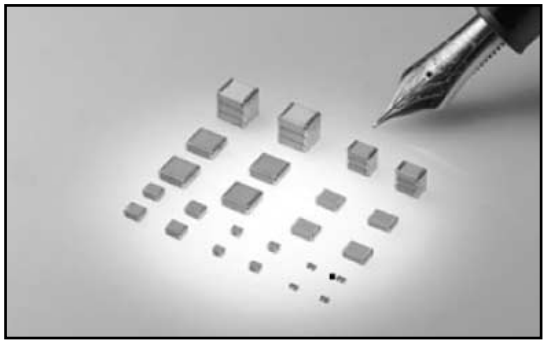
MULTILAYER CERAMIC CAPACITORS

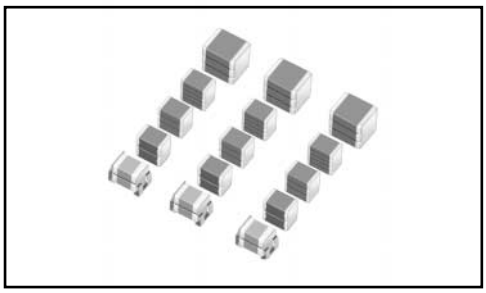


■MULTILAYER CERAMIC CAPACITORS

MULTILAYER CERAMIC CAPACITORS are made from extremely pure, fine and uniform synthesized materials.
These multilayer ceramic capacitors have several significant attributes, such as high capacitance values in small sizes and excellent high frequency characteristics. In addition, they can be mounted with standard surface mount equipment.
Our fully integrated manufacturing and total quality control systems ensure unprecedented high standards of various characteristics.

■STACKED TYPE CERAMIC CAPACITORS

STACKED TYPE CERAMIC CAPACITORS consist of a stack of our KC or VC series capacitors. This stacked capacitor takes up the same board space as one standard chip capacitor, making it an ideal replacement for Aluminum electrolytic capacitors in applications such as compact, high frequency switching power supply.



■Part Number System

KC	30	E	1H	105	M	–	T	P	□
Series / Type	Size	Temperature characteristics	Rated voltage	Capacitance	Capacitance tolerance		Packing form	Terminations	Custom No.

■Temperature Characteristics

Class	Temperature characteristics	EIA symbol	Capacitance change	Temperature range	Related series
1	CG	COG	0±30ppm/°C	–55~+125°C	XC series
2	R	X7R	±15%		VC, HC and VH,XC series
	E	Y5U(Z5U)	+20~–55%	–25~+85°C	KC and VC series
	F	Y5V	+30~–80%		CC series

■Rated Voltage

Symbol	IA	IC	IE	IH	2A	2E	2V	2H	2J	3A	3C	3D	3F
Rated Voltage	10	16	25	50	100	250	350	500	630	1000	1600	2000	3000

■Capacitance

Capacity constant	0R1	010	100	101	102	103	104	105	106	107
Capacitance	0.1 (pF)	1 (pF)	10 (pF)	100 (pF)	1000 (pF)	0.01 (μF)	0.1 (μF)	1 (μF)	10 (μF)	100 (μF)

■Capacitance Tolerance

Class	Temperature characteristics	Capacitance tolerance
1	CG	J (±5%)
		K (±10%)
2	R	K (±10%)
		M (±20%)
	E	M (±20%)
	F	Z (–20% / +80%)

■Packing Form

Symbol	T	C	B
Packing form	Taping CC, KC, VC KS, VS (ϕ178mm) (ϕ330mm)	Bulk case	Bulk (Sample)

Bulk case available for CC11 type, and CC21 type with T=0.60 only.

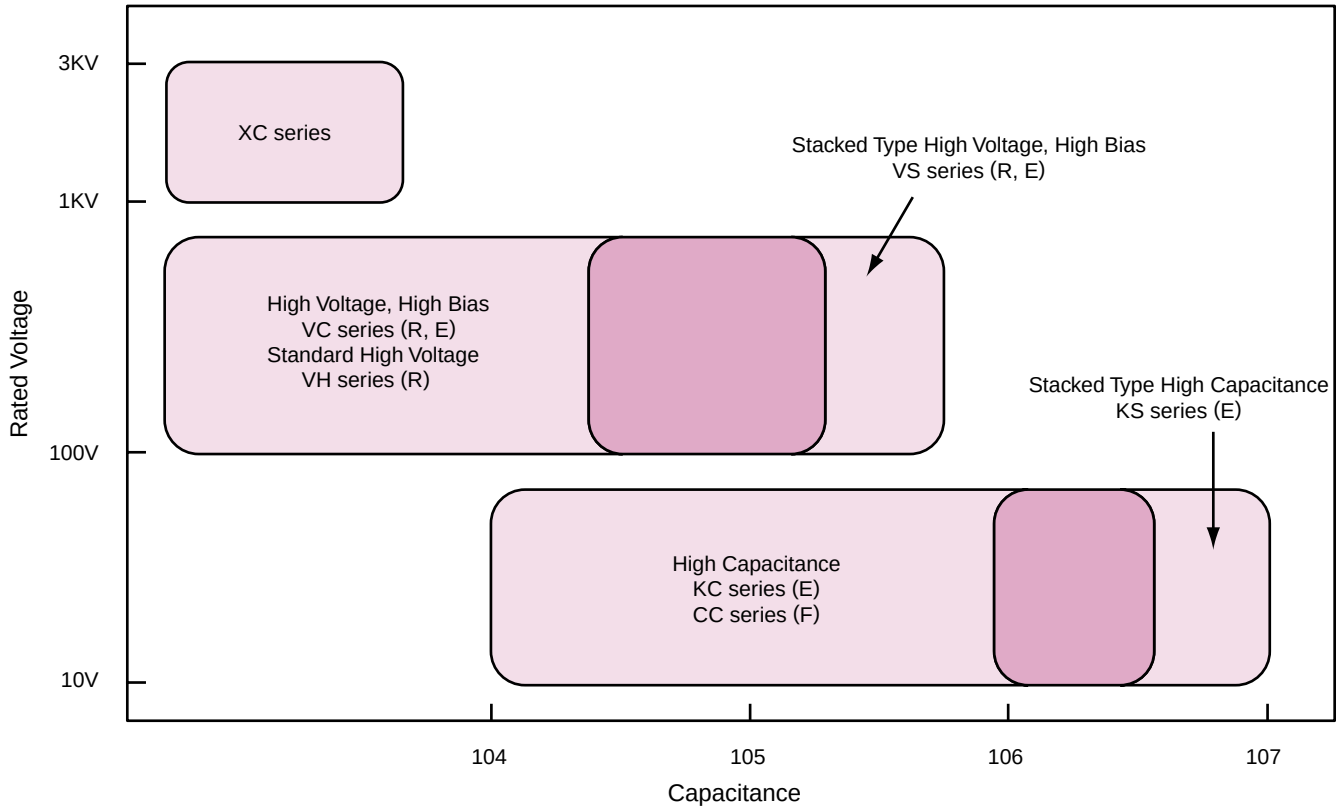
MULTILAYER CERAMIC CAPACITORS

■Terminations

Symbol	P	R	E	S	C
Terminations	Ni-barrier	Ag/Pd	Ag/Pd 2-layer	High reliability Ni-barrer	Solder Cu Ni-barrier
Soldering	Flow/Reflow	Reflow	Reflow (High temperature)	Flow/Reflow	Flow/Reflow

∗ Highly reliable Ni-barrier Terminations show excellent [Flexion] and [Temperature cycling] .
∗ Please consult us when Sn soldering is used.
∗ KC40, 70, 80 types are available for reflow soldering only.

