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Real-Time Current Monitor with USB Interface

Product Overview – ee203

- View current consumption graphically in real-time on any oscilloscope
- 6 decades of current range 1uA – 1A
- Wide system voltage range 1.5V – 5.5V
- USB interface for calibration, control, and data logging
- Affordable for any lab

Designed for developers of low-power and embedded systems, the Real-Time Current Monitor provides a graphical display of the current consumption of any system. Observe the behavior of your system as it comes out of a low-power sleep state of a few microamps and transitions through several power modes of various levels before returning to sleep. A single screen capture from the oscilloscope and/or a CSV data log file and you've just documented the complete power profile of your system.

A New Window into System Behavior

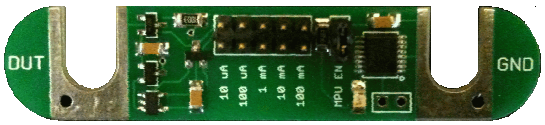
With hardware and software so intricately intertwined, a small coding error can have disastrous effects on your system power consumption. Delaying an accidental 10 ms instead of the intended 1 ms while your Wi-Fi transmitter powers up can easily transform a year of battery life into only a month.

Every microcontroller manufacturer has a note in their data sheets that inputs should not be allowed to float or they will oscillate and consume power. A simple software bug improperly initializing your I/O ports can make the difference between consuming microamps or milliamps.

Having the ability to observe the real-time power consumption of your system allows these and many other types of bugs to be easily discovered and corrected.

Simple to Use

Connect the red terminals in-line with the existing power supply to any system you would like to observe, connect the black terminal to ground, and the yellow terminal to an oscilloscope. Connect the USB port to a computer to power the unit and enable additional functionality You can now view the current flowing to your system as it operates, completely correlated with any other signals of interest that you are monitoring on your oscilloscope.



Demo Board

The Real-Time Current Monitor Demo Board can be used to explore the functionality of your Real-Time Current Monitor, to verify its proper operation, and to demonstrate the utility of seeing an MCU's power profile in real time. The Demo Board has a range of current sink options from 10 uA to 100 mA. There is also an MCU on board which is programmed to operate through several different power consumption profiles, ranging from 1 uA to 10 mA.

Real-Time Analysis

What you see on the scope is the current being consumed by your system at that moment. Watch as your system goes to sleep and currents drop to microamp levels, then monitor the wakeup sequence as internal logic units are switched on, clock frequencies are ramped up, and external peripherals such as a radio are turned on, driving current consumption into the range of 100's of milliamps.

No System Modifications Required

Whether your system is running from a battery, a lab power supply, or a wall wart, just run the supply through the red terminals. The wide voltage compliance range means that even if your system is battery powered and the supply voltage changes during operation the current readings are unaffected.

Six Order of Magnitude Range

Current consumption in battery powered and power-aware systems may span several orders of magnitude between sleep and active states. While it is possible to measure the power consumption of various modes in isolation, monitoring these state transitions in real time has historically been difficult and expensive. Now there is a simple, affordable product that makes this type of analysis readily accessible to everyone for debugging and system characterization as well as performance and power tuning.

New Model Enhancements

- Robust inputs can withstand up to 12V and are fused against accidental shorting.
- Power is computed in real-time as a function of input voltage x current.
- Current and power are continuously integrated.
- Current, voltage and power along with integrated current and power are sampled and can be recorded in Excel CSV format through the USB interface.
- Unit can be floated from ground if powered by a laptop or battery USB pack.
- Bandwidth is a flat 1Khz across the entire operating range.
- Linear and logarithmic display modes
- Unit self-calibrates for improved accuracy.

USB CSV data output stream

```
Time Stamp, Vscope,   Vsupply,  Current,   Power,    Cum Cur,  Cum Pwr
002:48.430, 3.00e+00, 3.28e+00, 1.00e-03, 3.29e-03,  168e-03,  553e-03
002:48.440, 3.00e+00, 3.29e+00, 1.00e-03, 3.30e-03,  169e-03,  553e-03
002:48.450, 3.00e+00, 3.29e+00, 1.00e-03, 3.29e-03,  169e-03,  554e-03
```

Technical Specifications

ABSOLUTE MAXIMUM RATINGS	MIN	TYP	MAX	Units
SUPPLY Voltage	0		12	V
DUT Current	0		2 [1]	A
NORMAL OPERATING RANGE (1.5V ≤ Vsupply ≤ 5.5V, 25°C - 50°C)				
SUPPLY Voltage	1.5		5.5	V
DUT Current	10^{-6}		10^{0}	A
SCOPE Output Voltage	0		6	V
Burden Voltage <= 1 mA			70[2]	mV
> 1 mA			250[2]	mV
Measurement Error	± 1 uA [3]		± 60 mV [4]	
Bandwidth	1000			Hz

[1] Input is fused at 2A
[2] Burden voltage will vary with input current
[3] RTI (Referred To Input) - DUT current
[4] RTO (Referred To Output) - SCOPE voltage output