EEVblog Electronics Community Forum

A Free & Open Forum For Electronics Enthusiasts & Professionals

Maxis
Newbie
Posts: 3
Country:

Re: A Tektronix TDS3014B with two strange issues
« **Reply #25 on:** September 25, 2018, 07:42:57 am »

Dear forum members,

This is my first post on this forum. I wanted to share my experience in fixing the TDS3014 power supply.

The power supply schematics traced Jay_Diddy_B helped me a lot in fixing my 3014.

The problem was in the mains flyback converter, which couldn't properly regulate its output voltage (was jumping from 19V to 23V up/down) causing the scope to do sporradic things, crashing SW, hanging, rebooting, etc.

The root cause of the failure was in the voltage reference/shunt regulator TL431. It was heating up like crazy leaving black spot of the burned PCB under it.
I've checked the other components, they seem to be in spec. After the replacement of TL431, the new regulator also heats up to 70 degrees. The output voltage with and w/o the load and the ripple figure are fine. I'm running the power supply from 240V AC mains. The scope runs like new again.

But now I'm questioning whether the problem is really fixed.

Is it normal that TL431 heats up so much?
I haven't seen it being glowing red on the thermal scan images kindly provided in this forum. Actually TL431 almost dissipates 400mW! It had left the same kind of burns on the PCB like the snubber network resistors and the load resistance.

If this is not a normal operation, IMHO, I can only assume that the optocoupler has degraded with the

time and doesn't have the same Current Transfer Ratio (if the CTR would fall low). Hence TL431 is supposed to put more current through IR LED in order to keep the output voltage on target, which pushes the TL431 operating mode beyond the spec.
For the moment I'm waiting for the CNY17-3 optocoupler to arrive, then I'll try replacing it.
However, if such a heavy operating mode in standby is normal, IMHO, the TDS3000 power supply is prone to fail with the time.

I'm just wondering, is it only my scope or are TDS3000 having a glowing red reference IC when running from 240V AC?

Thank you!

All the Best,

Maxim

« *Last Edit: September 25, 2018, 07:49:36 am by Maxis* »

Logged

Maxis

Newbie

Posts: 3
Country:

Re: A Tektronix TDS3014B with two strange issues

« **Reply #26 on:** September 26, 2018, 08:45:55 am »

Hello All!

A little update - coudn't get the original TCDT1103G, but quickly dropped in CNY17-3 (disconnecting the base of the phototransistor beforehand). Apart from a little pinout difference (and a package geometry too) these two parts have similar characteristics.

And bingo!

After the replacement of the optocoupler the current flowing through the IR LED is much lower. LM431 is barely warm. IMHO, since the scope was always connected to the mains for many years while sitting on the bench, the optocoupler has degraded (IMHO the IR LED did) and this was the root cause. So, in order to limit the output voltage, the LM431 had to pump lots of current though IR LED in order to compensate for the degraded Current Transfer Ratio. This caused TL431 dissipating around 500mW. Eventually this voltage reference got killed by the continuous overheating making the NAN power supply output unregulated (up to 30V instead of 14.7V). I wonder whether the output load resistance was tailored to limit the output voltage in such event (single fault protection) when the scope is OFF. Anyway apart from continuous rebooting and FW crashes the scope didn't burn

What is amazing is that the Tektronix power converter (the one generating all the voltages from 14.7V and connected to the NAN AC/DC converter) supported the recurring overvoltage up to 30V protecting the rest of the scope (sometimes it's good to overdesign things)!

Now, IMHO, the scope is finally fixed and its thermal profile is not any different from presented above on the IR scans.

Maybe someone would find it helpful.

Thank you and all the Best,

Maxim

P.S. Now I'll try fixing/calibrating my 2245A with the old-new repaired TDS3014!

« *Last Edit: September 26, 2018, 09:21:41 am by Maxis* »

Logged

Pages: Prev 1 [**2**] All **Go Up**

PRINT SEARCH

« previous next »

Jump to: => Repair go

EEVblog Main Site EEVblog on Youtube EEVblog on Twitter EEVblog on Facebook