

Overview

This compact module is excellent for converting wireless power to a measurable and stable DC voltage. Operating over a wide range of frequencies, it can harvest wireless energy from 60Hz to 6GHz. When connected to an antenna, the module can extract power from wireless sources or be used as a sensor for low power wireless signals. The RFD102A performs best in the 0.1GHz...2.5GHz range.

Please note that the standalone RFD102A module is available in limited quantities as of November 2019 and should not be used for new high volume designs as a standalone part. The RFD102A-DET (detector), RFD102A-TB (test board) and the RFD-ASSY-01 (4-way divider/combiner w/ solar engine) will continue to be sold after our inventory of RFD102A's has been sold out.

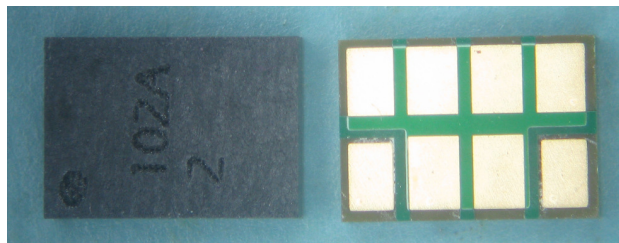


Figure 1. RFD102A 5mm x 7mm x 1.8mm wireless energy harvesting module.

Electrical Properties

Standard V output @ 915 MHz into 1MOHM

-13 dBm	0.4 V
0 dBm	2.9 V
10 dBm	10.4 V
20 dBm	30.0 V
30 dBm	34.0 V

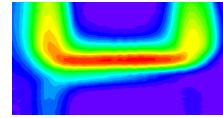
Operational Frequency Range

60Hz to 6GHz

RFD102A

Wireless Energy Harvesting Module

5 x 7 x 1.8 mm RF to DC converter



RF Diagnostics, LLC

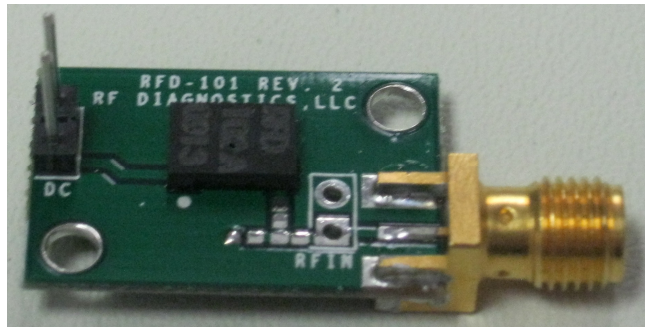
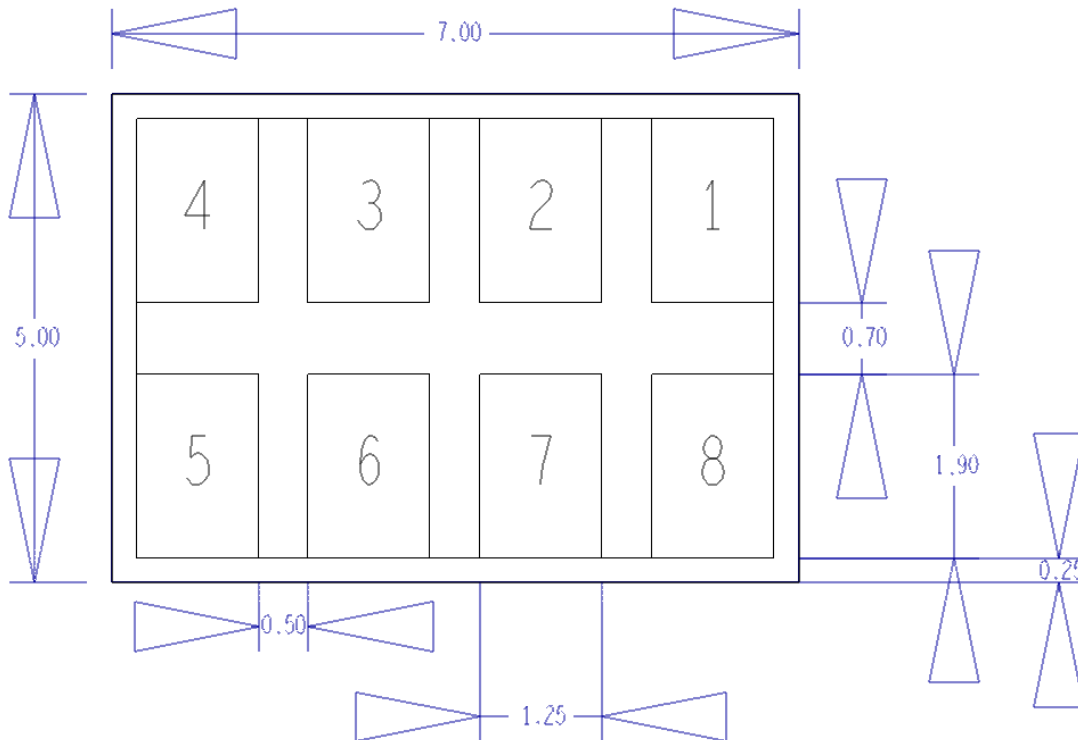


