

Design Requirements changed

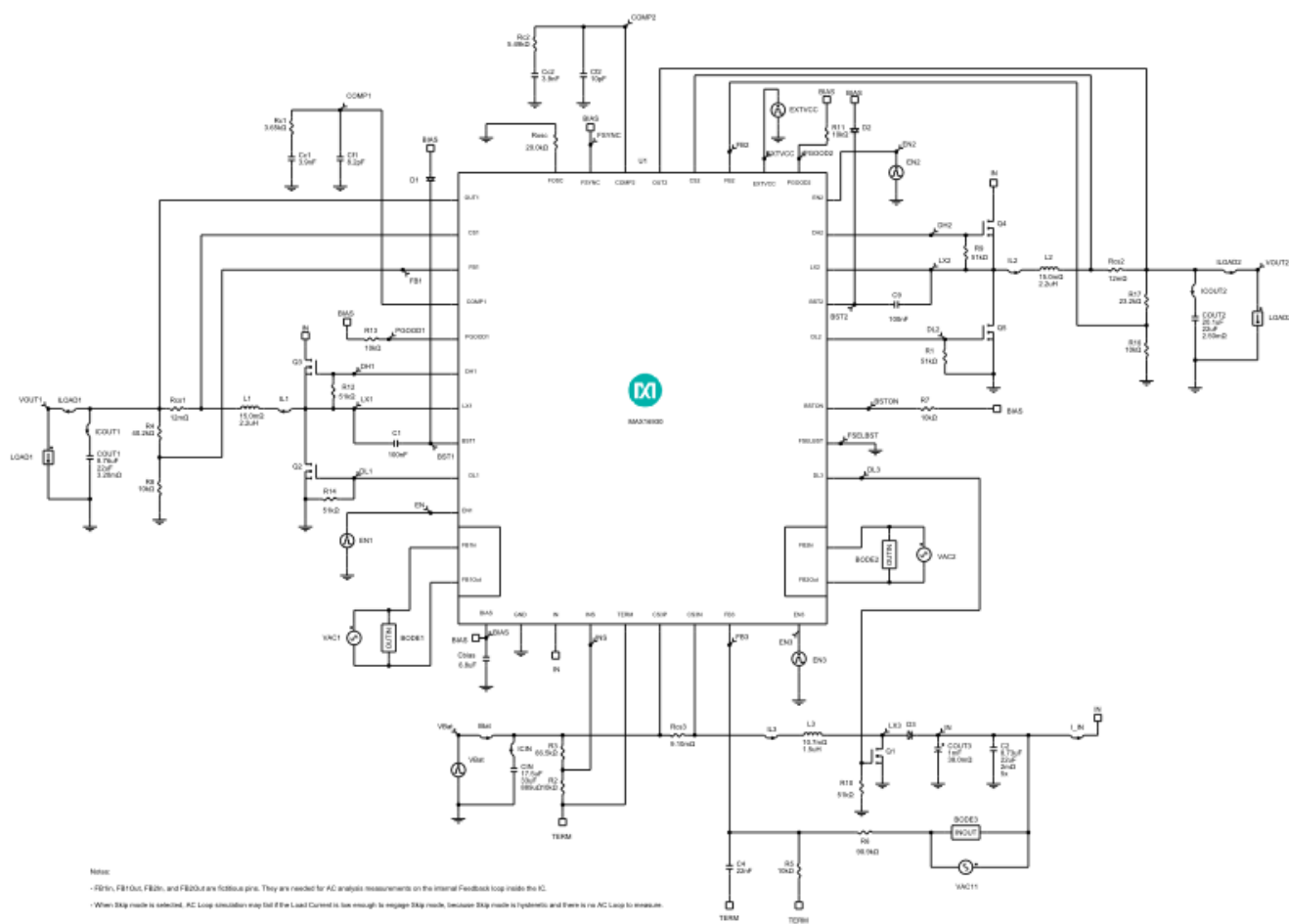
2.0

Design Requirements

Parameter	Value
Output Configuration	Adjustable Output Voltage
Minimum Input Voltage	7.5V
Maximum Input Voltage	14V
Nominal Input Voltage	12V
Input Voltage Ripple	0.5%
Output 1 Voltage	5V
Output 1 Current	3A
Output 2 Voltage	3.3V
Output 2 Current	3A
Output 1 Voltage Ripple	1%
Output 1 Load Step Start Current	1.5A
Output 1 Load Step Current	3A
Output 1 Load Step Edge Rate	1A/us
Output 1 Voltage Load Step Over/Undershoot	5%
Output 2 Voltage Ripple	1%
Output 2 Load Step Start Current	1.5A
Output 2 Load Step Current	3A
Output 2 Load Step Edge Rate	1A/us
Output 2 Voltage Load Step Over/Undershoot	5%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Input Voltage Sense	Enable
Preboost Turn ON Threshold	8.8V

Parameter	Value
Preboost Output Voltage	12V
Preboost Inductor Current ration (LIR)	0.3
Preboost Peak Current Limit	11.93A
Mode	PWM
Switching Frequency	1600000Hz
Ambient Temperature	25°C
Inductor 1 Current Ratio	0.3
Inductor 2 Current Ratio	0.3
Peak Current Limit Output 1	5.175A
Peak Current Limit Output 2	5.175A

Schematic



BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX16930	User-Defined	IC
C1	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
C2	5	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
C4	1	VJ0603Y223JXACW1BC	Vishay	Cap Ceramic 0.022uF 50V X7R 5% Pad SMD 0603 125°C T/R
C9	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
CIN	1	C4532X5R1C336M250KA	TDK	Cap Ceramic 33uF 16V 1812 85C
COUT1	1	GRM21BR61A226ME51L	Murata	Cap Ceramic 22uF 10V X5R 20% SMD 0805 85C Embossed T/R
COUT2	1	GRM32DR61C226KE18L	Murata	Cap Ceramic 22uF 16V X5R 10% SMD 1210 85C Embossed T/R
				Cap Aluminum Lytic 1000uF 25V

COUT3	1	EEUTP1E102	Panasonic	20% (12.5 X 20mm) Radial 5mm 0.038 Ohm 1490mA 2000h 135C Bulk
Cbias	1	04023C685KAT2A	AVX	Cap Ceramic 6.8uF 25V X7R 10% Pad SMD 0402 125°C T/R
Cc1	1	CGA3E2C0G1H392J080AA	TDK	Cap Ceramic 0.0039uF 50V C0G 5% Pad SMD 0603 125°C Automotive T/R
Cc2	1	CGA3E2C0G1H392J080AA	TDK	Cap Ceramic 0.0039uF 50V C0G 5% Pad SMD 0603 125°C Automotive T/R
Cf1	1	C0603C829J5GACTU	KEMET Corporation	Cap Ceramic 8.2pF 50V C0G 5% Pad SMD 0603 125°C T/R
Cf2	1	VJ0603A100JXACW1BC	Vishay	Cap Ceramic 10pF 50V C0G 5% Pad SMD 0603 125°C T/R
D1	1	MBR0520L	ON Semiconductor	Diode Schottky 20V 0.5A 2-Pin SOD-123 T/R
D2	1	MBR0520L	ON Semiconductor	Diode Schottky 20V 0.5A 2-Pin SOD-123 T/R
D3	1	V15P45S-M3/86A	Vishay	Diode Schottky 45V 15A 3- Pin(2+Tab) SMPC T/R
L1	1	VLP8040T-2R2N	TDK	Inductor Power Shielded Wirewound 2.2uH 30% 100KHz Ferrite 6.2A 15mOhm DCR Embossed Carrier T/R
L2	1	VLP8040T-2R2N	TDK	Inductor Power Shielded Wirewound 2.2uH 30% 100KHz Ferrite 6.2A 15mOhm DCR Embossed Carrier T/R
L3	1	SPM6530T-1R5M100	TDK	Inductor Power Shielded Wirewound 1.5uH 20% 100KHz Metal 11A 10.67mOhm DCR T/R
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	BSC120N03MS G	Infineon Technologies	Trans MOSFET N-CH 30VDS 14mOhm@4.5V 13mOhm@6V 7.2nC 3.7nC 1.1nF 0.39nF 150°C 36A 28W 4.5°C/W 1.1mm 34mm^2 PG-TDSON-8 Trans MOSFET N-CH 30VDS

Q5	1	FDMS0310AS	Fairchild Semiconductor	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	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°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	ERJ2RKF6652X	Panasonic	Res Thick Film 0402 66.5K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF4022V	Panasonic	Res Thick Film 0603 40.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R6	1	ERJ2RKF9092X	Panasonic	Res Thick Film 0402 90.9K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R7	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R8	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R9	1	ERJ3EKF5102V	Panasonic	Res Thick Film 0603 51K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R10	1	ERJ3EKF5102V	Panasonic	Res Thick Film 0603 51K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R11	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R12	1	ERJ3EKF5102V	Panasonic	Res Thick Film 0603 51K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R13	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R14	1	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R16	1	ERJ2RKF1002X	Panasonic	Res Thick Film 0402 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R17	1	ERJ2RKF2322X	Panasonic	Res Thick Film 0402 23.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
Rc1	1	ERJ3EKF3651V	Panasonic	Res Thick Film 0603 3.65K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

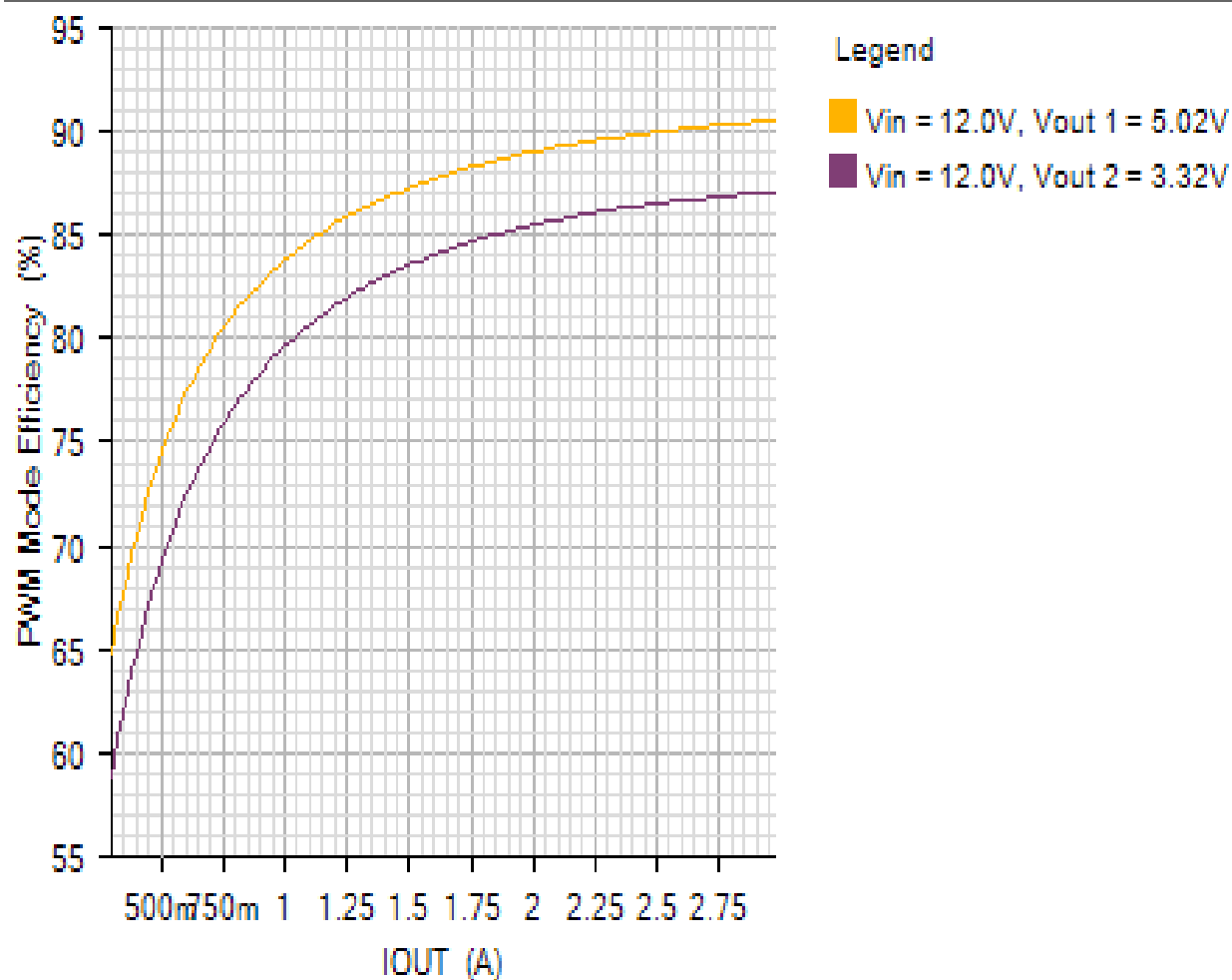
Rc2	1	ERJ3EKF5491V	Panasonic	Res Thick Film 0603 5.49K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R
Rcs1	1	NCSS12AFR012TRF	NIC Components	Res Metal Strip 1206 0.012 Ohm 1% 0.25W(1/4W) $\pm 75\text{ppm}/^\circ\text{C}$ Pad SMD T/R
Rcs2	1	NCSS12AFR012TRF	NIC Components	Res Metal Strip 1206 0.012 Ohm 1% 0.25W(1/4W) $\pm 75\text{ppm}/^\circ\text{C}$ Pad SMD T/R
Rcs3	1	SL1TTE9L10F	KOA Speer Electronics	Res Metal Plate 2512 0.0091 Ohm 1% 1W $\pm 180\text{ppm}/^\circ\text{C}$ J-Lead SMD Automotive T/R
Rosc	1	ERJ3EKF2002V	Panasonic	Res Thick Film 0603 20K Ohm 1% 0.1W(1/10W) $\pm 100\text{ppm}/^\circ\text{C}$ Pad SMD Automotive T/R

