Test Report: PMP22893

25W, 12V VIN to 200V VOUT, Super Boost Reference Design

Description

This reference design is a super boost able to take a standard 12V input and output 200V at 120mA. The power supply does this using a single boost stage and uses a coupled inductor to double the output voltage. The design is compact and reduces both size and cost by being a single stage design. It allows the use of LM51551 and does not violate the maximum duty cycle specifications. The efficiency is high overall for the super boost converter provides an optional disconnect FET that can effectively disconnect the input from the output to eliminate standby power in battery operated applications.

Features

- Low-cost design
- Small form factor
- Low standby power
- High-efficiency design

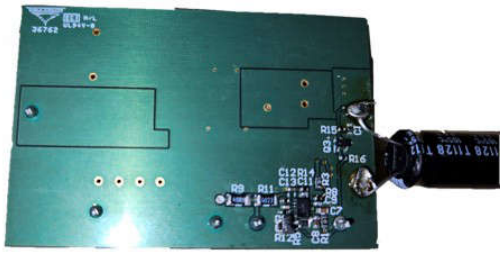
Applications

- Low-voltage battery system

Resources

PMP22893	Design Folder
LM51551	Product Folder





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1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1-1. Voltage and Current Requirements

Parameter	Specifications
Input Voltage	10.8V-13.2V; 12V nominal
Output voltage	200V
Output current	120mA

1.2 Required Equipment

- DC voltage supply
- DC electronic load
- Oscilloscope
- Digital multimeter

1.3 Considerations

Unless noted, all tests were taken at room temperature of 25℃.

1.4 Dimensions

PMP22893A is a 4-layer, 60mm × 40mm PCB.

2 Testing and Results

2.1 Efficiency Graphs

Efficiency is shown in Figure 2-1.

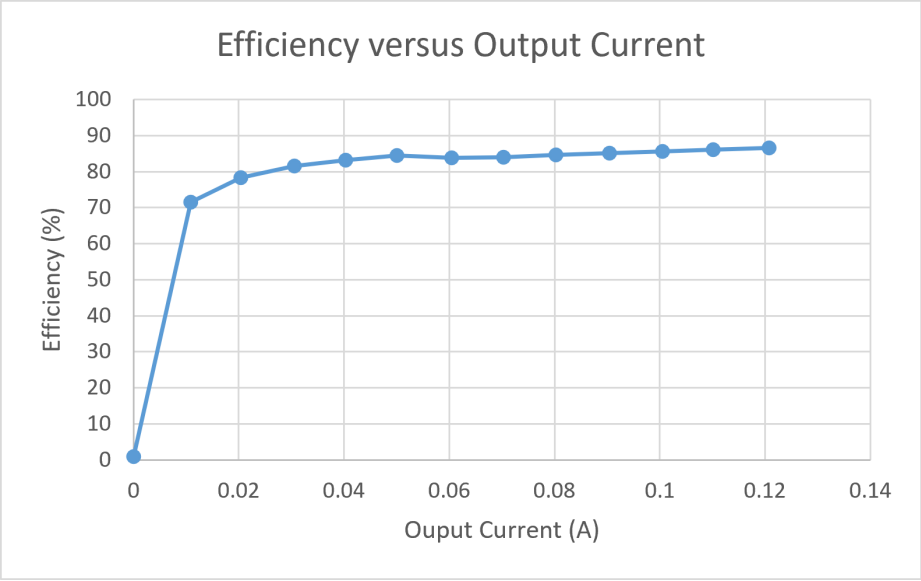


Figure 2-1. Efficiency Graph

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2.2 Efficiency Data

Efficiency data is shown in Table 2-1.

Table 2-1. Efficiency Data

V_{IN} (V)	I_{IN} (A)	V_{OUT} (V)	I_{OUT} (A)	P_{IN} (W)	P_{OUT} (W)	P_{LOSS} (W)	Efficiency (%)
12	0.045	205.43	0.000025	0.54	0.00513575	0.534864	0.951065
12.05	0.26	205.36	0.0109	3.133	2.238424	0.894576	71.44666
12.1	0.442	205.34	0.0204	5.3482	4.188936	1.159264	78.32422
12.04	0.639	205.34	0.03055	7.69356	6.273137	1.420423	81.53751
12.03	0.827	205.35	0.04028	9.94881	8.271498	1.677312	83.14058
12.03	1.011	205.36	0.05	12.16233	10.268	1.89433	84.42461
12.01	1.234	205.37	0.06043	14.82034	12.4105091	2.409831	83.73971
12	1.433	205.39	0.07034	17.196	14.4471326	2.748867	84.0145
12	1.622	205.4	0.0802	19.464	16.47308	2.99092	84.63358
12.05	1.812	205.42	0.09043	21.8346	18.5761306	3.258469	85.07658
12.04	2.004	205.43	0.10055	24.12816	20.6559865	3.472174	85.60946
12.04	2.183	205.44	0.11016	26.28332	22.6312704	3.65205	86.10507
12.03	2.384	205.46	0.1208	28.67952	24.819568	3.859952	86.54109

