

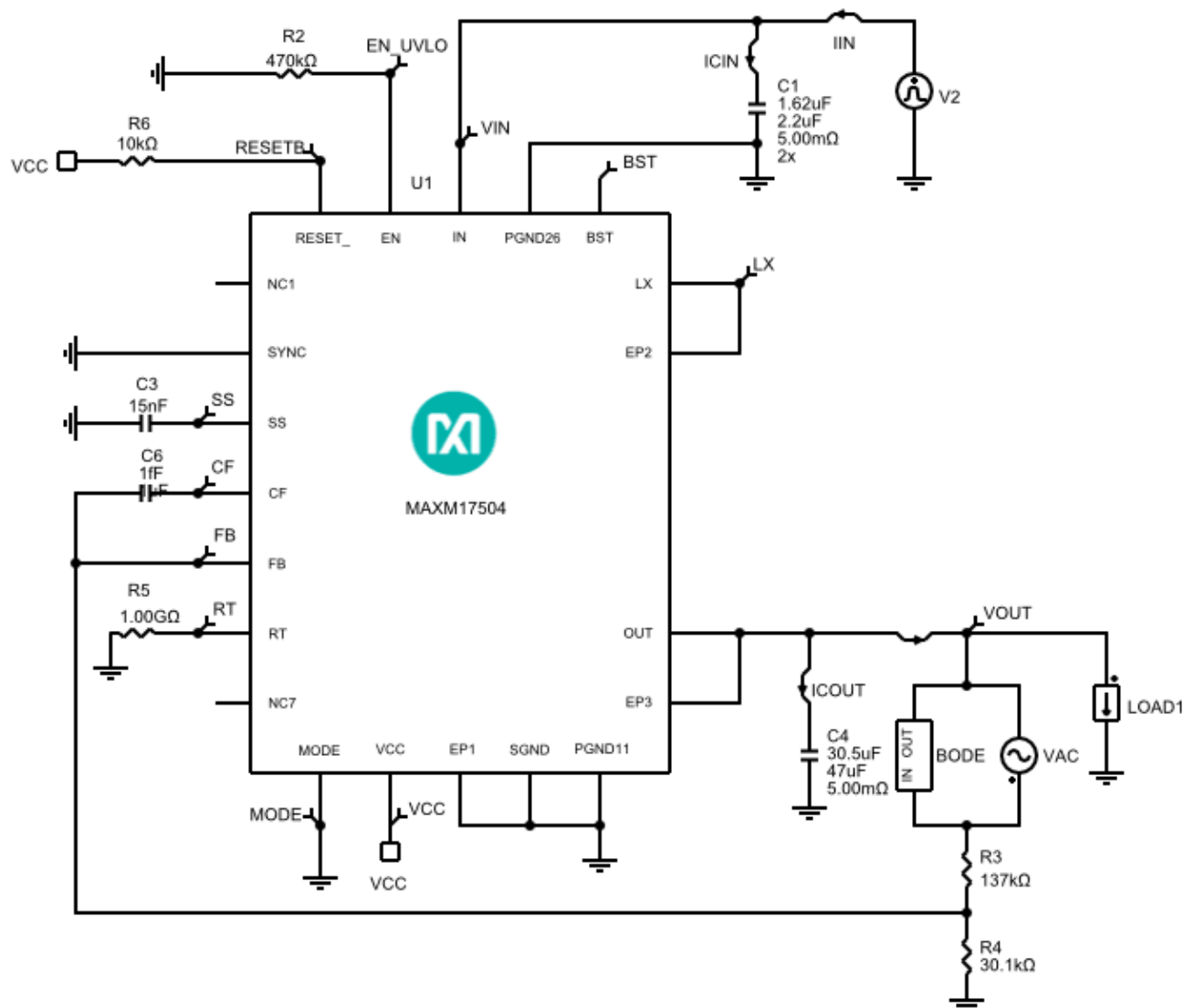
Initial Design

1.0

Design Requirements

| Parameter | Value |
|--|--------|
| Minimum Input Voltage | 11V |
| Maximum Input Voltage | 60V |
| Nominal Input Voltage | 24V |
| Input Steady-State Ripple | 0.48V |
| Input Undervoltage Lockout Level | 9.9V |
| Output Voltage | 5V |
| Output Current | 3.5A |
| Output Voltage Load Step Over/Undershoot | 0.15V |
| BOM Priority | Cost |
| Mode of Operation | PWM |
| Switching Frequency | 500kHz |
| Soft-start time | 3ms |
| Ambient Temperature | 25°C |

Schematic



***** Notes *****

- Changing the input or output capacitance value is not recommended. It might degrade the transient response or loop stability.
- If the current level (starting current for Load Steps) is too low, AC, Steady State and Load Step analyses may fail when PFM/DCM mode is selected.

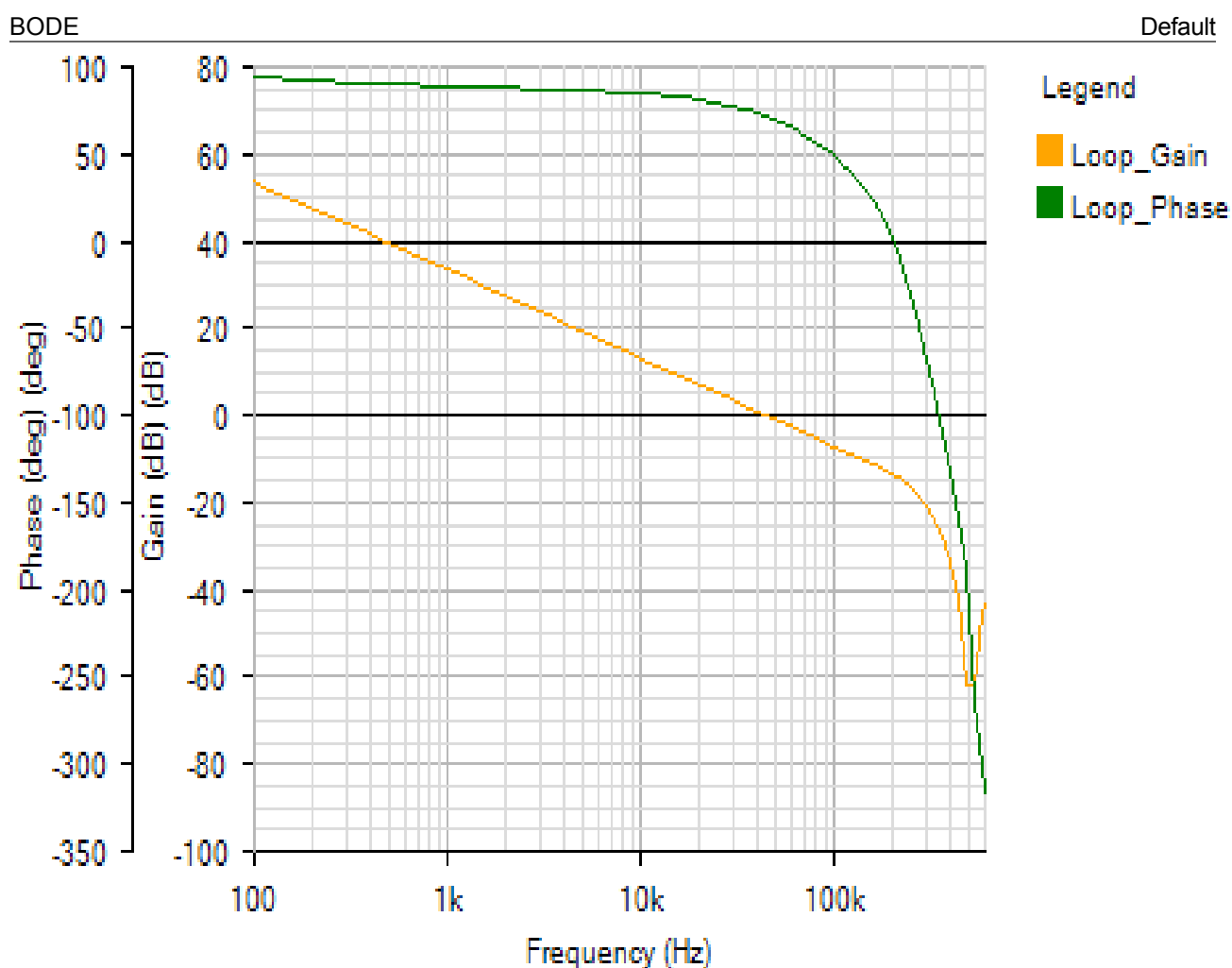
BOM

| Ref | Qty | Part Number | Manufacturer | Description |
|-----|-----|-----------------------------------|------------------|---|
| U1 | 1 | MAXM17504ALJ+ | Maxim Integrated | 4.5-60V, 3.5A, High-Efficiency, DC-DC Step-Down Power Module with Integrated Inductor |
| C1 | 2 | C1210C225K1RAC | Kemet | Cap Ceramic 2.2uF 100V X7R 10% SMD 1210 125C Bulk |
| C3 | 1 | CC0402KRX7R8BB153 | Yageo | Cap Ceramic 0.015uF 25V X7R 10% Pad SMD 0402 125°C T/R |

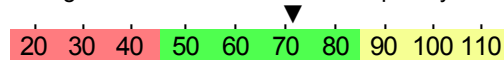
| | | | | |
|----|---|------------------------------------|-----------|--|
| C4 | 1 | GRM32ER71A476KE15L | Murata | Cap Ceramic 47uF 10V X7R 10% SMD 1210 125C Embossed T/R |
| R2 | 1 | ERJ2GEJ474X | Panasonic | Res Thick Film 0402 470K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R |
| R3 | 1 | ERJ2RKF1373X | Panasonic | Res Thick Film 0402 137K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R |
| R4 | 1 | ERJ2RKF3012X | Panasonic | Res Thick Film 0402 30.1K Ohm 1% 0.1W(1/10W) ±100ppm/°C Pad SMD Automotive T/R |
| R6 | 1 | ERJ2GEJ103X | Panasonic | Res Thick Film 0402 10K Ohm 5% 0.1W(1/10W) ±200ppm/°C Pad SMD Automotive T/R |

