

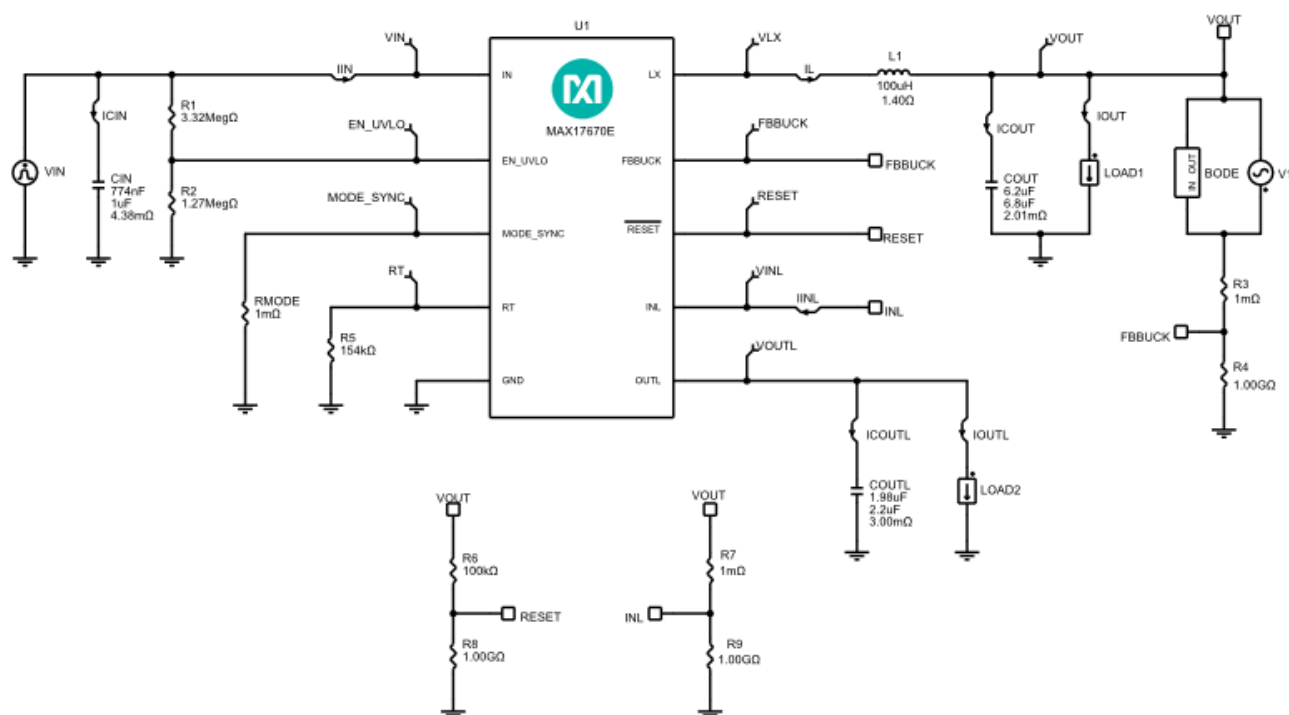
Initial Design

1.0

Design Requirements

Parameter	Value
Device Variant	MAX17670E (3.0V Linear Regulator)
Configuration	Step-Down Converter and Linear Regulator
Minimum Input Voltage	4.5V
Maximum Input Voltage	60V
Nominal Input Voltage	24V
Input Steady-State Ripple	3%
Input Undervoltage Lockout Level	4.4V
Step-Down Converter Output Voltage	3.3V
Linear Regulator Output Voltage	3V
Step-Down Converter Output Current	0.12A
Linear Regulator Output Current	0.03A
Step-Down Converter Load Start Current	0.12A
Linear Regulator Load Start Current	0.03A
Step-Down Converter Load Pulse Current	0.07A
Linear Regulator Load Pulse Current	0.015A
Step-Down Converter Load Pulse Edge Rate	10A/us
Linear Regulator Load Pulse Edge Rate	10A/us
Performance Priority	Balance Efficiency and Size
BOM Priority	Low Cost
Mode of Operation	PWM
Switching Frequency	315kHz
Ambient Temperature	25°C

Schematic



Note 1: When PFM mode is selected, AC Loop simulation may fail when the Load Current is low enough to engage PFM operation. PFM mode is hysteretic and there is no AC Loop to measure.

Note 2: When the Step-Down Converter Output Voltage is greater than 5V, EE-sim shorts INL to ground to avoid exceeding the maximum for INL. Similarly, when the Step-Down output voltage is greater than 5.5V, EE-SIM shorts RESET to ground. In your target system, RESET can be pulled up to any available voltage that is 5.5V or less and INL can be connected to any voltage that does not exceed 5V.

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX17670E	User-Defined	IC
CIN	1	C3216X7R2A105K160AA	TDK	Cap Ceramic 1uF 100V X7R 10% SMD 1206 125C Plastic T/R
COUT	1	C2012X7R1A685K125AC	TDK	Cap Ceramic 6.8uF 10V 0805 125C
COUTL	1	C1608X7R1A225K080AC	TDK	Cap Ceramic 2.2uF 10V X7R 10% SMD 0603 125C Paper T/R
L1	1	VLCF4020T-101MR26	TDK	Inductor Power Shielded Wirewound 100uH 20% 100KHz Ferrite 450mA 1.4Ohm DCR T/R
R1	1	RC0402FR-073M32L	Yageo	Res Thick Film 0402 3.32M Ohm 1% 0.063W(1/16W) ±100ppm/°C Epoxy Pad SMD T/R
R2	1	CRCW04021M27FKED	Vishay	Res Thick Film 0402 1.27M Ohm 1% 0.063W(1/16W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF1543X	Panasonic	Res Thick Film 0402 154K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD

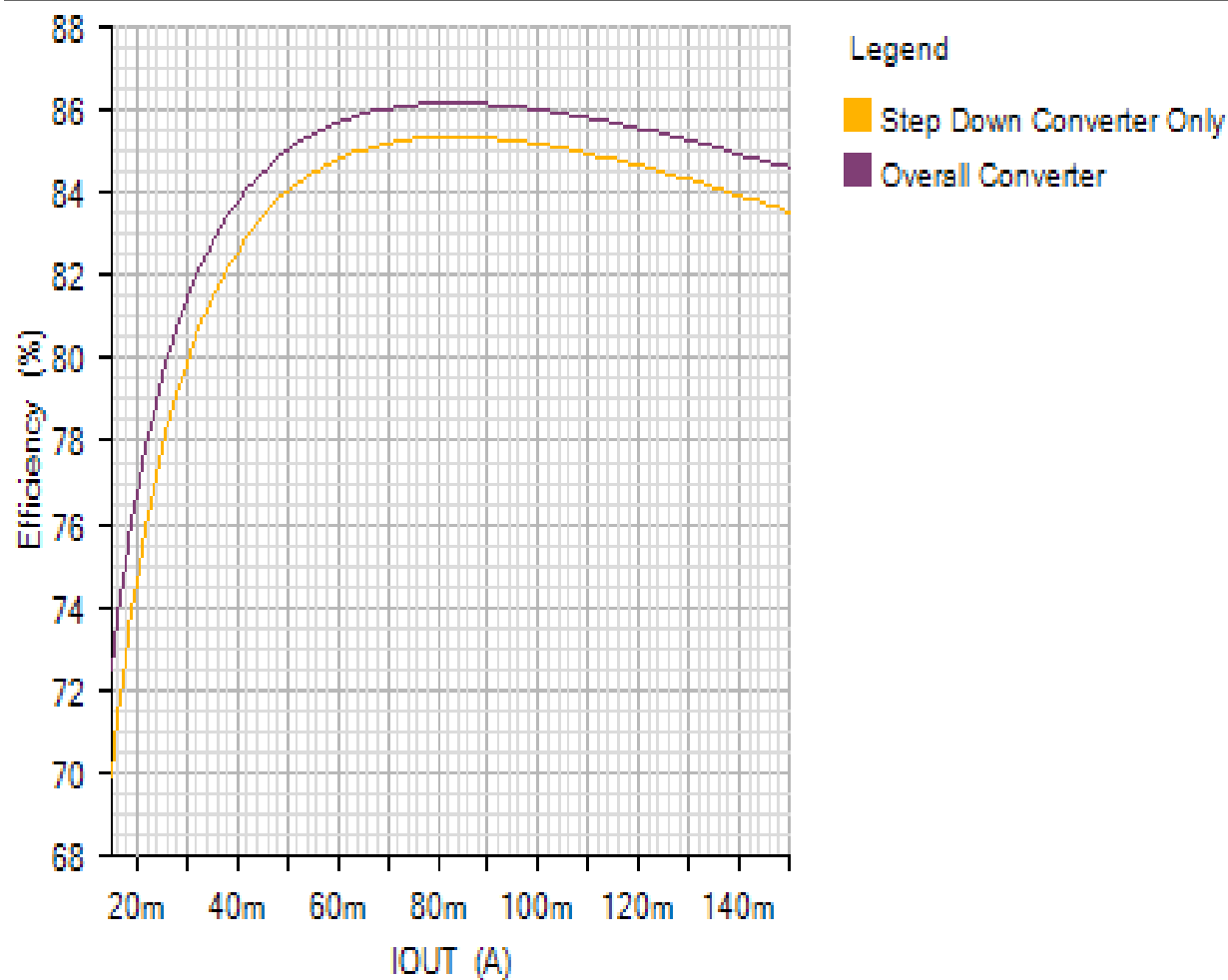
				Automotive T/R
R6	1	ERJ2RK1003X	Panasonic	Res Thick Film 0402 100K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R

