IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 7, July 2021

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.282

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE)

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.282|

|| Volume 10, Issue 7, July 2021 ||

| DOI:10.15662/IJAREEIE.2021.1007030 |

A Study of an Experimental Analysis of Power Bank with Buck-Boost Converter

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ABSTRACT: Progressing years have seen a mass amassing and making of minimal electronic contraptions and gadgets, similar to workstations, PCs, phones, modernized cameras, adaptable DVDs, PDAs, MP3 players, GPS devices, clinical consideration devices, etc, As of now these all things have become the need of the social classes and generally these things require a battery power supply. In any case, the standard issue is the confined furthest reaches of battery, the proportion of utilization time gave from batteries is much of the time far from incredible. A critical number of the equipment things customers manage this issue that the battery of their device runs out of energy at urgent focuses in time when they are required for critical applications and it's everything except possible to have a power supply for each advantageous contraption; regardless a normal support supply can resolve this issue. Normally the power bank does the going with three limits; it charges the internal battery and offer ability to outside contraptions It will give assorted power level yields with uncommon affirmation features like NTC (Negative Temperature Coefficient), and short out security, etc, with successful battery saving segment

KEYWORDS: NTC, Buck Converter, Boost Converter, Short Circuit Protection, Battery.

I. INTRODUCTION

The correspondence structure accepts a basic part in the current present day culture. The size ofthe electronic devices has wither from huge scope to smaller than usual and a short time later changing to nanometer scale with movement of semiconductor development [1]. For example, the current PDAs are arranged insignificantly and operateswith contact screen based development. The exceptional features of these cells are: data amassing, music with sound and video, course system, calls, web business, e-learning, etc, which requires gigantic cutoff battery structure [2, 3]. The in-builtlithium-molecule battery is planned for closeness and has confined energy storing to work PDAs. Thusly, these batteries are offering energy to hours and most prominent a day presented to utilize illustration of the phone. It suggests that the inbuilt battery is exhausted out and a while later need to module for charging the battery. The charging ought to be conceivable either through module or by external minimal fuel sources, for instance, power banks

These battery-fueled power banks are clear, adaptable and are generally used for charging all most all helpful electronic gadgets. The PDAs require highpowered batteries for further developing the functioning range [2]. Hence, The power sets aside cash with further developed cutoff points goes from 2000 mAh to 20000 mAh or past are in a mind boggling revenue for charging cells. A part of the smaller , electronic contraptions charged by thepower bankA Power bank is a device used to put energy into a secondary cell or rechargeable battery by forcing an electric current through it. The charging protocol depends on the size and type of the battery being charged. Some battery types have high tolerance for overcharging and can be recharged by connection to a constant voltage source or a constant current source; simple chargers of this type require manual disconnection at the end of the charge cycle, or may have a timer to cut off charging current at a

fixed time. Other battery types cannot withstand long high-rate over-charging; the charger may have temperature or voltage sensing circuits and a microprocessor controller to adjust the charging current, and cut off at the end of charge. A trickle charger provides a relatively small amount of current, only enough to counteract self-discharge of a battery

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that is idle for a long time. Slow battery chargers may take several hours to complete a charge; high-rate chargers may restore most capacity within minutes or less than an hour, but generally require monitoring of the battery to protect it from overcharge. Electric vehicles need high-rate chargers for public access; installation of such chargers and the distribution support for them is an issue in the proposed adoption of electric cars. In short, Power bank is portable charger which can be used in charging your mobile phone, mp3, mp4, ipad and other digital products **survive for the whole day when used continuously.** Therefore, in order to solve this annoying problem, through continuous research and exploration, finally a new technology power bank has been developed. It can solve a number of mobile devices power supply problems. Also, the safety of power bank is continuously valued by the people. Power bank must have protective measures for short circuit, battery overcharge and over discharge, thermal shutdown and other power supply problems. There should be a high-performance power management technology

II. PROBLEM DEFINATION

As per BIS, Standardization is sine-qua-non for development of the national economy all over the world. The goals of quality are set by standardization. Generally the activity consists of the process of formulating, issuing and implementing standards. Standards have always been closely connected with exchange of goods and services between suppliers and consumers. Bureau of Indian Standards has provided traceable and tangible benefits to economy in a number of ways - providing safe, reliable, quality goods; minimizing health hazards to consumers; promote exports and imports substitute; control over proliferation of varieties etc.

Thus it has become necessary to build or design a circuit which should follow BIS standards.

All the electronics products should strictly follow the BIS standards so that it can furtherproceed for manufacture and production.The present problem faced with the circuit is related to frequency and duty cycle. Because theinductor value and the current sense value can be made final according to the required dutycycle and frequency.should be made between the consistency and the gathering cost. Thusly, the uniqueness among cells or battery packs may regardless be expanded after cyclic charging and delivering cycles, causing risky charge disparity and inciting cheating or overdischarging in specific batteries [6].

