

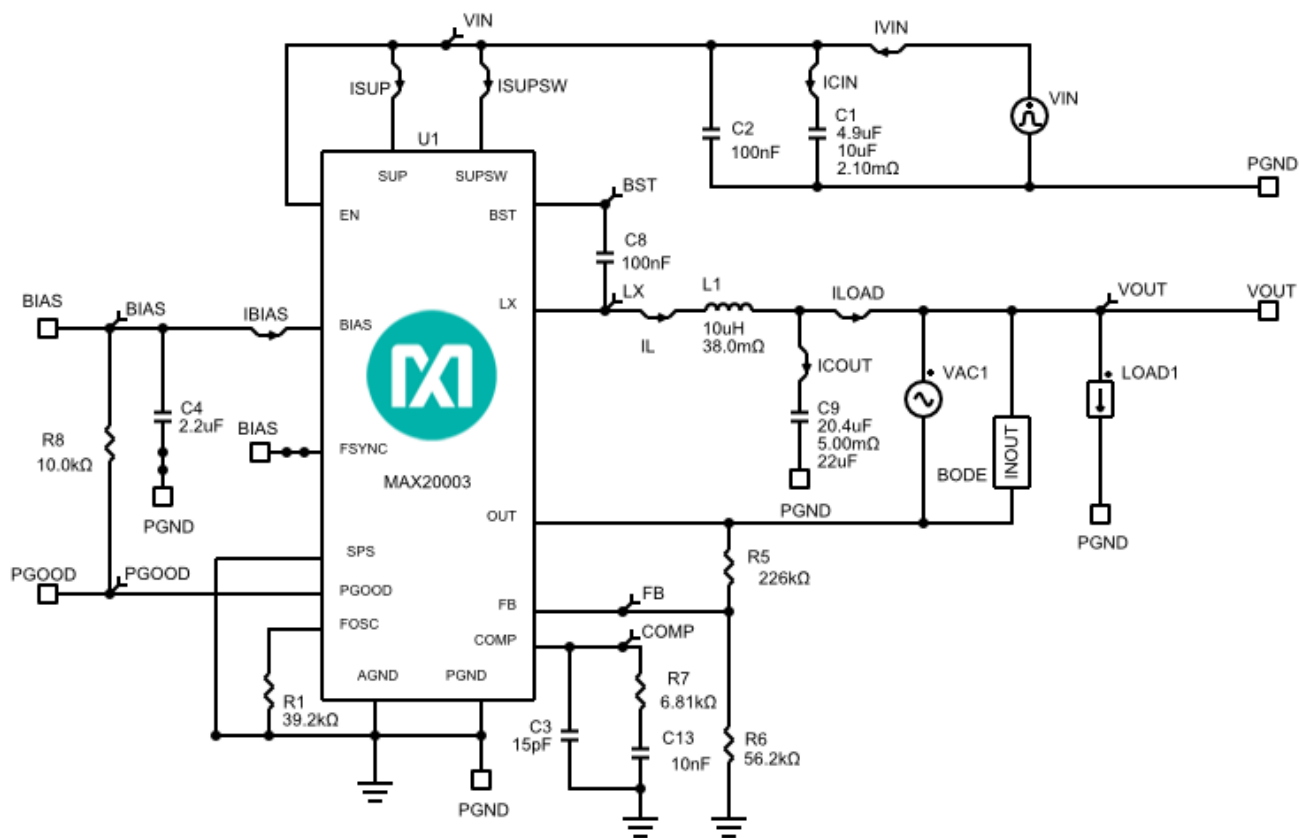
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	13V
Maximum Input Voltage	15V
Nominal Input Voltage	14V
Input Voltage Ripple	1%
Output Voltage Programming	Externally Resistor Adjustable
Output Voltage	5V
Output Current	1.5A
Output Voltage Ripple	1%
Load Step Start Current	0.75A
Load Step Current	1.5A
Load Step Edge Rate	5A/us
Output Voltage Load Step Over/Undershoot	3%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Switching Frequency	695kHz
Mode of Operation	PWM
Inductor Current Ratio (LIR)	0.3
Ambient Temperature	25°C

Schematic



If the current level (starting current for Load Steps) is too low, AC, Steady State and Load Step analyses may fail when SKIP mode is selected.

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

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.

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX20003	Maxim Integrated	36V, 220kHz to 2.2MHz, 2A/3A Fully Integrated Step-Down Converters with 15μA Operating Current
C1	1	C3216X7R1V106K160AC	TDK	Cap Ceramic 10uF 35V 1206 125C
C2	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
C3	1	C0402C150K5GACTU	KEMET Corporation	Cap Ceramic 15pF 50V C0G 10% Pad SMD 0402 125°C T/R
C4	1	C1608X7R1A225K080AC	TDK	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C8	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R

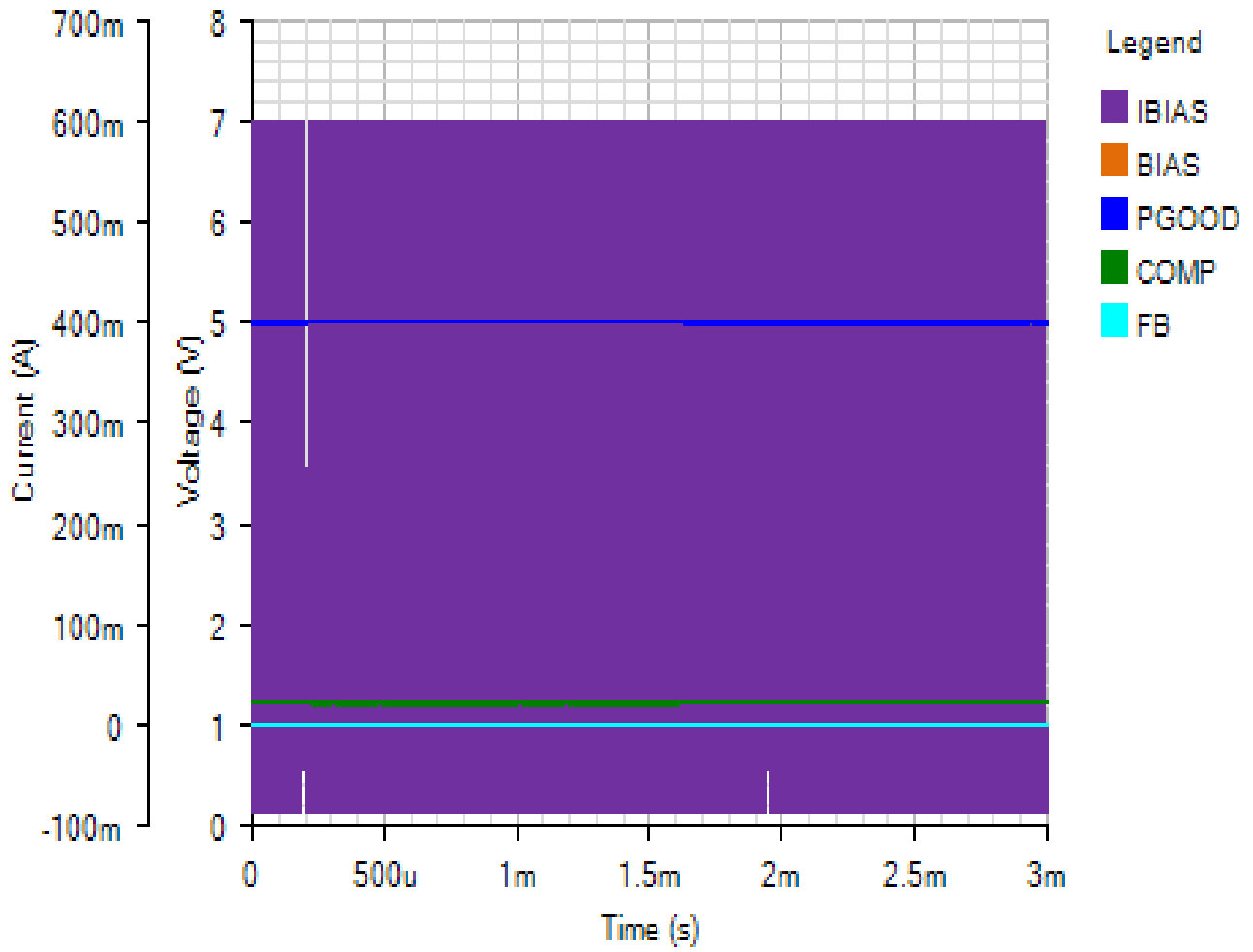
C9	1	C3225X7R1C226K250AC	TDK	Cap Ceramic 22uF 16V X7R 10% SMD 1210 125C Plastic T/R
C13	1	04025C103KAT2A	AVX	Cap Ceramic 0.01uF 50V X7R 10% Pad SMD 0402 125°C T/R
L1	1	VLP8040T-100M	TDK	Inductor Power Shielded Wirewound 10uH 20% 100KHz Ferrite 3.5A 38mOhm DCR Embossed Carrier T/R
R1	1	ERJ2RKF3922X	Panasonic	Res Thick Film 0402 39.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF2263X	Panasonic	Res Thick Film 0402 226K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF5622X	Panasonic	Res Thick Film 0402 56.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ2RKF6811X	Panasonic	Res Thick Film 0402 6.81K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R8	1	ERJ2GEJ103X	Panasonic	Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R

