

AI-01124 DIY Powerbank iPhone vs MacBook

Owner	Ⓒ Rigel Arcayan
Tags	Problem
Created time	@September 5, 2024 10:10 PM

I'm trying to design and build my own battery power pack usb c to charge and iPhone 12 Pro Max. I want to have the capability to charge the iPhone 4 times before recharging the pack. Can you tell me or guide me in determining the battery size, type, amp hour ratings and number of batteries needed.

Designing a Battery Power Pack for Your iPhone 12 Pro Max

Understanding Your Needs:

Before we dive into the technical details, let's clarify your requirements:

- **Device:** iPhone 12 Pro Max
- **Charge Cycles:** 4 full charges
- **Input:** USB-C

Battery Capacity:

To determine the battery capacity, we'll need to consider the iPhone's battery capacity and the desired number of charge cycles.

- **iPhone 12 Pro Max Battery Capacity:** Approximately 3687 mAh
- **Desired Charge Cycles:** 4

Total battery capacity = iPhone capacity * charge cycles
Total battery capacity = 3687 mAh * 4 = 14,748 mAh

Battery Type:

For a portable power pack, a **Lithium-ion (Li-ion) battery** is a popular choice due to its high energy density, long cycle life, and lightweight nature.

Amp-Hour Rating:

Amp-hours (Ah) are a unit of electric charge. The higher the Ah rating, the more capacity the battery has.

Since we've calculated a total battery capacity of 14,748 mAh, the amp-hour rating of the battery or battery pack should be **14.748 Ah**.

Number of Batteries:

The number of batteries needed will depend on the individual battery's capacity. If you're using a single Li-ion battery, it should have a capacity of 14.748 Ah. However, you might consider using multiple smaller batteries in parallel to increase reliability and improve charging/discharging efficiency.

Additional Considerations:

- **Battery Protection Circuit:** Ensure the battery pack has a built-in protection circuit to prevent overcharging, over-discharging, short circuits, and overheating.
- **USB-C Input/Output:** Make sure the power pack has a USB-C port for both input (charging the pack) and output (charging your iPhone).
- **Charging Efficiency:** Consider using a higher-quality battery management system (BMS) to improve charging efficiency and prolong battery life.
- **Safety:** Always handle batteries with care and follow proper safety guidelines.

By following these guidelines, you should be able to design and build a battery power pack that can charge your iPhone 12 Pro Max up to four times before needing a recharge.

Would you like more specific guidance on building the power pack, such as choosing components or assembling the circuit?

To calculate how long an 18 amp-hour (Ah) battery can run to charge an iPhone 12 Pro Max, we need to consider the battery capacity of the iPhone and the efficiency of the charging process.

iPhone 12 Pro Max Battery Specs:

- **Battery Capacity:** 3687mAh (approximately 3.7Ah)
- **Charging Efficiency:** Let's assume around 85% efficiency for the charging process.

Calculation:

1. Convert iPhone Battery Capacity to Amp-Hours:

$$3687 \text{ mAh} = 3.687 \text{ Ah}$$

2. Account for Charging Efficiency:

$$\text{Effective Capacity} = \frac{3.687 \text{ Ah}}{0.85} \approx 4.34 \text{ Ah}$$

3. Determine Number of Full Charges:

$$\text{Number of Charges} = \frac{18 \text{ Ah}}{4.34 \text{ Ah}} \approx 4.15$$

So, an 18Ah battery can fully charge an iPhone 12 Pro Max approximately **4 times**.

If you have any more questions or need further details, feel free to ask!

Source: Conversation with Copilot, 9/6/2024

(1) Battery Runtime Calculator: How Long Does Battery Last? - Dot Watts®.

<https://dotwatts.com/battery-runtime-calculator/>.

(2) Battery Run Time Calculation: A Complete Guide - Ufine Battery [Official].

<https://www.ufinebattery.com/blog/how-to-calculate-battery-run-time/>.

(3) Battery Capacity Calculator.

<https://www.batteryworld.com/battery-capacity-calculator>.

(4) How to Calculate Battery Runtime? (Battery Runtime Calculator).

<https://thepowerfacts.com/how-to-calculate-battery-runtime/>.

(5) Battery Life Calculator.

<https://www.omnicalculator.com/other/battery-life>.

I'm trying to design and build my own battery power pack usb c to charge and MacBook Pro Early 2015, 2.7 GHz Dual Core i5. I want to have the capability to charge the Macbook 2 times before recharging the pack. Can you tell me or guide me in determining the battery size, type, amp hour ratings and number of batteries needed.

To design a battery power pack that can charge your MacBook Pro Early 2015 twice before needing a recharge, you'll need to consider the following factors:

MacBook Pro Battery Specifications:

- **Battery capacity:** 7,370 mAh (milliamp-hours)
- **Charging voltage:** 20.1 V

Power Pack Requirements:

- **Capacity:** At least 2x the MacBook Pro battery capacity, so 14,740 mAh or more.
- **Output voltage:** 20.1 V
- **Output current:** The MacBook Pro's maximum charging current, which is typically around 2.4 A.

Battery Type:

- **Lithium-ion:** This is the most common type of battery for portable power packs due to its high energy density, long cycle life, and low self-discharge rate.

Amp-Hour Rating:

- The amp-hour rating of the battery pack should be equal to or greater than the required capacity. For example, a 15,000 mAh lithium-ion battery would be suitable.

Number of Batteries:

- The number of batteries needed will depend on the voltage and amp-hour rating of each individual battery. For a 20.1 V power pack, you could use a series of lithium-ion cells to achieve the required voltage. The number of cells in series will determine the total voltage of the pack.

Additional Considerations:

- **Charging time:** The charging time of the power pack will depend on the input voltage and current. A higher input voltage and current will result in a faster charging time.

- **Battery management system (BMS):** A BMS is essential for protecting the battery pack from overcharging, overdischarging, and short circuits.
- **Enclosure:** The enclosure should be sturdy and able to protect the battery pack from damage.

Design Example:

- **Battery type:** Lithium-ion
- **Number of batteries:** 7 (in series)
- **Amp-hour rating:** 2,100 mAh each
- **Total capacity:** 14,700 mAh
- **Output voltage:** 20.1 V
- **Output current:** 2.4 A

This design would provide enough capacity to charge your MacBook Pro Early 2015 twice before needing a recharge. However, you may want to consider a slightly larger battery pack for extra margin.

It's also important to note that designing and building your own battery power pack can be complex and requires knowledge of electronics and battery safety. If you're not comfortable with these concepts, it may be better to purchase a pre-built power pack.