Simulation Results

AC Loop - Mon Nov 26 2018 14:06:20



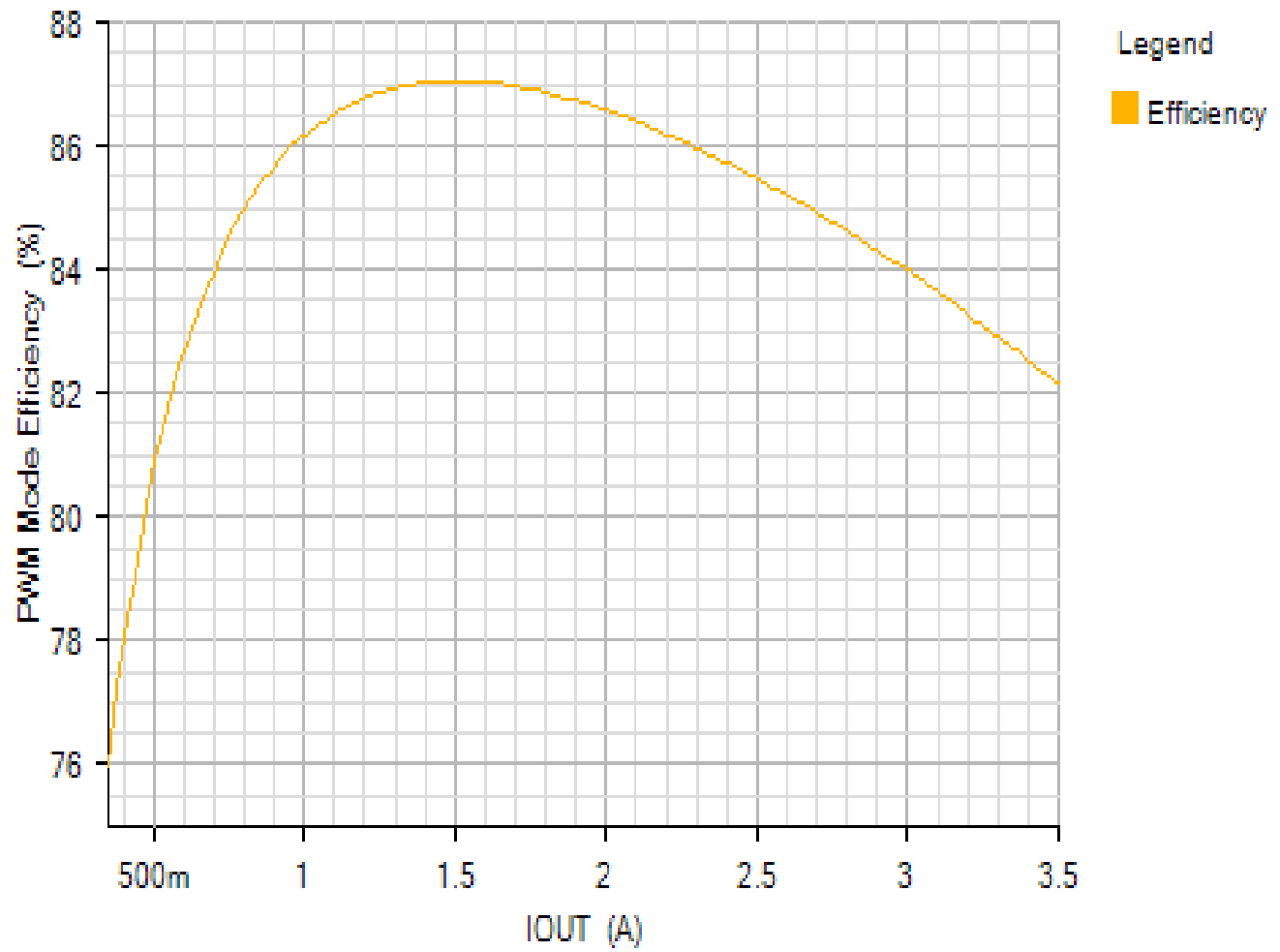
Phase Margin: 71.47° at a crossover frequency of 44.9kHz



