Panasonic

2014

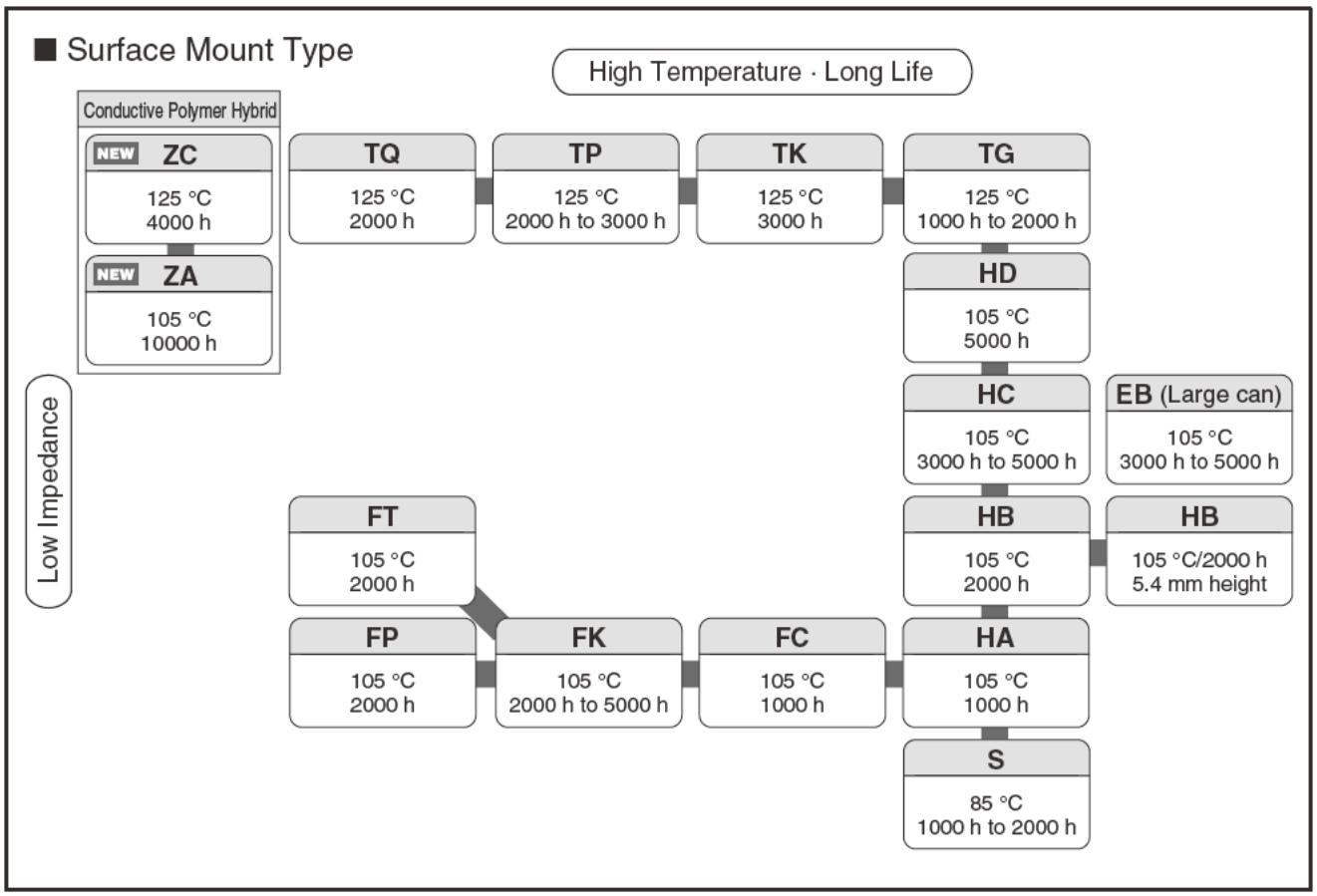
CATALOG

Electrolytic Capacitors

(Surface Mount Type Aluminum Electrolytic Capacitors)

2014.10 | industrial.panasonic.com/ww/

Small can type Aluminum Electrolytic Capacitors



Surface Mount Type

Series: **ZA** Type: **V**

High temperature Lead-Free reflow

■ Features

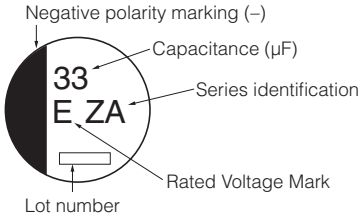
- Endurance: 10000 h at 105 °C
- Low ESR and High ripple current
  (70 % over, Lower ESR than Current V-FP)
- High voltage (to 80 V)
- Equivalent to conductive polymer type Aluminum Electrolytic Capacitor
  (There are little characteristics change by temperature and frequency)
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−55 °C to +105 °C					
Rated W.V.Range	25 V.DC to 80 V.DC					
Nominal Cap.Range	10 µF to 330 µF					
Capacitance Tolerance	±20 % (120 Hz/+20 °C)					
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (whichever is greater)					
tan δ	Please see the attached Standard Products list					
Endurance	The capacitor shall be subjected to application of the D.C. voltage with full rated ripple current at +105 °C for 10000 hours. After stabilizing at room temperature(+15 to 35 °C), the capacitor shall not exceed the specified limits. (The sum of DC voltage and ripple peak voltage shall not exceed the rated voltage.)					
	Capacitance change	±30 % of initial measured value				
	tan δ	≦ 200 % of initial specified value				
	E. S. R.	≦ 200 % of initial specified value				
	DC leakage current	≦ initial specified value				
	ESR after Endurance (Ω/100 kHz) (−40 °C)	Size Code				
		C	D	D8	F	G
		2.0	1.4	0.8	0.4	0.3
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)					
Damp Heat (Load)	After applying rated working voltage for 2000 hours at +85 °C±2 °C / 85% to 90%RH and then being stabilized at +20 °C, Capacitors shall meet the following limits.					
	Capacitance change	±30 % of initial measured value				
	tan δ	≦ 200 % of initial specified value				
	E. S. R.	≦ 200 % of initial specified value				
	DC leakage current	≦ initial specified value				
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.					
	Capacitance change	±10 % of initial measured value				
	tan δ	≦ initial specified value				
	DC leakage current	≦ initial specified value				

■ Marking

Example:25 V 33 µF Marking color : BLACK

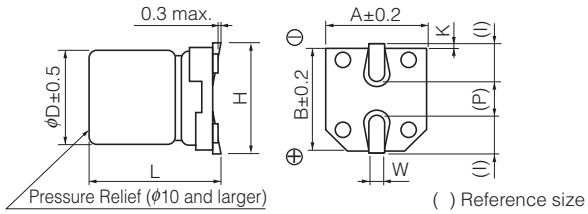


Rated Voltage Mark

E	25 V	J	63 V
V	35 V	K	80 V
H	50 V		

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

* This product qualify for AEC-Q200, but it has some deviations.

03 Dec. 2014

NEW

■ Standard Products

Endurance : 105 °C 10000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	Size Code	Ripple Current (100 kHz) (+105 °C) (mA r.m.s.)	E.S.R. (100 kHz) (+20 °C) (mΩ)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
25	33	5	5.8	C	900	80	0.14	EEHZA1E330R	(5)	1000
	56	6.3	5.8	D	1300	50	0.14	EEHZA1E560P	(5)	1000
	100	6.3	7.7	D8	2000	30	0.14	EEHZA1E101XP	(5)	900
	220	8	10.2	F	2300	27	0.14	EEHZA1E221P	(6)	500
	330	10	10.2	G	2500	20	0.14	EEHZA1E331P	(6)	500
35	22	5	5.8	C	900	100	0.12	EEHZA1V220R	(5)	1000
	27	6.3	5.8	D	1300	60	0.12	EEHZA1V270P	(5)	1000
	47	6.3	5.8	D	1300	60	0.12	EEHZA1V470P	(5)	1000
	68	6.3	7.7	D8	2000	35	0.12	EEHZA1V680XP	(5)	900
	150	8	10.2	F	2300	27	0.12	EEHZA1V151P	(6)	500
	270	10	10.2	G	2500	20	0.12	EEHZA1V271P	(6)	500
50	10	5	5.8	C	750	120	0.10	EEHZA1H100R	(5)	1000
	22	6.3	5.8	D	1100	80	0.10	EEHZA1H220P	(5)	1000
	33	6.3	7.7	D8	1600	40	0.10	EEHZA1H330XP	(5)	900
	68	8	10.2	F	1800	30	0.10	EEHZA1H680P	(6)	500
	100	10	10.2	G	2000	28	0.10	EEHZA1H101P	(6)	500
63	10	6.3	5.8	D	1000	120	0.08	EEHZA1J100P	(5)	1000
	22	6.3	7.7	D8	1500	80	0.08	EEHZA1J220XP	(5)	900
	33	8	10.2	F	1700	40	0.08	EEHZA1J330P	(6)	500
	56	10	10.2	G	1800	30	0.08	EEHZA1J560P	(6)	500
80	22	8	10.2	F	1550	45	0.08	EEHZA1K220P	(6)	500
	33	10	10.2	G	1700	36	0.08	EEHZA1K330P	(6)	500

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”.

■ Frequency correction factor for ripple current

Capacitance (μF)	Frequency (kHz)	0.1	0.12	0.2	0.3	0.5	1	2	3	5	10	15	20	30	40	50	100	300	500	1000
C < 47	Correction factor	0.10	0.10	0.10	0.15	0.20	0.30	0.40	0.45	0.50	0.60	0.65	0.70	0.75	0.80	0.85	1.00	1.00	1.05	1.05
47 ≦ C < 150		0.15	0.15	0.20	0.25	0.30	0.40	0.45	0.55	0.60	0.70	0.75	0.80	0.80	0.85	0.90	1.00	1.00	1.00	1.00
150 ≦ C		0.15	0.15	0.25	0.25	0.30	0.45	0.50	0.60	0.65	0.75	0.80	0.85	0.85	0.85	0.90	1.00	1.00	1.00	1.00

Surface Mount Type

Series: **ZC** Type: **V**

High temperature Lead-Free reflow

■ Features

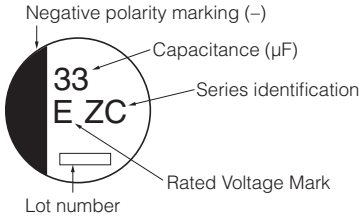
- Endurance: 4000 h at 125 °C
  (The longest endurance in the industry by each case size)
- Low ESR and High ripple current (85% over, Lower ESR than Current V-TP)
- High-withstand voltage (25 V to 63 V),Low LC(0.01 CV or 3 μA)
- Equivalent to conductive polymer type Aluminum Electrolytic Capacitor
  (There are little characteristics change by temperature and frequency)
- Vibration-proof product is available upon request. (φ8 mm and larger).
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−55 °C to +125 °C					
Rated W.V.Range	25 V.DC to 63 V.DC					
Nominal Cap.Range	10 μF to 330 μF					
Capacitance Tolerance	±20 % (120 Hz/+20 °C)					
DC Leakage Current	I ≦ 0.01 CV or 3 (μA) After 2 minutes (whichever is greater)					
tan δ	Please see the attached Standard Products list					
Endurance	The capacitor shall be subjected to application of the D.C. voltage with full rated ripple current at +125 °C for 4000 hours. After stabilizing at room temperature(+15 to 35 °C), the capacitor shall not exceed the specified limits. (The sum of DC voltage and ripple peak voltage shall not exceed the rated voltage.)					
	Capacitance change	±30 % of initial measured value				
	tan δ	≦ 200 % of initial specified value				
	E. S. R.	≦ 200 % of initial specified value				
	DC leakage current	≦ initial specified value				
	ESR after Endurance (Ω/100 kHz) (−40 °C)	Size Code				
		C	D	D8	F	G
		2.0	1.4	0.8	0.4	0.3
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)					
Damp Heat (Load)	After applying rated working voltage for 2000 hours at +85 °C±2 °C / 85% to 90%RH and then being stabilized at +20 °C, Capacitors shall meet the following limits.					
	Capacitance change	±30 % of initial measured value				
	tan δ	≦ 200 % of initial specified value				
	E. S. R.	≦ 200 % of initial specified value				
	DC leakage current	≦ initial specified value				
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.					
	Capacitance change	±10 % of initial measured value				
	tan δ	≦ initial specified value				
	DC leakage current	≦ initial specified value				

■ Marking

Example:25 V 33 μF Marking color : BLACK

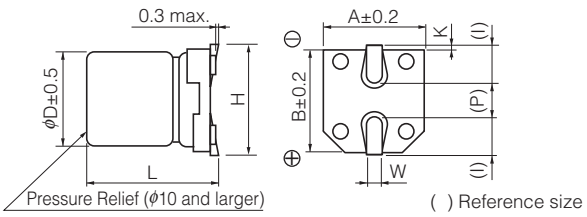


Rated Voltage Mark

E	25 V
V	35 V
H	50 V
J	63 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

✻ This product qualify for AEC-Q200, but it has some deviations.

NEW

■ Standard Products

Endurance : 125 °C 4000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	Size Code	Ripple Current (100 kHz) (+125 °C) (mA r.m.s.)	E.S.R. (100 kHz) (+20 °C) (mΩ)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
25	33	5	5.8	C	550	80	0.14	EEHZC1E330R	(5)	1000
	56	6.3	5.8	D	900	50	0.14	EEHZC1E560P	(5)	1000
	100	6.3	7.7	D8	1400	30	0.14	EEHZC1E101XP	(5)	900
	220	8	10.2	F	1600	27	0.14	EEHZC1E221P	(6)	500
	330	10	10.2	G	2000	20	0.14	EEHZC1E331P	(6)	500
35	22	5	5.8	C	550	100	0.12	EEHZC1V220R	(5)	1000
	47	6.3	5.8	D	900	60	0.12	EEHZC1V470P	(5)	1000
	68	6.3	7.7	D8	1400	35	0.12	EEHZC1V680XP	(5)	900
	150	8	10.2	F	1600	27	0.12	EEHZC1V151P	(6)	500
	270	10	10.2	G	2000	20	0.12	EEHZC1V271P	(6)	500
50	10	5	5.8	C	500	120	0.10	EEHZC1H100R	(5)	1000
	22	6.3	5.8	D	750	80	0.10	EEHZC1H220P	(5)	1000
	33	6.3	7.7	D8	1100	40	0.10	EEHZC1H330XP	(5)	900
	68	8	10.2	F	1250	30	0.10	EEHZC1H680P	(6)	500
	100	10	10.2	G	1600	28	0.10	EEHZC1H101P	(6)	500
63	10	6.3	5.8	D	700	120	0.08	EEHZC1J100P	(5)	1000
	22	6.3	7.7	D8	900	80	0.08	EEHZC1J220XP	(5)	900
	33	8	10.2	F	1100	40	0.08	EEHZC1J330P	(6)	500
	56	10	10.2	G	1400	30	0.08	EEHZC1J560P	(6)	500

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”.

■ Frequency correction factor for ripple current

Capacitance (μF)	Frequency (kHz)	0.1	0.12	0.2	0.3	0.5	1	2	3	5	10	15	20	30	40	50	100	300	500	1000
C < 47	Correction factor	0.10	0.10	0.10	0.15	0.20	0.30	0.40	0.45	0.50	0.60	0.65	0.70	0.75	0.80	0.85	1.00	1.00	1.05	1.05
47 ≦ C < 150		0.15	0.15	0.20	0.25	0.30	0.40	0.45	0.55	0.60	0.70	0.75	0.80	0.80	0.85	0.90	1.00	1.00	1.00	1.00
150 ≦ C		0.15	0.15	0.25	0.25	0.30	0.45	0.50	0.60	0.65	0.75	0.80	0.85	0.85	0.85	0.90	1.00	1.00	1.00	1.00

Surface Mount Type

Series: **S** Type: **V**

S High temperature Lead-Free reflow (suffix:A✻)

■ Features

- Endurance: 85 °C 2000 h
- Vibration-proof product is available upon request.(ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−40 °C to +85 °C							
Rated W.V. Range	6.3 V.DC to 50 V.DC							
Nominal Cap. Range	1 µF to 1500 µF							
Capacitance Tolerance	±20 % (120 Hz/+20 °C)							
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)							
tan δ	Please see the attached High temperature lead-free reflow products list.							
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	4	3	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	8	6	4	4	3	3	
Endurance	After applying rated working voltage for 2000 hours (Miniaturization product type 1000 hours) at +85 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meer the following limits.							
	Capacitance change	±20 % of initial measured value						
		Size code	Cap. change					
		D8(ϕ6.3×7.7)	2000 hours ±25 %					
		≦D(ϕ6.3) Miniature	1000 hours ±30 %					
	tan δ	≦ 200 % of initial specified value						
	DC leakege current	≦ initial specified value						
Shelf Life	After storage for 1000 hours at +85 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)							
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.							
	Capacitance change	±10 % of initial measured value						
	tan δ	≦ initial specified value						
	DC leakage current	≦ initial specified value						

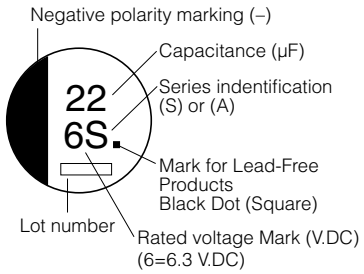
■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

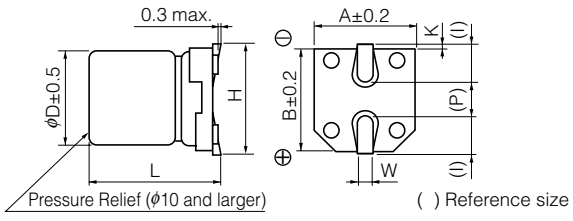
Example:6.3 V 22 µF (Polarized)

Marking color: BLACK



■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H.	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ High tempature Lead-Free reflow Products

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.4	B	29	0.30	2000	EEE0JA220AR	(5)	2000
	33	4	5.4	(B)	22	0.35	1000	EEE0JA330WAR	(5)	2000
	47	5	5.4	C	46	0.30	2000	EEE0JA470AR	(5)	1000
	100	5	5.4	(C)	47	0.40	1000	EEE0JA101WAR	(5)	1000
		6.3	5.4	D	71	0.30	2000	EEE0JA101AP	(5)	1000
	330	6.3	7.7	D8	188	0.30	2000	EEE0JA331XAP	(5)	900
		8	6.2	E	300	0.35	2000	EEE0JA331AP	(7)	1000
	470	8	10.2	(F)	380	0.35	1000	EEE0JA471UAP	(7)	500
	1000	10	10.2	G	700	0.35	2000	EEE0JA102AP	(7)	500
	1500	10	10.2	(G)	750	0.50	1000	EEE0JA152UAP	(7)	500
10	22	4	5.4	(B)	28	0.30	1000	EEE1AA220WAR	(5)	2000
	33	4	5.4	(B)	29	0.30	1000	EEE1AA330WAR	(5)	2000
		5	5.4	C	43	0.22	2000	EEE1AA330AR	(5)	1000
	47	5	5.4	(C)	47	0.30	1000	EEE1AA470WAR	(5)	1000
	100	5	5.4	(C)	50	0.30	1000	EEE1AA101WAR	(5)	1000
		6.3	5.4	D	70	0.26	2000	EEE1AA101AP	(5)	1000
	220	6.3	7.7	D8	173	0.22	2000	EEE1AA221XAP	(5)	900
		8	6.2	E	250	0.26	2000	EEE1AA221AP	(7)	1000
	330	8	10.2	F	390	0.26	2000	EEE1AA331AP	(7)	500
	470	8	10.2	(F)	390	0.26	1000	EEE1AA471UAP	(7)	500
		10	10.2	G	400	0.26	2000	EEE1AA471AP	(7)	500
	1000	10	10.2	(G)	580	0.35	1000	EEE1AA102UAP	(7)	500
16	10	4	5.4	B	28	0.16	2000	EEE1CA100AR	(5)	2000
	22	4	5.4	(B)	28	0.26	1000	EEE1CA220WAR	(5)	2000
		5	5.4	C	39	0.16	2000	EEE1CA220AR	(5)	1000
	33	5	5.4	(C)	35	0.26	1000	EEE1CA330WAR	(5)	1000
	47	5	5.4	(C)	39	0.26	1000	EEE1CA470WAR	(5)	1000
		6.3	5.4	D	70	0.16	2000	EEE1CA470AP	(5)	1000
	100	6.3	5.4	(D)	70	0.26	1000	EEE1CA101WAP	(5)	1000
		8	6.2	E	200	0.20	2000	EEE1CA101AP	(7)	1000
	220	6.3	7.7	D8	162	0.20	2000	EEE1CA221XAP	(5)	900
		8	10.2	(F)	280	0.20	1000	EEE1CA221UAP	(7)	500
	330	8	10.2	(F)	320	0.20	1000	EEE1CA331UAP	(7)	500
		10	10.2	G	380	0.20	2000	EEE1CA331AP	(7)	500
	470	8	10.2	(F)	350	0.26	1000	EEE1CA471UAP	(7)	500
		10	10.2	G	420	0.20	2000	EEE1CA471AP	(7)	500
25	4.7	4	5.4	B	22	0.14	2000	EEE1EA4R7AR	(5)	2000
	10	4	5.4	(B)	22	0.20	1000	EEE1EA100WAR	(5)	2000
		5	5.4	C	28	0.14	2000	EEE1EA100AR	(5)	1000
	22	5	5.4	(C)	35	0.20	1000	EEE1EA220WAR	(5)	1000
		6.3	5.4	D	55	0.14	2000	EEE1EA220AP	(5)	1000
	33	5	5.4	(C)	42	0.20	1000	EEE1EA330WAR	(5)	1000
		6.3	5.4	D	65	0.14	2000	EEE1EA330AP	(5)	1000
	47	6.3	5.4	(D)	70	0.20	1000	EEE1EA470WAP	(5)	1000
	100	8	6.2	(E)	91	0.16	1000	EEE1EA101UAP	(7)	1000
		6.3	7.7	D8	143	0.16	2000	EEE1EA101XAP	(5)	900
		8	10.2	F	180	0.16	2000	EEE1EA101AP	(7)	500
	220	8	10.2	(F)	230	0.20	1000	EEE1EA221UAP	(7)	500
		10	10.2	G	310	0.16	2000	EEE1EA221AP	(7)	500
	330	8	10.2	(F)	270	0.20	1000	EEE1EA331UAP	(7)	500
		10	10.2	G	340	0.16	2000	EEE1EA331AP	(7)	500
	470	10	10.2	(G)	380	0.25	1000	EEE1EA471UAP	(7)	500

✻ Size code( ):Miniaturization product
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

■ High tempature Lead-Free reflow Products

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
35	4.7	4	5.4	B	22	0.12	2000	EEE1VA4R7AR	(5)	2000
	10	4	5.4	(B)	22	0.16	1000	EEE1VA100WAR	(5)	2000
		5	5.4	C	30	0.12	2000	EEE1VA100AR	(5)	1000
	22	5	5.4	(C)	36	0.16	1000	EEE1VA220WAR	(5)	1000
		6.3	5.4	D	60	0.12	2000	EEE1VA220AP	(5)	1000
	33	6.3	5.4	(D)	60	0.16	1000	EEE1VA330WAP	(5)	1000
		8	6.2	E	130	0.14	2000	EEE1VA330AP	(7)	1000
	47	6.3	5.4	(D)	70	0.16	1000	EEE1VA470WAP	(5)	1000
		8	6.2	E	165	0.14	2000	EEE1VA470AP	(7)	1000
	100	6.3	7.7	D8	132	0.14	2000	EEE1VA101XAP	(5)	900
		8	10.2	(F)	140	0.14	1000	EEE1VA101UAP	(7)	500
		10	10.2	G	210	0.14	2000	EEE1VA101AP	(7)	500
	220	8	10.2	(F)	200	0.14	1000	EEE1VA221UAP	(7)	500
		10	10.2	G	310	0.14	2000	EEE1VA221AP	(7)	500
	330	10	10.2	(G)	350	0.30	1000	EEE1VA331UAP	(7)	500
50	0.1	4	5.4	B	1	0.12	2000	EEE1HAR10AR ✻✻✻	(5)	2000
	0.22	4	5.4	B	2	0.12	2000	EEE1HAR22AR ✻✻✻	(5)	2000
	0.33	4	5.4	B	3	0.12	2000	EEE1HAR33AR ✻✻✻	(5)	2000
	0.47	4	5.4	B	5	0.12	2000	EEE1HAR47AR ✻✻✻	(5)	2000
	1	4	5.4	B	10	0.12	2000	EEE1HA1R0AR	(5)	2000
	2.2	4	5.4	B	16	0.12	2000	EEE1HA2R2AR	(5)	2000
	3.3	4	5.4	B	16	0.12	2000	EEE1HA3R3AR	(5)	2000
	4.7	4	5.4	(B)	18	0.14	1000	EEE1HA4R7WAR	(5)	2000
		5	5.4	C	23	0.12	2000	EEE1HA4R7AR	(5)	1000
	10	5	5.4	(C)	27	0.14	1000	EEE1HA100WAR	(5)	1000
		6.3	5.4	D	35	0.12	2000	EEE1HA100AP	(5)	1000
	22	6.3	5.4	(D)	40	0.14	1000	EEE1HA220WAP	(5)	1000
		8	6.2	E	120	0.12	2000	EEE1HA220AP	(7)	1000
	33	8	6.2	(E)	65	0.12	1000	EEE1HA330UAP	(7)	1000
		6.3	7.7	D8	65	0.14	2000	EEE1HA330XAP	(5)	900
		8	10.2	F	110	0.12	2000	EEE1HA330AP	(7)	500
	47	6.3	7.7	D8	105	0.14	2000	EEE1HA470XAP	(5)	900
		8	10.2	(F)	110	0.12	1000	EEE1HA470UAP	(7)	500
		10	10.2	G	130	0.12	2000	EEE1HA470AP	(7)	500
	100	8	10.2	(F)	200	0.18	1000	EEE1HA101UAP	(7)	500
		10	10.2	G	250	0.12	2000	EEE1HA101AP	(7)	500
	220	10	10.2	(G)	300	0.18	1000	EEE1HA221UAP	(7)	500

✻ Size code( ):Miniaturization product
✻✻✻ Please kindly accept last shipment : 31/Mar/2015
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **S** Type: **V**

■ Features

- Endurance: 85 °C 2000 h
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−40 °C to +85 °C										
Rated W.V. Range	4 V.DC to 100 V.DC										
Nominal Cap. Range	1 µF to 1500 µF										
Capacitance Tolerance	±20 % (120 Hz/+20 °C)										
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) (Bi-Polar I ≦ 0.02 CV or 6 (µA) After 2 minutes (Whichever is greater)										
tan δ	Please see the attached standard products list										
Characteristics at Low Temperature	W.V. (V)	4	6.3	10	16	25	35	50	63	100	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	7	4	3	2	2	2	2	3	3	
	Z(−40 °C)/Z(+20 °C)	15	8	6	4	4	3	3	4	4	

Endurance

After applying rated working voltage for 2000 hours (Bi-polar:1000 hours for each polarity) at +85 °C ±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.

Capacitance change	±20 % of inisial measured value		
	Size code	Rated W.V.	Cap. change
	B(ϕ4) to D, D8(ϕ6.3)	4 W.V	1000 hours ±30 %
	≦ D(ϕ6.3) Miniature	6.3 W.V	
		≧ 10 W.V	1000 hours ±20 %
tan δ	≦ 200 % initial specified value		
DC leakege current	≦ initial specified value		

Shelf Life

After storage for 1000 hours at +85 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)

Resistance to Soldering Heat

After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.

