

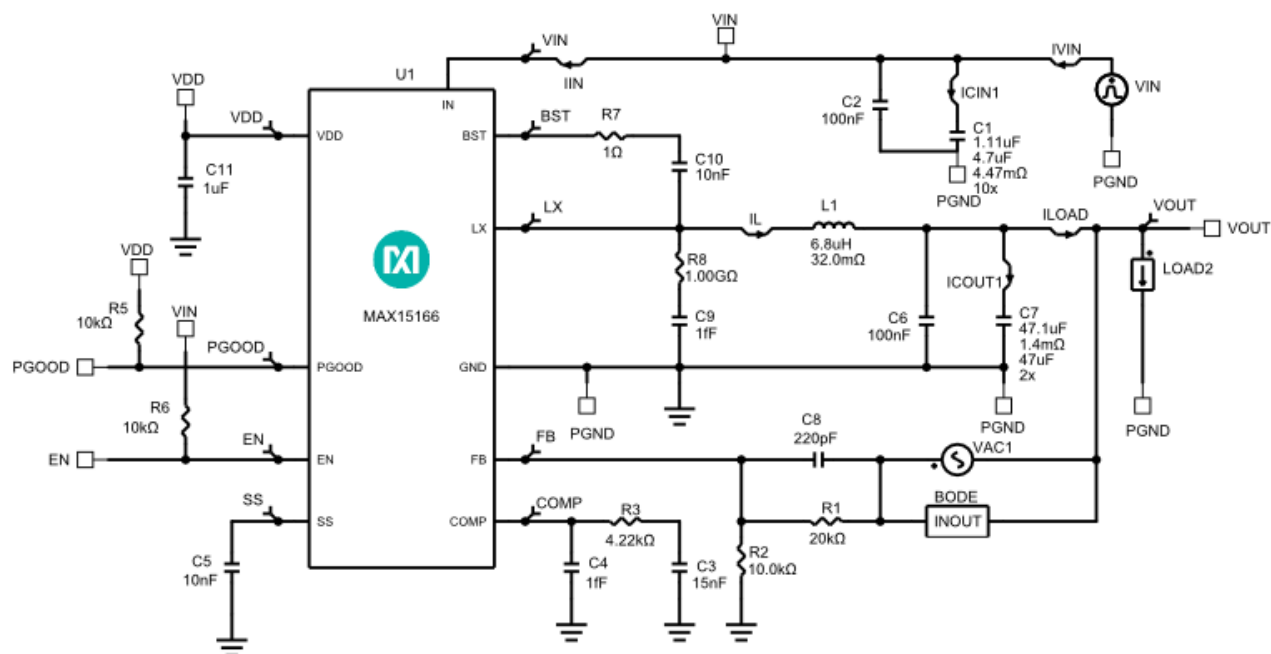
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	10.8V
Maximum Input Voltage	13.2V
Nominal Input Voltage	12V
Input Voltage Ripple	1%
Output Voltage	1.8V
Output Current	2A
Output Voltage Ripple	1%
Load Step Start Current	1A
Load Step Current	2A
Load Step Edge Rate	5A/us
Output Voltage Load Step Over/Undershoot	5%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Inductor Current Ratio (LIR)	0.3
Compensator Type	Type II: One less capacitor

Schematic



BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX15166	Maxim Integrated	High-Efficiency, 4A, Step-Down DC-DC Regulator with Internal Power Switches, 350KHz
C1	10	GRM188C81E475KE11	Murata	Cap Ceramic 4.7uF 25V 0603 105C
C2	1	CL10B104MB8NNNC	Samsung Electro-Mechanics	Cap Ceramic 0.1uF 50V X7R 20% Pad SMD 0603 125°C T/R
C3	1	06035C153KAT2A	AVX	Cap Ceramic 0.015uF 50V X7R 10% Pad SMD 0603 125°C T/R
C5	1	GCM188R72A103KA37D	Murata Manufacturing	Cap Ceramic 0.01uF 100V X7R 10% Pad SMD 0603 125°C Automotive T/R
C6	1	C0402C104M4RACTU	KEMET Corporation	Cap Ceramic 0.1uF 16V X7R 20% Pad SMD 0402 125°C T/R
C7	2	GRM32EE70J476ME20L	Murata	Cap Ceramic 47uF 6.3V 1210 125C
C8	1	NMC0402X7R221K50TRPF	NIC Components	Cap Ceramic 220pF 50V X7R 10% Pad SMD 0402 125°C T/R
C10	1	C1608X7R2A103M080AA	TDK	Cap Ceramic 0.01uF 100V X7R 20% Pad SMD 0603 125°C T/R
C11	1	TMK105BJ105MV-F	Taiyo Yuden	Cap Ceramic 1uF 25V X5R 20% Pad SMD 0402 85°C T/R
L1	1	VLP8040T-6R8M	TDK	Inductor Power Shielded Wirewound 6.8uH 20% 100KHz Ferrite 4A 32mOhm DCR Embossed Carrier T/R

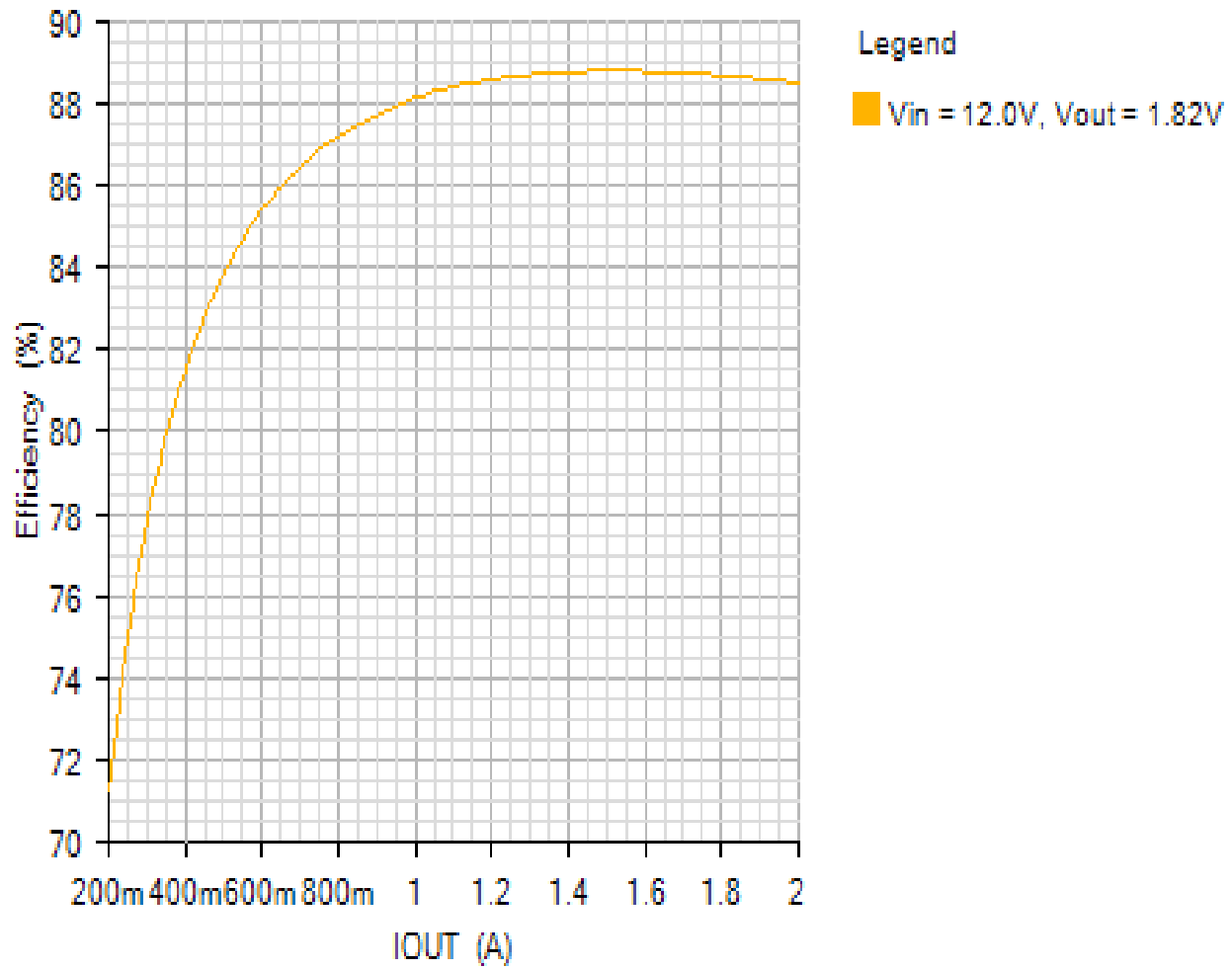
R1	1	ERJ3EKF2002V	Panasonic	Res Thick Film 0603 20K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ3EKF4221V	Panasonic	Res Thick Film 0603 4.22K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2GEJ103X	Panasonic	Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2GEJ103X	Panasonic	Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R7	1	ERJ2GEJ1R0X	Panasonic	Res Thick Film 0402 1 Ohm 5% 0.1W(1/10W) -100ppm/°C to 600ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Mon Nov 19 2018 12:55:46

