

## Mercury6e UHF RFID Module Family Performance, Efficiency and Flexibility

As companies start to build RFID solutions into a variety of different applications, they often discover that building a customized reader is the best way to fulfill their specific use case. And the best way to build a reader is by using RFID modules. While companies may be tempted to start at the chip level, using a module can offer benefits such as lower costs due to less development time, fast integration into a solution resulting in quicker time-to-market and complete certification for global use. Additionally, the use of modules can offer predictable and stable performance to ensure a successful RFID deployment.

ThingMagic, a JADAK brand, offers a series of embedded UHF RFID modules to drive innovation and increase productivity for a variety of applications. Hundreds of companies have designed ThingMagic embedded RFID modules into their solutions. A wide range of performance and form factors allows companies to meet their individual needs. By using ThingMagic modules, organizations benefit from the expertise of the engineers who have designed modules for years. In addition, ThingMagic's modules use a universal API that allows customers to write the software once and use it for multiple applications with different modules within the family.

It's this flexible solution – a universal API coupled with reliable, accurate modules – that makes ThingMagic the perfect solution for developing RFID applications for any use case, in any industry.

### Mercury®6e Series High Performance Multi-Protocol Embedded UHF RFID Modules



#### M6e

The 4-port M6e will meet or exceed the performance requirements of the most demanding fixed position multi-antenna reader applications, delivering the highest read rate and RF power. The M6e will transmit up to +31.5 dBm and can read more than 750 tags/second. This performance makes M6e the ideal RFID engine for challenging applications like race timing, portals with long cable runs and conveyors requiring multiple antennas. The M6e has both serial and USB interfaces to support both board-to-board and board-to-host connectivity.



#### Micro and Micro-LTE

The 2-port Micro and Micro-LTE deliver the form factor, efficiency, RF power and flexibility needed to embed UHF RFID in your best-in-class portable and hand held applications. The Micro reads 750 tags/second and the Micro-LTE is optimized for applications with small populations and reads 50 tags/second. The low power consumption of both modules fits battery operated applications and wider RF output range (-5 dBm to +30 dBm) is a key requirement for RFID enabled printers, tag commissioning stations and point of sales readers. Edge connections allow the Micro and Micro-LTE to be soldered directly to a motherboard as a standard component. The on-board connectors allow the module to be mated to a motherboard.



#### ThingMagic Nano

ThingMagic Nano delivers the smallest form factor for a Mercury Series embedded UHF RFID module with very low power consumption and is ideal for battery operated, low cost, small form-factor portable readers. ThingMagic Nano's wide RF output range (0 dBm to +27 dBm) is important for the read/write requirements for RFID-enabled printers and tag commissioning stations. It features a surface mount package designed for the efficiency of SMT manufacturing, driving down the total cost for embedding RFID in volume applications, including consumables authentication and device configuration.

