● Part Numbering

Radial Lead Type Monolithic Ceramic Capacitors

(Part Number)

RP	E	R7	1H	104	K	2	M1	A03	A
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID

❷Series/Terminal

Product ID	Series/Terminal	
RP	**E**	Radial Lead Type Monolithic Ceramic Capacitors (DC25V-DC100V)
RH	**E/D**	Radial Lead Type Monolithic Ceramic Capacitors 150°C max. (for Automotive) (DC50V-DC100V)
RD	**E**	Radial Lead Type Monolithic Ceramic Capacitors (Only for Commercial Use) (DC250V-DC630V)

❸Temperature Characteristics

Code	Temperature Characteristics	Temperature Range	Capacitance Change or Temperature Coefficient	Operating Temperature Range
5C	C0G	25 to 125°C	0±30ppm/°C	-55 to 125°C
F5	Y5V	-30 to 85°C	+22, -82%	-30 to 85°C
L8	X8L	-55 to 125°C	±15%	-55 to 150°C
		125 to 150°C	+15, -40%	
R7	X7R	-55 to 125°C	±15%	-55 to 125°C

❹Rated Voltage

Code	Rated Voltage
1E	DC25V
1H	DC50V
2A	DC100V
2E	DC250V
2J	DC630V

❺Capacitance

Expressed by three-digit alphanumerics. The unit is pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two numbers.
If there is a decimal point, it is expressed by the capital letter "**R**". In this case, all figures are significant digits.

❻Capacitance Tolerance

Code	Capacitance Tolerance	Temperature Characteristics	Capacitance Step
C	±0.25pF	C0G	≦5pF : 1pF Step
D	±0.5pF		6 to 9pF : 1pF Step
J	±5%		≧10 : E12 Series
K	±10%	X7R/X8L	E6 Series
M	±20%	X7R	E3 Series
Z	+80%, -20%	Y5V	E3 Series

❾Individual Specification Code

Expressed by three-digit alphanumerics

❿Packaging

Code	Packaging
A	Ammo Pack
B	Bulk

❼Dimensions (LxW)

Code	Dimensions (LxW)
1	4.0×3.5mm
2	5.0×3.5mm or 5.5×4.0mm or 5.7×4.5mm (Depends on Part Number List)
3	5.0×4.5mm or 5.5×5.0mm (Depends on Part Number List)
4	7.5×5.0mm
5	7.5×7.5mm*
6	10.0×10.0mm
7	12.5×12.5mm
8	7.5×5.5mm
U	7.7×12.5mm*

* DC630V: W+0.5mm

❽Lead Style

Code	Lead Style	Lead Spacing
A2	Straight Long	2.5mm
B1	Straight Long	5.0mm
C1	Straight Long	10.0mm
DB	Straight Taping	2.5mm
E1/E2	Straight Taping	5.0mm
K1	Inside Crimp	5.0mm
M1/M2	Inside Crimp Taping	5.0mm
P1	Outside Crimp	2.5mm
S1/S2	Outside Crimp Taping	2.5mm

Lead distance between reference and bottom planes.
M1, S1: H_0 = 16.0±0.5mm
M2, S2: H_0 = 20.0±0.5mm
E1: H = 17.5±0.5mm
E2: H = 20.0±0.5mm

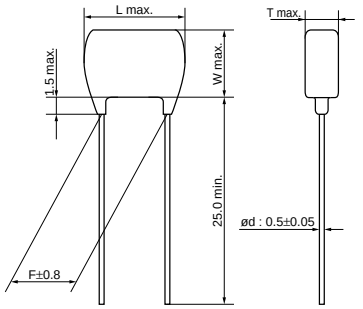
Radial Lead Type Monolithic Ceramic Capacitors

RH Series 150 deg. C max. (for Automotive) (DC50V-DC100V)

■ Features

1. Small size and large capacitance
2. Low ESR and ESL suitable for high frequency
3. Applied maximum temperature up to 150 deg. C
   Note: Maximum accumulative time to 150 deg. C is within 2000 hours.
4. Coated with epoxy (LxW=4.0x3.5mm) or silicone (LxW=4.0x3.5mm over) resin which is suitable for heat cycle.
5. The RH series meet AEC-Q200 reguirements.

