Pico Projector (HH1C-08)

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Background and Project Overview
Projector is widely used in offices, schools and homes. The trends of large projected image size and small projector’s size have been highly focused in sale market. In this project, we are going to study and use a peripheral electronic system which could cooperate with portable projector, and optimize its power consumption in order to enhance the battery life time.
- Design a battery recharging circuit.
- Design a minimized power consumption Circuit.
- Design ON/OFF control by D Flip Flop.
- Design a low-battery detection circuit.
- Implement a ARM9 board and cooperate with M5 projector for providing multimedia support.

System Block Diagram

1. Power Board
- Contains low-voltage detecting circuit and rechargeable management circuit.
- Design switching circuit by P-MOSFET to select 5.7V and 5V. D Flip Flop control ON/OFF and combine new power board with original projector.
- Input voltage 5V and 3.7V. Output voltage : 15V, 3.3V, 2.5V, 1.8V and 5V.

2. M5 Projector
- Using microcontroller control the most of the functions in the M5 board.
- MAX1565 generates voltage outputs 15V, 3.3V, 1.8V, 5V. Video processor HX6671 receives VGA signals from ARM9 board to project Window CE 5.0 interface.
- Combine ARM9 board which simulates a window machine’s functions, such as multimedia, document, internet and voice meeting, etc.

3. ARM9 board
- Embedded system performs multimedia, document and Internet to perform web-surfing and communication.
- Building New Kernel by Platform Builder 5.0. Simple Visual C++ programming is needed for operating drivers and functions.
- Output VGA port and connect to M5 projector.

Achievements
1. Low-voltage detecting circuit and Flip Flop control
- Comparator LM331 compare the battery voltage with a reference (3.3V). Output 5V when battery is above 4.7V. Shut down the whole system if battery is below 3.3V for protection purpose.
- D Flip Flop controls projector ON/OFF.

2. Rechargeable management circuit
- Use battery for portable projector purpose. Use VA7206 for charging purpose. Input 5V for charging and LED is ON. Shut down charging when battery is full and LED is OFF. LED is FLASH when no battery is connected.

3. Power Optimizing and Improve Power Efficiency
- Using LM3408 and LM3475, external step up/down converter improve efficiency.
- No operation current when the projector is shut down.
- Increase LED power efficiency by using LTC3454.

4. Operating ARM9 board
- Rebuilt kernel and using platform builder. Simple C++ program is needed for software and drivers.
- Separated power source from M5 projector to provide stable operation current.

Conclusion
In final year project, both new power board, M5 projector, and ARM9 board were developed successfully. During the result and testing, the power efficiency is improved and the aim of our project are running successfully. LED driver in power board and ARM9 board still able to have further improvement.