Simulation Results

Line Transient - Tue Nov 20 2018 11:27:18

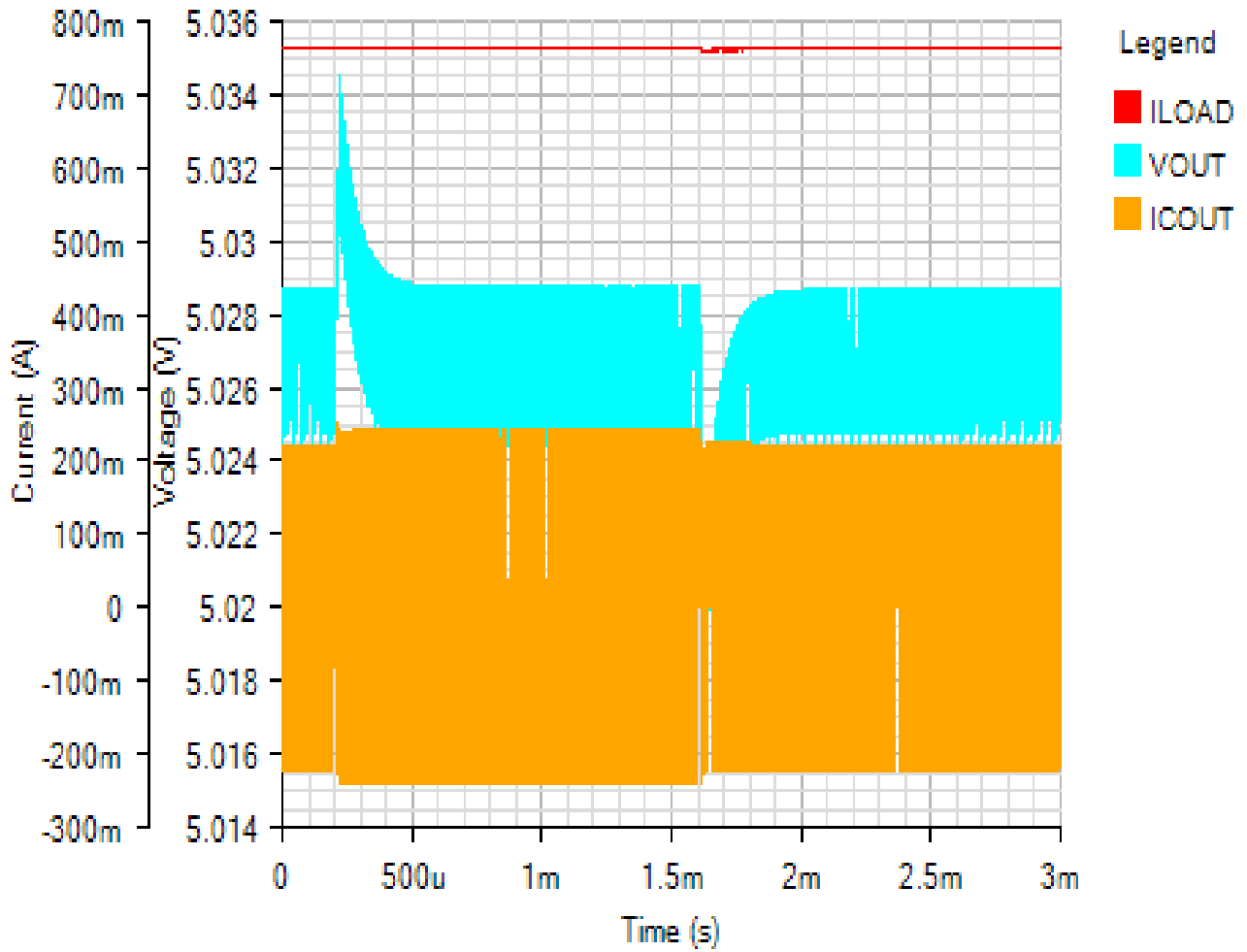
IC

Default



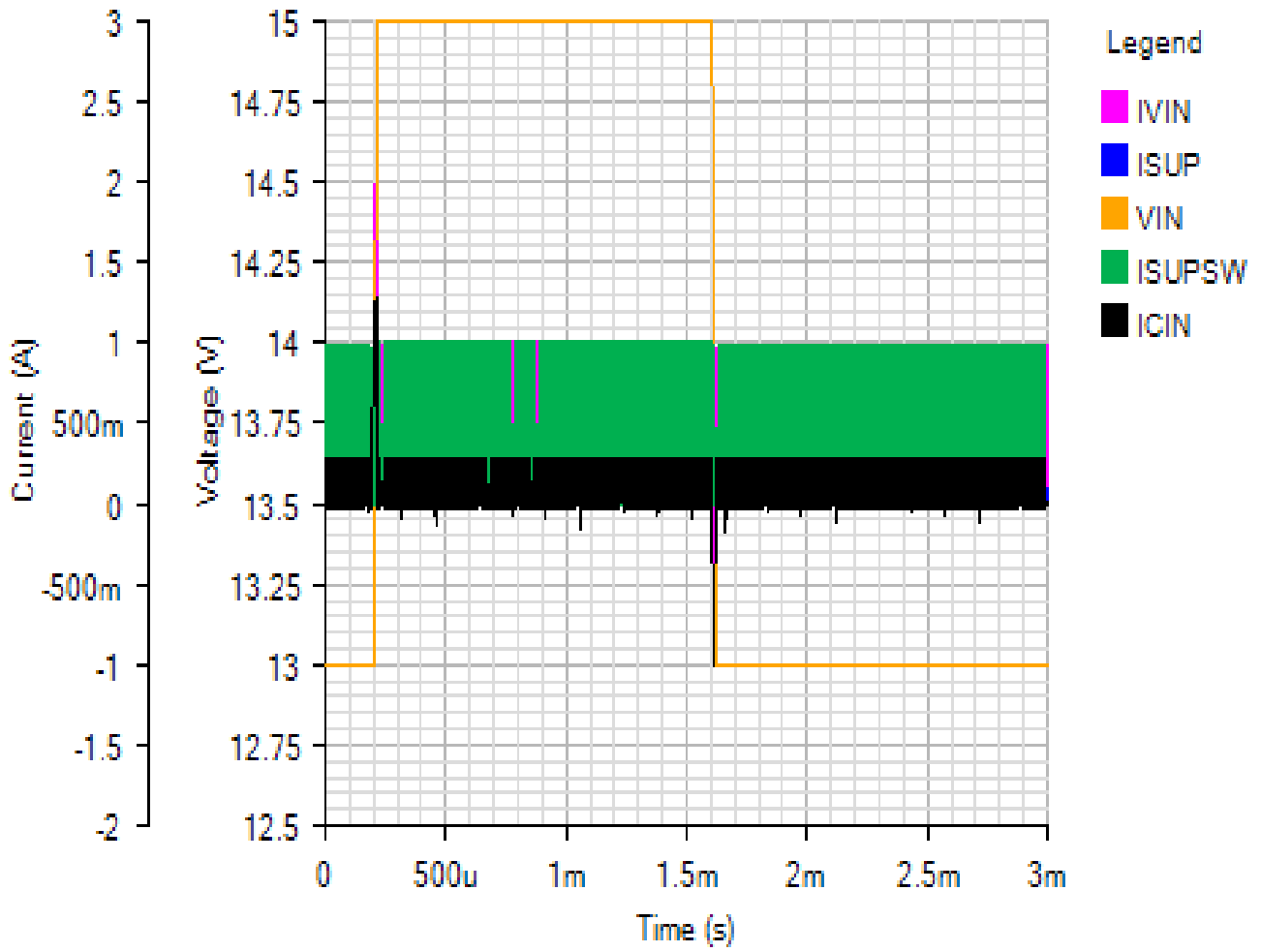
OUTPUT

Default



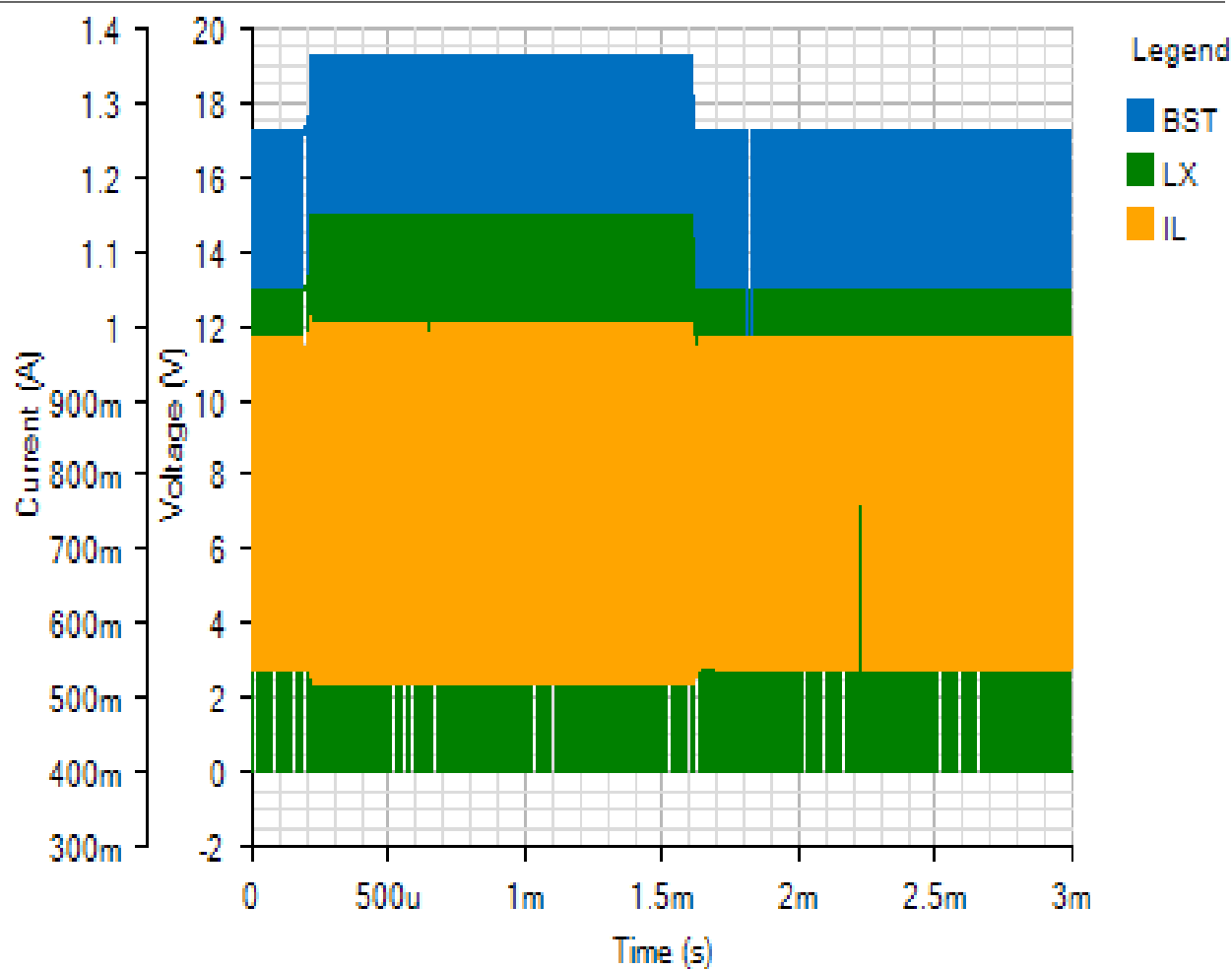
INPUT

Default

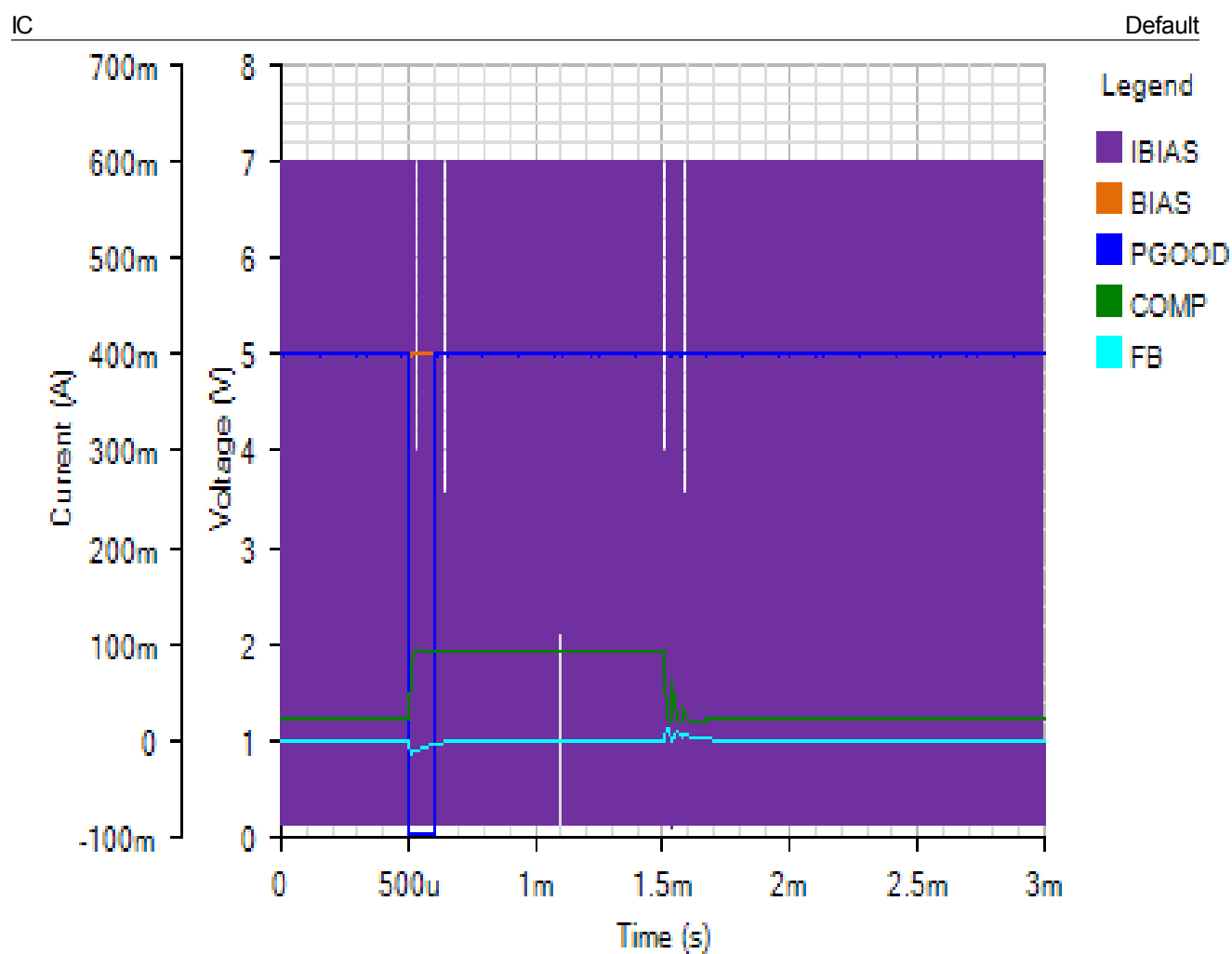


