Richardson RFPD, an Arrow Electronics company, is an electronic component distributor focused on the RF and wireless communications, IoT, power conversion and renewable energy markets.

- 70+ years of expertise in RF & Wireless connectivity
- World-class logistics and supply chain capabilities
- Global team of over 200 design, application and sales engineers
- 30+ worldwide locations

Richardson RFPD, an Arrow Company, is headquartered in Geneva, Illinois with offices around the world. We leverage the Arrow “From Sensor to Sunset” capabilities to deliver an end-to-end IoT solution.
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- IoT Line Card: Integrated Solutions
- IoT Line Card: Electronic Components

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- Richardson RFPD Engineering Support
- IoT Connectivity Services
- Bundled Connectivity Solutions
- Components & IC Evaluation Tools
- Module Evaluation Tools
- Prototyping: Module Integration
- Open Source Platforms

Richardson RFPD can tailor the right end-to-end solution for our customers’ IoT or M2M applications, starting with modules, gateways and components for applications such as:

- Cellular
- Wi-Fi
- ISM Proprietary
- GNSS
- Bluetooth

**IoT: SENSE ➔ MEASURE ➔ INTERPRET ➔ CONNECT ➔ ANALYZE**
COMMUNICATION SYSTEMS CATEGORIES

Licensed bands—long-range
- Cellular, public networks from carriers (MNO)
- Standards-based LPWA such as LTE CAT-M1, NB-IoT, EC-GSM

Unlicensed spectrum deployments—short-range
- Public commercial and private networks
- Standard wireless WPAN such as ZigBee, Wi-Fi, BT

Unlicensed spectrum deployments—long-range
- Public commercial and private networks
- Proprietary LPWA: Sigfox, LoRa, Ingenu

---

Richardson RFPD is a member of the LoRa Alliance.
LPWA: AN ATTRACTIVE NEW SEGMENT FOR CELLULAR COMMUNICATIONS

LPWA ("low-power wide-area") is also known as "Mobile IoT" and "Cellular IoT."

LPWA: THE FOUR “Cs”

**COST**
More than 50% reduction compared to broadband LTE. Think 2G or Bluetooth.

**COVERAGE**
5–10x greater compared to broadband LTE

**CURRENT**
More than 75x lower power than broadband LTE. 10+ years battery life.

**CAPACITY**
Supports over 1 million connected devices per square kilometer.

<table>
<thead>
<tr>
<th>LPWA</th>
<th>CELLULAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>2G, 3G, 4G</td>
<td>2G, 3G, 4G</td>
</tr>
<tr>
<td>Data Rate (speed)</td>
<td>High</td>
</tr>
<tr>
<td>Cost (+complexity)</td>
<td>Low</td>
</tr>
<tr>
<td>Power (consumption)</td>
<td>Low</td>
</tr>
<tr>
<td>Range (+penetration)</td>
<td>Very Long</td>
</tr>
<tr>
<td>Install (i.e., pairing)</td>
<td>Easy</td>
</tr>
</tbody>
</table>
IoT LINE CARD

SUPPLIERS

Amphenol® RF
Competitively-priced RF interconnect solutions including AMC, AMMC, MCX, SMA and Fakra 50 Ohm. SMA and AMC4 miniature connectors and cable assemblies from DC-6 GHz.

Anaren®
AHEAD OF WHAT’S POSSIBLE™
High-performance sensing solutions, including MEMS inertial, temperature, impedance and optical. ISM transceiver ICs and Smart Mesh wireless sensor networking products. Power management for IoT, energy harvesting PMUs.

Anaren®
What’ll we think of next?™
Pioneer in ultra-miniature softboard passive devices, including balun transformers, couplers, power dividers and crossovers. Proprietary ISM and BLE modules and antenna elements.

ABRACON, LLC
Embedded and external Antennas for a variety of IoT protocols and mounting options.

Cinch Connectivity Solutions
Leading supplier of competitively-priced brass and stainless-steel RF interconnect solutions.

Fibocom
Competitively-priced wireless modules and System on Chip (SoC) solutions.

FRACTUS ANTENNAS
Competitively-priced fractal-based geometric embedded antennas in surface mount packages.

Gore
Authorized Distributor
GORE Microwave/RF Assemblies

Guerrilla RF
High-performance GaAs MMICs for cellular and ISM applications.

Huber+Suhner
Excellence in Connectivity Solutions
High-performance RF interconnect solutions for industrial IoT applications. External and embedded antennas covering cellular and ISM bands.

Macom™
Partners from RF to Light
High-performance GaAs MMICs covering 3G/4G/5G cellular and ISM bands.

Maestro
IoT LINE CARD

SUPPLIERS

MAXSTENA
WIRELESS INNOVATIONS COMPANY
Innovative, comprehensive range of embedded and external, active and passive antenna solutions for GPS, GLONASS, COMPASS, Galileo, Wi-Fi, LTE, Globalstar and Iridium, and DSRC applications.