Simulation Results

Efficiency - Mon Nov 19 2018 13:53:48

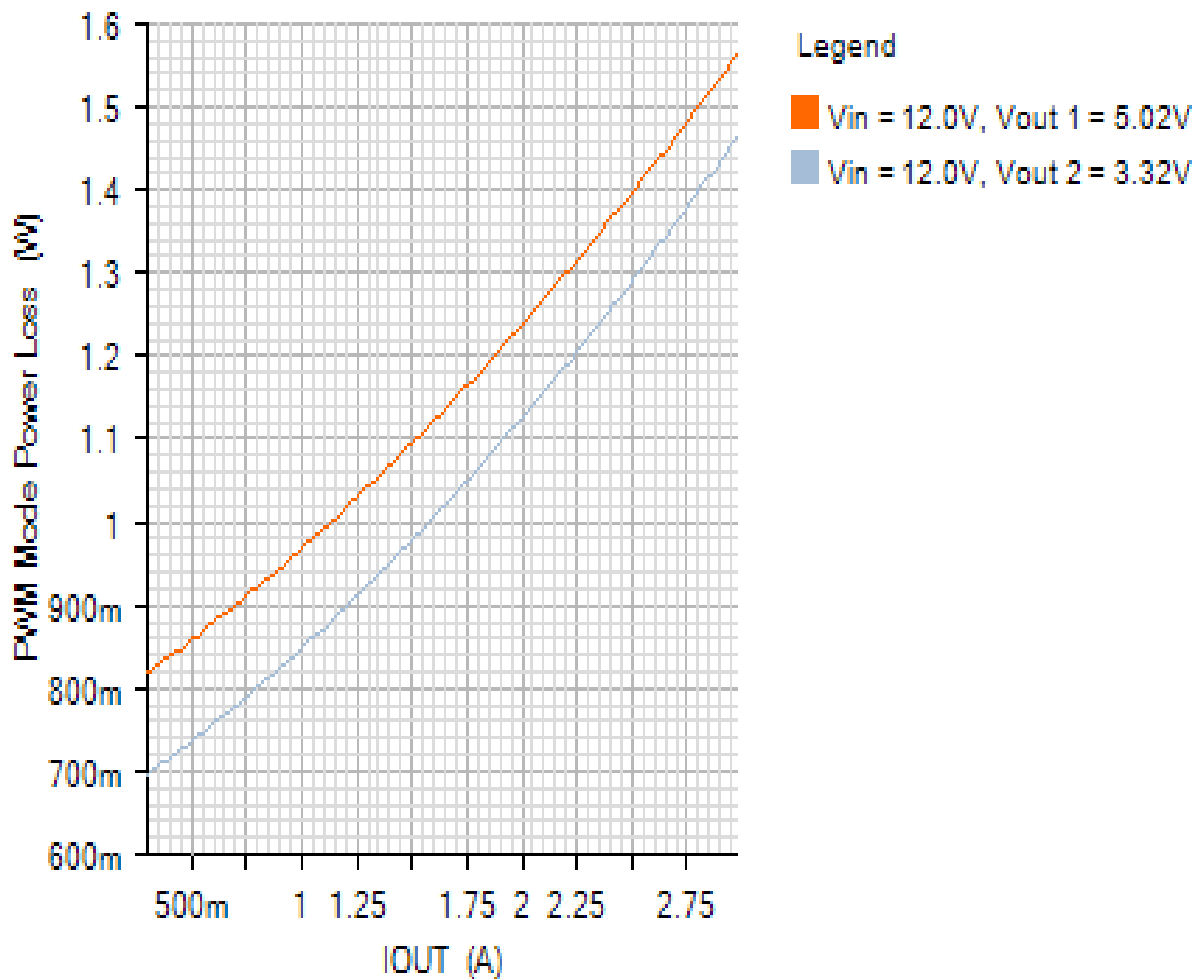
EFFICIENCY_PLOT

Default

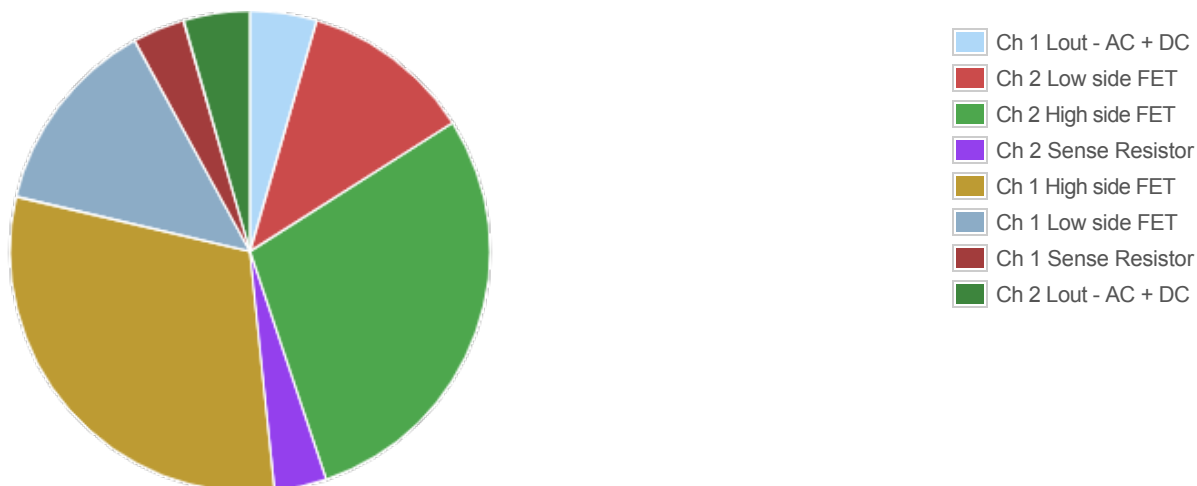


POWER_LOSS_PLOT

Default



Losses

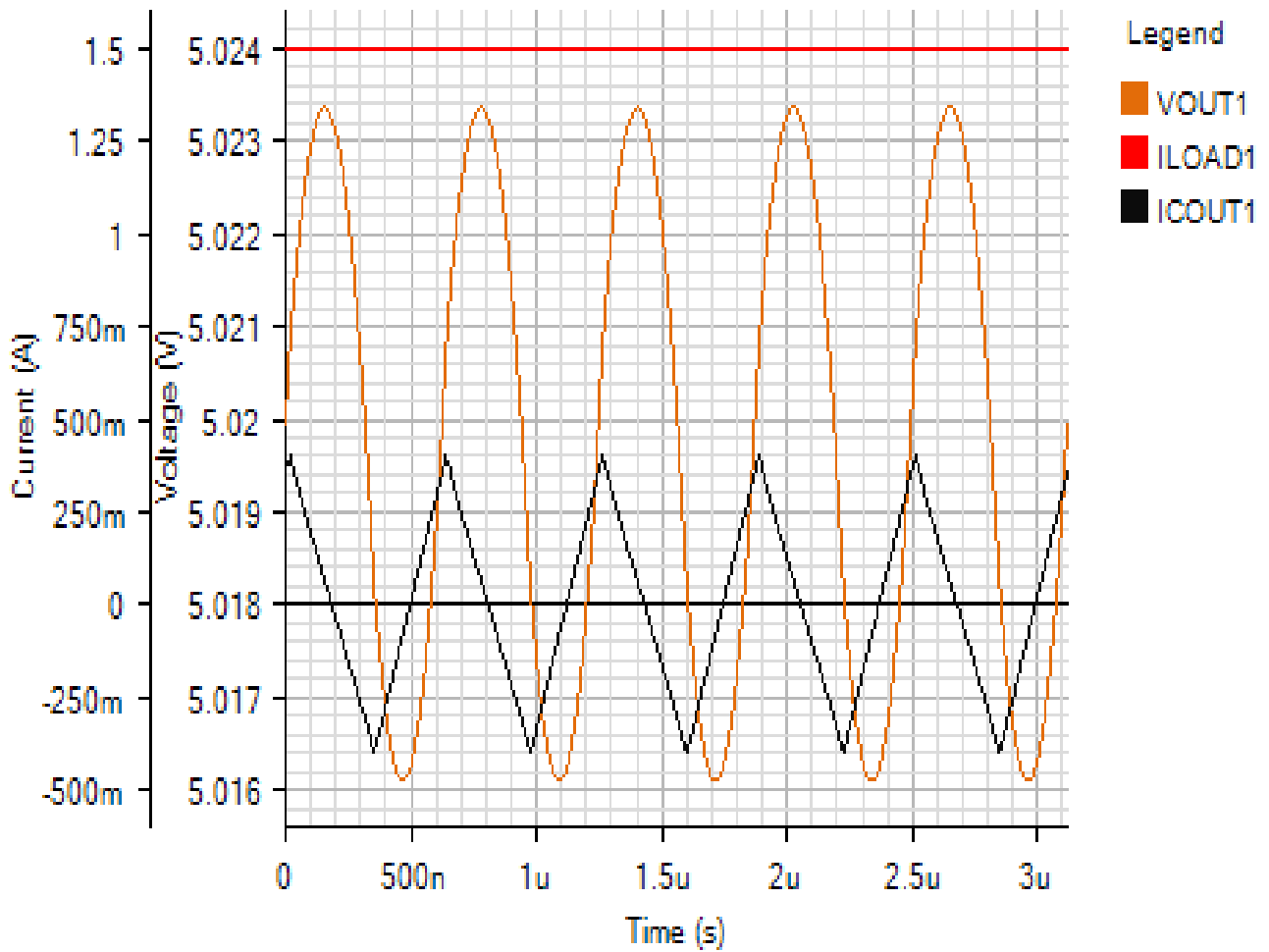


Ch 1 Lout - AC + DC	0.135788	4.5
Ch 2 Low side FET	0.349142	11.5
Ch 2 High side FET	0.872905	28.8
Ch 2 Sense Resistor	0.106519	3.5
Ch 1 High side FET	0.917381	30.3
Ch 1 Low side FET	0.403716	13.3
Ch 1 Sense Resistor	0.106734	3.5
Ch 2 Lout - AC + DC	0.13551	4.5
Total	3.027695	100

