⚠Caution/Notice

⚠Caution

■ Storage and Operation Conditions

■ Rating

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

1. Operating Voltage
2. Operating Temperature and Self-generated Heat
3. Fail-safe
4. Load Reduction and Self-generated Heat During Application of High-frequency and High-voltage

<DEF Series>

1. Operating Voltage
2. Operating Temperature and Self-generated Heat
3. Fail-safe

■ Soldering and Mounting

1. Vibration and Impact
2. Soldering
3. Bonding, Resin Molding and Coating
4. Treatment after Bonding, Resin Molding and Coating

Notice

■ Rating

1. Capacitance Change of Capacitor

■ Soldering and Mounting

1. Cleaning (ultrasonic cleaning)

⚠Caution

■ Storage and Operation Conditions

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. Also, avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 degrees centigrade and 15 to 85%.
Use capacitors within 6 months after delivery.
Check the solderability after 6 months or more.

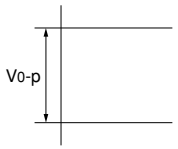
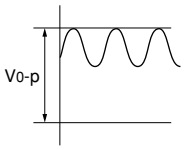
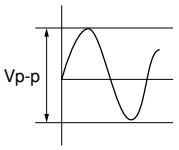
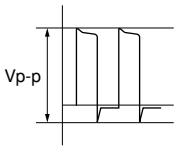
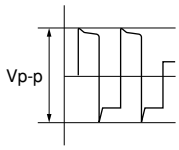
■ Rating

<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 Vp-p value of the applied voltage or the Vo-p that 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 Certified Capacitors because various regulations on withstand voltage or impulse withstand established for each type of equipment should be taken into consideration.

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 atmospheric temperature of 25°C. When measuring, use a thermocouple of small thermal capacity-K of ø0.1mm 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 the 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 follow an electric shock, fire or fume.

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⚠Caution

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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, if 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 Web site. (http://www.murata.com/products/design_support/mmcsv/index.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.

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

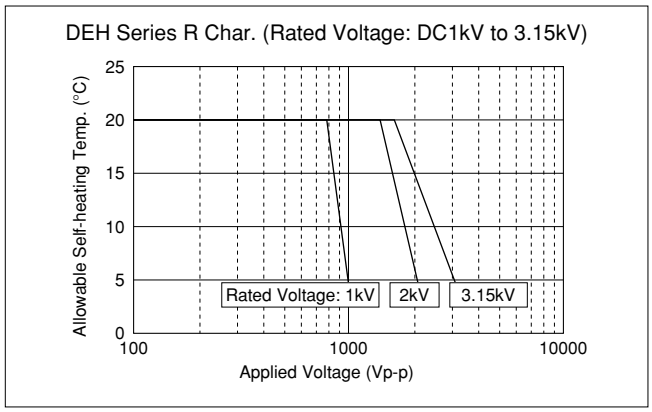
Series	Temp. Char.	DC Rated Voltage	Allowable Conditions at High-frequency *3		Capacitor's Ambient Temp. *2
			Applied Voltage (Max.)	Self-heating Temp. (25°C Ambient Temp.) *1	
DEH	R	250V	250Vp-p	10°C Max.	-25 to +85°C
	C	500V	500Vp-p	20°C Max.	
	R	1kV	800Vp-p	20°C Max.	
			1000Vp-p	5°C Max.	
		2kV	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		
			1000Vp-p	5°C Max.	

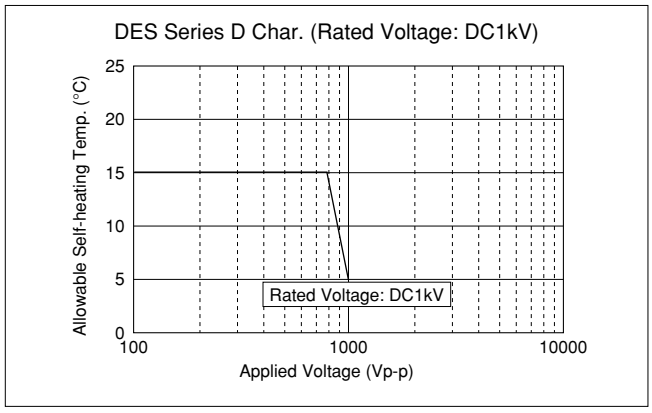
*1 Fig. 1 shows the relationship between the applied voltage and the allowable self-heating temperature regarding 1 to 3.15kV rated voltage of the DEH series R characteristic and 1kV rated voltage of the DES series D characteristic.

