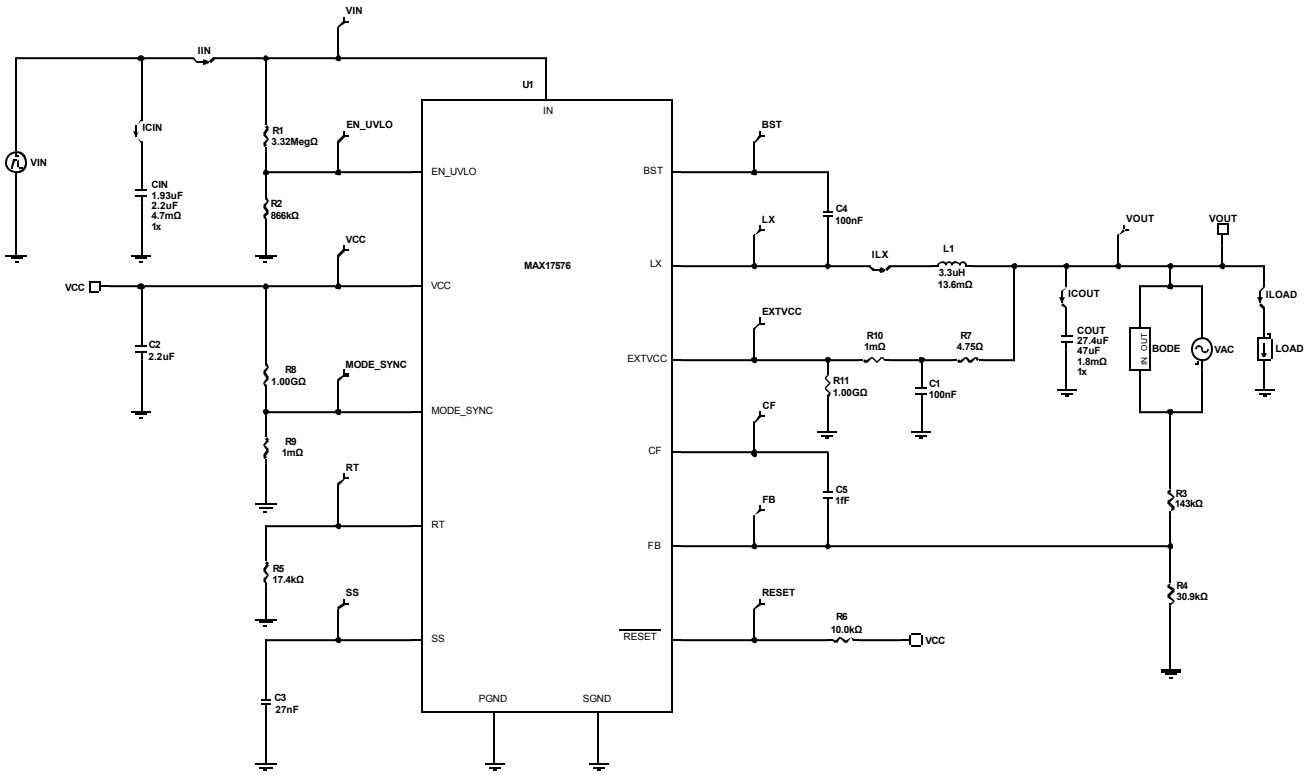
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	9V
Maximum Input Voltage	30V
Nominal Input Voltage	12V
Input Steady-State Ripple	2%
Input Undervoltage Lockout Level	5.85V
Output Voltage	5.1V
Output Current	2.5A
Output Voltage Load Step Over/Undershoot	2%
Load Start Current	0.5A
Load Pulse Current	1.5A
Load Pulse Edge Rate	10A/us
Performance Priority	Balance Efficiency and Size
BOM Priority	Low Cost
Mode of Operation	PWM
Switching Frequency	1113kHz
Soft Start Time	5ms
Ambient Temperature	25°C

Schematic



Note 1: AC simulations may fail when PFM/DCM Mode is selected and the Load Current is low enough to engage PFM/DCM operation. PFM/DCM is hysteretic and there is no AC Loop to measure.
Note 2: To change the Switching Frequency in online design tool return to the Design Requirements tab.
Note 3: The Efficiency Simulation gives the results for PWM mode only, irrespective of the selected Mode in the Design Requirements tab.
Note 4: External Clock Synchronization feature is not modelled.

BOM

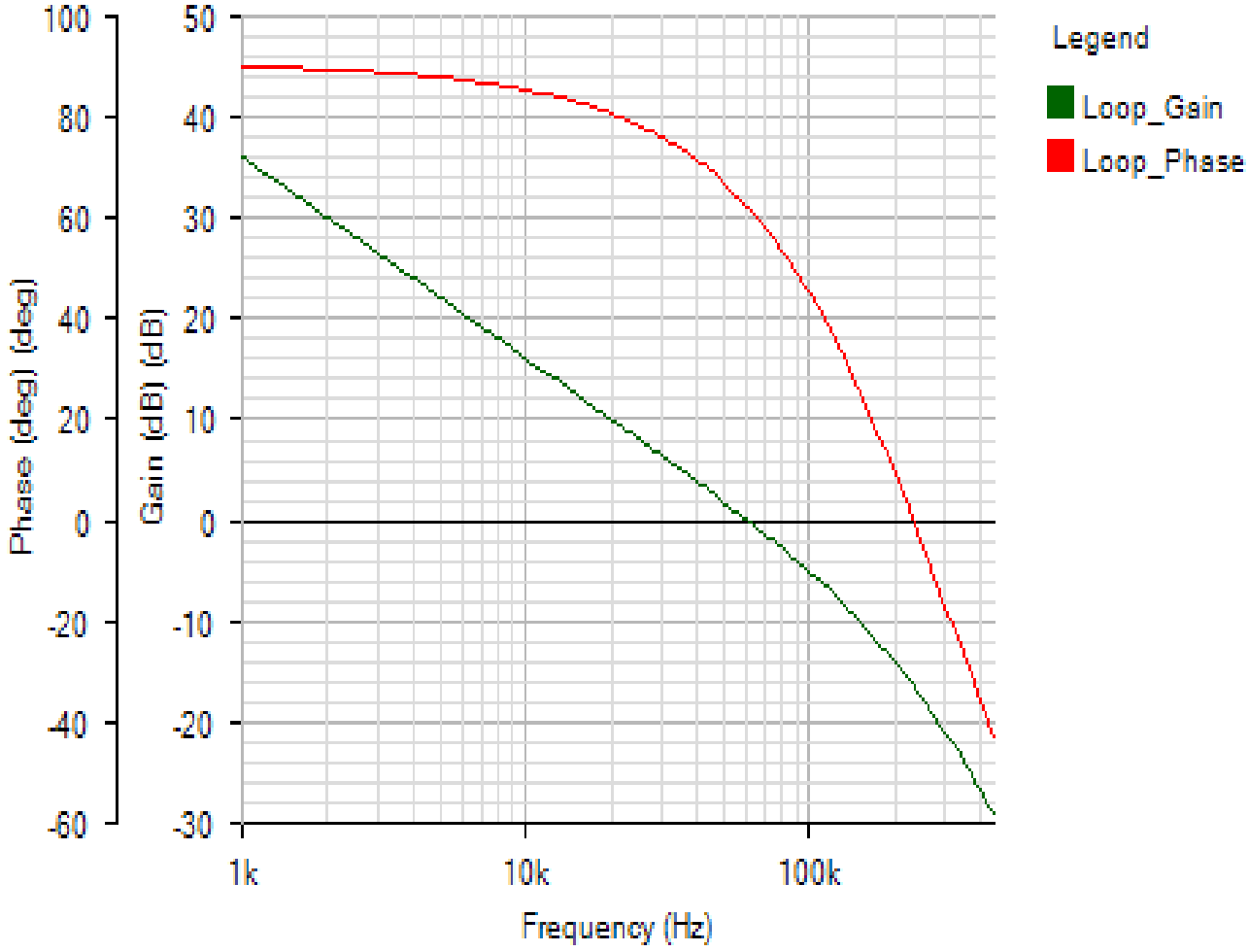
Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17576	Maxim Integrated	4.5V to 60V, 4A, High-Efficiency, Synchronous Step-Down DC-DC Converter with Internal Compensation
C1	1	CGA2B3X7R1H104K050BB	TDK	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0402 125°C Low ESR Automotive T/R
C2	1	GRM188R71A225KE15D	Murata Manufacturing	Cap Ceramic 2.2uF 10V X7R 10% Pad SMD 0603 125°C T/R
C3	1	C0402C273K8RACTU	KEMET Corporation	Cap Ceramic 0.027uF 10V X7R 10% Pad SMD 0402 125°C T/R
C4	1	EMK105B7104KV-F	Taiyo Yuden	Cap Ceramic 0.1uF 16V X7R 10% Pad SMD 0402 125°C T/R
CIN	1	GRM31CR71H225KA88	Murata Manufacturing	Cap 2.2uF 50V X7R 1206 10% 4.7mOhm 0.91nH LTB
COUT	1	GRM32ER70J476ME20L	Murata Manufacturing	Cap 47uF 6.3V X7R 1210 20% 1.8mOhm 0.82nH Active
				Inductor 3.3 uH 20% 13.6mOhm max 4.8Arms @20C 6.3Arms @40C

L1	1	MSS1246-332MLB	Coilcraft	10.16Asat @-10% 11.24Asat @-20% 11.76Asat @-30% 4.8mmHt 151.29mm^2 MSS1246 Active
R1	1	CRCW04023M32FKED	Vishay	Res Thick Film 0402 3.32M Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ2RKF8663X	Panasonic	Res Thick Film 0402 866K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	CRG0402-P-1433FT	Venkel	Res Thick Film 0402 143K Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD T/R
R4	1	CRG0402-P-3092FT	Venkel	Res Thick Film 0402 30.9K Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD T/R
R5	1	NTR04F1742DTRF	NIC Components	Res Thin Film 0402 17.4K Ohm 1% 0.063W(1/16W) ±50ppm/°C Pad SMD T/R
R6	1	RCG040210K0FKED	Vishay	Res Thick Film 0402 10K Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD T/R
R7	1	CRG0402-P-4R75FT	Venkel	Res Thick Film 0402 4.75 Ohm 1% 0.063W(1/16W) -300ppm/°C to 500ppm/°C Pad SMD T/R

