

Initial Design

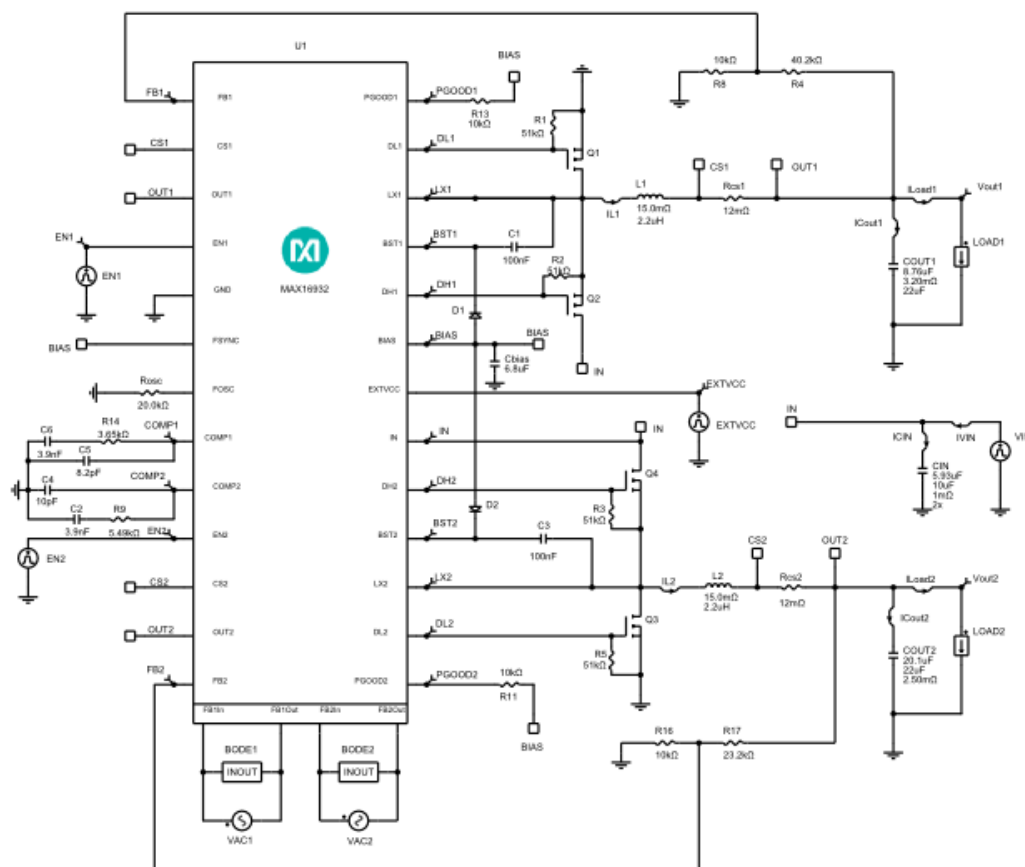
1.0

Design Requirements

Parameter	Value
Output Configuration	Adjustable Output Voltage
Minimum Input Voltage	10V
Maximum Input Voltage	14V
Nominal Input Voltage	12V
Input Voltage Ripple	0.5%
Output 1 Voltage	5V
Output 1 Current	3
Output 2 Voltage	3.3
Output 2 Current	3
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 Current	3A
Output 2 Load Step Start Current	1.5A
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
Mode	PWM
Switching Frequency	1600000Hz

Parameter	Value
Switching Frequency (Output 2)	Equal to Switching Frequency of Output 1
Ambient Temperature	25
Inductor 1 Current Ratio (LIR 1)	0.3
Inductor 1 Current Ratio (LIR 2)	0.3
Peak Current Limit Output 1	5.175A
Peak Current Limit Output 2	5.175A

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
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U1	1	MAX16932	User-Defined	IC
C1	1	VJ0603Y104KXAAC	Vishay	Cap Ceramic 0.1uF 50V X7R 10% Pad SMD 0603 150°C T/R
C2	1	04025C392KAT2A	AVX	Cap Ceramic 0.0039uF 50V X7R 10% 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	C0603C100K5GAC	KEMET Corporation	Cap Ceramic 10pF 50V C0G 10% Pad SMD 0603 125°C Bulk
C5	1	C0603C829K5GACTU	KEMET Corporation	Cap Ceramic 8.2pF 50V C0G 10% Pad SMD 0603 125°C T/R
C6	1	04025C392KAT2A	AVX	Cap Ceramic 0.0039uF 50V X7R 10% Pad SMD 0402 125°C T/R
CIN	2	C1206C106K4PAC	Kemet	Cap Ceramic 10uF 16V X5R 10% SMD 1206 85C Bulk
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
Cbias	1	C1206C685K4RACTU	KEMET Corporation	Cap Ceramic 6.8uF 16V X7R 10% Pad SMD 1206 125°C T/R
D1	1	MBR0520L	ON Semiconductor	Diode Schottky 20V 0.5A 2-Pin SOD-123 T/R
D2	1	1N914	ON Semiconductor	Diode Small Signal Switching 100V 0.3A 2-Pin DO-35 Bag
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
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	SiR474DP	Vishay	Trans MOSFET N-CH 30VDS 12mOhm@4.5V 11.3mOhm@6V 8nC 3.5nC 0.99nF 0.205nF 150°C 20A 29.8W 4.2°C/W 1.12mm 32.9mm^2 PowerPAK SO-8
R1	1	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R

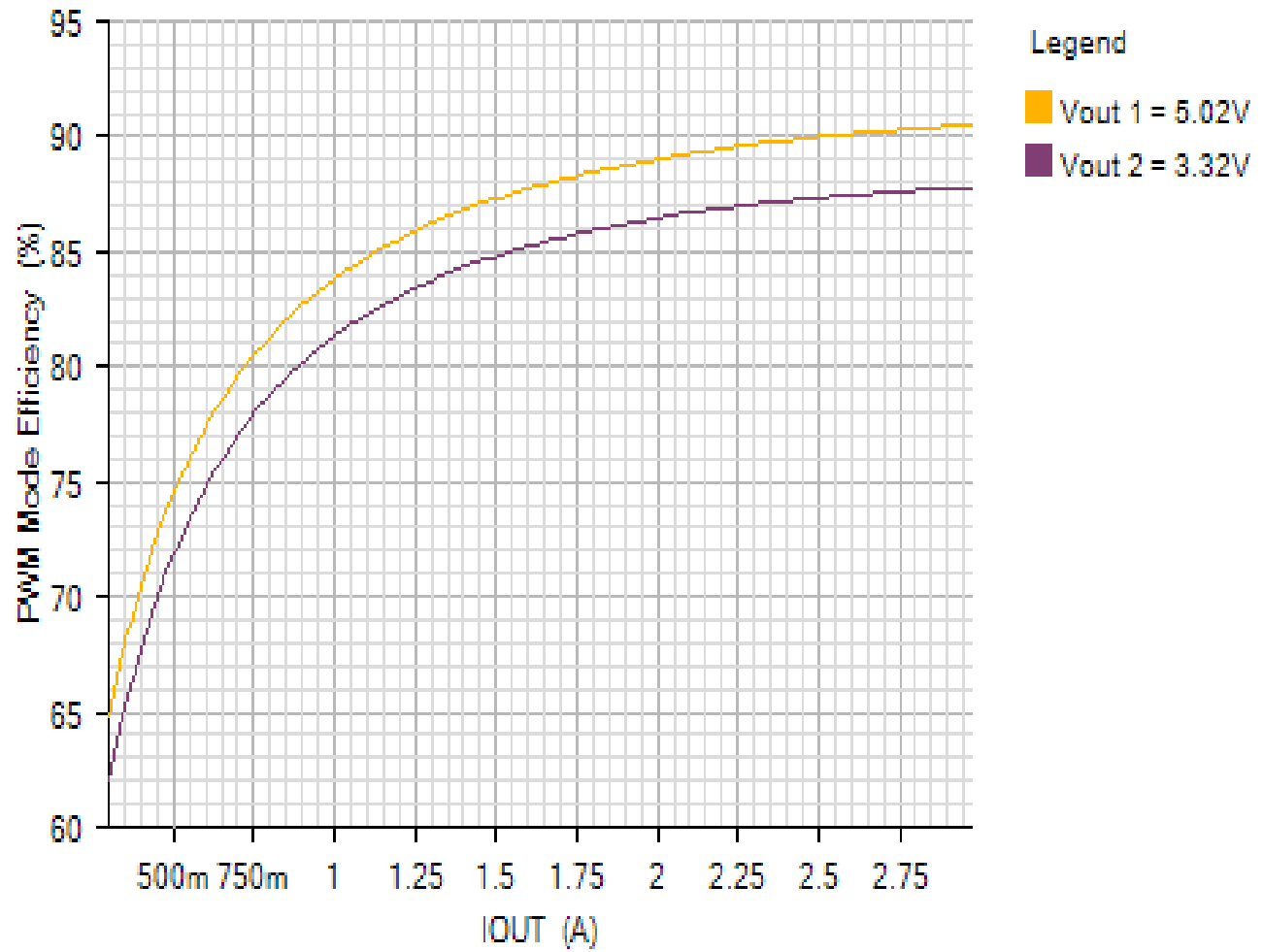
R2	1	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R3	1	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF4022V	Panasonic	Res Thick Film 0603 40.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ2GEJ513X	Panasonic	Res Thick Film 0402 51K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R8	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K 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	ERJ2GEJ103X	Panasonic	Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R13	1	ERJ2GEJ103X	Panasonic	Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R14	1	ERJ3EKF3651V	Panasonic	Res Thick Film 0603 3.65K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R16	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R17	1	ERJ3EKF2322V	Panasonic	Res Thick Film 0603 23.2K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
Rcs1	1	NCSS12AFR012TRF	NIC Components	Res Metal Strip 1206 0.012 Ohm 1% 0.25W(1/4W) ±75ppm/°C Pad SMD T/R
Rcs2	1	NCSS12AFR012TRF	NIC Components	Res Metal Strip 1206 0.012 Ohm 1% 0.25W(1/4W) ±75ppm/°C Pad SMD T/R
Rosc	1	ERJ3EKF2002V	Panasonic	Res Thick Film 0603 20K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Mon Nov 19 2018 17:33:57

