ADVANCED LINEAR DEVICES, INC.

A New Zero Power Method for Balancing Supercapacitors

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ADVANCED LINEAR DEVICES, INC.

SAB™ MOSFETs

- Automatically turns ON and OFF
- Near Zero Leakagesturns
- Operating At , Above and Below Threshold Voltage
- Active Always ON
- Fast Dynamic Response

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ALD EPAD® Technology

- Patented and Trademarked
- Precision on-chip trimming and calibration technology
- Incorporates Floating-gate MOSFET transistors
- Precision and ultra low operating voltages
- Proven EPAD® manufacturing technology
- 20 Year evolution in technology and manufacturing
- Millions of EPAD® enabled circuits shipped to date

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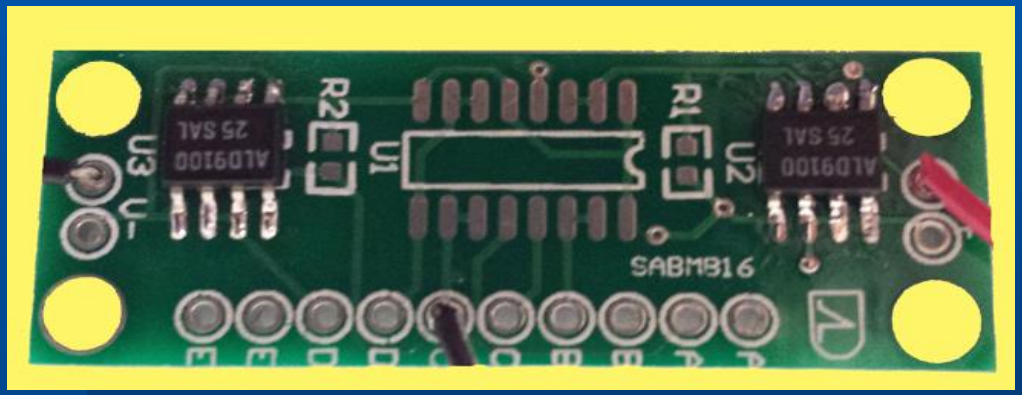
A plug and play PCB solution for automatically balancing supercapacitors



Actual board size
0.6 x 1.6 inches

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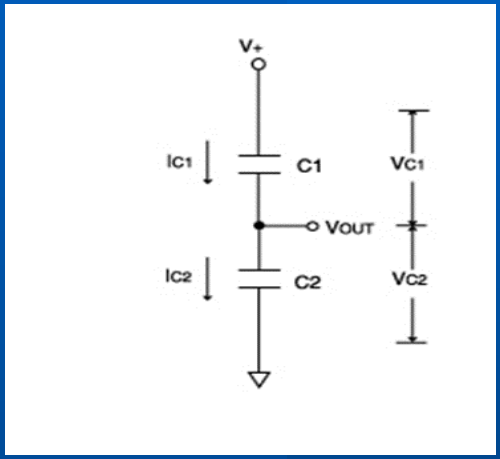
Benefits of MOSFET Balancing



Scenario 1:

- *Power Supply V+ = 4.6V*
- *If $I_{C1} = I_{C2}$*
- *$V_{OUT} = V+ / 2 = 2.30V$*
- Each Supercapacitor = 2.7V max. rating

Scenario 2:

- *If $I_{C1} > I_{C2}$*
- *V_{OUT} rises until $I_{C1} = I_{C2}$*
- *If $V_{C2} = V_{OUT} > 2.7V$, then C2 is damaged due to over voltage*

Scenario 3:

- *If $I_{C2} > I_{C1}$*
- *V_{OUT} drops until $I_{C1} = I_{C2}$*
- *If $V_{C1} (V+ - V_{OUT}) > 2.7V$, C1 is damaged due to over-voltage*
- *Total leakage current equals I_{C2}*

