Re: Charging A Lead Acid Battery

Source: http://sci.tech−archive.net/Archive/sci.electronics.basics/2008−02/msg00470.html

- *From*: ehsjr <ehsjr@xxxxxxxxxxxxxxx>
- *Date*: Sat, 16 Feb 2008 05:04:15 GMT

James Beck wrote:

> In article <Kfktj.9$wK4.1@trndny01>, ehsjr@xxxxxxxxxxxxxxx says...
>
> > James Beck wrote:
> >
> > > In article <ddac6f54−dd64−45ac−bd54−
> > > 3f43655f468d@xxxxxxxxxxxxxxxxxxxxxxxxxxx>,
> > > redbelly98@xxxxxxxxx says...
> > >
> > > > On Feb 14, 10:29 am, James Beck
> > > > <j...@xxxxxxxxxxxxxxxxxxxxxx> wrote:
> > > >
> > > > > In article
> > > > > <4b78e703−68e3−4822−b318−a1cd9fb8ff04
> > > > > @e6g2000prf.googlegroups.com>,
> > > > > redbell...@xxxxxxxxx
> > > > > says...
> > > > >
> > > > > > On Feb 13,
> > > > > > 9:09 am,
> > > > > > James Beck
> > > > > > <j...@xxxxxxxxxxxxxxxxxxxxxx>
> > > > > > wrote:
> > > > > >
> > > > > > > In

article
<6194982a−5fc6−406e−b08d−dd15013ba985
@y5g2000hsf.googlegroups.com>,
redbell...@xxxxxxxxx
says...

Why
is
your
simple
charger
so
complicated?
Why
not
use
a
12
volt
DC
wall
transformer
and
13
ohm
resistor
(5
watt)?
You
get
540mA
when
the
battery
is
low
at
5
volts,
and
about
400mA
as
the
battery
voltage
rises
to
7

volts.

−Bill

If
you
forget
to
turn
off
a
charger
like
that,
it
will
seriously
overcharge
a
6V
battery!
On
the
other
hand
Ed's
charger
will
not
do
that

It
won't?
It
should
continue
to
charge
the
battery
up
to
the
wall

wart voltage, which is still too high if you leave it plugged in too long. I would, and do, just use a CV source that is set to the float voltage of the battery. Pick a regulator that has over temp and current limiting and let it float.

Jim

What about
all the
voltage
drops
between the
wall wart
and battery:

1 to 1.5V
drop−out
voltage of
regulator
1.2−1.3V
between
regulator
"out" and
"adj" pins
(across 2.5R
resistor)
0.6−0.7V
diode drop
across
1N400x

Mark

Build it and try.
As the current drops I'll bet
you don't get the drops you
think,
especially across the resistor
used for the current sense.
You are also
assuming that the 9V wall
wart is regulated. A cheap
unregulated wall
wart that is a "nominal" 9V
under X% of load will
usually be quite a bit
higher than you expect as
the load drops. A CV float
charger could be

> used with any wall wart that
> is the V drop of the
> regulator or higher.

You make good points, I had been thinking
simplistically about the
voltage drops at 500 mA.

Mark

> Mind you, you can have problems with a simple float charger
> too.
> If you rely on the regulator's current and thermal limit to
> hold the current under a certain level it will get HOT. I also
> had a National part that the info in the datasheet didn't match
> real life and we blew out a few wall warts before I caught it.
>
> Jim

I'm amazed at this thread. The "very simple charger"
I diagrammed *stinks* if _used_ as a float charger, which
is what you were de facto discussing when you talked about
forgetting and leaving the batteries on it too long.
If used that way, it *might* prevent damage to the
batteries by the cumulative voltage drop which you and
Mark have discussed, but it is the *wrong* tool for
that job, and the wrong usage of the tool.

I am glad to see that you are taking the discussion to a
float charger. I'm responding below because you mentioned
relying on the chip's thermasl & current limits and that
some wall warts blew.

It would be poor practice to design a float charger that
relied on the regulator's current and thermal limit to
hold the current under a certain level, assuming by
"the regulator's" you mean the IC chip. Those things − the
current and thermal limit − only indirectly hold the
current under a certain level. They are design maximums
for the chip, not for whatever load the chip is feeding.

When the datasheet and app note show the part being used in this very way, I would assume the manufacturer has rated the part as such.
Wouldn't you?

That would depend on the datasheet, but in general, yes, I would probably trust it.

> The circuit design needs to keep the current under the
> maximum rating of the chip under worst case conditions.
> The designer specifies a heat sink and/or a design that
> keeps the chip temperature below the maximum spec. He/she
> needs to ensure that any other limitations (eg Vin−Vout
> rating) for the chip are adhered to.

The IC had a built in current limit and, like I mentioned above, National had several design examples that used over current protection as an integral part of the design. The problem was that the limit was wrong on the datasheet and in the app note. 1 − 1.2A was suppose to be min to max range, it turned out to be 1.9 − 2.2A or some such.

> A float charger may not need current limiting for normal
> conditions, but it does for worst case: a shorted battery.
> That's where a float charger without current limiting fails.
> Under normal conditions, the battery will limit the current
> drawn as the battery voltage increases, and additional
> limiting may not be required. Still, you need to consider
> the whole circuit. You mentioned that you had some blown wall
> warts. If the batteries require more than the wall wart can
> deliver, that may be a specification rather than circuit
> problem. (ie use a bigger wall wart) If they blew because the
> circuit relied on the chip to shut down when it got too hot,
> that's a design issue. You indicated an error in the National
> datasheet was the cause − do you still have the details? It
> could be helpful to know which part and what spec was wrong.
>
> Ed

The part was a National LM2941CT and the wall warts blew because the current limit of the IC was wrong on the datasheet. I didn't want to go to a bigger wall wart, we didn't want to charge at a greater rate anyway. I'm sure (hope) they have corrected the datasheets by now, but the funny thing was one of the applications engineers sent me a "fix" for this problem that entailed a small sense resistor and a transistor to implement a half assed current regulator and they had that wrong too. It was set up to pull the feedback pin lower as the current increased, that would increase the voltage out as the current demand increased causing the system to slam hard against the + rail. I think they were relying on the internal current limiting to do its' thing at the level the datasheet had listed erroneously. I had already fixed the problem myself. The point was I didn't want to add complexity to the design, that was why I chose the part in

> the first place, but I ended up adding parts anyway.
>
> As a side note, they have changed the datasheet, but there is still one hold over. In the application notes they still show a "1A Coil Driver" or some such, that is suppose to limit the current to 1A using the internal current regulation of the part. Well, it won't do it.
>
> Jim

Thanks, that's good information to know. Also as a side note, I've read comments by others who are skeptical, or suspicious or uncertain (searching for the right term, not sure what it is) of LDO's in general because they've been burned by them, too.

Ed

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