

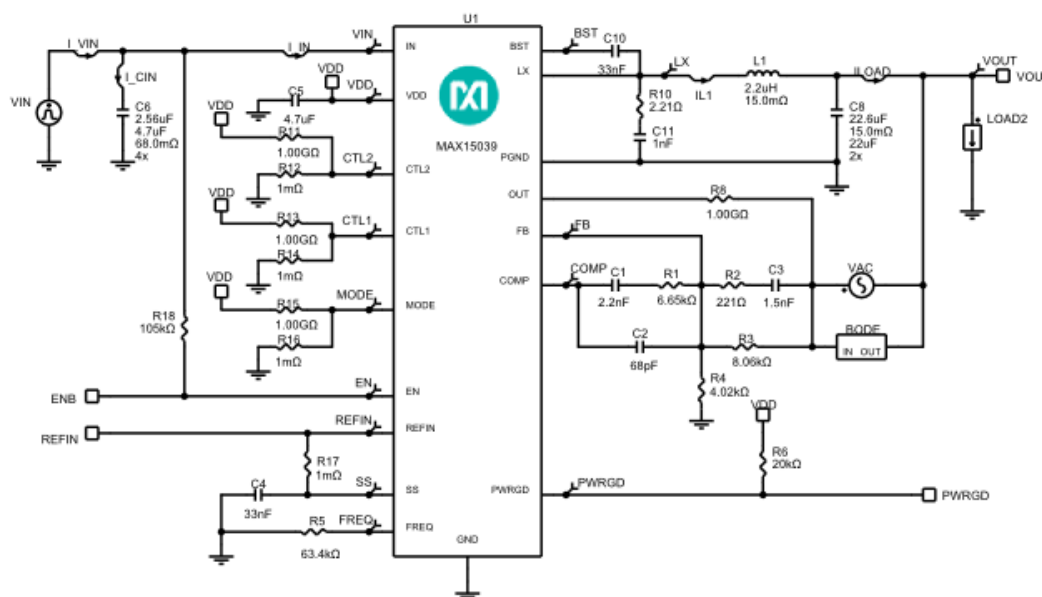
Initial Design

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	MAX15039ETG+	Maxim Integrated	6A, 2MHz Step-Down Regulator with Integrated Switches
C1	1	CGA3E2X7R1H222K080AA	TDK	Cap Ceramic 0.0022uF 50V X7R 10% Pad SMD 0603 125°C Automotive T/R
C2	1	06035A680JAT2A	AVX	Cap Ceramic 68pF 50V C0G 5% Pad SMD 0603 125°C T/R
C3	1	C1608C0G1H152J080AA	TDK	Cap Ceramic 0.0015uF 50V C0G 5% Pad SMD 0603 125°C T/R
C4	1	06035C333KAT2A	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R
C5	1	GCM32ER71H475KA55L	Murata Manufacturing	Cap Ceramic 4.7uF 50V X7R 10% Pad SMD 1210 125°C Automotive T/R
C6	4	GRM188C81C475KE11	Murata	Cap Ceramic 4.7uF 16V 0603 105C
C8	2	GRM32DR61C226KE18L	Murata	Cap Ceramic 22uF 16V X5R 10% SMD 1210 85C Embossed T/R
C10	1	06035C333KAT2A	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R
C11	1	GRM1885C1H102JA01D	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
L1	1	VLP8040T-2R2N	TDK	Inductor Power Shielded Wirewound 2.2uH 30% 100KHz Ferrite 6.2A 15mOhm DCR Embossed Carrier T/R
R1	1	ERJ3EKF6651V	Panasonic	Res Thick Film 0603 6.65K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

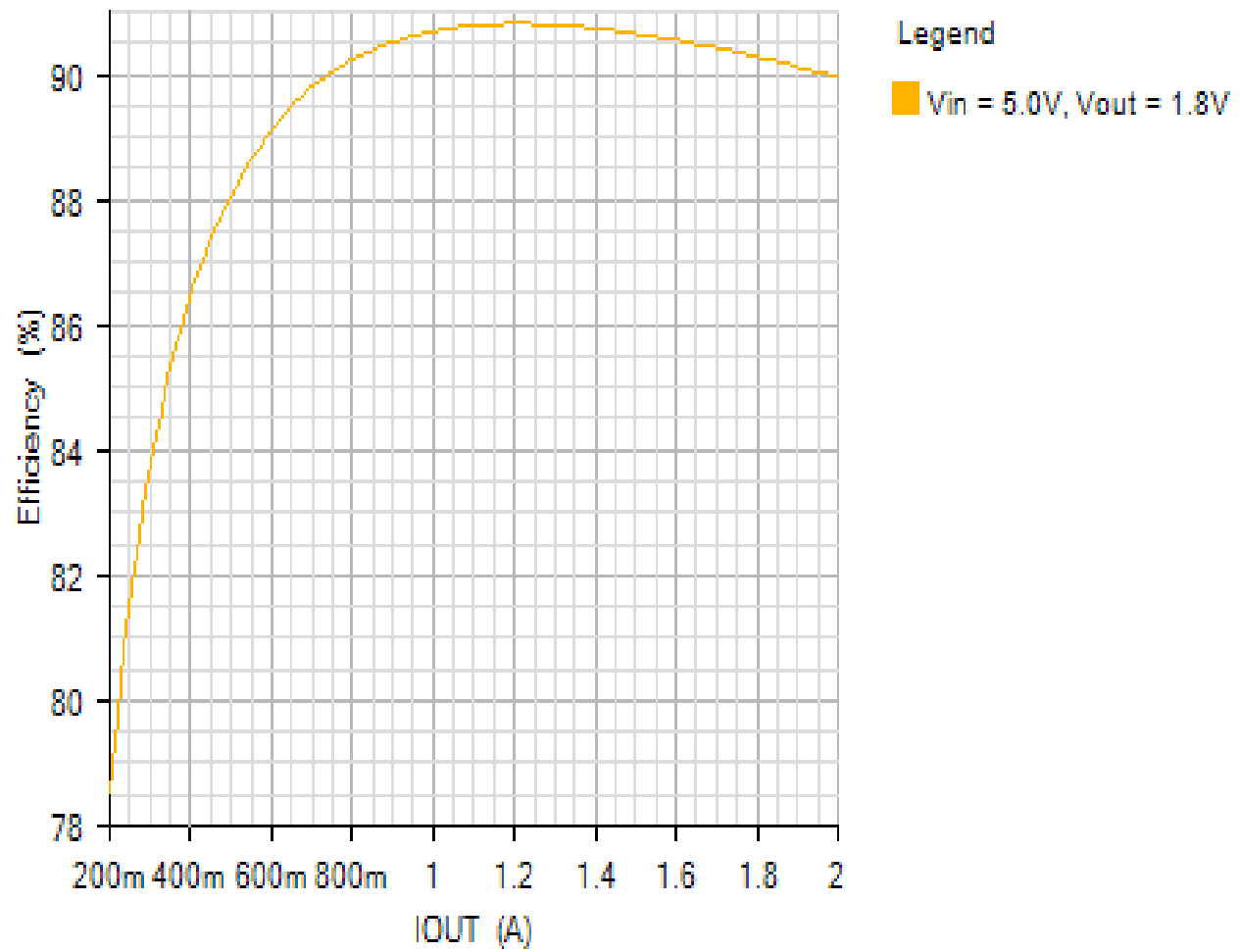
R2	1	ERJ3EKF2210V	Panasonic	Res Thick Film 0603 221 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ3EKF8061V	Panasonic	Res Thick Film 0603 8.06K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF4021V	Panasonic	Res Thick Film 0603 4.02K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ3EKF6342V	Panasonic	Res Thick Film 0603 63.4K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R10	1	RMCF0603FT2R21	Stackpole Electronics, Inc	Res Thick Film 0603 2.21 Ohm 1% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R18	1	ERJ3EKF1053V	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 10:46:40

