

Initial Design

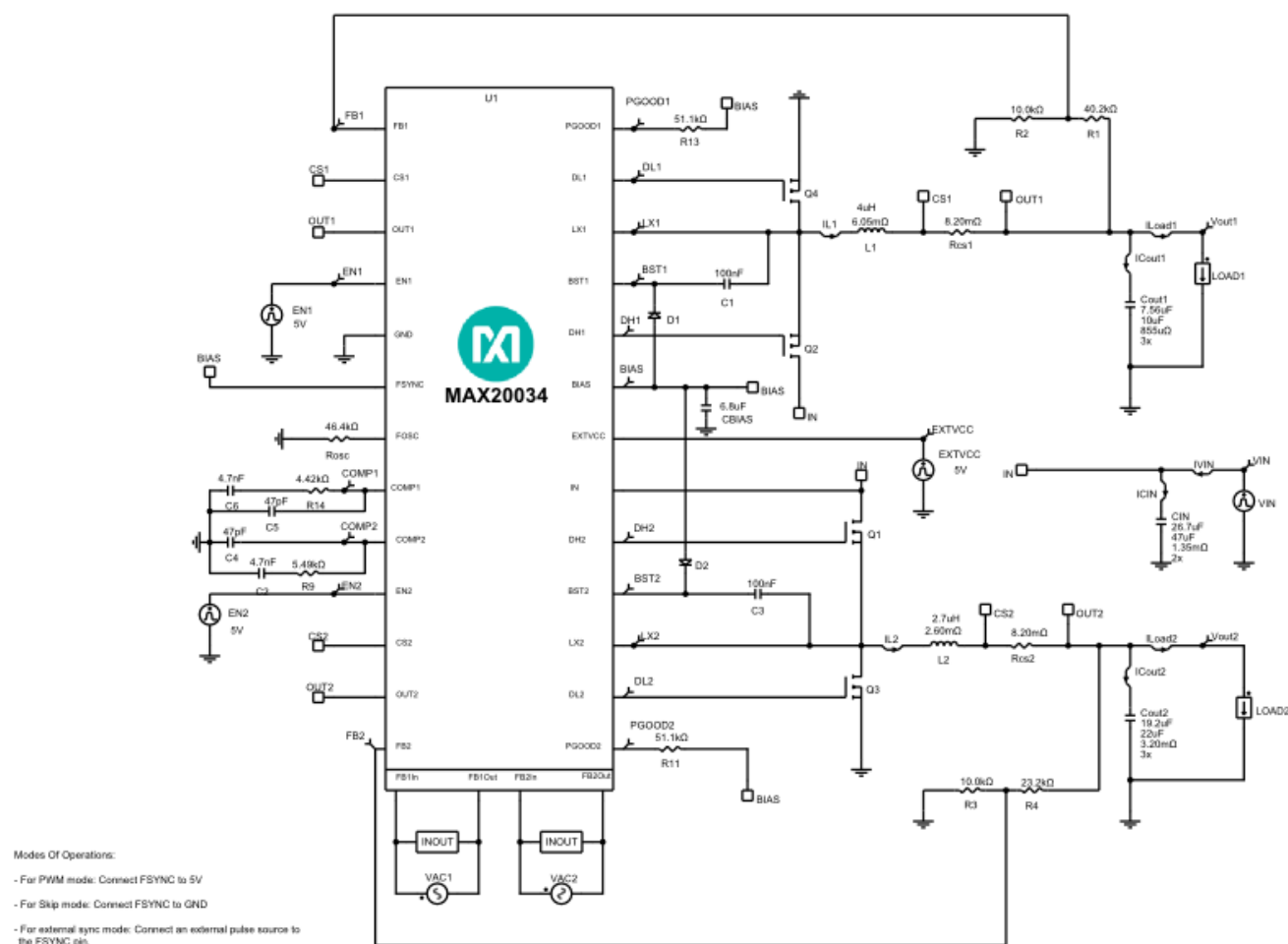
1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	10V
Maximum Input Voltage	14V
Nominal Input Voltage	12V
Input Voltage Ripple	0.5%
Output Configuration	Adjustable Output Voltage
Output 1 Voltage	5V
Output 2 Voltage	3.3V
Output 1 Current	5A
Output 2 Current	5A
Output 1 Voltage Ripple	1%
Output 2 Voltage Ripple	1%
Load 1 Step Current	2.5A
Load 2 Step Current	2.5A
Load 1 Start Current	5A
Load 2 Start Current	5A
Load 1 Step Edge Rate	1A/us
Load 2 Step Edge Rate	1A/us
Output 1 Voltage Load Step Over/Undershoot	5%
Output 2 Voltage Load Step Over/Undershoot	5%
Performance Priority	balanced
BOM Priority	Cost
Mode	PWM
Switching Frequency	600KHz

Parameter	Value
Ambient Temperature	25°C
Inductor 1 Current Ratio (LIR1)	0.3
Inductor 2 Current Ratio (LIR2)	0.3
Enable High Power Design	No

Schematic



Notes:

- FB1in, FB1Out, FB2in, and FB2Out are fictitious pins. They are needed for AC analysis measurements on the internal Feedback loop inside the IC.
- When Skip mode is selected, AC Loop simulation may fail if the Load Current is low enough to engage Skip mode, because Skip mode is hysteretic and there is no AC Loop to measure.

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX20034	User-Defined	IC

C1	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
C2	1	C0402C472J4RACTU	KEMET Corporation	Cap Ceramic 0.0047uF 16V X7R 5% Pad SMD 0402 125°C T/R
C3	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
C4	1	06031A470JAT2A	AVX	Cap Ceramic 47pF 100V C0G 5% Pad SMD 0603 125°C T/R
C5	1	06031A470JAT2A	AVX	Cap Ceramic 47pF 100V C0G 5% Pad SMD 0603 125°C T/R
C6	1	C0402C472J4RACTU	KEMET Corporation	Cap Ceramic 0.0047uF 16V X7R 5% Pad SMD 0402 125°C T/R
CBIAS	1	04023C685KAT2A	AVX	Cap Ceramic 6.8uF 25V X7R 10% Pad SMD 0402 125°C T/R
CIN	2	C5750X7R1C476M230KB	TDK	Cap Ceramic 47uF 16V X7R 20% SMD 2220 125C Plastic T/R
Cout1	3	C2012X7R1A106K125AC	TDK	Cap Ceramic 10uF 10V X7R 10% SMD 0805 125C Plastic T/R
Cout2	3	GRM31CR70J226KE19L	Murata	Cap Ceramic 22uF 6.3V X7R 10% SMD 1206 125C Embossed T/R
D1	1	MSS1P4-M3/89A	Vishay	Diode Schottky 40V 1A 2-Pin Micro SMP T/R
D2	1	MSS1P4-M3/89A	Vishay	Diode Schottky 40V 1A 2-Pin Micro SMP T/R
L1	1	SER1360-402KLB	Coilcraft	Inductor 4uH 10% 5.5mOhm 13.5A Isat 9.4A Irms
L2	1	SER1360-272KLB	Coilcraft	Inductor 2.7uH 10% 2.36mOhm 13.1A Isat 13A Irms
Q1	1	FDMS0310AS	Fairchild Semiconductor	Trans MOSFET N-CH 30VDS 5.2mOhm@4.5V 5mOhm@6V 13nC 5.8nC 1.72nF 0.655nF 150°C 22A 41W 3°C/W 1.1mm 32.5mm^2 PQFN 5x6 8L (Power 56)
Q2	1	FDMS0310AS	Fairchild Semiconductor	Trans MOSFET N-CH 30VDS 5.2mOhm@4.5V 5mOhm@6V 13nC 5.8nC 1.72nF 0.655nF 150°C 22A 41W 3°C/W 1.1mm 32.5mm^2 PQFN 5x6 8L (Power 56)
Q3	1	FDMS0310AS	Fairchild Semiconductor	Trans MOSFET N-CH 30VDS 5.2mOhm@4.5V 5mOhm@6V 13nC 5.8nC 1.72nF 0.655nF 150°C 22A 41W 3°C/W 1.1mm 32.5mm^2 PQFN 5x6 8L (Power 56)
Q4	1	FDMS0310AS	Fairchild Semiconductor	Trans MOSFET N-CH 30VDS 5.2mOhm@4.5V 5mOhm@6V 13nC 5.8nC 1.72nF 0.655nF 150°C 22A 41W 3°C/W 1.1mm 32.5mm^2 PQFN 5x6 8L (Power 56)
R1	1	ERJ3EKF4022V	Panasonic	Res Thick Film 0603 40.2K 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

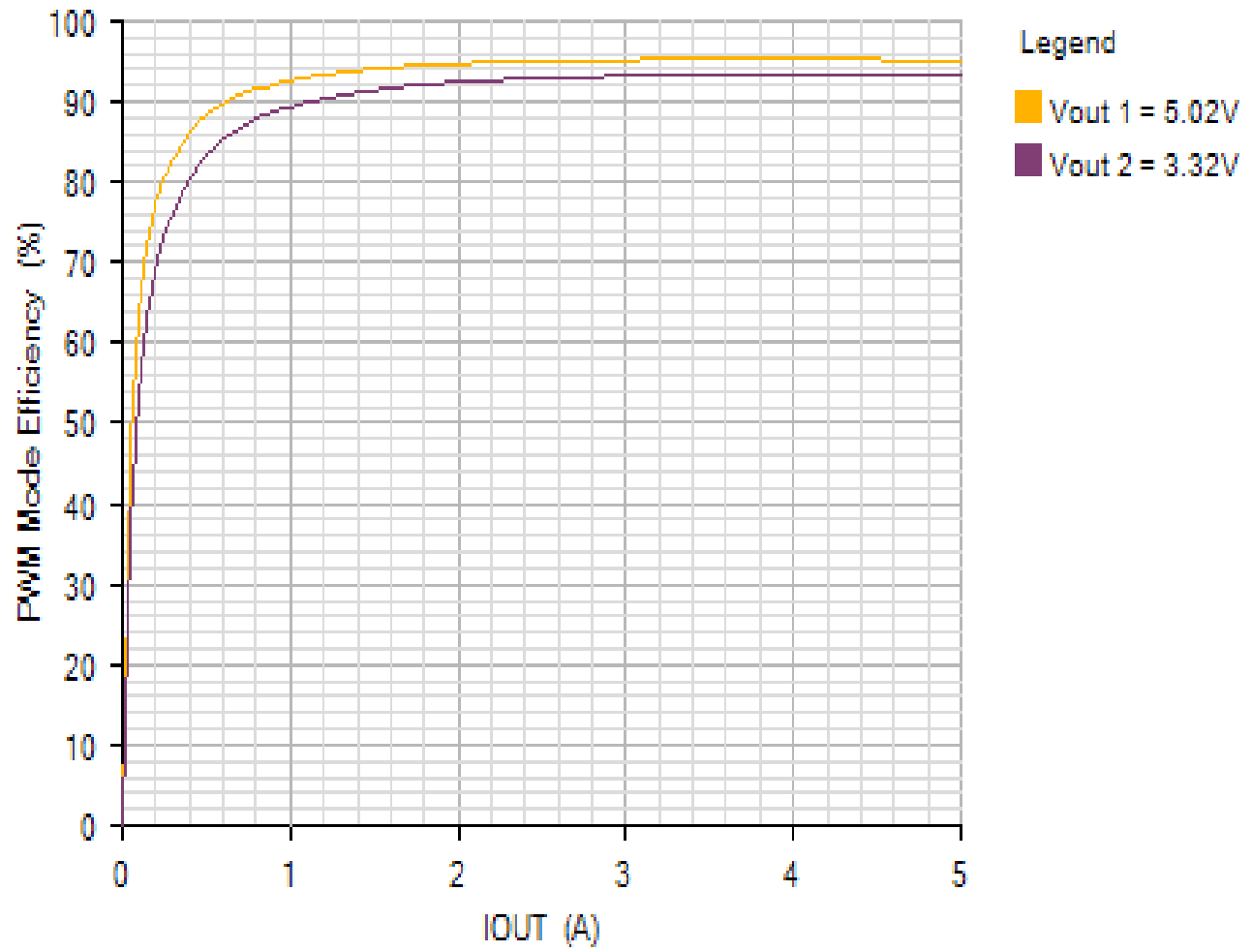
R3	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ2RKF2322X	Panasonic	Res Thick Film 0402 23.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R9	1	ERJ3EKF5491V	Panasonic	Res Thick Film 0603 5.49K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R11	1	PATT0603E5112GGTF	Vishay	Res Thin Film 0603 51.1K Ohm 2% 0.15W ±25ppm/°C Sulfur Resistant Pad SMD Automotive T/R
R13	1	PATT0603E5112GGTF	Vishay	Res Thin Film 0603 51.1K Ohm 2% 0.15W ±25ppm/°C Sulfur Resistant Pad SMD Automotive T/R
R14	1	ERJ3EKF4421V	Panasonic	Res Thick Film 0603 4.42K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
Rcs1	1	WSL12068L200FEA	Vishay	Res Metal Strip 1206 0.0082 Ohm 1% 0.25W(1/4W) ±75ppm/°C Sulfur Resistant Pad SMD Automotive T/R
Rcs2	1	WSL12068L200FEA	Vishay	Res Metal Strip 1206 0.0082 Ohm 1% 0.25W(1/4W) ±75ppm/°C Sulfur Resistant Pad SMD Automotive T/R
Rosc	1	ERJ3EKF4642V	Panasonic	Res Thick Film 0603 46.4K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Tue Nov 20 2018 12:11:53