SWITCHING

Default

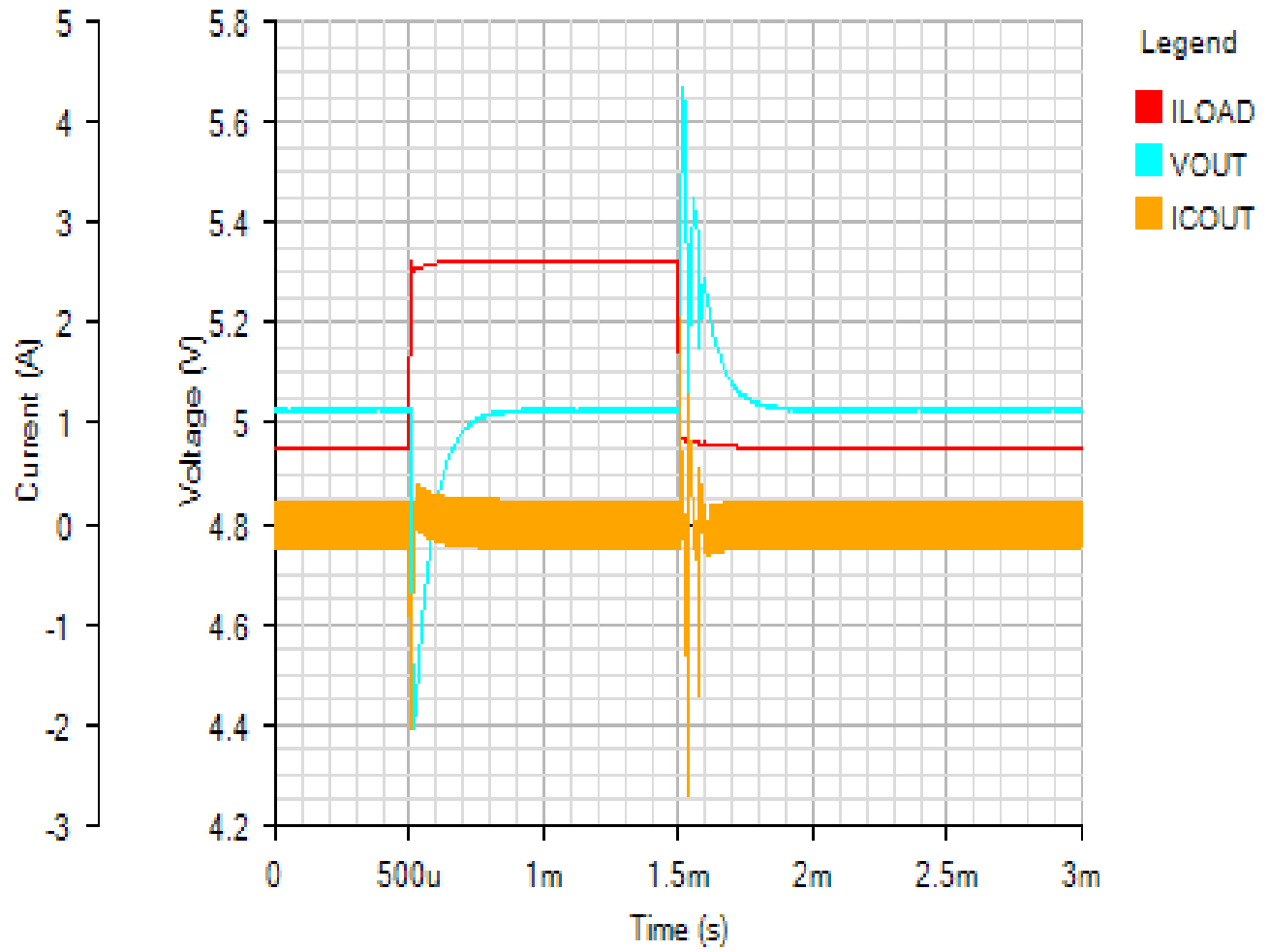


Load Step - Tue Nov 20 2018 11:27:18



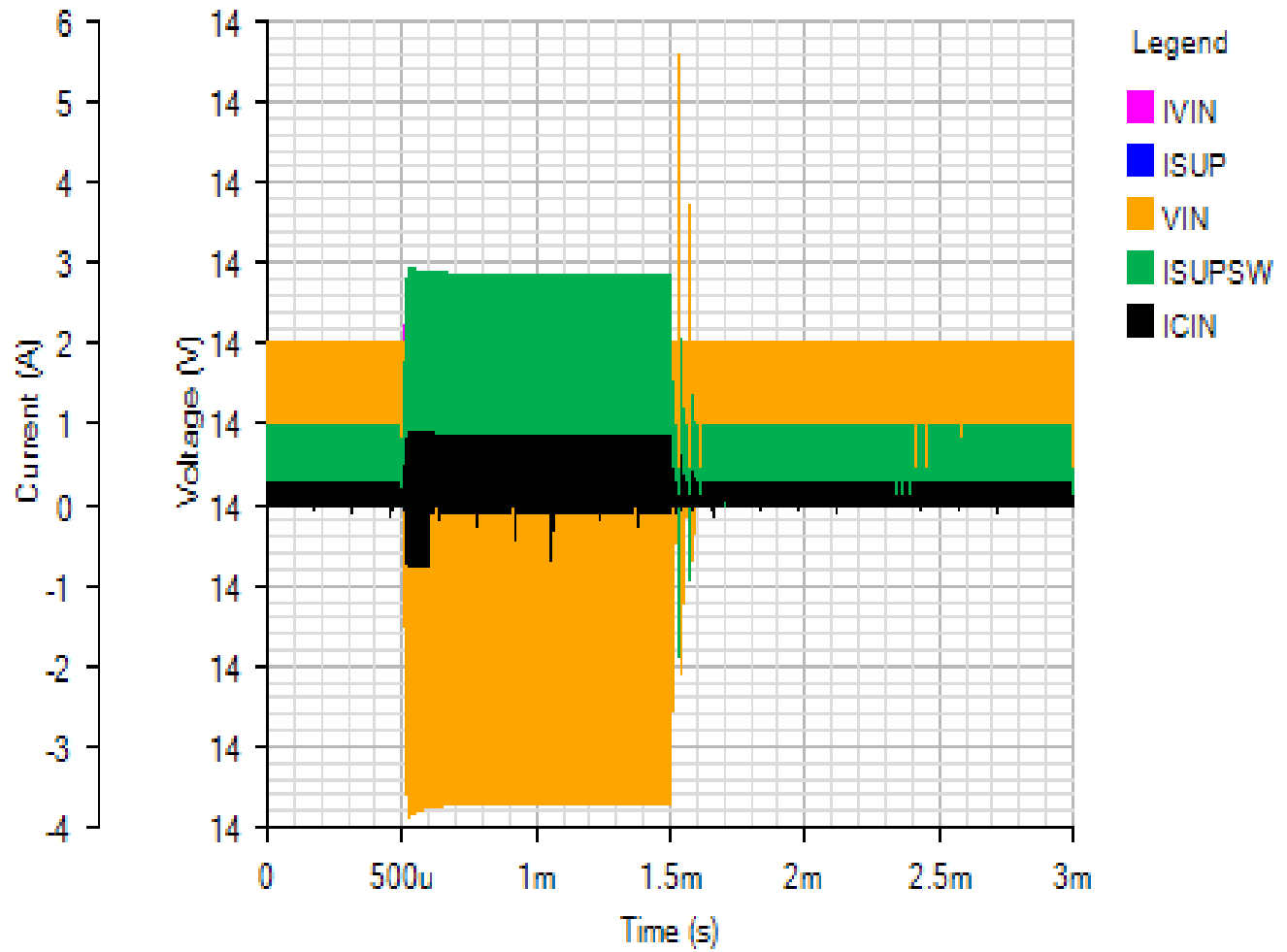
OUTPUT

Default



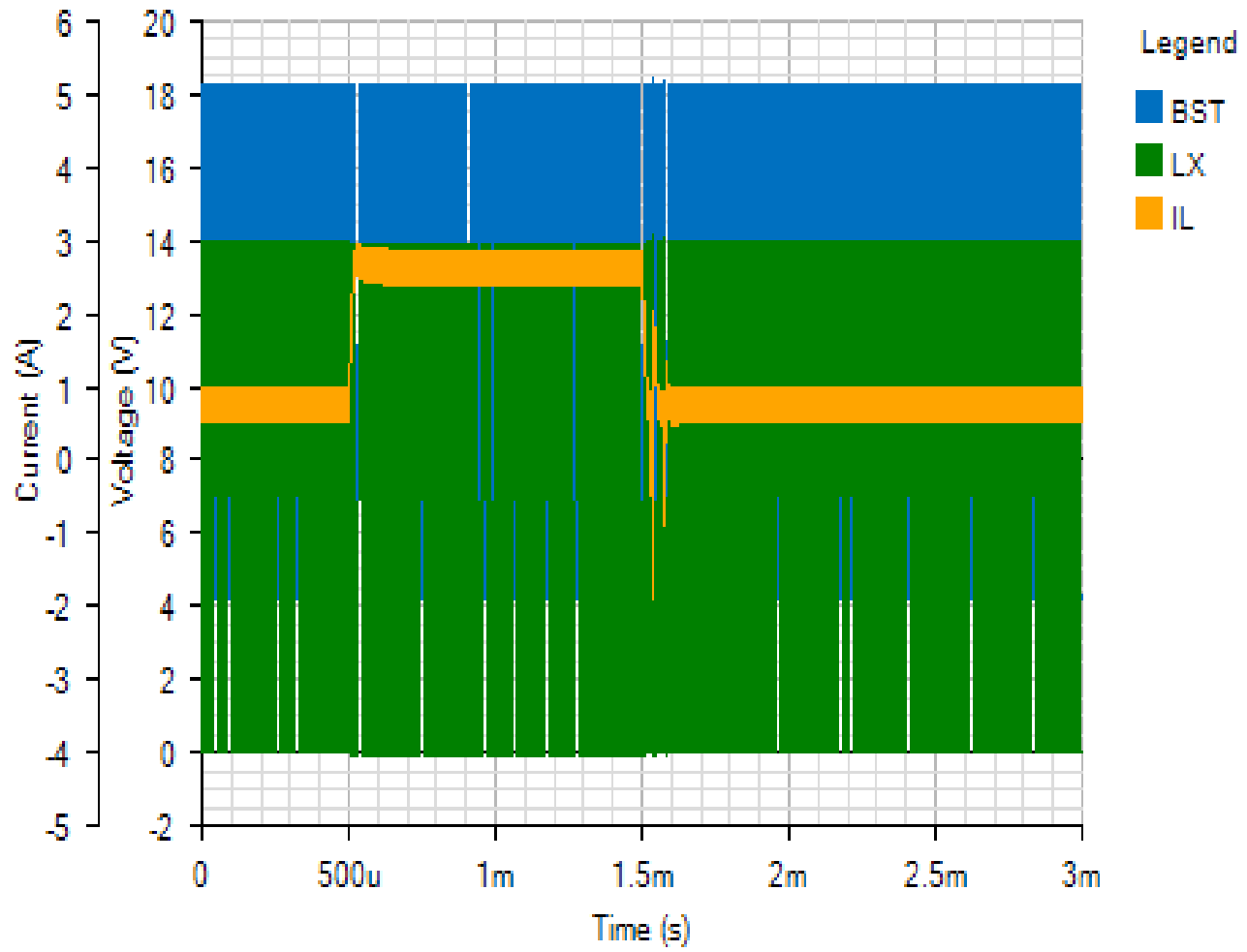
INPUT

Default



SWITCHING

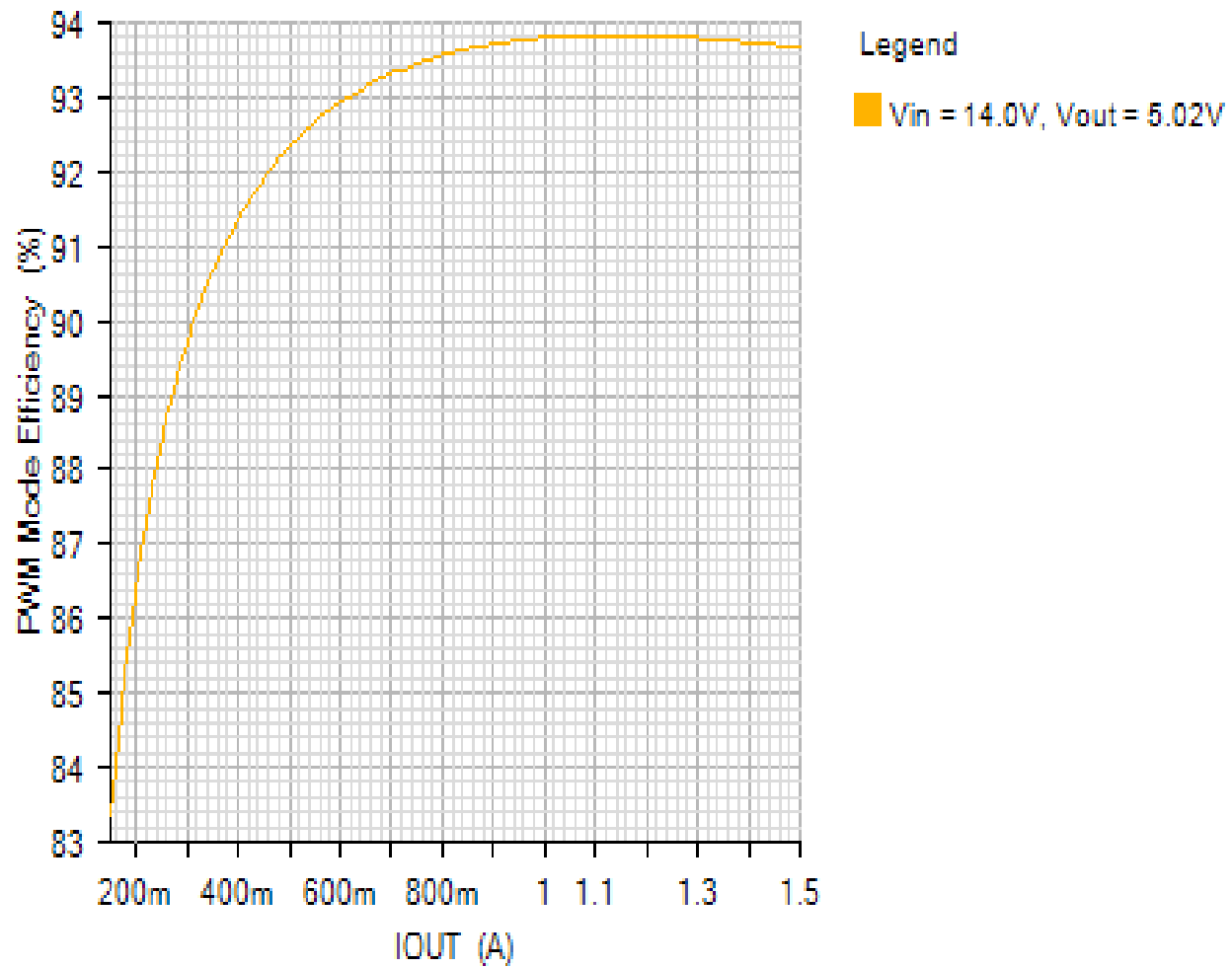