Figure 2. RFD102A-TB evaluation board with impedance matching sites on RFIN and optional 2-pin header connection for a through hole antenna connection.

Pin-out and Schematic



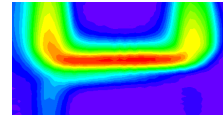
Footprint of the module viewed from the top of the module (X-ray, pads on bottom)

Dimensions in mm

RFD102A

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Pin 1	Pin 4	Pins 2, 3, 5 - 8
DC Output	RF Input	Ground

Module thickness is 1.8 mm max.

Additional Technical Information

Maximum Ratings and Output Voltage Protection

The RFD102A includes the following features:

- ESD protection for 8 kV pulse protection on the RF input line
- +/-10V maximum on the RF input line.
- +33dBm maximum RF input power on the RF input pin.
- An external Zener diode is recommended for use with the RFD102A to avoid device failure.
- -0.5V/+40V maximum on the DC output pin.
- Maximum output current is 18mA.
- Exceeding the above limits can cause partial or permanent module damage.

Other Comments

The recommended load on the DC output is 1-10kOhms for maximally efficient power transfer. Some input impedance tuning is needed to optimize the design for a specific frequency. The module is capable of producing a maximum of 18mA DC current into a 50-Ohm load however this is under a stressed condition. A better design target is between 1mA...10mA for an energy harvesting system.

S-parameters of the RFD102A-TB are available upon request at different input powers from -10dBm up to +10dBm. Some matching may be required to achieve the best results. The user needs to decide between matching to improve sensitivity at low input powers and matching to improve power transfer at high input powers since this is a nonlinear device. Matching should be performed experimentally to determine the best configuration. The RFD102A-TB has various 0402 surface mount locations

