International Journal of Research and Review
[Indexed, Peer-Reviewed Journal]
Volume 12; Issue: 2; February 2025
Website: www.ijrrjournal.com
Research Paper *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

Production of Portable Temporary Power Supply for Cellular Phone

Wen-Bin Lin[1], Kao-Feng Yarn[2]

[1] Department of Electrical Engineering, [2] Department of Electrical Engineering,
CTBC University of Technology, Taiwan 74448, ROC

Corresponding Author: Wen-Bin Lin

DOI: https://doi.org/10.52403/ijrr.20250214

ABSTRACT

Since most people nowadays use smart phones, they need a power bank as a backup power source. However, most of the mobile power supplies available in the market are heavy, making them inconvenient to carry. If we are traveling and have difficulty in obtaining power, it will come in handy when we need power temporarily.
The motive of this article is that when we are out of the house and our cell phone is out of battery and we need power temporarily, we can charge it right away. The hardware is powered by two AA batteries through a voltage-boosting circuit to achieve the charging effect. We can also bring our own rechargeable battery to use as a charging battery. If the battery runs out, just go to a convenience store and buy a battery to keep charging our cell phone. Although the charging speed is not fast, it can reach the maintenance power for temporary emergency calls.

Keywords: Cell phone, mobile power, charging

1. INTRODUCTION

Nowadays, almost all people use smartphones and rely on them, no matter for work or contacting things, they need cell phones. In an era where smartphones are becoming more and more common, power is very important. All we need is a power source that is readily available when there is a temporary power outage and we need a power source. The function of recharging can be performed by simply going to a convenience store and buying a battery.

2. MANUFACTURING MOTIVATION

The cell phone is a very important invention for mankind. From the beginning of the cell phone also have to use two cell phone batteries in the seat charger to replace the charger. Nowadays, smart phones can be charged quickly by connecting the charging cable to the phone, and there is no need to pull out the phone case to take out the phone's battery, making it more and more convenient to charge the phone. However, if you need to recharge your batteries when you go out of town and can't find a place that provides power, it's very inconvenient. Our temporary power supply solution means that it is easy to obtain power. We use two AA batteries for charging, which is boosted by a booster circuit to charge the battery. Generally speaking, we can buy the AA batteries at convenience stores, so we can get the power immediately when we need temporary electricity. Our “Portable Temporary Power Supply” is mainly for easy access to power supply and portable and lightweight [1-5].

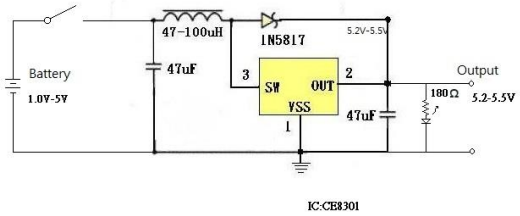

Figure 1: Aimed circuit diagram

3. PRODUCTION METHOD

As shown in Figure 1, the work in this paper is to use a boost circuit to boost the AA battery or rechargeable battery to 5V for charging. The battery holder is connected to the voltage boosting circuit and then charged via the USB socket.

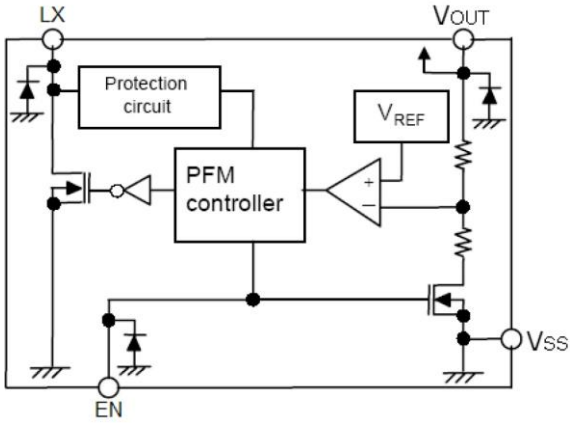

Figure 2: IC CE8301 block diagram

As shown in Figure 2, the CE8301 series is a CMOS boost DC/DC controller consisting of a reference voltage source, an oscillator circuit, a comparator, and a PFM control circuit. The series utilizes a PFM control circuit to automatically switch the duty ratio according to the load size. This product has low output ripple and high efficiency over a wide range. The CE8301 Series are boost DC/DC controllers constructed by using external components such as inductors, capacitors, and diodes. The built-in MOSFET uses a protection circuit to prevent damage by automatically breaking the circuit when the switching transistor current exceeds the control value.

4. HARDWARE PRODUCTION EXPERIENCES

We tested three ICs and finally chose CE8301. We utilize breadboards to test many parts before selecting the right ones for the boost circuit. Because its maximum output current can reach 400mA, which is the IC needed for our solution.