■Map of multilayer ceramic capacitors



MULTILAYER CERAMIC CAPACITORS

■List of multilayer ceramic capacitors

SERIES (Pages)	Features	Applications
KC SERIES (high capacitance) (P20)	Using our unique materials that offer the following exceptional properties, the KC series capacitors make excellent replacements for tantalum electrolytic capacitors. 1) Larger capacitance values in smaller sizes compared to conventional materials. 2) Very little drop in capacitance value when a DC voltage bias is applied. 3) Highly reliable termination with exellent flexion and temperature cycling is available.	DC brushless motor driving circuit. DC/DC converter smoothing circuit. Modem coupling circuit. Consumer electronics and industrial electronic equipment, including LCD control circuit.
VC SERIES (High voltage capacitor, high bias type) (P21)	Exhibiting the following exceptional properties, the VC series capacitors make excellent replacements for film capacitors. 1) The piezo-electric characteristics are small. 2) Very little drop in capacitance value when a DC voltage bias is applied. 3) Can reduce design size by replacing larger film type capacitors.	Stroboscope circuit Power supply, SSR snubber circuit. Modem ring detector circuit High voltage circuits for PDP, CRTs and in ultrasonic medical equipment.
XC SERIES (high voltage) (P22)	1) High voltage (rated voltage~3kV) 2) Small dielectric loss.	LCD back light, snubber circuit.
HC SERIES (Medium/high voltage capacitor) (P23)	1) High capacitance in small size. 2) High withstanding voltage.	Power supply snubber circuit.
VH SERIES (Medium/high voltage capacitor, high bias type) (P24)	1) Low tan δ 2) Very little drop in capacitance value when a DC bias is applied.	Trigger for strobe circuit. Snubber of switching power supply.
KS SERIES (high capacitance stacked type capacitor) **VS SERIES** (high voltage stacked type capacitor) (P25)	Offering the following exceptional properties, KS • VS stacked capacitors make excellent replacements for aluminum electrolytic capacitors. 1) Low impedance 2) Allowable ripple current is large 3) Long life 4) Non-polar 5) Surface mountable 6) Excellent temperature cycling	Smoothing circuit, snubber circuit of compact switching power supply.
CC SERIES (standard) (P26)	The monolithic structure with ceramic materials and internals electrodes ensures high reliability.	Consumer and industrial electronic equipment.

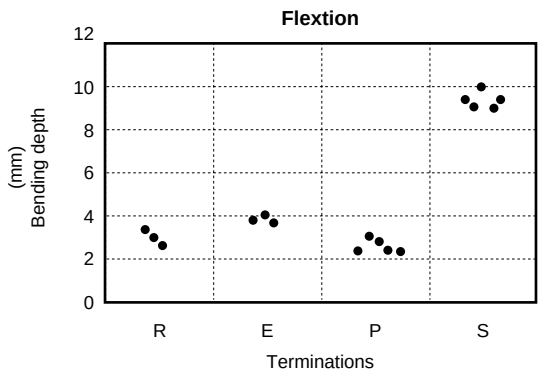
■Features of high reliability "S" terminations

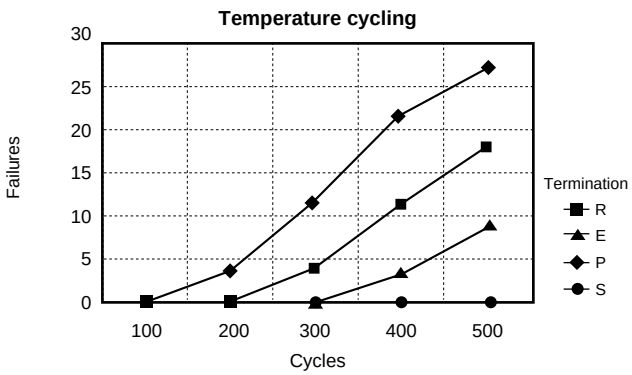
■Features

- Products with highly reliable terminations have the excellent features shown below. They are suitable for circuits that require high reliability.
  1) Excellent temperature cycle
  2) Large critical flexion

■Applications

- Suitable for circuits that need high temperature-resistant cycles and circuits in which Aluminum substrates are used.

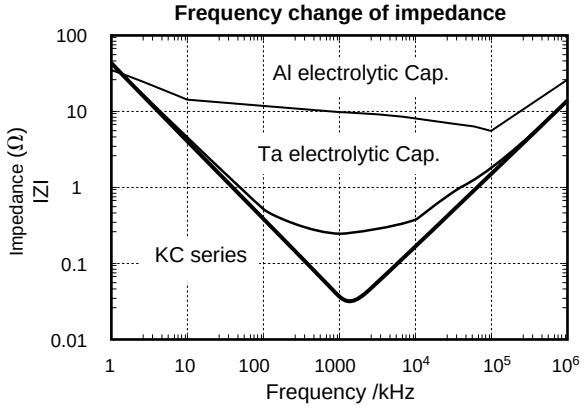




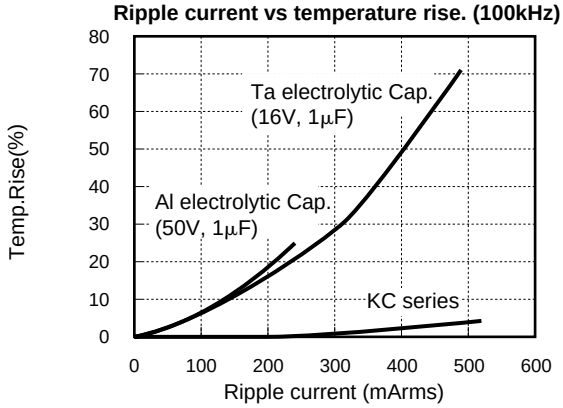
FEATURES OF MULTILAYER CERAMIC CAPACITORS

