



Datasheet

# IMPINJ R700 RAIN RFID READER

## DATASHEET

## DOCUMENT OVERVIEW

The all-new Impinj R700 reader is designed to support global enterprise RAIN deployments that need high performance and reliability.

- **Enterprise-grade reliability and security**—Secure and field-upgradable; built on a heritage of best-in-class reliability
- **Designed for enterprise-grade deployments**—High-speed processing power and superior receive sensitivity for next-generation, enterprise RAIN applications
- **Connects like other IoT devices**—Easily connect to IoT applications with RESTful API and support for popular IoT data transfer technologies
- **Build powerful, custom solutions**—Embed powerful, custom on-reader applications and use versatile, standardized connections
- **Fast Connection to IoT Applications**—Gigabit Ethernet connectivity prevents data bottlenecks and lowers latency
- **Built to Withstand Tough Environments**—Ruggedized cast aluminum enclosure withstands shock; ISO IP54 water-resistant case available.

This document constitutes the electrical and mechanical specifications pertaining to the Impinj R700 RAIN RFID Reader. It contains a functional overview, mechanical characteristics, and electrical specifications. For technical support, visit the Impinj support portal at [support.impinj.com](http://support.impinj.com).

**Table 1: Impinj R700 Key Specifications**

SPECIFICATION	DESCRIPTION
Physical Dimensions	With mounting brackets 8.4 in. long x 7.4 in. wide x 1.2 in. deep (21.5 cm x 18.7 cm x 3.0 cm) Without brackets: : 8.4 in. width x 5.9 in. depth x 1.2 in. height inch (21.4 x 14.9 x 3.0 cm)
Power Supply	PoE (802.3af), PoE+ (802.3at)
Air Interface Protocol	EPCglobal UHF Gen2 v2 / ISO 18000-63 RFID
Antenna Ports	4, Monostatic (RP-TNC)
Transmit Power	33 dBm max (PoE+), 30 dBm max (PoE)
Receive Sensitivity	-92 dBm max
Supported Regions	USA and Canada
Processor	Dual-Core 1 GHz
Memory	1 GB Flash, 1 GB RAM
Network Connectivity	10/100/1000 BASE-T Ethernet
Device Connectivity	3 USB Type-A device connections
General Purpose I/O	3 out, 2 in

Figure 1: Impinj R700 Top View



Figure 2: Impinj R700 Bottom View



Figure 3: Impinj R700 Front View



Figure 4: Impinj R700 Back View



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# 1 INTRODUCTION

The Impinj R700 RAIN RFID reader is a four port RFID reader compliant with the GS1 UHF Gen2v2 standard which ISO/IEC standardized as 18000-63. The Impinj R700 has been specifically designed to meet the increasing demands of next-generation IoT solutions and enterprise-grade RAIN deployments.

## 1.1 Features

- -92 dBm receive sensitivity enables reading smaller, global RAIN RFID tags at high speed for demanding use cases such as RAIN-based loss prevention
- 1 GHz dual-core processor, 1 GB RAM, and Gigabit Ethernet allow developers to deploy sophisticated on-reader tag-processing algorithms that leverage low-latency connectivity to enterprise IoT applications
- Support for up to 32 antennas with one-wire antenna connectivity facilitates large-scale system deployments
- Integrated, standardized connectors provide rich support for external peripherals

A secure, upgradable Linux operating system, encrypted software image, and a secure software boot with chain-of-trust prevents unauthorized software execution and addresses the demanding security needs of enterprise customers.

## 1.2 Reference Materials

The following reference documents were used to compile this datasheet:

- EPC Radio-Frequency Identity Protocols Generation-2 UHF RFID Protocol for Communications at 860 MHz – 960 MHz (Gen2v2 Specification, version 2.0.1 Feb 2016)
- Impinj R700 Installation and Operations Guide

