

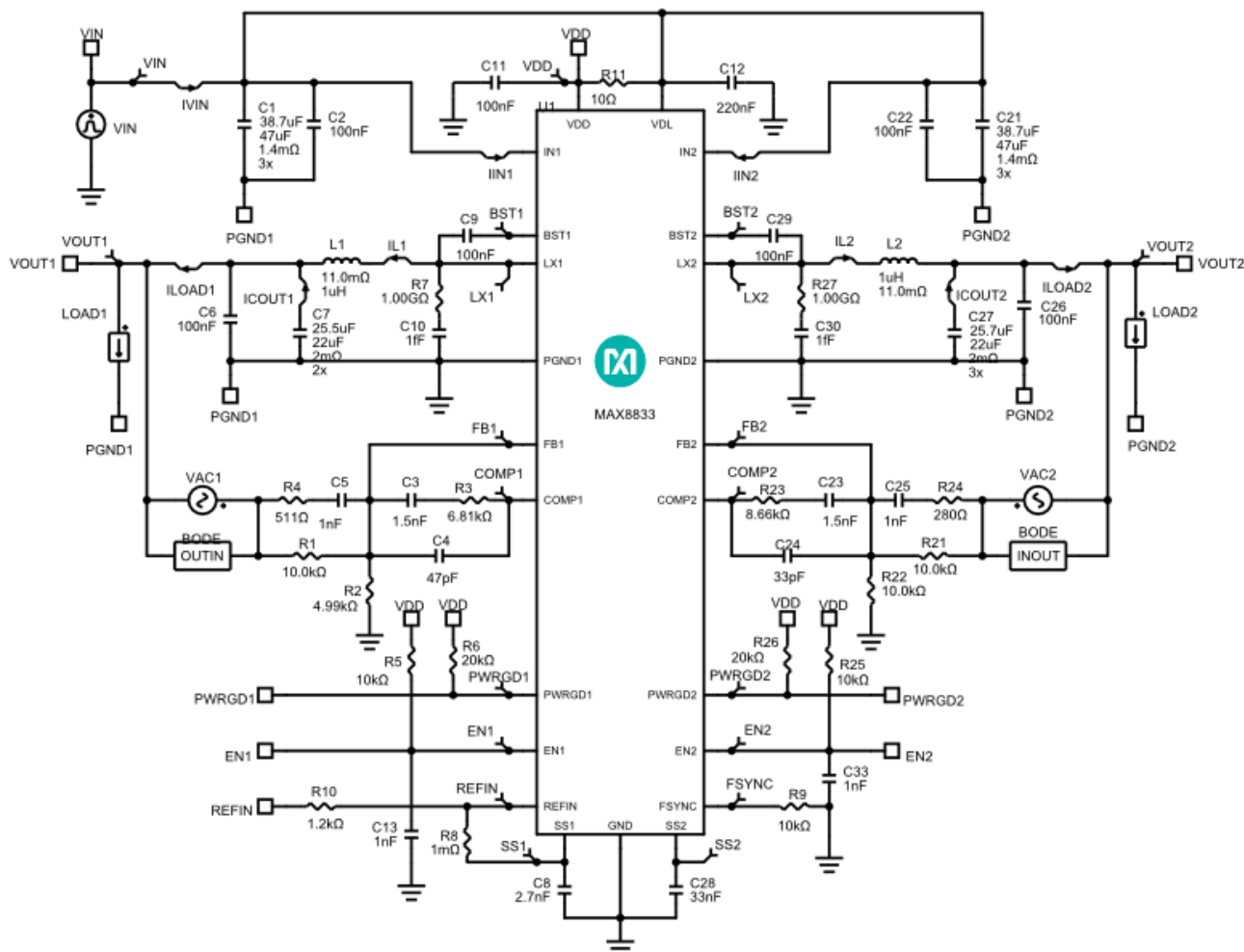
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	3V
Maximum Input Voltage	3.6V
Nominal Input Voltage	3.3V
Input Voltage Ripple	1%
Output Voltage 1	1.8V
Output Voltage 2	1.2V
Output Current 1	3A
Output Current 2	3A
Output Voltage Ripple 1	1%
Output Voltage Ripple 2	1%
Load Step Start Current 1	1.5A
Load Step Start Current 2	1.5A
Load Step Current 1	3A
Load Step Current 2	3A
Load Step Edge Rate 1	1A/us
Load Step Edge Rate 2	1A/us
Output Voltage Load Step Over/Undershoot 1	5%
Output Voltage Load Step Over/Undershoot 2	5%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Switching Frequency	1000Hz
Inductor Current Ratio (LIR) 1	0.3
Inductor Current Ratio (LIR) 2	0.3

Schematic



BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX8833	Maxim Integrated	Dual, 3A, 2MHz Step-Down Regulator
C1	3	GRM32EE70J476ME20L	Murata	Cap Ceramic 47uF 6.3V 1210 125C
C2	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C3	1	12065A152JAT2A	AVX	Cap Ceramic 0.0015uF 50V C0G 5% Pad SMD 1206 125°C T/R
C4	1	06031A470JAT2A	AVX	Cap Ceramic 47pF 100V C0G 5% Pad SMD 0603 125°C T/R
C5	1	GRM1885C1H102JA01D	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
C6	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R

C7	2	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
C8	1	06035C272KAT2A	AVX	Cap Ceramic 0.0027uF 50V X7R 10% Pad SMD 0603 125°C T/R
C9	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C11	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C12	1	GCM188R71E224KA55D	Murata Manufacturing	Cap Ceramic 0.22uF 25V X7R 10% Pad SMD 0603 125°C Automotive T/R
C13	1	GRM1885C1H102JA01D	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
C21	3	GRM32EE70J476ME20L	Murata	Cap Ceramic 47uF 6.3V 1210 125C
C22	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C23	1	C1608C0G1H152J080AA	TDK	Cap Ceramic 0.0015uF 50V C0G 5% Pad SMD 0603 125°C T/R
C24	1	06031A330FAT2A	AVX	Cap Ceramic 33pF 100V C0G 1% Pad SMD 0603 125°C T/R
C25	1	GRM1885C1H102JA01D	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
C26	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C27	3	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
C28	1	06035C333KAT2A	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R
C29	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C33	1	GRM1885C1H102JA01D	Murata Manufacturing	Cap Ceramic 0.001uF 50V C0G 5% Pad SMD 0603 125°C T/R
L1	1	VLP8040T-1R0N	TDK	Power Inductors 1uH
L2	1	VLP8040T-1R0N	TDK	Power Inductors 1uH
R1	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ3EKF4991V	Panasonic	Res Thick Film 0603 4.99K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ3EKF6811V	Panasonic	Res Thick Film 0603 6.81K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF5110V	Panasonic	Res Thick Film 0603 511 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ3GEYJ103V	Panasonic	Res Thick Film 0603 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R6	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
				Res Thick Film 0603 10K Ohm 5%

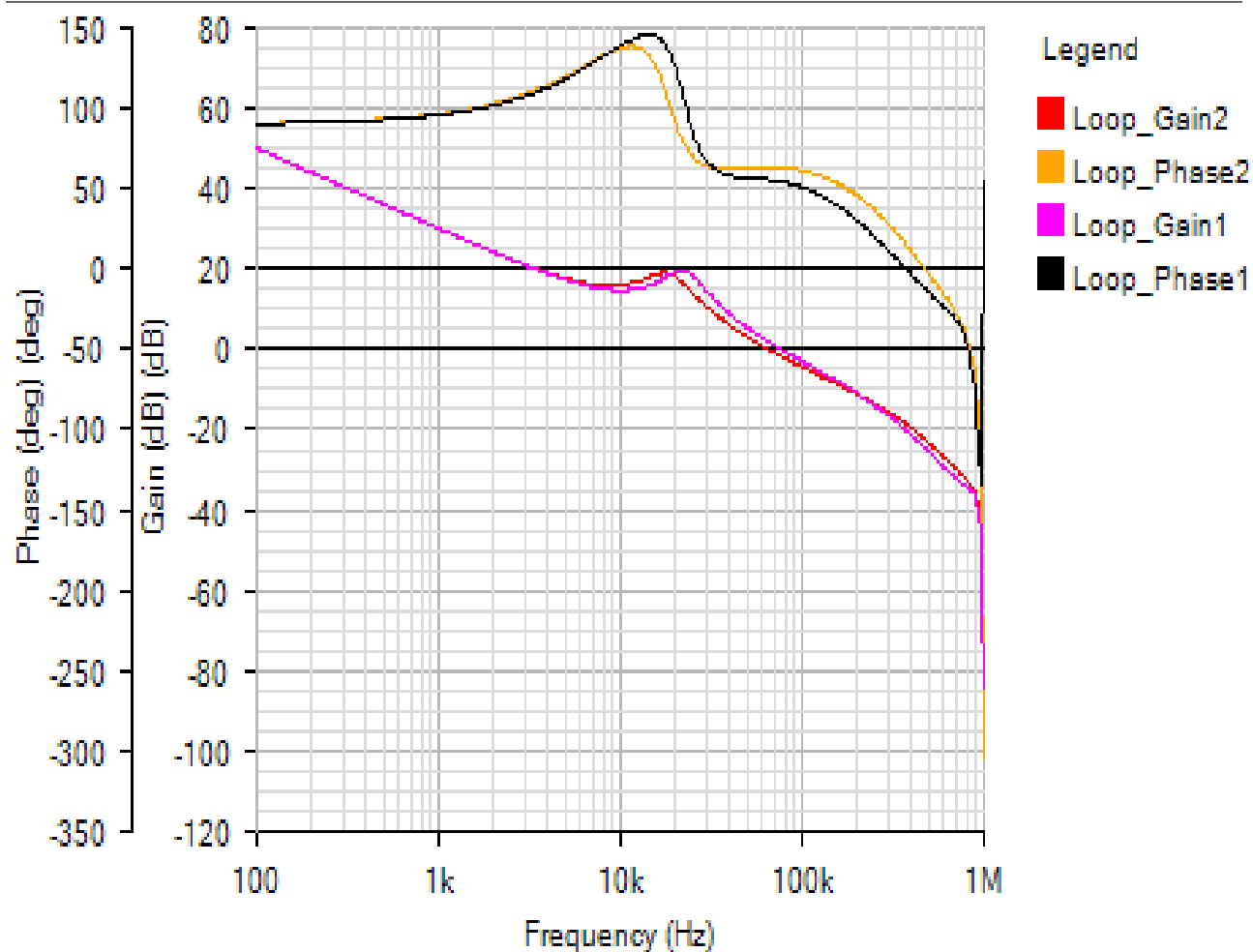
R9	1	ERJ3GEYJ103V	Panasonic	0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R10	1	ERJ3GEYJ122V	Panasonic	Res Thick Film 0603 1.2K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R11	1	ERJ3GEYJ100V	Panasonic	Res Thick Film 0603 10 Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R21	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R22	1	ERJ3EKF1002V	Panasonic	Res Thick Film 0603 10K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R23	1	ERJ3EKF8661V	Panasonic	Res Thick Film 0603 8.66K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R24	1	ERJ3EKF2800V	Panasonic	Res Thick Film 0603 280 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R25	1	ERJ3GEYJ103V	Panasonic	Res Thick Film 0603 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R26	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R

