

## Initial Design

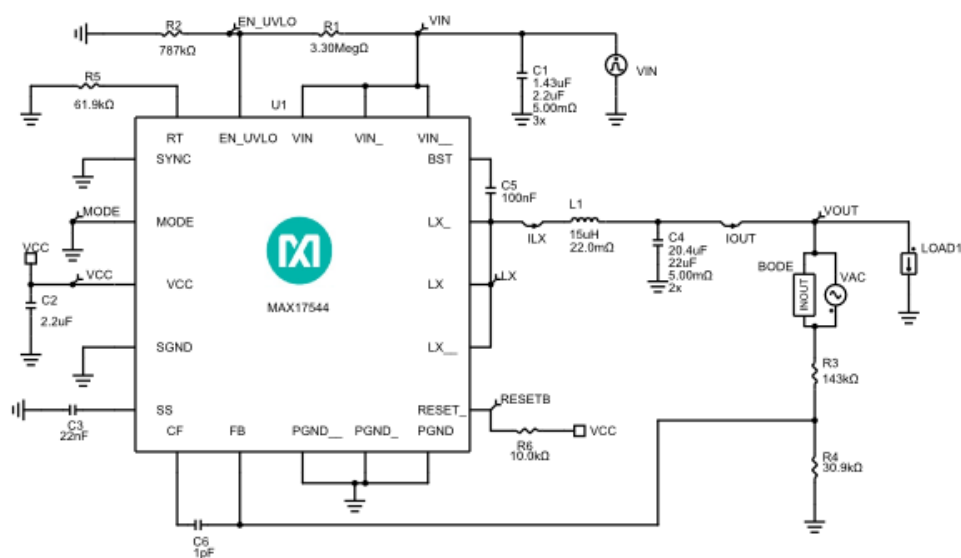
1.0

**Design Requirements**

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Parameter	Value
Maximum Input Voltage	42V
Nominal Input Voltage	24V
Minimum Input Voltage	7.5V
Input Steady-State Ripple	0.48V
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	330kHz
Soft-start time	4.5ms
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	<a href="#">MAX17544</a>	Maxim Integrated	4.5V-42V, 3.5A, High-Efficiency, Synchronous Step-Down DC-DC Converter with Internal Compensation
C1	3	<a href="#">GRM31CR71H225KA88</a>	Murata	Cap Ceramic 2.2uF 50V X7R 10% SMD 1206 125C
C2	1	<a href="#">C1608X7R1A225K080AC</a>	TDK	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C3	1	<a href="#">GRT155R71H223KE01D</a>	Murata Manufacturing	Cap Ceramic 0.022uF 50V X7R 10% Pad SMD 0402 125°C Automotive T/R
C4	2	<a href="#">GRM32ER71E226ME15</a>	Murata	Cap Ceramic 22uF 25V 1210 125C
C5	1	<a href="#">GCM155R71C104KA55D</a>	Murata Manufacturing	Cap Ceramic 0.1uF 16V X7R 10% Pad SMD 0402 125°C Automotive T/R
C6	1	<a href="#">CGA2B2NP01H010C050BA</a>	TDK	Cap Ceramic 1pF 50V C0G 0.25pF Pad SMD 0402 150°C Automotive T/R
L1	1	<a href="#">MSS1210-153MEB</a>	Coilcraft	Inductor 15uH 20% 19mOhm 7.4A Isat 8.7A Irms
R1	1	<a href="#">CRCW04023M30FKED</a>	Vishay	Res Thick Film 0402 3.3M Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	<a href="#">ERJ2RKF7873X</a>	Panasonic	Res Thick Film 0402 787K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	<a href="#">ERJ2RKF1433X</a>	Panasonic	Res Thick Film 0402 143K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

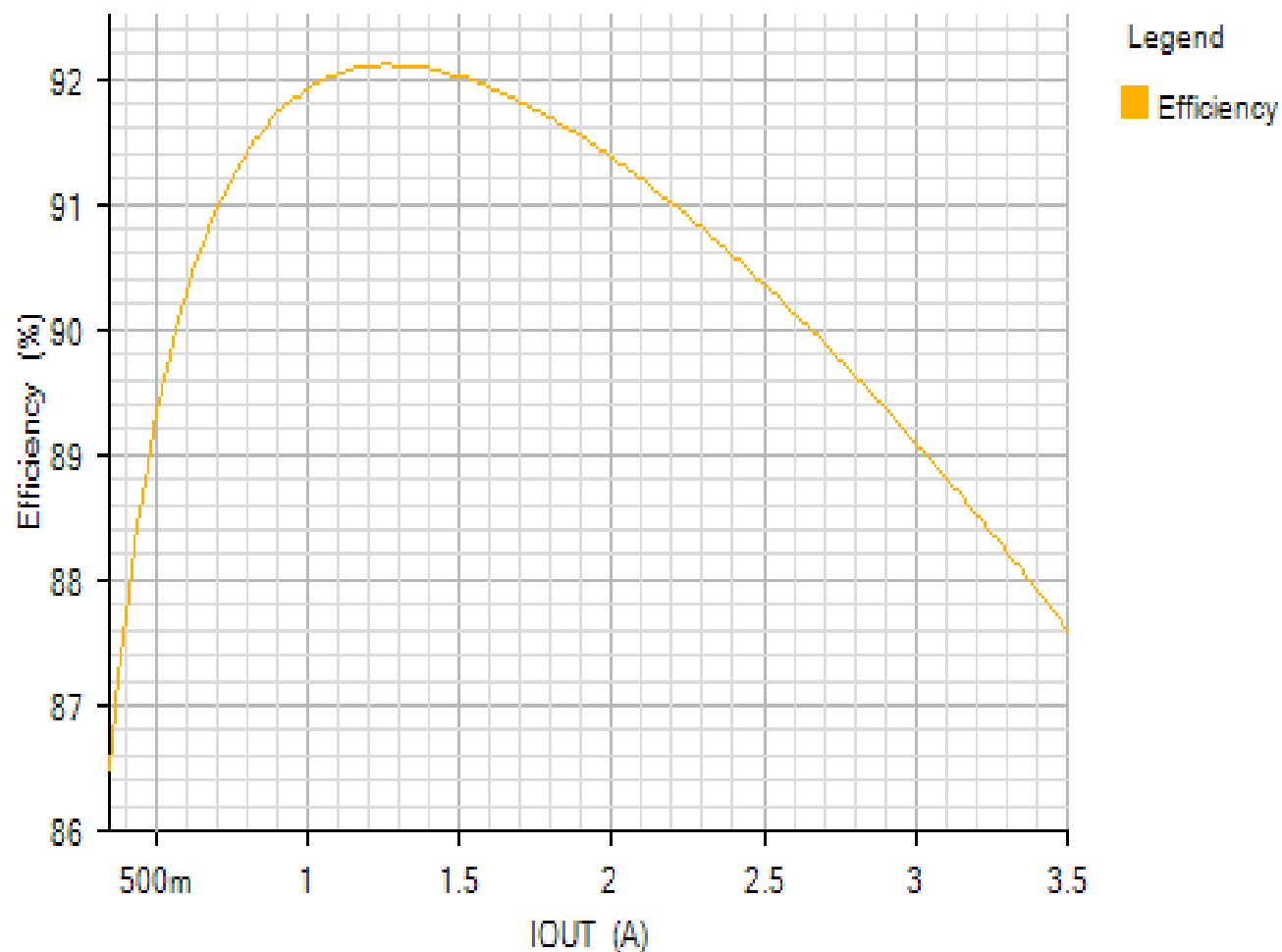
R4	1	ERJ2RKF3092X	Panasonic	Res Thick Film 0402 30.9K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF6192X	Panasonic	Res Thick Film 0402 61.9K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

