QT-150 Switching Transient Behavior

Purpose: Document measured behavior on low-voltage side of Q-Tran QT-150, when the line input is switched on/off.

Equipment: QT-150MV, with CK-S choke in line (hot) input leg to primary; 50W MR16 lamps (one or two, per experiment) on secondary; Tektronix TPS-2024 quad-channel isolated input DSO

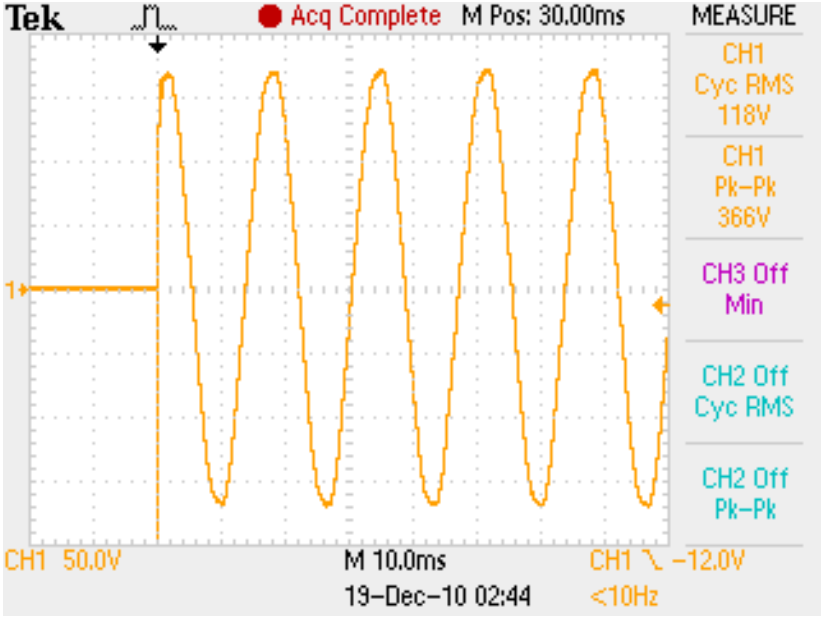
Setup: TPS-2024 channel 1 connected across the 120VAC line input to the QT-150 assembly (i.e., between the hot lead leading from the switch to the CK-S choke, and the neutral connection from the service to the primary of the QT-150 (12VAC tap);
TPS-2024 channel 2 connected across the secondary of the QT-150,

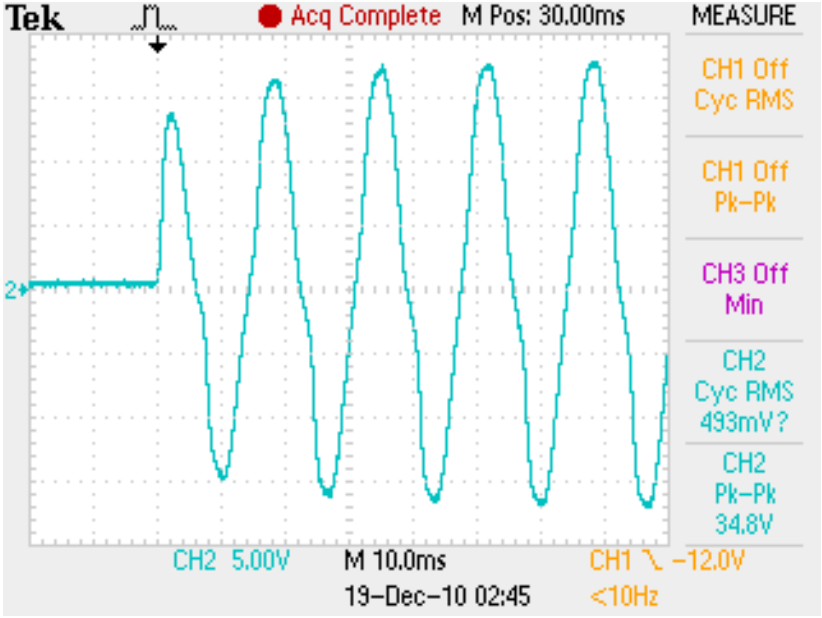
wired for 11-15V range output

Turn-On Transients

In the captures below, the yellow trace shows the input line voltage (120VAC), while the blue trace depicts the voltage across the load (2x 50W MR16).