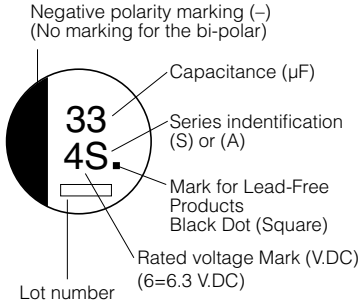
Capacitance change	±10 % of initial measured value
tan δ	≦ initial specified value
DC leakage current	≦ initial specified value

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

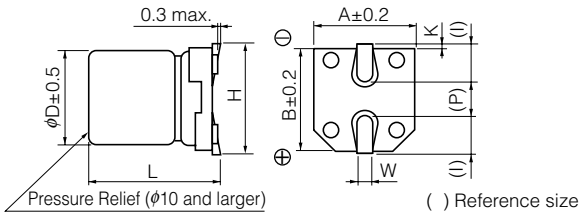
■ Marking

Example:4V 33 µF (Polarized)
Marking color: BLACK



■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

* This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ Standard Products

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
4	33	4	5.4	B	26	0.35	1000	EEE0GA330SR	(1)	2000
	47	4	5.4	B	34	0.35	1000	EEE0GA470SR	(1)	2000
	100	5	5.4	C	61	0.35	1000	EEE0GA101SR	(1)	1000
	220	6.3	5.4	D	82	0.35	1000	EEE0GA221SP	(1)	1000
	330	6.3	5.4	(D)	80	0.50	1000	EEE0GA331WP	(1)	1000
	470	6.3	7.7	D8	200	0.35	1000	EEE0GA471XP	(1)	900
6.3	22	4	5.4	B	29	0.26	2000	EEE0JA220SR	(1)	2000
	33	4	5.4	(B)	22	0.35	1000	EEE0JA330WR	(1)	2000
	47	4	5.4	(B)	36	0.35	1000	EEE0JA470WR	(1)	2000
		5	5.4	C	46	0.26	2000	EEE0JA470SR	(1)	1000
	100	5	5.4	(C)	47	0.35	1000	EEE0JA101WR	(1)	1000
		6.3	5.4	D	71	0.26	2000	EEE0JA101SP	(1)	1000
	220	6.3	5.4	(D)	74	0.35	1000	EEE0JA221WP	(1)	1000
	330	6.3	7.7	D8	188	0.26	2000	EEE0JA331XP	(1)	900
		8	6.2	E	300	0.35	2000	EEE0JA331P	(2)	1000
	470	8	10.2	F	380	0.35	2000	EEE0JA471P	(2)	500
	1000	8	10.2	(F)	500	0.35	2000	EEE0JA102UP	(2)	500
		10	10.2	G	700	0.35	2000	EEE0JA102P	(2)	500
	1500	10	10.2	G	750	0.35	2000	EEE0JA152P	(2)	500
10	22	4	5.4	(B)	28	0.30	1000	EEE1AA220WR	(1)	2000
	33	4	5.4	(B)	29	0.30	1000	EEE1AA330WR	(1)	2000
		5	5.4	C	43	0.20	2000	EEE1AA330SR	(1)	1000
	47	5	5.4	(C)	43	0.30	1000	EEE1AA470WR	(1)	1000
	100	5	5.4	(C)	50	0.30	1000	EEE1AA101WR	(1)	1000
		6.3	5.4	D	70	0.26	2000	EEE1AA101SP	(1)	1000
	220	6.3	7.7	D8	173	0.20	2000	EEE1AA221XP	(1)	900
		8	6.2	E	250	0.26	2000	EEE1AA221P	(2)	1000
	330	8	10.2	F	390	0.26	2000	EEE1AA331P	(2)	500
	470	8	10.2	(F)	390	0.26	2000	EEE1AA471UP	(2)	500
		10	10.2	G	400	0.26	2000	EEE1AA471P	(2)	500
	1000	10	10.2	G	580	0.26	2000	EEE1AA102P	(2)	500
16	10	4	5.4	B	28	0.16	2000	EEE1CA100SR	(1)	2000
	22	4	5.4	(B)	28	0.26	1000	EEE1CA220WR	(1)	2000
		5	5.4	C	39	0.16	2000	EEE1CA220SR	(1)	1000
	33	5	5.4	(C)	35	0.26	1000	EEE1CA330WR	(1)	1000
	47	5	5.4	(C)	39	0.26	1000	EEE1CA470WR	(1)	1000
		6.3	5.4	D	70	0.16	2000	EEE1CA470SP	(1)	1000
	100	6.3	5.4	(D)	70	0.26	1000	EEE1CA101WP	(1)	1000
		8	6.2	E	200	0.20	2000	EEE1CA101P	(2)	1000
	220	6.3	7.7	D8	162	0.16	2000	EEE1CA221XP	(1)	900
		8	10.2	F	280	0.20	2000	EEE1CA221P	(2)	500
	330	8	10.2	(F)	320	0.20	2000	EEE1CA331UP	(2)	500
		10	10.2	G	380	0.20	2000	EEE1CA331P	(2)	500
	470	8	10.2	(F)	350	0.20	2000	EEE1CA471UP	(2)	500
		10	10.2	G	420	0.20	2000	EEE1CA471P	(2)	500

✻ Size code( ):Miniaturization product
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
25	4.7	4	5.4	B	22	0.14	2000	EEE1EA4R7SR	(1)	2000
	10	4	5.4	(B)	22	0.20	1000	EEE1EA100WR	(1)	2000
		5	5.4	C	28	0.14	2000	EEE1EA100SR	(1)	1000
	22	5	5.4	(C)	35	0.20	1000	EEE1EA220WR	(1)	1000
		6.3	5.4	D	55	0.14	2000	EEE1EA220SP	(1)	1000
	33	5	5.4	(C)	42	0.20	1000	EEE1EA330WR	(1)	1000
		6.3	5.4	D	65	0.14	2000	EEE1EA330SP	(1)	1000
	47	6.3	5.4	(D)	70	0.20	1000	EEE1EA470WP	(1)	1000
	100	6.3	7.7	D8	143	0.14	2000	EEE1EA101XP	(1)	900
		8	6.2	(E)	91	0.16	2000	EEE1EA101UP	(2)	1000
		8	10.2	F	180	0.16	2000	EEE1EA101P	(2)	500
	220	8	10.2	(F)	230	0.16	2000	EEE1EA221UP	(2)	500
		10.0	10.2	G	310	0.16	2000	EEE1EA221P	(2)	500
	330	8	10.2	(F)	270	0.16	2000	EEE1EA331UP	(2)	500
		10	10.2	G	340	0.16	2000	EEE1EA331P	(2)	500
	470	10	10.2	G	380	0.16	2000	EEE1EA471P	(2)	500
35	4.7	4	5.4	B	22	0.12	2000	EEE1VA4R7SR	(1)	2000
	10	4	5.4	(B)	22	0.16	1000	EEE1VA100WR	(1)	2000
		5	5.4	C	30	0.12	2000	EEE1VA100SR	(1)	1000
	22	5	5.4	(C)	36	0.16	1000	EEE1VA220WR	(1)	1000
		6.3	5.4	D	60	0.12	2000	EEE1VA220SP	(1)	1000
	33	6.3	5.4	(D)	60	0.16	1000	EEE1VA330WP	(1)	1000
		8	6.2	E	130	0.14	2000	EEE1VA330P	(2)	1000
	47	6.3	5.4	(D)	70	0.16	1000	EEE1VA470WP	(1)	1000
		8	6.2	E	165	0.14	2000	EEE1VA470P	(2)	1000
	100	6.3	7.7	D8	132	0.12	2000	EEE1VA101XP	(1)	900
		8	10.2	(F)	140	0.14	2000	EEE1VA101UP	(2)	500
		10	10.2	G	210	0.14	2000	EEE1VA101P	(2)	500
	220	8	10.2	(F)	200	0.14	2000	EEE1VA221UP	(2)	500
		10	10.2	G	310	0.14	2000	EEE1VA221P	(2)	500
	330	10	10.2	G	350	0.14	2000	EEE1VA331P	(2)	500

✻ Size code( ):Miniaturization product
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
50	0.1	4	5.4	B	1	0.12	2000	EEE1HA0R1SR ✻✻✻	(1)	2000
	0.22	4	5.4	B	2	0.12	2000	EEE1HAR22SR ✻✻✻	(1)	2000
	0.33	4	5.4	B	3	0.12	2000	EEE1HAR33SR ✻✻✻	(1)	2000
	0.47	4	5.4	B	5	0.12	2000	EEE1HAR47SR ✻✻✻	(1)	2000
	1	4	5.4	B	10	0.12	2000	EEE1HA010SR	(1)	2000
	2.2	4	5.4	B	16	0.12	2000	EEE1HA2R2SR	(1)	2000
	3.3	4	5.4	B	16	0.12	2000	EEE1HA3R3SR	(1)	2000
	4.7	4	5.4	(B)	18	0.14	1000	EEE1HA4R7WR	(1)	2000
		5	5.4	C	23	0.12	2000	EEE1HA4R7SR	(1)	1000
	10	5	5.4	(C)	27	0.14	1000	EEE1HA100WR	(1)	1000
		6.3	5.4	D	35	0.12	2000	EEE1HA100SP	(1)	1000
	22	6.3	5.4	(D)	40	0.14	1000	EEE1HA220WP	(1)	1000
		8	6.2	E	120	0.12	2000	EEE1HA220P	(2)	1000
	33	6.3	7.7	D8	85	0.12	2000	EEE1HA330XP	(1)	900
		8	6.2	(E)	65	0.12	2000	EEE1HA330UP	(2)	1000
		8	10.2	F	110	0.12	2000	EEE1HA330P	(2)	500
	47	6.3	7.7	D8	105	0.12	2000	EEE1HA470XP	(1)	900
		8	10.2	(F)	110	0.12	2000	EEE1HA470UP	(2)	500
		10	10.2	G	130	0.12	2000	EEE1HA470P	(2)	500
	100	8	10.2	(F)	200	0.12	2000	EEE1HA101UP	(2)	500
		10	10.2	G	250	0.12	2000	EEE1HA101P	(2)	500
	220	10	10.2	G	300	0.12	2000	EEE1HA221P	(2)	500
63	22	8	6.2	(E)	40	0.18	2000	EEE1JA220UP	(2)	1000
		8	10.2	F	40	0.18	2000	EEE1JA220P	(2)	500
	33	8	10.2	F	45	0.18	2000	EEE1JA330P	(2)	500
	47	8	10.2	(F)	45	0.18	2000	EEE1JA470UP	(2)	500
		10	10.2	G	45	0.18	2000	EEE1JA470P	(2)	500
	100	10	10.2	G	60	0.18	2000	EEE1JA101P	(2)	500
100	3.3	8	6.2	E	50	0.18	2000	EEE2AA3R3P	(2)	1000
	4.7	8	6.2	(E)	50	0.18	2000	EEE2AA4R7UP	(2)	1000
	10	8	6.2	(E)	50	0.18	2000	EEE2AA100UP	(2)	1000
		8	10.2	F	85	0.18	2000	EEE2AA100P	(2)	500
	22	8	10.2	(F)	55	0.18	2000	EEE2AA220UP	(2)	500
		10	10.2	G	85	0.18	2000	EEE2AA220P	(2)	500
	33	10	10.2	G	90	0.18	2000	EEE2AA330P	(2)	500

✻ Size code( ):Miniaturization product
✻✻✻ Please kindly accept last shipment : 31/Mar/2015
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products (Bi-polar)

Endurance : 85 °C 2000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	Size Code	Specification Ripple Current (120 Hz) (+85 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Endurance (hours)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	5	5.4	C	29	0.52	2000	EEE0JA220NR	(1)	1000
	47	6.3	5.4	D	46	0.52	2000	EEE0JA470NP	(1)	1000
10	10	4	5.4	B	25	0.40	2000	EEE1AA100NR	(1)	2000
	33	6.3	5.4	D	43	0.40	2000	EEE1AA330NP	(1)	1000
16	4.7	4	5.4	B	20	0.32	2000	EEE1CA4R7NR	(1)	2000
	10	5	5.4	C	25	0.32	2000	EEE1CA100NR	(1)	1000
	22	6.3	5.4	D	39	0.32	2000	EEE1CA220NP	(1)	1000
25	3.3	4	5.4	B	12	0.28	2000	EEE1EA3R3NR	(1)	2000
	4.7	5	5.4	C	21	0.28	2000	EEE1EA4R7NR	(1)	1000
	10	6.3	5.4	D	28	0.28	2000	EEE1EA100NP	(1)	1000
35	2.2	4	5.4	B	12	0.24	2000	EEE1VA2R2NR	(1)	2000
	4.7	5	5.4	C	22	0.24	2000	EEE1VA4R7NR	(1)	1000
	10	6.3	5.4	D	30	0.24	2000	EEE1VA100NP	(1)	1000
50	0.22	4	5.4	B	2	0.24	2000	EEE1HAR22NR ✻✻✻	(1)	2000
	0.33	4	5.4	B	3	0.24	2000	EEE1HAR33NR ✻✻✻	(1)	2000
	0.47	4	5.4	B	5	0.24	2000	EEE1HAR47NR ✻✻✻	(1)	2000
	1	4	5.4	B	10	0.24	2000	EEE1HA010NR	(1)	2000
	2.2	5	5.4	C	16	0.24	2000	EEE1HA2R2NR	(1)	1000
	3.3	5	5.4	C	21	0.24	2000	EEENZ1H3R3R	(1)	1000
	4.7	6.3	5.4	D	31	0.24	2000	EEE1HA4R7NP	(1)	1000

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **HA** Type: **V**

HA High temperature Lead-Free reflow (suffix:A✻)

Hight-temperature assuranceize

HA
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■ Features

- Endurance: 105 °C 1000 h
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

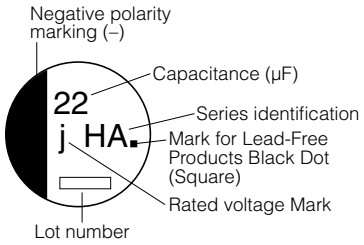
Category Temp. Range	−40 °C to +105 °C							
Rated W.V. Range	6.3 V.DC to 50 V.DC							
Nominal Cap. Range	1 µF to 1500 µF							
Capacitance Tolerance	±20 % (120 Hz/+20 °C)							
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)							
tan δ	Please see the attached High temperature lead-free reflow products list.							
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	4	3	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	8	6	4	4	3	3	
Endurance	After applying rated working voltage for 1000 hours at +105 °C±2 °C and then being stabilized at +20 °C, capacitors shall meet the following limits.							
	Capacitance change	±30 % of initial measured value						
	tan δ	≦ 200 % of initial specified value						
	DC leakage current	≦ initial specified value						
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)							
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.							
	Capacitance change	±10 % of initial measured value						
	tan δ	≦ initial specified value						
	DC leakage current	≦ initial specified value						

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example: 6.3 V 22 µF
Marking color: BLACK

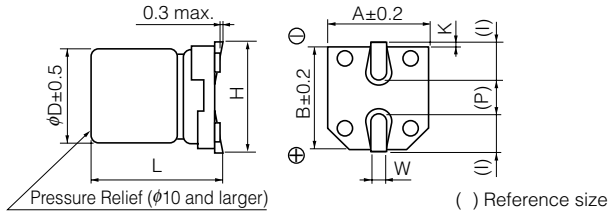


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm(not to scale)

(Unit : mm)



( ) Reference size

Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ High temperatre Lead-Free reflow products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Case size Length (mm)	Case size ✻Size Code	Specification Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	Specification tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.4	B	29	0.30	EEEHA0J220AR	(5)	2000
	33	4	5.4	(B)	29	0.35	EEEHAJ330WAR	(5)	2000
	47	5	5.4	C	46	0.30	EEEHA0J470AR	(5)	1000
	100	5	5.4	(C)	47	0.40	EEEHAJ101WAR	(5)	1000
		6.3	5.4	D	71	0.30	EEEHA0J101AP	(5)	1000
	330	6.3	7.7	D8	105	0.30	EEEHAJ331XAP	(5)	900
		8	6.2	(E)	180	0.35	EEEHAJ331UAP	(7)	500
		8	10.2	F	230	0.35	EEEHA0J331AP	(7)	500
	470	8	10.2	(F)	300	0.35	EEEHAJ471UAP	(7)	500
	1000	10	10.2	G	400	0.35	EEEHA0J102AP	(7)	500
	1500	10	10.2	(G)	480	0.50	EEEHAJ152UAP	(7)	500
10	22	4	5.4	(B)	28	0.30	EEEHAA220WAR	(5)	2000
	33	4	5.4	(B)	29	0.30	EEEHAA330WAR	(5)	2000
		5	5.4	C	43	0.22	EEEHA1A330AR	(5)	1000
	47	5	5.4	(C)	43	0.30	EEEHAA470WAR	(5)	1000
	100	6.3	5.4	(D)	71	0.30	EEEHAA101WAP	(5)	1000
		8	6.2	E	110	0.26	EEEHA1A101AP	(7)	1000
	220	6.3	7.7	D8	105	0.22	EEEHAA221XAP	(5)	900
		8	10.2	F	160	0.26	EEEHA1A221AP	(7)	500
	470	8	10.2	(F)	200	0.26	EEEHAA471UAP	(7)	500
		10	10.2	G	270	0.26	EEEHA1A471AP	(7)	500
	1000	10	10.2	(G)	400	0.35	EEEHAA102UAP	(7)	500
16	10	4	5.4	B	28	0.16	EEEHA1C100AR	(5)	2000
	22	4	5.4	(B)	28	0.26	EEEHAC220WAR	(5)	2000
		5	5.4	C	39	0.16	EEEHA1C220AR	(5)	1000
	33	5	5.4	(C)	35	0.26	EEEHAC330WAR	(5)	1000
	47	5	5.4	(C)	39	0.26	EEEHAC470WAR	(5)	1000
		6.3	5.4	D	70	0.16	EEEHA1C470AP	(5)	1000
	100	6.3	5.4	(D)	70	0.26	EEEHAC101WAP	(5)	1000
	220	6.3	7.7	D8	105	0.20	EEEHAC221XAP	(5)	900
		8	10.2	(F)	150	0.20	EEEHAC221UAP	(7)	500
		10	10.2	G	210	0.20	EEEHA1C221AP	(7)	500
	330	8	10.2	(F)	170	0.20	EEEHAC331UAP	(7)	500
		10	10.2	G	230	0.20	EEEHA1C331AP	(7)	500
	470	8	10.2	(F)	340	0.26	EEEHAC471UAP	(7)	500
		10	10.2	G	340	0.20	EEEHA1C471AP	(7)	500
	680	10	10.2	(G)	380	0.26	EEEHAC681UAP	(7)	500

✻ Size code( ):Miniaturization product

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V, 1H→H

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

■ High temperatre Lead-Free reflow products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
25	4.7	4	5.4	B	22	0.14	EEEHA1E4R7AR	(5)	2000
	10	4	5.4	(B)	22	0.20	EEEHAE100WAR	(5)	2000
		5	5.4	C	28	0.14	EEEHA1E100AR	(5)	1000
	22	5	5.4	(C)	35	0.20	EEEHAE220WAR	(5)	1000
		6.3	5.4	D	55	0.14	EEEHA1E220AP	(5)	1000
	33	5	5.4	(C)	45	0.20	EEEHAE330WAR	(5)	1000
		6.3	5.4	D	65	0.14	EEEHA1E330AP	(5)	1000
	47	6.3	5.4	(D)	70	0.20	EEEHAE470WAP	(5)	1000
		8	6.2	E	91	0.16	EEEHA1E470AP	(7)	1000
	100	8	6.2	(E)	91	0.16	EEEHAE101UAP	(7)	1000
		6.3	7.7	D8	91	0.16	EEEHAE101XAP	(5)	900
		8	10.2	F	130	0.16	EEEHA1E101AP	(7)	500
	220	8	10.2	(F)	160	0.20	EEEHAE221UAP	(7)	500
		10	10.2	G	190	0.16	EEEHA1E221AP	(7)	500
	330	8	10.2	(F)	180	0.20	EEEHAE331UAP	(7)	500
		10	10.2	G	340	0.16	EEEHA1E331AP	(7)	500
	470	10	10.2	(G)	360	0.25	EEEHAE471UAP	(7)	500
35	4.7	4	5.4	B	22	0.12	EEEHA1V4R7AR	(5)	2000
	10	4	5.4	(B)	22	0.16	EEEHAV100WAR	(5)	2000
		5	5.4	C	30	0.12	EEEHA1V100AR	(5)	1000
	22	5	5.4	(C)	35	0.16	EEEHAV220WAR	(5)	1000
		6.3	5.4	D	60	0.12	EEEHA1V220AP	(5)	1000
	33	6.3	5.4	(D)	42	0.16	EEEHAV330WAP	(5)	1000
		8	6.2	E	84	0.14	EEEHA1V330AP	(7)	1000
	47	8	6.2	(E)	84	0.14	EEEHAV470UAP	(7)	1000
		8	10.2	F	98	0.14	EEEHA1V470AP	(7)	500
	100	6.3	7.7	D8	84	0.14	EEEHAV101XAP	(5)	900
		8	10.2	(F)	120	0.14	EEEHAV101UAP	(7)	500
		10	10.2	G	160	0.14	EEEHA1V101AP	(7)	500
	220	8	10.2	(F)	170	0.14	EEEHAV221UAP	(7)	500
		10	10.2	G	210	0.14	EEEHA1V221AP	(7)	500
	330	10	10.2	(G)	250	0.30	EEEHAV331UAP	(7)	500
50	0.1	4	5.4	B	1	0.12	EEEHA1HR10AR ✻✻✻	(5)	2000
	0.22	4	5.4	B	2	0.12	EEEHA1HR22AR ✻✻✻	(5)	2000
	0.33	4	5.4	B	3	0.12	EEEHA1HR33AR ✻✻✻	(5)	2000
	0.47	4	5.4	B	5	0.12	EEEHA1HR47AR ✻✻✻	(5)	2000
	1	4	5.4	B	10	0.12	EEEHA1H1R0AR	(5)	2000
	2.2	4	5.4	B	16	0.12	EEEHA1H2R2AR	(5)	2000
	3.3	4	5.4	B	16	0.12	EEEHA1H3R3AR	(5)	2000
	4.7	5	5.4	C	23	0.12	EEEHA1H4R7AR	(5)	1000
	10	6.3	5.4	D	35	0.12	EEEHA1H100AP	(5)	1000
	22	8	6.2	E	70	0.12	EEEHA1H220AP	(7)	1000
	33	6.3	7.7	D8	70	0.14	EEEHAH330XAP	(5)	900
		8	6.2	(E)	70	0.12	EEEHAH330UAP	(7)	1000
		8	10.2	F	91	0.12	EEEHA1H330AP	(7)	500
	47	6.3	7.7	D8	63	0.14	EEEHAH470XAP	(5)	900
		8	10.2	(F)	95	0.12	EEEHAH470UAP	(7)	500
		10	10.2	G	100	0.12	EEEHA1H470AP	(7)	500
	100	8	10.2	(F)	110	0.18	EEEHAH101UAP	(7)	500
		10	10.2	G	120	0.12	EEEHA1H101AP	(7)	500
	220	10	10.2	(G)	150	0.18	EEEHAH221UAP	(7)	500

✻ Size code( ):Miniaturization product

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V, 1H→H

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

02 Mar. 2014

Surface Mount Type

Series: **HA** Type: **V**

Hight-temperature assuranceize

HA
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■ Features

- Endurance: 105 °C 1000 h
- Vibration-proof product is available upon request. (φ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

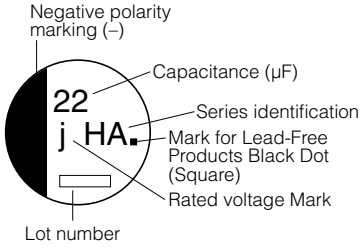
Category Temp. Range	−40 °C to +105 °C									
Rated W.V. Range	6.3 V.DC to 100 V.DC									
Nominal Cap. Range	1 µF to 1500 µF									
Capacitance Tolerance	±20 % (120 Hz/+20 °C)									
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)									
tan δ	Please see the attached standard products list									
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	63	100	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	4	3	2	2	2	2	3	3	
	Z(−40 °C)/Z(+20 °C)	8	6	4	4	3	3	4	4	
Endurance	After applying rated working voltage for 1000 hours at +105 °C±2 °C and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±20 % of initial measured value (6.3 W.V. of miniature : ±30 %)								
	tan δ	≦ 200 % of initial specified value								
	DC leakage current	≦ initial specified value								
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)									
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitor shall meet the following limits.									
	Capacitance change	±10 % of initial measured value								
	tan δ	≦ initial specified value								
	DC leakage current	≦ initial specified value								

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example:6.3 V 22 µF (Polarized)
Marking color : BLACK

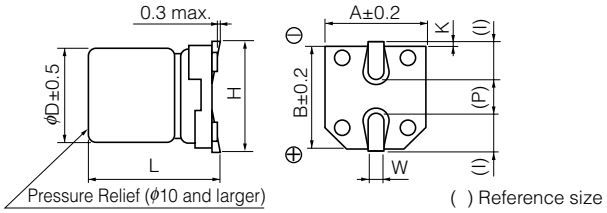


Rated Voltage Mark

j	6.3 V	V	35 V
A	10 V	H	50 V
C	16 V	J	63 V
E	25 V	2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

* This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ Standard Products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Case size Length (mm)	Case size ✻Size Code	Specification Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	Specification tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.4	B	29	0.30	EEEHA0J220R	(1)	2000
	33	4	5.4	(B)	29	0.35	EEEHA0J330WR	(1)	2000
	47	4	5.4	(B)	36	0.35	EEEHA0J470WR	(1)	2000
		5	5.4	C	46	0.30	EEEHA0J470R	(1)	1000
	100	5	5.4	(C)	47	0.35	EEEHA0J101WR	(1)	1000
		6.3	5.4	D	71	0.30	EEEHA0J101P	(1)	1000
	220	6.3	5.4	(D)	74	0.35	EEEHA0J221WP	(1)	1000
	330	6.3	7.7	D8	105	0.30	EEEHA0J331XP	(1)	900
		8	10.2	F	230	0.35	EEEHA0J331P	(2)	500
	470	8	10.2	(F)	300	0.35	EEEHA0J471UP	(2)	500
	1000	8	10.2	(F)	300	0.35	EEEHA0J102UP	(2)	500
		10	10.2	G	400	0.35	EEEHA0J102P	(2)	500
	1500	10	10.2	G	480	0.35	EEEHA0J152P	(2)	500
10	22	4	5.4	(B)	28	0.30	EEEHA1A220WR	(1)	2000
	33	4	5.4	(B)	29	0.30	EEEHA1A330WR	(1)	2000
		5	5.4	C	43	0.22	EEEHA1A330R	(1)	1000
	47	5	5.4	(C)	43	0.30	EEEHA1A470WR	(1)	1000
	100	6.3	5.4	(D)	71	0.30	EEEHA1A101WP	(1)	1000
		8	6.2	E	110	0.26	EEEHA1A101P	(2)	1000
	220	6.3	7.7	D8	105	0.22	EEEHA1A221XP	(1)	900
		8	10.2	F	160	0.26	EEEHA1A221P	(2)	500
	470	8	10.2	(F)	200	0.26	EEEHA1A471UP	(2)	500
		10	10.2	G	270	0.26	EEEHA1A471P	(2)	500
	1000	10	10.2	G	400	0.26	EEEHA1A102P	(2)	500
16	10	4	5.4	B	28	0.16	EEEHA1C100R	(1)	2000
	22	4	5.4	(B)	28	0.26	EEEHA1C220WR	(1)	2000
		5	5.4	C	39	0.16	EEEHA1C220R	(1)	1000
	33	5	5.4	(C)	35	0.26	EEEHA1C330WR	(1)	1000
	47	5	5.4	(C)	39	0.26	EEEHA1C470WR	(1)	1000
		6.3	5.4	D	70	0.16	EEEHA1C470P	(1)	1000
	100	6.3	5.4	(D)	70	0.26	EEEHA1C101WP	(1)	1000
	220	6.3	7.7	D8	105	0.16	EEEHA1C221XP	(1)	900
		8	10.2	(F)	150	0.20	EEEHA1C221UP	(2)	500
		10	10.2	G	210	0.20	EEEHA1C221P	(2)	500
	330	8	10.2	(F)	170	0.20	EEEHA1C331UP	(2)	500
		10	10.2	G	230	0.20	EEEHA1C331P	(2)	500
	470	8	10.2	(F)	340	0.20	EEEHA1C471UP	(2)	500
		10	10.2	G	340	0.20	EEEHA1C471P	(2)	500
	680	10	10.2	G	380	0.20	EEEHA1C681P	(2)	500

✻ Size code( ):Miniaturization product

· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

· When requesting vibration-proof product, please put the last "V" instead to "P"

■ Standard Products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
25	4.7	4	5.4	B	22	0.14	EEEHA1E4R7R	(1)	2000
	10	4	5.4	(B)	22	0.20	EEEHA1E100WR	(1)	2000
		5	5.4	C	28	0.14	EEEHA1E100R	(1)	1000
	22	5	5.4	(C)	35	0.20	EEEHA1E220WR	(1)	1000
		6.3	5.4	D	55	0.14	EEEHA1E220P	(1)	1000
	33	5	5.4	(C)	45	0.20	EEEHA1E330WR	(1)	1000
		6.3	5.4	D	65	0.14	EEEHA1E330P	(1)	1000
	47	6.3	5.4	(D)	70	0.20	EEEHA1E470WP	(1)	1000
		8	6.2	E	91	0.16	EEEHA1E470P	(2)	1000
	100	6.3	7.7	D8	91	0.14	EEEHA1E101XP	(1)	900
		8	6.2	(E)	91	0.16	EEEHA1E101UP	(2)	1000
		8	10.2	F	130	0.16	EEEHA1E101P	(2)	500
	220	8	10.2	(F)	160	0.16	EEEHA1E221UP	(2)	500
		10	10.2	G	190	0.16	EEEHA1E221P	(2)	500
	330	8	10.2	(F)	180	0.16	EEEHA1E331UP	(2)	500
		10	10.2	G	340	0.16	EEEHA1E331P	(2)	500
	470	10	10.2	G	360	0.16	EEEHA1E471P	(2)	500
35	4.7	4	5.4	B	22	0.12	EEEHA1V4R7R	(1)	2000
	10	4	5.4	(B)	22	0.16	EEEHA1V100WR	(1)	2000
		5	5.4	C	30	0.12	EEEHA1V100R	(1)	1000
	22	5	5.4	(C)	35	0.16	EEEHA1V220WR	(1)	1000
		6.3	5.4	D	60	0.12	EEEHA1V220P	(1)	1000
	33	6.3	5.4	(D)	42	0.16	EEEHA1V330WP	(1)	1000
		8	6.2	E	84	0.14	EEEHA1V330P	(2)	1000
	47	8	6.2	(E)	84	0.14	EEEHA1V470UP	(2)	1000
		8	10.2	F	98	0.14	EEEHA1V470P	(2)	500
	100	6.3	7.7	D8	84	0.12	EEEHA1V101XP	(1)	900
		8	10.2	(F)	120	0.14	EEEHA1V101UP	(2)	500
		10	10.2	G	160	0.14	EEEHA1V101P	(2)	500
	220	8	10.2	(F)	170	0.14	EEEHA1V221UP	(2)	500
		10	10.2	G	210	0.14	EEEHA1V221P	(2)	500
	330	10	10.2	G	250	0.14	EEEHA1V331P	(2)	500
50	0.1	4	5.4	B	1	0.12	EEEHA1HR10R ✻✻✻	(1)	2000
	0.22	4	5.4	B	2	0.12	EEEHA1HR22R ✻✻✻	(1)	2000
	0.33	4	5.4	B	3	0.12	EEEHA1HR33R ✻✻✻	(1)	2000
	0.47	4	5.4	B	5	0.12	EEEHA1HR47R ✻✻✻	(1)	2000
	1	4	5.4	B	10	0.12	EEEHA1H1R0R	(1)	2000
	2.2	4	5.4	B	16	0.12	EEEHA1H2R2R	(1)	2000
	3.3	4	5.4	B	16	0.12	EEEHA1H3R3R	(1)	2000
	4.7	5	5.4	C	23	0.12	EEEHA1H4R7R	(1)	1000
	10	6.3	5.4	D	35	0.12	EEEHA1H100P	(1)	1000
	22	8	6.2	E	70	0.12	EEEHA1H220P	(2)	1000
	33	6.3	7.7	D8	70	0.12	EEEHA1H330XP	(1)	900
		8	6.2	(E)	70	0.12	EEEHA1H330UP	(2)	1000
		8	10.2	F	91	0.12	EEEHA1H330P	(2)	500
	47	6.3	7.7	D8	63	0.12	EEEHA1H470XP	(1)	900
		8	10.2	(F)	95	0.12	EEEHA1H470UP	(2)	500
		10	10.2	G	100	0.12	EEEHA1H470P	(2)	500
	100	8	10.2	(F)	110	0.12	EEEHA1H101UP	(2)	500
		10	10.2	G	120	0.12	EEEHA1H101P	(2)	500
	220	10	10.2	G	150	0.12	EEEHA1H221P	(2)	500

