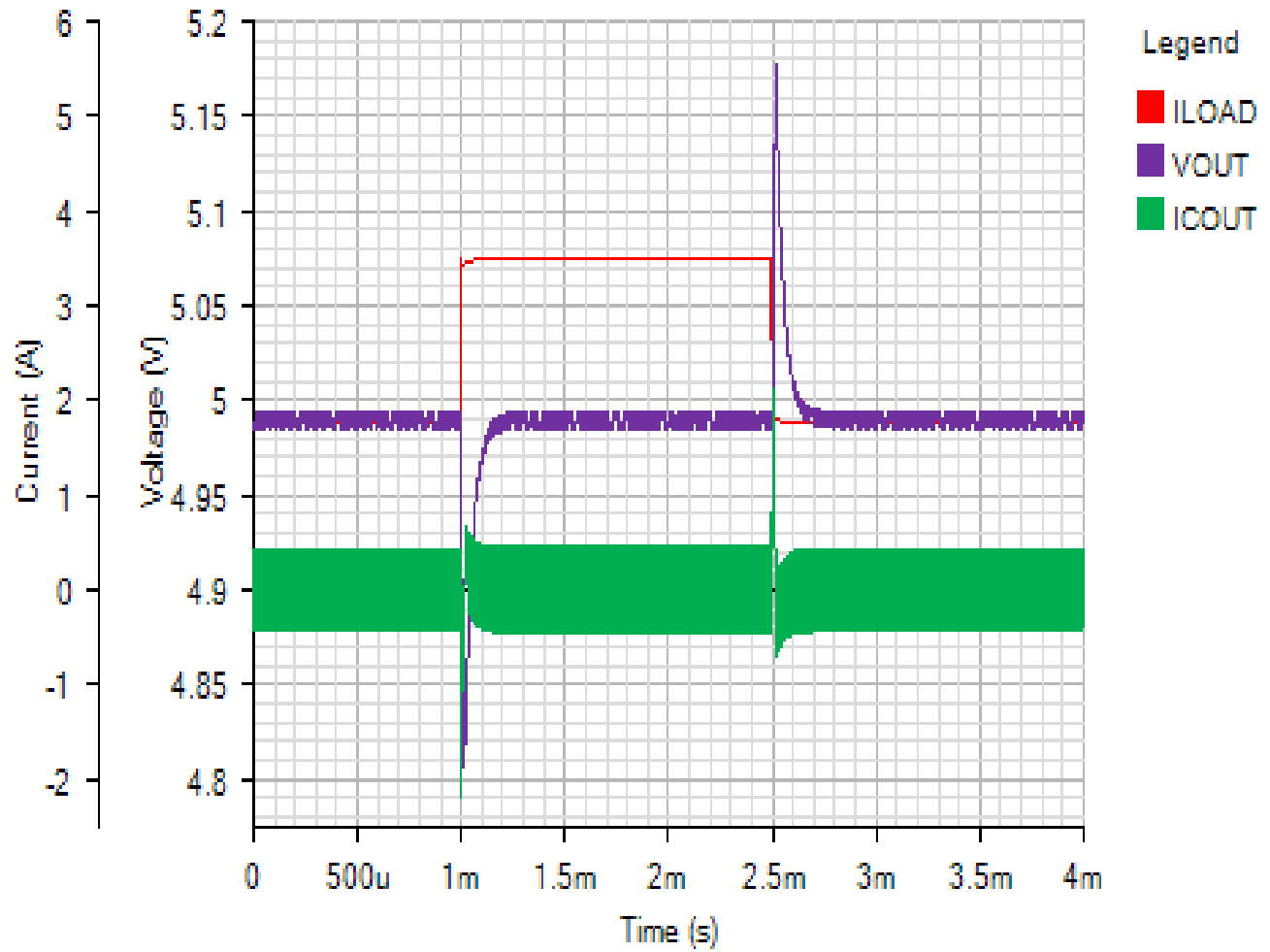
Component	Loss (W)	% of total
Inductor losses	0.35	13.7
Losses in IC	2.2	86.3
Total	2.55	100