## Simulation Results

Efficiency - Tue Nov 20 2018 16:14:41

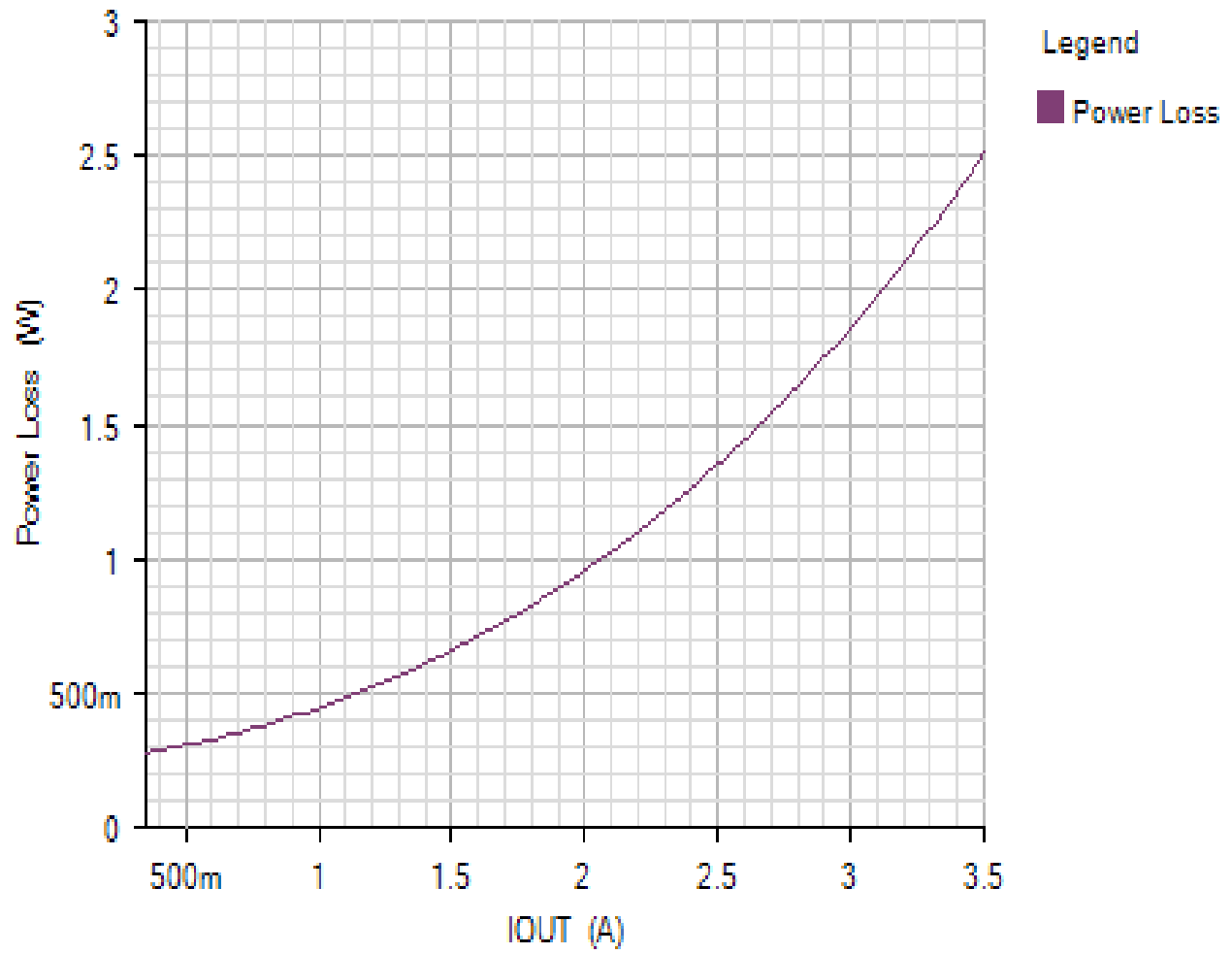
EFFICIENCY\_PLOT

Default



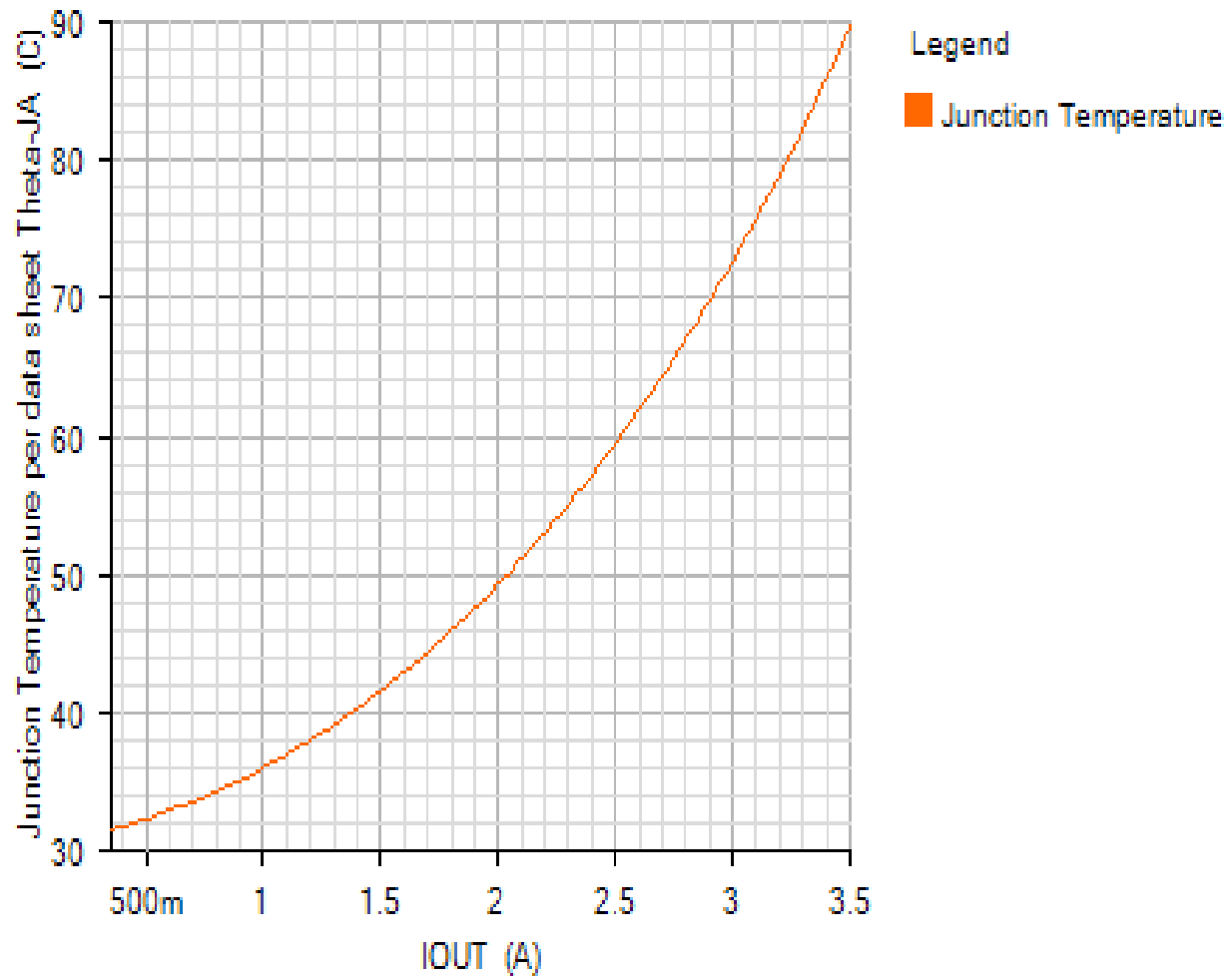
POWER\_LOSS\_PLOT

Default

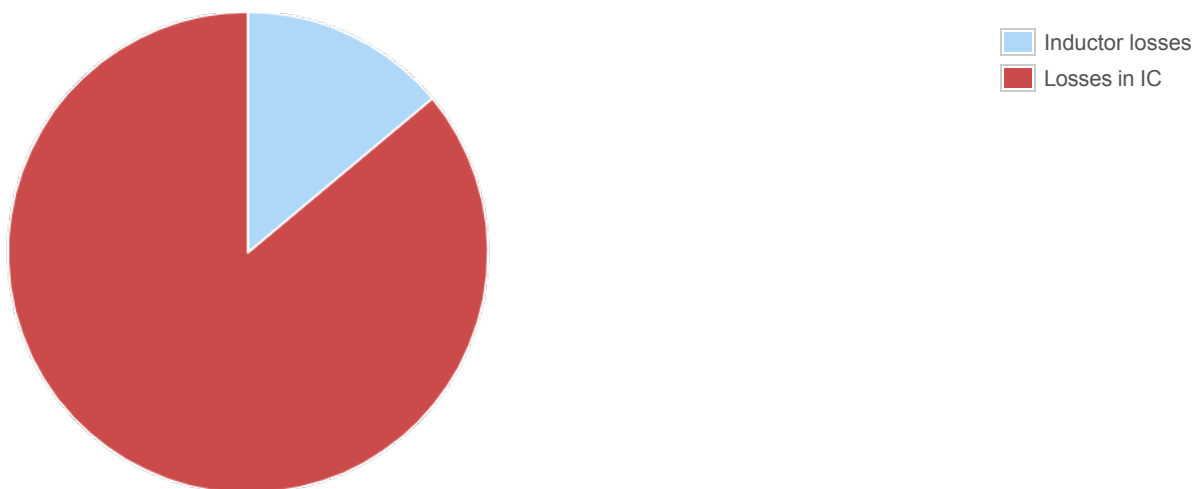