## TECHNICAL SPECIFICATIONS

| FEATURES SUMMARY            | MERCURY6E SERIES                                                                                                                                                                                                              |                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                          |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | M6e                                                                                                                                                                                                                           | Micro & Micro-LTE                                                                                                                                                                                                                 | ThingMagic Nano                                                                                                                                                                                                                          |
| Dimensions                  | 69 mm L x 43 mm W x 7.5 mm H<br>(2.7 in L by 1.7 in W by 0.3 in H)                                                                                                                                                            | 46 mm L x 26 mm W x 4.0 mm H<br>(1.8 in L x 1.0 in W x 0.16 in H)                                                                                                                                                                 | 22 mm L x 26 mm W x 3.0 mm H<br>(0.866 in L x 1.024 in W x 0.118 in H)                                                                                                                                                                   |
| RFID Protocol Support       | EPCglobal Gen 2 (ISO 18000-6C) with DRM; ISO 18000-6B and IP-X optional;<br>EPCglobal G2V2 (ISO 18000-63) pending market availability                                                                                         |                                                                                                                                                                                                                                   | EPCglobal Gen 2 (ISO 18000-6C);<br>EPCglobal G2V2 (ISO 18000-63)<br>pending market availability                                                                                                                                          |
| Antenna Connector           | Four 50 Ohm MMCX connectors supporting four monostatic antennas                                                                                                                                                               | Two 50 Ohm connections (board-edge or U.FL) supporting two monostatic antennas                                                                                                                                                    | Single 50 Ohm connection (board-edge) supporting a monostatic antenna                                                                                                                                                                    |
| RF Power Output             | Separate read and write levels, command adjustable from +5 dBm to +31.5 dBm (1.4W) with +/-0.5 dBm accuracy above +15 dBm <sup>1</sup>                                                                                        | Separate read and write levels, commanded adjustable from -5 dBm to +30 dBm (1W) in 0.5 dB steps, accurate to +/- 1 dBm <sup>2</sup>                                                                                              | Separate read and write levels, command adjustable from 0 dBm to +27 dBm (500mW) in 0.01 dB steps                                                                                                                                        |
| Regulatory                  | Pre-configured and screened for the following regions:<br><br>FCC (NA, SA),<br>ETSI (EU),<br>TRAI (India),<br>KCC (Korea),<br>ACMA (Australia),<br>SRRC-MII (P.R.China),<br>'Open' (Customizable) 865-869 MHz and 902-928 MHz | Pre-configured for the following regions:<br><br>FCC (NA, SA),<br>ETSI (EU),<br>TRAI (India),<br>KCC (Korea),<br>ACMA (Australia),<br>SRRC-MII (P.R. China),<br>MIC (Japan),<br>'Open' (Customizable) 865-868 MHz and 902-928 MHz | Pre-configured for the following regions:<br><br>FCC (NA, SA),<br>ETSI (EU),<br>TRAI (India),<br>KCC (Korea) MHz,<br>ACMA (Australia) MHz,<br>SRRC-MII (P.R.China),<br>MIC (Japan),<br>'Open' (Customizable) 865-870 MHz and 915-928 MHz |
| Physical                    | 15-pin low-profile connector providing DC power, communication, control and GPIO signals                                                                                                                                      | 28 board-edge connections or 20-pin Molex low profile connector (53748-0208) providing access to RF, DC power, communication, control and GPIO signals                                                                            | 41 board-edge connections providing access to RF, DC power, communication, control and GPIO signals                                                                                                                                      |
| Data Interfaces             | UART with 3.3/5V logic levels from 9.6 to 921.6 kbps; USB 2.0 full speed device port (up to 12 Mbps)                                                                                                                          | UART with 3.3/5V logic levels from 9.6 to 921.6 kbps; USB 2.0 full speed device port (up to 12 Mbps)                                                                                                                              | UART; 3.3V logic levels; 9.6 to 921.6 kbps                                                                                                                                                                                               |
| Control Interfaces          | Shutdown Control and Reset Indicator                                                                                                                                                                                          |                                                                                                                                                                                                                                   | Shutdown Control                                                                                                                                                                                                                         |
| GPIO Sensors and Indicators | Four 3.3V bidirectional ports configurable as input (sensor) ports or output (indicator) ports                                                                                                                                | Two 3.3V bidirectional ports configurable as input (sensor) ports or output (indicator) ports                                                                                                                                     | Four 3.3V bidirectional ports configurable as input (sensor) ports or output (indicator) ports                                                                                                                                           |
| API Support                 | C#/.NET, Java, C                                                                                                                                                                                                              | C#/.NET, Java, C                                                                                                                                                                                                                  | C#/.NET, Java, C                                                                                                                                                                                                                         |
| DC Power Required           | DC Voltage: 5.0 V +/- 5%<br><br>DC power consumption when reading:<br>6.7 W @ +31.5 dBm<br>4.2 W @ power levels under +17 dBm                                                                                                 | DC Voltage: 3.5 to 5.25 V <sup>3</sup><br><br>DC power consumption when reading:<br>5.5 W @ +30 dBm<br>3.5 W @ +27 dBm<br>2.5 W @ +23 dBm<br>2.0 W @ 0 dBm                                                                        | DC Voltage:<br>3.3 to 5.25 V for +25 dBm out<br>3.7 to 5.25 V for +27 dBm out<br><br>DC power consumption when reading:<br>3.7 W @ 5 VDC for +27 dBm out<br>3.2 W @ 5 VDC for +25 dBm out<br>1.6 W @ 5 VDC for 0 dBm out                 |

## TECHNICAL SPECIFICATIONS

| FEATURES SUMMARY                  | MERCURY6E SERIES                                                                                |                                                                                            |                                                      |
|-----------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------|
|                                   | M6e                                                                                             | Micro & Micro-LTE                                                                          | ThingMagic Nano                                      |
| Idle Power Consumption:           | 0.25 W                                                                                          | 0.32 W                                                                                     | 0.84 W                                               |
| Standby:                          | 0.12 W                                                                                          | 0.06 W                                                                                     | 0.04 W                                               |
| Sleep:                            | 0.005 W                                                                                         | 0.008 W                                                                                    | 0.02 W                                               |
| Shutdown:                         | 0.00025 W                                                                                       | 0.00025 W                                                                                  | 0.00025 W                                            |
| Certification                     | FCC 47 CFR Ch. 1 Part 15 Industrie Canada RSS-21 0 ETSI EN 302 208 v1.4.1                       |                                                                                            |                                                      |
| Operating Temp (case temperature) | -40C to +60C                                                                                    | -20C to +60C                                                                               | -20C to +70C                                         |
| Storage Temp.                     | -40C to +85C                                                                                    | -40C to +85C                                                                               | -40C to +85C                                         |
| Shock and Vibration               | Designed to be installed in host devices which are required to survive 5-foot drops to concrete | Survives 1 meter drop during handling                                                      | Survives 1 meter drop during handling                |
| Max Read Rate                     | Up to 750 tags/second using high-performance settings                                           | Micro: Up to 750 tags/second using high-performance settings<br>Micro-LTE : 50 tags/second | Up to 200 tags/second                                |
| Max Tag Read Distance             | Over 30 feet (9 m) with 6 dBiL antenna (36 dBm EIRP)                                            | Over 30 feet (9 m) with 6 dBiL antenna (36 dBm EIRP)                                       | Over 10 feet (3 m) with 6 dBiL antenna (33 dBm EIRP) |

