

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2021年1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。

车载用途使用指引

敝公司将汽车用电子设备划分为如下四个分类。而对于敝公司的每个产品，敝公司都设定了其可以被使用的分类。需在汽车用电子设备上使用敝公司的产品之前，请务必事先确认该产品是否适合使用在该用途上。如有不明之处，请与敝公司取得联系。

分 类	汽车用电子设备 (代表实例)
控制系	<ul style="list-style-type: none"> · 发动机引擎控制装置 (ECU) · 巡航定速控制装置 · 四轮转向系统 (4WS) · 变速箱 · 动力转向装置 · HEV / PHV / EV 基础控制 (电池 / 逆变器 / DC-DC) · 汽车定位器 (车辆位置情报提供装置) 等
安全系	<ul style="list-style-type: none"> · 防锁死刹车系统 (ABS) · 车身动态稳定系统 (ESC) · 安全气囊 · ADAS (直接控制走动 / 转向 / 停车的装置) 等
车身系	<ul style="list-style-type: none"> · 雨刷 · 自动门锁 · 电动车窗 · 无钥匙进入系统 (智能钥匙) · 电动后视镜 · 汽车电子后视镜 · 车内照明 · 车内空调系统 · LED 车头 / 车尾灯 · 轮胎压力监测系统 (TPMS) · 防盗装置 等
情报系	<ul style="list-style-type: none"> · 车载信息娱乐装置 (汽车导航 / 音响等) · 情报通讯装置 (ITS / T-BOX) · 汽车仪表 · ADAS (与传感、安全 / 传动系统没有关联的装置) · 行车记录仪 (车厂原装配件) 等

多层陶瓷电容器

回流焊

AEC-Q200

■ 型号标示法

J	M	K	3	1	6	△	B	J	1	0	6	M	L	H	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]
A	4
J	6.3
L	10
E	16
T	25
G	35
U	50
H	100
Q	250
S	630

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
J	树脂外部电极品
S	铜内部电极(高频用)
F	高可靠性用途
R	高可靠性用途(铜外部电极)

④ 外型尺寸

外型	L×W [mm]	EIA(inch)
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
A	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	0.85±0.10 1.25+0.15/-0.05
	316	3.2±0.20	1.6±0.20	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
B	107	1.6+0.20/-0	0.8+0.20/-0	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
	107	1.6+0.25/-0	0.8+0.25/-0	0.8+0.25/-0
	212	2.0+0.25/-0	1.25+0.25/-0	1.25+0.25/-0
K	212	2.0±0.15	1.25±0.15	0.85±0.15
	316	3.2±0.20	1.6±0.20	1.15±0.20 1.6±0.20
	325	3.2±0.50	2.5±0.30	2.5±0.30

注: 参照标准产品尺寸

△=空格

⑥ 温度特性

■ 高介电常数

代码	适用标准	温度范围 [°C]	基准温度 [°C]	静电容量变化率	静电容量允许偏差	允许偏差代码
BJ	EIA	X5R	-55~+85	25	±15%	±10%
						±20%
C6	EIA	X6S	-55~+105	25	±22%	±10%
						±20%
B7	EIA	X7R	-55~+125	25	±15%	±10%
						±20%
C7	EIA	X7S	-55~+125	25	±22%	±10%
						±20%
D7	EIA	X7T	-55~+125	25	+22%/-33%	±10%
						±20%

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■温度补偿用

代码	适用标准		温度范围 [°C]	基准温度 [°C]	静电容量变化率	静电容量允许偏差	允许偏差代码
CG	JIS	CG	-55~+125	20	0±30ppm/°C	±0.1pF	B
						±0.25pF	C
						±0.5pF	D
						±1pF	F
						±2%	G
CH	JIS	CH	-55~+125	20	0±60ppm/°C	±0.1pF	B
						±0.25pF	C
						±0.5pF	D
						±1pF	F
						±5%	J
CJ	JIS	CJ	-55~+125	20	0±120ppm/°C	±0.25pF	C
CK	JIS	CK	-55~+125	20	0±250ppm/°C	±0.25pF	C

⑦静电容量

代码号 (例)	静电容量
0R5	0.5pF
010	1pF
100	10pF
101	100pF
102	1,000pF
103	0.01 μF
104	0.1 μF
105	1 μF
106	10 μF
107	100 μF

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
G	±2%
J	±5%
K	±10%
M	±20%

⑨产品厚度

代码	产品厚度 [mm]
P	0.3
T	
V	0.5
C	0.7(107型以上)
A	0.8
D	0.85(212型以上)
F	1.15
G	1.25
L	1.6
N	1.9
M	2.5

⑩个别规格

代码	个别规格
-	标准
H	车载用品
8	电信基础设施 / 工业设备、医疗设备用途

⑪包装

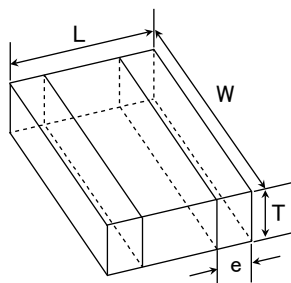
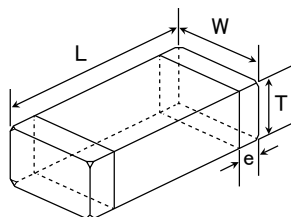
代码	包装仕様
F	φ178mm 卷盘带装 (2mm 间距)
R	φ178mm 压模带装 (4mm 间距)
T	φ178mm 卷盘带装 (4mm 间距)
P	φ178mm 卷盘带装 (4mm 间距, 1000 个/卷盘) 325 规格 (厚度代码 M)

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] (inch)				
	L	W	T	*1	e
□MK063 (0201)	0.6±0.03 (0.024±0.001)	0.3±0.03 (0.012±0.001)	0.3±0.03 (0.012±0.001)	T	0.15±0.05 (0.006±0.002)
□MK105 (0402)	1.0±0.05 (0.039±0.002)	0.5±0.05 (0.020±0.002)	0.5±0.05 (0.020±0.002)	V	0.25±0.10 (0.010±0.004)
□WK105 (0204)※	0.52±0.05 (0.020±0.002)	1.0±0.05 (0.039±0.002)	0.3±0.05 (0.012±0.002)	P	0.18±0.08 (0.007±0.003)
□MK107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.8±0.10 (0.031±0.004)	A	0.35±0.25 (0.014±0.010)
□MF107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.8±0.10 (0.031±0.004)	A	0.35+0.3/-0.25 (0.014+0.012/-0.010)
□VS107 (0603)	1.6±0.10 (0.063±0.004)	0.8±0.10 (0.031±0.004)	0.7±0.10 (0.028±0.004)	C	0.35±0.25 (0.014±0.010)
□WK107 (0306)※	0.8±0.10 (0.031±0.004)	1.6±0.10 (0.063±0.004)	0.5±0.05 (0.020±0.002)	V	0.25±0.15 (0.010±0.006)
□MK212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.85±0.10 (0.033±0.004)	D	0.5±0.25 (0.020±0.010)
□MF212 (0805)			1.25±0.10 (0.049±0.004)		
□MJ212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.85±0.10 (0.033±0.004)	D	0.5+0.35/-0.25 (0.020+0.014/-0.010)
			1.25±0.10 (0.049±0.004)		
□VS212 (0805)	2.0±0.10 (0.079±0.004)	1.25±0.10 (0.049±0.004)	0.85±0.10 (0.033±0.004)	D	0.5±0.25 (0.020±0.010)
□WK212 (0508)※	1.25±0.15 (0.049±0.006)	2.0±0.15 (0.079±0.006)	0.85±0.10 (0.033±0.004)	D	0.3±0.2 (0.012±0.008)
□MK316 (1206)	3.2±0.15 (0.126±0.006)	1.6±0.15 (0.063±0.006)	1.15±0.10 (0.045±0.004)	F	0.5+0.35/-0.25 (0.020+0.014/-0.010)
□MF316 (1206)			1.6±0.20 (0.063±0.008)		
□MJ316 (1206)	3.2±0.15 (0.126±0.006)	1.6±0.15 (0.063±0.006)	1.15±0.10 (0.045±0.004)	F	0.6+0.4/-0.3 (0.024+0.016/-0.012)
			1.6±0.20 (0.063±0.008)		
□MK325 (1210)	3.2±0.30 (0.126±0.012)	2.5±0.20 (0.098±0.008)	1.15±0.10 (0.045±0.004)	F	0.6±0.3 (0.024±0.012)
□MF325 (1210)			1.9±0.20 (0.075±0.008)		
			2.5±0.20 (0.098±0.008)		
□MJ325 (1210)	3.2±0.30 (0.126±0.012)	2.5±0.20 (0.098±0.008)	1.9±0.20 (0.075±0.008)	N	0.6+0.4/-0.3 (0.024+0.016/-0.012)
			2.5±0.20 (0.098±0.008)		
□MK432 (1812)	4.5±0.40 (0.177±0.016)	3.2±0.30 (0.126±0.012)	2.5±0.20 (0.098±0.008)	M	0.9±0.6 (0.035±0.024)

注: ※LW 逆转型、*1 产品厚度代码

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■ 标准包装

规格	EIA (inch)	产品厚度		标准数量 [pcs]	
		[mm]	代码	纸带	压模带
063	0201	0.3	T	15000	—
105	0402	0.5	V	10000	—
	0204 ※	0.3	P		
107	0603	0.7	C	4000	—
		0.8	A		
		0.8	A	3000 (树脂外部电极品)	—
		0.8	A	—	3000 (树脂外部电极品)
	0306 ※	0.5	V	—	4000
212	0805	0.85	D	4000	—
		1.25	G	—	3000
		1.25	G	—	2000 (树脂外部电极品)
	0508 ※	0.85	D	4000	—
316	1206	1.15	F	—	3000
		1.6	L	—	2000
325	1210	1.15	F	—	2000
		1.9	N		
		2.5	M	—	500(T), 1000(P)
432	1812	2.5	M	—	500

注: ※LW 逆转型 (□WK)

• 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。
 • 产品目录中的多层陶瓷电容器全部属于回流焊对应品。

