ON Semiconductor

Is Now

To learn more about onsemi™, please visit our website at
www.onsemi.com

Strata Enabled NCV6356 EVK User Guide and Test Report

Table of Contents

INTRODUCTION 3
Features 3
Applications 3
USER GUIDE 4
Hardware Setup 4
User Interface 4
TEST REPORT 6
Active Discharge 6
Delay Time 7
DVS 9
Efficiency 11
Over Current Protection 11
Ripple 13
Sleep Mode 15
SWN Ringing 17
Thermals 18
Transients 19

Introduction

The Strata Enabled NCV6356 EVK provides an easy to use evaluation kit within the Strata Development Environment for the NCV6356 configurable 5A step down converter. Through Strata, the developer can access datasheets, BOMs, schematics, and other collateral they may need. This document will provide instructions on how to use the evaluation kits as well as provide all the measurement results for the 5A switcher provided in this kit.

Features

- Vin range from 2.5V to 5.5V
- Max load of 5A
- Programmable Vout from 0.6V to 1.4V in 6.25mV steps
- Adaptive-On-Time (AOT)
- Operation at up to 2.4MHz switching frequency
- Both PFM and PPWM operation with automatic transition
- 3.0 x 4.0 mm DFN-14 package
- Automotive and industrial rated

Applications

- DC-DC Power
- Automotive
- Instrumentation

User Guide

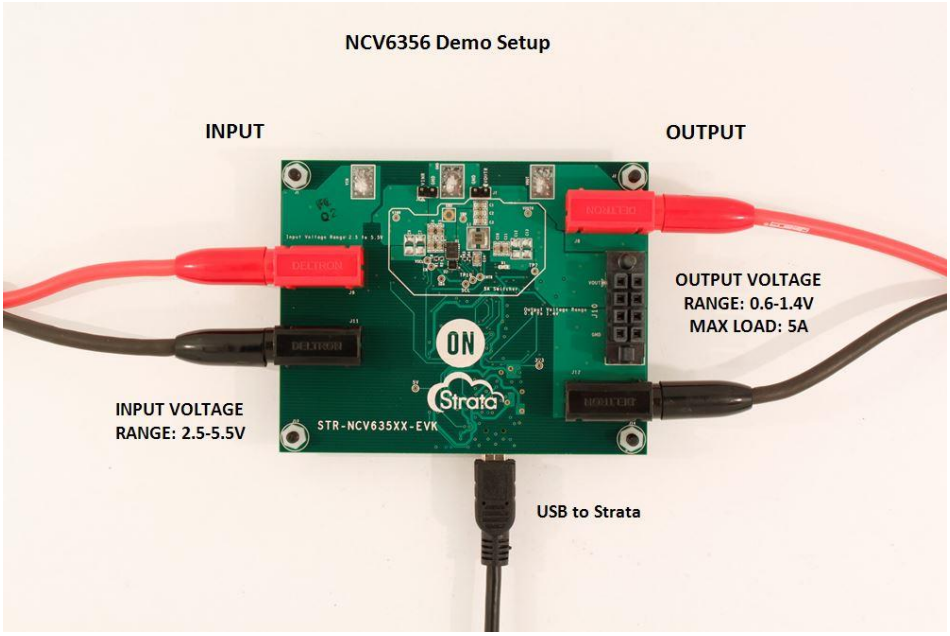
This section will explain how to use the Strata Enable NCV6356 EVK in a step by step manner, and will cover both the hardware required as well as how to use the User Interface in Strata.

Hardware Setup

The hardware required for using the Strata Enabled NCV6356 EVK are a computer (with Windows), a power supply, and a load. Follow the steps below.

1. Plug the power supply into the input of the board using the banana plugs J9 and J11. Do not apply over 5.5V to the input because this will break the board. For the NCV6356 there needs to be at least 2.5V on the input for it to properly regulate.
2. Connect the computer to the EVK board using the mini USB connector J18 on the bottom of the board.
3. Plug the load into the output using the banana plugs J8 and J12.

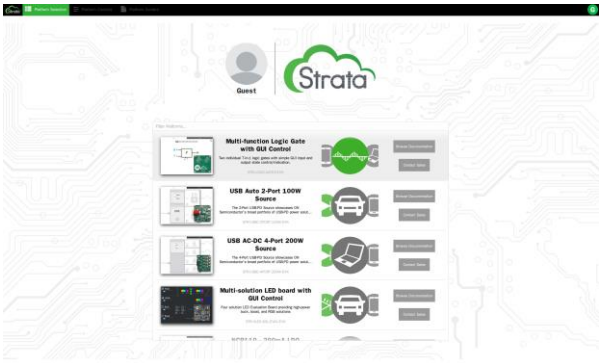
A picture of the setup can be found below.



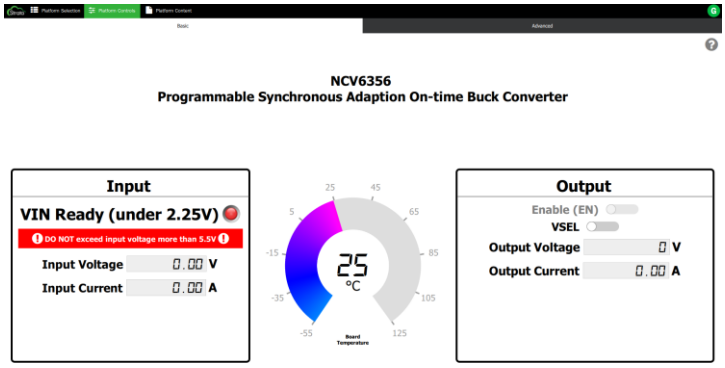
User Interface

The UI within the Strata app will allow the user to control the 5A switcher and monitor its telemetry without needing other lab equipment or training to do so. The steps below cover what is in the UI.

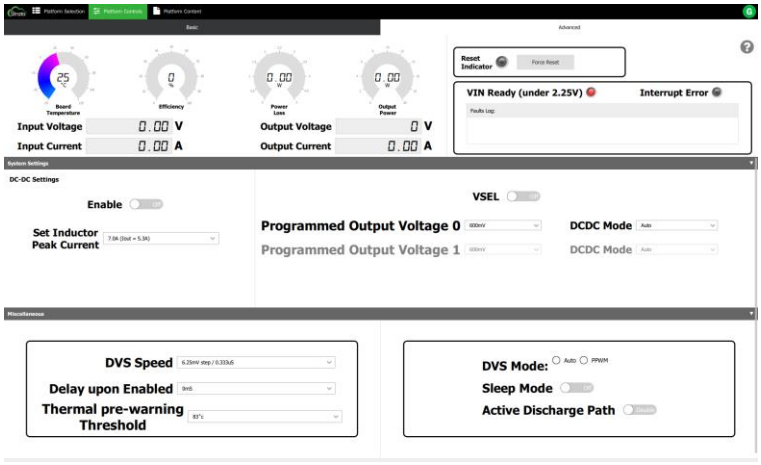
1. First, open the Strata app. Login and the home screen will appear.



2. The app will automatically detect the device that is plugged in and will bring up the UI for the board that is plugged in.



3. The view that comes up is the basic view, which offers basic telemetry, an enable switch for enabling/disabling the switcher, and a voltage select switch that will switch between the two programmed output voltages.
4. In the top right hand corner the user can switch to the Advanced view which is shown below. The Advanced view offers more telemetry for the user to monitor, along with many more controls.



5. The round button with a question mark in the top right corner is the Help button, and will show the user what everything on the UI is doing.
6. To look at the collateral provided with the EVK, click on the “Platform Content” tab at the top of the screen.

Test Report

This section will report important results and measurements from testing the Strata Enabled NCV6356 EVK.

Active Discharge

Active discharge offers a path to ground for the output to rapidly discharge when the switcher is turned off. Below shows two waveforms with active discharge on and off.

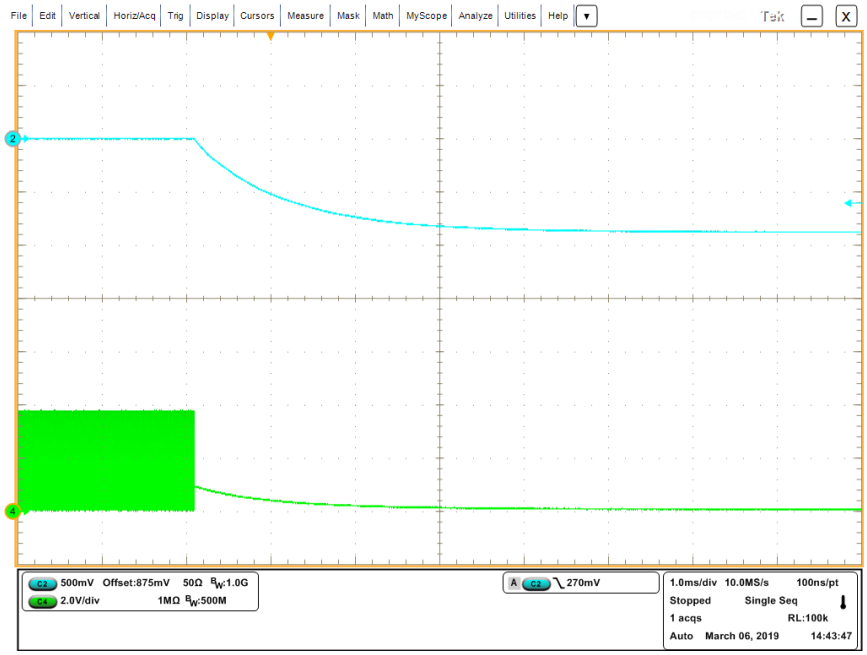


Figure 1: Active Discharge enabled. CH2 is output voltage, CH4 is SWN.

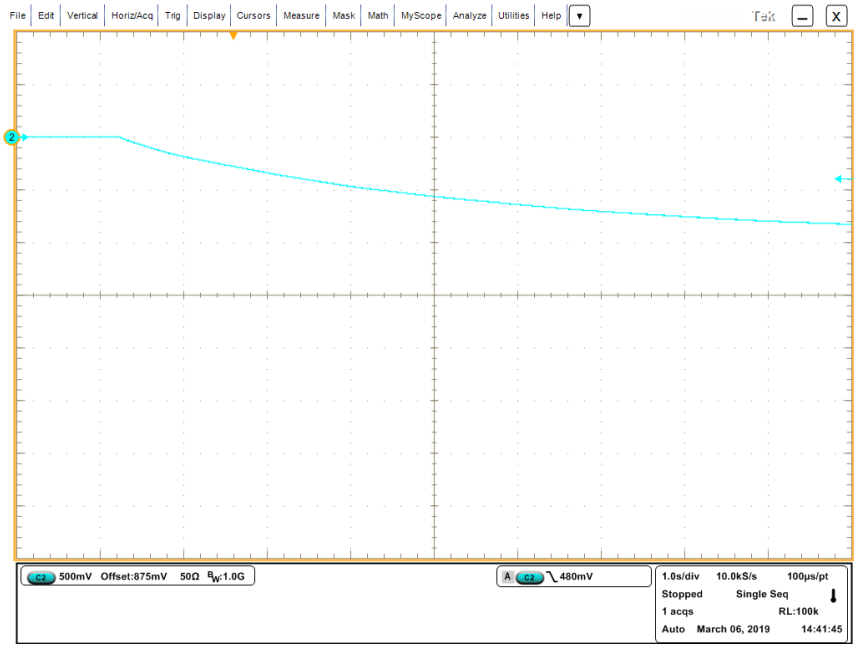


Figure 2: Active Discharge disabled. CH2 is output voltage.

