DATASHEET 48V MODULES

FEATURES AND BENEFITS*

- Up to 1,000,000 duty cycles or 10 year DC life
- 48V DC working voltage
- Active cell balancing
- Temperature output
- Overvoltage outputs available
- High power density

TYPICAL APPLICATIONS

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

PRODUCT SPECIFICATIONS

ELECTRICAL	BMOD0083 P048 B01	BMOD0165 P048 BXX
Rated Capacitance[1]	83 F	165 F
Minimum Capacitance, initial[1]	83 F	165 F
Maximum Capacitance, initial[1]	100 F	200 F
Maximum ESR $_{DC,}$ initial[1]	10 mΩ	6.3 mΩ
Test Current for Capacitance and ESR $_{DC}$[1]	100 A	100 A
Rated Voltage	48 V	48 V
Absolute Maximum Voltage[2]	51 V	51 V
Absolute Maximum Current	1,150 A	1,900 A
Leakage Current at 25°C, maximum[3]	3.0 mA	5.2 mA
Maximum Series Voltage	750 V	750 V
Capacitance of Individual Cells[11]	1,500 F	3,000 F
Stored Energy, Individual Cell[11]	1.5 Wh	3.0 Wh
Number of Cells	18	18
TEMPERATURE		
Operating Temperature (Cell Case Temperature)		
Minimum	-40°C	-40°C
Maximum	65°C	65°C
Storage Temperature (Stored Uncharged)		
Minimum	-40°C	-40°C
Maximum	70°C	70°C

*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.

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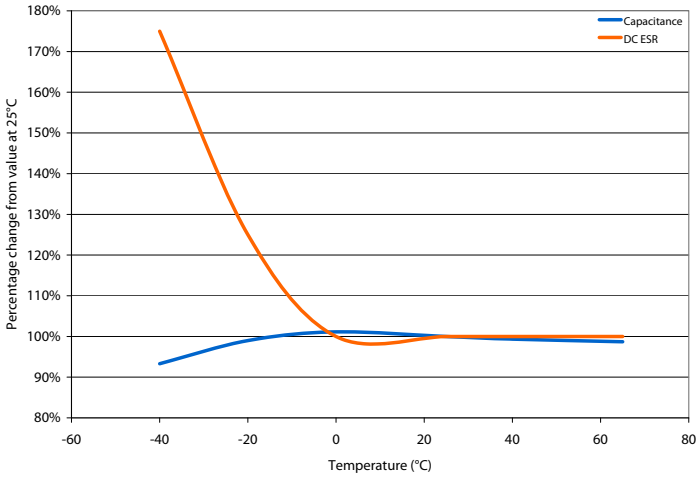
PRODUCT SPECIFICATIONS (Cont'd)

PHYSICAL	BMOD0083 B01	BMOD0165 BXX
Mass, typical	10.3 kg	13.5 kg
Power Terminals	M8/M10	M8/M10
Recommended Torque - Terminal	20/30 Nm	20/30 Nm
Vibration Specification	SAE J2380	SAE J2380
Shock Specification	SAE J2464	SAE J2464
Environmental Protection	IP65	IP65
Cooling	Natural Convection	Natural Convection
MONITORING / CELL VOLTAGE MANAGEMENT		
Internal Temperature Sensor	NTC Thermistor	NTC Thermistor
Temperature Interface	Analog	Analog
Cell Voltage Monitoring	Overvoltage Alarm	Overvoltage Alarm
Connector	Deutsch DTM	Deutsch DTM
Cell Voltage Management	VMS 2.0	VMS 2.0
POWER & ENERGY		
Usable Specific Power, P_d [4]	2,700 W/kg	3,300 W/kg
Impedance Match Specific Power, P_{max} [5]	5,600 W/kg	6,800 W/kg
Specific Energy, E_{max} [6]	2.6 Wh/kg	3.9 Wh/kg
Stored Energy[7]	27 Wh	53 Wh
SAFETY		
Short Circuit Current, typical (Current possible with short circuit from rated voltage. Do not use as an operating current.)	4,800 A	7,600 A
Certifications	RoHS	UL810a (B01 & B06 only, 150 Volts)
High-Pot Capability[12]	2,500 VDC	2,500 VDC