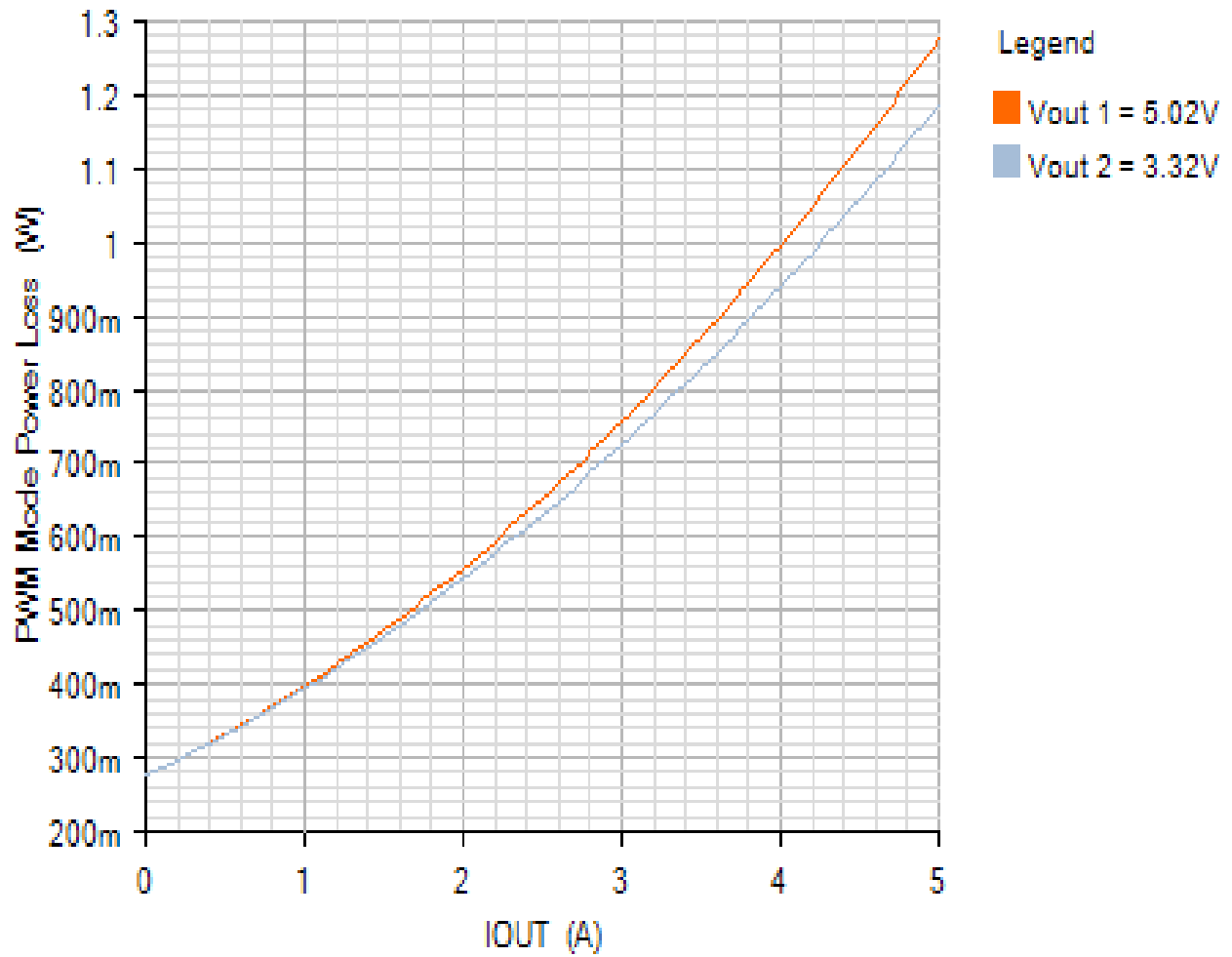
EFFICIENCY

Default



POWER_LOSS

Default



Losses

Component

Loss (W)

