

GAS DISCHARGE TUBE



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General Characteristics

RoHS Compliance

ACPA series Gas Discharge Tube comply to a maximum concentration value of 0.1% by weight in homogeneous materials for lead (Pb), mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyls ethers (PBDE) and 0.01 weight in homogeneous materials for cadmium and are in compliance with directive 2002/95/EC of European and of the council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive).

100% Inspection

1. DC breakdown voltage, Insulation resistance, Physical dimensions, Lead/ Weld strength and appearance.
2. All other gas tube characteristics are checked using the appropriate sampling procedures
3. Gas tubes have no radioactive content
4. ISO 9001 certified

Temperature Rating

Storage : -40°C to +150°C

Operate : -30°C to +85°C

Part Number System

Example part number

ACPA 2N 600 B 8 L A
(1) (2) (3) (4) (5) (6) (7)

(1) Brand Name
Series Code

(2) Series Code
2RM = 2 elements mini series
2R = 2 elements standard series
2N = 2 elements high current series
2S = 2 elements surface mount series
3R = 3 elements standard series

(3) DC Breakdown voltage
70 = 70V 90 = 90V 145 = 145V....6000 = 6000V

(4) Diameter
A = 5.5 mm B = 8mm

(5) Length
4 = 4mm 6 = 6mm 8 = 8mm 10 = 10mm

(6) Lead Type
B = No leads
L = Axial Lead L1=1.0mm L2=0.8mm L3=0.6mm Diameter
C = Radial lead clip-in style CL1=1.0mm CL2=0.8mm CL3=0.6mm Diameter

(7) Packing Type
B = Box
A = Taping and Ammo
R = Taping and Reel



2 Elements Mini Series

ACPA-2RM Ø5.5mm ,6mm long Specifications

Model Name	DC Breakdown Voltage (V)	Maximum Impulse Breakdown Voltage (V)		Maximum Impulse Discharge Current (KA)		Normal Alternating Discharge Current (A)		Impulse Life (100A) (10/1000µs) times	DC Holdover Voltage (V)	Minimum Insulation Resistance (GΩ) Note1	Maximum Capactiance (pf) 1MHZ
		100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles				
		100V/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec				
2RM-70	70 ±20%	700	800	10	5	5	15	500	52	1	1
2RM-75	75 ±20%	700	800						52	1	1
2RM-90	90 ±20%	600	700						52	1	1
2RM-120	120 ±20%	600	700						52	1	1
2RM-130	130 ±20%	600	700						52	1	1
2RM-145	145 ±20%	600	700						52	1	1
2RM-230	230 ±20%	600	700						80	1	1
2RM-250	250 ±20%	600	700						80	1	1
2RM-300	300 ±20%	700	900						150	1	1
2RM-350	350 ±20%	700	900						150	1	1
2RM-400	400 ±20%	800	1000						150	1	1
2RM-470	470 ±20%	900	1100						150	1	1
2RM-600	600 ±20%	1300	1500						5	2.5	2.5
2RM-800	800 ±20%	1500	1700	150	1	1					

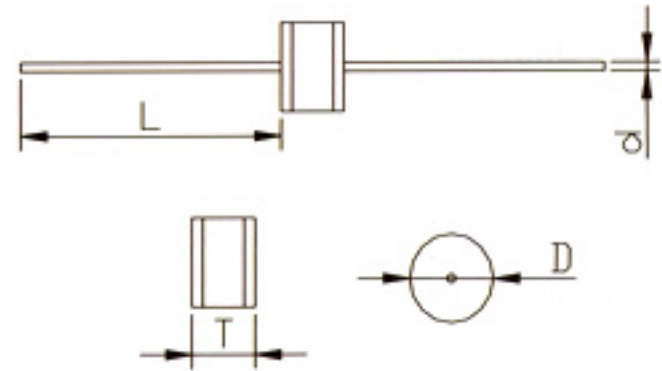
Note1 : DC Breakdown Voltage DC Measuring Voltage

70-90V	50V
120-400V	100V
470-800V	250V

Dimensions

Unit: mm

Item	Dimensions
D	5.5 +0.3,-0.5
T	6.0+0.3,-0.5
d	0.6or0.8±0.05
L	20min.



2 Elements Standard Series

ACPA-2R Ø8mm ,6mm long Specifications

Model Name	DC Breakdown Voltage	Maximum Impulse Breakdown Voltage		Maximum Impulse Discharge Current		Normal Alternating Discharge Current		Impulse Life (10/1000µs) (100A)	DC Holdover Voltage (V)	Minimum Insulation Resistance (GΩ) Note1	Maximum Capacitance (pf) 1MHZ
		100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles				
	(V)	(V)	(KA)	(A)							
2R-70	70 ±20%	500	600	15	10	5	65	500	52	10	1.5
2R-75	75 ±20%	500	600						52	10	1.5
2R-90	90 ±20%	500	600						52	10	1.5
2R-120	120 ±15%	500	700						52	10	1.5
2R-130	130 ±15%	500	700						52	10	1.5
2R-145	145 ±15%	500	700						52	10	1.5
2R-230	230 ±15%	500	700						80	10	1.5
2R-250	250 ±15%	500	700						80	10	1.5
2R-300	300 ±15%	700	900						150	10	1.5
2R-350	350 ±15%	700	900						150	10	1.5
2R-400	400 ±15%	800	1000						150	10	1.5
2R-470	470 ±15%	900	1100						150	10	1.5
2R-600	600 ±15%	1100	1300						10	5	5
2R-800	800 ±20%	1300	1500	150	10	1.5					

