HPA341 (UCC25600EVM) TEST REPORT (Rev 01)

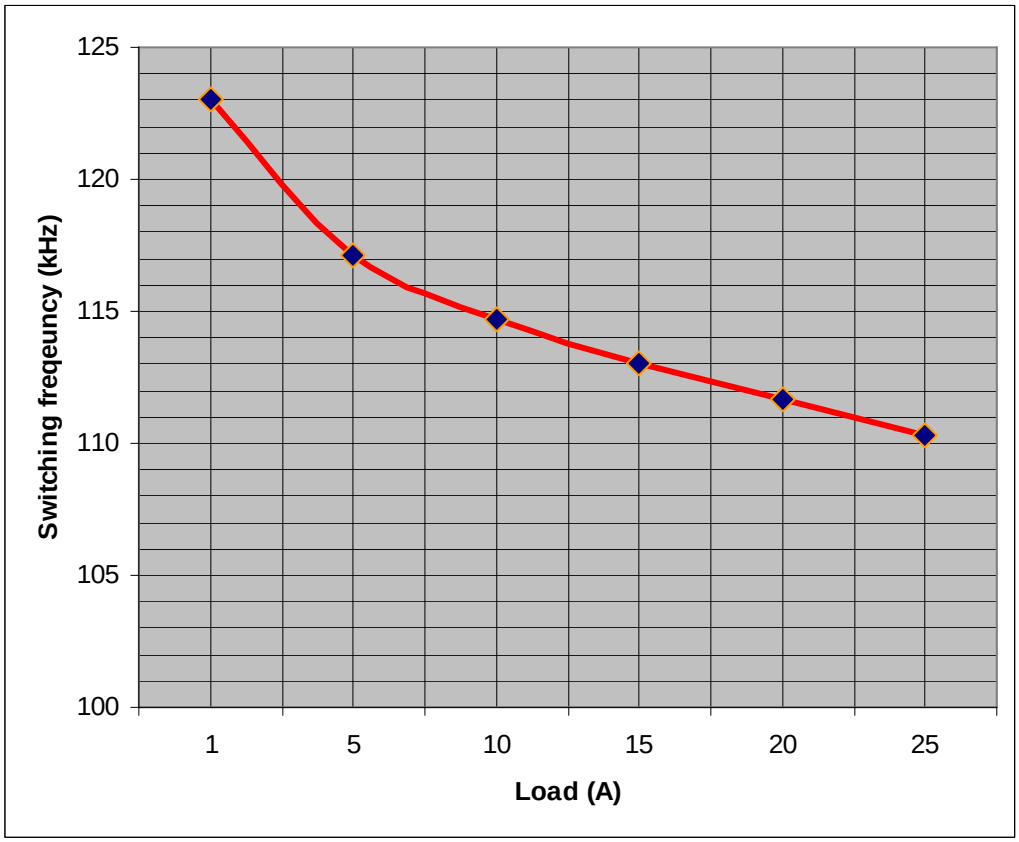
Equipment List

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

Module Setup

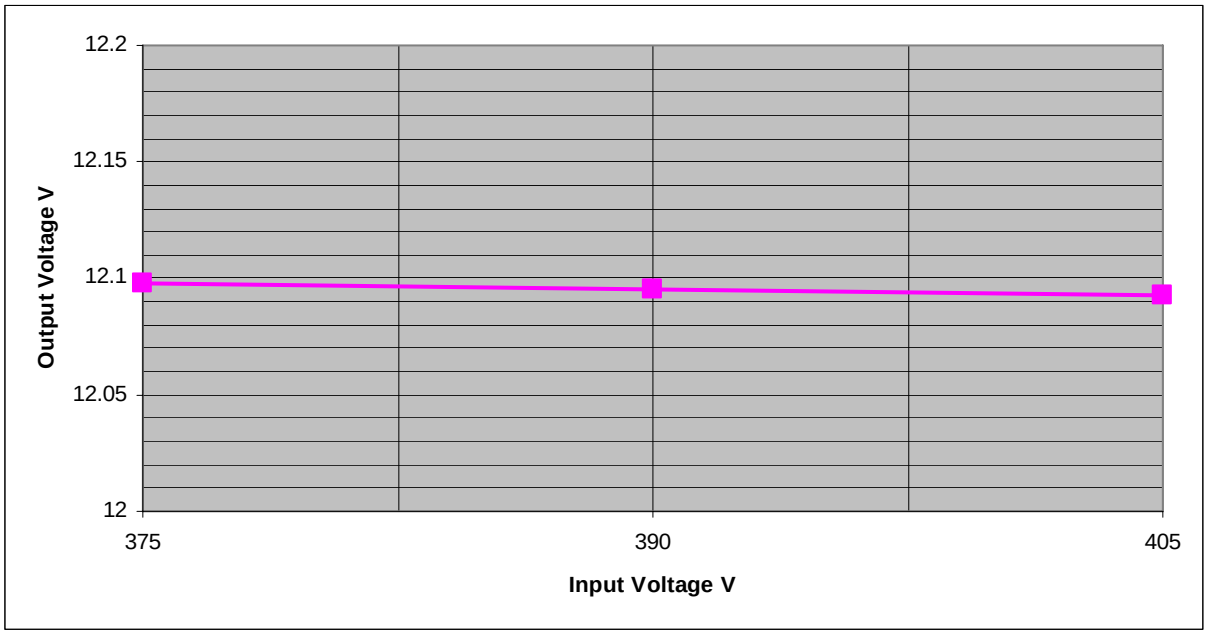
1. none

Switching Frequency Variation with Load



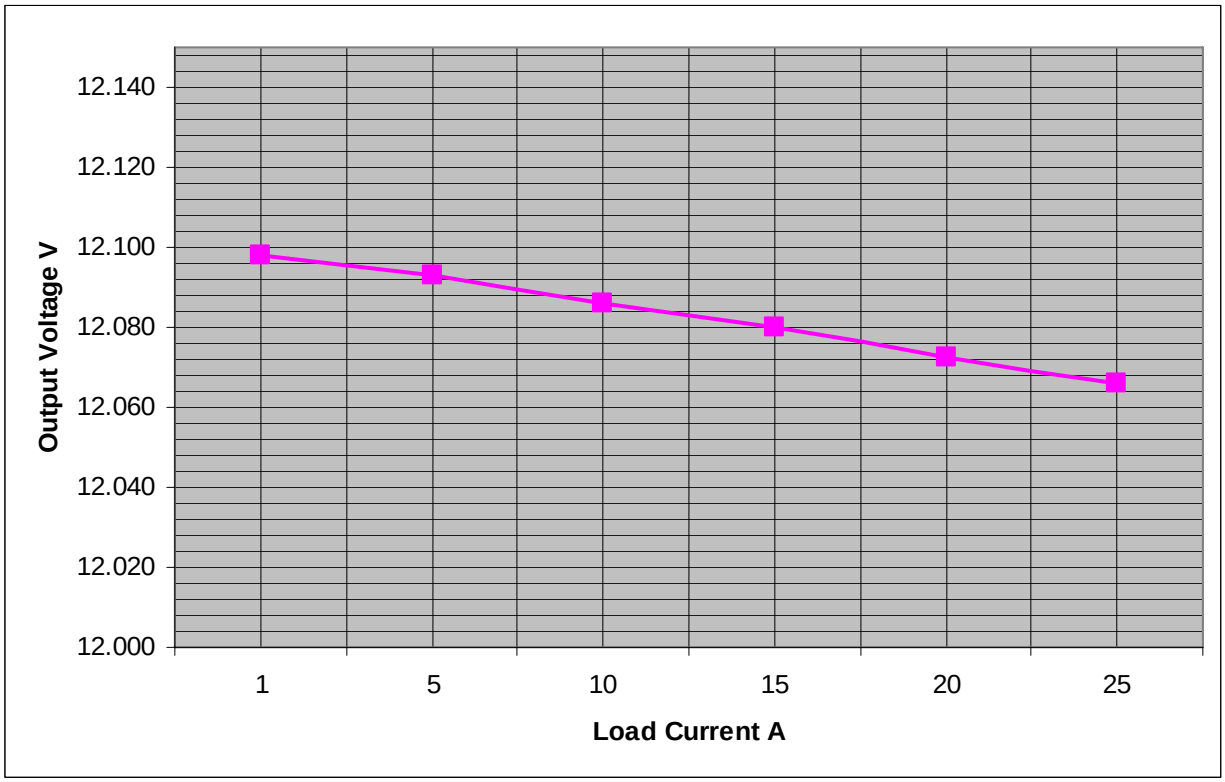
Vin = 390Vdc

Line Regulation



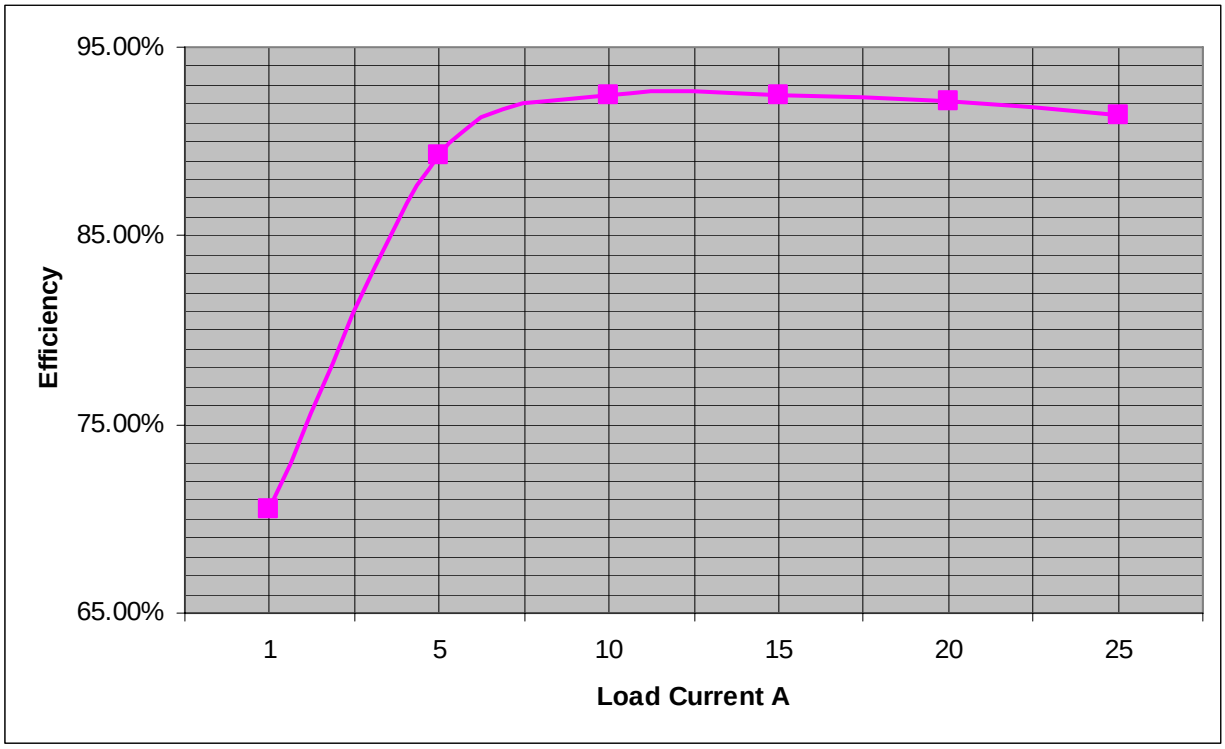
Io = 1A

Load Regulation



Vin = 390Vdc