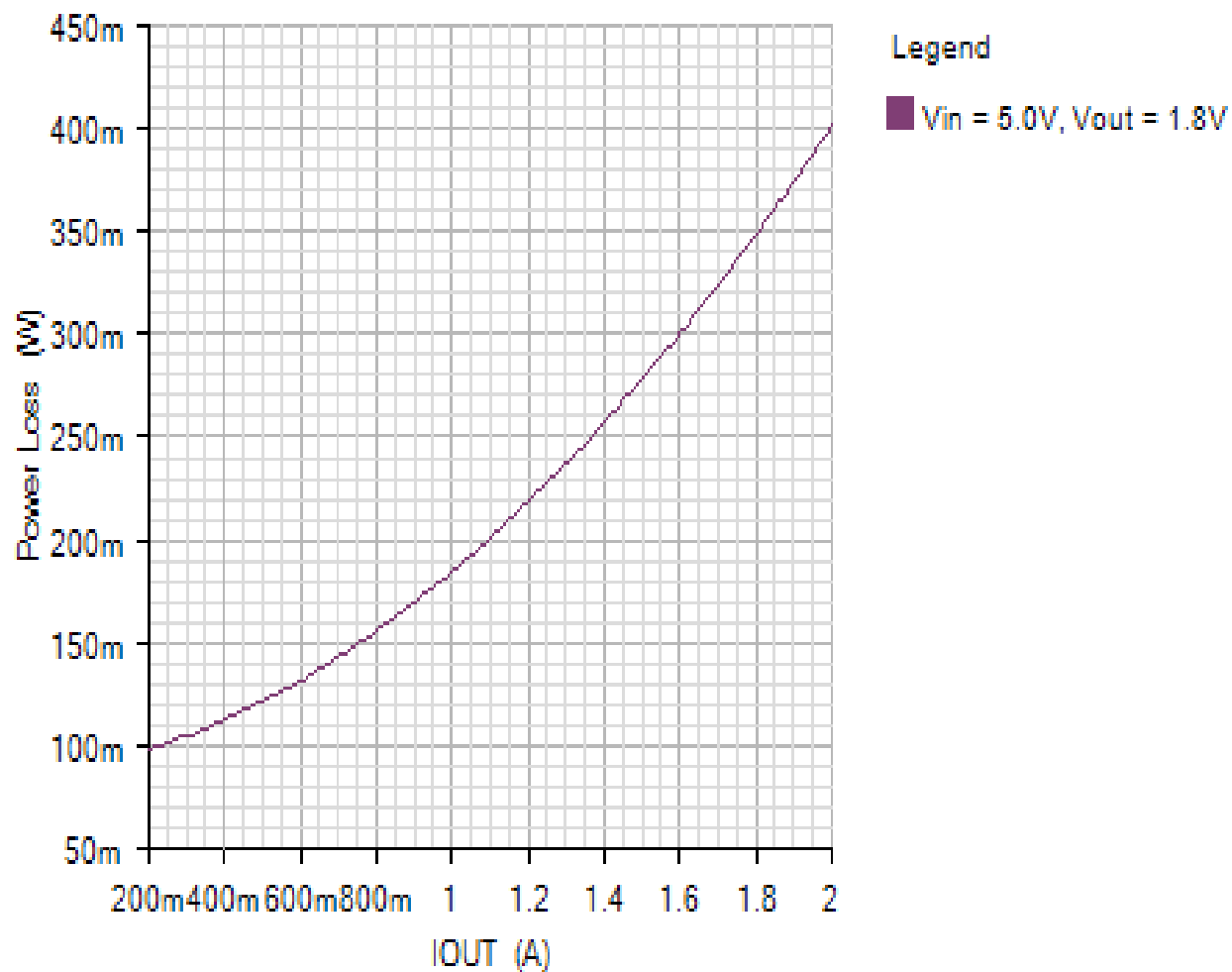
EFFICIENCY_PLOT

Default

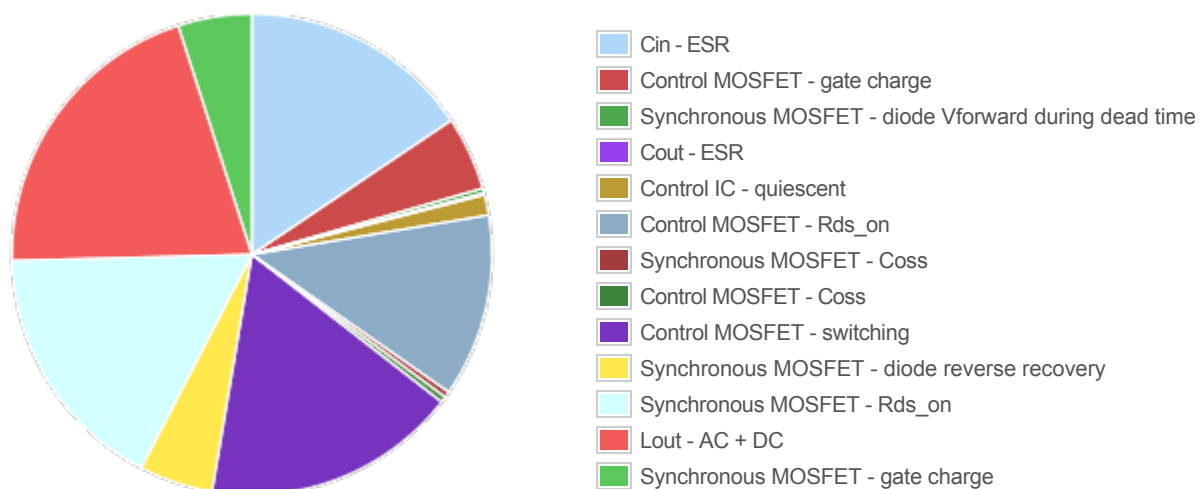


POWER_LOSS_PLOT

Default



Losses



Component

Loss (W)

