Re: Any ideas for driving an array of discrete LED's without running into heat problems?

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- *From*: miso@xxxxxxxxx

- *Date*: Thu, 6 Nov 2008 20:34:19 −0800 (PST)

On Nov 6, 12:24 pm, ferrari.secret.sa...@xxxxxxxxx wrote:

> Based on the data sheet, I agree with your interpretation of the 90mA/
> output limit and 750mA ground current limit, and overall power limit.
>
> It does seem likely that the chip is intended to work ok with different
> string lengths (3 vs 4 LED's), but the data sheet doesn't explicitly say
> so. It says "designed to operate with driver voltage drops (VCE) of 0.7
> to 3V, with an LED forward voltage, VF, of 1.2 to 4.0 V". OTOH, it also
> says in Absolute Maximum Ratings that Load Supply Voltage Range
> (VLED)
> is ˜.5 to 17 V. You should ask Allegro to clarify whether different
> string lengths are ok.
>
> What A6278 package are you using? If it has an exposed thermal pad,
> is it attached to a heat sink or a copper plane? Are you clocking
> the chip at a high rate or rapidly switching outputs off and on?
>
> Perhaps you should add series diodes to the LED chains −− eg, one
> Schottky diode in series with the 4−LED chains, or several diodes
> in series with the 3−LED chains. Or consider the series resistors
> that Martin recommended. Or turn the driver board over to move the
> drivers farther from the LED's and allow heat sinks to be attached.
>
> In your original post, you wrote:
>
>> Then, on the LED board (which is mounted directly on top of
>> the driver

> board − only about 0.5mm between the top of the Allegro chips and the
> back of the LED board), I have the 104 LED's in 0603 packages (LiteOn PN
> LTST−C190KRKT)... those LED's have a power dissipation of 75mW... so 104
> of them running full tilt would be 7.8 watts.

You miscalculated the LED power dissipation. An LED with 2V Vf at 20mA dissipates at most 40mW, rather than 75, so the LED board dissipation is at most 4.16 watts. This is still a lot of heat and should be dealt with.

−−
jiw

Thanks for the reply jiw... I will contact Allegro and confirm if it holds constant current on a per−leg basis, even with different voltages on each leg. I am using the TP package (eTSSOP with the large exposed thermal pad)... so it should be able to handle 0.25W with no problem.

I still can't figure out why those Allegro chips are getting so hot... I will have to do some more testing and measuring. At first I thought it was the LED board being so close, but the LED board gets "warm", never hot... the Allego chips get hot like they are dissipating multiple watts or something when they shouldn't be. The LED's are being driven correctly, so I guess I can just try to put some series diodes or resistors to reduce dissipation in the 6278 chip.

On the dissipation of the LED − you're right, how stupid of me... I just took 75mW from the datasheet without even realizing that's more than 40mW of total power I am putting through the LED's... duh.

Question... how much of that 40mW that I am putting through the LED's goes into light and how much into heat? i.e. does an LED conver 20% of the incoming energy to light? Or perhaps my understanding is wrong and the LED die will convert all of that 40mW to heat, and the light is just a byproduct of that transaction?

Thanks!

Generally it is a good idea to keep the distance from the leds to driver chip short to avoid any L di/dt issues.

If you goal is daylight visibility, you can improve it using a filter

over the display that matches the color of the LED. This may reduce the power requirement into the LED to achieve your goal.

About all you can do is keep Vled as low as practical. Also, put the same number of LEDs in series so that you can avoid the case where some drivers have to drop an extra Vf of the "missing" LED.

You can somewhat keep chips cooler by putting extra copper on the traces. That is, some of the heat flows through the bond wires. For instance, on the MAX7219, the bond wires are 1.3 mil versus the standard 1mil wire. Heat flow is proportional to the square of the radius, so fat wire does make a big difference. The current source pins are the best target for added extra copper to the PCB.

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