Part #: 900V SiC MOSFETs
ON Semiconductor AUTHORIZED DISTRIBUTOR Digi-Key
Description: 10x higher dielectric breakdown field strength, 2x higher electron saturation velocity, 3x higher energy bandgap, and 3x higher thermal conductivity
Download Datasheet

EEVblog Electronics Community Forum

A Free & Open Forum For Electronics Enthusiasts & Professionals

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August 11, 2020, 04:23:27 pm

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Author Topic: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair (Read 25560

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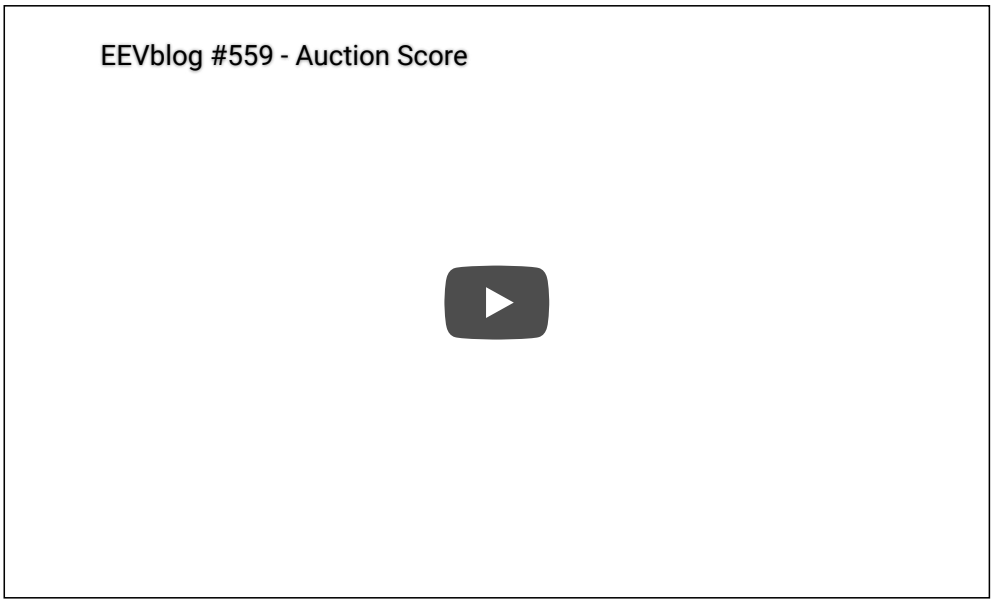
EEVblog
Administrator

Posts: 31556
Country:

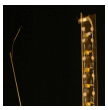
EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **on:** January 01, 2014, 01:11:35 am » Say Thanks Reply Quote

Dave tries to find out what's wrong with a Tektronix TDS3054 500MHz 4 channel oscilloscope.
SPOILER: there is no ending...
Auction score video:



« *Last Edit: January 01, 2014, 01:13:06 am by EEVblog* » Logged

mikeselectricstuff
Super Contributor



Posts: 12136
Country:

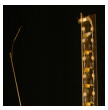
Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #1 on:** January 01, 2014, 01:36:33 am »
Say Thanks Reply Quote

"Distributed element filter" at 18:30 looks more like it's a laser-trimmed part (R or cap/inductor array) - you can see the laser cut-line on it

Report to moderator Logged

Youtube channel:Taking wierd stuff apart. Very apart.
Mike's Electric Stuff: High voltage, vintage electronics etc.
Day Job: Mostly LEDs

mikeselectricstuff
Super Contributor



Posts: 12136
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #2 on:** January 01, 2014, 01:45:43 am »
Say Thanks Reply Quote

Would at least be worth probing around that diff output & comparing to another channel with the same input.
Also try heating & freezing, and flexing the PCB a little

Report to moderator Logged

Youtube channel:Taking wierd stuff apart. Very apart.
Mike's Electric Stuff: High voltage, vintage electronics etc.
Day Job: Mostly LEDs

Vgkid
Super Contributor

Posts: 2582
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #3 on:** January 01, 2014, 01:46:13 am »
Say Thanks Reply Quote

Thanks for the upload, the maxtek marked chips in the hybrid are rather interesting. It appears that Maxtek(now Infinicon) only manufacturers instruments relating to thin film deposition, and various quartz based sensor assemblies.

Report to moderator Logged

If you own any North Hills Electronics gear, message me. L&N Fan

gxti
Frequent Contributor

Posts: 507
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #4 on:** January 01, 2014, 01:59:06 am »
Say Thanks Reply Quote

Sample memory would be a good guess. When you have billions of cells made as cheaply as possible and bought on the commodity market it's no surprise that RAM is often the first thing to fail in a computer. That said, from the zoomed in look at the noise it doesn't look much like a single bit error.

I was also going to suggest probing the hybrid output but Mike beat me to it.

Report to moderator Logged

free_electron
Super Contributor

Posts: 7452
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #5 on:** January 01, 2014, 02:01:49 am »

Say Thanks Reply Quote

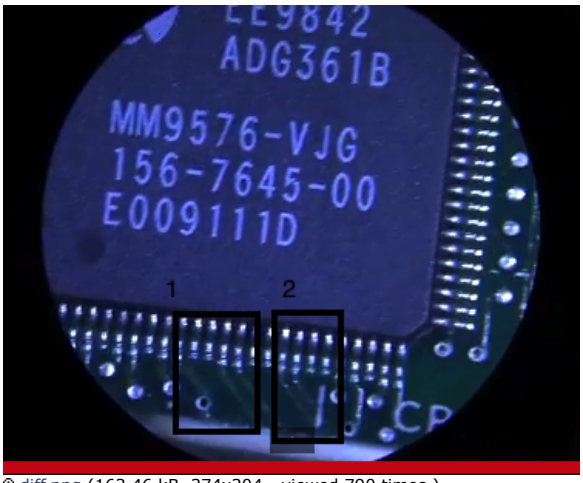
Maxtec was a spinoff of Maxim.
Maxim for a long time made some custom asics for tektronix. They were eventually borged by Tektronix hence the MaxTec name.

