

# SPECIFICATION FOR APPROVAL

**Model:** MCP0165C0-0048R0SHC-03  
**File Number:** JX-YF-S-163.E  
**File Version:** V2017-2

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## Features

- Compact, fully enclosed splash proof design
- Over 1,000,000 duty cycles
- High power density

## Applications

- Automotive
- Railway transportation
- Heavy duty machinery
- Energy storage system

## Specification



### ELECTRICAL

MCP0165C0-0048R0SHC-03

Nominal Capacitance	165 F
Capacitance Tolerance	0% / +20%
Rated Voltage	48 V
Surge Voltage	51 V
ESR, DC	5 mΩ
Maximum Continuous Current (Δ T=15°C)	90 A
Maximum Continuous Current (Δ T=40°C)	150 A
Maximum Peak Current, 1 sec.	2000 A
Leakage Current (25°C, after 72h)	5.2 mA
Capacitance of Individual Cells	3000 F
Number of Cells	18

### Environment

Operating Temperature Range	-40°C to +65°C
Storage Temperature Range	-40°C to +70°C
Environment Humidity	≤96%RH

### PHYSICAL

Weight	14.8 kg
Power Terminals	M8/M10
Recommended Torque - Terminal	20/30 Nm
Vibration Specification	IEC 255-21-1
Shock Specification	IEC 255-21-2
Environmental Protection	IP65

### FUNCTION

Cell Voltage Monitoring	Overvoltage Alarm
Temperature Monitoring	NTC Thermistor

### POWER AND ENERGY

Usable Power Density (Pd)	3,736 W/kg
Impedance Match Power Density (Pmax)	7,783 W/kg
Gravimetric Energy Density (Emax)	3.6 Wh/kg
Stored Energy	52.8 Wh

LIFE		MCP0165C0-0048R0SHC-03
<b>High Temperature</b> (at Rated Voltage & Maximum operating Temperature)		1,500 hours
<b>Capacitance Change</b> (% decrease from initial measured value)		≤20%
<b>ESR Change</b> (% increase from specified value)		≤100%
<b>Room Temperature</b> (at Rated Voltage at 25°C)		10 years
<b>Capacitance Change</b> (% decrease from initial measured value)		≤20%
<b>ESR Change</b> (% increase from specified value)		≤100%
<b>Cycle Life</b> (Number of cycles)		1,000,000
<b>Capacitance Change</b> (% decrease from initial measured value)		≤20%
<b>ESR Change</b> (% increase from specified value)		≤100%
<b>Shelf Life</b> (25°C, uncharged)		4 years
SAFE		
<b>Factory High-Pot Test</b>		2,500 V DC
THERMAL CHARACTERISTICS		
Typical Thermal Resistance		0.3 °C/W
Typical Thermal Capacitance		14,000 J/°C

## Notes

- Surge voltage is non-repetitive. The duration must not exceed 1 second.
- Maximum peak Current is non-repetitive. The duration must not exceed 1 second.
- Formula of maximum peak Current:

$$I_{peak} = \frac{1 / 2CV}{C \times ESR_{DC} + 1}$$

C is rated capacity, V is rated voltage.

- Formula of power and energy

Usable Power Density  $P_d = \frac{0.12V^2}{ESR_{DC} \times mass}$

Impedance Match Power Density  $P_{max} = \frac{V^2}{4ESR_{DC} \times mass}$

Gravimetric Energy Density  $E_{max} = \frac{1 / 2CV^2}{3600 \times mass}$

Stored Energy  $E = \frac{1 / 2CV^2}{3600}$

## Measuring Method

### 1) Charge and Discharge procedure

(Figure 1)

- A) Charge the capacitor using constant current I to rated voltage  $V_0$
- B) Keep rated voltage 5 min
- C) Discharge the capacitor using constant current I to half rated voltage, record discharge time  $T_1$  during voltage change from  $V_1$  to  $V_2$
- D) Rest 2-5s, record voltage change  $\Delta V$
- E) Discharge it to a very low voltage around 0.01V
- F)  $V_1=85\% V_0$   $V_2=50\% V_0$

### 2) Capacitance

$$C = I \cdot T_1 / (V_1 - V_2)$$

C: Capacitance (F)

I: Constant Discharge Current (A)

$T_1$ : Discharge Time (S)

$V_1 - V_2$ : Voltage Change (V)

### 3) DC ESR

$$\text{DC ESR} = \Delta V / I$$

DC ESR: DC Equivalent Series Resistance ( $\Omega$ )

$\Delta V$ : Voltage Change (V)

I: Constant Discharge Current (A)

