

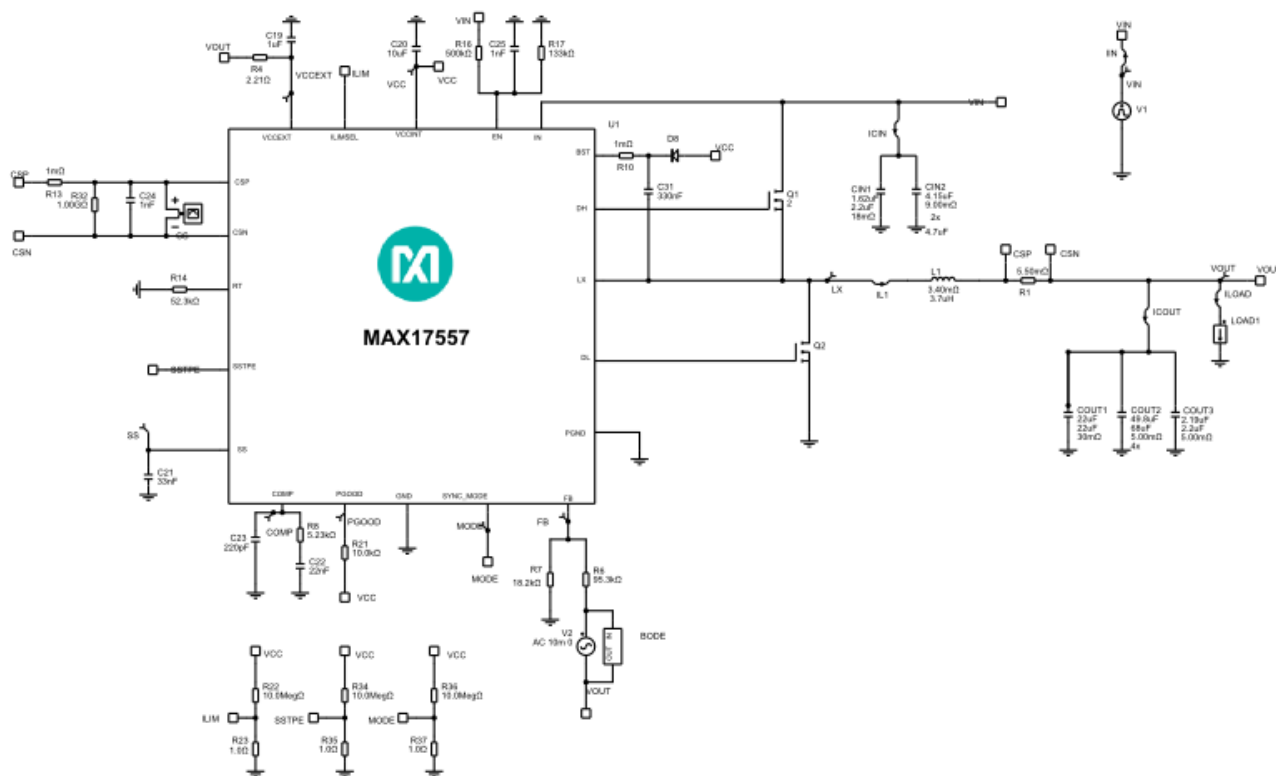
## Initial Design

1.0

**Design Requirements**

Parameter	Value
Nominal Input Voltage	24V
Minimum Input Voltage	8V
Maximum Input Voltage	60V
Input Undervoltage Lockout Level	6V
Input Voltage Ripple	5%
Output Voltage	5V
Output Current	10A
Load Step Start Current	5A
Load Step Current	10A
Output Voltage Load Step Over/Undershoot	3%
Switching Frequency	350kHz
Mode of Operation	PWM
Current Sensing Scheme	External Resistor based
Soft Start Time	5ms
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Capacitor Type	Ceramic

## Schematic



**Mode Configurations**  
Different operating modes can be configured by connecting IC pins (LIM, SSTPE, MODE) to VCC or GND.

1. For LIM pin, if connected to VCC (R22 = 1 ohm, R23 = 10Meg ohm), Latch off mode is enabled; if connected to GND (R22 = 10Meg ohm, R23 = 1 ohm), Fold back mode is enabled.
2. For SSTPE pin, if connected to VCC (R34 = 1 ohm, R35 = 10Meg ohm), soft stop mode is enabled; if connected to GND (R34 = 10Meg ohm, R35 = 1 ohm), soft stop mode is disabled.
3. For MODE pin, if connected to VCC (R24 = 1 ohm, R25 = 10Meg ohm), DCM mode is enabled; if connected to GND (R24 = 10Meg ohm, R25 = 1 ohm), PWM mode is enabled.

## BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17557	User-Defined	IC
C19	1	LMK212B7105KD-T	Taiyo Yuden	Cap Ceramic 1uF 10V X7R 10% Pad SMD 0805 125°C T/R
C20	1	C3216X7R1C106M160AC	TDK	Cap Ceramic 10uF 16V X7R 20% Pad SMD 1206 125°C T/R
C21	1	0603YC333KAT2A	AVX	Cap Ceramic 0.033uF 16V X7R 10% Pad SMD 0603 125°C T/R
C22	1	CGA6L2C0G2A223J160AA	TDK	Cap Ceramic 0.022uF 100V C0G 5% Pad SMD 1210 125°C Automotive T/R
C23	1	06035A221JAT2A	AVX	Cap Ceramic 220pF 50V C0G 5% Pad SMD 0603 125°C T/R
C24	1	CC0201KRX7R8BB102	Yageo	Cap Ceramic 0.001uF 25V X7R 10% Pad SMD 0201 125°C T/R
C25	1	C1608X7R2A102K080AA	TDK	Cap Ceramic 0.001uF 100V X7R 10% Pad SMD 0603 125°C T/R
C31	1	0805YC334KAT2A	AVX	Cap Ceramic 0.33uF 16V X7R 10% Pad SMD 0805 125°C T/R

CIN1	1	C1210C225K1RAC	Kemet	Cap Ceramic 2.2uF 100V X7R 10% SMD 1210 125C Bulk
CIN2	2	C5750X7R2A475K230KA	TDK	Cap Ceramic 4.7uF 100V X7R 10% SMD 2220 125C Plastic T/R
COUT1	1	ECASD41B226M030K00	Murata	Cap Aluminum 22uF 12.5V 20% (7.3 X 4.3 X 1.9mm) SMD 0.03 Ohm 1600mA 105C Embossed T/R
COUT2	4	C4532X5R0J686M280KA	TDK	Cap Ceramic 68uF 6.3V 1812 85C
COUT3	1	C1210C225K4R2C	Kemet	Cap Ceramic 2.2uF 16V 1210 125C
D8	1	GL34B-E3/98	Vishay	Diode Switching 100V 0.5A 2-Pin DO-213AA T/R
L1	1	MLC1565-372MLB	Coilcraft	Inductor 3.7uH 20% 3.1mOhm 14A Isat 16.58A Irms
Q1	2	FDMS86103L	Fairchild Semiconductor	Trans MOSFET N-CH 100VDS 11mOhm@4.5V 10mOhm@6V 23nC 10.75nC 2.79nF 0.469nF 150°C 81A 104W 1.2°C/W 1.1mm 33.7mm^2 8-PQFN (5x6), Power56
Q2	1	SiJ482DP	Vishay	Trans MOSFET N-CH 80VDS 9.5mOhm@4.5V 8.6mOhm@6V 24nC 13.5nC 2.43nF 1.18nF 150°C 60A 69.4W 1.8°C/W 1.14mm 43.3mm^2 PowerPak SO-8L
R1	1	NCSR150J5M50DTRGF	NIC Components	Res Metal Strip 2010 0.0055 Ohm 5% 1.5W ±50ppm/°C Pad SMD T/R
R4	1	RMCF0805FT2R21	Stackpole Electronics, Inc	Res Thick Film 0805 2.21 Ohm 1% 0.125W(1/8W) ±200ppm/°C Pad SMD Automotive T/R
R6	1	ERJ3EKF9532V	Panasonic	Res Thick Film 0603 95.3K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ6ENF1822V	Panasonic	Res Thick Film 0805 18.2K Ohm 1% 0.125W(1/8W) ±100ppm/°C Pad SMD Automotive T/R
R8	1	ERJ3EKF5231V	Panasonic	Res Thick Film 0603 5.23K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R14	1	ERJ6ENF5232V	Panasonic	Res Thick Film 0805 52.3K Ohm 1% 0.125W(1/8W) ±100ppm/°C Pad SMD Automotive T/R
R16	1	MC102825003JE	Ohmite	Res Thick Film 500K Ohm 5% 1.5W ±50ppm/°C Pad SMD
R17	1	ERJ2RKF1333X	Panasonic	Res Thick Film 0402 133K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R21	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R22	1	ERJ3GEYJ106V	Panasonic	Res Thick Film 0603 10M Ohm 5% 0.1W(1/10W) -400ppm/°C to 150ppm/°C Pad SMD Automotive T/R
				Res Thick Film 0402 1 Ohm 5%

