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⚠ REMINDERS

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- Please contact Taiyo Yuden Co., Ltd. for further details of product specifications as the individual specification is available.

- Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

- All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,(automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.
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- The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called "TAIYO YUDEN's official sales channel").
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MULTILAYER CERAMIC CAPACITORS

WAVE REFLOW

■PARTS NUMBER

J	M	K	3 1 6	△	B J	1 0 6	M	L	—	T	△
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫

△=Blank space

①Rated voltage

Code	Rated voltage[VDC]
P	2.5
A	4
J	6.3
L	10
E	16
T	25
G	35
U	50
H	100
Q	250
S	630

②Series name

Code	Series name
M	Multilayer ceramic capacitor
V	Multilayer ceramic capacitor for high frequency
W	LW reverse type multilayer capacitor

③End termination

Code	End termination
K	Plated
R	High Reliability Application

④Dimension(L×W)

Type	Dimensions (L×W)[mm]	EIA(inch)
042	0.4×0.2	01005
063	0.6×0.3	0201
105	1.0×0.5	0402
	0.52×1.0 ※	0204
107	1.6×0.8	0603
	0.8×1.6 ※	0306
212	2.0×1.25	0805
	1.25×2.0 ※	0508
316	3.2×1.6	1206
325	3.2×2.5	1210
432	4.5×3.2	1812

Note : ※LW reverse type(□WK) only

⑤Dimension tolerance

Code	Type	L[mm]	W[mm]	T[mm]
△	ALL	Standard	Standard	Standard
A	063	0.6±0.05	0.3±0.05	0.3±0.05
	105	1.0±0.10	0.5±0.10	0.5±0.10
	107	1.6+0.15/−0.05	0.8+0.15/−0.05	0.8+0.15/−0.05
	212	2.0+0.15/−0.05	1.25+0.15/−0.05	0.45±0.05
				0.85±0.10
				1.25+0.15/−0.05
	316	3.2±0.20	1.25±0.20	0.85±0.10
				1.6±0.20
	325	3.2±0.30	2.5±0.30	2.5±0.30
B	105	1.0+0.15/−0.05	0.5+0.15/−0.05	0.5+0.15/−0.05
	107	1.6+0.20/−0	0.8+0.20/−0	0.45±0.05
				0.8+0.20/−0
	212	2.0+0.20/−0	1.25+0.20/−0	0.85±0.10
				1.25+0.20/−0
	316	3.2±0.30	1.6±0.30	1.6±0.30
C	105	1.0+0.20/−0	0.5+0.20/−0	0.5+0.20/−0

Note: P.6 Standard external dimensions △= Blank space

⑥Temperature characteristics code

■High dielectric type(Excluding Super low distortion multilayer ceramic capacitor(CFCAP™))

Code	Applicable standard		Temperature range[℃]	Ref. Temp.[℃]	Capacitance change	Capacitance tolerance	Tolerance code
BJ	JIS	B	−25～+ 85	20	±10%	±10%	K
						±20%	M
	EIA	X5R	−55～+ 85	25	±15%	±10%	K
						±20%	M
B7	EIA	X7R	−55～+125	25	±15%	±10%	K
						±20%	M
C6	EIA	X6S	−55～+105	25	±22%	±10%	K
						±20%	M
C7	EIA	X7S	−55～+125	25	±22%	±10%	K
						±20%	M
LD(※)	EIA	X5R	−55～+ 85	25	±15%	±10%	K
						±20%	M
△F	JIS	F	−25～+ 85	20	+30/−80%	+80/−20%	Z
	EIA	Y5V	−30～+ 85	25	+22−82%	+80/−20%	Z

Note : ※.LD Low distortion high value multilayer ceramic capacitor △= Blank space

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■Temperature compensating type

Code	Applicable standard		Temperature range[℃]	Ref. Temp.[℃]	Capacitance change	Capacitance tolerance	Tolerance code
CH	JIS	CH	−55～＋125	20	0±60ppm/℃	±0.1pF	B
						±0.25pF	C
						±0.5pF	D
	EIA	C0H		25		1pF	F
						±5%	J
						±10%	K
CJ	JIS	CJ	−55～＋125	20	0±120ppm/℃	±0.25pF	C
	EIA	C0J		25			
CK	JIS	CK	−55～＋125	20	0±250ppm/℃	±0.25pF	C
	EIA	C0J		25			
UJ	JIS	UJ	−55～＋125	20	−750±120ppm/℃	±0.25pF	C
	EIA	U2J		25		±0.5pF	D
						±5%	J
UK	JIS	UK	−55～＋125	20	−750±250ppm/℃	±0.5pF	C
	EIA	U2K	−55～＋125	25			
SL	JIS	S	−55～＋125	20	+350～−1000ppm/℃	±5%	J

⑥Series code

(Super low distortion multilayer ceramic capacitor(CFCAP™)only)

Code	Series code
SD	Standard

⑦Nominal capacitance

Code (example)	Nominal capacitance
0R5	0.5pF
010	1pF
100	10pF
101	100p
102	1,000pF
103	10,000pF
104	0.1μF
105	1.0μF
106	10μF
107	100μF

Note : R=Decimal point

⑧Capacitance tolerance

Code	Capacitance tolerance
B	±0.1pF
C	±0.25pF
D	±0.5pF
F	±1pF
J	±5%
K	±10%
M	±20%
Z	+80/−20%

⑨Thickness

Code	Thickness[mm]
C	0.2
D	0.2(Temperature compensating of 042type)
P	0.3
T	
K	0.45
V	0.5
W	
A	0.8
D	0.85(212type or more)
F	1.15
G	1.25
L	1.6
N	1.9
Y	2.0 max
M	2.5

⑩Special code

Code	Special code
—	Standard

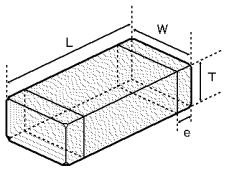
⑪Packaging

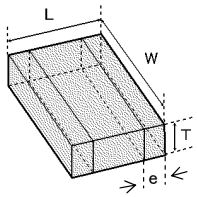
Code	Packaging
F	φ178mm Taping (2mm pitch)
T	φ178mm Taping (4mm pitch)
P	φ178mm Taping (4mm pitch, 1000 pcs/reel) 325 type(Thickness code M)
W	φ178mm Taping(1mm pitch)042type only