Steady State - Mon Nov 19 2018 13:53:48

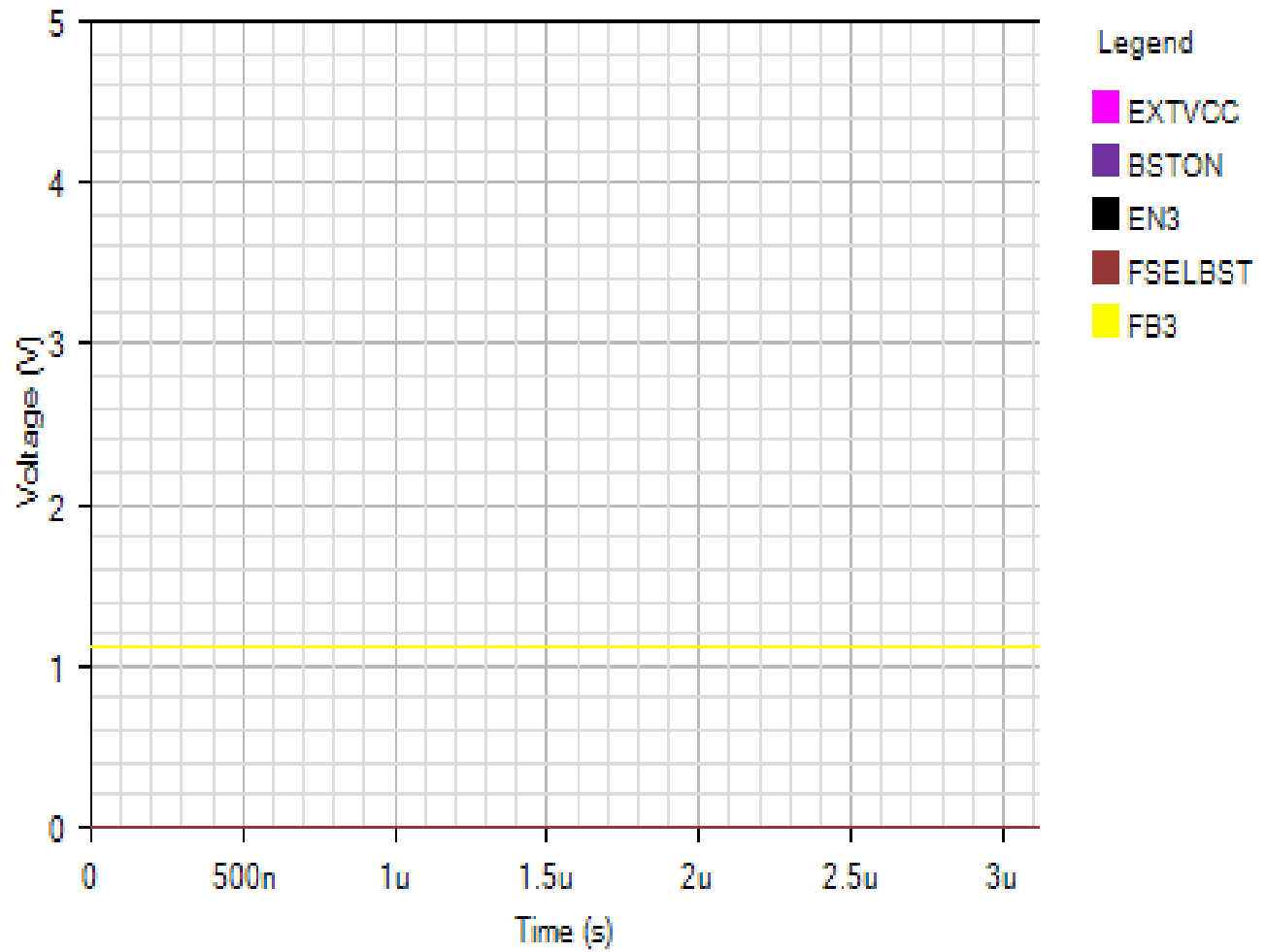
OUTPUT1

Default



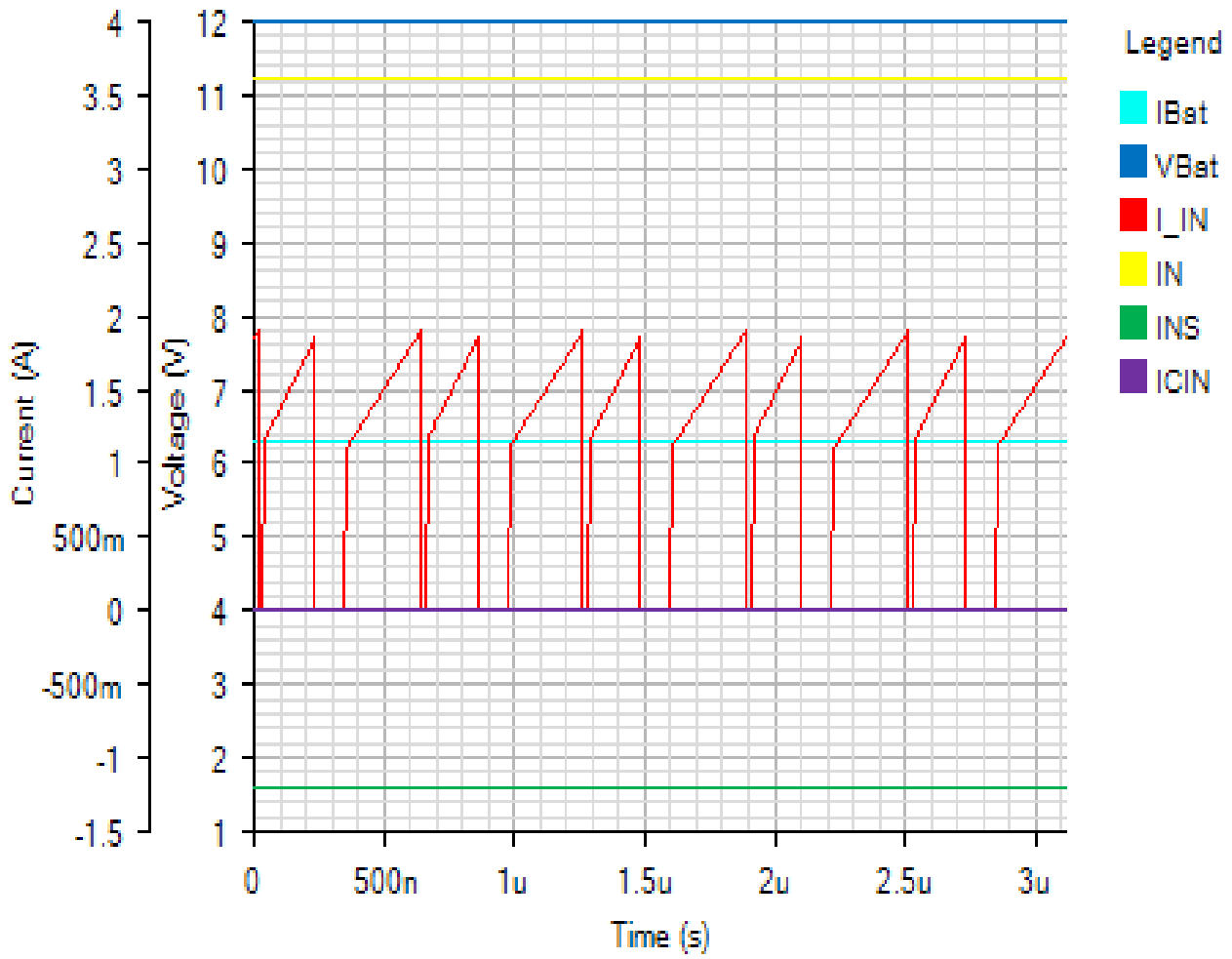
IC3

Default



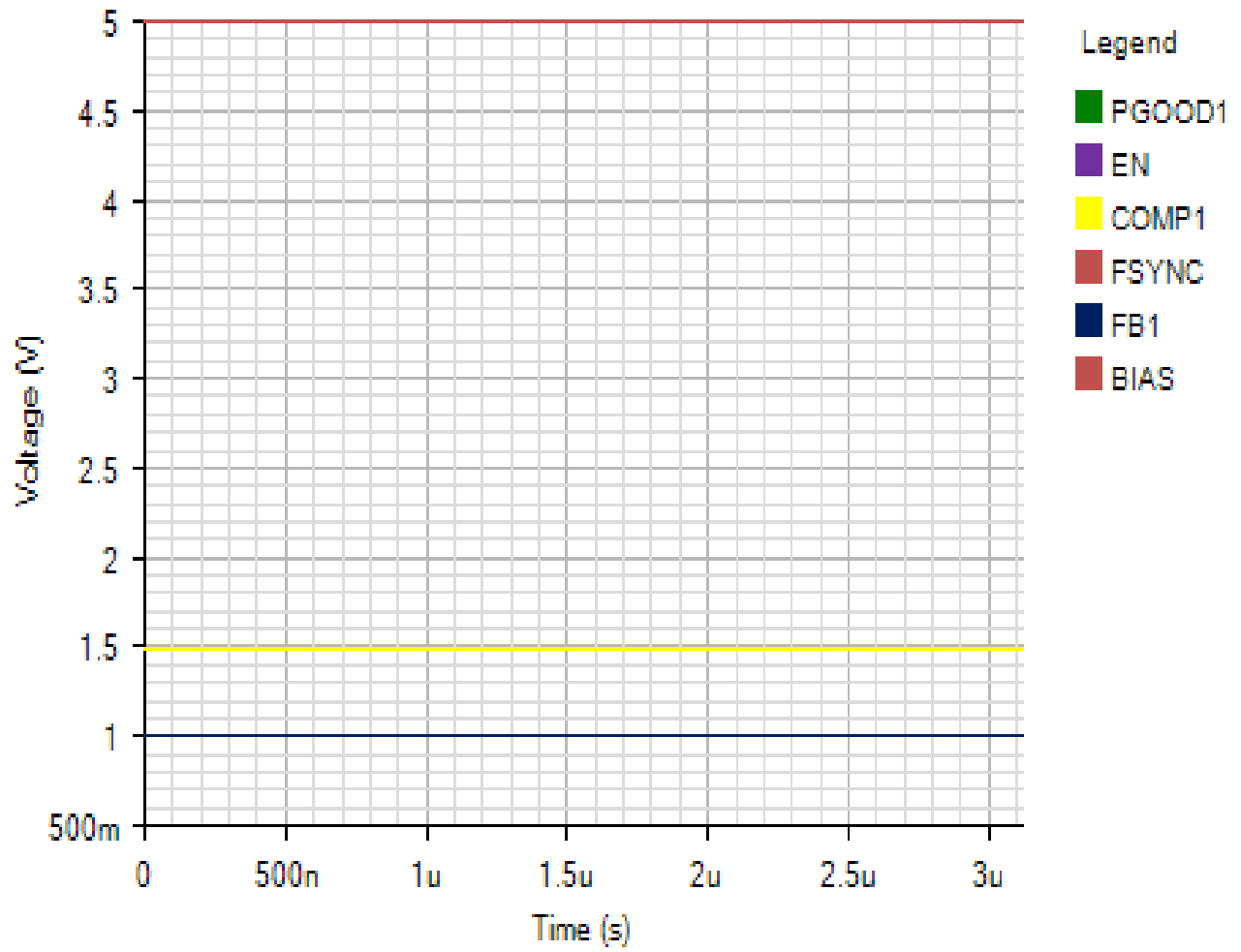
INPUT

Default



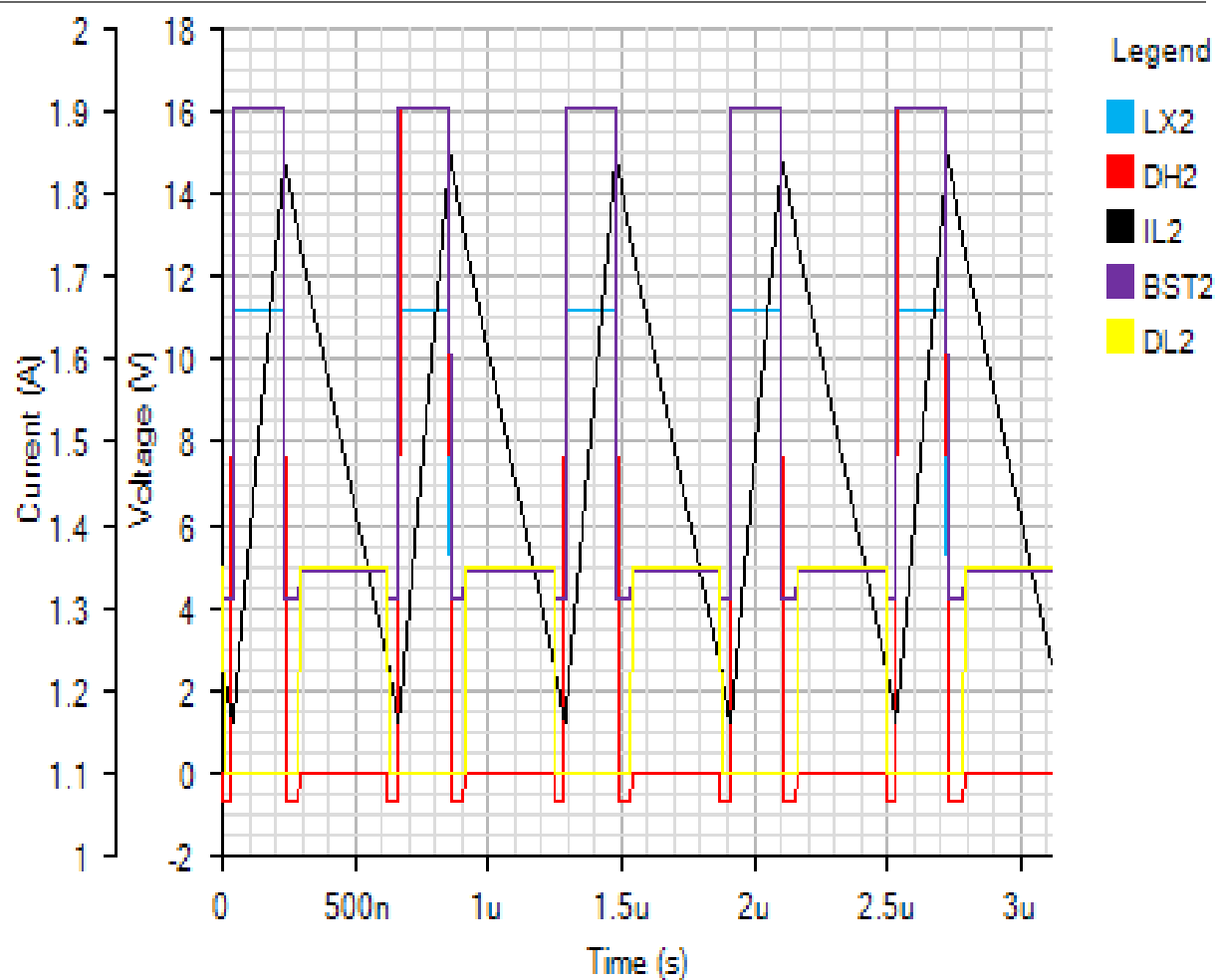
IC1

Default



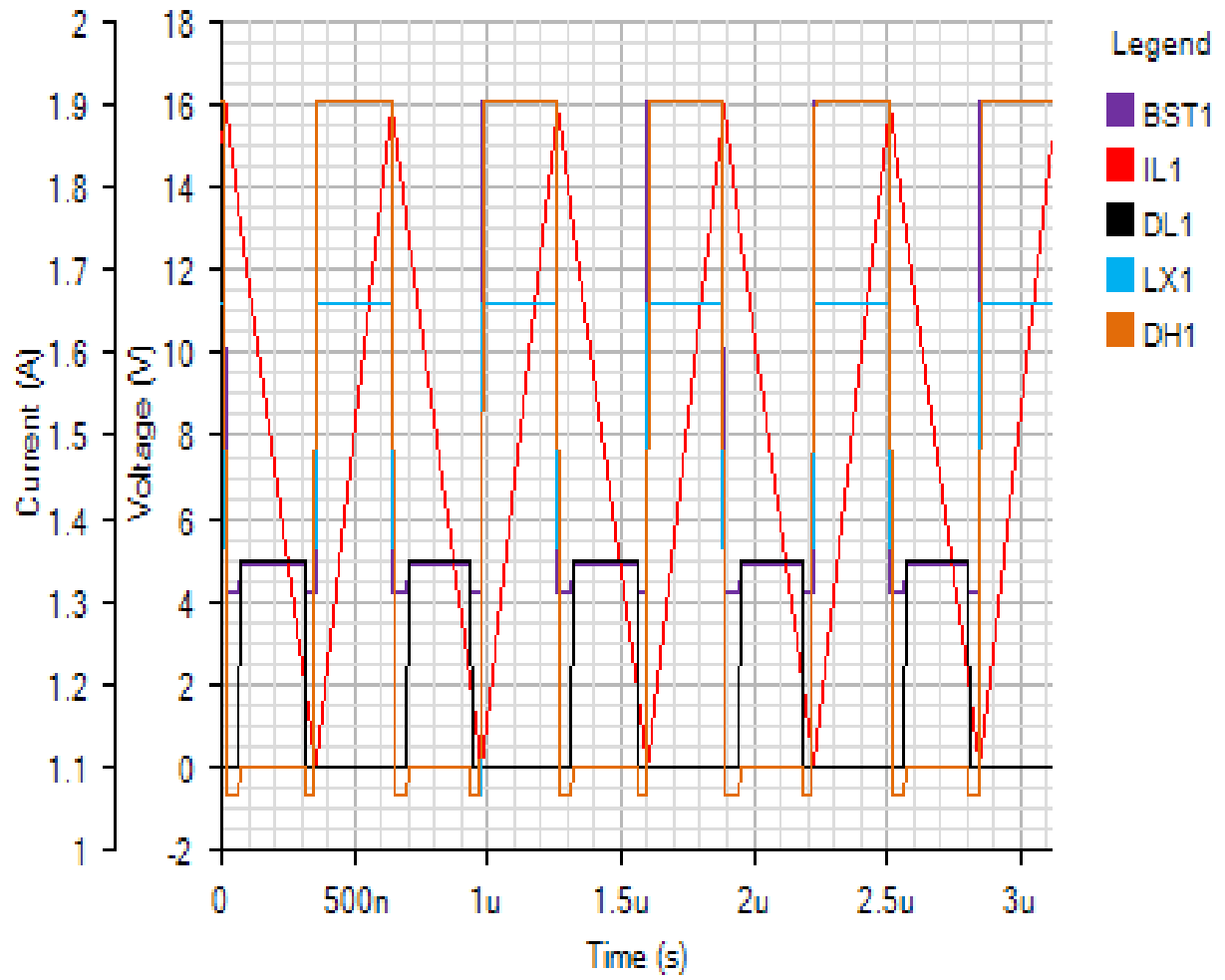
SWITCHING2

Default



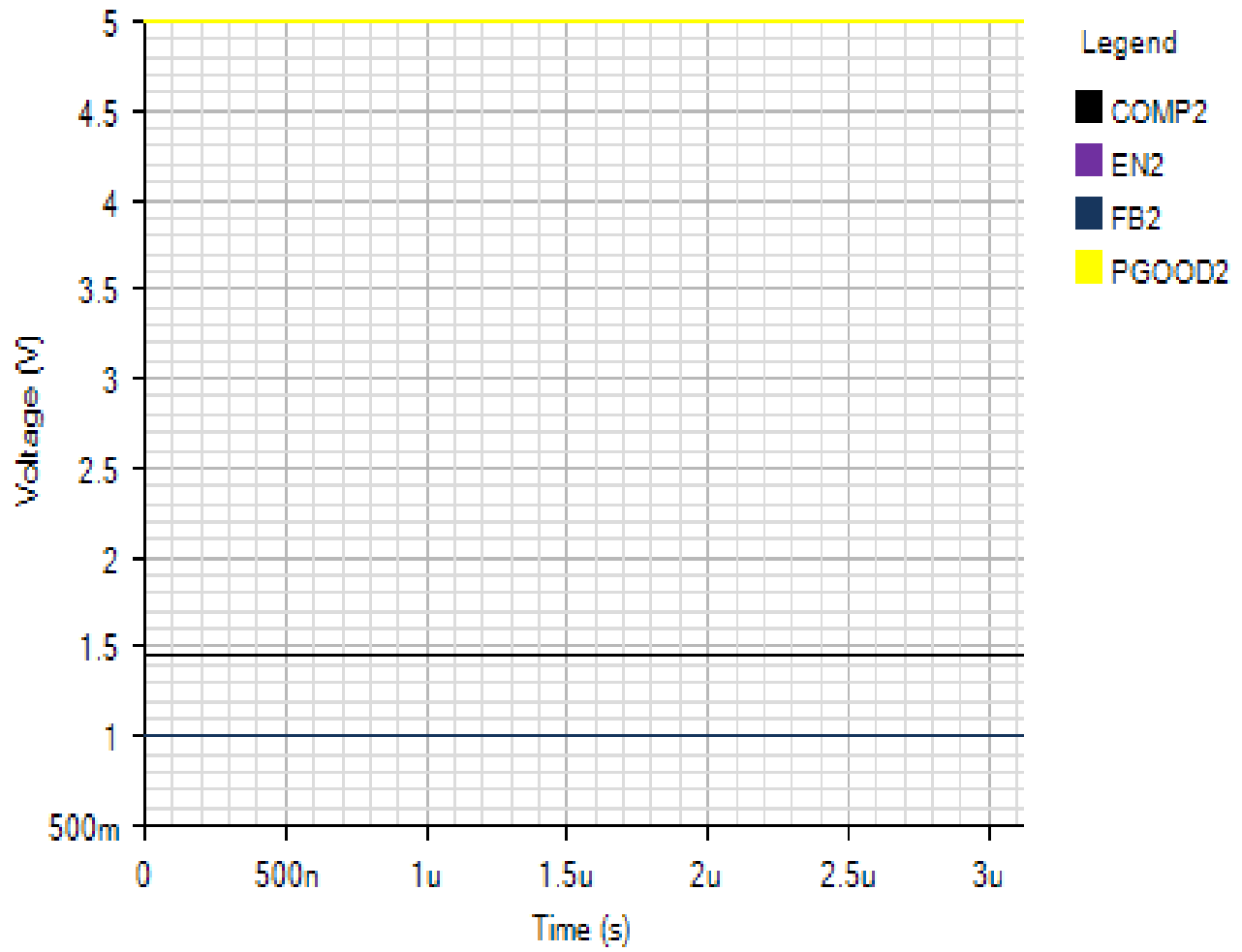
SWITCHING1

Default



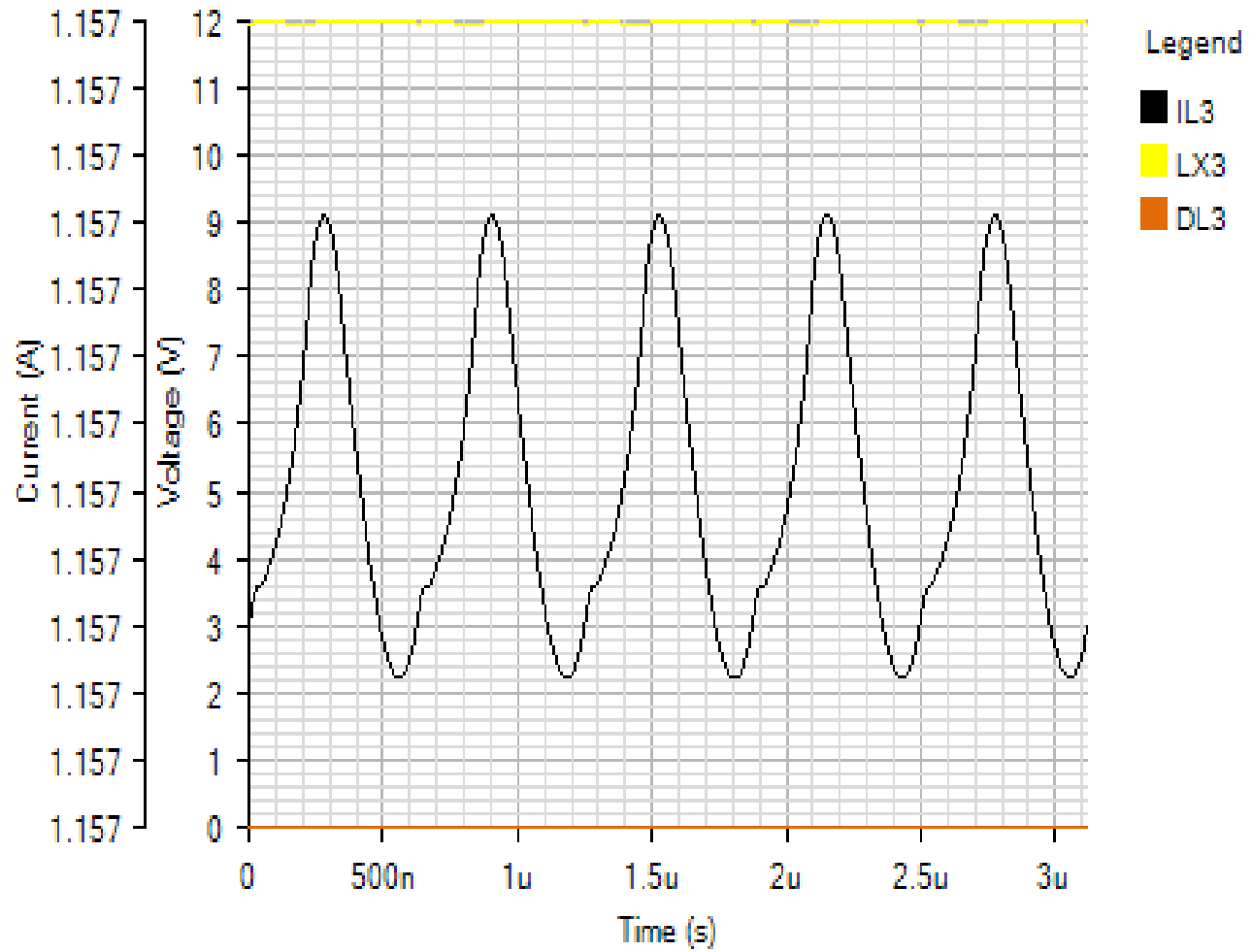
IC2

Default



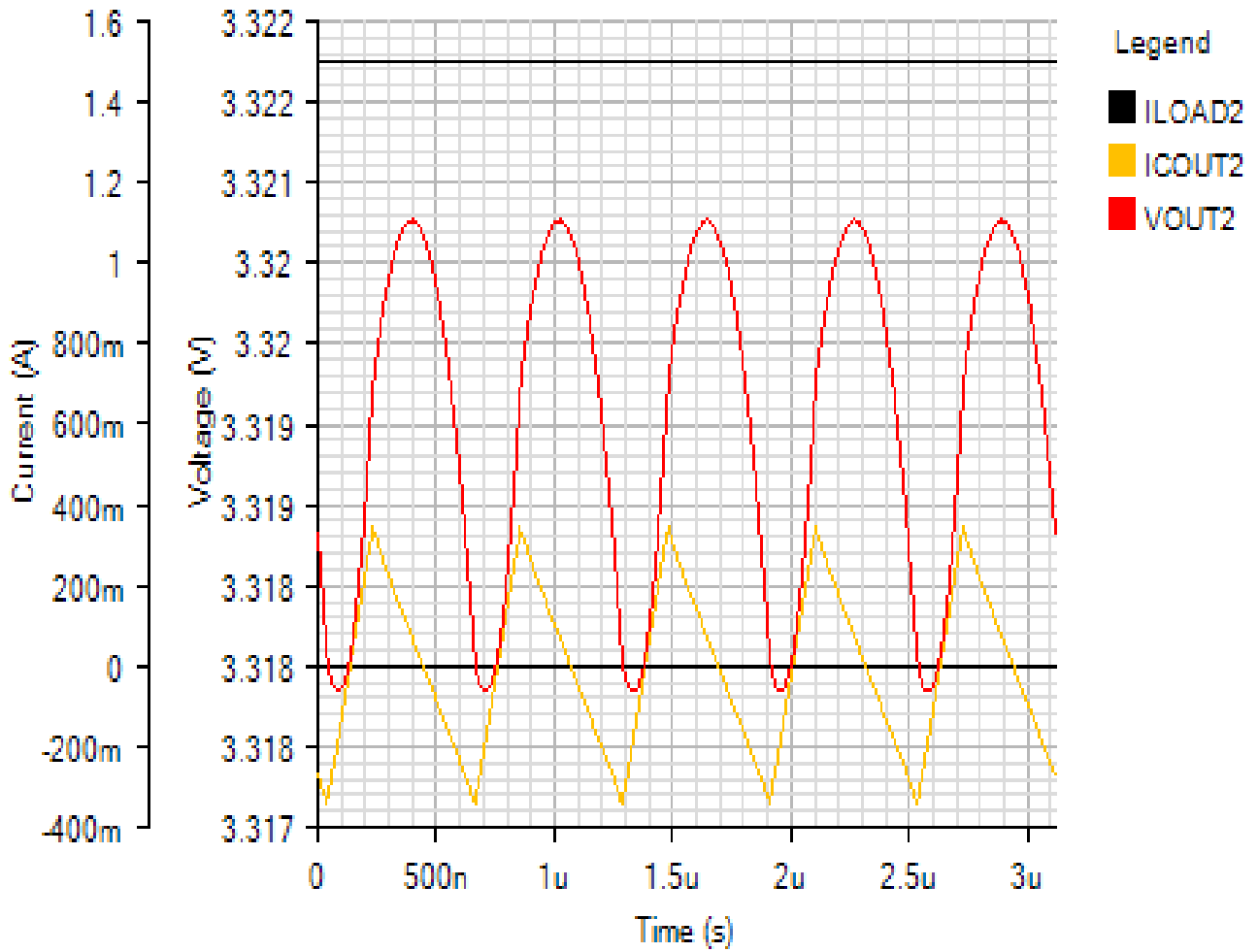
