RFID Reader Solutions
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IoT is coming

**IoT**
- is the ecosystem of technologies monitoring the status of physical objects, capturing meaningful data
- and communicating that information through IP networks to software applications.

**RFID**
- is enabling technology for the IoT
- connects the Internet to the real world
- makes items smart and able to communicate with their environment
- is a framework for a wide range of applications.

And we, PHYCHIPS, supply the key technology of IoT such as RFID Reader Chip, Module, Antenna.

**PHYCHIPS FACT SHEET**

<table>
<thead>
<tr>
<th>Foundation</th>
<th>Founded in 2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO</td>
<td>Jinho Ko / Ph.D</td>
</tr>
<tr>
<td>Location</td>
<td>Daejeon, Korea</td>
</tr>
<tr>
<td>Business Area</td>
<td>RFID Reader Solutions</td>
</tr>
<tr>
<td>Product Lineup</td>
<td>RFID Reader Chip</td>
</tr>
<tr>
<td></td>
<td>RFID Reader Module</td>
</tr>
<tr>
<td></td>
<td>RFID Reader Antenna</td>
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</table>
SoC solution for UHF RFID reader.
Integrated UHF RF, baseband MODEM, ARM Cortex™-M0 Processor, memory (64kB FLASH & 16KB SRAM) etc.

Key Features
- Optimized for FMCG (Fast Moving Consumer Goods)
- Internal high efficiency PA
- Power consumption: 170mA @ +20dBm
- 32bit low-power high performance ARM Cortex M0
- 64kB embedded flash memory
- 16kB on-chip SRAM
Specifications

**Highly integrated UHF RFID Reader SoC**

- Fully integrated SoC includes RF, MODEM, MCU, PA and Memory
- Fully support ISO18000-6C & EPC global Gen2 protocol
- ISO29173-1 RCP support
- Power consumption: 170mA @ +20dBm
- 3.3V single supply voltage
- 64pin 6mm x 6mm FBGA package

**RF Transceiver**

- Frequency range: 840MHz – 960MHz
- Direct conversion architecture
- Highly linear down conversion mixer
- Automatic gain control
- DC offset cancellation
- Tx polar structure without up-conversion mixer
- Internal high efficiency PA

**Modem**

- Decoding: FM0, M2, M4, M8
- Data rate: 40kHz, 80kHz, 160kHz, 320kHz, 640kHz
- Tx waveform generation using Lookup table

**MCU**

- 32-bit low-power high performance ARM Cortex-M0
- 64kB embedded flash memory
- 16kB on-chip SRAM
- 16 GPIOs
- Two UARTs
- I2C master/slave
- SPI master/slave
- Two timers
- In-System Programming

![RFID Reader Solutions Diagram](image-url)

**Key Features**

- Real-time automatic Tx leakage cancellation offers optimal matching & sensitivity
- Superior multi-tag reading
- No antenna matching required
- Built-in multi protocol S/W
- Free API
- User friendly developer kit
- Small & Cost-Effective
- EPC Gen2 V2
- Secure tag / Sensor tag
- IoT application ready
- Support global RFID band
Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>RED4</th>
<th>RED5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reader Chipset</td>
<td>PR9200</td>
<td></td>
</tr>
<tr>
<td>Air Protocol</td>
<td>ISO 18000-63(6C)/EPC Gen2</td>
<td></td>
</tr>
<tr>
<td>Channel Share</td>
<td>Frequency Hopping or LBT (Listen-Before-Talk)</td>
<td></td>
</tr>
<tr>
<td>Modulation</td>
<td>DSB-ASK</td>
<td></td>
</tr>
<tr>
<td>Encoding</td>
<td>Miller 2, 4, 8 and FM0 (default), I2C</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>UART (default), I2C, SPI</td>
<td>UART (default), I2C</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>3.3V (DC±5%)</td>
<td>3.6V (DC±5%)</td>
</tr>
<tr>
<td>Output Power</td>
<td>25dBm typ. (Adjustable by 1dB step)</td>
<td>30dBm typ. (Adjustable by 1dB step)</td>
</tr>
<tr>
<td>Dynamic Range</td>
<td>8dB typ.</td>
<td>30dB typ.</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>450mA @ 25dBm CW 20mA @ idle mode &gt; 10mA @ power down mode</td>
<td>1.3A @ 30dBm CW 20mA @ idle mode</td>
</tr>
<tr>
<td>Leakage Cancellation</td>
<td>Available</td>
<td>Available</td>
</tr>
<tr>
<td>Size (W x L x H)</td>
<td>24 x 24 x 3mm</td>
<td>24 x 24 x 3mm</td>
</tr>
<tr>
<td>Weight</td>
<td>3g</td>
<td>3g</td>
</tr>
</tbody>
</table>

