Initial Design

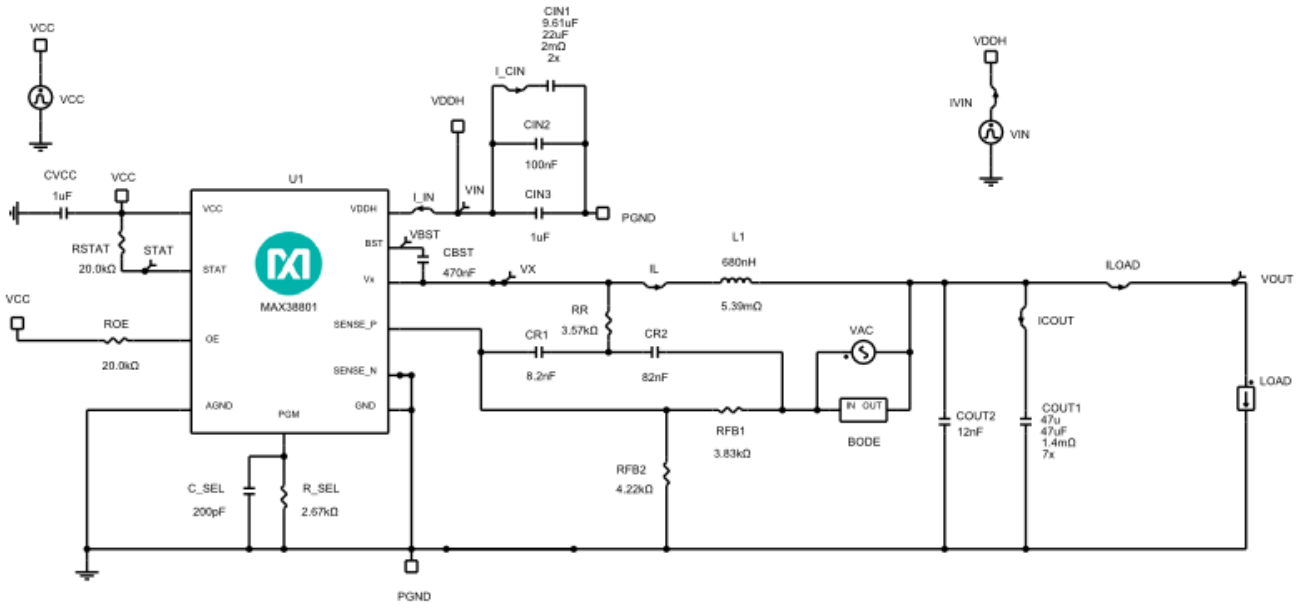
1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	11.4V
Maximum Input Voltage	12.6V
Nominal Input Voltage	12V
Input Voltage Ripple	1%
Output Voltage	1.8V
Output Current	10A
Output Voltage Ripple	1%
Load Step Start Current	5A
Load Step Current	10A
Load Step Edge Rate	5A/us
Output Voltage Load Step Over/Undershoot	3%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Reference Voltage value (Vref)	0.95V
External Reference Voltage	0.6V
Soft Start Time(Tss)	6ms
Over Current Protection (Valley OCP)	15A
Operation Modes	CCM/DCM
Reporting	Current
Rsense Gain	2.1mohm
Switching Frequency Setting	Fsw5
STAT Blank Time	2000us
Inductor Current Ratio(LIR)	0.3

Parameter	Value
Ambient Temperature	25°C

Schematic



Overtemperature Protection (OTP), and Current/Temp Reporting features are not modeled in EE-Sim.

This note only applies to online EE-sim Design Tool : R_SEL and C_SEL are set to the proper values for the design requirements entered. To change any of the chip parameters that these components set, change the design requirements accordingly and create a new design.

BOM

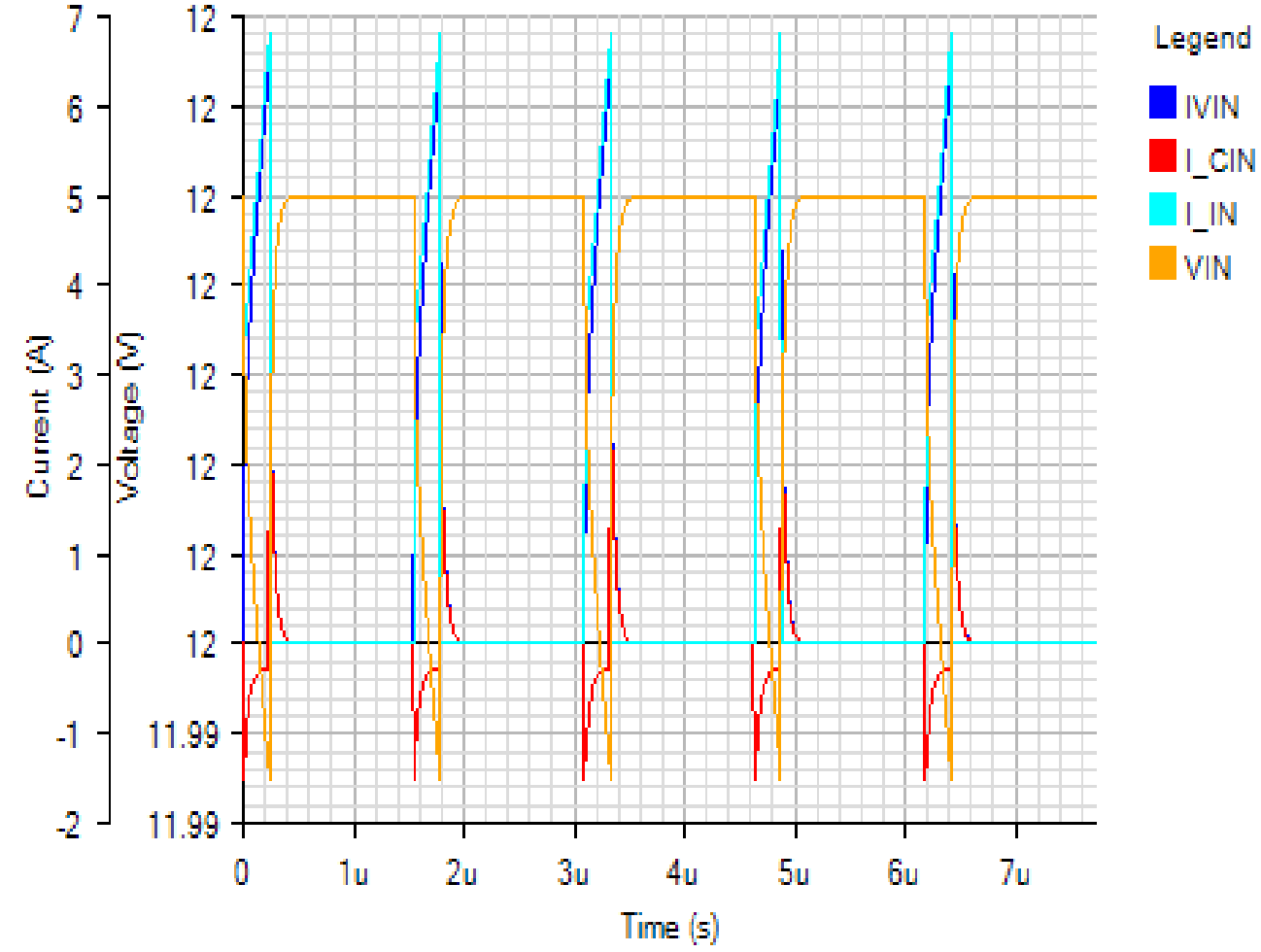
Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX38801	User-Defined	IC
CBST	1	GCM188R71E474KA64D	Murata Manufacturing	Cap Ceramic 0.47uF 25V X7R 10% Pad SMD 0603 125°C Automotive T/R
CIN1	2	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
CIN2	1	CC0402KRX7R8BB104	Yageo	Cap Ceramic 0.1uF 25V X7R 10% Pad SMD 0402 125°C T/R
CIN3	1	0603YC105KAT2A	AVX	Cap Ceramic 1uF 16V X7R 10% Pad SMD 0603 125°C T/R
COUT1	7	GRM32EE70J476ME20L	Murata	Cap Ceramic 47uF 6.3V 1210 125C
COUT2	1	0402YC123KAT2A	AVX	Cap Ceramic 0.012uF 16V X7R 10% Pad SMD 0402 125°C T/R
CR1	1	06031C822KAT2A	AVX	Cap Ceramic 0.0082uF 100V X7R 10% Pad SMD 0603 125°C T/R
CR2	1	C0603C823K3RACTU	KEMET Corporation	Cap Ceramic 0.082uF 25V X7R 10% Pad SMD 0603 125°C T/R

