

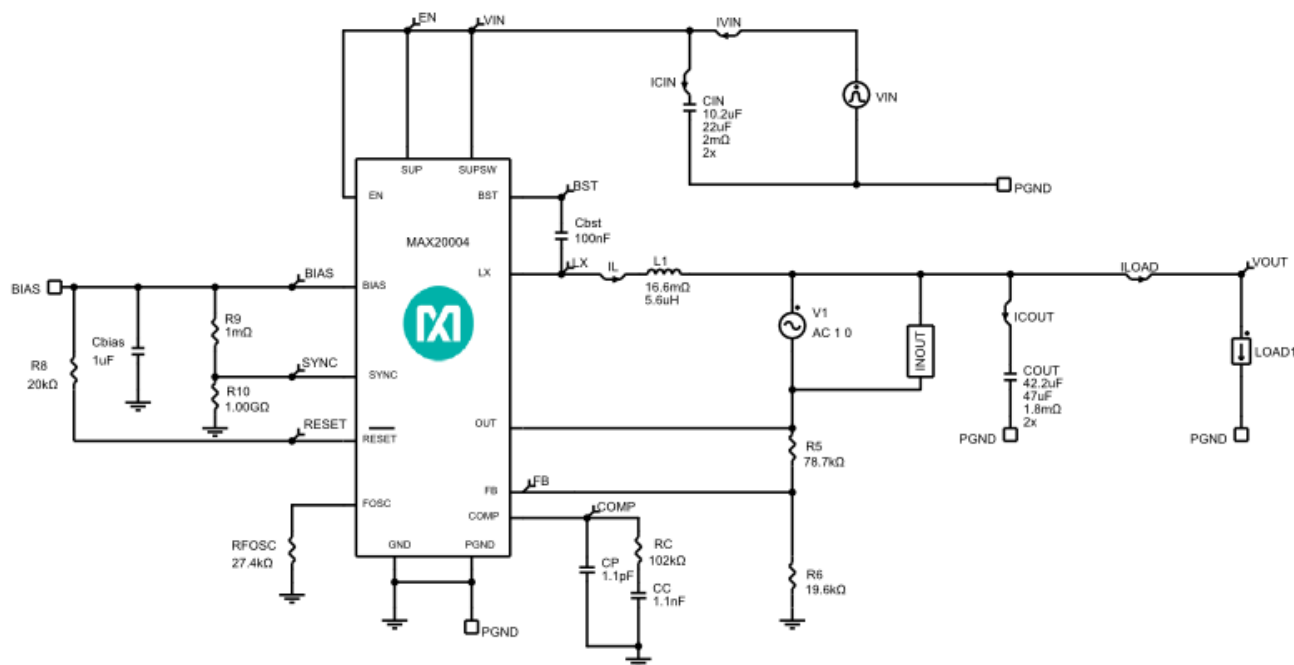
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	10V
Maximum Input Voltage	14V
Nominal Input Voltage	12V
Input Voltage Ripple	1%
Output Voltage Control	External Resistive Divider
Output Voltage	5V
Output Current	4A
Load Step Start Current	4A
Load Step Current	2A
Output Voltage Ripple	1%
Output Voltage Load Step Over/Undershoot	5%
Load Step Edge Rate	5A/us
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
External Synchronization Enable	Forced - PWM Mode
Switching Frequency	1000kHz
Spread Spectrum Enable	No
Inductor Current Ratio (LIR)	0.2
Ambient Temperature	25°C

Schematic



When Skip mode is selected, AC Loop simulation may fail if the Load Current is low enough to engage Skip mode, because Skip mode is hysteretic and there is no AC Loop to measure.

The following features described in the data sheet have not been modeled:

1. A mode for Maximum Duty Cycle Operation which is engaged when Vout is within a few percent of Vin.
 2. Spread Spectrum - The model will always operate with Spread Spectrum turned off, regardless of whether the SPS pin is pulled high or low.
- Even though Spread Spectrum is not modeled in EE-Sim, different parts are available with and without spread spectrum options. Please refer datasheet.

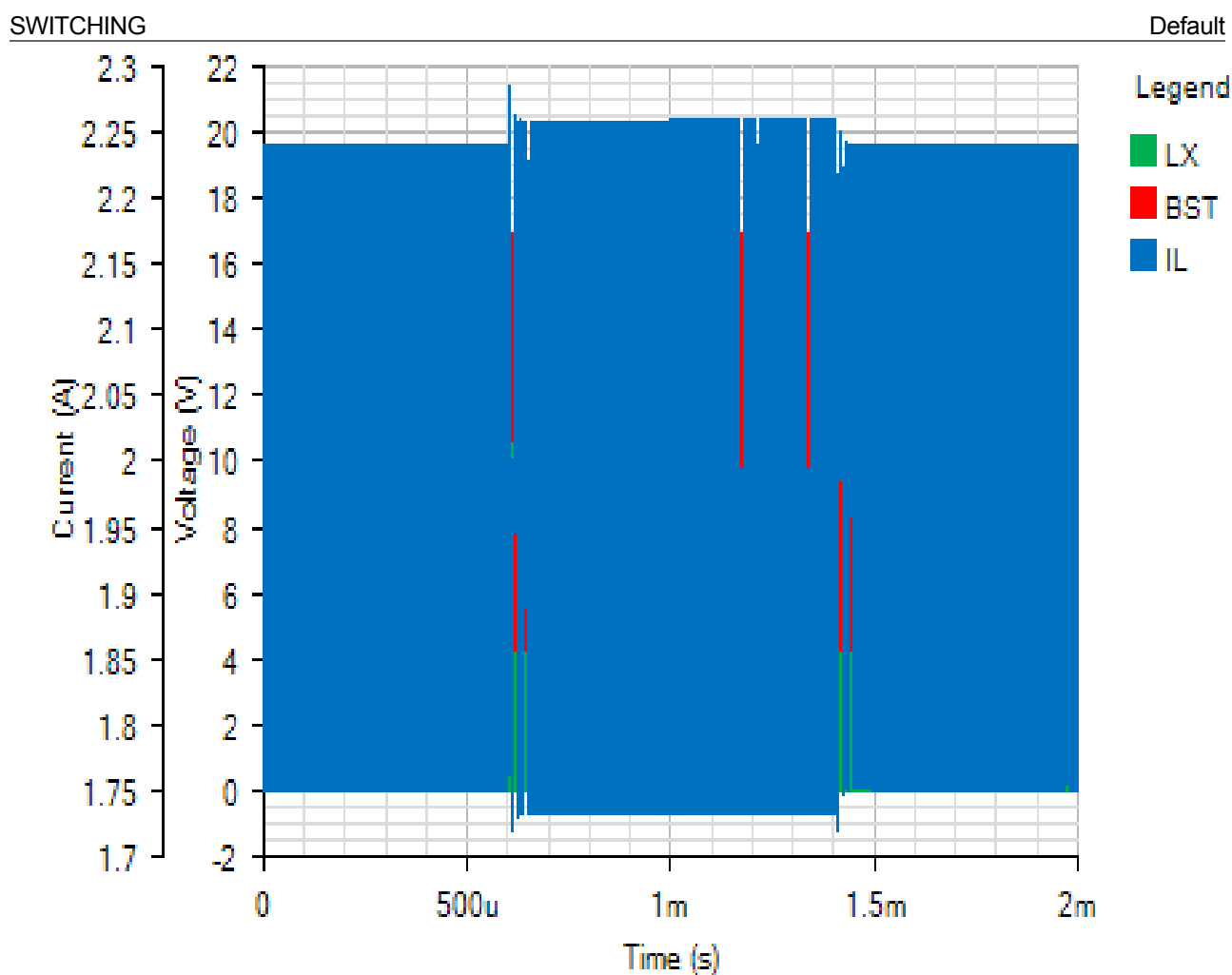
BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX20004AFOA/VY+	User-Defined	IC
CC	1	C0402C112J5GACTU	KEMET Corporation	Cap Ceramic 0.0011uF 50V C0G 5% Pad SMD 0402 125°C T/R
CIN	2	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
COUT	2	C1210C476K8R2C	Kemet	Cap Ceramic 47uF 10V 1210 125C
CP	1	GJM1555C1H1R1JB01W	Murata Manufacturing	Cap Ceramic 1.1pF 50V C0G 5% Pad SMD 0402 125°C T/R
Cbias	1	CC0402KRX5R5BB105	Yageo	Cap Ceramic 1uF 6.3V X5R 10% Pad SMD 0402 85°C T/R
Cbst	1	0402ZD104KAT2A	AVX	Cap Ceramic 0.1uF 10V X5R 10% Pad SMD 0402 85°C T/R
L1	1	MSS1260-562MLB	Coilcraft	Inductor 5.6uH 20% 14.9mOhm 9.2A Isat 6.4A Irms
R5	1	ERJ3EKF7872V	Panasonic	Res Thick Film 0603 78.7K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF1962X	Panasonic	Res Thick Film 0402 19.6K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

R8	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
RC	1	AR0402JR-07102K	Yageo	Res Thick Film 0402 102K Ohm 5% 0.063W(1/16W) ±100ppm/°C Epoxy Pad SMD Automotive T/R
RFOSC	1	AR0603JR-0727K4	Yageo	Res Thick Film 0603 27.4K Ohm 5% 0.1W(1/10W) ±100ppm/°C Epoxy Pad SMD Automotive T/R