■Features of KC (E) Series

Frequency change of impedance

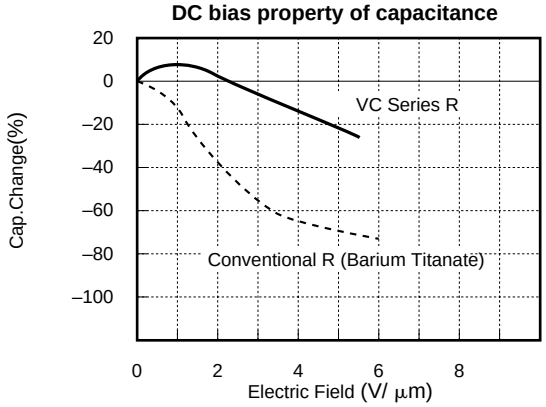


Ripple current vs temperature rise. (100kHz)

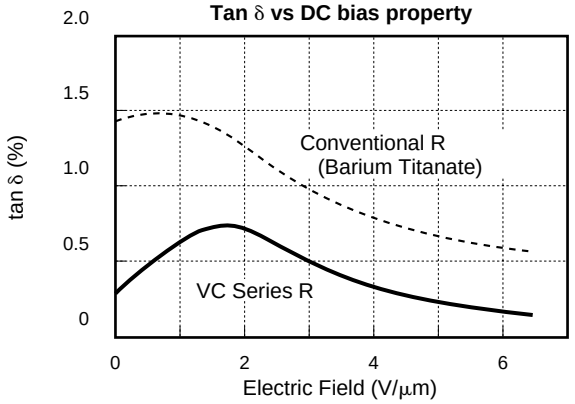


■Features of VC(R) Series

DC bias property of capacitance

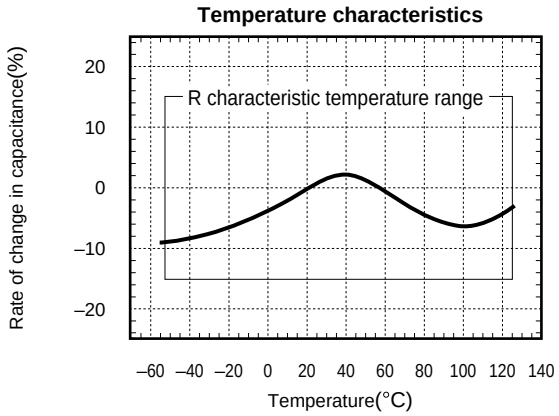


Tan δ vs DC bias property

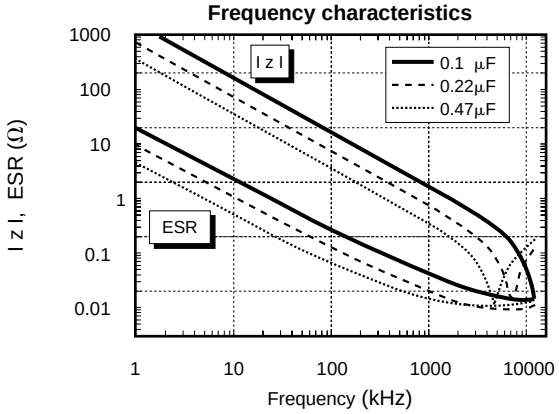


■Features of HC Series

Temperature characteristics

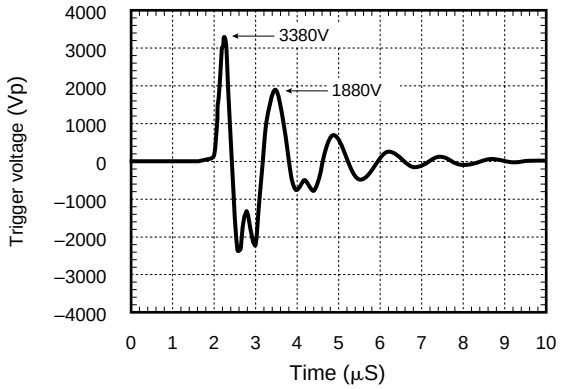


Frequency characteristics

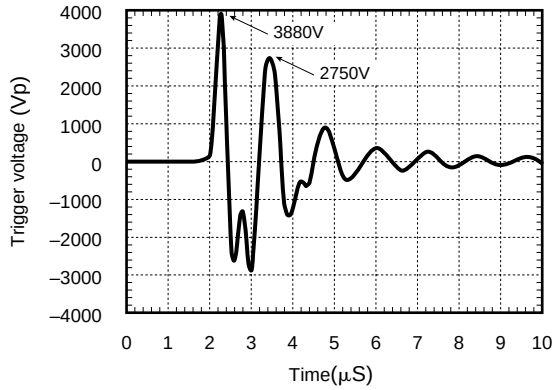


■Features of VH Series (rating : R630V, DC0.033μF)

Trigger voltage characteristics (Standard product)



Trigger voltage characteristics (Low ESR product)



HIGH CAPACITANCE TYPE [KC Series]

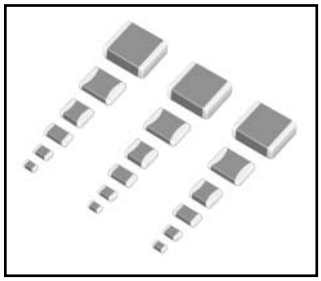
Using our unique materials that offer the following exceptional properties, the KC series capacitors make excellent replacements for tantalum capacitors.

■Features

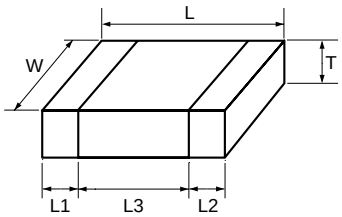
• Very little drop in capacitance value when a DC voltage bias is applied.
• Larger capacitance values in smaller sizes compared to convertional materials.

■Applications

• Smoothing circuit of switching power supply and DC/DC converter, motor control circuit.



