有关敝公司产品的注意事项

请务必在使用敝公司产品之前阅读。

⚠ 注 意

产品目录中的记载内容

本产品目录中所记载的内容为2019年10月的内容。因产品改良等原因，可能会不经预告而变更其记载内容，或是停止供应本产品目录中所记载的产品。所以，请务必在使用前先确认最新的产品信息。

未按照本产品目录中所记载的内容或交货规格说明书使用敝公司产品，即便其致使用设备发生损害、不良情况等时，敝公司也不承担任何责任，敬请知悉。

签署交货规格说明书

就本产品目录中所记载产品的产品规格等相关内容，敝公司备有交货规格说明书，详情请向敝公司咨询。在使用敝公司产品前请务必就交货规格说明书之内容确认并批准之。

实装前的事前评估

使用敝公司产品时，请务必事先安装到使用设备之后，在实际使用的环境下进行评估和确认。

用途的限定

1. 可以使用的设备

本产品目录中所记载的产品预设为使用于一般电子设备 [音像设备、办公自动化设备、家电产品、办公设备、信息通讯设备 (手机、电脑等)] 以及面向本产品目录或是交货规格说明书中另行注明的设备的通用性、标准性用途。

另外，面向汽车用电子设备、电信基础设施 / 工业设备、医疗设备 (国际 (GHTF) 第一类、第二类、第三类) 方面的应用，敝公司也备有预设的产品线，请参考本产品目录或是交货规格说明书的内容，使用相对应的产品。

2. 需要另行确认的设备

若考虑将本产品目录中所记载的产品使用于当产品发生故障、品质不良，或是由此引起的运转失常而可能会危及生命、身体或是财产，以及有可能给社会造成深刻影响的以下设备 (不包括本产品目录或是交货规格说明书中另行注明可以使用设备) 等时，请务必事先向敝公司咨询。

(1) 运输用设备 (汽车驱动控制设备、火车控制设备、船舶控制设备等)
(2) 交通信号设备
(3) 防灾 / 保安设备
(4) 医疗设备 (国际 (GHTF) 第三类)
(5) 高公共性信息通讯设备 / 信息处理设备 (电话交换机、电话 / 无线 / 广播电视基站等)
(6) 其他与上述设备有同等品质与可靠性要求的设备

3. 禁止使用的设备

请勿将敝公司产品使用于对安全性和可靠性有着极高要求的以下设备。

(1) 航天设备 (人工卫星、火箭等)
(2) 航空设备 (注释1)
(3) 医疗设备 (国际 (GHTF) 第四类)、植体 (体内植入型) 医疗设备 (注释2)
(4) 发电控制设备 (面向核能 / 水力 / 火力发电厂等的设备)
(5) 海底设备 (海底中继设备、海中的作业设备等)
(6) 军事设备
(7) 其他与上述设备有同等品质与可靠性要求的设备

注释 1 ：仅限于对航空设备的安全运行不产生直接干扰的设备 [机内娱乐设备、机内照明设备、电动座椅、餐饮设备等]，在满足敝公司另行指定的相关条件时，亦可将敝公司产品用于以上用途。在贵公司考虑将敝公司的产品用于以上用途时，请务必事先向敝公司咨询相关的信息。

注释 2 ：包括注入人体内的部分和与此相连接的体外部分。

4. 责任的限制

未经敝公司的事先书面同意，把本产品目录中所记载的产品使用于非敝公司预设用途的设备、前述需要向敝公司咨询的设备或敝公司禁止使用的设备，从而给客户或第三方造成损害的，敝公司不承担任何责任，敬请知悉。

安全设计

需将敝公司的产品使用于对安全性和可靠性要求较高的设备、电路上时，请进行充分的安全性评估和可靠性评估。另外，请通过设置保护电路、保护装置的系统，设置冗余电路不会被单一故障影响安全性的系统等失效导向安全 (fail-safe) 设计，确保充分的安全性。

有关知识产权

本产品目录中所记载的信息是用于说明相关产品的典型操作以及相关应用。此类信息的使用不代表对于敝公司以及第三方的知识产权以及其他权利的使用许可或是不侵权保证。

保证范围

敝公司产品的保证范围仅限于已经交付的敝公司产品本身，由敝公司产品的故障或不良情况所诱发的损害，敝公司不承担任何责任，敬请知悉。但是，以书面形式另行签署了交易基本合同书、品质保证协定书等时，敝公司将根据该合同的条件提供保证。

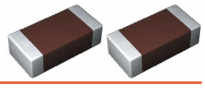
正规销售渠道

本产品目录中所记载的内容适用于从敝公司营业所、销售子公司、销售代理店 (即“正规销售渠道”) 购买的敝公司产品，并不适用于从其他渠道购买的敝公司产品，敬请知悉。

出口时的注意事项

本产品目录中所记载的部分产品在出口时须事先确认《外汇和对外贸易法》以及美国在出口管理方面的相关法规，并办理相关手续。如有不明之处，请向敝公司咨询。

多层陶瓷电容器



波峰焊 回流焊

■型号标示法

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

△＝空格

①额定电压

代码	额定电压 [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
X	2000

②系列名称

代码	系列名称
M	多层电容器
V	高频用多层电容器
W	LW 逆转型多层电容器

③端接类型

代码	端接类型
K	电镀
S	Cu 内部电极 (高频波用)

④外型尺寸

规格	L×W [mm]	EIA (inch)
021	0.25× 0.125	008004
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

注: ※LW 逆转型 (□WK)

⑤产品尺寸公差

代码	规格	L[mm]	W[mm]	T[mm]
△	所有规格	标准	标准	标准
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	1.6±0.20	0.85±0.10
				1.6±0.20
	325	3.2±0.30	2.5±0.30	2.5±0.30
B	063	0.6±0.09	0.3±0.09	0.3±0.09
	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	0.45±0.05
				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
E	063	0.6 + 0.25/− 0	0.3 + 0.25/− 0	0.3 + 0.25/ − 0
	105	1.0+0.30/−0	0.5+0.30/−0	0.5+0.30/−0

注: 参照标准产品的尺寸　　△= 空格

⑥温度特性

■高介电常数【超低失真多层陶瓷电容器 除外】

代码	适用标准		温度范围 [℃]	基准温度 [℃]	静电容量变化率	静电容量允许偏差	允许偏差代码
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

注: ※LD 低失真大容量多层陶瓷电容器　　△= 空格

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另外，有关各产品的详细信息 (特性图、可靠性信息、使用时的注意事项等)，请参阅敝公司网站 (http://www.ty-top.com/)。

■温度补偿用

代码	适用标准		温度范围 [℃]	基准温度 [℃]	静电容量变化率	静电容量允许偏差	允许偏差代码
CG	EIA	C0G	−55～＋125	25	0±30ppm/℃	±0.05pF	A
						±0.1pF	B
						±0.25pF	C
						±0.5pF	D
						±5%	J
UJ	JIS	UJ	−55～＋125	20	−750±120ppm/℃	±0.25pF	C
						±0.5pF	D
	EIA	U2J		25		±5%	J
UK	JIS	UK	−55～＋125	20	−750±250ppm/℃	±0.25pF	C
	EIA	U2K	−55～＋125	25			

⑥系列名称

· 超低失真多层陶瓷电容器

代码	系列名称
SD	标准品

· 中高耐压多层陶瓷电容器

代码	系列名称
SD	标准品

⑦静电容量

代码 (例)	静电容量
0R5	0.5pF
010	1pF
100	10pF
101	100pF
102	1,000pF
103	10,000pF
104	0.1μF
105	1.0μF
106	10μF
107	100μF

注: R=小数点

⑧静电容量允许偏差

代码	静电容量允许偏差
A	±0.05pF
B	±0.1pF
C	±0.25pF
D	±0.5pF
F	±1pF
G	±2%
J	±5%
K	±10%
M	±20%
Z	+80/−20%

⑨产品厚度

代码	产品厚度 [mm]
K	0.125
H	0.13
E	0.18
C	0.2
D	
P	0.3
T	
K	0.45 (107 型以上)
V	0.5
W	
A	0.8
D	0.85 (212 型以上)
F	1.15
G	1.25
L	1.6
N	1.9
Y	2.0 max
M	2.5

⑩个别规格

代码	个别规格
—	标准

⑪包装

代码	包装规格
F	φ178mm 卷盘带装 (2mm 间距)
T	φ178mm 卷盘带装 (4mm 间距)
P	φ178mm 卷盘带装 (4mm 间距, 1000 个/卷盘) 325 规格 (厚度代码M)
R	φ178mm 卷盘带装 (2mm 间距) 105 规格 (厚度代码E,H)
W	φ178mm 压纹带 (1mm 间距) 021/042 规格专用

⑫管理记号

代码	管理记号
△	标准

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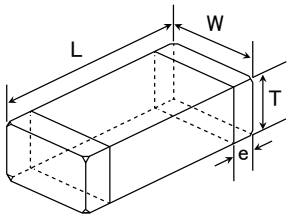
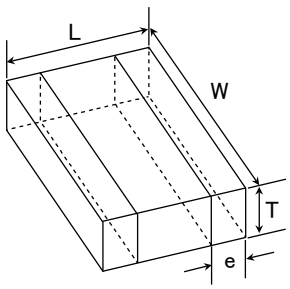
■标准产品尺寸





※ LW逆转型

Type (EIA)	标准产品尺寸[mm]				
	L	W	T	*1	e
□MK021(008004)	0.25±0.013	0.125±0.013	0.125±0.013	K	0.0675±0.0275
□VS021(008004)	0.25±0.013	0.125±0.013	0.125±0.013	K	0.0675±0.0275
□MK042(01005)	0.4±0.02	0.2±0.02	0.2±0.02	C	0.1±0.03
				D	
□VS042(01005)	0.4±0.02	0.2±0.02	0.2±0.02	C	0.1±0.03
□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	0.13±0.02	H	0.25±0.10
			0.18±0.02	E	
			0.2±0.02	C	
			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	
□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	
□WK212(0508)※	1.25±0.15	2.0±0.15	0.85±0.10	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	
			1.6±0.20	L	
□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	
□MK432(1812)	4.5±0.40	3.2±0.30	2.0+0/−0.30	Y	0.6±0.4
			2.5±0.20	M	0.9±0.6

注: ※LW 逆转型、*1 产品厚度代码

■标准包装

规格	EIA(inch)	产品厚度		标准数量 [pcs]	
		[mm]	代码	纸带	压纹带
021	008004	0.125	K	—	50000
042	01005	0.2	C	—	40000
			D		
063	0201	0.3	P	15000	—
			T		
105	0402	0.13	H	—	20000
		0.18	E	—	15000
		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
		1.6	L	—	2000
325	1210	0.85	D	—	2000
		1.15	F		
		1.9	N		
		2.0 max	Y		
		2.5	M	—	1000
432	1812	2.0 max	Y	—	1000
		2.5	M	—	500

注: ※LW 逆转型 (□WK)

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■型号一览

・产品目录中的多层陶瓷电容器全部属于RoHS对应品。
・型号的[]中将会记入静电容量允许偏差代码。

注）
*1 根据个别规格的约定，将有对应X7R/X7S规格之情况。
*2 根据使用电路和机器，需要按照相应规格处理。请务必咨询正规销售渠道。
*3 关于尺寸规格，请参照型号标示法的④外型尺寸、⑤产品尺寸公差、⑨产品厚度、以及标准产品的尺寸。

多层陶瓷电容器 (高介电常数)

●021型

【温度特性 BJ : X5R (-55~+85℃)】 厚度0.125mm (K)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
EMK021 BJ221□K-W		16		X5R	220 p	±10, ±20	10	150	0.125±0.013	R
EMK021 BJ471□K-W				X5R	470 p	±10, ±20	10	150	0.125±0.013	R
EMK021 BJ102□K-W				X5R	1000 p	±10, ±20	10	150	0.125±0.013	R
JMK021 BJ222□K-W		6.3		X5R	2200 p	±10, ±20	10	150	0.125±0.013	R
JMK021 BJ472□K-W				X5R	4700 p	±10, ±20	10	150	0.125±0.013	R
JMK021 BJ103□K-W				X5R	0.01 μ	±10, ±20	10	150	0.125±0.013	R
AMK021 BJ223MK-W		4		X5R	0.022 μ	±20	10	150	0.125±0.013	R