CVCC	1	CC0603KRX7R6BB105	Yageo	Cap Ceramic 1uF 10V X7R 10% Pad SMD 0603 125°C T/R
C_SEL	1	VJ0603D201MXXAT	Vishay	Cap Ceramic 200pF 25V C0G 20% Pad SMD 0603 125°C T/R
L1	1	SPM6530T-R68M140	TDK	Inductor Power Shielded Wirewound 680nH 20% 100KHz Metal 16A 5.39mOhm DCR T/R
RFB1	1	ERJ2RKF3831X	Panasonic	Res Thick Film 0402 3.83K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
RFB2	1	ERJ3EKF4221V	Panasonic	Res Thick Film 0603 4.22K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
ROE	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
RR	1	ERJ2RKF3571X	Panasonic	Res Thick Film 0402 3.57K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
RSTAT	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R_SEL	1	ERJ3EKF2671V	Panasonic	Res Thick Film 0603 2.67K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

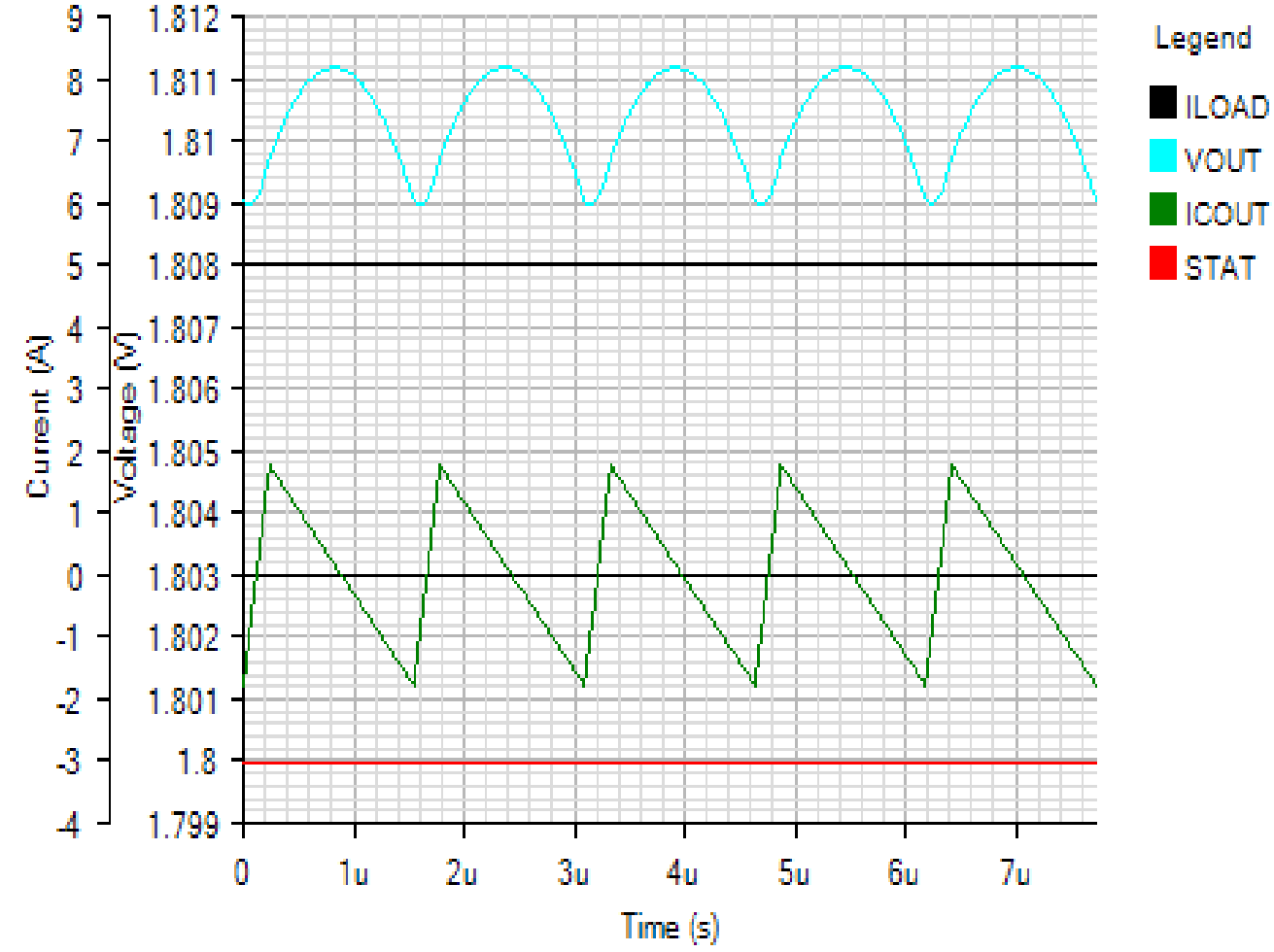
Simulation Results

Steady State - Sun Nov 18 2018 16:02:40

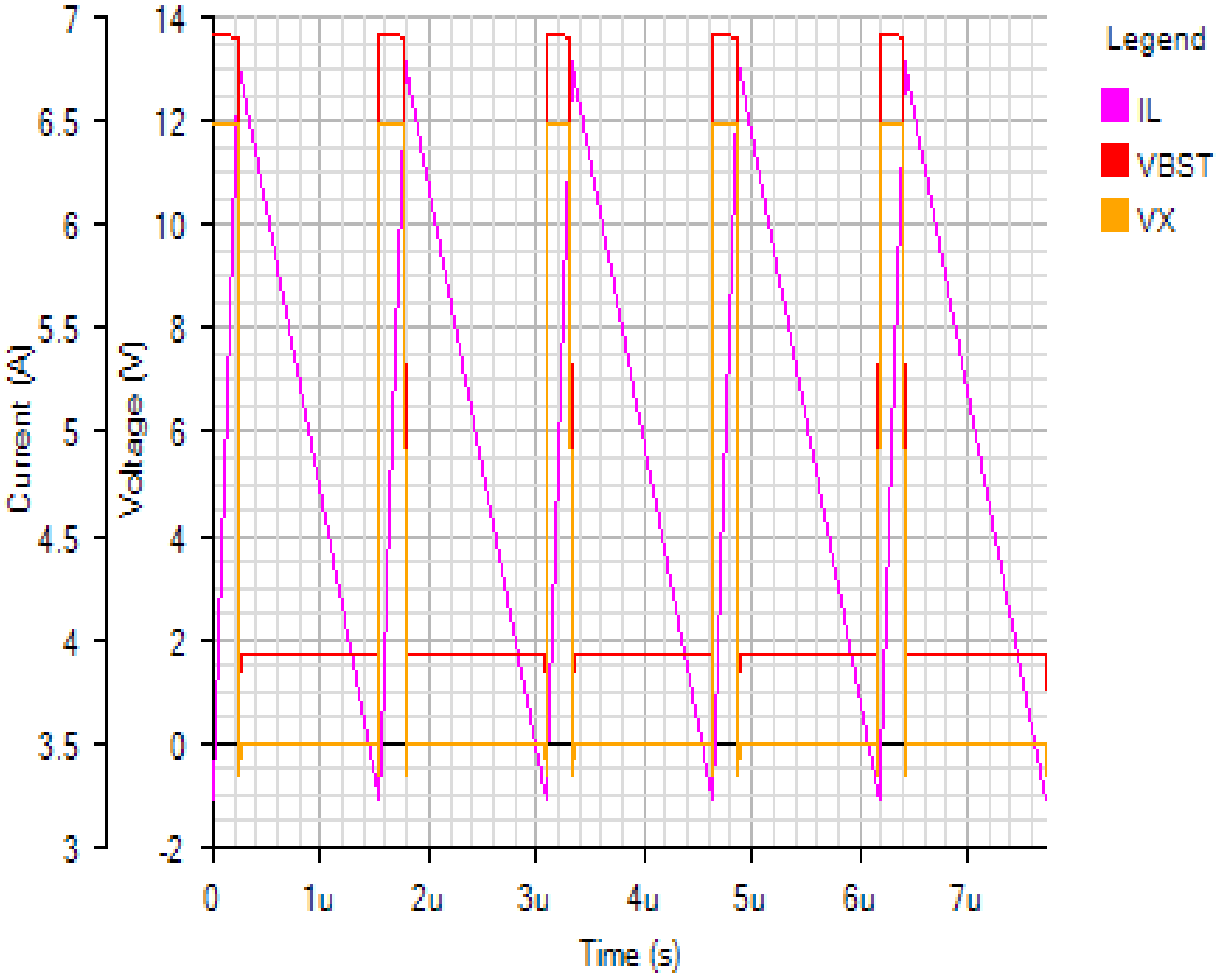
INPUT Default



OUTPUT Default

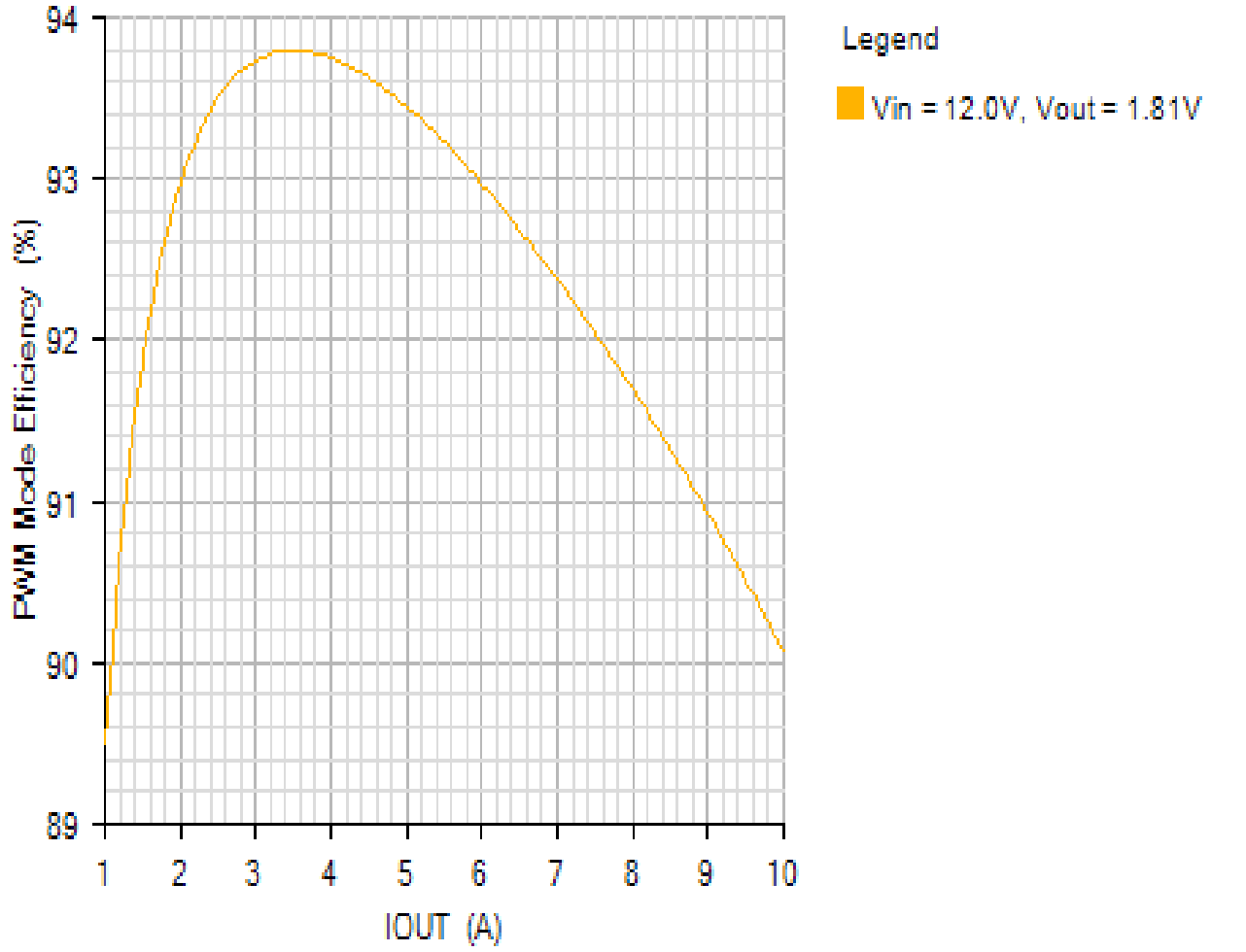


SWITCHING Default

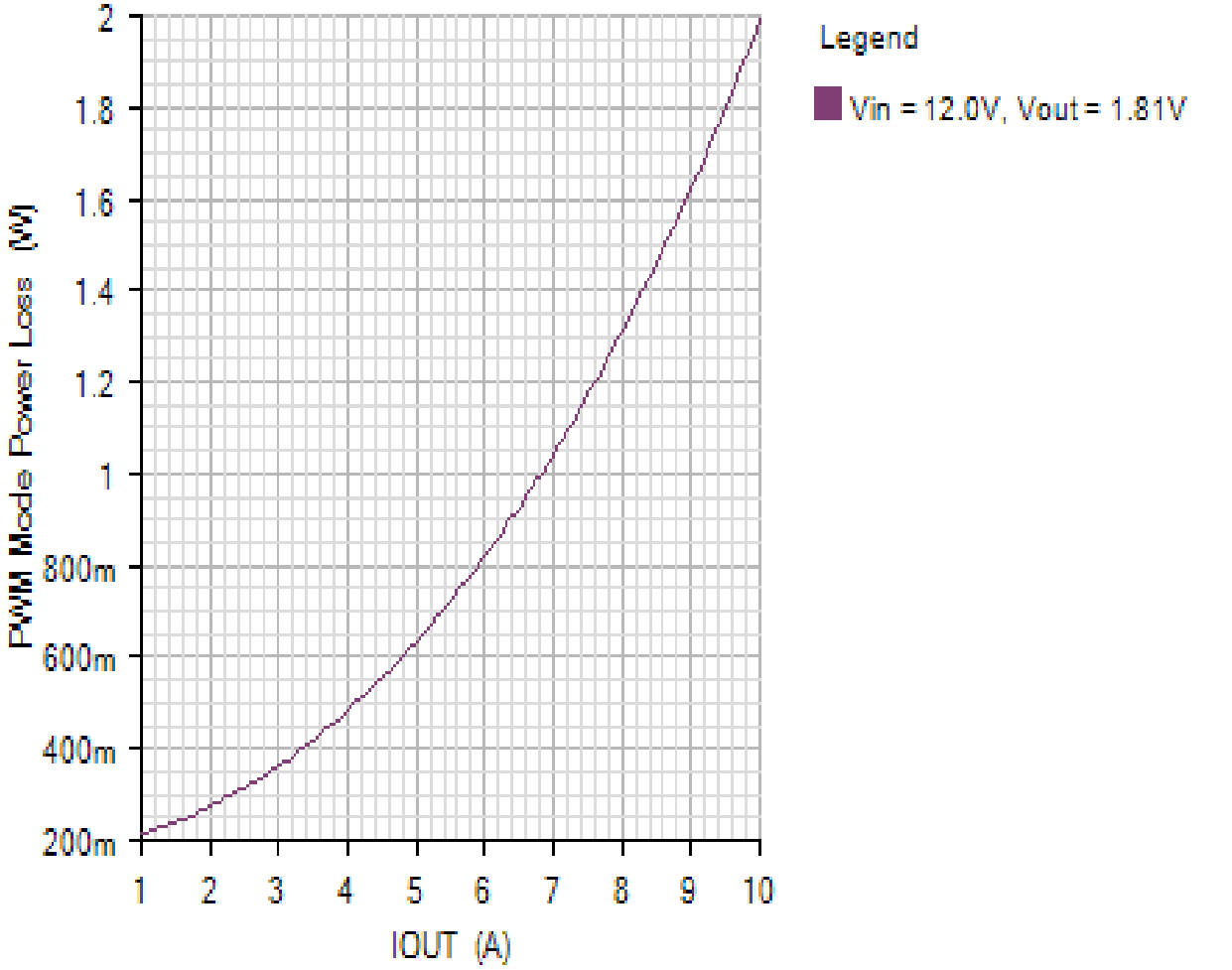


