High Temperature Film Capacitor for Automotive Application

Recommended for smoothing capacitors of xEV power electronics that require high heat resistance and safety.

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**High Temperature Film Capacitor**

**New Products**

Enable to use at 125°C continuously

Functional self-healing at high temperature ranges, leading to an open mode failure

Smoothing capacitor for xEV Power Electronics that require high heat-resistance and safety

High Temperature Film Capacitor for Automotive Application

- **Items**
  - Rated Capacitance: 10, 15, 20µF
  - Rated Voltage: 500V
  - Operational Life: 125 °C /500V 2000h
  - Biased Humidity: 85 °C /85%RH/500V 1000h
  - Temperature Cycling: -40 °C ⇔ 125 °C  1000 cycles

**Basic Specifications**

- **Capacitance**
  - FHA50Y206KS: 20µF
  - FHA50Y156KS: 15µF
  - FHA50Y106KS: 10µF

**Dimensions (mm)**

- **H T S W T H**
  - FHA50Y206KS:
    - 14.5
    - 29.0
    - 35.0
    - 35.5
  - FHA50Y156KS:
    - 20.0
    - 29.0
    - 35.0
  - FHA50Y106KS:
    - 20.0
    - 20.0

**MARKING**

**Material**

- Thermoplastic Resin
- Thermosetting Resin

**Temperature**

- ε<sub>r</sub> 85 - 105 °C: 2.1
- ε<sub>r</sub> 125 - 135°C: 3 ≤

**Applications**

- EV
- HEV
- PHEV
- FCEV

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**Characteristics of the dielectric film**

- "High temperature" + "High ε<sub>r</sub>"

**Characteristics of the Capacitor**

- "High Temperature" + "Small"
High Temperature Capacitor FH series that can be used continuously at 125°C

Currently, film capacitors commonly used for automotive applications are generally guaranteed up to 105°C. Murata has recently developed a new high heat resistant film material. Using this material, we have commercialized a high heat resistance film capacitor that can be used continuously at 125°C with Shizuki Electronic Co., Inc.

Although there was a high heat resistance film capacitor in the past, there was a concern that the self-healing function is hard to work at high temperature and short-circuit failure may result. On the other hand, the product developed this time has a self-healing function in high temperature range.

**Performances**

The FH series uses materials with high heat resistance. Therefore, it has a higher allowable ripple current under higher temperature environment than conventional PP film capacitor.

This feature is more prominent in the high frequency range. For example, when the ambient temperature is at 105°C, PP film capacitor would be already on its limit for allowable ripple current, but because of the higher heat resistance of FH series, the allowable ripple current can be increased drastically.

**Typical Block Diagram**
High Temperature Film Capacitor for Automotive Application

**Target Application; Electric Compressor**

The compressor for air conditioner of xEV is driven by inverter system. In accordance with the trend of electromechanical integration of xEV, simplification of the cooling mechanism, miniaturization, and high power density has also been required to the air conditioner system. Based on the application trends, smoothing capacitors are also required to correspond to higher temperatures than before. Film Capacitor FH series using new high heat resistant dielectric material contributes to high power density of your systems which is required for reliability and safety in high temperature range.

**Target Application; OBC (On Board Charger)**

OBC is an AC/DC converter for charging high voltage battery of EV and PHEV. In recent years, soft switching type resonance converters are increasing. The resonance converter is driven at high frequency, and the temperature of the coil part is rising. Due to the miniaturization of OBC, packaging density has promoted, and heat resistance is required for parts. The high heat resistance film capacitor FH series contributes to high density mounting of your OBC system.

