

## Initial Design

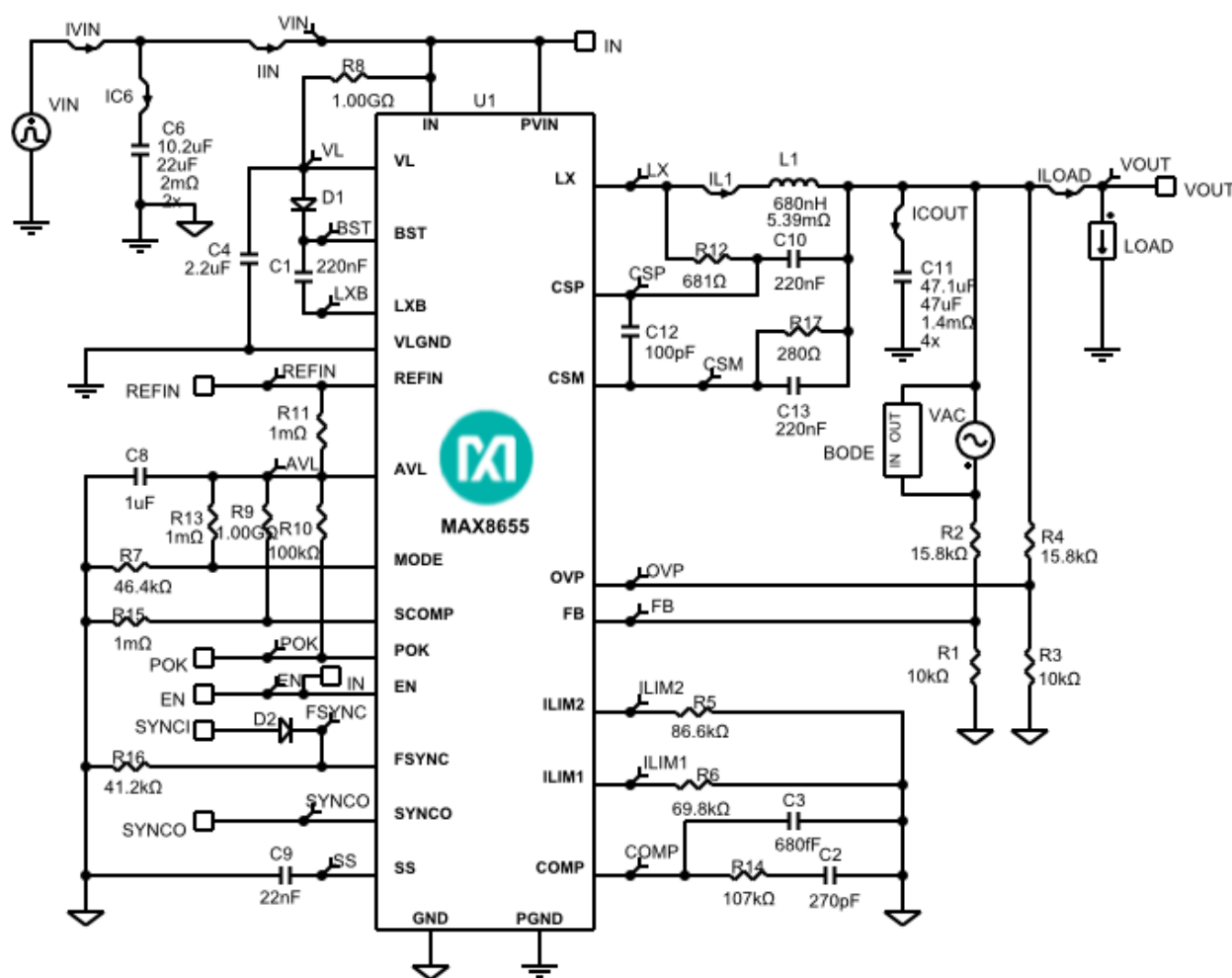
1.0

**Design Requirements**

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Parameter	Value
Min. Input Voltage	10.8V
Max. Input Voltage	13.2V
Typ. Input Voltage	12V
Input Voltage Ripple	2%
Output Voltage	1.8V
Output Current	10A
Output Voltage Ripple	2%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Switching Frequency	600kHz
Inductor Current Ratio (LIR)	0.3

## Schematic



## BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	<a href="#">MAX8655ETN+</a>	Maxim Integrated	Highly Integrated, 25A, Wide-Input, Internal MOSFET, Step-Down Regulator
C1	1	<a href="#">GCM188R71E224KA55D</a>	Murata Manufacturing	Cap Ceramic 0.22uF 25V X7R 10% Pad SMD 0603 125°C Automotive T/R
C2	1	<a href="#">06035C271KAT2A</a>	AVX	Cap Ceramic 270pF 50V X7R 10% Pad SMD 0603 125°C T/R
C3	1	<a href="#">C0603H688K2GAC</a>	KEMET Corporation	Cap Ceramic 0.68pF 200V C0G 10% Pad SMD 0603 200°C Bulk
C4	1	<a href="#">GRM188R61E225KA12D</a>	Murata Manufacturing	Cap Ceramic 2.2uF 25V X5R 10% Pad SMD 0603 85°C T/R
C6	2	<a href="#">GRM32ER71E226ME15</a>	Murata	Cap Ceramic 22uF 25V 1210 125C
C8	1	<a href="#">CL10A105KA5LNNC</a>	Samsung Electro-Mechanics	Cap Ceramic 1uF 25V X5R 10% Pad SMD 0603 85°C T/R

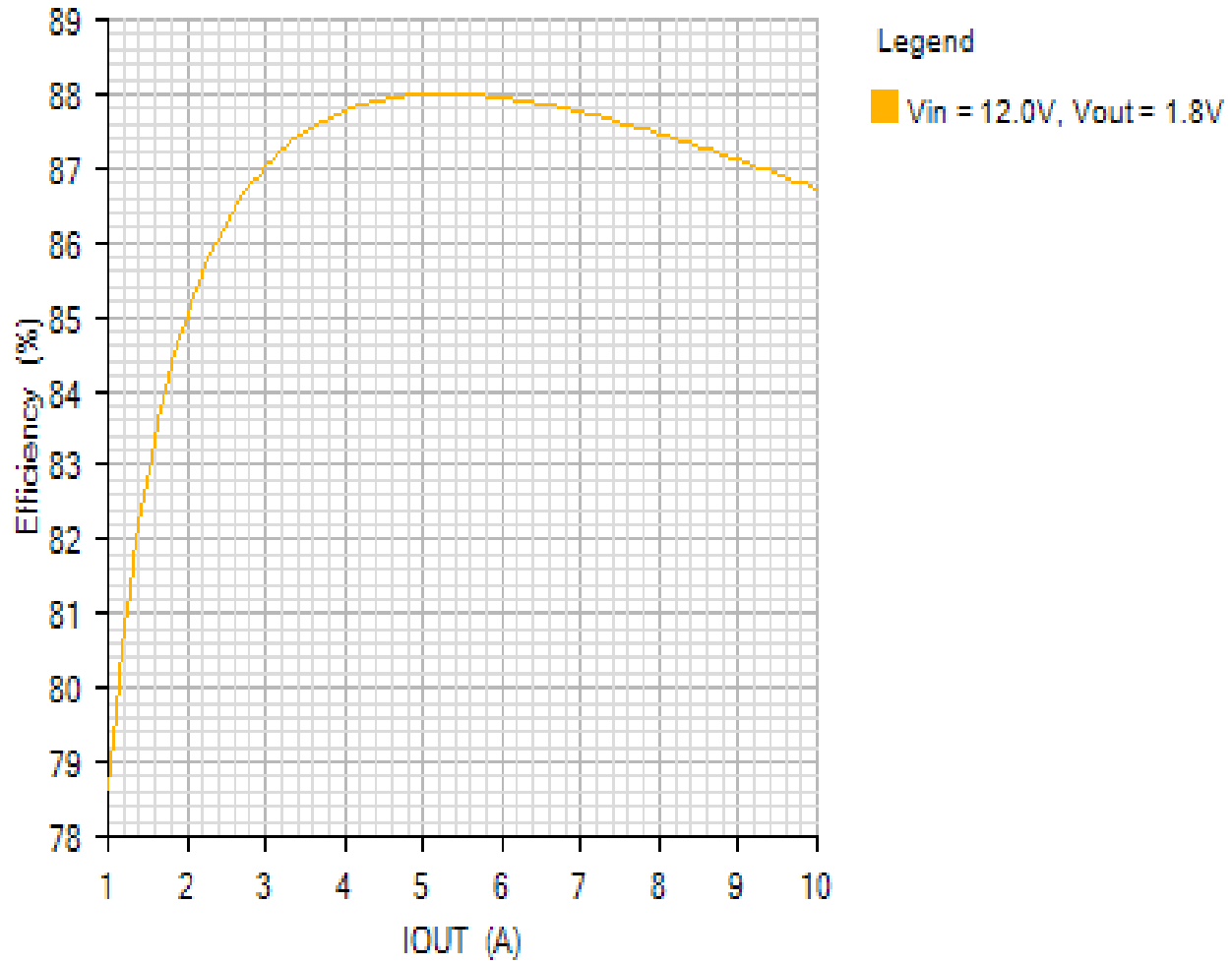
C9	1	C1608X7R2A223K080AA	TDK	Cap Ceramic 0.022uF 100V X7R 10% Pad SMD 0603 125°C T/R
C10	1	GCM188R71H224KA64D	Murata Manufacturing	Cap Ceramic 0.22uF 50V X7R 10% Pad SMD 0603 125°C Automotive T/R
C11	4	GRM32EE70J476ME20L	Murata	Cap Ceramic 47uF 6.3V 1210 125C
C12	1	0603YC101KAT2A	AVX	Cap Ceramic 100pF 16V X7R 10% Pad SMD 0603 125°C T/R
C13	1	0603YD224KAT2A	AVX	Cap Ceramic 0.22uF 16V X5R 10% Pad SMD 0603 85°C T/R
D1	1	BAT54W,115	Nexperia	Diode Schottky 0.2A Automotive 3-Pin SC-70 T/R
D2	1	BAT54W,115	Nexperia	Diode Schottky 0.2A Automotive 3-Pin SC-70 T/R
L1	1	SPM6530T-R68M140	TDK	Inductor Power Shielded Wirewound 680nH 20% 100KHz Metal 16A 5.39mOhm DCR T/R
R1	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ3EKF1582V	Panasonic	Res Thick Film 0603 15.8K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF1582V	Panasonic	Res Thick Film 0603 15.8K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ3EKF8662V	Panasonic	Res Thick Film 0603 86.6K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ3EKF6982V	Panasonic	Res Thick Film 0603 69.8K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ3EKF4642V	Panasonic	Res Thick Film 0603 46.4K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R10	1	CRCW0603100KFKEAHP	Vishay	Res Thick Film 0603 100K Ohm 1% 0.25W(1/4W) ±100ppm/°C Pad SMD Automotive T/R
R12	1	ERJ3EKF6810V	Panasonic	Res Thick Film 0603 681 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R14	1	ERJ3EKF1073V	Panasonic	Res Thick Film 0603 107K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R16	1	ERJ3EKF4122V	Panasonic	Res Thick Film 0603 41.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R17	1	ERJ3EKF2800V	Panasonic	Res Thick Film 0603 280 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

