

HPA341 (UCC25600EVM) TEST REPORT (Rev 01)

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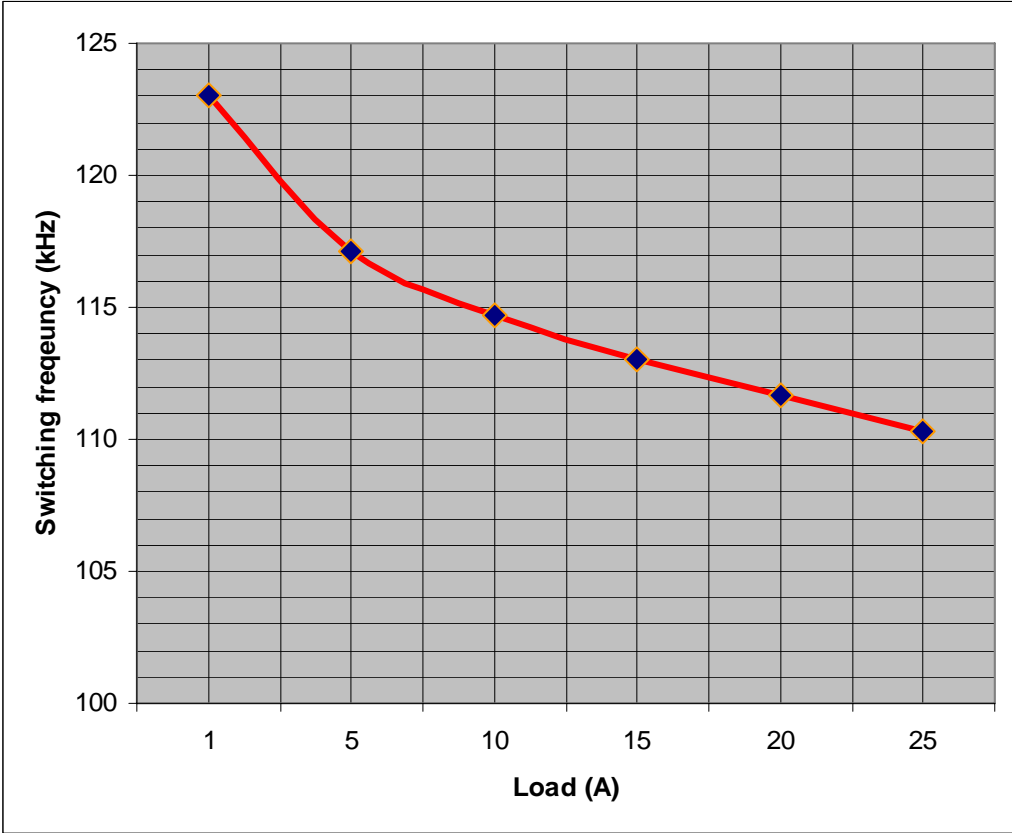
Equipment List

Techtronix, Oscilloscope, TDS640A
Fluke 45 Dual Display Multimeter
Electronic Load, TDI RBL 488 50-150-800
Voltage Source: HP 6051