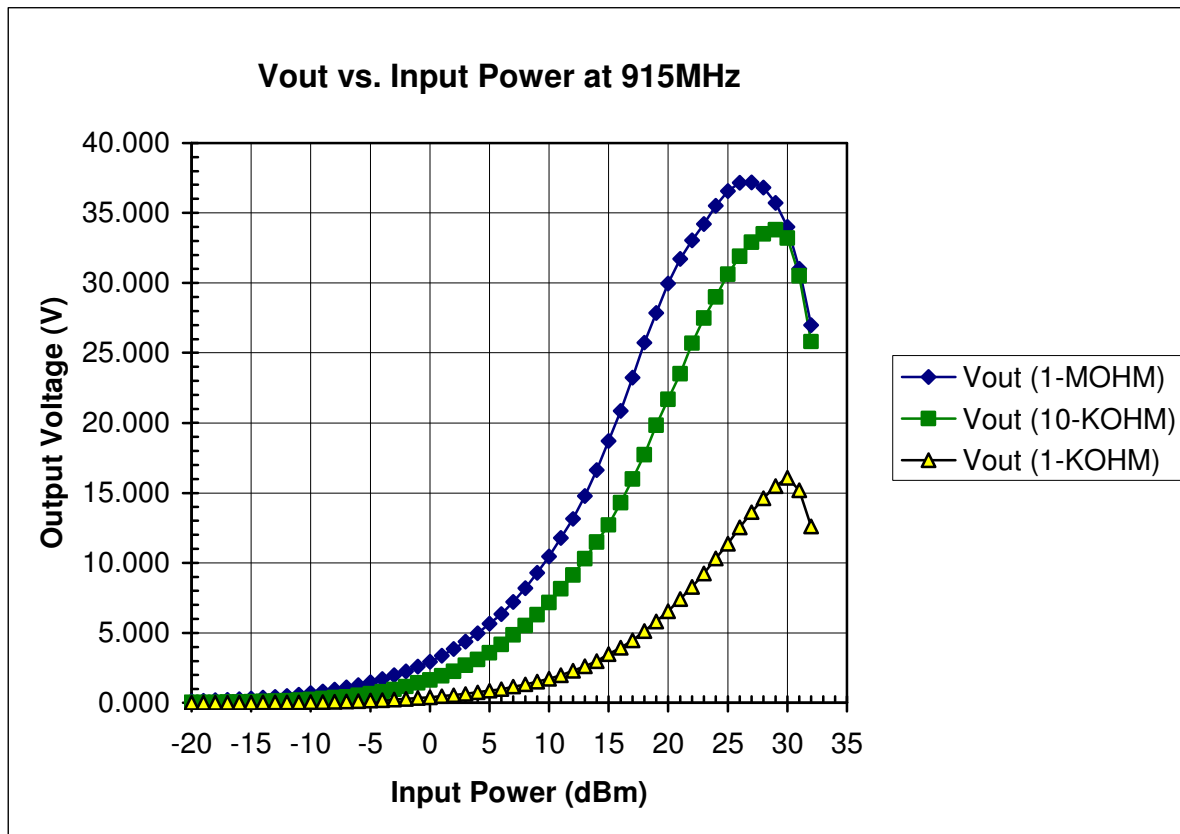
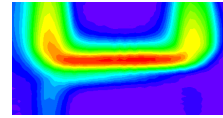


Figure 3. DC output vs. RF input power for the RFD102A-TB into a 1MOHM, 10KOHM and 1KOHM load at 915MHz.

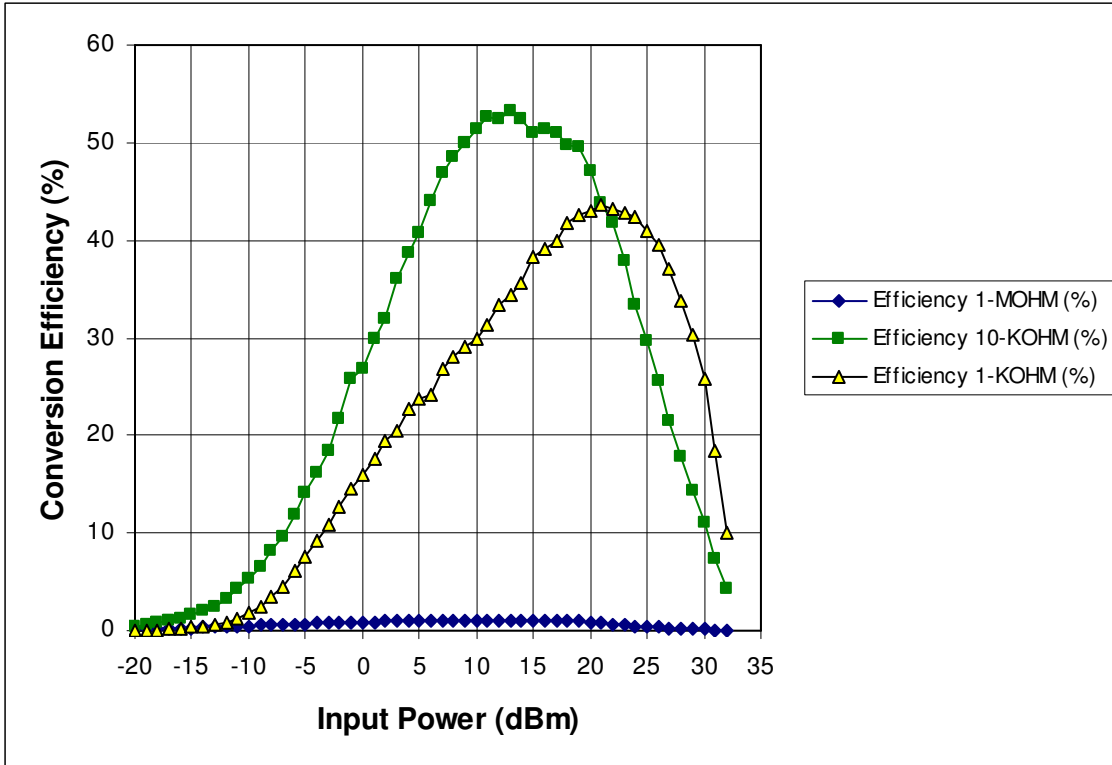
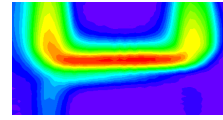