## Simulation Results

Efficiency - Wed Nov 21 2018 15:56:32

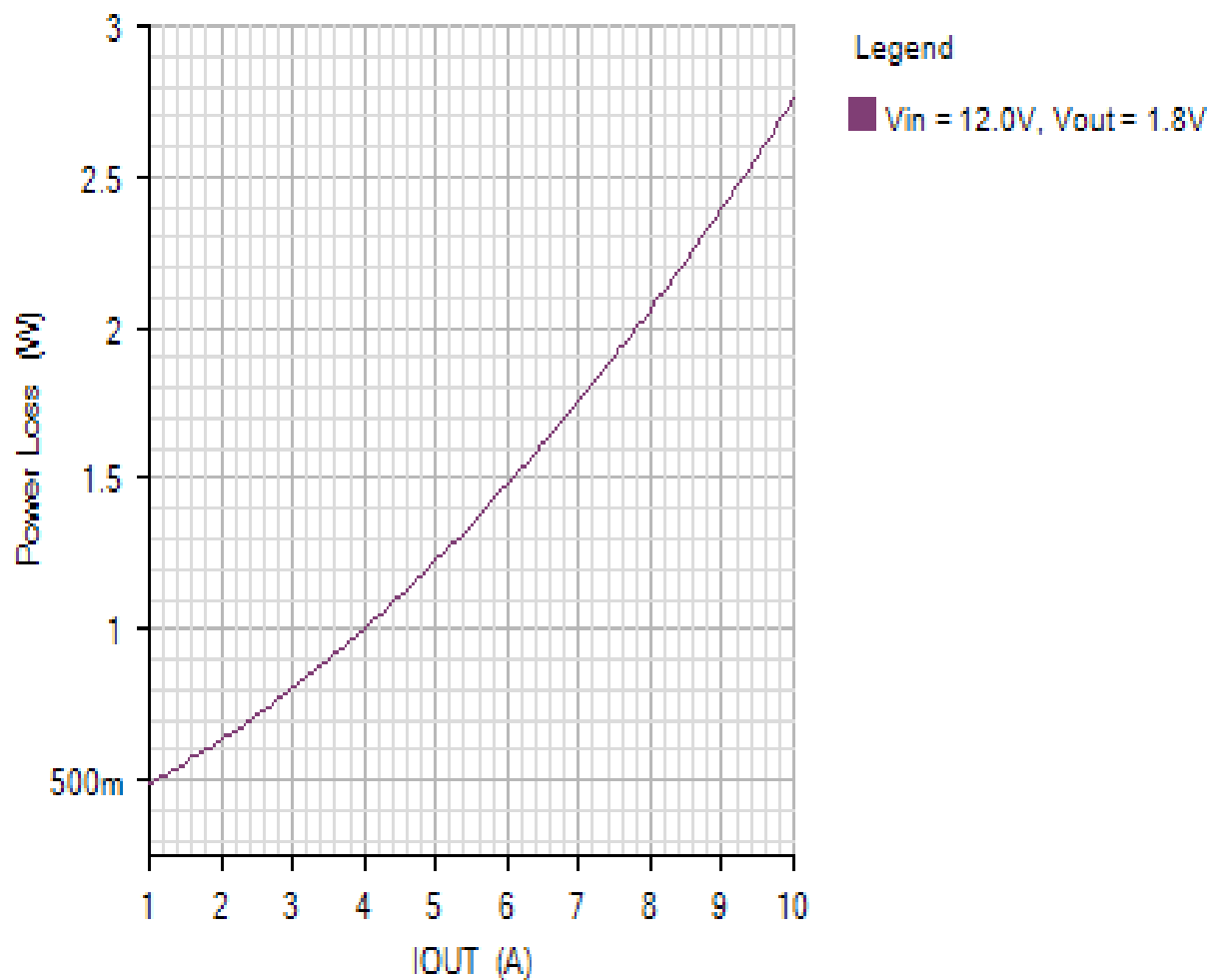
EFFICIENCY\_PLOT

Default

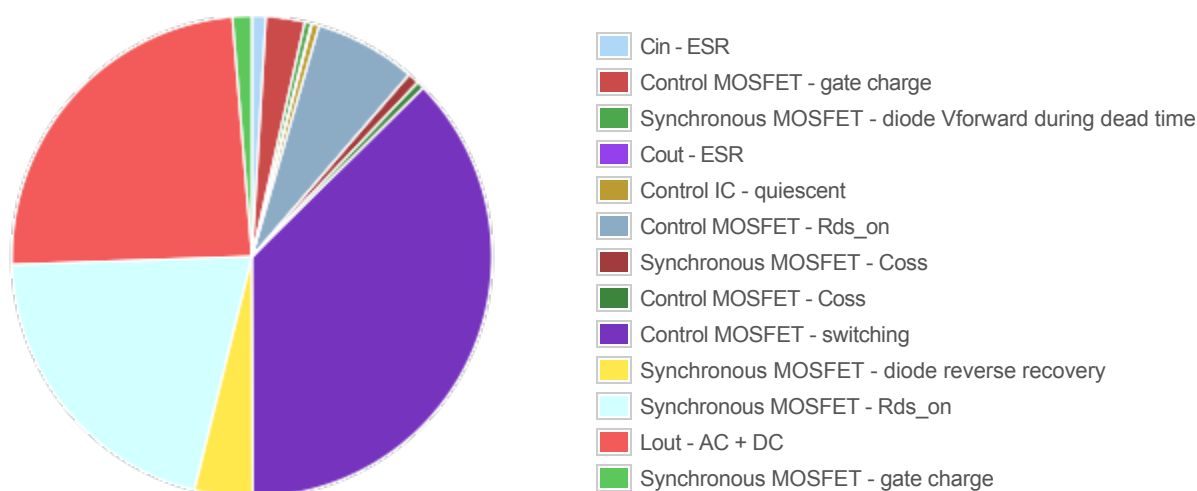


POWER\_LOSS\_PLOT

Default



Losses



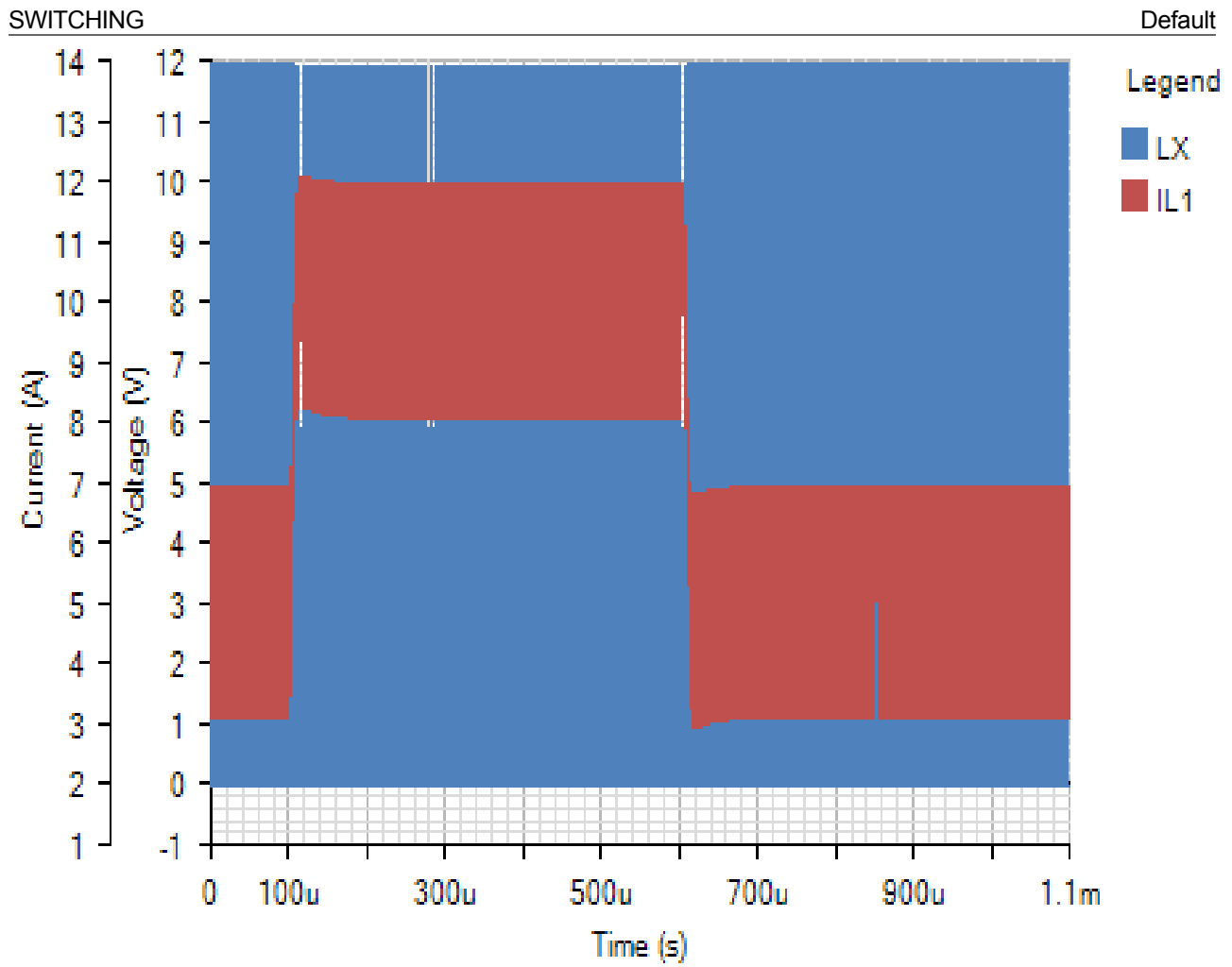
Component

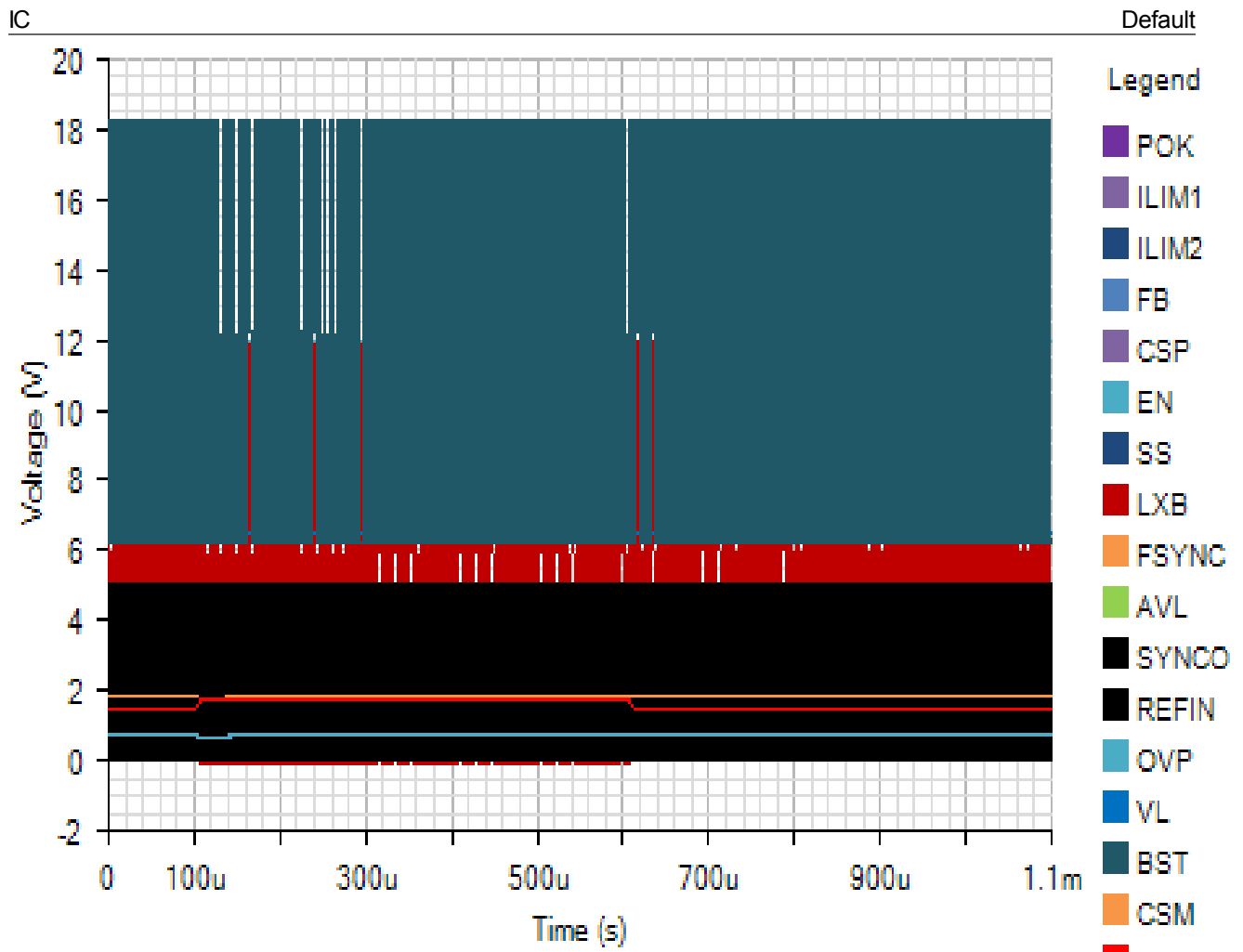
Loss (W)

% of total

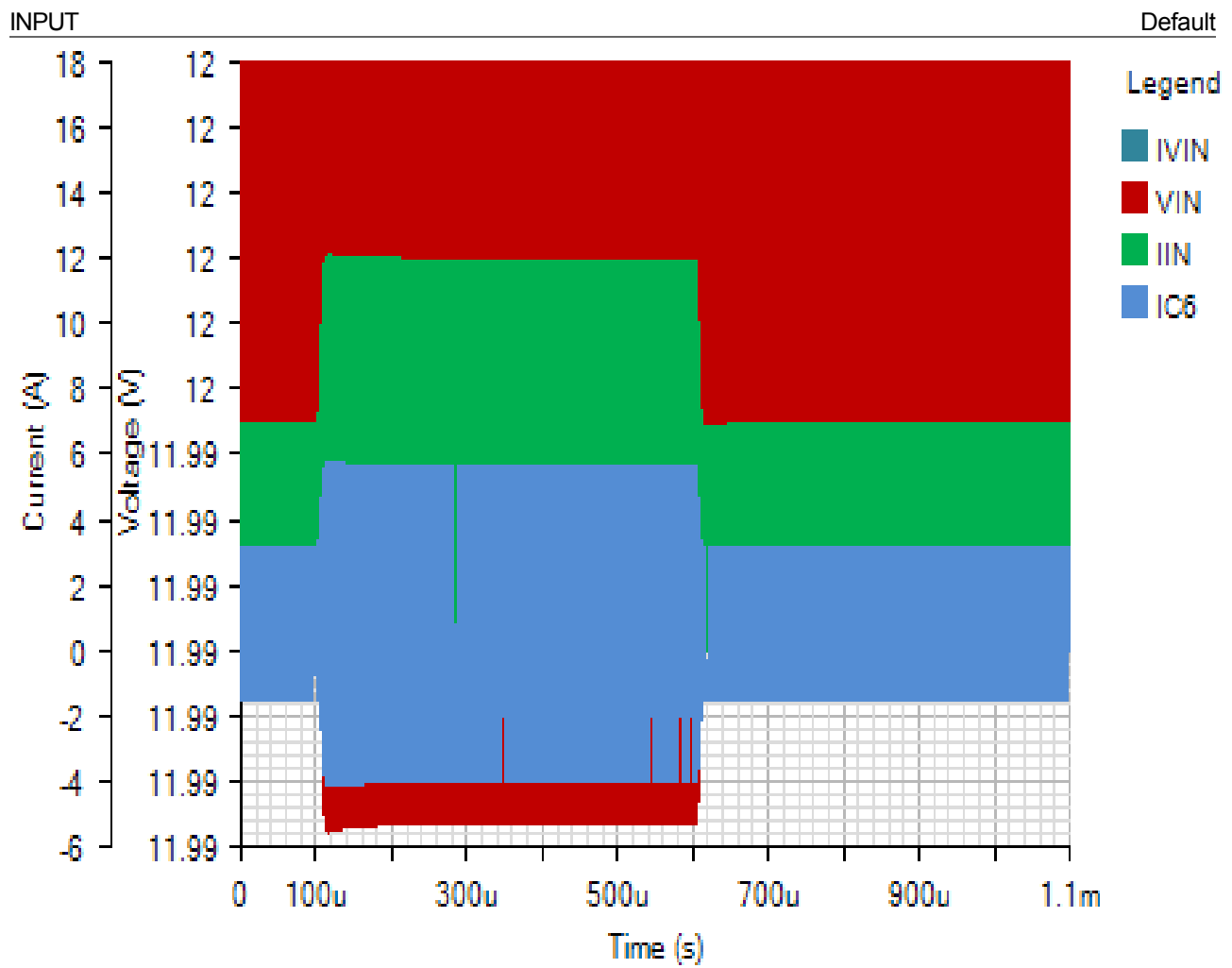
Component	Loss (W)	% of total
Cin - ESR	0.0255	0.9
Control MOSFET - gate charge	0.072	2.6
Synchronous MOSFET - diode Vforward during dead time	0.012	0.4
Cout - ESR	0.001641	0.1
Control IC - quiescent	0.0132	0.5
Control MOSFET - Rds_on	0.188635	6.8
Synchronous MOSFET - Coss	0.021168	0.8
Control MOSFET - Coss	0.013954	0.5
Control MOSFET - switching	1.028571	37.3
Synchronous MOSFET - diode reverse recovery	0.108	3.9
Synchronous MOSFET - Rds_on	0.567574	20.6
Lout - AC + DC	0.668035	24.2
Synchronous MOSFET - gate charge	0.036	1.3
Total	2.756278	100