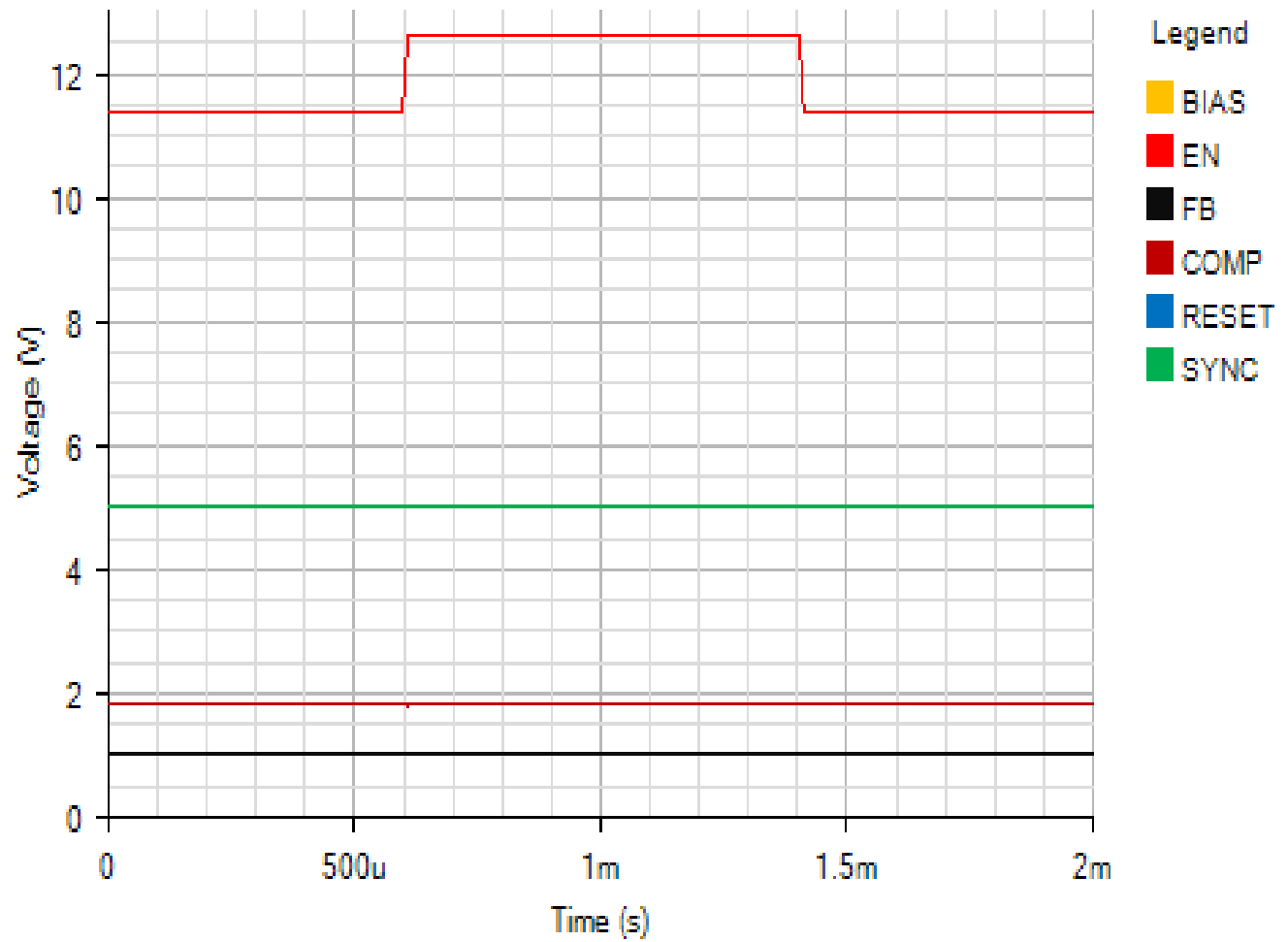
Simulation Results

Line Transient - Mon Jan 07 2019 09:30:35



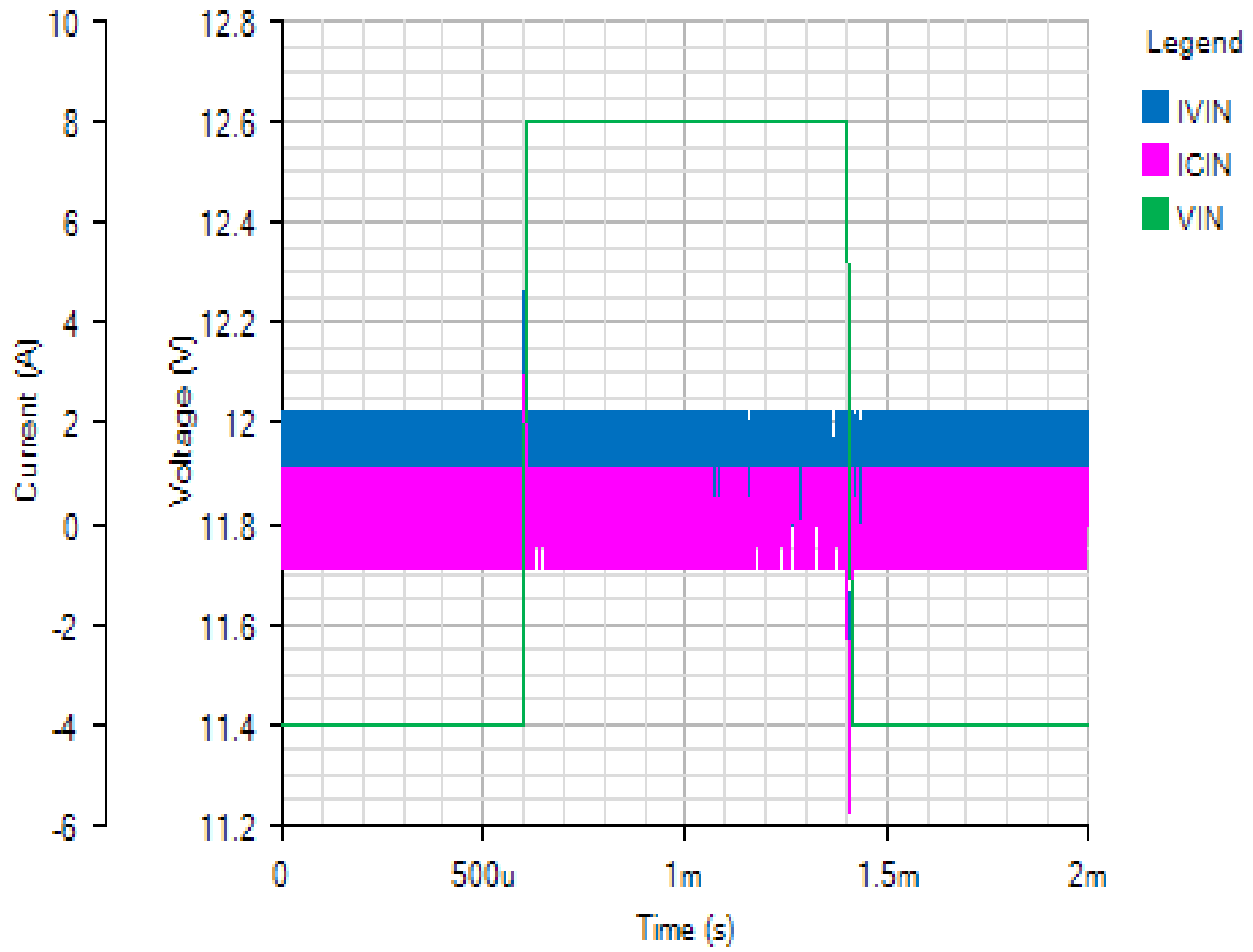
IC

Default



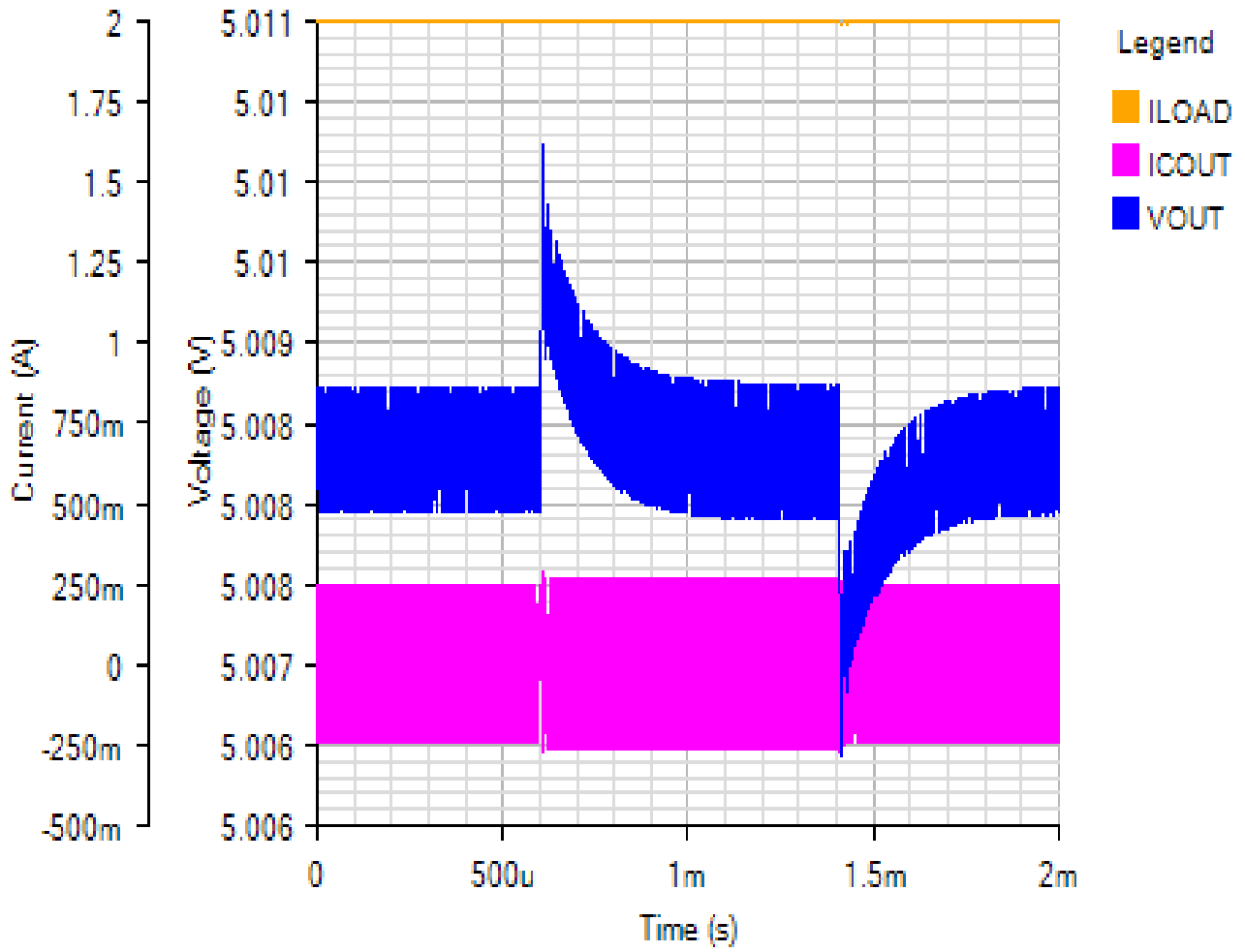
INPUT

Default



OUTPUT