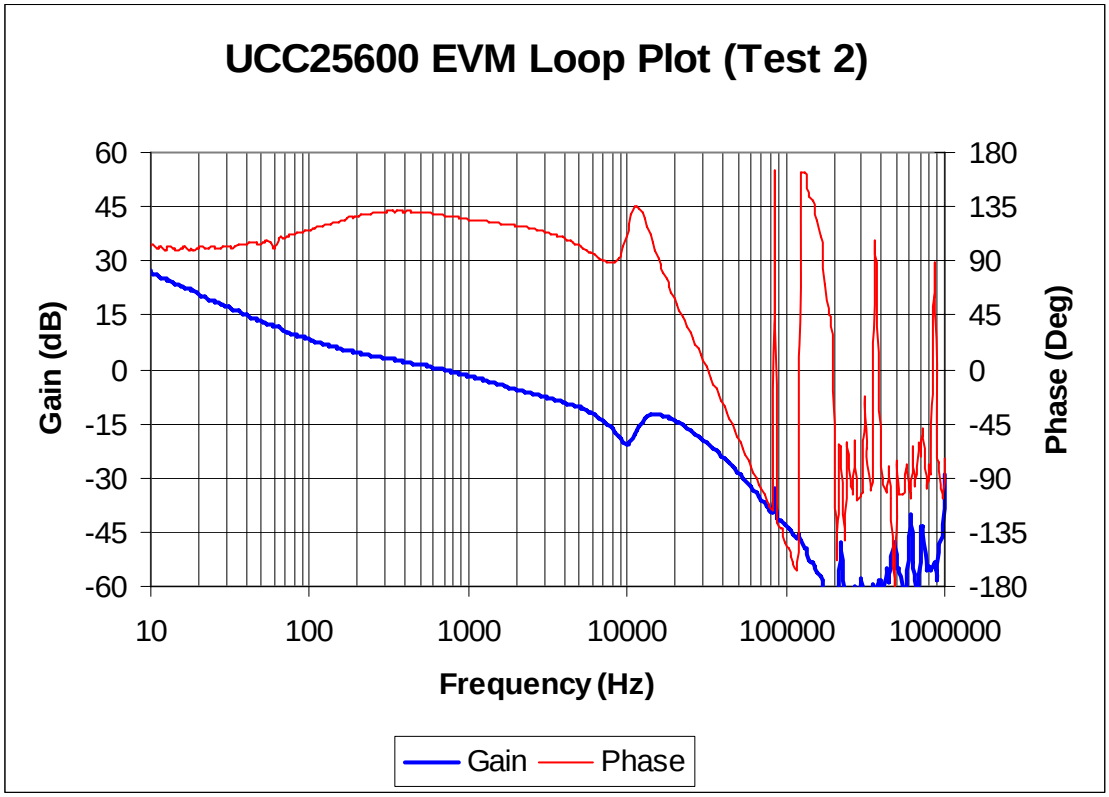
Efficiency



Vin = 390Vdc

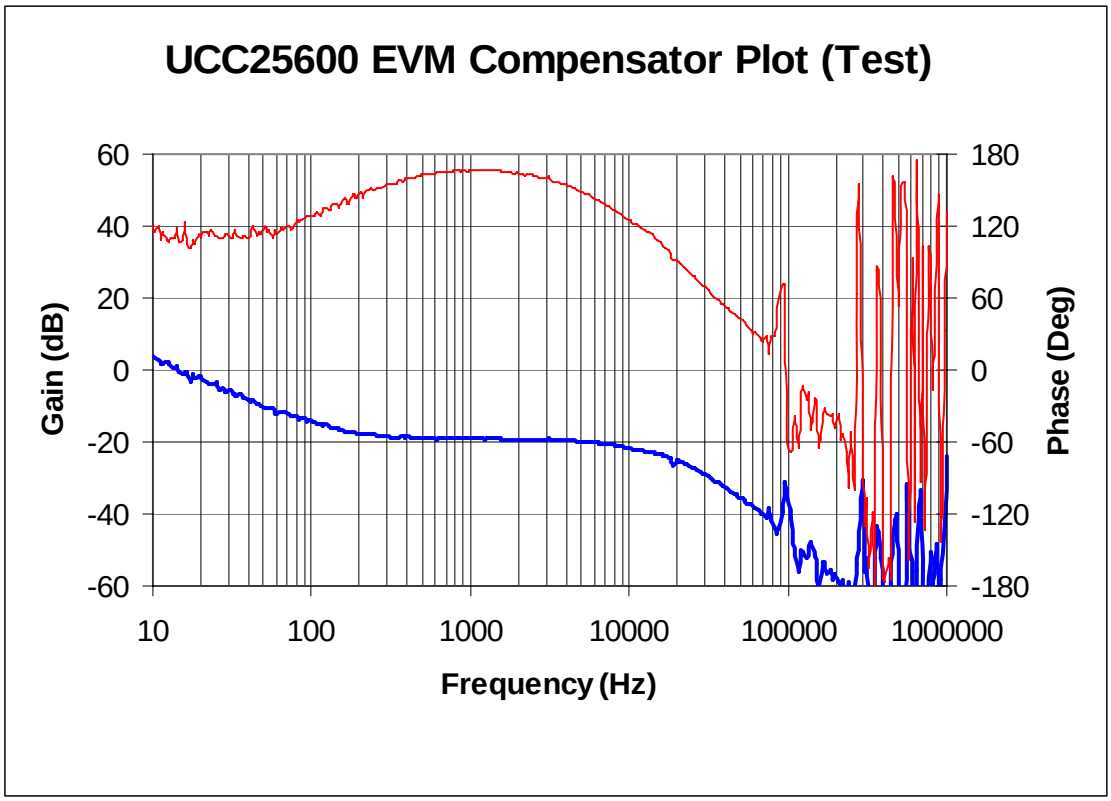
Bode Plots

Full System



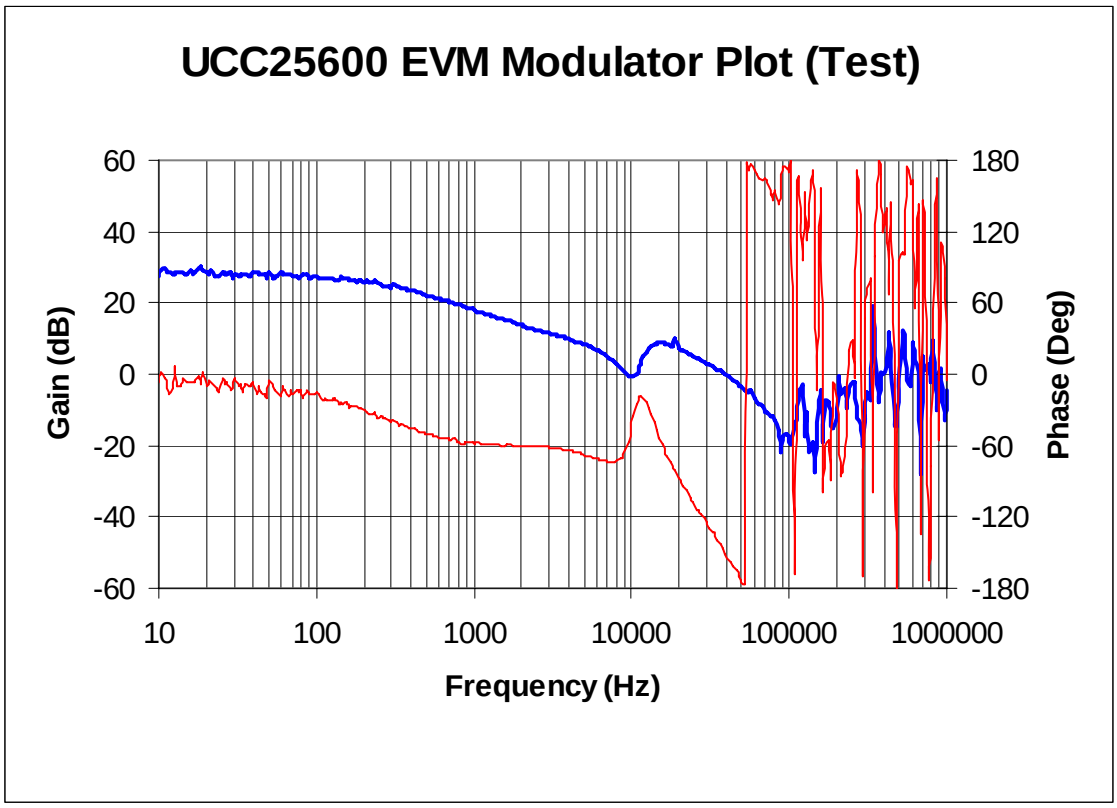
Note: Vin = 390V, Io = 1A

Compensator



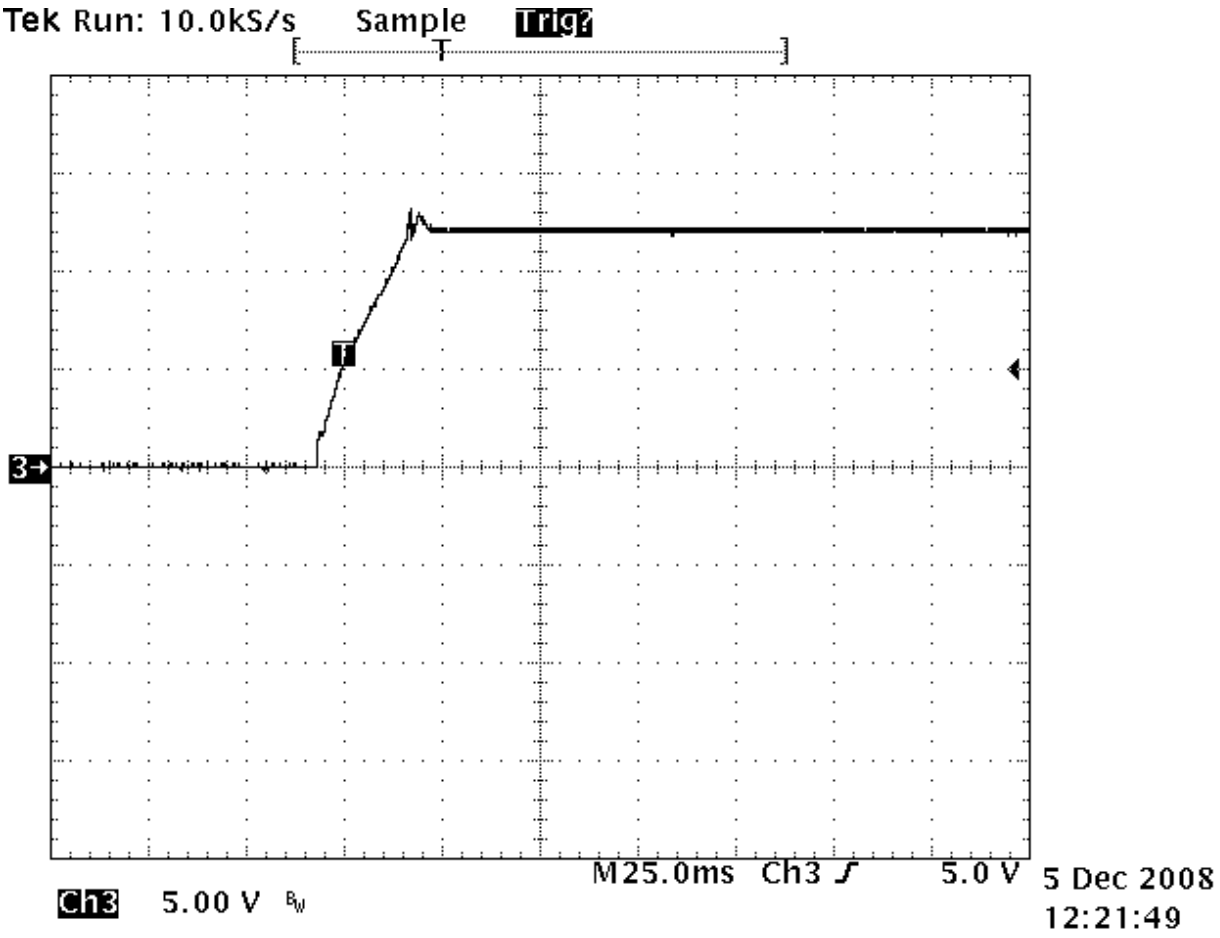
Note: Vin = 390V, Io = 1A

Modulator



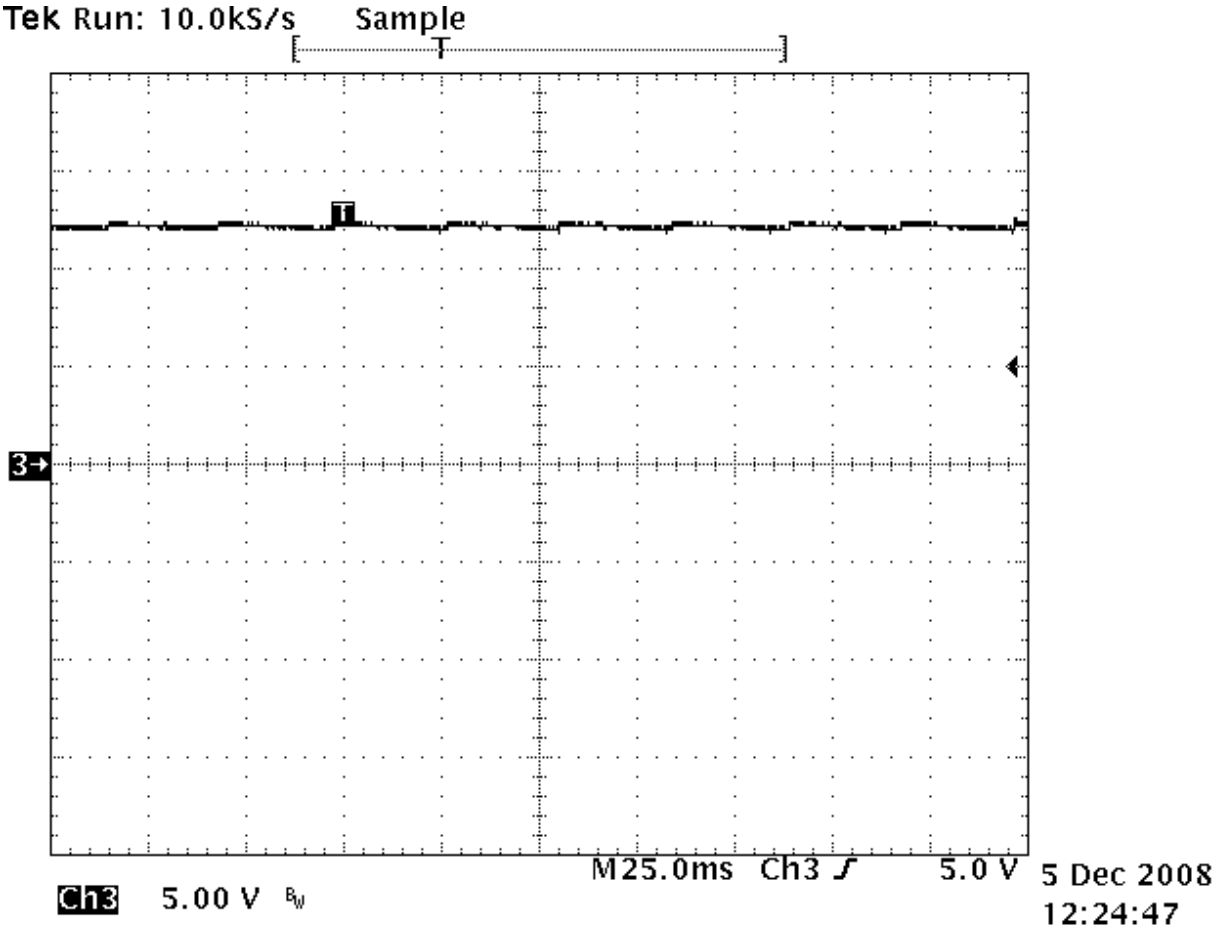
Note: Vin = 390V, Io = 1A

Output Voltage Turn On



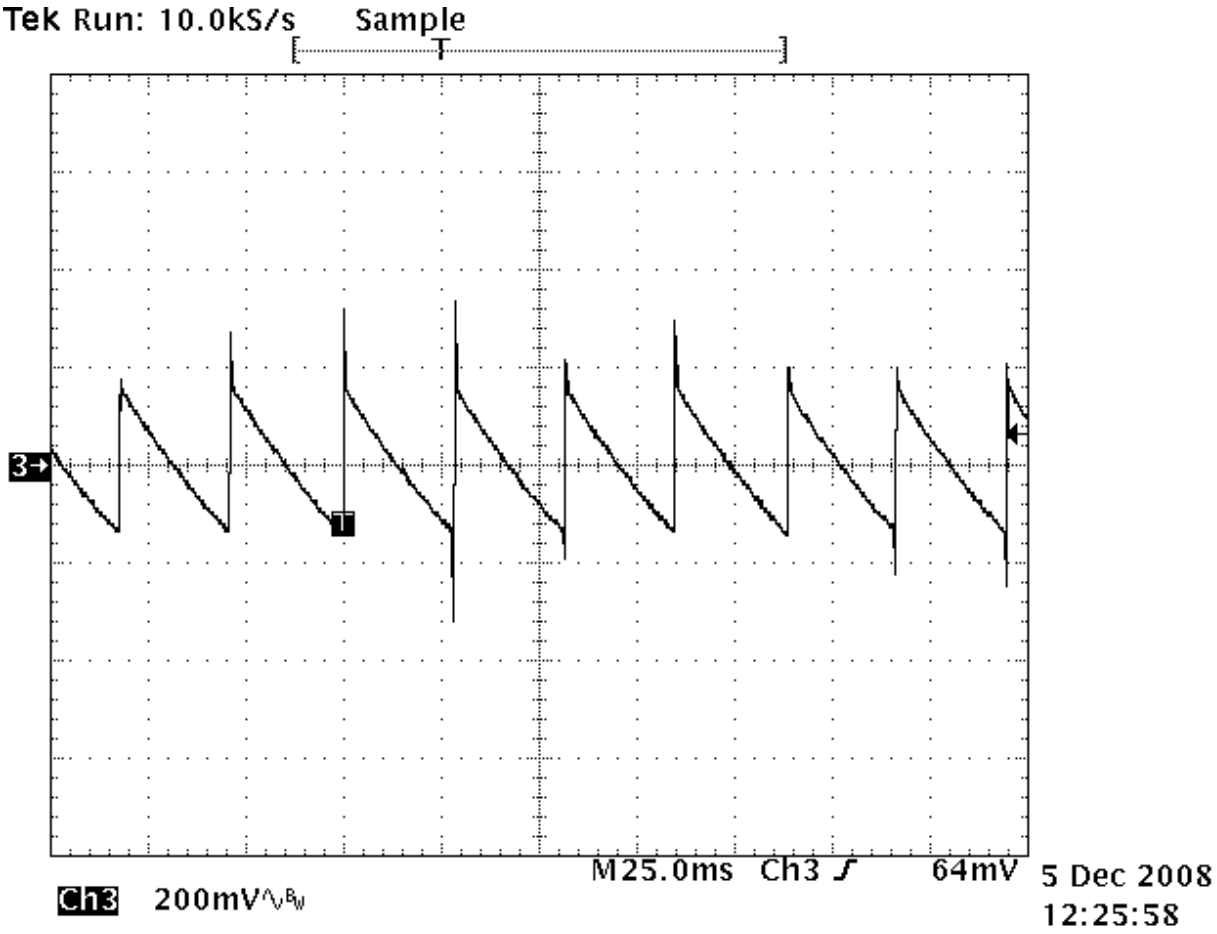