Tek spat em back out after the danaher borging and part of it went back to Maxim.

The hybrid contains Ac/Dc gnd and attenuator relays. the maxtec has an amplifier and divider chain (voltage divider)

the Maxtec chip also splits the signal in a HF component and LF component. From the signal corruption it looks like the problem is in the HF section as the lf signal is perfect.
I would reflow the analog devices ADG361 square chip of that channel. at 25:58 you see the two differntial pairs. one is hf the other lf. check the pins inbetween. one of the rails may be gone. they are fed using ferrite beads.

The trimming mark you see on the resistor is actually called an r-cut. you have to look at it form the long side. the reason they do that is because blasting it with the laser evaporates the resistance material. as it cools down it partially can re-sublimate in the cut. by going lengthwise they avoid it from getting back in the cut area.



diff.png (163.46 kB, 374x304 - viewed 790 times.)

Report to moderator Logged

Professional Electron Wrangler.
Any comments, or points of view expressed, are my own and not endorsed , induced or compensated by my employer(s).

kxenos
Frequent Contributor

Posts: 284
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #6 on:** January 01, 2014, 02:12:29 am »

Say Thanks Reply Quote

Dave, if you probe the differential output of the hybrid would it be possible to see if the problem is already there?

Report to moderator Logged

EEVblog
Administrator

Posts: 31556

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #7 on:** January 01, 2014, 02:15:58 am »

Say Thanks Reply Quote

Quote from: free_electron on January 01, 2014, 02:01:49 am

Country:

> the Maxtec chip also splits the signal in a HF component and LF component. From the signal corruption it looks like the problem is in the HF section as the lf signal is perfect.

Interesting, thanks.

> **Quote**
>
> I would reflow the analog devices ADG361 square chip of that channel. at 25:58 you see the two differntial pairs. one is hf the other lf. check the pins inbetween. one of the rails may be gone. they are fed using ferrite beads.

No ferrite beads in sight.

Logged

Jay_Diddy_B
Super Contributor
Posts: 2216
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #8 on:** January 01, 2014, 02:22:13 am »

Hi,
I would guess that the front end is o.k.

What happens if you move the trace up and down the screen?

I would guess that there is something wrong after the ADC. I have seen similar displays on TDS5xx series if there is a bad connection in the acquisition memory.

Regards,

Jay_Diddy_B

Report to moderator Logged

free_electron
Super Contributor
Posts: 7452
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #9 on:** January 01, 2014, 02:30:04 am »

backside board… actually side facing the front panel.

Report to moderator Logged

Professional Electron Wrangler.
Any comments, or points of view expressed, are my own and not endorsed , induced or compensated by my employer(s).

Hydrawerk
Super Contributor
Posts: 2393
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #10 on:** January 01, 2014, 02:43:12 am »

Well, the TDS3054 internal construction is not solid... For such an expensive scope (even today) i would expect more steel parts... Compare it to the DSOX2000, that is full of sheet metal.

There are only 4 SMD ferrites on the whole board, all under the 5th chip between the ADC's, and they test fine.

Logged

NiHaoMike
Super Contributor

Posts: 6357
Country:
"Don't turn it on - Take it apart!"

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #13 on:** January 01, 2014, 04:14:05 am »
Say Thanks Reply Quote

I was once assigned a 12GHz Agilent scope to use for testing. There were many problems with it, as in one channel would not properly recognize active probes, another channel was completely dead (flat line), and yet another channel was noisy. They just swapped out the scope for a new one and I never heard what was wrong with the old one.

Try tapping the board with a pen or other plastic object to see if it's an intermittent connection.

Report to moderator Logged

Cryptocurrency has taught me to love math and at the same time be baffled by it.

Cryptocurrency lesson 0: Altcoins and Bitcoin are not the same thing.

EEVblog
Administrator

Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #14 on:** January 01, 2014, 04:24:16 am »
Say Thanks Reply Quote

Just shot a Part 2 video on this.
No surprises for guessing the outcome...

Logged

member_xyz
Contributor

Posts: 46
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #15 on:** January 01, 2014, 04:52:55 am »
Say Thanks Reply Quote

I find it frustrating to watch your fault finding/repair videos.
Initial mechanical inspection and some speculation is OK to a certain point, but don't go overboard.
I don't kow why you avoid using electronic test equipment to do at least some basic measurements?
You have a multi channel scope, you could easily do some signal comparisons on the front end.
At the end of the day it may not resolve the issue, but for **** sake you are running en electronics blog/forum.

Report to moderator Logged

The following users thanked this post: Doctorandus_P

calexanian
Super Contributor

Posts: 1878
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #16 on:** January 01, 2014, 05:01:49 am »
Say Thanks Reply Quote

Quote from: member_xyz on January 01, 2014, 04:52:55 am

> I find it frustrating to watch your fault finding/repair videos.
> Initial mechanical inspection and some speculation is OK to a certain point, but don't go overboard.
> I don't kow why you avoid using electronic test equipment to do at least some basic measurements?
> You have a multi channel scope, you could easily do some signal comparisons on the front end.
> At the end of the day it may not resolve the issue, but for **** sake you are running en electronics blog/forum.

