NewAE Technology Inc.
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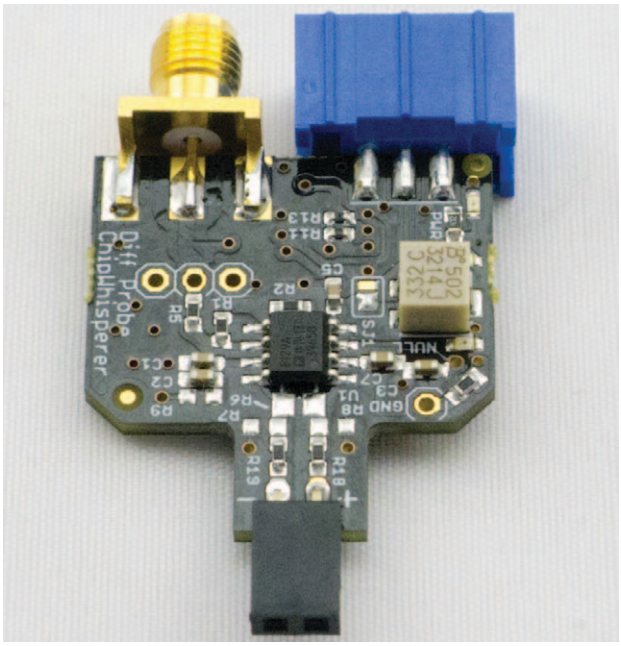
ChipWhisperer® Embedded Security Analysis Tools
Probes

Simple Differential Probe

Product Datasheet



The NAE-DIFFPROBE is a simple differential probe to reduce common-mode noise in shunt measurement applications.

Built on a commercial differential line driver, it provides improved performance over single-ended measurement at a fraction of the cost of traditional oscilloscope differential probes.

A small bias adjust compensates for constant differential voltage, as found due to the voltage drop on a shunt based on the static power consumption of a device.

Output LEDs indicate when the output is not centered around the half-way point of the input power suppliers, alerting you to a shift in the input conditions that will not be obvious if monitoring the probe output on AC-coupled systems.

Product Highlights

- Usable over 20 kHz - 200 MHz.
- Can be used down to DC with jumper change.
- 10x gain.
- Adjustable DC-offset null.
- LED feedback for null voltage setting.
- Based on AD8129 Differential Amplifier.
- Usable on both VCC and GND shunts.
- Can operate on VCC shunt with single-ended power supply, requires dual-ended supply for GND shunts.

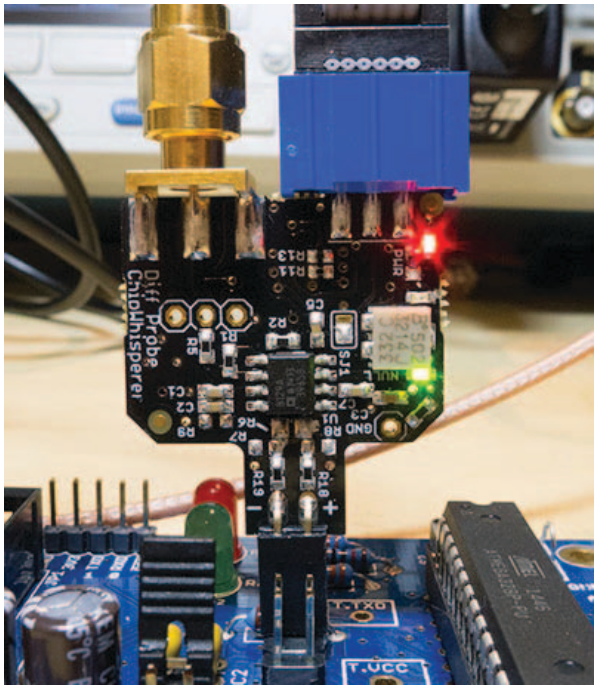
Ordering Summary

NAE-DIFFPROBE Differential Probe, requires power supply (such as CW503).

Product Links

Full Documentation https://wiki.newae.com/CW501_Differential_Probe

Probe Usage



The probe is typically used across a shunt resistor. The differential aspect is required to reject noise from the device power supply unrelated to the dynamic power consumption of the device under test.