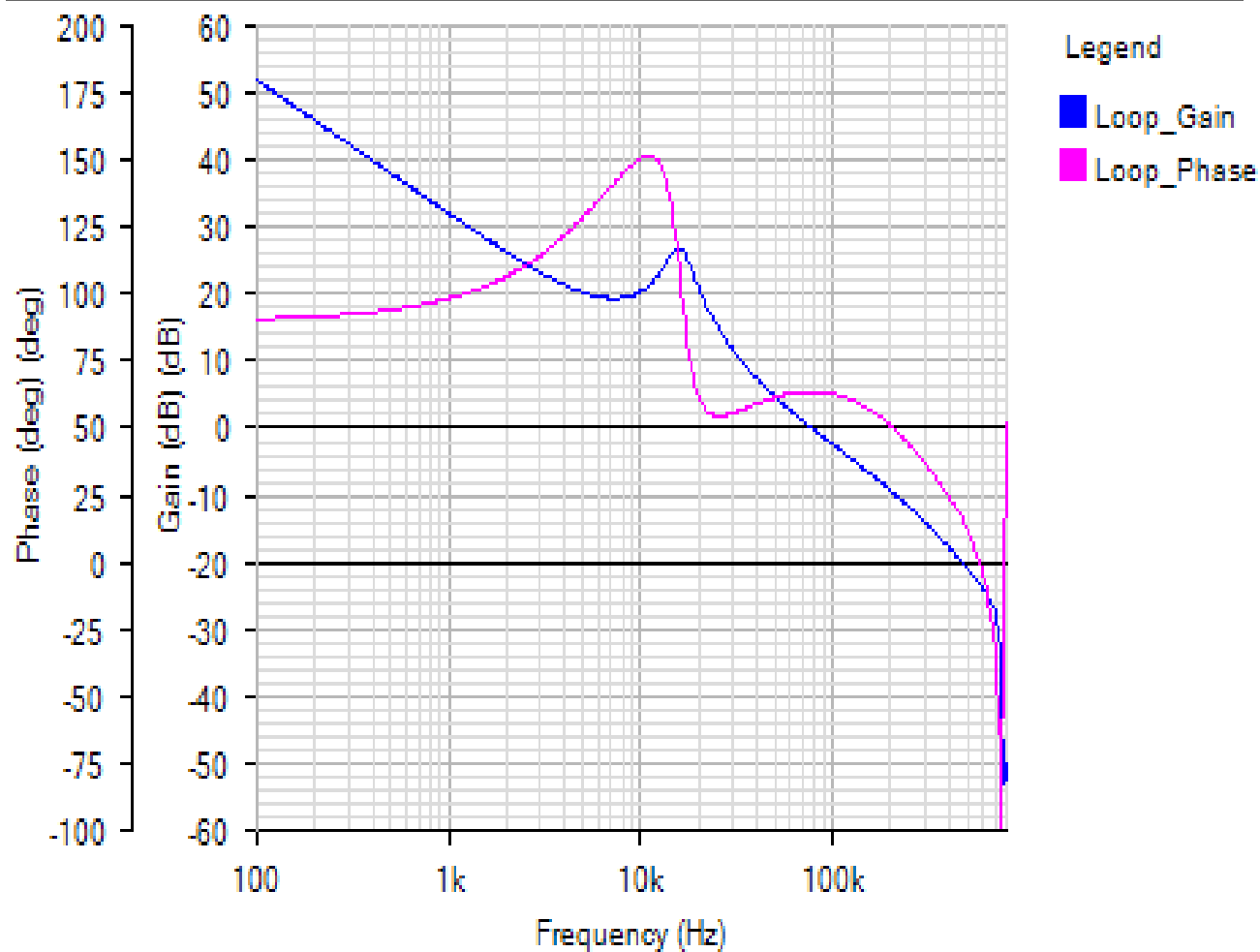
% of total

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

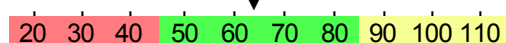
AC Loop - Mon Nov 19 2018 10:46:40