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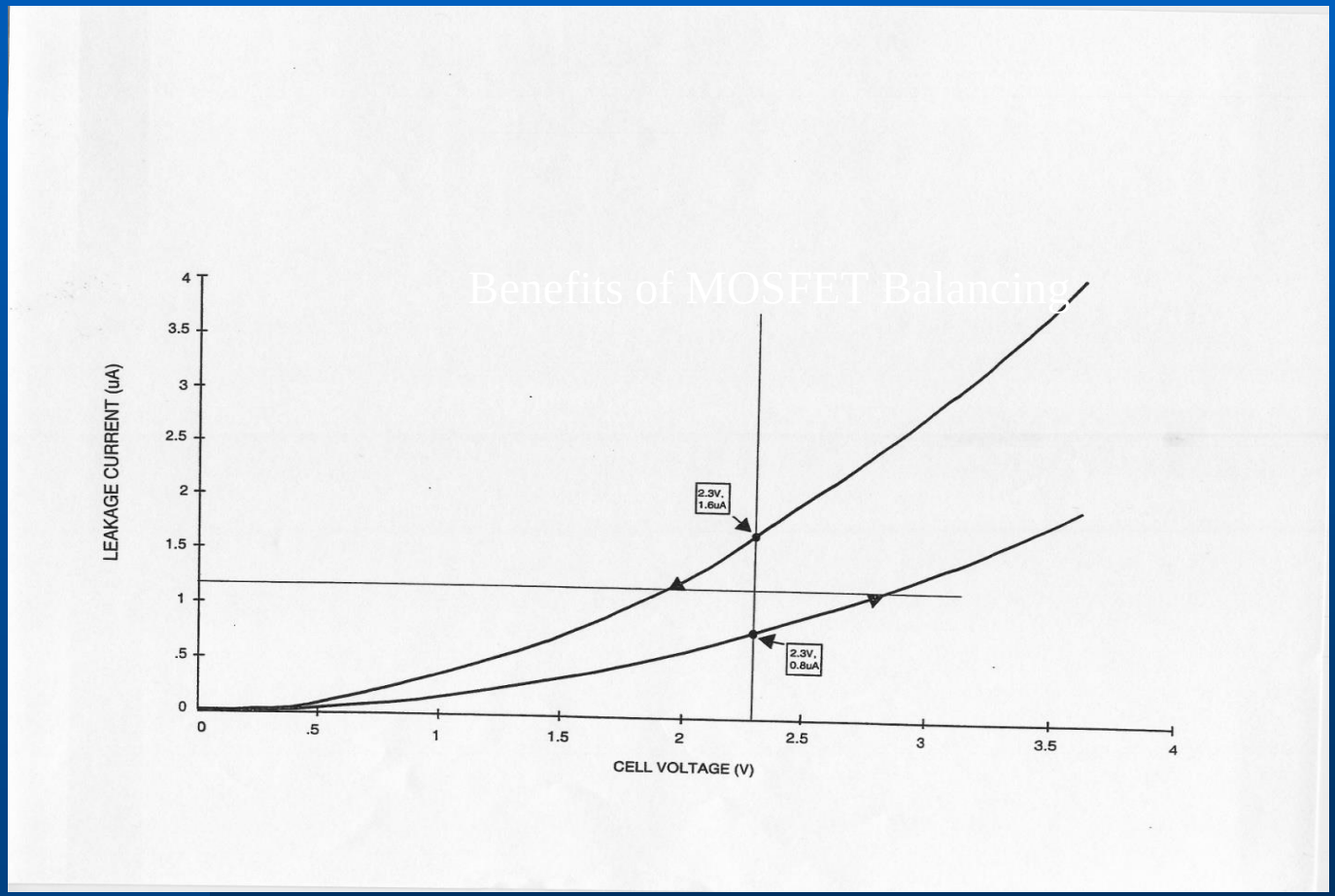
Benefits of MOSFET Balancing