⑫Internal code

Code	Internal code
△	Standard

■STANDARD EXTERNAL DIMENSIONS





※ LW reverse type

Type(EIA)	Dimension [mm]				
	L	W	T	*1	e
□MK042(01005)	0.4±0.02	0.2±0.02	0.2±0.02	C	0.1±0.03
				D	
□MK063(0201)	0.6±0.03	0.3±0.03	0.3±0.03	P	0.15±0.05
				T	
□MK105(0402)	1.0±0.05	0.5±0.05	0.2±0.02	C	0.25±0.10
			0.3±0.03	P	
			0.5±0.05	V	
□VK105(0402)	1.0±0.05	0.5±0.05	0.5±0.05	W	0.25±0.10
□WK105(0204)※	0.52±0.05	1.0±0.05	0.3±0.05	P	0.18±0.08
□MK107(0603)	1.6±0.10	0.8±0.10	0.45±0.05	K	0.35±0.25
			0.8±0.10	A	
□MR107(0603)	1.6±0.10	0.8±0.10	0.8±0.10	A	0.1～0.6
□WK107(0306)※	0.8±0.10	1.6±0.10	0.5±0.05	V	0.25±0.15
□MK212(0805)	2.0±0.10	1.25±0.10	0.45±0.05	K	0.5±0.25
			0.85±0.10	D	
			1.25±0.10	G	
□MR212(0805)	2.0±0.10	1.25±0.10	1.25±0.10	G	0.25～0.75
□WK212(0508)※	1.25±0.15	2.0±0.15	0.85±0.1	D	0.3±0.2
□MK316(1206)	3.2±0.15	1.6±0.15	0.85±0.10	D	0.5+0.35/−0.25
			1.15±0.10	F	
			1.25±0.10	G	
			1.6±0.20	L	
□MR316(1206)	3.2±0.15	1.6±0.15	1.6±0.20	L	0.25～0.85
□MK325(1210)	3.2±0.30	2.5±0.20	0.85±0.10	D	0.6±0.3
			1.15±0.10	F	
			1.9±0.20	N	
			1.9+0.1/−0.2	Y	
			2.5±0.20	M	
□MR325(1210)	3.2±0.30	2.5±0.20	1.9±0.20	N	0.3～0.9
			2.5±0.20	M	
□MK432(1812)	4.5±0.40	3.2±0.30	2.5±0.20	M	0.9±0.6

Note : ※. LW reverse type, *1.Thickness code

■STANDARD QUANTITY

Type	EIA(inch)	Dimension		Standard quantity[pcs]	
		[mm]	Code	Paper tape	Embossed tape
042	01005	0.2	C	—	40000
			D		
063	0201	0.3	P	15000	—
			T		
105	0402	0.2	C	20000	—
		0.3	P	15000	—
		0.5	V	10000	—
			W		
	0204 ※	0.30	P		
107	0603	0.45	K	4000	—
		0.8	A		
	0306 ※	0.50	V	—	4000
212	0805	0.45	K	4000	—
		0.85	D		
		1.25	G	—	3000
	0508 ※	0.85	D	4000	—
316	1206	0.85	D	4000	—
		1.15	F	—	3000
		1.25	G		
		1.6	L	—	2000
325	1210	0.85	D	—	2000
		1.15	F		
		1.9	N		
		2.0 max	Y		
		2.5	M	—	500(T), 1000(P)
432	1812	2.5	M	—	500

Note : ※.LW Reverse type(□WK)

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■PARTS NUMBER

【Temperature Characteristic RH : RH/R2H】 0.5mm thickness(W)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	Q	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UVK105 RH0R5BW-F		50	RH	R2H	0.5 p	±0.1pF	410	200	0.5±0.05	R
UVK105 RH0R6BW-F			RH	R2H	0.6 p	±0.1pF	412	200	0.5±0.05	R
UVK105 RH0R7BW-F			RH	R2H	0.7 p	±0.1pF	414	200	0.5±0.05	R
UVK105 RH0R8BW-F			RH	R2H	0.8 p	±0.1pF	416	200	0.5±0.05	R
UVK105 RH0R9BW-F			RH	R2H	0.9 p	±0.1pF	418	200	0.5±0.05	R
UVK105 RH010BW-F			RH	R2H	1 p	±0.1pF	420	200	0.5±0.05	R
UVK105 RH1R1BW-F			RH	R2H	1.1 p	±0.1pF	422	200	0.5±0.05	R
UVK105 RH1R2BW-F			RH	R2H	1.2 p	±0.1pF	424	200	0.5±0.05	R
UVK105 RH1R3BW-F			RH	R2H	1.3 p	±0.1pF	426	200	0.5±0.05	R
UVK105 RH1R5BW-F			RH	R2H	1.5 p	±0.1pF	430	200	0.5±0.05	R
UVK105 RH1R6BW-F			RH	R2H	1.6 p	±0.1pF	432	200	0.5±0.05	R
UVK105 RH1R8BW-F			RH	R2H	1.8 p	±0.1pF	436	200	0.5±0.05	R
UVK105 RH020BW-F			RH	R2H	2 p	±0.1pF	440	200	0.5±0.05	R
UVK105 RH2R2JW-F			RH	R2H	2.2 p	±5%	444	200	0.5±0.05	R
UVK105 RH2R4JW-F			RH	R2H	2.4 p	±5%	448	200	0.5±0.05	R
UVK105 RH2R7JW-F			RH	R2H	2.7 p	±5%	454	200	0.5±0.05	R
UVK105 RH030JW-F			RH	R2H	3 p	±5%	460	200	0.5±0.05	R
UVK105 RH3R3JW-F			RH	R2H	3.3 p	±5%	466	200	0.5±0.05	R
UVK105 RH3R6JW-F			RH	R2H	3.6 p	±5%	472	200	0.5±0.05	R
UVK105 RH3R9JW-F			RH	R2H	3.9 p	±5%	478	200	0.5±0.05	R
UVK105 RH4R3JW-F			RH	R2H	4.3 p	±5%	486	200	0.5±0.05	R
UVK105 RH4R7JW-F			RH	R2H	4.7 p	±5%	494	200	0.5±0.05	R
UVK105 RH5R1JW-F			RH	R2H	5.1 p	±5%	502	200	0.5±0.05	R

Super Low Distortion Multilayer Ceramic Capacitors(CFCAP™)

●105TYPE

【Temperature Characteristic SD : Standard】 0.5mm thickness(V)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UMK105 SD391KV-F		50	Standard Type	390 p	±10	0.1	200	0.5±0.05	R
UMK105 SD471KV-F				470 p	±10	0.1	200	0.5±0.05	R
UMK105 SD561KV-F				560 p	±10	0.1	200	0.5±0.05	R
TMK105 SD681KV-F		25		680 p	±10	0.1	200	0.5±0.05	R
TMK105 SD821KV-F				820 p	±10	0.1	200	0.5±0.05	R
TMK105 SD102KV-F				1000 p	±10	0.1	200	0.5±0.05	R
TMK105 SD122KV-F				1200 p	±10	0.1	200	0.5±0.05	R
EMK105 SD152KV-F		16		1500 p	±10	0.1	200	0.5±0.05	R
EMK105 SD182KV-F				1800 p	±10	0.1	200	0.5±0.05	R
EMK105 SD222KV-F				2200 p	±10	0.1	200	0.5±0.05	R
EMK105 SD272KV-F				2700 p	±10	0.1	200	0.5±0.05	R
LMK105 SD332KV-F		10		3300 p	±10	0.1	200	0.5±0.05	R
LMK105 SD392KV-F				3900 p	±10	0.1	200	0.5±0.05	R
LMK105 SD472KV-F				4700 p	±10	0.1	200	0.5±0.05	R

【Temperature Characteristic SD : Standard】 0.3mm thickness(P)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
LMK105 SD152KP-F		10	Standard Type	1500 p	±10	0.1	200	0.3±0.03	R
JMK105 SD272KP-F		6.3		2700 p	±10	0.1	200	0.3±0.03	R