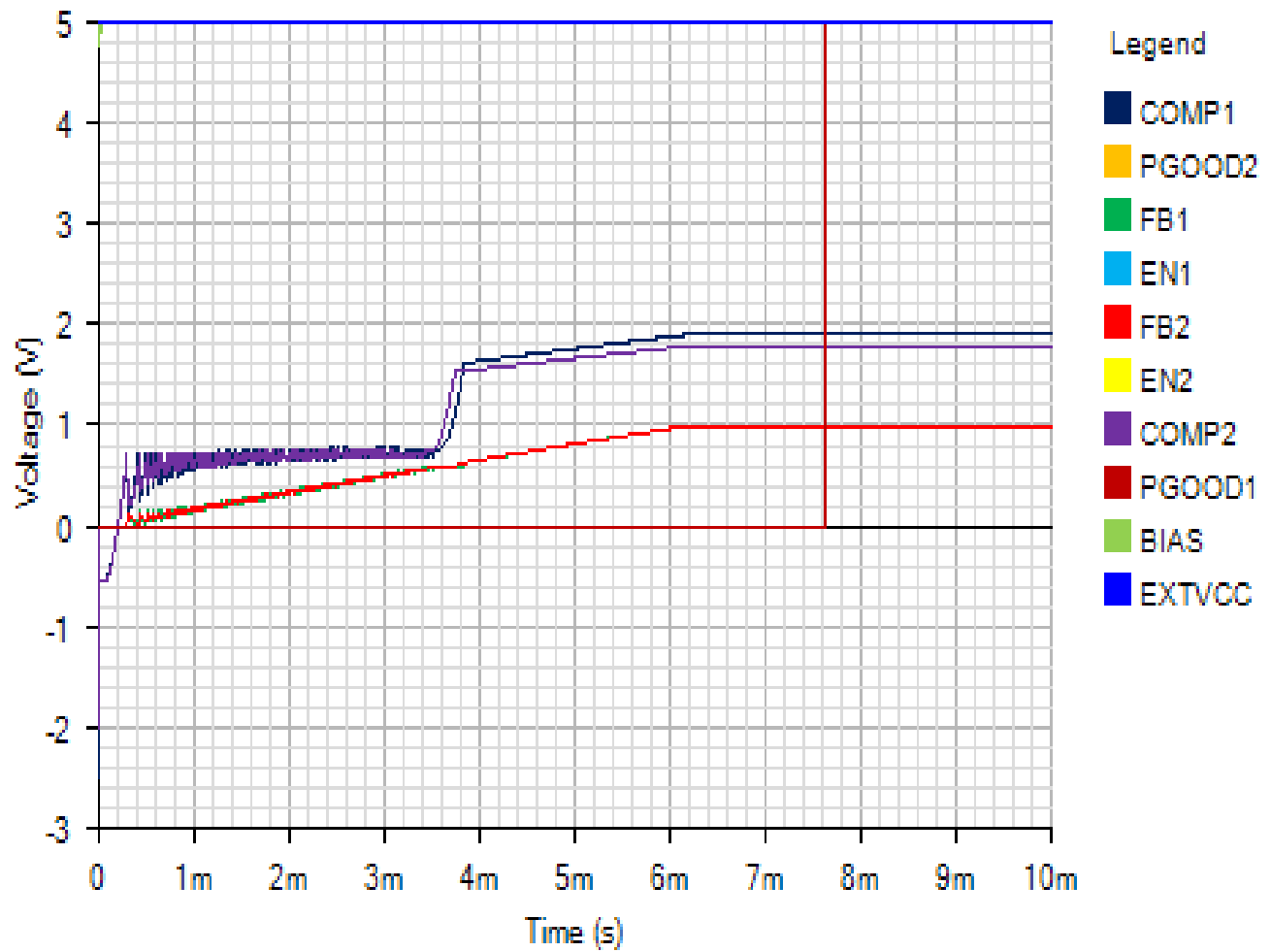
% of total

Component	Loss (W)	% of total
Total	0	100

Start Up - Tue Nov 20 2018 12:11:53

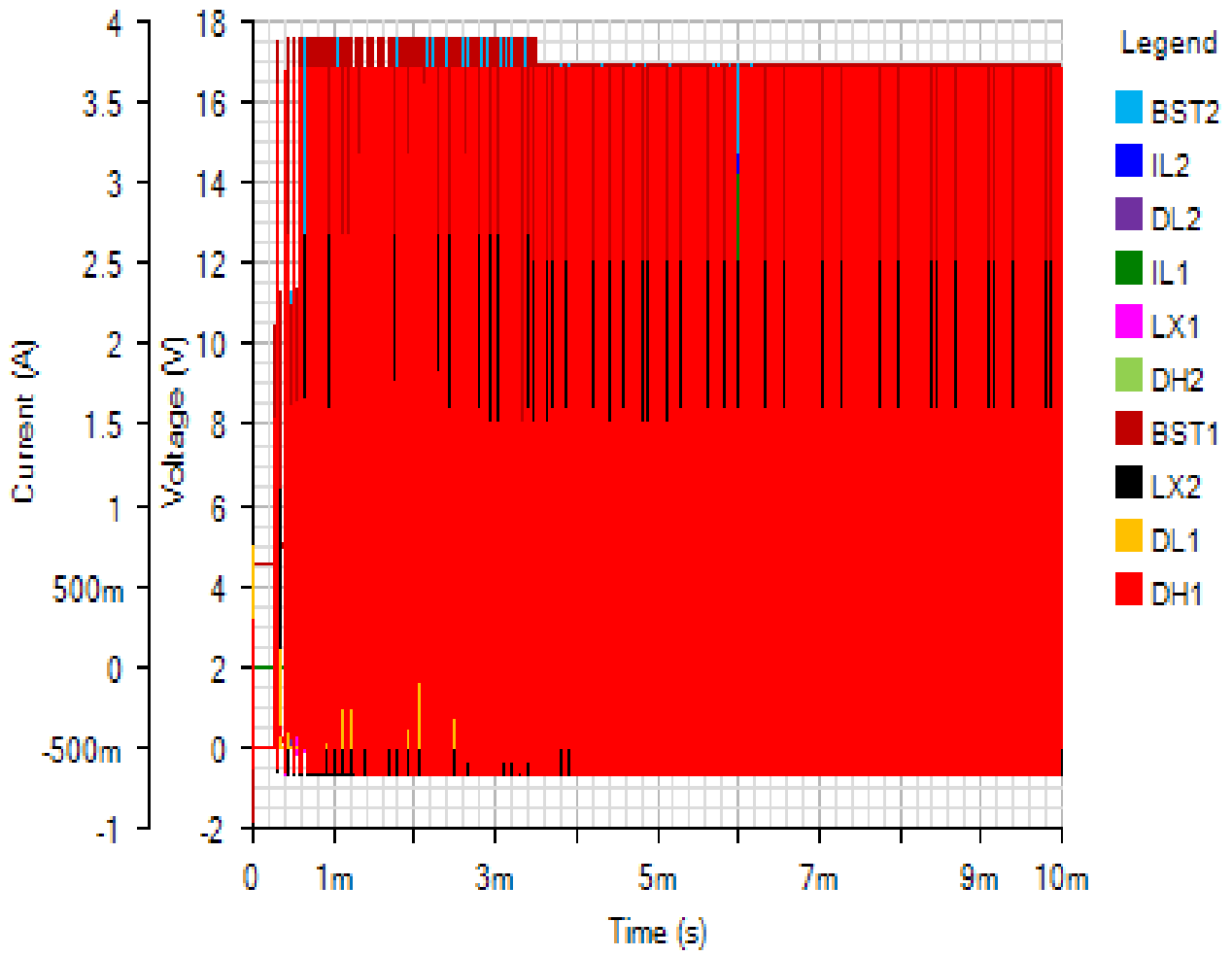
IC

Default



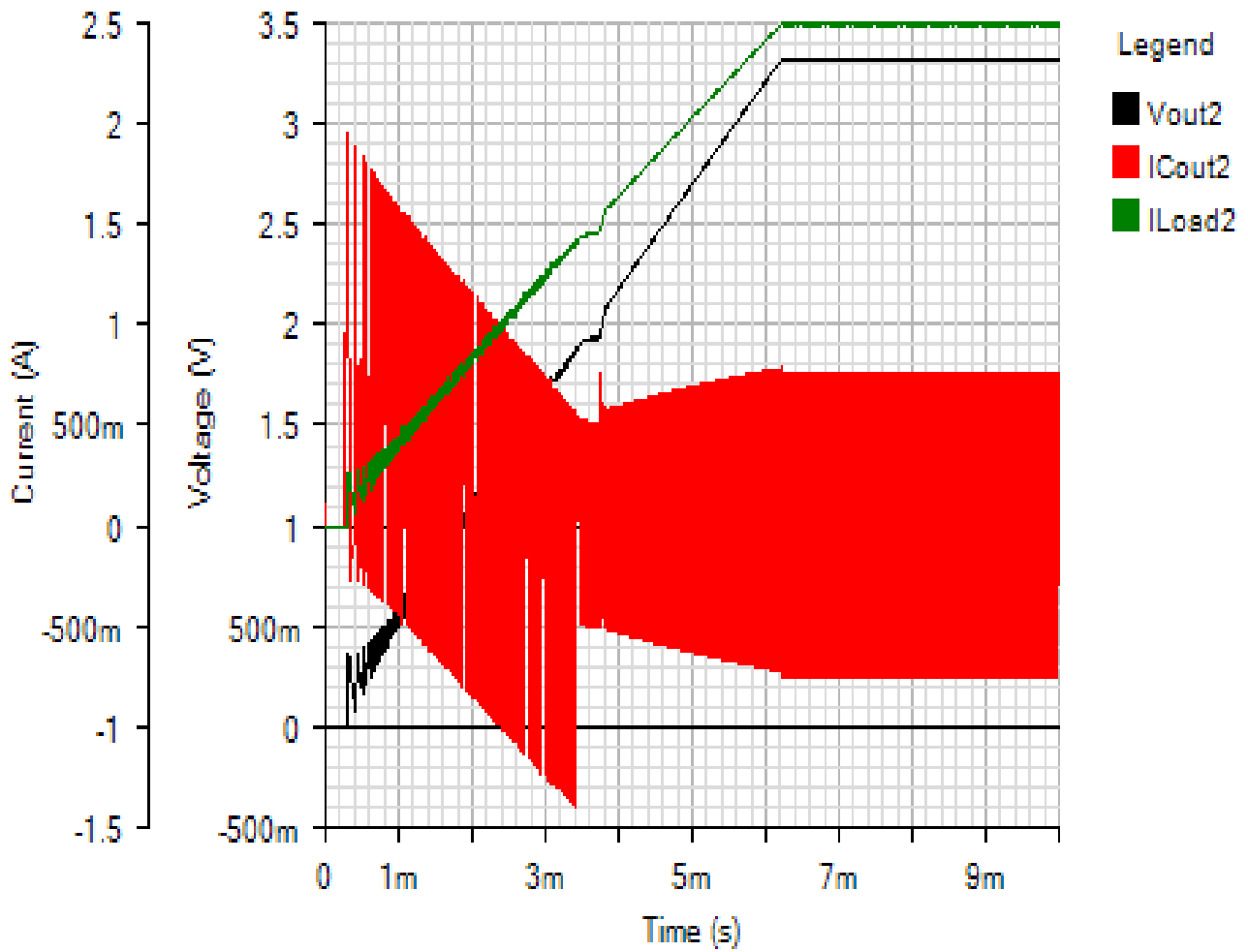
SWITCHING

Default



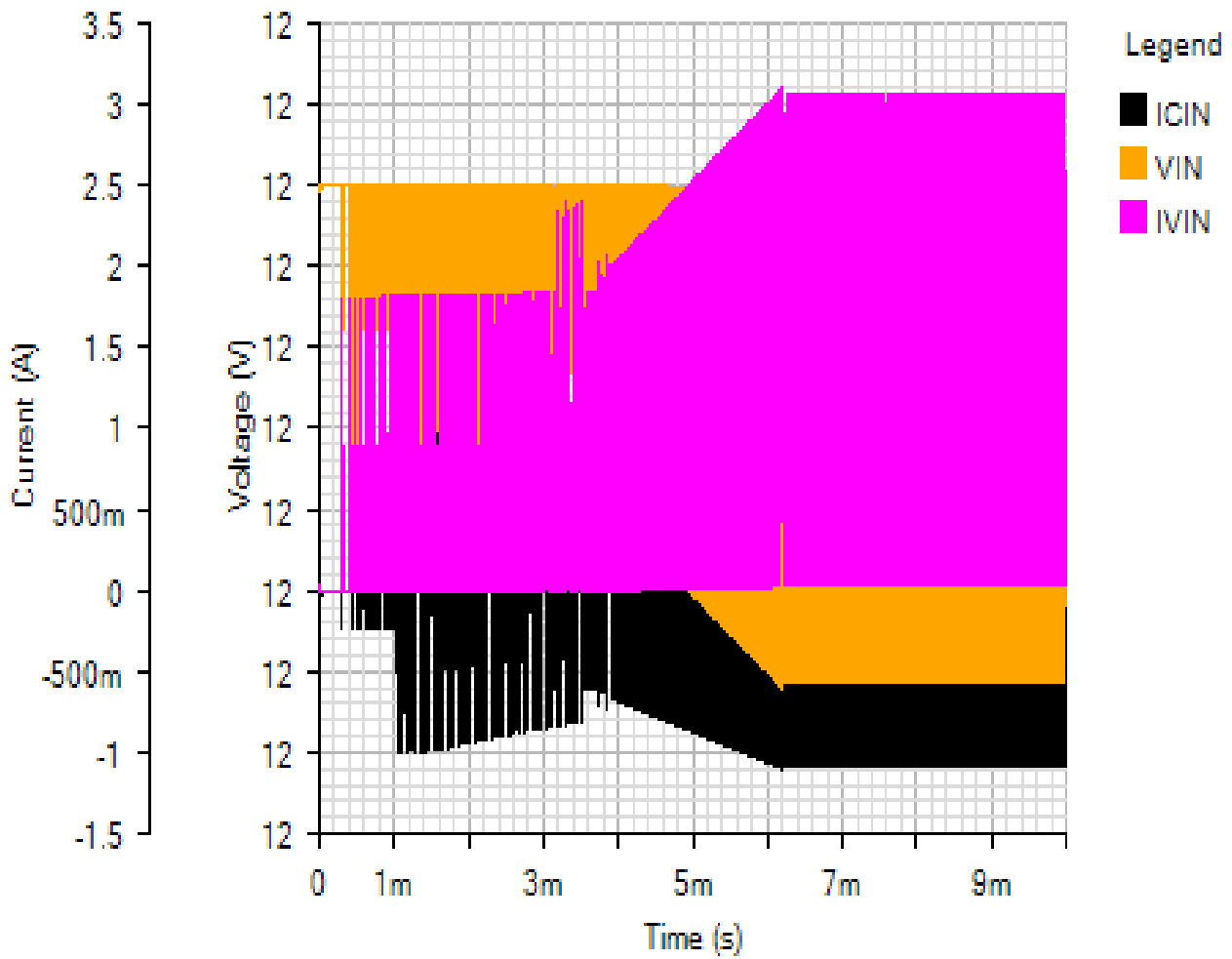
OUTPUT2

Default



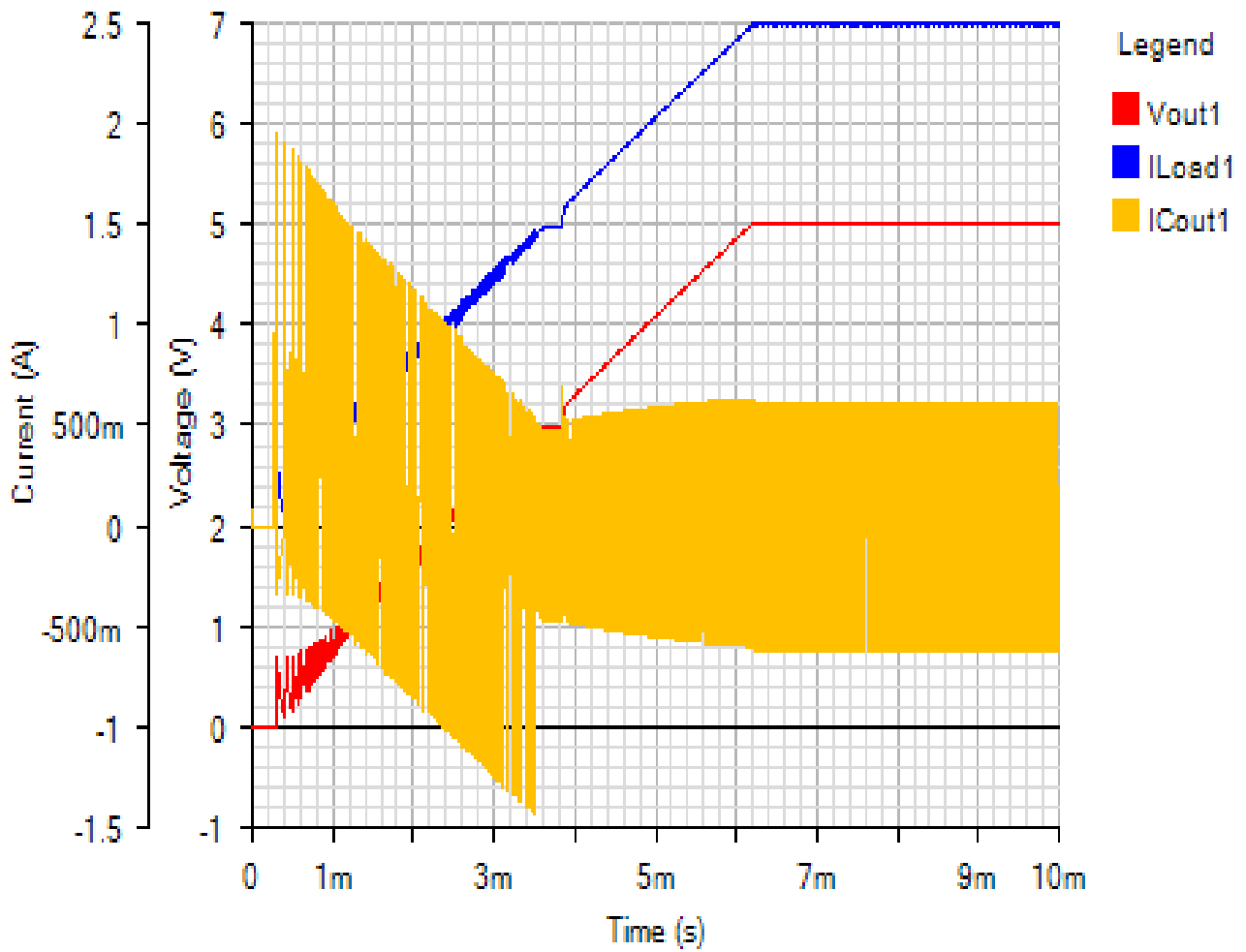
INPUT

Default



OUTPUT1

