Surface-Mount Medium and High Voltage Ceramic Capacitors DC Series Product Specification

CUSTOMER: _____

CUSTOMER PART NO.: _____

STE PART NO.: ST1815NB331K0

SPECS OF STE: _____

Drafted by	For Customer Approval
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Design Change Record

No.	Date	Version	Reason For Change	Description
1	2024.08.20	A		First Acknowledgment
2				
3				
4				
5				
6				
7				
8				

1、 Characteristics

■The product height is 2.4mm, significantly reduced compared to traditional lead-type capacitor；

■The product is tape-packaged and suitable for SMT (Surface Mount Technology) automatic insertion soldering;

■DC ceramic capacitors enable comprehensive surface mounting and miniaturization of end products;

■The product is coated using flame-retardant epoxy resin (compliant with UL 94V-0 flame retardant rating).

2、 Application

■The D-A isolation and noise reduction of the transformerless DDA modem;

3、 Principles of Part Number Coding

ST	1815	N	B	331	K	0

- ST: Model: ST
- 1815: Size:1815≈4.5*3.9m
- N: Rated Voltage
  N: 1KVDC
  R: 2KVDC
  S: 3KVDC
- B: Temperature Coefficient:
  S(SL):+350～-1000ppm/℃
  B(Y5P): ＋10%
  E(Y5U): ＋22% ～ -56%
  F(Y5V): ＋30% ～ -80%
- 331: Capacitance:
  470:47pF
  101:100pF
  331:330pF
  222:2200pF
- K: Capacitance Tolerance:
  K：±10%
  M：±20%
- 0: Internal Management Code

4、Technical Information

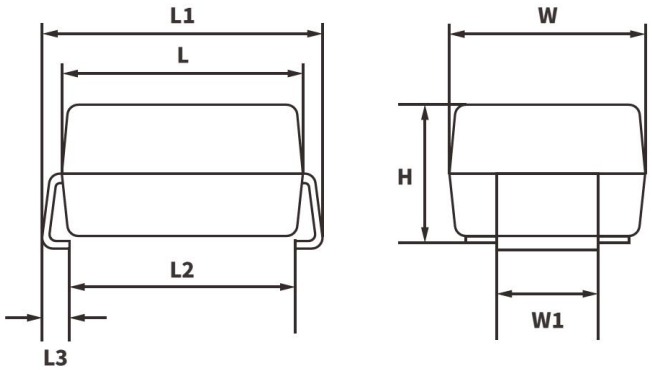
Rated Voltage	1000VDC、2000VDC、3000VDC
Capacitance Range	10pF～2200pF
Dissipation Factor	S(SL) :D.F.≤0.1%（25℃、1±0.2MHz、1.0±0.1Vrms） B(Y5P)/E(Y5U)/F(Y5V)：D.F.≤2.5%（25℃、1±0.2KHz、1.0±0.1Vrms）
Withstanding Voltage	S(SL) : Rated voltage 1000V applied voltage 1.5UR S(SL) : Rated voltage 2000V\3000V applied voltage 1.5UR+500V B(Y5P)/E(Y5U)/F(Y5V) : Rated voltage 1000V applied voltage 2UR B(Y5P)/E(Y5U)/F(Y5V) : Rated voltage 2000V\3000V applied voltage 1.5UR+500V
Insulation Resistance	S(SL):＞10000MΩ B(Y5P)/E(Y5U)/F(Y5V)：＞4000MΩ (Charging for 60±5 seconds under 500VDC)

5、Product Imprinting

Example	Description		
	1	STE	SongTian Logo
	2	N	Rated voltage 1000V
	3	B	Temperature Characteristics：Y5P
	4	331	Capacitance：330pF
	5	K	Capacitance Tolerance：K（±10%）

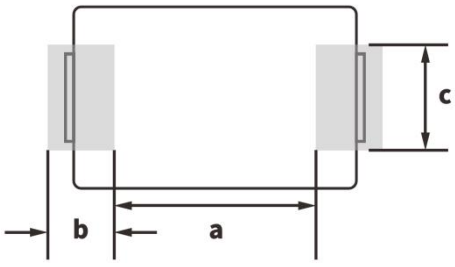
6、Physical Dimensions (for 1815)

■ Product Dimension



Product Dimension(mm)			
L	4.5±0.3	L1	5.1±0.3
W	3.9±0.3	L2	4.0±0.2
H	2.2±0.3	L3	0.5±0.3
W1	1.8±0.3		

