

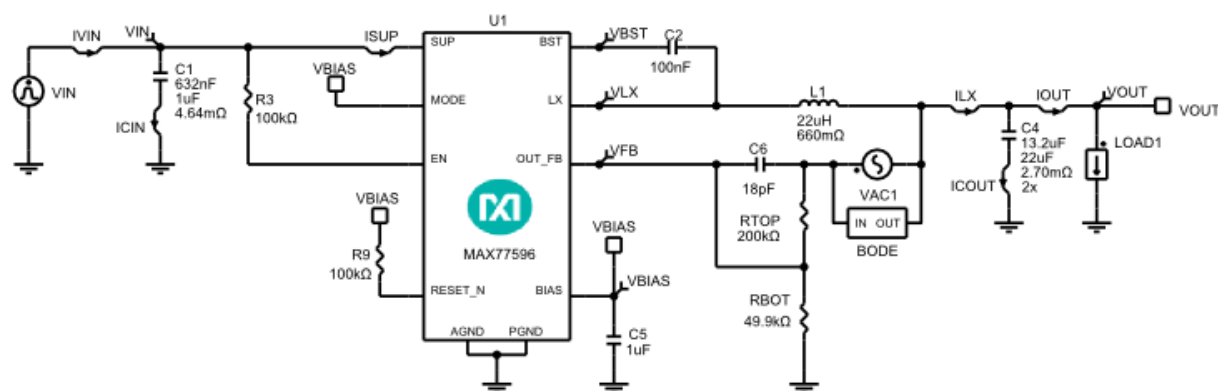
Initial Design

1.0

Design Requirements

Parameter	Value
Min. Input Voltage	10V
Max. Input Voltage	24V
Typ. Input Voltage	12V
Input Voltage Ripple	1%
Output Voltage	5V
Output Current	0.3A
Output Voltage Ripple	1%
Load Step Start Current	0.3A
Load Step Current	0.15A
Load Step Edge Rate	0.1A/us
Output Voltage Load Step Over/Undershoot	1%
Performance Priority	Balance Efficiency and Size
Cost Tradeoff	Cost
Inductor Current Ratio (LIR)	0.3

Schematic



When the load current is less than 135mA, the PWM portion of burst mode has an effective load of at least 135mA. Therefore, AC Loop simulations must be run with at least this much load current.

BOM

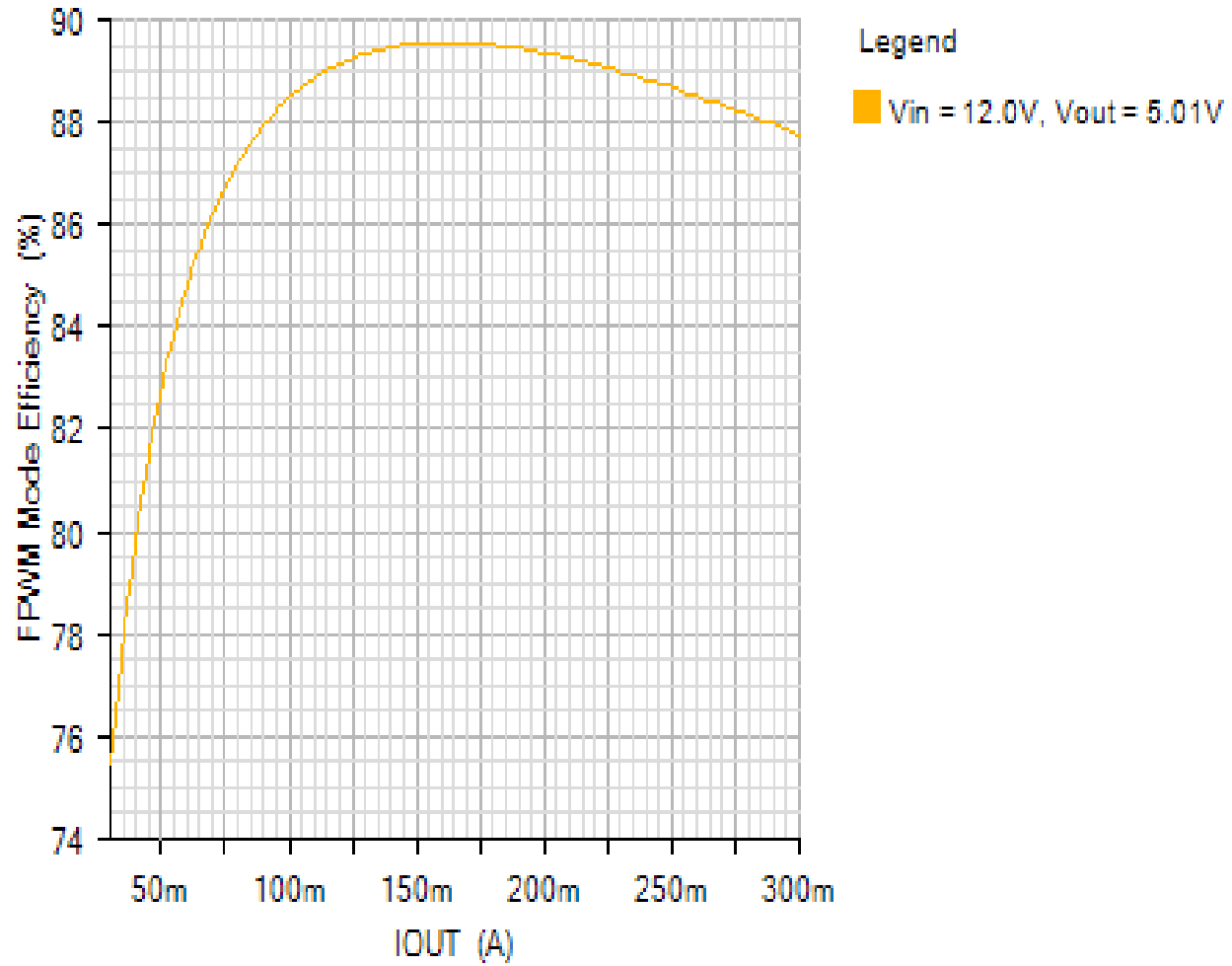
Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX77596	Maxim Integrated	24V, 300mA, Buck Converter with 1.1μA IQ
C1	1	C1608X5R1H105K080AB	TDK	Cap Ceramic 1uF 50V X5R 10% SMD 0603 85C Paper T/R
C2	1	CC0603KRX7R8BB104	Yageo	Cap Ceramic 0.1uF 25V X7R 10% Pad SMD 0603 125°C T/R
C4	2	GRM31CD71A226KE15L	Murata	Cap Ceramic 22uF 10V X7T 10% SMD 1206 125C Embossed T/R
C5	1	CL10B105KA8VPNC	Samsung Electro-Mechanics	Cap Ceramic 1uF 25V X7R 10% Pad SMD 0603 125°C Automotive T/R
C6	1	C0603C180J3GACTU	KEMET Corporation	Cap Ceramic 18pF 25V C0G 5% Pad SMD 0603 125°C T/R
L1	1	VLS3015ET-220M	TDK	Inductor Power Shielded Wirewound 22uH 20% 1MHz Ferrite 620mA 660mOhm DCR 1212 T/R
R3	1	ERJ3GEYJ104V	Panasonic	Res Thick Film 0603 100K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R9	1	ERJ3GEYJ104V	Panasonic	Res Thick Film 0603 100K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
RBOT	1	ERJ3EKF4992V	Panasonic	Res Thick Film 0603 49.9K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
RTOP	1	ERJ3EKF2003V	Panasonic	Res Thick Film 0603 200K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Sun Nov 18 2018 16:16:17