I like the commentary on the mechanical stuff. If I wanted to look at a waveform on a scope all day I would just stay at work and get something done. This is more fun! O0

Report to moderator Logged

Charles Alexanian
Alex-Tronix Control Systems

TooOldForThis
Regular Contributor

Posts: 55
Country:
H: 42.576MHz/Tesla

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #17 on:** January 01, 2014, 05:32:05 am »

What does the channel look like in single sweep mode? If there is any sign of a changing signal when no new data is flowing into the sample memory, then the problem must be in the sample memory or display logic.

Report to moderator Logged

taemun
Regular Contributor

Posts: 109
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #18 on:** January 01, 2014, 05:57:50 am »

The waveform disappearing seems to be linked to the acquisition speed (SPS). At 5:20, you go into the Acquire menu, and on "Normal" horizontal resolution, you're pulling 10MSPS (look at the bottom right), and it has a display, and then "Fast" is 500kSPS, which doesn't have a display. At 5:25 you increase sample rate to 5MSPS (10us/div @ "Fast") and that has a display again.

At 5:54 it works on "Normal" down to 5MSPS (200us/div @ "Normal"), then dies below that.

I'd guess that something changes mode below 5MSPS.

Report to moderator Logged

Kryoclasm
Regular Contributor

Posts: 175
Country:
KL3DL

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #19 on:** January 01, 2014, 06:13:10 am »

Pull hybrid 3 & 4 and plop 4 in 3's spot.

That will confirm or eliminate that part of the board.

PITA, but would be interesting to see.

Report to moderator Logged

"I predict that very shortly the old-fashioned incandescent lamp, having a filament heated to brightness by the passage of electric current through it, will entirely disappear." -Nikola Tesla

Eliminateur
Regular Contributor

Posts: 179
Country:
Electronic's Technician

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #20 on:** January 01, 2014, 06:13:28 am »

Quote from: kxenos on January 01, 2014, 02:12:29 am

> Dave, if you probe the differential output of the hybrid would it be possible to see if the problem is already there?

same thing i was thinking, why not probe the diff output when fed with the test signal and compare it to the same output from one of the good channels?, it might help pinpoint the problem better.
You could also probe the rest of the pins as well and compare

Report to moderator Logged

taemun
Regular Contributor

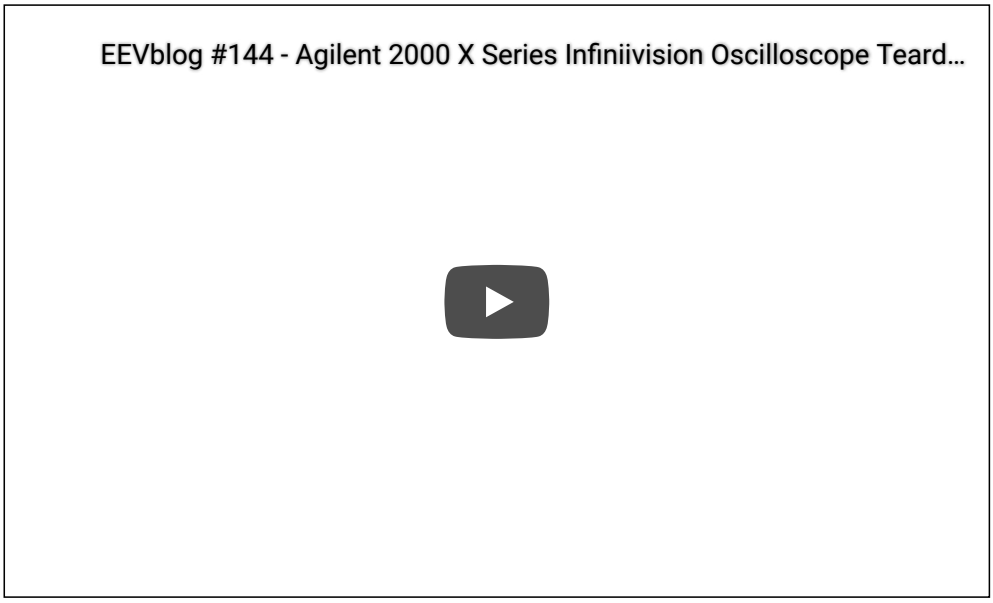
Posts: 109
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #21 on:** January 01, 2014, 06:16:17 am »

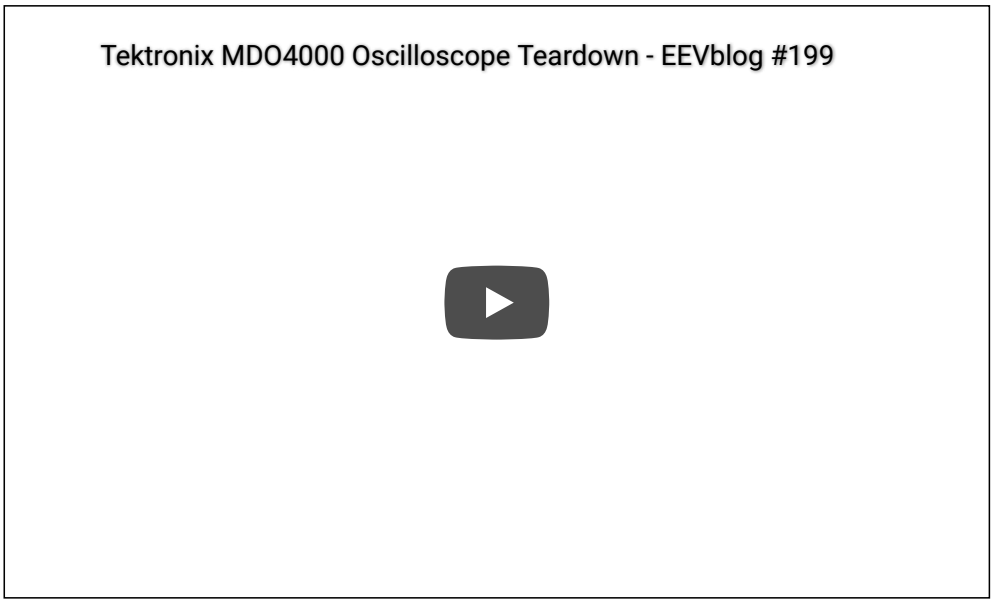
Quote from: Kryoclasm on January 01, 2014, 06:13:10 am