*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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⚠Caution

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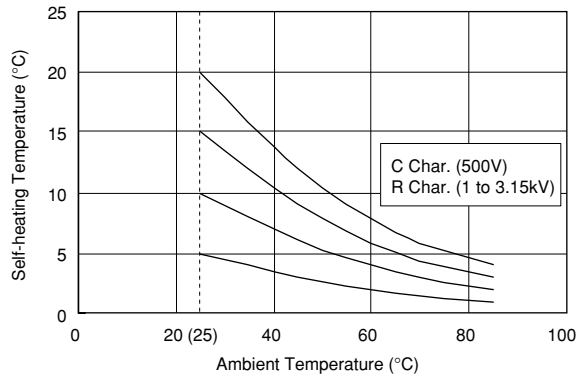
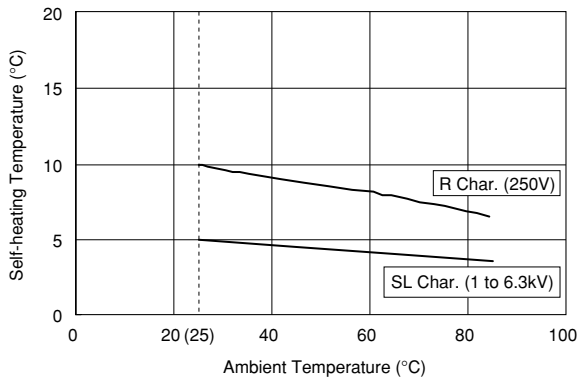
<Fig. 2> Dependence of Self-heating Temperature on Ambient Temperature

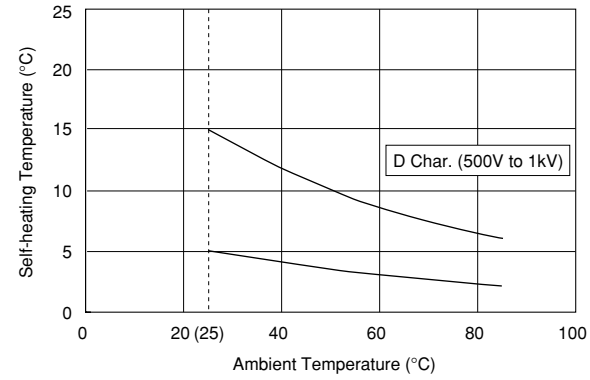
DEH Series C Char. and R Char. (Rated Voltage: DC1kV to 3.15kV)



DEH Series R Char. (Rated Voltage: DC250V) and
DEA/DEC Series SL Char. (Rated Voltage: DC1kV to 6.3kV)



DES Series D Char.
(Rated Voltage: DC500V to 1kV)



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⚠Caution

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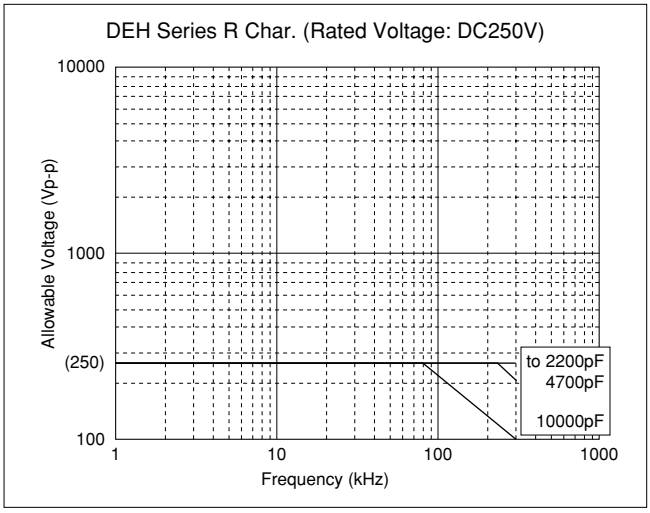
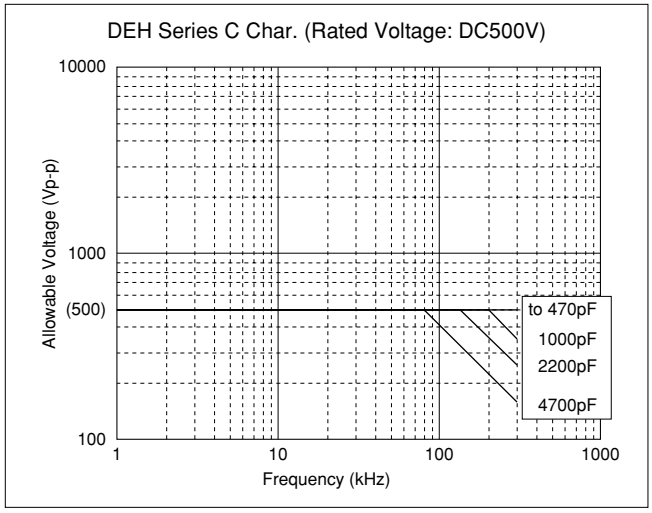
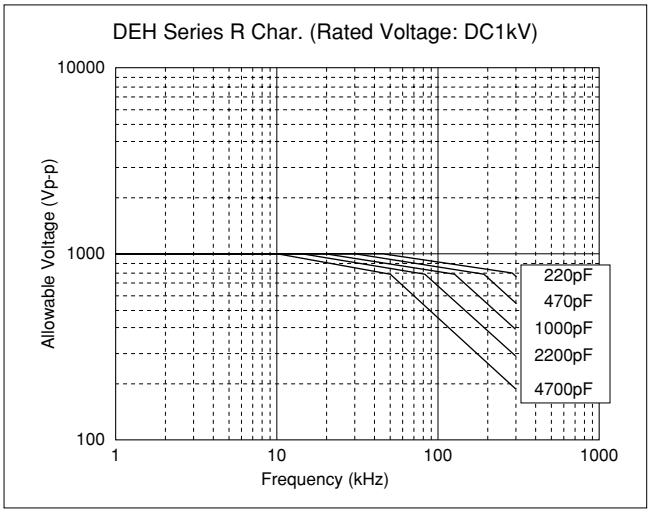
<Fig. 3> Allowable Voltage (Sine Wave Voltage) - Frequency Characteristics (At Ambient Temperature of 85°C or less)

