

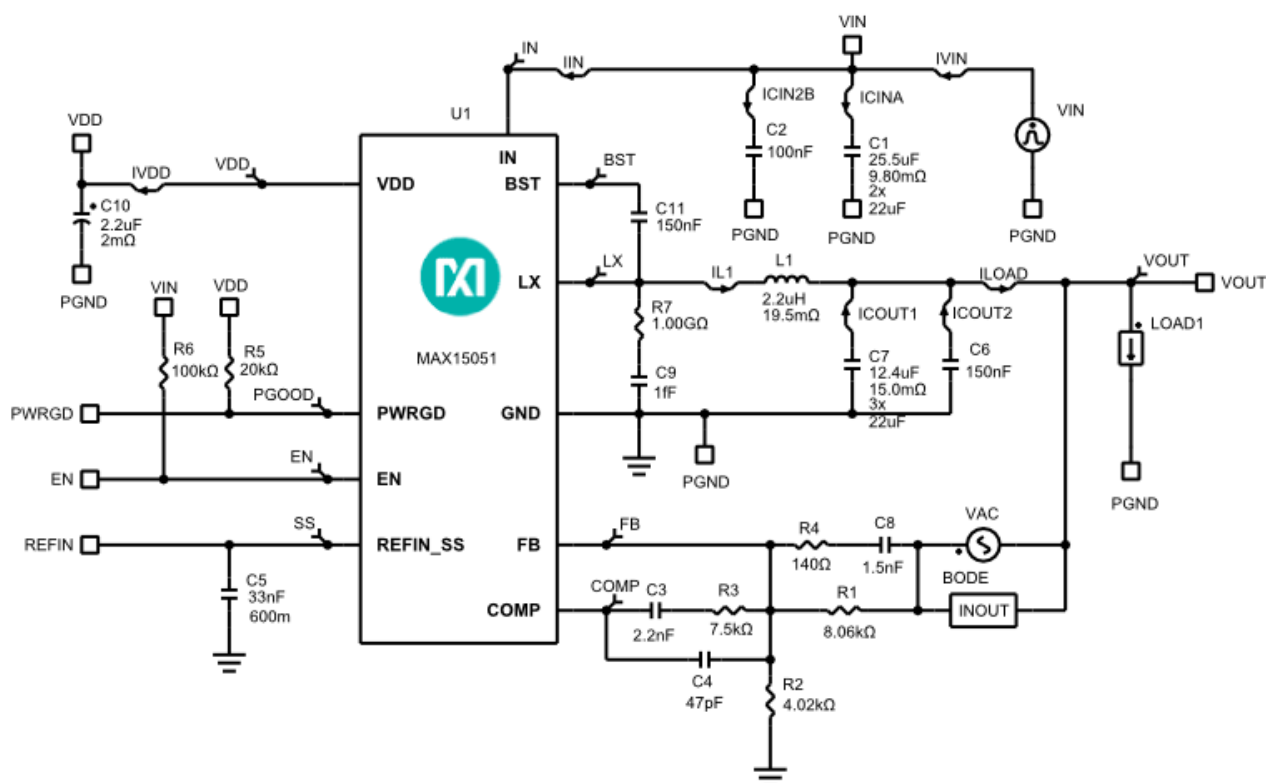
Initial Design

1.0

Design Requirements

Parameter	Value
Minimum Input Voltage	4.5V
Maximum Input Voltage	5.5V
Nominal Input Voltage	5V
Input Voltage Ripple	1%
Output Voltage	1.8V
Output Current	2A
Output Voltage Ripple	1%
Load Step Edge Rate	1A/us
Output Voltage Load Step Over/Undershoot	5%
Performance Priority	Balance Efficiency and Size
BOM Priority	Cost
Inductor Current Ratio (LIR)	0.3

Schematic



For the MAX15050, If the current level (starting current for Load Steps) is too low, AC, Steady State and Load Step analyses may fail due to Skip Mode operation. MAX15051 d

BOM

Ref	Qty	Part Number	Manufacturer	Description
U1	1	MAX15051	Maxim Integrated	High-Efficiency, 4A, 1MHz, Step-Down Regulators with Integrated Switches
C1	2	GRM32ER71E226ME15	Murata	Cap Ceramic 22uF 25V 1210 125C
C2	1	GCM188L81H104KA57D	Murata Manufacturing	Cap Ceramic 0.1uF 50V X8L 10% Pad SMD 0603 150°C Automotive T/R
C3	1	CGA3E2X7R1H222K080AA	TDK	Cap Ceramic 0.0022uF 50V X7R 10% Pad SMD 0603 125°C Automotive T/R
C4	1	06031A470JAT2A	AVX	Cap Ceramic 47pF 100V C0G 5% Pad SMD 0603 125°C T/R
C5	1	06035C333KAT2A	AVX	Cap Ceramic 0.033uF 50V X7R 10% Pad SMD 0603 125°C T/R

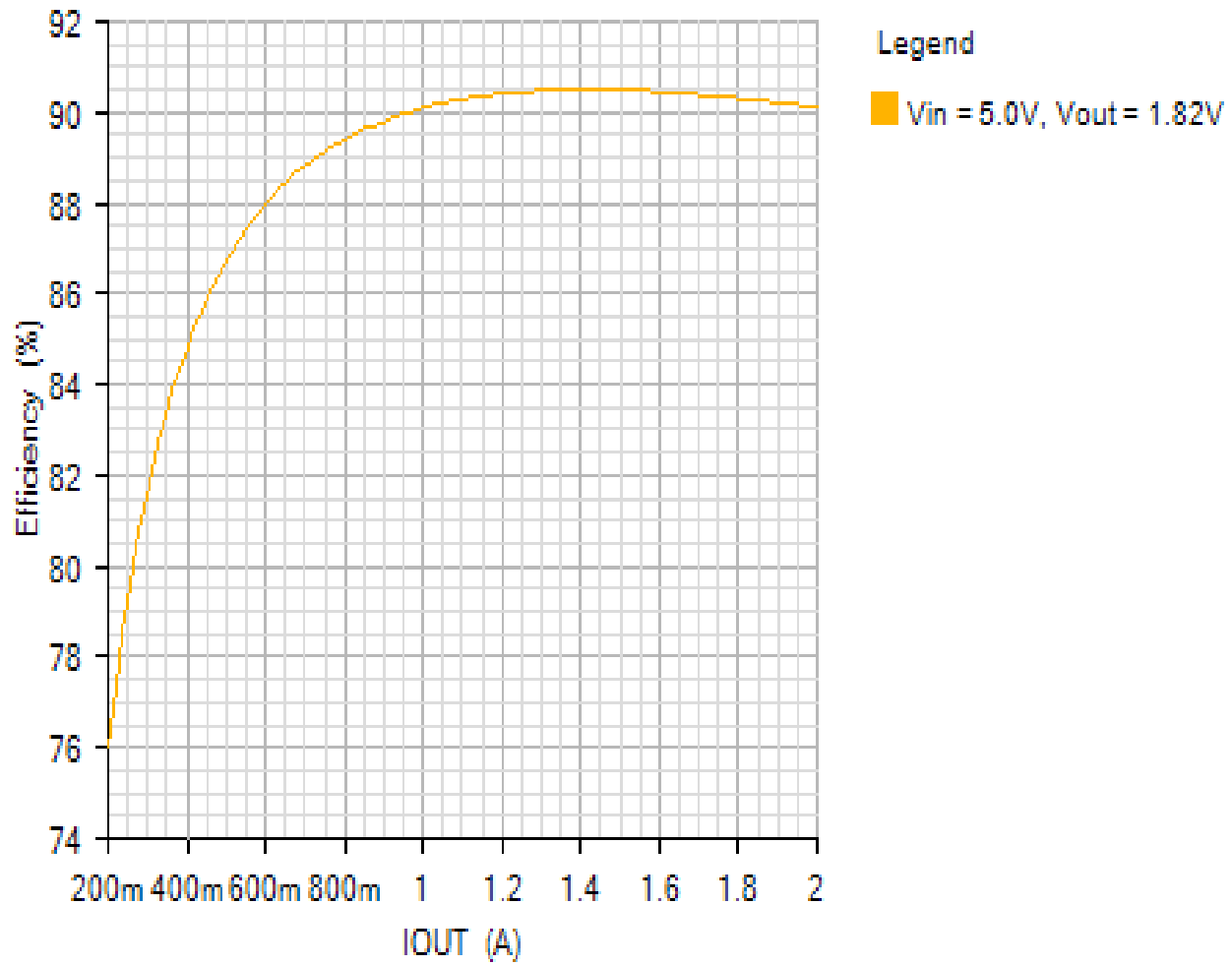
C6	1	0603ZC154KAT2A	AVX	Cap Ceramic 0.15uF 10V X7R 10% Pad SMD 0603 125°C T/R
C7	3	GRM188C80G226ME15D	Murata	Cap Ceramic 22uF 4V 0603 105C
C8	1	C1608C0G1H152J080AA	TDK	Cap Ceramic 0.0015uF 50V C0G 5% Pad SMD 0603 125°C T/R
C10	1	EMK212B7225KG-T	Taiyo Yuden	Cap Ceramic 2.2uF 16V X7R 10% Pad SMD 0805 125°C T/R
C11	1	0603ZC154KAT2A	AVX	Cap Ceramic 0.15uF 10V X7R 10% Pad SMD 0603 125°C T/R
L1	1	CLF6045T-2R2N	TDK	Inductor 2.2uH 30% 15mOhm 3.9A Isat 4A Irms
R1	1	ERJ3EKF8061V	Panasonic	Res Thick Film 0603 8.06K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R2	1	ERJ3EKF4021V	Panasonic	Res Thick Film 0603 4.02K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R3	1	ERJ3EKF7501V	Panasonic	Res Thick Film 0603 7.5K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R4	1	ERJ3EKF1400V	Panasonic	Res Thick Film 0603 140 Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R
R5	1	ERJ3GEYJ203V	Panasonic	Res Thick Film 0603 20K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R
R6	1	ERJ3GEYJ104V	Panasonic	Res Thick Film 0603 100K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R