**Target Application; WPT (Wireless Power Transfer System)**

The charger for EV and PHEV is expected to change from the existing wired plug type to the wireless type. In the wireless type, the resonance system carries out energy conversion at high frequencies, and the temperature of the coil part rises as well. The miniaturization and high-density mounting of WPT is advancing, and high heat resistance film capacitor FH series is suitable as a smoothing capacitor of the secondary circuit.
Conventional Film Capacitors

- Guarantee 105°C continuous or less in general (PP)
- Very limited functional self-healing at high temperature ranges, leading to a short mode failure (PPS and PEN)

High Temperature Film Capacitors

- Enable to use at 125°C continuously
- Functional self-healing at high temperature ranges, leading to an open mode failure

Material

High Temperature Capacitors (New Products)

- Enable to use at 125°C continuously
- Functional self-healing at high temperature ranges, leading to an open mode failure

Applications

Smoothing capacitor for xEV Power Electronics that require high heat-resistance and safety

- Electric Compressor
- OBC (On Board Charger)
- WPT (Wireless Power Transfer System)

Specifications

<table>
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<th>Items</th>
<th>Basic Specifications</th>
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<tr>
<td>Rated Capacitance</td>
<td>10, 15, 20µF</td>
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<tr>
<td>Rated Voltage</td>
<td>500V</td>
</tr>
<tr>
<td>Operational Life</td>
<td>125°C/500V 2000h</td>
</tr>
<tr>
<td>Biased Humidity</td>
<td>85°C/85%RH/500V 1000h</td>
</tr>
<tr>
<td>Temperature Cycling</td>
<td>-40°C⇔125°C 1000 cycles</td>
</tr>
</tbody>
</table>

Features

- Characteristics of the dielectric film “High temperature”+ “High εr”
- Characteristics of the Film Capacitor “High Temperature”+“Small”

Features

- Characteristics of the dielectric film “High temperature”+ “High εr”
- Characteristics of the Film Capacitor “High Temperature”+“Small”

<table>
<thead>
<tr>
<th>Items</th>
<th>p.p.</th>
<th>New Film</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Thermoplastic Resin</td>
<td>Thermosetting Resin</td>
</tr>
<tr>
<td>Temperature</td>
<td>85-105°C</td>
<td>125-135°C</td>
</tr>
<tr>
<td>εr</td>
<td>2.1-2.2</td>
<td>3 ≤</td>
</tr>
</tbody>
</table>

Dimensions

- FHA50Y206KS
- FHA50Y156KS
- FHA50Y106KS

<table>
<thead>
<tr>
<th>Pant Number</th>
<th>Capacitance</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHA50Y206KS</td>
<td>20µF</td>
<td>35.0 37.0 20.0 29.0</td>
</tr>
<tr>
<td>FHA50Y156KS</td>
<td>15µF</td>
<td>35.0 35.5 14.5 29.0</td>
</tr>
<tr>
<td>FHA50Y106KS</td>
<td>10µF</td>
<td></td>
</tr>
</tbody>
</table>

Note

- Please read rating and CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
- This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
High Temperature Film Capacitor for Automotive Application

Characteristics of the Capacitor

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Features</th>
<th>Material</th>
<th>Applications</th>
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<tbody>
<tr>
<td>85 - 105 °C</td>
<td>High εr 2.1 - 2.2, high performance at high temperatures</td>
<td>Thermoplastic Resin, Thermosetting Resin</td>
<td>OBC (On Board Charger), Electric Compressor</td>
</tr>
<tr>
<td>125 - 135°C</td>
<td>Enable to use at 125°C continuously, functional self-healing at high temperature</td>
<td></td>
<td>General (PP)</td>
</tr>
</tbody>
</table>

Characteristics of the dielectric film

- 85 °C /85%RH/500V 1000h
- 125 °C 1000 cycles
- FHA50Y106KS 10µF
- FHA50Y156KS
- FHA50Y206KS

Dimensions (mm)

- FHA50Y106KS: 37.0 x 29.0 x 14.5
- FHA50Y156KS: 37.0 x 29.0 x 20.0
- FHA50Y206KS: 37.0 x 29.0 x 29.0

Specifications

- Conventional Film Capacitors
- Rated Capacitance 10, 15, 20µF
- Operational Life 125 °C /500V 2000h
- Rated Voltage 500V
- Guarantee 105°C continuous or less in general (PPS and PEN)
- Temperature Cycling -40 °C

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  - Power plant equipment
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  - Disaster prevention / crime prevention equipment
  - Data-processing equipment
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