Simulation Results

AC Loop - Wed Nov 21 2018 16:17:05

BODE

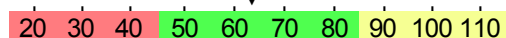
Default



Phase Margin (output #1): 54.41° at a crossover frequency of 76.4kHz



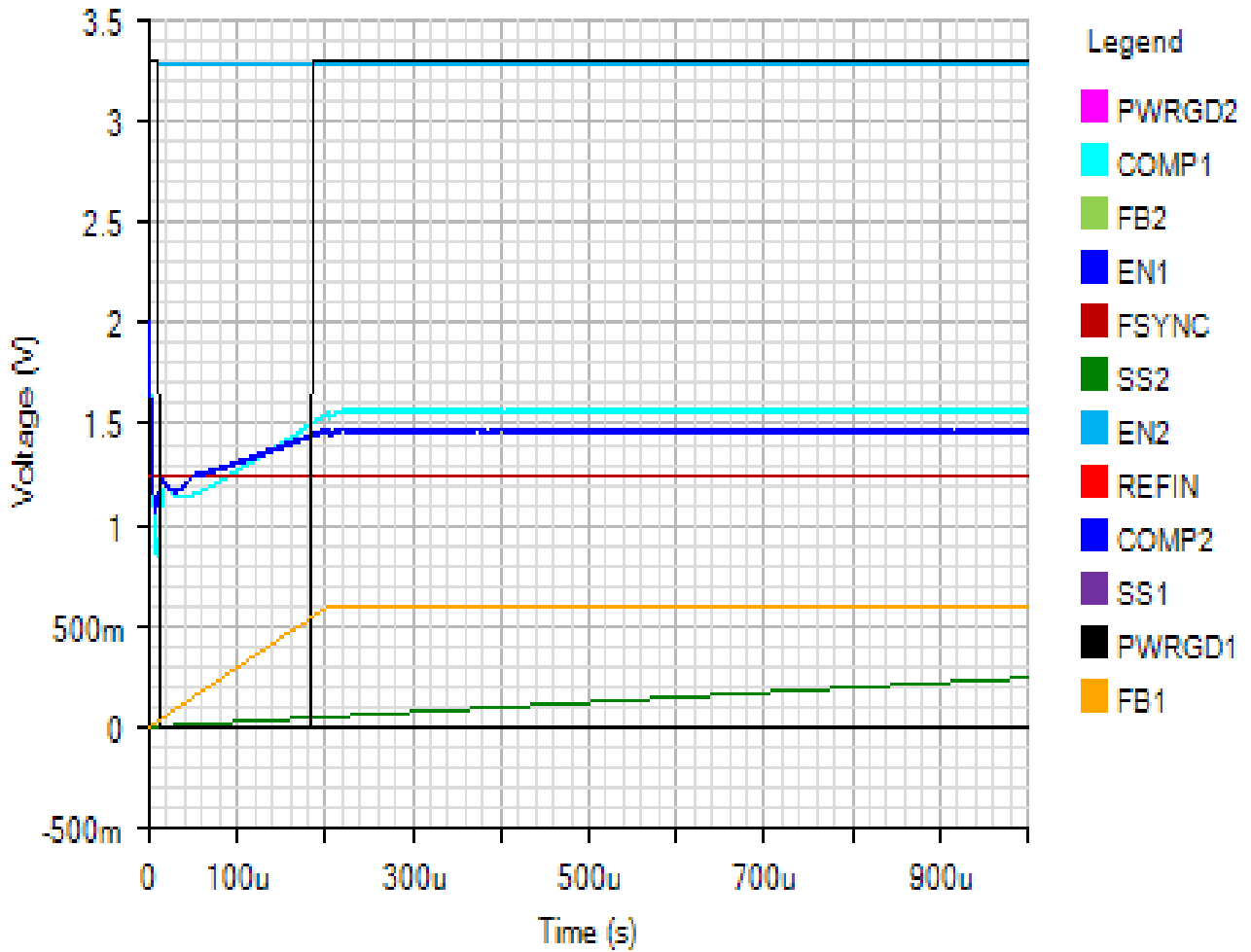
Phase Margin (output #2): 63.48° at a crossover frequency of 65.4kHz