SWITCHING3

Default



OUTPUT2

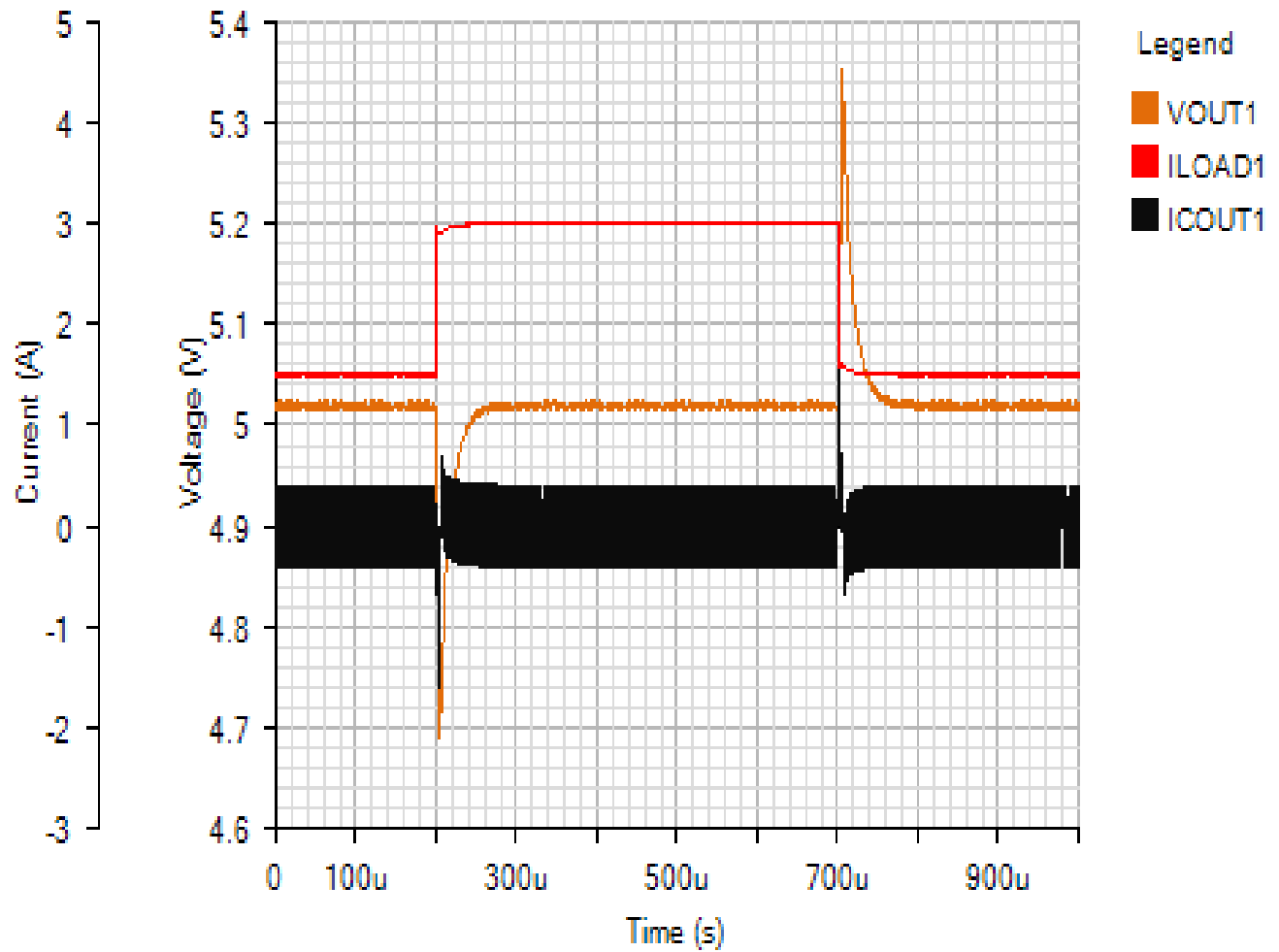
Default



Load Step - Mon Nov 19 2018 13:53:48

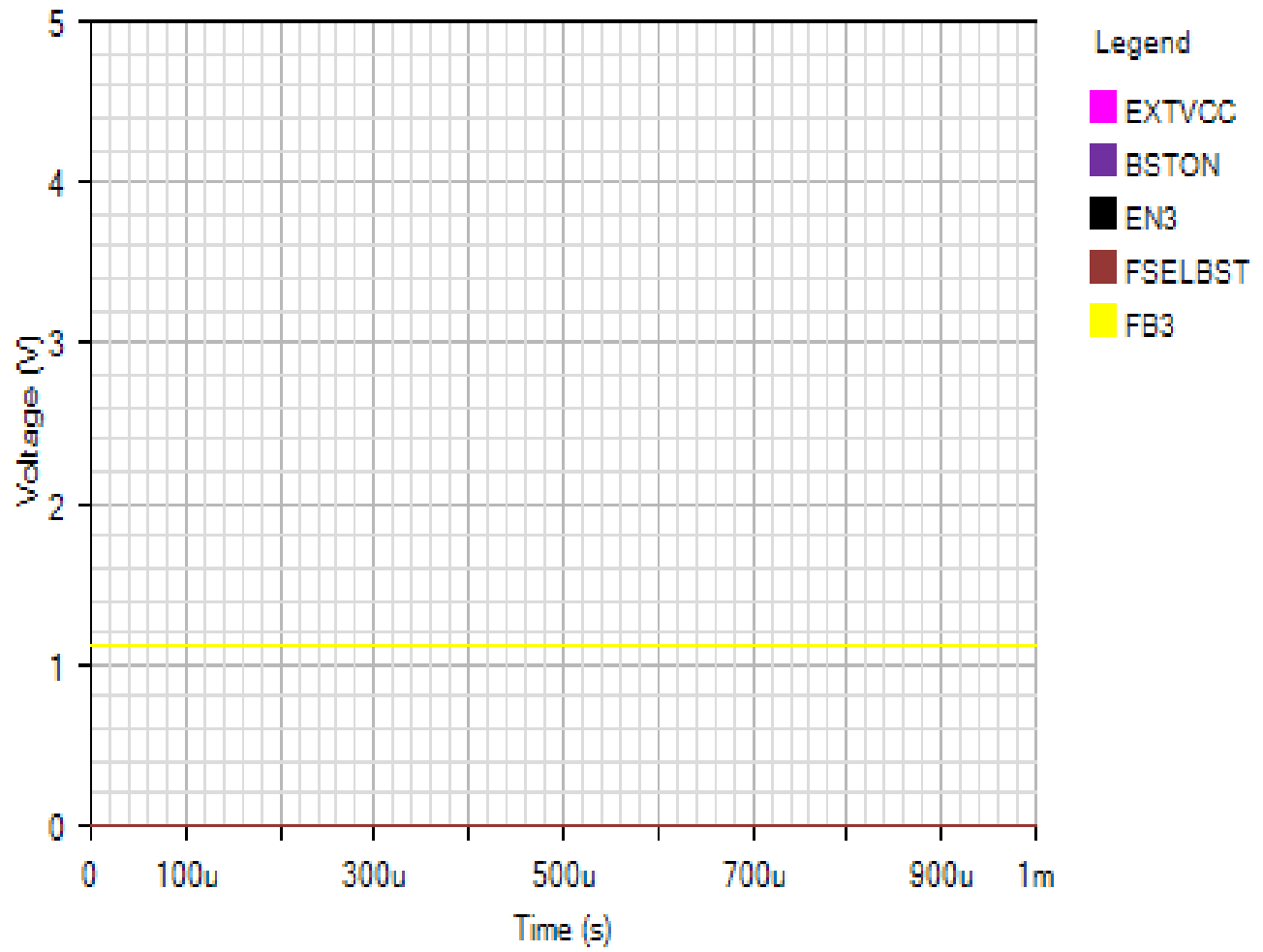
OUTPUT1

Default



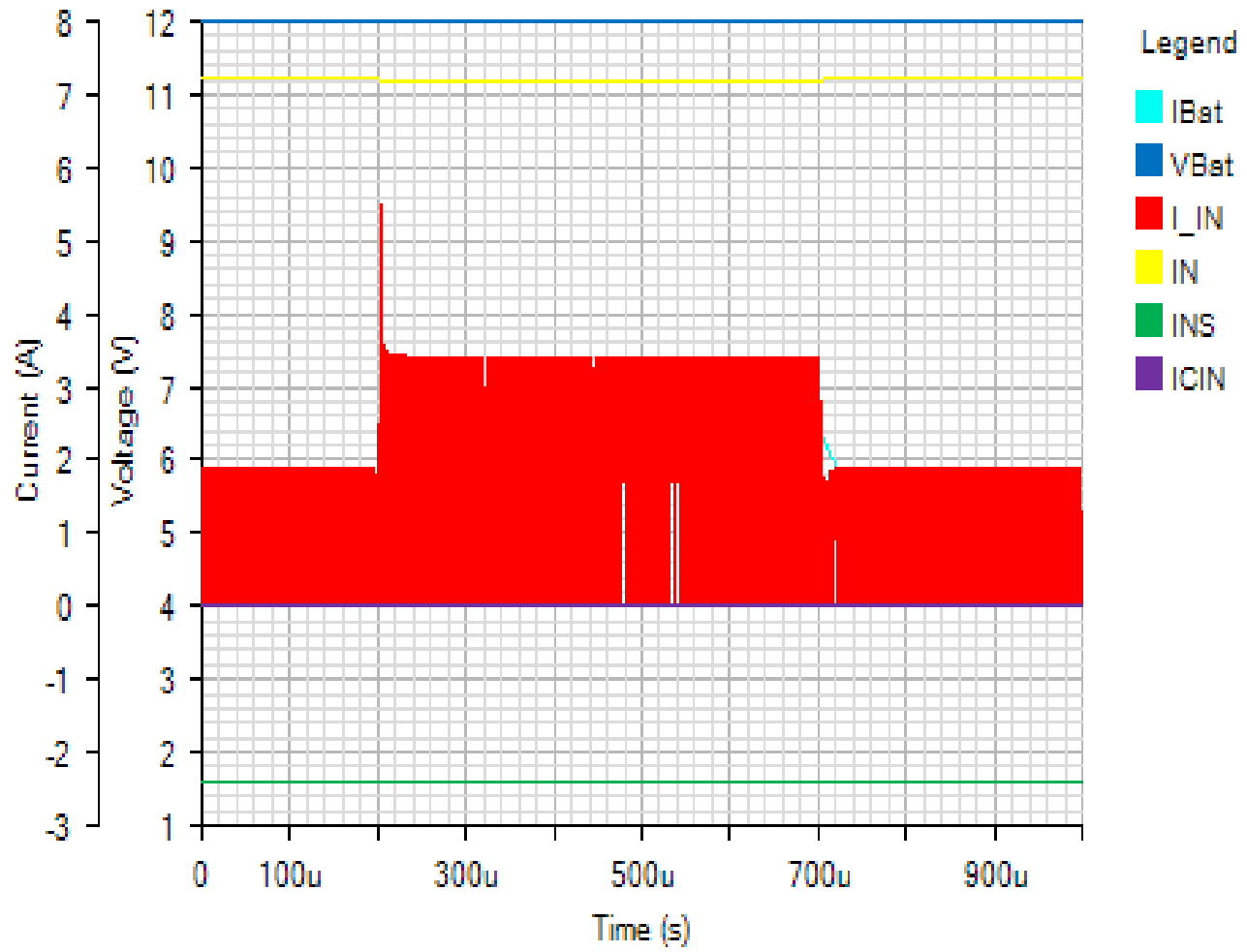
IC3

Default



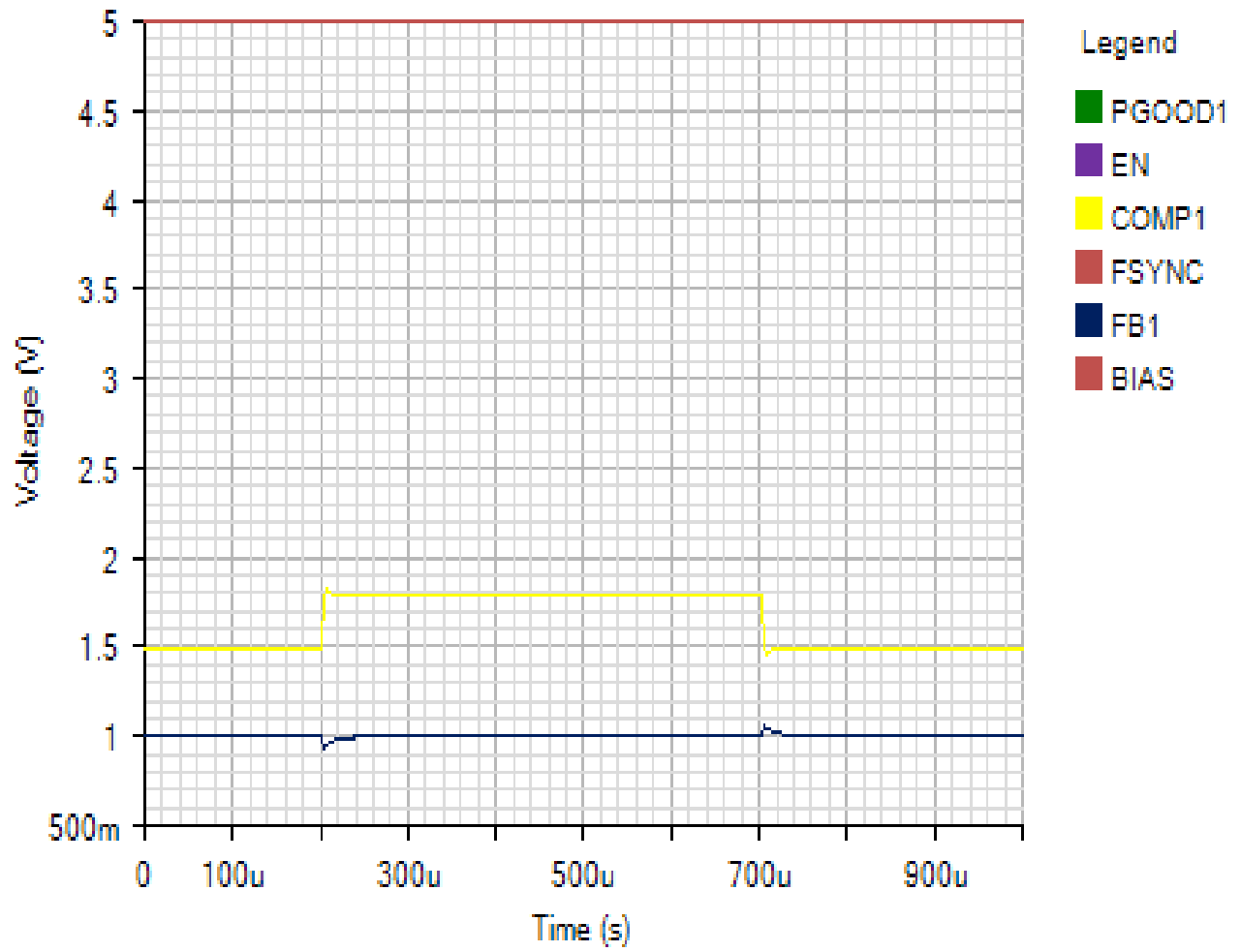
INPUT

Default



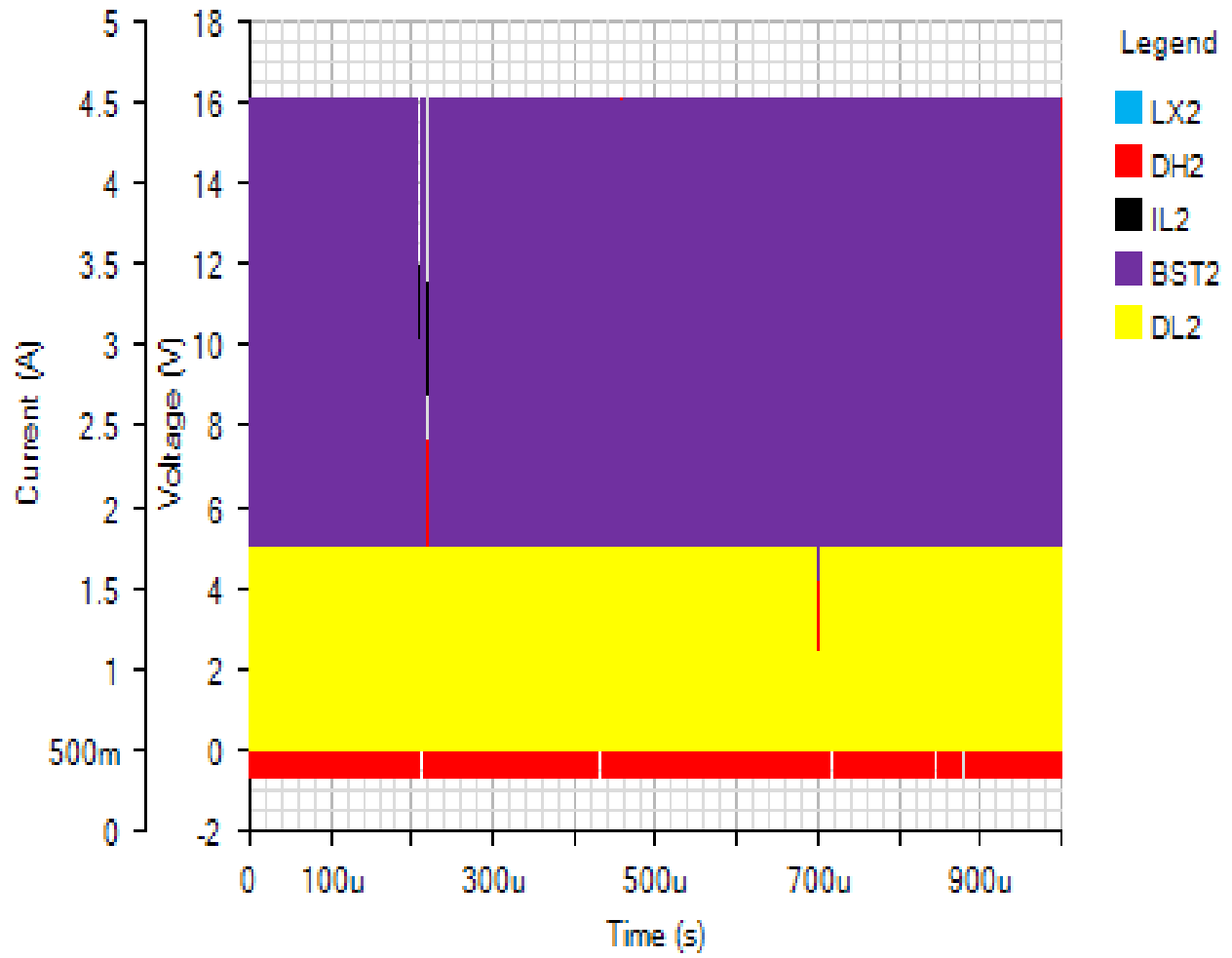
IC1

Default



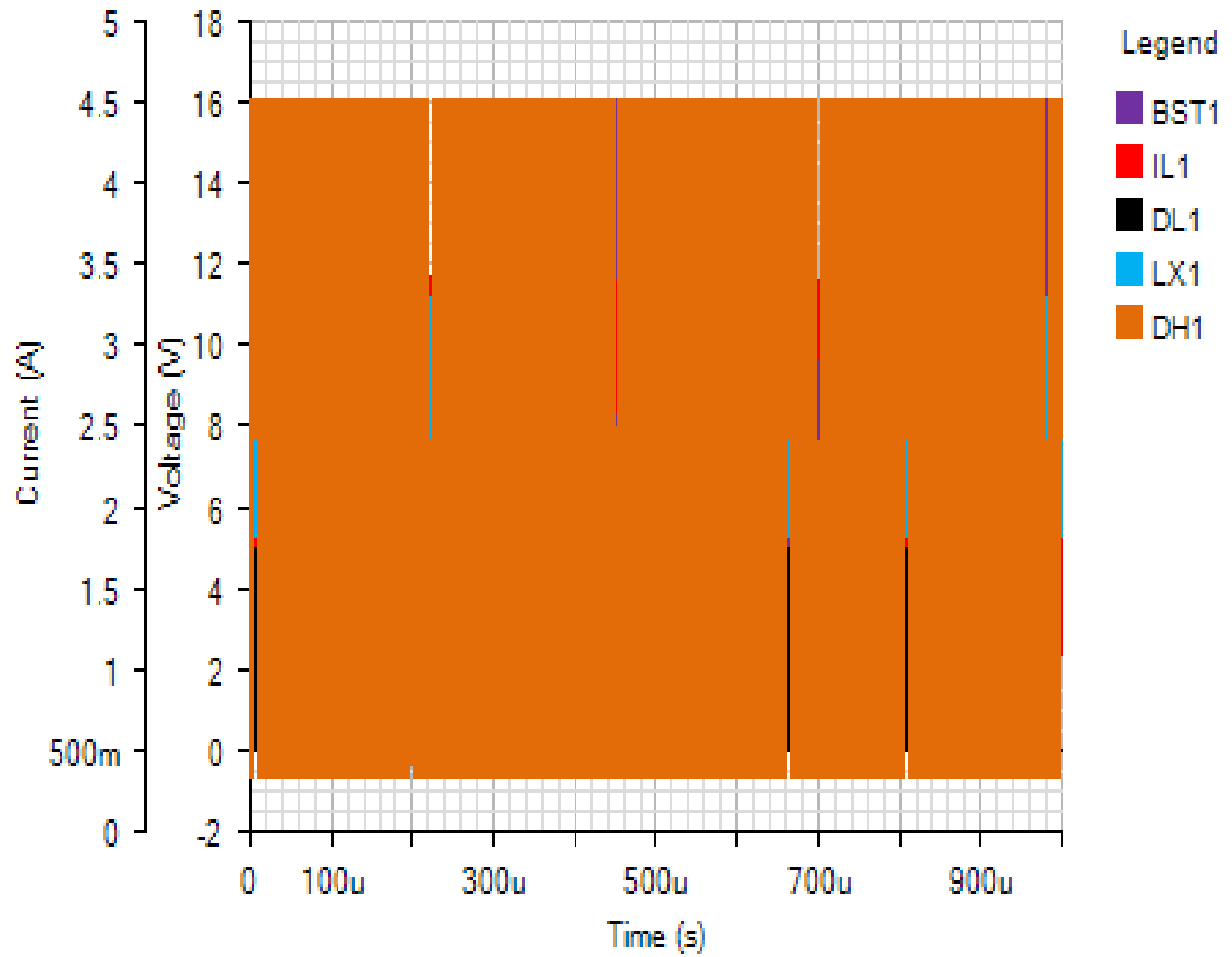
SWITCHING2

Default



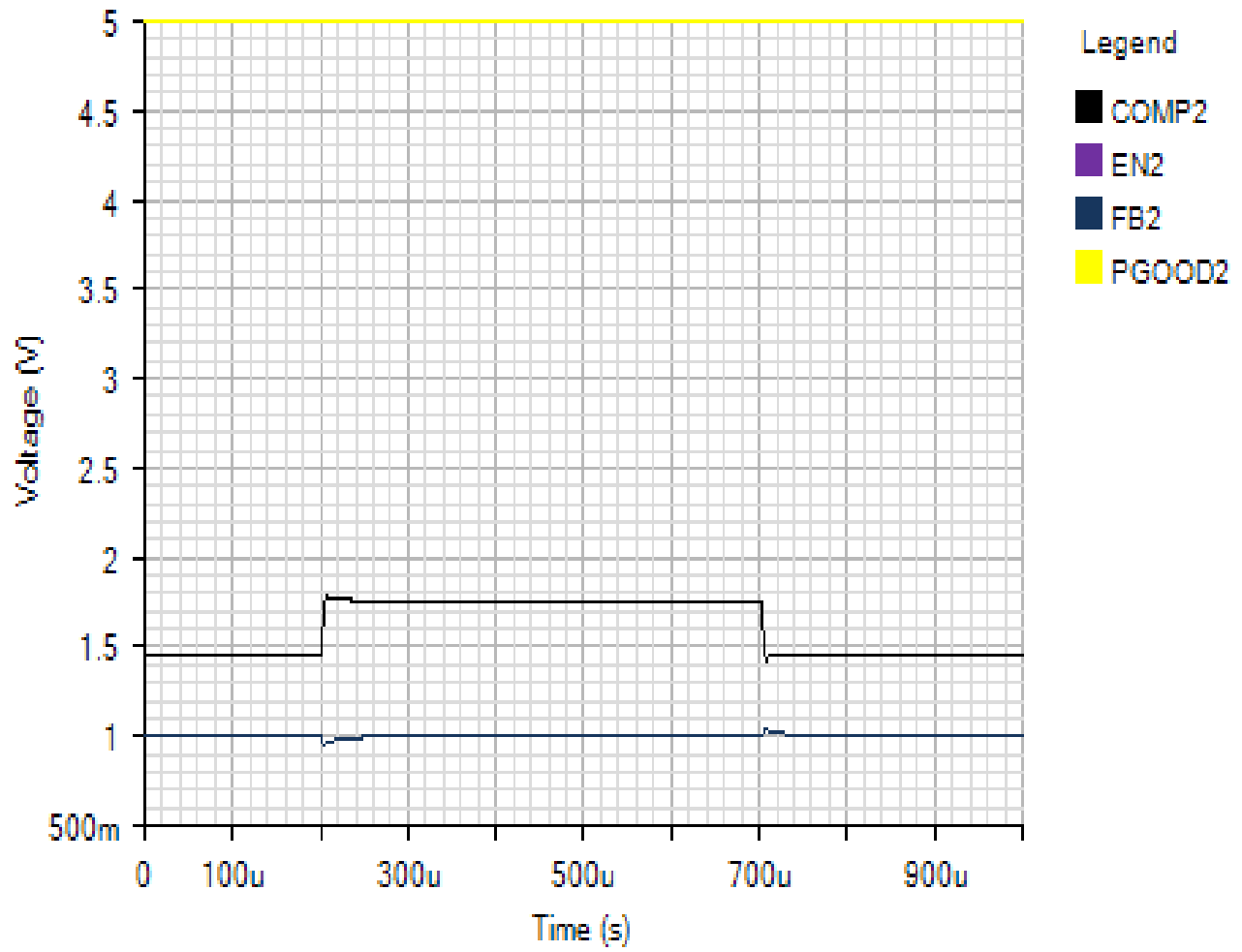