●107TYPE

【Temperature Characteristic SD : Standard】 0.8mm thickness(A)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UMK107 SD102KA-T		50	Standard Type	1000 p	±10	0.1	200	0.8±0.10	R
UMK107 SD122KA-T				1200 p	±10	0.1	200	0.8±0.10	R
UMK107 SD152KA-T				1500 p	±10	0.1	200	0.8±0.10	R
UMK107 SD182KA-T				1800 p	±10	0.1	200	0.8±0.10	R
UMK107 SD222KA-T				2200 p	±10	0.1	200	0.8±0.10	R
UMK107 SD272KA-T				2700 p	±10	0.1	200	0.8±0.10	R
UMK107 SD332KA-T				3300 p	±10	0.1	200	0.8±0.10	R
TMK107 SD392KA-T		25		3900 p	±10	0.1	200	0.8±0.10	R
TMK107 SD472KA-T				4700 p	±10	0.1	200	0.8±0.10	R
EMK107 SD562KA-T		16		5600 p	±10	0.1	200	0.8±0.10	R
EMK107 SD682KA-T				6800 p	±10	0.1	200	0.8±0.10	R
EMK107 SD822KA-T				8200 p	±10	0.1	200	0.8±0.10	R
EMK107 SD103KA-T				10000 p	±10	0.1	200	0.8±0.10	R
LMK107 SD123KA-T		10	Standard Type	12000 p	±10	0.1	200	0.8±0.10	R
LMK107 SD153KA-T				15000 p	±10	0.1	200	0.8±0.10	R
LMK107 SD183KA-T				18000 p	±10	0.1	200	0.8±0.10	R
LMK107 SD223KA-T				22000 p	±10	0.1	200	0.8±0.10	R

●212TYPE

【Temperature Characteristic SD : Standard】 1.25mm thickness(G)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
GMK212 SD183KG-T		35	Standard Type	18000 p	±10	0.1	200	1.25±0.10	R
GMK212 SD223KG-T				22000 p	±10	0.1	200	1.25±0.10	R
GMK212 SD273KG-T				27000 p	±10	0.1	200	1.25±0.10	R
LMK212 SD683KG-T		10		68000 p	±10	0.1	200	1.25±0.10	R
LMK212 SD823KG-T				82000 p	±10	0.1	200	1.25±0.10	R
LMK212 SD104KG-T				0.1 μ	±10	0.1	200	1.25±0.10	R

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■PARTS NUMBER

【Temperature Characteristic SD : Standard】 0.85mm thickness(D)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UMK212 SD392KD-T		50	Standard Type	3900 p	±10	0.1	200	0.85±0.10	R
UMK212 SD472KD-T				4700 p	±10	0.1	200	0.85±0.10	R
UMK212 SD562KD-T				5600 p	±10	0.1	200	0.85±0.10	R
UMK212 SD682KD-T				6800 p	±10	0.1	200	0.85±0.10	R
UMK212 SD822KD-T				8200 p	±10	0.1	200	0.85±0.10	R
UMK212 SD103KD-T				10000 p	±10	0.1	200	0.85±0.10	R
GMK212 SD123KD-T		35		12000 p	±10	0.1	200	0.85±0.10	R
GMK212 SD153KD-T				15000 p	±10	0.1	200	0.85±0.10	R
EMK212 SD333KD-T		16		33000 p	±10	0.1	200	0.85±0.10	R
LMK212 SD473KD-T		10		47000 p	±10	0.1	200	0.85±0.10	R

●316TYPE

【Temperature Characteristic SD : Standard】 1.6mm thickness(L)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
TMK316 SD823KL-T		25	Standard Type	82000 p	±10	0.1	200	1.6±0.20	R
TMK316 SD104KL-T				0.1 μ	±10	0.1	200	1.6±0.20	R

【Temperature Characteristic SD : Standard】 1.15mm thickness(F)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics	Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
GMK316 SD333KF-T		35	Standard Type	33000 p	±10	0.1	200	1.15±0.10	R
GMK316 SD393KF-T				39000 p	±10	0.1	200	1.15±0.10	R
TMK316 SD473KF-T		25		47000 p	±10	0.1	200	1.15±0.10	R
TMK316 SD563KF-T				56000 p	±10	0.1	200	1.15±0.10	R
TMK316 SD683KF-T				68000 p	±10	0.1	200	1.15±0.10	R

Low Distortion High Value Multilayer Ceramic Capacitors(CF LD)

●107TYPE

【Temperature Characteristic LD : X5R】 0.8mm thickness(A)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
TMK107BLD105□A-T		25		X5R	1 μ	±10, ±20	10	150	0.8+0.20/−0	R

●212TYPE

【Temperature Characteristic LD : X5R】 1.25mm thickness(G)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
GMK212 LD105□G-T		35		X5R	1 μ	±10, ±20	10	150	1.25±0.10	R
GMK212BLD225□G-T				X5R	2.2 μ	±10, ±20	10	150	1.25+0.20/−0	R

●316TYPE

【Temperature Characteristic LD : X5R】 1.6mm thickness(L)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UMK316 LD105□L-T		50		X5R	1 μ	±10, ±20	10	150	1.6±0.20	R
GMK316BLD475□L-T		35		X5R	4.7 μ	±10, ±20	10	150	1.6±0.30	R
TMK316BLD106□L-T		25		X5R	10 μ	±10, ±20	10	150	1.6±0.30	R

●325TYPE

【Temperature Characteristic LD : X5R】 1.9mm thickness(N)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
UMK325 LD105□N-T		50		X5R	1 μ	±10, ±20	10	200	1.9±0.20	R

Medium-High Voltage Multilayer Ceramic Capacitor

●107TYPE

【Temperature Characteristic BJ : B/X5R】 0.8mm thickness(A)

Part number 1	Part number 2	Rated voltage [V]	Temperature characteristics		Capacitance [F]	Capacitance tolerance [%]	tan δ [%]	HALT Rated voltage x %	Thickness*3 [mm]	Soldering R:Reflow W:Wave
HMK107 BJ102□A-T		100	B	X5R*1	1000 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ152□A-T			B	X5R*1	1500 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ222□A-T			B	X5R*1	2200 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ332□A-T			B	X5R*1	3300 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ472□A-T			B	X5R*1	4700 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ682□A-T			B	X5R*1	6800 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ103□A-T			B	X5R*1	10000 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ153□A-T			B	X5R*1	15000 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ223□A-T			B	X5R*1	22000 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ333□A-T			B	X5R*1	33000 p	±10, ±20	3.5	200	0.8±0.10	R
HMK107 BJ104□A-T			B	X5R*1	0.1 μ	±10, ±20	3.5	200	0.8±0.10	R

▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (http://www.ty-top.com/) .

積層セラミックコンデンサ

■包装

①最小受注単位数

●テーピング梱包

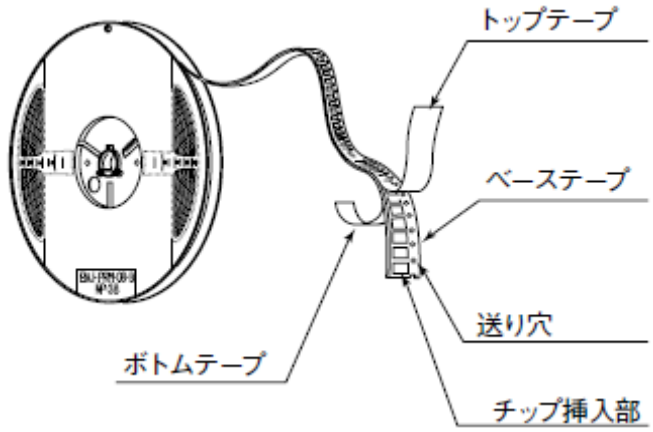
タイプ(EIA)	製品厚み		標準数量 [pcs]	
	mm	code	紙テープ	エンボステープ
□MK042(01005)	0.2	C, D	—	40000
□MK063(0201)	0.3	P,T	15000	—
□WK105(0204) ※	0.3	P	10000	
□MK105(0402)	0.2	C	20000	
	0.3	P	15000	
	0.5	V	10000	
□VK105(0402)	0.5	W		
□MK107(0603)	0.45	K	4000	
□WK107(0306) ※	0.5	V	—	4000
□MR107(0603)	0.8	A	4000	—
□MK212(0805)	0.45	K		
□WK212(0508) ※	0.85	D		
□MR212(0805)	1.25	G	—	3000
□MK316(1206)	0.85	D	4000	—
□MR316(1206)	1.15	F	—	3000
	1.25	G		
	1.6	L		2000
□MK325(1210)	0.85	D	—	
□MR325(1210)	1.15	F		
	1.9	N		
	2.0max.	Y		
	2.5	M		500(T), 1000(P)
□MK432(1812)	2.5	M	—	500