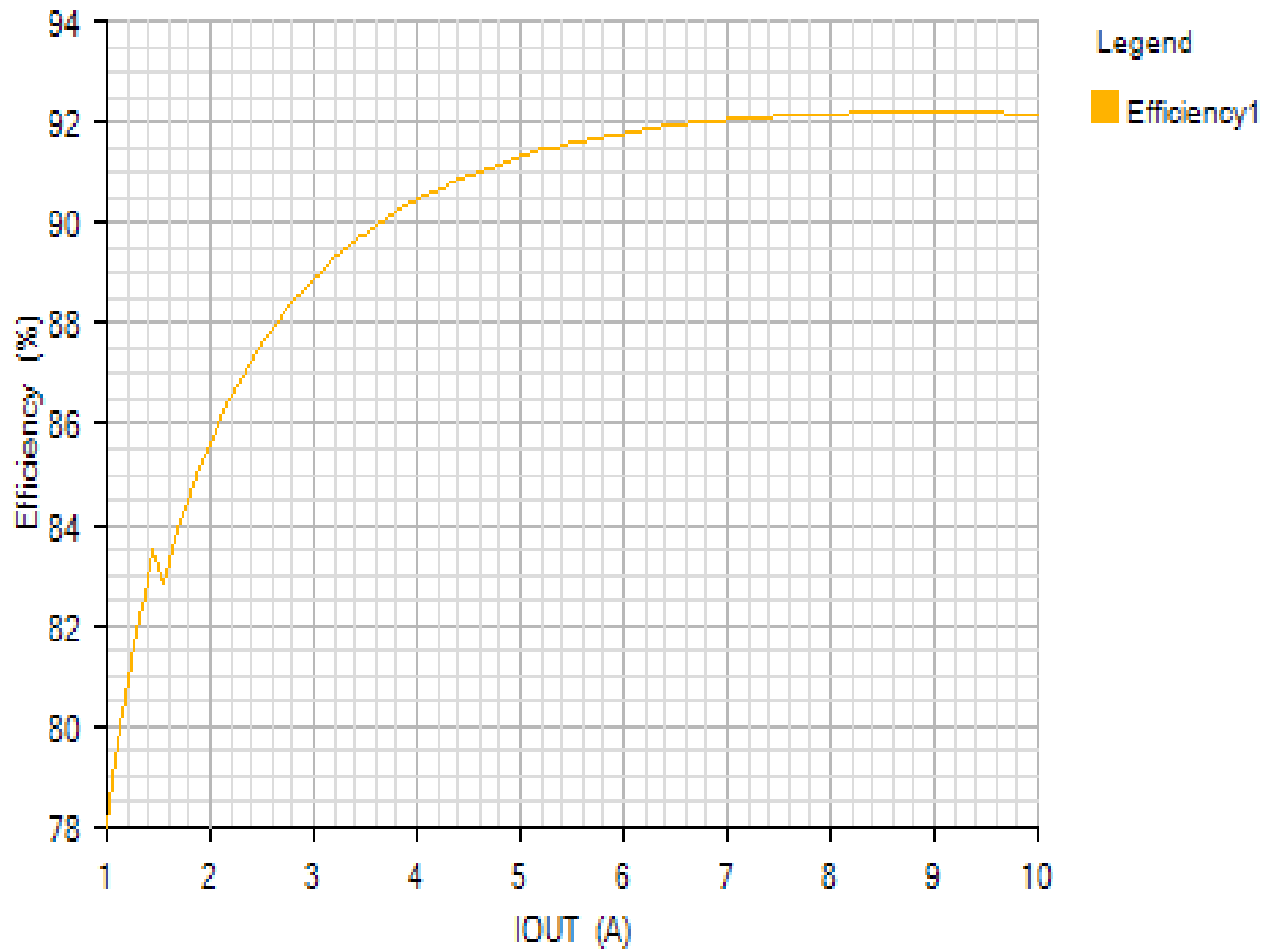
R23	1	ERJ2GEJ1R0X	Panasonic	0.1W(1/10W) -100ppm/°C to 600ppm/°C Pad SMD Automotive T/R
R34	1	ERJ3GEYJ106V	Panasonic	Res Thick Film 0603 10M Ohm 5% 0.1W(1/10W) -400ppm/°C to 150ppm/°C Pad SMD Automotive T/R
R35	1	ERJ2GEJ1R0X	Panasonic	Res Thick Film 0402 1 Ohm 5% 0.1W(1/10W) -100ppm/°C to 600ppm/°C Pad SMD Automotive T/R
R36	1	ERJ3GEYJ106V	Panasonic	Res Thick Film 0603 10M Ohm 5% 0.1W(1/10W) -400ppm/°C to 150ppm/°C Pad SMD Automotive T/R
R37	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 - Tue Nov 20 2018 09:10:47**

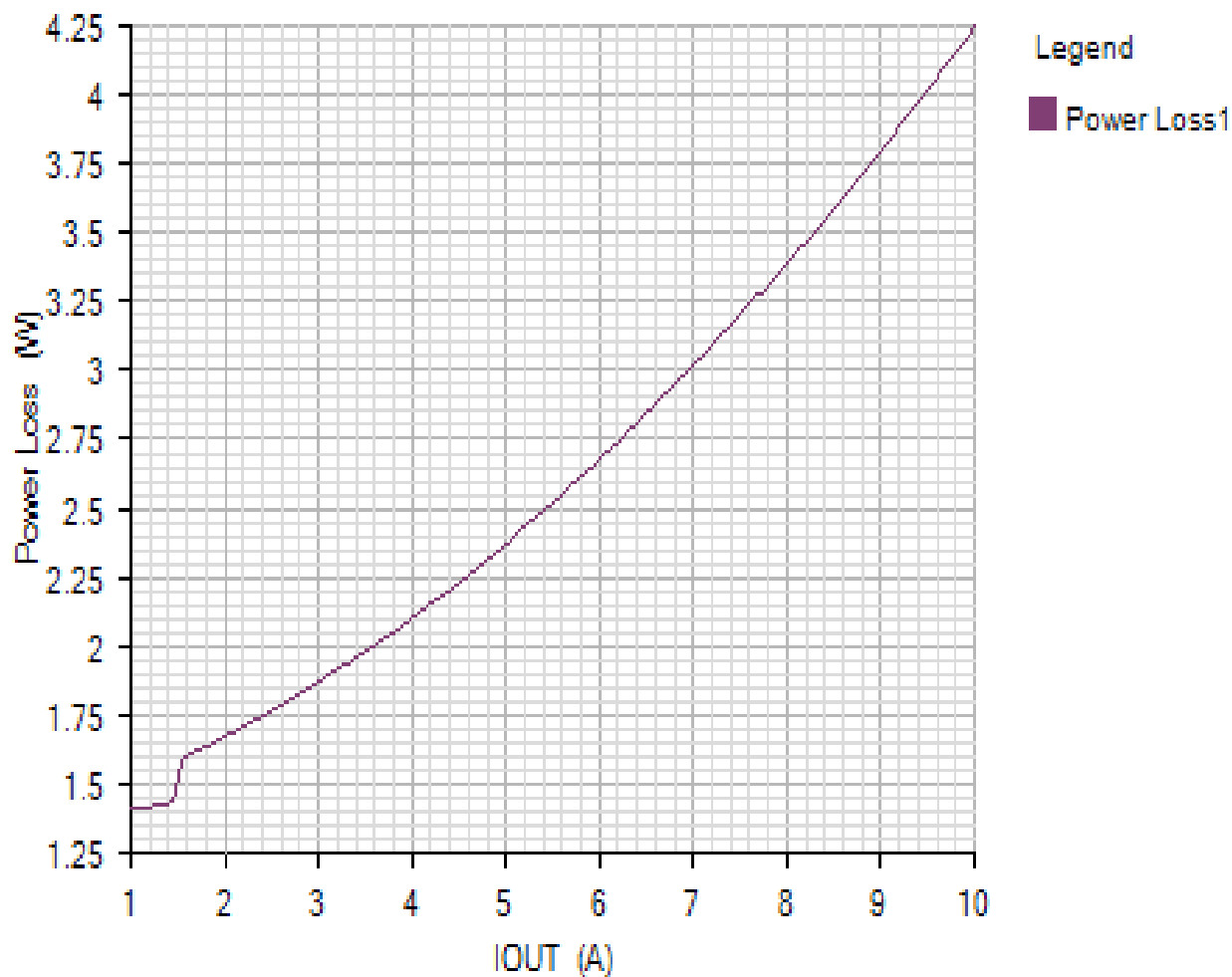
EFFICIENCY\_PLOT

Default

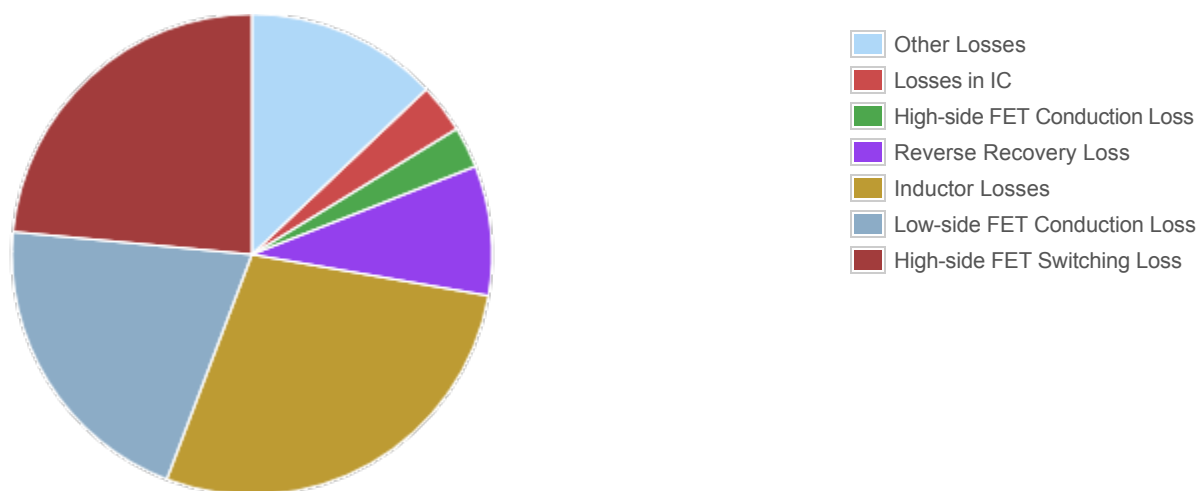


POWER\_LOSS\_PLOT

Default



Losses



Component

Loss (W)