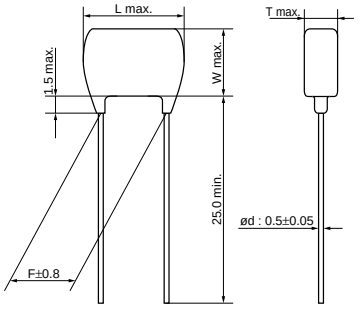
Dimensions code: 1
Lead style code: A2



· Lead Wire : Solder Coated Copper Wire or Solder Coated CP Wire

(in mm)

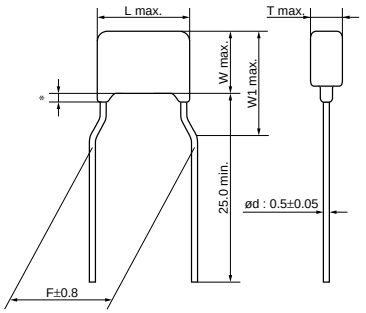
Dimensions code: 2
Lead style code: A2



· Lead Wire : Solder Coated Copper Wire or Solder Coated CP Wire

(in mm)

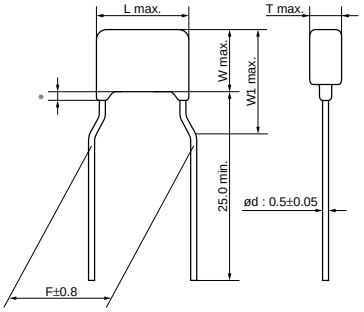
Dimensions code: 1
Lead style code: K1



* Coating extension does not exceed the end of the lead bend.
· Lead Wire : Solder Coated Copper Wire or Solder Coated CP Wire

(in mm)

Dimensions code: 2
Lead style code: K1



* Coating extension does not exceed the end of the lead bend.
· Lead Wire : Solder Coated Copper Wire or Solder Coated CP Wire

(in mm)

■ Dimensions

Dimensions and Lead Style Code	Dimensions (mm)					
	L	W	W1	T	F	d
1A2/1DB	4.0	3.5	-	See the individual product specifications	2.5	0.5
1K1/1M1	4.0	3.5	5.0		5.0	0.5
2A2/2DB	5.7	4.5	-		2.5	0.5
2K1/2M1	5.7	4.5	7.0		5.0	0.5

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■ Marking

Dimensions Code \ Rated Voltage	DC50V	DC100V
Temp. Char.	X8L	
1		
2		
Temperature Characteristics	Marked with code (X8L char.: 8)	
Nominal Capacitance	Marked with 3 figures	
Capacitance Tolerance	Marked with code	
Rated Voltage	Marked with code (DC50V: 5, DC100V: 1) A part is omitted (Please refer to the marking example.)	
Manufacturer's Identification	Marked with Ⓜ A part is omitted (Please refer to the marking example.)	

Part Number	Temp. Char.	Rated Voltage (Vdc)	Capacitance	Dimensions LxW (mm)	Dimension T (mm)	Lead Space F (mm)	Lead Style Code Bulk	Lead Style Code Taping (1)	Lead Style Code Taping (2)
RHEL81H102K1□□A03□	X8L	50	1000pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H102K1□□A03□	X8L	50	1000pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H152K1□□A03□	X8L	50	1500pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H152K1□□A03□	X8L	50	1500pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H222K1□□A03□	X8L	50	2200pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H222K1□□A03□	X8L	50	2200pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H332K1□□A03□	X8L	50	3300pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H332K1□□A03□	X8L	50	3300pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H472K1□□A03□	X8L	50	4700pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H472K1□□A03□	X8L	50	4700pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H682K1□□A03□	X8L	50	6800pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H682K1□□A03□	X8L	50	6800pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H103K1□□A03□	X8L	50	10000pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H103K1□□A03□	X8L	50	10000pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H153K1□□A03□	X8L	50	15000pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H153K1□□A03□	X8L	50	15000pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H223K1□□A03□	X8L	50	22000pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL81H223K1□□A03□	X8L	50	22000pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL81H333K1□□A03□	X8L	50	33000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL81H333K1□□A03□	X8L	50	33000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHEL81H473K1□□A03□	X8L	50	47000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL81H473K1□□A03□	X8L	50	47000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHEL81H683K1□□A03□	X8L	50	68000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL81H683K1□□A03□	X8L	50	68000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHEL81H104K1□□A03□	X8L	50	0.10µF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL81H104K1□□A03□	X8L	50	0.10µF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHDL81H154K2□□C03□	X8L	50	0.15µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H154K2□□C03□	X8L	50	0.15µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL81H224K2□□C03□	X8L	50	0.22µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H224K2□□C03□	X8L	50	0.22µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL81H334K2□□C03□	X8L	50	0.33µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H334K2□□C03□	X8L	50	0.33µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL81H474K2□□C03□	X8L	50	0.47µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H474K2□□C03□	X8L	50	0.47µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL81H684K2□□C03□	X8L	50	0.68µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H684K2□□C03□	X8L	50	0.68µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL81H105K2□□C03□	X8L	50	1.0µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL81H105K2□□C03□	X8L	50	1.0µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-