Module Setup

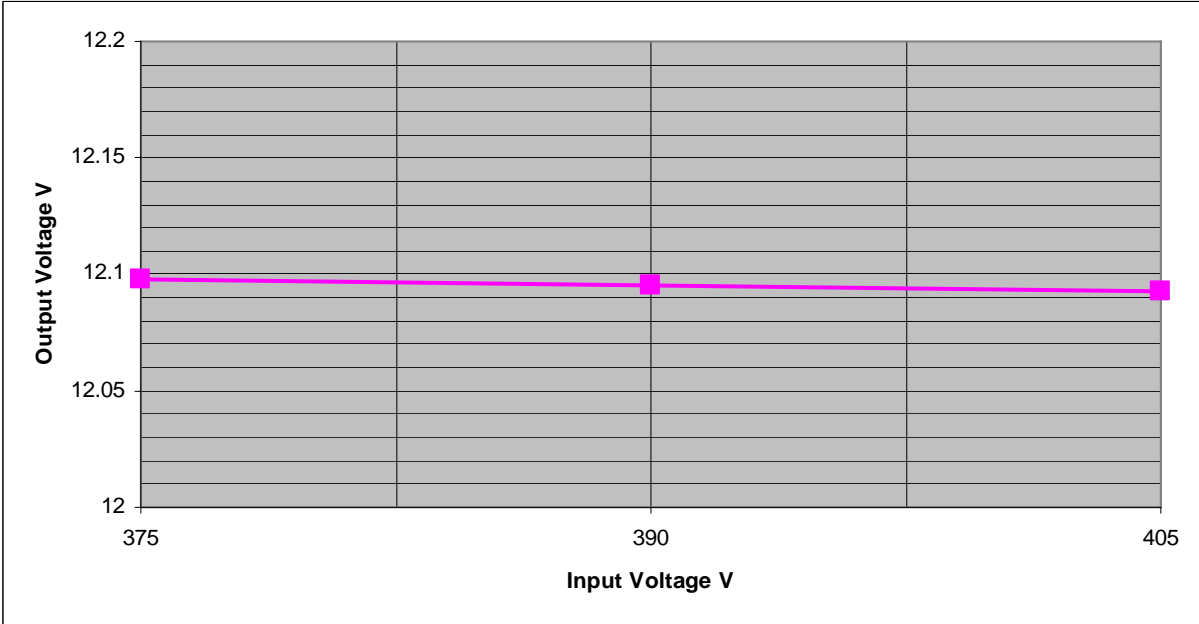
1. none

Switching Frequency Variation with Load



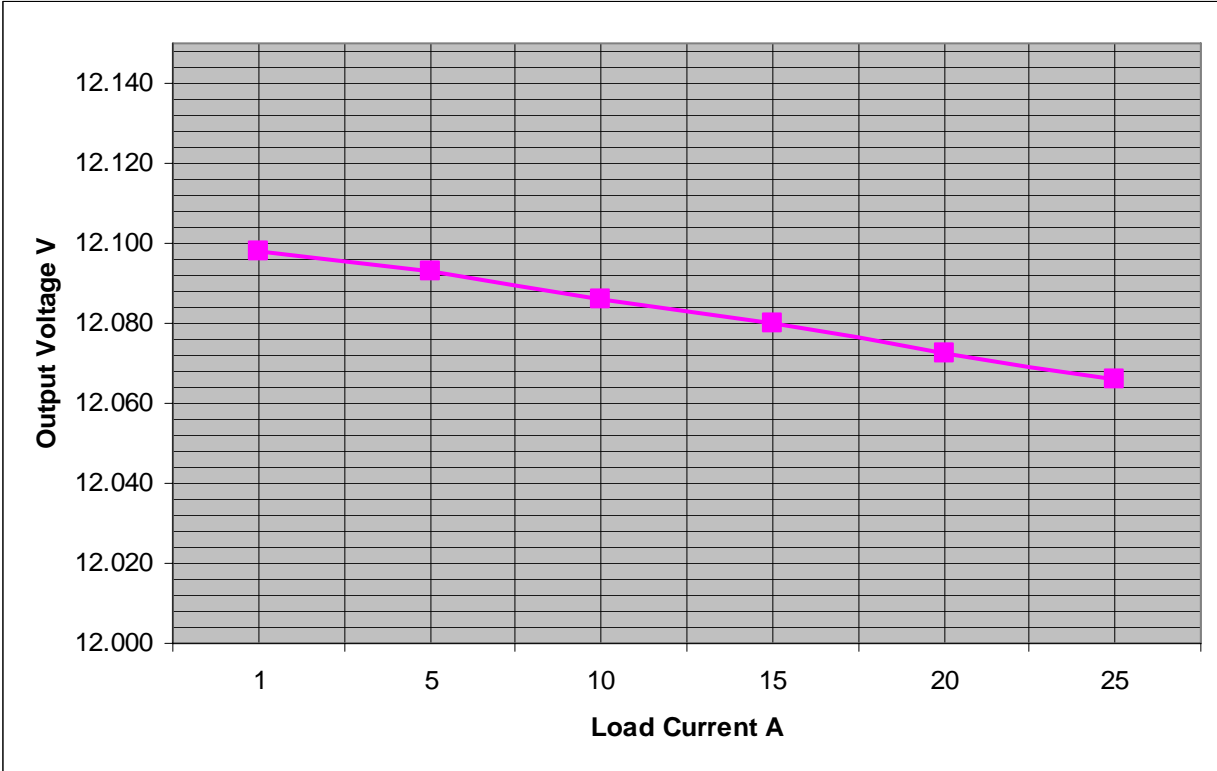
Vin = 390Vdc

Line Regulation



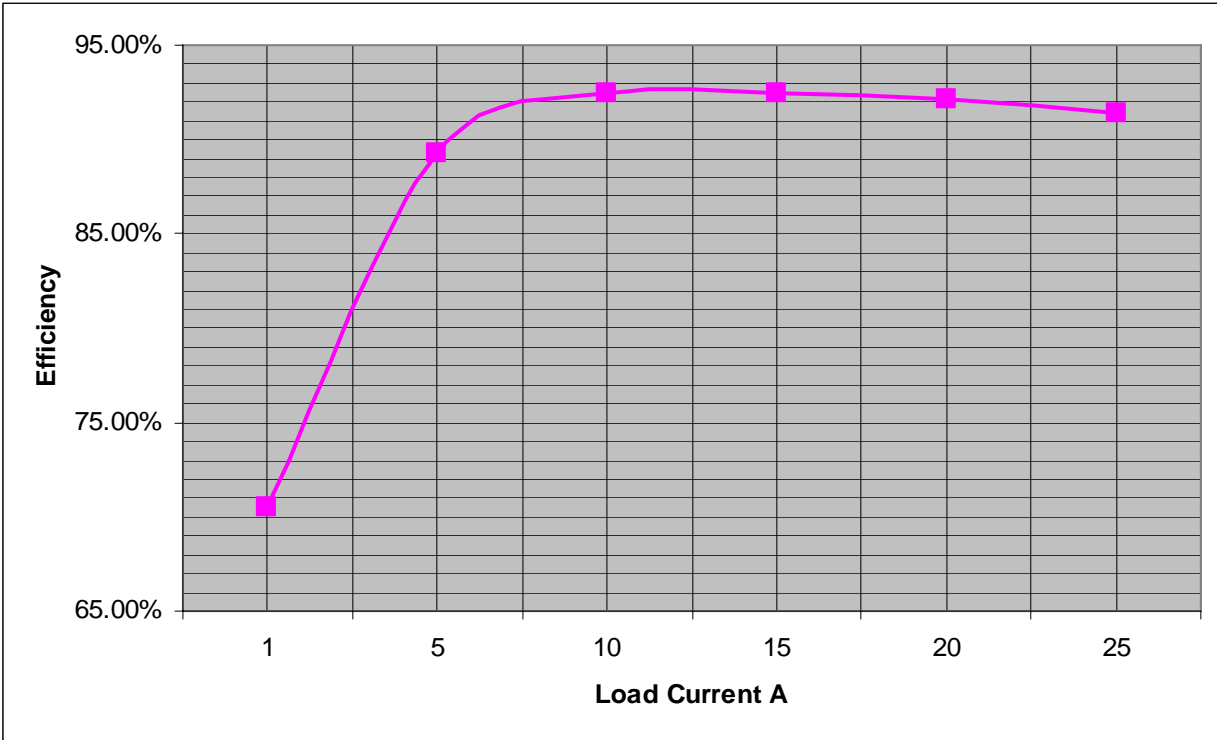
$I_o = 1A$

Load Regulation



$V_{in} = 390V_{dc}$

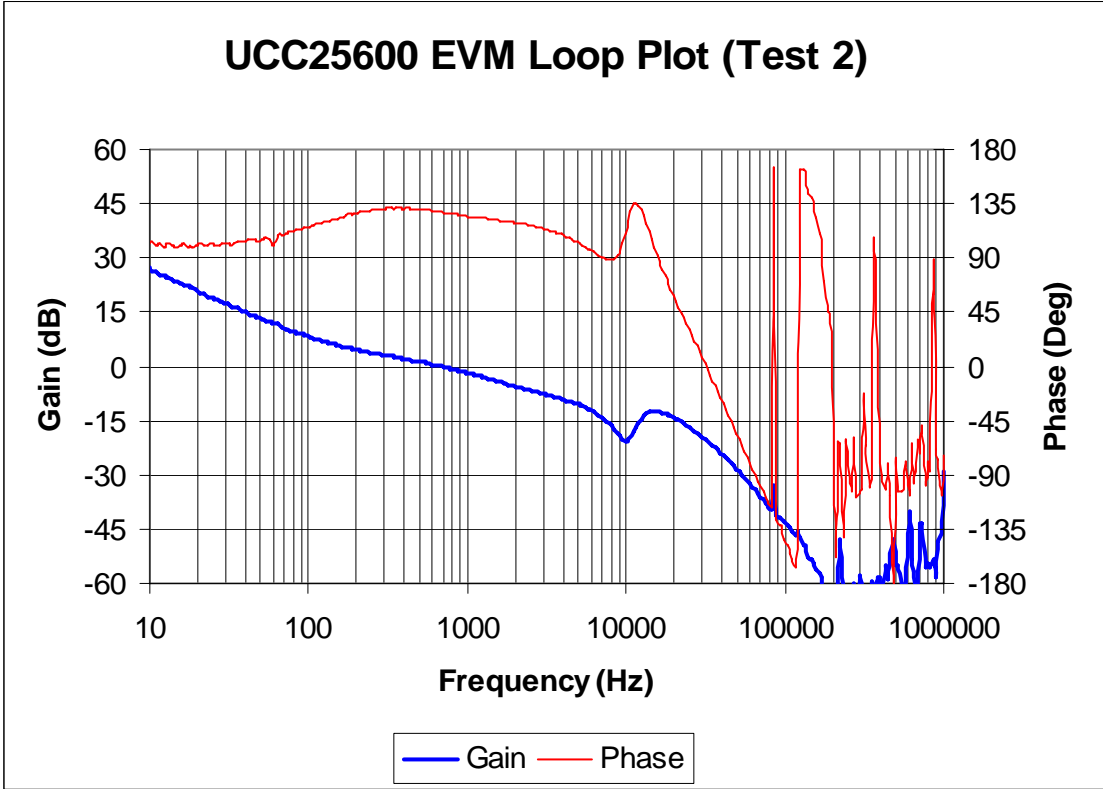
Efficiency



Vin = 390Vdc

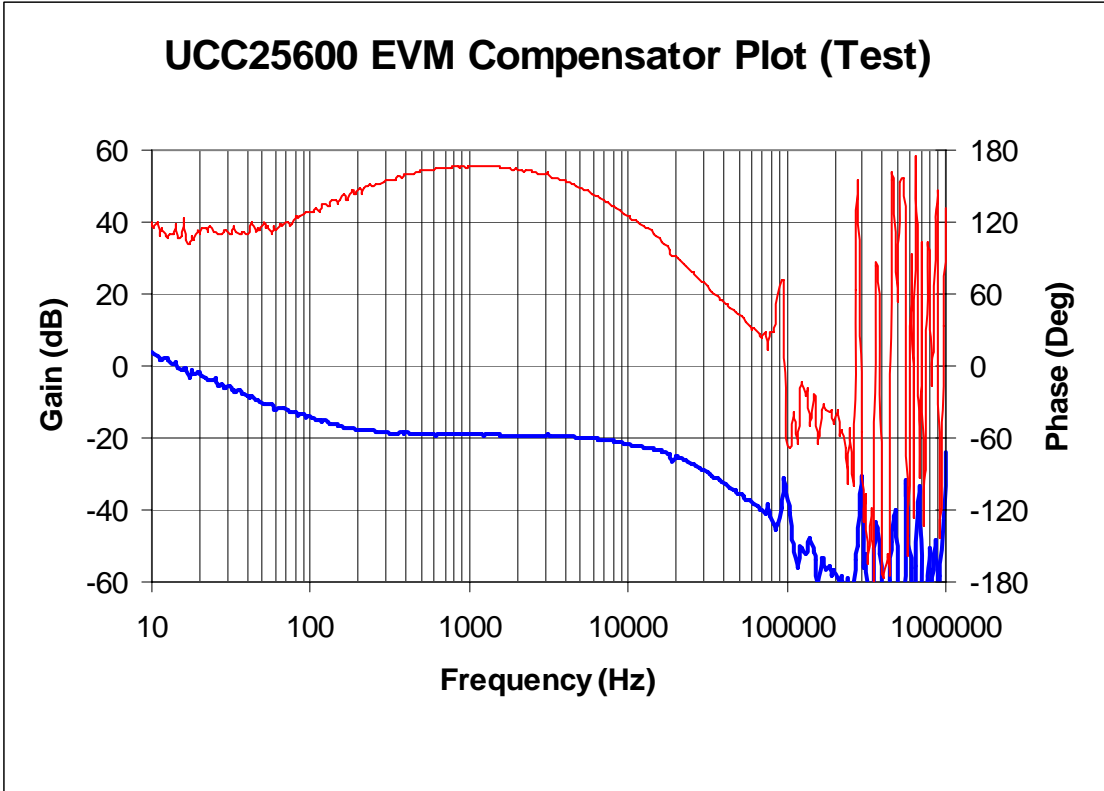
Bode Plots

Full System



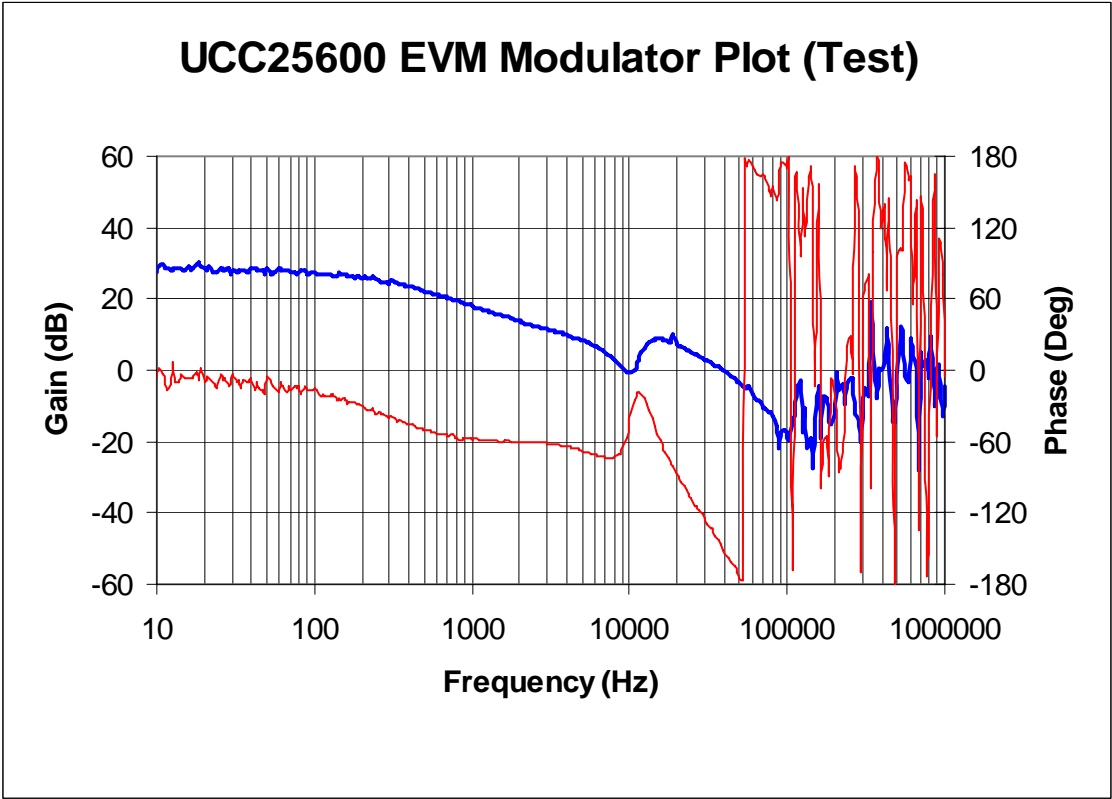
Note: $V_{in} = 390V$, $I_o = 1A$

Compensator



Note: $V_{in} = 390V$, $I_o = 1A$

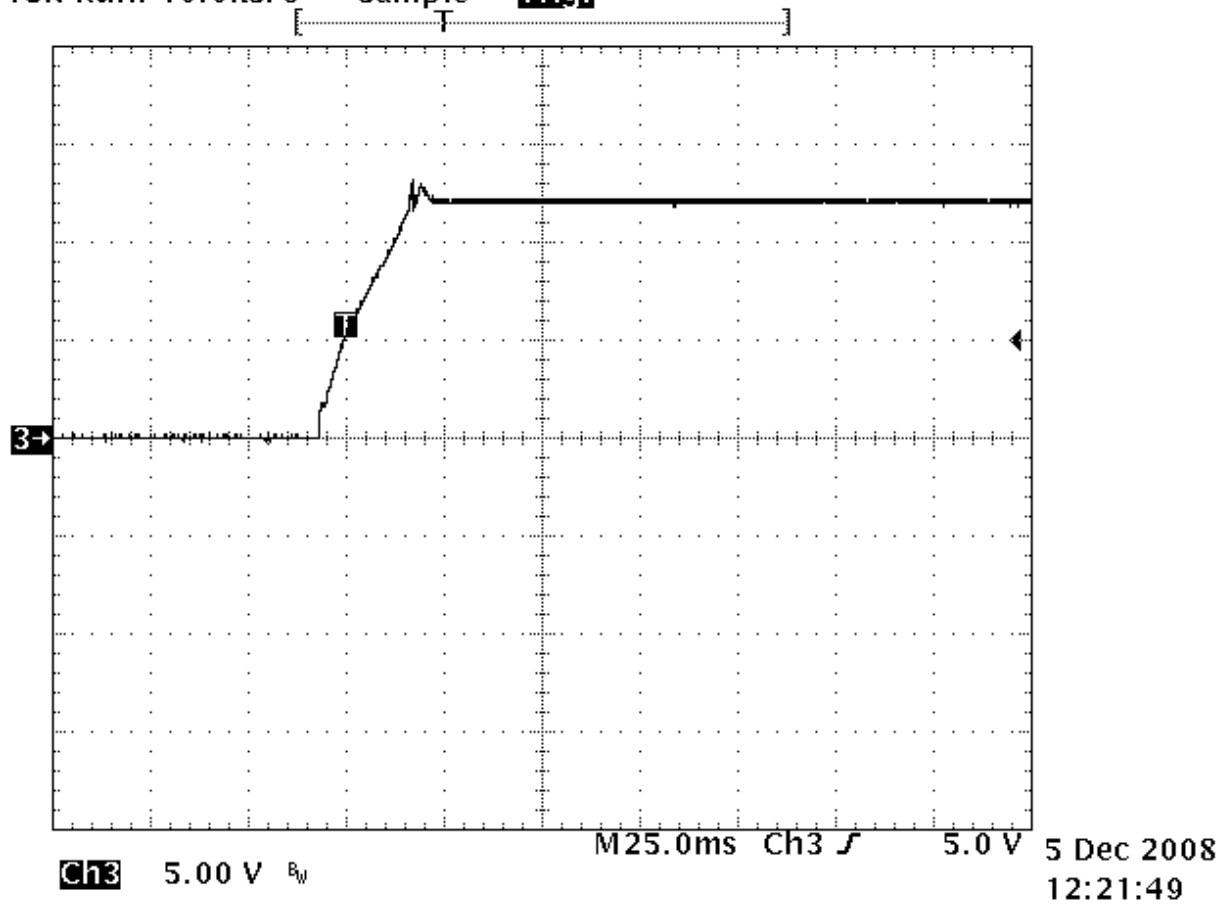
Modulator



Note: $V_{in} = 390V$, $I_o = 1A$

Output Voltage Turn On