Efficiency - Sun Nov 18 2018 16:02:40

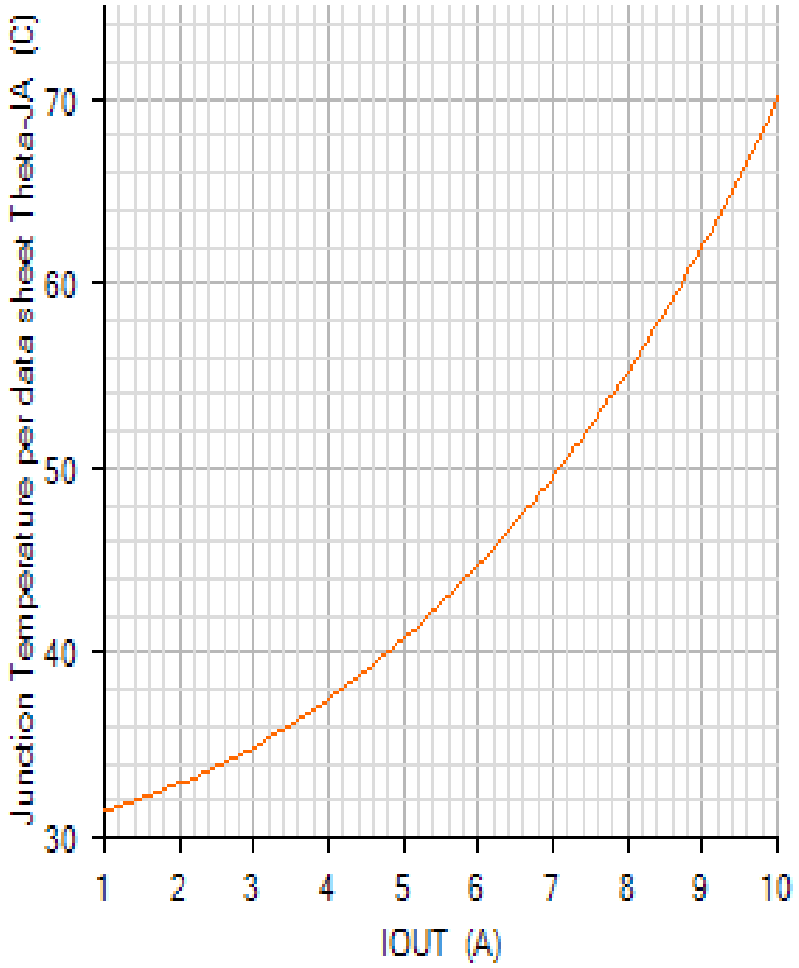
EFFICIENCY Default



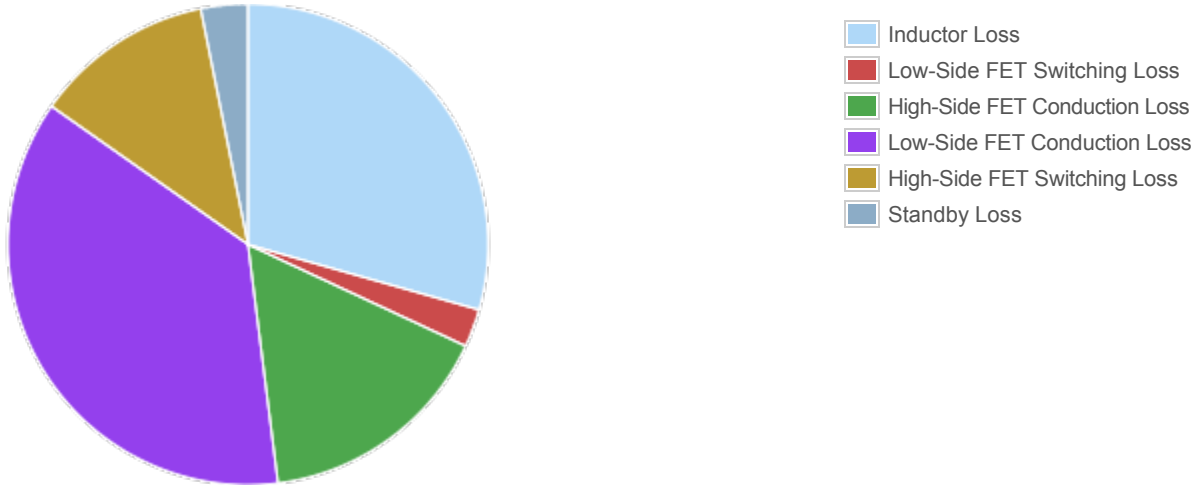
POWER_LOSS Default



JUNCTION_TEMPERATURE Default



Losses



Component	Loss (W)	% of total

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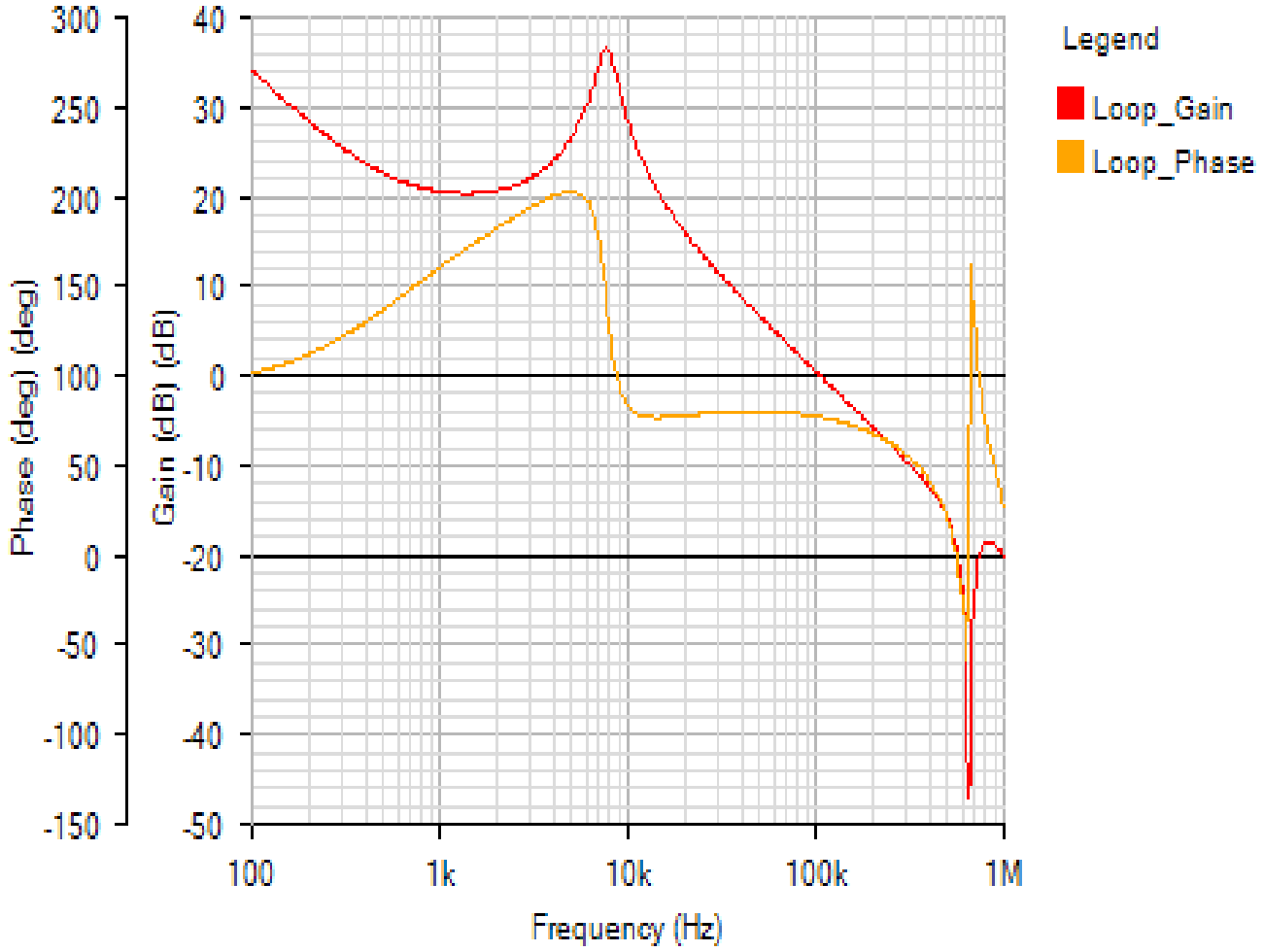
Inductor Loss	0.293738	29.4
Low-Side FET Switching Loss	0.02561	2.6
High-Side FET Conduction Loss	0.160689	16.1
Low-Side FET Conduction Loss	0.367375	36.7
High-Side FET Switching Loss	0.120989	12.1
Standby Loss	0.031599	3.2
Total	1	100

