

<DES/DEH/DEA/DEB/DEC Series>

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the V_{p-p} value of the applied voltage or the V_{0-p} which contains DC bias within the rated voltage range.

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When using the low-dissipation DEA (SL Char.) /DEC (SL Char.) /DEH (C, R Char.) /DES (D Char.) series in a high-frequency and high-voltage circuit, be sure to read the instructions in item 4.

When DC-rated capacitors are to be used in input circuits from commercial power source (AC filter), be sure to use Safety Recognized Capacitors because various regulations on withstand voltage or impulse withstand established for each equipment should be taken into considerations.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

2. Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. The frequency of the applied sine wave voltage should be less than 300kHz. The applied voltage load (*) should be such that the capacitor's self-generated heat is within 20°C in an atmosphere temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of $\phi 0.1\text{mm}$ in conditions where the capacitor is not affected by radiant heat from other components or surrounding ambient fluctuations.

Excessive heat may lead to deterioration of the capacitor's characteristics and reliability.

(Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

*Before using the low-dissipation DEA/DEC (SL Char.) /DEH/DES series, be sure to read the instructions in item 4.

3. Fail-Safe

When capacitor is broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure would follow an electric shock, fire or fume.

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4. Load Reduction and Self-generated Heat During Application of High-frequency and High-voltage
 Due to the low self-heating characteristics of low-dissipation capacitors, the allowable electric power of these capacitors is generally much higher than that of B characteristic capacitors. However, in case the self-heating temperature is 20°C under a high-frequency voltage whose peak-to-peak value equals the capacitor's rated voltage, the capacitor's power consumption may exceed its allowable electric power.
 Therefore, when using the DEA/DEC (SL Char.) /DEH /DES series in a high-frequency and high-voltage circuit with a frequency of 1kHz or higher, make sure that the Vp-p values including the DC bias, do not exceed the applied voltage value specified in Table 1. Also make sure that the self-heating temperature (the difference between the capacitor's surface temperature and the capacitor's ambient temperature) at an ambient temperature of 25°C does not exceed the value specified in Table 1.
 As shown in Fig. 2, the self-heating temperature depends on the ambient temperature. Therefore, if you are not able to set the ambient temperature to approximately 25°C, please contact our sales representatives or product engineers.

We are offering free software, The Capacitor Selection Tool: by Voltage Form* which will assist you in selecting a suitable capacitor.
 The software can be downloaded from Murata's Internet Web site.
 (http://www.murata.com/designlib/mmcsv_e.html)
 By inputting capacitance values and applied voltage waveform of the specific capacitor series, this software will calculate the capacitor's power consumption and list suitable capacitors.
 When the result of this software is different from the measurement result of the self-heating temperature on your side, please contact our sales representatives or product engineers.