✻ Size code( ):Miniaturization product

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

02 Mar. 2014

■ Standard Products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	✻Size Code	Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
63	10	8	6.2	E	25	0.18	EEEHA1J100P	(2)	1000
	22	8	6.2	(E)	25	0.18	EEEHA1J220UP	(2)	1000
		8	10.2	F	30	0.18	EEEHA1J220P	(2)	500
	33	10	10.2	G	45	0.18	EEEHA1J330P	(2)	500
	47	8	10.2	(F)	45	0.18	EEEHA1J470UP	(2)	500
		10	10.2	G	50	0.18	EEEHA1J470P	(2)	500
100	3.3	8	6.2	E	30	0.18	EEEHA2A3R3P	(2)	1000
	4.7	8	6.2	(E)	30	0.18	EEEHA2A4R7UP	(2)	1000
	10	8	10.2	F	55	0.18	EEEHA2A100P	(2)	500
	22	8	10.2	(F)	55	0.18	EEEHA2A220UP	(2)	500
		10	10.2	G	60	0.18	EEEHA2A220P	(2)	500
	33	10	10.2	G	65	0.18	EEEHA2A330P	(2)	500
	47	10	10.2	(G)	65	0.18	EEEHA2A470UP	(2)	500

✻ Size code( ):Miniaturization product

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **HB** Type: **V**

HB High temperature Lead-Free reflow (suffix:A✻)

■ Features

- Endurance: 105 °C 2000 h
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

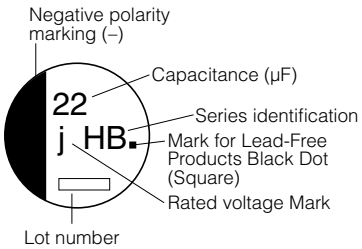
Category Temp. Range	–40 °C to +105 °C								
Rated W.V. Range	6.3 V.DC to 50 V.DC								
Nominal Cap. Range	1 µF to 1500 µF								
Capacitance Tolerance	±20 % (120 Hz/ +20 °C)								
DC Leakage Current	I≦0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)								
tan δ	Please see the attached High temperature lead-free reflow products list.								
Characteristics at Low Temperature	Standard	W.V.(V)	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
		Z(–25 °C)/Z(+20 °C)	4	3	2	2	2	2	
		Z(–40 °C)/Z(+20 °C)	8	6	4	4	3	3	
	Miniaturization product	Z(–25 °C)/Z(+20 °C)	4	3	2	2	2	2	
		Z(–40 °C)/Z(+20 °C)	10	8	6	6	4	4	
Endurance	After applying rated working voltage for 2000 hours at +105 °C±2 °C and then being stabilized at +20 °C, capacitors shall meet the following limits.								
	Capacitance change	±20 % of initial measured value (16 V.DC or less : Within ±25 %, Miniaturization product : Within ±35 %)							
	tan δ	≦ 200 % of initial specified value							
	DC leakage current	≦ initial specified value							
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)								
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.								
	Capacitance change	±10 % of initial measured value							
	tan δ	≦ initial specified value							
	DC leakage current	≦ initial specified value							

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example : 6.3 V 22 µF (Polarized)
Marking color : BLACK

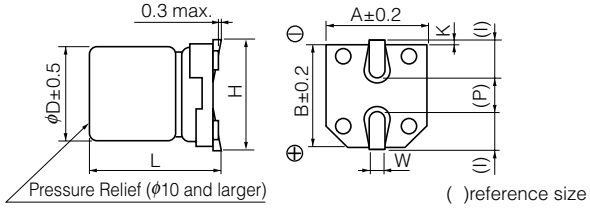


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ High temperate Lead-Free reflow Products

Endurance : 105 °C 2000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.8	B	26	0.30	EEEHB0J220AR	(5)	2000
	33	4	5.8	B	29	0.30	EEEHB0J330AR	(5)	2000
	47	4	5.8	(B)	26	0.50	EEEHBJ470UAR	(5)	2000
		5	5.8	C	46	0.30	EEEHB0J470AR	(5)	1000
	100	5	5.8	(C)	42	0.50	EEEHBJ101UAR	(5)	1000
		6.3	5.8	D	71	0.30	EEEHB0J101AP	(5)	1000
	220	6.3	5.8	(D)	80	0.50	EEEHBJ221UAP	(5)	1000
		8	10.2	F	150	0.35	EEEHB0J221AP	(7)	500
	330	8	6.2	(E)	180	0.50	EEEHBJ331UAP	(7)	1000
		8	10.2	F	230	0.35	EEEHB0J331AP	(7)	500
	470	8	10.2	(F)	230	0.50	EEEHBJ471UAP	(7)	500
	1500	10	10.2	(G)	290	0.50	EEEHBJ152UAP	(7)	500
10	33	4	5.8	(B)	23	0.30	EEEHBA330UAR	(5)	2000
		5	5.8	C	43	0.26	EEEHB1A330AR	(5)	1000
	68	6.3	5.8	D	70	0.22	EEEHB1A680AP	(5)	1000
	100	6.3	5.8	(D)	71	0.30	EEEHBA101UAP	(5)	1000
		8	6.2	E	110	0.26	EEEHB1A101AP	(7)	1000
	150	6.3	5.8	(D)	64	0.50	EEEHBA151UAP	(5)	1000
	220	8	6.2	(E)	110	0.30	EEEHBA221UAP	(7)	1000
		8	10.2	F	160	0.26	EEEHB1A221AP	(7)	500
	470	8	10.2	(F)	220	0.35	EEEHBA471UAP	(7)	500
		10	10.2	G	270	0.26	EEEHB1A471AP	(7)	500
16	10	4	5.8	B	28	0.16	EEEHB1C100AR	(5)	2000
	22	4	5.8	(B)	29.5	0.26	EEEHBC220UAR	(5)	2000
		5	5.8	C	39	0.16	EEEHB1C220AR	(5)	1000
	33	6.3	5.8	D	65	0.16	EEEHB1C330AP	(5)	1000
	47	5	5.8	(C)	39	0.26	EEEHBC470UAR	(5)	1000
		6.3	5.8	D	70	0.16	EEEHB1C470AP	(5)	1000
		6.3	7.7	D8	84	0.16	EEEHBC470XAP	(5)	900
	100	6.3	5.8	(D)	70	0.26	EEEHBC101UAP	(5)	1000
		8	10.2	F	120	0.20	EEEHB1C101AP	(7)	500
	220	8	10.2	(F)	150	0.20	EEEHBC221UAP	(7)	500
		10	10.2	G	210	0.20	EEEHB1C221AP	(7)	500
	330	10	10.2	G	230	0.20	EEEHB1C331AP	(7)	500
	470	8	10.2	(F)	240	0.40	EEEHBC471UAP	(7)	500
		10	10.2	G	340	0.20	EEEHB1C471AP	(7)	500
25	4.7	4	5.8	B	22	0.14	EEEHB1E4R7AR	(5)	2000
	6.8	4	5.8	B	25	0.14	EEEHB1E6R8AR	(5)	2000
	10	4	5.8	(B)	28	0.16	EEEHBE100UAR	(5)	2000
		5	5.8	C	28	0.14	EEEHB1E100AR	(5)	1000
	22	6.3	5.8	D	55	0.14	EEEHB1E220AP	(5)	1000
	33	5	5.8	(C)	50	0.20	EEEHBE330UAR	(5)	1000
		6.3	5.8	D	65	0.14	EEEHB1E330AP	(5)	1000
	47	6.3	5.8	(D)	65	0.20	EEEHBE470UAP	(5)	1000
		8	6.2	E	91	0.16	EEEHB1E470AP	(7)	1000
	100	8	6.2	(E)	100	0.16	EEEHBE101UAP	(7)	1000
		8	10.2	F	130	0.16	EEEHB1E101AP	(7)	500
	220	8	10.2	(F)	130	0.30	EEEHBE221UAP	(7)	500
		10	10.2	G	190	0.16	EEEHB1E221AP	(7)	500
	330	8	10.2	(F)	130	0.30	EEEHBE331UAP	(7)	500
		10	10.2	G	220	0.16	EEEHB1E331AP	(7)	500
	470	10	10.2	(G)	230	0.30	EEEHBE471UAP	(7)	500

✻Size code( ):Miniaturization product

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

02 Mar. 2014

■ High temperate Lead-Free reflow Products

Endurance : 105 °C 2000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	✻Size Code	Ripple Current (120 Hz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
35	4.7	4	5.8	B	21	0.12	EEEHB1V4R7AR	(5)	2000
	6.8	4	5.8	(B)	25	0.12	EEEHBV6R8UAR	(5)	2000
	10	5	5.8	C	28	0.12	EEEHB1V100AR	(5)	1000
	22	6.3	5.8	D	55	0.12	EEEHB1V220AP	(5)	1000
	33	8	6.2	E	84	0.14	EEEHB1V330AP	(7)	1000
	47	6.3	7.7	D8	98	0.20	EEEHBV470YAP	(5)	900
		8	6.2	(E)	91	0.18	EEEHBV470UAP	(7)	1000
		8	10.2	F	98	0.14	EEEHB1V470AP	(7)	500
	100	8	10.2	(F)	98	0.20	EEEHBV101UAP	(7)	500
		10	10.2	G	160	0.14	EEEHB1V101AP	(7)	500
	220	10	10.2	(G)	180	0.14	EEEHBV221UAP	(7)	500
50	0.1	4	5.8	B	1	0.12	EEEHB1HR10AR ✻✻✻	(5)	2000
	0.22	4	5.8	B	2	0.12	EEEHB1HR22AR ✻✻✻	(5)	2000
	0.33	4	5.8	B	3	0.12	EEEHB1HR33AR ✻✻✻	(5)	2000
	0.47	4	5.8	B	5	0.12	EEEHB1HR47AR ✻✻✻	(5)	2000
	0.68	4	5.8	B	7	0.12	EEEHB1HR68AR ✻✻✻	(5)	2000
	1	4	5.8	B	10	0.12	EEEHB1H1R0AR	(5)	2000
	2.2	4	5.8	B	16	0.12	EEEHB1H2R2AR	(5)	2000
	3.3	4	5.8	B	16	0.12	EEEHB1H3R3AR	(5)	2000
	4.7	5	5.8	C	23	0.12	EEEHB1H4R7AR	(5)	1000
	6.8	5	5.8	C	23	0.12	EEEHB1H6R8AR	(5)	1000
	10	6.3	5.8	D	35	0.12	EEEHB1H100AP	(5)	1000
	22	6.3	5.8	(D)	35	0.14	EEEHBH220UAP	(5)	1000
		8	6.2	E	70	0.12	EEEHB1H220AP	(7)	1000
	33	8	10.2	F	91	0.12	EEEHB1H330AP	(7)	500
	47	6.3	7.7	D8	63	0.12	EEEHBH470YAP	(5)	900
		8	10.2	(F)	95	0.12	EEEHBH470UAP	(7)	500
		10	10.2	G	100	0.12	EEEHB1H470AP	(7)	500
	100	10	10.2	(G)	250	0.12	EEEHBH101UAP	(7)	500
	220	10	10.2	(G)	270	0.18	EEEHBH221UAP	(7)	500

✻Size code( ):Miniaturization product

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **HB** Type: **V**

Long life
HB (5.5 mm max.)
↑ Low profile
HA

■ Features

- Endurance: 105 °C 2000 h
- 5.8 mm height (≦ϕ6.3), 5.5 mm height max.
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

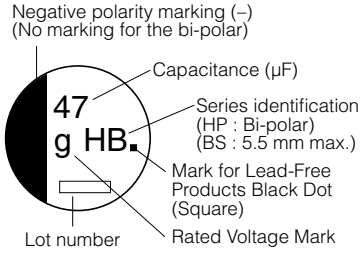
Category Temp. Range	−40 °C to +105 °C								
Rated W.V. Range	4 V.DC to 50 V.DC								
Nominal Cap. Range	1 µF to 470 µF								
Capacitance Tolerance	±20 % (120 Hz/+20 °C)								
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Bi-polar I ≦ 0.02 CV or 6 (µA) after 2 minutes) (Whichever is greater)								
tan δ	Please see the attached standard products list								
Characteristics at Low Temperature	W.V. (V)	4	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	7	4	3	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	15	8	6	4	4	3	3	
Endurance	After applying rated working voltage for 2000 hours (Bi-polar : 1000 hours for each polarity) at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.								
	Capacitance change	±20 % of inisial measured value (4 W.V. : ±35 % 6.3 W.V. : ±25 % ϕ4 to ϕ6.3), 5.5 mm max. : ±25 %							
	tan δ	≦ 200 % of initial specified value							
	DC leakage current	≦ initial specified value							
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)								
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20°C, capacitors shall meet the following limits.								
	Capacitance change	±10 % of initial measured value							
	tan δ	≦ initial specified value							
	DC leakage current	≦ initial specified value							

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example:4 V 47 µF
Marking color: BLACK

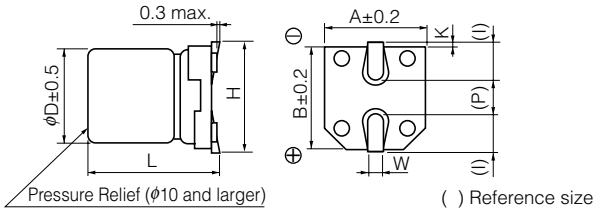


Rated Voltage Mark

g	4 V	E	25 V
j	6.3 V	V	35 V
A	10 V	H	50 V
C	16 V		

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

● 5.5 mm height max.

Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$

✻ This product qualify for AEC-Q200, but it has some deviations.

01 Sep. 2013

■ Standard Products

Endurance : 105 °C 2000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	Size Code	Specification Ripple Current (120 Hz) (+105 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
4	47	4	5.8	B	34	0.50	EEEHB0G470R	(1)	2000
	100	5	5.8	C	61	0.50	EEEHB0G101R	(1)	1000
	150	6.3	5.8	D	82	0.50	EEEHB0G151P	(1)	1000
	220	6.3	5.8	D	82	0.50	EEEHB0G221P	(1)	1000
6.3	22	4	5.8	B	26	0.30	EEEHB0J220R	(1)	2000
	33	4	5.8	B	29	0.30	EEEHB0J330R	(1)	2000
	47	5	5.8	C	46	0.30	EEEHB0J470R	(1)	1000
	100	6.3	5.8	D	71	0.30	EEEHB0J101P	(1)	1000
	220	8	10.2	F	150	0.35	EEEHB0J221P	(2)	500
	330	8	10.2	F	230	0.35	EEEHB0J331P	(2)	500
10	33	5	5.8	C	43	0.22	EEEHB1A330R	(1)	1000
	100	8	6.2	E	110	0.26	EEEHB1A101P	(2)	1000
	220	8	10.2	F	160	0.26	EEEHB1A221P	(2)	500
	470	10	10.2	G	270	0.26	EEEHB1A471P	(2)	500
16	10	4	5.8	B	28	0.16	EEEHB1C100R	(1)	2000
	22	5	5.8	C	39	0.16	EEEHB1C220R	(1)	1000
	47	6.3	5.8	D	70	0.16	EEEHB1C470P	(1)	1000
	100	8	10.2	F	120	0.20	EEEHB1C101P	(2)	500
	220	10	10.2	G	210	0.20	EEEHB1C221P	(2)	500
	330	10	10.2	G	230	0.20	EEEHB1C331P	(2)	500
25	4.7	4	5.8	B	22	0.14	EEEHB1E4R7R	(1)	2000
	6.8	4	5.8	B	25	0.14	EEEHB1E6R8R	(1)	2000
	33	6.3	5.8	D	65	0.14	EEEHB1E330P	(1)	1000
	47	8	6.2	E	91	0.16	EEEHB1E470P	(2)	1000
	100	8	10.2	F	130	0.16	EEEHB1E101P	(2)	500
	220	10	10.2	G	190	0.16	EEEHB1E221P	(2)	500
35	10	5	5.8	C	28	0.12	EEEHB1V100R	(1)	1000
	22	6.3	5.8	D	55	0.12	EEEHB1V220P	(1)	1000
	33	8	6.2	E	84	0.14	EEEHB1V330P	(2)	1000
	47	8	10.2	F	98	0.14	EEEHB1V470P	(2)	500
	100	10	10.2	G	160	0.14	EEEHB1V101P	(2)	500
50	0.1	4	5.8	B	1	0.12	EEEHB1HR10R ✻✻✻	(1)	2000
	0.22	4	5.8	B	2	0.12	EEEHB1HR22R ✻✻✻	(1)	2000
	0.33	4	5.8	B	3	0.12	EEEHB1HR33R ✻✻✻	(1)	2000
	0.47	4	5.8	B	5	0.12	EEEHB1HR47R ✻✻✻	(1)	2000
	1	4	5.8	B	10	0.12	EEEHB1H1R0R	(1)	2000
	2.2	4	5.8	B	16	0.12	EEEHB1H2R2R	(1)	2000
	3.3	4	5.8	B	16	0.12	EEEHB1H3R3R	(1)	2000
	4.7	5	5.8	C	23	0.12	EEEHB1H4R7R	(1)	1000
	6.8	5	5.8	C	23	0.12	EEEHB1H6R8R	(1)	1000
	10	6.3	5.8	D	35	0.12	EEEHB1H100P	(1)	1000
	22	8	6.2	E	70	0.12	EEEHB1H220P	(2)	1000
	33	8	10.2	F	91	0.12	EEEHB1H330P	(2)	500
	47	10	10.2	G	100	0.12	EEEHB1H470P	(2)	500

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products (Bi-polar)

Endurance : 105 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (120 Hz) (+105°C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)				(pcs)
6.3	47	6.3	5.8	D	35	0.60	EEEHP0J470P	(1)	1000
10	10	4	5.8	B	20	0.44	EEEHP1A100R	(1)	2000
	33	6.3	5.8	D	26	0.44	EEEHP1A330P	(1)	1000
16	10	5	5.8	C	25	0.32	EEEHP1C100R	(1)	1000
25	3.3	4	5.8	B	12	0.28	EEEHP1E3R3R	(1)	2000
	4.7	4	5.8	B	12	0.28	EEEHP1E4R7R	(1)	2000
	10	6.3	5.8	D	28	0.28	EEEHP1E100P	(1)	1000
	22	6.3	5.8	D	55	0.28	EEEHP1E220P	(1)	1000
35	2.2	4	5.8	B	10	0.24	EEEHP1V2R2R	(1)	2000
50	0.22	4	5.8	B	2	0.24	EEEHP1HR22R ✻✻✻	(1)	2000
	0.33	4	5.8	B	3	0.24	EEEHP1HR33R ✻✻✻	(1)	2000
	0.47	4	5.8	B	5	0.24	EEEHP1HR47R ✻✻✻	(1)	2000
	1	4	5.8	B	10	0.24	EEEHP1H1R0R	(1)	2000
	3.3	6.3	5.8	D	16	0.24	EEEHP1H3R3P	(1)	1000
	4.7	6.3	5.8	D	23	0.24	EEEHP1H4R7P	(1)	1000

■ Standard Products (5.5 mm max.)

Endurance : 105 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (120 Hz) (+105°C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)				(pcs)
6.3	22	4	5.4	B	26	0.30	EEEHB0J220SR	(1)	2000
	47	5	5.4	C	46	0.30	EEEHB0J470SR	(1)	1000
	100	6.3	5.4	D	71	0.30	EEEHB0J101SP	(1)	1000
10	33	5	5.4	C	43	0.22	EEEHB1A330SR	(1)	1000
16	10	4	5.4	B	28	0.16	EEEHB1C100SR	(1)	2000
	22	5	5.4	C	39	0.16	EEEHB1C220SR	(1)	1000
	47	6.3	5.4	D	70	0.16	EEEHB1C470SP	(1)	1000
25	4.7	4	5.4	B	22	0.14	EEEHB1E4R7SR	(1)	2000
	6.8	4	5.4	B	25	0.14	EEEHB1E6R8SR	(1)	2000
	33	6.3	5.4	D	65	0.14	EEEHB1E330SP	(1)	1000
35	10	5	5.4	C	28	0.12	EEEHB1V100SR	(1)	1000
	22	6.3	5.4	D	55	0.12	EEEHB1V220SP	(1)	1000
50	0.1	4	5.4	B	1	0.12	EEEHB1HR10SR ✻✻✻	(1)	2000
	0.22	4	5.4	B	2	0.12	EEEHB1HR22SR ✻✻✻	(1)	2000
	0.33	4	5.4	B	3	0.12	EEEHB1HR33SR ✻✻✻	(1)	2000
	0.47	4	5.4	B	5	0.12	EEEHB1HR47SR ✻✻✻	(1)	2000
	1	4	5.4	B	10	0.12	EEEHB1H1R0SR	(1)	2000
	2.2	4	5.4	B	16	0.12	EEEHB1H2R2SR	(1)	2000
	3.3	4	5.4	B	16	0.12	EEEHB1H3R3SR	(1)	2000
	4.7	5	5.4	C	23	0.12	EEEHB1H4R7SR	(1)	1000
	6.8	5	5.4	C	23	0.12	EEEHB1H6R8SR	(1)	1000
	10	6.3	5.4	D	35	0.12	EEEHB1H100SP	(1)	1000

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

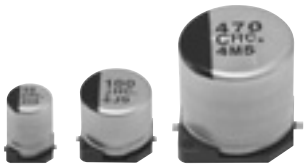
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **HC** Type: **V**

Long life

HC
↑
HB



■ Features

- Life time: 3000 h to 5000 h at 105 °C
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

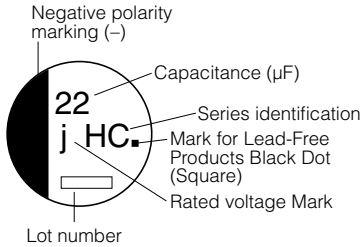
Category Temp. Range	–40 °C to +105 °C	
Rated W.V. Range	6.3 V.DC to 50 V.DC	
Nominal Cap. Range	1 µF to 1000 µF	
Capacitance Tolerance	±20 % (120 Hz/+20 °C)	
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)	
tan δ	Please see the attached standard products list	
Endurance	After applying rated working voltage for +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits. ϕ4 to ϕ6.3 (3000 hours After applying rated working voltage) ϕ8 to ϕ10 (5000 hours After applying rated working voltage)	
	Capacitance change	±30 % of initially measured value
	tan δ	≦300 % of initially specified values
	DC leakage current	≦ initially specified values
Shelf life	After storage for 1000 hours at +105 °C ±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)	
Resistance to Soldering Heat	Capacitance change	±10 % of initially measured values
	tan δ	≦ initially specified values
	DC leakage current	≦ initially specified values

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example:6.3 V 22 µF
Marking color : BLACK

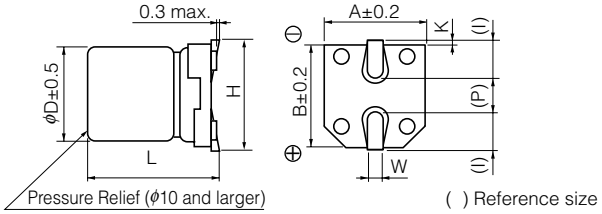


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

✻ This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ Standard Products

Endurance : 105 °C 3000 h (ϕ8, ϕ10 : 5000 h)

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	Size Code	Ripple Current (120 Hz) (+105 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
6.3	22	4	5.8	B	26	0.30	EEEHC0J220R	(1)	2000
	47	5	5.8	C	46	0.30	EEEHC0J470R	(1)	1000
	100	6.3	5.8	D	71	0.30	EEEHC0J101P	(1)	1000
	220	6.3	7.7	D8	101	0.30	EEEHC0J221XP	(1)	900
	330	8	10.2	F	230	0.30	EEEHC0J331P	(2)	500
	1000	10	10.2	G	313	0.50	EEEHC0J102P	(2)	500
10	33	5	5.8	C	43	0.26	EEEHC1A330R	(1)	1000
	220	8	10.2	F	160	0.26	EEEHC1A221P	(2)	500
16	10	4	5.8	B	28	0.20	EEEHC1C100R	(1)	2000
	22	5	5.8	C	39	0.20	EEEHC1C220R	(1)	1000
	47	6.3	5.8	D	70	0.20	EEEHC1C470P	(1)	1000
	100	6.3	7.7	D8	81	0.20	EEEHC1C101XP	(1)	900
	470	10	10.2	G	340	0.20	EEEHC1C471P	(2)	500
25	33	6.3	5.8	D	65	0.16	EEEHC1E330P	(1)	1000
	47	6.3	7.7	D8	65	0.16	EEEHC1E470XP	(1)	900
	100	8	10.2	F	130	0.16	EEEHC1E101P	(2)	500
	330	10	10.2	G	238	0.16	EEEHC1E331P	(2)	500
35	4.7	4	5.8	B	15	0.14	EEEHC1V4R7R	(1)	2000
	10	5	5.8	C	28	0.14	EEEHC1V100R	(1)	1000
	22	6.3	5.8	D	55	0.14	EEEHC1V220P	(1)	1000
	33	6.3	7.7	D8	57	0.14	EEEHC1V330XP	(1)	900
	220	10	10.2	G	220	0.14	EEEHC1V221P	(2)	500
50	0.1	4	5.8	B	1	0.12	EEEHC1HR10R ✻✻✻	(1)	2000
	0.22	4	5.8	B	2.6	0.12	EEEHC1HR22R ✻✻✻	(1)	2000
	0.33	4	5.8	B	3.2	0.12	EEEHC1HR33R ✻✻✻	(1)	2000
	0.47	4	5.8	B	5	0.12	EEEHC1HR47R ✻✻✻	(1)	2000
	1	4	5.8	B	10	0.12	EEEHC1H1R0R	(1)	2000
	2.2	4	5.8	B	16	0.12	EEEHC1H2R2R	(1)	2000
	3.3	4	5.8	B	16	0.12	EEEHC1H3R3R	(1)	2000
	4.7	5	5.8	C	23	0.12	EEEHC1H4R7R	(1)	1000
	10	6.3	5.8	D	35	0.12	EEEHC1H100P	(1)	1000
	22	6.3	7.7	D8	49	0.12	EEEHC1H220XP	(1)	900
	33	8	10.2	F	91	0.12	EEEHC1H330P	(2)	500
	47	8	10.2	F	100	0.12	EEEHC1H470P	(2)	500
	100	10	10.2	G	160	0.12	EEEHC1H101P	(2)	500

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **HD** Type: **V**

※6.3V to 35V : High temperature Lead-Free reflow (suffix:A✻)
50V to 100V : Standard Lead-Free reflow

■ Features

- Endurance: 105 °C 5000 h
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

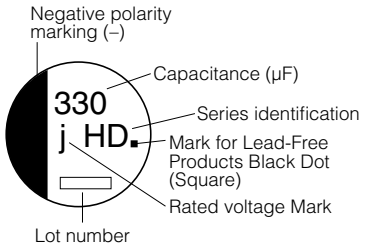
Category Temp. Range	−40 °C to +105 °C									
Rated W.V. Range	6.3 V.DC to 100 V.DC									
Nominal Cap. Range	1 µF to 1000 µF									
Capacitance Tolerance	±20 % (120 Hz/+20 °C)									
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)									
tan δ	Please see the attached High temperature lead-free reflow products list.									
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	63	100	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	3	3	2	2	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	4	4	3	3	3	3	3	3	
Endurance	After applying rated working voltage for 5000 hours at +105 °C±2 °C and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±30 % of initial measured value								
	tan δ	≦ 300 % of initial specified value								
	DC leakage current	≦ initial specified value								
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)									
	Capacitance change	±20 % of initial measured value								
	tan δ	≦ 200 % of initial specified value								
	DC leakage current	≦ initial specified value								
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±10 % of initial measured value								
	tan δ	≦ initial specified value								
	DC leakage current	≦ initial specified value								

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	50, 60	120	1 k	10 k to
Correction factor	0.70	1.00	1.30	1.70

■ Marking

Example: 6.3 V 330 µF
Marking color: BLACK

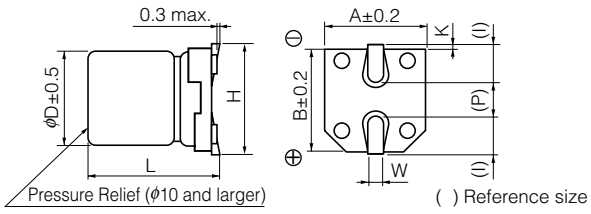


Rated Voltage Mark

j	6.3 V
A	10 V
C	16 V
E	25 V
V	35 V
H	50 V
J	63 V
2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

03 Mar. 2014

■ High temperature Lead-Free reflow Products(6.3V to 35V)