注)
 • 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。
 • 车载(车身系 / 情报系)用途 (AEC-Q200 Qualified) 的产品。有关更多的内容，请务必于“车载用途使用指引”中确认。
 < AEC-Q200 : AEC-Q200 qualified >
 车载 (车身系/情报系) 用途的多层陶瓷电容器，已就其代表性产品实施了对应AEC-Q200标准的评价测试。
 125°C products: AEC-Q200 Grade1 (已在Grade1的测试条件下评价完毕。)
 105°C products: AEC-Q200 Grade2 (已在Grade2的测试条件下评价完毕。)
 85°C products: AEC-Q200 Grade3 (已在Grade3的测试条件下评价完毕。)
 关于本产品的详细规格和评估测试结果等信息，请咨询正规销售渠道。
 此外，订购时请索取产品规格书，就其内容进行确认并批准之。
 * *1: 关于寸规格，请参照型号标示法的④外型尺寸④、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)

● 063规格

【温度特性 B7R : X7R (- 55 ~ + 125°C)】 厚度0.3mm (T)

型号1	型号2	额定电压 [V]	温度特性	静电容量 [F]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
TMK063 B7101□PHFE		25	X7R	100 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7151□PHFE				150 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7221□PHFE				220 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7331□PHFE				330 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7471□PHFE				470 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7102□PHFE				1000 p	±10, ±20	3.5	200	0.3±0.03	
TMK063 B7152□PHFE				1500 p	±10, ±20	5	200	0.3±0.03	
TMK063 B7222□PHFE				2200 p	±10, ±20	5	200	0.3±0.03	
TMK063 B7332□PHFE				3300 p	±10, ±20	5	200	0.3±0.03	
EMK063 B7101□PHFE				16	X7R	100 p	±10, ±20	3.5	200
EMK063 B7151□PHFE		150 p	±10, ±20			3.5	200	0.3±0.03	
EMK063 B7221□PHFE		220 p	±10, ±20			3.5	200	0.3±0.03	
EMK063 B7331□PHFE		330 p	±10, ±20			3.5	200	0.3±0.03	
EMK063 B7471□PHFE		470 p	±10, ±20			3.5	200	0.3±0.03	
EMK063 B7102□PHFE		1000 p	±10, ±20			3.5	200	0.3±0.03	
EMK063 B7152□PHFE		1500 p	±10, ±20			5	200	0.3±0.03	
EMK063 B7222□PHFE		2200 p	±10, ±20			5	200	0.3±0.03	
EMK063 B7332□PHFE		3300 p	±10, ±20			5	200	0.3±0.03	
LMK063 B7101□PHFE		10	X7R			100 p	±10, ±20	3.5	200
LMK063 B7151□PHFE				150 p	±10, ±20	3.5	200	0.3±0.03	
LMK063 B7221□PHFE				220 p	±10, ±20	3.5	200	0.3±0.03	
LMK063 B7331□PHFE				330 p	±10, ±20	3.5	200	0.3±0.03	
LMK063 B7471□PHFE				470 p	±10, ±20	3.5	200	0.3±0.03	
LMK063 B7102□PHFE				1000 p	±10, ±20	3.5	200	0.3±0.03	
LMK063 B7152□PHFE				1500 p	±10, ±20	5	200	0.3±0.03	
LMK063 B7222□PHFE				2200 p	±10, ±20	5	200	0.3±0.03	
LMK063 B7332□PHFE				3300 p	±10, ±20	5	200	0.3±0.03	
LMK063 B7472□PHFE				4700 p	±10, ±20	5	200	0.3±0.03	
LMK063 B7682□PHFE		6800 p	±10, ±20	5	200	0.3±0.03			
LMK063 B7103□PHFE			X7R	0.01 μ	±10, ±20	5	200	0.3±0.03	

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●105规格

【温度特性 BJ : X5R (-55 ~ +85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释	
							额定电压 × %			
UMK105 BJ471[VHF]		50	X5R	470 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ102[VHF]			X5R	1000 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ152[VHF]			X5R	1500 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ222[VHF]			X5R	2200 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ332[VHF]			X5R	3300 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ472[VHF]			X5R	4700 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 BJ682[VHF]			X5R	6800 p	±10, ±20	2.5	150	0.5±0.05		
UMK105 BJ103[VHF]			X5R	0.01 μ	±10, ±20	3.5	200	0.5±0.05		
UMK105 BJ223[VHF]			X5R	0.022 μ	±10, ±20	5	200	0.5±0.05		
UMK105 BJ473[VHF]			X5R	0.047 μ	±10, ±20	5	200	0.5±0.05		
UMK105 BJ104[VHF]			X5R	0.1 μ	±10, ±20	10	150	0.5±0.05		
TMK105 BJ472[VHF]			25	X5R	4700 p	±10, ±20	2.5	200	0.5±0.05	
TMK105 BJ682[VHF]				X5R	6800 p	±10, ±20	2.5	200	0.5±0.05	
TMK105 BJ103[VHF]				X5R	0.01 μ	±10, ±20	3.5	200	0.5±0.05	
TMK105 BJ153[VHF]				X5R	0.015 μ	±10, ±20	3.5	200	0.5±0.05	
TMK105 BJ223[VHF]				X5R	0.022 μ	±10, ±20	3.5	200	0.5±0.05	
TMK105 BJ333[VHF]		X5R		0.033 μ	±10, ±20	3.5	150	0.5±0.05		
TMK105 BJ473[VHF]		X5R		0.047 μ	±10, ±20	3.5	150	0.5±0.05		
TMK105 BJ104[VHF]		X5R		0.1 μ	±10, ±20	5	150	0.5±0.05		
TMK105 BJ224[VHF]		X5R		0.22 μ	±10, ±20	10	150	0.5±0.05		
TMK105ABJ474[VHF]		X5R		0.47 μ	±10, ±20	10	150	0.5±0.10		
EMK105 BJ103[VHF]		16	X5R	0.01 μ	±10, ±20	3.5	200	0.5±0.05		
EMK105 BJ153[VHF]			X5R	0.015 μ	±10, ±20	3.5	200	0.5±0.05		
EMK105 BJ223[VHF]			X5R	0.022 μ	±10, ±20	3.5	200	0.5±0.05		
EMK105 BJ333[VHF]			X5R	0.033 μ	±10, ±20	3.5	150	0.5±0.05		
EMK105 BJ473[VHF]			X5R	0.047 μ	±10, ±20	3.5	150	0.5±0.05		
EMK105 BJ104[VHF]			X5R	0.1 μ	±10, ±20	5	150	0.5±0.05		
EMK105 BJ224[VHF]			X5R	0.22 μ	±10, ±20	10	150	0.5±0.05		
EMK105ABJ474[VHF]			X5R	0.47 μ	±10, ±20	10	150	0.5±0.10		
EMK105 BJ105[VHF]			X5R	1 μ	±10, ±20	10	150	0.5±0.05		
LMK105 BJ333[VHF]			10	X5R	0.033 μ	±10, ±20	3.5	150	0.5±0.05	
LMK105 BJ473[VHF]		X5R		0.047 μ	±10, ±20	3.5	150	0.5±0.05		
LMK105 BJ104[VHF]		X5R		0.1 μ	±10, ±20	5	150	0.5±0.05		
LMK105 BJ224[VHF]		X5R		0.22 μ	±10, ±20	5	150	0.5±0.05		
LMK105ABJ474[VHF]		X5R		0.47 μ	±10, ±20	10	150	0.5±0.10		
LMK105 BJ105[VHF]		X5R		1 μ	±10, ±20	10	150	0.5±0.05		
LMK105ABJ225[VHF]		X5R		2.2 μ	±10, ±20	10	150	0.5±0.10		
JMK105 BJ104[VHF]		6.3		X5R	0.1 μ	±10, ±20	5	150	0.5±0.05	
JMK105 BJ224[VHF]				X5R	0.22 μ	±10, ±20	5	150	0.5±0.05	
JMK105 BJ474[VHF]				X5R	0.47 μ	±10, ±20	10	150	0.5±0.05	
JMK105 BJ105[VHF]			X5R	1 μ	±10, ±20	10	150	0.5±0.05		
JMK105 BJ225[VHF]			X5R	2.2 μ	±10, ±20	10	150	0.5±0.05		
JMK105BBJ475MVHF			X5R	4.7 μ	±20	10	150	0.5+0.15/-0.05		
AMK105 BJ225[VHF]		4	X5R	2.2 μ	±10, ±20	10	150	0.5±0.05		
AMK105BBJ475MVHF			X5R	4.7 μ	±20	10	150	0.5+0.15/-0.05		

陶瓷电容器

AUTO

车载用
多层陶瓷电容器(高介电常数)

