

Change of epoxy coating - Industrial leaded MLCC (K series)

For further information, please contact your regional Vishay office.

CONTACT INFORMATION

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Description of Change: We will change the epoxy coating of the industrial leaded MLCC K series. Parts with new epoxy coating will be sent starting April 2025. The color of the epoxy will change from yellow to black. There will be no change in form/fit/function.

Reason for Change: Obsolescence of the current epoxy from April 2025 on.

Expected Influence on Quality/Reliability/Performance: Quality/Reliability/Performance will stay the same - no influence

Part Numbers/Series/Families Affected: Please see materials list on the succeeding page.

Vishay Brand(S): Vishay BCcomponents

Time Schedule:

Start Shipment Date: Mon Apr 28, 2025

Sample Availability: on request

Product Identification: By series name (K series)

Qualification Data: on request

This PCN is considered approved, without further notification, unless we receive specific customer concerns before Wed Feb 21, 2024 or as specified by contract.

Issued By: Florian Weyland, florian.veyland@vishay.com



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Product Change Notification



Product Group: CC/Mon Jan 22, 2024/PCN-CC-00001-2024-REV-0

1C10C0G100J050B	1C10C0G100J050R	1C10C0G100J100B	1C10C0G101J050B	1C10C0G101J050R
1C10C0G101J100B	1C10C0G102J050B	1C10C0G102J050R	1C10C0G102J100B	1C10C0G220J050B
1C10C0G220J050R	1C10C0G220J100B	1C10C0G220J100R	1C10C0G221J050B	1C10C0G221J050R
1C10C0G221J100B	1C10C0G222J050B	1C10C0G222J050R	1C10C0G222J100B	1C10C0G330J050B
1C10C0G330J050R	1C10C0G330J100B	1C10C0G331J050B	1C10C0G331J050R	1C10C0G331J100B
1C10C0G332J050B	1C10C0G332J100B	1C10C0G470J050B	1C10C0G470J050R	1C10C0G470J100B
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1C10X7R102K050R	1C10X7R102K100B	1C10X7R102K100R	1C10X7R103K050B	1C10X7R103K050R
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1C25C0G332J050B	1C25C0G332J100B	1C25C0G470J050B	1C25C0G470J100B	1C25C0G471J050B
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1C30X7R333K050B	1C30X7R333K100B	1C30X7R472K100B	1C30X7R473K050B	1C30X7R473K100B
1C30Z5U103M050B	1C30Z5U103M100B	1C30Z5U104M050B	1C30Z5U104M100B	1C30Z5U223M050B
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1C30Z5U473M050B	1C30Z5U473M100B	2C20C0G103J050B	2C20X7R105K050B	2C20X7R105K050R
2C20X7R224K050B	2C20X7R224K050R	2C20X7R334K050B	2C20X7R474K050B	2C20X7R474K050R



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2C30X7R334K050B	2C30X7R474K050B	2C30Z5U105M050B	2C30Z5U474M050B	2C37X7R105K050B
2C37X7R224K050B	2C37X7R334K050B	2C37X7R474K050B	2C37Z5U224M050B	2C37Z5U334M050B
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K100J10C0GH5UL2	K100J15C0GF53H5	K100J15C0GF53L2	K100J15C0GF53L5	K100J15C0GF55H5
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K100J15C0GF5UK5	K100J15C0GF5UL2	K100J15C0GF5WH5	K100J15C0GH53H5	K100J15C0GH53L2
K100J15C0GH5TH5	K100J15C0GH5TL2	K100J15C0GH5UH5	K100J15C0GH5UL2	K100K10C0GF53H5
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K100K10C0GH53H5	K100K10C0GH53L2	K100K10C0GH5TH5	K100K10C0GH5TL2	K100K10C0GH5UH5
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K101M15X7RF5TL2	K101M15X7RF5UH5	K101M15X7RF5UL2	K101M15X7RH53H5	K101M15X7RH53L2
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K101M15X7RK53L2	K101M15X7RK5TH5	K101M15X7RK5TL2	K101M15X7RK5UH5	K101M15X7RK5UL2
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K102G15C0GF5TH5	K102G15C0GF5TL2	K102G15C0GF5UH5	K102G15C0GF5WH5	K102G15C0GF5WH5-XD
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K102J10C0GF5UL2	K102J10C0GF5WH5	K102J15C0GF53H5	K102J15C0GF53L2	K102J15C0GF55H5
K102J15C0GF5TH5	K102J15C0GF5TK2	K102J15C0GF5TL2	K102J15C0GF5UH5	K102J15C0GF5UK5
K102J15C0GF5UL2	K102J15C0GF5WH5	K102J15C0GF5WH5-XD	K102J15X7RF5UH5	K102J15X7RH5UH5
K102J15X7RH5UK5	K102J20C0GH53H5	K102J20C0GH53L2	K102J20C0GH5TH5	K102J20C0GH5TL2
K102J20C0GH5UH5	K102J20C0GH5UK5	K102J20C0GH5UL2	K102J20C0GK53H5	K102J20C0GK53L2
K102J20C0GK5TH5	K102J20C0GK5TL2	K102J20C0GK5UH5	K102J20C0GK5UL2	K102J20C0GL53H5
K102J20C0GL5TH5	K102J20C0GL5UH5	K102K10C0GF53H5	K102K10C0GF53L2	K102K10C0GF5TH5



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K102K10C0GF5TL2	K102K10C0GF5UH5	K102K10C0GF5UL2	K102K10X7RF53H5	K102K10X7RF53L2
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K102K10X7RH53H5	K102K10X7RH53L2	K102K10X7RH5TH5	K102K10X7RH5TL2	K102K10X7RH5UH5
K102K10X7RH5UL2	K102K10X7RH5WH5	K102K15C0GF53H5	K102K15C0GF53L2	K102K15C0GF5TH5
K102K15C0GF5TL2	K102K15C0GF5UH5	K102K15C0GF5UL2	K102K15C0GF5WH5-XD	K102K15X7RF53H5
K102K15X7RF53H5-XA	K102K15X7RF53K2	K102K15X7RF53L2	K102K15X7RF55H5	K102K15X7RF55K2
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K102K15X7RF5UH5	K102K15X7RF5UK5	K102K15X7RF5UL2	K102K15X7RF5WH5	K102K15X7RF5WH5-XD
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K102K20C0GH5TH5	K102K20C0GH5TL2	K102K20C0GH5UH5	K102K20C0GH5UL2	K102K20C0GH53H5
K102K20C0GH53L2	K102K20C0GH5TH5	K102K20C0GH5TL2	K102K20C0GH5UH5	K102K20C0GH5UL2
K102K20C0GL53H5	K102K20C0GL5TH5	K102K20C0GL5UH5	K102M10X7RF53H5	K102M10X7RF53L2
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K102M10X7RH53L2	K102M10X7RH5TH5	K102M10X7RH5TL2	K102M10X7RH5UH5	K102M10X7RH5UL2
K102M15X7RF53H5	K102M15X7RF53L2	K102M15X7RF55L2	K102M15X7RF5TH5	K102M15X7RF5TK2
K102M15X7RF5TL2	K102M15X7RF5UH5	K102M15X7RF5UL2	K102M15X7RF5WH5	K102M15X7RF5WH5-XD
K102M15X7RH53H5	K102M15X7RH53L2	K102M15X7RH5TH5	K102M15X7RH5TL2	K102M15X7RH5UH5
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K152J20C0GH5TL2	K152J20C0GH5UH5	K152J20C0GH5UL2	K152J20C0GK53H5	K152J20C0GK53L2
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K152K10X7RF5TL2	K152K10X7RF5UH5	K152K10X7RF5UL2	K152K10X7RF5WH5	K152K10X7RH53H5
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K152K15X7RF5TL2	K152K15X7RF5UH5	K152K15X7RF5UL2	K152K15X7RF5WH5	K152K15X7RF5WH5-XD
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Product Change Notification



Product Group: CC/Mon Jan 22, 2024/PCN-CC-00001-2024-REV-0

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K331K10X7RF5TL2	K331K10X7RF5UH5	K331K10X7RF5UL2	K331K10X7RH53H5	K331K10X7RH53L2
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PPAP

Submission Date:

Jan 29,2024

Description

Mono Kap Capacitor

Vishay PN:

MK Series

Manufacturing Site:

Vishay Components (Huizhou) Co., Ltd.