注: ※ LW 逆転タイプ

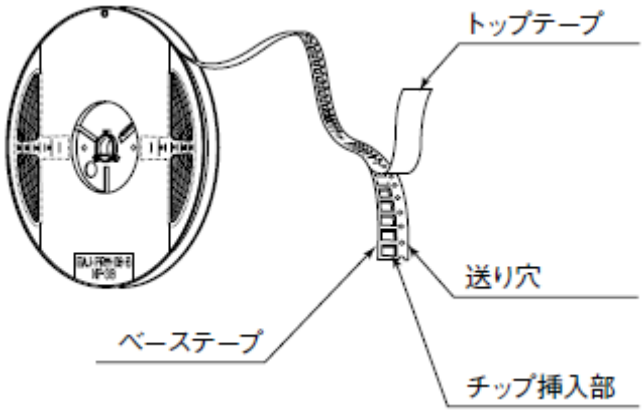
②テーピング材質

※プレスポケットタイプは、ボトムテープ無し。

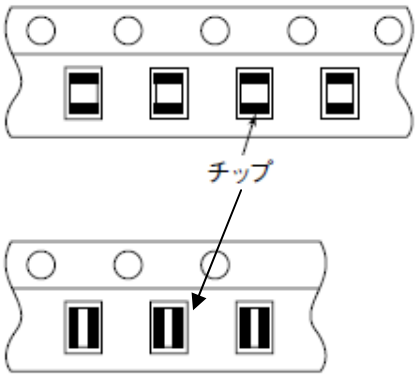
●紙テープ



●エンボステープ



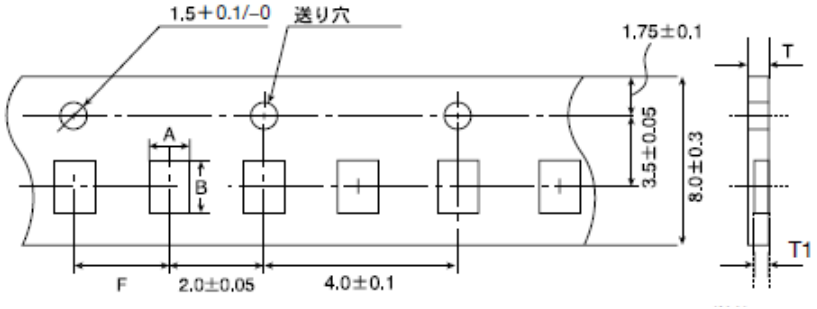
チップ詰め状態



③代表テーピング寸法

紙テープ（8mm 幅）

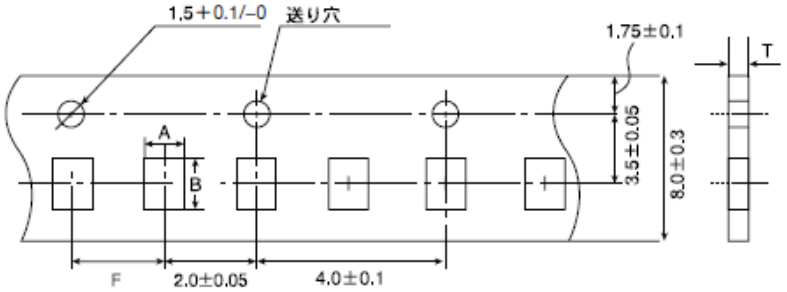
●プレステープ（2mm ピッチ）



タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み	
	A	B	F	T	T1
□MK063(0201)	0.37	0.67	2.0±0.05	0.45max.	0.42max.
□WK105(0204) ※	0.65	1.15			
□MK105(0402) (*1 C)				0.4max.	0.3max.
□MK105(0402) (*1 P)				0.45max.	0.42max.

注：*1 製品厚み、C：0.2mm、P：0.3mm。※ LW 逆転タイプ。　　単位：mm

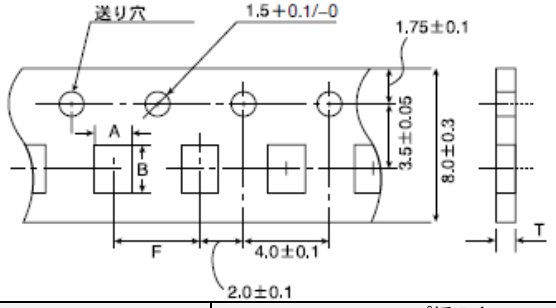
●パンチテープ（2mm ピッチ）



タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み
	A	B	F	T
□MK105 (0402) □VK105 (0402)	0.65	1.15	2.0±0.05	0.8max.

単位：mm

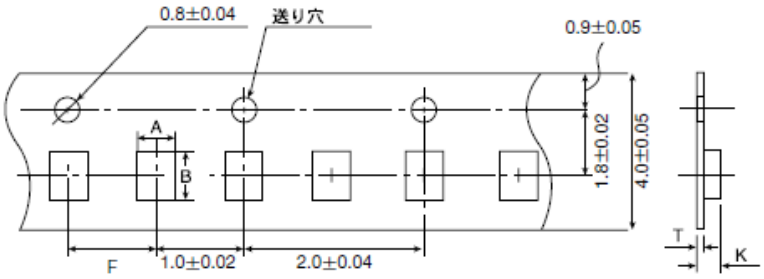
●パンチテープ（4mm ピッチ）



タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み
	A	B	F	T
□MK107(0603) □WK107(0306) ※ □MR107(0603)	1.0	1.8	4.0±0.1	1.1max.
□MK212(0805) □WK212(0508 ※	165	2.4		1.1max.
□MK316(1206)	2.0	3.6		

注：製品寸法によってテーピング寸法が異なる場合があります。※ LW 逆転タイプ。　　単位：mm

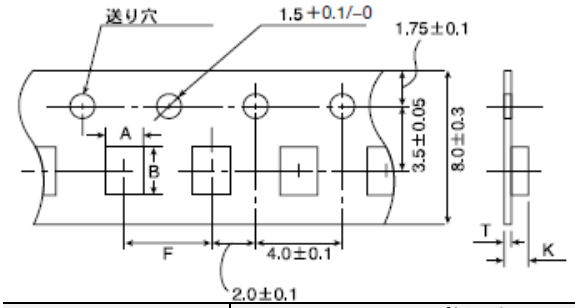
●エンボステープ（4mm 幅）



タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み	
	A	B	F	K	T
□MK042(01005)	0.23	0.43	1.0±0.02	0.5max.	0.25max.