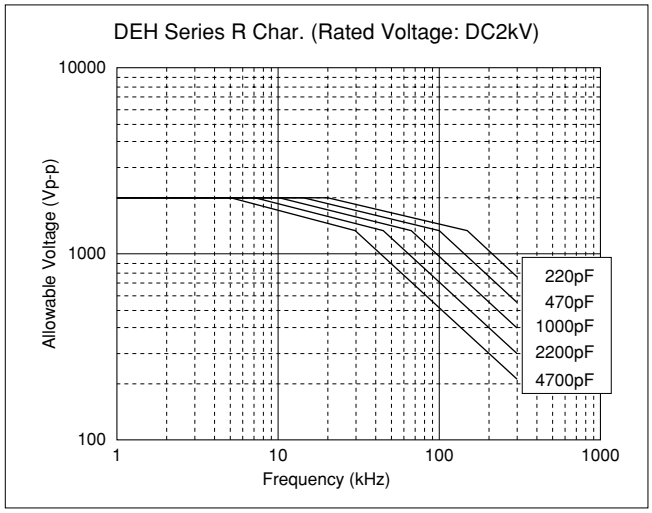
Because of the influence of harmonics, when the applied voltage is a rectangular wave or pulse wave voltage (instead of a sine wave voltage), the heat generated by the capacitor is higher than the value obtained by application of the sine wave with the same fundamental frequency.

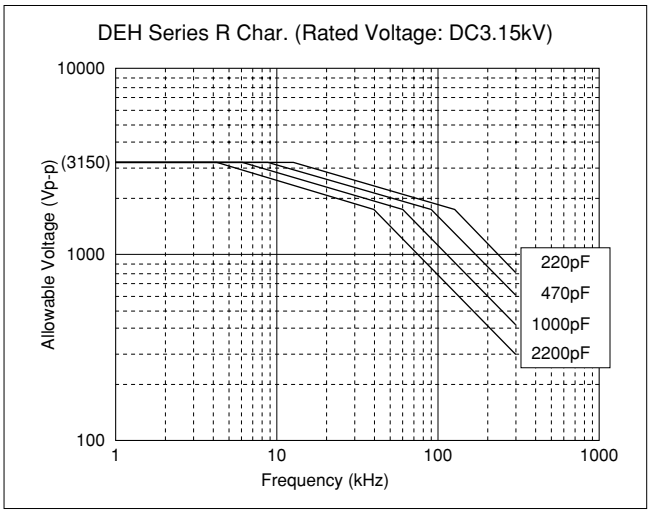
Roughly calculated for reference, the allowable voltage for a rectangular wave or pulse wave corresponds approximately to the allowable voltage for a sine wave whose fundamental frequency is twice as large as that of the rectangular wave or pulse wave. This allowable voltage, however, varies depending 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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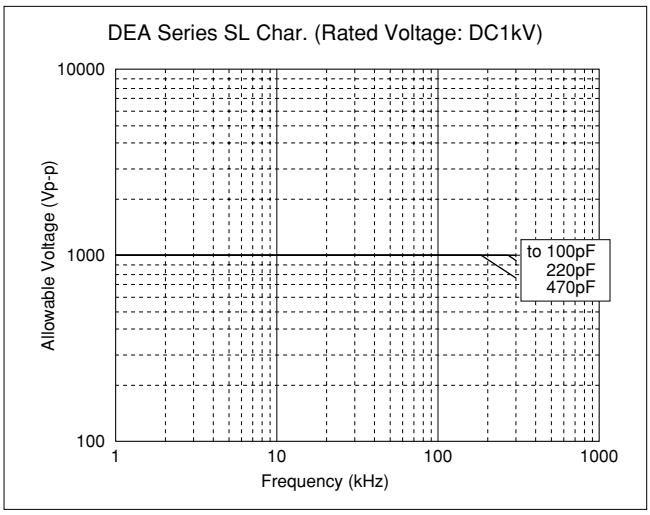
<Fig. 3 (continued)> Allowable Voltage (Sine Wave Voltage) - Frequency Characteristics (At Ambient Temperature of 85°C or less)