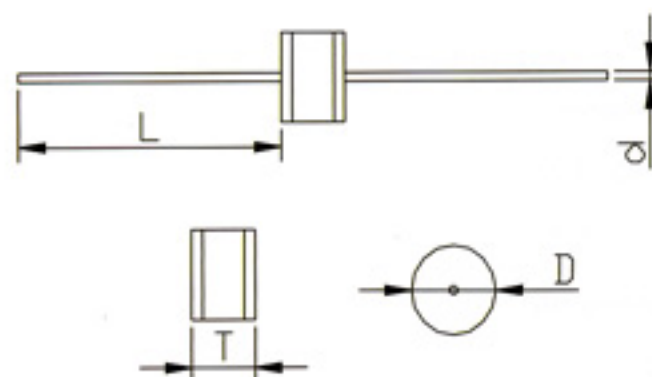
Note1 : DC Breakdown Voltage DC Measuring Voltage

70-90V	50V
120-400V	100V
470-800V	250V

Dimensions

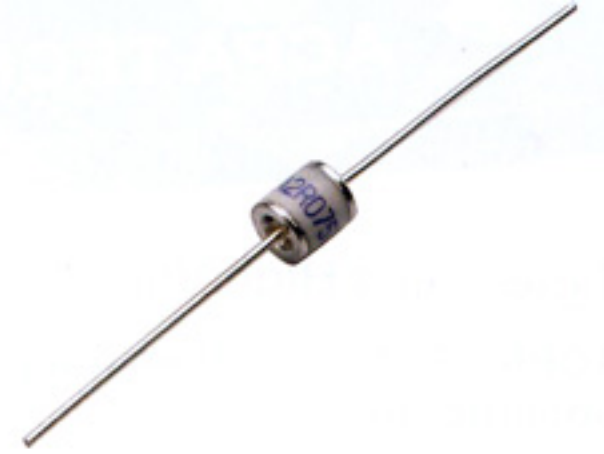
Unit: mm

Item	Dimensions
D	8.0 +0.3,-0.5
T	6.0+0.3,-0.5
d	0.8or1.0±0.05
L	20min.



2 Elements High Current Series

ACPA-2N Ø8mm ,6mm long Specifications



Model Name	DC Breakdown Voltage	Maximum Impulse Breakdown Voltage _g		Maximum Impulse Discharge Current		Normal Alternating Discharge Current		Impulse Life	DC Holdover Voltage	Minimum Insulation Resistance	Maximum Capacitance
		(V)	(V)	(KA)	(A)	(10/1000µs) (100A)	(V)				
	100V/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles	times	<150ms	Note1	1MHZ
2N-70	70 ±20%	500	600	20	15	20	65	500	52	10	1.5
2N-75	75 ±20%	500	600						52	10	1.5
2N-90	90 ±20%	500	600						52	10	1.5
2N-120	120 ±15%	500	700						52	10	1.5
2N-130	130 ±15%	500	700						52	10	1.5
2N-145	145 ±15%	500	700						52	10	1.5
2N-230	230 ±15%	500	700						80	10	1.5
2N-250	250 ±15%	500	700						80	10	1.5
2N-300	300 ±15%	700	900						150	10	1.5
2N-350	350 ±15%	700	900						150	10	1.5
2N-400	400 ±15%	800	1000						150	10	1.5
2N-470	470 ±15%	900	1100						150	10	1.5
2N-600	600 ±15%	1100	1300						150	10	1.5

Note1 : DC Breakdown Voltage DC Measuring Voltage

70-90V

50V

120-400V

100V

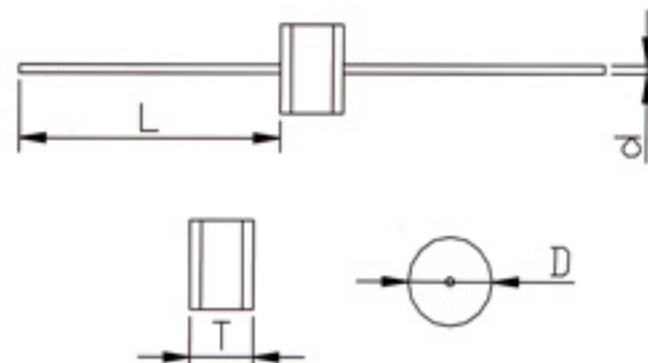
470-800V

250V

Dimensions

Unit: mm

Item	Dimensions
D	8.0 +0.3,-0.5
T	6.0+0.3,-0.5
d	0.8or1.0±0.05
L	20min.