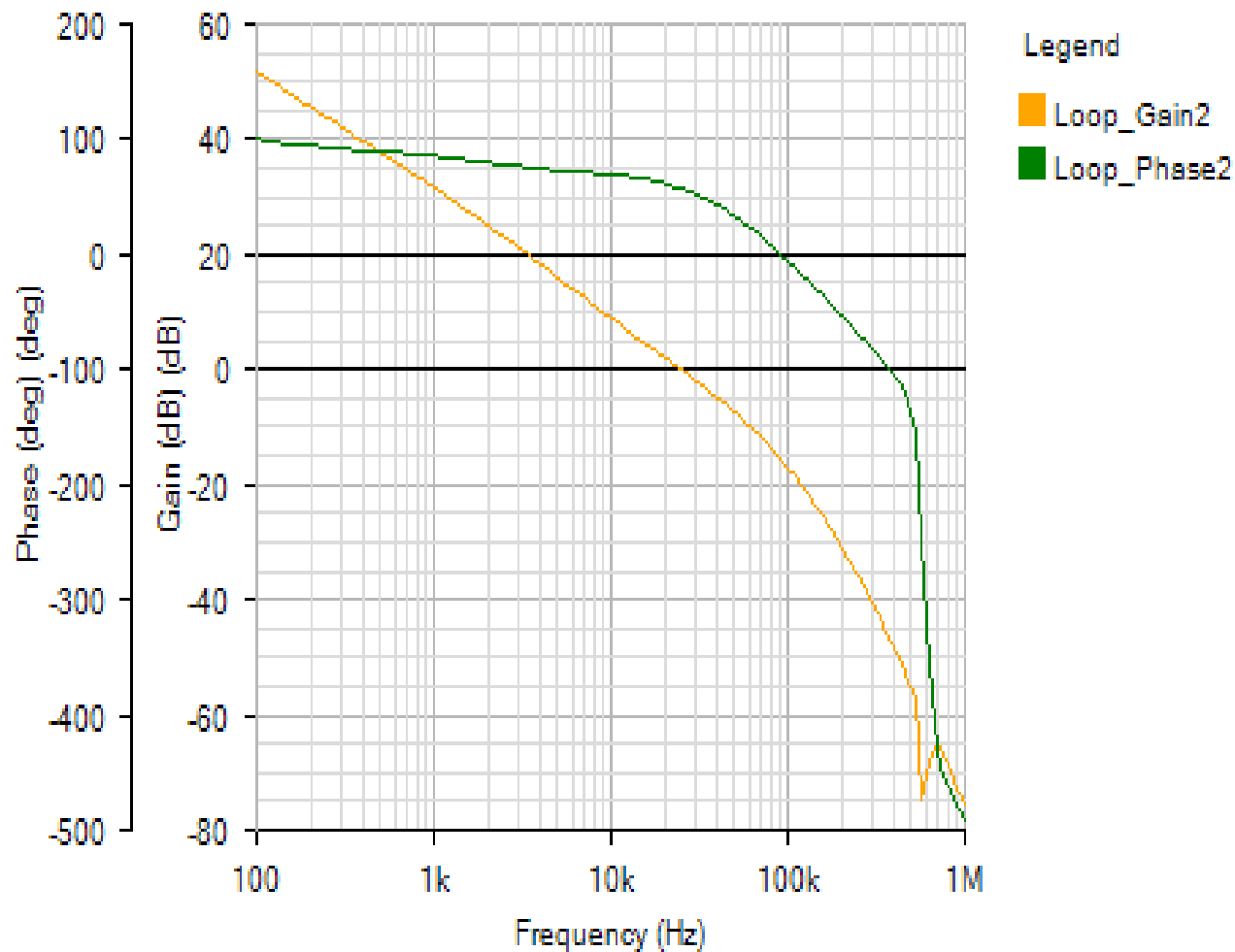
Default



AC Loop - Tue Nov 20 2018 12:11:53

BODE2

Default

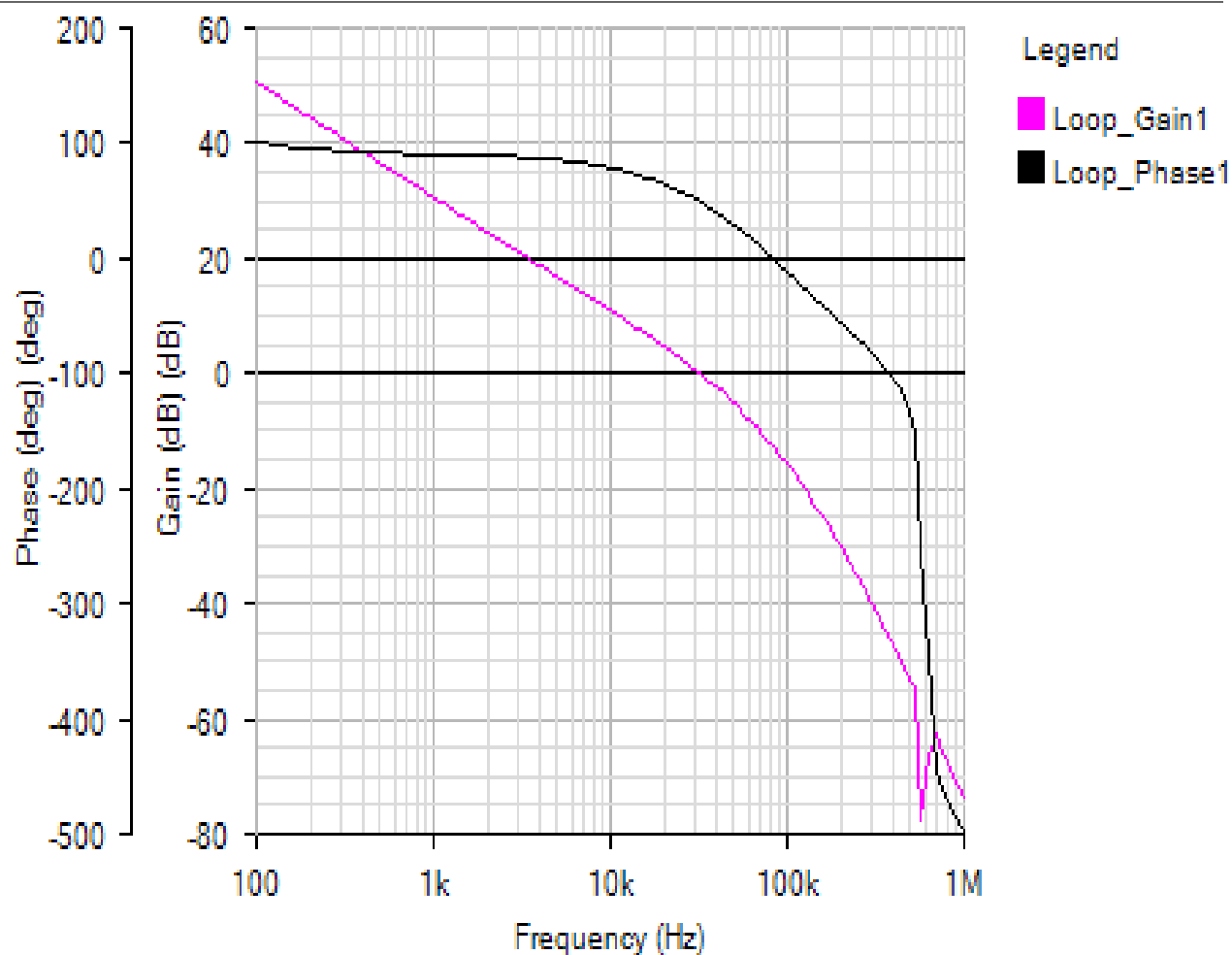


Phase Margin (output #2): 57.1° at a crossover frequency of 25kHz

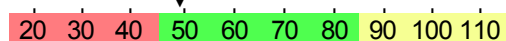


BODE1

Default



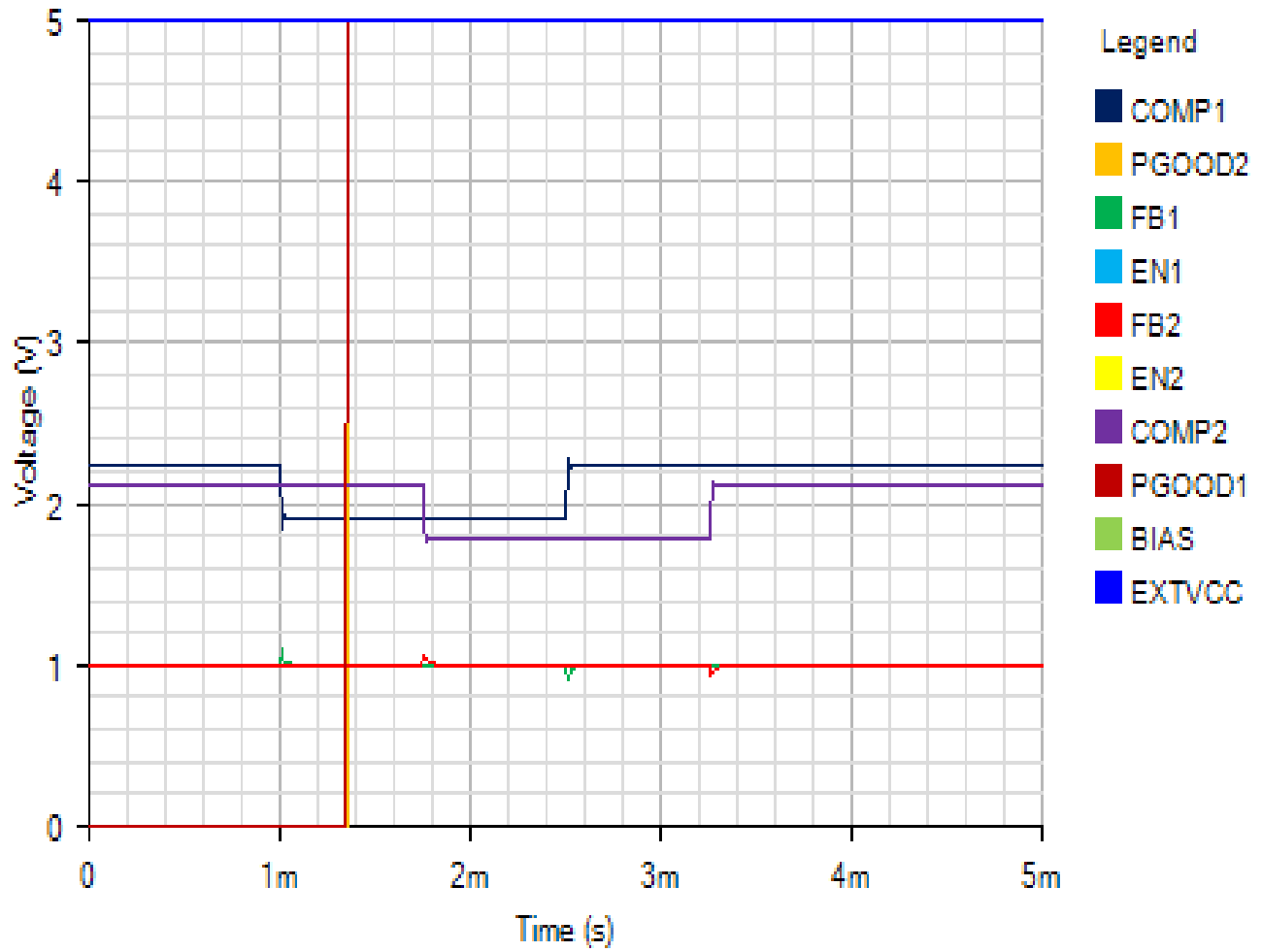
Phase Margin (output #1): 48.82° at a crossover frequency of 32.1kHz