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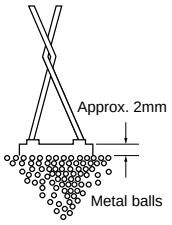
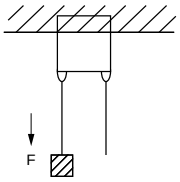
Part Number	Temp. Char.	Rated Voltage (Vdc)	Capacitance	Dimensions LxW (mm)	Dimension T (mm)	Lead Space F (mm)	Lead Style Code Bulk	Lead Style Code Taping (1)	Lead Style Code Taping (2)
RHEL82A102K1□□A03□	X8L	100	1000pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A102K1□□A03□	X8L	100	1000pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A152K1□□A03□	X8L	100	1500pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A152K1□□A03□	X8L	100	1500pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A222K1□□A03□	X8L	100	2200pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A222K1□□A03□	X8L	100	2200pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A332K1□□A03□	X8L	100	3300pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A332K1□□A03□	X8L	100	3300pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A472K1□□A03□	X8L	100	4700pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A472K1□□A03□	X8L	100	4700pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A682K1□□A03□	X8L	100	6800pF ±10%	4.0 x 3.5	2.5	2.5	A2	DB	-
RHEL82A682K1□□A03□	X8L	100	6800pF ±10%	4.0 x 3.5	2.5	5.0	K1	M1	-
RHEL82A103K1□□A03□	X8L	100	10000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL82A103K1□□A03□	X8L	100	10000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHEL82A153K1□□A03□	X8L	100	15000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL82A153K1□□A03□	X8L	100	15000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHEL82A223K1□□A03□	X8L	100	22000pF ±10%	4.0 x 3.5	3.15	2.5	A2	DB	-
RHEL82A223K1□□A03□	X8L	100	22000pF ±10%	4.0 x 3.5	3.15	5.0	K1	M1	-
RHDL82A333K2□□C03□	X8L	100	33000pF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL82A333K2□□C03□	X8L	100	33000pF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL82A473K2□□C03□	X8L	100	47000pF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL82A473K2□□C03□	X8L	100	47000pF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL82A683K2□□C03□	X8L	100	68000pF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL82A683K2□□C03□	X8L	100	68000pF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-
RHDL82A104K2□□C03□	X8L	100	0.10µF ±10%	5.7 x 4.5	4.5	2.5	A2	DB	-
RHDL82A104K2□□C03□	X8L	100	0.10µF ±10%	5.7 x 4.5	4.5	5.0	K1	M1	-

Two blank columns are filled with the lead style code. Please refer to the 3 columns on the right for the appropriate code.
The last blank column is filled with the packaging code. (B: bulk, A: ammo pack)