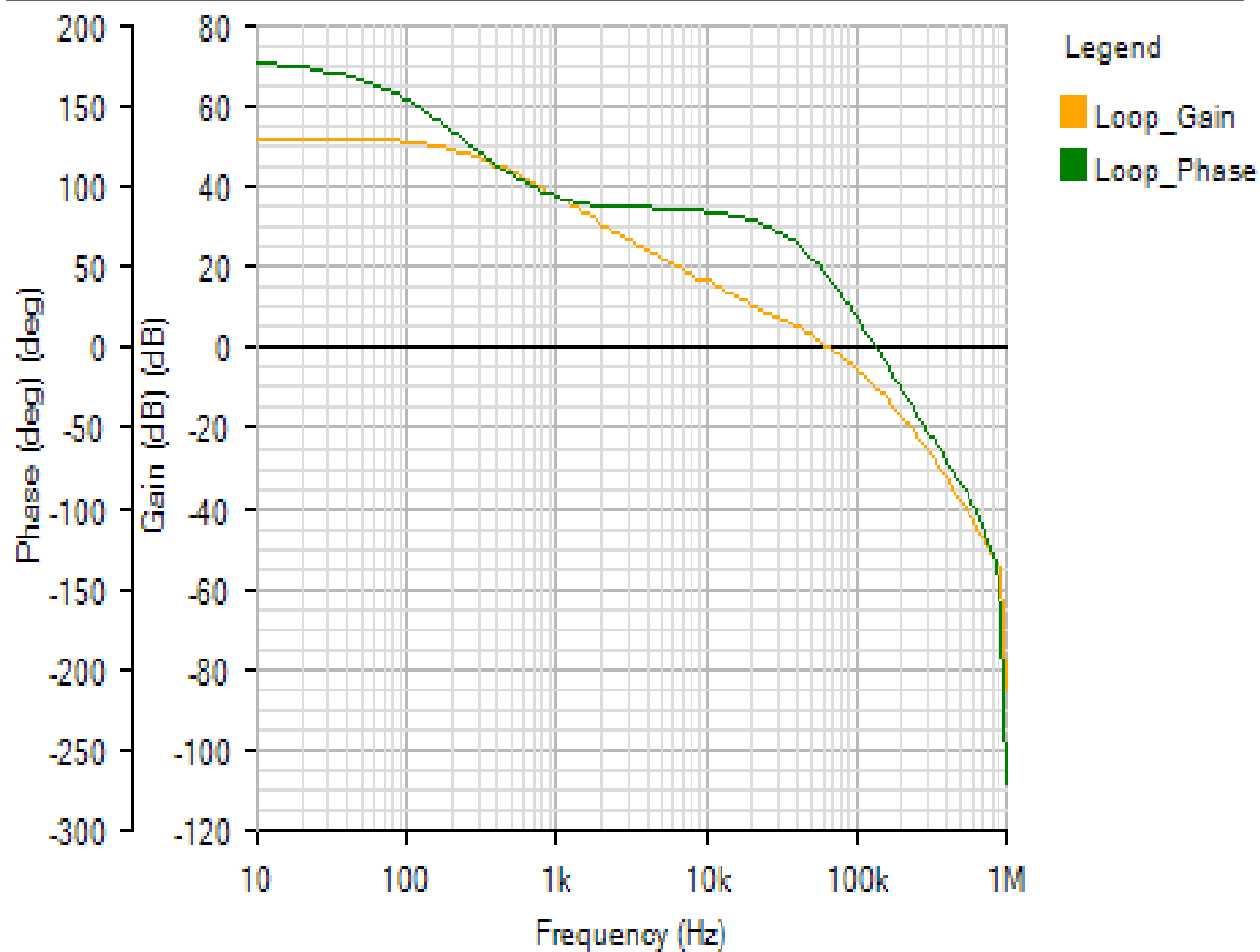
Default



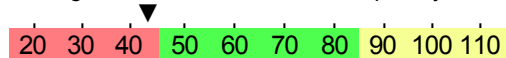
AC Loop - Mon Jan 07 2019 09:30:35

BODE

Default



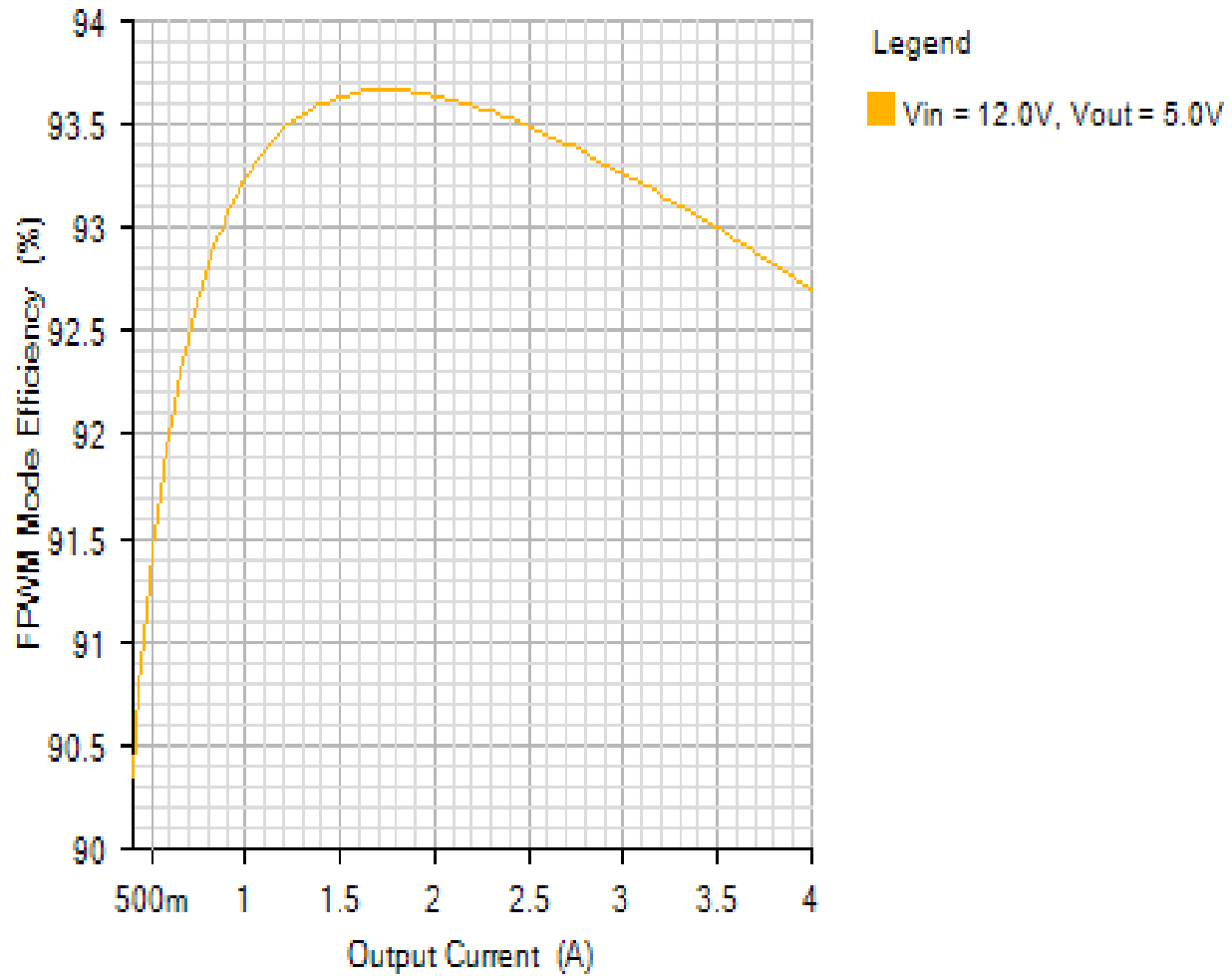
Phase Margin: 42.7° at a crossover frequency of 66.5kHz