TYPICAL CHARACTERISTICS

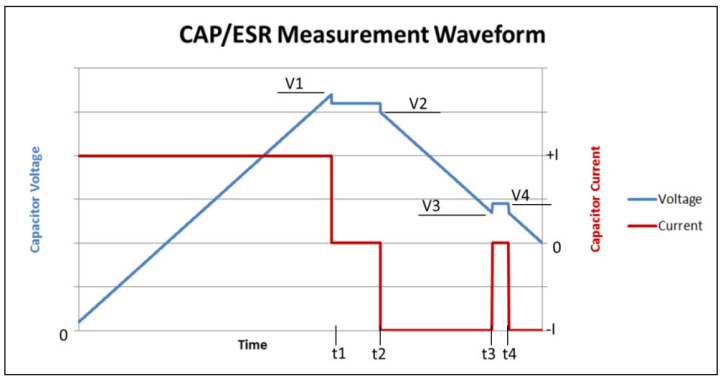
THERMAL CHARACTERISTICS	BMOD0083 B01	BMOD0165 BXX
Thermal Resistance ($R_{ca,}$ All Cell Cases to Ambient), typical[8]	0.40°C/W	0.40°C/W
Thermal Capacitance (C_{th}), typical	7,700 J/°C	13,000 J/°C
Maximum Continuous Current (ΔT = 15 °C)[8]	61 A, RMS	77 A, RMS
Maximum Continuous Current (ΔT = 40 °C)[8]	100 A, RMS	130 A, RMS
LIFE		
DC Life at High Temperature[1] (held continuously at Rated Voltage and Maximum Operating Temperature)	1,500 hours	1,500 hours
Capacitance Change (% decrease from minimum initial value)	20%	20%
ESR Change (% increase from maximum initial value)	100%	100%
Projected DC Life at 25°C[1] (held continuously at Rated Voltage)	10 years	10 years
Capacitance Change (% decrease from minimum initial value)	20%	20%
ESR Change (% increase from maximum initial value)	100%	100%
Projected Cycle Life at 25°C[1,9,10]	1,000,000 cycles	1,000,000 cycles
Capacitance Change (% decrease from minimum initial value)	20%	20%
ESR Change (% increase from maximum initial value)	100%	100%
Test Current	100 A	100 A
Shelf Life (Stored uncharged at 25°C)	4 years	4 years

ESR AND CAPACITANCE VS TEMPERATURE

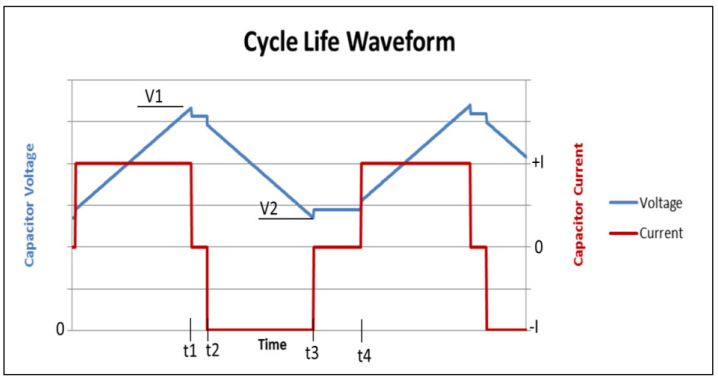


NOTES

1. Capacitance and ESR_{DC} measured at 25°C using specified test current per waveform below.
2. Absolute maximum voltage, non-repeated. Not to exceed 1 second.
3. After 72 hours at rated voltage. Initial leakage current can be higher.
4. Per IEC 62391-2, $P_d = \frac{0.12V^2}{ESR_{DC} \times mass}$
5. $P_{max} = \frac{V^2}{4 \times ESR_{DC} \times mass}$
6. $E_{max} = \frac{½\ CV^2}{3{,}600 \times mass}$
7. $E_{stored} = \frac{½\ CV^2}{3{,}600}$
8. $\Delta T = I_{RMS}^2 \times ESR \times R_{ca}$
9. Cycle using specified test current per waveform below.
10. Cycle life varies depending upon application-specific characteristics. Actual results will vary.
11. 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.
12. Duration = 60 seconds. Not intended as an operating parameter.