Efficiency - Mon Nov 26 2018 14:06:20

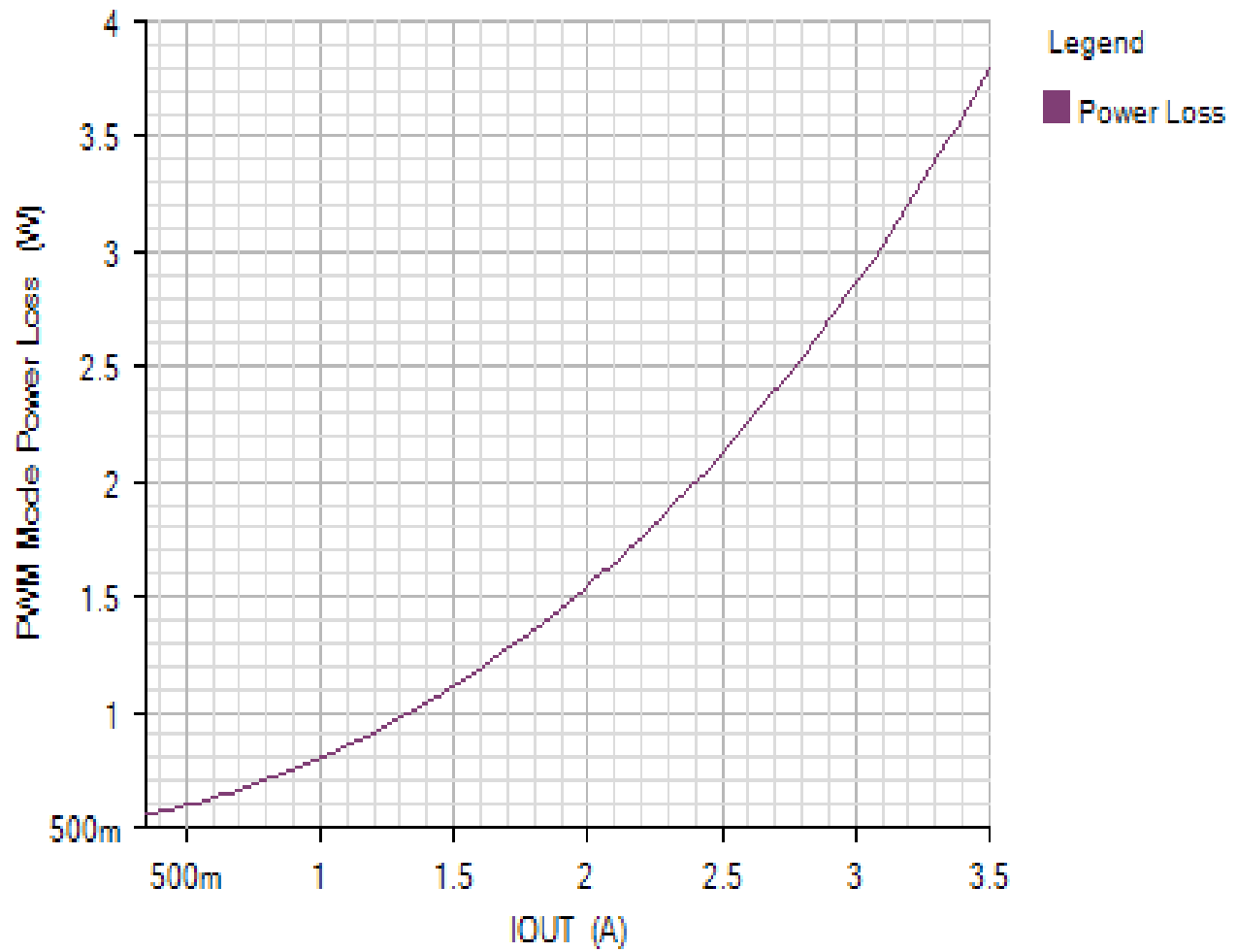
EFFICIENCY_PLOT

Default



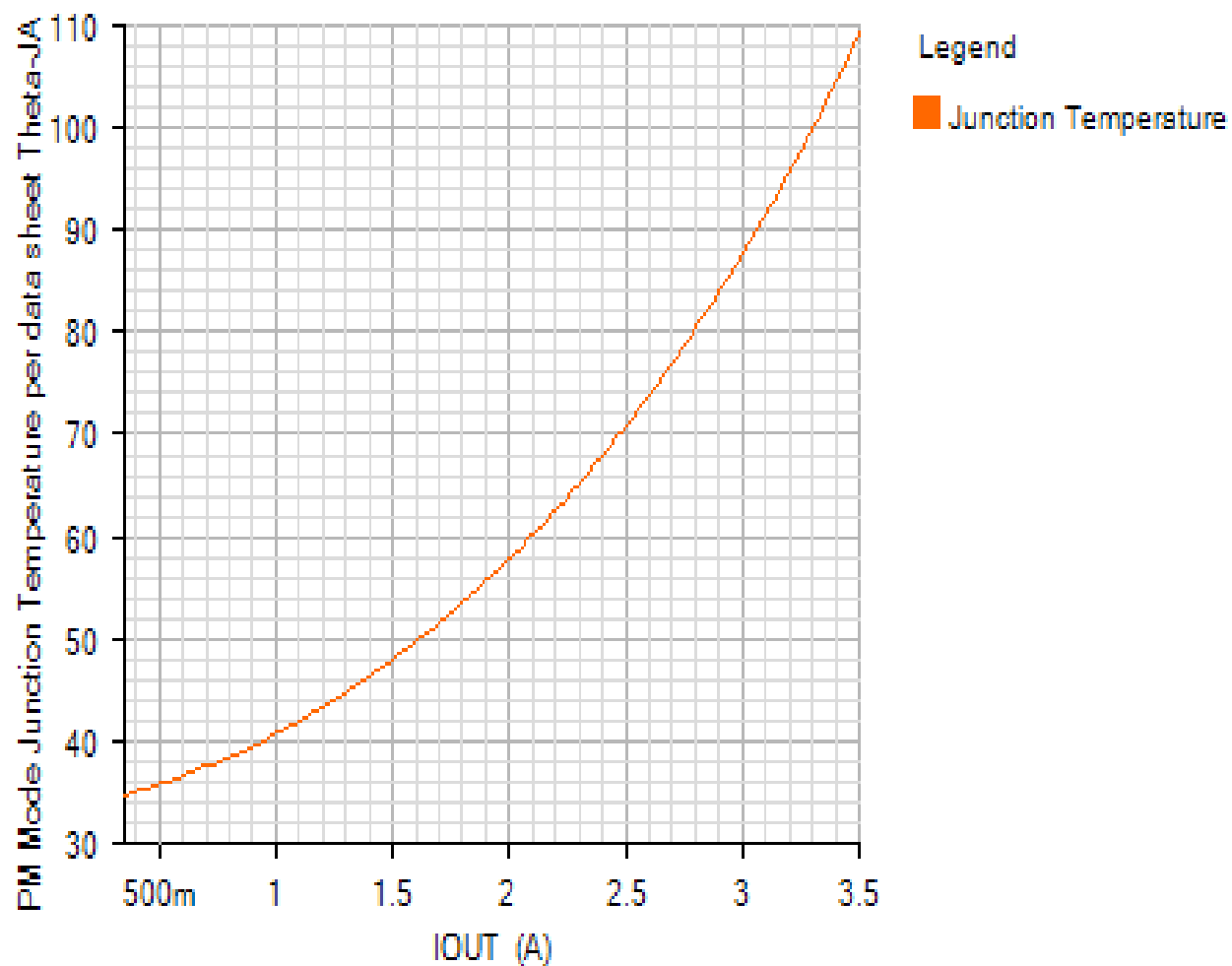
POWER_LOSS_PLOT

Default

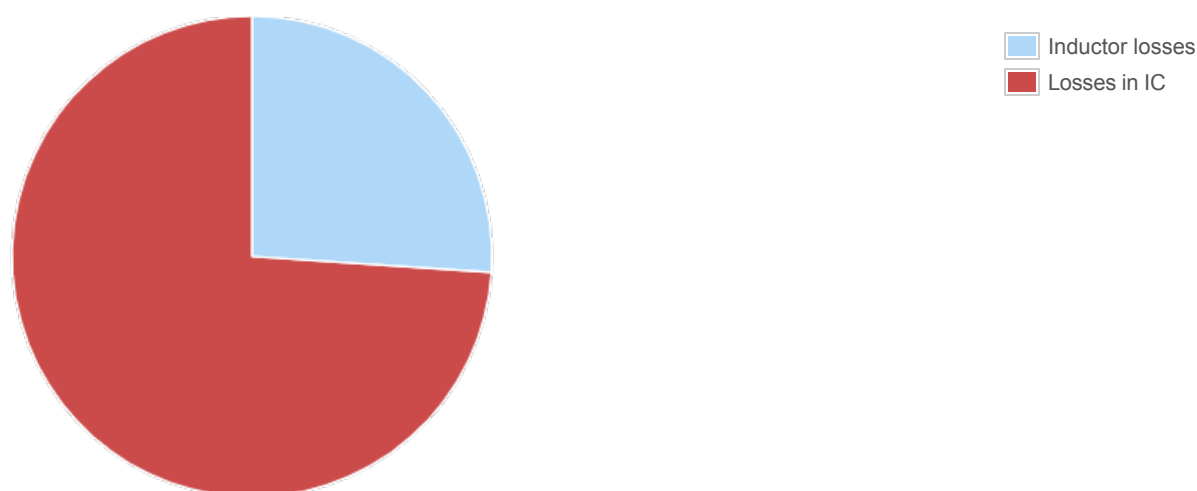


JUNCTION_TEMPERATURE_PLOT

Default



Losses



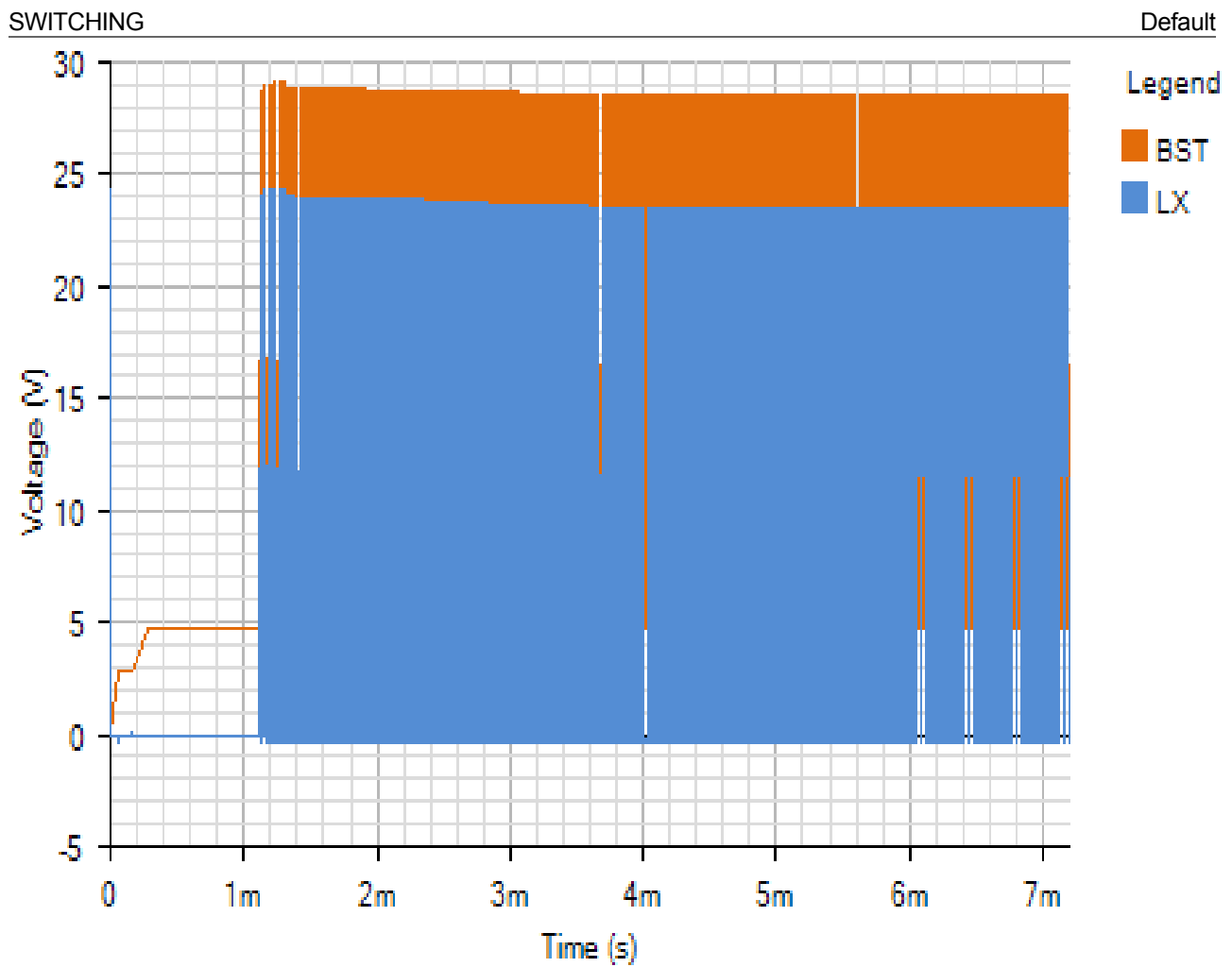
Component

Loss (W)

% of total

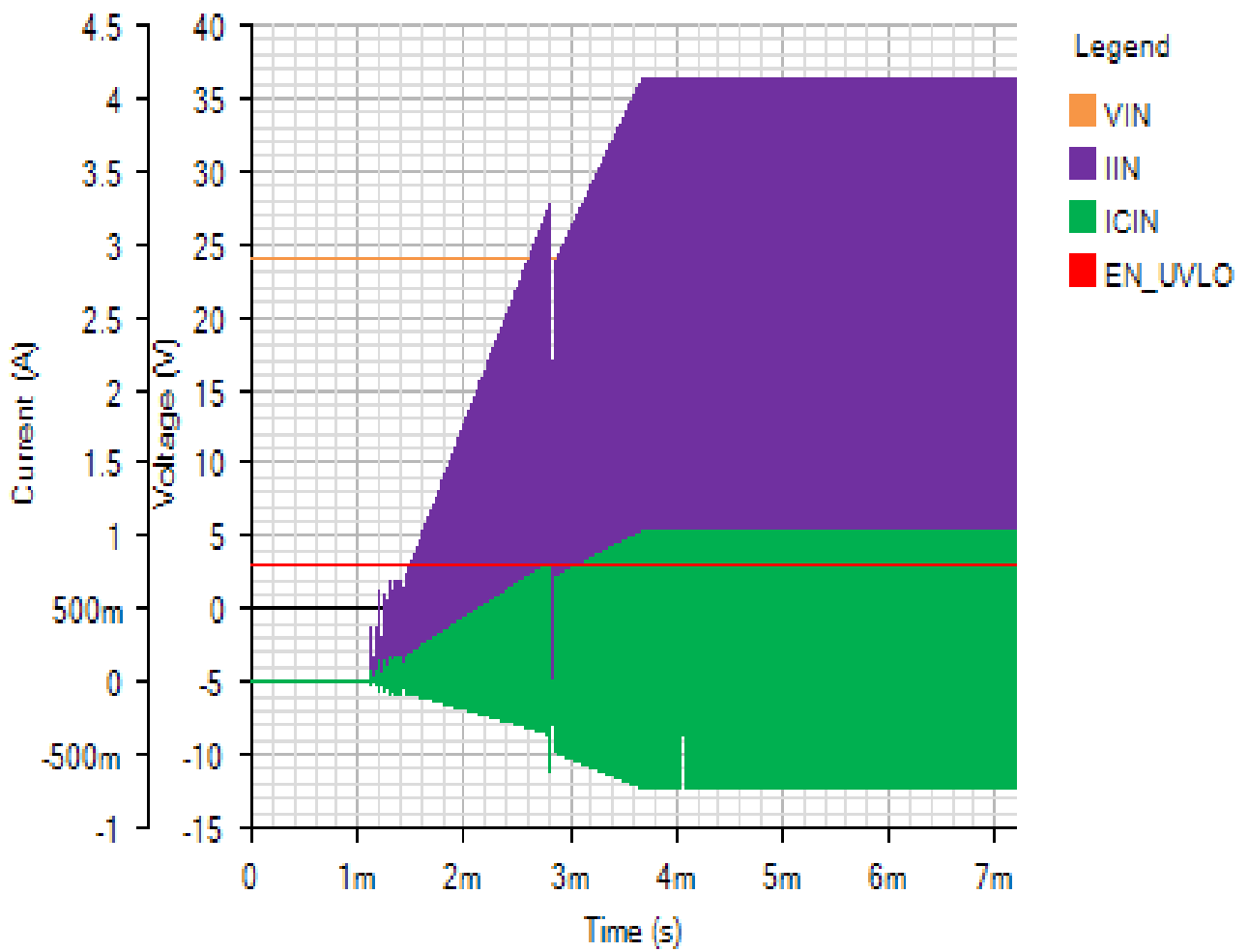
| Component | Loss (W) | % of total |
|-----------------|----------|------------|
| Inductor losses | 0.99 | 26.1 |
| Losses in IC | 2.81 | 73.9 |
| Total | 3.8 | 100 |