Load Step - Fri Nov 16 2018 09:48:01



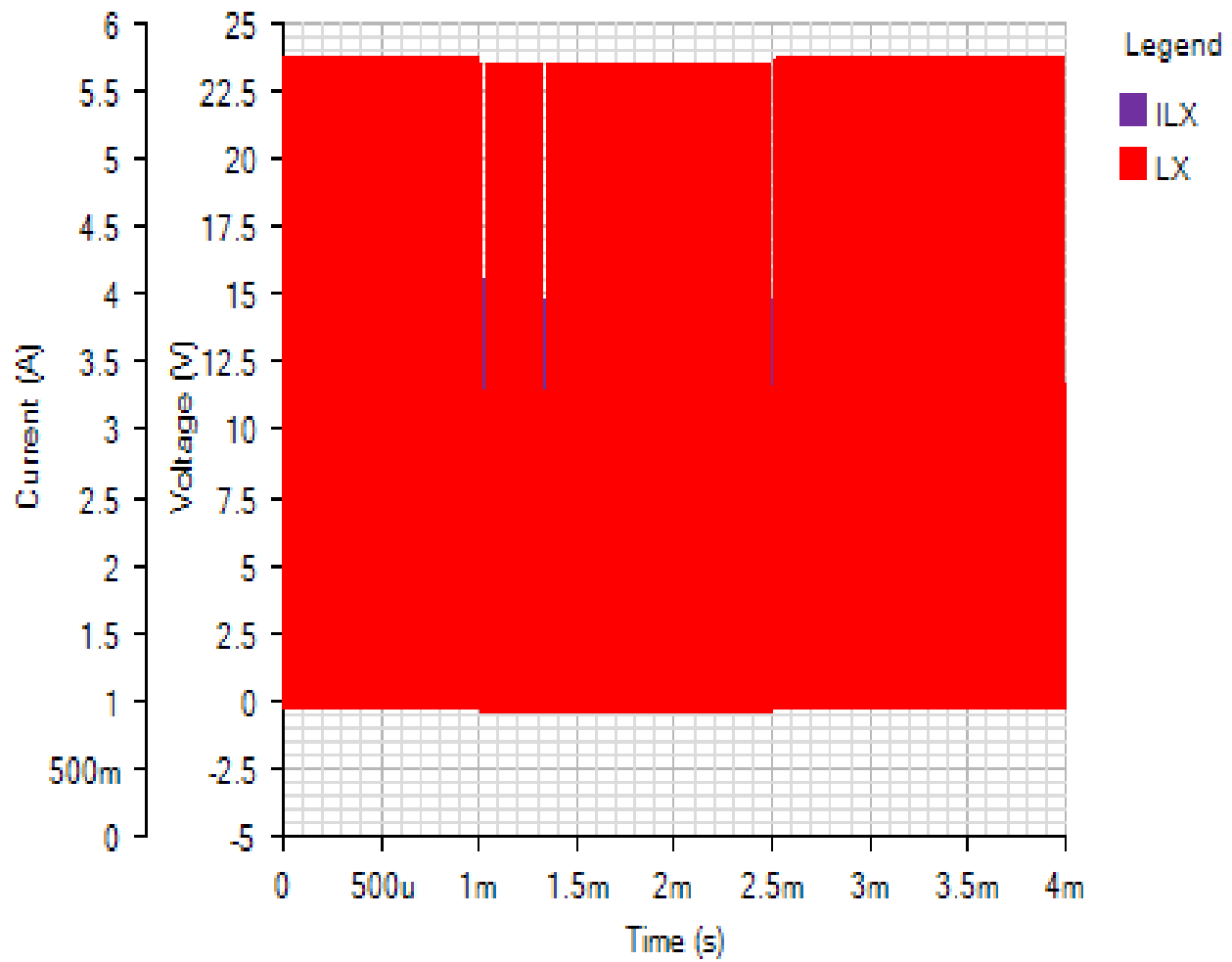
OUTPUT

Default



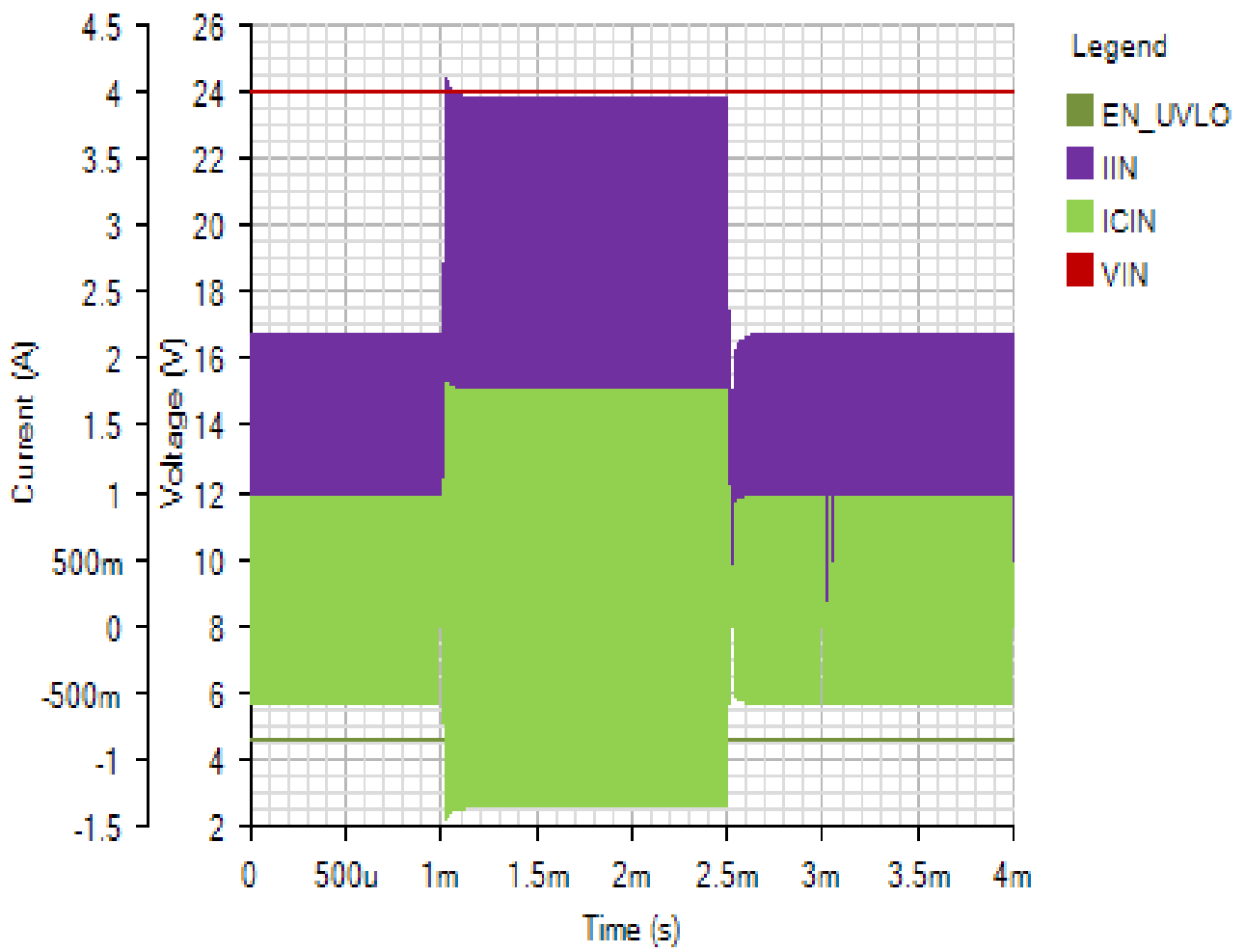
SWITCHING

Default



INPUT

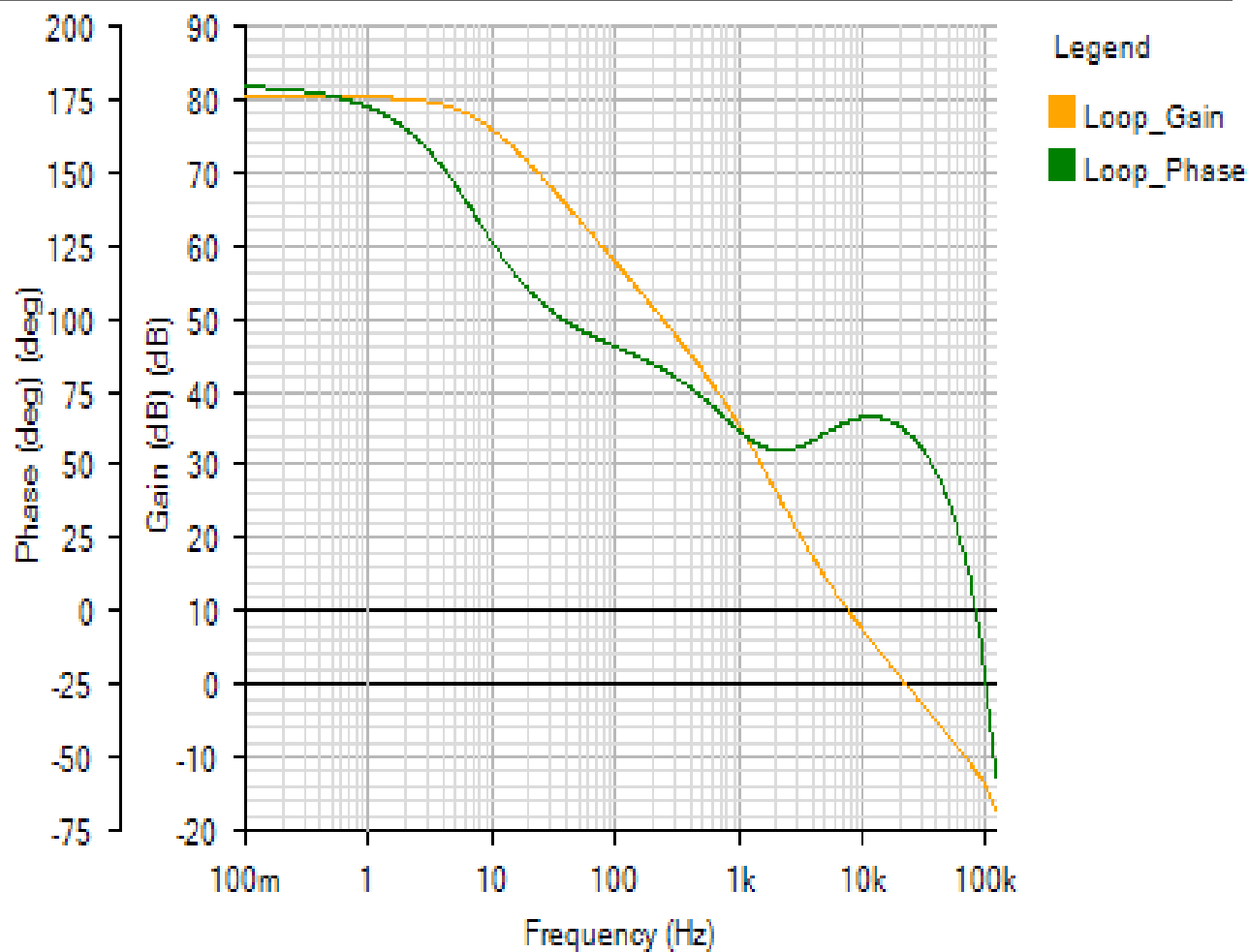
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AC Loop - Fri Nov 16 2018 09:48:01