Note that the yellow trace is 50V/division, while the blue is 5V/division.

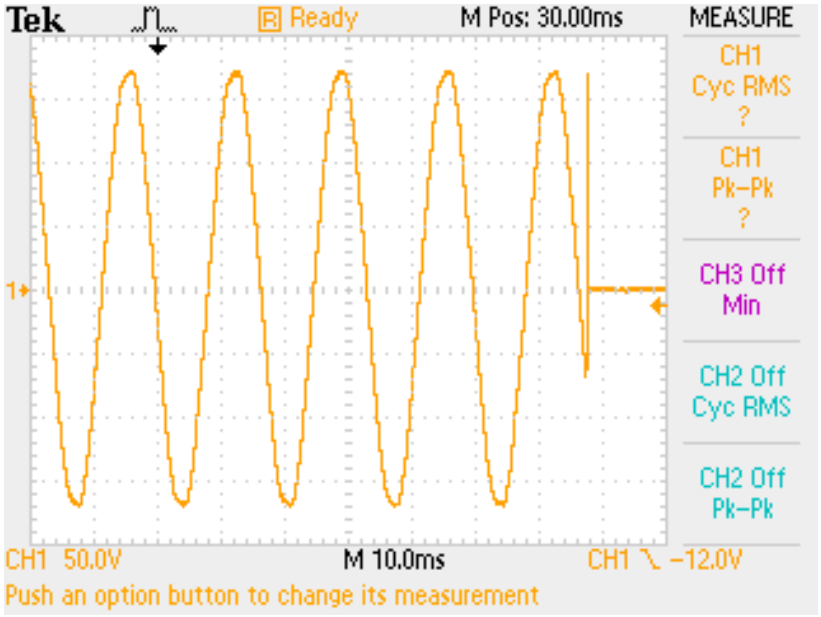


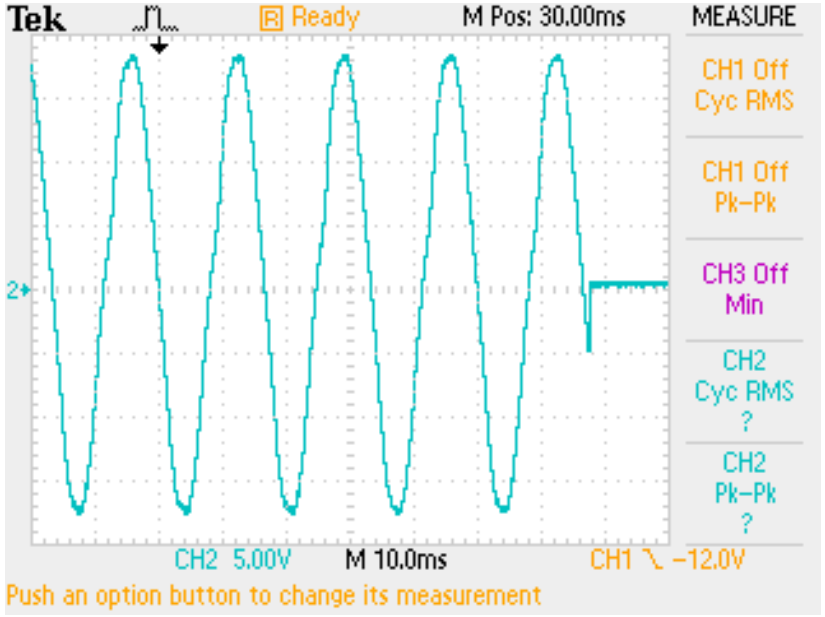


Notice that the large turn-on transient on the input line is not present at all on the load (secondary) side, and that the load takes approximately 2 line cycles to reach full nominal output, as the transformer energizes.