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Section 1

DESIGN RECORDS



Radial Leaded Multilayer Ceramic Capacitors for General Purpose Class 1 and Class 2, 50 V_{DC}, 100 V_{DC}, 200 V_{DC}, 500 V_{DC}

**FEATURES**

- High capacitance with small size
- High reliability
- Crimp and straight leadstyles
- Material categorization:
for definitions of compliance please see
www.vishay.com/doc?99912

RoHS
COMPLIANT**APPLICATIONS**

- Temperature compensation
- Coupling and decoupling

QUICK REFERENCE DATA

DESCRIPTION	VALUE							
Ceramic Class	1				2			
Ceramic Dielectric	C0G				X7R			
Voltage (V _{DC})	50	100	200	500	50	100	200	500
Min. Capacitance (pF)	10	10	33	33	100	100	100	100
Max. Capacitance (pF)	10 000	5600	3900	1800	1 000 000	560 000	220 000	47 000
Mounting	Radial							

MARKING

Marking indicates capacitance value and tolerance in accordance with "EIA 198" and voltage marks.

OPERATING TEMPERATURE RANGE

C0G, X7R: - 55 °C to + 125 °C

TEMPERATURE CHARACTERISTICS

Class 1: C0G

Class 2: X7R

SECTIONAL SPECIFICATIONS

Climatic category (acc. to EN 60058-1)

Class 1 and 2: 55/125/21

APPROVALS

EIA 198

IEC 60384-9

DESIGN

- The capacitors consist of a general purpose MLCC
- The lead wires are 0.5 mm and are made of 100 % tinned copper clad steel wire
- The capacitors may be supplied with straight or kinked leads having a lead spacing of 2.5 mm and 5.0 mm
- Coating is made of yellow colored flame retardant epoxy resin in accordance with UL 94 V-0

CAPACITANCE RANGE

10 pF to 1 µF

TOLERANCE ON CAPACITANCE

± 5 %, ± 10 %, ± 20 %

RATED VOLTAGE

50 V_{DC}, 100 V_{DC}, 200 V_{DC}, 500 V_{DC}

TEST VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 250 % of rated voltage
- 200 V_{DC}: 150 % of rated voltage + 100 V_{DC}
- 500 V_{DC}: 130 % of rated voltage + 100 V_{DC}

INSULATION RESISTANCE AT RATED VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 100 GΩ or 1000 ΩF, whichever is less at rated voltage within 2 min of charging
- 200 V_{DC}, 500 V_{DC}, and size 10: 10 GΩ or 100 ΩF, whichever is less at rated voltage within 2 min of charging

DISSIPATION FACTOR

Class 1 0.1 % max. when C ≥ 30 pF
(at 1 MHz; 1 V where C ≤ 1000 pF, and at 1 kHz; 1 V where C > 1000 pF)

For C < 30 pF: DF = 100/(400 + 20 x C)
DF = dissipation factor in %;
C = capacitance value in pF

Class 2 2.5 % max. (at 1 kHz; 1 V)

**LEAD CONFIGURATION AND DIMENSIONS** (in millimeters)

L2 Component outline for lead spacing 2.5 mm ± 0.8 mm (straight leads)							
H5 Component outline for lead spacing 5.0 mm ± 0.8 mm (flat bent leads)							
K2 Component outline for lead spacing 2.5 mm ± 0.8 mm (outside kink)							
K5 Component outline for lead spacing 5.0 mm ± 0.8 mm (outside kink)							
SIZE CODE	Wb _{MAX.}	H _{MAX.}	T _{MAX.}	MAXIMUM SEATING HEIGHT (SH)			
				L2	H5	K2	K5
10	3.6	3.6	2.3	1.6	2.6	3.5	-
15	4.0	4.0	2.6	1.6	2.6	3.5	3.5
20	5.0	5.0	3.2	1.6	2.6	3.5	3.5

Notes

- Bulk packed types have a standard lead length L = 30 mm ± 5 mm
- The K5 lead style is not available for size 10
- L2 and H5 are preferred styles

MARKING

SIZE 10 AND 15 CAPACITANCE VALUE < 100 pF	SIZE 10 AND 15 CAPACITANCE VALUE ≥ 100 pF	SIZE 20
Vishay logo or BC logo t: Tolerance code XX: Capacitance code	Vishay logo or BC logo XXX: Capacitance code	Vishay logo or BC logo t: Tolerance code XXX: Capacitance code

Notes

- The capacitance code indicates actual capacitance in pF when capacitance value < 100 pF
- Two significant digits followed by one digit for the multiplier as given following: 1 = * 10, 2 = * 100, 3 = * 1000, 4 = * 10 000, 5 = * 100 000
- The tolerance codes are J = 5 %, K = 10 %, M = 20 %

ORDERING CODE INFORMATION

K	104	K	15	X7R	F	5	3	H	5
1	2 3 4	5	6 7	8 9 10	11	12	13	14	15
Product Type	Capacitance (pF)	Capacitance Tolerance	Size Code	T.C. Code	Rated Voltage	Lead Diameter	Packaging / Lead Length	Lead Style	Lead Spacing
K = radial leaded MLCC	The first two digits are the significant figures of capacitance and the last digit is a multiplier as follows: 0 = * 1 1 = * 10 2 = * 100 3 = * 1000 4 = * 10 000 5 = * 100 000	J = ± 5 % K = ± 10 % M = ± 20 %	Please refer to relevant datasheet	Please refer to relevant datasheet	F = 50 V _{DC} H = 100 V _{DC} K = 200 V _{DC} L = 500 V _{DC}	5 = 0.50 mm ± 0.05 mm	3 = bulk T = tape and reel U = ammo	H = flat crimp L = straight K = outside crimp	2 = 2.5 mm 5 = 5.0 mm



