

Proposed problem improvement proposal, but since it was proved that it is not logically reasonable as a countermeasure from the following trouble observation and explanation, if there is as simple a countermeasure as possible to avoid as much as possible, then again Please teach.

The observation results of malfunction behavior are shown below.

<UCC28056 gradual rise start failure waveform observation result >

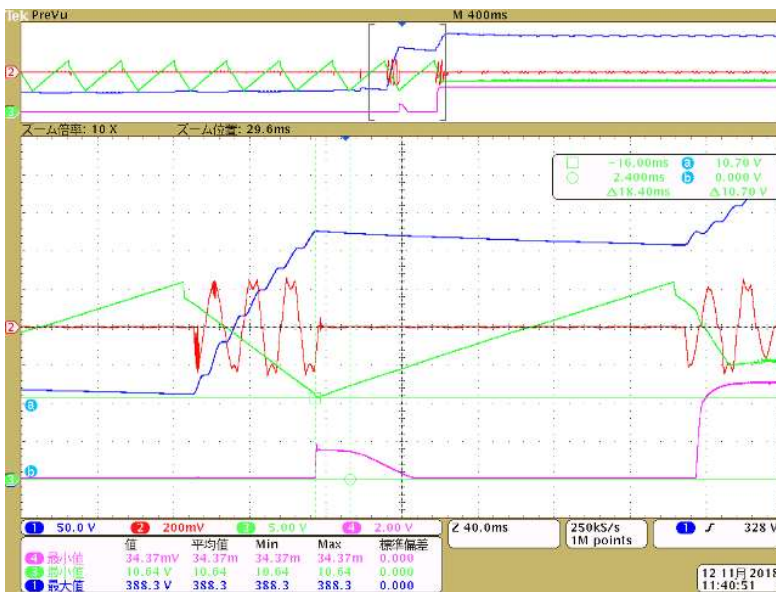
1. Gradual startup condition: The PFC\_COMP pin is set by the remote control signal Activate and measure PFC with AC 80V.

2. Evaluation board connection condition : Removed D1 and D2 of LLC\_EVM, jumper wired D1, D2 cathode line and PFC DC 380V + line.

3. Test conditions : (Below both LLC\_EVM (transformed transformer), output setting: 5 V 0.3 A 24 V 0 A) Smooth capacitor capacity : PFC\_C13=10uF, LLC\_C16=120uF (Default setting) (Excluding the test of ④)

4. Test results

① Incremental rise trouble waveform at startup (1) **Hunting occurred at 5 V output due to malfunction at PFC boost.**



- ① Blue :PFC\_Out [50V/div]
  - ② Red :PFC\_In [2A/div]
  - ③ Green:Vcc(LLC) [5V/div]
  - ④ Pink :5V\_out [2V/div]
- H:[40mS(400mS)/div]

After starting PFC output boosting, 5V output is activated by detection of LLC bulk voltage (about 328 V), but immediately after VCC of LLC detects restart level (10.5 V), Vcc discharge cycle stops and 5 V output also It stops.

After that, the 5 V output is restarted in the discharge cycle from the self start level (26 V).

② Fault waveform at gradual rise startup (2) **Gate signal (TP 9) generation state of LLC.**

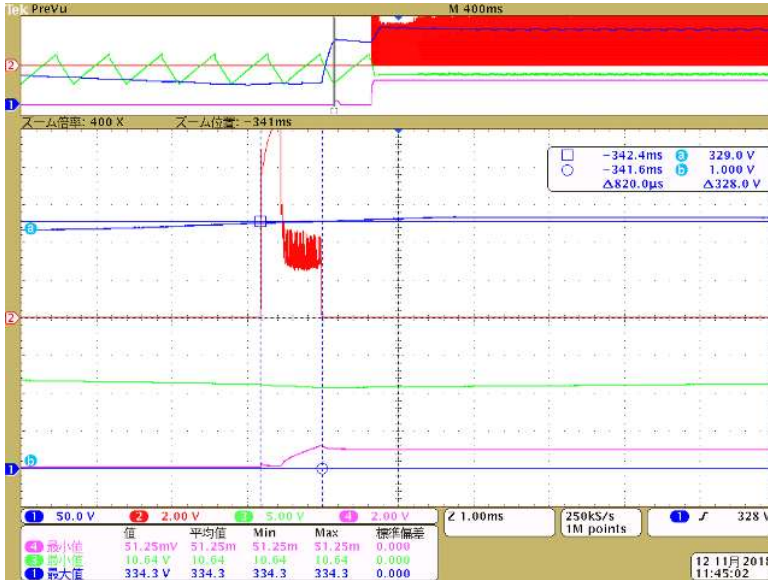


- ① Blue :PFC\_Out [50V/div]
  - ② Red :LLC\_gate [2V/div]
  - ③ Green :Vcc(LLC) [5V/div]
  - ④ Pink :5V\_out [2V/div]
- H:[40mS(400mS)/div]

At the same time, LLC gate pulse is output by bulk detection after PFC boosting starts, 5V starts output

at 5 V, but immediately after the Vcc discharge reaches the restart level (10.5 V), the gate pulse stops and the 5 V output is stopped.