●042型

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】 厚度 0.2mm (C)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
EMK042 BJ101□C-W		16		X5R	100 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ151□C-W				X5R	150 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ221□C-W				X5R	220 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ331□C-W				X5R	330 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ471□C-W				X5R	470 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ681□C-W				X5R	680 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ102□C-W			B	X5R	1000 p	±10, ±20	5	200	0.2±0.02	R
EMK042 BJ152□C-W				X5R	1500 p	±10, ±20	10	150	0.2±0.02	R
EMK042 BJ222□C-W				X5R	2200 p	±10, ±20	10	150	0.2±0.02	R
EMK042 BJ332□C-W				X5R	3300 p	±10, ±20	10	150	0.2±0.02	R
EMK042 BJ472□C-W				X5R	4700 p	±10, ±20	10	150	0.2±0.02	R
EMK042 BJ682□C-W				X5R	6800 p	±10, ±20	10	150	0.2±0.02	R
EMK042 BJ103□C-W				X5R	0.01 μ	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ101□C-W		10		X5R*1	100 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ151□C-W				X5R*1	150 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ221□C-W				X5R*1	220 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ331□C-W				X5R*1	330 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ471□C-W				X5R*1	470 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ681□C-W				X5R*1	680 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ102□C-W			B	X5R*1	1000 p	±10, ±20	5	200	0.2±0.02	R
LMK042 BJ152□C-W				X5R	1500 p	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ222□C-W				X5R	2200 p	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ332□C-W				X5R	3300 p	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ472□C-W				X5R	4700 p	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ682□C-W				X5R	6800 p	±10, ±20	10	150	0.2±0.02	R
LMK042 BJ103□C-W				X5R	0.01 μ	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ152□C-W		6.3		X5R*1	1500 p	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ222□C-W				X5R*1	2200 p	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ332□C-W				X5R*1	3300 p	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ472□C-W				X5R*1	4700 p	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ682□C-W				X5R*1	6800 p	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ103□C-W				X5R*1	0.01 μ	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ223□C-W				X5R	0.022 μ	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ473□C-W				X5R	0.047 μ	±10, ±20	10	150	0.2±0.02	R
JMK042 BJ104□C-W				X5R	0.1 μ	±10, ±20	10	150	0.2±0.02	R
AMK042 BJ473□C-W		4		X5R	0.047 μ	±10, ±20	10	150	0.2±0.02	R
AMK042 BJ104□C-W				X5R	0.1 μ	±10, ±20	10	150	0.2±0.02	R

【温度特性 B7 : X7R (-55~+125℃)】 厚度 0.2mm (C)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
EMK042 B7101□C-W		16		X7R	100 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7151□C-W				X7R	150 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7221□C-W				X7R	220 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7331□C-W				X7R	330 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7471□C-W				X7R	470 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7681□C-W				X7R	680 p	±10, ±20	5	200	0.2±0.02	R
EMK042 B7102□C-W				X7R	1000 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7101□C-W		10		X7R	100 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7151□C-W				X7R	150 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7221□C-W				X7R	220 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7331□C-W				X7R	330 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7471□C-W				X7R	470 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7681□C-W				X7R	680 p	±10, ±20	5	200	0.2±0.02	R
LMK042 B7102□C-W				X7R	1000 p	±10, ±20	5	200	0.2±0.02	R

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另外，有关各产品的详细信息(特性图、可靠性信息、使用时的注意事项等)，请参阅敝公司网站(http://www.ty-top.com/)。

■型号一览

●063型

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】 厚度 0.3mm (P)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK063 BJ101□P-F		50	B	X5R*1	100 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ151□P-F			B	X5R*1	150 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ221□P-F			B	X5R*1	220 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ331□P-F			B	X5R*1	330 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ471□P-F			B	X5R*1	470 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ681□P-F			B	X5R*1	680 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ102□P-F			B	X5R*1	1000 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 BJ152□P-F			B	X5R	1500 p	±10, ±20	5	200	0.3±0.03	R
UMK063 BJ222□P-F			B	X5R	2200 p	±10, ±20	5	200	0.3±0.03	R
UMK063 BJ332□P-F			B	X5R	3300 p	±10, ±20	5	200	0.3±0.03	R
UMK063 BJ472□P-F			B	X5R	4700 p	±10, ±20	5	200	0.3±0.03	R
UMK063 BJ682□P-F			B	X5R	6800 p	±10, ±20	5	200	0.3±0.03	R
UMK063 BJ103□P-F			B	X5R	0.01 μ	±10, ±20	5	200	0.3±0.03	R
GMK063 BJ104□P-F		35		X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
TMK063 BJ152□P-F		25	B	X5R	1500 p	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ222□P-F			B	X5R	2200 p	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ332□P-F			B	X5R	3300 p	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ472□P-F			B	X5R	4700 p	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ682□P-F			B	X5R	6800 p	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ103□P-F			B	X5R	0.01 μ	±10, ±20	5	200	0.3±0.03	R
TMK063 BJ223□P-F			B	X5R	0.022 μ	±10, ±20	7.5	200	0.3±0.03	R
TMK063ABJ104□P-F				X5R	0.1 μ	±10, ±20	10	150	0.3±0.05	R
EMK063 BJ152□P-F		16	B	X5R*1	1500 p	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ222□P-F			B	X5R*1	2200 p	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ332□P-F			B	X5R*1	3300 p	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ472□P-F			B	X5R*1	4700 p	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ682□P-F			B	X5R*1	6800 p	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ103□P-F			B	X5R*1	0.01 μ	±10, ±20	5	200	0.3±0.03	R
EMK063 BJ153□P-F				X5R	0.015 μ	±10, ±20	7.5	200	0.3±0.03	R
EMK063 BJ223□P-F			B	X5R	0.022 μ	±10, ±20	7.5	200	0.3±0.03	R
EMK063 BJ333□P-F				X5R	0.033 μ	±10, ±20	7.5	150	0.3±0.03	R
EMK063 BJ473□P-F				X5R	0.047 μ	±10, ±20	7.5	150	0.3±0.03	R
EMK063 BJ683□P-F				X5R	0.068 μ	±10, ±20	10	150	0.3±0.03	R
EMK063 BJ104□P-F				X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
EMK063 BJ224□P-F				X5R	0.22 μ	±10, ±20	10	150	0.3±0.03	R
EMK063BBJ474□PLF				X5R	0.47 μ	±10, ±20	10	150	0.3±0.09	R
LMK063 BJ223□P-F		10	B	X5R	0.022 μ	±10, ±20	7.5	150	0.3±0.03	R
LMK063 BJ333□P-F				X5R	0.033 μ	±10, ±20	7.5	150	0.3±0.03	R
LMK063 BJ473□P-F				X5R	0.047 μ	±10, ±20	7.5	150	0.3±0.03	R
LMK063 BJ683□P-F				X5R	0.068 μ	±10, ±20	10	150	0.3±0.03	R
LMK063 BJ104□P-F				X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
LMK063 BJ224□P-F				X5R	0.22 μ	±10, ±20	10	150	0.3±0.03	R
LMK063BBJ474□PLF				X5R	0.47 μ	±10, ±20	10	150	0.3±0.09	R
LMK063BBJ105MPLF				X5R	1 μ	±20	10	150	0.3±0.09	R
JMK063 BJ104□P-F		6.3		X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
JMK063 BJ224□P-F				X5R	0.22 μ	±10, ±20	10	150	0.3±0.03	R
JMK063 BJ334MP-F				X5R	0.33 μ	±20	10	150	0.3±0.03	R
JMK063 BJ474□P-F				X5R	0.47 μ	±10, ±20	10	150	0.3±0.03	R
JMK063ABJ105□P-F				X5R	1 μ	±10, ±20	10	150	0.3±0.05	R
PMK063EBJ475MP-F		2.5		X5R	4.7 μ	±20	10	150	0.3+0.25/−0	R

【温度特性 C6 : X6S (-55~+105℃)】 厚度 0.3mm (P)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
TMK063 C6104□P-F		25	X6S	0.1 μ	±10, ±20	10	150	0.3±0.03	R
EMK063AC6104□P-F		16	X6S	0.1 μ	±10, ±20	10	150	0.3±0.05	R
LMK063 C6104□P-F		10	X6S	0.1 μ	±10, ±20	10	150	0.3±0.03	R
LMK063 C6224□P-F			X6S	0.22 μ	±10, ±20	10	150	0.3±0.03	R
LMK063BC6474□PLF			X6S	0.47 μ	±10, ±20	10	150	0.3±0.09	R
JMK063 C6104□P-F		6.3	X6S	0.1 μ	±10, ±20	10	150	0.3±0.03	R
JMK063 C6224□P-F			X6S	0.22 μ	±10, ±20	10	150	0.3±0.03	R
JMK063BC6474□P-F			X6S	0.47 μ	±10, ±20	10	150	0.3±0.09	R
JMK063BC6105MP-F			X6S	1 μ	±20	10	150	0.3±0.09	R
AMK063 C6474□P-F		4	X6S	0.47 μ	±10, ±20	10	150	0.3±0.03	R
AMK063AC6105□P-F			X6S	1 μ	±10, ±20	10	150	0.3±0.05	R

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■型号一览

【温度特性 B7 : X7R (-55~+125℃)】 厚度 0.3mm (P)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK063 B7101□P-F		50		X7R	100 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7151□P-F				X7R	150 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7221□P-F				X7R	220 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7331□P-F				X7R	330 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7471□P-F				X7R	470 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7681□P-F				X7R	680 p	±10, ±20	3.5	200	0.3±0.03	R
UMK063 B7102□P-F				X7R	1000 p	±10, ±20	3.5	200	0.3±0.03	R
TMK063 B7152□P-F		25		X7R	1500 p	±10, ±20	5	200	0.3±0.03	R
TMK063 B7222□P-F				X7R	2200 p	±10, ±20	5	200	0.3±0.03	R
TMK063 B7332□P-F				X7R	3300 p	±10, ±20	5	200	0.3±0.03	R
TMK063 B7472□P-F				X7R	4700 p	±10, ±20	5	200	0.3±0.03	R
TMK063 B7682□P-F				X7R	6800 p	±10, ±20	5	200	0.3±0.03	R
TMK063 B7103□P-F				X7R	0.01 μ	±10, ±20	5	200	0.3±0.03	R
EMK063 B7152□P-F		16		X7R	1500 p	±10, ±20	5	200	0.3±0.03	R
EMK063 B7222□P-F				X7R	2200 p	±10, ±20	5	200	0.3±0.03	R
EMK063 B7332□P-F				X7R	3300 p	±10, ±20	5	200	0.3±0.03	R
EMK063 B7472□P-F				X7R	4700 p	±10, ±20	5	200	0.3±0.03	R
EMK063 B7682□P-F				X7R	6800 p	±10, ±20	5	200	0.3±0.03	R
EMK063 B7103□P-F				X7R	0.01 μ	±10, ±20	5	200	0.3±0.03	R
EMK063 B7223□P-F				X7R	0.022 μ	±10, ±20	7.5	150	0.3±0.03	R

