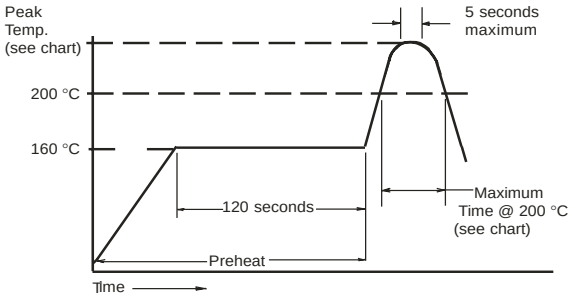
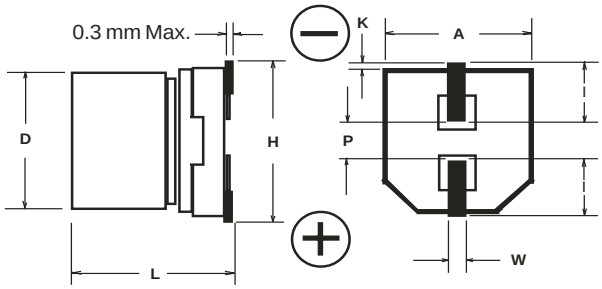
Application Guide Aluminum SMT Capacitors

Reflow Soldering Temperature Profile:



Case Code	Peak Temp (°C)	Max. Time @ 200 °C (Sec.)
A, B, C, D	240	40
E, F, G, H J, K, L, P R, S, U, X	230	30

Outline Drawing

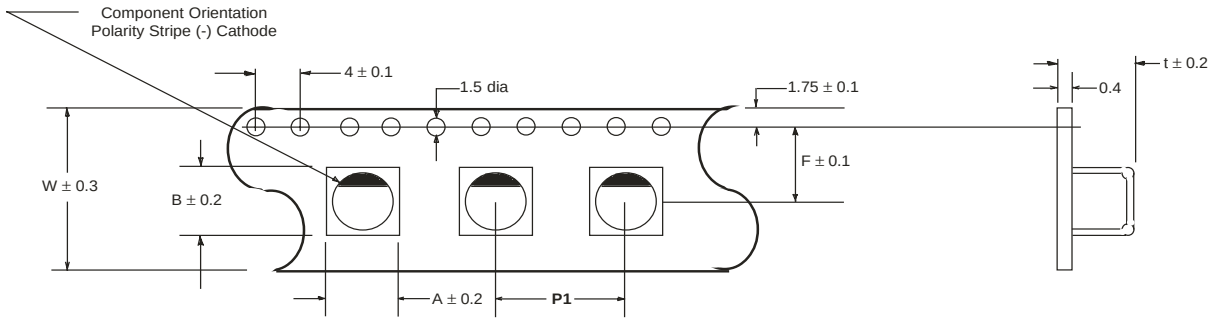


Case Dimensions

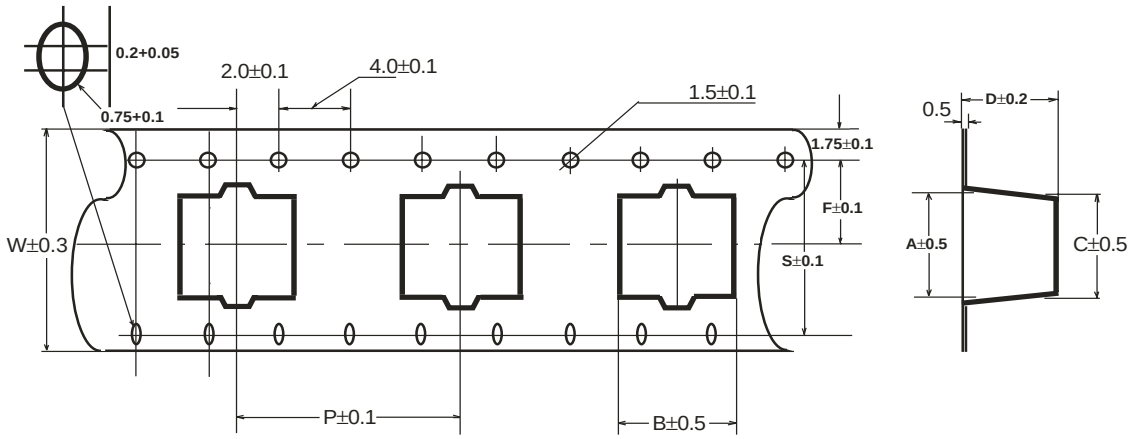
Case Code	(mm) D ±0.5	L	A ±0.2	H (max)	I (ref)	W	P (ref)	K
A	3.0	5.4 +.1,.2	3.3	4.5	1.5	0.55 ±0.1	0.60	0.35 +0.15 –0.20
B	4.0	*5.4 +.1,.2	4.3	5.5	1.8	0.65 ±0.1	1.00	0.35 +0.15 –0.20
C	5.0	*5.4 +.1,.2	5.3	6.5	2.2	0.65 ±0.1	1.50	0.35 +0.15 –0.20
D	6.3	*5.4 +.1,.2	6.6	7.8	2.4	0.65 ±0.1	1.80	0.35 +0.15 –0.20
X	6.3	7.9 ±.3	6.6	7.8	2.6	0.65 ±0.1	1.80	0.35 +0.15 –0.20
E	8.0	6.2 ±.3	8.3	9.5	3.4	0.65 ±0.1	2.20	0.35 +0.15 –0.20
F	8.0	10.2 ±.3	8.3	10.0	3.4	0.90 ±0.2	3.20	0.70 ±0.20
G	10.0	10.2 ±.3	10.3	13.0	3.5	0.90 ±0.2	4.60	0.70 ±0.20
H	12.5	13.5 ±.5	13.5	15.0	4.7	0.90 ±0.3	4.40	0.70 ±0.30
J	10.0	13.5 ±.5	10.3	12.0	3.5	0.90 ±0.2	4.60	0.70 ±0.20
K	10.0	16.5 ±.5	10.3	12.0	3.5	0.90 ±0.2	4.60	0.70 ±0.20
L	12.5	16.5 ±.5	13.5	15.0	4.7	0.90 ±0.3	4.40	0.70 ±0.30
P	16.0	16.5 ±.5	17.0	19.0	5.5	1.20 ±0.3	6.70	0.70 ±0.30
R	18.0	16.5 ±.5	19.0	21.0	6.5	1.20 ±0.3	6.70	0.70 ±0.30
S	18.0	21.5 ±.5	19.0	21.0	6.5	1.20 ±0.3	6.70	0.70 ±0.30
U	16.0	21.5 ±.5	17.0	19.0	6.7	1.20 ±0.3	6.70	0.70 ±0.30