- * Subject series are below.
 - DEA/DEC (SL char.) /DEH/DES/DEF Series

FAILURE TO FOLLOW THE ABOVE CAUTIONS (ITEMS 1 TO 4) MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

<Table 1> Allowable Conditions at High-frequency

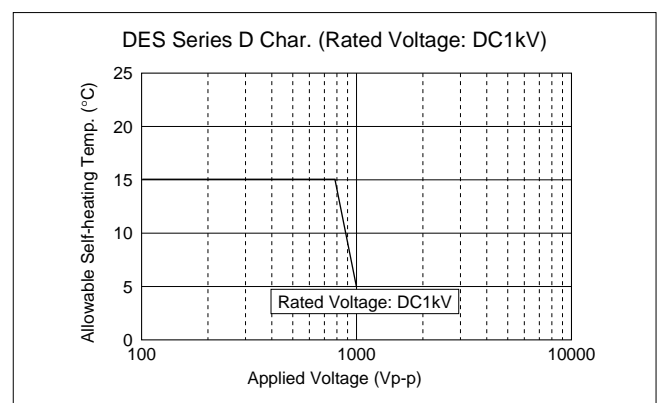
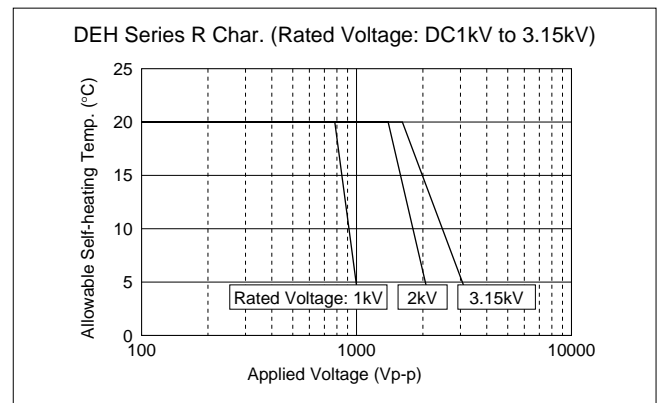
Series	Temp. Char.	DC Rated Voltage	Allowable Conditions at High-frequency *3		Capacitor's Ambient Temp. *2
			Applied Voltage (Max.)	Self-heating Temp. (25°C Ambient Temp.) *1	
DEH	R	250V	250Vp-p	10°C Max.	-25 to +85°C
	C	500V	500Vp-p	20°C Max.	
	R	1kV	800Vp-p	20°C Max.	
			1000Vp-p	5°C Max.	
		2kV	1400Vp-p	20°C Max.	
			2000Vp-p	5°C Max.	
3.15kV	1600Vp-p	20°C Max.			
	3150Vp-p	5°C Max.			
DEA	SL	1kV	1000Vp-p	5°C Max.	
		2kV	2000Vp-p		
		3.15kV	3150Vp-p		
DEC	SL	6.3kV	6300Vp-p	5°C Max.	