Figure 4. RF to DC conversion efficiency ($100 \times P_{out_DC}/P_{in_RF}$) vs. RF input power for the RFD102A-TB into 1MOHM, 10KOHM and 1KOHM loads at 915MHz.

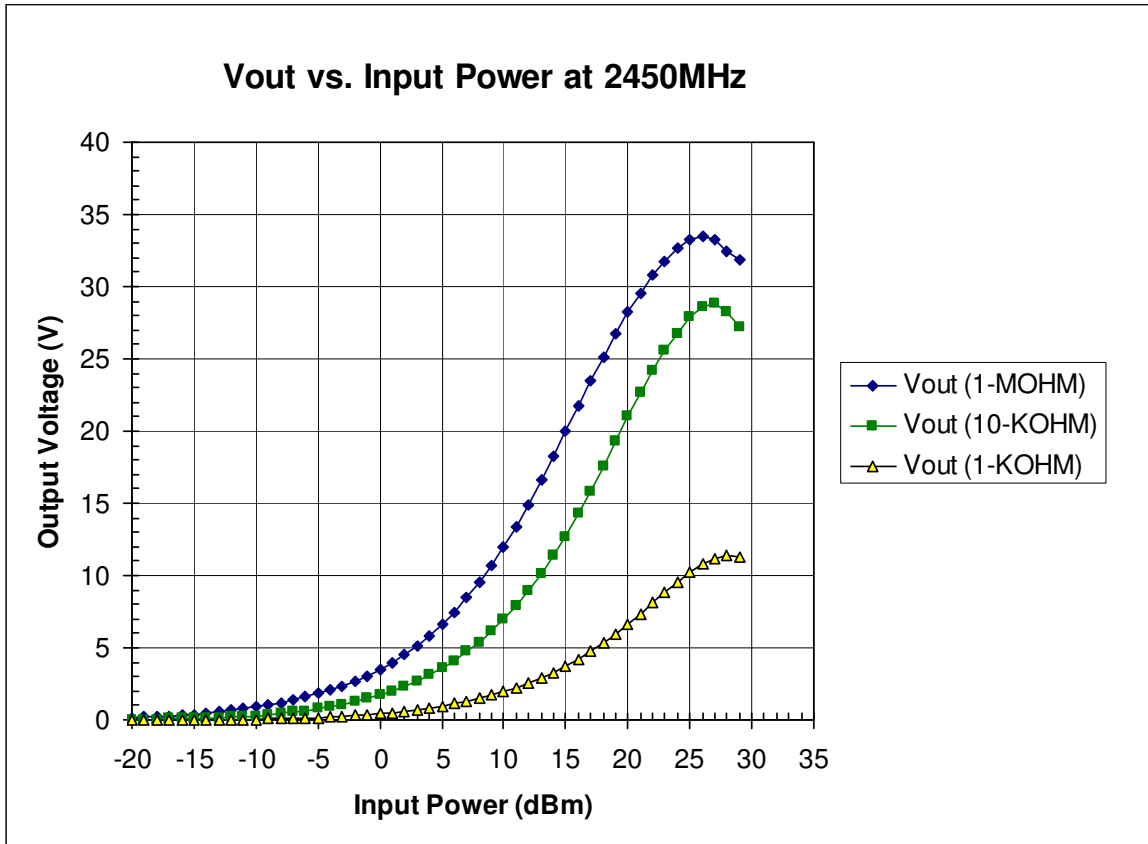
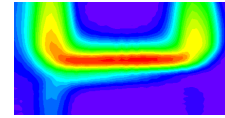