Specifications and Test Methods

No.	Item		Specifications	Test Method
1	Operating Temperature Range		-55 to +150˚C	–
2	Appearance		No defects or abnormalities	Visual inspection
3	Dimension and Marking		See previous pages	Visual inspection, Vernier Caliper
4	Dielectric Strength	Between Terminals	No defects or abnormalities	The capacitor should not be damaged when DC voltage of 250% of the rated voltage is applied between the terminations for 1 to 5 sec. (Charge/Discharge current ≦ 50mA)
		Body Insulation	No defects or abnormalities	The capacitor is placed in a container with metal balls of 1mm diameter so that each terminal, short-circuit, is kept approximately 2mm from the balls as shown in the figure, and 250% of the rated DC voltage is impressed for 1 to 5 sec. between capacitor terminals and metal balls. (Charge/Discharge current ≦ 50mA) 
5	Insulation Resistance	Room Temperature	C≦0.047μF: 10,000MΩ min. C>0.047μF: 500MΩ · μF min. C: Nominal capacitance	The insulation resistance should be measured at 25±3°C with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 2 min. of charging. (Charge/Discharge current ≦ 50mA)
		High Temperature	C≦0.047μF: 100MΩ min. C>0.047μF: 5MΩ · μF min. C: Nominal capacitance	The insulation resistance should be measured at 150±3°C with a DC voltage not exceeding the rated voltage at normal temperature and humidity and within 2 min. of charging. (Charge/Discharge current ≦ 50mA)
6	Capacitance		Within the specified tolerance	The capacitance/D.F. should be measured at the frequency of 1±0.1kHz and a voltage of AC1±0.2V(r.m.s.)
7	Dissipation Factor (D.F.)		0.025 max.	
8	Capacitance Temperature Characteristics		Within ±15% (Temp. Range: -55 to +125°C) Within +15/-40% (Temp. Range: +125 to +150°C)	The capacitance change should be measured after 5 min. at each specified temperature stage. <table><tr><th>Step</th><th>Temperature (˚C)</th></tr><tr><td>1</td><td>25±2</td></tr><tr><td>2</td><td>-55±3</td></tr><tr><td>3</td><td>25±2</td></tr><tr><td>4</td><td>150±3</td></tr><tr><td>5</td><td>25±2</td></tr></table>
9	Terminal Strength	Tensile Strength	Termination not to be broken or loosened	As in the figure, fix the capacitor body, apply the force gradually to each lead in the radial direction of the capacitor until reaching 10N and then keep the force applied for 10±1 sec. 
		Bending Strength	Termination not to be broken or loosened	Each lead wire should be subjected to a force of 2.5N and then bent 90˚ at the point of egress in one direction. Each wire is then returned to the original position and bent 90˚ in the opposite direction at the rate of one bend per 2 to 3 sec.
10	Vibration Resistance	Appearance	No defects or abnormalities	The capacitor should be firmly soldered to the supporting lead wire and vibrated at a frequency range of 10 to 2000Hz, 1.5mm in total amplitude, with about a 20 min. rate of vibration change from 10Hz to 2000Hz and back to 10Hz. Apply for a total of 6 hrs., 2 hrs. each in 3 mutually perpendicular directions.
		Capacitance	Within the specified tolerance	
		D.F.	0.025 max.	

Continued on the following page.

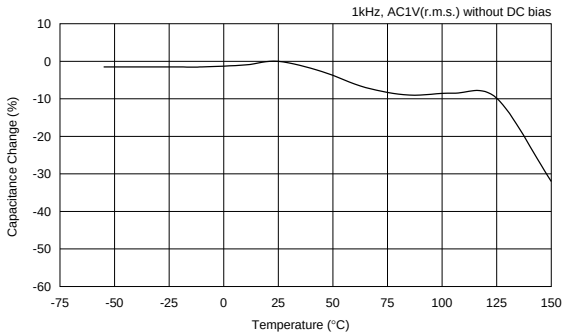
Specifications and Test Methods

Continued from the preceding page.