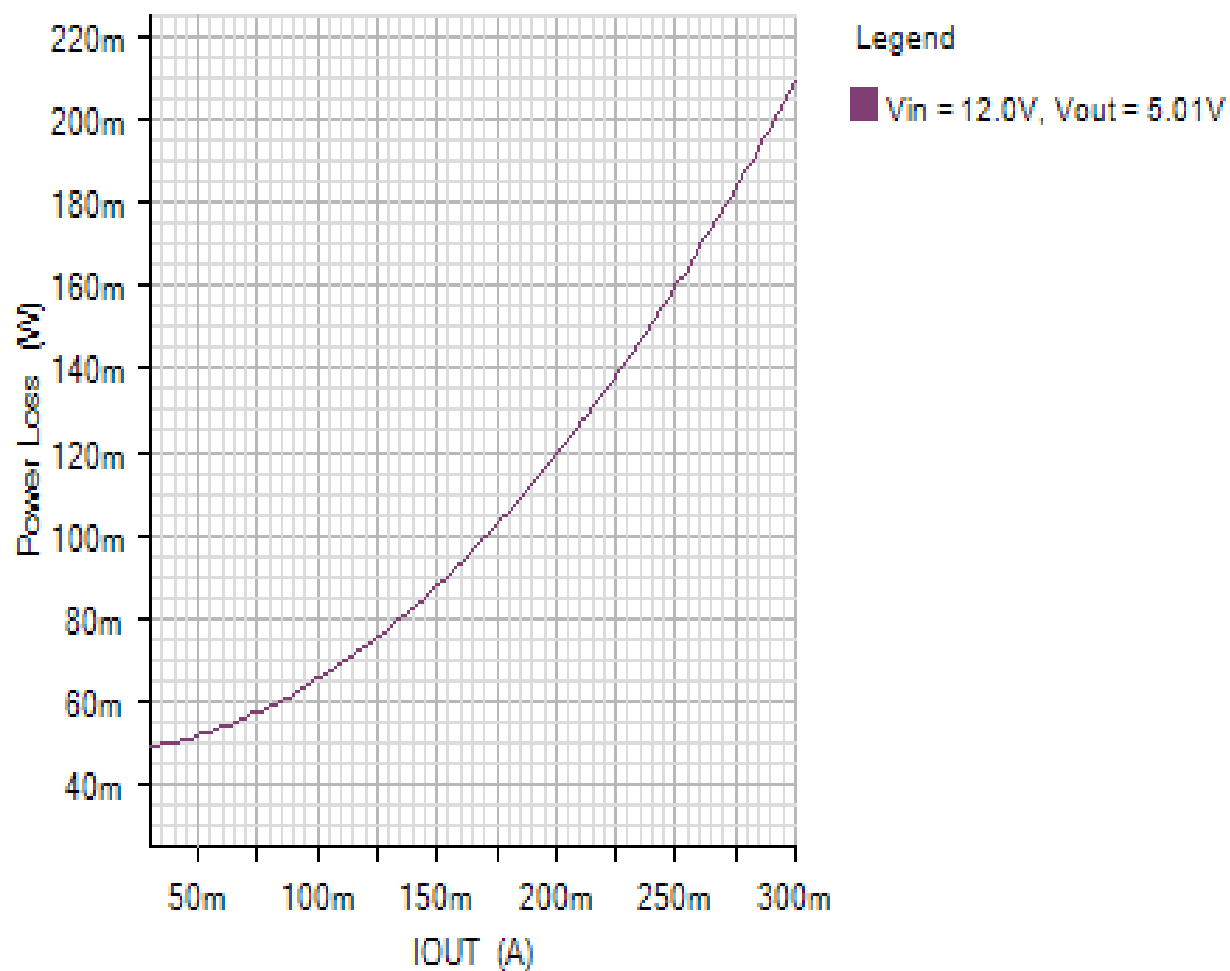
EFFICIENCY_PLOT

Default

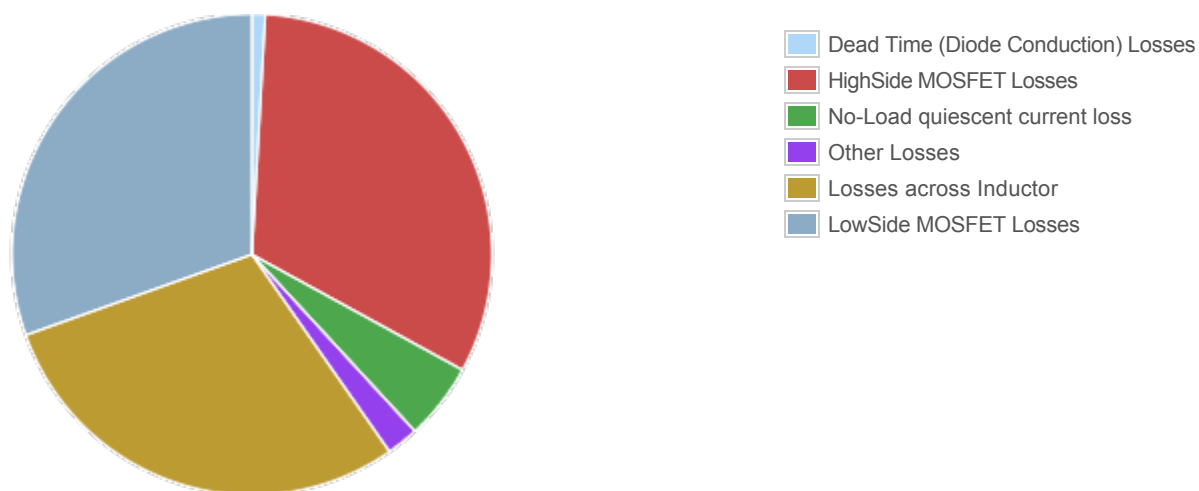


POWER_LOSS_PLOT

Default



Losses



Component

Loss (W)