Load Step - Tue Nov 20 2018 12:11:53

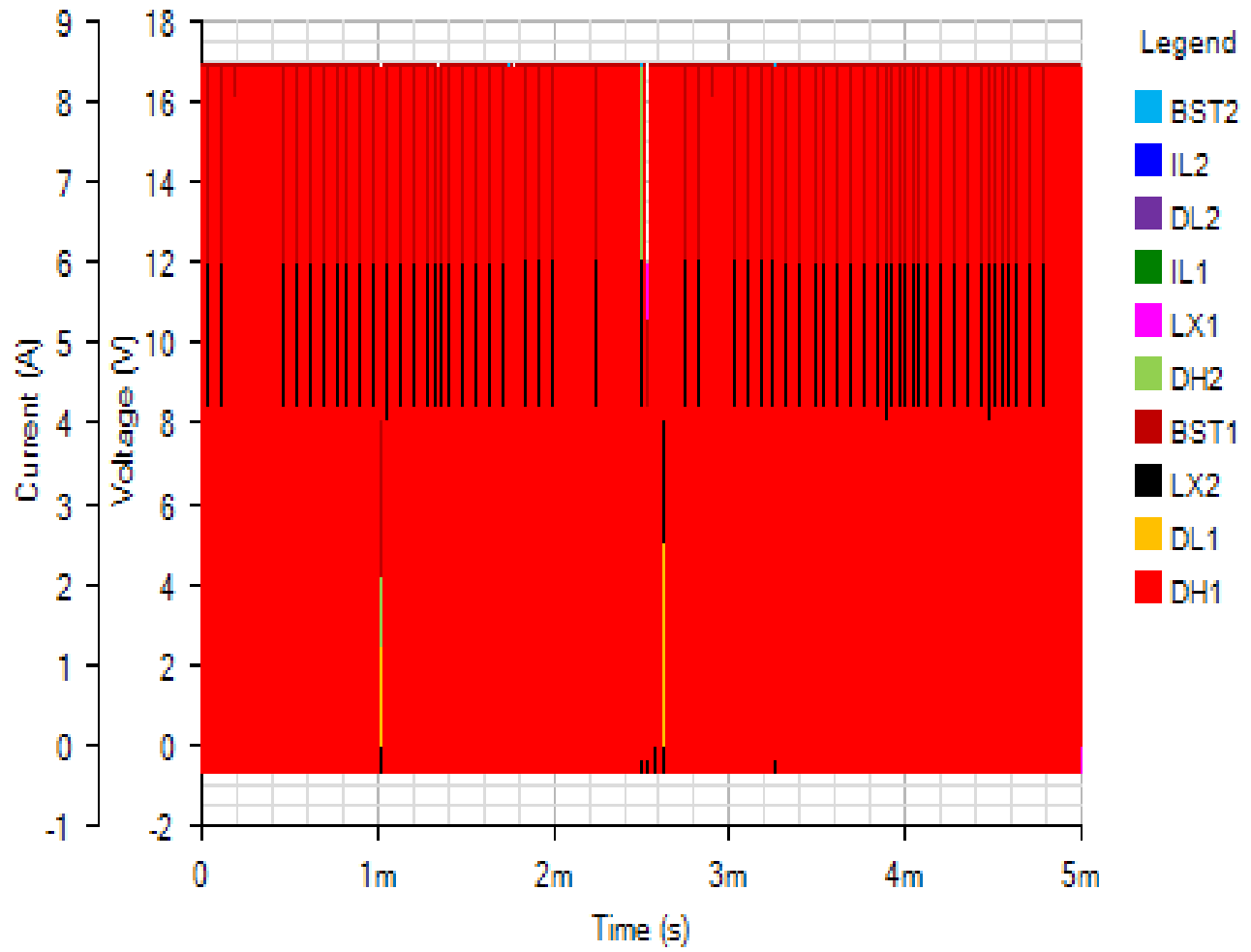
IC

Default



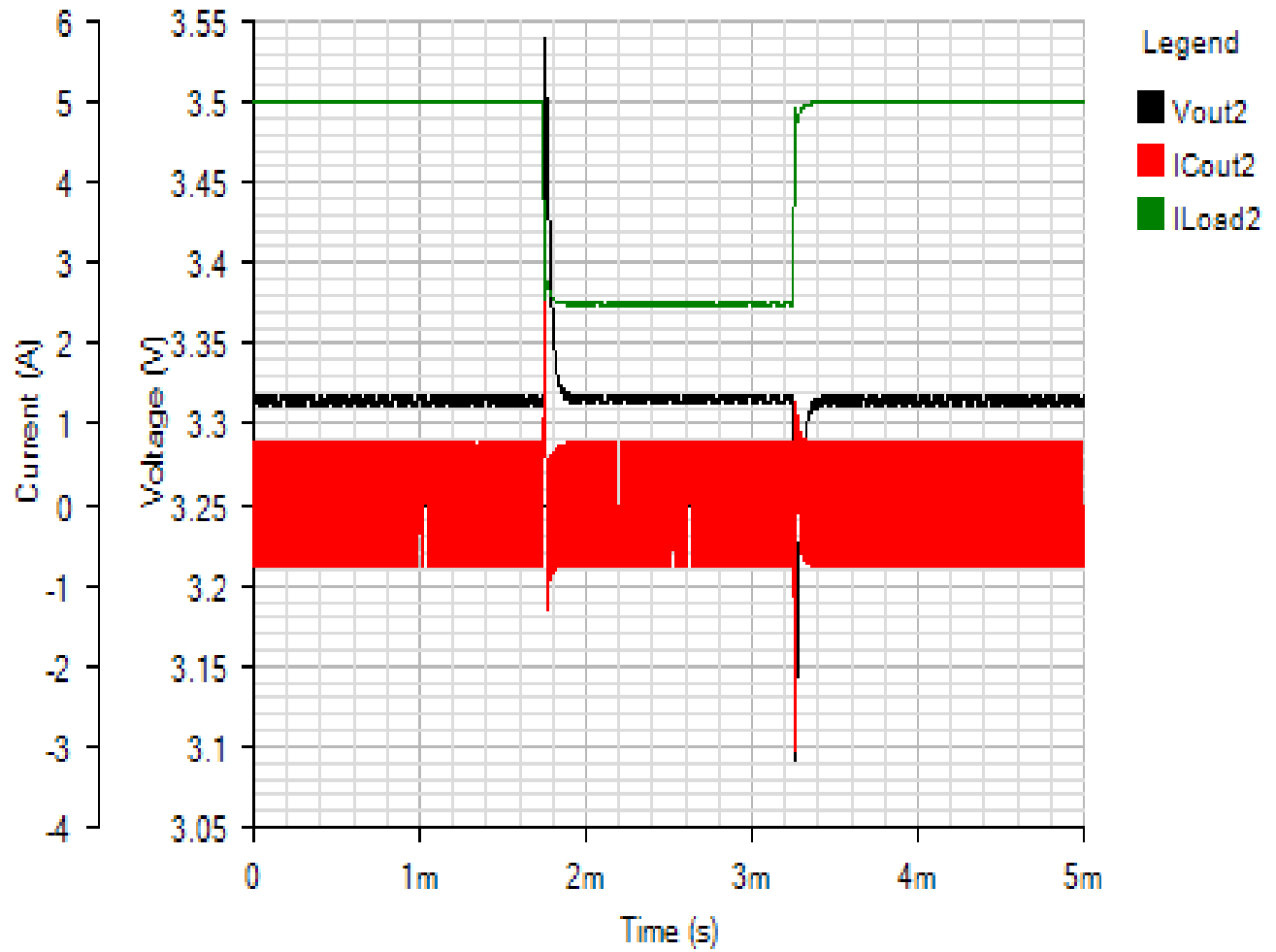
SWITCHING

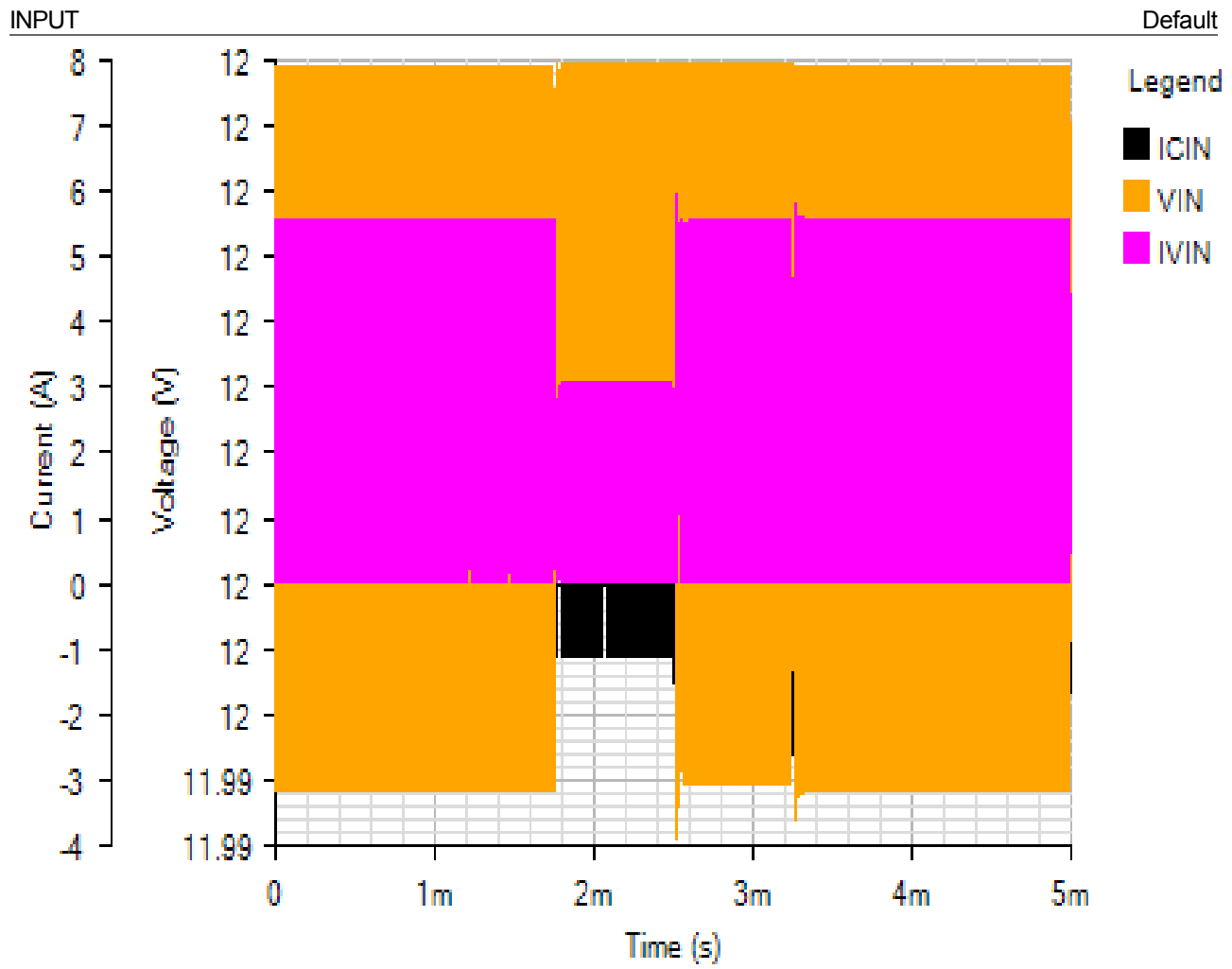
Default



OUTPUT2