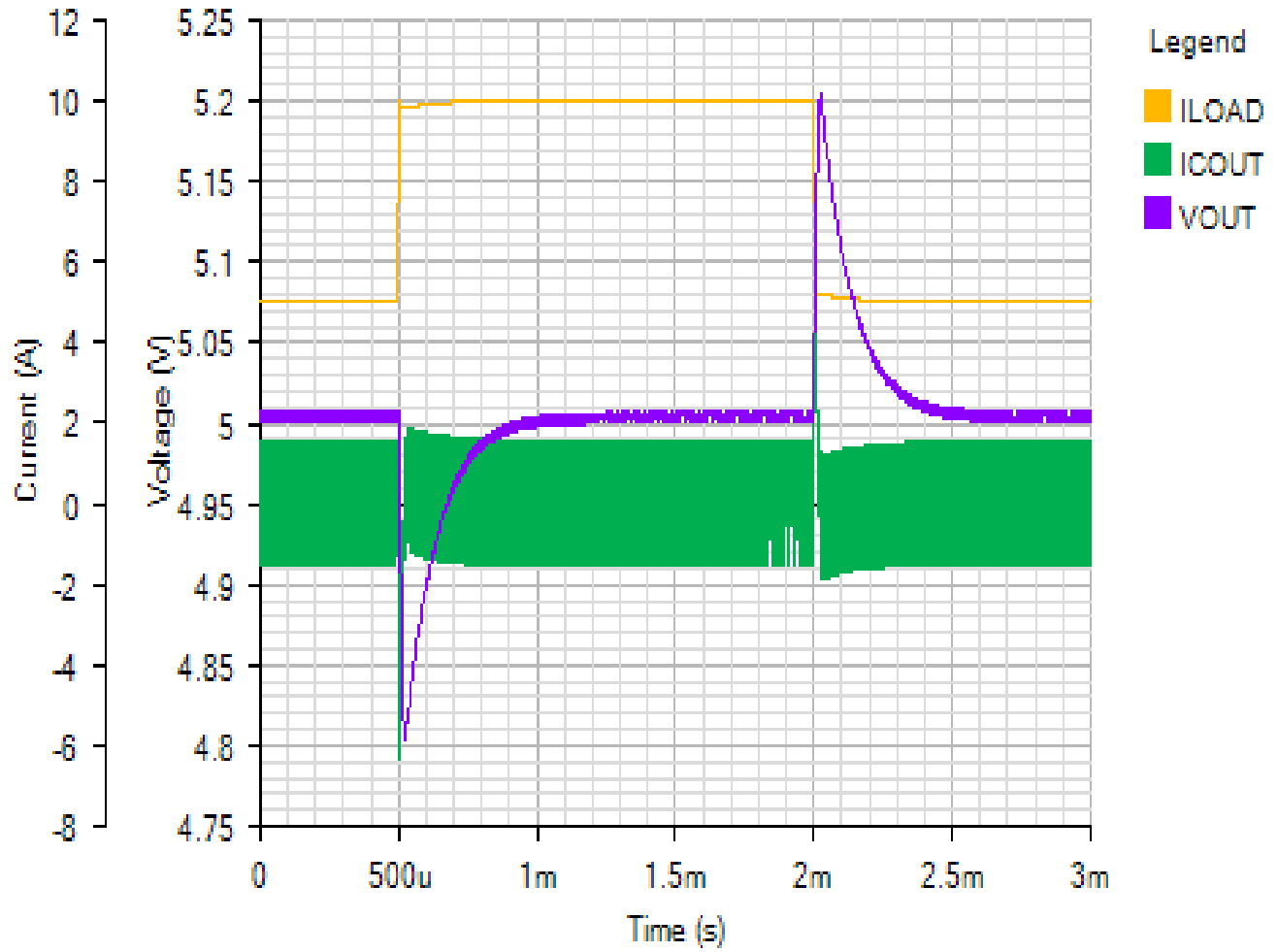
% of total

Component	Loss (W)	% of total
Other Losses	0.55	13
Losses in IC	0.14	3.3
High-side FET Conduction Loss	0.11798	2.8
Reverse Recovery Loss	0.37	8.7
Inductor Losses	1.19	28
Low-side FET Conduction Loss	0.88	20.7
High-side FET Switching Loss	0.997704	23.5
Total	4.245684	100

Load Step - Tue Nov 20 2018 09:10:47

OUTPUT

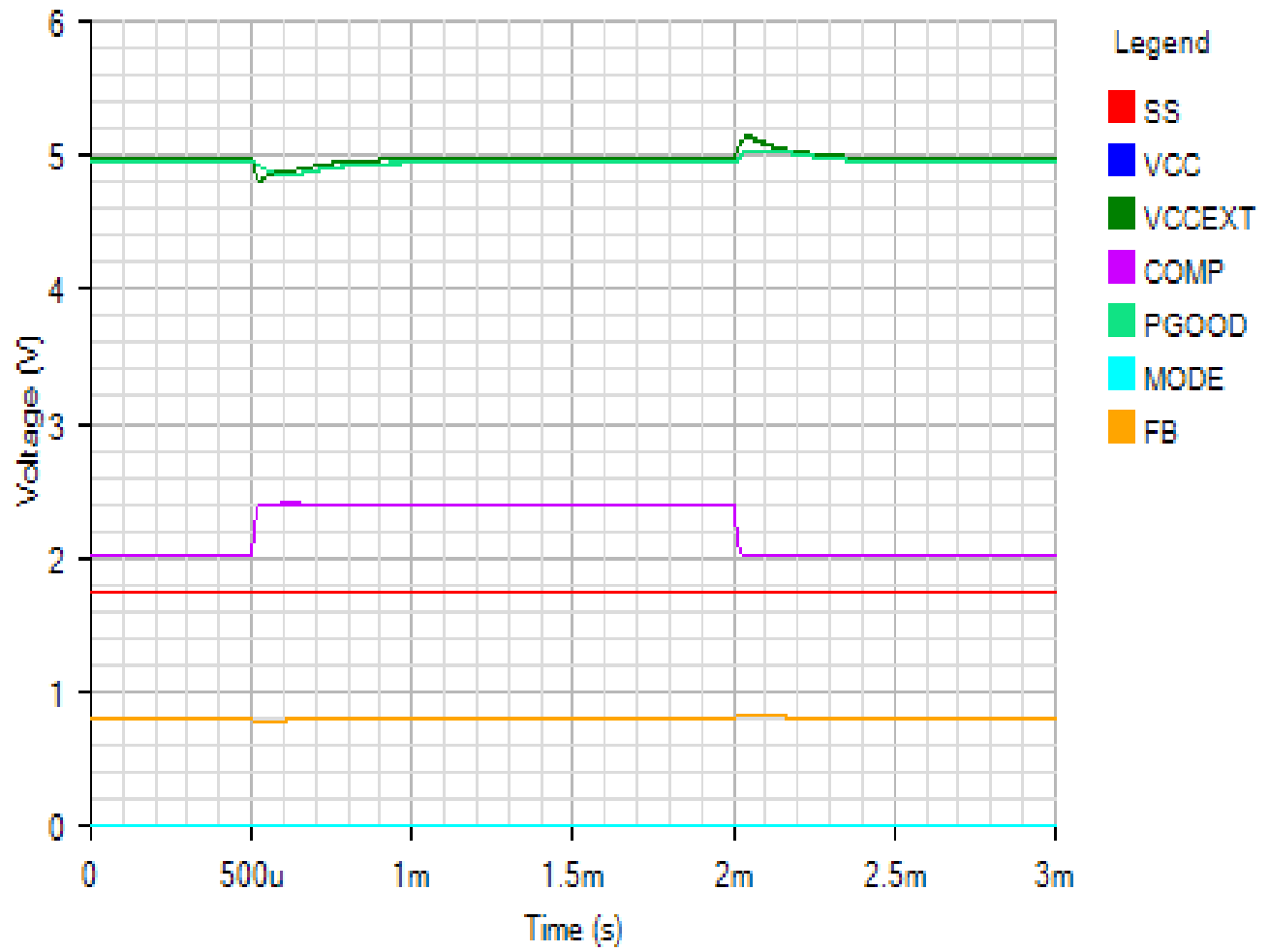
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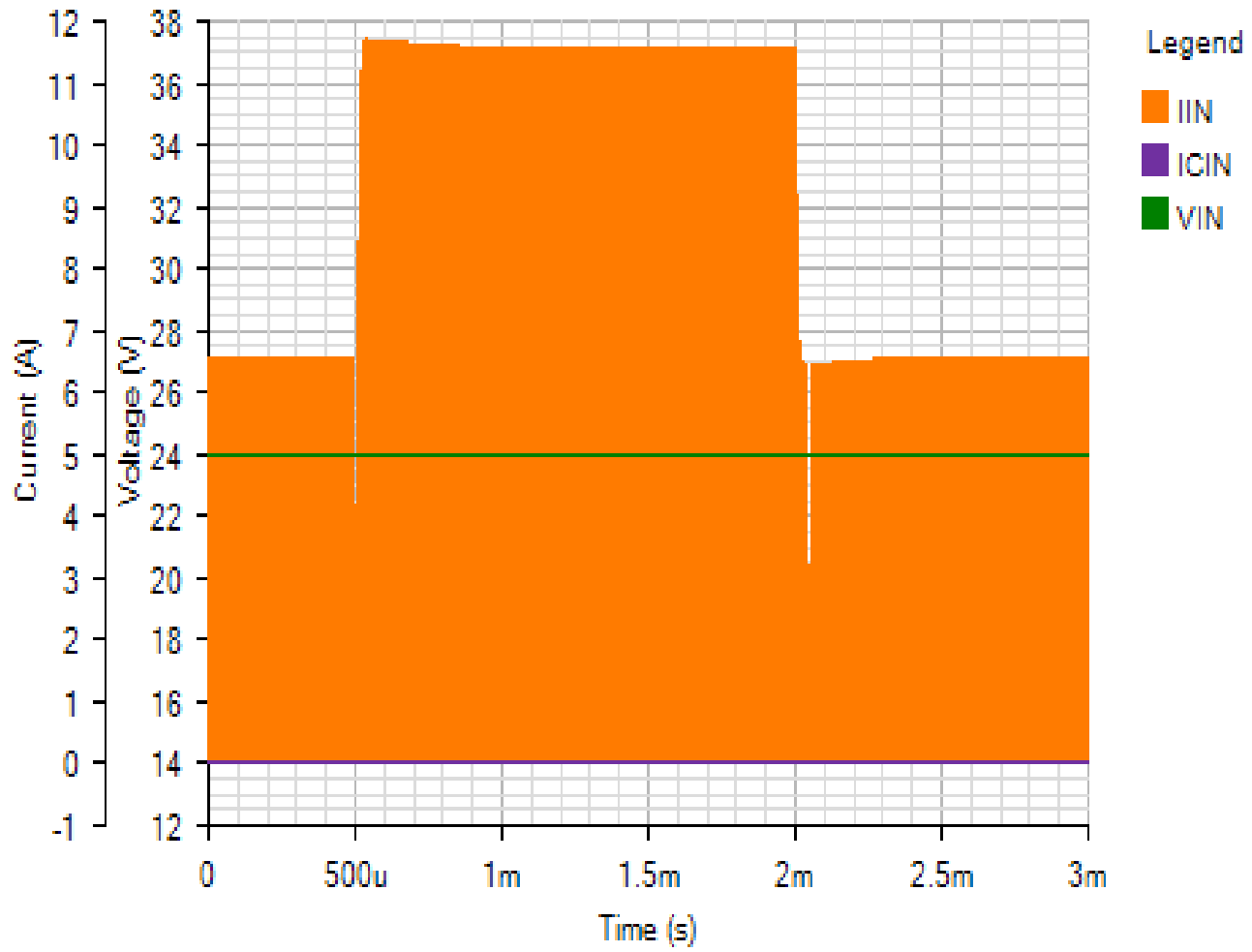
IC