AC Loop - Sun Nov 18 2018 16:02:40

BODE Default

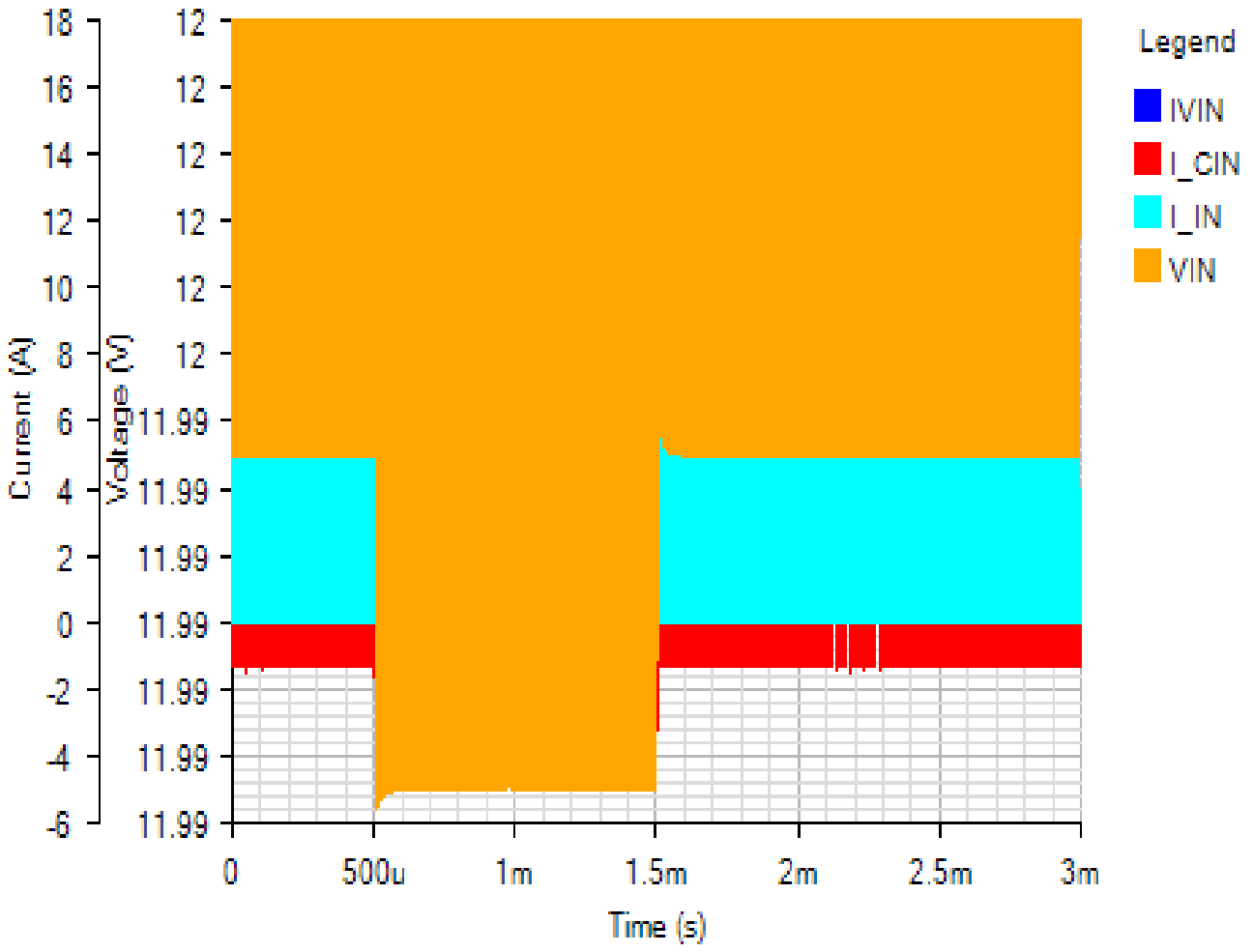


Phase Margin: 77.03° at a crossover frequency of 105.5kHz

20 30 40 50 60 70 80 90 100 110

Load Step - Sun Nov 18 2018 16:02:40