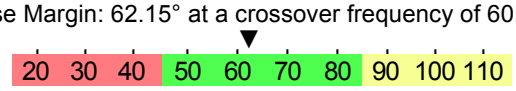
Simulation Results

AC Analysis - Fri Nov 27 2020 10:10:54

BODE Default



Phase Margin: 62.15° at a crossover frequency of 60.6kHz



Efficiency - Fri Nov 27 2020 10:10:54

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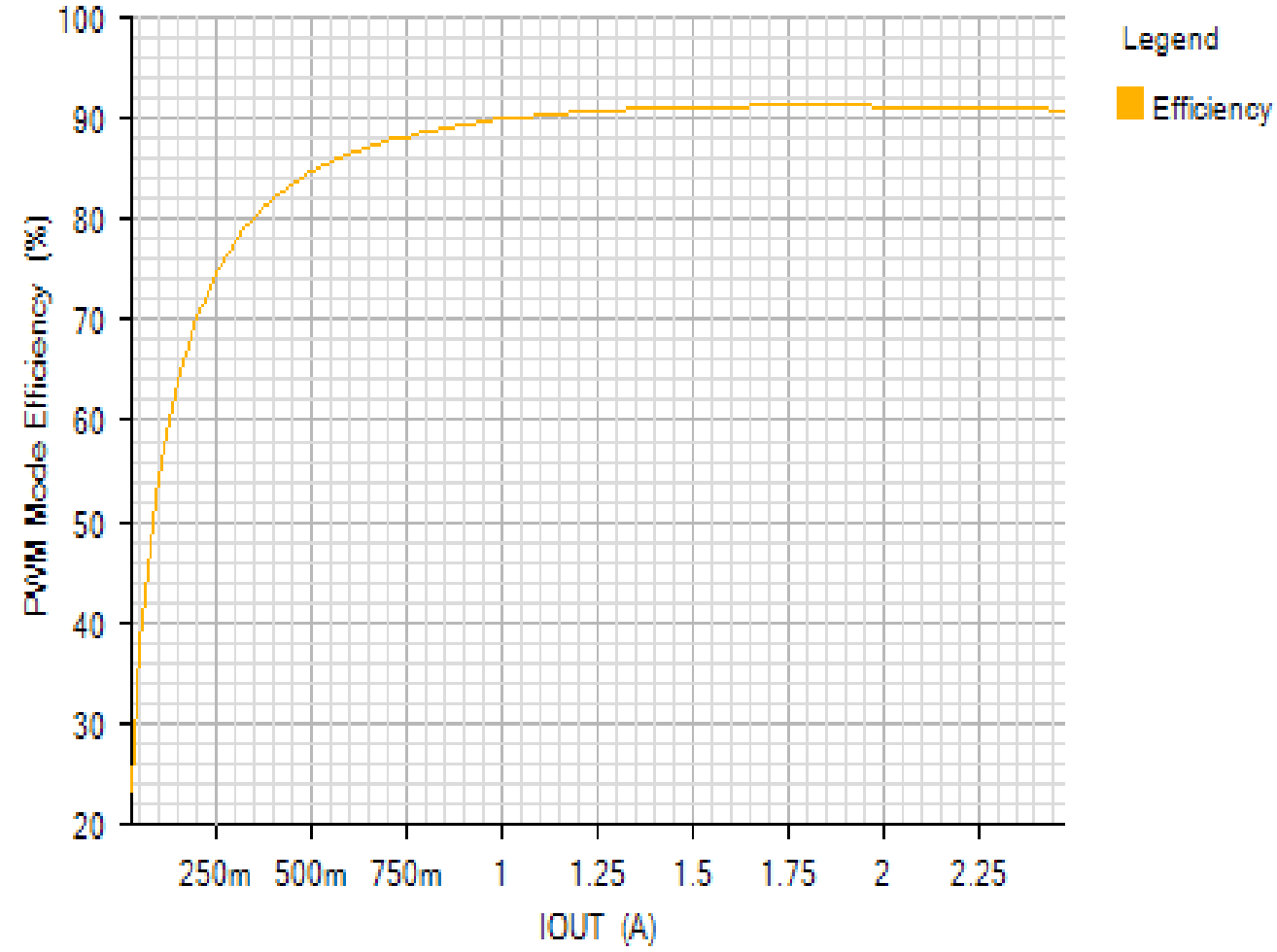
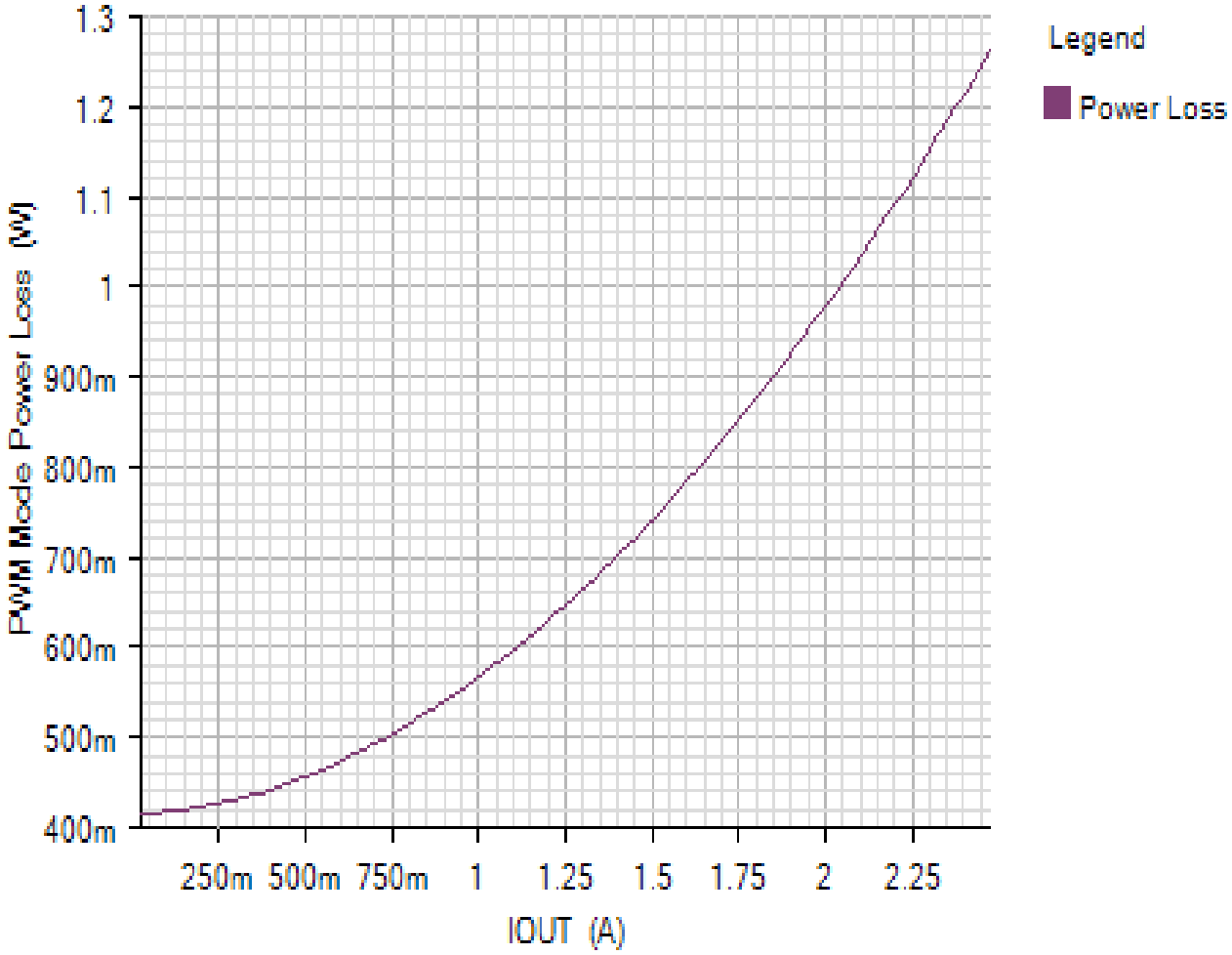
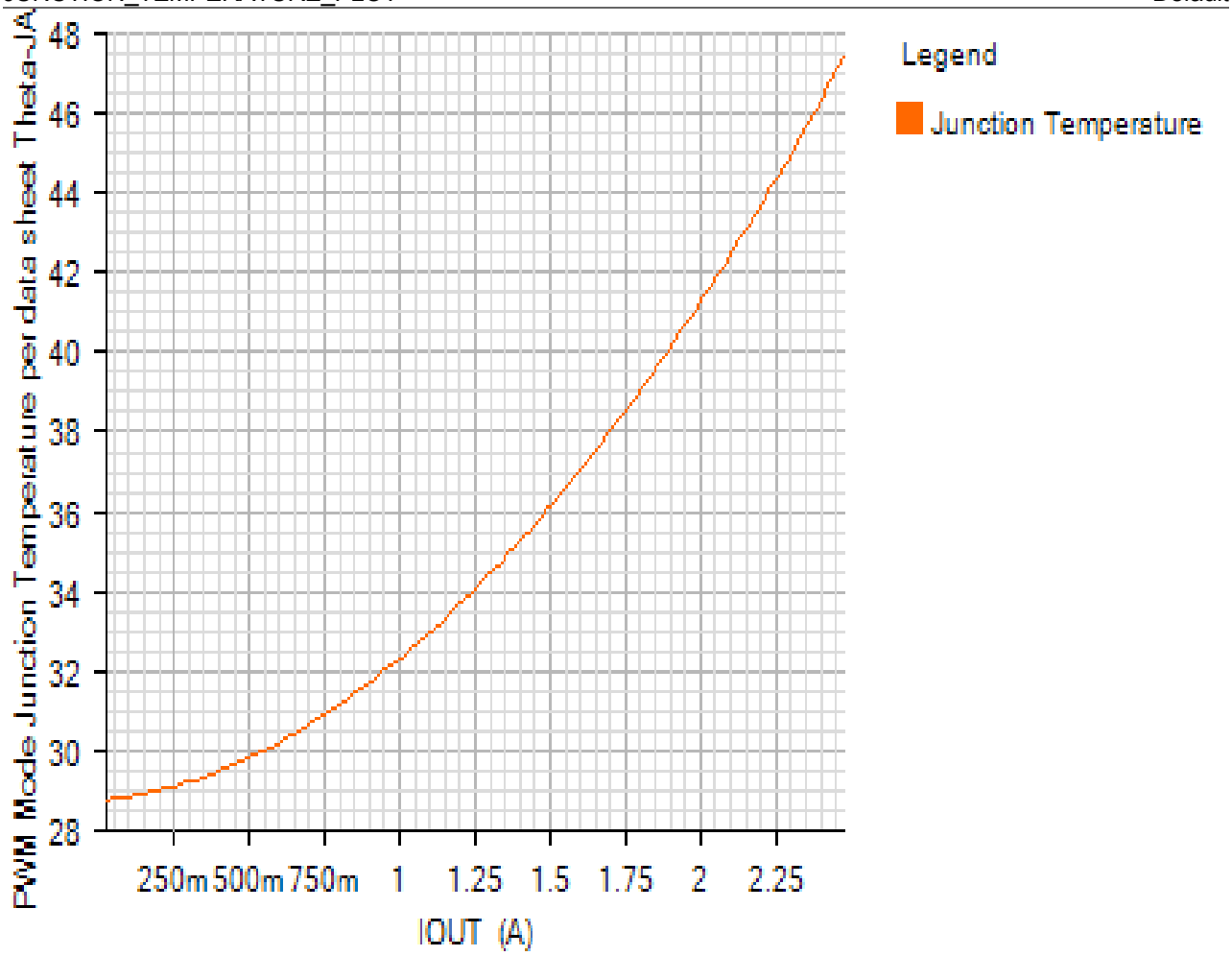


