Universal Interface Cube	University of Florida

TI Innovation Challenge 2014 Project Report

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Qty.	**List all TI analog IC or TI processor part number and URL**	**1) Explain where it was used in the project? 2) What specific features or performance made this component well-suited to the design?**
3	LMZ10500SHE	This switching regulator was used in three parts of the project (Cube, IR Re-broadcaster, and Remote). It was selected because of its high efficiency, small footprint, and low external component count. The efficiency and footprint were particularly important in the IR Re-broadcaster, as it is a small (1.41" square) board designed to run for long periods of time from a single coin cell battery. The low external component count minimized the opportunity for design errors, which was critical given the tight deadline the project was created under.
2	MSP430G2231IPW14R	This MSP430 was used in the "IR Re-broadcaster" portion of our project. It was chosen for its extremely low cost, low power consumption and powerful, but easy-to-use, development environment (CCS). Additionally it was chosen for the combination of SPI and timer modules, allowing us to both communicate with our radio module and generate IR waveforms with timed precision. This microprocessor was also used to generate the resonant signal in the inductive charger for the simple reason that it was cheaper to use and easier to obtain than a 100kHz oscillator.
3	BQ24075RGTT	This IC was used in three parts of the project (Cube, IR Re-broadcaster, and Remote). Early on in the design of our project, it because clear we would need some way to both charge batteries and power devices from USB power when they are plugged in. The BQ24075's power path management feature and customizable charging timer and current made this portion of the project trivial and allowed us to focus efforts on more challenging portions of the project.
1	MSP430G2413IPW20	This MSP430 was used in the "Cube" portion of our project. It was chosen for its extremely low cost, low power consumption and powerful, but easy-to-use, development environment (CCS).Additionally, it was chosen for the two SPI peripherals, which allowed us to both communicate with our radio module and RFID module.
1	MSP430F5529IPNR	This MSP430 was used in the "remote" portion of our project. It was chosen not only for its low power and low cost, but also for its large pin count, compatibility with the MSP430 graphics library, and large amount of flash memory. The three latter features were crucial in constructing a touch-screen LCD remote with full color graphics. The large pin count granted us a parallel connection to the LCD, which allowed us to update the screen quickly enough to be indiscernible to users.
1	TPS61165DBVR	This IC was used to drive the backlight of the "Remote" portion of the project. It was chosen due to its use in the MSP430 graphics library application example project. We were able to use the reference design and remove concerns about the design of the backlight circuitry.
1	TPS28225	This IC was used in the inductive charger in order to generate complementary MOSFET control signals. It was chosen particularly because of it's high current sink capability and automatic dead-time generation between control signals, which allowed us to avoid shorting our power rails together.

Submit your TI Innovation Challenge project to TI's Project repository. Your team is encouraged to post your project as early as possible- Your submission will be kept offline until the contest has officially closed!

Instructions:

- Project Name must be labelled “TI IC Design Contest North America: Project Name and School”
- Fill out project form (template is completely flexible) and include the following documents
    - The TI report template
    - Your full class report
    - Supplemental photos
    - A video of your partially or fully built out design. We’d love to see your team engaging with TI products!

The Universal Interface Cube is a device created to make even the most complex home entertainment system easy enough for a grandmother to use. When placed on top of certain devices, such as an Xbox 360 or a TV, the cube will not only power the device on, but it will also power on and configure any other necessary devices. The cube knows where it has been placed by reading RFID stickers attached to each device. Once the cube knows where it has been placed, the cube transmits a sequence of commands using 2.4GHz radio frequency (RF) communications to an infrared (IR) “node” which converts the RF commands to IR commands. For example, if the cube is placed on an Xbox 360, the cube will transmit the commands to the IR nodes which will turn the Xbox on, turn the TV on, turn the sound system on, set the TV to the correct input, and set the sound system to the correct input. Additionally, the system includes a touch screen remote which displays contextual buttons depending on the active device. In the previous example of the Xbox, the remote’s interface actually changes to resemble that of an Xbox controller.

Please submit your class report with this one page document. Your class report should include the following (Max of 30 pages, excluding appendix):

- Table of contents
- List of figures and tables
- A detailed written description of the project design
- Hardware Design
- Any Software Architecture used (include any software code as part of Appendix)
- Testing and Results / Conclusions
- Future Work / Recommendations
- Acknowledgements and/or References
- Appendix: schematics, CAD drawings, Critical IC Bill of Materials (Entrants may use Digikey Online BOM tool on www.Digikey.com), User Manual, etc.

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