2 Elements High Voltage Series

ACPA-2R Ø8mm ,8mm long Specifications

Model Name	DC Breakdown Voltage	Maximum Impulse Breakdown Voltage		Maximum Impulse Discharge Current		Normal Alternating Discharge Current		Impulse Life (10/1000µs) (100A)	Minimum Insulation Resistance (GΩ)	Maximum Capacitance (pf)
		(V)	(V)	(KA)	(A)					
	5KV/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles	times	Note1	1MHZ
2R-1000	1000 ±20%	1300	1400	8	5	5	10	100	10	1.5
2R-1400	1400 ±20%	2100	2200						10	1.5
2R-1600	1600 ±20%	2300	2400						10	1.5
2R-2000	2000 ±20%	2700	2800						10	1.5
2R-2500	2500 ±20%	3500	3600						10	1.5
2R-2700	2340-2970	3600	3800	5	3	3	5	300*	10	1.5
2R-3000	3000 ±20%	4100	4200						10	1.5
2R-3500	3500 ±20%	4900	5000	5	3	2.5	5	100	10	1.5
2R-4000	4000 ±20%	5300	5500						10	1.5
2R-4500	4500 ±20%	5800	6000						10	1.5
2R-5000	5000 ±20%	6000	6400						10	1.5
2R-6000	6000 ±20%	7000	7800						10	1.5

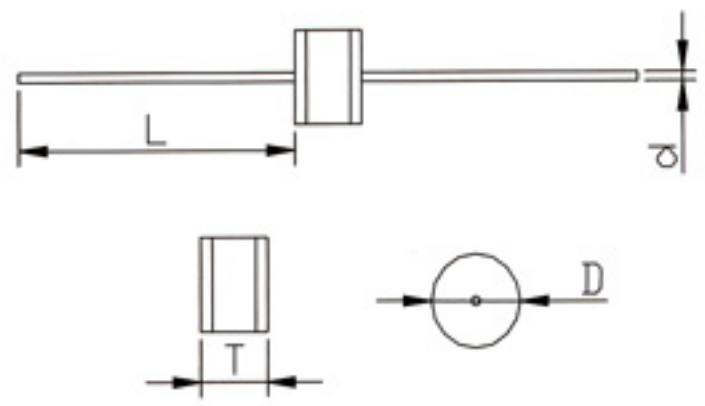
Note1 : DC Breakdown Voltage DC Measuring Voltage
 1000-2000V 500V
 2500-6000V 1000V

* Measured with 8/20µs waveform, 100A

Dimensions

Unit: mm

Item	Dimensions
D	8.0 +0.3,-0.5
T	8.0+0.6,-0.1
d	0.8or1.0±0.05
L	20min.





2 Elements Switching Series

ACPA-2T Ø8mm ,6mm long Specifications

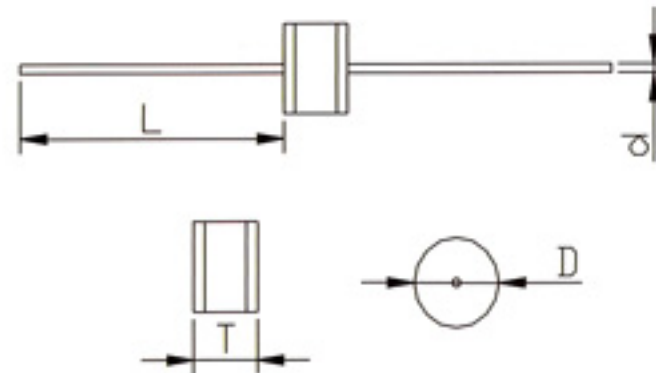
Model Name	Switching Voltage (V)	Maximum Ignition Frequency (HZ)	Switching Operations (times)	Minimum Insulation Resistance (GΩ) Note 1	Operation Temperature °C	Maximum Capacitance 0.1Vrms 1MHZ (pf)
2T-350	350±10%	400	1×10 ⁵	1	-45~125	1
2T-400	400±10%	400	1×10 ⁵			
2T-470	470±10%	400	1×10 ⁵			
2T-600	600±10%	400	1×10 ⁵			
2T-800	800±10%	400	1×10 ⁵			
2T-1000	1000±10%	400	1×10 ⁵			

