

BOOSTCAP[®]
Product Testing
and Certifications

Document #1011437

Maxwell Technologies ultracapacitors have been extensively tested and certified under a variety of standards. The following table specifies the certifications granted or projected date for granting of the respective standards or certifications.

Type	Series	Product	Certification		
			UL810a	RoHS	
Cells	PC	PC5	X	x	
		PC10	X	X	
		PC5-5	X	X	
	BC	BCAP0120-P250			X
		BCAP0140-E250	X	X	
		BCAP0310-P250	X	X	
		BCAP0350-E250	X	X	
	MC	BCAP0650-P270			X
		BCAP0650-E270			X
		BCAP1200-P270			X
		BCAP1200-E270			X
		BCAP1500-P270			X
		BCAP1500-E270			X
		BCAP2000-P270			X
		BCAP2000-E270			X
	15 V	BPAK	BCAP3000-P270	X	X
BCAP3000-E270			X	X	
BPAK0020-P015					X
BPAK0023-E015					X
16 V	BMOD	BPAK0053-P015			x
		BPAK0058-E015	X		x
		BMOD0053-P015			x
		BMOD0058-E015	X		x
	BMOD	BMOD0110-P016			x
		BMOD0110-E016			x
		BMOD0250-P016			x
		BMOD0250-E016			x
48 V	BMOD	BMOD0500-P016	X		x
		BMOD0500-E016	X		x
		BMOD0083-P048			x
		BMOD0083-E048			x
		BMOD0110-P048			x
		BMOD0110-E048			x
48 V+	BMOD	BMOD0165-P048	X		x
		BMOD0165-E048	X		x
48 V+	BMOD	BMOD0063-P125			x
		BMOD0018-P390			x

Maxwell Technologies ultra capacitors have been extensively tested and validated specific to a variety of standards. The following table specifies the testing validation standards in which each product has satisfied. Products **underlined & in bold** have been tested to the specified standard. Other products within the group have been qualified due to similarity.

Type	Series	Product	Shock				Vibration				Thermal Cycling		Thermal Shock		Salt Fog		Pressure		Altitude		Dust/ Water Resistance		
			IEC 60068-2-27	IEC 60068-2-29	SAE J2464	MIL 810-B I 516.3 V	IEC 60068-2-6	SAE J2380	MIL 810-D 514.3 I	ISO 16750-3	SAEJ 1455	IEC 60068-2-14	SAE J2464	IEC 60068-2-14	IEC16750-3	MIL 810D 509.2 I	ASTM B117	IEC 60068 2-13 (0.1atm, 24-hr, -60deg.C)	High Pressure (3 atm, 24-hr)	40,000 ft, -35oC	IP65 (IEC529)	IP67 (IEC529)	
Cells	PC	PC5				X															X		
		PC10				X															X		
		PC5-5																					
	HC	BCAP0025-P270																					
		BCAP0050-P270																					
		BCAP0150-P270																					
	BC	BCAP0120-P250	X	X			X					X		X									
		BCAP0140-E250	X	X			X					X		X									
		BCAP0310-P250	X	X			X					X		X					X				
		BCAP0350-E250	X	X			X					X		X					X		X		
	MC	BCAP0650 P270	X		X							X		X		X	X	X	X				X
		BCAP0650 E270	X		X							X		X		X	X	X	X				X
		BCAP1200 P270	X		X							X		X		X							X
		BCAP1200 E270	X		X							X		X		X							X
		BCAP1500 P270	X		X							X		X		X							X
		BCAP1500 E270	X		X							X		X		X							X
		BCAP2000 P270	X		X							X		X		X							X

Type	Series	Product	Shock				Vibration					Thermal Cycling		Thermal Shock		Salt Fog		Pressure		Altitude		Dust/Water Resistance	
			IEC 60068-2-27	IEC 60068-2-29	SAE J2464	MIL 810-B 516.3 V	IEC 60068-2-6	SAE J2380	MIL 810-D 514.3 I	ISO 16750-3	SAEJ 1455	IEC 60068-2-14	SAE J2464	IEC 60068-2-14	IEC16750-3	MIL 810D 509.2 I	ASTM B117	IEC 60068 2-13 (0.1atm, 24-hr, -60deg.C)	High Pressure (3 atm, 24-hr)	40,000 ft, -35oC	IP65 (IEC529)	IP67 (IEC529)	
		BCAP2000 E270	x		x						x		x		x								x
		BCAP3000 P270	x		x						x		x		x								x
		BCAP3000 E270	x		x		x	x			x		x		x								x
15 V	BPAK	BPAK0020-P015		x	x		x																
		BPAK0023-E015		x	x		x																
		BPAK0053-P015		x	x		x																
		BPAK0058-E015 B0x		x	x		x																
16 V	BMOD	BMOD0053-P015		x	x		x																
		BMOD0058-E015 B0x		x	x		x																
		BMOD0110-P016		x	x		x																x
		BMOD0110-E016		x	x		x																x
		BMOD0250-P016		x	x		x	x															x
		BMOD0250-E016		x	x		x	x															x
		BMOD0500-P016		x	x		x	x															x
		BMOD0500-E016		x	x		x	x															x
		BMOD0083-P048			x			x				x		x									x
		BMOD0083-E048			x			x				x		x									x
48 V		BMOD0110-P048			x		x				x		x									x	