### 4) AC ESR

Measure AC ESR using LCR meter

Frequency: 1KHz

Voltage: fully discharge

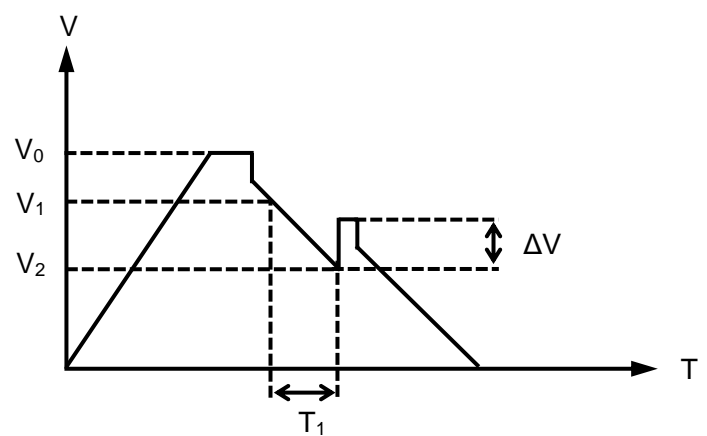
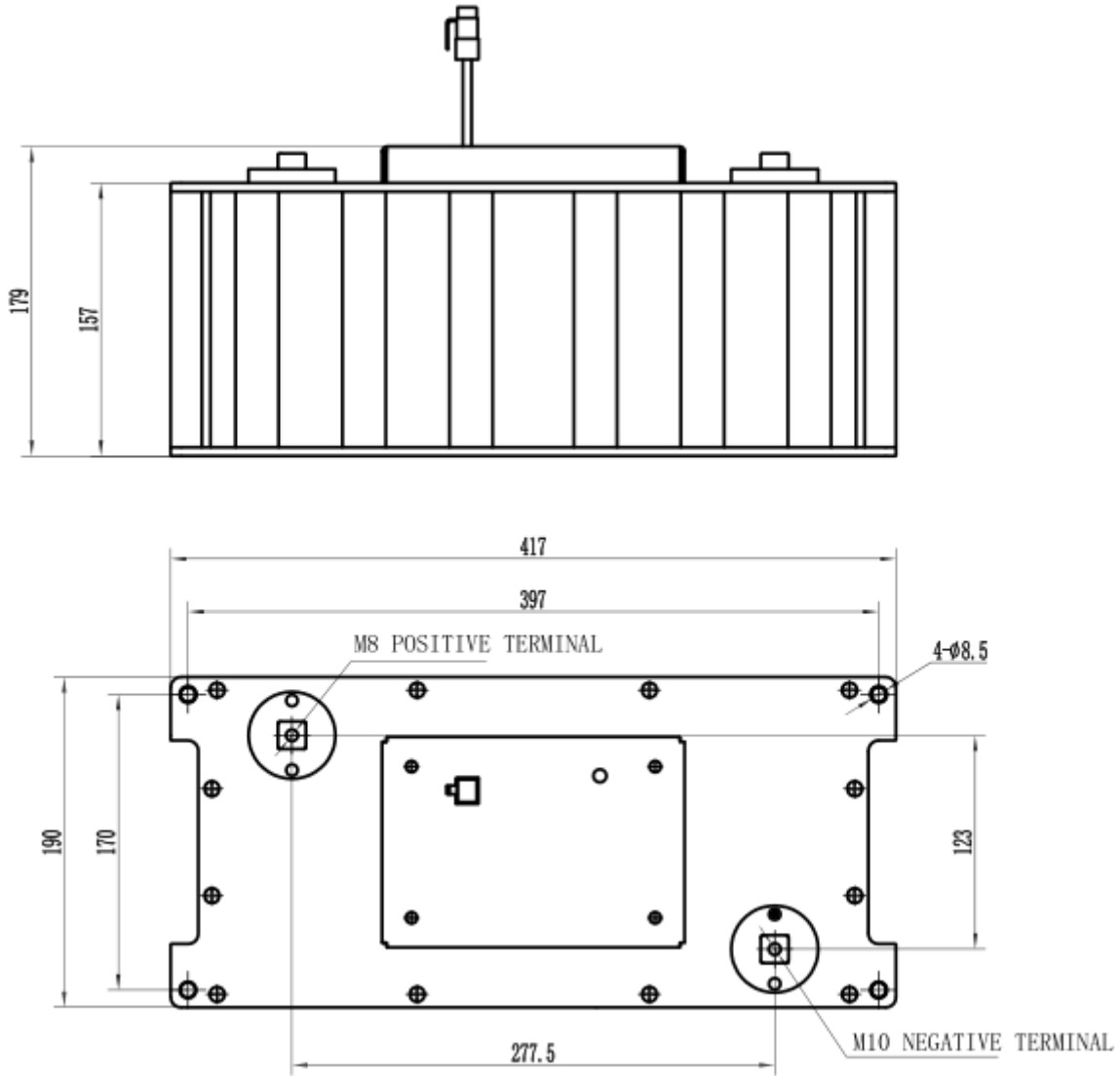


Figure 1

## Dimensions



Part Number	Dimension (mm)		
	L ( $\pm 1$ mm)	W ( $\pm 1$ mm)	H (Max)
MCP0165C0-0048R0SHC-03	417	190	179

## Pin Definition

Pin Number	Wire Color	Definition	Output
1	Black	GND	
2	Red	Overvoltage Alarm	High - Inactive Low - Active
3	Void	Void	
4	Green	Temperature	