Note: DC Breakdown Voltage Measuring Voltage
 350-400V 100V
 470-1000V 250V

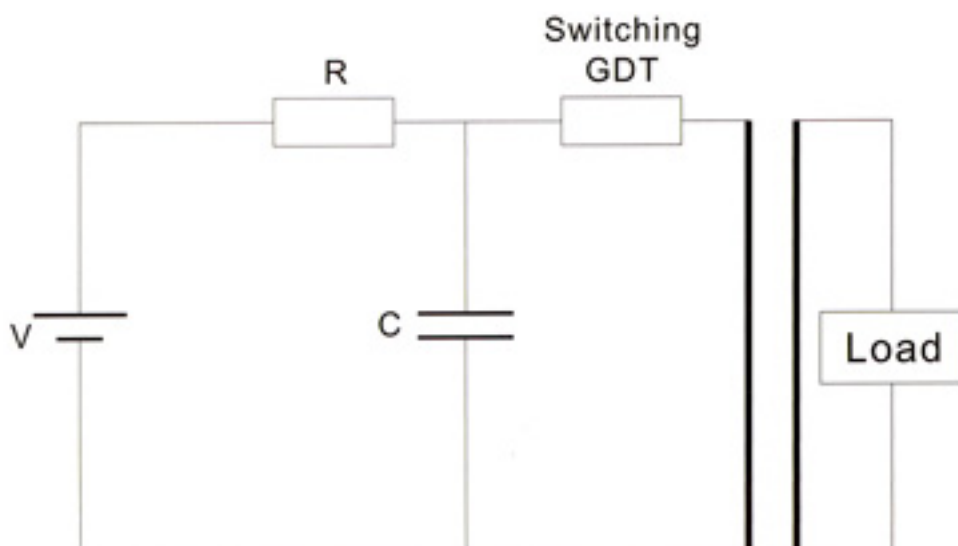
Dimensions

Unit: mm

Item	Dimensions
D	8.0 +0.3,-0.5
T	6.0+0.3,-0.5
d	0.8or1.0±0.05
L	20min.



Basic Application Circuit





2 Elements Surface Mount Mini Series

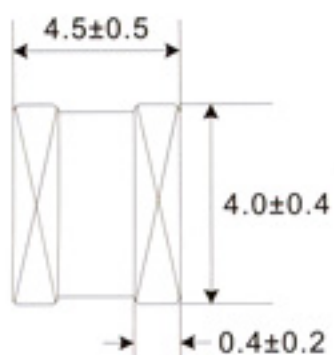
ACPA-2SM Ø4mm ,4.2mm long Specifications

Model Name	DC Breakdown Voltage	Maximum Impulse Breakdown Voltage		Maximum Impulse Discharge Current		Normal Alternating Discharge Current		Impulse Life	DC Holdover Voltage	Minimum Insulation Resistance	Maximum Capacitance
		(V)	(V)	(KA)	(A)	(10/1000µs) (100A)	(V)				
	100V/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles	times	<150ms	Note1	1MHZ
2SM-75	75 ±20%	700	800	5	3	3	6	300	52	1	0.5
2SM-90	90 ±20%	700	800						52	1	0.5
2SM-145	145 ±20%	700	800						52	1	0.5
2SM-230	230 ±20%	600	700						80	1	0.5
2SM-250	250 ±20%	600	700						80	1	0.5
2SM-300	300 ±20%	600	700						150	1	0.5
2SM-350	350 ±20%	650	800						150	1	0.5
2SM-400	400 ±20%	700	800						150	1	0.5
2SM-470	470 ±20%	700	800						150	1	0.5
2SM-600	600 ±20%	900	1000						150	1	0.5
2SM-800	800 ±20%	1100	1200	3	2	2	5	300	150	1	0.5
2SM-1000	1000 ±20%	1400	1500						150	1	0.5
2SM-1200	1200 ±20%	1800	1900						150	1	0.5

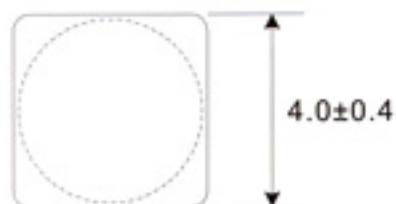
Note1 : DC Breakdown Voltage DC Measuring Voltage

70-90V	50V
120-400V	100V
470-800V	250V
1000-1200V	500V

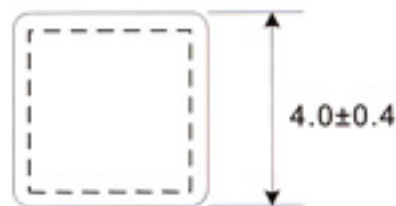
Dimensions



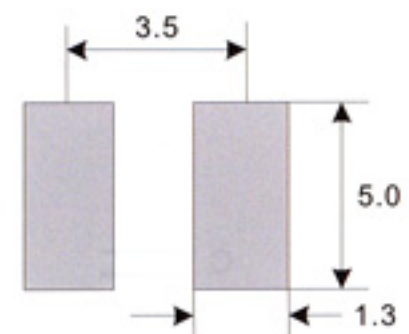
Round Type



Square Type



Recommended Pad Size



(Unit: mm)