Efficiency - Mon Jan 07 2019 09:30:35

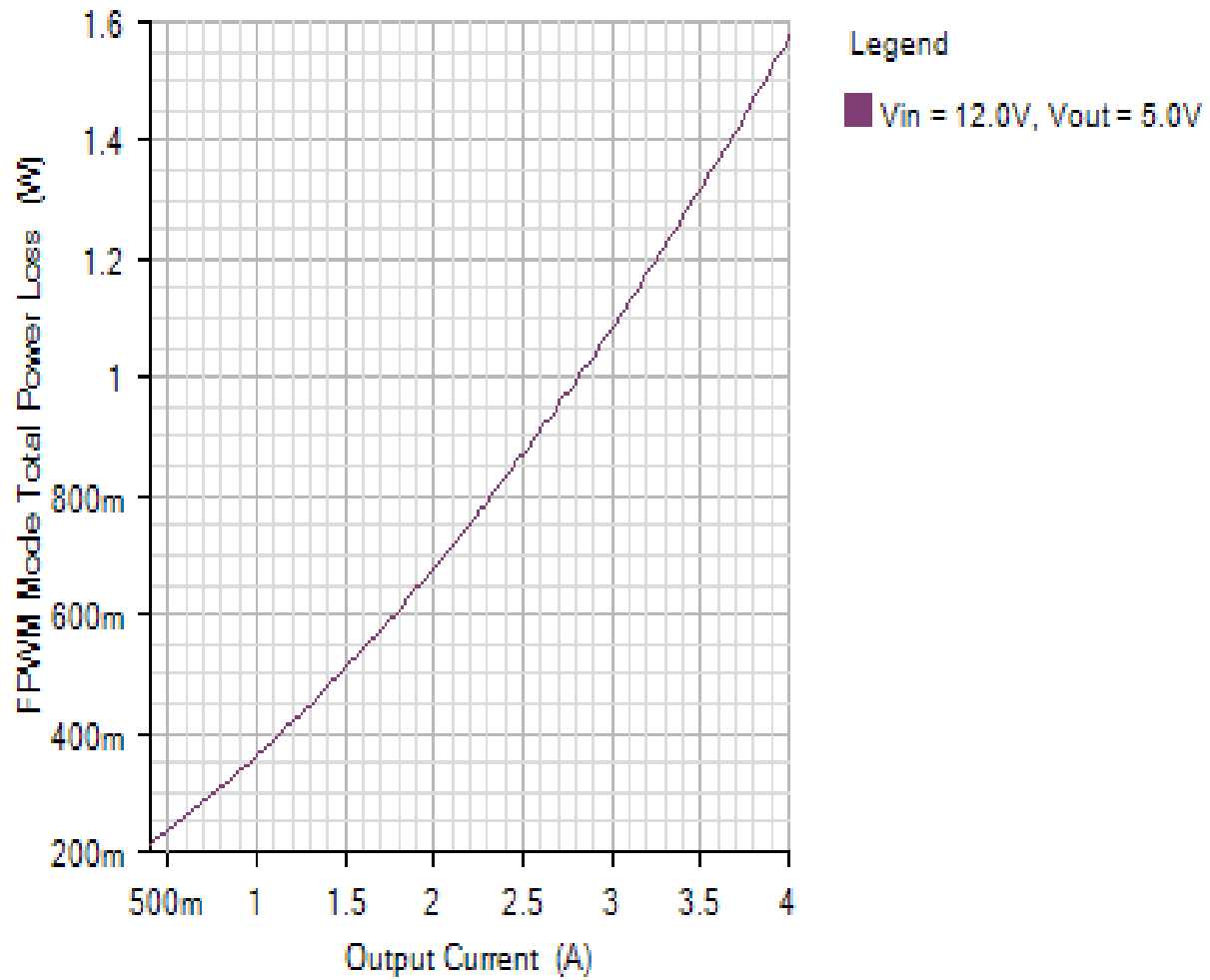
EFFICIENCY

Default



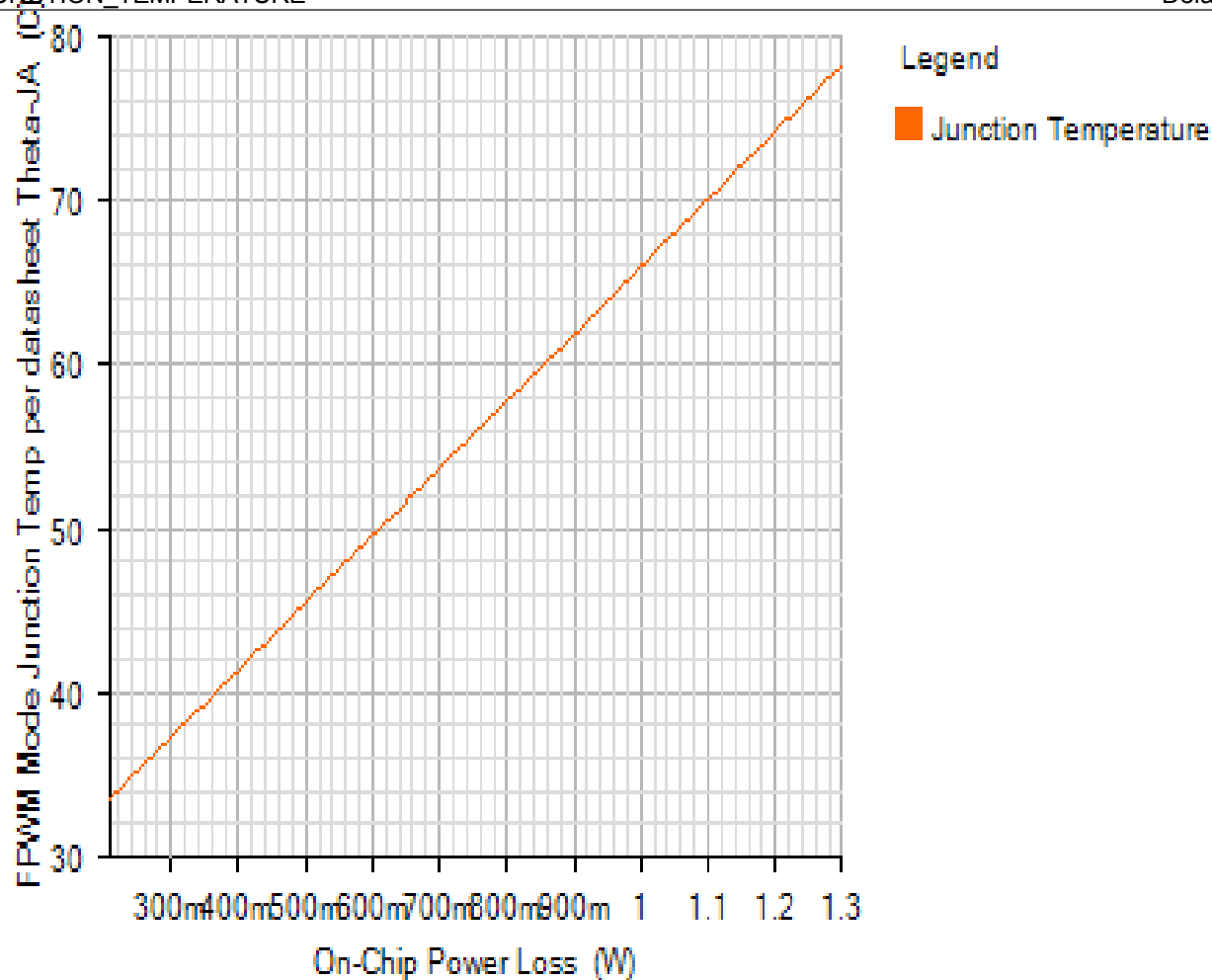
TOTAL_POWER_LOSS

Default

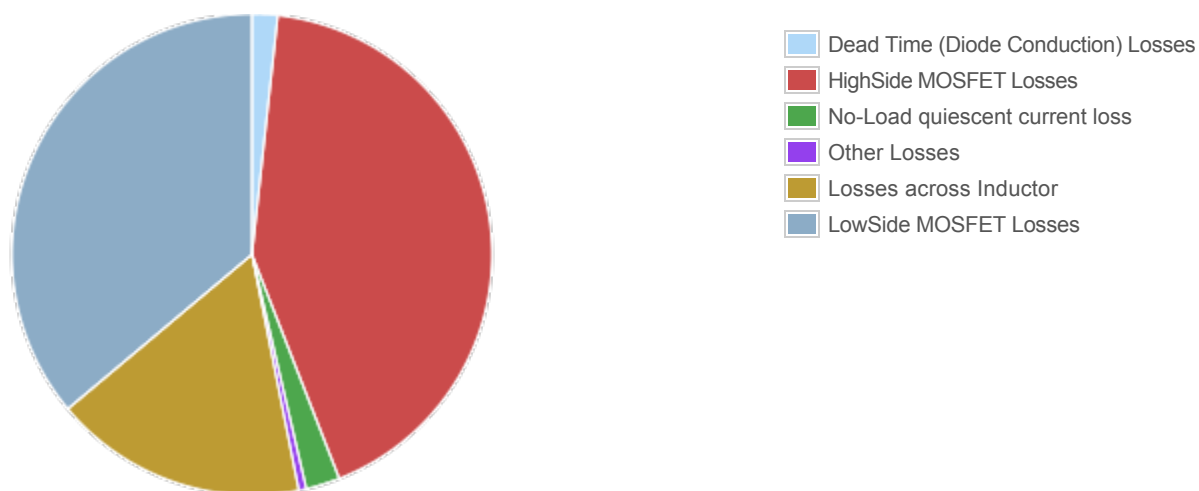


JUNCTION_TEMPERATURE

Default



Losses



Component

Loss (W)

