

# Common Mobile Charger

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**Abstract:** *If you want to replace your mobile phone with a new one, you have to replace your charger too, even if it works perfectly well. If you have two handsets from different manufacturers, you have to carry a different one for each. Thus, one household has many chargers that become redundant over time. It is a nightmare and an inconvenience for all consumers alike to have a different charger for each handset. Every year, such discarded mobile chargers generate tones of e-waste, which is a major environmental problem. A universal mobile charger, which is compatible to all handsets produced by different manufacturers, old and new, is the perfect solution. It would significantly reduce e-waste, plus be economical to users.*

## 1. PAST DEVELOPMENT

In the Global Mobile World Congress meet in Barcelona, 2009, such a solution was first proposed. The idea of a universal mobile charger, that is, one that is compatible with all mobile phones, was presented by. The world's biggest mobile phone manufacturers and network operators agreed to adopt a new universal standard of phone recharger in an effort to be more environmentally friendly. The United Nations International Telecommunications Union (ITU) in October 2009 approved a universal phone charger standard.

The European Parliament in Strasbourg voted in favor of draft legislation which would include compatibility with "universal" chargers as one of the "essential requirements" of all electrical goods approved for sale in the EU, in the year 2012. The bill has the informal backing of the EU's 28 member states; it was then left to the European Commission, the EU's executive, to detail what a common phone charger should look like and the conditions under which it would be imposed on the industry.

Major producers of mobile phones have agreed to a memorandum of understanding (MoU) with the European Commission (EU) to harmonize chargers for mobile phones sold in the EU. The companies that have signed the MoU are: Apple, LG, Motorola, NEC, Nokia, Qualcomm, and Research in Motion, Samsung, Sony Ericsson, and Texas Instruments.

Choice, the largest consumer organization of Australia, has started a campaign against Apple, HTC, and Blackberry, companies which have not signed the international standard

convention proposed by the ITU. Though Apple is the signatory to the MoU with the European Commission, it has not signed up to the ITU's standard.

As the companies who have agreed to a standardization of the mobile phone charger manufacture most mobile phones in India, a universal common charger was expected in the market. A Nokia official in Ahmedabad said that "Universal chargers are expected to hit the Indian Market after the first quarter of 2011". But the development process has been slow and sparred.

## 2. WHY DO WE NEED A COMMON CHARGER?

It is tedious to use a different charger for each handset. If a user has an Apple I-phone and a Samsung phone, he needs two chargers to charge each one. Users also need to carry with them the chargers. This is a major inconvenience. Also, the amount of discarded chargers generates tones of e-waste every year which is difficult to dispose of. The cost of a mobile phone includes the cost of a charger, thus causing an unnecessary burden to consumers.

## 3. TECHNICAL REQUIREMENTS

Common mobile charger has some specific technical requirements that have to be fulfilled so that it is compatible with every phone and it provides highest power efficiency.[2]

### Cable and wire specification

The cable and wire should be interfaced between the EPS and plug connector with the flame resistance according to EN60950.

### AC Input Characteristic

The EPS in AC input has to be AC to DC convertor. Operating Temperature Range has to be between 0 to + 45 °C. The input voltage range should be preferred be atleast 90-264V and the input frequency have to be taken as universally specified.

### DC Input Characteristic

- 1) Output Voltage Range: 5V  $\pm$ 0.25V from no load to maximum output current measured at the Micro-B plug of the captive cable or on Standard-A receptacle in case of detachable cable.
- 2) Output Current Range at 5V  $\pm$ 0.25V voltage range is 500 mA to 1500 mA (maximum 1.5A load at voltages below 4.75V). Output Voltage Ripple 80 mVp-p.
- 3) EPS shall short the D+ and D- lines with a resistance not greater than 200 ohms. The charger converts 90V-264VAC at 50-60Hz into 5VDC, 500-1500mA.
- 4) The galvanic isolation required for user safety also isolates the charger output from earth ground, although there still exists capacitive coupling between the primary and secondary through the transformer
- 5) Output of the power adapter shall meet LPS, SELV, non-hazardous energy requirements. Maximum Current under Single Fault Condition shall not exceed 3A.
- 6) The power adapter shall meet Class II requirements with max leakage current not exceeding 90 micro-Amps.
- 7) Output Voltage Ripple (Under load conditions from idle to full): 80 mVp-p measured at 20 MHz bandwidth.
- 8) Max Load Current at voltages below 4.75V: 1.5 A.

### Safety and protection

The EPS should not be damaged as a result of any electrical overload, over temperature condition or any short circuit condition. If shut down occurs, unit shall not resume until AC power is cycled. Output of the power adaptor shall meet LPS, SELV, non-hazardous energy requirements the maximum current under fault condition should not exceed 3A.