JUNCTION\_TEMPERATURE\_PLOT

Default



Losses



Component

Loss (W)

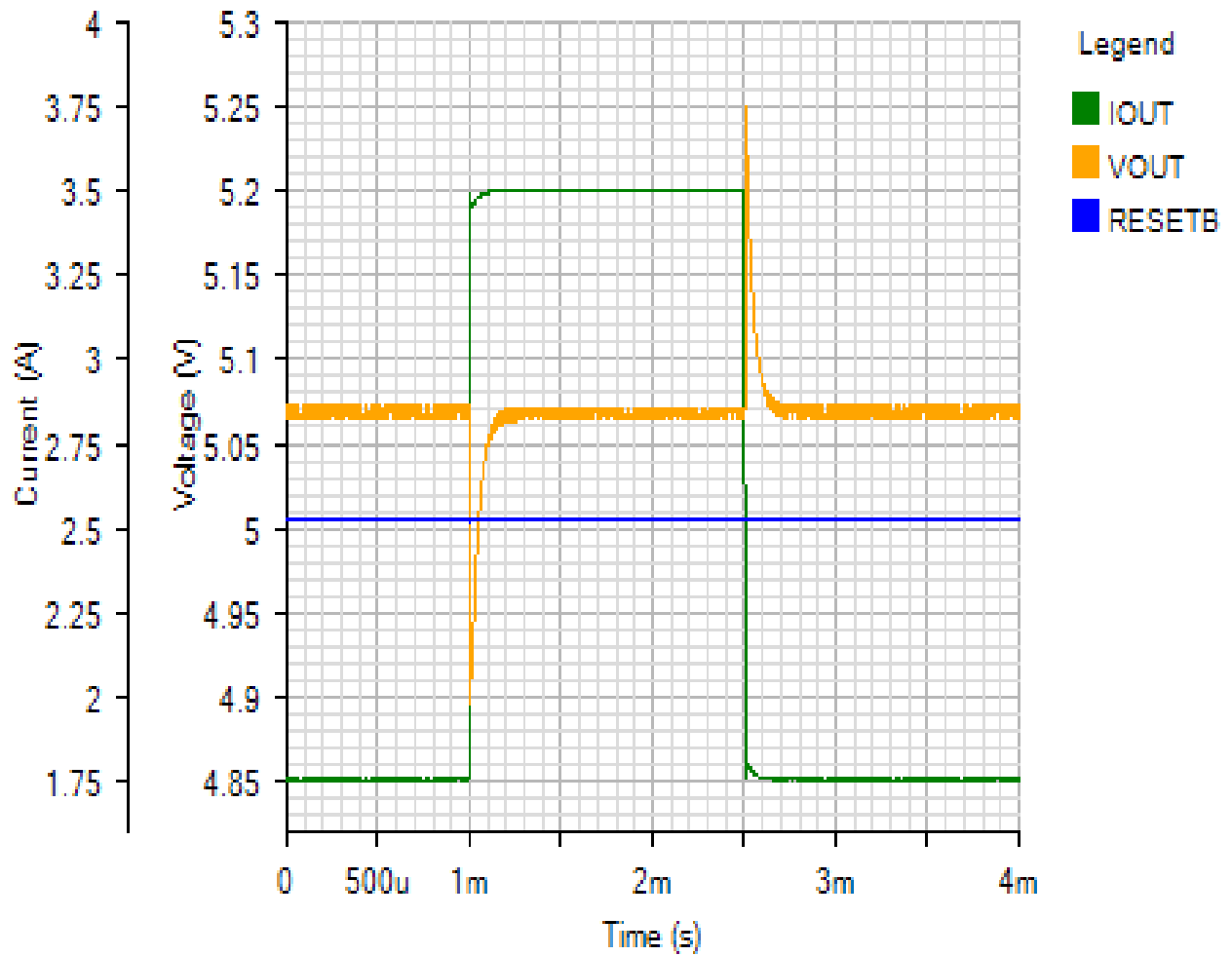
% of total

Component	Loss (W)	% of total
Inductor losses	0.35	13.9
Losses in IC	2.16	86.1
Total	2.51	100

