

スパークギャップ SPARK GAPS

OPERATING TEMP. -30~+85°C



フロー/WAVE

特長 FEATURES

- ・自己消火性樹脂を用い、安全性が高い
- ・もれ電流が極めて小さい
- ・静電容量が極めて小さい
- ・ Very safe due to self-extinguishing resin
- ・ Leakage current is very small.
- ・ Electrostatic capacitance is very small.

用途 APPLICATIONS

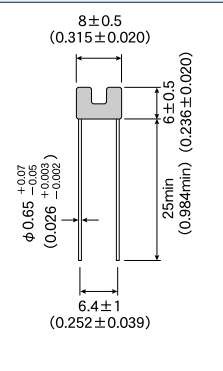
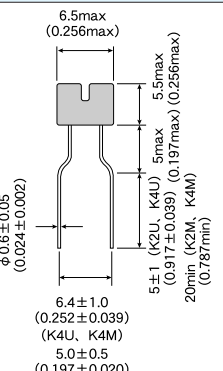
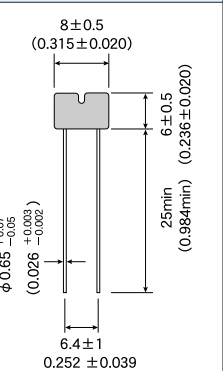
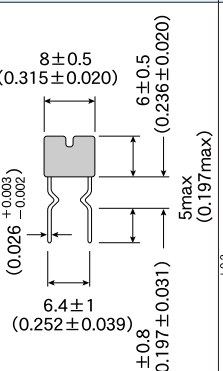
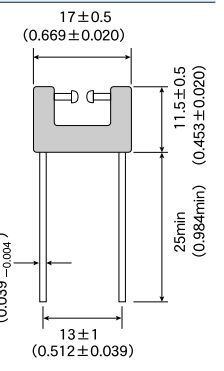
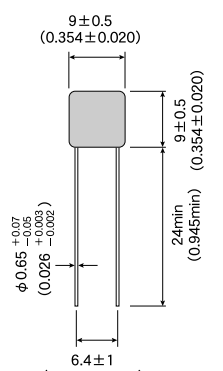
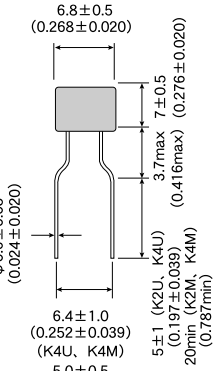
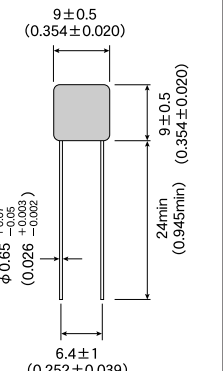
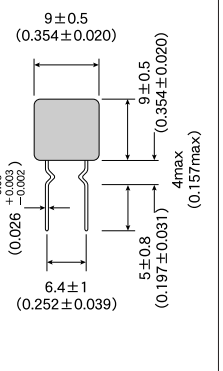
- ・ CRT周辺の異常電圧吸収
- ・ Used to absorb abnormal voltages in the periphery of a CRT