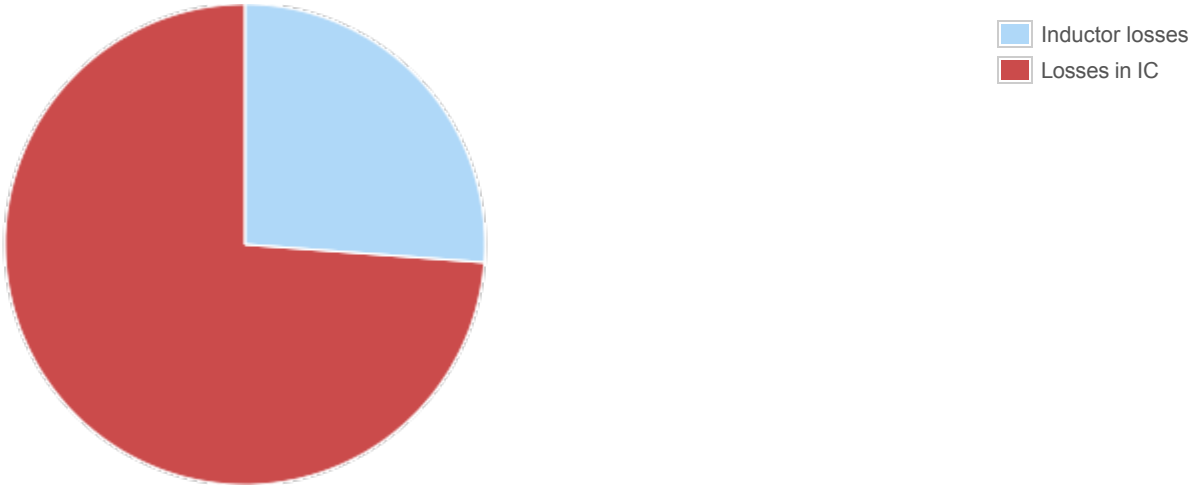
POWER_LOSS_PLOT Default



JUNCTION_TEMPERATURE_PLOT Default



Losses



Component	Loss (W)	% of total

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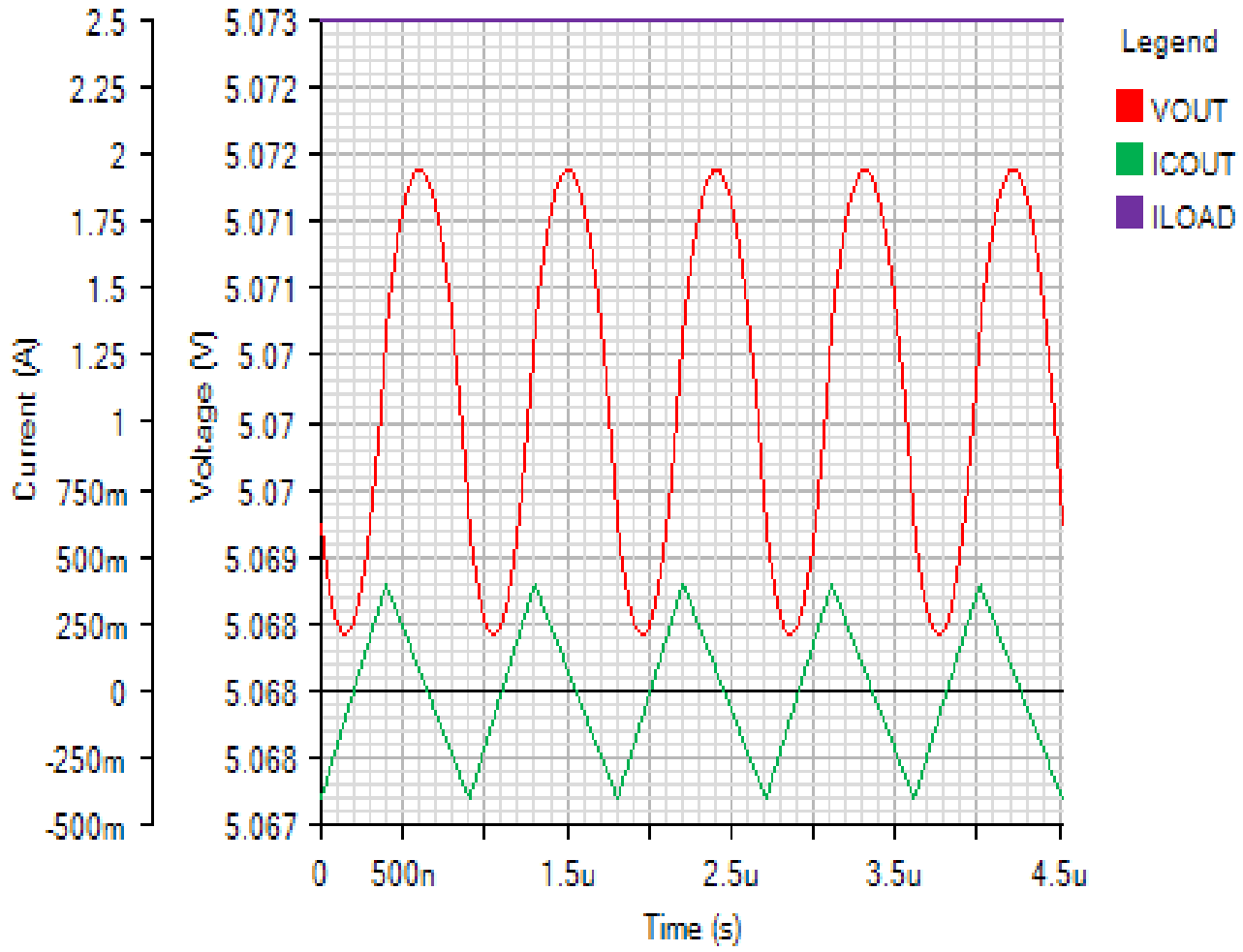
Inductor losses	0.33	26.2
Losses in IC	0.93	73.8
Total	1.26	100

Steady State - Fri Nov 27 2020 10:10:54

OUTPUT Default



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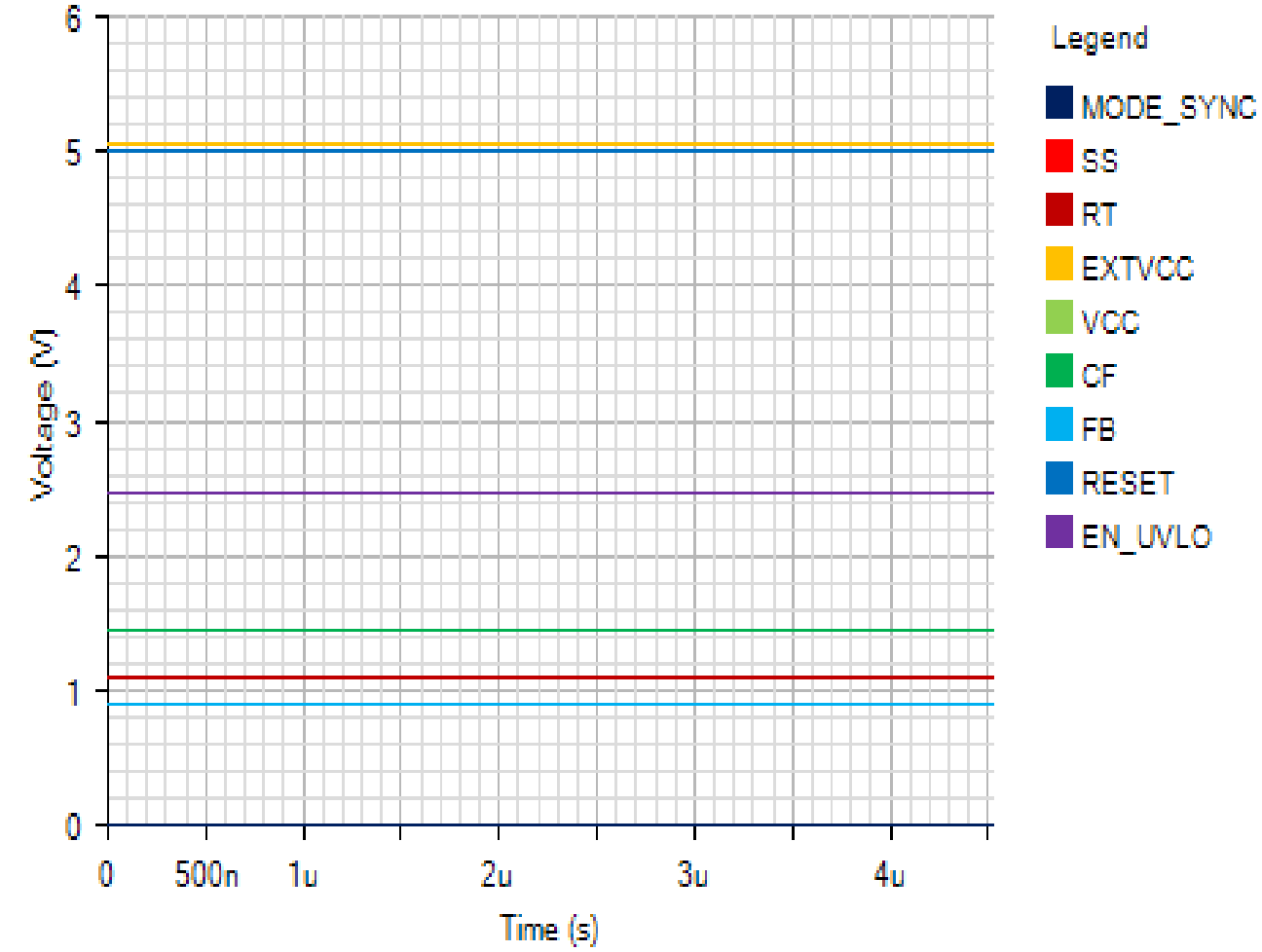