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■ 型号一览

【温度特性 B7 : X7R (- 55 ~ + 125°C) , D7 : X7T (- 55 ~ + 125°C) 】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ⁻¹ [mm]	注释	
							额定电压 x %			
UMK105 B7221□VHF		50	X7R	220 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7331□VHF			X7R	330 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7471□VHF			X7R	470 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7681□VHF			X7R	680 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7102□VHF			X7R	1000 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7152□VHF			X7R	1500 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7222□VHF			X7R	2200 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7332□VHF			X7R	3300 p	±10, ±20	2.5	200	0.5±0.05		
UMK105 B7472□VHF			X7R	4700 p	±10, ±20	2.5	150	0.5±0.05		
UMK105 B7682□VHF			X7R	6800 p	±10, ±20	2.5	150	0.5±0.05		
UMK105 B7103□VHF			X7R	0.01 μ	±10, ±20	3.5	150	0.5±0.05		
UMK105 B7153□VHFE			X7R	0.015 μ	±10, ±20	3.5	200	0.5±0.05		
UMK105 B7223□VHF			X7R	0.022 μ	±10, ±20	10	200	0.5±0.05		
UMK105 B7333□VHFE			X7R	0.033 μ	±10, ±20	3.5	150	0.5±0.05		
UMK105 B7473□VHF			X7R	0.047 μ	±10, ±20	10	200	0.5±0.05		
UMK105 B7104□VHF			X7R	0.1 μ	±10, ±20	10	150	0.5±0.05		
TMK105 B7472□VHF			25	X7R	4700 p	±10, ±20	2.5	200	0.5±0.05	
TMK105 B7682□VHF				X7R	6800 p	±10, ±20	2.5	200	0.5±0.05	
TMK105 B7103□VHF				X7R	0.01 μ	±10, ±20	3.5	200	0.5±0.05	
TMK105 B7153□VHF				X7R	0.015 μ	±10, ±20	3.5	150	0.5±0.05	
TMK105 B7223□VHF		X7R		0.022 μ	±10, ±20	3.5	150	0.5±0.05		
TMK105 B7333□VHF		X7R		0.033 μ	±10, ±20	3.5	150	0.5±0.05		
TMK105 B7473□VHF		X7R		0.047 μ	±10, ±20	3.5	150	0.5±0.05		
TMK105 B7104□VHF		X7R		0.1 μ	±10, ±20	10	150	0.5±0.05		
EMK105 B7103□VHF		16		X7R	0.01 μ	±10, ±20	3.5	200	0.5±0.05	
EMK105 B7153□VHF				X7R	0.015 μ	±10, ±20	3.5	150	0.5±0.05	
EMK105 B7223□VHF			X7R	0.022 μ	±10, ±20	3.5	150	0.5±0.05		
EMK105 B7333□VHF			X7R	0.033 μ	±10, ±20	3.5	150	0.5±0.05		
EMK105 B7473□VHF			X7R	0.047 μ	±10, ±20	3.5	150	0.5±0.05		
EMK105 B7104□VHF			X7R	0.1 μ	±10, ±20	5	150	0.5±0.05		
EMK105 B7224□VHF			X7R	0.22 μ	±10, ±20	10	150	0.5±0.05		
LMK105 B7473□VHF			X7R	0.047 μ	±10, ±20	3.5	150	0.5±0.05		
LMK105 B7104□VHF		10	X7R	0.1 μ	±10, ±20	5	150	0.5±0.05		
LMK105 B7224□VHF			X7R	0.22 μ	±10, ±20	10	150	0.5±0.05		
JMK105 B7104□VHF		6.3	X7R	0.1 μ	±10, ±20	5	150	0.5±0.05		
JMK105 B7224□VHF			X7R	0.22 μ	±10, ±20	10	150	0.5±0.05		
JMK105 B7474□VHF			X7R	0.47 μ	±10, ±20	10	150	0.5±0.05		
JMK105CD7105□VHF			X7T	1 μ	±10, ±20	10	150	0.5+0.20/-0		
AMK105 B7474□VHF		4	X7R	0.47 μ	±10, ±20	10	150	0.5±0.05		

陶瓷电容器

AUTO

车载用
多层陶瓷电容器 (高介电常数)

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●107规格

【温度特性 BJ : X5R (- 55 ~ + 85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK107 BJ104□AHT		50	X5R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
UMK107 BJ224□AHT			X5R	0.22 μ	±10, ±20	10	150	0.8±0.10	
UMK107 BJ474□AHT			X5R	0.47 μ	±10, ±20	10	150	0.8±0.10	
UMK107ABJ105□AHT			X5R	1 μ	±10, ±20	10	150	0.8+0.15/-0.05	
GMK107 BJ223□AHT			X5R	0.022 μ	±10, ±20	2.5	200	0.8±0.10	
GMK107 BJ473□AHT		35	X5R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
GMK107 BJ104□AHT			X5R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
GMK107 BJ224□AHT			X5R	0.22 μ	±10, ±20	10	150	0.8±0.10	
GMK107ABJ474□AHT			X5R	0.47 μ	±10, ±20	10	150	0.8+0.15/-0.05	
GMK107 BJ105□AHT			X5R	1 μ	±10, ±20	10	150	0.8±0.10	
TMK107 BJ223□AHT		25	X5R	0.022 μ	±10, ±20	2.5	200	0.8±0.10	
TMK107 BJ473□AHT			X5R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
TMK107 BJ104□AHT			X5R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
TMK107 BJ224□AHT			X5R	0.22 μ	±10, ±20	5	150	0.8±0.10	
TMK107 BJ474□AHT			X5R	0.47 μ	±10, ±20	3.5	150	0.8±0.10	
TMK107 BJ105□AHT		16	X5R	1 μ	±10, ±20	10	150	0.8±0.10	
TMK107BBJ225□AHT			X5R	2.2 μ	±10, ±20	10	150	0.8+0.20/-0	
EMK107 BJ104□AHT			X5R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
EMK107 BJ224□AHT			X5R	0.22 μ	±10, ±20	5	150	0.8±0.10	
EMK107 BJ474□AHT			X5R	0.47 μ	±10, ±20	3.5	150	0.8±0.10	
EMK107 BJ105□AHT		10	X5R	1 μ	±10, ±20	5	150	0.8±0.10	
EMK107ABJ225□AHT			X5R	2.2 μ	±10, ±20	10	150	0.8+0.15/-0.05	
EMK107BBJ475□AHT			X5R	4.7 μ	±10, ±20	10	150	0.8+0.20/-0	
LMK107 BJ474□AHT			X5R	0.47 μ	±10, ±20	3.5	150	0.8±0.10	
LMK107 BJ105□AHT			X5R	1 μ	±10, ±20	5	150	0.8±0.10	
LMK107 BJ225□AHT		6.3	X5R	2.2 μ	±10, ±20	10	150	0.8±0.10	
LMK107 BJ475□AHT			X5R	4.7 μ	±10, ±20	10	150	0.8±0.10	
LMK107BBJ106MAHT			X5R	10 μ	±20	10	150	0.8+0.20/-0	
JMK107 BJ105□AHT			X5R	1 μ	±10, ±20	5	150	0.8±0.10	
JMK107 BJ225□AHT			X5R	2.2 μ	±10, ±20	10	150	0.8±0.10	
JMK107 BJ475□AHT		4	X5R	4.7 μ	±10, ±20	10	150	0.8±0.10	
JMK107ABJ106□AHT			X5R	10 μ	±10, ±20	10	150	0.8+0.15/-0.05	
AMK107ABJ106□AHT			X5R	10 μ	±10, ±20	10	150	0.8+0.15/-0.05	
AMK107BBJ226MAHT		X5R	22 μ	±20	10	150	0.8+0.20/-0		

【温度特性 B7 : X7R (- 55 ~ + 125°C) , C7 : X7S (- 55 ~ + 125°C) , D7 : X7T (- 55 ~ + 125°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK107 B7102□AHT		50	X7R	1000 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7152□AHT			X7R	1500 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7222□AHT			X7R	2200 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7332□AHT			X7R	3300 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7472□AHT			X7R	4700 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7682□AHT			X7R	6800 p	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7103□AHT			X7R	0.01 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7153□AHT			X7R	0.015 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7223□AHT			X7R	0.022 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7333□AHT			X7R	0.033 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7473□AHT			X7R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107 B7683□AHT			X7R	0.068 μ	±10, ±20	3.5	150	0.8±0.10	
UMK107 B7104□AHT			X7R	0.1 μ	±10, ±20	3.5	200	0.8±0.10	
UMK107AC7154□AHT			X7S	0.15 μ	±10, ±20	3.5	150	0.8+0.15/-0.05	
UMK107 C7224□AHT			X7S	0.22 μ	±10, ±20	3.5	150	0.8±0.10	
GMK107 B7473□AHT		35	X7R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
GMK107 B7104□AHT			X7R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
GMK107 B7224□AHT			X7R	0.22 μ	±10, ±20	10	150	0.8±0.10	
GMK107 B7474□AHT			X7R	0.47 μ	±10, ±20	10	150	0.8±0.10	
GMK107AB7105□AHT			X7R	1 μ	±10, ±20	10	150	0.8+0.15/-0.05	
TMK107 B7223□AHT		25	X7R	0.022 μ	±10, ±20	2.5	200	0.8±0.10	
TMK107 B7473□AHT			X7R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
TMK107 B7104□AHT			X7R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
TMK107 B7224□AHT			X7R	0.22 μ	±10, ±20	10	150	0.8±0.10	
TMK107 B7474□AHT			X7R	0.47 μ	±10, ±20	10	150	0.8±0.10	
TMK107AB7105□AHT		16	X7R	1 μ	±10, ±20	10	150	0.8+0.15/-0.05	
EMK107 B7473□AHT			X7R	0.047 μ	±10, ±20	3.5	200	0.8±0.10	
EMK107 B7104□AHT			X7R	0.1 μ	±10, ±20	3.5	150	0.8±0.10	
EMK107 B7224□AHT			X7R	0.22 μ	±10, ±20	5	150	0.8±0.10	
EMK107 B7474□AHT			X7R	0.47 μ	±10, ±20	10	150	0.8±0.10	
EMK107 B7105□AHT		10	X7R	1 μ	±10, ±20	10	150	0.8±0.10	
LMK107 B7224□AHT			X7R	0.22 μ	±10, ±20	5	150	0.8±0.10	
LMK107 B7474□AHT			X7R	0.47 μ	±10, ±20	3.5	150	0.8±0.10	
LMK107 B7105□AHT			X7R	1 μ	±10, ±20	10	150	0.8±0.10	
LMK107BD7225□AHT			X7T	2.2 μ	±10, ±20	10	200	0.8+0.20/-0	
JMK107 B7105□AHT		6.3	X7R	1 μ	±10, ±20	10	150	0.8±0.10	
JMK107 B7225□AHT			X7R	2.2 μ	±10, ±20	10	150	0.8±0.10	

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陶瓷电容器

AUTO

车载用
多层陶瓷电容器(高介电常数)