Note: Vin = 390V, Io = 25A

Output voltage in burst operation



Note: Vin = 390V, Io = 0A

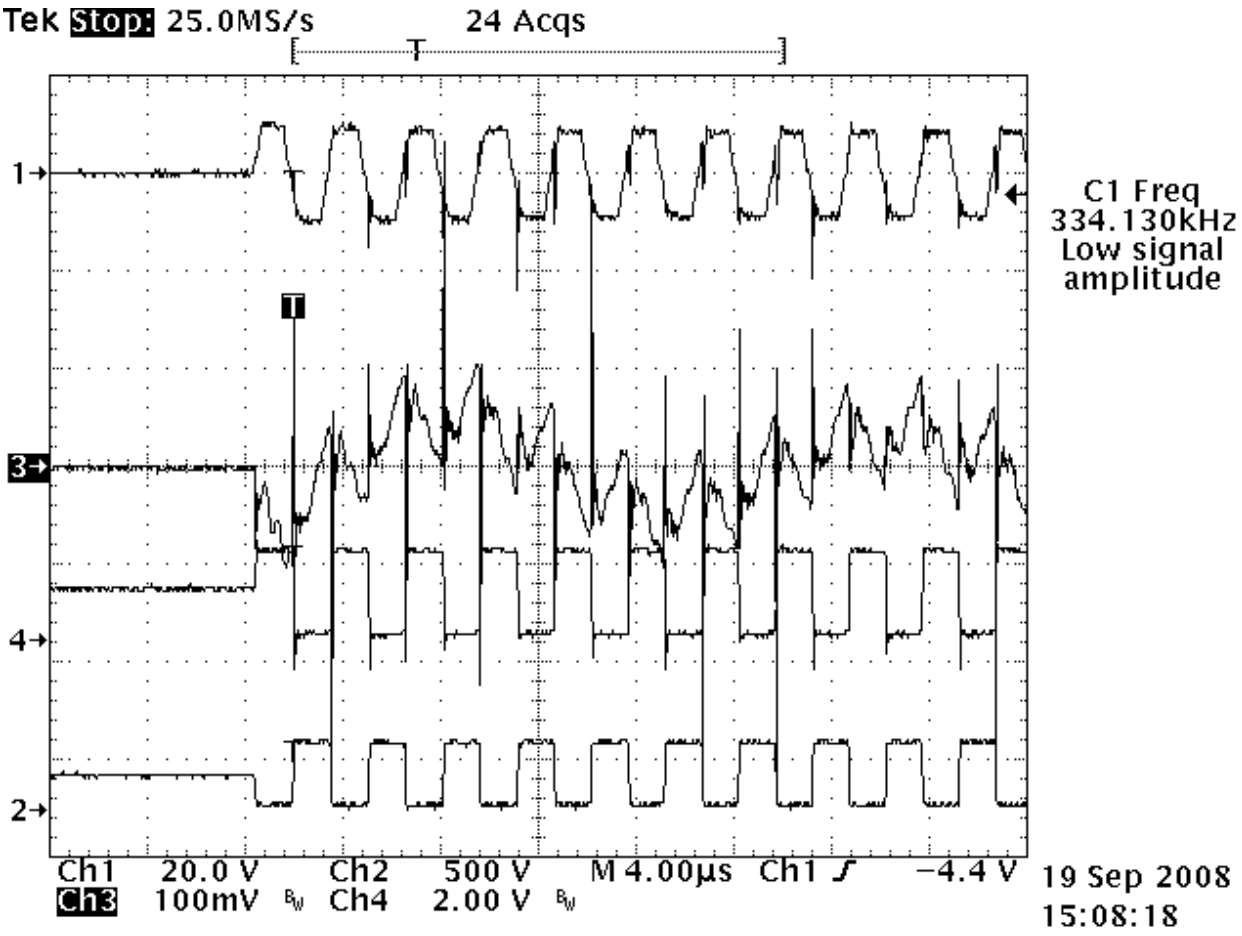
Output Voltage in Burst Operation (Zoom-in)



Note: Vin = 390V, Io = 0A

Vin = 390V, burst operation depends on how light load is achieve. 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.

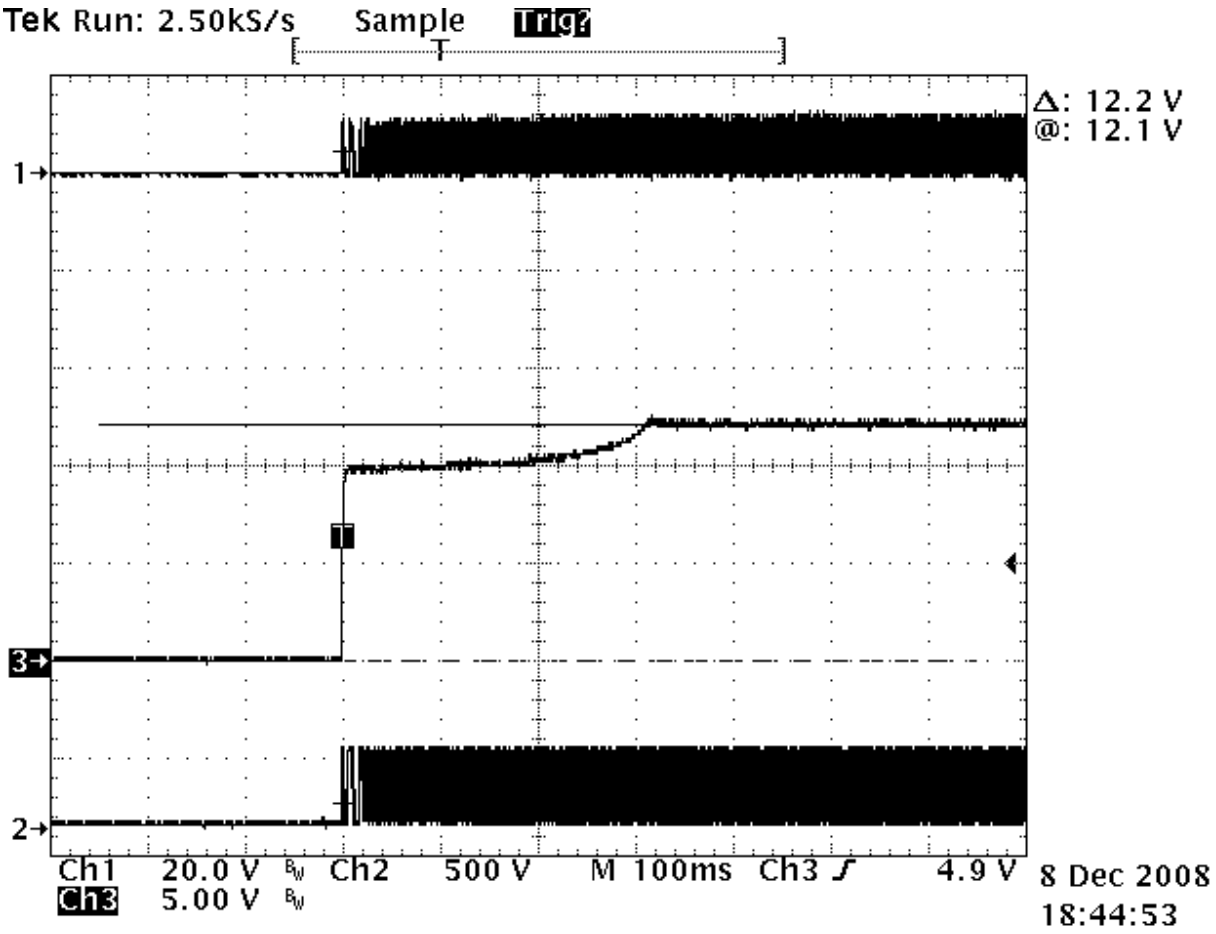
Waveforms of Burst Operation on the Primary-side



