Li-Ion battery charger for Systems RF wireless

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RESUME : The design of a Li-Ion battery charger for System RF wireless is presented in this paper. The proposed chip can create a reversible three-stage linear Li-Ion battery charger and is designed with gpdk180 nm CMOS processes. The three-stage charger functions include trickle-current charging, large-current charging and constant-voltage charging. This technique can reduce the damage of Li-Ion battery. The proposed circuit can adjust the maximum charge current of 1A, the constant voltage is set to 4.2V. Input voltage of the proposed circuit is from 4.4V to 4.8V. The average efficiency of the proposed charger is about 80%. The charger can precisely provide Vout where range is from 2.2V to 4.2V. The chip area is 0.5×1mm^2.

Mots clés : Li-Ion charger, Multi-mode, LDO.

1 INTRODUCTION

With the variety of electronic devices are generally existed in our daily life, many kinds of charger in accordance with those electronic devices emerged. Most chargers only provide fixed voltage. Hence users need to purchase a variety of rechargeable battery with specification which reduces the convenience greatly. Besides, the size of the portable products gets smaller.

The technology of global universal charger battery has been approved, most systems RF wireless have to use integrated charger. Implementation of unified chargers can be said a good way to solve multiple problems, it can not only eliminate the threat of health to consumers, but also benefits to environmental protection and the development of industries. When the battery charger is designed with switching-mode power supply (SMPS) converters, the passive elements are too huge to put them into chip. Also, the battery chargers based on the switched capacitor(SC) topology have the same problem, so the circuitsize is not suitable for portable products. There are some previous works designed with the architecture of low drop out(LDO) voltage regulator[1]. Fig.1(a) is the architecture of traditional Li-Ion battery charger. The drawbacks of battery needs polarity of electric charging, this paper proposed a method to implement the problem. The architecture of the proposed Li-Ion battery charger shows in Fig.1(b). The charger solves the device characteristics problems.

Meanwhile, it also provides a reversible polarity charging mechanism. The proposed charger provides applications greatly and conveniently.

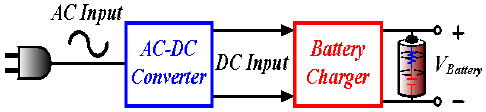

Fig. 1(a) Architecture of traditional Li-Ion battery charger.

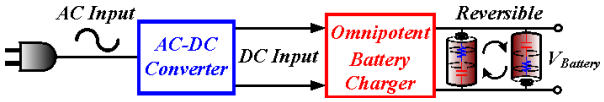

Fig.1(b) Architecture of the proposed Li-Ion battery charger.

In this paper, the system structure of the proposed circuit design is shown in Section II. Section III provides the simulation results to the performance and specification of the proposed charger. Finally, the conclusion is made in section IV.

2 CIRCUIT DESIGN

This paper can improve the [3], [4]. The structure of the proposed charger includes mode selector, current generating circuit, current sensing circuit, and automatic voltage detecting circuit. Function block diagram is showed in Fig. 2.

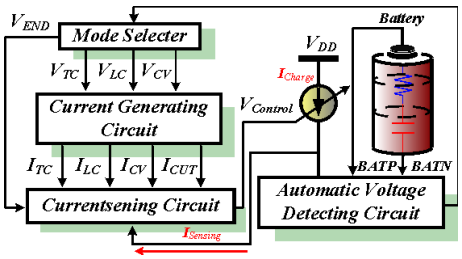

Fig. 2 Function block diagram of the proposed charge

3 SIMULATION RESULTS

The simulation results of the proposed charger using Cadence Spectre is shown in Fig.3.

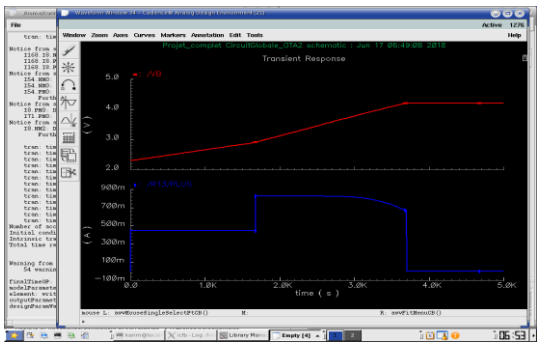

Fig. 3 Battery voltage and charging current.

Fig. 4 shows layout graph of the proposed charger, the layout area is 0.5mm*1mm (with PADs).

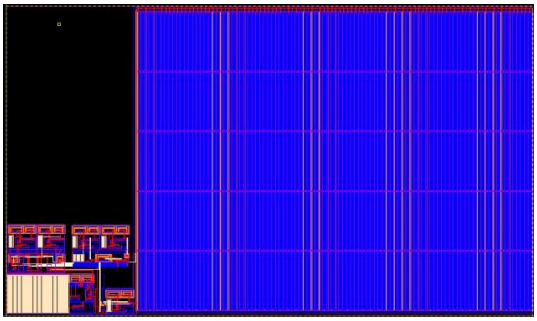

Fig. 4. Layout graph of the proposed charger.

4 CONCLUSION

A Li-Ion battery charger with multi-mode techniques is proposed in this paper. When charger charges battery, the proposed techniques solve battery polarity problems. Beside, utilizing variable current source to control three-stage charging mode is safe. The maximum efficiency of the proposed charger is about 80%. The charger can provide the output voltage from 2.2V to 4.2V precisely. The proposed charger provides applications greatly and conveniently.

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