Load Step - Wed Nov 21 2018 15:56:32



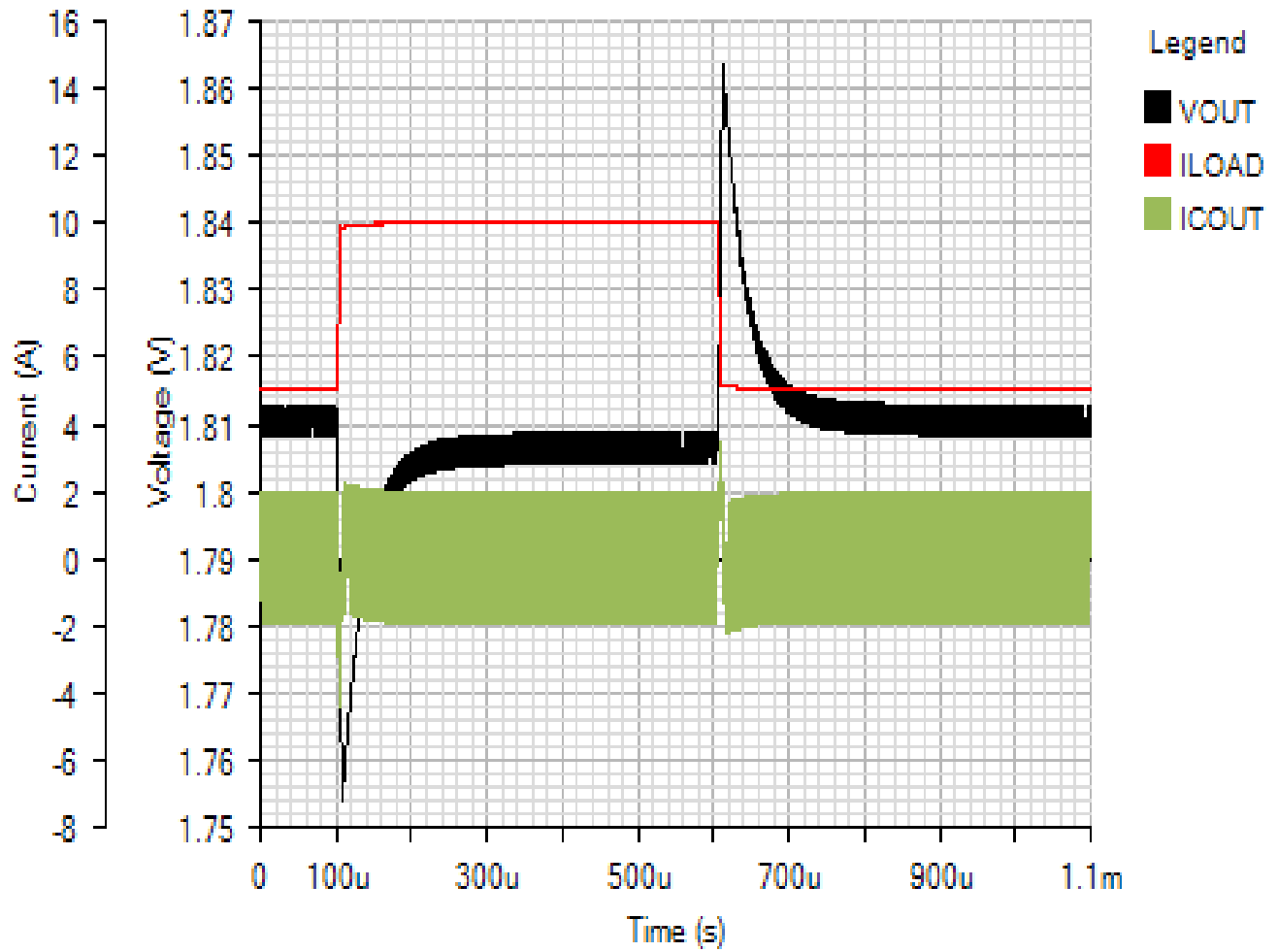




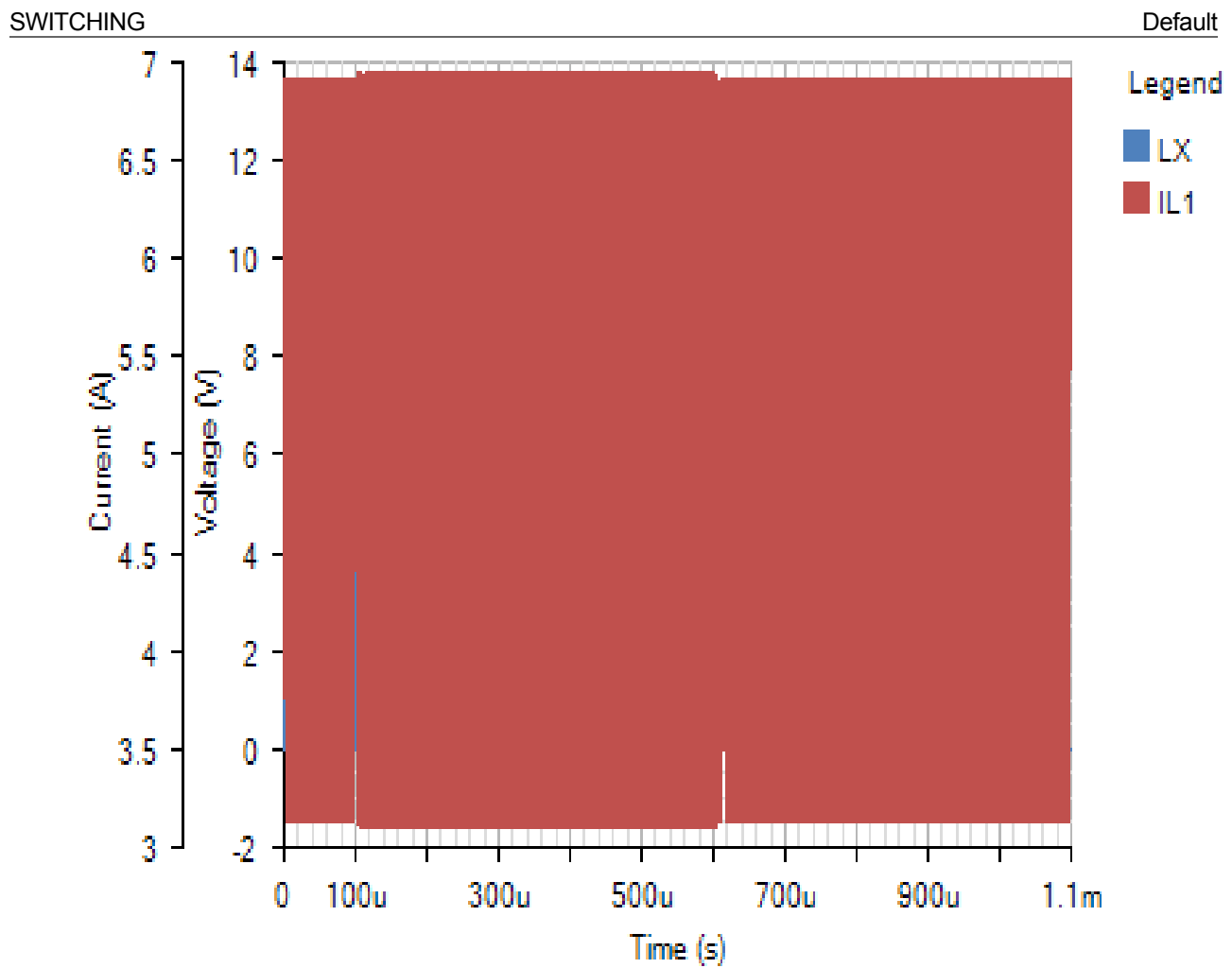


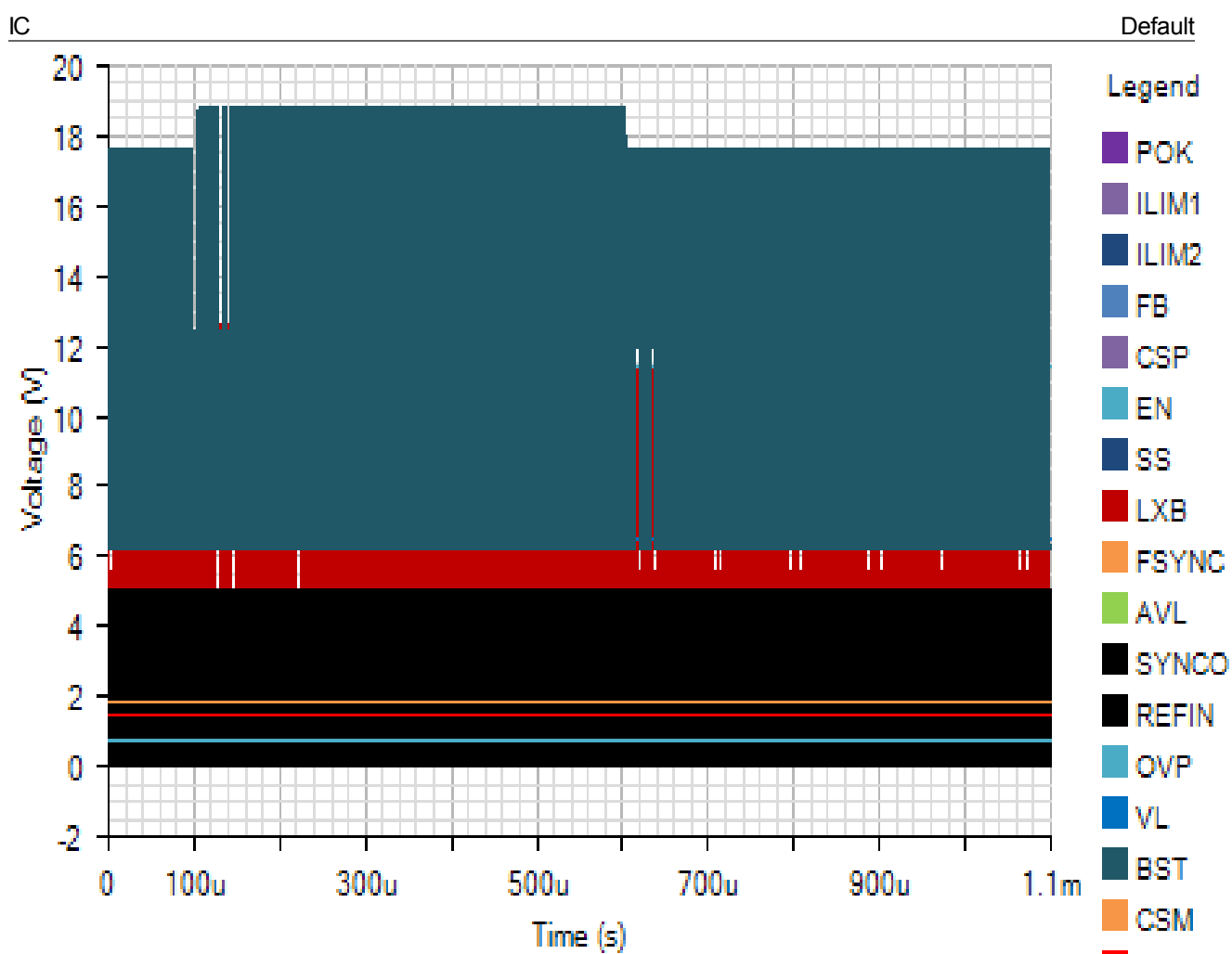
OUTPUT

Default



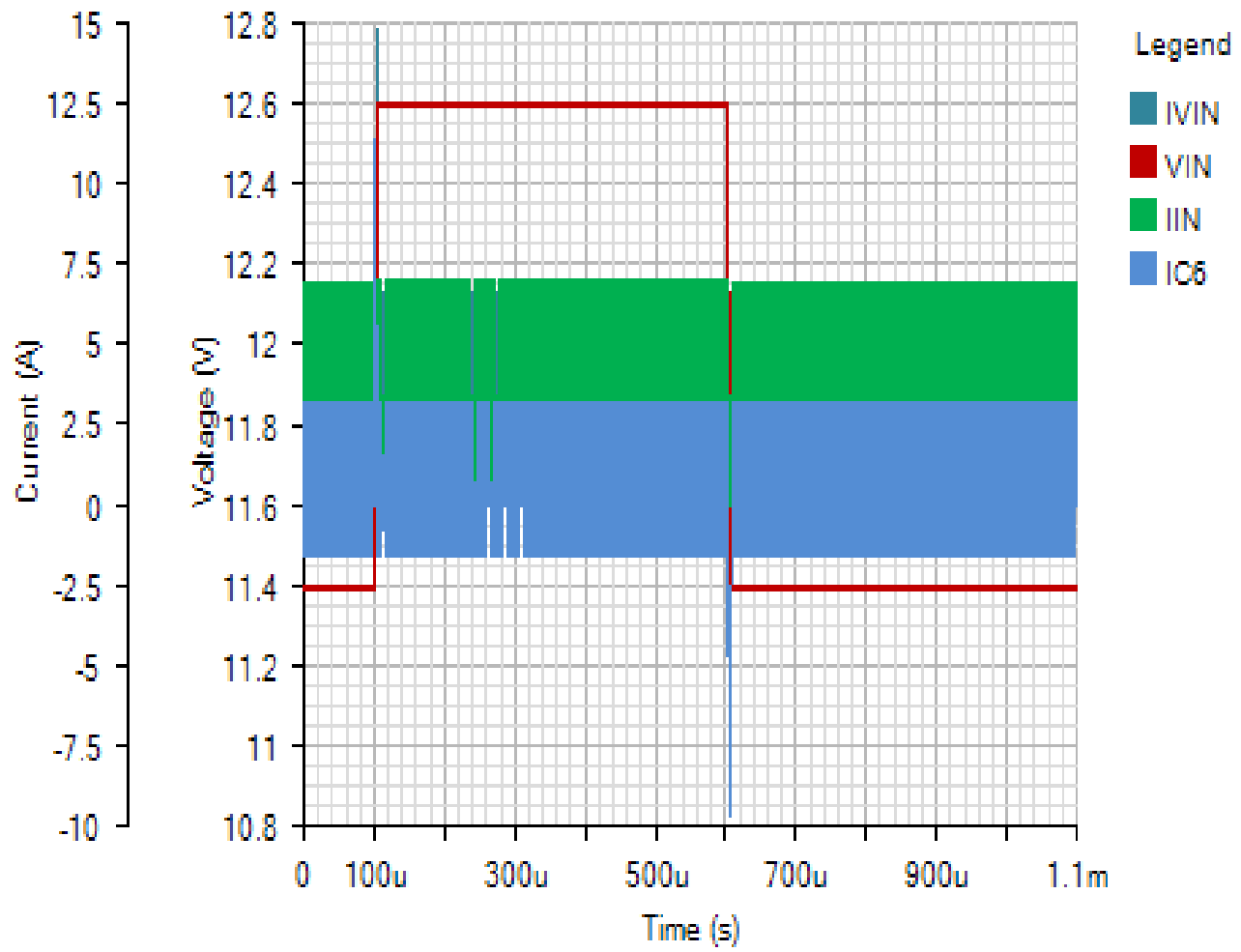
Line Transient - Wed Nov 21 2018 15:56:32