> Pull hybrid 3 & 4 and plop 4 in 3's spot.
>
> That will confirm or eliminate the part of the board.
>
> PITA, but would be interesting to see.

Or maybe probe the outputs first. Noise as on the display would be super easy to see, surely. The



Or even Tektronix MDO4000 series.



« *Last Edit: January 01, 2014, 02:45:44 am by Hydrawerk* »

Report to moderator Logged

Amazing machines. https://www.youtube.com/user/denha (It is not me...)

david77
Frequent Contributor
Posts: 808
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #11 on:** January 01, 2014, 03:25:37 am »

I have no idea what I'm talking about, but from the video it seems to me that only the positive side of the signal is affected by that weird noise.
So I'm left thinking could it be some issue with biasing/decoupling of something in the front end?
Maybe a dead cap or a very noisy power rail?

Seeing as what people still pay for these scopes on ebay it is probably even worth your while to look a bit further.

I guess a proper manual is not available for this machine, right?

Report to moderator Logged

EEVblog
Administrator
Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #12 on:** January 01, 2014, 04:03:49 am »

Quote from: free_electron on January 01, 2014, 02:30:04 am

backside board... actually side facing the front panel.

EEVblog slogan isn't "don't probe it, solder it mindlessly!".

Report to moderator Logged

georges80
Frequent Contributor

Posts: 830
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #22 on:** January 01, 2014, 06:38:59 am »

Say Thanks Reply Quote

Well, if google has anything to say:

http://www.seekchip.com/icstock-m/MM9576-VJG.html

Implies those aren't ADC chips but some kind of fancy fifo/ram controller.

My 'guess' is that the maxtek chips would have the adc (or equivalent) - I'd assume one would keep all the analog stuff on the hybrid module versus trying to feed it down to the 'digital' board.

The MM9577 again, if you believe google:

http://www.seekchip.com/icstock-%EF%BC%AD/MM9577-ACE.html

is an ADC (not very fast).

Good luck

cheers,
george.

Report to moderator Logged

Maxlor
Frequent Contributor

Posts: 564
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #23 on:** January 01, 2014, 06:41:12 am »

Say Thanks Reply Quote

> **Quote from: member_xyz on January 01, 2014, 04:52:55 am**
>
> I find it frustrating to watch your fault finding/repair videos.
> Initial mechanical inspection and some speculation is OK to a certain point, but don't go overboard.
> I don't kow why you avoid using electronic test equipment to do at least some basic measurements?
> You have a multi channel scope, you could easily do some signal comparisons on the front end.
> At the end of the day it may not resolve the issue, but for **** sake you are running en electronics blog/forum.

Yeah... as a software engineer, the random poking around kind of makes me cringe. The term we use for that is shotgun debugging. My approach would be to use bisection to find the problem area. In this instance, you've guessed at what some of the traces on the boards do, let's probe them with a scope at various points to see whether the fault exists before or after that point. Why waste time with random wild shot guesses.

On the other hand, since Dave is commenting on the various bits and pieces he examines as part of the random wild shot guesses (Dave: hey, at least they appear that way in the video. If you've done a more methodical problem analysis, it's not in the video. If I've stepped on your toes here, I'm sorry), I find the video interesting to watch. There's still so much I don't know, and what might be an off-hand side comment to you is really an information nugget to me.

Report to moderator Logged

EEVblog
Administrator

Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #24 on:** January 01, 2014, 06:41:19 am »

Say Thanks Reply Quote

> **Quote from: member_xyz on January 01, 2014, 04:52:55 am**
>
> I don't kow why you avoid using electronic test equipment to do at least some basic measurements?
> You have a multi channel scope, you could easily do some signal comparisons on the front end.
> At the end of the day it may not resolve the issue, but for **** sake you are running en electronics blog/forum.

Because:
a) That's what you do first
b) The video was already long enough
c) A ran out of time (it was new years eve)

Now, I could have not uploaded the video, and kept it until I had finished the repair or done some more stuff, and that's how some bloggers do repair videos. But that's not how I do it. I shoot some content and I upload it, even if it's not finished.
I have already shot a part 2 that does that stuff, and once again I have ran out time to finish it off (new years day + other things to do), but I'm ging to upload that, still an unfinished repair.

Logged

Maxlor
Frequent Contributor
Posts: 564
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #25 on:** January 01, 2014, 06:44:34 am »
Say Thanks Reply Quote

One other thing just came to mind: it might be interesting to see a sinus signal in dots mode. I'm thinking that if the erroneous dots are still all in the same region at the top, it might be a problem in the analog section, i.e. something causes the signal to run into the maximum. If it mirrors the actual signal, a bit error in the digital signal seems more likely.