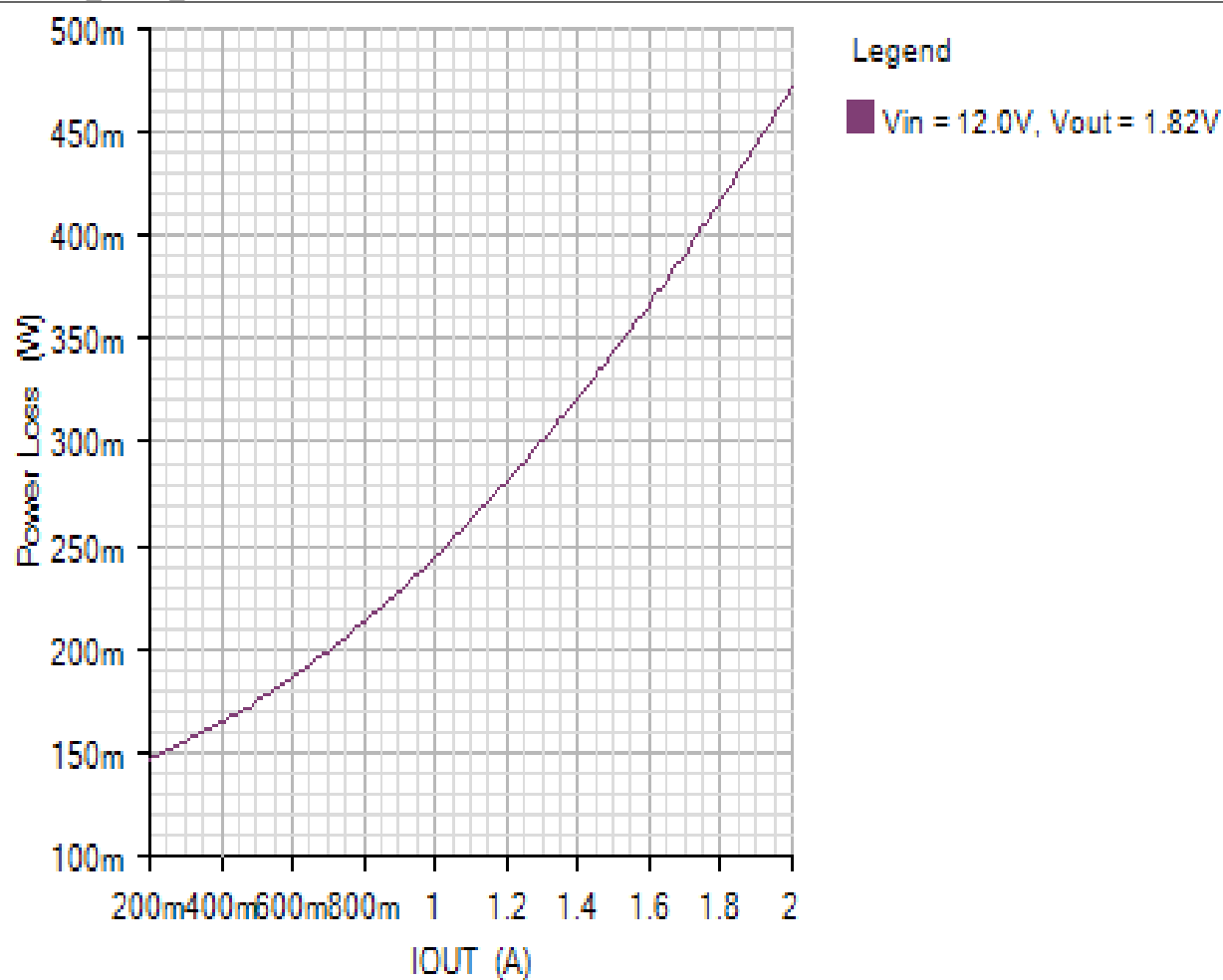
EFFICIENCY_PLOT

Default

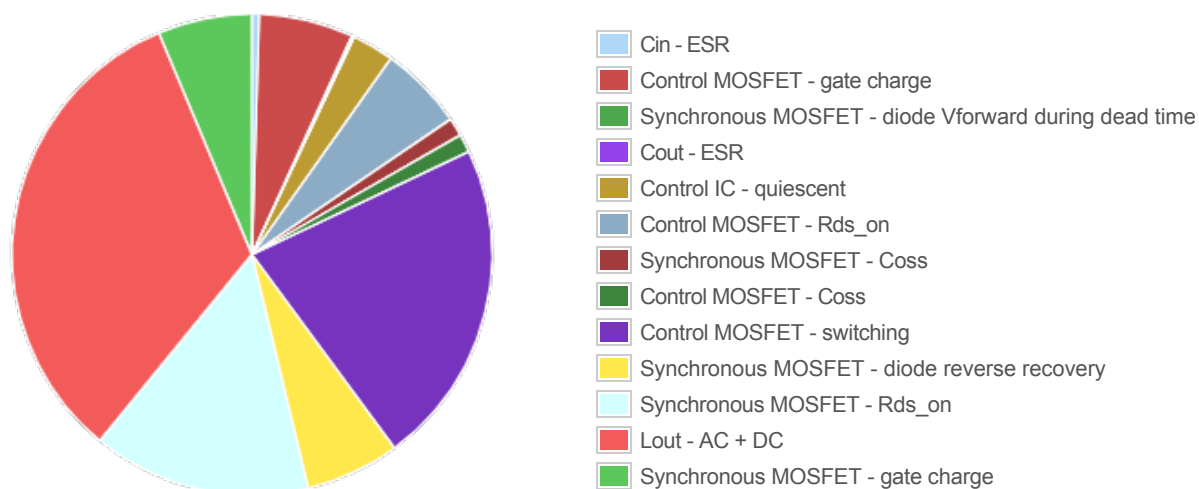


POWER_LOSS_PLOT

Default



Losses



Component

Loss (W)

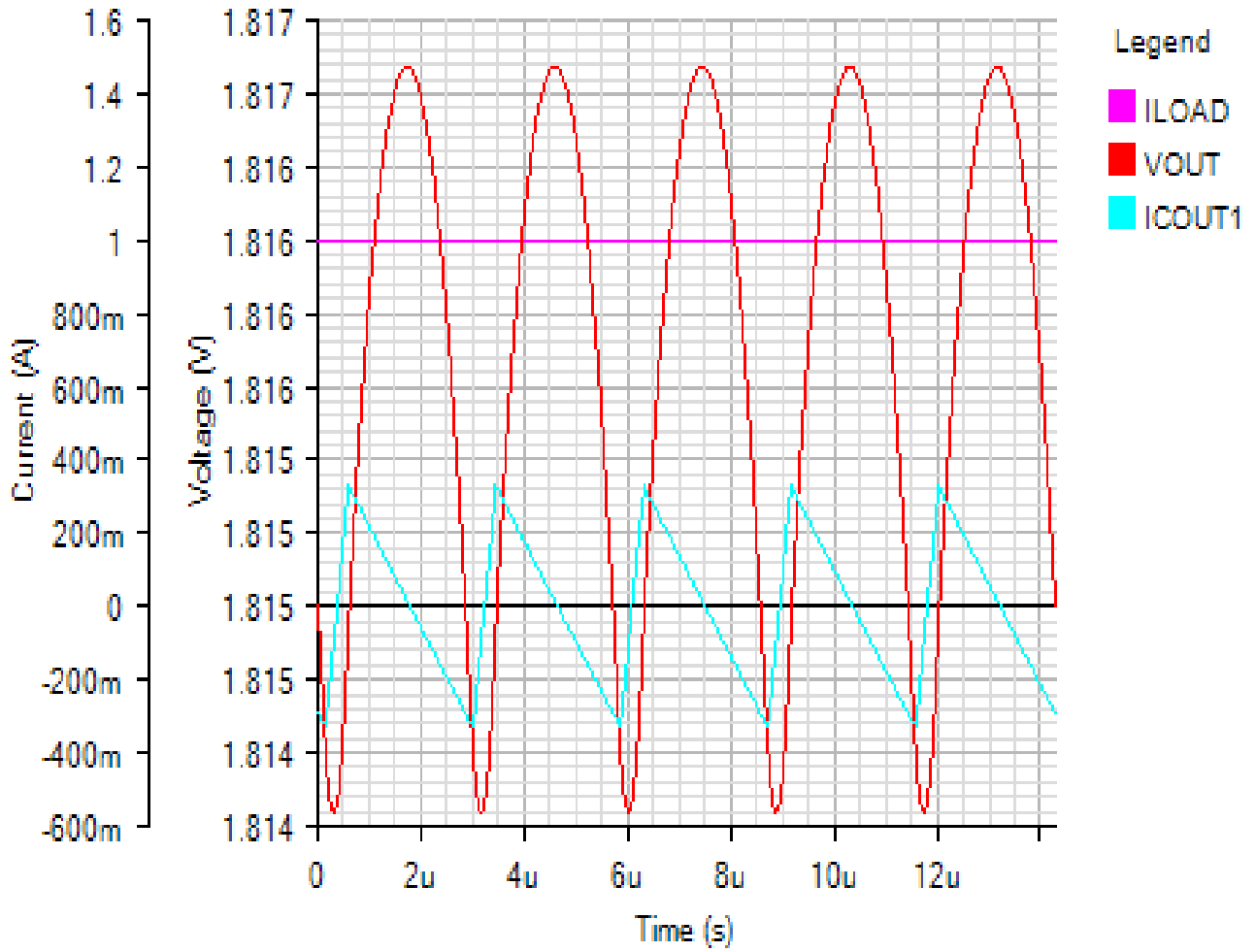
% of total

Component	Loss (W)	% of total
Cin - ESR	0.002298	0.5
Control MOSFET - gate charge	0.03	6.4
Synchronous MOSFET - diode Vforward during dead time	0.0008	0.2
Cout - ESR	0.000024	0
Control IC - quiescent	0.0132	2.8
Control MOSFET - Rds_on	0.026778	5.7
Synchronous MOSFET - Coss	0.005832	1.2
Control MOSFET - Coss	0.005832	1.2
Control MOSFET - switching	0.103448	21.9
Synchronous MOSFET - diode reverse recovery	0.03	6.4
Synchronous MOSFET - Rds_on	0.069364	14.7
Lout - AC + DC	0.154442	32.7
Synchronous MOSFET - gate charge	0.03	6.4
Total	0.472019	100