Figure 5. DC output vs. RF input power for the RFD102A-TB into a 1MOHM, 10KOHM and 1KOHM load at 2450MHz.

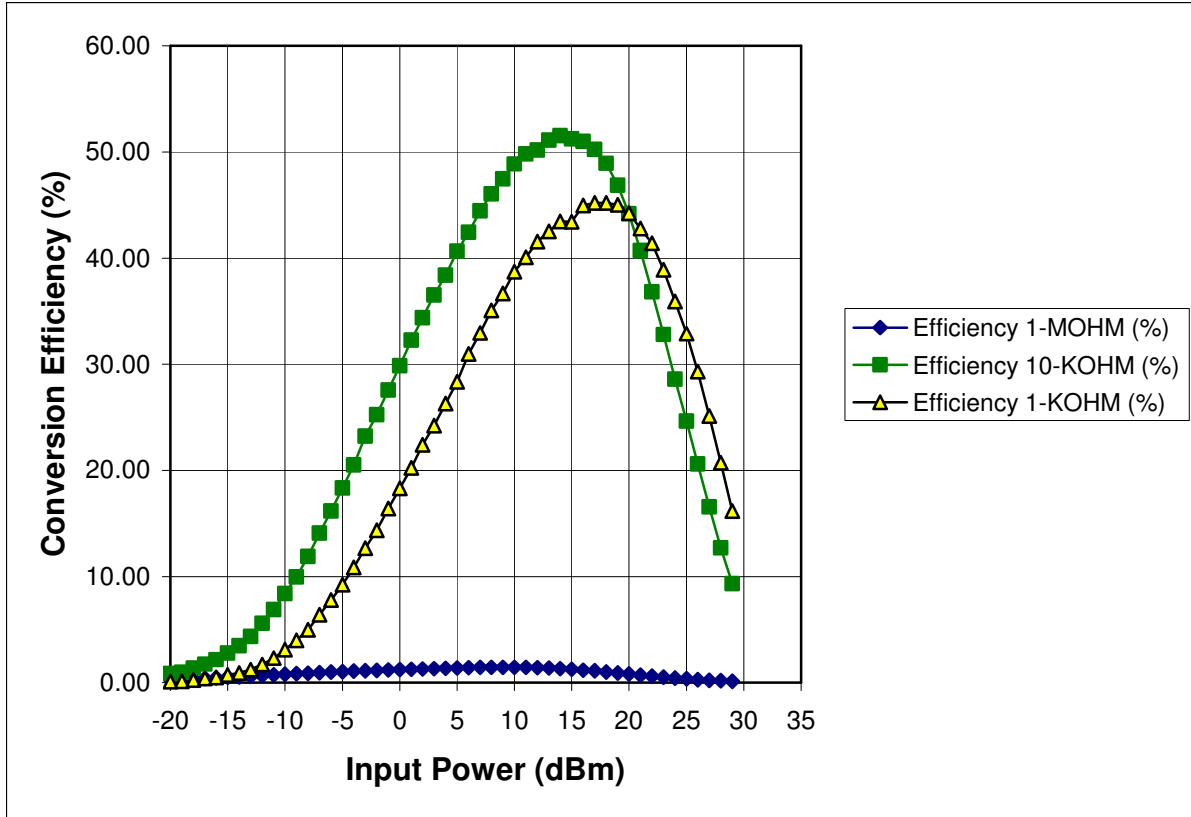
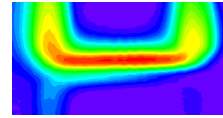


