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

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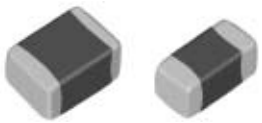
Should you have any question or inquiry on this matter, please contact our sales staff.

中高耐圧積層セラミックコンデンサ
MEDIUM-HIGH VOLTAGE MULTILAYER CERAMIC CAPACITOR

	Code	Temp.characteristics	Operating temp. range
OPERATING TEMP.	BJ	B	−25〜+85℃
		X5R*	−55〜+85℃
	B7	X7R	−55〜+125℃
	C7	X7S	−55〜+125℃

*個別仕様の取交しにより、X7R/X7S仕様に対応している場合があります。

*We may provide X7R/X7S for some items according to the individual specification.



リフロー／REFLOW

特長　FEATURES

・内部電極にNi金属を使用しており、マイグレーションが発生せず、高信頼性を示す。
・高定格電圧でありながら小型形状

・The use of Nickel(Ni) as material for internal electrodes almost completely eliminates migration and high reliability
・Small case sizes with high rated voltage

用途　APPLICATIONS

・一般電話交換機
・インバータ
・無線、通信基地局
・DC/DCコンバータ用

・General telephone exchange
・Inverter.
・Wireless and Telecommunication base.
・For DC/DC Converter

形名表記法　ORDERING CODE

1 定格電圧（VDC）

H	100
Q	250
S	630

2 シリーズ名

M	積層コンデンサ

3 端子電極

K	メッキ品

4 形状寸法（EIA）L×W（mm）

107（0603）	1.6×0.8
212（0805）	2.0×1.25
316（1206）	3.2×1.6
325（1210）	3.2×2.5
432（1812）	4.5×3.2

5 温度特性

BJ	B
	X5R
B7	X7R
C7	X7S

6 公称静電容量（pF）

例	
104	100,000
105	1,000,000

7 容量許容差

K	±10%
M	±20%

8 製品厚み（mm）

A	0.8
D	0.85
G	1.25
F	1.15
L	1.6
N	1.9
M	2.5

9 個別仕様

−	標準

10 包装

T	φ178mm テーピング（4mmピッチ）

11 当社管理記号

△	標準品

△＝スペース

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

1 Rated voltage（VDC）

H	100
Q	250
S	630

2 Series name

M	Multilayer ceramic capacitors

3 End termination

K	Plated

4 Dimensions(case size)（mm）

107（0603）	1.6×0.8
212（0805）	2.0×1.25
316（1206）	3.2×1.6
325（1210）	3.2×2.5
432（1812）	4.5×3.2

5 Temperature characteristics code

BJ	B
	X5R
B7	X7R
C7	X7S

6 Nominal capacitance（pF）

example	
104	100,000
105	1,000,000

7 Capacitance tolerance

K	±10%
M	±20%

8 Thickness（mm）

A	0.8
D	0.85
G	1.25
F	1.15
L	1.6
N	1.9
M	2.5

9 Special code

−	Standard products

10 Packaging

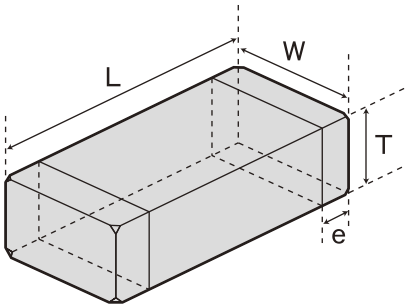
T	φ178mm Taping (4mm pitch)

11 Internal code

△	Standard products

△=Blank space

外形寸法　EXTERNAL DIMENSIONS



Type (EIA)	L	W	T		e
□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)
□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)
			1.25±0.10 (0.049±0.004)	G	
□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	$0.5^{+0.35}_{-0.25}$ $(0.020^{+0.014}_{-0.010})$
			1.6±0.20 (0.063±0.008)	L	
□MK325 (1210)	3.2±0.3 (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)
			1.9±0.20 (0.075±0.008)	N	
□MK432 (1812)	4.5±0.4 (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)

Unit : mm (inch)

概略バリエーション　AVAILABLE CAPACITANCE RANGE

	Type	107			212				316						325						432					
	Temp. Char	X7R	X7S	B/X5R	X7R		B/X5R		X7R			B/X5R			X7R			B/X5R			X7R			B/X5R		
Cap [μF]	VDC [pF:3digits]	100V	100V	100V	100V	250V	100V	250V	100V	250V	630V	100V	250V	630V	100V	250V	630V	100V	250V	630V	100V	250V	630V	100V	250V	630V
0.001	102	A		A		D		D			F			F												
0.0015	152	A		A		D		D			F			F												
0.0022	222	A		A		D		D			F			F												
0.0033	332	A		A		D		D			F			F												
0.0047	472	A		A		G		G			F			F												
0.0068	682	A		A		G		G			F			F												
0.01	103	A		A	G	G	G	G			F			F												
0.015	153	A		A	G	G	G	G			L			L												
0.022	223	A		A	G	G	G	G			L			L			N			N						
0.033	333	A		A	G		G			L			L				N			N						
0.047	473				G		G		L	L		L	L			N	N		N	N			M			M
0.068	683				G		G			L			L										M			M
0.1	104		A	A	G		G		L	L		L	L		F	N		F	N			M	M		M	M
0.15	154								L			L				N			N							
0.22	224				G		G		L			L			N	N		N	N			M			M	
0.33	334								L			L										M			M	
0.47	474								L			L			N			N			M	M		M	M	
0.68	684														N			N								
1.0	105								L			L			N			N			M			M		
1.5	155																				M			M		
2.2	225														N			N			M			M		

※グラフ記号は製品厚みを表します。Letters in the table indicate thickness.

温度特性コード Temp.char.Code	温度特性 Temperature characteristics					静電容量許容差〔%〕 Capacitance tolerance	tanδ〔%〕 Dissipation factor
	準拠規格 Applicable standard		温度範囲〔℃〕 Temperature range	基準温度〔℃〕 Ref. Temp.	静電容量変化率〔%〕 Capacitance change		
BJ	JIS	B	−25〜+85	20	±10	±10(K) ±20(M)	2.5 max.*
	EIA	X5R	−55〜+85	25	±15		
B7	EIA	X7R	−55〜+125	25	±15		
C7	EIA	X7S	−55〜+125	25	±22		

*：代表的な値を記載しています。詳細はアイテム一覧表を参照ください。

*：The figure indicates typical value. Please refer to PART NUMBERS table.

