

Re: In search of a better line driver

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Chris Carlen wrote:

- > *Here are some of the ways I have driven 50 ohm coax cables with TTL*
- > *level logic signals:*
- >
- > *1. I have used 74HC14, 74AC14, and 74ACTQ14 devices to drive 50ohm*
- > *cables, with reasonably good results. I have tended to use one gate in*
- > *the package to drive several others in parallel, with a back terminating*
- > *resistor tuned to match the line Z, minus the output Z of the parallel*
- > *gates. This tends to produce some bumps after the edges that I'd like*
- > *to look better, mainly when driving an open line. Also, unless many*
- > *gates are used, lot variations in the output impedances of the gates can*
- > *cause substantial variations in edge quality from lot to lot.*

Do you **need** to drive open (unterminated) lines? If so, you can hardly avoid reflections, which will inevitably disturb the signal shape. The only thing you can do then is to make the edges as slow as possible without violating your timing requirements.

The best signal shape results from the use of a properly terminated cable. The problem with that is that the back termination resistor forms a voltage divider together with the termination on the other end of the cable, so that the signal at the receiving end has only half the amplitude of the signal at the output of the driver. If your driver chip swings 5V, you'll get only 2.5V at the other end. That's only just TTL compatible, so you loose noise margin.

- > *I haven't tried using only a 74HC14 package with some parallel gates,*
- > *without one gate as pre-driver. Maybe this would be better. Ultimately*
- > *I want to not use such a large 14-pin package.*

I don't believe it would make much difference.

- > *Also, I don't think it would be wise to use one 14-pin package to drive*
- > *multiple channels, since the ground and VCC bounces from one channel*
- > *feed a little bit into the others, except for very non-critical*
- > *applications.*
- >

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- > 2. *I have used TC4426A MOSFET drivers as line drivers. They are very*
- > *good at this, but too slow for some purposes. I'd like to keep things*
- > *at least as fast or faster than HC CMOS.*
- >
- > 3. *Lately I have tried the Fairchild TinyLogic NC7WZ14 UHS dual Schmitt*
- > *inverters. I tied the two gates from one package in parallel, and again*
- > *used the back terminating R. I made a really nice layout on a 4-layer*
- > *board with a pair of 0.1uF 0805 bypass caps on either side of the package.*
- >
- > *Boy this chip works great! It makes simply marvelous edges into even*
- > *the unterminated line.*
- >
- > *But there is one problem. The thing is so small I can hardly solder it.*
- > *It sits on pads just a few tenths of millimeters per side. For the*
- > *first and only board on which I have used them, I had another tech.*
- > *assemble it who did a lousy job, giving it back to me after apparently*
- > *no inspection. Today I bitched and moaned for an hour while I fixed the*
- > *poor solder joints. But they are almost impossible to solder well by*
- > *hand. Well, things might be better if I had the proper illuminated*
- > *magnifier, but I don't. Also, I was using 0.015" wire solder, which is*
- > *still too much to meter out consistently at this size.*

There are other ways to solder such parts. It involves using liquid flux, wetting your soldering iron (with a broad tip) with a bit of solder, and swiping it across the pins. The flux should prevent the solder from bridging the pins.

- > *Actually, I have a little general purpose line driver board I made using*
- > *the TC4426/7 chips, and had 100 of them assembled by an outside*
- > *contractor. It's only 0.65" x 0.75" and plugs into any board needing*
- > *line drivers, sparing me from re-evaluating the driver design for every*
- > *new situation. It simply includes everything: ESD and OVP protection,*
- > *LED driver, and the line driver. Expensive, but that's Ok for my lab*
- > *environment if it saves me time. These are cool, and I intend to do the*
- > *same perhaps with the Fairchild chips.*
- >
- > *But if I could find a SO-8 packaged chip with similar specs to the*
- > *Fairchild UHS stuff, that would be almost ideal.*
- >
- > *Are there any fast, 5V powered line driver chips in SO-8 or a package at*
- > *least a little larger than the 2.00mm x 1.25mm package of the Fairchild*
- > *UHS device?*

There's a little bit of extra information needed first. What levels do you want on the cable? Do you want to be able to receive the signal on the other end with an ordinary TTL input (that is 0..0.8V means 0 and 2.0..5V means 1)? What signal rise and fall times do you need? What are the cable lengths you need to support, and at what loss? Is it necessary to support unterminated cables?

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Cheers
Stefan