Default



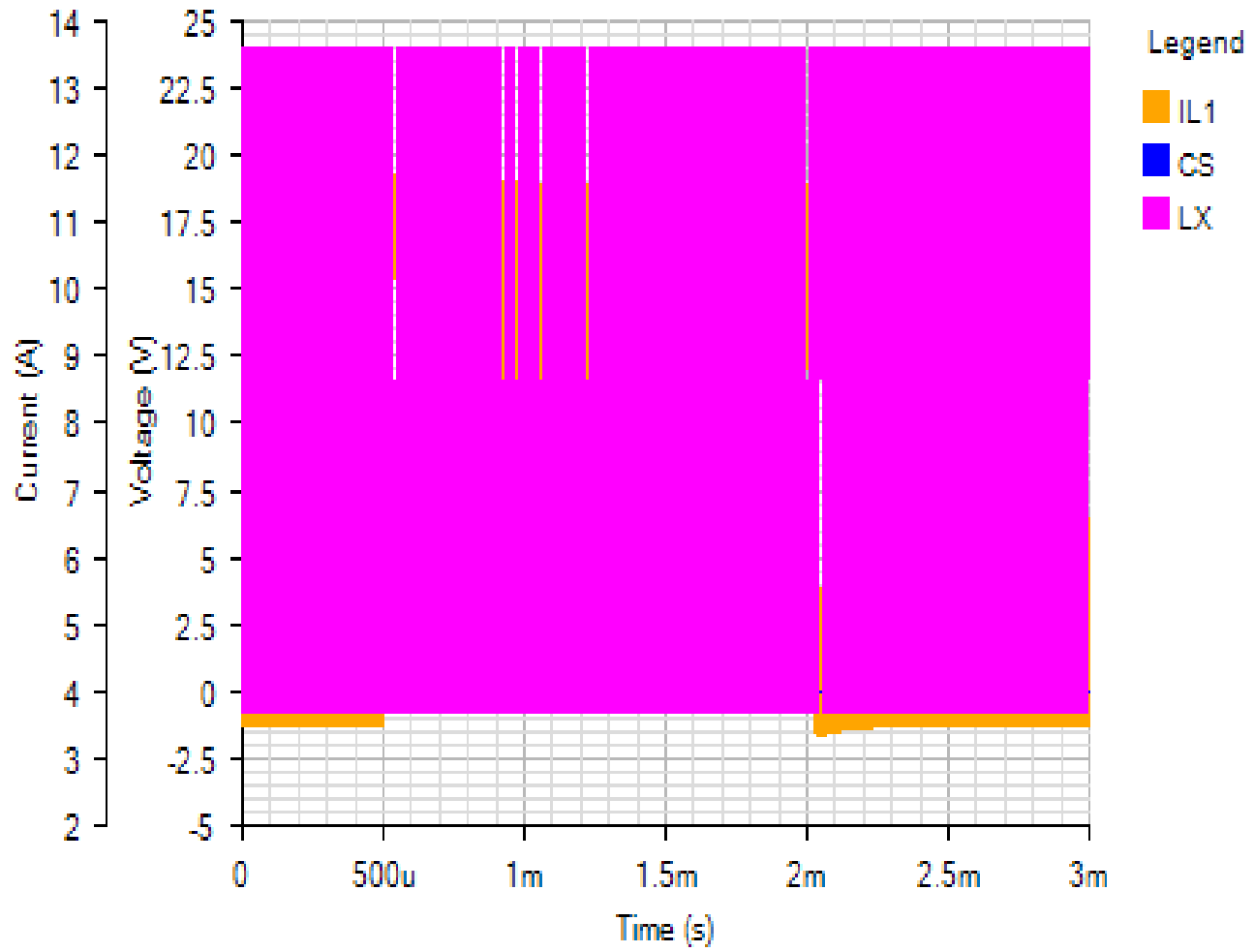
INPUT

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SWITCHING

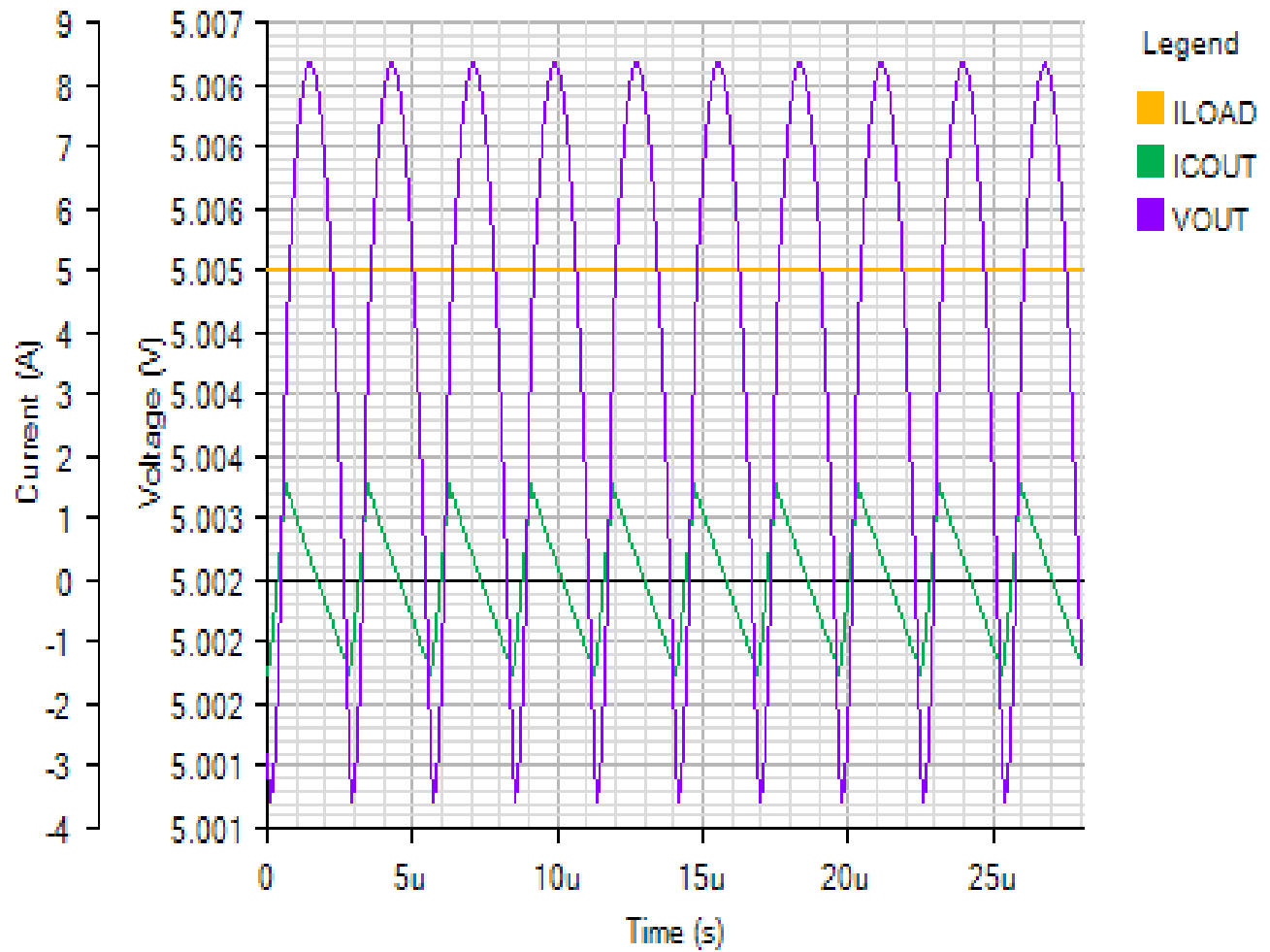
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Steady State - Tue Nov 20 2018 09:10:47