SWITCHING1

Default



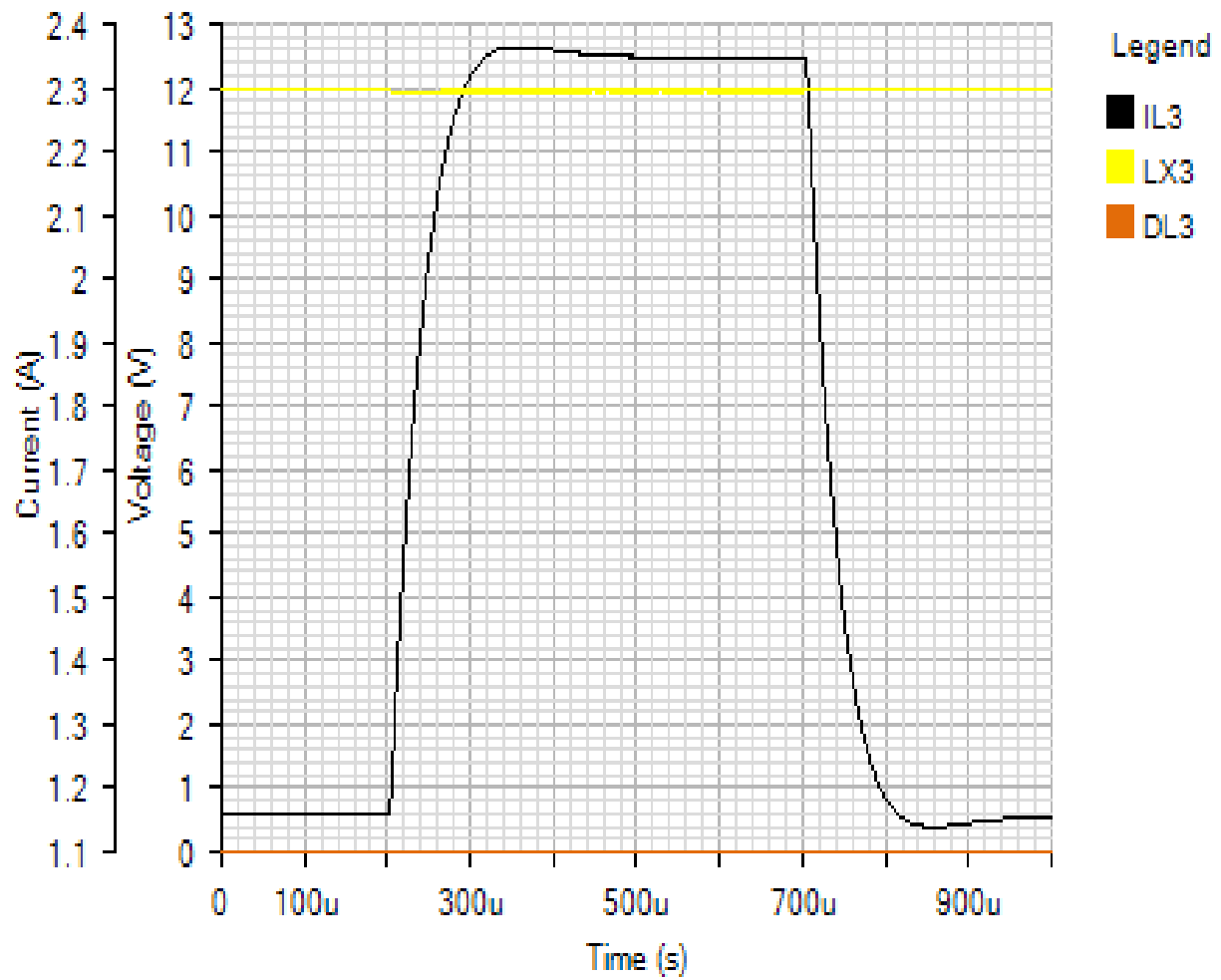
IC2

Default



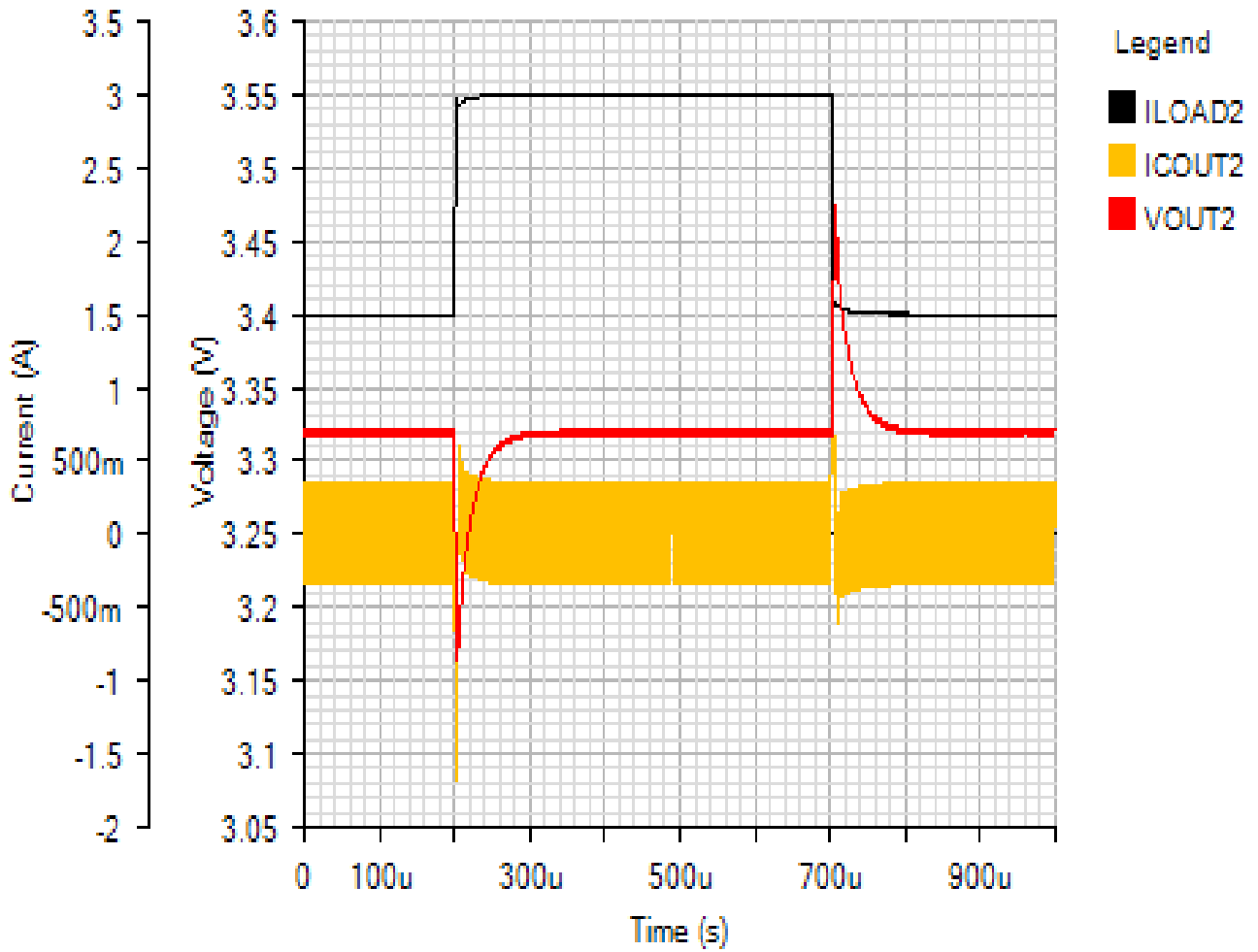
SWITCHING3

Default



OUTPUT2

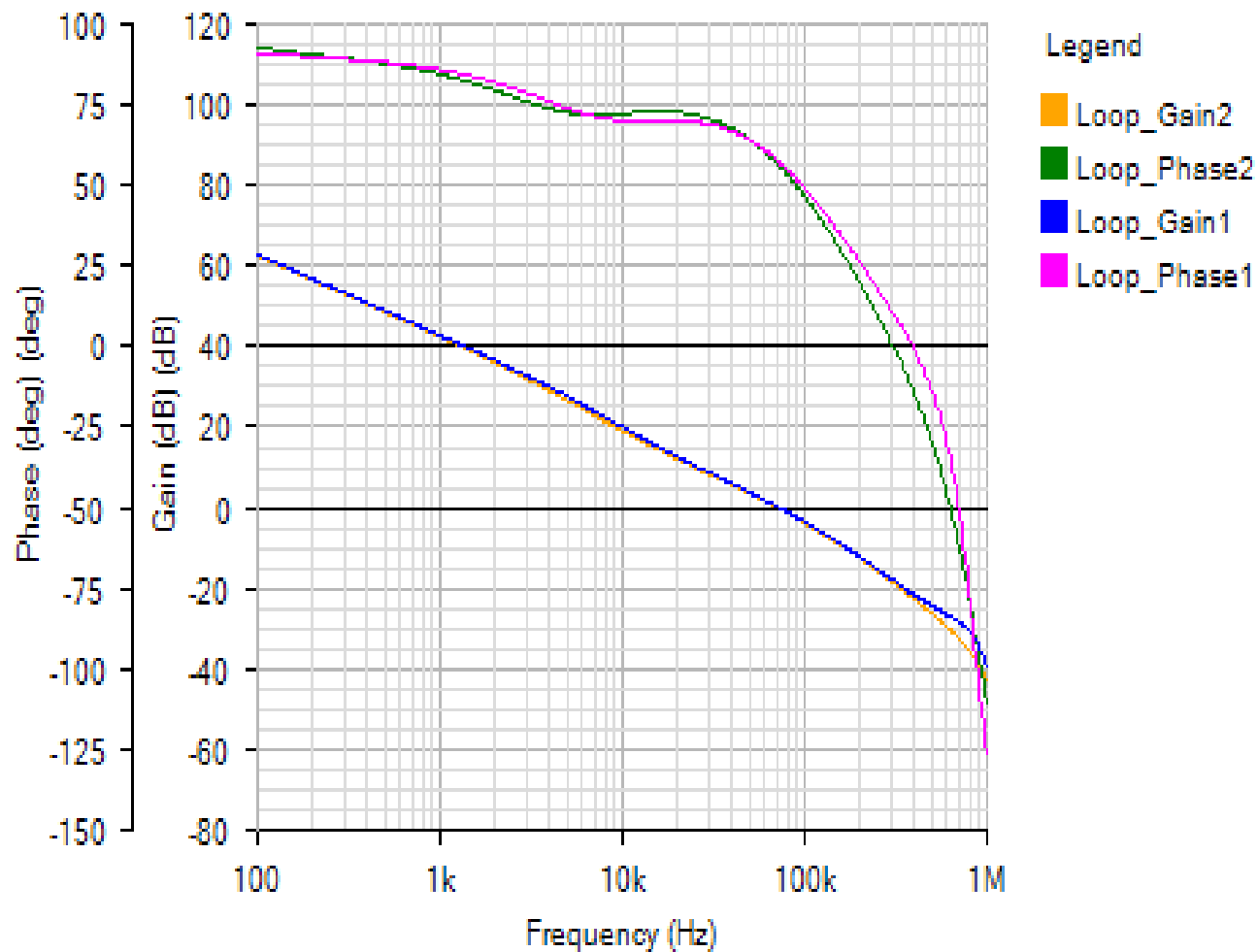
Default



AC Loop - Mon Nov 19 2018 13:53:48

BODE

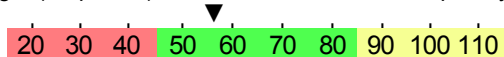
Default



Phase Margin (output #1): 57.26° at a crossover frequency of 72.6kHz



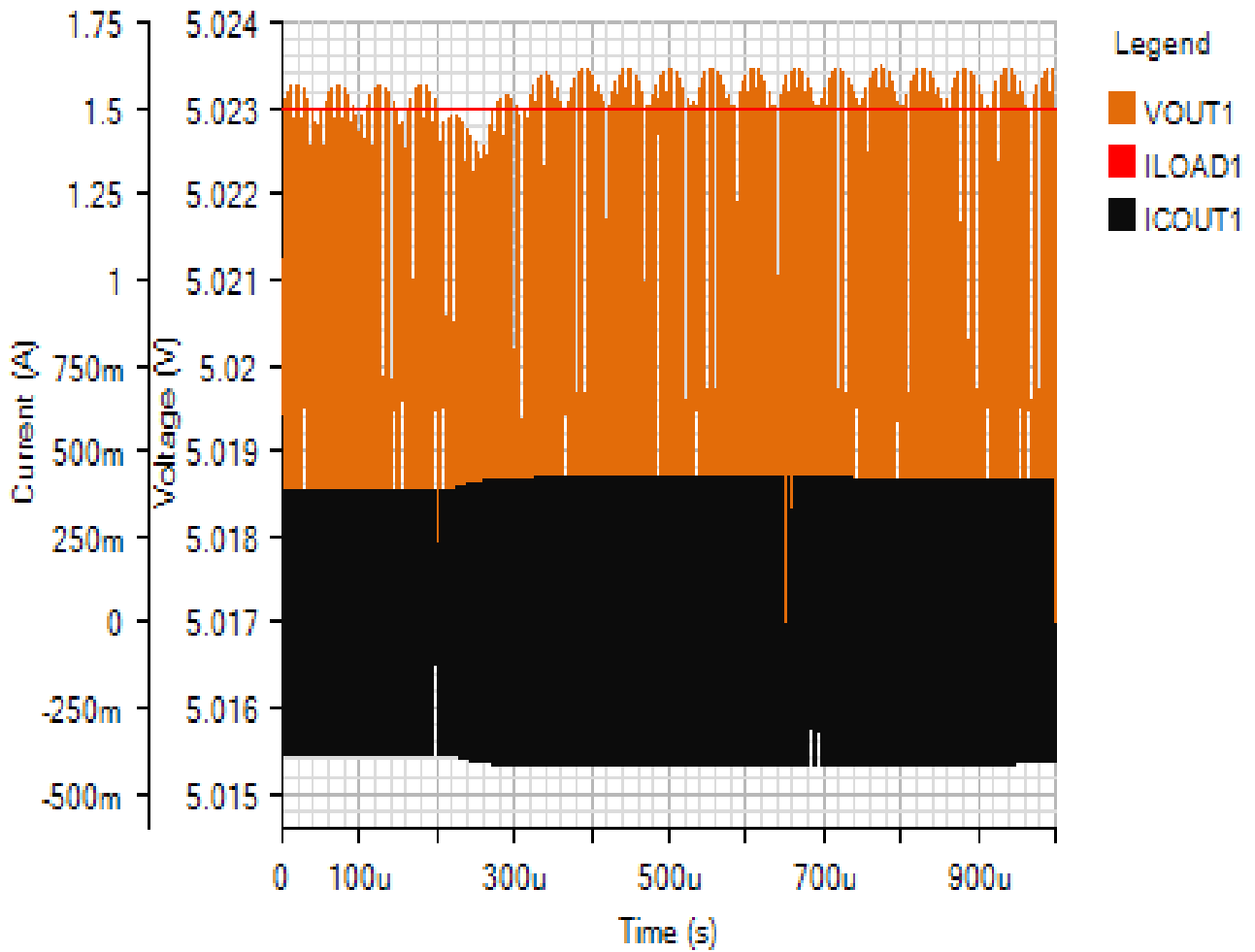
Phase Margin (output #2): 56.39° at a crossover frequency of 71.7kHz