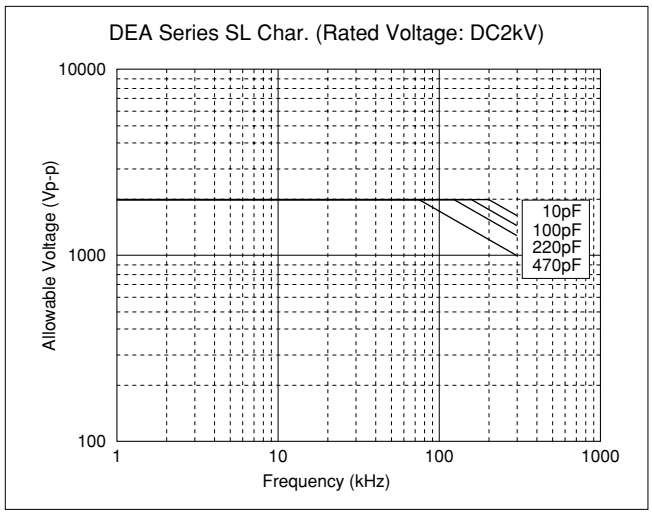
Because of the influence of harmonics, when the applied voltage is a rectangular wave or pulse wave voltage (instead of a sine wave voltage), the heat generated by the capacitor is higher than the value obtained by application of the sine wave with the same fundamental frequency.

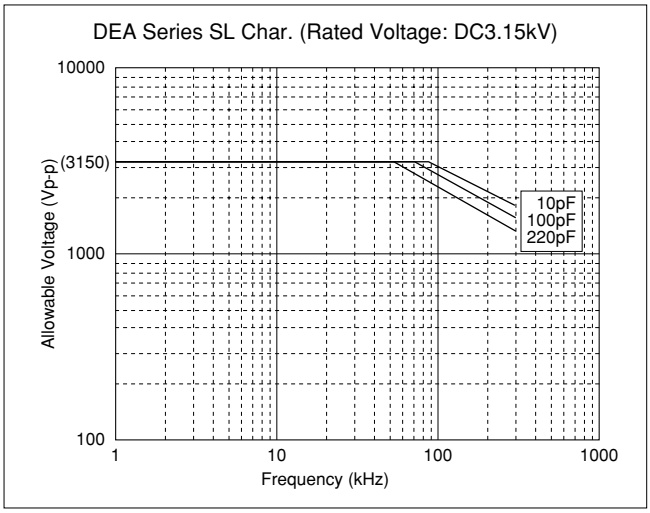
Roughly calculated for reference, the allowable voltage for a rectangular wave or pulse wave corresponds approximately to the allowable voltage for a sine wave whose fundamental frequency is twice as large as that of the rectangular wave or pulse wave.

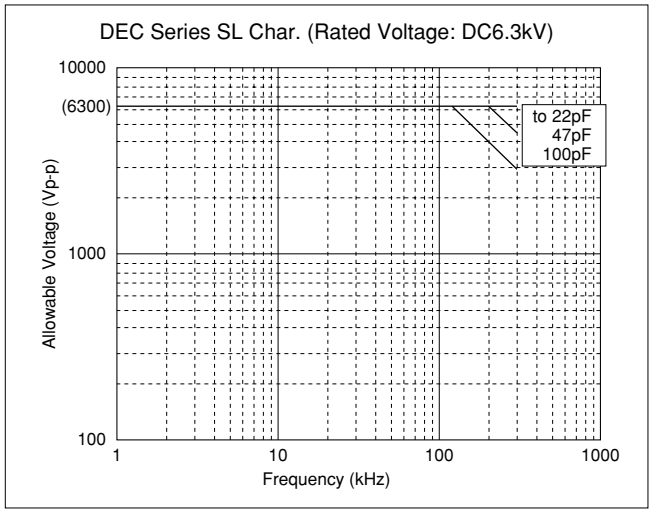
This allowable voltage, however, varies depending on the voltage and current waveforms.

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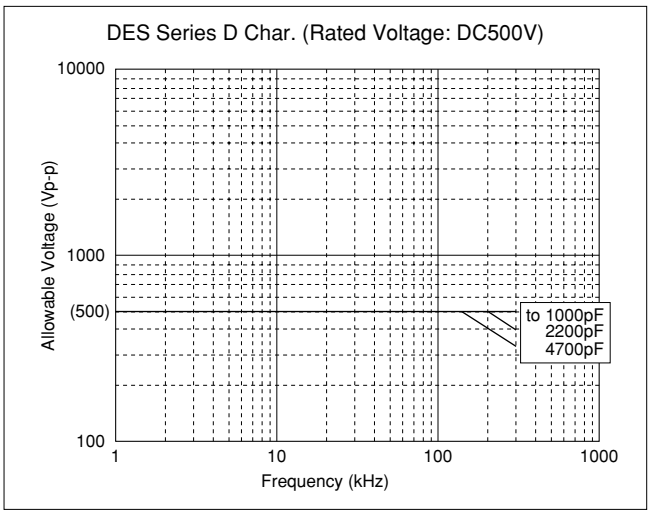
<Fig. 3 (continued)> Allowable Voltage (Sine Wave Voltage) - Frequency Characteristics (At Ambient Temperature of 85°C or less)