MICROCHIP
Wireless modules and System on Chip (SoCs) for Wi-Fi, BT, ZigBee, proprietary 2.4 GHz and LoRa.

NXP
Proprietary ISM, BLE and Zigbee System on Chip (SoC) solutions. Proprietary ISM transceivers. Sensors. Battery and power management ICs. SiGe-based MMICs for cellular and ISM bands.

PSemi
A Murata Company
Pioneer in Silicon on Insulator (SoI) MMIC switches and DSAs for cellular and ISM bands. RF Front End Modules (FEMs) for Wi-Fi.

Qualcomm
SAW and BAW filters for cellular, BT/Wi-Fi and ISM applications. SAW-based resonator products for ISM bands.

Radiall
Competitively-priced RF interconnect solutions for embedded and infrastructure applications.

Sierra Wireless
High-performance wireless modules and gateways for cellular Cat 1–12 and LPWA, and Wi-Fi, Bluetooth and GNSS. Global SIM options. Cloud and connectivity services.

Skyworks
Competitively-priced and innovative RF Front End Modules (FEMs). High-performance GaAs MMICs covering 3G/4G/5G cellular and ISM bands.

TAOGLAS.
Wireless modules and System on Chip (SOCs) for BT, Wi-Fi and ISM applications.

High-performance external and internal antennas for cellular Cat 1–12, LPWA, LoRa, and Sigfox; Wi-Fi, Bluetooth, ZigBee and proprietary ISM; and GPS, GLONASS, BeiDou and Galileo.

AUTHORIZED DISTRIBUTOR
Embedded antennas for a wide variety of applications and mounting types. Competitively-priced RF interconnect components covering DC-6 GHz.

CENTRI
Coming in 2019

Te Connectivity

Coming in 2019
# IoT LINE CARD: INTEGRATED SOLUTIONS

<table>
<thead>
<tr>
<th>WIRELESS MODULES</th>
<th>Cellular Cat 1 – 12</th>
<th>Cat M1/NB-IoT</th>
<th>Wi-Fi</th>
<th>Bluetooth</th>
<th>ZigBee</th>
<th>GPS/ GNSS</th>
<th>ISM</th>
<th>LoRa</th>
<th>SigFox</th>
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<tr>
<td>IOT GATEWAYS</td>
<td>Sierra Wireless Maestro Wireless</td>
<td>Sierra Wireless</td>
<td>Maestro Wireless</td>
<td>Analog Devices</td>
<td></td>
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<tr>
<td>DEVICE CLOUD &amp; APPS</td>
<td>Sierra Wireless</td>
<td>Sierra Wireless</td>
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</table>

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
### IoT LINE CARD: ELECTRONIC COMPONENTS

<table>
<thead>
<tr>
<th><strong>Cellular</strong></th>
<th><strong>Cat M1/NB-IoT</strong></th>
<th><strong>Wi-Fi</strong></th>
<th><strong>Bluetooth</strong></th>
<th><strong>ZigBee</strong></th>
<th><strong>GPS/GNSS</strong></th>
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<th><strong>LoRa</strong></th>
<th><strong>SigFox</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANTENNAS</strong></td>
<td><strong>Embedded</strong></td>
<td><strong>RF</strong></td>
<td><strong>SYSTEM ON CHIP (SOC)</strong></td>
<td><strong>RF FRONT END</strong></td>
<td><strong>MODULE (FEM)</strong></td>
<td><strong>RFICS</strong></td>
<td><strong>SENSORS</strong></td>
<td><strong>POWER MGMT ICS</strong></td>
</tr>
<tr>
<td>Abracon</td>
<td>Fractus Antennas</td>
<td>Huber+Suher</td>
<td>Analog Devices</td>
<td>Skyworks</td>
<td>Anaren</td>
<td>Gore</td>
<td>Amphenol RF</td>
<td>HUBER+SUHNER</td>
</tr>
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<td>Radiall</td>
</tr>
</tbody>
</table>
Versatile, next generation cellular modules (3G/4G/LTE/LPWA, some with 2G fallback) are at the heart of much of our IoT product offering, including SIM card options and managed connectivity/cloud. A number of these modules are offered in the CF3® form factor, which allows quick and easy swapping between products with varying levels of processing power, as well as different regional coverages from 2G to LPWA. These products address diverse applications, such as asset tracking, oil and gas, utility, mobile data, transportation, medical, and transaction processing markets.