This is especially useful when a shunt resistor is inserted into a real system, such as lifting a power pin of a TQFP device and inserting a shunt.

The probe also fits on most ChipWhisperer measurement targets including the CW305 and CW308. Note these targets already have a low-noise power supply and do not normally benefit from the differential probe, but instead the probe connection is provided to help understand the effect of the differential probe compared to single-ended probes in various noise environments.

Probe Power - General Notes

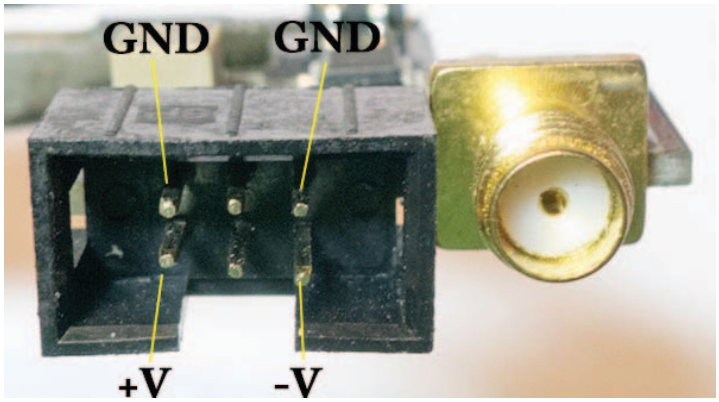
The supply voltages of the differential probe must be at least 2V above/below (for +V & -V respectively) the common mode voltage. The Probe Power Supply (CW503) provides a +/- 8V supply, allowing you to use the probe on any reasonable shunt inserted into VCC and GND.

If not using the CW503 probe power supply, ensure voltages are sufficient for your use. For example:

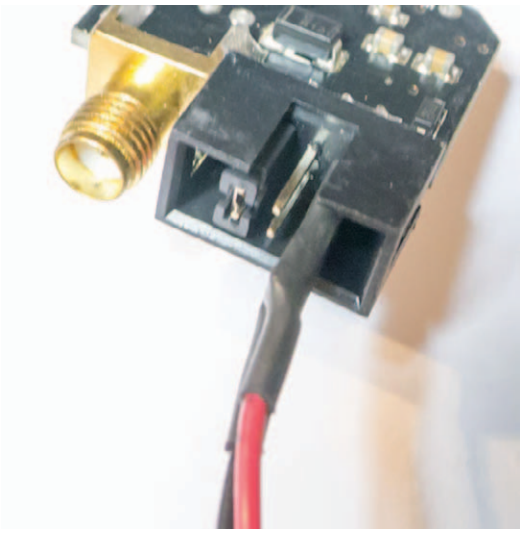
- If measuring the power across a shunt in the 3.3V rail, you should power the probe with at least +5V on the positive rail.

- If measuring the power across a shunt in the GND rail, you should power the probe with at least -2.25V on the negative rail, and +2.25V on the positive rail (the device requires 4.5V minimum between rails).

Be aware that if powering the probe via a single-ended supply (see below), you can only use the probe on a VCC shunt. The following shows the pinout of the 6-pin connector:



