

## Initial Design

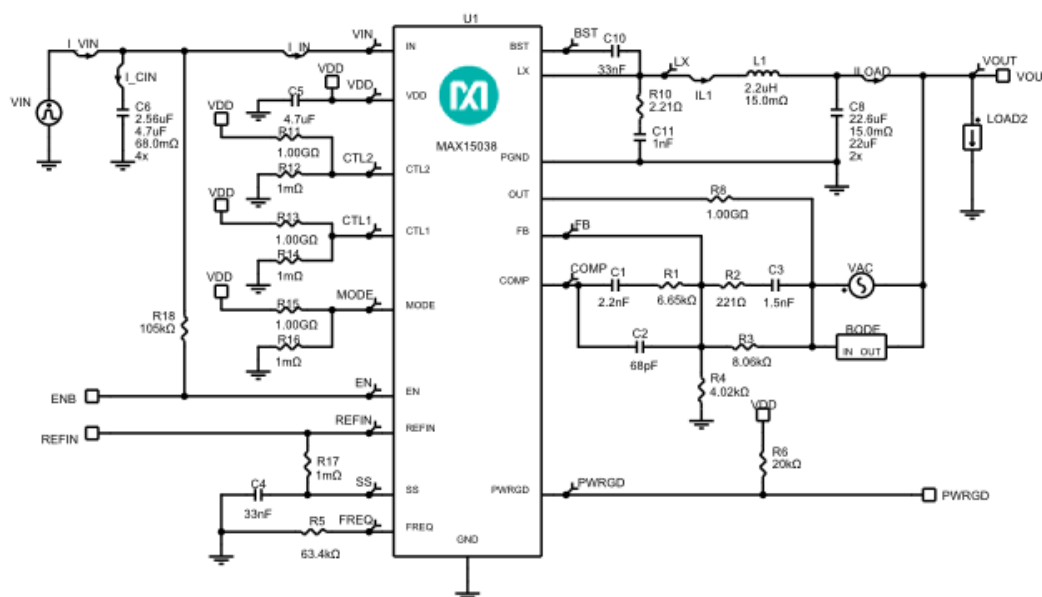
1.0

**Design Requirements**

---

Parameter	Value
Minimum Input Voltage	4.5V
Maximum Input Voltage	5.5V
Nominal Input Voltage	5V
Input Voltage Ripple	3%
Output Voltage Programming	External Resistive Divider
Output Voltage	1.8V
Output Current	2A
Output Voltage Ripple	1%
Load Step Start Current	1A
Load Step Current	2A
Output Voltage Load Step Over/Undershoot	5%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Switching Frequency	800kHz
Operating Mode	PWM mode
Inductor Current Ratio (LIR)	0.3

## Schematic



Notes:  
- Series RC snubber components, R10 & C11, are optional. Values are dependent on circuit parasitics, layout, etc.  
- If the current level (Starting current for Load Steps) is too low, AC, Steady Stat and Load Step analyses may fail when Skip mode is selected

## BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	<a href="#">MAX15038ETG+</a>	Maxim Integrated	4A, 2MHz Step-Down Regulator with Integrated Switches
C1	1	<a href="#">CGA3E2X7R1H222K080AA</a>	TDK	Cap Ceramic 0.0022uF 50V X7R 10% Pad SMD 0603 125°C Automotive T/R
C2	1	<a href="#">06035A680JAT2A</a>	AVX	Cap Ceramic 68pF 50V C0G 5% Pad SMD 0603 125°C T/R
C3	1	<a href="#">C1608C0G1H152J080AA</a>	TDK	Cap Ceramic 0.0015uF 50V C0G 5% Pad SMD 0603 125°C T/R
C4	1	<a href="#">06035C333KAT2A</a>	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R
C5	1	<a href="#">GCM32ER71H475KA55L</a>	Murata Manufacturing	Cap Ceramic 4.7uF 50V X7R 10% Pad SMD 1210 125°C Automotive T/R
C6	4	<a href="#">GRM188C81C475KE11</a>	Murata	Cap Ceramic 4.7uF 16V 0603 105C
C8	2	<a href="#">GRM32DR61C226KE18L</a>	Murata	Cap Ceramic 22uF 16V X5R 10% SMD 1210 85C Embossed T/R
C10	1	<a href="#">06035C333KAT2A</a>	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R
C11	1	<a href="#">GRM1885C1H102JA01D</a>	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
L1	1	<a href="#">VLP8040T-2R2N</a>	TDK	Inductor Power Shielded Wirewound 2.2uH 30% 100KHz Ferrite 6.2A 15mOhm DCR Embossed Carrier T/R
R1	1	<a href="#">ERJ3EKF6651V</a>	Panasonic	Res Thick Film 0603 6.65K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

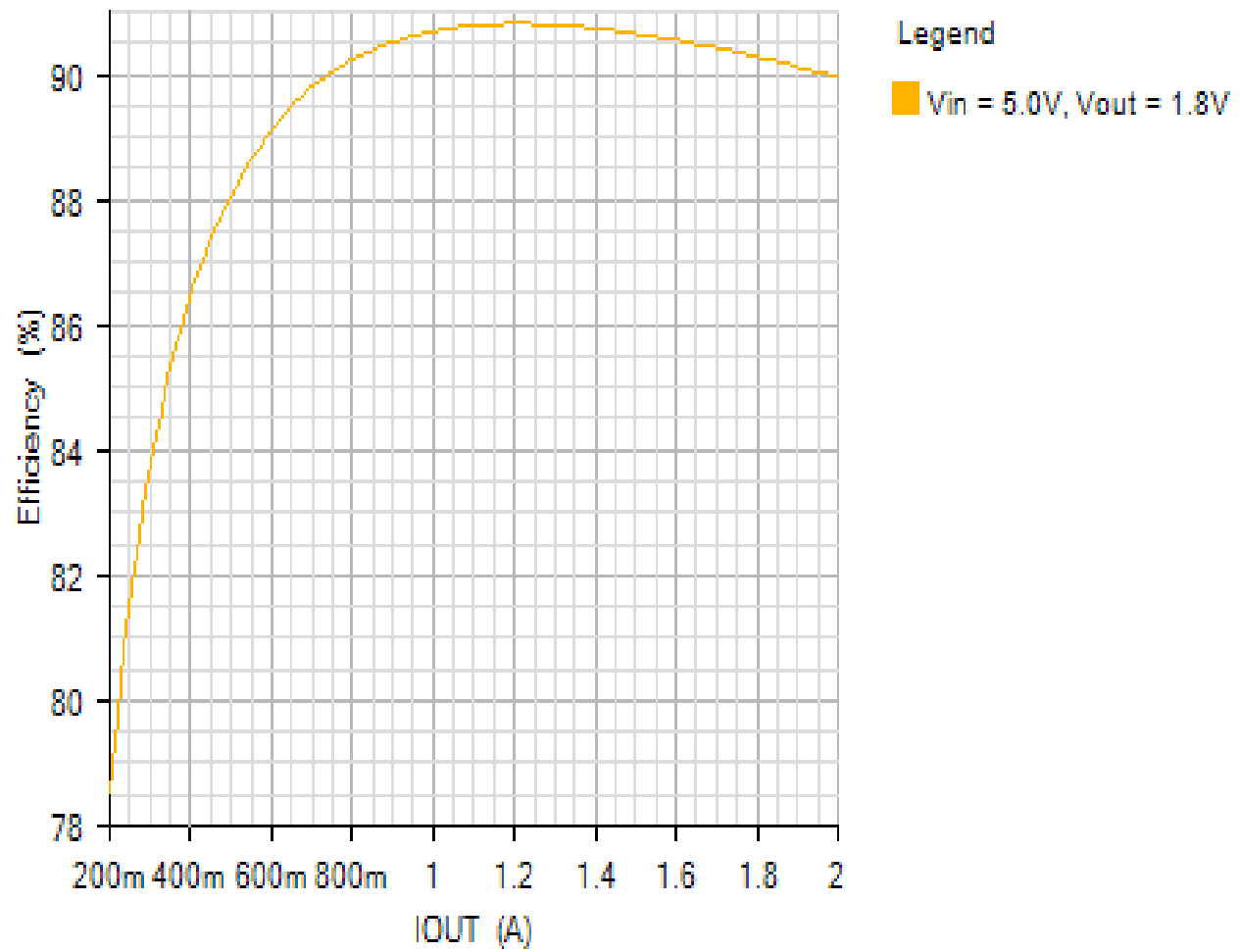
R2	1	<a href="#">ERJ3EKF2210V</a>	Panasonic	Res Thick Film 0603 221 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	<a href="#">ERJ3EKF8061V</a>	Panasonic	Res Thick Film 0603 8.06K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	<a href="#">ERJ3EKF4021V</a>	Panasonic	Res Thick Film 0603 4.02K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	<a href="#">ERJ3EKF6342V</a>	Panasonic	Res Thick Film 0603 63.4K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	<a href="#">ERJ3GEYJ203V</a>	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R10	1	<a href="#">RMCF0603FT2R21</a>	Stackpole Electronics, Inc	Res Thick Film 0603 2.21 Ohm 1% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R18	1	<a href="#">ERJ3EKF1053V</a>	Panasonic	Res Thick Film 0603 105K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