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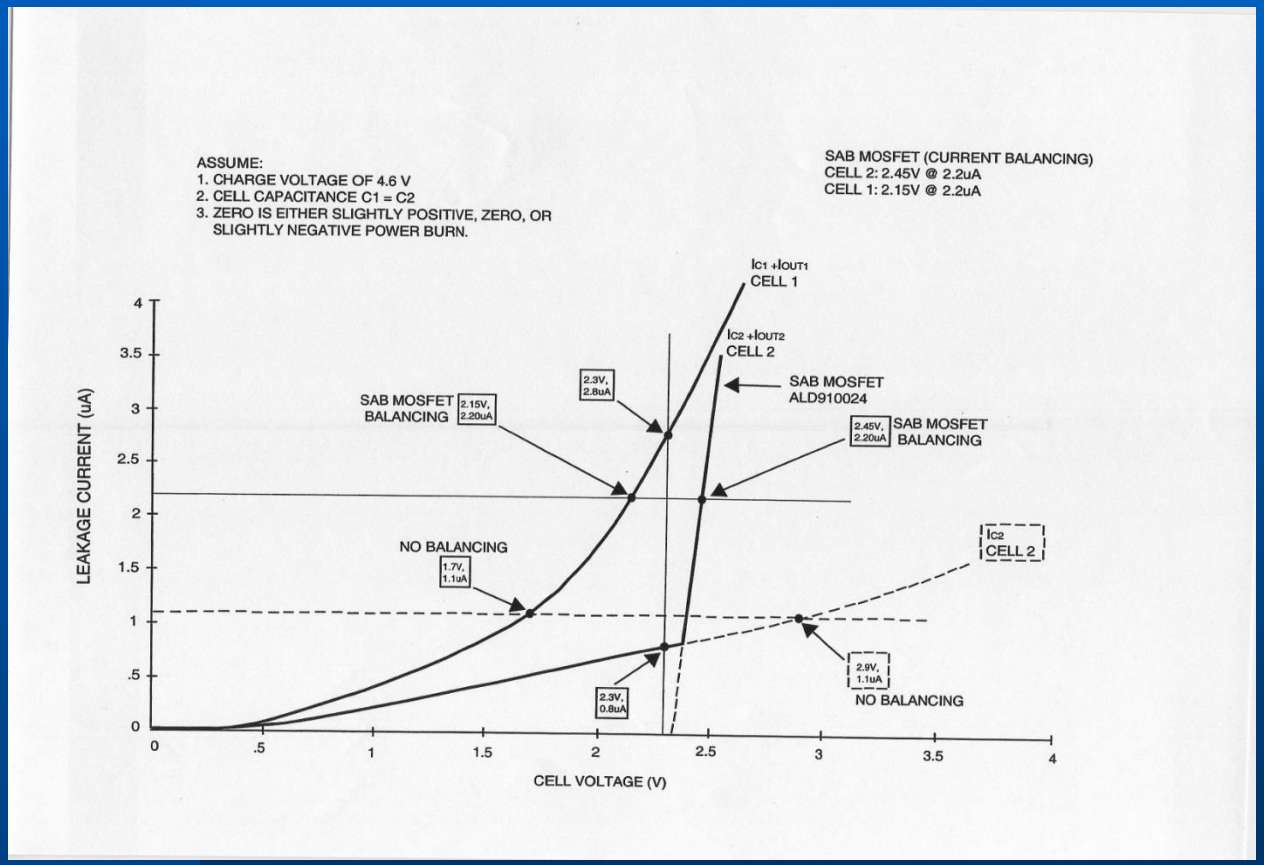
Benefits of MOSFET Balancing



Two supercapacitors connected in series balanced using a MOSFET chip.