● 212规格

【温度特性 BJ : X5R (- 55 ~ + 85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ⁻¹ [mm]	注释
							额定电压 x %		
UMK212 BJ104□GHT		50	X5R	0.1 μ	±10, ±20	3.5	200	1.25±0.10	
UMK212 BJ224□GHT			X5R	0.22 μ	±10, ±20	3.5	200	1.25±0.10	
UMK212 BJ474□GHT			X5R	0.47 μ	±10, ±20	3.5	150	1.25±0.10	
UMK212 BJ105□GHT		35	X5R	1 μ	±10, ±20	5	150	1.25±0.10	
GMK212 BJ104□GHT			X5R	0.1 μ	±10, ±20	3.5	200	1.25±0.10	
GMK212 BJ224□GHT			X5R	0.22 μ	±10, ±20	3.5	150	1.25±0.10	
GMK212 BJ474□GHT		25	X5R	0.47 μ	±10, ±20	3.5	150	1.25±0.10	
GMK212 BJ105□GHT			X5R	1 μ	±10, ±20	5	150	1.25±0.10	
GMK212BBJ225□GHT			X5R	2.2 μ	±10, ±20	10	150	1.25+0.20/-0	
TMK212 BJ104□GHT		16	X5R	0.1 μ	±10, ±20	3.5	200	1.25±0.10	
TMK212 BJ224□GHT			X5R	0.22 μ	±10, ±20	3.5	150	1.25±0.10	
TMK212 BJ474□GHT			X5R	0.47 μ	±10, ±20	3.5	200	1.25±0.10	
TMK212 BJ105□GHT		10	X5R	1 μ	±10, ±20	3.5	150	1.25±0.10	
TMK212 BJ225□GHT			X5R	2.2 μ	±10, ±20	5	150	1.25±0.10	
TMK212BBJ475□GHT			X5R	4.7 μ	±10, ±20	10	150	1.25+0.20/-0	
TMK212BBJ106□GHT		6.3	X5R	10 μ	±10, ±20	10	150	1.25+0.20/-0	
EMK212 BJ105□GHT			X5R	1 μ	±10, ±20	3.5	150	1.25±0.10	
EMK212 BJ225□GHT			X5R	2.2 μ	±10, ±20	5	150	1.25±0.10	
EMK212ABJ475□GHT		4	X5R	4.7 μ	±10, ±20	10	150	1.25+0.15/-0.05	
EMK212BBJ106□GHT			X5R	10 μ	±10, ±20	10	150	1.25+0.20/-0	
LMK212 BJ225□GHT			X5R	2.2 μ	±10, ±20	5	200	1.25±0.10	
LMK212ABJ475□GHT		10	X5R	4.7 μ	±10, ±20	10	150	1.25+0.15/-0.05	
LMK212ABJ106□GHT			X5R	10 μ	±10, ±20	10	150	1.25+0.15/-0.05	
JMK212ABJ475□GHT			X5R	4.7 μ	±10, ±20	5	200	1.25+0.15/-0.05	
JMK212ABJ106□GHT		6.3	X5R	10 μ	±10, ±20	10	150	1.25+0.15/-0.05	
JMK212BBJ226MGHT			X5R	22 μ	±20	10	150	1.25+0.20/-0	
AMK212ABJ226MGHT			X5R	22 μ	±20	10	150	1.25+0.15/-0.05	
AMK212BBJ476MGHT		4	X5R	47 μ	±20	10	150	1.25+0.20/-0	

【温度特性 BJ : X5R (- 55 ~ + 85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ⁻¹ [mm]	注释
							额定电压 x %		
EMK212 BJ105□DHT		16	X5R	1 μ	±10, ±20	5	200	0.85±0.10	
EMK212ABJ225□DHT			X5R	2.2 μ	±10, ±20	5	150	0.85±0.10	
EMK212BBJ475□DHT			X5R	4.7 μ	±10, ±20	10	150	0.85±0.10	

【温度特性 B7 : X7R (- 55 ~ + 125°C) , C7 : X7S (- 55 ~ + 125°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ⁻¹ [mm]	注释	
							额定电压 x %			
UMK212 B7103□GHT		50	X7R	0.01 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212 B7153□GHT			X7R	0.015 μ	±10, ±20	2.5	200	1.25±0.10		
UMK212 B7223□GHT			X7R	0.022 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212 B7333□GHT			X7R	0.033 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212 B7473□GHT			X7R	0.047 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212 B7683□GHT			X7R	0.068 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212 B7104□GHT			X7R	0.1 μ	±10, ±20	3.5	200	1.25±0.10		
UMK212BB7154□GHTE			X7R	0.15 μ	±10, ±20	3.5	200	1.25+0.2/-0		
UMK212 B7224□GHT			X7R	0.22 μ	±10, ±20	3.5	150	1.25±0.10		
UMK212BC7334□GHTE			X7S	0.33 μ	±10, ±20	3.5	150	1.25+0.2/-0		
UMK212 C7474□GHTE			X7S	0.47 μ	±10, ±20	3.5	150	1.25±0.10		
UMK212CC7684□GHTE			X7S	0.68 μ	±10, ±20	3.5	150	1.25+0.25/-0		
UMK212 B7105□GHT			35	X7R	1 μ	±10, ±20	10	150	1.25±0.10	
GMK212 B7224□GHT				X7R	0.22 μ	±10, ±20	3.5	150	1.25±0.10	
GMK212 B7105□GHT				X7R	1 μ	±10, ±20	10	150	1.25±0.10	
TMK212 B7224□GHT		25	X7R	0.22 μ	±10, ±20	3.5	150	1.25±0.10		
TMK212 B7334□GHT			X7R	0.33 μ	±10, ±20	3.5	200	1.25±0.10		
TMK212 B7474□GHT			X7R	0.47 μ	±10, ±20	3.5	150	1.25±0.10		
TMK212 B7105□GHTR		16	X7R	1 μ	±10, ±20	10	150	1.25±0.10		
TMK212 B7225□GHT			X7R	2.2 μ	±10, ±20	10	150	1.25±0.10		
EMK212 B7224□GHT			X7R	0.22 μ	±10, ±20	3.5	200	1.25±0.10		
EMK212 B7334□GHT		10	X7R	0.33 μ	±10, ±20	3.5	200	1.25±0.10		
EMK212 B7474□GHT			X7R	0.47 μ	±10, ±20	3.5	200	1.25±0.10		
EMK212 B7105□GHTR			X7R	1 μ	±10, ±20	10	150	1.25±0.10		
EMK212 B7225□GHT		6.3	X7R	2.2 μ	±10, ±20	10	150	1.25±0.10		
EMK212AB7475□GHT			X7R	4.7 μ	±10, ±20	10	150	1.25+0.15/-0.05		
LMK212 B7105□GHTR			X7R	1 μ	±10, ±20	10	150	1.25±0.10		
LMK212 B7225□GHT		10	X7R	2.2 μ	±10, ±20	10	150	1.25±0.10		
LMK212 B7475□GHT			X7R	4.7 μ	±10, ±20	10	150	1.25±0.10		
JMK212 B7475□GHT			X7R	4.7 μ	±10, ±20	10	150	1.25±0.10		
JMK212AB7106□GHT		6.3	X7R	10 μ	±10, ±20	10	150	1.25+0.15/-0.05		

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●316规格

【温度特性 BJ : X5R (-55 ~ +85°C)】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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK316 BJ474□LHT		50	X5R	0.47 μ	±10, ±20	3.5	200	1.6±0.20	
UMK316 BJ105□LHT			X5R	1 μ	±10, ±20	3.5	200	1.6±0.20	
UMK316 BJ225□LHT			X5R	2.2 μ	±10, ±20	10	150	1.6±0.20	
UMK316 ABJ475□LHT			X5R	4.7 μ	±10, ±20	10	150	1.6±0.20	
GMK316 BJ105□LHT			X5R	1 μ	±10, ±20	3.5	200	1.6±0.20	
GMK316 BJ225□LHT		35	X5R	2.2 μ	±10, ±20	10	150	1.6±0.20	
GMK316 BJ475□LHT			X5R	4.7 μ	±10, ±20	10	150	1.6±0.20	
GMK316 BBJ106□LHT			X5R	10 μ	±10, ±20	10	150	1.6±0.30	
TMK316 BJ225□LHT			X5R	2.2 μ	±10, ±20	3.5	200	1.6±0.20	
TMK316 BJ475□LHT			X5R	4.7 μ	±10, ±20	5	150	1.6±0.20	
TMK316 BJ106□LHT		25	X5R	10 μ	±10, ±20	5	150	1.6±0.20	
EMK316 BJ225□LHT			X5R	2.2 μ	±10, ±20	3.5	200	1.6±0.20	
EMK316 BJ475□LHT			X5R	4.7 μ	±10, ±20	5	150	1.6±0.20	
EMK316 BJ106□LHT			X5R	10 μ	±10, ±20	5	150	1.6±0.20	
EMK316 BBJ226MLHT			X5R	22 μ	±20	10	150	1.6±0.30	
LMK316 BJ475□LHT		10	X5R	4.7 μ	±10, ±20	5	150	1.6±0.20	
LMK316 BJ106□LHT			X5R	10 μ	±10, ±20	5	150	1.6±0.20	
LMK316 ABJ226□LHT			X5R	22 μ	±10, ±20	10	150	1.6±0.20	
JMK316 BJ106□LHT			X5R	10 μ	±10, ±20	5	200	1.6±0.20	
JMK316 ABJ226□LHT			6.3	X5R	22 μ	±10, ±20	10	150	1.6±0.20
JMK316 ABJ476MLHT		X5R		47 μ	±20	10	150	1.6±0.20	