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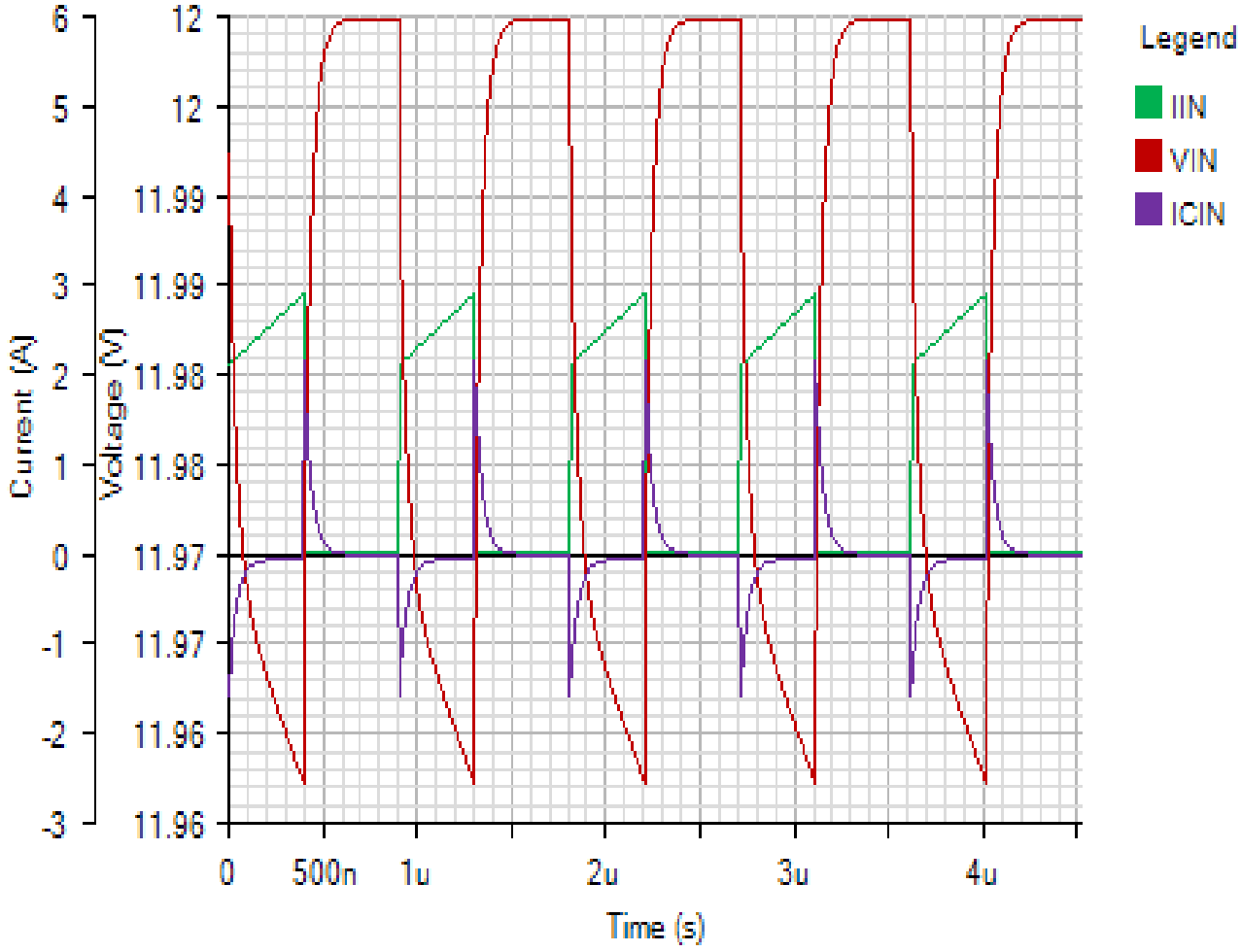
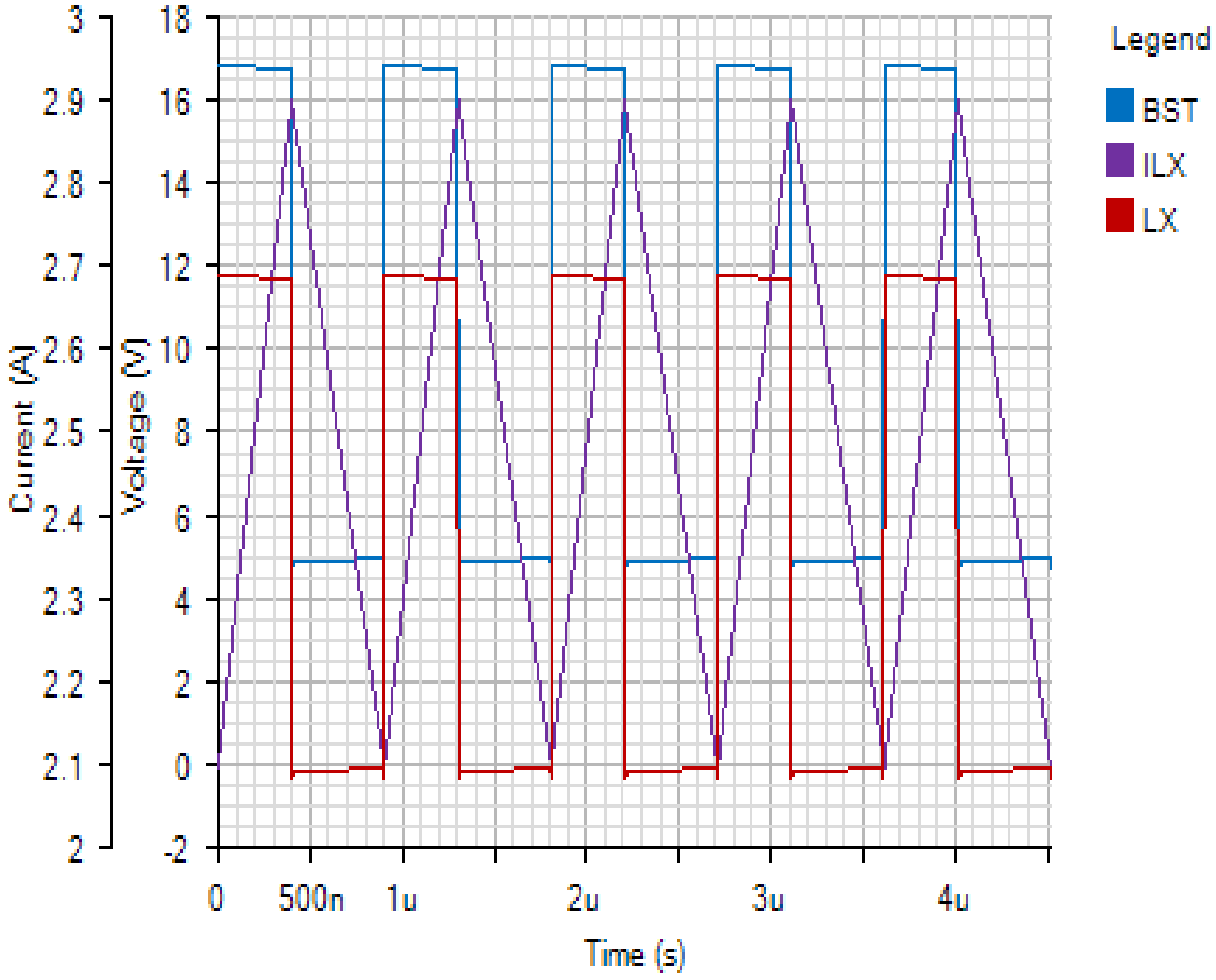
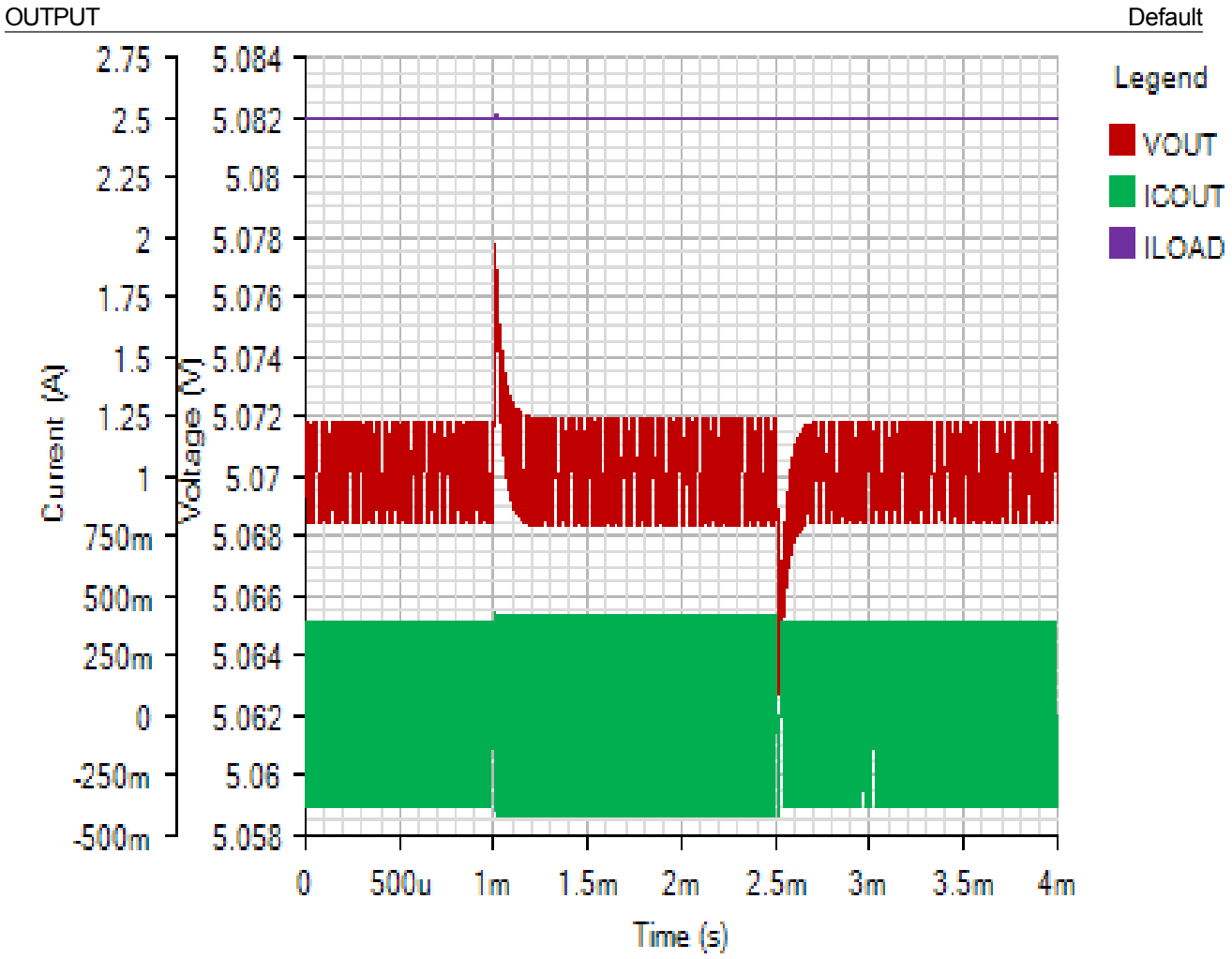