●105型

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】 厚度 0.5mm (V)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK105 BJ223□V-F		50		X5R	0.022 μ	±10, ±20	5	200	0.5±0.05	R
UMK105 BJ473□V-F				X5R	0.047 μ	±10, ±20	5	200	0.5±0.05	R
UMK105 BJ104□V-F				X5R	0.1 μ	±10, ±20	10	150	0.5±0.05	R
UMK105 BJ224□V-F				X5R	0.22 μ	±10, ±20	10	150	0.5±0.05	R
UMK105ABJ474□V-F				X5R	0.47 μ	±10, ±20	10	150	0.5±0.10	R
UMK105CBJ105MV-F				X5R	1 μ	±20	10	150	0.5+0.20/−0	R
GMK105 BJ104□V-F		35	B	X5R	0.1 μ	±10, ±20	5	150	0.5±0.05	R
GMK105ABJ105□V-F				X5R	1 μ	±10, ±20	10	150	0.5±0.10	R
TMK105 BJ153□V-F		25	B	X5R*1	0.015 μ	±10, ±20	3.5	200	0.5±0.05	R
TMK105 BJ223□V-F			B	X5R*1	0.022 μ	±10, ±20	3.5	200	0.5±0.05	R
TMK105 BJ333□V-F			B	X5R*1	0.033 μ	±10, ±20	3.5	150	0.5±0.05	R
TMK105 BJ473□V-F			B	X5R*1	0.047 μ	±10, ±20	3.5	150	0.5±0.05	R
TMK105 BJ104□V-F			B	X5R	0.1 μ	±10, ±20	5	150	0.5±0.05	R
TMK105 BJ224□V-F				X5R	0.22 μ	±10, ±20	10	200	0.5±0.05	R
TMK105ABJ474□V-F				X5R	0.47 μ	±10, ±20	10	200	0.5±0.10	R
TMK105 BJ105□V-F				X5R	1 μ	±10, ±20	10	150	0.5±0.05	R
TMK105CBJ225□V-F				X5R	2.2 μ	±10, ±20	10	150	0.5+0.20/−0	R
EMK105 BJ224□V-F		16	B	X5R	0.22 μ	±10, ±20	5	150	0.5±0.05	R
EMK105ABJ474□V-F				X5R	0.47 μ	±10, ±20	10	200	0.5±0.10	R
EMK105 BJ105□V-F				X5R	1 μ	±10, ±20	10	150	0.5±0.05	R
EMK105ABJ225□V-F				X5R	2.2 μ	±10, ±20	10	150	0.5±0.10	R
LMK105 BJ225□V-F		10		X5R	2.2 μ	±10, ±20	10	150	0.5±0.05	R
LMK105BBJ475MVLF				X5R	4.7 μ	±20	10	150	0.5+0.15/−0.05	R
JMK105 BJ225□V-F		6.3		X5R	2.2 μ	±10, ±20	10	150	0.5±0.05	R
JMK105BBJ475MV-F	JMK105 BJ475MV-FD			X5R	4.7 μ	±20	10	150	0.5+0.15/−0.05	R
AMK105EBJ226MV-F		4		X5R	22 μ	±20	20	150	0.5+0.30/−0	R

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】 厚度 0.3mm (P)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK105 BJ104□P-F		50		X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
TMK105 BJ103□P-F		25	B	X5R	0.01 μ	±10, ±20	5	150	0.3±0.03	R
TMK105 BJ104□P-F				X5R	0.1 μ	±10, ±20	10	150	0.3±0.03	R
TMK105 BJ224□P-F				X5R	0.22 μ	±10, ±20	10	150	0.3±0.03	R
TMK105 BJ474□P-F				X5R	0.47 μ	±10, ±20	10	150	0.3±0.03	R
EMK105 BJ474□P-F		16		X5R	0.47 μ	±10, ±20	10	150	0.3±0.03	R
LMK105 BJ105□PLF		10		X5R	1 μ	±10, ±20	10	150	0.3±0.03	R
JMK105 BJ105□P-F		6.3		X5R	1 μ	±10, ±20	10	150	0.3±0.03	R
AMK105 BJ225MP-F		4		X5R	2.2 μ	±20	10	150	0.3±0.03	R

【温度特性 BJ : X5R (-55~+85℃)】 厚度 0.2mm (C)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
LMK105 BJ104□C-F		10		X5R	0.1 μ	±10, ±20	10	150	0.2±0.02	R
JMK105 BJ224□C-F		6.3		X5R	0.22 μ	±10, ±20	10	150	0.2±0.02	R
JMK105 BJ474□C-F				X5R	0.47 μ	±10, ±20	10	150	0.2±0.02	R
JMK105 BJ105MC-F				X5R	1 μ	±20	10	150	0.2±0.02	R

【温度特性 BJ : X5R (-55~+85℃)】 厚度0.18mm (E)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
LMK105 BJ104□E-R		10		X5R	0.1 μ	±10, ±20	10	150	0.18±0.02	R
JMK105 BJ224□E-R		6.3		X5R	0.22 μ	±10, ±20	10	150	0.18±0.02	R
JMK105 BJ474□E-R				X5R	0.47 μ	±10, ±20	10	150	0.18±0.02	R
AMK105 BJ105ME-R		4		X5R	1 μ	±20	10	150	0.18±0.02	R

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■型号一览

【温度特性 BJ : X5R (-55~+85℃)】 厚度 0.13mm (H)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
LMK105 BJ104MH-R		10	X5R	0.1 μ	±20	10	150	0.13±0.02	R
JMK105 BJ224MH-R		6.3	X5R	0.22 μ	±20	10	150	0.13±0.02	R
AMK105 BJ474MH-R		4	X5R	0.47 μ	±20	10	150	0.13±0.02	R

【温度特性 C6 : X6S (-55~+105℃)】 厚度 0.5mm (V)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
GMK105CC6105MV-F		35	X6S	1 μ	±20	10	150	0.5+0.20/−0	R
TMK105AC6105□V-F		25	X6S	1 μ	±10, ±20	10	150	0.5±0.10	R
EMK105 C6105□V-F		16	X6S	1 μ	±10, ±20	10	150	0.5±0.05	R
EMK105CC6225MV-F			X6S	2.2 μ	±20	10	150	0.5+0.20/−0	R
LMK105 C6105□V-F		10	X6S	1 μ	±10, ±20	10	200	0.5±0.05	R
LMK105AC6225MV-F			X6S	2.2 μ	±20	10	150	0.5±0.10	R
JMK105 C6105□V-F		6.3	X6S	1 μ	±10, ±20	10	150	0.5±0.05	R
JMK105 C6225MV-F			X6S	2.2 μ	±20	10	150	0.5±0.05	R
JMK105BC6475MV-F			X6S	4.7 μ	±20	10	150	0.5+0.15/−0.05	R
AMK105BC6475MV-F		4	X6S	4.7 μ	±20	10	200	0.5+0.15/−0.05	R

【温度特性 B7 : X7R (-55~+125℃)】 厚度 0.5mm (V)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK105 B7152□V-F		50	X7R	1500 p	±10, ±20	2.5	200	0.5±0.05	R
UMK105 B7222□V-F			X7R	2200 p	±10, ±20	2.5	200	0.5±0.05	R
UMK105 B7332□V-F			X7R	3300 p	±10, ±20	2.5	200	0.5±0.05	R
UMK105 B7472□V-F			X7R	4700 p	±10, ±20	2.5	150	0.5±0.05	R
UMK105 B7682□V-F			X7R	6800 p	±10, ±20	2.5	150	0.5±0.05	R
UMK105 B7103□V-F			X7R	0.01 μ	±10, ±20	3.5	150	0.5±0.05	R
UMK105 B7223□V-FR			X7R	0.022 μ	±10, ±20	10	200	0.5±0.05	R
UMK105 B7473□V-FR			X7R	0.047 μ	±10, ±20	10	200	0.5±0.05	R
UMK105 B7104□V-FR			X7R	0.1 μ	±10, ±20	10	150	0.5±0.05	R
TMK105 B7223□V-F		25	X7R	0.022 μ	±10, ±20	3.5	150	0.5±0.05	R
TMK105 B7473□V-F			X7R	0.047 μ	±10, ±20	3.5	150	0.5±0.05	R
TMK105 B7104□V-FR			X7R	0.1 μ	±10, ±20	10	200	0.5±0.05	R
TMK105 B7224□V-FR			X7R	0.22 μ	±10, ±20	10	150	0.5±0.05	R
EMK105 B7223□V-F		16	X7R	0.022 μ	±10, ±20	3.5	200	0.5±0.05	R
EMK105 B7473□V-F			X7R	0.047 μ	±10, ±20	3.5	200	0.5±0.05	R
EMK105 B7104□V-F			X7R	0.1 μ	±10, ±20	5	150	0.5±0.05	R
EMK105 B7224□V-FR			X7R	0.22 μ	±10, ±20	10	150	0.5±0.05	R
LMK105 B7224□V-FR		10	X7R	0.22 μ	±10, ±20	10	150	0.5±0.05	R
LMK105 B7474□V-F			X7R	0.47 μ	±10, ±20	10	150	0.5±0.05	R
JMK105 B7224□V-F		6.3	X7R	0.22 μ	±10, ±20	5	150	0.5±0.05	R
JMK105 B7474□V-F			X7R	0.47 μ	±10, ±20	10	150	0.5±0.05	R

● 107型

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】 厚度 0.8mm (A)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK107ABJ474□A-T	UMK107 BJ474□A-TD	50	X5R	0.47 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
UMK107 BJ105□A-T			X5R	1 μ	±10, ±20	10	150	0.8±0.10	R
UMK107BBJ225□A-T			X5R	2.2 μ	±10, ±20	10	150	0.8+0.20/−0	R
GMK107BBJ475□A-T		35	X5R	4.7 μ	±10, ±20	10	150	0.8+0.20/−0	R
TMK107ABJ225□A-T	TMK107 BJ225□A-TD	25	X5R	2.2 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
TMK107BBJ475□A-T			X5R	4.7 μ	±10, ±20	10	150	0.8+0.20/−0	R
TMK107BBJ106MA-T			X5R	10 μ	±20	10	150	0.8+0.20/−0	R
EMK107ABJ475□A-T	EMK107 BJ475□A-TD	16	X5R	4.7 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
EMK107BBJ106MA-T			X5R	10 μ	±20	10	150	0.8+0.20/−0	R
LMK107BBJ106□ALT	LMK107 BJ106□ALTD	10	X5R	10 μ	±10, ±20	10	150	0.8+0.20/−0	R
LMK107BBJ226MA-T			X5R	22 μ	±20	10	150	0.8+0.20/−0	R
JMK107ABJ106□A-T	JMK107 BJ106□A-T	6.3	X5R	10 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
JMK107BBJ226MA-T			X5R	22 μ	±20	10	150	0.8+0.20/−0	R
JMK107BBJ476MA-RE			X5R	47 μ	±20	15	150	0.8+0.20/−0	R
AMK107BBJ476MA-RE		4	X5R	47 μ	±20	20	150	0.8+0.20/−0	R

【温度特性 BJ : X5R (-55~+85℃)】 厚度 0.45mm (K)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
TMK107 BJ105□K-T		25	X5R	1 μ	±10, ±20	10	150	0.45±0.05	R
EMK107 BJ105□K-T		16	X5R	1 μ	±10, ±20	10	150	0.45±0.05	R
EMK107BBJ225□K-T			X5R	2.2 μ	±10, ±20	10	150	0.45±0.05	R
LMK107 BJ105□K-T		10	X5R	1 μ	±10, ±20	10	150	0.45±0.05	R
LMK107 BJ225□K-T			X5R	2.2 μ	±10, ±20	10	150	0.45±0.05	R
LMK107BBJ475MKLT	LMK107 BJ475MKLTD		X5R	4.7 μ	±20	10	150	0.45±0.05	R
JMK107 BJ105□K-T		6.3	X5R	1 μ	±10, ±20	10	150	0.45±0.05	R
JMK107 BJ225□K-T			X5R	2.2 μ	±10, ±20	10	150	0.45±0.05	R
JMK107 BJ475MK-T			X5R	4.7 μ	±20	10	150	0.45±0.05	R
JMK107BBJ106MK-TT			X5R	10 μ	±20	10	150	0.45±0.05	R
AMK107BBJ106MK-T*2		4	X5R	10 μ	±20	10	150	0.45±0.05	R