ORDERING CODES

DIELECTRIC COG						
CAP. (pF)	50 V _{DC}		100 V _{DC}		200 V _{DC}	500 V _{DC}
	SMALLER SIZE	NORMAL SIZE	SMALLER SIZE	NORMAL SIZE	NORMAL SIZE	NORMAL SIZE
10	K100#10C0GF5###	K100#15C0GF5###	K100#10C0GH5###	K100#15C0GH5###	-	-
12	K120#10C0GF5###	K120#15C0GF5###	K120#10C0GH5###	K120#15C0GH5###	-	-
15	K150#10C0GF5###	K150#15C0GF5###	K150#10C0GH5###	K150#15C0GH5###	-	-
18	K180#10C0GF5###	K180#15C0GF5###	K180#10C0GH5###	K180#15C0GH5###	-	-
22	K220#10C0GF5###	K220#15C0GF5###	K220#10C0GH5###	K220#15C0GH5###	-	-
27	K270#10C0GF5###	K270#15C0GF5###	K270#10C0GH5###	K270#15C0GH5###	-	-
33	K330#10C0GF5###	K330#15C0GF5###	K330#10C0GH5###	K330#15C0GH5###	K330#15C0GK5###	K330#15C0GL5##5
39	K390#10C0GF5###	K390#15C0GF5###	K390#10C0GH5###	K390#15C0GH5###	K390#15C0GK5###	K390#15C0GL5##5
47	K470#10C0GF5###	K470#15C0GF5###	K470#10C0GH5###	K470#15C0GH5###	K470#15C0GK5###	K470#15C0GL5##5
56	K560#10C0GF5###	K560#15C0GF5###	K560#10C0GH5###	K560#15C0GH5###	K560#15C0GK5###	K560#15C0GL5##5
68	K680#10C0GF5###	K680#15C0GF5###	K680#10C0GH5###	K680#15C0GH5###	K680#15C0GK5###	K680#15C0GL5##5
82	K820#10C0GF5###	K820#15C0GF5###	K820#10C0GH5###	K820#15C0GH5###	K820#15C0GK5###	K820#15C0GL5##5
100	K101#10C0GF5###	K101#15C0GF5###	K101#10C0GH5###	K101#15C0GH5###	K101#15C0GK5###	K101#15C0GL5##5
120	K121#10C0GF5###	K121#15C0GF5###	K121#10C0GH5###	K121#15C0GH5###	K121#15C0GK5###	K121#15C0GL5##5
150	K151#10C0GF5###	K151#15C0GF5###	K151#10C0GH5###	K151#15C0GH5###	K151#15C0GK5###	K151#15C0GL5##5
180	K181#10C0GF5###	K181#15C0GF5###	K181#10C0GH5###	K181#15C0GH5###	K181#15C0GK5###	K181#15C0GL5##5
220	K221#10C0GF5###	K221#15C0GF5###	K221#10C0GH5###	K221#15C0GH5###	K221#15C0GK5###	K221#15C0GL5##5
270	K271#10C0GF5###	K271#15C0GF5###	K271#10C0GH5###	K271#15C0GH5###	K271#15C0GK5###	K271#15C0GL5##5
330	K331#10C0GF5###	K331#15C0GF5###	K331#10C0GH5###	K331#15C0GH5###	K331#15C0GK5###	K331#15C0GL5##5
390	K391#10C0GF5###	K391#15C0GF5###	K391#10C0GH5###	K391#15C0GH5###	K391#15C0GK5###	K391#15C0GL5##5
470	K471#10C0GF5###	K471#15C0GF5###	K471#10C0GH5###	K471#15C0GH5###	K471#15C0GK5###	K471#20C0GL5##5
560	K561#10C0GF5###	K561#15C0GF5###	K561#10C0GH5###	K561#15C0GH5###	K561#15C0GK5###	K561#20C0GL5##5
680	K681#10C0GF5###	K681#15C0GF5###	-	K681#15C0GH5###	K681#15C0GK5###	K681#20C0GL5##5
820	K821#10C0GF5###	K821#15C0GF5###	-	K821#15C0GH5###	K821#15C0GK5###	K821#20C0GL5##5
1000	K102#10C0GF5###	K102#15C0GF5###	-	K102#20C0GH5###	K102#20C0GK5###	K102#20C0GL5##5
1200	-	K122#15C0GF5###	-	K122#20C0GH5###	K122#20C0GK5###	K122#20C0GL5##5
1500	-	K152#15C0GF5###	-	K152#20C0GH5###	K152#20C0GK5###	K152#20C0GL5##5
1800	-	K182#15C0GF5###	-	K182#20C0GH5###	K182#20C0GK5###	K182#20C0GL5##5
2200	-	K222#15C0GF5###	-	K222#20C0GH5###	K222#20C0GK5###	-
2700	-	K272#20C0GF5###	-	K272#20C0GH5###	K272#20C0GK5###	-
3300	-	K332#20C0GF5###	-	K332#20C0GH5###	K332#20C0GK5###	-
3900	-	K392#20C0GF5###	-	K392#20C0GH5###	K392#20C0GK5###	-
4700	-	K472#20C0GF5###	-	K472#20C0GH5###	-	-
5600	-	K562#20C0GF5###	-	K562#20C0GH5###	-	-
6800	-	K682#20C0GF5###	-	-	-	-
8200	-	K822#20C0GF5###	-	-	-	-
10 000	-	K103#20C0GF5###	-	-	-	-

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: $\pm 5\%$ = J; $\pm 10\%$ = K
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