	Type	Series	Product	Shock				Vibration				Thermal Cycling		Thermal Shock		Salt Fog		Pressure		Altitude		Dust/Water Resistance		
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Discontinued	>48V		BMOD0110-E048			X				X			X								X			
			BMOD0165-P048			X					X			X								X		
			BMOD0165-E048			X					X			X								X		
			BMOD0063 P125 xxx V2.1			X					X					X								
			BMOD0063 P125 xxx V2.2			X				X						X							X	
			BMOD0018-P390			X				X				X									X	
Discontinued	BCAP		BCAP2600-E270	X																				
			BCAP2600-P270	X				X	X															
			BMOD145 E048																					
			BMOD145 P048			X				X													X	
Discontinued	BMOD		BMOD430 E048																					
			BMOD430 P048	X				X														X		

Certification and Compliance Descriptions

UL810a – Underwriters Laboratories: Standby Energy Storage Capacitors testing protocol

RoHS – Directive (2002/95/EC) limiting use of hazardous substances in electrical and electronic components.

Testing Standards Descriptions

Shock:

BS EN 60068-2-27. Cells are subjected to half-sine pulse waves (100G-peak acceleration, 6 ms duration). Three shocks applied in each direction of the longitudinal axis and in each direction of the transverse axis (12 shocks total).

BS EN 60068-2-29. Modules are subjected to half-sine pulse waves (40G-peak acceleration, 6 ms duration). 660 shocks applied in each of the following directions +x/-x/+y/-y/+z/-z (3960 shocks in total).

SAE J2464. Cells and modules are subjected to half-sine pulse waves (20G-peak acceleration, 11ms duration). Four shocks applied in lateral, longitudinal and vertical axes (12 shocks total)

MIL 810 B, Method 516.3, Version 5. Cells are subjected to half sine pulse waves (40-G peak acceleration, 9 ms duration).

Vibration:

BS EN 60068-2-6. Cells are subjected to a sinusoidal waveform in the frequency range 10 to 500 Hz with amplitude is 0.75 mm. The test entails 15 sweeps in the longitudinal axis and 15 sweeps in the transverse axis.

SAE J2380. (Vibration Testing of Electric Vehicle Batteries) Cells and modules are subjected to random vibration, 1.9G max acceleration, 11 hours per lateral, longitudinal and vertical axes.

SAE J1455. Cells and modules are subjected to Random Vibration, ~4.6Grms total, 0-600Hz, 38.1 hours duration

MIL 810 D, Method 514.3, Version 1. Figure 514.3 -1, -2, -3 (60 minutes per axes)

Thermal Cycling:

IEC 60068-2-14. Thermal cycle between minimum and maximum operating temperatures, 24 minutes dwell at each extreme, 2 °C/min ramp between minimum storage temperature and 23 °C and 4 °C/min ramp between 23 °C and maximum storage temperature. Perform 100 cycles in total.

Thermal Shock:

IEC 60068-2-14. Thermal cycle between minimum and maximum operating temperature at < 1 minute transfer time, 1 hour dwell

Salt Fog: (cell of the same construction can be qualified by similarity)

MIL 810 D, Method 509.2, Version 1 . Per method for 48 hours.

ASTM B117. Standard Practice for Operating Salt Spray (Fog) Apparatus

Water Resistance: (cell of the same construction can be qualified by similarity)

IP65. Water proof testing to IEC 529, level 5. Water is projected at all angles through a 12.5 mm nozzle at a flow rate of 100 l/min at a gage pressure of 100 kN/m² for 3 minutes at a distance of 3 meters.

Revision History

Rev	Changes
3.	Corrected certification table for vibration testing. Was: SAE2464.