

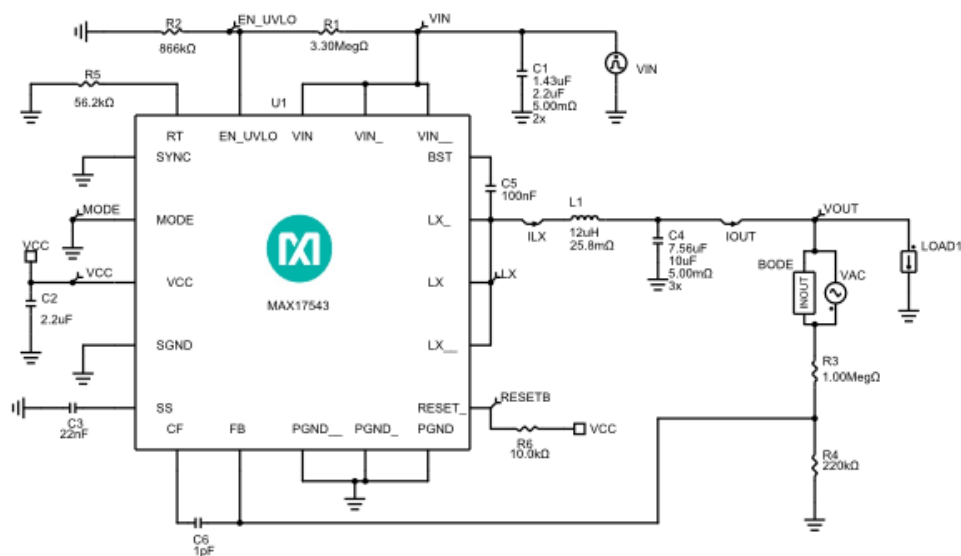
Initial Design

1.0

Design Requirements

Parameter	Value
Maximum Input Voltage	42V
Nominal Input Voltage	24V
Minimum Input Voltage	6.5V
Input Steady-State Ripple	0.48V
Input Undervoltage Lockout Level	5.9V
Output Voltage	5V
Output Current	2.5A
Output Voltage Load Step Over/Undershoot	0.15V
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Mode of Operation	PWM
Switching Frequency	360kHz
Soft-start time	3ms
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	MAX17543	Maxim Integrated	4.5V-42V, 2.5A, High-Efficiency, Synchronous Step-Down DC-DC Converter with Internal Compensation
C1	2	GRM31CR71H225KA88	Murata	Cap Ceramic 2.2uF 50V X7R 10% SMD 1206 125C
C2	1	C1608X7R1A225K080AC	TDK	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C3	1	GRT155R71H223KE01D	Murata Manufacturing	Cap Ceramic 0.022uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
C4	3	C2012X7R1A106K125AC	TDK	Cap Ceramic 10uF 10V X7R 10% SMD 0805 125C Plastic T/R
C5	1	GCM155R71C104KA55D	Murata Manufacturing	Cap Ceramic 0.1uF 16V X7R 10% Pad SMD 0402 125°C Automotive T/R
C6	1	CGA2B2NP01H010C050BA	TDK	Cap Ceramic 1pF 50V C0G 0.25pF Pad SMD 0402 150°C Automotive T/R
L1	1	MSS1278-123MLB	Coilcraft	Inductor 12uH 20% 23.2mOhm 9.9A Isat 5.2A Irms
R1	1	CRCW04023M30FKED	Vishay	Res Thick Film 0402 3.3M Ohm 1% 0.063W(1/16W) ±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	ERJ2RKF1004X	Panasonic	Res Thick Film 0402 1M Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD

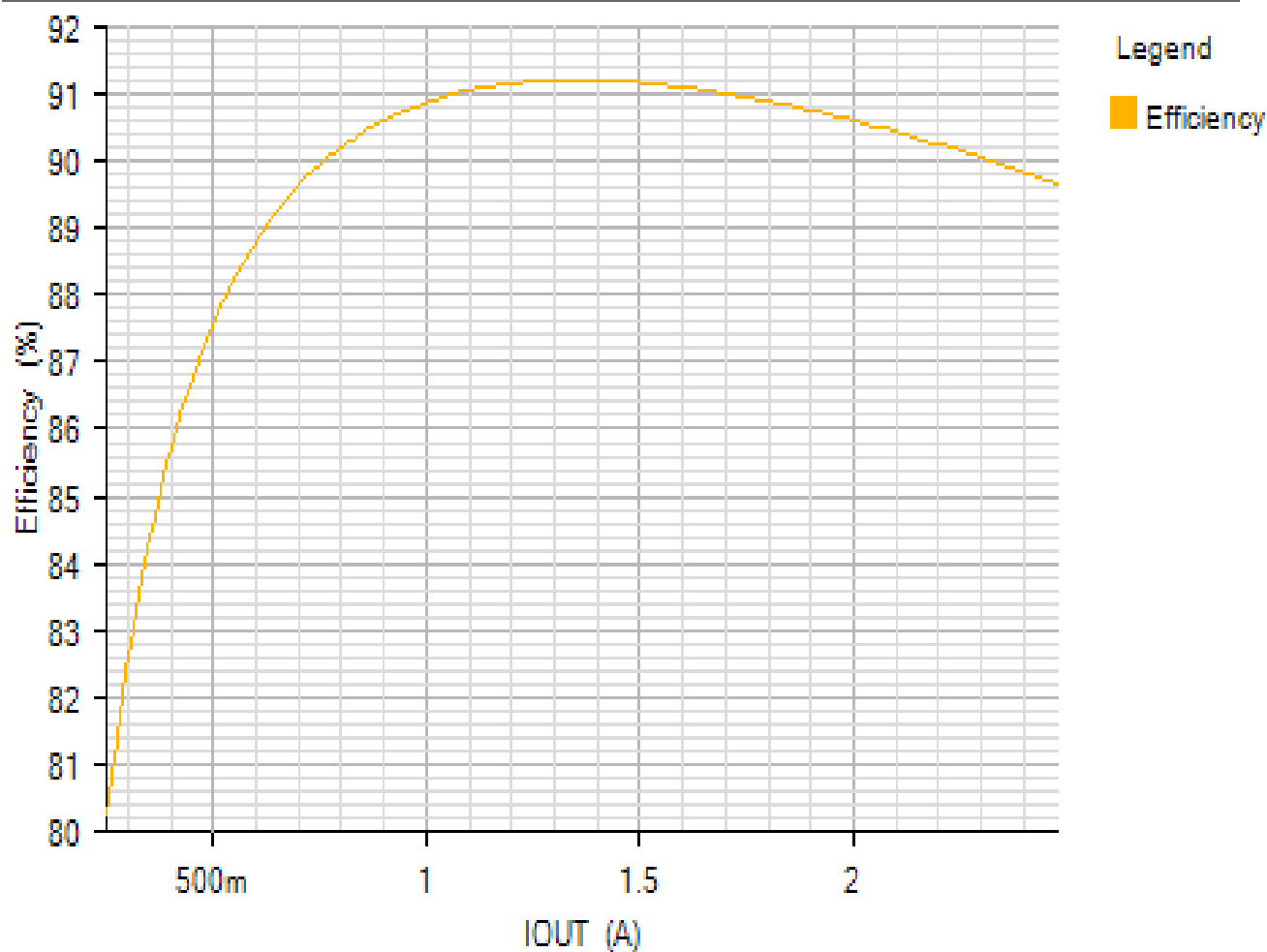
Automotive T/R				
R4	1	ERJ2RKF2203X	Panasonic	Res Thick Film 0402 220K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF5622X	Panasonic	Res Thick Film 0402 56.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Tue Nov 20 2018 16:02:13