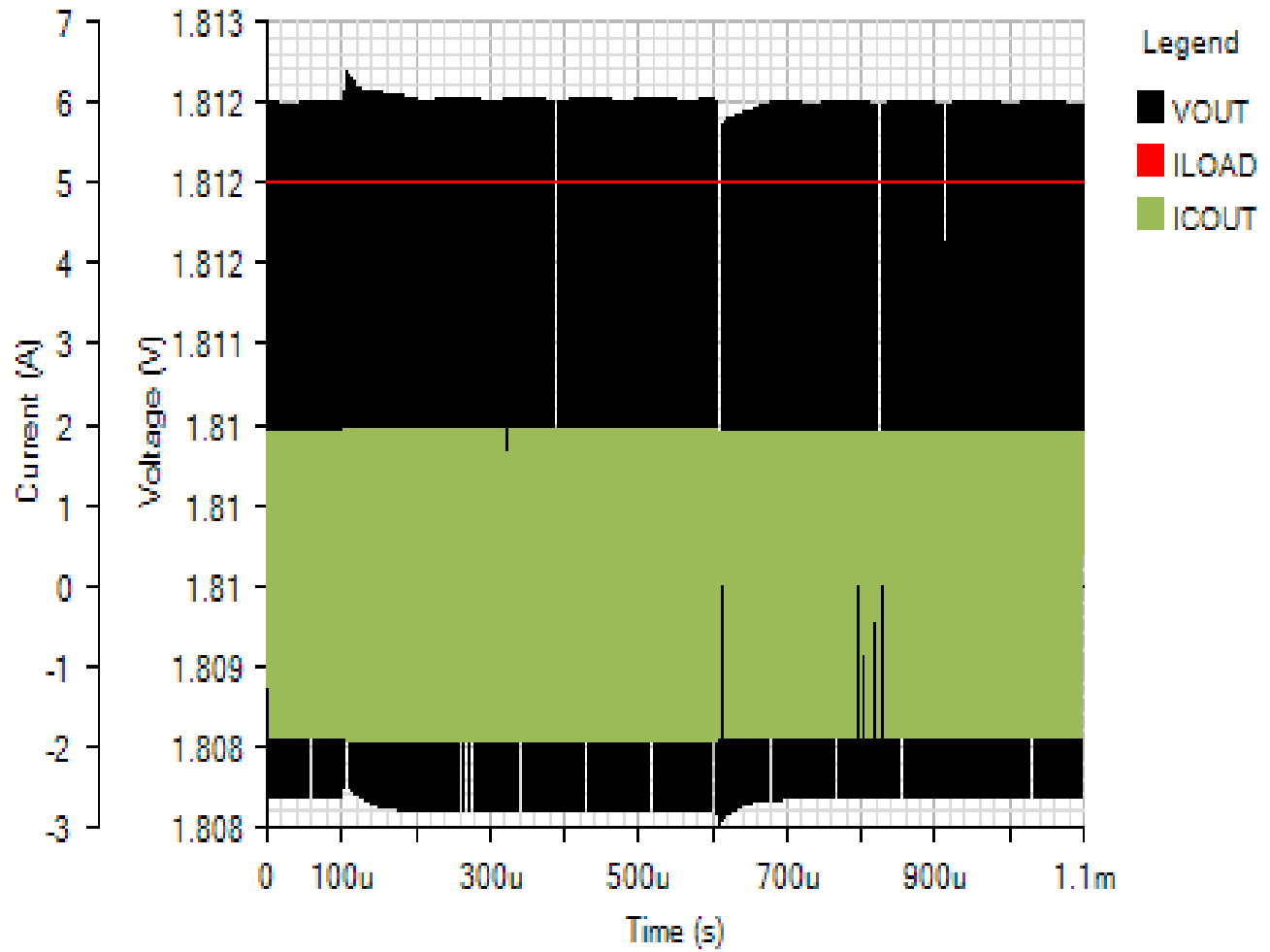
INPUT

Default



OUTPUT

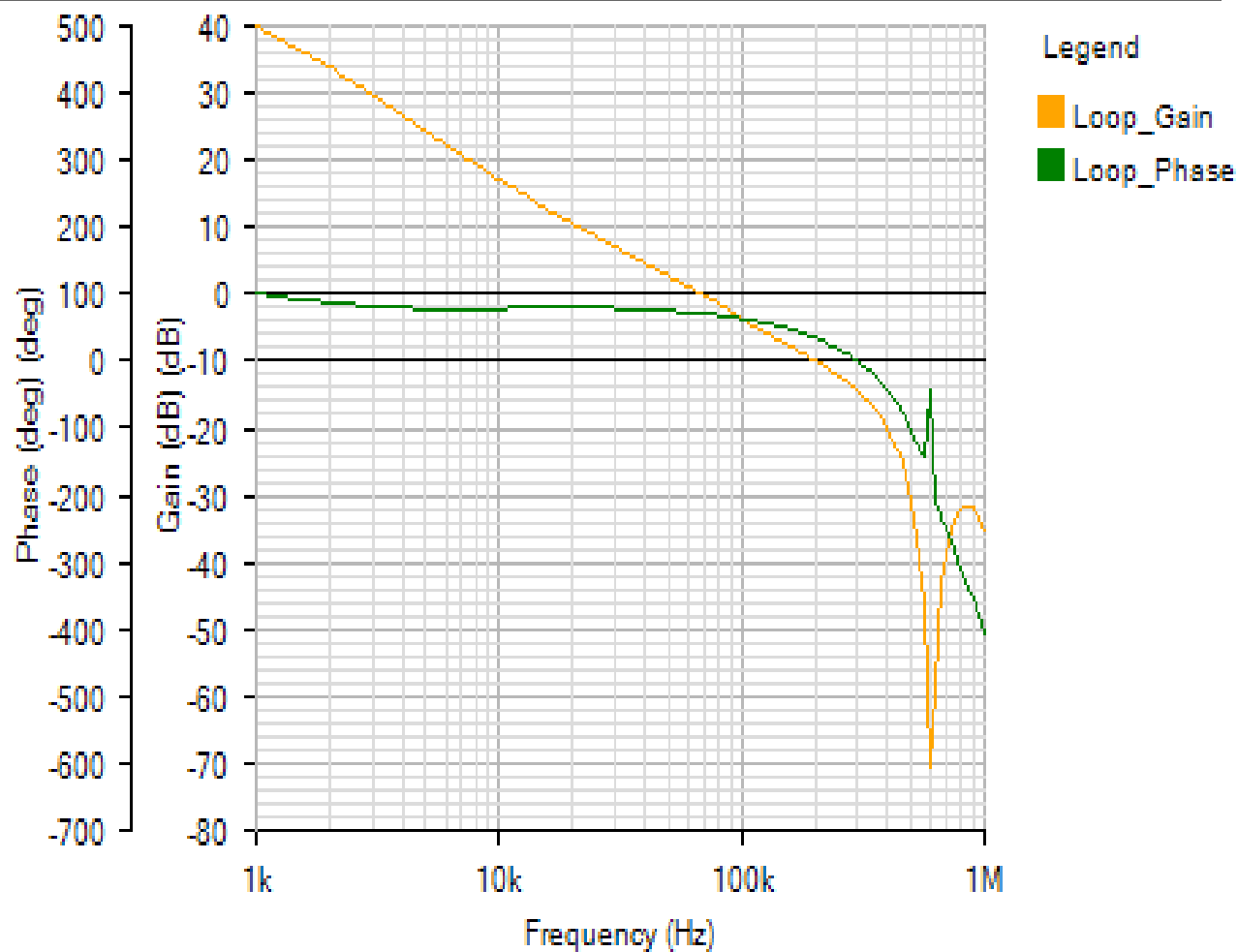
Default



AC Loop - Wed Nov 21 2018 15:56:32