■ Pad Dimension



Pad Dimension (mm)	
a	4.0 Min
b	2.2±0.1
c	3.2±0.2

7、Specification List

Temperature Characteristics	Nominal Capacitance（pF）	STE Part Number	Temperature Characteristics	Nominal Capacitance（pF）	STE Part Number
SL	10	ST1815*S100K0	Y5P	82	ST1815*B820K0
	12	ST1815*S120K0		100	ST1815*B101K0
	15	ST1815*S150K0		120	ST1815*B121K0
	18	ST1815*S180K0		150	ST1815*B151K0
	20	ST1815*S200K0		180	ST1815*B181K0
	22	ST1815*S220K0		200	ST1815*B201K0
	27	ST1815*S270K0		220	ST1815*B221K0
	30	ST1815*S300K0		270	ST1815*B271K0
	33	ST1815*S330K0		300	ST1815*B301K0
	39	ST1815*S390K0		330	ST1815*B331K0
	47	ST1815*S470K0	Y5U	390	ST1815*E391M0
	56	ST1815*S560K0		470	ST1815*E471M0
	68	ST1815*S680K0		560	ST1815*E561M0
Y5V	1200	ST1815*F122M0		680	ST1815*E681M0
	1500	ST1815*F152M0		820	ST1815*E821M0
	1800	ST1815*F182M0		1000	ST1815*E102M0
	2000	ST1815*F202M0			
	2200	ST1815*F222M0			

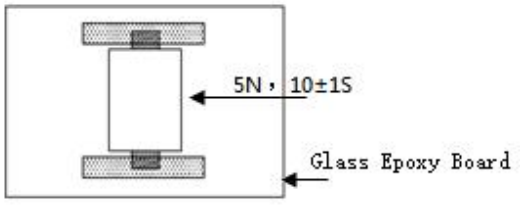
Note: The"*" could be N（1KV）,R（2KV） or S（3KV）

8、Basic Characteristics and Reliability Experiments

No.	Item	Standard	Test Method
1	Appearance and Dimensions	No obvious defects in appearance and dimensions within the standard range.	Capacitor must be visually inspected for any obvious defects Measure the dimensions using a vernier caliper
2	Marking	Clear and easily recognizable	Visual inspection
3	Capacitance	Within the tolerance range	S(SL): The dissipation factor must be measured at 25℃, using a frequency of 1±0.2MHz and a voltage of 1.0±0.1Vrms. B(Y5P), E(Y5U), F(Y5V) : The capacitance and dissipation factor must be measured at 25℃, using a frequency of 1±0.2KHz and a voltage of 1.0±0.1Vrms.
4	Dissipation Factor	S(SL) :D.F.≤0.1% B(Y5P), E(Y5U), F(Y5V)： D.F.≤2.5%	
5	Insulation Resistance	S(SL):＞10000MΩ B(Y5P)/E(Y5U)/F(Y5V)：＞4000MΩ	The insulation resistance must be tested after charging at 500VDC for 60±5 seconds.
6	Dielectric Strength (Between terminals)	No breakdown or arcing	The capacitor withstands the test voltage from Table 1 for 5 seconds between the two leads without damage.（Charging and discharging current does not exceed 50mA） <Table 1>

Temperature Coefficient	Rated voltage	Applied voltage
SL	1KV	1.5UR
SL	2KV、3KV	1.5UR+500V
Y5P、Y5U、Y5V	1KV	2UR
Y5P、Y5U、Y5V	2KV、3KV	1.5UR+500V

Recommended voltage rise time>0.3s.