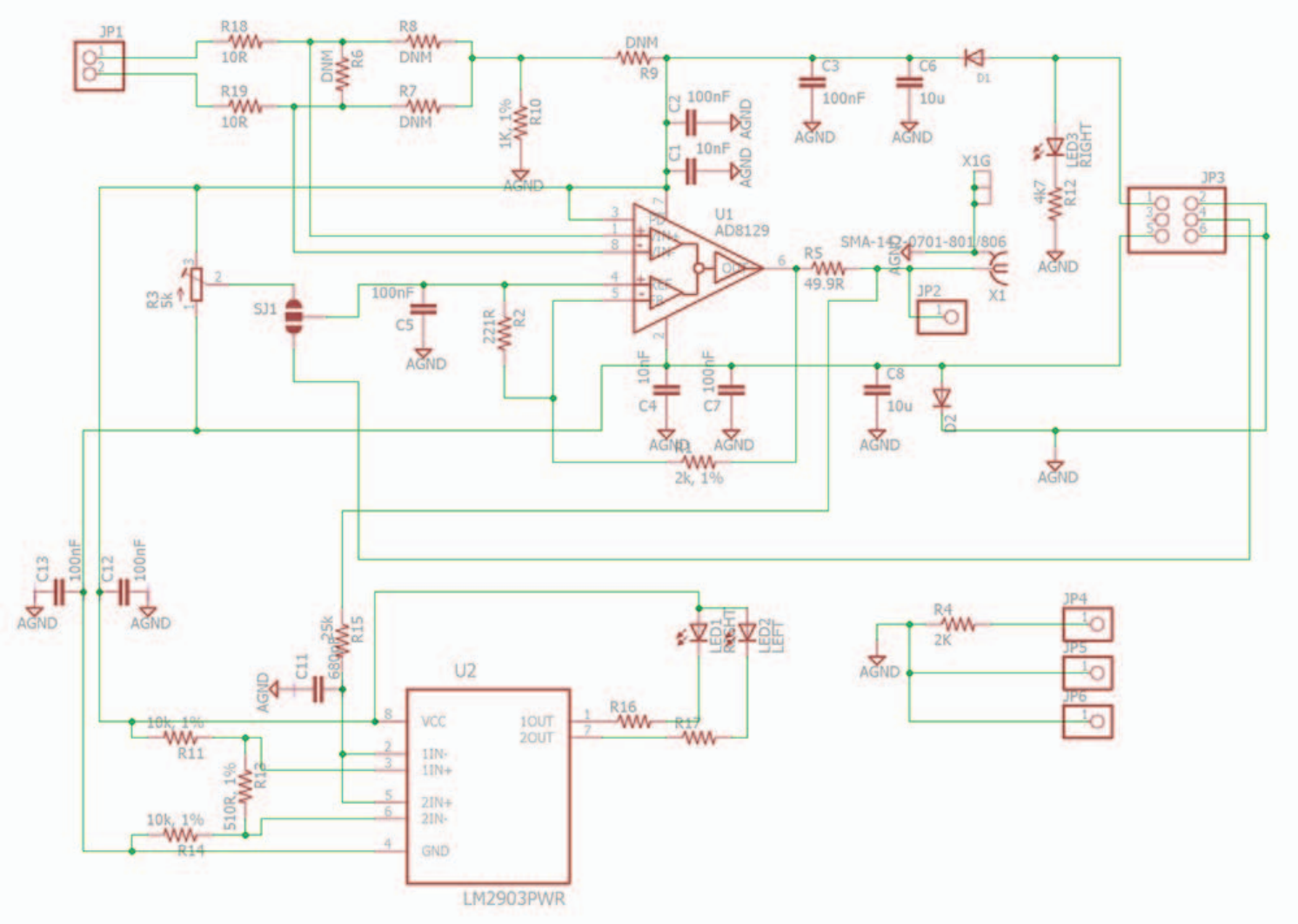
Probe Power - Single Ended



Using a single-ended supply means connecting the -V input to the GND pad. This is done via a jumper mounted as shown on the 6-pin connector on left.

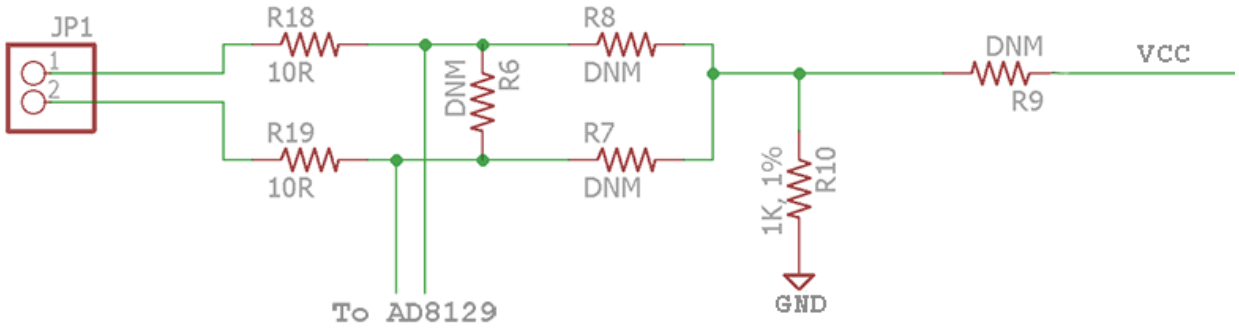
Note again the common-mode limits still apply. This means the common-mode voltage must be at least +2V since the -V supply is 0V. Thus you can only use the single-ended power supply for a VCC shunt.