## Simulation Results

Efficiency - Mon Nov 19 2018 10:39:11

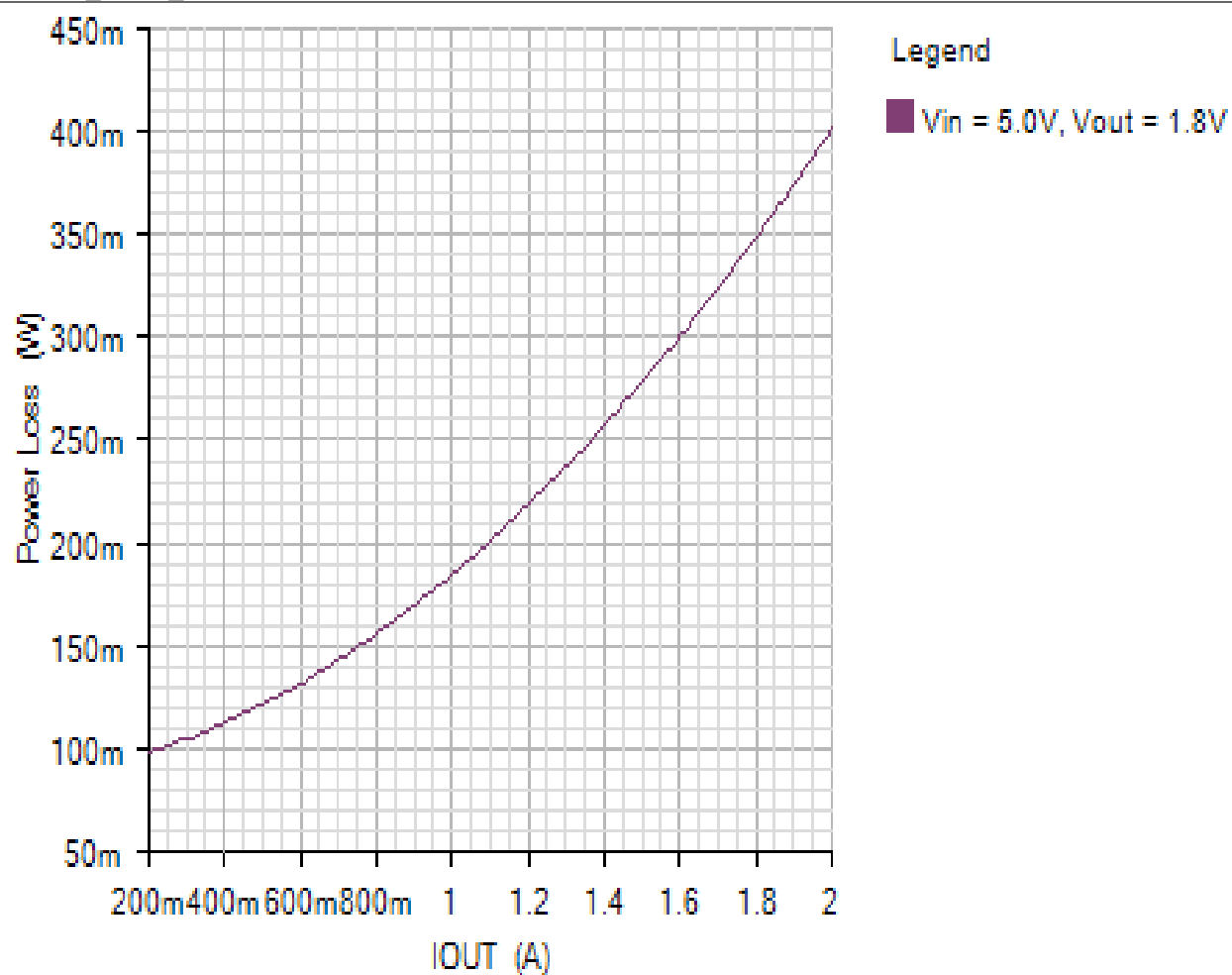
EFFICIENCY\_PLOT

Default

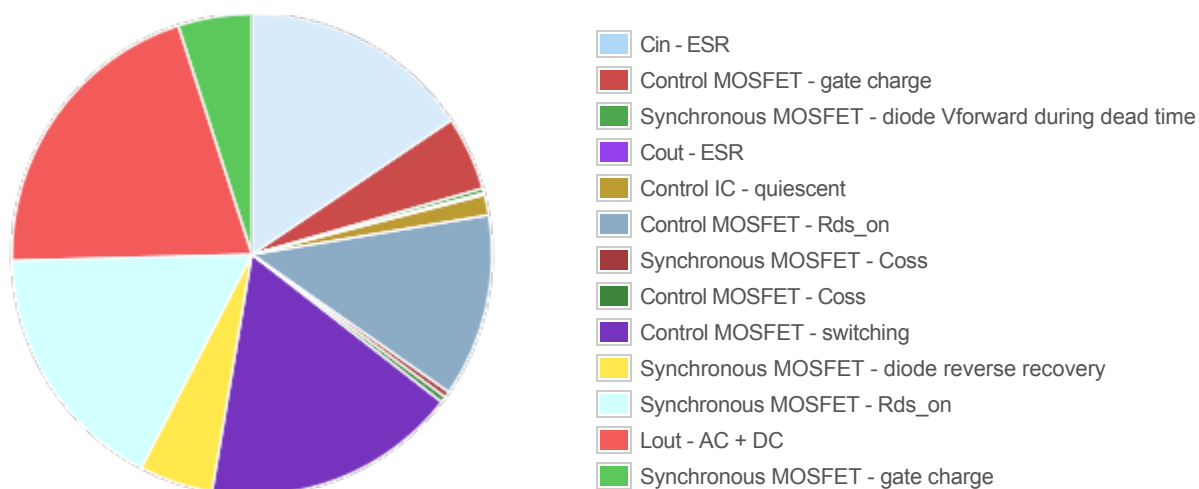


POWER\_LOSS\_PLOT

Default



Losses



Component

Loss (W)