BODE

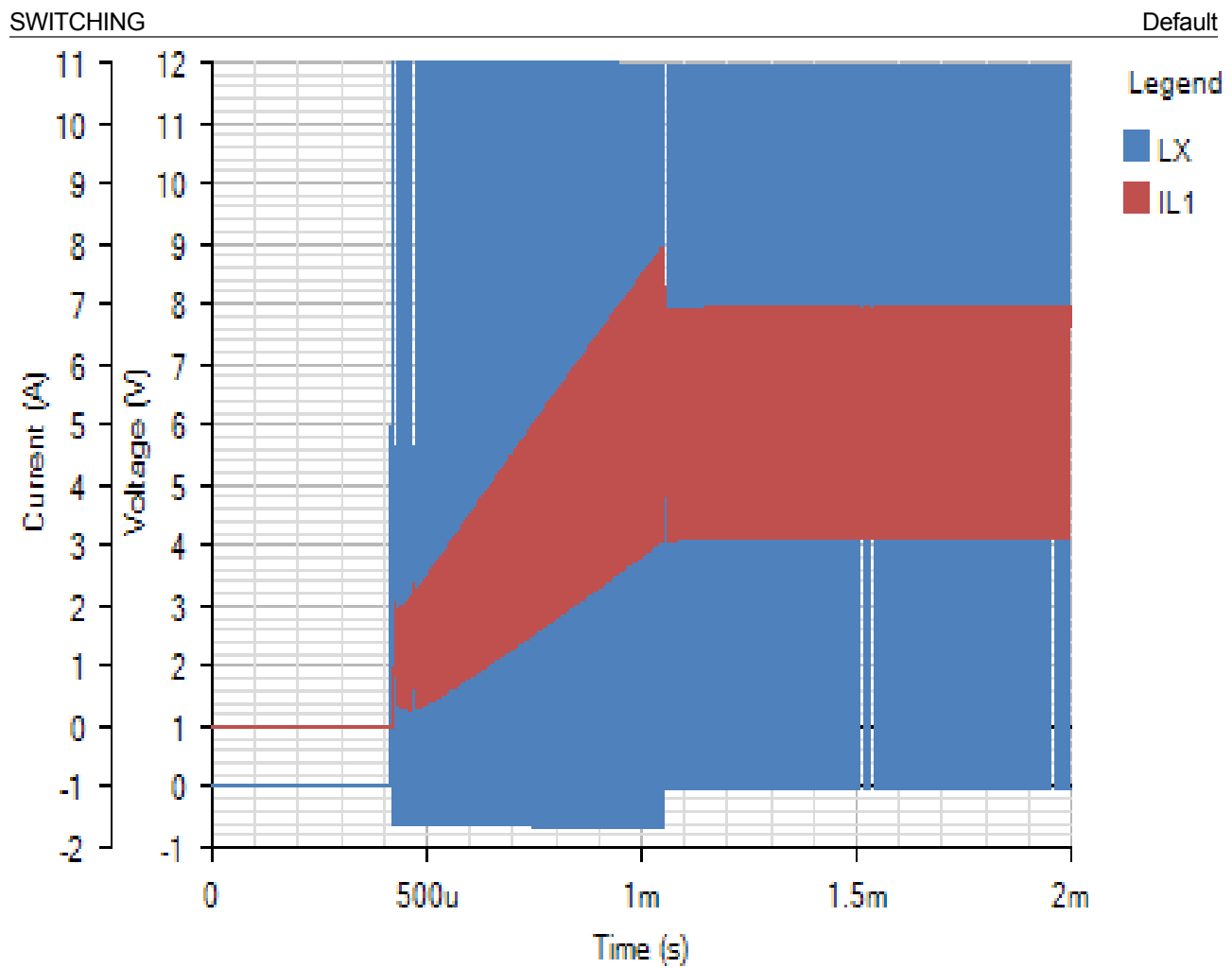
Default



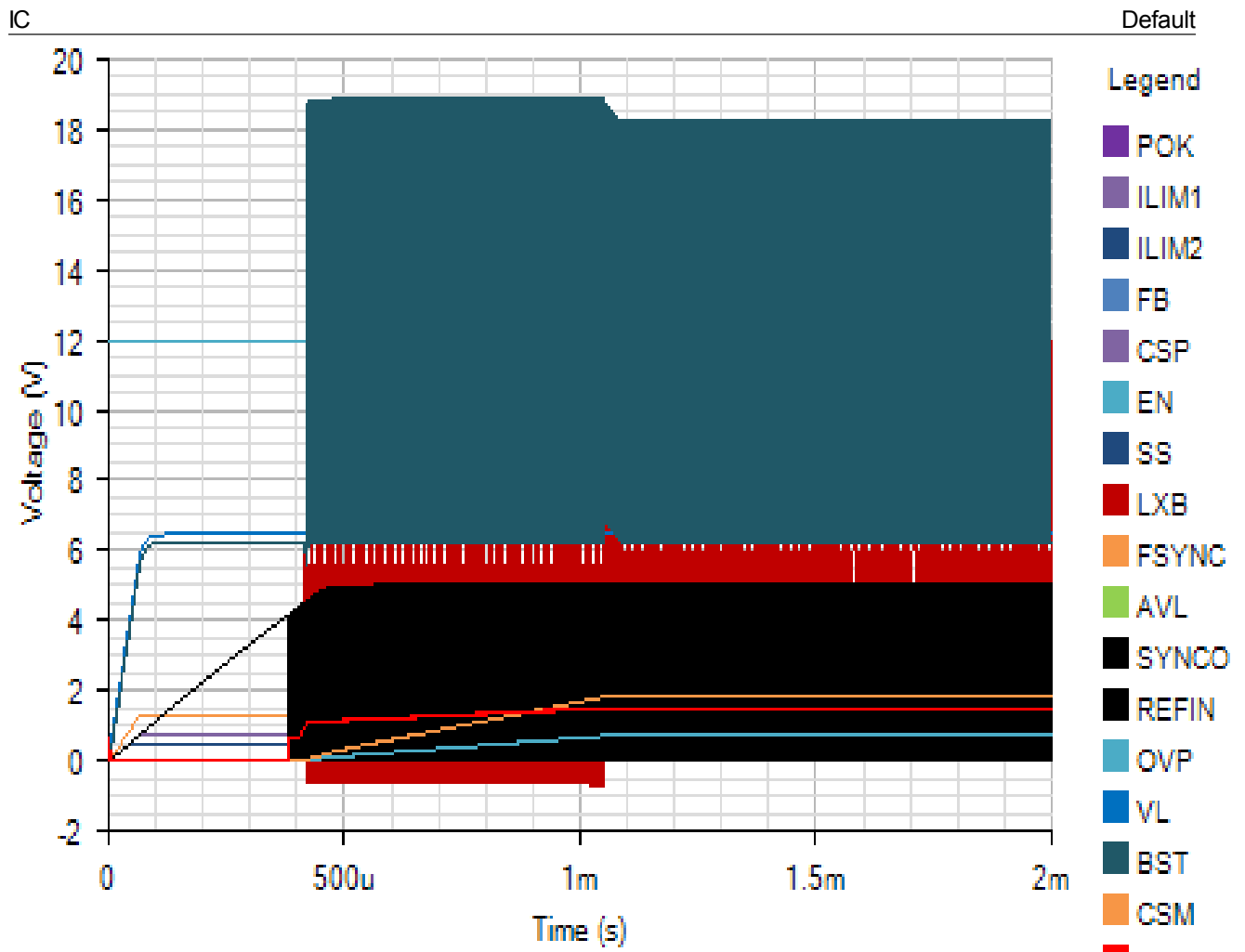
Phase Margin: 71.63° at a crossover frequency of 66.6kHz