Steady State - Mon Nov 19 2018 12:55:46

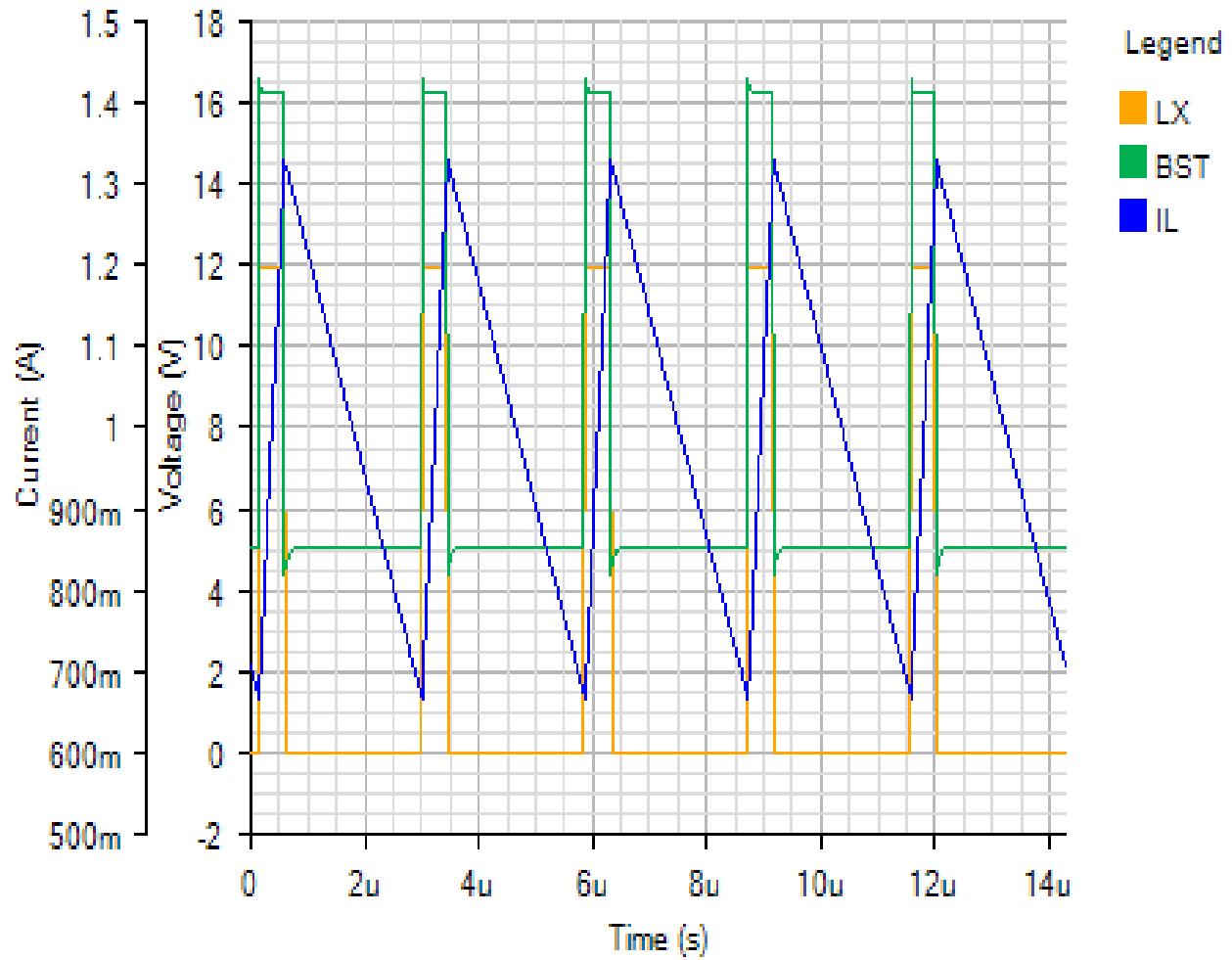
OUTPUT

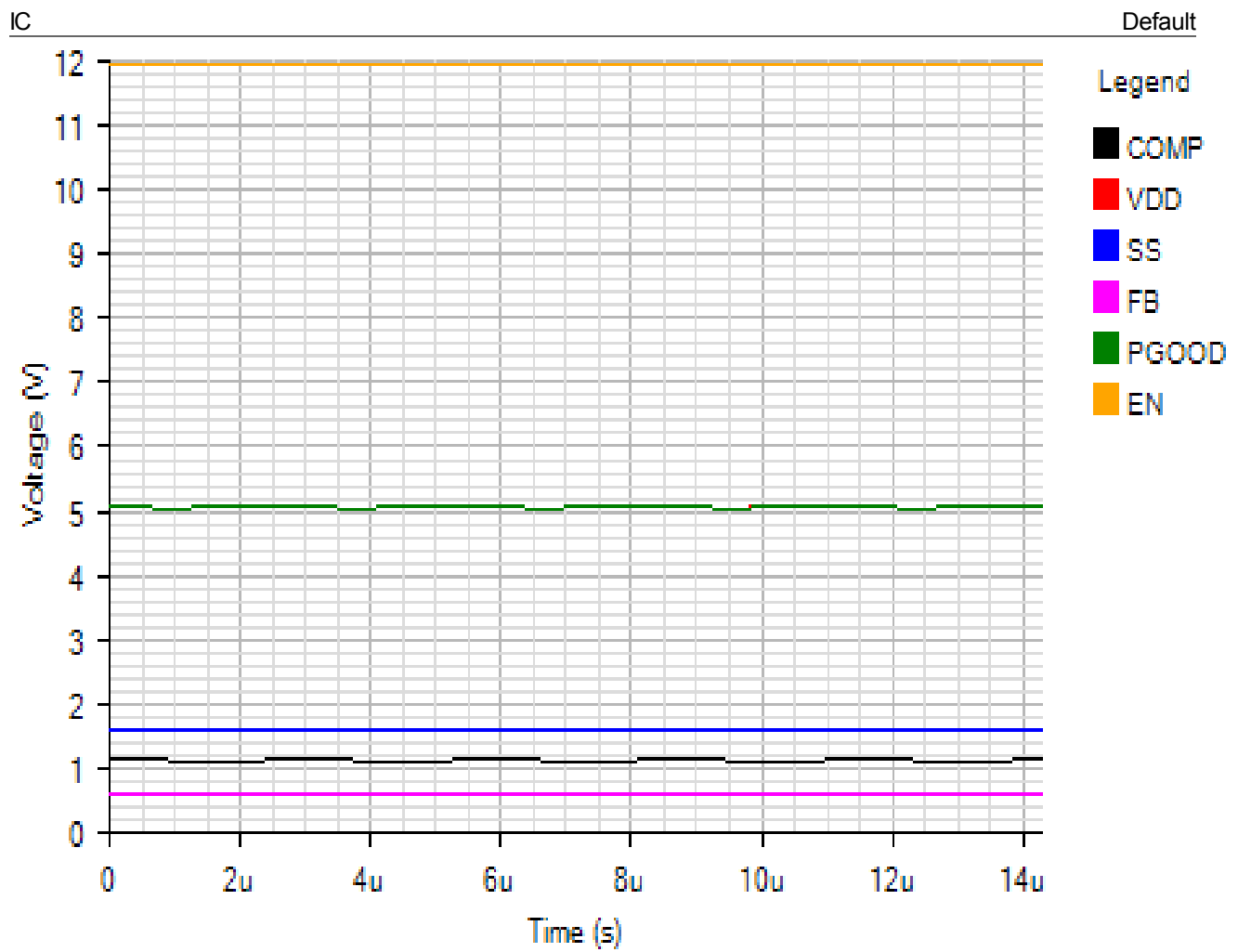
Default



SWITCHING

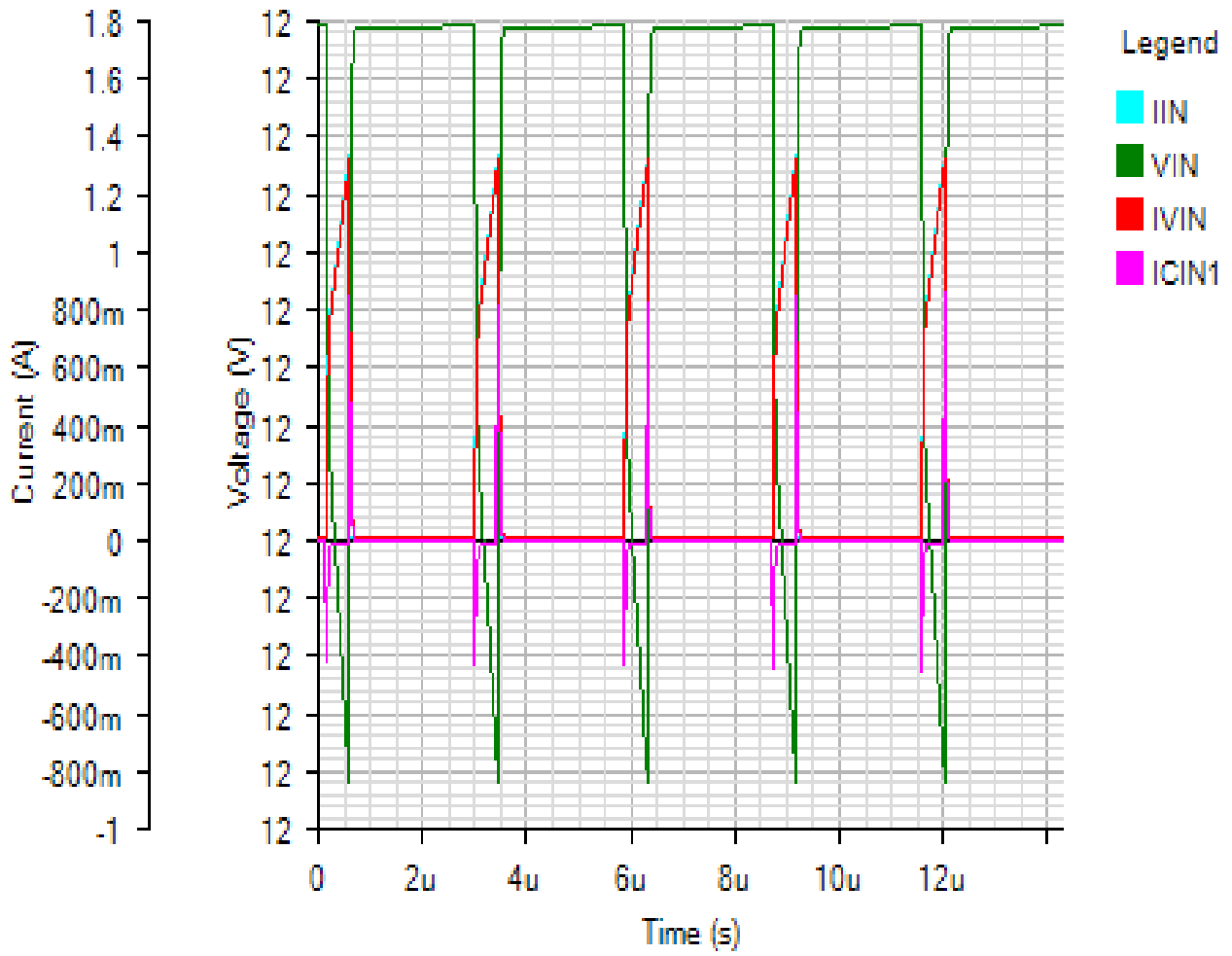