SWITCHING Default



Line Transient - Fri Nov 27 2020 10:10:54



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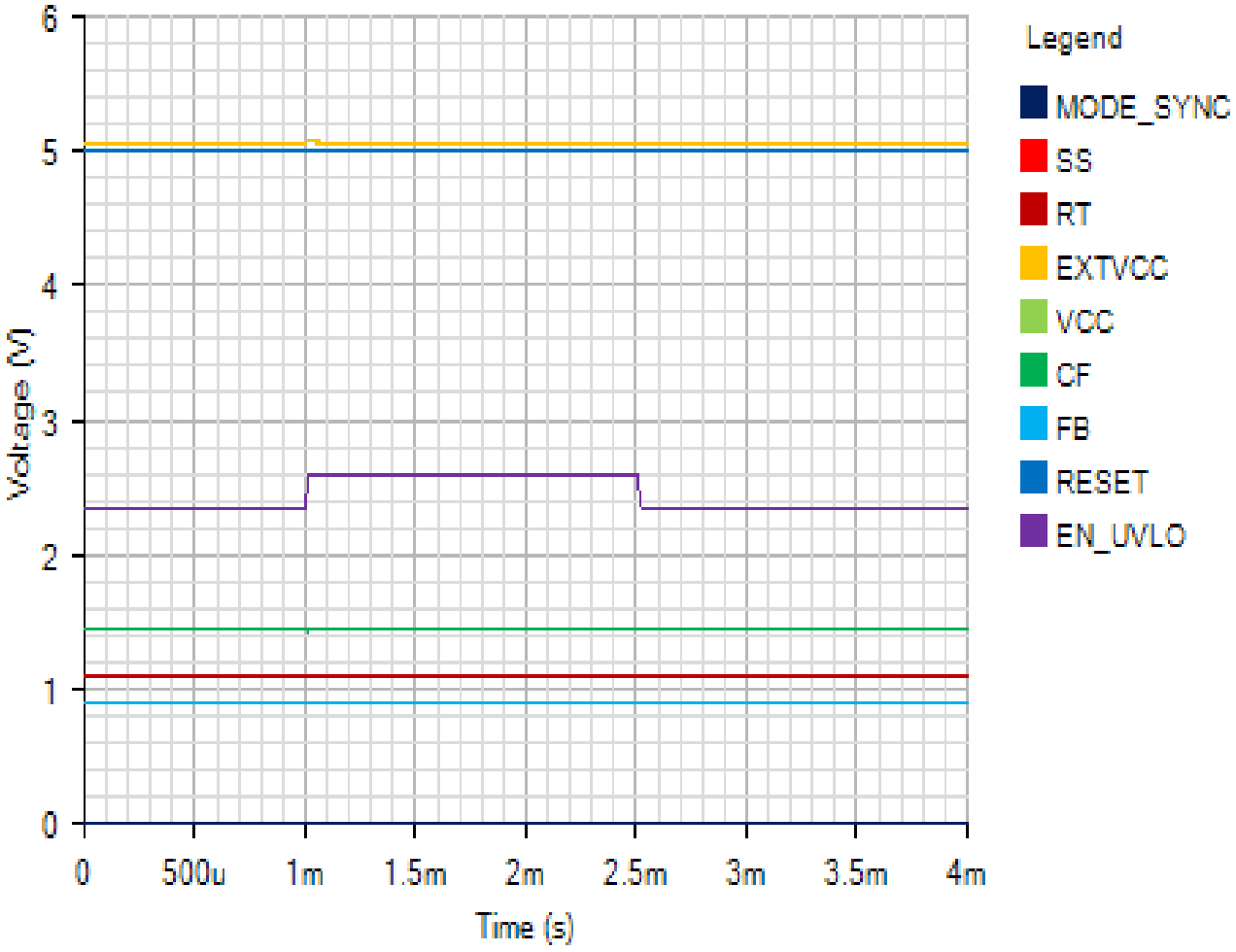

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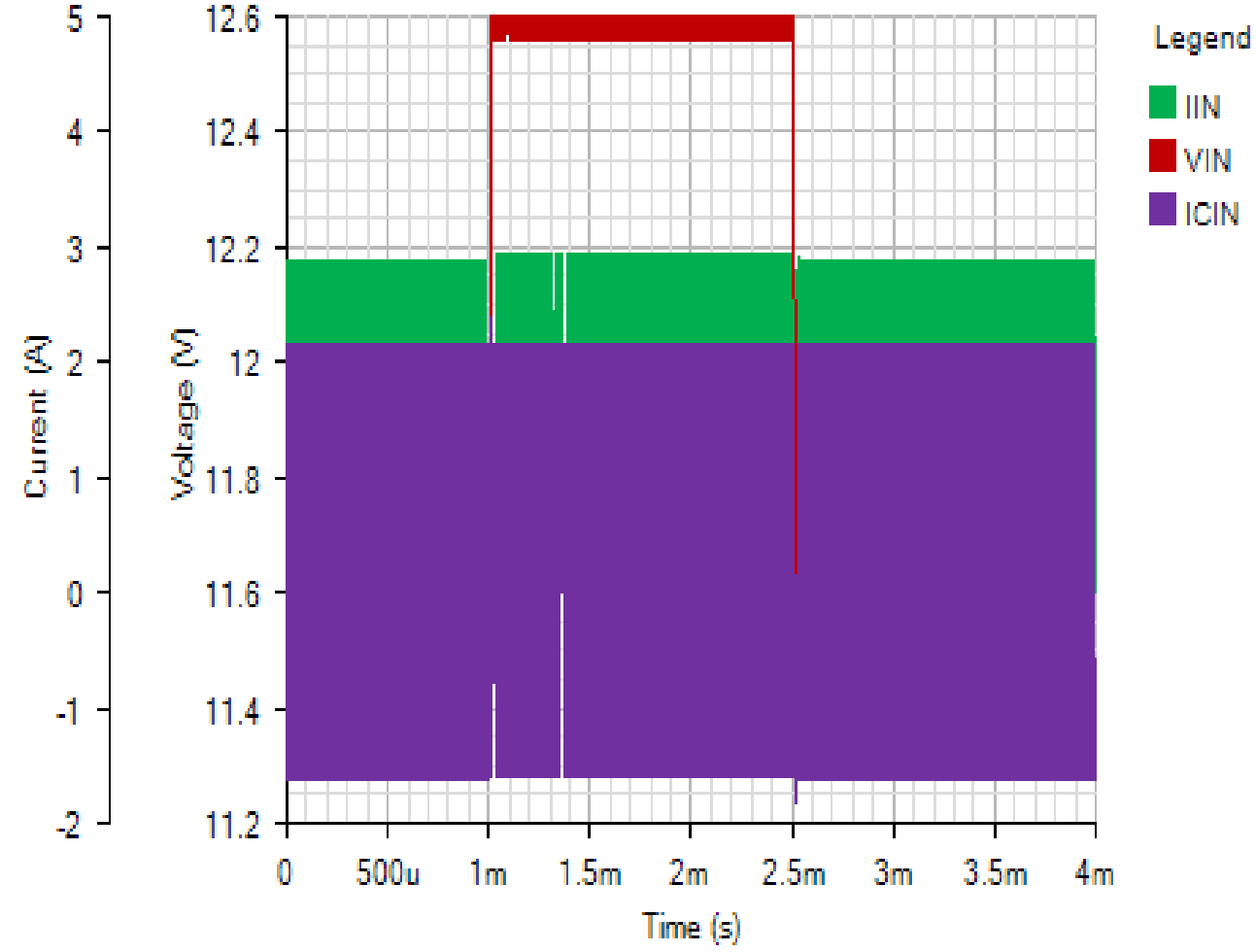