セレクションガイド Selection Guide P.12
アイテム一覧 Part Numbers P.78
特性図 Electrical Characteristics P.83
梱包 Packaging P.98
信頼性 Reliability Data P.84
使用上の注意 Precautions P.108
etc

■ 107TYPE(0603 case size)

【温度特性 Temp.char.　BJ:B/X5R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance 〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor 〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness 〔mm〕 (inch)
100V	HMK107 BJ102□A		RoHS	0.001	B/X5R*2	3.5	R	±10% ±20%	0.8±0.1 (0.031±0.0041)
	HMK107 BJ152□A		RoHS	0.0015					
	HMK107 BJ222□A		RoHS	0.0022					
	HMK107 BJ332□A		RoHS	0.0033					
	HMK107 BJ472□A		RoHS	0.0047					
	HMK107 BJ682□A		RoHS	0.0068					
	HMK107 BJ103□A		RoHS	0.01					
	HMK107 BJ153□A		RoHS	0.015					
	HMK107 BJ223□A		RoHS	0.022					
	HMK107 BJ333□A		RoHS	0.033					
	HMK107 BJ104□A		RoHS	0.1					

形名の□には静電容量許容差記号が入ります。

*2 個別仕様の取交しにより、X7R/X7S仕様に対応している場合があります。

□ Please specify the capacitance tolerance code.

*2 We may provide X7R/X7S for some items according to the individual specification.

【温度特性 Temp.char.　B7:X7R C7:X7S】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance 〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor 〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness 〔mm〕 (inch)
100V	HMK107 B7102□A		RoHS	0.001	X7R	3.5	R	±10% ±20%	0.8±0.1 (0.031±0.0041)
	HMK107 B7152□A		RoHS	0.0015					
	HMK107 B7222□A		RoHS	0.0022					
	HMK107 B7332□A		RoHS	0.0033					
	HMK107 B7472□A		RoHS	0.0047					
	HMK107 B7682□A		RoHS	0.0068					
	HMK107 B7103□A		RoHS	0.01					
	HMK107 B7153□A		RoHS	0.015					
	HMK107 B7223□A		RoHS	0.022					
	HMK107 B7333□A		RoHS	0.033					
	HMK107 C7104□A		RoHS	0.1	X7S				

形名の□には静電容量許容差記号が入ります。

□ Please specify the capacitance tolerance code.

■ 212TYPE(0805 case size)

【温度特性 Temp.char.　BJ:B/X5R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK212 BJ103□G		RoHS	0.01	B/X5R*2	3.5	R	±10% ±20%	1.25±0.1 (0.049±0.004)
	HMK212 BJ153□G		RoHS	0.015					
	HMK212 BJ223□G		RoHS	0.022					
	HMK212 BJ333□G		RoHS	0.033					
	HMK212 BJ473□G		RoHS	0.047					
	HMK212 BJ683□G		RoHS	0.068					
	HMK212 BJ104□G		RoHS	0.1					
	HMK212 BJ224□G		RoHS	0.22					
250V	QMK212 BJ102□D		RoHS	0.001		2.5			0.85±0.1 (0.033±0.004)
	QMK212 BJ152□D		RoHS	0.0015					
	QMK212 BJ222□D		RoHS	0.0022					
	QMK212 BJ332□D		RoHS	0.0033					
	QMK212 BJ472□G		RoHS	0.0047					1.25±0.1 (0.049±0.004)
	QMK212 BJ682□G		RoHS	0.0068					
	QMK212 BJ103□G		RoHS	0.01					
	QMK212 BJ153□G		RoHS	0.015					
	QMK212 BJ223□G		RoHS	0.022					

形名の□には静電容量許容差記号が入ります。

*2 個別仕様の取交しにより、X7R仕様に対応している場合があります。

□ Please specify the capacitance tolerance code.

*2 We may provide X7R for some items according to the individual specification.

【温度特性 Temp.char.　B7:X7R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK212 B7 103□G		RoHS	0.01	X7R	3.5	R	±10% ±20%	1.25±0.1 (0.049±0.004)
	HMK212 B7 153□G		RoHS	0.015					
	HMK212 B7 223□G		RoHS	0.022					
	HMK212 B7 333□G		RoHS	0.033					
	HMK212 B7 473□G		RoHS	0.047					
	HMK212 B7 683□G		RoHS	0.068					
	HMK212 B7 104□G		RoHS	0.1					
	HMK212 B7 224□G		RoHS	0.22					
250V	QMK212 B7 102□D		RoHS	0.001		2.5			0.85±0.1 (0.033±0.004)
	QMK212 B7 152□D		RoHS	0.0015					
	QMK212 B7 222□D		RoHS	0.0022					
	QMK212 B7 332□D		RoHS	0.0033					
	QMK212 B7 472□G		RoHS	0.0047					1.25±0.1 (0.049±0.004)
	QMK212 B7 682□G		RoHS	0.0068					
	QMK212 B7 103□G		RoHS	0.01					
	QMK212 B7 153□G		RoHS	0.015					
	QMK212 B7 223□G		RoHS	0.022					

形名の□には静電容量許容差記号が入ります。

□ Please specify the capacitance tolerance code.

■ 316TYPE（1206 case size）

【温度特性 Temp.char.　BJ:B/X5R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK316 BJ473□L		RoHS	0.047	B/X5R*2	3.5	R	±10% ±20%	1.6±0.2 (0.063±0.008)
	HMK316 BJ104□L		RoHS	0.1					
	HMK316 BJ154□L		RoHS	0.15					
	HMK316 BJ224□L		RoHS	0.22					
	HMK316 BJ334□L		RoHS	0.33					
	HMK316 BJ474□L		RoHS	0.47					
	HMK316 BJ105□L		RoHS	1					
250V	QMK316 BJ333□L		RoHS	0.033		2.5			
	QMK316 BJ473□L		RoHS	0.047					
	QMK316 BJ683□L		RoHS	0.068					
	QMK316 BJ104□L		RoHS	0.1					
630V	SMK316 BJ102□F		RoHS	0.001					1.15±0.1 (0.045±0.004)
	SMK316 BJ152□F		RoHS	0.0015					
	SMK316 BJ222□F		RoHS	0.0022					
	SMK316 BJ332□F		RoHS	0.0033					
	SMK316 BJ472□F		RoHS	0.0047					
	SMK316 BJ682□F		RoHS	0.0068					
	SMK316 BJ103□F		RoHS	0.01					
	SMK316 BJ153□L		RoHS	0.015					1.6±0.2 (0.063±0.008)
	SMK316 BJ223□L		RoHS	0.022					

形名の□には静電容量許容差記号が入ります。

*2 個別仕様の取交しにより、X7R仕様に対応している場合があります。

□ Please specify the capacitance tolerance code.

*2 We may provide X7R for some items according to the individual specification.

【温度特性 Temp.char.　B7:X7R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK316 B7 473□L		RoHS	0.047	X7R	3.5	R	±10% ±20%	1.6±0.2 (0.063±0.008)
	HMK316 B7 104□L		RoHS	0.1					
	HMK316 B7 154□L		RoHS	0.15					
	HMK316 B7 224□L		RoHS	0.22					
	HMK316 B7 334□L		RoHS	0.33					
	HMK316 B7 474□L		RoHS	0.47					
	HMK316 B7 105□L		RoHS	1					
250V	QMK316 B7 333□L		RoHS	0.033		2.5			
	QMK316 B7 473□L		RoHS	0.047					
	QMK316 B7 683□L		RoHS	0.068					
	QMK316 B7 104□L		RoHS	0.1					
630V	SMK316 B7 102□F		RoHS	0.001					1.15±0.1 (0.045±0.004)
	SMK316 B7 152□F		RoHS	0.0015					
	SMK316 B7 222□F		RoHS	0.0022					
	SMK316 B7 332□F		RoHS	0.0033					
	SMK316 B7 472□F		RoHS	0.0047					
	SMK316 B7 682□F		RoHS	0.0068					
	SMK316 B7 103□F		RoHS	0.01					
	SMK316 B7 153□L		RoHS	0.015					1.6±0.2 (0.063±0.008)
	SMK316 B7 223□L		RoHS	0.022					

形名の□には静電容量許容差記号が入ります。

□ Please specify the capacitance tolerance code.