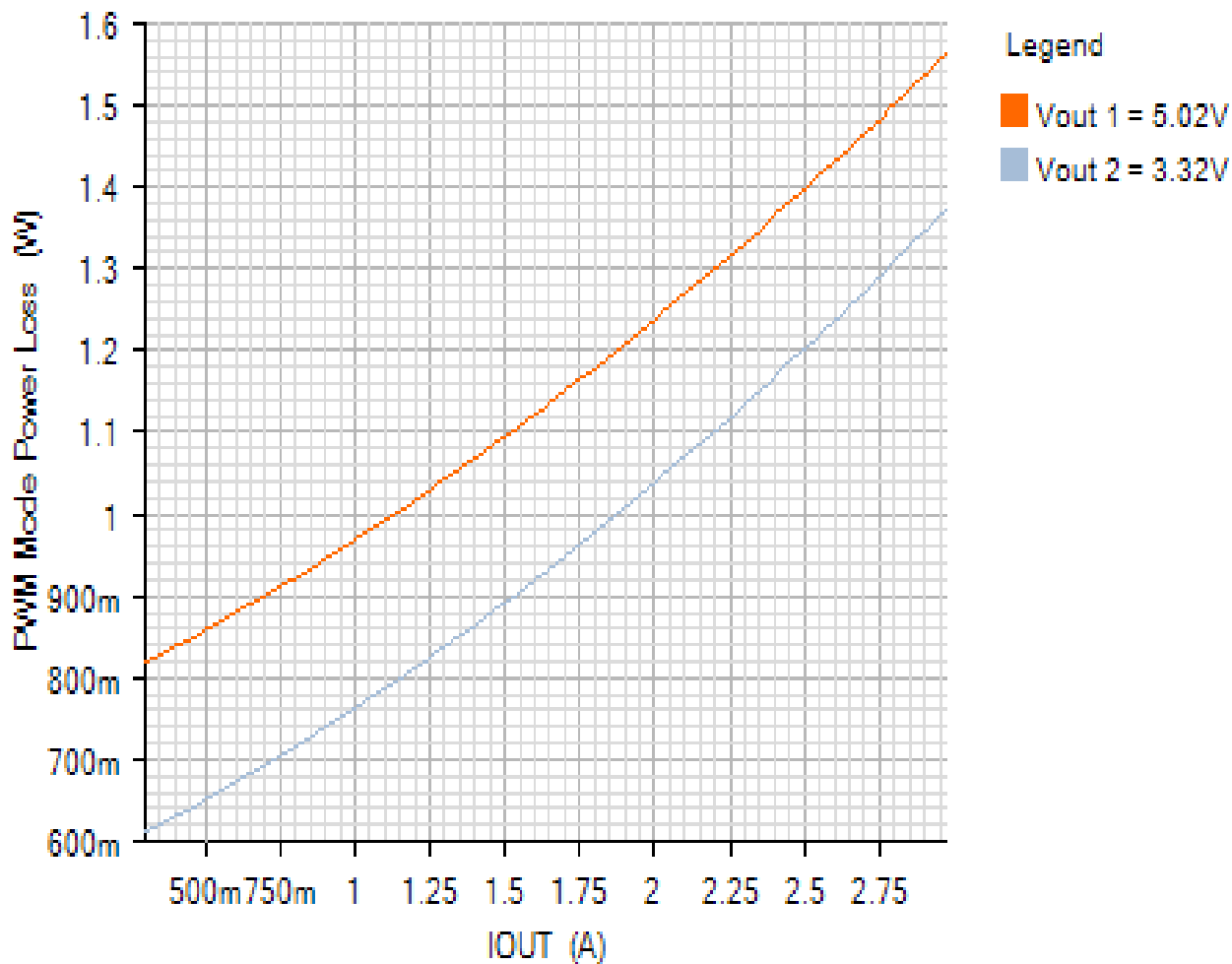
EFFICIENCY

Default

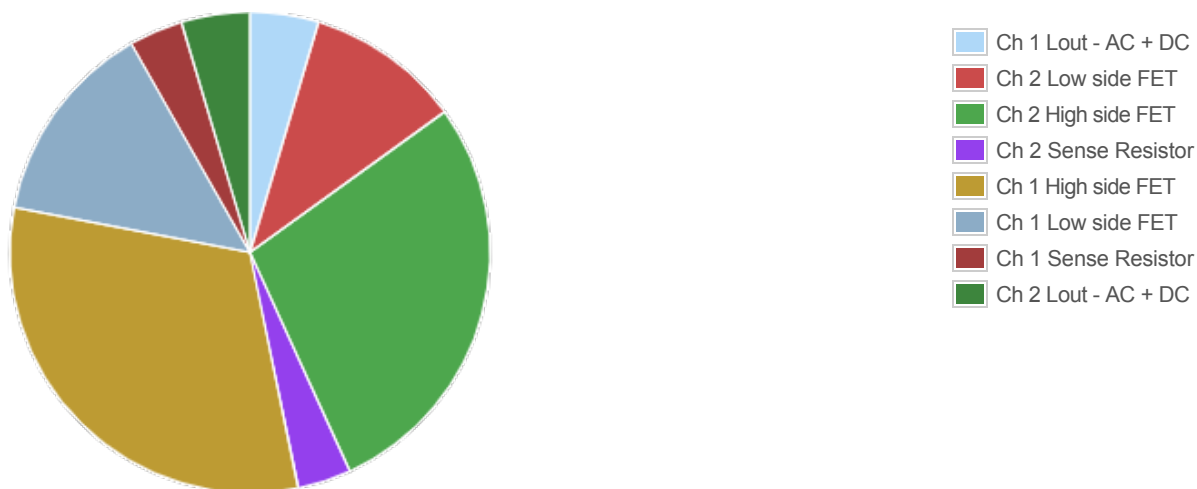


POWER_LOSS

Default



Losses



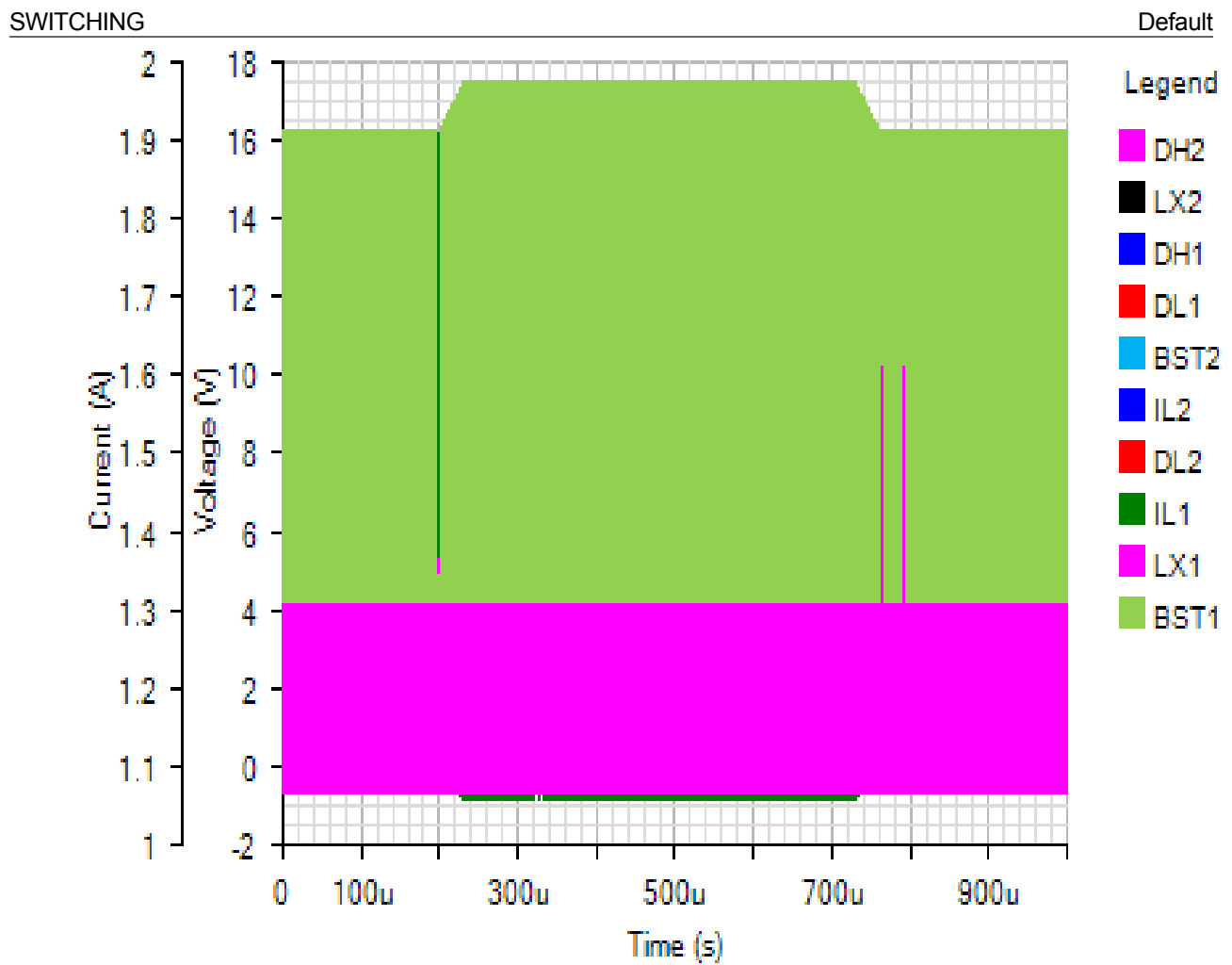
Component

Loss (W)