Delay Time

This section shows the results for the programmable delay time.

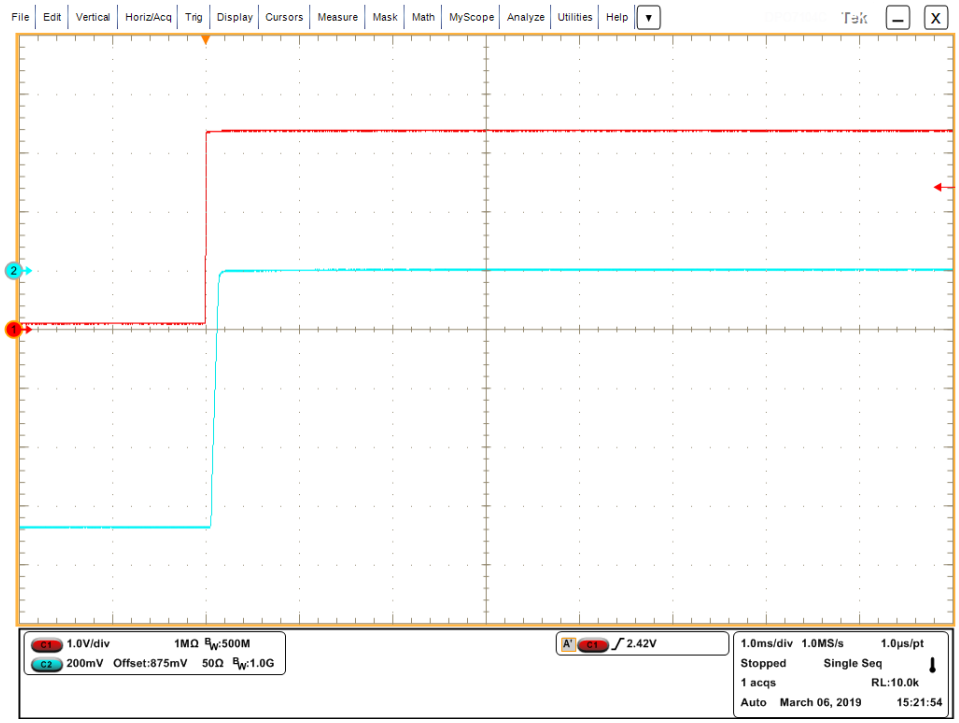


Figure 3: 0ms delay time. CH1 is EN and CH2 is output voltage.

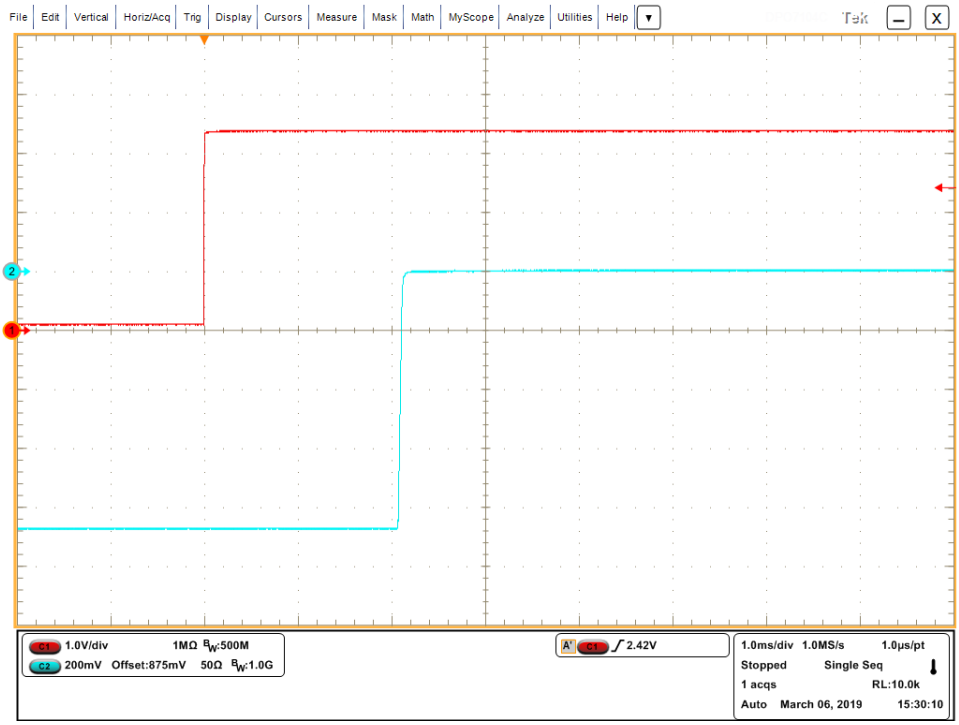


Figure 4: 2ms delay time. CH1 is EN and CH2 is output voltage.

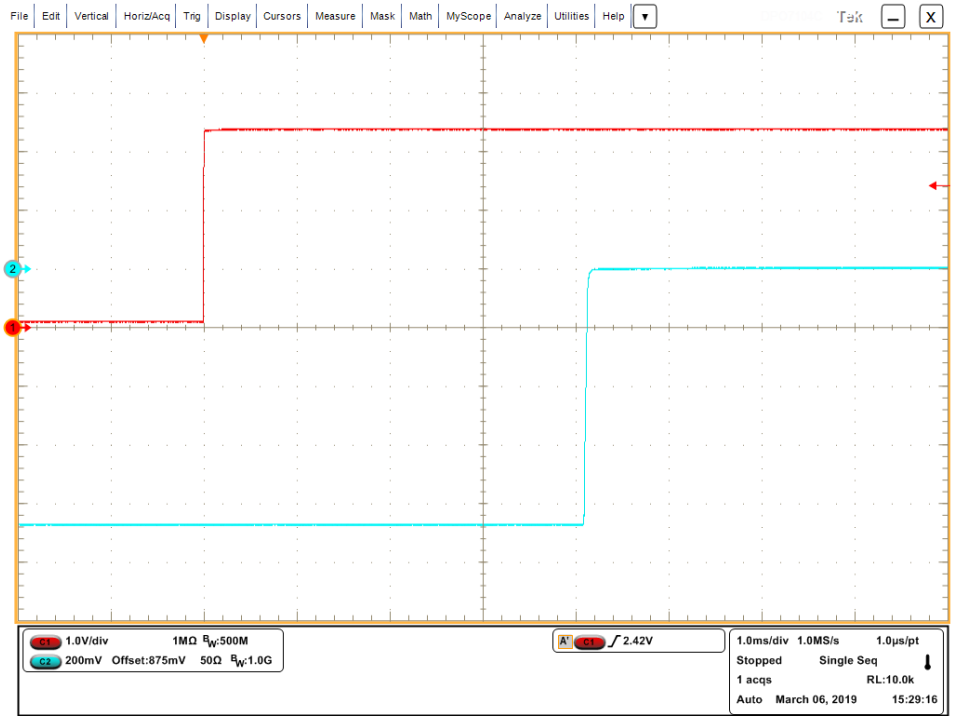


Figure 5: 4ms delay time. CH1 is EN and CH2 is output voltage.

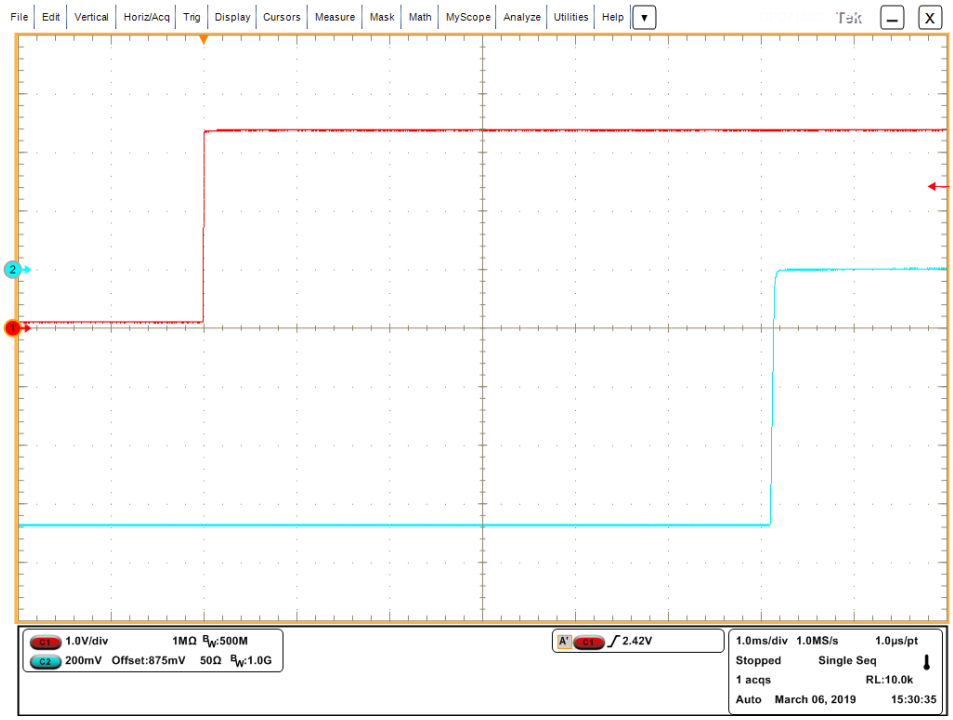


Figure 6: 6ms delay time. CH1 is EN and CH2 is output voltage.

DVS

Shows results for the 4 available DVS options.

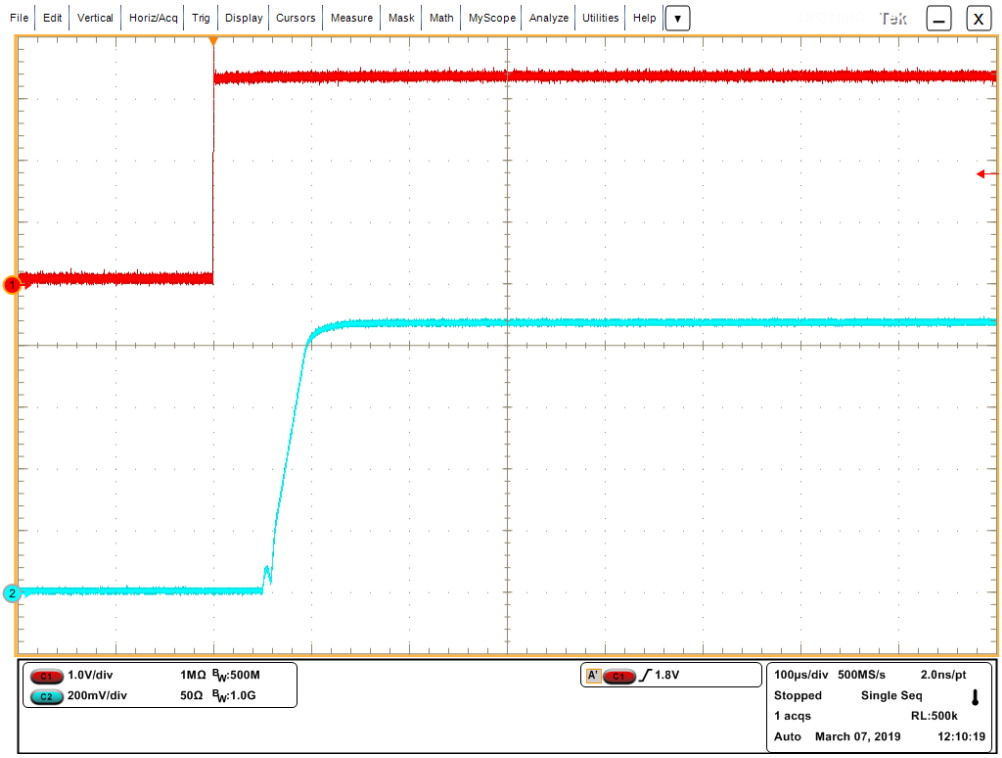


Figure 7: DVS Speed of 6.25mV / 0.333us.