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



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

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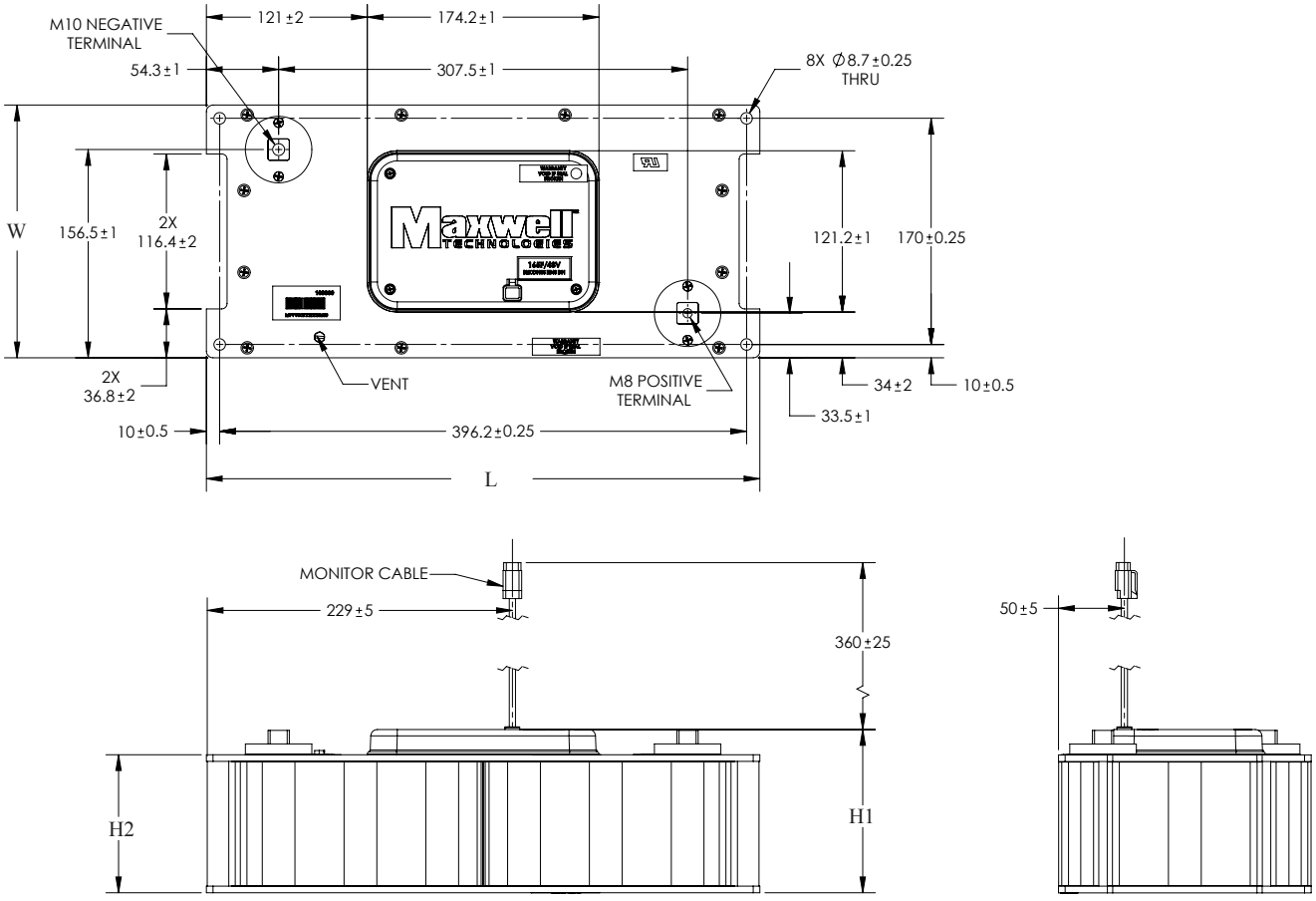
MOUNTING RECOMMENDATIONS

Please refer to the user manual for installation recommendations.