Start Up - Wed Nov 21 2018 16:17:05

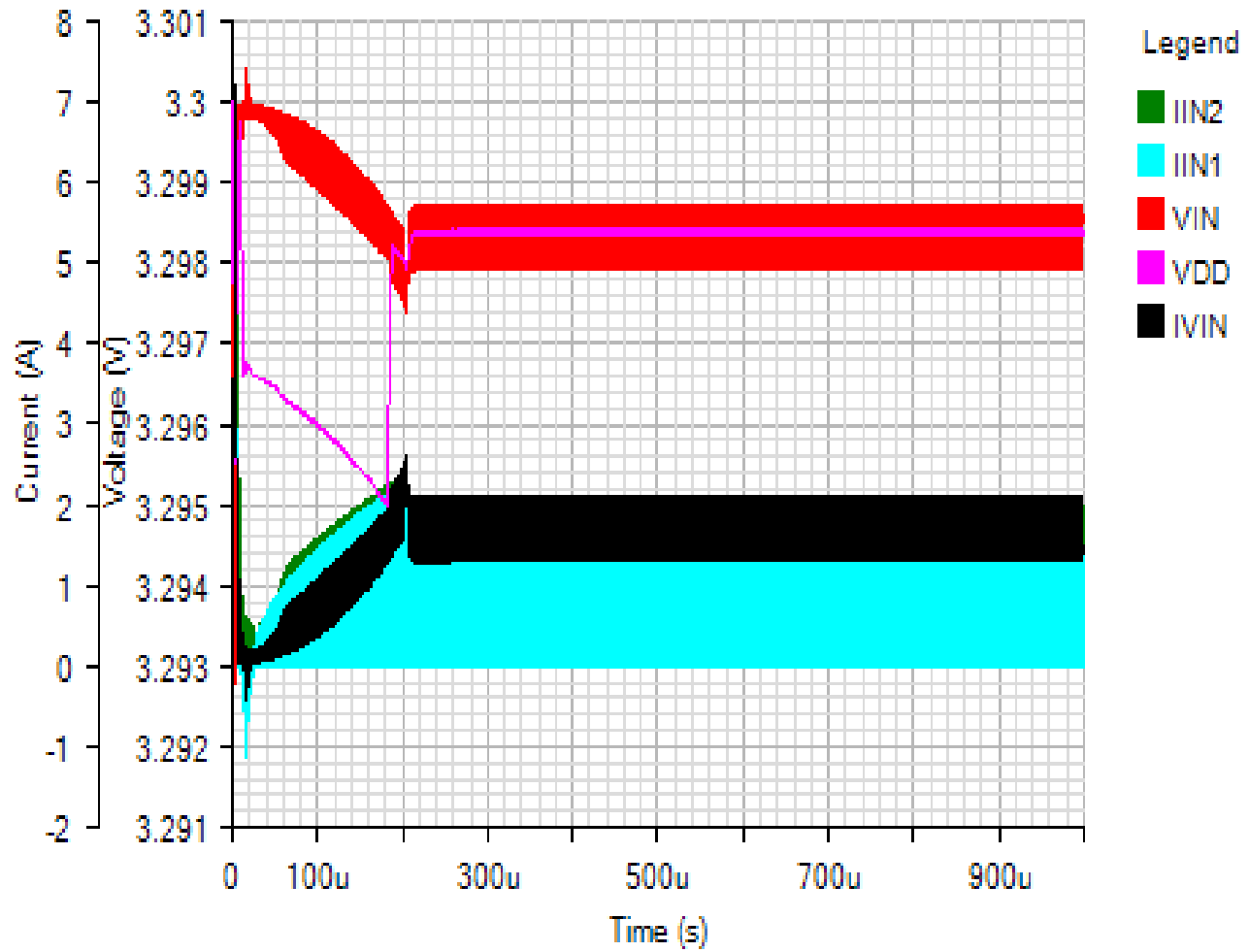
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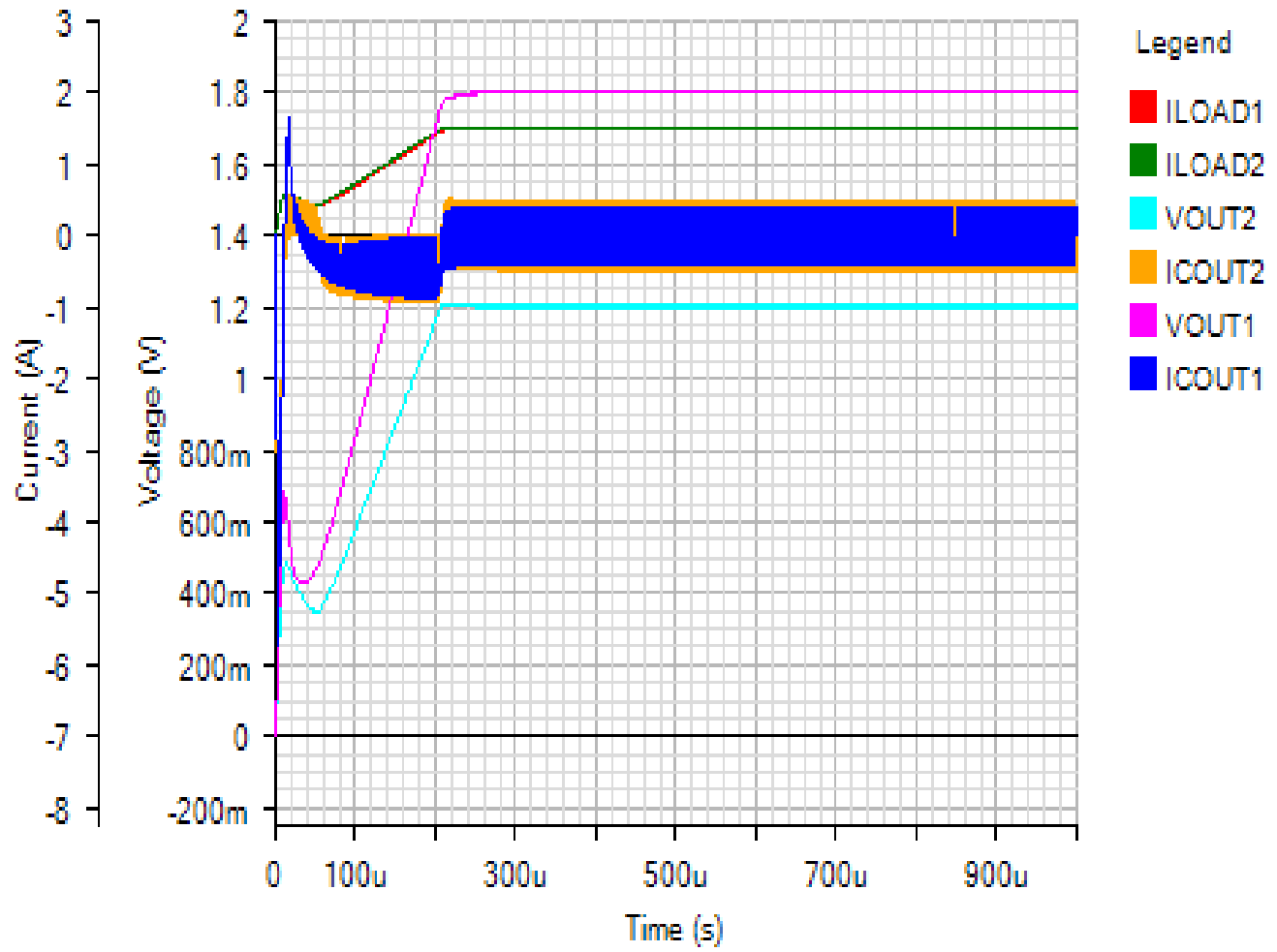
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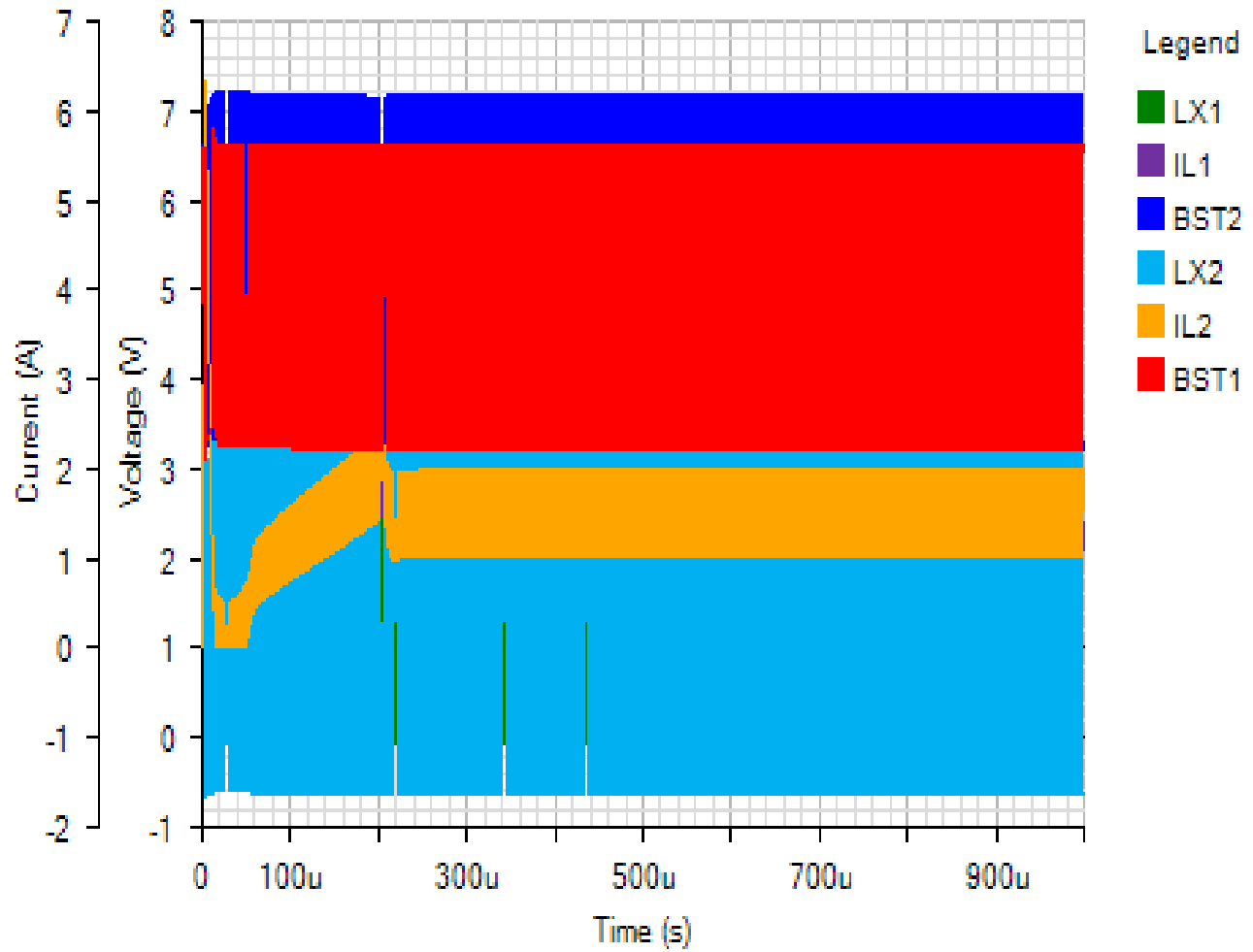
OUTPUT

Default



SWITCHING

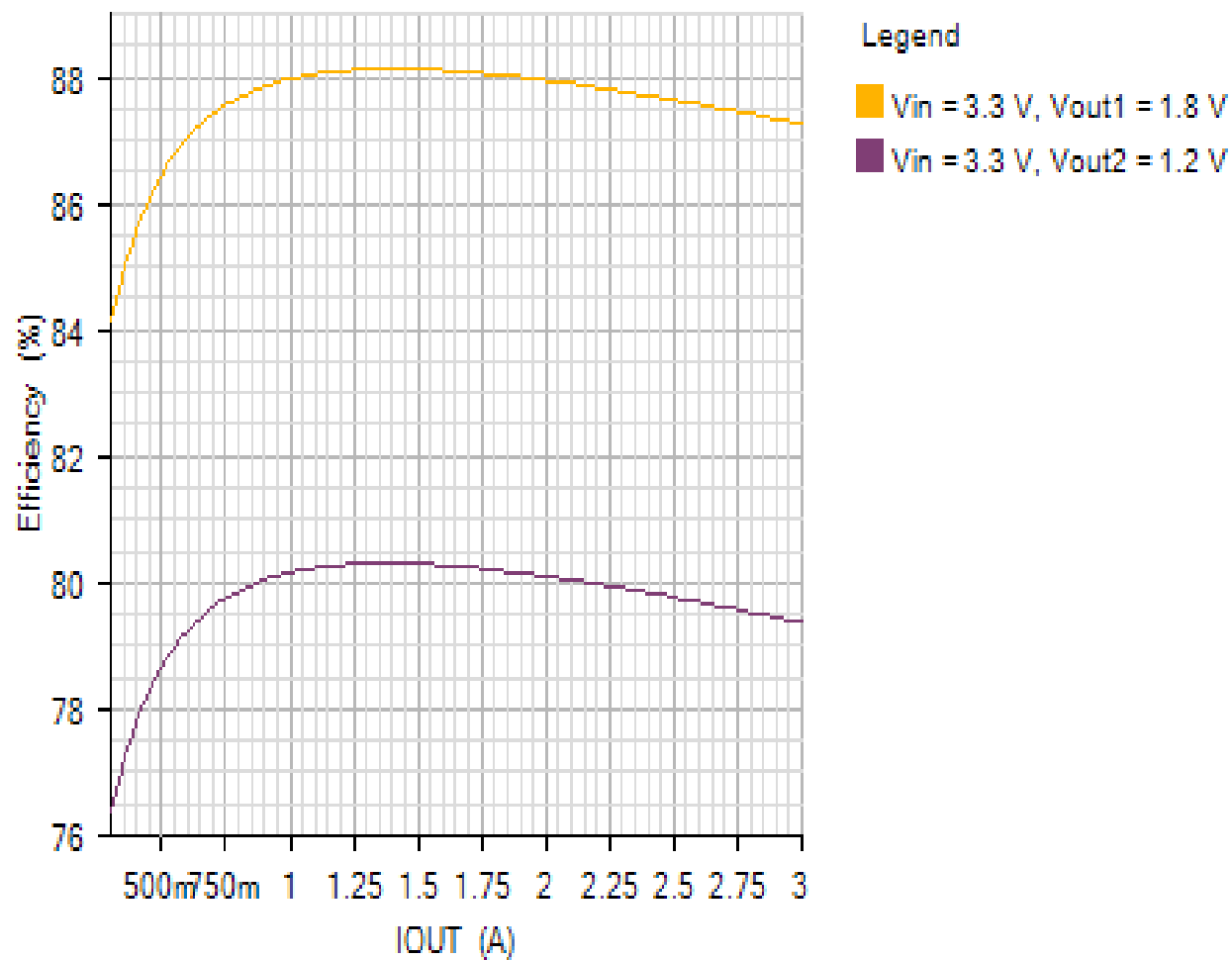
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Efficiency - Wed Nov 21 2018 16:17:05