Report to moderator Logged

calexanian
Super Contributor
Posts: 1878
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #26 on:** January 01, 2014, 06:57:17 am »
Say Thanks Reply Quote

Quote from: georges80 on January 01, 2014, 06:38:59 am

> Well, if google has anything to say:
>
> http://www.seekchip.com/icstock-m/MM9576-VJG.html
>
> Implies those aren't ADC chips but some kind of fancy fifo/ram controller.
>
> My 'guess' is that the maxtek chips would have the adc (or equivalent) - I'd assume one would keep all the analog stuff on the hybrid module versus trying to feed it down to the 'digital' board.
>
> The MM9577 again, if you believe google:
>
> http://www.seekchip.com/icstock-%EF%BC%AD/MM9577-ACE.html
>
> is an ADC (not very fast).
>
> Good luck
>
> cheers,
> george.

Fi/Fo chips could be just streaming data straight to ram and the main chip figures out what to do with the data later. It lends credence to the problem actually lying in ram. I wonder. Does each channel have a separate ram chip? Could just be a faulty Dram.

Report to moderator Logged

Charles Alexanian
Alex-Tronix Control Systems

EEVblog
Administrator
Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #27 on:** January 01, 2014, 07:15:05 am »
Say Thanks Reply Quote

Quote from: calexanian on January 01, 2014, 06:57:17 am

> Fi/Fo chips could be just streaming data straight to ram and the main chip figures out what to do with the data later. It lends credence to the problem actually lying in ram. I wonder. Does each channel have a separate ram chip? Could just be a faulty Dram.

There are 3 58LC128K18B4 memory chips. I can't find any info on them.

Logged

georges80
Frequent Contributor
Posts: 830
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #28 on:** January 01, 2014, 07:24:41 am »
Say Thanks Reply Quote

Quote from: EEVblog on January 01, 2014, 07:15:05 am

> There are 3 58LC128K18B4 memory chips. I can't find any info on them.

Your search mojo must be defective

This datasheet should be close enough for a 1st stab:

http://www.datasheetarchive.com/dl/Scans-061/DSA2IH0096628.pdf

cheers,
george.

Report to moderator Logged

EEVblog
Administrator

Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #29 on:** January 01, 2014, 07:29:13 am »

Yep, that's the one.
128K x 18bit which was obvious form the part number. Third chip is likely intensity data?
It matches the 9bit ADC claim, needing two memory chips for the 4 channels.
Obviously not fast enough for the 5GS/s, so there must be a pipeline in the ASIC.

Logged

calexanian
Super Contributor

Posts: 1878
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #30 on:** January 01, 2014, 07:36:53 am »

And we have no forum members at Tek who can dust off somebody to give their thoughts?

Report to moderator Logged

Charles Alexanian
Alex-Tronix Control Systems

djsb
Frequent Contributor

Posts: 602
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #31 on:** January 01, 2014, 08:02:55 am »

Why not try asking on this yahoo group

http://groups.yahoo.com/neo/groups/TekScopes/info

There are a lot of knowledgeable people in this group who could possibly help.

David.

Report to moderator Logged

David
Hertfordshire,UK
University Electronics Technician, London PIC,CCS C,Arduino,Kicad, Altium Designer,LPKF S103,S62 Operator, Electronics instructor. http://debuggingrules.com/ Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.

peter.mitchell
Super Contributor

Posts: 1568
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #32 on:** January 01, 2014, 08:52:12 am »

Quote from: EEVblog on January 01, 2014, 04:24:16 am

> Just shot a Part 2 video on this.
> No surprises for guessing the outcome...

I'm guessing you mean BER?
I hope that isnt the case.

Report to moderator Logged

TiN
Super Contributor

Posts: 4191
Country:

xDevs.com/live - 24/7 lab feed

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #33 on:** January 01, 2014, 09:57:31 am »

If you have access to high-bw scope with differential probe, maybe worth check that faulty channel diff-pair output and compare it to working channels.
Set same settings on both channels, feed same signal and outputs from front end should be very close

In that case you can save time fixing what is not broken (front end voodoo board), if signals to ADC chip do look properly. From scope display it seems like
it's digital logic issue (with memory or acquisition), not analog stuff.

Quote

> Now, I could have not uploaded the video, and kept it until I had finished the repair or done some more stuff, and that's how some bloggers do repair videos.

Don't listen hates, just upload everything you have 😃 If one have better idea to do repair videos - well, making own blog today is easy as sending two bits to web 😃

« *Last Edit: January 01, 2014, 10:01:01 am by TiN* »

Report to moderator Logged

YouTube | **Metrology IRC Chat room** | Live-cam | Share T&M documentation? Upload! No MB limit, firmwares, photos.

Rubi
Contributor
Posts: 22
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #34 on:** January 01, 2014, 10:57:10 am »

> **Quote from: member_xyz on January 01, 2014, 04:52:55 am**
>
> The term we use for that is shotgun debugging.

LOL!!!
As an prof. software engineer I love that term.

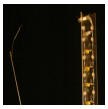
Sometimes you are so desperate because nothing works as expected that you fall back in this kind of amateur behaviour and guess what unfortunately it never helps finding the problem,...

« *Last Edit: January 01, 2014, 12:08:16 pm by Rubi* »

Report to moderator Logged

My uC blog:
http://rubines.blogspot.co.at/

mikeselectricstuff
Super Contributor



Posts: 12136
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #35 on:** January 01, 2014, 11:29:55 am »

It might be instructive to look at a ramp waveform, as if the issue is something like a dodgy bit, you may see some regular patterns at certain timebase settings from the monotonic progression of input value - probably most useful in single-shot mode at a high speed to avoid the effects of any filtering, antialiasing etc.