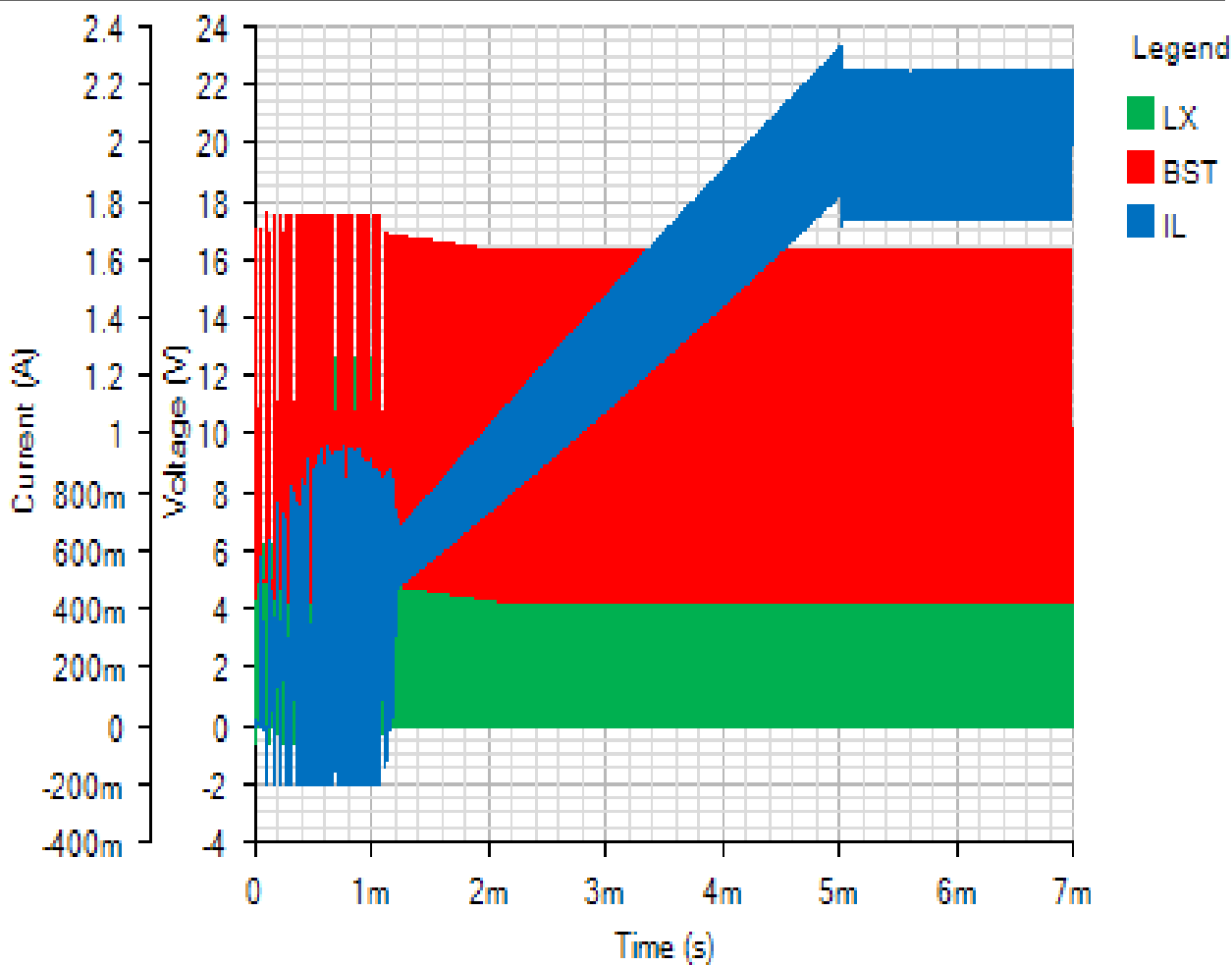
% of total

Component	Loss (W)	% of total
Dead Time (Diode Conduction) Losses	0.053992	1.7
HighSide MOSFET Losses	1.333812	42.4
No-Load quiescent current loss	0.072	2.3
Other Losses	0.016023	0.5
Losses across Inductor	0.536472	17
LowSide MOSFET Losses	1.136326	36.1
Total	3.148625	100