Load Step - Tue Nov 20 2018 16:14:41

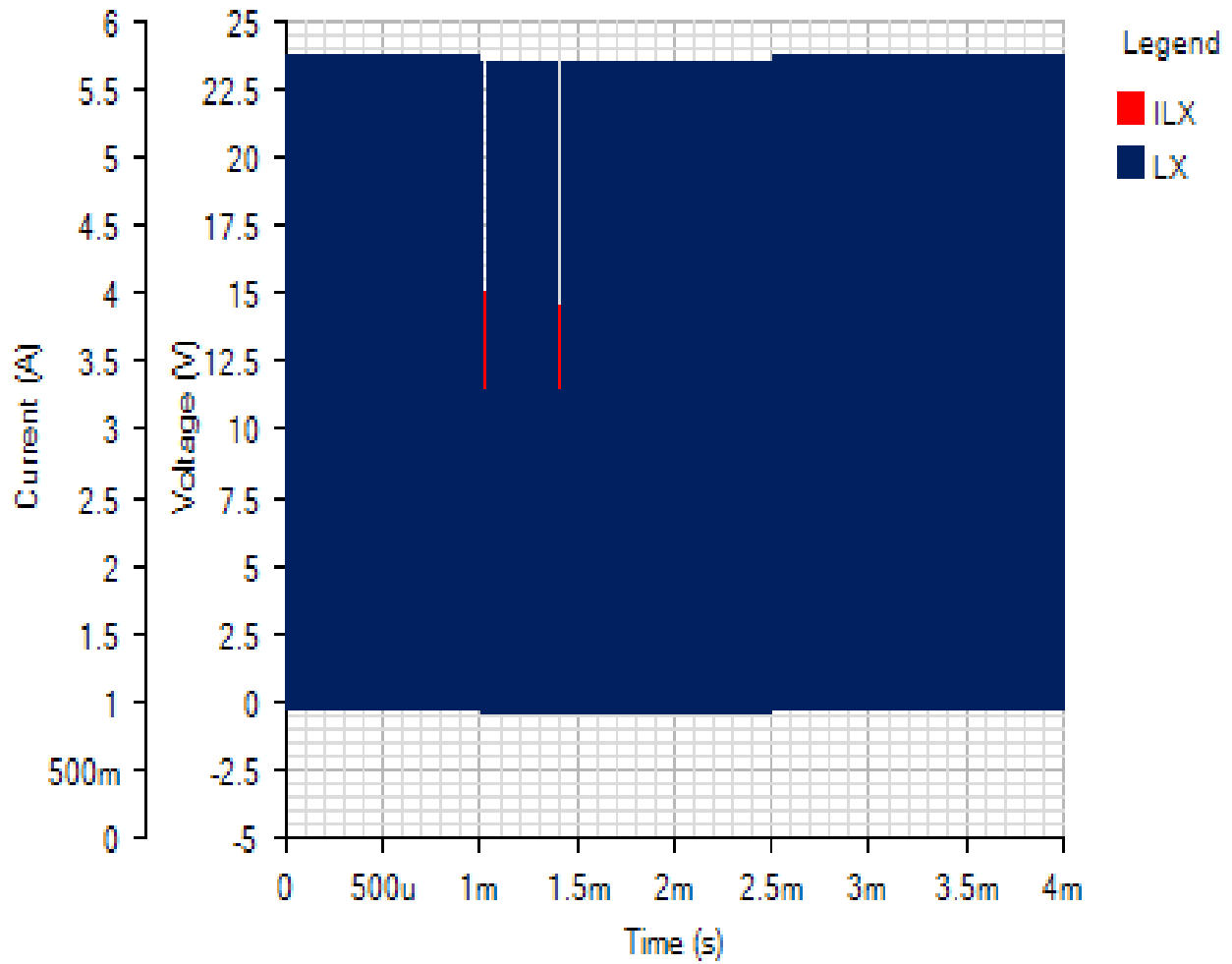
OUTPUT

Default

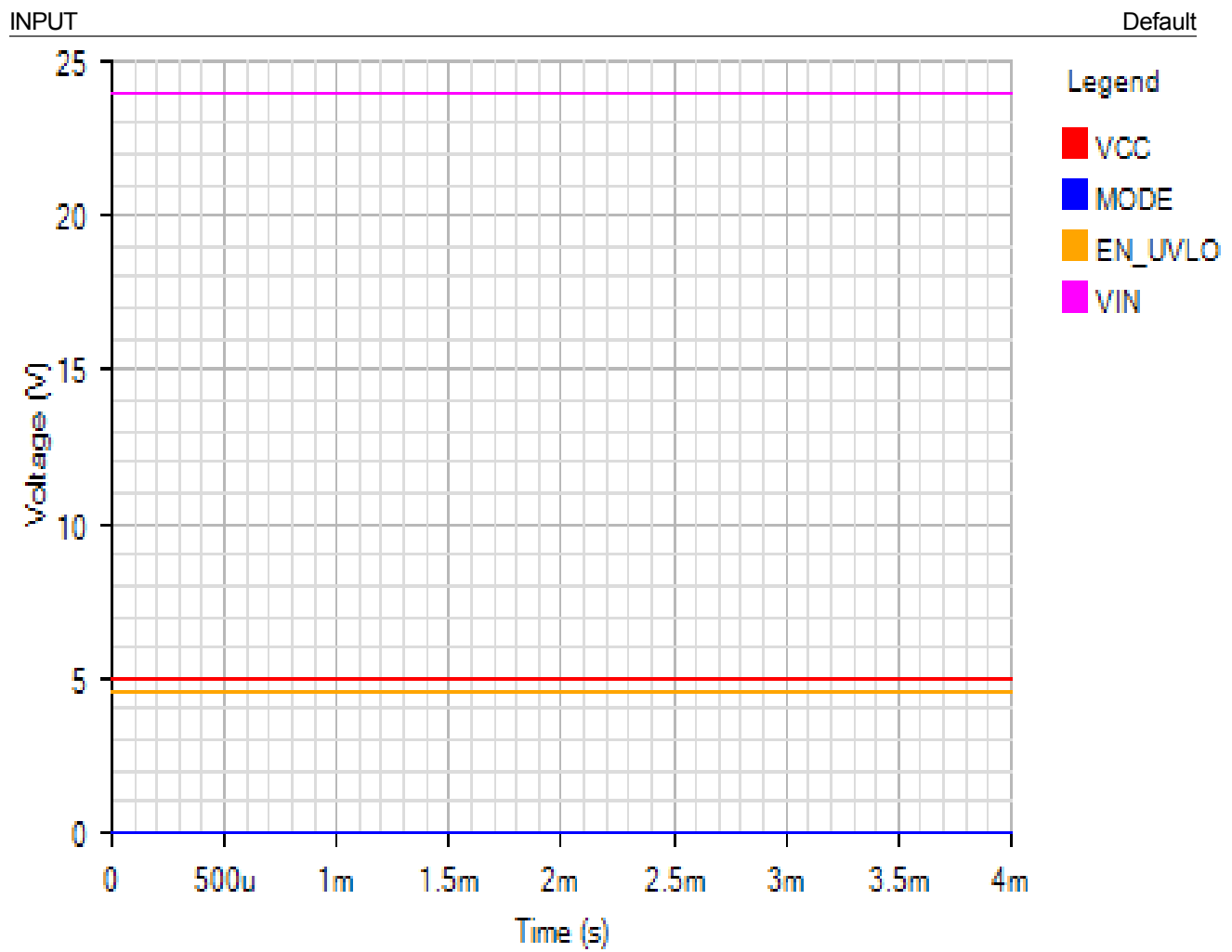


SWITCHING

Default