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING SIERRA WIRELESS AND FIBOCOM**

**FEATURED PRODUCTS**

**CELLULAR MODULES - SURFACE MOUNT**

Cost-effective, low-power IoT cellular modules

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL7802</td>
<td>Cat-M1/NB-IoT, global, 2G fallback</td>
</tr>
<tr>
<td>HL8548</td>
<td>3G global with 2G fallback</td>
</tr>
<tr>
<td>HL75xx</td>
<td>4G, region-specific</td>
</tr>
<tr>
<td>M910-GL</td>
<td>Cat-M1/NB-IoT / GPRS</td>
</tr>
</tbody>
</table>

**CELLULAR MODULES: SMT MODEMS**

Linux-based, industrial-grade modules with integrated application processing

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP7702</td>
<td>Cat-M1/NB-IoT, global, 2G fallback</td>
</tr>
<tr>
<td>WP760x</td>
<td>4G, region-specific, 2G / 3G fallback</td>
</tr>
<tr>
<td>WP8548</td>
<td>3G global with 2G fallback</td>
</tr>
</tbody>
</table>

The CF3 footprint enables:
- 2G, 3G, 4G, LPWA network
- Any region or market
- Future-proof product platforms
Leading edge cellular modules for 4G/LTE are a key part of our IoT product offering. Several of these modules are offered in PCI-SIG® standards-based form-factors. These standard interface modules address diverse applications, such as public safety networks, mobile computing, and networking device platforms.

**FEATURED PRODUCTS**

**MINI PCIe FORM FACTOR**
- MC7430: 4G Cat-6, 3G fallback, Asia
- MC7455: 4G Cat-6, 3G fallback, Americas/EMEA

**M.2 FORM FACTOR**
- EM7565: 4G Cat-12, 3G fallback, global
- EM7511: 4G, public safety, 3G fallback, Americas
- EM7455: 4G Cat-6, 3G fallback, Americas, EMEA
- EM7430: 4G Cat-6, 3G fallback, Asia

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING SIERRA WIRELESS**

- PCI standards-based modules
- LTE Advanced Pro coverage on a single EM75xx module
- Switch networks over-the-air by storing up to 3 different certified firmware variants

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
**BLUETOOTH & GNSS MODULES**

Additional technologies in our portfolio include Bluetooth, Wi-Fi and GNSS modules, some offered in the CF3® form-factor, which enables future-proofing of designs. GPS modules are available for tracking and positioning applications, along with an extensive line of accessories, including integrated or external antennas, and cables and connectors to complete a wide array of solutions. Suitable applications include home automation and security, personal health devices, industrial, and smart city.

**FEATURED PRODUCTS**

**BLUETOOTH MODULES**

Hostless variants with regulatory certifications and integrated antenna

- BC127  BT4.2 high end audio
- BX3100  Wi-Fi b/g/n, BT4.2 combo
- BX3105  BT5.0, hostless, integrated antenna

**GNSS MODULES**

Options available with or without integrated antenna

- XA1100  GPS only, integrated antenna
- XM1110  GPS, Glonass, Galileo, BeiDou, no antenna
- XA1130  GPS, Galileo, integrated antenna
- A5135-H  GPS / GLONASS concurrent, BeiDou / Galileo ready

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING SIERRA WIRELESS AND MAESTRO WIRELESS SOLUTIONS**

- Fully-certified hostless Wi-Fi and BT solutions with integrated antennas
- Stand-alone and integrated-antenna GNSS solutions that deliver unrivaled positioning performance
SMART CONNECTIVITY MODULES

Operating in the sub-1 GHz or 2.4 GHz ISM bands, our modules provide a perfect solution for applications where the need is to transmit serial data with a high degree of reliability and unparalleled energy efficiency. Combined with ready-to-deploy wireless mesh software, they enable reliable operation in harsh, dynamically changing RF environments.

PRODUCTS FROM LEADING SUPPLIERS INCLUDING ANALOG DEVICES, MICROCHIP, AND ST MICROELECTRONICS

FEATURED PRODUCTS

PROPRIETARY PROTOCOL MODULES

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTP5901IPC-IPMA</td>
<td>2.4 GHz Smart Mesh IP module with chip antenna</td>
</tr>
<tr>
<td>LTP5902IPC-IPMA</td>
<td>2.4 GHz SmartMesh IP module with antenna connector</td>
</tr>
<tr>
<td>SP1ML</td>
<td>Sub-1 GHz ultra-low power ISM module with integrated antenna</td>
</tr>
</tbody>
</table>

LoRa WAN MODULES

<table>
<thead>
<tr>
<th>Module</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN2903</td>
<td>915 MHz long-range LoRa module (North America)</td>
</tr>
<tr>
<td>RN2483</td>
<td>433/868 MHz LoRa module (Europe)</td>
</tr>
</tbody>
</table>

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
### Cellular Gateways

IoT Gateways, also called modems, cover 3G and 4G/LTE and provide integrated, quick-to-market IoT solutions. Additional technologies in our portfolio include GPS trackers for tracking and positioning applications. These products address a number of markets, including fleet management, asset tracking, industrial, and medical.