Start Up - Mon Nov 26 2018 14:06:20



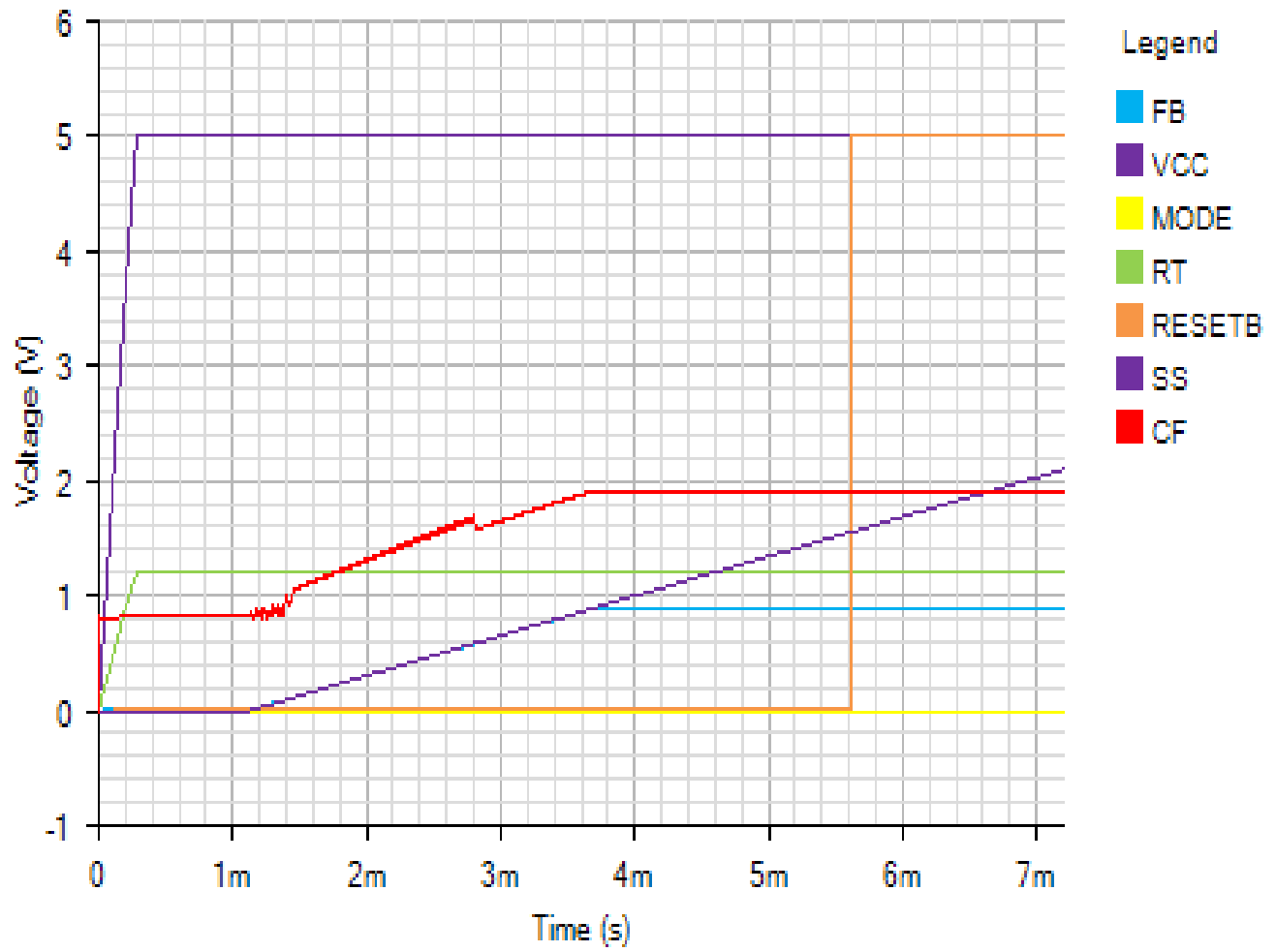
INPUT

Default



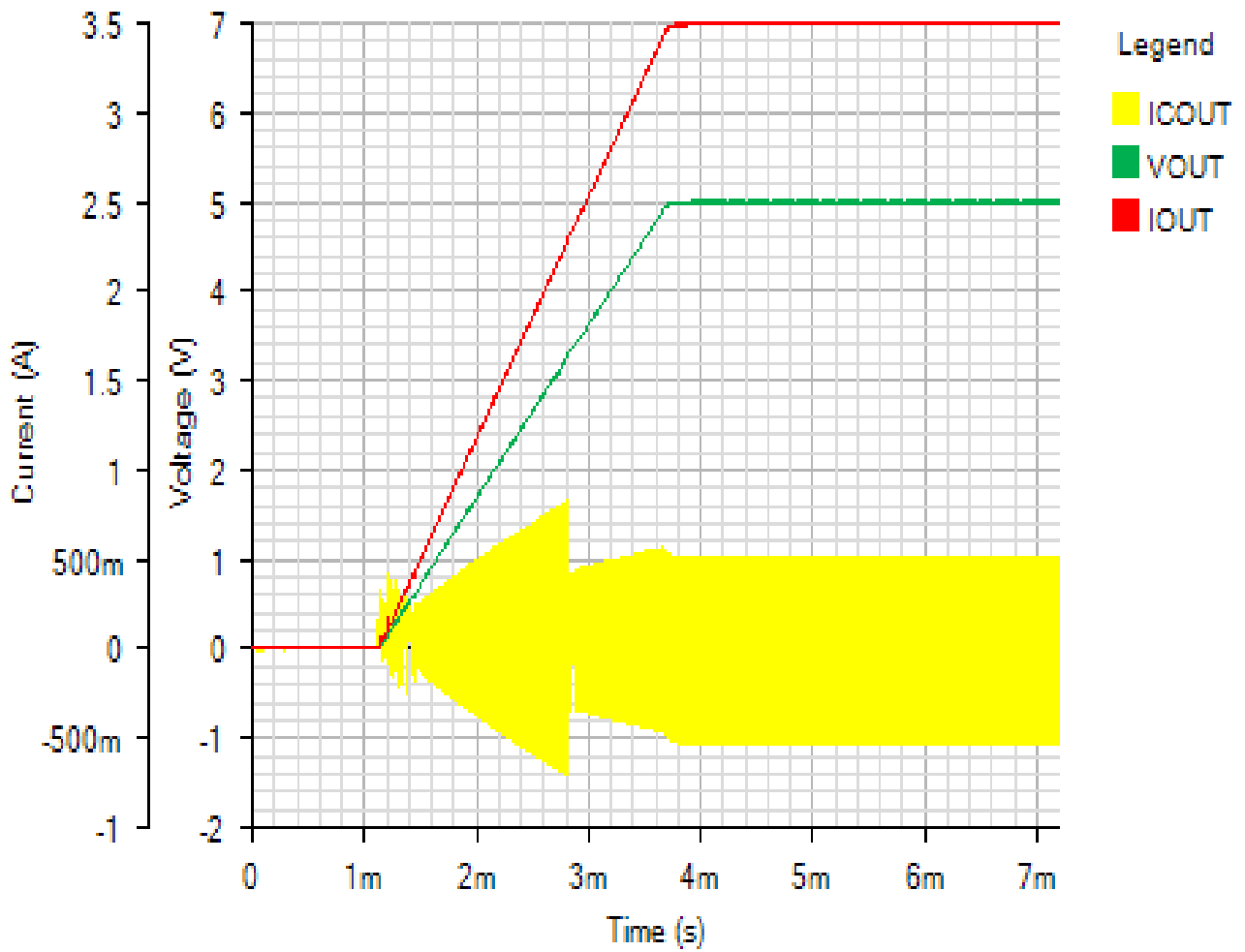
IC

Default

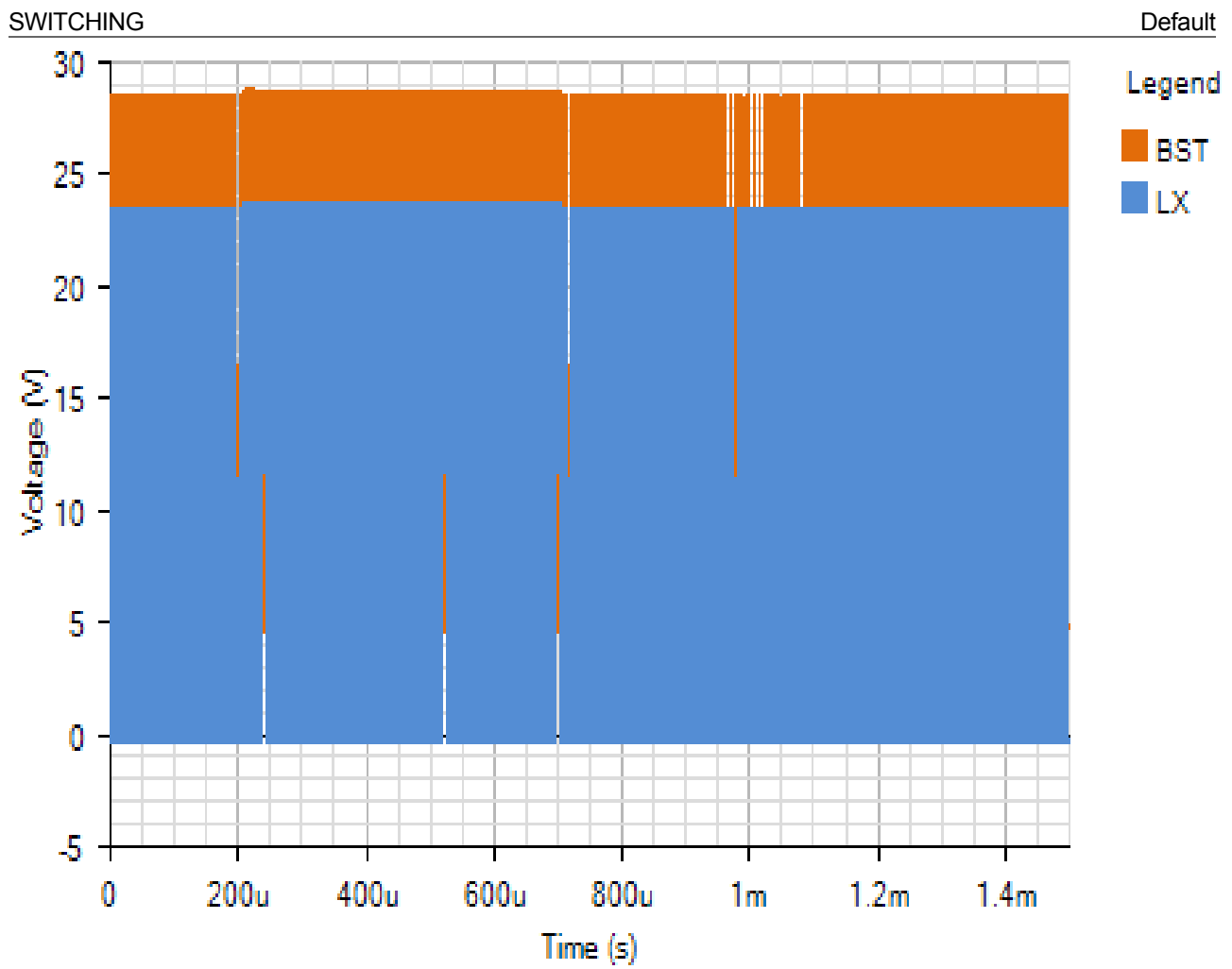