Probe Schematic

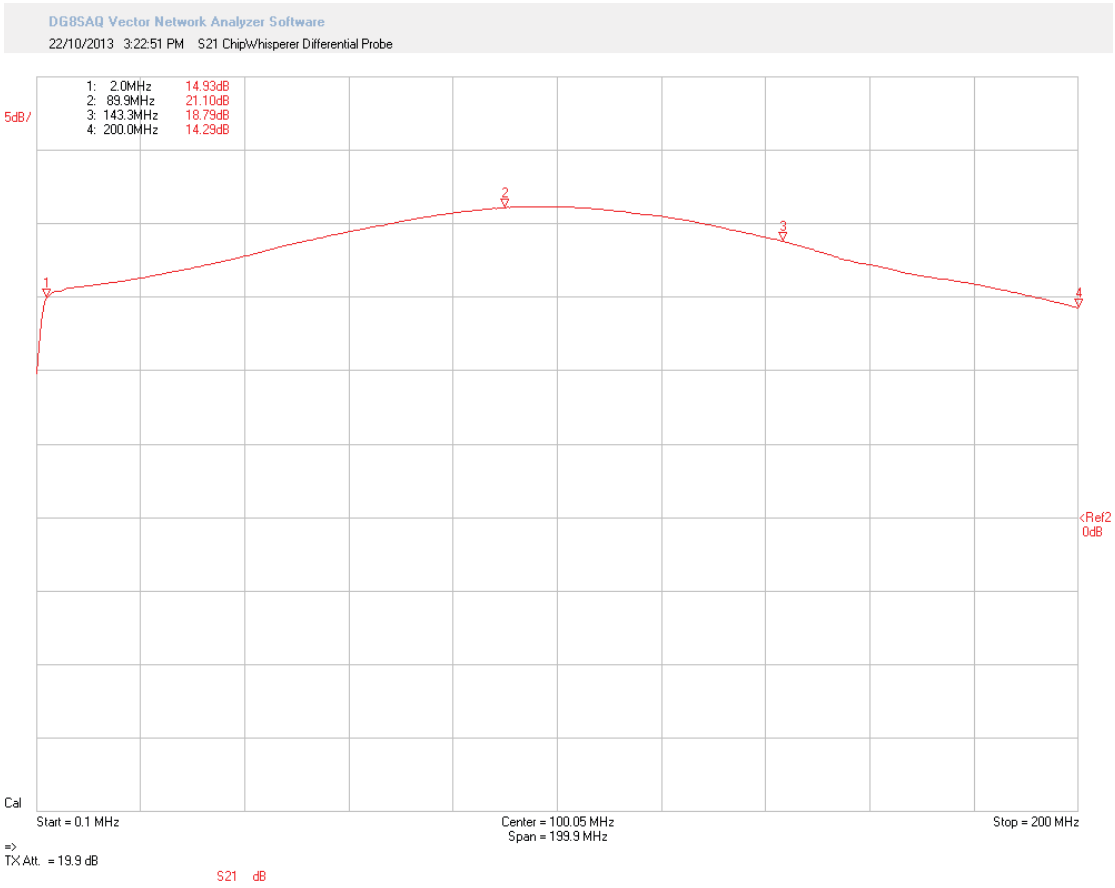


Input Options

Note there are a variety of additional input options. In particular R6 can be used as a shunt resistor if you wish to keep the measurement shunt on the probe itself.



Typical Bandwidth



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