■ 325TYPE(1210 case size)

【温度特性 Temp.char.　BJ:B/X5R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance 〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor 〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness 〔mm〕 (inch)
100V	HMK325 BJ104□F		RoHS	0.1	B/X5R*2	3.5	R	±10% ±20%	1.15±0.1 (0.045±0.004)
	HMK325 BJ224□N		RoHS	0.22					1.9±0.2 (0.075±0.008)
	HMK325 BJ474□N		RoHS	0.47					
	HMK325 BJ684□N		RoHS	0.68					
	HMK325 BJ105□N		RoHS	1					
	HMK325 BJ225□N		RoHS	2.2					
250V	QMK325 BJ473□N		RoHS	0.047		2.5			
	QMK325 BJ104□N		RoHS	0.1					
	QMK325 BJ154□N		RoHS	0.15					
	QMK325 BJ224□N		RoHS	0.22					
630V	SMK325 BJ223□N		RoHS	0.022					
	SMK325 BJ333□N		RoHS	0.033					
	SMK325 BJ473□N		RoHS	0.047					

形名の□には静電容量許容差記号が入ります。
*2 個別仕様の取交しにより、X7R仕様に対応している場合があります。

□ Please specify the capacitance tolerance code.
*2 We may provide X7R for some items according to the individual specification.

【温度特性 Temp.char.　B7:X7R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance 〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor 〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness 〔mm〕 (inch)
100V	HMK325 B7 104□F		RoHS	0.1	X7R	3.5	R	±10% ±20%	1.15±0.1 (0.045±0.004)
	HMK325 B7 224□N		RoHS	0.22					1.9±0.2 (0.075±0.008)
	HMK325 B7 474□N		RoHS	0.47					
	HMK325 B7 684□N		RoHS	0.68					
	HMK325 B7 105□N		RoHS	1					
	HMK325 B7 225□N		RoHS	2.2					
250V	QMK325 B7 473□N		RoHS	0.047		2.5			
	QMK325 B7 104□N		RoHS	0.1					
	QMK325 B7 154□N		RoHS	0.15					
	QMK325 B7 224□N		RoHS	0.22					
630V	SMK325 B7 223□N		RoHS	0.022					
	SMK325 B7 333□N		RoHS	0.033					
	SMK325 B7 473□N		RoHS	0.047					

形名の□には静電容量許容差記号が入ります。

□ Please specify the capacitance tolerance code.

■ 432TYPE（1812 case size）

【温度特性 Temp.char.　BJ:B/X5R】

定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK432 BJ474□M		RoHS	0.47	B/X5R*2	3.5	R	±10% ±20%	2.5±0.2 (0.098±0.008)
	HMK432 BJ105□M		RoHS	1					
	HMK432 BJ155□M		RoHS	1.5					
	HMK432 BJ225□M		RoHS	2.2					
250V	QMK432 BJ104□M		RoHS	0.1		2.5			
	QMK432 BJ224□M		RoHS	0.22					
	QMK432 BJ334□M		RoHS	0.33					
	QMK432 BJ474□M		RoHS	0.47					
630V	SMK432 BJ473□M		RoHS	0.047					
	SMK432 BJ683□M		RoHS	0.068					
	SMK432 BJ104□M		RoHS	0.1					

形名の□には静電容量許容差記号が入ります。

*2 個別仕様の取交しにより、X7R仕様に対応している場合があります。

□ Please specify the capacitance tolerance code.

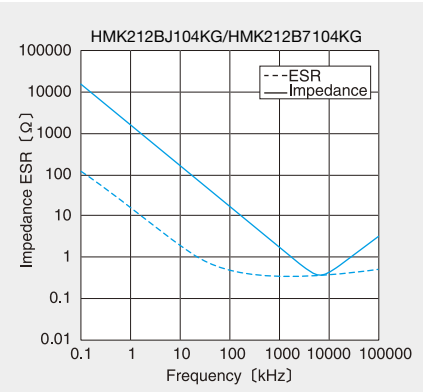
*2 We may provide X7R for some items according to the individual specification.

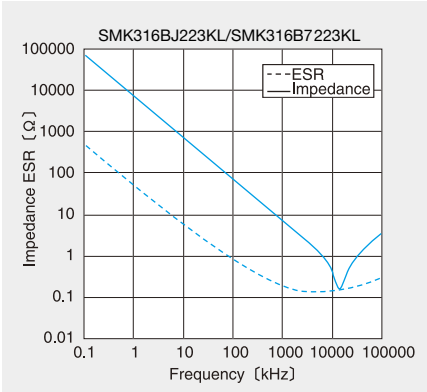
【温度特性 Temp.char.　B7:X7R】

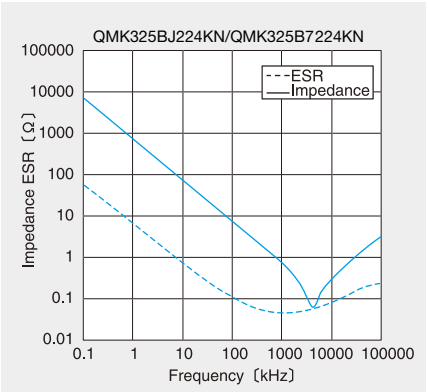
定格電圧 Rated Voltage	形　名 Ordering code		EHS (Environmental Hazardous Substances)	公　称 静電容量 Capacitance〔μF〕	温度特性 Temperature characteristics	tanδ Dissipation factor〔%〕Max.	実装条件 Soldering method R:リフロー Reflow soldering W: フロー Wave soldering	静電容量 許 容 差 Capacitance tolerance	厚 み Thickness〔mm〕(inch)
100V	HMK432 B7 474□M		RoHS	0.47	X7R	3.5	R	±10% ±20%	2.5±0.2 (0.098±0.008)
	HMK432 B7 105□M		RoHS	1					
	HMK432 B7 155□M		RoHS	1.5					
	HMK432 B7 225□M		RoHS	2.2					
250V	QMK432 B7 104□M		RoHS	0.1		2.5			
	QMK432 B7 224□M		RoHS	0.22					
	QMK432 B7 334□M		RoHS	0.33					
	QMK432 B7 474□M		RoHS	0.47					
630V	SMK432 B7 473□M		RoHS	0.047					
	SMK432 B7 683□M		RoHS	0.068					
	SMK432 B7 104□M		RoHS	0.1					

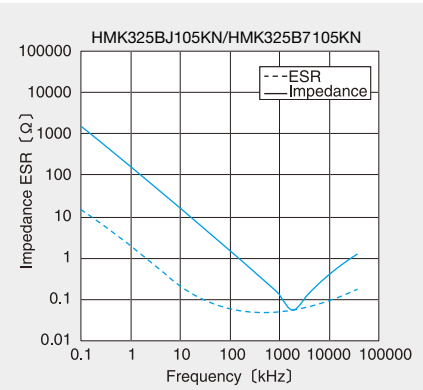
形名の□には静電容量許容差記号が入ります。

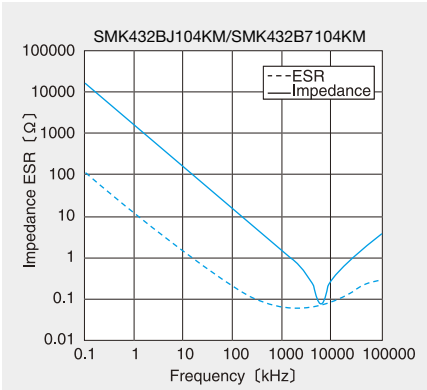
□ Please specify the capacitance tolerance code.