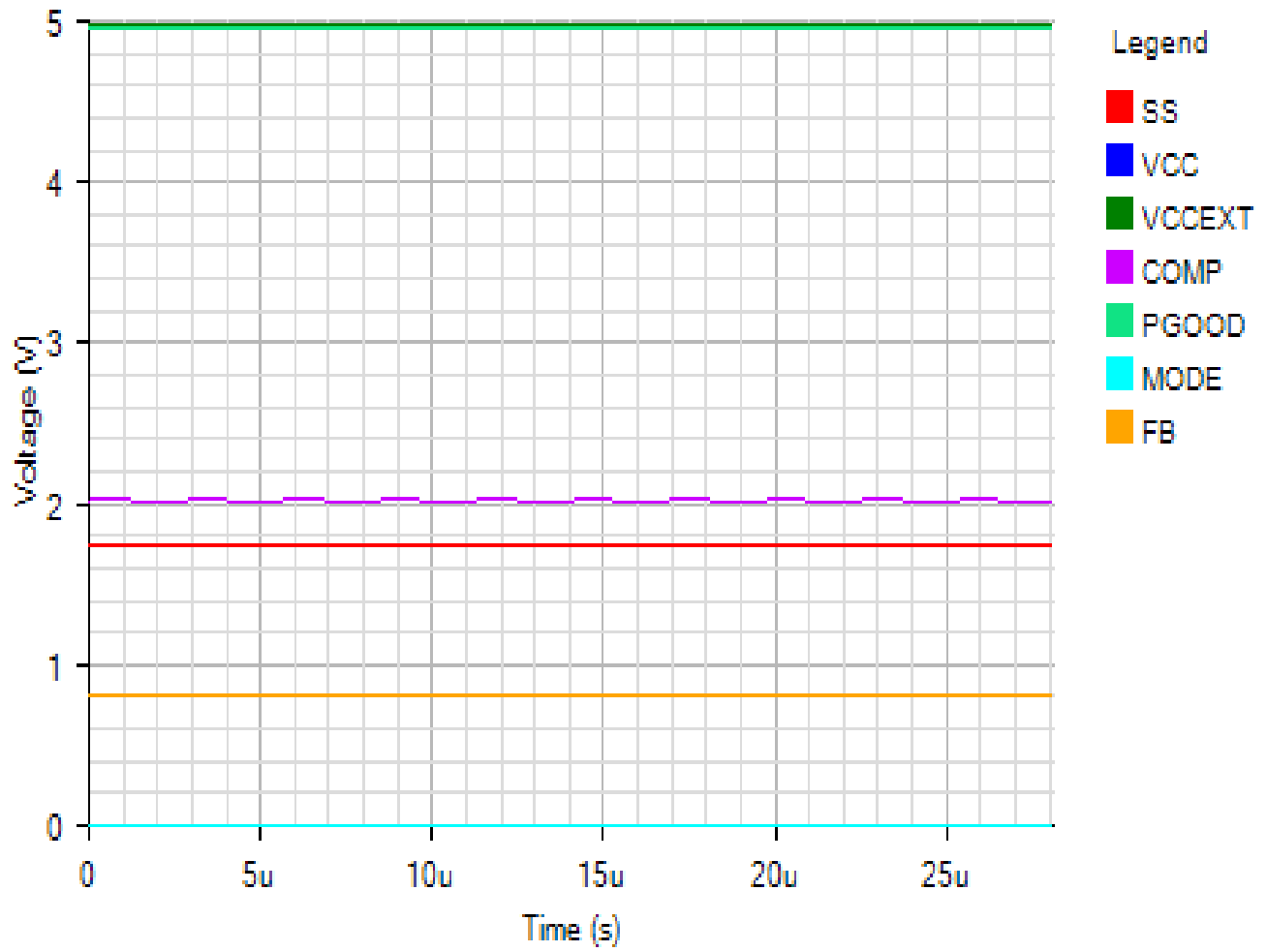
OUTPUT

Default



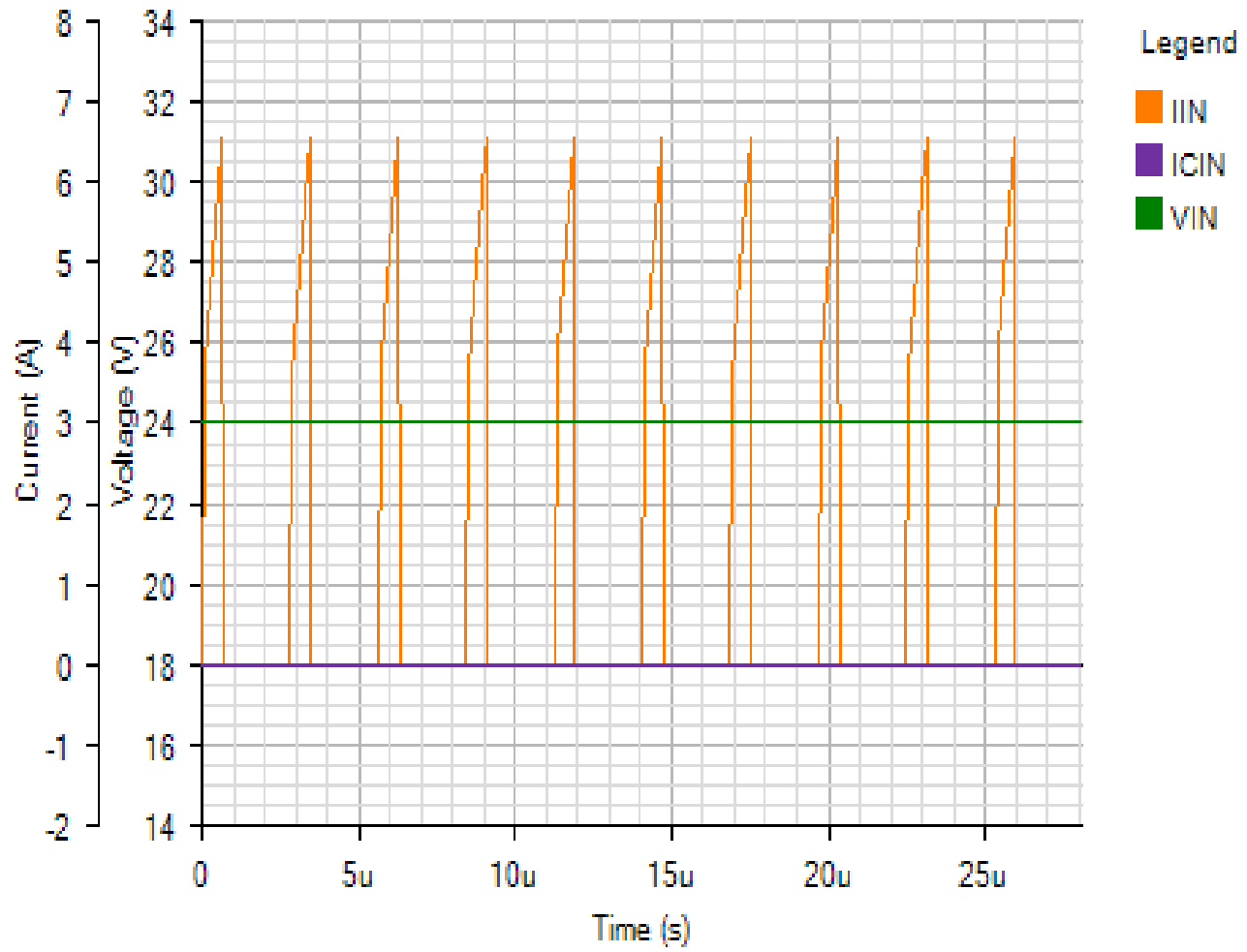
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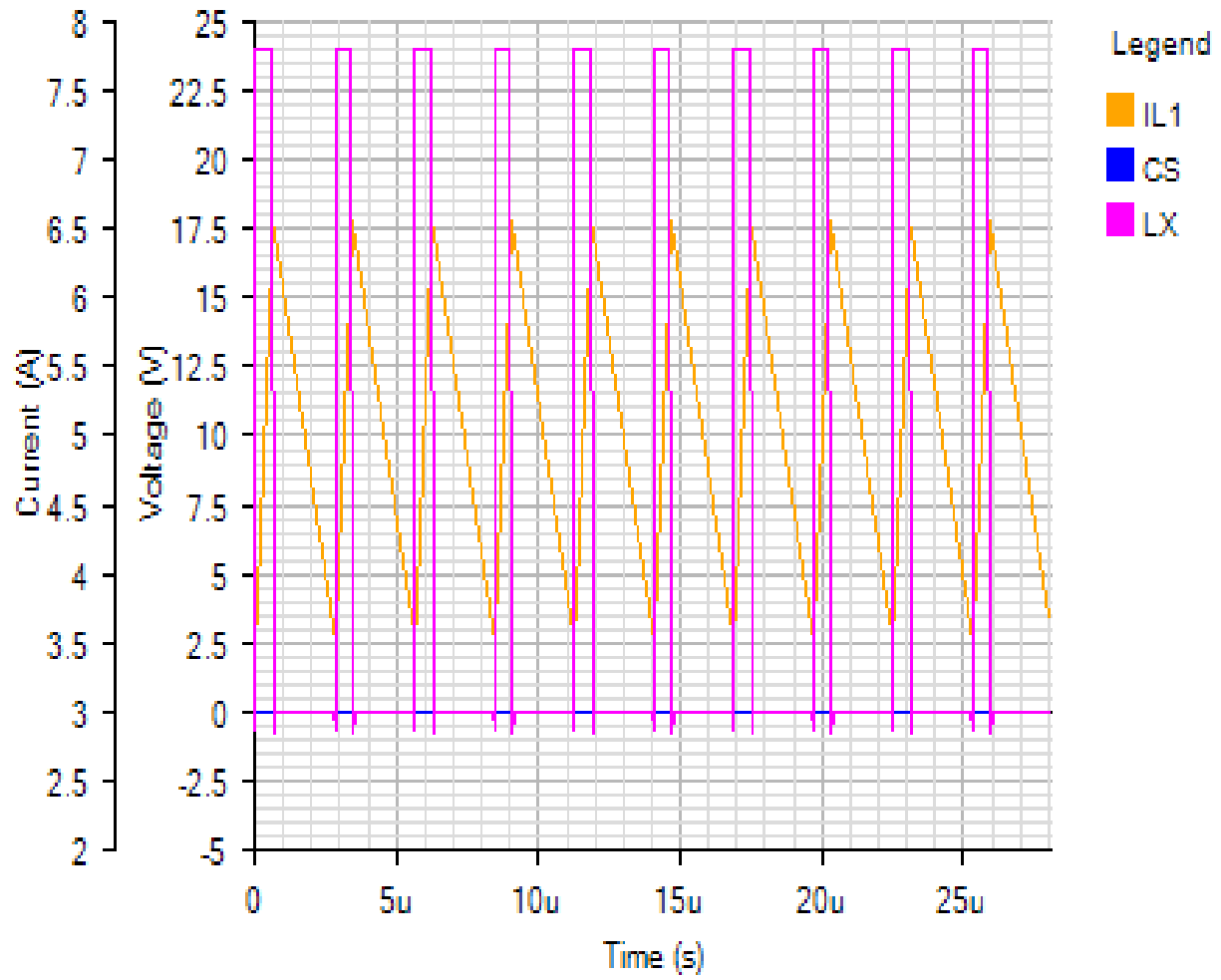
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SWITCHING