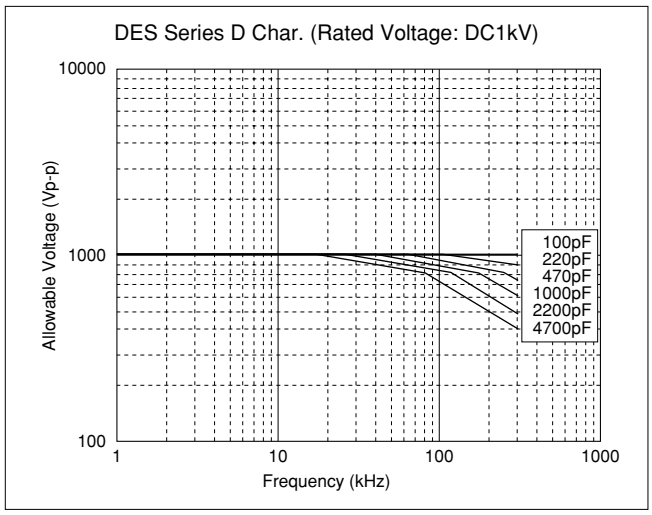
Because of the influence of harmonics, when the applied voltage is a rectangular wave or pulse wave voltage (instead of a sine wave voltage), the heat generated by the capacitor is higher than the value obtained by application of the sine wave with the same fundamental frequency.

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.

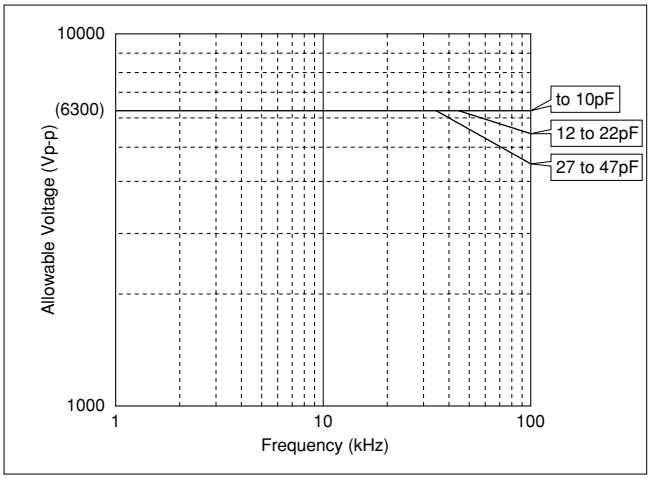




<DEF Series>

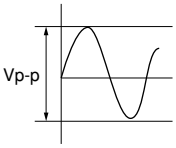
1. Operating Voltage

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



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

The capacitor can be applied at a maximum of 6.3kVp-p at 100kHz when the lamp is turned on.

Voltage	AC Voltage
Positional Measurement	

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⚠Caution

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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 the 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.

■ Soldering and Mounting

1. Vibration and Impact

Do not expose a capacitor or its lead wires to excessive shock or vibration during use.
Excessive shock or vibration may cause fatigue destruction of lead wires mounted on the circuit board.
Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or another coating.
Please confirm there is no influence of holding measures on the product with the intended equipment.

2. Soldering

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.
Soldering the capacitor with a soldering iron should be performed in following conditions.

Temperature of iron-tip: 400 degrees C. max.
Soldering iron wattage: 50W max.
Soldering time: 3.5 sec. max.

3. Bonding, Resin Molding and Coating

For bonding, molding or coating this product, verify that these processes do not affect the quality of the capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.
When the amount of applications, dryness/hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc). are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.
The variation in thickness of adhesive, molding resin or coating may cause outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

4. Treatment after Bonding, Resin Molding and Coating

When the outer coating is hot (over 100°C) after soldering, it becomes soft and fragile.
Therefore, please be careful not to give it mechanical stress.

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

Notice

■ Rating

1. Capacitance Change of Capacitors

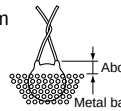
1. DEA/DEC/DEF Series (Temp. Char. CH, SL)
   Capacitance might change a little depending on the surrounding temperature or an applied voltage. Please contact us if you intend to use this product in a strict time constant circuit.
2. DEB/DEC Series (Temp. Char. B, E, F)
   Capacitors have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage. Therefore, it is not likely to be suitable for use in a time constant circuit. Please contact us if you need detailed information.
3. DEH/DES Series
   Capacitance might change greatly depending on the surrounding temperature or an applied voltage. Therefore, it is not likely to be suitable for use in a time constant circuit. Please contact us if you need detailed information.