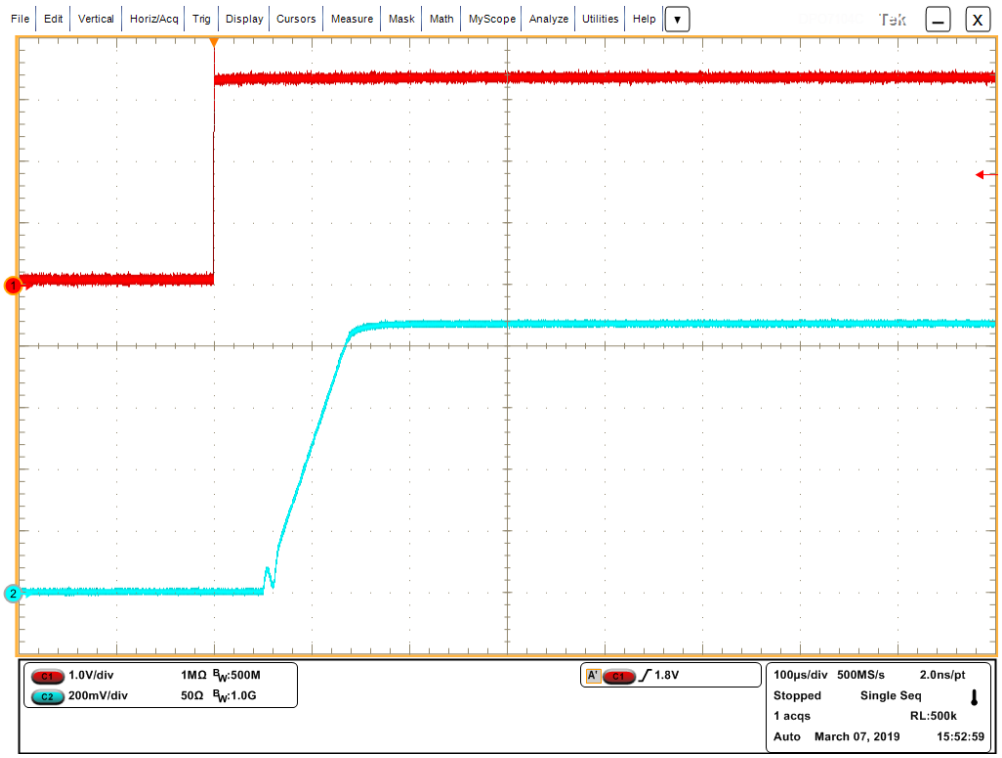


Figure 8: DVS Speed of 6.25mV / 0.666us.

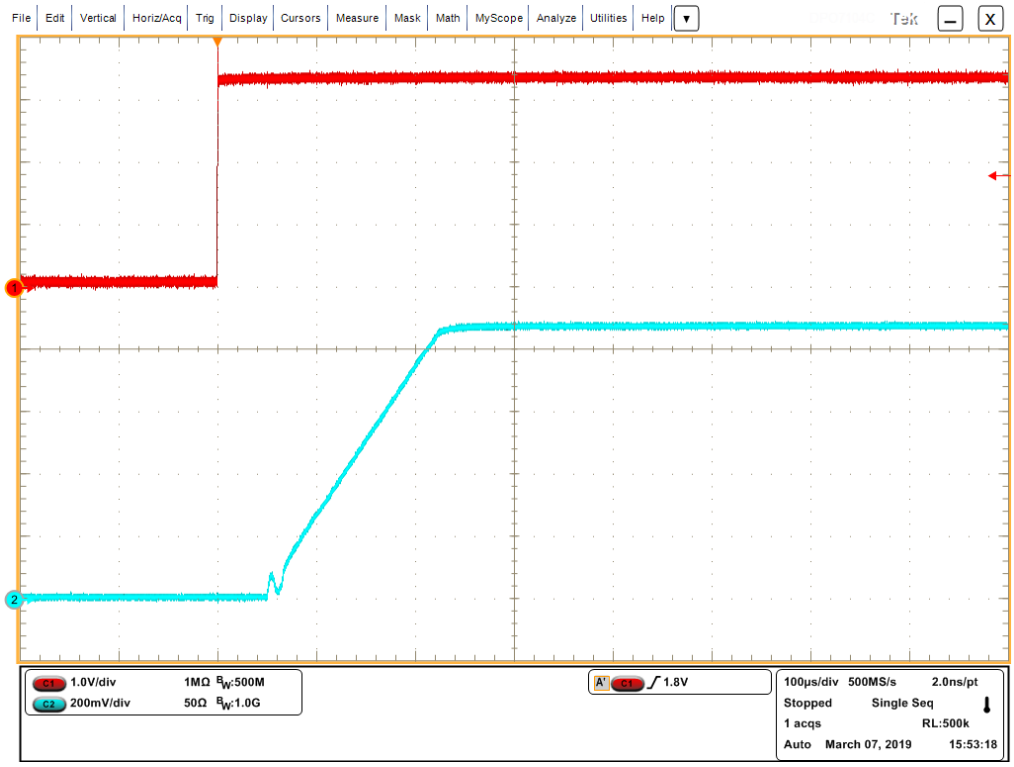


Figure 9: DVS Speed of 6.25mV / 1.333us.

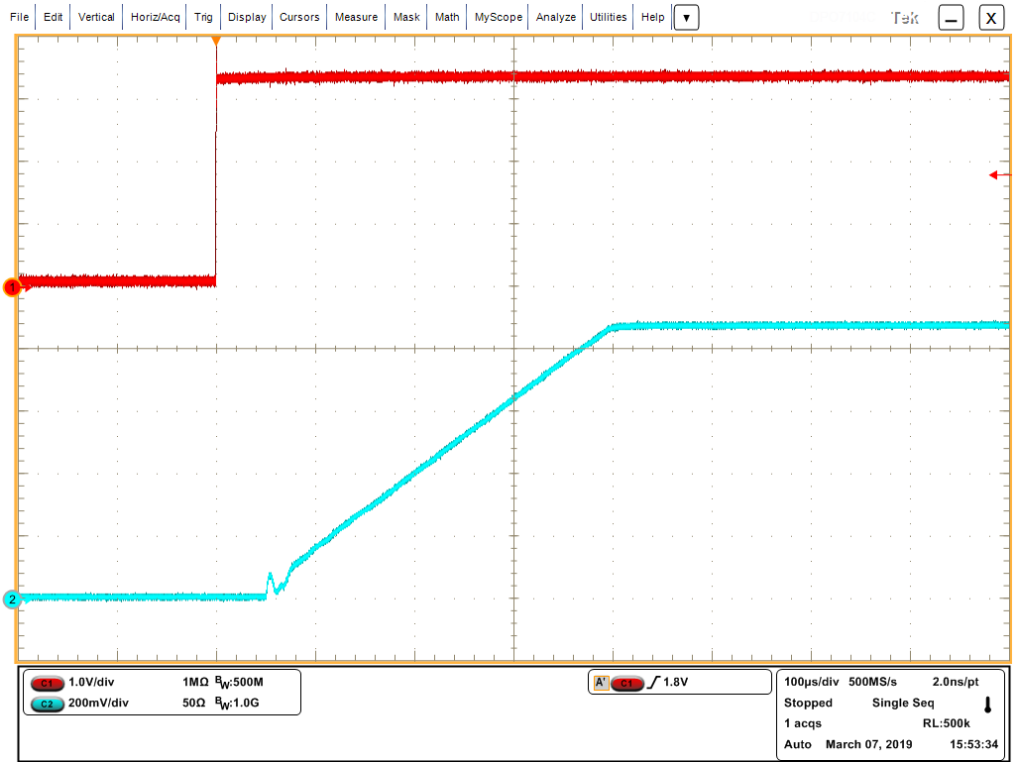


Figure 10: DVS Speed of 6.25mV / 2.666us.

Efficiency

Efficiency data was taken using 5V input to the max and min output voltages. Both Auto Mode and Forced PPWM mode are directly compared as well.

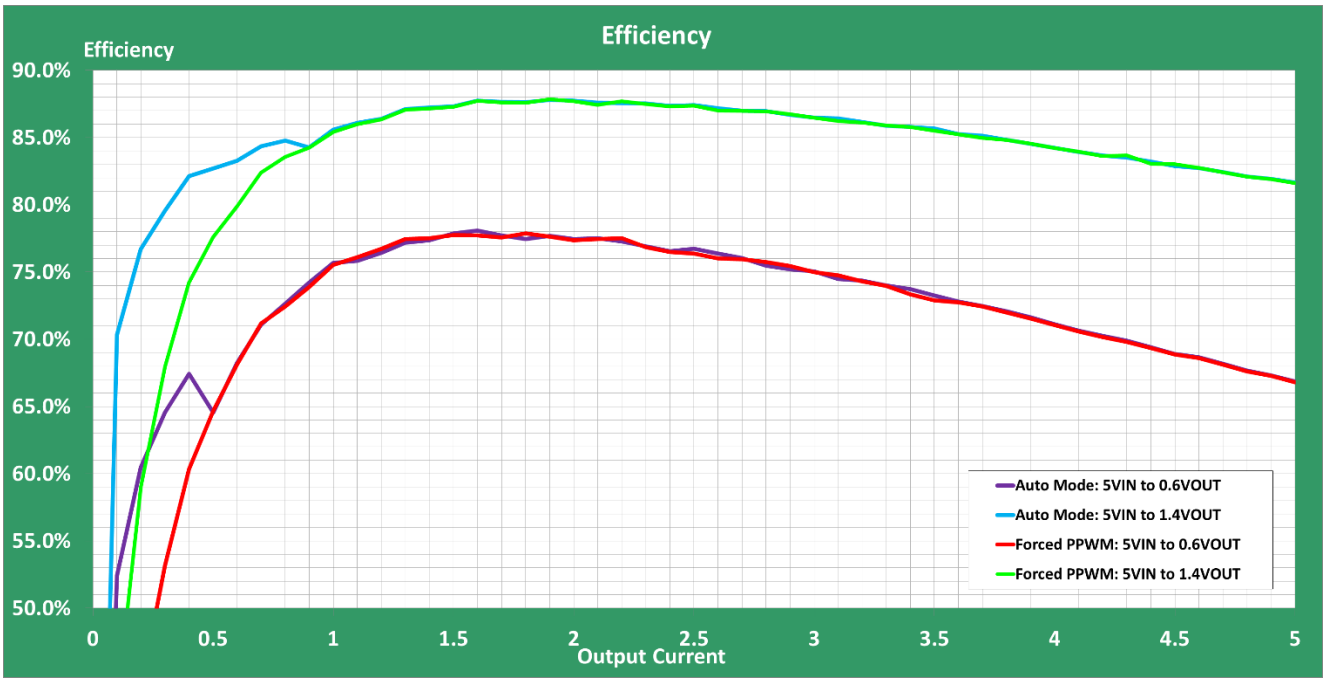


Figure 11: Efficiency data shown for the best and worst case over the range of output voltages and switching modes.