## 1.3 Additional User Documentation

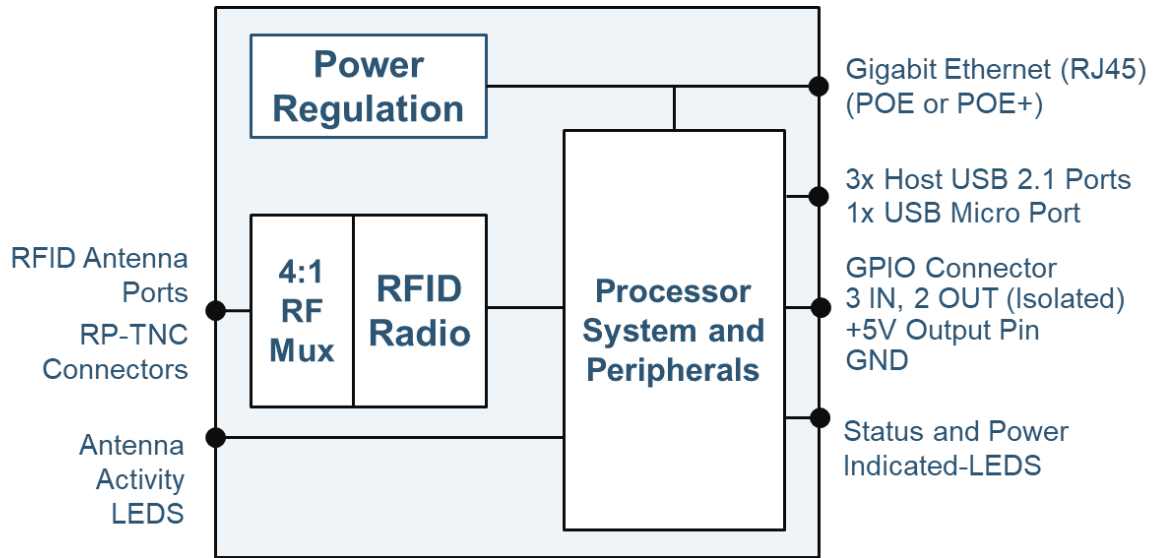
The following table lists documents that may be helpful in operating the Impinj R700. These documents can be found on the Impinj support portal at [support.impinj.com](http://support.impinj.com).

**Table 2: Impinj R700 User Documentation**

DOCUMENT	DESCRIPTION
<b>Impinj R700 Quick Start Guide</b>	Simple guide to begin using the Impinj R700
<b>Impinj R700 Installation and Operations Guide</b>	Detailed instructions for installing, connecting, configuring, operating, upgrading, and troubleshooting the Impinj R700
<b>RShell Reference Manual</b>	Guide to using the Reader Shell (RShell) command line interface to configure, maintain, and query the status of Impinj RAIN RFID readers
<b>Octane LLRP Guide</b>	Describes the LLRP capabilities supported by Impinj RAIN RFID readers, which includes Impinj custom LLRP extensions
<b>Embedded Developers Quick Start Guide</b>	Guide to begin developing custom on-reader applications
<b>Impinj R700 Firmware Release Notes</b>	Details up to date features and known issues

## 1.4 Block Diagram

Figure 5: Impinj R700 Block Diagram



## 2 SPECIFICATIONS

### 2.1 Mechanical

Table 3: Impinj R700 Mechanical Specifications

SPECIFICATION	DESCRIPTION
Physical Dimensions	With mounting brackets 8.4 in. long x 7.4 in. wide x 1.2 in. deep (21.5 cm x 18.7 cm x 3.0 cm) Without brackets: : 8.4 in. width x 5.9 in. depth x 1.2 in. height inch (21.4 x 14.9 x 3.0 cm)
Mounting	<ul style="list-style-type: none"> <li>VESA 100 x 100</li> <li>Removable bracket compatible with Impinj Speedway mounting system</li> </ul>
Weight	2.12 lb, 0.96 kg
Housing Material	Die-cast Aluminum
Factory Reset Button	Restores reader to known factory state
LED Indicators	System status, inventory, firmware upgrade, antenna activity, network activity

#### 2.1.1 Mounting

The Impinj R700 comes with two options for mounting the reader. The rear of the unit has tapped holes compatible with VESA 100 x 100 mounting solutions. Additionally, the reader ships with mounting brackets that match the dimensions of the Impinj Speedway mounting bracket. For more information reference the Impinj R700 RAIN RFID Reader Installation and Operations Guide found at [support.impinj.com](http://support.impinj.com).