BODE

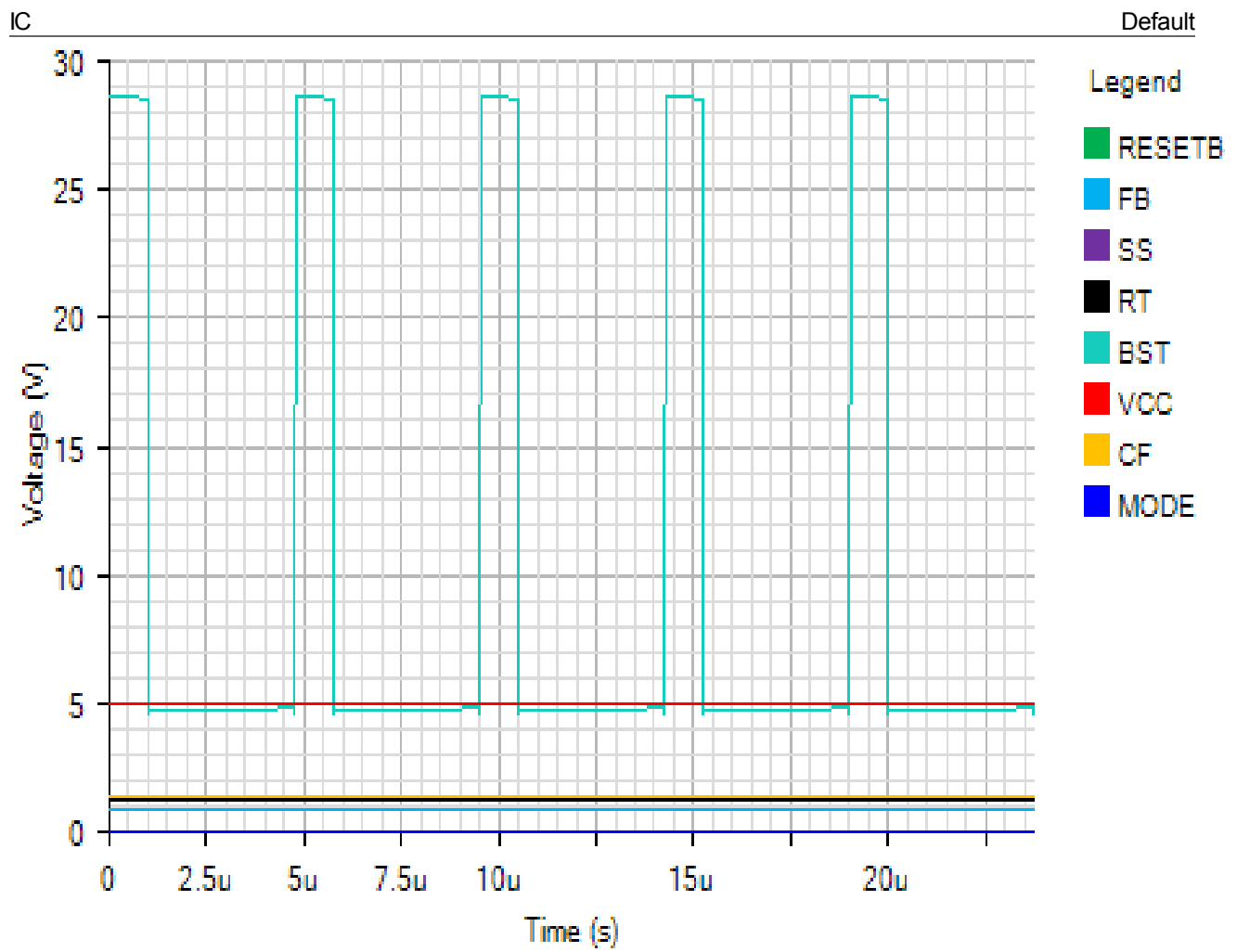
Default



Phase Margin: 61.54° at a crossover frequency of 22.6kHz

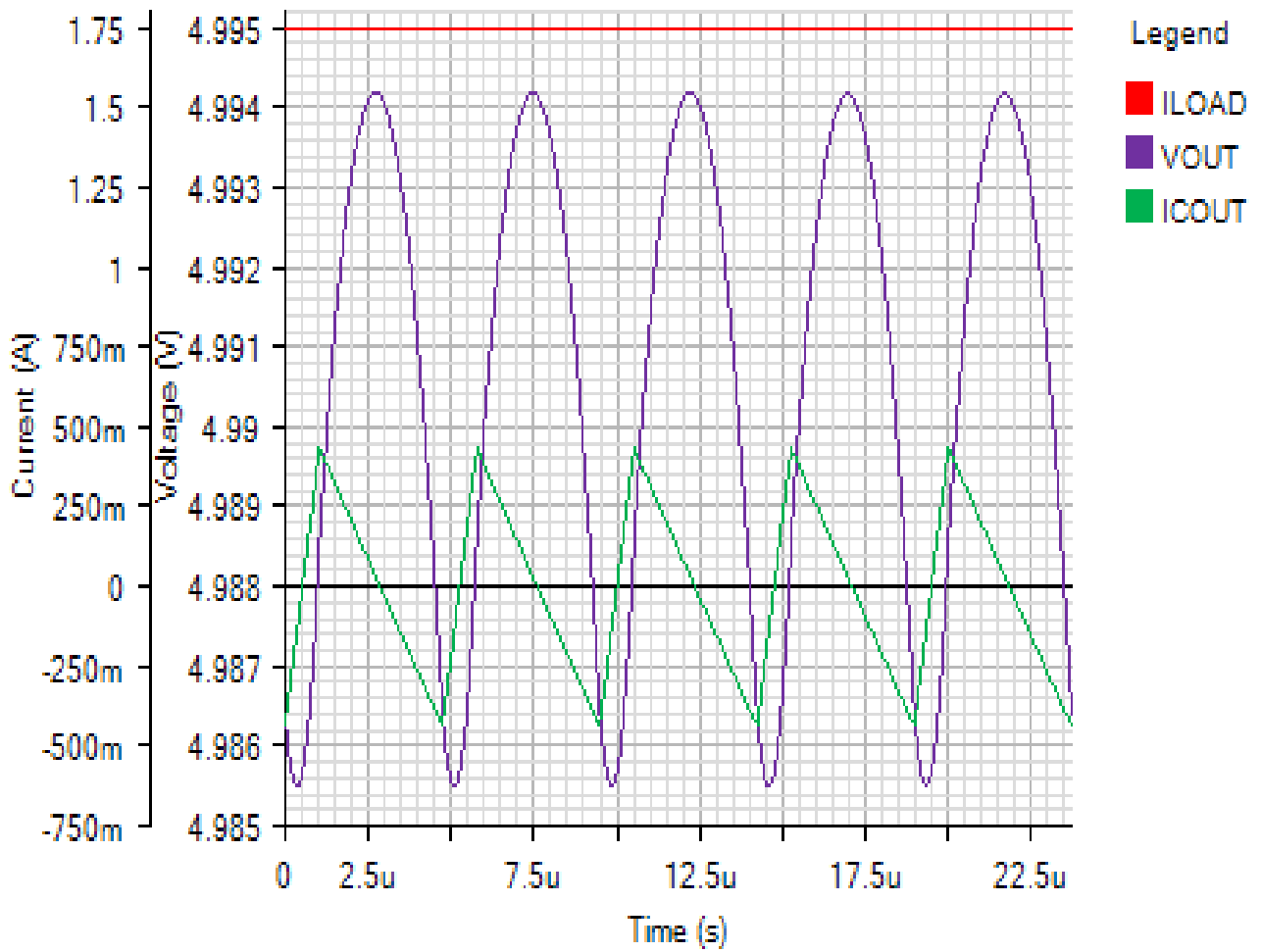