Also, have you thoroughly checked the other channels at a range of timebase an memory settings - dodgy memory may manifest itself on other channels depending on how the memory is allocated in various modes.

Report to moderator Logged

Youtube channel:Taking wierd stuff apart. Very apart.
Mike's Electric Stuff: High voltage, vintage electronics etc.
Day Job: Mostly LEDs

jgorsk
Contributor
Posts: 44

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #36 on:** January 01, 2014, 11:32:00 am »

Hi Dave,

It may be a good idea to look for help at this Tek forum

http://www1.tek.com/forum/viewforum.php?f=5

If I remember correctly, simillar problems with the TDS3000 series were sometimes solved by running some kind of calibration.

What's in the error log of that scope?

Report to moderator Logged

AndyC_772
Super Contributor

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #37 on:** January 01, 2014, 11:57:15 am »

+1 for the idea that it's a digital problem, not an analogue one.

When you viewed the waveform in dots mode, the extra random dots you see are clustered together and are well separated from the correct signal. There's a substantial distance in the y-axis between

Posts: 3631
Country:
Professional design engineer

each (faulty) sample point and its neighbours.

If it were an analogue problem, I'd expect to see clipping, or oscillation, or some kind of non-linear distortion - but the resulting signal would be continuous in time and would have constrained bandwidth. What you're seeing on the faulty channel is a signal which appears discontinuous in time and which appears different depending on the ADC sample rate and memory depth in use. That strongly suggests it's a digital problem.

I'd be looking for a memory fault. Maybe try replacing the memory ICs. You can buy some new ones here:

http://www.questcomp.com/questdetails.aspx?pn=MT58LC128K18B4LG-9&utm_source=Findchips&utm_medium=cpc&utm_term=MT58LC128K18B4LG-9&utm_content=PartDetails&utm_campaign=FindchipsWS

Another option in the meantime might be to swap over the ADG361B chips between a working channel and the faulty one. If the fault moves with the chip, at least you know what it is even if a replacement IC isn't readily available.

Report to moderator Logged

News: design focus - high speed digital design and termination
CEL | Reliable Electronics

Anks
Frequent Contributor
Posts: 252
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #38 on:** January 01, 2014, 11:58:11 am »

I would check the diff pair and if that looked good using another channel for reference I would swap chips on the main board.

Report to moderator Logged

EEVblog
Administrator
Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #39 on:** January 01, 2014, 12:06:45 pm »

> **Quote from: mikeselectricstuff on January 01, 2014, 11:29:55 am**
>
> Also, have you thoroughly checked the other channels at a range of timebase an memory settings - dodgy memory may manifest itself on other channels depending on how the memory is allocated in various modes.

The other channels seem to work just fine.
I do need to do more thorough testing and calibration etc though.

Logged

Rubi
Contributor
Posts: 22
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #40 on:** January 01, 2014, 12:13:29 pm »

You could remove the ferrites from the differential output on the hybrid and bridge the output from another channel.
So you could see for sure if the hybrid is responsible for the problem.

Report to moderator Logged

My uC blog:
http://rubines.blogspot.co.at/

NANDBlog
Super Contributor
Posts: 4660
Country:
Current job: ATEX certified product design

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #41 on:** January 01, 2014, 12:41:50 pm »

My guess would be that you have one bit flipped on the digital side. This can be at the parallel communication somewhere, and the cause for this could be ground bouncing. I would check the decoupling capacitors if any of those are cracked, or if you have significant noise on the power supply right at the ASIC pins.

Report to moderator Logged

Rufus

Super Contributor

Posts: 2094

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #42 on:** January 01, 2014, 12:54:13 pm »

It looks like a digital problem to me. Something like the MSb of the conversion being intermittently hot.

I think more detective work on what was actually being displayed would have been worthwhile. If it is digital and the hybrid is all analog there was no point looking at it.

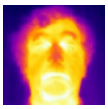
The disappearing trace at low sweep rates might also give some clues. Is it really disappearing or is the glitch detector always capturing a 'hot' bit at lower rates and you end up with an offset signal above the trigger level? That would indicate the problem is before the trace memory.

If you run with the scope open there are lots of options for comparing signals and heating/cooling/poking things to see if you can make it more or less intermittent.

Report to moderator Logged

PA0PBZ

Super Contributor



Posts: 4361

Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #43 on:** January 01, 2014, 01:00:40 pm »

The wires heat-shrinked with the AC are most likely mainly for the line trigger.

Report to moderator Logged

Keyboard error: Press F1 to continue.

jerryuk

Newbie

Posts: 3

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair - FIX?

Say Thanks Reply Quote

« **Reply #44 on:** January 01, 2014, 04:16:47 pm »

I had exactly the same fault with a TDS3032B (Noise superimposed on the signal)
Initially I contacted Tektronix but they wanted over £1000 just to take a look so I decided to pull it apart and see what I could find.
Same pcb as the 54 but only 2 hybrid modules fitted of course.
Carried out the same tests but could find nothing so reassembled the scope.
I then found that by selecting bandwidth limit of 20Mhz or 150Mhz the fault did not show.
Switching back to Full BW and the fault was still there.
However I switched the bandwidth to 20 MHz and cycled the power and then reselected Full BW
Unbelievably the fault had gone
That was over a year ago and the fault has not come back (I did try some percussive maintenance to see if it was a poor joint etc but could not get the fault to come back).
May be worth a try
NOTE: I cannot remember the exact sequence I carried out but it was something like I describe above but it was definately the Bandwidth setting that I was changing.

Jerry

Report to moderator Logged

vikpc

Contributor

Posts: 9

Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #45 on:** January 01, 2014, 04:56:52 pm »

Maybe it just relays?