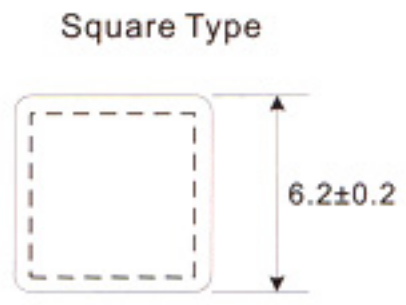
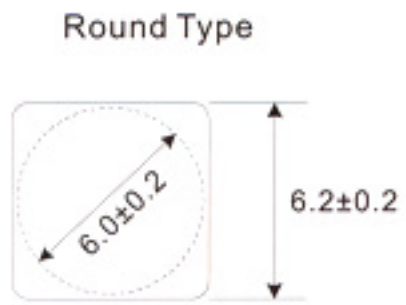
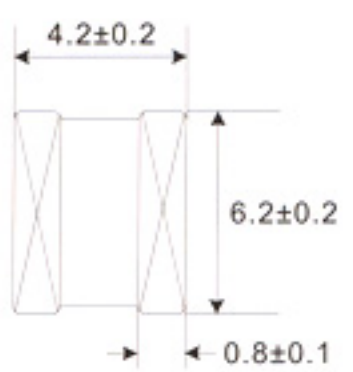
2 Elements Surface Mount Series

ACPA-2S Ø6.2mm ,4.2mm long Specifications

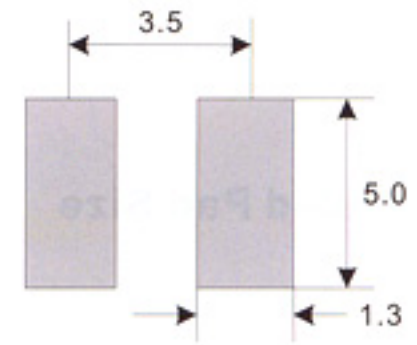
Model Name	DC Breakdown Voltage	Maximum Impulse Breakdown Voltage		Maximum Impulse Discharge Current		Normal Alternating Discharge Current		Impulse Life	DC Holdover Voltage	Minimum Insulation Resistance	Maximum Capacitance
	(V)	(V)		(KA)		(A)		(10/1000µs) (100A)	(V)	(GΩ)	(pf)
	100V/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec	Single 9cycles	times	<150ms	Note1	1MHZ
2S-75	75 ±20%	600	700	8	5	5	15	500	52	1	0.8
2S-90	90 ±20%	600	700						52	1	0.8
2S-145	145 ±20%	500	700						52	1	0.8
2S-230	230 ±20%	450	550						80	1	0.8
2S-250	250 ±20%	450	550						80	1	0.8
2S-300	300 ±20%	500	600						150	1	0.8
2S-350	350 ±20%	500	600						150	1	0.8
2S-400	400 ±20%	600	700						150	1	0.8
2S-470	470 ±20%	700	800						150	1	0.8
2S-600	600 ±20%	800	900						150	1	0.8
2S-800	800 ±20%	900	1000	150	1	0.8					

Note1 : DC Breakdown Voltage DC Measuring Voltage
 70-90V 50V
 120-400V 100V
 470-800V 250V

Dimensions



Recommended Pad Size



(Unit: mm)



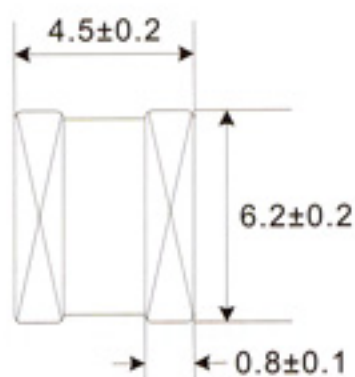
2 Elements Surface Mount High Voltage Series

ACPA-2S Ø6.2mm ,4.2mm long Specifications

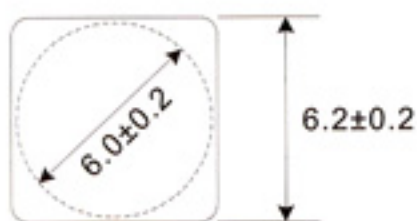
Model Name	DC Breakdown Voltage (V)	Maximum Impulse Breakdown Voltage (V)		Maximum Impulse Discharge Current (8/20µs) (KA)		Normal Alternating Discharge Current (A)		Impulse Life (10/1000µs) (100A) times	Minimum Insulation Resistance (GΩ) Note1	Maximum Capacitance (pf) 1MHZ
		5KV/s	100V/µs	1000V/µs	1 time	10 times	50Hz, 1sec			
	2S-1000	1000±20%	1500	1600	5	3	3	10	300	1
2S-1200	1200 ±20%	1700	1800	1						0.8
2S-1800	1800 ±20%	2500	2600	1						0.8
2S-2000	2000 ±20%	2700	2800	1						0.8
2S-2500	2500 ±20%	3100	3200	1						0.8
2S-2700	2700 ±20%	3300	3400	1						0.8
2S-3000	3000 ±20%	3600	3700	1						0.8

Note1 : DC Breakdown Voltage DC Measuring Voltage
 1000-2000V 500V
 2500-3000V 1000V

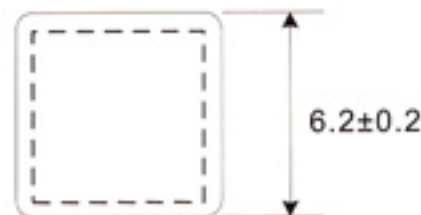
Dimensions



Round Type

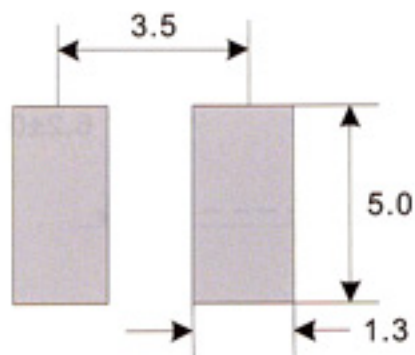


Square Type



(Unit: mm)