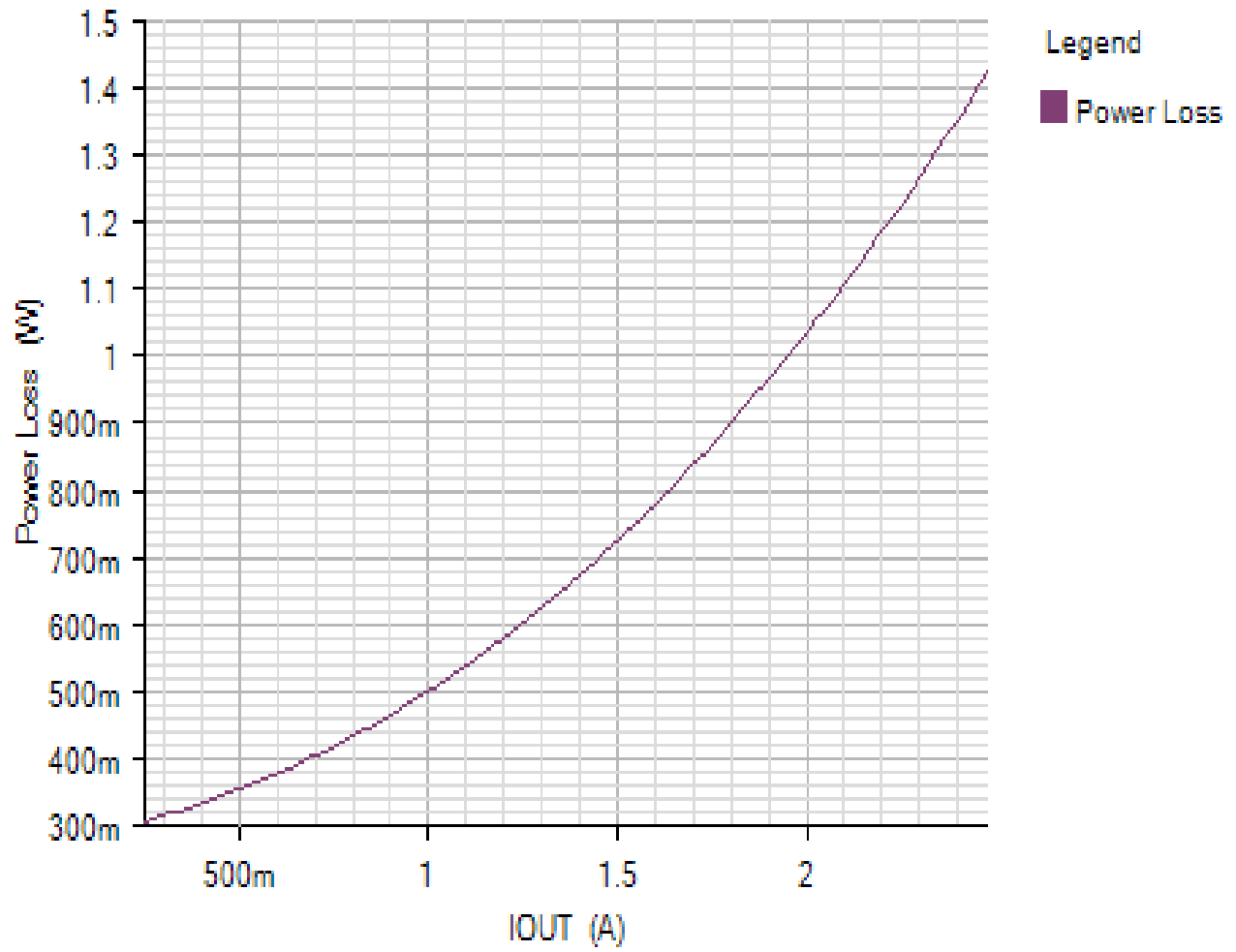
EFFICIENCY_PLOT

Default



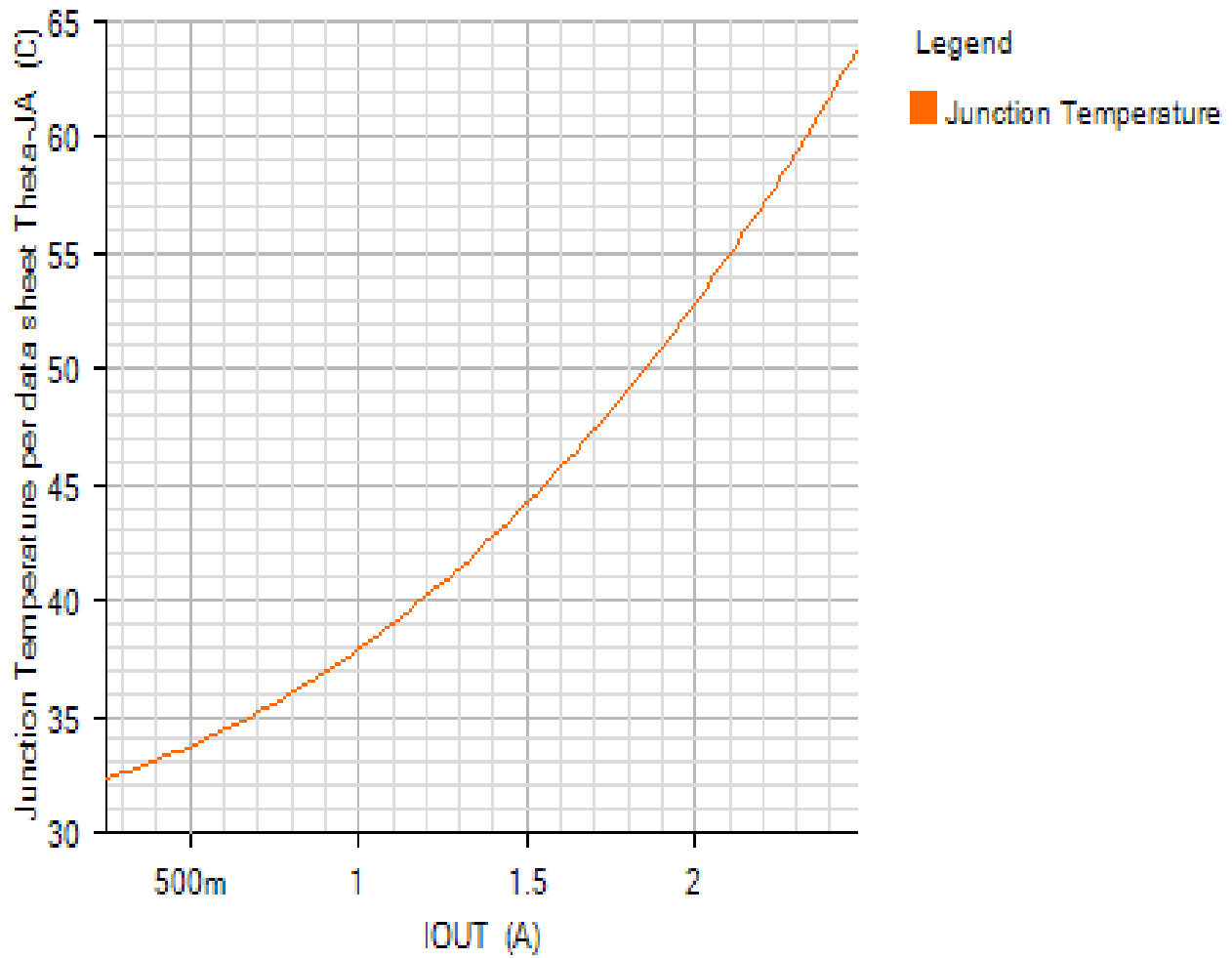
POWER_LOSS_PLOT

Default

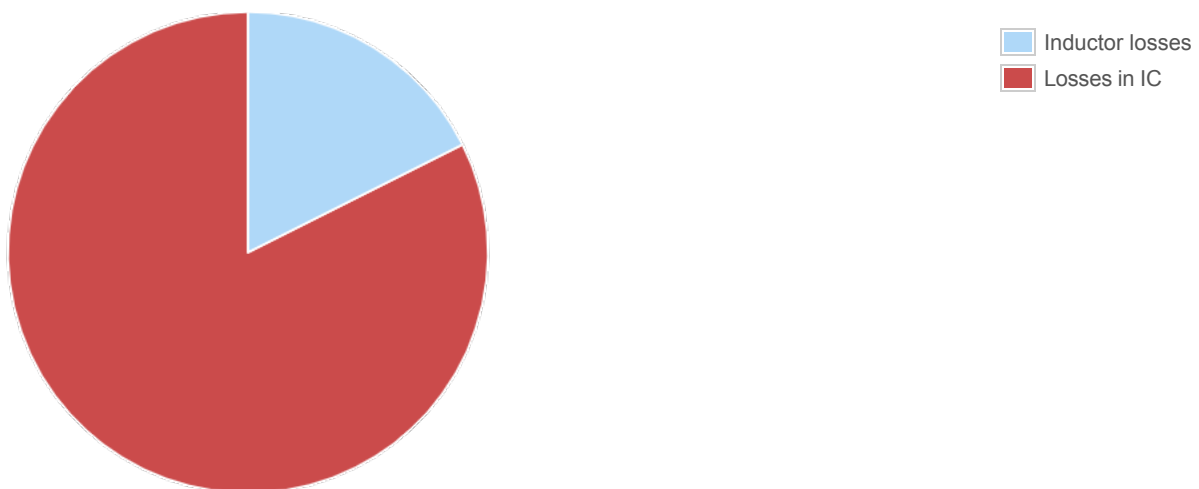


JUNCTION_TEMPERATURE_PLOT