Turn-Off Transients

In the captures below, the yellow trace shows the input line voltage (120VAC), while the blue trace depicts the voltage across the load (2x 50W MR16).

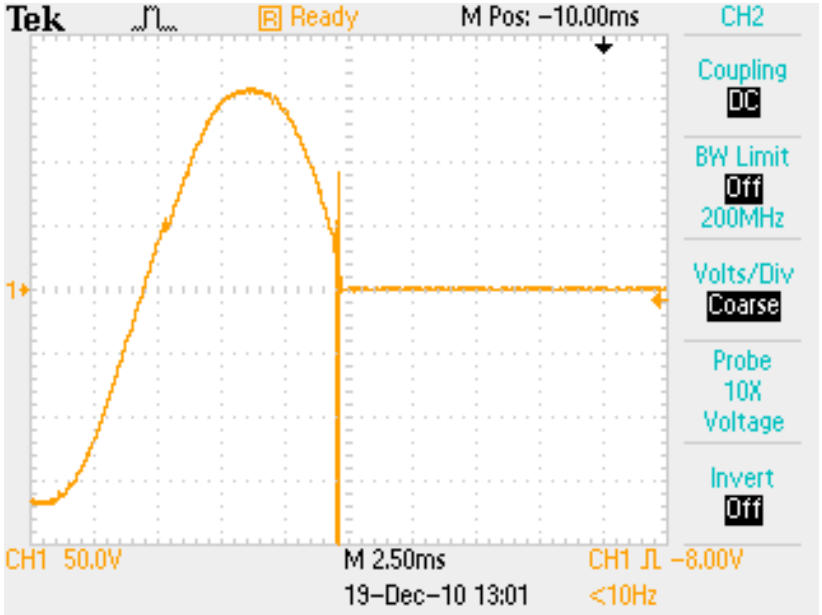


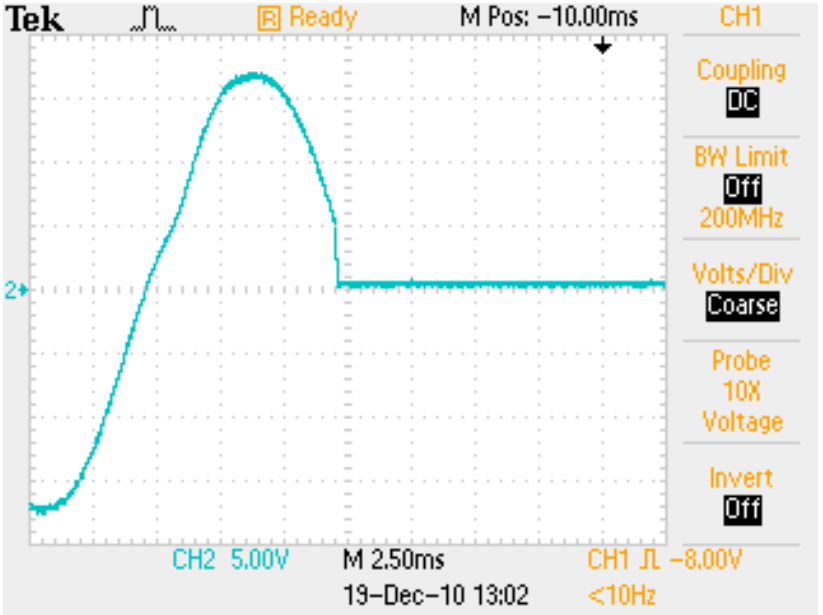


Like the turn-on case, the large kick-back (back emf) visible on the 120VAC side is not coupled through to the load (12VAC secondary) at all.

Turn-Off Transients, Detail

The following captures depict a typical turn-off, at higher resolution.