#### Featured Products

**Cellular Gateways**

<table>
<thead>
<tr>
<th>Model</th>
<th>Connectivity</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>FX30</td>
<td>3G/4G, global</td>
<td></td>
</tr>
<tr>
<td>GL7500</td>
<td>4G Cat-4, 3G fallback, Americas</td>
<td></td>
</tr>
<tr>
<td>GL8200</td>
<td>3G, 2G fallback, global</td>
<td></td>
</tr>
<tr>
<td>E225</td>
<td>3G, 2G fallback, global</td>
<td></td>
</tr>
<tr>
<td>E228</td>
<td>4G Cat-4 with 3G fallback, global</td>
<td></td>
</tr>
</tbody>
</table>

**GPS Trackers**

<table>
<thead>
<tr>
<th>Model</th>
<th>Connectivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>FOX3-3G</td>
<td>GPS/QZSS/GLONASS/Galileo/BeiDou, Cat-M1/NB-IoT</td>
</tr>
<tr>
<td>BOLERO43</td>
<td>GPS+Galileo/GLONASS, 3G</td>
</tr>
</tbody>
</table>

### Products from Leading Suppliers Including Sierra Wireless and Maestro Wireless Solutions

- Simple, robust, cost-effective modem terminals
- Certified, industrial-grade, with small form factor for easy product integration
- Global coverage
**ANTENNAS**

Next to the SoC, antenna selection and optimization is the most critical aspect to a successful solution. Richardson RFPD provides a wide array of antenna types to support IoT applications:

- Short Range Wireless (802.11ac/g/n WiFi, Bluetooth)
- Satellite (GPS, Iridium, Globalstar)
- Asset Management
- Land Mobile Radio

We also carry a variety of antenna technologies (including fractal, helix, ceramic patch, loop, PIFA and metal stamp) and internal and external mounting styles (from surface mount to parabolic dish or Yagi.)

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING ABRACON, FRACTUS ANTENNAS, MAXTENA, RALTRON, TAOGLAS AND TE CONNECTIVITY**

**FEATURED PRODUCTS**

**SURFACE MOUNT**

- FR05-S1-R-0-105 433/868/915 MHz, 18.0 x 7.3 mm
- FR01-S4-210 0.698-3.80 GHz, 30.0 x 3.0 mm
- FR01-S4-224 0.698-3.80 GHz, 12.0 x 3.0 mm
- PA.25A 0.8-2.2 GHz, PIFA chip
- FR05-S1-E-0-103 1.5-1.6 GHz, 10.0 x 10.0 mm
- FR05-S1-NO-1-004 2.4-5.9 GHz, 7.0 x 3.0 mm

**CONNECTORIZED**

- TG.09.0113 0.8-2.1 GHz dipole stub
- FXU63B63 0.7-3.0 GHz flat patch
- M1227HCT-A2-SMA GPS L1/L2 active antenna
- M1600HCT-P-SMA GPS/Iridium, ruggedized

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
Richardson RFPD offers a broad selection of accelerometer, temperature and other sensors, some with additional integrated functions. These sensors are suitable for scientific, medical and aerospace applications, test and measurement equipment, and industrial automation.

**SENSORS**

- ADXL362: MEMS accelerometer, ultra-low power, low-g
- ADXRS29x: Pitch gyro, ultra-low noise roll
- ADUX1020: Optical gesture and proximity sensor
- LTC2986: Temperature measurement system

**FEATURED PRODUCTS**

- **SENSORS**
  - ADXL1001/ADXL1002: Ultra Low Power MEMS accelerometer
  - ADuCM4050: ARM® Cortex®-M4 core MCU with 512 kB flash memory
- **MICROCONTROLLERS**
  - ADuCM302x: ARM® Cortex®-M4 core MCU with 256 kB flash memory

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING ANALOG DEVICES AND MICROCHIP**

Richardson RFPD offers microcontroller units that can be used in a multitude of IoT processing applications. They allow interpreting capabilities in industrial, automotive, instrumentation and IoT precision-sensing applications.

- **MICROCONTROLLERS**
  - ADuCM4050: ARM® Cortex®-M4 core MCU with 512 kB flash memory
- **FEATURED PRODUCTS**
  - ADuCM302x: ARM® Cortex®-M4 core MCU with 256 kB flash memory

- **SENSORS**
  - ADXL362: MEMS accelerometer, ultra-low power, low-g
  - ADXRS29x: Pitch gyro, ultra-low noise roll
  - ADUX1020: Optical gesture and proximity sensor
  - LTC2986: Temperature measurement system

**FEATURED PRODUCTS**

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  - ADuCM4050: ARM® Cortex®-M4 core MCU with 512 kB flash memory
- **MICROCONTROLLERS**
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  - ADuCM4050: ARM® Cortex®-M4 core MCU with 512 kB flash memory
- **FEATURED PRODUCTS**
  - ADuCM302x: ARM® Cortex®-M4 core MCU with 256 kB flash memory

**SENSORS**

- **Accelerometers:** Leading-edge performance in measuring acceleration, tilt, shock, vibration
- **Temperature:** Sense temperature with precision and reliability
- **Gyroscopes:** Reliably sense angular rate under severe operating conditions
Choosing the right integrated radio transceiver IC for your IoT project is critical to the success of the program. Richardson RFPD carries a broad selection of high-performance transceivers at very low power, making them ideally suited for IoT applications.