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■型号一览

【温度特性 C6：X6S (-55~+105℃)】 厚度 0.8mm (A)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
TMK107BC6225□A-T		25		X6S	2.2 μ	±10, ±20	10	150	0.8+0.20/−0	R
EMK107 C6105□A-T		16		X6S	1 μ	±10, ±20	5	150	0.8±0.10	R
EMK107BC6225□A-T				X6S	2.2 μ	±10, ±20	10	150	0.8+0.20/−0	R
EMK107BC6475□A-T				X6S	4.7 μ	±10, ±20	10	150	0.8+0.20/−0	R
EMK107BC6106MA-T				X6S	10 μ	±20	10	150	0.8+0.20/−0	R
LMK107 C6105□A-T		10		X6S	1 μ	±10, ±20	5	150	0.8±0.10	R
LMK107AC6475□A-T				X6S	4.7 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
LMK107BC6106MA-T				X6S	10 μ	±20	10	150	0.8+0.20/−0	R
JMK107 C6475□A-T		6.3		X6S	4.7 μ	±10, ±20	10	150	0.8±0.10	R
JMK107BC6106MA-T				X6S	10 μ	±20	10	150	0.8+0.20/−0	R
JMK107BC6226MA-T				X6S	22 μ	±20	10	150	0.8+0.20/−0	R
AMK107BC6226MA-T		4		X6S	22 μ	±20	10	150	0.8+0.20/−0	R

【温度特性 B7：X7R (-55~+125℃)】 厚度 0.8mm (A)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK107 B7224□A-TR		50		X7R	0.22 μ	±10, ±20	10	150	0.8±0.10	R
UMK107 B7474□A-TR				X7R	0.47 μ	±10, ±20	10	150	0.8±0.10	R
UMK107AB7105□A-T				X7R	1 μ	±10, ±20	10	150	0.8+0.15/−0.05	R
TMK107 B7474□A-TR		25		X7R	0.47 μ	±10, ±20	10	150	0.8±0.10	R
TMK107 B7105□A-T				X7R	1 μ	±10, ±20	10	150	0.8±0.10	R
EMK107 B7474□A-T		16		X7R	0.47 μ	±10, ±20	3.5	150	0.8±0.10	R
EMK107 B7105□A-T				X7R	1 μ	±10, ±20	5	150	0.8±0.10	R
EMK107BB7225□A-T				X7R	2.2 μ	±10, ±20	10	150	0.8+0.20/−0	R
LMK107 B7225□A-TR		10		X7R	2.2 μ	±10, ±20	10	150	0.8±0.10	R
JMK107 B7225□A-TR		6.3		X7R	2.2 μ	±10, ±20	10	200	0.8±0.10	R
JMK107BB7475□A-T				X7R	4.7 μ	±10, ±20	10	150	0.8+0.20/−0	R

●212型

【温度特性 BJ：B (-25~+85℃)/X5R (-55~+85℃)】厚度 1.25mm (G)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK212BBJ475□G-T		50		X5R	4.7 μ	±10, ±20	10	150	1.25+0.20/−0	R
GMK212BBJ106□G-T		35		X5R	10 μ	±10, ±20	10	150	1.25+0.20/−0	R
TMK212ABJ475□G-T	TMK212 BJ475□G-T	25		X5R	4.7 μ	±10, ±20	10	150	1.25+0.15/−0.05	R
TMK212BBJ106MG-T				X5R	10 μ	±20	10	150	1.25+0.20/−0	R
TMK212BBJ226MG-TT				X5R	22 μ	±20	10	150	1.25+0.20/−0	R
EMK212ABJ106□G-T	EMK212 BJ106□G-T	16		X5R	10 μ	±10, ±20	10	150	1.25+0.15/−0.05	R
EMK212BBJ226MG-T				X5R	22 μ	±20	10	150	1.25+0.20/−0	R
LMK212BBJ476MG-T		10		X5R	47 μ	±20	10	150	1.25+0.20/−0	R
JMK212BBJ476MG-T	JMK212 BJ476MG-T	6.3		X5R	47 μ	±20	10	150	1.25+0.20/−0	R
JMK212BBJ107MG-TE				X5R	100 μ	±20	20	150	1.25+0.20/−0	R
AMK212BBJ107MG-TE		4		X5R	100 μ	±20	20	150	1.25+0.20/−0	R
PMK212BBJ107MG-T		2.5		X5R	100 μ	±20	10	150	1.25+0.20/−0	R

【温度特性 BJ：B (-25~+85℃)/X5R (-55~+85℃)】厚度 0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK212ABJ105□D-T	UMK212 BJ105□D-TD	50		X5R	1 μ	±10, ±20	10	150	0.85±0.10	R
UMK212BBJ225□D-T				X5R	2.2 μ	±10, ±20	10	150	0.85±0.10	R
GMK212BBJ475□D-T		35		X5R	4.7 μ	±10, ±20	10	150	0.85±0.10	R
TMK212 BJ474□D-T		25	B	X5R	0.47 μ	±10, ±20	3.5	200	0.85±0.10	R
TMK212 BJ105□D-T			B	X5R	1 μ	±10, ±20	5	200	0.85±0.10	R
TMK212ABJ225□D-T	TMK212 BJ225□D-T			X5R	2.2 μ	±10, ±20	5	150	0.85±0.10	R
TMK212BBJ475□D-T	TMK212 BJ475□D-TD			X5R	4.7 μ	±10, ±20	10	150	0.85±0.10	R
TMK212BBJ106□D-T				X5R	10 μ	±10, ±20	10	150	0.85±0.10	R
EMK212 BJ105□D-T		16	B	X5R*1	1 μ	±10, ±20	5	200	0.85±0.10	R
EMK212ABJ225□D-T	EMK212 BJ225□D-T			X5R*1	2.2 μ	±10, ±20	5	200	0.85±0.10	R
EMK212 BJ475□D-T				X5R	4.7 μ	±10, ±20	10	150	0.85±0.10	R
EMK212ABJ106□D-T	EMK212 BJ106□D-TD			X5R	10 μ	±10, ±20	10	150	0.85±0.10	R
LMK212 BJ105□D-T		10	B	X5R*1	1 μ	±10, ±20	3.5	200	0.85±0.10	R
LMK212 BJ225□D-T				X5R*1	2.2 μ	±10, ±20	5	200	0.85±0.10	R
LMK212ABJ106□D-T	LMK212 BJ106□D-T			X5R	10 μ	±10, ±20	10	150	0.85±0.10	R
LMK212BBJ226MD-T				X5R	22 μ	±20	10	150	0.85±0.10	R
JMK212ABJ106□D-T	JMK212 BJ106□D-T	6.3		X5R	10 μ	±10, ±20	10	200	0.85±0.10	R
JMK212ABJ226MD-T	JMK212 BJ226MD-T			X5R	22 μ	±20	10	150	0.85±0.10	R
AMK212BBJ476MD-T		4		X5R	47 μ	±20	10	150	0.85±0.10	R

【温度特性 C6：X6S (-55~+105℃)】厚度 1.25mm (G)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
TMK212BC6106□G-T		25		X6S	10 μ	±10, ±20	10	150	1.25+0.20/−0	R
EMK212BC6226MG-TT		16		X6S	22 μ	±20	10	150	1.25+0.20/−0	R
LMK212BC6226MG-T		10		X6S	22 μ	±20	10	150	1.25+0.20/−0	R
JMK212BC6226MG-T		6.3		X6S	22 μ	±20	10	150	1.25+0.20/−0	R
JMK212BC6476MG-T				X6S	47 μ	±20	10	150	1.25+0.20/−0	R
AMK212BC6476MG-T		4		X6S	47 μ	±20	10	150	1.25+0.20/−0	R
AMK212BC6107MG-TE				X6S	100 μ	±20	20	150	1.25+0.20/−0	R

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另外，有关各产品的详细信息(特性图、可靠性信息、使用时的注意事项等)，请参阅敝公司网站(http://www.ty-top.com/)。

■型号一览

【温度特性 C6：X6S (-55~+105℃)】厚度 0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
LMK212AC6106□D-T		10		X6S	10 μ	±10, ±20	10	150	0.85±0.10	R
AMK212BC6226MD-T		4		X6S	22 μ	±20	10	150	0.85±0.10	R

【温度特性 B7：X7R (-55~+125℃)】厚度 1.25mm (G)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK212 B7224□G-T		50		X7R	0.22 μ	±10, ±20	3.5	150	1.25±0.10	R/W
UMK212 B7474□G-T				X7R	0.47 μ	±10, ±20	3.5	150	1.25±0.10	R/W
UMK212 B7105□G-T				X7R	1 μ	±10, ±20	10	150	1.25±0.10	R/W
UMK212BB7225□G-T				X7R	2.2 μ	±10, ±20	10	150	1.25+0.20/−0	R
GMK212 B7105□G-T		35		X7R	1 μ	±10, ±20	3.5	150	1.25±0.10	R/W
TMK212 B7225□G-TR		25		X7R	2.2 μ	±10, ±20	10	150	1.25±0.10	R
TMK212AB7475□G-T	TMK212 B7475□G-T			X7R	4.7 μ	±10, ±20	10	150	1.25+0.15/−0.05	R
EMK212 B7475□G-T		16		X7R	4.7 μ	±10, ±20	10	150	1.25±0.10	R
EMK212BB7106MG-T				X7R	10 μ	±20	10	150	1.25+0.20/−0	R
LMK212AB7106□G-T	LMK212 B7106□G-TD	10		X7R	10 μ	±10, ±20	10	150	1.25+0.15/−0.05	R
JMK212AB7106□G-T	JMK212 B7106□G-T	6.3		X7R	10 μ	±10, ±20	10	150	1.25+0.15/−0.05	R

【温度特性 B7：X7R (-55~+125℃)】厚度 0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK212AB7104□D-T		50		X7R	0.1 μ	±10, ±20	10	150	0.85±0.10	R
UMK212AB7224□D-T				X7R	0.22 μ	±10, ±20	10	150	0.85±0.10	R
UMK212AB7474□D-T				X7R	0.47 μ	±10, ±20	10	150	0.85±0.10	R
UMK212AB7105□D-T				X7R	1 μ	±10, ±20	10	150	0.85±0.10	R
TMK212AB7225□D-TR		25		X7R	2.2 μ	±10, ±20	10	150	0.85±0.10	R
EMK212 B7474□D-T		16		X7R	0.47 μ	±10, ±20	3.5	200	0.85±0.10	R/W
EMK212 B7105□D-T				X7R	1 μ	±10, ±20	5	200	0.85±0.10	R
EMK212AB7225□D-T	EMK212 B7225□D-T			X7R	2.2 μ	±10, ±20	5	150	0.85±0.10	R
LMK212 B7105□D-T		10		X7R	1 μ	±10, ±20	3.5	200	0.85±0.10	R
LMK212AB7225□D-T	LMK212 B7225□D-T			X7R	2.2 μ	±10, ±20	5	200	0.85±0.10	R
LMK212AB7475□D-TR	LMK212 B7475□D-TR			X7R	4.7 μ	±10, ±20	10	150	0.85±0.10	R

●316型

【温度特性 BJ：B (-25~+85℃)/X5R (-55~+85℃)】厚度 1.6mm (L)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK316 BJ475□L-T		50		X5R	4.7 μ	±10, ±20	10	150	1.6±0.20	R
UMK316BBJ106□L-T				X5R	10 μ	±10, ±20	10	150	1.6±0.30	R
TMK316BBJ226ML-T		25		X5R	22 μ	±20	10	150	1.6±0.30	R
EMK316BBJ476ML-T		16		X5R	47 μ	±20	10	150	1.6±0.30	R
LMK316ABJ476ML-T	LMK316 BJ476ML-T	10		X5R	47 μ	±20	10	150	1.6±0.20	R
JMK316ABJ107ML-T	JMK316 BJ107ML-T	6.3		X5R	100 μ	±20	10	150	1.6±0.20	R
AMK316ABJ107ML-T	AMK316 BJ107ML-T	4		X5R	100 μ	±20	10	150	1.6±0.20	R
AMK316BBJ157ML-T				X5R	150 μ	±20	10	150	1.6±0.30	R
PMK316BBJ227ML-T		2.5		X5R	220 μ	±20	10	150	1.6±0.30	R