DES	D	500V	500Vp-p	15°C Max.	
		1kV	800Vp-p	5°C Max.	
			1000Vp-p		

*1 Fig. 1 shows the relationship between the applied voltage and the allowable self-heating temperature regarding 1 to 3.15kV rated voltage of the DEH series R characteristic and 1kV rated voltage of the DES series D characteristic.

*2 When the ambient temperature is 85 to 125°C, the applied voltage needs to be further reduced. If the DEA/DEH/DES series needs to be used at an ambient temperature of 85 to 125°C, please contact our sales representatives or product engineers.

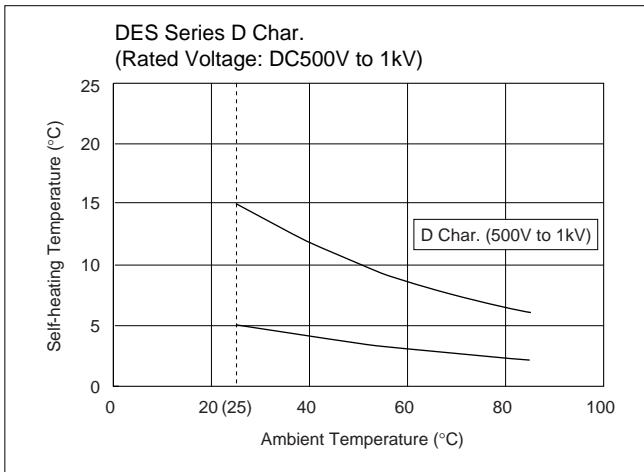
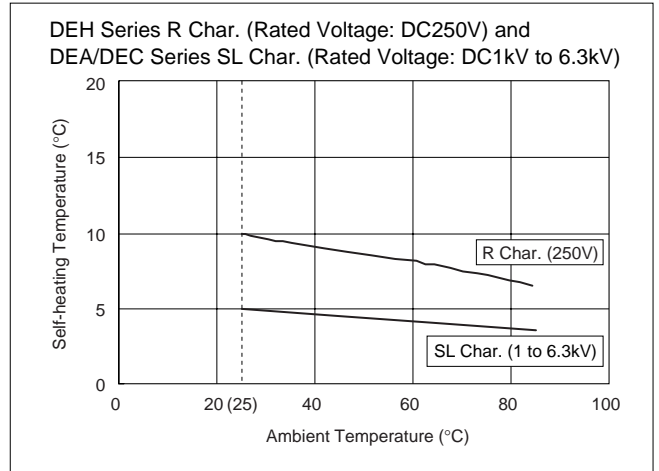
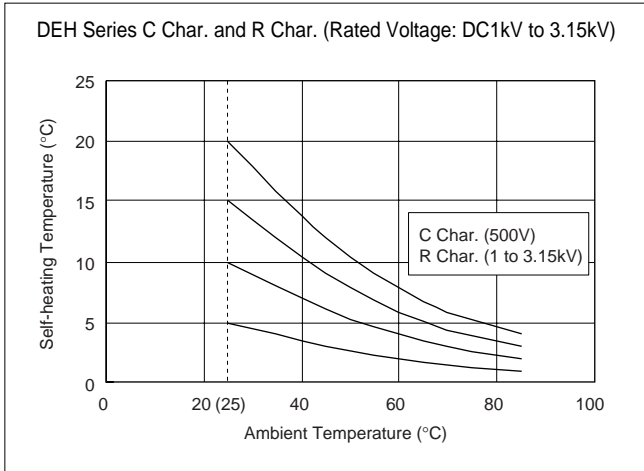
*3 Fig. 3 shows reference data on the allowable voltage - frequency characteristics for a sine wave voltage.