2.3 Thermal Images

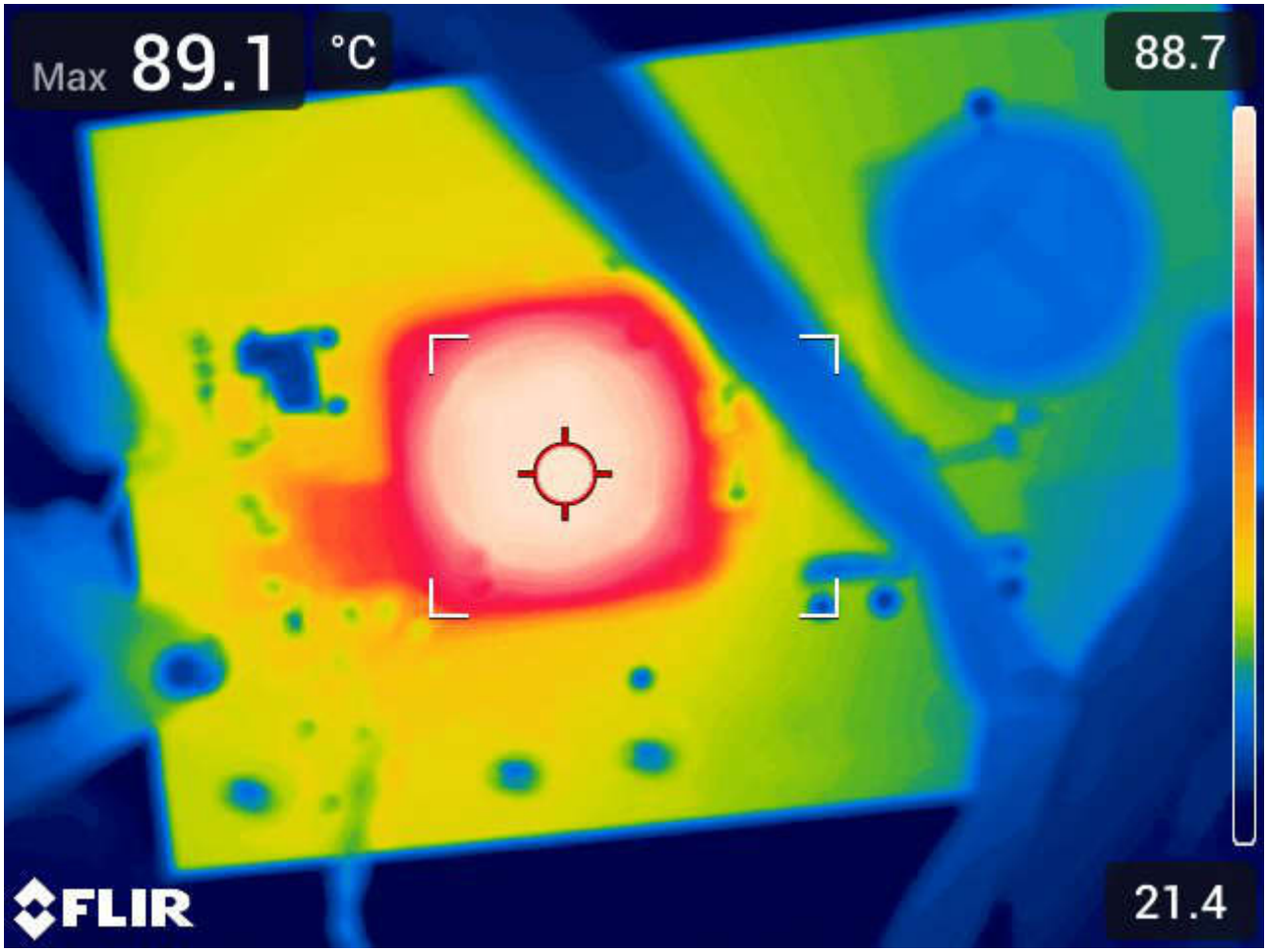


Figure 2-2. Thermal Image (Top)

