

Re: Charging A Lead Acid Battery

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- *From:* James Beck <jim@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
 - *Date:* Fri, 15 Feb 2008 14:33:51 -0500
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In article <[Kfktj.9\\$wK4.1@trndny01](mailto:Kfktj.9$wK4.1@trndny01)>, ehsjr@xxxxxxxxxxxxxxxxxxxx says...

James Beck wrote:

In article <ddac6f54-dd64-45ac-bd54-3f43655f468d@xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx>, redbelly98@xxxxxxxxxxxx says...

On Feb 14, 10:29 am, James Beck
<j...@xxxxxxxxxxxxxxxxxxxxxxxxxxxx> wrote:

In article
<4b78e703-68e3-4822-b318-a1cd9fb8ff04@e6g2000prf.googlegroups.com>,
redbell...@xxxxxxxxxxxx says...

On Feb 13, 9:09 am, James
Beck
<j...@xxxxxxxxxxxxxxxxxxxxxxxxxxxx>
wrote:

In article
<6194982a-5fc6-406e-b08d-dd15013ba985@y5g2000hsf.googlegroups.com>,
redbell...@xxxxxxxxxxxx
says...

Why
is
your

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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

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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

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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.

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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 thermal & 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?

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 V_{in} – V_{out} 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

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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

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