Endurance : 105 °C 5000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (120 Hz) (+105°C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)					(pcs)
6.3	330	8.0	10.2	F	230	1.5	0.30	EEEHD0J331AP	(7)	500
	1000	10.0	10.2	G	313	0.8	0.50	EEEHD0J102AP	(7)	500
10	100	8.0	6.2	E	62	2.0	0.30	EEEHD1A101AP	(7)	1000
	220	8.0	10.2	F	160	1.5	0.30	EEEHD1A221AP	(7)	500
	330	8.0	10.2	F	160	1.5	0.30	EEEHD1A331AP	(7)	500
16	10	4.0	5.8	B	28	12.0	0.20	EEEHD1C100AR	(5)	2000
	22	5.0	5.8	C	39	7.2	0.20	EEEHD1C220AR	(5)	1000
	47	6.3	5.8	D	70	4.0	0.20	EEEHD1C470AP	(5)	1000
	100	8.0	10.2	F	130	1.5	0.20	EEEHD1C101AP	(7)	500
	220	10.0	10.2	G	220	0.8	0.20	EEEHD1C221AP	(7)	500
	470	10.0	10.2	G	340	0.8	0.20	EEEHD1C471AP	(7)	500
25	4.7	4.0	5.8	B	17	12.0	0.16	EEEHD1E4R7AR	(5)	2000
	10	5.0	5.8	C	28	7.2	0.16	EEEHD1E100AR	(5)	1000
	22	6.3	5.8	D	55	4.0	0.16	EEEHD1E220AP	(5)	1000
	33	6.3	5.8	D	55	4.0	0.16	EEEHD1E330AP	(5)	1000
	47	8.0	6.2	E	56	2.0	0.18	EEEHD1E470AP	(7)	1000
	100	8.0	10.2	F	130	1.5	0.16	EEEHD1E101AP	(7)	500
	330	10.0	10.2	G	238	0.8	0.16	EEEHD1E331AP	(7)	500
35	4.7	4.0	5.8	B	17	12.0	0.13	EEEHD1V4R7AR	(5)	2000
	10	5.0	5.8	C	28	7.2	0.13	EEEHD1V100AR	(5)	1000
	22	6.3	5.8	D	55	4.0	0.13	EEEHD1V220AP	(5)	1000
	33	8.0	6.2	E	53	2.0	0.16	EEEHD1V330AP	(7)	1000
		6.3	7.7	D8	57	2.0	0.13	EEEHDV330XAP	(5)	900
	47	6.3	7.7	D8	57	2.0	0.14	EEEHDV470XAP	(5)	900
		8.0	10.2	F	79	1.5	0.14	EEEHD1V470AP	(7)	500
	100	10.0	10.2	G	101	0.8	0.14	EEEHD1V101AP	(7)	500
	220	10.0	10.2	G	220	0.8	0.14	EEEHD1V221AP	(7)	500

■ Standard Lead-Free reflow Products(50V to 100V)

Endurance : 105 °C 5000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (120 Hz) (+105°C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)					(pcs)
50	0.47	4.0	5.8	B	5	12.0	0.12	EEEHD1HR47R ✻✻✻	(1)	2000
	1	4.0	5.8	B	7	12.0	0.12	EEEHD1H1R0R	(1)	2000
	2.2	4.0	5.8	B	12	12.0	0.12	EEEHD1H2R2R	(1)	2000
	3.3	4.0	5.8	B	16	12.0	0.12	EEEHD1H3R3R	(1)	2000
	4.7	5.0	5.8	C	21	7.2	0.12	EEEHD1H4R7R	(1)	1000
	10	6.3	5.8	D	33	4.0	0.12	EEEHD1H100P	(1)	1000
	22	8.0	6.2	E	50	2.0	0.14	EEEHD1H220P	(2)	1000
	33	8.0	10.2	F	74	1.5	0.14	EEEHD1H330P	(2)	500
	47	10.0	10.2	G	94	0.8	0.14	EEEHD1H470P	(2)	500
	100	10.0	10.2	G	94	0.8	0.14	EEEHD1H101P	(2)	500
63	10	8.0	6.2	E	45	2.0	0.18	EEEHD1J100P	(2)	1000
	22	8.0	10.2	F	65	1.5	0.18	EEEHD1J220P	(2)	500
	33	10.0	10.2	G	80	0.8	0.18	EEEHD1J330P	(2)	500
100	3.3	8.0	6.2	E	30	2.0	0.18	EEEHD2A3R3P	(2)	1000
	10	8.0	10.2	F	55	1.5	0.18	EEEHD2A100P	(2)	500
	22	10.0	10.2	G	70	0.8	0.18	EEEHD2A220P	(2)	500

✻✻✻ Please kindly accept last shipment : 31/Mar/2015

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: Medium-size **HD** Type: **V**

HD High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Endurance: 5000 h at 105 °C
- Vibration-proof product is available upon request.
- RoHS directive compliant

■ Specifications

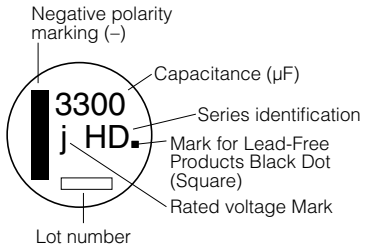
Category Temp. Range	–55 °C to +105 °C	
Rated W.V.Range	6.3 V.DC to 35 V.DC	
Nominal Cap.Range	680 µF to 7500 µF	
Capacitance Tolerance	±20 % (120 Hz/+20 °C)	
DC Leakage Current	I ≦ 0.01 CV (µA) After 2 minutes	
tan δ	Please see the attached High temperature lead-free reflow products list.	
Endurance	After applying rated working voltage for 5000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.	
	Capacitance change	±30 % of initial measured value
	tan δ	≦ 200 % of initial specified value
	DC leakage current	≦ initial specified value
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance (With voltage treatment)	
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.	
	Capacitance change	±10 % of initial measured value
	tan δ	≦ initial specified value
	DC leakage current	≦ initial specified value

■ Frequency correction factor for ripple current

Cap (µF)	Frequency (Hz)				
	60	120	1 k	10 k	100 k to
680 to 1000	0.93	1.00	1.20	1.27	1.33
1200 to 2200	0.94	1.00	1.13	1.19	1.25
2700 to 7500	0.94	1.00	1.12	1.18	1.18

■ Marking

Example:6.3 V 3300 µF Marking color : BLACK

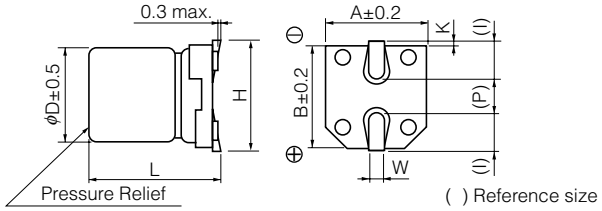


Rated Voltage Mark

j	6.3 V
A	10 V
C	16 V
E	25 V
V	35 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A,B	H	I	W	P	K
H13	12.5	13.5±0.5	13.5	15.0 max.	4.7	0.90±0.3	4.4	0.70±0.3
J16	16.0	16.5±0.5	17.0	19.0 max	5.5	1.20±0.3	6.7	0.70±0.3
K16	18.0	16.5±0.5	19.0	21.0 max	6.7	1.20±0.3	6.7	0.70±0.3

■ High temperature Lead-Free reflow Products

Endurance : 105 °C 5000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification		Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	Size Code	Ripple Current (120 Hz) (+105 °C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
6.3	3300	12.5	13.5	H13	680	0.32	EEEHD0J332AQ	(9)	200
	6800	16	16.5	J16	1280	0.38	EEEHD0J682AM	(9)	125
	7500	18	16.5	K16	1540	0.40	EEEHD0J752AM	(9)	125
10	2200	12.5	13.5	H13	620	0.24	EEEHD1A222AQ	(9)	200
	4700	16	16.5	J16	1280	0.28	EEEHD1A472AM	(9)	125
	6800	18	16.5	K16	1540	0.32	EEEHD1A682AM	(9)	125
16	1500	12.5	13.5	H13	620	0.18	EEEHD1C152AQ	(9)	200
	3300	16	16.5	J16	1280	0.22	EEEHD1C332AM	(9)	125
	4700	18	16.5	K16	1540	0.24	EEEHD1C472AM	(9)	125
25	1000	12.5	13.5	H13	580	0.16	EEEHD1E102AQ	(9)	200
	2200	16	16.5	J16	1200	0.18	EEEHD1E222AM	(9)	125
	3300	18	16.5	K16	1540	0.20	EEEHD1E332AM	(9)	125
35	680	12.5	13.5	H13	580	0.14	EEEHD1V681AQ	(9)	200
	1500	16	16.5	J16	1200	0.16	EEEHD1V152AM	(9)	125
	1800	18	16.5	K16	1450	0.16	EEEHD1V182AM	(9)	125

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “Q or M”

Surface Mount Type

Series: **FC** Type: **V**

FC High temperature Lead-Free reflow(suffix:A✻)

Low impedance

FC ↑ HA

■ Features

- Endurance : 105 °C 1000 h
- Low impedance (1/2 for HA series)
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−40 °C to +105 °C						
Rated W.V. Range	6.3 V.DC to 35 V.DC						
Nominal Cap. Range	1 µF to 1500 µF						
Capacitance Tolerance	±20 % (120 Hz/+20 °C)						
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)						
tan δ	Please see the attached High temperature lead-free reflow products list.						
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	(Impedance ratio at 120 Hz)
	Z(−25 °C) / Z(+20 °C)	2	2	2	2	2	
	Z(−40 °C) / Z(+20 °C)	3	3	3	3	3	
Endurance	After applying rated working voltage for 1000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.						
	Capacitance change	±20 % of initial measured value					
	tan δ	≦ 200 % of initial specified value					
	DC leakage current	≦ initial specified value					
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance.(With voltage treatment)						
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.						
	Capacitance change	±10 % of initial measured value					
	tan δ	≦ initial specified value					
	DC leakage current	≦ initial specified value					

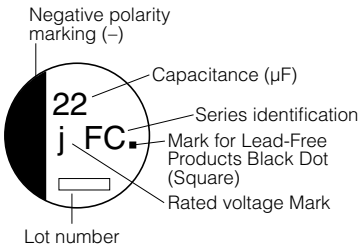
■ Frequency correction factor for ripple current

	Frequency (Hz)				
	50, 60	120	1 k	10 k	100 k to
Correction factor	0.70	0.75	0.90	0.95	1.00

■ Marking

Example:6.3 V 22 µF

Marking color : BLACK

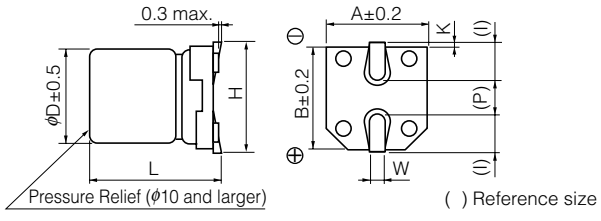


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V		

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

✻ This product qualify for AEC-Q200, but it has some deviations.

■ High temperature Lead-Free reflow Products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	Size Code	Specification Ripple Current (100 kHz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Impedance (100 kHz) (+20 °C) (Ω)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.4	B	60	0.26	3.00	EEEFC0J220AR	(5)	2000
	47	5	5.4	C	95	0.26	1.80	EEEFC0J470AR	(5)	1000
	68	6.3	5.4	D	140	0.26	1.00	EEEFC0J680AP	(5)	1000
	100	6.3	5.4	D	140	0.26	1.00	EEEFC0J101AP	(5)	1000
	220	8	6.2	E	230	0.26	0.40	EEEFC0J221AP	(6)	1000
	330	8	10.2	F	450	0.26	0.30	EEEFC0J331AP	(6)	500
	1000	10	10.2	G	670	0.26	0.15	EEEFC0J102AP	(6)	500
	1500	10	10.2	G	670	0.26	0.15	EEEFC0J152AP	(6)	500
10	33	5	5.4	C	95	0.19	1.80	EEEFC1A330AR	(5)	1000
	100	8	6.2	E	230	0.19	0.40	EEEFC1A101AP	(6)	1000
	150	8	6.2	E	230	0.19	0.40	EEEFC1A151AP	(6)	1000
	220	8	10.2	F	450	0.19	0.30	EEEFC1A221AP	(6)	500
	470	10	10.2	G	670	0.19	0.15	EEEFC1A471AP	(6)	500
	1000	10	10.2	G	670	0.19	0.15	EEEFC1A102AP	(6)	500
16	10	4	5.4	B	60	0.16	3.00	EEEFC1C100AR	(5)	2000
	22	5	5.4	C	95	0.16	1.80	EEEFC1C220AR	(5)	1000
	47	6.3	5.4	D	140	0.16	1.00	EEEFC1C470AP	(5)	1000
	68	8	6.2	E	230	0.16	0.40	EEEFC1C680AP	(6)	1000
	100	8	6.2	E	230	0.16	0.40	EEEFC1C101AP	(6)	1000
	220	10	10.2	G	670	0.16	0.15	EEEFC1C221AP	(6)	500
	330	10	10.2	G	670	0.16	0.15	EEEFC1C331AP	(6)	500
	470	10	10.2	G	670	0.16	0.15	EEEFC1C471AP	(6)	500
	680	10	10.2	G	670	0.16	0.15	EEEFC1C681AP	(6)	500
25	6.8	4	5.4	B	60	0.14	3.00	EEEFC1E6R8AR	(5)	2000
	22	6.3	5.4	D	140	0.14	1.00	EEEFC1E220AP	(5)	1000
	33	6.3	5.4	D	140	0.14	1.00	EEEFC1E330AP	(5)	1000
	47	8	6.2	E	230	0.14	0.40	EEEFC1E470AP	(6)	1000
	68	8	10.2	F	450	0.14	0.30	EEEFC1E680AP	(6)	500
	100	8	10.2	F	450	0.14	0.30	EEEFC1E101AP	(6)	500
	220	10	10.2	G	670	0.14	0.15	EEEFC1E221AP	(6)	500
	330	10	10.2	G	670	0.14	0.15	EEEFC1E331AP	(6)	500
	470	10	10.2	G	670	0.14	0.15	EEEFC1E471AP	(6)	500
35	1	4	5.4	B	60	0.12	3.00	EEEFC1V1R0AR	(5)	2000
	2.2	4	5.4	B	60	0.12	3.00	EEEFC1V2R2AR	(5)	2000
	3.3	4	5.4	B	60	0.12	3.00	EEEFC1V3R3AR	(5)	2000
	4.7	4	5.4	B	60	0.12	3.00	EEEFC1V4R7AR	(5)	2000
	6.8	5	5.4	C	95	0.12	1.80	EEEFC1V6R8AR	(5)	1000
	10	5	5.4	C	95	0.12	1.80	EEEFC1V100AR	(5)	1000
	22	6.3	5.4	D	140	0.12	1.00	EEEFC1V220AP	(5)	1000
	33	8	6.2	E	230	0.12	0.40	EEEFC1V330AP	(6)	1000
	47	8	6.2	E	230	0.12	0.40	EEEFC1V470AP	(6)	1000
	100	10	10.2	G	670	0.12	0.15	EEEFC1V101AP	(6)	500
	220	10	10.2	G	670	0.12	0.15	EEEFC1V221AP	(6)	500
	330	10	10.2	G	670	0.12	0.15	EEEFC1V331AP	(6)	500

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **FC** Type: **V**

Low impedance

FC
↑
HA

■ Features

- Endurance : 105 °C 1000 h
- Low impedance (1/2 for HA series)
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

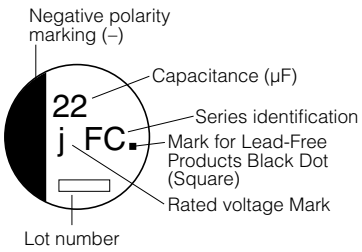
Category Temp. Range	−40 °C to +105 °C							
Rated W.V. Range	6.3 V.DC to 50 V.DC							
Nominal Cap. Range	1 µF to 1500 µF							
Capacitance Tolerance	±20 % (120 Hz/+20 °C)							
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)							
tan δ	Please see the attached standard products list							
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
	Z(−25 °C) / Z(+20 °C)	2	2	2	2	2	2	
	Z(−40 °C) / Z(+20 °C)	3	3	3	3	3	3	
Endurance	After applying rated working voltage for 1000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.							
	Capacitance change	±20 % of initial measured value						
	tan δ	≦ 200 % of initial specified value						
	DC leakage current	≦ initial specified value						
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance.(With voltage treatment)							
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitor shall meet the following limits.							
	Capacitance change	±10 % of initial measured value						
	tan δ	≦ initial specified value						
	DC leakage current	≦ initial specified value						

■ Frequency correction factor for ripple current

	Frequency (Hz)				
	50, 60	120	1 k	10 k	100 k to
Correction factor	0.70	0.75	0.90	0.95	1.00

■ Marking

Example:6.3 V 22 µF
Marking color : BLACK

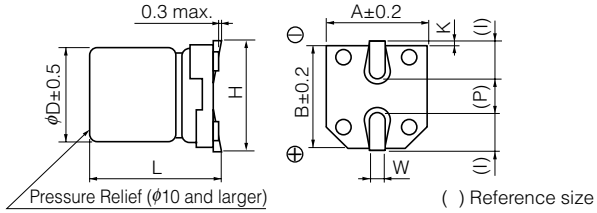


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	$5.4^{+0.1}_{-0.2}$	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	$5.4^{+0.1}_{-0.2}$	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	$5.4^{+0.1}_{-0.2}$	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

✻ This product qualify for AEC-Q200, but it has some deviations.

01 Mar. 2014

■ Standard Products

Endurance : 105 °C 1000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	Size Code	Specification Ripple Current (100 kHz) (+105°C) (mA r.m.s.)	tan δ (120 Hz) (+20 °C)	Impedance (100 kHz) (+20 °C) (Ω)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.4	B	60	0.26	3.00	EEEFC0J220R	(1)	2000
	47	5	5.4	C	95	0.26	1.80	EEEFC0J470R	(1)	1000
	68	6.3	5.4	D	140	0.26	1.00	EEEFC0J680P	(1)	1000
	100	6.3	5.4	D	140	0.26	1.00	EEEFC0J101P	(1)	1000
	220	8	6.2	E	230	0.26	0.40	EEEFC0J221P	(2)	1000
	330	8	10.2	F	450	0.26	0.30	EEEFC0J331P	(2)	500
	1000	10	10.2	G	670	0.26	0.15	EEEFC0J102P	(2)	500
	1500	10	10.2	G	670	0.26	0.15	EEEFC0J152P	(2)	500
10	33	5	5.4	C	95	0.19	1.80	EEEFC1A330R	(1)	1000
	100	8	6.2	E	230	0.19	0.40	EEEFC1A101P	(2)	1000
	150	8	6.2	E	230	0.19	0.40	EEEFC1A151P	(2)	1000
	220	8	10.2	F	450	0.19	0.30	EEEFC1A221P	(2)	500
	470	10	10.2	G	670	0.19	0.15	EEEFC1A471P	(2)	500
	1000	10	10.2	G	670	0.19	0.15	EEEFC1A102P	(2)	500
16	10	4	5.4	B	60	0.16	3.00	EEEFC1C100R	(1)	2000
	22	5	5.4	C	95	0.16	1.80	EEEFC1C220R	(1)	1000
	47	6.3	5.4	D	140	0.16	1.00	EEEFC1C470P	(1)	1000
	68	8	6.2	E	230	0.16	0.40	EEEFC1C680P	(2)	1000
	100	8	6.2	E	230	0.16	0.40	EEEFC1C101P	(2)	1000
	220	10	10.2	G	670	0.16	0.15	EEEFC1C221P	(2)	500
	330	10	10.2	G	670	0.16	0.15	EEEFC1C331P	(2)	500
	470	10	10.2	G	670	0.16	0.15	EEEFC1C471P	(2)	500
	680	10	10.2	G	670	0.16	0.15	EEEFC1C681P	(2)	500
25	6.8	4	5.4	B	60	0.14	3.00	EEEFC1E6R8R	(1)	2000
	22	6.3	5.4	D	140	0.14	1.00	EEEFC1E220P	(1)	1000
	33	6.3	5.4	D	140	0.14	1.00	EEEFC1E330P	(1)	1000
	47	8	6.2	E	230	0.14	0.40	EEEFC1E470P	(2)	1000
	68	8	10.2	F	450	0.14	0.30	EEEFC1E680P	(2)	500
	100	8	10.2	F	450	0.14	0.30	EEEFC1E101P	(2)	500
	220	10	10.2	G	670	0.14	0.15	EEEFC1E221P	(2)	500
	330	10	10.2	G	670	0.14	0.15	EEEFC1E331P	(2)	500
	470	10	10.2	G	670	0.14	0.15	EEEFC1E471P	(2)	500
35	1	4	5.4	B	60	0.12	3.00	EEEFC1V1R0R	(1)	2000
	2.2	4	5.4	B	60	0.12	3.00	EEEFC1V2R2R	(1)	2000
	3.3	4	5.4	B	60	0.12	3.00	EEEFC1V3R3R	(1)	2000
	4.7	4	5.4	B	60	0.12	3.00	EEEFC1V4R7R	(1)	2000
	6.8	5	5.4	C	95	0.12	1.80	EEEFC1V6R8R	(1)	1000
	10	5	5.4	C	95	0.12	1.80	EEEFC1V100R	(1)	1000
	22	6.3	5.4	D	140	0.12	1.00	EEEFC1V220P	(1)	1000
	33	8	6.2	E	230	0.12	0.40	EEEFC1V330P	(2)	1000
	47	8	6.2	E	230	0.12	0.40	EEEFC1V470P	(2)	1000
	100	10	10.2	G	670	0.12	0.15	EEEFC1V101P	(2)	500
	220	10	10.2	G	670	0.12	0.15	EEEFC1V221P	(2)	500
	330	10	10.2	G	670	0.12	0.15	EEEFC1V331P	(2)	500
50	1	4	5.4	B	30	0.12	5.00	EEEFC1H1R0R	(1)	2000
	2.2	4	5.4	B	30	0.12	5.00	EEEFC1H2R2R	(1)	2000
	3.3	4	5.4	B	30	0.12	5.00	EEEFC1H3R3R	(1)	2000
	4.7	5	5.4	C	50	0.12	3.00	EEEFC1H4R7R	(1)	1000
	10	6.3	5.4	D	70	0.12	2.00	EEEFC1H100P	(1)	1000
	22	8	6.2	E	120	0.12	0.70	EEEFC1H220P	(2)	1000
	33	8	10.2	F	300	0.12	0.60	EEEFC1H330P	(2)	500
	47	10	10.2	G	500	0.12	0.30	EEEFC1H470P	(2)	500
	100	10	10.2	G	500	0.12	0.30	EEEFC1H101P	(2)	500
	220	10	10.2	G	500	0.12	0.30	EEEFC1H221P	(2)	500

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **FK** Type: **V**

FK High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Endurance: 2000 h at 105 °C
- Low impedance (40 % to 60 % less than FC series)
  Miniaturized (30 % to 50 % less than FC series)
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	–55 °C to +105 °C						
Rated W.V.Range	6.3 V.DC to 35 V.DC						
Nominal Cap.Range	4.7 µF to 1500 µF						
Capacitance Tolerance	±20 % (120 Hz/+20 °C)						
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)						
tan δ	Please see the attached High temperature lead-free reflow products list.						
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	(Impedance ratio at 120 Hz)
	Z(–25 °C)/Z(+20 °C)	2	2	2	2	2	
	Z(–40 °C)/Z(+20 °C)	3	3	3	3	3	
	Z(–55 °C)/Z(+20 °C)	4	4	4	3	3	
Endurance	After applying rated working voltage for 2000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.						
	Capacitance change	±30 % of initial measured value					
	tan δ	≦ 200 % of initial specified value					
	DC leakage current	≦ initial specified value					
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)						
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitor shall meet the following limits.						
	Capacitance change	±10 % of initial measured value					
	tan δ	≦ initial specified value					
	DC leakage current	≦ initial specified value					

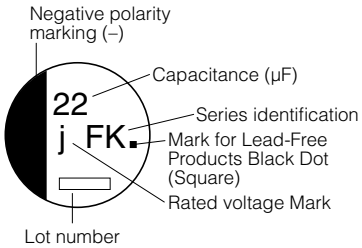
■ Frequency correction factor for ripple current

Cap (µF)	Frequency (Hz)			
	120	1 k	10 k	100 k to
4.7 to 470	0.65	0.85	0.95	1.00
680 to 1500	0.70	0.90	0.95	1.00

■ Marking

Example:6.3 V 22 µF

Marking color : BLACK

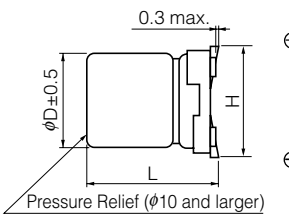


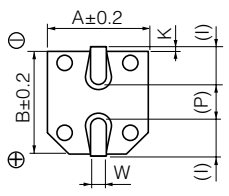
Rated Voltage Mark

j	6.3 V
A	10 V
C	16 V
E	25 V
V	35 V

■ Dimensions in mm (not to scale)

(Unit : mm)





( ) Reference size

Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

■ High temperature Lead-Free reflow Products

Endurance : 105 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+105 °C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
6.3	22	4	5.8	B	90	1.35	0.26	EEEFK0J220AR	(5)	2000
	47	4	5.8	(B)	90	1.35	0.26	EEEFKJ470UAR	(5)	2000
		5	5.8	C	160	0.70	0.26	EEEFK0J470AR	(5)	1000
	100	5	5.8	(C)	160	0.70	0.26	EEEFKJ101UAR	(5)	1000
		6.3	5.8	D	240	0.36	0.26	EEEFK0J101AP	(5)	1000
	220	6.3	5.8	D	240	0.36	0.26	EEEFK0J221AP	(5)	1000
	330	6.3	7.7	D8	280	0.34	0.26	EEEFKJ331XAP	(5)	900
		8	6.2	E	300	0.26	0.26	EEEFK0J331AP	(6)	1000
	470	8	10.2	F	600	0.16	0.26	EEEFK0J471AP	(6)	500
	1000	8	10.2	F	600	0.16	0.26	EEEFK0J102AP	(6)	500
	1500	10	10.2	G	850	0.08	0.26	EEEFK0J152AP	(6)	500
10	22	4	5.8	B	90	1.35	0.19	EEEFK1A220AR	(5)	2000
	33	4	5.8	(B)	90	1.35	0.19	EEEFKA330UAR	(5)	2000
		5	5.8	C	160	0.70	0.19	EEEFK1A330AR	(5)	1000
	150	6.3	5.8	D	240	0.36	0.19	EEEFK1A151AP	(5)	1000
	220	6.3	7.7	D8	280	0.34	0.19	EEEFKA221XAP	(5)	900
		8	6.2	E	300	0.26	0.19	EEEFK1A221AP	(6)	1000
	330	8	10.2	F	600	0.16	0.19	EEEFK1A331AP	(6)	500
	470	8	10.2	F	600	0.16	0.19	EEEFK1A471AP	(6)	500
	680	8	10.2	F	600	0.16	0.19	EEEFK1A681AP	(6)	500
	1000	10	10.2	G	850	0.08	0.19	EEEFK1A102AP	(6)	500
16	10	4	5.8	B	90	1.35	0.16	EEEFK1C100AR	(5)	2000
	22	4	5.8	(B)	90	1.35	0.16	EEEFKC220UAR	(5)	2000
		5	5.8	C	160	0.70	0.16	EEEFK1C220AR	(5)	1000
	47	5	5.8	(C)	160	0.70	0.16	EEEFKC470UAR	(5)	1000
		6.3	5.8	D	240	0.36	0.16	EEEFK1C470AP	(5)	1000
	68	6.3	5.8	D	240	0.36	0.16	EEEFK1C680AP	(5)	1000
	100	6.3	5.8	D	240	0.36	0.16	EEEFK1C101AP	(5)	1000
	150	6.3	7.7	D8	280	0.34	0.16	EEEFKC151XAP	(5)	900
	220	6.3	7.7	D8	280	0.34	0.16	EEEFKC221XAP	(5)	900
		8	6.2	E	300	0.26	0.16	EEEFK1C221AP	(6)	1000
	330	8	10.2	F	600	0.16	0.16	EEEFK1C331AP	(6)	500
	470	8	10.2	F	600	0.16	0.16	EEEFK1C471AP	(6)	500
	680	10	10.2	G	850	0.08	0.16	EEEFK1C681AP	(6)	500
25	10	4	5.8	B	90	1.35	0.14	EEEFK1E100AR	(5)	2000
	22	5	5.8	C	160	0.70	0.14	EEEFK1E220AR	(5)	1000
	33	5	5.8	(C)	160	0.70	0.14	EEEFKE330UAR	(5)	1000
		6.3	5.8	D	240	0.36	0.14	EEEFK1E330AP	(5)	1000
	47	6.3	5.8	D	240	0.36	0.14	EEEFK1E470AP	(5)	1000
	68	6.3	5.8	D	240	0.36	0.14	EEEFK1E680AP	(5)	1000
	100	6.3	7.7	D8	280	0.34	0.14	EEEFKE101XAP	(5)	900
		8	6.2	E	300	0.26	0.14	EEEFK1E101AP	(6)	1000
	150	8	10.2	F	600	0.16	0.14	EEEFK1E151AP	(6)	500
	220	8	10.2	F	600	0.16	0.14	EEEFK1E221AP	(6)	500
	330	8	10.2	F	600	0.16	0.14	EEEFK1E331AP	(6)	500
	470	10	10.2	G	850	0.08	0.14	EEEFK1E471AP	(6)	500
35	4.7	4	5.8	B	90	1.35	0.12	EEEFK1V4R7AR	(5)	2000
	10	4	5.8	(B)	90	1.35	0.12	EEEFKV100UAR	(5)	2000
		5	5.8	C	160	0.70	0.12	EEEFK1V100AR	(5)	1000
	22	5	5.8	C	160	0.70	0.12	EEEFK1V220AR	(5)	1000
	33	6.3	5.8	D	240	0.36	0.12	EEEFK1V330AP	(5)	1000
	47	6.3	5.8	D	240	0.36	0.12	EEEFK1V470AP	(5)	1000
	68	6.3	7.7	D8	280	0.34	0.12	EEEFKV680XAP	(5)	900
	100	6.3	7.7	D8	280	0.34	0.12	EEEFKV101XAP	(5)	900
		8	10.2	F	600	0.16	0.12	EEEFK1V101AP	(6)	500
	150	8	10.2	F	600	0.16	0.12	EEEFK1V151AP	(6)	500
	220	8	10.2	F	600	0.16	0.12	EEEFK1V221AP	(6)	500
	330	10	10.2	G	850	0.08	0.12	EEEFK1V331AP	(6)	500

✻Size code( ):Miniaturization product

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: Medium-size **FK** Type: **V**

FK High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Endurance: 5000 h at 105 °C
- Vibration-proof product is available upon request.
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

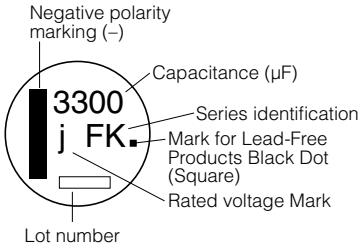
Category Temp. Range	–55 °C to +105 °C										
Rated W.V.Range	6.3 V.DC to 100 V.DC										
Nominal Cap.Range	47 µF to 6800 µF										
Capacitance Tolerance	±20 % (120 Hz/+20 °C)										
DC Leakage Current	I ≦ 0.01 CV (µA) After 2 minutes										
tan δ	Please see the attached High temperature lead-free reflow products list.										
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	63	80	100	(Impedance ratio at 120 Hz)
	Z(–25 °C)/Z(+20 °C)	2	2	2	2	2	2	2	2	2	
	Z(–40 °C)/Z(+20 °C)	3	3	3	3	3	3	3	3	3	
	Z(–55 °C)/Z(+20 °C)	4	4	4	3	3	3	3	3	3	
Endurance	After applying rated working voltage for 5000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.										
	Capacitance change	±30 % of initial measured value									
	tan δ	≦ 200 % of initial specified value									
	DC leakage current	≦ initial specified value									
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance (With voltage treatment)										
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.										
	Capacitance change	±10 % of initial measured value									
	tan δ	≦ initial specified value									
	DC leakage current	≦ initial specified value									

■ Frequency correction factor for ripple current

Cap (µF)	Frequency (Hz)			
	120	1 k	10 k	100 k to
47 to 6800	0.75	0.90	0.95	1.00

■ Marking

Example:6.3 V 3300 µF Marking color : BLACK

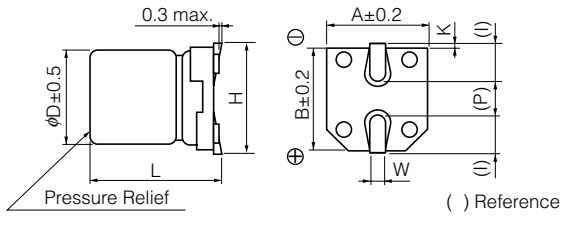


Rated Voltage Mark

j	6.3 V
A	10 V
C	16 V
E	25 V
V	35 V
H	50 V
J	63 V
K	80 V
2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
H13	12.5	13.5±0.5	13.5	15.0 max.	4.7	0.90±0.3	4.4	0.70±0.30
J16	16.0	16.5±0.5	17.0	19.0 max.	5.5	1.20±0.3	6.7	0.70±0.30
K16	18.0	16.5±0.5	19.0	21.0 max.	6.7	1.20±0.3	6.7	0.70±0.30

✻ This product qualify for AEC-Q200, but it has some deviations.