【温度特性 BJ：B (-25~+85℃)/X5R (-55~+85℃)】厚度 0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK316 BJ105□D-T		50	B	X5R	1 μ	±10, ±20	3.5	150	0.85±0.10	R
UMK316 BJ225□D-T			B	X5R	2.2 μ	±10, ±20	3.5	150	0.85±0.10	R
UMK316ABJ475□D-T	UMK316 BJ475□D-T			X5R	4.7 μ	±10, ±20	10	150	0.85±0.10	R
TMK316 BJ105□D-T		25	B	X5R	1 μ	±10, ±20	3.5	200	0.85±0.10	R
TMK316 BJ225□D-T			B	X5R	2.2 μ	±10, ±20	3.5	150	0.85±0.10	R
TMK316 BJ475□D-T				X5R	4.7 μ	±10, ±20	5	150	0.85±0.10	R
TMK316ABJ106□D-T	TMK316 BJ106□D-TD			X5R	10 μ	±10, ±20	10	150	0.85±0.10	R
EMK316 BJ225□D-T		16	B	X5R	2.2 μ	±10, ±20	3.5	200	0.85±0.10	R
EMK316 BJ475□D-T			B	X5R	4.7 μ	±10, ±20	5	200	0.85±0.10	R
EMK316 BJ106□D-T				X5R	10 μ	±10, ±20	10	150	0.85±0.10	R
EMK316ABJ226MD-T	EMK316 BJ226MD-T			X5R	22 μ	±20	10	150	0.85±0.10	R
LMK316 BJ475□D-T		10	B	X5R	4.7 μ	±10, ±20	5	200	0.85±0.10	R
LMK316 BJ106□D-T				X5R	10 μ	±10, ±20	10	200	0.85±0.10	R
LMK316ABJ226MD-T	LMK316 BJ226MD-T			X5R	22 μ	±20	10	150	0.85±0.10	R
JMK316 BJ106□D-T		6.3		X5R	10 μ	±10, ±20	10	200	0.85±0.10	R
JMK316ABJ226MD-T	JMK316 BJ226MD-T			X5R	22 μ	±20	10	150	0.85±0.10	R
JMK316ABJ476MD-T	JMK316 BJ476MD-T			X5R	47 μ	±20	10	150	0.85±0.10	R

【温度特性 C6：X6S (-55~+105℃)】厚度 1.6mm (L)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
EMK316BC6226ML-T		16		X6S	22 μ	±20	10	150	1.6±0.30	R
LMK316BC6476ML-T		10		X6S	47 μ	±20	10	150	1.6±0.30	R
JMK316AC6476ML-T		6.3		X6S	47 μ	±20	10	150	1.6±0.20	R
AMK316AC6476ML-T		4		X6S	47 μ	±20	10	200	1.6±0.20	R
AMK316AC6107ML-T				X6S	100 μ	±20	10	150	1.6±0.20	R

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■型号一览

【温度特性 C7 : X7S (-55~+125℃)】厚度 1.6mm (L)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
AMK316AC7476ML-T		4		X7S	47 μ	±20	10	150	1.6±0.20	R

【温度特性 B7 : X7R (-55~+125℃)】厚度 1.6mm (L)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK316 B7225□L-T		50		X7R	2.2 μ	±10, ±20	10	150	1.6±0.20	R
UMK316AB7475□L-T	UMK316 B7475□L-T			X7R	4.7 μ	±10, ±20	10	150	1.6±0.20	R
GMK316AB7106□L-TR		35		X7R	10 μ	±10, ±20	10	150	1.6±0.20	R
TMK316AB7475□L-T	TMK316 B7475□L-T	25		X7R	4.7 μ	±10, ±20	10	200	1.6±0.20	R
TMK316AB7106□L-T	TMK316 B7106□L-TD			X7R	10 μ	±10, ±20	10	150	1.6±0.20	R
EMK316 B7475□L-T		16		X7R	4.7 μ	±10, ±20	5	200	1.6±0.20	R
EMK316AB7106□L-T	EMK316 B7106□L-TD			X7R	10 μ	±10, ±20	10	200	1.6±0.20	R
EMK316BB7226ML-T				X7R	22 μ	±20	10	150	1.6±0.30	R
LMK316AB7106□L-T	LMK316 B7106□L-TD	10		X7R	10 μ	±10, ±20	10	200	1.6±0.20	R
LMK316AB7226□L-TR	LMK316 B7226□L-TD			X7R	22 μ	±10, ±20	10	150	1.6±0.20	R

【温度特性 B7 : X7R (-55~+125℃)】厚度 0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK316 B7225□D-T		50		X7R	2.2 μ	±10, ±20	10	150	0.85±0.10	R
TMK316AB7475□D-T		25		X7R	4.7 μ	±10, ±20	10	150	0.85±0.10	R
LMK316AB7106MD-T		10		X7R	10 μ	±20	10	150	0.85±0.10	R

●325型

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK325 BJ106□M-P		50		X5R	10 μ	±10, ±20	5	150	2.5±0.20	R
GMK325 BJ226MM-P		35		X5R	22 μ	±20	5	150	2.5±0.20	R
TMK325ABJ476MM-P		25		X5R	47 μ	±20	10	150	2.5±0.30	R
EMK325ABJ107MM-P		16		X5R	100 μ	±20	10	150	2.5±0.30	R
LMK325 BJ476MM-P		10		X5R	47 μ	±20	10	150	2.5±0.20	R
LMK325ABJ107MM-P	LMK325 BJ107MM-P			X5R	100 μ	±20	10	150	2.5±0.30	R
JMK325ABJ157MM-P		6.3		X5R	150 μ	±20	10	150	2.5±0.30	R
JMK325ABJ227MM-P				X5R	220 μ	±20	10	150	2.5±0.30	R
JMK325ABJ337MM-PE				X5R	330 μ	±20	10	150	2.5±0.30	R
AMK325ABJ157MM-P		4		X5R	150 μ	±20	10	150	2.5±0.30	R
AMK325ABJ227MM-P				X5R	220 μ	±20	10	150	2.5±0.30	R
AMK325ABJ337MM-P				X5R	330 μ	±20	10	150	2.5±0.30	R

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】厚度 1.9mm (Y,N)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK325 BJ475□N-T		50		X5R	4.7 μ	±10, ±20	10	150	1.9±0.20	R
GMK325 BJ225□N-T		35	B	X5R	2.2 μ	±10, ±20	3.5	200	1.9±0.20	R
GMK325 BJ475□N-T				X5R	4.7 μ	±10, ±20	10	150	1.9±0.20	R
GMK325 BJ106□N-T				X5R	10 μ	±10, ±20	5	150	1.9±0.20	R
TMK325 BJ335MN-T		25	B	X5R*1	3.3 μ	±20	3.5	200	1.9±0.20	R
TMK325 BJ475□N-T			B	X5R*1	4.7 μ	±10, ±20	3.5	200	1.9±0.20	R
TMK325 BJ106□N-T			B	X5R	10 μ	±10, ±20	5	200	1.9±0.20	R
EMK325 BJ475□N-T		16	B	X5R*1	4.7 μ	±10, ±20	3.5	200	1.9±0.20	R
EMK325 BJ106□N-T				X5R	10 μ	±10, ±20	3.5	200	1.9±0.20	R
EMK325 BJ476MY-T				X5R	47 μ	±20	10	150	1.9+0.1/−0.2	R
LMK325 BJ226MY-T		10	B	X5R	22 μ	±20	5	150	1.9+0.1/−0.2	R
LMK325 BJ106□N-T				X5R	10 μ	±10, ±20	3.5	200	1.9±0.20	R
JMK325 BJ226MY-T		6.3	B	X5R	22 μ	±20	5	200	1.9+0.1/−0.2	R
JMK325 BJ107MY-T				X5R	100 μ	±20	10	150	1.9+0.1/−0.2	R
JMK325 BJ476MN-T				X5R	47 μ	±20	10	150	1.9±0.20	R

【温度特性 BJ : B (-25~+85℃)/X5R (-55~+85℃)】厚度0.85mm (D)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
TMK325 BJ106□D-T		25		X5R	10 μ	±10, ±20	5	150	0.85±0.10	R
EMK325 BJ106□D-T		16		X5R	10 μ	±10, ±20	5	150	0.85±0.10	R
EMK325 BJ226MD-T				X5R	22 μ	±20	10	150	0.85±0.10	R
LMK325 BJ335□D-T		10	B	X5R	3.3 μ	±10, ±20	3.5	200	0.85±0.10	R
LMK325 BJ475□D-T			B	X5R	4.7 μ	±10, ±20	5	200	0.85±0.10	R
LMK325 BJ106□D-T				X5R	10 μ	±10, ±20	5	150	0.85±0.10	R

【温度特性 C6 : X6S (-55~+105℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
EMK325AC6476MM-P		16		X6S	47 μ	±20	10	150	2.5±0.30	R
LMK325AC6107MM-P		10		X6S	100 μ	±20	10	150	2.5±0.30	R
AMK325AC6157MM-P		4		X6S	150 μ	±20	10	150	2.5±0.30	R
AMK325AC6227MM-P				X6S	220 μ	±20	10	150	2.5±0.30	R
AMK325AC6337MM-PE				X6S	330 μ	±20	10	150	2.5±0.30	R
PMK325AC6337MM-P		2.5		X6S	330 μ	±20	10	150	2.5±0.30	R

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■型号一览

【温度特性 C7 : X7S (-55~+125℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
JMK325AC7107MM-P		6.3		X7S	100 μ	±20	10	150	2.5±0.30	R

【温度特性 B7 : X7R (-55~+125℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK325 B7335□M-P		50		X7R	3.3 μ	±10, ±20	3.5	200	2.5±0.20	R
UMK325 B7475□M-P				X7R	4.7 μ	±10, ±20	5	150	2.5±0.20	R
UMK325AB7106□M-P				X7R	10 μ	±10, ±20	10	150	2.5±0.30	R
TMK325AB7106□M-P		25		X7R	10 μ	±10, ±20	10	200	2.5±0.30	R
TMK325 B7226□M-PR				X7R	22 μ	±10, ±20	10	150	2.5±0.20	R
EMK325 B7226□M-PR		16		X7R	22 μ	±10, ±20	10	150	2.5±0.20	R
LMK325 B7476□M-PR		10		X7R	47 μ	±10, ±20	10	150	2.5±0.20	R
JMK325 B7476□M-PR		6.3		X7R	47 μ	±10, ±20	10	200	2.5±0.20	R

【温度特性 B7 : X7R (-55~+125℃)】厚度 1.9mm (N)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
UMK325 B7475□N-TR		50		X7R	4.7 μ	±10, ±20	10	150	1.9±0.20	R
TMK325 B7335□N-T		25		X7R	3.3 μ	±10, ±20	3.5	200	1.9±0.20	R
TMK325 B7475□N-T				X7R	4.7 μ	±10, ±20	3.5	150	1.9±0.20	R
TMK325 B7106□N-TR				X7R	10 μ	±10, ±20	10	150	1.9±0.20	R
EMK325 B7475□N-T		16		X7R	4.7 μ	±10, ±20	3.5	200	1.9±0.20	R
EMK325 B7106□N-T				X7R	10 μ	±10, ±20	3.5	150	1.9±0.20	R
LMK325 B7106□N-T		10		X7R	10 μ	±10, ±20	3.5	200	1.9±0.20	R

●432型

【温度特性 BJ : X5R (-55~+85℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
AMK432 BJ477MM-T		4		X5R	470 μ	±20	10	150	2.5±0.20	R

【温度特性 C6 : X6S (-55~+105℃)】厚度 2.5mm (M)

型号1	型号2	额定电压 [V]	温度特性		静电容量 [F]	静电容量允许偏差 [%]	tan δ [%]	高温负载 额定电压 x %	厚度*3 [mm]	焊接方式 R: 回流焊 W: 波峰焊
PMK432 C6477MM-T		2.5		X6S	470 μ	±20	10	150	2.5±0.20	R