DIELECTRIC X7R						
CAP. (pF)	50 V _{DC}		100 V _{DC}		200 V _{DC}	500 V _{DC}
	SMALLER SIZE	NORMAL SIZE	SMALLER SIZE	NORMAL SIZE	NORMAL SIZE	NORMAL SIZE
100	K101#10X7RF5###	K101#15X7RF5###	K101#10X7RH5###	K101#15X7RH5###	K101#15X7RK5###	K101#15X7RL5##5
120	K121#10X7RF5###	K121#15X7RF5###	K121#10X7RH5###	K121#15X7RH5###	K121#15X7RK5###	K121#15X7RL5##5
150	K151#10X7RF5###	K151#15X7RF5###	K151#10X7RH5###	K151#15X7RH5###	K151#15X7RK5###	K151#15X7RL5##5
180	K181#10X7RF5###	K181#15X7RF5###	K181#10X7RH5###	K181#15X7RH5###	K181#15X7RK5###	K181#15X7RL5##5
220	K221#10X7RF5###	K221#15X7RF5###	K221#10X7RH5###	K221#15X7RH5###	K221#15X7RK5###	K221#15X7RL5##5
270	K271#10X7RF5###	K271#15X7RF5###	K271#10X7RH5###	K271#15X7RH5###	K271#15X7RK5###	K271#15X7RL5##5
330	K331#10X7RF5###	K331#15X7RF5###	K331#10X7RH5###	K331#15X7RH5###	K331#15X7RK5###	K331#15X7RL5##5
390	K391#10X7RF5###	K391#15X7RF5###	K391#10X7RH5###	K391#15X7RH5###	K391#15X7RK5###	K391#15X7RL5##5
470	K471#10X7RF5###	K471#15X7RF5###	K471#10X7RH5###	K471#15X7RH5###	K471#15X7RK5###	K471#15X7RL5##5
560	K561#10X7RF5###	K561#15X7RF5###	K561#10X7RH5###	K561#15X7RH5###	K561#15X7RK5###	K561#15X7RL5##5
680	K681#10X7RF5###	K681#15X7RF5###	K681#10X7RH5###	K681#15X7RH5###	K681#15X7RK5###	K681#15X7RL5##5
820	K821#10X7RF5###	K821#15X7RF5###	K821#10X7RH5###	K821#15X7RH5###	K821#15X7RK5###	K821#15X7RL5##5
1000	K102#10X7RF5###	K102#15X7RF5###	K102#10X7RH5###	K102#15X7RH5###	K102#15X7RK5###	K102#15X7RL5##5
1200	K122#10X7RF5###	K122#15X7RF5###	K122#10X7RH5###	K122#15X7RH5###	K122#15X7RK5###	K122#15X7RL5##5
1500	K152#10X7RF5###	K152#15X7RF5###	K152#10X7RH5###	K152#15X7RH5###	K152#15X7RK5###	K152#15X7RL5##5
1800	K182#10X7RF5###	K182#15X7RF5###	K182#10X7RH5###	K182#15X7RH5###	K182#15X7RK5###	K182#15X7RL5##5
2200	K222#10X7RF5###	K222#15X7RF5###	K222#10X7RH5###	K222#15X7RH5###	K222#15X7RK5###	K222#15X7RL5##5
2700	K272#10X7RF5###	K272#15X7RF5###	K272#10X7RH5###	K272#15X7RH5###	K272#15X7RK5###	K272#15X7RL5##5
3300	K332#10X7RF5###	K332#15X7RF5###	K332#10X7RH5###	K332#15X7RH5###	K332#15X7RK5###	K332#20X7RL5##5
3900	K392#10X7RF5###	K392#15X7RF5###	K392#10X7RH5###	K392#15X7RH5###	K392#15X7RK5###	K392#20X7RL5##5
4700	K472#10X7RF5###	K472#15X7RF5###	K472#10X7RH5###	K472#15X7RH5###	K472#15X7RK5###	K472#20X7RL5##5
5600	K562#10X7RF5###	K562#15X7RF5###	K562#10X7RH5###	K562#15X7RH5###	K562#15X7RK5###	K562#20X7RL5##5
6800	K682#10X7RF5###	K682#15X7RF5###	K682#10X7RH5###	K682#15X7RH5###	K682#15X7RK5###	K682#20X7RL5##5
8200	K822#10X7RF5###	K822#15X7RF5###	K822#10X7RH5###	K822#15X7RH5###	K822#15X7RK5###	K822#20X7RL5##5
10 000	K103#10X7RF5###	K103#15X7RF5###	K103#10X7RH5###	K103#15X7RH5###	K103#15X7RK5###	K103#20X7RL5##5
12 000	K123#10X7RF5###	K123#15X7RF5###	-	K123#15X7RH5###	K123#15X7RK5###	K123#20X7RL5##5
15 000	K153#10X7RF5###	K153#15X7RF5###	-	K153#15X7RH5###	K153#15X7RK5###	K153#20X7RL5##5
18 000	K183#10X7RF5###	K183#15X7RF5###	-	K183#15X7RH5###	K183#15X7RK5###	K183#20X7RL5##5
22 000	K223#10X7RF5###	K223#15X7RF5###	-	K223#15X7RH5###	K223#15X7RK5###	K223#20X7RL5##5
27 000	K273#10X7RF5###	K273#15X7RF5###	-	K273#20X7RH5###	K273#20X7RK5###	K273#20X7RL5##5
33 000	K333#10X7RF5###	K333#15X7RF5###	-	K333#20X7RH5###	K333#20X7RK5###	K333#20X7RL5##5
39 000	K393#10X7RF5###	K393#15X7RF5###	-	K393#20X7RH5###	K393#20X7RK5###	K393#20X7RL5##5
47 000	K473#10X7RF5###	K473#15X7RF5###	-	K473#20X7RH5###	K473#20X7RK5###	K473#20X7RL5##5
56 000	K563#10X7RF5###	K563#15X7RF5###	-	K563#20X7RH5###	K563#20X7RK5###	-
68 000	K683#10X7RF5###	K683#15X7RF5###	-	K683#20X7RH5###	K683#20X7RK5###	-
82 000	K823#10X7RF5###	K823#15X7RF5###	-	K823#20X7RH5###	K823#20X7RK5###	-
100 000	K104#10X7RF5###	K104#15X7RF5###	-	K104#20X7RH5###	K104#20X7RK5###	-
150 000	-	K154#20X7RF5###	-	K154#20X7RH5###	K154#20X7RK5###	-
220 000	-	K224#20X7RF5###	-	K224#20X7RH5###	K224#20X7RK5###	-
330 000	-	K334#20X7RF5###	-	K334#20X7RH5###	-	-
470 000	-	K474#20X7RF5###	-	K474#20X7RH5###	-	-
560 000	-	K564#20X7RF5###	-	K564#20X7RH5###	-	-
680 000	-	K684#20X7RF5###	-	-	-	-
1 000 000	-	K105#20X7RF5###	-	-	-	-

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: $\pm 10\%$ = K; $\pm 20\%$ = M
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



TAPING AND PACKAGING

LABELLING

Each reel is provided with a label showing the following details:

Manufacturer, K style, capacitance, tolerance, batch number, quantity of components, rated voltage, dielectric.

On special request other designations can be shown.

For example:

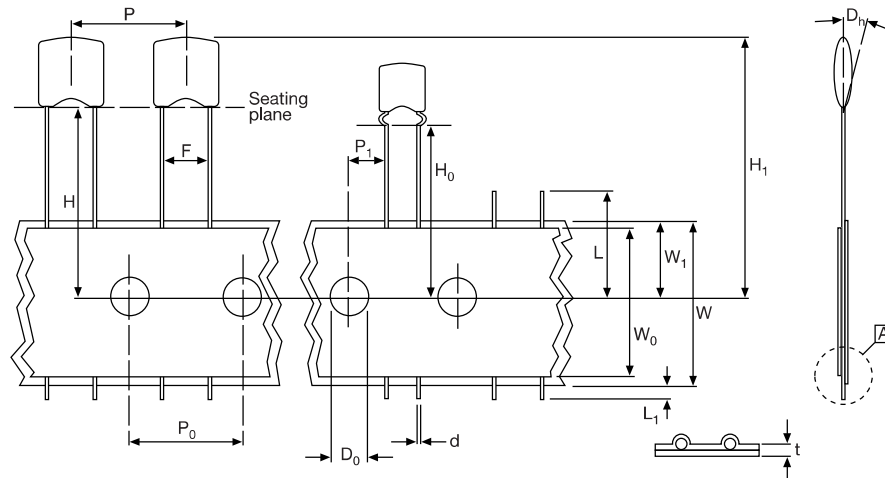


PACKAGING QUANTITIES AND BOX DIMENSIONS

PACKAGING	SIZE CODE	SMALLEST PACKAGING QUANTITY (SPQ)	BOX DIMENSIONS L x W x H (mm)
Tape on reel	10, 15	4000	370 x 370 x 60
	20	3000	
Ammopack	10, 15, 20	2500	335 x 290 x 50
Bulk ⁽¹⁾	10, 15, 20	5000	245 x 120 x 65

Note

⁽¹⁾ SPQ contains one or a multiple of poly-bags, 1000 units per bag

CAPACITORS ON TAPE


PARAMETER	SYMBOL	DIMENSIONS	
		mm	INCH
Cut-off length	L	≤ 11.0	≤ 0.443
Lead end protrusion	L ₁	≤ 1.0	≤ 0.039
Height to seating plane (straight leads)	H	≥ 18.0	≥ 0.709
Height to seating plane (crimp leads)	H ₀	16.0 ± 0.5	0.630 ± 0.020
Top of component height	H ₁	≤ 32	≤ 1.26
Body inclination	Δh	0.0 ± 1.0	0.000 ± 0.039
Carrier tape width	W	$18.0 + 1.0/- 0.5$	$0.709 + 0.039/- 0.020$
Hold down tape width	W ₀	15.0 REF.	0.591 REF.
Sprocket hole position	W ₁	$9.00 + 0.075/- 0.50$	$0.354 + 0.030/- 0.020$
Lead space	F	$2.50 + 0.60/- 0.40$	$0.100 + 0.024/- 0.016$
		$5.00 + 0.60/- 0.40$	$0.200 + 0.024/- 0.016$
Sprocket hole pitch	P ₀	12.70 ± 0.3	0.500 ± 0.012
Sprocket hole center to lead center at F = 2.5 mm	P ₁	5.08 ± 0.7	0.200 ± 0.028
Sprocket hole center to lead center at F = 5 mm		3.85 ± 0.7	0.150 ± 0.028
Sprocket hole diameter	D ₀	4.00 ± 0.30	0.157 ± 0.012
Overall tape thickness	t	≤ 0.90	≤ 0.035
Wire lead diameter	d	0.50 ± 0.05	0.020 ± 0.002
Taping pitch	P	12.7 REF.	0.50 REF.