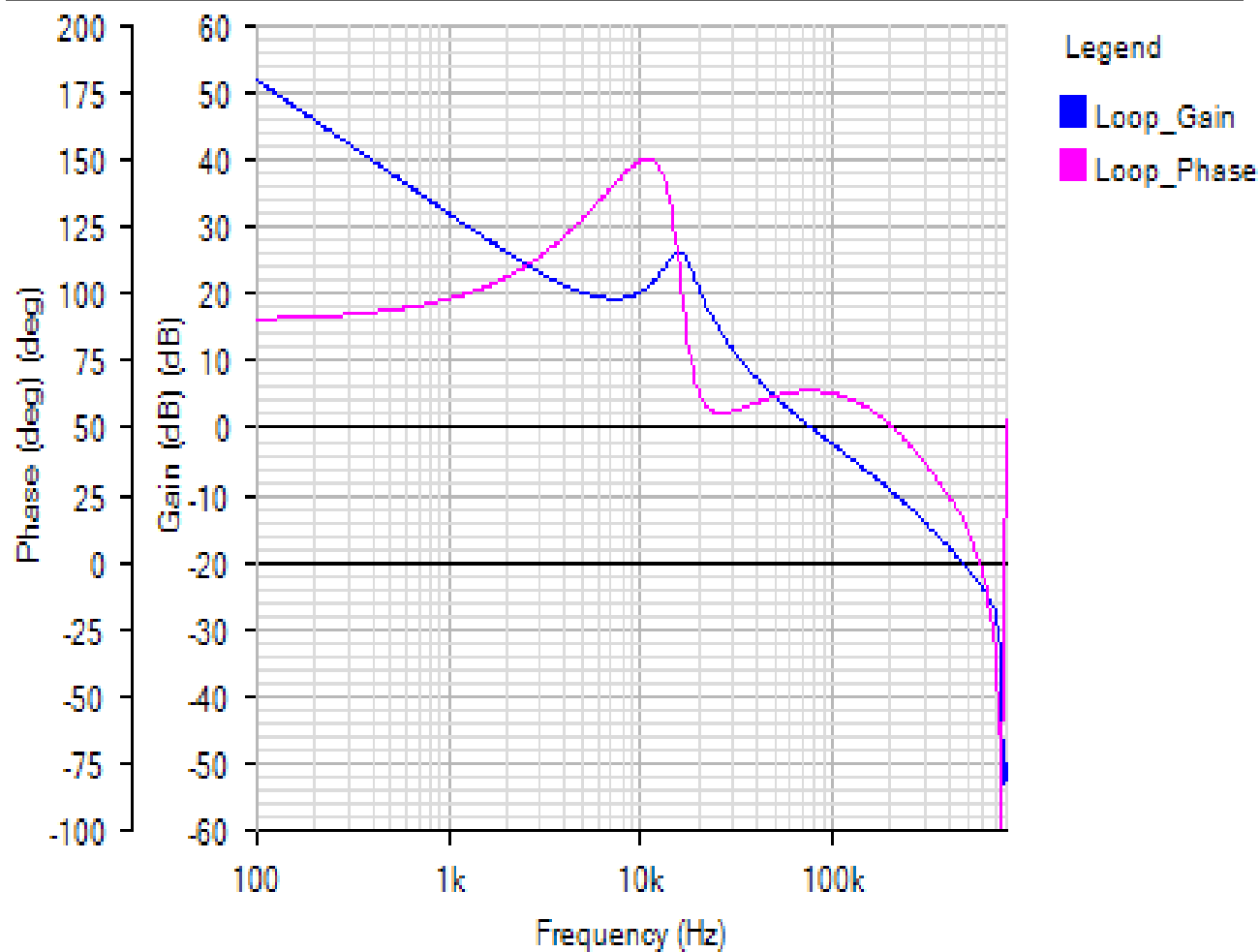
% of total

Component	Loss (W)	% of total
Cin - ESR	0.062669	15.6
Control MOSFET - gate charge	0.02	5
Synchronous MOSFET - diode Vforward during dead time	0.00128	0.3
Cout - ESR	0.000536	0.1
Control IC - quiescent	0.0055	1.4
Control MOSFET - Rds_on	0.049542	12.3
Synchronous MOSFET - Coss	0.00162	0.4
Control MOSFET - Coss	0.00162	0.4
Control MOSFET - switching	0.068966	17.2
Synchronous MOSFET - diode reverse recovery	0.02	5
Synchronous MOSFET - Rds_on	0.068187	17
Lout - AC + DC	0.082168	20.4
Synchronous MOSFET - gate charge	0.02	5
Total	0.402087	100

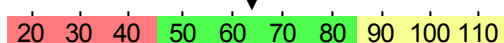
AC Loop - Mon Nov 19 2018 10:39:11

BODE

Default



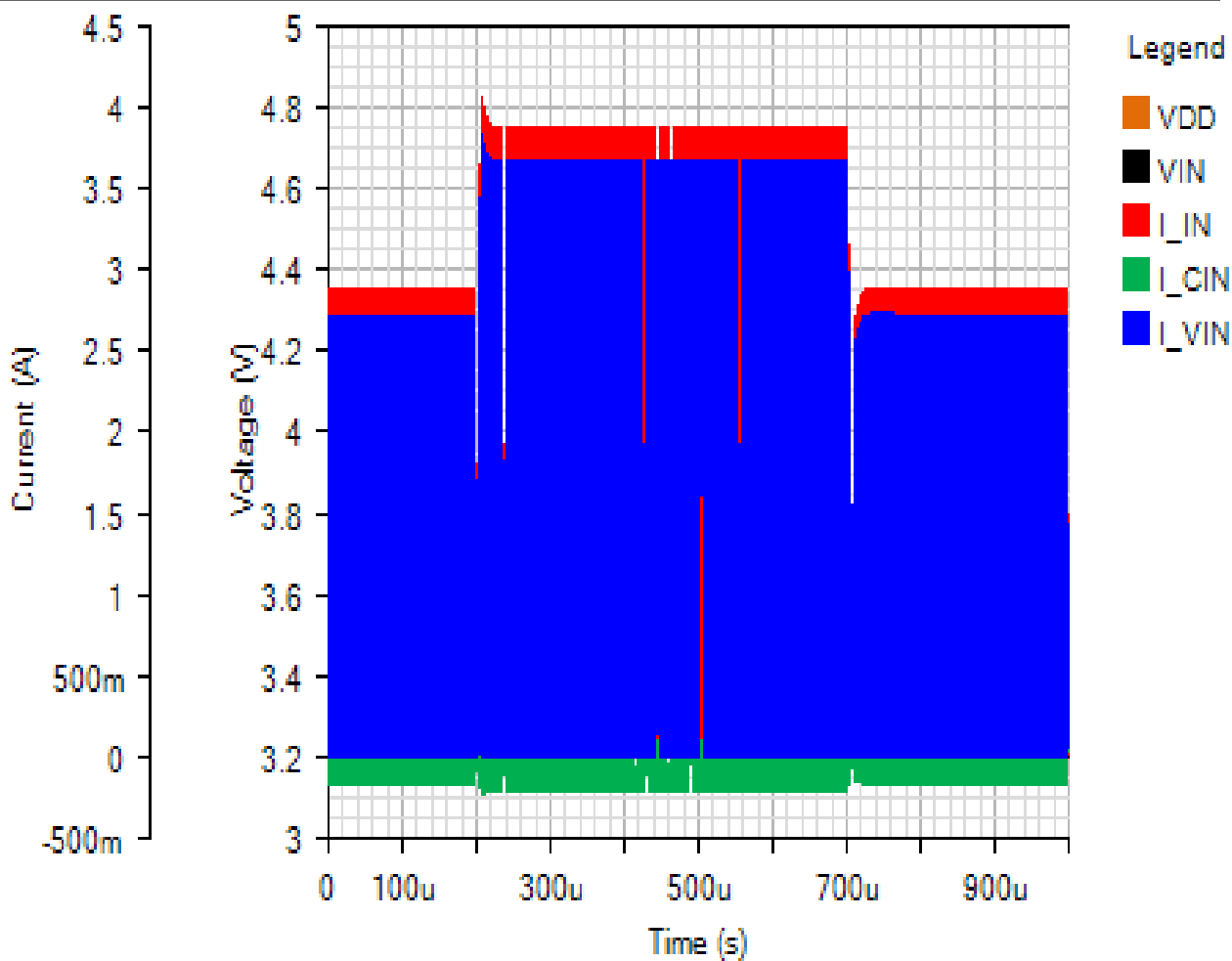
Phase Margin: 63.86° at a crossover frequency of 77.6kHz



