THINGMAGIC NANO Q&A

Q. What is the manufacturing process for the Nano?

JADAK's manufacturing process allows us to maintain high quality standards at high volume levels. Every module is individually tested and calibrated to ensure maximum performance and minimal variation from module to module. This is critical for many applications. For example, in printing applications the sensitivity variation between tag models is so great that establishing ideal transmit levels would be nearly impossible if module-to-module variation was factored in as well.

Q. What is the DC voltage range for the Nano?

The permitted DC Voltage range is 3.3 to 5.5 V. If the DC input voltage drops below 3 V, protection circuitry will shut it down completely to prevent memory corruption due to “brown-out” conditions. This makes it especially good for battery-powered devices.

Q. What is the temperature range of the Nano?

The operating temperature range is -20 C to +60 C. The module firmware continuously monitors its internal temperature and will not let it transmit if the temperature might damage the module.

Q. How is the tag read rate determined?

Our modules operate at speeds that are close to the limits of the Gen2 protocol. We create a test environment that determines the limits of the module independent of the limits of the Gen2 protocol. Testing read speed with large populations of tags does not test the limits of the module because, according to the rules of the Gen2 protocol, the reader offers far more opportunities for tags to respond than tags will actually take advantage of. Therefore, it is more efficient to induce a single tag to respond at every opportunity rather than have a large population of tags contend for chances to respond. A single tag does not normally respond at every opportunity – it responds then goes silent to give other tags a chance to respond. However, we have created special settings in our modules that disable this delay mechanism and cause one tag to respond as quickly as its circuitry allows. This is how we measure reading speeds at over 750 tags per second. As a comparison, the same module will read a population of hundreds of tags at around 500 tags per second with Gen2 protocol constraints.

Q. What is the typical battery exchange cycle?

Battery consumption is 1.6 to 3.7 W when transmitting, and 0.02 W when ready to transmit.

To that, we can add 0.00025 W when shut down completely via a TTL control line.

Using the first two figures and an estimate of your duty cycle (active reading time vs. idle time), you can calculate your average power consumption when the module is active. Average the time the module is turned off and you can determine your average power consumption for the life of the battery.

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Q. Do you have a Development Board for the Nano?

Yes, there is a DevKit for ThingMagic Nano.

Q. Do the readers work at full power in Japan and China regulatory regions?

Yes. We have installed special circuitry in the module to allow the modules to pass Chinese and Japanese regulations at the maximum RF power output levels allowed.

Q. What is the largest/best PCB integrated antenna recommended for an all in one on board mounted solution?

This depends on your application. If a linear omni-directional antenna will work for you, a simple folded dipole antenna may provide the needed performance. This is similar to what was used in our USB-Plus reader, which typically reads tags to 1 meter at +23 dBm output levels. Circularly-polarized antennas tend to be a bit larger. If your application permits them to radiate both upwards and downwards, they can be built into a PC board. If they can only radiate in one direction, you will need some thickness to the antenna. The most common solution uses a ceramic material to raise the radiating element above the board.

Q. How about moving UHF RFID? Is there a speed limit for reading?

You can approximate the time the tag needs to be in the field by taking the inverse of the published read speed. For example, a 200 tag-per-second reader would need at least 5 msec to read one tag. If you conservatively use the beam-width of your antenna to estimate to the length of your read field, you can calculate the distance that the tag will be in the read field while traveling through it. Dividing this length by the read time will give you a good estimate of your maximum tag speed.

Q. What is typical battery life at maximum read rate and distance?

Use the method discussed above to determine your average long-term power consumption and convert this to current at the typical output voltage for the battery. If you already have a battery in your system, look at its “mA-h” rating. This tells you the trade-off between current consumption at its typical output Voltage and hours of operation. This will allow you to calculate the battery life when it starts out fully charged. If you are designing a system, determine the number of hours of operation you need, and calculate in reverse to determine the battery capacity needed.

Q. Do you need a heat sink for Nano?

As with all UHF RFID modules, the Nano generates heat when transmitting. The Nano module transfers its internal heat to its bottom surface and to the ground pads around its circumference, where it is then transferred to the ground plane of the PC board it is soldered to. You may not need any more heat sinking than this, but that depends on the RF transmit level, the average time spent transmitting, and the maximum ambient temperature that the assembly will experience.

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Q. What is the reader sensitivity in dBm?

Receiver sensitivity is approximately -60 dBm. The exact value depends on the specific operational settings in use, including region of operation and encoding settings.

Q. What would be the max distance of the Nano with a 9 dbi antenna?

It depends on whether the antenna gain is 9 dBiC or 9 dBiL. Virtually all tags on the market have linear antennas, so you must subtract as much as 3 dB from the circularly polarized gain of an antenna to give the effective gain that can be received by a tag. A 9 dBiC antenna has approximately 6 dBi of linear gain. With this antenna, you would be able to read a typical "squiggle" tag at around 5 meters. Not many applications will use such a large antenna with the Nano (those antennas are typically about 300 cm on a side). Using a much smaller antenna that would fit into a hand-held device, you will be able to read 2 to 3 meters.

Q. On the same piece of reader hardware, is it user configurable for various regional regulatory requirements (its frequency band)? Is the Nano reader globally certified?

Yes, it can be configured to operate within the permitted frequency band of all countries, worldwide. We have obtained modular certification for the US and Canada, so your equipment will be automatically certified for countries that have adopted US and Canadian standards. Countries that follow the EU standards require you to produce a declaration of compliance backed by test data, which is available for the Nano. Other countries have their own requirements and require that the entire unit, not just the module, be approved. Again we can provide test data for the module that will make it easier for you to obtain the certification you need for your RFID reader or printer.

ABOUT JADAK:

JADAK, a business unit of Novanta, is a market leader in machine vision, RFID, barcode, printing, and color and light measurement products and services for original equipment manufacturers. The company designs and manufactures embedded detection and analysis solutions that help customers solve unique inspection, tracking, scanning and documenting challenges. The company is ISO 9001 and ISO 13485 registered.

Novanta is a trusted technology partner to OEMs in the medical and advanced industrial technology markets, with deep proprietary expertise in photonics, vision and precision motion technologies.

ThingMagic is JADAK's RFID product line.

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