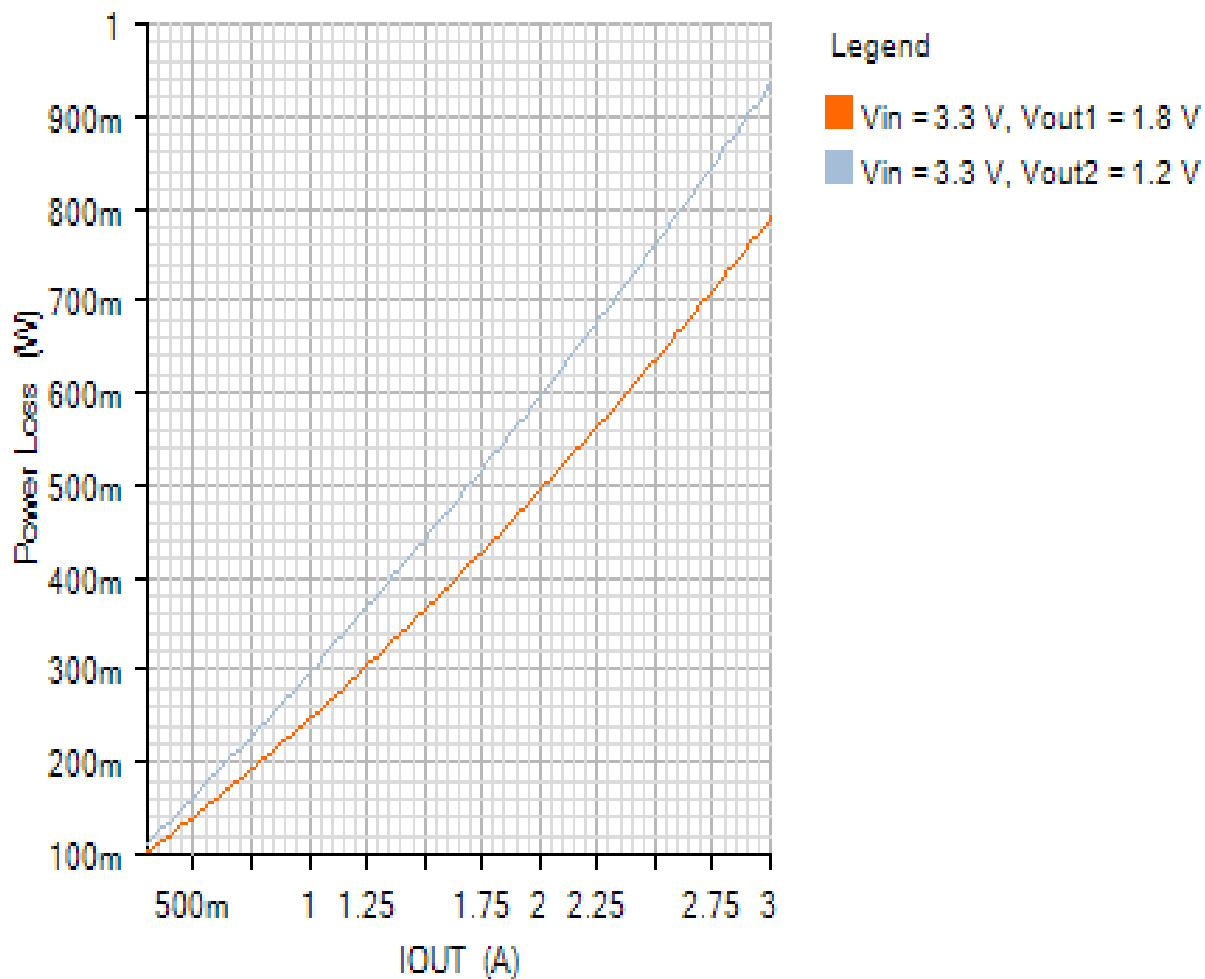
EFFICIENCY_PLOT

Default

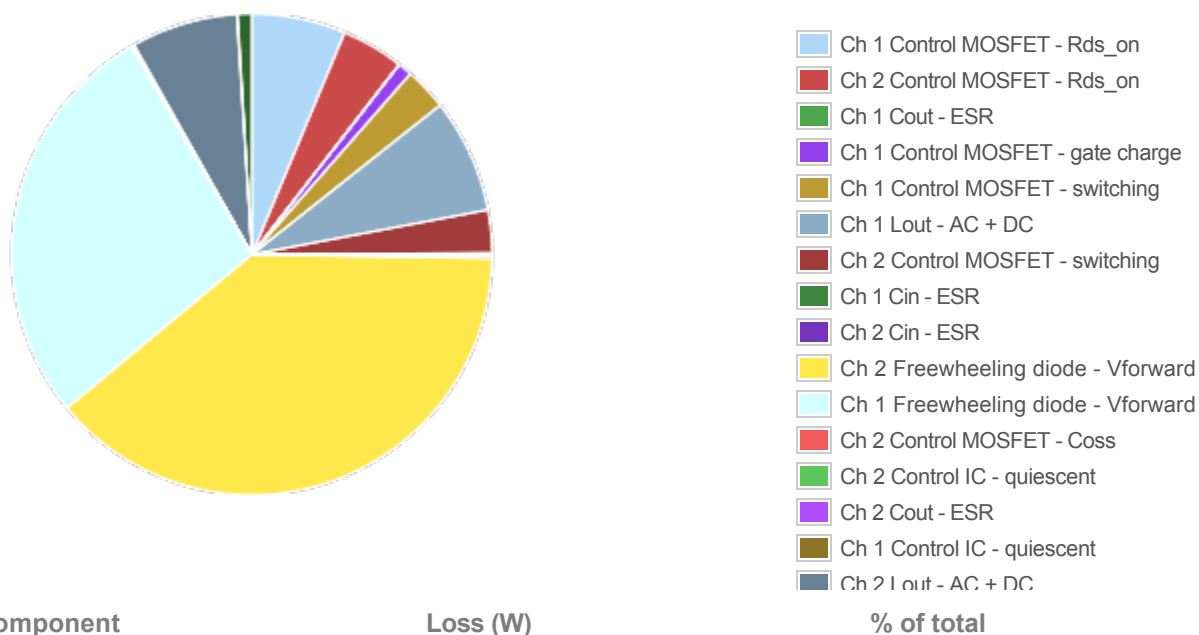


POWER_LOSS_PLOT

Default



Losses

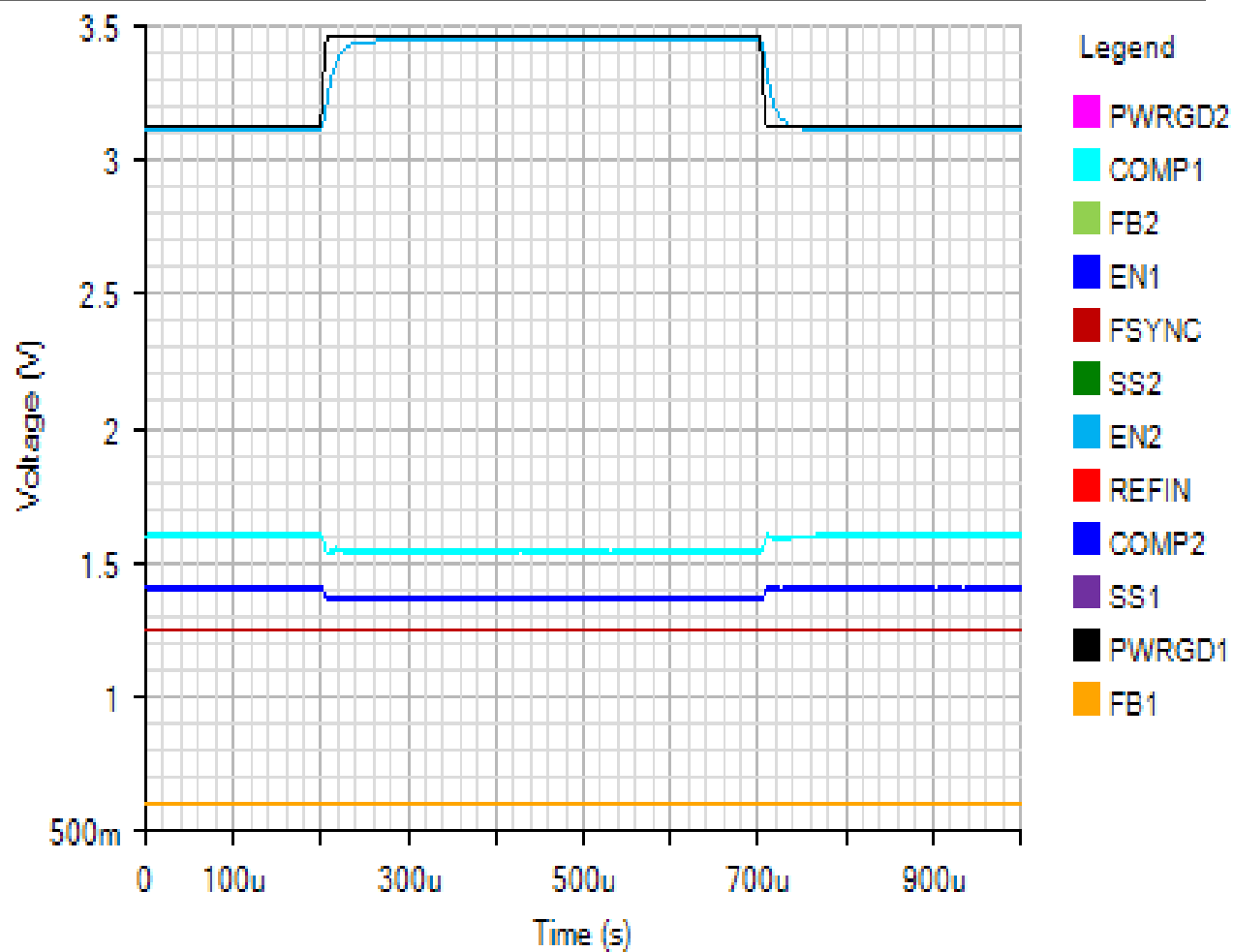


Ch 1 Control MOSFET - Rds_on	0.108814	6.3
Ch 2 Control MOSFET - Rds_on	0.072389	4.2
Ch 1 Cout - ESR	0.000112	0
Ch 1 Control MOSFET - gate charge	0.0165	1
Ch 1 Control MOSFET - switching	0.0495	2.9
Ch 1 Lout - AC + DC	0.132626	7.7
Ch 2 Control MOSFET - switching	0.0495	2.9
Ch 1 Cin - ESR	0.003123	0.2
Ch 2 Cin - ESR	0.002916	0.2
Ch 2 Freewheeling diode - Vforward	0.668182	38.7