% of total

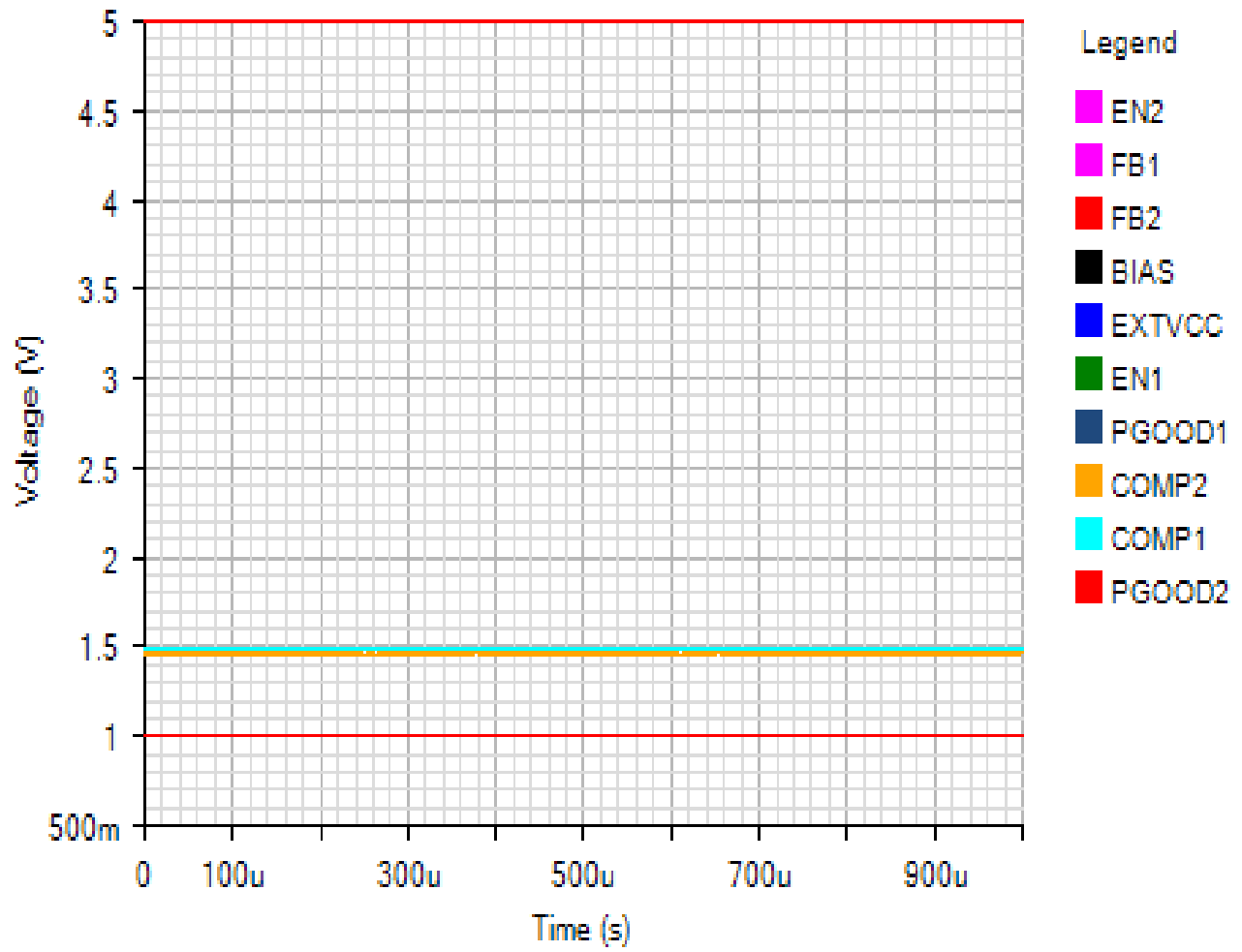
Component	Loss (W)	% of total
Ch 1 Lout - AC + DC	0.135788	4.6
Ch 2 Low side FET	0.306482	10.4
Ch 2 High side FET	0.824862	28.1
Ch 2 Sense Resistor	0.106519	3.6
Ch 1 High side FET	0.917381	31.2
Ch 1 Low side FET	0.403716	13.7
Ch 1 Sense Resistor	0.106734	3.6
Ch 2 Lout - AC + DC	0.13551	4.6
Total	2.936992	100