形名表記法 ORDERING CODE

1 形式 AG スパークギャップ	2 外形形状 10 外形寸法毎の各タイプ 15 20 40	3 樹脂材料 P アルキド樹脂	4 被覆状態 △ 樹脂キャップなし C 樹脂キャップ付 △=スペース	5 公称放電開始電圧 [VDC] 122 1200 492 4900																																								
6 放電電圧許容差 [V] F ±500 G ±800 H ±2000 J ±1000 L ±1000	7 包装 △— 10、20タイプ単品(袋詰め) S— 15タイプ単品(袋詰め) B— 15タイプテーピング品 △△ 40タイプ単品(袋詰め) △=スペース	8 リード形状 [mm] <table border="1"> <thead> <tr> <th></th><th>形状</th><th>間隔</th><th>径</th><th>長さ</th></tr> </thead> <tbody> <tr> <td>H3D</td><td>Hフォーミング</td><td>6.4</td><td>0.65</td><td>5.0±0.8</td></tr> <tr> <td>L3N</td><td>ストレート</td><td>6.4</td><td>0.65</td><td>24以上</td></tr> <tr> <td>K2M</td><td>Kフォーミング</td><td>5.0</td><td>0.60</td><td>20以上</td></tr> <tr> <td>K2U</td><td>Kフォーミング</td><td>5.0</td><td>0.60</td><td>5.0±1</td></tr> <tr> <td>K4M</td><td>Kフォーミング</td><td>6.4</td><td>0.60</td><td>20以上</td></tr> <tr> <td>K4U</td><td>Kフォーミング</td><td>6.4</td><td>0.60</td><td>5.0±1</td></tr> <tr> <td>△△△</td><td>ストレート(40タイプ)</td><td>13</td><td>1.0</td><td>24以上</td></tr> </tbody> </table>				形状	間隔	径	長さ	H3D	Hフォーミング	6.4	0.65	5.0±0.8	L3N	ストレート	6.4	0.65	24以上	K2M	Kフォーミング	5.0	0.60	20以上	K2U	Kフォーミング	5.0	0.60	5.0±1	K4M	Kフォーミング	6.4	0.60	20以上	K4U	Kフォーミング	6.4	0.60	5.0±1	△△△	ストレート(40タイプ)	13	1.0	24以上
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1 Type AG Spark gaps	2 External dimension 10 Type by external dimension 15 20 40	3 Resin material P Alkyd resin	4 Coating conditions △ without resin cap C with resin cap △=Blank space	5 Nominal discharge starting voltage [VDC] 122 1200 492 4900																																								
6 Discharge voltage Tolerance [V] F ±500 G ±800 H ±2000 J ±1000 L ±1000	7 Packaging △— Type 10,20 bulk S— Type 15, bulk B— Type 15, taped △△ Type 40, bulk △=Blank space	8 Lead configuration [mm] <table border="1"> <thead> <tr> <th></th><th>Lead type</th><th>Lead space</th><th>Diameter</th><th>Length</th></tr> </thead> <tbody> <tr> <td>H3D</td><td>H-formed</td><td>6.4</td><td>0.65</td><td>5.0±0.8</td></tr> <tr> <td>L3N</td><td>Straight</td><td>6.4</td><td>0.65</td><td>24Min.</td></tr> <tr> <td>K2M</td><td>K-formed</td><td>5.0</td><td>0.60</td><td>20Min.</td></tr> <tr> <td>K2U</td><td>K-formed</td><td>5.0</td><td>0.60</td><td>5.0±1</td></tr> <tr> <td>K4M</td><td>K-formed</td><td>6.4</td><td>0.60</td><td>20Min.</td></tr> <tr> <td>K4U</td><td>K-formed</td><td>6.4</td><td>0.60</td><td>5.0±1</td></tr> <tr> <td>△△△</td><td>Straight (40 Type)</td><td>13</td><td>1.0</td><td>25Min.</td></tr> </tbody> </table>				Lead type	Lead space	Diameter	Length	H3D	H-formed	6.4	0.65	5.0±0.8	L3N	Straight	6.4	0.65	24Min.	K2M	K-formed	5.0	0.60	20Min.	K2U	K-formed	5.0	0.60	5.0±1	K4M	K-formed	6.4	0.60	20Min.	K4U	K-formed	6.4	0.60	5.0±1	△△△	Straight (40 Type)	13	1.0	25Min.
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外形寸法 EXTERNAL DIMENSIONS

Type	AG10	AG15	AG20		AG40
リード線	ストレート Straight	Kフォーミング Formed	ストレート Straight	Hフォーミング Formed	ストレート Straight
Lead type	L3N	K2M,K2U,K4M,K4U	L3N	H3D	△△△(スペース) Blank Space
キャップレス Cappedless	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 25min (0.984min) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 本体の厚さ Thickness of body : 3±0.5 (0.118±0.020)	 6.5max (0.256max) 5.5max (0.197max) 5±1 (K2U, K4U) (0.317±0.039) (0.197max) 20min (K2M, K4M) (0.787min) φ0.6±0.05 (0.024±0.002) 6.4±1.0 (0.252±0.039) (K4U, K4M) 5.0±0.5 (0.197±0.020) (K2U, K2M) 本体の厚さ Thickness of body : 3.5max (0.138max)	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 25min (0.984min) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 0.252±0.039 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 5max (0.197max) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 5±0.8 (0.197±0.031) 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)	 17±0.5 (0.669±0.020) 11.5±0.5 (0.453±0.020) 25min (0.984min) φ1.0±0.2 (0.039±0.004) 13±1 (0.512±0.039) 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)
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Unit : mm(inch)