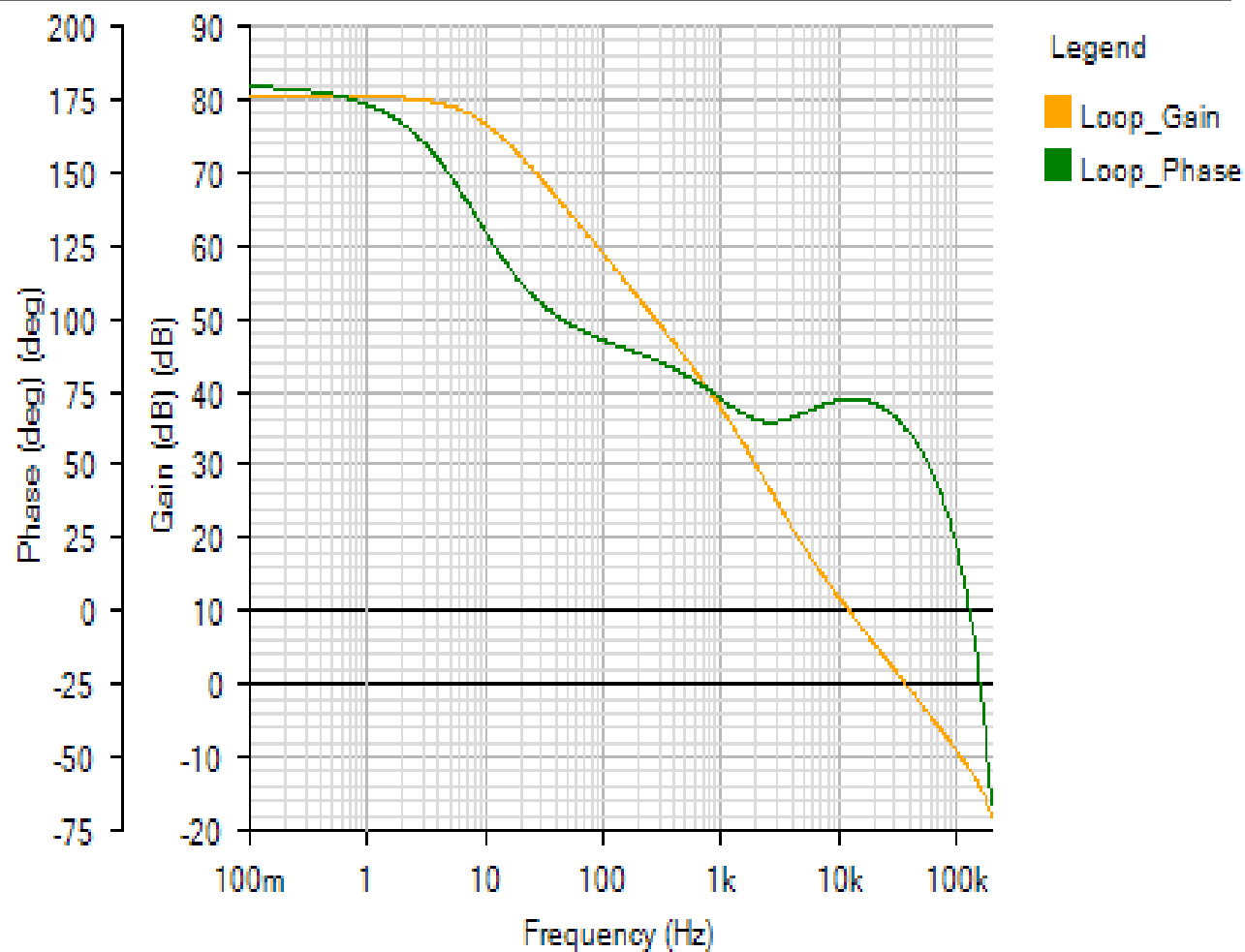




AC Loop - Tue Nov 20 2018 16:14:41

BODE

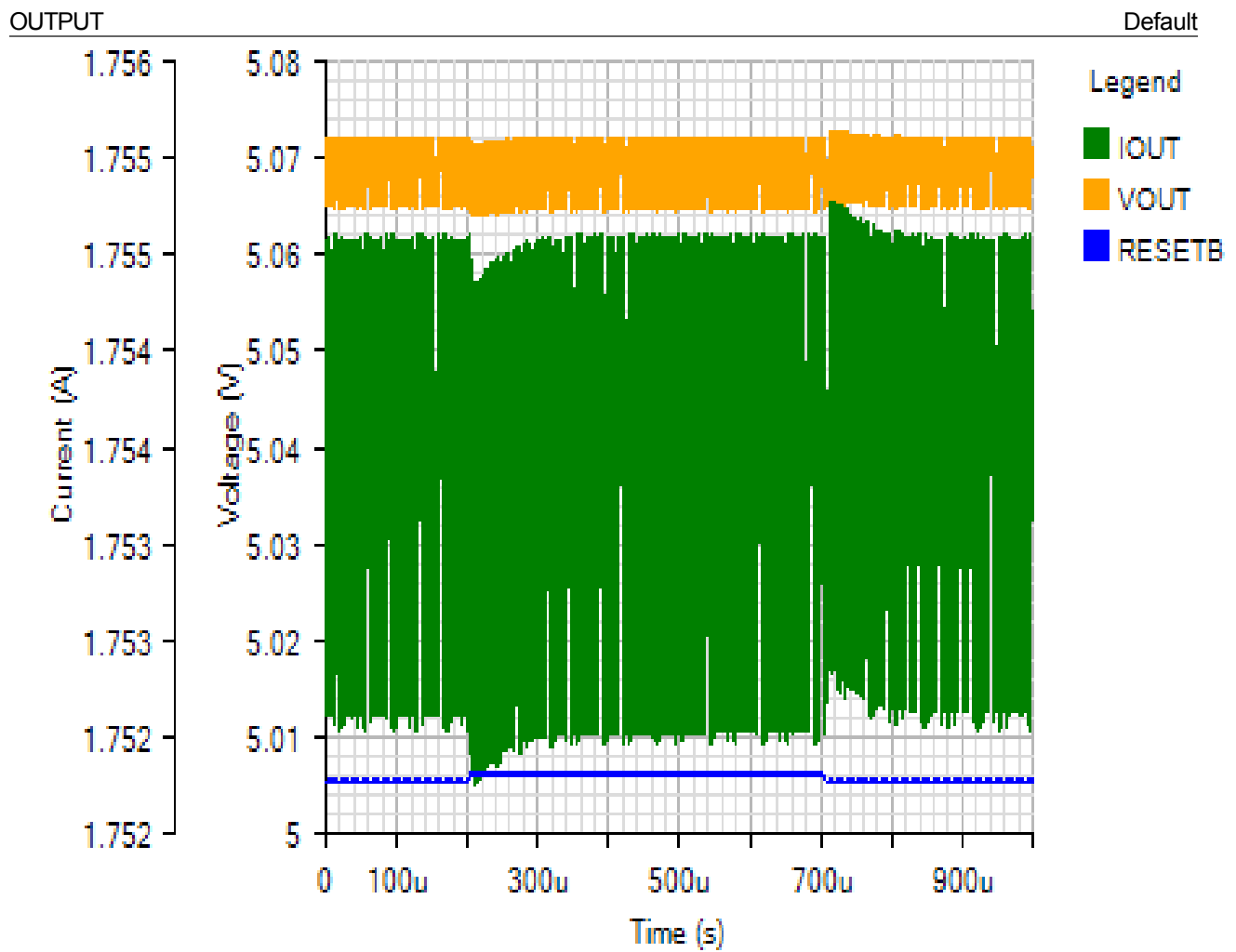
Default



