

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 |
|-------------------------------------------------------------------------------|--|------------------------|
| High Temperature (at Rated Voltage & Maximum operating Temperature) | | 1,500 hours |
| Capacitance Change (% decrease from initial measured value) | | ≤20% |
| ESR Change (% increase from specified value) | | ≤100% |
| Room Temperature (at Rated Voltage at 25°C) | | 10 years |
| Capacitance Change (% decrease from initial measured value) | | ≤20% |
| ESR Change (% increase from specified value) | | ≤100% |
| Cycle Life (Number of cycles) | | 1,000,000 |
| Capacitance Change (% decrease from initial measured value) | | ≤20% |
| ESR Change (% increase from specified value) | | ≤100% |
| Shelf Life (25°C, uncharged) | | 4 years |
| SAFE | | |
| Factory High-Pot Test | | 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 ΔV
- 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 (Ω)

ΔV : Voltage Change (V)

I: Constant Discharge Current (A)

4) AC ESR

Measure AC ESR using LCR meter

Frequency: 1KHz

Voltage: fully discharge

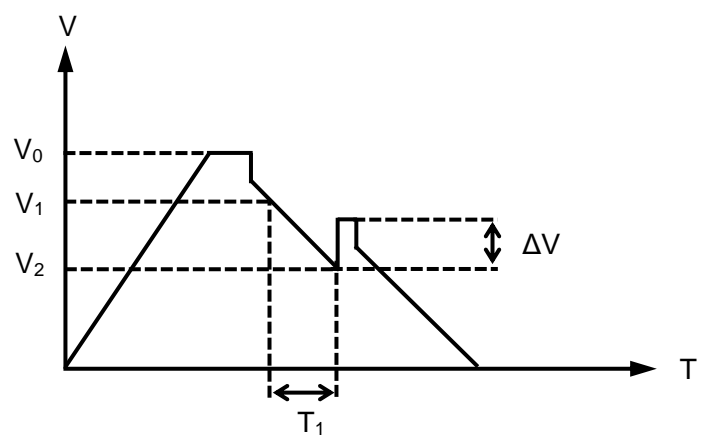
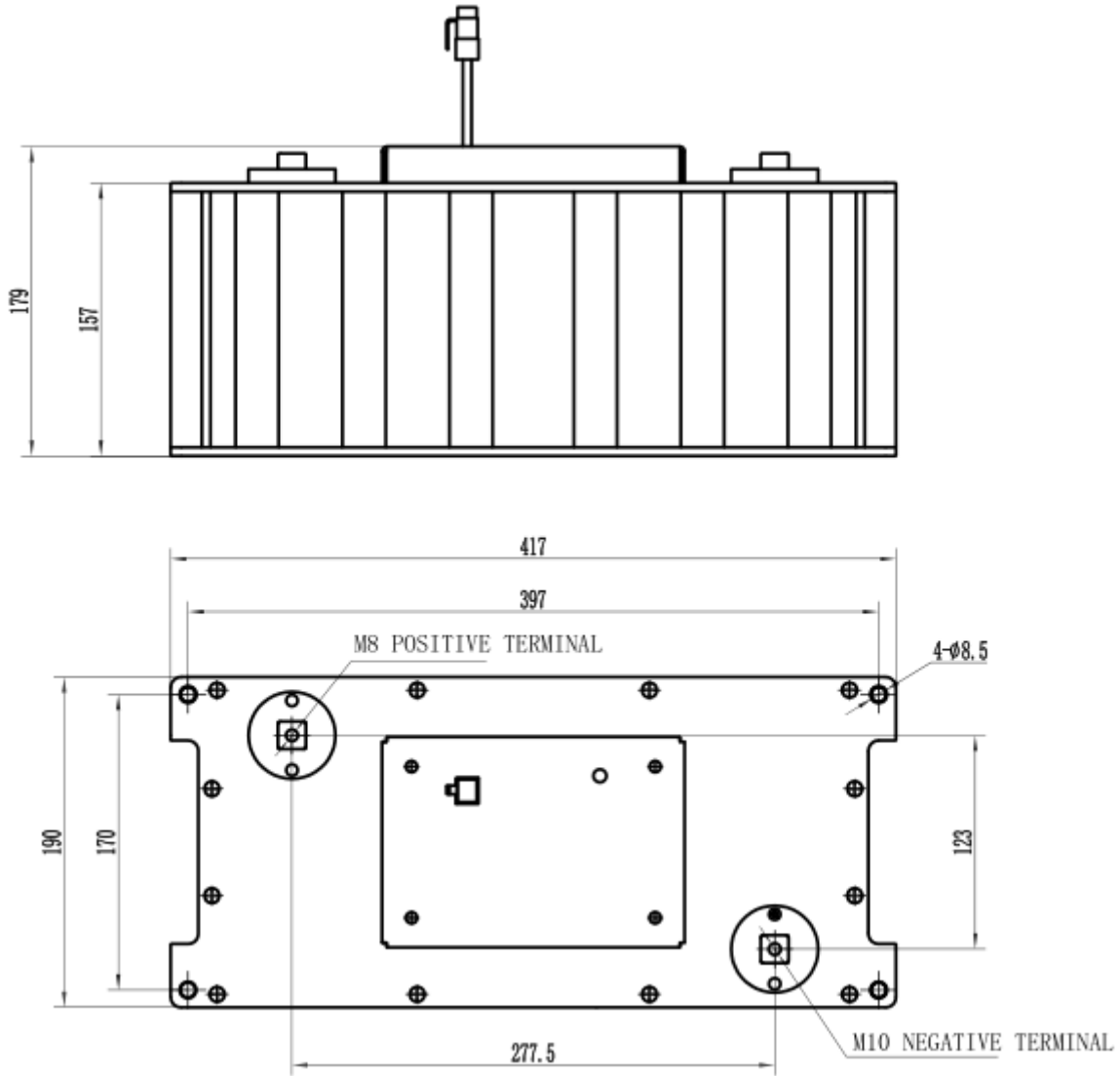


Figure 1

Dimensions



| Part Number | Dimension (mm) | | |
|------------------------|-----------------|-----------------|---------|
| | L (± 1 mm) | W (± 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 | |