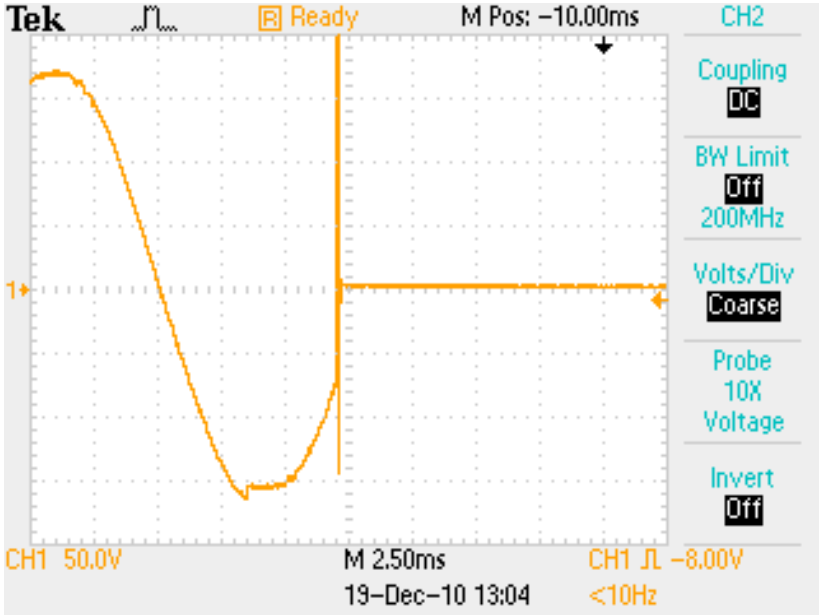


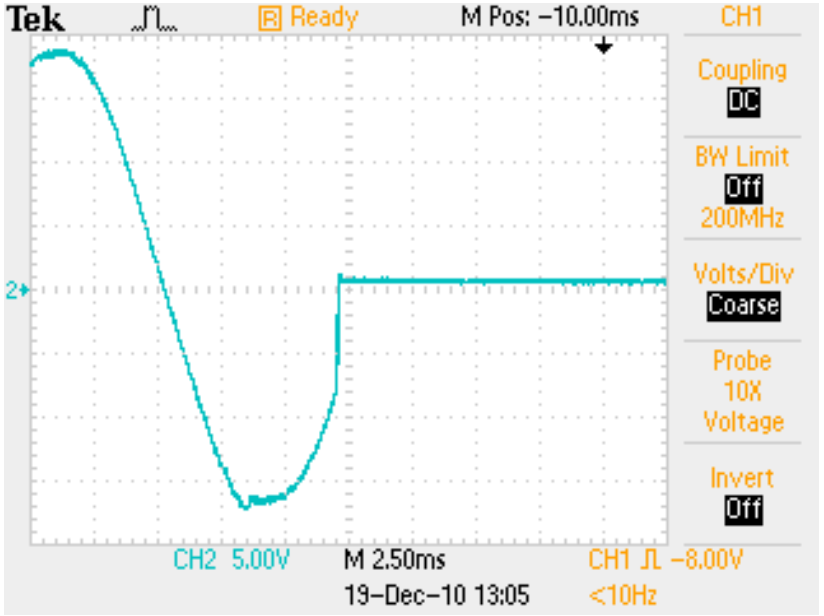


The input line turn-on transient is seen to be very sharp (containing little energy), and no evidence of the transient is seen on the secondary at all. Note also the smoothing of other transients in the input line, as seen in the output.

Turn-Off Transients, Detail with Small Load

To show the impact of reducing the load on the secondary, these captures were taken with a single 50W MR16 load, instead of the two used in previous tests:





Even with a dramatically reduced load on the secondary, there are no visible transients on the load side.

QT-150 Transient Behavior Results

- Neither turn-on nor turn-off events cause any noticeable spikes on the low-voltage (secondary) side of the QT-150.

- This behavior is not dependent upon the transformer being fully loaded; even with a one-third load, no objectionable cases were observed.

- Indeed, the QT-150 (with CK-S) may well serve to protect sensitive electronics on its low-voltage (secondary) side from narrow spikes and transient voltages that may appear on its primary.