Start Up - Wed Nov 21 2018 15:56:32

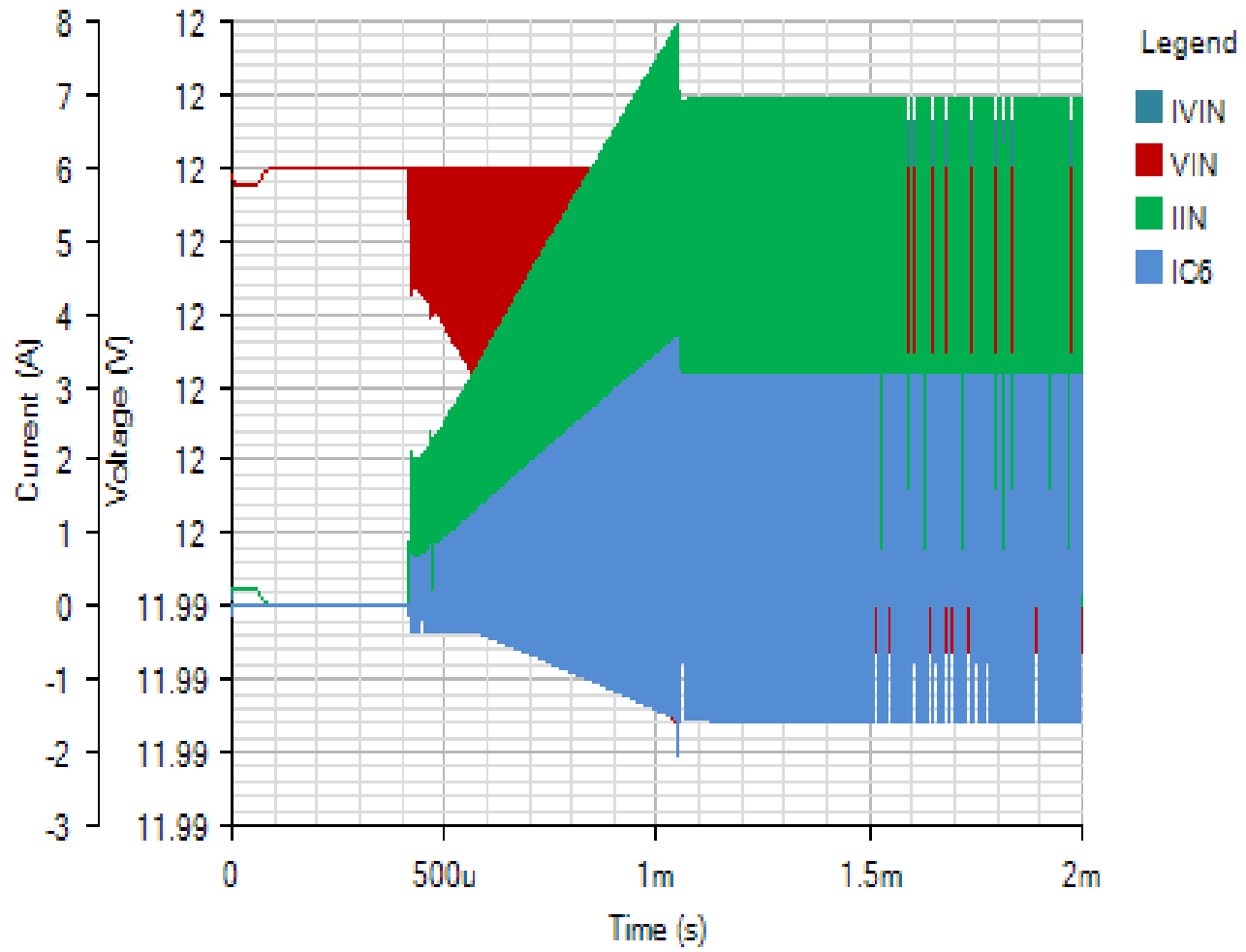






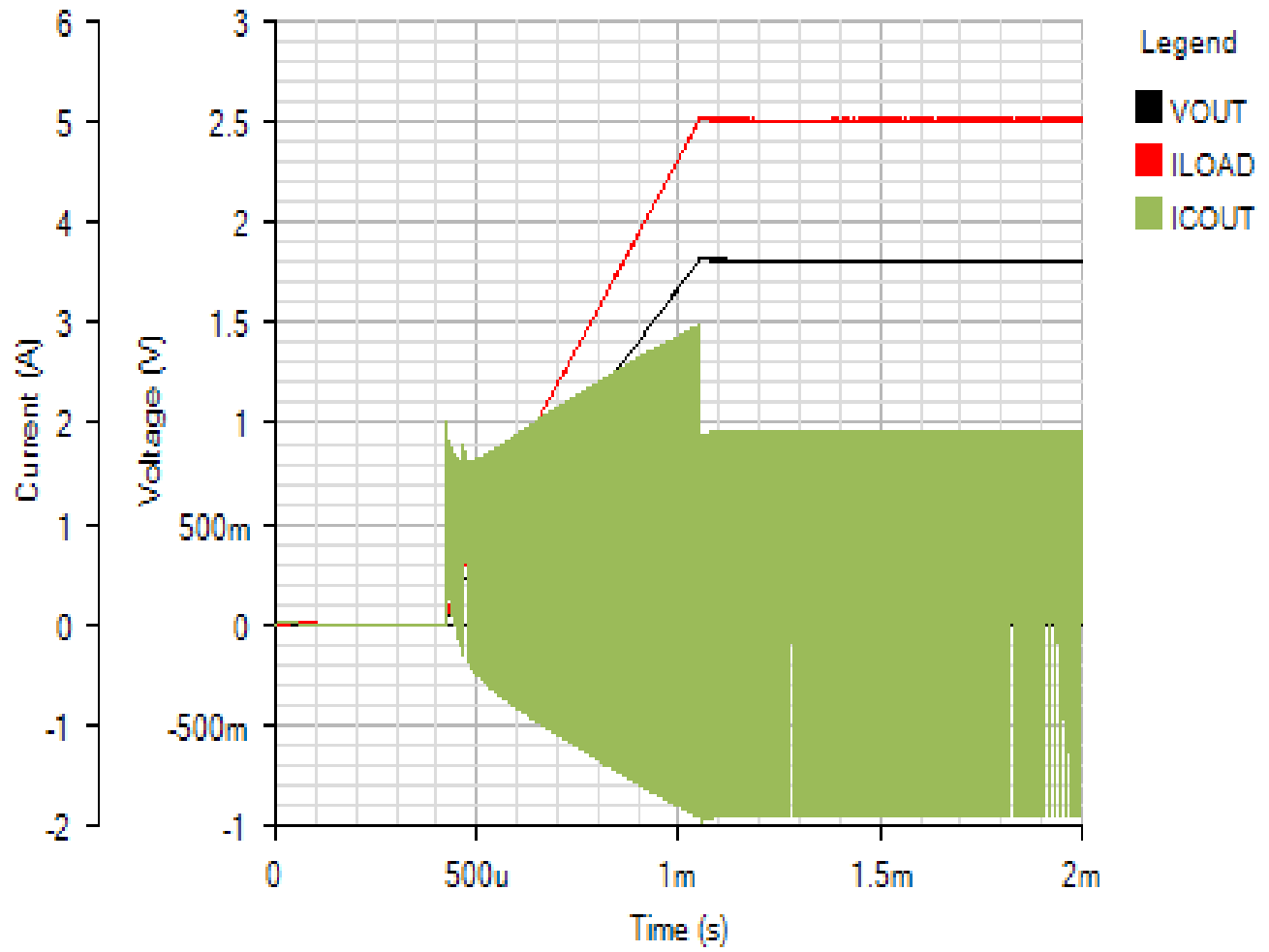
INPUT

Default



OUTPUT

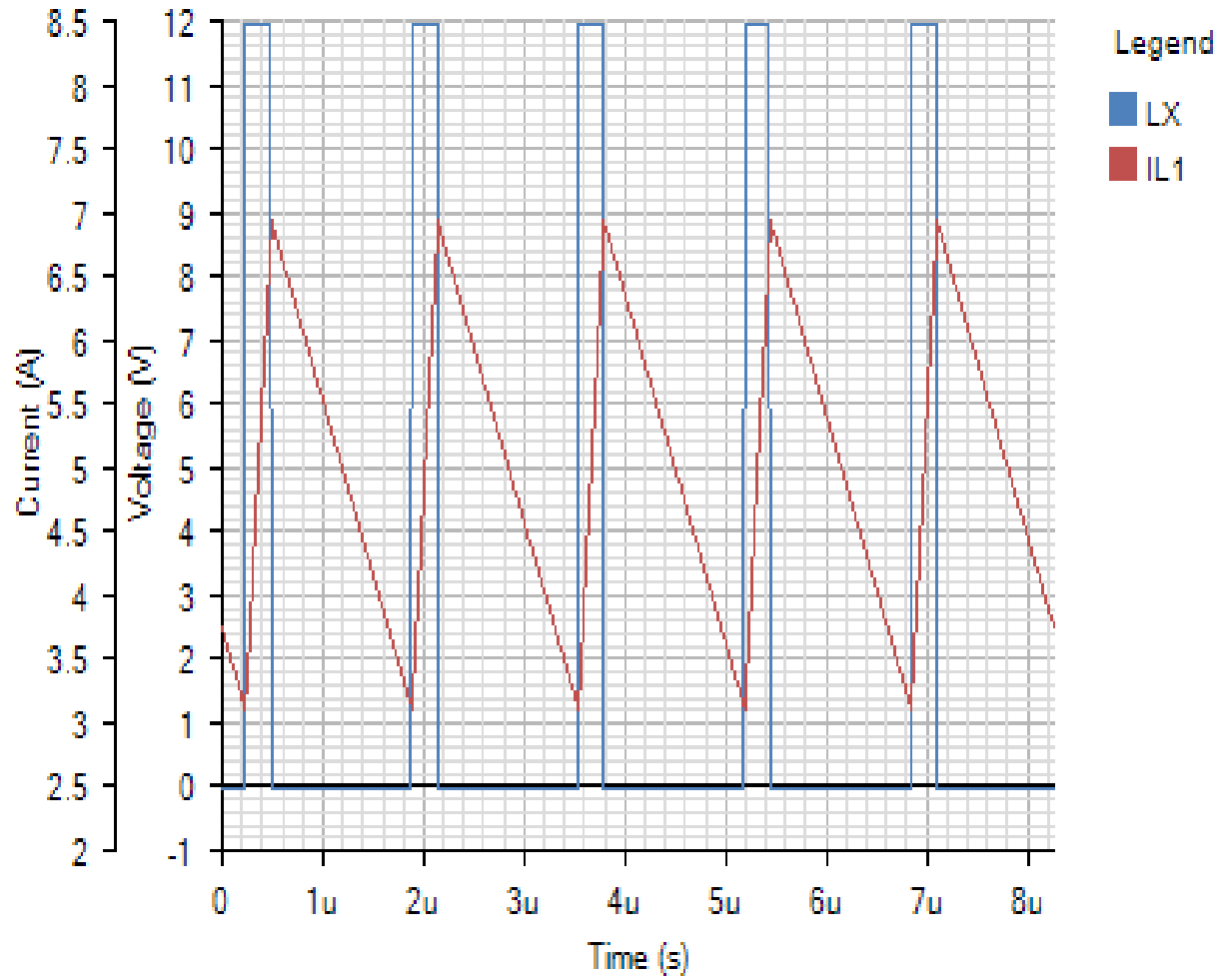