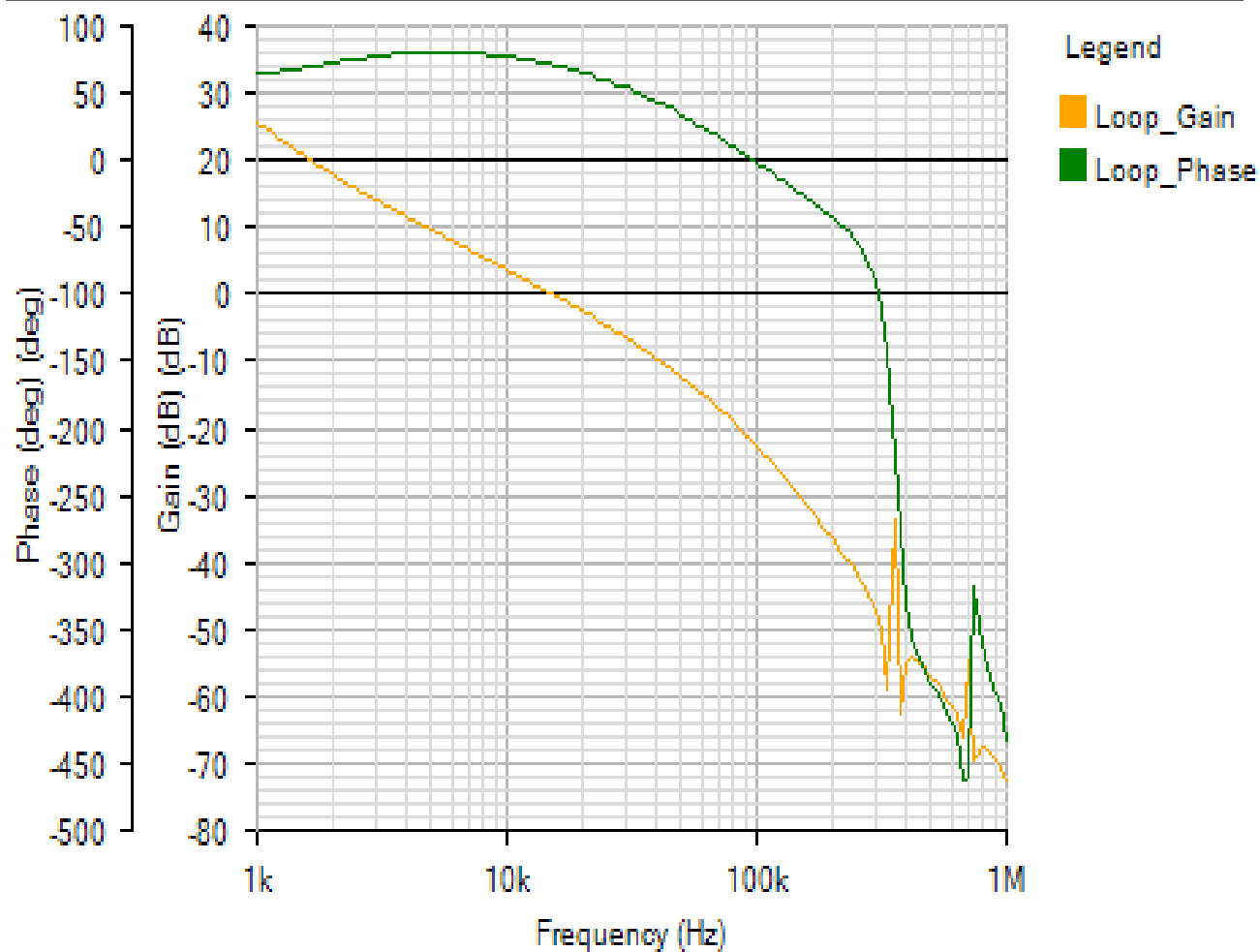
Default



AC Loop - Tue Nov 20 2018 09:10:47

BODE

Default



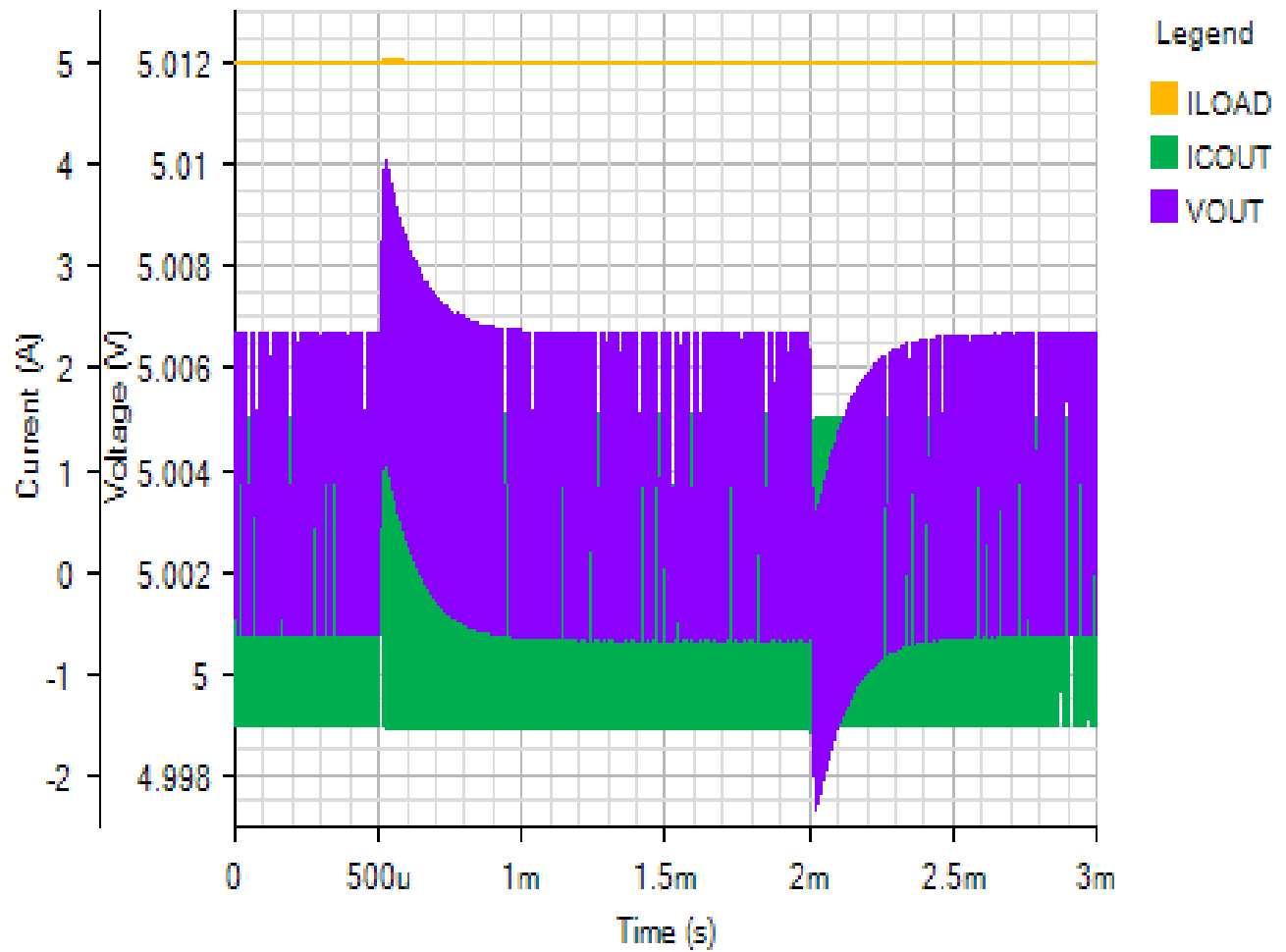
20 30 40 50 60 70 80 90 100 110



Line Transient - Tue Nov 20 2018 09:10:47

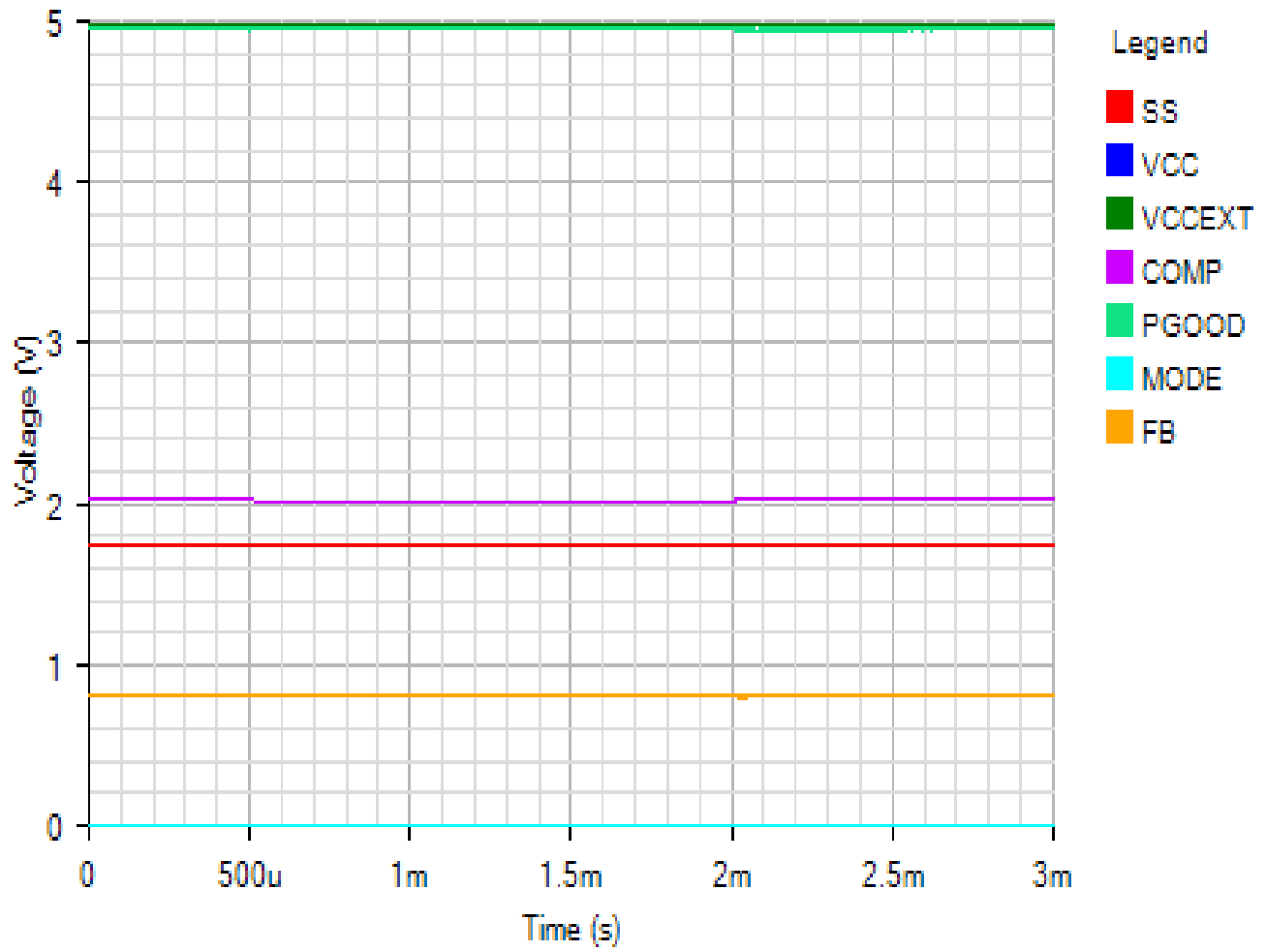