OUTPUT

Default

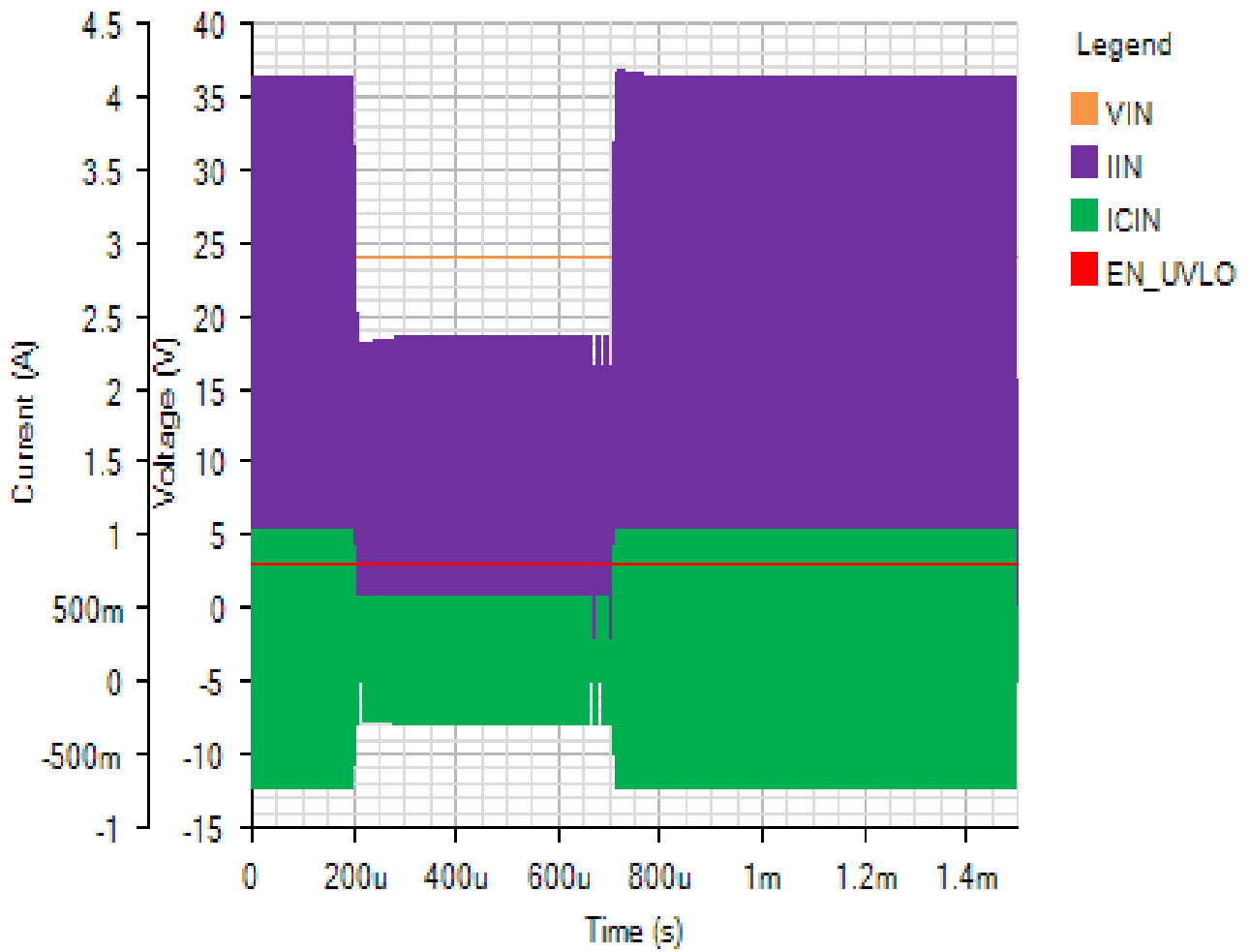


Load Step - Mon Nov 26 2018 14:06:20



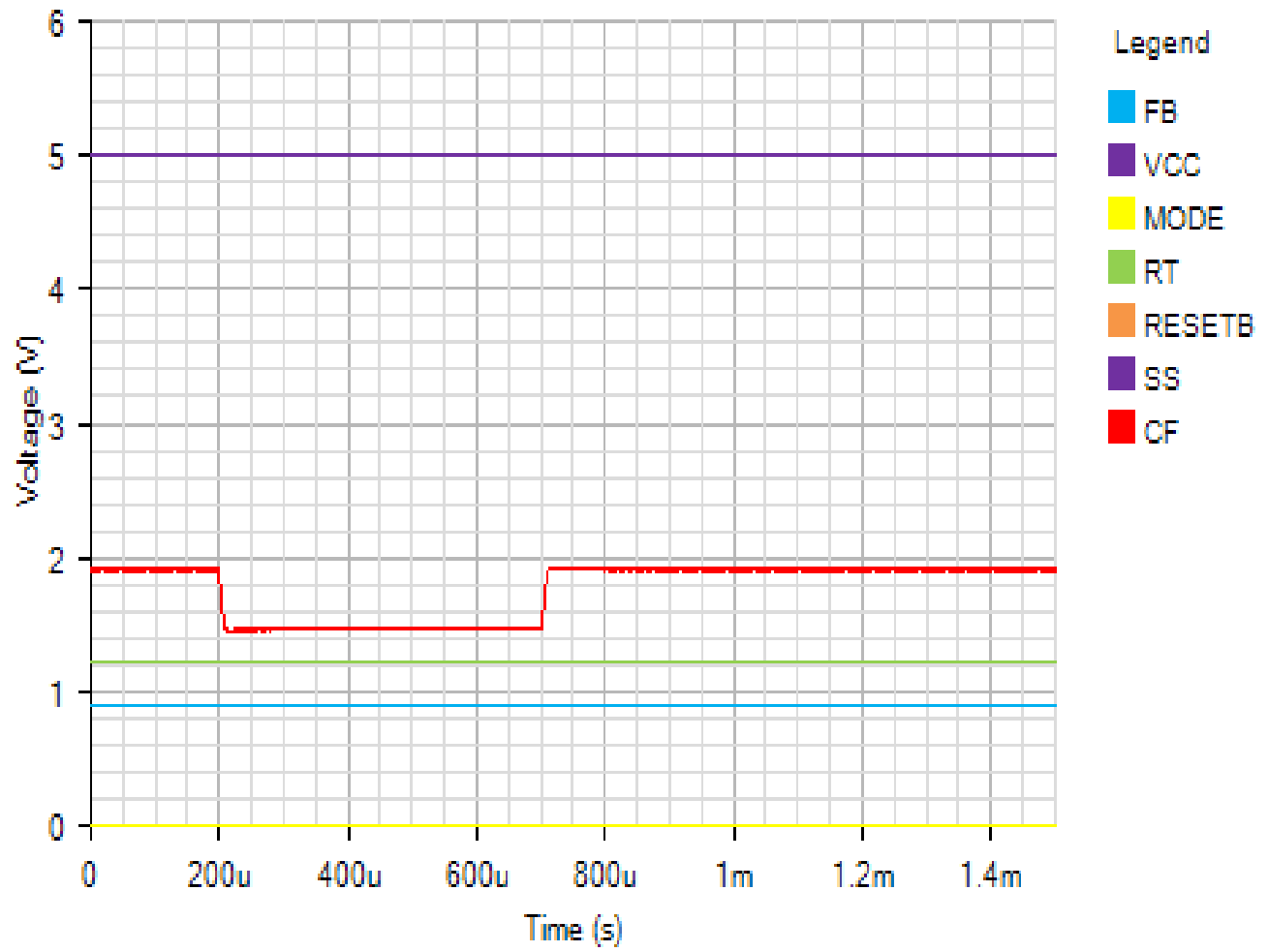
INPUT

Default