Default



Efficiency - Tue Nov 20 2018 11:27:18

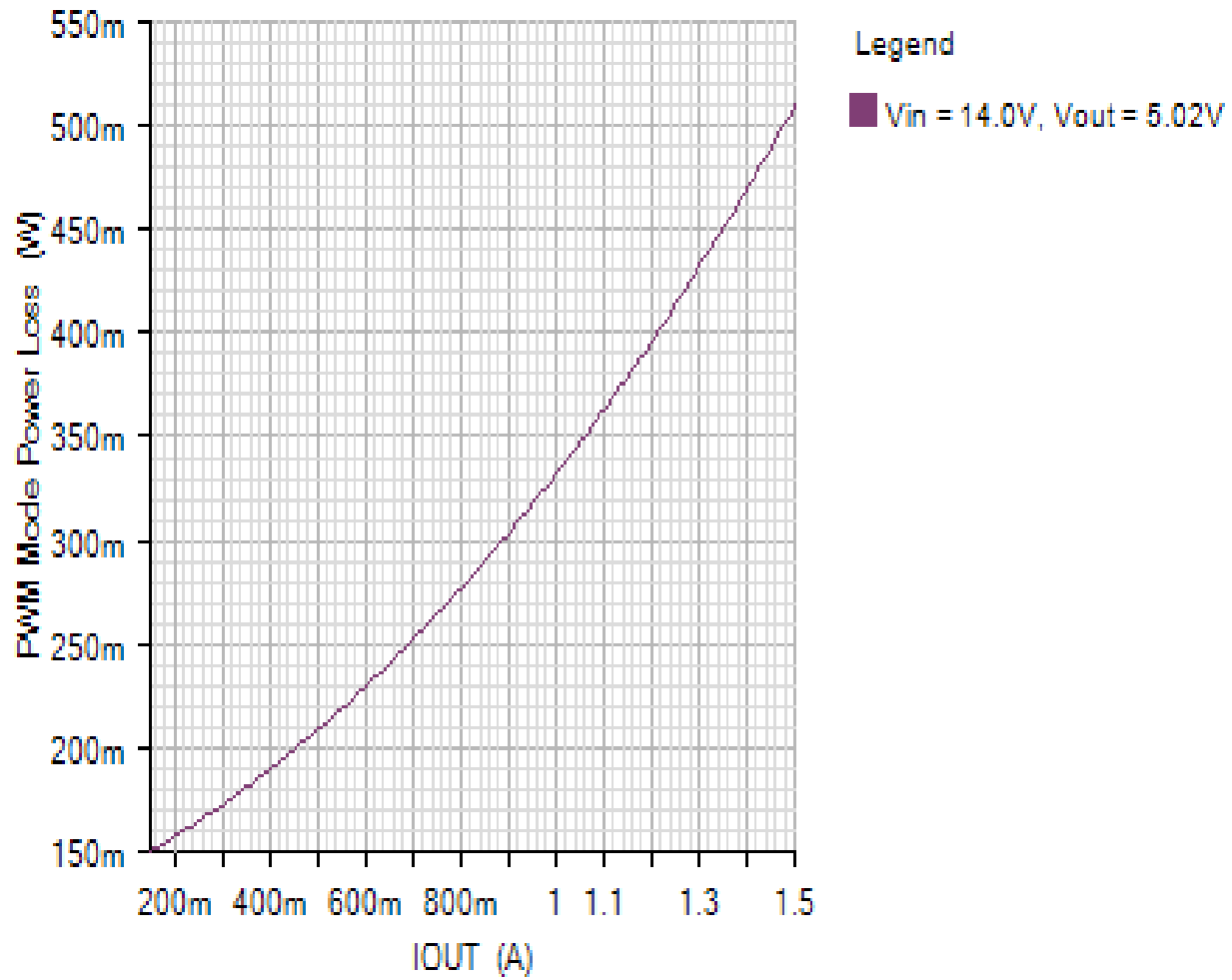
EFFICIENCY

Default



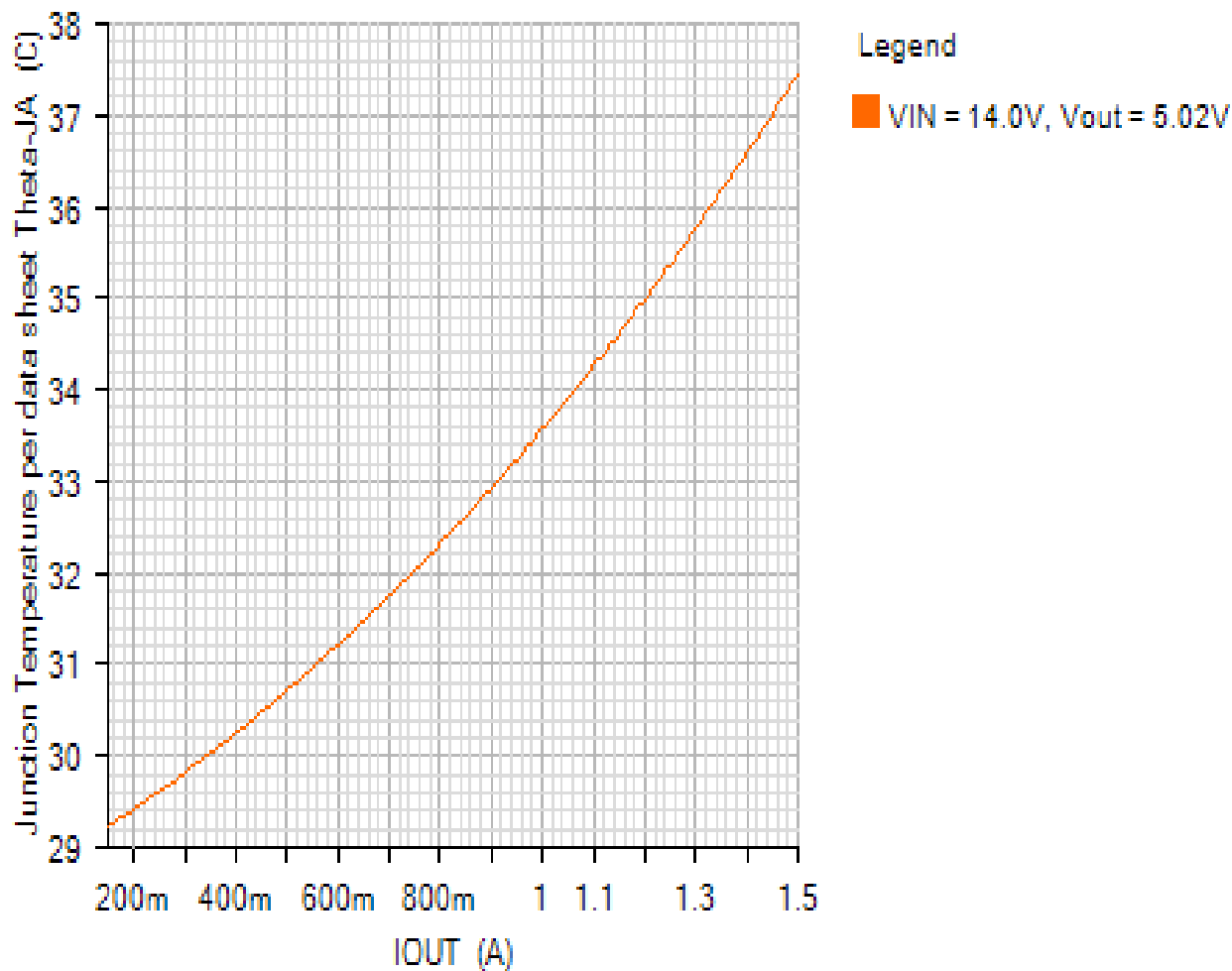
POWER_LOSS

Default

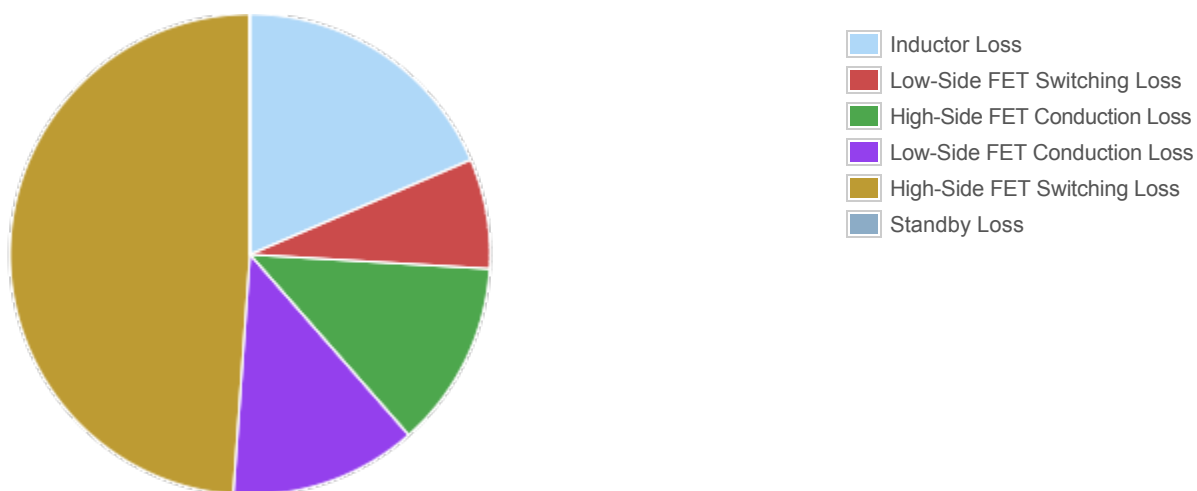


JUNCTION_TEMPERATURE

Default