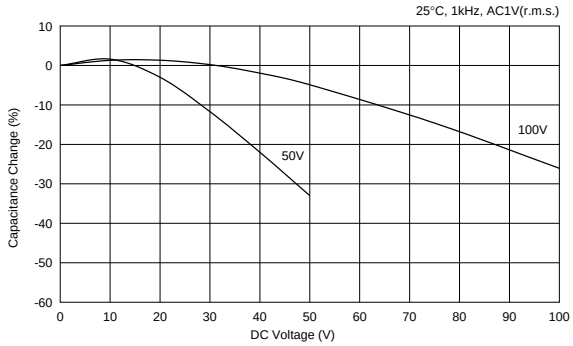
No.	Item		Specifications	Test Method
11	Solderability of Leads		Lead wire should be soldered with uniform coating on the axial direction over 3/4 of the circumferential direction.	The terminal of a capacitor is dipped into a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion) and then into molten solder (JIS-Z-3282) for 2±0.5 sec. In both cases the depth of dipping is up to about 1.5 to 2mm from the terminal body. Temp. of solder: 245±5˚C Lead Free Solder (Sn-3.0Ag-0.5Cu) 235±5˚C H60A or H63A Eutectic Solder
12	Resistance to Soldering Heat	Appearance	No defects or abnormalities	The lead wire is immersed in the melted solder 1.5 to 2mm from the main body at 270±5˚C for 3±0.5 sec. The specified items are measured after 48±4 hrs. • Pretreatment Perform a heat treatment at 150+0/-10˚C for 1 hr., and then let sit at room temperature for 48±4 hrs.
		Capacitance Change	Within ±7.5%	
		Dielectric Strength (Between Terminals)	No defects	
13	Temperature Cycle	Appearance	No defects or abnormalities except color change of outer coating	The capacitor should be subjected to 1000 temperature cycles. Step / Temperature (˚C) / Time (min) 1 / -55±3 / 30±3 2 / Room Temp. / 3 max. 3 / 150±3 / 30±3 4 / Room Temp. / 3 max. The capacitors are heat treated for 1hr. at 150+0/-10°C, allowed to sit at room temperature for 48±4 hrs., and given an initial measurement.
		Capacitance Change	Within ±12.5%	
		D.F.	0.05 max.	
		Insulation Resistance	1,000MΩ or 50MΩ · μF min. (whichever is smaller)	
		Dielectric Strength (Between Terminals)	No defects or abnormalities	
14	Humidity (Steady State)	Appearance	No defects or abnormalities	Set the capacitor at 85±2˚C and relative humidity of 85 ±2% for 500 $^{+24}_{0}$ hrs. Remove and set for 48±4 hrs. at room temperature, then measure.
		Capacitance Change	Within ±12.5%	
		D.F.	0.05 max.	
		Insulation Resistance	1,000MΩ or 50MΩ · μF min. (whichever is smaller)	
15	Humidity Load	Appearance	No defects or abnormalities	Apply the rated voltage at 85±2˚C and relative humidity of 85±2% for 500 $^{+24}_{0}$ hrs. Remove and set for 48±4 hrs. at room temperature, then measure. (Charge/Discharge current ≦ 50mA)
		Capacitance Change	Within ±12.5%	
		D.F.	0.05 max.	
		Insulation Resistance	500MΩ or 25MΩ · μF min. (whichever is smaller)	
16	High Temperature Load	Appearance	No defects or abnormalities except color change of outer coating	Apply a DC voltage of 150% of the rated voltage for 1000 $^{+48}_{0}$ hrs. at the maximum operating temperature. Remove and set for 48±4 hrs. at room temperature, then measure. (Charge/Discharge current ≦ 50mA) • Pretreatment Apply test voltage for 1 hr., at test temperature. Remove and set for 48±4 hrs. at room temperature.
		Capacitance Change	Within ±12.5%	
		D.F.	0.04 max.	
		Insulation Resistance	1,000MΩ or 50MΩ · μF min. (whichever is smaller)	
17	Solvent Resistance	Appearance	No defects or abnormalities	The capacitor should be fully immersed, unagitated, in reagent at 20 to 25 ˚C for 30±5 sec. and then remove gently. Marking on the surface of the capacitor should immediately be visually examined. Reagent : • Isopropyl alcohol
		Marking	Legible	

RH Series Characteristics Data (Typical Example)

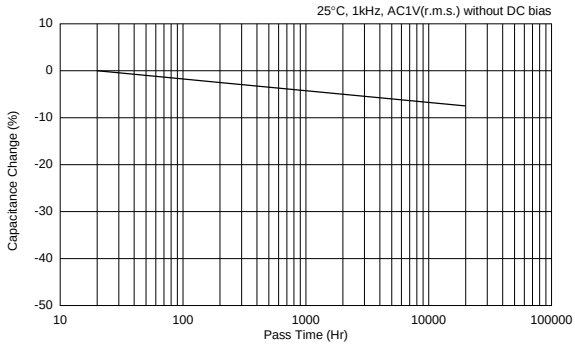
■ Capacitance - Temperature Characteristics