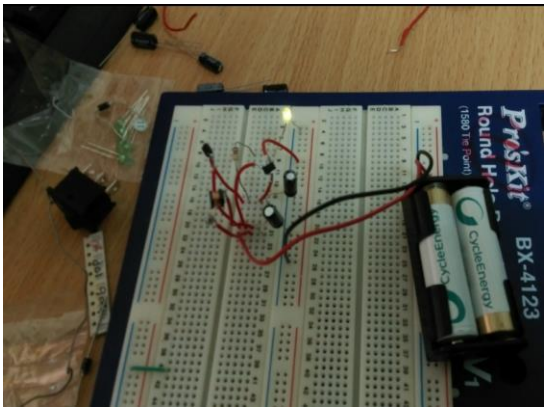

Figure 3: Breadboard parts

After we confirmed the parts, we started charging the cell phone battery. We found that we were trying to charge a AA battery but were unable to do so. One AA battery is not enough, so we use two AA batteries in series, as shown in Figure 3, so as to provide stable charging.

As shown in Figure 4, this is a discharge test using a cell phone battery. Use two 3-watt light bulbs to discharge the cell phone battery, and it will stop discharging in about 15-20 minutes.

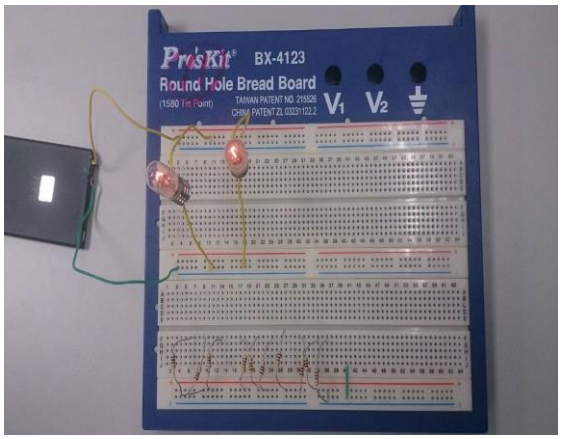

Figure 4: Test bread board diagram

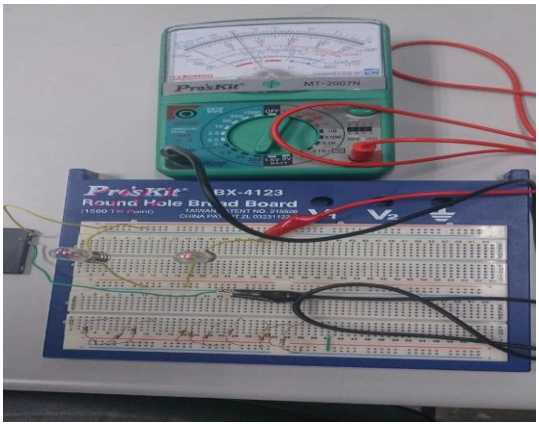

Figure 5: Breadboard discharge test

As shown in Figure 5, this is a measurement of his discharge voltage using a meter on the way to discharge. Measurement is used to obtain more accurate data to determine the amount of batteries to be used in the finished product, and also as a reference for the data of the batteries to be tested later.
Rechargeable battery is 1.2V, cell phone battery is 3.8V, cell phone battery discharge voltage is 3V. As shown in Figure 6, one battery for the charging test, we charge the cell phone battery by one battery. It is found that the charging time of one battery is about one hour, and the on-current is only 90mA. Because the boost circuit will slowly reduce the amount of current with the power of the battery, so only 90mA is not enough for continuous charging. With today's smartphone batteries, the capacity is so large that one battery can be used on top of an old cell phone. However, nowadays most people are replacing their smartphones, so it is better to use more than two AA batteries for charging.

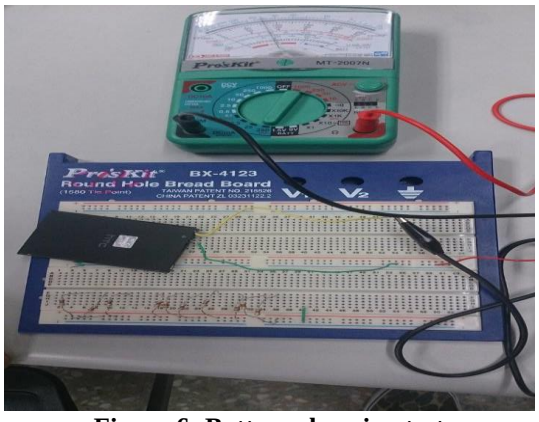

Figure 6: Battery charging test

5. BATTERY TEST

We will do a test to compare which battery takes longer to charge and how much it charges. Three types of batteries, namely, rechargeable batteries, alkaline batteries and zinc carbon batteries, will be used for the experimental tests. Below are the results of our tests.