Line Transient - Mon Nov 19 2018 17:33:57



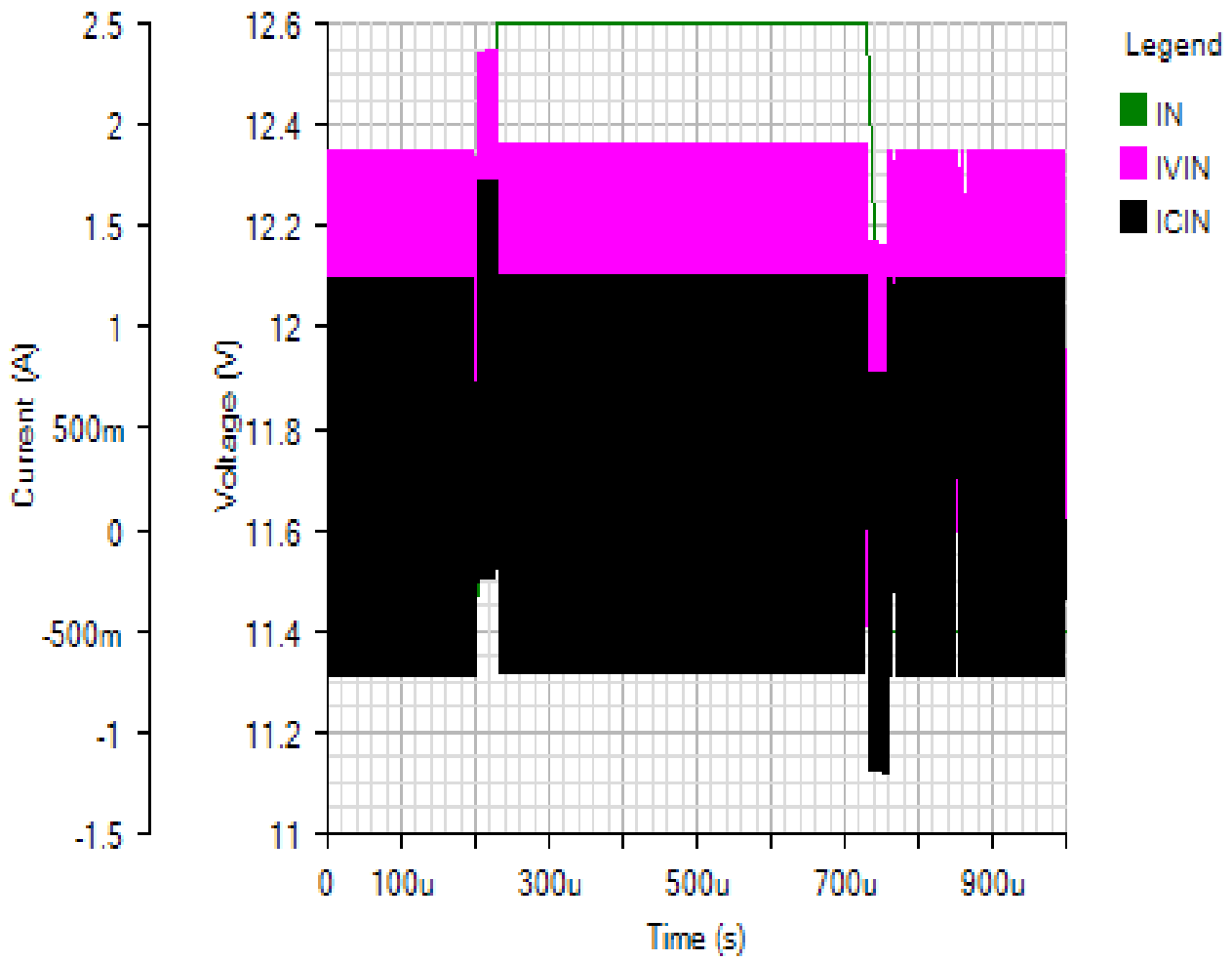
IC

Default



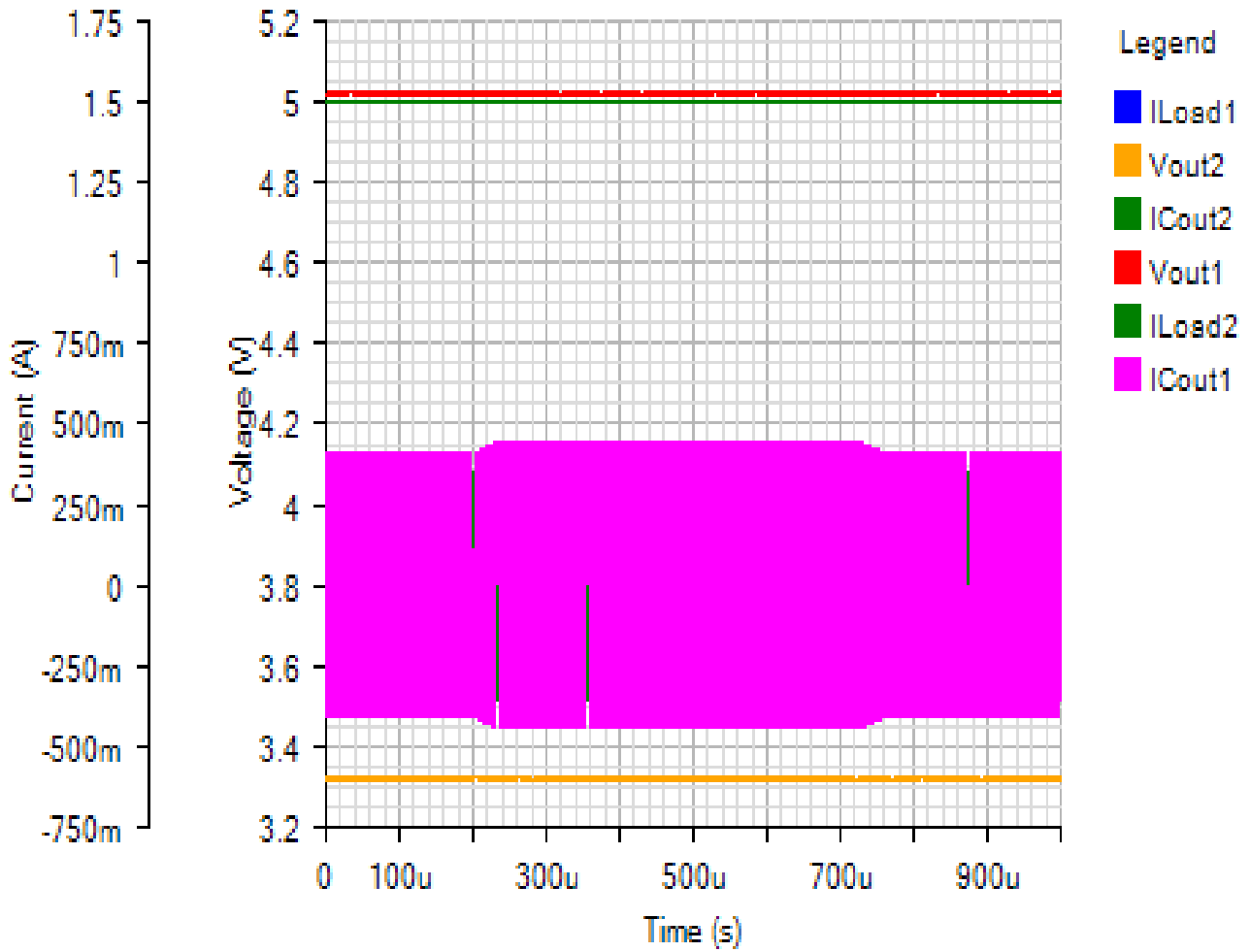
INPUT

Default

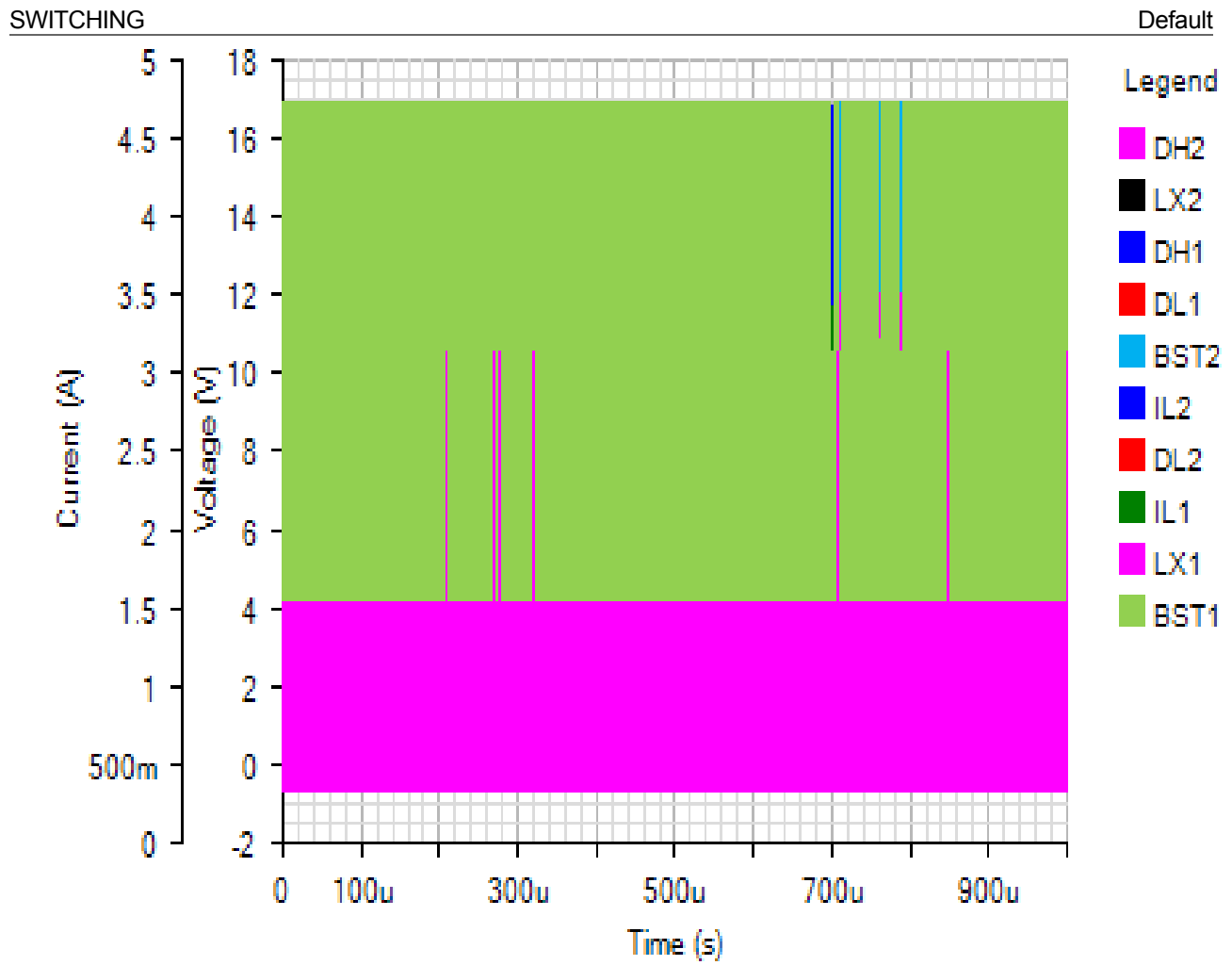


OUTPUT

Default

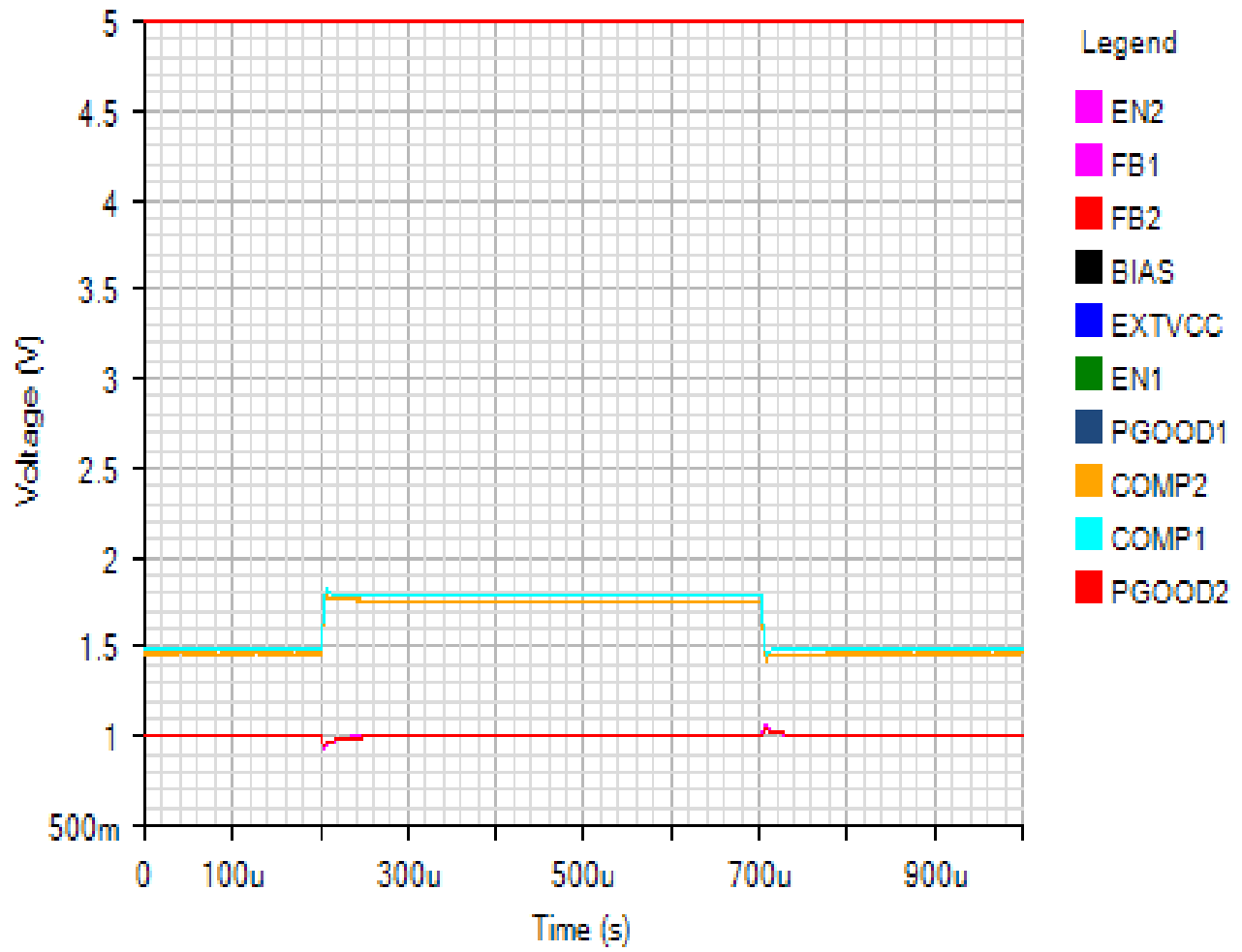


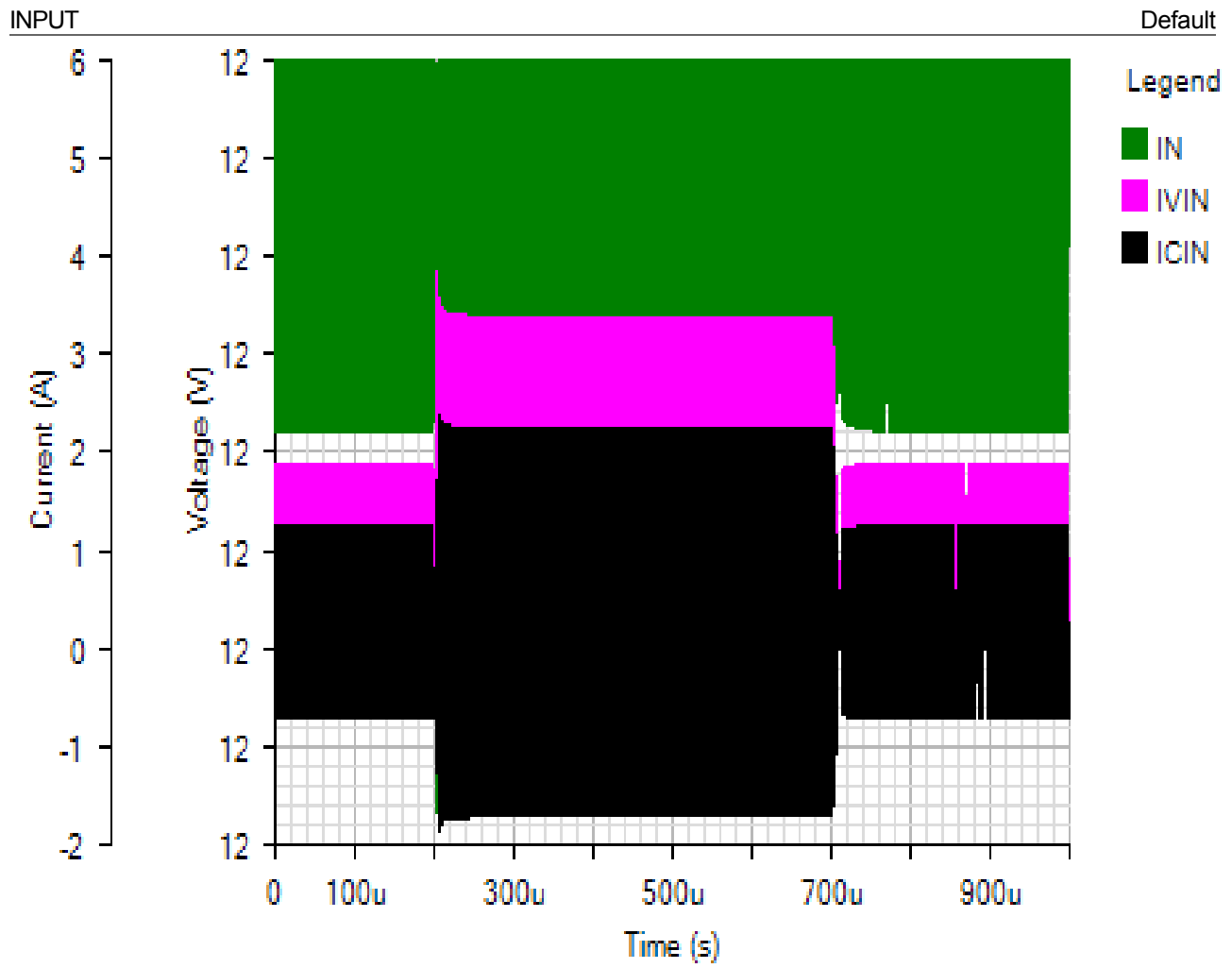