Start Up - Mon Jan 07 2019 09:30:35

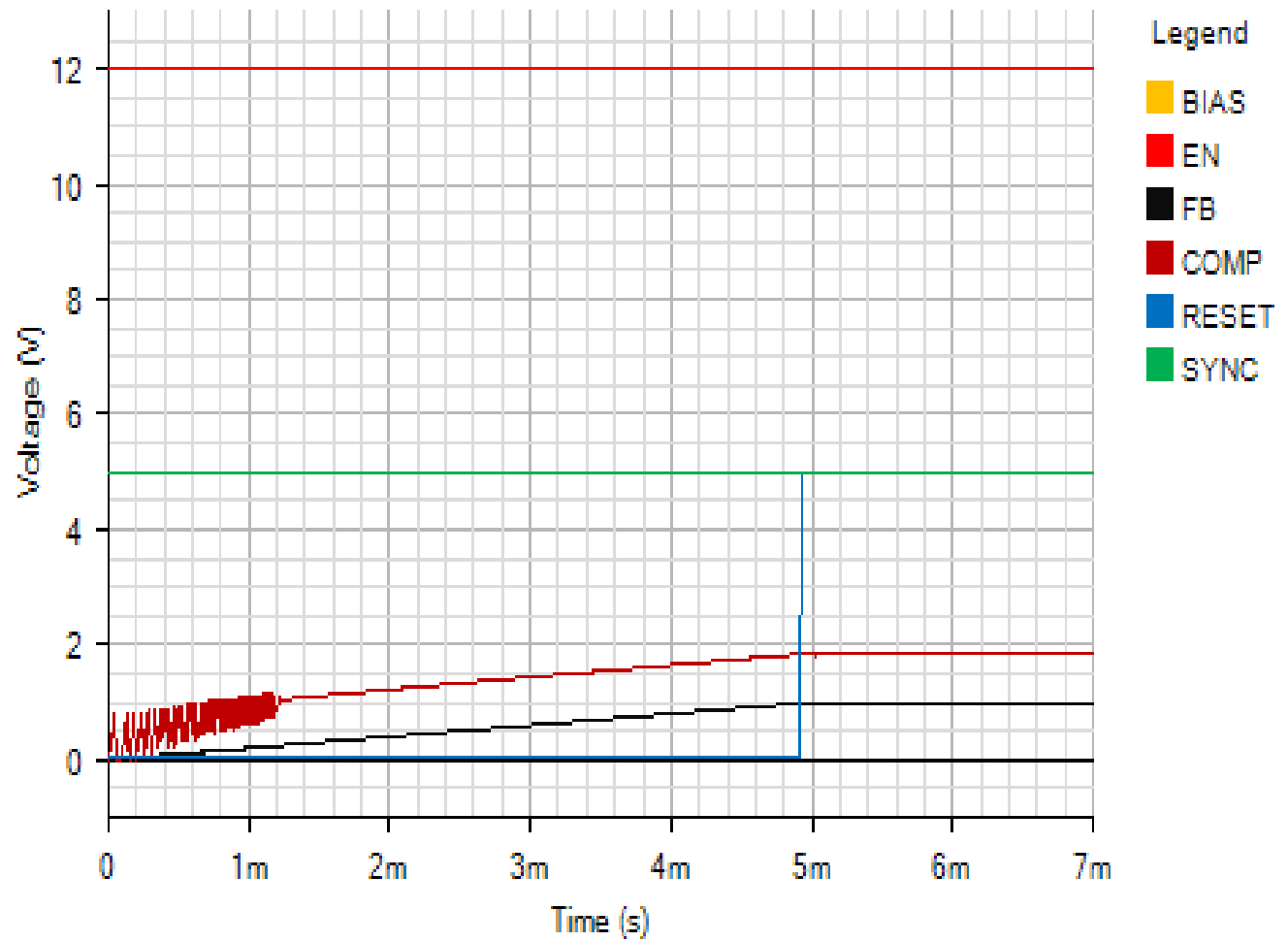
SWITCHING

Default



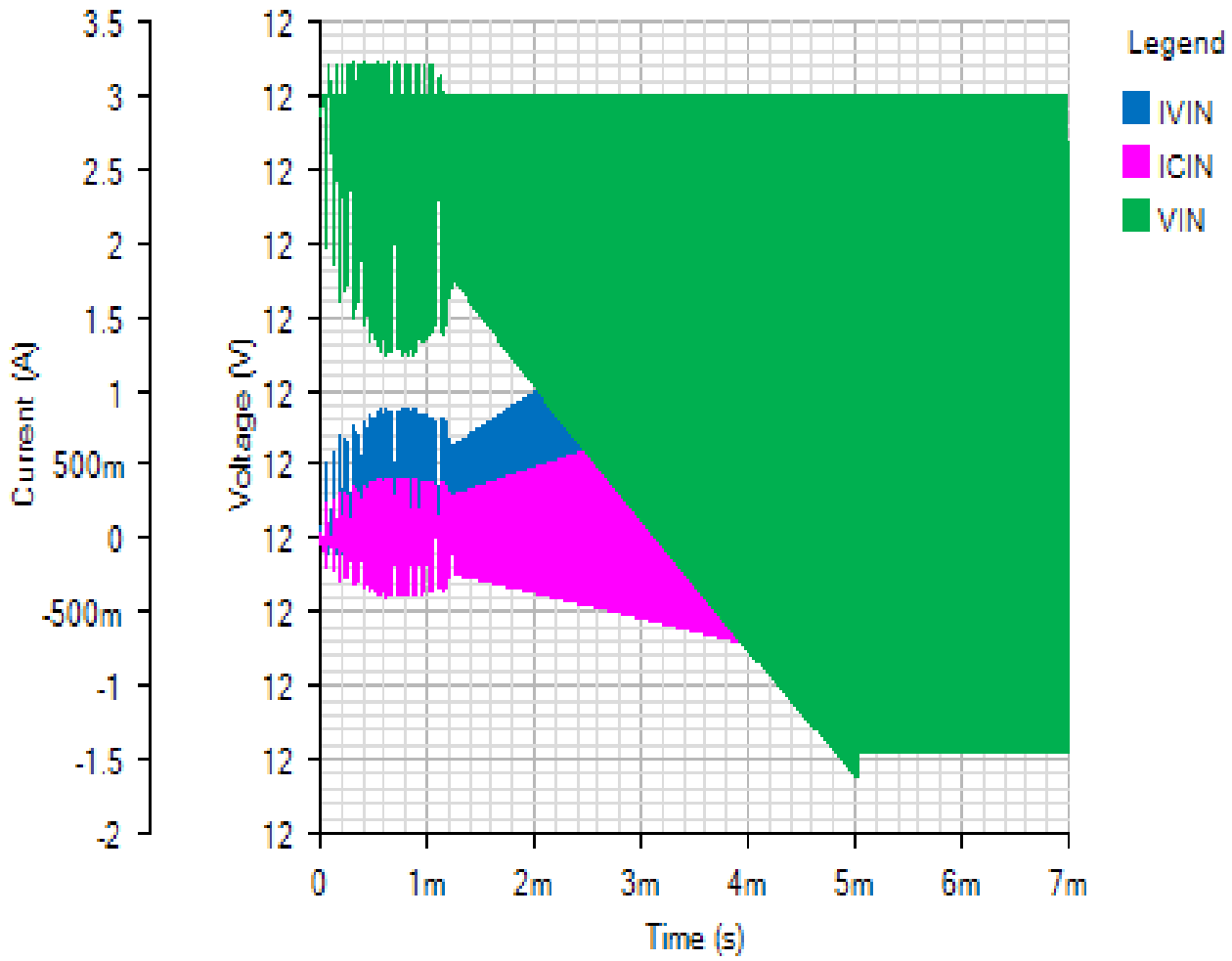
IC

Default



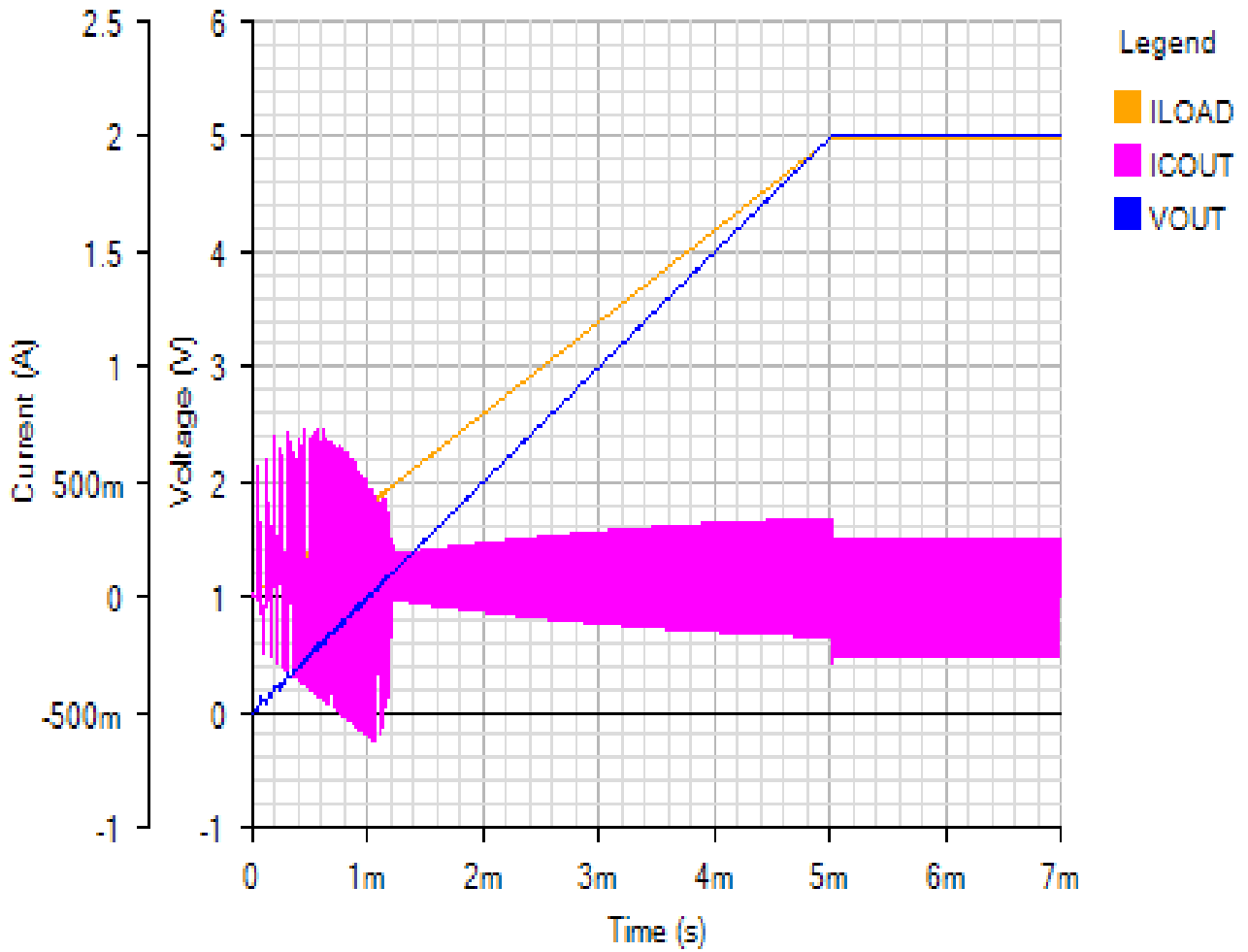
INPUT

Default



OUTPUT