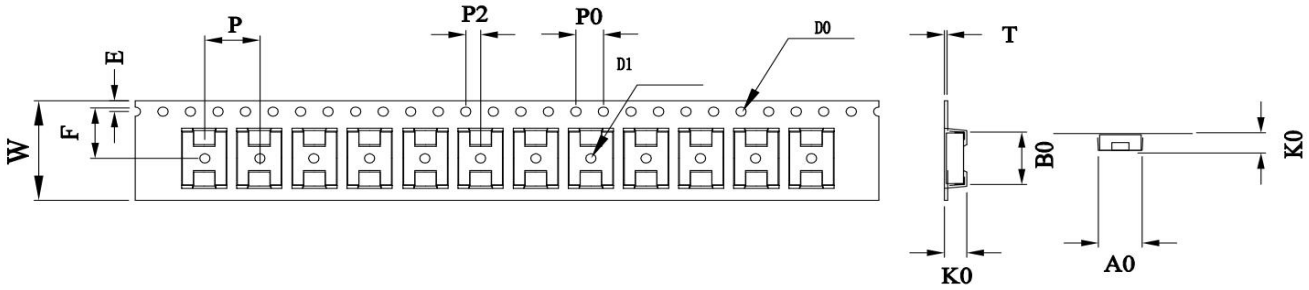
No.	Item		Standard	Test Method
7	Solderability		The lead surface requires solder coverage on over 75% of the area.	Immerse the capacitor in the solution of ethanol and rosin (25%rosin in weight proportion) Solder temperature: 245±3℃ Dipping time: 3±0.3 seconds
8	Solder Heat Resistance	Appearance	No visual damage	Preheat the capacitor at 150 to 180℃ for 90±30s Reflow temp.:230°℃-260℃ Reflow time:60±15s Refow number of times:4 times Let sit at 15-35℃,45-75%RH condition for 24±2 h,then measure. The next reflow process should be done after the temperature of the sample has dropped to room temperature
		Capacitance Change Rate	S(SL):≤±1% B(Y5P):≤±10% E(Y5U)/F(Y5V)：≤±20%	
		Insulation Resistance	SL:＞10000MΩ B(Y5P)/E(Y5U)/F(Y5V)：＞4000MΩ	
		Dielectric Strength	No permanent break-down or flashover during the test period	
9	Vibration	Appearance	No visual damage	Requency: 10-55-10Hz Amplitude of vibration: 1.5mm Direction: Up and down, left and right,front andrear Time: 2hours Condition: sinusoidal wave
		Capacitance	≤±20%	
10	Shock	Appearance	No visual damage	Condition: Accelerated speed: 490m/s^2 Pulse duration: 11ms Direction: XYZ Number of times: 3times
		Capacitance	≤±20%	
11	Welding Strength (Cutting testing)		No pin misalignment or other adverse events	Weld the capacitor onto the test fixture as shown in the diagram, apply a 5N pushing force in the direction of the arrow. Solder the capacitor using reflow soldering and handle with care to avoid damage from heat shocks. 
12	Steady-State Humidity-Heat	Appearance	No visual damage	Capacitor kept at 40±2°C, 90-95% RH for 500±12 hours. Post-test: Store capacitor at room temperature for 1-2 hours.
		Capacitance Change Rate	S(SL) ： ≤±3% B(Y5P)：≤±10% E(Y5U)：≤±20% F(Y5V)：≤±30%	
		Dissipation Factor	S(SL) :≤0.2% B(Y5P):≤5% E(Y5U)/F(Y5V)：≤7%	
		Insulation Resistance	SL:＞10000MΩ B(Y5P)/E(Y5U)/F(Y5V)：＞4000MΩ	

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Standard</th><th>Test Method</th></tr>
<tr><td rowspan="4">13</td><td rowspan="4">Humidity Resistance</td><td>Appearance</td><td>No visual damage</td><td rowspan="4">Capacitor maintained at a temperature of 40±2°C and a relative humidity of 90-95% under rated U_R for 500（+24/-0） hours.
Post-test handling: The capacitor must be stored at room temperature for 24±2 hours.</td></tr>
<tr><td>Capacitance Change Rate</td><td>S(SL) ：≤±3%
B(Y5P)：≤±10%
E(Y5U)：≤±20%
F(Y5V)：≤±30%</td></tr>
<tr><td>Dissipation Factor</td><td>S(SL) :≤0.2%
B(Y5P):≤5%
E(Y5U)/F(Y5V)：≤7%</td></tr>
<tr><td>Insulation Resistance</td><td>SL:＞10000MΩ
B(Y5P)/E(Y5U)/F(Y5V)：
＞4000MΩ</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Durability</td><td>Appearance</td><td>No visual damage</td><td rowspan="4">Peak Voltage: Each test capacitor withstands three instances of 1.5U_R peak voltage, followed by a life test. Conduct a 1000（+48/-0） hour test at 105+2/-0℃ with relative humidity not exceeding 50%, using voltages specified in the table.
Post-test Handling: The capacitor must be stored at room temperature for 24±2 hours.</td></tr>
<tr><td>Capacitance Change Rate</td><td>S(SL) ：≤±5%
B(Y5P)/E(Y5U)：≤±20%
F(Y5V)：≤±30%</td></tr>
<tr><td>Dissipation Factor</td><td>S(SL) :≤0.2%
B(Y5P):≤5%
E(Y5U)/F(Y5V)：≤7%</td></tr>
<tr><td>Insulation Resistance</td><td>SL:＞10000MΩ
B(Y5P)/E(Y5U)/F(Y5V)：
＞4000MΩ</td></tr>
<tr><td>18</td><td colspan="2">High-Low Temperature Shock</td><td>No visual damage</td><td>Test the capacitors in the order specified in the table for one cycle, and repeat the process for a total of 5 cycles
<table><tr><th>Order</th><th>(℃)</th><th>(min)</th></tr><tr><td>1</td><td>-25 ± 2</td><td>30</td></tr><tr><td>2</td><td>+25 ± 2</td><td>3</td></tr><tr><td>3</td><td>+105 ± 2</td><td>30</td></tr><tr><td>4</td><td>+25 ± 2</td><td>3</td></tr></table>Temperature Cycle