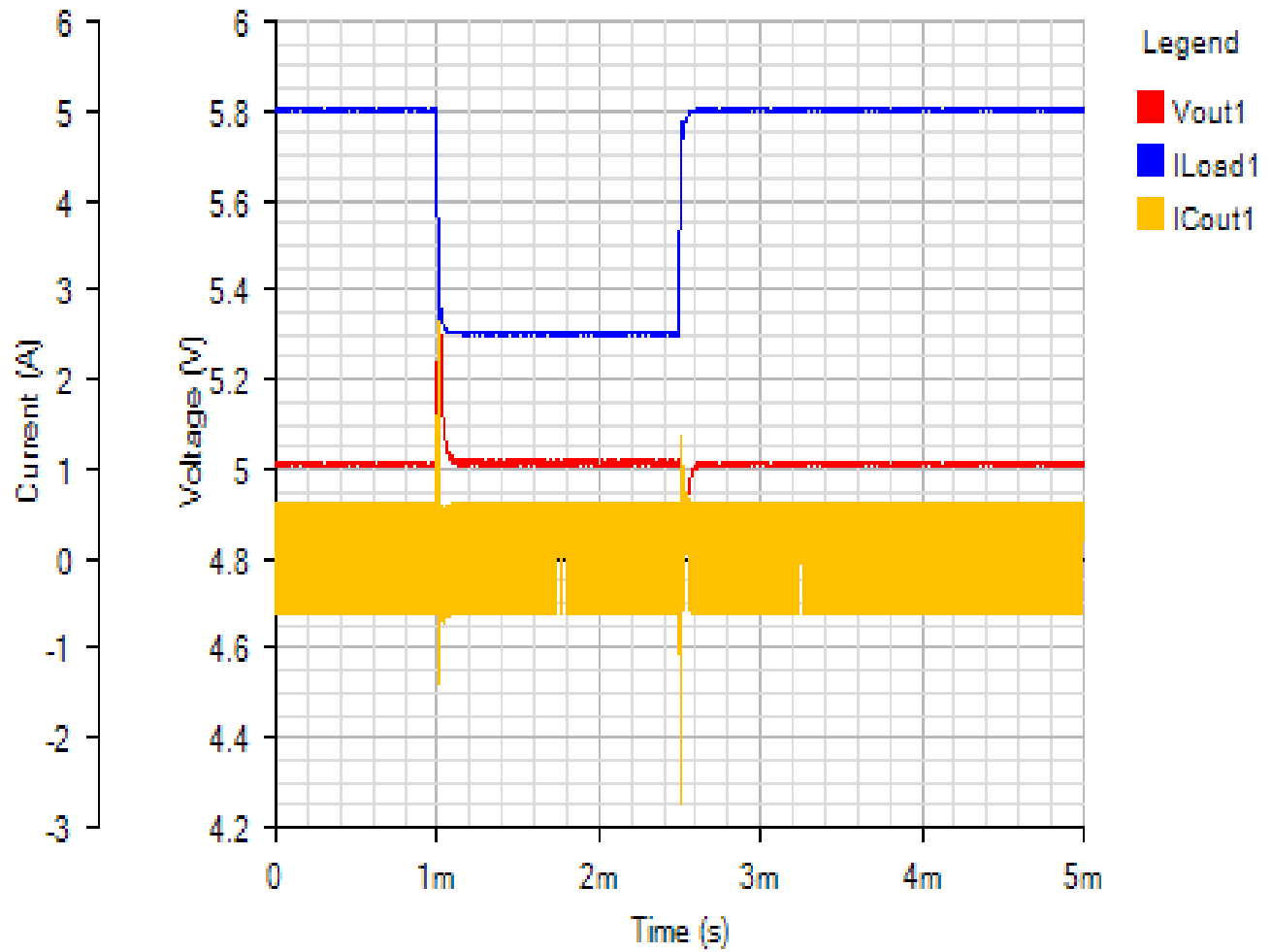
Default





OUTPUT1

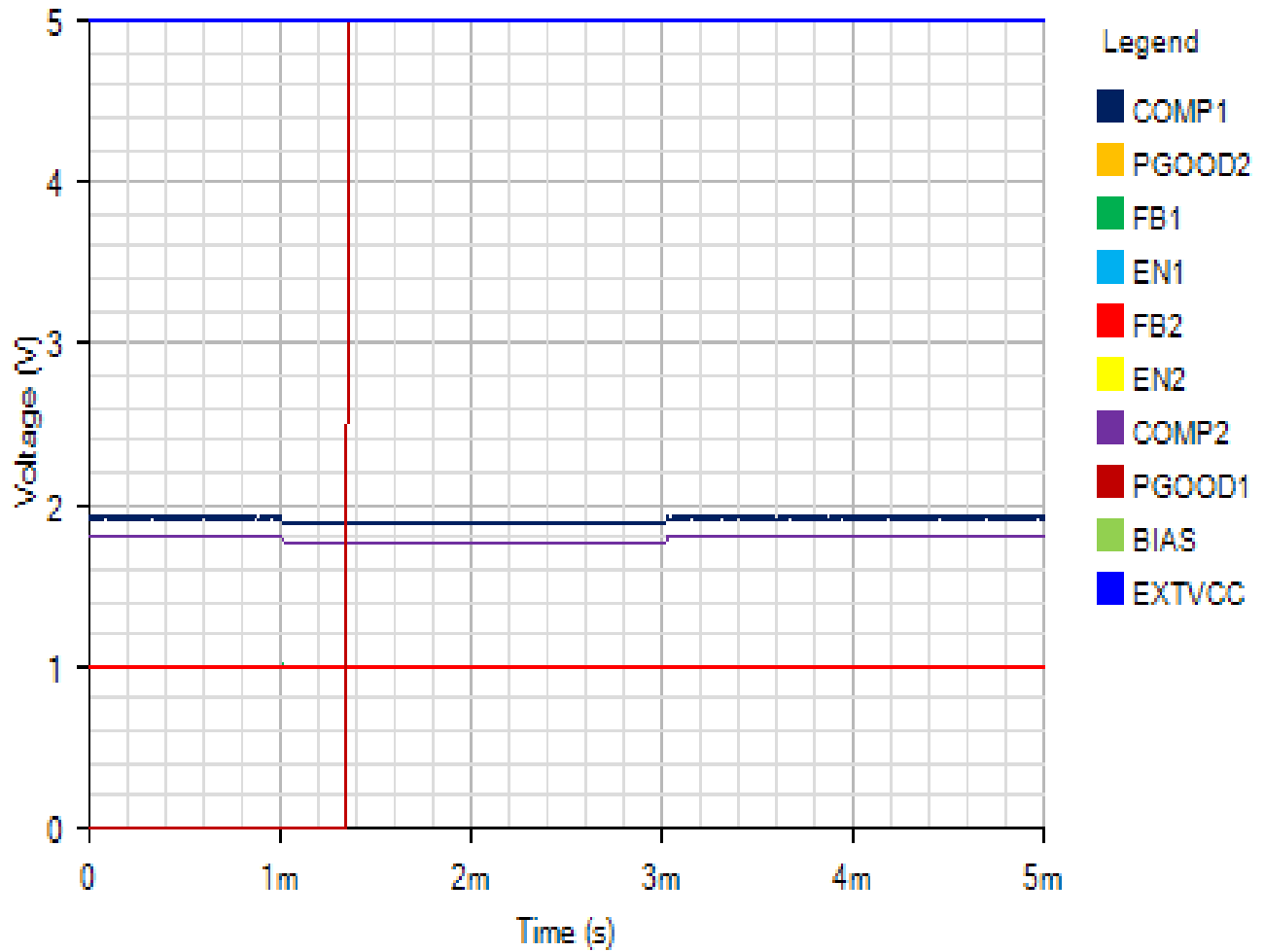
Default



Line Transient - Tue Nov 20 2018 12:11:53

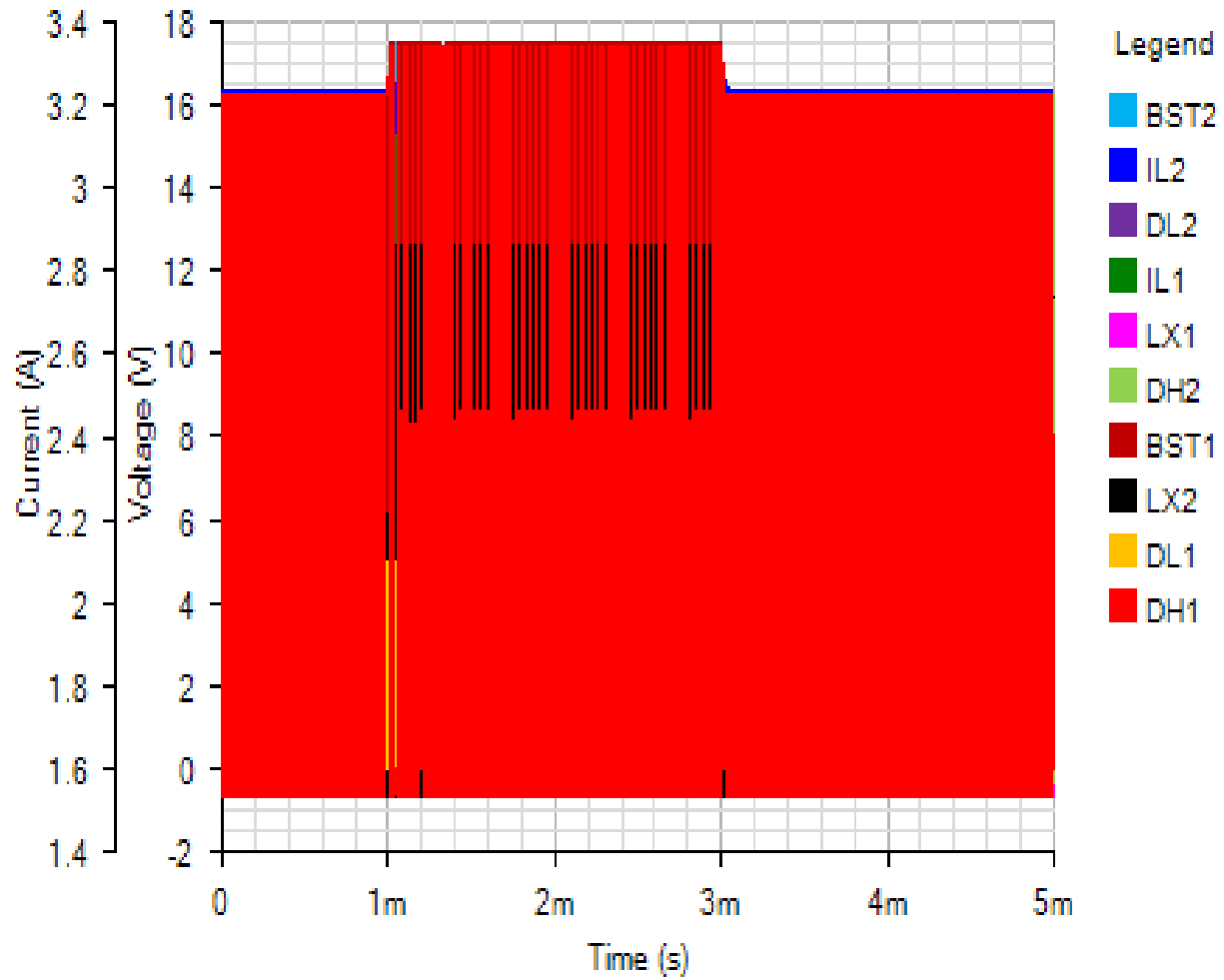
IC

Default



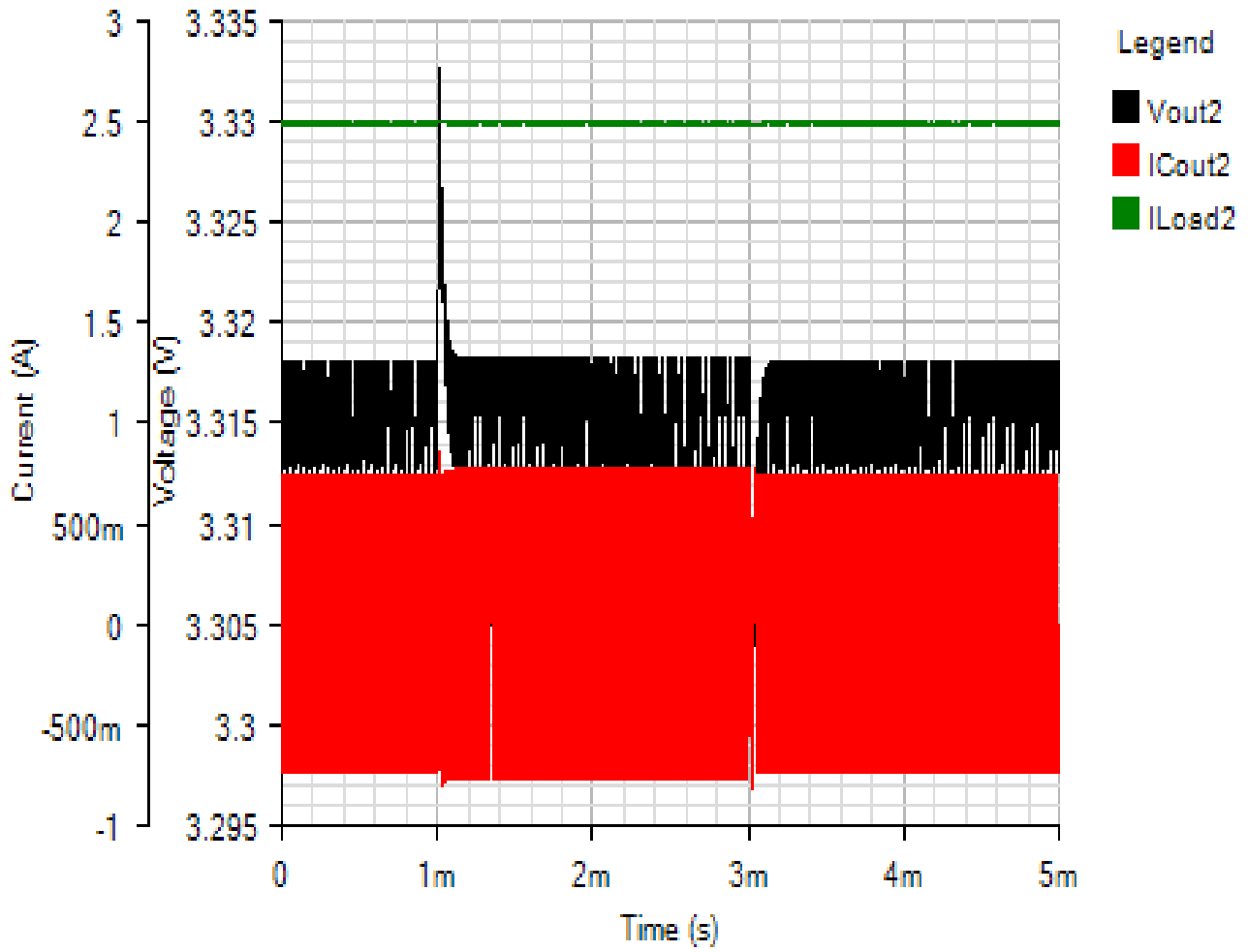