Simulation Results

Efficiency - Wed Dec 19 2018 14:57:51

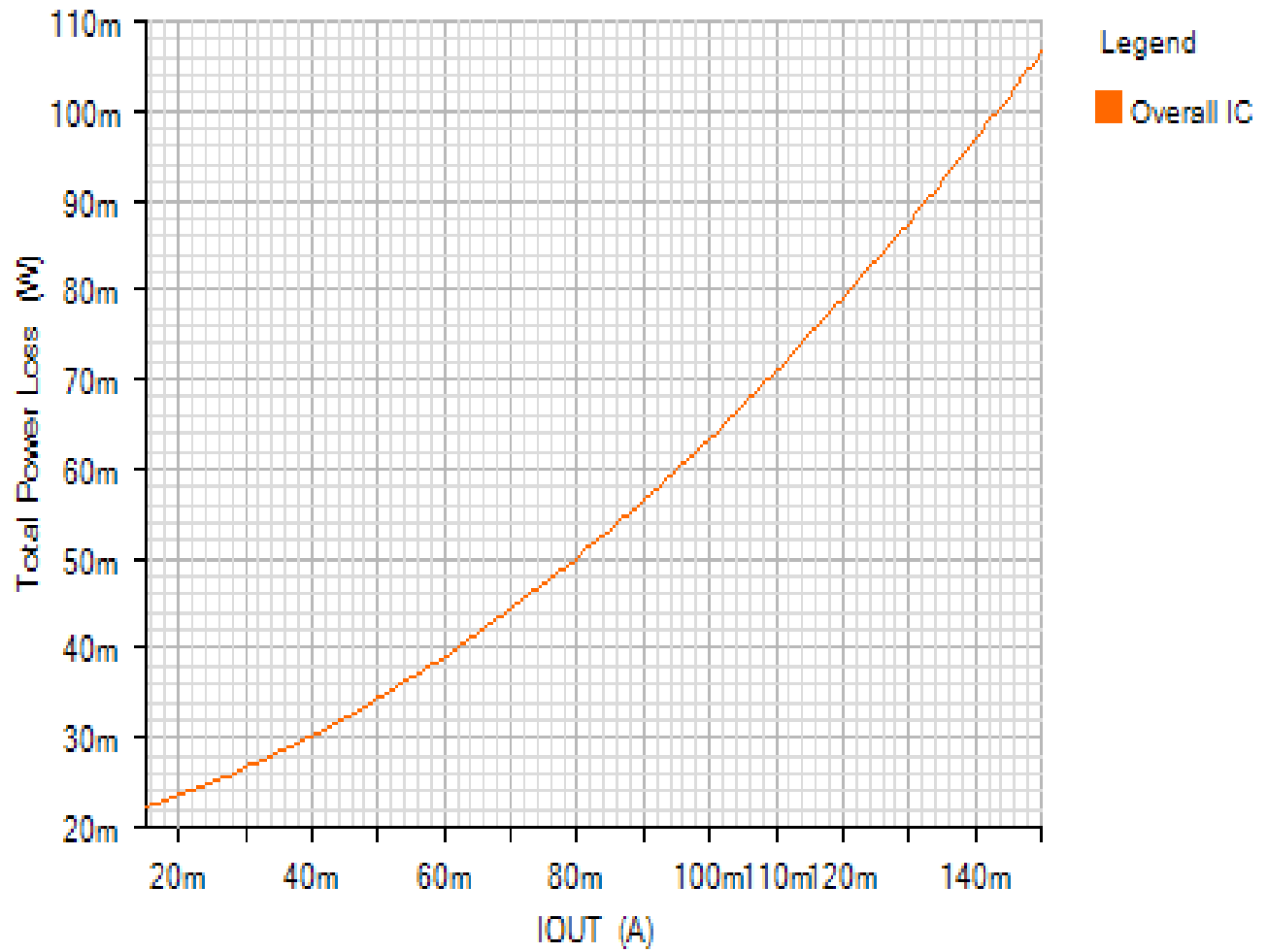
EFFICIENCY_PLOT

Default



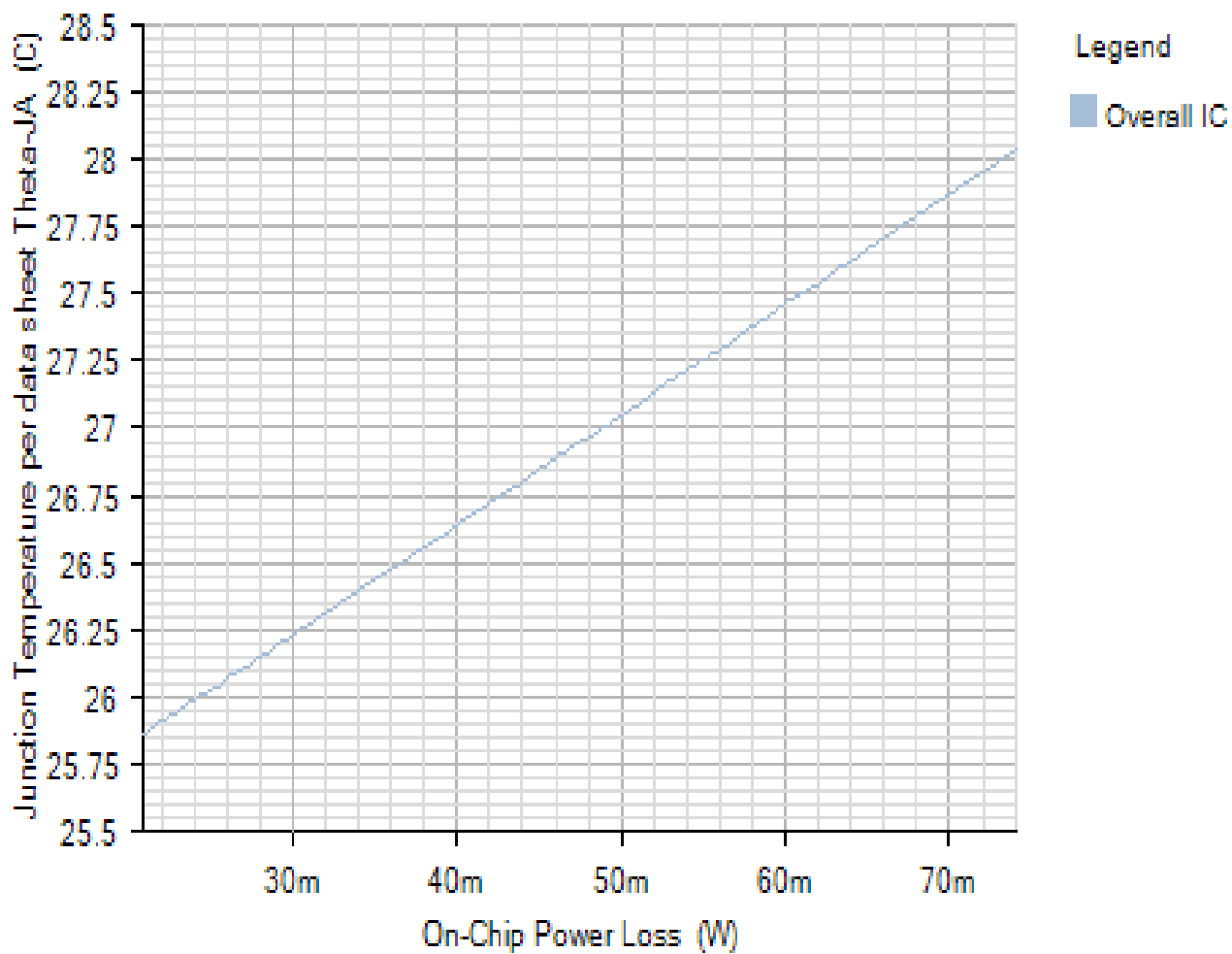
POWER_LOSS_PLOT

Default

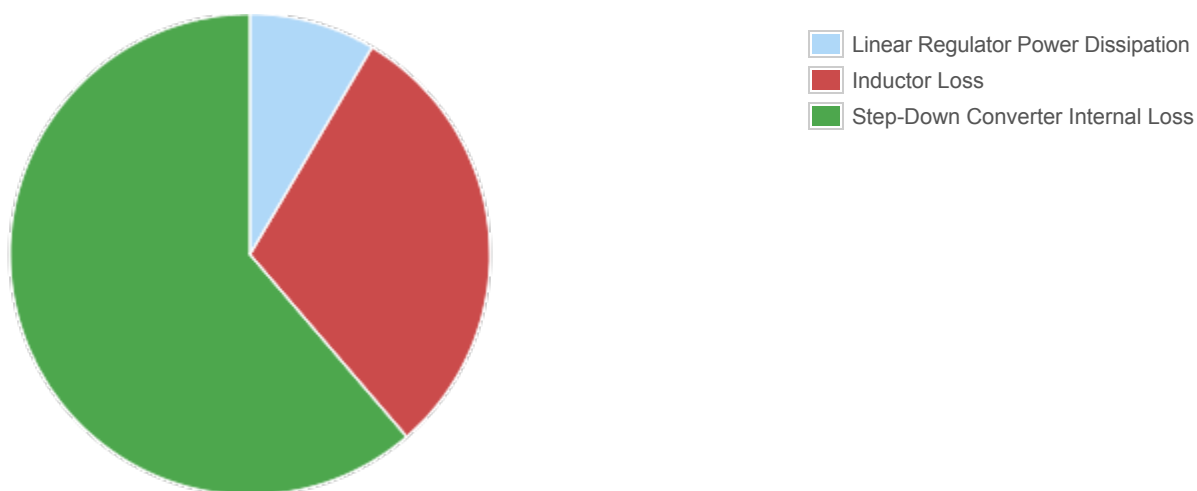


JUNCTION_TEMPERATURE_PLOT

Default



Losses



Component

Loss (W)

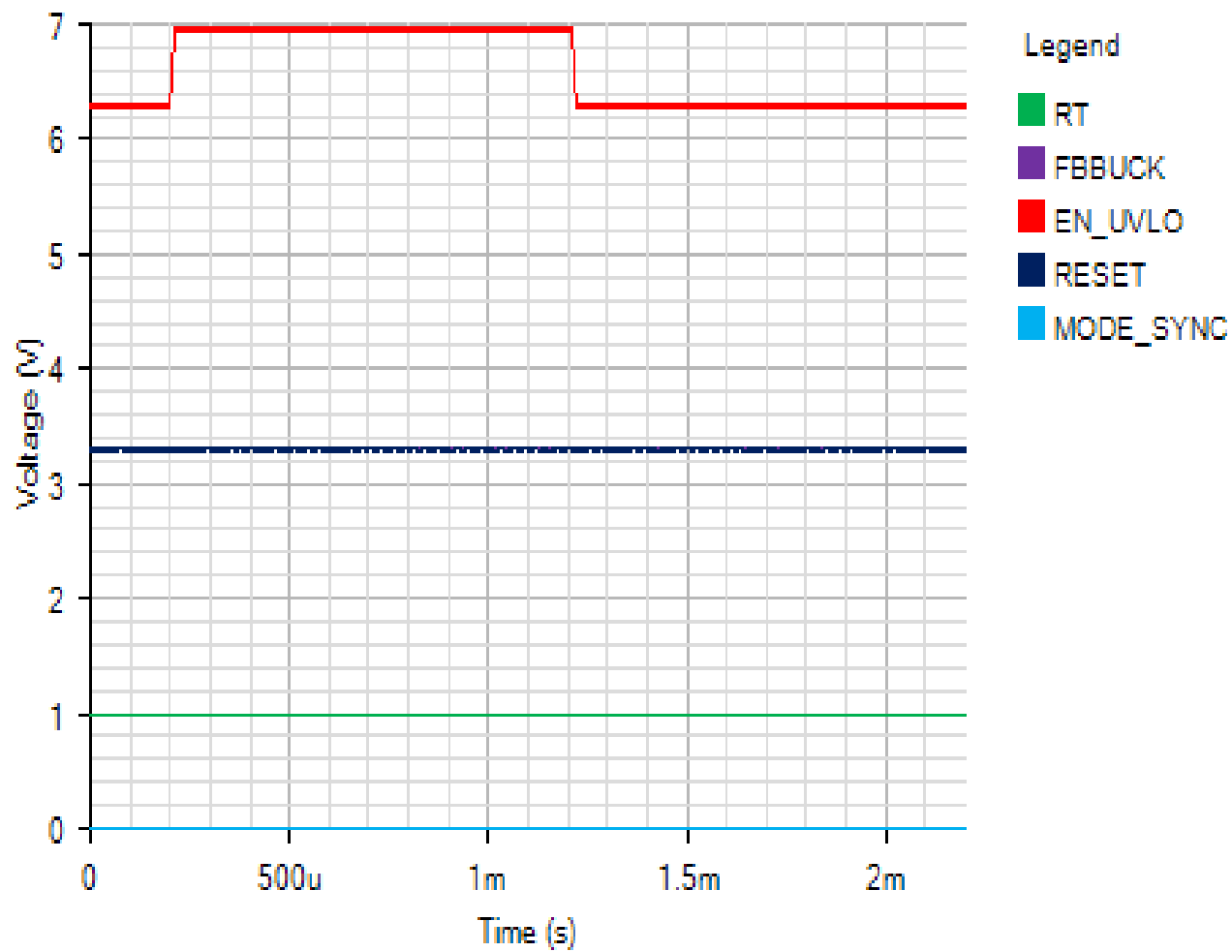
% of total

Component	Loss (W)	% of total
Linear Regulator Power Dissipation	0.009	8.5
Inductor Loss	0.032	30.2
Step-Down Converter Internal Loss	0.065	61.3
Total	0.106	100