Report to moderator Logged

ResR

Regular Contributor

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #46 on:** January 01, 2014, 06:55:58 pm »

Have you checked the passive components? Maybe some resistor is burned out or capacitor cracked and doesn't filter the noise any longer on that channel?? Sometimes a transistor that is starting to fail gives out noise with the signal also.

Report to moderator Logged

Posts: 149
Country:
-Artificial_Intelligent-

Alexei.Polkhanov
Frequent Contributor

Posts: 683
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #47 on:** January 01, 2014, 07:14:46 pm »

Quote from: NANDBlog on January 01, 2014, 12:41:50 pm

> My guess would be that you have one bit flipped on the digital side. This can be at the parallel communication somewhere, and the cause for this could be ground bouncing. I would check the decoupling capacitors if any of those are cracked, or if you have significant noise on the power supply right at the ASIC pins.

I would +1 to that. Signal on screen does show signs of what you have described.

Report to moderator Logged

atw60444
Contributor

Posts: 41
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #48 on:** January 01, 2014, 07:17:22 pm »

Did Dave say he'd uploaded #565, part two? No sign of it here yet

Report to moderator Logged

Jonny
Regular Contributor

Posts: 61
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #49 on:** January 01, 2014, 07:38:12 pm »

Quote from: atw60444 on January 01, 2014, 07:17:22 pm

> Did Dave say he'd uploaded #565, part two? No sign of it here yet

There, There.... he only said he shot it. I'm sure we'll see it soon enough

Report to moderator Logged

Jonny

Rufus
Super Contributor

Posts: 2094

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #50 on:** January 01, 2014, 07:58:45 pm »

Quote from: georges80 on January 01, 2014, 06:38:59 am

> Well, if google has anything to say:
>
> http://www.seekchip.com/icstock-m/MM9576-VJG.html

The MM numbers are date or batch codes the part numbers are ADG.

The ADG365 is mentioned in a Tektronix patent about some video triggering scheme. It is described as a trigger circuit controlling a sampler.

Report to moderator Logged

vikpc
Contributor

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #51 on:** January 01, 2014, 08:00:24 pm »

Posts: 9
Country:

im think need swap hybrid modules betwen channels to check where is problem.. Dave have cool desoldering station.. its about 10-20min to swap

Report to moderator Logged

georges80
Frequent Contributor

Posts: 830
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #52 on:** January 01, 2014, 08:42:44 pm »

Say Thanks Reply Quote

Quote from: Rufus on January 01, 2014, 07:58:45 pm

Quote from: georges80 on January 01, 2014, 06:38:59 am

Well, if google has anything to say:

http://www.seekchip.com/icstock-m/MM9576-VJG.html

The MM numbers are date or batch codes the part numbers are ADG.

The ADG365 is mentioned in a Tektronix patent about some video triggering scheme. It is described as a trigger circuit controlling a sampler.

Given the parts are NS and MM is an NS part number 'starter', I'd suggest those are NS part numbers. The ADGxxx may be a branding for Tek. MMxxxx doesn't look anything like a typical batch/date code - the stuff below the MMxxxx is more likely that info.

cheers,
george.

Report to moderator Logged

sync
Frequent Contributor

Posts: 799
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #53 on:** January 01, 2014, 08:56:02 pm »

Say Thanks Reply Quote

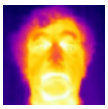
Quote from: vikpc on January 01, 2014, 08:00:24 pm

im think need swap hybrid modules betwen channels to check where is problem.. Dave have cool desoldering station.. its about 10-20min to swap

... and risk to destroy another channel.
And probably you should not touch the hybrids which makes swapping a bit difficult.

Report to moderator Logged

PA0PBZ
Super Contributor



Posts: 4361
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #54 on:** January 01, 2014, 09:50:09 pm »

Say Thanks Reply Quote

Quote from: Jonny on January 01, 2014, 07:38:12 pm

Quote from: atw60444 on January 01, 2014, 07:17:22 pm

Did Dave say he'd uploaded #565, part two? No sign of it here yet

There, There.... he only said he shot it. I'm sure we'll see it soon enough

There: https://www.eevblog.com/forum/blog/eevblog-565-tektronix-tds3054-oscilloscope-repair-part-2

Report to moderator Logged

Keyboard error: Press F1 to continue.

jancumps
Supporter

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #55 on:** January 01, 2014, 10:42:26 pm »

Say Thanks Reply Quote

Quote from: Maxlor on January 01, 2014, 06:41:12 am

Posts: 1250
Country:

New Low

> **Quote from: member_xyz on January 01, 2014, 04:52:55 am**
>
> I find it frustrating to watch your fault finding/repair videos.
> Initial mechanical inspection and some speculation is OK to a certain point, but don't go overboard.
> I don't kow why you avoid using electronic test equipment to do at least some basic measurements?
> You have a multi channel scope, you could easily do some signal comparisons on the front end.
> At the end of the day it may not resolve the issue, but for **** sake you are running en electronics blog/forum.

Yeah... as a software engineer, the random poking around kind of makes me cringe. The term we use for that is shotgun debugging. My approach would be to use bisection to find the problem area. In this instance, you've guessed at what some of the traces on the boards do, let's probe them with a scope at various points to see whether the fault exists before oYr after that point. Why waste time with random wild shot guesses.

On the other hand, since Dave is commenting on the various bits and pieces he examines as part of the random wild shot guesses (Dave: hey, at least they appear that way in the video. If you've done a more methodical problem analysis, it's not in the video. If I've stepped on your toes here, I'm sorry), I find the video interesting to watch. There's still so much I don't know, and what might be an off-hand side comment to you is really an information nugget to me.