▶由于篇幅有限，本产品目录中只记载了有代表性的产品规格，若考虑使用敝公司产品时，请确认交货规格说明书中的详细规格。
另外，有关各产品的详细信息(特性图、可靠性信息、使用时的注意事项等)，请参阅敝公司网站(http://www.ty-top.com/)。

■PACKAGING

①Minimum Quantity

●Taped package

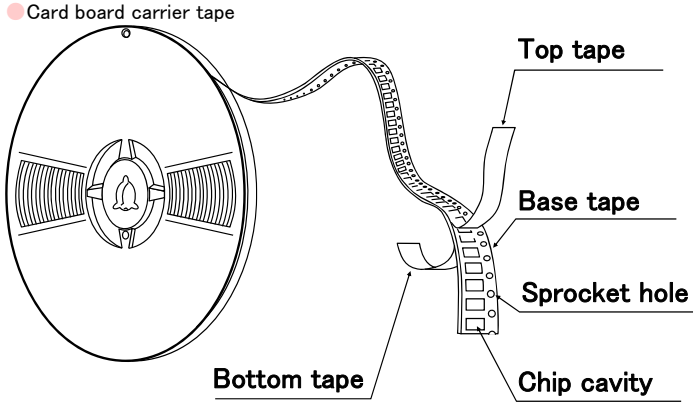
Type(EIA)	Thickness		Standard quantity [pcs]	
	mm	code	Paper tape	Embossed tape
□MK021(008004)	0.125	K	—	50000
□VS021(008004)				
□MK042(01005)	0.2	C, D	—	40000
□VS042(01005)	0.2	C		
□MK063(0201)	0.3	P,T	15000	—
□WK105(0204) ※	0.3	P	10000	—
□MK105(0402) □MF105(0402)	0.13	H	—	20000
	0.18	E	—	15000
	0.2	C	20000	—
	0.3	P	15000	—
	0.5	V	10000	—
□VK105(0402)	0.5	W	10000	—
□MK107(0603)	0.45	K	4000	—
□WK107(0306) ※	0.5	V	—	4000
□MF107(0603)	0.8	A	4000	—
□VS107(0603)	0.7	C	4000	—
□MJ107(0603)	0.8	A	3000	3000
□MK212(0805)	0.45	K	4000	—
□WK212(0508) ※	0.85	D		
□MF212(0805)	1.25	G	—	3000
□VS212(0805)	0.85	D	4000	—
□MJ212(0805)	0.85	D	4000	—
	1.25	G	—	2000
□MK316(1206)	0.85	D	4000	—
□MF316(1206)	1.15	F	—	3000
	1.6	L	—	2000
□MJ316(1206)	1.15	F	—	3000
	1.6	L	—	2000
□MK325(1210) □MF325(1210)	0.85	D	—	2000
	1.15	F		
	1.9	N		
	2.0max.	Y		
	2.5	M	—	1000
□MJ325(1210)	1.9	N	—	2000
	2.5	M	—	500(T), 1000(P)
□MK432(1812)	2.5	M	—	500

Note : ※ LW Reverse type.

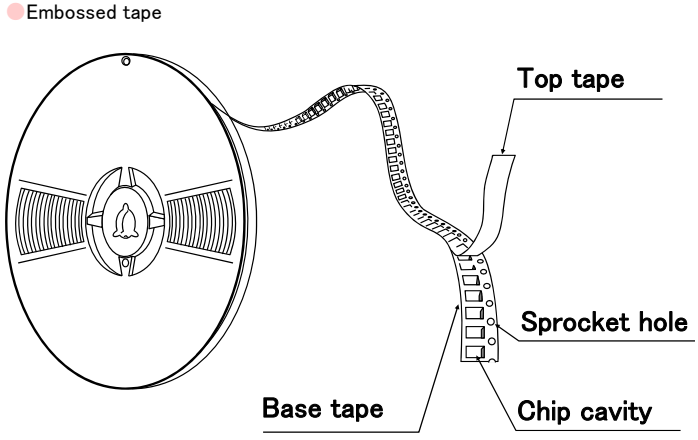
②Taping material

※No bottom tape for pressed carrier tape

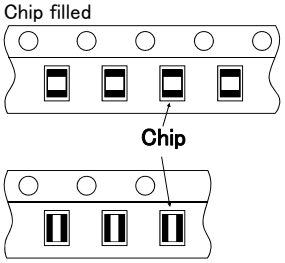
●Card board carrier tape



●Embossed tape



Chip filled



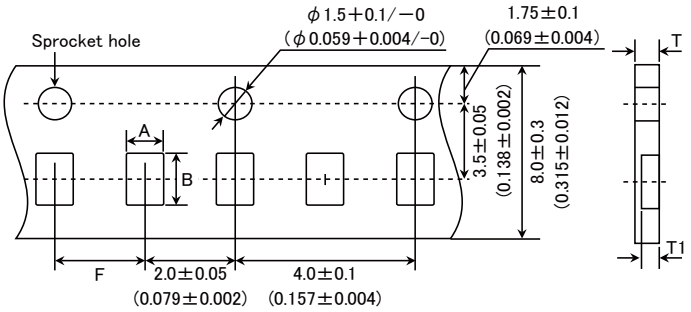
※ LW Reverse type.

③Representative taping dimensions

●Paper Tape(8mm wide)

●Pressed carrier tape(2mm pitch)

Unit:mm(inch)



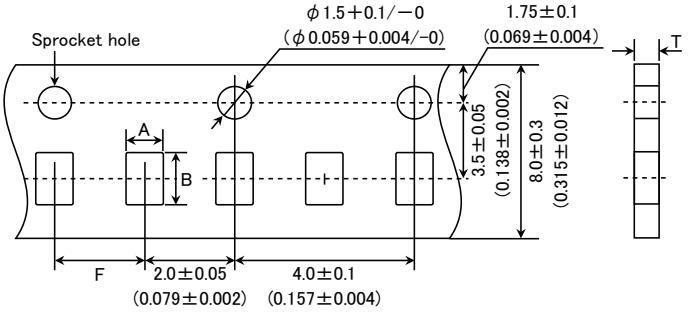
Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	T	T1
□MK063(0201)	0.37	0.67	2.0±0.05	0.45max.	0.42max.
□WK105(0204) ※	0.65	1.15			
□MK105(0402) (*1 C)				0.4max.	0.3max.
□MK105(0402) (*1 P)				0.45max.	0.42max.

Note *1 Thickness, C:0.2mm ,P:0.3mm. ※ LW Reverse type.

Unit:mm

●Punched carrier tape (2mm pitch)

Unit:mm(inch)

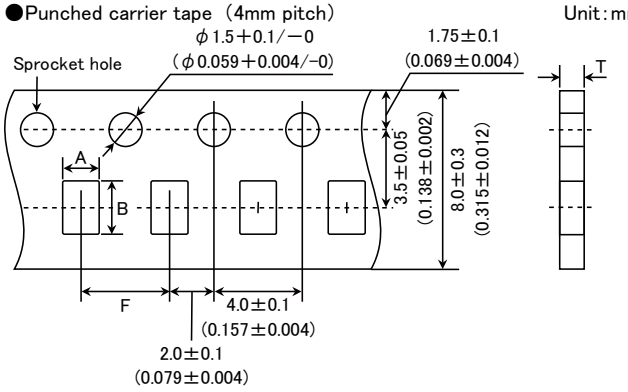


Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness
	A	B	F	T
□MK105 (0402) □MF105 (0402) □VK105 (0402)	0.65	1.15	2.0±0.05	0.8max.

Unit:mm

●Punched carrier tape (4mm pitch)

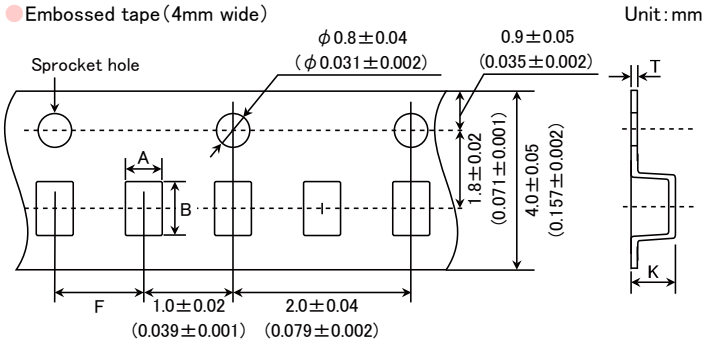
Unit:mm(inch)



Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness
	A	B	F	T
□MK107(0603) □WK107(0306) ※ □MF107(0603)	1.0	1.8	4.0±0.1	1.1max.
□MK212(0805) □WK212(0508) ※	1.65	2.4		1.1max.
□MK316(1206)	2.0	3.6		

Note : Taping size might be different depending on the size of the product. ※ LW Reverse type. Unit : mm

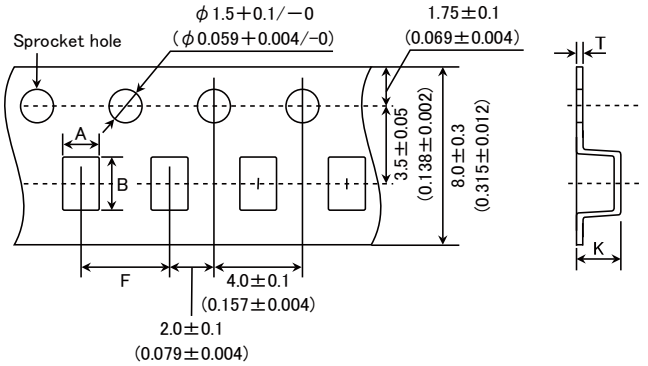
● Embossed tape (4mm wide) Unit : mm (inch)



Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
□MK021(008004)	0.135	0.27	1.0±0.02	0.5max.	0.25max.
□VS021(008004)					
□MK042(01005)	0.23	0.43			
□VS042(01005)					

Unit : mm

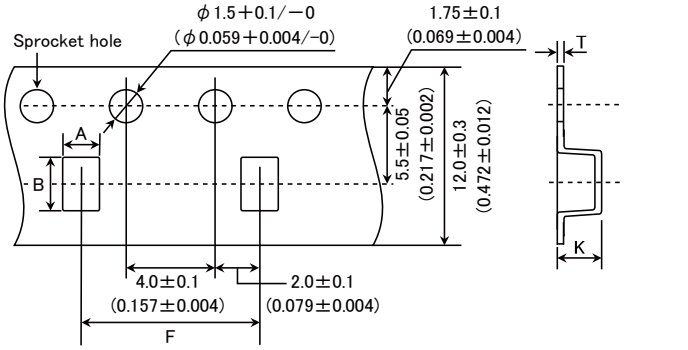
● Embossed tape (8mm wide) Unit : mm (inch)



Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
□MK105(0402)	0.6	1.1	2.0±0.1	0.6max	0.2±0.1
□WK107(0306) ※	1.0	1.8	4.0±0.1	1.3max.	0.25±0.1
□MK212(0805) □MF212(0805)	1.65	2.4		3.4max.	0.6max.
□MK316(1206) □MF316(1206)	2.0	3.6			
□MK325(1210) □MF325(1210)	2.8	3.6			

Note : ※ LW Reverse type. Unit : mm

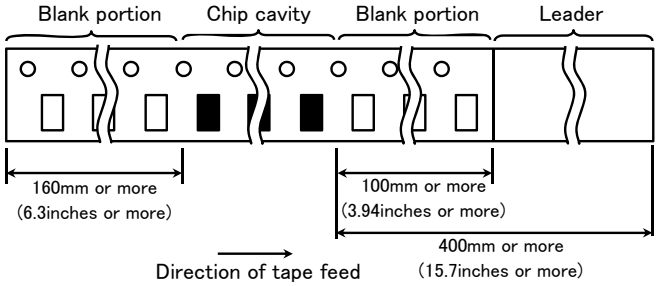
● Embossed tape (12mm wide)　　Unit : mm (inch)



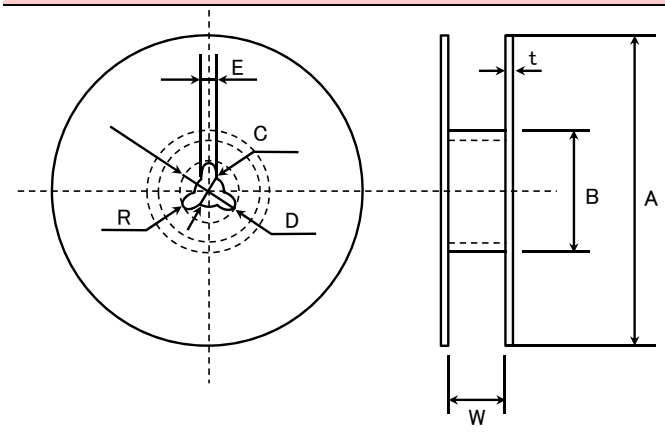
Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
□MK325(1210)	3.1	4.0	8.0±0.1	4.0max.	0.6max.
□MK432(1812)	3.7	4.9	8.0±0.1	4.0max.	0.6max.