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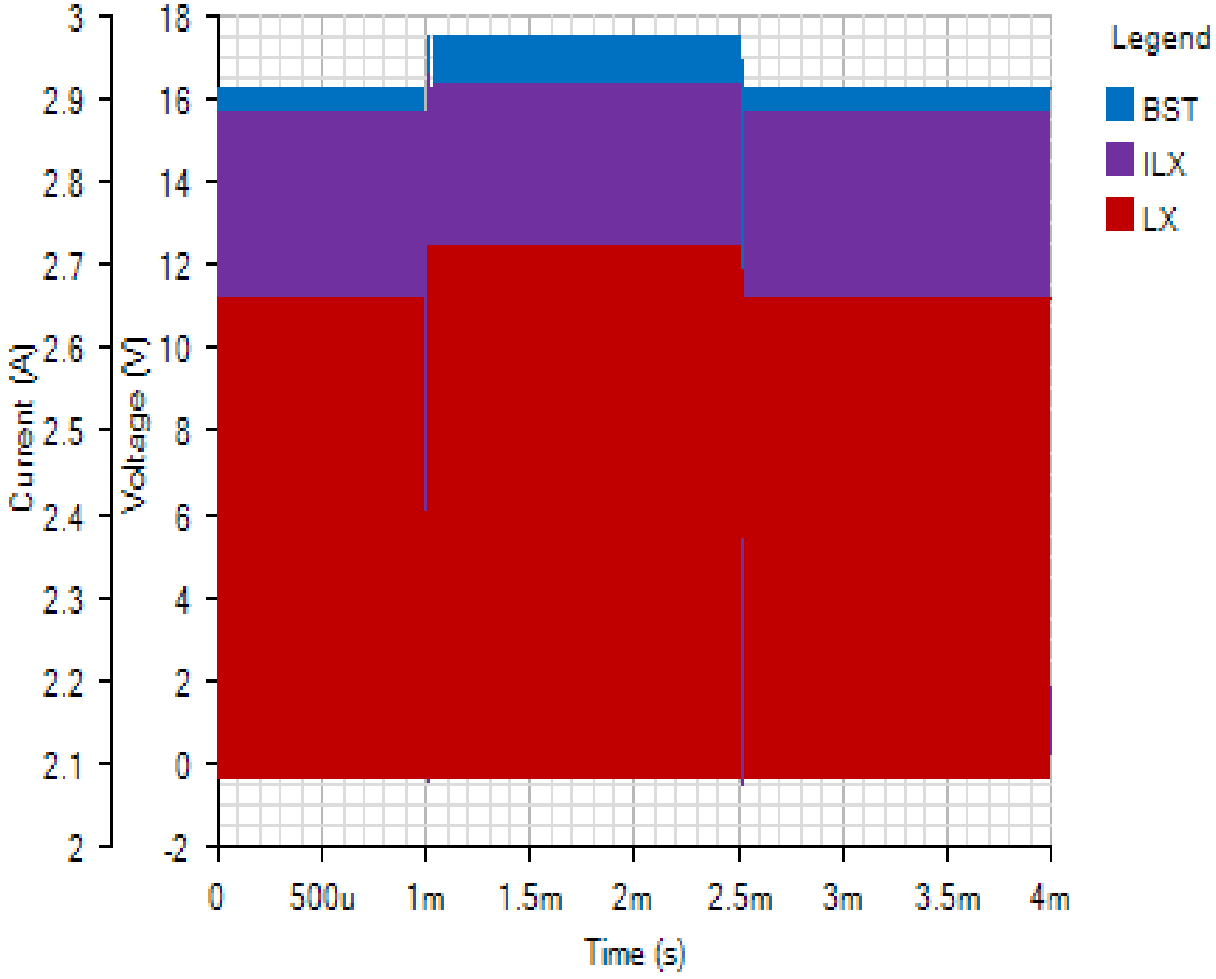
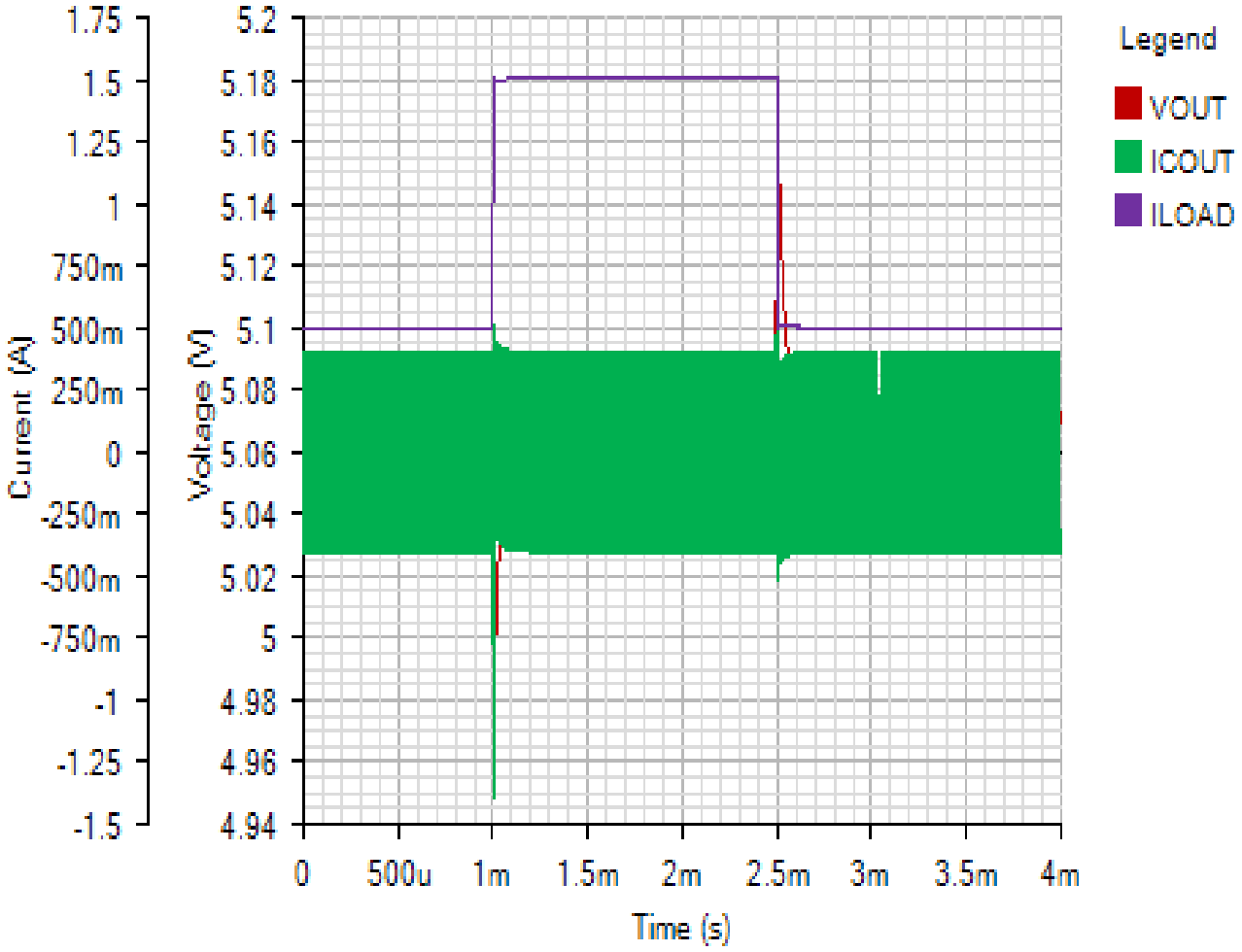


Load Step - Fri Nov 27 2020 10:10:54

OUTPUT Default



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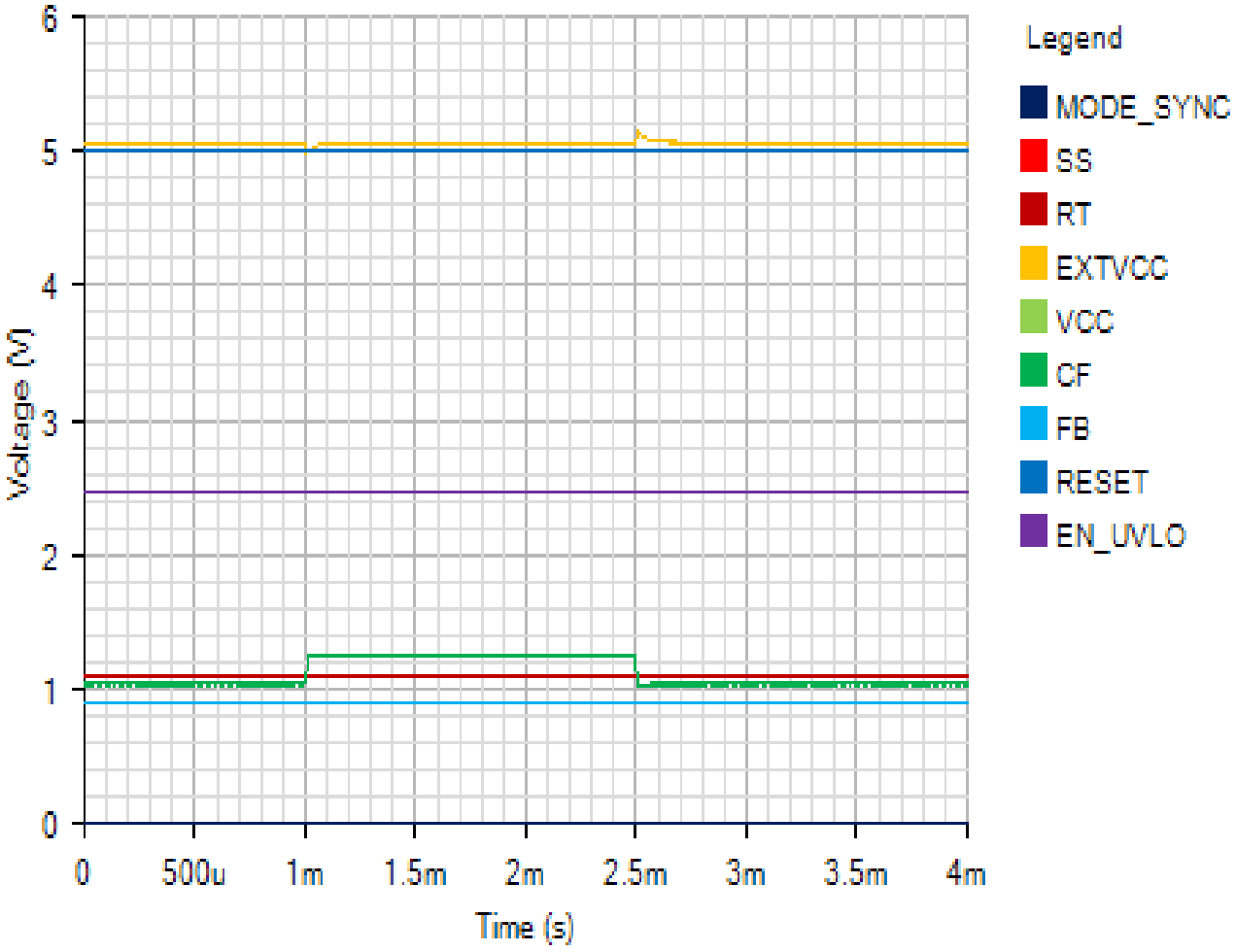

