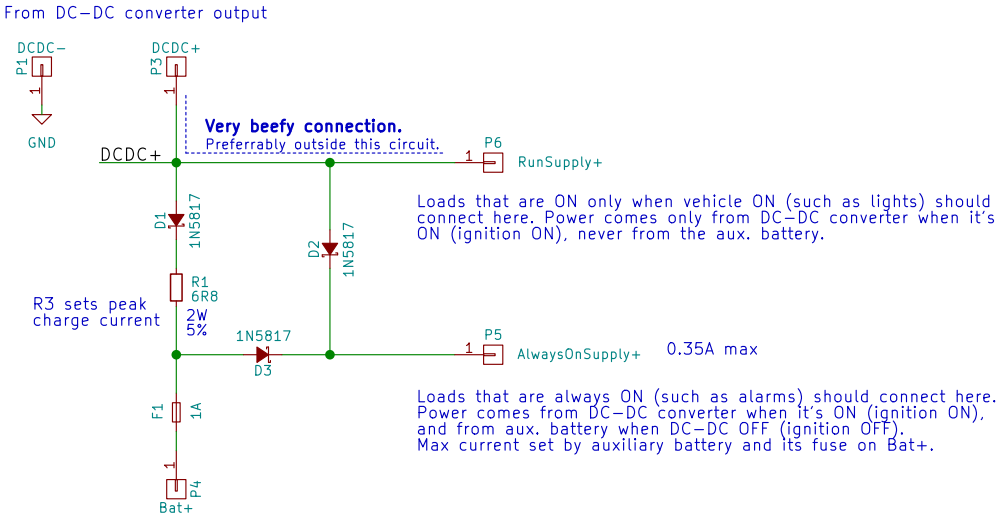
12V auxiliary lead–acid battery charger & switcher



Notes

The DC–DC converter is only ON when the vehicle's ignition is ON.

In the target system this circuit was designed for, the DC–DC converter has an output of 13.5V (ideally would be 13.8V).

Automotive spade terminals were used for P1 to P5.

R3 = 6.8 Ohm results in approx. 400mA peak charge current, which is approx. C/10 for the aux battery that this circuit was originally designed for.
Value is calculated considering the top DC–DC converter output voltage on the vehicle this circuit was designed for (13.5V) minus D1's drop at the peak current (0.4A) and a discharged aux battery (10.5V).
Power dissipated was calculated at this peak charge current and roughly doubled resulting in 2W: (13.5V – 0.35V – 10.5V) * 0.4A = 1.06W –> 2W

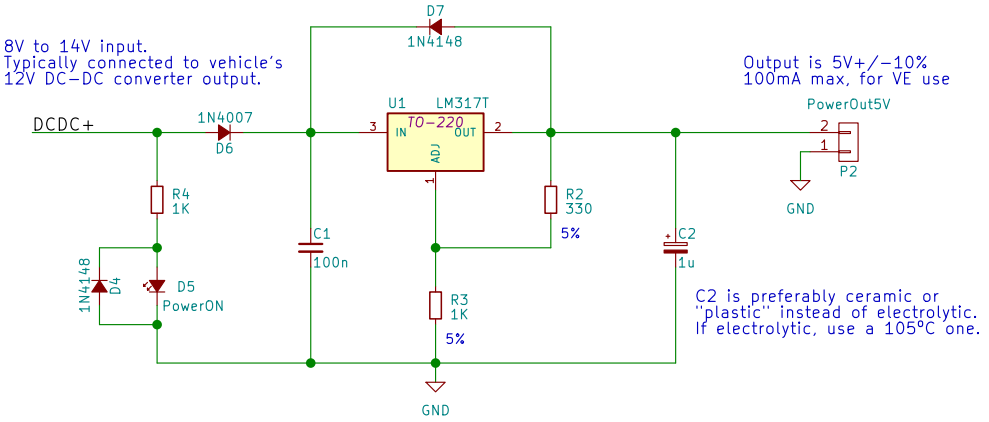
DCDC+ is positive output of the DC–DC converter for the low voltage system, and DCDC– the negative one.
The connection DCDC+ to RunSupply+ must support the full DC–DC converter max current, and is included in this circuit only for explanation; it should be made outside this circuit, with appropriate cables (already the case in an existing vehicle).

D1 and D2 prevents the battery from being drained by devices on the RunSupply (you may forget a light on). At the same time it provides power for the AlwaysOnSupply loads, such that they don't drain current from the aux battery and thus help it charge faster (through D1 and R1).

D3 forces the aux battery charge current to go through D1 and R1, otherwise they would be bypassed by D2.

Only the positive connections are shown in this circuit. All grounds/negatives are connected together (DC–DC converter–, aux. battery– and both load supplies' negatives).

5V linear regulator



Notes

D5 is a power ON LED which is always useful in development and assembly. Also useful in these endeavours is D4, which protects this LED from supply polarity reversal.

Heatsink on LM317, at least approx. 500mm^2 of surface area (was determined empirically).

Automotive spade terminals were used for P1 and P2.

Designed by Nuno João in Dez 2015 (regulator) and Fev 2016 for "Morcega"
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Title: Lead auxiliary battery charger & switcher + 5V regulator

Size: A4	Date: 2016–11–22	**Rev: 1**
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