アイテム一覧 PART NUMBERS

形 式 Type	放電開始電圧 Discharge starting voltage (DC)				絶縁抵抗 Insulation resistance [MΩ] *1	リード形状 Lead configuration
	公称値 Nominal value [V]			許容差 Tolerance [V]		
AG10P□○○○○◇ — L3N	4000	4900		±800、±1000	10000min	ストレート Straight
AG15P□○○○○◇☆ —▽▽▽	1200	1500	2000	± 500	10000min	Kフォーミング K Formed
		2500		± 800		
AG20P□○○○○◇ —▽▽▽	1200	1500	2000	± 500	10000min	ストレート、Hフォーミング Straight ,H Formed
		2500		± 800		
AG40P□○○○○◇	6000	7000	8000 9000	± ²⁰⁰⁰ / ₁₀₀₀ ±2000	10000min	ストレート Straight

形名の□には被覆状態、○には放電開始電圧、◇には許容差、☆には包装、▽にはリード形状記号が入ります。

□Please specify the coating condition code and ○ the discharge starting voltage code and ◇ the tolerance code and ☆ the packaging code and ▽ the lead configuration code.

(注)使用している材料は自己消火性樹脂で、UL94V-0、UL1410(phase II 規制)を保証するものです。

Note : The material used is a self-extinguishing resin conforming to UL94V-0 and UL1410(phase II regulation)

*1 AG10、AG15、AG20はDC500V20秒以内の値です。 *1 Values of AG10,AG15,AG20 are set at DC500V within 20 seconds.

AG40はDC1000V20秒以内の値です。

Values of AG40 is set at DC1000V within 20 seconds.