Simulation Results

Efficiency - Mon Nov 19 2018 11:21:04

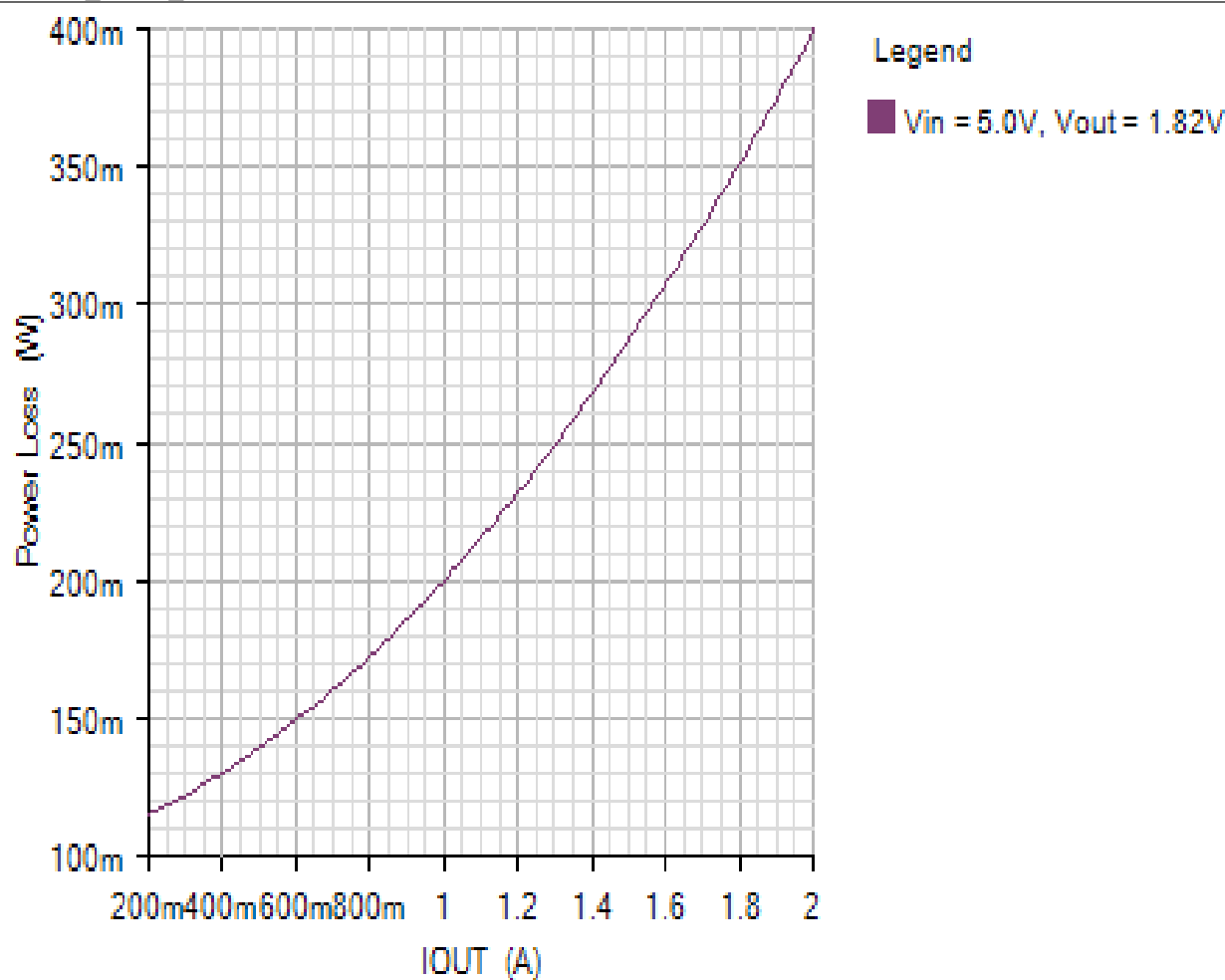
EFFICIENCY_PLOT

Default

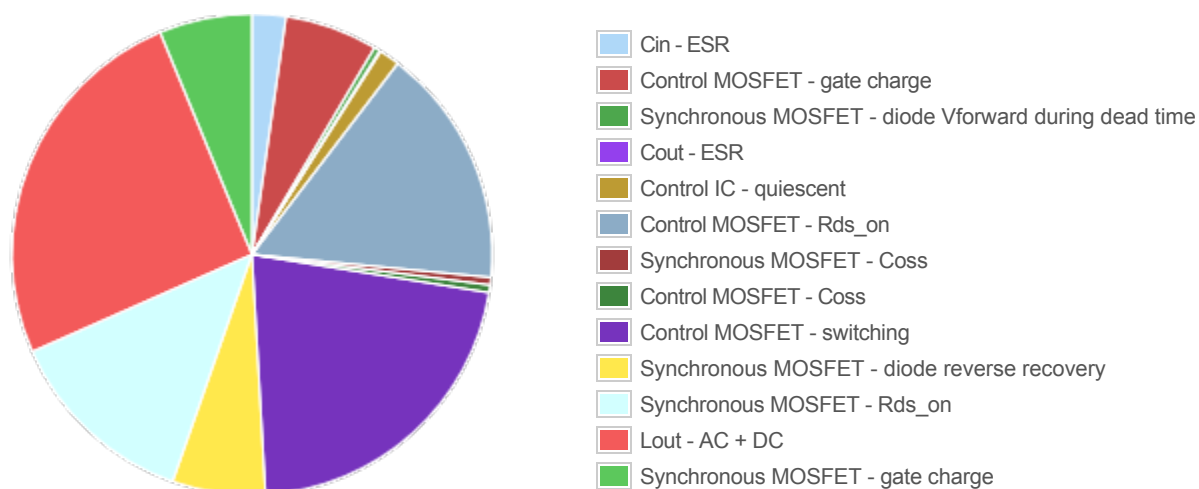


POWER_LOSS_PLOT

Default



Losses



Component

Loss (W)