### Adaptor Detection

EPS shall meet the USB-IF Charging Port Test Requirements for a Dedicated Charging Port. Top level requirements listed below:

- 1) The EPS shall short the D+ and D- lines with a resistance not greater than 200 ohms.
- 2) The resistance between the D+ or D- lines of the EPS and either Vbus or Gnd shall be greater than 2mOhms.
- 3) The capacitance between the D+ or D- lines of the EPS and either Vbus or Gnd shall be less than 1nF.

### Reliability

Durability of plug and receptacles shall as minimum meet the performance of the universal serial bus. [8]

- 1) Micro-B Plug: 10,000 cycles
- 2) Standard-A Receptacle and Plug: 10,000 cycles (ruggedized Standard-A):

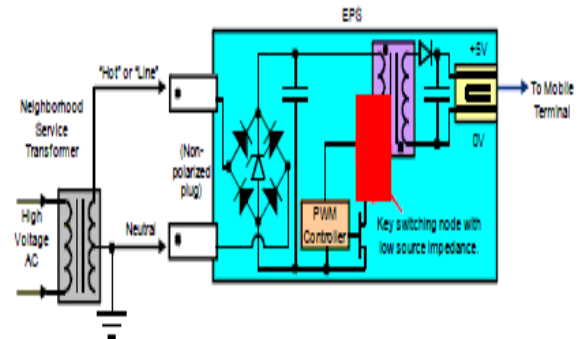


Fig. 1: Common Mobile Charger basic electrical Circuit

Only one thing should be noted carefully while designing the charger that it shall not be damaged as a result of any electrical overload, over-temperature condition or any short circuit condition.

### 4. WORKING OF COMMON MOBILE CHARGER

Common Mobile Charger will work in the same way as a normal charger works only that common charger will be very power efficient.[3]

- 1) It will use the Switched Mode Power Supply. It works on the concept of Power Supply Unit (PSU). PSU is a device that transfers electrical energy from one end to another by changing the basic characteristics. It is of two types (based on the mode of operation):-Linier and Switching.
- 2) Energy transfer is done by continuously switching electrical components (inductor, capacitor, etc) on and off. We can control the output voltage/current by varying the duty cycle, frequency or the corresponding phase.
- 3) It has greater efficiency than bulky chargers and very light and small due to SMPS technology.
- 4) The AC supply first enters through the line filters in the charger. Line filters are the kind of electronic filters that are placed between an electronic device and an external line to alter/attenuate the electromagnetic interference effect.
- 5) The filtered signal is made to pass through the full wave bridge rectifier circuit. Rectifier converts the AC voltage to DC.
- 6) Output DC voltage from rectifier circuit passes through the PFC (Power Factor Correction) circuit which operates power circuits at their maximum efficiency.
- 7) Then the pulse transformer is optimized to produce rectangular electrical pulses. It is a power transformer which reduces the voltage level of the input power and gives a low voltage power that is exactly required to charge the battery.[4]

## 5. BENEFITS

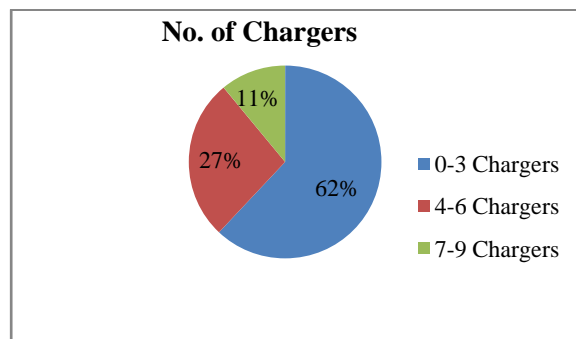
The common mobile charger not only solves a problem, it provides added benefits.

- 1) The environmental benefits of universal mobile chargers are expected to be significant:
- 2) Reducing the number of charger sold unnecessarily will reduce the corresponding generated electronic waste, which currently amounts to thousands of tons. . It will put an end to charger clutter and 51,000 tons of electronic waste annually.[3]
- 3) The common chargers are also expected to improve energy-efficiency, thus reducing energy consumption as they will also comply with the newest European standards on energy efficiency.[3]
- 4) Common mobile chargers will also include a 4-star or higher efficiency rating, which is up to three times more energy-efficient than an unrated charger. Furthermore, with potentially 50 per cent less chargers being manufactured each year, the industry can expect to reduce greenhouse gases in manufacturing and transporting replacement chargers by 13.6 to 21.8 million tons a year.
- 5) The economical benefits of common mobile charger are as follows:
- 6) Consumers will be able to purchase mobile phones without a charger, thus logically reducing their cost. They will also be able to purchase much more cost-effective stand-alone chargers than is currently the case.
- 7) Consumers will be able to charge their mobile phone from the new common charger, so consumers will not need to buy a new charger together with every mobile phone.
- 8) Incompatibility of chargers for mobile phones is a major inconvenience for users across the world. Currently, specific chargers are sold together with specific mobile phones. A user who wants to change his/her mobile phone usually acquires a new charger and disposes of the current one, even if it is in perfect condition. This unnecessarily generates considerable amounts of electronic waste. So by using this common mobile charger we can reduce waste and hassle for consumers.
- 9) Users can also benefit from chargers more efficient and more economic independent.
- 10) By using common mobile charger the large majority of phones will charge within 2 hours. When there is a large battery and small charger combination, this process may take up to 6 hours.
- 11) Common chargers have sufficient immunity to external interference.