Load Step - Mon Nov 19 2018 10:39:11

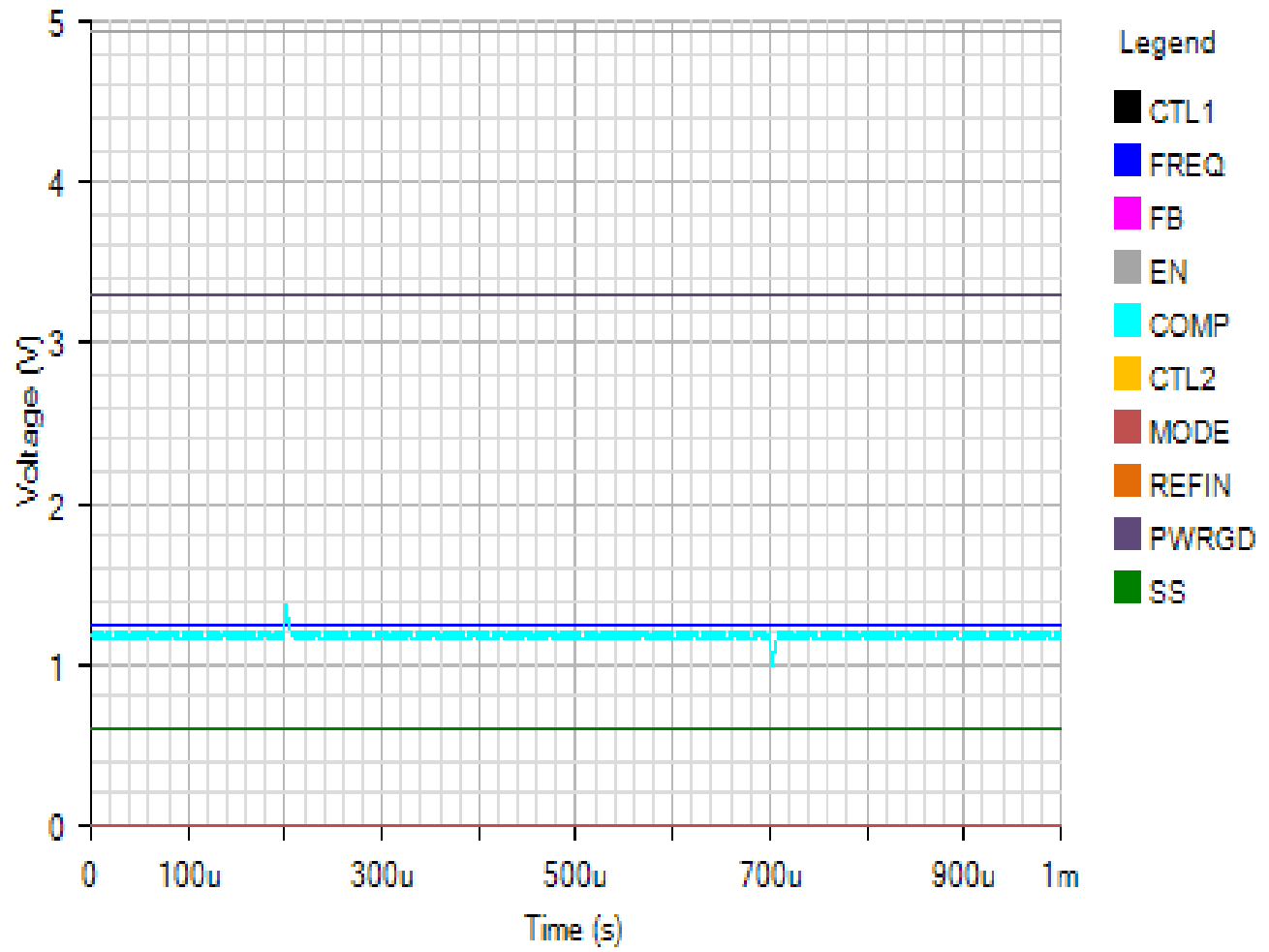
INPUT

Default



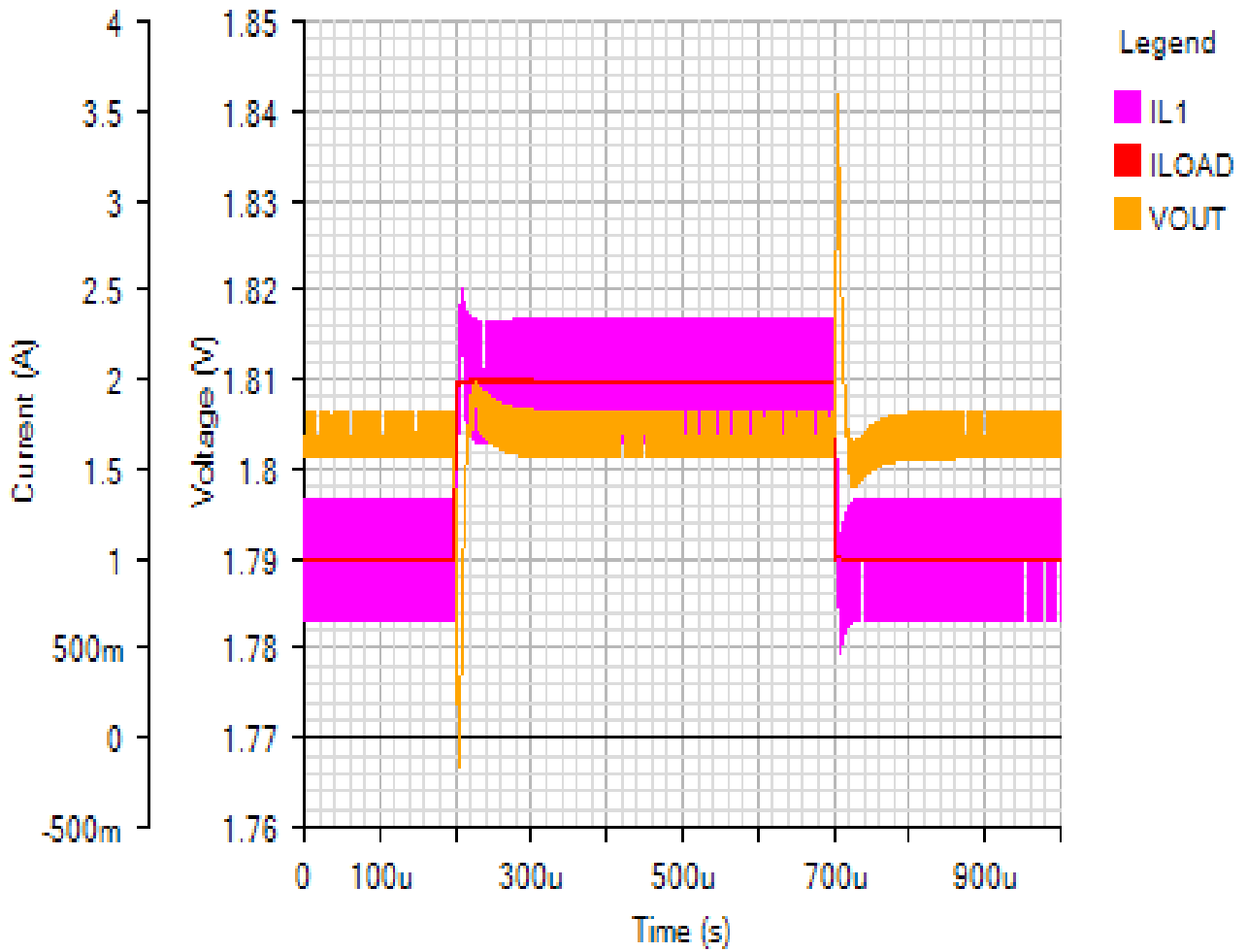