■Dimensions



Unit : mm

Type	EIA Symbol	L	W	T	L1, L2	L3
KC11	0603	1.60±0.10	0.80±0.10	0.80±0.10	0.2~	0.5~
KC20	0805	2.0±0.2	1.25±0.2	1.25 max	0.2~	0.5~
KC30	1206	3.2±0.2	1.6±0.2	1.80 max	0.2~	1.0~
KC40	1210	3.2±0.3	2.5±0.2	2.50 max	0.3~	1.0~
KC70	1812	4.5±0.4	3.2±0.3	2.50 max	0.4~	2.0~
KC80	2220	5.7±0.4	5.0±0.4	2.50 max	0.4~	2.0~

■List of products in KC Series

Temperature characteristics : E(–25°C～+85°C, +20%～–55%)
Capacitance tolerance : M(±20%)

Rated Voltage : 50VDC

Part Number	Capacitance(μF)	Product height T(mm)
KC11E1H104M-□S	0.1	0.8±0.1
KC20E1H104M-□S	0.1	0.75+0 / -0.2
KC20E1H154M-□S	0.15	1.00+0 / -0.25
KC20E1H224M-□S	0.22	1.25+0 / -0.3
KC30E1H104M-□S	0.1	1.00+0 / -0.25
KC30E1H154M-□S	0.15	1.00+0 / -0.25
KC30E1H224M-□S	0.22	1.00+0 / -0.25
KC30E1H334M-□S	0.33	1.00+0 / -0.25
KC30E1H474M-□S	0.47	1.00+0 / -0.25
KC30E1H684M-□S	0.68	1.25+0 / -0.3
KC30E1H105M-□S	1	1.80+0 / -0.4
KC40E1H684M-□S	0.68	1.00+0 / -0.25
KC40E1H105M-□S	1	1.25+0 / -0.3
KC40E1H155M-□S	1.5	1.70+0 / -0.4
KC40E1H225M-□S	2.2	2.20+0 / -0.5
KC40E1H335M-□S	3.3	2.50+0 / -0.6
KC70E1H155M-□S	1.5	1.00+0 / -0.25
KC70E1H225M-□S	2.2	1.70+0 / -0.4
KC70E1H335M-□S	3.3	2.20+0 / -0.5
KC70E1H475M-□S	4.7	2.20+0 / -0.5
KC70E1H685M-□S	6.8	2.50+0 / -0.6
KC70E1H106M-□S	10	2.50+0 / -0.6
KC80E1H335M-□S	3.3	1.25+0 / -0.3
KC80E1H475M-□S	4.7	1.25+0 / -0.3
KC80E1H685M-□S	6.8	1.70+0 / -0.4
KC80E1H106M-□S	10	2.20+0 / -0.5
KC80E1H156M-□S	15	2.50+0 / -0.6

Rated Voltage : 25VDC

Part Number	Capacitance(μF)	Product height T(mm)
KC20E1E154M-□S	0.15	0.75+0 / -0.2
KC20E1E224M-□S	0.22	1.00+0 / -0.25
KC20E1E334M-□S	0.33	1.25+0 / -0.3
KC20E1E474M-□S	0.47	1.25+0 / -0.3
KC30E1E684M-□S	0.68	1.00+0 / -0.25
KC30E1E105M-□S	1	1.80+0 / -0.4
KC30E1E155M-□S	1.5	1.25+0 / -0.3
KC30E1E225M-□S	2.2	1.80+0 / -0.4
KC40E1E105M-□S	1	1.00+0 / -0.25
KC40E1E155M-□S	1.5	1.00+0 / -0.25
KC40E1E225M-□S	2.2	1.70+0 / -0.4
KC40E1E335M-□S	3.3	2.20+0 / -0.5
KC40E1E475M-□S	4.7	2.50+0 / -0.6
KC40E1E685M-□S	6.8	2.50+0 / -0.6
KC40E1E106M-□S	10	2.50+0 / -0.6
KC70E1E225M-□S	2.2	1.00+0 / -0.25
KC70E1E335M-□S	3.3	1.25+0 / -0.3
KC70E1E475M-□S	4.7	1.70+0 / -0.4
KC70E1E685M-□S	6.8	2.20+0 / -0.5
KC70E1E106M-□S	10	2.50+0 / -0.6
KC70E1E156M-□S	15	2.50+0 / -0.6
KC70E1E226M-□S	22	2.50+0 / -0.6
KC80E1E475M-□S	4.7	1.25+0 / -0.3
KC80E1E685M-□S	6.8	1.25+0 / -0.3
KC80E1E106M-□S	10	1.70+0 / -0.4
KC80E1E156M-□S	15	2.20+0 / -0.5
KC80E1E226M-□S	22	2.50+0 / -0.6

Rated Voltage : 16VDC

Part Number	Capacitance(μF)	Product height T(mm)
KC11E1C154M-□S	0.15	0.8±0.1
KC11E1C224M-□S	0.22	0.8±0.1
KC20E1C334M-□S	0.33	1.00+0 / -0.25
KC20E1C474M-□S	0.47	1.00+0 / -0.25
KC20E1C684M-□S	0.68	1.00+0 / -0.25
KC20E1C105M-□S	1	1.25+0 / -0.3
KC30E1C105M-□S	1	1.25+0 / -0.3
KC40E1C335M-□S	3.3	1.00+0 / -0.25
KC40E1C475M-□S	4.7	1.25+0 / -0.3
KC40E1C685M-□S	6.8	1.70+0 / -0.4
KC40E1C106M-□S	10	2.20+0 / -0.5
KC70E1C335M-□S	3.3	1.00+0 / -0.25
KC70E1C475M-□S	4.7	1.25+0 / -0.3
KC70E1C685M-□S	6.8	1.70+0 / -0.4
KC70E1C106M-□S	10	1.70+0 / -0.4
KC70E1C156M-□S	15	2.20+0 / -0.5
KC70E1C226M-□S	22	2.50+0 / -0.6
KC70E1C336M-□S	33	2.50+0 / -0.6
KC80E1C476M-□S	47	2.50+0 / -0.6

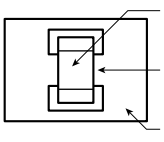
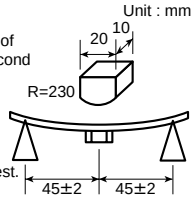
∗ Specify the taped product (T) or bulk product (B) for □.
∗ Highly reliable Ni-barrier terminations show excellent flexion and temperature cycling.
∗ KC40, KC70, KC80 types are available for reflow soldering in principle. Please consult us when flow soldering is used.

QUANTITY OF STANDARD PACKAGES

Type	T Dimensions(mm)	Q`ty/Standard package (No. of units)	Carrier tape material
KC20	0.75 +0 –0.2	4000	Paper
	1.00 +0 –0.25		
	1.25 +0 –0.3	2000	Plastic
KC30 VC30	1.00 +0 –0.25	4000/2000	Paper or Plastic
	1.25 +0 –0.3	2000	Plastic
	1.80 +0 –0.4		
KC40 VC40	1.00 +0 –0.25		
	1.25 +0 –0.3		
	1.70 +0 –0.4		
	2.20 +0 –0.5	1000	
	2.50 +0 –0.5		
KC70 VC70	1.00 +0 –0.25	1000	
	1.25 +0 –0.3		
	1.70 +0 –0.4	800 (CC70/500)	
	2.20 +0 –0.5		
	2.50 +0 –0.5		
KC80 VC80	1.25 +0 –0.3	1000	
	1.70 +0 –0.4	800	
	2.20 +0 –0.5		
	2.50 +0 –0.5		
KS70 VS70	5.8 max.	1500	
KS80 VS80	6.5 max.	1000	
HC35 VH35	1.8 max.	2000	
HC38 VH38	2.2 max.		
HC47 VH47	2.8 max.	T≦2.2 / 1000 T>2.2 / 700	
HC69	2.8 max.		
HC79	3.0 max.	750	
XC44	2.3 max.	2000	
XC47	3.0 max.	T≦2.2 / 1000 T>2.2 / 700	