02 Mar. 2014

■ High temperature Lead-Free reflow Products

Endurance : 105 °C 5000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (100 kHz) (+105 °C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)					(pcs)
6.3	3300	12.5	13.5	H13	1100	0.06	0.30	EEEFK0J332AQ	(9)	200
	6800	16	16.5	J16	1800	0.035	0.36	EEEFK0J682AM	(9)	125
10	2200	12.5	13.5	H13	1100	0.06	0.21	EEEFK1A222AQ	(9)	200
	4700	16	16.5	J16	1800	0.035	0.25	EEEFK1A472AM	(9)	125
	6800	18	16.5	K16	2060	0.033	0.29	EEEFK1A682AM	(9)	125
16	1500	12.5	13.5	H13	1100	0.06	0.16	EEEFK1C152AQ	(9)	200
	3300	16	16.5	J16	1800	0.035	0.20	EEEFK1C332AM	(9)	125
	4700	18	16.5	K16	2060	0.033	0.22	EEEFK1C472AM	(9)	125
25	1000	12.5	13.5	H13	1100	0.06	0.14	EEEFK1E102AQ	(9)	200
	1500	16	16.5	J16	1800	0.035	0.16	EEEFK1E152AM	(9)	125
	2200	16	16.5	J16	1800	0.035	0.16	EEEFK1E222AM	(9)	125
	3300	18	16.5	K16	2060	0.033	0.18	EEEFK1E332AM	(9)	125
35	470	12.5	13.5	H13	1100	0.06	0.12	EEEFK1V471AQ	(9)	200
	680	12.5	13.5	H13	1100	0.06	0.12	EEEFK1V681AQ	(9)	200
	1000	16	16.5	J16	1800	0.035	0.12	EEEFK1V102AM	(9)	125
	1500	16	16.5	J16	1800	0.035	0.12	EEEFK1V152AM	(9)	125
50	330	12.5	13.5	H13	900	0.12	0.12	EEEFK1H331AQ	(10)	200
	390	12.5	13.5	H13	900	0.12	0.12	EEEFK1H391AQ	(10)	200
	470	16	16.5	J16	1610	0.073	0.12	EEEFK1H471AM	(10)	125
	560	16	16.5	J16	1610	0.073	0.12	EEEFK1H561AM	(10)	125
	680	16	16.5	J16	1610	0.073	0.12	EEEFK1H681AM	(10)	125
	1000	16	16.5	J16	1610	0.073	0.12	EEEFK1H102AM	(10)	125
63	150	12.5	13.5	H13	800	0.16	0.10	EEEFK1J151AQ	(10)	200
	220	12.5	13.5	H13	800	0.16	0.10	EEEFK1J221AQ	(10)	200
	470	16	16.5	J16	1410	0.082	0.10	EEEFK1J471AM	(10)	125
	680	18	16.5	K16	1690	0.08	0.10	EEEFK1J681AM	(10)	125
80	68	12.5	13.5	H13	500	0.32	0.08	EEEFK1K680AQ	(11)	200
	100	12.5	13.5	H13	500	0.32	0.08	EEEFK1K101AQ	(11)	200
	150	12.5	13.5	H13	500	0.32	0.08	EEEFK1K151AQ	(11)	200
	330	16	16.5	J16	793	0.17	0.08	EEEFK1K331AM	(11)	125
	470	18	16.5	K16	917	0.153	0.08	EEEFK1K471AM	(11)	125
100	47	12.5	13.5	H13	500	0.32	0.07	EEEFK2A470AQ	(11)	200
	68	12.5	13.5	H13	500	0.32	0.07	EEEFK2A680AQ	(11)	200
	100	16	16.5	J16	793	0.17	0.07	EEEFK2A101AM	(11)	125
	150	16	16.5	J16	793	0.17	0.07	EEEFK2A151AM	(11)	125
	220	18	16.5	K16	917	0.153	0.07	EEEFK2A221AM	(11)	125
	330	18	16.5	K16	917	0.153	0.07	EEEFK2A331AM	(11)	125

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “Q or M”

Surface Mount Type

Series: **FK** Type: **V**

■ Features

- Endurance: 2000 h to 5000 h at 105 °C
- Low impedance (40 % to 60 % less than FC series)
  Miniaturized (30 % to 50 % less than FC series)
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	–55 °C to +105 °C										
Rated W.V.Range	6.3 V.DC to 100 V.DC										
Nominal Cap.Range	3.3 µF to 6800 µF										
Capacitance Tolerance	±20 % (120 Hz/+20 °C)										
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (Whichever is greater)										
tan δ	Please see the attached standard products list										
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	63	80	100	(Impedance ratio at 120 Hz)
	Z(–25 °C)/Z(+20 °C)	2	2	2	2	2	2	2	2	2	
	Z(–40 °C)/Z(+20 °C)	3	3	3	3	3	3	3	3	3	
	Z(–55 °C)/Z(+20 °C)	4	4	4	3	3	3	3	3	3	
Endurance	After applying rated working voltage for 2000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits. (≧ϕ12.5 and suffix "G" in ϕ8×10.2, ϕ10×10.2 are 5000 hours)										
	Capacitance change	±30 % of initial measured value (Suffix "G" is 35 %)									
	tan δ	≦ 200 % of initial specified value (Suffix "G" is 300 %)									
	DC leakage current	≦ initial specified value									
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance (With voltage treatment)										
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.										
	Capacitance change	±10 % of initial measured value									
	tan δ	≦ initial specified value									
	DC leakage current	≦ initial specified value									

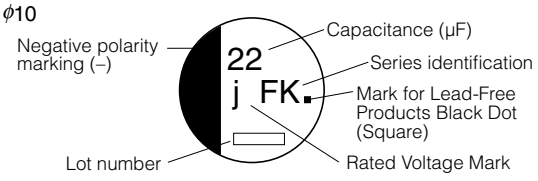
■ Frequency correction factor for ripple current

	Frequency (Hz)				
	50, 60	120	1 k	10 k	100 k to
Correction factor	0.70	0.75	0.90	0.95	1.00

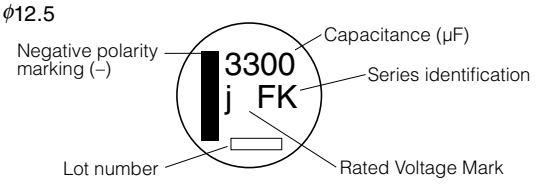
■ Marking

Example:6.3 V 22 µF, 6.3 V 3300 µF
Marking color : BLACK

≦ ϕ10



≧ ϕ12.5

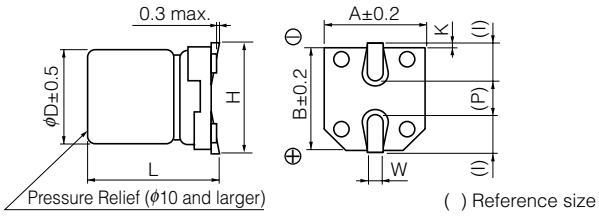


Rated Voltage Mark

j	6.3 V
A	10 V
C	16 V
E	25 V
V	35 V
H	50 V
J	63 V
K	80 V
2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A,B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+1.5}_{-0.2}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+1.5}_{-0.2}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+1.5}_{-0.2}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+1.5}_{-0.2}$
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+1.5}_{-0.2}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2
H13	12.5	13.5±0.5	13.5	15.0 max.	4.7	0.90±0.3	4.4	0.70±0.3
J16	16.0	16.5±0.5	17.0	19.0 max.	5.5	1.20±0.3	6.7	0.70±0.3
K16	18.0	16.5±0.5	19.0	21.0 max.	6.7	1.20±0.3	6.7	0.70±0.3

* This product qualify for AEC-Q200, but it has some deviations.

■ Standard Products

Endurance : 105 °C 2000 h (≧ φ12.5 : 5000 h)

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (100 kHz) (+105 °C) (mA r.m.s.)	Impedance (100 kHz) (+20 °C) (Ω)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
6.3	22	4	5.8	B	90	1.35	0.26	EEEFK0J220R	(1)	2000
	47	4	5.8	(B)	90	1.35	0.26	EEEFK0J470UR	(1)	2000
		5	5.8	C	160	0.70	0.26	EEEFK0J470R	(1)	1000
	100	5	5.8	(C)	160	0.70	0.26	EEEFK0J101UR	(1)	1000
		6.3	5.8	D	240	0.36	0.26	EEEFK0J101P	(1)	1000
	220	6.3	5.8	D	240	0.36	0.26	EEEFK0J221P	(1)	1000
	330	6.3	7.7	D8	280	0.34	0.26	EEEFK0J331XP	(1)	900
		8	6.2	E	300	0.26	0.26	EEEFK0J331P	(2)	1000
	470	8	10.2	F	600	0.16	0.26	EEEFK0J471P	(2)	500
	1000	8	10.2	F	600	0.16	0.26	EEEFK0J102P	(2)	500
	1500	10	10.2	G	850	0.08	0.26	EEEFK0J152P	(2)	500
	3300	12.5	13.5	H13	1100	0.06	0.30	EEVFK0J332Q	(3)	200
	6800	16	16.5	J16	1800	0.035	0.36	EEVFK0J682M	(3)	125
10	22	4	5.8	B	90	1.35	0.19	EEEFK1A220R	(1)	2000
	33	4	5.8	(B)	90	1.35	0.19	EEEFK1A330UR	(1)	2000
		5	5.8	C	160	0.70	0.19	EEEFK1A330R	(1)	1000
	150	6.3	5.8	D	240	0.36	0.19	EEEFK1A151P	(1)	1000
	220	6.3	7.7	D8	280	0.34	0.19	EEEFK1A221XP	(1)	900
		8	6.2	E	300	0.26	0.19	EEEFK1A221P	(2)	1000
	330	8	10.2	F	600	0.16	0.19	EEEFK1A331P	(2)	500
	470	8	10.2	F	600	0.16	0.19	EEEFK1A471P	(2)	500
	680	8	10.2	F	600	0.16	0.19	EEEFK1A681P	(2)	500
	1000	10	10.2	G	850	0.08	0.19	EEEFK1A102P	(2)	500
	2200	12.5	13.5	H13	1100	0.06	0.21	EEVFK1A222Q	(3)	200
	4700	16	16.5	J16	1800	0.035	0.25	EEVFK1A472M	(3)	125
	6800	18	16.5	K16	2060	0.033	0.29	EEVFK1A682M	(3)	125
16	10	4	5.8	B	90	1.35	0.16	EEEFK1C100R	(1)	2000
	22	4	5.8	(B)	90	1.35	0.16	EEEFK1C220UR	(1)	2000
		5	5.8	C	160	0.70	0.16	EEEFK1C220R	(1)	1000
	47	5	5.8	(C)	160	0.70	0.16	EEEFK1C470UR	(1)	1000
		6.3	5.8	D	240	0.36	0.16	EEEFK1C470P	(1)	1000
	68	6.3	5.8	D	240	0.36	0.16	EEEFK1C680P	(1)	1000
	100	6.3	5.8	D	240	0.36	0.16	EEEFK1C101P	(1)	1000
	150	6.3	7.7	D8	280	0.34	0.16	EEEFK1C151XP	(1)	900
	220	6.3	7.7	D8	280	0.34	0.16	EEEFK1C221XP	(1)	900
		8	6.2	E	300	0.26	0.16	EEEFK1C221P	(2)	1000
	330	8	10.2	F	600	0.16	0.16	EEEFK1C331P	(2)	500
	470	8	10.2	F	600	0.16	0.16	EEEFK1C471P	(2)	500
	680	10	10.2	G	850	0.08	0.16	EEEFK1C681P	(2)	500
	1500	12.5	13.5	H13	1100	0.06	0.16	EEVFK1C152Q	(3)	200
	3300	16	16.5	J16	1800	0.035	0.20	EEVFK1C332M	(3)	125
	4700	18	16.5	K16	2060	0.033	0.22	EEVFK1C472M	(3)	125
25	10	4	5.8	B	90	1.35	0.14	EEEFK1E100R	(1)	2000
	22	5	5.8	C	160	0.70	0.14	EEEFK1E220R	(1)	1000
	33	5	5.8	(C)	160	0.70	0.14	EEEFK1E330UR	(1)	1000
		6.3	5.8	D	240	0.36	0.14	EEEFK1E330P	(1)	1000
	47	6.3	5.8	D	240	0.36	0.14	EEEFK1E470P	(1)	1000
	68	6.3	5.8	D	240	0.36	0.14	EEEFK1E680P	(1)	1000
	100	6.3	7.7	D8	280	0.34	0.14	EEEFK1E101XP	(1)	900
		8	6.2	E	300	0.26	0.14	EEEFK1E101P	(2)	1000
	150	8	10.2	F	600	0.16	0.14	EEEFK1E151P	(2)	500
	220	8	10.2	F	600	0.16	0.14	EEEFK1E221P	(2)	500
	330	8	10.2	F	600	0.16	0.14	EEEFK1E331P	(2)	500
	470	10	10.2	G	850	0.08	0.14	EEEFK1E471P	(2)	500
	1000	12.5	13.5	H13	1100	0.06	0.14	EEVFK1E102Q	(3)	200
	1500	16	16.5	J16	1800	0.035	0.14	EEVFK1E152M	(3)	125
	2200	16	16.5	J16	1800	0.035	0.16	EEVFK1E222M	(3)	125
	3300	18	16.5	K16	2060	0.033	0.18	EEVFK1E332M	(3)	125

✻ Size code( ):Miniaturization product
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products

Endurance : 105 °C 2000 h (≥ φ12.5 : 5000 h)

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+105 °C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
35	4.7	4	5.8	B	90	1.35	0.12	EEEFK1V4R7R	(1)	2000
	10	4	5.8	(B)	90	1.35	0.12	EEEFK1V100UR	(1)	2000
		5	5.8	C	160	0.70	0.12	EEEFK1V100R	(1)	1000
	22	5	5.8	C	160	0.70	0.12	EEEFK1V220R	(1)	1000
	33	6.3	5.8	D	240	0.36	0.12	EEEFK1V330P	(1)	1000
	47	6.3	5.8	D	240	0.36	0.12	EEEFK1V470P	(1)	1000
	68	6.3	7.7	D8	280	0.34	0.12	EEEFK1V680XP	(1)	900
	100	6.3	7.7	D8	280	0.34	0.12	EEEFK1V101XP	(1)	900
		8	10.2	F	600	0.16	0.12	EEEFK1V101P	(2)	500
	150	8	10.2	F	600	0.16	0.12	EEEFK1V151P	(2)	500
	220	8	10.2	F	600	0.16	0.12	EEEFK1V221P	(2)	500
	330	10	10.2	G	850	0.08	0.12	EEEFK1V331P	(2)	500
	470	12.5	13.5	H13	1100	0.06	0.12	EEVFK1V471Q	(3)	200
	680	12.5	13.5	H13	1100	0.06	0.12	EEVFK1V681Q	(3)	200
	1000	16	16.5	J16	1800	0.035	0.12	EEVFK1V102M	(3)	125
	1500	16	16.5	J16	1800	0.035	0.12	EEVFK1V152M	(3)	125
50	4.7	4	5.8	B	60	2.90	0.10	EEEFK1H4R7R	(1)	2000
	10	5	5.8	(C)	85	1.52	0.10	EEEFK1H100UR	(1)	1000
		6.3	5.8	D	165	0.88	0.10	EEEFK1H100P	(1)	1000
	22	6.3	5.8	D	165	0.88	0.10	EEEFK1H220P	(1)	1000
	33	6.3	7.7	D8	195	0.68	0.10	EEEFK1H330XP	(1)	900
		8	6.2	E	195	0.68	0.10	EEEFK1H330P	(2)	1000
	47	6.3	7.7	D8	195	0.68	0.10	EEEFK1H470XP	(1)	900
		8	6.2	E	195	0.68	0.10	EEEFK1H470P	(2)	1000
	100	8	10.2	F	350	0.34	0.10	EEEFK1H101P	(2)	500
	150	10	10.2	G	670	0.18	0.10	EEEFK1H151P	(2)	500
	220	10	10.2	G	670	0.18	0.10	EEEFK1H221P	(2)	500
	330	12.5	13.5	H13	900	0.12	0.10	EEVFK1H331Q	(3)	200
	390	12.5	13.5	H13	900	0.12	0.10	EEVFK1H391Q	(3)	200
	470	16	16.5	J16	1610	0.073	0.10	EEVFK1H471M	(3)	125
	560	16	16.5	J16	1610	0.073	0.10	EEVFK1H561M	(3)	125
	680	16	16.5	J16	1610	0.073	0.10	EEVFK1H681M	(3)	125
	1000	16	16.5	J16	1610	0.073	0.10	EEVFK1H102M	(3)	125
63	4.7	5	5.8	C	50	3.00	0.08	EEEFK1J4R7R	(1)	1000
	10	6.3	5.8	D	80	1.50	0.08	EEEFK1J100P	(1)	1000
	22	6.3	7.7	D8	120	1.20	0.08	EEEFK1J220XP	(1)	900
		8	6.2	E	120	1.20	0.08	EEEFK1J220P	(2)	1000
	33	8	10.2	F	250	0.65	0.08	EEEFK1J330P	(2)	500
	47	8	10.2	F	250	0.65	0.08	EEEFK1J470P	(2)	500
	68	8	10.2	(F)	250	0.65	0.08	EEEFK1J680UP	(2)	500
	100	10	10.2	G	400	0.35	0.08	EEEFK1J101P	(2)	500
	150	12.5	13.5	H13	800	0.16	0.08	EEVFK1J151Q	(3)	200
	220	12.5	13.5	H13	800	0.16	0.08	EEVFK1J221Q	(3)	200
	470	16	16.5	J16	1410	0.082	0.08	EEVFK1J471M	(3)	125
	680	18	16.5	K16	1690	0.08	0.08	EEVFK1J681M	(3)	125
80	3.3	5	5.8	C	25	5.00	0.08	EEEFK1K3R3R	(1)	1000
	4.7	6.3	5.8	D	40	3.00	0.08	EEEFK1K4R7P	(1)	1000
	10	6.3	7.7	D8	60	2.40	0.08	EEEFK1K100XP	(1)	900
		8	6.2	E	60	2.40	0.08	EEEFK1K100P	(2)	1000
	22	8	10.2	F	130	1.30	0.08	EEEFK1K220P	(2)	500
	33	8	10.2	F	130	1.30	0.08	EEEFK1K330P	(2)	500
	47	10	10.2	G	200	0.70	0.08	EEEFK1K470P	(2)	500
	68	12.5	13.5	H13	500	0.32	0.08	EEVFK1K680Q	(3)	200
	100	12.5	13.5	H13	500	0.32	0.08	EEVFK1K101Q	(3)	200
	150	12.5	13.5	H13	500	0.32	0.08	EEVFK1K151Q	(3)	200
	330	16	16.5	J16	793	0.17	0.08	EEVFK1K331M	(3)	125
	470	18	16.5	K16	917	0.153	0.08	EEVFK1K471M	(3)	125

✻ Size code( ):Miniaturization product
· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".
· When requesting vibration-proof product, please put the last "V" instead to "P"

■ Standard Products

Endurance : 105 °C 2000 h (≧ φ12.5 : 5000 h)

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+105 °C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
100	22	8	10.2	F	130	1.30	0.07	EEEFK2A220P	(2)	500
	33	10	10.2	G	200	0.70	0.07	EEEFK2A330P	(2)	500
	47	12.5	13.5	H13	500	0.32	0.07	EEVFK2A470Q	(3)	200
	68	12.5	13.5	H13	500	0.32	0.07	EEVFK2A680Q	(3)	200
	100	16	16.5	J16	793	0.17	0.07	EEVFK2A101M	(3)	125
	150	16	16.5	J16	793	0.17	0.07	EEVFK2A151M	(3)	125
	220	18	16.5	K16	917	0.153	0.07	EEVFK2A221M	(3)	125
	330	18	16.5	K16	917	0.153	0.07	EEVFK2A331M	(3)	125

✻ Size code( ):Miniaturization product

· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

■ Endurace 5000 h Products

Endurance : 105 °C 5000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (100 kHz) (+105 °C)	Impedance (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
6.3	470	8	10.2	F	600	0.16	0.26	EEEFK0J471GP	(2)	500
	1000	8	10.2	F	600	0.16	0.26	EEEFK0J102GP	(2)	500
	1500	10	10.2	G	850	0.08	0.26	EEEFK0J152GP	(2)	500
10	330	8	10.2	F	600	0.16	0.19	EEEFK1A331GP	(2)	500
	470	8	10.2	F	600	0.16	0.19	EEEFK1A471GP	(2)	500
	680	8	10.2	F	600	0.16	0.19	EEEFK1A681GP	(2)	500
	1000	10	10.2	G	850	0.08	0.19	EEEFK1A102GP	(2)	500
16	330	8	10.2	F	600	0.16	0.16	EEEFK1C331GP	(2)	500
	470	8	10.2	F	600	0.16	0.16	EEEFK1C471GP	(2)	500
	680	10	10.2	G	850	0.08	0.16	EEEFK1C681GP	(2)	500
25	150	8	10.2	F	600	0.16	0.14	EEEFK1E151GP	(2)	500
	220	8	10.2	F	600	0.16	0.14	EEEFK1E221GP	(2)	500
	330	8	10.2	F	600	0.16	0.14	EEEFK1E331GP	(2)	500
	470	10	10.2	G	850	0.08	0.14	EEEFK1E471GP	(2)	500
35	100	8	10.2	F	600	0.16	0.12	EEEFK1V101GP	(2)	500
	150	8	10.2	F	600	0.16	0.12	EEEFK1V151GP	(2)	500
	220	8	10.2	F	600	0.16	0.12	EEEFK1V221GP	(2)	500
	330	10	10.2	G	850	0.08	0.12	EEEFK1V331GP	(2)	500
50	100	8	10.2	F	350	0.34	0.10	EEEFK1H101GP	(2)	500
	150	10	10.2	G	670	0.18	0.10	EEEFK1H151GP	(2)	500
	220	10	10.2	G	670	0.18	0.10	EEEFK1H221GP	(2)	500

· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

· When requesting vibration-proof product, please put the last "V" instead to "P"

Surface Mount Type

Series: **FT** Type: **V**

High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Endurance: 2000 h at 105 °C
- Miniaturized, Low ESR (1 size smaller than series FK)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	–55 °C to +105 °C	
Rated W.V.Range	6.3 V.DC to 50 V.DC	
Nominal Cap.Range	10 µF to 2200 µF	
Capacitance Tolerance	±20 % (120 Hz/+20 °C)	
DC Leakage Current	I ≦ 0.01 CV After 2 minutes	
tan δ	Please see the attached High temperature lead-free reflow products list.	
Endurance	After applying rated working voltage for 2000 hours at +105 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.	
	Capacitance change	±30 % of initial measured value
	tan δ	≦ 200 % of initial specified value
	DC leakage current	≦ initial specified value
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)	
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitor shall meet the following limits.	
	Capacitance change	±10 % of initial measured value
	tan δ	≦ initial specified value
	DC leakage current	≦ initial specified value

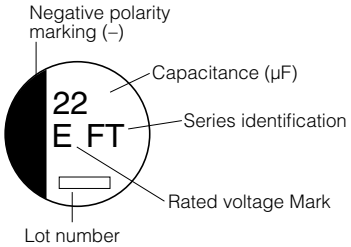
■ Frequency correction factor for ripple current

Cap (µF)	Frequency (Hz)			
	120	1 k	10 k	100 k to
10 to 470	0.65	0.85	0.95	1.00
560 to 2200	0.70	0.90	0.95	1.00

■ Marking

Example:25 V 22 µF

Marking color : BLACK

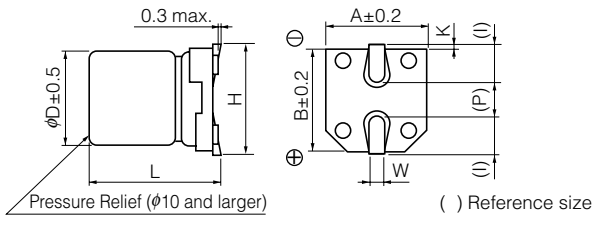


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.3	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.3	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

■ High temperature Lead-Free reflow Products

Endurance : 105 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+105 °C)	ESR (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
6.3	100	4	5.8	B	160	0.85	0.26	EEEFT0J101AR	(5)	2000
	220	5	5.8	C	240	0.36	0.26	EEEFT0J221AR	(5)	1000
	330	6.3	5.8	D	300	0.26	0.26	EEEFT0J331AP	(5)	1000
	470	6.3	7.7	D8	600	0.16	0.26	EEEFTJ471XAP	(5)	900
	680	6.3	7.7	D8	600	0.16	0.26	EEEFTJ681XAP	(5)	900
	1500	8	10.2	F	850	0.08	0.26	EEEFT0J152AP	(6)	500
	2200	10	10.2	G	1190	0.06	0.28	EEEFT0J222AP	(6)	500
10	68	4	5.8	B	160	0.85	0.19	EEEFT1A680AR	(5)	2000
	150	5	5.8	C	240	0.36	0.19	EEEFT1A151AR	(5)	1000
	220	6.3	5.8	D	300	0.26	0.19	EEEFT1A221AP	(5)	1000
	330	6.3	7.7	D8	600	0.16	0.19	EEEFTA331XAP	(5)	900
	470	6.3	7.7	D8	600	0.16	0.19	EEEFTA471XAP	(5)	900
	1000	8	10.2	F	850	0.08	0.19	EEEFT1A102AP	(6)	500
	1500	10	10.2	G	1190	0.06	0.19	EEEFT1A152AP	(6)	500
16	47	4	5.8	B	160	0.85	0.16	EEEFT1C470AR	(5)	2000
	68	5	5.8	C	240	0.36	0.16	EEEFT1C680AR	(5)	1000
	100	5	5.8	C	240	0.36	0.16	EEEFT1C101AR	(5)	1000
	150	6.3	5.8	D	300	0.26	0.16	EEEFT1C151AP	(5)	1000
	220	6.3	5.8	D	300	0.26	0.16	EEEFT1C221AP	(5)	1000
	330	6.3	7.7	D8	600	0.16	0.16	EEEFTC331XAP	(5)	900
	680	8	10.2	F	850	0.08	0.16	EEEFT1C681AP	(6)	500
	1000	10	10.2	G	1190	0.06	0.16	EEEFT1C102AP	(6)	500
25	22	4	5.8	B	160	0.85	0.14	EEEFT1E220AR	(5)	2000
	33	4	5.8	B	160	0.85	0.14	EEEFT1E330AR	(5)	2000
	47	5	5.8	C	240	0.36	0.14	EEEFT1E470AR	(5)	1000
	68	5	5.8	C	240	0.36	0.14	EEEFT1E680AR	(5)	1000
	100	6.3	5.8	D	300	0.26	0.14	EEEFT1E101AP	(5)	1000
	150	6.3	7.7	D8	600	0.16	0.14	EEEFTE151XAP	(5)	900
	220	6.3	7.7	D8	600	0.16	0.14	EEEFTE221XAP	(5)	900
	470	8	10.2	F	850	0.08	0.14	EEEFT1E471AP	(6)	500
	820	10	10.2	G	1190	0.06	0.14	EEEFT1E821AP	(6)	500
35	22	4	5.8	B	160	0.85	0.12	EEEFT1V220AR	(5)	2000
	33	5	5.8	C	240	0.36	0.12	EEEFT1V330AR	(5)	1000
	47	5	5.8	C	240	0.36	0.12	EEEFT1V470AR	(5)	1000
	68	6.3	5.8	D	300	0.26	0.12	EEEFT1V680AP	(5)	1000
	100	6.3	5.8	D	300	0.26	0.12	EEEFT1V101AP	(5)	1000
	150	6.3	7.7	D8	600	0.16	0.12	EEEFTV151XAP	(5)	900
	330	8	10.2	F	850	0.08	0.12	EEEFT1V331AP	(6)	500
	560	10	10.2	G	1190	0.06	0.12	EEEFT1V561AP	(6)	500
50	10	4	5.8	(B)	85	2.30	0.10	EEEFTH100UAR	(5)	2000
		5	5.8	C	165	0.88	0.10	EEEFT1H100AR	(5)	1000
	22	5	5.8	C	165	0.88	0.10	EEEFT1H220AR	(5)	1000
	47	6.3	5.8	D	195	0.68	0.10	EEEFT1H470AP	(5)	1000
	100	6.3	7.7	D8	350	0.34	0.10	EEEFTH101XAP	(5)	900
	220	8	10.2	F	670	0.18	0.10	EEEFT1H221AP	(6)	500
	330	10	10.2	G	900	0.12	0.10	EEEFT1H331AP	(6)	500