Line Transient - Wed Dec 19 2018 14:57:51

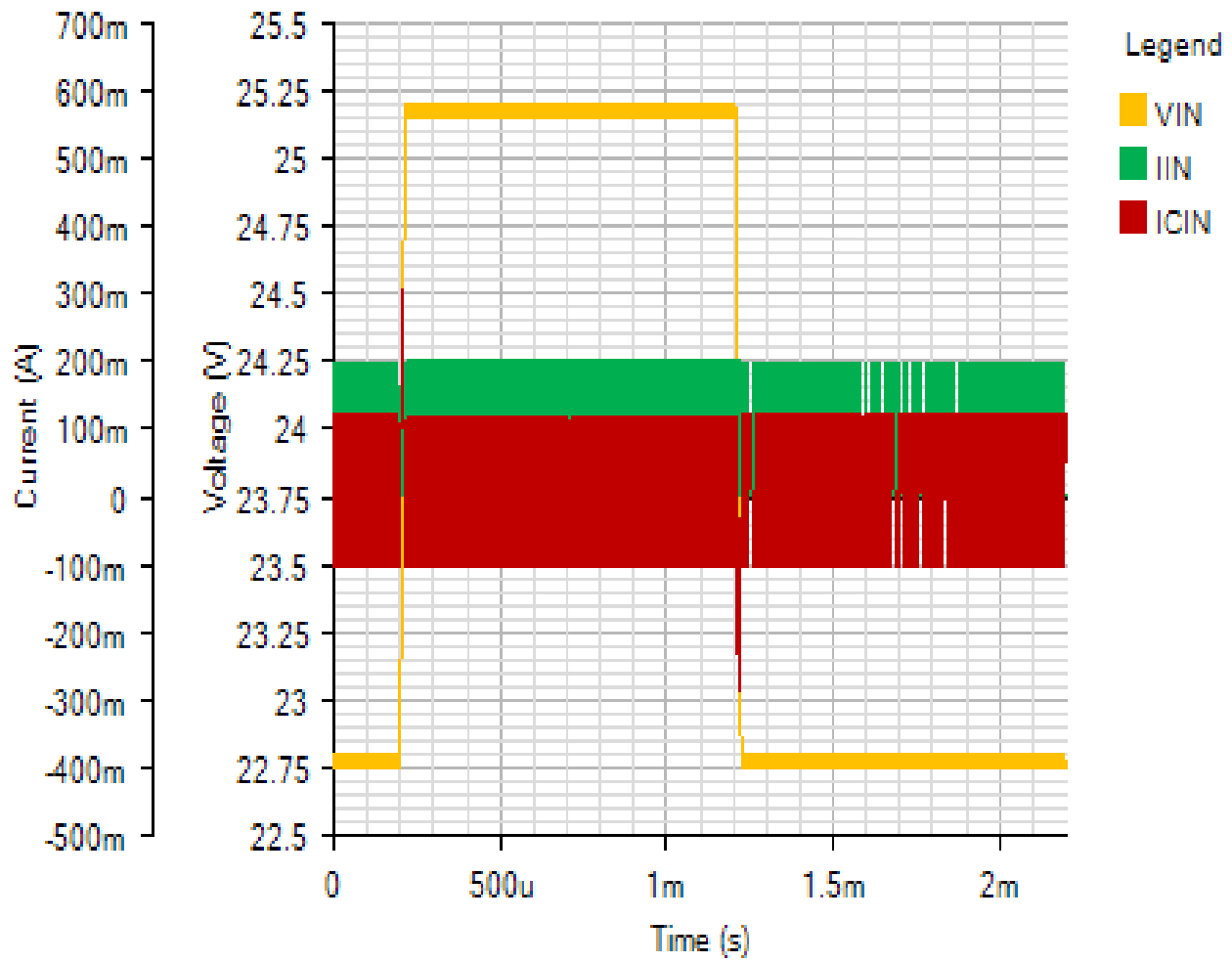
IC

Default



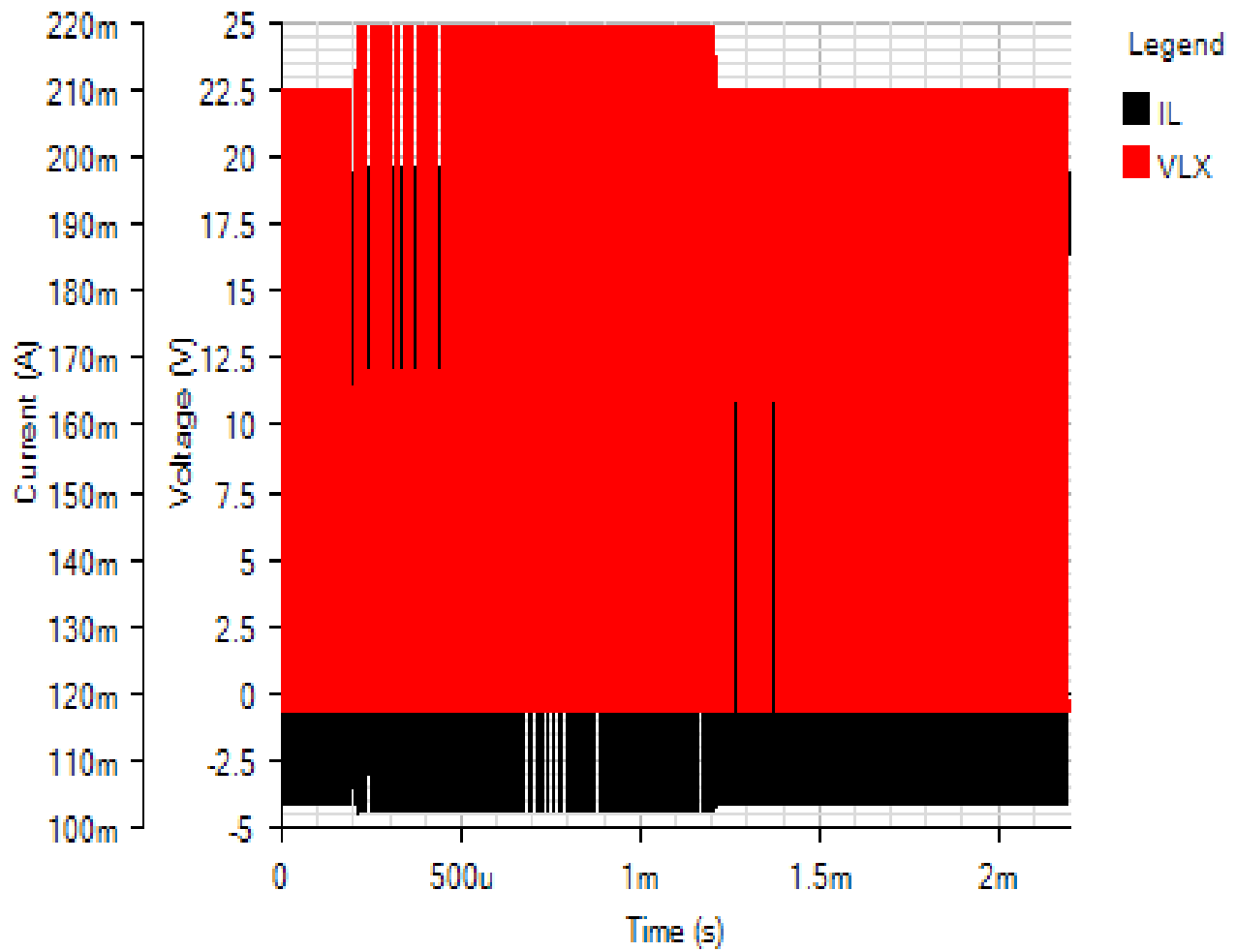
INPUT

Default



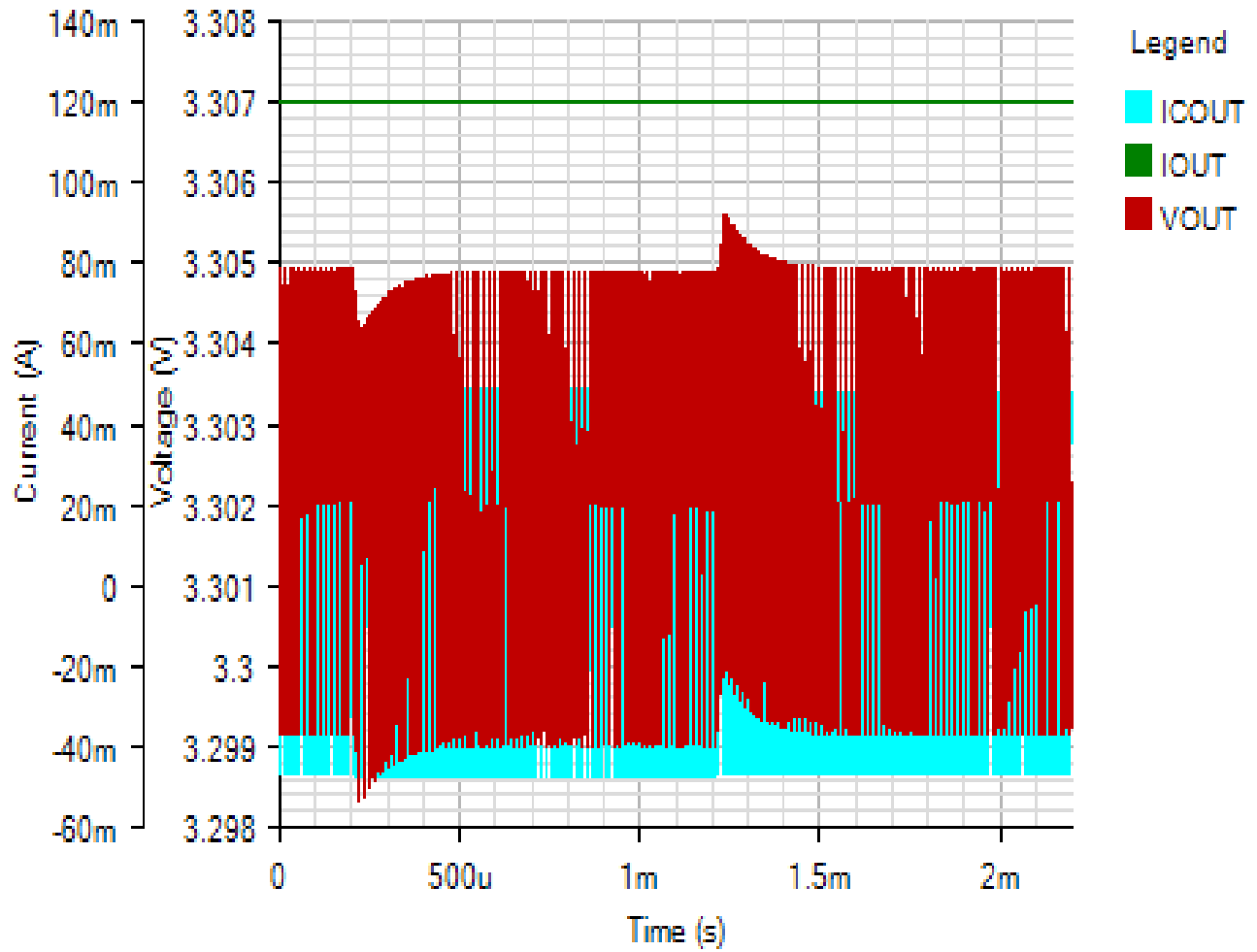
SWITCHING

Default



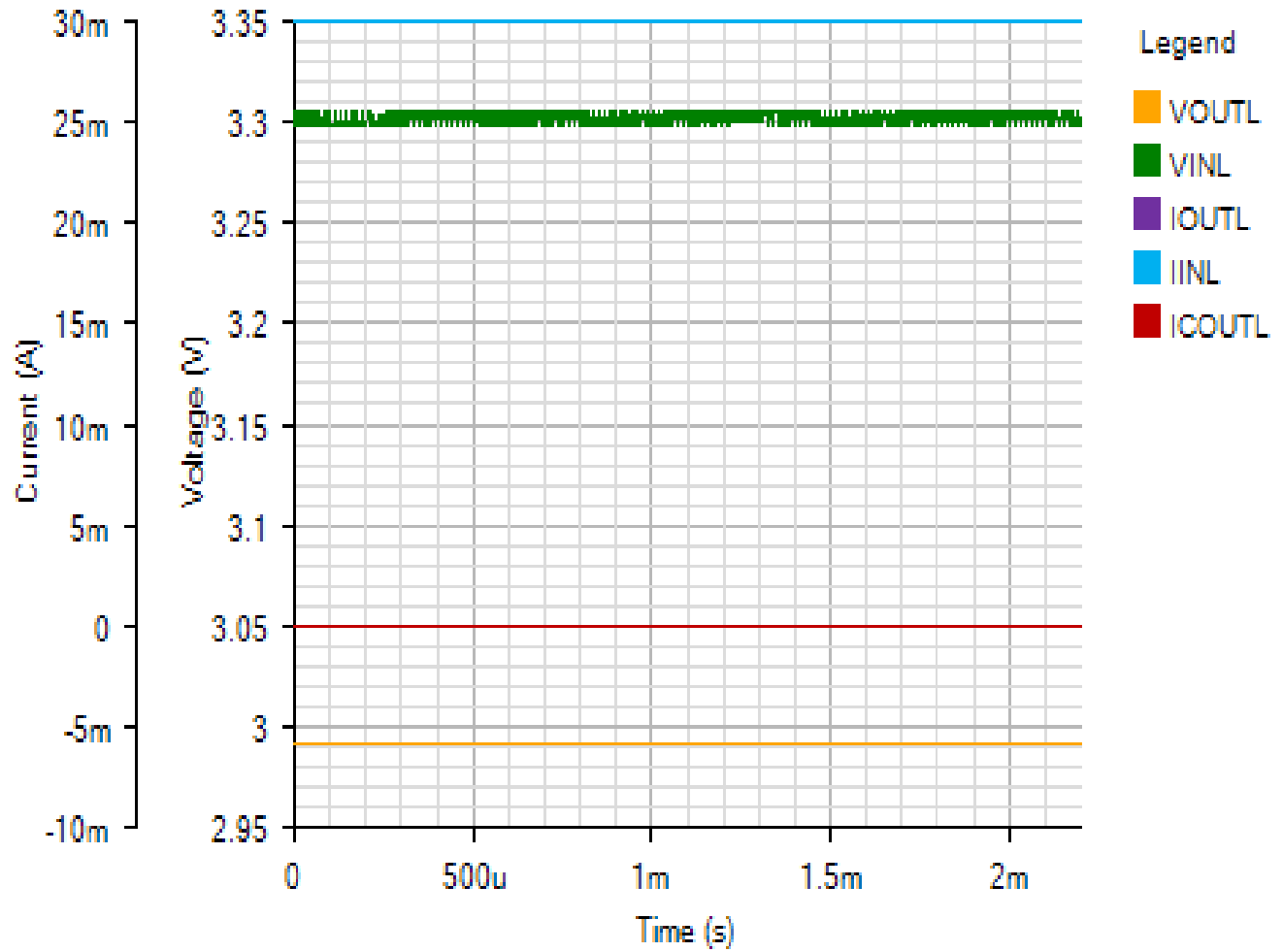