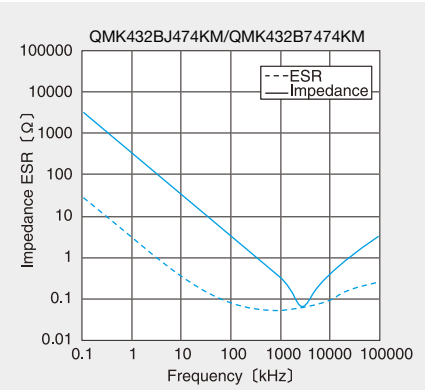




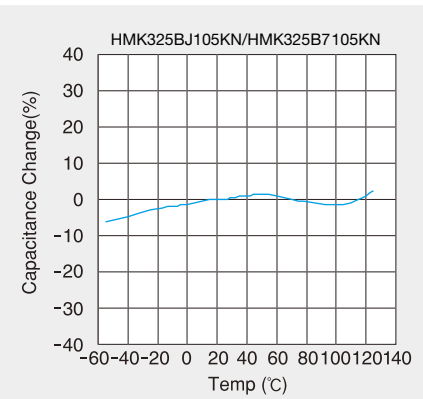








静電容量－温度特性 Temperature characteristics



①最小受注単位数　Minimum Quantity

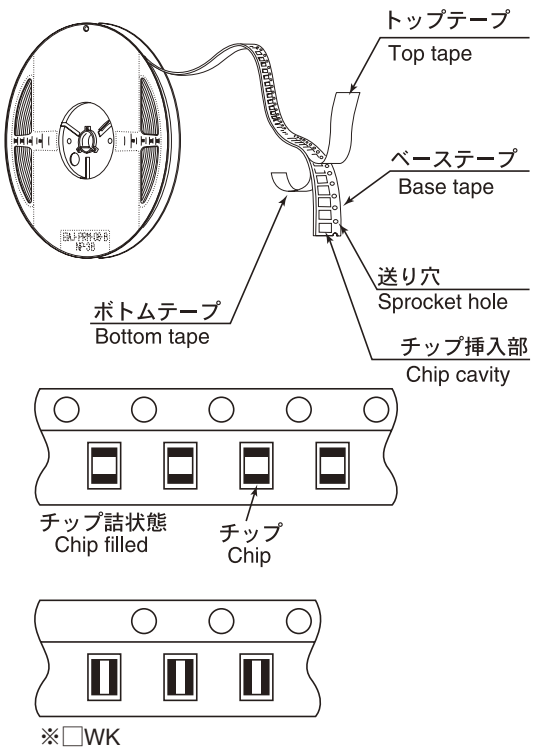
■テーピング梱包　　Taped packaging

形式(EIA) Type	製品厚み Thickness		標準数量 Standard quantity [pcs]	
	mm(inch)	code	紙テープ paper	エンボステープ Embossed tape
□MK042(01005)	0.2(0.008)	C	15000	—
□MK063(0201)	0.3(0.012)	P	15000	—
□2K096(0302)	0.3(0.012)	P	10000	—
	0.45(0.018)	K		
□WK105(0204)	0.3(0.012)	P	10000	—
□MK105(0402)	0.5(0.020)	V, W	10000	—
□VK105(0402)		W		
□MK107(0603) □WK107(0306)	0.45(0.018)	K	4000	—
	0.5(0.020)	V	—	4000
	0.8(0.031)	A	4000	—
□2K110(0504)	0.5(0.020)	V	4000	—
	0.8(0.031)	A	4000	—
	0.6(0.024)	B	4000	—
□MK212(0805) □WK212(0508)	0.45(0.018)	K	4000	—
	0.85(0.033)	D	4000	—
	1.25(0.049)	G	—	3000
□4K212(0805)	0.85(0.033)	D	4000	—
□2K212(0805)	0.85(0.033)	D	4000	—
□MK316(1206)	0.85(0.033)	D	4000	—
	1.15(0.045)	F	—	3000
	1.25(0.049)	G		
	1.6(0.063)	L	—	2000
□MK325(1210)	0.85(0.033)	D	—	2000
	1.15(0.045)	F		
	1.5(0.059)	H		
	1.9(0.075)	N		
	2.0max(0.079)	Y	—	2000
	2.5(0.098)	M	—	500(T), 1000(P)
□MK432(1812)	2.5(0.098)	M	—	500