単位：mm

●エンボステープ（8mm 幅）

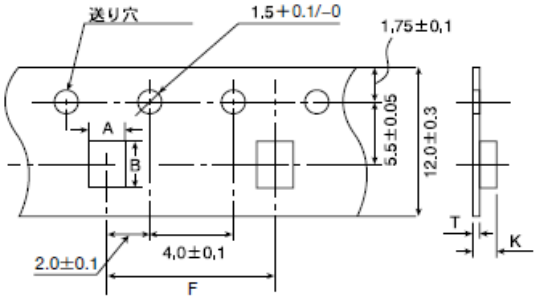


タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み	
	A	B	F	K	T
□WK107(0306) ※	1.0	1.8	4.0±0.1	1.3max	0.25±0.1
□MK212(0805) □MR212(0805)	1.65	2.4		3.4max.	0.6max.
□MK316(1206) □MR316(1206)	2.0	3.6			
□MK325(1210) □MR325(1210)	2.8	3.6			

注：※ LW 逆転タイプ。

単位：mm

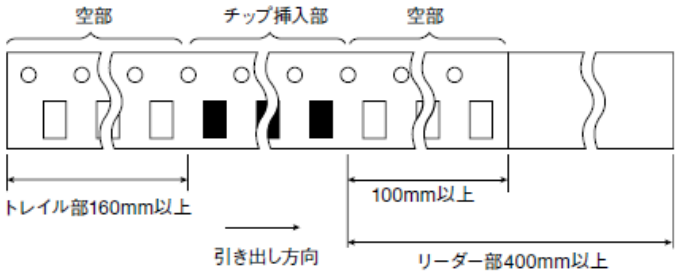
●エンボステープ（12mm 幅）



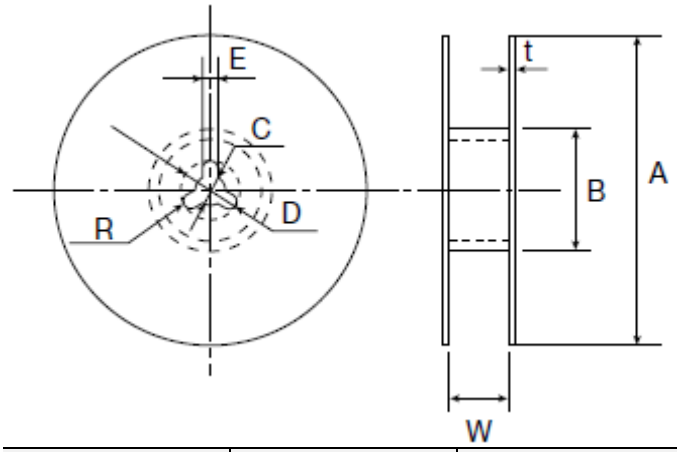
タイプ(EIA)	チップ挿入部		挿入ピッチ	テープ厚み	
	A	B	F	K	T
□MK432(1812)	3.7	4.9	8.0±0.1	4.0max.	0.6max.

単位：mm

④トレイル部／リーダー部



⑤リール寸法



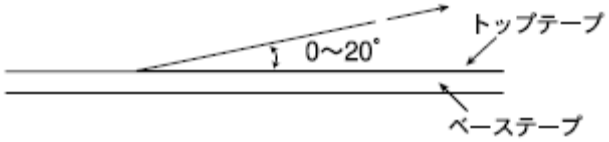
A	B	C	D	E	R
φ178±2.0	φ50min.	φ13.0±0.2	φ21.0±0.8	2.0±0.5	1.0

	t	W
4mm 幅テープ	1.5max.	5±1.0
8mm 幅テープ	2.5max.	10±1.5
12mm 幅テープ	2.5max.	14±1.5

単位：mm

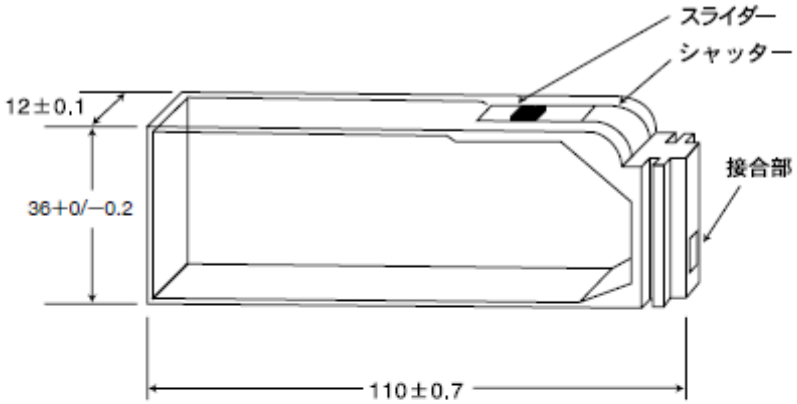
⑥トップテープ強度

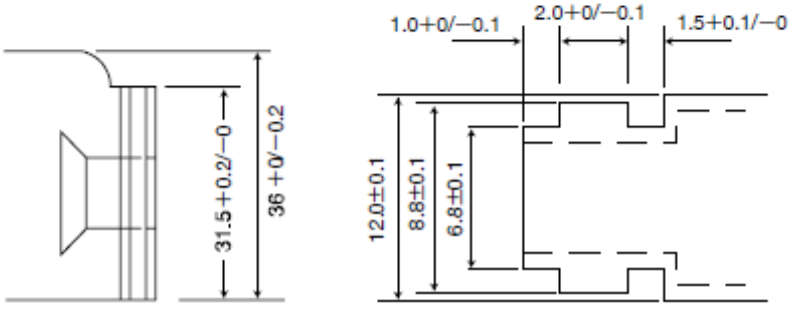
トップテープのはがし力は下図矢印方向にて 0.1～0.7N となります。



⑦バルクカセット

個別仕様の取り交わしが必要になります。
必ず、正規販売チャンネルにお問合せください。





単位：mm

Super Low Distortion Multilayer Ceramic Capacitors （CFCAP™）

■RELIABILITY DATA

1. Operating Temperature Range	
Specified Value	－55 to ＋125℃

2. Storage Temperature Range	
Specified Value	－55 to ＋125℃

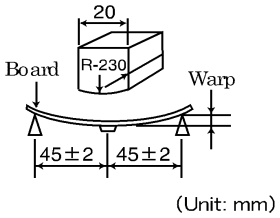
3. Rated Voltage	
Specified Value	6.3VDC, 10VDC, 16VDC, 25VDC, 35VDC, 50VDC

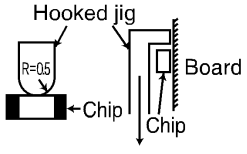
4. Dielectric Withstanding Voltage （Between terminals）	
Specified Value	No breakdown or damage
Test Methods and Remarks	Applied voltage : Rated voltage×3 Duration : 1 to 5 sec. Charge/discharge current : 50mA max.

5. Insulation Resistance	
Specified Value	10000 MΩ or 500MΩ μF, whichever is smaller
Test Methods and Remarks	Applied voltage : Rated voltage Duation : 60±5 sec. Charge/discharge current : 50mA max.

6. Capacitance （Tolerance）	
Specified Value	±10%
Test Methods and Remarks	Measuring frequency : 1kHz±10% Measuring voltage : 102Vrms Bias application : None

7. Dissipation Factor	
Specified Value	0.1%max
Test Methods and Remarks	Measuring frequency : 1kHz±10% Measuring voltage : 1±0.2Vrms Bias application : None

8. Bending Strength	
Specified Value	Appearance :N abnormality Capacitance change : ±5%
Test Methods and Remarks	Warp : 1mm Speed : 0.5mm/second Duration :10 seconds Test board : glass epoxy resin substrate Thickness : 1.6mm  (Unit: mm) Capacitance measurement shall be conducted with the board bent.