BODE

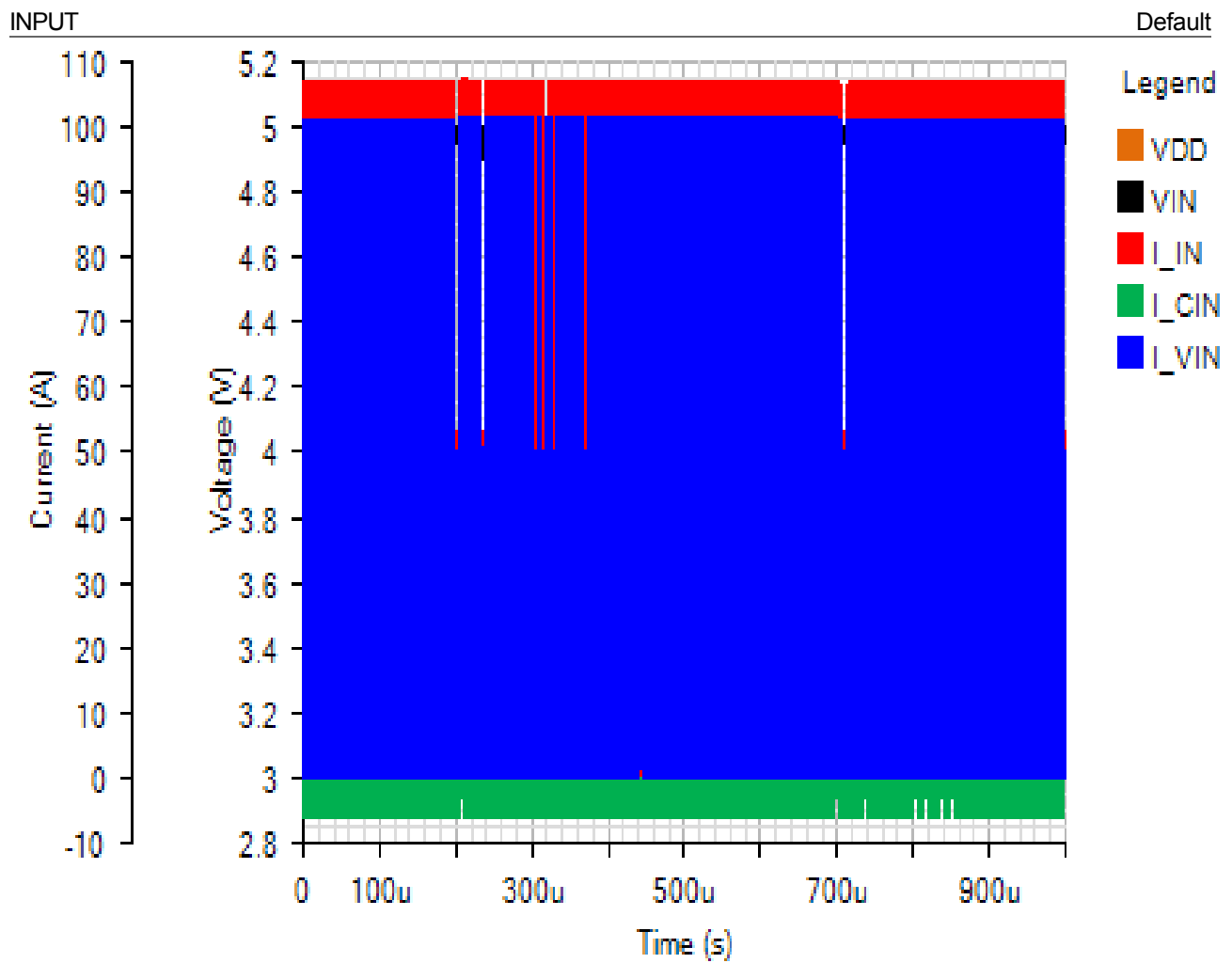
Default



Phase Margin: 63.61° at a crossover frequency of 77.7kHz

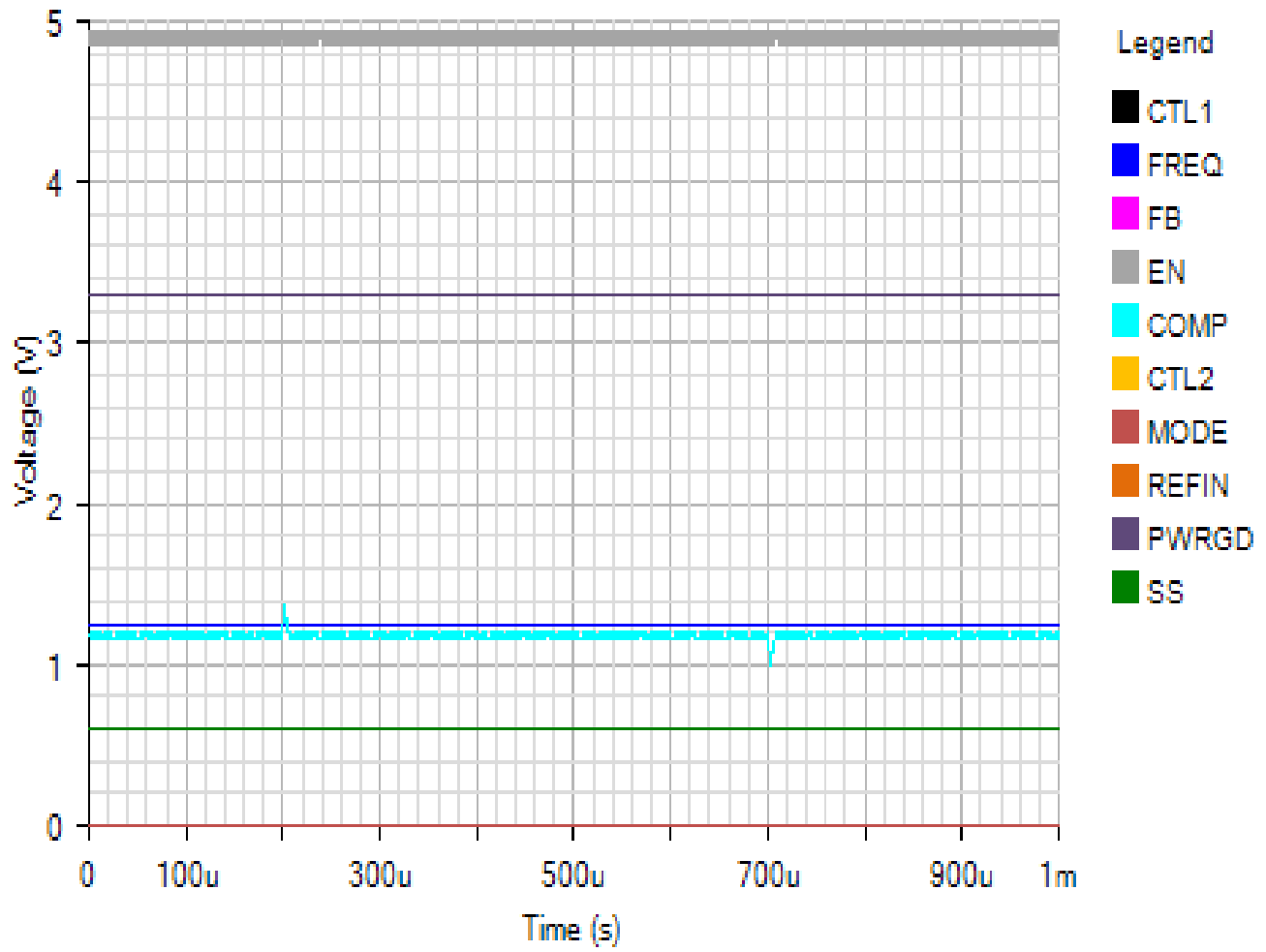


Load Step - Mon Nov 19 2018 10:46:40



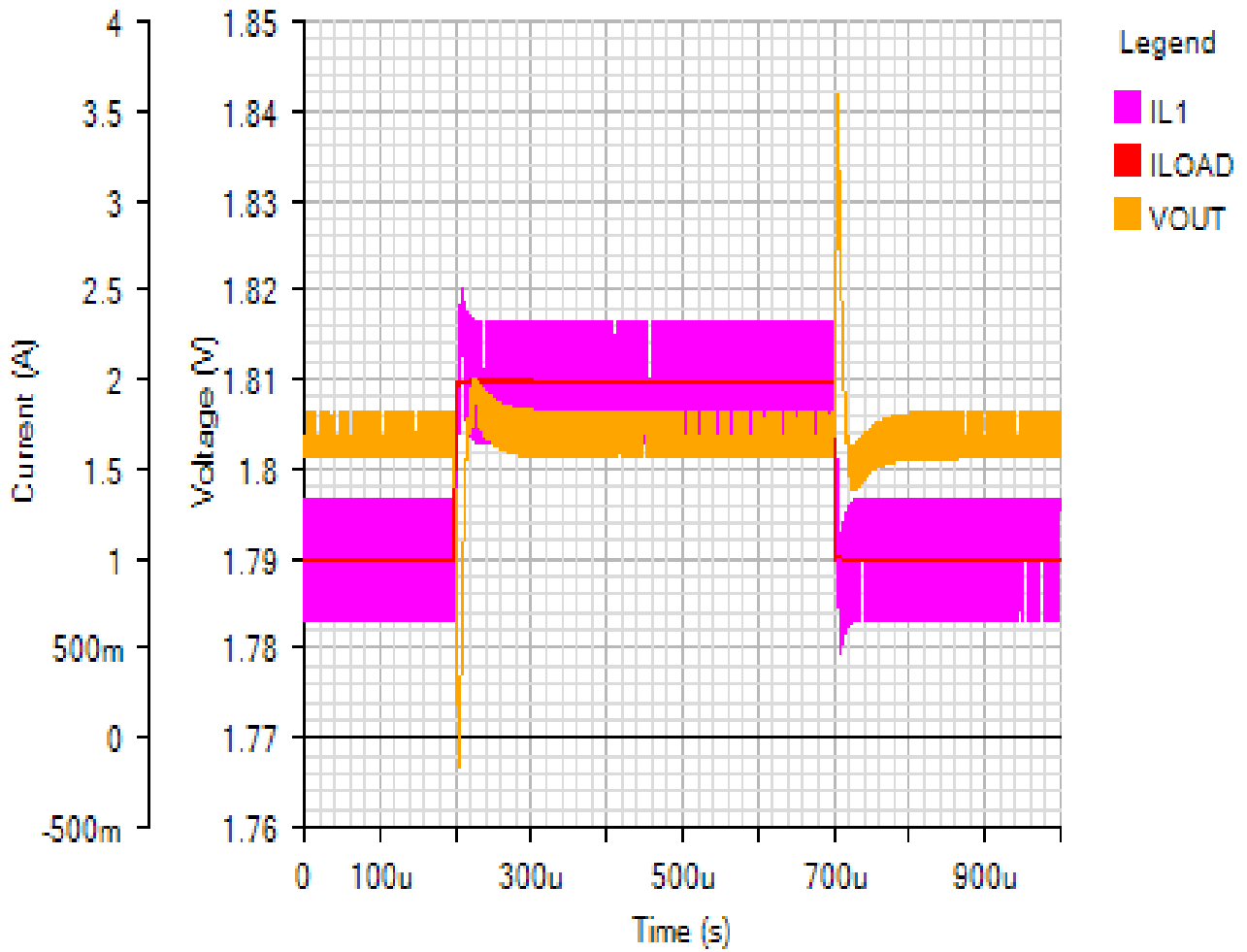
IC

Default



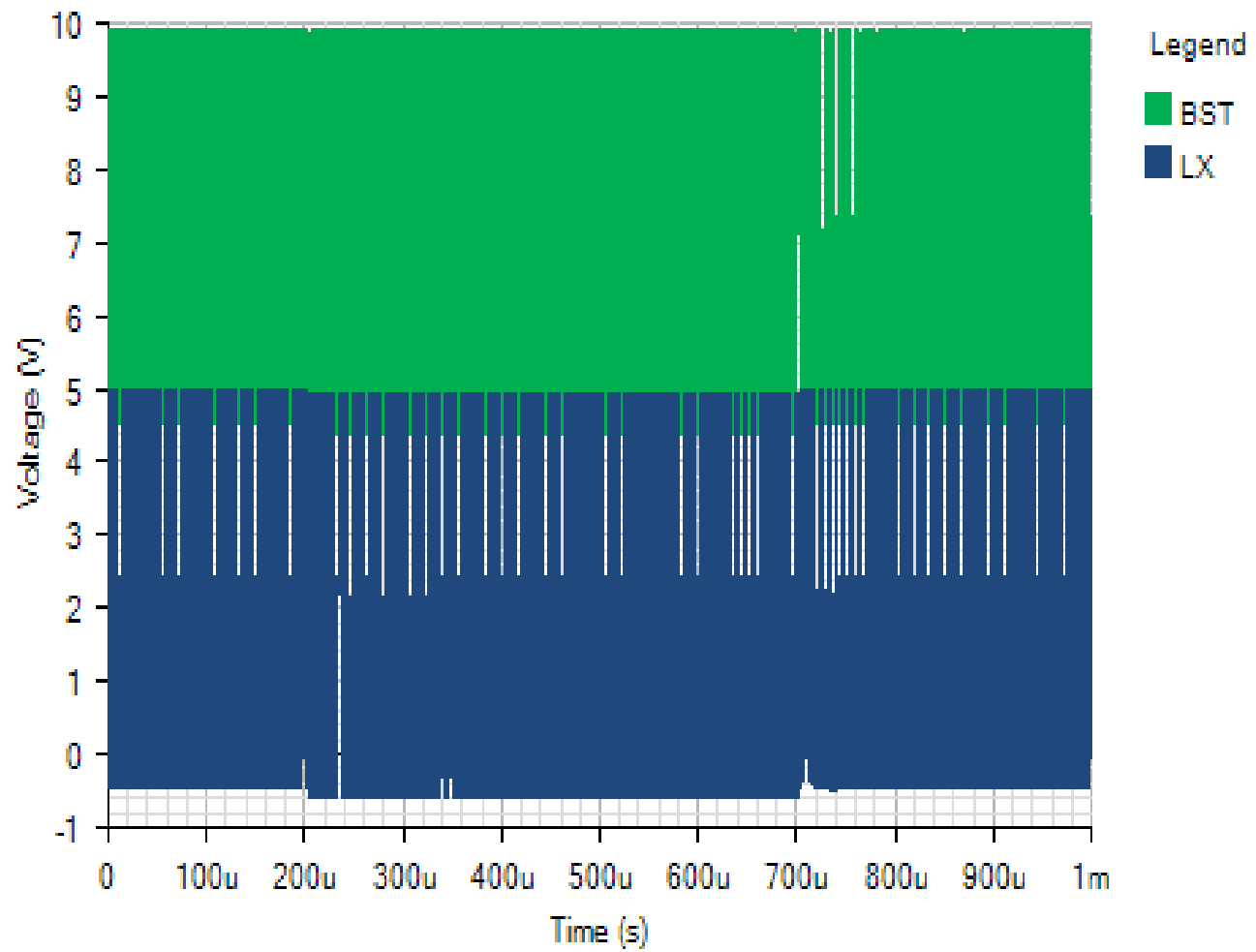
OUTPUT

Default

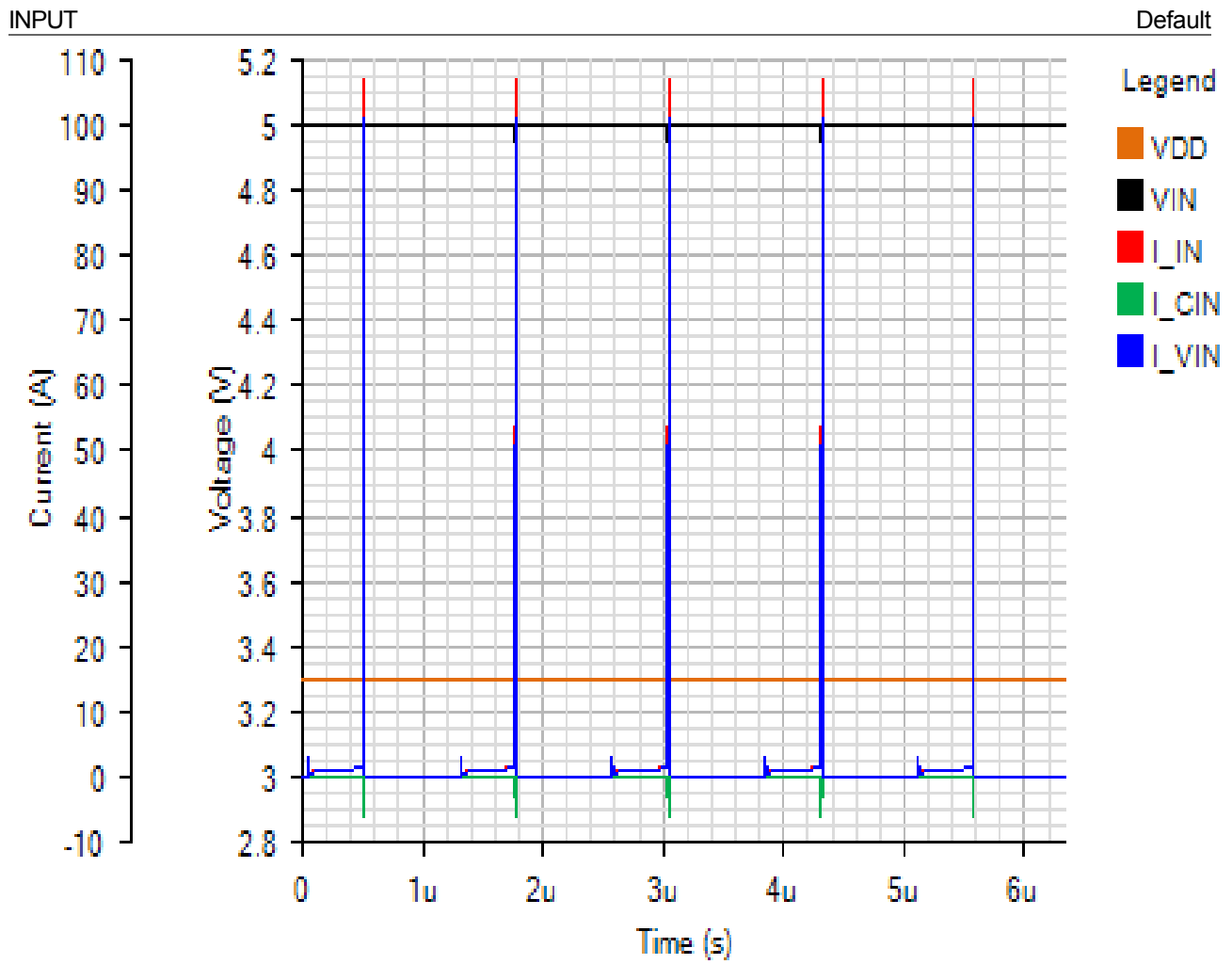


SWITCHING

Default

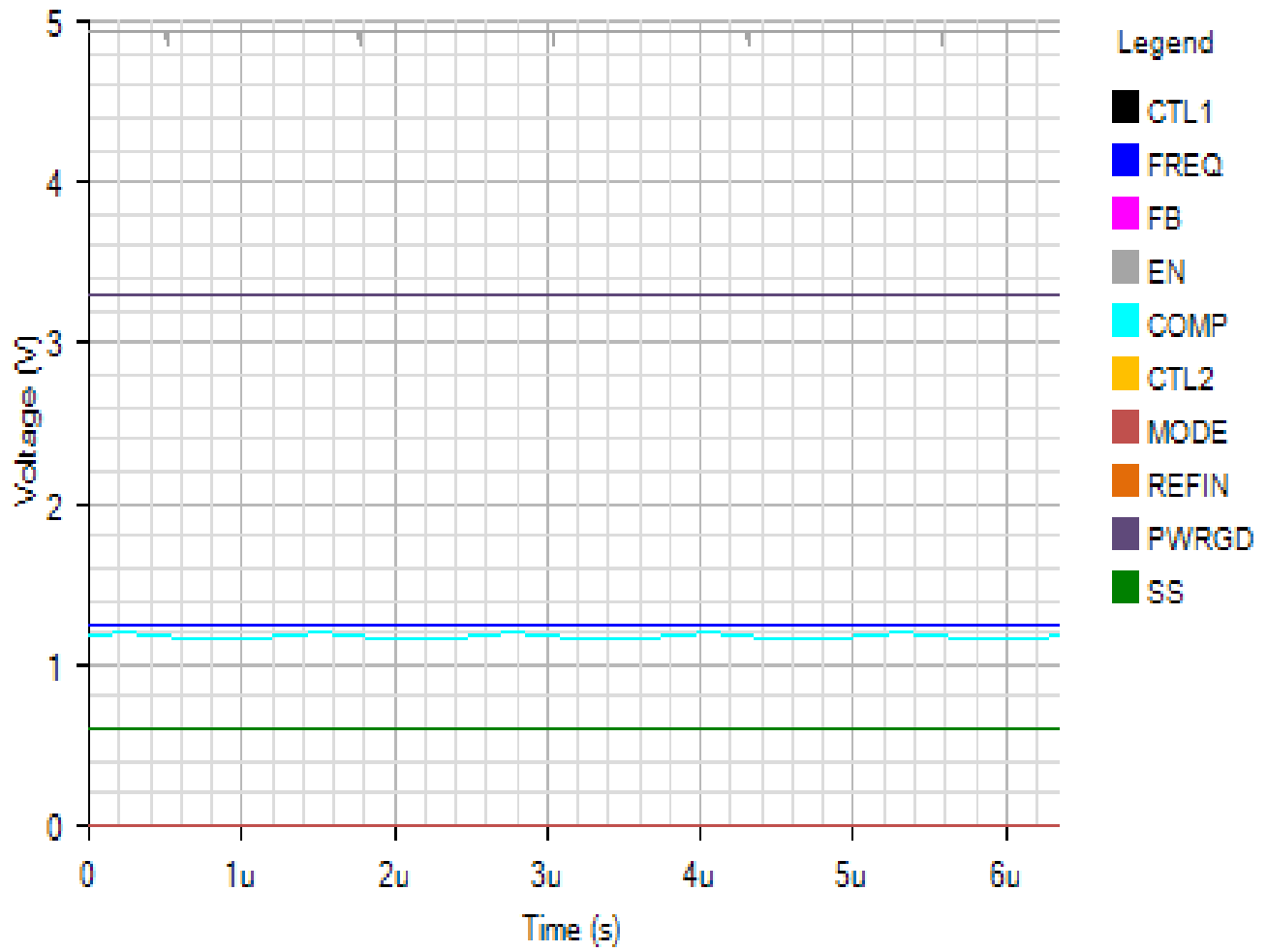


Steady State - Mon Nov 19 2018 10:46:40



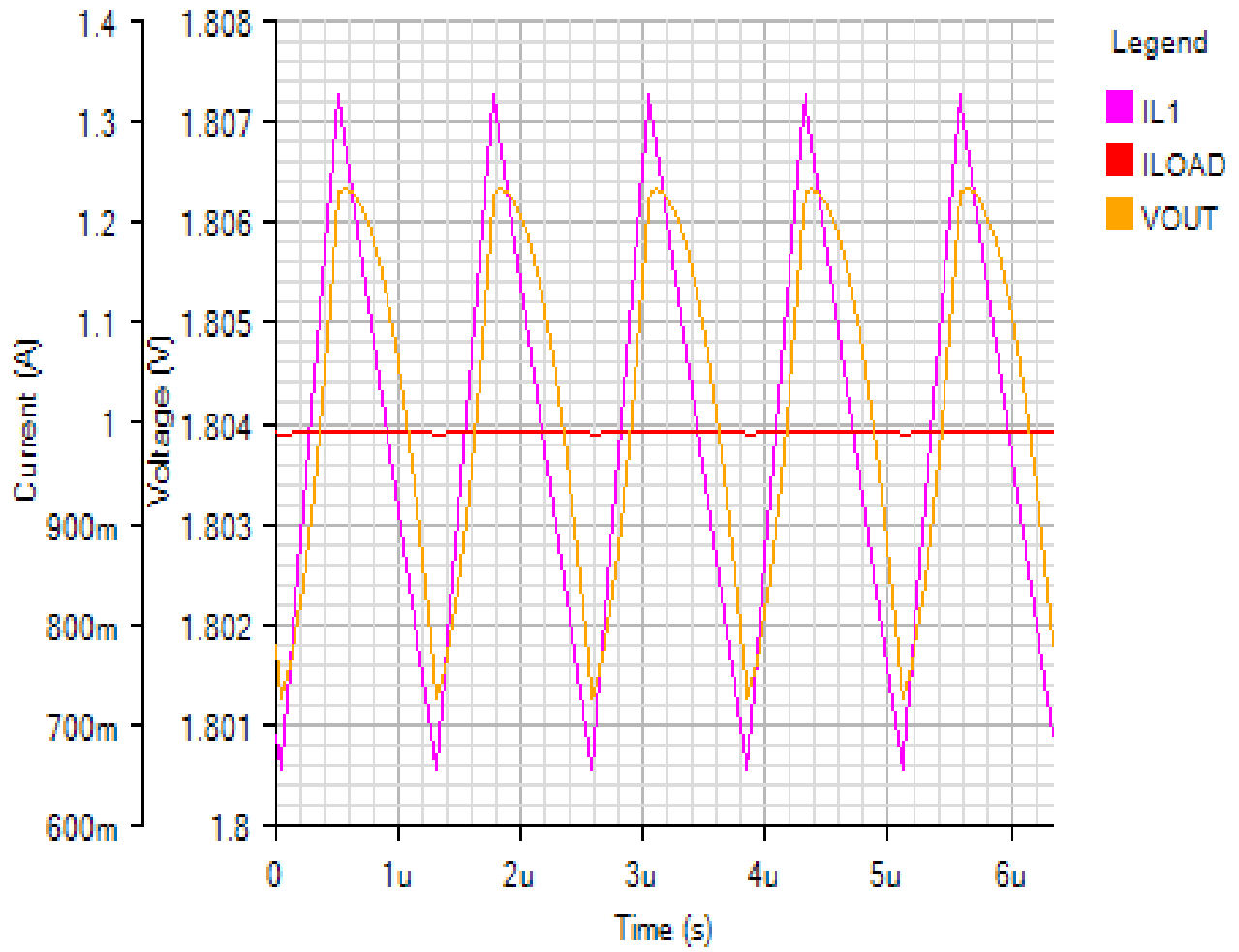
IC

Default



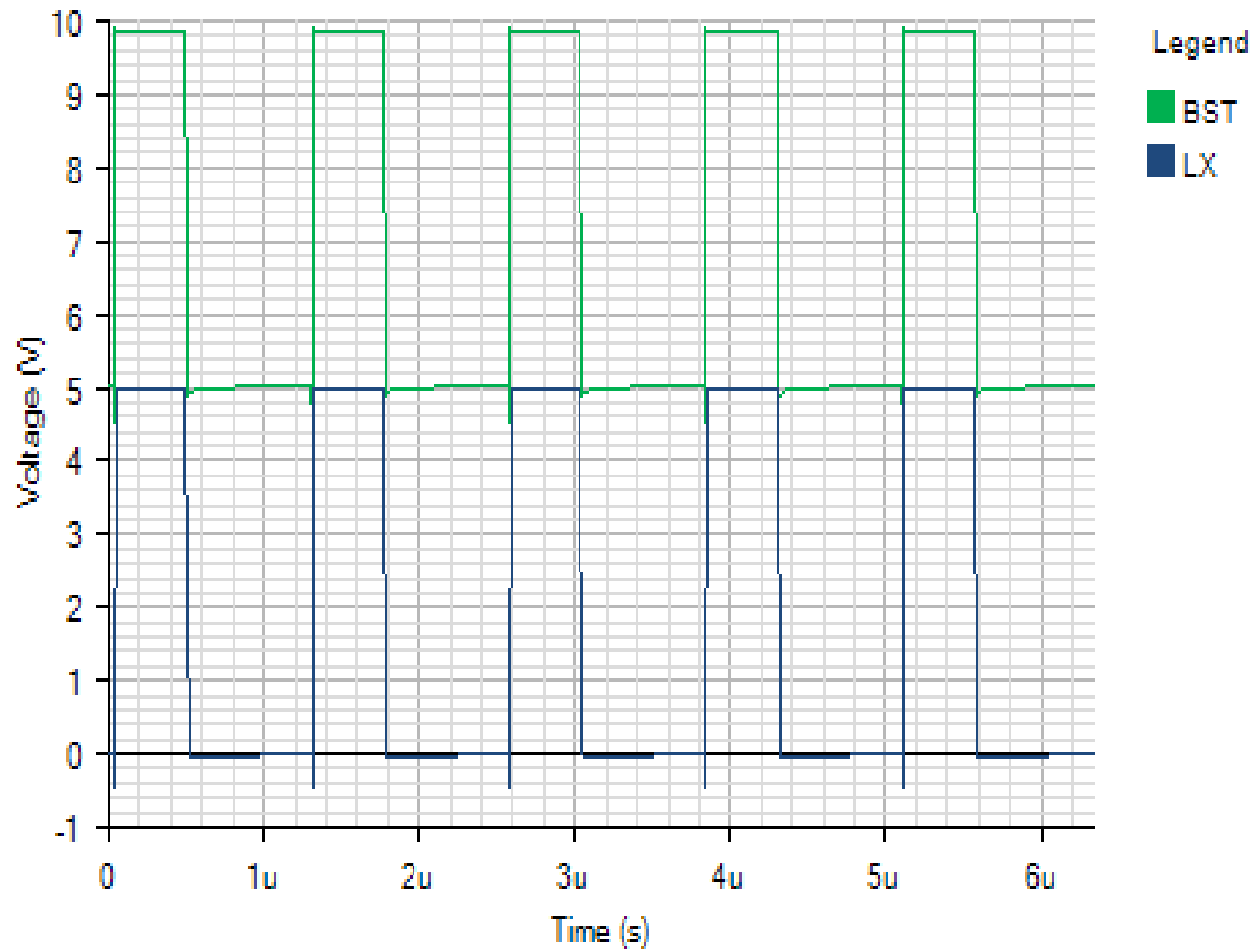
OUTPUT

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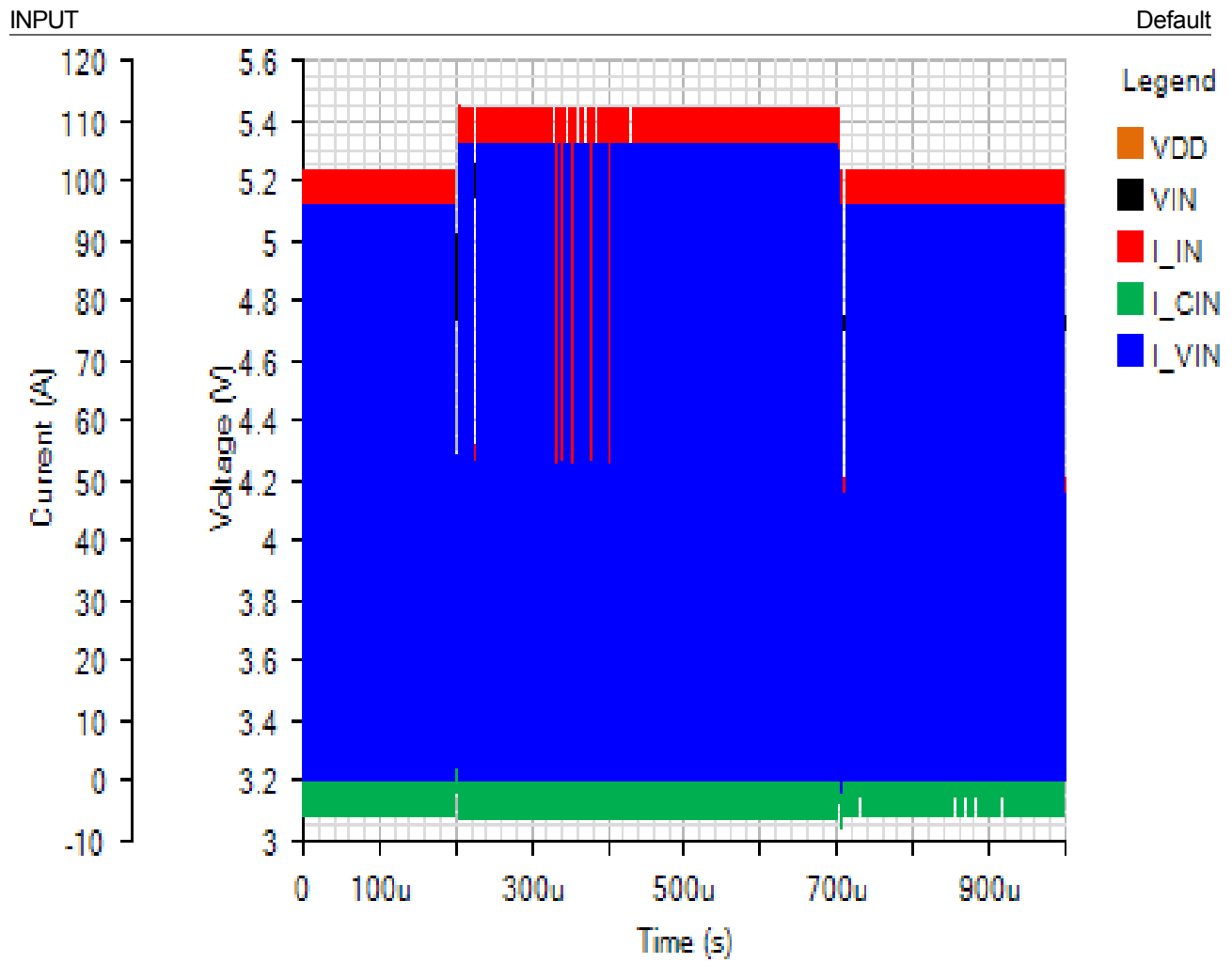


SWITCHING

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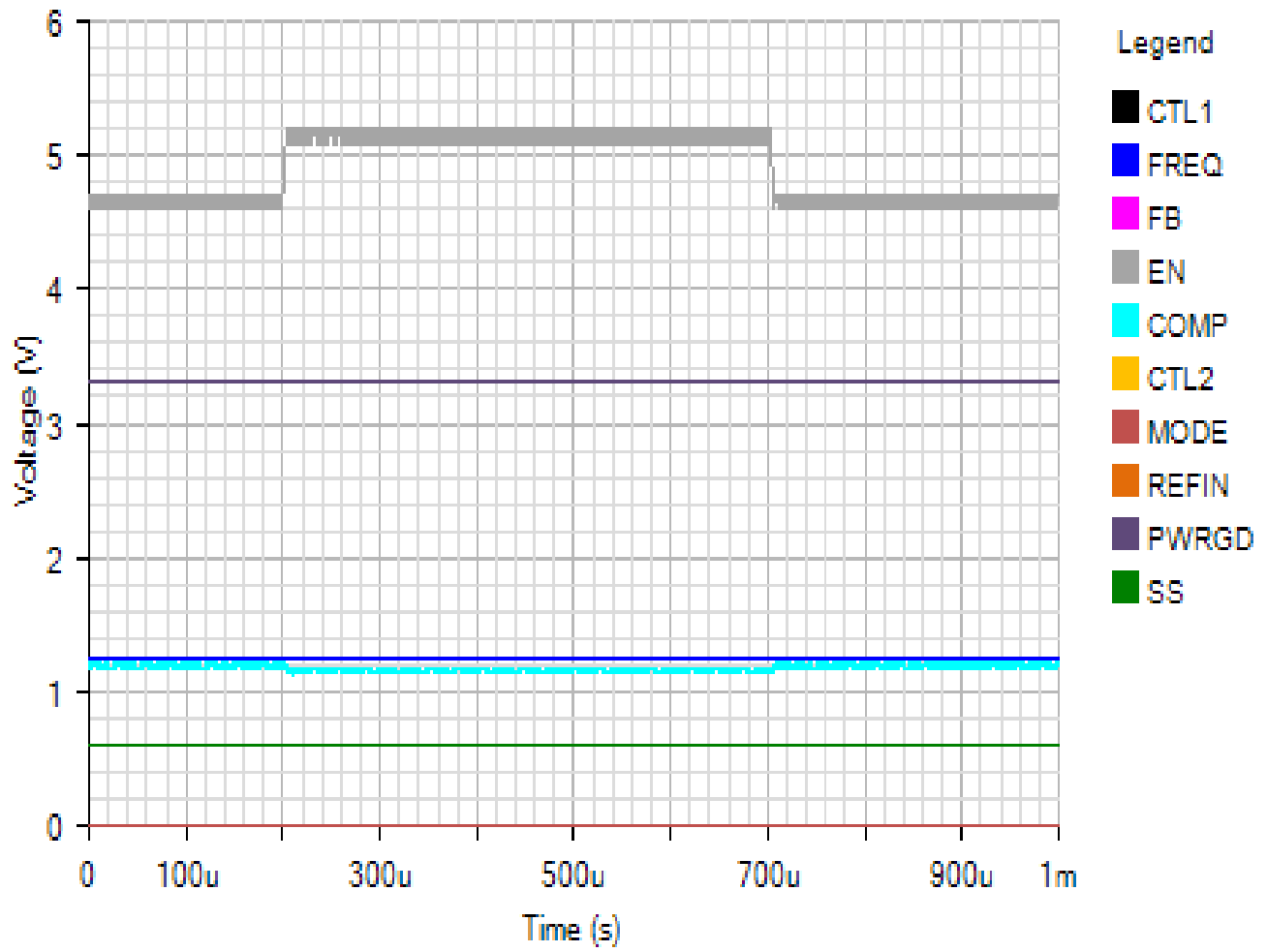


Line Transient - Mon Nov 19 2018 10:46:40



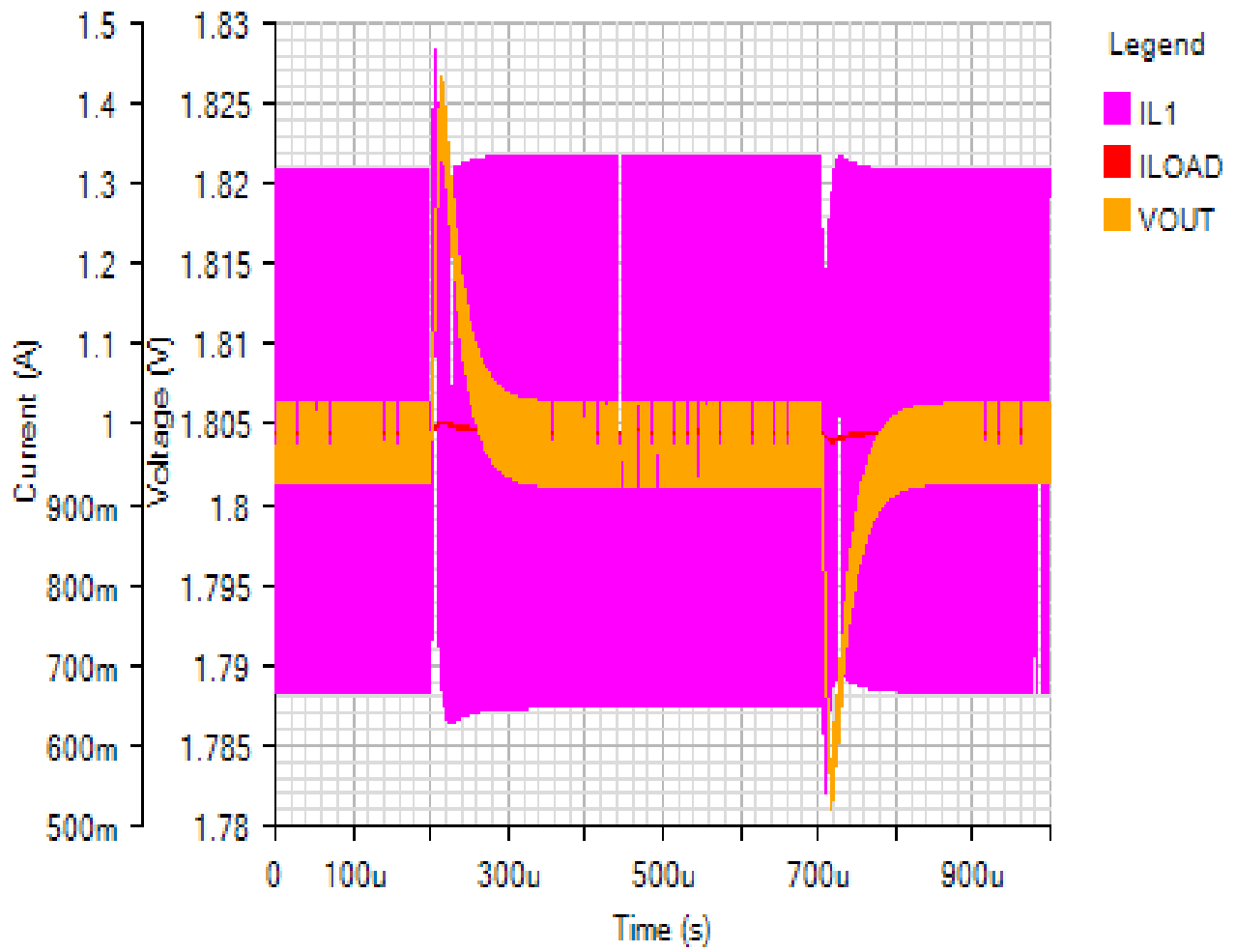
IC

Default



OUTPUT

Default



SWITCHING

Default