III. OBJECTIVES OF THE WORK

As the existing power bank products are having number of problems thus there is need to over-come all faults. Following are the some objectives mentioned for the power bank project,

- To manufacture the efficient and flexible PCBA.
- PCBA should not malfunction with increase or decrease in temperature.
- To avoid EMI & EMC if present.
- To increase the backup time.
- Proper use of NTC.
- To save the damage of battery.
- To achieve the proper voltage and current level to match the BIS standards.

IV. SOFTWARE REQUIREMENTS

The PCB Designing Software that we used is mentioned below

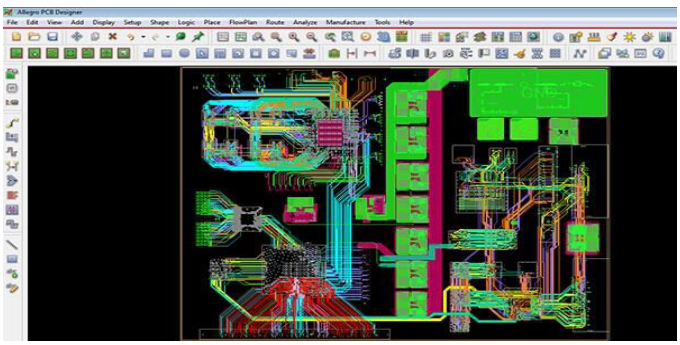

Figure 4.1: Cadence

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The whole PCBA testing is the major factor to analyze all the factors accurately. Thus all precise instruments are required for proper testing. Following are the hardware machinery's that was used for testing.

DC Power Supply DC power supplies are power supplies which produce an output DC voltage. Power supplies are devices that deliver electric power to one or several loads. They generate the output power by converting an input signal into an output signal (in this case, a DC output).

IR Thermometer Similar to visible light, it is also possible to focus, reflect, or absorb infrared light. Infrared thermometers employ a lens to focus the infrared light emitting from the object onto a detector known as 0a thermopile.The thermopile is nothing but thermocouples connected in series or parallel. When the infrared radiation falls on the thermopile surface, it gets absorbed and converts into heat. Voltage output is produced in proportion to the incident infrared energy. The detector uses this output to determine the temperature, which gets displayed on the screen.While this entire process may sound complicated, it takes only a few seconds for the infrared thermometer to record the temperature and display in your desired unit.

Multimeter A multimeter is a measuring instrument that can measure multiple electrical properties. A typical multimeter can measure voltage, resistance, and current, in which case it is also known as a volt-ohm-milliammeter (VOM). Analog multimeters use a microammeter with a moving pointer to display readings. Digital Multimeters (DMM, DVOM) have numeric displays and have made analog multimeters obsolete as they are cheaper, more precise, and more physically robust than analog multimeters

CRO The CRO stands for a cathode ray oscilloscope. It is typically divided into four sections which are display, vertical controllers, horizontal controllers, and Triggers. Most of the oscilloscopes are used the probes and they are used for the input of any instrument. We can analyze the waveform by plotting amplitude along with the x-axis and y-axis. The applications of CRO are mainly involved in the radio, TV receivers, also in laboratory work involving research and design. In modern electronics, the CRO plays

Soldering Iron A soldering iron is a hand tool used in soldering. It supplies heat to melt solder so that it can flow into the joint between two workpieces.A soldering iron is composed of a heated metal tip and an insulated handle. Heating is often achieved electrically, by passing an electric current (supplied through an electrical cord or battery cables) through a resistive heating element. Cordless irons can be heated by combustion of gas stored in a small tank, often using a catalytic heater rather than a flame. Simple irons, less commonly used today than in the past, were simply a large copper bit on a handle, heated in a flame. Solder melts at approximately 185 °C (365 °F). Soldering irons are designed to reach a temperature range of 200 to 480 °C (392 to 896 °F).

Experimental Result

The portable devices normally works on DC supply, it takes DC supply for charging and also delivers the DC supply output. The performance of the devices depends on the components used and the specification of the devices. Normally the electrical specification consists of input voltage, in- put current, output voltage, output current, battery specification, etc. All the components that are being used on the board depend on the electrical characteristics of the device. Some of the working ranges of the device are mentioned in the Table I.