REEL DATA

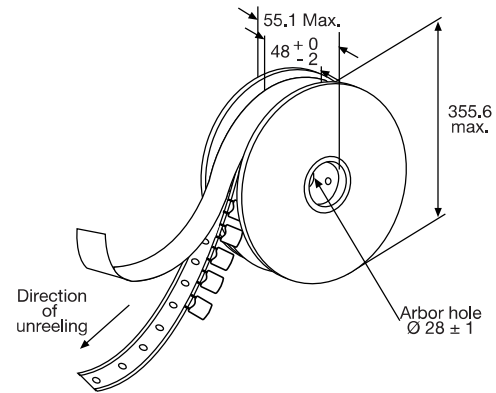
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

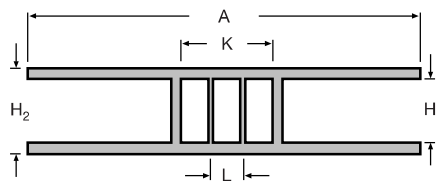
Tape begins and ends with a minimum of 4 empty positions (50 mm tape).

Maximum of 5 splicers per reel.

REEL



REEL DIMENSIONS



REEL SIZE		(mm)
A	Outer diameter	355.6 max.
L	Hole diameter	28 ± 1.5
K	Core diameter	90
H ₁	Internal width	48 + 0/- 2
H ₂	External width	55 max.

AMMOPACK DATA

A maximum of 0.5 % of the total number of capacitors per box may be missing.

A maximum of 2 consecutive vacant positions is followed by 6 consecutive components.

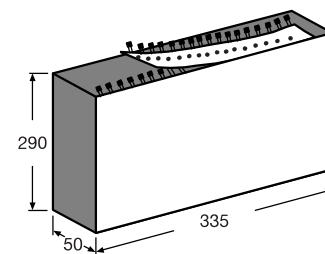
Tape begins and ends with a minimum of 4 empty positions (50 mm tape).

Maximum of 5 splicers per reel.

The cumulative pitch tolerance over 20 consecutive units is not to exceed ± 1.0 mm.

Lead space (F) shall be measured at (3.6 ± 0.5) mm from the capacitor seating plane.

AMMOPACK



RELATED DOCUMENTS

General Information

www.vishay.com/doc?45163



Radial Leaded Multilayer Ceramic Capacitors for Automotive Applications

Class 1 and Class 2, 50 V_{DC}, 100 V_{DC}, 200 V_{DC}

**FEATURES**

- AEC-Q200 qualified with PPAP available
- High reliability MLCC insert with wet build process
- High operating temperature up to 160 °C
- High capacitance with small size
- Radial mounting style
- Crimp and straight leadstyles
- Parts compliant with ELV directive
- For new designs the series K...G is recommended (www.vishay.com/ppg?45250)
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

RoHS
COMPLIANT**APPLICATIONS**

- Automotive

QUICK REFERENCE DATA

DESCRIPTION	VALUE							
Ceramic class	1				2			
Ceramic dielectric	C0G				X7R		X8R	
Voltage (V _{DC})	50	100	200	50	100	200	50	100
Min. capacitance (pF)	100	100	100	470	470	330	470	470
Max. capacitance (pF)	8200	8200	1000	1 000 000	470 000	100 000	150 000	27 000
Mounting	Radial							

MARKING

Marking indicates capacitance value and tolerance in accordance with "EIA 198".

OPERATING TEMPERATURE RANGE

-55 °C to +160 °C (50 % rated voltage above 150 °C)

TEMPERATURE CHARACTERISTICS

Class 1: C0G

Class 2: X7R, X8R

SECTIONAL SPECIFICATIONS

Climatic category (acc. to EN 60058-1)

Class 1 and 2: 55/125/21

APPROVALS

EIA 198

IEC 60384-9

AEC-Q200

DESIGN

- The capacitors consist of a high reliability MLCC
- The lead wires are 0.5 mm and are made of 100 % tinned copper clad steel wire (nickel wires for welding are available on request)
- The capacitors may be supplied with straight or kinked leads having a lead spacing of 2.5 mm and 5.0 mm

- Coating is made of yellow colored flame retardant epoxy resin in accordance with UL 94 V-0

CAPACITANCE RANGE

100 pF to 1 µF

TOLERANCE ON CAPACITANCE

± 5 %, ± 10 %, ± 20 %

RATED VOLTAGE

50 V_{DC}, 100 V_{DC}, 200 V_{DC}

TEST VOLTAGE

- 50 V_{DC} and 100 V_{DC}: 250 % of rated voltage
- 200 V_{DC}: 200 % of rated voltage

INSULATION RESISTANCE

100 GΩ or 1000 ΩF whichever is less at rated voltage within 2 min of charging.

DISSIPATION FACTOR

Class 1: 0.1 % max.

(at 1 MHz, 1 V where C ≤ 1000 pF;
at 1 kHz, 1 V where C > 1000 pF)

Class 2: 2.5 % max.

(at 1 kHz, 1 V)

LEAD CONFIGURATION AND DIMENSIONS in millimeters

L2 Component outline for lead spacing 2.5 mm ± 0.8 mm (straight leads) H5 Component outline for lead spacing 5.0 mm ± 0.8 mm (flat bent leads) K2 Component outline for lead spacing 2.5 mm ± 0.8 mm (outside kink) K5 Component outline for lead spacing 5.0 mm ± 0.8 mm (outside kink)								
SIZE CODE	Wb _{MAX.}	H _{MAX.}	T _{MAX.}	Lead Diameter	MAXIMUM SEATING HEIGHT (SH)			
					L2	H5	K2	K5
15	3.0 - 3.8	2.0 - 3.8	1.6 - 2.6	0.50 ± 0.05	1.6	2.6	3.5	3.5
20	4.3 - 5.1	2.5 - 5.1	1.9 - 3.2	0.50 ± 0.05	1.6	2.6	3.5	3.5

Notes

- Bulk packed types have a standard lead length L = 30 mm ± 5 mm
- L2 and H5 are preferred styles

MARKING

SIZE 15		SIZE 20	
Side One	Side Two	Side One	Side Two

Notes

- Two significant digits followed by one digit for the multiplier as given following: 1 = * 10, 2 = * 100, 3 = * 1000, 4 = * 10 000, 5 = * 100 000
- The tolerance codes are J = 5 %, K = 10 %, M = 20 %

ORDERING CODE INFORMATION

K	104	K	15	X7R	F	5	3	H	5	R
1	2 3 4	5	6 7	8 9 10	11	12	13	14	15	16
Product Type	Capacitance (pF)	Capacitance Tolerance	Size Code	T.C. Code	Rated Voltage	Lead Diameter	Packaging / Lead Length	Lead Style	Lead Spacing	AEC-Q200 qualified
K = radial leaded MLCC	The first two digits are the significant figures of capacitance and the last digit is a multiplier as follows: 1 = * 10 2 = * 100 3 = * 1000 4 = * 10 000 5 = * 100 000	J = ± 5 % K = ± 10 % M = ± 20 %	Please refer to relevant datasheet	Please refer to relevant datasheet	F = 50 V _{DC} H = 100 V _{DC} K = 200 V _{DC}	5 = 0.50 mm ± 0.05 mm	3 = bulk T = tape and reel U = ammo	H = flat crimp L = straight K = outside crimp	2 = 2.5 mm 5 = 5.0 mm	R = AEC-Q200 qualified and RoHS-compliant