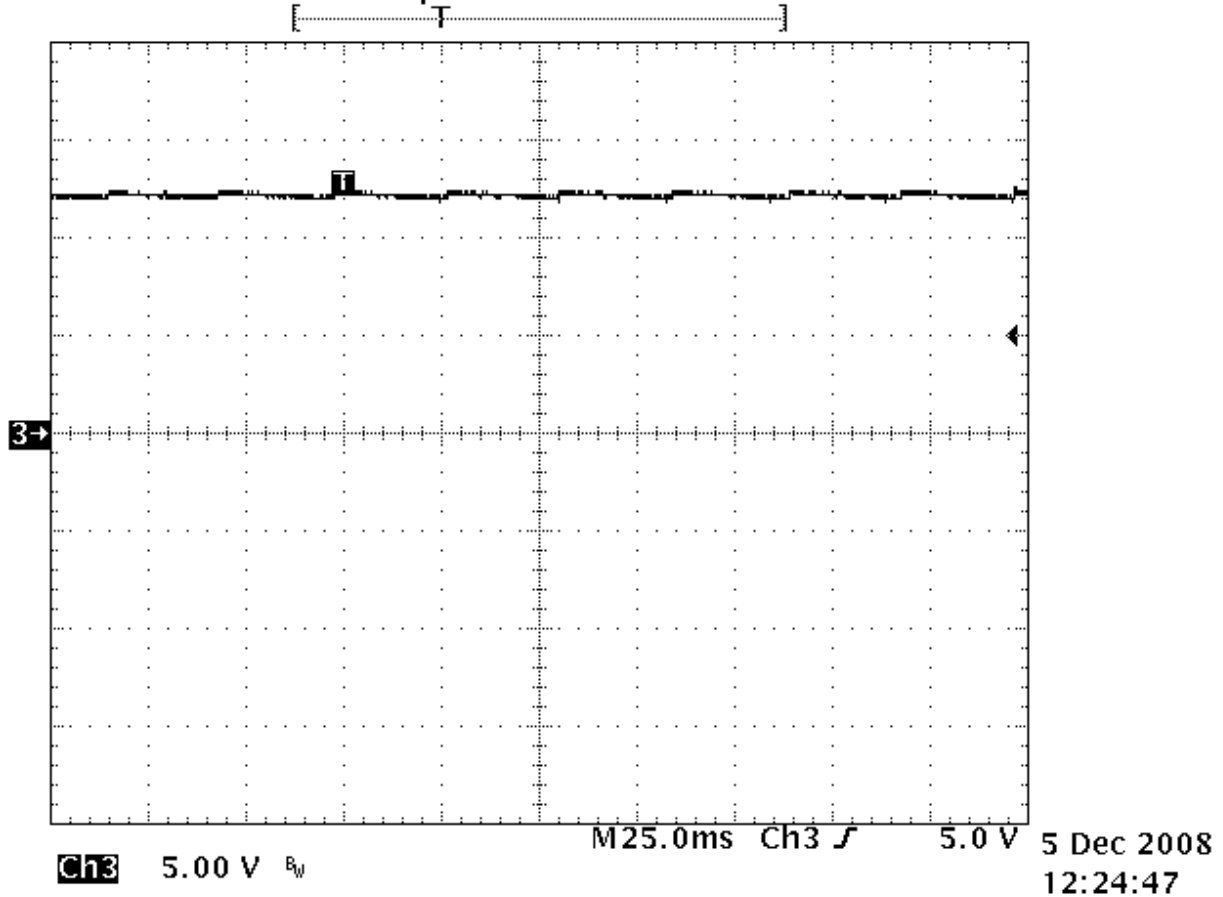
Tek Run: 10.0kS/s Sample **1192**



Note: $V_{in} = 390V$, $I_o = 25A$

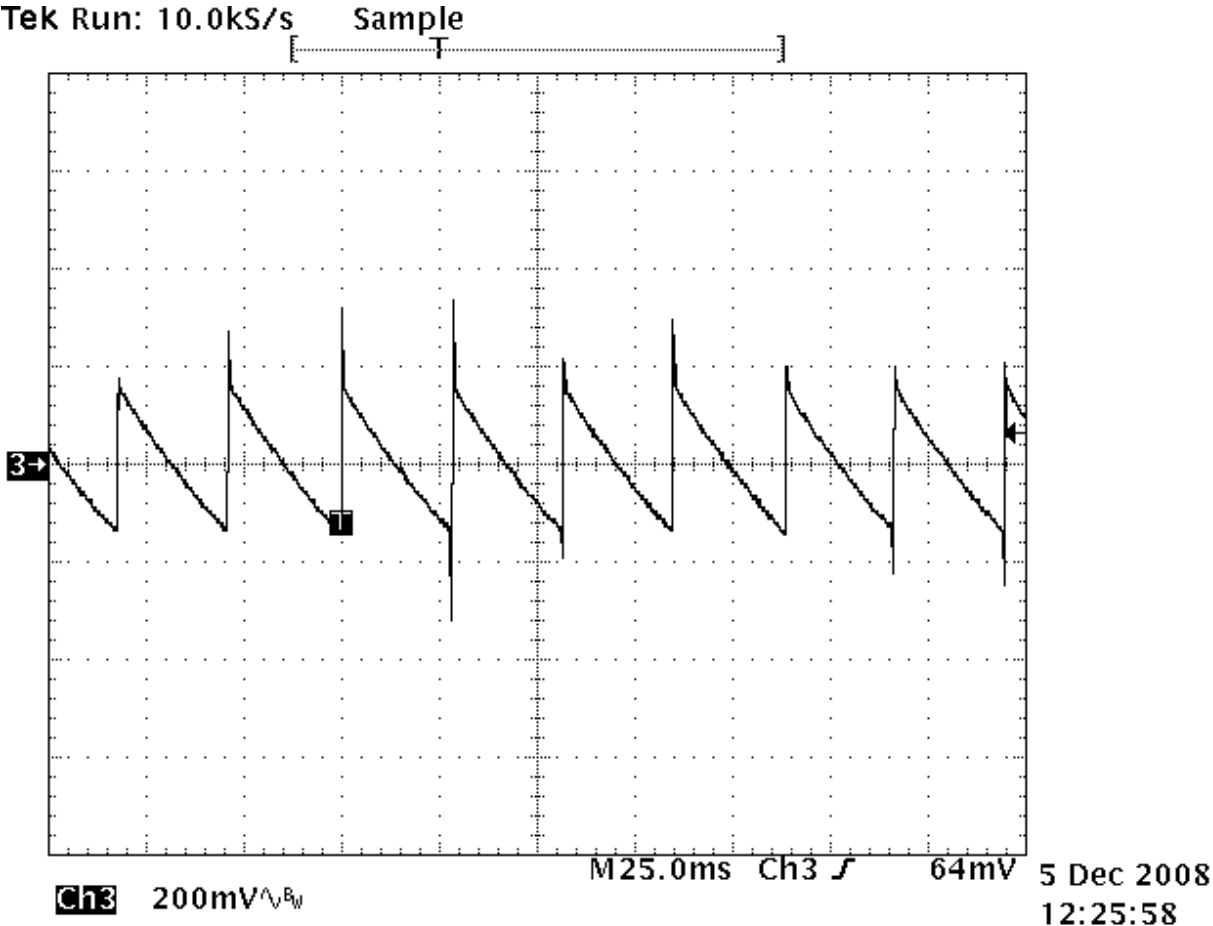
Output voltage in burst operation

Tek Run: 10.0kS/s Sample



Note: $V_{in} = 390V$, $I_o = 0A$

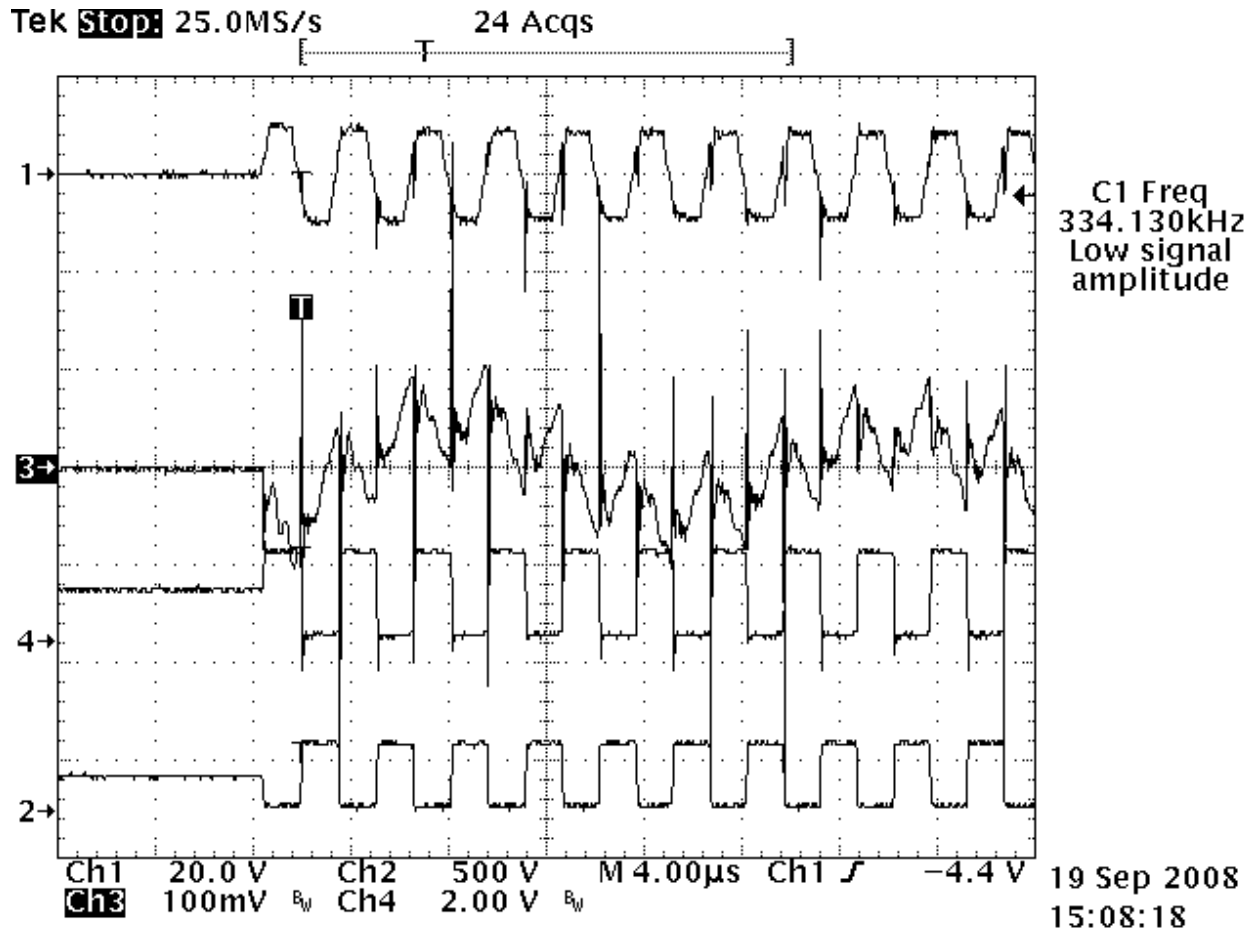
Output Voltage in Burst Operation (Zoom-in)



Note: $V_{in} = 390V$, $I_o = 0A$

$V_{in} = 390V$, burst operation depends on how light load is achieved. At light load the operation may be in burst or may be in output voltage over voltage protection. If OVP, output voltage stays at about 13.1V.

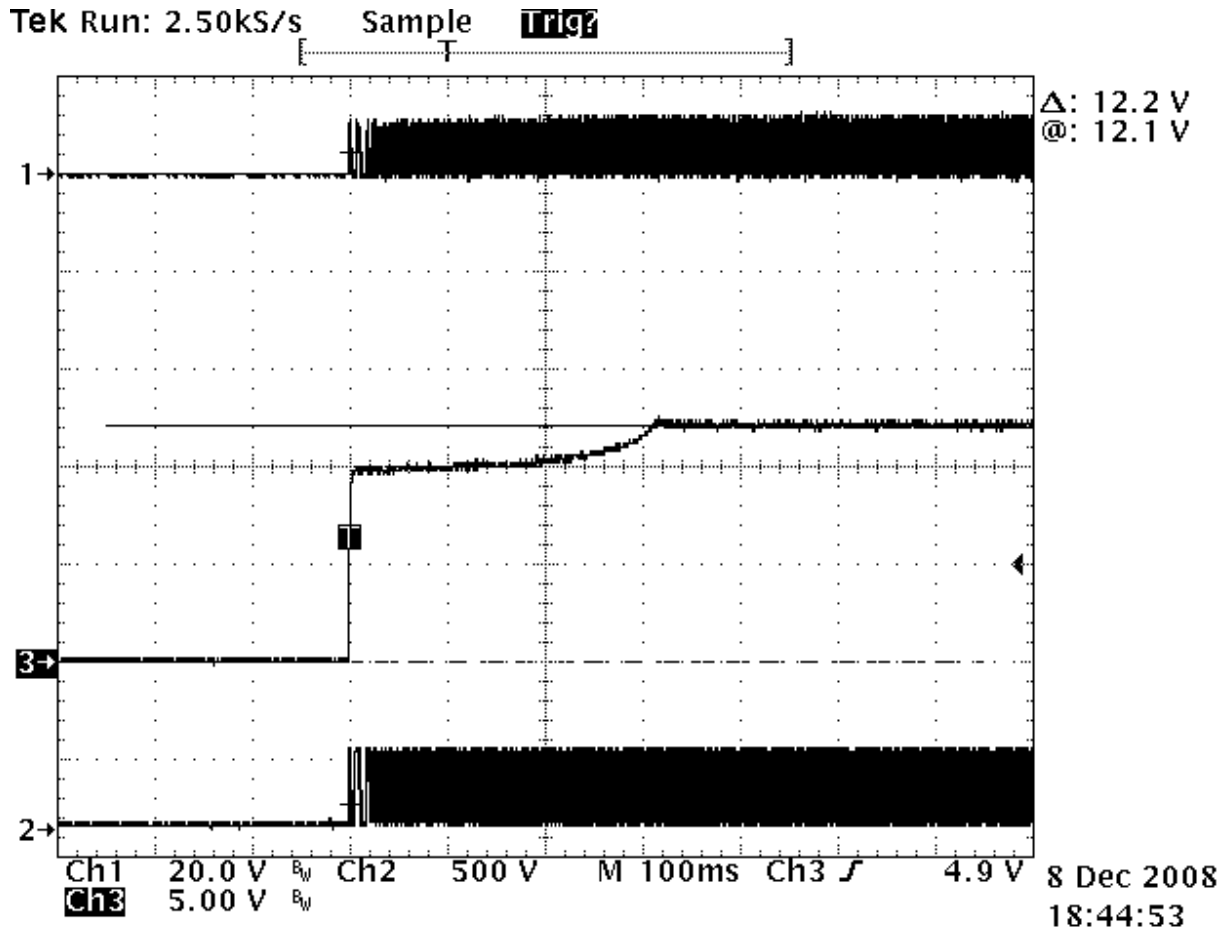
Waveforms of Burst Operation on the Primary-side