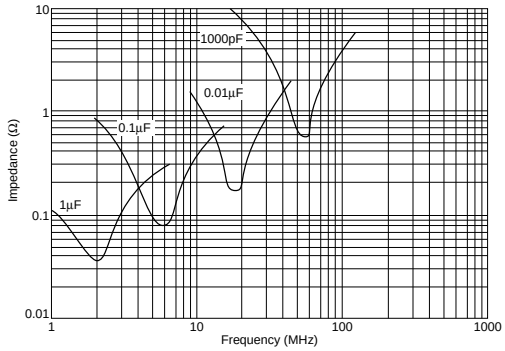
■ Capacitance - DC Voltage Characteristics



■ Capacitance Change - Aging



■ Impedance - Frequency Characteristics



Packaging

■ Packaging

Two types of packaging for monolithic ceramic capacitors are available.

1. Bulk Packaging

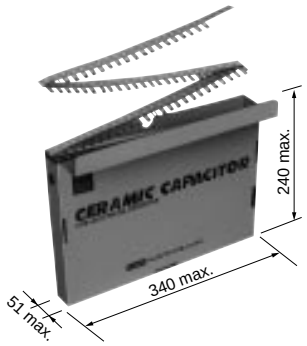
Minimum Quantity*1

Dimensions Code	Dimensions (L×W)	Minimum Quantity (pcs./Bag)
1	4.0×3.5mm	500
2	5.0×3.5mm or 5.5×4.0mm or 5.7×4.5mm (Depends on Part Number List)	
3	5.0×4.5mm or 5.5×5.0mm (Depends on Part Number List)	
4	7.5×5.0mm	
5	7.5×7.5mm (DC630V: 7.5×8.0mm)	
6	10.0×10.0mm	
8	7.5×5.5mm	
7	12.5×12.5mm	100
U	7.7×12.5mm (DC630V: 7.7×13.0mm)	200

Please order with an integral multiple of the minimum quantity above.

2. Tape Carrier Packaging

(1) Dimensions of Ammo Pack



(in mm)

(2) Minimum Quantity*1

Dimensions Code	Dimensions (L×W)	Minimum Quantity (pcs./Ammo Pack)
1	4.0×3.5mm	2000*2
2	5.0×3.5mm or 5.5×4.0mm or 5.7×4.5mm (Depends on Part Number List)	
3	5.0×4.5mm or 5.5×5.0mm (Depends on Part Number List)	
4	7.5×5.0mm	
5	7.5×7.5mm (DC630V: 7.5×8.0mm)	2000*2
8	7.5×5.5mm	1500
6	10.0×10.0mm	
U	7.7×12.5mm (DC630V: 7.7×13.0mm)	1000

Please order with an integral multiple of the minimum quantity above.

*2 1500 pcs. for **RPER71H335K5□□C03A, RPER71H475K5□□C03A, RPER72A105K5□□C03A, RPER71H335K3M1C60A, RPER71H475K3M1C60A** and **RDE** Series, **RHD** Series (Two blank columns are filled with the lead style code.)

*1 "Minimum Quantity" means the numbers of units of each delivery or order. The quantity should be an integral multiple of the "minimum quantity". (Please note that the actual delivery quantity in a package may change sometimes.)

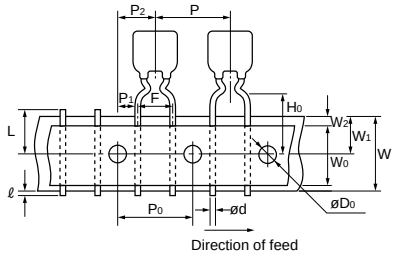
Continued on the following page.

Packaging

Continued from the preceding page.

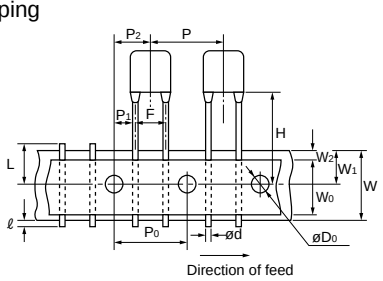
Taping Dimensions

Inside Crimp Taping



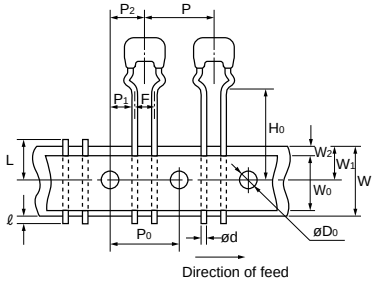
Dimensions and Lead style code	Dimensions (LXW)
1M1	4.0X3.5mm
2M1	5.0X3.5mm or 5.5X4.0mm or 5.7X4.5mm (Depends on Part Number List)
2M2	
3M1	5.0X4.5mm or 5.5X5.0mm (Depends on Part Number List)
3M2	
4M1	7.5X5.0mm
4M2	
8M1	7.5X5.5mm
8M2	