Input Voltage	5.000 V
Working Voltage Range	4.50 V to 5.80 V
Input Current	1.00 A to 2.10 A
Output Voltage	4.95 V to 5.25 V
Output current	Max. upto 3.00 A

Table 5.1: Electrical Parameters

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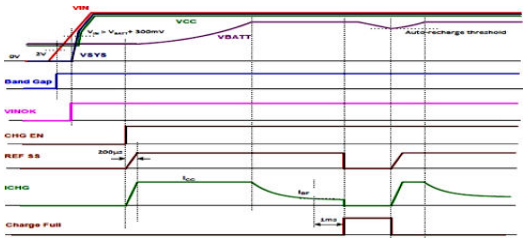

Figure 5.1: Charging Mode

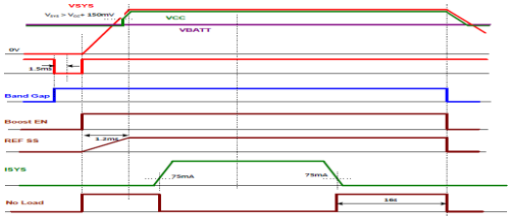

Figure 5..2: Discharging Mode

This describes the behavior of electrical performance in charging mode. Considering the Lithium-ion battery, the battery voltage is normally 2.90 V to 3.40 V when it is fully discharged and the full charged voltage is 4.20 V, thus when the charging starts it normally takes the maximum current which starts decreasing with the rise in battery voltage. Battery tries to maintain its voltage to 4.20 V which is normally called as the CV mode i.e. Constant Voltage mode, thus the device works in CV mode and CC mode, first the CC mode is in operation i.e. constant current mode then the CV mode comes in operation

voltage protection then normally whenever there is rise in voltage the product should get reset and whenever the voltage comes in its charging range it should get on automatically. Over Current Protection, the circuit of device should be such designed that it should not deliver over current to the external devices. Thermal protection and thermal shutdown, thermal protection is related to the temperature of the printed circuit board, it should always work in its specified range, the proper working range of the power bank

V. DESCRIPTION

A battery influence set aside cash with series buck–support type BPMs has been proposed in this investigation to recognize charge balance, yield voltage rule, and variation to interior disappointment. With related buck–support converters, the drained or hurt battery can be viably isolated just by killing the contrasting powerful power switch without the need of an extra mechanical switch. Moreover, the BPMs in the power bank can be independently controlled. A delivering circumstance is modified to execute charge change and weight voltage rule all through the delivering cooperation. With bidirectional BPMs, charge evening out can be made during either the charging or the delivering stage with no extra changing circuit. This work is revolved around the delivering movement since charge change can be refined even more viably for the charging stage since voltage rule isn't needed. With the proposed delivering circumstance, charge evening out can be developed before the completion of the delivering. As such, the battery power can be utilized even more capably. This can work with charge change for the going with charge stage. In this assessment, the SOC appraisal is made by perceiving the stacked voltage under the same delivering current. The different SOC appraisal computations likewise as the delivering circumstances can be tweaked without liberal changes on BPMs for extra overhauls

VI. RESULT AND DISCUSSION

A Buck-Boost converter is a type of switched mode power supply that merges the principles of both i.e. Buck and Boost converter in a single cir- cuit. Like other SMPS designs, it provides a regulated DC output voltage which is taken from either an AC or a DC input. The Buck converter described in Power Bank produces a DC output of 4.20 V, 4.35 V, etc, in a range from 4.50 V to 6.00V the input voltage. The boost converter will produce an output voltage of fixed DC 5.00

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V with the input voltage taking from battery ranging from 2.90 V to 4.20 V. A buck converter is the converter which produces the lower voltage than the applied input voltage and the boost converter produces the voltage greater than the applied in- put voltage. Normally in the Power Bank device, the input supply is given from the wall charger or the laptop or from any computer. The normal input specification of any power bank is 5.00 V and the batteries that are internally connected to the device are of 4.20 V or 4.35 V thus to charge them buck converter is used and same when the output is given out from the portable device then boost converter is used which normally boosts the battery voltage to the fixed 5.00 V which is the requirement of any device. It is normally a DC-DC converter which suits best for the power bank device with very minimum components required like inductor, etc.

VII. APPLICATION AND FUTURE SCOPE

In the present world, portability has become a very important factor; we are constantly looking for new and innovative ways to add comfort to our lives. One of the most frustrating things that can happen anywhere is to find that your mobile phone or any digital device has run out of power at the moment you need it most. Thus the new technology has arrived to the market that will allow you to abolish this common problem once and for all. Power Banks is a portable charging device that allows you to charge any devices which are charged by USB capable wherever you may be.The concept of power bank is becoming very popular as it has become the need and also its demand is increasing because of fast growth of digital products. Portable Chargers are convenient and because of their small size it has become very easy to carry power bank of large-capacity. Since the global economy is growing very rapidly, people continued to carry more and more portable electronic products, such as mobile phones,camcorders, laptops, digital cameras, tablets, portable players like MP3 player, PDAs, Global Positioning System devices, DVD player, MP4 player, thermal equipment, healthcare equipment, etc. People have become so much addicted to the technology that he is not able to live without it, and also the digital devices don't have so much of power that it can survive for the whole day when used continuously.
Therefore, in order to solve this annoying problem, through contin- uous research and exploration, finally a new technology power bank has been developed. It can solve a number of mobile devices power supply problems. Also, the safety of power bank is continuously valued by the people. Power bank must have protective measures for short circuit, bat- tery overcharge and over discharge, thermal shutdown and other power supply problems. There should be a high-performance power management technology.