Pre-test Preparation:
Capacitors must be stored at 85±2℃ for 1 hour, followed by 24±2 hours at room temperature before the initial measurement.
[Post-test Handling]:
Capacitors must be stored at room temperature for 24±2 hours.</td></tr>
</table>

9、 Packing Instructions (for 1815)

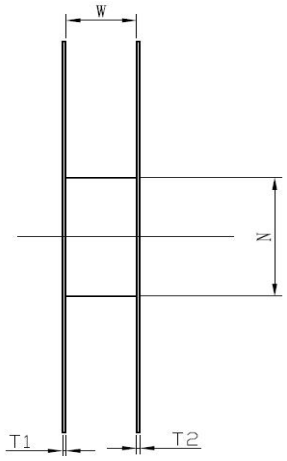
■ Description of tape and reel package method

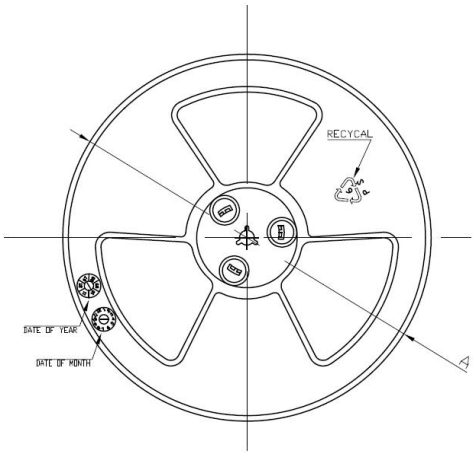


unit：mm

A0	B0	K0	P	P0	P2	T
4.2±0.1	5.7±0.1	2.7±0.1	8.0±0.1	4.0±0.1	2.0±0.1	0.3±0.1
W	E	F	D0	D1	PCS/REEL	
12.0±0.3	1.75±0.1	5.5±0.1	1.5+0.1/-0	1.50+0.1/-0	3000pcs	