【温度特性 B7 : X7R (-55 ~ +125°C) , C7 : X7S (-55 ~ +125°C)】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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释	
							额定电压 x %			
UMK316 B7473□LHT		50	X7R	0.047 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7683□LHT			X7R	0.068 μ	±10, ±20	2.5	200	1.6±0.20		
UMK316 B7104□LHT			X7R	0.1 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7154□LHT			X7R	0.15 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7224□LHT			X7R	0.22 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7334□LHT			X7R	0.33 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7474□LHT			X7R	0.47 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 B7105□LHT			X7R	1 μ	±10, ±20	3.5	200	1.6±0.20		
UMK316 BC7155□LHTE			X7S	1.5 μ	±10, ±20	3.5	150	1.6±0.30		
UMK316 B7225□LHT			X7R	2.2 μ	±10, ±20	10	150	1.6±0.20		
UMK316 AC7475□LHTE			X7S	4.7 μ	±10, ±20	2.5	150	1.6±0.20		
GMK316 B7105□LHT			35	X7R	1 μ	±10, ±20	3.5	200	1.6±0.20	
GMK316 B7225□LHT				X7R	2.2 μ	±10, ±20	10	150	1.6±0.20	
GMK316 AB7475□LHT				X7R	4.7 μ	±10, ±20	10	150	1.6±0.20	
TMK316 B7105□LHT			25	X7R	1 μ	±10, ±20	3.5	200	1.6±0.20	
TMK316 B7225□LHT		X7R		2.2 μ	±10, ±20	3.5	200	1.6±0.20		
TMK316 AB7475□LHT		X7R		4.7 μ	±10, ±20	10	150	1.6±0.20		
TMK316 AB7106□LHT		16	X7R	10 μ	±10, ±20	10	150	1.6±0.20		
EMK316 B7225□LHT			X7R	2.2 μ	±10, ±20	3.5	200	1.6±0.20		
EMK316 AB7475□LHT			X7R	4.7 μ	±10, ±20	10	150	1.6±0.20		
EMK316 AB7106□LHT		10	X7R	10 μ	±10, ±20	10	150	1.6±0.20		
LMK316 B7475□LHT			X7R	4.7 μ	±10, ±20	5	150	1.6±0.20		
LMK316 AB7106□LHT			X7R	10 μ	±10, ±20	10	150	1.6±0.20		
JMK316 AB7106□LHT		6.3	X7R	10 μ	±10, ±20	10	150	1.6±0.20		
JMK316 AB7226□LHT			X7R	22 μ	±10, ±20	10	150	1.6±0.20		
AMK316 AB7226□LHT		4	X7R	22 μ	±10, ±20	10	150	1.6±0.20		
AMK316 AC7476MLHT			X7S	47 μ	±20	10	150	1.6±0.20		

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● 325规格

【温度特性 BJ : X5R (- 55 ~ + 85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK325 BJ106□MHP		50	X5R	10 μ	±10, ±20	5	150	2.5±0.20	
GMK325 BJ106□MHP		35	X5R	10 μ	±10, ±20	5	150	2.5±0.20	
TMK325 BJ106□MHP		25	X5R	10 μ	±10, ±20	5	150	2.5±0.20	
EMK325 BJ226□MHP		16	X5R	22 μ	±10, ±20	5	150	2.5±0.20	
EMK325ABJ476□MHP			X5R	47 μ	±10, ±20	10	150	2.5±0.30	
LMK325 BJ226□MHP		10	X5R	22 μ	±10, ±20	5	150	2.5±0.20	
LMK325 BJ476□MHP			X5R	47 μ	±10, ±20	10	150	2.5±0.20	
JMK325 BJ476□MHP		6.3	X5R	47 μ	±10, ±20	10	150	2.5±0.20	

【温度特性 BJ : X5R (- 55 ~ + 85°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK325 BJ475□NHT		50	X5R	4.7 μ	±10, ±20	10	150	1.9±0.20	
GMK325 BJ225MNHT		35	X5R	2.2 μ	±20	3.5	200	1.9±0.20	
GMK325 BJ475□NHT			X5R	4.7 μ	±10, ±20	10	150	1.9±0.20	
TMK325 BJ475□NHT		25	X5R	4.7 μ	±10, ±20	10	150	1.9±0.20	
EMK325 BJ475MNHT		16	X5R	4.7 μ	±20	3.5	200	1.9±0.20	
EMK325 BJ106□NHT			X5R	10 μ	±10, ±20	5	150	1.9±0.20	

【温度特性 B7 : X7R (- 55 ~ + 125°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK325 B7225□MHP		50	X7R	2.2 μ	±10, ±20	3.5	200	2.5±0.20	
UMK325 B7335□MHP			X7R	3.3 μ	±10, ±20	3.5	200	2.5±0.20	
UMK325 B7475□MHP			X7R	4.7 μ	±10, ±20	5	150	2.5±0.20	
UMK325AB7106□MHP			X7R	10 μ	±10, ±20	10	150	2.5±0.30	
GMK325AB7106□MHP		35	X7R	10 μ	±10, ±20	10	150	2.5±0.30	
TMK325 B7335□MHP		25	X7R	3.3 μ	±10, ±20	3.5	200	2.5±0.20	
TMK325AB7106□MHP			X7R	10 μ	±10, ±20	10	150	2.5±0.30	
TMK325 B7226□MHP			X7R	22 μ	±10, ±20	10	150	2.5±0.20	
EMK325 B7226□MHP			16	X7R	22 μ	±10, ±20	10	150	2.5±0.20
LMK325 B7226□MHP		10	X7R	22 μ	±10, ±20	10	150	2.5±0.20	
JMK325 B7226□MHP		6.3	X7R	22 μ	±10, ±20	10	150	2.5±0.20	
JMK325 B7476□MHP			X7R	47 μ	±10, ±20	10	150	2.5±0.20	

【温度特性 B7 : X7R (- 55 ~ + 125°C)】 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]	静电容量允许误差 [%]	tanδ [%]	高温负载	厚度 ¹ [mm]	注释
							额定电压 x %		
UMK325 B7105□NHT		50	X7R	1 μ	±10, ±20	3.5	200	1.9±0.20	
GMK325 B7225□NHT		35	X7R	2.2 μ	±10, ±20	3.5	200	1.9±0.20	
GMK325 B7475□NHTR			X7R	4.7 μ	±10, ±20	10	150	1.9±0.20	
TMK325 B7475□NHT		25	X7R	4.7 μ	±10, ±20	10	150	1.9±0.20	
EMK325 B7475□NHT		16	X7R	4.7 μ	±10, ±20	3.5	150	1.9±0.20	
EMK325 B7106□NHTR			X7R	10 μ	±10, ±20	10	150	1.9±0.20	

▶ 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/>)。

Multilayer Ceramic Capacitors

PACKAGING

① Minimum Quantity

● Taped package

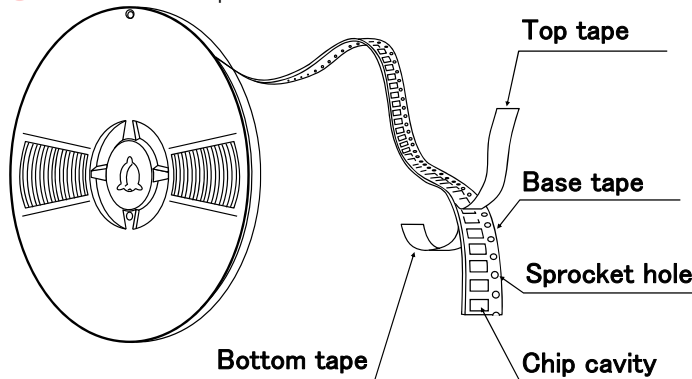
Type(EIA)	Thickness		Standard quantity [pcs]	
	mm	code	Paper tape	Embossed tape
<input type="checkbox"/> MK021(008004)	0.125	K	—	50000
<input type="checkbox"/> VS021(008004)				
<input type="checkbox"/> MK042(01005)	0.2	C, D	—	40000
<input type="checkbox"/> VS042(01005)				
<input type="checkbox"/> MK063(0201)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

Note : ※ LW Reverse type.

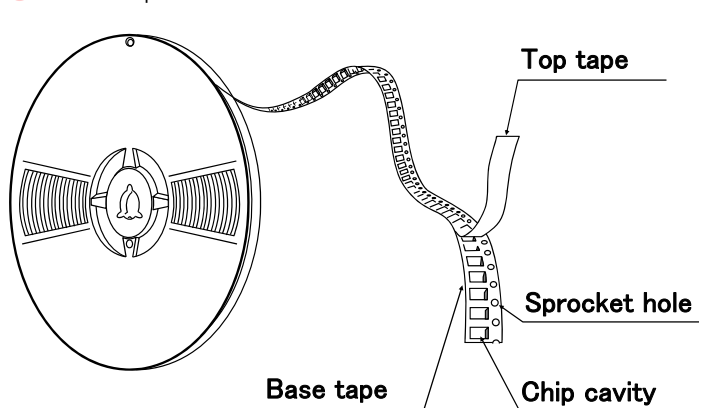
② Taping material

※No bottom tape for pressed carrier tape

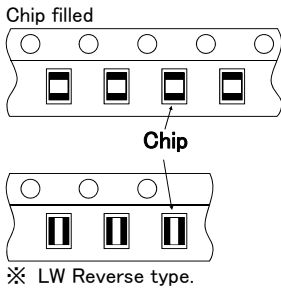
● Card board carrier tape



● Embossed tape



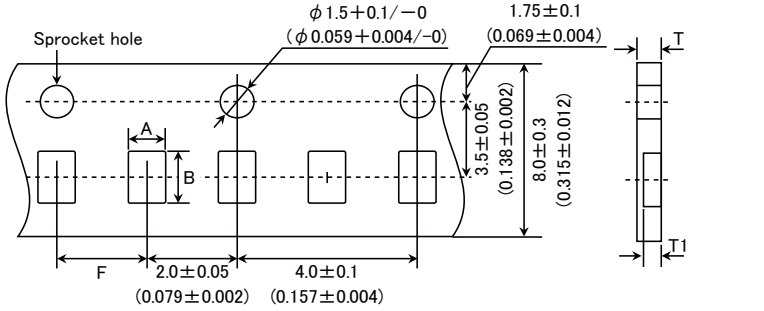
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③ Representative taping dimensions

● Paper Tape (8mm wide)

● Pressed carrier tape (2mm pitch)