INPUT Default



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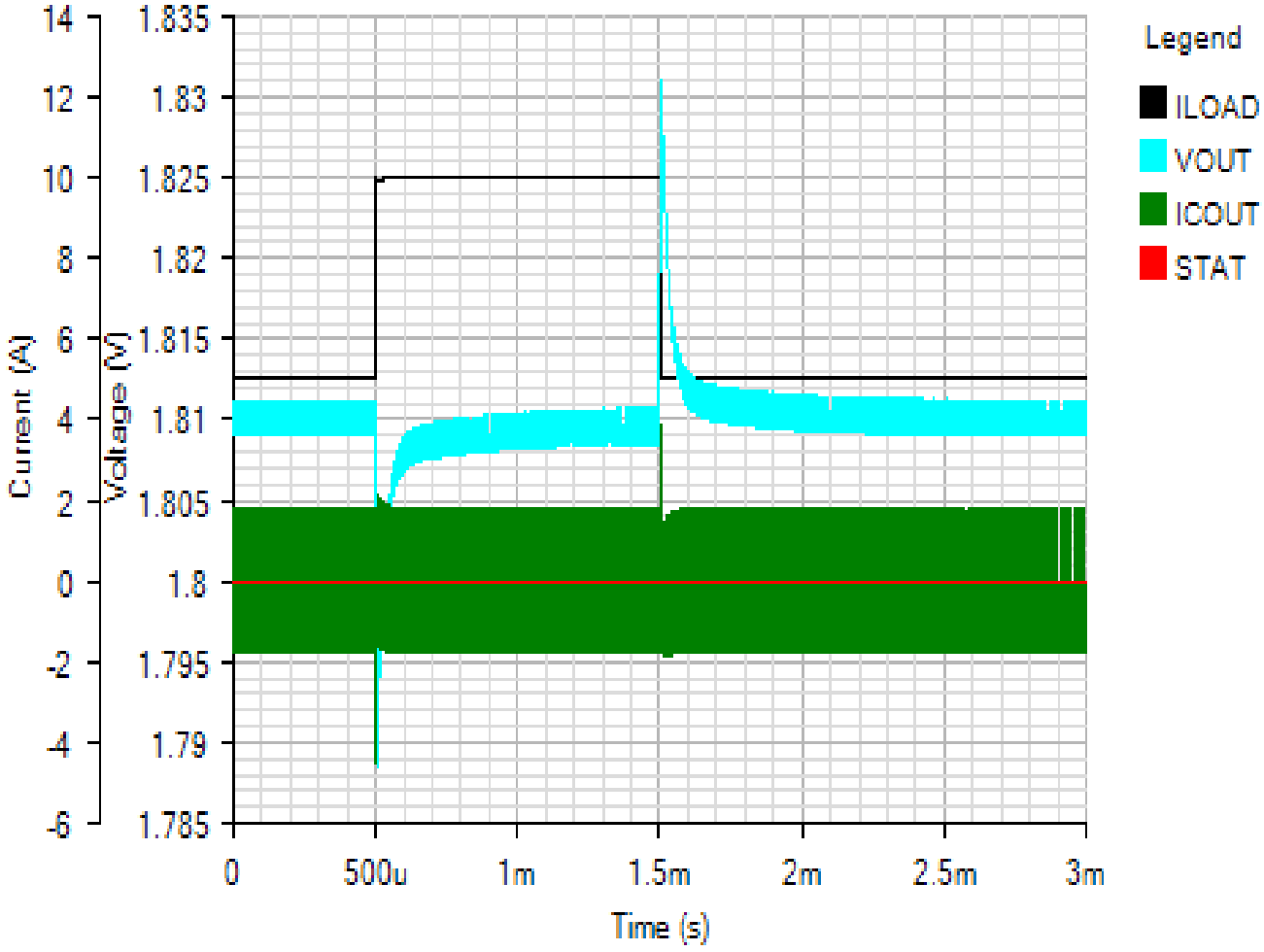
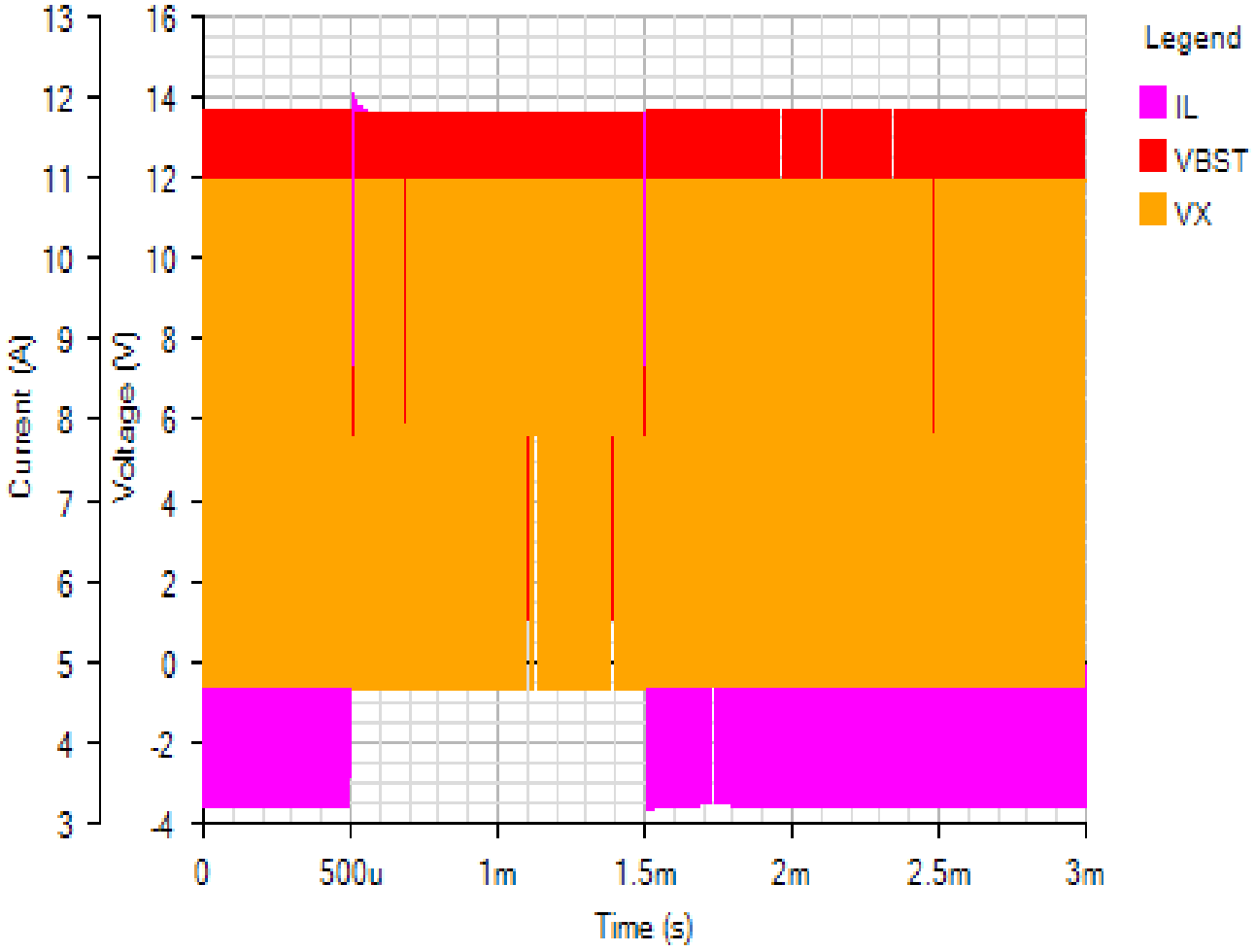
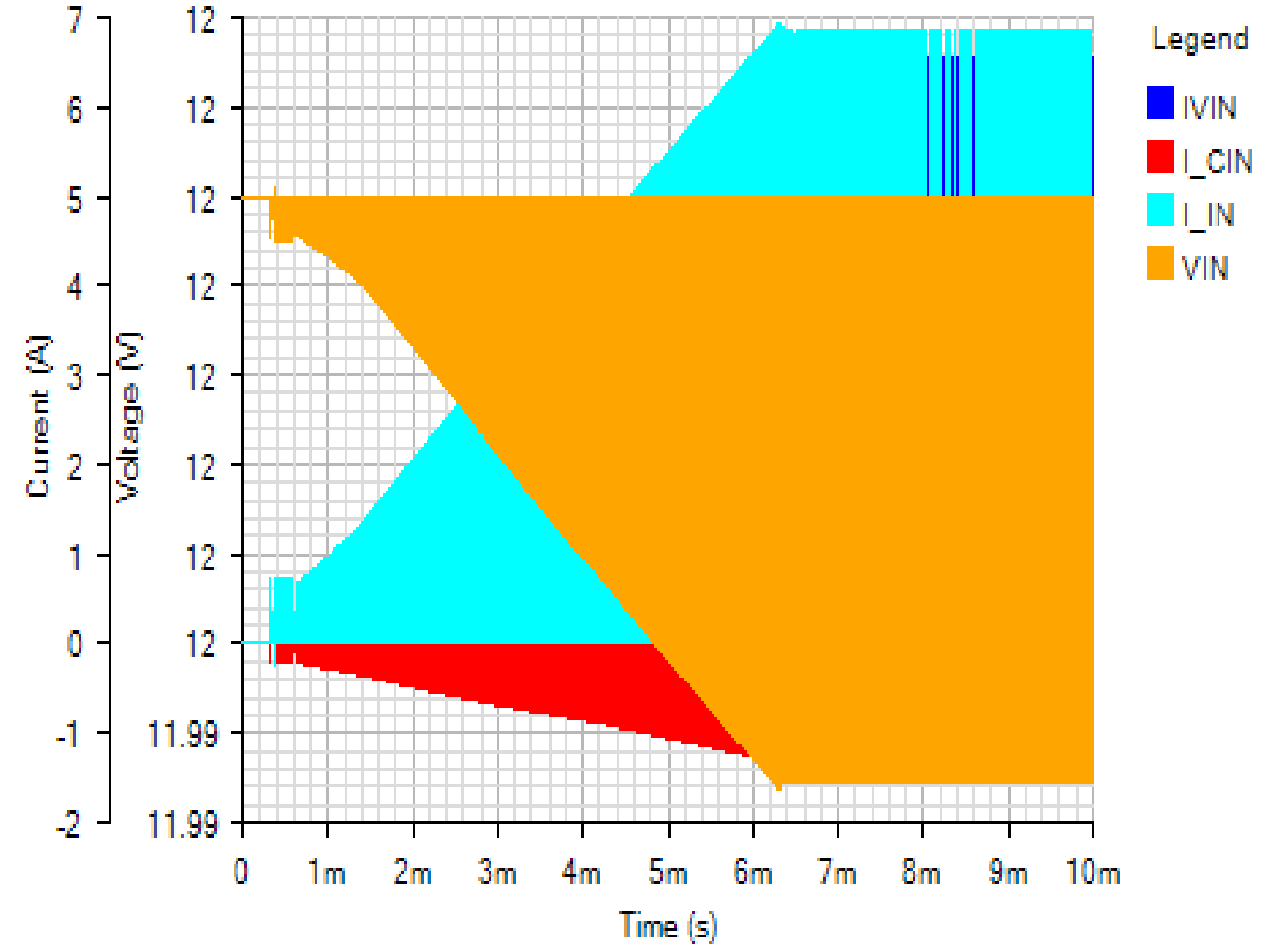


