Remote Controls Go Wireless RF

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New remote controls with RF4CE chips and software give IR remotes the boot.

About two years ago, the Radio Frequency for Consumer Electronics (RF4CE) Consortium joined with the ZigBee Alliance to create a wireless protocol specifically for consumer-electronic products. Manufacturers and consumers have tired of handheld infrared (IR) controls and the "code sheet" needed to configure them. You can expect to see more handheld two-way RF4CE remote controls included with TVs, CD players, security systems, and even overhead room fans. The RF4CE protocol also appeals to manufacturers of HVAC, security, and irrigation equipment, among others, that need non line-of-sight controls.

The ZigBee RF4CE devices -- their official name -- will adhere to a standard, so remote controls can operate many manufacturers' devices. The two-way communication capability means you'll get a "dashboard" to control home lights, door locks, heating and air-conditioning equipment, and even some appliances.

"You'll see new applications, too," said Volker Prueller, manager of low power RF marketing at Texas Instruments. "The special glasses used to watch 3-D TV need a communication link to synchronize the glasses with the images, and you can do that with RF4CE communications. You also can find RF4CE capabilities in our mobile-phone development platform, so people can use their phone as a remote control."

Devices that use RF4CE communications can eliminate expensive wiring, stressed Tim Dry, segment marketing manager at Renesas. "Say you have a large meeting room you can partition into smaller spaces. You can use RF4CE controllers instead of wiring lights to banks of switches. Then whoever occupies the room can easily use a wireless hand control to reconfigure and adjust the lights for their conference or meeting."

"Think of RF4CE as just a protocol stack that links your application with an IEEE 802.15.4 transceiver," said Prueller. "The stack builds on the 802.15.4 MAC and PHY, so you don't have to become a protocol expert or a wireless engineer to include RF4CE communications in a product design." The low-power transceiver chips or modules operate in the unlicensed 2.4-GHz band set aside by

communication agencies worldwide.

Fig 1. The CC2533 Basic RF4CE Development Kit from Texas Instruments provides the hardware and software needed to test an RF4CE connection and go on to develop an RF4CE prototype.

Texas Instruments has two transceiver, the CC2530 and the CC2533. The latter provides a lower-cost system on a chip specifically for remote controllers. "For each device we have development kits, software applications, the RF4CE stack, and a remote-control profile as well as a reference design," said Prueller. "The basic development kit comes with the remote control, a receiver target module, and a USB dongle for a PC, so you can start right away. You can download the free RemoTI RF4CE stack, TI’s implementation of the RF4CE-compliant software architecture."

Engineers have a choice of three new GreenPeak Technologies chips, the GP520 for set-top boxes, the GP530 for TVs, and the GP540 for general-purpose remote controls. The GP540 chip can drive an IR transmitter for compatibility with older equipment, and it includes keyboard-scanning capabilities. "All three ICs include serial ports, so designers can connect to almost any MCU they want," said Cees Links, GreenPeak's founder and CEO. "And these ICs can work together, so consumer devices can communicate with each other, point to point or point to multi-point." GreenPeak sells a complete development kit that comes with many software examples that put customers on a short path to implement RF4CE communications.

Renesas offers a series of integrated circuits to tackle RF4CE communications. The R8C/3MQ family provides ICs with an R8C CPU core and a 2.4-GHz IEEE 802.15.4 transceiver plus timers, counters, and I/O ports. "The R8C/3MQ devices come in 6 mm-by-6 mm packages, and we have optimized them for low-power battery applications like remote controls," explained Tim Dry of Renesas.

"The RF4CE stack needs about 50 kilobytes flash memory, and we run a small real-time operating system in that memory, too," continued Dry. "So if you choose a chip with, say, 64 kbytes of flash, you still have space for application code. If you need more memory, the R8C/3MQ offers up to 128 Kbytes of on-chip flash. The stack for the R8C/3MQ is free, as is its source code."

For more information:

Texas Instruments CC2533 Basic RF4CE Development Kit, CC2533DK-RF4CE-BA. http://focus.ti.com/docs/toolsw/folders/print/cc2533dk-rf4ce-ba.html [1].

GreenPeak Technologies GP520, GP530, and GP540, http://www.greenpeak.com/Product/Chips.html [2].

Renesas R8C/3MQ, http://am.renesas.com/products/mpumcu/r8c/r8c3x/r8c3mq/r8c3mq_root.jsp [3], and http://www.renesas.com/products/mpumcu/r8c/r8c3x/r8c3mq/child_folder/r8c3mq_spec_child.jsp [4].

Renesas uPD78F8056/57/58, http://www2.renesas.com/maps_frontend/mapsDScreen_en_internet.php?product=UPD78F8056 [5].

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[1] http://focus.ti.com/docs/toolsw/folders/print/cc2533dk-rf4ce-ba.html
[2] http://www.greenpeak.com/Product/Chips.html
[3] http://am.renesas.com/products/mpumcu/r8c/r8c3x/r8c3mq/r8c3mq_root.jsp
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[5] http://www2.renesas.com/maps_frontend/mapsDScreen_en_internet.php?product=UPD78F8056