<Fig. 1> Relationship Between Applied Voltage and Self-heating Temperature (Allowable Self-heating Temp. at 25°C Ambient Temp.)



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<Fig. 2> Dependence of Self-heating Temperature on Ambient Temperature



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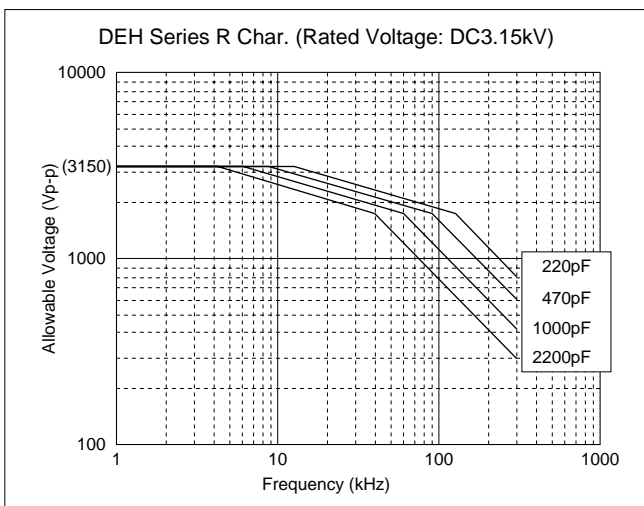
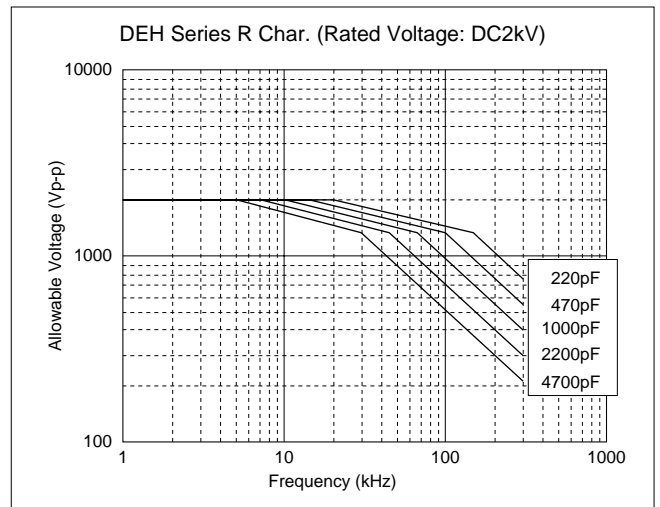
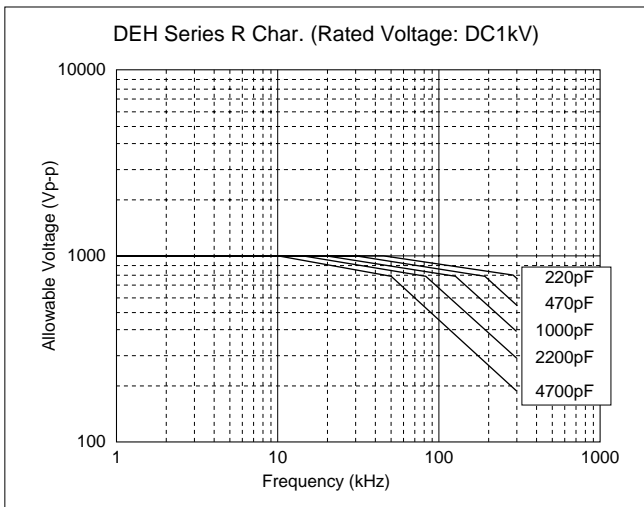
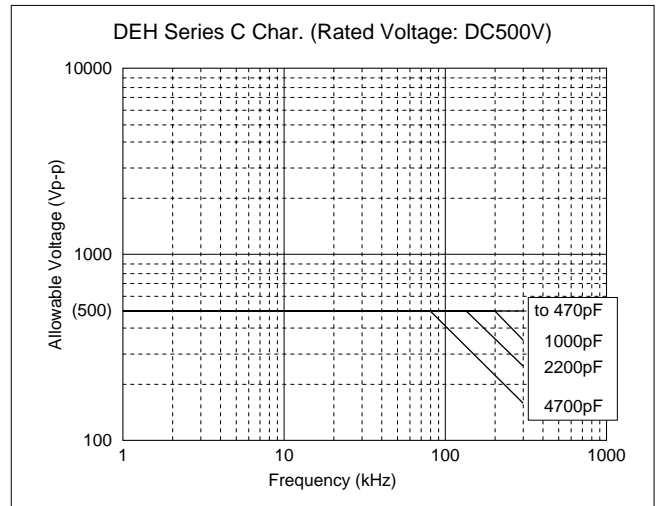
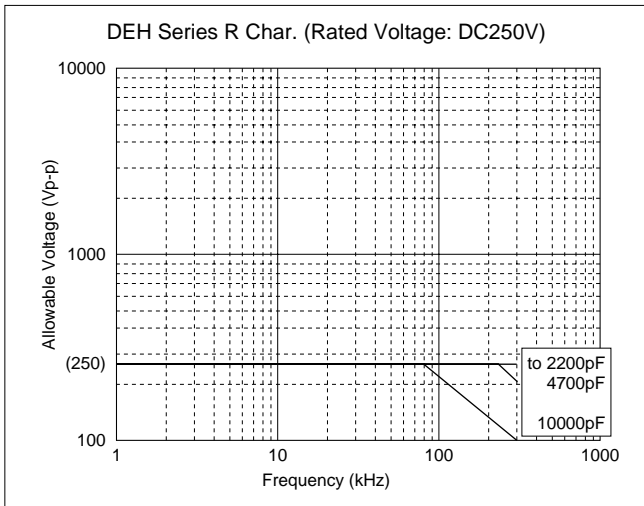
<Fig. 3> Allowable Voltage (Sine Wave Voltage) - Frequency Characteristics (At Ambient Temperature of 85°C or less)

Because of the influence of harmonics, when the applied voltage is a rectangular wave or pulse wave (instead of a sine wave voltage), the heat generated by the capacitor is higher than the value obtained by application of the sine wave with the same fundamental frequency.

Roughly calculated for reference, the allowable voltage for a rectangular wave or pulse wave corresponds approximately

to the allowable voltage for a sine wave whose fundamental frequency is twice as large as that of the rectangular wave or pulse wave. This allowable voltage, however, varies depending on the voltage and current waveforms.

Therefore, you are requested to make sure that the self-heating temperature is not higher than the value specified in Table 1.



