スパークギャップ
SPARK GAPS

フロー／WAVE

OPERATING TEMP.	−30～+85℃

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 外径形状

15	外形寸法毎の各タイプ
20	

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

7 包装

△—	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

△= スペース

8 リード形状［mm］

	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

A G 1 5 P C 1 2 2 F S — K 2 M
1 2 3 4 5 6 7 8

1 Type

AG	Spark gaps

2 External dimension

15	Type by external
20	dimension

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

7 Packaging

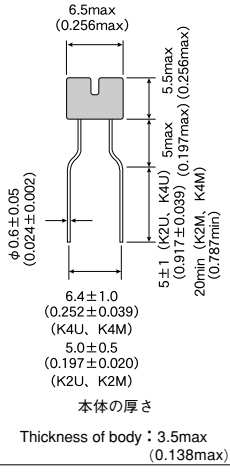
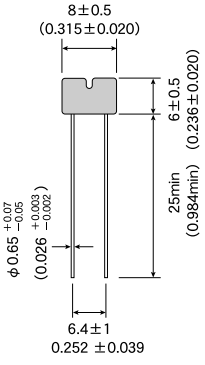
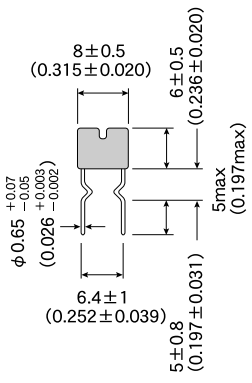
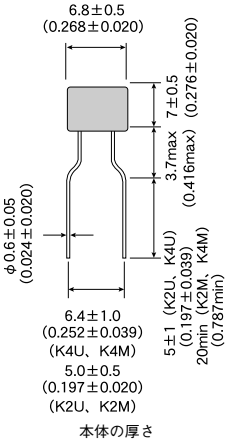
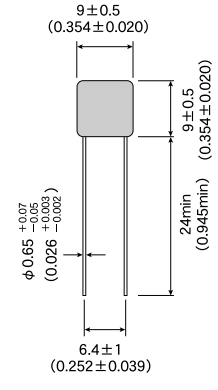
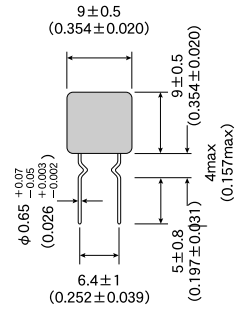
△—	Type 20, bulk
S—	Type 15, bulk
B—	Type 15, taped

△=Blank space

8 Lead configuration［mm］

	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

外形寸法　EXTERNAL DIMENSIONS

Type	AG15	AG20	
リード線	Kフォーミング Formed	ストレート Straight	Hフォーミング Formed
Lead type	K2M,K2U,K4M,K4U	L3N	H3D
キャップレス Capless	 本体の厚さ Thickness of body：3.5max (0.138max)	 本体の厚さ Thickness of body：4±0.5 (0.157±0.020)	 本体の厚さ Thickness of body：4±0.5 (0.157±0.020)
キャップ付き Capped	 本体の厚さ Thickness of body：4±0.5 (0.157±0.020)	 本体の厚さ Thickness of body：4.7±0.5 (0.184±0.020)	 本体の厚さ Thickness of body：4.7±0.5 (0.184±0.020)

Unit：mm(inch)

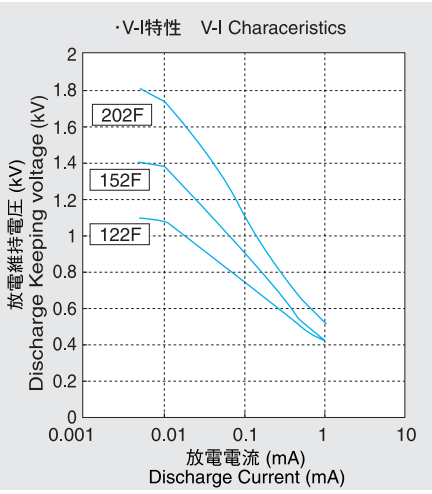
アイテム一覧　PART NUMBERS

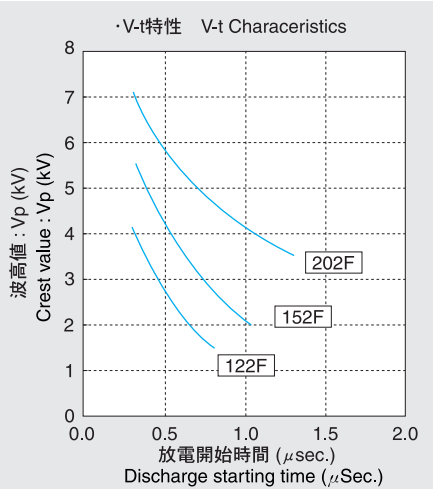
形　式 Type		EHS (Environmental Hazardous Substances)	放電開始電圧 Discharge starting voltage (DC) 公称値 Nominal value［V］	放電開始電圧 許容差 Tolerance［V］	絶縁抵抗 Insulation resistance［MΩ］＊1	リード形状 Lead configuration
AG15P□○○○◇☆ —▽▽▽		RoHS	1200　1500　2000	± 500	10000min	Kフォーミング　K Formed
			2500	± 800		
AG20P□○○○◇ —▽▽▽		RoHS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

