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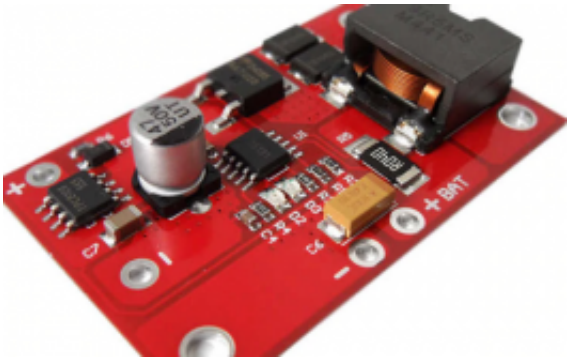
# Low Power Lead-Acid solar chip CN3767, what a crap!

rin67630 · Dec 14, 2020

**rin67630**
Solar Addict
Joined: Apr 29, 2020
Messages: 1,117
Location: Nort-Rhine-Westphlia Germany



Hi I had ordered a couple of low power 5A "MPPT" solar charger modules based on the Consonance chip CN3767, specialized to charge Lead-Acid batteries.




The data sheet looked promising: CONSONANCE/CN3767
Beside the accepted fact that "MPPT" means for them "Manual Power Point Trimmer", I got only miserable charge levels with it.
Then, I began to check it thoroughly:
It t never charged the battery above 13,55V and that is not adjustable!
The output never came to absorption, not even to regular 13,8 float charge level, irrespective of what is fed at the input and what charge level was initial
That low voltage will bring every lead-acid battery to sulfation.

I wrote that to Consonance and got this answer the same day:

"*The phenomenon you tested is correct. CN3767 has a fixed output and cannot be adjusted.*

*In addition, the floating charging cycle voltage of 12V lead-acid battery is 13.5V, so the floating charging voltage of cn3767 is set at 13.55v. When a battery with voltage over 13.5V is connected, it will not be charged.*

*CN3767 for the battery below 12.4V, the battery will enter the charging state automatically when it is connected. If the battery voltage exceeds 12.4V, it may enter into floating charge. When the battery voltage exceeds 13.5V, it will not enter the charging state.*"

Have those guys at Consonance ever got a clue on how to charge lead-acid, before they began to design a "specialized" chip?

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Dec 17, 2020 #2

I have now had a long thread with the technical support at Consonance. They are very friendly and reactive, but seem really to have an absolutely surrealistic design for solar operation.
They are just requiring the battery to be discharged before they will start the next charge cycle.
That means if your battery is at 12,5V at the beginning of one of the rare sunny days in winter, it will completely miss the opportunity and just do a trickle charge. If after that you get 10 cloudy days, you just have lost the game.

So, this leaves only one option: AVOID any product containing Consonance (CN37xx) chips.
This behavior is burned into their silicon and cannot be changed.

S

**sunshine**
Solar Enthusiast
Joined: Apr 24, 2020
Messages: 749

Dec 17, 2020 #3

> rin67630 said:
>
> They are just requiring the battery to be discharged before they will start the next charge cycle

Probably means at 12.5v and above the battery will be still charged at the 13.55v rate rather than 14.4v (new cycle) which would occur below 12.5v.
My Tecsup 12v/25a battery charger has the same profile except at 25amps instead of 4amps and keeps at float unless the battery goes below a arbitrary voltage as this thing does.
You may find the charge rate is close to the 4amp max even at the float v of 13.5v when the battery is at 12.5v,

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Joined: Apr 29, 2020
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Location: Nort-Rhine-Westphlia Germany

Dec 17, 2020 #4

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What is perfectly fine for a mains battery charger is just silly for a solar use.
The CN37xx chips are explicitly designed with "MPPT" control, i.e. for solar use.

Running solar, you have to use every opportunity to get whatever is technically possible into the battery until it is full at cycling voltage level.
One never knows how much the next hours/days will be able to deliver.

With the Consonance chip, at dawn after 10 minutes at max current, the charge rate got rapidly limited by their ridiculous battery voltage limitation, decreasing rapidly to tiny amperages, jeopardizing all the valuable solar power and leaving the battery at 65% at dusk. 😱

S

**sunshine**
Solar Enthusiast
Joined: Apr 24, 2020
Messages: 749

Dec 17, 2020 #5

> rin67630 said:
>
> Running solar, you have to use every opportunity to get whatever is technically possible into the battery until it is full at cycling voltage level.
> One never knows how much the next hours/days will be able to deliver.