Type	T Dimensions(mm)	Q`ty/Standard package (No.of units)	Carrier tape material
CC11/KC11	0.80±0.10	4000	Paper
CC21	0.60±0.10		
	0.85±0.10		
	1.25±0.10	2000	Plastic
CC31	0.85±0.10	4000	Paper
	1.15±0.10	2000	Plastic

PERFORMANCE AND TEST METHOD

Item		Performance: CC series (Class 1)	Performance: CC series (Class 2) KC series B • R	Performance: CC series (Class 2) VC series E • F	Test method and conditions (In accordance with JIS 5101-1)
Dissipation Factor (or Q)		C*≧30pF→Q≧1,000, C*30pF→Q≧400+20°C*	2.5% or less ∗1)	5% or less ∗2)	Class1: MHz (≦1000pF) 0.5~2Vrms. 1kHz (>1000pF) Class2: 1kHz 1Vrms. (C≦10μF) 120Hz 0.5Vrms. (C>10μF) Application time is 1~5seconds. WV=500, 630V : applied in silicon oil.
Withstanding voltage		No insulation breakdown and no failure. CC series: Class1 applied 300% of the rated voltage, Class2 applied 250% of the rated voltage KC series: Applied 250% of the rated voltage VC series: Applied 150% (Wv=500, 630V), 200% (WV=250V), 250% (WV=100V) of the rated voltage			
Insulation resistance		No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.			Rated voltage is applied for 1 minute.
Adhesion strength of termination		 No peeling-off or exfoliation shall be manifest or recognizable in its incipient stages.			Solder a specimen on the testing jig shown on the left and apply a force of 5N (0.51kgf) in the direction indicated by arrow.
Vibration resistance	Visual	No serious mechanical damage			Vibration frequency : 10~55Hz Full amplitude : 1.5mm, 10~55~10Hz 1min. XYZ direction 2hrs for each total 6hrs.
	Capacitance	Within the specified tolerance			
	Dissipation factor (or Q)	C*30pF→Q≧1,000, C*30pF→Q≧400+20C*	2.5% or less ∗1)	5% or less ∗2)	
Resistance to soldering heat	Visual	No serious mechanical damage			Type of solder : JIS Z3282 H63A for Ni-barrier termination H60A (Ag included) for Ag/Pd termination Soldering temperature : 270±5°C for Ni-barrier termination 230±5°C for Ag/Pd termination Immersion time : 10±1 seconds. for Ni-barrier termination 4±1 seconds for Ag/Pd termination Preheating prior to immersion : 80~100°C (1~2min.) 170~200°C (1~2min.) Continuous immersion after preheating
	Rate change in capacitance	No more than ±2.5% or ±0.25pF, whichever is larger.	Within ±7.5%	Within ±20%	
	Dissipation factor (or Q)	C*30pF→Q≧1,000, C*30pF=→Q≧400+20C*	2.5% or less ∗1)	5% or less ∗2)	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.			
	Withstanding voltage	No insulation breakdown and no failure.			
Solderability		Termination surface should be covered with new solder to over 75%.			Type of solder : JIS Z3282 H63A for Ni-barrier termination H60A (Ag included) for Ag/Pd termination Soldering temperature : 230±5°C Immersion time : 4±1 seconds for Ni-berrier termination 2±1 seconds for Ag/Pd termination
Temperature cycle	Visual	No serious mechanical damage			Step 1: Lower limit temp.∗ 30min. Step 2: Room temp. 3min. Step 3: Upper limit temp.∗ 30min. Step 4: Room temp. 3min. Leaving a specimen under the temperature of step 1~4 above in order completes 1 cycle. The cycle is repeated 5 times.
	Capacitance change	No more than ±2.5% or ±0.25pF, whichever is larger.	Within ±7.5%	Within ±20%	
	Dissipation factor (or Q)	C*30pF→Q≧1,000, C*30pF=→Q≧400+20C*	2.5% or less ∗1)	5% or less ∗2)	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.			
	Withstanding voltage	No insulation breakdown and no failure.			
Humidity load test	Visual	No serious mechanical damage			Test temperature : 65±2°C Relative humidity : 90~95% Testing time : 1000 $^{+48hours}_{-0}$ 100% of rated voltage is applied
	Capacitance change	No more than ±5% or ±0.5pF, whichever is larger.	Within ±12.5%	Within ±30%	
	Dissipation factor (or Q)	C*30pF→Q≧350, 30pF>C*≧10pF→Q≧275+(5/2)C* C*<10pF→Q≧200+10C*	5% or less ∗3)	7.5% or less ∗4)	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.			
Life test (at elevated ambient temperature)	Visual	No serious mechanical damage			Test temp. : # Testing time : 1000 $^{+48hours}_{-0}$ 200% of rated voltage is applied. In case of VC series, 100% or 200% of rated voltage (DC voltage) is applied.
	Capacitance change	No more than ±3% or ±0.3pF, whichever is larger	Within ±12.5%	Within ±30%	
	Dissipation factor (or Q)	C*30pF→Q≧350, 30pF>C*≧10pF→Q≧275+(5/2)C* C*<10pF→Q≧200+10C*	4% or less ∗3)	7.5% or less ∗4)	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.			
∗Flexion	Visual	No serious mechanical damage			Unit : mm Add load at a speed of about 0.5mm per second until flexion amount reaches 1mm. Have a capacitance meter connected to both ends of the specimen during a test. 
	Capacitance change	No more than ±5% or ±0.5pF, whichever is larger.	Within ±12.5%	Within ±30%	

Note : C* represents capacitance values (pF).
∗Pleases consult us regarding [S] termination.

Lower limit temp.∗and upper limit temp.∗are shown as below.

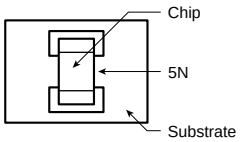
Temp.characteristics	C△, U△, SL, R	B, E, F
Lower limit temp.	−55°C	−25°C
Upper limit temp.	+125°C	+85°C

Test temp.# is shown as below.