■ Soldering and Mounting

1. Cleaning (ultrasonic cleaning)

To perform ultrasonic cleaning, observe the following conditions.
Rinse bath capacity: Output of 20 watts per liter or less.
Rinsing time: 5 min. maximum.
Do not vibrate the PCB/PWB directly.
Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

Nominal Body Diameter \ Temp. Char.		R	C	R
ø6mm		HR 102 66	HR 471 66	———
ø7-9mm		HR R 332K 250V 66	HR C 152K 66	HR R 102K 1KV 66
ø10-21mm		HR R 103K 250V Ⓜ66	HR C 472K Ⓜ66	HR R 272K 3KV Ⓜ66
High Temperature Guaranteed Code		HR		
Temperature Characteristics		Marked with code (omitted for nominal body diameter ø6mm)		
Nominal Capacitance		Marked with 3 figures		
Capacitance Tolerance		Marked with code (omitted for nominal body diameter ø6mm)		
Rated Voltage	**DC250V**	Marked with code (Marked with horizontal line over nominal capacitance for nominal body diameter ø6mm)		
	DC500V	Omitted		
	DC1-3.15kV	Marked with code (In case of DC3.15kV, marked with 3KV)		
Manufacturer's Identification		Marked with Ⓜ (omitted for nominal body diameter ø9mm and under)		
Manufactured Date Code		Abbreviation		

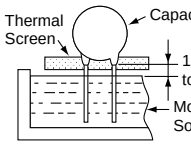
1	Operating Temperature Range		-25 to +125°C	
2	Appearance and Dimensions		No marked defect on appearance form and dimensions are within specified range.	The capacitor should be visually inspected for evidence o defect. Dimensions should be measured with slide caliper
3	Marking		To be easily legible	The capacitor should be visually inspected.
4	Dielectric Strength	Between Lead Wires	No failure	The capacitor should not be damaged when DC voltage o 200% of the rated voltage (DC1 to 3.15kV) or DC voltage 250% of the rated voltage (DC250V, DC500V) is applied between the lead wires for 1 to 5 sec. (Charge/Discharge current≦50mA)
		Body Insulation	No failure	The capacitor is placed in the container with metal balls of diameter 1mm so that each lead wire, short circuited, is kept about 2mm off the metal balls as shown in the figure at right, and AC1250V(r.m.s.) <50/60Hz> is applied for 1 to 5 sec. between capacitor lead wires and metal balls. (Charge/Discharge current≦50mA) 
5	Insulation Resistance (I.R.)	Between Lead Wires	Char. R [DC1 to 3.15kV], Char. C : 10000MΩ min. Char. R [DC250V]: 1000MΩ min.	The insulation resistance should be measured with DC500±50V (Char. R [DC 250V]: DC100±15V) within 60±5 sec. of charging.
6	Capacitance		Within specified tolerance	The capacitance should be measured at 20°C with 1±0.2k and AC5V(r.m.s.) max.
7	Dissipation Factor (D.F.)		Char. R [DC250V]: 0.4% max. Char. R [DC1 to 3.15kV]: 0.2% max. Char. C: 0.3% max.	The dissipation factor should be measured at 20°C with 1±0.2kHz and AC5V(r.m.s.) max.
8	Temperature Characteristics		T. C. / Temp. Char. (-25 to +85°C / +85 to +125°C): R: Within ±15%; C: Within ±20%; Within +15/-30% Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then placed at room condition*1 for 24±2 hrs. before measurements.	The capacitance measurement should be made at each s specified in Table.
9	Strength of Lead	Pull	Lead wire should not be cut off. Capacitor should not be broken.	As shown in the figure at right, fix the body of the capacitor and apply a tensile weight gradually to each lead wire in the radial direction of the capacitor up to 10N (5N for lead diameter 0.5mm), and keep it for 10±1 sec. 
		Bending		Each lead wire should be subjected to 5N (2.5N for lead diameter 0.5mm) of weight and bent 90° at the point of eg in one direction, then returned to its original position and b 90° in the opposite direction at the rate of one bend in 2 to sec.
10	Vibration Resistance	Appearance	No marked defect	The capacitor should be firmly soldered to the supporting wire and vibrated at a frequency range of 10 to 55Hz, 1.5 total amplitude, with about a 1 minute rate of vibration cha from 10Hz to 55Hz and back to 10Hz. Apply for a total of 2 hrs. each in 3 mutually perpendicular directions.
		Capacitance	Within specified tolerance	
		D.F.	Char. R [DC250V]: 0.4% max. Char. R [DC1 to 3.15kV]: 0.2% max. Char. C: 0.3% max.	
11	Solderability of Leads		Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.	The lead wire of a capacitor should be dipped into a ethan solution of 25wt% rosin and then into molten solder for 2± sec. In both cases the depth of dipping is up to about 1.5 2mm from the root of lead wires. Temp. of solder: Lead Free Solder (Sn-3Ag-0.5Cu) 245±5 H63 Eutectic Solder 235±5°C

T. C.	Temp. Char.	
	-25 to +85°C	+85 to +125°C
R	Within ±15%	Within +15/-30%
C	Within ±20%	

Step	1	2	3	4	5
Temp. (°C)	20±2	-25±3	20±2	125±2	20±2

*1 "room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Continued on the following pa