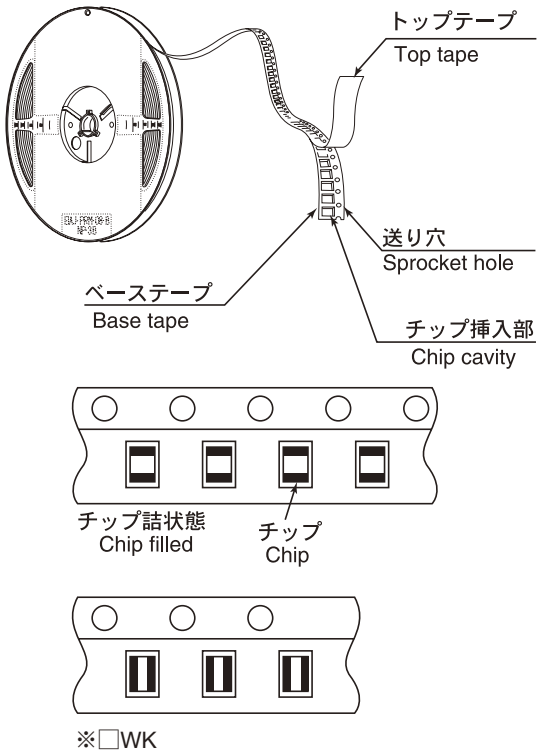
②テーピング材質　Taping material

紙テープ
Card board carrier tape

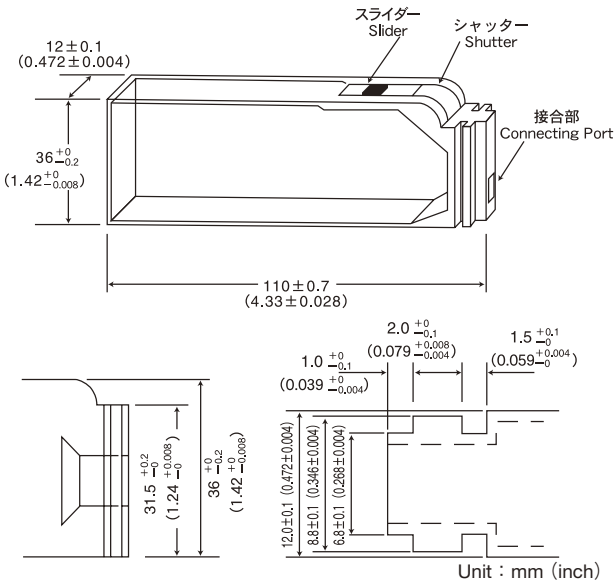
※プレスポケットタイプは、
ボトムテープ無し。



エンボステープ
Embossed Tape



③バルクカセット　Bulk Cassette

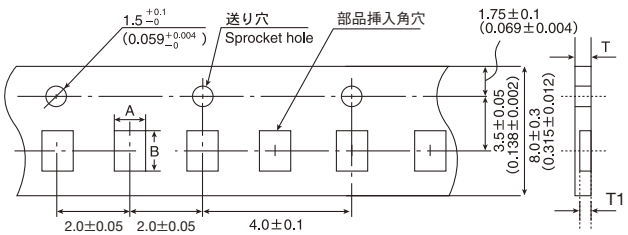


105, 107, 212形状で個別対応致しますのでお問い合せ下さい。
Please contact any of our offices for accepting your requirement according to dimensions 0402, 0603, 0805.(inch)

梱包　PACKAGING

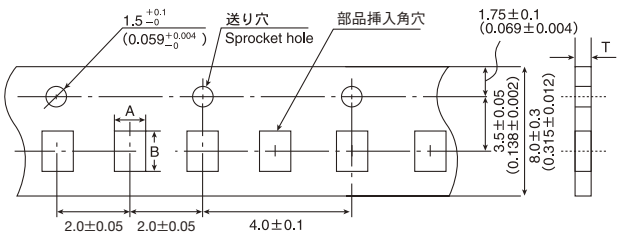
③テーピング寸法　Taping dimensions

紙テープ　Paper Tape（8mm幅）(0.315inches wide)



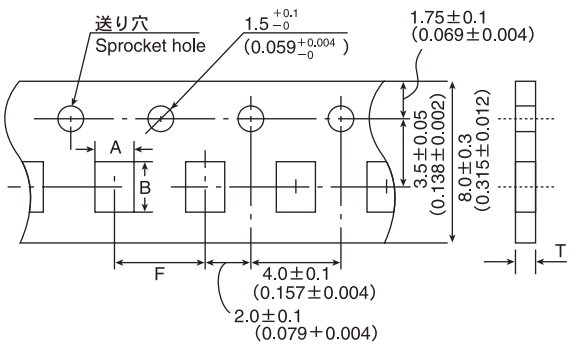
Type（EIA）	チップ挿入部 Chip Cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	T	T1
□MK042(01005)	0.25 (0.010)	0.45 (0.018)	2.0±0.05 (0.079±0.002)	0.36max. (0.014)	0.27max. (0.011)
□MK063(0201)	0.37 (0.016)	0.67 (0.027)	2.0±0.05 (0.079±0.002)	0.45max. (0.018)	0.42max. (0.017)
□WK105(0204)	0.65 (0.026)	1.15 (0.045)	2.0±0.05 (0.079±0.002)	0.45max (0.018max)	0.42max (0.017max)

Unit：mm（inch）



Type（EIA）	チップ挿入部 Chip Cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness
	A	B	F	T
□2K096(0302)	0.72 (0.028)	1.02 (0.040)	2.0±0.05 (0.079±0.002)	0.45max.(0.018max) 0.6max.(0.024max)
□MK105(0402) □VK105(0402)	0.65 (0.026)	1.15 (0.045)	2.0±0.05 (0.079±0.002)	0.8max. (0.031max.)

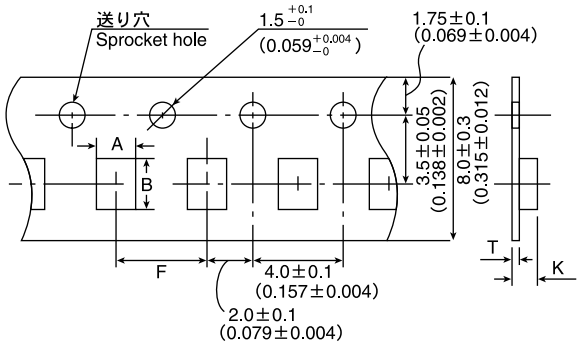
Unit：mm（inch）



Type（EIA）	チップ挿入部 Chip Cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness
	A	B	F	T
□MK107(0603) □WK107(0306)	1.0 (0.039)	1.8 (0.071)	4.0±0.1 (0.157±0.004)	1.1max. (0.043max.)
□2K110(0504)	1.15 (0.045)	1.55 (0.061)	4.0±0.1 (0.157±0.004)	1.0max. (0.039max.)
□MK212(0805) □WK212(0508)	1.65 (0.065)	2.4 (0.094)	4.0±0.1 (0.157±0.004)	1.1max. (0.043max.)
□4K212(0805) □2K212(0805)				
□MK316(1206)	2.0 (0.079)	3.6 (0.142)		

Unit：mm（inch）

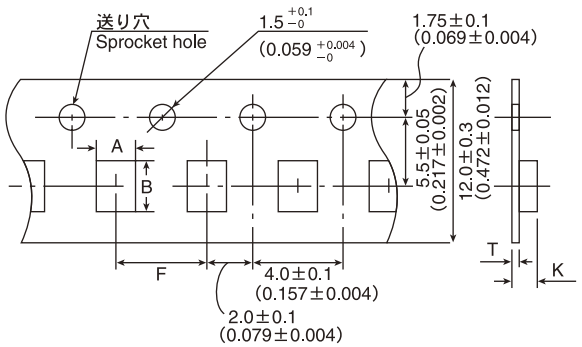
エンボステープ　Embossed tape（8mm幅）(0.315inches wide)



Type (EIA)	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
□WK107（0306）	1.0 (0.039)	1.8 (0.071)	4.0±0.1 (0.157±0.004)	1.3max. (0.051max.)	0.25±0.1 (0.01±0.004)
□MK212（0805）	1.65 (0.065)	2.4 (0.094)		3.4max. (0.134max.)	0.6max. (0.024max.)
□MK316（1206）	2.0 (0.079)	3.6 (0.142)			
□MK325（1210）	2.8 (0.110)	3.6 (0.142)			

Unit：mm（inch）

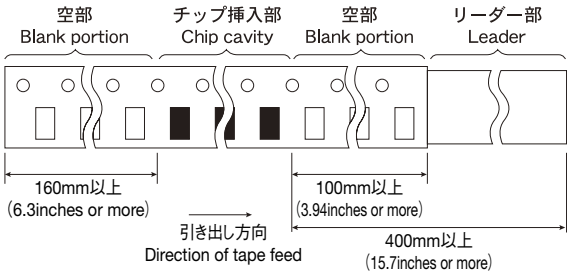
エンボステープ　Embossed tape（12mm幅）(0.472inches wide)