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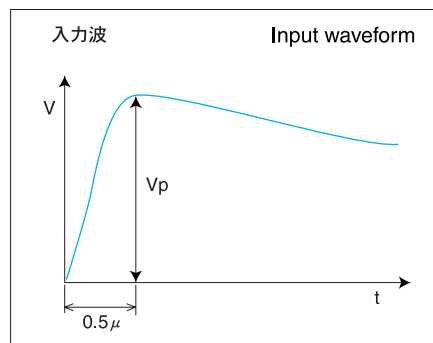
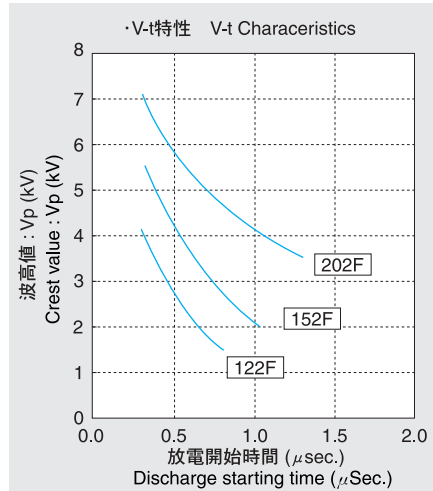
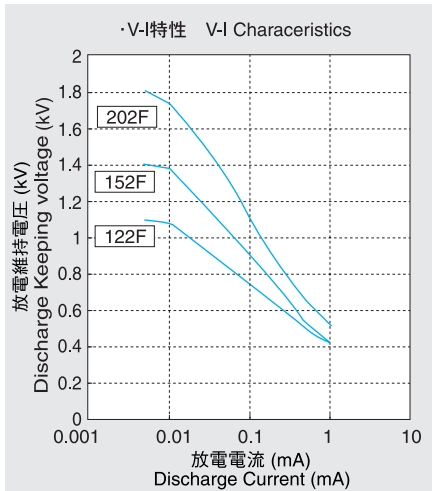
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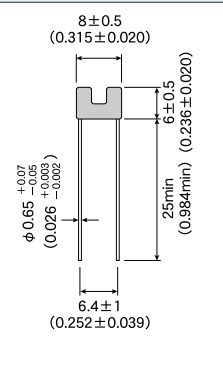
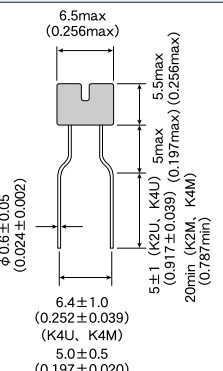
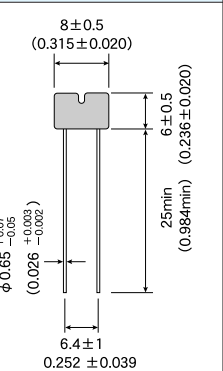
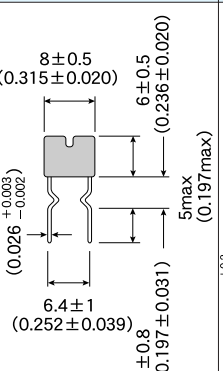
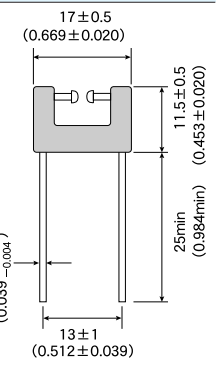
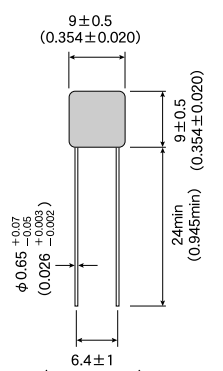
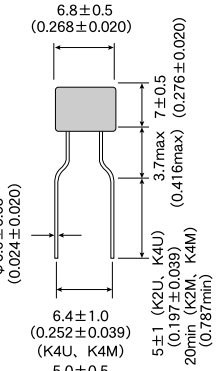
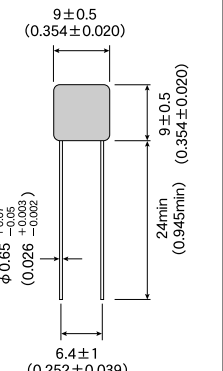
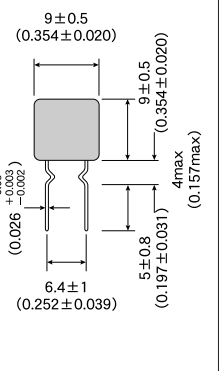
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etc

TAIYO YUDEN



外形寸法 EXTERNAL DIMENSIONS

Type	AG10	AG15	AG20		AG40
リード線	ストレート Straight	Kフォーミング Formed	ストレート Straight	Hフォーミング Formed	ストレート Straight
Lead type	L3N	K2M,K2U,K4M,K4U	L3N	H3D	△△△(スペース) Blank Space
キャップレス Cappedless	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 25min (0.984min) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 本体の厚さ Thickness of body : 3±0.5 (0.118±0.020)	 6.5max (0.256max) 5.5max (0.197max) 5±1 (K2U, K4U) (0.317±0.039) (0.197max) 20min (K2M, K4M) (0.787min) φ0.6±0.05 (0.024±0.002) 6.4±1.0 (0.252±0.039) (K4U, K4M) 5.0±0.5 (0.197±0.020) (K2U, K2M) 本体の厚さ Thickness of body : 3.5max (0.138max)	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 25min (0.984min) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 0.252±0.039 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)	 8±0.5 (0.315±0.020) 6±0.5 (0.236±0.020) 5max (0.197max) φ0.65 ^{+0.07} _{-0.05} (0.026 ^{+0.003} _{-0.002}) 6.4±1 (0.252±0.039) 5±0.8 (0.197±0.031) 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)	 17±0.5 (0.669±0.020) 11.5±0.5 (0.453±0.020) 25min (0.984min) φ1.0±0.2 (0.039±0.004) 13±1 (0.512±0.039) 本体の厚さ Thickness of body : 4±0.5 (0.157±0.020)
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Unit : mm(inch)