Line Transient - Mon Nov 19 2018 13:53:48

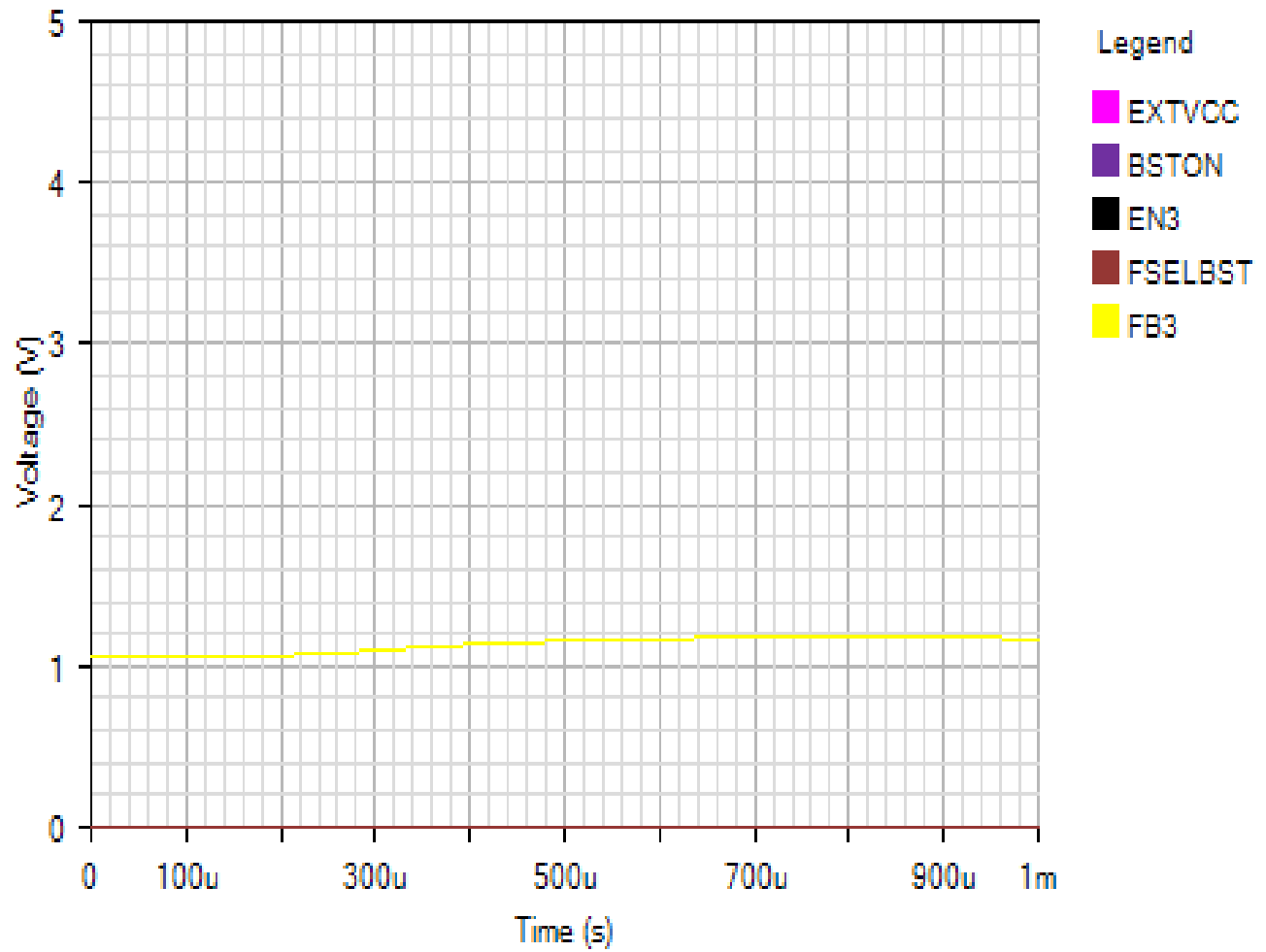
OUTPUT1

Default



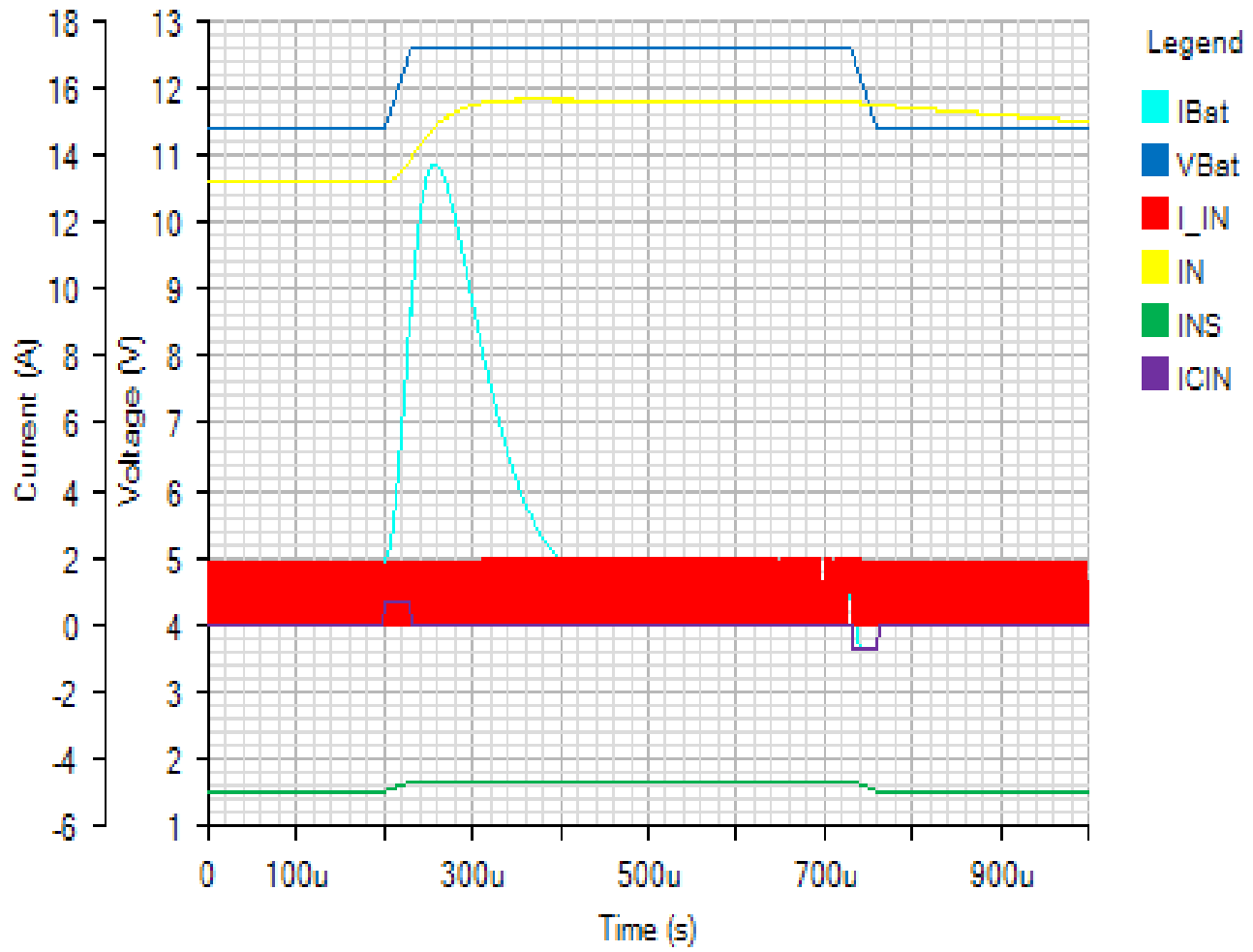
IC3

Default



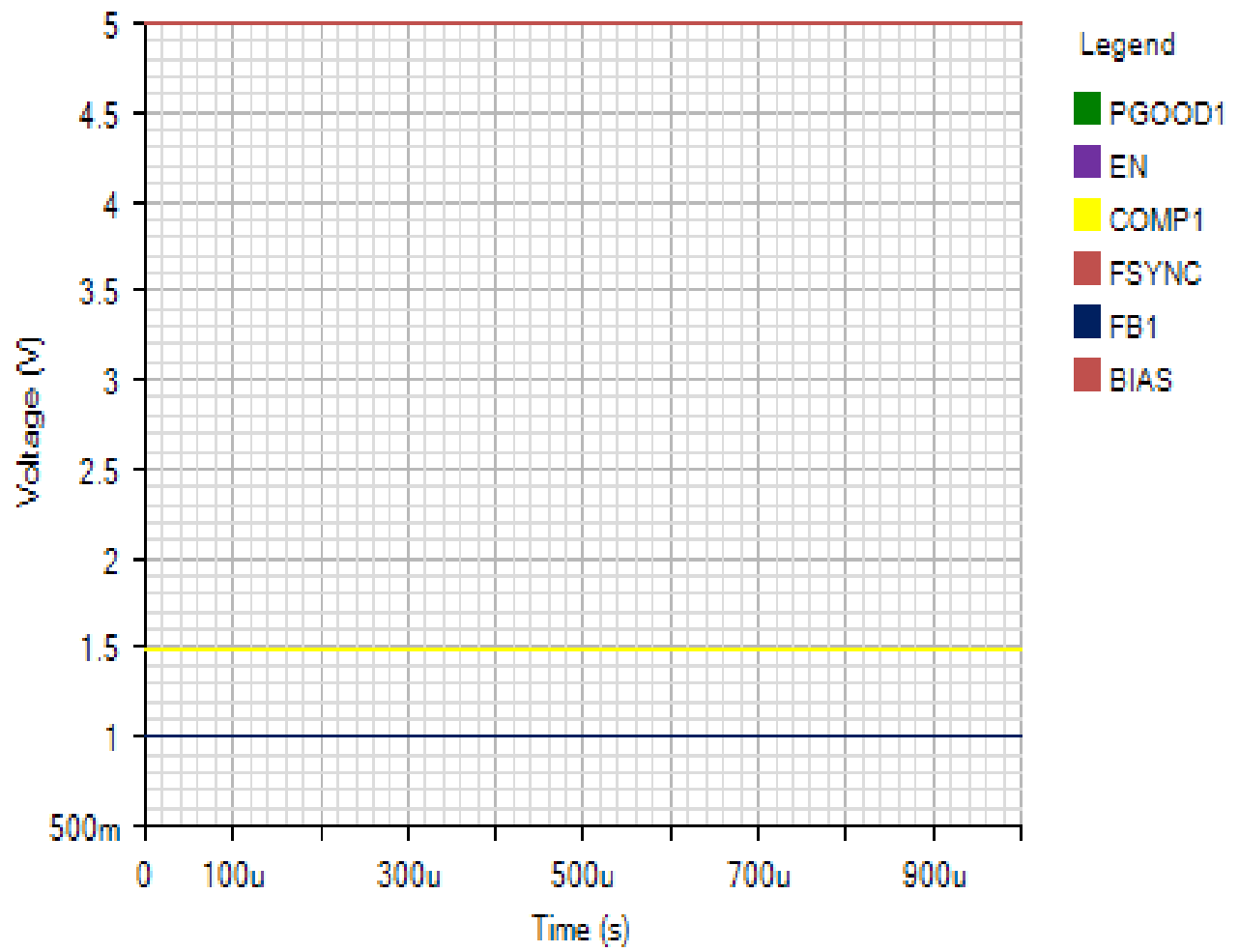
INPUT

Default



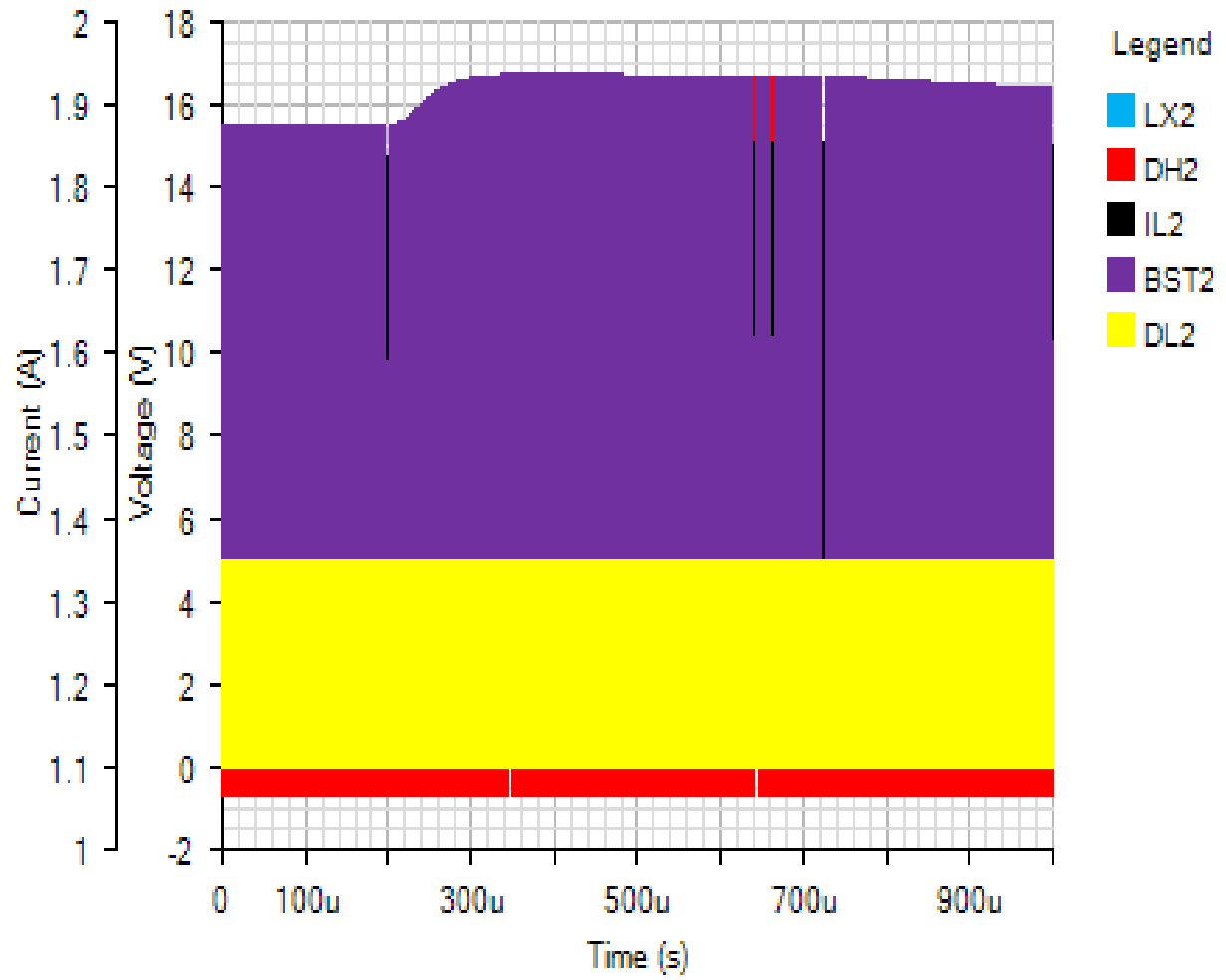
IC1

Default



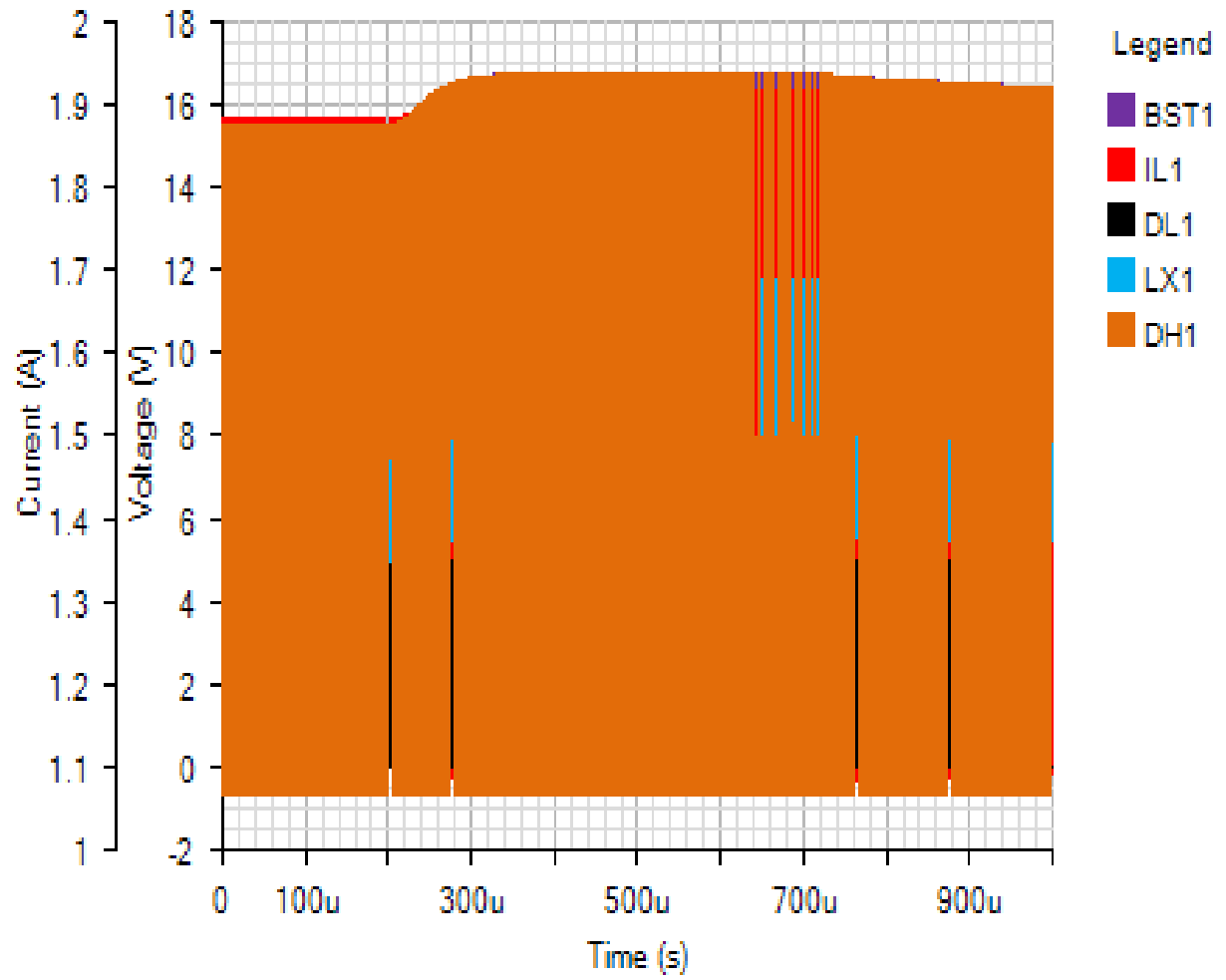
SWITCHING2

Default



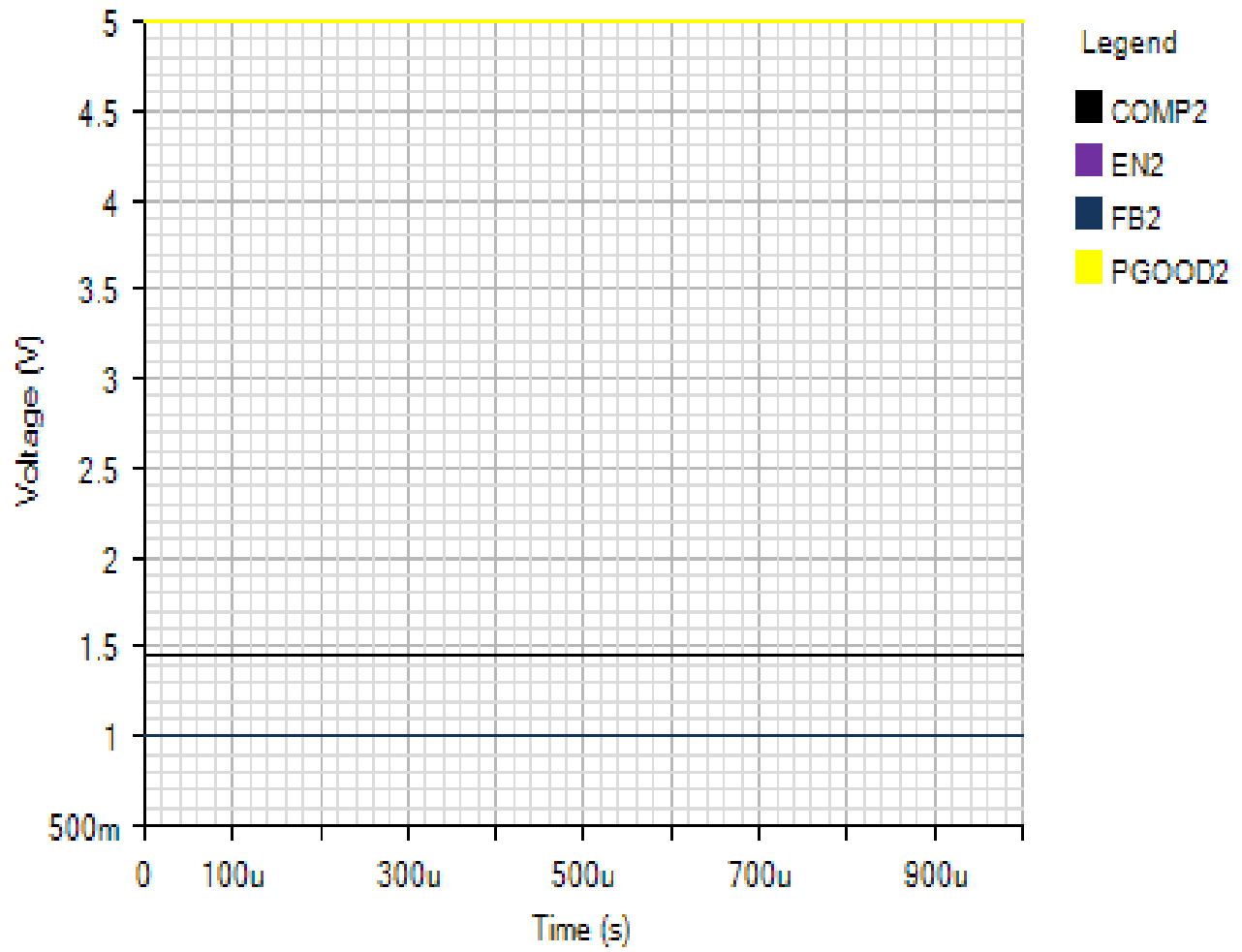
SWITCHING1

Default



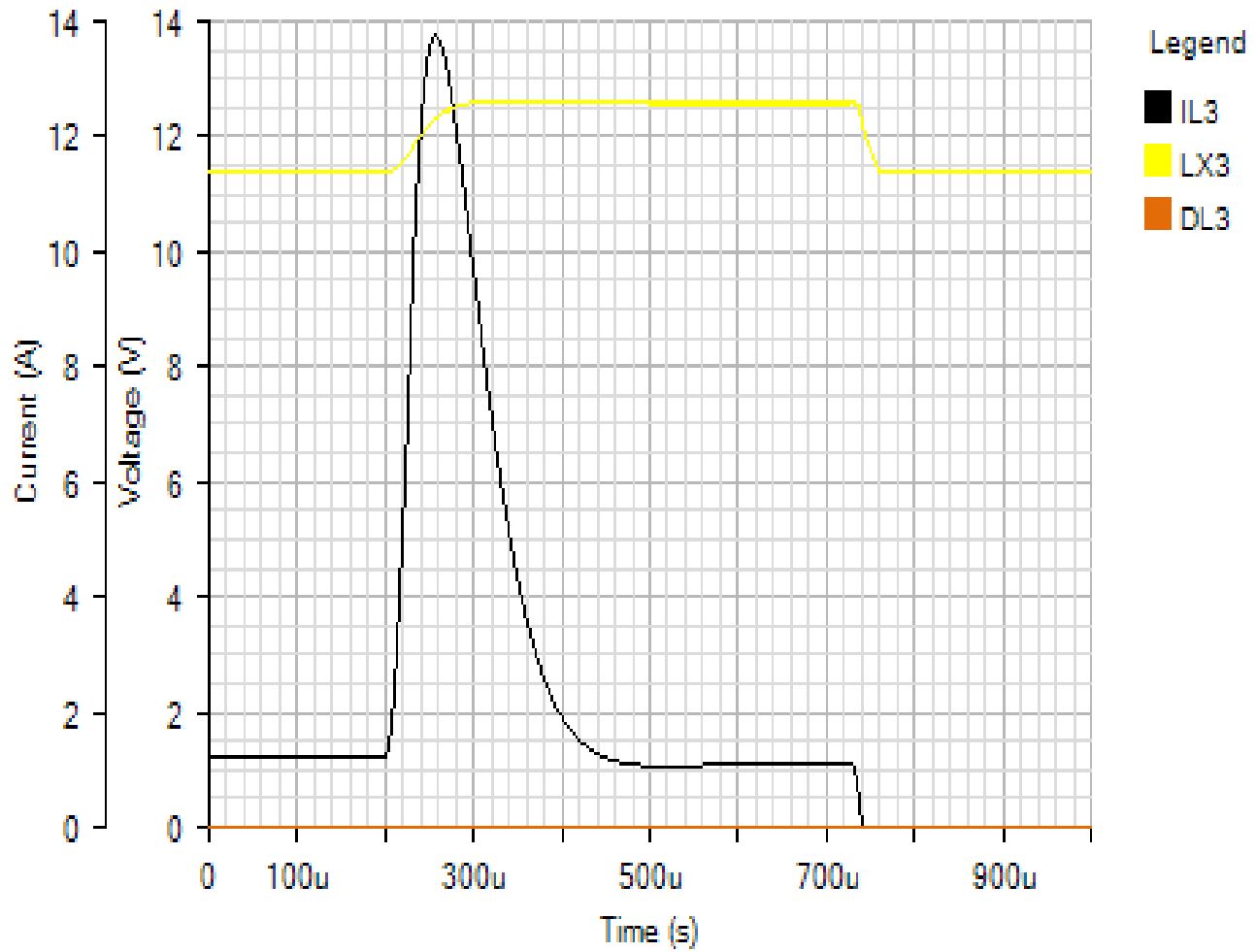