CH1 = Vds of Q6
 CH3 = resonant tank current
 CH4 = GD1
 CH2 = GD2

$V_{in} = 390V, I_o < 0.5A$

Output voltage with different soft start time

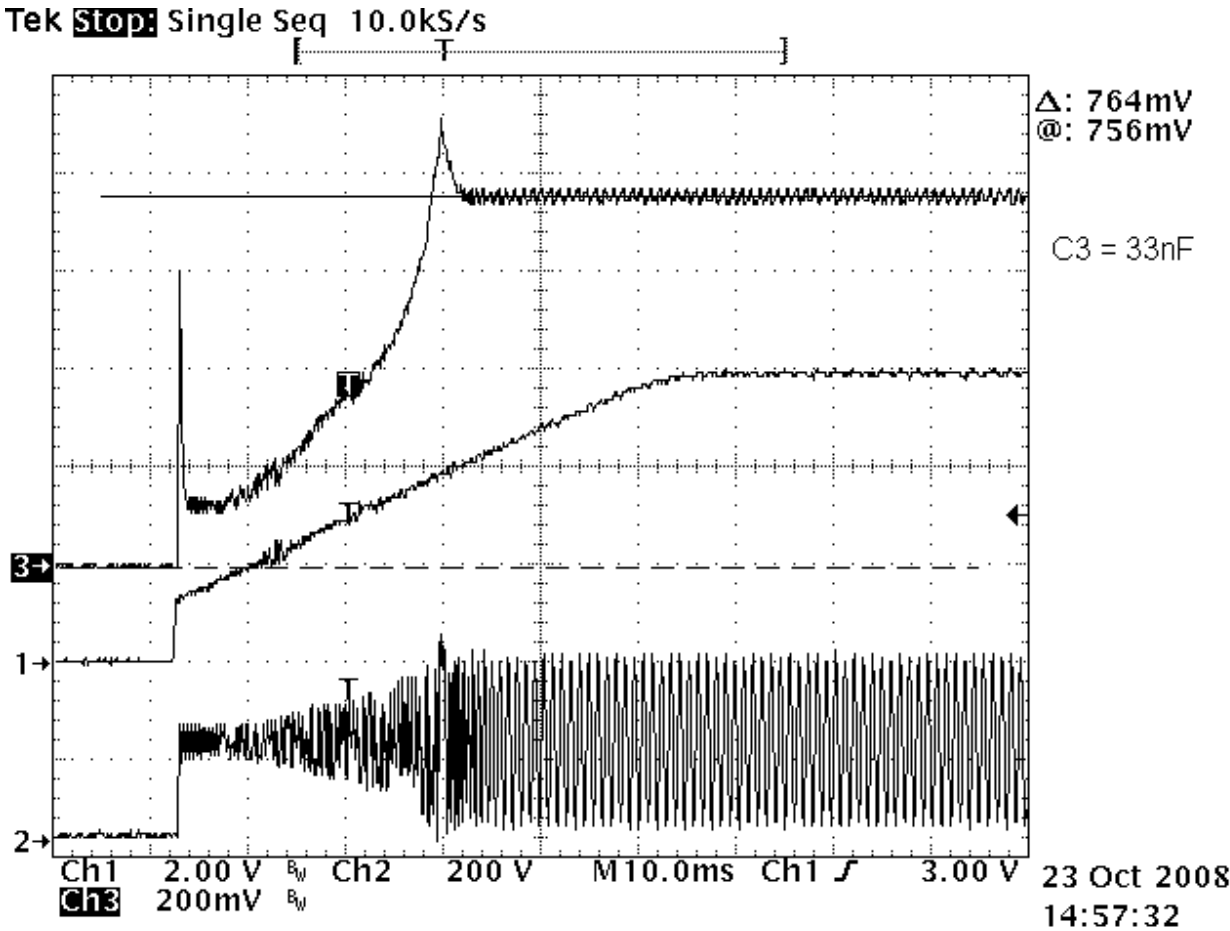


$C_{ss} = 1\mu\text{F}$, output voltage (CH3) presents long climbing while no V_o OVP showing. But at light load (1A or less), the primary two MOSFETs were destroyed by OVP. The long ss time may leave resonant cap voltage to reach a higher value than MOSFETs V_{ds} breakdown.

If $C_{ss} = 47\text{nF}$, no MOSFETs (Q5 and Q6) voltage breakdown failure at V_o OVP.

High temperature was observed on Q5 and Q6 during hiccup and V_o OVP when the secondary uses SR. With secondary diodes, Q5 and Q6 temperature at room temperature ambient is about 30C to 35C with 400LFM airflow cooling.

Load Current Sensing, Soft Start and Vds of Q6 (1)



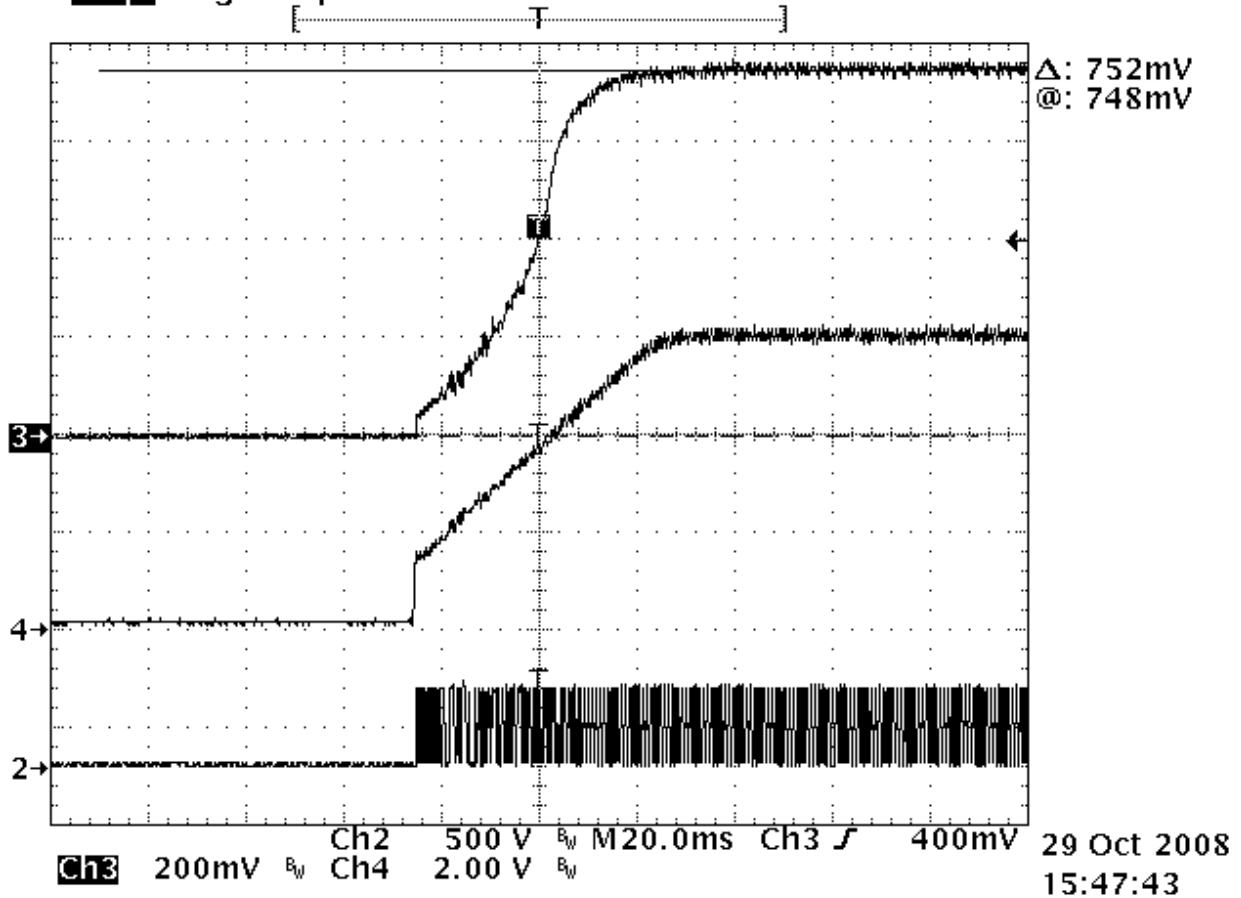
CH3: Load current sensing signal (TP17)
 CH4: Soft start pin
 CH3: Vds of Q6

Vin = 390V, Io = 25A

Note: C3 = 33 nF not effectively filtering out current sensing spike at start and may cause false triggering OCP at start.

Load Current Sensing, Soft Start and Vds of Q6 (2)

Tek **Stop:** Single Seq 5.00kS/s



CH3: Load current sensing signal (TP17)

CH4: Soft start pin

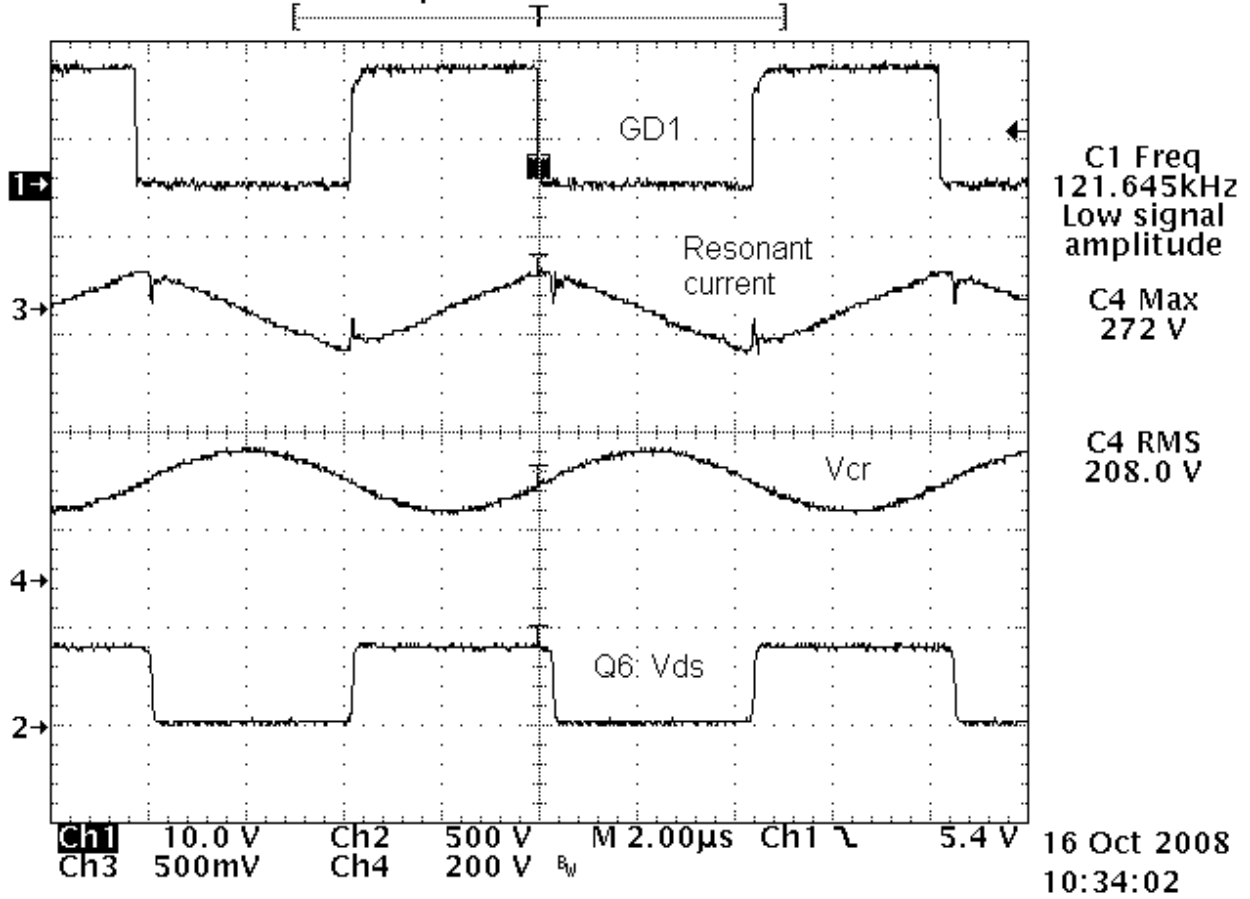
CH3: Vds of Q6

$V_{in} = 390V$, $I_o = 25A$

Note: $C_3 = 1.0 \mu F$ to effective filtering out current sensing spike at start.