<sup>1</sup>Maximum power may have to be reduced to meet regulatory limits, which specify the combined effect of the module, antenna, cable, and enclosure shielding of the integrated product. Adequate heat sinking required to run continuously at maximum power. <sup>2</sup>Duty cycle restrictions, based on temperature, apply at power levels above +23 dBm. <sup>3</sup>Will operate below +3.5 V with reduced input line noise immunity. Specifications subject to change without notice.

## ORDERING INFORMATION

| Mercury6e Series Embedded RFID Readers                                                  | SKU              |
|-----------------------------------------------------------------------------------------|------------------|
| M6e - Embedded (+30 dBm in North America, +31.5 dBm in Europe)                          | M6E              |
| M6e-A - Embedded (+31.5 dBm in all regions, requires contract)                          | M6E-A            |
| M6e-JIC - Embedded (PRC high and low bands)                                             | M6E-JIC          |
| Micro (M6E-M) - North/South America, EU, IN, KR, PRC                                    | M6E-M            |
| Micro-LTE (M6E-MICRO) - North/South America, EU, IN, KR, PRC                            | M6E-MICRO        |
| M6e license for optional IPX and ISO 18K-6B protocols (Gen2 standard)                   | M6E-LIC-2F       |
| Micro (M6E-M) license for optional IPX and ISO 18K-6B protocols (Gen2 standard)         | M6E-M-LIC-2F     |
| Micro-LTE (M6E-MICRO) license for optional IPX and ISO 18k-6B protocols (Gen2 standard) | M6E-MICRO-LIC-2F |
| ThingMagic Nano - North/South America, EU, IN, KR, PRC                                  | M6E-NANO         |
| Mercury6e Series Embedded RFID Reader Development Kits                                  | SKU              |
| M6e Development Kit (North/South America, EU, IN, KR)                                   | M6E-DEVKIT       |
| Micro (M6E-M) - Development Kit (North/South America, EU, IN, KR, PRC)                  | M6E-M-DEVKIT     |
| Micro-LTE (M6E-MICRO) - Development Kit (North/South America, EU, IN, KR, PRC)          | M6E-MICRO-DEVKIT |
| ThingMagic Nano Development Kit (North/South America, EU, IN, KR, PRC)                  | M6E-NANO-DEVKIT  |



## MAKING RFID EASY TO USE

ThingMagic is dedicated to driving the barriers to deploying RFID technology as low as possible. We design our products to be easy to use out-of-the box and to deliver predictable, reliable and repeatable performance. Our development tools require little RFID expertise, enabling you to rapidly design, test and deploy your RFID solutions.

### Developers Kit

Everything needed to read and write RFID tags and begin developing RFID-enabled applications:

- Test chassis
- Cables
- Antenna
- Sample Tags
- Full schematics to help you design your own complementary components

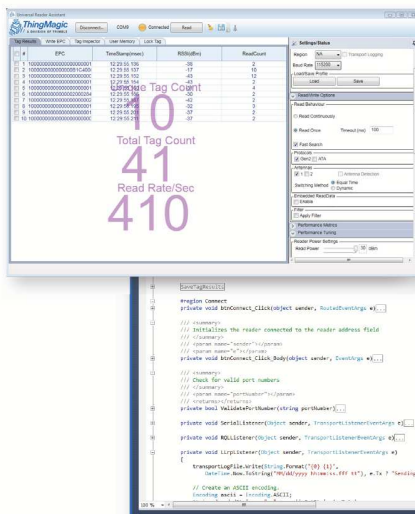
### Mercury xPRESS Sensor Hub

An extensible, compliance-ready solution development platform that enables companies to rapidly create cost-effective finished reader devices.



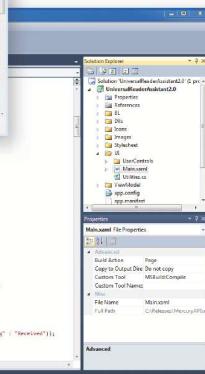
### Mercury API

A common development platform, supporting an extensive variety of hardware to connect, configure and control ThingMagic readers.



### Universal Reader Assistant

A utility for advanced demo, testing and tuning of all ThingMagic readers. Reduces complexity for novice users while permitting low-level control for advanced developers.



atlasRFIDstore.com  
 1.888.238.1155 • Inside USA  
 1.205.383.2244 • Outside USA  
 info@atlasRFIDstore.com • www.atlasRFIDstore.com



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