IC2

Default



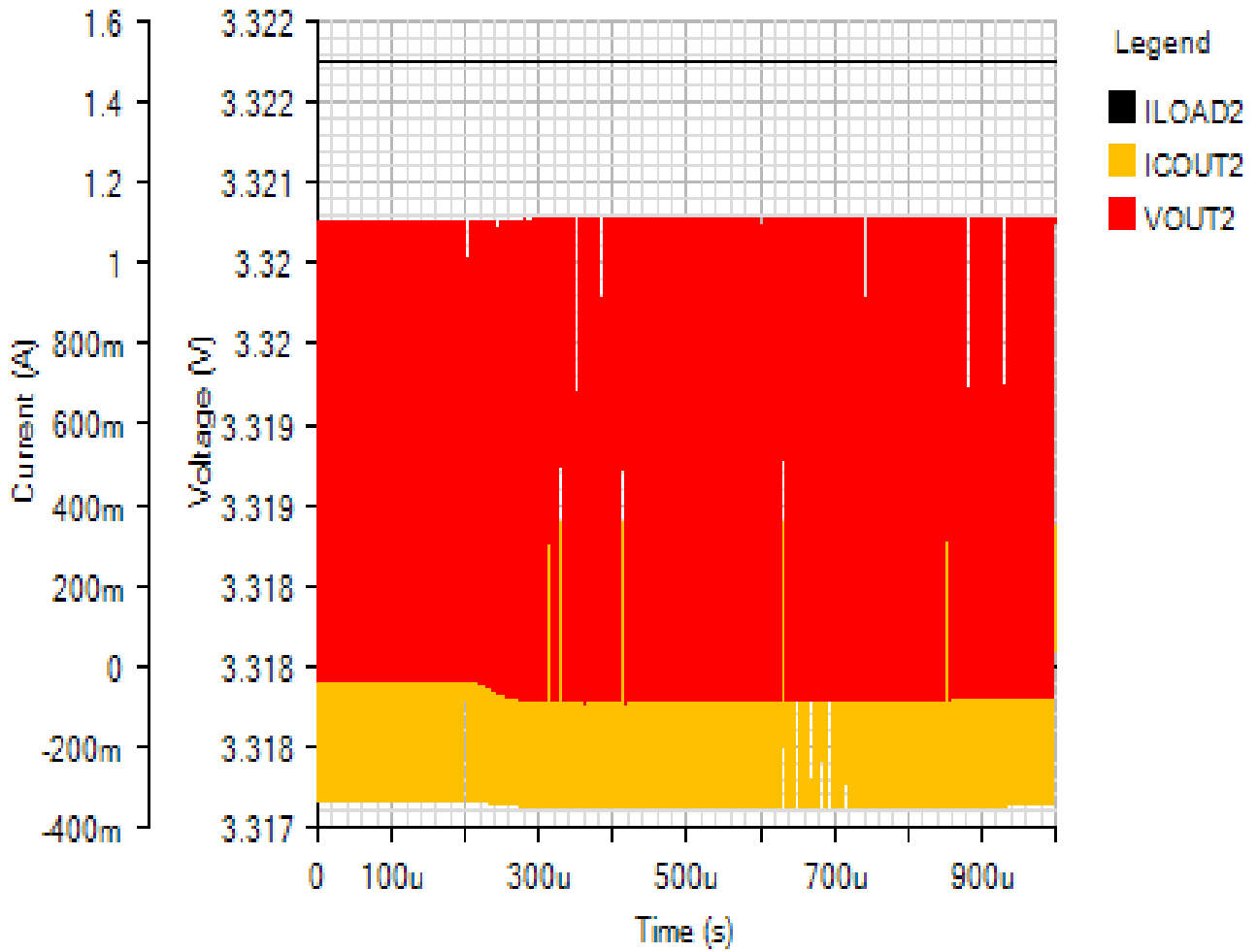
SWITCHING3

Default



OUTPUT2

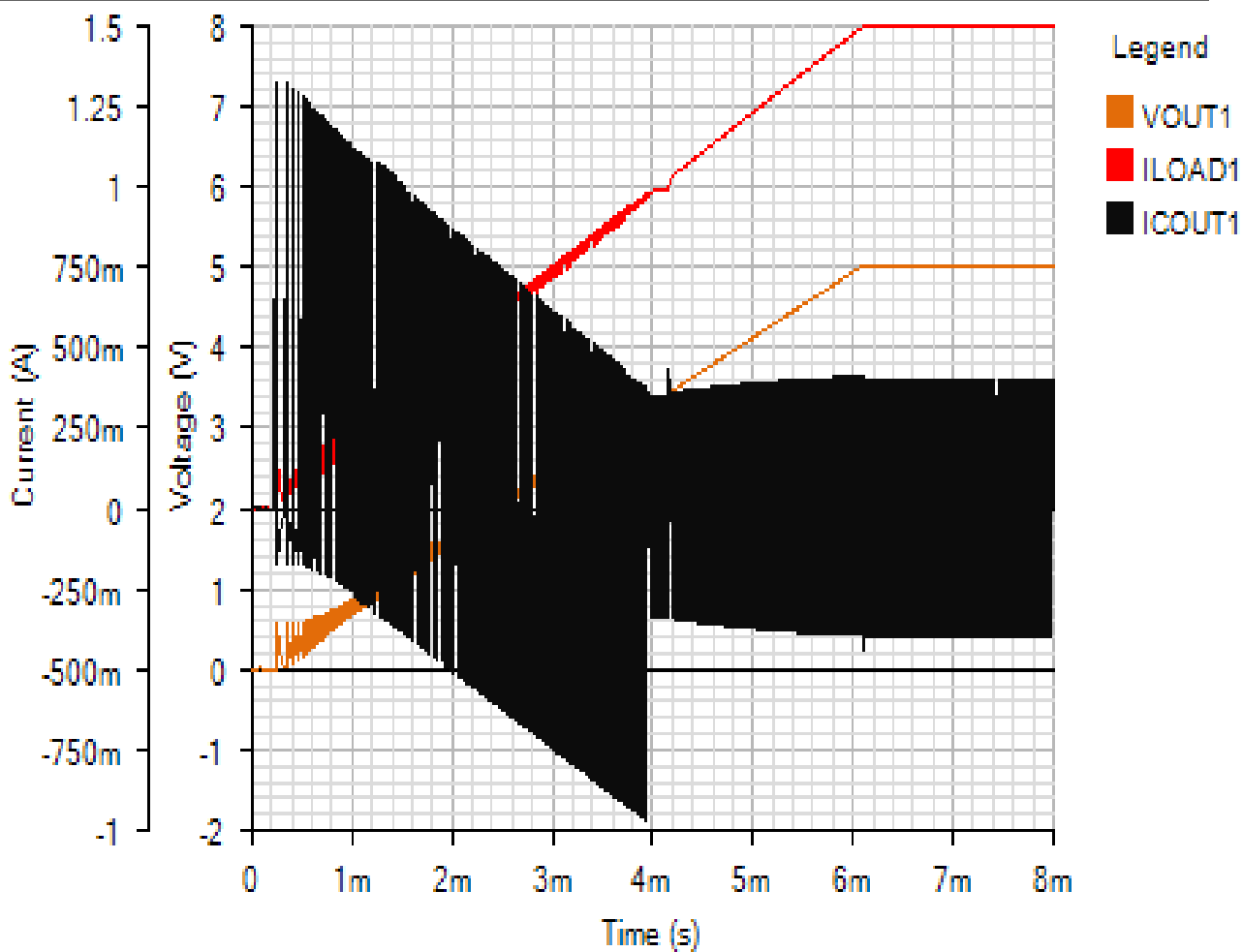
Default



Start Up - Mon Nov 19 2018 13:53:48

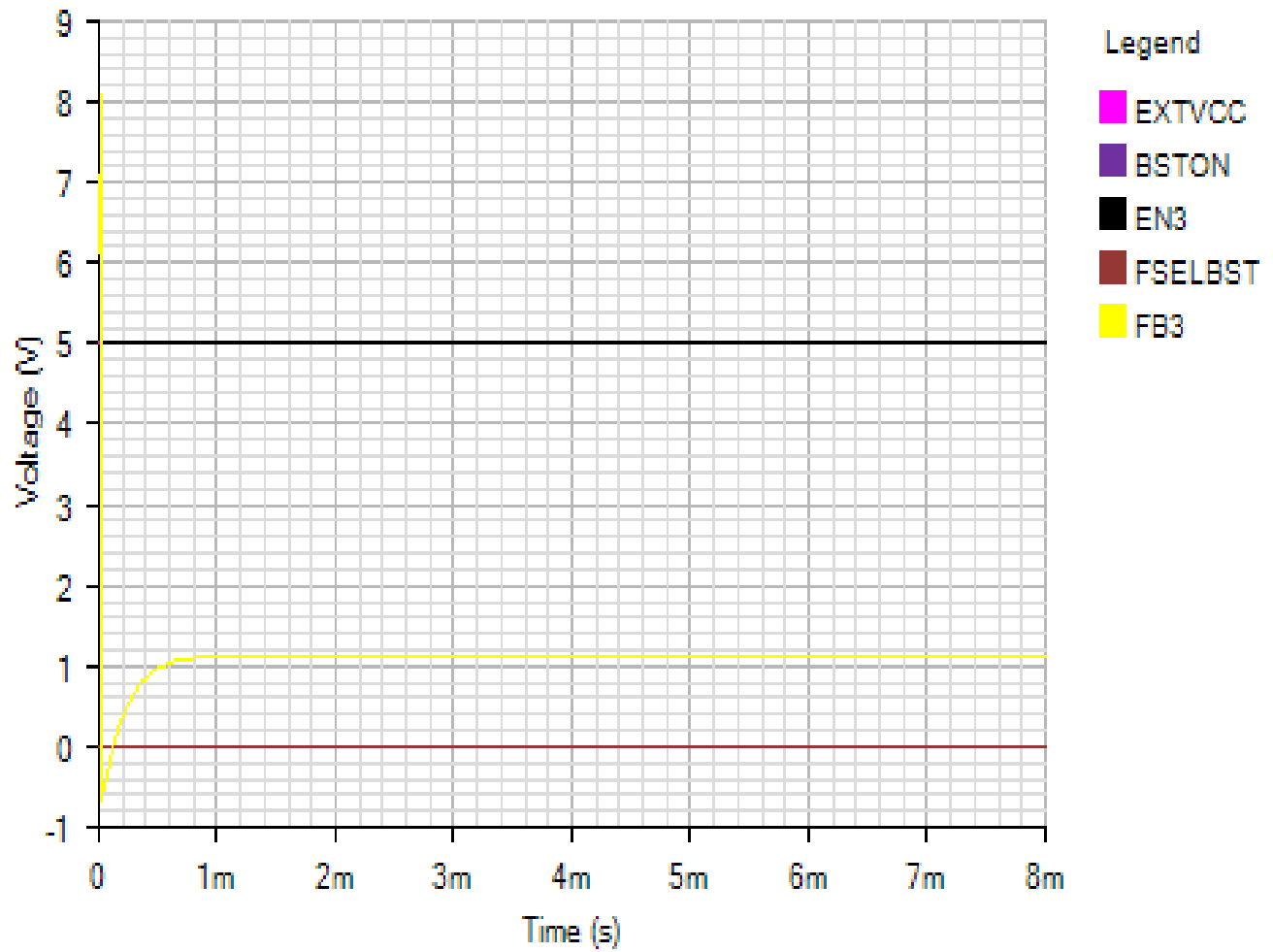
OUTPUT1

Default



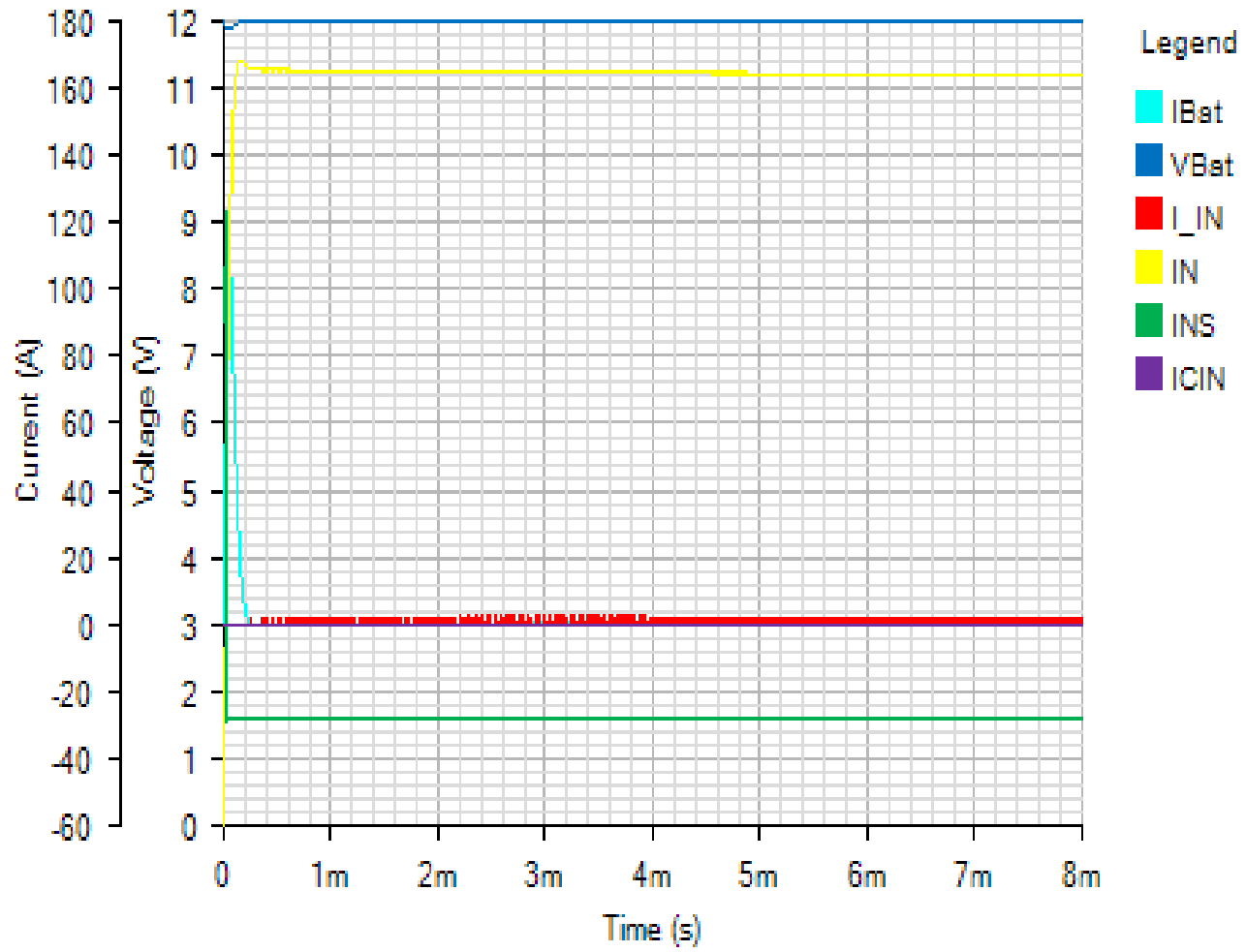
IC3

Default



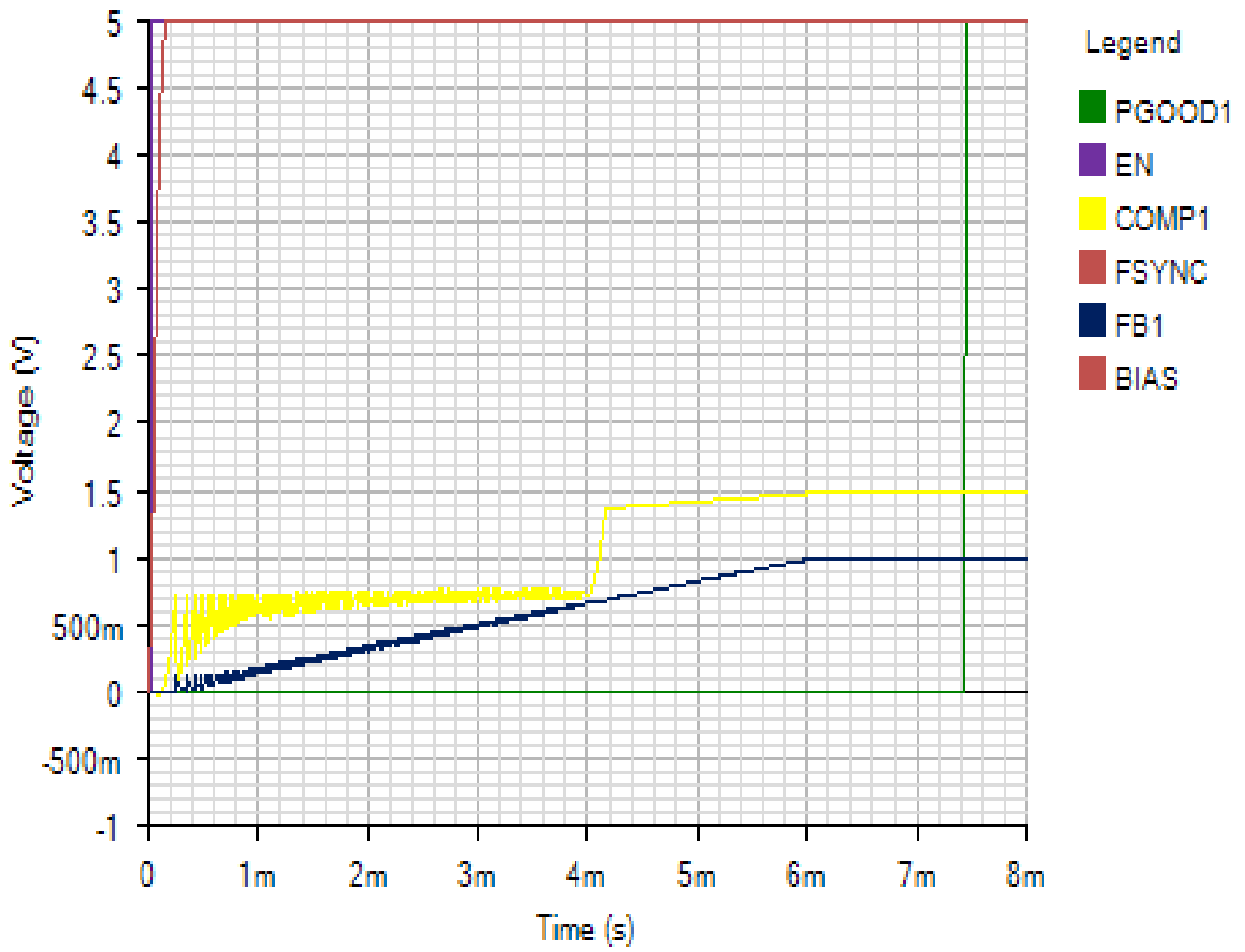
INPUT

Default



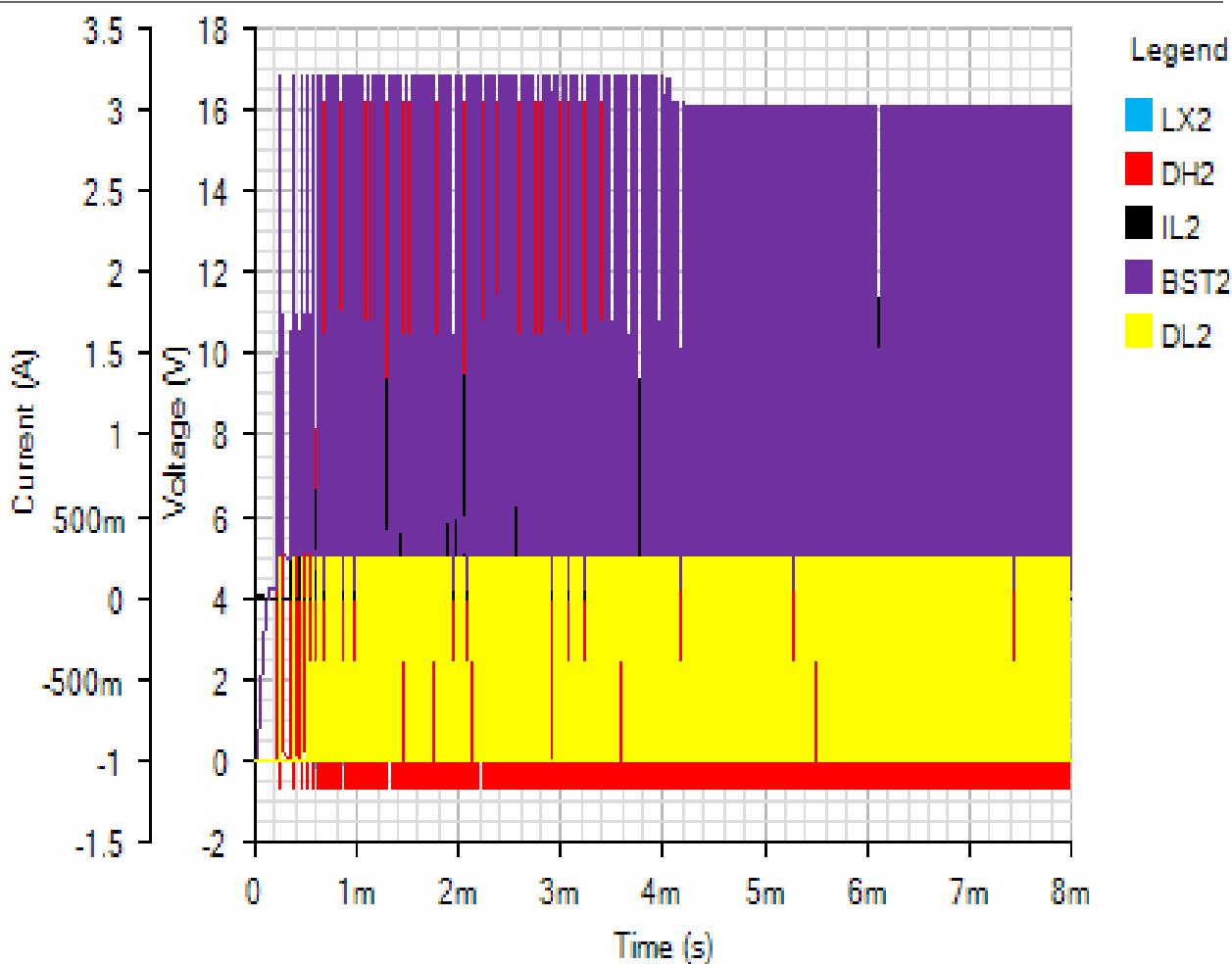
IC1

Default



