

## FEATURES AND BENEFITS\*

- Up to 1,000,000 duty cycles or 10 year DC life
- 51V DC working voltage
- Active cell balancing
- Temperature output
- Overvoltage outputs available
- High power density
- Extreme Vibration Environment Compatible

## TYPICAL APPLICATIONS

- Hybrid vehicles
- Rail
- Heavy industrial equipment
- UPS systems



## PRODUCT SPECIFICATIONS

### ELECTRICAL

### BMOD0189 P051 B2A

Rated Capacitance <sup>1</sup>	189 F
Minimum Capacitance, initial <sup>1</sup>	189 F
Maximum Capacitance, initial <sup>1</sup>	200 F
Maximum ESR <sub>DC</sub> , initial <sup>1</sup>	5.6 mΩ
Test Current for Capacitance and ESR <sub>DC</sub> <sup>1</sup>	100 A
Rated Voltage	51 V
Stored Energy <sup>3</sup>	69 Wh
Absolute Maximum Voltage <sup>2</sup>	54 V
Over Voltage (OV) Alarm "ON" Range <sup>†</sup>	51.3 - 54.3 V
Nominal Module Balance "ON" Voltage	45.0 V
Absolute Maximum Current	1,900 A
Maximum Series Voltage	750 V
Capacitance of Individual Cells <sup>7</sup>	3,400 F
Stored Energy, Individual Cell <sup>7</sup>	3.8 Wh
Number of Cells	18

### TEMPERATURE

Operating Temperature (Cell Case Temperature)	
Minimum	-40°C
Maximum	65°C

\* Results may vary. Additional terms and conditions, including the limited warranty, apply at the time of purchase. See the warranty details for applicable operating and use requirements.

† Module OV "OFF" signal is latched to low voltage power supply input. To reset the alarm signal the low voltage supply must be removed temporarily.

## PRODUCT SPECIFICATIONS (Cont'd)

### PHYSICAL

### BMOD0189 P051 B2A

Mass, typical	16.8 kg (w/ fan)
Power Terminals	M8 Thru hole
Recommended Torque - Terminal	N/A
Vibration Specification	ISO 16750-3, Table 12
Shock Specification	IEC 60068-2-27, -29
Environmental Protection	IP65
Cooling	Forced Air

### MONITORING / CELL VOLTAGE MANAGEMENT

Internal Temperature Sensor	NTC Thermistor
Temperature Interface	OT Alarm
Cell Voltage Monitoring	Overvoltage Alarm
Connector (Mating)	Deutsch DTM06-4S, Amphenol ATM06-4S
Cell Management System	CMS 2.5

### SAFETY

Short Circuit Current, typical (Current possible with short circuit from rated voltage. Do not use as an operating current.)	9,200 A
Certifications	RoHS, REACH
High-Pot Test <sup>8</sup>	3,600 VDC

## TYPICAL CHARACTERISTICS

### THERMAL CHARACTERISTICS

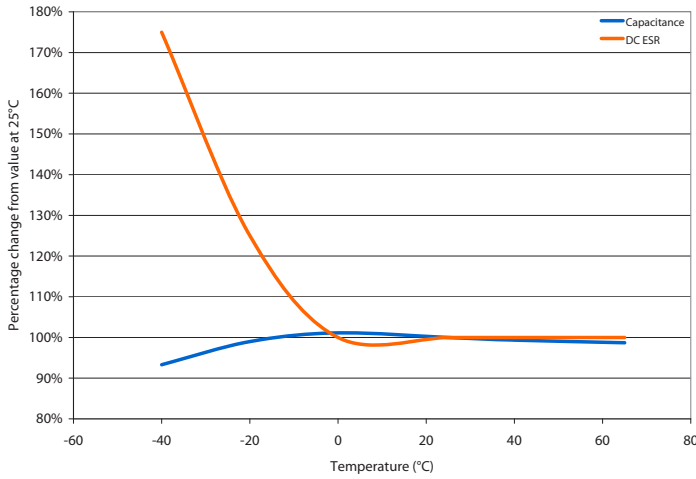
### BMOD0189 P051 B2A

Thermal Resistance ( $R_{ca}$ , All Cell Cases to Ambient), typical <sup>4</sup>	0.12°C/W
Thermal Capacitance ( $C_{th}$ ), typical	15,000 J/°C
Maximum Continuous Current ( $\Delta T = 10\text{ °C}$ ) <sup>4</sup> (BOL, Beginning of Life)	120 A, RMS