Waveforms of Resonant Tank (Labels)

Tek Run: 50.0MS/s Sample

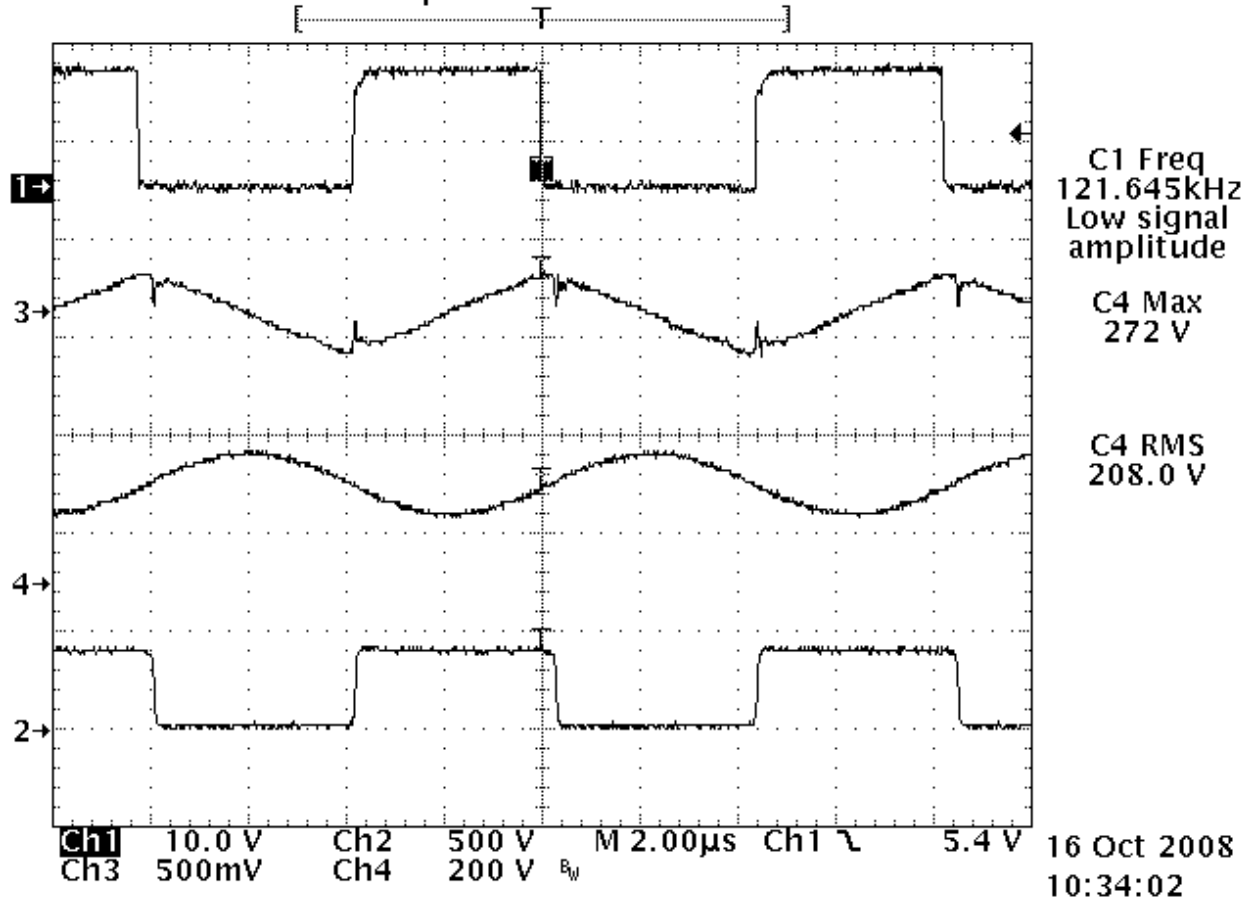


- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

Vin = 390V

Waveforms of Resonant Tank (Load = 1A)

Tek Run: 50.0MS/s Sample



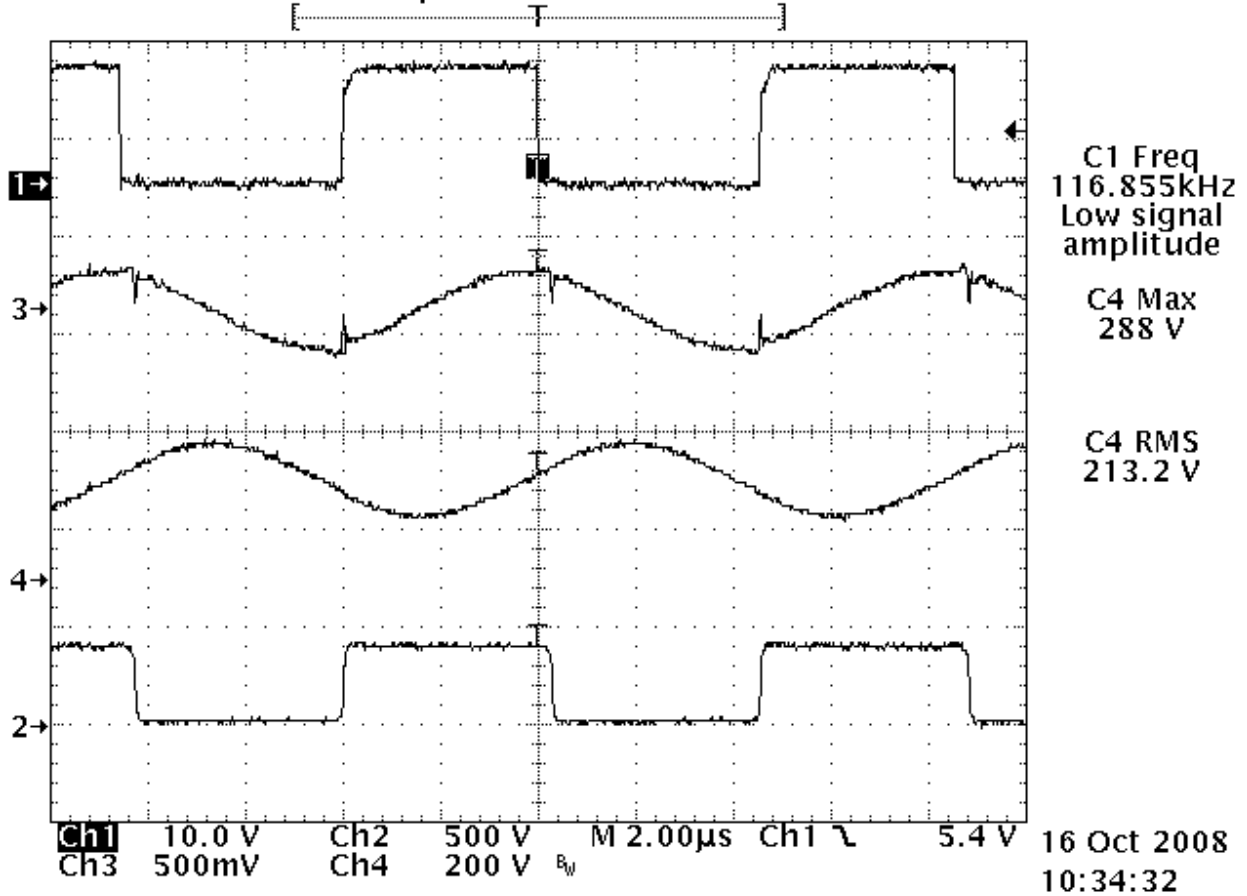
Note:

- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 V_{ds}

V_{in} = 390V

Waveforms of Resonant Tank (Load = 5A)

Tek Run: 50.0MS/s Sample

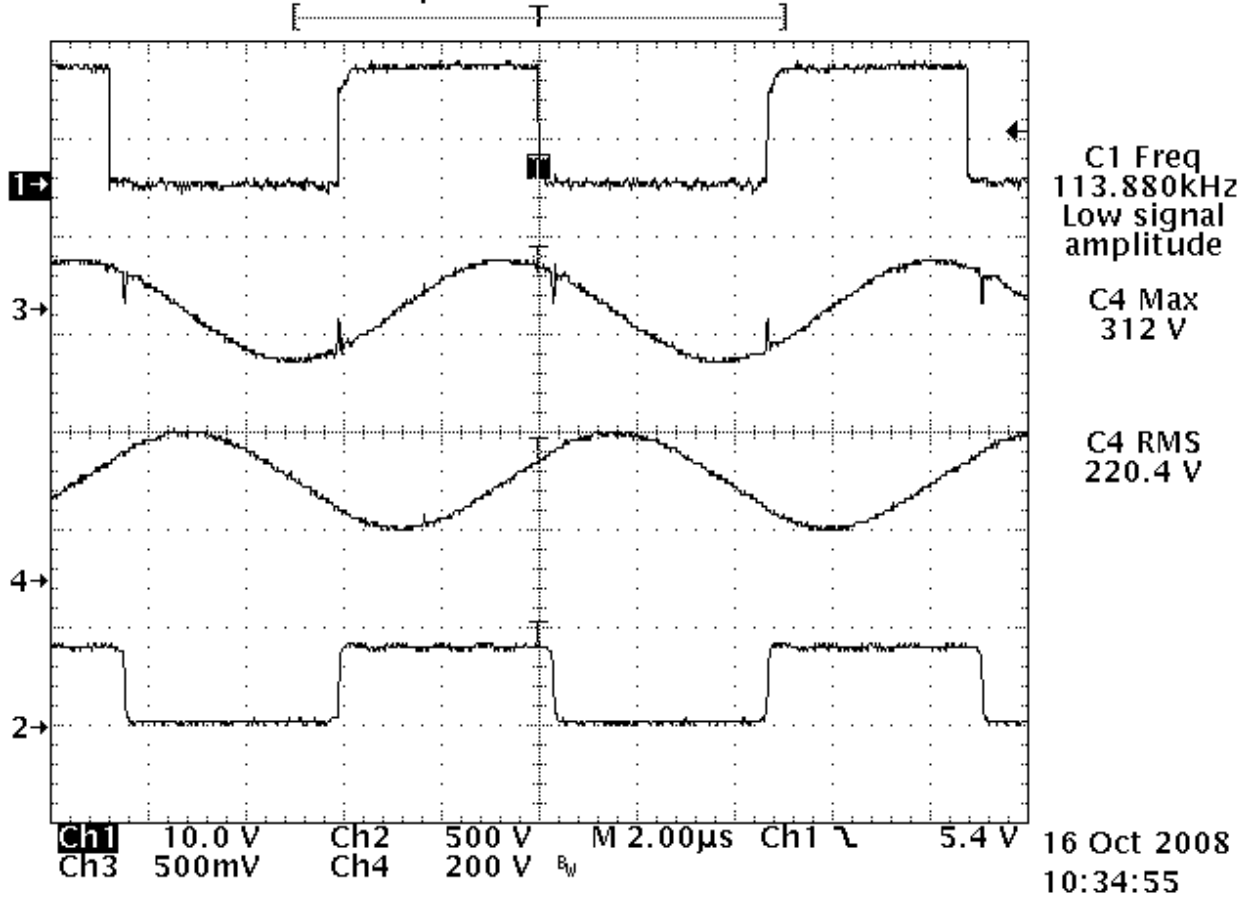


- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

Vin = 390V

Waveforms of Resonant Tank (Load = 10A)