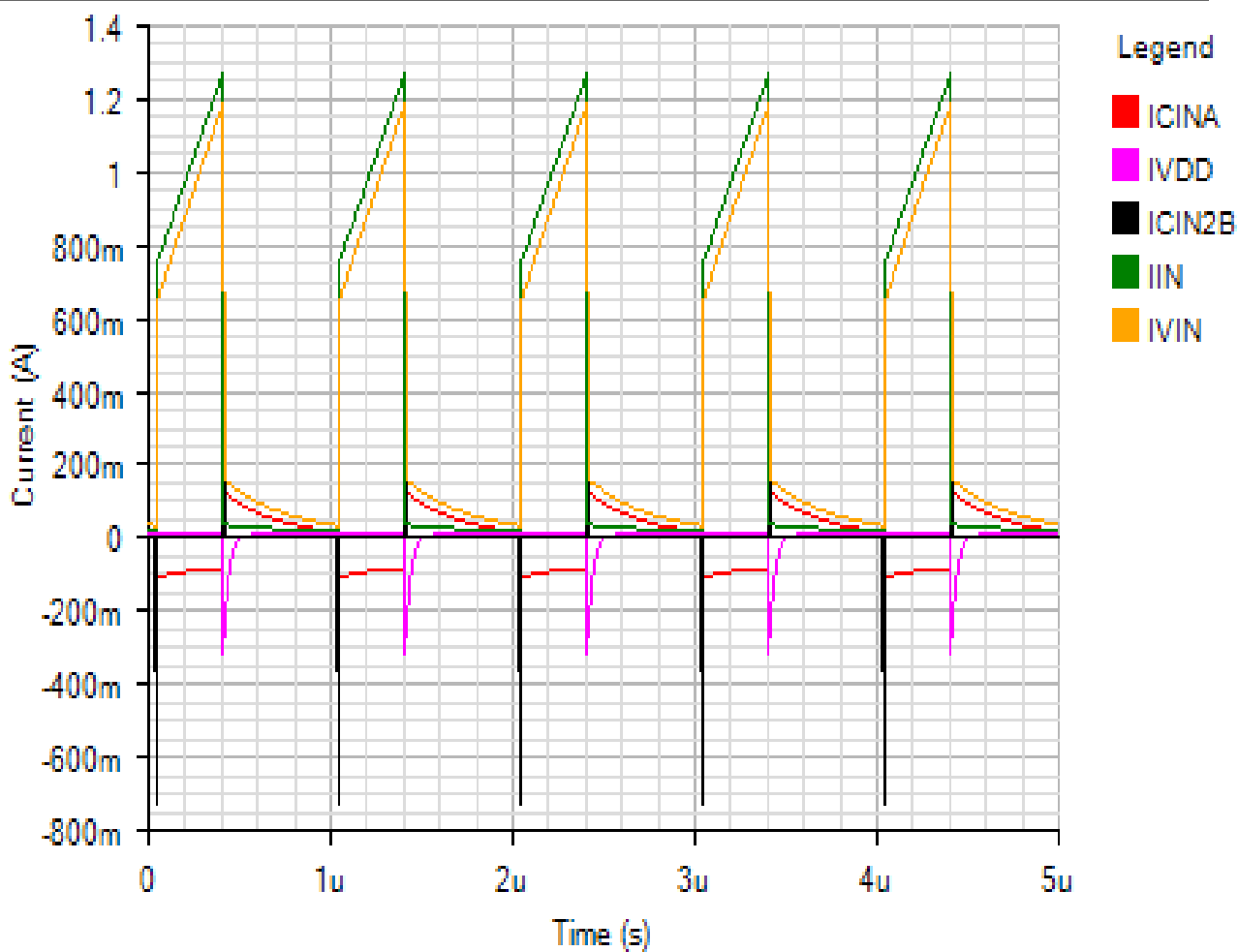
% of total

Component	Loss (W)	% of total
Cin - ESR	0.009077	2.3
Control MOSFET - gate charge	0.025	6.3
Synchronous MOSFET - diode Vforward during dead time	0.0016	0.4
Cout - ESR	0.000346	0.1
Control IC - quiescent	0.0055	1.4
Control MOSFET - Rds_on	0.06447	16.1
Synchronous MOSFET - Coss	0.002025	0.5
Control MOSFET - Coss	0.002025	0.5
Control MOSFET - switching	0.086207	21.6
Synchronous MOSFET - diode reverse recovery	0.025	6.3
Synchronous MOSFET - Rds_on	0.052052	13
Lout - AC + DC	0.101367	25.4
Synchronous MOSFET - gate charge	0.025	6.3
Total	0.39967	100