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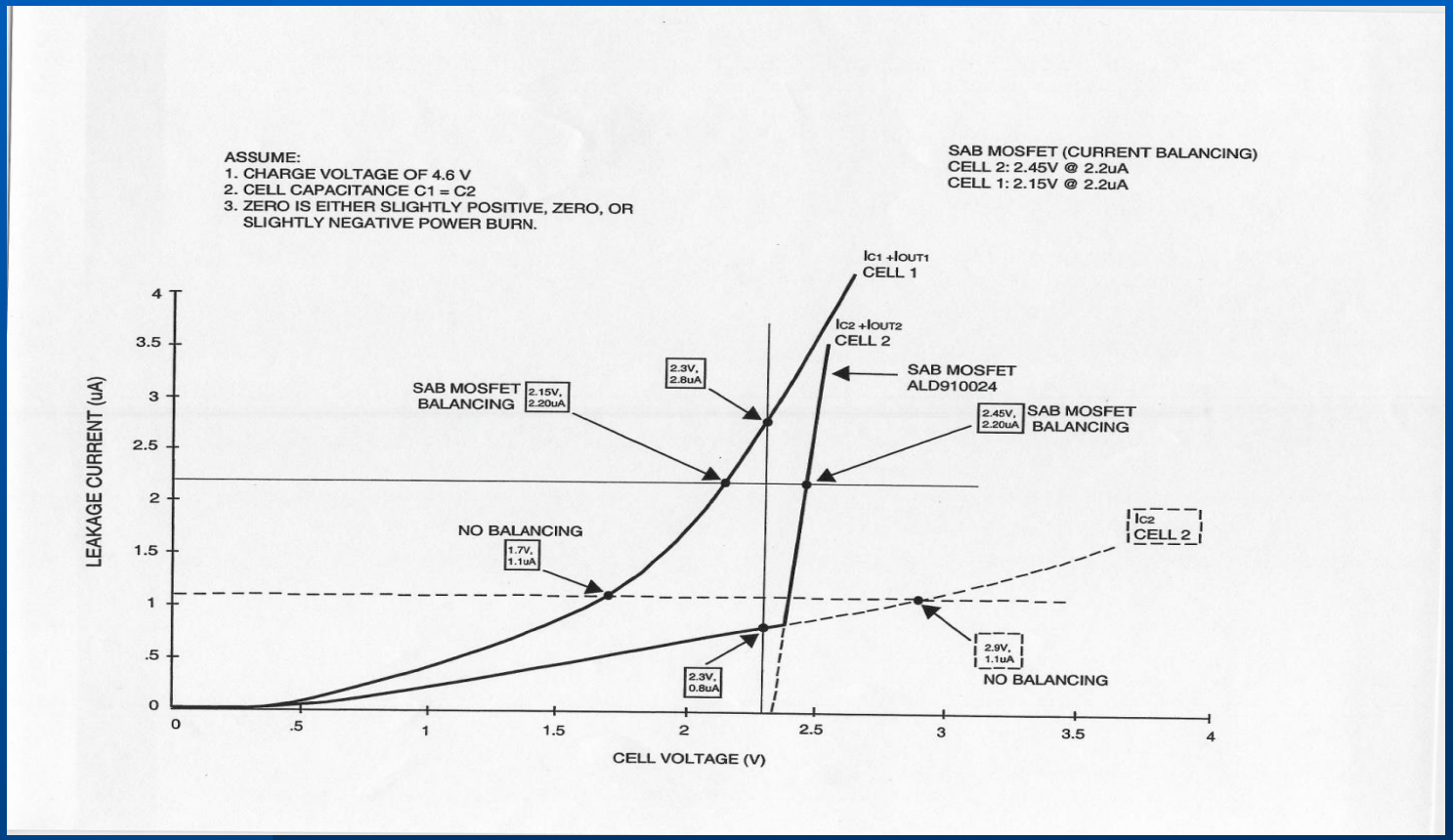
MOSFET vs OPAMP Balancing



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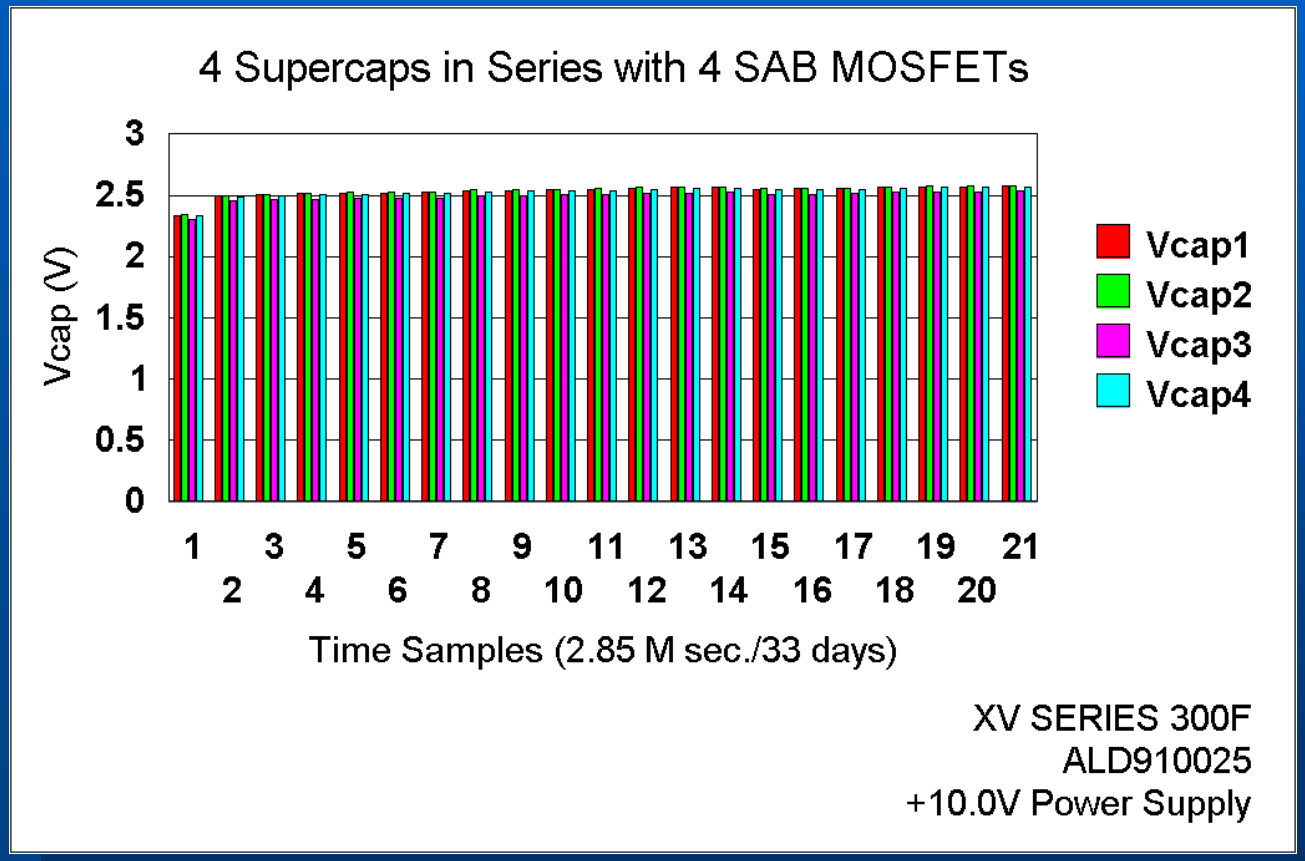