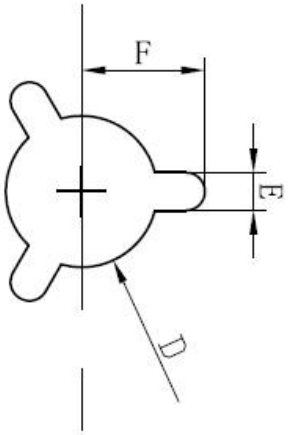
■ 13-inch reel size



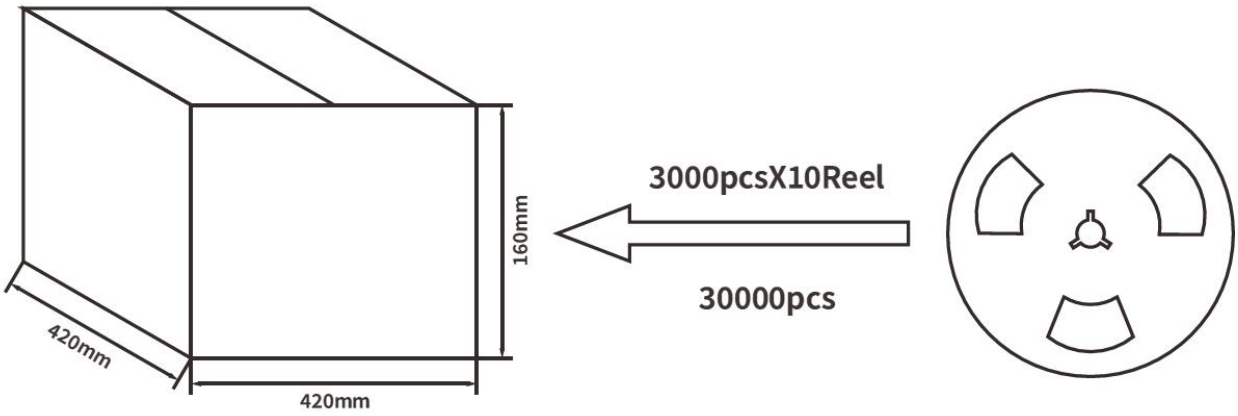


Unit：mm

SPEC	12
E±0.5	2.6
F±0.5	10.8
W±0.2	12.5
T1±0.3	2.0
T2±0.3	2.0
A+0/-2	Φ330
N±3.0	Φ100

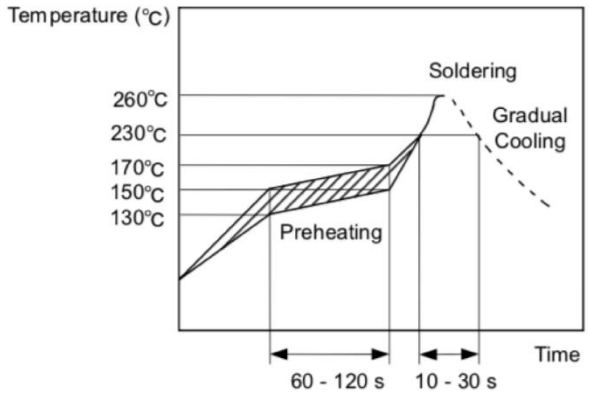


■ Packing Carton

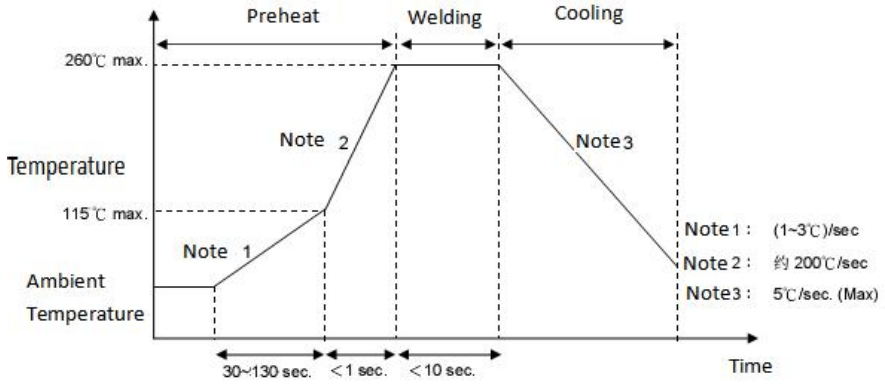


10、 Soldering Instruction

■ Reflow Soldering Curve



■ Wave Soldering Curve



■ Soldering Conditions

Item	Condition
Soldering Iron Tip Temperature	400℃(max.)
Soldering Time	3.5 sec(max.)
Soldering Iron Power	50W(max.)

11、 Storage Environment

- The insulation coating of the capacitor cannot form a perfect seal; therefore, avoid using or storing the capacitor in corrosive environments, especially where chloride gas, sulfide gas, acids, alkalis, salts, or similar substances are present, and minimize exposure to moisture. Verify that cleaning, soldering, or forming processes do not affect the product quality before these processes are performed.
- This is an MSL3 product. Hence,to prevent moisture absorption,the capacitor is packaged in a moisture-proof sealed bag.
- The capacitor should be stored and used within the following conditions for up to 6 months after delivery:

  Temperature: Below 30°C

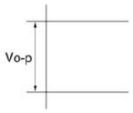
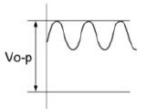
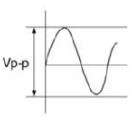
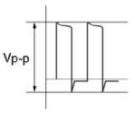
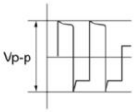
  Humidity: 60%RH max
- After opening the moisture-proof packaging, solder the capacitor within 168 hours. Post-opening, store the capacitor in a moisture-proof bag with desiccant, along with the information card, and maintain the aforementioned conditions.
- If the storage period exceeds 6 months or the sealed bag is opened, perform baking (60°C, 168 hours) before soldering.