SWITCHING Default

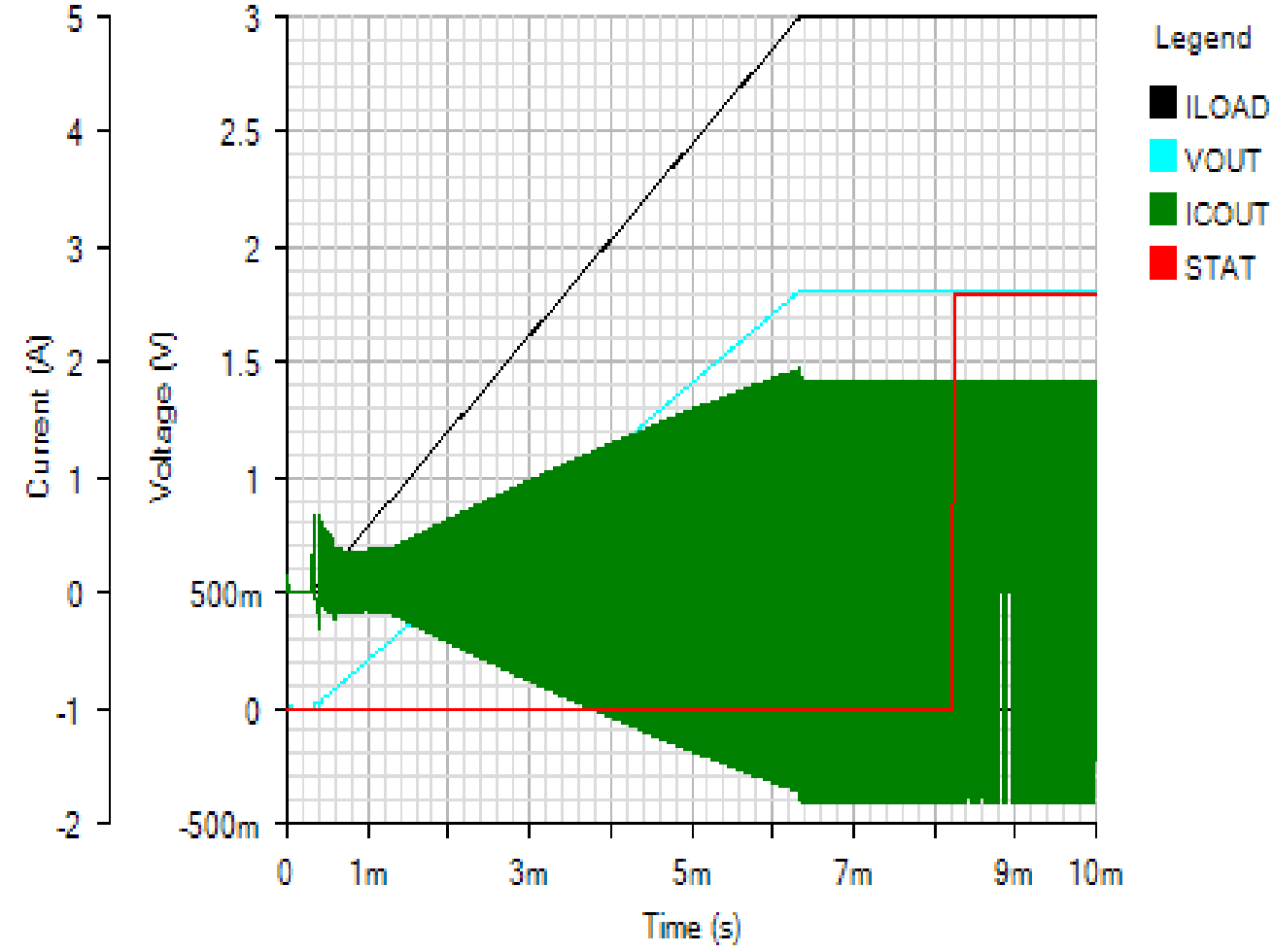


Start Up - Sun Nov 18 2018 16:02:40

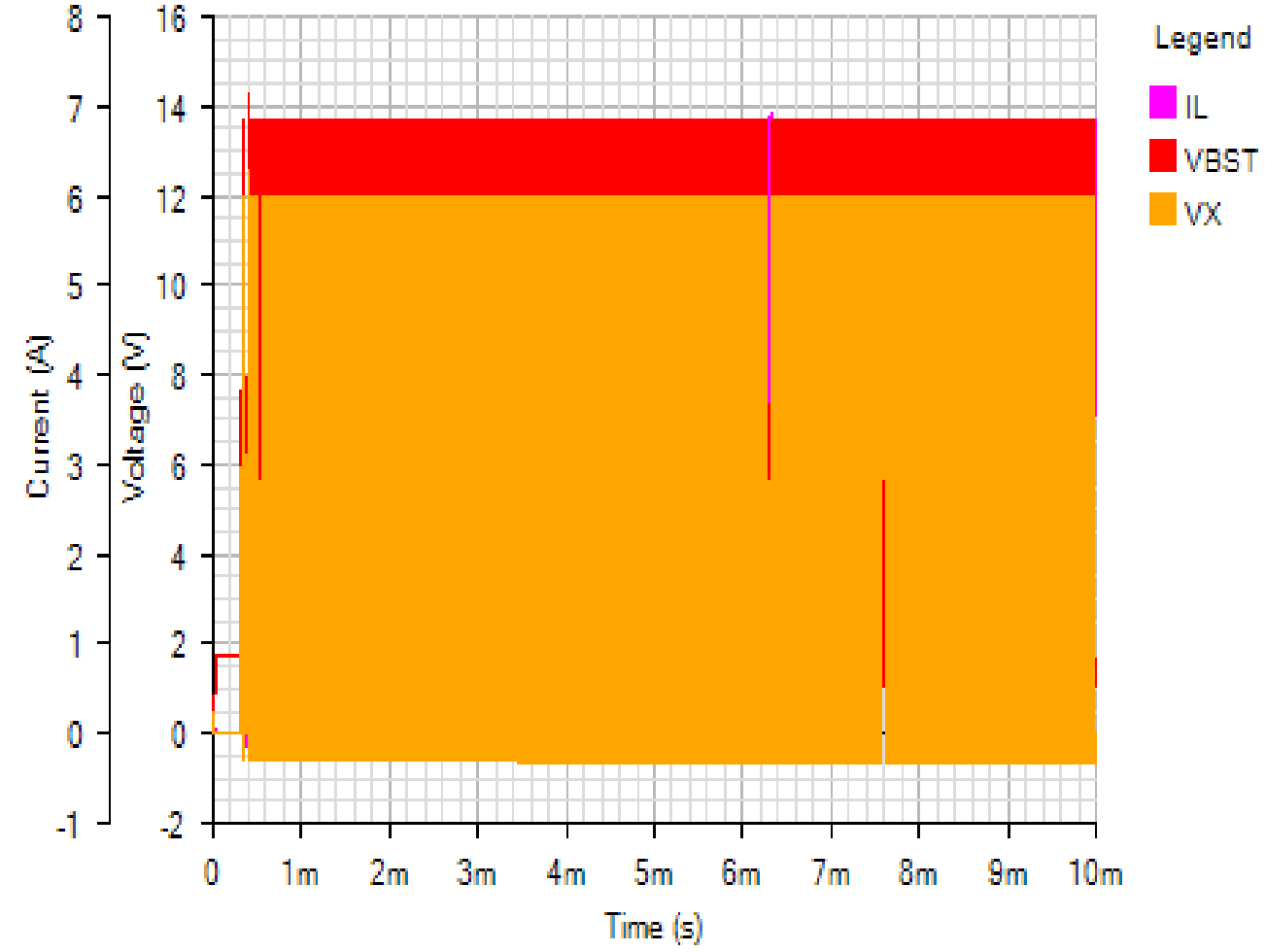
INPUT Default



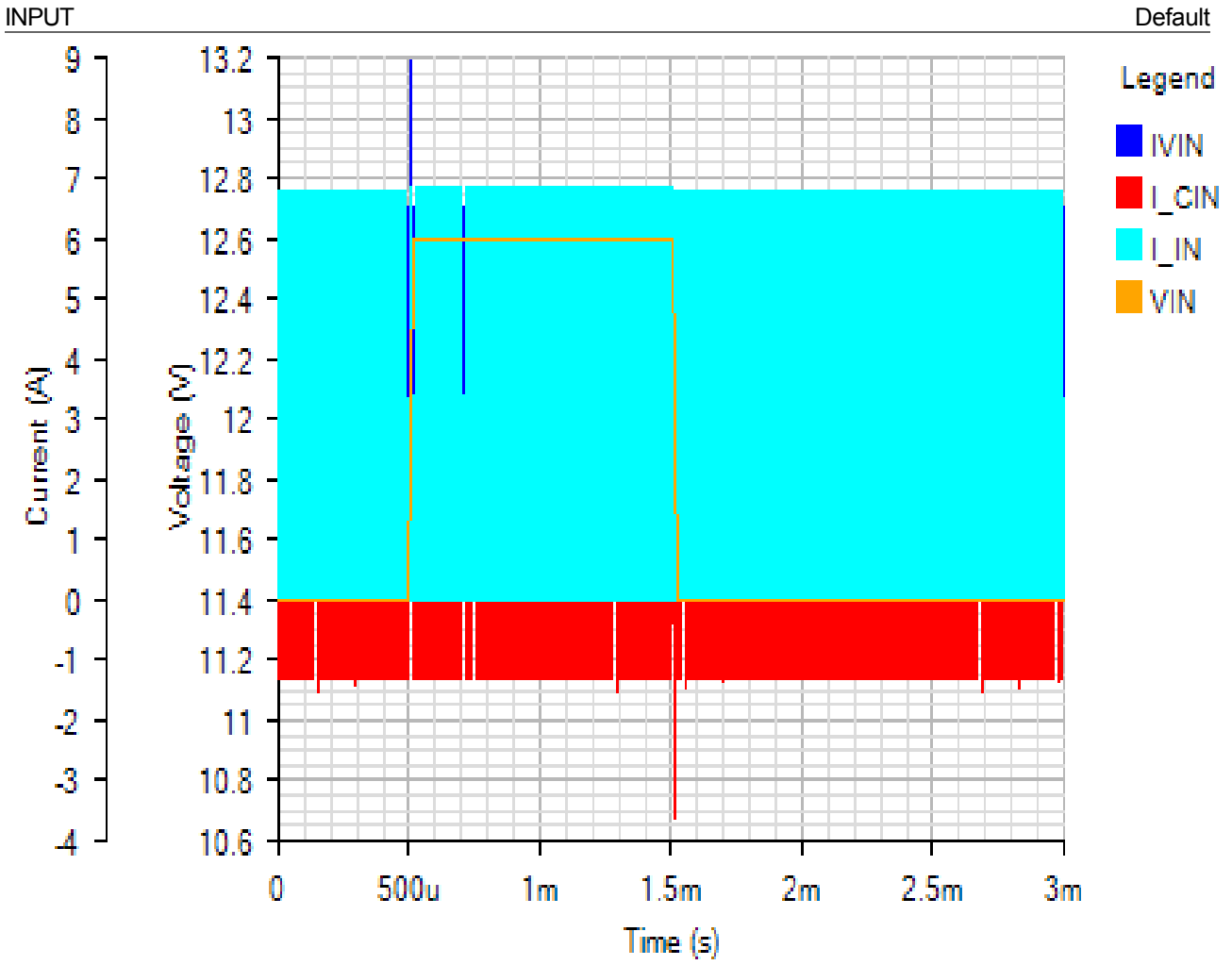