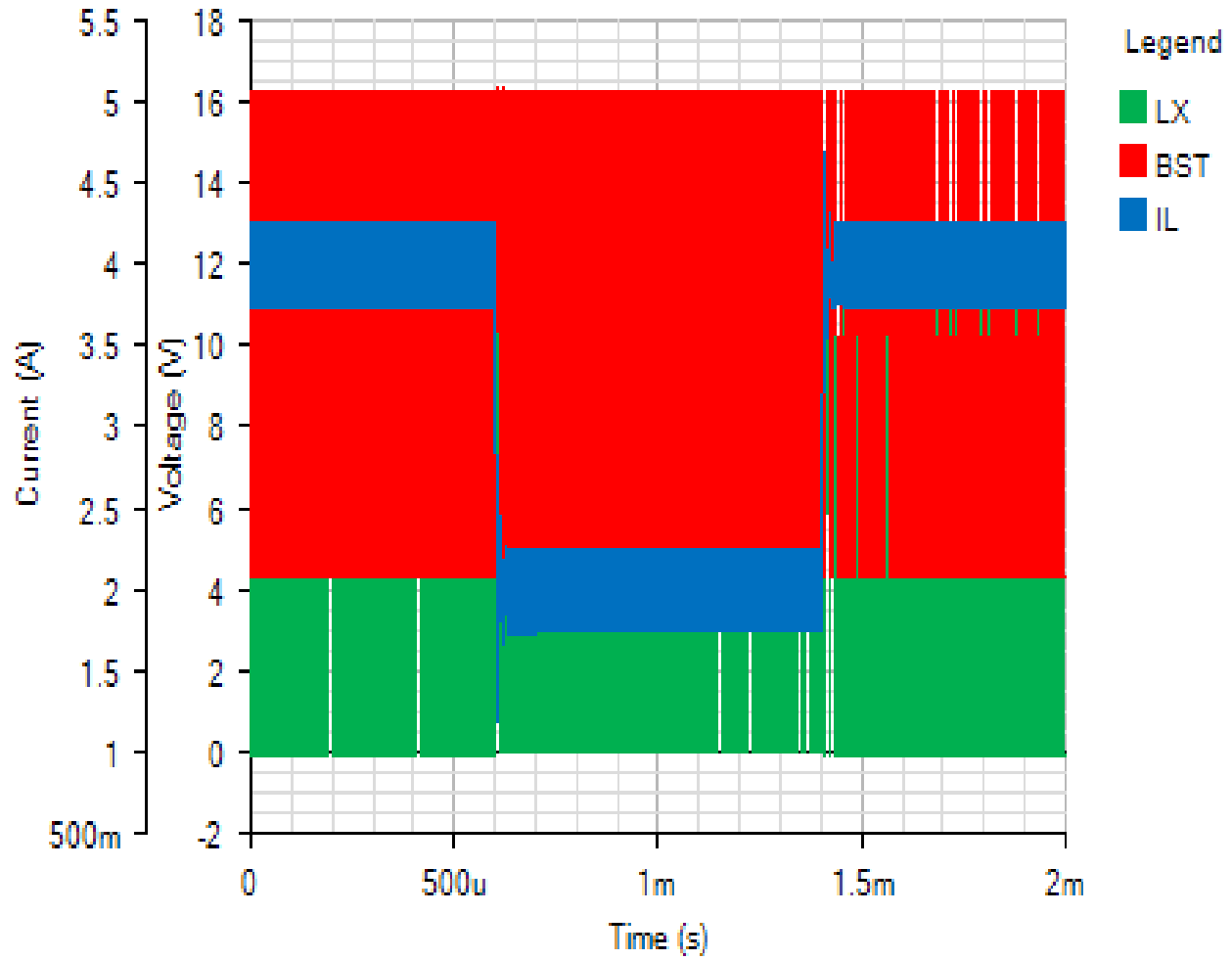
Default

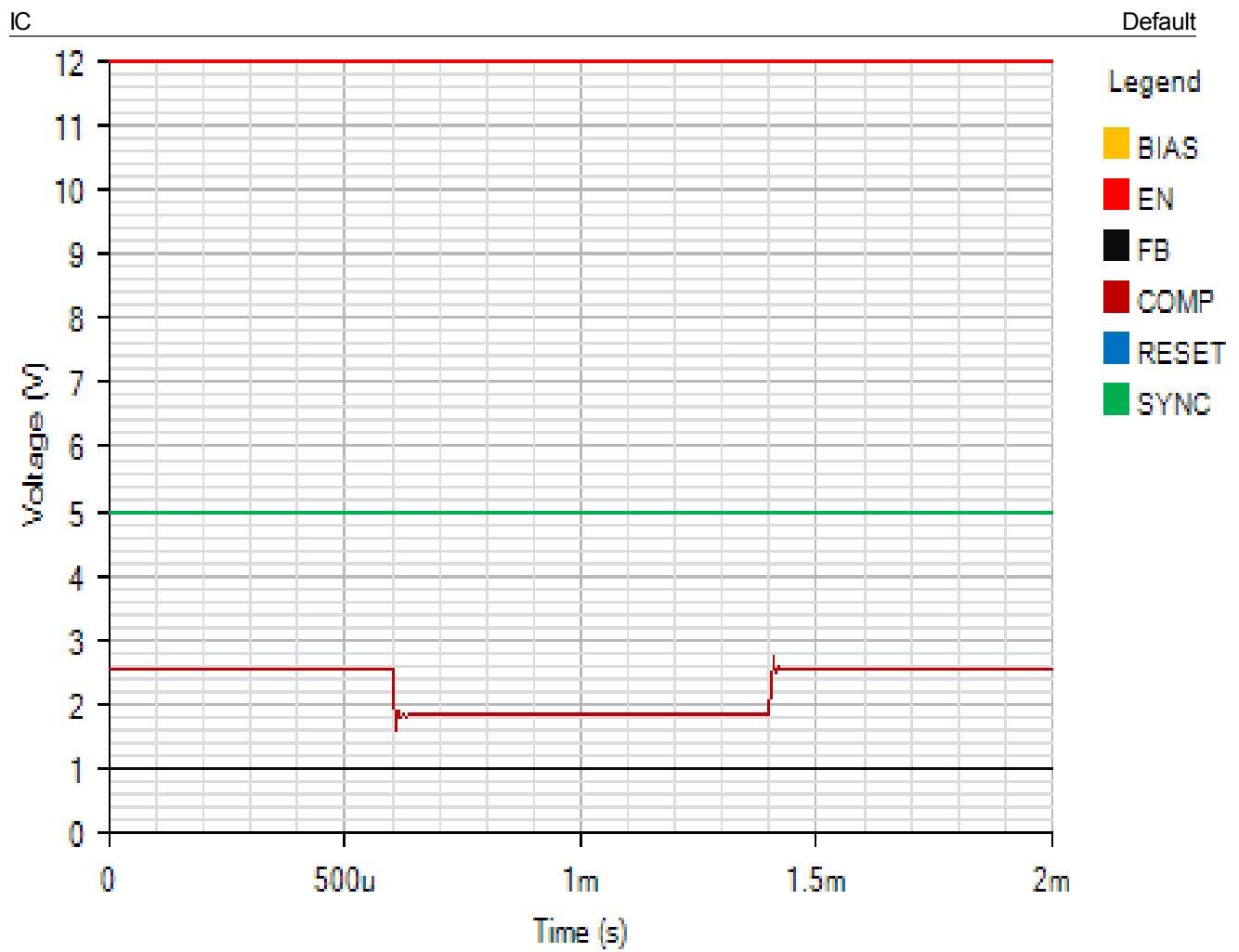


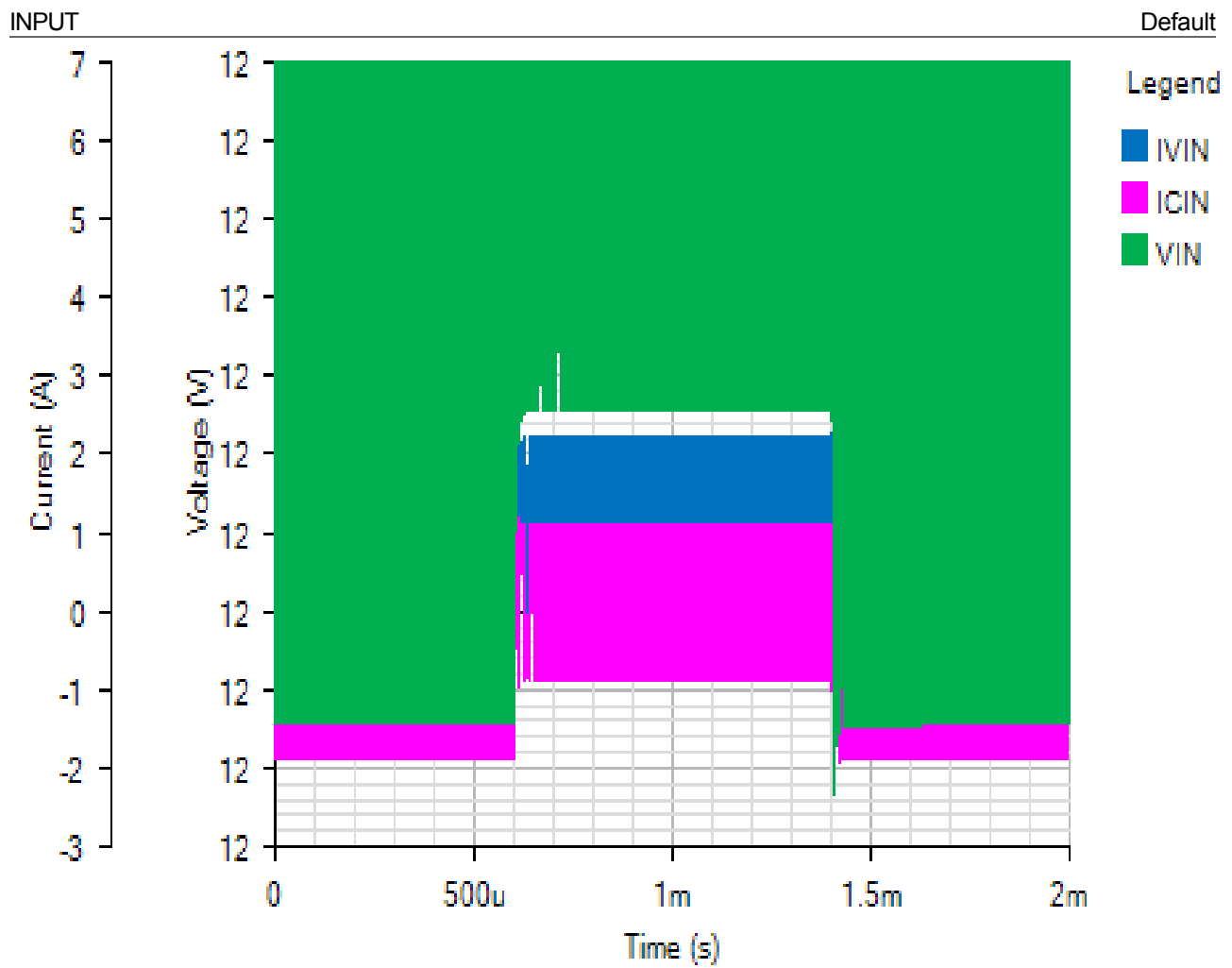
Load Step - Mon Jan 07 2019 09:30:35

SWITCHING

Default

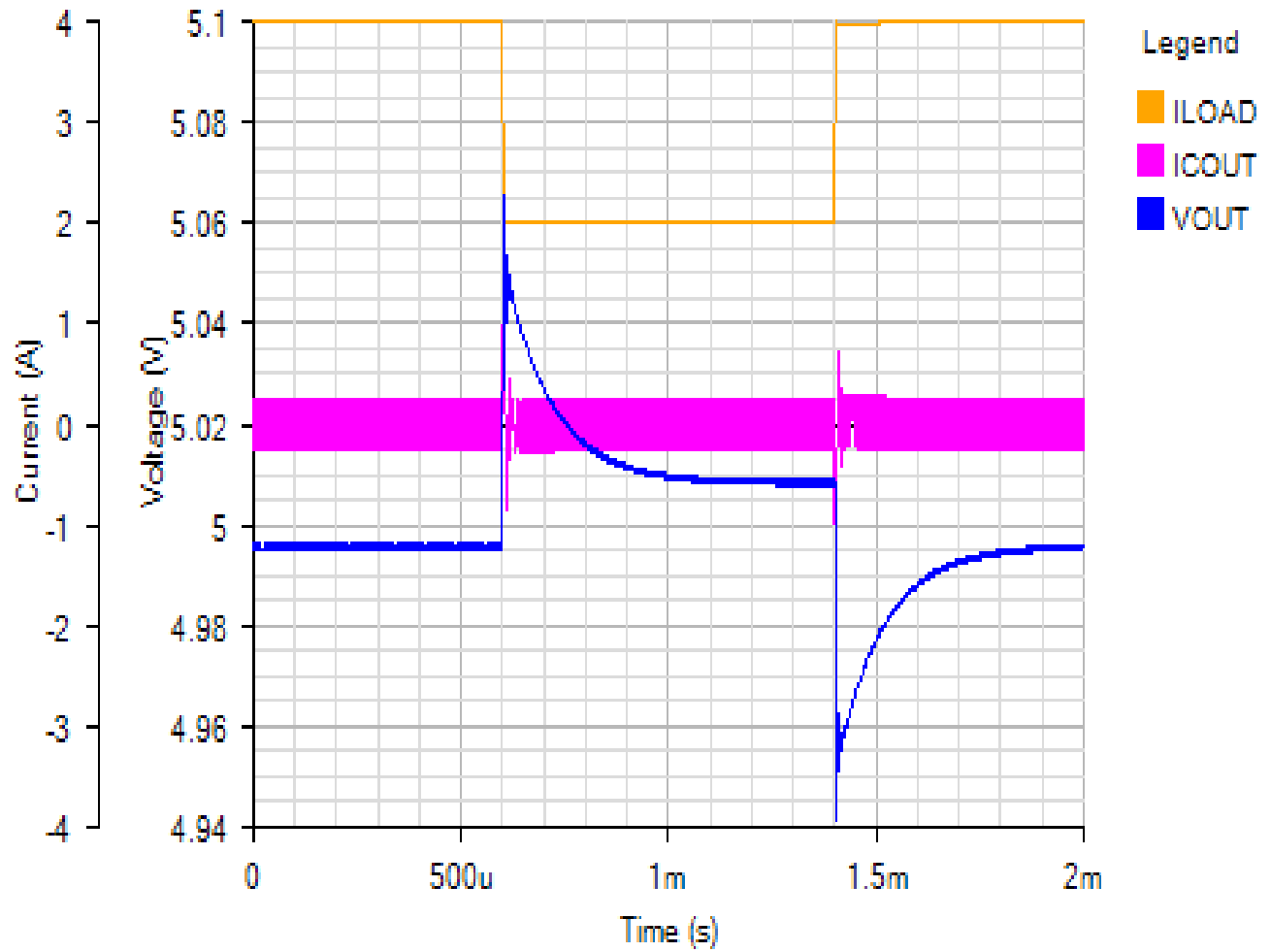






OUTPUT

