



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

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☑ 6381 907 438

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A Study of Software Requirements 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 of the 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 operates with 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-built lithium-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 the power bank A 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 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 further proceed for manufacture and production. The present problem faced with the circuit is related to frequency and duty cycle. Because the inductor value and the current sense value can be made final according to the required duty cycle and frequency. It 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

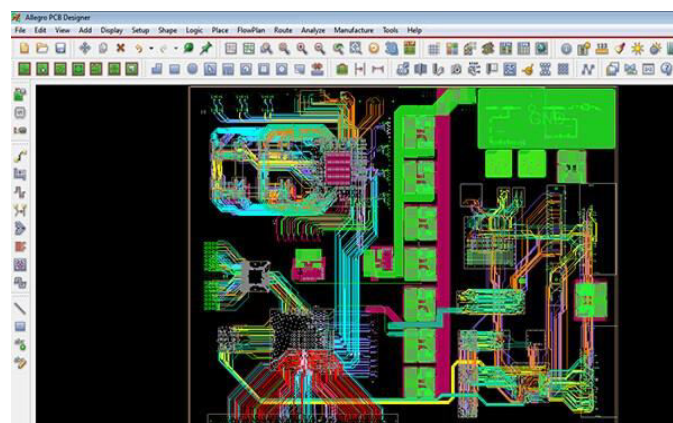


Figure 4.1: Cadence



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 a 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 use 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 a major role. 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).

V. COMPONENT SELECTION AND PERFORMANCES

As discussed, proper component selection is very important as per the electric specification to get the better efficiency. Power Bank or Portable Charger are specially made to provide the backup to other devices thus efficiency matters the most, because it is the only thing for which it has been made. The power bank with better efficiency can give incredible power, thus proper selection of component is a must. The most accuracy is needed in the selection of capacitors and inductor. Inductor plays a very important role in the Buck and Boost mode. The current specification of the inductor is so selected that it should not be lower than that of MOSFET current, also the inductor should not saturate at minimum voltage of the battery thus proper value and proper current is very important for the proper working of device. The tolerance level and the value of capacitor and the resistance are also very important to get the proper rated input and voltage. Protection and Salient Features Different protection features have become the need of the product as most of the expensive devices are connected to the portable chargers. Some of them listed below with detailed explanation, Over Voltage Protection, whenever the device is getting charged and if suddenly the voltage rises then this feature helps to protect the device by making the charging current negligible to zero. Short Circuit Protection, device may get damaged by any internal short circuit or if any external short-circuited device is connected to it, thus it is very much necessary that the power bank should have internal short circuit protection. Reset Protection, if the device is having integrated over voltage protection then normally whenever there is a 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.

VI. CONCLUSION

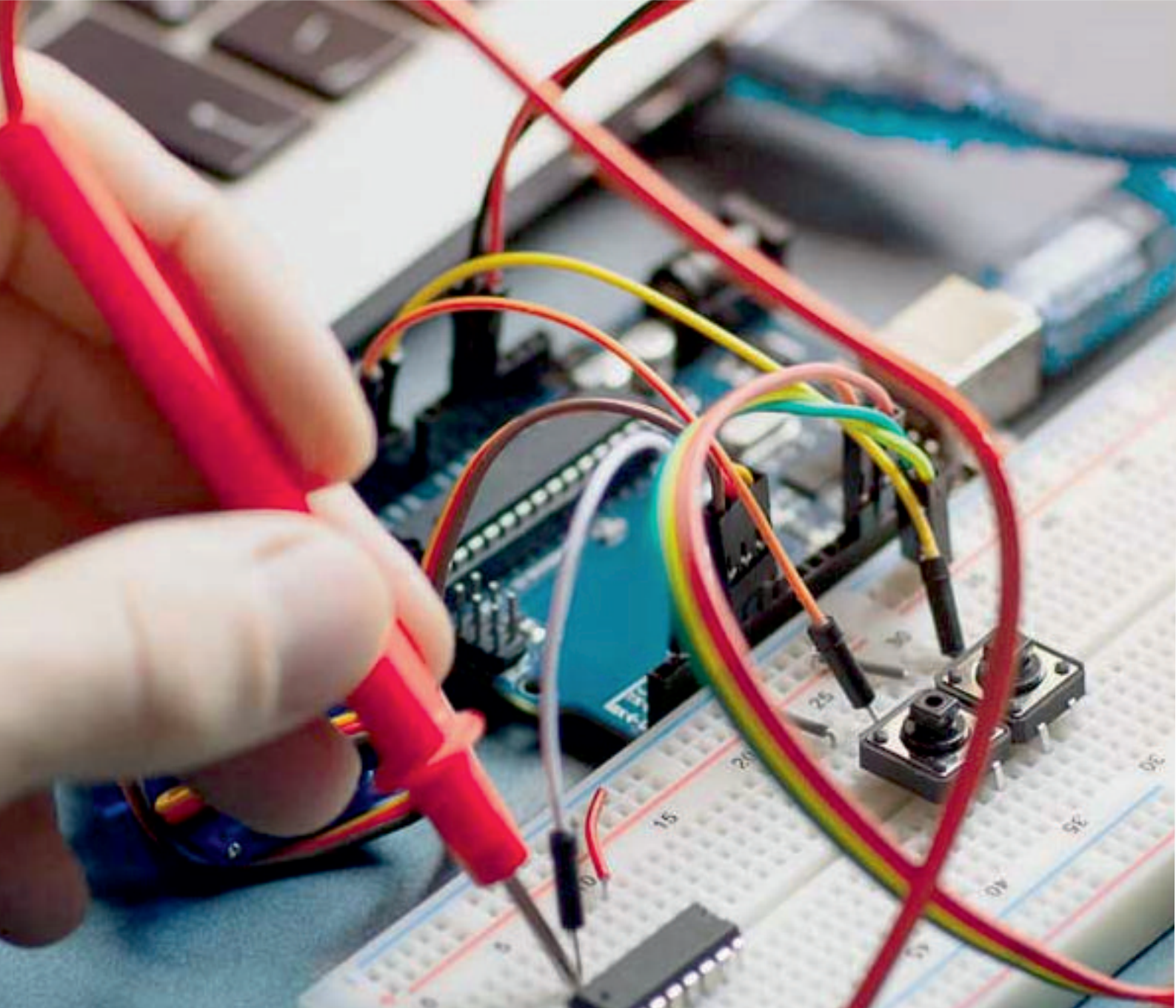
A battery influence set aside with series buck-support type BPMs has been proposed in this investigation to recognize charge balance, yield voltage rule, and variation to interior disappointment. With related buck-support



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

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