OUTPUT1

Default



LINEAR_REGULATOR

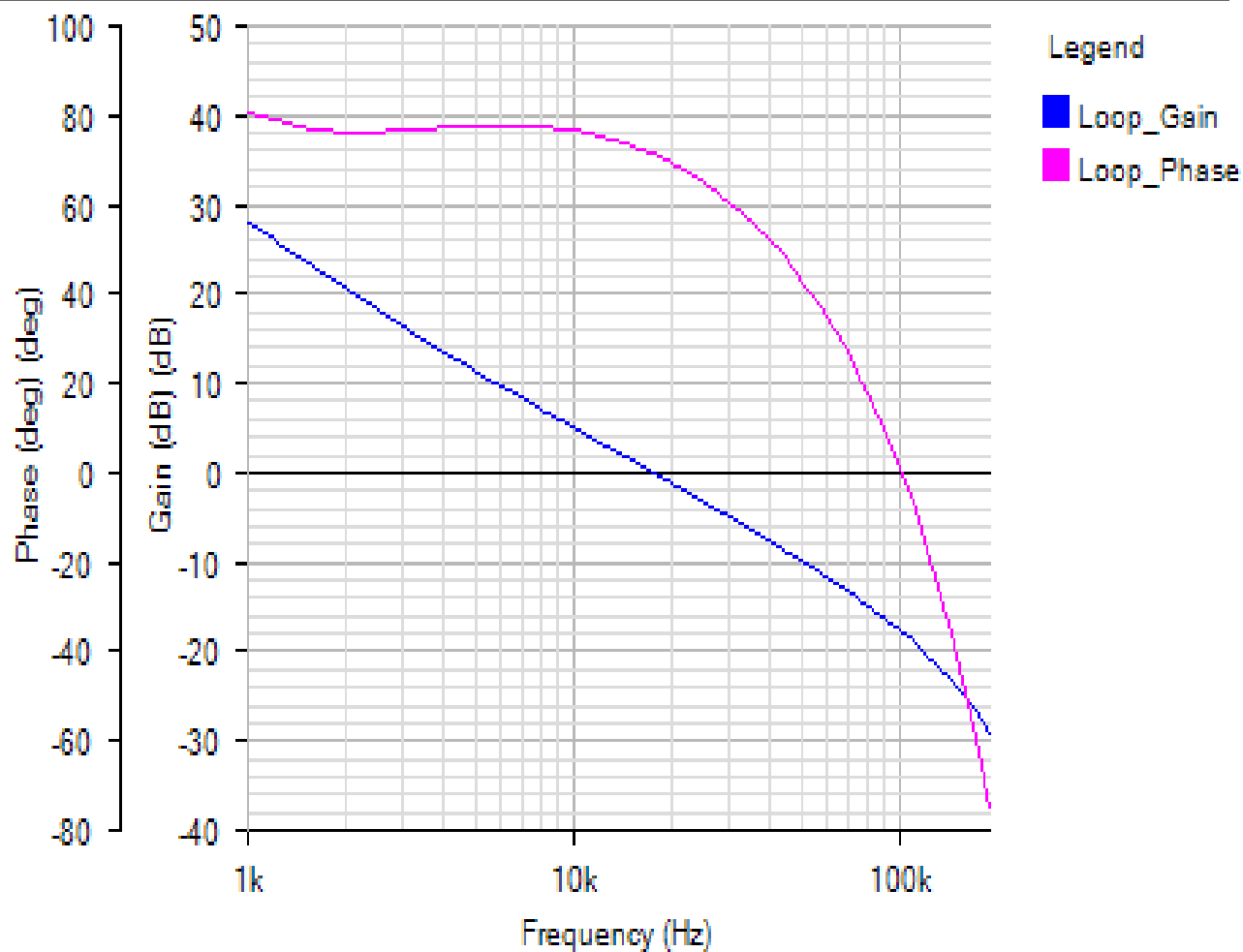
Default



AC Analysis - Wed Dec 19 2018 14:57:51

BODE

Default



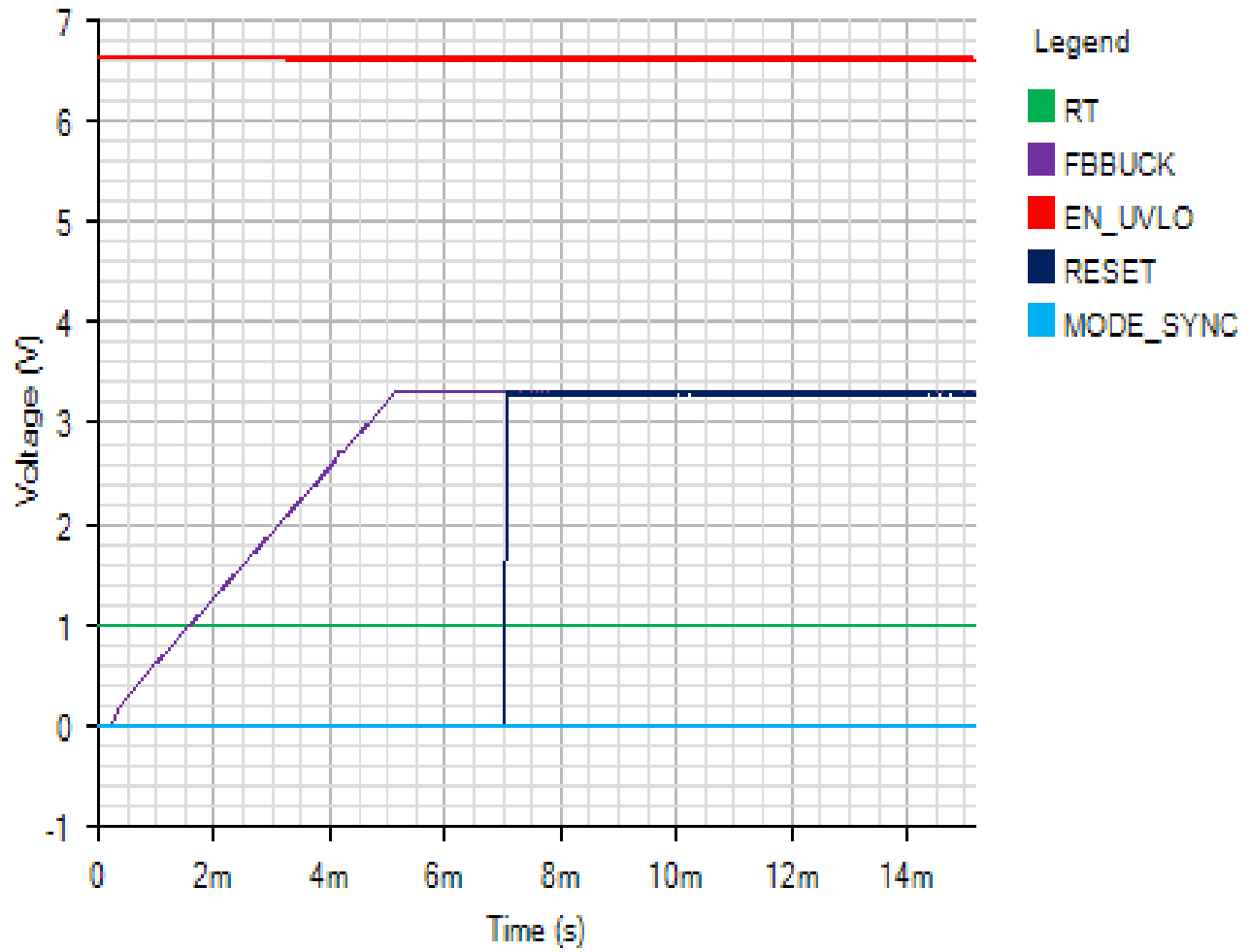
Phase Margin: 71.21° at a crossover frequency of 17.6kHz