Tek Run: 50.0MS/s Sample

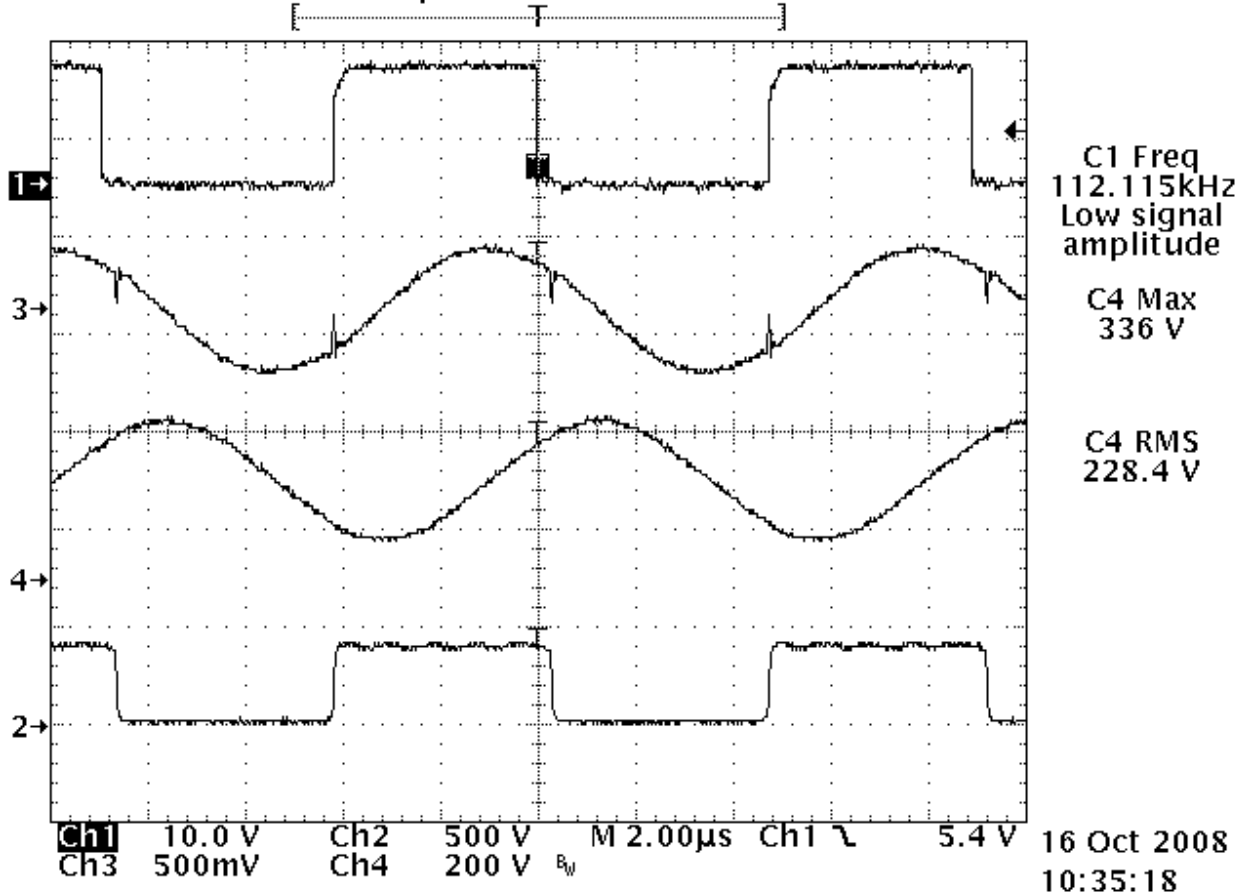


- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

Vin = 390V

Waveforms of Resonant Tank (Load = 15A)

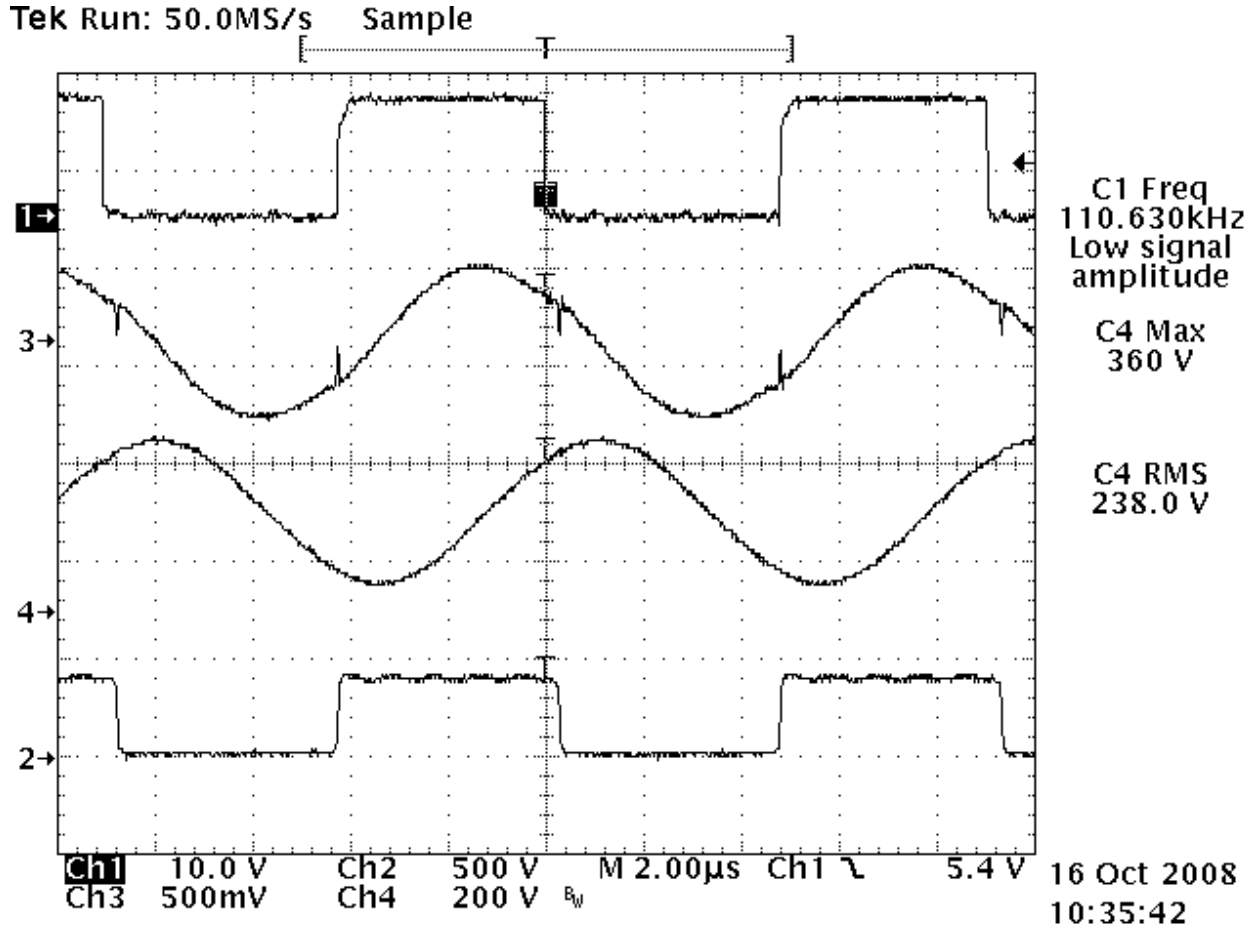
Tek Run: 50.0MS/s Sample



- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

Vin = 390V

Waveforms of Resonant Tank (Load = 20A)

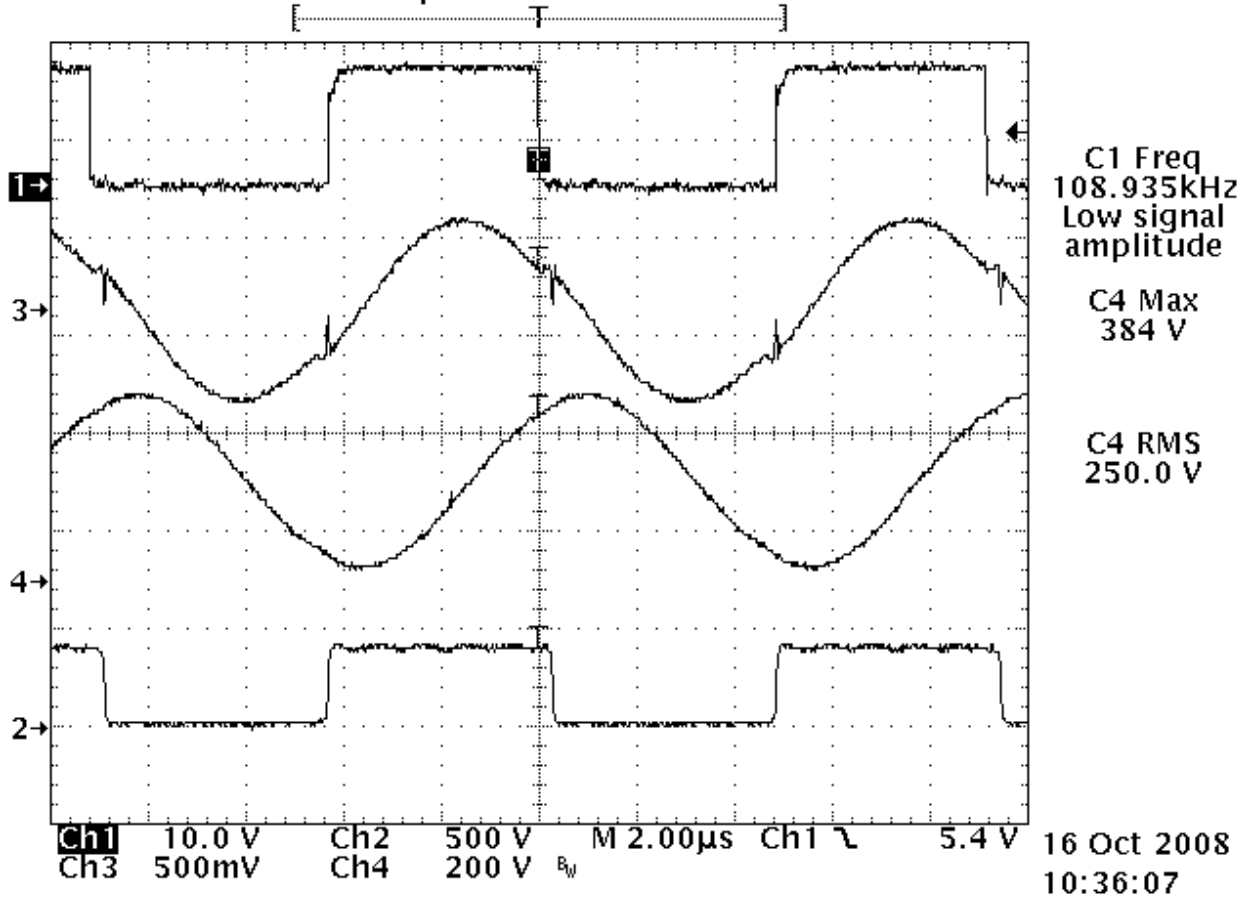


- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

$V_{in} = 390V$

Waveforms of Resonant Tank (Load = 25A)

Tek Run: 50.0MS/s Sample

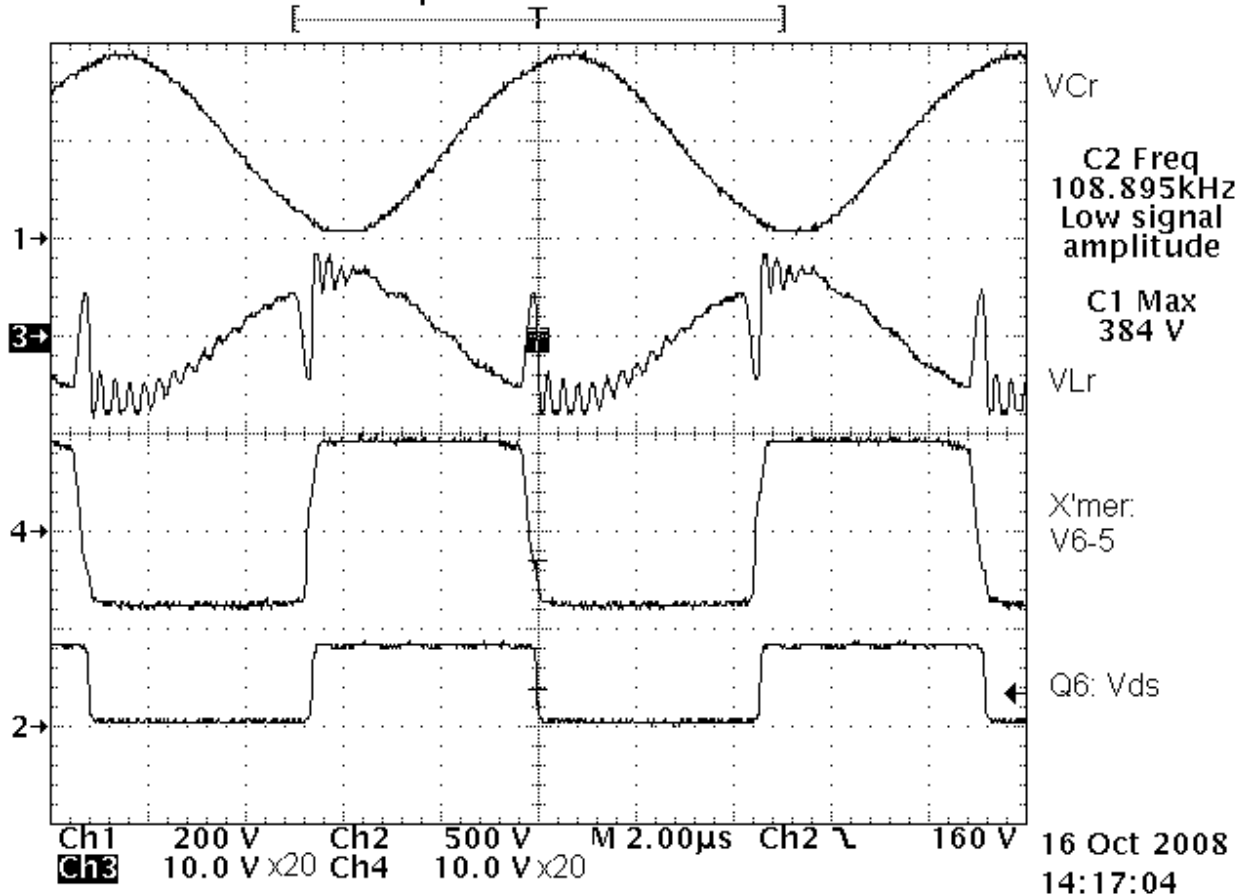


- CH1 = IC GD1-pin
- CH3 = Resonant tank current
- CH4 = Resonant capacitor voltage
- CH2 = Q6 Vds

