News & Highlights

European Union Legislates Charging Port Standard

Chris Palmer

Senior Technology Writer

In June 2022, continuing legislative efforts aimed at decreasing electronic waste and bolstering consumer rights, the European Parliament voted overwhelmingly in favor of a rule requiring all new rechargeable mobile devices like smartphones, tablets, earbuds, and keyboards to use universal serial bus type C (USB-C) charging ports by December 2024. The same rules will apply to new laptops beginning in 2026 [1]. While the law will only be enforced in the European Union (EU), its consequences will likely be felt worldwide as most technology companies will find it cheaper to produce all their devices with USB-C connectors rather than make products with different charging technology only for EU countries.

Most major device manufacturers have already adopted USB-C (Fig. 1(a)). This means the legislation, which EU regulators first began contemplating in 2009 as a way to reduce electronic waste and save consumers money [2], will most affect Apple (Cupertino, CA, USA), whose product line uses a mix of charging technologies. In November 2022, Apple executives sent a letter opposing the USB-C mandate to the European Commission arguing that it would stifle charging-technology innovation [3]. Nevertheless, Apple has confirmed that it will comply with the ruling [4].

"I see no disadvantage in going fully to USB-C. It does everything people need," said Jack Gold, president and principal analyst at J.Gold Associates, an information technology consulting firm based in Northborough, MA, USA. "If it works for the rest of the world, why would it not work for Apple?"

Beginning on April 28, 2026, the same stipulations regarding the use of USB-C will apply to laptops as well. The next step is for EU member states to adopt and publish, by December 28, 2023, the laws and regulations necessary to comply with the directive [5].

The new rules allow many wearable devices, such as smartwatches and fitness trackers, to continue having their own specialized charging connectors. The rules also state that producers must provide information on their device's power requirements and whether it supports fast charging. Buyers are also to be allowed to choose whether their new devices come with a charging cable.

"This new rule may actually drive-up costs and waste in the short term because when Apple makes the transition, its products will likely need to ship with a USB-C charger cable, if not a plug," Gold said. But over the long haul, the European Commission estimates that reducing production and disposal of new chargers will decrease electronic waste by 980 tonnes annually and save

consumers at least 250 million EUR per year [6]. In contrast, a study commissioned by Apple examining the lack of innovation that could result from standardization estimated a potential total loss of value to consumers in the billions of EUR [7].

Since it was first introduced in 2015, USB-C's most notable selling point has been its universality. In addition to charging at up to 240 W, a USB-C cable with the latest, USB 4.0, specifications can transmit video from a computer to a monitor or television, transfer vast amounts of data at speeds up to 40 gigabits per second [8] and, perhaps most importantly, do all these things simultaneously. USB-C is also reversible, meaning it works whichever way you plug it in. And it can charge both ways, letting a user charge a smartphone from a laptop, for instance.

However, not all USB-C cables are built the same [9], with many omitting several lines or components necessary to enable all functions, and not all are built to USB 4.0 specifications. The new EU rules fail to stipulate anything about the data-handling capabilities of USB-C cables sold in the region. Apple had already achieved USB-C's universality and reversibility benefits with its lightning connector that is used in all current iPhones and base model iPads (Fig. 1(b)). There are now more than one billion iPhones in the world [10], and every model of iPhone released since 2012 has come with a lightning port.
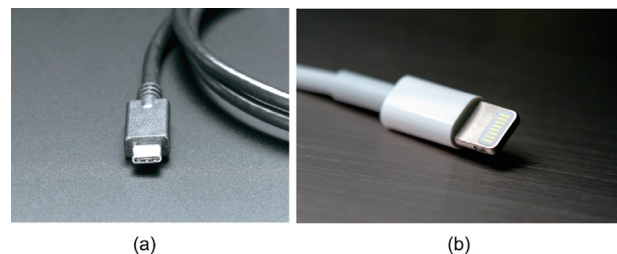

(a)   (b)

Fig. 1. (a) USB-C cables can transmit data at USB 4.0 speed, as fast as 60 Gbps. By comparison, (b) Apple's lightning cables support USB 2.0 and transmit data at a much slower rate of 480 Mbps. As for charging specs, the lightning cable supports fast charging on the iPhone 13 at 20 W. In contrast, USB-C cables with USB 4.0 specifications can support fast charging up to 240 W. Both connections have reversible ends, making them relatively easy to plug into devices, and they also include chips that help guarantee compatibility and control the power supply to ensure the stability of current and data transfers. Credit: (a) Flickr (CC BY-NC-SA-2.0); (b) Flickr (CC BY 2.0).