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形 式 Type	放電開始電圧 Discharge starting voltage (DC)				絶縁抵抗 Insulation resistance [MΩ] *1	リード形状 Lead configuration
	公称値 Nominal value [V]			許容差 Tolerance [V]		
AG10P□○○○○◇ — L3N	4000	4900		±800、±1000	10000min	ストレート Straight
AG15P□○○○○◇☆ —▽▽▽	1200	1500	2000	± 500	10000min	Kフォーミング K Formed
		2500		± 800		
AG20P□○○○○◇ —▽▽▽	1200	1500	2000	± 500	10000min	ストレート、Hフォーミング Straight ,H Formed
		2500		± 800		
AG40P□○○○○◇	6000	7000	8000 9000	± ²⁰⁰⁰ / ₁₀₀₀ ±2000	10000min	ストレート Straight

形名の□には被覆状態、○には放電開始電圧、◇には許容差、☆には包装、▽にはリード形状記号が入ります。

□Please specify the coating condition code and ○ the discharge starting voltage code and ◇ the tolerance code and ☆ the packaging code and ▽ the lead configuration code.

(注)使用している材料は自己消火性樹脂で、UL94V-0、UL1410(phase II 規制)を保証するものです。

Note : The material used is a self-extinguishing resin conforming to UL94V-0 and UL1410(phase II regulation)

*1 AG10、AG15、AG20はDC500V20秒以内の値です。 *1 Values of AG10,AG15,AG20 are set at DC500V within 20 seconds.

AG40はDC1000V20秒以内の値です。

Values of AG40 is set at DC1000V within 20 seconds.

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etc

TAIYO YUDEN

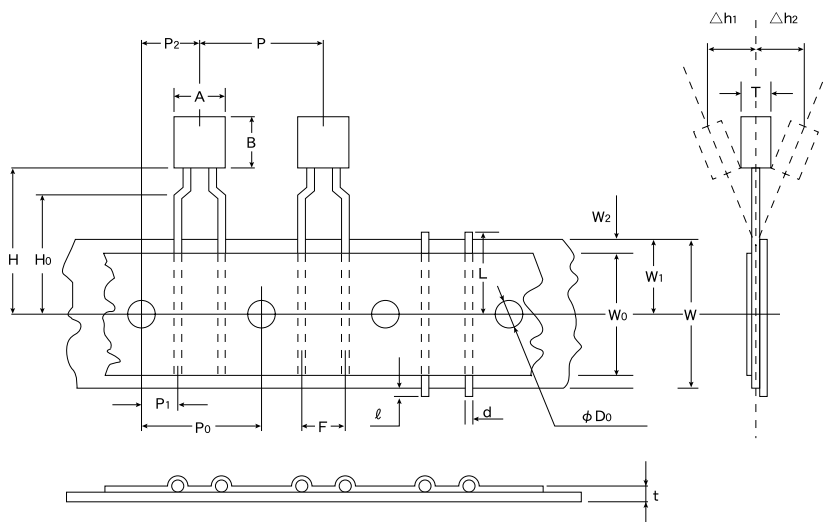
標準数量 Standard Quantity

Type	標準数量 Standard Quantity [pcs]	
	袋詰め Bulk	テーピング Taped
AG10	500	—
AG15	1000	1300※
AG20	500	—
AG40	200	—

※K2Mタイプのみ

※Available for K2M type only

テーピング寸法 (K2Mタイプ) Taping Dimensions(K2M Type)



