# 16-bit RF Microcontroller for RF4CE

uPD78F8056/57/58

RF4CE (Radio Frequency for Consumer Electronics) is a radio network protocol specification, constructed on the IEEE802.15.4 MAC/PHY layer. RF4CE enables remote controllers omnidirectional, bi-directional, and secured connections, which will offer additional values in consumer electronics. The uPD78F8056/57/58 microcontroller is a 16-bit microcontroller offered to meet the RF4CE requirements by integrating the low power IEEE802.15.4 compliant radio transceiver, the 1.8V programmable/erasable Flash EEPROM, and ultra low power 78K0R-L CPU core in a QFN 56pin package. RF4CE SDK (Software Development Kit) with RF4CE library, AT commands, and 3ch Real-time Sniffer, and the TK-RF8058+SB evaluation kit are offered for quick start-up of development of consumer electronics.

■ Features

✓ **Low power of 19mA during reception and 21mA during transmission**
✓ **Flash programming, erasing, and EEPROM emulation at 1.8V**
✓ **RF4CE library and AT commands are ready**
✓ **The 3ch Real-time Sniffer/Sniffer Viewer is available**

●**Block Diagram of uPD78F8056/57/58**

●**Evaluation Module MB-RF8058**
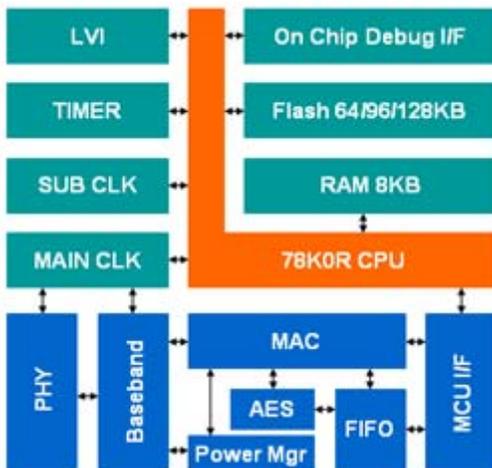
●**RF4CE SDK**
➢ RF4CE library
➢ AT command

➢ 3ch Real-time Sniffer captures packets at 2425, 2450, and 2475 MHz simultaneously, analyzes them in the main window, and displays the network configuration. It also supports decoding of an encrypted payload.

●**Evaluation Kit TK-RF8058+SB**
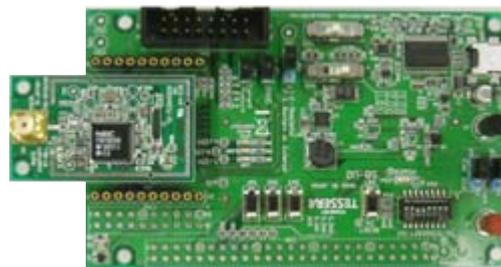
The support board offers battery sockets, USB I/F, MINICUBE2 Emulator I/F, consumed current measurement terminals of the module. An executable file of the RF4CE stack, a free compiler, a Flash writer and a free debugger are included in the kit.
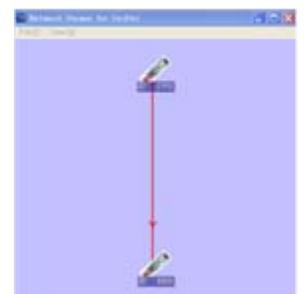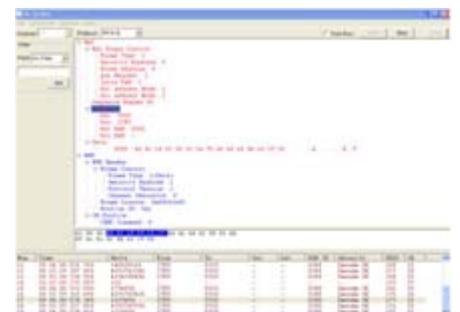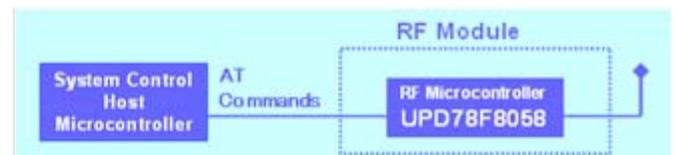
➢**Sniffer Viewer** displays the network configuration based on the info collected by the Sniffer.