Steady State - Mon Nov 19 2018 11:21:04

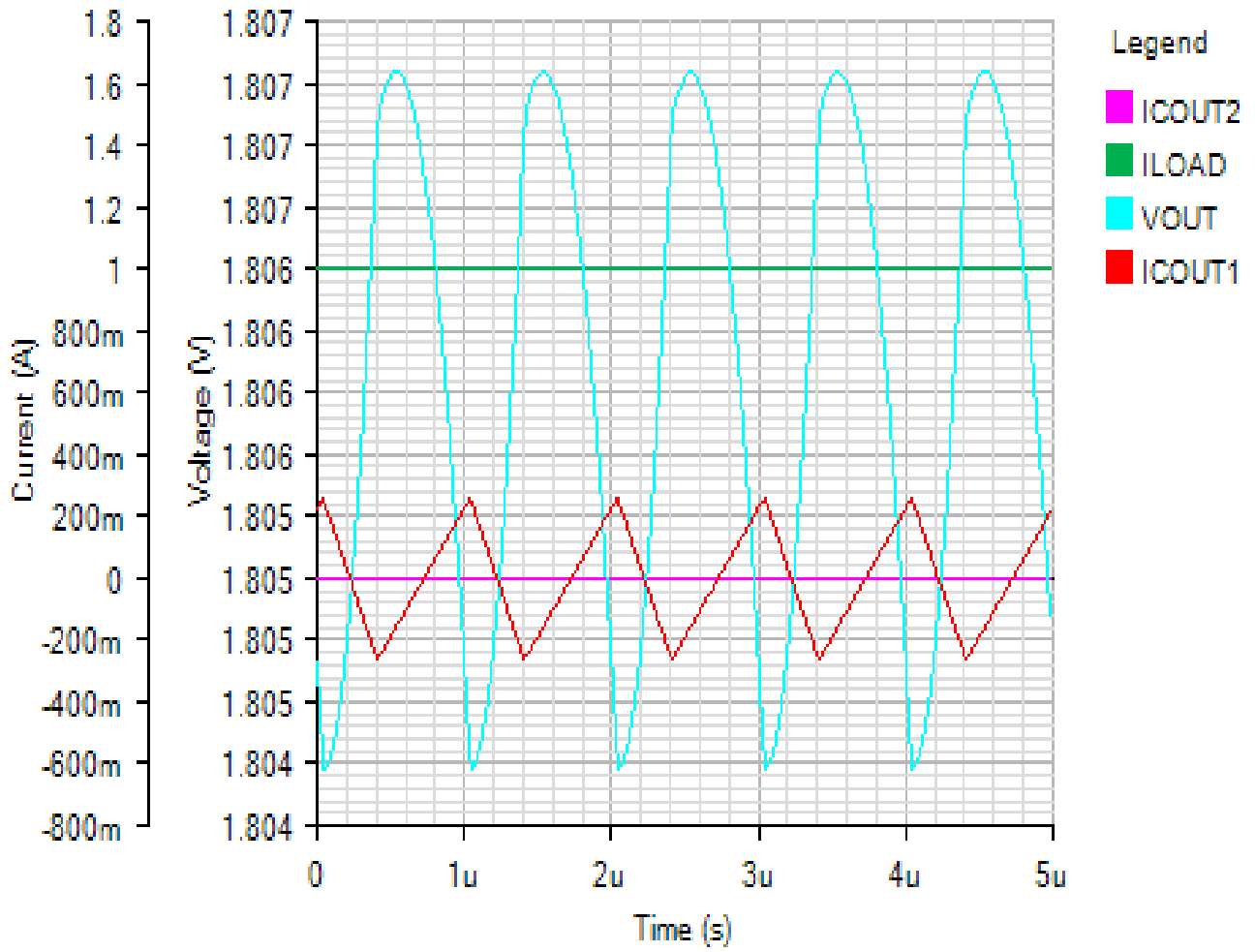
INPUT

Default



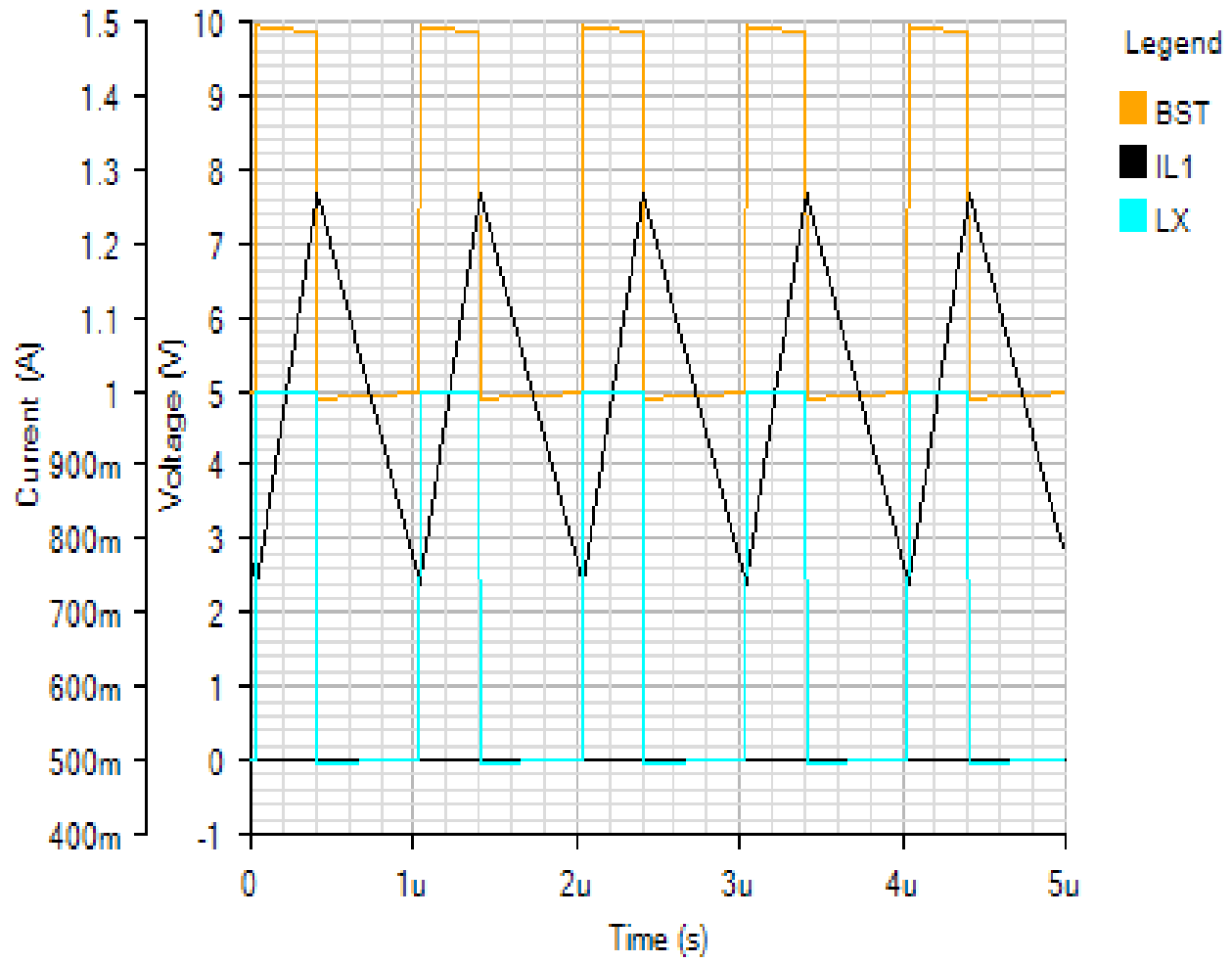
OUTPUT

Default



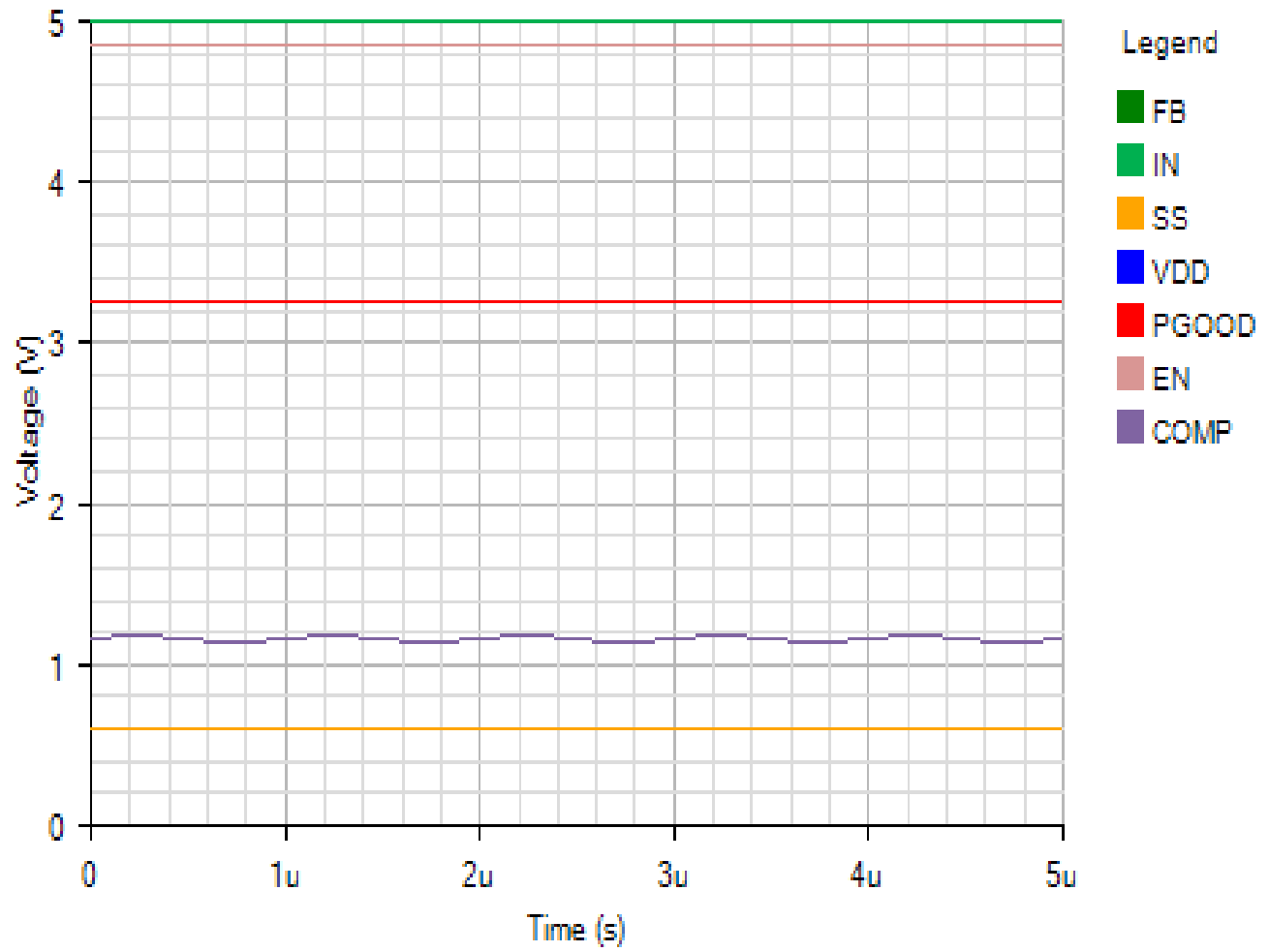