Temp.characteristics	C△, U△, SL, R	B, E, F
Test temp.	+125°C	+85°C

∗1) CC series B/R (16, 10V) ; 3.5% or less
∗2) KC series E (16V) ; 6% or less
CC series F (16V) ; 9% (C≧1μF)
CC series F (10V) ; 12.5% or less
15% or less (21 type C≧10μF, 31 type C≧22μF)
∗3) CC series B/R (16, 10V) ; 7% or less
∗4) KC series E (16V) ; 8.5% or less
CC series F (16V) ; 12.5% (C≧1μF)
CC series F (10V) ; 15% or less
20% or less (21 type C≧10μF, 31 type C≧22μF)

PERFORMANCE AND TEST METHOD

Item		Performance		Testing method and conditions (In accordance with JIS 5101-1)
		VS Series	KS • VS Series	
		R	E	
Withstanding voltage		No insulation breakdown and no failure.		Applications time is 1~5 seconds. WV=630V : applied in silicon oil.
		KS series Applied 250% of the rated voltage	VS series Applied 150% (WV=630V), 200% (WV=250V), 250%(WV=100V) of the rated voltage	
Insulation resistance		No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.		Rated voltage is applied for 1 minute.
Adhesion strength of termination		 Solder a specimen on the testing jig shown on the left and apply a force of 5N (0.51kgf) in the direction indicated by an arrow. No peeling-off or exfoliation shall be manifest or recognizable in its incipient stages.		According to JIS6429
Vibration resistance	Visual	No serious mechanical damage		Vibration frequency : 10~55Hz Full amplitude : 1.5mm, 10~55~10Hz 1min. XYZ direction 2hrs for each, total 6hrs.
	Capacitance	Within the specified tolerance		
	Dissipation factor	2.5% or less	5% or less	
Resistance to soldering heat	Visual	No serious mechanical damage		Type of solder : JIS Z3282 H60A (Ag included) Soldering temperature : 230±5°C Immersion time : 4±1 seconds Preheating prior to immersion : 80~100°C (1~2min.) 170~200°C (1~2min.) Continuous immersion after preheating
	Capacitance change	Within ±7.5%	Within ±20%	
	Dissipation factor	2.5% or less	5% or less	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.		
	Withstanding voltage	No insulation breakdown and no failure.		
Solderability		Termination surface should be covered with new solder to over 90%.		Type of solder : JIS Z3282 H60A (Ag included) Soldering temperature : 230±5°C Immersion time : 2±1 seconds
Temperature cycle	Visual	No serious mechanical damage		Step / Temperature / Time 1 / Lower limit temp.* / 30min. 2 / Room temp. / 3min. 3 / Upper limit temp.* / 30min. 4 / Room temp. / 3min. Leaving a specimen under the temperature of step 1~4 above in order completes 1 cycle. The cycle is repeated 5 times.
	Capacitance change	Within ±7.5%	Within ±20%	
	Dissipation factor	2.5% or less	5% or less	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.		
	Withstanding voltage	No insulation breakdown and no failure.		
Humidity load test	Visual	No serious mechanical damage		Test temperature : 65±2°C Relative humidity : 90~95% Testing time : 1000 $^{+48hours}_{-0}$ 100% of rated voltage (DC voltage) is applied
	Capacitance change	Within ±12.5%	Within ±30%	
	Dissipation factor	5% or less	7.5% or less	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.		
Life test (at elevated ambient temperature)	Visual	No serious mechanical damage		Test temp. : # Testing time : 1000 $^{+48hours}_{-0}$ 200% of rated voltage (DC voltage) is applied for KS series. In case of VS series, 100% or 200% of rated voltage (DC voltage) is applied.
	Capacitance change	Within ±12.5%	Within ±30%	
	Dissipation factor	4% or less	7.5% or less	
	Insulation resistance	No less than 10,000MΩ or 500MΩ • μF, whichever is smaller.		

Lower limit temp.* and upper limit temp.* are shown as below.

Temp.characteristics	R	E
Lower limit temp.	–55°C	–25°C
Upper limit temp.	+125°C	+85°C

Test temp.# is shown as below.

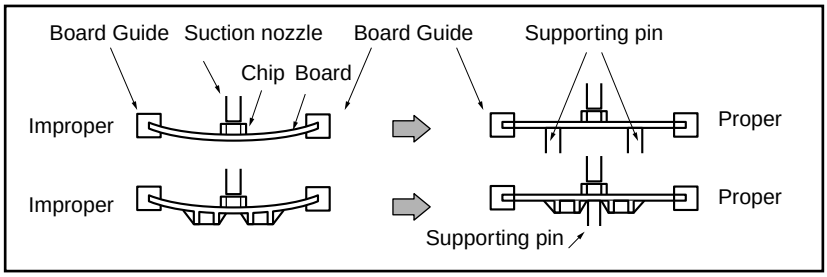
Temp.characteristics	R	E
Test temp.	+125°C	+85°C

HANDLING PRECAUTIONS

■Mounting

1. Chip mounting

(1) While mounting, if the bottom dead point of the suction nozzle is too low, the force on the chip may be great enough to cause breaking or cracking. Adjust the distance of the botton dead point of the nozzle from the top surface of the chip, after resetting the substrate straight, to prevent overload on the chip.

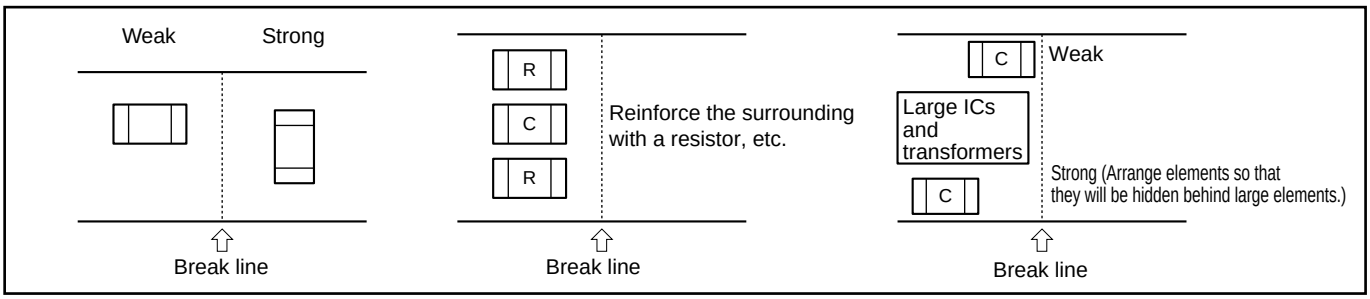


(2) To prevent cracking or breaking, set the static load force between 100~300gf when mounting.

(3) A worn clamp fixture of the mounter can cause an uneven distribution of the clamping force, leading to cracking or breaking of the capacitor. Check the dimensions of the clamping fixture in the closed position, perform routine maintenance on the suction nozzle and clamping fixture, and inspect or change worn parts on a periodic basis.

2. Board breaking

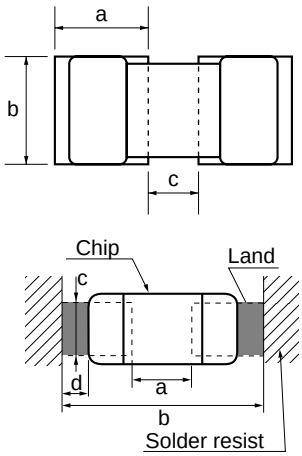
When large multi-circuit boards are broken into individual boards after soldering, flexure stress may be placed on the parts causing them to cracking or breaking. For designing patterns please refer to below.