Load Step - Mon Nov 19 2018 17:33:57



IC

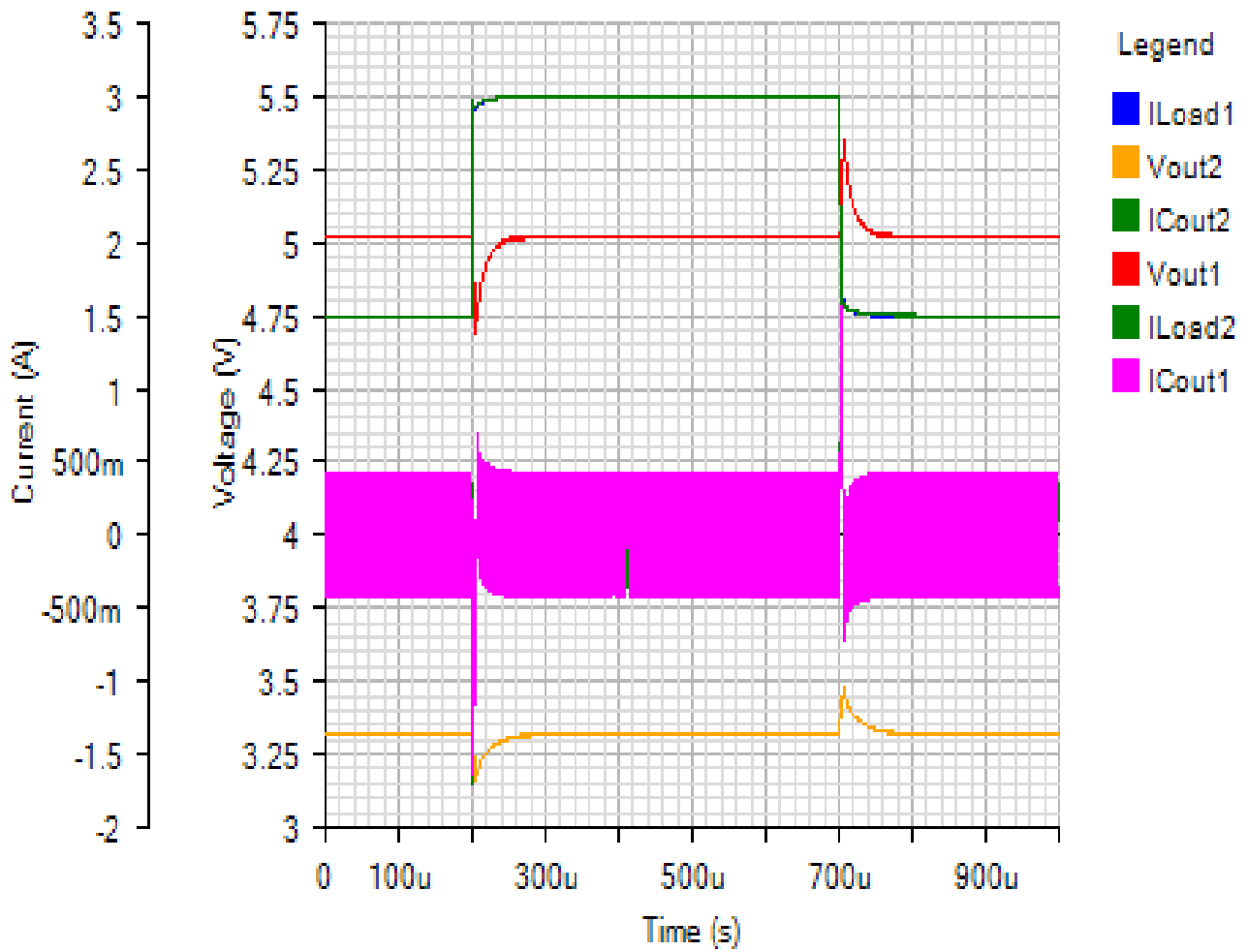
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OUTPUT

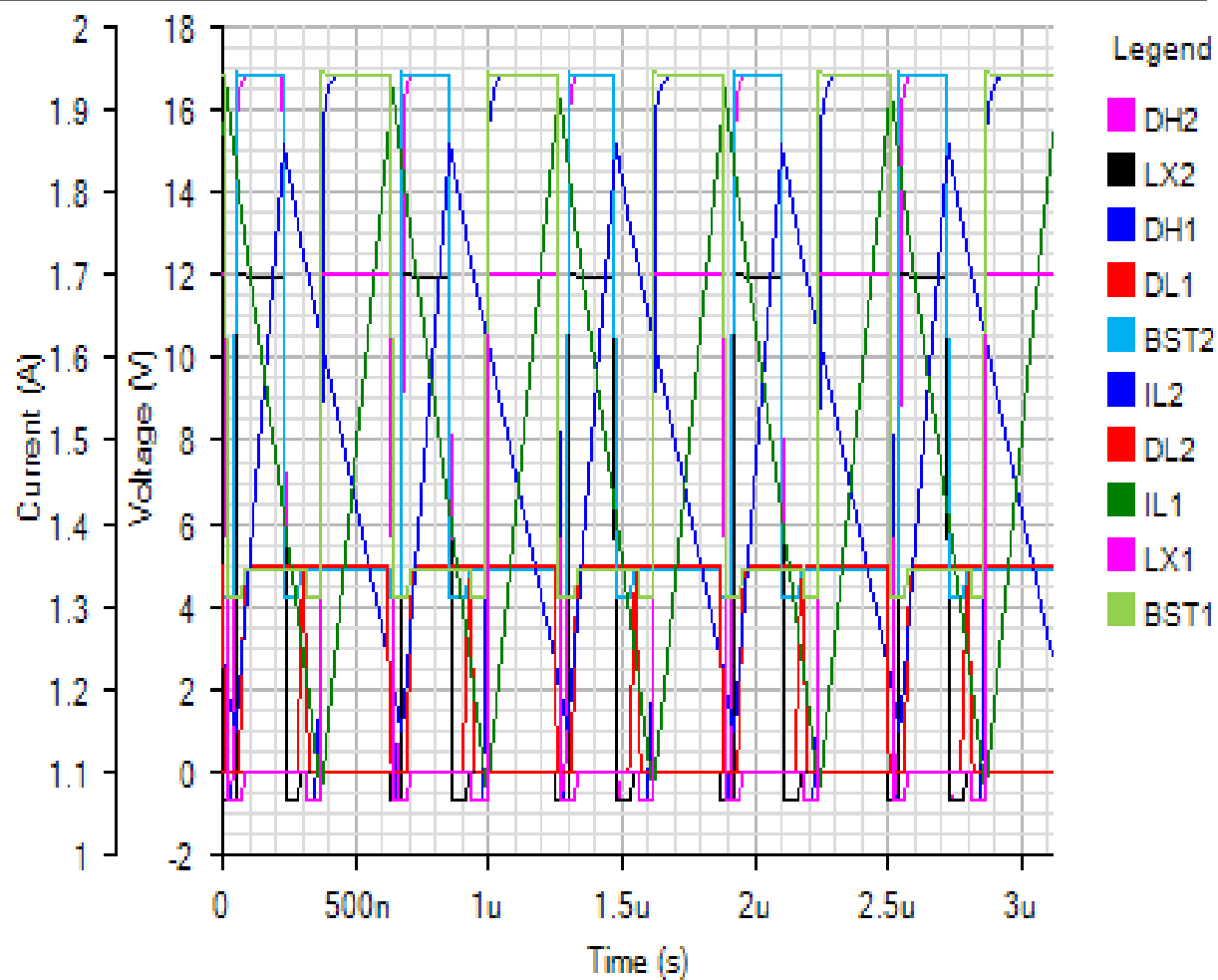
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Steady State - Mon Nov 19 2018 17:33:57