I'm also from software side and I disagree

There is a substantial difference. Hardware has a much bigger physical component in it. Software debugging is almost always about logic that's failing.
There is nothing wrong with (seemingly) random poking at and looking at parts of the scope - to see if something looks bad - before digging deeper into it.

chances are quite high that a failure is visible or smellable.

When that faiils it is the right time to get into a more structured approach like described above.

Report to moderator Logged

Saneoc

Contributor

Posts: 8
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #56 on:** January 01, 2014, 10:55:03 pm »

Hi all!
First of all, I'm sorry for my english, but I want to say something.
  The strange thing I notticed is the fact that the noise is always above the trace at the positive half cycle and mostly below the trace at the negative one (or near zero).
Probably this can be caused by some adc logic error, but I don't know how to test it.

Report to moderator Logged

jancumps

Supporter

Posts: 1250
Country:

New Low

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #57 on:** January 01, 2014, 10:57:02 pm »

In the follow up video, noise is on both sides with a sinus 1KHz test signal.

Report to moderator Logged

Saneoc

Contributor

Posts: 8
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #58 on:** January 01, 2014, 11:07:19 pm »

I saw it, but there the clamping is also present.
  You may notice that at some point the polarity of added signal is changing.

Report to moderator Logged

vaualbus

Frequent Contributor

Posts: 306
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair

Say Thanks Reply Quote

« **Reply #59 on:** January 01, 2014, 11:24:40 pm »

I will not consider noise to be a problem, it could be due to a lot of factors. Remember that the scope not working in their perfect condition so it could be normal.

« *Last Edit: January 02, 2014, 08:45:13 am by vaualbus* »

Report to moderator Logged

EEVblog

Administrator

Posts: 31556
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #60 on:** January 01, 2014, 11:41:14 pm »

> **Quote from: Jonny on January 01, 2014, 07:38:12 pm**
>
> > **Quote from: atw60444 on January 01, 2014, 07:17:22 pm**
> >
> > Did Dave say he'd uploaded #565, part two? No sign of it here yet
>
> There, There.... he only said he shot it. I'm sure we'll see it soon enough

It usually takes 12-24 hours or overnight for the video to upload, process, and then monetise before I can release it. And that's after the editing.

Logged

KarolNi
Contributor

Posts: 6
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #61 on:** January 02, 2014, 10:52:42 pm »

I've watched 2nd part, but I spotted something in 2:39 in this part. Noise seemed to be periodic - I think it might be some coupling and heterodyning with other periodic signal - clock or dc converter ripple, maybe on digital side. It will not be handy, but maybe some off-circiut check of decoupling capacitors?
For 2nd video I'm curious about negative voltage on broken diode vs. positive on operating channels - but this wouldn't be issue IMHO. Dave, have you checked voltage on pads after desoldering diode?
Last thing - maybe some phone procedure (factory reset, reflash with newest firmware, if available and recalibration) will work?

Good luck!
Karol

Edit: I mean heterodyning sample clock with ripple or other clock.
Karol
« *Last Edit: January 03, 2014, 08:52:14 am by KarolNi* »

Report to moderator Logged

burra7
Contributor

Posts: 5
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #62 on:** January 04, 2014, 10:11:48 pm »

DC ripple sounds interesting. I tried to have a look and the ripple seems like 50kHz. Might be an idea to measuere the DC rails +5V1, -5V1, +15V and -15V to see if we can find the ripple there also.

Have made a block shema also:
https://bitbucket.org/burra/tds-3054/src
« *Last Edit: January 05, 2014, 08:50:51 am by burra7* »

Report to moderator Logged

Wim_L
Regular Contributor

Posts: 210
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #63 on:** January 05, 2014, 06:16:30 pm »

A close look at the video in dots mode. 6:21

It seems the noise is quantised, a group of dots gathering, but in discrete steps, not as a smooth noise band. Perhaps something to investigate? A certain subset of the 9 bits failing or going random?

Report to moderator Logged

M0BSW
Frequent Contributor

Posts: 674
Country: 00

Left this site 2013, they will not delete it ????

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
Say Thanks Reply Quote
« **Reply #64 on:** January 05, 2014, 08:15:37 pm »

> **Quote from: calexanian on January 01, 2014, 07:36:53 am**
>
> And we have no forum members at Tek who can dust off somebody to give their thoughts?

Actually there is Alan W2AEW a Tek employee, Very helpful fella , I'm sure you'd just have to ask him for his thoughts and He'd help
« *Last Edit: January 05, 2014, 08:18:32 pm by M0BSW* »

Report to moderator Logged

no one would or will tell me how to delete this account

R_G_B_
Frequent Contributor
Posts: 376
Country:

Re: EEVblog #564 - Tektronix TDS3054 Oscilloscope Teardown Repair
« **Reply #65 on:** March 16, 2018, 12:59:27 pm »

Say Thanks Reply Quote

I am to having the noise problem on high sampling rates

E.g noise when the time base is below 400us.

I narrowed this down a bit as follows.

10k points the noise appears below 400us @ 5Meg samples.

At 500 points sampling this happens below 10us at 5Meg samples

Because of the decimation in sampling points there does not seem to be as much noise in the display but it is there and it seems to be low frequency ripple And Wonder of the signal. Could this be a fault with the triggering circuit. Open circuit resistor seems that the error message complaint is about the termination resistor being to hot. 4KTBR watts Boltzmann's constant having anything to do with the noise at higher sampling rates with intermittent or resistance ?

Just some thoughts

Report to moderator Logged

R_G_B

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