VIII. CONCLUSION

The fundamental point of this undertaking is to produce and plan the most effective Power Bank of best quality by eliminating every one of the issues that are being looked in the current force banks. Force bank items which will be planned will enjoy the benefits of high productivity, low reserve current, high impedance dismissal just as aggressive estimating. Likewise it ought to have changed both charging and releasing boundaries. These outcomes in lower expenses and a lot higher adaptability when contrasted with conventional arrangements in the force bank application market

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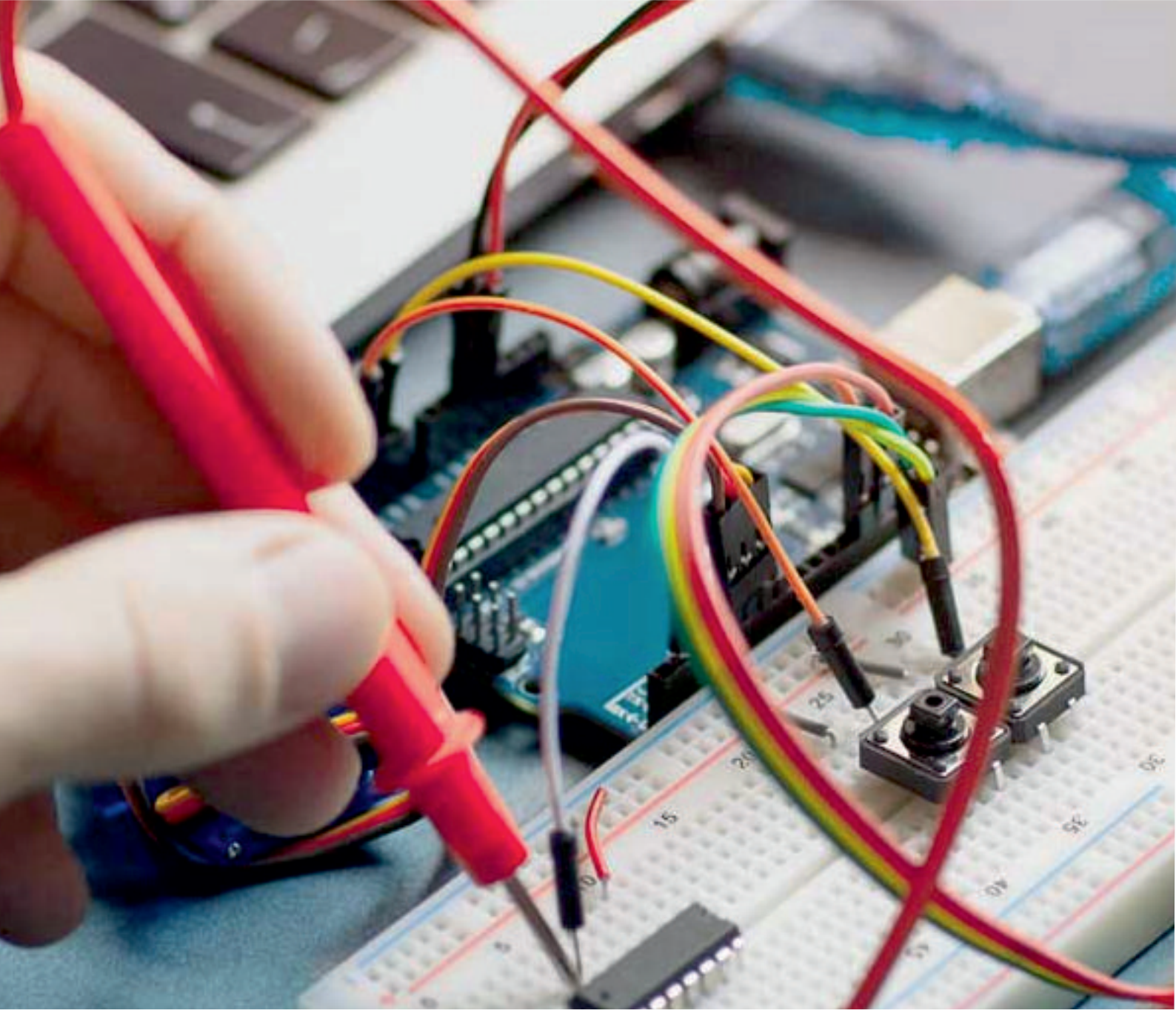

INNO SPACE
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Impact Factor: 7.282

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