PRODUCTS FROM LEADING SUPPLIERS INCLUDING ANALOG DEVICES

FEATURED PRODUCTS

EMBEDDED TRANSCEIVERS

- ADF7030-1: Sub-GHz ISM-band, high performance, narrowband
- ADF7242: 2.4 GHz, 802.15.4 & proprietary, Zero-IF
- AD936x: 70 MHz to 3.8 GHz, wideband

SYSTEM-ON-CHIPS

Product from leading suppliers including Analog Devices, Fibocom and Microchip

FEATURED PRODUCTS

- ADF7030-1 Sub-GHz ISM-band, high performance, narrowband
- ADF7242 2.4 GHz, 802.15.4 & proprietary, Zero-IF
- AD936x 70 MHz to 3.8 GHz, wideband

Comprehensive list of relevant parts on the IoT application page at RichardsonRFPD.com

SoCs & Transceivers

- IEEE 802.15.4e complete radio system in a chip with embedded processor and networking software
- High-performance radio transceiver ICs with wideband and narrowband channel options available for all ISM bands
Richardson RFPD offers a large selection of front-end modules designed with cost and space-savings in mind. They combine industry-leading power amplifier, low noise amplifier, filtering and switching functions into single low-cost, multi-chip modules. Our products offer extended range and efficiency for IoT applications such as automotive, connected home, industrial, medical, smart energy and wearables.

**Featured Products**

**Cellular FEMS**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>SKY68000-31</td>
<td>4G B4/B13 for IoT</td>
</tr>
<tr>
<td>SKY68011-31</td>
<td>4G B2/B4/B12 for IoT</td>
</tr>
</tbody>
</table>

**Smart Energy FEMS**

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<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKY66113-11</td>
<td>2.4 GHz BLE/802.15.4/Thread/ZigBee</td>
</tr>
<tr>
<td>SKY66403-11</td>
<td>2.4 GHz ZigBee/Thread/BLE</td>
</tr>
<tr>
<td>SKY66420-11</td>
<td>860-930 MHz ISM</td>
</tr>
<tr>
<td>MAMF-010614</td>
<td>5-6 GHz WiFi LNA/switch</td>
</tr>
</tbody>
</table>

**GNSS FEMS**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKY65713-11</td>
<td>LNA/filter, BDS/GPS/GNSS</td>
</tr>
<tr>
<td>SKY65903-11</td>
<td>LNA/dual-filter, BDS/GPS/GNSS</td>
</tr>
</tbody>
</table>

**FEMs**

- MBMM PAs with high-linearity Tx/Rx switches
- ISM Tx/Rx complete front-end with integrated filter and antenna diversity
- Positioning solutions with LNA filter and integrated matching networks
richardson RFPD offers a large selection of RF semiconductor ICs suitable for high-volume IoT applications where the customer is comfortable designing RF circuitry. Available solutions include CMOS or pHEMT control products, pHEMT or SiGe LNAs, and HBT power amplifiers, and are suitable for any application up to 6 GHz.

### Featured Products

#### Power Amplifiers

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>SKY65111-348LF</td>
<td>ISM 0.6-1.0 GHz, 2 Watt</td>
</tr>
<tr>
<td>SKY65111-348LF</td>
<td>ISM 0.4-1.5 GHz, 0.5 Watt</td>
</tr>
</tbody>
</table>

#### Low Noise Amplifiers

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Frequency</th>
<th>NF</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAAL-011078</td>
<td>0.7-6 GHz</td>
<td>0.35 dB</td>
</tr>
<tr>
<td>SKY67153</td>
<td>0.7-3.8 GHz</td>
<td>0.5 dB</td>
</tr>
<tr>
<td>GRF2100</td>
<td>0.7-3.8 GHz</td>
<td>0.8 dB</td>
</tr>
</tbody>
</table>

### POWER AMPLIFIERS

#### SPDT Switches

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Frequency</th>
<th>IL</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASW-007107</td>
<td>DC-8 GHz</td>
<td>0.5 dB IL</td>
</tr>
<tr>
<td>SKY13330-397LF</td>
<td>0.1-6 GHz</td>
<td>0.3 dB IL</td>
</tr>
<tr>
<td>PE42427</td>
<td>0.005-6 GHz</td>
<td>0.25 dB IL</td>
</tr>
</tbody>
</table>

PRODUCTS FROM LEADING SUPPLIERS INCLUDING SKYWORKS, MACOM, PSEMI AND GUERRILLA RF

• RF components from the industry's leading manufactures
• Global team of over 200 design, application and sales engineers

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
**PASSIVES**

AW and BAW filters ensure signal integrity, and balun transformers perform impedance transformation for balanced radio transceivers and SoCs.