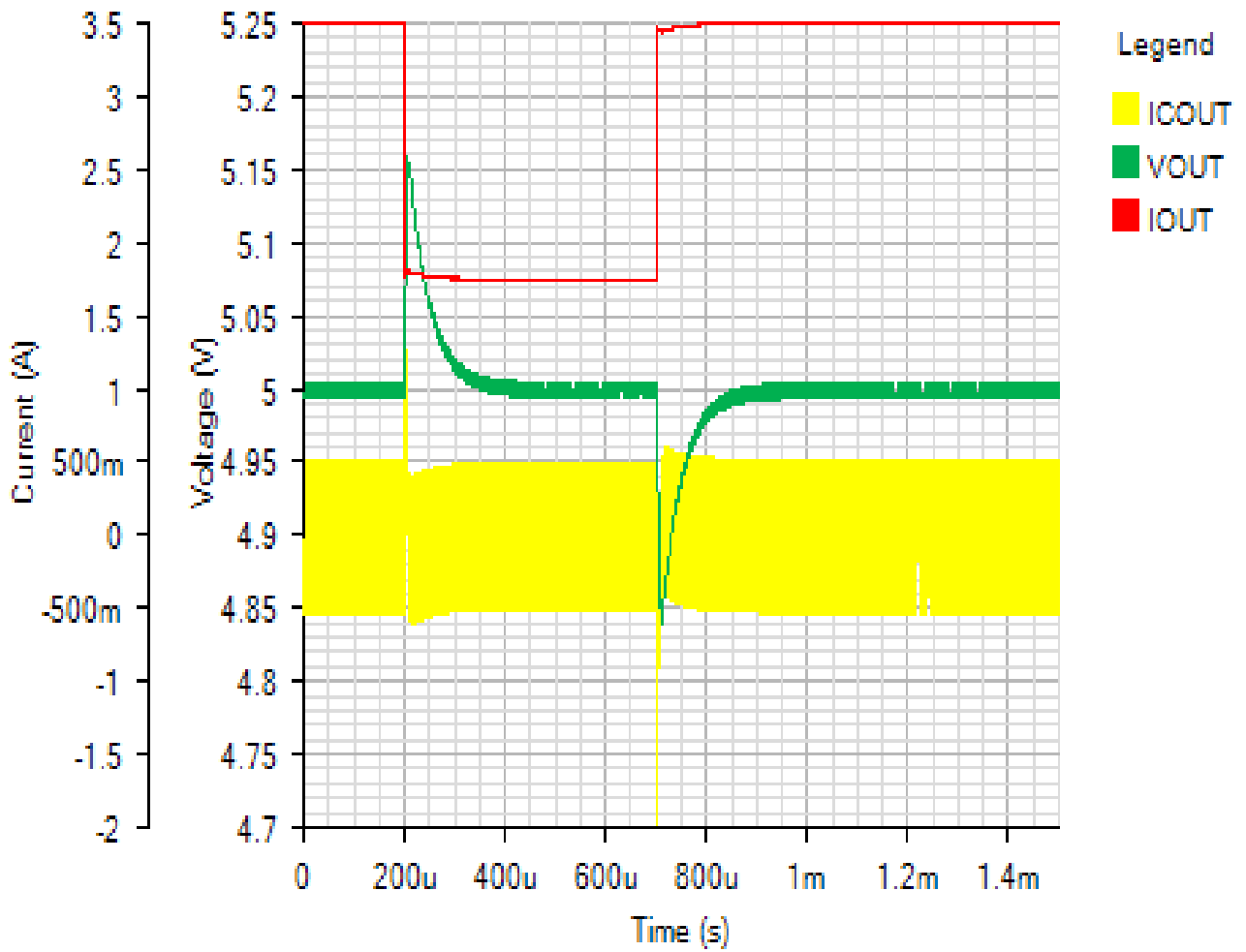
IC

Default



OUTPUT

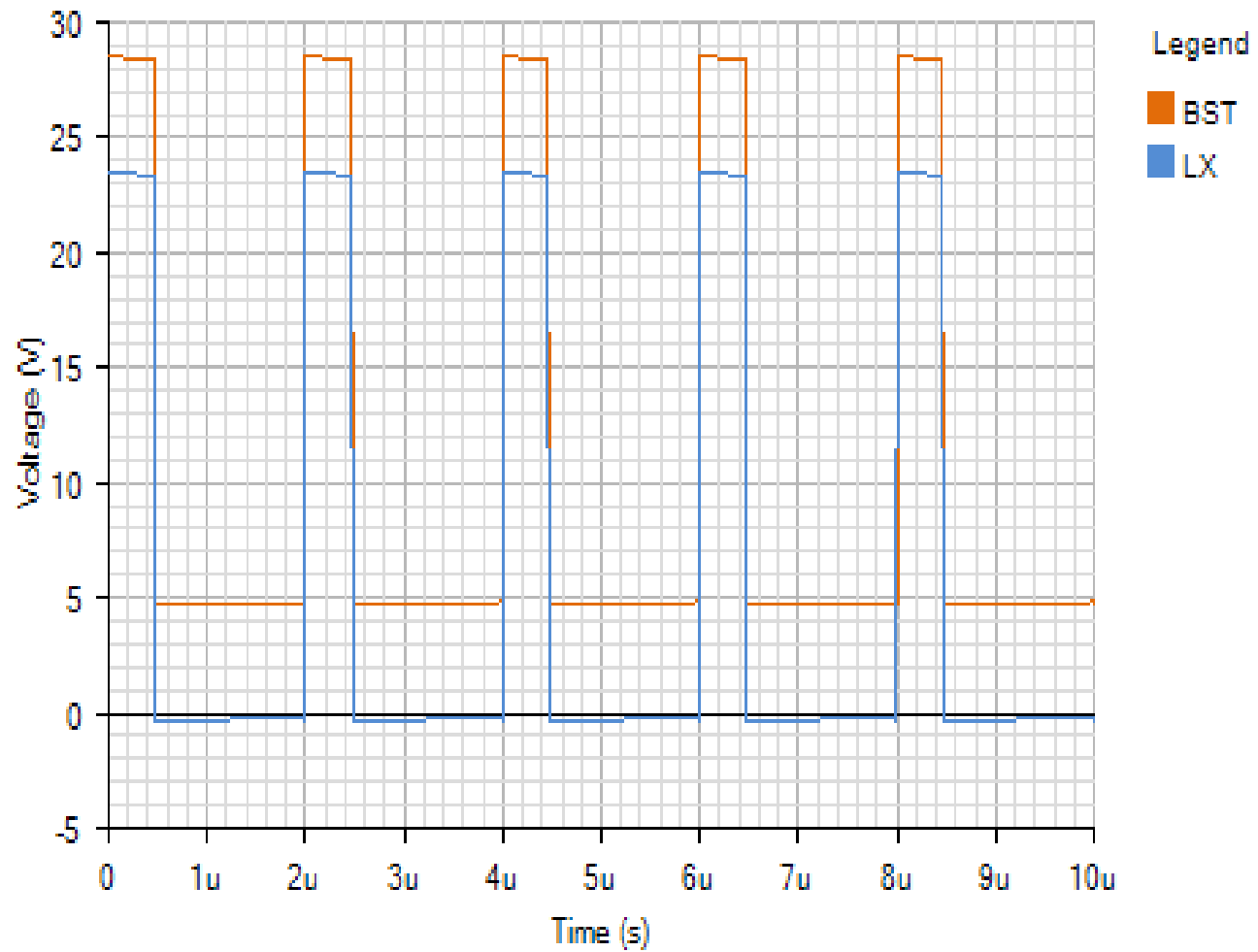
Default



Steady State - Mon Nov 26 2018 14:06:20

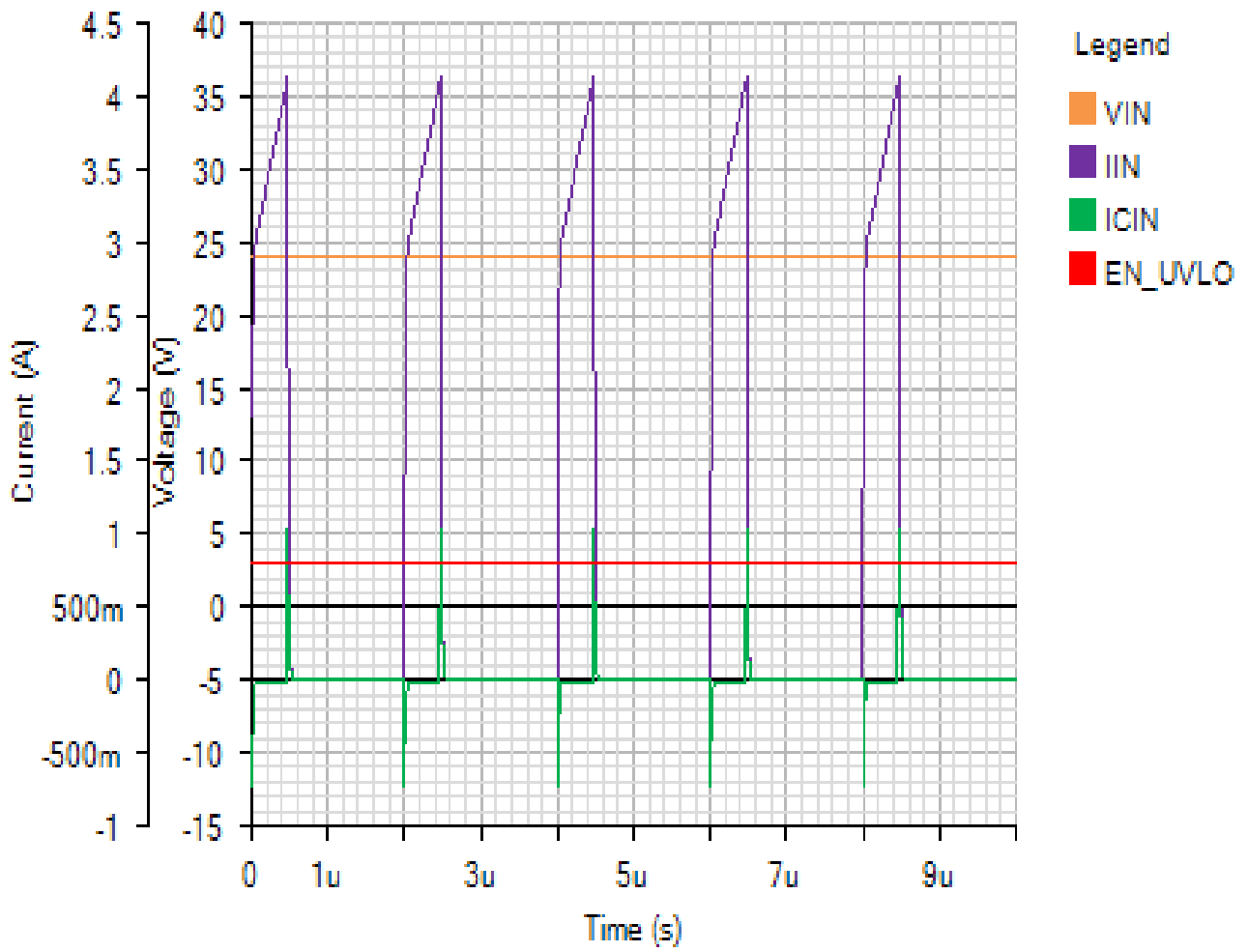