Default



Losses



Component

Loss (W)

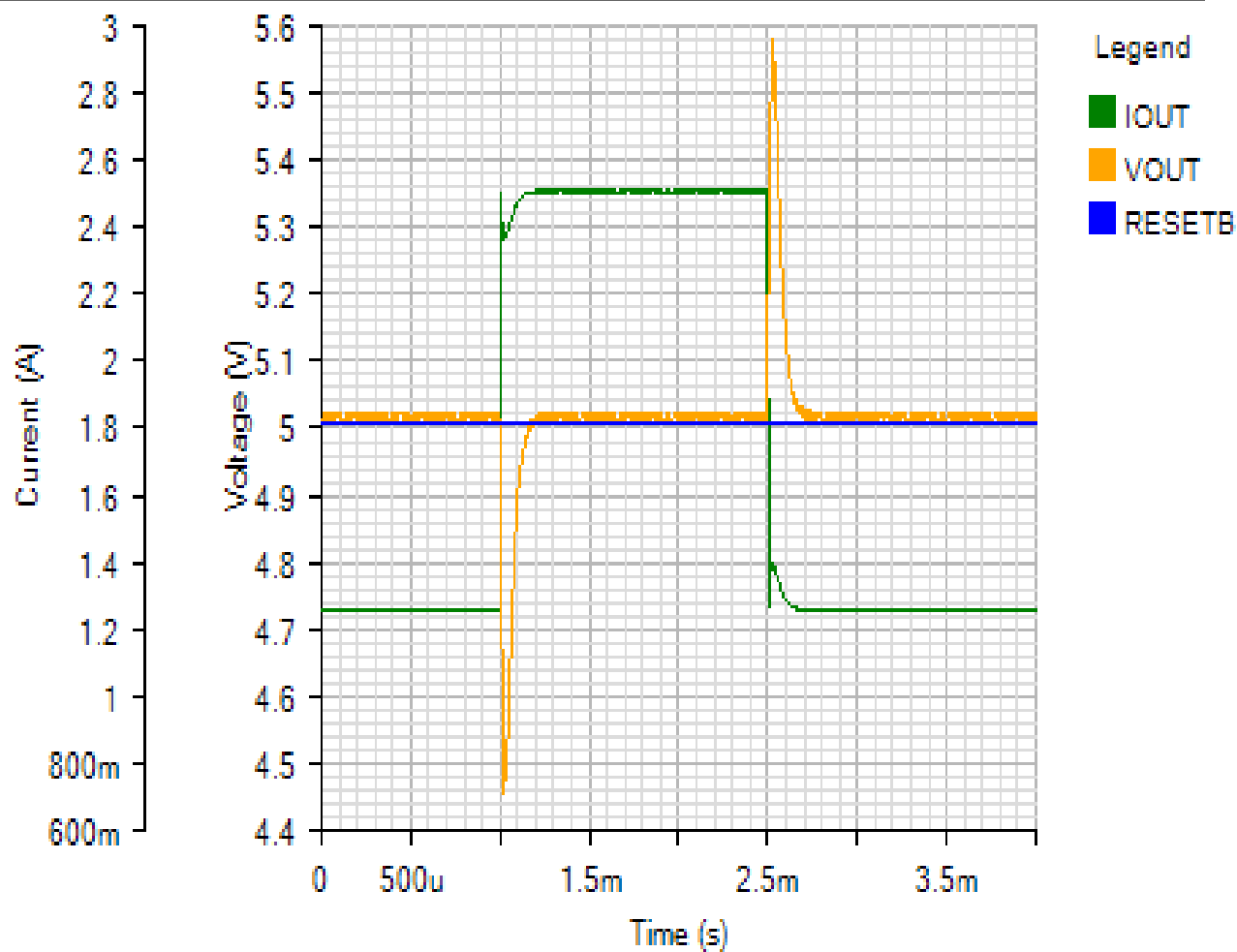
% of total

Component	Loss (W)	% of total
Inductor losses	0.25	17.6
Losses in IC	1.17	82.4
Total	1.42	100