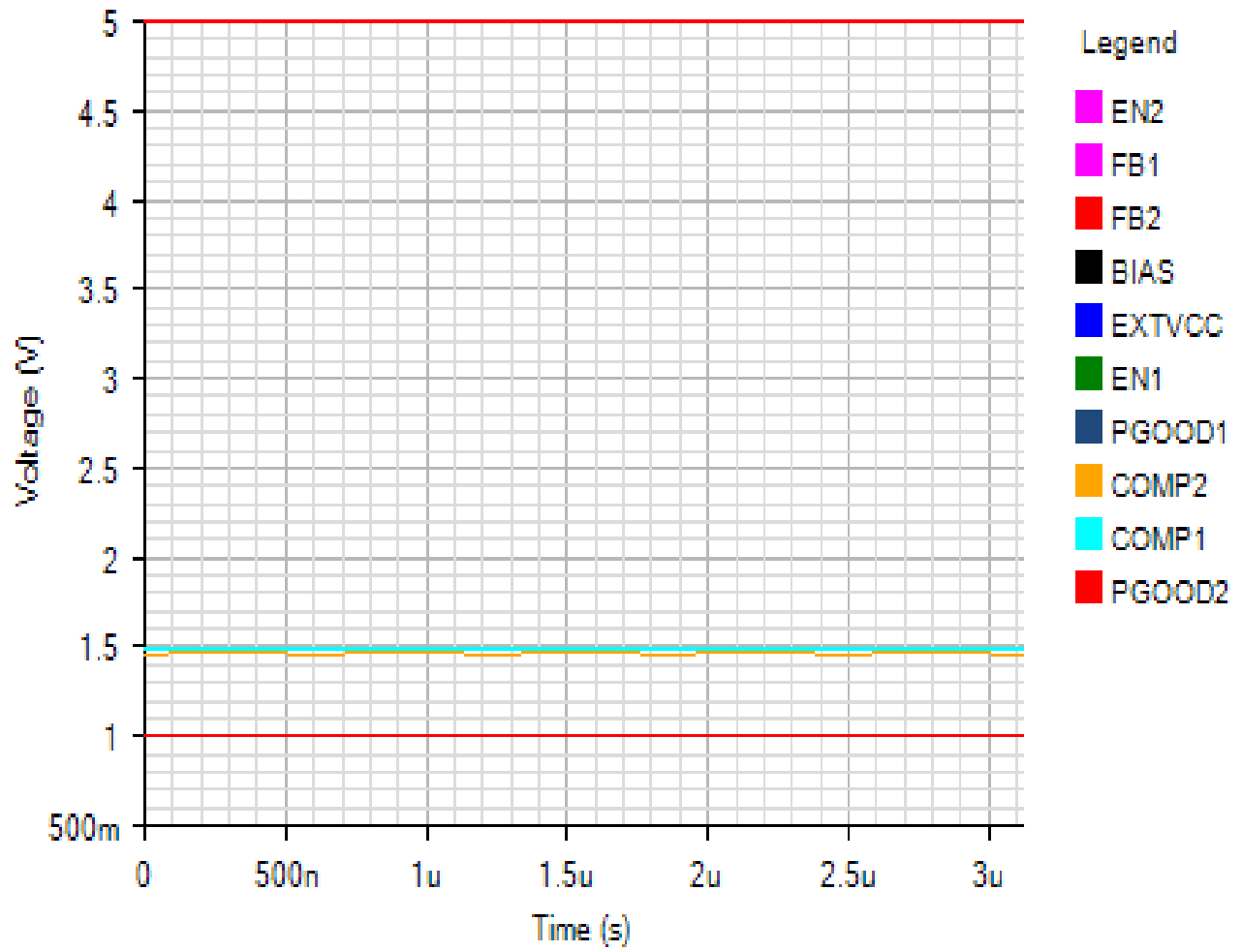
SWITCHING

Default



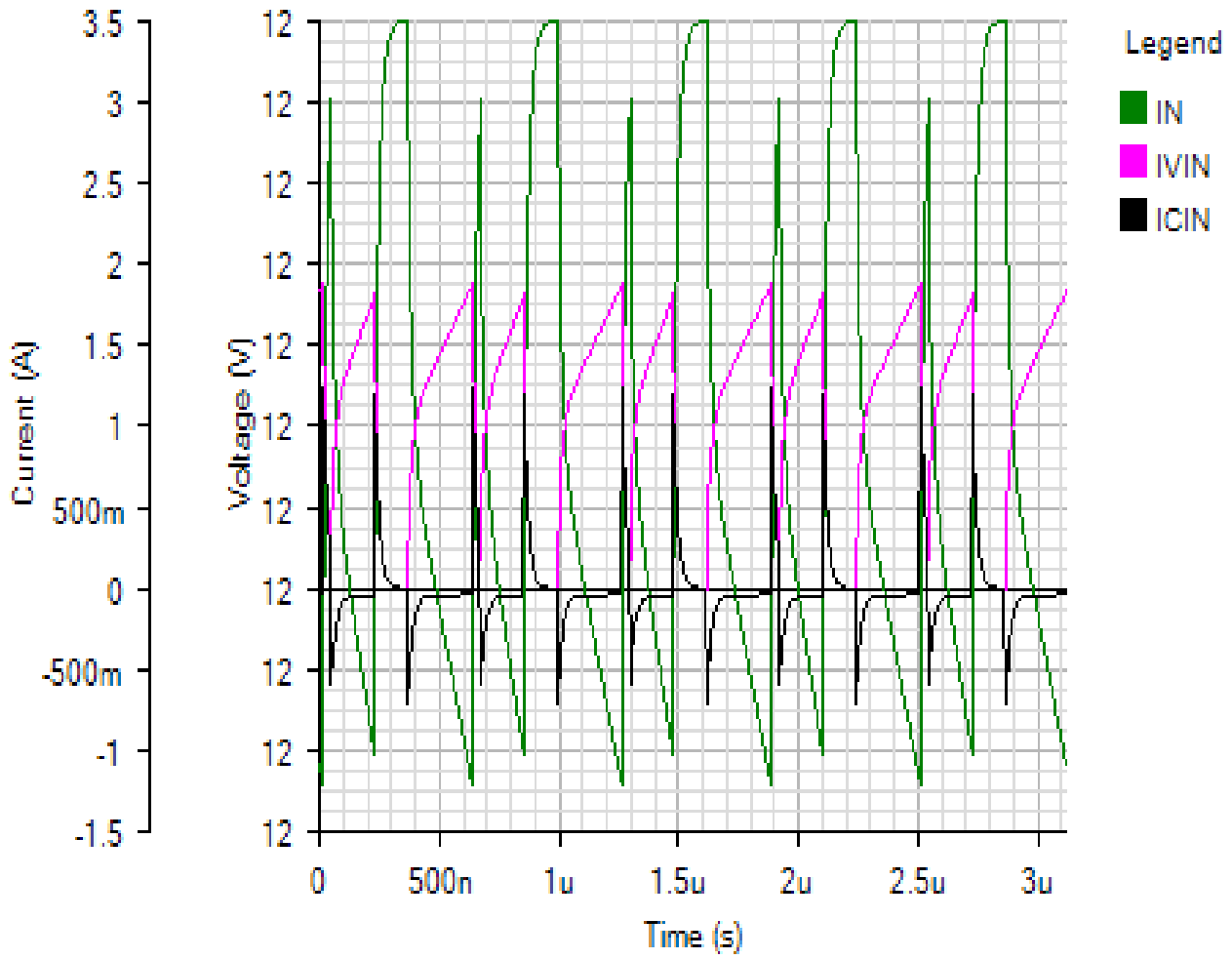
IC

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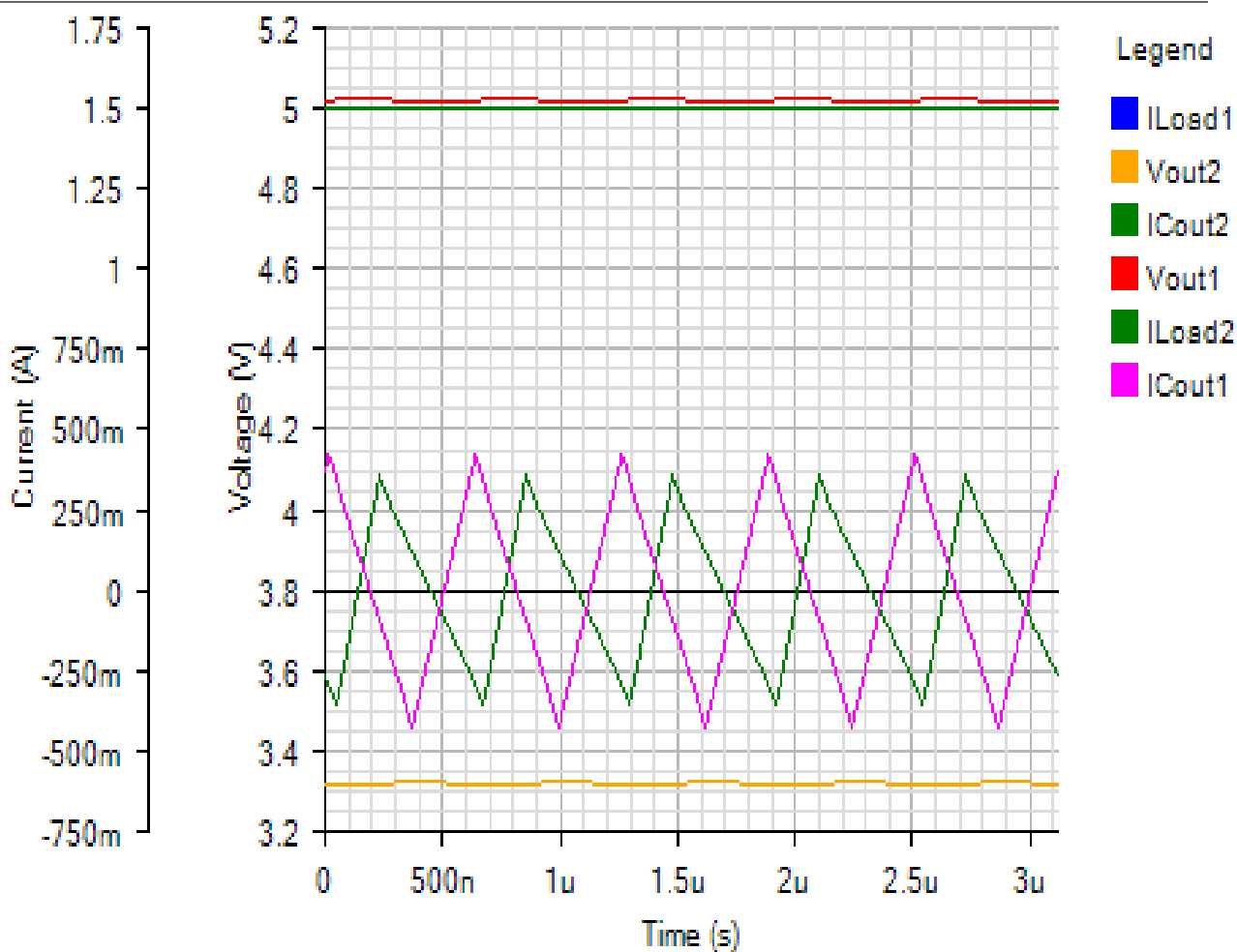
INPUT