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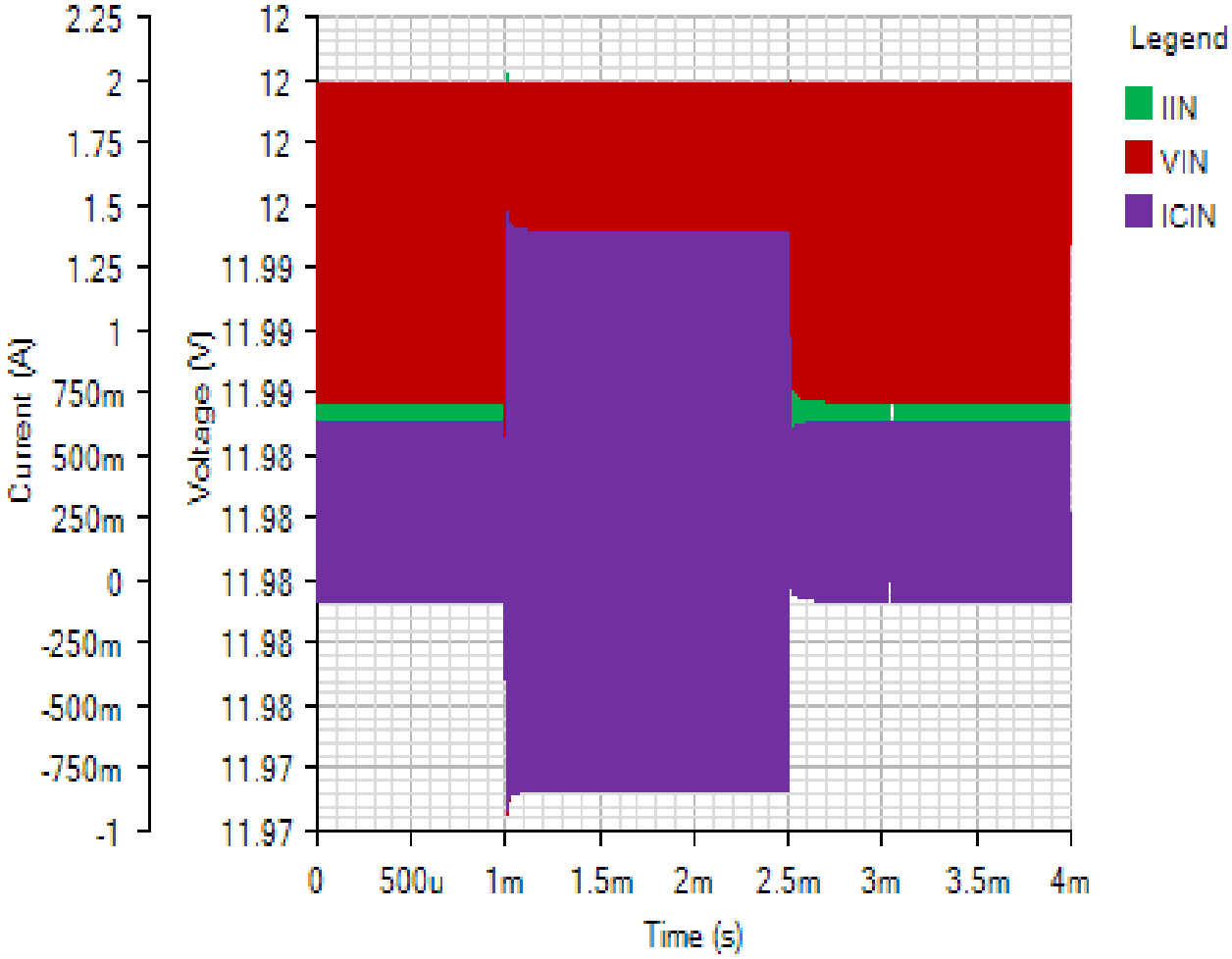

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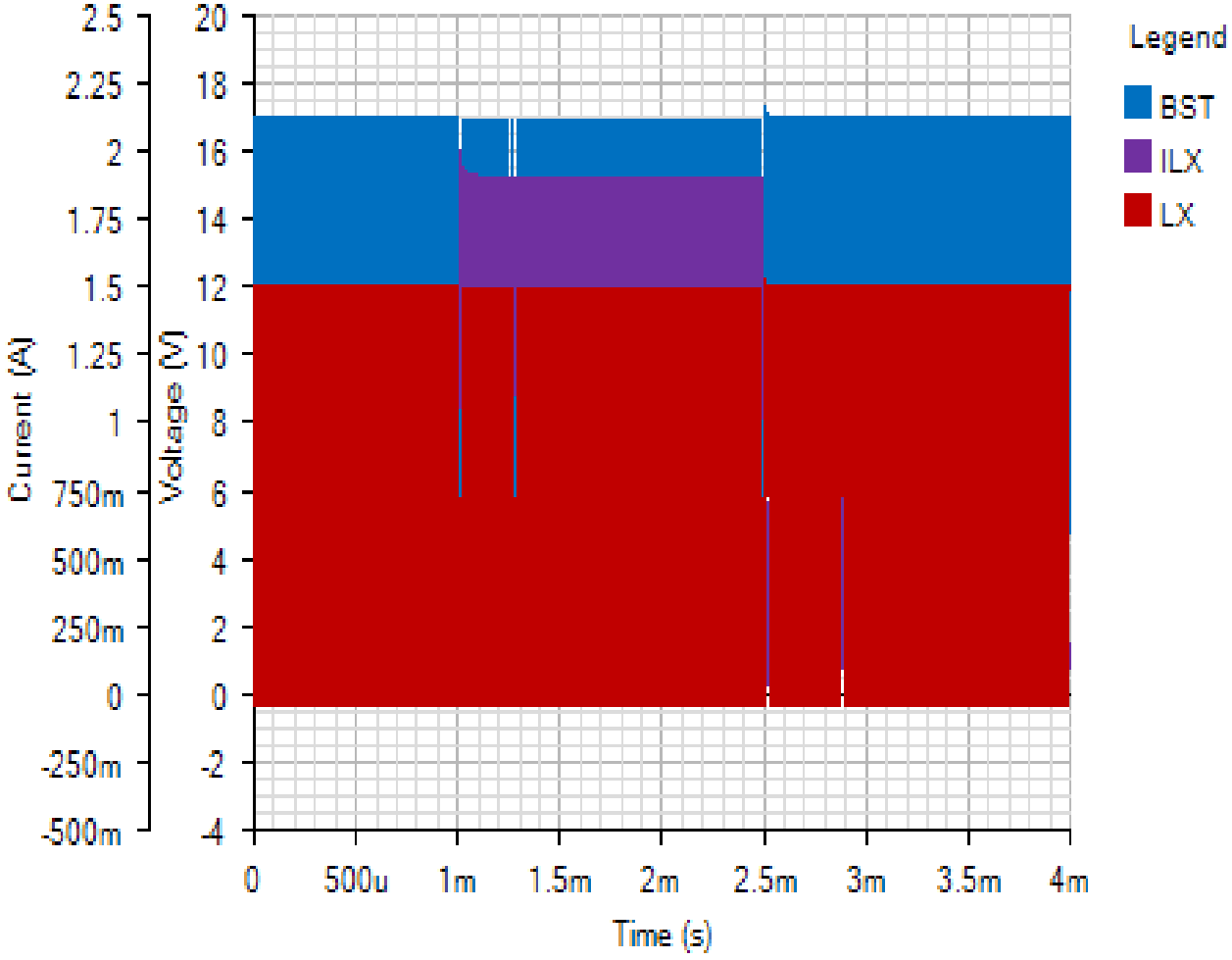