SWITCHING

Default



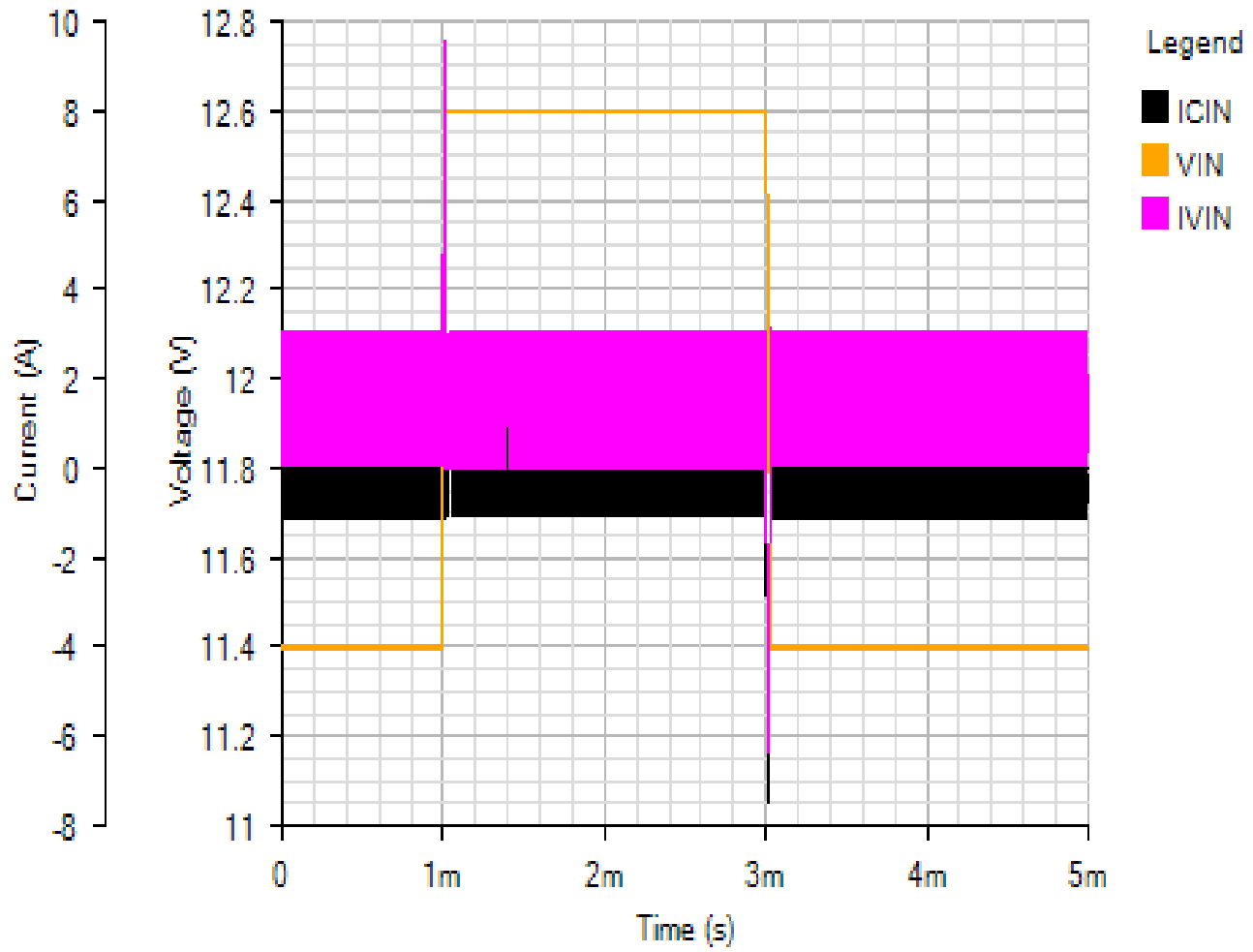
OUTPUT2

Default



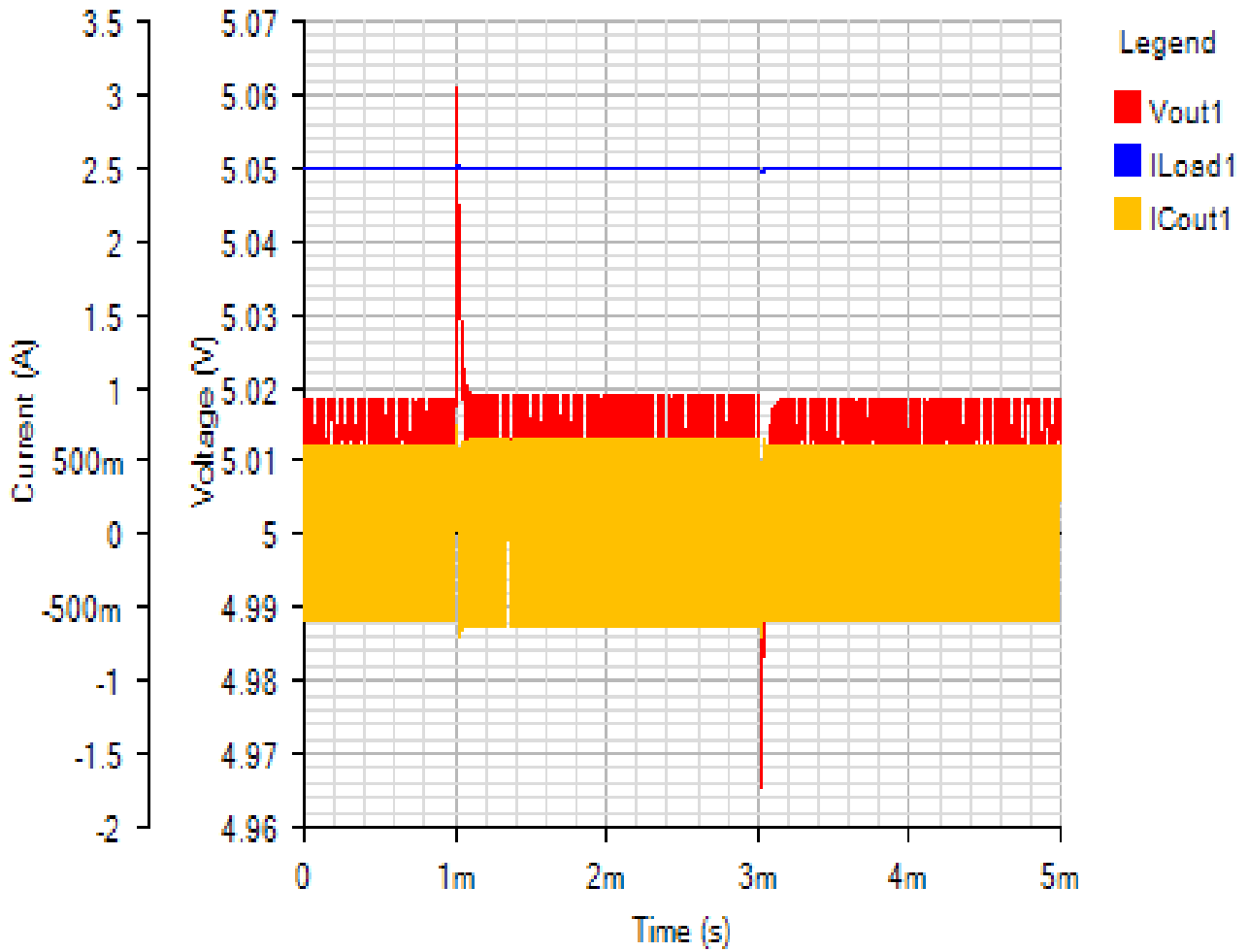
INPUT

Default

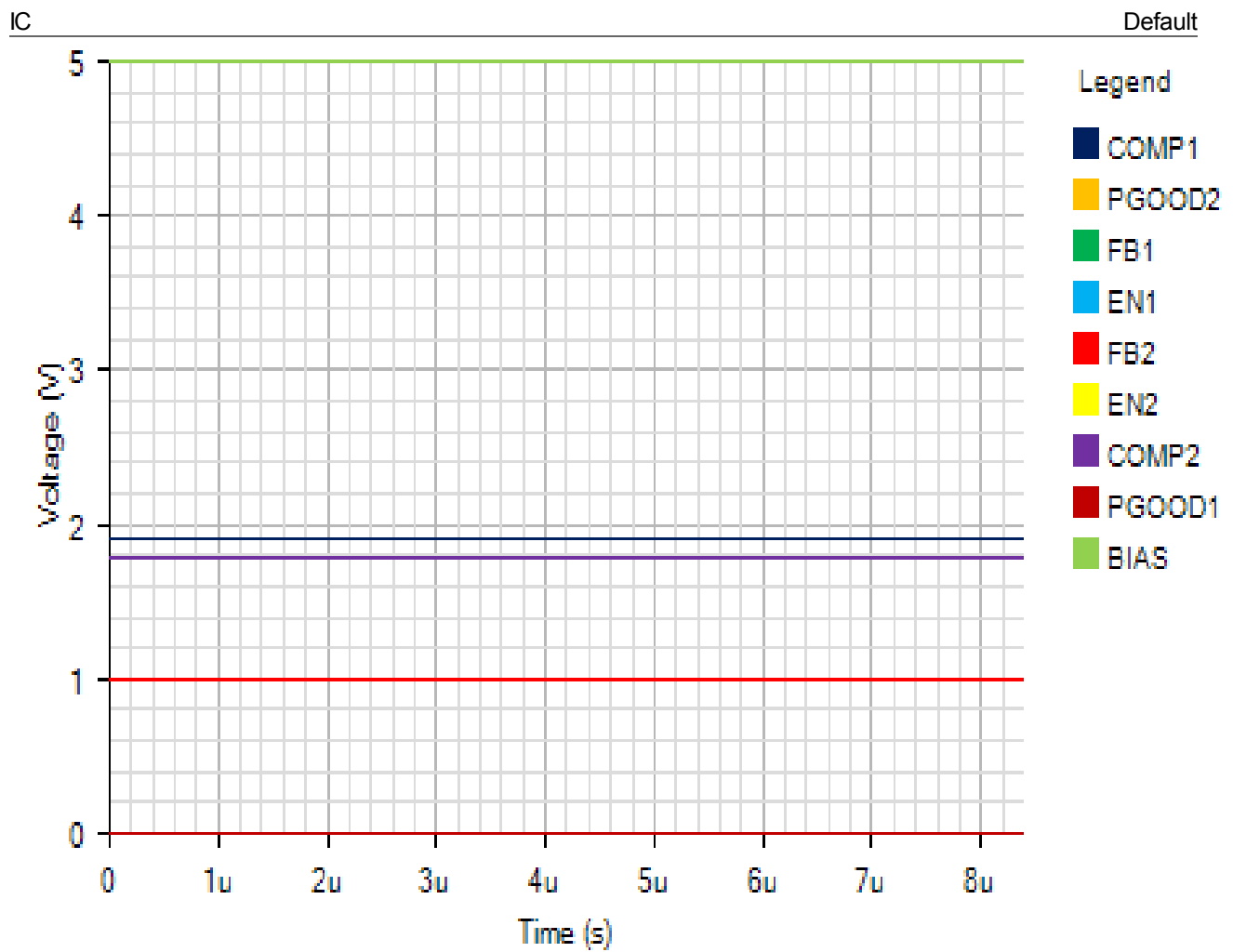


OUTPUT1

Default