SWITCHING

Default



IC

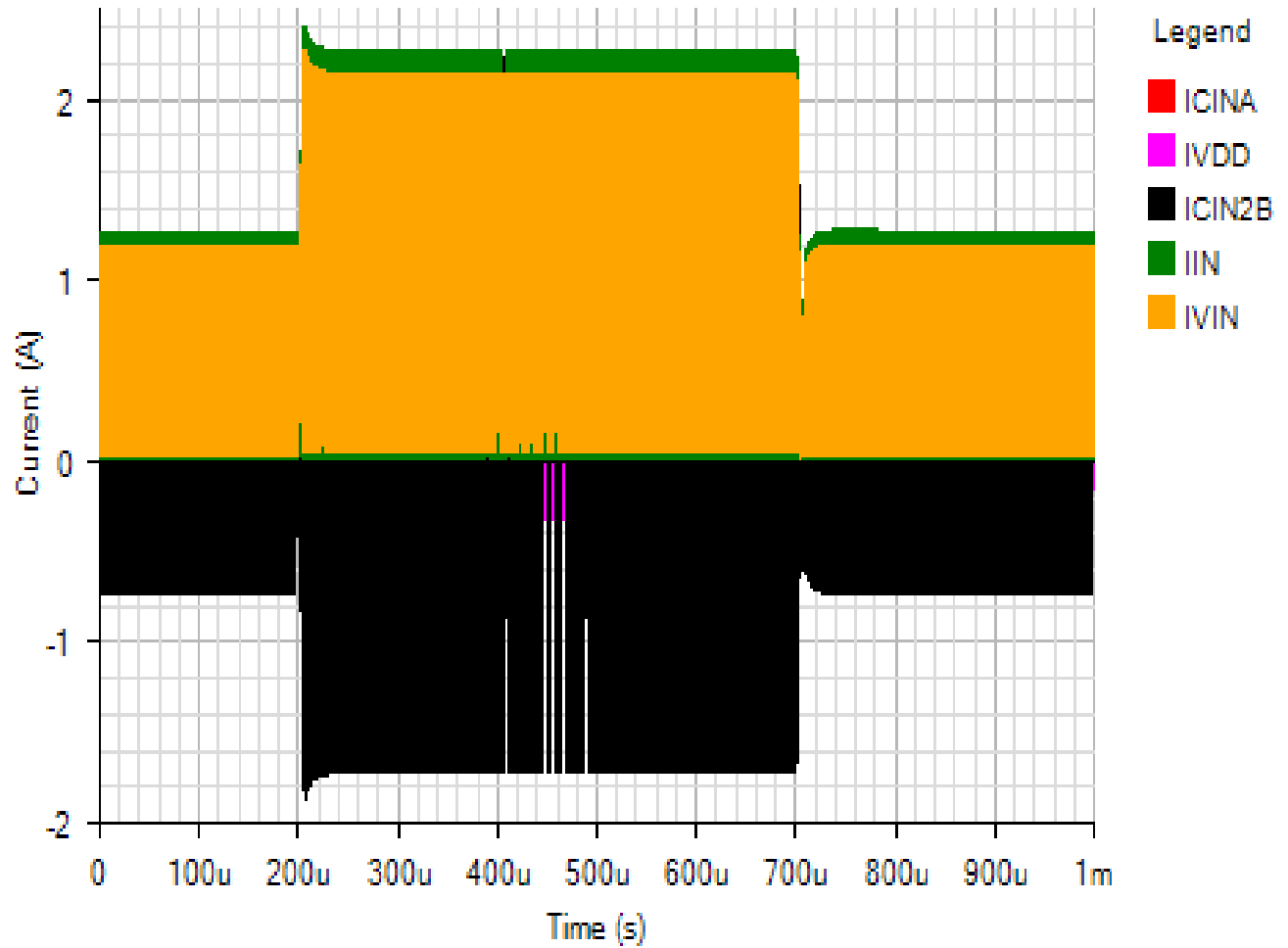
Default



Load Step - Mon Nov 19 2018 11:21:04

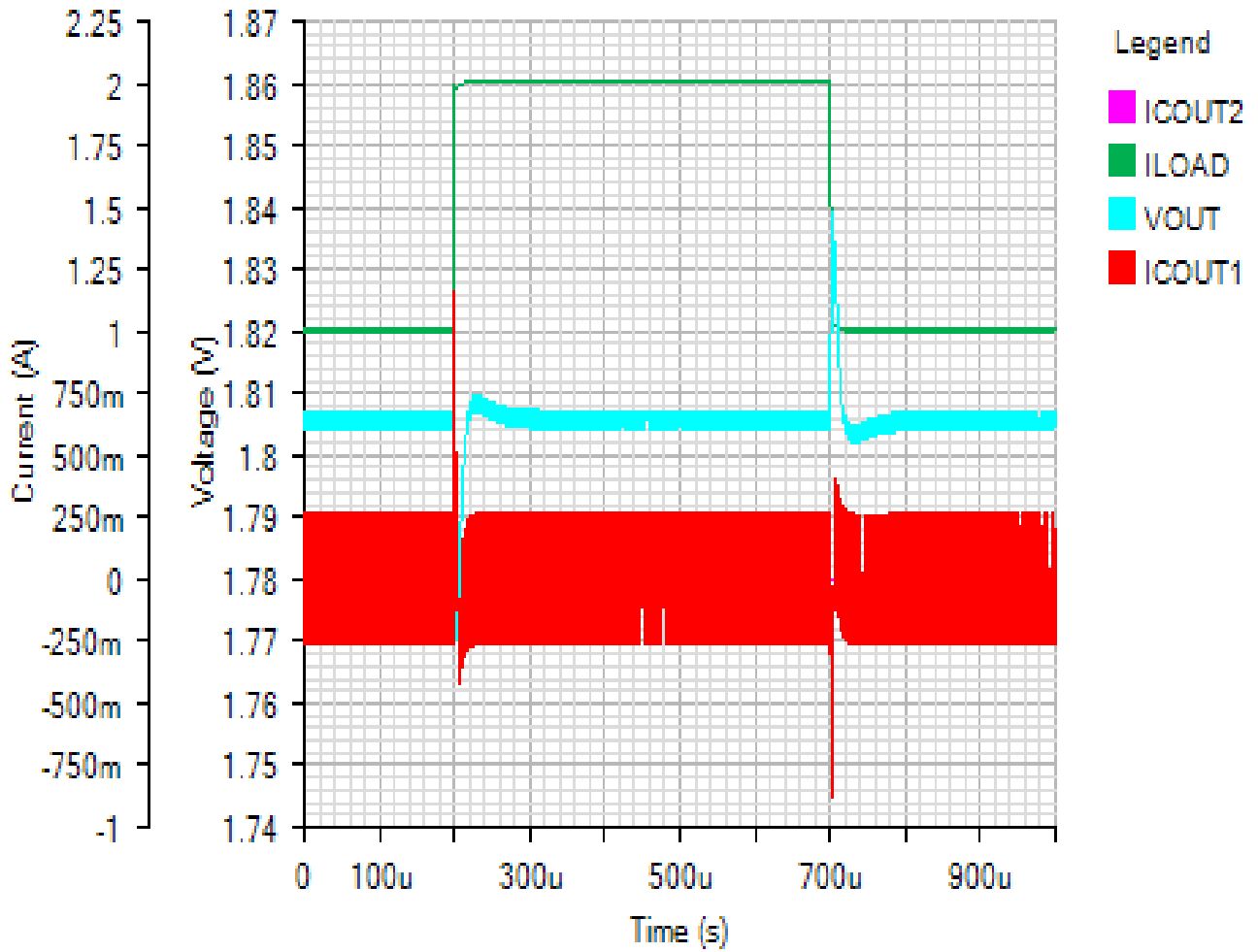
INPUT

Default