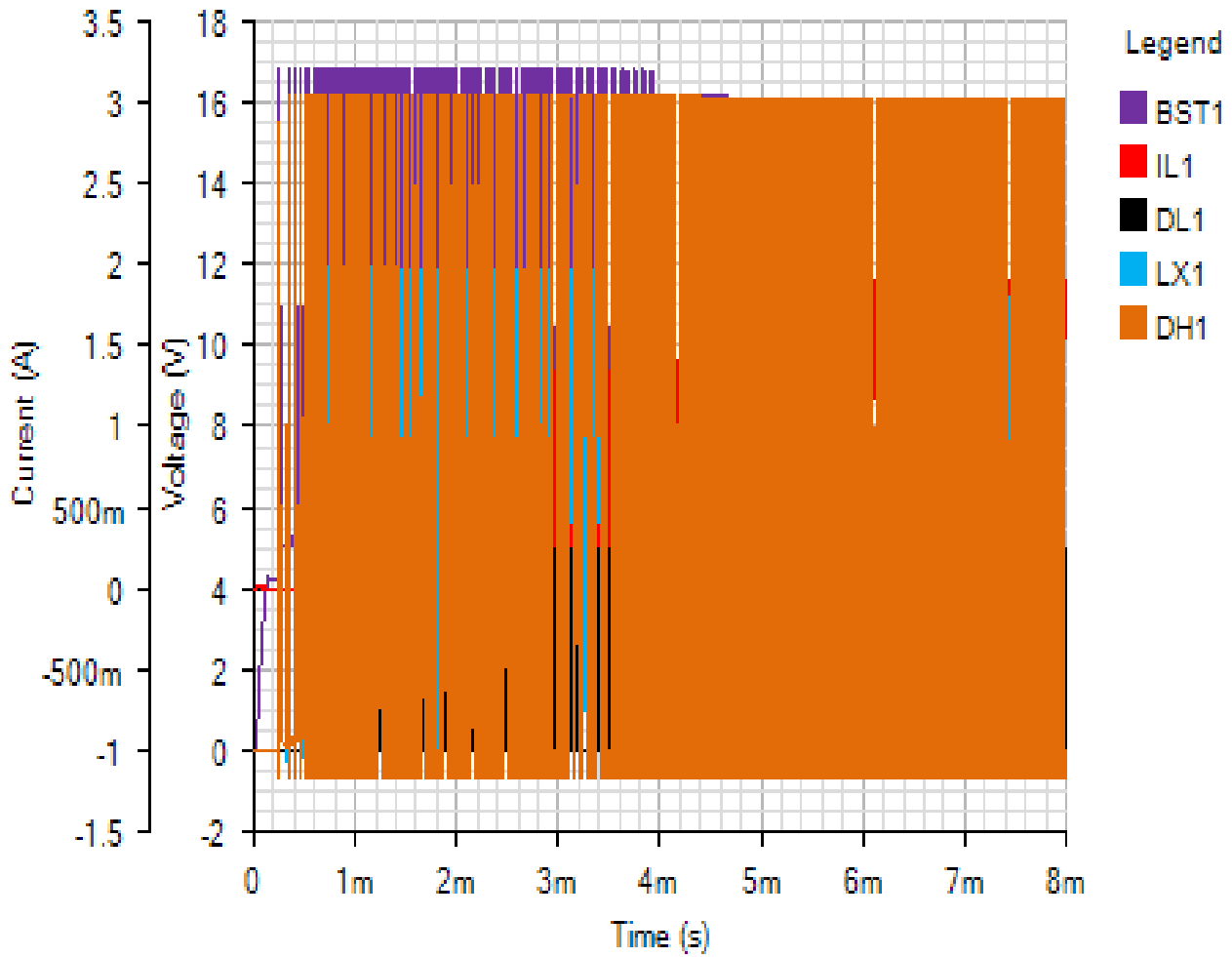
SWITCHING2

Default



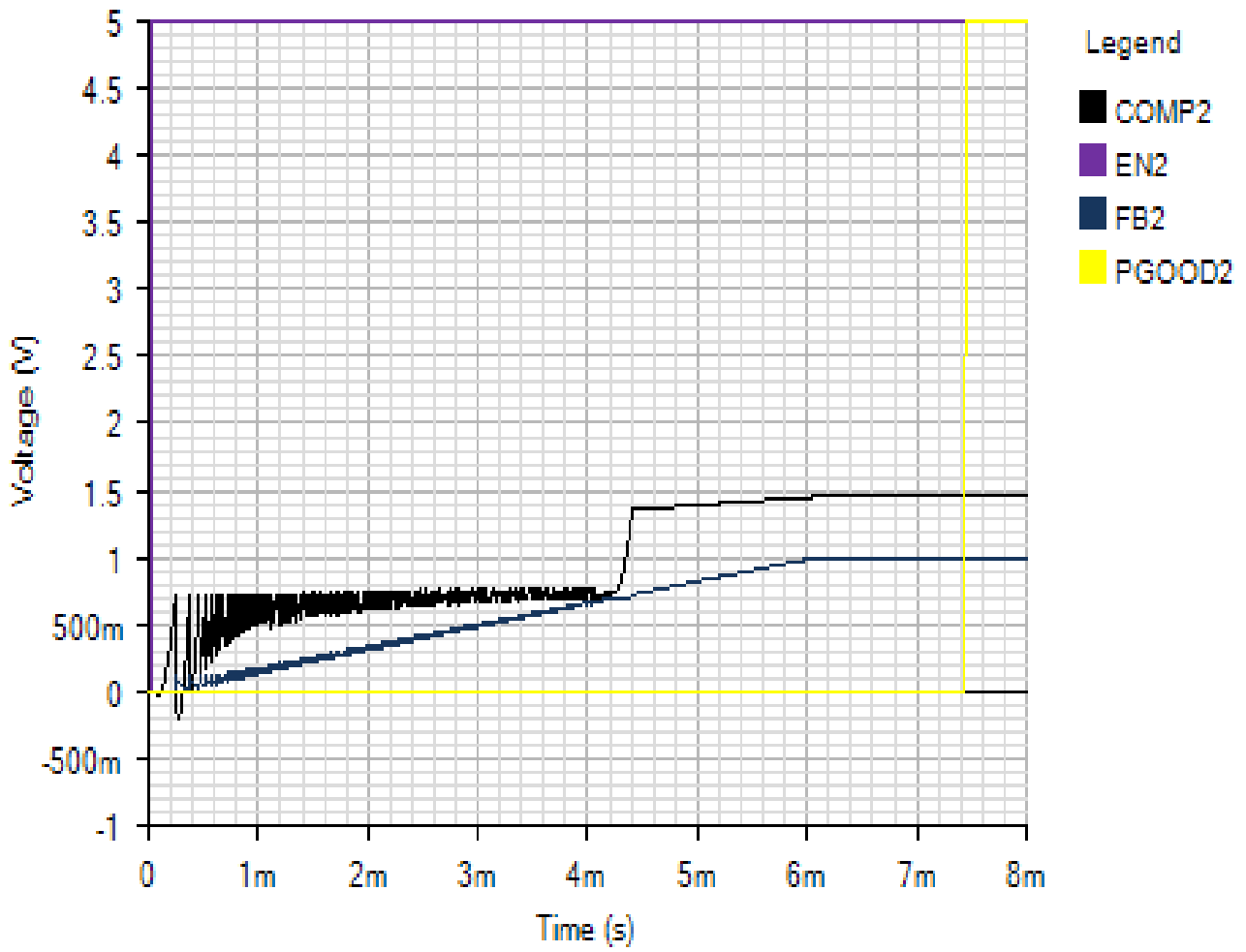
SWITCHING1

Default



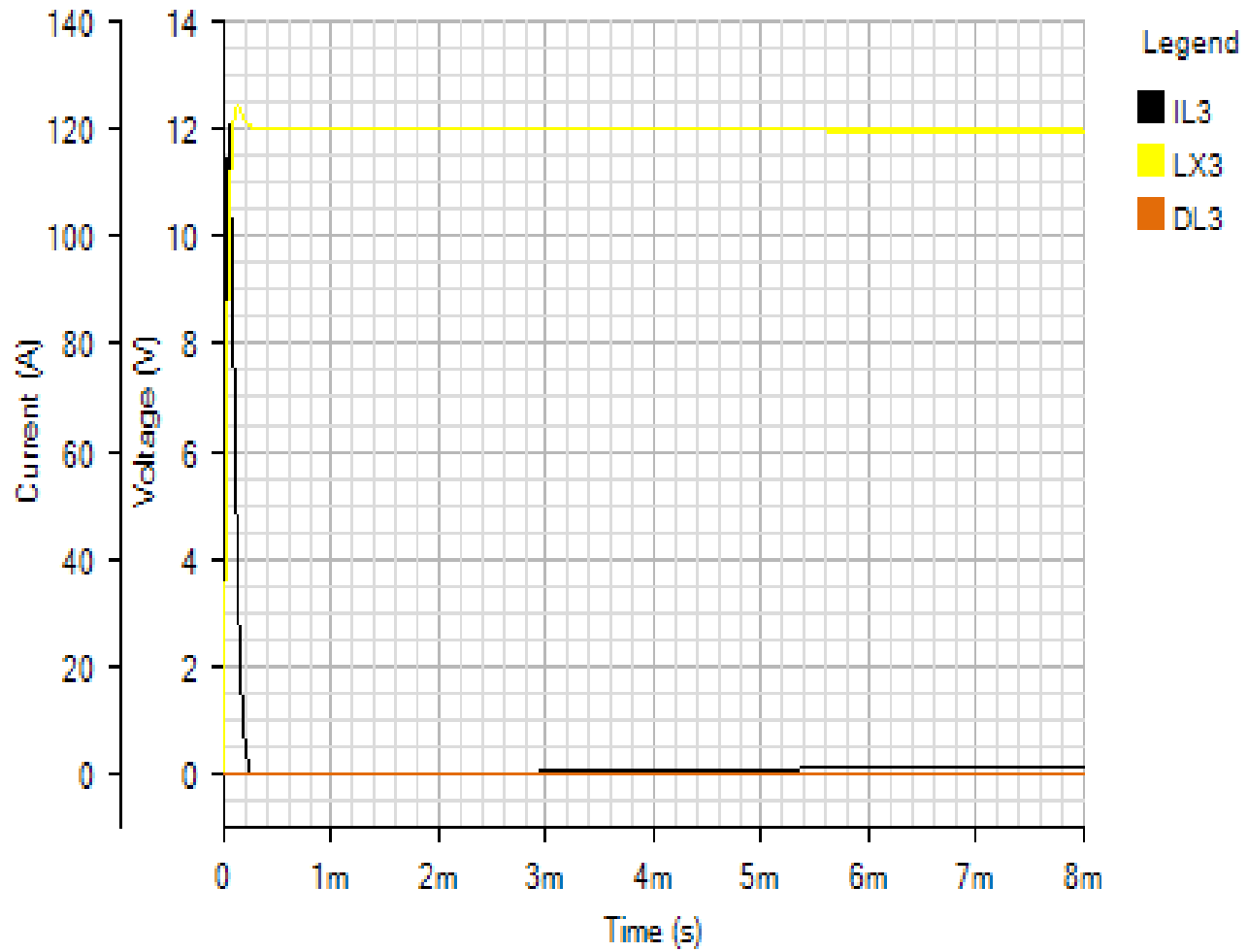
IC2

Default



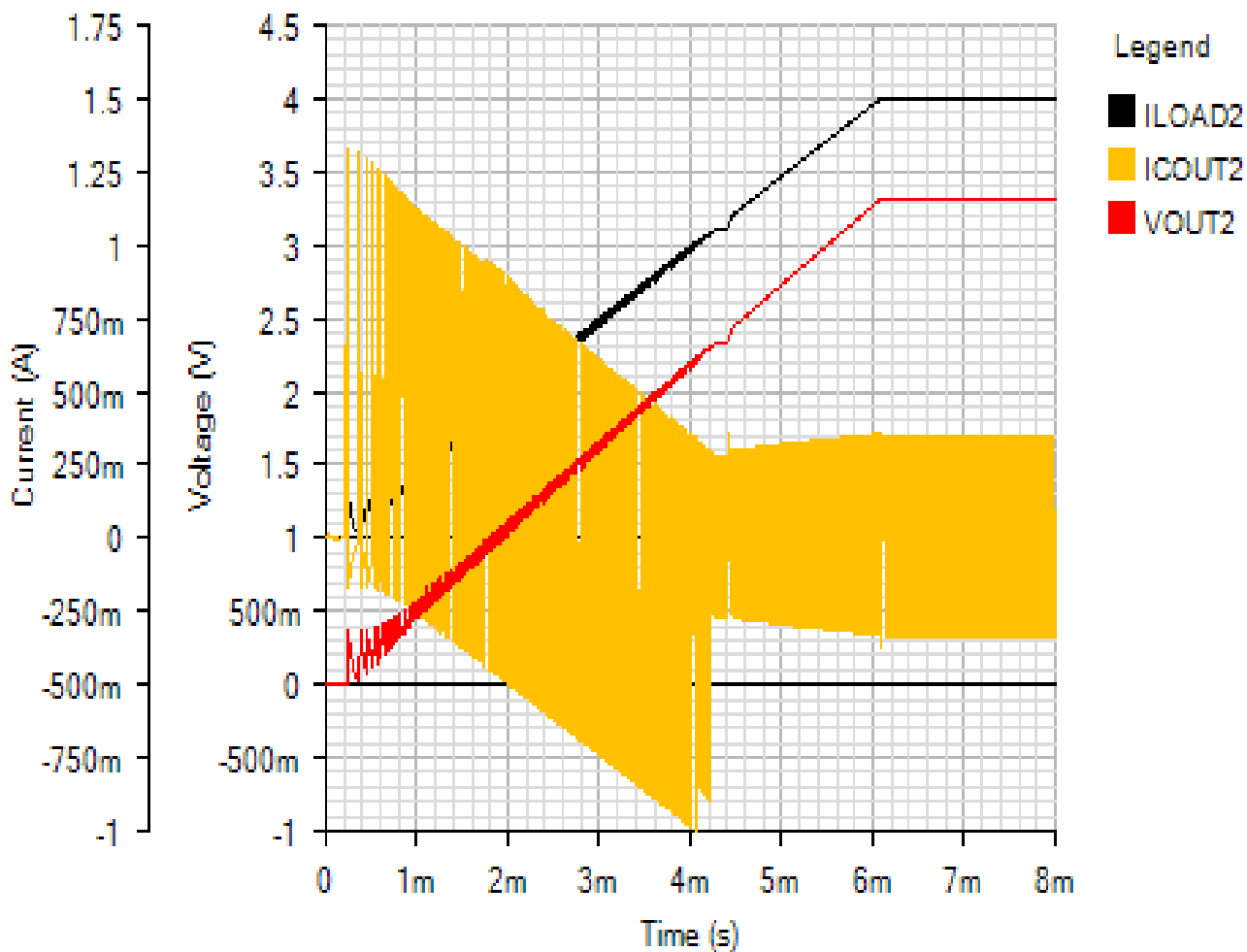
SWITCHING3

Default



OUTPUT2

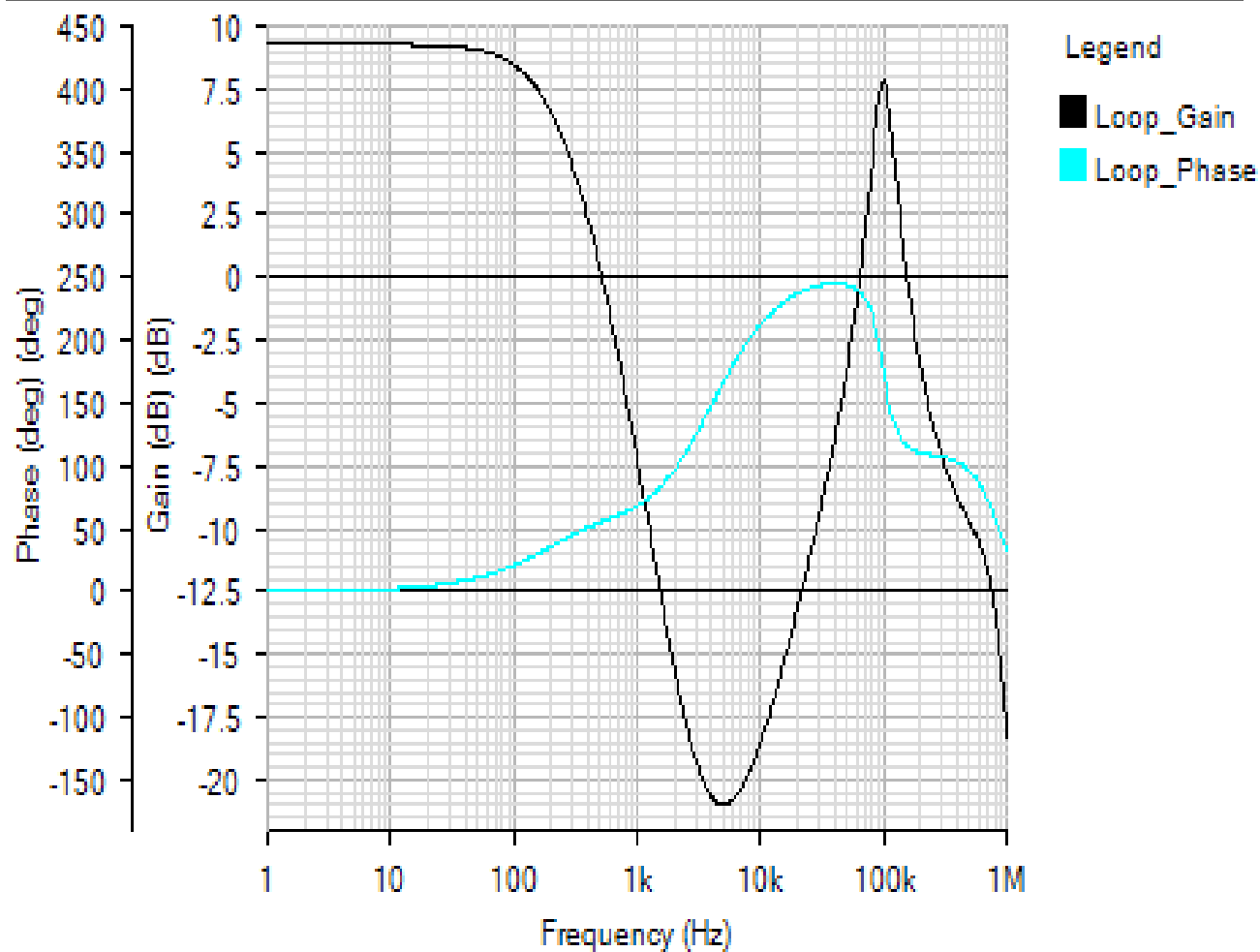
Default



PreBoost AC - Mon Nov 19 2018 13:53:48

BODE

Default



Phase Margin: 55.72° at a crossover frequency of 0.5kHz