MARKINGS

Products are marked with the following information: Rated capacitance, rated voltage, product number, name of manufacturer, positive and negative terminal, warning marking, serial number.

BMOD0083 P048 B01



Part Description	Dimensions (mm)				Package Quantity
	L (max)	W (max)	H1 (max)	H2 (max)	
BMOD0083 P048 B01	418	194	126	106	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.

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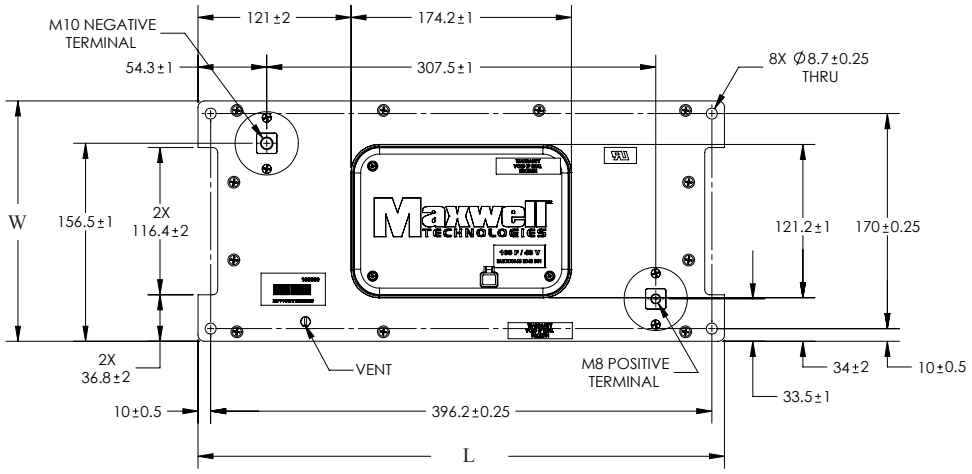
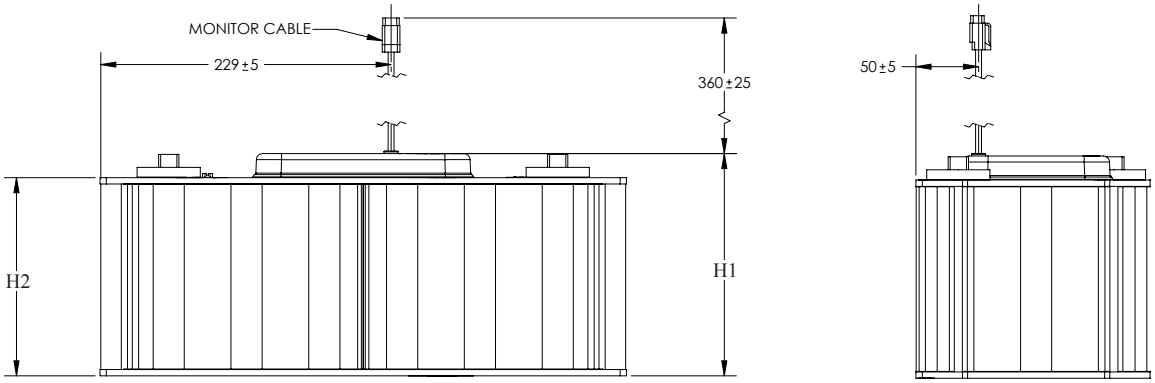
BMOD0165 P048 BXX





Part Description	Dimensions (mm) L (max)	W (max)	H1 (max)	H2 (max)	Package Quantity
BMOD0165 P048 BXX*	418	194	179	157	1

*Refer to user manual for product variant details.

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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