Gold says that even though the company likely saw the new rule coming, it chose not to proactively make the change, mostly for financial reasons. "Apple has resisted going to a standardized connecter for years, and their excuse has been they do it better," Gold said. "But the real reason is they want to control the marketplace. Apple makes a ton of money in accessories, either selling them themselves or licensing them to others."

Renaud Foucart, senior lecturer of economics at Lancaster University, UK, who researches European technology policy, said that Apple also sees lightning cables as a way of differentiating themselves. "For Apple, it is part of their identity," he said. "One of Apple's main selling points is that they have something different from the competition—forcing them to be compatible could hurt their market share."

The EU is not the only market pushing for a common charger for mobile phones. Politicians in Brazil [11], India [12], and the United States [13] are also considering a common connector rule. While Apple could choose to create one line of USB-C products for the EU and another set of lightning-based devices for the rest of the world, Foucart and Gold both said that they anticipate the company, which is already testing new iPhones with USB-C ports [14], will make the switch to USB-C across all its devices.

A more radical move would be for Apple to fully embrace wireless charging and remove its charging ports altogether. Wireless charging is already supported across the entire lineup of iPhones. And although multiple peripheral devices have data connections to the iPhone via lightning, Apple has shown it will not hesitate to remove features it deems outdated. The company was the first major computer manufacturer to do away with the floppy disk drive and then the CD-ROM drive. And then in 2016 it famously removed the iPhone's 3.5 mm headphone jacks beginning with the iPhone 7 model, which was met with an enormous customer backlash [15]. However, the controversial move, announced on the same day the company debuted its wireless Air Pods, ultimately proved successful. Apple sold 12 billion USD in Air Pods in 2020 [16], eclipsing the total revenue of firms like NVIDIA and AMD, and many manufacturers have since also jettisoned headphone jacks from their new smartphones.

"Despite the obvious success of wireless earphones, going full wireless charging would be a risk at this stage," said Ryan Reith, vice president of worldwide mobile device trackers at the research firm International Data Corporation (Needham, MA, USA), citing current adoption rates hovering around 20% globally. "We are probably four or five years away from companies really trying that across their portfolios," Reith said, "But we will get there eventually." Looking ahead to that eventuality, the European Commission is now considering mandating a common standard for wireless charging, possibly as early as 2026 [17].

The USB-C mandate is not the first time in recent history that an EU ruling has driven big changes at consumer tech companies with global consequences, a phenomenon that has become so common that it has been given a name: the Brussels Effect [18]. *The General Data Protection Regulation*, the EU's 2016 online data privacy legislation, triggered a global redesign of the internet user experience [19]. And a March 2022 law, the *Digital Market Act*, is forcing technology companies like Apple and Google (Mountain View, CA, USA) to allow other businesses to operate on their services and platforms [20].

In other regulations aimed at reducing electronic waste and saving consumers money, the EU will require, as of January 2024, batteries in devices ranging from smartphones to e-bikes to be manufactured with a minimum amount of recycled materials and so that they are easier for consumers to remove and replace [21]. The EU also published regulations in March 2021 reinforcing consumer's rights to repair washing machines, dishwashers, refrigerators, and display devices like monitors and televisions [22];

extending such right-to-repair regulations to mobile phones, tablets, and laptops is also under consideration and could be announced as early as 2023 [22].

"The EU tends to have much more of a consumer focus than a big-business focus, which is just the opposite of many countries and regions," Gold said. "But we are finding that when Europe speaks, the world listens. The EU is a big enough market that if they say they are going in a certain direction, manufacturers across the world pretty much follow along."

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