Phase Margin: 62.57° at a crossover frequency of 37kHz

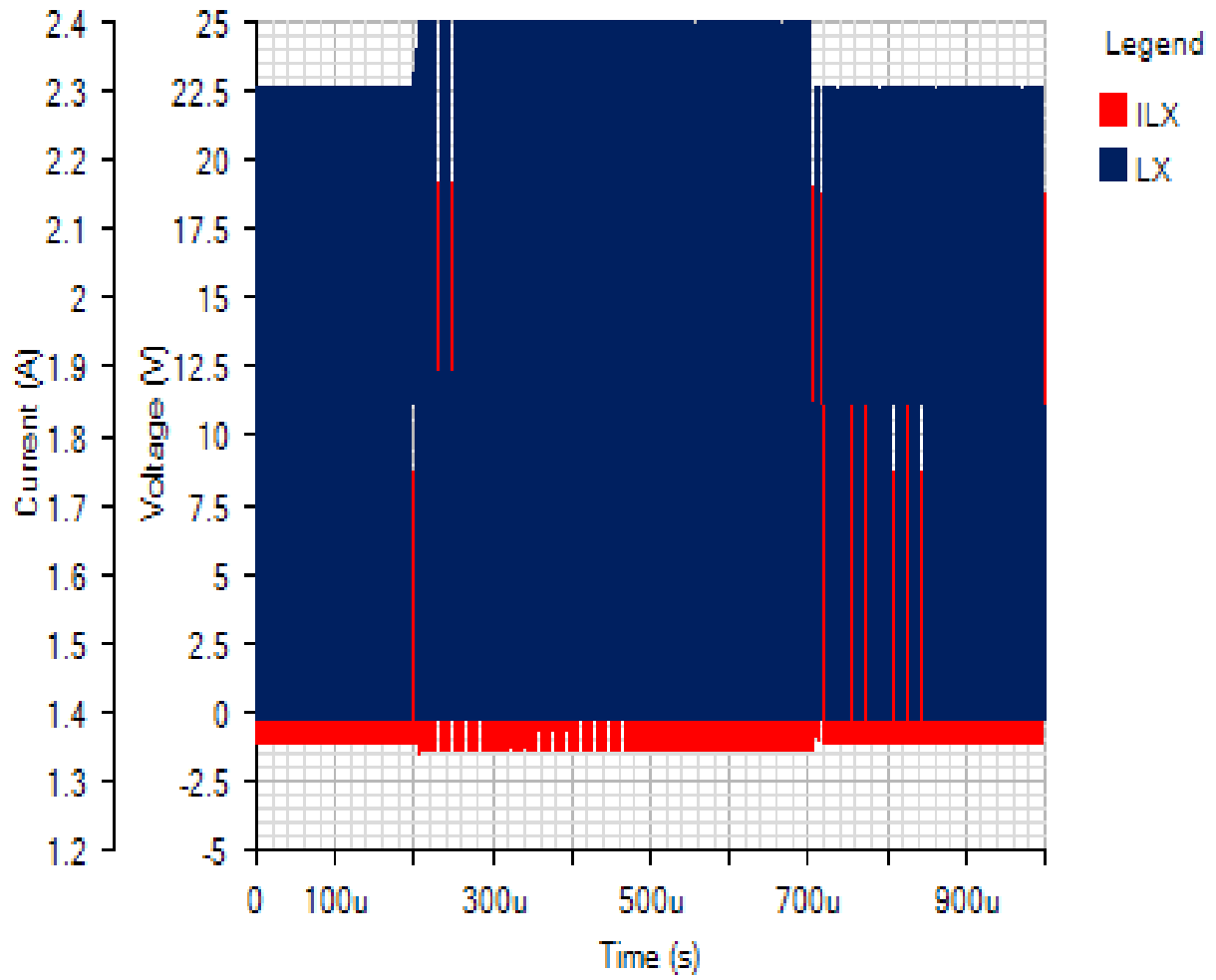


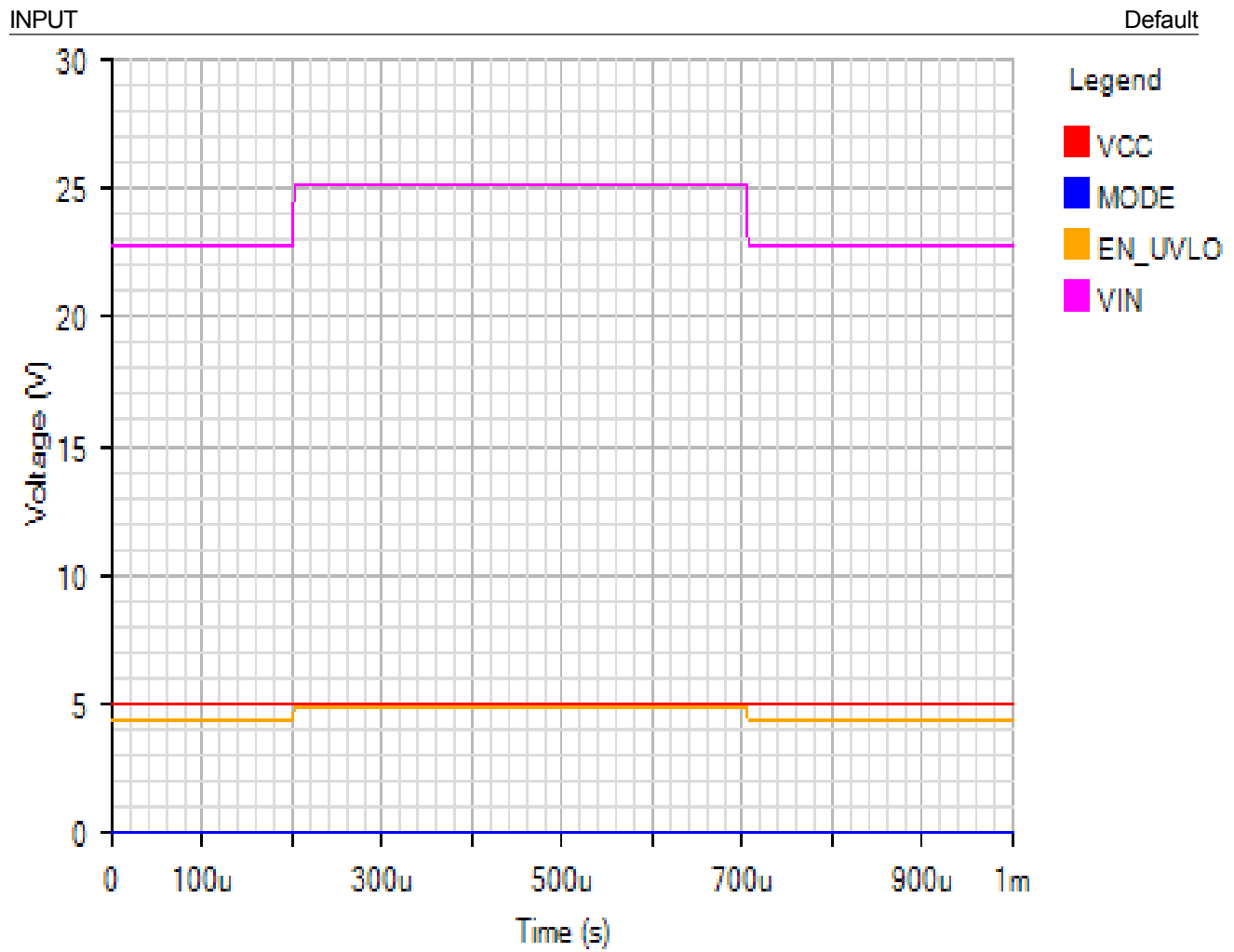
Line Transient - Tue Nov 20 2018 16:14:41