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

Vin = 390V, Io <0.5A

Output voltage with different soft start time

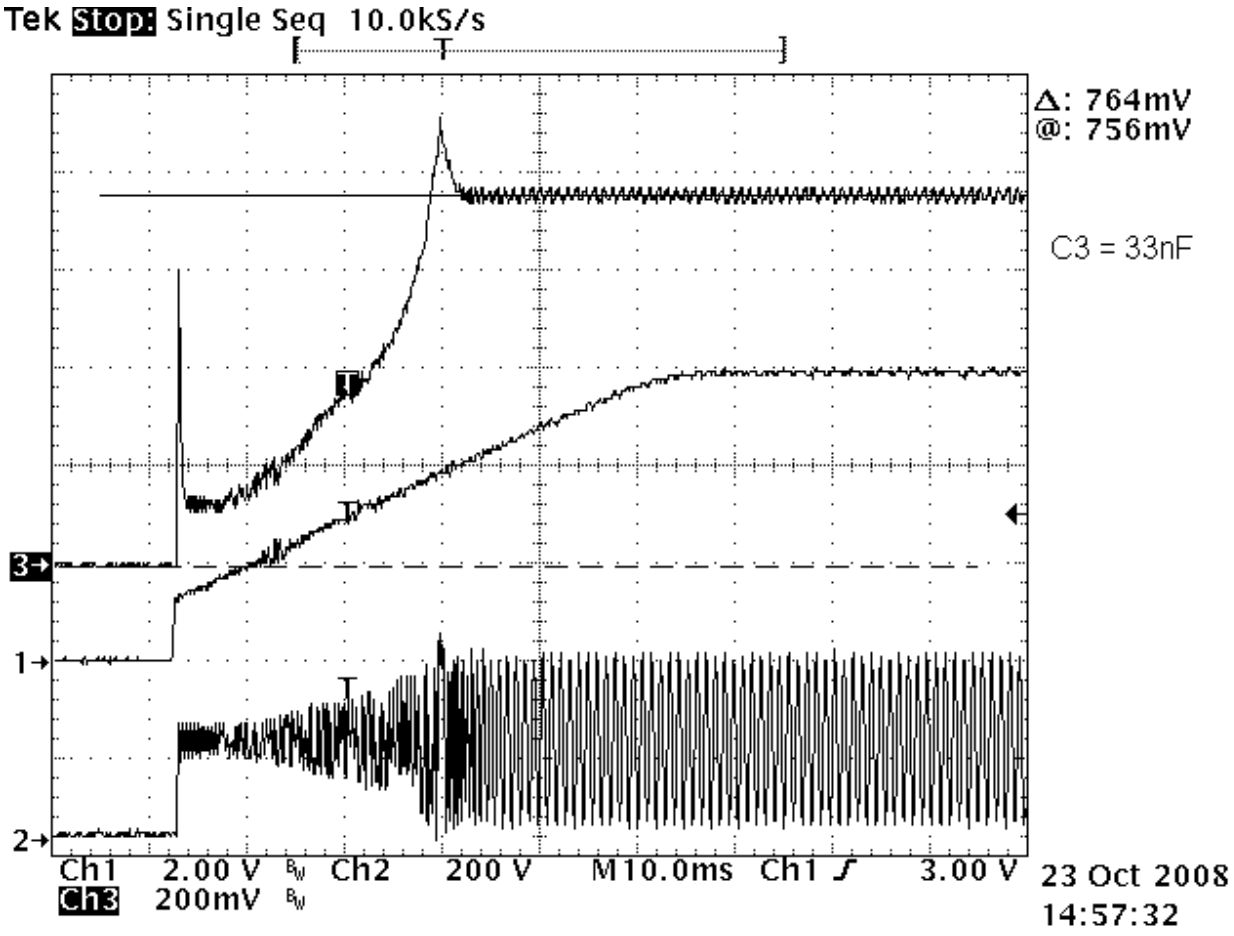


Css = 1uF, output voltage (CH3) presents long climbing while no Vo OVP showing.
But at light load (1A or less), the primary two MOSFETs were destroyed by OVP. The long ss time may leave resonant cap voltage to reach a higher value than MOSFETs Vds breakdown.

If Css = 47nF, no MOSFETs (Q5 and Q6) voltage breakdown failure at Vo OVP.

High temperature was observed on Q5 and Q6 during hiccup and Vo 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)

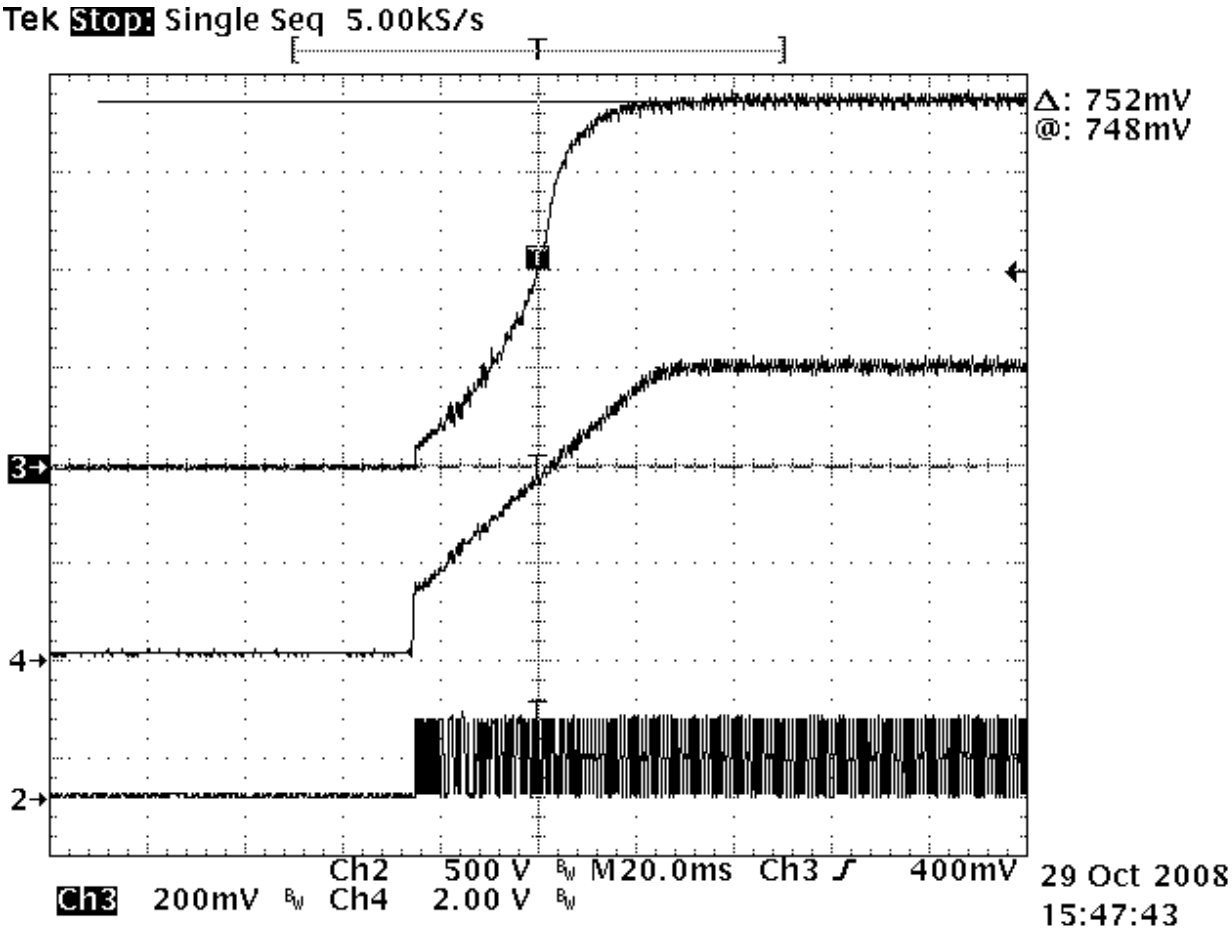


CH3: Load current sensing signal (TP17)
CH4: Soft start pin
CH3: Vds of Q6

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)

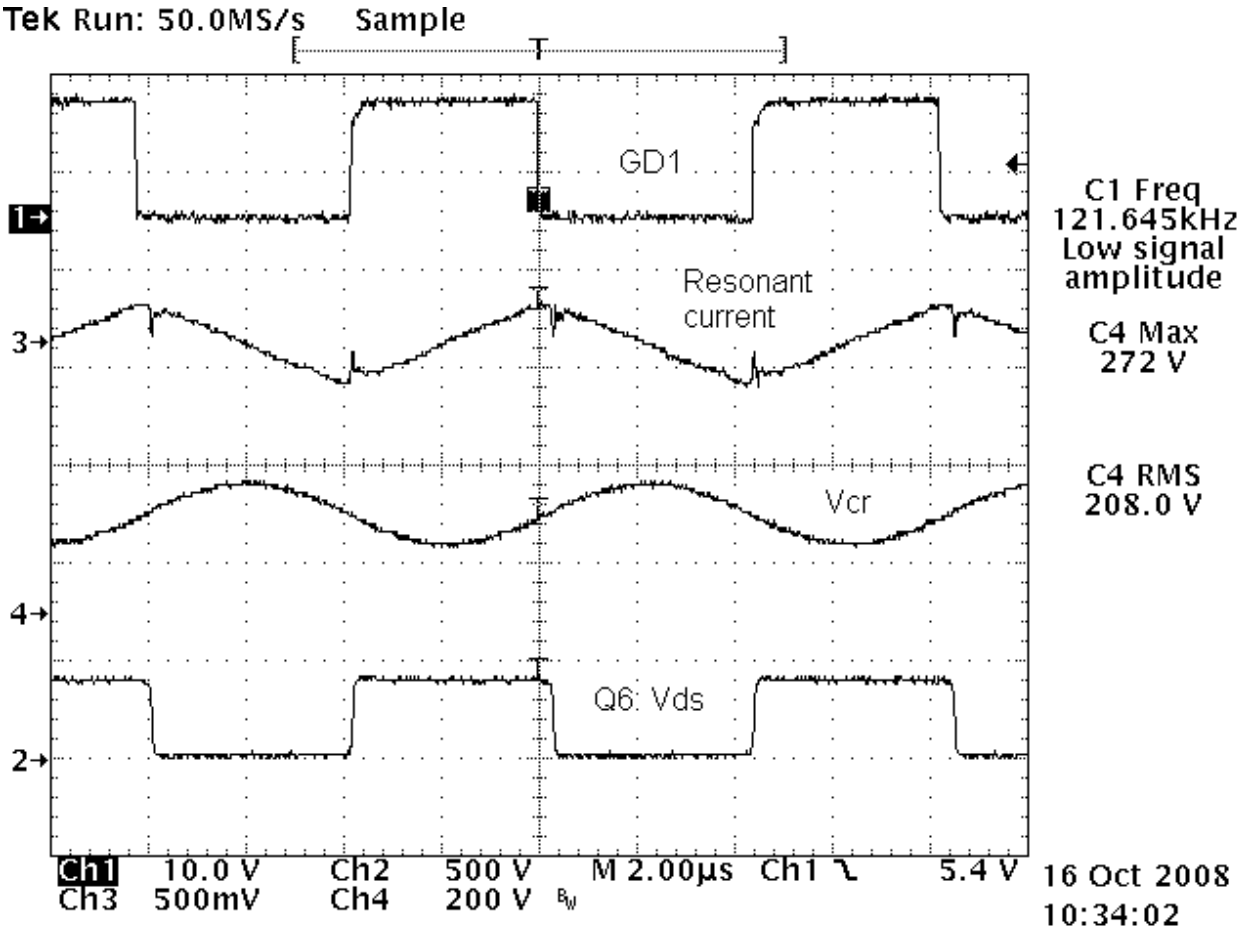


CH3: Load current sensing signal (TP17)
CH4: Soft start pin
CH3: Vds of Q6

Vin = 390V, Io = 25A

Note: C3 = 1.0 uF to effective filtering out current sensing spike at start.

