



Power Tracer

Low-noise transparent card reader for SPA/DPA side channel power measurements with precise triggering capabilities.

Introduction

Using top end low-noise and high bandwidth analogue components that are electrically isolated from digital circuitry, the device provides output with an excellent signal-to-noise ratio. The capacitors inside the Power Tracer are pre-charged to power the smart card during each single measurement to avoid any external noise in the circuit. Power Tracer measures power consumption without measurement resistance in the power chain for stable card voltage and maximum signal bandwidth.

The device further includes a smart card reader, a hardware based trigger, and software-controlled smart card supply voltage, power signal gain and offset.

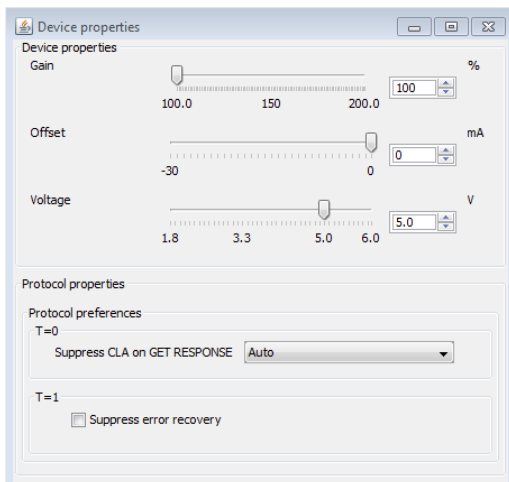
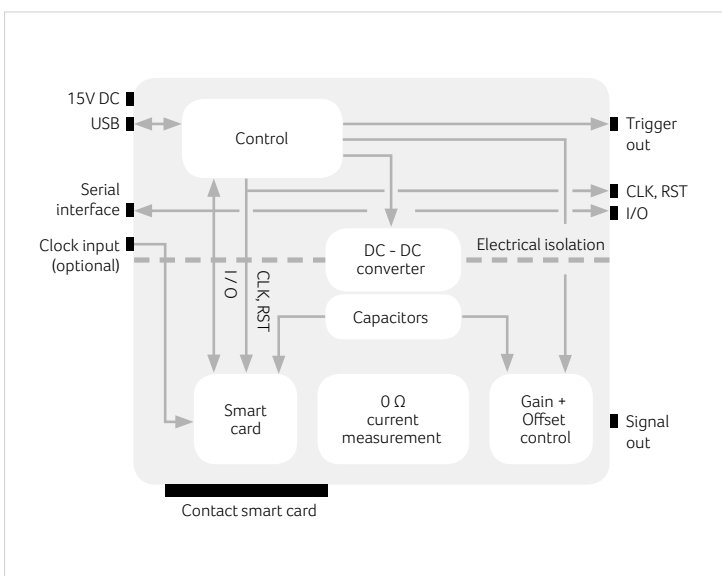


Figure 1
Configuration window of the Power Tracer



Conceptual overview of the Power Tracer

Key features

- High quality power signal with configurable gain and offset
- Configurable card voltage
- Configurable delay before trigger pulse
- Internal and external clock
- Buffered 'soft' clock signal for smart card
- Serial interface externally available (e.g. to monitor smart card I/O or to control embedded devices)
- Compatible to operate with the EM Probe Station and icWaves

How to use Power Tracer?

The user configures and acquires power traces using Power Tracer in the steps below:

1. Select one of the acquisition modules included in Inspector SCA or use them as a reference for further development. The built-in modules are excellent examples for developing specific-purpose acquisition modules for communicating with cards under test.
2. Configure parameters for acquisition and Power Tracer (Figure 1).
3. Acquire power traces. Inspector enables the user to fine-tune the software controlled power signal gain and offset while acquiring traces in a test run. This minimizes the influence of the oscilloscope's quantification noise.

Inspector integration

Inspector SCA software controls the Power Tracer for side channel analysis. The Power Tracer can be extended with Riscure's EM Probe Station. Using this product, EM measurements can be made of contact smart cards inserted in the Power Tracer.

Technical specifications

The Power Tracer 4 meets the following specifications:

- Internal oscillator for smart card clock input
 - Software configurable frequency 1 – 10MHz
 - Clock signal softened and buffered for smart card
- Current measurement circuit for 'signal' output
 - Amplifier
 - Low noise (26pA/vHz@1MHz)
 - High bandwidth (-3dB@1.5GHz)
 - Virtually zero-ohms for high bandwidth
 - Isolated electrically from digital control circuit for low-noise signal
 - Fed by capacitors during measurement for low-noise signal
 - Software configurable gain (100%-200%)
 - Software configurable offset ($\pm 2V$ offset (@50 Ohms))
 - Software configurable smart card voltage (1.8 – 6V)
- BNC output connectors
 - Trigger, digital output signal (TTL-levels).
1 μs trigger delay resolution
 - Clock, digital output signal (TTL-levels)
 - Reset, buffered analog output signal from smart card RESET pad
 - IO, buffered analog output signal from smart card IO pad
 - Signal, analog output signal proportional to smart card supply current
 - 50 Ω output impedance
 - Output range $\pm 4V$ for 1M Ω oscilloscope input impedance
 - Output range $\pm 2V$ for 50 Ω oscilloscope input impedance
- USB connector
 - USB 2.0 connection to PC
- PS2 connector
 - 3 pins for RS-232 (RS-232 signal levels)
 - 3 pins for GND, +12V, -12V power supply to e.g. Riscure EM probe



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