Ch 1 Freewheeling diode - Vforward	0.476508	27.6
Ch 2 Control MOSFET - Coss	0.000882	0.1
Ch 2 Control IC - quiescent	0.00132	0.1
Ch 2 Cout - ESR	0.000097	0
Ch 1 Control IC - quiescent	0.00132	0.1
Ch 2 Lout - AC + DC	0.123507	7.2
Ch 1 Control MOSFET - Coss	0.000882	0.1
Ch 2 Control MOSFET - gate charge	0.0165	1
Total	1.724677	100

Line Transient - Wed Nov 21 2018 16:17:05

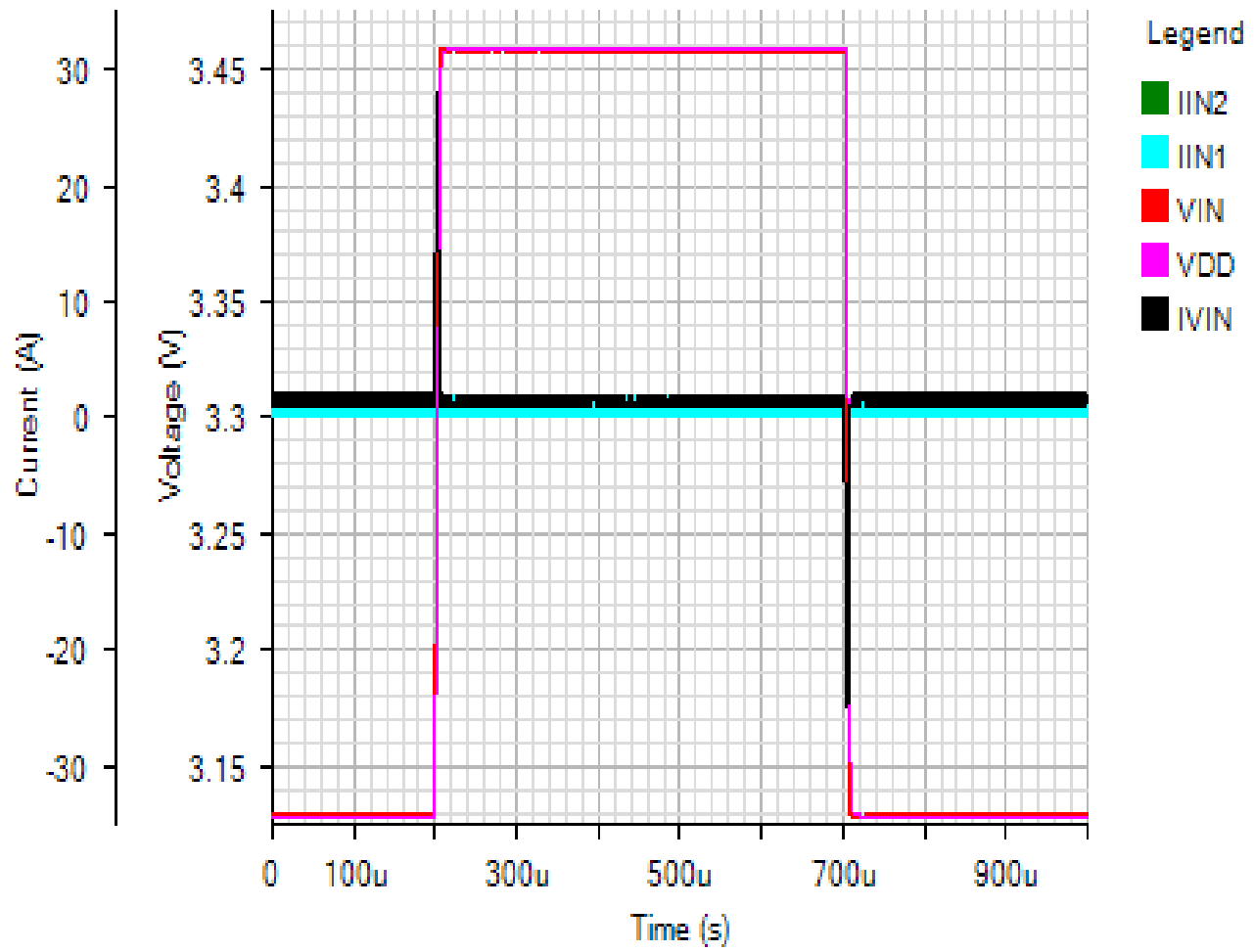
IC

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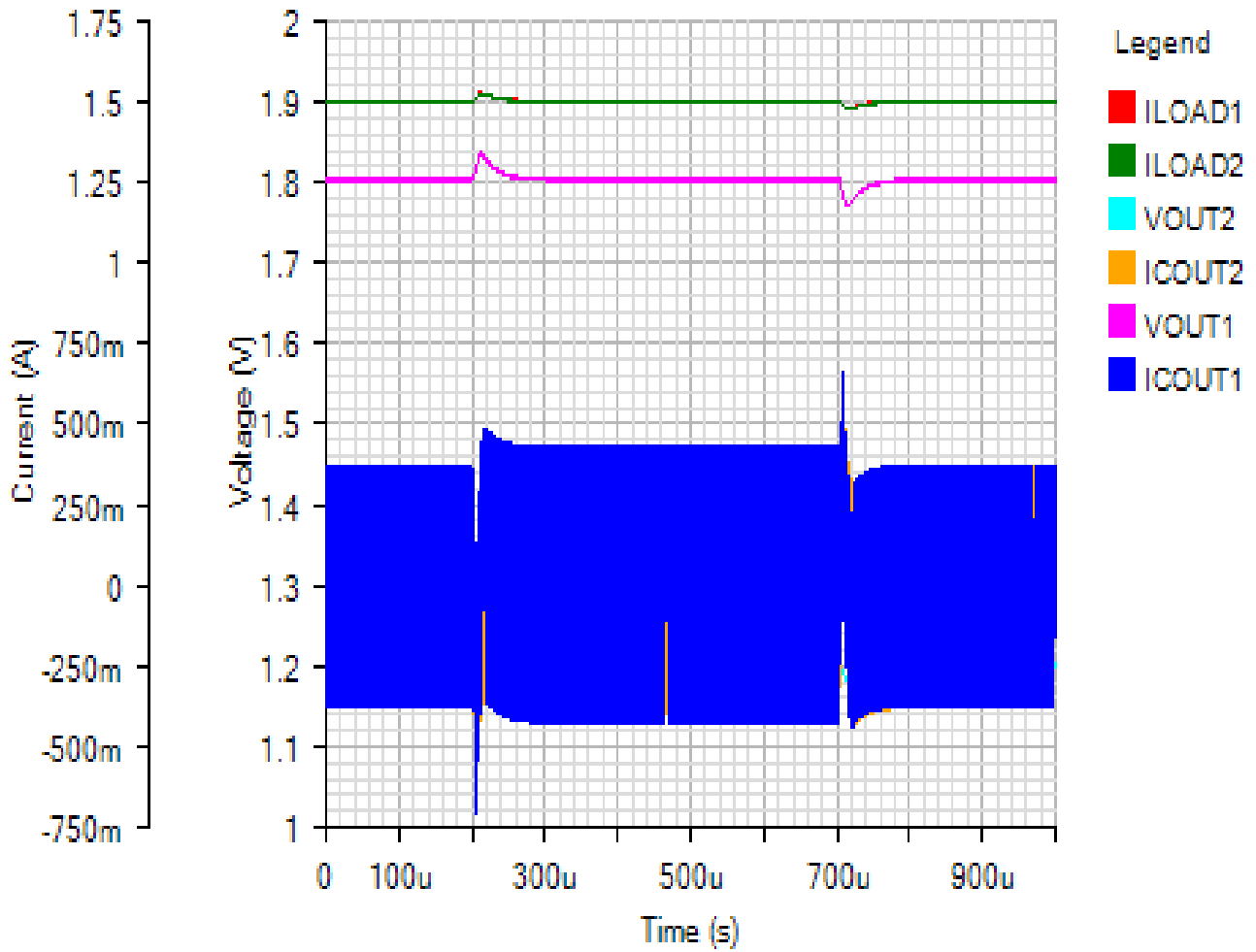
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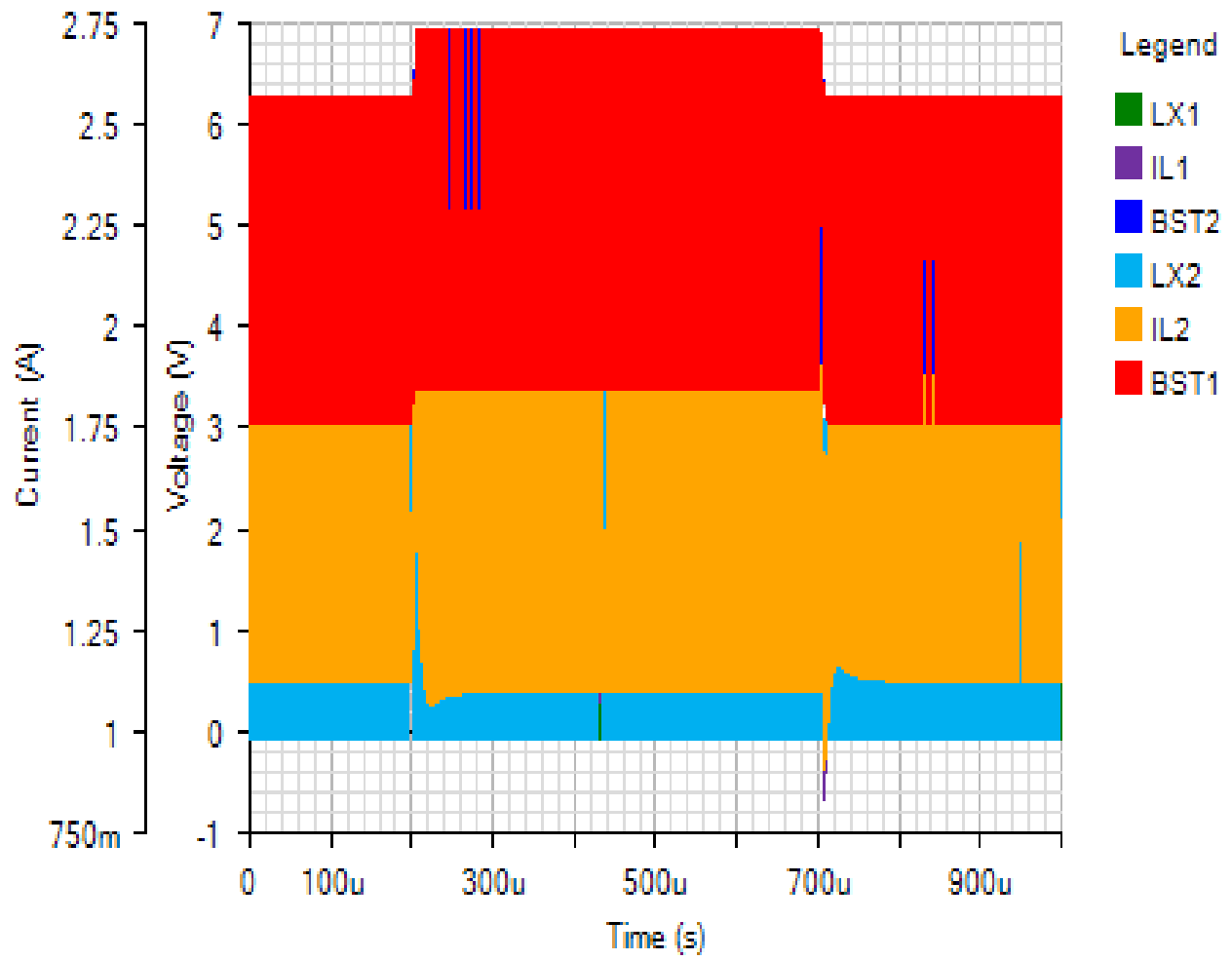
OUTPUT

