Cell specification
TB077170226mFF1. 20Ah

Ver 2.1
APRIL 09 2013
TopBattery Co., Ltd.
TB077170226mFF1/20Ah

- **Model**: TB077170226mFF1
- **Nominal capacity**: 20.0 Ah
- **Nominal voltage**: 3.2 V
- **Thickness**: 7.7 ± 0.15 mm
- **Width**: 169.5 ± 1.5 mm
- **Length**: 225.5 ± 2.0 mm
- **Weight**: 506 ± 5.0 g
- **Operating voltage**: 2.0 ~ 3.6 V
- **AC Impedance**: 3.5 mΩ Max.
- **DC Resistance**: 3.0 mΩ Max.
- **Charging current**: Standard A 4 (0.2 C), Max A 40 (2.0 C)
- **Discharging current**: Standard A 4 (0.2 C), Continuous A 200 (10.0 C), Pulse_5sec A 500 (25.0 C)
- **Operating temperature**: -20 ~ 60°C
- **Cycle life**: Ret 80% after 2000 cycle
- **Energy Density**: Volumetric Wh/L 217.5, Gravimetric Wh/Kg 126.5
Cell capacity, ACR, DCR, Weight and Dimension

- **0.5C discharge capacity**
  - Average: 20.69
  - Stdev: 0.19
  - N: 1280

- **ACR at SOC 30%**
  - Average: 0.7367
  - Stdev: 0.019
  - N: 404

- **DCR at SOC 30%**
  - Average: 2.359
  - Stdev: 0.069
  - N: 404

- **Cell weight**
  - Average: 504.1
  - Stdev: 1.057
  - N: 110

- **Cell thickness at SOC 30%**
  - Average: 7.656
  - Stdev: 0.065
  - N: 110

- **Cell width without side folding**
  - Average: 169.1
  - Stdev: 0.323
  - N: 110

- **Cell length**
  - Average: 225.5
  - Stdev: 0.357
  - N: 110
Cycle life at 25°C

- 1.0C = 20.0A
- Environment temperature : 25±3°C
- Charge : CCCV, 1.0C, 3.6V. 0.05C cut off.
- Rest : 10min
- Discharge : CC, 1.0C, 2.0V cut off.
Temperature dependent discharge capacity

- 1.0C = 20.0A
- Charge: CCCV, 3.6V, 0.2C, 0.01C cut off at 25±3°C
- Storage in designated temp. (70°C, 60°C, 40°C, 25°C, 0°C, -10°C, -20°C, -30°C) for 4 hrs.
- Discharge: CC, 0.2C, 2.0V cut off in designated temp.
Discharge rate characteristics

- $1.0C = 20.0A$
- Environment temperature : $25\pm3^\circ C$
- Charge: CCCV, 0.5C, 3.6V. 0.05C cut off.
- Rest: 10min
- Discharge: CC, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0C, 2.0V cut off.

![Discharge rate characteristics graph]

- Voltage [mV]
- Capacity [mAh]
TB077170226mFF1. 20Ah. Continuous discharge

1.0C = 20A
Charge: CCCV, 0.5C, 3.6V, 0.05C cut off
Discharge: CC,(0.5C, 5C, 8C, 10C, 15C, 20C, 25C), 2.0V

Charge and discharge characteristics are illustrated in the graph, showing voltage (mV) versus capacity (Ah) at different temperatures and discharge rates.
TB077170226mFF1. 20Ah. Pulse discharge

1.0C = 20A
Charge : CCCV, 0.5C, 3.6V, 0.05C cut off
Discharge: 5sec Pulse(10C, 15C, 20C, 25C) , 3times @ SOC50%
High temperature storage test

- 1.0C = 20A
- Charge : CCCV, 3.6V, 0.2C, 0.01C cut off.
- Storage 14 days in 55°C chamber
- Take out the test cell from 55°C chamber and storage 2hrs at 25±3°C
- Discharge : CC, 0.2C, 2.0V cut off.
- Repeat charge and discharge at 25±3°C
## Cell safety test result

<table>
<thead>
<tr>
<th>Test Items</th>
<th>Test Condition</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nail penetration</td>
<td>Ø3.0mm, blunt with 1.5 radius nail, 5mm/sec.</td>
<td>EUCAR Level ≤ 4</td>
</tr>
<tr>
<td>Overcharge</td>
<td>32A, 5.4V, 2hr</td>
<td>EUCAR Level ≤ 4</td>
</tr>
<tr>
<td>Hot box</td>
<td>5°C/min, 300°C</td>
<td>EUCAR Level ≤ 5</td>
</tr>
<tr>
<td>Overdischarge</td>
<td>-1C for 1.5hr</td>
<td>EUCAR Level ≤ 4</td>
</tr>
<tr>
<td>Crush</td>
<td>Z-axis, 15% Pressing for 5 min, 50% Pressing for 5min</td>
<td>EUCAR Level ≤ 4</td>
</tr>
<tr>
<td>External short</td>
<td>&lt; 5mΩ</td>
<td>EUCAR Level ≤ 4</td>
</tr>
</tbody>
</table>
| Impact test      | Height : 610mm±25 mm, Iron hammer weight : 9.1Kg, Iron bar diameter : 15.8mm, 6hr holding after impact test | Cell max temperature ≤ 170°C  
No vent, No leakage,  
No disassembly, No rupture,  
and No fire   |

※ All of those tests are conducted with SOC 100% charged cell.

<table>
<thead>
<tr>
<th>EUCAR Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>No effect</td>
</tr>
<tr>
<td>1</td>
<td>Passive protection activated</td>
</tr>
<tr>
<td>2</td>
<td>Defect/Damage</td>
</tr>
<tr>
<td>3</td>
<td>Leakage, Δ mass &lt; 50%</td>
</tr>
<tr>
<td>4</td>
<td>Venting, Δ mass &gt; 50%</td>
</tr>
<tr>
<td>5</td>
<td>Fire of Flame</td>
</tr>
<tr>
<td>6</td>
<td>Rupture</td>
</tr>
<tr>
<td>7</td>
<td>Explosion</td>
</tr>
</tbody>
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