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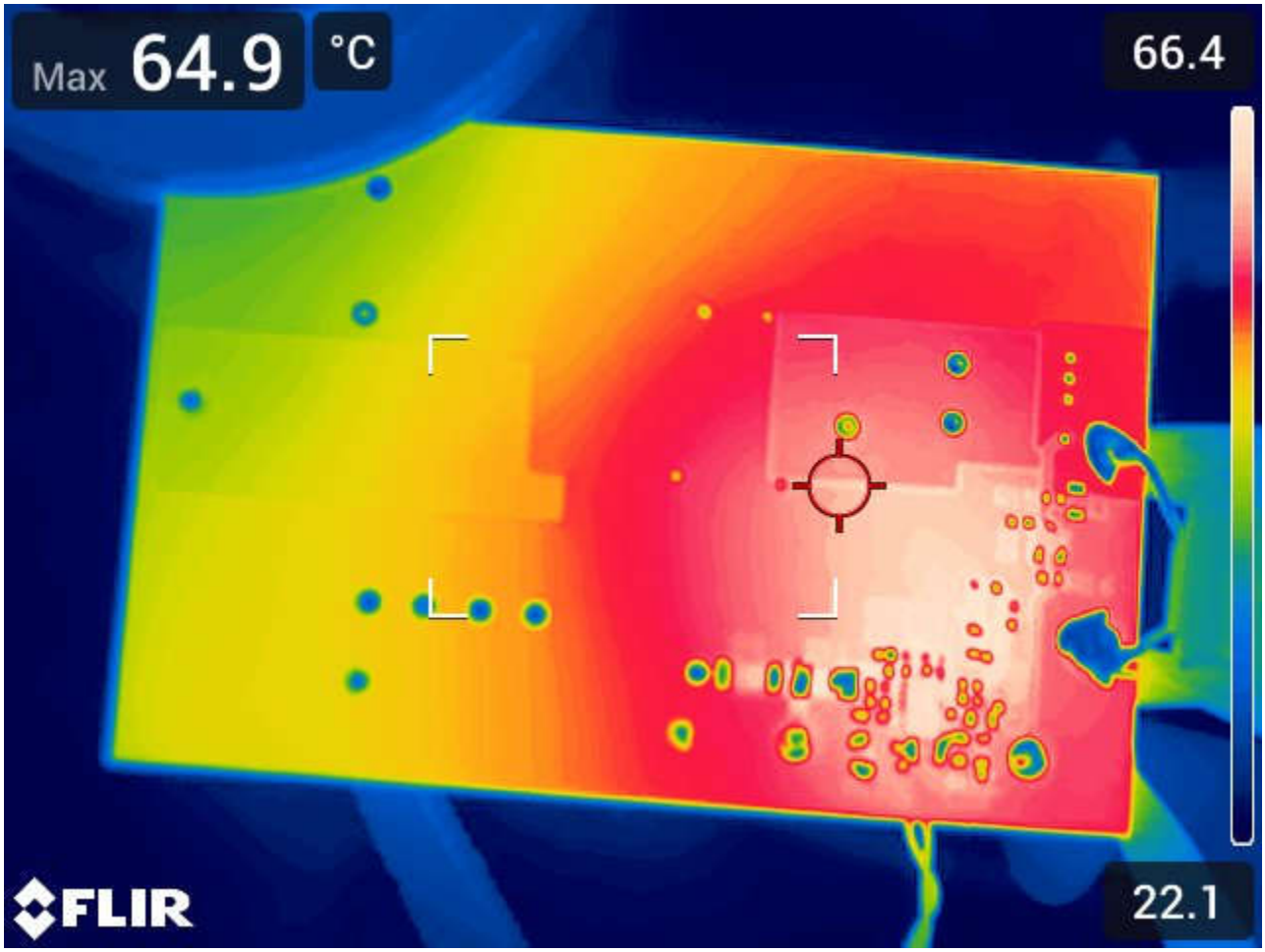


Figure 2-3. Thermal Image (Bottom)

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2.4 Bode Plots

The Bode plot is shown in Figure 2-4.

