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 $I_{\text{SUPPLY}}$ vs. $V_{\text{SUPPLY}}$ was made using only SMU1.

- Example 2: $X_{\text{OUT}}$ 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 $X_{\text{OUT}}$ 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.
How broad is the B2900A series capability?

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

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Number of channels</th>
<th>Max output DC</th>
<th>Max output Pulse</th>
<th>Min source resolution</th>
<th>Min measure resolution</th>
<th>Min timing interval</th>
<th>Viewing mode</th>
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<tbody>
<tr>
<td>B2901A</td>
<td>1</td>
<td>210 V</td>
<td>3.03A</td>
<td>1 pA</td>
<td>100 fA</td>
<td>20 µs</td>
<td>Single graph</td>
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<tr>
<td></td>
<td></td>
<td>200 V</td>
<td>10.5 A</td>
<td>1 µV</td>
<td>100 nV</td>
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<td></td>
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<tr>
<td>B2902A</td>
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<td>210 V</td>
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</tr>
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To learn more please visit our website below:
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