9. Adhesive Force of Terminal Electrodes	
Specified Value	Terminal electrodes shall be no exfoliation or a sign of exfoliation.
Test Methods and Remarks	Applied force : 5N Duration : 30 ±5 seconds 

10. Solderability

Specified Value	At least 95% of terminal electrode is covered by new solder.
Test Methods and Remarks	

	Eutectic solder	Lead-free solder
Solder type	H60A or H63A	Sn-3.0Ag-0.5Cu
Solder temperature	230±5℃	245±3℃
Duration	4±1 sec.	

11. Resistance to Soldering Heat

Specified Value	Apearance : No abnormality Capacitance change : ±2.5% max. Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
Test Methods and Remarks	Solder temp. : 270 ±5℃ Duraton : 3 ±0.5 sec. Preheating conditions : 80 to 100℃, 2 to 5 min. or 5 to 10 min. 150 to 200℃, 2 to 5 min. or 5 to 10 min. Measurement shall be conducted : 24±2hrs under the standard condition Note1

12. Temperature Cycle (Thermal Shock)

Specified Value	Appearance : No abnormality Capcitance change : ±2.5%max Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals): No abnormality
Test Methods and Remarks	Conditions for 1 cycle

Step	temperature(℃)	Time(min.)
1	Minimum operating temperature	30±3 min.
2	Normal temperature	2 to 3 min.
3	Maximum operating temperature	30±3 min.
4	Normal temperature	2 to 3 min.

Number of cycles: 5 times
Measurement shall be conducted : 24±2hrs under the standard condition Note1

13. Humidity (Steady state)

Specified Value	Appearance : No abnormality Capacitance change : ±5% max Dissipation factor : 0.5% max Insulation resistance : 50MΩ μF or 1000MΩ, whichever is smaller
Test Methods and Remarks	Temperature : 40±2℃ Humidity : 90 to 95% RH Duration : 500 +24/−0 hrs Measurement shall be conducted : 24 ±2hrs under the standard condition Note1

14. Humidity Loading

Specified Value	Appearance : No abnormality Capacitance change : ±7.5% max Dissipation factor : 0.5% max Insulation resistance : 25MΩ μF or 500MΩ, whichever is smaller
Test Methods and Remarks	According to JIS C 5102 clause 9.9. Temperature : 40±2℃ Humidity : 90 to 95% RH Duration : 500 +24/−0 hrs Applied voltage : Rated voltage Charge/discharge current : 50mA max Measurement shall be conducted : 24 ±2hrs under the standard condition Note1

15. High Temperature Loading		
Specified Value	Appearance	: No abnormality
	Capacitance change	: ±3% max
	Dissipation factor	: 0.35% max
	Insulation resistance	: 50MΩ μF or 1000MΩ, whichever is smaller
Test Methods and Remarks	According to JIS C 5102 clause 9.10.	
	Temperature	: Maximum operating temperature
	Duration	: 1000 +48/−0 hrs
	Applied voltage	: Rated voltage x 2
	Charge/discharge current	: 50mA max
	Measurement shall be conducted	: 24 ±2hrs under the standard condition Note1

Note1 Standard condition: Temperature: 5 to 35℃, Relative humidity: 45 to 85 % RH, Air pressure: 86 to 106kPa
When there are questions concerning measurement results, in order to provide correlation data, the test shall be conducted under the following condition.
Temperature: 20±2℃, Relative humidity: 60 to 70 % RH, Air pressure: 86 to 106kPa
Unless otherwise specified, all the tests are conducted under the "standard condition".

Precautions on the use of Multilayer Ceramic Capacitors

■PRECAUTIONS

1. Circuit Design

Precautions

◆Verification of operating environment, electrical rating and performance

1. A malfunction of equipment in fields such as medical, aerospace, nuclear control, etc. may cause serious harm to human life or have severe social ramifications.
   Therefore, any capacitors to be used in such equipment may require higher safety and reliability, and shall be clearly differentiated from them used in general purpose applications.

◆Operating Voltage (Verification of Rated voltage)

1. The operating voltage for capacitors must always be their rated voltage or less.
   If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages shall be the rated voltage or less.
   For a circuit where an AC or a pulse voltage may be used, the sum of their peak voltages shall also be the rated voltage or less.
2. Even if an applied voltage is the rated voltage or less reliability of capacitors may be deteriorated in case that either a high frequency AC voltage or a pulse voltage having rapid rise time is used in a circuit.

2. PCB Design

Precautions

◆Pattern configurations (Design of Land-patterns)

1. When capacitors are mounted on PCBs, the amount of solder used (size of fillet) can directly affect the capacitor performance. Therefore, the following items must be carefully considered in the design of land patterns:
   (1) Excessive solder applied can cause mechanical stresses which lead to chip breaking or cracking. Therefore, please consider appropriate land-patterns for proper amount of solder.
   (2) When more than one component are jointly soldered onto the same land, each component's soldering point shall be separated by solder-resist.

◆Pattern configurations (Capacitor layout on PCBs)

After capacitors are mounted on boards, they can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering of the boards, etc.). For this reason, land pattern configurations and positions of capacitors shall be carefully considered to minimize stresses.

Technical considerations

◆Pattern configurations (Design of Land-patterns)

The following diagrams and tables show some examples of recommended land patterns to prevent excessive solder amounts.

(1) Recommended land dimensions for typical chip capacitors

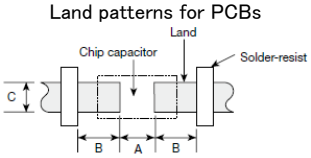
●Multilayer Ceramic Capacitors : Recommended land dimensions

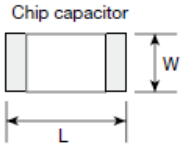
(unit: mm)

Wave-soldering

Type		107	212	316	325
Size	L	1.6	2.0	3.2	3.2
	W	0.8	1.25	1.6	2.5
A		0.8 to 1.0	1.0 to 1.4	1.8 to 2.5	1.8 to 2.5
B		0.5 to 0.8	0.8 to 1.5	0.8 to 1.7	0.8 to 1.7
C		0.6 to 0.8	0.9 to 1.2	1.2 to 1.6	1.8 to 2.5

Land patterns for PCBs





Reflow-soldering

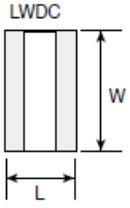
Type		042	063	105	107	212	316	325	432
Size	L	0.4	0.6	1.0	1.6	2.0	3.2	3.2	4.5
	W	0.2	0.3	0.5	0.8	1.25	1.6	2.5	3.2
A		0.15 to 0.25	0.20 to 0.30	0.45 to 0.55	0.8 to 1.0	0.8 to 1.2	1.8 to 2.5	1.8 to 2.5	2.5 to 3.5
B		0.15 to 0.20	0.20 to 0.30	0.40 to 0.50	0.6 to 0.8	0.8 to 1.2	1.0 to 1.5	1.0 to 1.5	1.5 to 1.8
C		0.15 to 0.30	0.25 to 0.40	0.45 to 0.55	0.6 to 0.8	0.9 to 1.6	1.2 to 2.0	1.8 to 3.2	2.3 to 3.5

Note : Recommended land size might be different according to the allowance of the size of the product.