Straight Taping

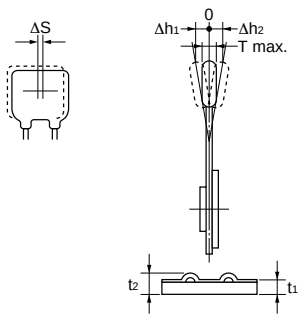


Dimensions and Lead style code	Dimensions (LXW)
1DB	4.0X3.5mm
2DB	5.7X4.5mm
5E1	7.5X7.5mm (DC630V: 7.5X8.0mm)
5E2	
6E1	10.0X10.0mm
6E2	
UE1	7.7X12.5mm (DC630V: 7.7X13.0mm)

Outside Crimp Taping



Dimensions and Lead style code	Dimensions (LXW)
2S1	5.0X3.5mm
2S2	
3S1	5.0X4.5mm
3S2	



Item	Code	Dimensions (mm)
Pitch of Component	P	12.7±1.0
Pitch of Sprocket Hole	P0	12.7±0.2
Lead Spacing	F	$2.5^{+0.4}_{-0.2}$ (DB) (S1) (S2)
		$5.0^{+0.6}_{-0.2}$
Length from Hole Center to Component Center	P2	6.35±1.3
Length from Hole Center to Lead	P1	3.85±0.7
		5.1±0.7 (DB) (S1) (S2)
		254±1.5 Total length of components pitch X 20
Body Dimension		Depends on Part Number List
Deviation Along Tape, Left or Right Defect	ΔS	±2.0
Carrier Tape Width	W	18.0±0.5
Position of Sprocket Hole	W1	$9.0^{+0}_{-0.5}$
Lead Distance between Reference and Bottom Plane	H0	16.0±0.5 (M1) (S1)
		20.0±0.5 (M2) (S2)
For Straight Lead Type	H	20±0.5 (E2),17.5±0.5 (E1),16±0.5 (DB)
Diameter of Sprocket Hole	D0	4.0±0.1
Lead Diameter	d	0.5±0.05
Total Tape Thickness	t1	0.6±0.3
Total Thickness of Tape and Lead Wire	t2	1.5 max.
Body Thickness	T	Depends on Part Number List
Deviation Across Tape	Δh1	1.0 max. (RHD Series: 1.5 max.)
	Δh2	1.0 max. (RHD Series: 1.5 max.)
Portion to Cut in Case of Defect	L	$11.0^{+0}_{-1.0}$
Protrusion Length	ℓ	0.5 max.
Hold Down Tape Width	W0	9.5 min.
Hold Down Tape Position	W2	1.5±1.5
Coating Extension		Depends on Dimensions

⚠Caution

■ ⚠Caution (Storage and Operating Condition)

Operating and storage environment

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like are present. And avoid exposure to moisture. Before cleaning, bonding or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed 5 to 40 degrees centigrade and 20 to 70%.
Use capacitors within 6 months after delivered.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

⚠Caution

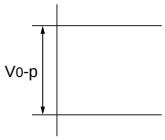
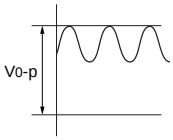
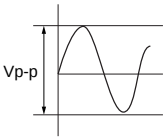
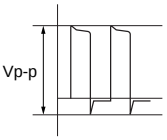
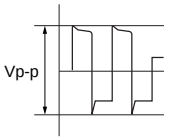
■ ⚠Caution (Rating)

1. Operating Voltage

When DC-rated capacitors are to be used in AC or ripple current circuits, be sure to maintain the Vp-p value of the applied voltage or the V0-p which contains DC bias within the rated voltage range.

When the voltage is applied to the circuit, starting or stopping may generate irregular voltage for a transit period because of resonance or switching. Be sure to use a capacitor with a rated voltage range that includes these irregular voltages.