Default





INPUT

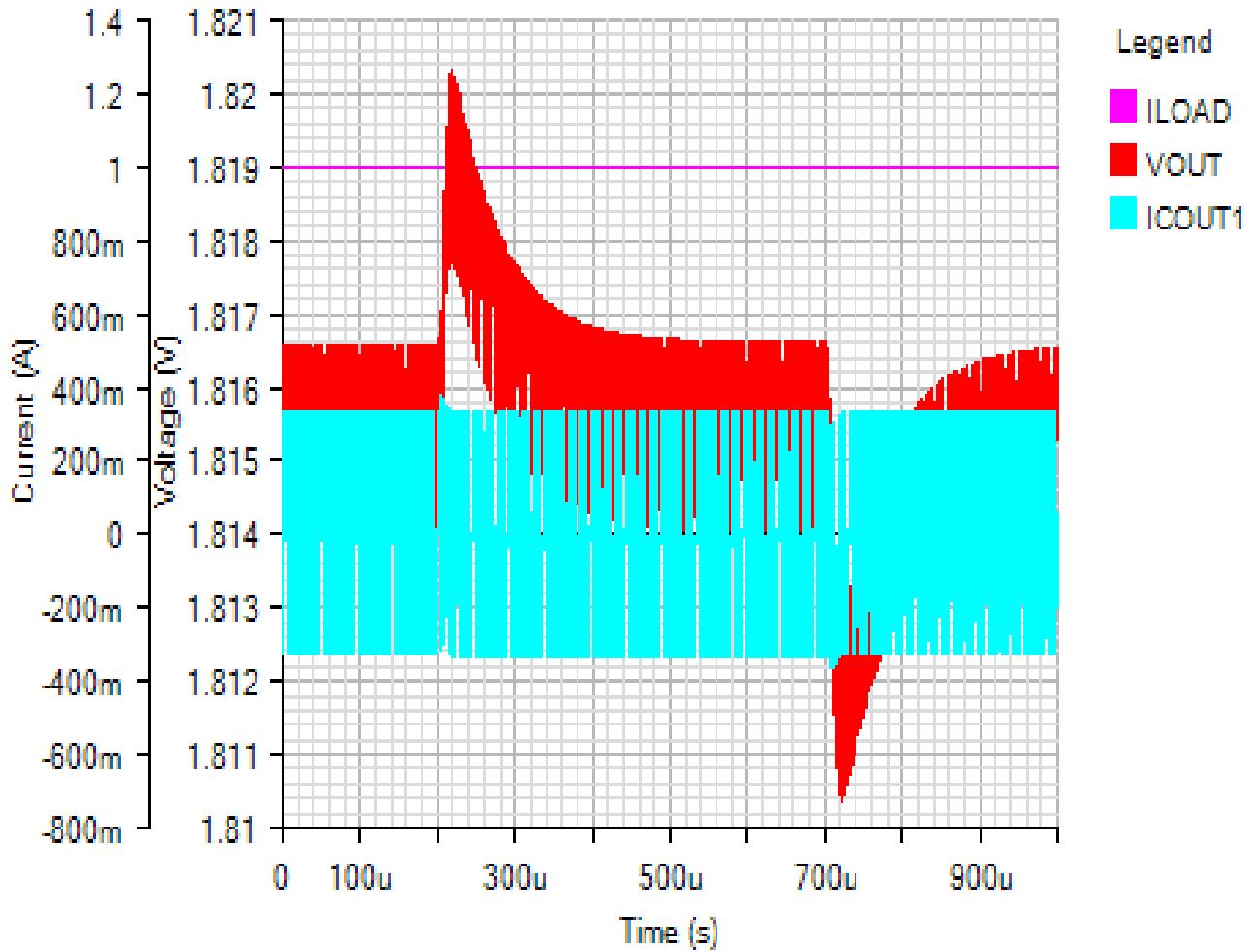
Default



Line Transient - Mon Nov 19 2018 12:55:46

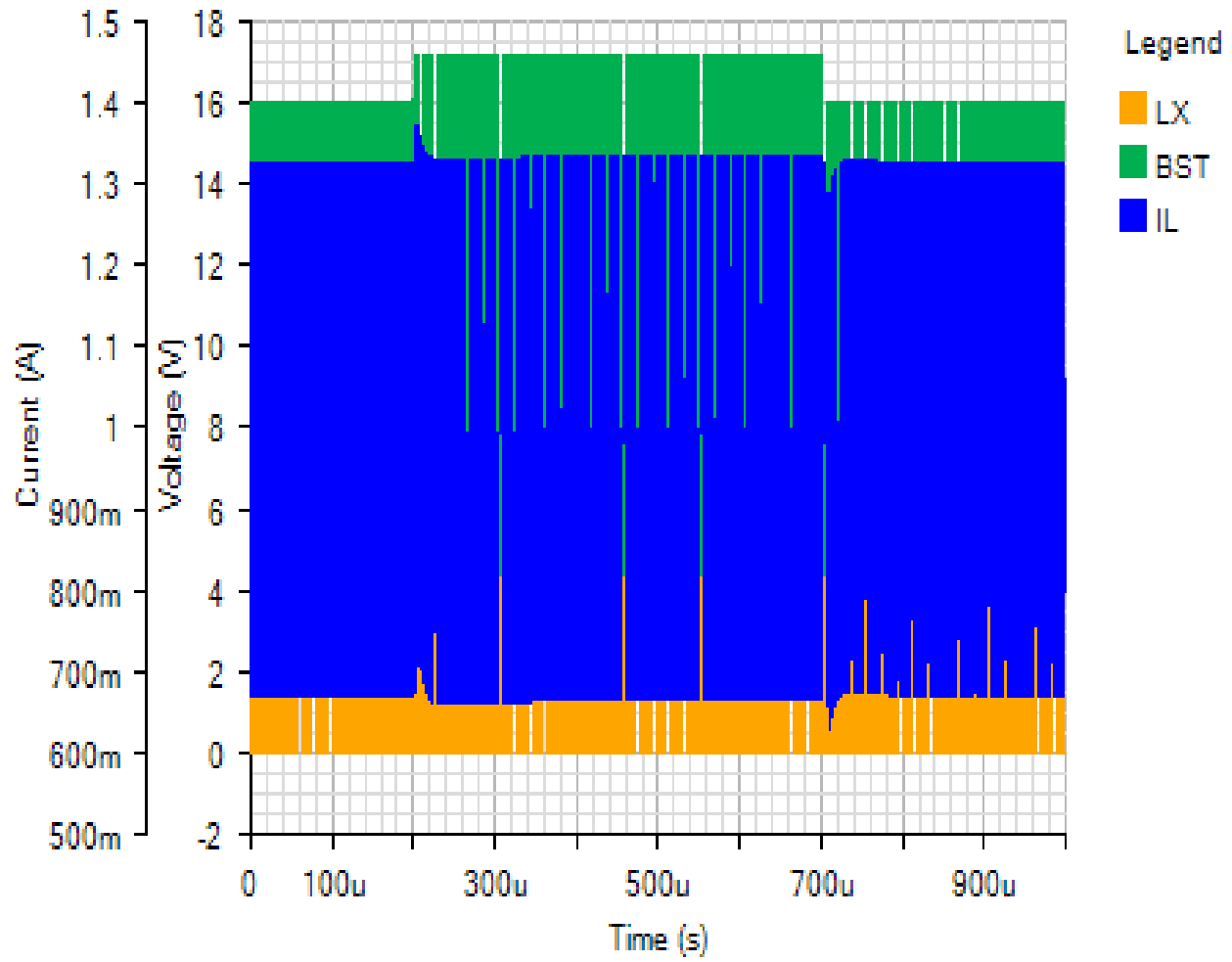
OUTPUT

Default