✻ Size code( ):Miniaturization product

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V, 1H→H

· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

Surface Mount Type

Series: **FP** Type: **V**

FP High temperature Lead-Free reflow (suffix:A✻)

■ Features

- Low ESR (30 % to 50 % less than FK series)
- Endurance: 2000 h at 105 °C
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	−55 °C to +105 °C							
Rated W.V. Range	6.3 V.DC to 50 V.DC							
Nominal Cap. Range	10 µF to 1800 µF							
Capacitance Tolerance	±20 % (120 Hz/+20 °C)							
DC Leakage Current	I ≦ 0.01 CV or 3 (µA) After 2 minutes (whichever is greater)							
tan δ	Please see the attached standard products list							
Characteristics at Low Temperature	W.V. (V)	6.3	10	16	25	35	50	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	2	2	2	2	2	2	
	Z(−40°C)/Z(+20 °C)	3	3	3	3	3	3	
	Z(−55°C)/Z(+20 °C)	4	4	4	3	3	3	
Endurance	After applying rated working voltage at +105 °C ±2 °C for 2000 hours the capacitors shall meet the limits specified below. Post-test requirement at +20 °C							
	Capacitance change	±30 % of initial measured value						
	tan δ	≦ 200 % of initial specified value						
	DC leakege current	≦ initial specified value						
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)							
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.							
	Capacitance change	±10 % of initial measured value						
	tan δ	≦ initial specified value						
	DC leakage current	≦ initial specified value						

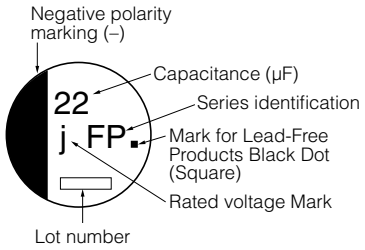
■ Frequency correction factor for ripple current

Cap (µF)	Frequency (Hz)			
	120	1 k	10 k	100 k to
10 to 470	0.65	0.85	0.95	1.00
560 to 1800	0.75	0.90	0.95	1.00

■ Marking

Example:6.3 V 22 µF

Marking color: BLACK

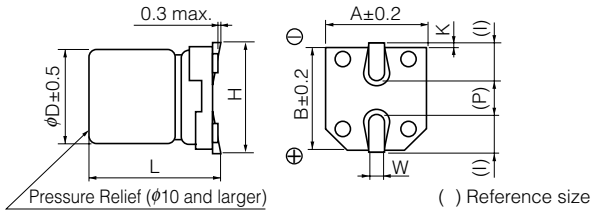


Rated Voltage Mark

j	6.3 V	E	25 V
A	10 V	V	35 V
C	16 V	H	50 V

■ Dimensions in mm(not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
B	4.0	5.8±0.30	4.3	5.5 max.	1.8	0.65±0.1	1.0	$0.35^{+0.15}_{-0.20}$
C	5.0	5.8±0.30	5.3	6.5 max.	2.2	0.65±0.1	1.5	$0.35^{+0.15}_{-0.20}$
D	6.3	5.8±0.30	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
D8	6.3	7.7±0.30	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
E	8.0	6.2±0.30	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.30	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.30	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

01 Mar. 2014

■ Standard Products

Endurance : 105 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+105 °C)	E.S.R. (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
6.3	22	4	5.8	B	160	0.85	0.26	EEEFP0J220AR	(5)	2000
	47	4	5.8	(B)	160	0.85	0.26	EEEFPJ470UAR	(5)	2000
		5	5.8	C	240	0.36	0.26	EEEFP0J470AR	(5)	1000
	100	5	5.8	(C)	240	0.36	0.26	EEEFPJ101UAR	(5)	1000
		6.3	5.8	D	300	0.26	0.26	EEEFP0J101AP	(5)	1000
	220	6.3	5.8	D	300	0.26	0.26	EEEFP0J221AP	(5)	1000
	330	6.3	7.7	D8	600	0.16	0.26	EEEFPJ331XAP	(5)	900
		8	6.2	E	500	0.18	0.26	EEEFP0J331AP	(6)	1000
	470	8	10.2	F	850	0.08	0.26	EEEFP0J471AP	(6)	500
	1000	8	10.2	F	850	0.08	0.26	EEEFP0J102AP	(6)	500
	1500	10	10.2	G	1190	0.06	0.26	EEEFP0J152AP	(6)	500
	1800	10	10.2	(G)	850	0.08	0.26	EEEFPJ182UAP	(6)	500
10	22	4	5.8	B	160	0.85	0.19	EEEFP1A220AR	(5)	2000
	33	4	5.8	(B)	160	0.85	0.19	EEEFPA330UAR	(5)	2000
		5	5.8	C	240	0.36	0.19	EEEFP1A330AR	(5)	1000
	150	6.3	5.8	D	300	0.26	0.19	EEEFP1A151AP	(5)	1000
	220	6.3	7.7	D8	600	0.16	0.19	EEEFPA221XAP	(5)	900
		8	6.2	E	500	0.18	0.19	EEEFP1A221AP	(6)	1000
	330	8	10.2	F	850	0.08	0.19	EEEFP1A331AP	(6)	500
	470	8	10.2	F	850	0.08	0.19	EEEFP1A471AP	(6)	500
	680	8	10.2	F	850	0.08	0.19	EEEFP1A681AP	(6)	500
	1000	10	10.2	G	1190	0.06	0.19	EEEFP1A102AP	(6)	500
	1200	10	10.2	(G)	850	0.08	0.19	EEEFPA122UAP	(6)	500
16	10	4	5.8	B	160	0.85	0.16	EEEFP1C100AR	(5)	2000
	22	4	5.8	(B)	160	0.85	0.16	EEEFPC220UAR	(5)	2000
		5	5.8	C	240	0.36	0.16	EEEFP1C220AR	(5)	1000
	47	5	5.8	(C)	240	0.36	0.16	EEEFPC470UAR	(5)	1000
		6.3	5.8	D	300	0.26	0.16	EEEFP1C470AP	(5)	1000
	68	6.3	5.8	D	300	0.26	0.16	EEEFP1C680AP	(5)	1000
	100	6.3	5.8	D	300	0.26	0.16	EEEFP1C101AP	(5)	1000
		6.3	7.7	D8	600	0.16	0.16	EEEFPC101XAP	(5)	900
	150	6.3	7.7	D8	600	0.16	0.16	EEEFPC151XAP	(5)	900
	220	6.3	7.7	D8	600	0.16	0.16	EEEFPC221XAP	(5)	900
		8	6.2	E	500	0.18	0.16	EEEFP1C221AP	(6)	1000
	330	8	10.2	F	850	0.08	0.16	EEEFP1C331AP	(6)	500
	470	8	10.2	F	850	0.08	0.16	EEEFP1C471AP	(6)	500
	680	10	10.2	G	1190	0.06	0.16	EEEFP1C681AP	(6)	500
	820	10	10.2	(G)	850	0.08	0.16	EEEFPC821UAP	(6)	500
25	10	4	5.8	B	160	0.85	0.14	EEEFP1E100AR	(5)	2000
	22	5	5.8	C	240	0.36	0.14	EEEFP1E220AR	(5)	1000
	33	5	5.8	(C)	240	0.36	0.14	EEEFPE330UAR	(5)	1000
		6.3	5.8	D	300	0.26	0.14	EEEFP1E330AP	(5)	1000
	47	6.3	5.8	D	300	0.26	0.14	EEEFP1E470AP	(5)	1000
	68	6.3	5.8	D	300	0.26	0.14	EEEFP1E680AP	(5)	1000
	100	6.3	7.7	D8	600	0.16	0.14	EEEFPE101XAP	(5)	900
		8	6.2	E	500	0.18	0.14	EEEFP1E101AP	(6)	1000
	150	8	10.2	F	850	0.08	0.14	EEEFP1E151AP	(6)	500
	220	8	10.2	F	850	0.08	0.14	EEEFP1E221AP	(6)	500
	330	8	10.2	F	850	0.08	0.14	EEEFP1E331AP	(6)	500
	470	10	10.2	G	1190	0.06	0.14	EEEFP1E471AP	(6)	500
	560	10	10.2	(G)	850	0.08	0.14	EEEFPE561UAP	(6)	500

✻ Size code( ):Miniaturization product

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P”

■ Standard Products

Endurance : 105 °C 2000 h

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (100 kHz) (+105 °C) (mA r.m.s.)	E.S.R. (100 kHz) (+20 °C) (Ω)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
35	10	4	5.8	(B)	160	0.85	0.12	EEEFPV100UAR	(5)	2000
	22	5	5.8	C	240	0.36	0.12	EEEFP1V220AR	(5)	1000
	33	6.3	5.8	D	300	0.26	0.12	EEEFP1V330AP	(5)	1000
	47	6.3	5.8	D	300	0.26	0.12	EEEFP1V470AP	(5)	1000
	68	6.3	7.7	D8	600	0.16	0.12	EEEFPV680XAP	(5)	900
	100	6.3	7.7	D8	600	0.16	0.12	EEEFPV101XAP	(5)	900
		8	10.2	F	850	0.08	0.12	EEEFP1V101AP	(6)	500
	150	8	10.2	F	850	0.08	0.12	EEEFP1V151AP	(6)	500
	220	8	10.2	F	850	0.08	0.12	EEEFP1V221AP	(6)	500
	330	10	10.2	G	1190	0.06	0.12	EEEFP1V331AP	(6)	500
	390	10	10.2	(G)	850	0.08	0.12	EEEFPV391UAP	(6)	500
50	100	8	10.2	F	670	0.18	0.10	EEEFP1H101AP	(6)	500
	220	10	10.2	G	900	0.12	0.10	EEEFP1H221AP	(6)	500

✻ Size code( ):Miniaturization product
If Part number exceeds 12 digits, voltage code is abbreviated as follows; 0J→J, 1A→A, 1C→C, 1E→E, 1V→V
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **TG** Type: **V**

■ Features

- Endurance:125 °C 1000 h to 2000 h
- Miniaturization (40 % less than TA Series)
- Low ESR (Low temp)
- Vibration-proof product is available upon request. (φ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant (Parts No φ8 to φ10 : EEE✻, φ12.5 to φ18 : EEV✻)

■ Specifications

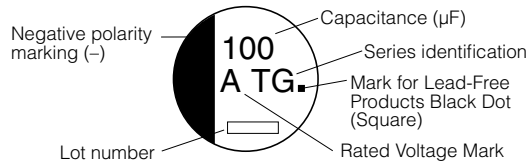
Category Temp. Range	−40 °C to +125 °C									
Rated W.V. Range	10 V.DC to 100 V.DC									
Nominal Cap. Range	10 μF to 4700 μF									
Capacitance Tolerance	±20 % (120 Hz/+20 °C)									
DC Leakage Current	I ≦ 0.01 CV After 2 minutes									
tan δ	Please see the attached standard products list									
Characteristics at Low Temperature	W.V. (V)	10	16	25	35	50	63	80	100	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	3	2	2	2	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	6	4	4	3	3	3	3	3	
Endurance	After applying rated working voltage for 1000 hours (φ8×6.2), 2000 hours (φ8×10.2≦) at +125 °C±2 °C and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±30 % of initial measured value (code U : ±35 %)								
	tan δ	≦ 300 % of initial specified value (code U : ±350 %)								
	DC leakage current	≦ initial specified value								
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance (With voltage treatment)									
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±10 % of initial measured value								
	tan δ	≦ initial specified value								
	DC leakage current	≦ initial specified value								

■ Frequency correction factor for ripple current

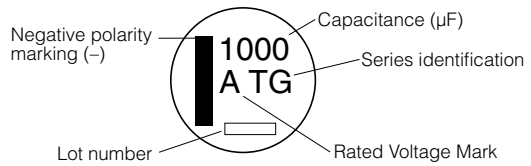
	Frequency (Hz)			
	120	1 k	10 k	100 k to
Correction factor	0.65	0.85	0.95	1.00

■ Marking

Example : 10 V 100 μF, 10 V 1000 μF
Marking coloc : BLACK
Lead-Free products (≦ φ10)



Lead-Free products (≧ φ12.5)

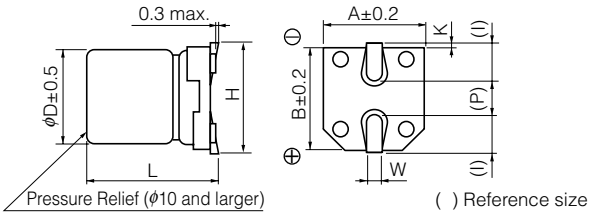


Rated Voltage Mark

A	10 V	H	50 V
C	16 V	J	63 V
E	25 V	K	80 V
V	35 V	2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
E	8.0	6.2±0.3	8.3	9.5 max.	3.4	0.65±0.1	2.2	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.20
H13	12.5	13.5±0.5	13.5	15.0 max.	4.7	0.90±0.3	4.4	0.70±0.30
J16	16.0	16.5±0.5	17.0	19.0 max.	5.5	1.20±0.3	6.7	0.70±0.30
K16	18.0	16.5±0.5	19.0	21.0 max.	6.7	1.20±0.3	6.7	0.70±0.30

✻ This product qualify for AEC-Q200, but it has some deviations.

■ Standard Products

Endurance : 125 °C 1000 h (ϕ8×10.2 ≦ : 2000 h)

W.V. (V)	Cap. (±20 %) (μF)	Case size Dia. (mm)	Length (mm)	✻Size Code	Specification Ripple Current (100 kHz) (+125 °C) (mA r.m.s.)	ESR (100 kHz) (+20 °C) (Ω)	tan δ (120 Hz) (+20 °C)	Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty Taping (pcs)
10	100	8	6.2	E	100	1.00	0.30	EEETG1A101P	(2)	1000
	220	8	6.2	(E)	100	1.00	0.30	EEETG1A221UP	(2)	1000
		8	10.2	F	197	0.50	0.30	EEETG1A221P	(2)	500
	330	8	10.2	(F)	197	0.50	0.30	EEETG1A331UP	(2)	500
		10	10.2	G	270	0.30	0.30	EEETG1A331P	(2)	500
	470	10	10.2	(G)	270	0.30	0.30	EEETG1A471UP	(2)	500
	1000	12.5	13.5	H13	800	0.12	0.30	EEVTG1A102Q	(3)	200
	1500	12.5	13.5	(H13)	800	0.12	0.30	EEVTG1A152UQ	(3)	200
	2200	16	16.5	J16	1100	0.08	0.32	EEVTG1A222M	(3)	125
	3300	16	16.5	(J16)	1100	0.08	0.34	EEVTG1A332UM	(3)	125
		18	16.5	K16	1300	0.075	0.34	EEVTG1A332M	(3)	125
	4700	18	16.5	K16	1300	0.075	0.36	EEVTG1A472M	(3)	125
16	100	8	10.2	F	197	0.50	0.23	EEETG1C101P	(2)	500
	220	8	10.2	(F)	197	0.50	0.23	EEETG1C221UP	(2)	500
		10	10.2	G	270	0.30	0.23	EEETG1C221P	(2)	500
	330	10	10.2	(G)	270	0.30	0.23	EEETG1C331UP	(2)	500
		12.5	13.5	H13	800	0.12	0.23	EEVTG1C331Q	(3)	200
	470	12.5	13.5	H13	800	0.12	0.23	EEVTG1C471Q	(3)	200
	680	12.5	13.5	H13	800	0.12	0.23	EEVTG1C681Q	(3)	200
	1000	12.5	13.5	(H13)	800	0.12	0.23	EEVTG1C102UQ	(3)	200
		16	16.5	J16	1100	0.08	0.23	EEVTG1C102M	(3)	125
	2200	16	16.5	(J16)	1100	0.08	0.25	EEVTG1C222UM	(3)	125
		18	16.5	K16	1300	0.075	0.25	EEVTG1C222M	(3)	125
	3300	18	16.5	K16	1300	0.075	0.27	EEVTG1C332M	(3)	125
25	47	8	6.2	E	100	1.00	0.18	EEETG1E470P	(2)	1000
	100	8	6.2	(E)	100	1.00	0.18	EEETG1E101UP	(2)	1000
		8	10.2	F	197	0.50	0.18	EEETG1E101P	(2)	500
	220	8	10.2	(F)	197	0.50	0.18	EEETG1E221UP	(2)	500
		10	10.2	G	270	0.30	0.18	EEETG1E221P	(2)	500
	330	10	10.2	(G)	270	0.30	0.18	EEETG1E331UP	(2)	500
		12.5	13.5	H13	800	0.12	0.18	EEVTG1E331Q	(3)	200
	470	12.5	13.5	H13	800	0.12	0.18	EEVTG1E471Q	(3)	200
	680	12.5	13.5	(H13)	800	0.12	0.18	EEVTG1E681UQ	(3)	200
		16	16.5	J16	1100	0.08	0.18	EEVTG1E681M	(3)	125
	1000	16	16.5	(J16)	1100	0.08	0.18	EEVTG1E102UM	(3)	125
		18	16.5	K16	1300	0.075	0.18	EEVTG1E102M	(3)	125
	2200	18	16.5	K16	1300	0.075	0.20	EEVTG1E222M	(3)	125
35	33	8	6.2	E	100	1.00	0.16	EEETG1V330P	(2)	1000
	47	8	6.2	(E)	100	1.00	0.16	EEETG1V470UP	(2)	1000
		8	10.2	F	197	0.50	0.16	EEETG1V470P	(2)	500
	100	8	10.2	(F)	197	0.50	0.16	EEETG1V101UP	(2)	500
		10	10.2	G	270	0.30	0.16	EEETG1V101P	(2)	500
	220	10	10.2	(G)	270	0.30	0.16	EEETG1V221UP	(2)	500
	330	12.5	13.5	H13	800	0.12	0.16	EEVTG1V331Q	(3)	200
35	470	12.5	13.5	(H13)	800	0.12	0.16	EEVTG1V471UQ	(3)	200
		16	16.5	J16	1100	0.08	0.16	EEVTG1V471M	(3)	125
	680	16	16.5	(J16)	1100	0.08	0.16	EEVTG1V681UM	(3)	125
		18	16.5	K16	1300	0.075	0.16	EEVTG1V681M	(3)	125
	1000	18	16.5	K16	1300	0.075	0.16	EEVTG1V102M	(3)	125

✻Size code( ):Miniaturization product

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “P, Q, or M”

■ Standard Products

Endurance : 125 °C 1000 h (φ8×10.2 ≦ : 2000 h)

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	✻Size Code	Ripple Current (100 kHz) (+125 °C) (mA r.m.s.)	ESR (100 kHz) (+20 °C) (Ω)	tan δ (120 Hz) (+20 °C)			Taping (pcs)
50	10	8	6.2	E	80	1.60	0.14	EEETG1H100P	(2)	1000
	22	8	6.2	E	80	1.60	0.14	EEETG1H220P	(2)	1000
	33	8	6.2	(E)	80	1.60	0.14	EEETG1H330UP	(2)	1000
		8	10.2	F	133	0.75	0.14	EEETG1H330P	(2)	500
	47	8	10.2	(F)	133	0.75	0.14	EEETG1H470UP	(2)	500
		10	10.2	G	221	0.50	0.14	EEETG1H470P	(2)	500
	100	10	10.2	(G)	221	0.50	0.14	EEETG1H101UP	(2)	500
	220	12.5	13.5	H13	600	0.23	0.14	EEVTG1H221Q	(3)	200
	330	12.5	13.5	H13	600	0.23	0.14	EEVTG1H331Q	(3)	200
	470	16	16.5	J16	900	0.15	0.14	EEVTG1H471M	(3)	125
	680	16	16.5	(J16)	900	0.15	0.14	EEVTG1H681UM	(3)	125
		18	16.5	K16	950	0.14	0.14	EEVTG1H681M	(3)	125
	1000	18	16.5	K16	950	0.14	0.14	EEVTG1H102M	(3)	125
63	10	8	6.2	E	55	2.20	0.12	EEETG1J100P	(2)	1000
	22	8	10.2	F	100	1.00	0.12	EEETG1J220P	(2)	500
	33	8	10.2	(F)	100	1.00	0.12	EEETG1J330UP	(2)	500
		10	10.2	G	150	0.80	0.12	EEETG1J330P	(2)	500
	47	8	10.2	(F)	100	1.00	0.12	EEETG1J470UP	(2)	500
		10	10.2	G	150	0.80	0.12	EEETG1J470P	(2)	500
	100	10	10.2	(G)	150	0.80	0.12	EEETG1J101UP	(2)	500
		12.5	13.5	H13	350	0.26	0.12	EEVTG1J101Q	(3)	200
	220	12.5	13.5	H13	350	0.26	0.12	EEVTG1J221Q	(3)	200
	330	16	16.5	J16	500	0.18	0.12	EEVTG1J331M	(3)	125
	470	16	16.5	J16	500	0.18	0.12	EEVTG1J471M	(3)	125
80	10	8	10.2	F	70	1.30	0.12	EEETG1K100P	(2)	500
	22	8	10.2	(F)	70	1.30	0.12	EEETG1K220UP	(2)	500
		10	10.2	G	90	1.00	0.12	EEETG1K220P	(2)	500
	33	8	10.2	(F)	70	1.30	0.12	EEETG1K330UP	(2)	500
		10	10.2	G	90	1.00	0.12	EEETG1K330P	(2)	500
	47	10	10.2	(G)	90	1.00	0.12	EEETG1K470UP	(2)	500
		12.5	13.5	H13	250	0.42	0.12	EEVTG1K470Q	(3)	200
	100	12.5	13.5	(H13)	250	0.42	0.12	EEVTG1K101UQ	(3)	200
		16	16.5	J16	350	0.30	0.12	EEVTG1K101M	(3)	125
	220	16	16.5	(J16)	350	0.30	0.12	EEVTG1K221UM	(3)	125
		18	16.5	K16	400	0.28	0.12	EEVTG1K221M	(3)	125
	330	16	16.5	(J16)	350	0.30	0.12	EEVTG1K331UM	(3)	125
		18	16.5	K16	400	0.28	0.12	EEVTG1K331M	(3)	125
	470	18	16.5	K16	400	0.28	0.12	EEVTG1K471M	(3)	125
100	10	8	10.2	F	70	1.30	0.10	EEETG2A100P	(2)	500
	22	8	10.2	(F)	70	1.30	0.10	EEETG2A220UP	(2)	500
		10	10.2	G	90	1.00	0.10	EEETG2A220P	(2)	500
	33	10	10.2	G	90	1.00	0.10	EEETG2A330P	(2)	500
	47	12.5	13.5	H13	250	0.42	0.10	EEVTG2A470Q	(3)	200
	100	16	16.5	J16	350	0.30	0.10	EEVTG2A101M	(3)	125
	220	18	16.5	K16	400	0.28	0.10	EEVTG2A221M	(3)	125
	330	18	16.5	K16	400	0.28	0.10	EEVTG2A331M	(3)	125

✻Size code( ):Miniaturization product

· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".

· When requesting vibration-proof product, please put the last "V" instead to "P, Q, or M"

Surface Mount Type

Series: Medium-size **TK** Type: **V**

TK High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Endurance: 2000 h at 125 °C
- Vibration-proof product is available upon request.
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

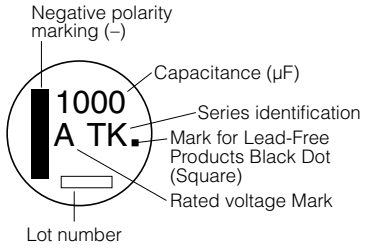
Category Temp. Range	−40 °C to +125 °C									
Rated W.V. Range	10 V.DC to 100 V.DC									
Nominal Cap. Range	47 µF to 4700 µF									
Capacitance Tolerance	±20 % (120 Hz/+20 °C)									
DC Leakage Current	I ≦ 0.01 CV After 2 minutes									
tan δ	Please see the attached High temperature lead-free reflow products list.									
Characteristics at Low Temperature	W.V. (V)	10	16	25	35	50	63	80	100	(Impedance ratio at 120 Hz)
	Z(−25 °C)/Z(+20 °C)	3	2	2	2	2	2	2	2	
	Z(−40 °C)/Z(+20 °C)	6	4	4	3	3	3	3	3	
Endurance	After applying rated working voltage for 2000 hours at +125 °C±2 °C and then being stabilized at +20 °C, Capacitors shall meet the following limits.									
	Capacitance change	±30 % of initial measured value (Miniaturization product : Within ±35 %)								
	tan δ	≦ 300 % of initial specified value (Miniaturization product : Within 350 %)								
	DC leakage current	≦ initial specified value								
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance.(With voltage treatment)									
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.									
	Capacitance change	±10 % of initial measured value								
	tan δ	≦ initial specified value								
	DC leakage current	≦ initial specified value								

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	120	1 k	10 k	100 k to
Correction factor	0.75	0.90	0.95	1.00

■ Marking

Example:10 V 1000 µF
Marking color: BLACK

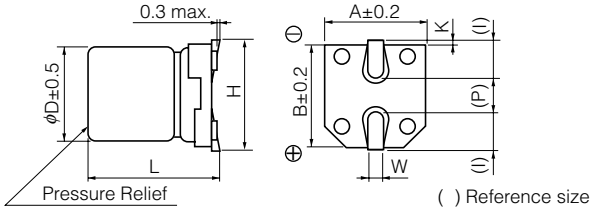


Rated Voltage Mark

A	10 V	H	50 V
C	16 V	J	63 V
E	25 V	K	80 V
V	35 V	2A	100 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
H13	12.5	13.5±0.5	13.5	15.0 max.	4.7	0.90±0.3	4.4	0.70±0.3
J16	16.0	16.5±0.5	17.0	19.0 max.	5.5	1.20±0.3	6.7	0.70±0.3
K16	18.0	16.5±0.5	19.0	21.0 max.	6.7	1.20±0.3	6.7	0.70±0.3

✻ This product qualify for AEC-Q200, but it has some deviations.