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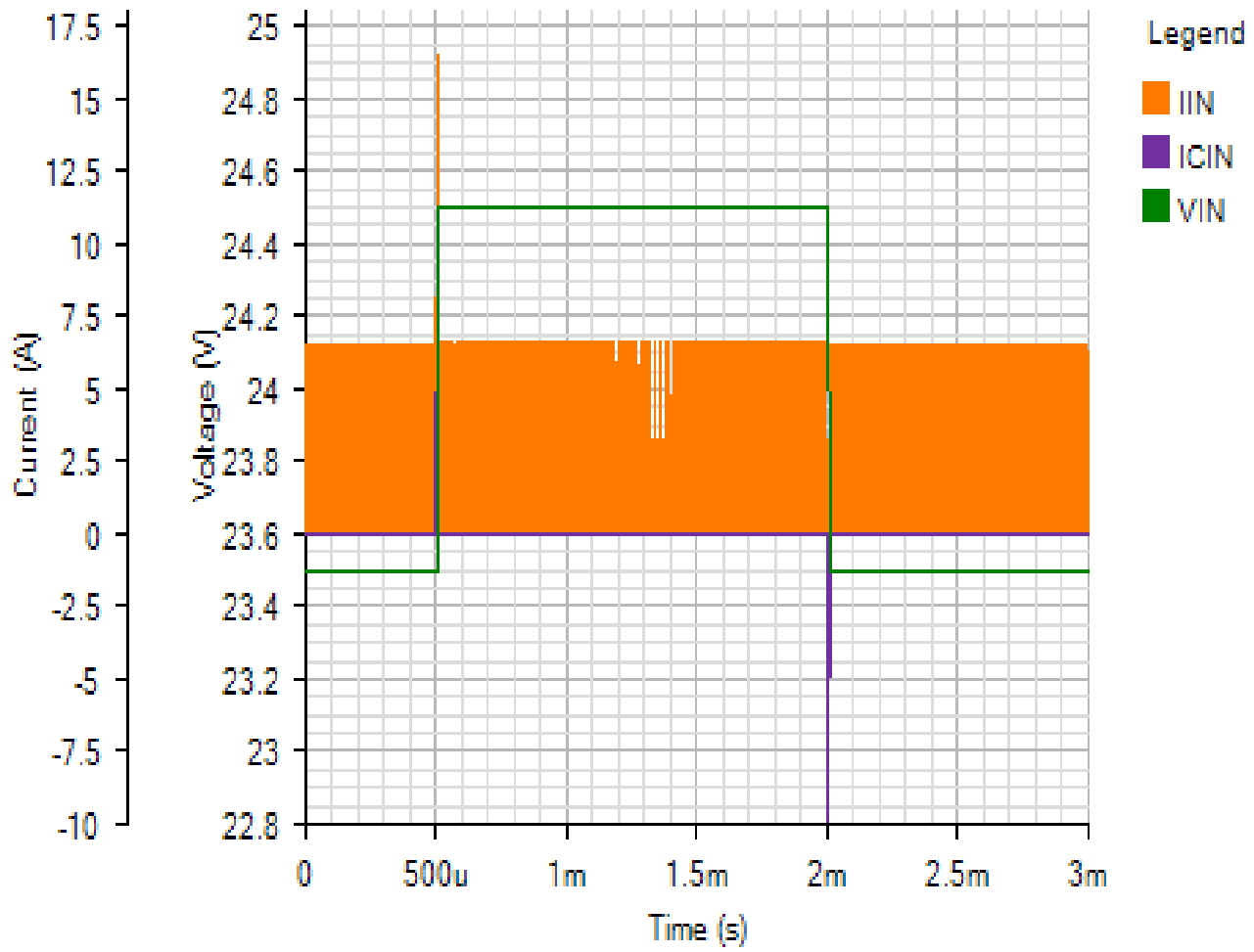
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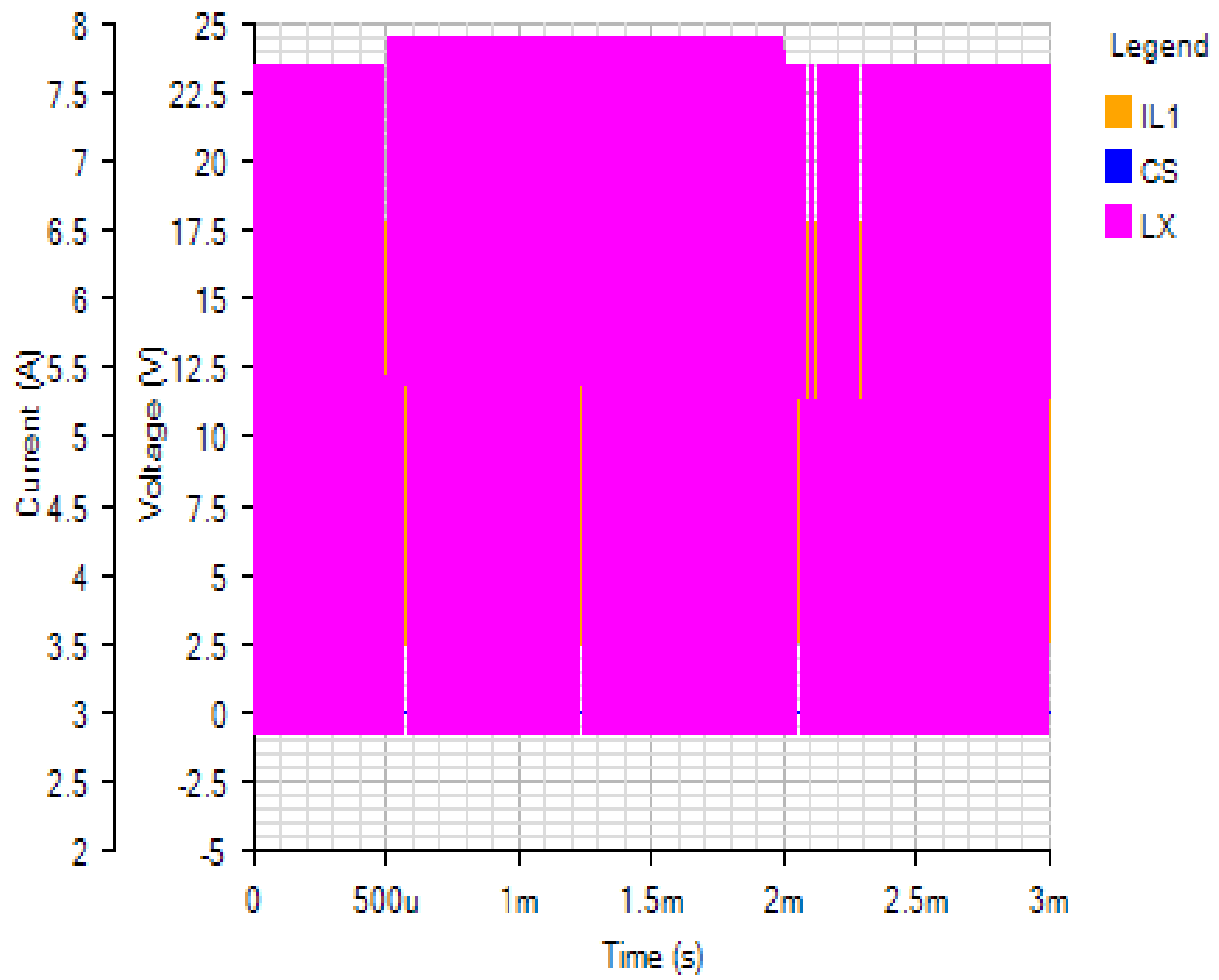
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SWITCHING