Default



SWITCHING

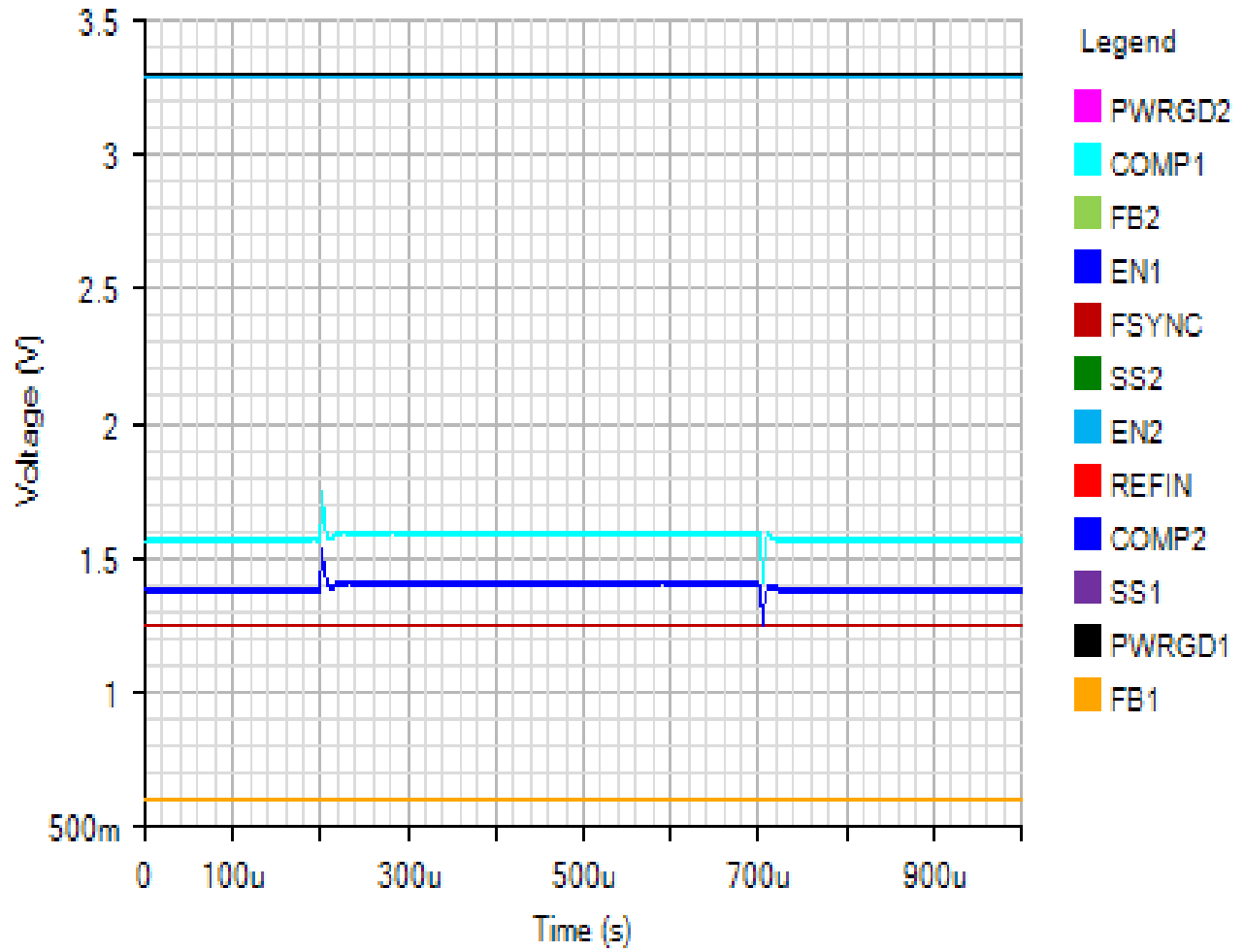
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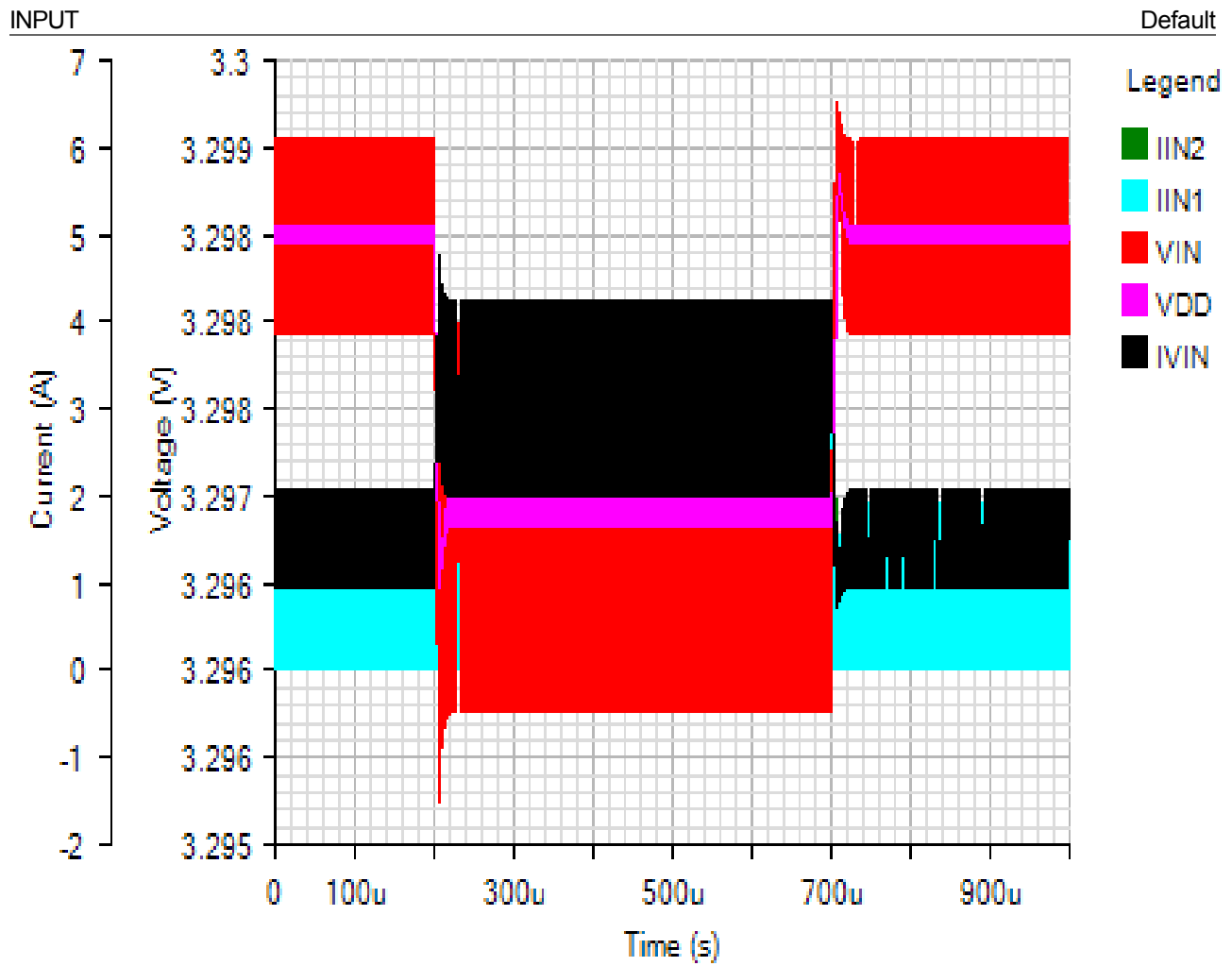