**ORDERING CODES**

DIELECTRIC COG			
CAP. (pF)	50 V_{DC}	100 V_{DC}	200 V_{DC}
100	K101#15C0GF5###R	K101#15C0GH5###R	K101#15C0GK5###R
120	K121#15C0GF5###R	K121#15C0GH5###R	K121#15C0GK5###R
150	K151#15C0GF5###R	K151#15C0GH5###R	K151#15C0GK5###R
180	K181#15C0GF5###R	K181#15C0GH5###R	K181#15C0GK5###R
220	K221#15C0GF5###R	K221#15C0GH5###R	K221#15C0GK5###R
270	K271#15C0GF5###R	K271#15C0GH5###R	K271#15C0GK5###R
330	K331#15C0GF5###R	K331#15C0GH5###R	K331#15C0GK5###R
390	K391#15C0GF5###R	K391#15C0GH5###R	K391#15C0GK5###R
470	K471#15C0GF5###R	K471#15C0GH5###R	K471#15C0GK5###R
560	K561#15C0GF5###R	K561#15C0GH5###R	K561#15C0GK5###R
680	K681#15C0GF5###R	K681#15C0GH5###R	K681#15C0GK5###R
820	K821#15C0GF5###R	K821#15C0GH5###R	K821#15C0GK5###R
1000	K102#15C0GF5###R	K102#15C0GH5###R	K102#15C0GK5###R
1200	K122#15C0GF5###R	K122#15C0GH5###R	-
1500	K152#15C0GF5###R	K152#15C0GH5###R	-
1800	K182#15C0GF5###R	K182#15C0GH5###R	-
2200	K222#15C0GF5###R	K222#20C0GH5###R	-
2700	K272#15C0GF5###R	K272#20C0GH5###R	-
3300	K332#15C0GF5###R	K332#20C0GH5###R	-
3900	K392#15C0GF5###R	K392#20C0GH5###R	-
4700	K472#20C0GF5###R	K472#20C0GH5###R	-
5600	K562#20C0GF5###R	K562#20C0GH5###R	-
6800	K682#20C0GF5###R	K682#20C0GH5###R	-
8200	K822#20C0GF5###R	K822#20C0GH5###R	-

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: $\pm 5\%$ = J; $\pm 10\%$ = K
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



DIELECTRIC X7R			
CAP. (pF)	50 V _{DC}	100 V _{DC}	200 V _{DC}
330	-	-	K331#15X7RK5###R
390	-	-	K391#15X7RK5###R
470	K471#15X7RF5###R	K471#15X7RH5###R	K471#15X7RK5###R
560	K561#15X7RF5###R	K561#15X7RH5###R	K561#15X7RK5###R
680	K681#15X7RF5###R	K681#15X7RH5###R	K681#15X7RK5###R
820	K821#15X7RF5###R	K821#15X7RH5###R	K821#15X7RK5###R
1000	K102#15X7RF5###R	K102#15X7RH5###R	K102#15X7RK5###R
1200	K122#15X7RF5###R	K122#15X7RH5###R	K122#15X7RK5###R
1500	K152#15X7RF5###R	K152#15X7RH5###R	K152#15X7RK5###R
1800	K182#15X7RF5###R	K182#15X7RH5###R	K182#15X7RK5###R
2200	K222#15X7RF5###R	K222#15X7RH5###R	K222#15X7RK5###R
2700	K272#15X7RF5###R	K272#15X7RH5###R	K272#15X7RK5###R
3300	K332#15X7RF5###R	K332#15X7RH5###R	K332#15X7RK5###R
3900	K392#15X7RF5###R	K392#15X7RH5###R	K392#15X7RK5###R
4700	K472#15X7RF5###R	K472#15X7RH5###R	K472#15X7RK5###R
5600	K562#15X7RF5###R	K562#15X7RH5###R	K562#15X7RK5###R
6800	K682#15X7RF5###R	K682#15X7RH5###R	K682#15X7RK5###R
8200	K822#15X7RF5###R	K822#15X7RH5###R	K822#15X7RK5###R
10 000	K103#15X7RF5###R	K103#15X7RH5###R	K103#15X7RK5###R
12 000	K123#15X7RF5###R	K123#15X7RH5###R	K123#15X7RK5###R
15 000	K153#15X7RF5###R	K153#15X7RH5###R	K153#15X7RK5###R
18 000	K183#15X7RF5###R	K183#15X7RH5###R	K183#15X7RK5###R
22 000	K223#15X7RF5###R	K223#15X7RH5###R	K223#15X7RK5###R
27 000	K273#15X7RF5###R	K273#15X7RH5###R	K273#15X7RK5###R
33 000	K333#15X7RF5###R	K333#15X7RH5###R	K333#20X7RK5###R
39 000	K393#15X7RF5###R	K393#15X7RH5###R	K393#20X7RK5###R
47 000	K473#15X7RF5###R	K473#15X7RH5###R	K473#20X7RK5###R
56 000	K563#15X7RF5###R	K563#15X7RH5###R	K563#20X7RK5###R
68 000	K683#15X7RF5###R	K683#15X7RH5###R	K683#20X7RK5###R
82 000	K823#15X7RF5###R	K823#15X7RH5###R	K823#20X7RK5###R
100 000	K104#15X7RF5###R	K104#15X7RH5###R	K104#20X7RK5###R
150 000	K154#15X7RF5###R	K154#20X7RH5###R	-
220 000	K224#20X7RF5###R	K224#20X7RH5###R	-
330 000	K334#20X7RF5###R	K334#20X7RH5###R	-
470 000	K474#20X7RF5###R	K474#20X7RH5###R	-
560 000	K564#20X7RF5###R	-	-
680 000	K684#20X7RF5###R	-	-
1 000 000	K105#20X7RF5###R	-	-

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: ± 10 % = K; ± 20 % = M
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



DIELECTRIC X8R		
CAP. (pF)	50 V _{DC}	100 V _{DC}
470	K471#15X8RF5###R	K471#15X8RH5###R
560	K561#15X8RF5###R	K561#15X8RH5###R
680	K681#15X8RF5###R	K681#15X8RH5###R
820	K821#15X8RF5###R	K821#15X8RH5###R
1000	K102#15X8RF5###R	K102#15X8RH5###R
1200	K122#15X8RF5###R	K122#15X8RH5###R
1500	K152#15X8RF5###R	K152#15X8RH5###R
1800	K182#15X8RF5###R	K182#15X8RH5###R
2200	K222#15X8RF5###R	K222#15X8RH5###R
2700	K272#15X8RF5###R	K272#15X8RH5###R
3300	K332#15X8RF5###R	K332#15X8RH5###R
3900	K392#15X8RF5###R	K392#15X8RH5###R
4700	K472#15X8RF5###R	K472#15X8RH5###R
5600	K562#15X8RF5###R	K562#15X8RH5###R
6800	K682#15X8RF5###R	K682#15X8RH5###R
8200	K822#15X8RF5###R	K822#15X8RH5###R
10 000	K103#15X8RF5###R	K103#15X8RH5###R
12 000	K123#15X8RF5###R	K123#15X8RH5###R
15 000	K153#15X8RF5###R	K153#15X8RH5###R
18 000	K183#15X8RF5###R	K183#15X8RH5###R
22 000	K223#15X8RF5###R	K223#15X8RH5###R
27 000	K273#15X8RF5###R	K273#15X8RH5###R
33 000	K333#15X8RF5###R	-
39 000	K393#15X8RF5###R	-
47 000	K473#15X8RF5###R	-
56 000	K563#15X8RF5###R	-
68 000	K683#20X8RF5###R	-
82 000	K823#20X8RF5###R	-
100 000	K104#20X8RF5###R	-
150 000	K154#20X8RF5###R	-

