

## MEMS Accelerometer Evaluation Quick Bench-top Evaluation of ICs and Electronic Components

Keysight B2900A Series of Precision Source/Measure Units facilitates quick DC evaluation of MEMS accelerometer.



B2912A (front view)

B2912A (rear view)

### DC evaluation of MEMS accelerometers

- MEMS (Micro-Electro-Mechanical System) accelerometers possess both electronic and mechanical specifications that need characterization, and this can require measurement under both static and dynamic conditions.
- Static evaluation requires measurements to be made under constant acceleration (such as gravity), while dynamic evaluation usually requires some mechanical apparatus to apply dynamic acceleration to the MEMS device.
- In addition to static and dynamic evaluation, simple electrical functional tests may also be needed in order to fully characterize device behavior.
- This one-pager outlines two DC measurement examples using an off-the-shelf MEMS accelerometer.

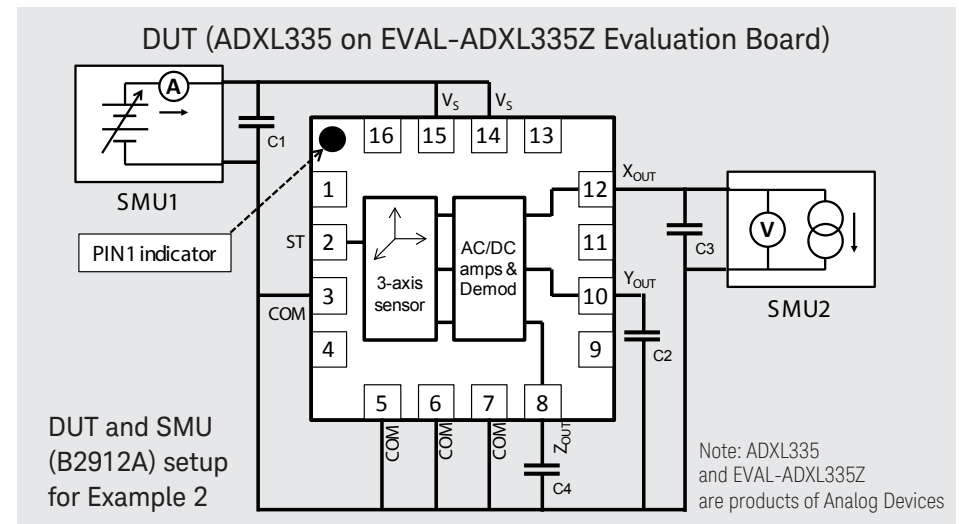
### Measurement examples

- Example 1: Supply current vs. supply voltage  
One essential DUT specification is supply current under static acceleration measurement conditions (i.e. the force of gravity). In this example an I-V measurement of  $I_{SUPPLY}$  vs.  $V_{SUPPLY}$  was made using only SMU1.
- Example 2:  $X_{OUT}$  voltage by manual 360° rotation of DUT  
A simple MEMS device functional test can be made using the B2900A series' time sampling capability. In this example the DUT was manually rotated under the static force of gravity and the  $X_{OUT}$  voltage was monitored over time (V-t measurement). SMU2 was set to current force & voltage measurement (IFVM) mode with a negligible force current (~10 nA), while SMU1 supplied a constant 3 V source voltage.

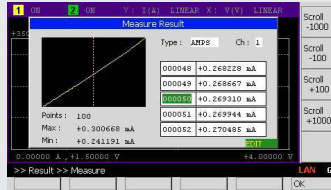
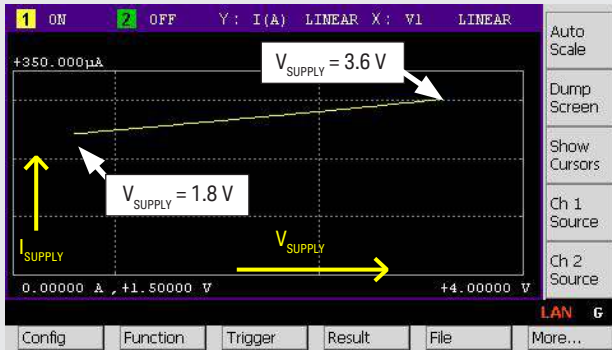
Note: High Capacitance Mode is ON for SMU1 in both measurement examples.