Start Up - Wed Dec 19 2018 14:57:51

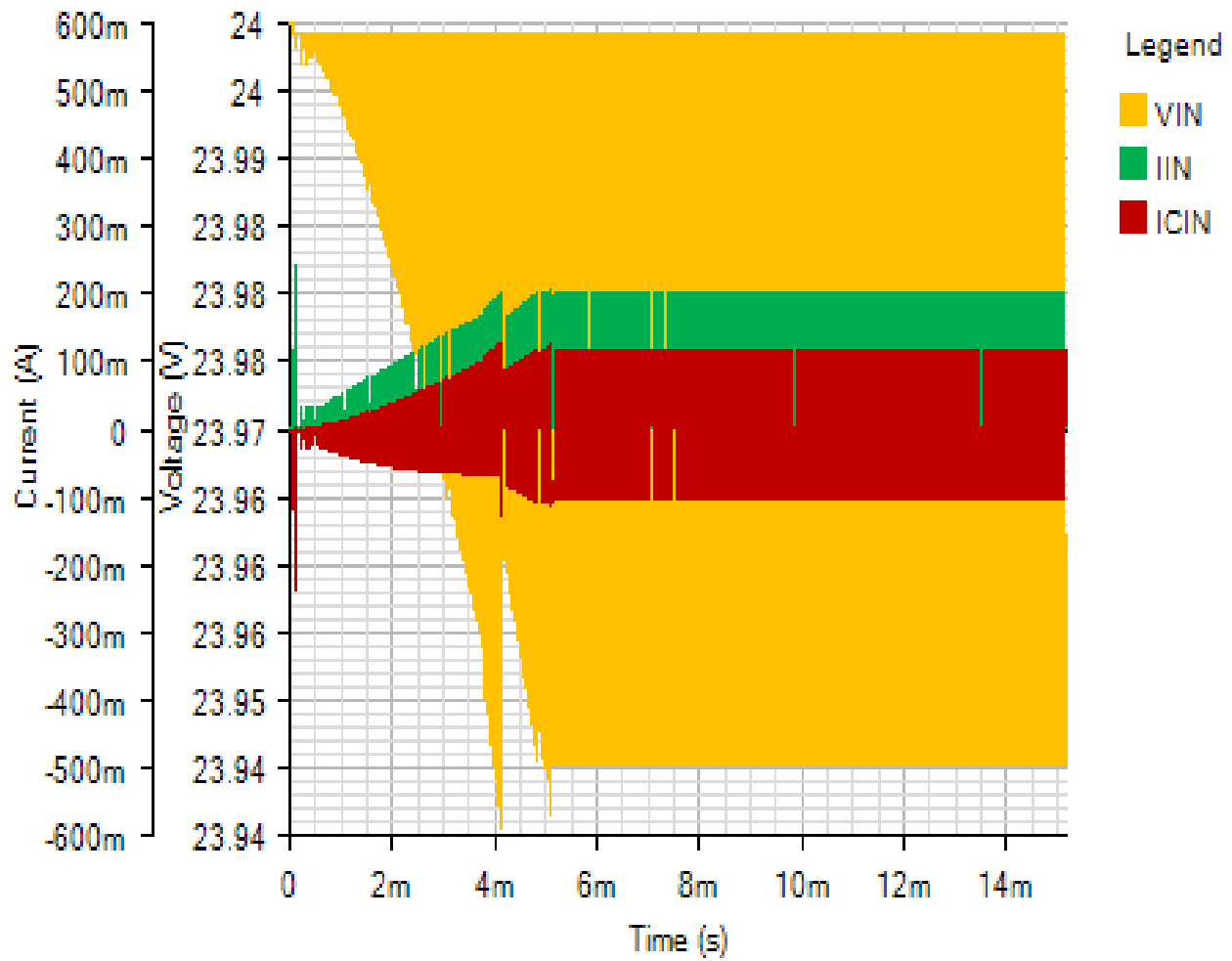
IC

Default



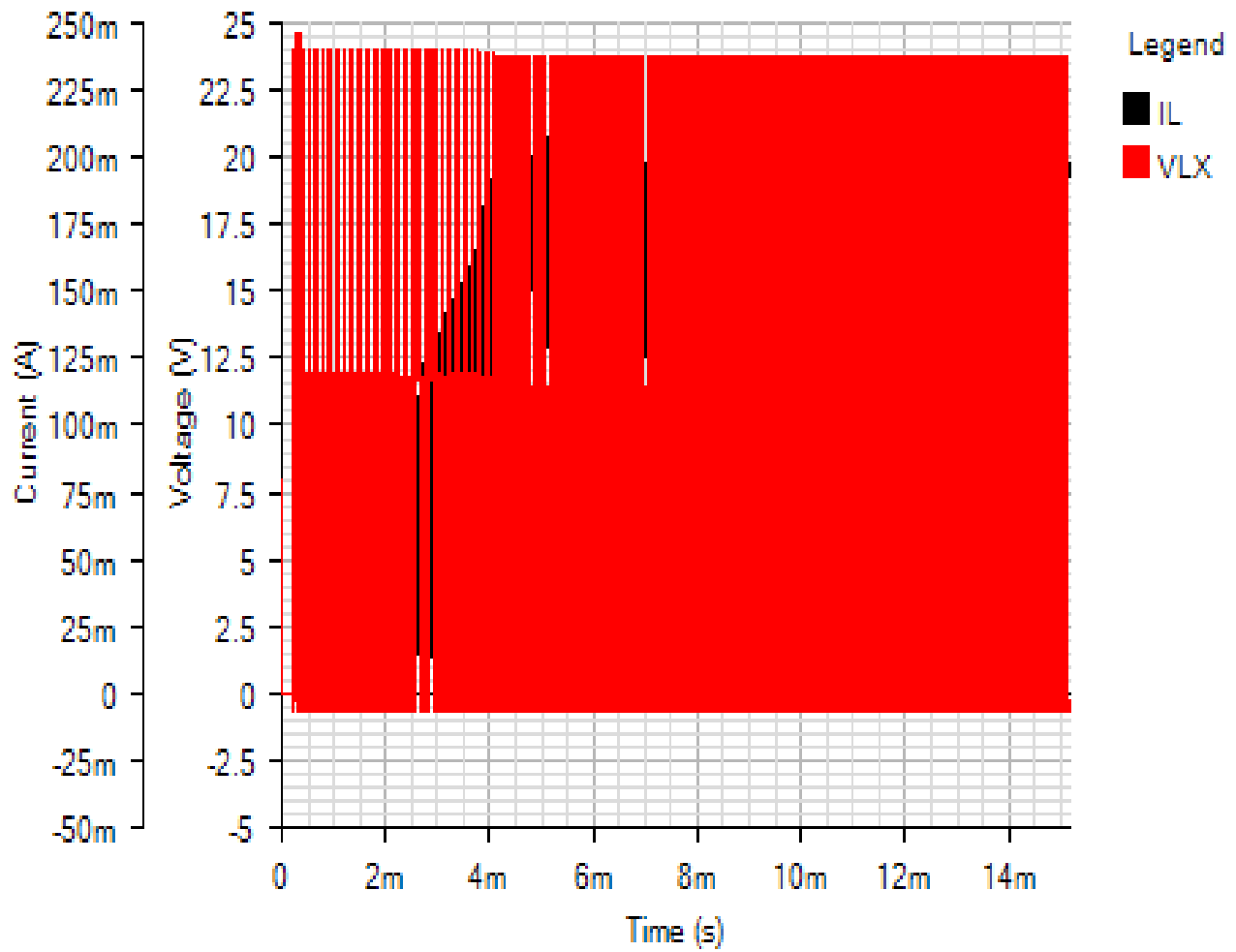
INPUT

Default



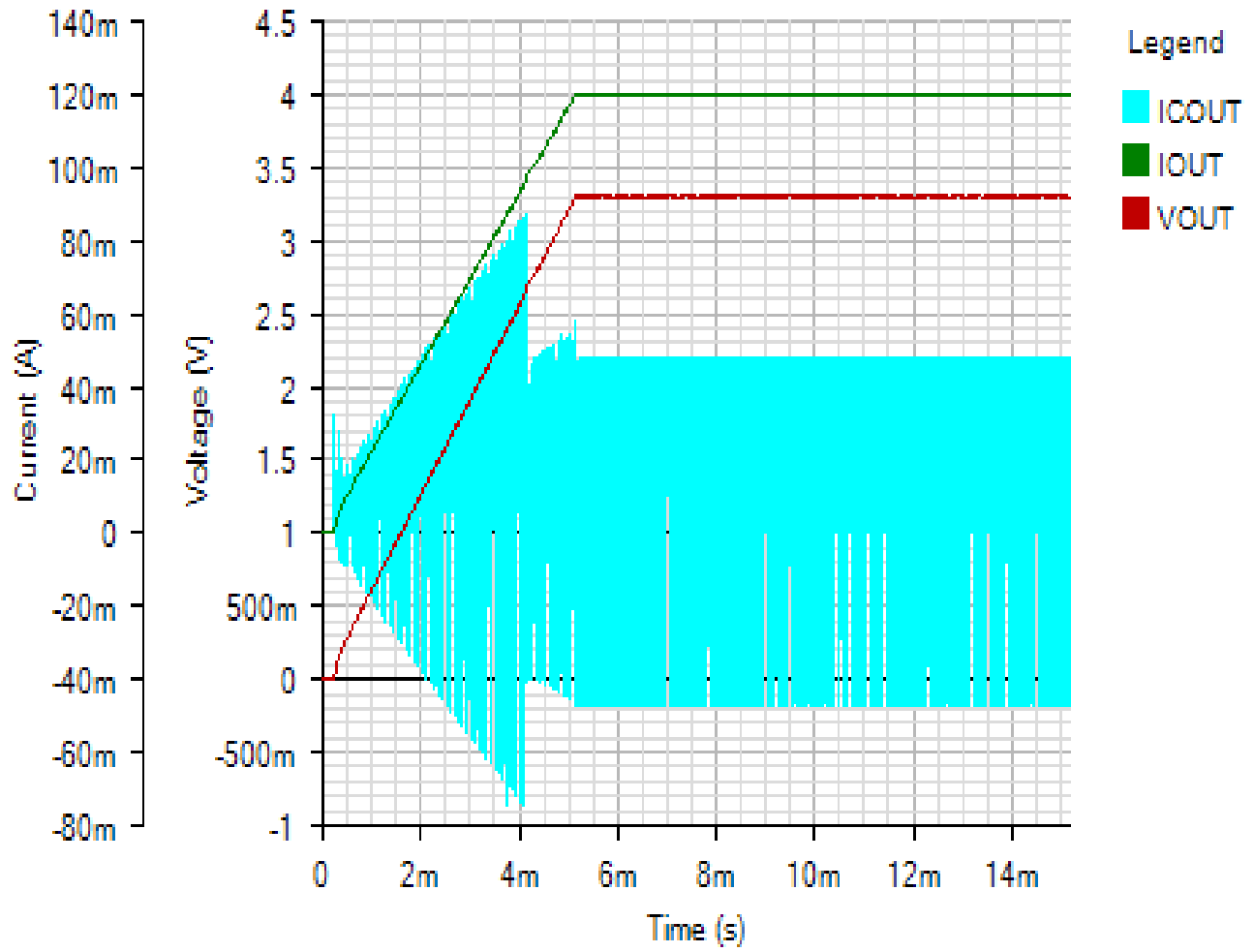
SWITCHING

Default



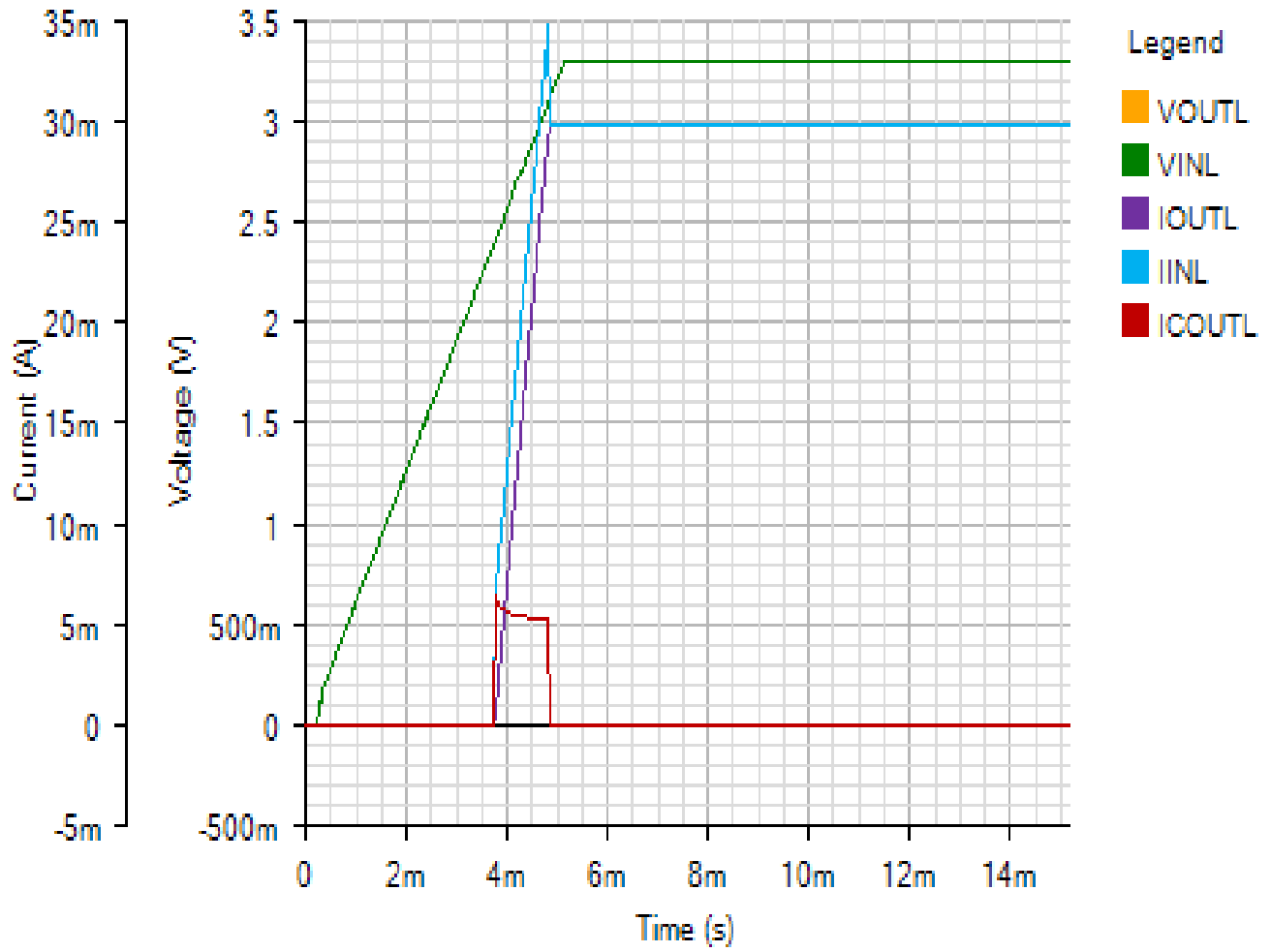