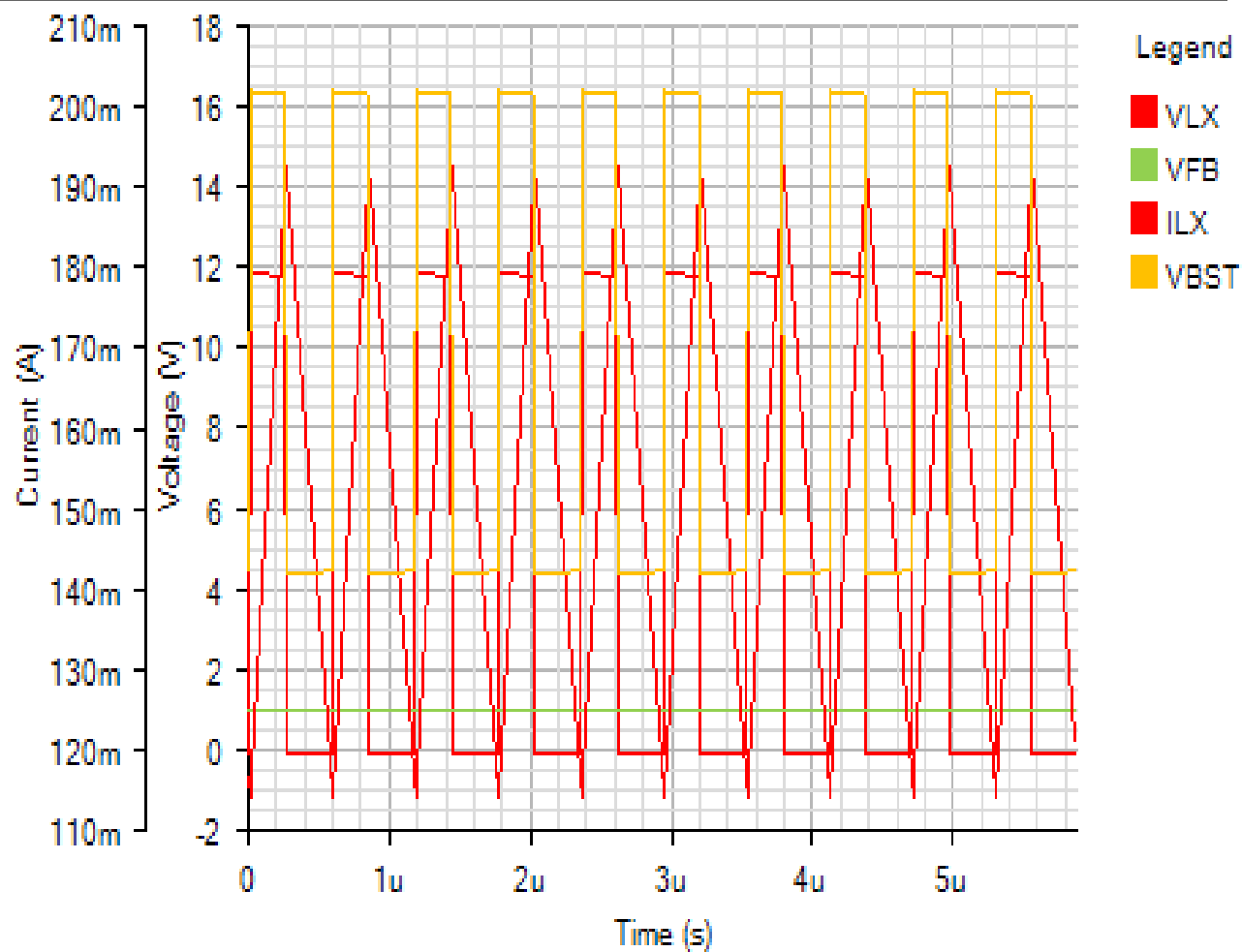
% of total

Component	Loss (W)	% of total
Dead Time (Diode Conduction) Losses	0.008867	0.9
HighSide MOSFET Losses	0.320825	32.1
No-Load quiescent current loss	0.05157	5.2
Other Losses	0.021609	2.2
Losses across Inductor	0.292706	29.3
LowSide MOSFET Losses	0.304423	30.4
Total	1	100