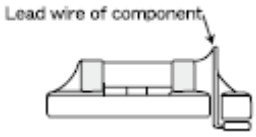
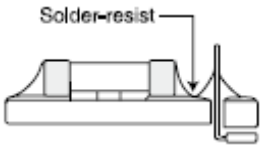
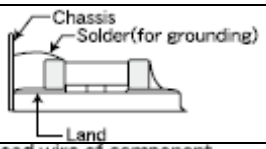
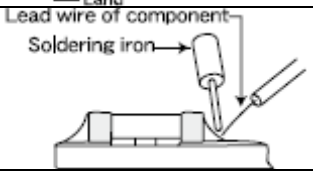
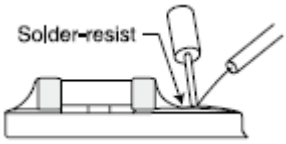
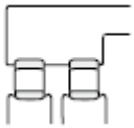
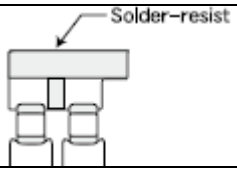
●LWDC: Recommended land dimensions for reflow-soldering

(unit: mm)

Type		105	107	212
Size	L	0.52	0.8	1.25
	W	1.0	1.6	2.0
A		0.18 to 0.22	0.25 to 0.3	0.5 to 0.7
B		0.2 to 0.25	0.3 to 0.4	0.4 to 0.5
C		0.9 to 1.1	1.5 to 1.7	1.9 to 2.1

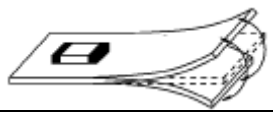
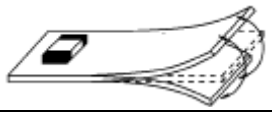


(2) Examples of good and bad solder application

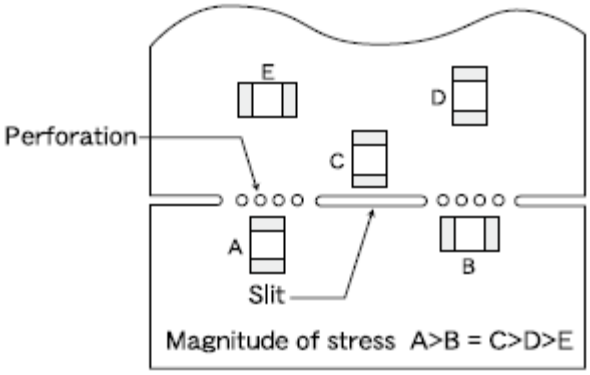
Items	Not eommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded Components near mounted components		
Horizontal component placement		

◆Pattern configurations (Capacitor layout on PCBs)

1-1. The following is examples of good and bad capacitor layouts ; capacitors shall be located to minimize any possible mechanical stresses from board warp or deflection.

Items	Not recommended	Recommended	
Deflection of board			Place the product at a right angle to the direction of the anticipated mechanical stress.

1-2. The amount of mechanical stresses given will vary depending on capacitor layout. Please refer to diagram below.



1-3. When PCB is split, the amount of mechanical stress on the capacitors can vary according to the method used. The following methods are listed in order from least stressful to most stressful: push-back, slit, V-grooving, and perforation. Thus, please consider the PCB, split methods as well as chip location.

3. Mounting

Precautions

◆Adjustment of mounting machine

1. When capacitors are mounted on PCB, excessive impact load shall not be imposed on them.
2. Maintenance and inspection of mounting machines shall be conducted periodically.

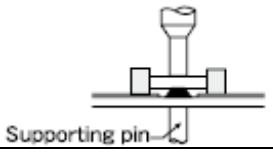
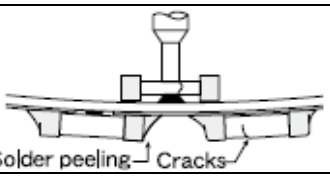
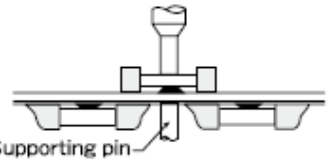
◆Selection of Adhesives

1. When chips are attached on PCBs with adhesives prior to soldering, it may cause capacitor characteristics degradation unless the following factors are appropriately checked : size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, please contact us for further information.

Technical considerations

◆Adjustment of mounting machine

1. When the bottom dead center of a pick-up nozzle is too low, excessive force is imposed on capacitors and causes damages. To avoid this, the following points shall be considerable.
   (1) The bottom dead center of the pick-up nozzle shall be adjusted to the surface level of PCB without the board deflection.
   (2) The pressure of nozzle shall be adjusted between 1 and 3 N static loads.
   (3) To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins or back-up pins shall be used on the other side of the PCB. The following diagrams show some typical examples of good and bad pick-up nozzle placement:

Items	Not recommended	Recommended
Single-sided mounting		
Double-sided mounting		

2. As the alignment pin is worn out, adjustment of the nozzle height can cause chipping or cracking of capacitors because of mechanical impact on the capacitors.
To avoid this, the monitoring of the width between the alignment pins in the stopped position, maintenance, check and replacement of the pin shall be conducted periodically.

◆Selection of Adhesives

Some adhesives may cause IR deterioration. The different shrinkage percentage of between the adhesive and the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect components. Therefore, the following precautions shall be noted in the application of adhesives.

(1) Required adhesive characteristics

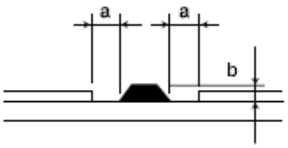
a. The adhesive shall be strong enough to hold parts on the board during the mounting & solder process.
b. The adhesive shall have sufficient strength at high temperatures.
c. The adhesive shall have good coating and thickness consistency.
d. The adhesive shall be used during its prescribed shelf life.
e. The adhesive shall harden rapidly.
f. The adhesive shall have corrosion resistance.
g. The adhesive shall have excellent insulation characteristics.
h. The adhesive shall have no emission of toxic gasses and no effect on the human body.

(2) The recommended amount of adhesives is as follows;

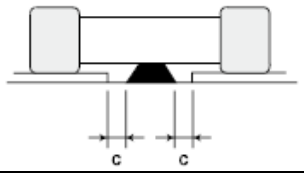
[Recommended condition]

Figure	212/316 case sizes as examples
a	0.3mm min
b	100 to 120 μm
c	Adhesives shall not contact land

Amount adhesive



After capacitors are bonded



4. Soldering

Precautions

◆Selection of Flux

Since flux may have a significant effect on the performance of capacitors, it is necessary to verify the following conditions prior to use;

(1) Flux used shall be less than or equal to 0.1 wt%(in Cl equivalent) of halogenated content. Flux having a strong acidity content shall not be applied.
(2) When shall capacitors are soldered on boards, the amount of flux applied shall be controlled at the optimum level.
(3) When water-soluble flux is used, special care shall be taken to properly clean the boards.

◆Soldering

Temperature, time, amount of solder, etc. shall be set in accordance with their recommended conditions.
Sn-Zn solder paste can adversely affect MLCC reliability.
Please contact us prior to usage of Sn-Zn solder.