■ High temperature Lead-Free reflow Products

Endurance : 125 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification				Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+125 °C)	ESR (100 kHz) (Ω)		tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	+20 °C	−40 °C				(pcs)
10	1000	12.5	13.5	H13	800	0.120	1.80	0.30	EEETK1A102AQ	(9)	200
	1500	12.5	13.5	(H13)	800	0.120	1.80	0.30	EEETKA152UAQ	(9)	200
	2200	16	16.5	J16	1100	0.080	1.20	0.32	EEETK1A222AM	(9)	125
	3300	16	16.5	(J16)	1100	0.080	1.20	0.34	EEETKA332UAM	(9)	125
		18	16.5	K16	1300	0.075	1.10	0.36	EEETK1A332AM	(9)	125
	4700	18	16.5	K16	1300	0.075	1.10	0.38	EEETK1A472AM	(9)	125
16	330	12.5	13.5	H13	800	0.120	1.80	0.23	EEETK1C331AQ	(9)	200
	470	12.5	13.5	H13	800	0.120	1.80	0.23	EEETK1C471AQ	(9)	200
	680	12.5	13.5	H13	800	0.120	1.80	0.23	EEETK1C681AQ	(9)	200
	1000	12.5	13.5	(H13)	800	0.120	1.80	0.23	EEETKC102UAQ	(9)	200
		16	16.5	J16	1100	0.080	1.20	0.25	EEETK1C102AM	(9)	125
	2200	16	16.5	(J16)	1100	0.080	1.20	0.27	EEETKC222UAM	(9)	125
		18	16.5	K16	1300	0.075	1.10	0.27	EEETK1C222AM	(9)	125
	3300	18	16.5	K16	1300	0.075	1.10	0.29	EEETK1C332AM	(9)	125
25	330	12.5	13.5	H13	800	0.120	1.80	0.18	EEETK1E331AQ	(9)	200
	470	12.5	13.5	H13	800	0.120	1.80	0.18	EEETK1E471AQ	(9)	200
	680	12.5	13.5	(H13)	800	0.120	1.80	0.18	EEETKE681UAQ	(9)	200
		16	16.5	J16	1100	0.080	1.20	0.18	EEETK1E681AM	(9)	125
	1000	16	16.5	(J16)	1100	0.080	1.20	0.18	EEETKE102UAM	(9)	125
		18	16.5	K16	1300	0.075	1.10	0.18	EEETK1E102AM	(9)	125
	2200	18	16.5	K16	1300	0.075	1.10	0.20	EEETK1E222AM	(9)	125
35	330	12.5	13.5	H13	800	0.120	1.80	0.16	EEETK1V331AQ	(9)	200
	470	12.5	13.5	(H13)	800	0.120	1.80	0.16	EEETKV471UAQ	(9)	200
		16	16.5	J16	1100	0.080	1.20	0.16	EEETK1V471AM	(9)	125
	680	16	16.5	(J16)	1100	0.080	1.20	0.16	EEETKV681UAM	(9)	125
		18	16.5	K16	1300	0.075	1.10	0.16	EEETK1V681AM	(9)	125
	1000	18	16.5	K16	1300	0.075	1.10	0.16	EEETK1V102AM	(9)	125
50	220	12.5	13.5	H13	600	0.230	3.40	0.14	EEETK1H221AQ	(10)	200
	330	12.5	13.5	H13	600	0.230	3.40	0.14	EEETK1H331AQ	(10)	200
	470	16	16.5	J16	900	0.150	2.20	0.14	EEETK1H471AM	(10)	125
	680	16	16.5	(J16)	900	0.150	2.20	0.14	EEETKH681UAM	(10)	125
		18	16.5	K16	950	0.140	2.10	0.14	EEETK1H681AM	(10)	125
	1000	18	16.5	K16	950	0.140	2.10	0.14	EEETK1H102AM	(10)	125
63	100	12.5	13.5	H13	350	0.260	5.20	0.12	EEETK1J101AQ	(11)	200
	220	12.5	13.5	H13	350	0.260	5.20	0.12	EEETK1J221AQ	(11)	200
	330	16	16.5	J16	500	0.180	3.60	0.12	EEETK1J331AM	(11)	125
	470	16	16.5	J16	500	0.180	3.60	0.12	EEETK1J471AM	(11)	125
80	47	12.5	13.5	H13	250	0.420	8.40	0.12	EEETK1K470AQ	(11)	200
	100	12.5	13.5	(H13)	250	0.420	8.40	0.12	EEETKK101UAQ	(11)	200
		16	16.5	J16	350	0.300	6.00	0.12	EEETK1K101AM	(11)	125
	220	16	16.5	(J16)	350	0.300	6.00	0.12	EEETKK221UAM	(11)	125
		18	16.5	K16	400	0.280	5.60	0.12	EEETK1K221AM	(11)	125
	330	16	16.5	(J16)	350	0.300	6.00	0.12	EEETKK331UAM	(11)	125
		18	16.5	K16	400	0.280	5.60	0.12	EEETK1K331AM	(11)	125
	470	18	16.5	K16	400	0.280	5.60	0.12	EEETK1K471AM	(11)	125
100	47	12.5	13.5	H13	250	0.420	8.40	0.10	EEETK2A470AQ	(11)	200
	100	16	16.5	J16	350	0.300	6.00	0.10	EEETK2A101AM	(11)	125
	220	18	16.5	K16	400	0.280	5.60	0.10	EEETK2A221AM	(11)	125
	330	18	16.5	K16	400	0.280	5.60	0.10	EEETK2A331AM	(11)	125

✻ Size code( ):Miniaturization product

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

· When requesting vibration-proof product, please put the last “V” instead to “Q or M”

Surface Mount Type

Series: **TK** Type: **V**

■ Features

- Endurance : 125 °C 3000 h
- Low ESR at –40 °C (50 % lower than TG series)
- Added ESR specification after the endurance test
- Vibration-proof product is available upon request.
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

Category Temp. Range	–40 °C to +125 °C					
Rated W.V. Range	10 V.DC to 35 V.DC					
Nominal Cap. Range	47 µF to 470 µF					
Capacitance Tolerance	±20 % (120 Hz/+20 °C)					
DC Leakage Current	I ≦ 0.01 CV After 2 minutes					
tan δ	Please see the attached standard products list					
Characteristics at Low Temperature	W.V. (V)	10	16	25	35	(Impedance ratio at 120 Hz)
	Z(–25 °C)/Z(+20 °C)	3	2	2	2	
	Z(–40 °C)/Z(+20 °C)	4	3	3	3	
Endurance	After the life test with DC rated woking voltage at +125 °C ±2 °C for 3000 hours, the capacitors shall meet the limits specified below.					
	Capacitance change	±30 % of initially measured values (code U : ±35 %)				
	tan δ	≦ 300 % of initially specified values (code U : ±350 %)				
	DC leakage current	≦ initially specified values				
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)					
ESR after the Life test	After the life test with DC rated working voltage at +125 °C±2 °C for 3000 hours, ESR value shall meet the specified below.					
	After 1000 hours	20 °C	≦ 150 % of the initially measured specified value.			
		–40 °C	≦ 200 % of the initially measured specified value.			
	After 2000 hours	20 °C	≦ 300 % of the initially measured specified value.			
		–40 °C	≦ 400 % of the initially measured specified value.			
	After 3000 hours	20 °C	≦ 1000 % of the initially measured specified value.			
		–40 °C	≦ 1500 % of the initially measured specified value.			

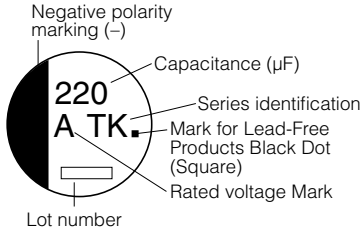
■ Frequency correction factor for ripple current

	Frequency (Hz)			
	120	1 k	10 k	100 k to
Correction factor	0.65	0.85	0.95	1.00

■ Marking

Example:10 V 220 µF (polarized)

Marking color: BLACK

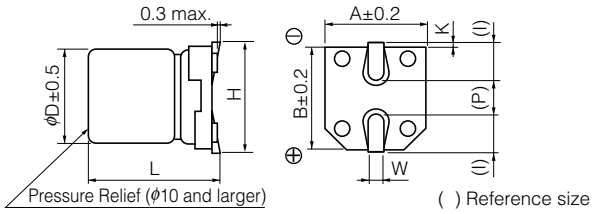


Rated Voltage Mark

A	10 V
C	16 V
E	25 V
V	35 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
F	8.0	10.2±0.3	8.3	10.0 max.	3.4	0.90±0.2	3.1	0.70±0.2
G	10.0	10.2±0.3	10.3	12.0 max.	3.5	0.90±0.2	4.6	0.70±0.2

* This product qualify for AEC-Q200, but it has some deviations.

03 Mar. 2014

■ Standard Products

Endurance : 125 °C 3000 h

W.V.	Cap. (±20 %)	Case size			Specification				Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+125 °C)	ESR (100 kHz) (Ω)		tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	+20 °C	-40 °C				(pcs)
10	220	8	10.2	F	197	0.3	5	0.30	EEETK1A221P	(8)	500
	330	8	10.2	(F)	197	0.3	5	0.30	EEETK1A331UP	(8)	500
		10	10.2	G	270	0.2	3	0.30	EEETK1A331P	(8)	500
	470	10	10.2	(G)	270	0.2	3	0.30	EEETK1A471UP	(8)	500
16	100	8	10.2	F	197	0.3	5	0.23	EEETK1C101P	(8)	500
	220	8	10.2	(F)	197	0.3	5	0.23	EEETK1C221UP	(8)	500
		10	10.2	G	270	0.2	3	0.23	EEETK1C221P	(8)	500
	330	10	10.2	(G)	270	0.2	3	0.23	EEETK1C331UP	(8)	500
25	100	8	10.2	F	197	0.3	5	0.18	EEETK1E101P	(8)	500
	220	8	10.2	(F)	197	0.3	5	0.18	EEETK1E221UP	(8)	500
		10	10.2	G	270	0.2	3	0.18	EEETK1E221P	(8)	500
	330	10	10.2	(G)	270	0.2	3	0.18	EEETK1E331UP	(8)	500
35	47	8	10.2	F	197	0.3	5	0.16	EEETK1V470P	(8)	500
	100	8	10.2	(F)	197	0.3	5	0.16	EEETK1V101UP	(8)	500
		10	10.2	G	270	0.2	3	0.16	EEETK1V101P	(8)	500
	220	10	10.2	(G)	270	0.2	3	0.16	EEETK1V221UP	(8)	500

✻ Size code( ) : Miniaturization product
· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “P”

Surface Mount Type

Series: **TP** Type: **V**

TP High temperature Lead-Free reflow(suffix:A✻)

■ Features

- Lower ESR at Low temperature after endurance
- Endurance: 3000 h at 125 °C(D8 size : 2000 h)
- Automotive
- Vibration-proof product is available upon request. (ϕ8 mm and larger)
- AEC-Q200 qualified*
- RoHS directive compliant

■ Specifications

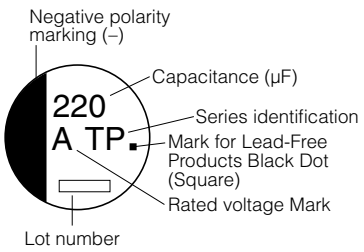
Category Temp. Range	−40 °C to +125 °C				
Rated W.V.Range	10 V.DC to 35 V.DC				
Nominal Cap.Range	47 µF to 470 µF				
Capacitance Tolerance	±20 % (120 Hz/+20 °C)				
DC Leakage Current	I ≦ 0.01 CV (µA) After 2 minutes				
tan δ	Please see the attached standard products list				
Endurance	After the life test with DC rated working voltage at +125 °C±2 °C for 3000 hours(D8 size : 2000 h). the capacitors shall meet the limits specified below.				
	Capacitance change	±30 % of initial measured value			
	tan δ	≦ 300 % of initial specified value			
	DC leakage current	≦ initial specified value			
	ESR after Endurance (Ω/100kHz)		Size Code		
			D8	F	G
		Initial(+20 °C)	0.45	0.2	0.15
		After 2000 h(-40 °C)	40	4.5	3.5
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance (With voltage treatment)				
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.				
	Capacitance change	±10 % of initial measured value			
	tan δ	≦ initial specified value			
	DC leakage current	≦ initial specified value			

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	120	1 k	10 k	100 k to
Correction factor	0.65	0.85	0.95	1.00

■ Marking

Example:10 V 220 µF Marking color : BLACK

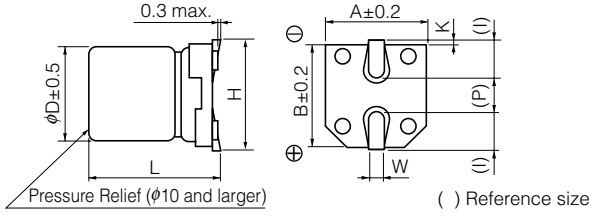


Rated Voltage Mark

A	10 V
C	16 V
E	25 V
V	35 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A, B	H	I	W	P	K
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$
F	8.0	10.2±0.3	8.3	10.0max.	3.4	0.90±0.2	3.1	0.70±0.20
G	10.0	10.2±0.3	10.3	12.0max.	3.5	0.90±0.2	4.6	0.70±0.20

✻ This product qualify for AEC-Q200, but it has some deviations.

■ Standard Products

Endurance : 125 °C 3000 h (ϕ6.3×7.7 ≦ : 2000 h)

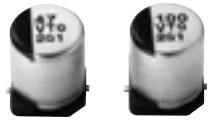
W.V.	Cap. (±20 %)	Case size			Specification				Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	✻Size Code	Ripple Current (100 kHz) (+125 °C)	ESR (100 kHz) (Ω)		tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	+20 °C	-40 °C				(pcs)
10	220	8	10.2	F	270	0.20	3	0.30	EEETP1A221AP	(8)	500
	330	8	10.2	(F)	270	0.20	3	0.30	EEETPA331UAP	(8)	500
		10	10.2	G	500	0.15	2	0.30	EEETP1A331AP	(8)	500
	470	10	10.2	G	500	0.15	2	0.30	EEETP1A471AP	(8)	500
16	100	6.3	7.7	D8	197	0.45	5	0.23	EEETPC101XAP	(8)	900
		8	10.2	F	270	0.20	3	0.23	EEETP1C101AP	(8)	500
	220	8	10.2	F	270	0.20	3	0.23	EEETP1C221AP	(8)	500
	330	10	10.2	G	500	0.15	2	0.23	EEETP1C331AP	(8)	500
	470	10	10.2	G	500	0.15	2	0.23	EEETP1C471AP	(8)	500
25	100	8	10.2	F	270	0.20	3	0.18	EEETP1E101AP	(8)	500
	220	10	10.2	G	500	0.15	2	0.18	EEETP1E221AP	(8)	500
	330	10	10.2	G	500	0.15	2	0.18	EEETP1E331AP	(8)	500
35	47	6.3	7.7	D8	197	0.45	5	0.16	EEETPV470XAP	(8)	900
		8	10.2	F	270	0.20	3	0.16	EEETP1V470AP	(8)	500
	100	8	10.2	F	270	0.20	3	0.16	EEETP1V101AP	(8)	500
	220	10	10.2	G	500	0.15	2	0.16	EEETP1V221AP	(8)	500

✻ Size code( ):Miniaturization product
If Part number exceeds 12 digits, voltage code is abbreviated as follows; 1A→A, 1C→C, 1E→E, 1V→V
· Please refer to the page of "Reflow Profile" and "The Taping Dimensions".
· When requesting vibration-proof product, please put the last "V" instead to "P"

Surface Mount Type

Series: **TQ** Type: **V**

TQ High temperature Lead-Free reflow(suffix:A✻)



■ Features

- 1 size smaller and same performance compare with V-TK series
- Low ESR
  (85% low ESR in low temperature after endurance compare with V-TP series)
- Endurance: 2000 h at 125 °C
- AEC-Q200 qualified*
- RoHS directive compliant

■ Recommended Applications

- Automotive

■ Specifications

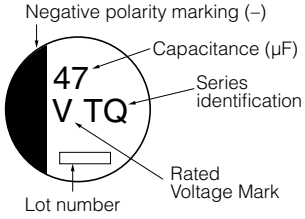
Category Temp. Range	−40 °C to +125 °C		
Rated W.V.Range	35 V.DC		
Nominal Cap.Range	47 µF to 100 µF		
Capacitance Tolerance	±20 % (120 Hz/+20 °C)		
DC Leakage Current	I ≦ 0.01 CV (µA) After 2 minutes		
tan δ	Please see the attached standard products list		
Endurance	After the life test with DC rated working voltage at +125 °C±2 °C for 2000 hours, the capacitors shall meet the limits specified below.		
	Capacitance change	±30 % of initial measured value	
	tan δ	≦300 % of initial specified value	
	DC leakage current	≦ initial specified value	
	ESR after Endurance (Ω/100kHz)		Size Code
			D8
		Initial(+20 °C)	0.30
		After 2000 h(-40 °C)	6
Shelf Life	After storage for 1000 hours at +125 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)		
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.		
	Capacitance change	±10 % of initial measured value	
	tan δ	≦ initial specified value	
	DC leakage current	≦ initial specified value	

■ Frequency correction factor for ripple current

	Frequency (Hz)			
	120	1 k	10 k	100 k to
Correction factor	0.65	0.85	0.95	1.00

■ Marking

Example:35 V 47 µF Marking color : BLACK

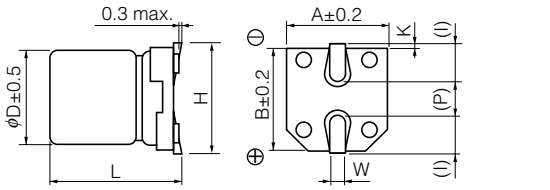


Rated Voltage Mark

V	35 V

■ Dimensions in mm (not to scale)

(Unit : mm)



( ) Reference size

Size code	D	L	A, B	H	I	W	P	K
D8	6.3	7.7±0.3	6.6	7.8 max.	2.6	0.65±0.1	1.8	$0.35^{+0.15}_{-0.20}$

✻ This product qualify for AEC-Q200, but it has some deviations.

01 Mar. 2014

■ Standard Products

Endurance : 125 °C 2000 h

W.V.	Cap. (±20 %)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia.	Length	Size Code	Ripple Current (100 kHz) (+125 °C)	E.S.R. (100 kHz) (+20 °C)	tan δ (120 Hz) (+20 °C)			Taping
(V)	(μF)	(mm)	(mm)		(mA r.m.s.)	(Ω)				(pcs)
35	47	6.3	7.7	D8	197	0.30	0.16	EEETQV470XAP	(5)	900
	100	6.3	7.7	D8	197	0.30	0.16	EEETQV101XAP	(5)	900

If Part number exceeds 12 digits, voltage code is abbreviated as follows; 1V→V

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.

Surface Mount Type

Series: **EB(Large Can Size)** Type: **V**

■ Features

- Endurance : 105 °C 3000 h to 5000 h
- RoHS directive compliant

■ Specifications

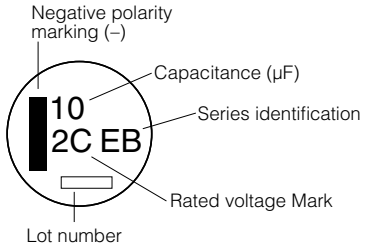
Category Temp. Range	–25 °C to +105 °C							
Rated W.V. Range	160 V.DC to 450 V.DC							
Nominal Cap. Range	2.2 µF to 100 µF							
Capacitance Tolerance	±20 % (120 Hz/+20 °C)							
DC Leakage Current	I ≦ 0.06 CV +10 (µA) After 2 minutes							
tan δ	Please see the attached standard products list							
Characteristics at Low Temperature	W.V. (V)	160	200	250	350	400	450	(Impedance ratio at 120 Hz)
	Z(–25 °C) / Z(+20 °C)	2	2	3	5	6	6	
Endurance	After the life test with DC rated working voltage at +105 °C±2 °C for 5000 hours, the capacitors shall meet the limits specified below. (Size code G13 : 3000 hours, G17 : 4000 hours)							
	Capacitance change	±20 % of initial measured value						
	tan δ	≦ 200 % of initial specified value						
	DC leakage current	≦ initial specified value						
Shelf Life	After storage for 1000 hours at +105 °C±2 °C with no voltage applied and then being stabilized at +20 °C, capacitors shall meet the limits specified in Endurance. (With voltage treatment)							
Resistance to Soldering Heat	After reflow soldering and then being stabilized at +20 °C, capacitors shall meet the following limits.							
	Capacitance change	±10 % of initial measured value						
	tan δ	≦ initial specified value						
	DC leakage current	≦ initial specified value						

■ Frequency correction factor for ripple current

Rated Voltage (V.DC)	Frequency (Hz)			
	120	1 k	10 k ≦ f < 30 k	30 k ≦ f ≦ 100 k
160 to 250	0.55	0.85	0.90	1.00
350 to 450	0.50	0.80	0.90	1.00

■ Marking

Example : 160 V 10 µF

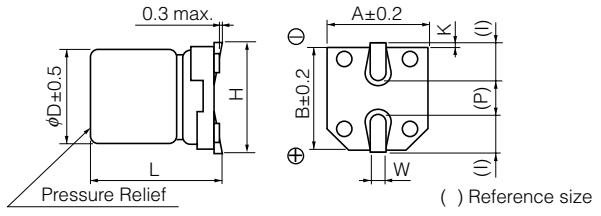


Rated Voltage Mark

2C	160 V	2V	350 V
2D	200 V	2G	400 V
2E	250 V	2W	450 V

■ Dimensions in mm (not to scale)

(Unit : mm)



Size code	D	L	A,B	H	I	W	P	K
G13	10.0	13.5±0.5	10.3	12.0 max.	3.5	0.9±0.2	4.6	0.70±0.20
G17	10.0	16.5±0.5	10.3	12.0 max.	3.5	0.9±0.2	4.6	0.70±0.20
H16	12.5	16.5±0.5	13.5	15.0 max.	4.7	0.9±0.2	4.4	0.70±0.30
J16	16.0	16.5±0.5	17.0	19.0 max.	5.5	1.2±0.3	6.7	0.70±0.30
J21	16.0	21.5±0.5	17.0	19.0 max.	5.5	1.2±0.3	6.7	0.70±0.30
K16	18.0	16.5±0.5	19.0	21.0 max.	6.7	1.2±0.3	6.7	0.70±0.30
K21	18.0	21.5±0.5	19.0	21.0 max.	6.7	1.2±0.3	6.7	0.70±0.30

■ Standard Products

Endurance : 105 °C 5000 h (G13 : 3000 h, G17 : 4000 h)

W.V. (V)	Cap. (±20 %) (μF)	Case size			Specification			Part No. (RoHS:compliant)	Reflow	Min. Packaging Q'ty
		Dia. (mm)	Length (mm)	Size Code	Ripple Current (100 kHz) (+105 °C) (mA)	tan δ (120 Hz) (+20 °C)	Endurance (hours)			Taping (pcs)
160	10	10	13.5	G13	70	0.15	3000	EEVEB2C100Q	(4)	250
	33	12.5	16.5	H16	470	0.15	5000	EEVEB2C330SQ	(4)	150
	47	16	16.5	J16	600	0.15	5000	EEVEB2C470SM	(4)	125
	68	16	21.5	J21	750	0.15	5000	EEVEB2C680M	(4)	75
		18	16.5	K16	750	0.15	5000	EEVEB2C680SM	(4)	125
	100	18	21.5	K21	1060	0.15	5000	EEVEB2C101M	(4)	75
200	10	10	16.5	G17	80	0.15	4000	EEVEB2D100Q	(4)	200
	22	12.5	16.5	H16	470	0.15	5000	EEVEB2D220SQ	(4)	150
	33	16	16.5	J16	600	0.15	5000	EEVEB2D330SM	(4)	125
	47	18	16.5	K16	600	0.15	5000	EEVEB2D470SM	(4)	125
	68	16	21.5	J21	750	0.15	5000	EEVEB2D680M	(4)	75
	100	18	21.5	K21	1060	0.15	5000	EEVEB2D101M	(4)	75
250	10	10	16.5	G17	88	0.15	4000	EEVEB2E100Q	(4)	200
	22	16	16.5	J16	560	0.15	5000	EEVEB2E220SM	(4)	125
	33	18	16.5	K16	560	0.15	5000	EEVEB2E330SM	(4)	125
	47	16	21.5	J21	710	0.15	5000	EEVEB2E470M	(4)	75
	68	18	21.5	K21	990	0.15	5000	EEVEB2E680M	(4)	75
350	3.3	10	13.5	G13	38	0.20	3000	EEVEB2V3R3Q	(4)	250
	4.7	10	16.5	G17	50	0.20	4000	EEVEB2V4R7Q	(4)	200
	10	16	16.5	J16	270	0.20	5000	EEVEB2V100SM	(4)	125
	22	18	16.5	K16	350	0.20	5000	EEVEB2V220SM	(4)	125
	33	16	21.5	J21	480	0.20	5000	EEVEB2V330M	(4)	75
	47	18	21.5	K21	670	0.20	5000	EEVEB2V470M	(4)	75
400	3.3	10	13.5	G13	40	0.24	3000	EEVEB2G3R3Q	(4)	250
	4.7	10	16.5	G17	50	0.24	4000	EEVEB2G4R7Q	(4)	200
	10	16	16.5	J16	250	0.24	5000	EEVEB2G100SM	(4)	125
	22	16	21.5	J21	410	0.24	5000	EEVEB2G220M	(4)	75
	33	18	21.5	K21	600	0.24	5000	EEVEB2G330M	(4)	75
450	2.2	10	13.5	G13	29	0.24	3000	EEVEB2W2R2Q	(4)	250
	3.3	10	16.5	G17	41	0.24	4000	EEVEB2W3R3Q	(4)	200
	4.7	12.5	16.5	H16	49	0.24	5000	EEVEB2W4R7SQ	(4)	150
	10	18	16.5	K16	310	0.24	5000	EEVEB2W100SM	(4)	125
	22	18	21.5	K21	560	0.24	5000	EEVEB2W220M	(4)	75

· Please refer to the page of “Reflow Profile” and “The Taping Dimensions”.
· When requesting vibration-proof product, please put the last “V” instead to “Q or M”

Notices

■ Applicable laws and regulations

- This product satisfies the requirements of the RoHS Directive (2011/65/EU) (related to the specified hazardous substances contained in electrical and electronic equipment).
- The ozone-depleting chemicals regulated by the Montreal Protocol are not intentionally used in the materials used in our manufacturing processes.
- PBBs(Poly-Brominated Biphenyls)/PBDEs (Poly-Brominated Diphenyl ethers)
  The above specified brominated flame retardants are not intentionally used.
- When exporting this product, observe the export procedures specified in export control laws such as the Foreign Exchange and Foreign Trade Control Law.

■ Limited applications

- This product is intended to be used for general-purpose standard applications for general electronic equipment (such as AV equipment, household appliances, business or office equipment, information or communications equipment, etc.)
- If this product is being examined for possible use in applications where higher reliability or safety is required, in cases where a malfunction of this product may endanger life or property, then the delivery specifications meeting the application requirements must be agreed to and exchanged.

Items to be observed

(1) The purpose of these specifications is to ensure the quality of components as individual components. Before use, check and evaluate their operation when mounted on your products.
(2) Do not use our components outside of the corresponding specifications.

■ When using this capacitor in a product where safety is critical

We take great care in the quality of this product. However, performance may deteriorate and short-circuiting or open-circuiting may occur if it will be used in transportation equipment (e.g. trains, cars, traffic lights), medical equipment, airborne equipment, aerospace equipment, electric heating appliances, combustion/gas equipment, rotating equipment, disaster/crime prevention equipment, or other equipment where a defect in this component may cause the loss of human life or other significant damage. Ensure that the target equipment has a failsafe design and is provided with the following systems to guarantee adequate safety.
(1) * Ensure the safety of the whole system by installing a protection circuit and a protection device.
(2) Redundant circuits, etc. to maintain the safety of the entire system so that a single independent failure will not lead to unsafe conditions.

■ Conditions of use

This product is intended to be used in electronic equipment for general-purpose standard applications and is not designed for use in any special environments.
When this capacitor is used in a special environment or under special conditions, its performance may be affected. Before use, verify the performance and reliability of the capacitor.

⚠ Application Guidelines

1. Circuit design

Verify the usage and fitting environments and make sure to observe the rated performance specified in the corresponding catalog or specifications.

1.1 Operating temperature and frequency

Variations in temperature and frequency can affect the electrical characteristics of capacitors. Design circuits allowing for these variations.

(1) At high temperatures leakage current increases.
(2) At low temperatures the capacitance decreases and an increase in the tangent of the loss angle and impedance.
(3) As frequency increases, capacitance decreases and the tangent of the loss angle increases, while the capacitive portion of impedance decreases till the resonant frequency is reached.
(4) At low frequency there is temperature rise caused by ripple currents accompanying the increase in equivalent series resistance.

1.2 Operating temperature and life expectancy

(1) The capacitor life is affected by usage temperature.
In general, the capacitor life is approximately doubled when the temperature decreases by 10 °C.
Reduce the usage temperature as much as possible.

(2) The use of capacitors beyond the upper category temperatures may cause rapid deterioration in the characteristics and break down may occur.
The temperature referred to here includes the ambient temperature(within equipment), including heat produced by heat generating devices (power transistors, resistors, etc.), self-heating due to ripple currents, etc. Take these factors into consideration when checking the temperature of capacitors.
Do not place any heat generating devices, etc. on the back of capacitors.

(3) The life acceleration can be calculated with the following equation:

$$L_2 = L_1 \times 2^{\frac{T_1 - T_2}{10}}$$

L_1 : Life at a temperature T_1 °C (h)
L_2 : Life at a temperature T_2 °C (h)
T_1 : Category upper limit temperature + heat generation due to ripple currents (°C)
T_2 : Ambient temperature to calculate the life + heat generation due to ripple currents (°C)

1.3 Common application conditions to avoid

If the loads shown below are applied to a capacitor, then its characteristics may degrade rapidly or it may short-circuit. Rapid heat or gas generation may occur, which leads to the activation of the pressure valve. Electrolytes will then leak from the sealing section. In the worst case, an explosion or ignition may occur.
When the capacitor breaks down, combustible materials (electrolytes, element fixing materials, etc.) may flow externally in all directions.

(1) Polarity
Aluminum electrolytic capacitors have polarities.
Do not apply a reversed or alternating-current voltage.
If the polarity is reversed, then short-circuiting may occur in the initial state or the pressure valve may be activated, leading to capacitor breakdown.
Check the polarity when using a polar capacitor.
If the polarity is unstable or unclear in a circuit, then use bipolar capacitors. However, bipolar capacitors cannot be used in alternating current circuits.

(2) Applied voltage
Do not apply an excessive voltage (voltage exceeding the rating).
The peak direct current voltage superposed with a ripple voltage (alternating current component) must be equal to or less than the rated voltage. A surge voltage exceeding the rated voltage is allowed and specified. However, the allowable conditions are limited and the specifications do not guarantee the application of such a surge voltage for a long time.

(3) Ripple current
Do not allow an excessive current (current exceeding the rated ripple current) to pass.
If an excessive ripple current passes through, then the amount of internally generated heat will grow, the capacitor life will be reduced, or the pressure valve will be activated, leading to breakdown.
Even if the current is equivalent to or less than the allowable level, a reversed voltage may be applied when a direct current bias voltage is low.
Use capacitors so that a reversed voltage is not applied.

(4) Charging/discharging applications
Standard capacitors are not suitable for use in repeating charge/discharge applications. For charge/discharge applications, consult us with your actual application condition.
For rush current, please to nor exceed 100 A.

(5) ON-OFF circuit
Do not use capacitors in circuit where ON-OFF switching is repeated more than 10000 times/per day.
In case of applying to the theses ON-OFF circuit, consult with us about circuit condition and so on.

(6) Series/parallel connection
[Parallel connection]
If capacitors are connected in parallel, then the balance of currents between these capacitors may be disrupted and an excessive ripple current may pass through only part of these capacitors.
Wire your circuits such that excessive ripple current does not pass through the capacitors.

[Series connection]
If capacitors are connected in series, then the balance of voltages between these capacitors may be disrupted and excessive voltage may be applied. Add a bleeder resistor in parallel with each capacitor. By taking leak currents into consideration the balance of voltages will not be disrupted.

(7) Electrical isolation of the capacitors
Isolate capacitors completely in a circuit in the following cases.
Between the housing and cathode and anode terminals and between circuit traces.

(8) Capacitor sleeve
Exterior sleeves or lamination covering capacitors are for indication purposes only and do not guarantee electrical insulation.

1.4 Capacitor mounting considerations

For aluminum electrolytic capacitors, conductive electrolysis whose main solvent is combustible organic solvent and combustible electrolytic paper is used.
If the electrolysis leaks onto a printed circuit board, then it may corrode or short-circuit the traces, leading to smoke or fire. Check the following points when designing products.

(1) Double-sided circuit board
If capacitors are used in double-sided boards, then do not lay wiring traces immediately below the capacitors.
If the sealed part of a capacitor adheres to the surface of a through-hole printed circuit board, then the solder may be absorbed into the gap during dip soldering and the anode and cathode terminals may be short-circuited.