■Soldering

1. Basic design

Recommended land pattern for reflow soldering.



Unit : mm

	Type	CC11 KC11	CC21 KC20	CC31 KC30 VC30	KC40 VC40	KS70 KC70,VS70 VC70	KC80 VC80 KS80,VS80
	Chip length (L)× Width (W)	1.6×0.8	2.0×1.25	3.2×1.6	3.2×2.5	4.5×3.2	5.7×5.0
Land dimension	a	0.6~0.7	0.6~0.7	0.8~0.9	1.0~1.2	1.1~1.3	1.5~1.7
	b	0.6~0.8	0.8~1.1	1.0~1.4	1.8~2.5	2.3~3.2	3.5~5.0
	c	0.6~0.8	1.0~1.2	2.2~2.4	2.0~2.4	2.6~3.4	3.6~4.6

Unit : mm

Type	Chip dimension		Land dimension			
	L	W	a	b	c	d
26	2.0	1.25	0.8~1.2	2.4~3.2	0.9~1.2	0.2~0.6
35	3.3	1.6	1.9~2.6	3.9~4.9	1.2~1.6	0.3~0.8
38	3.5	2.7	2.1~2.8	4.1~5.1	2.0~2.7	0.3~0.8
44	4.6	2.0	3.6	8.2	1.8	1.4~2.2
47	4.7	3.3	2.7~3.7	5.7~6.3	2.4~3.3	0.5~1.3
69	6.1	5.3	3.1~4.6	7.1~8.7	3.8~5.3	0.5~1.3
79	6.9	5.7	3.9~5.9	7.9~9.5	4.1~5.7	0.5~1.3

2. General cautions for soldering

(1) Excessively high soldering temperatures or long soldering times can cause leaching of terminations, and consequently decrease adherence strength, and capacitance value, etc.

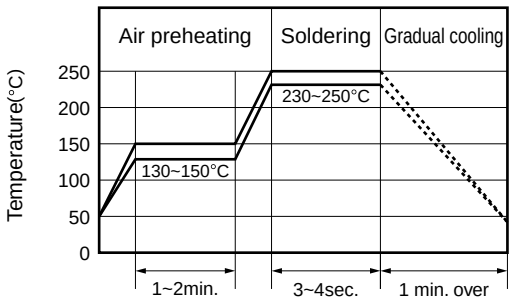
HANDLING PRECAUTIONS

(2) For soldering, please refer to the soldering curves below.
(CC,KC,VC,KS,VS series)

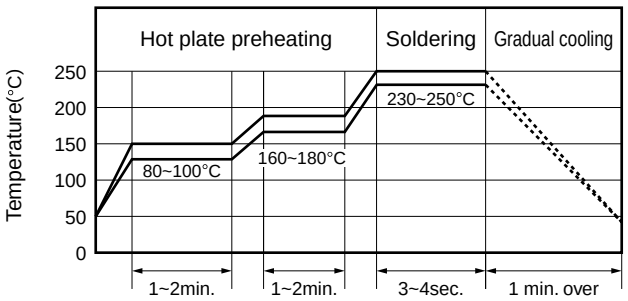
(3) For parts with Ag/Pd terminations, be aware that silver has a tendency to diffuse into the solder bath. To prevent leaching, please use a Sn : Pb=6 : 4 solder, with 2~5% Ag added.

(4) When using a soldering iron for repair work, make sure to apply the tip of the iron and the solder to the edge of the chip at the same time, being careful not to touch the chip directly with the iron.

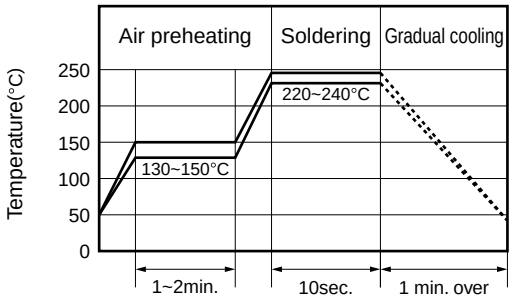
①Flow soldering (air preheating) recommended conditions



②Flow soldering (hot plate preheating) recommended conditions



③Reflow soldering recommended conditions



④As to the soldering recommended conditions to the Sn-barrier, please consult us.

Note1 : Below are listed recommended conditions for the temperature profile of Ag/Pd terminated parts.
(1) Keep the peak temperature as low as possible.
(2) Do not keep the parts above 200°C for more than 20 seconds.

Note2 : Reflow soldering on Ag/Pd terminated parts should be done only once.

(5) Please use a mild flux (containing less than 0.2wt% Cl). Also, if the flux is water soluble, be sure to wash thoroughly to remove any residue from the underside of components that could affect resistance.

3. Cleaning

When using ultrasonic cleaning, the board may resonate if the output power is too high. Because this vibration can cause cracking or decrease in the adhesion of the termination, we recommend the conditions below.

Frequency : 28kHz
Output power : 20W/liter
Cleaning time : 5 minutes max.

■Storage/keeping

(1) Deterioration of solderability can be caused by oxidization/sulfurization because of high temperature, high humidity or chlorine/sulfur gas. Parts should be used within 6 months if possible and stored below 40°C and 70%RH in a atmosphere free of sulfur, chlorine or toxic gasses.

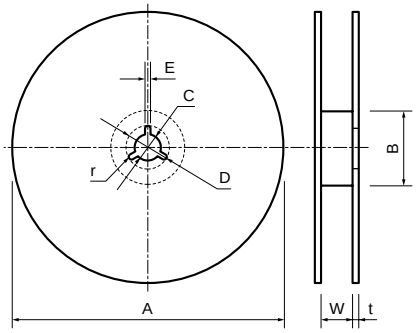
(2) These capacitors are made of ceramics. Avoid dropping or other mechanical shock that could damage the parts.

(3) The capacitors kept in your storage for over 6 months should be used only after checking solderability.