SWITCHING

Default

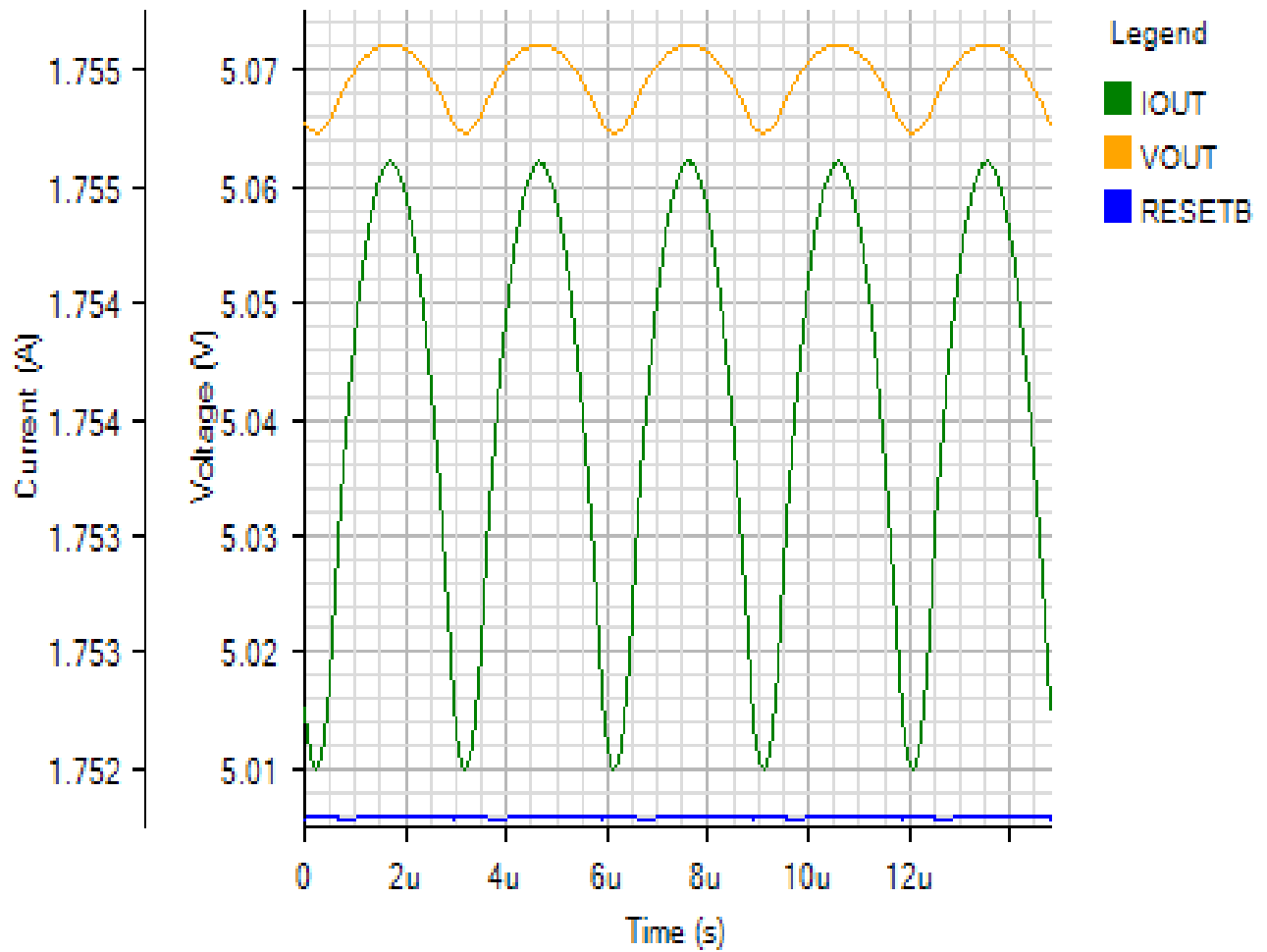




Steady State - Tue Nov 20 2018 16:14:41

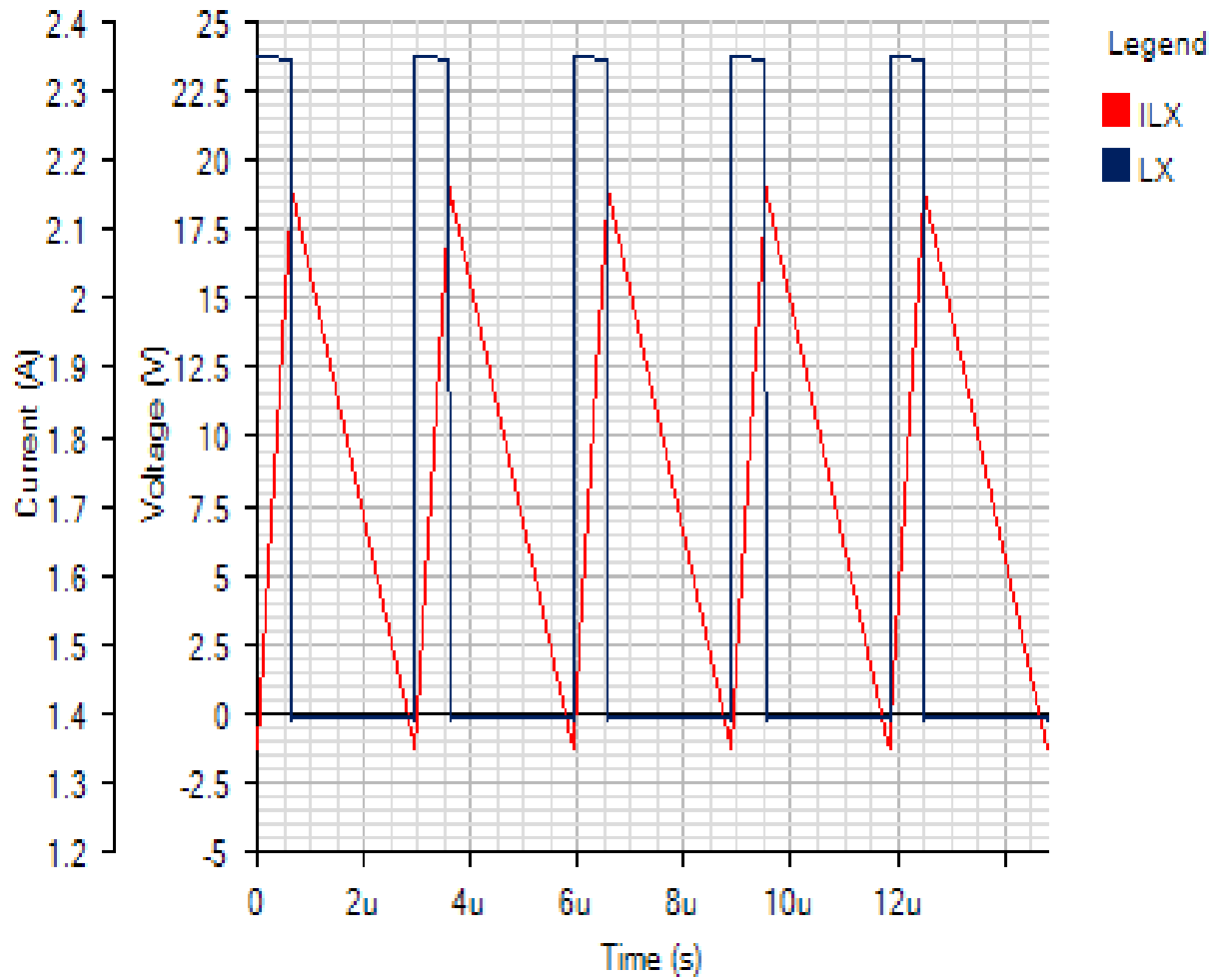
OUTPUT

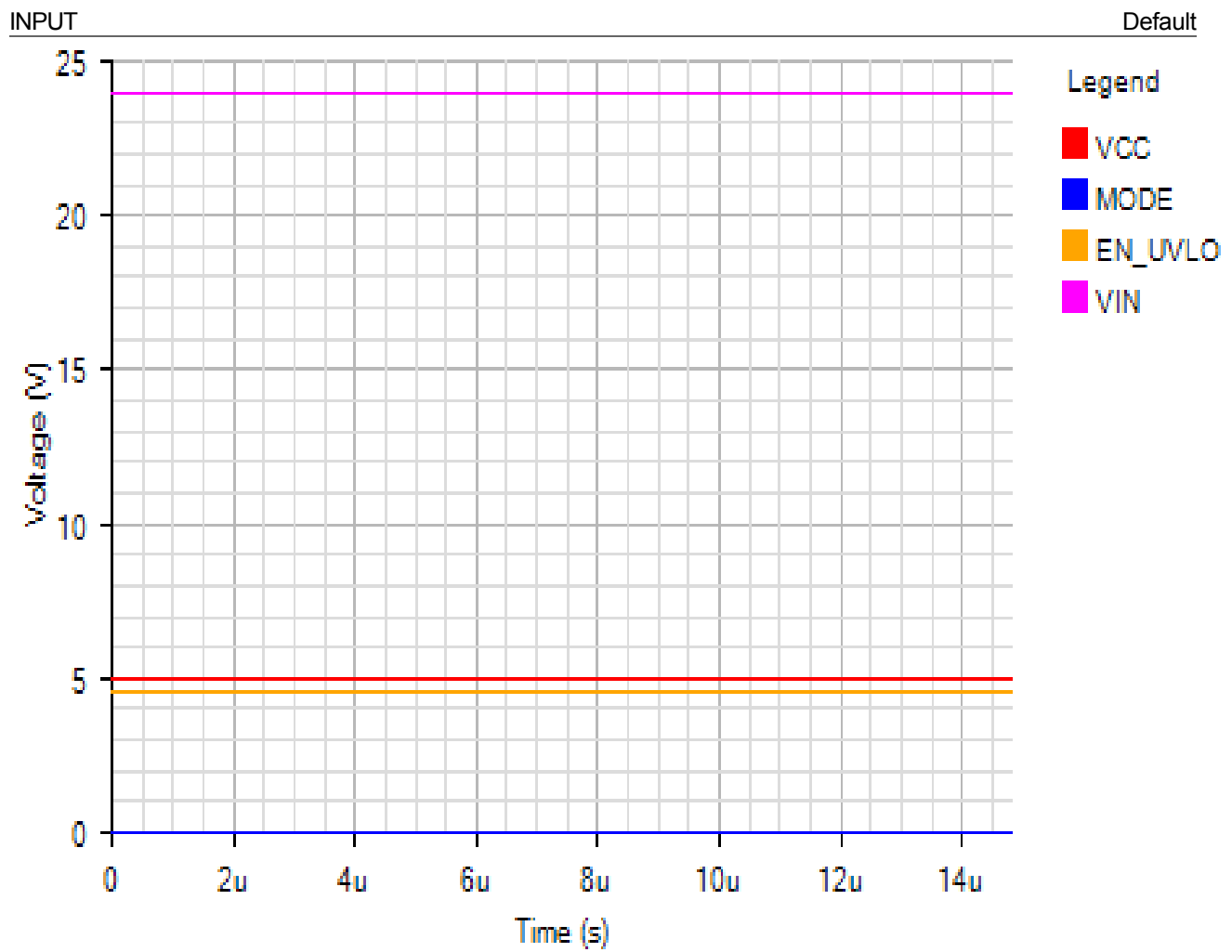
Default