**FILTERS**

- B39431B3732H110 SAW, 433 MHz, 3x3 mm
- B39162B8813P810 SAW, GPS/GLONASS, 1.1x0.9 mm
- B39162B8666L210 SAW, GPS extractor/diplexer
- B39242B8857L210 BAW, 2.4-2.5 GHz, 1.1x0.9 mm

**BALUN TRANSFORMERS**

- BFD0310N50100AHF 0.3-1.0 GHz, 2:1, 0404 pkg
- BD0826N5010AHF 0.8-2.6 GHz, 2:1, 0404 pkg
- BD2425NNRF 2.4-2.5 GHz for Nordic RF ICs
- BD2425N50100AHF 2.4-2.5 GHz, 2:1, 0404 pkg

**FEATURED PRODUCTS**

**EMI SHIELDING & GROUNDING**

MI mitigation is a critical item to consider prior to designing any RF-enabled product. Besides the certification compliance that is required for radio transmitting products, optimal performance is affected by proper EMI interference mitigation and antenna grounding.

**FEATURED PRODUCTS**

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING QUALCOMM AND ANAREN**

**PRODUCTS FROM LEADING SUPPLIERS INCLUDING GORE**

**SMI GROUND PADS**

- 25SMT-6101-01 Supersoft, 1.9x1.1x1.1 mm (LxWxT)
- 25SMT-6110-03 Supersoft, 3.6x2.8x2.4 mm (LxWxT)

**EMI SHIELDING & GROUNDING**

- SAW technology offers high rejection in small footprint
- Softboard baluns less prone to cracking vs. ceramic
- Gore’s line of unique surface mount (SMI) ground pads
- Can serve as an EMI “fence” or to properly ground antennas and other circuits
INTERCONNECT

Richardson RFPD provides a comprehensive RF interconnect product and vendor portfolio, from high-end, space-qualified coaxial cables, connectors, attenuators and terminations to low-cost, commercial-grade solutions. IoT applications include smart cities, industrial infrastructure, smart agriculture, connected cars, connected equipment and AI.

FEATURED PRODUCTS

Richardson RFPD provides a comprehensive RF interconnect product and vendor portfolio, from high-end, space-qualified coaxial cables, connectors, attenuators and terminations to low-cost, commercial-grade solutions. IoT applications include smart cities, industrial infrastructure, smart agriculture, connected cars, connected equipment and AI.

ON-BOARD CONNECTORS

Common IoT connector families to consider include AMMC, UMC/AMC/MHF, MMCX, MCX, SMA, TNC, N Type and FAKRA. Several of these are also available in reverse polarity designs. Adapters are available.

CABLE ASSEMBLIES

UMC, AMC, AMMC, MHF types supplied as pigtails or complete assemblies terminated with the most popular type of connectors for IoT. Customs available.

PRODUCTS FROM LEADING SUPPLIERS INCLUDING AMPHENOL RF, CARLISLE, CINCH CONNECTIVITY, GORE, HUBER+SUHNER, RADIALL, RF INDUSTRIES AND TE CONNECTIVITY

RF TEST CABLES

- RF test required at every level of the IoT supply chain
- Turn to Richardson RFPD for a complete range of standard RF test cables

COMPREHENSIVE LIST OF RELEVANT PARTS ON THE IOT APPLICATION PAGE AT RICHARDSONRFPD.COM
POWER MANAGEMENT

Many IoT applications require wireless mobile connectivity, and power management is often a primary challenge in the system design. Battery life can have a significant implication on cost-of-ownership and can sometimes be a barrier to viability. Richardson RFPD offers ultra-low power products and system-level power management functions built-in at the component level.

FEATURED PRODUCTS

POWER MANAGEMENT ICs

- **ADP5091**: Energy harvesting PMU
- **LTC3331**: Nanopower buck-boost DC/DC with energy-harvesting battery charger
- **LTC3109**: Ultra-low power step-up converter and power manager
- **ADP5301**: Ultra-low power step-down regulator, high efficiency

PRODUCTS FROM LEADING SUPPLIERS INCLUDING ANALOG DEVICES, RECOM AND WALL INDUSTRIES

- Solutions for power conversion applications that provide unmatched power densities and reliability
- Energy-harvesting technology to source power from the environment with system-level power management functions built-in at the component level
RICHARDSON RFPD ENGINEERING SUPPORT

Richardson RFPD, an Arrow Electronics company, is a global leader in the RF and wireless communications, power conversion and renewable energy markets. It brings relationships with many of the industry's top radio frequency and power component suppliers. Whether it's designing components or engineering complete solutions, Richardson RFPD's worldwide design centers and technical sales team provide comprehensive support for customers' go-to-market strategy, from prototype to production.