IC

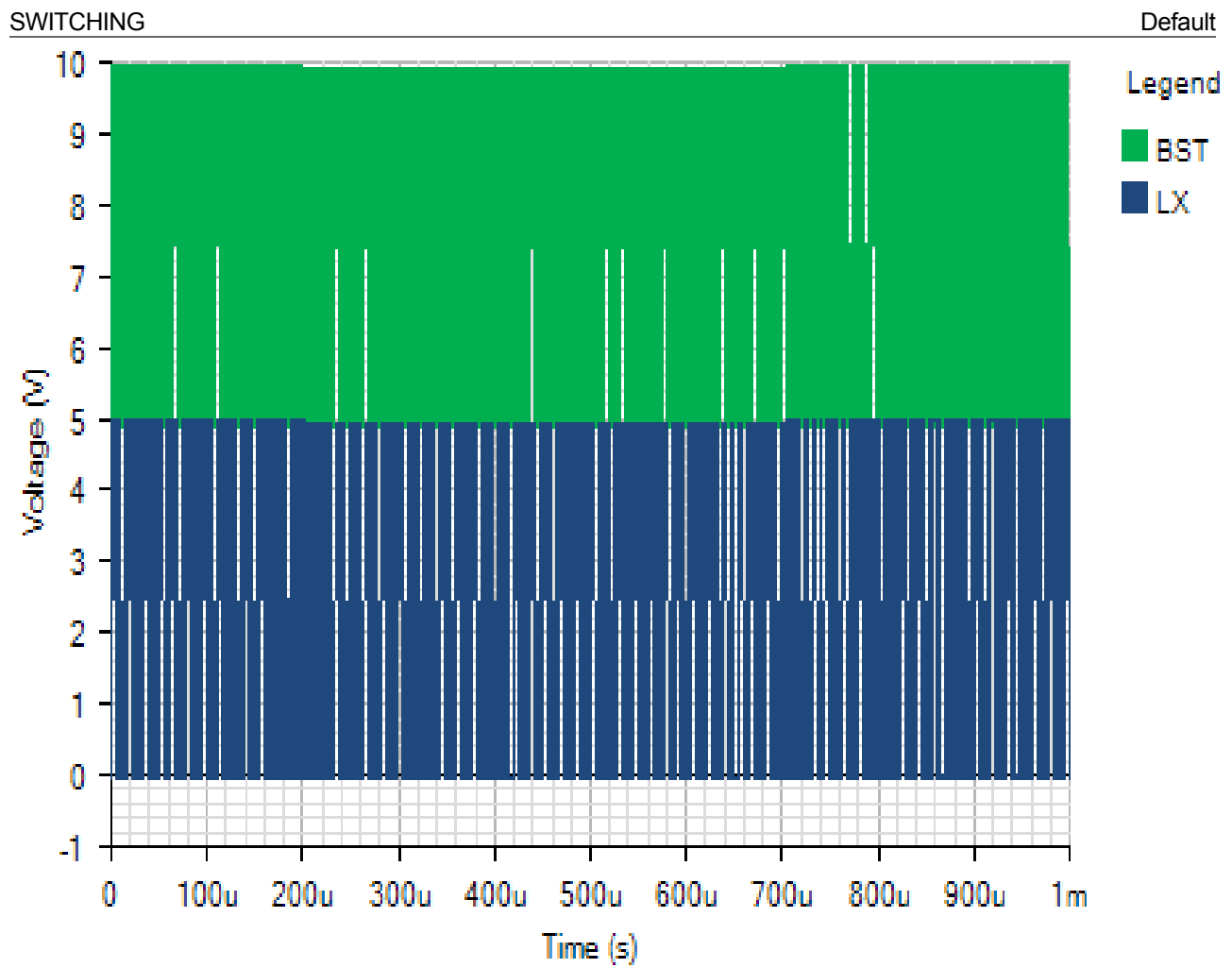
Default



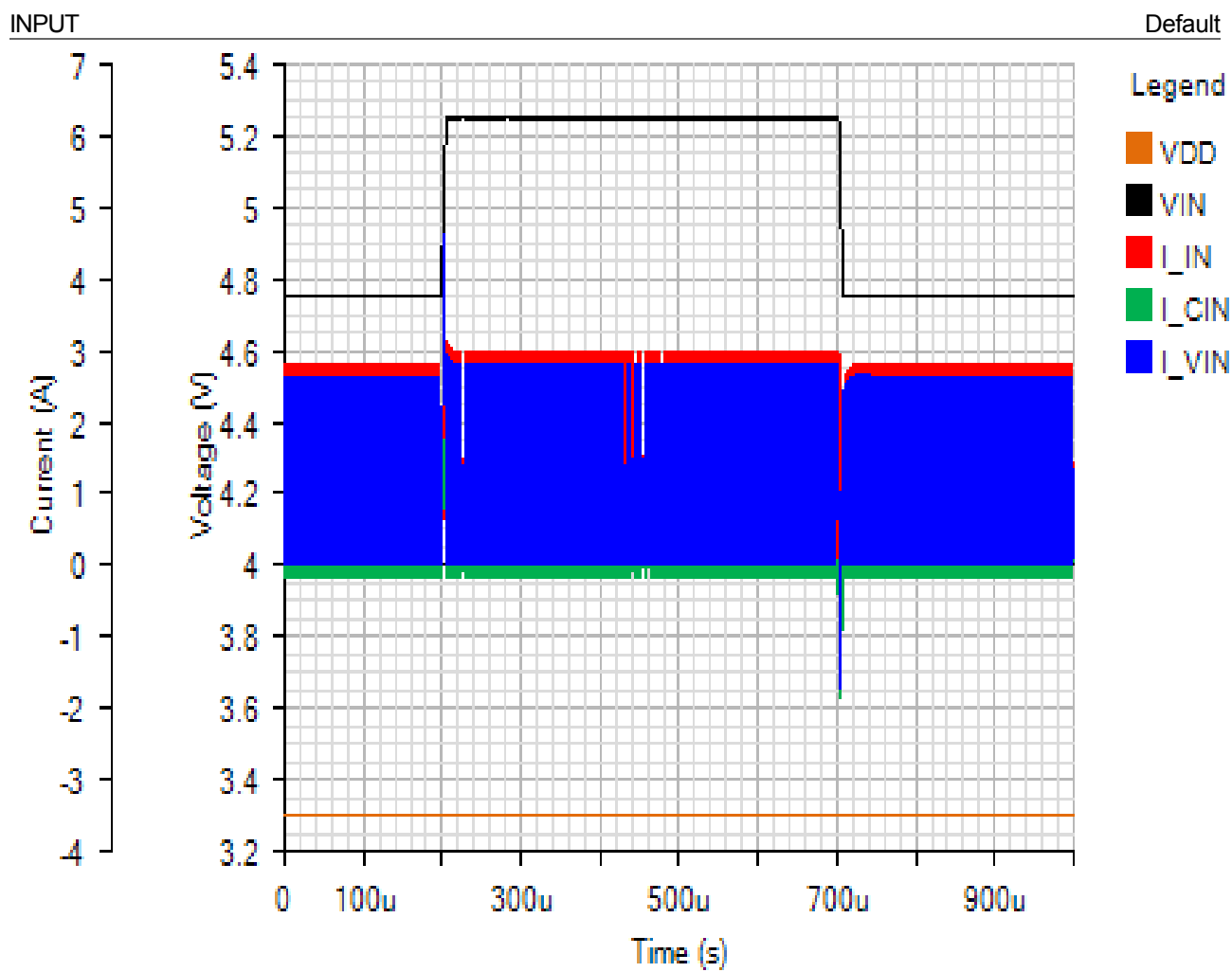
OUTPUT

Default