12	Soldering Effect (Non-Preheat)	Appearance	No marked defect	The lead wire should be immersed into the melted solder 350±10°C up to about 1.5 to 2mm from the main body for 3.5±0.5 sec. Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. before initial measurer Post-treatment: Capacitor should be stored for 24±2 hrs. at room condit Measurement order: Dielectric strength -> Pre-treatment -> Capacitance -> Soldering effect test -> Post-treatment -> Capacitance・Dielectric strength (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		Dielectric Strength (Between Lead Wires)	Per item 4.	
13	Soldering Effect (On-Preheat)	Appearance	No marked defect	First the capacitor should be stored at 120+0/-5°C for 60+0/-5 sec. Then, as in figure, the lead wires should be immersed in solder of 260+0/-5°C up to 1.5 to 2.0mm from the root of terminal for 7.5+0/-1 sec.  Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. before initial measurer Post-treatment: Capacitor should be stored for 24±2 hrs. at room condit Measurement order: Dielectric strength -> Pre-treatment -> Capacitance -> Soldering effect test -> Post-treatment -> Capacitance・Dielectric strength (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		Dielectric Strength (Between Lead Wires)	Per item 4.	
14	Temperature Cycle	Appearance	No marked defect	The capacitor should be subjected to 5 temperature cycle <Temperature Cycle> Step / Temperature (°C) / Time (min) 1 / -25±3 / 30 2 / Room Temp. / 3 3 / 125±3 / 30 4 / Room Temp. / 3 Cycle time: 5 cycle Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. before initial measurer Post-treatment: Capacitor should be stored for 24±2 hrs. at room condit Measurement order: I.R.・Dielectric strength -> Pre-treatment -> Capacitanc D.F. -> Temperature cycle test -> Post-treatment -> Capacitance・D.F.・I.R.・Dielectric strength (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		D.F.	0.4% max.	
		I.R.	1000MΩ min.	
		Dielectric Strength (Between Lead Wires)	Per item 4.	
15	Humidity (Under Steady State)	Appearance	No marked defect	Set the capacitor for 500 +24/-0 hrs. at 40±2°C in 90 to 95 relative humidity. Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. before initial measurer Post-treatment: Capacitor should be stored for 1 to 2 hrs. at room condi Measurement order: I.R. -> Pre-treatment -> Capacitance・D.F. -> Humidity t Post-treatment -> Capacitance・D.F.・I.R. (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		D.F.	0.4% max.	
		I.R.	1000MΩ min.	

*1 "room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Continued on the following pa

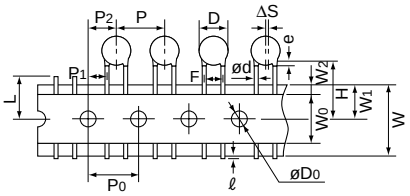
16	Humidity Loading	Appearance	No marked defect	Apply the rated voltage for 500+24/-0 hrs. at 40±2°C in 90 95% relative humidity. (Charge/Discharge current≦50mA) Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then pla room condition*1 for 24±2 hrs. before initial measureme Post-treatment: Capacitor should be stored for 1 to 2 hrs. at room condi (Char. R [DC1 to 3.15kV], Char. C) Post-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. (Char. R [DC250V]) Measurement order: I.R. -> Pre-treatment -> Capacitance・D.F. -> Humidity loading test -> I.R.*2 -> Post-treatment -> Capacitance・D.F. (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		D.F.	0.6% max.	
		I.R.	1000MΩ min.	
17	Life	Appearance	No marked defect	Apply a DC voltage of 200% of the rated voltage (DC250V DC500V) or DC voltage of 150% of the rated voltage (DC 3.15kV) for 1000 +48/-0 hrs. at 125±2°C with a relative humidity of 50% max. (Charge/Discharge current≦50mA) Pre-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. before initial measurer Post-treatment: Capacitor should be stored at 125±3°C for 1 hr., then p at room condition*1 for 24±2 hrs. Measurement order: I.R. -> Pre-treatment -> Capacitance・D.F. -> Life test - I.R.*3 -> Post-treatment -> Capacitance・D.F. (Char. R [DC250V])
		Capacitance Change	Within ±10%	
		D.F.	0.4% max.	
		I.R.	Char. R [DC1 to 3.15kV], Char. C : 2000MΩ min. Char. R [DC250V]: 1000MΩ min.	

*1 "room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

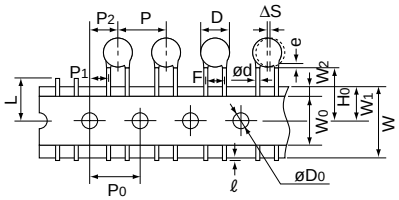
*2 The measurement of I.R. will be held in 1 to 2 hrs. after Humidity loading test.

*3 The measurement of I.R. will be held in 12 to 24 hrs. after Life test.