V_{in} = 390V

Waveform of primary-side voltages (label)

Tek Run: 50.0MS/s Sample

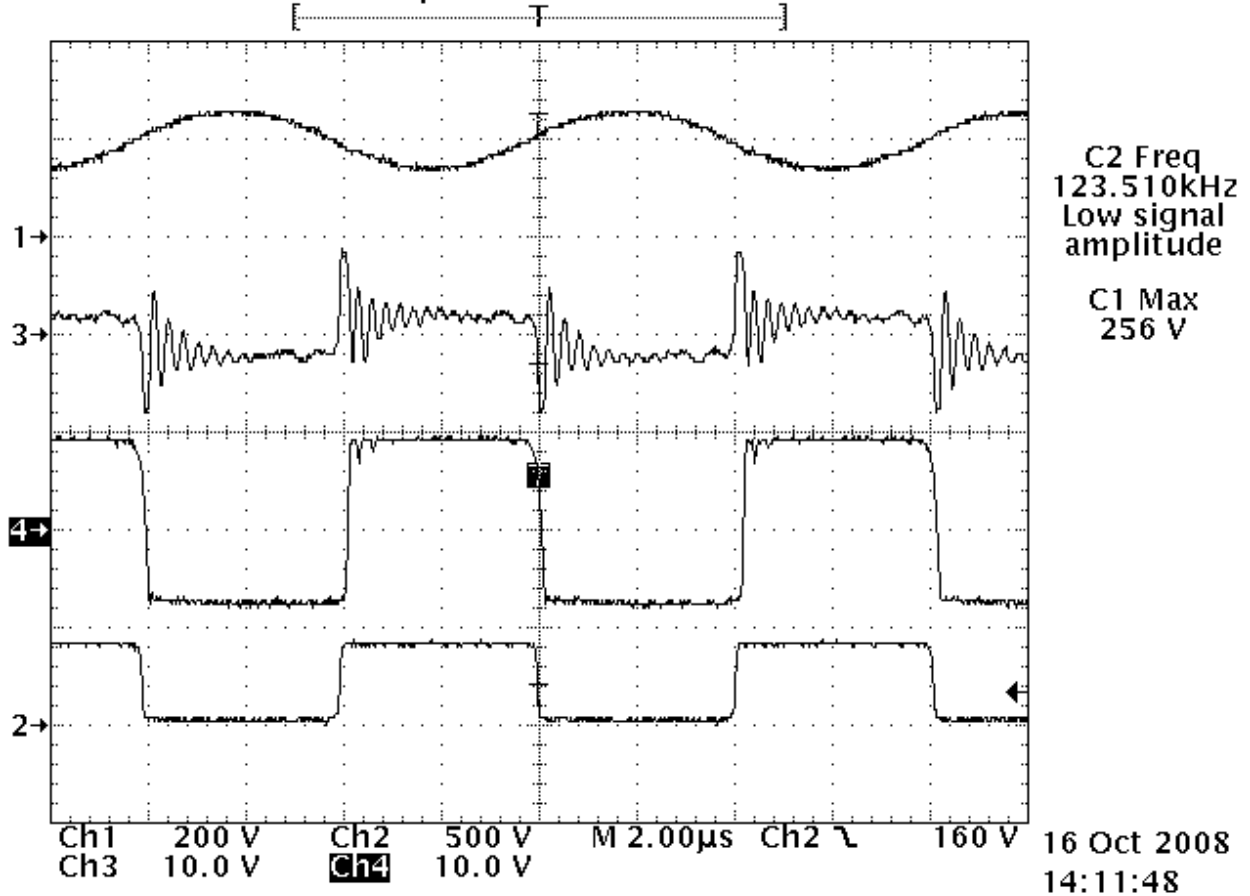


- CH1 = Voltage of resonant capacitor (Cr)
- CH3 = Voltage of resonant inductor (Lr)
- CH4 = Voltage of transformer primary winding
- CH2 = Voltage of Q6 Vds

Vin = 390V

Waveform of primary-side voltages (1A)

Tek Run: 50.0MS/s Sample

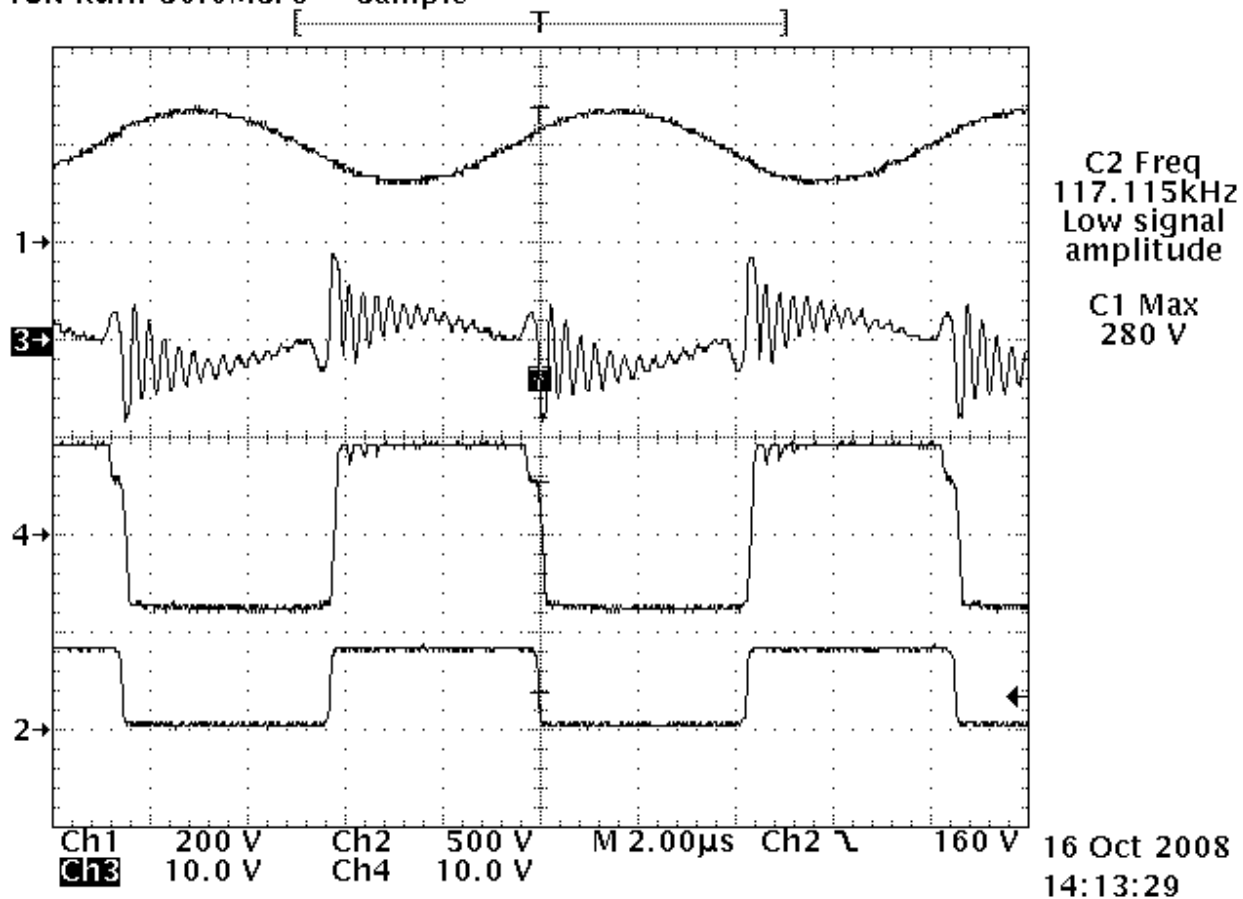


- CH1 = Voltage of resonant capacitor (Cr)
- CH3 = Voltage of resonant inductor (Lr)
- CH4 = Voltage of transformer primary winding
- CH2 = Voltage of Q6 Vds

Vin = 390V

Waveform of primary-side voltages (5A)

Tek Run: 50.0MS/s Sample

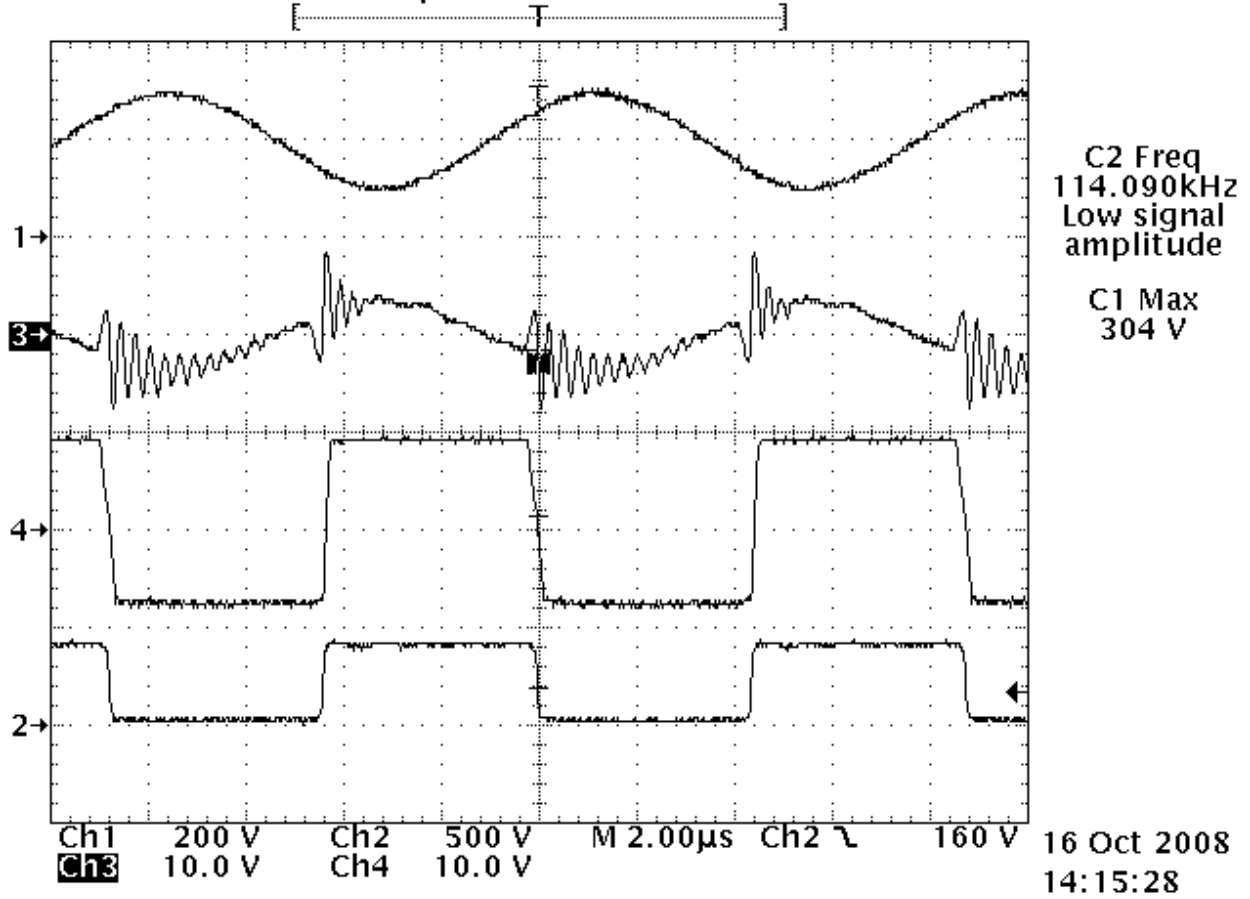


CH1 = Voltage of resonant capacitor (Cr)
CH3 = Voltage of resonant inductor (Lr)
CH4 = Voltage of transformer primary winding
CH2 = Voltage of Q6 Vds