*5.8 ±.3 for AFK and AHD Series

Tape Specifications

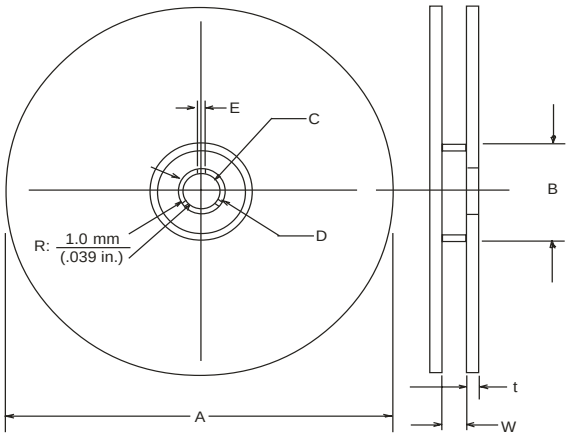


Case Code	(mm) W	A	B	P1	F	t
A	12.0	3.4	3.5	8.0	5.5	5.8
B	12.0	4.7	4.6	8.0	5.5	5.8
C	12.0	6.0	6.0	12.0	5.5	5.8
D	16.0	7.0	7.0	12.0	7.5	5.8
X	16.0	7.0	7.0	12.0	7.5	8.4
E	16.0	8.7	8.7	12.0	7.5	6.8
F	24.0	8.7	8.7	16.0	11.5	11.0
G	24.0	10.7	10.7	16.0	11.5	11.0



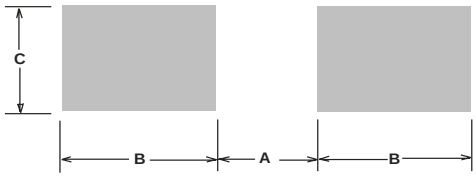
Case Code	(mm) W	A	B	C	D	F	P	S
J	32	10.7	10.7	14.5	14.5	14.2	20	28.4
K	32	10.7	10.7	14.5	18.5	14.2	20	28.4
H	32	14.0	14.0	18.0	14.5	14.2	24	28.4
L	32	14.0	14.0	18.0	17.5	14.2	24	28.4
P	44	17.5	17.5	23.0	17.5	20.2	28	40.4
R	44	19.5	19.5	26.0	17.5	20.2	32	40.4
S	44	19.5	19.5	26.0	22.5	20.2	32	40.4
U	44	17.5	17.5	23.0	22.5	20.2	28	40.4

Reel Specifications



Case Code	(mm) A	B	C	D	E	W	t
A, B size	380 ±2.0	50 min	13.0 ±0.5	21.0 ±0.8	2.0 ±0.5	14 ±1.0	3.0
C, D, E, X size	380 ±2.0	50 min	13.0 ±0.5	21.0 ±0.8	2.0 ±0.5	18 ±1.0	3.0
F, G size	380 ±2.0	50 min	13.0 ±0.5	21.0 ±0.8	2.0 ±0.5	26 ±1.0	3.0
J, K, H, L size	330 ±2.0	50 min	13.0 ±0.5	21.0 ±0.8	2.0 ±0.5	34 ±1.0	3.0
P, R, S, U size	330 ±2.0	50 min	13.0 ±0.5	21.0 ±0.8	2.0 ±0.5	46 ±1.0	3.0

Land Pattern:



Case Code	(mm) A	B	C
A	0.6	2.2	1.5
B	1.0	2.5	1.6
C	1.5	2.8	1.6
D	2.2	3.0	1.6
E	2.2	4.5	1.6
F	3.2	4.0	2.0
G	4.6	4.3	2.0
J, K	4.0	4.5	2.0
H	4.0	5.7	2.0
L	4.0	5.7	2.0
P	6.0	6.5	2.5
U	6.0	6.5	2.5
R, S	6.0	7.5	2.5

Application Guide Aluminum SMT Capacitors

Cleaning

Below is a table describing the acceptable cleaning agents for cleaning a PC board containing SMT aluminum electrolytic capacitors in vertical cylindrical cans (V-Chips).