Figure 6. RF to DC conversion efficiency ($100 \times P_{out_DC}/P_{in_RF}$) vs. RF input power for the RFD102A-TB into 1MOHM, 10KOHM and 1KOHM loads at 2450MHz.

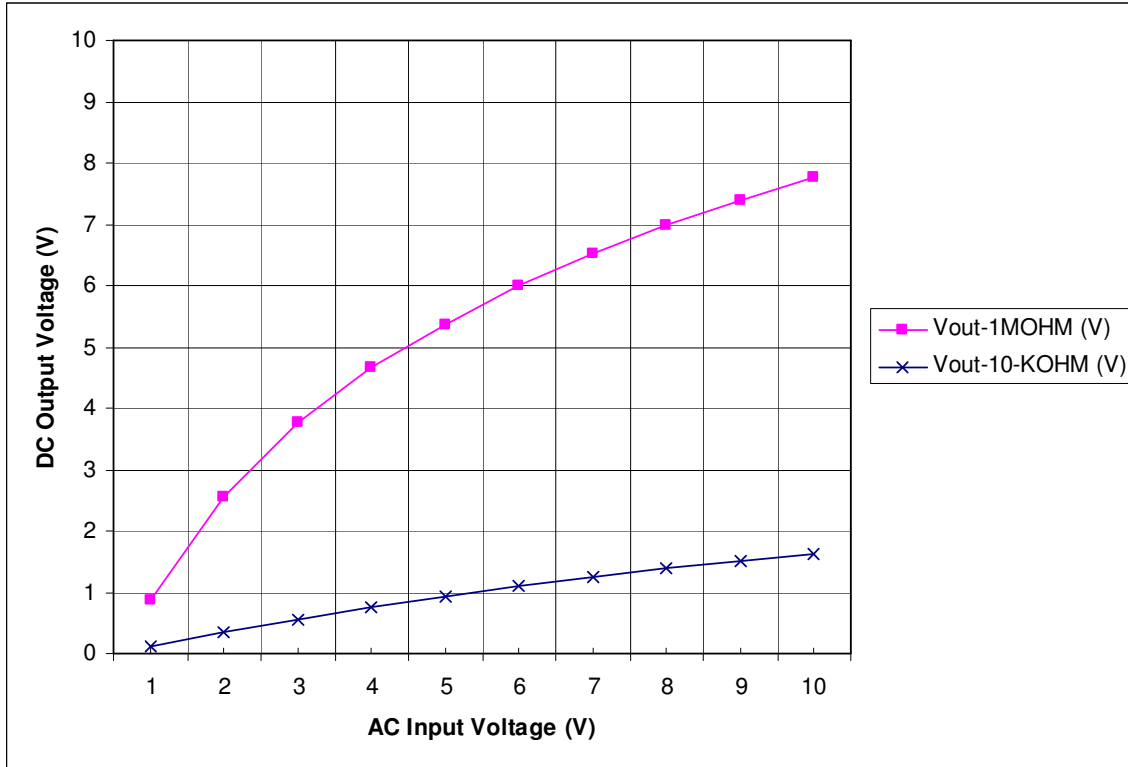
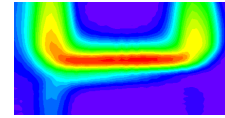


Figure 7. DC output voltage vs. AC input voltage at 60Hz into a 1MOHM and a 10KOHM load.