Steady State - Sun Nov 18 2018 16:16:17

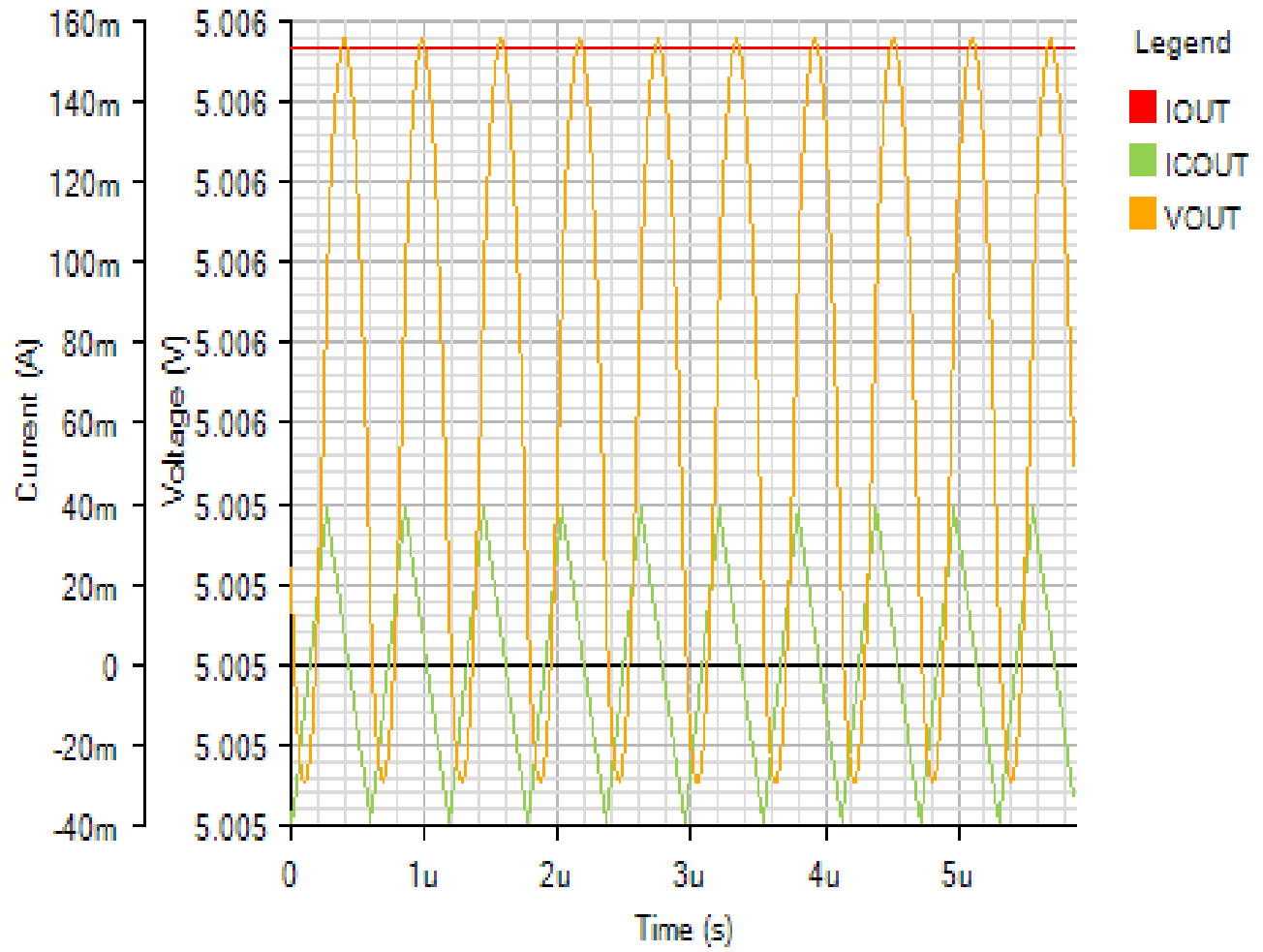
SWITCHING

Default



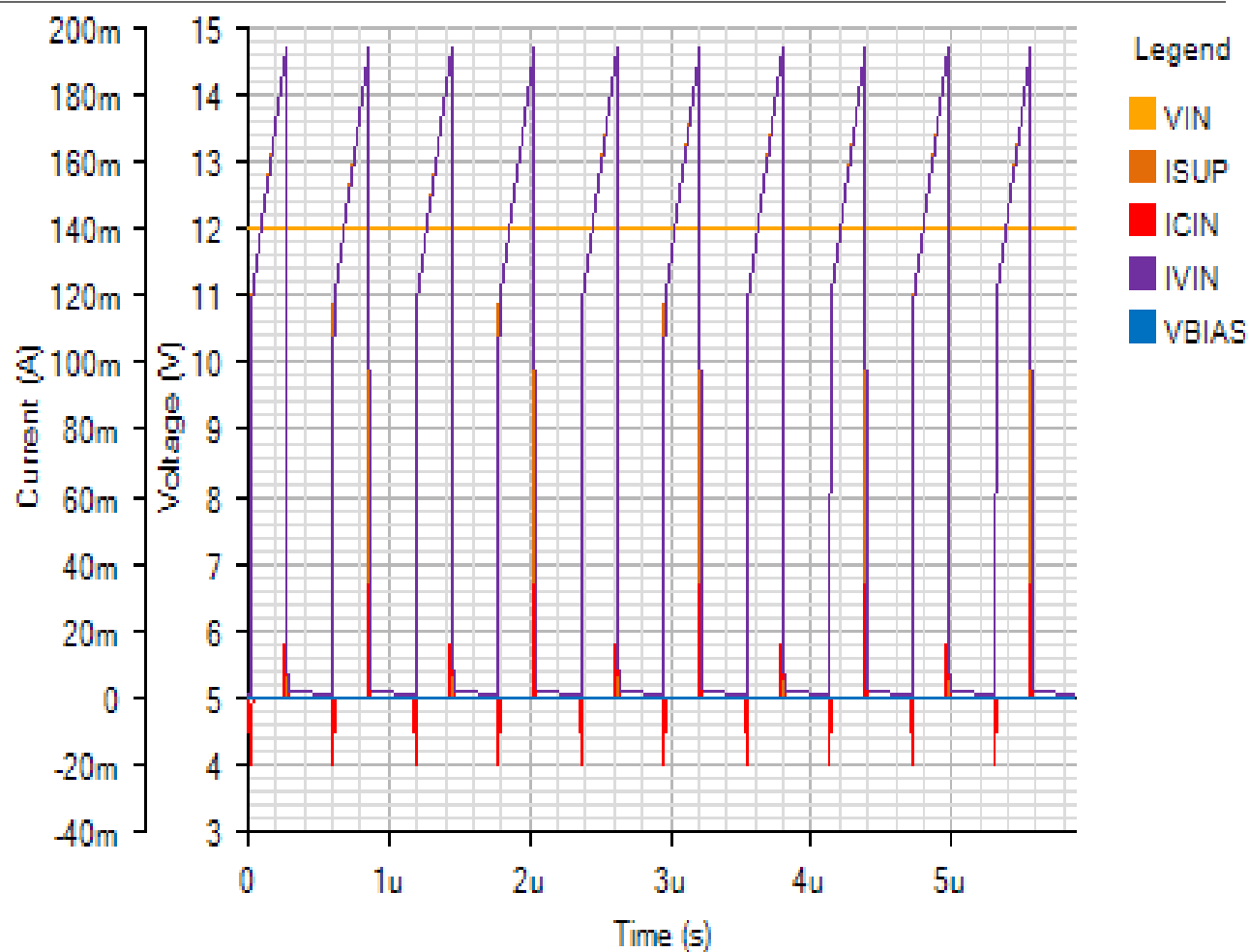
OUTPUT

Default



INPUT