Load Step - Tue Nov 20 2018 16:02:13

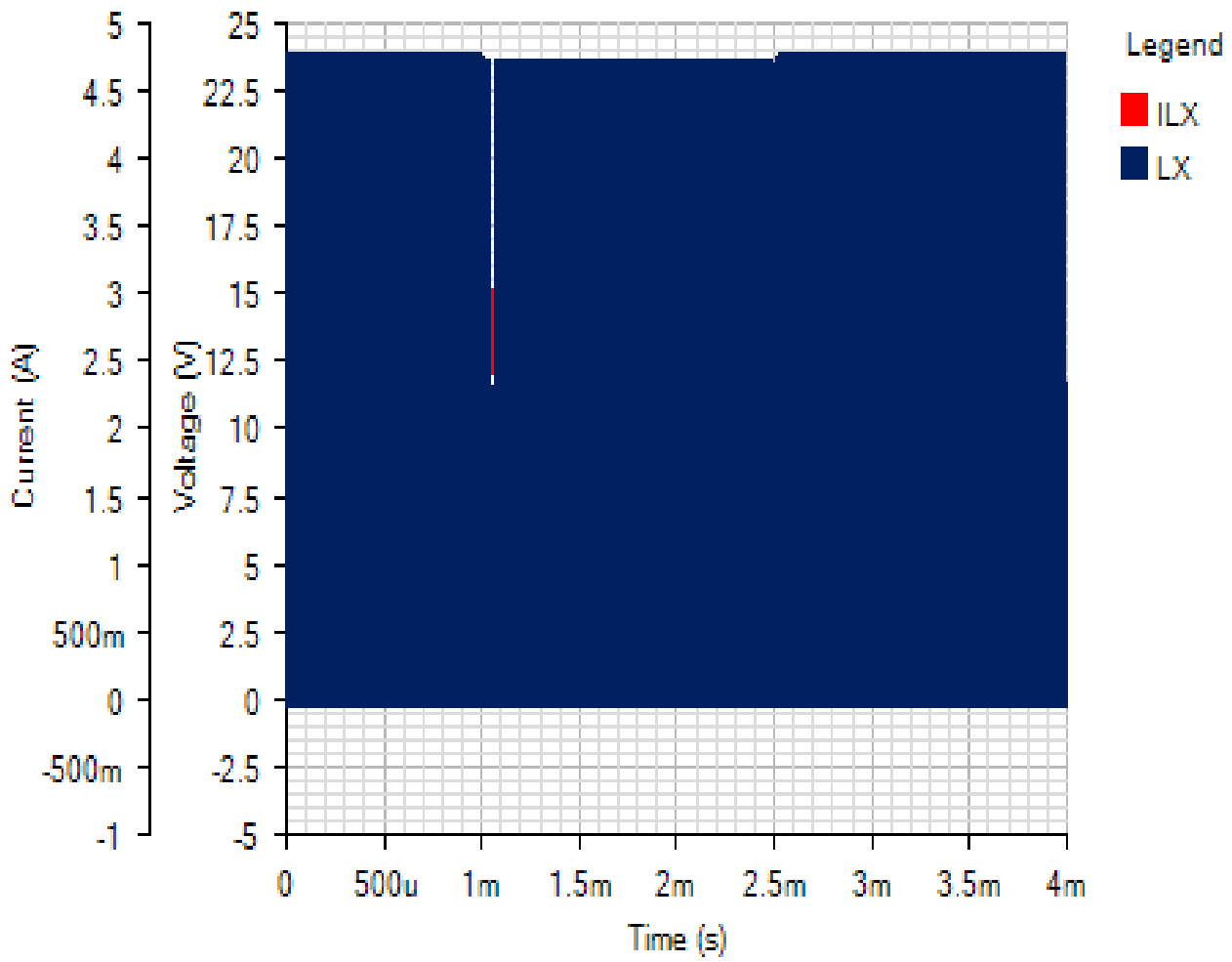
OUTPUT

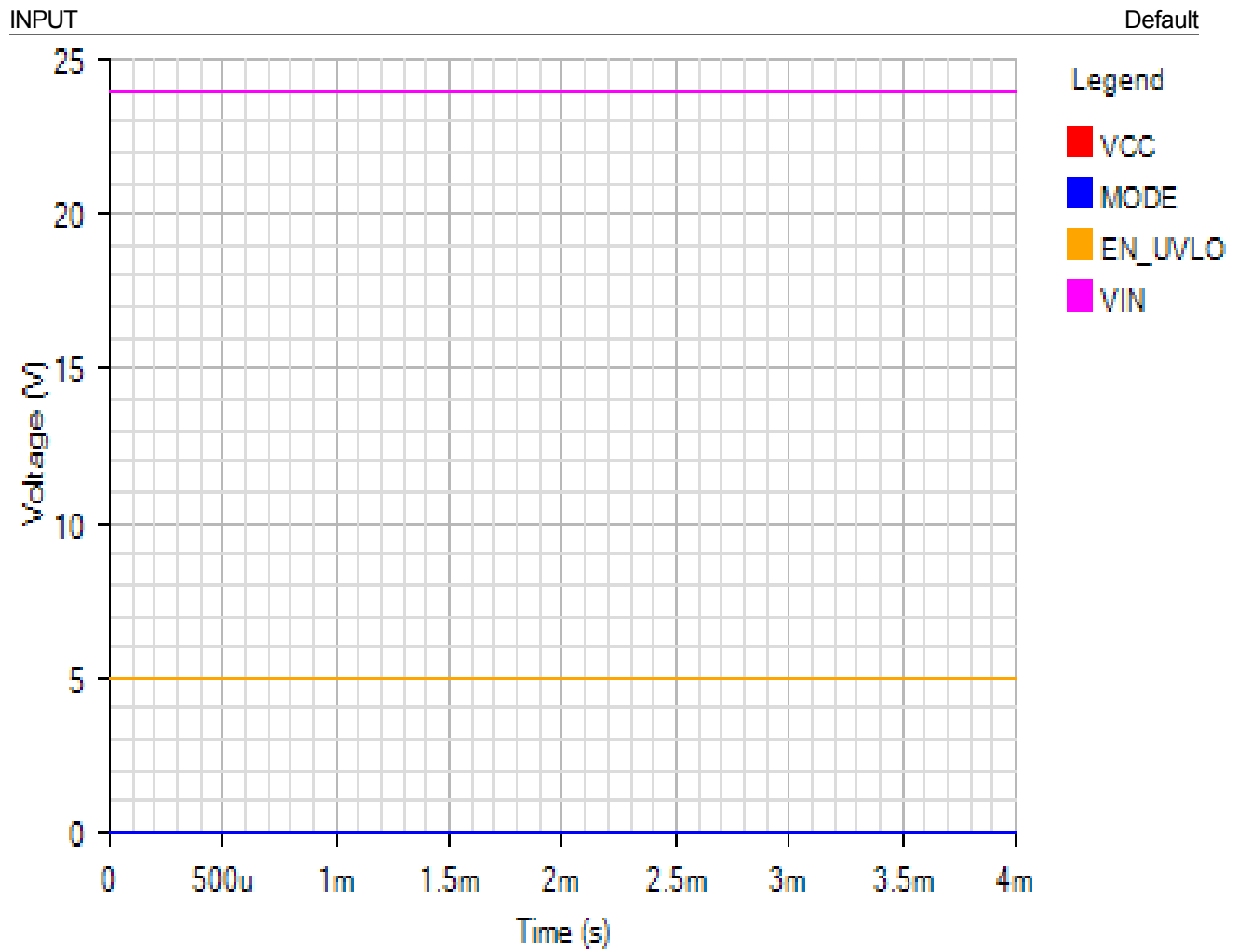