OUTPUT Default



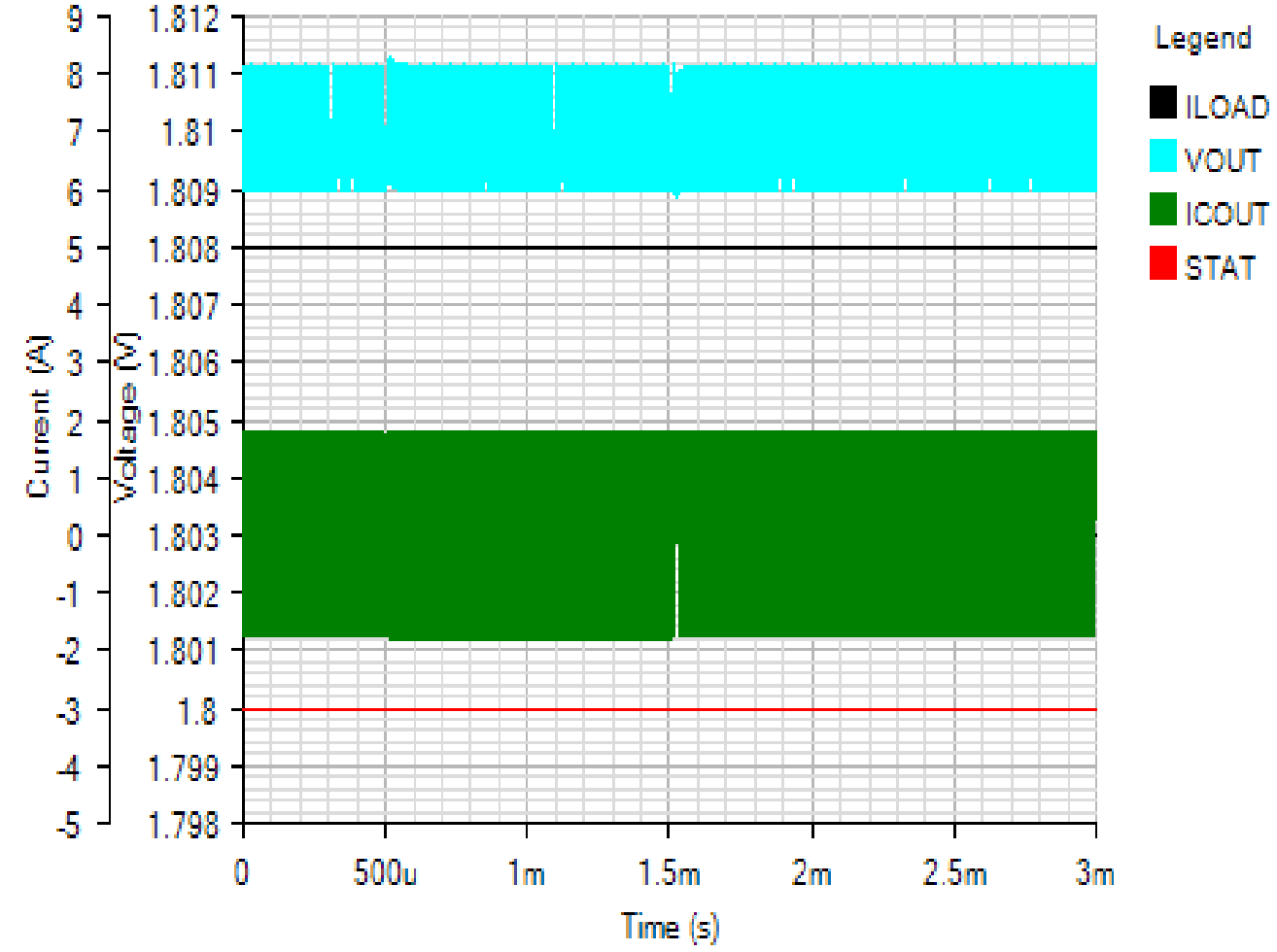
SWITCHING Default



Line Transient - Sun Nov 18 2018 16:02:40



OUTPUT Default



SWITCHING Default