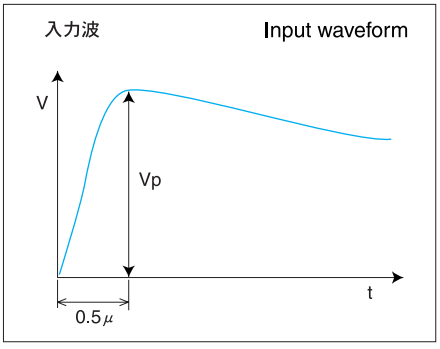
形名の□には被覆状態、○には放電開始電圧、◇には許容差、☆には包装、▽にはリード形状記号が入ります。
□Please specify the coating condition code and ○ the discharge starting voltage code and ◇ the tolerance code and ☆ the packaging code and ▽ the lead configuration code.

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

セレクションガイド Selection Guide ◀ P.14
アイテム一覧 Part Numbers P.481 ▶
特性図 Electrical Characteristics P.482 ▶
梱包 Packaging P.483 ▶
信頼性 Reliability Data P.484 ▶
使用上の注意 Precautions P.486 ▶
etc


·V-I特性　V-I Characeristics
放電維持電圧 (kV)
Discharge Keeping voltage (kV)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
202F
152F
122F
0.001
0.01
0.1
1
10
放電電流 (mA)
Discharge Current (mA)


·V-t特性　V-t Characeristics
波高値 : Vp (kV)
Crest value : Vp (kV)
8
7
6
5
4
3
2
1
0
202F
152F
122F
0.0
0.5
1.0
1.5
2.0
放電開始時間 (μsec.)
Discharge starting time (μSec.)

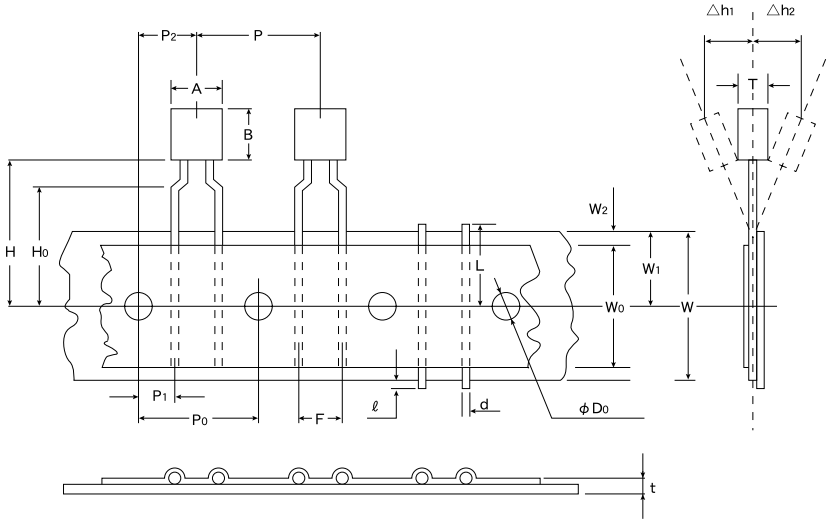

入力波
Input waveform
V
Vp
t
0.5μ

最小受注単位数　Minimum Quantity

Type	最小受注単位数　Minimum Quantity　[pcs]	
	袋詰め Bulk	テーピング Taped
AG15	1000	1300※
AG20	500	—

※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)



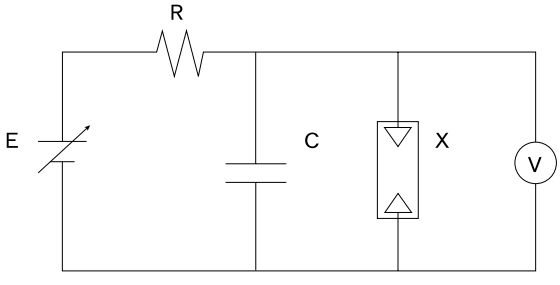
記号 Symbol	寸法 Dimensions
A	6.8±0.5 (0.268±0.020)
B	7.0±0.5 (0.276±0.020)
T	4.0±0.5 (0.157±0.020)
P	12.7±1.0 (0.500±0.039)
P_0	12.7±0.3 (0.500±0.012)
P_1	3.85±0.5 (0.152±0.020)
P_2	6.35±1.3 (0.250±0.051)
F	5.0±0.5 (0.197±0.020)
W	$18.0^{+1.0}_{-0.5}$ ($0.709^{+0.039}_{-0.020}$)
W_0	12.0min (0.472min)
W_1	$9.0^{+0.75}_{-0.5}$ ($0.354^{+0.030}_{-0.020}$)
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)
△h1 △h2	2.0max (0.079max)
d	0.6±0.05 (0.024±0.002)