Default



SWITCHING

Default

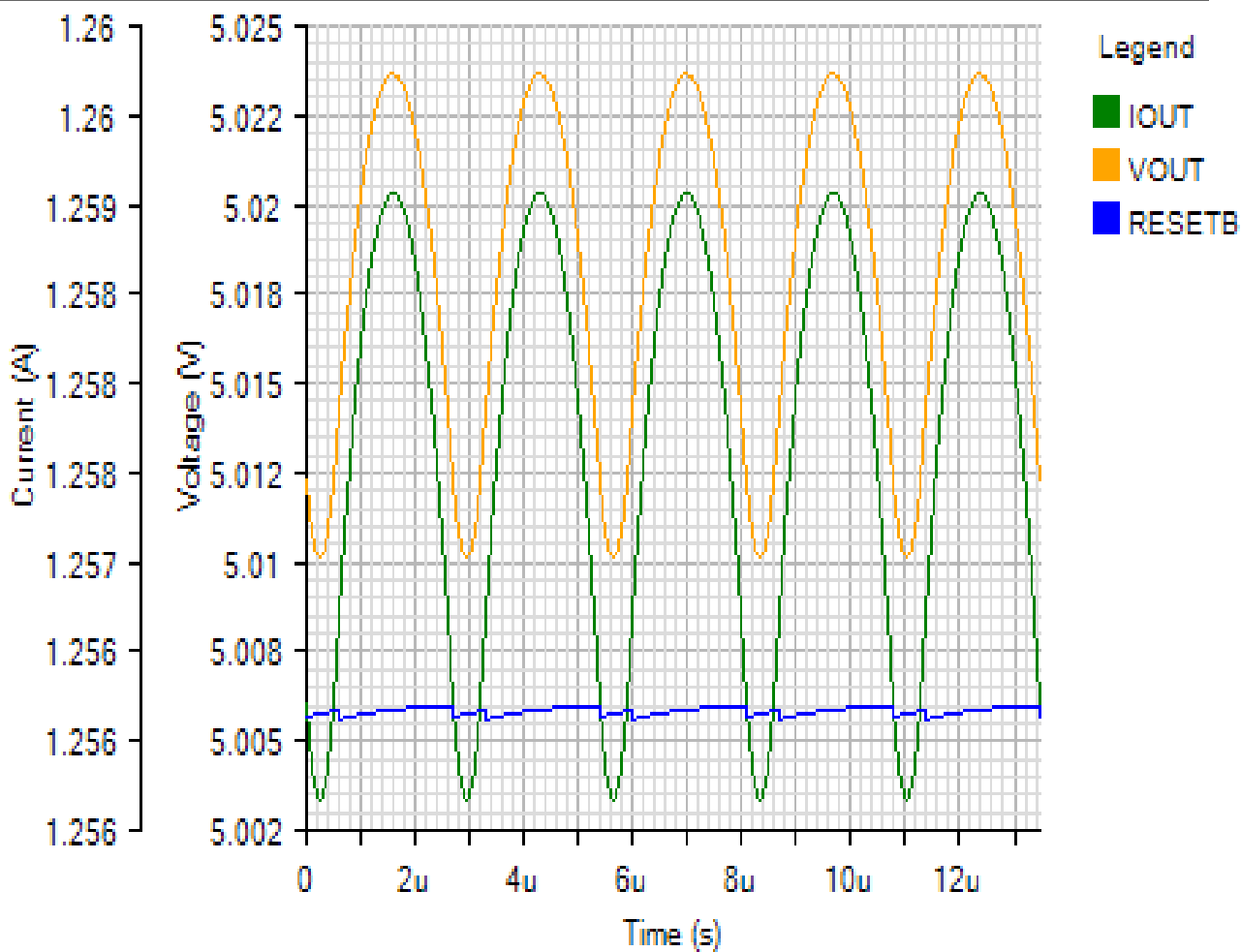




Steady State - Tue Nov 20 2018 16:02:13