SWITCHING

Default



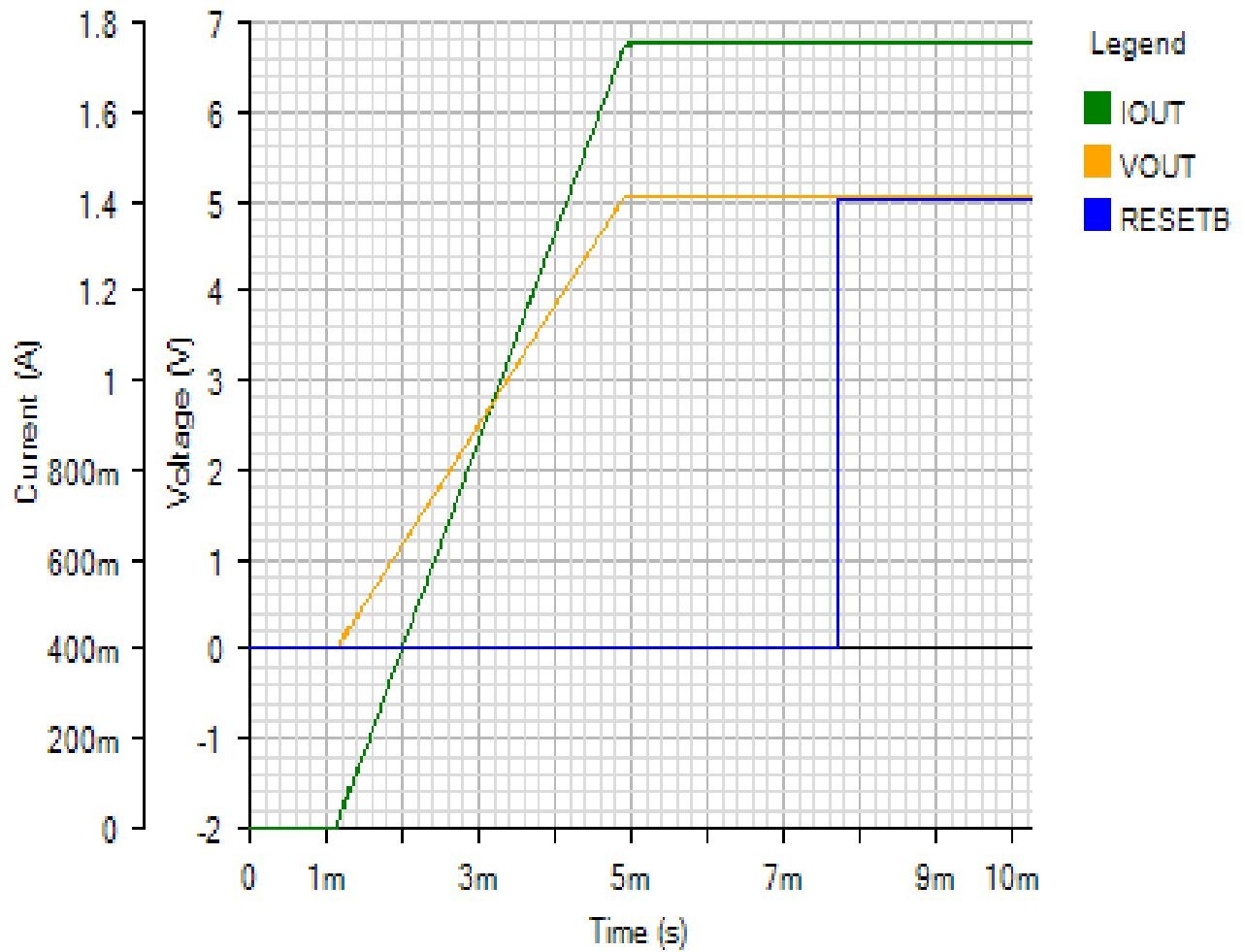




Start Up - Tue Nov 20 2018 16:14:41

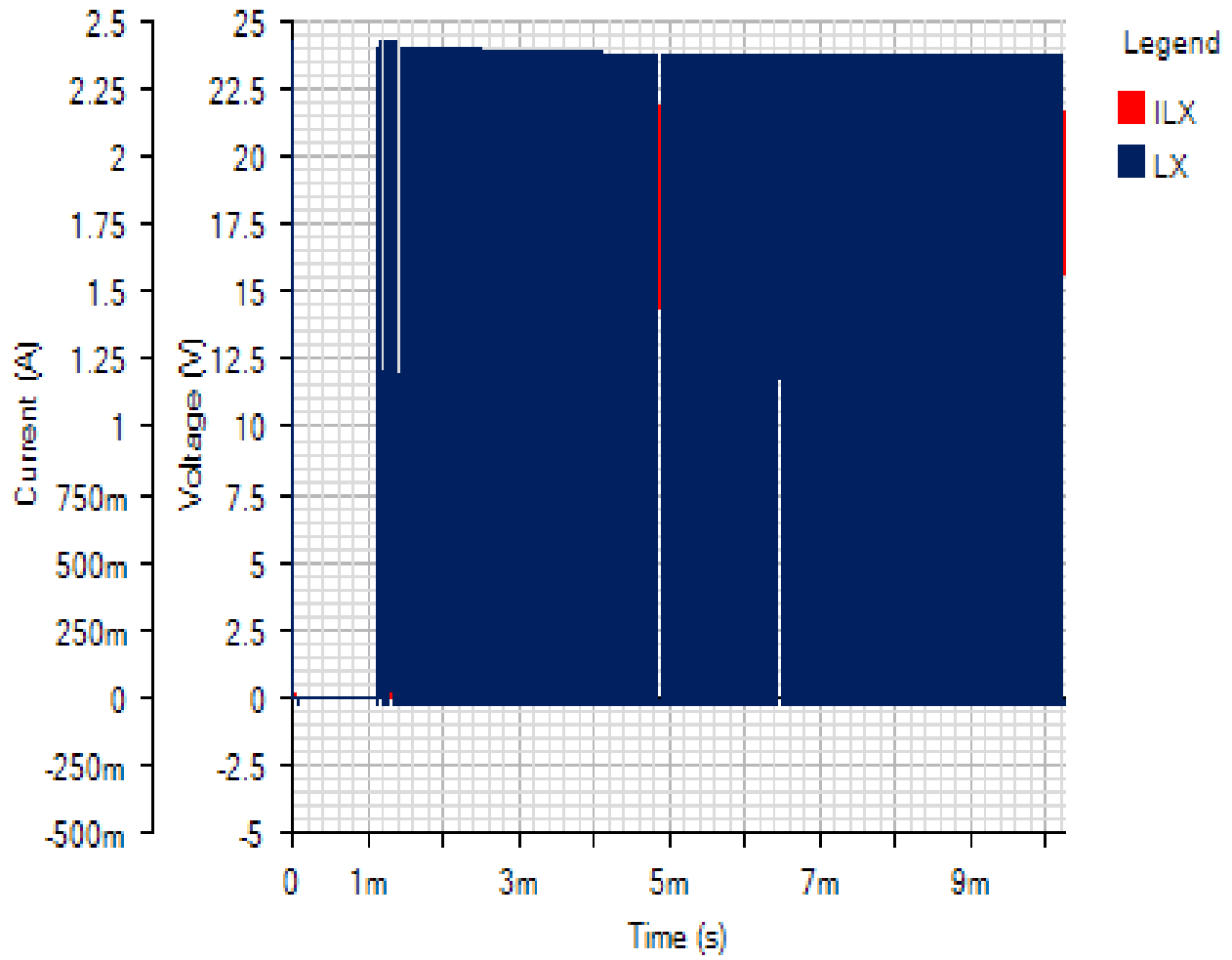
OUTPUT

Default



SWITCHING

Default



INPUT

Default