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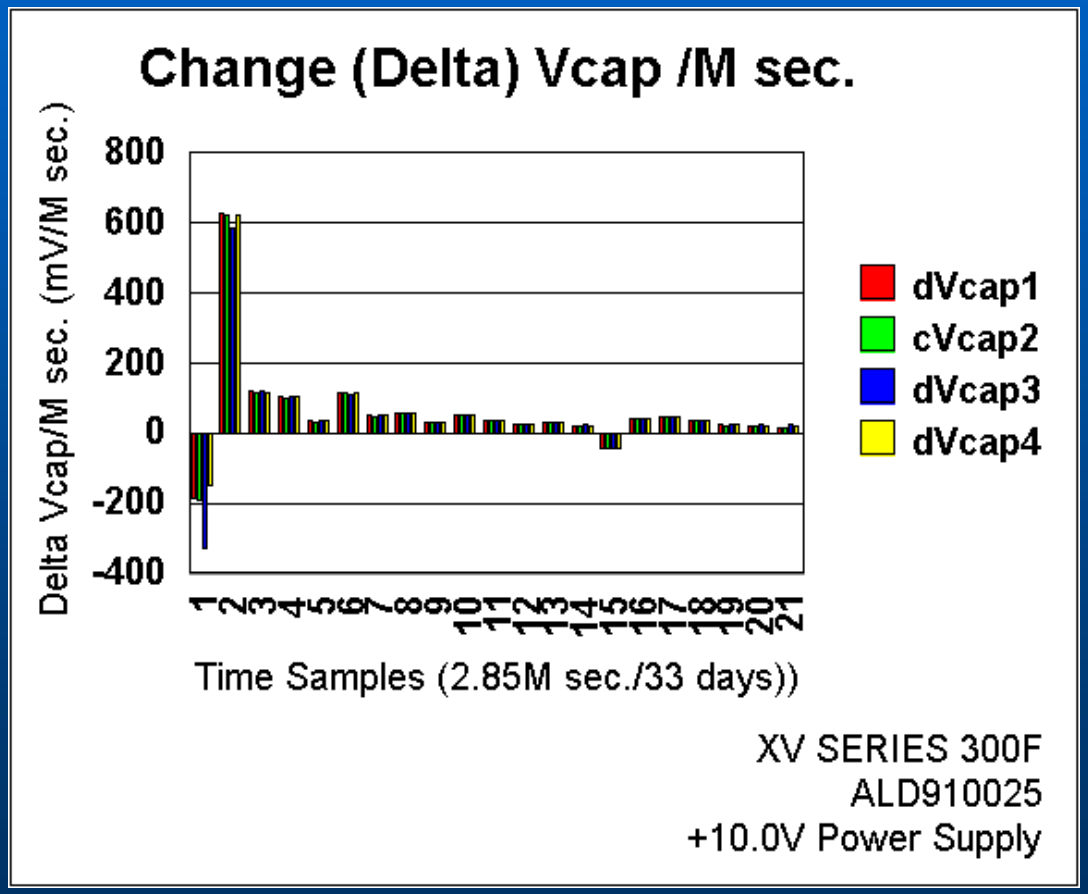

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