③ Fault waveform at gradual rise startup (3) **Waveform enlarged waveform of gate signal (TP9) in item ②**

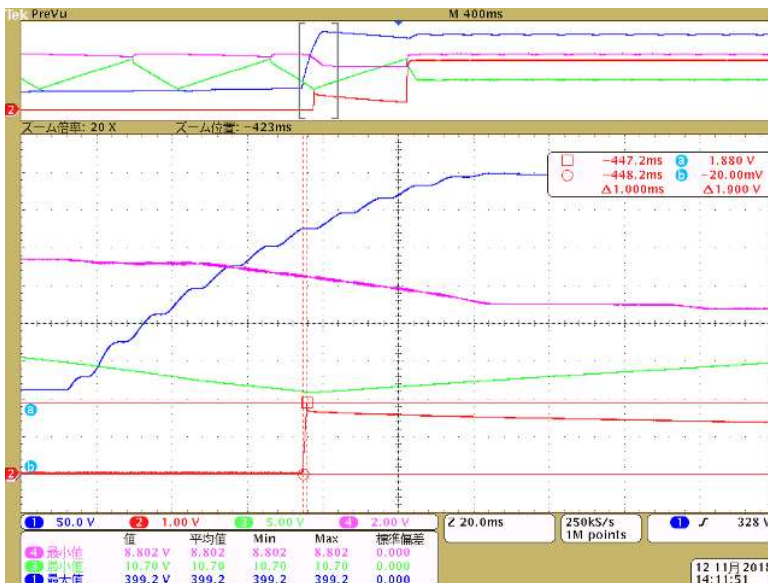


- ① Blue :PFC\_Out [50V/div]
  - ② Red :LLC\_gate [2V/div]
  - ③ Green:Vcc(LLC) [5V/div]
  - ④ Pink :5V\_out [2V/div]
- H:[1mS(400mS)/div]

Since the discharge of Vcc reaches the restart level (10.5 V) and stops immediately after the LLC gate drive signal (TP 9) starts, the 5 V output stops and the self start level (26 V) after completion of the charge cycle of Vcc voltage In the discharge cycle from 5 V output is restarted.

④ Fault waveform at gradual rise startup (4) **The PFC boost waveform is normal, but the output malfunctions.**

In this case, the smoothing capacitor capacity increase and retest : PFC\_C13 = 10+220uF, LLC\_C16=120+220uF



- ① Blue :PFC\_Out [50V/div]
  - ② Red :LLC\_out [2A/div]
  - ③ Green:Vcc(LLC) [5V/div]
  - ④ Pink :Vcc(PFC) [2V/div]
- H:[20mS(400mS)/div]

At this timing, the boosting of the PFC output is steadily boosted up to the steady value. In case However, when the LLC starts up at the bulk detection level (about 328 V) and outputs 5 V during boosting, the Vcc discharge cycle reaches the restart level (10.5 V) during the rise of 5 V and the LLC operation stops, so the 5 V output is It stops at mid-rise.

After that, Vcc completes the charge cycle and enters the discharge cycle from the restart operation, the 5V output restarts.

\* We also commented on the waveform observation data sent earlier, but at the time timing to detect the bulk voltage at the end of the discharge cycle at the repetition of the VLC charge and discharge cycle of

the LLC at the boost start of the PFC output from the above-mentioned waveform explanation, after 5 V output start As Vcc reaches the restart level, stop the LLC operation? 5 V output will not restart until entering the standby state (standby state) and reaching the self-start level.

Therefore, when PFC boosting and LLC bulk detection operate at such timing, even if the winding voltage of LLC is further increased or measures to raise Vcc smoothing capacity are taken, the voltage rise of the power auxiliary winding is the same as the rise of 5 V output Since timing (after LLC activation) can not rise faster than 5 V output, at that time Vcc has already reached the restart level, so it is impossible to stop the restart and I think that there is no countermeasure effect.

Since the timing of Vcc charging and discharging of this event and the timing of PFC boosting are not synchronized, the probability of occurrence may be less than 1/100 depending on the timing of the remote activation of input, but whenever the timing matches, the retrigger of 5 V output Startup occurs and it is not preferable as an output startup operation.

**Reality This phenomenon has been confirmed 10 times or more from the beginning of the evaluation so we think that it is a problem.**