The evolution of electricity supply, demand, efficiency and reliability is driving significant infrastructural and operational improvements of electrical grids worldwide. Grid energy storage systems store and release power when and where it is required within grids to maintain their stability and maximize efficiency. Energy storage systems can balance and increase grid flexibility when managing multiple energy generation resources, integrating a high level of intermittent renewable energy, or operating a micro grid. Maxwell ultracapacitors provide cost-effective and reliable instantaneous power. With over 11 GW of power installed worldwide, the long life, high power and superior charge/discharge cycling of ultracapacitors make them the ideal energy storage solution for utility scale, microgrid, or commercial applications. Ultracapacitors can be used as a standalone solution or in combination with other energy storage technologies such as batteries. By combining two complementary technologies, ultracapacitors can extend battery life and reduce overall operating cost, providing fast response as well as backup capacity. With Maxwell ultracapacitors, it is easy to design scalable systems with lifetimes of up to a million charge/discharge cycles at 100% depth of discharge.

Features and Benefits

- Power shaping
- Ramp rate control
- Frequency regulation
- Reactive power firming
- Increase grid stability
- Increase power quality
- Low-maintenance operation
- Non-toxic, lead-free materials

Results may vary. Additional terms and conditions, including the limited warranty, apply at the time of purchase. See the warranty details and enclosed information for applicable operating and use requirements.
Possible Scenario for a 1 MW / 60 Second Configuration

Operating Parameters

<table>
<thead>
<tr>
<th></th>
<th>BMOD0165</th>
<th>BMOD0130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacitance</td>
<td>165 F</td>
<td>130 F</td>
</tr>
<tr>
<td>Voltage</td>
<td>43.5 V</td>
<td>56 V</td>
</tr>
<tr>
<td>( \text{ESR}_{dc} )</td>
<td>6.3 mohm</td>
<td>8.1 mohm</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>5.2 mA</td>
<td>120 mA</td>
</tr>
<tr>
<td>Total Energy, Individual Module</td>
<td>43.4 Wh**</td>
<td>56.6 Wh</td>
</tr>
</tbody>
</table>

1 MW / 60 Second System Characteristics†

<table>
<thead>
<tr>
<th></th>
<th>17 series x 38 parallel</th>
<th>10 series x 50 parallel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Number of Modules</td>
<td>646</td>
<td>500</td>
</tr>
<tr>
<td>Capacitance</td>
<td>368 F</td>
<td>650 F</td>
</tr>
<tr>
<td>Voltage</td>
<td>740 V</td>
<td>560 V</td>
</tr>
<tr>
<td>Floor Space††</td>
<td>106 ft</td>
<td>89 ft</td>
</tr>
</tbody>
</table>

* Module voltage reduced to maintain the same individual cell voltage (~2.4 V) as the 56 V module solution.
** Total module energy based on reduced cell voltage.
† Discharge to V1/2
†† 6’ height

Images not to scale. Results may vary. For specification configuration needs, please contact Maxwell at contactus@maxwell.com.

Product dimensions are for reference only unless otherwise identified. Product dimensions and specifications may change without notice. Please contact Maxwell Technologies directly for any technical specifications critical to application. All products featured on this datasheet are covered by the following U.S. patents and their respective foreign counterparts: 6643119, 7295423, 7342770, 7352558, 7384433, 7440258, 7492571, 7508651, 7580243, 7791860, 7816891, 7859826, 7883553, 7935155, 8072734, 8096481, 8279580, and patents pending.

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