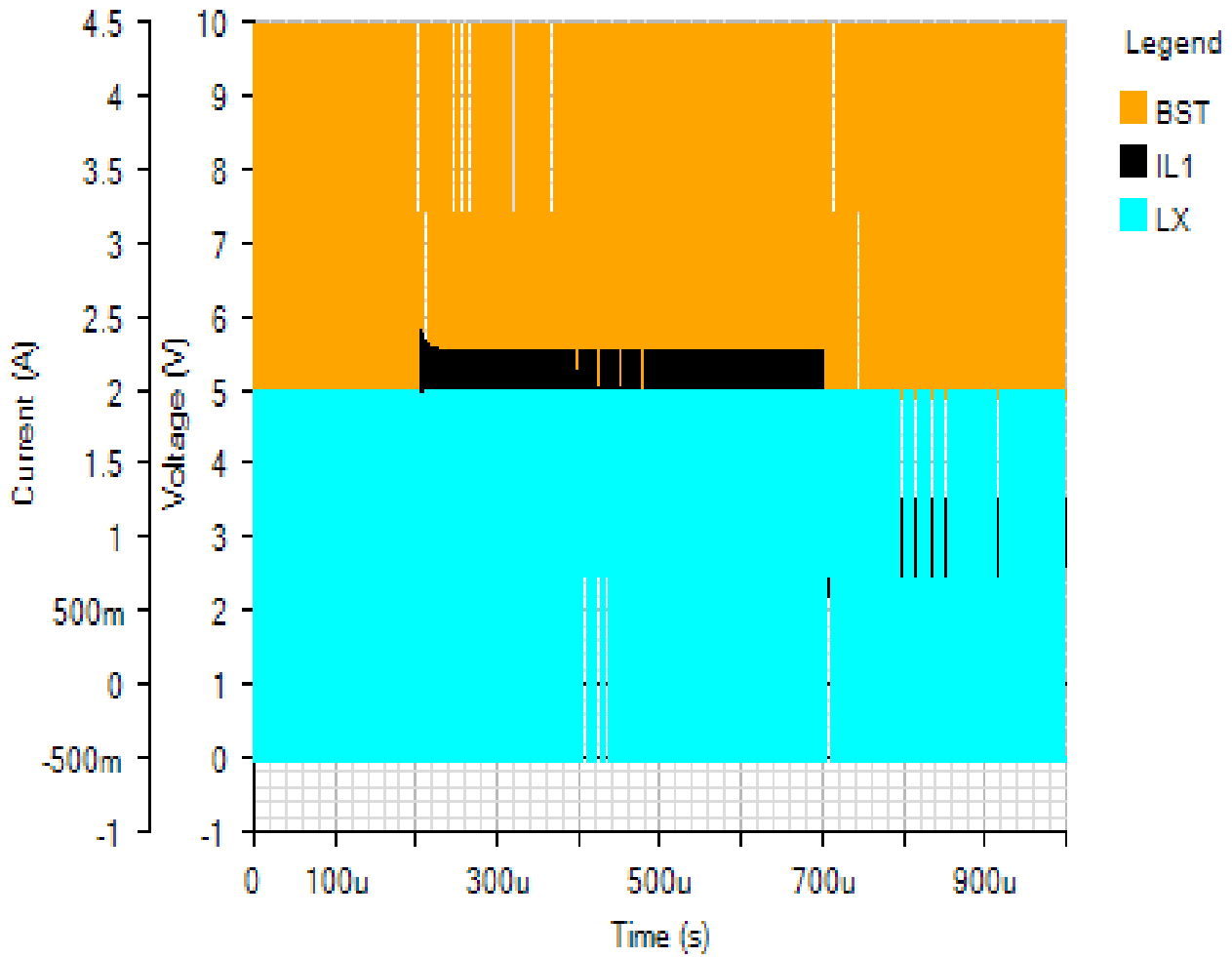
OUTPUT

Default



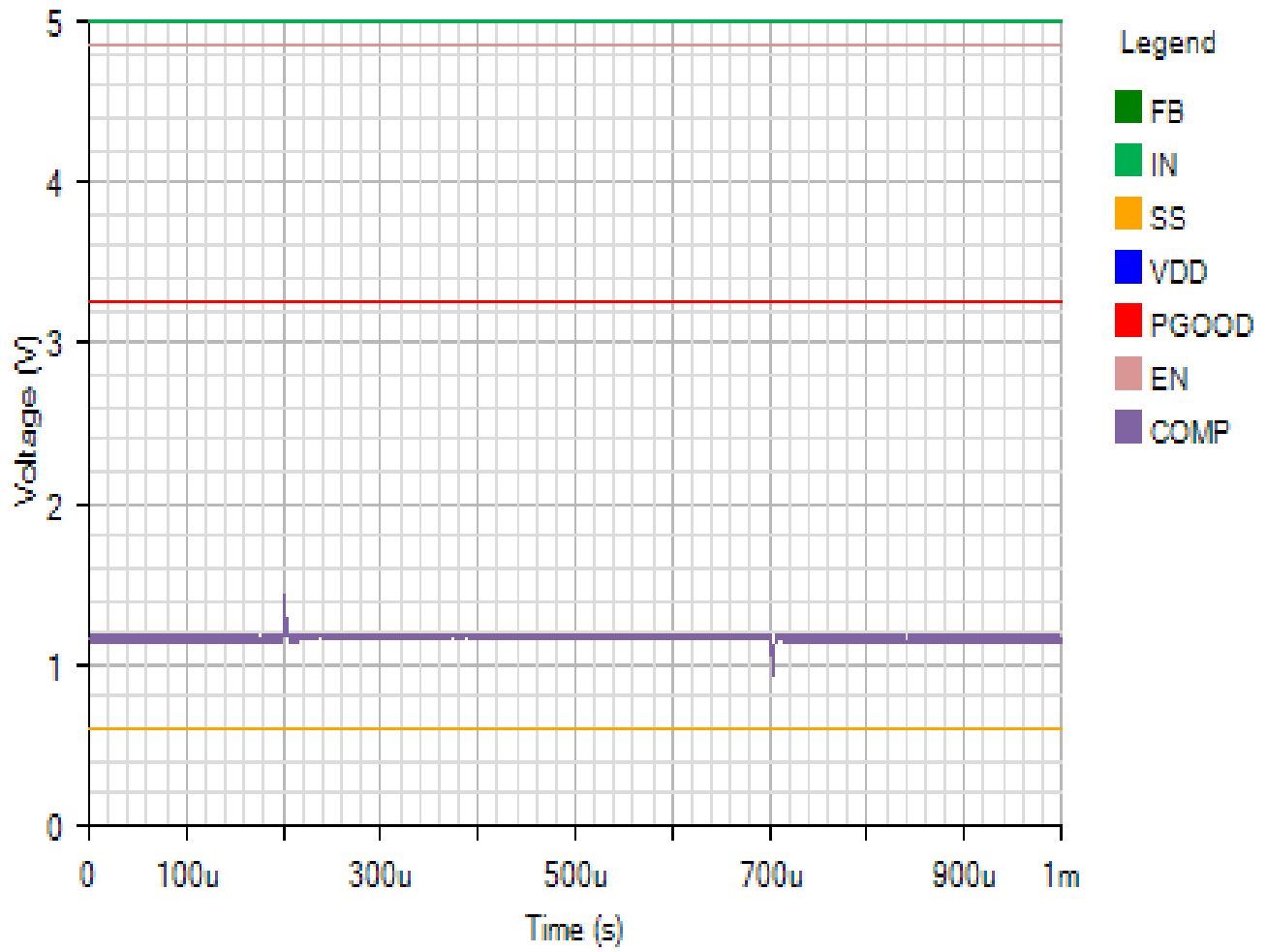
SWITCHING

Default

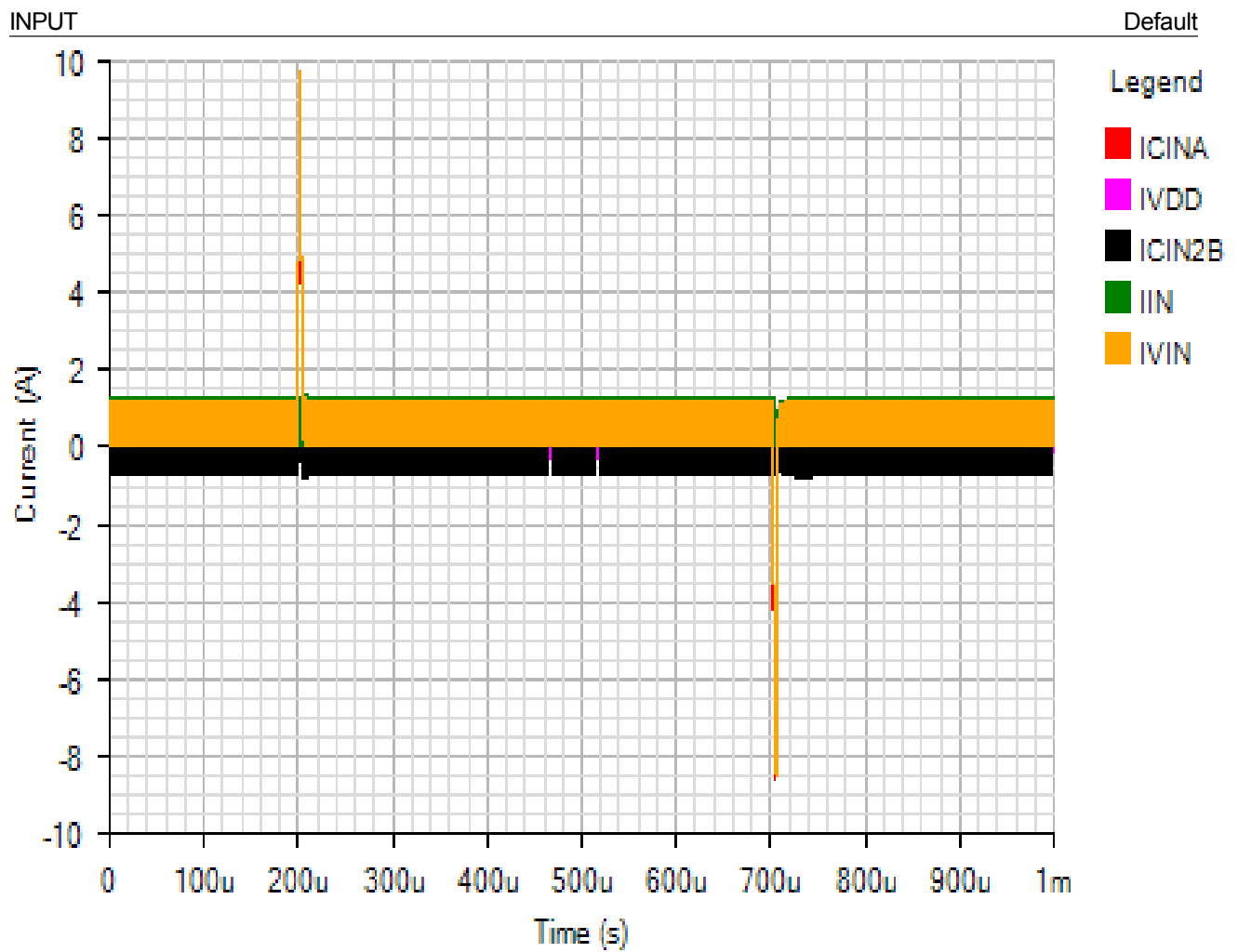


IC

Default