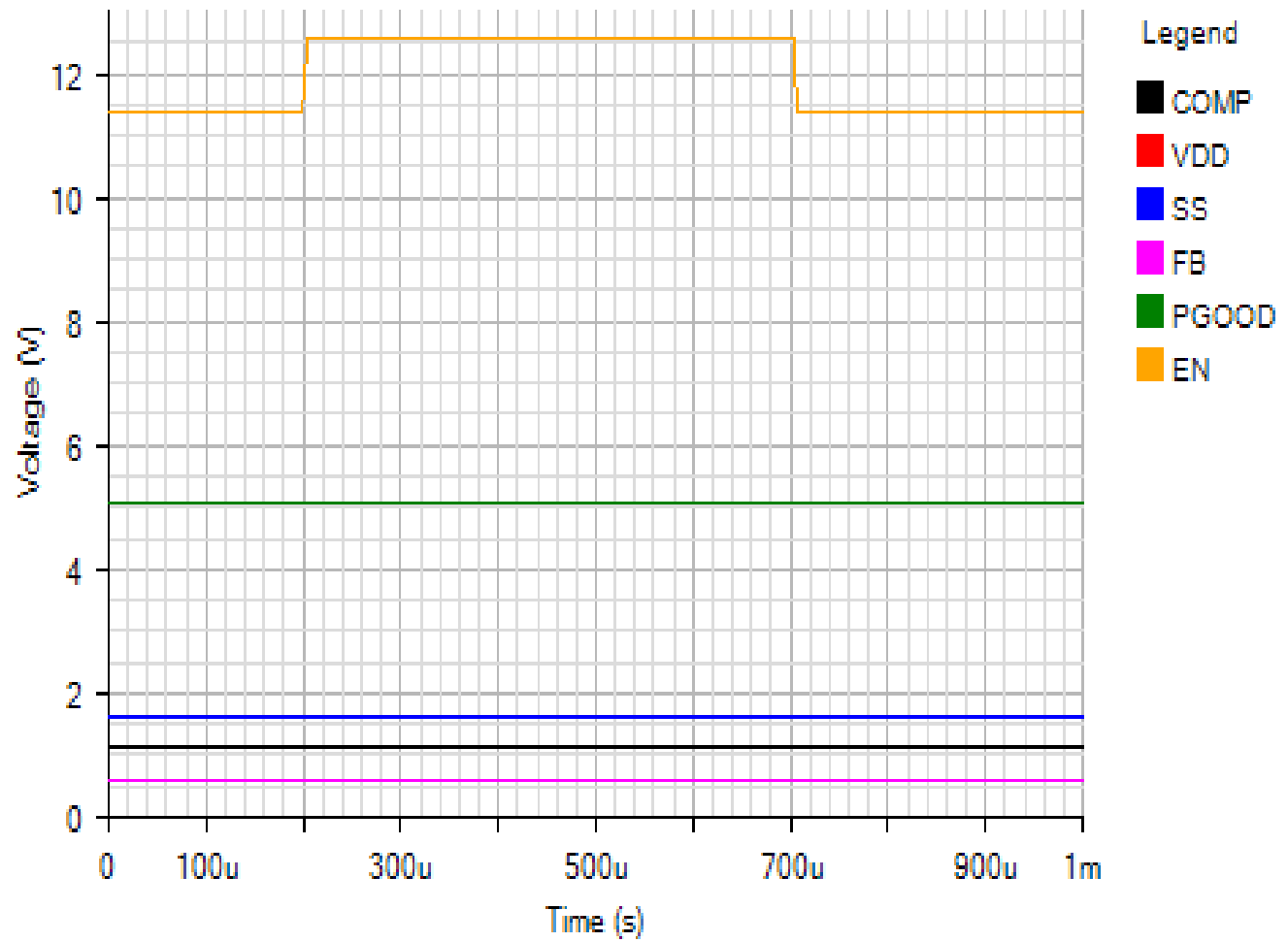
SWITCHING

Default



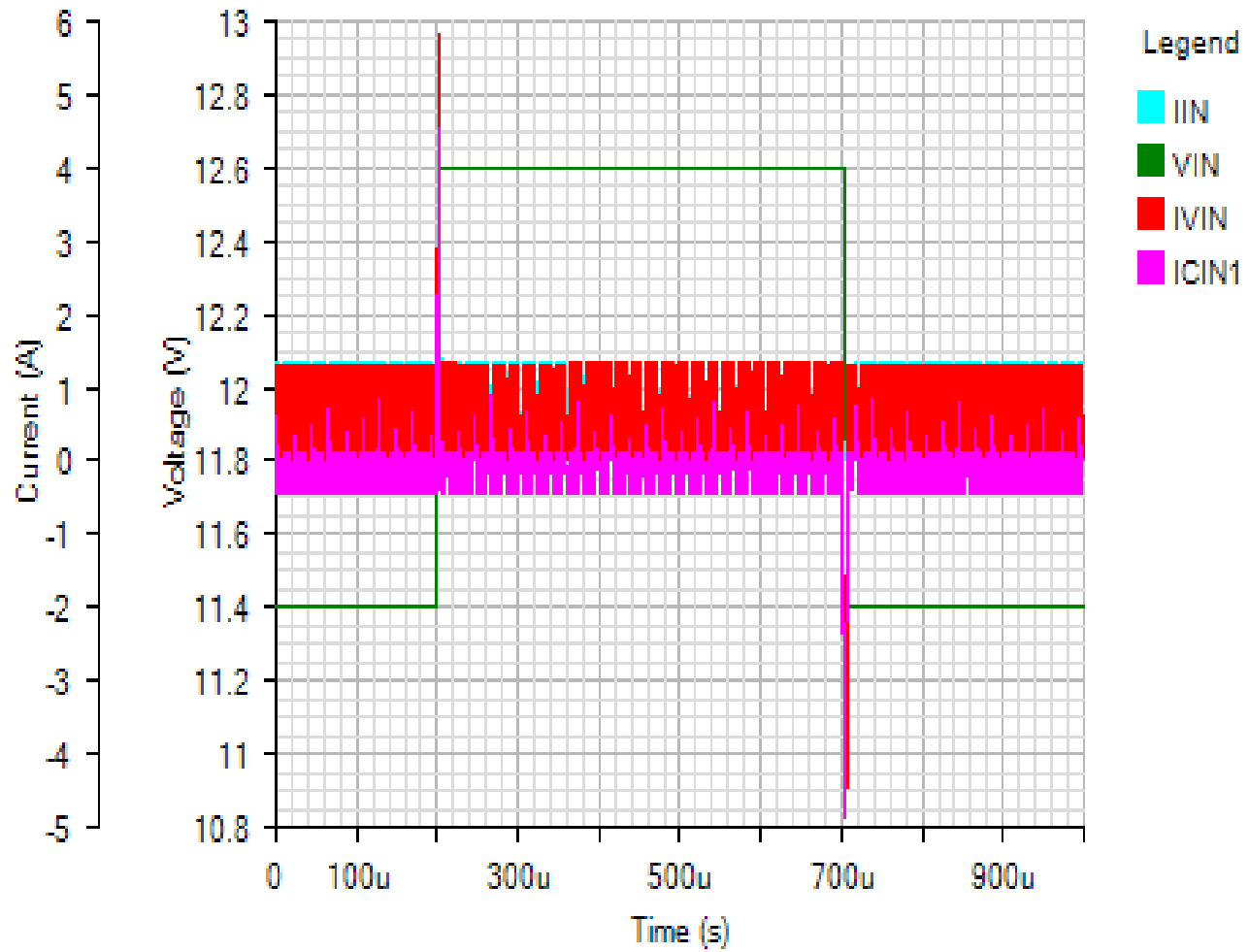
IC

Default



INPUT

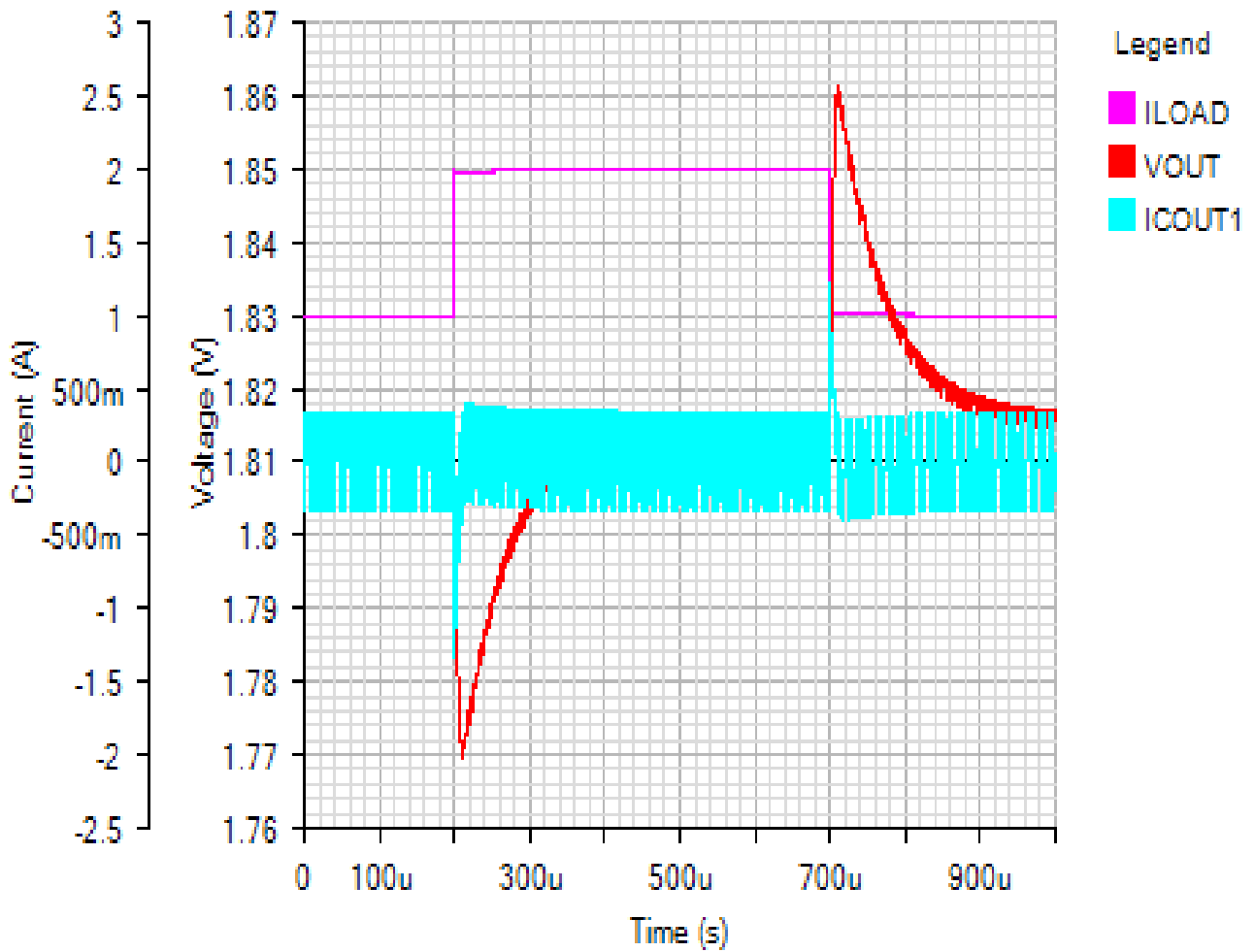
Default