Losses



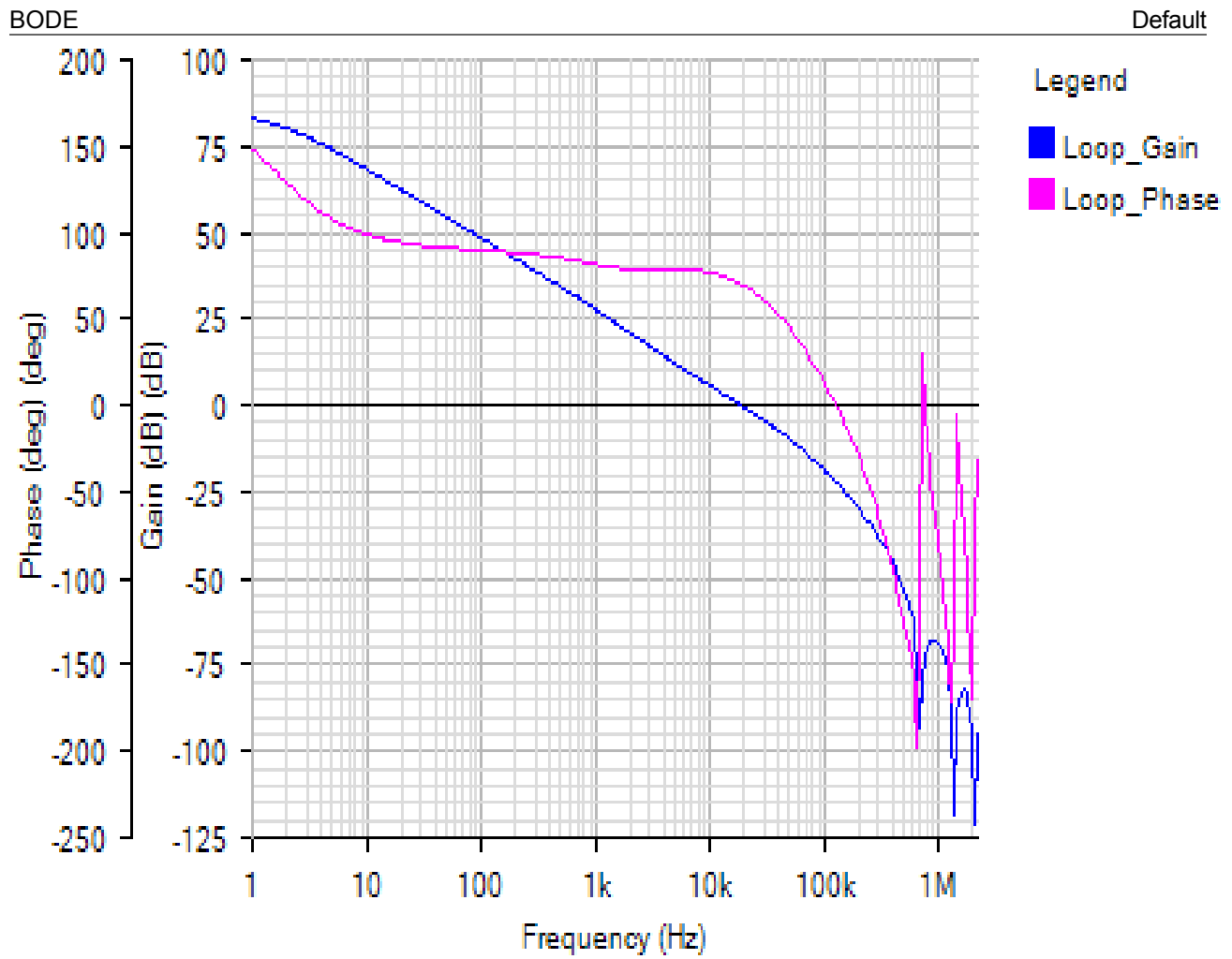
Component

Loss (W)

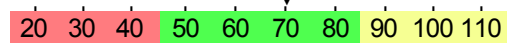
% of total

Component	Loss (W)	% of total
Inductor Loss	0.185594	18.6
Low-Side FET Switching Loss	0.073896	7.4
High-Side FET Conduction Loss	0.125542	12.6