5.1 Rechargeable Batteries

As shown in Figure 7, after testing the rechargeable battery, we found that it is the battery that can charge the longest and the most power. We tested it with two cell phone batteries of different battery capacities. Rechargeable batteries take longer to charge than the other two. However, the drawback is that it is not as conveniently accessible, so it can only be used as a backup battery before going out. A comparison of the charging time and power of the rechargeable batteries is shown in Table 1.

Figure 5: Rechargeable batteries

Table1: Rechargeable battery charging time and power capacity

HTC E8(2600mAh)		A2(1600mAh)	
Charging Time	**Charging Percentage**	**Charging Time**	**Charging Percentage**
0 min.	21%	0 min.	11%
60 min.	27%	67 min.	77%
120 min.	33%	110 min.	93%
150 min.	35%		

Figure8: Zinc carbon batteries

Table2: Zinc carbon batteries charging time and power capacity

HTC E8(2600mAh)		A2(1600mAh)	
Charging Time	**Charging Percentage**	**Charging Time**	**Charging Percentage**
0 min.	25%	0min.	21%
60 min.	26%	60min.	33%

5.2 Zinc Carbon Batteries

As shown in Fig. 8, the test using zinc carbon battery found that it is not better than the other two batteries, but is the worst one. Not only does it take a short time to charge, but the amount of power it takes to charge is minimal. But as a temporary power source, it does the job, just not as effectively. A comparison of charging time and power of zinc carbon batteries is shown in Table 2.

Figure9: Alkaline batteries

Table3: Alkaline batteries charging time and power capacity

HTC E8(2600mAh)		A2(1600mAh)	
Charging Time	**Charging Percentage**	**Charging Time**	**Charging Percentage**
0 min.	54%	0 min.	1%
60 min.	59%	750 min.	25%
157 min.	64%	1200 min.	31%

5.3 Alkaline batteries

As shown in Fig. 9, alkaline batteries are the batteries that are more evenly distributed among the three types of batteries and more in line with our ideal. It doesn't have the staying power of a rechargeable battery, but because it's easier to access than a rechargeable battery, and because it lasts as long as a rechargeable battery and has a good charge capacity, it's the ideal battery for us. A comparison of alkaline battery charging time and capacity is shown in Table 3.

6. FINISHED RESULTS

After selecting the parts and the circuit, the finished product may still have some imperfections, but it is close to the same as the original design concept, and the finished product and the boost circuit diagrams are shown in Figure 10 to Figure 12.

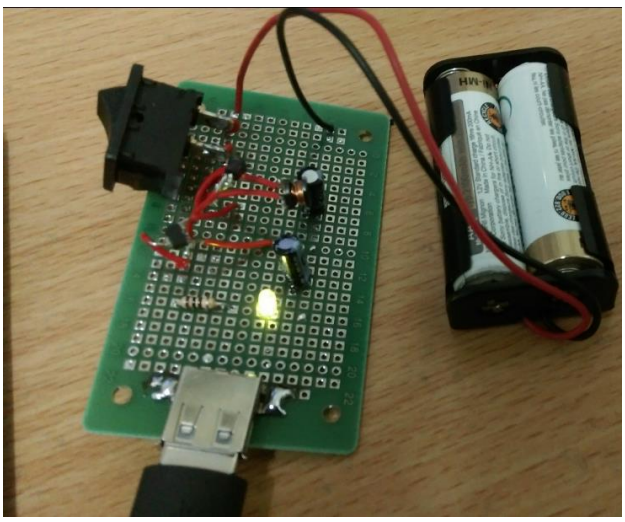

Figure10: Finished Circuit Board

Figure11: Circuit board charging

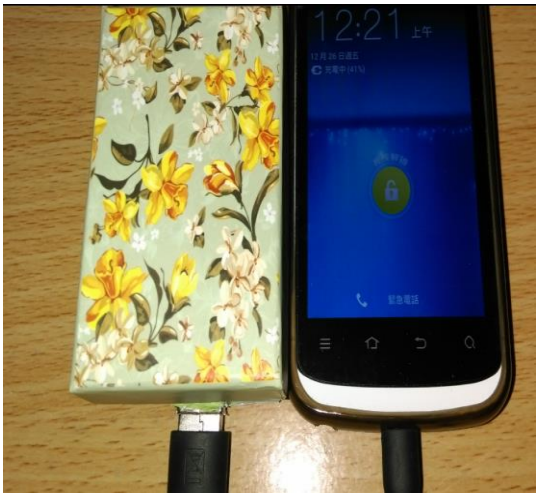

Figure12: Finished product packaging and charging

Declaration by Authors

Acknowledgement: The authors would like to acknowledge Mr. Ming-Cherng Chure who constructed much of the hardware for the experimental system.

Source of Funding: None

Conflict of Interest: No conflicts of interest declared.

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How to cite this article: Wen-Bin Lin, Kao-Feng Yarn. Production of portable temporary power supply for cellular phone. *International Journal of Research and Review*. 2025; 12(2): 123-127. DOI: *https://doi.org/10.52403/ijrr.20250214*

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