Recommended Pad Size





3 Elements Mini Series

ACPA-3RM Ø6mm ,8mm long Specifications

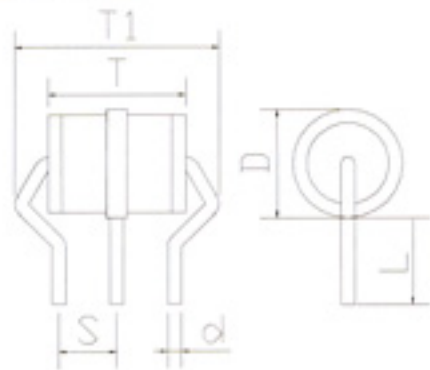
Model Name	DC Breakdown Voltage (V)	Maximum Impulse Breakdown Voltage (V)		Maximum Impulse Discharge Current (8/20 μ s) (KA)	Alternating Discharge Current (A)	Impulse Life (10/1000 μ s) (200A) times	DC Holdover Voltage (V)	Minimum Insulation Resistance (G Ω) Note1	Maximum Capacitance (pf) 1MHZ
		100V/ μ s	1000V/ μ s						
		100V/s	1000V/ μ s						
3RM-90	90 \pm 20%	750	850	5	5	100	52	10	2
3RM-145	145 \pm 20%	750	850	5	5	100	52	10	2
3RM-200	200 \pm 20%	600	700	10	10	100	135	10	2
3RM-230	230 \pm 20%	600	700	10	10	100	135	10	2
3RM-250	250 \pm 20%	600	700	10	10	100	135	10	2
3RM-350	350 \pm 20%	650	750	5	5	100	150	10	2
3RM-400	400 \pm 20%	700	800	5	5	100	150	10	2
3RM-420	420 \pm 20%	700	800	5	5	100	150	10	2
3RM-470	470 \pm 20%	800	900	5	5	100	150	10	2
3RM-600	600 \pm 20%	900	1000	5	5	100	150	10	2

Note1 : DC Breakdown Voltage DC Measuring Voltage

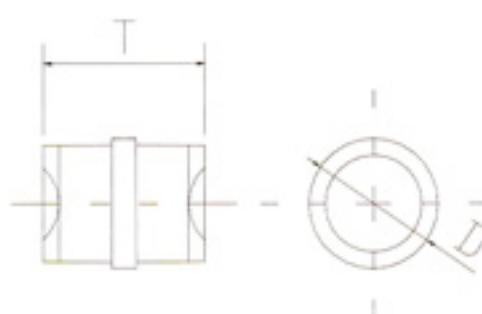
90V	50V
145-400V	100V
420-600V	250V

Dimensions

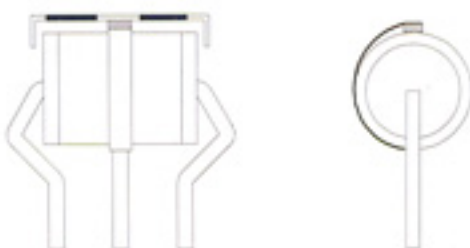
C1 TYPE



B TYPE



CF1 TYPE



Unit: mm

Item	Dimensions	
	Spec.	Tolerance
D	6.0	+0.2,-0.5
T	8.5	\pm 0.5
T1	11.5	+0.8,-0.5
L	7.5	\pm 0.5
S	3.8	\pm 0.3
d	0.8	\pm 0.05



3 Elements Standard Series

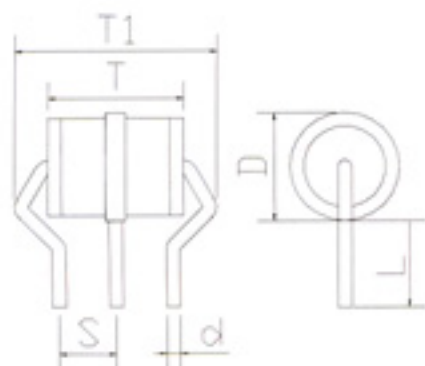
ACPA-3R Ø8mm ,10mm long Specifications

Model Name	DC Breakdown Voltage (V)	Maximum Impulse Breakdown Voltage _p (V)		Maximum Impulse Discharge Current (8/20µs) (KA)	Alternating Discharge Current (A)	Impulse Life (10/1000µs) (200A) times	DC Holdover Voltage (V)	Minimum Insulation Resistance (GΩ) Note1	Maximum Capacitance (pf) 1MHZ
		100V/µs	1000V/µs						
		100V/s	1000V/µs						
3R-75	75±20%	600	700	20	20	130	52	10	2
3R-90	90±20%	600	700	20	20	130	52	10	2
3R-145	145±20%	500	700	20	20	130	52	10	2
3R-200	200±20%	500	700	20	20	130	135	10	2
3R-230	230±20%	600	700	20	20	130	135	10	2
3R-250	250±20%	600	700	20	20	130	135	10	2
3R-350	350±20%	700	900	20	20	130	150	10	2
3R-400	400±20%	800	1000	20	20	130	150	10	2
3R-420	420±20%	800	1000	20	20	130	150	10	2
3R-470	470±20%	1100	1400	20	20	130	150	10	2
3R-600	600±20%	1200	1500	20	20	130	150	10	2