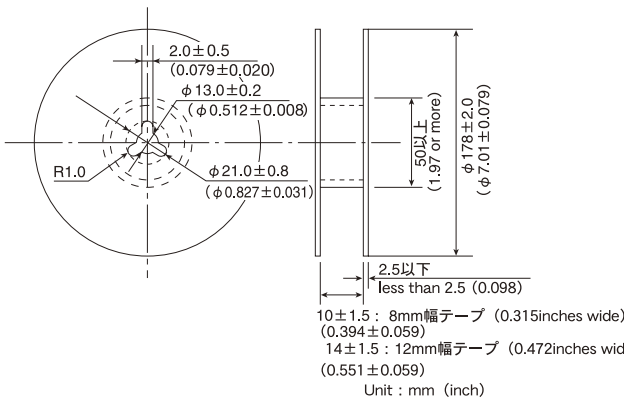
Type (EIA)	チップ挿入部 Chip cavity		挿入ピッチ Insertion Pitch	テープ厚み Tape Thickness	
	A	B	F	K	T
□MK432（1812）	3.7 (0.146)	4.9 (0.193)	8.0±0.1 (0.315±0.004)	4.0max. (0.157max.)	0.6max. (0.024max.)

Unit：mm（inch）

④リーダー部／空部　Leader and Blank portion

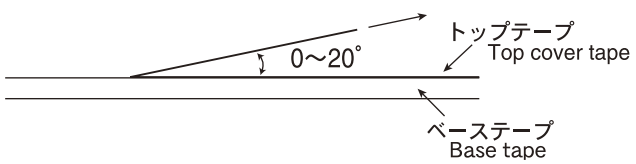


⑤リール寸法　Reel size

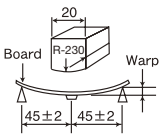
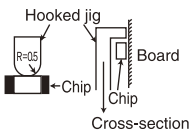


⑥トップテープ強度　Top Tape Strength

トップテープのはがし力は下図矢印方向にて0.1～0.7Nとなります。
The top tape requires a peel-off force of 0.1～0.7N in the direction of the arrow as illustrated below.

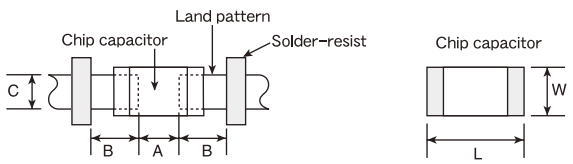


MEDIUM－HIGH VOLTAGE MULTILAYER CERAMIC CAPACITOR

Item	Specified Value	Test Methods and Remarks
1.Operating Temperature Range	X7R, X7S:－55 to ＋125℃ B: －25 to ＋85℃	
2.Storage Temperature Range	X7R, X7S :－55 to ＋125℃ B: －25 to ＋85℃	
3.Rated Voltage	100VDC, 250VDC, 630VDC	
4.Withstanding Voltage Between terminals	No breakdown or damage	Applied voltage:Rated voltage×2.5 (100V) Rated voltage×2 (250V) Rated voltage×1.2 (630V) Duration：1～5sec. Chage/dischage current：50mAmax.
5.Insulation Resistance	100MΩ μF or 10GΩ, whichever is smaller.	Applied voltage:Rated voltage (100V, 250V) 500V (630V) Duration：60± 5 sec. Chage/dischage current：50mAmax.
6.Capacitance (Tolerance)	±20%、±10%	Measuring frequency:1kHz±10% Measuring voltage:1±0.2Vrms Bias application:None
7.Tangent of Loss Angel	3.5%max (100V). 2.5%max (250V, 630V).	Measuring frequency:1kHz±10% Measuring voltage:1±0.2Vrms Bias application:None
8.Temperature Characteristic of Capacitance	B: ±10% (－25 to ＋85℃) X7R: ±15% (－55 to ＋125℃) X7S: ±22% (－55 to ＋125℃)	According to JIS 5102 clause7.12. Charge of maximum capacitance deviation in step 1 to 5 Temperature at step 1:+25℃ Temperature at step 2:minimum operating temperature Temperature at step 3:+25℃ (Reference temperature) Temperature at step 4:maximum operating temperature Temperature at step 5:+25℃ Reference temperature Characteristic B shall be +20℃
9.Resistance to Flexure of Substrate	Appearance:No abnormality Capacitance change:Within±10%	Warp:1mm Testing boade:glass epoxy－resin substrate Thickness:1.6mm The measurement shall be made with board in the bent position  (Unit: mm)
10.Adhesion of Electrode	No separation or indication of separation of electrode	Applied force:5N Duration:30±5sec.  Cross-section
11.Solderability	At least 75% of terminal electrode is covered by solder	Solder temperature:230±5℃ Duration:4±1sec.
12.Resistance to Soldering	Appearance:No abnormality Capacitance change:Within±15% (100V), ±10% (250V, 630V) tanδ : Initial value Insulation resistance:Intial value Withstanding voltage (between terminals): No abnormality	Preconditioning:Thermal treatment (at 150℃ for 1hr) Solder temperature:270±5℃ Duration:3±0.5sec. Preheating conditions: 80 to 100℃, 2 to 5 min. 150 to 200℃, 2 to 5min. Recovery:Rcovery for the following reriod under the standerd condition after the test. 24±2hrs
13.Thermal shock	Appearance:No abnormality Capacitance change:Within±15% (100V), ±7.5% (250V, 630V) tanδ : Initial value Insulation resistance:Initial value	Preconditioning:Thermal treatment (at 150℃ for 1hr) Conditions for 1 cycle Step 1:Minimum operating temperature ＋0／－3℃ 30±3min. Step 2:Room temperature 2 to 3min. Step 3:Maximum operating temperature ＋0／－3℃ 30±3min. Step4:Room temperature 2 to 3min. Number of cycles:5 times Recovery after the test:24±2hrs

Item	Specified Value	Test Methods and Remarks
14.Damp Heat (steady state)	Appearance:No abnormality Capacitance change: Within±15% tanδ : 7%max (100V), 5%max (250V, 630V). Insulation resistance:25MΩ μF or 1000MΩ Whichever is smaller.	Preconditioning:Thermal treatment (at 150℃ for 1hr) Temperature:40±2℃ Humidity : 90 to 95%RH Duration: 500+24/−0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. 24±2hrs
15.Loading under Damp Heat	Appearance:No abnormality Capacitance change: Within±15% tanδ : 7%max (100V), 5%max (250V, 630V). Insulation resistance:10MΩ μF or 500MΩ Whichever is smaller.	Preconditioning:Thermal treatment (at 150℃ for 1hr) Preconditioning:Voltage treatment Temperature:40±2℃ Humidity : 90 to 95%RH Applied voltage:Rated voltage Chage/dischage current : 50mAmax. Duration: 500+24/−0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. 24±2hrs
16.Loading at High Temperature	Appearance:No abnormality Capacitance change: Within±15% tanδ : 7%max (100V), 5%max (250V, 630V). Insulation resistance:50MΩ μF or 1000MΩ Whichever is smaller.	According to JIS 5102 clause 9.10. Preconditioning:Voltage treatment Temperature:125±3℃ (X7R, X7S) 85±2℃ (BJ) Applied voltage:Rated voltage x 2 (100V) Rated voltage x 1.5 (250V) Rated voltage x 1.2 (630V) Chage/dischage current : 50mAmax. Duration: 1000+24/−0 hrs Recovery:Rcovery for the following reriod under the standerd condition after the removal from test chamber. As for thermal treatment shall be performed prior to the recovery. 24±2hrs