### LIFE

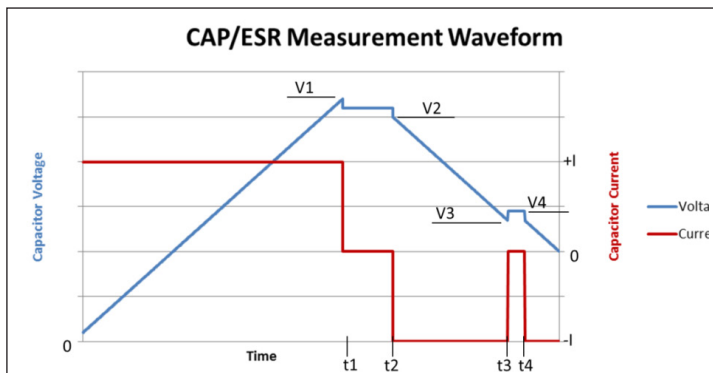
<b>DC Life at High Temperature<sup>1</sup></b> (held continuously at Rated Voltage and Maximum Operating Temperature)	1,500 hours
Capacitance Change (% decrease from minimum initial value)	25%
ESR Change (% increase from maximum initial value)	110%
<b>Projected DC Life at 25°C<sup>1</sup></b> (held continuously at Rated Voltage)	10 years
Capacitance Change (% decrease from minimum initial value)	20%
ESR Change (% increase from maximum initial value)	100%
<b>Projected Cycle Life at 25°C<sup>1,5,6</sup></b>	1,000,000 cycles
Capacitance Change (% decrease from minimum initial value)	20%
ESR Change (% increase from maximum initial value)	100%
Test Current	100 A
<b>Shelf Life</b> (Stored uncharged at 25°C)	4 years

### ESR AND CAPACITANCE VS TEMPERATURE

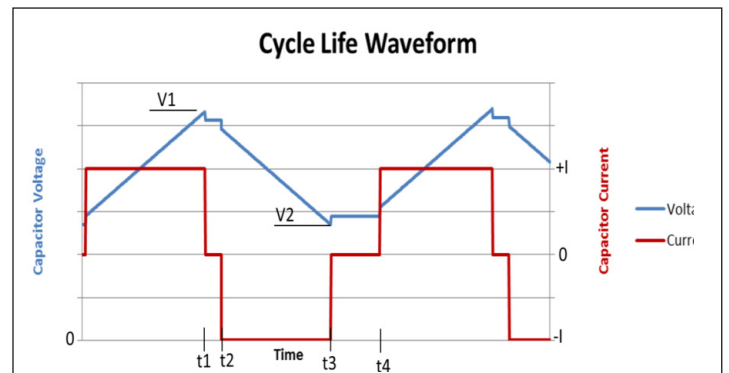


### NOTES

1. Capacitance and ESR<sub>DC</sub> measured at 25°C using specified test current per waveform below.
2. Absolute maximum voltage, non-repeated. Not to exceed 1 second.
3.  $E_{\text{stored}} = \frac{1}{2} \frac{CV^2}{3,600}$
4.  $\Delta T = I_{\text{RMS}}^2 \times \text{ESR} \times R_{\text{ca}}$
5. Cycle using specified test current per waveform below.
6. Cycle life varies depending upon application-specific characteristics. Actual results will vary.
7. Per United Nations material classification UN3499, all Maxwell ultracapacitors have less than 10 Wh capacity to meet the requirements of Special Provisions 361. Both individual ultracapacitors and modules composed of those ultracapacitors shipped by Maxwell can be transported without being treated as dangerous goods (hazardous materials) under transportation regulations.
8. Duration = 60 seconds. Not intended as an operating parameter.