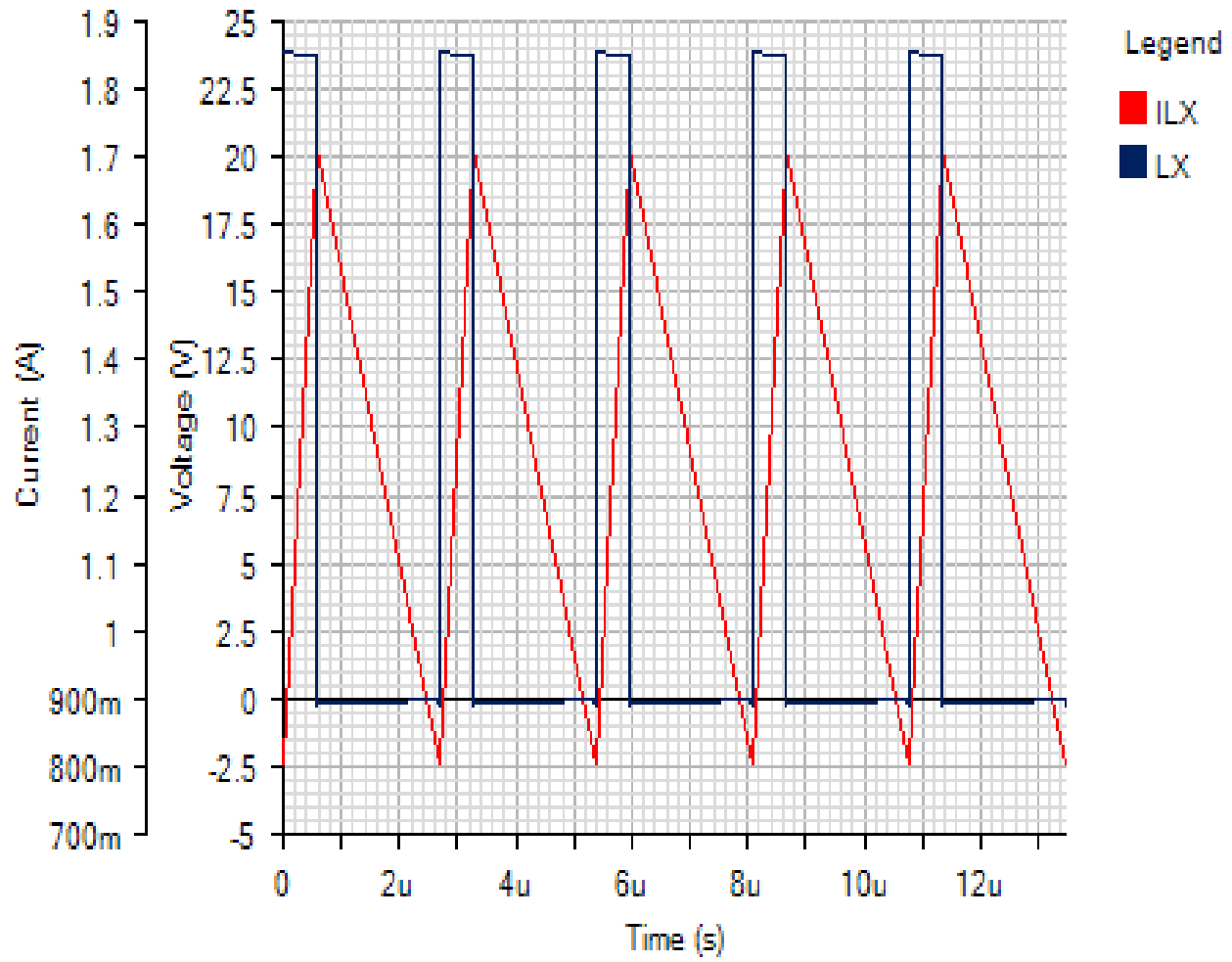
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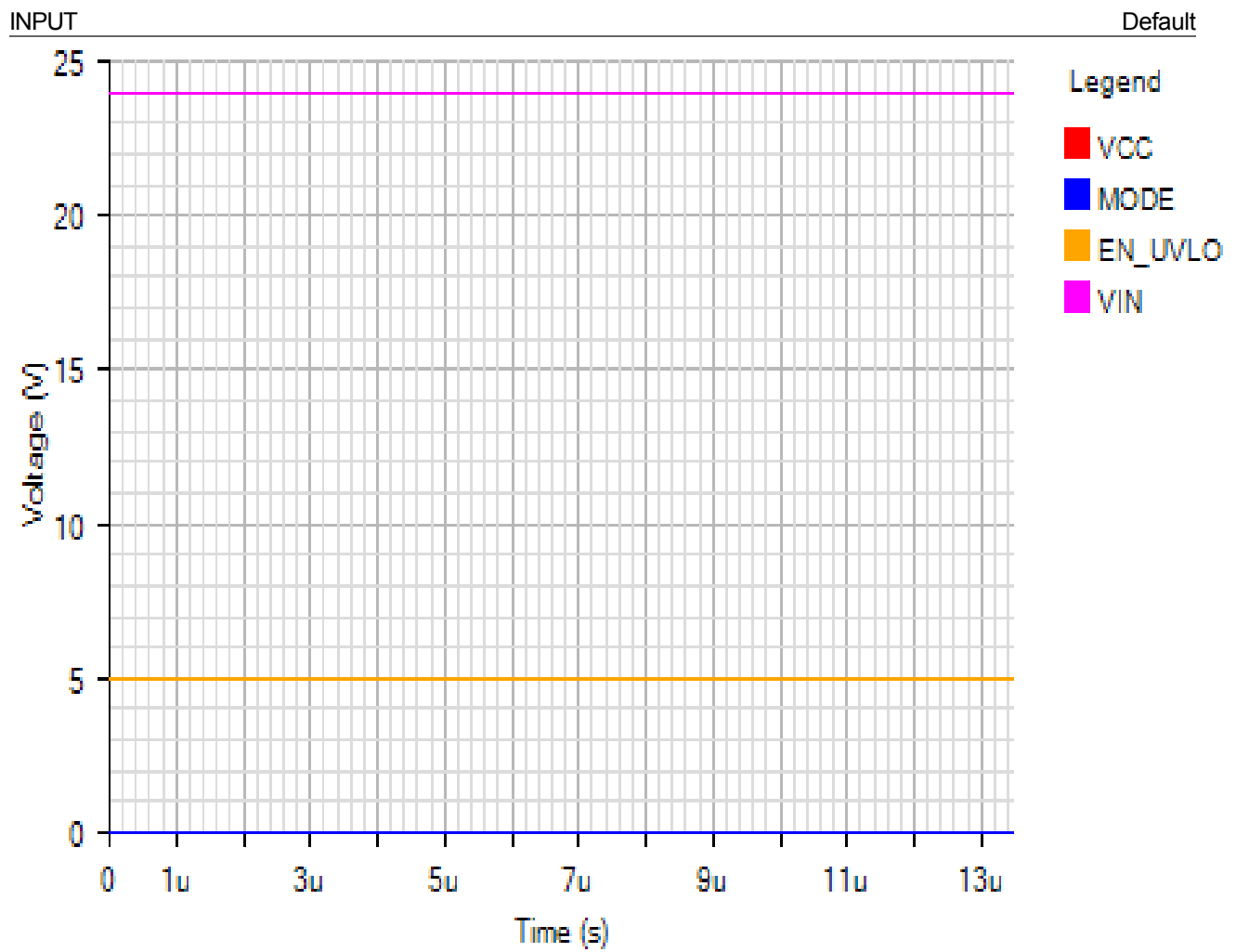
Default