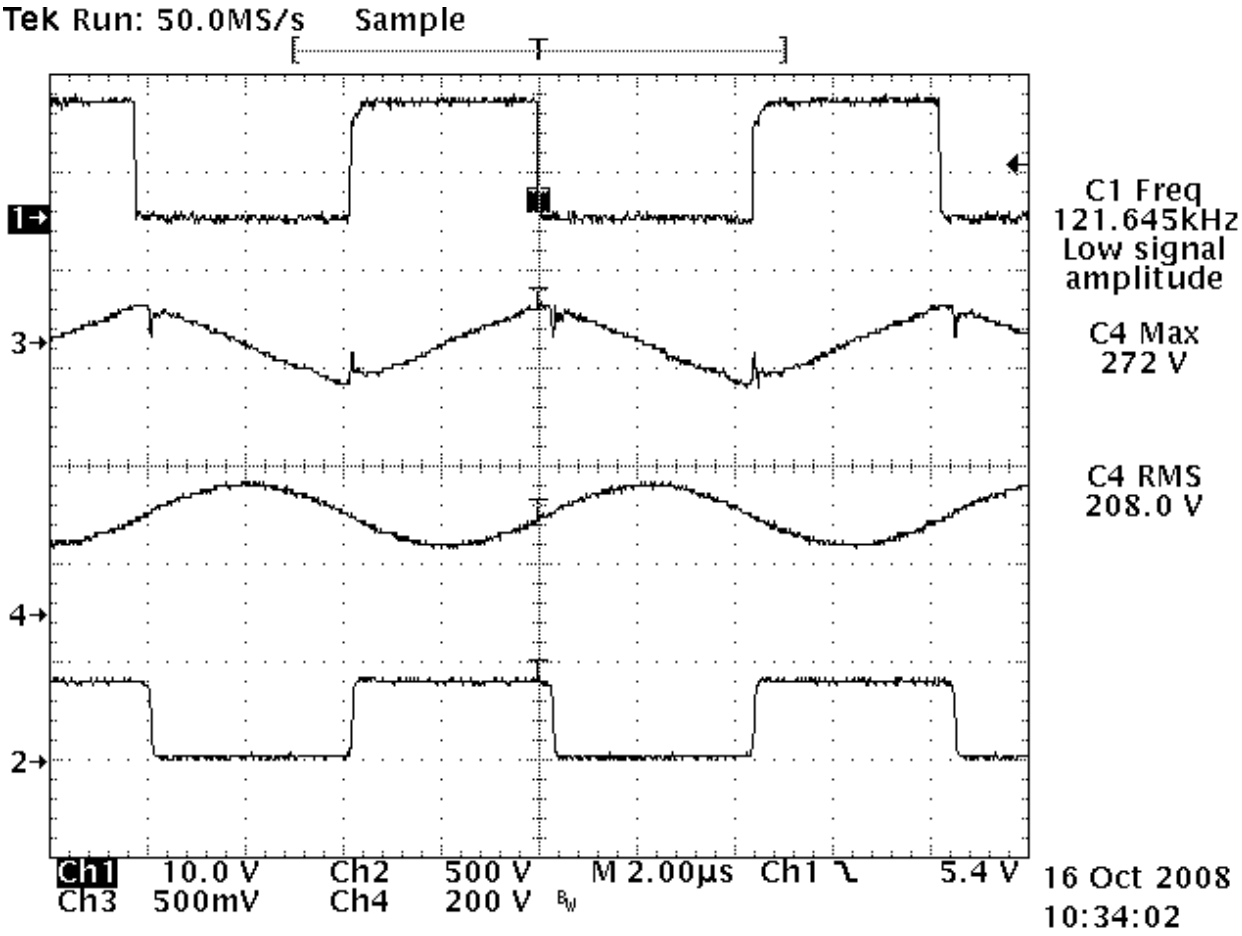
Waveforms of Resonant Tank (Labels)



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

Vin = 390V

Waveforms of Resonant Tank (Load = 1A)

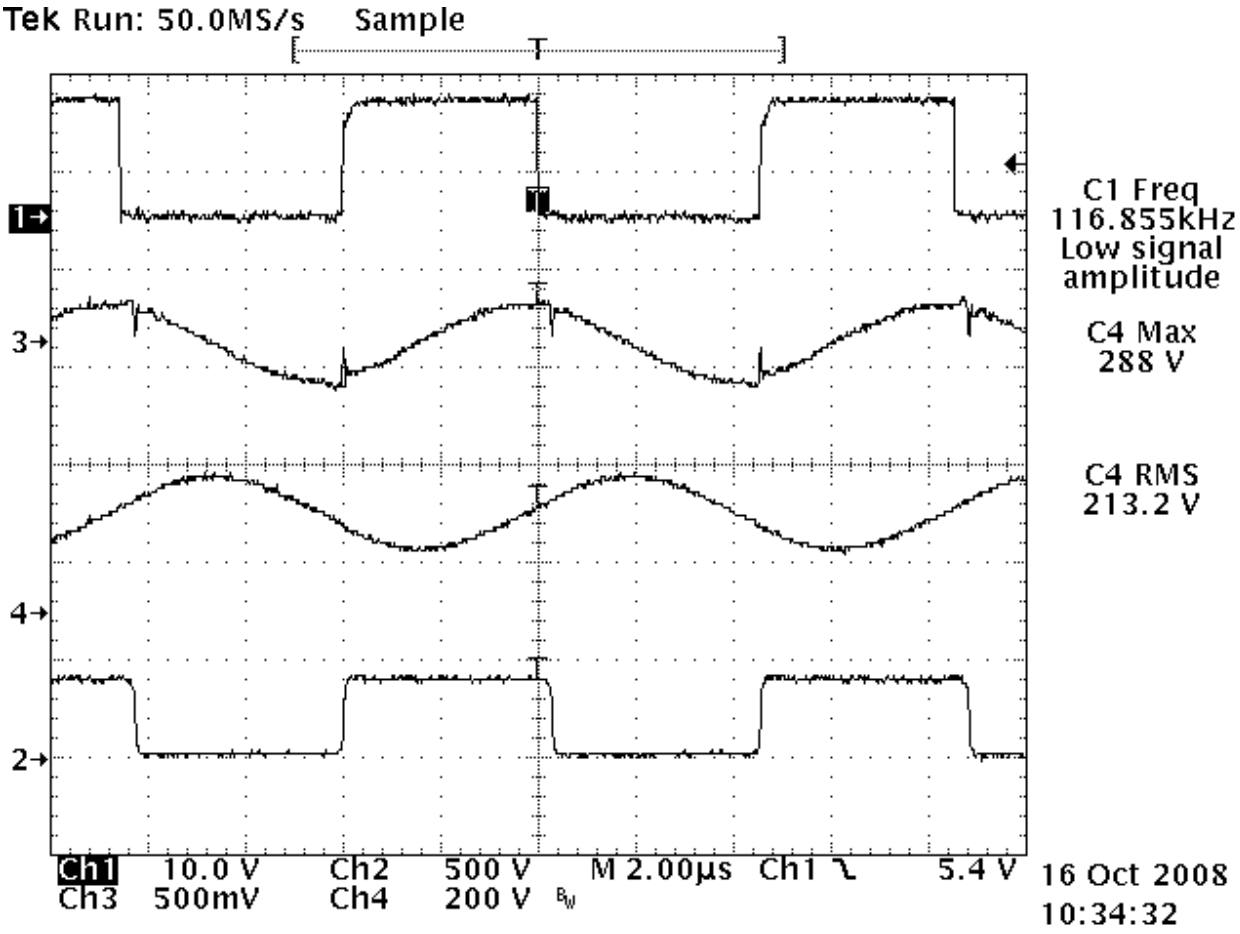


Note:

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

Vin = 390V

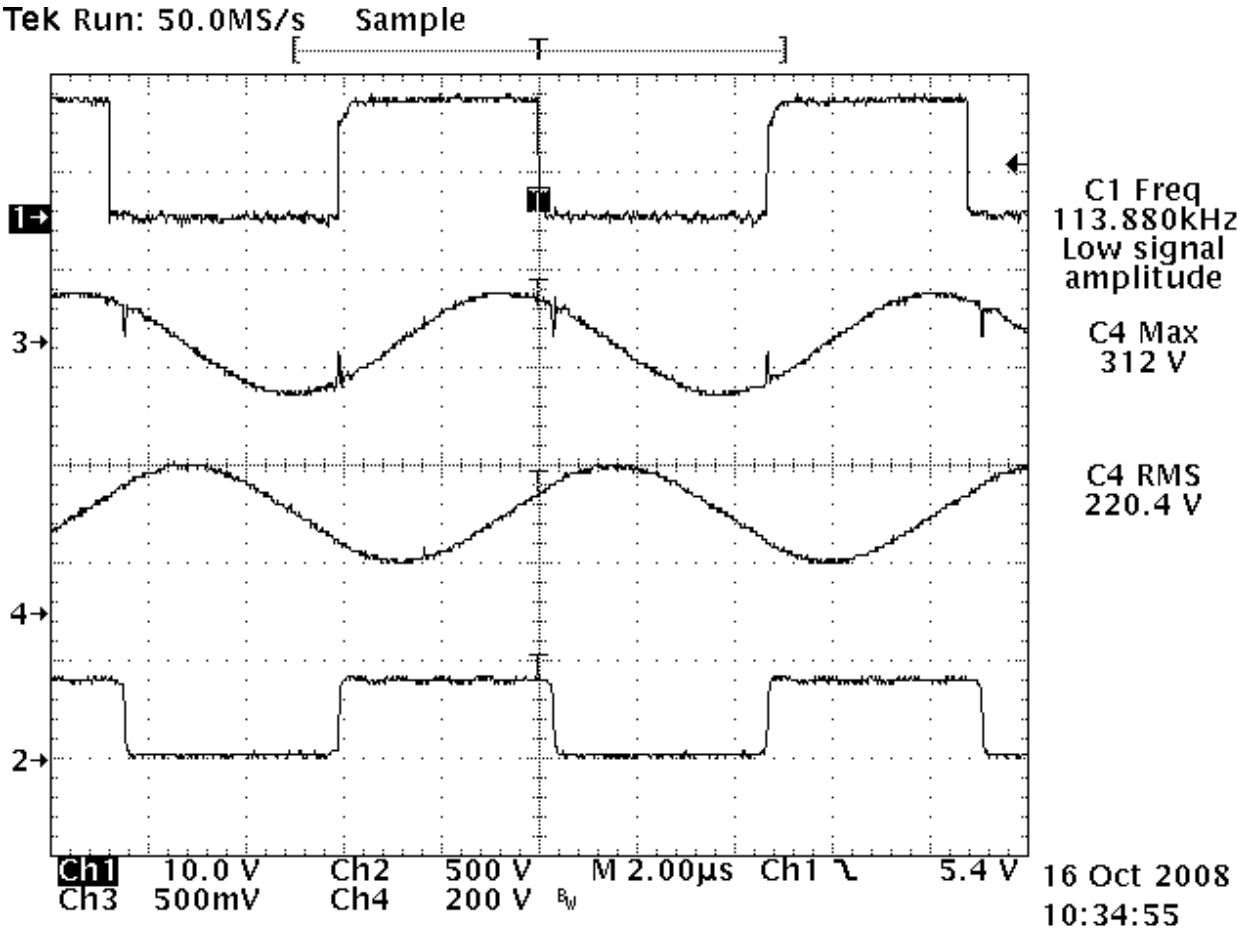
Waveforms of Resonant Tank (Load = 5A)