Low-Side FET Conduction Loss	0.126067	12.6
High-Side FET Switching Loss	0.488351	48.8
Standby Loss	0.000549	0.1
Total	1	100

AC Loop - Tue Nov 20 2018 11:27:18



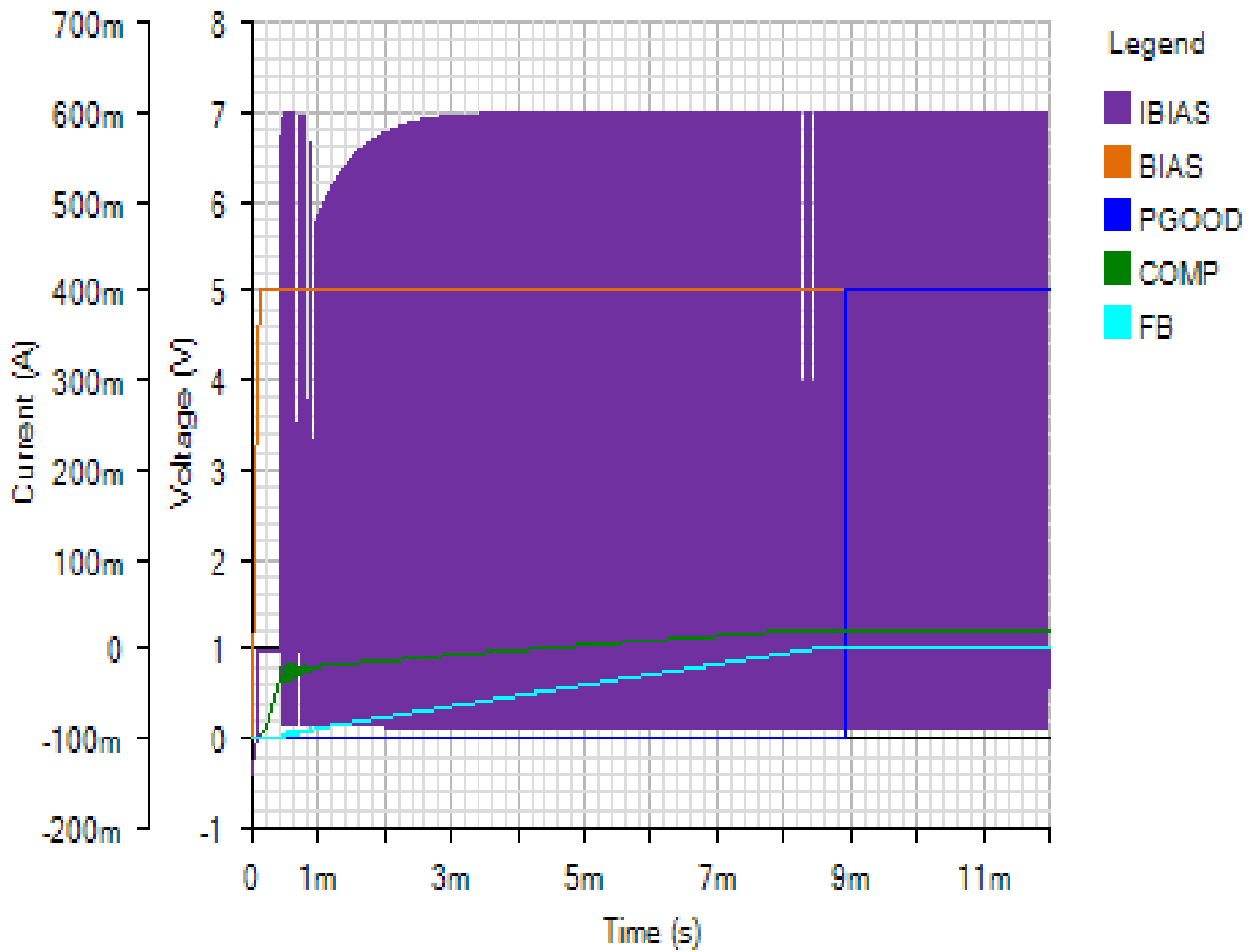
Phase Margin: 70.21° at a crossover frequency of 18.9kHz