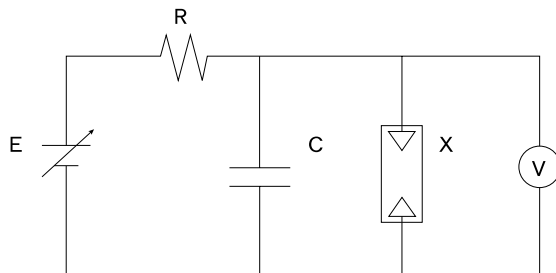
記号 Symbol	寸法 Dimensions
A	6.8±0.5 (0.268±0.020)
B	7.0±0.5 (0.276±0.020)
T	4.0±0.5 (0.157±0.020)
P	12.7±1.0 (0.500±0.039)
P ₀	12.7±0.3 (0.500±0.012)
P ₁	3.85±0.5 (0.152±0.020)
P ₂	6.35±1.3 (0.250±0.051)
F	5.0±0.5 (0.197±0.020)
W	18.0 ^{+1.0} _{-0.5} (0.709 ^{+0.039} _{-0.020})
W ₀	12.0min (0.472min)
W ₁	9.0 ^{+0.75} _{-0.5} (0.354 ^{+0.030} _{-0.020})
W ₂	3.0max (0.118max)
H	19.6±0.5 (0.772±0.020)
H ₀	16.0±0.5 (0.630±0.020)
φD ₀	4.0±0.3 (0.157±0.012)
L	11.0max (0.433max)
ℓ	2.0max (0.079max)
t	0.75±0.2 (0.030±0.008)
Δh ₁	2.0max (0.079max)
Δh ₂	
d	0.6±0.05 (0.024±0.002)

Unit : mm(inch)

SPARK GAPS

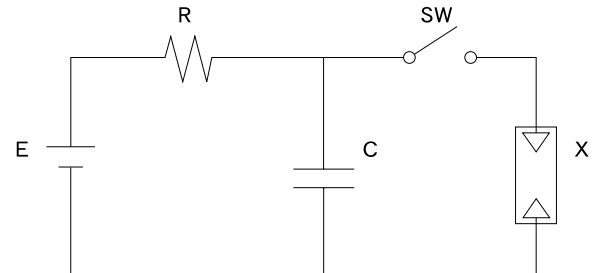
Item		Specified Value		Test Methods and Remarks
1.Operating Temperature Range		-30°C~+85°C		
2.Operating Humidity Range		95%RH max. (No dew condensation)		
3.Storage Temperature Range		-40°C~+85°C		
4.Discharge Voltage		Within the specified tolerance		With Circuit 1 shown below, conduct measurement with voltage application.
5.Insulation Resistance		10,000 MΩ min.		Applied voltage : 500VDC(AG10、AG15、AG20) 1000VDC(AG40) Duration : Within 20 sec.
6.Capacitance		1pFmax.		Measuring frequency : 1±0.1MHz Measuring voltage : 0.5~5.0Vrms Bias application : None
7.Discharge Life	Discharge Voltage Change	AG10	AG15、AG20、AG40	With the Circuit 2 shown below, repeat discharge with specified voltage, followed by the measurement within 2 to 5 hrs. Number of discharge : 10,000 times (AG10、AG15、AG20) : 5,000 times(AG40)
		+70 -30 %	+20 -35 %	
	Insulation Resistance	1000MΩ	5000MΩ	
8.Damp Heat	Discharge Voltage Change	+70 -30 %	+50 -30 %	Temperature : 40±2°C Humidity : 90~95%RH Duration : 250 hrs Recovery : 2 to 5 hrs of recovery under the standard condition after the removal from test chamber.
	Insulation Resistance	1000MΩ	5000MΩ	
9.Terminal Strength	Tensile	No damage		Apply the tensile force in the direction to draw terminal. Applied force : 9.8N(AG10、AG15、AG20) : 39.2N(AG40)
	Torsional	No damage		Apply the bending force to incline the body to right and left through angle of 90° Applied force : 4.9N(AG10、AG15、AG20) : 9.8N(AG40)

Circuit 1



AG10、AG15、AG20 AG40
R : 20MΩ、 5MΩ
C : 2000pF、 3000pF

Circuit 2



AG10、 AG15、AG20 AG40
R : 20MΩ、 20MΩ、 5MΩ
C : 3000pF、 10000pF、 3000pF
E : Refer to individual specification

Note on standard condition: "standard condition" referred to herein is defined as follows:

5 to 35°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

In order to provide correlation data, the test shall be conducted under condition of 20±2°C of temperature, 60 to 70% relative humidity and 86 to 106kPa of air pressure.

Unless otherwise specified, all the tests are conducted under the "standard condition."