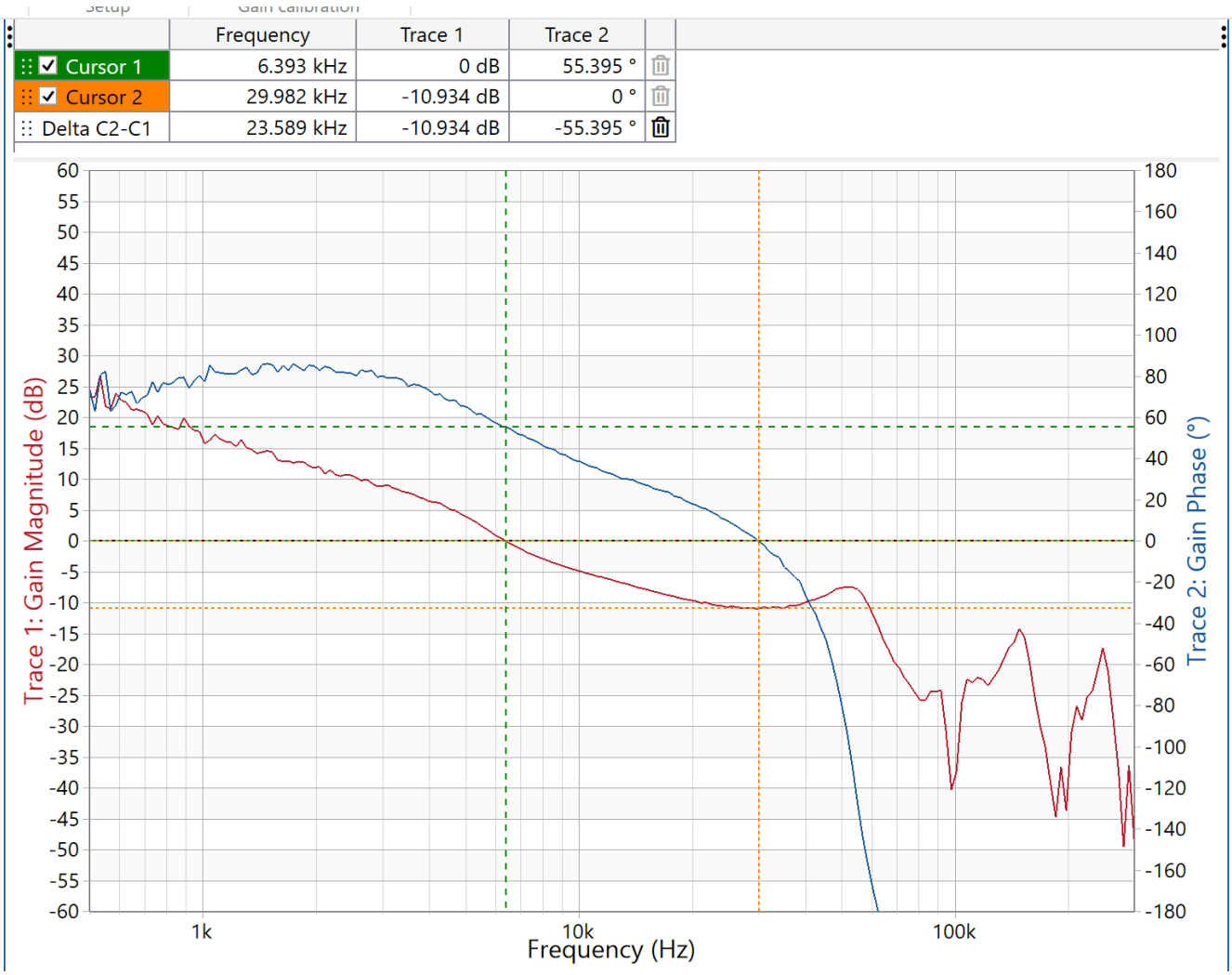


Figure 2-4. Bode Plot

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3 Waveforms

3.1 Switching

Switching behavior is shown in Figure 3-1 through Figure 3-2.