Unit：mm(inch)

SPARK GAPS

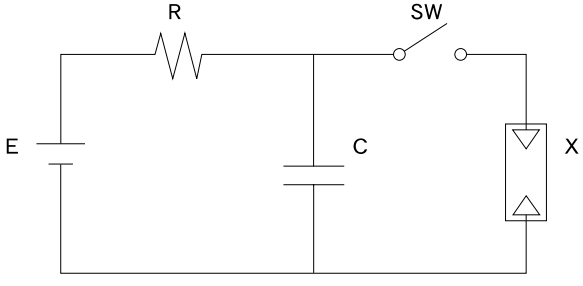
Item		Specified Value	Test Methods and Remarks
1.Operating Temperature Range		−30℃～+85℃	
2.Operating Humidity Range		95%RH max. (No dew condensation)	
3.Storage Temperature Range		−40℃～+85℃	
4.Discharge Voltage		Within the specified tolerance	With the Circuit 1 shown below, conduct measurement with voltage application.
5.Insulation Resistance		10,000 MΩ min.	Applied voltage：500VDC 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	+20 −35 %	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
	Insulation Resistance	5000MΩ	
8.Damp Heat	Discharge Voltage Change	+50 −30 %	Temperature：40±2℃ 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	5000MΩ	
9.Terminal Strength	Tensile	No damage	Apply the tensile force in the direction to draw terminal. Applied force：9.8N
	Torsional	No damage	Apply the bending force to incline the body to right and left through angle of 90° Applied force：4.9N

Circuit 1



AG15、AG20
R：20MΩ
C：2000pF

Circuit 2



AG15、AG20
R：20MΩ
C：10000pF
E：Refer to individual specification

Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35℃ 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℃ 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."

Precautions on the use of Spark Gaps

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) 1. Spark Gaps has determined electric discharge voltage between metaled Electrode using the insulation resistance of air. Therefore, since a life changes with the energies of input serge, please give me examination enough in the case of use. 2. Since between the Electrode will be in a short state at the time of electric discharge, when using it for a low impedance circuit, the Follow Current occurs and reduce the life of Spark Gaps remarkably. In such a case, please connect low resistance or a capacitive varistor in series. 3. Since the voltage which starts electric discharge when the early serge of a standup is actually impressed, since electric discharge delay generates Spark Gaps may become higher than the specified electric discharge start voltage, cautions are required. 4. Since Spark Gaps was developed for serge with small energy, when using it as an object for guidance thunder absorption with the big energy generated on a commercial power supply line, telephone / communication line, etc., it requires cautions enough. ◆Operating Environment precautions 1. Spark Gaps should not be used in the following environments: (1)Environmental conditions to avoid a. exposure to water or salt water. b. exposure to moisture or condensation. c. exposure to corrosive gases (such as hydrogen sulfide, sulfurous 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 (leaded 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 chucking or clinching.	

Precautions on the use of Spark Gaps

Stages	Precautions	Technical considerations
4. Soldering	◆Selection of Flux 1. When soldering Spark Gaps on the board, flux should be applied thinly and evenly. 2. Flux used should be with less than or equal to 0.1 wt% (equivalent to Chroline) of halogenated content. Flux having a strong acidity content should not be applied. 3. When using water-soluble flux, special care should be taken to properly clean the boards. ◆Wave Soldering 1.Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions. 2. 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.	1. 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. 2. 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. 3. 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. 1. 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 1. When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions.	1. 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. 1. 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 1. Be careful not to subject the Spark Gaps to excessive mechanical shocks. Withstanding voltage failure may result. 2. If Spark Gaps are dropped onto the floor or a hard surface they should not be used.	1. Because the Spark Gaps is made of ceramic, mechanical shocks applied to the board may damage or crack the Spark Gaps. 2.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 1. 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℃ 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. 2. Spark Gaps should not be kept in an environment filled with decomposition gases such as (sulfurous hydrogen, sulfurous acid, chlorine, ammonia, etc.) 3. Spark Gaps should not be kept in a location where they may be exposed to moisture, condensation or direct sunlight.	1. 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.