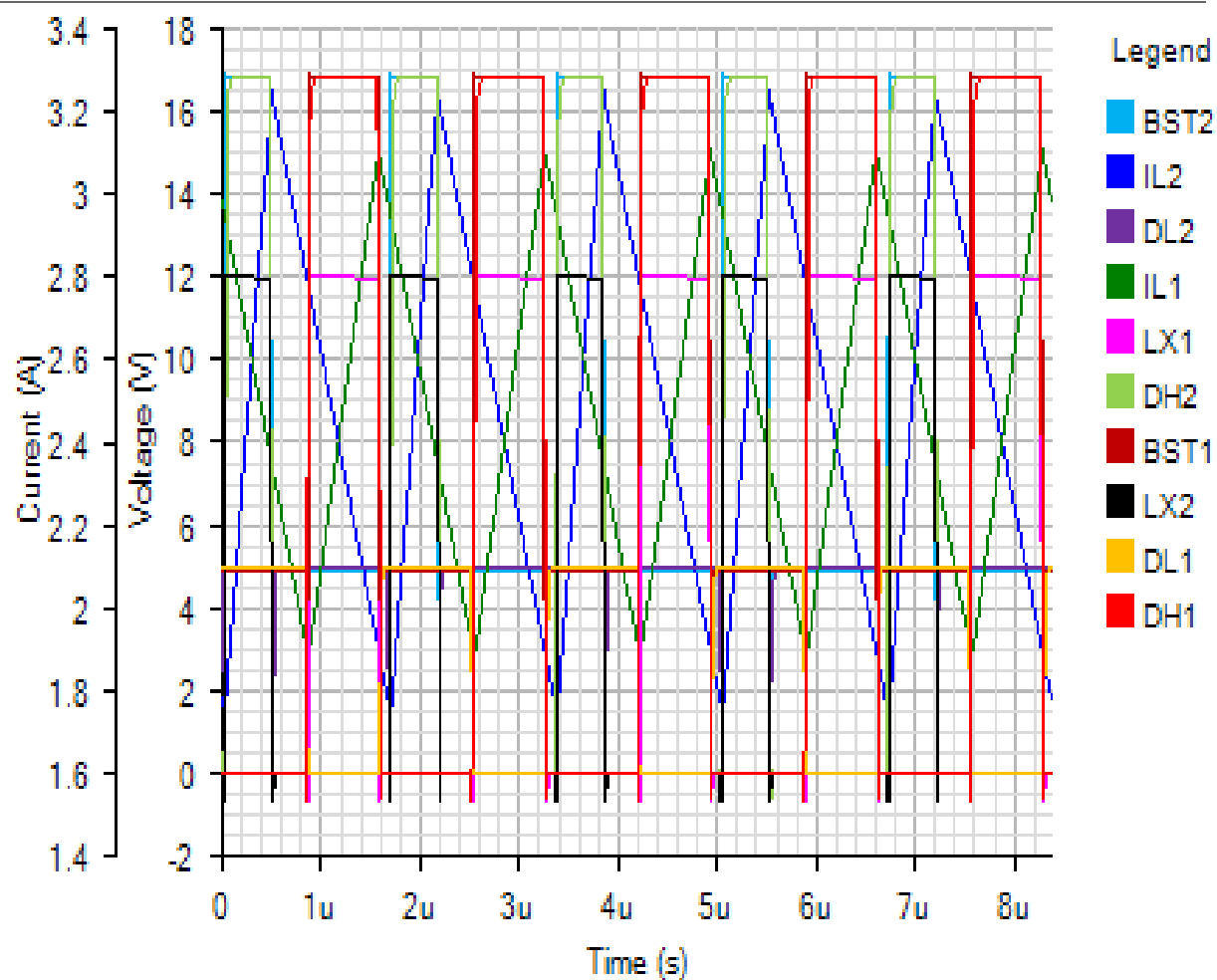


Steady State - Tue Nov 20 2018 12:11:53



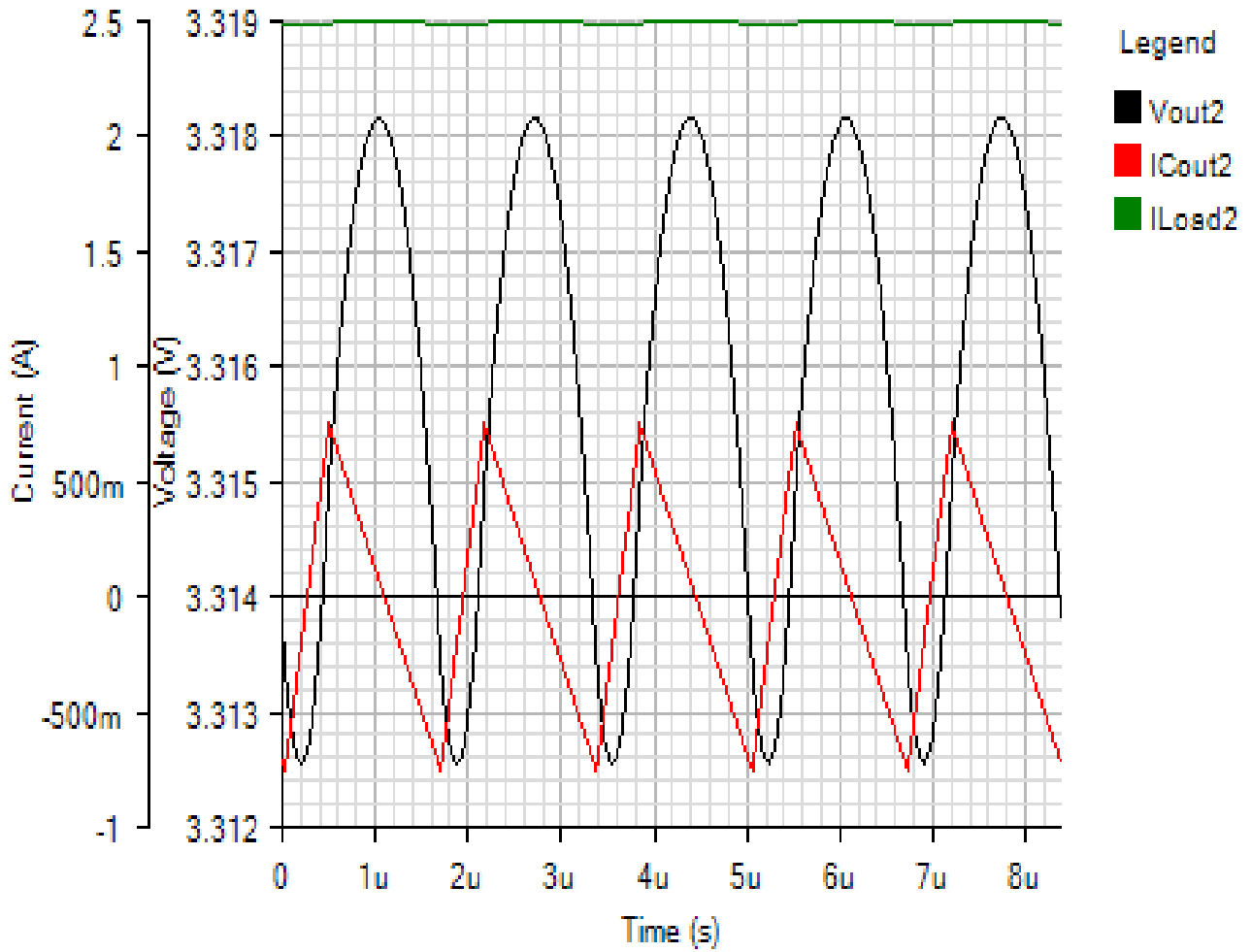
SWITCHING

Default



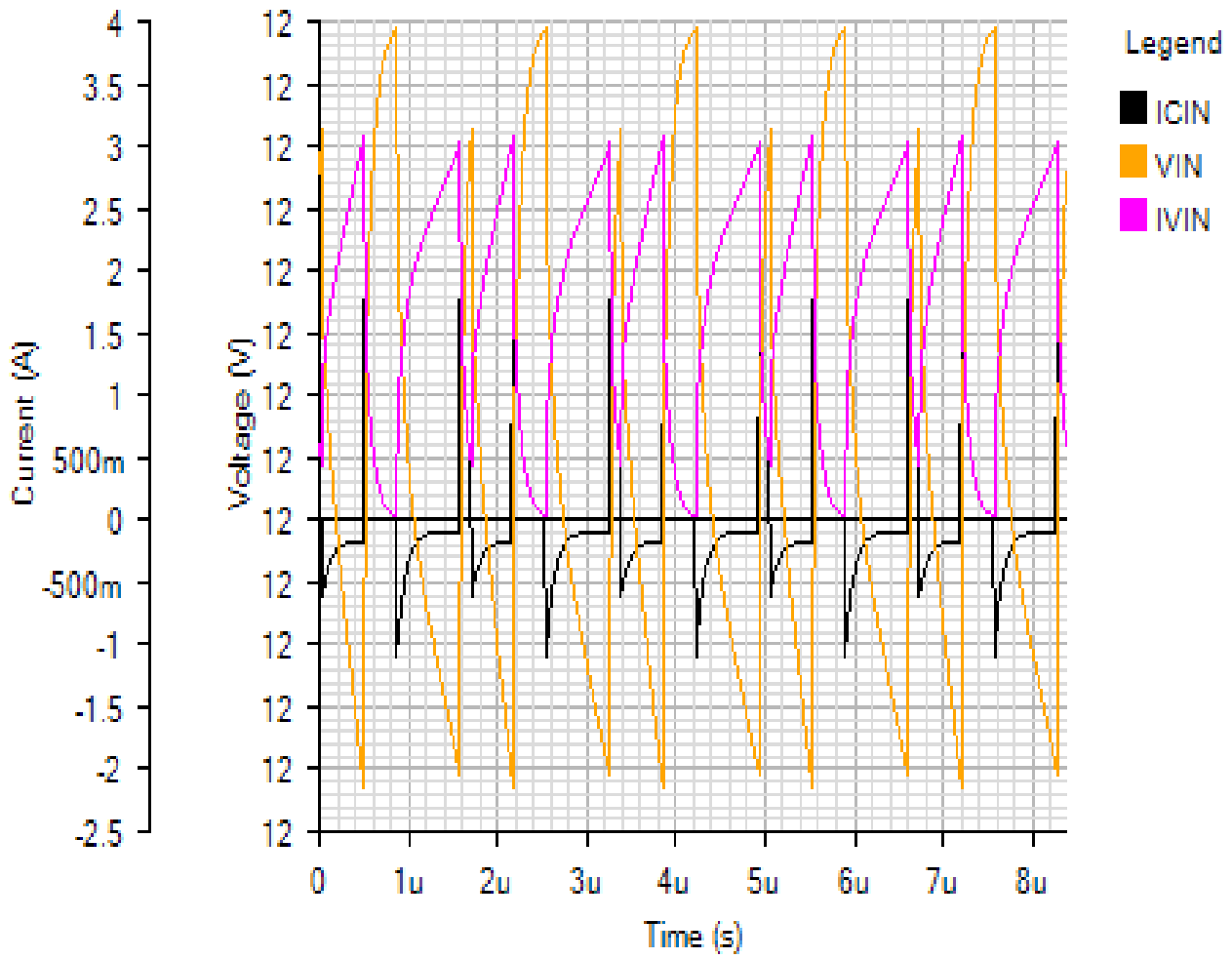
OUTPUT2

Default



INPUT

Default



OUTPUT1

Default