Its rated at 4 amps. Googling brings up a wide range of quoted outputs from 1.7 to 4 amps.
There is no heat sink on the bare board. On $10 pwms there is a rudimentary attempt at a heat sink which is the same on 10amp to 30amp models and can be modified easily to bring temps down under load.
Maybe look at this issue by adding a heat sink to keep the output up and to prolong its life.
If the 1.7 amp figure is the continuous, non heat sink load, the battery capacity should only be 17 amphr.

The CN37xx chip may be their attempt to avoid the common issue of boiling batteries when too many $10 pwms are installed.

**rin67630**
Solar Addict
Joined: Apr 29, 2020
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Location: Nort-Rhine-Westphlia Germany

Dec 17, 2020 #6

> sunshine said:
>
> If the 1.7 amp figure is the continuous, non heat sink load, the battery capacity should only be 17 amphr.

There is no thermal issue, the chip does not even warm up. It is their logic in the chip, that is wrong.
In solar power, there is nothing like continuous, unless you are on the ISS. One have to use the power when it is available, and that is precisely what this chip refrains to do.
Believe me, every cheap $4 PWM will be ways better than this chinese cr*p.

I have now spent quite a lot of time on experimenting and comparing the performance of many SCC solutions at the low-power range 0,5 - 10A.
For the time being, most PWM controllers, having a lower own consumption, will harvest better than over-dimensioned MPPTs, that drain more the battery than charging, during wintertime...

**Oli.Hall**
New Member
Joined: Jun 8, 2021
Messages: 1

Jun 13, 2022 #7

Hi,

**TL;DR - This module WILL fully charge your battery to 14.80V, but ONLY if there is sufficient solar input power to maintain charge current above 0.38 X the current set-point (which is 1.7A / 3A / 5A according to module purchased).**

Sorry to dig this thread up from a long time ago, but I wanted to add some further explanation on how the Consonance CN3767 chip works that may help others looking for info on solar charging modules based on the this chip as the thread above doesn't contain all the facts on how the charging profile actually works, and the quirk in the charge profile that the OP is seeing.

What is not clear from the conversation above is that the CN3767 does include an absorbtion phase in it's charge profile. It will charge fully batteries to ~14.80V as long as the input power conditions are met. You should read the datasheet to determine how the unit determines what charge stages to use as I don't want to rehash the contents of the datasheet here.

I have tested this unit on the bench, and when sufficient input power is available, the unit will use a proper three stage "bulk>absorbtion>float" charge profile, charging at the current set-point until 14.80V before tapering off, and

when current falls to 0.38 X set-point, the unit enters float stage at 13.55V. This is what you would normally expect to happen with a regular lead acid charger.

However, there appears to be a feature (a bug?) in the programming, which is seen when solar input power is insufficient to maintain charging current above 0.38 X the current set-point.

If available solar input power is low, and the low input power causes the charge current to fall below 0.38 X current set-point at any time the battery voltage is above 13.55V, then the charger aborts the charge cycle, bypassing bulk and absorbtion stages and goes straight to the float stage.

I believe this is the behaviour that the OP was seeing. If he bought a module with a current set-point of 5A and his available solar input did not give enough power to exceed 1.9A battery charge current, then the battery would never be charged beyond 13.55V.

The 0.38 X set-point charge termination is hard coded in the chip and the only way to change this behaviour is to increase solar input power, or reduce the set-point by changing the resistors on the board which reduces the maximum charge rate.



case of low input power. Or it could be argued that this is behaviour is by design, so battery voltage is not held above 13.55V for an indefinite period of time to prevent excessive gassing and water loss.

I hope this helps somone!

Thanks,
Oli.

👍 rin67630 and sunshine

**rin67630**
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Joined: Apr 29, 2020
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Location: Nort-Rhine-Westphlia Germany

Jun 14, 2022 #8

> Oli.Hall said:
>
> Hi,
>
> **TL;DR - This module WILL fully charge your battery to 14.80V, but ONLY if there is sufficient solar input power to maintain charge current above 0.38 X the current**
>
> Click to expand...

Thank you for that explanation.
Indeed <0.38 x max current to definitively abort charge and switch over to float is just plainly stupid for a solar charger.
Did the designers live in a desert, where you never have clouds?

S

**sunshine**
Solar Enthusiast
Joined: Apr 24, 2020
Messages: 749

Jun 14, 2022 #9

> rin67630 said:
>
> Did the designers live in a desert, where you never have clouds?

Maybe they don't see the necessity to put any more charge in a fully charged battery...."If available solar input power is low, and the low input power causes the charge current to fall below 0.38 X current set-point at any time the battery voltage is above 13.55V, then the charger aborts the charge cycle, bypassing bulk and absorbtion stages and goes straight to the float stage."