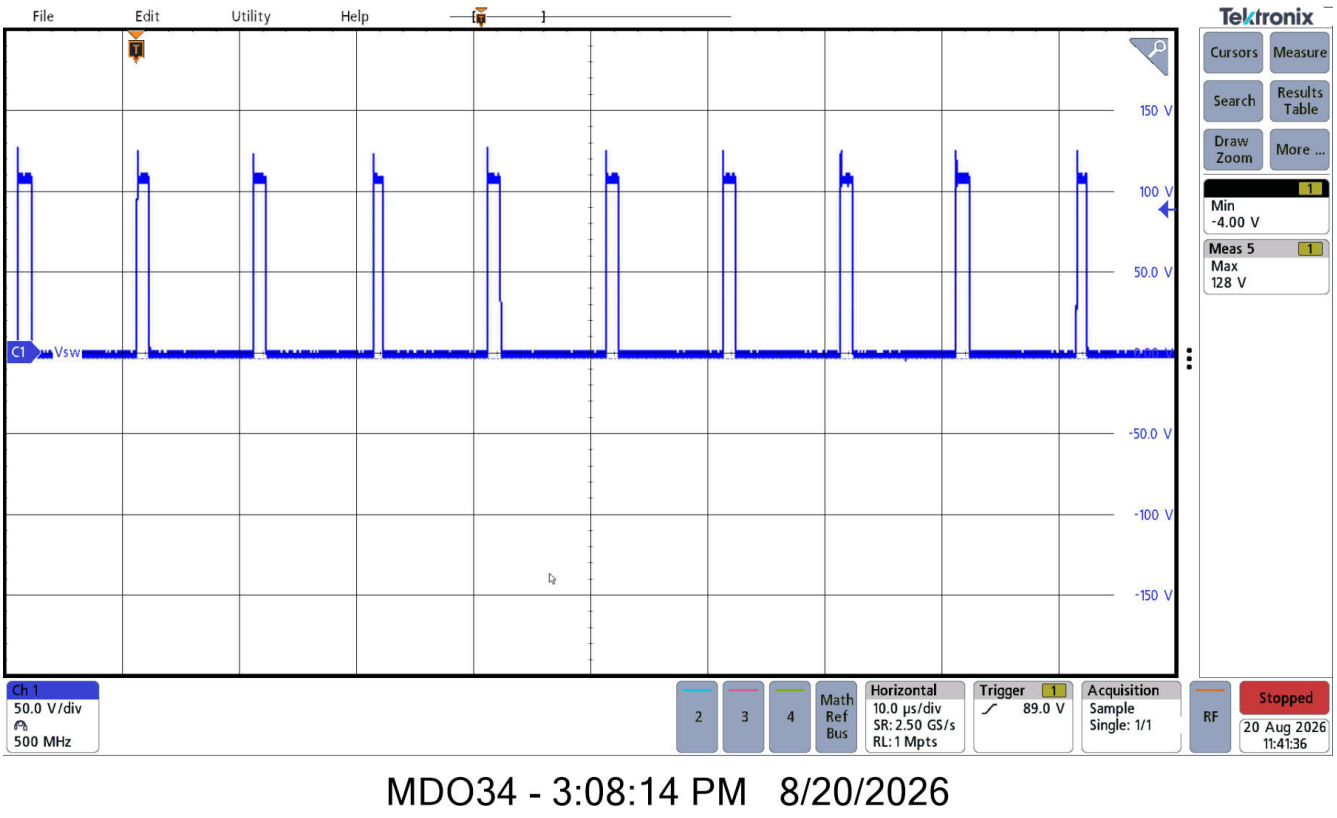


Figure 3-1. Switching Waveform-fsw = 100kHz

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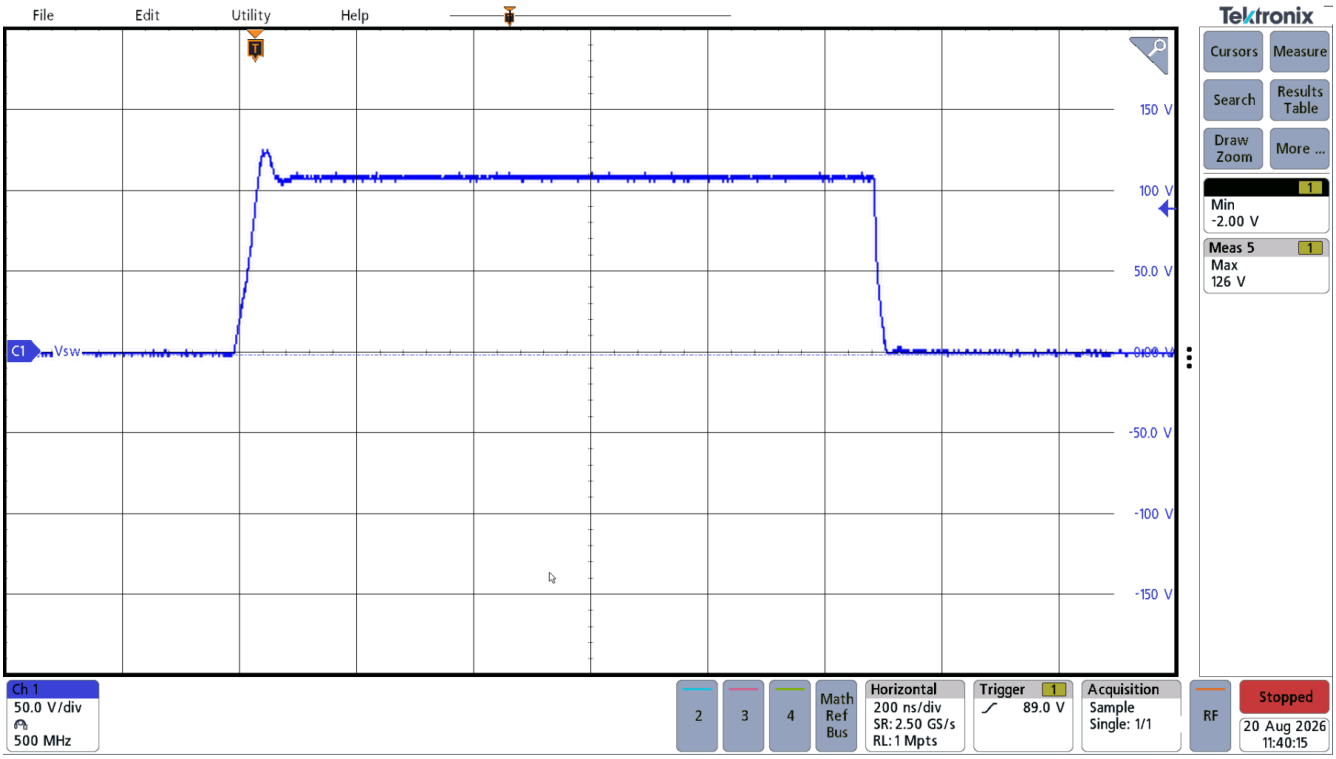


Figure 3-2. Switch node voltage; max stress 126V

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3.2 Output Voltage Ripple

Output voltage ripple is shown in Figure 3-3.