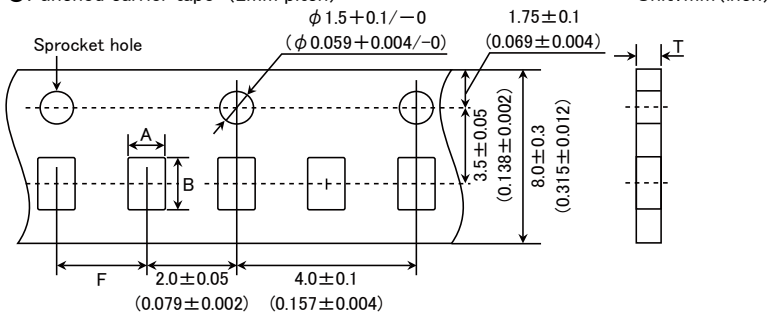


Type(EIA)	Chip Cavity		Insertion Pitch F	Tape Thickness	
	A	B		T	T1
□MK063(0201)	0.37	0.67	2.0±0.05	0.45max.	0.42max.
□WK105(0204) ※	0.65	1.15		0.4max.	0.3max.
□MK105(0402) (*1 C)				0.45max.	0.42max.
□MK105(0402) (*1 P)					

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

Unit: mm

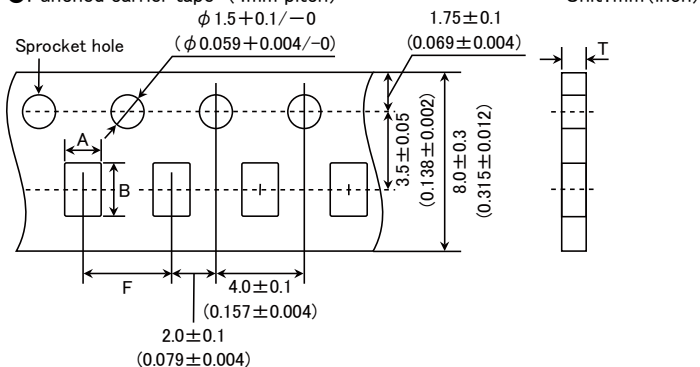
● Punched carrier tape (2mm pitch)



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

Unit: mm

● Punched carrier tape (4mm pitch)

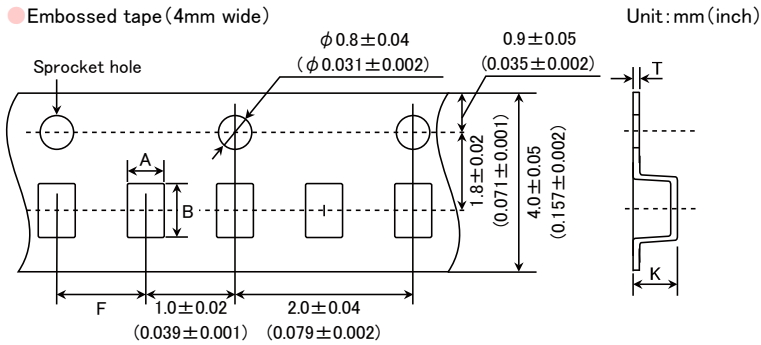


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Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness
	A	B	F	T
□MK107(0603) □WK107(0306) ※ □MF107(0603)	1.0	1.8	4.0±0.1	1.1max.
□MK212(0805) □WK212(0508) ※ □MK316(1206)	1.65	2.4		1.1max.
	2.0	3.6		

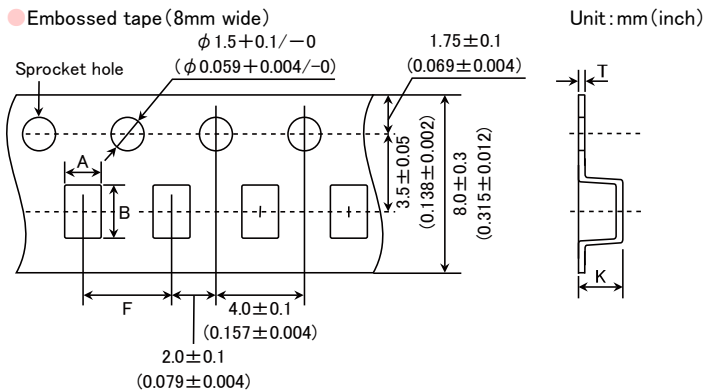
Note: Taping size might be different depending on the size of the product. ※ LW Reverse type.

Unit: mm



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

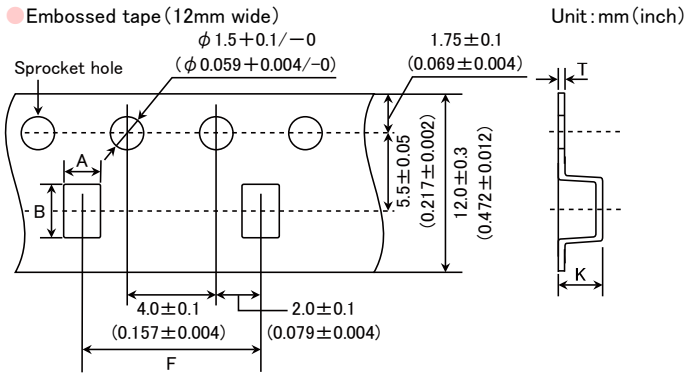
Unit: mm



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) ※ □MK212(0805) □MF212(0805)	1.0	1.8	4.0±0.1	1.3max.	0.25±0.1
□MK316(1206) □MF316(1206)	2.0	3.6		3.4max.	0.6max.
□MK325(1210) □MF325(1210)	2.8	3.6			

Note: ※ LW Reverse type.

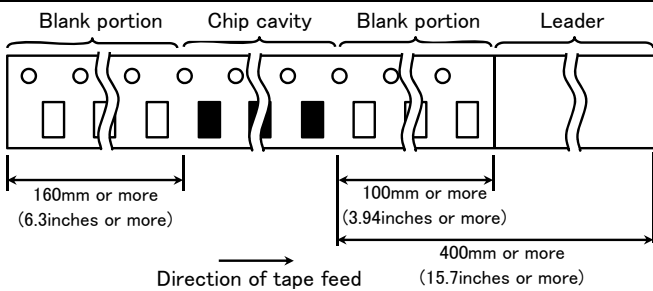
Unit: mm



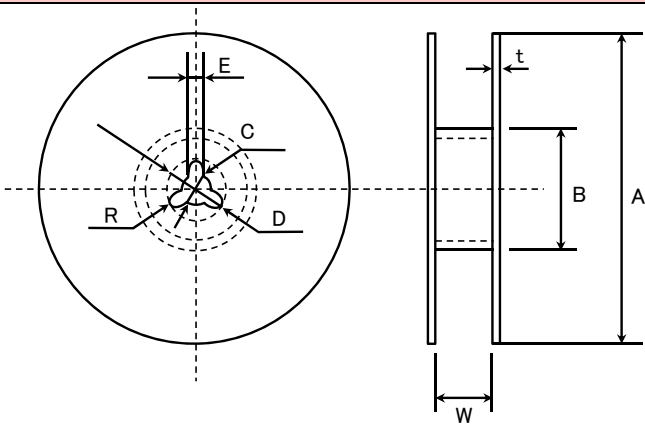
Type(EIA)	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
□MK325(1210)	3.1	4.0	8.0 ± 0.1	4.0max.	0.6max.
□MK432(1812)	3.7	4.9	8.0 ± 0.1	4.0max.	0.6max.

Unit: mm

④Trailer and Leader



⑤Reel size

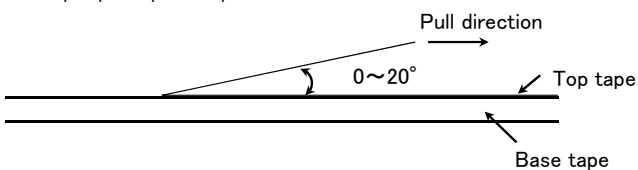


A	B	C	D	E	R
$\phi 178\pm 2.0$	$\phi 50$ min.	$\phi 13.0\pm 0.2$	$\phi 21.0\pm 0.8$	2.0 ± 0.5	1.0
	T	W			
4mm wide tape	1.5max.	5 ± 1.0			
8mm wide tape	2.5max.	10 ± 1.5			
12mm wide tape	2.5max.	14 ± 1.5			

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	-55 to +125°C	
		High Frequency Type		
Specified Value	High Permittivity (Class2)		Specification	Temperature Range
		BJ	B	-25 to +85°C
			X5R	-55 to +85°C
		B7	X7R	-55 to +125°C
		C6	X6S	-55 to +105°C
		C7	X7S	-55 to +125°C
		D7	X7T	-55 to +125°C
		LD(※)	X5R	-55 to +85°C
Note: ※LD Low distortion high value multilayer ceramic capacitor				

2. Storage Conditions

Specified Value	Temperature Compensating(Class1)	Standard	-55 to +125°C	
		High Frequency Type		
Specified Value	High Permittivity (Class2)		Specification	Temperature Range
		BJ	B	-25 to +85°C
			X5R	-55 to +85°C
		B7	X7R	-55 to +125°C
		C6	X6S	-55 to +105°C
		C7	X7S	-55 to +125°C
		D7	X7T	-55 to +125°C
		LD(※)	X5R	-55 to +85°C
Note: ※LD Low distortion high value multilayer ceramic capacitor				

3. Rated Voltage

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

4. Withstanding Voltage (Between terminals)

Specified Value	Temperature Compensating(Class1)	Standard	No breakdown or damage
		High Frequency Type	
Test Methods and Remarks	High Permittivity (Class2)		
		Class 1	Class 2
	Applied voltage	Rated volta × 3	Rated voltage × 2.5
	Duration	1 to 5 sec.	
	Charge/discharge current	50mA max.	

5. Insulation Resistance

Specified Value	Temperature Compensating(Class1)	Standard	10000 MΩ min.
		High Frequency Type	
	High Permittivity (Class2) Note 1		C ≤ 0.047 μF : 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.	