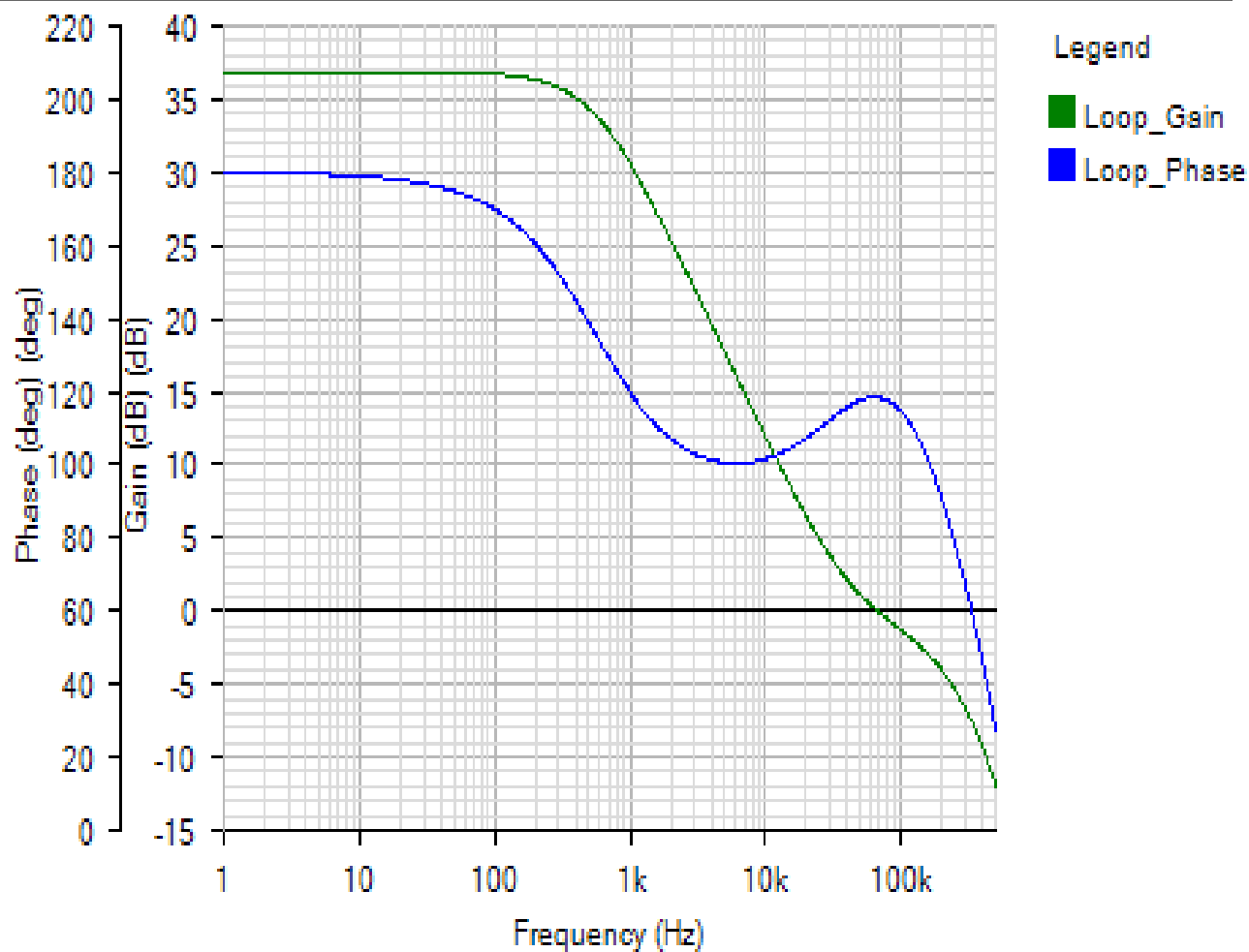
Default



AC Loop - Sun Nov 18 2018 16:16:17

BODE

Default



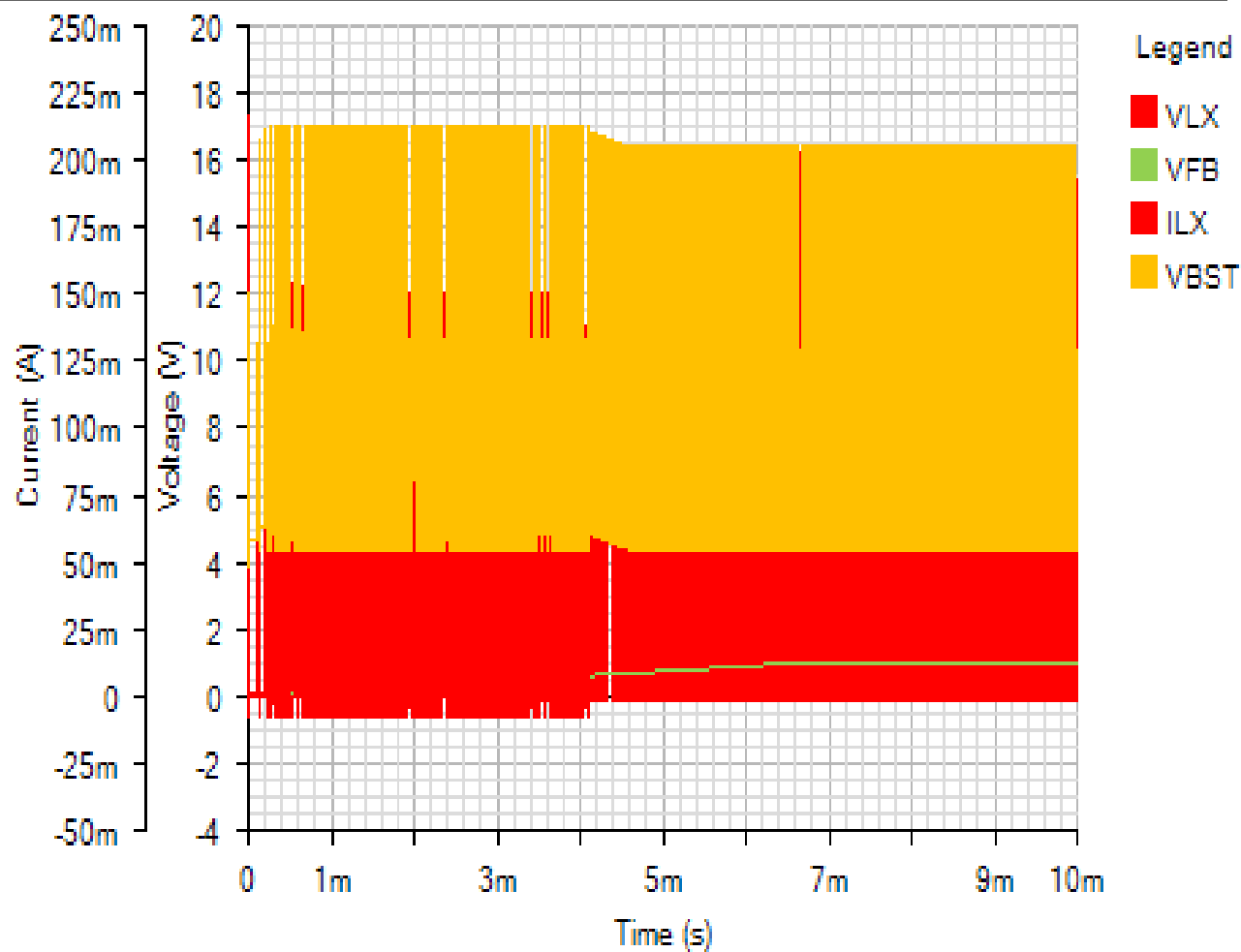
Phase Margin: 118.45° at a crossover frequency of 66.9kHz