(2) Circuit board hole positioning
Solder may protrude from the through-holes or holes for post-mounted component leads and damage the capacitor exterior sleeves. Be mindful of the hole positions.

(3) Circuit board hole spacing
Make holes for capacitors with a gap equivalent to that of capacitor leads (terminals) during design. Otherwise, there will be stress on the capacitor leads when they are inserted into these holes, leading to current leaks, short-circuiting, or electrolysis leakage.

(4) Surface-mount types
For surface-mount type capacitors, design land traces with reference to the recommended board land sizes described in the delivery specifications, etc.

(5) Capacitors equipped with pressure valves
Provide a space above the pressure valve so that it can operate properly.
For capacitors equipped with a pressure valve (as per the shape and dimensional descriptions of each series), provide a space as follows. If the space is smaller than the requirements, then the pressure valve may not operate properly, leading to an explosion.

Product diameter	Space
ϕ6.3 to ϕ16 mm	2 mm or more
ϕ18 to ϕ35 mm	3 mm or more
ϕ40 mm or more	5 mm or more

(6) Clearance for seal mounted pressure relief vents
When the pressure valve section of a capacitor faces the printed wiring, provide a degassing hole aligned with the pressure valve position for proper operation of the valve.

(7) Wiring near the pressure relief vent.
Considerations must be taken in designing circuits so that there are no traces, particularly for high-voltage or large-current wiring, above the pressure valve sections.
When a pressure valve is activated, combustible high-temperature gas exceeding 100°C will be released. Gas may condense or the wiring covers may melt and secondary accidents may occur.

(8) Circuit board patterns under the capacitor.
If electrolysis leaks, then the circuit traces may short-circuit and tracking or migration may occur.

2. Mounting

2.1 Considerations before using

(1) Do not reuse capacitors that have been installed and energized.
(2) Capacitors may generate transient recovery voltages. In this case, discharge them using a resistor of approx. 1 kΩ.
(3) Capacitors stored for a long time may have a larger current leak.
In this case, dispose the voltage using a resistor of approx. 1 kΩ.
(4) Do not drop capacitors onto a floor, etc.
Do not use dropped capacitors because they may be damaged mechanically or electrically.
(5) Do not use corrupted capacitors.
If a capacitor s seal is deteriorated, then its performance will be degraded, life reduced, and/or the electrolyte will leak.

2.2 Capacitor insertion

(1) Check the capacitor ratings (capacitance and voltage) before mounting.
(2) Check the capacitor polarity before mounting.
(3) Check the capacitor lead and hole intervals and land size before mounting.
If these intervals are different, then stress will be applied to the inside of the capacitor through its leads when they are inserted into the board holes, leading to short-circuiting or other failures.
(4) When an automatic mounter is used, the force to clinch and fix capacitor leads must not be excessive.
When capacitor leads are clinched and fixed onto a circuit board, the leads may be pulled and a large force applied to the capacitor if there are missing cogs or the gap between the clinching section and the circuit board is too small. If this is the case, then the capacitor may break down.
For surface-mount type capacitors, if the mounting pressure is excessive, then current leaks may increase, short-circuiting may occur, or the capacitor may break down and come off.

2.3 Manual soldering

(1) Solder capacitors under the soldering conditions (temperature and time) as described in the specifications or at 350 °C for three seconds or less.
(2) If the capacitor lead terminals must be pre-processed in order to align the gaps between the terminals and holes, place them before soldering to prevent stress from being applied to the capacitor body.
(3) If it is necessary to manually remove soldered capacitors, repair them after the solder has sufficiently melted to prevent stress from being applied to the capacitor terminals.
(4) Do not touch the capacitor body with the soldering iron tip. Otherwise, a hole may occur on the capacitor exterior sleeve. The sleeve may break or become damaged.

2.4 Flow soldering

(1) Do not immerse the capacitor body in a solder bath. The capacitor's inner pressure could increase and the capacitor will break down.
(2) Solder capacitors under the soldering conditions (temperature and time) described in the specifications.
(3) When soldering, do not allow other components to fall or touch the capacitors.
When soldering, if resistors, ceramic capacitors, or other components (with a high heat conductance) fall and their lead terminals or metallic sections touch the capacitor, then local thermal stress can occur causing the capacitor's exterior sleeve to break down. This phenomenon is identical to short-circuiting.
(4) Prevent flux from adhering to anything other than the terminals.

2.5 Reflow soldering for chip capacitors

(1) Surface-mount type capacitor are exclusively for reflow soldering. When reflow solder is used an ambient heat condition system such as the simultaneous use of infrared and hot-air is recommended.
✻ This system cannot be used for flow or dip soldering.
(2) Soldering capacitors under the soldering conditions (pre-heating, soldering temperature and time) described in the specifications.
(3) Reflow-solder only once.
If you need to apply reflow soldering twice, then make sure to contact us.
(4) Do not reuse the installed surface-mount type capacitors.
(5) The crack on top marking might be occurred by reflow heat stress.
But please acknowledge that it does not influence the reliability of the product.
(6) VPS (Vapor Phase Soldering) reflow can cause significant characteristics change and/ or mounting failure due to deformation by acute temperature rise. VPS is acceptable provided that the process does not exceed recommended reflow profile and temperature rise is less than 3degC/sec. Please contact Panasonic for detailed conditions.

2.6 Other soldering considerations

If the chip capacitor temperature becomes very high due to pre-heating or hardening of the fixing resin, then the capacitor exterior sleeve may shrink or crack. If capacitors are passed through a heat-curing furnace, then the ambient temperature must be 150°C or less and the duration must be two minutes or less.

2.7 Capacitor handling after soldering

(1) Do not tilt, bring down, or twist the capacitors soldered to the printed circuit board; otherwise a torque will be generated with the capacitor circumference as the fulcrum. As a result, a large force will be applied to the inside of the element through the terminals and the capacitor may break down.
(2) Do not hold the capacitors soldered to the printed circuit board to carry the board; otherwise the board s entire weight will be applied to the inside of the element through the terminals and the capacitor may break down.
(3) Do not hit the capacitors soldered to the printed circuit board with foreign objects. When stacking printed circuit boards, do not hit the capacitors with circuit boards or other components (terminals, etc.)

2.8 Circuit board cleaning

(1) Apply the following conditions to flux cleaning after soldering
Temperature: 60°C or less, duration: Five minutes or less (Ultrasonic waves may be used.)
However, rinse sufficiently and dry the boards (at 100°C for 20 minutes or less).
[Applicable solvents]
Pine Alpha ST-100S
Clean-thru 750H, 750L, or 710M
Aqua Cleaner 210SEP
Sunelec B-12
DK Beclear CW-5790
Techno Cleaner 219
Cold Cleaner P3-375
Telpen Cleaner EC-7R
Techno Care FRW-17, FRW-1, or FRV-1

Remarks
1 : If you wish to use solvents other than the above or Deionized water, please contact us.
2 : Please do not use ozone-depleting chemicals in order to protect the environment.
3 : Depending on the cleaning method, the marking on a capacitor may be erased or blurred.

(2) Avoid using the following solvent groups unless specifically allowed for in the specification
(a) Halogen solvents: Corrode the inside capacitors.
The solvent may enter (diffuse) inside the capacitor, decompose and cause a reaction. Then, the released chlorine ions may react with the aluminum and corrode it.
For capacitors for which we guarantee cleaning, use solvents under the cleaning conditions (temperature, time, etc.) described in the specifications.
(b) Alkaline solvents: Corrode (melt) aluminum housings.
(c) Petroleum solvents: Deteriorate sealing rubber.
(d) Xylene solvents: Deteriorate sealing rubber.
(e) Acetone: Erases indications.

(3) Be sure to dry the printed circuit boards immediately after cleaning so that the solvent does not remain between the capacitor's sealed section and the circuit board.

(4) Manage the contamination of solvents (conductance, PH, specific gravity, amount of water, etc.)
If the solvent is contaminated, then the chlorine concentration will become high and the inside capacitor may be corroded. Control the flux concentration against the solvent to 2 %wt or less.

2.9 Mounting adhesives and coating agents

(1) If bond or coating agents are used to fix capacitors or prevent moisture, then solvents contained in these materials may corrode the capacitors. Select solvents other than halogen compounds. Do not use chloroprene-derived polymers.
Also, if the bond and coating material containing organic solvents, such as xylene and toluene, are used, resin of the top plate of a snap-in terminal type capacitor will be dissolved.
In this case please select part number without the top plate.

(2) If fixing or coating agents are used for capacitors, then check the following points.
(a) Do not allow flux residue or contaminants to remain between the capacitor's sealed section and the circuit board.
(b) Harden and dry bond or coating agents so that the solvents do not remain. Do not completely block the sealed section of a capacitor. (At least 1/3 of the sealed section must be exposed.)

2.10 Fumigation process

When electronic equipment incorporating aluminum electrolytic capacitors is exported, wooden packing materials may be fumigated using halogen compounds such as bromomethane. If drying after the fumigation process is insufficient, halogen remaining in the packing materials may be released, enter and corrode the capacitors.
If the fumigation process is carried out, then check carefully for remaining halogen after processing and drying.
Make sure not to apply the fumigation process to completely packed electronic equipment.

3. Precautions for using capacitors

3.1 Environmental Conditions

Capacitors should not be stored or used in the following environments.
(1) Exposure to temperatures above the upper category or below the lower category temperature of the capacitor.
(2) Direct contact with water, salt water, or oil.
(3) High humidity conditions where water could condense on the capacitor.
(4) Exposure to toxic gases such as hydrogen sulfide, sulfuric acid, nitric acid, chlorine, Chlorine compound, Bromine, Bromine compound or ammonia.
(5) Exposure to ozone, radiation, or ultraviolet rays.
(6) Vibration and shock conditions exceeding specified requirements.

3.2 Electrical Precautions

(1) Do not touch the capacitor terminals directly.
If you touch the capacitor terminals, you will receive an electric shock. Do not touch the exposed aluminum sections of a capacitor, such as the pressure valve sections because they are not insulated.

(2) Do not short-circuit the capacitor terminals.
Do not spill conductive solutions such as acidic or alkaline solutions on the capacitors. Otherwise, short-circuiting will occur. The circuit will malfunction and the capacitors break down.

(3) A low-molecular-weight-siloxane which is included in a silicon material shall causes abnormal electrical characteristics.

4. Precautions for checks and maintenance

(1) Periodically check the capacitors used in industrial equipment. When checking and maintaining capacitors, turn off the equipment and discharge the capacitors beforehand. In this case, do not apply stress to the capacitor lead terminals, etc.

(2) Periodically check the following items.
(a) Significant appearance abnormalities (deformation, electrolysis leakage, etc.)
(b) Electrical characteristics (described in the corresponding catalog or delivery specifi cations)
If any abnormalities are found, then replace the capacitors or take appropriate actions.

5. Emergency procedures

(1) Capacitors of a certain size or larger are equipped with a pressure valve to release excessive pressure.
If the capacitor pressure valve is activated and gas becomes visible when using equipment, then turn off the equipment or unplug it. If the power is not turned off, then the short-circuited capacitors may damage the circuit or the gas may become liquefied and cause a short-circuit. In the worst case, secondary disasters such as equipment damage may occur.
Gases released from the capacitor s pressure valve is not fume but liquefi ed electrolysis.

(2) When a pressure valve is activated, a high-temperature gas exceeding 100 °C will be released. Do not place your face close to the capacitor.
If the gas gets into your eyes or you inhale it, then immediately wash your eyes with water or gargle. If the gas comes in contact with your skin, then wash it with soap.

6. Long Term Storage

(1) Leakage current of a capacitor increases with long storage times. The aluminum oxide fi lm deteriorates as a function of temperature and time.
If used without reconditioning, an abnormally high current will be required to restore the oxide fi lm.
This surge current could cause the circuit or the capacitor to fail.
Storage period is one year. When storage period is over 12 months, a capacitor should be reconditioned by applying the rated voltage in series with a 1000 Ω current limiting resistor for a time period of 30 minutes.
For storage condition, keep room temperature (5 °C to 35 °C) and humidity (45% to 85%) where direct sunshine doesn't reach.

(2) Environmental Conditions
(a) Exposure to temperatures above the upper category or below the lower category temperature of the capacitor.
(b) Direct contact with water, salt water, or oil
(c) High humidity conditions where water could condense on the capacitor.
(d) Exposure to toxic gases such as hydrogen sulfi de, sulfuric acid, nitric acid, chlorine, Chlorine compound, Bromine, Bromine compound or ammonia.
(e) Exposure to ozone, radiation, or ultraviolet rays.
(f) Vibration and shock conditions exceeding specifi ed requirements.

7. Discarding

When discarding capacitors, use either of the following procedures.

(1) Make holes on the capacitor or break it up completely.
Then burn it at a temperature of 800°C or higher.
If capacitors are burnt as is, then they may explode.

(2) If you do not burn them, then ask professional waste disposer.

The precautions in using aluminum electrolytic capacitors follow the Precautionary Guidelines for the Use of Fixed Aluminum Electrolytic Capacitors for Electronic equipment, RCR-2367B issued by EIAJ in March 2002.
Please refer to the above guidelines for details.

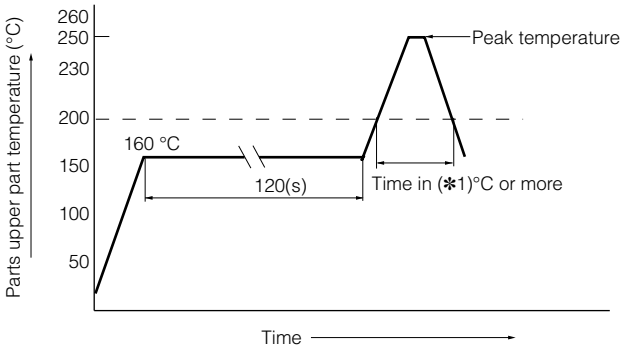
* Intellectual property right

We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights.

Representative patents relating to Conductive Polymer Hybrid Aluminum Electrolytic Capacitors are as follows :
US Patent Nos. 7497879 and 7621970 JP Patent No. 5360250

■ Reflow guaranteed condition

● RoHS compliant



■ Lead-Free reflow

Reflow No.	Fig. (1)	Fig. (2)	Fig. (3)	Fig. (4)
Category	ϕ3 to ϕ6.3	ϕ8 to ϕ10	ϕ12.5 to ϕ18	EB series (ϕ10 to ϕ18)
Peak temperature	250 °C	235 °C	230 °C (220 °C)	230 °C
Time in peak temperature	5 s	5 s	5 s (5 s)	5 s
Time in (✻1) °C or more	≧200 °C 60 s	≧200 °C 60 s	≧200 °C 20 s (30 s)	≧200 °C 20 s
Time of reflow	1 time	1 time	1 time	1 time

■ High temperature Lead-Free reflow

Reflow No.	Fig. (5)	Fig. (6)		Fig. (7)		Fig. (8)	
Category	ϕ4 to ϕ6.3	ϕ8 to ϕ10		ϕ8 to ϕ10		ϕ6.3 to ϕ10 (TK・TP series)	
Peak temperature	260 °C (255 °C)	245 °C	260 °C	250 °C	260 °C	255 °C	260 °C
Time in peak temperature	≧250 °C 5 s (10 s)	≧240 °C 10 s	≧250 °C 5 s	≧240 °C 10 s	≧250 °C 5 s	≧250 °C 30 s	≧250 °C 20 s
Time in (✻1) °C or more	≧230 °C 30 s	≧230 °C 30 s	≧230 °C 30 s	≧230 °C 30 s	≧230 °C 30 s	≧230 °C 40 s	≧230 °C 30 s
	≧217 °C 40 s	≧217 °C 40 s	≧217 °C 40 s	≧217 °C 40 s	≧217 °C 40 s	≧217 °C 65 s	≧217 °C 65 s
	≧200 °C 70 s	≧200 °C 70 s	≧200 °C 70 s	≧200 °C 70 s	≧200 °C 70 s	≧200 °C 90 s	≧200 °C 70 s
Time of reflow	2 times	2 times	1 time	2 times	1 time	2 times	2 times

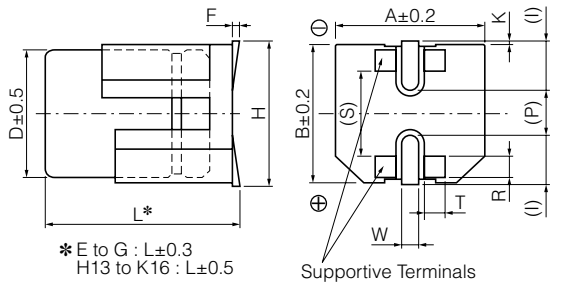
Reflow No.	Fig. (9)	Fig. (10)	Fig. (11)
Category	ϕ12.5 to ϕ18 (FK, TK, HD series) 6.3 V to 35 V	ϕ12.5 to ϕ18 (FK series) 50 V to 63 V (TK series) 50 V	ϕ12.5 to ϕ18 (FK series) 80 V to 100 V (TK series) 63 V to 100 V
Peak temperature	245 °C	245 °C	245 °C
Time in peak temperature	≧240 °C 30 s	≧240 °C 5 s	≧240 °C 5 s
Time in (✻1) °C or more	≧217 °C 90 s	≧217 °C 30 s	≧217 °C 30 s
Time of reflow	2 times	2 times	1 time

✻ For reflow, use a thermal condition system such as infrared radiation (IR) or hot blast.

✻ Panasonic have several series available for pure Tin terminal and ZVEI reflow based on J-STD-020D (JEDEC). (Please contact sales for details.)

■ Dimensions (Vibration-proof products)

✻ The size and shape are different from standard products. Please inquire details of our company.



✻ E to G : L±0.3
H13 to K16 : L±0.5

( ) Reference size

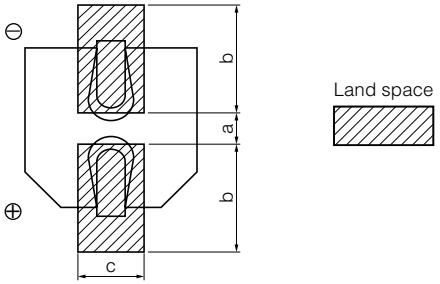
(Unit : mm)

Size Code	φD	L	A, B	H max.	F	I	W	P	K	R	S	T
E	8.0	6.5	8.3	9.5	0 to +0.15	3.4	0.7±0.1	2.2	$0.35^{+0.15}_{-0.20}$	0.70±0.2	5.3±0.2	1.7±0.2
F	8.0	10.5	8.3	10.0	0 to +0.15	3.4	1.2±0.2	3.1	0.70±0.2	0.70±0.2	5.3±0.2	1.3±0.2
G	10.0	10.5	10.3	12.0	0 to +0.15	3.5	1.2±0.2	4.6	0.70±0.2	0.70±0.2	6.9±0.2	1.3±0.2
H13	12.5	13.8	13.5	15.0	–0.1 to +0.15	4.7	1.2±0.2	4.4	0.70±0.3	2.2±0.2	7.1±0.2	2.4±0.2
J16	16.0	16.8	17.0	19.0	–0.1 to +0.15	5.5	1.4±0.2	6.7	0.70±0.3	3.0±0.2	9.0±0.2	1.9±0.2
K16	18.0	16.8	19.0	21.0	–0.1 to +0.15	6.7	1.4±0.2	6.7	0.70±0.3	3.0±0.2	11.0±0.2	1.9±0.2

■ Land/Pad Pattern

The circuit board land/pad pattern size for chip capacitors is specified in the following table.
The land pitch influences installation strength and consider it.

● Standard products

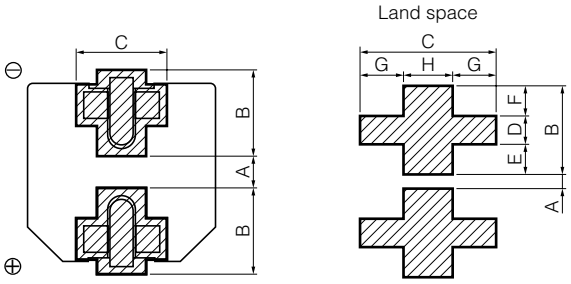


[Table of Board Land Size vs. Capacitor Size] (Unit : mm)

Size/Dimension	a	b	c
A (φ3)	0.6	2.2	1.5
B (φ4)	1.0	2.5	1.6
C (φ5)	1.5	2.8	1.6
D (φ6.3)	1.8	3.2	1.6
E (φ8 × 6.2L)	2.2	4.0	1.6
F (φ8 × 10.2L)	3.1	4.0	2.0
G (φ10 × 10.2L)	4.6	4.1	2.0
H (φ12.5)	4.0	5.7	2.0
J (φ16)	6.0	6.5	2.5
K (φ18)	6.0	7.5	2.5

✻ When size “a” is wide, back fillet can be made, decreasing fitting strength.

● Vibration-proof products



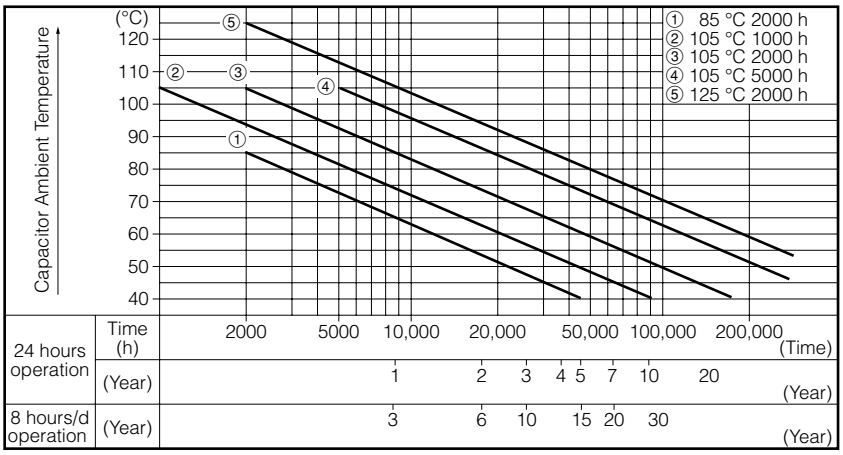
[Table of Board Land Size vs. Capacitor Size] (Unit : mm)

Size/Dimension	A	B	C	D	E	F	G	H
E (φ8 × 6.5L)	1.8	4.2	5.0	1.3	1.5	1.4	1.5	2.0
F (φ8 × 10.5L)	2.7	4.0	4.7	1.3	1.0	1.7	1.1	2.5
G (φ10)	3.9	4.4	4.7	1.3	1.2	1.9	1.1	2.5
H (φ12.5)	3.9	6.0	6.9	2.8	1.3	1.9	2.2	2.5
J (φ16)	5.8	6.8	6.2	3.6	1.3	1.9	1.7	2.8
K (φ18)	5.8	7.3	6.2	3.6	1.8	1.9	1.7	2.8

✻ When size “A” is wide, back fillet can be made, decreasing fitting strength.

✻ Take mounting conditions, solderability and fitting strength into consideration when selecting parts for your company’s design.

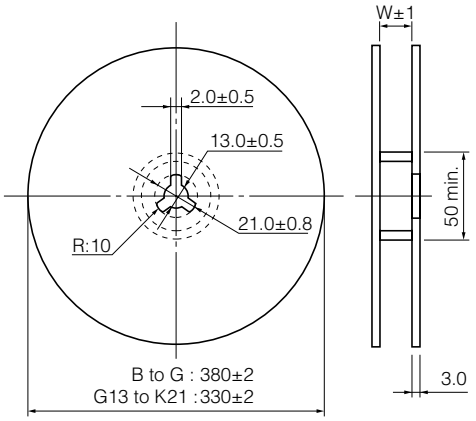
■ Expected Life Estimate Quick Reference Guide



Surface Mount Type

■ Packaging Specifications.

● Reel Dimensions in mm (not to scale)

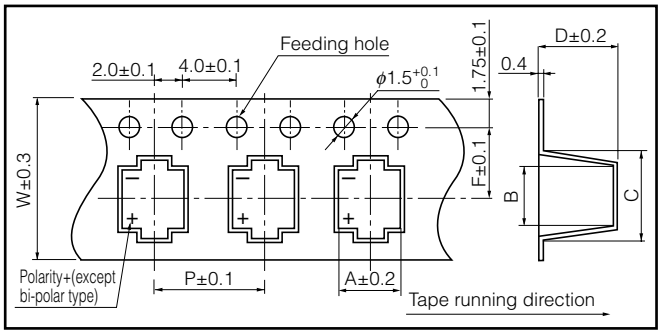


(Unit : mm)

Size	W
B, C	14
D, E, D8	18
F, G	26

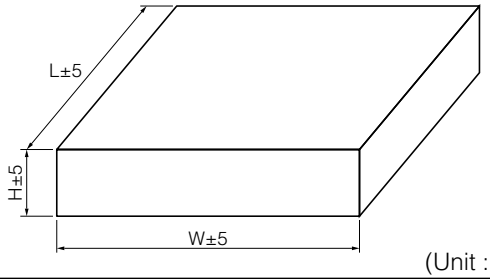
Size	W
G13, G17	34
H13, H16	
J16, J21	46
K16, K21	

● Taping Dimensions in mm (size B to G)



Ask factory for technical specifications.

● Dimensions of Outer Carton Box



(Unit : mm)

Size code	H	W, L
B, C	220	395
D, D8, E	250	395
F, G	220	395
G13, G17	210	350
H13, H16		
J16, J21	230	350
K16, K21		

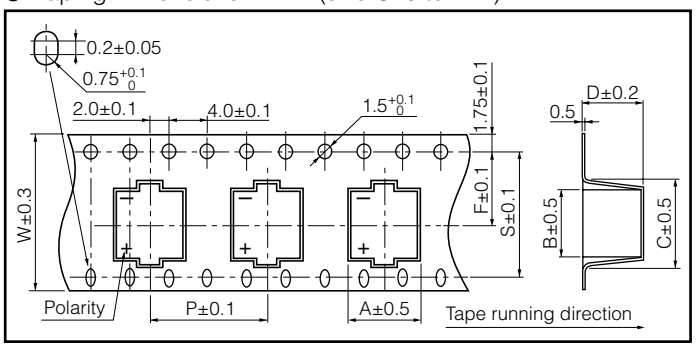
● Min.Packing Quantity

Size code	Height	Min.Packing Quantity pcs.
		380 mm reel
B	L=5.4 mm	2000
	L=5.8 mm	2000
C, D	L=5.4 mm	1000
	L=5.8 mm	1000
E	–	1000
D8	–	900
F, G	–	500

Size code	Min.Packing Quantity pcs.
	330 mm reel
G13	250
G17, H13	200
H16	150
J16, K16	125
J21, K21	75

Size code	W	A	B	C	P	F	D	
							Height	
							L=5.4 mm	L=5.8 mm
B	12.0	4.7	4.6 +0.2 −0.1	6.5±0.3	8.0	5.5	5.8	6.2
C	12.0	5.7	5.7 +0.3 −0.2	8.0±0.5	12.0	5.5	5.8	6.4
D	16.0	7.0	7.0 +0.3 −0.2	9.0±0.5	12.0	7.5	5.8	6.4
D8	16.0	7.0	7.0 +0.3 −0.2	9.0±0.5	12.0	7.5	8.4	
E	16.0	8.7	8.7 +0.3 −0.2	11.4±0.5	12.0	7.5	6.8	
F	24.0	8.7	8.7 +0.3 −0.2	12.5±0.5	16.0	11.5	11.0	
G	24.0	10.7	10.7 +0.3 −0.2	14.5±0.5	16.0	11.5	11.0	

● Taping Dimensions in mm (size G13 to K21)



Ask factory for technical specifications.

Size	Taping Size							
	A	B	C	D	F	P	S	W
G13	10.7	10.7	14.5	14.5	14.2	20.0	28.4	32.0
G17	10.7	10.7	14.5	17.5	14.2	20.0	28.4	32.0
H13	14.0	14.0	18.0	14.5	14.2	24.0	28.4	32.0
H16	14.0	14.0	18.0	17.5	14.2	24.0	28.4	32.0
J16	17.5	17.5	23.0	17.5	20.2	28.0	40.4	44.0
J21	17.5	17.5	23.0	22.5	20.2	28.0	40.4	44.0
K16	19.5	19.5	26.0	17.5	20.2	32.0	40.4	44.0
K21	19.5	19.5	26.0	22.5	20.2	32.0	40.4	44.0

05 Mar. 2014

Discontinued Series (not recommended for new design)

Aluminum Electrolytic Capacitors (Surface Mount Type)

Discontinued Product						Replacement	
Series	Part No.	Endurance	Features	Rated.W.V. (V)	Capacitance (μF)	Series	Endurance
V-S	EEE---S---	+ 85 °C 1000 h	Dia 3 mm	4 to 50	0.1 to 22	Available upon request	
V-G	ECEV--G---R, P-	+105 °C 1000 h	Height 5.5 mm	6.3 to 50	0.1 to 470	V-HA	+105 °C 1000 h
V-A	ECEV--A----R, P	+ 85 °C 1000 h	Height 5.5 mm	4 to 50	0.1 to 1000	V-S	+ 85 °C 2000 h
	ECEV--A----NR, P	+ 85 °C 1000 h	Height 5.5 mm BP	6.3 to 50	0.22 to 47		
V-FE	EEVFE------	+105 °C 1000 h	Low impedance	6.3 to 35	1 to 1000	V-FK	+105 °C 2000 to 5000 h
V-GG	ECEV--G---G	+105 °C 2000 h	Longlife	6.3 to 50	0.1 to 220	HB	+105 °C 2000 h
	ECEV--G---N	+105 °C 2000 h	Longlife Bi-polar	6.3 to 50	0.1 to 47	HB-BP	
V-TA	EEVTA------	+125 °C 1000 h	For Automotive Application, Containing Pb	10 to 50	10 to 330	V-TG	+125 °C 1000 to 2000 h
V-TB	EEVTB------	+125 °C 500 to 1000 h	Low temp. Characteristic stability type	10 to 50	10 to 330	V-TK	+125 °C 3000 h

Check Panasonic website for discontinued / revised product series specification.

http://panasonic.net/id/

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The information in this catalog is valid as of July 2014.