Start Up - Tue Nov 20 2018 11:27:18

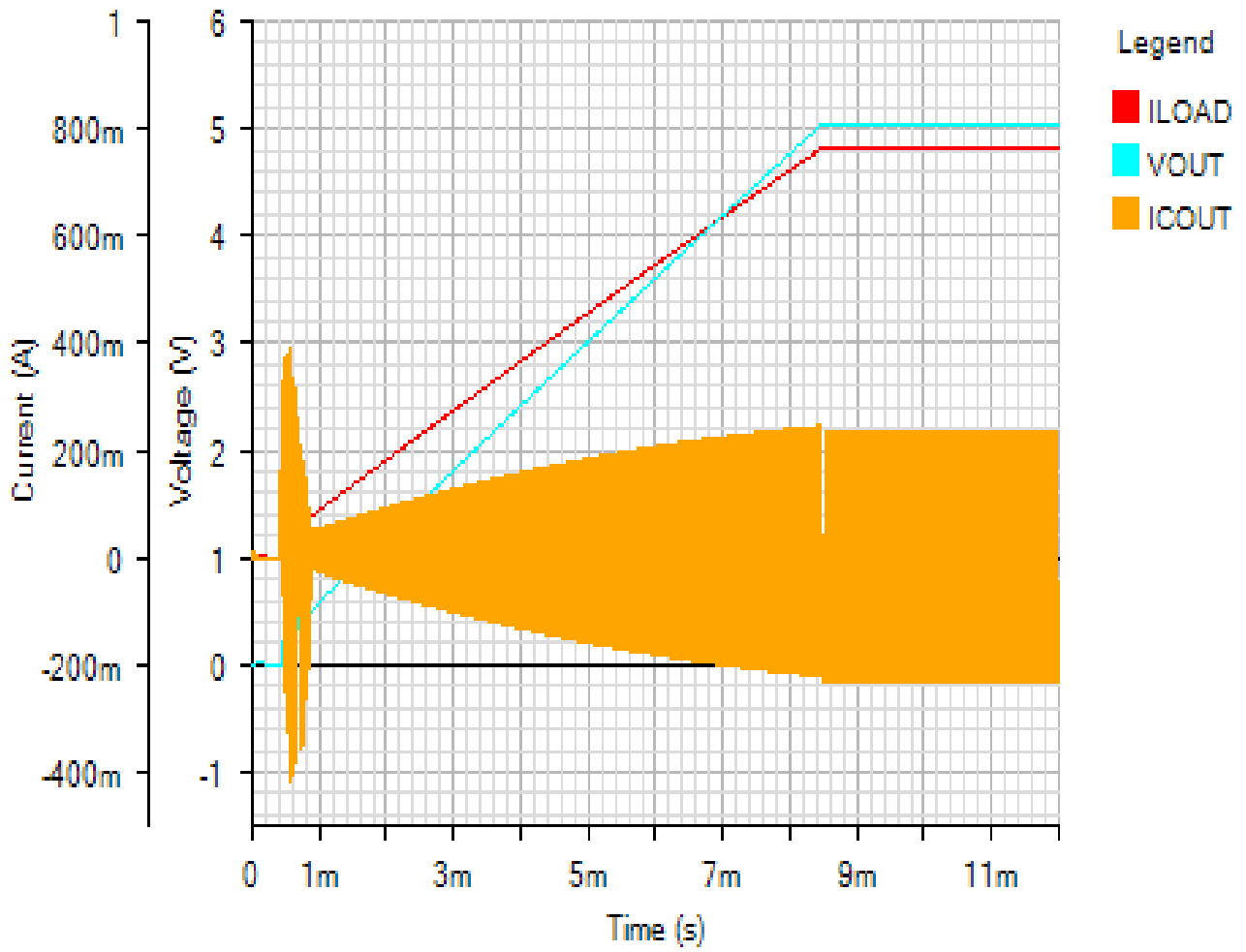
IC

Default



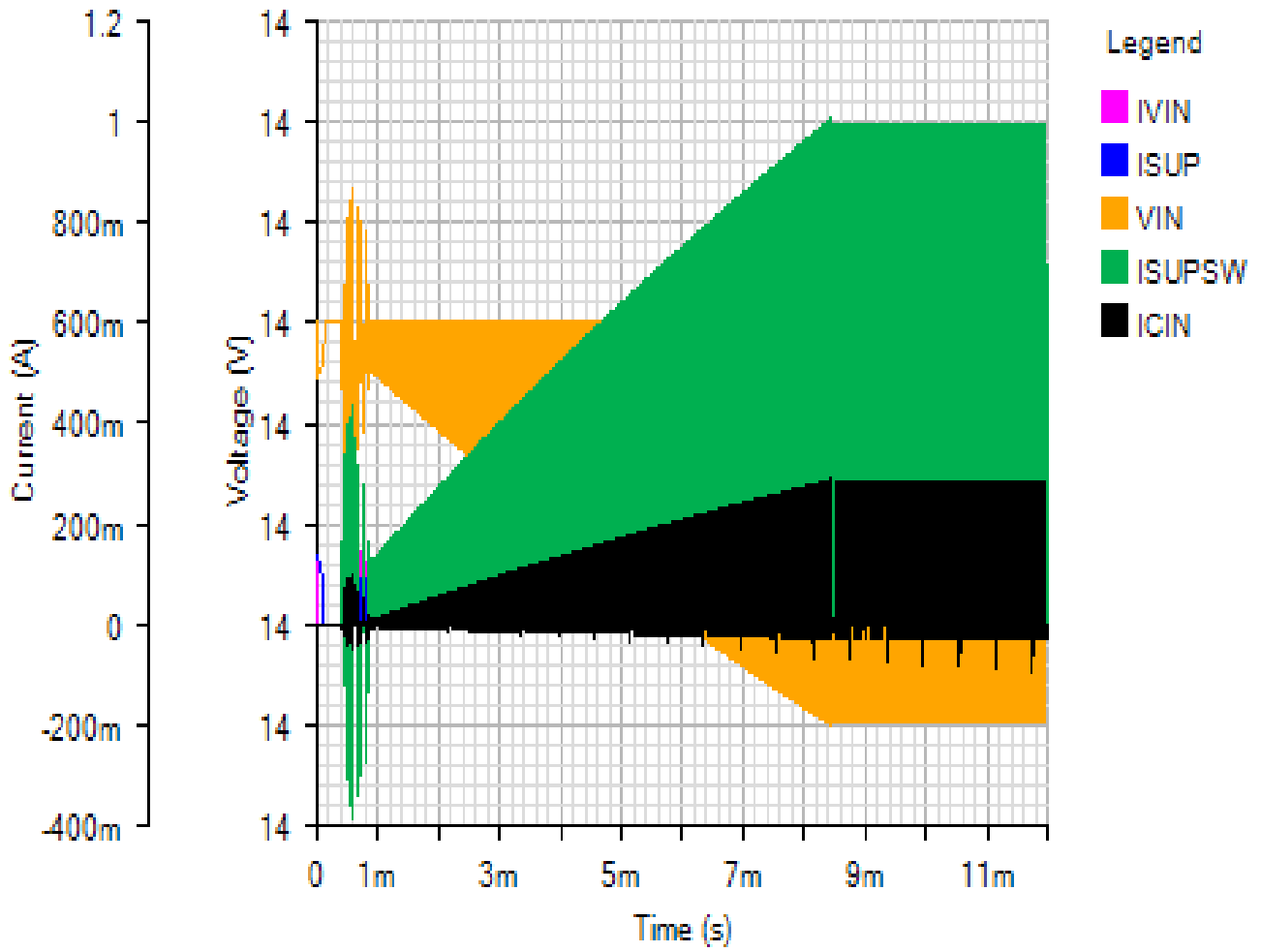
OUTPUT

Default



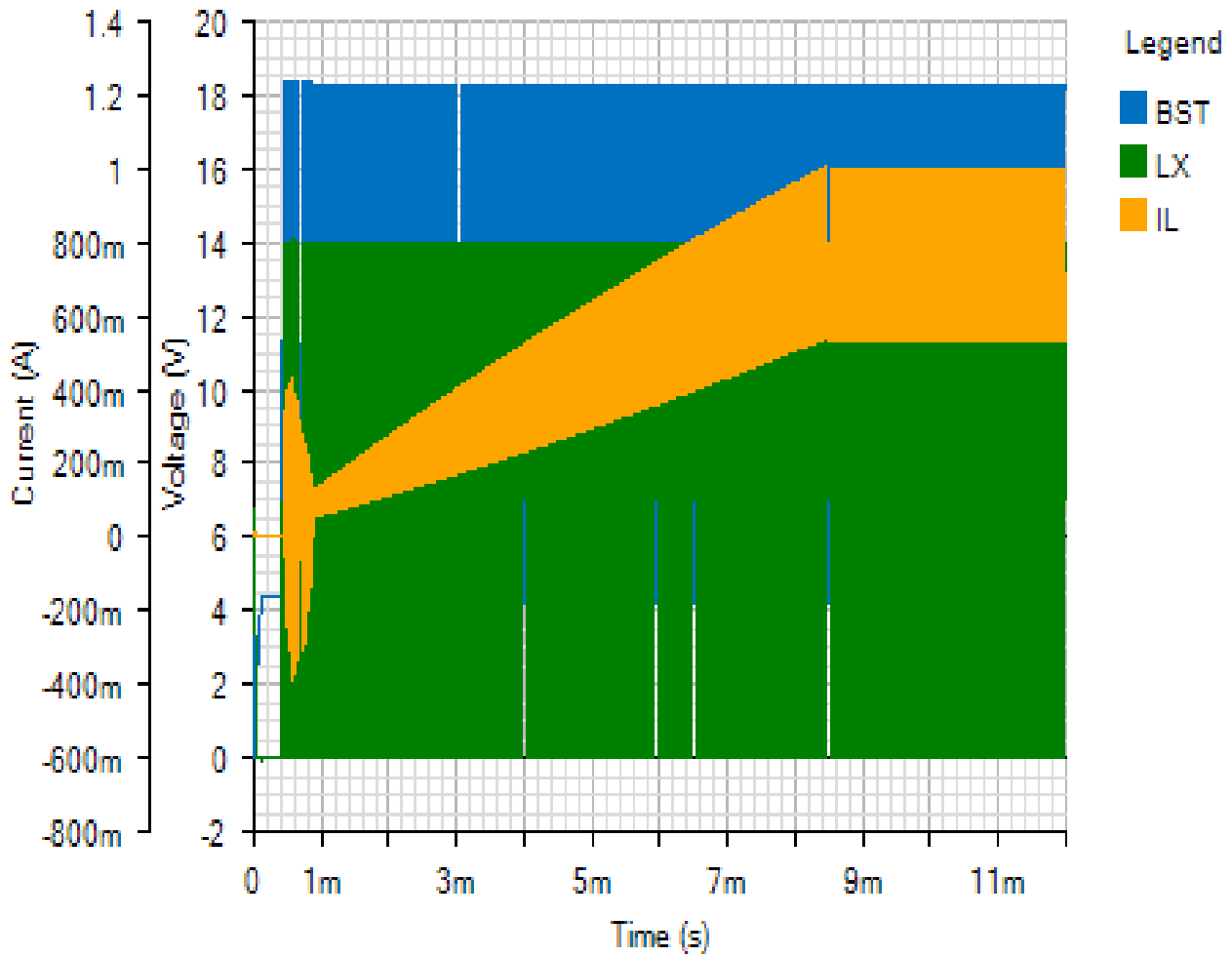
INPUT

Default



SWITCHING