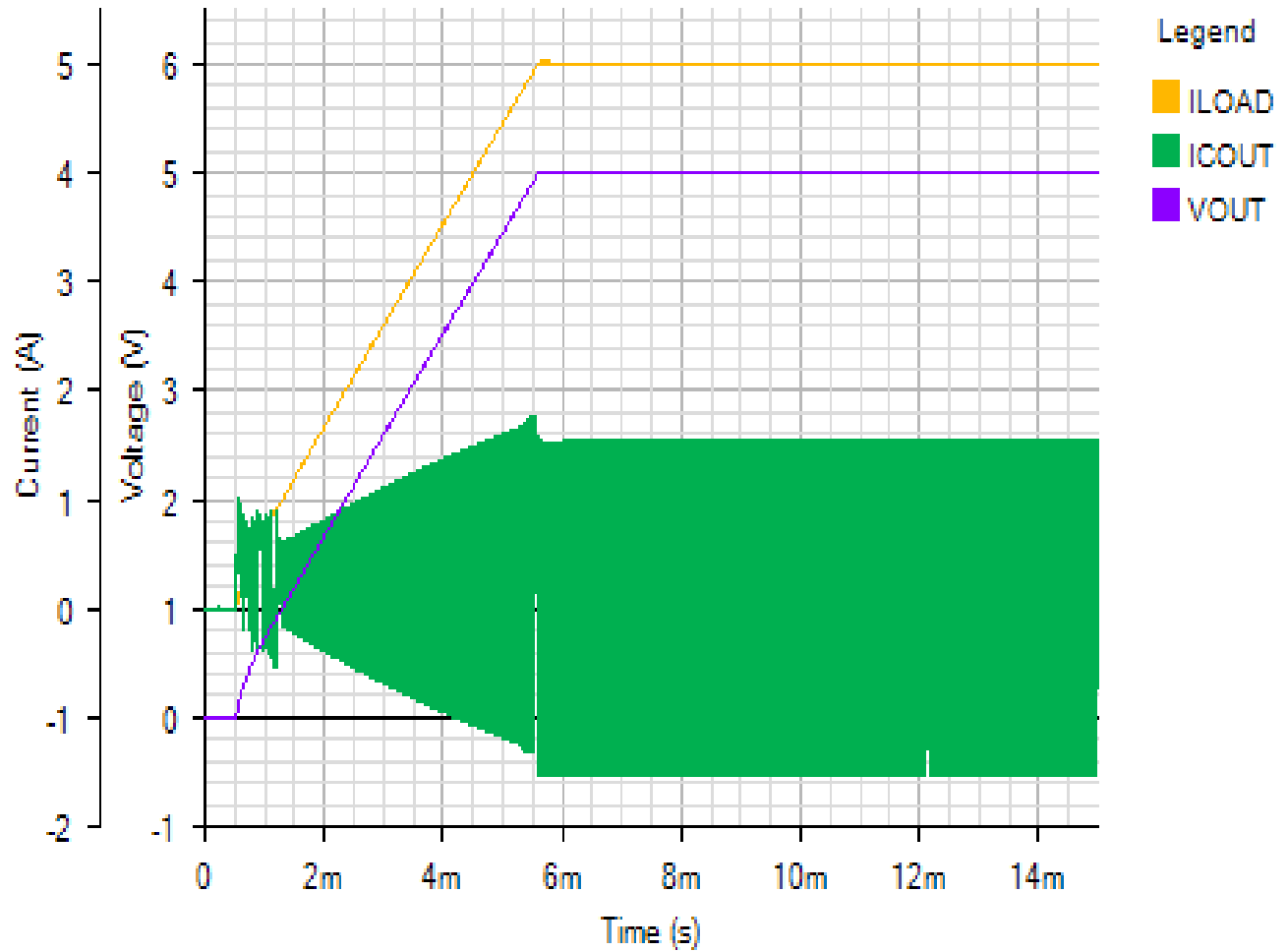
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Start Up - Tue Nov 20 2018 09:10:47

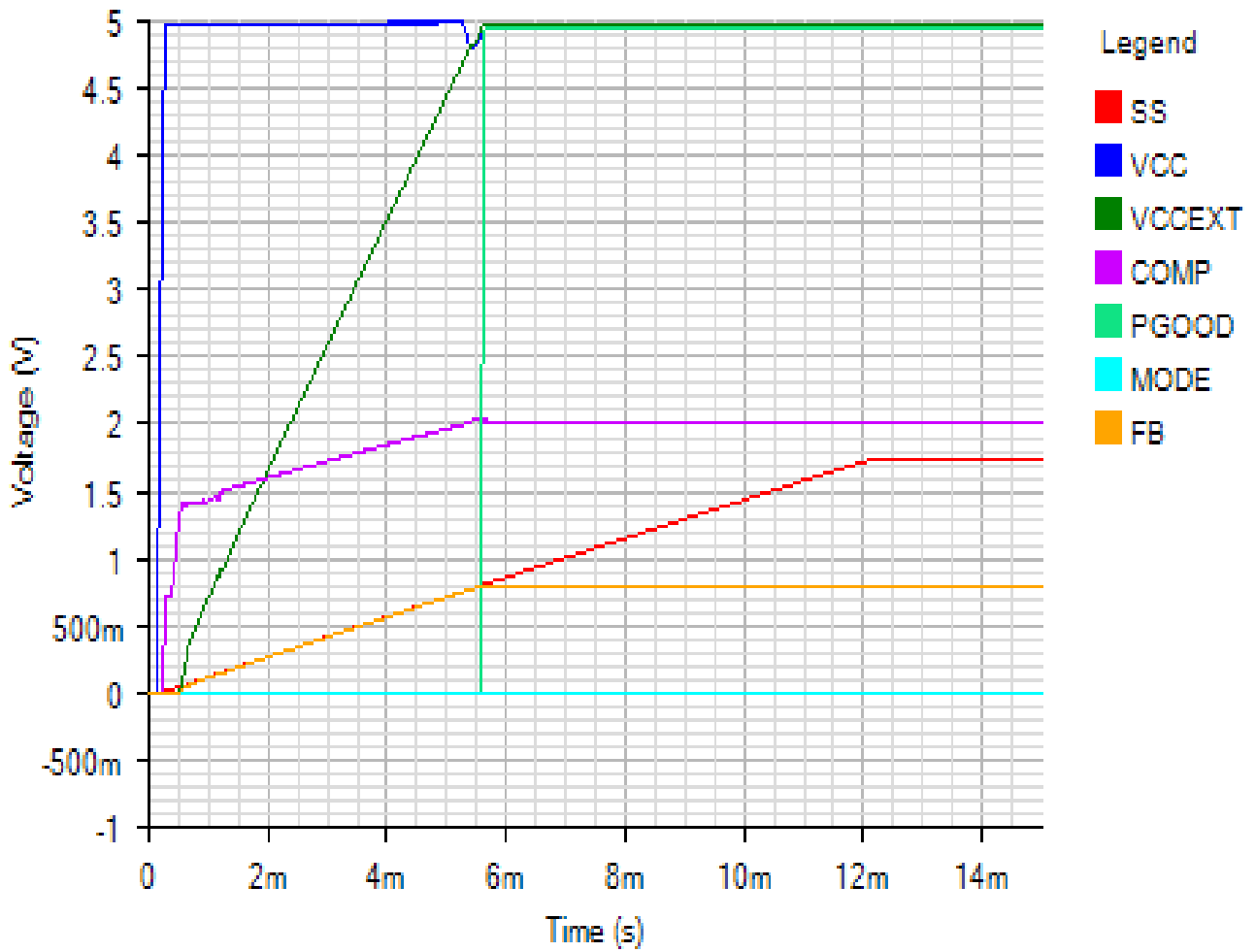
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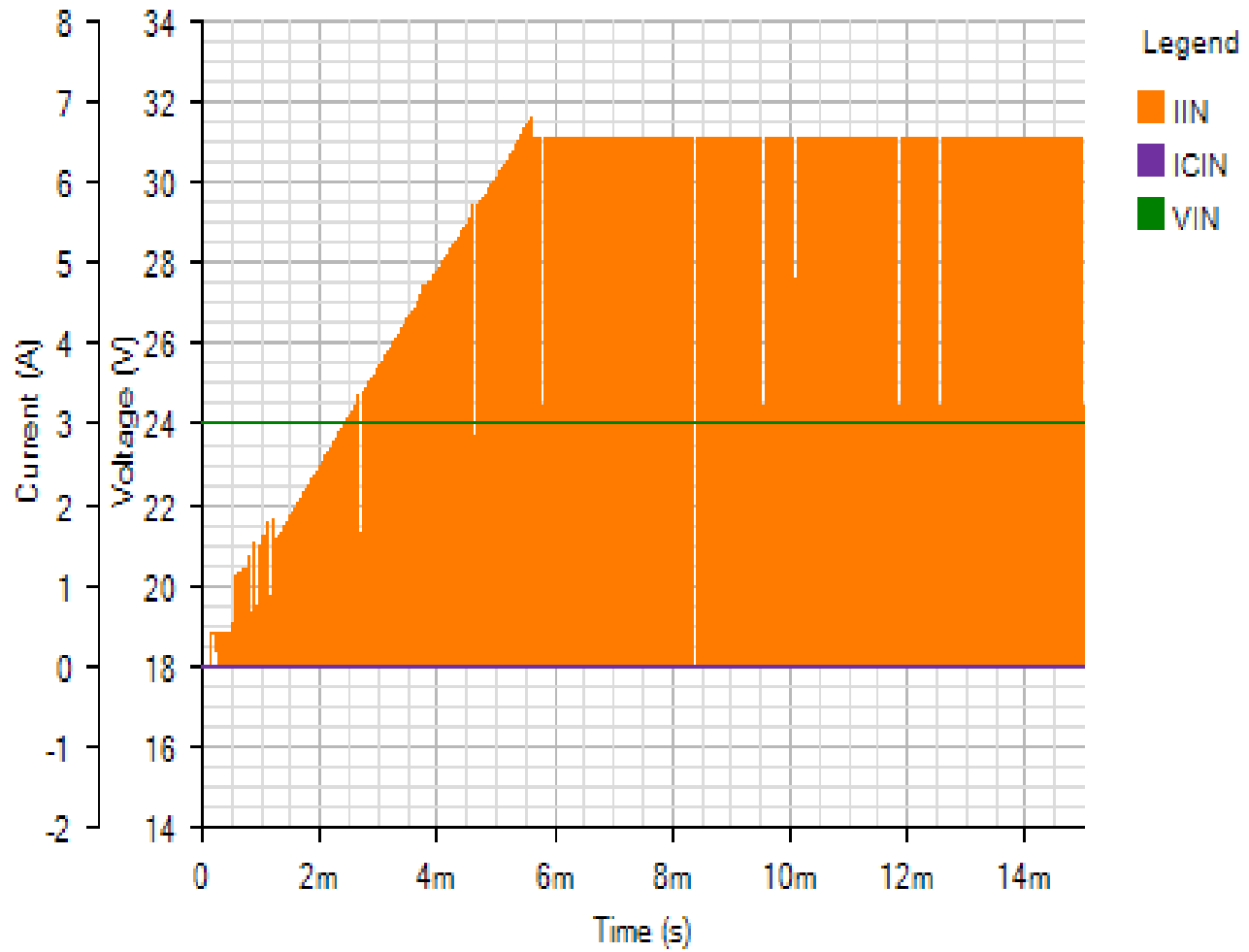
IC

Default



INPUT

Default



SWITCHING

Default