■ Specifications

<table>
<tr><td rowspan="12">uPD78F8056
uPD78F8057
uPD78F8058

Renesas
Electronics
Corporation</td><td>CPU</td><td colspan="3">78K0R-L core, Max CPU clock: 20MHz, Recommended 4MHz for RF4CE</td></tr>
<tr><td>Flash</td><td colspan="3">64KB/96KB/128KB, Programming, erasing, and reading at 1.8V – 3.6V</td></tr>
<tr><td>RAM</td><td colspan="3">8KB, 1KB is occupied by EEPROM emulation</td></tr>
<tr><td>RF transceiver</td><td colspan="3">Offset-QPSK, 250K/1M/2Mbps, 2405～2480MHz 16ch
Sensitivity -95dBmTYP, EVM 12%TYP</td></tr>
<tr><td>Clocks</td><td colspan="3">Main clock: 32MHz crystal
Main clock can be divided to 2/4/8/16MHz for CPU clock, or
On-chip oscillator of 1/8/20MHz is available for CPU
32.768kHz sub-clock is available for Real Time Counter
On–chip oscillator specialized for Watch Dog Timer
100kHz on-chip oscillator for stand-by</td></tr>
<tr><td>Cryptography</td><td colspan="3">AES 128-bit hardware crypto engine</td></tr>
<tr><td>Peripherals</td><td colspan="3">16bit timer x 12, CSI(SPI)/UART/Simple I2C x 1, UART x 1, External INT x 3</td></tr>
<tr><td>Operating Voltage</td><td colspan="3">1.8V - 3.6V, -40 - +85C, with LVI and POC</td></tr>
<tr><td>Package</td><td colspan="3">Quad Flat Non-leaded (QFN) 56pin, 8mm x 8mm, 0.5mm pin pitch</td></tr>
<tr><td>Consumed Current</td><td colspan="3">19mA during reception, 21mA during transmission including CPU,
Stop current: 0.5uA, Standby Current: 1.1uA during 32.768kHz sub-clock,
Standby current: 4.0uA during 100kHz on-chip oscillation</td></tr>
<tr><td rowspan="6">RF4CE SDK
for 78K0R

Skyley
Networks
Inc.</td><td>RF4CE Library</td><td colspan="3">Stacks of CERC profile and NWK/MAC/PHY layers</td></tr>
<tr><td>AT
Command</td><td colspan="3">ATINFO, ATSCAN, ATEDSCAN, ATAUTOANS, ATSTART, ATPAIR, ATUNPAIR,
ATRESET, ATWAKE, ATSLEEP, ATSETPS, ATTXDATA, ATSREG</td></tr>
<tr><td rowspan="4">3 channel
Real-time
Sniffer</td><td colspan="3">Captures packets on three designated RF channels simultaneously and analyzes the packets. Requires 3 78K0R UD Sticks</td></tr>
<tr><td>Text Display</td><td colspan="2">Filtering by types of frames and commands, sorting by time stamp and destination addresses. Import and export of log files</td></tr>
<tr><td>Sniffer Viewer</td><td colspan="2">Graphical display of the network configuration</td></tr>
<tr><td>Crypto key setting</td><td colspan="2">Decoding of encrypted payload automatically and displays it</td></tr>
<tr><td rowspan="3">TK-RF8058+SB
Evaluation Kit

Tessera
Technology Inc.</td><td>Evaluation Module</td><td colspan="3">MB-RF8058 module with uPD78F8058</td></tr>
<tr><td>Support board</td><td colspan="3">On-chip debug and Flash programming/erasing via USB
On-chip debug and Flash programming/erasing via MINICUBE2
Power source: One dry battery, two dry batteries, USB power, or external voltage source. Measurement terminal of consumed current in the module</td></tr>
<tr><td>Software bundled
in the kit</td><td colspan="3">Packet error rate test, Quasi-modulated transmission, Non-modulated carrier transmission, An execution file of the RF4CE stack with AT commands, Free compiler, debugger, and project manager</td></tr>
</table>

[How to purchase] Available through the sales channel of Renesas Electronics
[Vendor Web sites]
Skyley Networks Inc.: www.skyley.com
Tessera Technology Inc.: www.tessera.co.jp
Renesas Electronics Corporation: www2.renesas.com/micro/en/technology/zigbee/index.html