Over Current Protection

Over current protection (OCP) data shown below using the programmable OCP setting within the Strata UI.

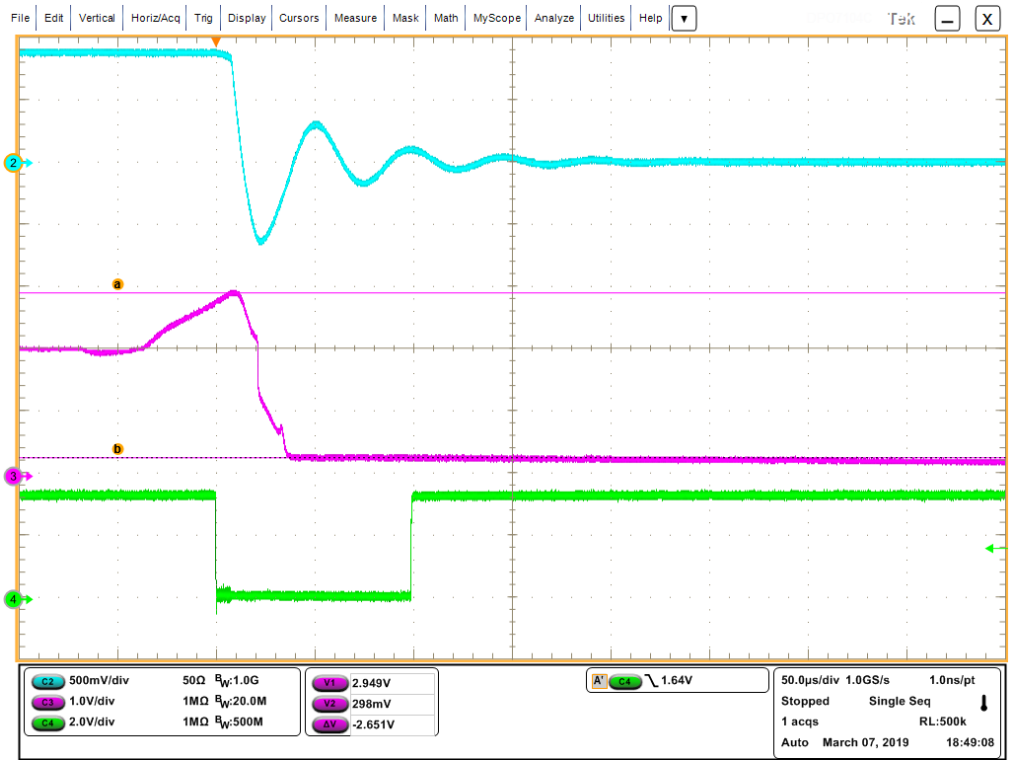


Figure 12: OCP setting at 7A. CH2 is output voltage, CH3 is output current sensed at output of Current sense amplifier, CH4 is the INT pin on the controller. CH3 has a resolution of 400mV/A.

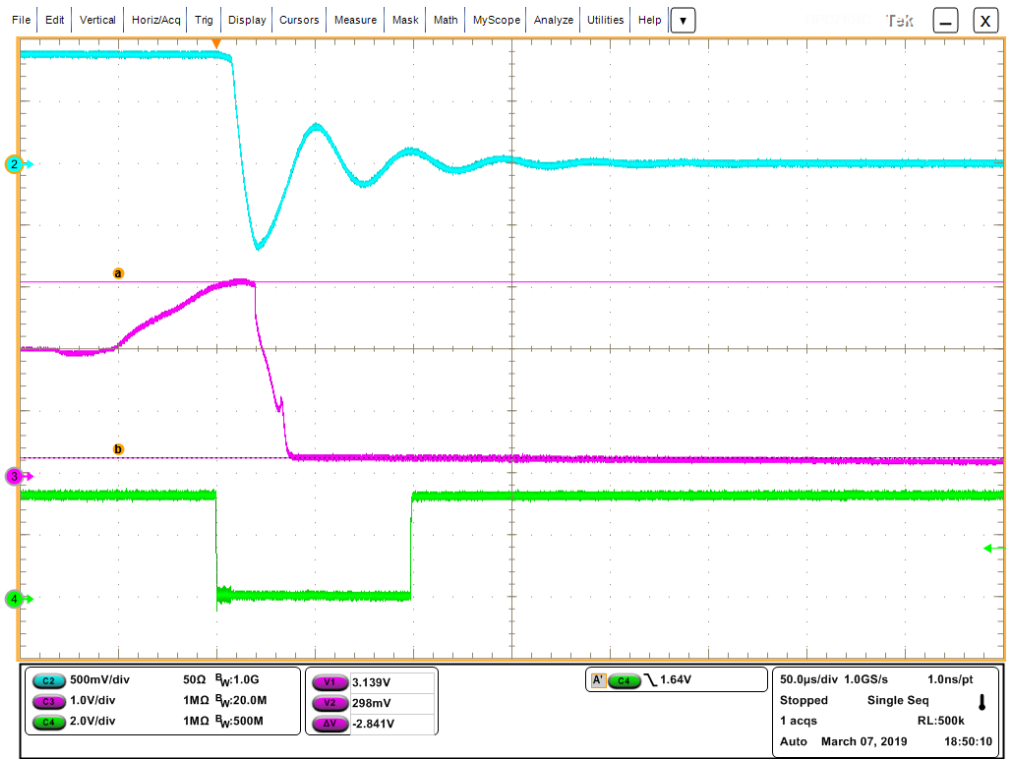


Figure 13: OCP setting at 7.7A. CH2 is output voltage, CH3 is output current sensed at output of Current sense amplifier, CH4 is the INT pin on the controller. CH3 has a resolution of 400mV/A.

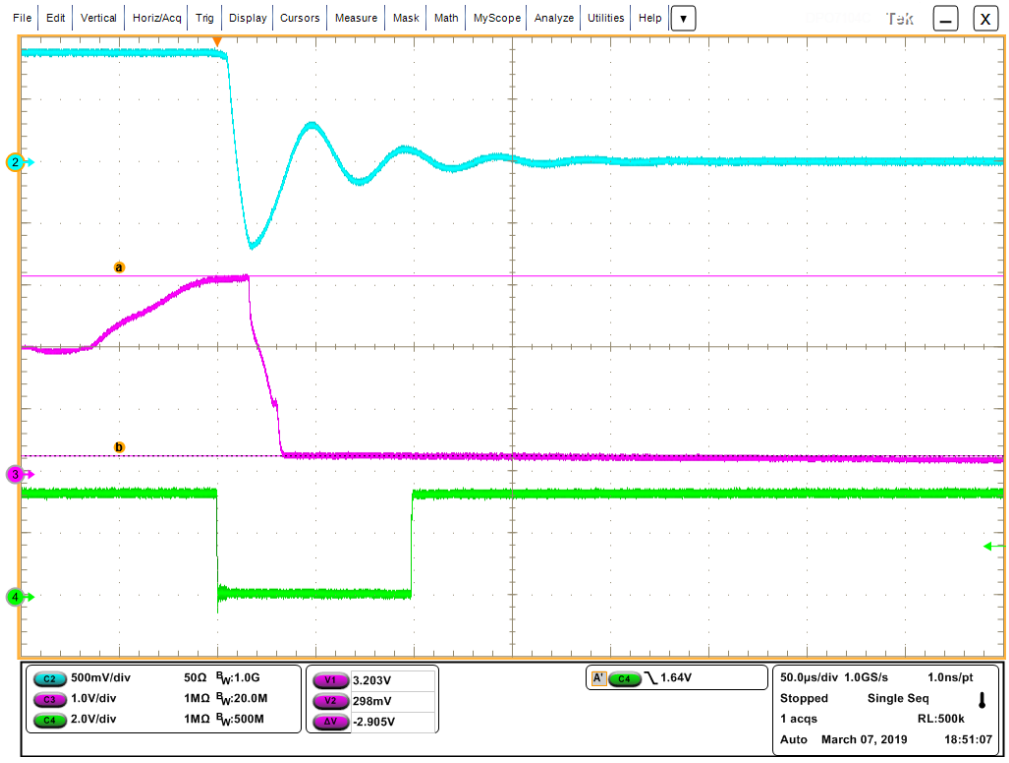


Figure 14: OCP setting at 8.2A. CH2 is output voltage, CH3 is output current sensed at output of Current sense amplifier, CH4 is the INT pin on the controller. CH3 has a resolution of 400mV/A.

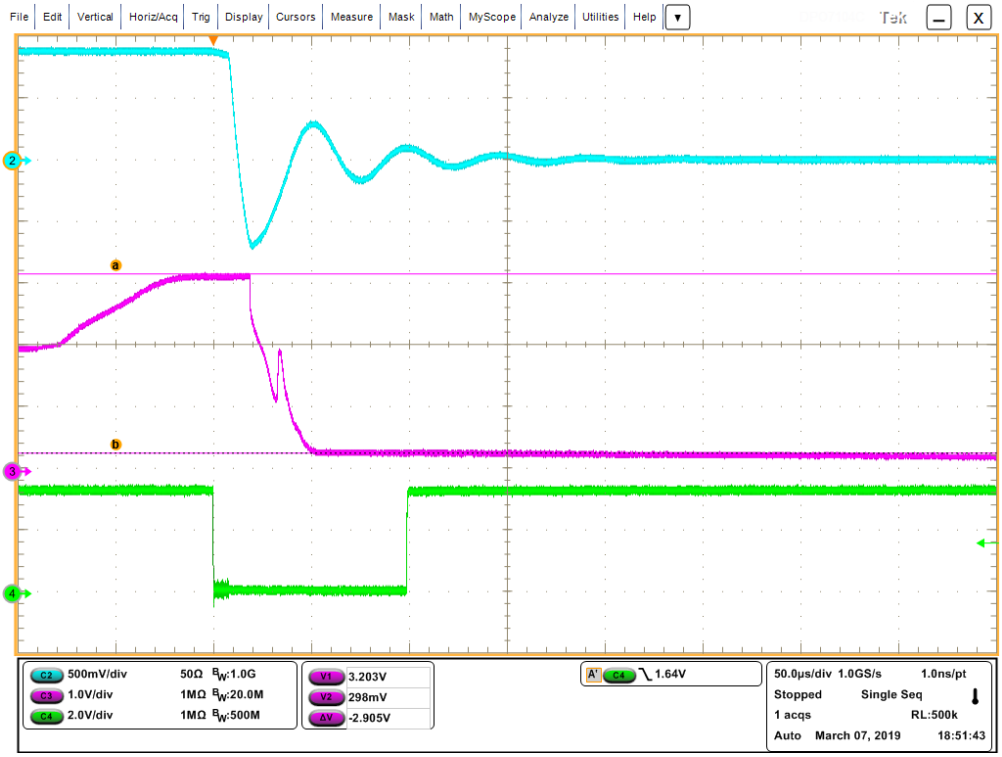


Figure 15: OCP setting at 8.8A. CH2 is output voltage, CH3 is output current sensed at output of Current sense amplifier, CH4 is the INT pin on the controller. CH3 has a resolution of 400mV/A.