Precautions on the use of Multilayer Ceramic Capacitors

Stages	Precautions	Technical considerations
1.Circuit Design	Verification of operating environment, electrical rating and performance 1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any capacitors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications. Operating Voltage (Verification of Rated voltage) 1. The operating voltage for capacitors must always be lower than their rated values. If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage. 2. Even if the applied voltage is lower than the rated value, the reliability of capacitors might be reduced if either a high frequency AC voltage or a pulse voltage having rapid rise time is present in the circuit.	
2.PCB Design	Pattern configurations (Design of Land-patterns) 1. When capacitors are mounted on a PCB, the amount of solder used (size of fillet) can directly affect capacitor performance. Therefore, the following items must be carefully considered in the design of solder land patterns: (1) The amount of solder applied can affect the ability of chips to withstand mechanical stresses which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads which in turn determines the amount of solder necessary to form the fillets. (2) When more than one part is jointly soldered onto the same land or pad, the pad must be designed so that each component's soldering point is separated by solder-resist.	1.The following diagrams and tables show some examples of recommended patterns to prevent excessive solder amourts. (larger fillets which extend above the component end terminations) Examples of improper pattern designs are also shown. (1) Recommended land dimensions for a typical chip capacitor land patterns for PCBs  Recommended land dimensions for wave-soldering (unit: mm)

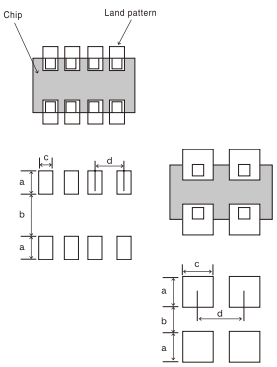
Type		107	212	316	325
Size	L	1.6	2.0	3.2	3.2
	W	0.8	1.25	1.6	2.5
A		0.8～1.0	1.0～1.4	1.8～2.5	1.8～2.5
B		0.5～0.8	0.8～1.5	0.8～1.7	0.8～1.7
C		0.6～0.8	0.9～1.2	1.2～1.6	1.8～2.5

Recommended land dimensions for reflow-soldering (unit: mm)

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

Excess solder can affect the ability of chips to withstand mechanical stresses. Therefore, please take proper precautions when designing land-patterns.

Type		212 (4 circuits)
Size	L	2.0
	W	1.25
a		0.5～0.6
b		0.5～0.6
c		0.2～0.3
d		0.5



Type		212 (2 circuits)	110 (2 circuits)	096 (2 circuits)
Size	L	2.0	1.37	0.9
	W	1.25	1.0	0.6
a		0.5～0.6	0.35～0.45	0.25～0.35
b		0.5～0.6	0.55～0.65	0.15～0.25
c		0.5～0.6	0.3～0.4	0.15～0.25
d		1.0	0.64	0.45

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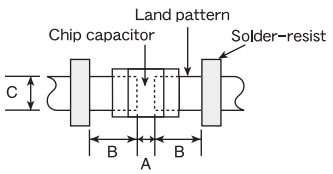
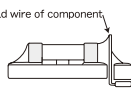
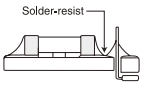
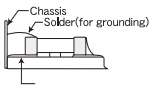
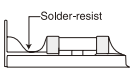
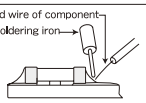
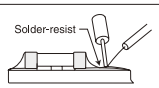
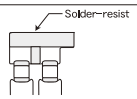
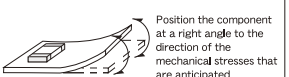
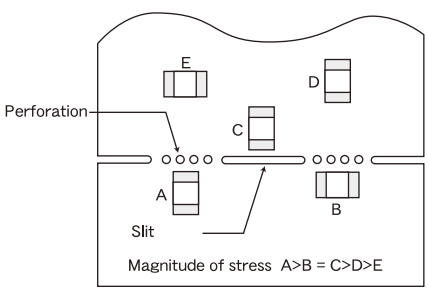
2.PCB Design	Pattern configurations (Capacitor layout on panelized [breakaway] PC boards) 1. After capacitors have been mounted on the boards, chips can be subjected to mechanical stresses in subsequent manufacturing processes (PCB cutting, board inspection, mounting of additional parts, assembly into the chassis, wave soldering the reflow soldered boards etc.) For this reason, planning pattern configurations and the position of SMD capacitors should be carefully performed to minimize stress.	LWDC Recommended land dimensions for reflow-soldering  (unit: mm) (2) Examples of good and bad solder application 1-1. The following are examples of good and bad capacitor layout; SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection. 1-2. To layout the capacitors for the breakaway PC board, it should be noted that the amount of mechanical stresses given will vary depending on capacitor layout. The example below shows recommendations for better design. 1-3. When breaking PC boards along their perforations, 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, any ideal SMD capacitor layout must also consider the PCB splitting procedure.

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

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		

	Not recommended	Recommended
Deflection of the board		



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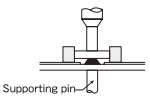
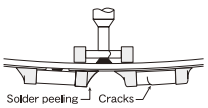
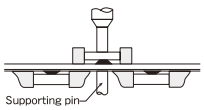
3.Considerations for automatic placement	Adjustment of mounting machine 1. Excessive impact load should not be imposed on the capacitors when mounting onto the PC boards. 2. The maintenance and inspection of the mounters should be conducted periodically.	1. If the lower limit of the pick-up nozzle is low, too much force may be imposed on the capacitors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle: (1) The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board. (2) The pick-up pressure should 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 should be used under the PC board. The following diagrams show some typical examples of good pick-up nozzle placement:

	Not recommended	Recommended
Single-sided mounting		
Double-sided mounting		

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

Selection of Adhesives
1. Mounting capacitors with adhesives in preliminary assembly, before the soldering stage, may lead to degraded capacitor characteristics unless the following factors are appropriately checked; the size of land patterns, type of adhesive, amount applied, hardening temperature and hardening period. Therefore, it is imperative to consult the manufacturer of the adhesives on proper usage and amounts of adhesive to use.

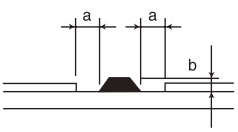
1. Some adhesives may cause reduced insulation resistance. The difference between the shrinkage percentage of the adhesive and that of the capacitors may result in stresses on the capacitors and lead to cracking. Moreover, too little or too much adhesive applied to the board may adversely affect component placement, so the following precautions should be noted in the application of adhesives.