Start Up - Sun Nov 18 2018 16:16:17

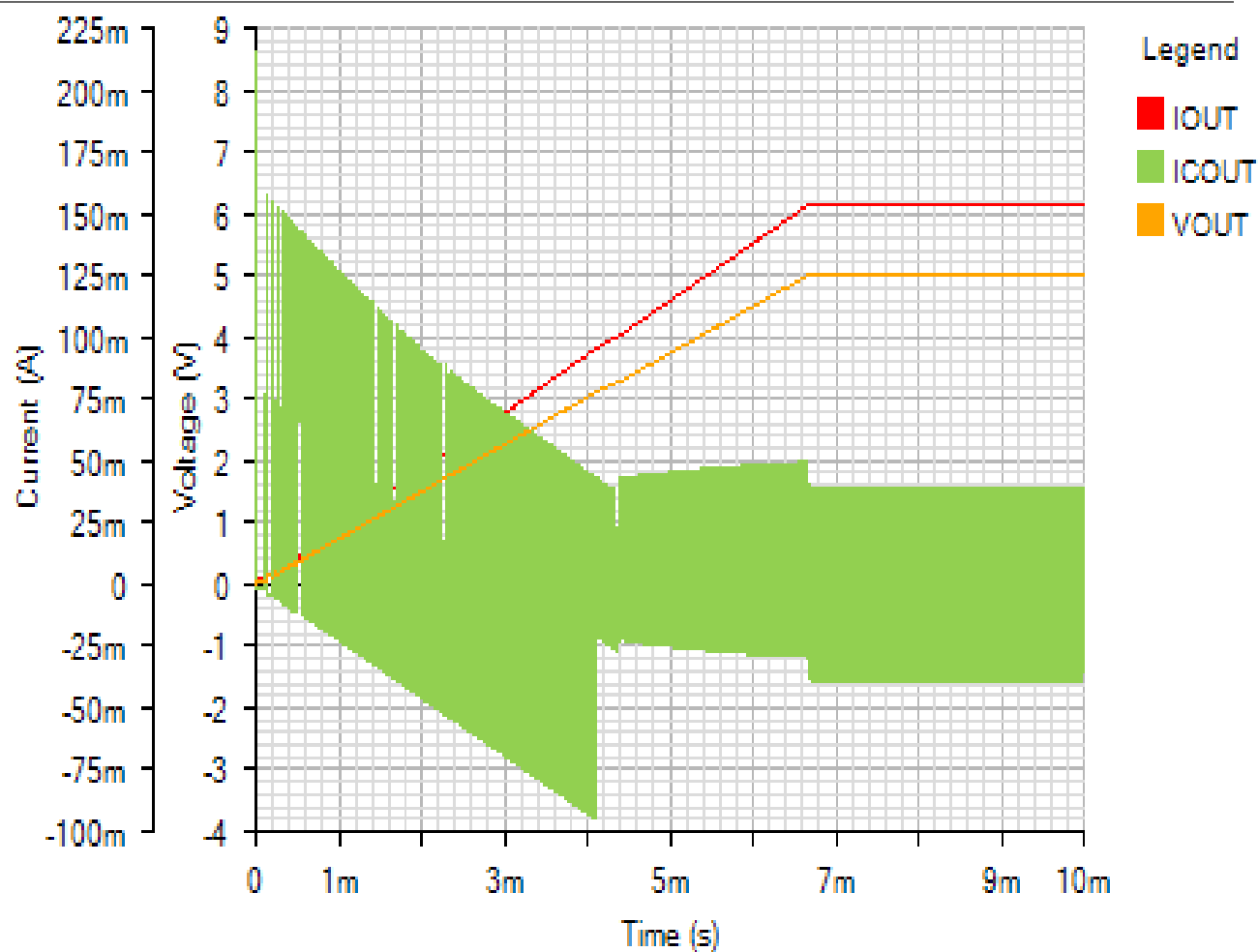
SWITCHING

Default



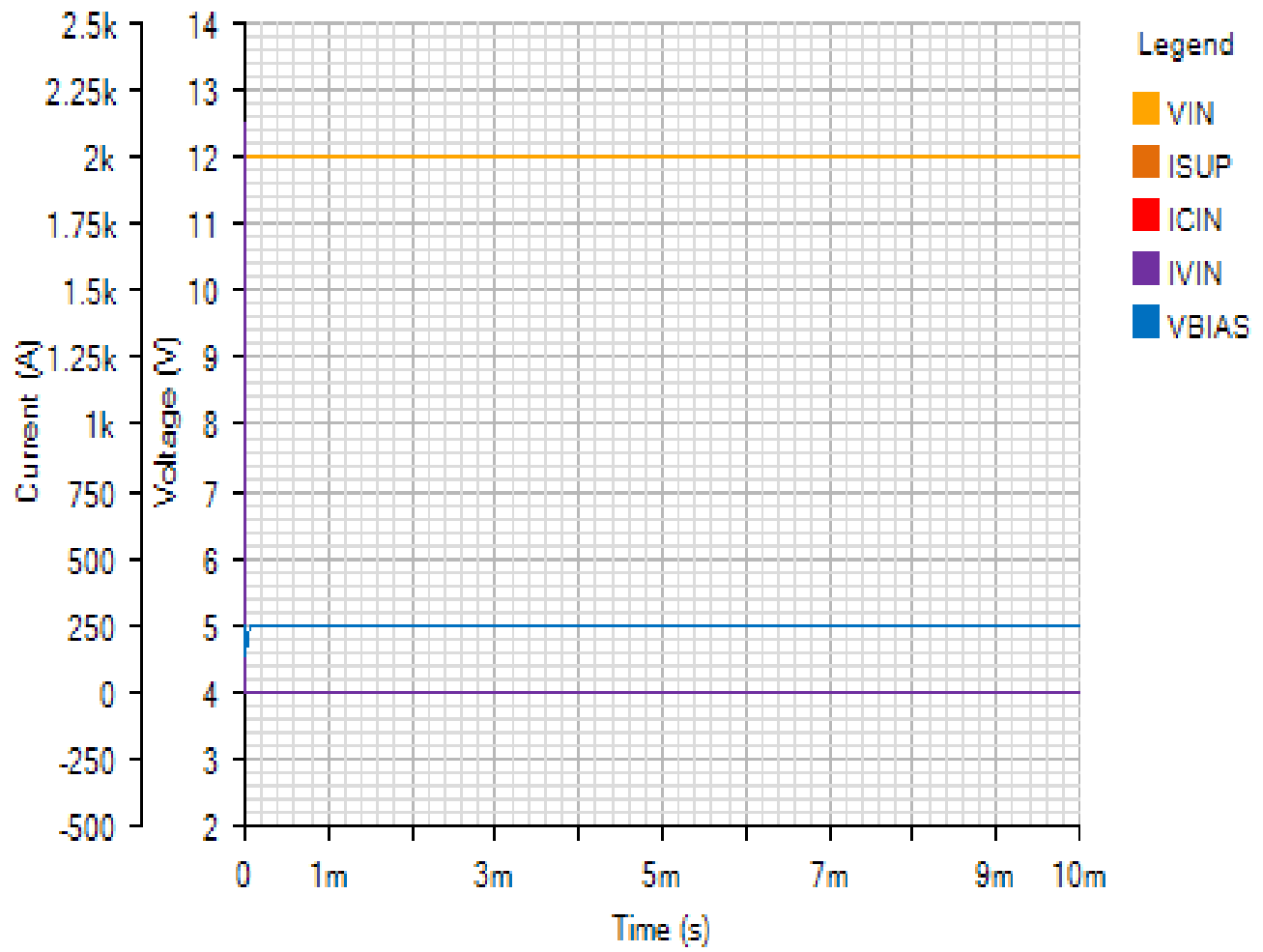
OUTPUT

Default



INPUT