Ripple

Ripple data is shown below across light and max load. At max load, the part will always be in PPWM. In light load, if "Auto" mode is selected in UI, the part will be in PFM, whereas if "Forced PPWM" is selected in the UI the part will be in PPWM mode. Ripple is not shaped consistently due to the switching frequency not being static.

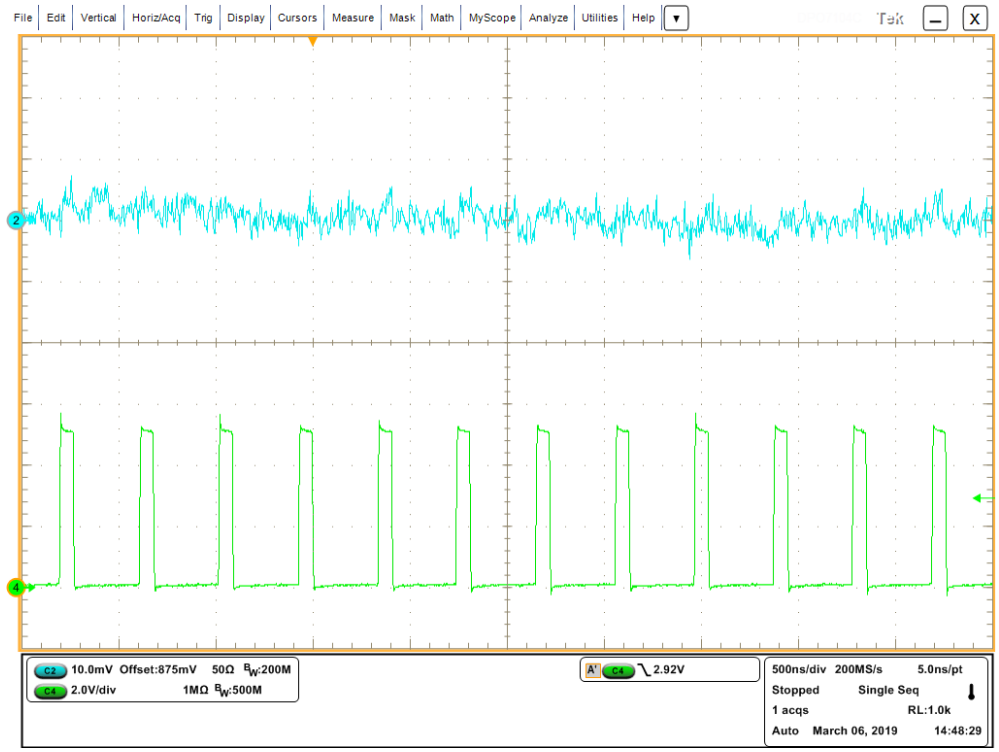


Figure 16: Ripple when the switcher is in forced PPWM mode at 0A load. Switching frequency is not constant therefore ripple is not shaped consistently. CH2 is output voltage and CH4 is SWN.

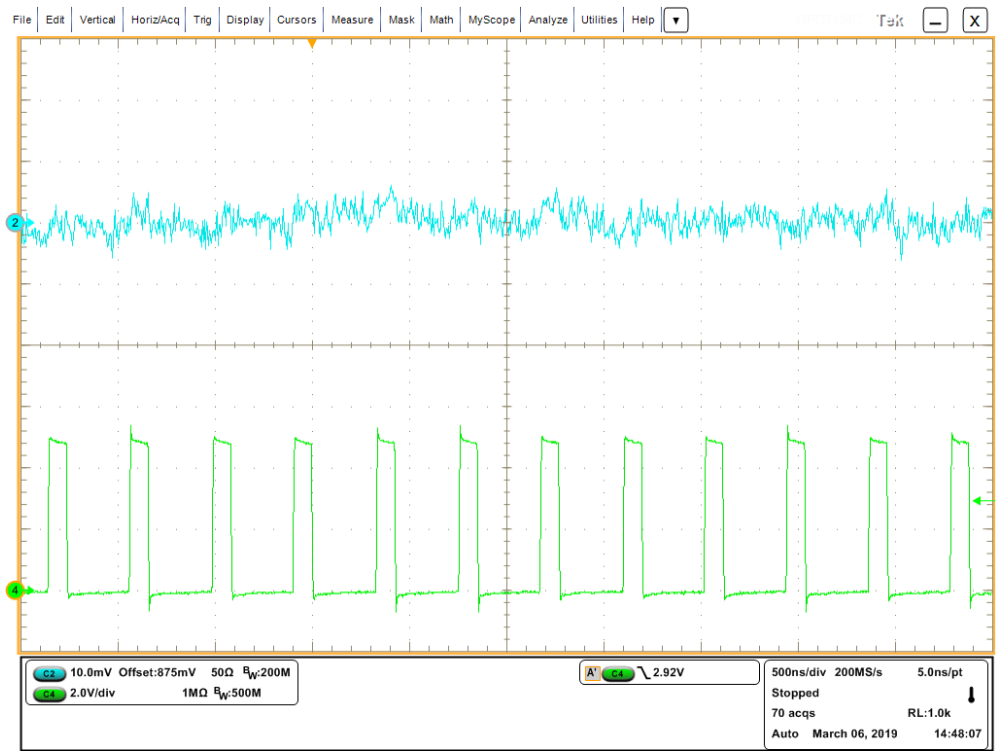


Figure 17: Ripple when the switcher is in forced PPWM mode at 5A load. Switching frequency is not constant therefore ripple is not shaped consistently. CH2 is output voltage and CH4 is SWN.

Figure 18: Ripple when the switcher is in Auto mode at 0A. CH2 is output voltage and CH4 is SWN.

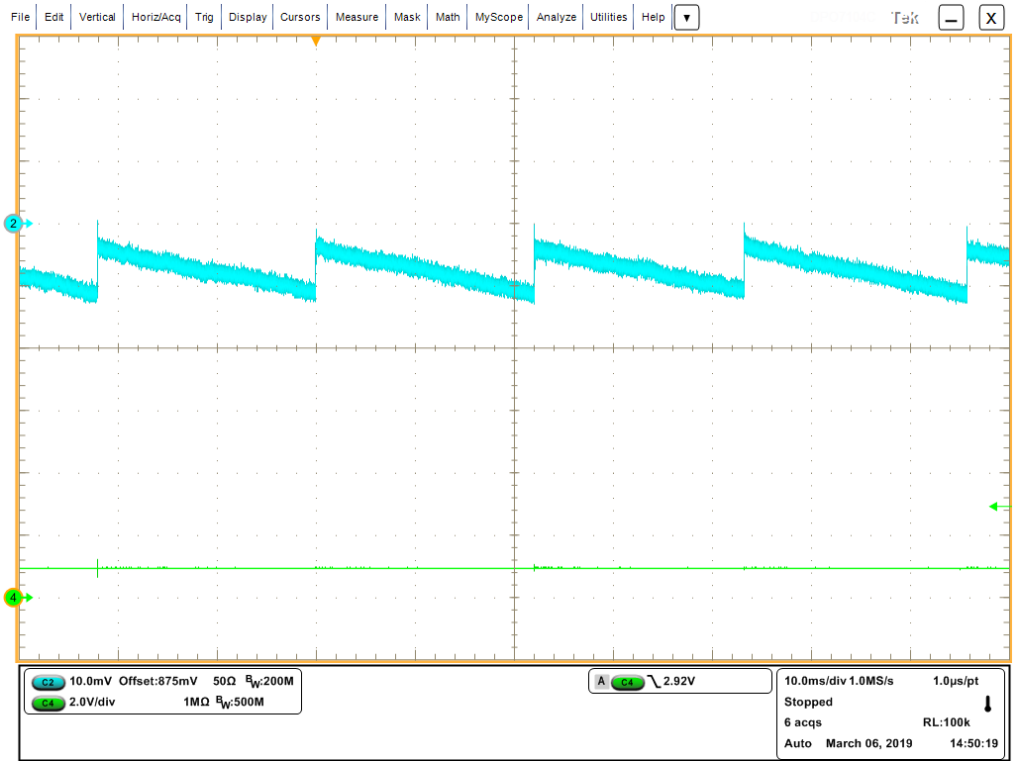


Figure 19: Ripple when switcher is in Auto mode and 0A. This is zoomed out from previous figure.

Sleep Mode

This section is testing the different start up sequences of the NCV6356. Sleep mode can be controlled using the UI. The three different start up sequences for the NCV6356 are shown below.

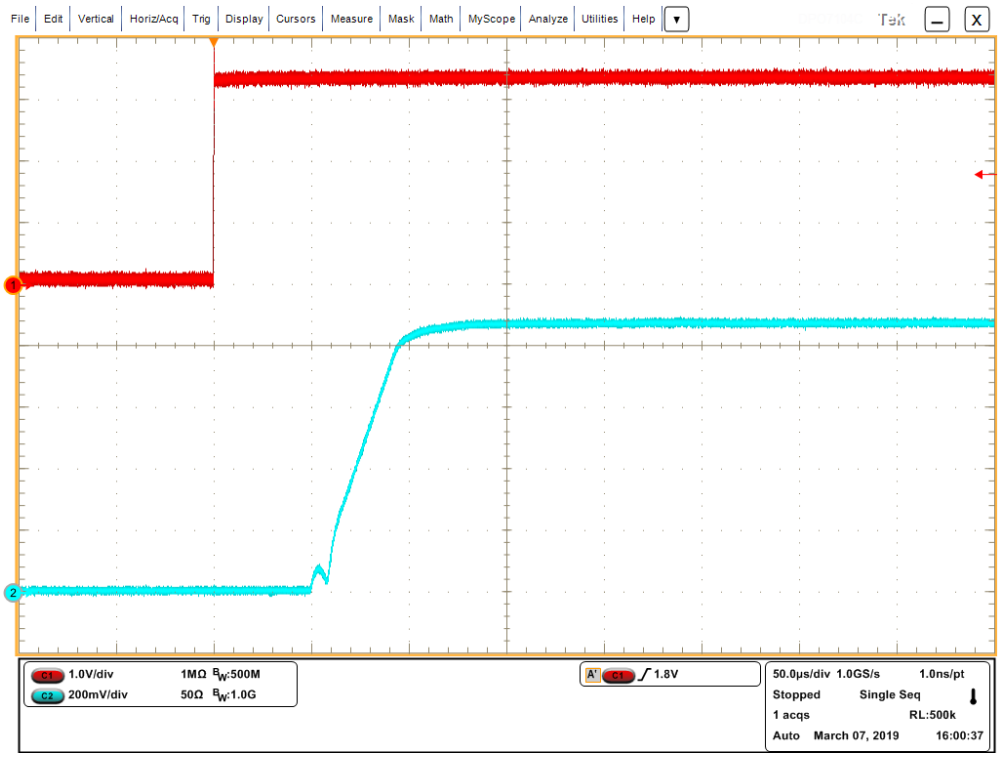


Figure 20: Sleep mode disabled.

