Re: Current−driving a powerful IR−illuminator array

Source: http://sci.tech−archive.net/Archive/sci.electronics.design/2006−04/msg00061.html

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- *From*: Fred Bloggs <nospam@xxxxxxxxxx>
- *Date*: Sat, 01 Apr 2006 13:27:36 GMT

John Larkin wrote:

> On Fri, 31 Mar 2006 13:56:34 GMT, Fred Bloggs <nospam@xxxxxxxxxx>
> wrote:
>
> > > Hi! I want to drive a fairly powerful IR−illuminator array
> > > using
> > > high−efficiency IR−LED's (Agilent HSDL−4230 to be
> > > specific), which can
> > > support continous currents of 100 mA and peak currents of
> > > up to 500 mA.
> > > I want perhaps 40 of these.. and essentially I want to flash
> > > them all
> > > in sync to an electronic camera shutter of around 1 ms width,
> > > with a
> > > duty−cycle of perhaps 1−to−30. Now when googling around
> > > for suitable
> > > circuits, most refer to relatively small power demands, with
> > > LEDs that
> > > use a current of only a tenth of this.. both with resistors and
> > > with
> > > MAX−circuits etc.
> > >
> > > Would it be crazy to try to get the right current by the old
> > > resistor−in−series trick ?
> >
> > Not at all, and this also lets you avoid unequal LED voltage drops while driving all the LEDs in parallel. You would have 40 resistor + LED branches all tied in parallel with a medium power MOSFET switching the whole thing ON/OFF, and a common voltage regulator with large output filter capacitor supplying the power.

> > Obviously running 20 amps continously
> > through some resistors would be crazy but here the
> > duty−cycle is so
> > high that on average the current is only 20/30 amps..
>
> You will be running only 500mA through the resistors at 3% duty cycle.

20 amps at 3% duty cycle is indeed 600 mA average current. But the RMS current, the thing wot fries resistors, is 3.5 amps.

John

He's not going to do 20Amps. That 500mA Ipk is for a 100us pulsewidth not exceeding 20% duty. The 50−100mA pulse is more realistic and operation can be continuous. I would not bother with RMS current computations. In the case of 40 LEDs in parallel he has 40*Iled*Vf total dissipation in the LEDs and 40*Iled*Vdc power delivered from the supply, leaving Iled*(Vdc−Vf) dissipation in each resistor, a peak multiplied by 1/30 for average power dissipation per resistor. If he goes to 8 strings of 5 LEDs then then each string looks like a single LED of 5*Vf at Iled making the peak power dissipation per string resistor Iled*(Vdc−5*Vf), or generally strings of N LEDs giving Iled*(Vdc−N*Vf)/30 average power dissipation per string resistor. Another misconception about these arrays is that somehow forcing identical current through each LED zeroes out the optical radiant power mismatch. It doesn't, and since the aging alone is −26% over the lifetime of the emitter, this error is much larger than the minuscule +/−8% 4−sigma spread in Vf, putting the 2−sigma at 4%, an insignificant number even for arrays as small as 40 LEDs.

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