Steady State - Fri Nov 16 2018 09:48:01



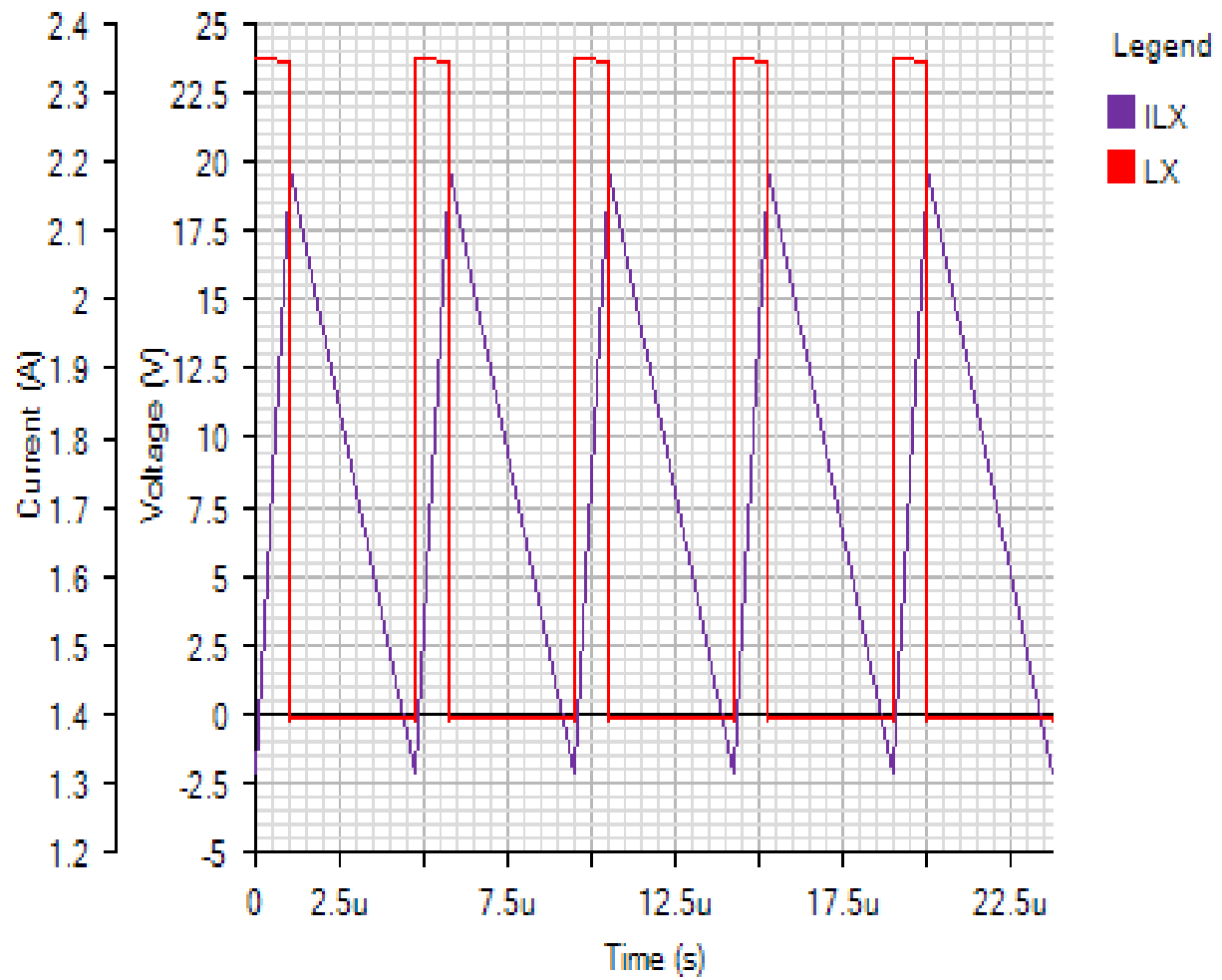
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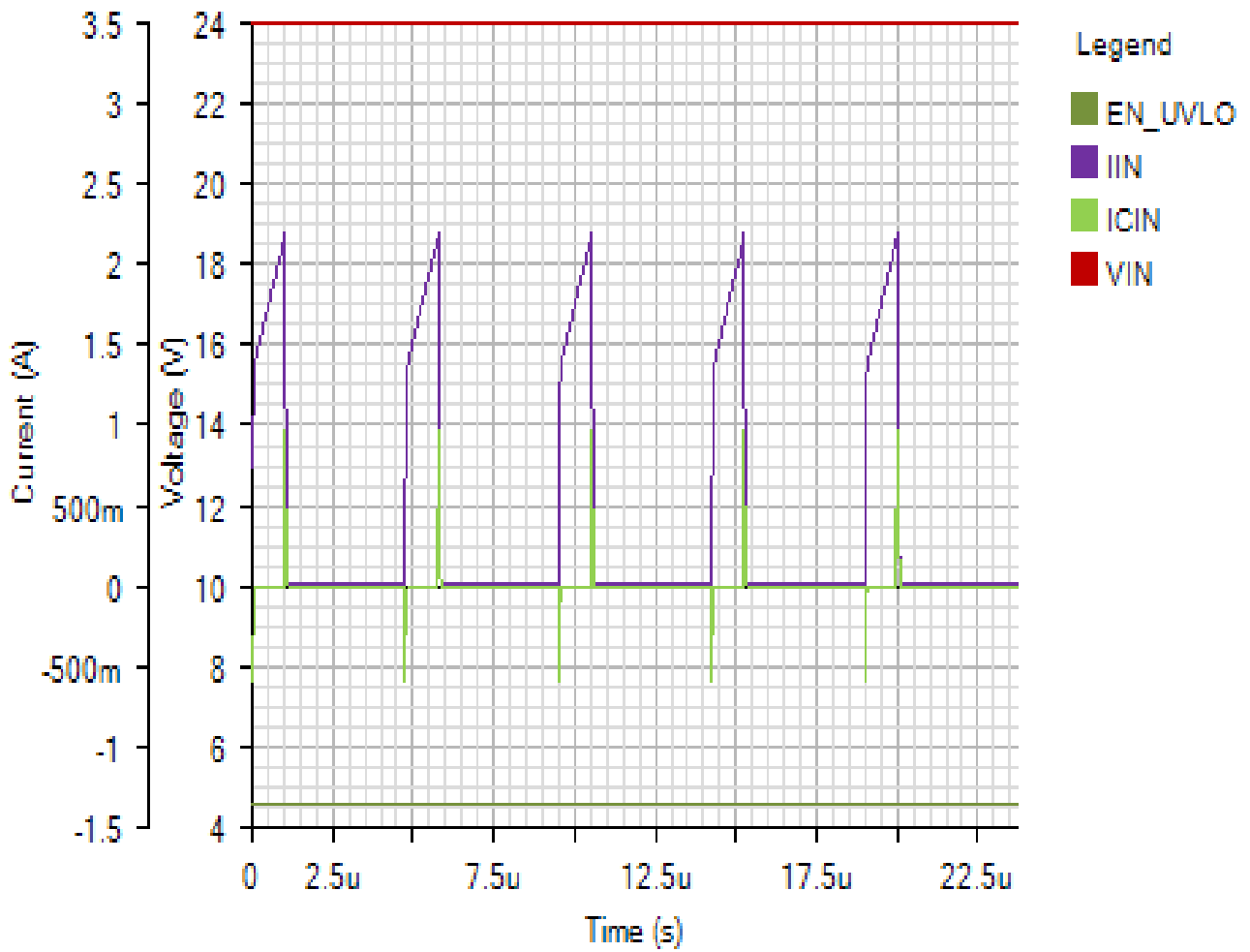
SWITCHING