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

Vin = 390V

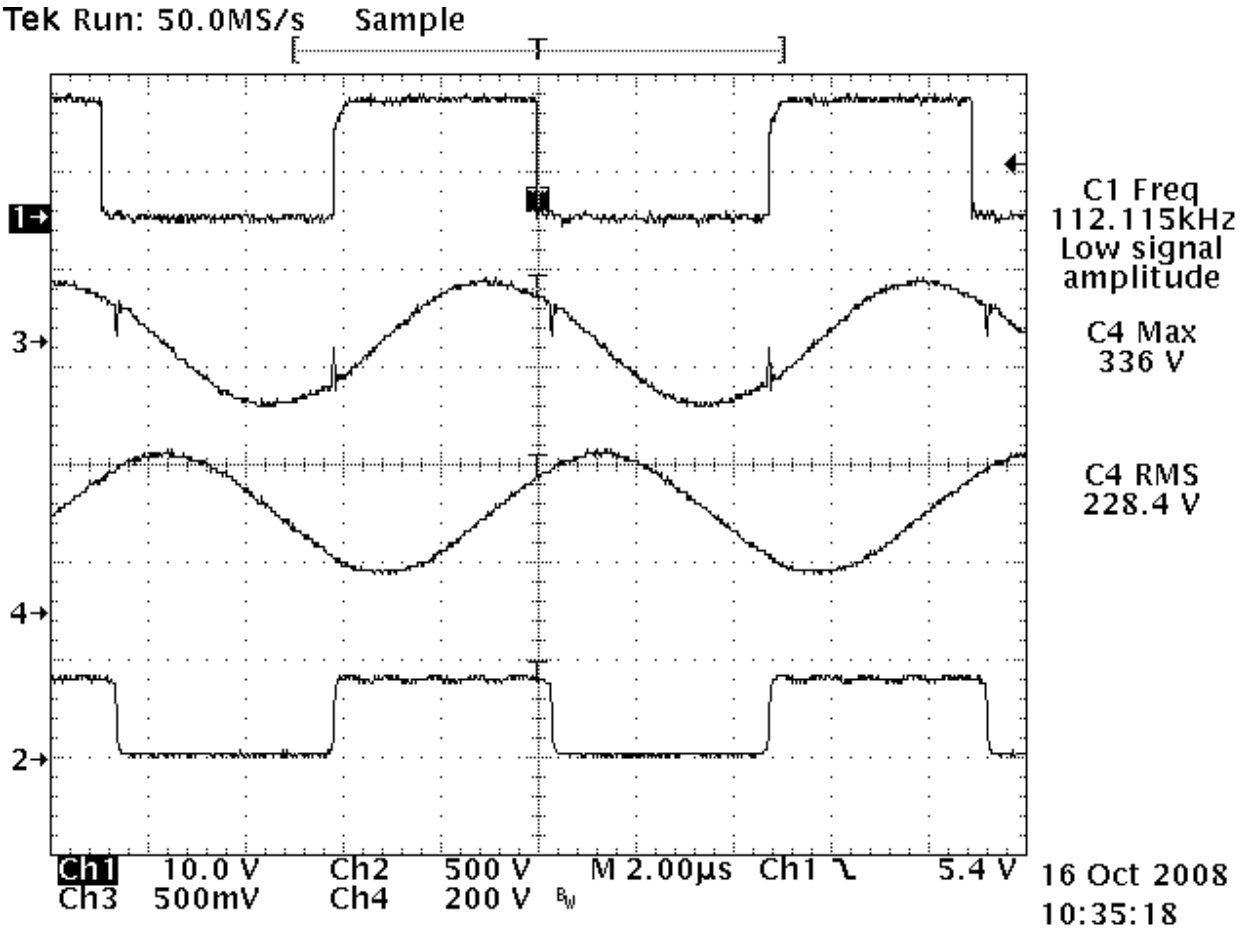
Waveforms of Resonant Tank (Load = 10A)



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

Vin = 390V

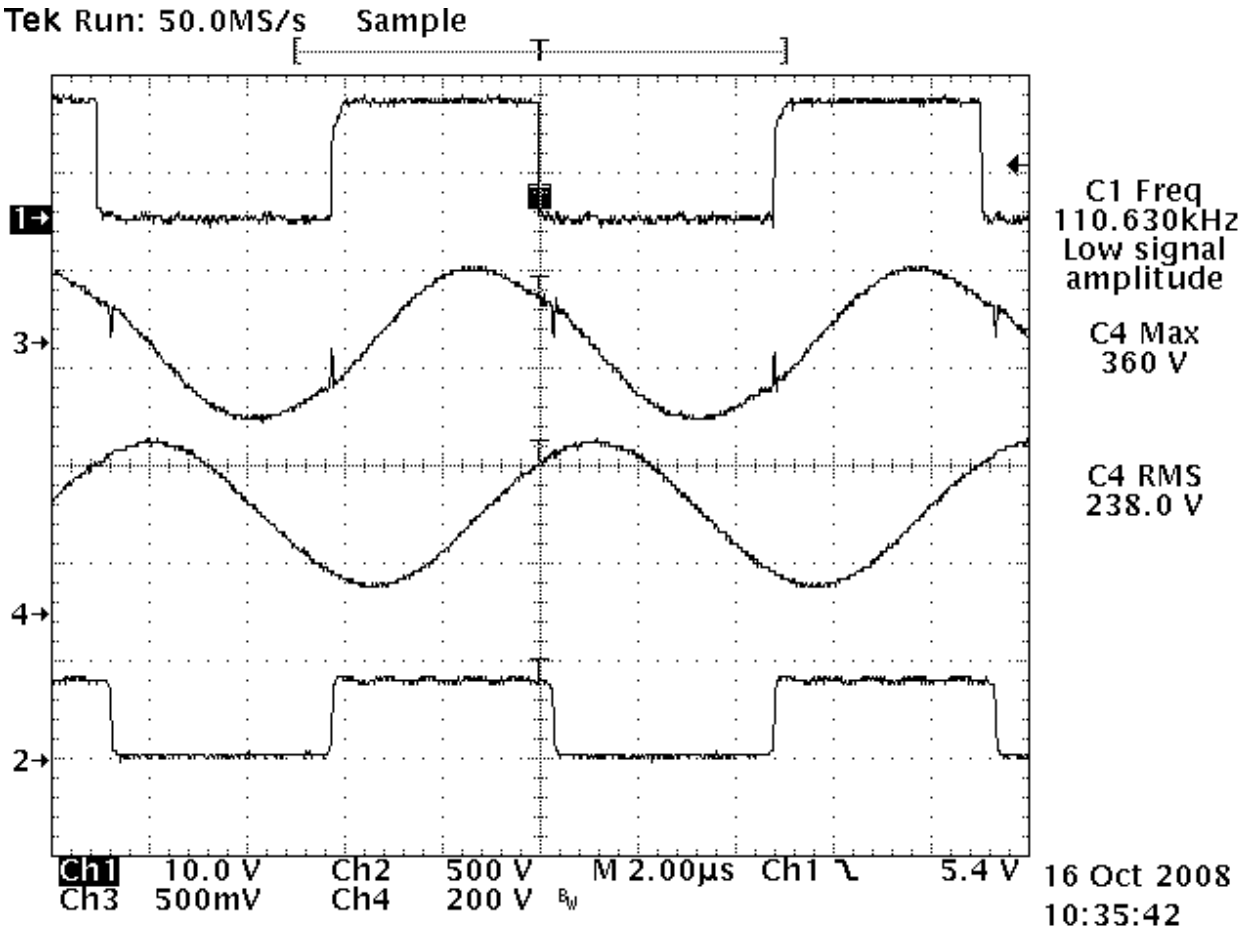
Waveforms of Resonant Tank (Load = 15A)



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

Vin = 390V

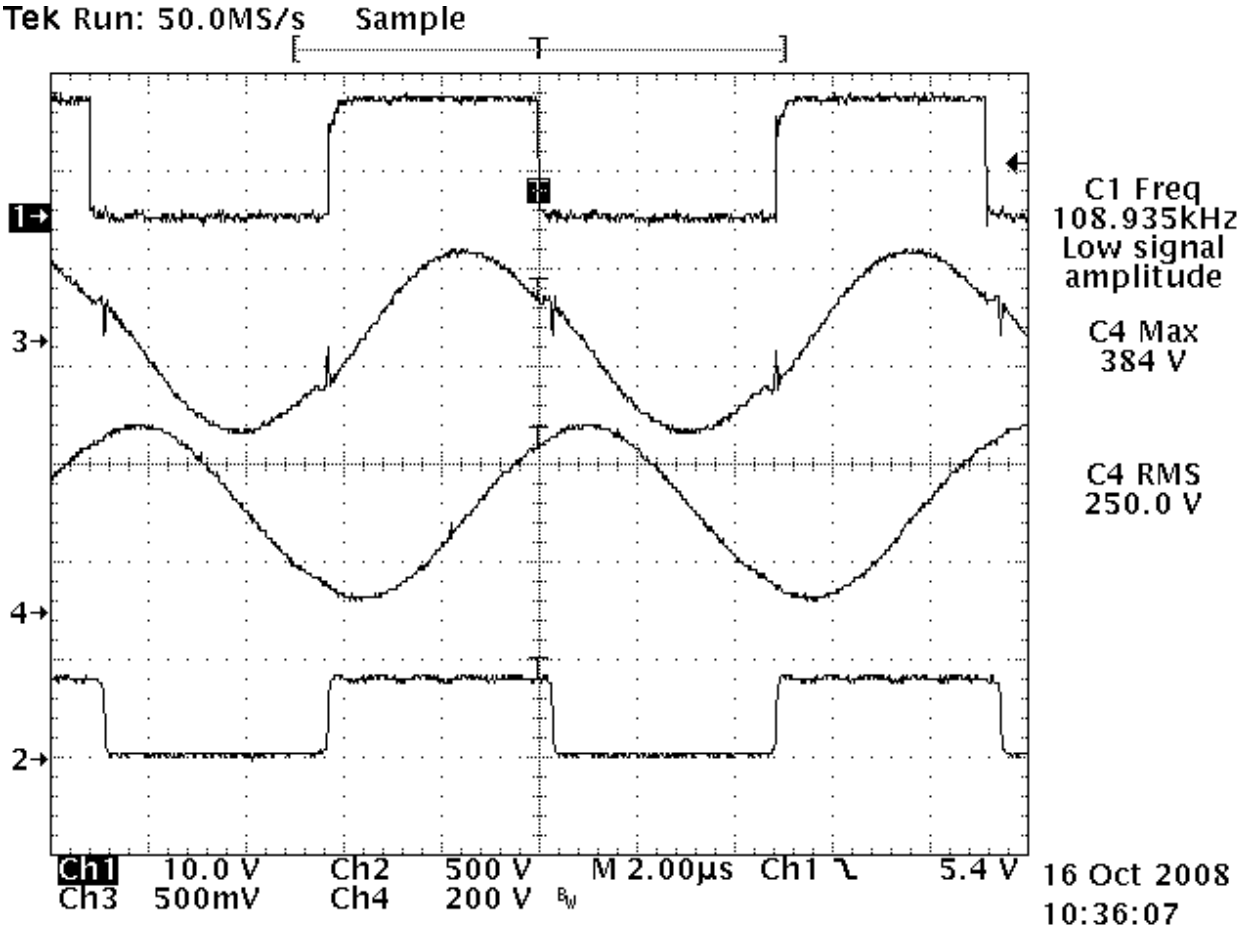
Waveforms of Resonant Tank (Load = 20A)