V_{in} = 390V

Waveform of primary-side voltages (10A)

Tek Run: 50.0MS/s Sample

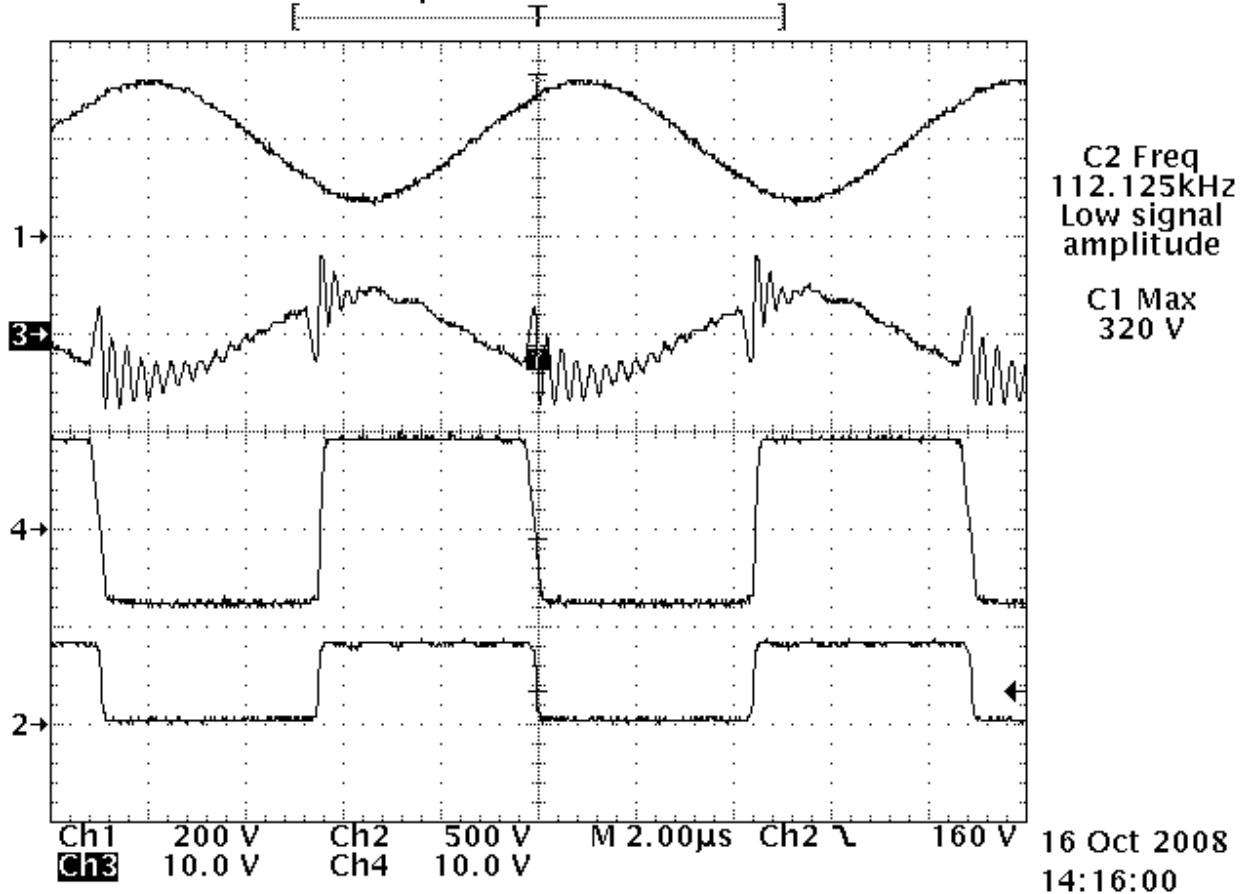


- CH1 = Voltage of resonant capacitor (Cr)
- CH3 = Voltage of resonant inductor (Lr)
- CH4 = Voltage of transformer primary winding
- CH2 = Voltage of Q6 Vds

Vin = 390V

Waveform of primary-side voltages (15A)

Tek Run: 50.0MS/s Sample

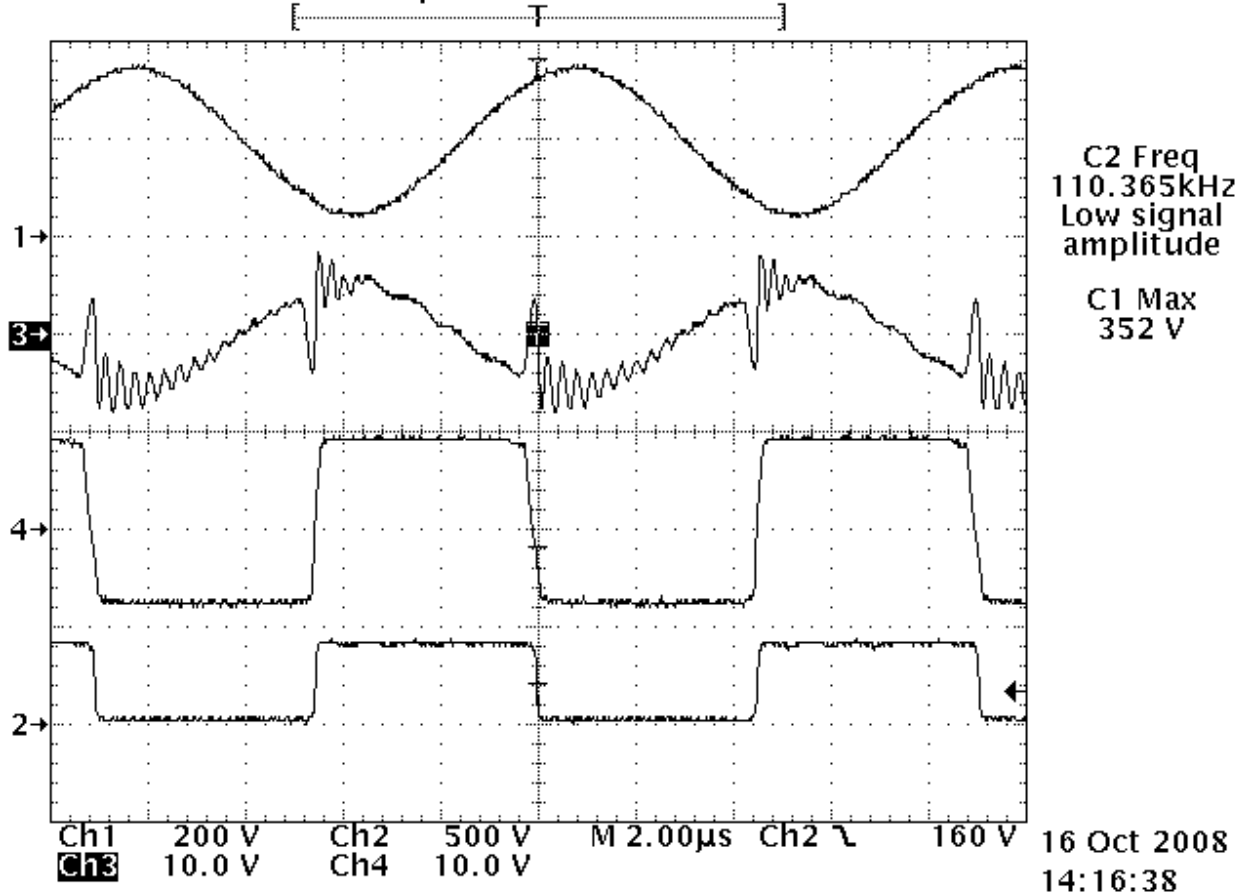


- CH1 = Voltage of resonant capacitor (Cr)
- CH3 = Voltage of resonant inductor (Lr)
- CH4 = Voltage of transformer primary winding
- CH2 = Voltage of Q6 Vds

Vin = 390V

Waveform of primary-side voltages (20A)

Tek Run: 50.0MS/s Sample

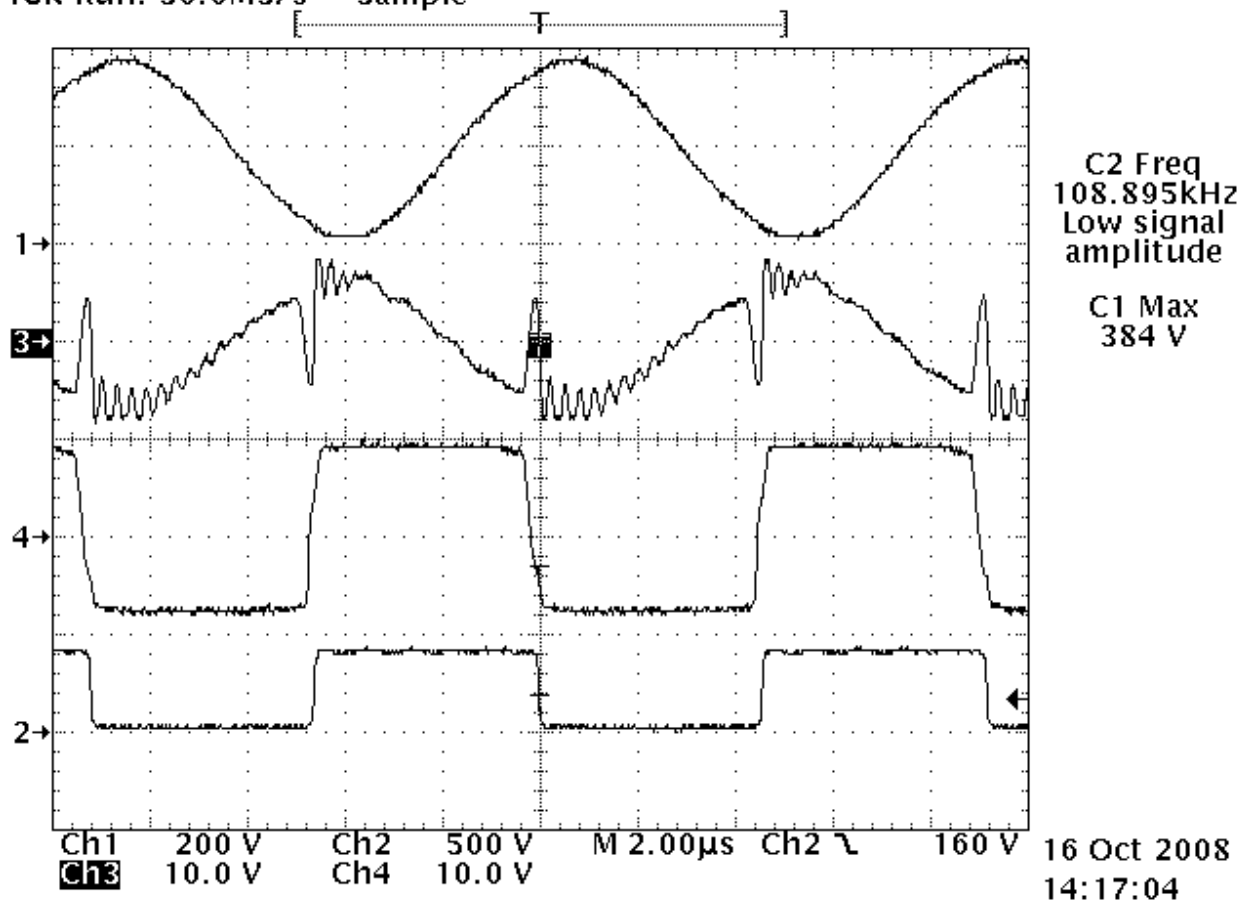


- CH1 = Voltage of resonant capacitor (Cr)
- CH3 = Voltage of resonant inductor (Lr)
- CH4 = Voltage of transformer primary winding
- CH2 = Voltage of Q6 Vds

V_{in} = 390V

Waveform of primary-side voltages (25A)

Tek Run: 50.0MS/s Sample



CH1 = Voltage of resonant capacitor (Cr)
CH3 = Voltage of resonant inductor (Lr)
CH4 = Voltage of transformer primary winding
CH2 = Voltage of Q6 Vds

V_{in} = 390V