Load Step - Wed Nov 21 2018 16:17:05

IC

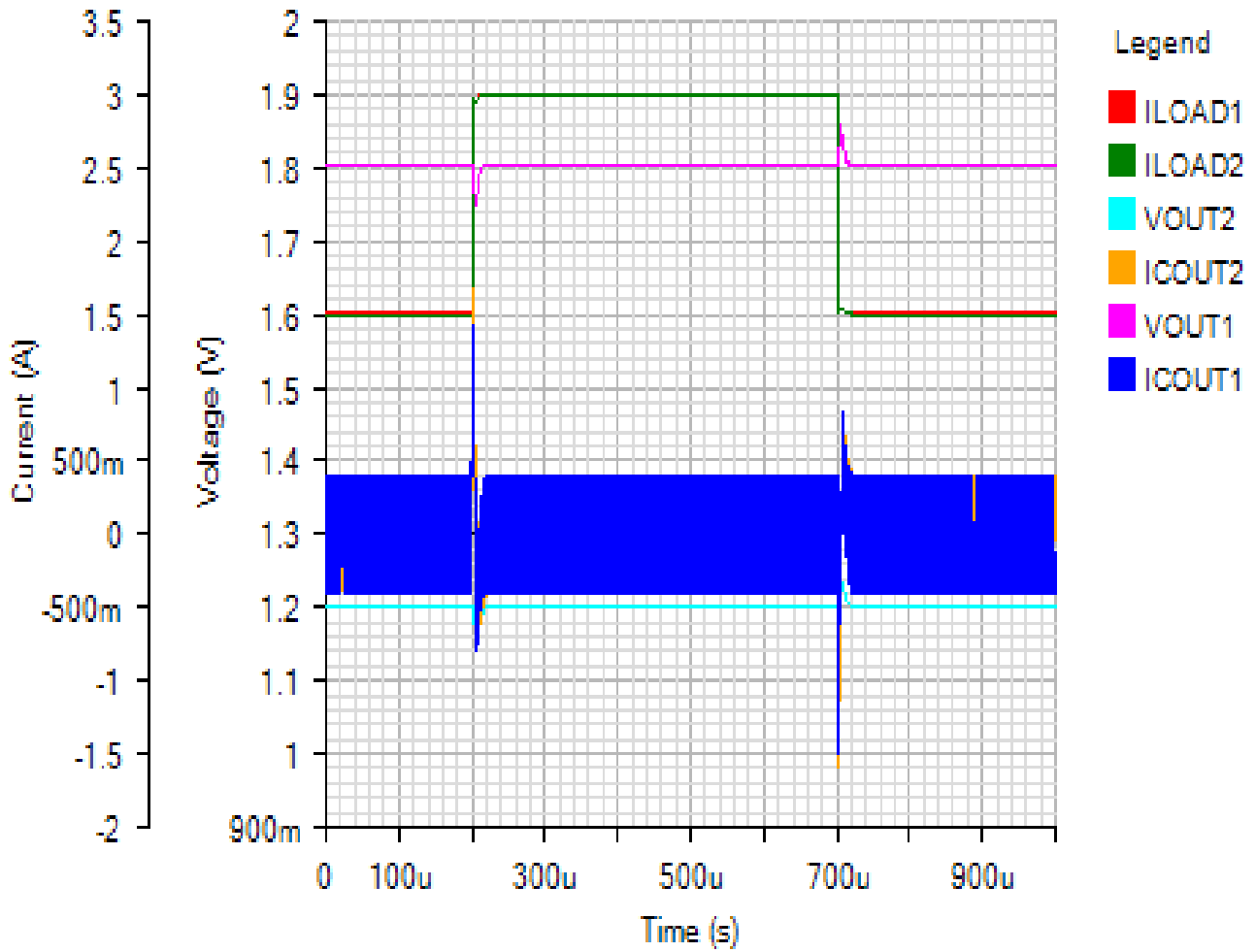
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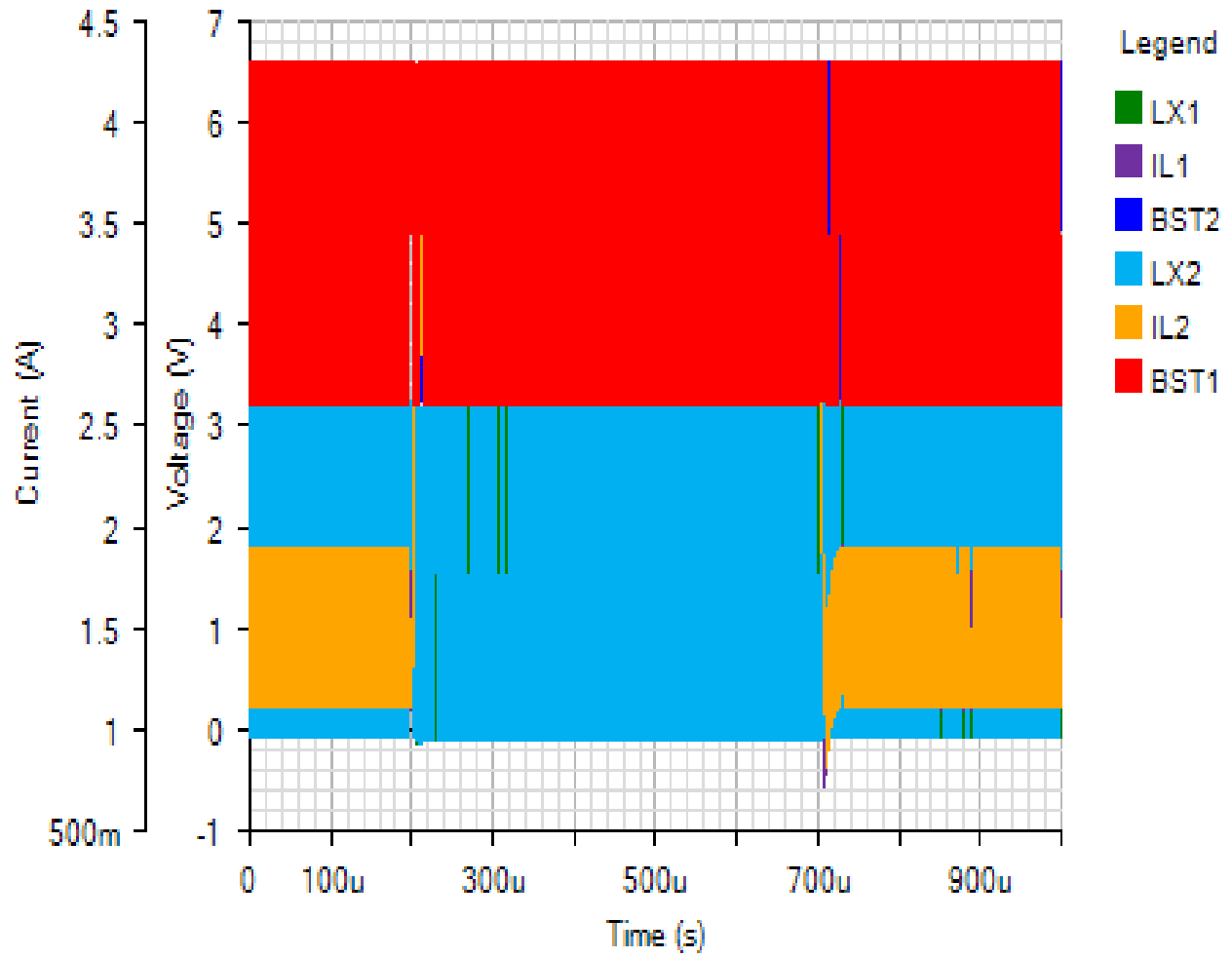
OUTPUT