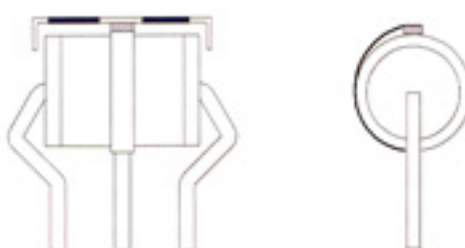
Note1 : DC Breakdown Voltage DC Measuring Voltage
 75-90V 50V
 145-400V 100V
 420-600V 250V

Dimensions

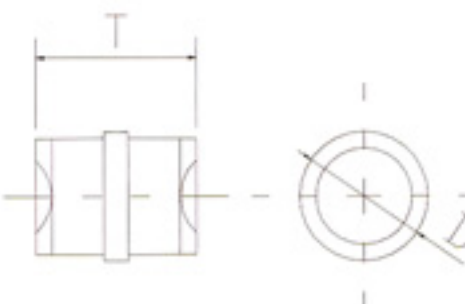
C TYPE



CF TYPE



B TYPE



Unit: mm

Item	Dimensions	
	Spec.	Tolerance
D	8.0	+0.2,-0.8
T	10.0	±0.5
T1	13.4	+0.8,-0.5
L	7.5	±0.5
S	4.4	±0.4
d	1.0	±0.05

Appendix

Standard Bulk Packaging

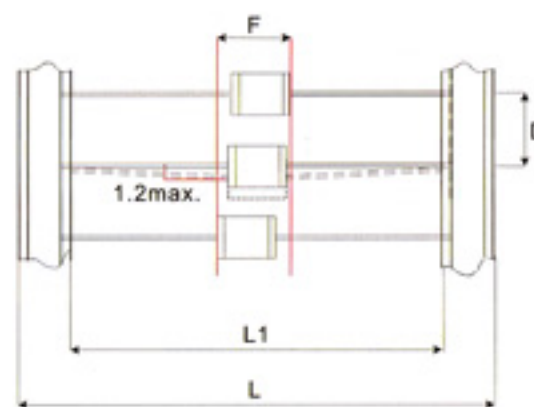
- 100 pcs per plastic tray
- 500 pcs per inner box
- 10 inner boxes per carton
- 5,000 pcs per full carton

