

# N<sub>60</sub><sup>TM</sup> 3.0V 3400F Cell

NE03V03400SW001

# Datasheet



See Note on Assembly Recommendations<sup>10</sup>

## DIMENSION & WEIGHT

|                |          |
|----------------|----------|
| D1 (±0.5)      | 60.3 mm  |
| D2 (±0.2)      | 60.3 mm  |
| L (±0.3)       | 138.0 mm |
| H (±0.125)     | 3.0 mm   |
| d (-0.05)      | 14.0 mm  |
| Nominal Weight | 500 g    |

## TYPICAL THERMAL CHARACTERISTICS

|  |          |
|--|----------|
| Thermal Resistance, $R_{th}$ (Housing)                                   | 3.2 °C/W |
| Thermal Capacitance, $C_{th}$  | 580 J/°C |
| Usable Continuous Current ( $\Delta T = 15^\circ\text{C}$ ) <sup>9</sup> | 140 A    |
| Usable Continuous Current ( $\Delta T = 40^\circ\text{C}$ ) <sup>9</sup> | 225 A    |

## ELECTRICAL SPECIFICATIONS

|   |                      |                |
|---|----------------------|----------------|
| Rated Voltage, $V_R$                              |                      | <b>3.0 VDC</b> |
| Surge Voltage <sup>1</sup>                        |                      | 3.15 VDC       |
| Rated Capacitance, $C^2$                          |                      | <b>3400 F</b>  |
| Capacitance Tolerance                             | Min. / Max.          | 3400F / 4080F  |
|   | Average <sup>4</sup> | 3560F          |
| Initial DC-ESR, $R_{DC}^3$                        | Max.                 | 0.24 mΩ        |
|   | Average <sup>4</sup> | 0.15 mΩ        |
| Maximum Leakage Current <sup>5</sup>              |                      | 12 mA          |
| Maximum Peak Current, Non-repetitive <sup>6</sup> |                      | 2,800 A        |
| Maximum Stored Energy, $E_{max}^7$                |                      | 4.2 Wh         |
| Gravimetric Specific Energy <sup>7</sup>          |                      | 8.5 Wh/kg      |
| Usable Specific Power <sup>7</sup>                |                      | 9.0 kW/kg      |
| Impedance Match Specific Power <sup>7</sup>       |                      | 18.7 kW/kg     |

## TYPICAL LIFETIME CHARACTERISTICS

|  |                  |
|--|------------------|
| DC Life at High Temperature <sup>8</sup><br>(Continuous charging at $V_R$ and 65°C)  | 1,500 hours      |
| Projected DC Life at Room Temperature <sup>8</sup><br>(Continuous charging at $V_R$ and 25 ± 10 °C)                                    | 10 years         |
| Projected Cycle Life at Room Temperature <sup>8</sup><br>(Cycled from $V_R$ to 1/2 $V_R$ using constant current of 100A at 25 ± 10 °C) | 1,000,000 cycles |
| Shelf Life<br>(Stored without charge at 25 ± 10 °C)  | 4 years          |

## TEMPERATURE SPECIFICATIONS

|  |            |
|--|------------|
| Operating Temperature Range                          | -40 ~ 65°C |
| Storage Temperature Range<br>(Stored without charge) | -40 ~ 70°C |

## SAFETY & ENVIRONMENTAL SPECIFICATIONS

|           |                           |
|-----------|---------------------------|
| Vibration | ISO 16750-3 Table 12 & 14 |
| Shock     | SAE J2464, IEC 60068-2-27 |
| RoHS      | Compliant                 |
| REACH     | Compliant                 |
| UL        | Compliant (UL 810A)       |

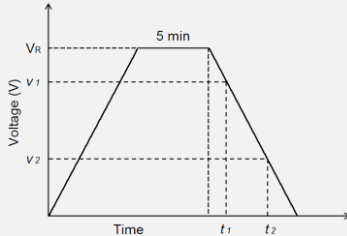
## NOTE

### 1. Surge Voltage

- > Absolute maximum voltage, non-repetitive. The duration must not exceed 1 second.

### 2. Rated Capacitance (Measurement Method)

- > Constant current charge with 5A to  $V_R$ .
- > Constant voltage charge at  $V_R$  for 5 min.
- > Constant current discharge with 5A to 0.1V.