Default



SWITCHING

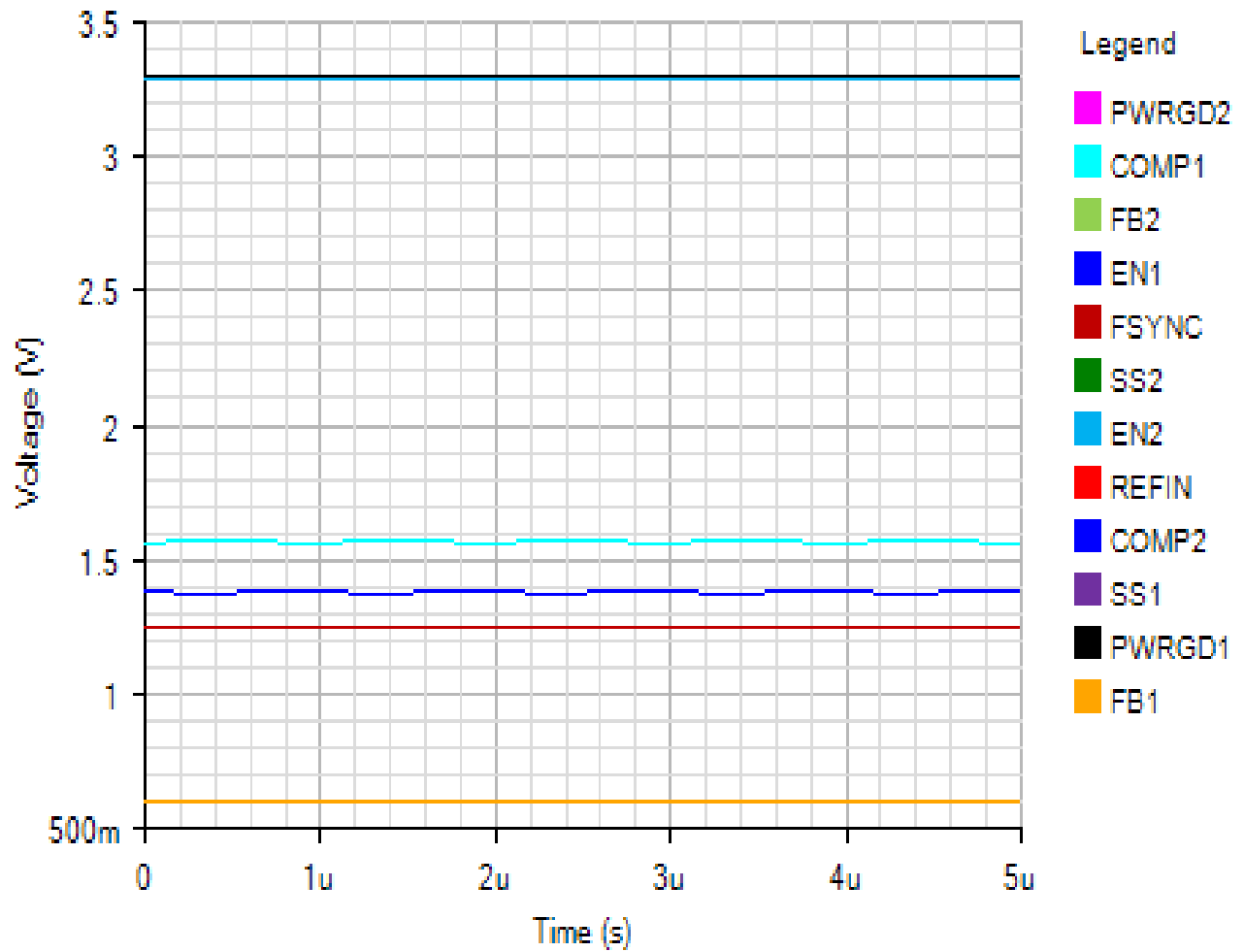
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Steady State - Wed Nov 21 2018 16:17:05

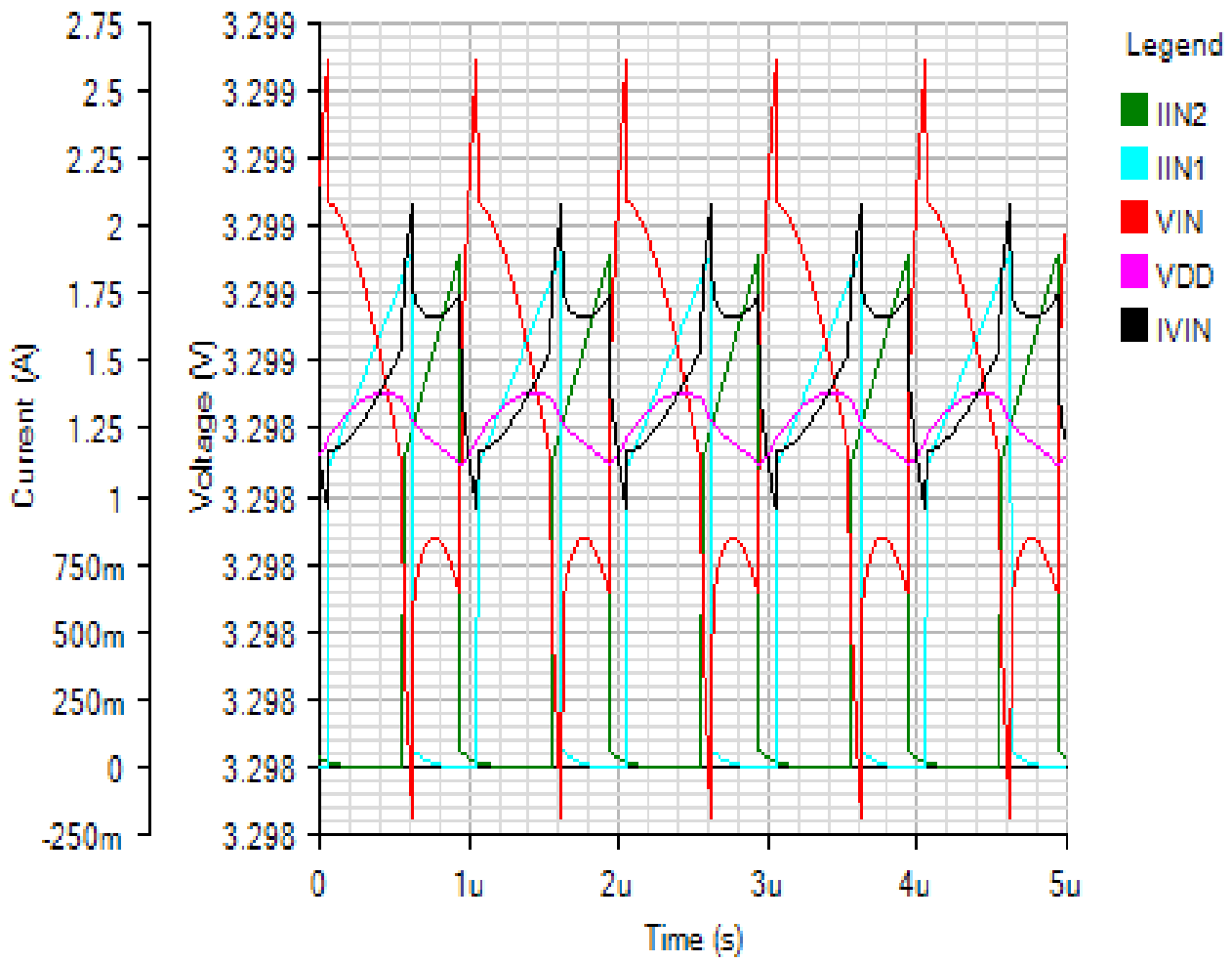
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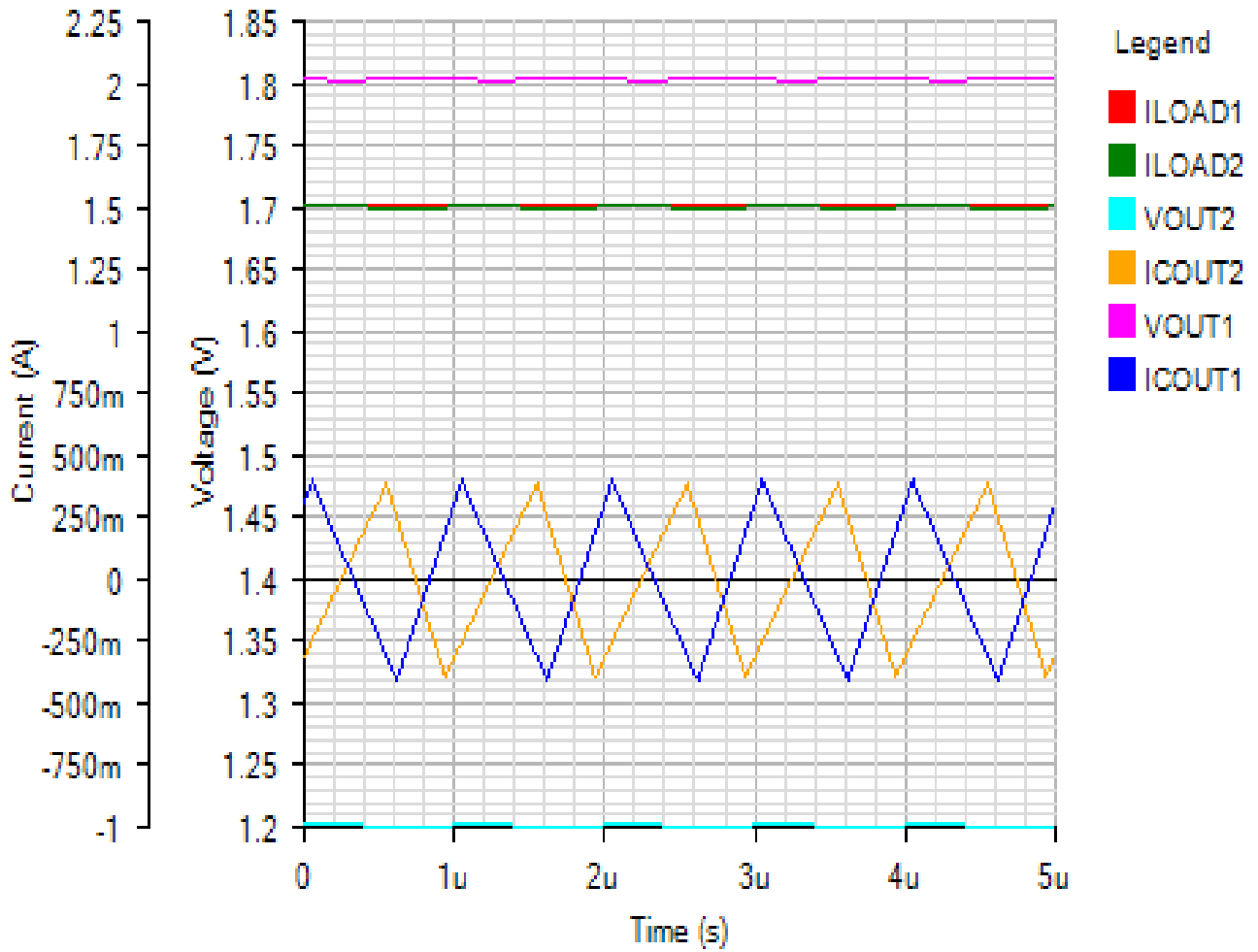
INPUT

Default



OUTPUT

Default



SWITCHING

Default