ASSISTANCE FROM EXPERIENCED APPLICATIONS ENGINEERING SUPPORT TEAM

- Design feasibility and component selection
- Hardware design and development including:
  - RF front-end and antenna synthesis, component matching and system integration
  - CAD design and analysis
  - Comprehensive documentation packages including schematics, CAD files and BOMs
- Firmware and application development
- Design reviews including schematic and layout recommendations
- Industry certification testing and compliance

Reach out to our support team at:

iotsupport@richardsonrfpd.com
IoT CONNECTIVITY SERVICES

Richardson RFPD offers a wide selection of wireless connectivity support services to help take your hardware designs to market, including:

- SIM CARDS
- DATA PLANS
- BUNDLED CONNECTIVITY PLANS
- CUSTOM CONNECTIVITY
- CLOUD SERVICES
- PLATFORM SERVICES
- SOFTWARE APPLICATIONS
- SECURITY
- ANALYTICS
- CUSTOM CONNECTIVITY CLOUD SERVICES
- PLATFORM SERVICES
- SECURITY
- ANALYTICS

For questions on our connectivity services, please email us at: iotservices@richardsonrfpd.com

DEVICE-TO-CLOUD SOLUTIONS
MORE THAN A DEVICE SUPPLIER
BUNLED CONNECTIVITY SOLUTIONS

COMING IN 2019: “READY-TO-CONNECT” FULLY-INTEGRATED PLATFORM

The Sierra Wireless Ready-to-Connect bundle offer includes cellular modules and routers pre-connected to global mobile networks with IoT services for operating a fleet of widely-distributed connected products. Each Ready-to-Connect device comes with built-in security. It is natively managed from the Sierra Wireless AirVantage IoT platform in a fully-integrated way, making your IoT journey a simple one.

Accelerated Time-to-Market
Simplified development, built-in security

Global Deployment Ready
Resilient global cellular connectivity out-of-the-box

Centralized Device Management
Monitor and act on all SIMs and devices through a single platform

Flexible Commercial Model
One contract OPEX- or CAPEX-friendly pricing
Richardson RFPD offers a multitude of evaluation and development tools to customers who are willing to develop circuits with discrete components and ICs. Most of our development boards are designed to facilitate quick experimentation and validation of product performance against manufacturer's datasheet specifications. They are usually accompanied by software tools, a comprehensive documentation package and bench test data.

**FEATURED PRODUCTS**

- **Antenna Evaluation Boards**
  - Fractus Antennas EB.FR01-S4-250-UFL2R

- **Front-End Semiconductors EVKs**
  - Skyworks SKY6715x-396EKx

- **Development Tools for Integrated Transceivers**
  - Analog Devices ADRV9371-W/PCBZ

Hundreds of design kits and evaluation boards available in stock at RichardsonRFPD.com
MODULE EVALUATION TOOLS

Our selection of module evaluation tools includes boards, development kits, Arduino shields and accessories. Additional documentation and software are available at richardsonrfpd.com.

FEATURED PRODUCTS

- **LoRa Arduino Expansion Board**
  - ST Micro I-NUCLEO-LRWAN1

- **GNSS Evaluation Kit**
  - Sierra Wireless XA1110

- **2.4 GHz SmartMesh IP Starter Kit**
  - Analog Devices DC9021B

Hundreds of design kits and evaluation boards available in stock at richardsonrfpd.com
PROTOTYPING: MODULE INTEGRATION

Richardson RFPD offers a wide selection of reference designs that are commonly used as stand-alone solutions but can also be integrated in more complex circuits and sub-systems. They are all built and tested for function and performance and offer comprehensive documentation and fully-tested evaluation hardware and software. They are the best path to fast prototyping or quick proof-of-concept (PoC).

FEATURED PRODUCTS

**Smart Mesh Module**
Analog Devices LTP5902-IPM

**Complete SoMs (System on Module)**
Analog Devices ADRV9361-Z7035

**LoRa Modem**
Microchip RN2903 LoRa® Technology PICtail™/PICtail Plus

HUNDREDS OF DESIGN KITS AND EVALUATION BOARDS AVAILABLE IN STOCK AT RICHARDSONRFPD.COM
PROTOTYPING/ENABLEMENT TOOL - OPEN SOURCE PLATFORMS

mangOH™ Kits Include

• CF3 socket module
• SIM card and 100 Mb of data
• Sensors: accelerometer, gyroscope, light, altimeter, humidity, gas Cortex M4 MCU for RTOS
• IoT expansion cards
• On-board Wi-Fi and BT
• Audio jack and USB
• Battery connector
• Raspberry Pi connector

Some of the products that can accompany the MangOH Red board include:
HL7700, HL7702, HL7800, WP7601, WP8548
Richardson RFPD’s parent company, Arrow Electronics, helps us fill-in the product and service gaps for you. Our ability to leverage Arrow’s expertise in areas beyond connectivity allows us to wrap total solutions in an unparalleled and seamless fashion.