When DC-rated capacitors are to be used in input circuits from commercial power source (AC filter), be sure to use Safety Recognized Capacitors because various regulations on withstand voltage or impulse withstand established for each equipment should be taken into considerations.

Voltage	DC Voltage	DC+AC Voltage	AC Voltage	Pulse Voltage (1)	Pulse Voltage (2)
Positional Measurement					

2. Operating Temperature and Self-generated Heat

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself. When the capacitor is used in a high-frequency current, pulse current or similar current, it may have self-generated heat due to dielectric loss. In case of "High Dielectric Constant Type Capacitors (X7R/X8L/Y5V/Z5U char.)", applied voltage load should be such that self-generated heat is within 20 °C under the condition where the capacitor is subjected at an atmosphere temperature of 25 °C. Please contact us if self-generated heat occurs with "Temperature Compensating Type Capacitors (C0G char.)". When measuring, use a thermocouple of small thermal capacity -K of ø0.1mm under conditions where the capacitor is not affected by radiant heat from other components or wind from surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

3. Fail-Safe

Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

⚠Caution

■ ⚠Caution (Soldering and Mounting)

1. Vibration and impact
   Do not expose a capacitor or its leads to excessive shock or vibration during use.
2. Soldering
   When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.
3. Bonding, resin molding and coating
   In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.
   In case the amount of application, dryness/ hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor may be damaged by the organic solvents and may result, worst case, in a short circuit.
   The variation in thickness of adhesive or molding resin or coating may cause an outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.
4. Treatment after bonding, resin molding and coating
   When the outer coating is hot (over 100 degrees centigrade) after soldering, it becomes soft and fragile. So please be careful not to give it mechanical stress.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

■ ⚠Caution (Handling)

Vibration and impact
Do not expose a capacitor or its leads to excessive shock or vibration during use.

FAILURE TO FOLLOW THE ABOVE CAUTIONS MAY RESULT, WORST CASE, IN A SHORT CIRCUIT AND CAUSE FUMING OR PARTIAL DISPERSION WHEN THE PRODUCT IS USED.

Notice

■ Notice (Rating)

Capacitance change of capacitor

In case of X7R/X8L/Y5V char.

Capacitors have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor is left on for a long time. Moreover, capacitance might change greatly depending on the surrounding temperature or an applied voltage.

■ Notice (Soldering and Mounting)

1. Cleaning (ultrasonic cleaning)

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity : Output of 20 watts per liter or less.

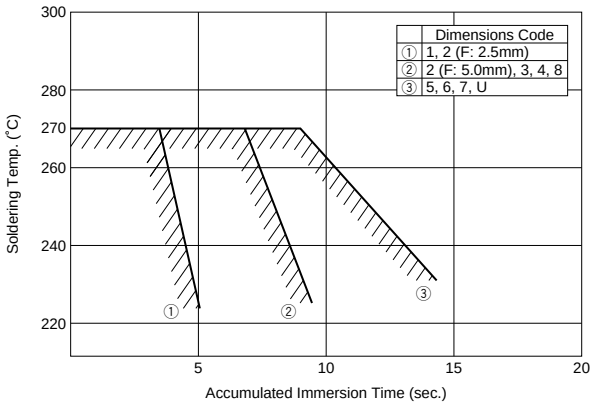
Rinsing time : 5 min. maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

2. Soldering and Mounting

(1) Allowable Conditions for Soldering Temperature and Time



Perform soldering within tolerance range (shaded portion).

(2) Insertion of the Lead Wire

· When soldering, insert the lead wire into the PCB without mechanically stressing the lead wire.

· Insert the lead wire into the PCB with a distance appropriate to the lead space.

⚠Note:

1. Export Control
   <For customers outside Japan>
   No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.
   <For customers in Japan>
   For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.
2. Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.
   ① Aircraft equipment ② Aerospace equipment
   ③ Undersea equipment ④ Power plant equipment
   ⑤ Medical equipment ⑥ Transportation equipment (vehicles, trains, ships, etc.)
   ⑦ Traffic signal equipment ⑧ Disaster prevention / crime prevention equipment
   ⑨ Data-processing equipment ⑩ Application of similar complexity and/or reliability requirements to the applications listed above
3. Product specifications in this catalog are as of January 2010. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.
4. Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
5. This catalog has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
6. Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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