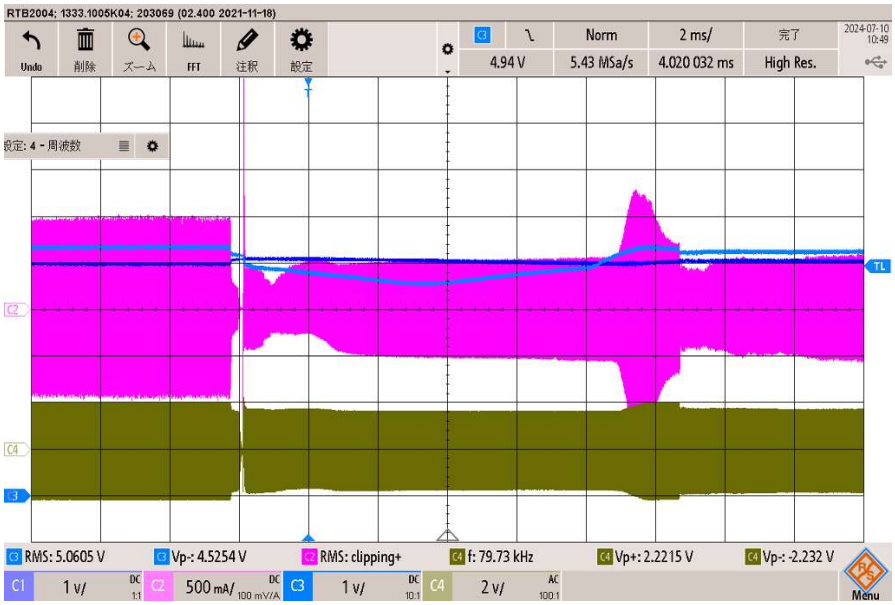
E2E question to TI (7th post)

Hello Mike. This is Kurata. Thank you for your reply. Since it took a while to get your reply, we have also considered the problem and how to improve it. The issues we are considering are as follows. The waveform posted recently was an enlarged waveform after the FB terminal drooped, in order to confirm the maximum control frequency. Although it was not the enlarged waveform at the timing you were looking for, you should be able to recognize that the frequency is gradually increasing in stages over time in the original waveform. Also, as a result of trial and error to improve the problem during the period when we were unable to receive your reply, the situation has improved under the following conditions. <Design changes> ① Reduce the winding ratio of the transformer. Changed from Np=38T to 39T (returning to the winding ratio calculated in the data sheet). ② Reduced the voltage division ratio of the VCR terminal input voltage from 0.01212 to 0.01. The upper capacitor capacitance was changed (121.2pF to 147pF), and the lower capacitor capacitance was changed (10000pF to 14700pF).

3) The control loop gain was reviewed to ensure phase margin. (Bandwidth suppression)

<Test data after improvement>

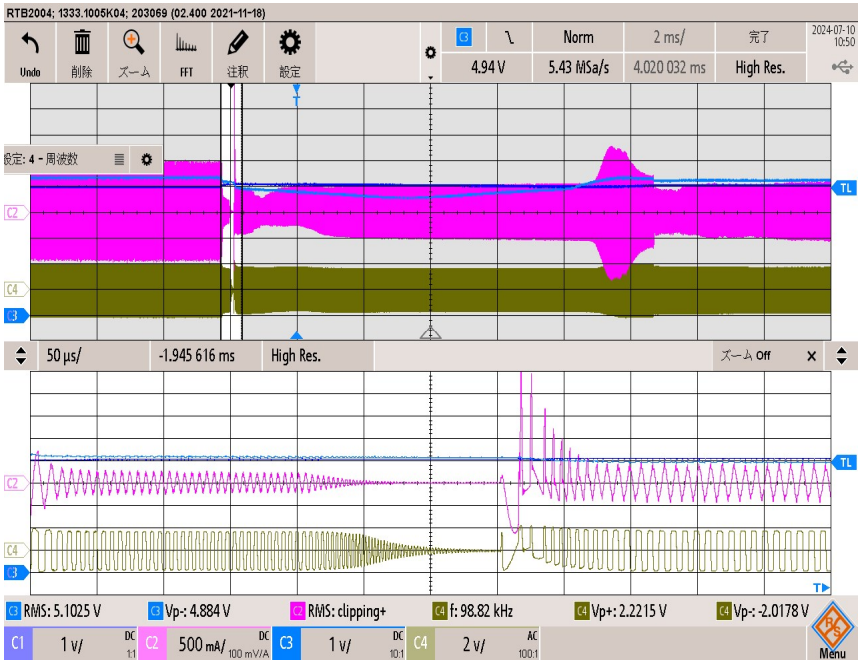
)_① Overall waveform



C1 (blue): 5V output voltage_1V/div, C2 (pink): LLC primary current_500mA/div, C3 (light blue): FB terminal voltage_1V/div