SWITCHING

Default



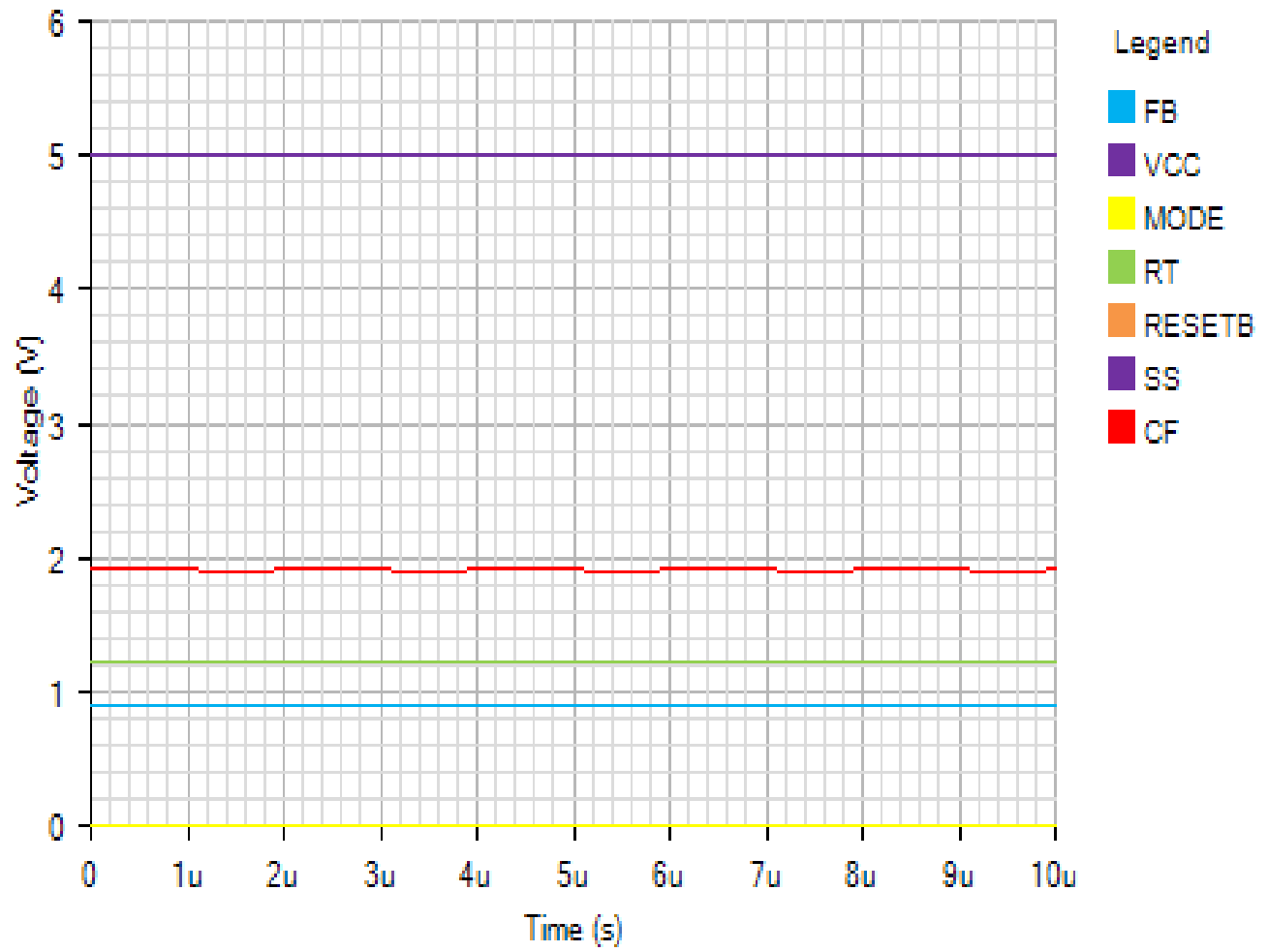
INPUT

Default



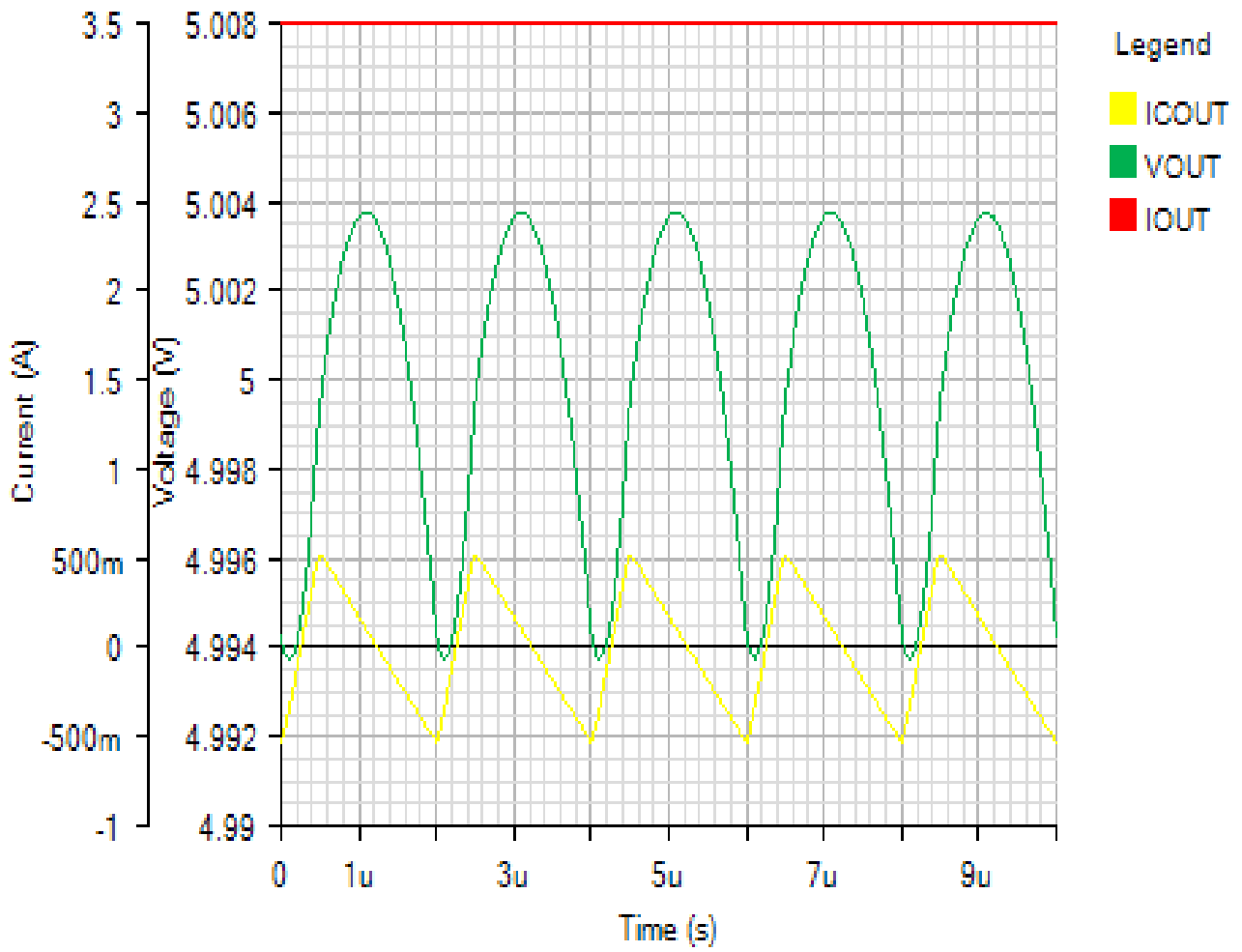
IC

Default

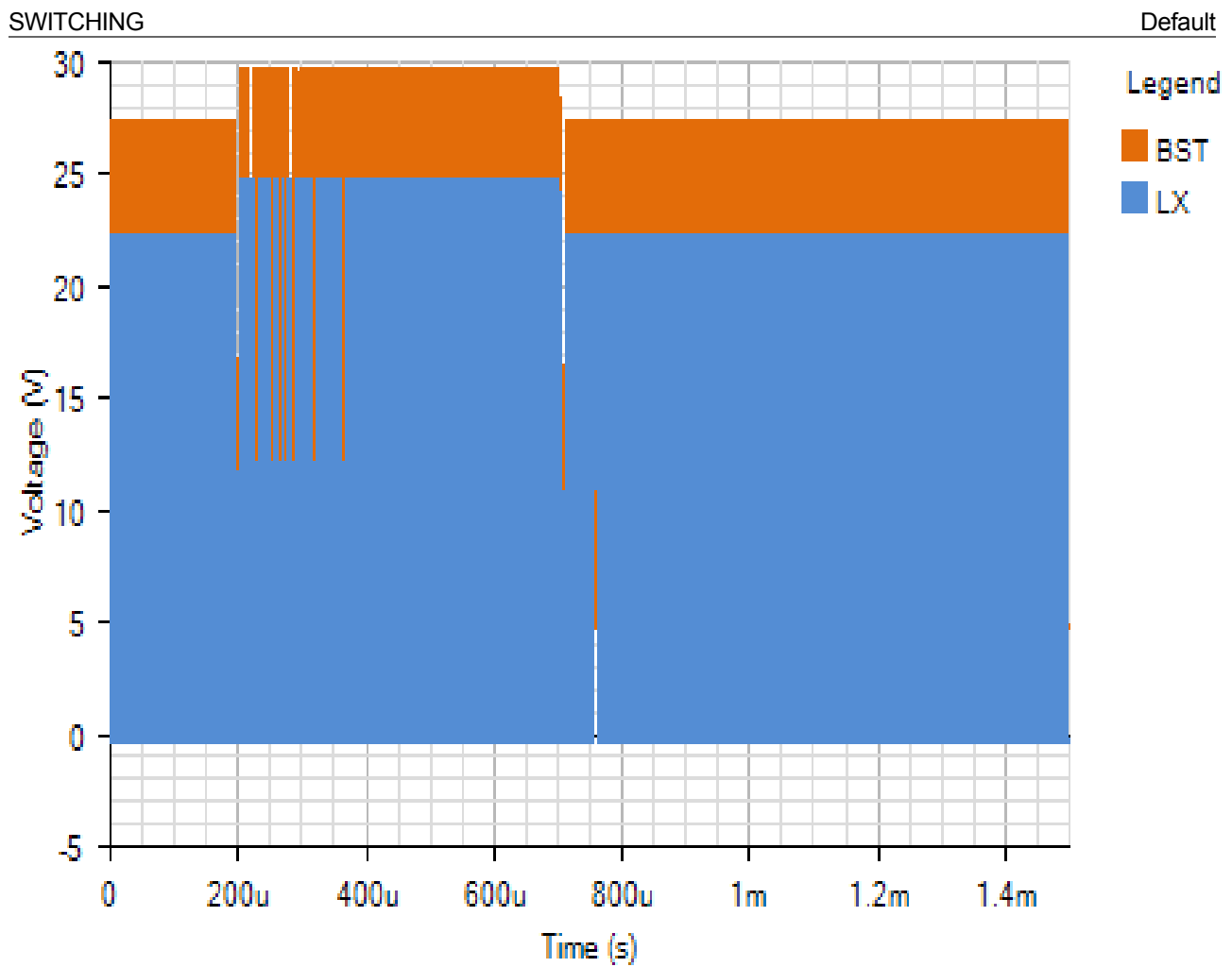


OUTPUT