Unit : mm

④Trailer and Leader



⑤Reel size



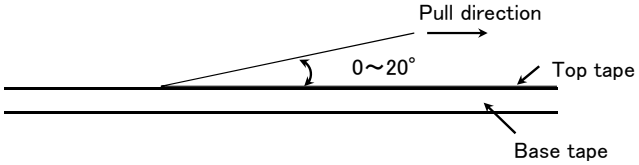
A	B	C	D	E	R
φ178±2.0	φ50min.	φ13.0±0.2	φ21.0±0.8	2.0±0.5	1.0

	T	W
4mm wide tape	1.5max.	5±1.0
8mm wide tape	2.5max.	10±1.5
12mm wide tape	2.5max.	14±1.5

Unit : mm

⑥Top Tape Strength

The top tape requires a peel-off force of 0.1 to 0.7N in the direction of the arrow as illustrated below.



Multilayer Ceramic Capacitors

■RELIABILITY DATA

1.Operating Temperature Range

Specified Value	Temperature Compensating(Class1)	Standard / High Frequency Type	−55 to +125℃
	High Permittivity (Class2)		

	Specification	Temperature Range
BJ	B	−25 to +85℃
	X5R	−55 to +85℃
B7	X7R	−55 to +125℃
C6	X6S	−55 to +105℃
C7	X7S	−55 to +125℃
LD(※)	X5R	−55 to +85℃

Note: ※LD Low distortion high value multilayer ceramic capacitor

2. Storage Conditions

Specified Value	Temperature Compensating(Class1)	Standard / High Frequency Type	−55 to +125℃
	High Permittivity (Class2)		

	Specification	Temperature Range
BJ	B	−25 to +85℃
	X5R	−55 to +85℃
B7	X7R	−55 to +125℃
C6	X6S	−55 to +105℃
C7	X7S	−55 to +125℃
LD(※)	X5R	−55 to +85℃

Note: ※LD Low distortion high value multilayer ceramic capacitor

3. Rated Voltage

Specified Value	Temperature Compensating(Class1)	Standard	50VDC, 25VDC, 16VDC
		High Frequency Type	50VDC, 25VDC, 16VDC
	High Permittivity (Class2)		50VDC, 35VDC, 25VDC, 16VDC, 10VDC, 6.3VDC, 4VDC, 2.5VDC

4. Withstanding Voltage (Between terminals)

Specified Value	Temperature Compensating(Class1)	Standard / High Frequency Type	No breakdown or damage
	High Permittivity (Class2)		

Test Methods and Remarks	Class 1	Class 2
Applied voltage	Rated voltage × 3	Rated voltage × 2.5
Duration	1 to 5 sec.	
Charge/discharge current	50mA max.	

5. Insulation Resistance

Specified Value	Temperature Compensating(Class1)	Standard / High Frequency Type	10000 MΩ min.
	High Permittivity (Class2) Note 1		C≦0.047 F : 10000 MΩ min. C＞0.047 μF : 500MΩ・μF
Test Methods and Remarks	Applied voltage : Rated voltage Duration : 60±5 sec. Charge/discharge current : 50mA max.		

6. Capacitance (Tolerance)

Specified Value

Temperature Compensating(Class1)	Standard	C□ / U□: 0.2pF≦C≦5pF : ±0.25pF; 0.2pF≦C≦10pF : ±0.5pF; C＞10pF : ±5% or ±10%
	High Frequency Type	CG: 0.2pF≦C≦2pF : ±0.1pF; C＞2pF : ±5%
High Permittivity (Class2)		±10% or ±20%

Test Methods and Remarks

	Class 1		Class 2	
	Standard	High Frequency Type	C≦10μF	C＞10μF
Preconditioning	None		Thermal treatment (at 150℃ for 1hr) Note 2	
Measuring frequency	1MHz±10%		1kHz±10%	120±10Hz
Measuring voltage Nte	0.5 to 5Vrms		1±0.2Vrms	0.5±0.1Vrms
Bias application	None			

7. Q or Dissipation Factor

Specified Value

Temperature Compensating(Class1)	Standard	C＜30pF : Q≧400+20C C≧30pF : Q≧1000 (C:Nominal capacitance)
	High Frequency Type	Refer to detailed specification
High Permittivity (Class2) Note 1		BJ, B7, C6, C7:2.5% max.

Test Methods and Remarks

	Class 1		Class 2	
	Standard	High Frequency Type	C≦10μF	C＞10μF
Preconditioning	None		Thermal treatment (at 150℃ for 1hr) Note 2	
Measuring frequency	1MHz±10%	1GHz	1kHz±10%	120±10Hz
Measuring voltage Note 1	0.5 to 5Vrms		1±0.2Vrms	0.5±0.1Vrms
Bias application	None			

High Frequency Type
Measuring equipment : HP4291A
Measuring jig : HP16192A

8. Temperature Characteristic (Without voltage application)

Specified Value

Temperature Compensating(Class1)	Standard	Temperature Characteristic [ppm/℃]: C□: 0 / U□: −750; CG / UJ, UK; Tolerance [ppm/℃]: G:±30 / J:±120 / K:±250
	High Frequency Type	Temperature Characteristic [ppm/℃]: C□: 0; CG; Tolerance [ppm/℃]: G:±30

High Permittivity (Class2)

	Specification	Capacitance change	Reference temperature	Temperature Range
BJ	B	±10%	20℃	−25 to +85℃
	X5R	±15%	25℃	−55 to +85℃
B7	X7R	±15%	25℃	−55 to +125℃
C6	XS	±22%	25℃	−55 to +105℃
C7	X7S	±22%	25℃	−55 to +125℃
LD(※)	X5R	±15%	25℃	−55 to +85℃

Note : ※LD Low distortion high value multilayer ceramic capacitor

Test Methods and Remarks

Class 1
Capacitance at 20℃ and 85℃ shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.

$$\frac{(C_{85}-C_{20})}{C_{20}\times\Delta T}\times 10^{6}(\mathrm{ppm/℃}) \qquad \Delta T=65$$

Class 2
Capacitance at each step shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.

Step	B	X5R、X7R、X6S、X7S
1	Minimum operating temperature	
2	20℃	25℃
3	Maximum operating temperature	

$$\frac{(C-C_2)}{C_2}\times 100(\%)$$

C : Capacitance in Step 1 or Step 3
C_2 : Capacitance in Step 2

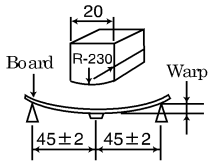
9. Deflection

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within ±5% or ±0.5 pF, whichever is larger.
		High Frequency Type	Appearance : No abnormality Capacitance change : Within±0.5 pF
	High Permittivity (Class2)		Appearance : No abnormality Capacitance change : Within ±12.5%

Test Methods and Remarks

	Multilayer Ceramic Capacitors	
	021, 042, 063, ※105 Type	The other types
Board	Glass epoxy-resin substrate	
Thickness	0.8mm	1.6mm
Warp	1mm	
Duration	10 sec.	

※105 Type thickness, C: 0.2mm ,P: 0.3mm.



(Unit: mm)

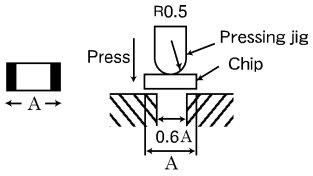
Capacitance measurement shall be conducted with the board bent

10. Body Strength

Specified Value	Temperature Compensating(Class1)	Standard	—
		High Frequency Type	No mechanical damage.
	High Permittivity (Class2)		—

Test Methods and Remarks

High Frequency 105Type
Applied force : 5N
Duraton : 10 sec.



11. Adhesive Strength of Terminal Electrodes

Specified Value	Temperature Compensating(Class1)	Standard	No terminal separation or its indication.
		High Frequency Type	
	High Permittivity (Class2)		

Test Methods and Remarks

	Multilayer Ceramic Capacitors	
	021, 042, 063 Type	105 Type or more
Applied force	2N	5N
Duration	30±5 sec.	

12. Solderability

Specified Value	Temperature Compensating(Class1)	Standard	At least 95% of terminal electrode is covered by new solder.
		High Frequency Type	
	High Permittivity (Class2)		

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.	

13. Resistance to Soldering

Specified Value

Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within ±2.5% or ±0.25pF, whichever is larger. Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
	High Frequency Type	Appearance : No abnormality Capacitance change : Within ±2.5% Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within ±7.5% Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals): No abnormality

Test Methods and Remarks

	Class 1	
	021, 042, 063 Type	105 Type
Preconditioning	None	
Preheating	150℃, 1 to 2 min.	80 to 100℃, 2 to 5 min. 150 to 200℃, 2 to 5 min.
Solder temp.	270±5℃	
Duration	3±0.5 sec.	
Recovery	6 to 24 hrs (Standard condition) Note 5	

	Class 2		
	021, 042、063 Type	105, 107, 212 Type	316, 325, 432 Type
Preconditioning	Thermal treatment (at 150℃ for 1 hr) Note 2		
Preheating	150℃, 1 to 2 min.	80 to 100℃, 2 to 5 min. 150 to 200℃, 2 to 5 min.	80 to 100℃, 5 to 10 min. 150 to 200℃, 5 to 10 min.
Solder temp.	270±5℃		
Duration	3±0.5 sec.		
Recovery	24±2 hrs (Standard condition) Note 5		

14. Temperature Cycle (Thermal Shock)

Specified Value

Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within ±2.5% or ±0.25pF, whichever is larger. Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
	High Frequency Type	Appearance : No abnormality Capacitance change : Within ±0.25pF Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within ±7.5% Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality

Test Methods and Remarks

	Class 1	Class 2
Preconditioning	None	Thermal treatment (at 150℃ for 1 hr) Note 2
1 cycle	Step 1: Minimum operating temperature, 30±3 Step 2: Normal temperature, 2 to 3 Step 3: Maximum operating temperature, 30±3 Step 4: Normal temperature, 2 to 3	
Number of cycles	5 times	
Recovery	6 to 24 hrs (Standard condition) Note 5	24±2 hrs (Standard condition) Note 5

15. Humidity (Steady State)

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within ±5% or ±0.5pF, whichever is larger. Q : C＜10pF : Q≧200＋10C 10≦C＜30pF : Q≧275＋2.5C C≧30pF:Q≧350(C:Nominal capacitance) Insulation resistance : 1000 MΩ min.
		High Frequency Type	Appearance : No abnormality Capacitance change : Within ±0.5pF, Insulation resistance : 1000 MΩ min.
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within ±12.5% Dissipation factor : 5.0% max. Insulation resistance : 50 MΩ μF or 1000 MΩ whichever is smaller.

