Project : IPod 2-way Remote Control

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I. Operation Description of Remote Control

The remote control consists of the following parts:

1. MCU
2. Serial Flash
3. RF Module ZM2102
4. EEPROM
5. CSTN panel
6. LCD Backlight Driver
7. Keypad
8. Power Management

I.1 MCU

MCU is an 8-bit micro-controller with RISC architecture. It consists of 1 master/slave SPI interface, 1 USART, watchdog timer, 6 sleep modes, Interrupt and wake-up on pin change and 10-bit ADC. The clock source is a 7.3728 MHz crystal.

I.2 Serial Flash

It is an 8-Mbit serial flash memory interfaced with MCU SPI. It is used to store the font library of the songs, title bar and the logo of “PopAlive”.

I.3 RF Module ZM2102

The ZM2102 Z-Wave Module is a fully integrated RF communication module that uses the unlicensed Short-Range-Device (SRD) frequency band of 908.42 MHz in US. The Z-Wave Protocol is patented. USART of MCU is used to interface with ZM2102 for iPod commands and Z-wave commands communication.

I.4 EEPROM

The EEPROM provides 128k-bit memory SPI-interfaced with RF module ZM2102. It is used to store the Home ID of the Z-Wave network.

I.5 CSTN panel

The CSTN panel is interfaced with MCU by 8-bit MPU interface. The GPIOs of MCU simulates the MPU interface.

I.6 Backlight Driver

The LED driver is a step-up DC/DC converter designed to drive LEDs in series from a LI-Ion cell. An ON/OFF pin from MCU is used to control the shutdown of LED driver. The CSTN panel's LED anode/cathode are connected to the LED driver.

I.7 Keypad

The keypad consists of nine keys. They are all GPIO pins from MCU. The key detection mechanism is used interrupt and scanning method.

I.8 Power Management

The polymer Lithium Ion battery is stepped down to 2.8V by a positive voltage regulator. 2.8V is the operating voltage for the whole system. A battery level detection pin from MCU is connected to the battery and the ADC of the MCU is used to monitor the battery level. The battery of the RC is chargeable and cannot be replaced by user.

II. Operation Description of Docking

The docking consists of the following parts:

1. Power Management
2. RC Charging
3. RF Module ZM2102
4. Audio Amplifier
5. User Interface

II.1 Power Management

The power supply of the system is given by either the external speaker or the external charger, which are plugged into the 30-pin bottom connector of the docking. The input voltage will be down-converted to 5.0V which is in turn down-converted to 3.3V. 3.3V is used to supply for RF Z-Wave module and audio amplifier while 5.0V is used to supply the charging IC.

II.2 RC Charging

The docking is responsible for the remote control battery charging. The responsible charging IC operates standalone without interfacing with any other ICs. Whenever charging, both blue LEDs will be turned on. Whenever the charging is finished, both blue LEDs will be turned off.

II.3 RF Module ZM2102

The ZM2102 Z-Wave Module is a fully integrated RF communication module that uses the unlicensed Short-Range-Device (SRD) frequency band of 908.42 MHz in US. The Z-Wave Protocol is patented.
It communicates with iPod by UART interface while it communicates with audio amplifier by GPIO control pins.

II.4 Audio Amplifier

The audio amplifier is a dual power amplifier with digital volume control and shutdown mode. It is used for the feature of volume control to both the external speakers and line out. The volume control function is performed by two control pins provided by Z-Wave module. The shutdown mode is controlled by a GPIO pin from Z-Wave module.

II.5 User Interface

Ipod Connector – a 30-pin connector interfaced with iPod
Bottom Connector – a 30-pin connector interfaced with either external speaker or iPod charger or PC. The iPod charging is through this connector.
S-Video Connector– a 9-pin connector for 4-pin S-Video cable. It is used for playing video from iPod.
Audio Out Connector – for 3-pole audio cable
Slide Switch – for selection of either iPod original audio out signals or iPod original audio out signals amplified by internal amplifier.
Pair Button – for pairing with remote control

III. History

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Offical Release for FCC Requirement
Schematic Reference: iPod_Remote_p1 and iPod_CL_p2