Cleaning Agent	Name	Manufacturer	Recommended Use Level	Symptoms of Damage
Water Base				
Water Base	Distilled Water		1	None
Alkaline	Aqua Cleaner 210SEP	Sanei	2	
Surface active agent	Pine Alpha ST-100S	Aralawa Kasei Kogyo	2	None, though marking ink may fade
	Clean-thru 750H	Kao Corporation	2	
	Clean-thru 750L		2	
	Clean-thru 710M		2	
	Sun-elec B-12	Sanyo Kasei	2	
	DK be-clean CW-5790	Dai-ichi Kogyo Seiyaku	2	
Solvent Base				
Petroleum Based	Cold-cleaner P3-375	Henkel Hakusui	3	Swelling on sealing rubber, rinse and dry well after cleaning
	Techno-cleaner 219	Seiwa Sangyo	3	
Hydrocarbon	Axarel 32	Mitsui DFC	3	
Alcohol base	Isopropyl Alcohol		1	None
Silicon base	Techno-care FRW-17	Toshiba Corporation	3	None if used in combination
	Techno-care FRW-1		3	
	(Techno-care FRV-100)		3	
Halogenated hydrocarbon	Asashi-clean AK-225AES	Ashahi Glass	3	Contains CFC's subject to environmental regulations
	HCFC141B-MS	Daikin Kogyo	3	
Telpen base	Telpen-cleaner EC-7R	Nippon Alpha Metals	3	Swelled seal

Use Level Number	Recommendations
1	Cleaning is possible
2	Cleaning is possible (marking may fade)
3	Cleaning is possible (Use caution. 1 and 2 are better choices)

V-Chips may be immersed for 5 minutes, safely, in Level 1&2 solvents. Use Level 3 solvents with caution

Do not use chlorine-based halogenated cleaning solvents, adhesives or coating agents.

When halogenated chlorine-based solvents are used in the cleaning process, free chlorine is liberated from the solvent. This chlorine causes corrosion and deterioration of the aluminum inside the capacitor.

Dangers of "Free-Chlorine":

After the solvent dries, the chlorine remains on the capacitor seal, the chlorine slowly permeates into the capacitor element causing corrosion and damage that happens slowly. It may take some time before a failure is apparent. A representation of the chemical reaction is on the following page.

Reaction of Free-chlorine and Aluminum

Combined free chlorine and hydrogen become hydrochloric acid, but it has high dissociation and most of it becomes chlorine ions. These chlorine ions react with the aluminum. The order of the reactions is represented below.

1.) Hydration of oxide film

$$AlO_3 + 3H_2O \longrightarrow 2Al(OH)_3$$

2.) Reaction of hydrated oxide film and chlorine (Dissolution of film)

$$Al(OH)_3 + 3HCl \longrightarrow AlCl_3 + 3H_2O$$

3.) Reaction of aluminum and hydrochloric acid (Dissolution of aluminum)

$$Al + 3HCl \longrightarrow AlCl_3 + 3/2H_2\uparrow$$

4.) Precipitation of aluminum hydroxide

$$AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$$

The entire reaction can be summerized as the following:

$$Al + Al_2O_3 + 3HCl_3 + 3H_2O \longrightarrow 2Al(OH)_3 + AlCl_3 + H3/2\uparrow$$

Therefore the compounds produced by the reactions are aluminum hydroxide and hydrochloric acid from reaction #4; the hydrochloric acid is not consumed and acts as a catalyst.

Solvents that should not be used

Composition	Boiling Point (°C)	Common Name
1.1.1 -Trichloroethane	74.1	Chlorosen
Trichloroethylene	87.2	Trichlene
Tetrachloroethylene	121.1	Perchloroenthylene

Additional Cleaning Notes:

1.) Solvents containing CFC's destroy the ozone layer and should be avoided to protect the global environment.

2.) To avoid solvent residue between the capacitor's seal and the PC board, make sure the assembly is dried thoroughly after cleaning.

Coating

Below is a list of coatings that are safe for use with V-Chips

Manufacturer	Material	Coating Material Name
Hitachi Chemical	Acrylic	Taffi -1141, Taffi -1147
	Urethane	Taffi -1154
Boxy Brown	Acrylic	Humi Seal 1B66
	Urethane	Humi Seal 1A27
Dow Corning	Silicon	Perugan Z, Perugan C
Nihon Zeon	Urethane	Quinate System 160B

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