**rin67630**
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Joined: Apr 29, 2020
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Jun 14, 2022 #10

> sunshine said:
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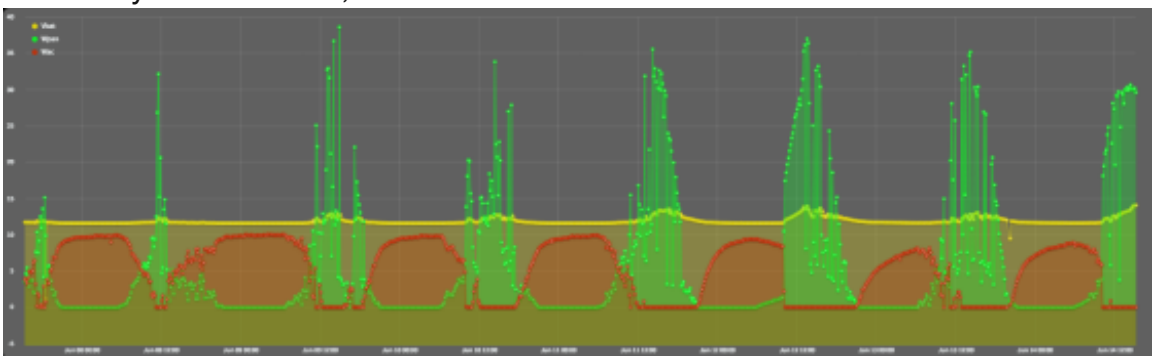
A fully garged battery is it after 4 hours at absorbtion. If it gets over to float as soon a a cloud passes by, I would never ever get a chance to charge to absorbtion.
This is my real life week, and its mid summer!



**Daijoubu**
New Member
Joined: Sep 14, 2023
Messages: 1
Location: Canada

Sep 14, 2023 #11

Sorry for reviving such an old thread but for completeness sake in case someone else like me stumble upon this thread from searching online.
My experience with the Consonance CN37xx for lithium ion has been positif, eg CN3722 and CN3791, the lead acid variant CN3767 should work similarly to its counterpart.
They were better than the PWM controllers I tested which will short circuit the panels and drop the voltage down to the battery's voltage (in the case of lead acid) and tank the current output.

The main issue is as Oli.Hall pointed out, these boards are configured for 3A charging with a 50W solar panel, that and the Vmp set point seen below.
If you use it with a smaller panel, you'll need to change the Rcs from the stock 40 milliohms (0.04 ohm) (I would get the smaller white module instead for lower power applications, the Vmp 0805 SMD resistors are larger and easier to swap out, on the red board it seems to be 0603 and the Rcs shunt is also smaller because it doesn't need to dissipate as much heat)

The formula from the datasheet dictates 0.12V / I = Rcs

Some common values with E96 series 1% resistor values, wattage for your

typical 18V panels

220mΩ = 0.55A 10W
110mΩ = 1.09A 20W
715mΩ = 1.68A 30W
53.6mΩ = 2.22A 40W

You can further fine up the Vpp voltage depending on the panel, I have the smaller board variant with the white silkscreen SOLA12TA and that board is configured for Vpp of 17.66V, at least on my sample.
If you follow the link, you'll see a seller in the UK who shows the voltage at the panel vs battery
I plan on using mine to top off my car's battery with a 10 or 20W panel, so that my dashcam's parking mode can run (mostly) continously.

Vmp is set via the voltage divider from the internal Vref of 1.205V
It seems like the red board variant could be set to ~9V (silkscreen seems to indicate it's available with 6V, 9V and 18V configuration), I looked at some pictures and the dividers connected to pin 6 are 178k / 28k (SMD resistors 25D/13C) which result into a Vmpp of only 8.87V and explain the poor performance if used with an 18V panel to charge a 12V battery (if it even works)

Example module from Amazon https://m.media-amazon.com/images/I/61nCyuno28L.jpg

One should always check the datasheet and not trust those barebone Chinese implementations based around the reference design
If the Chinese are listening, someone should make a variant with the multiturn pots, like with the CN3722, so you can adjust the Vmp

Last edited: Sep 14, 2023

**rin67630**
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Location: Nort-Rhine-Westphlia Germany

Dec 20, 2023 #12

> Daijoubu said:
>
> The main issue is as Oli.Hall pointed out, these boards are configured for 3A charging with a 50W solar panel, that and the Vmp set point seen below.

When will you get 3A charging with a 50W panel?
One or two hours around 12:00 during the highest summer, with no clouds?
The rest of the time, from September to May you get nothing at all?
How stupid is that?
Every 3$ PWM controller will be thousand times more effective.

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