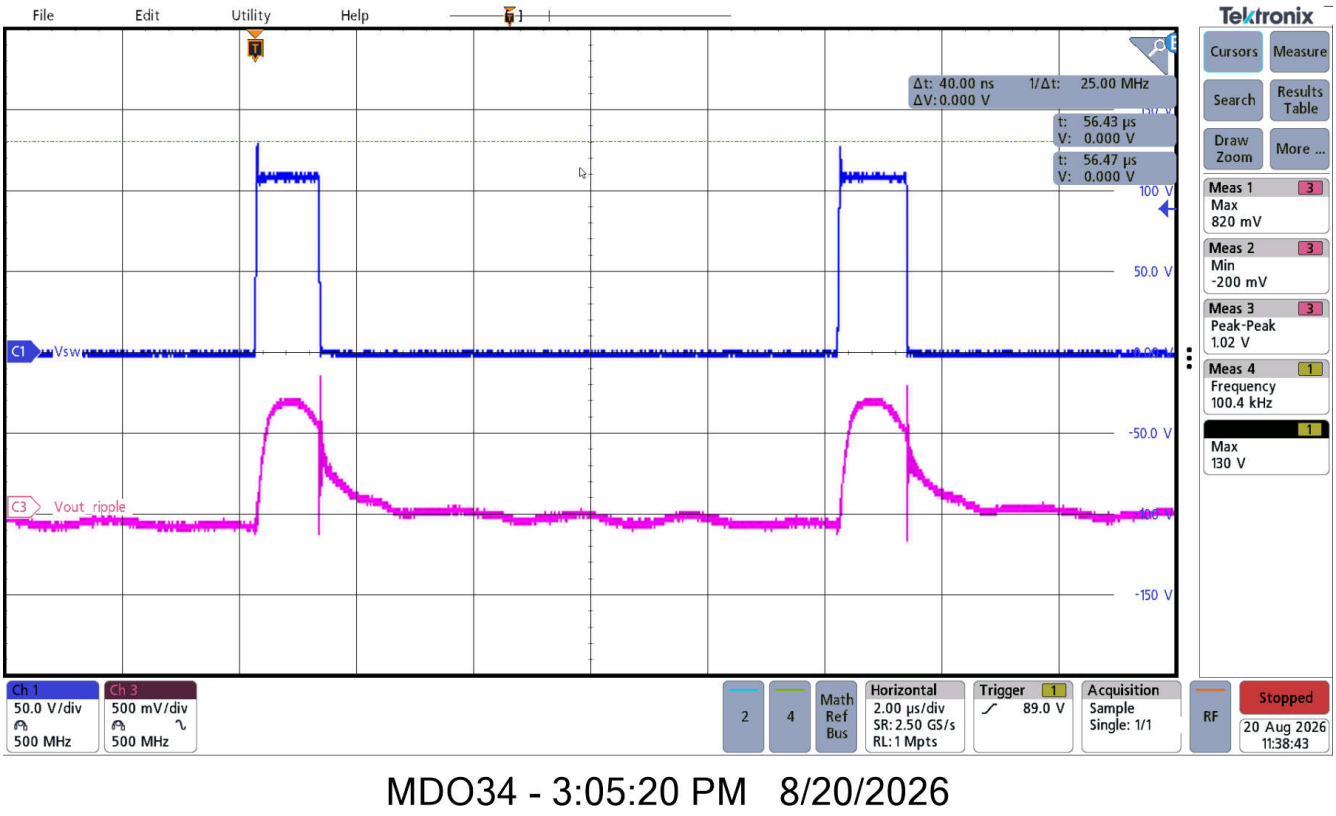


Figure 3-3. Output Voltage Ripple 1

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3.3 Load Transients

Load transient response is shown in Figure 3-4.