## 2.2 Environmental

**Table 4: Impinj R700 Environmental Specifications**

SPECIFICATION	DESCRIPTION
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Storage Temperature	-4°F to 158°F (-20°C to 70°C)
Humidity	5% - 95% non-condensing
Sealing	Ingress Protection (IP) 50 rating
Shock and Vibration	United States Military Standard, MIL-STD-810G

## 2.3 RFID

**Table 5: Impinj R700 RFID Specifications**

SPECIFICATION	DESCRIPTION
Air Protocol	EPCglobal UHF Class 1 Gen 2 / ISO 18000-63 RFID
Transmit Power	10 – 30 dBm (PoE), 10 – 33 dBm (PoE+)
Frequency Range	FCC: 902-928 MHz
Return Loss	10 dB min
Read Rate	Up to 1100 reads per second
Antenna Impedance	50 ohm
Max Receive Sensitivity	-92 dBm at 10 <sup>-3</sup> bit error rate
Gen 2 Reader Modes	11 fixed modes, 3 autopilot modes



## 2.4 Connectivity

**Table 6: Impinj R700 Connectivity Specifications**

SPECIFICATION	DESCRIPTION
<b>Network</b>	10/100/1000 Base-T Ethernet (RJ45)
<b>Antenna Ports</b>	4 monostatic ports (RP-TNC)
<b>USB</b>	3 Type A host, 1 micro device
<b>Power</b>	PoE (802.3af), PoE+ (802.3at)
<b>General Purpose I/O</b>	3 out, 2 in optically isolated
<b>General Purpose I/O Header</b>	Phoenix Contact 9 pin 3.81 mm pitch

### 2.4.1 Power

The Impinj R700 is powered exclusively through Power over Ethernet (PoE) or PoE+ via the Ethernet port. For applications where the reader is not connected to a PoE capable switch, a midspan injector can be used to add inline power to a network connection via a power supply.

### 2.4.2 GPIO

The Impinj R700 utilizes a Phoenix Contact 9 position 3.81mm pitch header to expose the GPIO signals. To connect external signals a matching terminal block must be installed.

**Table 7: Impinj R700 GPIO Pin Assignments**

PIN	ASSIGNMENT
1	+5V (500 mA max current)
2	Chassis GND
3	IN 0
4	IN 1
5	OUT 0
6	OUT 1
7	OUT 2
8	V MINUS
9	V PLUS

**Table 8: Impinj R700 GPIO Electrical Specifications**

SPECIFICATION	DESCRIPTION
V PLUS	5 – 30 V (reference to V MINUS)
Input Logic 0	0 - 0.8 V
Input Logic 1	3 – 30 V
Output Logic 0	0 – 0.5 V (reference to V MINUS)
Output Logic 1	V PLUS – 0.5 V
GPO Current Draw	1.5 A Source or Sink
Isolation	Optical

## 2.5 Hardware and Operating System

**Table 9: Impinj R700 Hardware and Operating System Specifications**

SPECIFICATION	DESCRIPTION
Processor	Dual-Core 1 GHz Cortex A7
Memory	1 GB Flash, 1 GB RAM
Operating System	Linux, 5.1 kernel
Firmware	Impinj R700 LLRP with Impinj extensions
Firmware Upgrade	Web-based and remote capable
Network Stack	IPv4, IPv6
Network Services	SSH, HTTP, NTP, DHCP, SFTP, mDNS
Network Security	802.1x port security
Network Management	Event logs with syslog forwarding

## 3 DEVELOPMENT LIBRARIES

**Table 10: Impinj R700 Supported Development Libraries**

API	DESCRIPTION
Octane SDK	Host-based applications (.NET, Java)
LLRP Toolkit	Host-based applications (.NET, Java, C, C++)
Embedded Toolkit	On-reader applications (C, C++)

## 4 REGULATORY SPECIFICATIONS

**Table 11: Impinj R700 Regulatory Specifications**

SPECIFICATION	DESCRIPTION
RF	USA (FCC ID TWYR700) <ul style="list-style-type: none"> <li>Professional Installation required under FCC rules</li> </ul> Canada (ISED Certification # 6324A-R700)
Safety	UL listed for USA and Canada
RoHS	RoHS3 2015/863 compliant

## 5 ORDERING INFORMATION

### 5.1 Hardware

**Table 12: Impinj R700 Part Number Information**

PART NUMBER	DESCRIPTION
IPJ-R700-141	4 antenna ports, USA and Canada region support

### 5.2 Accessories and Warranties

**Table 13: Impinj R700 Hardware Accessories and Services**

PART NUMBER	DESCRIPTION
IPJ-A2010	PoE+ midspan power injector (without AC power cord)
IPJ-A2041-xxx	AC power cord for PoE+ injector ARG Argentina                          RSA South Africa AUS Australia, New Zealand        UK1 UK, Singapore BRA Brazil                                      Malaysia, Hong Kong CHN China                                      USA USA EU1 Europe IND India JPN Japan
IPJ-C205x	Warranty extension 1 1-year 2 2-year 3 3-year
IPJ-C2001	Firmware Updates (1-year)