OUTPUT1

Default



LINEAR_REGULATOR

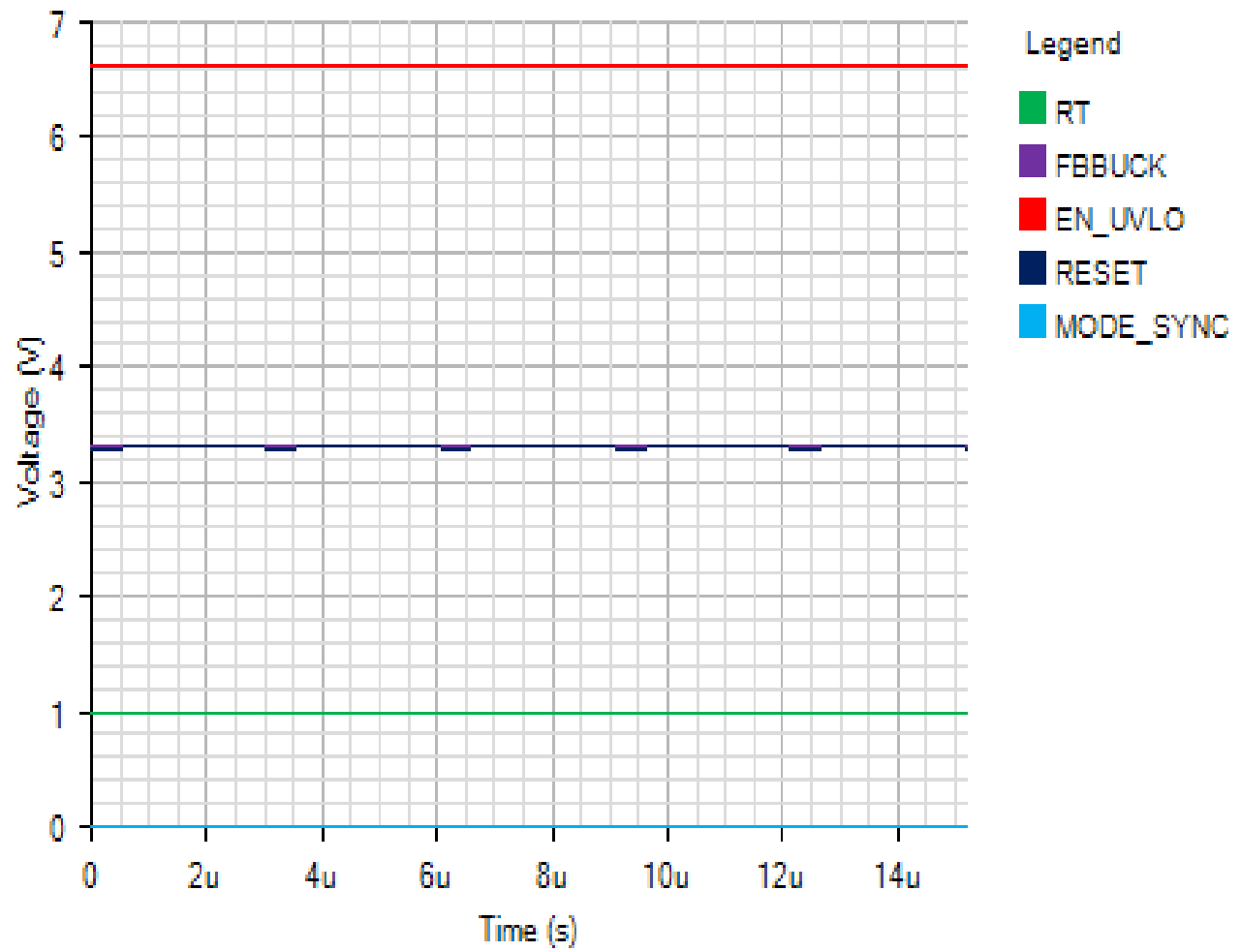
Default



Steady State - Wed Dec 19 2018 14:57:51

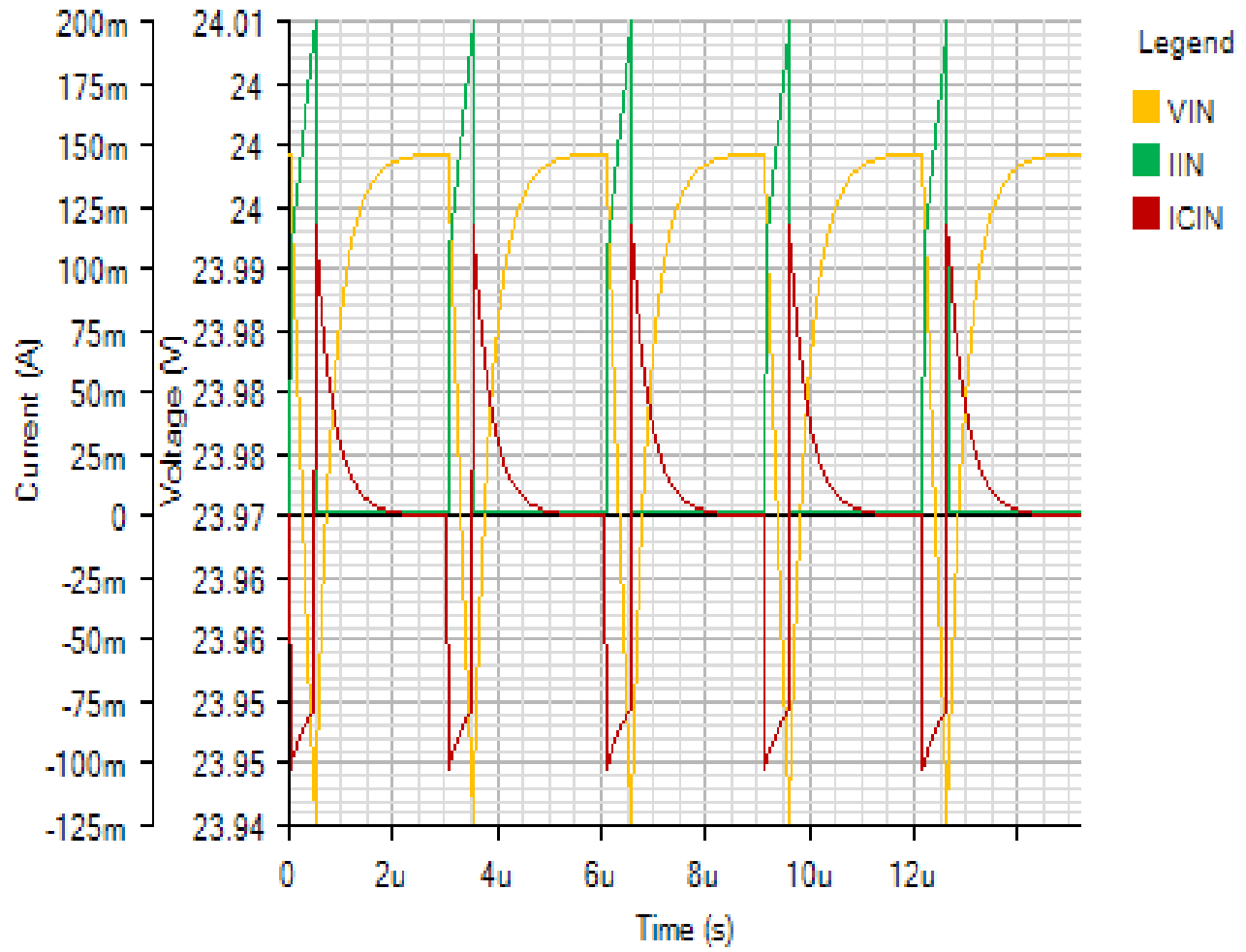
IC

Default



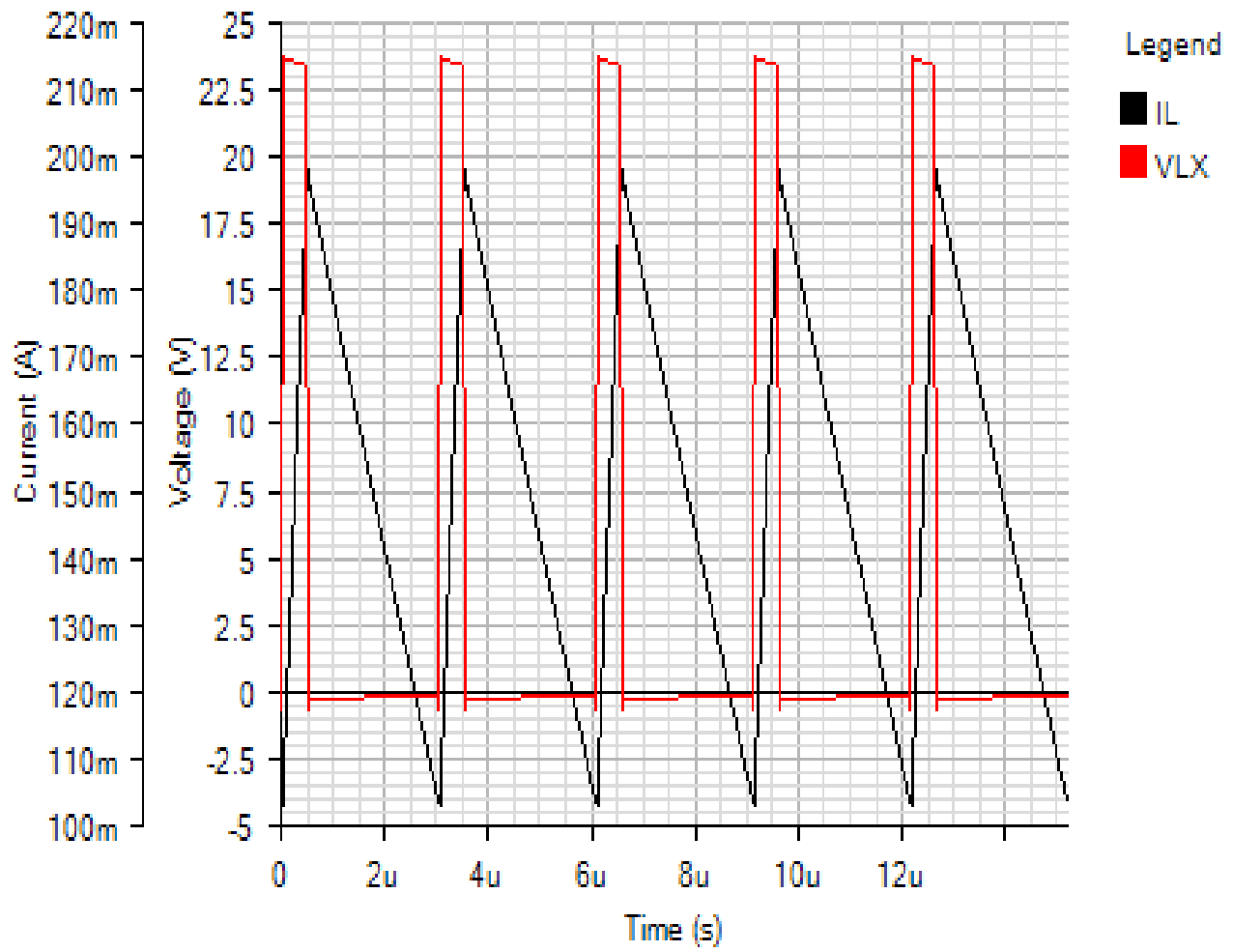
