

> which chips to use to make power supply providing +12V/0,4A and -5V/0,3A from +5V/2A usb charger?



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Creating a power supply that can provide both +12V/0.4A and -5V/0.3A from a +5V/2A USB charger is a challenging task that requires specific electronic components.

Here's a simplified approach:

1. **Boost Converter for +12V/0.4A:** Since the USB output is +5V, you will need a boost converter to step up the voltage to +12V. There are many ICs available for this purpose, like the LM2577. This chip can output up to 800mA, which is more than sufficient for your 400mA requirement. You will need to configure the feedback resistors in the chip's circuit according to the datasheet to set the desired output voltage.
2. **Inverting Buck-Boost Converter for -5V/0.3A:** For generating a -5V output, you can use an inverting buck-boost converter. The TPS63700 from Texas Instruments is a good choice. It can handle up to 1.8A input current and can be configured to provide a -5V output.

Please note that designing and building such a power supply requires a good understanding of electronics and the risks associated with it. If you don't have experience in electronics design, it's recommended to ask for help from a qualified person or professional.

Furthermore, you'll need to ensure that the total power demand ( $P = IV$ , so  $(12V * 0.4A) + (5V * 0.3A) = 6.3W$ ) does not exceed the maximum power output of your USB charger ( $P = IV$ , so  $5V * 2A = 10W$ ). Also, power conversion is not 100% efficient, so you'll have to account for losses in the converters, which means that you will likely need a USB charger with more than 6.3W of output power to ensure reliable operation.

You will also need other components such as capacitors and inductors for these converters to function properly. The exact values and types would be mentioned in the datasheets of the respective ICs.



is possible to use DC/DC module for reversed -5V by reversing outputs?



Theoretically, yes, you can flip the polarity of a DC voltage by reversing the outputs. However, this is not generally recommended for several reasons:

1. **Grounding issues:** Usually, the negative terminal of a DC power supply is connected to the ground of your circuit. If you reverse the outputs to get -5V, your new "ground" becomes a +5V relative to your circuit ground. This can cause major issues in your circuit, especially if other parts of it are still using the original ground.
2. **Isolation problems:** Most DC/DC converters are not isolated, meaning the input and output share a common ground. Flipping the outputs might cause short circuits or other issues.
3. **Safety concerns:** Reversing the polarity can lead to incorrect operation of the connected devices,

potentially damaging them. It can also be dangerous if the devices are not designed to handle negative voltages.

If you need a -5V supply, the safest and most reliable method is to use a DC/DC converter specifically designed to generate negative voltages, like an inverting buck-boost converter. For instance, the TPS63700 from Texas Instruments, as mentioned earlier, can be configured to provide a -5V output.

Remember, any modification to power supplies or electronic components should be done with utmost care, understanding of the principles involved, and safety measures in place. If you're not experienced in electronics, it's recommended to seek assistance from a professional.



well, understood - and is possible to use regular DC/DC step-down to create -5V from -12V source, having connected input gnd as + and input -12 as gnd?



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Yes, you can indeed use a regular step-down (buck) converter to generate -5V from a -12V source if you adjust the connections correctly, treating the -12V as the new "ground" and the ground as your +12V.

In this setup, the buck converter will see the potential difference as +12V (because it doesn't inherently know the "absolute" voltages, it only sees the difference), and you can then step that down to +5V. However, this new +5V will actually be -5V relative to your original ground.

This approach should work in principle, but keep in mind that it may cause problems if you need to interface this power supply with other parts of your system that are using the original ground reference. Issues can arise because now the ground reference for this part of your circuit (i.e., the -5V output) is not the same as the ground reference for the rest of your circuit.

If you decide to go this route, take care to ensure that there is no direct electrical connection between the two parts of your system that have different ground references. It might be better to use isolated DC/DC converters to avoid potential issues.

Please be aware that working with power electronics can be dangerous if not done correctly. Always double-check your work and consider seeking assistance from a professional if you're unsure.



well, I have in fact existing power source generating +12V +5V and -12V with common GND, I want to convert that -12V to -5V, so here I want to use reversed DC/DC step down ...



In that case, you can indeed use a regular DC/DC step-down (buck) converter to convert the -12V to -5V. Here are the steps you can follow:

1. Connect the input GND of your buck converter to the -12V output of your power supply.

2. Connect the input  $V_{in}$  of your buck converter to the common GND of your power supply.

The buck converter will see this as a 12V input (ignoring the negative sign) and you can set it up to output 5V. However, due to the way you've connected it, the 5V output will actually be -5V relative to your common ground.

The output GND of your buck converter will actually be at -12V relative to your common ground, and the output  $V_{out}$  will be at -5V relative to your common ground.

Just ensure that the buck converter you choose can handle the current requirements of your load. A common choice for this kind of application could be the LM2596 chip, which can handle up to 3A of current.

Remember to always take safety precautions when working with power electronics. If you're unsure about anything, it's always a good idea to seek help from a professional.



so, in this case I WILL NOT CONNECT the output GND to nowhere, having output -5V already okay to common GND?



Correct. In this setup, the output GND of your buck converter is actually connected to the -12V rail of your original power supply. So, it should not be connected to the common GND. The -5V output from your buck converter should indeed be -5V relative to the common GND.

So, you should only use the  $V_{out}$  of your buck converter as your -5V rail. The output GND of the buck converter should not be connected to anything in the rest of your circuit, to avoid creating a short circuit between the -12V and common GND rails.

Always ensure to verify the voltage levels with a multimeter before connecting anything to your new -5V rail to avoid any damage. And remember, working with power electronics can be dangerous if not done correctly, so always double-check your work and consider seeking help from a professional if you're unsure.

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