Creating and deploying connected solutions requires expertise across a broad span of technologies from sensors, embedded compute, short and long-range wireless connectivity, gateways, cloud platforms and application development. It also requires expertise in real time service monitoring & management and full life-cycle management.

From Sensor to Sunset™ represents Arrow’s comprehensive portfolio of technology from sensors, wireless connectivity, gateways to cloud platforms, data ingestion, aggregation and visualization, analytics, and security. Service capabilities span ideation, design, integration, manufacturing, logistics, financing, wireless connectivity with billing services, marketing, monitoring and managed services, and sustainable and secure end of life cycle disposition.

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**SOLUTIONS FOR EVERY STEP OF IOT**

**CREATE**
- Ideation
- Hardware Design
- Software & Firmware Development
- Manufacturing Services
- Logistics

**CONNECT**
- Cellular (LTE, LTE-M, NB-IoT)
- Satellite
- LPWAN
- Device Management & Application Platform

**MANAGE**
- 24/7 Service Desk
- Remote Monitoring
- IT Service Management
- Troubleshooting & Repair

**SUSTAIN**
- Parts Replacement
- Secure Disposition
- Safe Disposition
CONNECT WITH OUR ONLINE IoT EXPERIENCE

- SEARCH 6,000 SKUs
- DETAILED DATASHEETS
- PARAMETRIC SEARCH
- OVER 30 LEADING BRANDS
- COVERING 8 MAJOR PRODUCT GROUPS & 40 PRODUCT CATEGORIES

WWW.RICHARDSONRFPD.COM/IOTPRODUCTSLIST
# Primary Global Sales Locations

## Americas
- **BRAZIL**
  - P: +55 (11) 3613-9375  
  - F: +55 (11) 3613-9355  
  - Sao Paulo

- **CANADA**
  - P: +1 (905) 565-4450  
  - F: +1 (905) 565-4455  
  - Mississauga, Ontario

- **USA**
  - P: +1 (630) 262-6800  
  - F: +1 (630) 262-6850  
  - Geneva, Illinois

## Asia
- **CHINA**
  - P: +86 (10) 6588 5548  
  - F: +86 (10) 6588 5541  
  - Beijing
  - P: +86 (28) 8620 3488  
  - F: +86 (28) 8620 3499  
  - Chengdu
  - P: +86 1360 2492 739  
  - F: +86 1385 7104 571  
  - Guangzhou
  - P: +86 (25) 8320 0266  
  - F: +86 (25) 8320 0299  
  - Nanjing

- **JAPAN**
  - P: +81 (3) 6452-9811  
  - F: +81 (3) 6452-9822  
  - Tokyo

- **KOREA**
  - P: +82 (2) 539-4731  
  - F: +82 (2) 539-4730  
  - Seoul

- **MALAYSIA**
  - P: +60 (3) 7832-5088  
  - F: +60 (3) 7832-5988  
  - Selangor (Darul Ehsan, West)

- **SINGAPORE**
  - P: +65 6487-5995  
  - F: +65 6487-5665  

- **Taiwan**
  - P: +886 (2) 2698-3288  
  - F: +886 (2) 2698-3285  
  - Taipei

- **THAILAND**
  - P: +66 (2) 1099642  
  - F: +66 (2) 1099643  
  - Bangkok

## Europe, Middle East and Africa (EMEA)
- **FRANCE**
  - P: +33 (1) 41 32 15 50  
  - F: +33 (1) 41 32 15 51  
  - Paris

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  - F: +49 (0) 89 93099 590  
  - Muenchen

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  - P: +972 (9) 7483232  
  - F: +972 (9) 7416510  
  - Petach Tikva

- **ITALY**
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  - F: +39 (055) 45924214  
  - Florence

- **POLAND**
  - P: +48 600288180  
  - Warsaw

- **RUSSIA**
  - P: +7 (495) 5899972  
  - F: +7 (495) 5899972  
  - Moscow

- **SPAIN**
  - P: +34 (91) 296 87 80  
  - F: +34 (91) 296 83 81  
  - Madrid

- **UNITED KINGDOM**
  - P: +44 (0) 1753 733010  
  - F: +44 (0) 1753 733012  
  - London

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Customers in Vietnam, Philippines, Oceania, Indonesia, and SE Asia countries not listed above should contact our Singapore office.

Customers in Eastern Europe, the Middle East and Africa should contact our office in Italy. Customers in Scandinavia should contact our office in the United Kingdom.

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To see the complete list of sales offices, please visit: [richardsonrfpd.com/sales](http://richardsonrfpd.com/sales)  
Contact us at: [rfpdsales@richardsonrfpd.com](mailto:rfpdsales@richardsonrfpd.com)