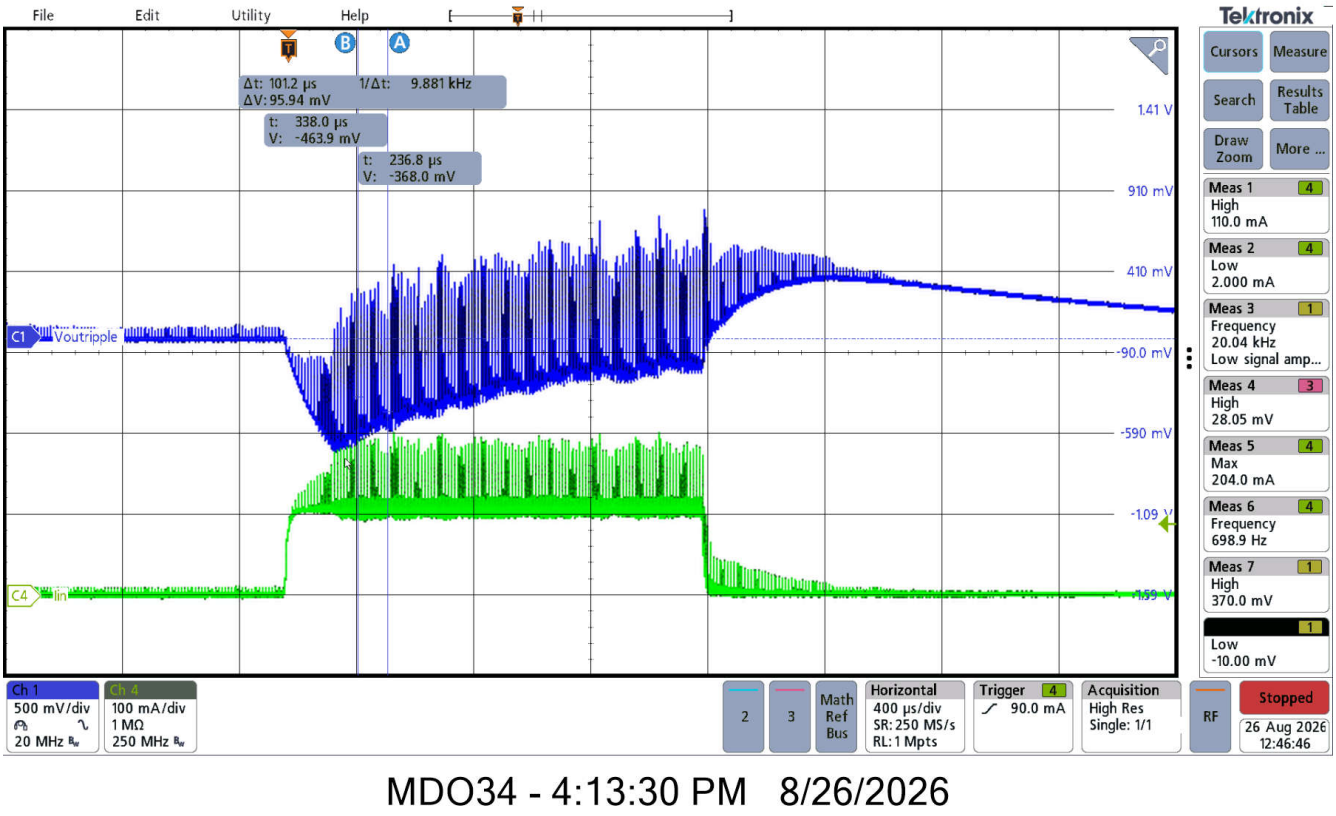


Figure 3-4. Load Transient 1

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3.4 Start-up Sequence