**What is Quick Bench-top Evaluation?**

The B2900A series does not require a PC to make measurements on the bench-top. You can view graphical measurement results on the B2900A and save the graphs and data to any USB memory device, thereby improving the efficiency of your bench-top evaluation and debugging. Of course, if you prefer using a PC to control the B2900A then you can download Keysight Technologies, Inc. free Quick I/V Measurement Software from our website.



### Example 1: Supply current vs. supply voltage (I-V measurement)

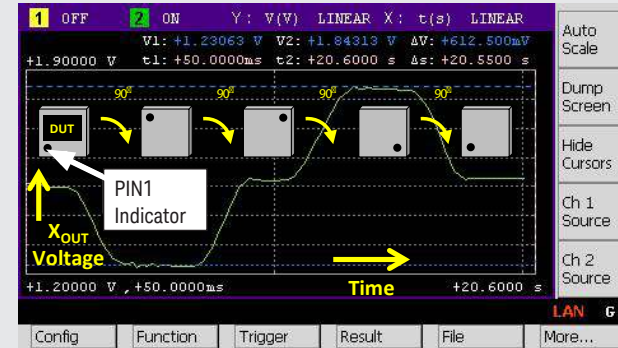


Pop-up windows can show each measurement result

A Source/Measure Unit (SMU) is a convenient way to measure supply current characteristics by sweeping the supply voltage across its specifications. In this example the supply current increases as the supply voltage varies from 1.8 V to 3.6 V. If needed, each measured result can be displayed in a sub-window popped up in the graphical display.

**Note:** In this example the “High Capacitance Mode” is set to “ON” since there is a 0.1  $\mu$ F capacitor mounted on the evaluation board.

### Example 2: $X_{OUT}$ voltage measurement by manual 360° DUT rotation (V-t measurement)



Using the B2900A series' time sampling capability and superior graphical user interface, time domain DC measurements (such as V-t or I-t) can be made with the same precision as regular I-V measurements. In this example the DUT was slowly and manually rotated by 360° under the force of gravity so that  $X_{OUT}$  varied from 1.23 V to 1.84 V in response to the direction of gravity to the 3-axis sensor.

The B2912A's aperture time was set to 10 PLC (200 ms) to take into account the DUT's fixed filter response and its speed of manual rotation.

While this measurement could also be done using an oscilloscope, the B2900A offers convenience, low-cost and a small footprint. In addition, unlike a scope the B2900A can also perform precision I-V measurements and precision time domain DC measurements.

**Note:** In this example the “High Capacitance Mode” is set to “ON” since there is a 0.1  $\mu$ F capacitor mounted on the evaluation board.

## How broad is the B2900A series capability?

– The specifications below cover most bench-top IC evaluation needs.

Product Number	Number of channels	Max output		Min source resolution	Min measure resolution	Min timing interval	Viewing mode
		DC	Pulse				
B2901A	1	210 V 3.03A	200 V 10.5 A	1 pA 1 $\mu$ V	100 fA 100 nV	20 $\mu$ s	Single graph
B2902A	2	210 V 3.03A	200 V 10.5 A	1 pA 1 $\mu$ V	100 fA 100 nV	20 $\mu$ s	Single, dual, graph
B2911A	1	210 V 3.03A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 $\mu$ s	Single, graph, roll
B2912A	2	210 V 3.03A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 $\mu$ s	Single, dual, graph, roll

To learn more please visit our website below:

[www.keysight.com/find/b2900a](http://www.keysight.com/find/b2900a)

### Related Applications

- ✓ Other types of accelerometers
- ✓ Silicon microphones
- ✓ Pressure sensors
- ✓ Electronic compasses (magnetometers)
- ✓ Other MEMS devices
- ✓ Devices/modules with movement or switch
- ✓ NEMS (Nano-Electro-Mechanical Systems) devices