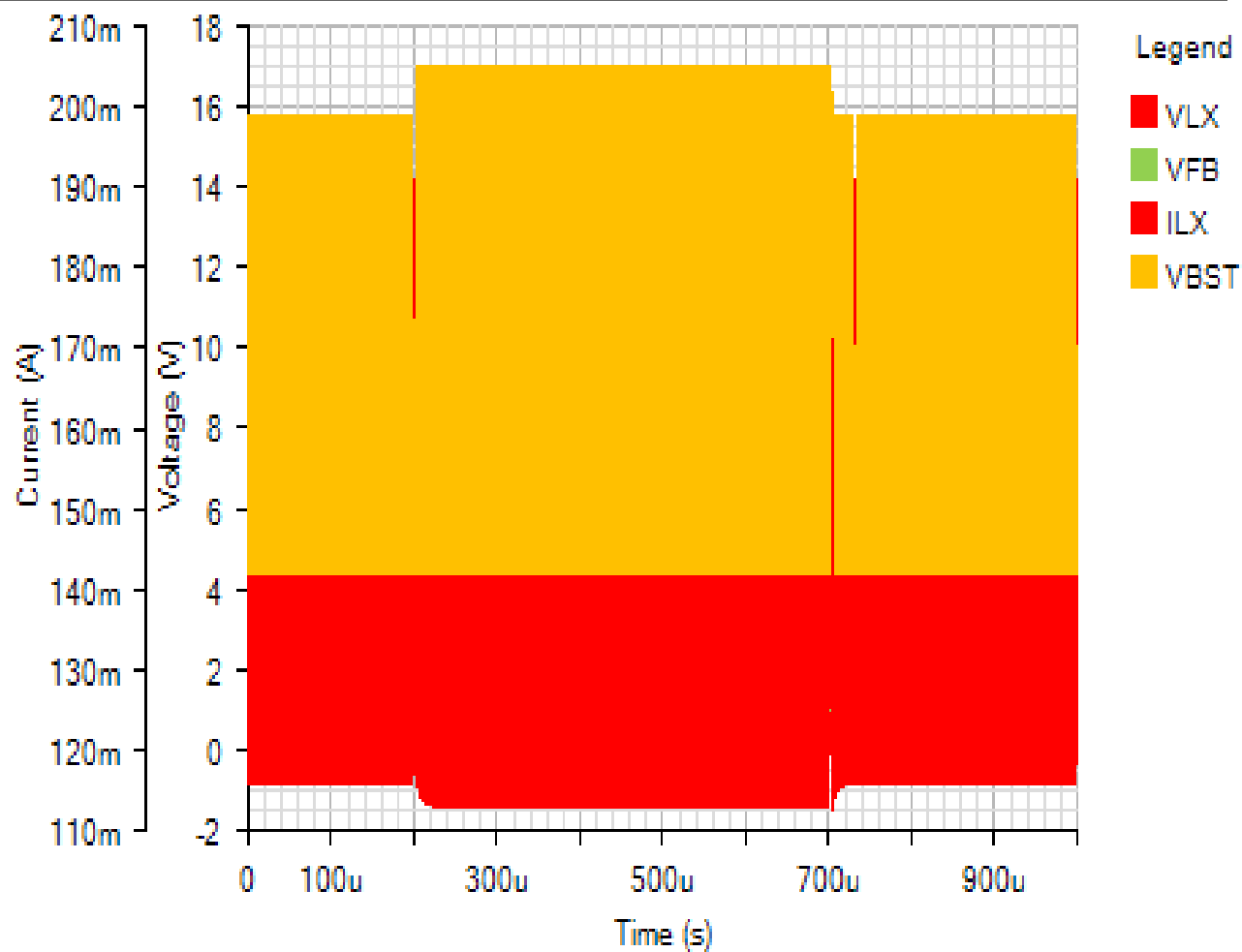
Default



Line Transient - Sun Nov 18 2018 16:16:17

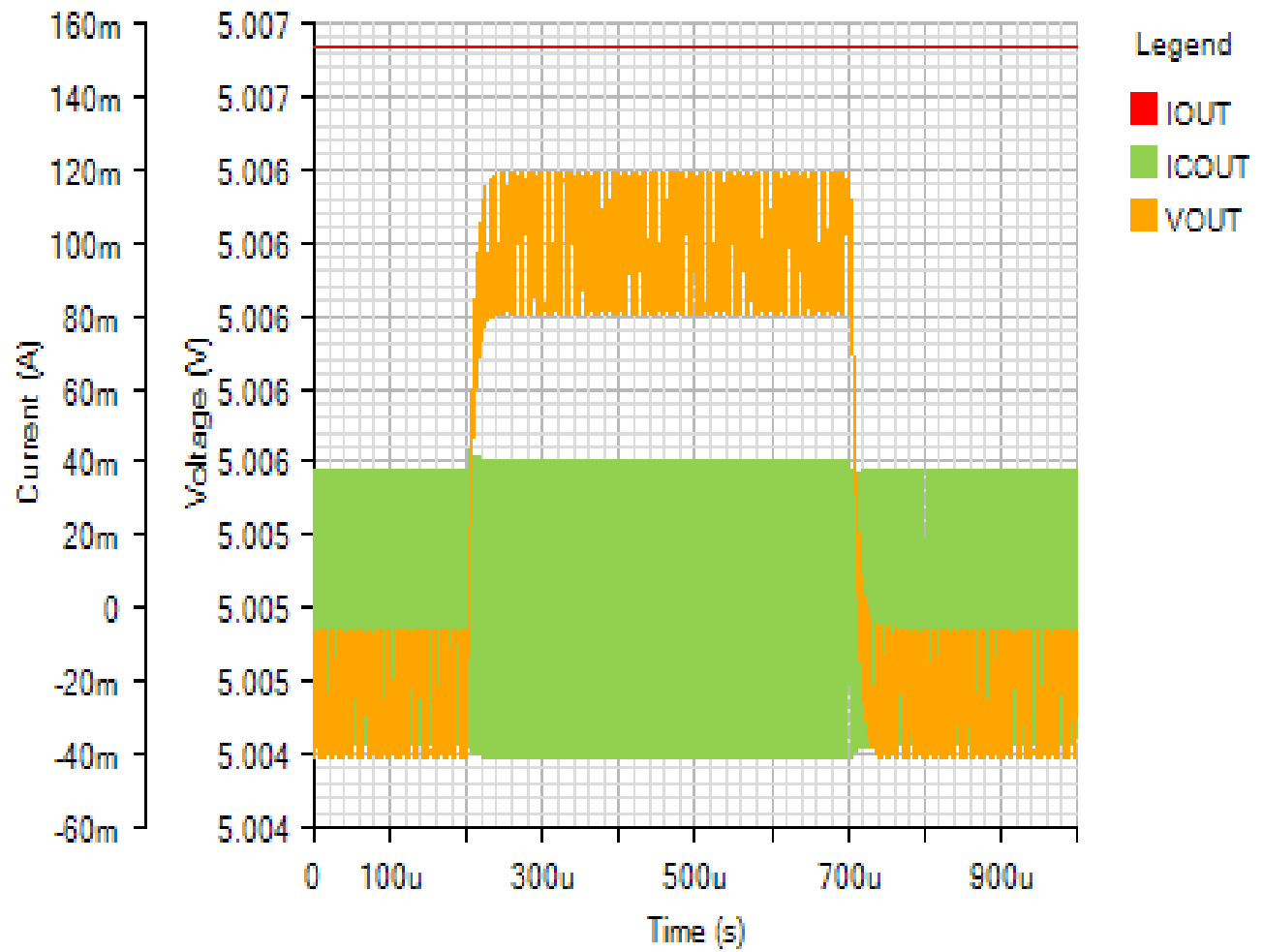
SWITCHING

Default



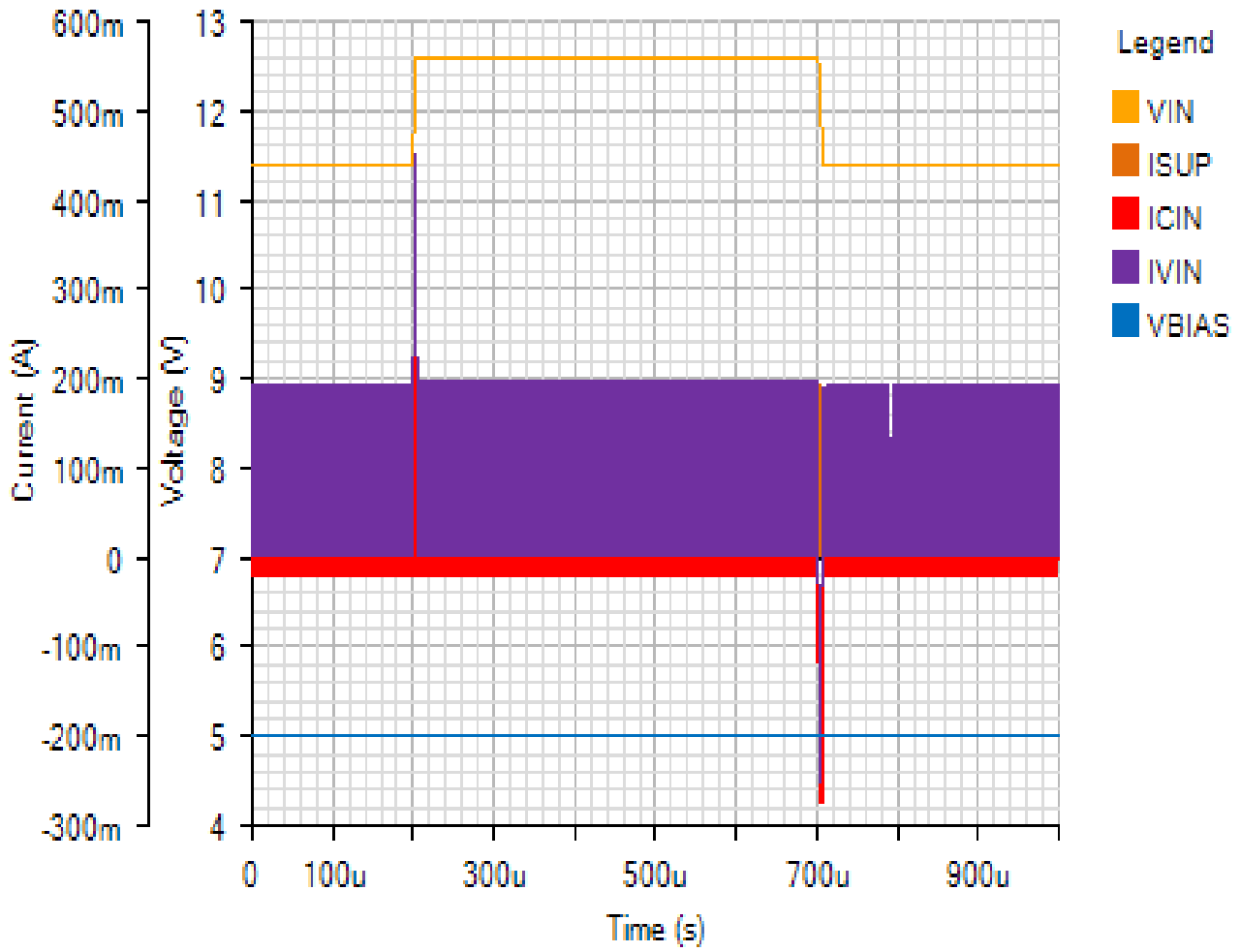