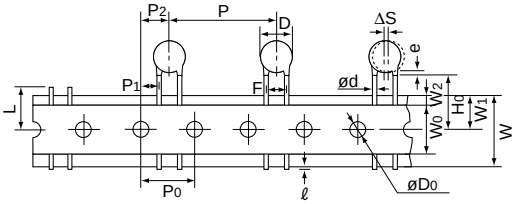
● 15.0mm pitch / lead spacing 7.5mm taping
Straight type
(Lead Code: P3)



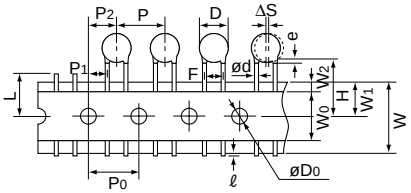
● 15.0mm pitch / lead spacing 7.5mm taping
Vertical crimp type
(Lead Code: N3)



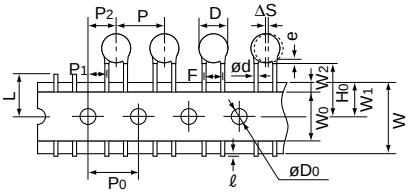
● 30.0mm pitch / lead spacing 7.5mm taping
Vertical crimp type
(Lead Code: N7)

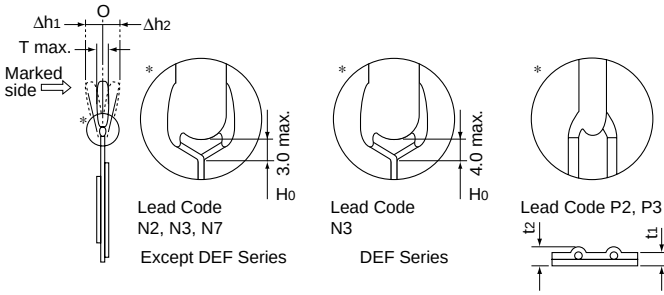


● 12.7mm pitch / lead spacing 5.0mm taping
Straight type
(Lead Code: P2)



● 12.7mm pitch / lead spacing 5.0mm taping
Vertical crimp type
(Lead Code: N2)





Item	Code	P3	N3	N7	P2	N2
Pitch of component	P	15.0±2.0		30.0±2.0	12.7±1.0	
Pitch of sprocket hole	P_0	15.0±0.3			12.7±0.3	
Lead spacing	F	7.5±1.0			$5.0^{+0.8}_{-0.2}$	
Length from hole center to component center	P_2	7.5±1.5			6.35±1.3	
Length from hole center to lead	P_1	3.75±1.0			3.85±0.7	
Body diameter	D	See the individual product specifications.				
Deviation along tape, left or right	ΔS	0±2.0			0±1.0	
Carrier tape width	W	18.0±0.5				
Position of sprocket hole	W_1	9.0±0.5				
Lead distance between reference and bottom planes	H	$20.0^{+1.5}_{-1.0}$	—		$20.0^{+1.5}_{-1.0}$	—
	H_0	—	$18.0^{+2.0}_{-0}$		—	$18.0^{+2.0}_{-0}$
Protrusion length	ℓ	+0.5 to -1.0				
Diameter of sprocket hole	ϕD_0	4.0±0.1				
Lead diameter	ϕd	0.6±0.05				
Total tape thickness	t_1	0.6±0.3				
Total thickness, tape and lead wire	t_2	1.5 max.				
Body thickness	T	See the individual product specifications.				
Portion to cut in case of defect	L	$11.0^{+0}_{-1.0}$				
Hold down tape width	W_0	11.5 min.				
Hold down tape position	W_2	1.5±1.5				
Coating extension on lead	e	3.0 max. (Vertical crimp type: Up to the end of crimp)				
Deviation across tape, front	Δh_1	2.0 max.			1.0 max.	
Deviation across tape, rear	Δh_2					

(in :

Continued on the following pa

Bulk	Taping
Polyethylene Bag 	Ammo Pack 

■ Minimum Quantity (Order in Sets Only)

[Bulk] (pcs./Bag)

	Body Dia. D (mm)	Lead Code A□, C□	Lead Code B□, D□, J□
		Long	Short
DES Series DEH Series DEA Series DEB Series	4.5 to 6	500	500
	7	250 *1	500
	8 to 11	250	500
	12	200 *2	250 *3
	13, 14	200	250
	15 to 18	100	200
	19 to 21	50	100
DEC Series DEF Series	7 to 9	250	500
	10, 11	100	–
	12 to 15	100	–

∗1 Lead Spacing F=5.0mm (Code: A2): 500pcs.
∗2 Rated Voltage DC250V (Code: 2E), DC500V (Code: 2H): 250pcs.
∗3 Rated Voltage DC250V (Code: 2E), DC500V (Code: 2H): 500pcs.

[Taping] (pcs./Ammo Pack)

Lead Code	N2, P2	N3, P3	N7
DES Series	1,500	1,000	500
DEH Series	1,500	900 *4	500
DEA Series	1,500	900 *4	500
DEB Series	1,500	900 *4	500
DEF Series	–	900	–

∗4 Rated Voltage DC1kV (Code: 3A): 1,000pcs.

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