Battery capacity vs rated

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Understanding these factors helps in better managing battery performance and expectations. Regular monitoring and proper maintenance can mitigate some of the discrepancies between actual and rated capacities123.

Most power banks have lithium-ion (Li-Ion) or lithium-polymer (Li-Po) batteries and electronic circuits. These batteries use cells with a voltage of 3.7V. There are other types of lithium batteries that come with different voltages such as 3.6V, 3.8V.

The lithium batteries may be made of one cell or multiple cells. If the battery is made of a single cell then the voltage rate will be the same as that cell. If the lithium battery is made of multiple cells then the voltage rate will be based on the configuration that is used to connect cells together. However, most of the times power banks come with lithium batteries of 3.7V.

So, when manufacturers calculate the capacity of a power bank they use a voltage of 3.7V. The rated/advertised battery capacity is based on a voltage of 3.7V. But, the power bank won"t be able to output 100% of its capacity. Here"s why.

Power banks use a USB-C port to charge other devices, these ports have a voltage of 5V and not 3.7V. So, when the 3.7V is converted to 5V the capacity of the power bank drops. To calculate the exact capacity of a power bank with a 5V output, you can use this formula:

The above formula calculates the stored capacity of a power bank at 5V but without power loss. However, the output power of a power bank is always going to be lower than the stored power because of the power loss when the voltage is raised.

Therefore, the real battery capacity depends on the quality of your power bank. The better the power bank, the less power is lost during the voltage conversation, this is also called efficiency rating.

The higher the efficiency rate the better. The average efficiency rate of a power bank is 85%. High-quality power banks have a higher efficiency rate than 85%, while low-quality ones have a lower efficiency rate than 85%.

As you can see, the real capacity of the power bank depends on a lot of things. Manufacturers won"t be able to know the real capacity of a power bank so instead, they show only the internal battery capacity.

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