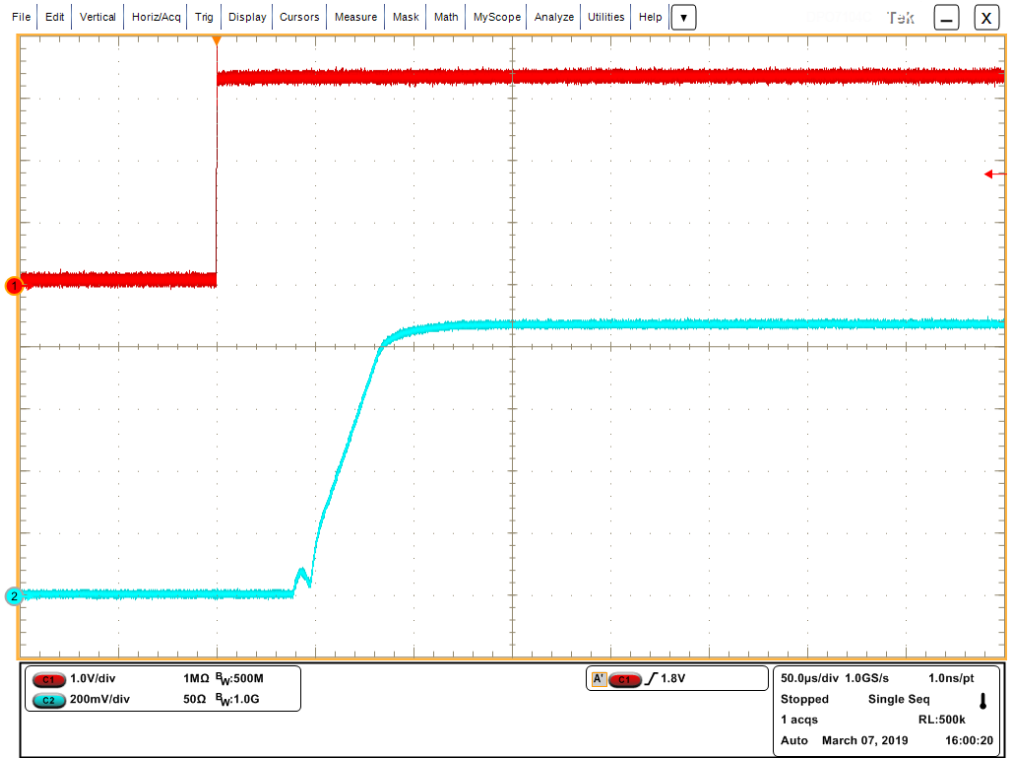


Figure 21: Sleep Mode enabled.

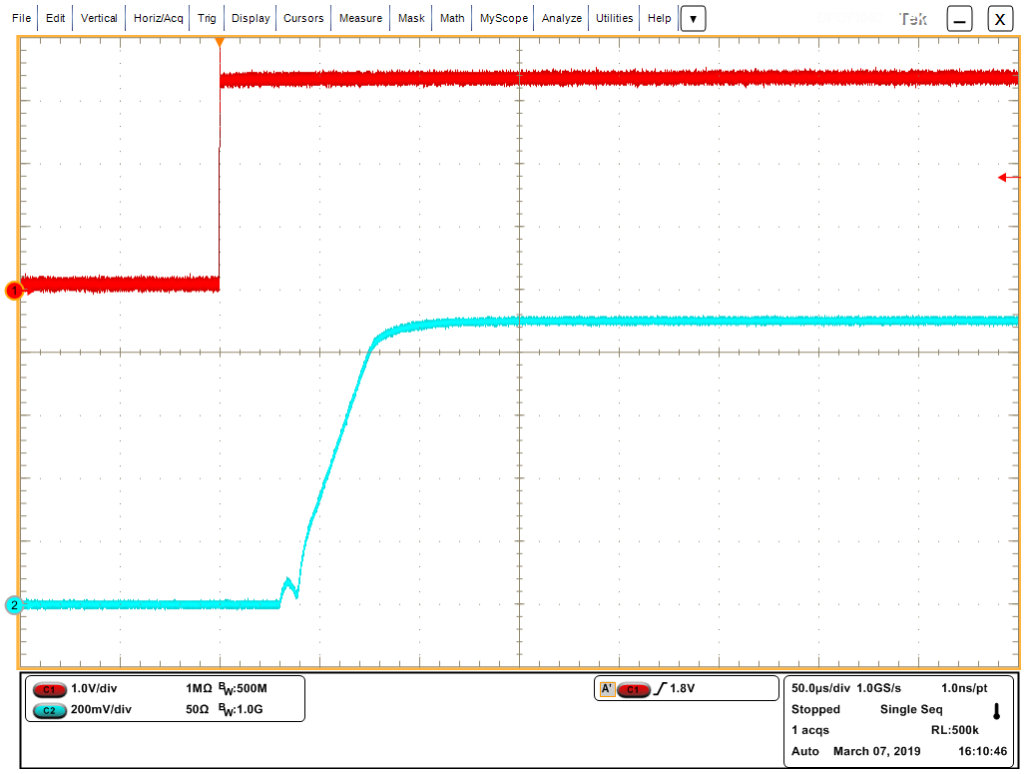


Figure 22: Fast Mode start up.

SWN Ringing

This section shows the ringing on both edges of the SWN.

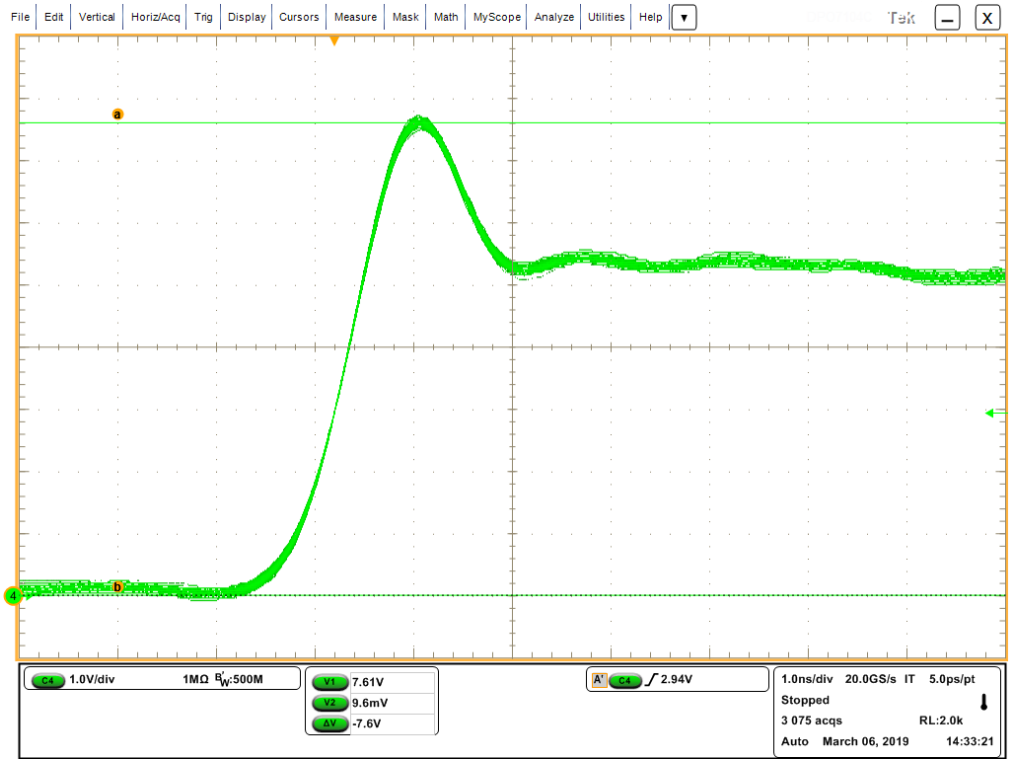


Figure 23: Positive edge ring of the SWN.

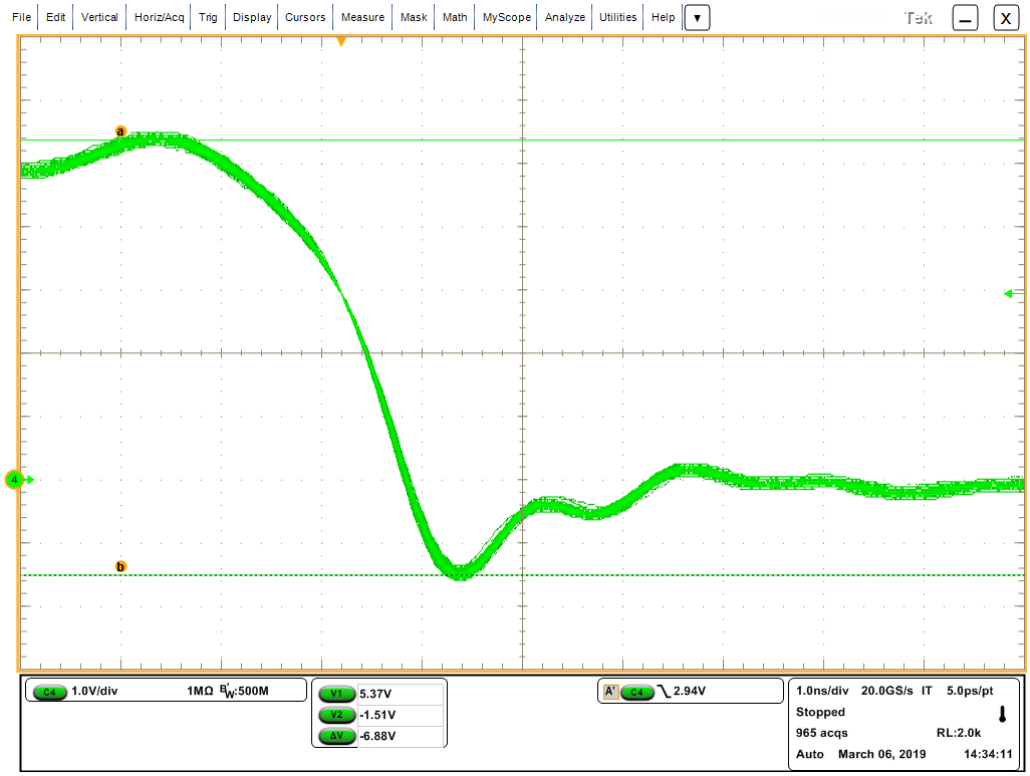


Figure 24: Negative edge ring of the SWN.

Thermals

Thermal data was taken by letting the board sit at maximum load until the thermal path is saturated.