INPUT

Default



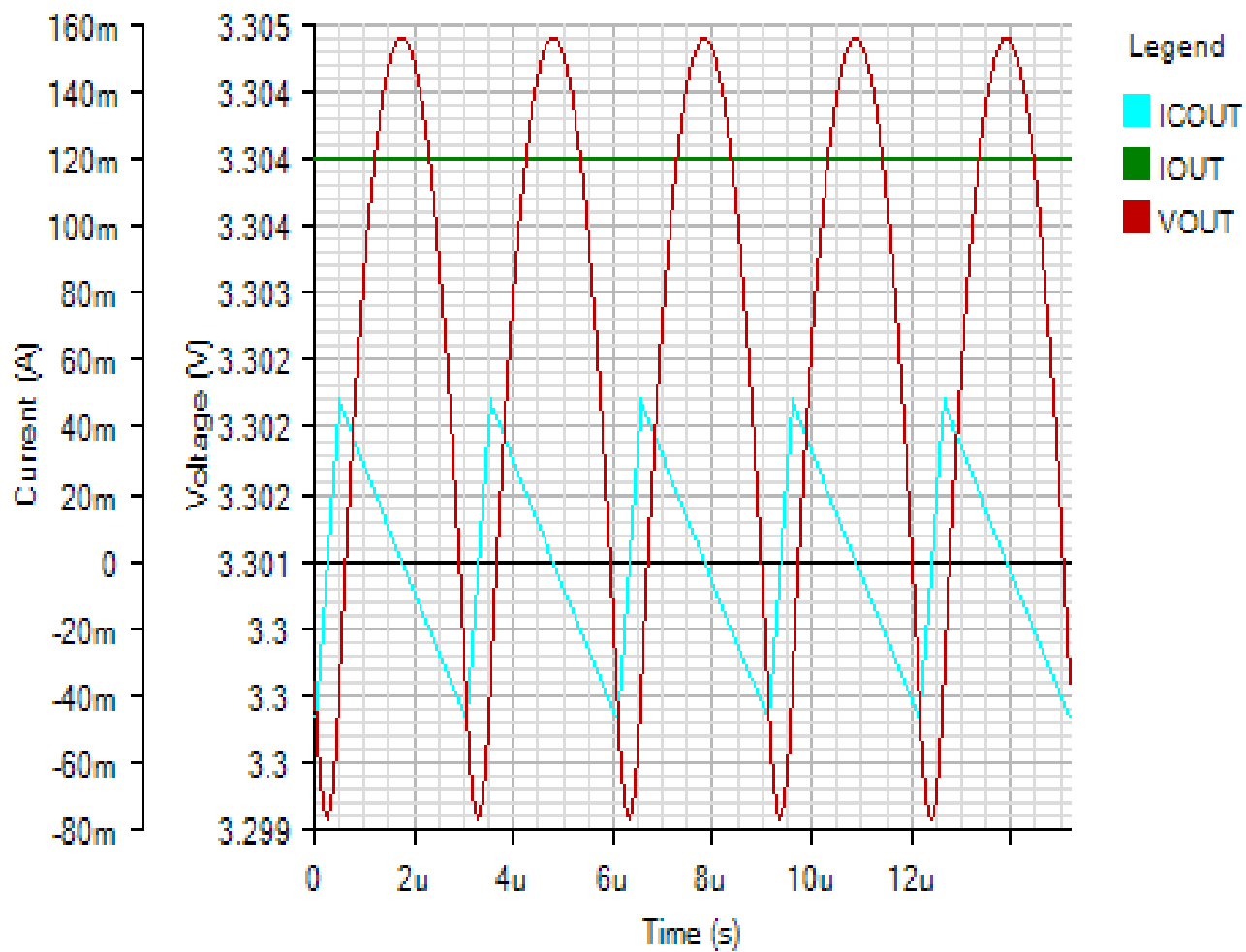
SWITCHING

Default



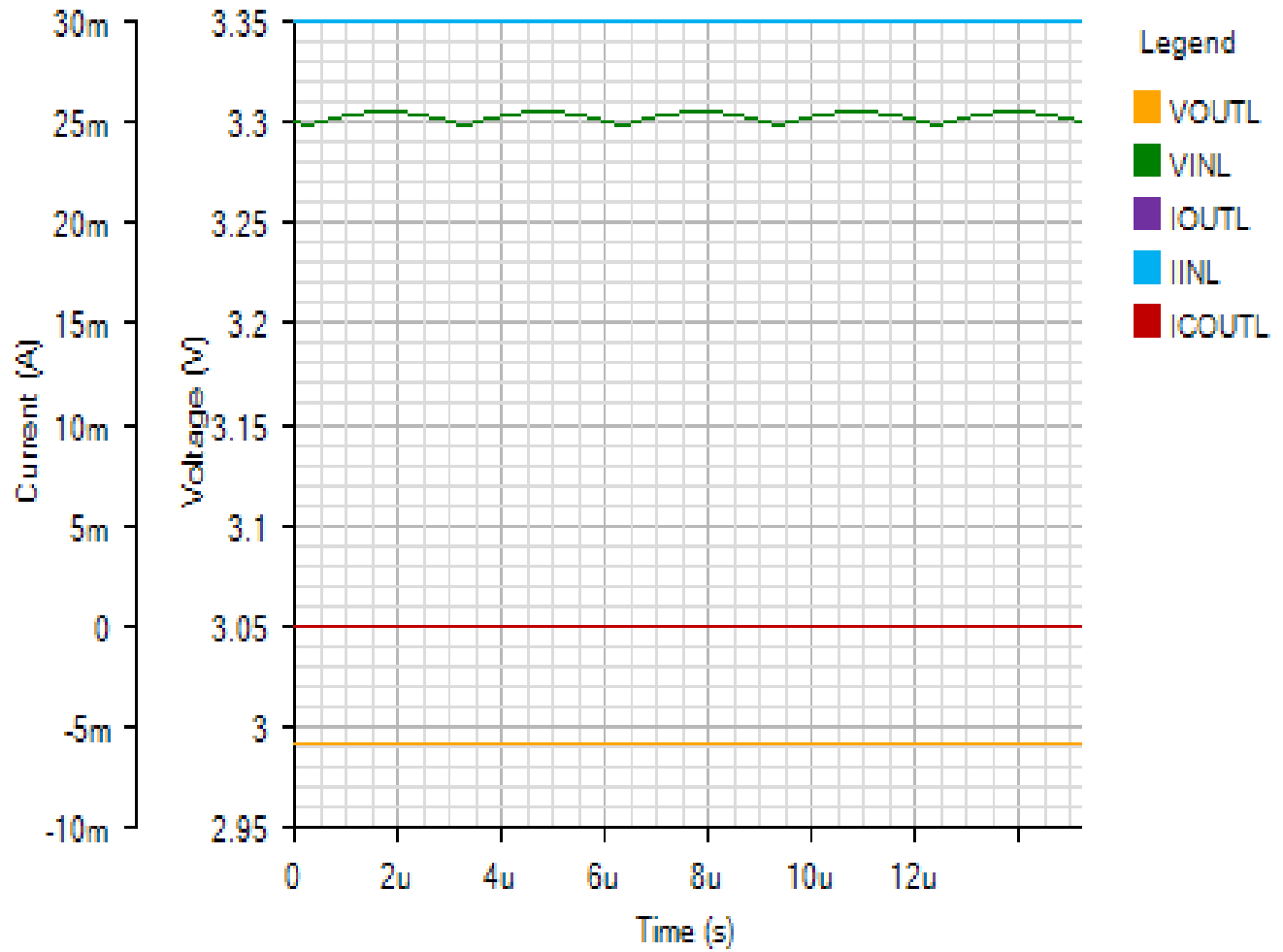
OUTPUT1

Default



LINEAR_REGULATOR

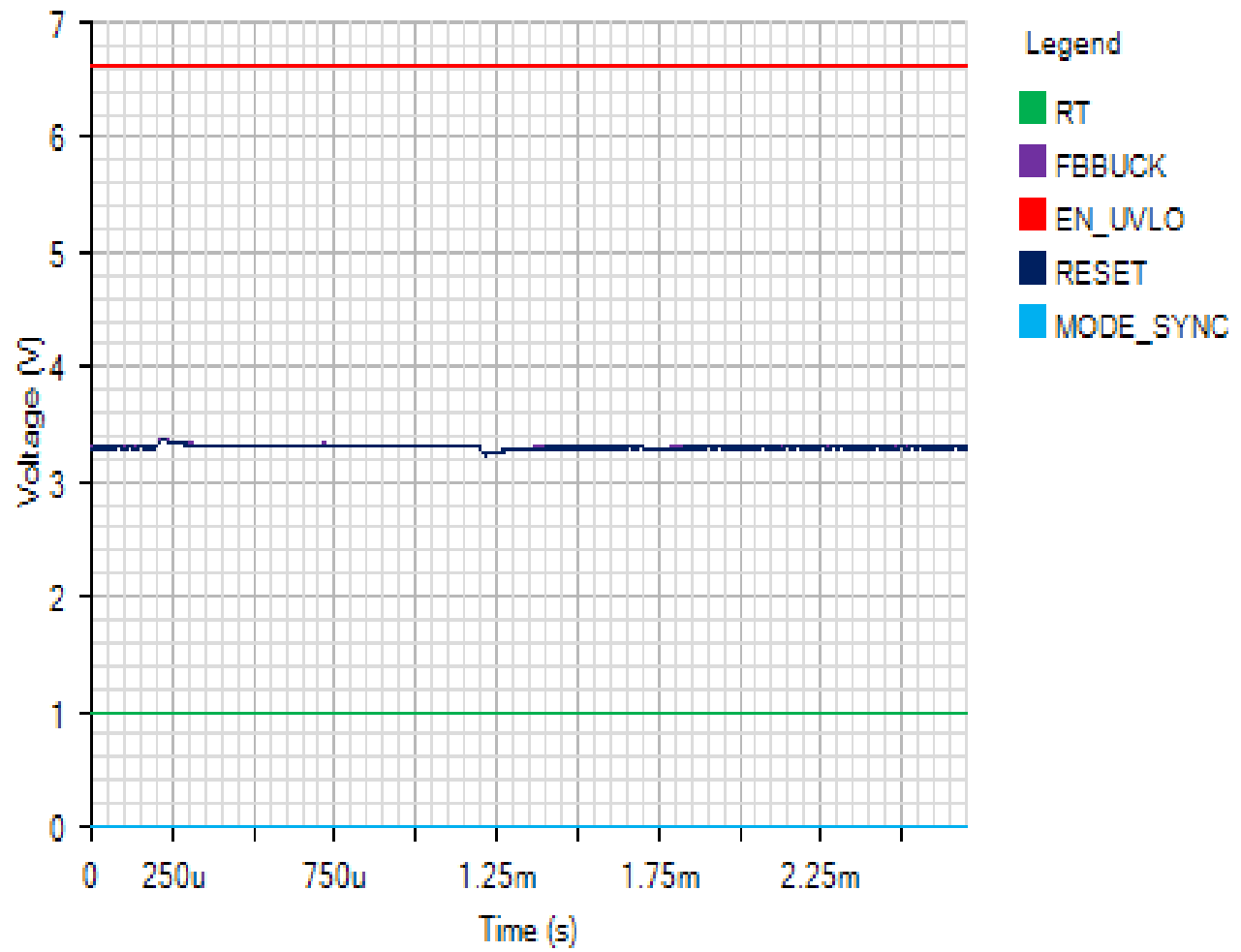
Default