OUTPUT

Default



INPUT

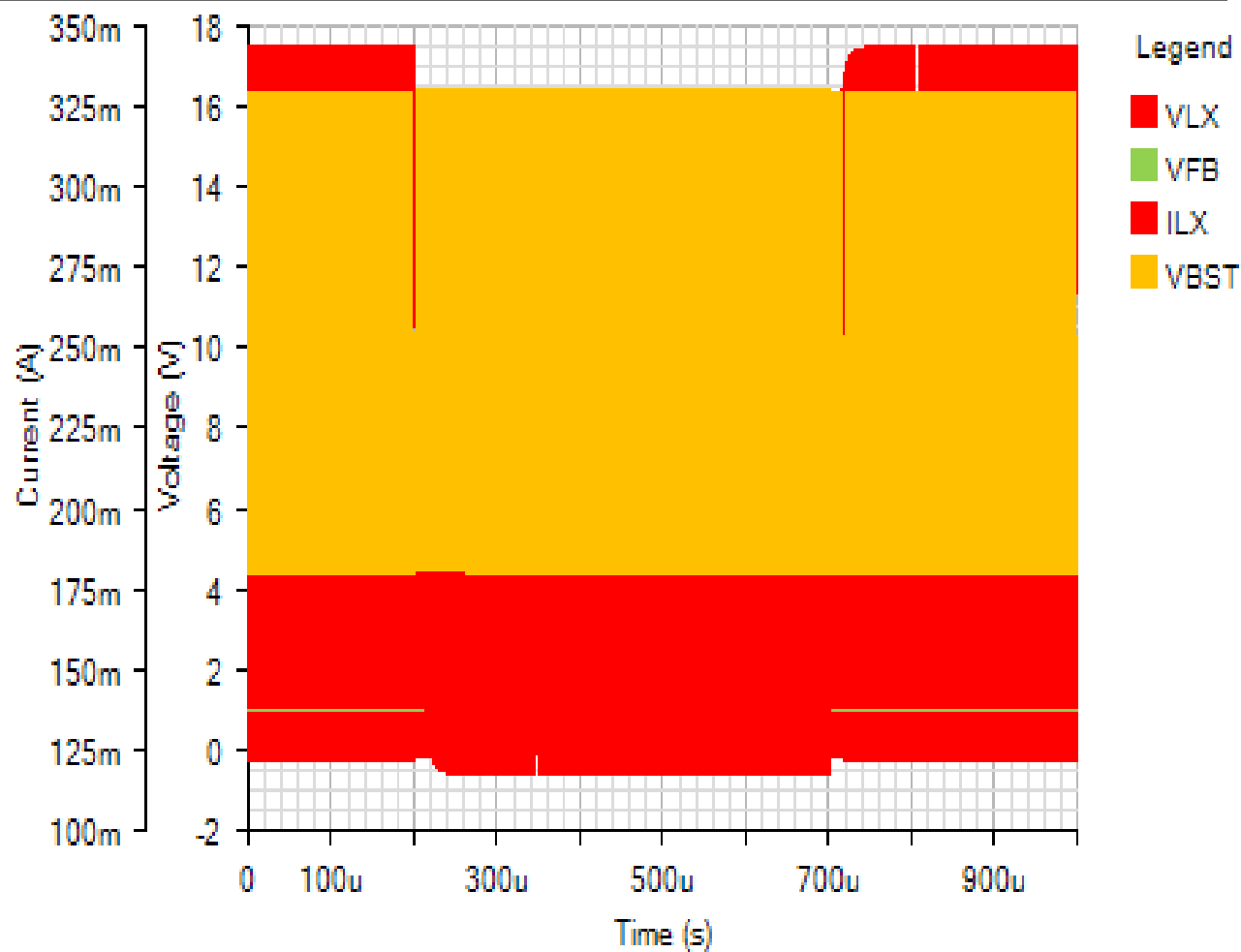
Default



Load Step - Sun Nov 18 2018 16:16:17

SWITCHING

Default



OUTPUT

Default