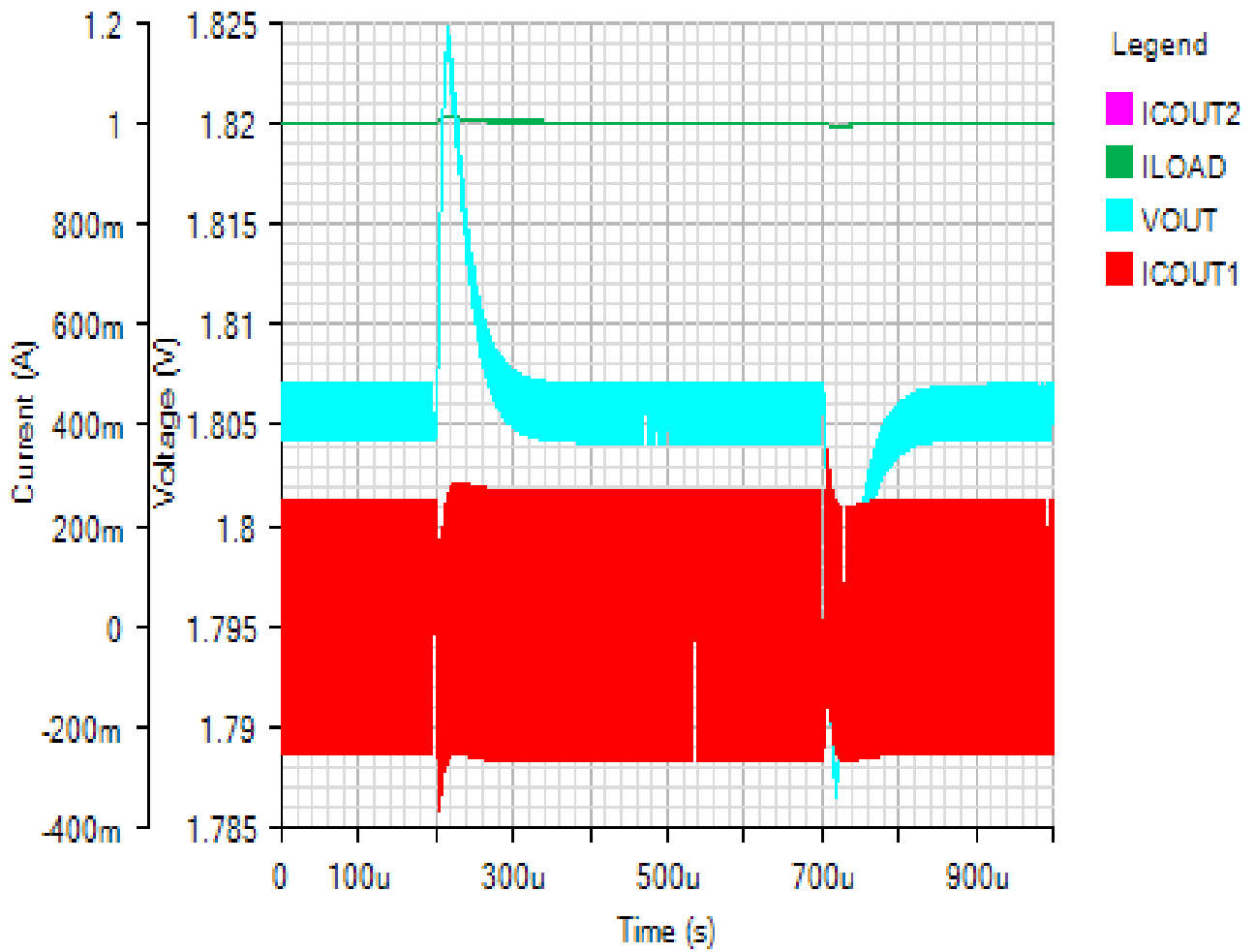


Line Transient - Mon Nov 19 2018 11:21:04



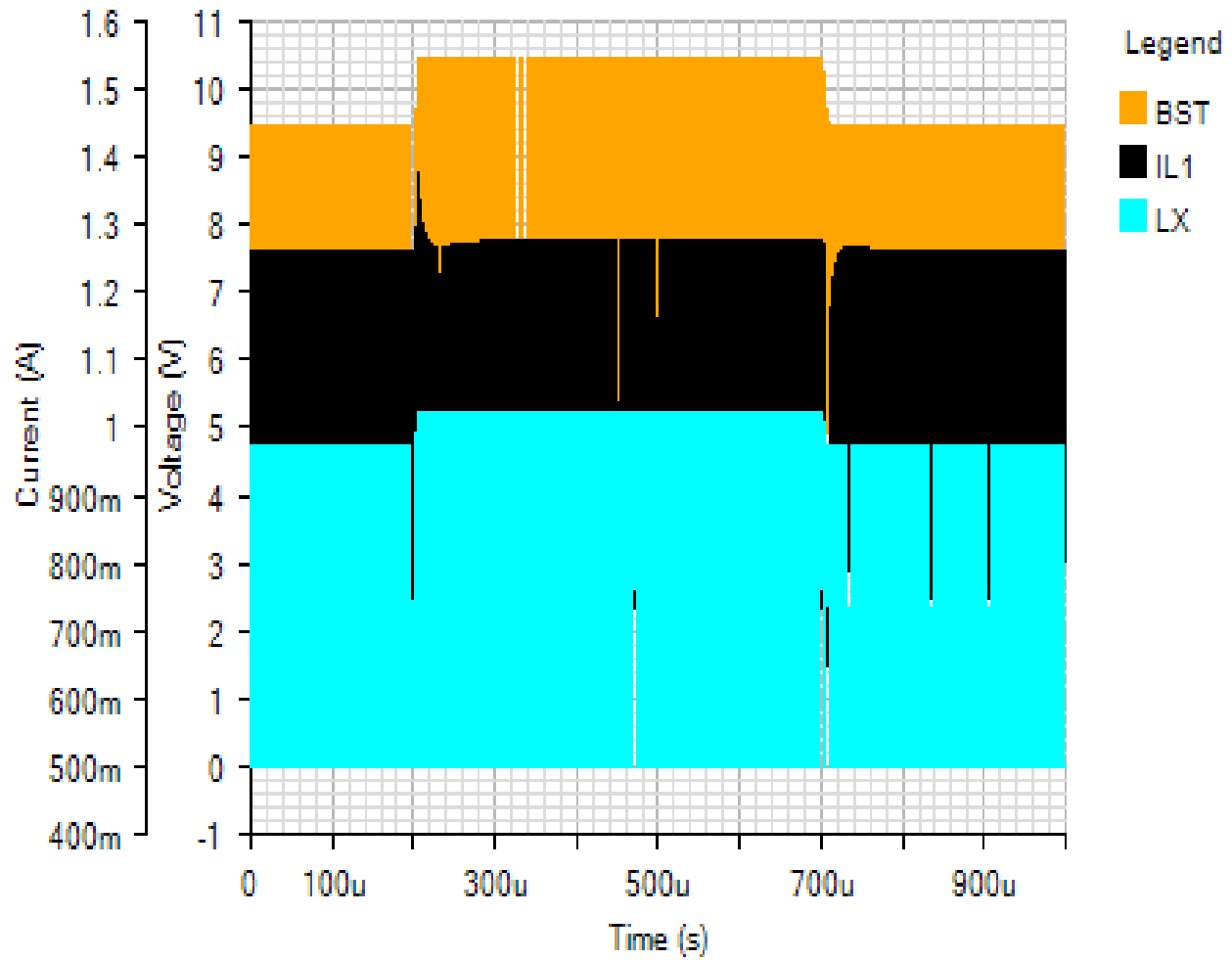
OUTPUT

Default



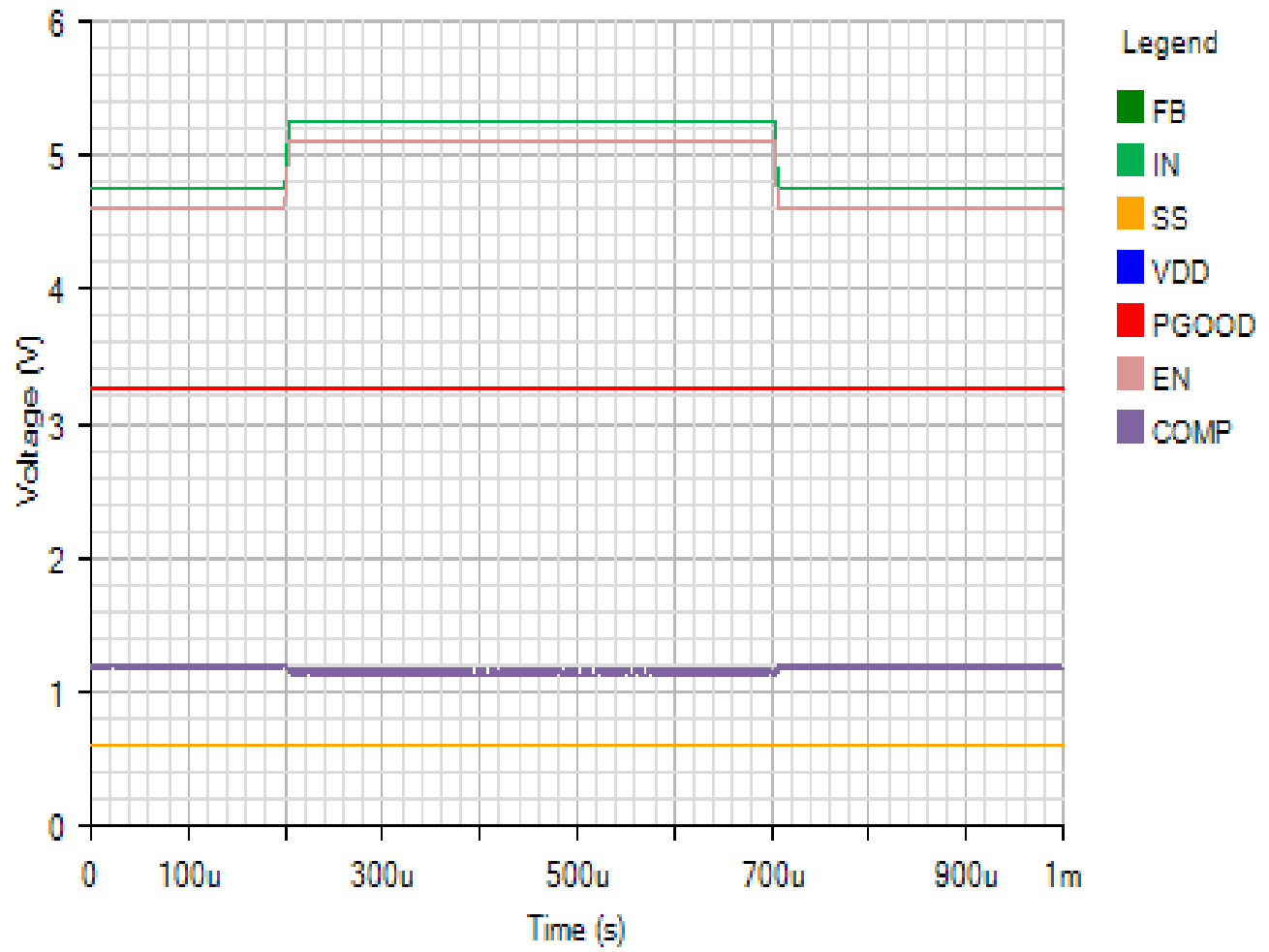