Default



OUTPUT

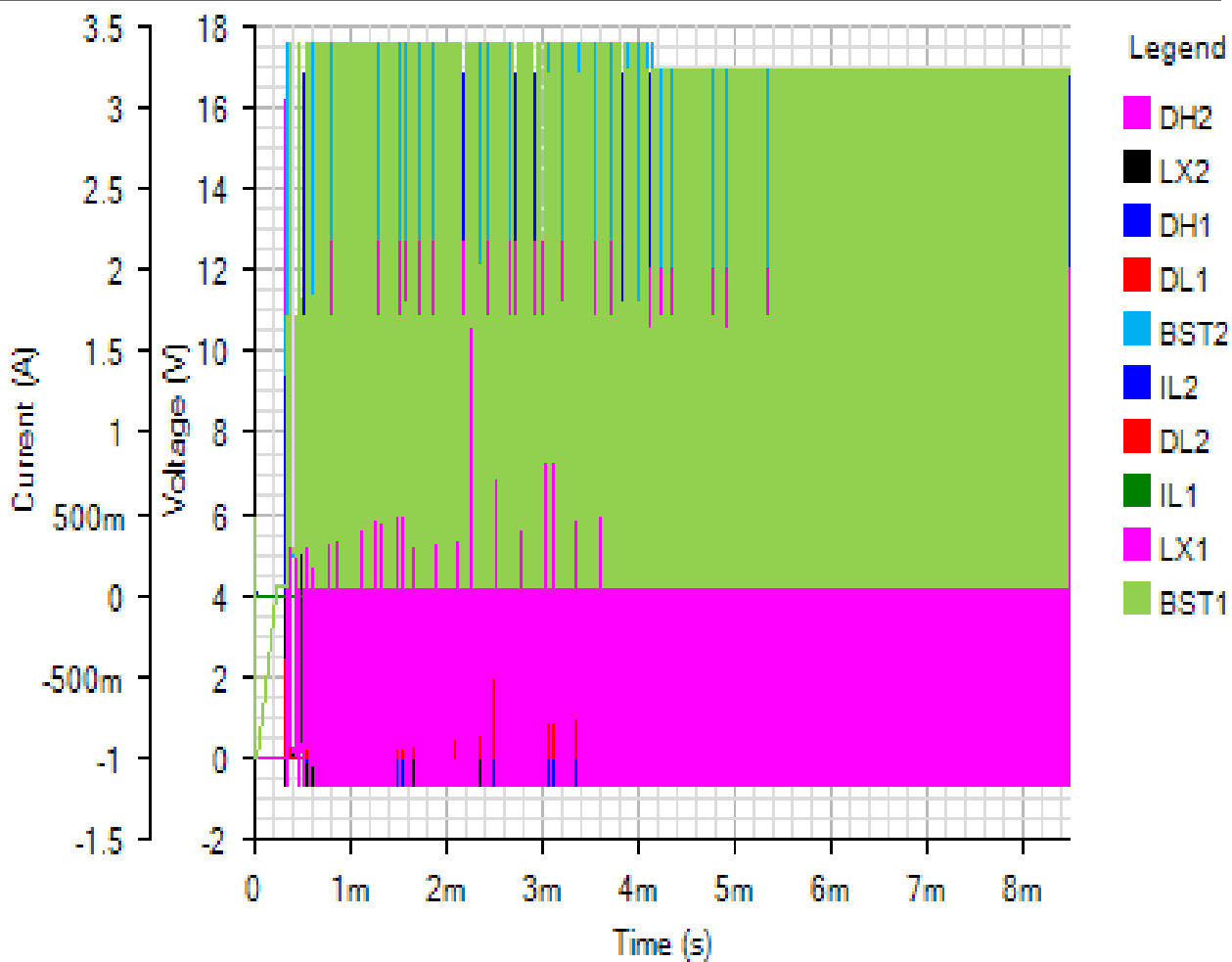
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Start Up - Mon Nov 19 2018 17:33:57