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

Vin = 390V

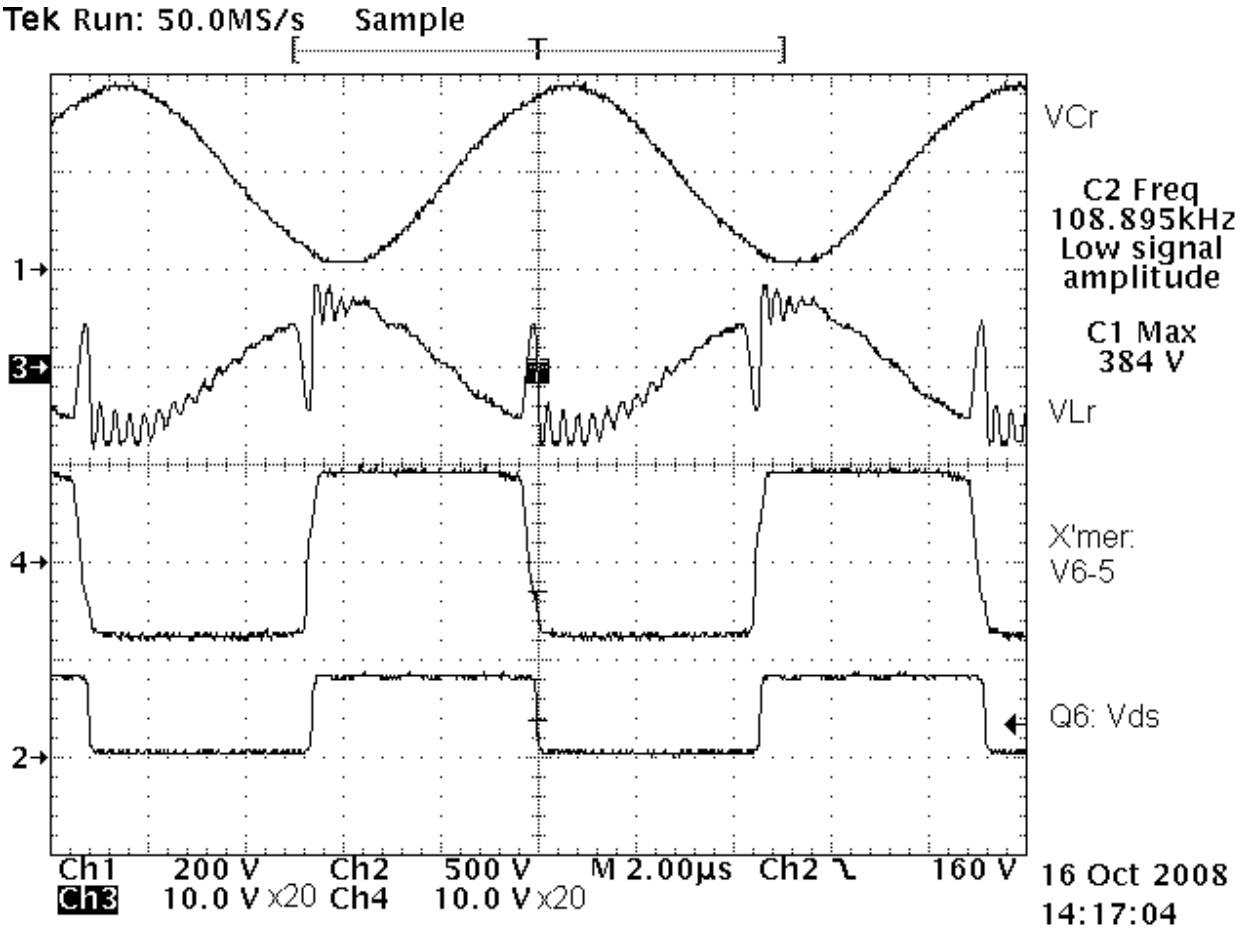
Waveforms of Resonant Tank (Load = 25A)



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

Vin = 390V

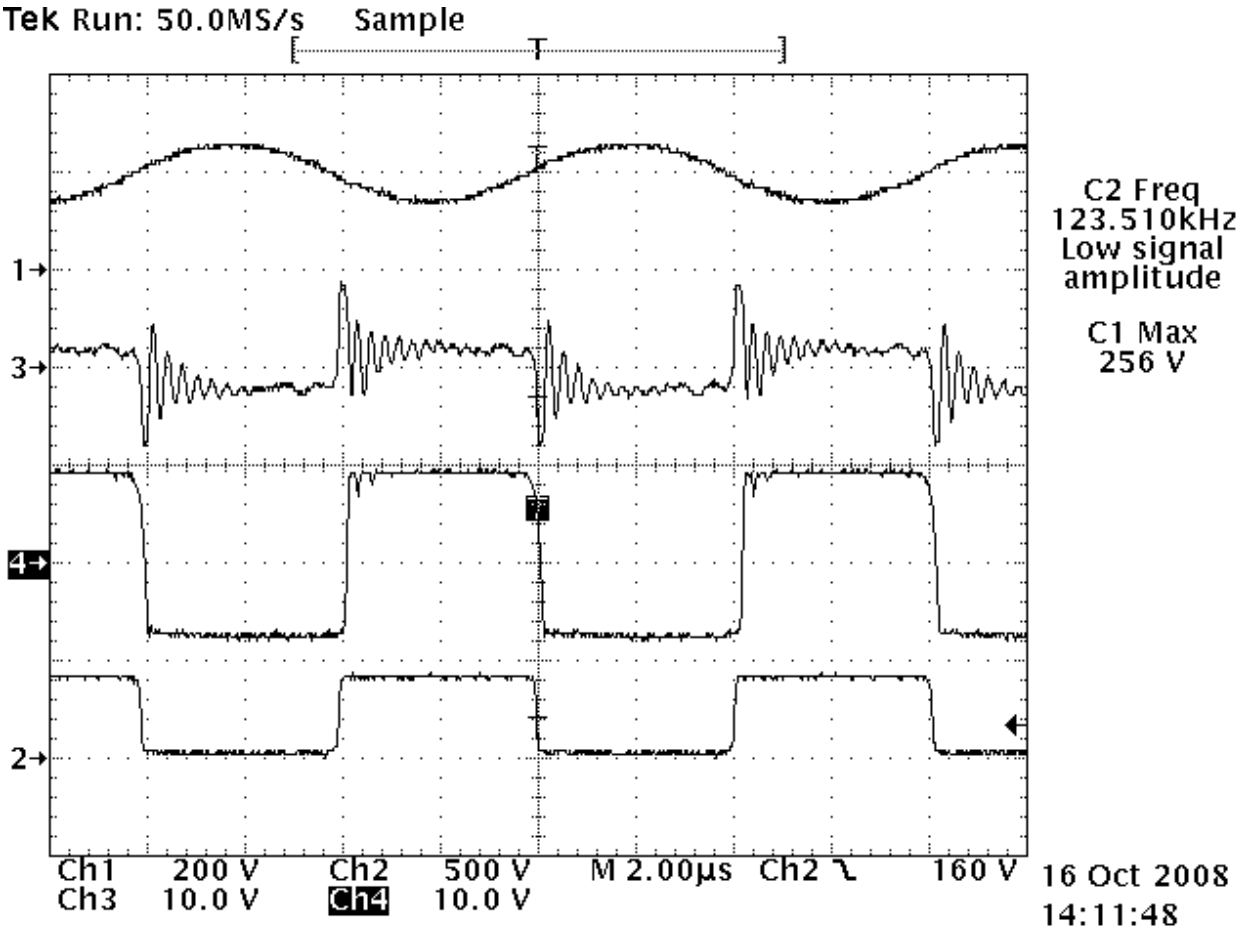
Waveform of primary-side voltages (label)



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

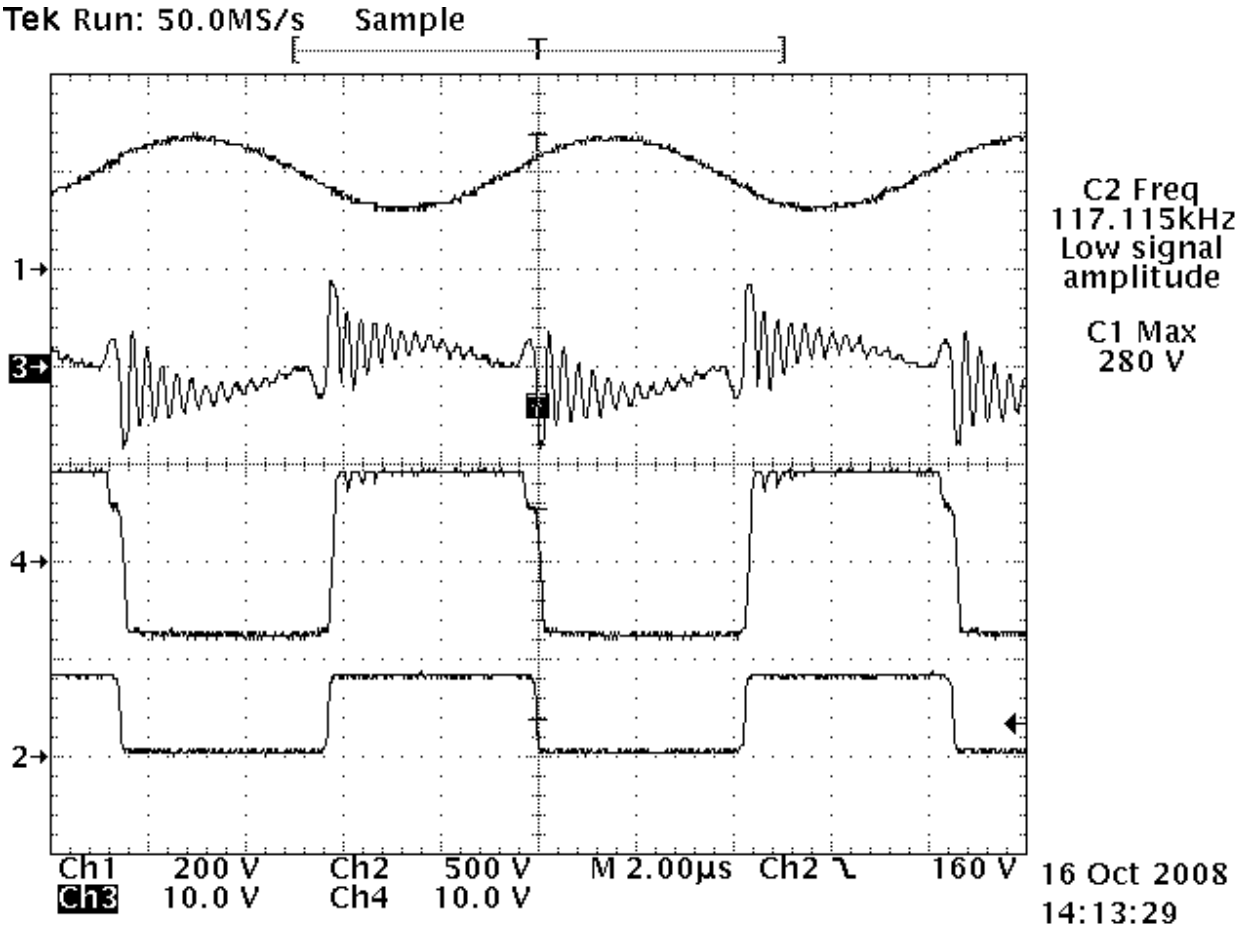
Waveform of primary-side voltages (1A)



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

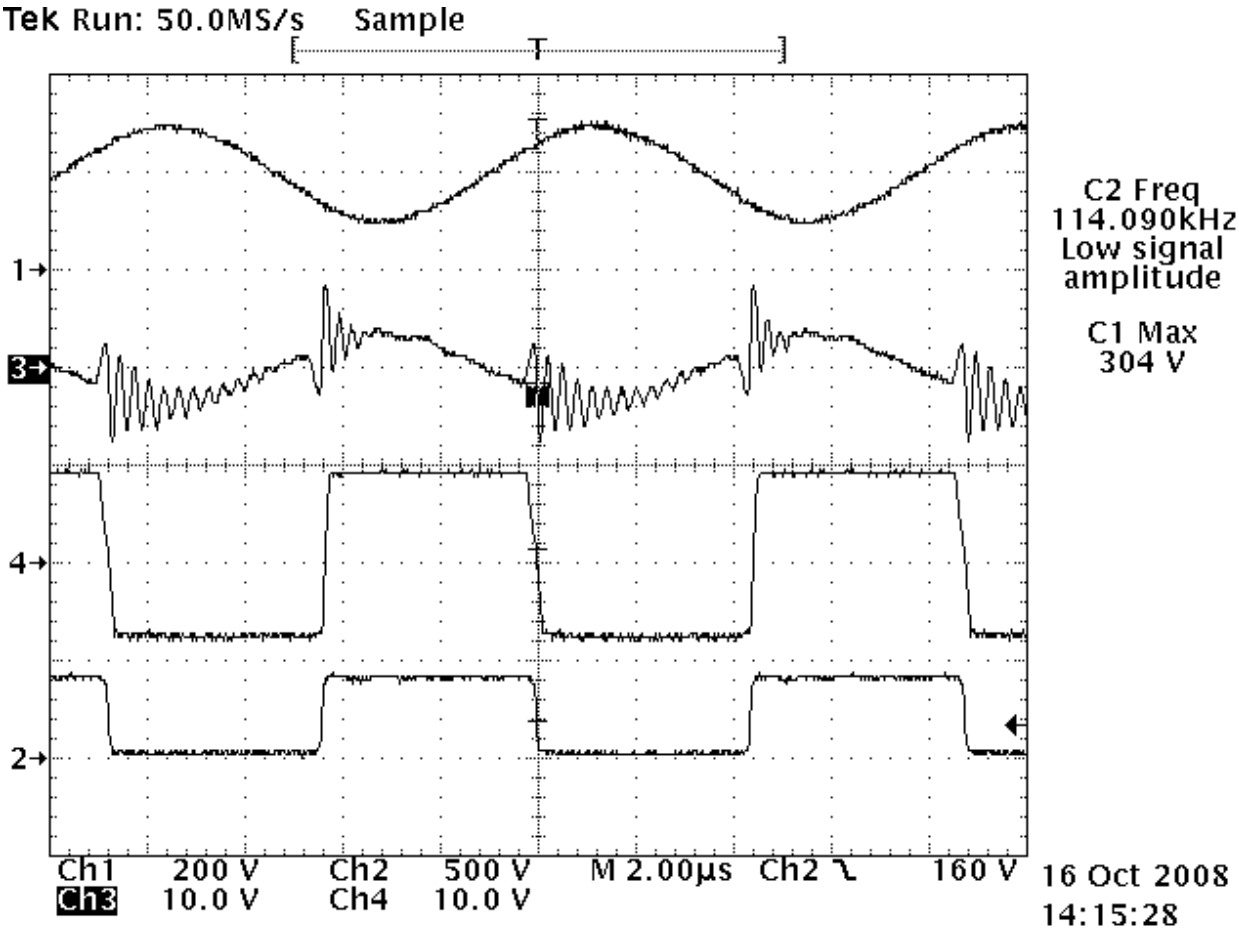
Waveform of primary-side voltages (5A)