Read range by antenna

<table>
<thead>
<tr>
<th>Antenna Gain</th>
<th>Module Read Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>RED4 (Output Power: 25dBm)</td>
<td>RED5 (Output Power: 30dBm)</td>
</tr>
<tr>
<td>-1.0 dBiC</td>
<td>2.0m</td>
</tr>
<tr>
<td>0.0 dBiC</td>
<td>2.2m</td>
</tr>
<tr>
<td>2.5 dBiC</td>
<td>3.0m</td>
</tr>
<tr>
<td>3.5 dBiC</td>
<td>3.5m</td>
</tr>
<tr>
<td>6.0 dBiC</td>
<td>4.5m</td>
</tr>
</tbody>
</table>

# Note: Reader Sens = -62dBm, Tag Sens = -17dBm
QUBE series
RFID Reader Antenna

Key Features
- Square Quadrifilar Spiral Technology
- Wide Beamwidth, Wide Bandwidth
- Low Weight, Compact Size
- Low Return Loss
- Extremely Low Frequency Shift by Platform & User Environment
- RoHS Compliant

Standard Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Size (mm) (W x L x H)</th>
<th>Gain (dBic)</th>
<th>BW (MHz) (-3dB@Peak Gain)</th>
<th>Axial Ratio</th>
<th>Pol.</th>
<th>Weight (g)</th>
<th>Center Freq. (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUBE 4010</td>
<td>40 x 40 x 10</td>
<td>0</td>
<td>16</td>
<td>1.3</td>
<td>RHCP</td>
<td>6.5</td>
<td>866, 921</td>
</tr>
<tr>
<td>QUBE 6010</td>
<td>60 x 60 x 10</td>
<td>2.5</td>
<td>30</td>
<td>24</td>
<td>RHCP</td>
<td>13</td>
<td>866, 921</td>
</tr>
<tr>
<td>QUBE 6015</td>
<td>60 x 60 x 15</td>
<td>3.5</td>
<td>35</td>
<td>2.5</td>
<td>RHCP</td>
<td>14</td>
<td>866, 921</td>
</tr>
</tbody>
</table>
QUBE series
RFID Reader Antenna

Key Features
- Flat Patch Antenna
- Rectangular Micro-strip Antenna
- Small Form Factor
- Low Return Loss
- Uniform Dielectric Constant
- Offset Single-point Feeding Method
- Operating Temperature: -40 – 80°C

Standard Products

<table>
<thead>
<tr>
<th>Product</th>
<th>Size (mm)</th>
<th>Gain (dBic)</th>
<th>BW (MHz)</th>
<th>Pol.</th>
<th>Weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KSA-ST921MS25</td>
<td>25 x 25 x 04</td>
<td>0</td>
<td>3</td>
<td>RHCP</td>
<td>4</td>
</tr>
</tbody>
</table>
- Easy to test and get familiar with RED series.
- User manual, Applications Notes, Datasheets will be provided.
- Intensive technical support will be provided by highly experienced RFID engineers.
Tx Leakage RSSI Plot

Read Range Calculator

Protocol Script Editor
RFID: BEST WAY TO REALIZE THE IOT WORLD

- RFID is enabling technology for the IoT
- RFID connects the Internet to the real world
- RFID makes items to communicate with their environment
- RFID is a framework for a wide range of applications.

Realize your IoT world by RFID
RFID: BEST WAY TO AUTHENTICATE YOUR PRODUCT

Easy to Authenticate
- Anybody
- Anywhere
- Anytime

Protect your product from all kind of Counterfeiting
RFID: BEST WAY TO MANAGE YOUR SHOP

Easy to monitor
- Product information
- Price
- Inventory
- Theft etc

Give the best service to your customer
RFID: BEST WAY TO MONITOR YOUR FACTORY

Easy to monitor
- Production Line
- Warehouse
- Logistics etc

Monitoring your product from production to logistics