Start-up behavior is shown in Figure 3-5.

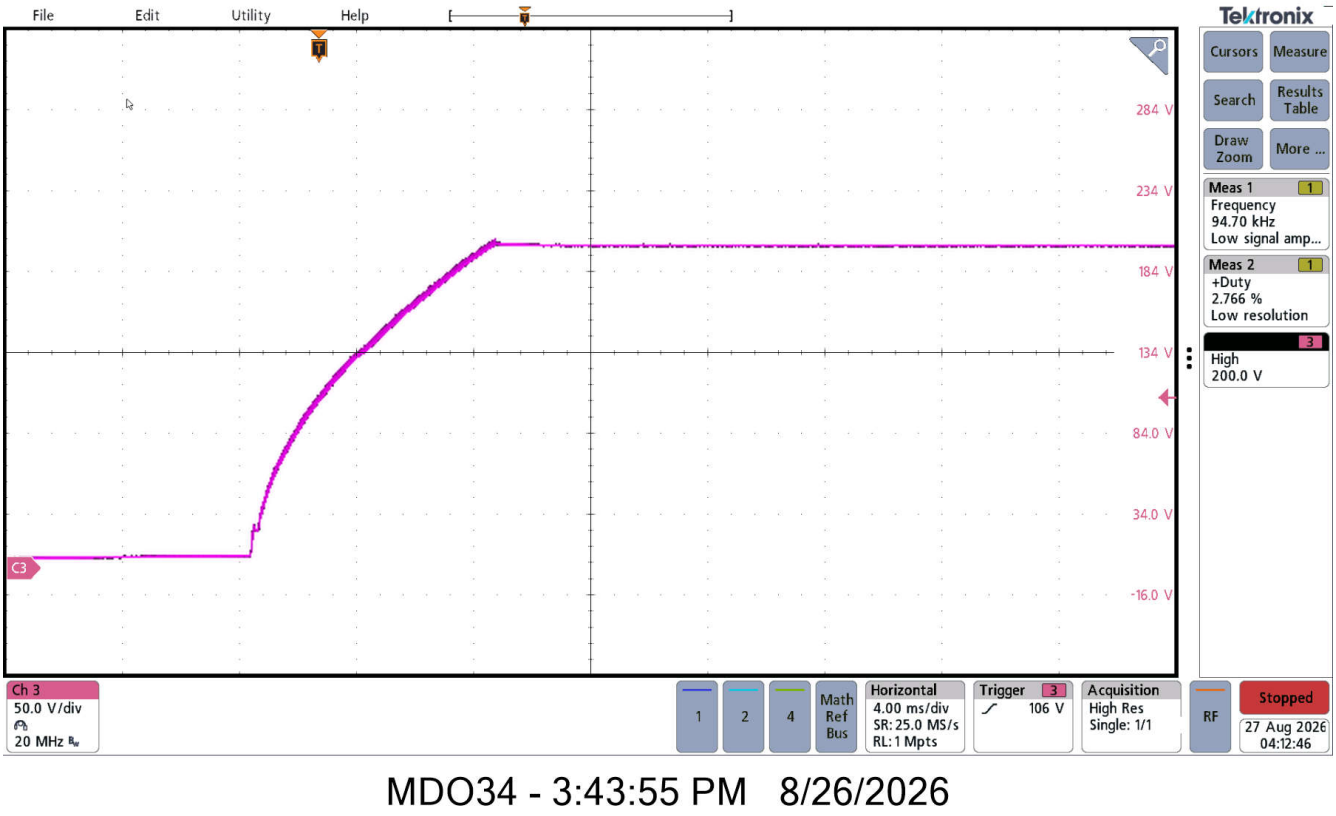


Figure 3-5. Start-up 1

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