7 SURGE ABSORBERS

Stages	Precautions	Technical considerations
1. Circuit Design	◆Verification of operating environment, electrical rating and performance 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any Spark Gaps to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. ◆Verification of Rated voltage (DC rated voltage) ◆Operating Environment precautions 1. Capacitors should not be used in the following environments: (1)Environmental conditions to avoid - exposure to water or salt water. - exposure to moisture or condensation. - exposure to corrosive gases (such as hydrogen sulfide, sulfuric acid, chlorine, and ammonia)	
2. PCB Design	1. When Spark Gaps are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs. As a result, humidity resistance performance would be lost and may lead to a reduction in insulation resistance and cause a withstand voltage failure.	
3. Considerations for automatic insertion	◆Adjustment Automatic Insertion machines (lead components) 1. When inserting Spark Gaps in a PC board by auto-insertion machines the impact load imposed on the capacitors should be minimized to prevent the leads from chocking or clinching.	

Precautions on the use of Spark Gaps

Stages	Precautions	Technical considerations
4. Soldering	◆Selection of Flux - When soldering Spark Gaps on the board, flux should be applied thinly and evenly. - Flux used should be with less than or equal to 0.1 wt% (equivalent to Choline) of halogenated content. Flux having a strong acidity content should not be applied. - When using water-soluble flux, special care should be taken to properly clean the boards. ◆Wave Soldering - Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. - Do not immerse the entire Spark Gaps in the flux during the soldering operation. Only solder the lead wires on the bottom of the board.	- Flux is used to increase solderability in wave soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system. - With too much halogenated substance (Chlorine, etc.) content is used to activate the flux, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors. - Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux. - If Spark Gaps are used beyond the range of the recommended conditions, heat stresses may cause cracks inside the Spark Gaps, and consequently degrade the reliability of the Spark Gaps.
5. Cleaning	◆Board cleaning When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions.	The resin material used for the outer coating of capacitors is occasionally a wax substance for moisture resistance which can easily be dissolved by some solutions. So before cleaning, special care should be taken to test the component's vulnerability to the solutions used. When using water-soluble flux please clean the PCB with purified water sufficiently and dry thoroughly at the end of the process. Insufficient washing or drying could lower the reliability of the capacitors.
6. Post-cleaning-process	◆Application of resin molding, etc. to the PCB and components. Please contact your local Taiyo Yuden sales office before performing resin coating or molding on mounted capacitors. Please verify on the actual application that the coating process will not adversely affect the component quality.	1-1. The thermal expansion and coefficient of contraction of the molded resin are not necessarily matched with those of the Spark Gaps. The Spark Gaps may be exposed to stresses due to thermal expansion and contraction during and after hardening. This may lower the specified characteristics and insulation resistance or cause reduced withstand voltage by cracking the ceramic or separating the coated resin from the ceramics. 1-2. With some types of mold resins, the resin's decomposition gas or reaction gas may remain inside the resin during the hardening period or while left under normal conditions, causing a deterioration of the capacitor's performance. 1-3. Some mold resins may have poor moisture proofing properties. Please verify the contents of the resins before they are applied. 1-4. Please contact Taiyo Yuden before using if the hardening process temperature of the mold resins is higher than the operating temperature of the Spark Gaps.
7. Handling	◆Mechanical considerations - Be careful not to subject the Spark Gaps to excessive mechanical shocks. Withstanding voltage failure may result. - If Spark Gaps are dropped onto the floor or a hard surface they should not be used.	- Because the Spark Gaps is made of ceramic, mechanical shocks applied to the board may damage or crack the Spark Gaps. - Spark Gaps which are dropped onto the floor or a hard surface may develop defects and have a higher risk of failure over time.
8. Storage conditions	◆Storage - To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. Recommended conditions: Ambient temperature Below 40 °C Humidity Below 70% RH. Products should be used within 12 months after delivery. After the above period, the solderability should be checked before using the Spark Gaps. - Spark Gaps should not be kept in an environment filled with decomposition gases such as (sulfurous hydrogen, sulfurous acid, chlorine, ammonia, etc.) - Spark Gaps should not be kept in a location where they may be exposed to moisture, condensation or direct sunlight.	Under high temperature/high humidity conditions, the decrease in solderability due to the oxidation of terminal electrodes and deterioration of taping and packaging characteristics may be accelerated.