PACKAGE FORM DETAILS

■TAPING

Reel Type Size

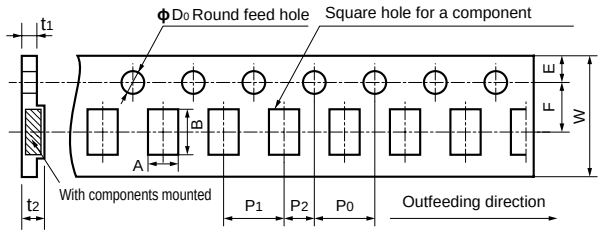


Unit : mm

Series	Size	A	B	C	D	E	W	t	r
CC KC VC	11,20,21, 30,31,40	ϕ178±2	ϕ50min	ϕ13.0 ±0.5	ϕ21.0 ±0.8	2.0±0.5	10.0±1.5	paper 0.8±0.2	1.0±0.2
	70,80						14.0±1.5		
KS VS	70	ϕ329±2	ϕ50min	ϕ13.0 ±0.5	ϕ21.0 ±0.5	2.5±0.5	13.5±1.5	2.5±0.5	1.0±0.2
	80	ϕ329±2	ϕ50min	ϕ13.0 ±0.5	ϕ21.0 ±0.5	2.5±0.5	17.5±1.5	2.5±0.5	1.0±0.2

Taping Specifications

• Paper carrier tape for 4,000pcs. (11,20,21,30,31size)

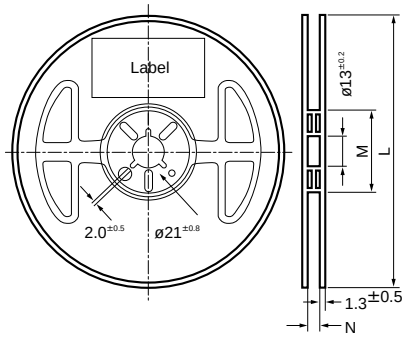


Unit : mm

Series	Size	A	B	W	F	E	P1	P2	P0	D0	t1	t2	Hole
CC KC VC	11	1.1 ±0.2	1.9 ±0.2	8.0 ±0.3	3.50 ±0.05	1.75 ±0.1	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	ϕ1.5 +0.1 −0	1.0 max	1.1 max	Square punch-hole
	20,21	1.62 ±0.2	2.3 ±0.2										
	30,31	2.0 ±0.2	3.6 ±0.2										

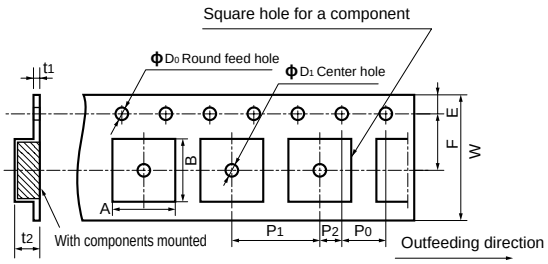
■TAPING OF HC, VH, XC SERIES

Reel Type Size



■Features

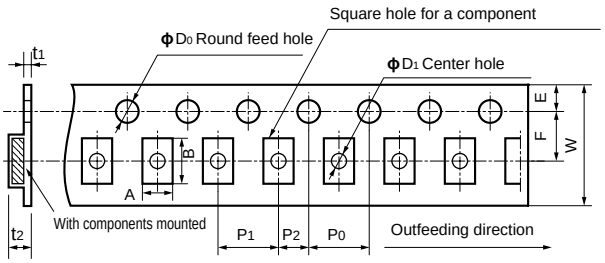
Plastic carrier tape for 800, 1000 and 1500pcs. (70, 80 size)



Unit : mm

Series	Size	A	B	W	F	E	P1	P2	P0	D0	D1	t1	t2	Hole
KC VC	70	3.6 ±0.2	4.9 ±0.2	12.0 ±0.2	5.50 ±0.05	1.75 ±0.1	8.0 ±0.1	2.00 ±0.05	4.0 ±0.1	ϕ1.5 +0.1 −0	ϕ1.5 min	0.6 max	2.5 max	Square embossed hole
	80	5.4 ±0.2	6.1 ±0.2	12.0 ±0.2	5.50 ±0.05	1.75 ±0.1	8.0 ±0.1	2.00 ±0.05	4.0 ±0.1	ϕ1.5 +0.1 −0	ϕ1.5 min	0.6 max	2.5 max	
KS VS	70	3.9 ±0.1	5.6 ±0.1	12.0 ±0.1	5.5 ±0.1	1.75 ±0.1	8.0 ±0.1	2.0 ±0.1	4.0 ±0.1	ϕ1.5 +0.1 −0	ϕ1.15 ±0.05	0.40 ±0.05	5.6 ±0.1	
	80	5.75 ±0.1	7.05 ±0.1	16.0 ±0.2	7.5 ±0.1	1.75 ±0.1	8.0 ±0.1	2.0 ±0.1	4.0 ±0.1	ϕ1.55 +0.1 −0	ϕ1.15 ±0.05	0.40 ±0.05	6.55 ±0.1	

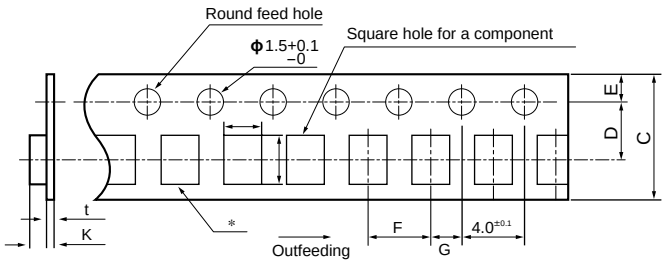
• Plastic carrier tape for 2,000pcs. (Partially 20,21,30,31size and 40 size)



Unit : mm

Series	Size	A	B	W	F	E	P1	P2	P0	D0	D1	t1	t2	Hole
CC KC VC	20,21	1.45 ±0.2	2.3 ±0.2	8.0 ±0.2	3.50 ±0.05	1.75 ±0.1	4.0 ±0.1	2.00 ±0.05	4.0 ±0.1	ϕ1.5 +0.1 −0	ϕ1.15 ±0.05	0.6 max	2.0 max	Square embossed hole
	30,31	2.0 ±0.2	3.6 ±0.2											
	40	2.9 ±0.2	3.6 ±0.2											

Taping Specitications



Unit : mm

Size code	A ±0.1	B ±0.1	C ±0.1	D ±0.1	E ±0.1	F ±0.1	G ±0.1	K MAX	t MAX	L 0 −3	M +1 0	N +0.3	Standard packaging volume (pc./reel)
26	1.6	2.4	8.0	3.5	1.75	4.0	2.0	2.5	0.3	180	60	9	2000
35	1.7	3.7	8.0	3.5	1.75	4.0	2.0	2.5	0.3	180	60	9	
38	3.1	3.8	8.0	3.5	1.75	4.0	2.0	2.5	0.3	180	60	9	
44	2.25	4.95	12.0	5.65	1.75	4.0	2.0	2.5	0.3	180	60	9	
47	3.6	4.9	12.0	5.5	1.75	8.0	2.0	2.5	0.3	180	60	13	T≦2.2 / 1000 T>2.2 / 700
69	5.6	6.2	12.0	5.5	1.75	8.0	2.0	2.5	0.3	180	60	13	
79	6.2	7.5	12.0	5.5	1.75	8.0	2.0	2.5	0.4	180	60	13	750