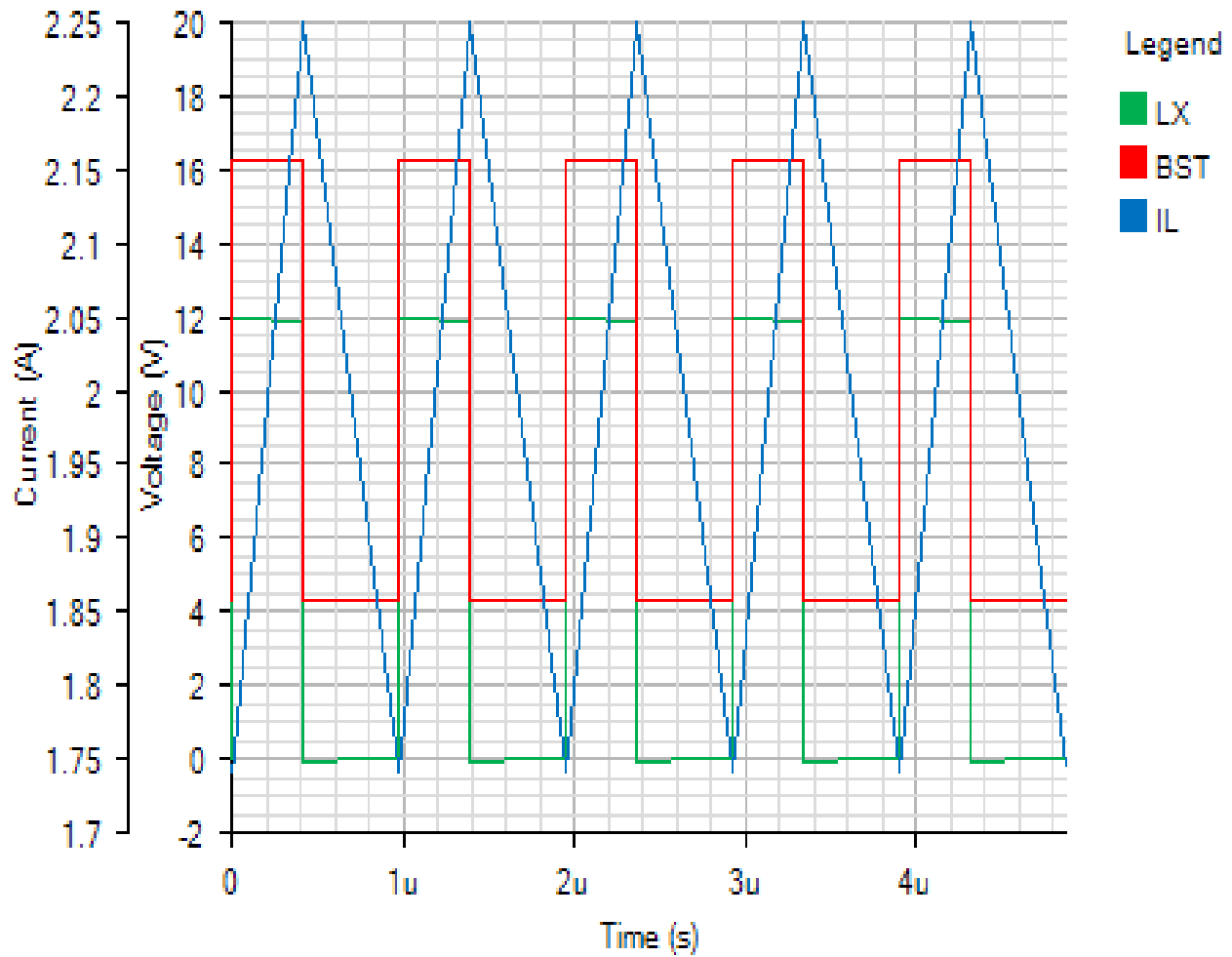
Default

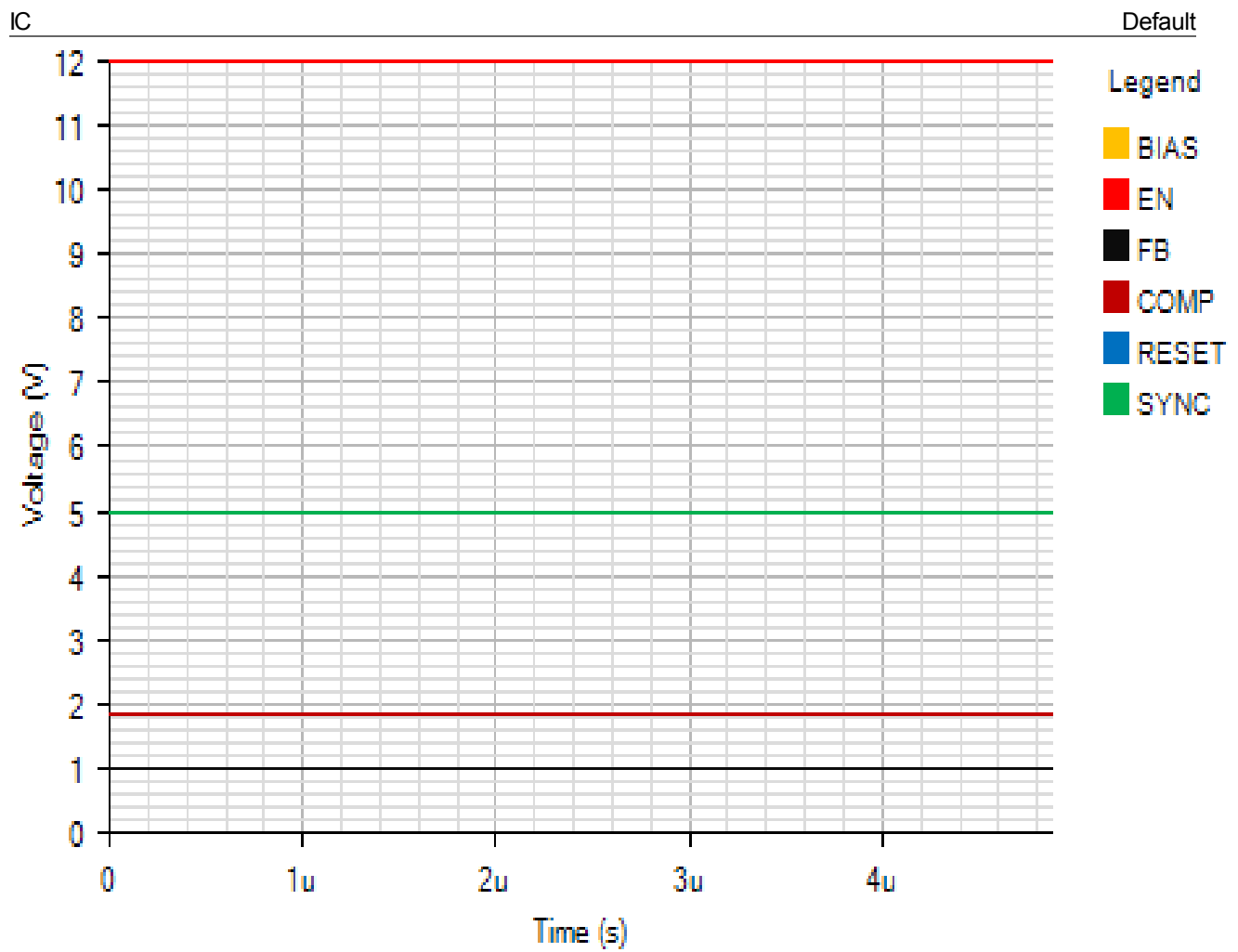


Steady State - Mon Jan 07 2019 09:30:35

SWITCHING

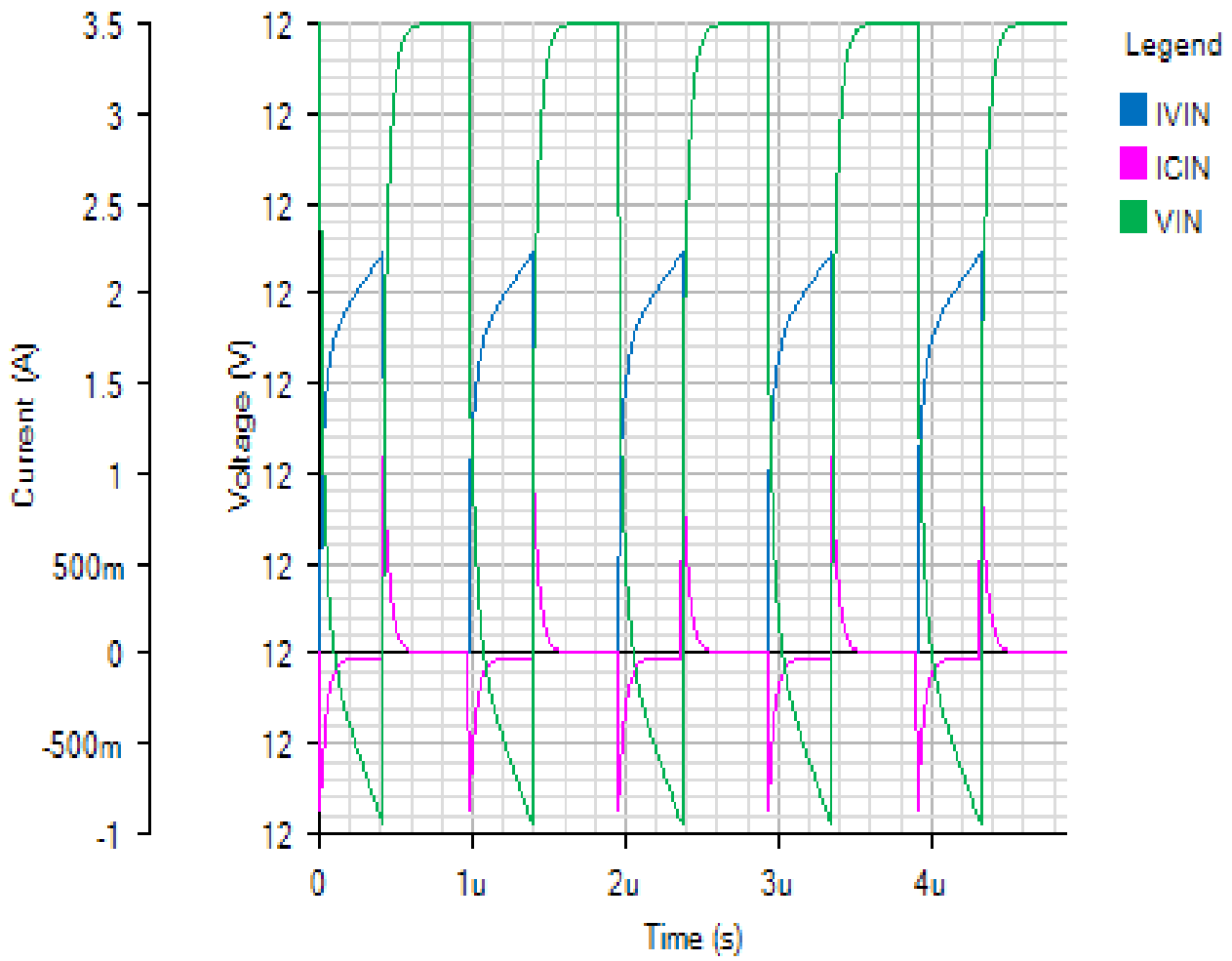
Default





INPUT

Default



OUTPUT

Default