Default

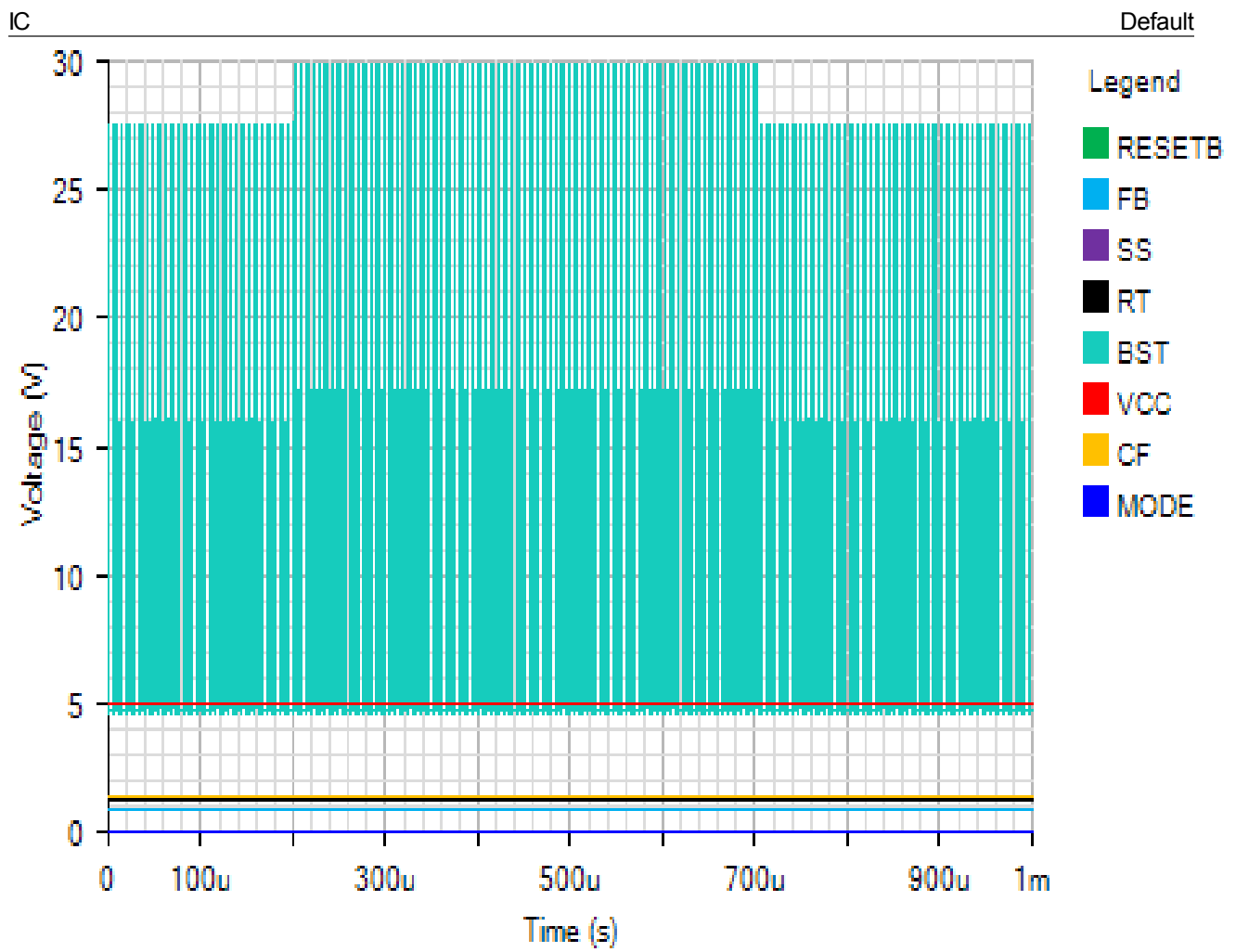


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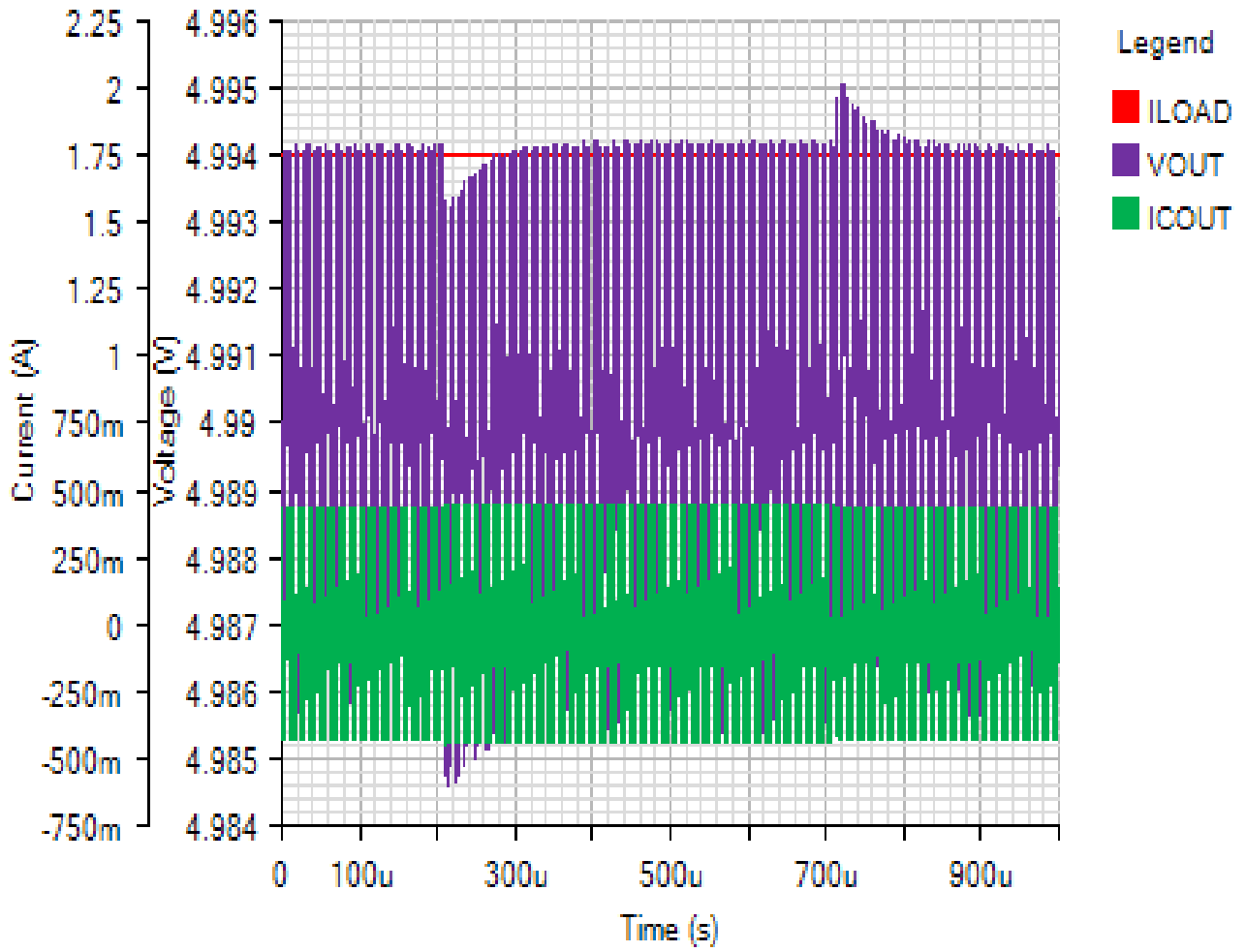