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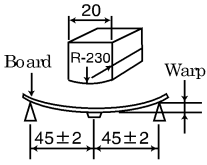
6. Capacitance (Tolerance)				
Specified Value	Temperature Compensating(Class1)	Standard	C□	0.2pF ≤ C ≤ 5pF : ±0.25pF
			U□	0.2pF ≤ C ≤ 10pF : ±0.5pF
	SL	C > 10pF : ±5% or ±10%		
High Permittivity (Class2)	High Frequency Type	CH	0.3pF ≤ C ≤ 2pF : ±0.1pF	C > 2pF : ±5%
	BJ, B7, C6, C7, D7, LD(※) : ±10% or ±20% Note: ※LD Low distortion high value multilayer ceramic capacitor			

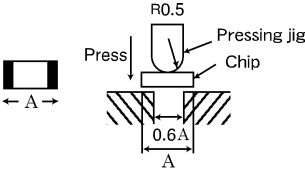
7. Q or Dissipation Factor						
Specified Value	Temperature Compensating(Class1)	Standard	C < 30pF : Q ≥ 400 + 20C C ≥ 30pF : Q ≥ 1000 (C : Nominal capacitance)			
			High Frequency Type	Refer to detailed specification		
	High Permittivity (Class2)	Note 1	BJ, B7, C6, C7, D7: 2.5% max.			
Test Methods and Remarks			Class 1		Class 2	
			Standard	High Frequency Type	C ≤ 10 μF	C > 10 μF
	Preconditioning		None		Thermal treatment (at 150°C for 1hr) Note 2	
	Measuring frequency		1MHz ± 10%	1GHz	1kHz ± 10%	120 ± 10Hz
	Measuring voltage Note		0.5 to 5Vrms		1 ± 0.2Vrms	0.5 ± 0.1rms
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]		Tolerance [ppm/°C]	
			C□ : 0	CG, CH, C, J, CK	G : ±30	H : ±60
	U□ : -750	UJ, UK	J : ±120	K : ±250		
High Permittivity (Class2)	High Frequency Type	CH	Temperature Characteristic [ppm/°C]		Tolerance [ppm/°C]	
			C□ : 0	CH	H : ±60	
			Specification	Capacitance change	Reference temperature	Temperature Range
		BJ	B	±10%	20°C	-25 to +85°C
			X5R	±15%	25°C	-55 to +85°C
		B7	X7R	±15%	25°C	-55 to +125°C
		C6	X6S	±22%	25°C	-55 to +105°C
		C7	X7S	±22%	25°C	-55 to +125°C
		D7	X7S	+22/-33%	25°C	-55 to +125°C
		LD(※)	X5R	±15%	25°C	-55 to +85°C
Note : ※LD Low distortion high value multilayer ceramic capacitor						

Test Methods and Remarks	Class 1 : Capacitance at 20°C and 85°C shall be measured in thermal equilibrium, and the temperature characteristic shall be calculated from the following equation.					
	$\frac{(C_{85} - C_{20})}{C_{20} \times \Delta T} \times 10^6 (\text{ppm}/^\circ\text{C}) \quad \Delta T = 65$					
	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, X7T		
	1	Minimum operating temperature				
2	20°C		25°C			
3	Maximum operating temperature					
$\frac{(C - C_2)}{C_2} \times 100 (\%)$						
C : Capacitance in Step 1 or Step 3						
C2 : Capacitance in Step 2						

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9. Deflection																				
Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 5\%$ or ± 0.5 pF, whichever is larger.																	
		High Frequency Type	Appearance : No abnormality Capaitance change : Within ± 0.5 pF																	
	High Permittivity (Class2)		Appearance : No abnormality Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Note: ※LD Low distortion high value multilayer ceramic capacitor																	
Test Methods and Remarks	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Multilayer Ceramic Capacitors</th> </tr> <tr> <th>042, 063, ※1105 Type</th> <th>The other types</th> </tr> </thead> <tbody> <tr> <td>Board</td> <td colspan="2">Glass epoxy-resin substrate</td> </tr> <tr> <td>Thickness</td> <td>0.8mm</td> <td>1.6mm</td> </tr> <tr> <td>Warp</td> <td colspan="2">1mm (Soft Termination type:3mm)</td> </tr> <tr> <td>Duration</td> <td colspan="2">10 sec.</td> </tr> </tbody> </table> <p>※1:105 Type thickness, C: 0.2mm, P: 0.3mm.</p>			Multilayer Ceramic Capacitors		042, 063, ※1105 Type	The other types	Board	Glass epoxy-resin substrate		Thickness	0.8mm	1.6mm	Warp	1mm (Soft Termination type:3mm)		Duration	10 sec.		 <p>(Unit: mm) Capacitance measurement shall be conducted with the board bent</p>
		Multilayer Ceramic Capacitors																		
042, 063, ※1105 Type		The other types																		
Board	Glass epoxy-resin substrate																			
Thickness	0.8mm	1.6mm																		
Warp	1mm (Soft Termination type:3mm)																			
Duration	10 sec.																			

10. Body Strength			
Specified Value	Temperature Compensating(Class1)	Standard	—
		High Frequency Type	No mechanical damage.
	High Permittivity (Class2)		—
Test Methods and Remarks	High Frequency Type Applied force : 5N Duration : 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	<table border="1"> <thead> <tr> <th rowspan="2"></th> <th colspan="2">Multilayer Ceramic Capacitors</th> </tr> <tr> <th>042, 063 Type</th> <th>105 Type or more</th> </tr> </thead> <tbody> <tr> <td>Applied force</td> <td>2N</td> <td>5N</td> </tr> <tr> <td>Duration</td> <td colspan="2">30 ± 5 sec.</td> </tr> </tbody> </table>			Multilayer Ceramic Capacitors		042, 063 Type	105 Type or more	Applied force	2N	5N	Duration	30 ± 5 sec.		
		Multilayer Ceramic Capacitors												
		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	<table border="1"> <thead> <tr> <th></th> <th>Eutectic solder</th> <th>Lead-free solder</th> </tr> </thead> <tbody> <tr> <td>Solder type</td> <td>H60A or H63A</td> <td>Sn-3.0Ag-0.5Cu</td> </tr> <tr> <td>Solder temperature</td> <td>230 ± 5°C</td> <td>245 ± 3°C</td> </tr> <tr> <td>Duration</td> <td colspan="2">4 ± 1 sec.</td> </tr> </tbody> </table>			Eutectic solder	Lead-free solder	Solder type	H60A or H63A	Sn-3.0Ag-0.5Cu	Solder temperature	230 ± 5°C	245 ± 3°C	Duration	4 ± 1 sec.		
		Eutectic solder	Lead-free solder												
	Solder type	H60A or H63A	Sn-3.0Ag-0.5Cu												
	Solder temperature	230 ± 5°C	245 ± 3°C												
Duration	4 ± 1 sec.														

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13. Resistance to Soldering

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, 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 $\pm 2.5\%$ Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within $\pm 7.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality Note: ※LD Low distortion high value multilayer ceramic capacitor

Test Methods and Remarks	Class 1			
		042, 063 Type	105 Type	
	Preconditioning	None		
	Preheating	150°C, 1 to 2 min.	80 to 100°C, 2 to 5 min. 150 to 200°C, 2 to 5 min.	
	Solder temp.	270 \pm 5°C		
	Duration	3 \pm 0.5 sec.		
	Recovery	6 to 24 hrs (Standard condition) Note 5		
	Class 2			
		042, 063 Type	105, 107, 212 Type	316, 325 Type
	Preconditioning	Thermal treatment (at 150°C for 1 hr) Note 2		
	Preheating	150°C, 1 to 2 min.	80 to 100°C, 2 to 5 min. 150 to 200°C, 2 to 5 min.	80 to 100°C, 5 to 10 min. 150 to 200°C, 5 to 10 min.
	Solder temp.	270 \pm 5°C		
	Duration	3 \pm 0.5 sec.		
	Recovery	24 \pm 2 hrs (Standard condition) Note 5		

14. Temperature Cycle (Thermal Shock)

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, 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 $\pm 0.25\text{pF}$ Q : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within $\pm 7.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Dissipation factor : Initial value Insulation resistance : Initial value Withstanding voltage (between terminals) : No abnormality Note: ※LD Low distortion high value multilayer ceramic capacitor

Test Methods and Remarks	Class 1		Class 2	
	Preconditioning	None	Thermal treatment (at 150°C for 1 hr) Note 2	
	1 cycle	Step	Temperature (°C)	Time (min.)
		1	Minimum operating temperature	30 \pm 3
		2	Normal temperature	2 to 3
		3	Maximum operating temperature	30 \pm 3
4	Normal temperature	2 to 3		
Number of cycles	5 times			
Recovery	6 to 24 hrs (Standard condition) Note 5	24 \pm 2 hrs (Standard condition) Note 5		

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15. Humidity (Steady State)					
Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever is larger. Q : $C < 10\text{pF} : Q \geq 200 + 10C$ $10 \leq C < 30\text{pF} : Q \geq 275 + 2.5C$ $C \geq 30\text{pF} : Q \geq 350$ (C: Nominal capacitance) Insulation resistance : 1000 M Ω min.		
		High Frequency Type	Appearance : No abnormality Capacitance change : Within $\pm 0.5\text{pF}$, Insulation resistance : 1000 M Ω min.		
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Dissipation factor : 5.0% max. (BJ, B7, C6, C7, D7, LD(※)) Insulation resistance : 50 M Ω μF or 1000 M Ω whichever is smaller. Note: ※LD Low distortion high value multilayer ceramic capacitor		
Test Methods and Remarks		Class 1		Class 2	
		Standard	High Frequency Type	All items	
	Preconditioning	None			Thermal treatment (at 150°C for 1 hr) Note 2
	Temperature	40 \pm 2°C	60 \pm 2°C	40 \pm 2°C	
	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 \pm 2 hrs (Standard condition) Note 5	

16. Humidity Loading					
Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 7.5\%$ or $\pm 0.75\text{pF}$, whichever is larger. Q : $C < 30\text{pF} : Q \geq 100 + 10C/3$ $C \geq 30\text{pF} : Q \geq 200$ (C: Nominal capacitance) Insulation resistance : 500 M Ω min.		
		High Frequency Type	Appearance : No abnormality Capacitance change : $C \leq 2\text{pF} : \text{Within } \pm 0.4 \text{ pF}$ $C > 2\text{pF} : \text{Within } \pm 0.75 \text{ pF}$ (C: Nominal capacitance) Insulation resistance : 500 M Ω min.		
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Dissipation factor : 5.0% max. (BJ, B7, C6, C7, D7, LD(※)) Insulation resistance : 25 M Ω μF or 500 M Ω , whichever is smaller. Note: ※LD Low distortion high value multilayer ceramic capacitor		
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°C) Note 3
	Temperature	40 \pm 2°C	60 \pm 2°C	40 \pm 2°C	
	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 \pm 2 hrs (Standard condition) Note 5		

17. High Temperature Loading

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For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our Web site (<http://www.ty-top.com/>).