Default



Steady State - Wed Nov 21 2018 15:56:32

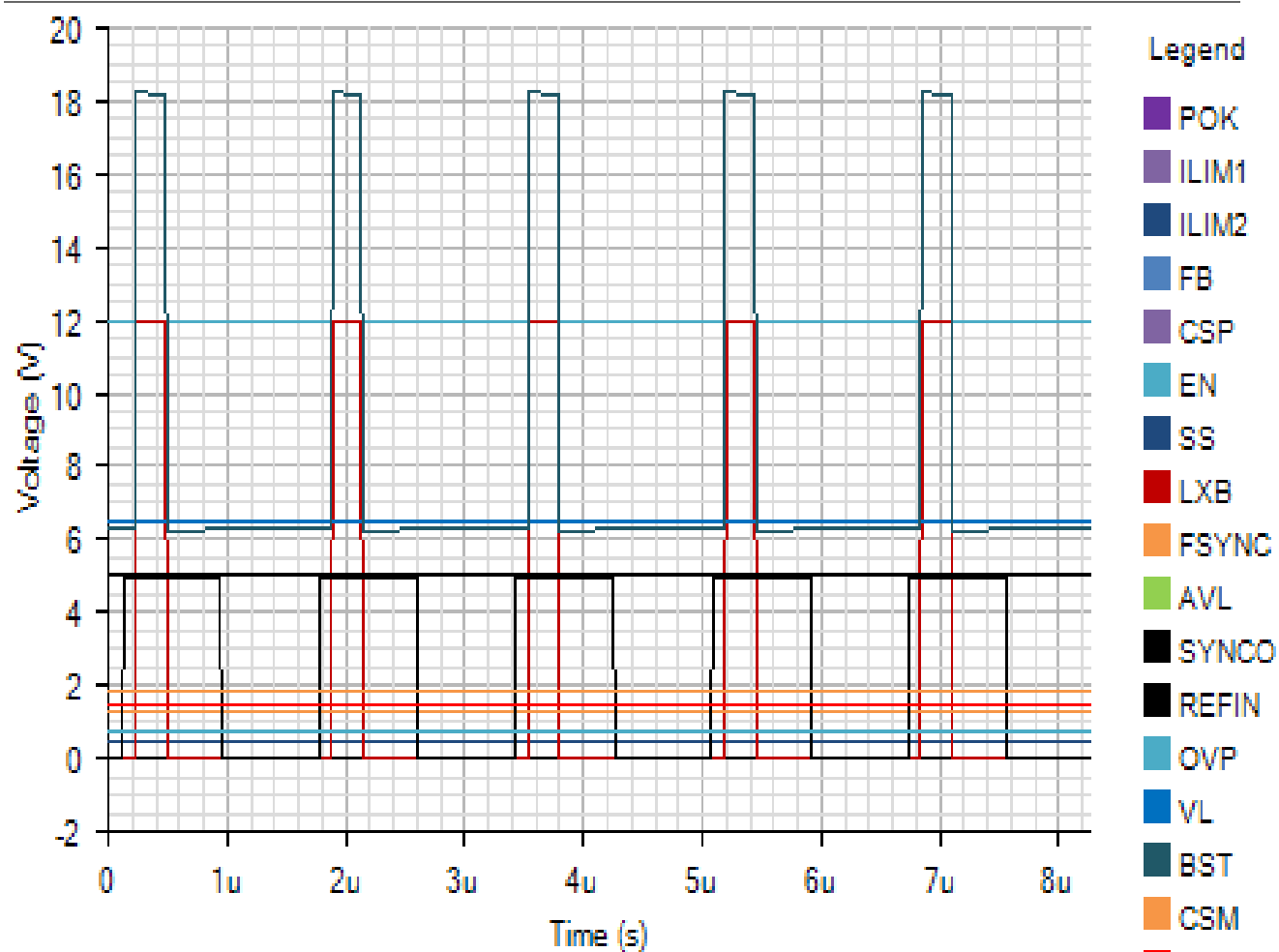
SWITCHING

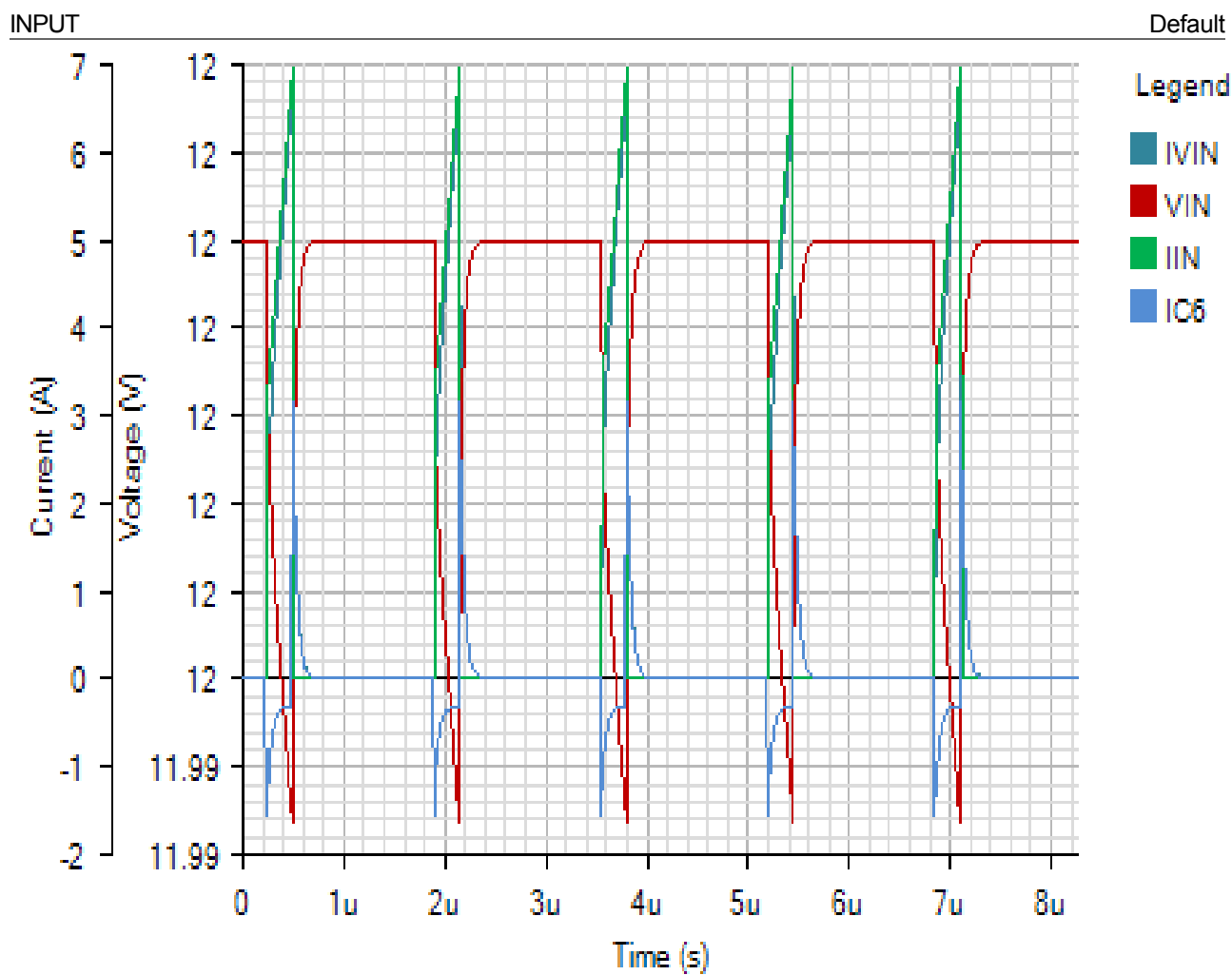
Default



IC

Default





OUTPUT

Default