## 5.3 Antennas and Antenna Cables

**Table 14: Antenna and Antenna Cable Ordering Information**

PART NUMBER	PART NAME	DESCRIPTION
IPJ-A0303-000	Mini-Guardrail Antenna	The Impinj Mini-Guardrail antenna has a short-read zone and fits easily into small enclosures. The small form factor and mounting holes support a multitude of use cases. Requires 1 SMA to R-TNC cable (not included)
IPJ-A0311-xxx	Threshold Antenna EU1 ETSI USA FCC	The Impinj Threshold RAIN RFID antenna provides wide zone coverage ideal for a road racecourse or other boundary and threshold crossings. Includes 1 SMA to R-TNC (2 m)
IPJ-A0400-xxx	Brickyard Antenna EU1 ETSI USA FCC	The Brickyard antenna by CSL has a one meter read zone designed for point-of-sale terminals enabling quick and easy item identification. Integrated 2.4 m pigtail R-TNC cable
IPJ-A0402-xxx	Guardwall Antenna EU1 ETSI USA FCC	The Impinj Guardwall RAIN RFID antenna is deployed in pairs and provides a tightly controlled read zone designed to integrate into conveyor systems. Includes 2 x SMA to R-TNC (2 m) cables
IPJ-A0404-000	Matchbox Antenna	The Impinj Matchbox antenna is a very small RAIN RFID antenna suited for embedded applications needing strong performance in a tight read zone. Requires 1 SMA to R-TNC cable (not included)
IPJ-A1000-xxx	Far Field LHP Antenna EU1 ETSI USA FCC	The Far-Field circularly polarized panel antenna by Laird is ideal for applications that need to read tags at a longer distance, typically more than 1.5 feet. Common far field applications include pallet tracking, real-time inventory management, asset management, conveyor systems, and supply chain visibility. Features an integrated 2.4 m pigtail cable. Left hand circularly polarized (LHP) version.
IPJ-A1001-xxx	Far Field RHP Antenna EU1 ETSI USA FCC	The Far-Field circularly polarized panel antenna by Laird is ideal for applications that need to read tags at a longer distance, typically more than 1.5 feet. Common far field applications include pallet tracking, real-time inventory management, asset management, conveyor systems, and supply chain visibility. Features an integrated 2.4 m pigtail cable. Right hand circularly polarized (RHP) version.
IPJ-A1100-xxx	Slim Outdoor Antenna EU1 ETSI USA FCC	The Slim Outdoor antenna by Times-7 is a thin, powerful, long-read range RAIN RFID antenna rated for permanent outdoor and industrial use. Requires 1 SMA to R-TNC cable (not included)
IPJ-A1200-xxx	Compact Outdoor Antenna EU1 ETSI USA FCC	The Compact Outdoor antenna by Times-7 is rated for outdoor and industrial use and designed for a wide range of RAIN RFID applications requiring a long-read range and compact size. Requires 1 SMA to R-TNC cable (not included)
IPJ-A300x-000	Antenna Cable 2 2 meters 4 4 meters 8 8 meters	RG58, SMA male to R-TNC male
IPJ-A311x-000	Antenna Cable 2 2.1 meters 4 4.6 meters	Low Loss/High Flex, SMA male to R-TNC male
IPJ-A312x-000	Antenna Cable 2 2.1 meters 4 4.6 meters	Low Loss/High Flex, SMA male to SMA male

## 6 IMPINJ FIXED READER COMPARISON

Table 15: Impinj Fixed Reader Comparison

FEATURE	IMPINJ R700	SPEEDWAY R420	SPEEDWAY R220	SPEEDWAY R120
Antenna Ports	4	4	2	1
Maximum Read Zones	32	32	2	8 (with port pack)
Reads Per Second	1100	1100	200	200
Maximum Transmit Power (dBm)	33	32.5	32.5	30
Receive Sensitivity (dBm)	-92	-84	-84	-84
Processor Speed	1 GHz (dual-core)	400 MHz (single core)	400 MHz (single core)	400 MHz (single core)
Random Access Memory (MB)	1024	256	256	256
Custom Application Partition (MB)	128	32	32	32
Autopilot Reader Modes	yes	yes	yes	yes
USB Peripheral Slots	3	1	1	1
GPIO Block	Integrated	Accessory	Accessory	Accessory
Ethernet Network Speed	10/100/1000	10/100	10/100	10/100
Power Over Ethernet Support	PoE/PoE+	PoE EU2: PoE+	PoE	PoE

## 7 NOTICES

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