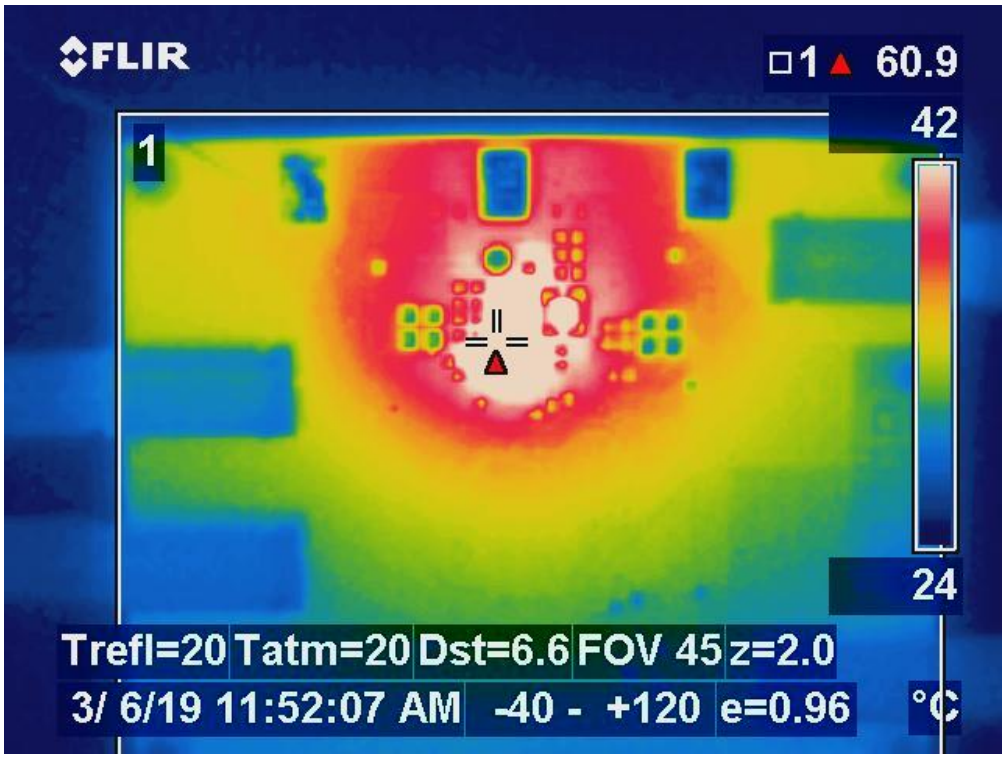


Figure 25: Thermal image of STR-NCV6356-EVK with 5.5 Vin and 0.6V Vout.

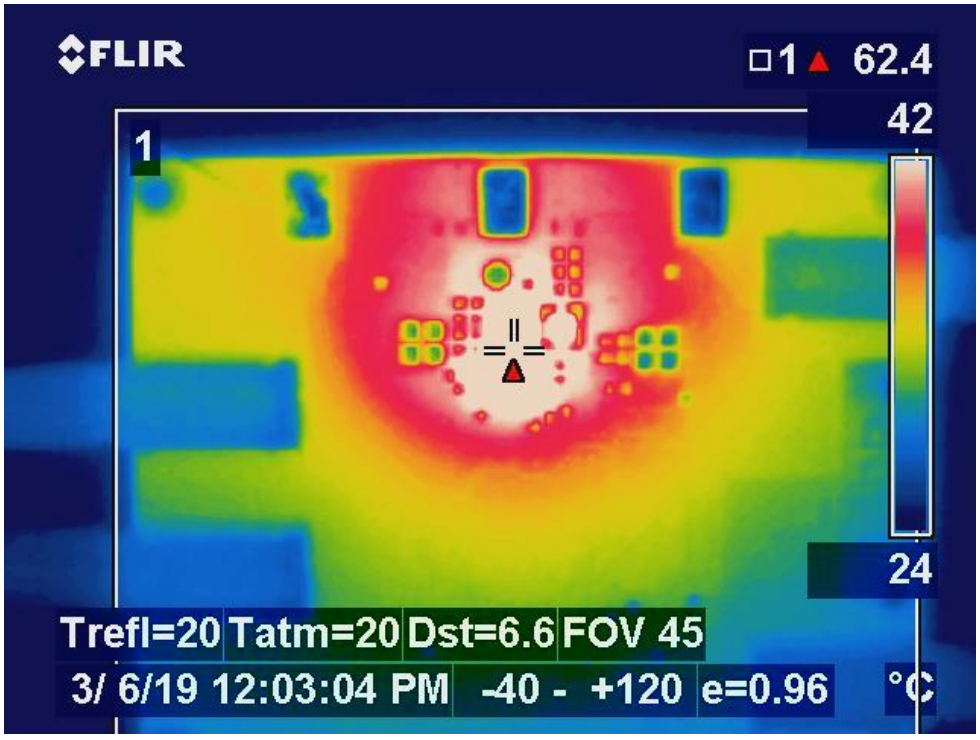


Figure 26: Thermal image of STR-NCV6356-EVK with 5.5 Vin and 1.4V Vout.

Transients

Transient data was taken for a load step from 0.5A to 2.5A, and a load step from 0.5A to 5A. The slew rate for the 0.5A to 2.5A load step was 8A/us and the slew rate for the load step from 0.5A to 5A was 20A/us.

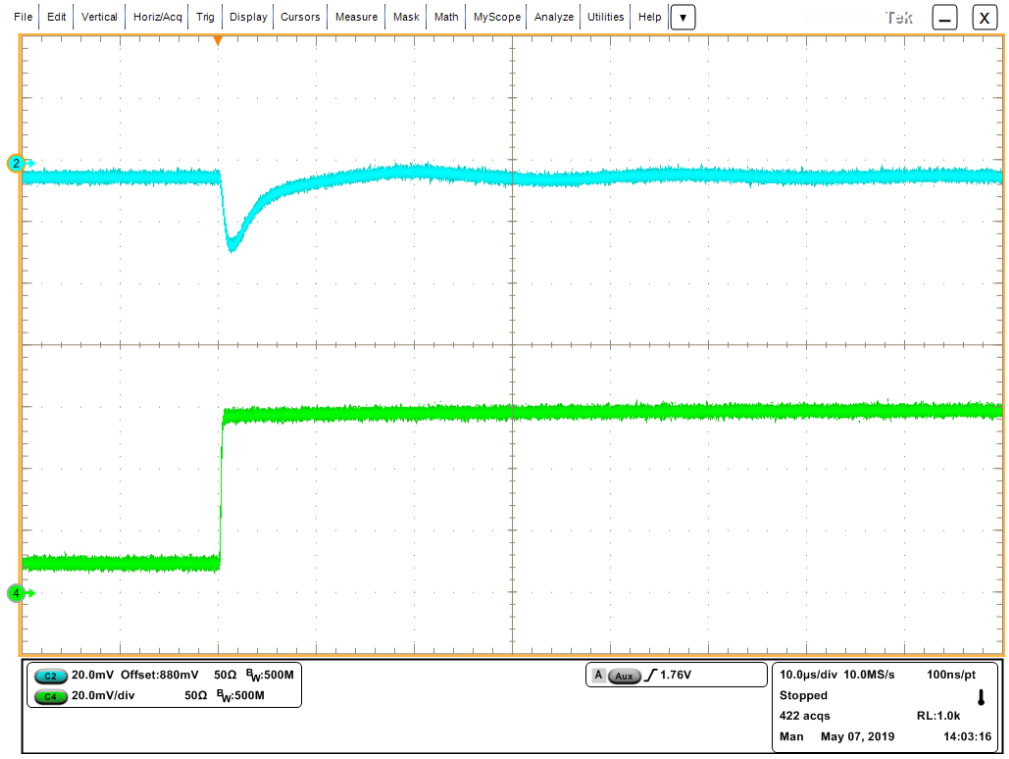


Figure 27: Load step from 0.5A to 2.5A at 1kHz frequency.

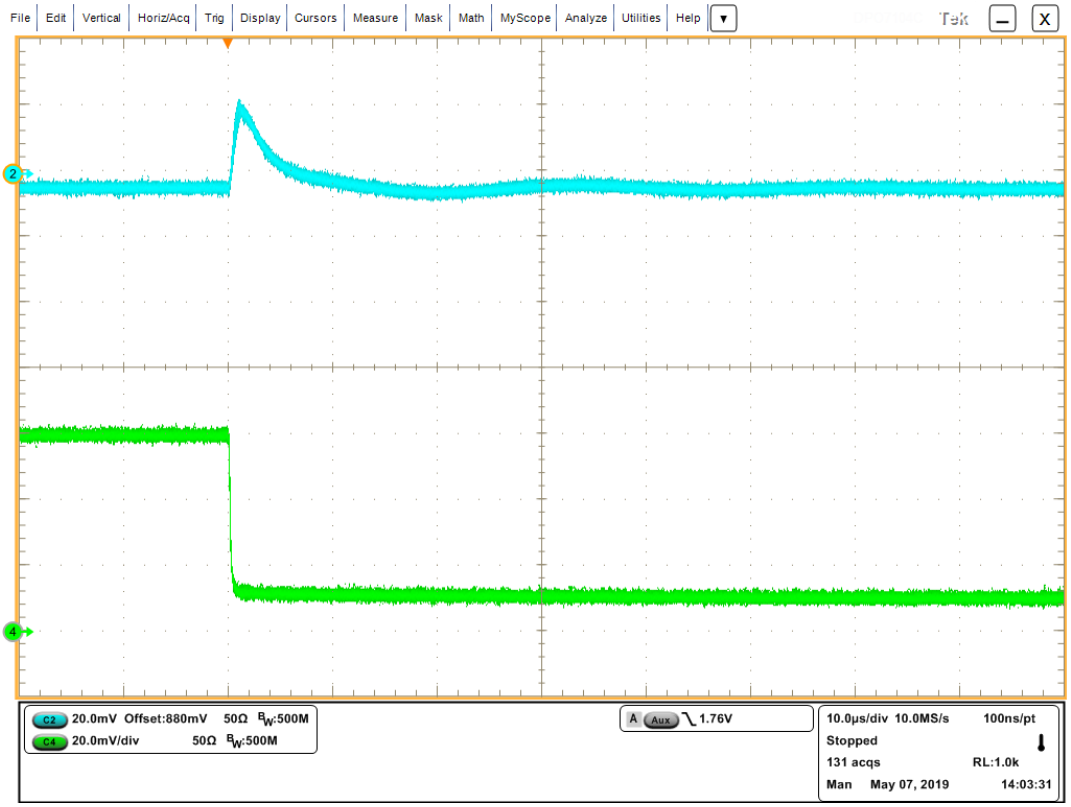


Figure 28: Load step from 2.5A to 0.5A at 1kHz.