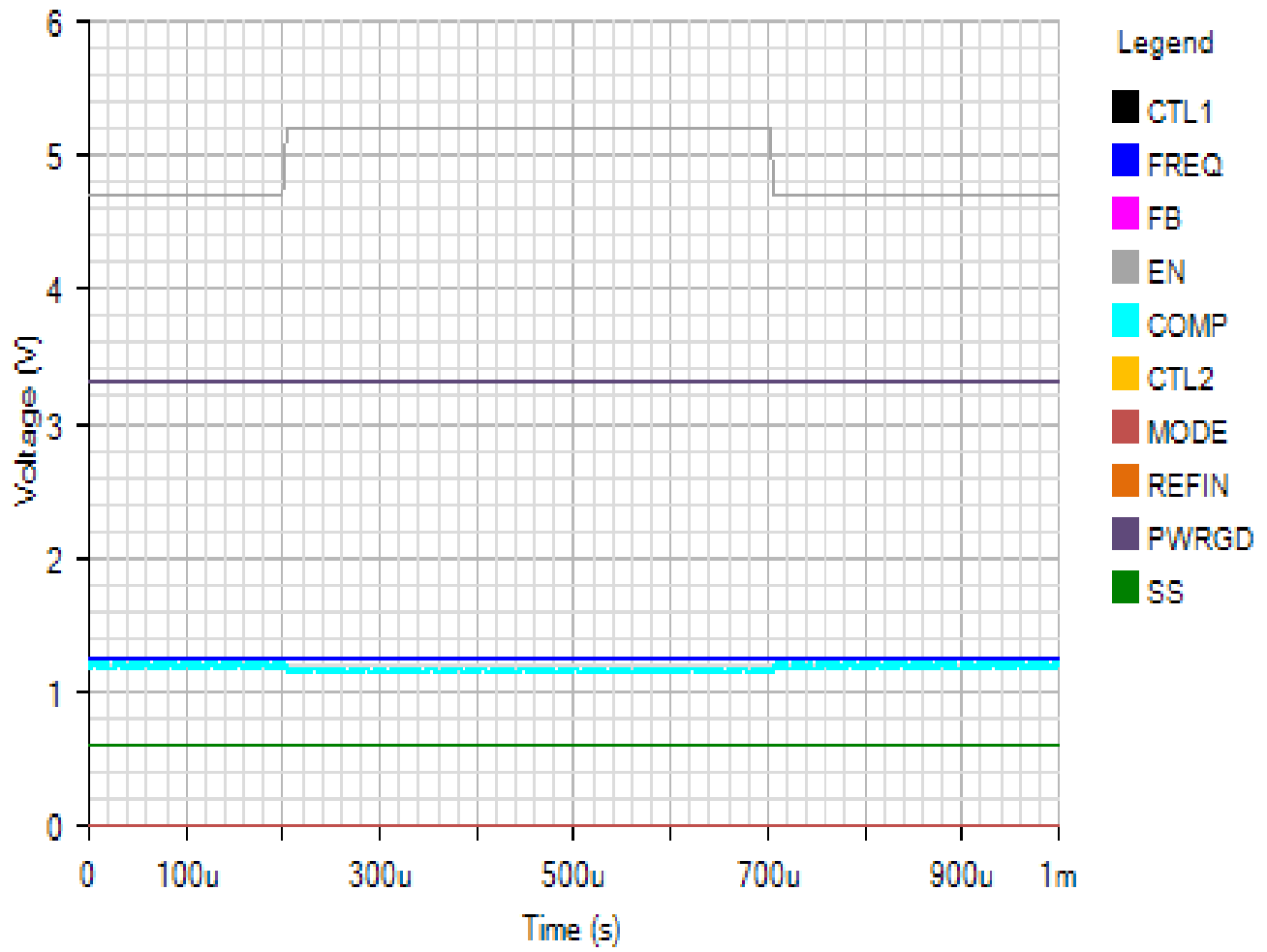


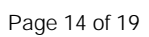
Line Transient - Mon Nov 19 2018 10:39:11