Taping & Reel Specifications

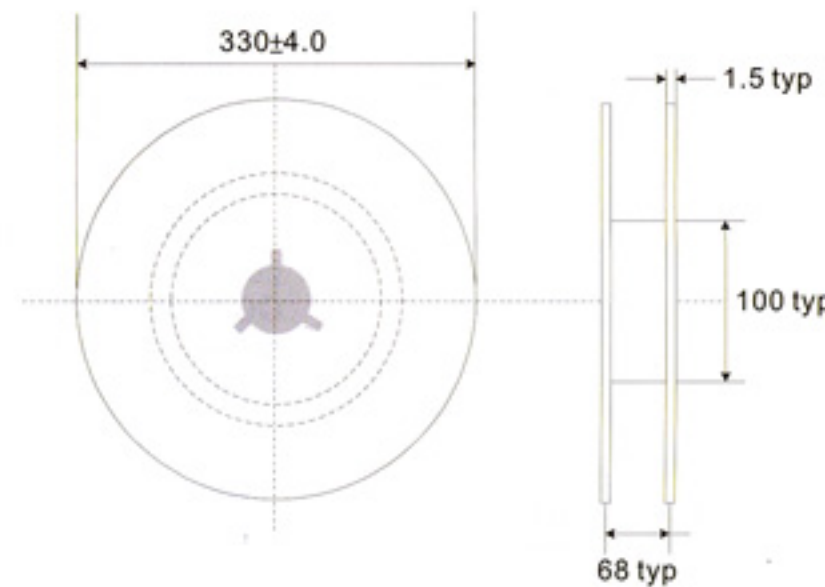
2RM, 2R, 2N Axial Lead Taping

Unit: mm

Item	Dimensions	
	Spec.	Tolerance
L1	64	±3
L	52	±2
D	10	±0.5
F	long+1.4	Max



Reel

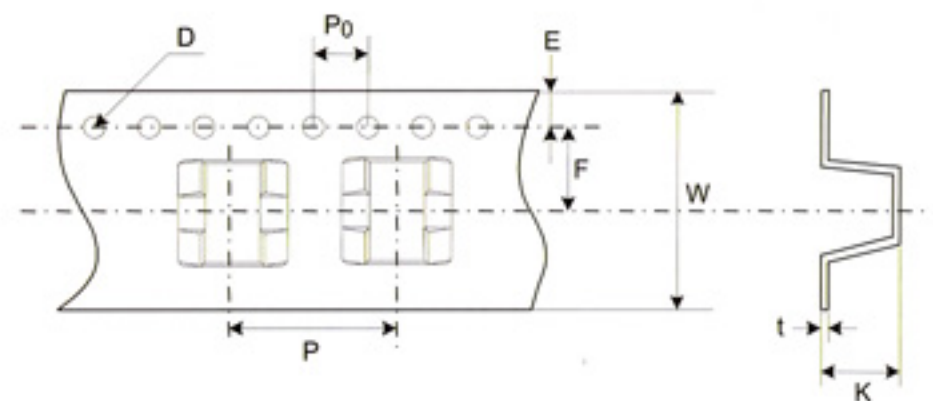


2SM SMD Taping

Unit: mm

Item	Spec
P	8.0±0.1
P0	4.0±0.1
W	12.0±0.3
F	5.45±0.1
E	1.75±0.1
D	Φ1.55±0.05
K	4.55±0.1
t	0.4±0.05

Quantity: 1,500 pcs per reel (13")
 3 reels per inner box
 5 inners box per carton
 22,500 pcs per full carton

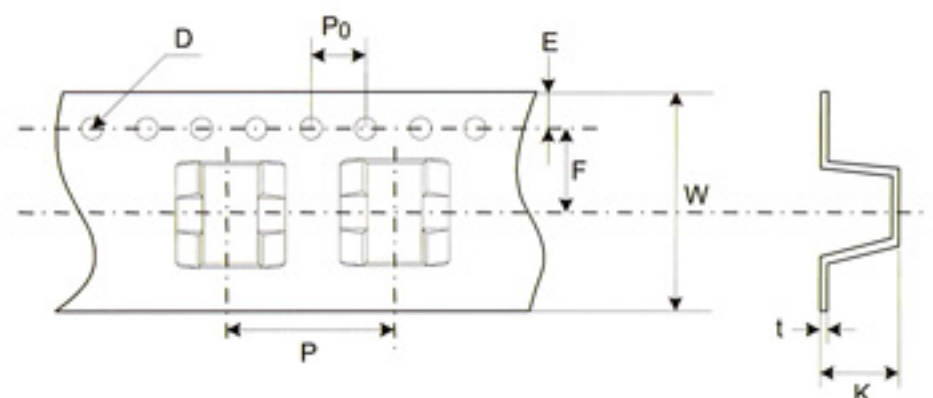


2SM SMD Taping

Unit: mm

Item	Spec
P	12.0±0.1
P0	4.0±0.1
W	16.0±0.3
F	7.5±0.1
E	1.75±0.1
D	Φ1.55±0.05
K	6.4±0.1
t	0.4±0.05

Quantity: 900 pcs per reel (13")
 3 reels per inner box
 5 inners box per carton
 13,500 pcs per full carton



Electrical Terms and Definitions

Item	Test Condition / Description		Requirement
DC Breakdown Voltage	The voltage is measured with a low rate of rise $dv / dt \approx 100 \text{ v/s}$		To meet the specified value
Maximum Impulse Breakdown Voltage	The maximum impulse breakdown voltage is measured with a rise time of $dv / dt \approx 100 \text{ v/\mu s}$ and $dv / dt \approx 1000 \text{ v/\mu s}$		
Maximum Impulse Discharge Current	The maximum current applying a waveform 8/20 $\mu \text{ sec}$ that can be applied across the terminals of the gas tube without causing the gas tube DC breakdown voltage to change more than $\pm 25\%$ from its initial measure voltage, $IR > 10^8 \text{ ohms}$ (-20%, +30% for 70-90V)		
Impulse Life	The minimum number of impulses of a specified waveform and peak current which a gas tube conduct without causing the gas tube DC breakdown voltage to change more than $\pm 25\%$ from its initial measure voltage . Dwell time between pulses is 1-2 minutes.		
Alternating Discharge Current	Rate RMS value of AC current at 50HZ, 1 sec or sine waveform 9 cycles, intervals: 3min. DC breakdown voltage may not change more than $\pm 25\%$ from its initial measure voltage, $IR > 10^8 \text{ ohms}$ (-20%, +30% for 70-90V)		
DC Holdover Voltage	The maximum DC voltage across the two terminals of gas tube under which it may be expected to return to the high impedance state after the gas tube breakdown.		
Insulation Resistance	The resistance of gas tube shall be measured each terminal to each other terminal.		
	DC Breakdown Voltage	Measuring Voltage	
	70-150V	50V	
	151-400V	100V	
	401-1000V	250V	
1001-2000V	500V		
2001-6000V	1000V		
Capacitance	The capacitance of gas tube shall be measured each terminal to each other terminal. Test frequency : 1 MHZ In measurements involving 3-electrode gas tubes ,the terminal not being tested shall be connected to a ground plane.		