Start Up - Fri Nov 27 2020 10:10:54

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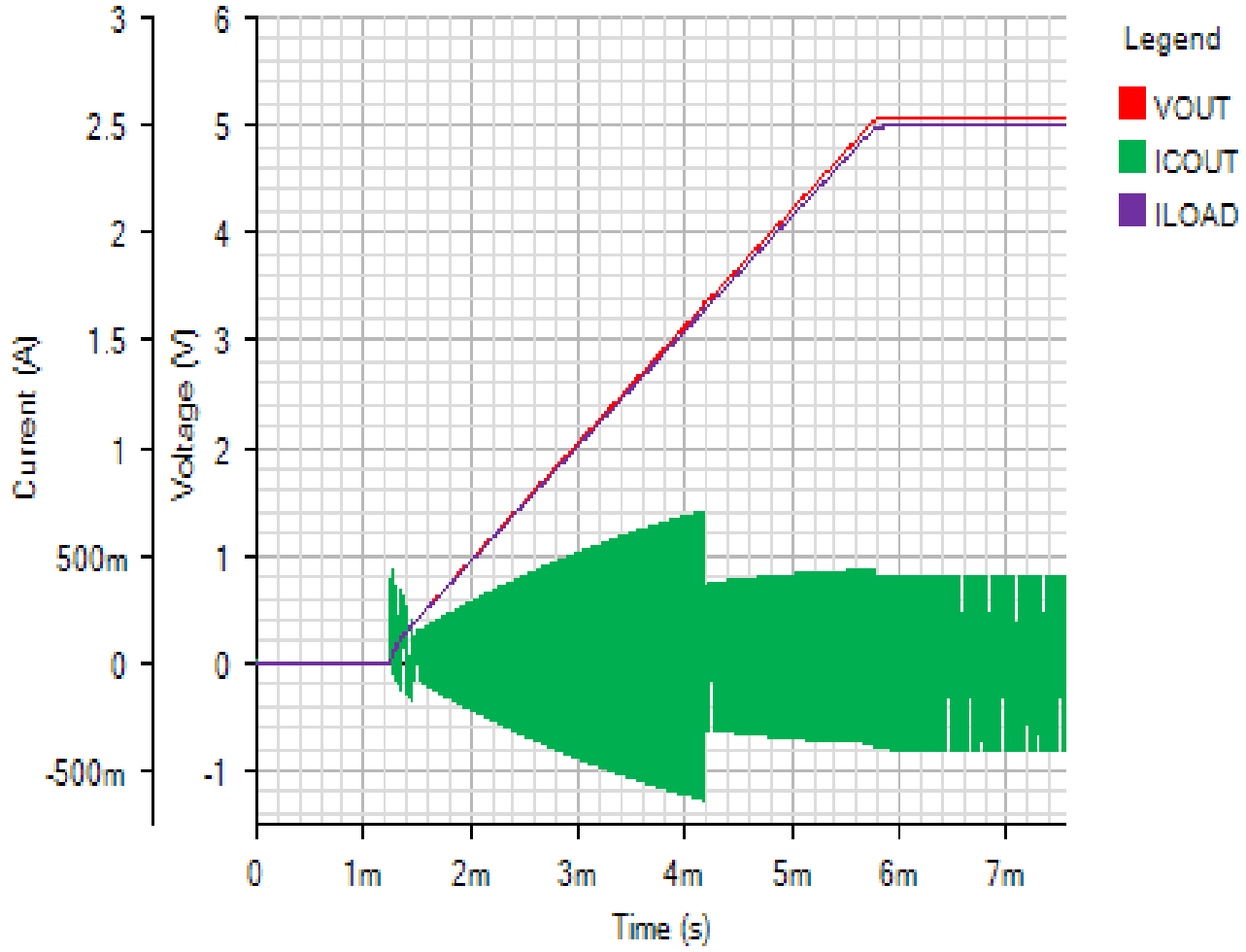

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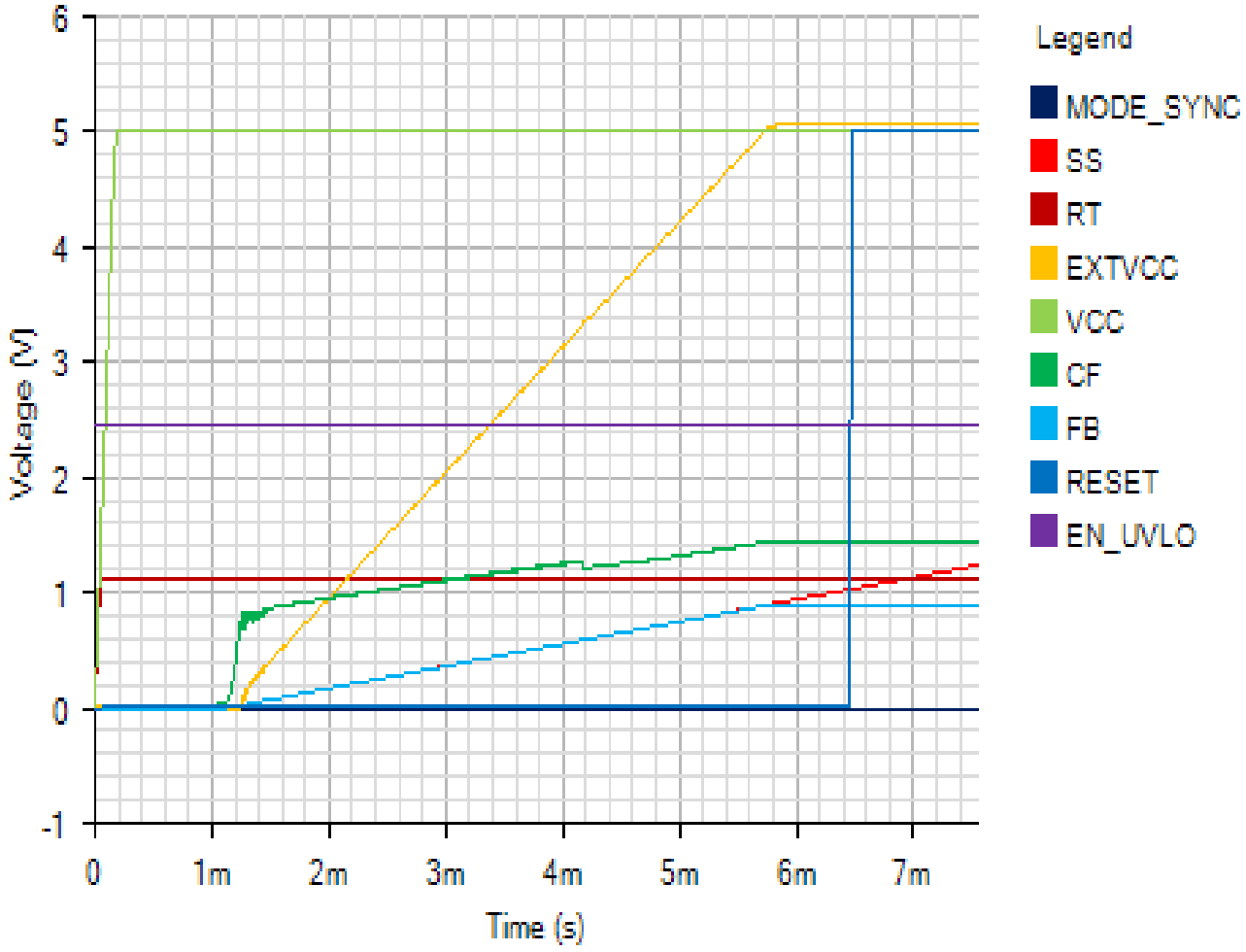

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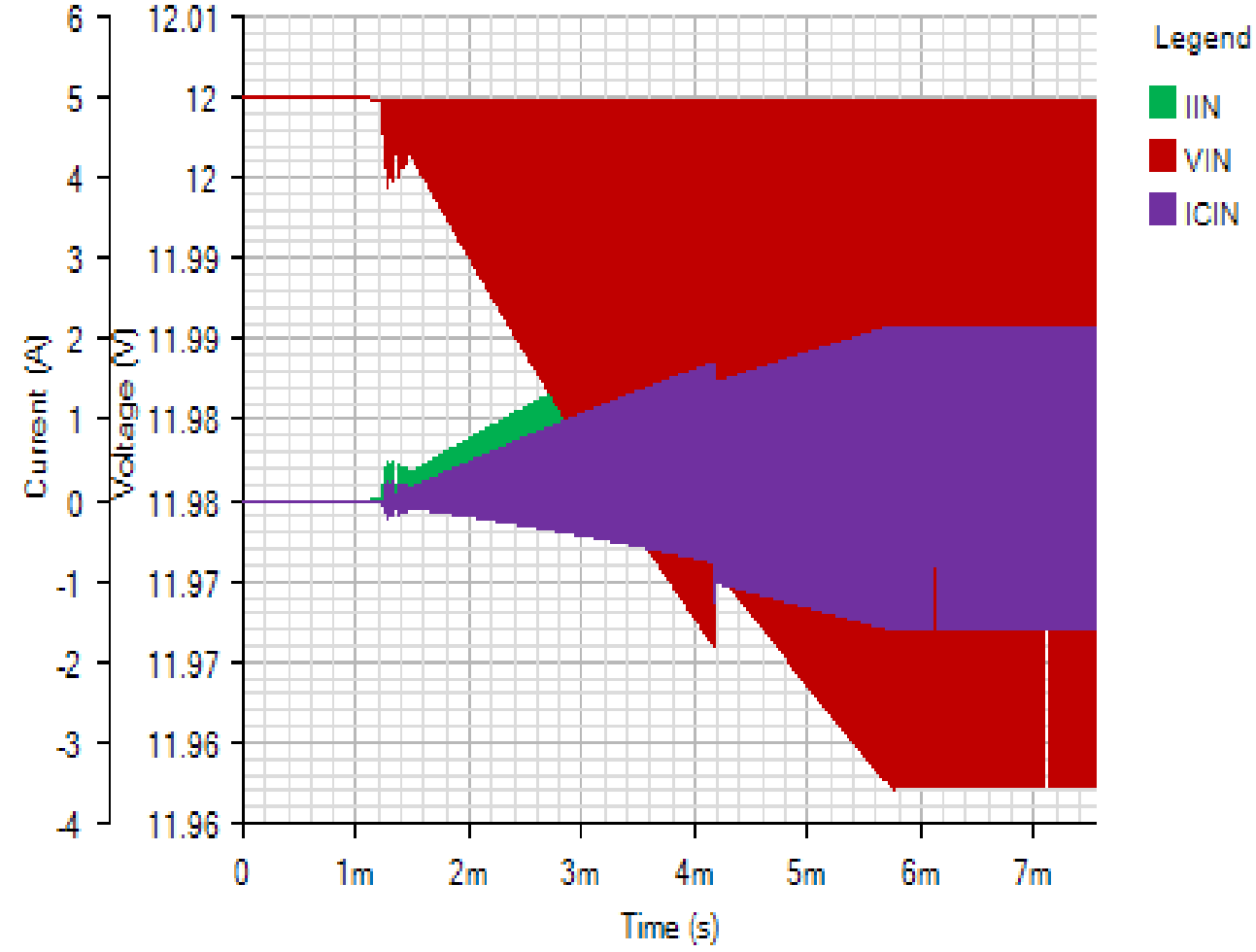

SWITCHING Default