IC

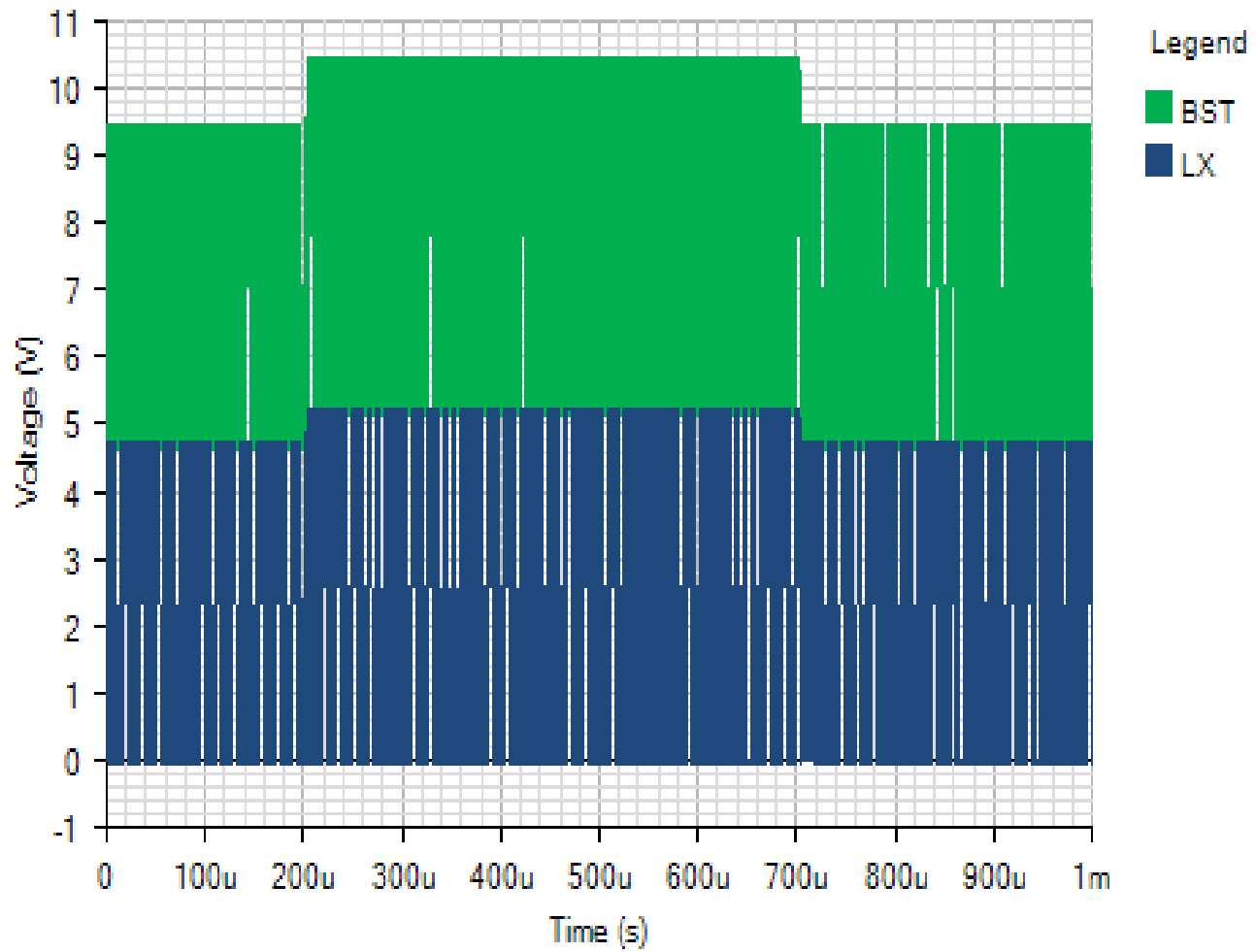
Default





SWITCHING

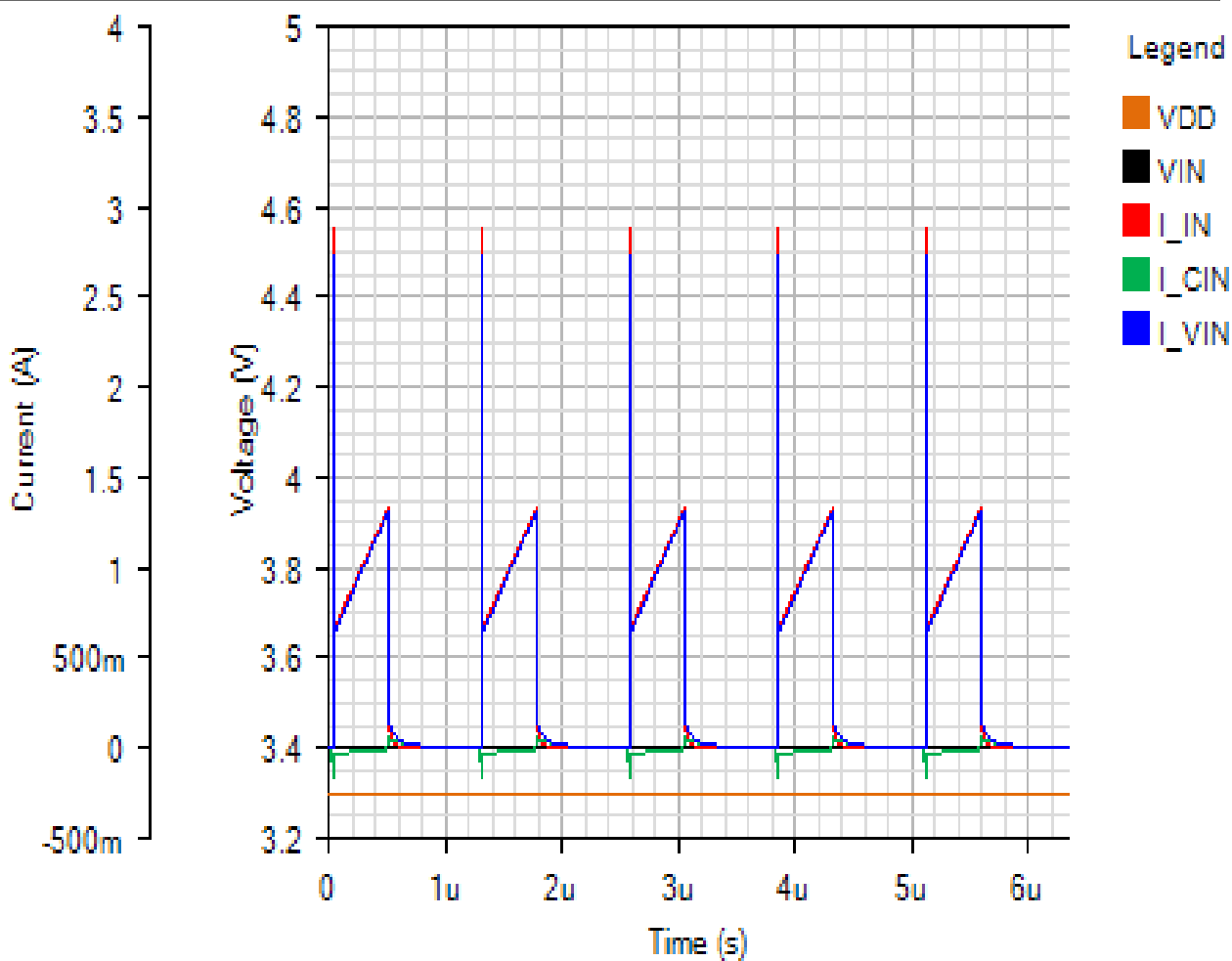
Default



Steady State - Mon Nov 19 2018 10:39:11

