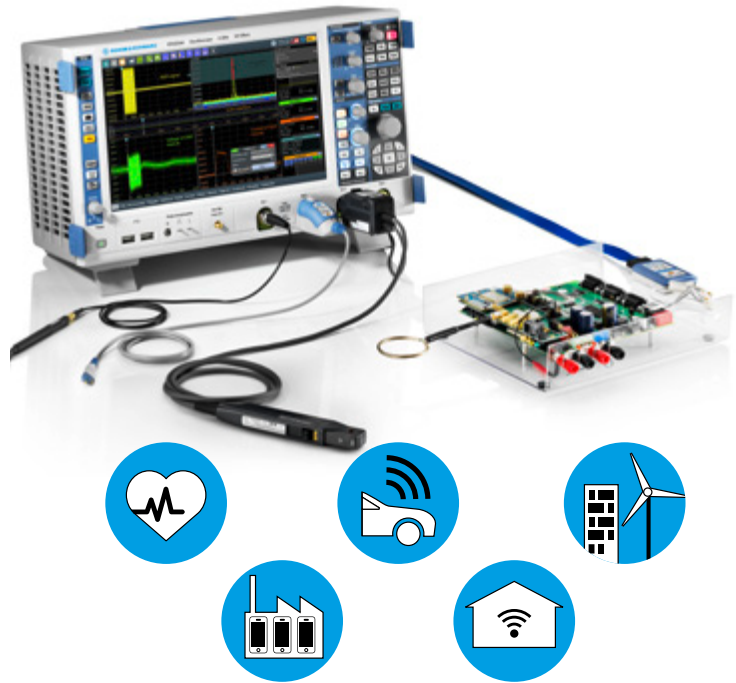


# Testing IoT designs with the R&S® RT02000

## Focus RF Signal Analysis

The need for Internet of Things (IoT) solutions can arise fast. In most cases, wireless communications modules are added to an embedded design. When designing and debugging IoT systems, many different measurements need to be performed. Since developers are very familiar with using an oscilloscope for voltage and time measurements, they also want to use it to for all other necessary measurements. And now they can – with the R&S® RT02000 multi-domain oscilloscope.



### Typical measurement tasks during the development of wireless embedded IoT systems that can be accomplished with Rohde & Schwarz digital oscilloscope solutions

Task	Need	Product feature
Validation of power management	<ul style="list-style-type: none"> <li>Measure small currents</li> <li>Verify power integrity</li> </ul>	<ul style="list-style-type: none"> <li>Up to 16-bit resolution, 500 <math>\mu\text{V}/\text{div}</math> vertical scale</li> <li>High acquisition rate of 1 million waveforms/s</li> <li>Fast FFT analysis, from DC</li> <li>High-sensitivity current probe, 1:1 passive probe</li> </ul>
Chipset interconnection testing	<ul style="list-style-type: none"> <li>Trigger and decode serial protocols</li> <li>Measure bus timing on parallel buses</li> </ul>	<ul style="list-style-type: none"> <li>Serial triggering and decoding options for up to 17 protocols, including custom decoding (NRZ/Manchester protocols)</li> <li>MSO option with 5 Gsample/s, 16 channels and up to 200 000 waveforms/s</li> </ul>
Testing of wireless modules	<ul style="list-style-type: none"> <li>Capture transmission bursts</li> <li>Check signal quality</li> </ul>	<ul style="list-style-type: none"> <li>Full bandwidth down to 1 mV/div</li> <li>Fast FFT and mask test in frequency domain</li> <li>Zone trigger option</li> <li>Signal analysis with R&amp;S®VSE vector signal explorer software</li> </ul>
Validation of overall system	<ul style="list-style-type: none"> <li>Trigger and decode serial protocols</li> <li>Correlate device activity at various interfaces and the power supply</li> </ul>	<ul style="list-style-type: none"> <li>Time-correlated view of analog signals, decoded serial and parallel buses, signal spectrum</li> <li>Segmented memory and history mode</li> </ul>
EMI debugging	<ul style="list-style-type: none"> <li>Identify EMI sources on the PCB</li> <li>Precompliance testing against EMI standard</li> </ul>	<ul style="list-style-type: none"> <li>Fast FFT with spectrogram option</li> <li>Log scale and mask for EMI precompliance measurements against EMI standards</li> </ul>

## Measurement examples

### Analysis of a wireless module's data capture, processing and communications timing

The upper screenshot displays an IoT module's GSM connection time-correlated to power consumption and data traffic on the modem interface. The RF and power supply voltage and current are measured on the analog channels. The digital channels acquire the module's modem interface communications via UART and decode the protocol. The spectrum of the GSM bursts is shown on the top right.



Timing analysis of data capture, processing and communication of a wireless module.

### Analysis of the wireless signal

The optional R&S®VSE vector signal explorer base software can load I/Q data acquired in real time from the R&S®RTO with the R&S®RTO-K11 option and provide extensive analysis. The base version of the R&S®VSE software provides magnitude, spectrum, statistics and I/Q vector analysis. The lower screenshot shows a GSM based magnitude, power versus time (PVT) measurement and the modulation spectrum. In addition there is a table view of the modulation accuracy and the modulation spectrum.



Analysis of a GSM signal with the R&S®VSE vector signal explorer software.

## Suggested configuration

The following table shows a suggested configuration for IoT measurements. This configuration can be extended depending on your needs, e.g. by adding custom decoding for NRZ/Manchester protocols, I/Q acquisition and vector analysis software, even after the initial purchase. A broad portfolio of active and current probes is also available.

Designation	Type	Order No.
Digital Oscilloscope, 2 channels, 3 GHz bandwidth, 10 Gsample/s sampling rate per channel, 50 Msample sampling memory per channel I/Q Software Interface	R&S®RTO2032	1329.7002.32
License dongle, for software licenses for PC software	R&S®RTO-K11	1329.7360.02
Vector Signal Explorer Base Software	R&S®FSPC	1310.0002.03
GSM Measurement Application, GSM, EDGE, EDGE Evolution and VAMOS	R&S®VSE	1320.7500.06
	R&S®VSE-K10	1320.7574.02

### Rohde & Schwarz GmbH & Co. KG

Europe, Africa, Middle East | +49 89 4129 12345  
 North America | 1 888 TEST RSA (1 888 837 87 72)  
 Latin America | +1 410 910 79 88  
 Asia Pacific | +65 65 13 04 88  
 China | +86 800 810 82 28 | +86 400 650 58 96  
 www.rohde-schwarz.com  
 customersupport@rohde-schwarz.com

R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG  
 Trade names are trademarks of the owners  
 PD 3607.6267.92 | Version 01.00 | October 2016 (as)  
 R&S®RTO2000; Testing IoT designs with the R&S®RTO2000  
 Data without tolerance limits is not binding | Subject to change  
 © 2016 Rohde & Schwarz GmbH & Co. KG | 81671 Munich, Germany



3607626792