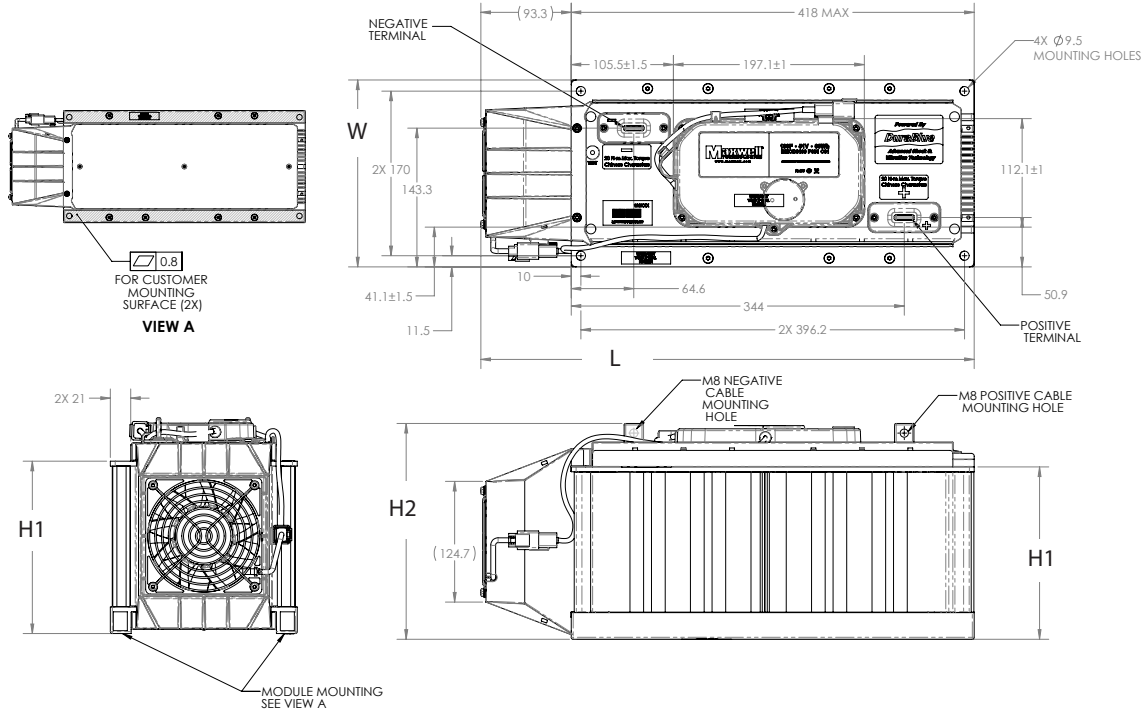
$V1 = V_{\text{rated}}$        $t2 - t1 = 15 \text{ seconds}$        $\text{Capacitance} = I \times (t3 - t2) / (V2 - V3)$   
 $V3 = 0.5 \times V_{\text{rated}}$        $t4 - t3 = 5 \text{ seconds}$        $\text{ESR} = (V4 - V3) / I$



$V1 = V_{\text{rated}}$        $t2 - t1 = 5 \text{ seconds (I=0)}$   
 $V2 = 0.5 \times V_{\text{rated}}$        $t4 - t3 = 15 \text{ seconds (I=0)}$

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**BMOD0189 P051 B2A**



Part Description	Dimensions (mm)				Package Quantity
	L (max)	W (max)	H1 (max)	H2 (max)	
BMOD0189 P051 B2A	515	197	181	228	1

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, 7180726, 7295423, 7342770, 7352558, 7384433, 7440258, 7492571, 7508651, 7580243, 7791860, 7816891, 7859826, 7883553, 7935155, 8072734, 8098481, 8279580, and patents pending.

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