Line Transient - Fri Nov 16 2018 09:48:01



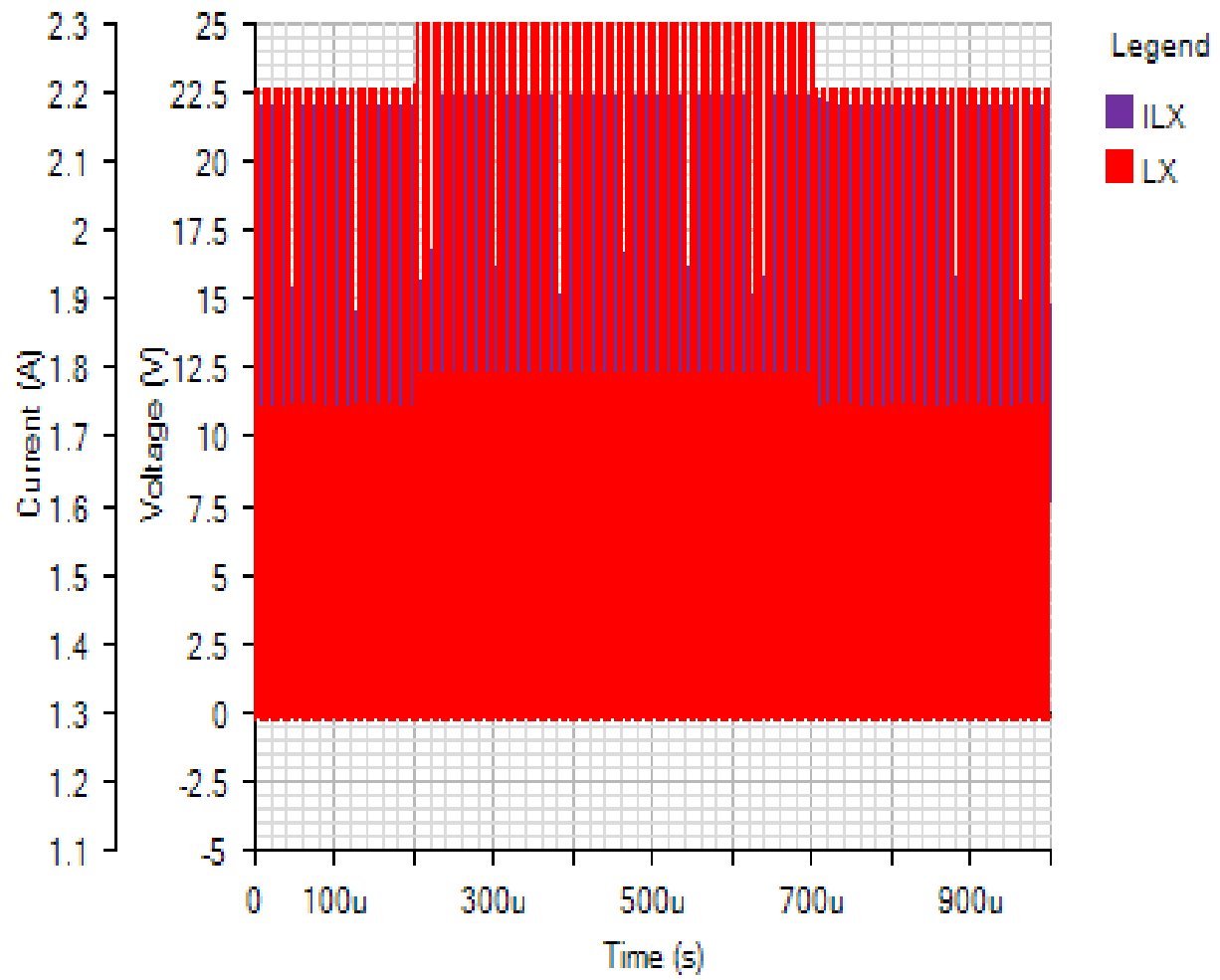
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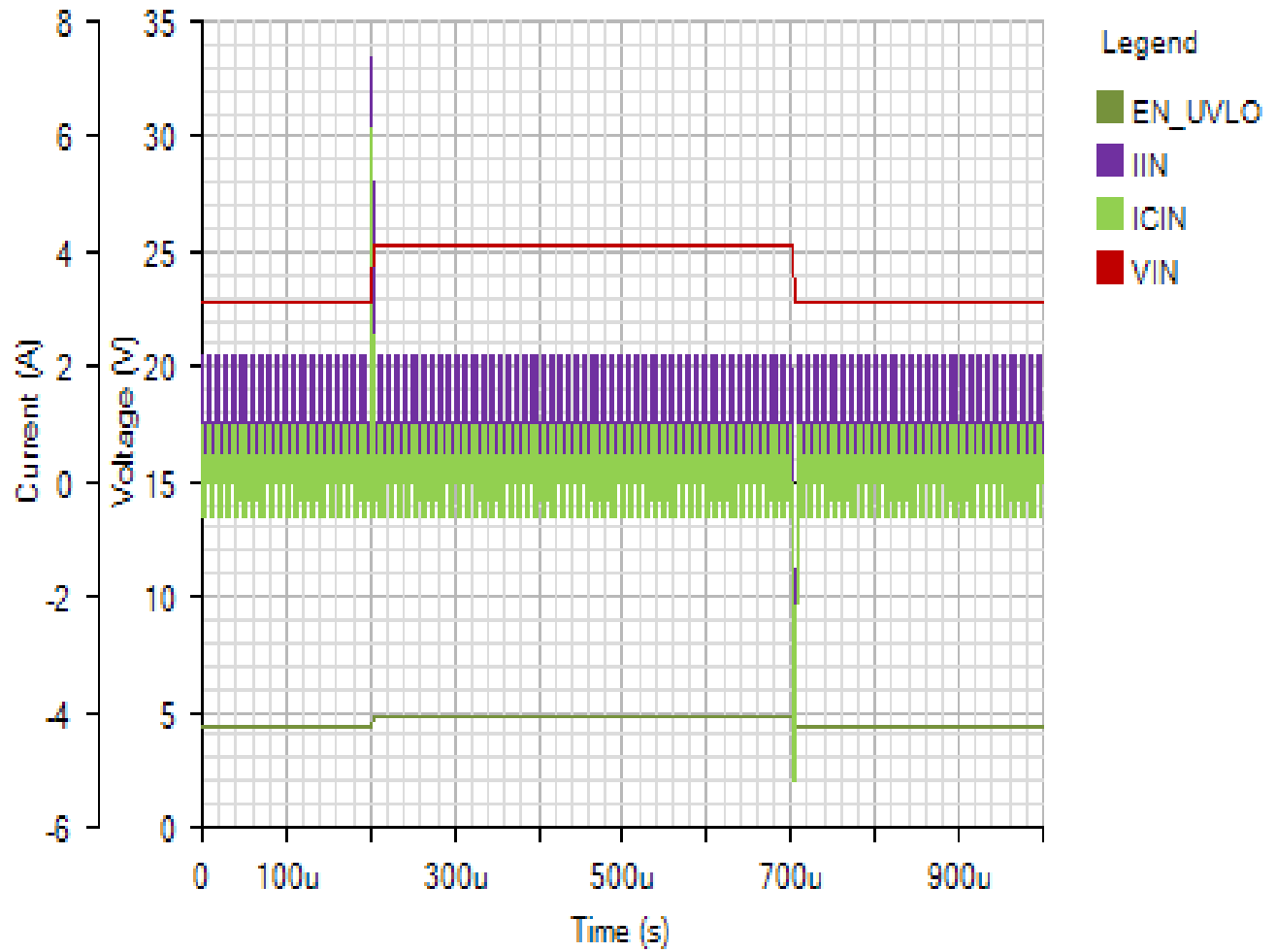
SWITCHING