Notes

- Lead diameter is 0.5 mm
- # 5th digit is capacitance tolerance code: $\pm 10\%$ = K; $\pm 20\%$ = M
- # 13th digit is packaging code: bulk = 3; reel = T; ammo = U
- # 14th digit is lead style code: L; H; K (L and H are preferred lead configuration)
- # 15th digit is lead spacing code: 2.5 mm = 2; 5.0 mm = 5



TAPING AND PACKAGING

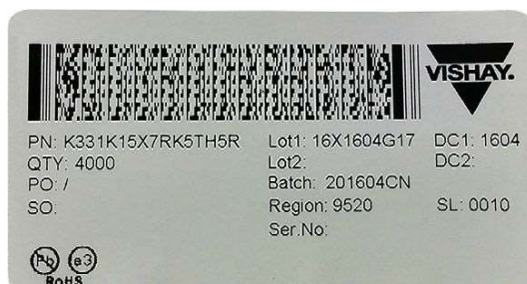
LABELLING

Each reel is provided with a label showing the following details:

manufacturer, K style, capacitance, tolerance, batch number, quantity of components, rated voltage, dielectric.

On special request other designations can be shown.

For example:



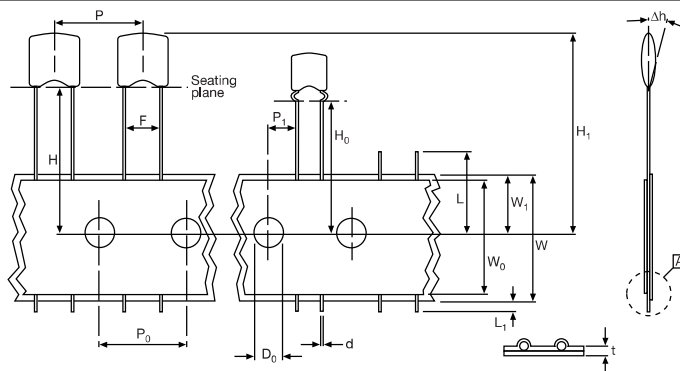
PACKAGING QUANTITIES AND BOX DIMENSIONS

PACKAGING	SIZE CODE	SMALLEST PACKAGING QUANTITY (SPQ)	BOX DIMENSIONS L x W x H (mm)
Tape on reel	15	4000	370 x 370 x 60
	20	3000	
Ammopack	15, 20	2500	335 x 290 x 50
Bulk ⁽¹⁾	15, 20	5000	245 x 120 x 65

Note

⁽¹⁾ SPQ contains one or a multiple of poly-bags, 1000 units per bag

CAPACITORS ON TAPE



PARAMETER	SYMBOL	DIMENSIONS	
		mm	INCH
Cut-off length	L	≤ 11.0	≤ 0.443
Lead end protrusion	L ₁	≤ 1.0	≤ 0.039
Height to seating plane (straight leads)	H	≥ 18.0	≥ 0.709
Height to seating plane (crimp leads)	H ₀	16.0 ± 0.5	0.630 ± 0.020
Top of component height	H ₁	≤ 32	≤ 1.26
Body inclination	Δh	0.0 ± 1.0	0.000 ± 0.039
Carrier tape width	W	18.0 + 1.0 / - 0.5	0.709 + 0.039 / - 0.020
Hold down tape width	W ₀	15.0 REF.	0.591 REF.
Sprocket hole position	W ₁	9.00 + 0.075 / - 0.50	0.354 + 0.030 / - 0.020
		2.50 + 0.60 / - 0.40	0.100 + 0.024 / - 0.016
Lead space	F	5.00 + 0.60 / - 0.40	0.200 + 0.024 / - 0.016
		12.70 ± 0.30	0.500 ± 0.012
Sprocket hole pitch	P ₀	12.70 ± 0.30	0.500 ± 0.012
Sprocket hole center to lead center at F = 2.5 mm	P ₁	5.08 ± 0.70	0.200 ± 0.028
Sprocket hole center to lead center at F = 5 mm		3.85 ± 0.70	0.150 ± 0.028
Sprocket hole diameter	D ₀	4.00 ± 0.30	0.157 ± 0.012
Overall tape thickness	t	≤ 0.90	≤ 0.035
Wire lead diameter	d	0.50 ± 0.05	0.020 ± 0.002
Taping pitch	P	12.7 REF.	0.50 REF.



REEL DATA

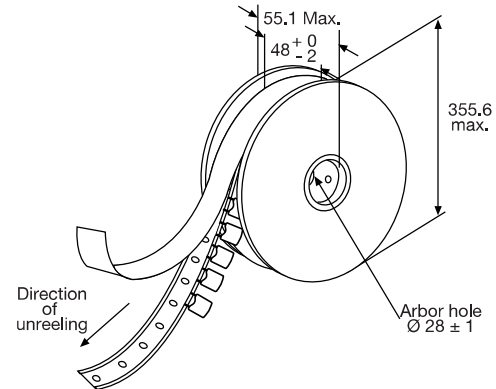
A maximum of 0.5 % of the total number of capacitors per reel may be missing.

A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

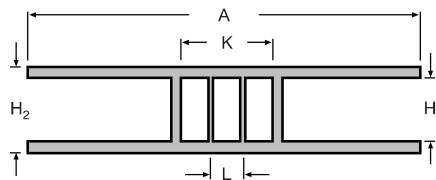
Tape begins and ends with a minimum of 4 empty positions (50 mm tape).

Maximum of 5 splicers per reel.

REEL



REEL DIMENSIONS



REEL SIZE		(mm)
A	Outer diameter	355.6 max.
L	Hole diameter	28 ± 1
K	Core diameter	90
H ₁	Internal width	$48 + 0 / - 2$
H ₂	External width	55 max.

AMMOPACK DATA

A maximum of 0.5 % of the total number of capacitors per pack may be missing.

A maximum of 1 consecutive vacant positions is followed by 6 consecutive components.

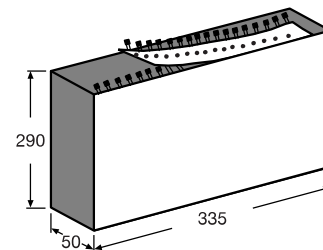
Tape begins and ends with a minimum of 4 empty positions (50 mm tape).

Maximum of 5 splicers per pack.

The cumulative pitch tolerance over 20 consecutive units is not to exceed ± 1.0 mm.

Lead space (F) shall be measured at (3.6 ± 0.5) mm from the capacitor seating plane.