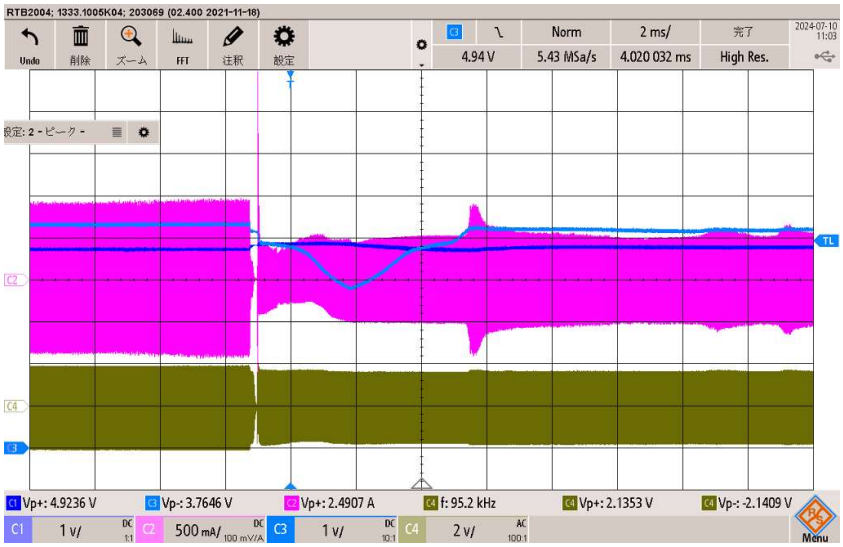
C4 (gray): BW terminal voltage_2V/div, H: 2msec/div

1)_② Enlarged waveform of the same (2msec/div, 50 μ sec/div)



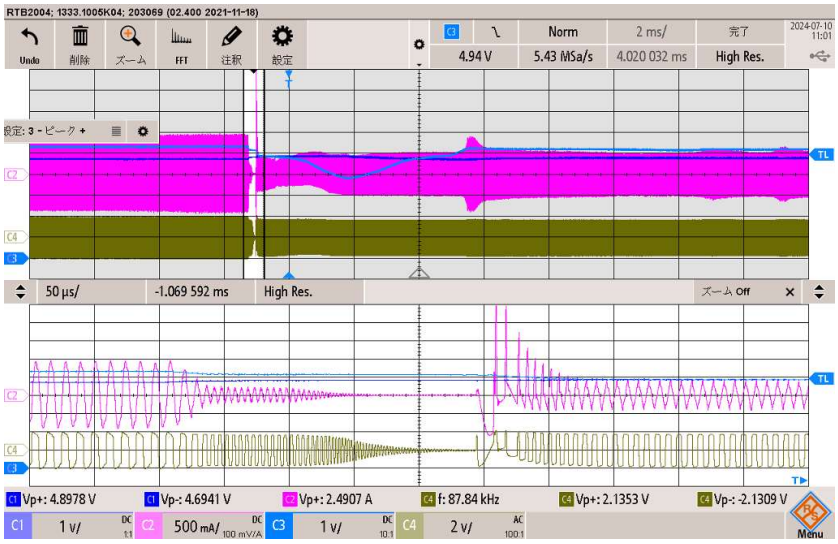
2) When the output voltage is set to 5V-5% (4.75V) <Conditions> Input DC390V, load 100⇒0% when the switch suddenly changes

2)_① Overall waveform



C1 (blue): 5V output voltage_1V/div, C2 (pink): LLC primary current_500mA/div, C3 (light blue): FB terminal voltage_1V/div
C4 (gray): BW terminal voltage_2V/div, H: 2msec/div

2)_② Enlarged waveform (2msec/div, 50 μ sec/div)



<Additional questions from test results>

1. With the above improvements, when the output voltage was set to 5V and 4.75V, it was confirmed that in both cases, the voltage control closed loop did not diverge and settled to a steady control value through convergence control of the FB terminal voltage.

Based on this, to ensure control up to no load, is precision required for the transformer winding ratio and the tolerance value of the VCR terminal voltage setting?