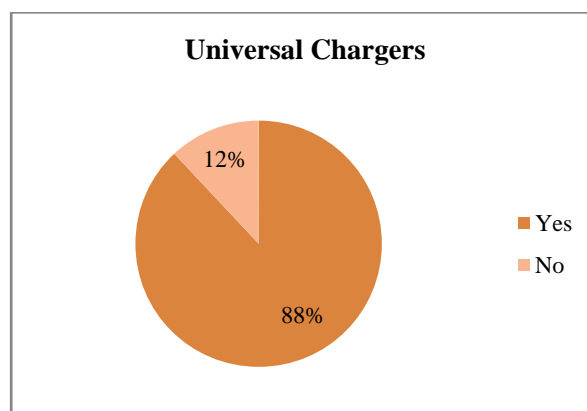
## 6. SURVEY

A survey was conducted by us to know about how people will react towards common mobile charger and its usage. This survey was taken by 130 persons of every strata of society. Below are the results we analyzed from the survey.

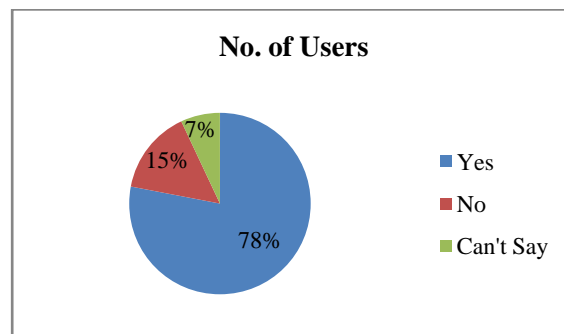
### Q.1 What is the number of mobile phone chargers in your household?



### Q.2 Would you think it convenient to have a universal charger for all mobile handsets?



### Q.3 Will you be ready to pay more for such a mobile charger provided you don't have to buy a new one when you change your handset?



## 7. FUTURE SCOPE

Any such product once introduced has every chance of being highly successful. Based on our survey and consumer response, it has been shown that there is big potential for it. Even when the cost of it is still relative, there is a major scope in all spheres of life. There are often more chargers than there are energy ports available. Such a charger could be used in common public transport, as a facility provided to consumers,

as fixed plug in chargers. Commuters can charge their mobiles while travelling in trains, buses, metros, etc. This would eliminate the need of always carrying your charger while travelling, plus also avoiding the battery giving up while travelling long distances if you don't have yours. The same could be applied in all offices, public and corporate, where a given number of chargers can be made available by the company to their employees which can be used effectively. In households too, we don't have to have a different one for each handset, but can manage with about half of what is currently used. Many people, unaware of the differences in the battery requirements, often use another charger for their phone. While this is easy, it has a negative impact on their battery phone, because of the distinct nature of all. This inconvenience would be eliminated once it is standardized and consumers wouldn't have to worry about damage to their phones. India would serve as a huge market for the manufacturers as we are the second on the list of countries with the most number of mobile handsets in use.

## 8. CONCLUSION

To the layman, who doesn't know much about the energy efficiency of a charger, or its compatibility with different batteries, one charger is like the other. For this reason manufacturers and the European Union play important role to provide energy efficient adapters to end users, and elimination the partisan nature of the mobile phone charger. UCS would reduce 50% of the clutter annually. Thus, they are also taking care of environmental protection. Universal Charging Solution helps us not only to reduce expenses and mitigate negative environmental impacts, but makes our daily life easier with modular, brand and type independent, interchangeable mobile phone chargers. The UCS project is rising slower than it was

calculated in the original timeline; however, most new data ready mobile phones support a micro USB common port for charger since late 2011. This is the first step and necessary condition to reach charger less mobile phone boxes in the market, which will be the next and very important step in the evolution process of mobile phone chargers. Such an introduction of such a product would approximately reduce the amount to 50%, which would greatly benefit environmental conversation and help e-waste disposal. Also, consumer preference and willingness to buy has been enormous, according to our survey, the market for UCS is extremely large.

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