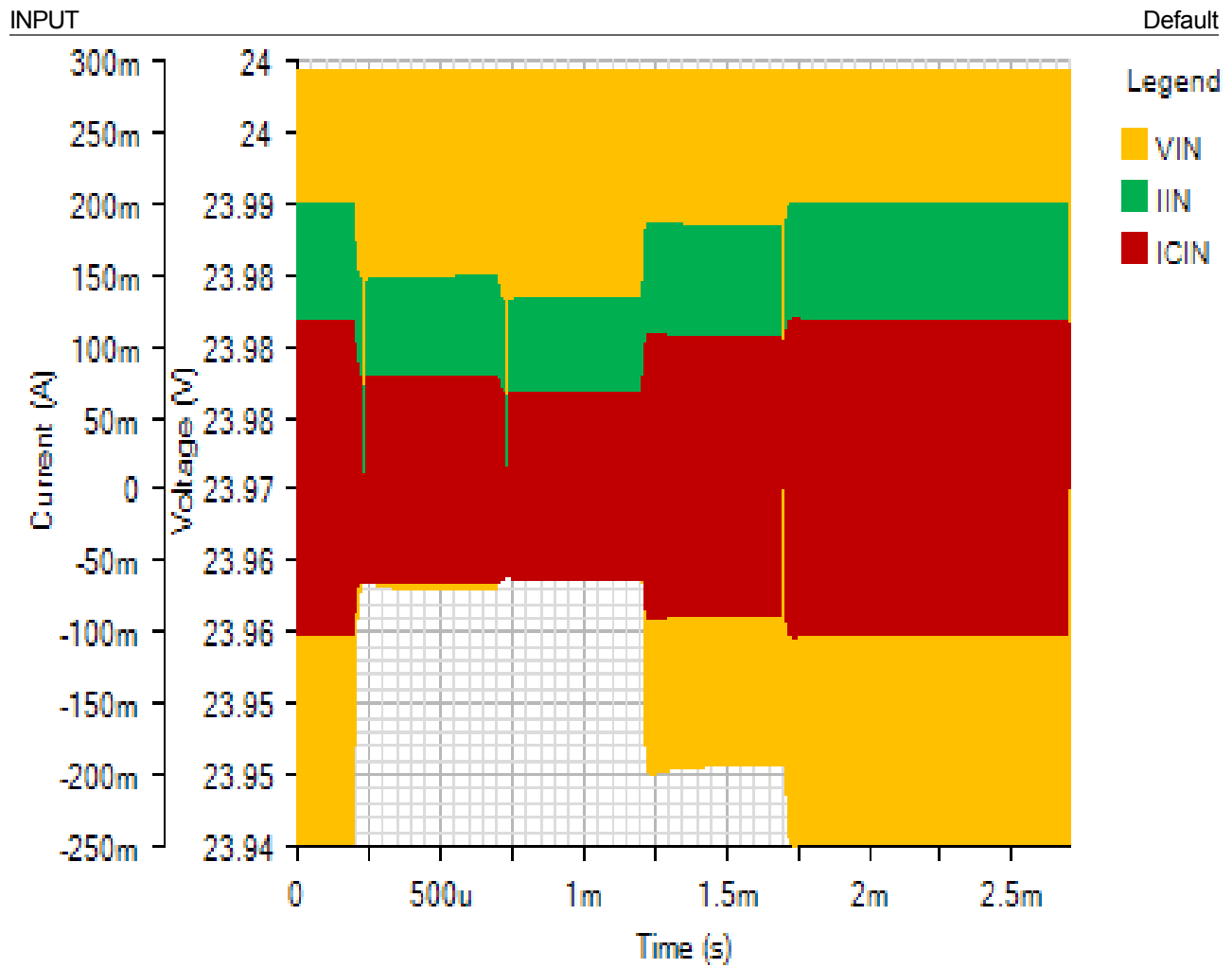


Load Step - Wed Dec 19 2018 14:57:51

IC

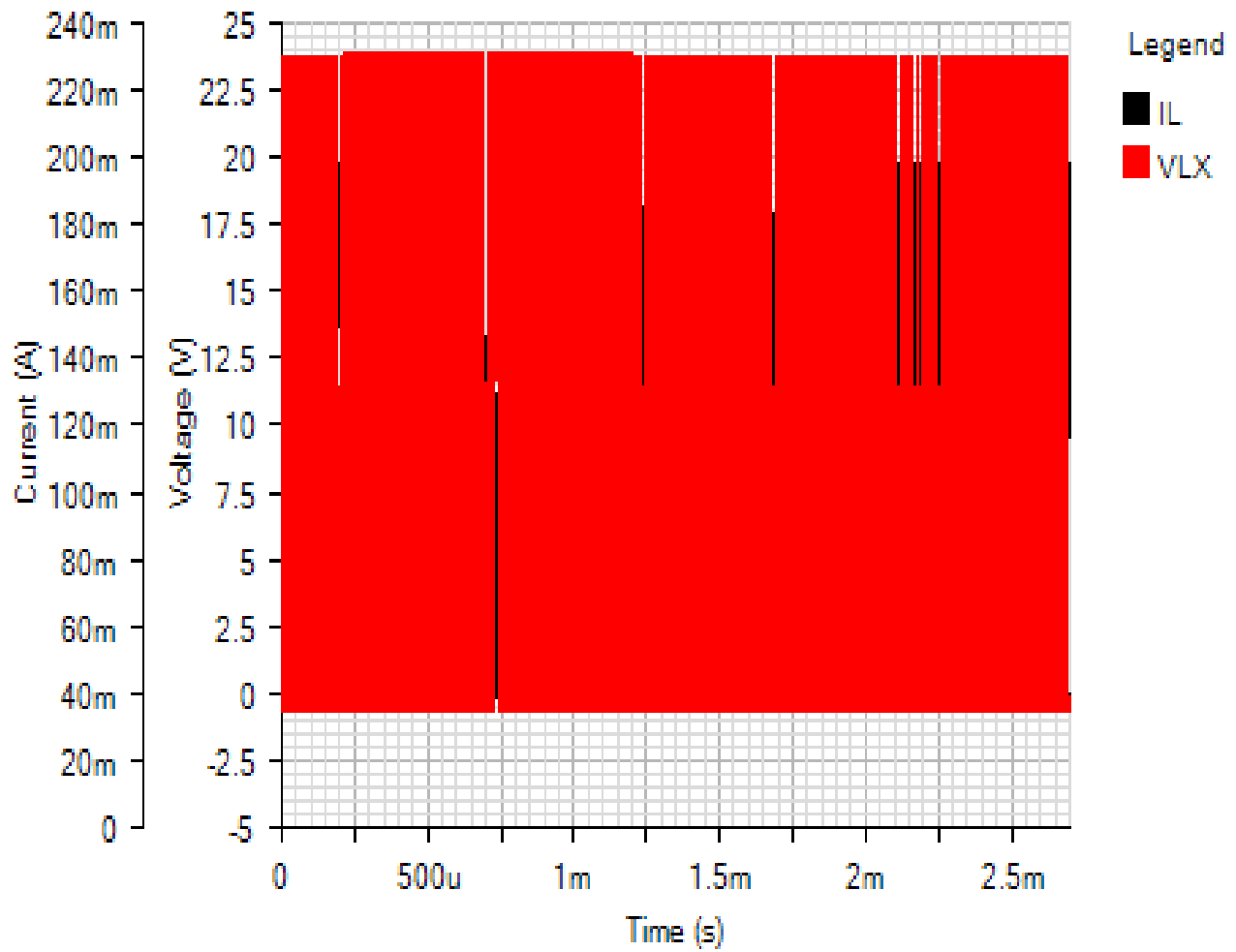
Default





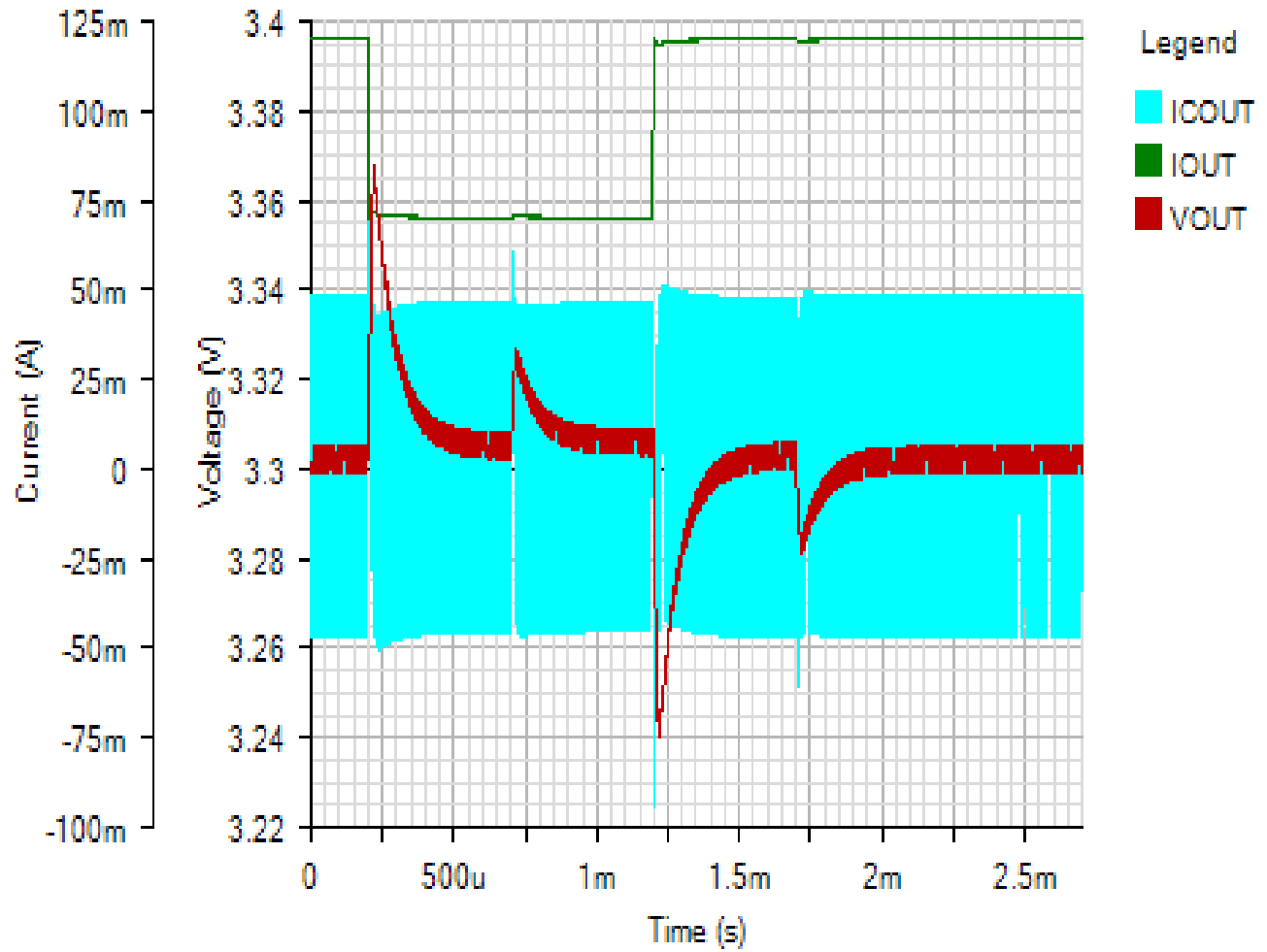
SWITCHING

Default



OUTPUT1

Default



LINEAR_REGULATOR

Default