Specified Value	Temperature Compensating(Class1)	Standard	Appearance : No abnormality Capacitance change : Within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever is larger. Q : $C < 10\text{pF}$: $Q \geq 200 + 10C$ $10 \leq C < 30\text{pF}$: $Q \geq 275 + 2.5C$ $C \geq 30\text{pF}$: $Q \geq 350$ (C: Nominal capacitance) Insulation resistance : $1000 \text{ M}\Omega$ min.
		High Frequency Type	Appearance : No abnormality Capacitance change : Within $\pm 3\%$ or $\pm 0.3\text{pF}$, whichever is larger. Insulation resistance : $1000 \text{ M}\Omega$ min.
	High Permittivity (Class2) Note 1		Appearance : No abnormality Capacitance change : Within $\pm 12.5\%$ (BJ, B7, C6, C7, D7, LD(※)) Dissipation factor : 5.0% max. (BJ, B7, C6, C7, D7, LD(※)) Insulation resistance : $50 \text{ M}\Omega \mu\text{F}$ or $1000 \text{ M}\Omega$, whichever is smaller. Note: ※LD Low distortion high value multilayer ceramic capacitor

Test Methods and Remarks		Class 1		Class 2		
		Standard	High Frequency Type	BJ, LD(※)	C6	B7, C7, D7
	Preconditioning	None		Voltage treatment (Twice the rated voltage shall be applied for 1 hour at 85°C, 105°C or 125°C) Note 3, 4		
	Temperature	Maximum operating temperature		Maximum operating temperature		
	Duration	1000+48/-0 hrs		1000+48/-0 hrs		
	Applied voltage	Rated voltage $\times 2$		Rated voltage $\times 2$ Note 4		
	Charge/discharge current	50mA max.		50mA max.		
	Recovery	6 to 24hr (Standard condition) Note 5		24 \pm 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 $150 \pm 0 / -10^\circ\text{C}$ for an hour and kept at room temperature for 24 ± 2 hours.

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 ± 2 hours.

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°C, 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: $20 \pm 2^\circ\text{C}$, 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.

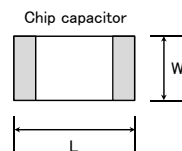
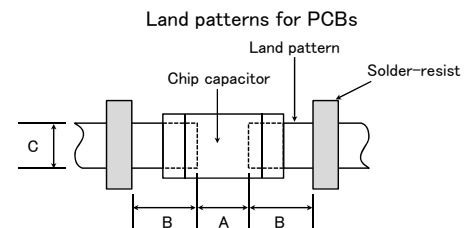
- ◆ Pattern configurations (Design of Land-patterns)
 The following diagrams and tables show some examples of recommended land patterns to prevent excessive solder amounts.

(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	



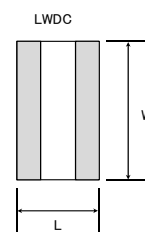
Reflow-soldering

Type	042	063	105	107	212	316	325	432
Size	L	0.4	0.6	1.0	1.6	2.0	3.2	4.5
	W	0.2	0.3	0.5	0.8	1.25	1.6	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	



Technical considerations

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(2) Examples of good and bad solder application

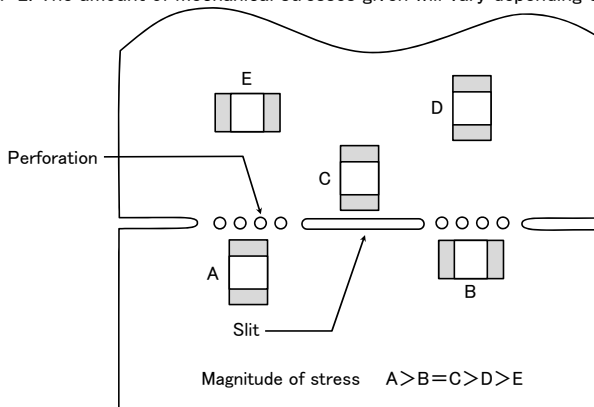
Items	Not recommended	Recommended
Mixed mounting of SMD and leaded components		
Component placement close to the chassis		
Hand-soldering of leaded components near mounted components		
Horizontal component placement		

◆ 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

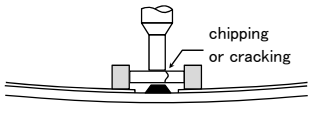
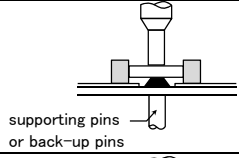
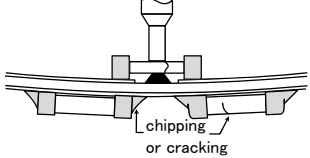
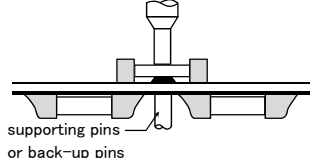
- When capacitors are mounted on PCB, excessive impact load shall not be imposed on them.
- Maintenance and inspection of mounting machines shall be conducted periodically.

◆ Selection of Adhesives

- 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.

◆ 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		

Technical considerations

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.

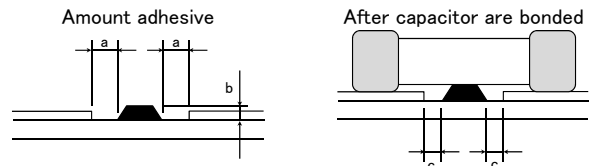
◆ Selection of Adhesives

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



4. Soldering

◆ 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.

Precautions

◆ 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.

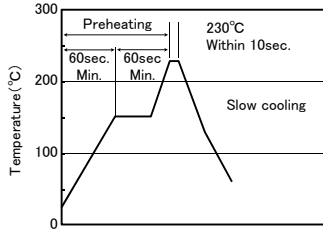
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◆Soldering

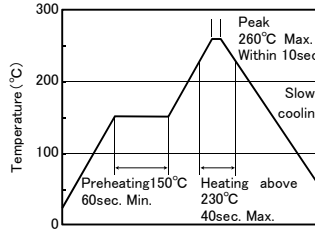
- Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling.
- Therefore, the soldering must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
- Preheating : Capacitors shall be preheated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

[Reflow soldering]

【Recommended conditions for eutectic soldering】

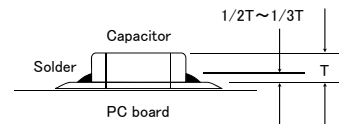


【Recommended condition for Pb-free soldering】



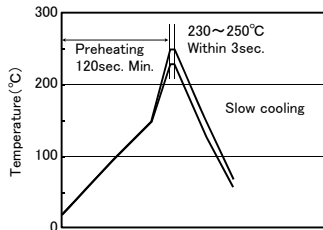
Caution

- 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.
- ③Allowable number of reflow soldering : 2 times max.

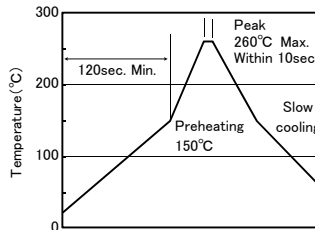


[Wave soldering]

【Recommended conditions for eutectic soldering】



【Recommended condition for Pb-free soldering】

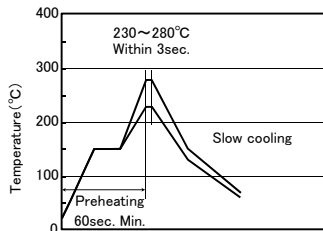


Caution

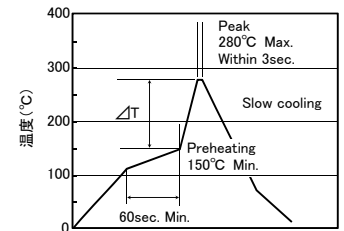
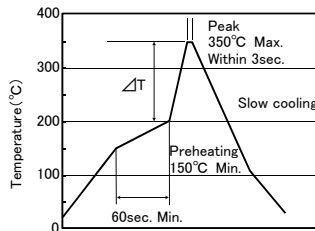
- ①Wave soldering must not be applied to capacitors designated as for reflow soldering only.
- ②Allowable number of wave soldering : 1 times max.

[Hand soldering]

【Recommended conditions for eutectic soldering】



【Recommended condition for Pb-free soldering】



	ΔT
316type or less	$\Delta T \leq 150^{\circ}\text{C}$

	ΔT
325type or more	$\Delta T \leq 130^{\circ}\text{C}$

Caution

- ①Use a 50W soldering iron with a maximum tip diameter of 1.0 mm.
- ②The soldering iron shall not directly touch capacitors.
- ③Allowable number of hand soldering : 1 times max.

5. Cleaning	
Precautions	<p>◆Cleaning conditions</p> <ol style="list-style-type: none"> 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.) 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	<ol style="list-style-type: none"> 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). 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	<ol style="list-style-type: none"> 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. 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	<p>◆Splitting of PCB</p> <ol style="list-style-type: none"> 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. Board separation shall not be done manually, but by using the appropriate devices. <p>◆Mechanical considerations</p> <p>Be careful not to subject capacitors to excessive mechanical shocks.</p> <p>(1) If ceramic capacitors are dropped onto a floor or a hard surface, they shall not be used.</p> <p>(2) Please be careful that the mounted components do not come in contact with or bump against other boards or components.</p>

8. Storage conditions	
Precautions	<p>◆Storage</p> <ol style="list-style-type: none"> 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. <ul style="list-style-type: none"> Recommended conditions <ul style="list-style-type: none"> Ambient temperature : Below 30°C Humidity : Below 70% RH The ambient temperature must be kept below 40°C. 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. <ul style="list-style-type: none"> Ceramic chip capacitors shall be kept where no chlorine or sulfur exists in the air. 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°C for 1hour.
Technical considerations	<p>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.</p>

※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.