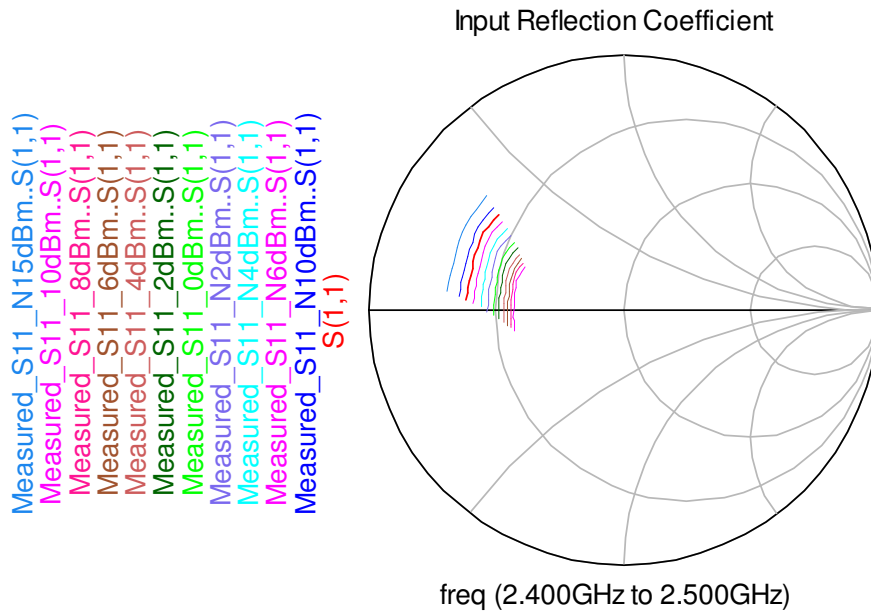


Figure 8. RFD102A-TB S11 from 2.4-2.5GHz at various input powers from -15dBm to +10dBm. A full S-parameter zip file up to 6GHz is available for download.

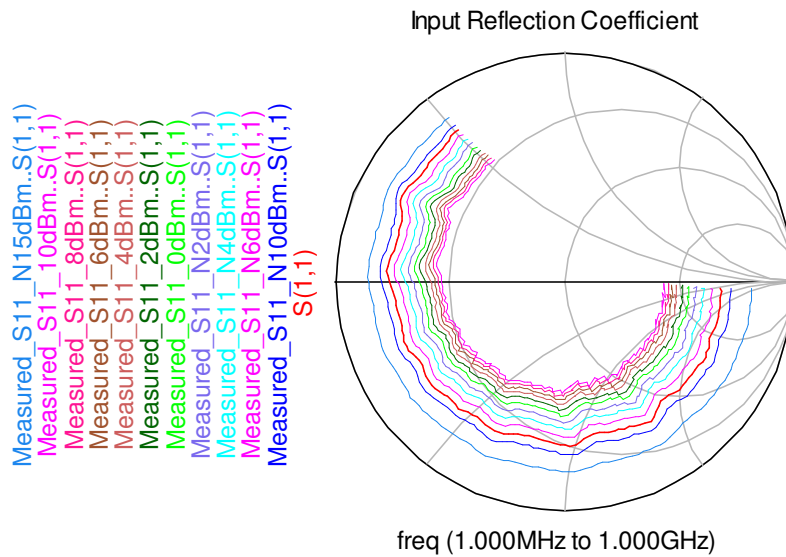
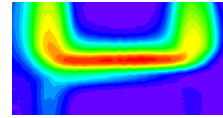


Figure 9. RFD102A-TB S11 from 1MHz...1GHz at various input powers from -15dBm to +10dBm.

Disclaimer

This module is guaranteed to be defect free upon shipment. However the module is not intended for use in critical applications such as medical devices, automotive safety, or anywhere else where poor performance can result in injury, loss of life or property. The user agrees to assume all risks arising from use of the module and releases RF Diagnostics from all liability for its malfunction or misuse. Specifications listed on datasheets are subject to change without notice.

Datasheet Revision: 11-11-2019