Test Methods and Remarks

	Class 1		Class 2
	Standard	High Frequency Type	All items
Preconditioning	None		Thermal treatment(at 150℃ for 1 hr) Note 2
Temperature	40±2℃	60±2℃	40±2℃
Humidity	90 to 95%RH		90 to 95%RH
Duration	500＋24/－0 hrs		500＋24/－0 hrs
Recovery	6 to 24 hrs (Standard condition) Note 5		24±2 hrs (Standard condition) Note 5

16. Humidity Loading

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within ±7.5% or ±0.75pF, whichever is larger. Q : C＜30pF:Q≧100＋10C/3 C≧30pF:Q≧200 (C:Nominal capacitance) Insulation resistance : 500 MΩ min.
		High Frequency Type	Appearance : No abnormality Capacitance change : C≦2pF:Within ±0.4 pF C＞2pF:Within ±0.75 pF (C:Nominal capacitance) Insulation resistance : 500 MΩ min.
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within ±12.5% Dissipation factor : 5.0% max. Insulation resistance : 25 MΩ μF or 500 MΩ, whichever is smaller.

Test Methods and Remarks

	Class 1		Class 2
	Standard	High Frequency Type	All items
Preconditioning	None		Voltage treatment (Rated voltage are applied for 1 hour at 40℃) Note 3
Temperature	40±2℃	60±2℃	40±2℃
Humidity	90 to 95%RH		90 to 95%RH
Duration	500＋24/－0 hrs		500＋24/－0 hrs
Applied voltage	Rated voltage		Rated voltage
Charge/discharge current	50mA max.		50mA max.
Recovery	6 to 24 hrs (Standard condition) Note 5		24±2 hrs(Standard condition) Note 5

17. High Temperature Loading

Specified Value

Temperature Compensating(Class1)	Standard	Appearance	: No abnormality
		Capacitance change	: Within ±3% or ±0.3pF, whichever is larger.
		Q	: C＜10pF： Q≧200＋10C 10≦C＜30pF：Q≧275＋2.5C C≧30pF： Q≧350(C：Nominal capacitance)
		Insulation resistance	: 1000 MΩ min.
	High Frequency Type	Appearance	: No abnormality
		Capacitance change	: Within ±3% or ±0.3pF, whichever is larger.
		Insulation resistance	: 1000 MΩ min.
High Permittivity (Class2) Note 1		Appearance	: No abnormality
		Capacitance change	: Within ±12.5%
		Dissipation factor	: 5.0% max.
		Insulation resistance	: 50 MΩ μF or 1000 MΩ, whichever is smaller.

Test Methods and Remarks

	Class 1		Class 2		
	Standard	High Frequency Type	BJ, LD(※)	C6	B7, C7
Preconditioning	None		Voltage treatment(Twice the rated voltage shall be applied for 1 hour at 85℃, 105℃ or 125℃) Note 3, 4		
Temperature	Maximum operating temperature		Maximum operating temperature		
Duration	1000＋48/－0 hrs		1000＋48/－0 hrs		
Applied voltage	Rated voltage×2 Note 4		Rated voltage×2 Note 4		
Charge/discharge current	50mA max.		50mA max.		
Recovery	6 to 24hr (Standard condition) Note 5		24±2 hrs (Standard condition) Note 5		

Note: ※LD Low distortion high value multilayer ceramic capacitor

Note 1 The figures indicate typical specifications. Please refer to individual specifications in detail.

Note 2 Thermal treatment : Initial value shall be measured after test sample is heat-treated at 150＋0/－10℃ for an hour and kept at room temperature for 24±2hours.

Note 3 Voltage treatment : Initial value shall be measured after test sample is voltage-treated for an hour at both the temperature and voltage specified in the test conditions, and kept at room temperature for 24±2hours.

Note 4 150% of rated voltage is applicable to some items. Please refer to their specifications for further information.

Note 5 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

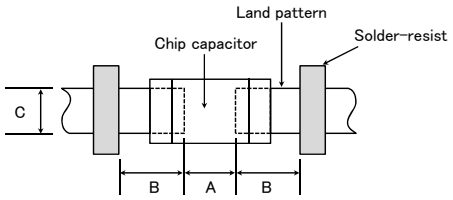
●Multilayer Ceramic Capacitors : Recommended land dimensions

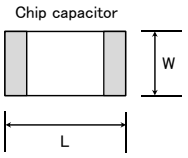
(unit: mm)

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

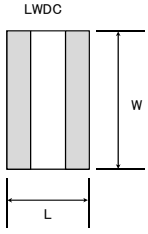
Type		021	042	063	105	107	212	316	325	432
Size	L	0.25	0.4	0.6	1.0	1.6	2.0	3.2	3.2	4.5
	W	0.125	0.2	0.3	0.5	0.8	1.25	1.6	2.5	3.2
A		0.095～0.135	0.15～0.25	0.20～0.30	0.45～0.55	0.6～0.8	0.8～1.2	1.8～2.5	1.8～2.5	2.5～3.5
B		0.085～0.125	0.10～0.20	0.20～0.30	0.40～0.50	0.6～0.8	0.8～1.2	1.0～1.5	1.0～1.5	1.5～1.8
C		0.110～0.150	0.15～0.30	0.25～0.40	0.45～0.55	0.6～0.8	0.9～1.6	1.2～2.0	1.8～3.2	2.3～3.5

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

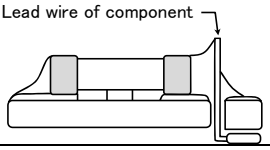
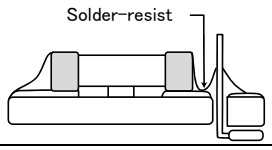
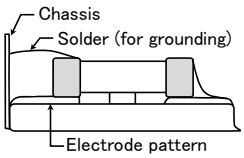
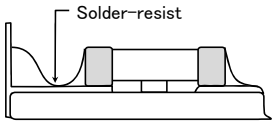
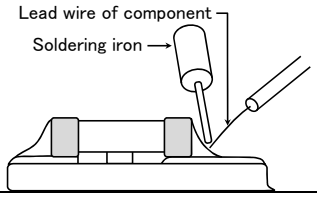
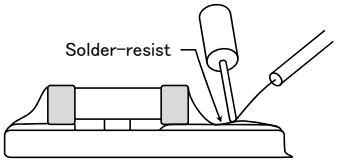
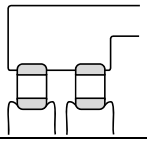
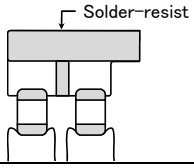
●LWDC: Recommended land dimensions for reflow-soldering

(unit: mm)

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

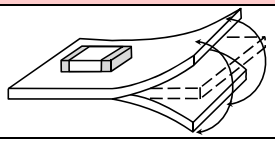
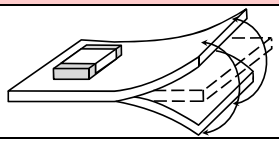


(2)Examples of good and bad solder application

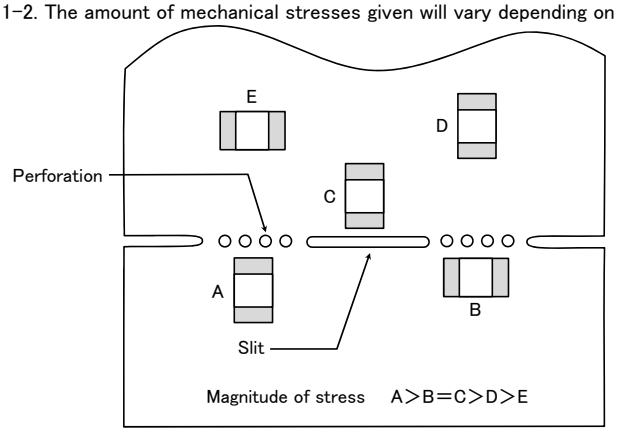
Item	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

◆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.

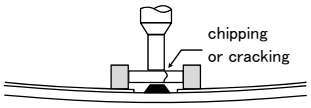
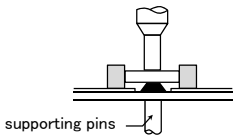
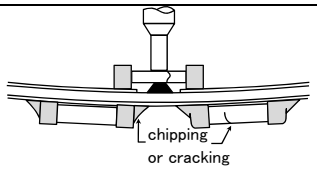
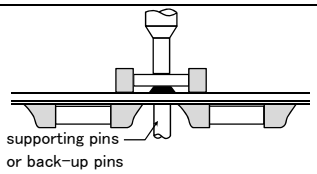
◆Selection of Adhesives

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:

Item	Improper method	Proper method
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

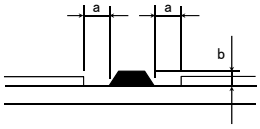
Some adhesives may cause IR deterioration. The different shrinkage percentage of between the adhesive and the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect components. Therefore, the following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

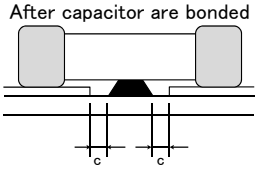
(2) The recommended amount of adhesives is as follows;
   [Recommended condition]

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 capacitor 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

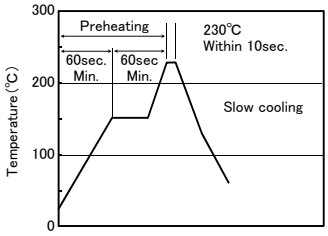
1-1. When too much halogenated substance(Chlorine, etc.) content is used to activate flux, or highly acidic flux is used, it may lead to corrosion of terminal electrodes or degradation of insulation resistance on the surfaces of the capacitors.
1-2. Flux is used to increase solderability in wave soldering. 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

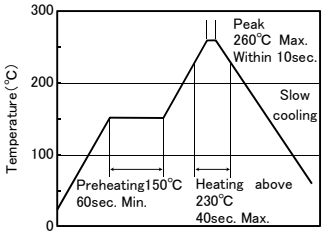
- Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling.
- Therefore, the soldering must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
- Preheating : Capacitors shall be preheated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

[Reflow soldering]

【Recommended conditions for eutectic soldering】



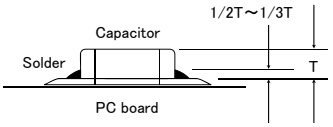
【Recommended condition for Pb-free soldering】



Caution

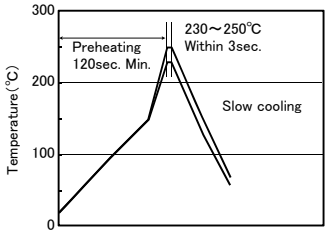
①The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of a capacitor.

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

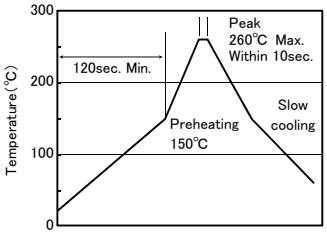


[Wave soldering]

【Recommended conditions for eutectic soldering】



【Recommended condition for Pb-free soldering】

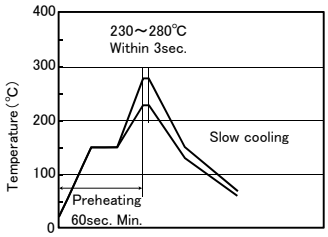


Caution

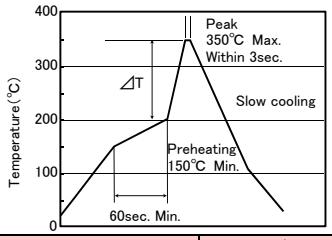
①Wave soldering must not be applied to capacitors designated as for reflow soldering only. soldering for 1 times.

[Hand soldering]

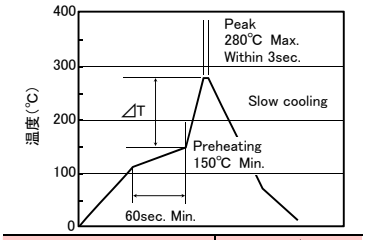
【Recommended conditions for eutectic soldering】



【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. soldering for 1 times.

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 les 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.