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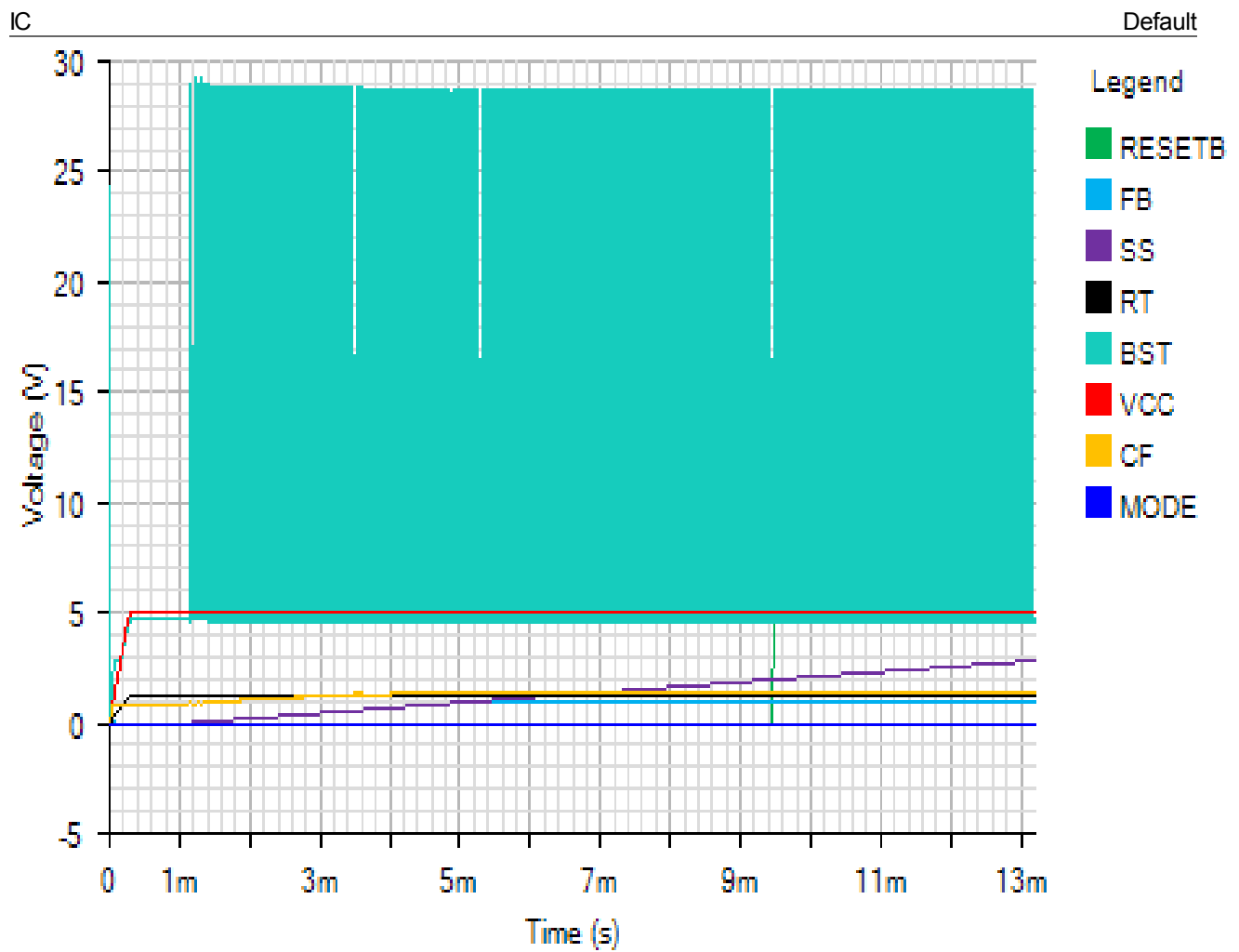