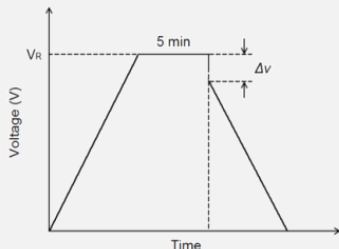
$$C = \frac{I \times (t_2 - t_1)}{v_1 - v_2}$$

where  $C$  is the capacitance (F);

$I$  is the absolute value of the discharge current (A);  
 $v_1$  is the measurement starting voltage,  $0.8 \times V_R$  (V);  
 $v_2$  is the measurement end voltage,  $0.4 \times V_R$  (V);  
 $t_1$  is the time from discharge start to reach  $v_1$  (s);  
 $t_2$  is the time from discharge start to reach  $v_2$  (s)

### 3. Initial DC-ESR (Measurement Method)

- > Constant current charge with  $4 * C * V_R$  [mA] to  $V_R$ .  
*e.g. In case of 3V 3400F cell,  $4 * 3400 * 3 = 40,800 \text{ mA} = 40.8 \text{ A}$*
- > Constant voltage charge at  $V_R$  for 5 min.
- > Constant current discharge with 150A to 0.1V.



$$ESR_{DC} = \frac{\Delta v}{I}$$

where  $ESR_{DC}$  is the DC-ESR ( $\Omega$ );

$\Delta v$  is the voltage drop during first 10ms of discharge (V);  
 $I$  is the absolute value of the discharge current (A)

### 4. Average

- > Typical value or percentage spread that may be present in one shipment

### 5. Maximum Leakage Current (Measurement Method)

- > The capacitor is charged to its rated voltage  $V_R$  at 25°C.
- > Leakage current is the amount of current measured after 72 hours of continuous holding of the capacitor at  $V_R$ .

### 6. Maximum Peak Current

- > Current that can be used for 1-second discharging from the rated voltage to the half rated voltage under the constant current discharging mode

$$I = \frac{\frac{1}{2}V_R}{\Delta t / C + ESR_{DC}}$$

where  $I$  is the maximum peak current (A);  
 $V_R$  is the rated voltage (V);  
 $\Delta t$  is the discharge time (sec);  $\Delta t = 1$  sec in this case;  
 $C$  is the rated capacitance (F);  
 $ESR_{DC}$  is the maximum DC-ESR ( $\Omega$ )

- > The stated maximum peak current should **not** be used in normal operation and is only provided as a reference value.

### 7. Energy & Power (Based on IEC 62391-2)

- > Maximum Stored Energy,  $E_{max}$  (Wh) =  $\frac{\frac{1}{2}CV_R^2}{3600}$
- > Gravimetric Specific Energy (Wh/kg) =  $\frac{E_{Max}}{Weight}$
- > Usable Specific Power (W/kg) =  $\frac{0.12V_R^2}{ESR_{DC} \times Weight}$
- > Impedance Match Specific Power (W/kg) =  $\frac{0.25V_R^2}{ESR_{DC} \times Weight}$

### 8. DC Life and Cycle Life Test

- > End-of-Life (EOL) Conditions:
  - Capacitance: -20% from the rated minimum value
  - DC-ESR: +100% from the specified maximum initial value
- > Capacitance and ESR measurements are taken at 25°C.

### 9. Usable Continuous Current

- > Maximum current which can be used within the allowed temperature range under the constant current discharging mode

$$I = \sqrt{\frac{\Delta T}{R_{th} \times ESR_{DC}}}$$

where  $I$  is the maximum continuous current (A);  
 $\Delta T$  is the change in temperature (°C);  
 $R_{th}$  is the thermal resistance (°C/W);  
 $ESR_{DC}$  is the maximum DC-ESR ( $\Omega$ )

### 10. Assembly Recommendations

- > Assembly should be done in such way as not to place undue mechanical stress on the terminals of the cell.
- > Do not exceed the maximum torque value of 14 N-m when assembling threaded type cells.
- > Provide adequate spacing in between cells to secure required insulation strength for the application.
- > Provide sufficient clearance above the safety vent and do not position anything near the safety vent that may be damaged in an event of vent rupture.

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