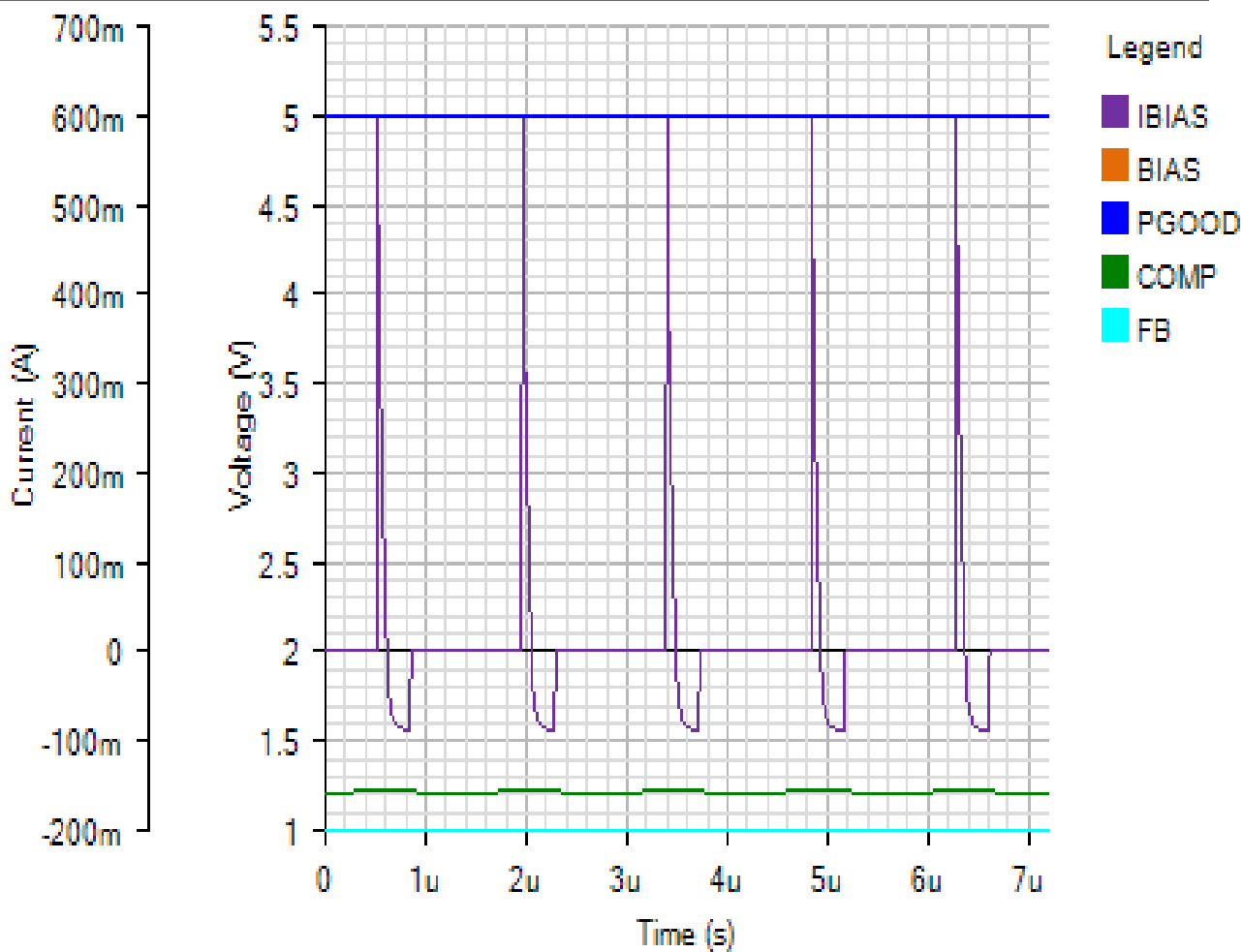
Default



Steady State - Tue Nov 20 2018 11:27:18

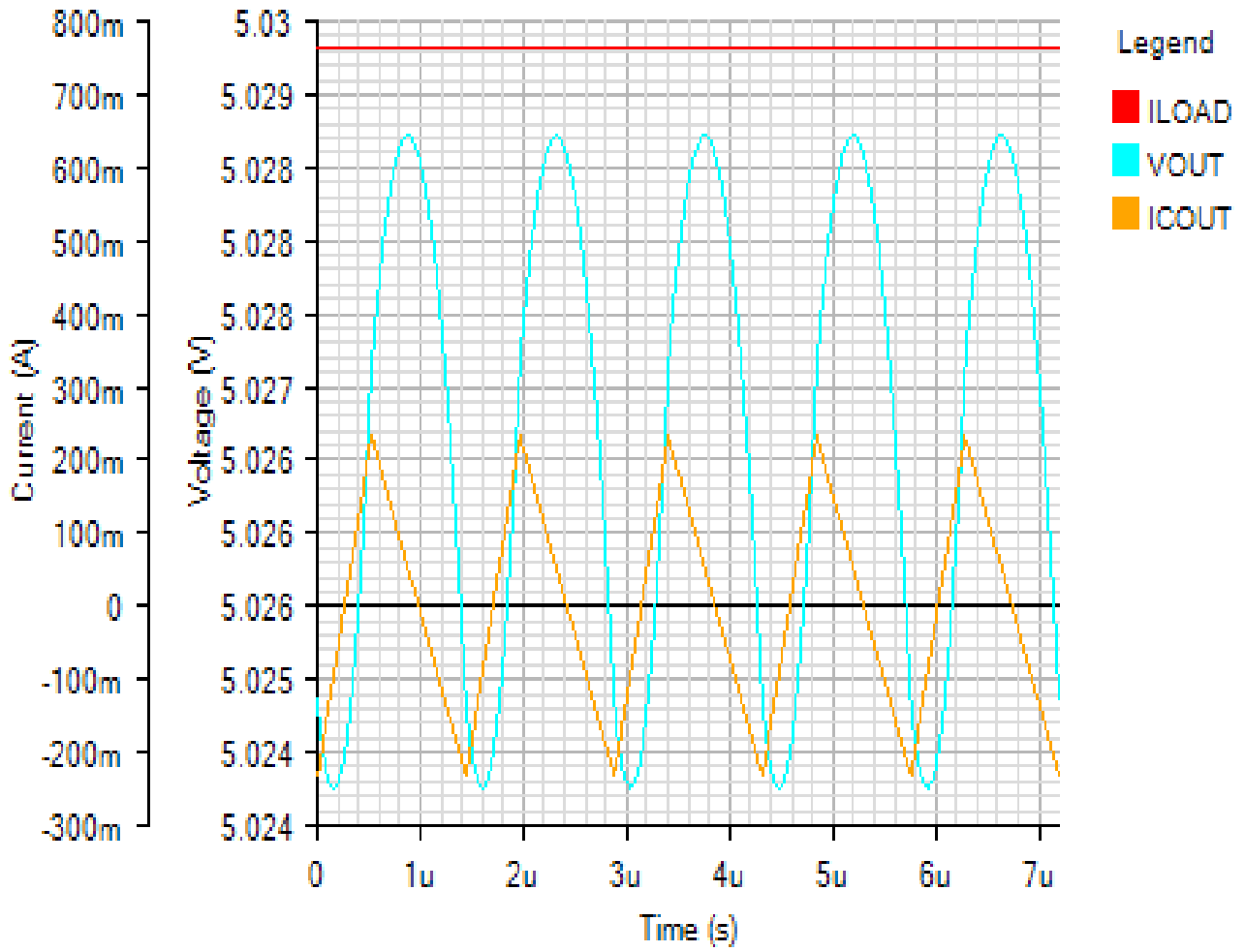
IC

Default



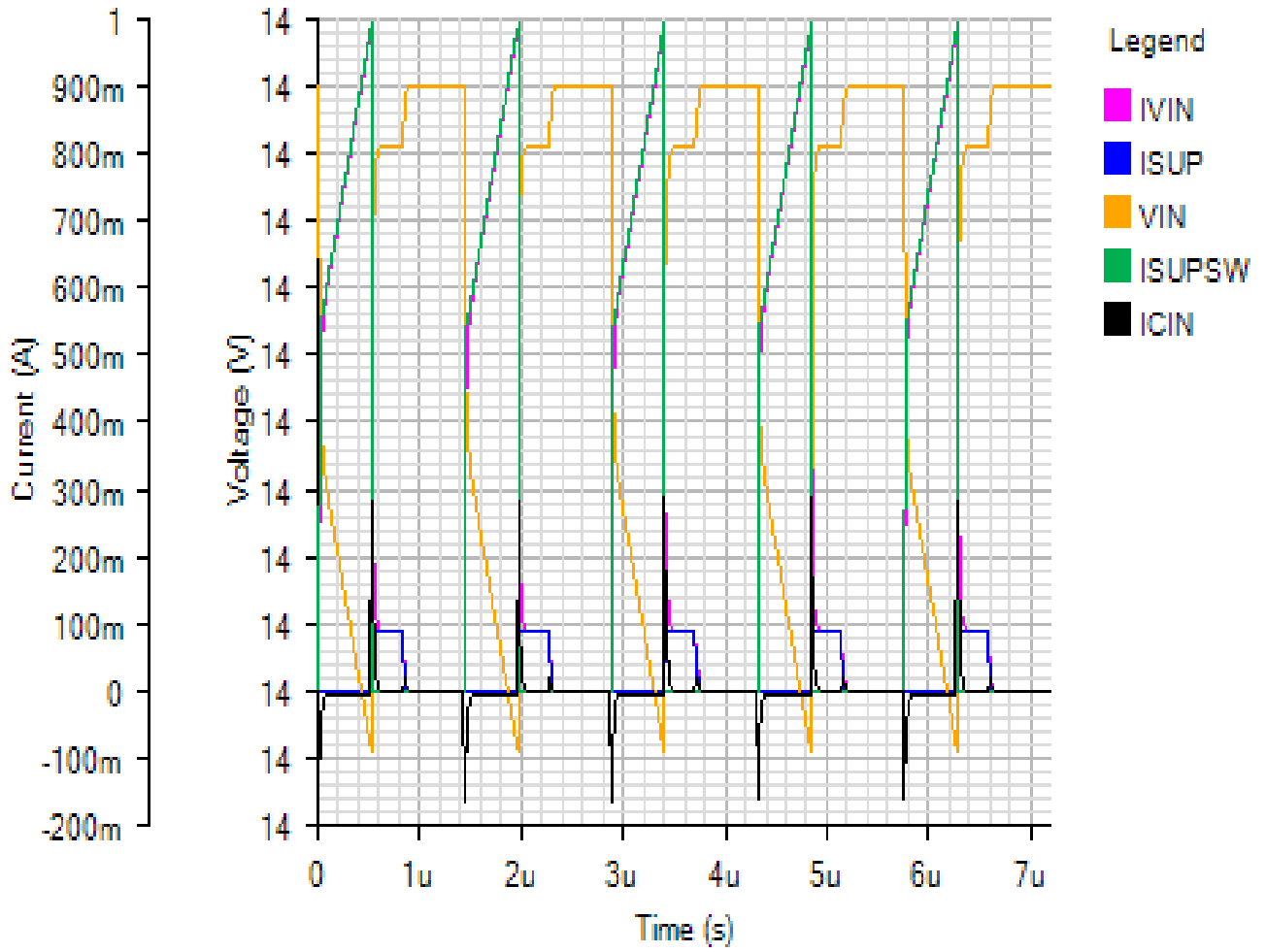
OUTPUT

Default



INPUT

Default



SWITCHING

Default