12、 Usage Precaution

Warning

- Operating Voltage:

  Ensure that the applied voltage (Vp-p or Vo-p with DC bias) stays within the rated voltage range when using DC-rated capacitors ripple current circuits. Temporary abnormal voltages may occur during start-up or shutdown due to resonance or switching. Use capacitors within the rated voltage range to accommodate such conditions.

Voltage	VDC	VDC+VAC	VAC	Pulse Voltage (1)	Pulse Voltage (2)
Position Measurement					

- Operating Temperature and Self-Heating (Applicable to B/E Characteristics)

  The capacitor's surface temperature should be kept below the upper limit of its rated operating temperature range. Consider the self-heating of the capacitor, which may occur in high-frequency

currents, pulse currents, etc. External voltage should not allow the temperature rise due to self-heating to exceed a range of 20°C around 25°C. Use a φ0.1mm low heat capacity (K) thermocouple for measurements, and ensure that the capacitor is not influenced by heat dissipation from other components or fluctuations in ambient temperature. Overheating may lead to a decrease in capacitor characteristics and reliability.

(Do not conduct measurements when the cooling fan is running, as it may affect the accuracy of the measurement).

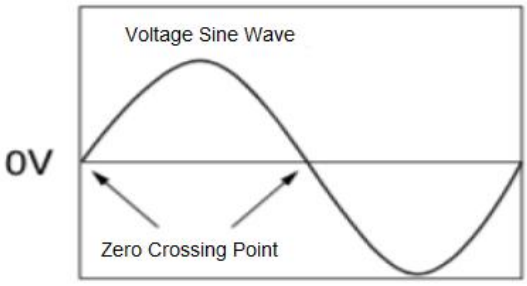
■ Test Conditions for Withstand Voltage

Test Equipment:

The voltage test equipment should be capable of generating a sine wave similar to 50/60Hz. Applying deformed sine waves or overload voltages exceeding the specified voltage may result in failure.

Voltage Application Method:

When applying the withstand voltage, the leads or terminals of the capacitor should be securely connected to the output terminals of the withstand voltage test equipment. Gradually increase the voltage from near zero to the test voltage. If the test voltage is not gradually increased from near zero but directly applied to the capacitor, it should include *zero crossing during application. At the end of the test, the test voltage should be reduced to near zero before removing the capacitor leads or terminals from the output terminals of the withstand voltage test equipment. If the test voltage is not gradually increased from near zero but directly applied to the capacitor, surges may occur, leading to failure.



*Zero crossing refers to the position where the sine wave voltage passes through 0V. See the figure on the right.

■ Repeated withstand voltage tests conducted by users may damage the capacitor, so capacitors tested after the test should not be used as qualified products again.

■ Fail-Safe Design

If the capacitor is damaged, it can lead to a short circuit fault. Be sure to provide appropriate automatic fault protection functions, such as fuses, on the product to prevent electric shock, fire, or smoke.

■ Vibration and Shock

During use, avoid excessive shocks or vibrations that may expose the capacitor or pins, and prevent any crushing, bending, or external impact.

■ Bonding, Molding, or Coating

Before bonding, molding, or coating this product, verify through testing the performance of bonding, molding, or coating the product in the designated equipment to ensure that these processes do not affect the quality of the capacitor.

If there are drying/adhesive hardening conditions and the molding resin contains organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.), SMC is not suitable. Organic solvents may cause damage to the resin on the outer layer of the capacitor, resulting in cases of damage or short circuits.

During temperature cycling, changes in the thickness of adhesives, molding resins, or coatings may lead to cracking of the outer shell resin and/or cracking of ceramic components.

■ Capacitors mounted on PCBs require the PCB pads to align with the capacitor pins for proper soldering. Otherwise, poor soldering between the capacitor and PCB may occur, leading to deformation of the capacitor pins or damage to the body, resulting in capacitor damage. Capacitors soldered to PCBs should not be forcibly moved or have the body tilted.

■ Consult our technical personnel in advance when performing resin molding on capacitors.

■ Restricted Applications

Contact us before using our products in the following applications that require exceptionally high reliability to prevent defects that could directly cause harm to third parties' life, body, or property.

Aircraft Equipment

Aerospace Equipment

Submersible Equipment

Power Plant Control Equipment

Medical Equipment

Transportation Equipment

Traffic Signal Equipment

Disaster Prevention/Crime Prevention Equipment

Data Processing Equipment affecting the public

Applications with similar complexity and/or reliability requirements.