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

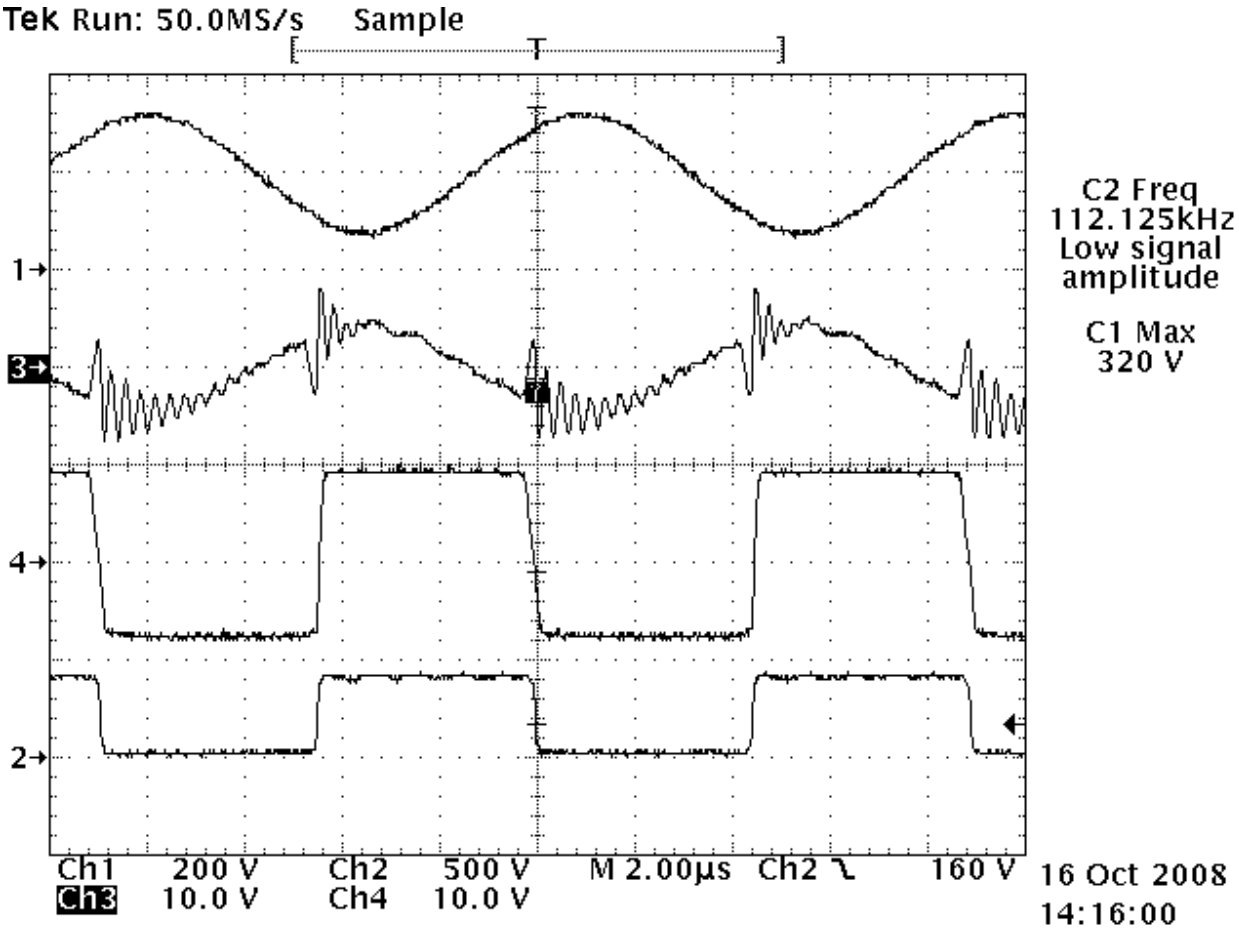
Waveform of primary-side voltages (10A)



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

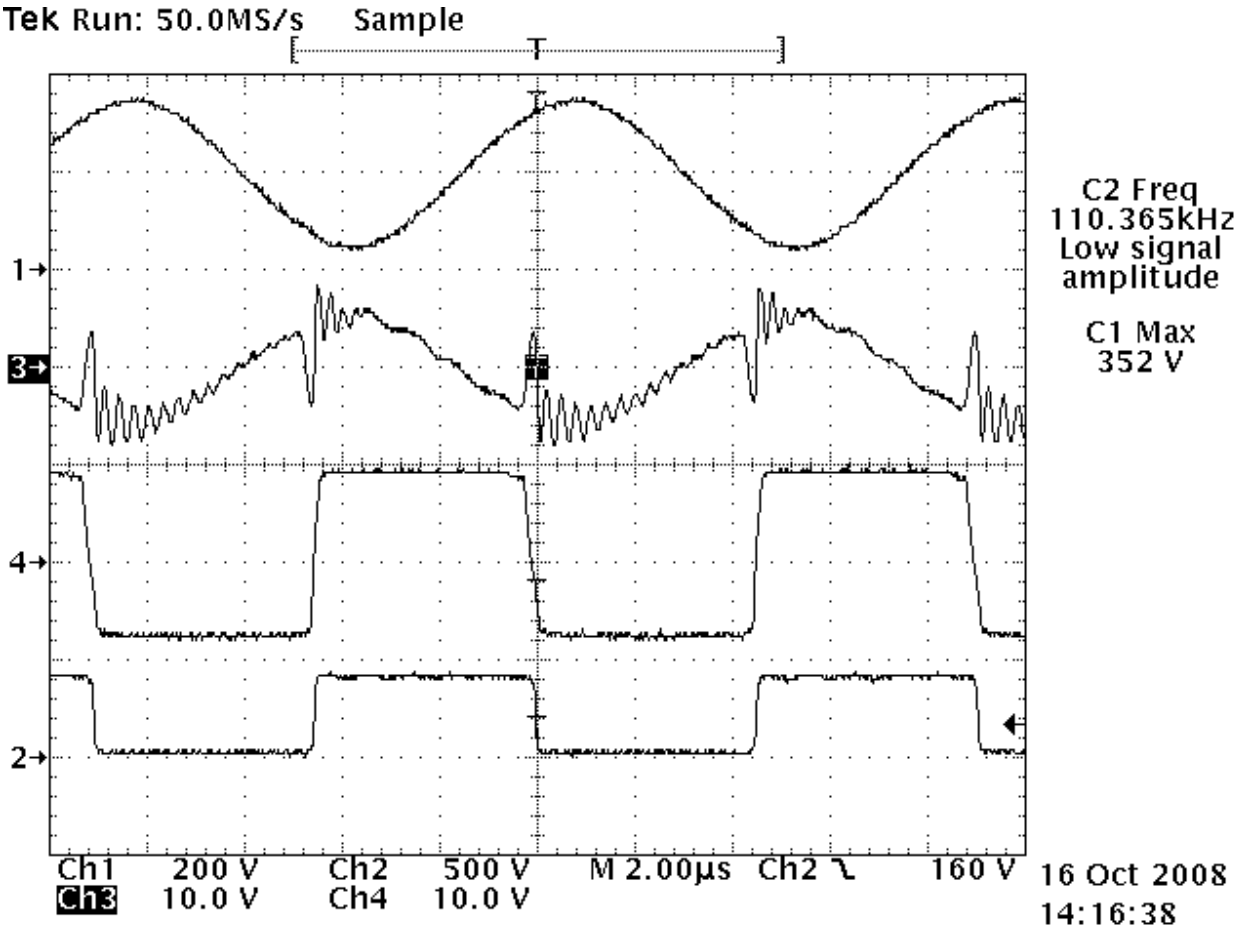
Waveform of primary-side voltages (15A)



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

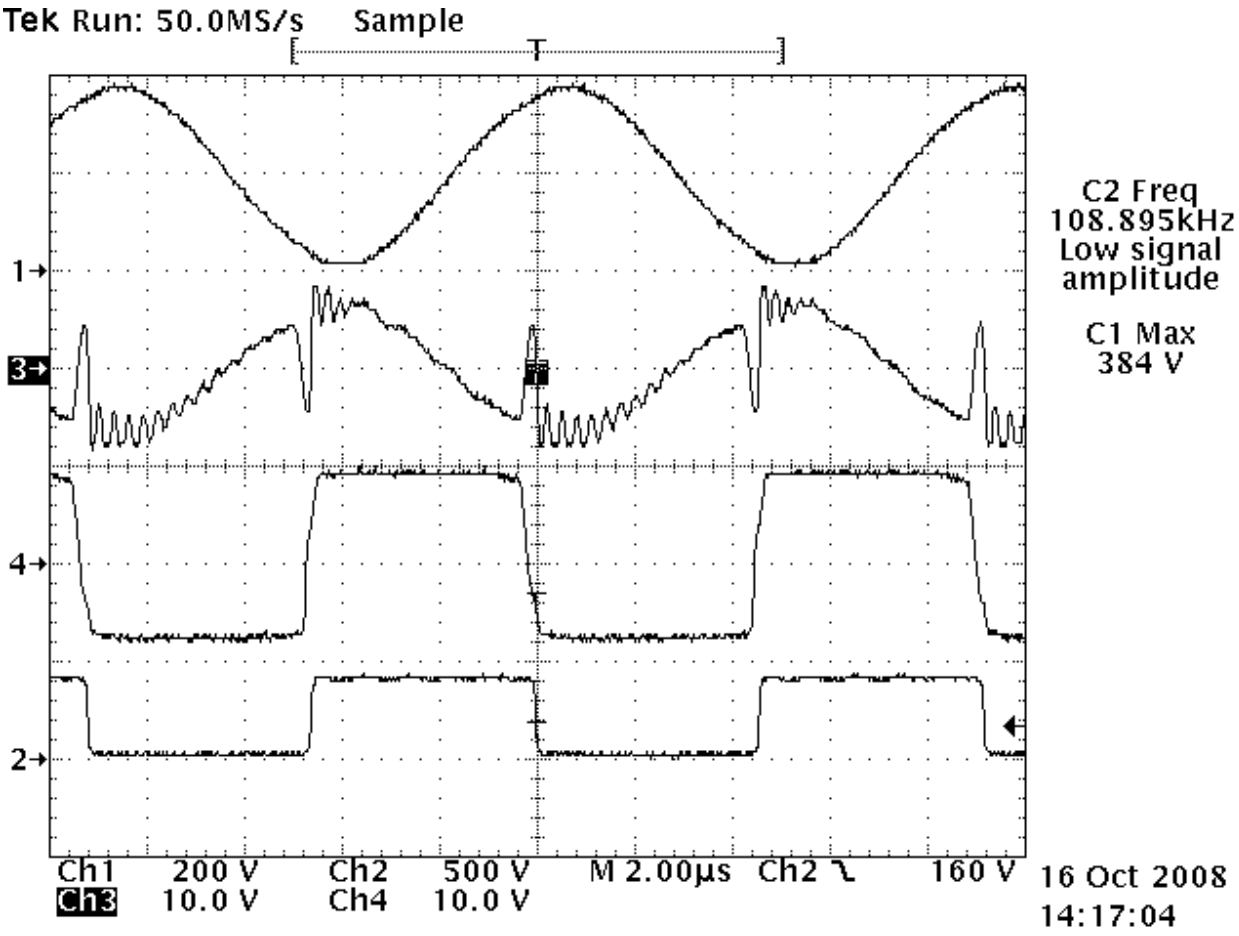
Waveform of primary-side voltages (20A)



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 (25A)



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