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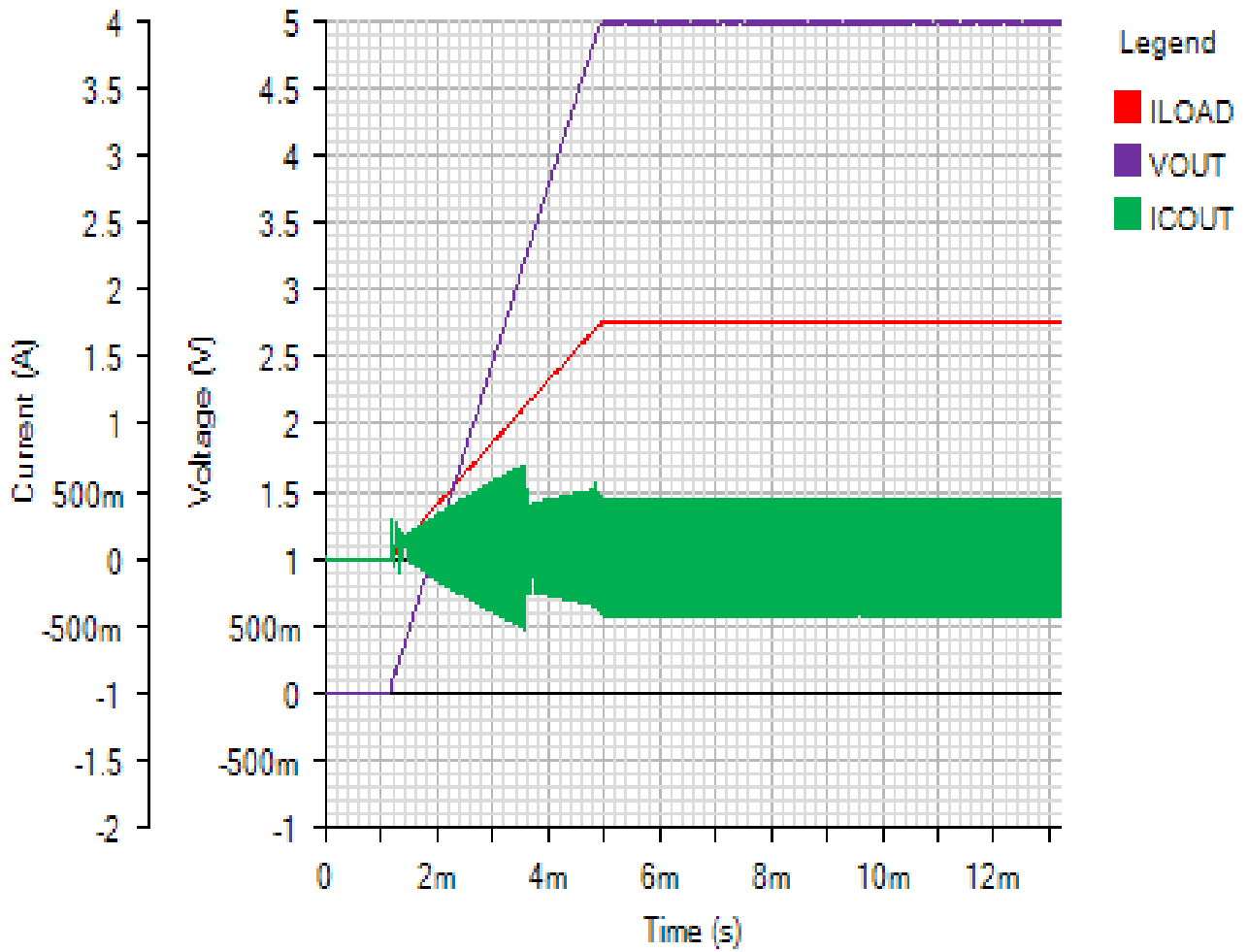


Start Up - Fri Nov 16 2018 09:48:01



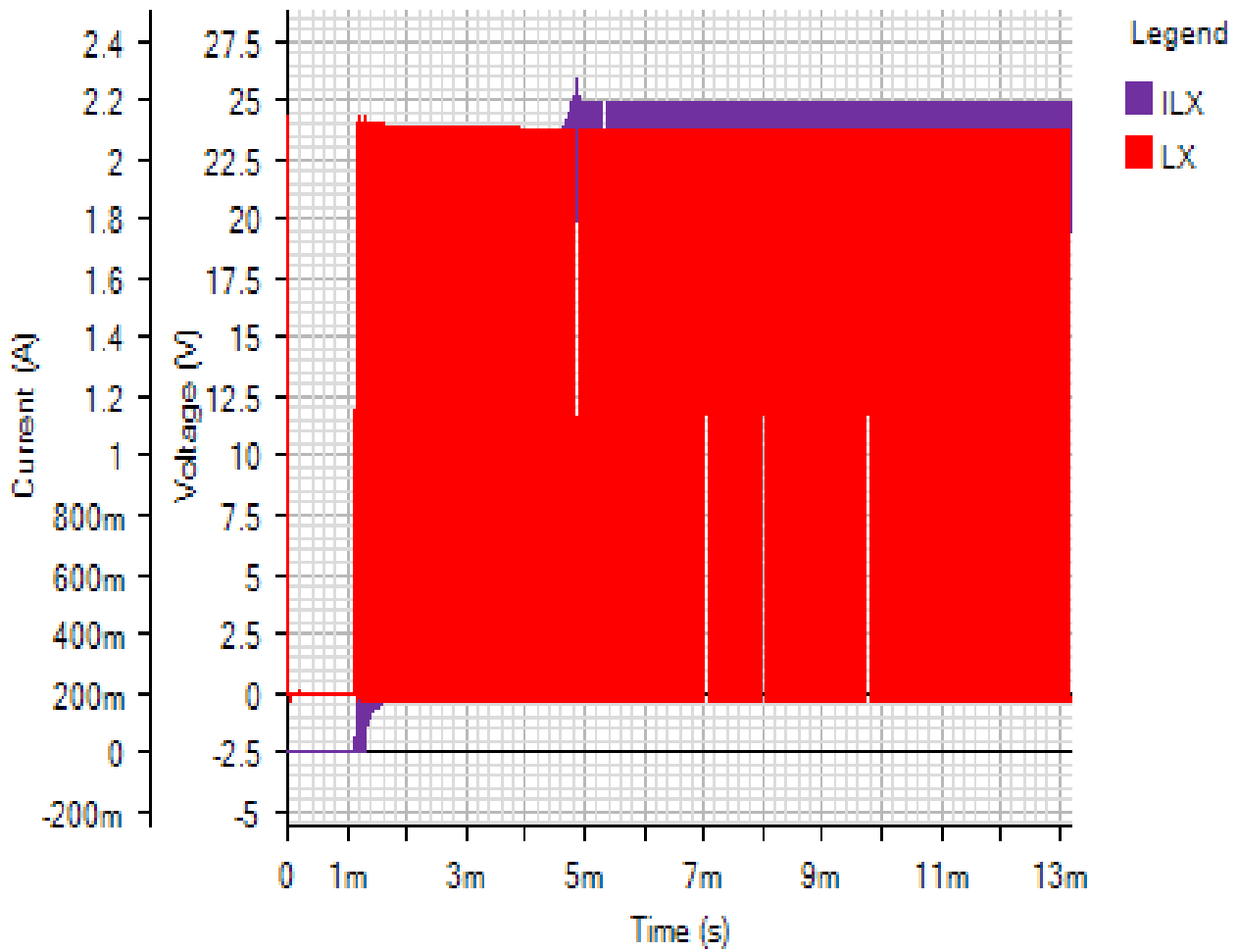
OUTPUT

Default



SWITCHING

Default



INPUT

Default