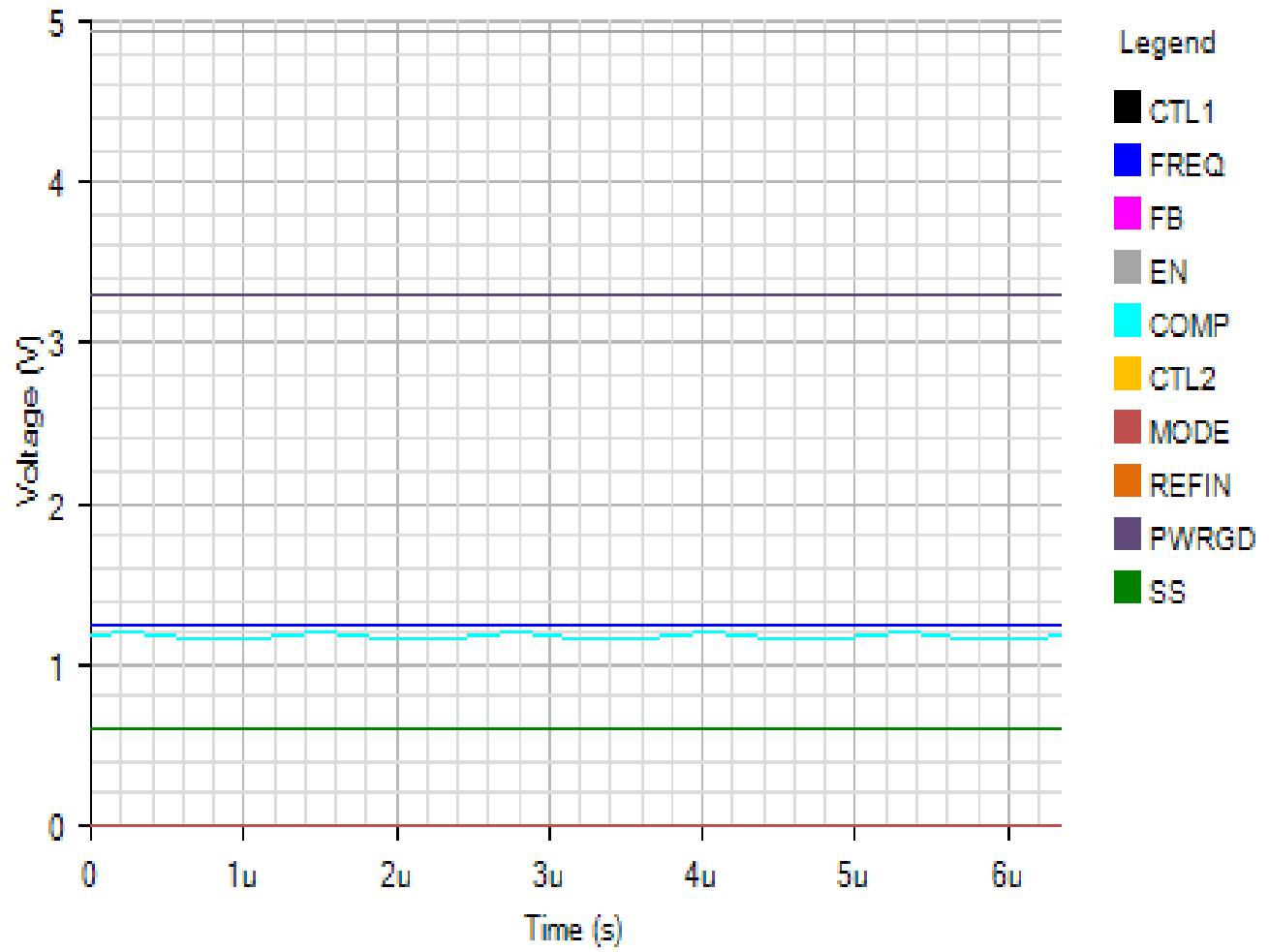
INPUT

Default



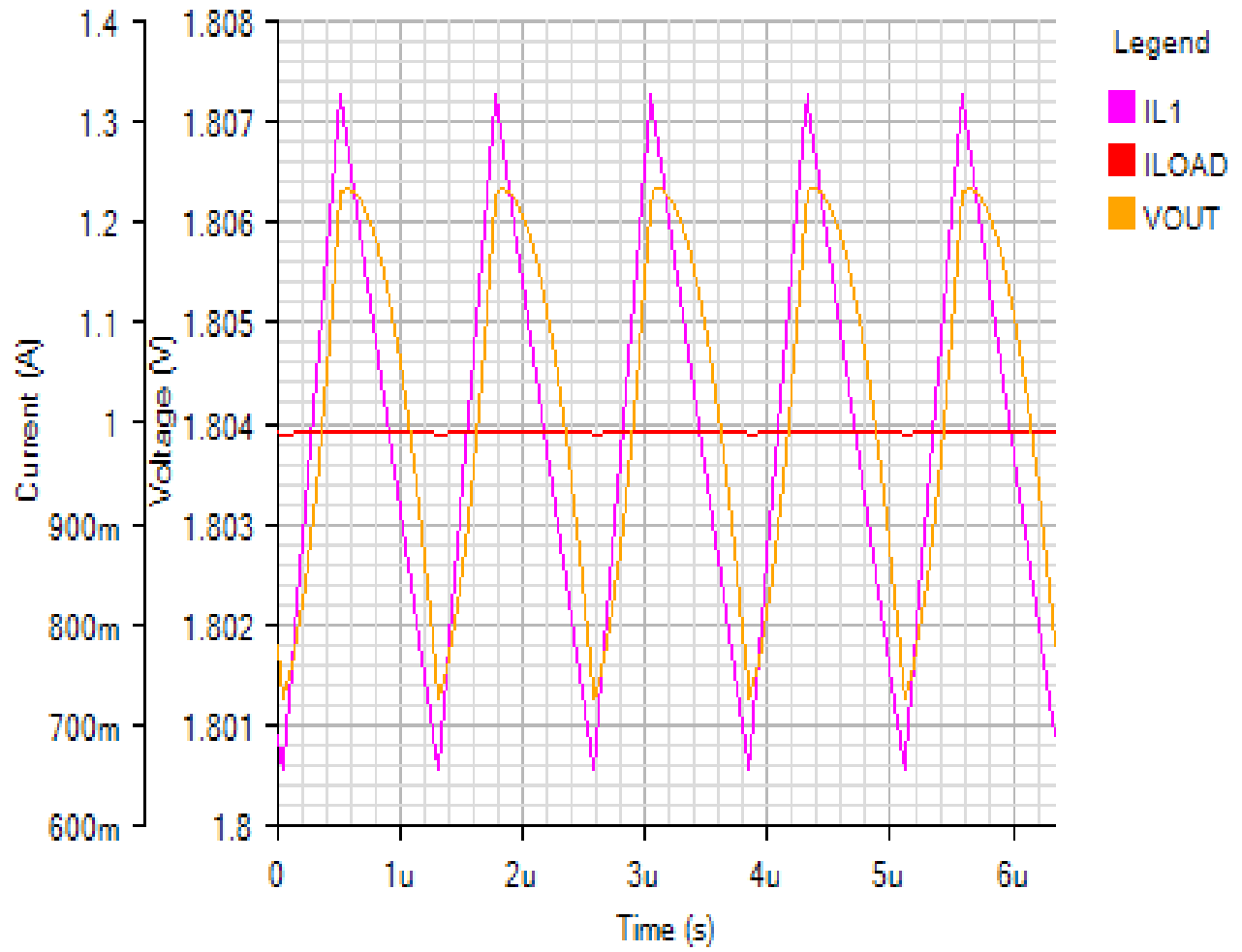
IC

Default



OUTPUT

Default



SWITCHING

Default