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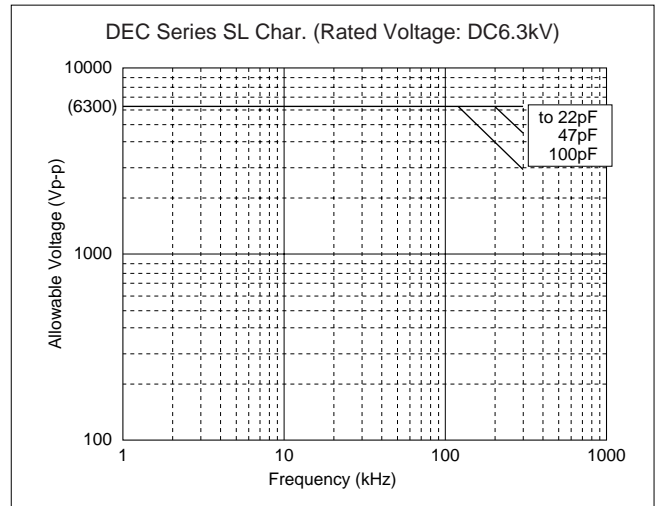
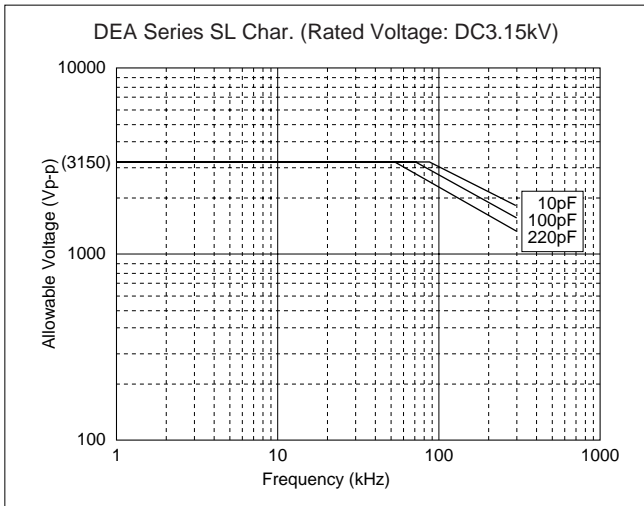
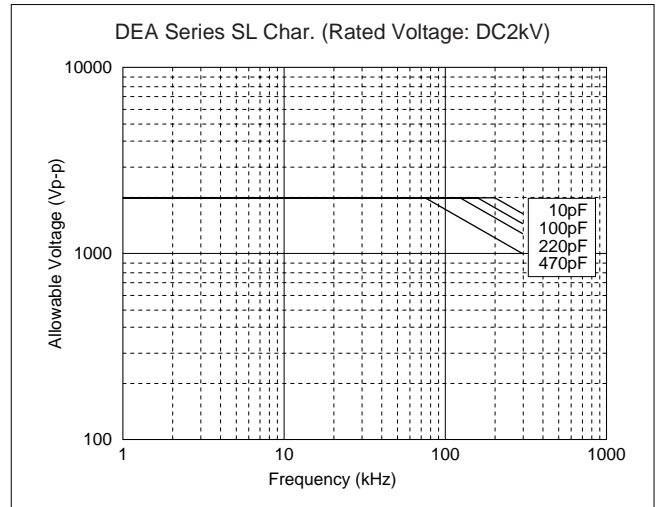
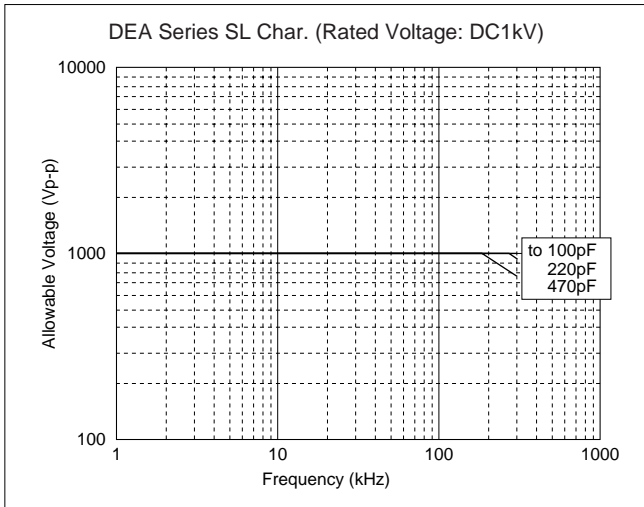
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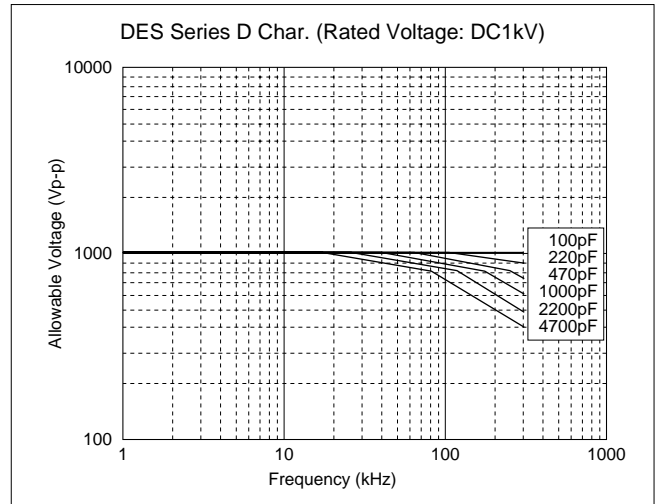
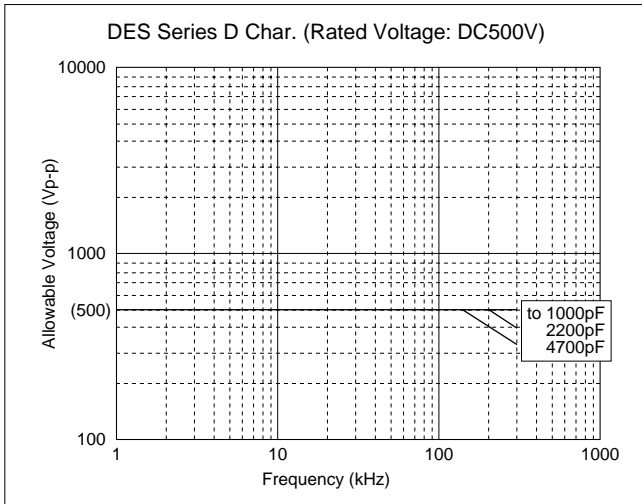
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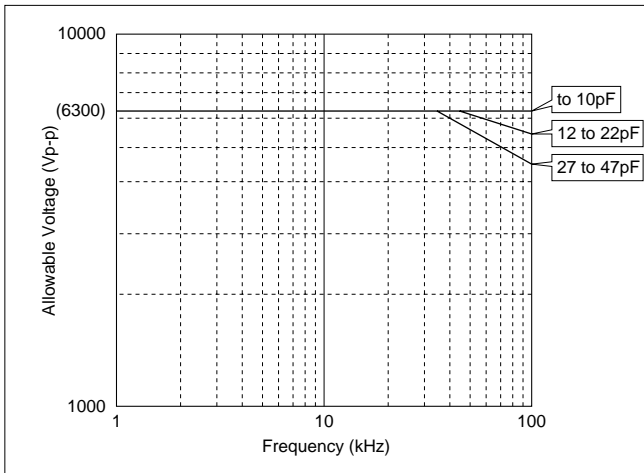
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<DEF Series>

1. Operating Voltage

The frequency of the applied sine wave voltage should be less than 100kHz. The applied voltage should be less than the value shown in figure below. In case of non-sine wave which includes a harmonic frequency, please contact our sales representatives or product engineers.



The temperature of the surface of capacitor: below the upper limit of its rated operating temperature range (including self-heating.)

The capacitor can be applied maximum 6.3kVp-p at 100kHz when lamp turn on.

Voltage	AC Voltage
Positional Measurement	

2. Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or similar current, it may self-generate heat due to dielectric loss. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

3. Fail-Safe

When capacitor is broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure could result in an electric shock, fire or fume.