SWITCHING

Default



IC

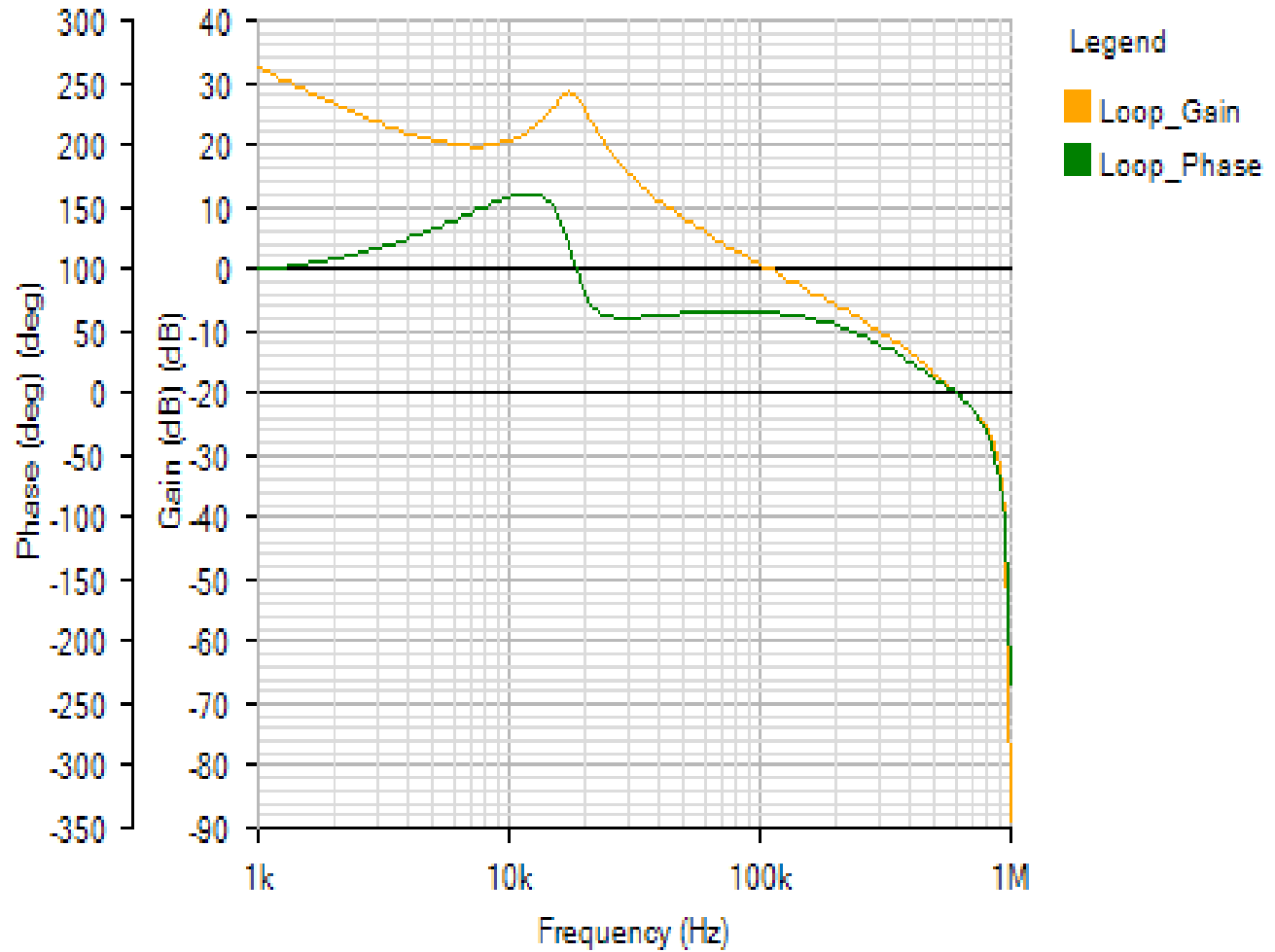
Default



AC Loop - Mon Nov 19 2018 11:21:04

BODE

Default



Phase Margin: 65.33° at a crossover frequency of 108.2kHz