(1) Required adhesive characteristics
a. The adhesive should be strong enough to hold parts on the board during the mounting & solder process.
b. The adhesive should have sufficient strength at high temperatures.
c. The adhesive should have good coating and thickness consistency.
d. The adhesive should be used during its prescribed shelf life.
e. The adhesive should harden rapidly
f. The adhesive must not be contaminated.
g. The adhesive should have excellent insulation characteristics.
h. The adhesive should not be toxic and have no emission of toxic gasses.

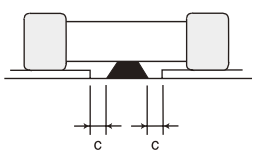
(2) The recommended amount of adhesives is as follows;

Figure	212/316 case sizes as examples
a	0.3mm min
b	100 ～120 μm
c	Adhesives should not contact the pad

Amount of adhesive



After capacitors are bonded



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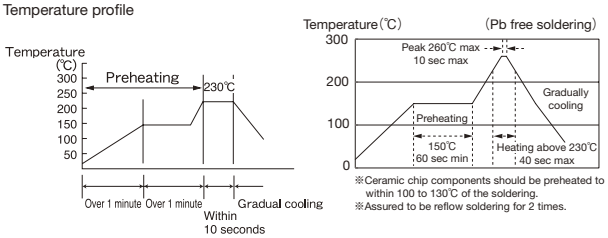
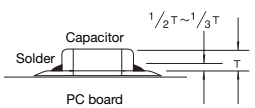
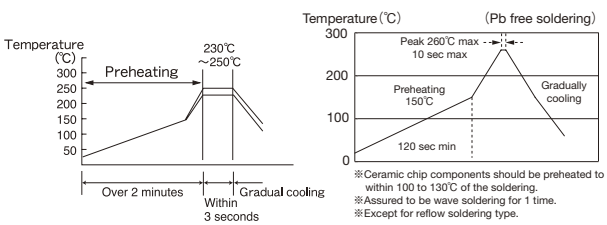
Stages	Precautions	Technical considerations
4. Soldering	Selection of Flux 1. Since flux may have a significant effect on the performance of capacitors, it is necessary to verify the following conditions prior to use; (1) Flux used should be with less than or equal to 0.1 wt% (equivelent to chroline) of halogenated content. Flux having a strong acidity content should not be applied. (2) When soldering capacitors on the board, the amount of flux applied should be controlled at the optimum level. (3) When using water-soluble flux, special care should be taken to properly clean the boards.	1-1. When too much halogenated substance (Chlorine, etc.) content is used to activate the flux, or highly acidic flux is used, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors. 1-2. Flux is used to increase solderability in flow soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect 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 by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux.
	Soldering Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions.	1-1. Preheating when soldering Heating: Ceramic chip components should be preheated to within 100 to 130℃ of the soldering. Cooling: The temperature difference between the components and cleaning process should not be greater than 100℃. Ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling. Therefore, the soldering process must be conducted with great care so as to prevent malfunction of the components due to excessive thermal shock.
	Sn-Zn solder paste can affect MLCC reliability performance. Please contact us prior to usage.	Recommended conditions for soldering [Reflow soldering] Temperature profile  Caution 1. The ideal condition is to have solder mass (fillet) controlled to 1/2 to 1/3 of the thickness of the capacitor, as shown below:  2. Because excessive dwell times can detrimentally affect solderability, soldering duration should be kept as close to recommended times as possible. [Wave soldering] Temperature profile  Caution 1. Make sure the capacitors are preheated sufficiently. 2. The temperature difference between the capacitor and melted solder should not be greater than 100 to 130℃ 3. Cooling after soldering should be as gradual as possible. 4. Wave soldering must not be applied to the capacitors designated as for reflow soldering only.

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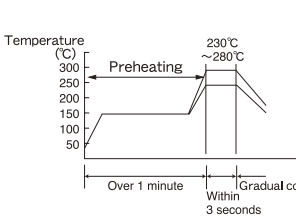
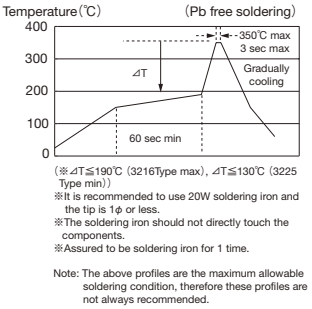
Stages	Precautions	Technical considerations
4. Soldering		[Hand soldering] Temperature profile   (※⊿T≦190℃ (3216Type max), ⊿T≦130℃ (3225 Type min)) ※It is recommended to use 20W soldering iron and the tip is 1φ or less. ※The soldering iron should not directly touch the components. ※Assured to be soldering iron for 1 time. Note: The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended. Caution 1. Use a 20W soldering iron with a maximum tip diameter of 1.0 mm. 2. The soldering iron should not directly touch the capacitor.
5.Cleaning	Cleaning conditions 1. When cleaning the PC board after the capacitors are all mounted, select the appropriate cleaning solution according to the type of flux used and purpose of the cleaning (e.g. to remove soldering flux or other materials from the production process.) 2. Cleaning conditions should be determined after verifying, through a test run, that the cleaning process does not affect the capacitor's characteristics.	1. The use of inappropriate solutions can cause foreign substances such as flux residue to adhere to the capacitor or deteriorate the capacitor's outer coating, resulting in a degradation of the capacitor's electrical properties (especially insulation resistance). 2. Inappropriate cleaning conditions (insufficient or excessive cleaning) may detrimentally affect the performance of the capacitors. (1) Excessive cleaning In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the capacitor or the soldered portion, or decrease the terminal electrodes' strength. Thus the following conditions should be carefully checked; Ultrasonic output Below 20 W/ ℓ Ultrasonic frequency Below 40 kHz Ultrasonic washing period 5 min. or less
6.Post cleaning processes	1. With some type of resins a 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 the capacitor's operating temperature, the stresses generated by the excess heat may lead to capacitor damage or destruction. The use of such resins, molding materials etc. is not recommended.	
7.Handling	Breakaway PC boards (splitting along perforations) 1. When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. Mechanical considerations 1. Be careful not to subject the capacitors to excessive mechanical shocks. (1) If ceramic capacitors are dropped onto the floor or a hard surface, they should not be used. (2) When handling the mounted boards, be careful that the mounted components do not come in contact with or bump against other boards or components.	

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Stages	Precautions	Technical considerations
8.Storage conditions	Storage 1. To maintain the solderability of terminal electrodes and to keep the packaging material 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 capacitor electrode solderability decreases as time passes, so should be used within 6 months from the time of delivery. ・Ceramic chip capacitors should be kept where no chlorine or sulfur exists in the air. 2. The capacitance value of high dielectric constant capacitors (type 2 &3) will gradually decrease with the passage of time, so this should be taken into consideration in the circuit design. If such a capacitance reduction occurs, a heat treatment of 150℃ for 1hour will return the capacitance to its initial level.	1. If the parts are stored in a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place. For this reason, components should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the capacitors.