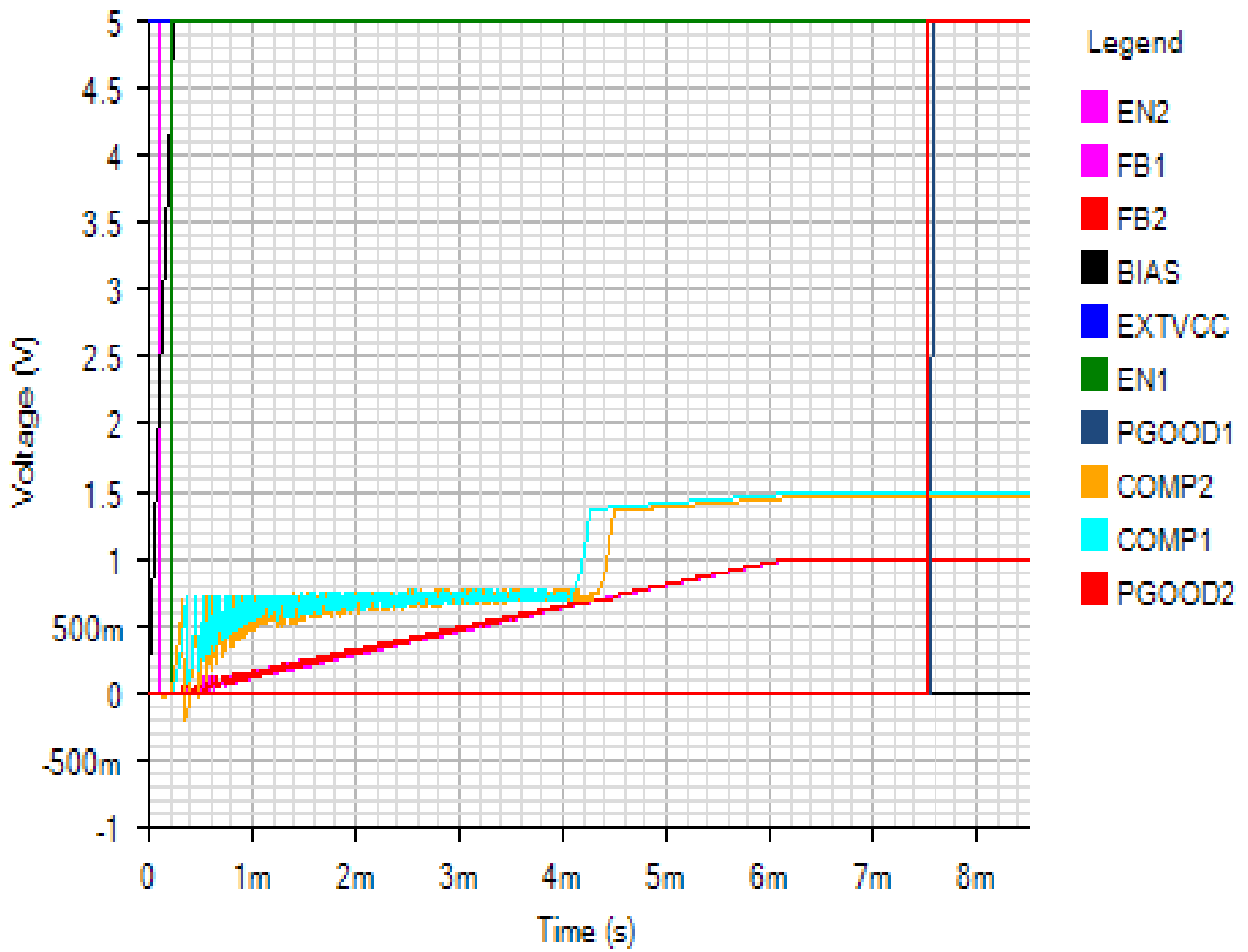
SWITCHING

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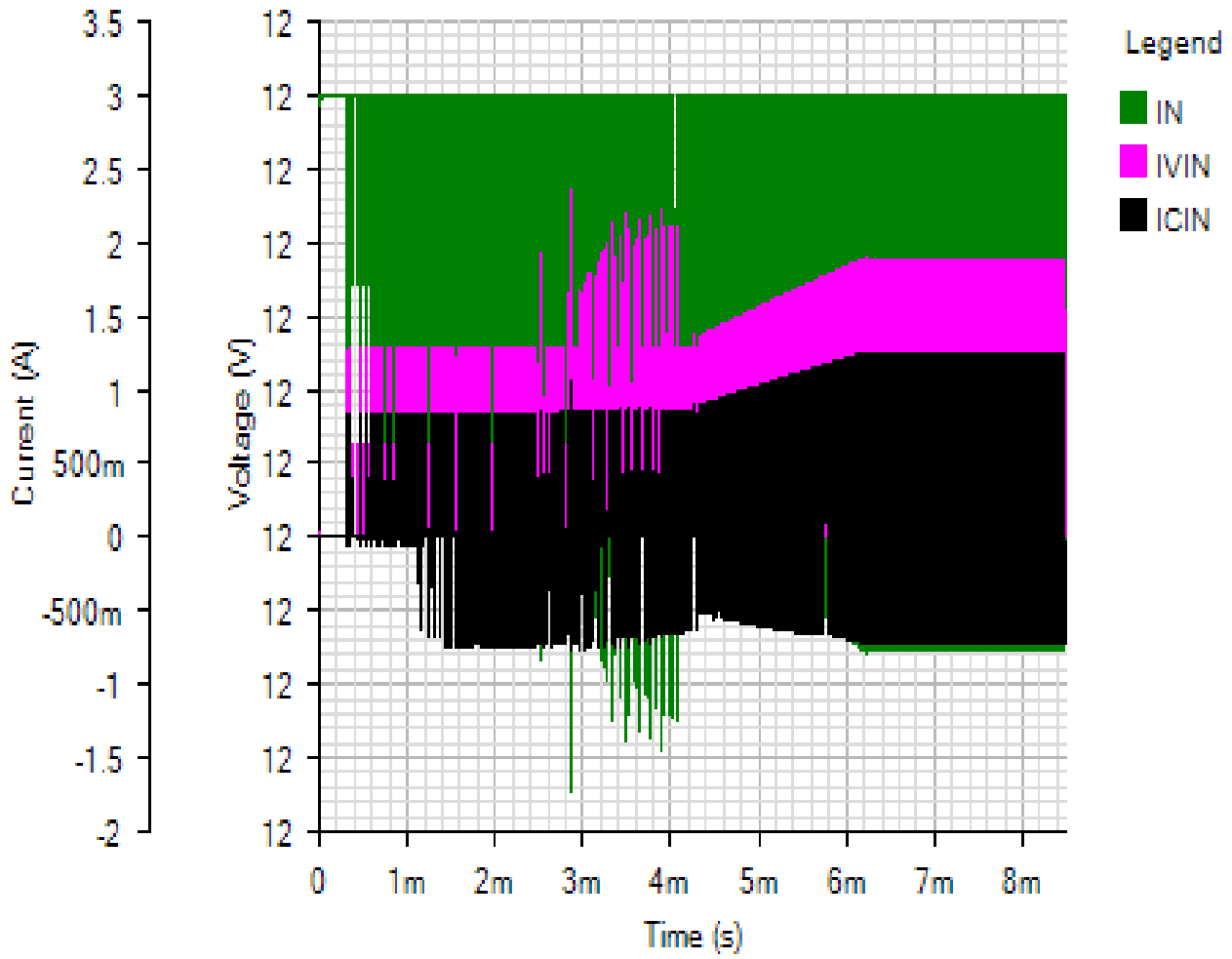
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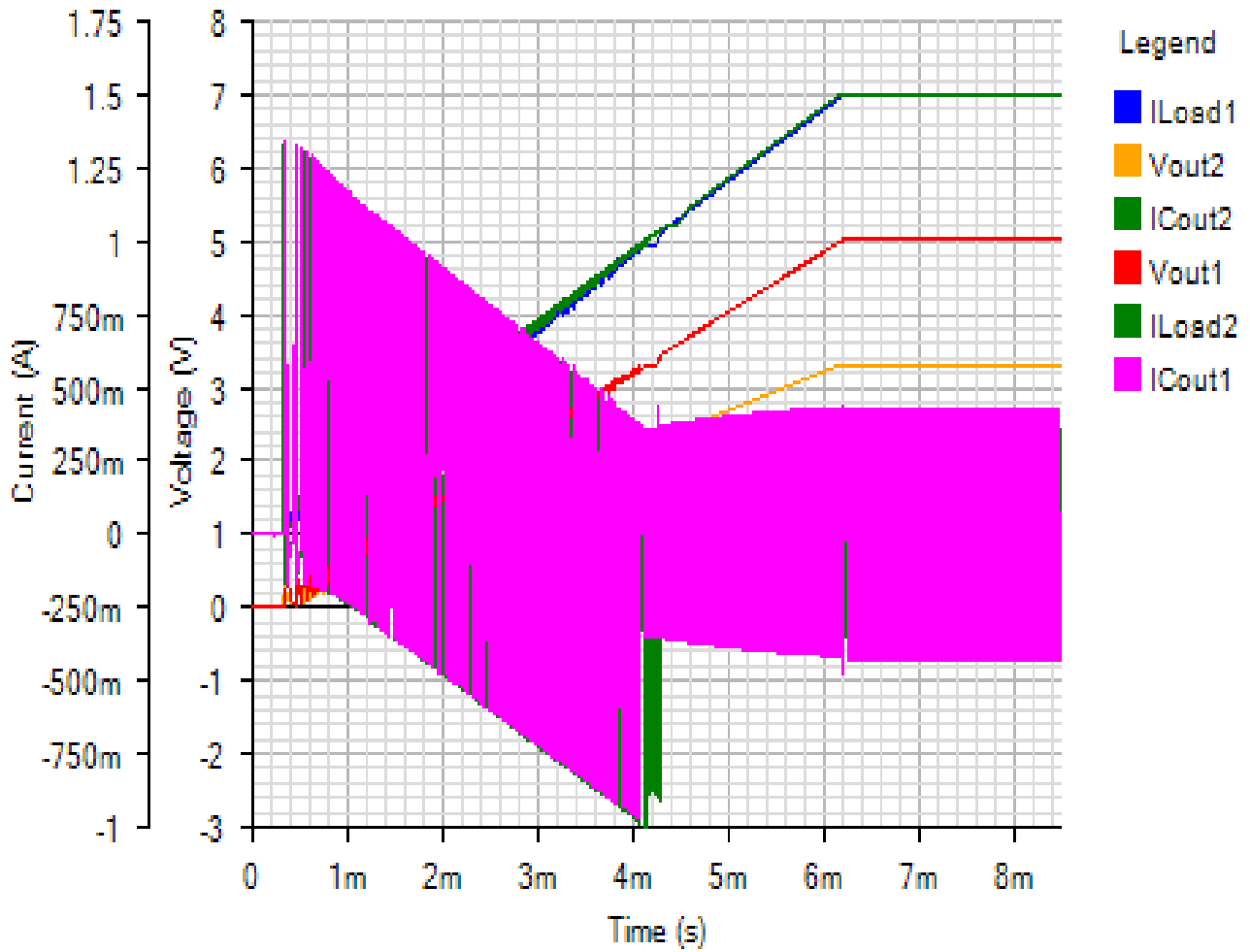
INPUT

Default



OUTPUT

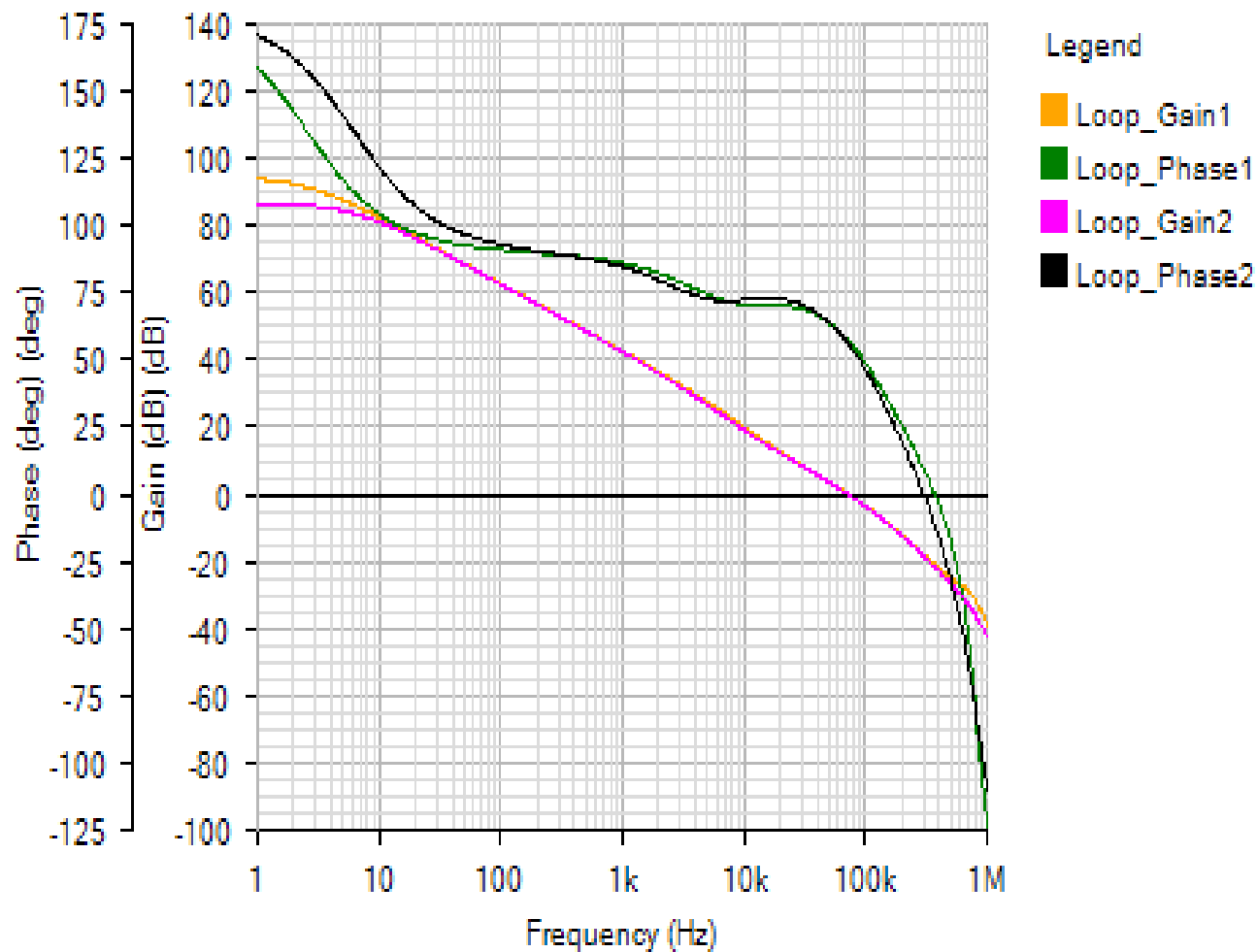
Default



AC Loop - Mon Nov 19 2018 17:33:57

BODE

Default



Phase Margin (output #1): 57.02° at a crossover frequency of 72.6kHz



Phase Margin (output #2): 56.24° at a crossover frequency of 71.7kHz