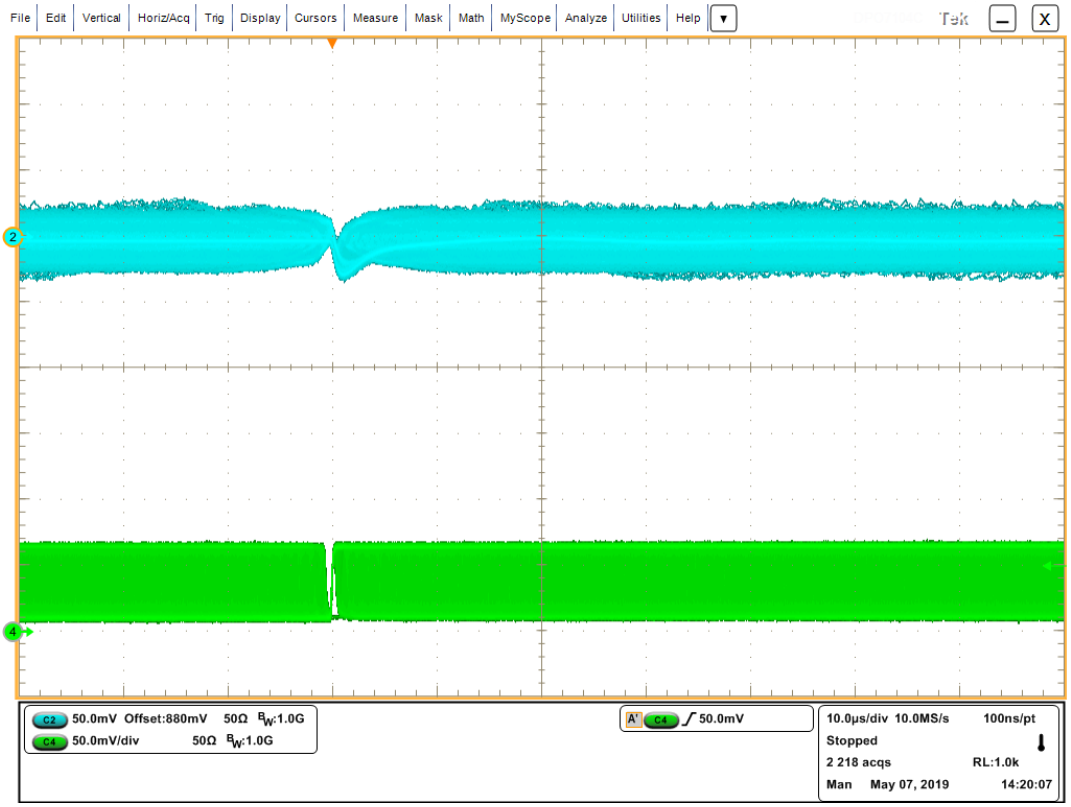


Figure 29: Transient sweep from 1kHz to 1MHz and a load step from 0.5A to 2.5A.

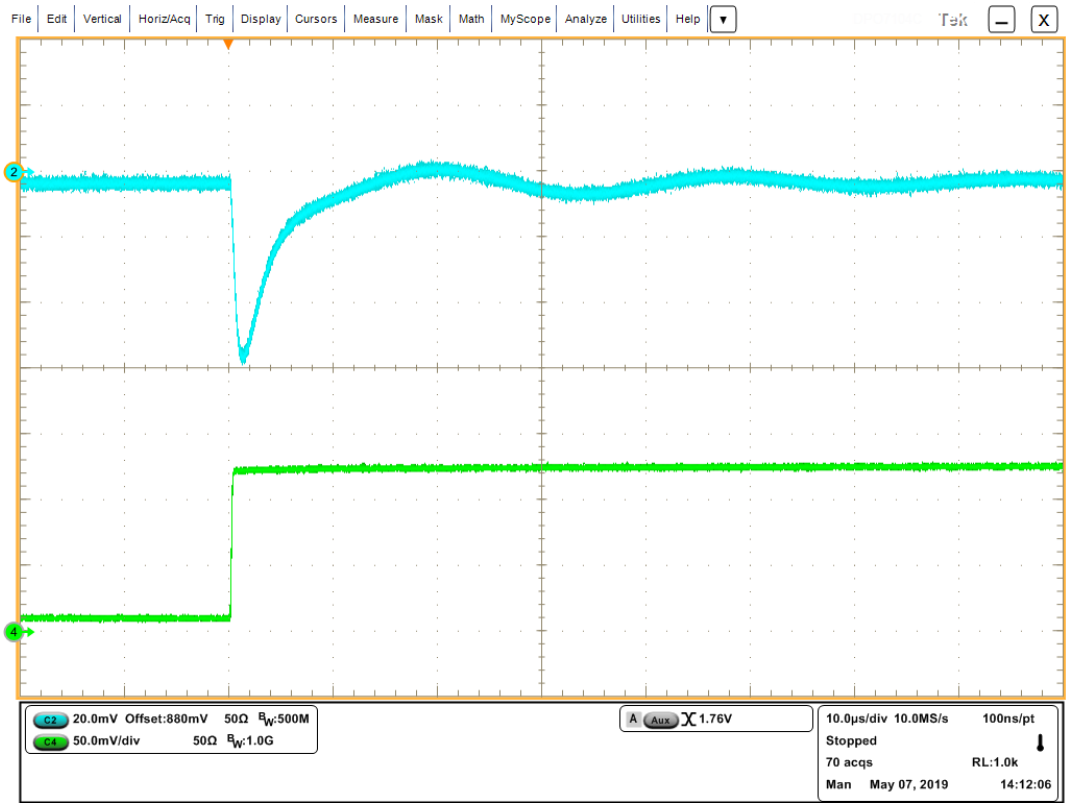


Figure 30: Load step from 0.5A to 5A at 1kHz.

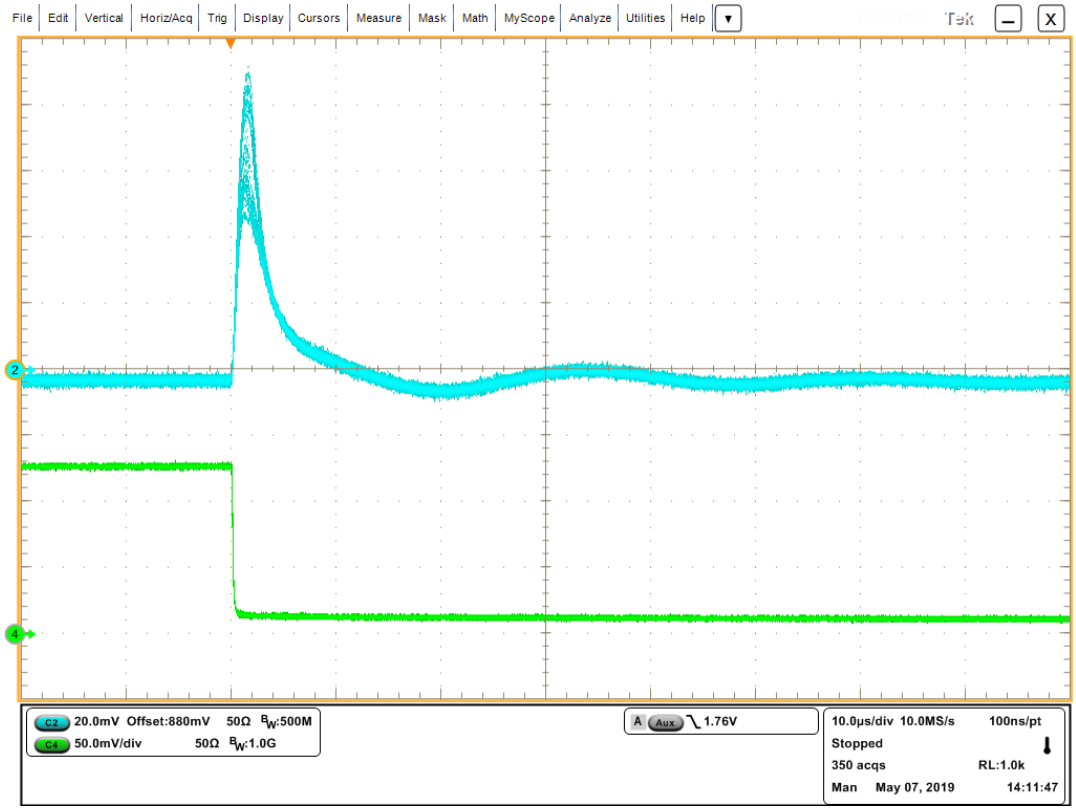


Figure 31: Load step from 5A to 0.5A at 1kHz.

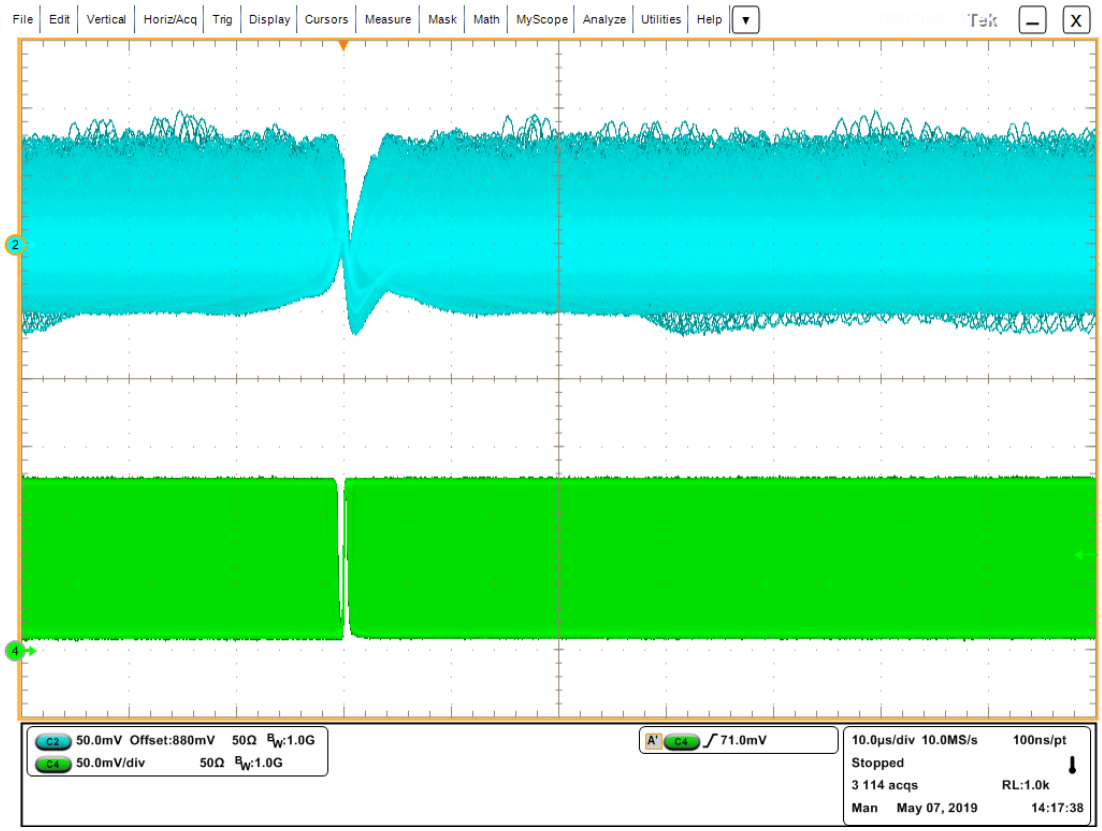


Figure 32: Transient sweep from 1kHz to 1MHz and a load step from 0.5A to 5A.

PUBLICATION ORDERING INFORMATION

LITERATURE FULLFILLMENT:
Literature Distribution Center for ON Semiconductor 19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA

Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support:
800−282−9855 Toll Free USA/Canada

Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website:
https://www.onsemi.com/

Order Literature:
https://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative