VCU128 Digital Multiphase

Test Report, Prepared for Xilinx

November 28th, 2018
Infrastructure Power
Renesas Electronics America

BIG IDEAS
FOR EVERY SPACE

ISL68127 TESTING OVERVIEW

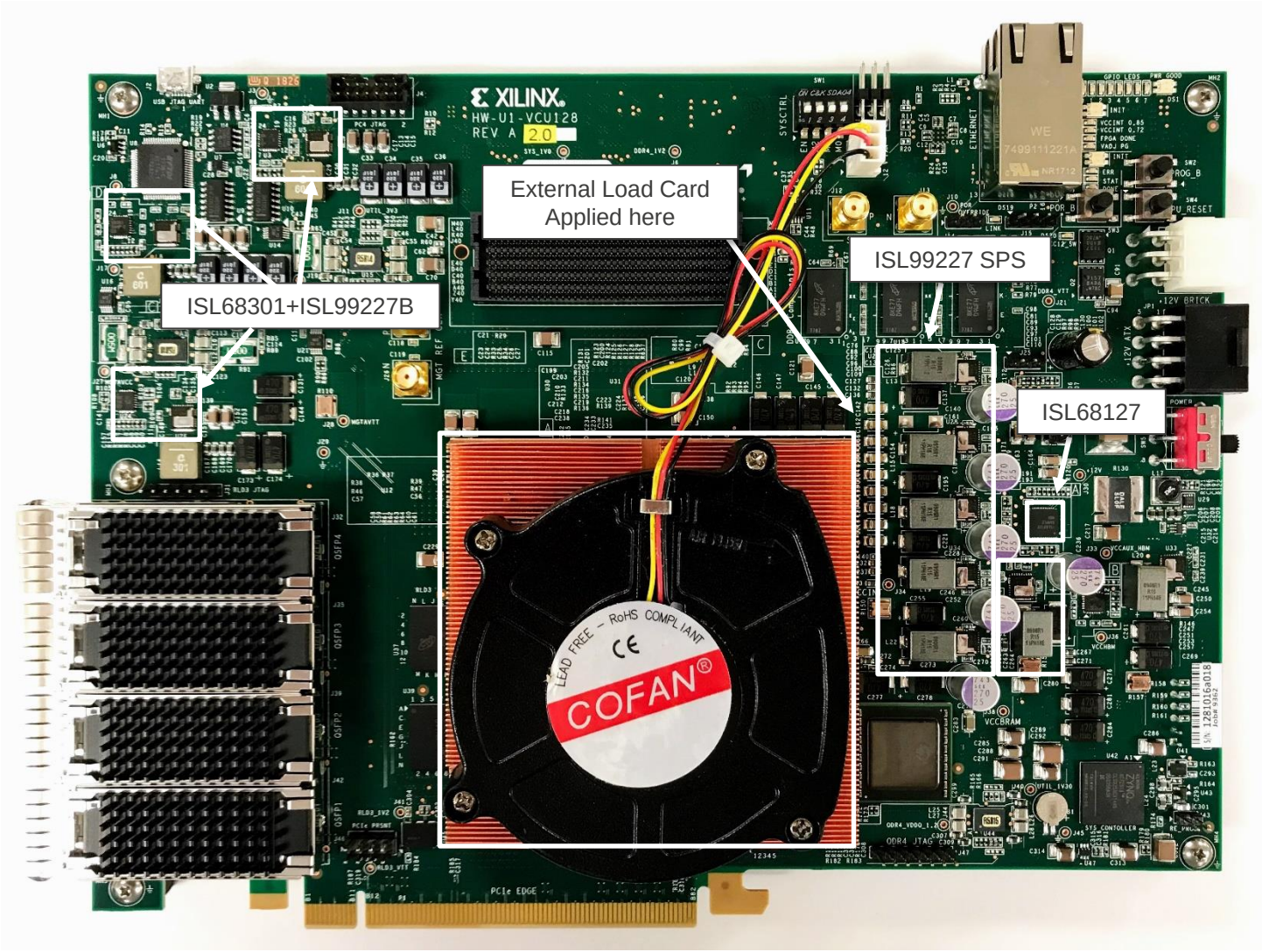
Transient Testing of Xilinx VCU128 Reference Design

- Testing completed using external load hitter and oscilloscope

For all Tests:

- Vin = 12V
- 5PH Setup
- 8CH Oscilloscope used to verify sequencing behavior
- External load card driven by function generator
- 3D plots of output voltage vs. rep rate frequency and duty cycle captured with Renesas software
- Project File Name: ISL68127_ISL68301_ALL_Xilinx_VCU128_0800218-01

XILINX VCU128 OVERVIEW

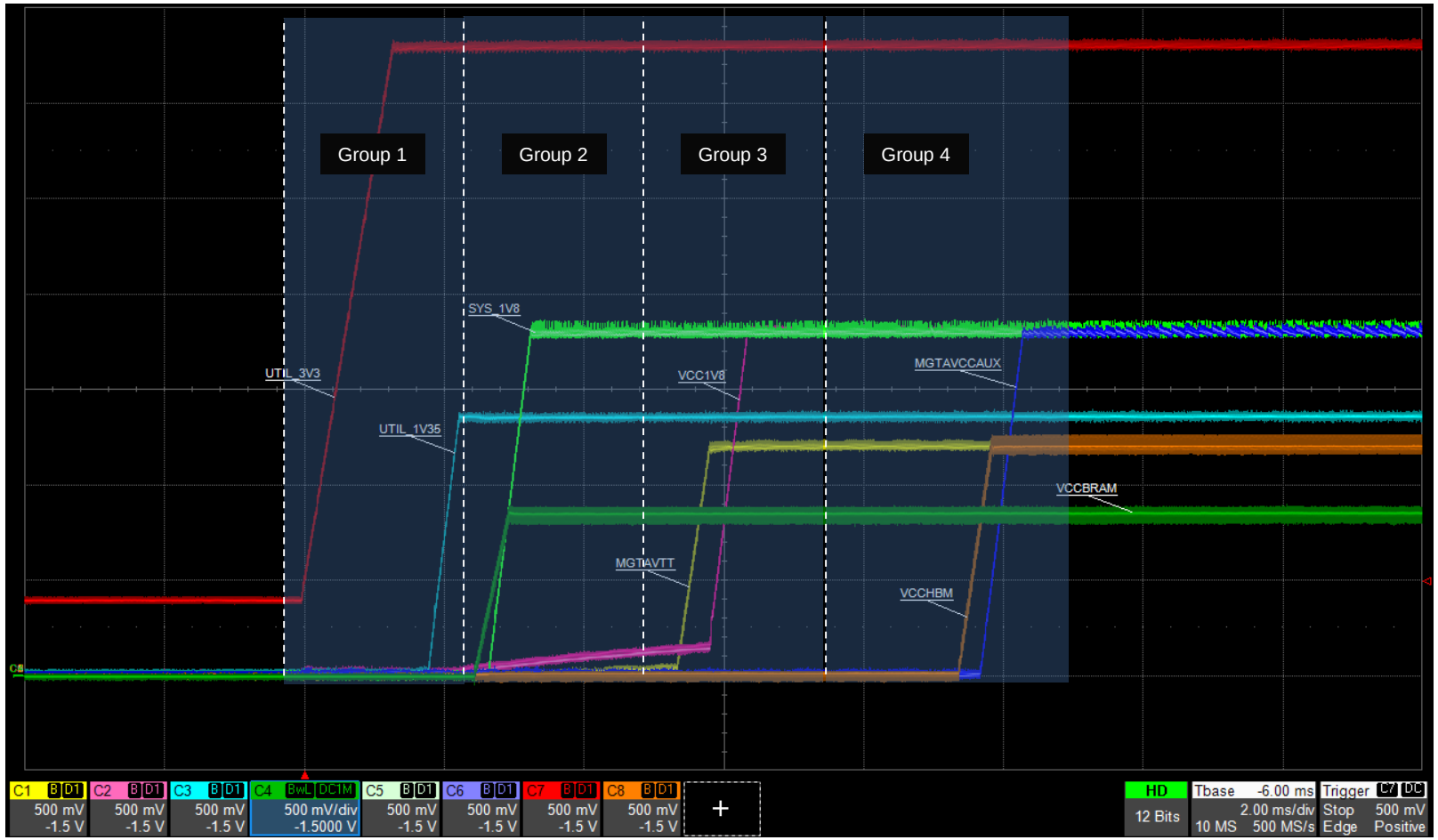


Load Hitter Card

Closed loop control. Load transient follows function generator step size and slew rate

STARTUP WAVEFORMS

VCU128 RAIL SEQUENCING – ENABLE SIGNAL



Test Conditions

Vin = 12V
8CH Oscilloscope used to verify sequencing

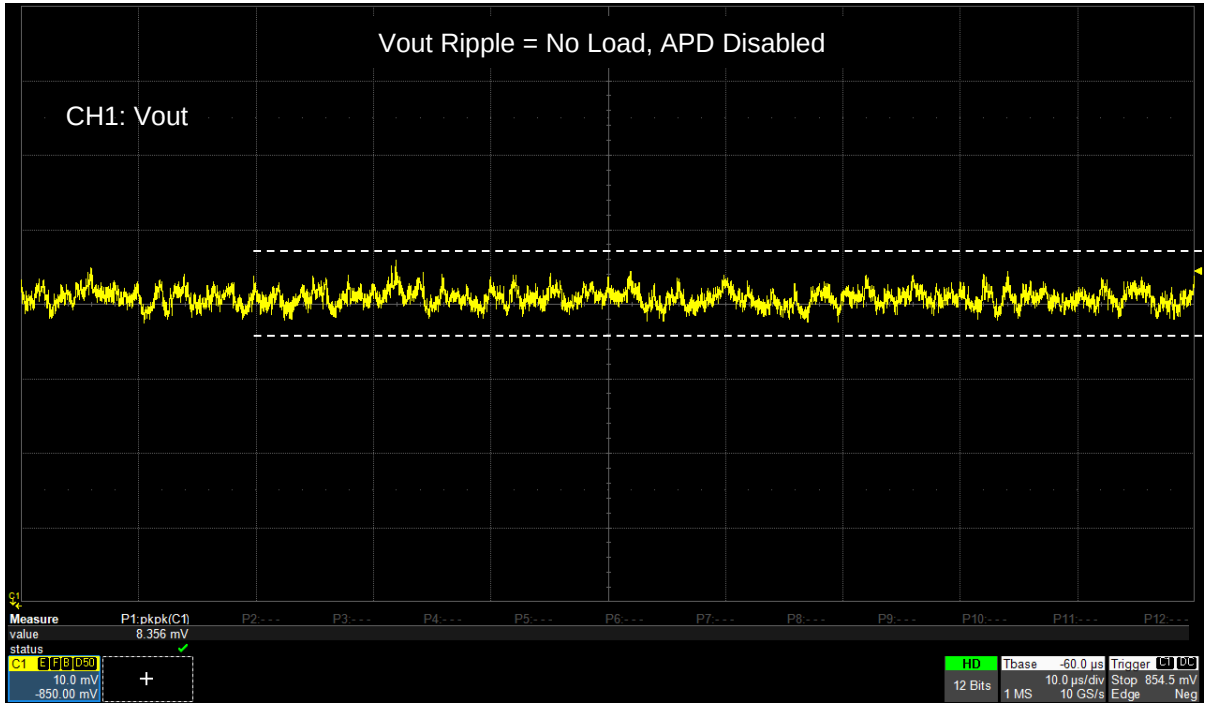
Test Results

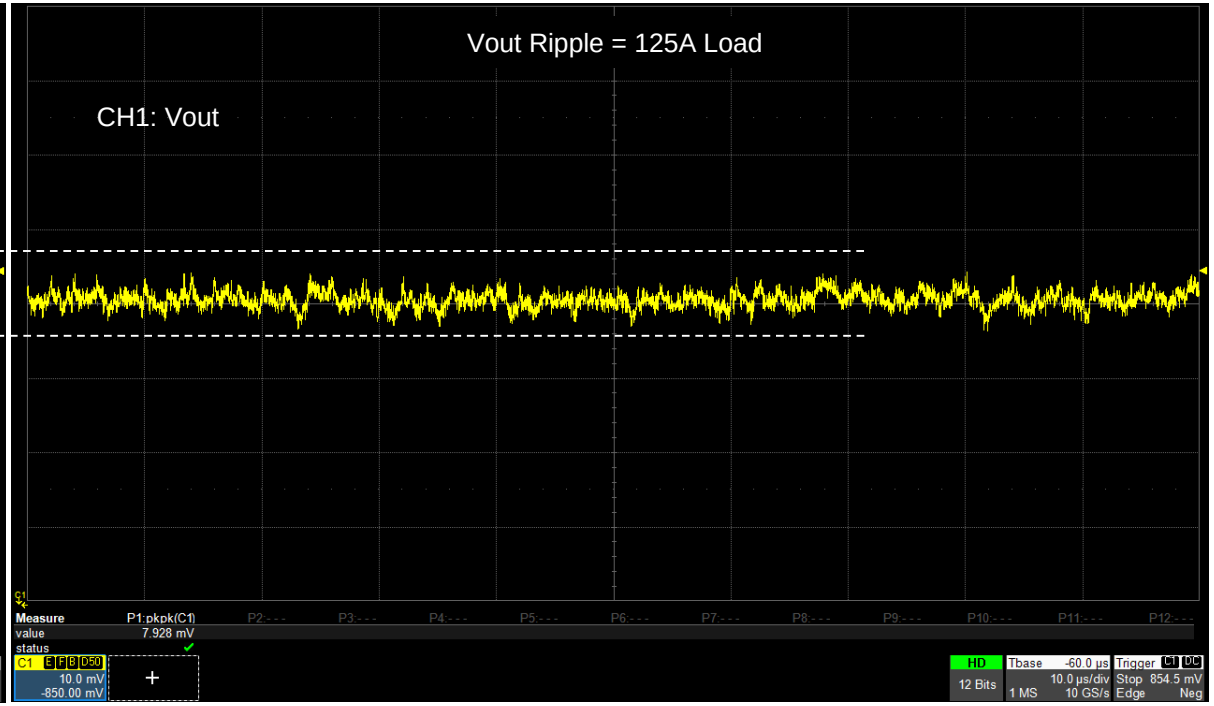
All groups ramp within the planned timing limits

VCCINT TESTING

VCCINT – VOUT RIPPLE, APD DISABLED

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Disabled



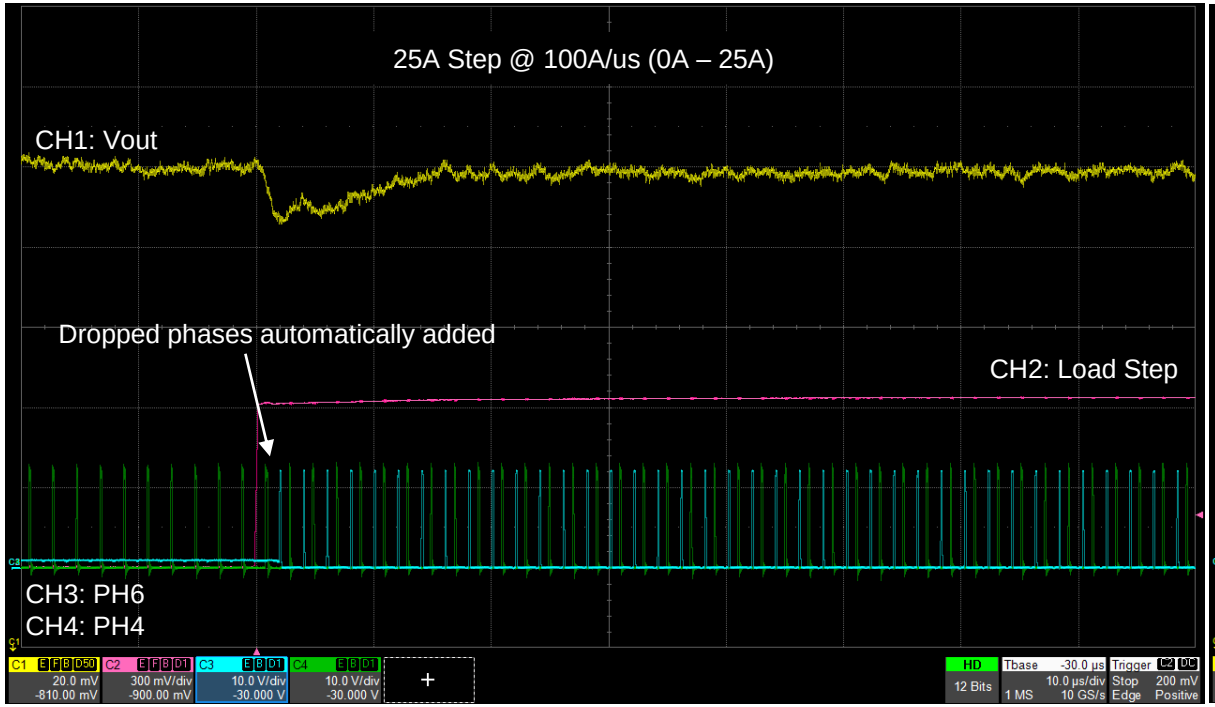


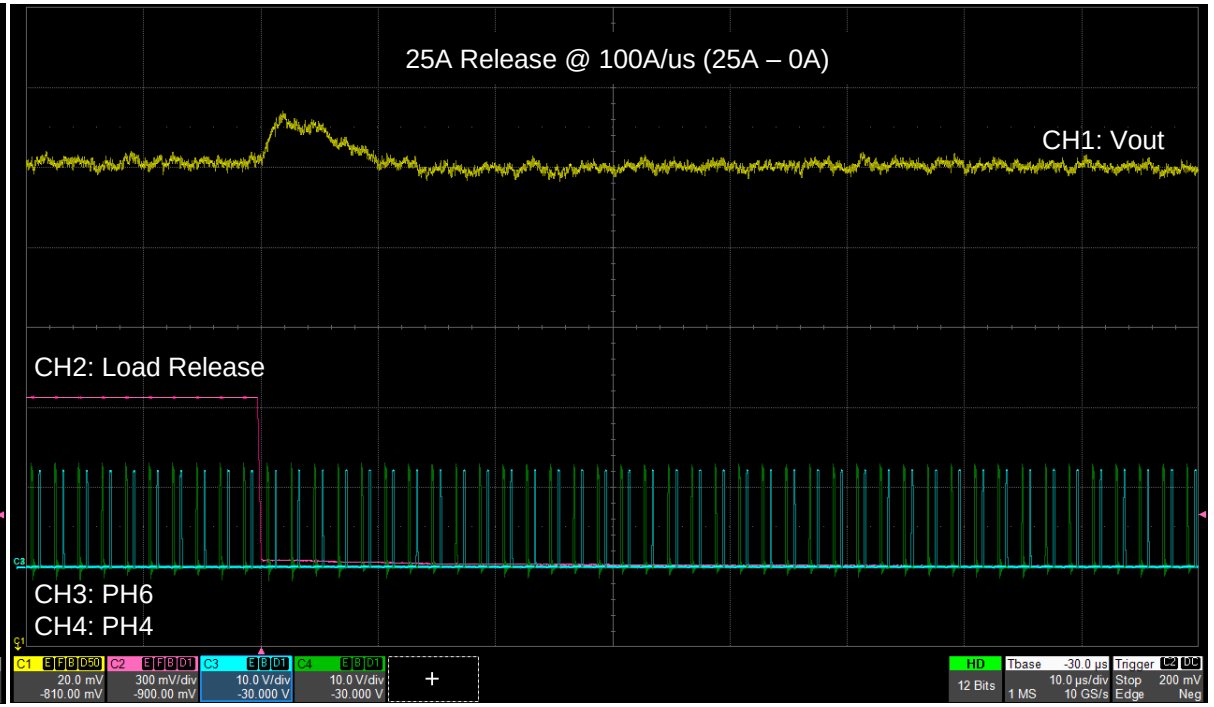
Vout Ripple is <10mVpkpk at both no load and 50A loads.

VCCINT – TRANSIENT RESULTS, 25A STEP @ 100A/US

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled

APD = Automatic Phase Dropping

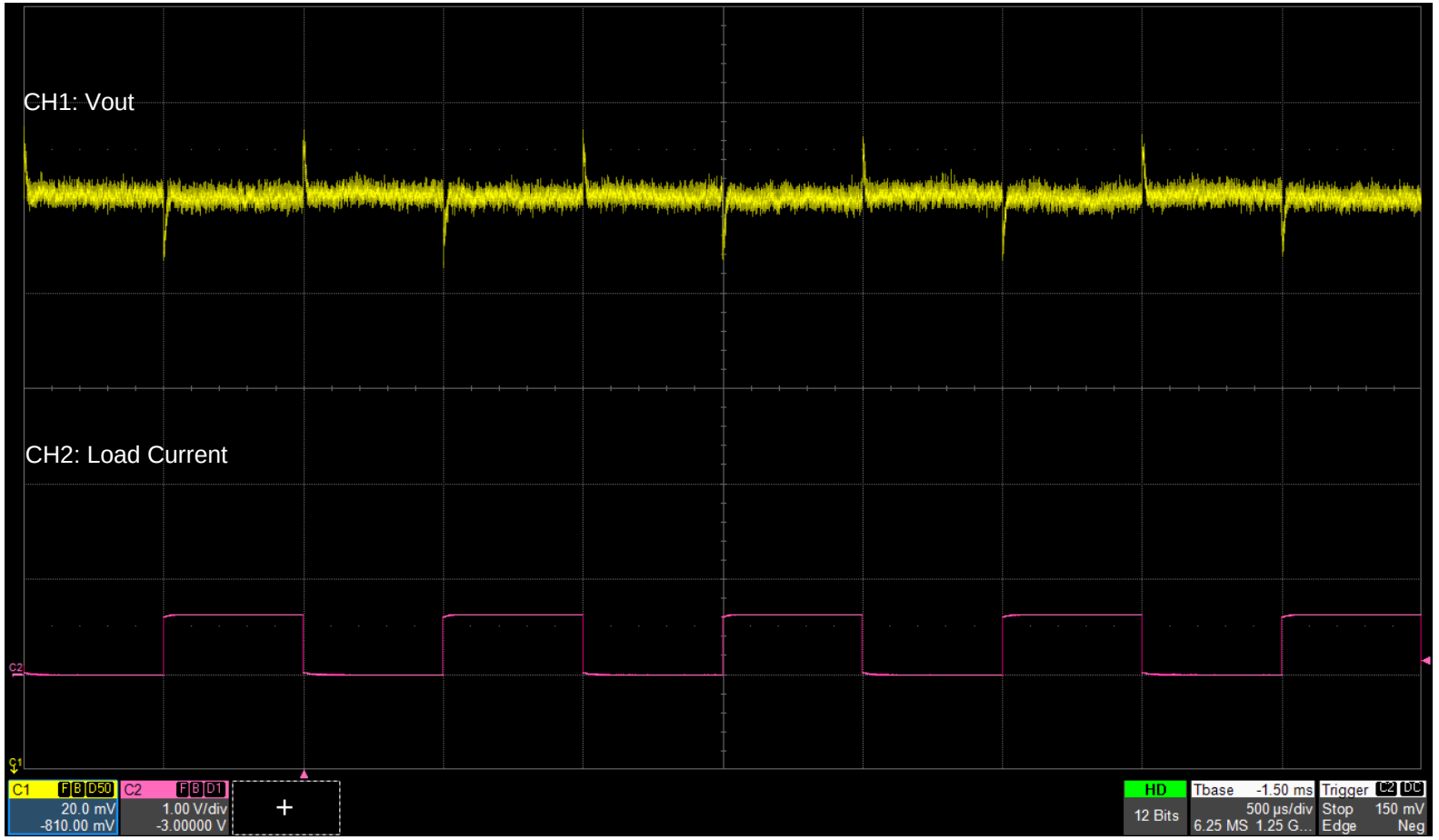




Deviation remains within +/-2% from 25A load step. Dropped phases (improved efficiency at light load) are automatically added

VCCINT TRANSIENT RESPONSE, 1KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled



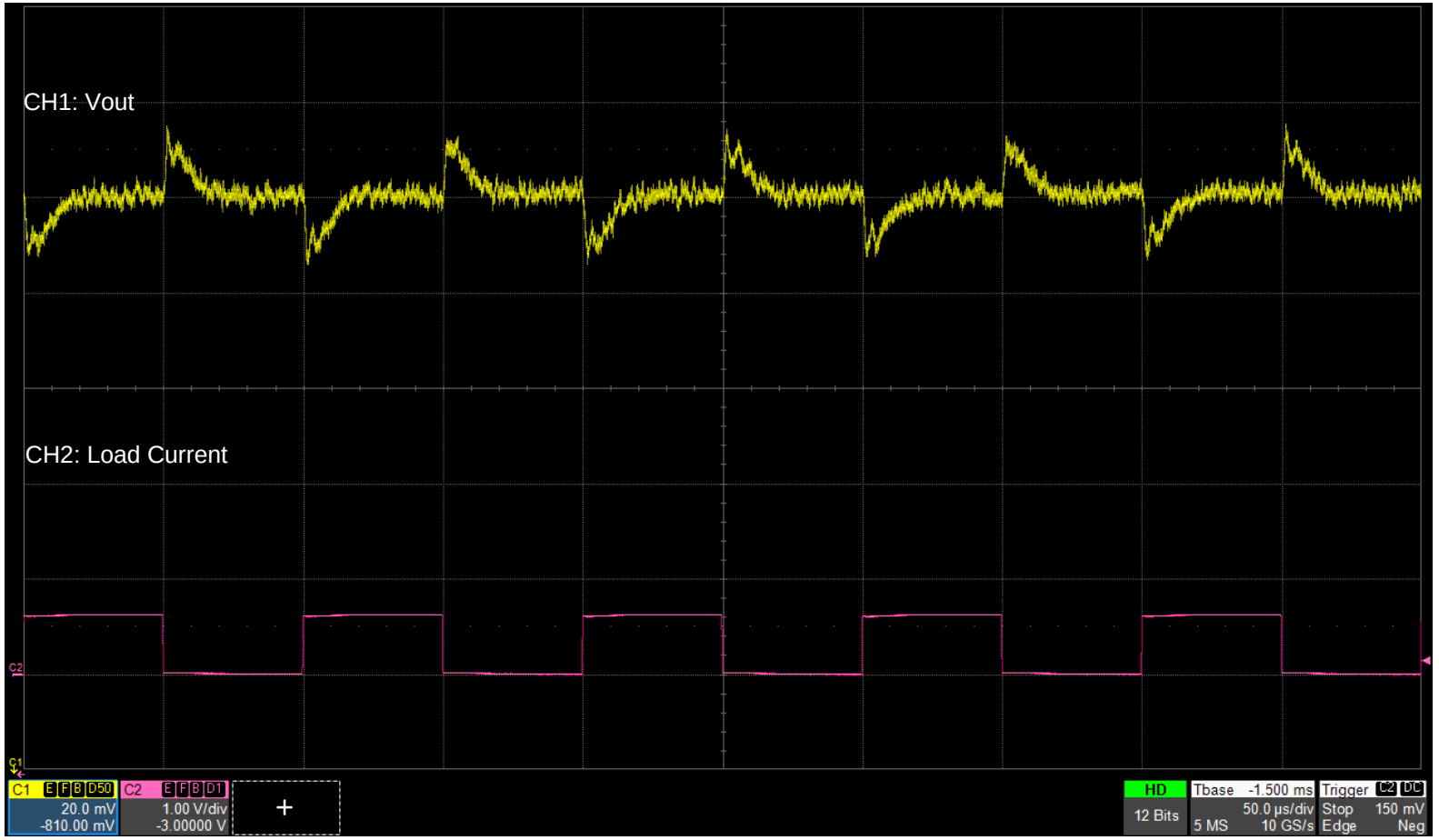
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
5PH Test Data
Diode Braking = Disabled

Load Step = 0A to 25A
Slew Rate = 100A/us

VCCINT TRANSIENT RESPONSE, 10KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled



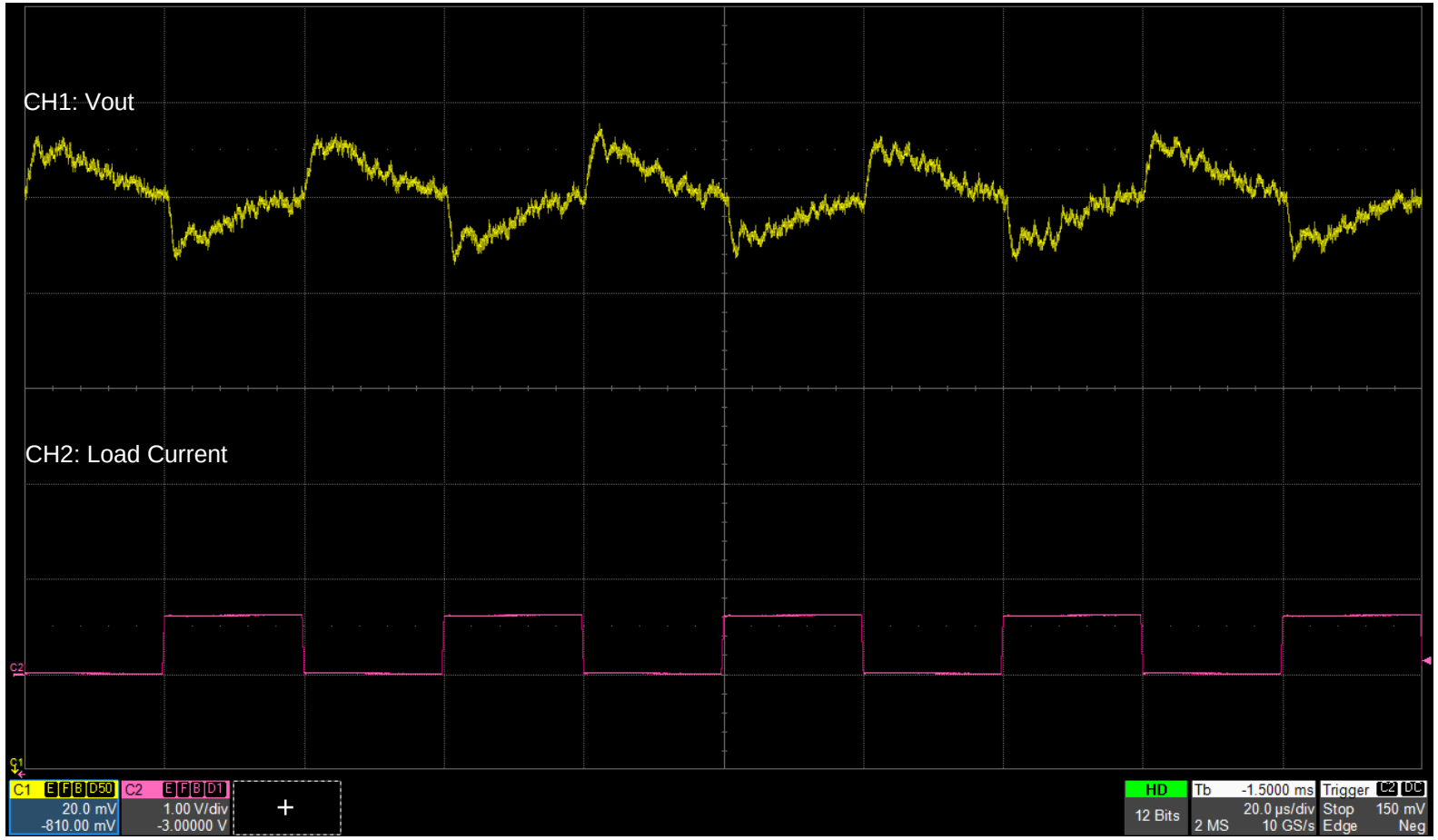
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
5PH Test Data
Diode Braking = Disabled

Load Step = 0A to 25A
Slew Rate = 100A/us

VCCINT TRANSIENT RESPONSE, 25KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled



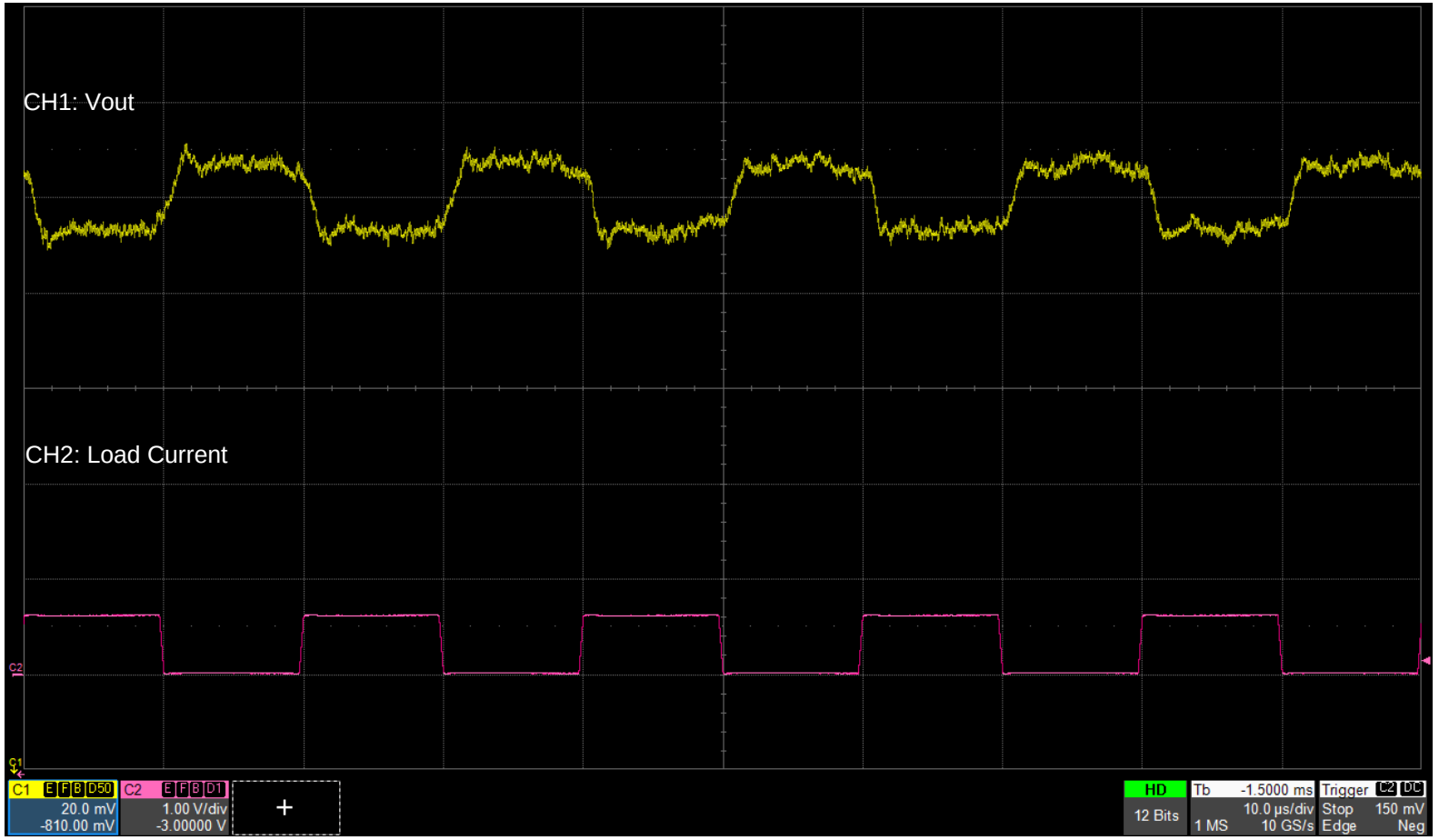
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
5PH Test Data
Diode Braking = Disabled

Load Step = 0A to 25A
Slew Rate = 100A/us

VCCINT TRANSIENT RESPONSE, 50KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled



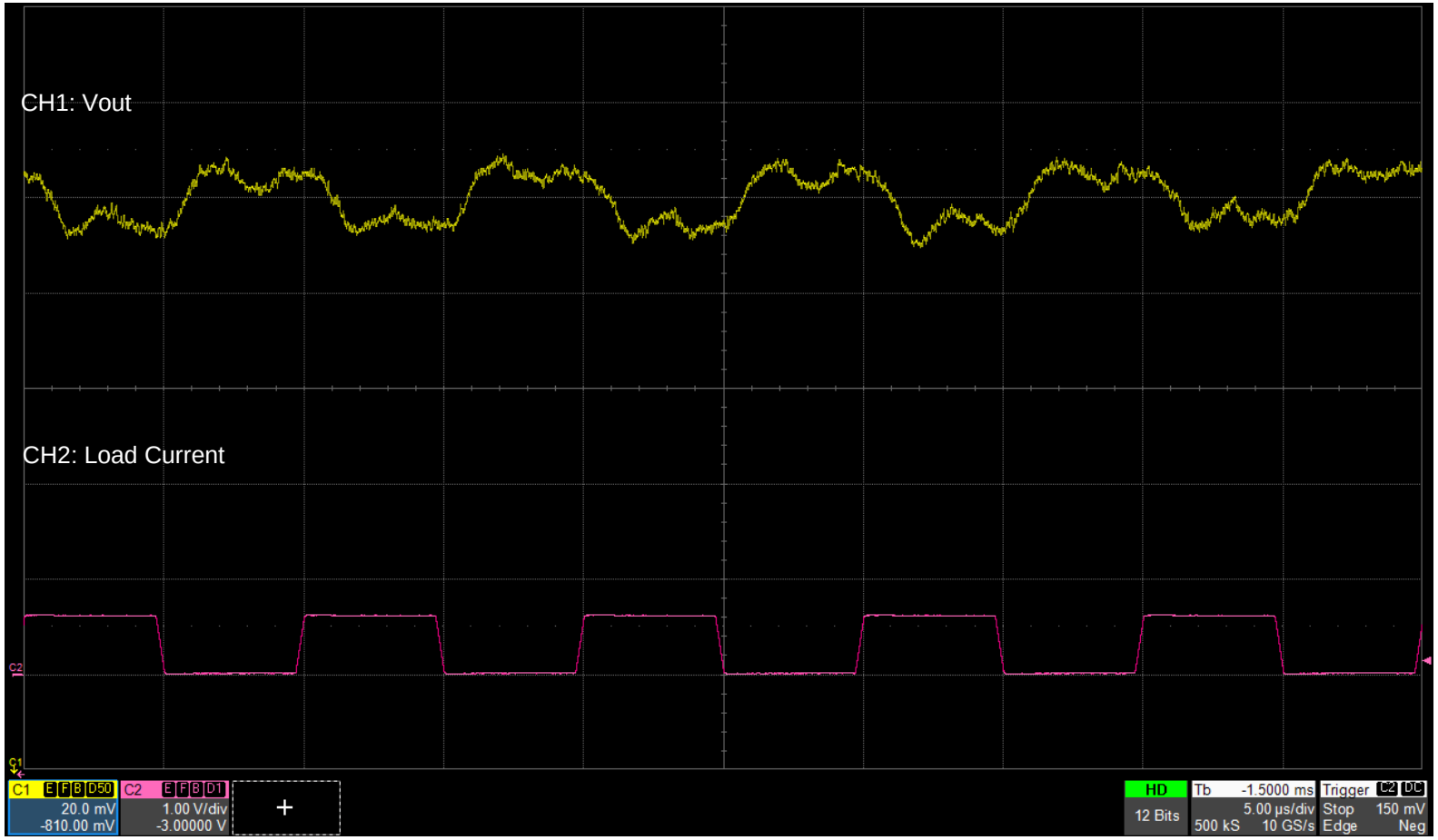
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
5PH Test Data
Diode Braking = Disabled

Load Step = 0A to 25A
Slew Rate = 100A/us

VCCINT TRANSIENT RESPONSE, 100KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled



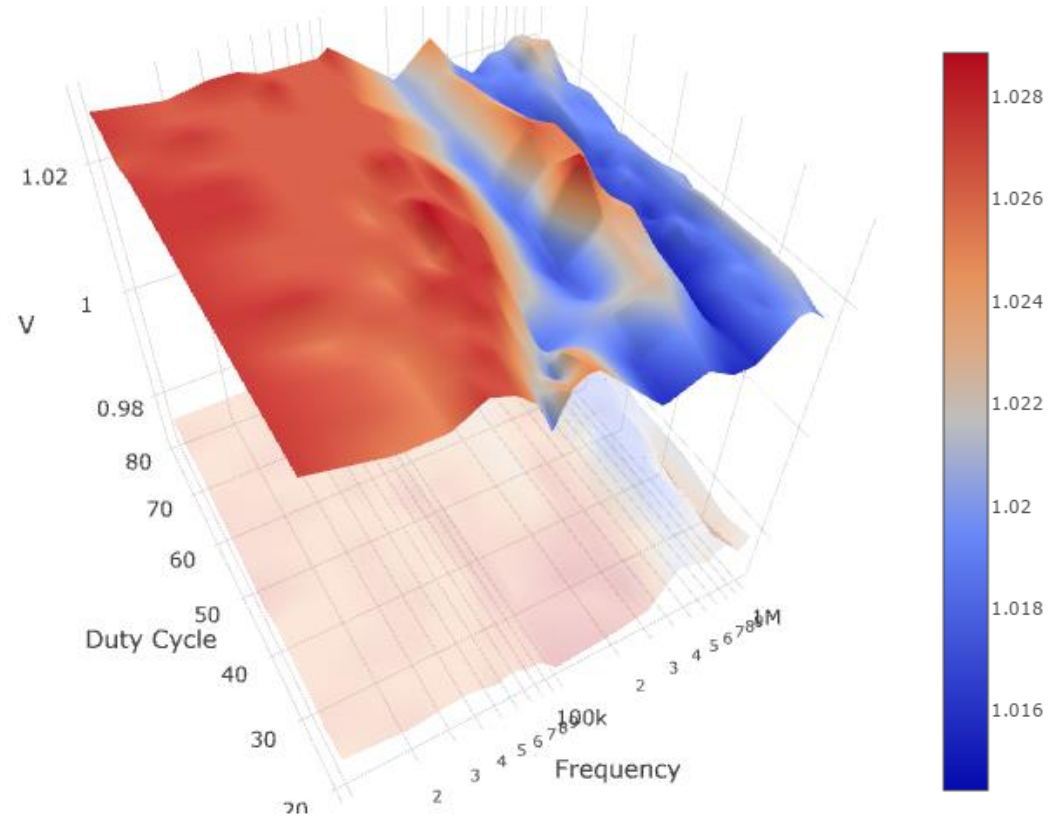
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
5PH Test Data
Diode Braking = Disabled

Load Step = 0A to 25A
Slew Rate = 100A/us

3D PLOT – VOUT MAX/MIN DEVIATION

Automated Test Setup sweeps load step duty cycle and frequency, generating a 3D plotting max and min deviation

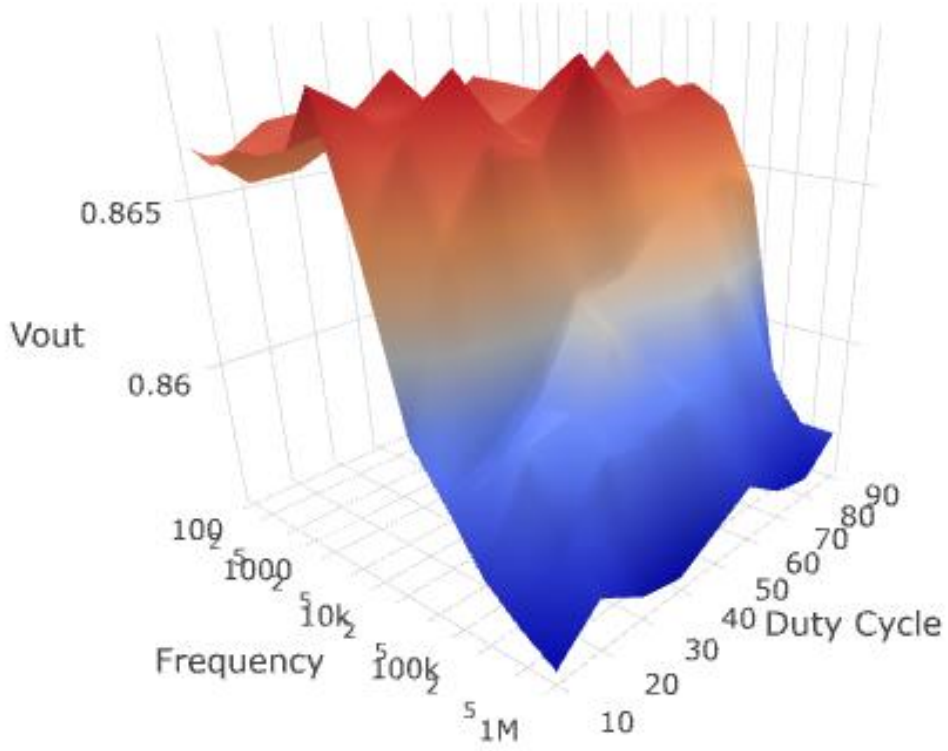


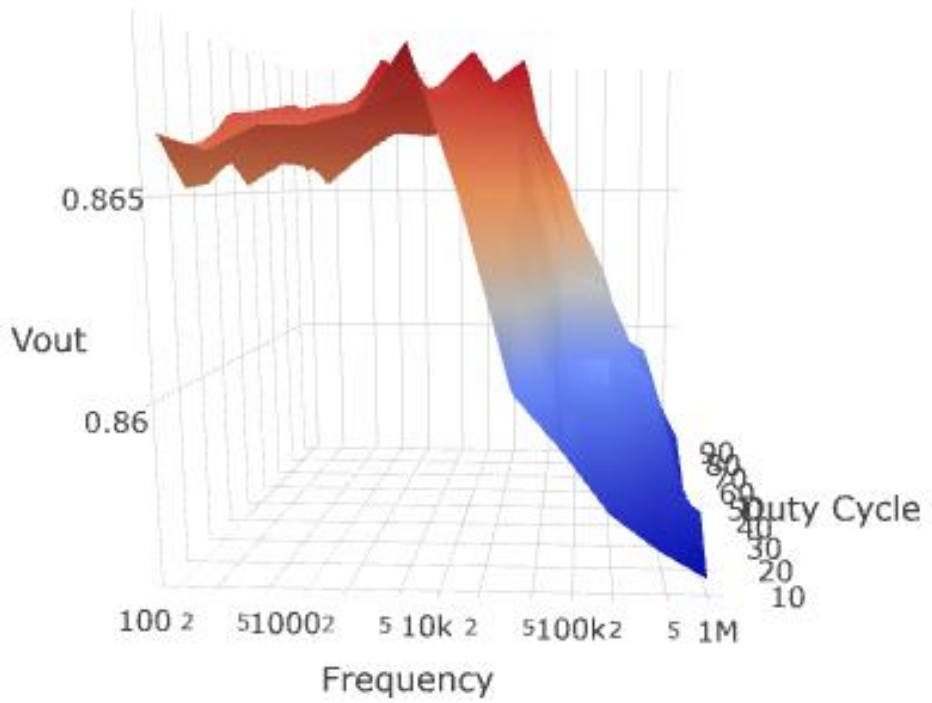
Example data – see next slide for actual measured results

VCCINT 3D PLOTTING, VMAX

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled

Vout Max remains within +2% tolerance band over 100Hz to 1MHz sweep, 10% to 90% load transient duty cycle

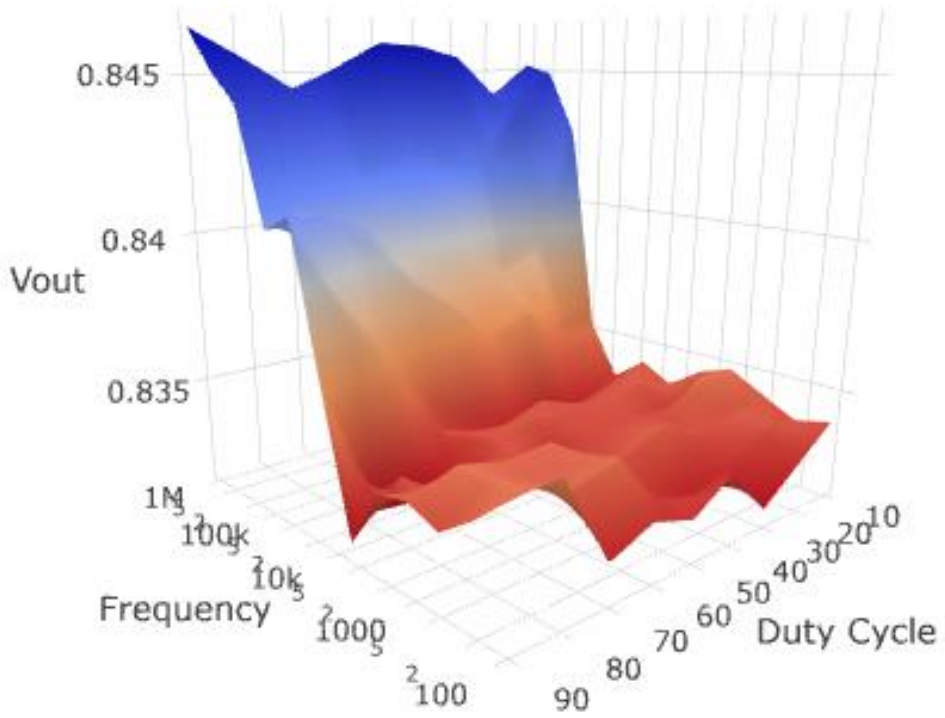


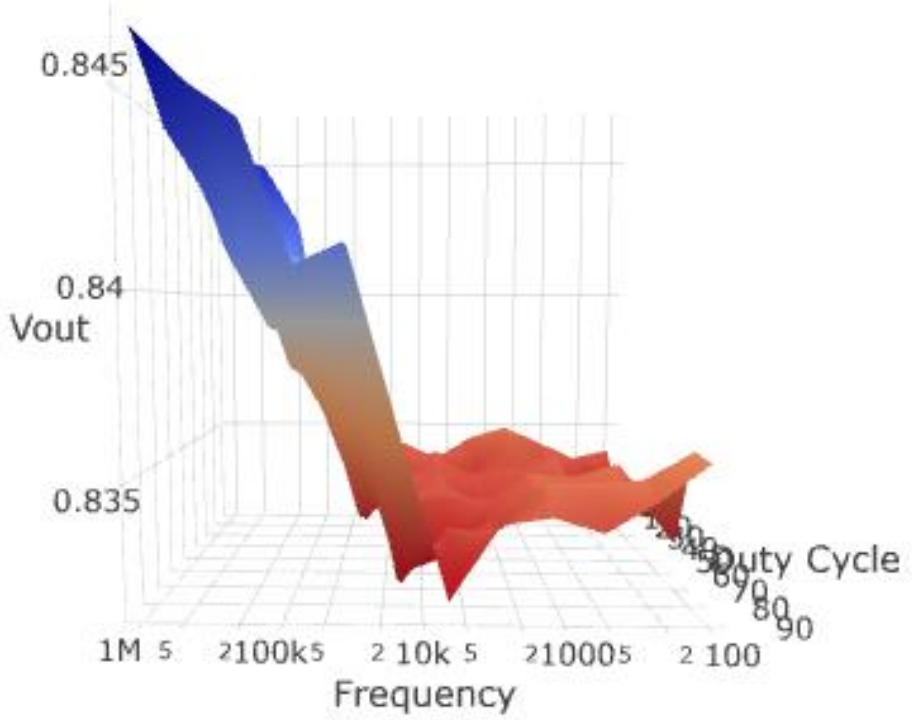


VCCINT 3D PLOTTING, VMIN

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
5PH Configuration, APD Enabled

Vout Min remains within -2% tolerance band over 100Hz to 1MHz sweep, 10% to 90% load transient duty cycle

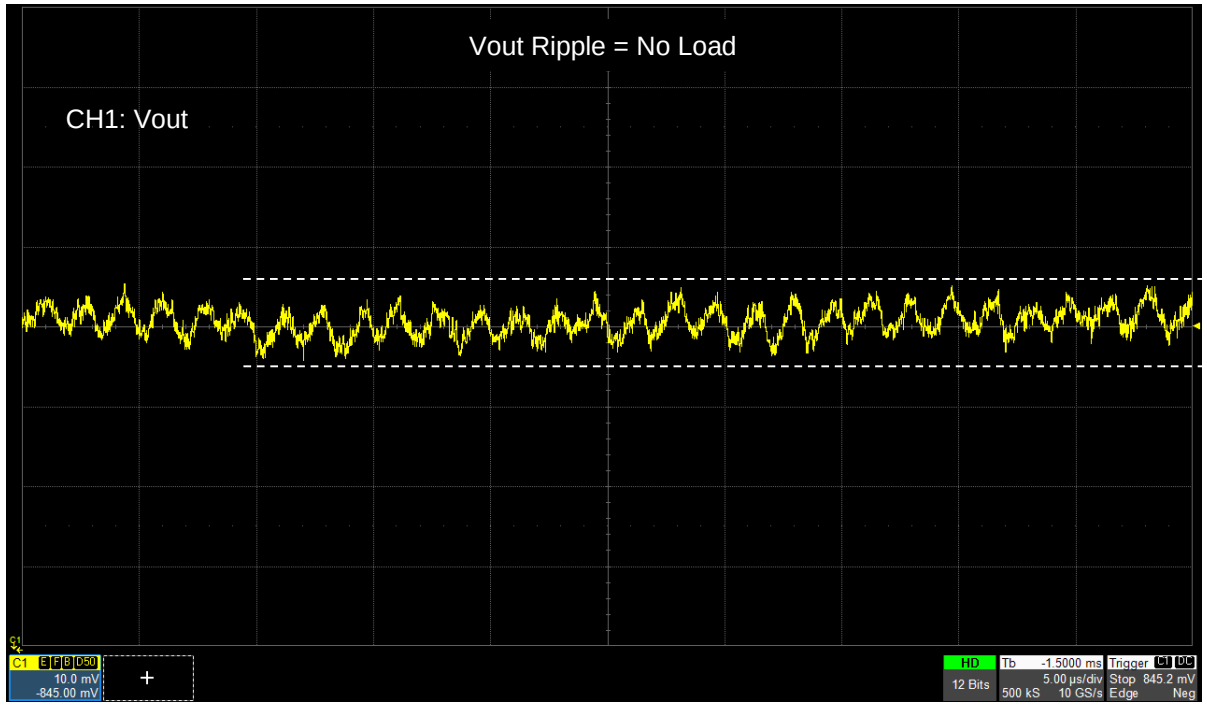


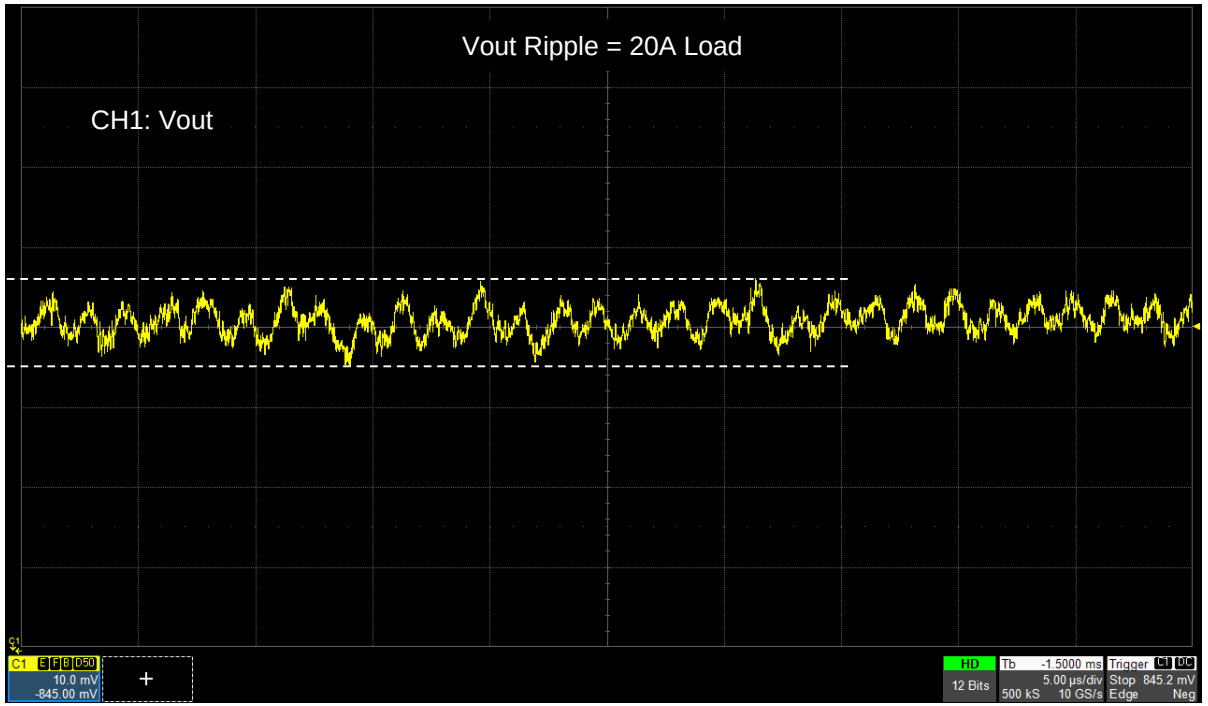


VCCBRAM TESTING

VCCBRAM – VOUT RIPPLE

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration

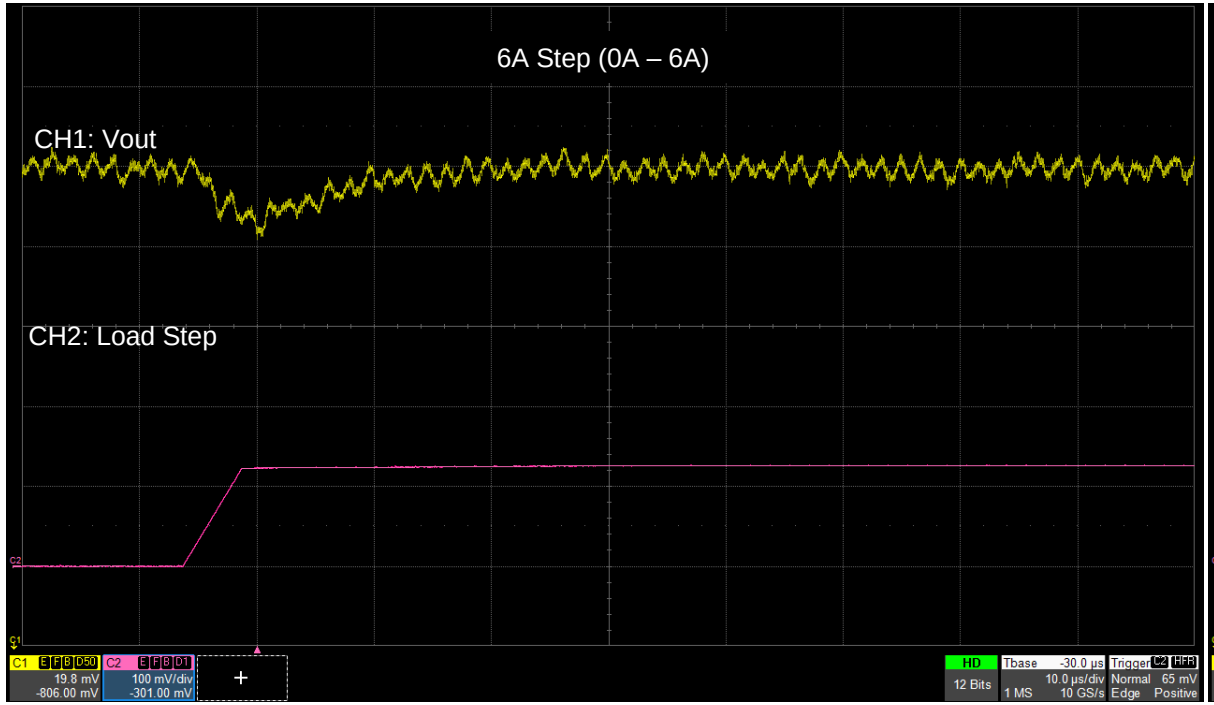


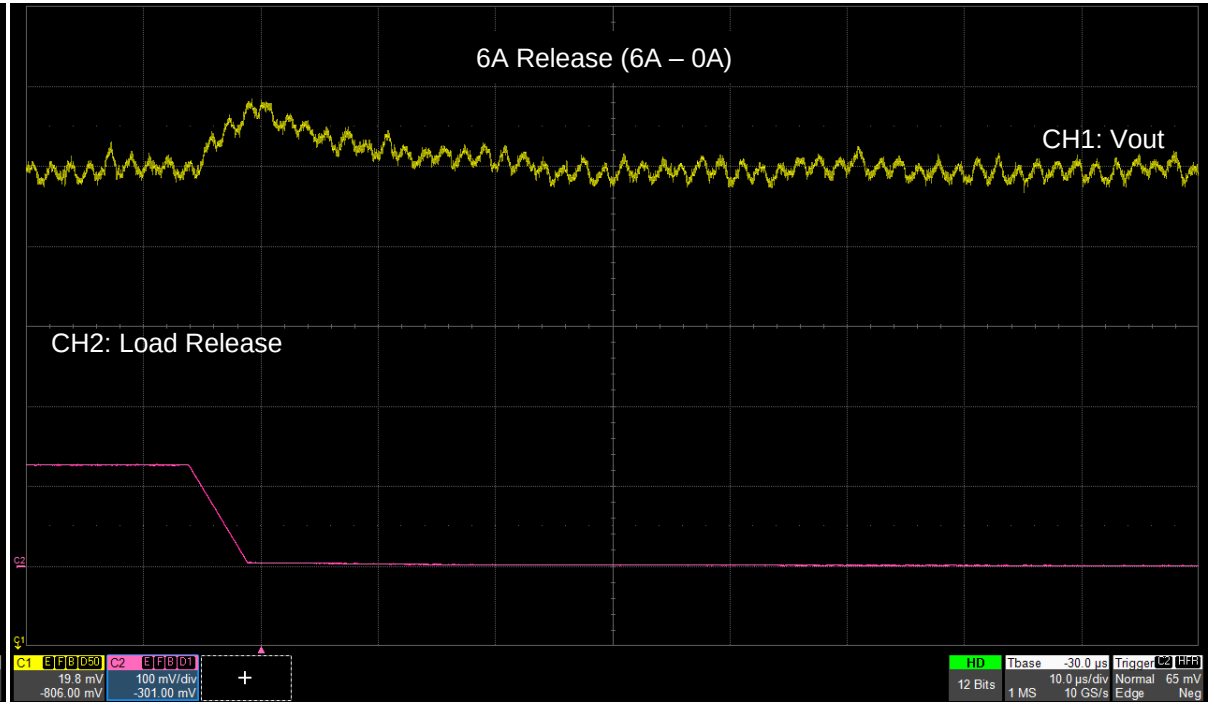


Vout Ripple is <10mVpkpk at both no load and 20A loads.

VCCBRAM – TRANSIENT RESULTS, 6A STEP

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration

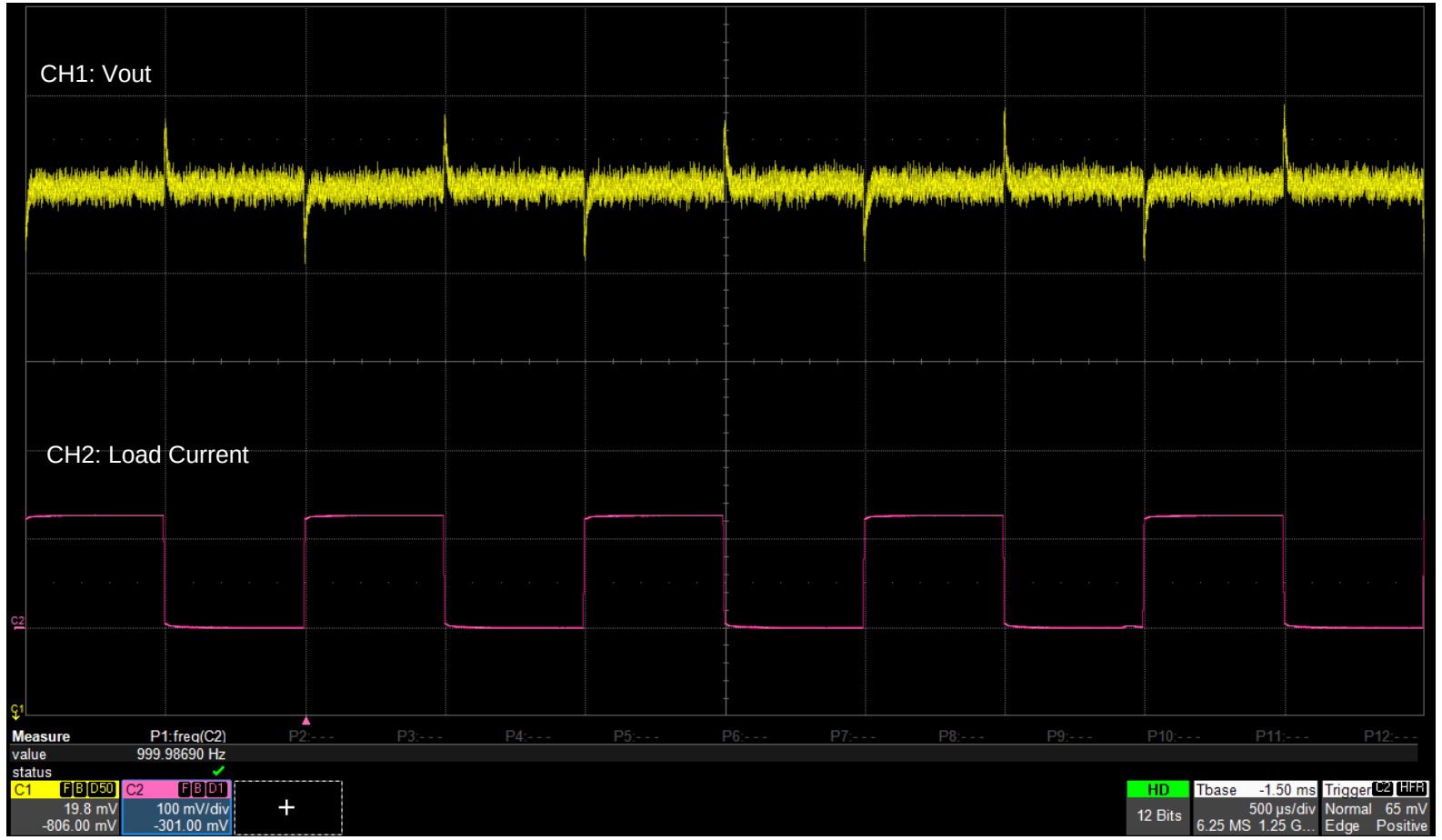




Deviation remains within 20mV from 6A load step.

VCCBRAM TRANSIENT RESPONSE, 1KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration



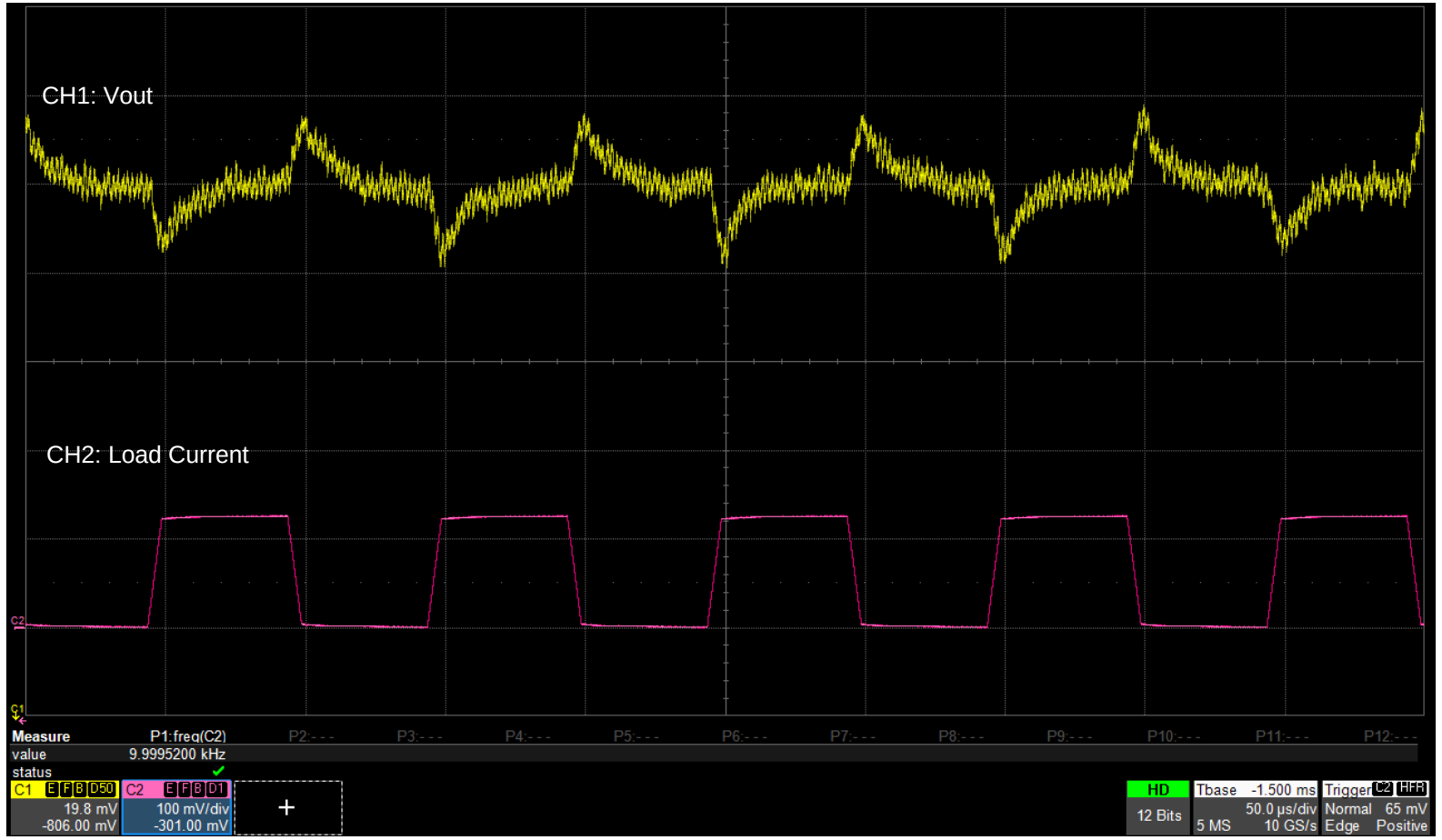
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
1PH Test Data
Diode Braking = Disabled

Load Step = 0A to 6A

VCCBRAM TRANSIENT RESPONSE, 10KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration



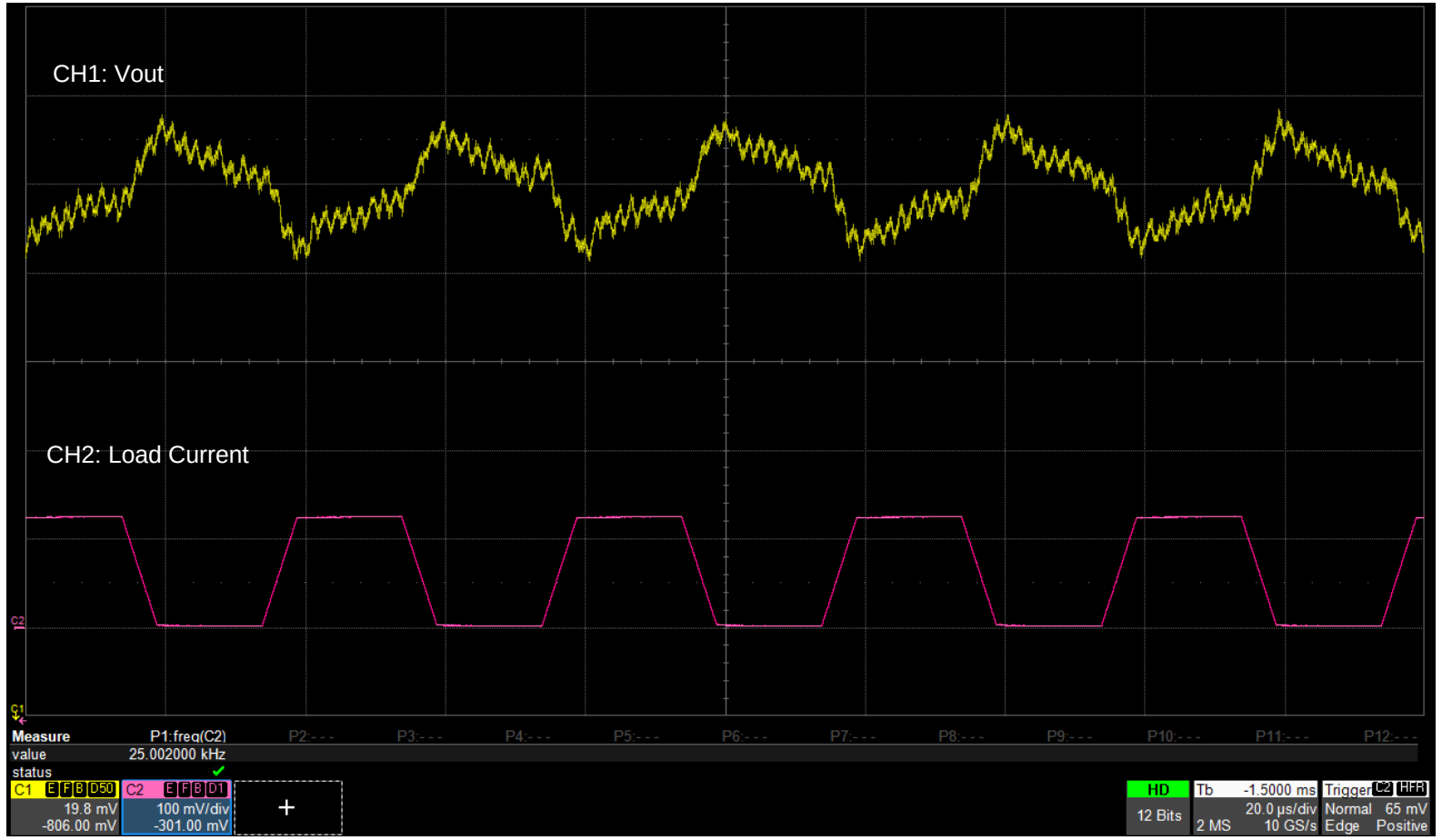
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
1PH Test Data
Diode Braking = Disabled

Load Step = 0A to 6A

VCCBRAM TRANSIENT RESPONSE, 25KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration



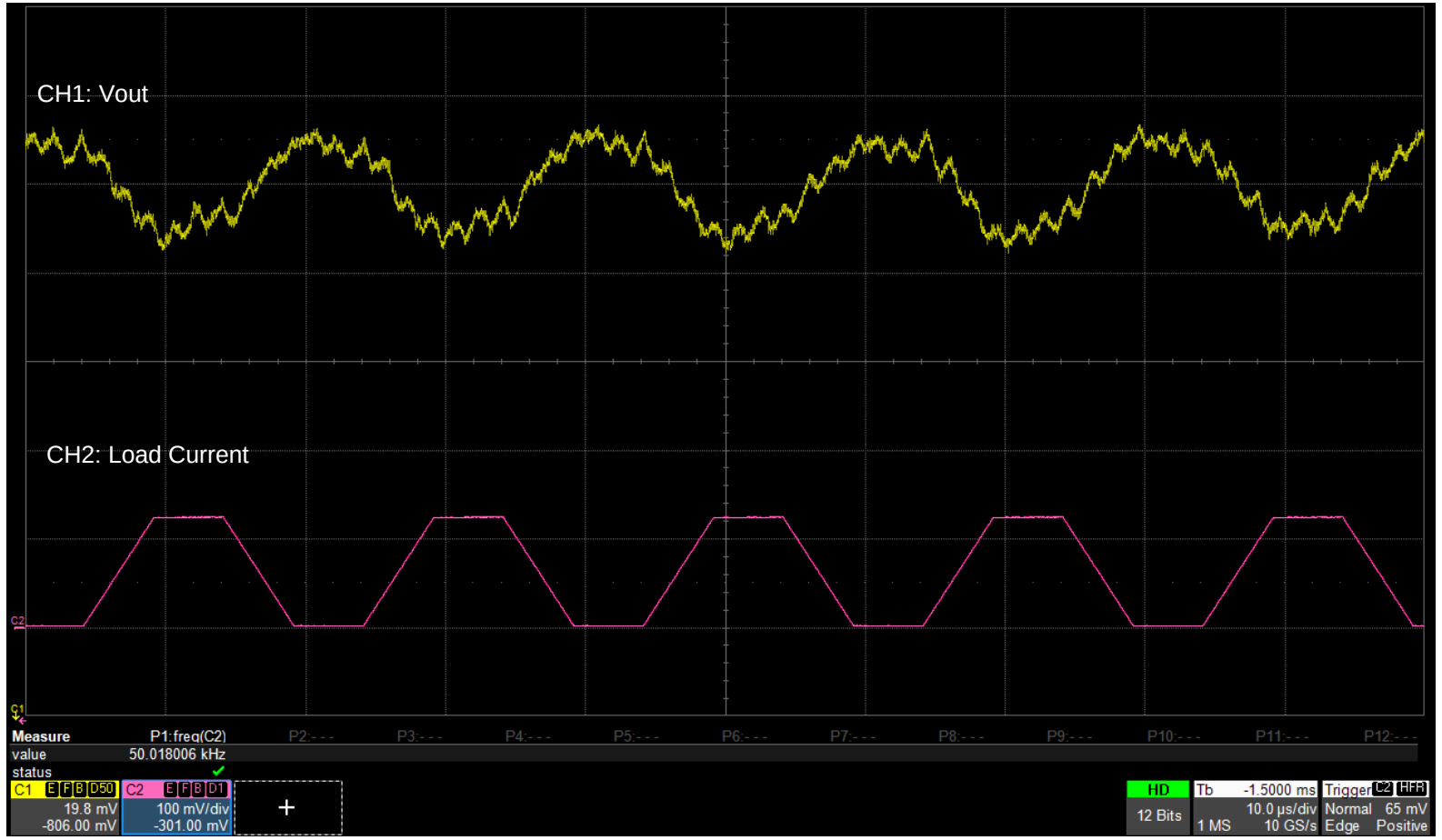
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
1PH Test Data
Diode Braking = Disabled

Load Step = 0A to 6A

VCCBRAM TRANSIENT RESPONSE, 50KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration



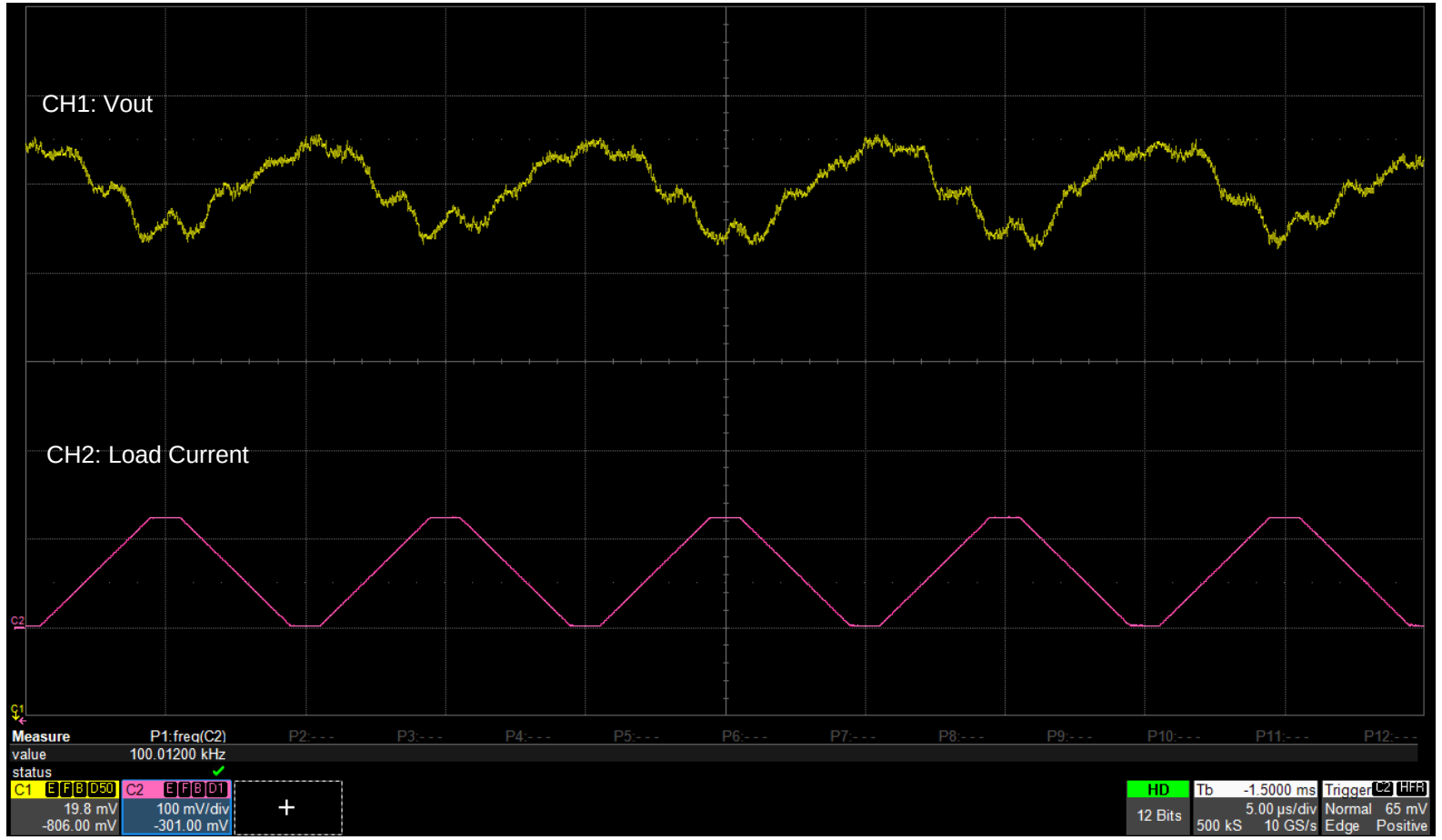
Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
1PH Test Data
Diode Braking = Disabled

Load Step = 0A to 6A

VCCBRAM TRANSIENT RESPONSE, 100KHZ 50% DUTY

Test Conditions:
Vin=12V, Vout=850mV,
Lout = 150nH, Fsw=500kHz,
1PH Configuration



Test Conditions

Vin = 12V
Vout = 0.850V
Fsw = 500kHz
1PH Test Data
Diode Braking = Disabled

Load Step = 0A to 6A

SUMMARY

SUMMARY

Transient testing and Vout ripple measurements completed on Xilinx VCU128 reference board.

BIG IDEAS FOR EVERY SPACE

Renesas.com