Technical considerations

◆Selection of Flux

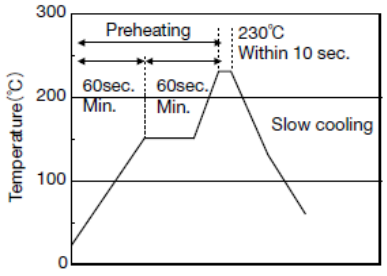
1-1. When too much halogenated substance(Chlorine, etc.) content is used to activate flux, or highly acidic flux is used, it may lead to corrosion of terminal electrodes or degradation of insulation resistance on the surfaces of the capacitors.
1-2. Flux is used to increase solderability in wave soldering. However if too much flux is applied, a large amount of flux gas may be emitted and may adversely affect the solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.
1-3. Since the residue of water-soluble flux is easily dissolved in moisture in the air, the residues on the surfaces of capacitors in high humidity conditions may cause a degradation of insulation resistance and reliability of the capacitors. Therefore, the cleaning methods and the capability of the machines used shall also be considered carefully when water-soluble flux is used.

◆Soldering

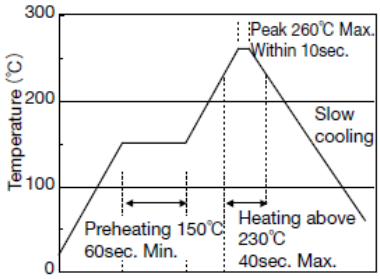
- Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling.
- Therefore, the soldering must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
- Preheating : Capacitors shall be preheated sufficiently, and the temperature difference between the capacitors and solder shall be within 100 to 130℃.
- Cooling : The temperature difference between the capacitors and cleaning process shall not be greater than 100℃.

[Reflow soldering]

【Recommended conditions for eutectic soldering】



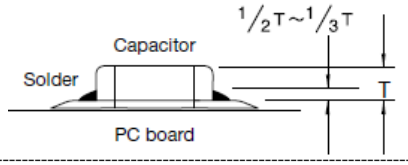
【Recommended condition for Pb-free soldering】



Caution

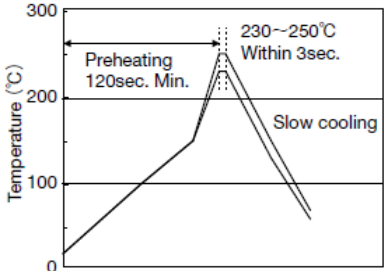
①The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of a capacitor.

②Because excessive dwell times can adversely affect solderability, soldering duration shall be kept as close to recommended times as possible.

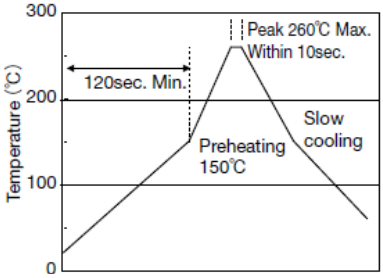


[Wave soldering]

【Recommended conditions for eutectic soldering】



【Recommended condition for Pb-free soldering】

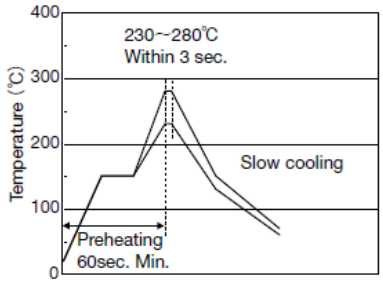


Caution

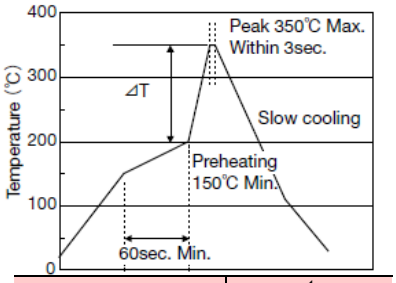
①Wave soldering must not be applied to capacitors designated as for reflow soldering only.

[Hand soldering]

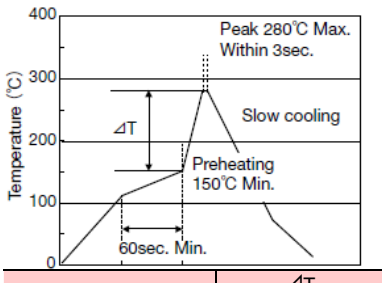
【Recommended conditions for eutectic soldering】



【Recommended condition for Pb-free soldering】



	⊿T
316type or less	⊿T≦150℃



	⊿T
325type or more	⊿T≦130℃

Caution

①Use a 50W soldering iron with a maximum tip diameter of 1.0 mm.

②The soldering iron shall not directly touch capacitors.

5. Cleaning

Precautions

◆Cleaning conditions

1. When PCBs are cleaned after capacitors mounting, please select the appropriate cleaning solution in accordance with the intended use of the cleaning. (e.g. to remove soldering flux or other materials from the production process.)
2. Cleaning condition shall be determined after it is verified by using actual cleaning machine that the cleaning process does not affect capacitor's characteristics.

Technical considerations

1. The use of inappropriate cleaning solutions can cause foreign substances such as flux residue to adhere to capacitors or deteriorate their outer coating, resulting in a degradation of the capacitor's electrical properties (especially insulation resistance).
2. Inappropriate cleaning conditions (insufficient or excessive cleaning) may adversely affect the performance of the capacitors. In the case of ultrasonic cleaning, too much power output can cause excessive vibration of PCBs which may lead to the cracking of capacitors or the soldered portion, or decrease the terminal electrodes' strength. Therefore, the following conditions shall be carefully checked;

   Ultrasonic output : 20 W/ℓ or less

   Ultrasonic frequency : 40 kHz or less

   Ultrasonic washing period : 5 min. or less

6. Resin coating and mold	
Precautions	1. With some type of resins, decomposition gas or chemical reaction vapor may remain inside the resin during the hardening period or while left under normal storage conditions resulting in the deterioration of the capacitor's performance. 2. When a resin's hardening temperature is higher than capacitor's operating temperature, the stresses generated by the excessive heat may lead to damage or destruction of capacitors. The use of such resins, molding materials etc. is not recommended.

7. Handling	
Precautions	◆Splitting of PCB 1. When PCBs are split after components mounting, care shall be taken so as not to give any stresses of deflection or twisting to the board. 2. Board separation shall not be done manually, but by using the appropriate devices. ◆Mechanical considerations Be careful not to subject capacitors to excessive mechanical shocks. (1)If ceramic capacitors are dropped onto a floor or a hard surface, they shall not be used. (2)Please be careful that the mounted components do not come in contact with or bump against other boards or components.

8. Storage conditions	
Precautions	◆Storage 1. To maintain the solderability of terminal electrodes and to keep packaging materials in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. ・Recommended conditions Ambient temperature : Below 30℃ Humidity : Below 70% RH The ambient temperature must be kept below 40℃. Even under ideal storage conditions, solderability of capacitor is deteriorated as time passes, so capacitors shall be used within 6 months from the time of delivery. ・Ceramic chip capacitors shall be kept where no chlorine or sulfur exists in the air. 2. The capacitance values of high dielectric constant capacitors will gradually decrease with the passage of time, so care shall be taken to design circuits . Even if capacitance value decreases as time passes, it will get back to the initial value by a heat treatment at 150℃ for 1hour.
Technical considerations	If capacitors are stored in a high temperature and humidity environment, it might rapidly cause poor solderability due to terminal oxidation and quality loss of taping/packaging materials. For this reason, capacitors shall be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the capacitors.

※RCR-2335B(Safety Application Guide for fixed ceramic capacitors for use in electronic equipment)is published by JEITA.
Please check the guide regarding precautions for deflection test, soldering by spot heat, and so on.