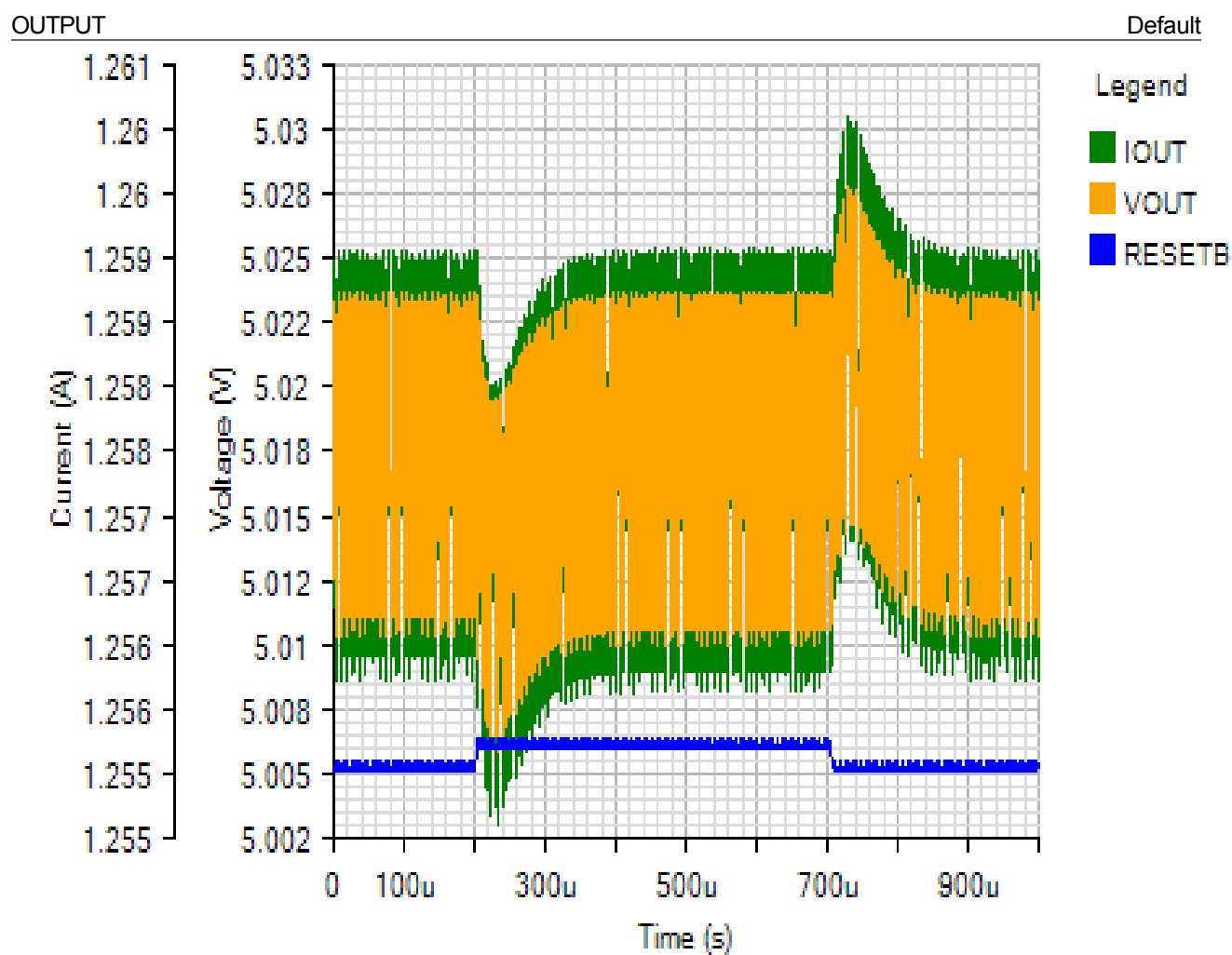
SWITCHING

Default



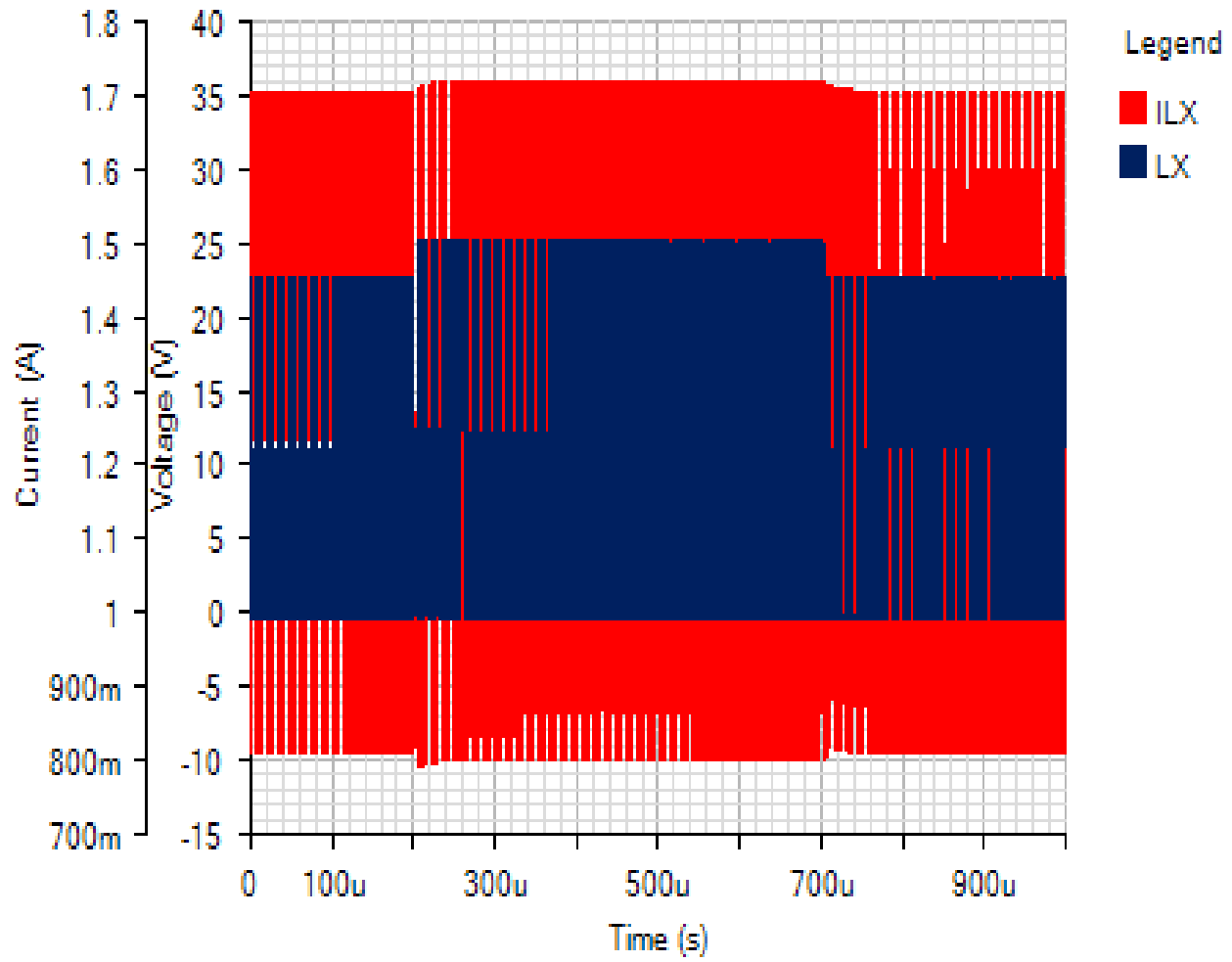


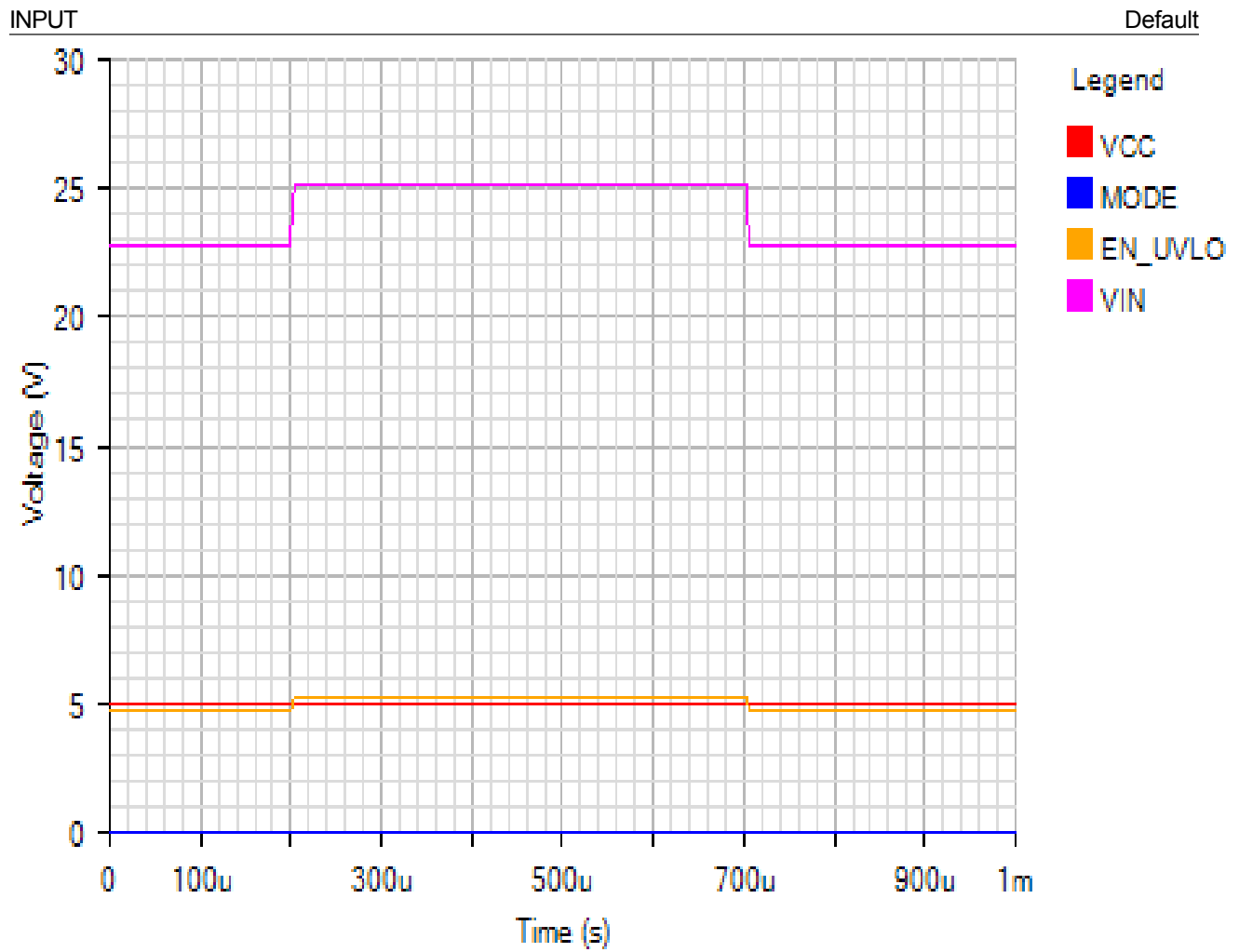
Line Transient - Tue Nov 20 2018 16:02:13