Load Step - Mon Nov 19 2018 12:55:46

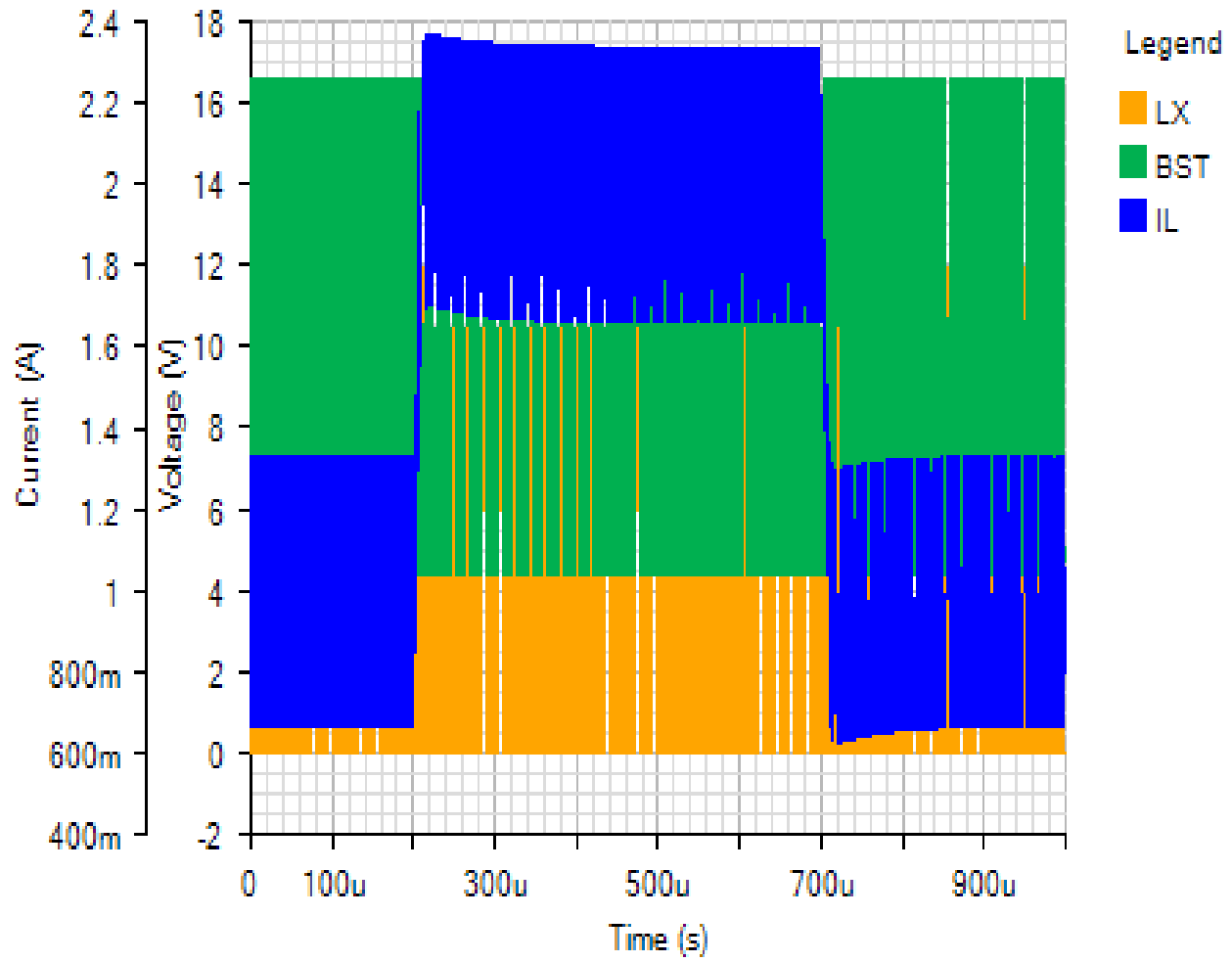
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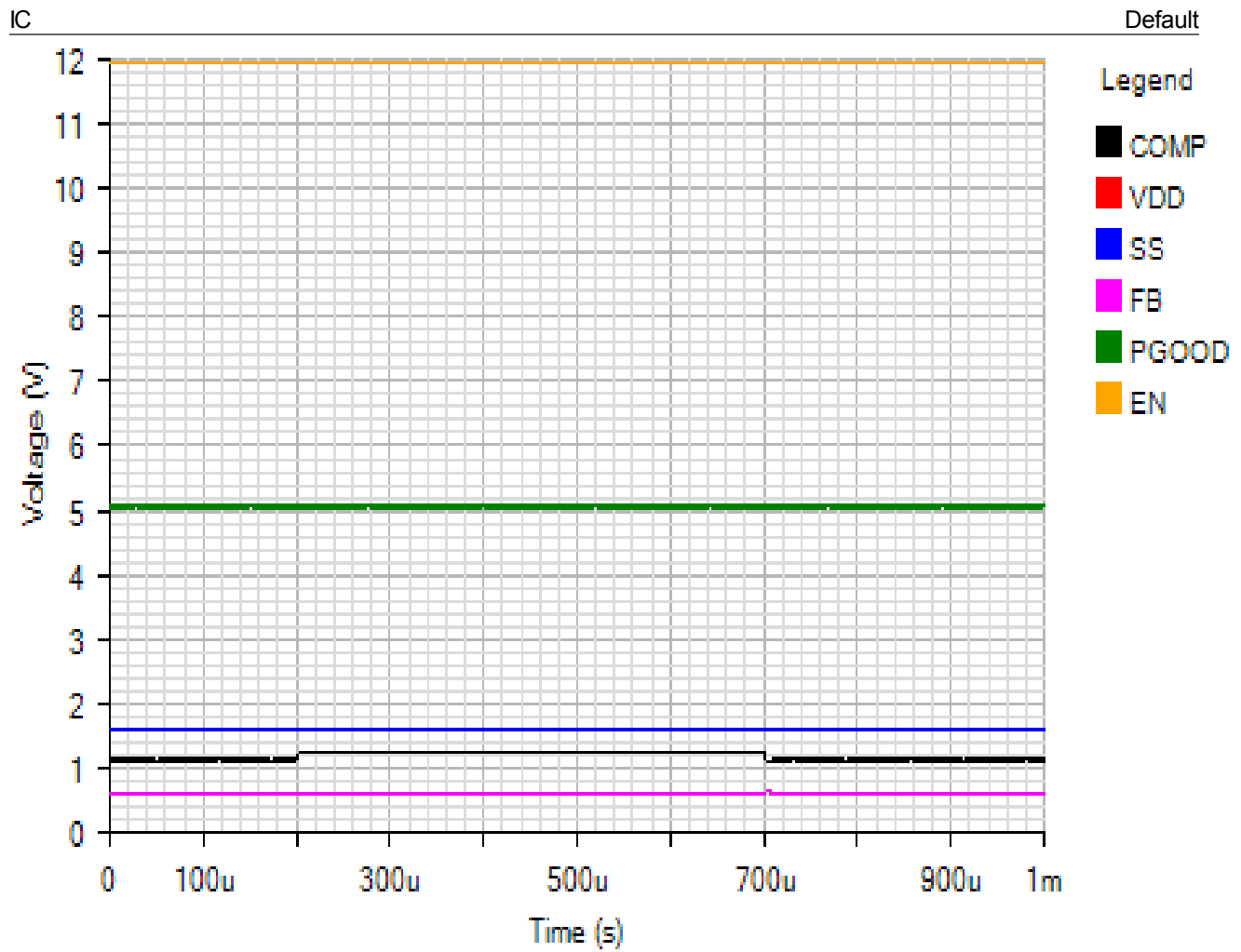
Default



SWITCHING

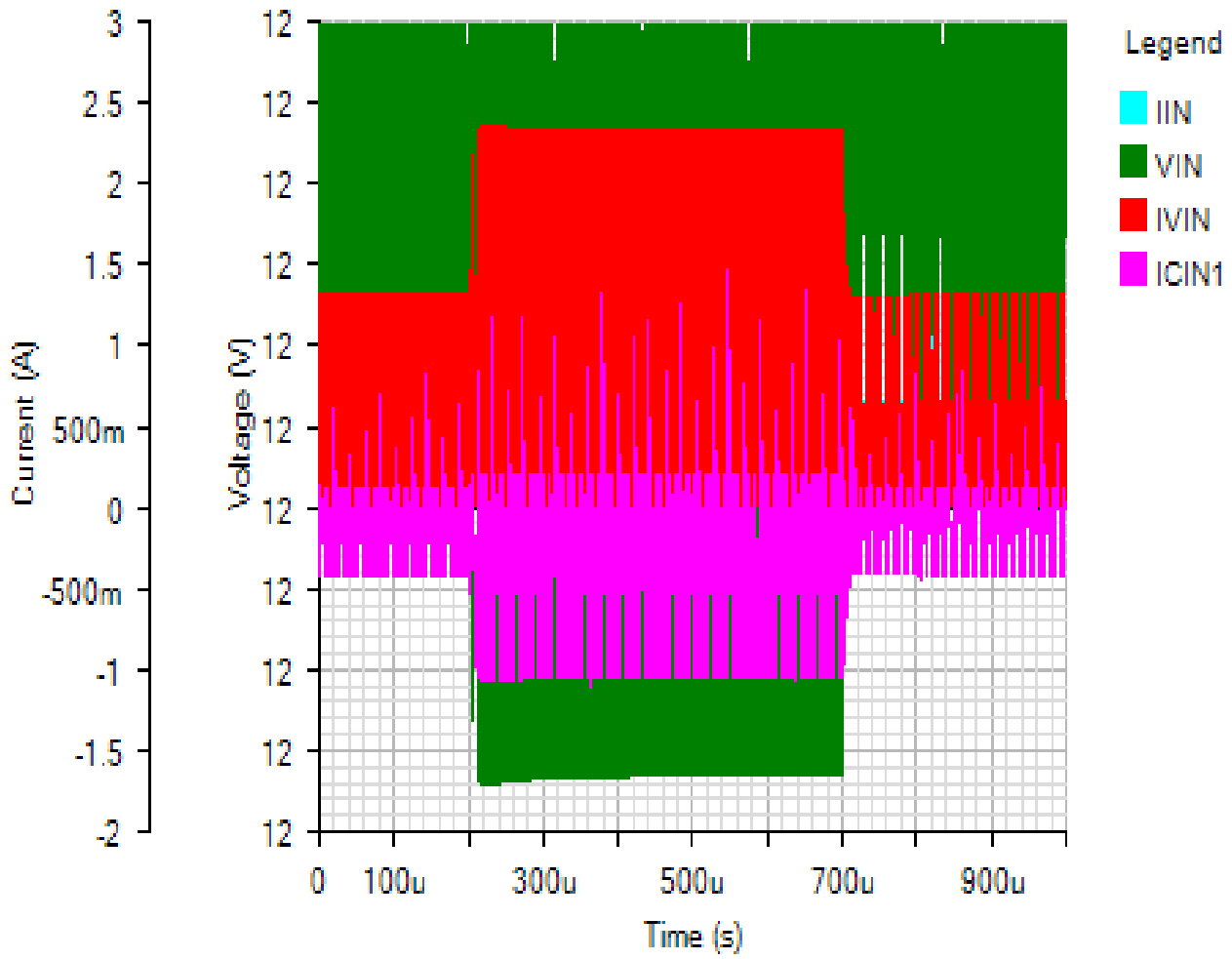
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INPUT

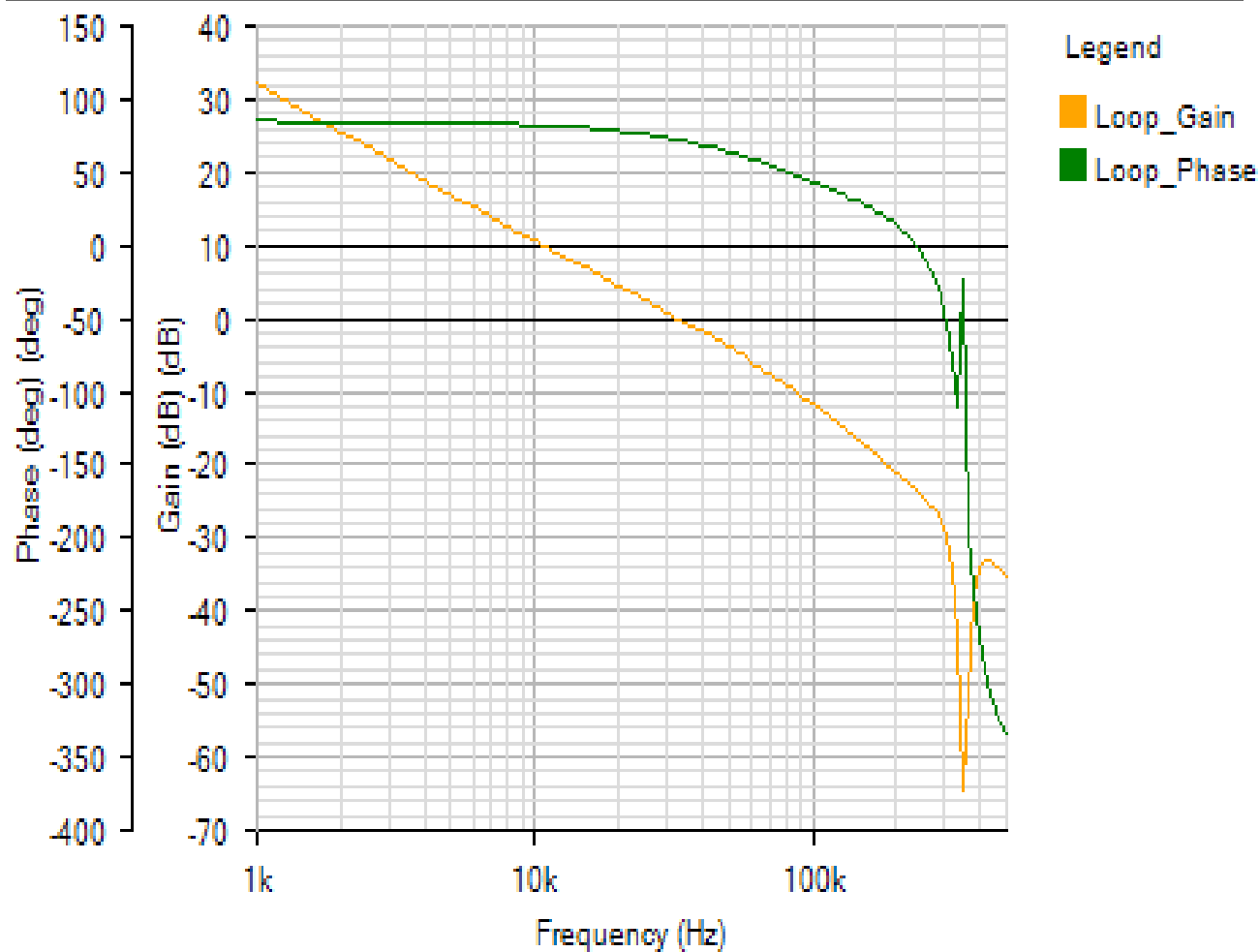
Default



AC Loop - Mon Nov 19 2018 12:55:46

BODE

Default



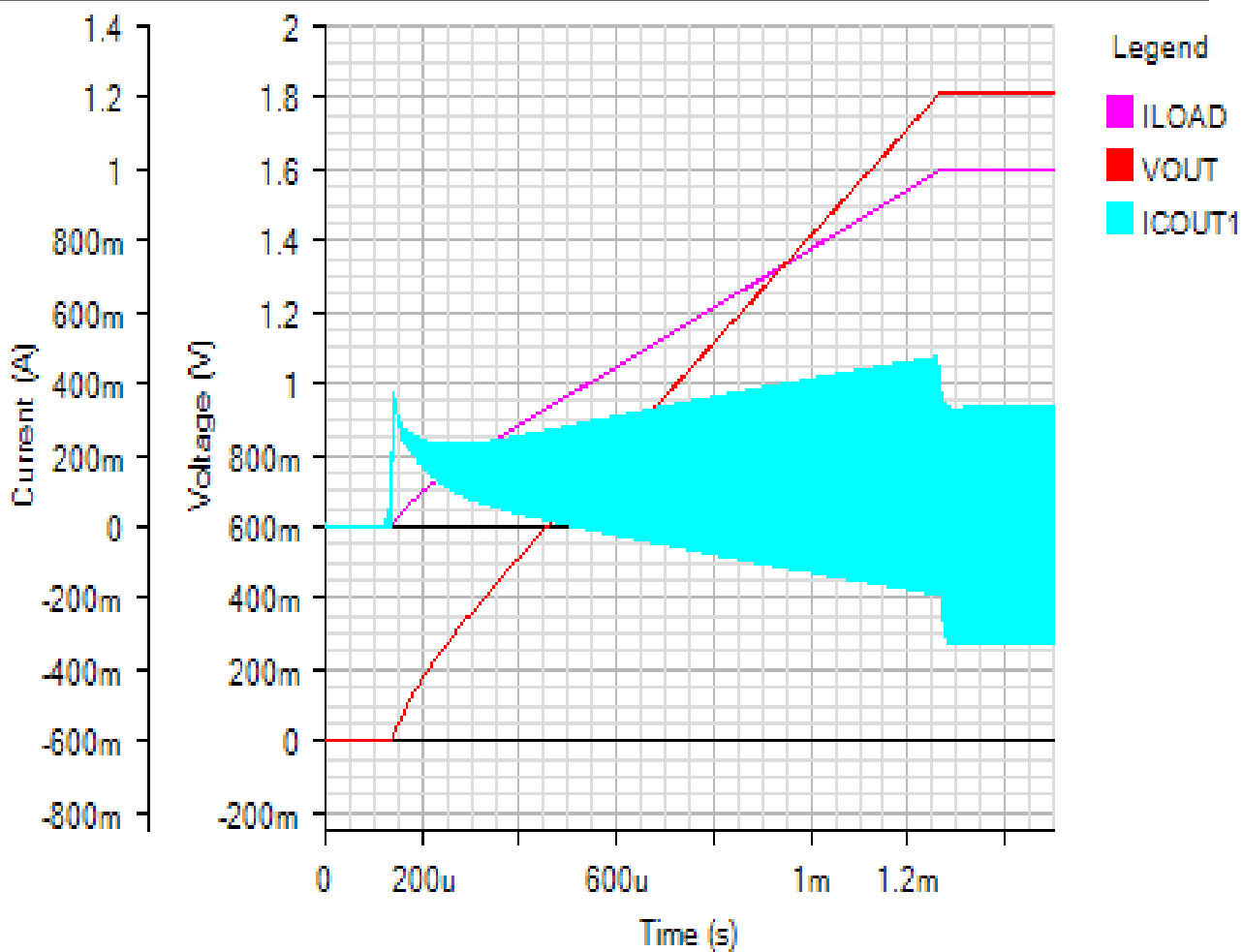
Phase Margin: 72.21° at a crossover frequency of 33kHz



Start Up - Mon Nov 19 2018 12:55:46

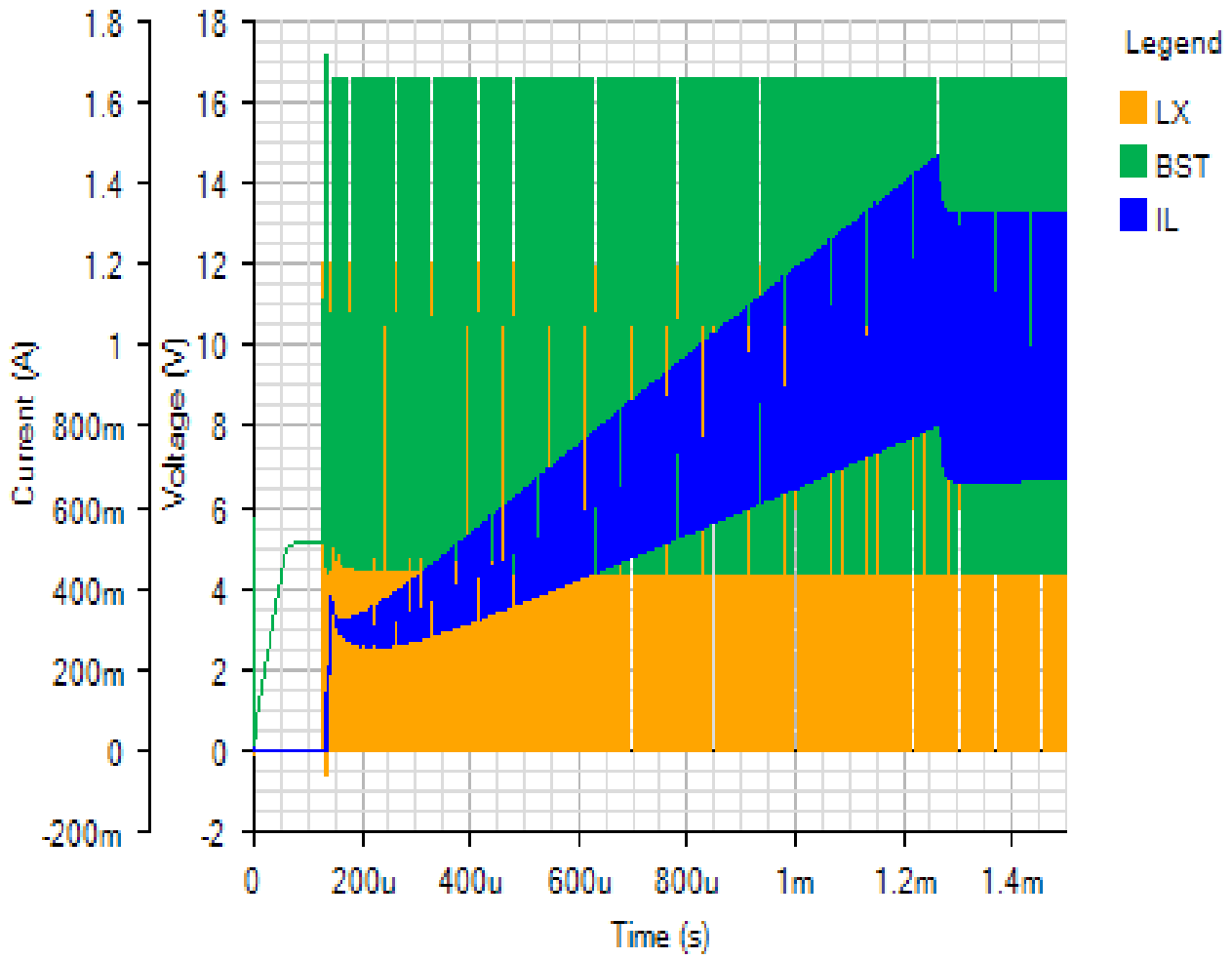
OUTPUT

Default



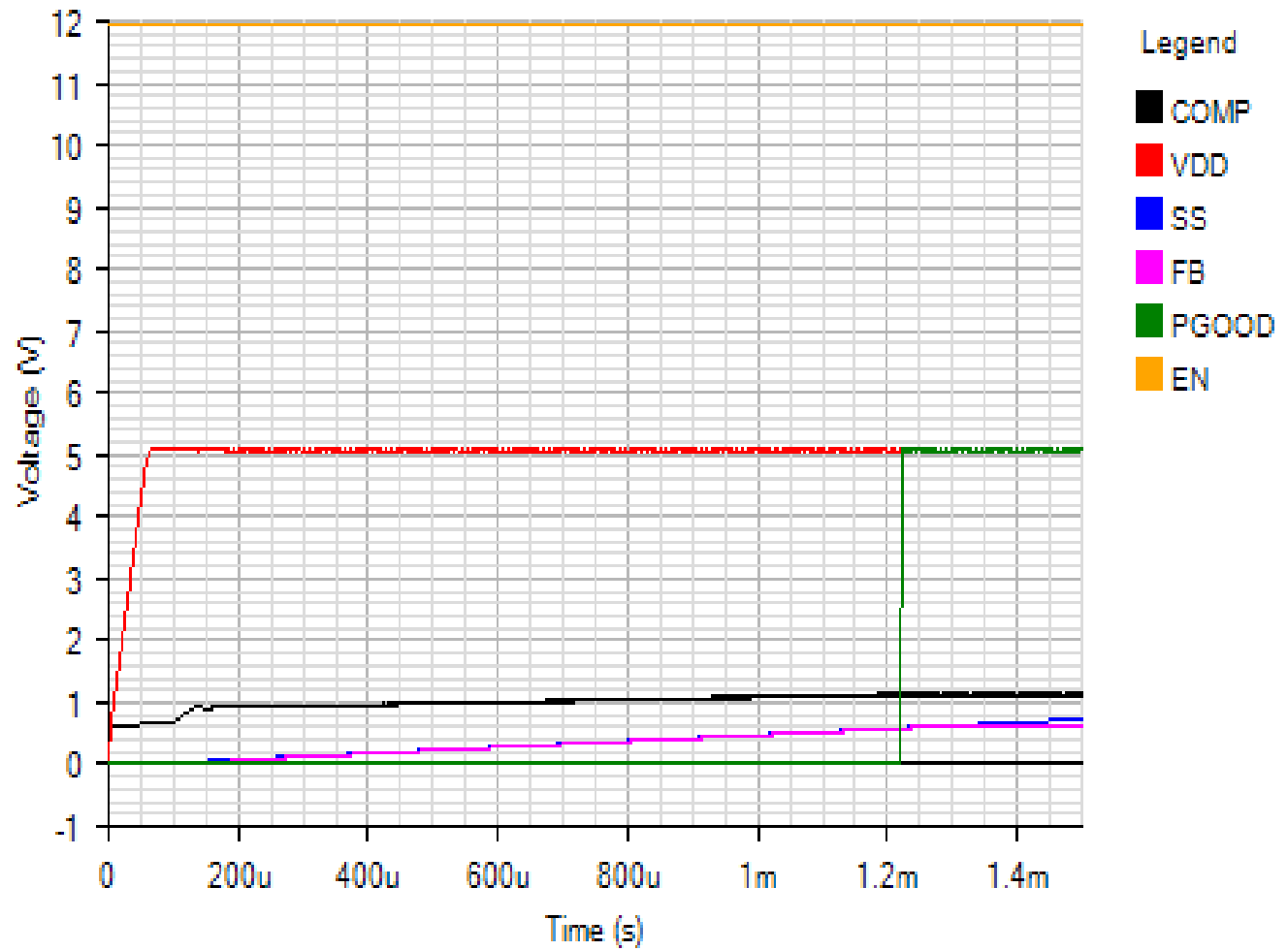
SWITCHING

Default



IC

Default



INPUT

Default