Default

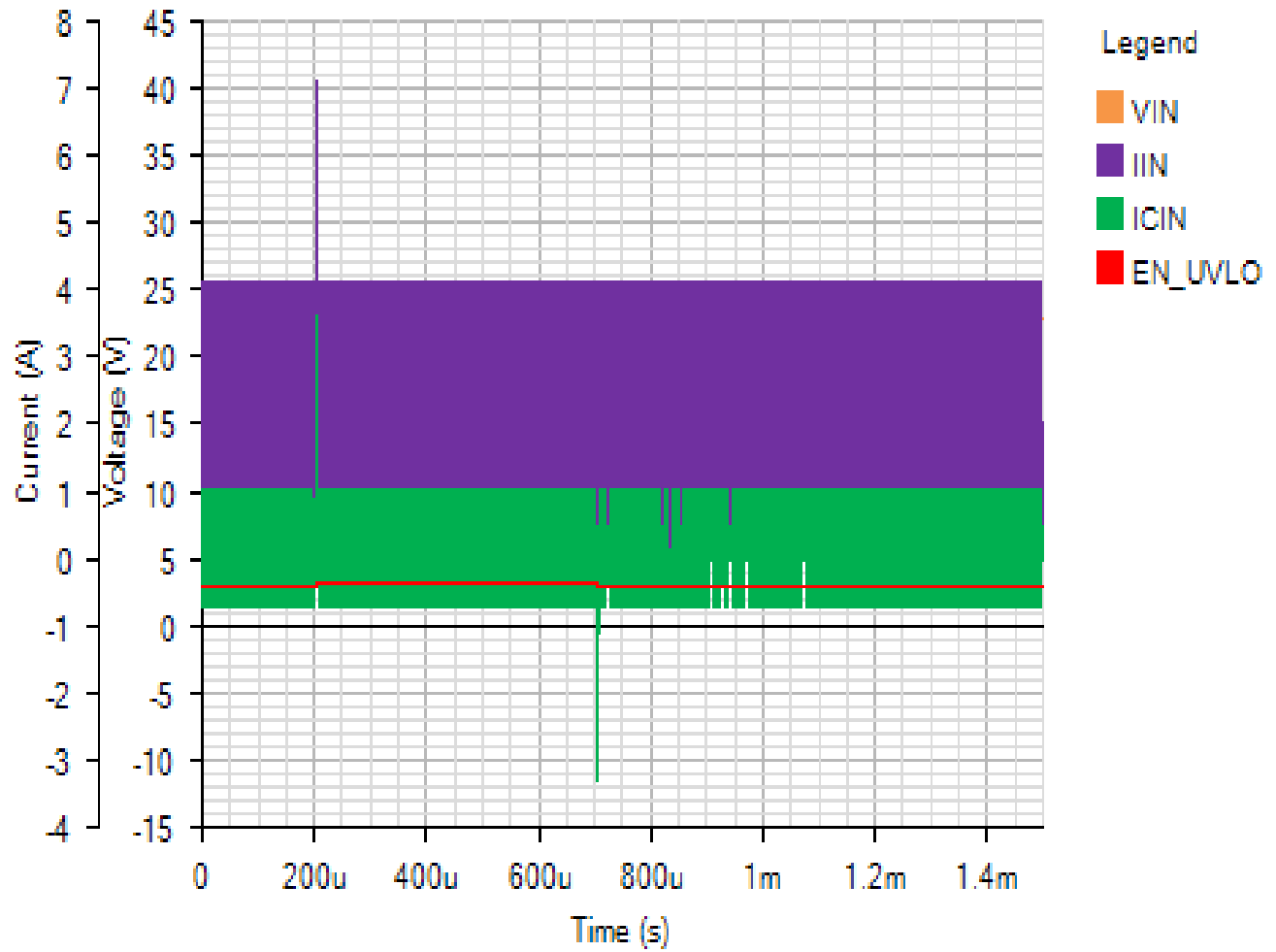


Line Transient - Mon Nov 26 2018 14:06:20



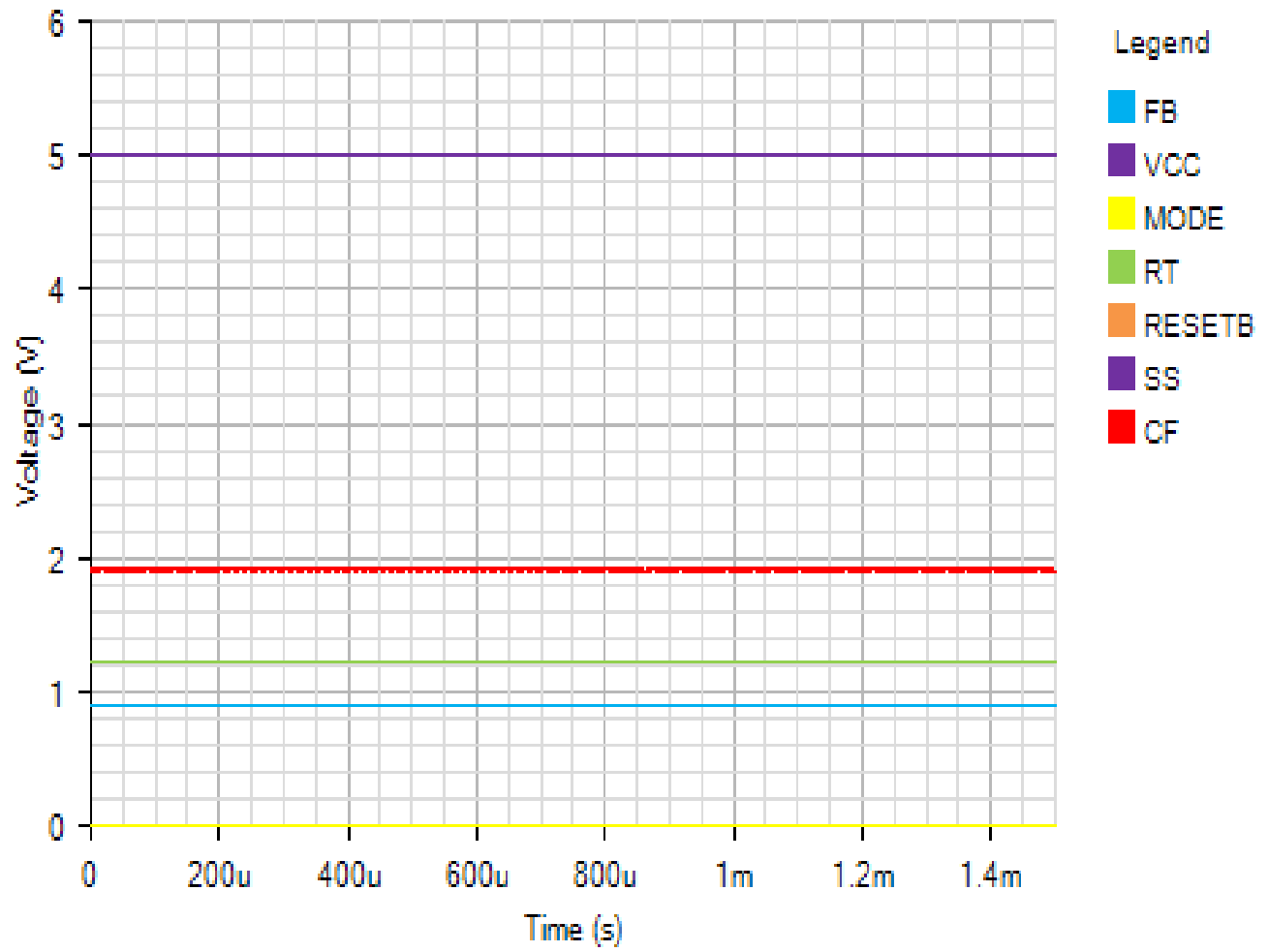
INPUT

Default



IC

Default



OUTPUT

Default