SWITCHING

Default

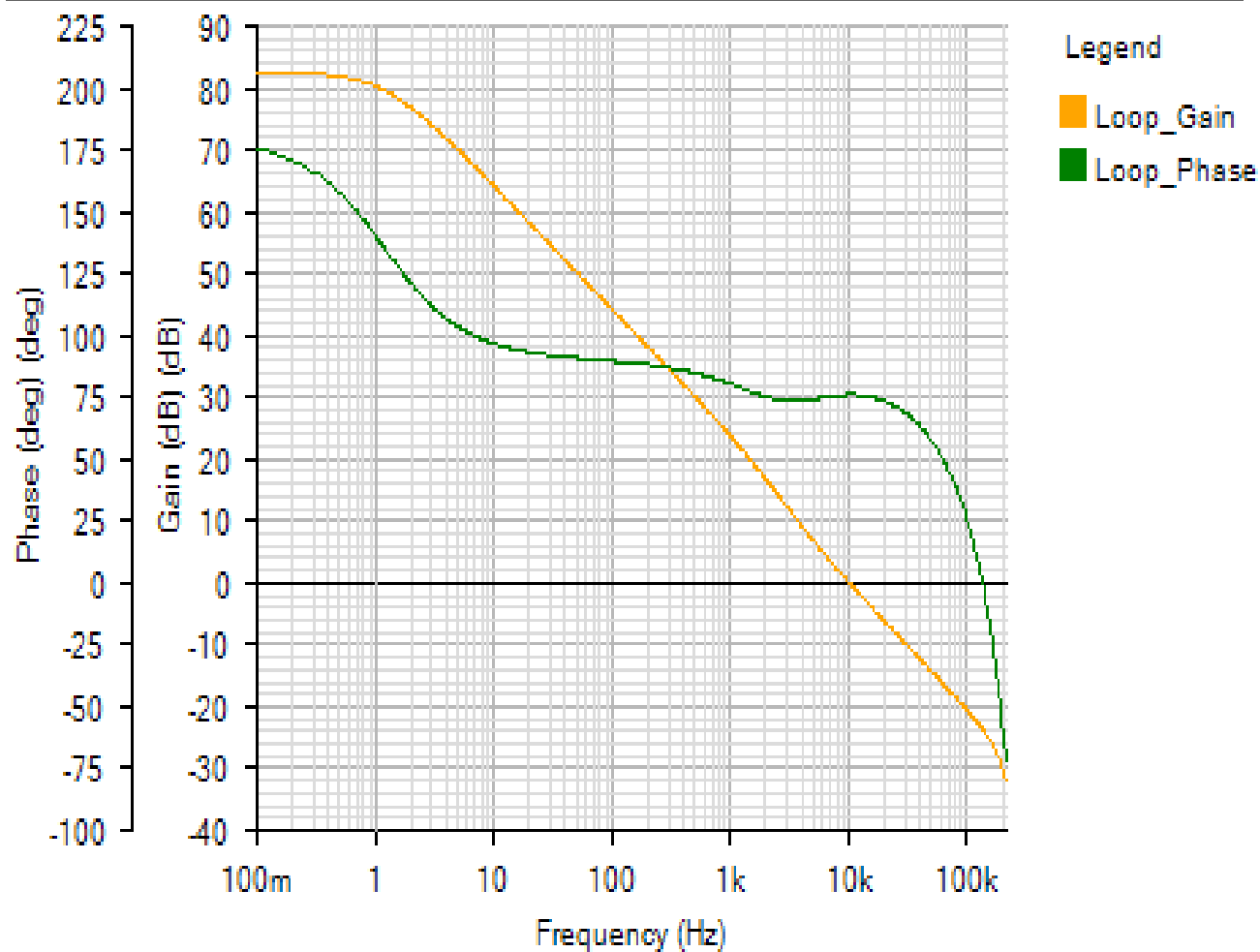




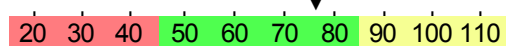
AC Loop - Tue Nov 20 2018 16:02:13

BODE

Default



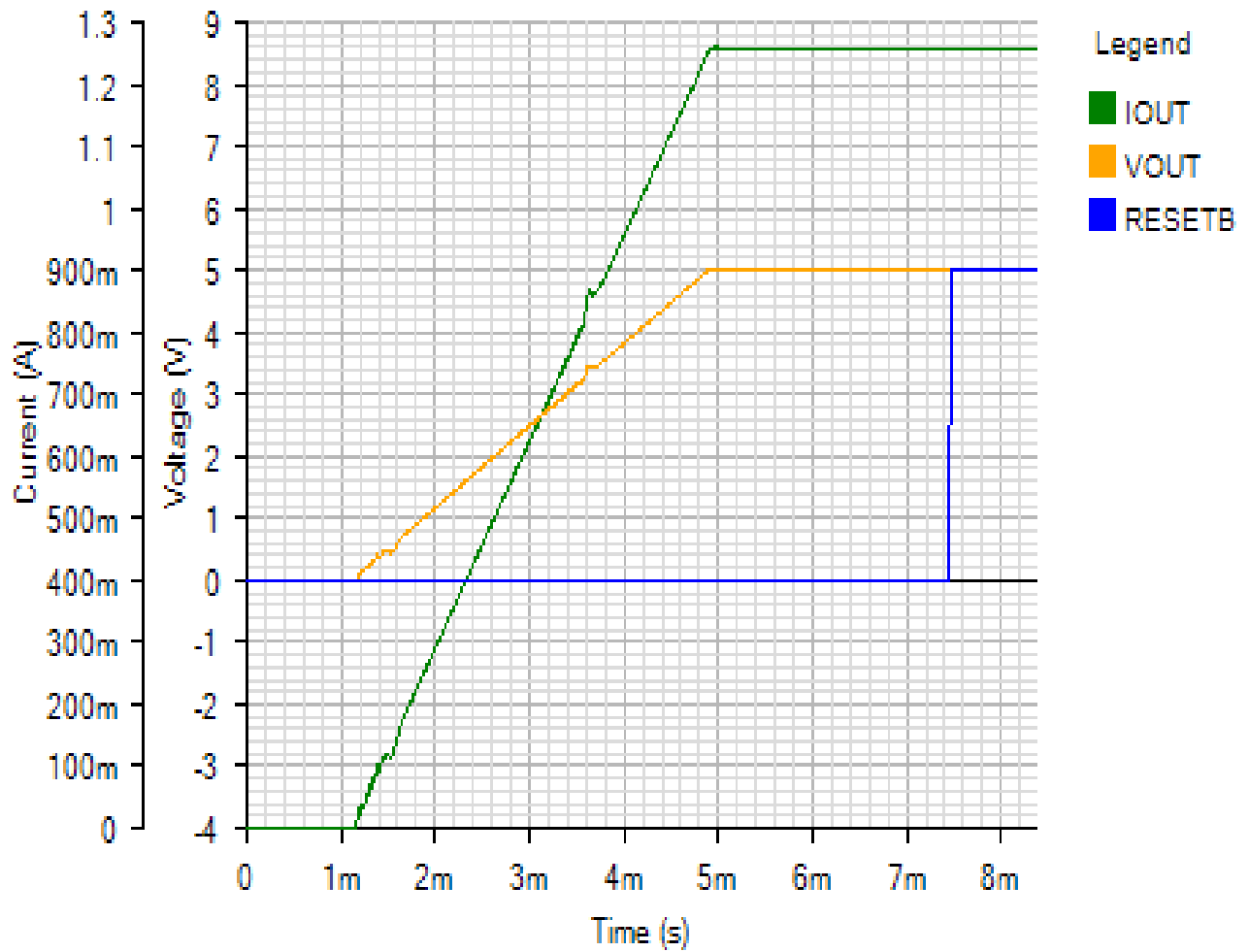
Phase Margin: 76.04° at a crossover frequency of 10.2kHz



Start Up - Tue Nov 20 2018 16:02:13

OUTPUT

Default



SWITCHING

Default