AMMOPACK



RELATED DOCUMENTS

General Information

www.vishay.com/doc?45214



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Section 2

ENGINEERING CHANGE DOCUMENTS

Not Applicable



Section 3

CUSTOMER ENGINEER APPROVAL

Not Applicable



Section 4

DESIGN FMEA

Attachment 7

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (Design FMEA)

Project Name: LMLCC

Product Name: Automotive product For MK series

Key Date: 8 Mar., 2004

Team Member: K Hau, BY Chen, Defu Xiong, Andy Ye, MR Tang, Jerry Li, Wei Li

Item / Function	Requirement	Potential Failure mode	Potential Failure Effects	Classification	Sev.	Potential Cause of Failure	Current Status				
							Control Prevention	Occ.	Controls detection	Det.	Rf
Electric character	Cap: $\pm 5\%$ K: $\pm 10\%$ M: $\pm 20\%$ DF: $\leq 0.1\%$ X7R: $\leq 2.5\%$ No short/open Characteristics meet AEC Q200 (K**H series operation temperature is 175°C)	Cap. out of spec	weak electrical characteristics	SC	6	1. The C of chip is out of spec	Apply AEC-Q200 qualified chip	2	1.Samples inspection 2.Test samples according to AEC-Q200	5	6
					6	2.Assembled material caused C drift	C drift test/evaluation	2		5	6
		High DF	Reliability reduced		7	1.Weak chip	Apply AEC-Q200 qualified chip	2	1.Samples inspection 2.Test samples according to AEC-Q200	5	7
					7	2.Soldering affect	Apply Sn95Sb5 or SOLDER 96.5SN3AG0.5CU solder	2		5	7
					7	3.High dielectric loss tangent	Apply dielectric loss tangent is lower than 0.05% (P)	2		5	7
		Short /low IR	Electrical characteristics lost		8	1.Weak chip	Apply AEC-Q200 qualified chip	2	1.Samples inspection 2.Test samples according to AEC-Q200	5	8
					8	2. Moisture Content of coating powder is higher	Moisture Content lower than 0.6% for coating material	2		5	8
					8	3.Low resistance for coating material	Apply volume resistance is over 10*12Ω-cm for coating material	2		5	8
					8	4.Parts weak in High temp.	Apply high temp. coating material	2		5	8
		Open	Electrical characteristics lost		8	1.Weak chip	Apply AEC-Q200 qualified chip	2	1.Samples inspection 2. Pull strength test 3.Test samples according to AEC-Q200	5	8
					8	2.Unmatched flux with soldering&wire	1.CP wire with Sn95Sb5 soldering and flux 100 2.Nickel wire with Sn95Sb5 soldering and flux 1544	2		5	8

Attachment 7

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (Design FMEA)

Project Name: LMLCC

Product Name: Automotive product For MK series

Key Date: 8 Mar., 2004

Team Member: K Hau, BY Chen, Defu Xiong, Andy Ye, MR Tang, Jerry Li, Wei Li

Item / Function	Requirement	Potential Failure mode	Potential Failure Effects	Classification	Sev.	Potential Cause of Failure	Current Status				
							Control Prevention	Occ.	Controls detection	Det.	Rf
Mechanical character	Body size meet with current specification, Lead frame is meet customer requirement ; no appearance defect.	Body size out of spec	Affect assembly in customer side		8	1. Chip size out of spec	Apply standard size chip	2	Inspection samples for size	2	3
					8	2 FG size out of spec	Controlled body size according inner standard spec	2	Inspection samples for size	2	3
		Unbefitting Lead frame	Effect assembly in customer side		8	No matched lead mould with customer requirement	1. Current lead frame : "K" "H" and "L" 2. Design new mould according to customer requirement	2	Samples inspection	2	3
		Coating crack	Damp enter coating		7	1. Coefficient of thermal expansion unmatched with chip	apply coefficient of thermal expansion of powder is about 10 ⁻⁵ /°C	2	Temperature cycle test according to ACE Q200	5	7
					7	2. Coating powder can't withstand High temp.	Apply high temp. coating material	2	Run high temp. store test or endurance	5	7
		Poor pull strength	Parts broken		8	1. Weak chip	apply AEC-Q200 qualified chip	2	Terminal Strength inspection	5	8
					8	2. Poor tensile strength of wire	Apply tensile strength of wire is over 28 kg/mm ²	2		5	8
					8	3. Unbefitting coating material	Apply epoxy powder to coat	2		5	8
	Other character	Whisker	Short /Noise		8	Wrong wire and process	1. Apply CP wire or nickel wire or copper wire 2. Not expose copper during assembling for CP wire	2	whisker test	5	8
		Parts out of RoHS standard	Environment pollution	SC	8	Use material and process that contain lead	1. Apply lead free material and process 2. Apply different P/N to control pb-free parts	2	Supplier provide test report or RoHS compliance announce	2	3

Remark: When R.P.N ≥ 100 or S ≥ 9 correct action must be performance

Prepared by: MR Tang

Date:



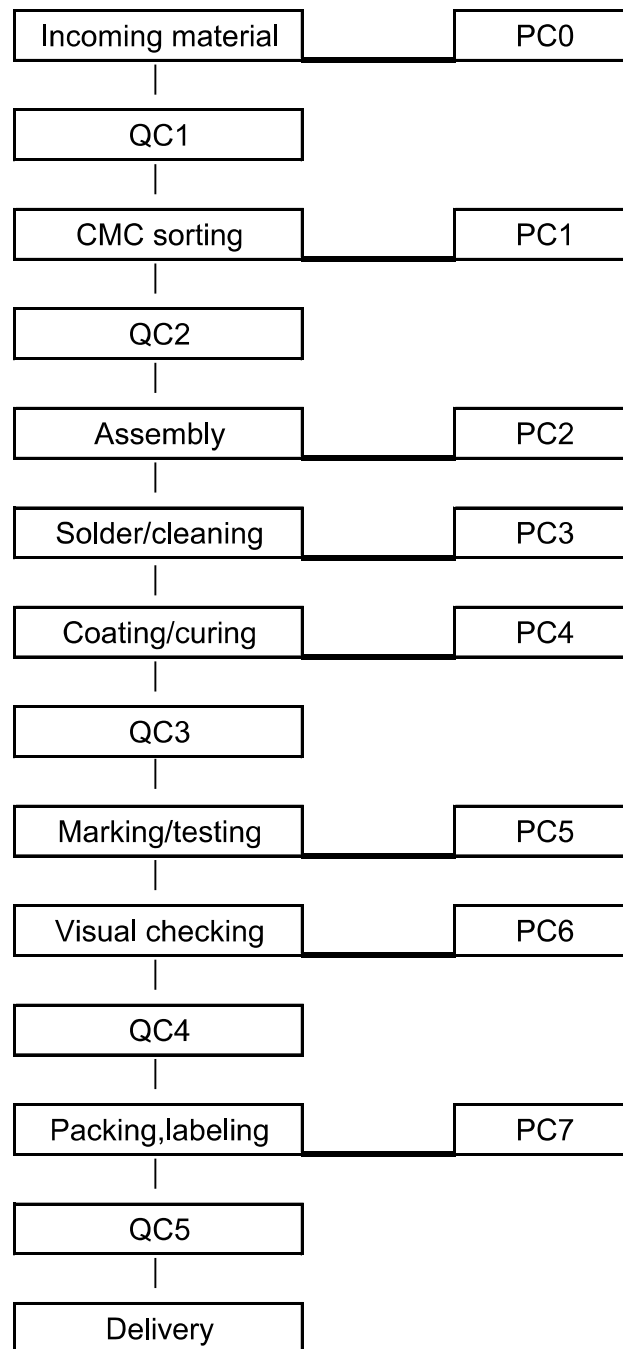
Section 5

PROCESS FLOW DIAGRAM



Flow Chart - Production and Tests

Mono Kap Capacitor



PC: Production control

QC: Quality control



Section 6

PROCESS FMEA

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)

Item : MK new machine

Component(s) : MK normal Automotive parts

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Design Responsibility :

Mingrong Tang

Key Date :

2017/6/1

Prepared by :

Mingrong Tang

FMEA Ur

Date (Ori

Edition:

process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
IQC inspection	all material RoHS compliance	Raw material out of RoHS standard	Scrap	8	SC	Vendor Error	Supplier updated RoHS test report each year	2	IQC check content according to QA-INS-929	5	80	
	Meet specification (lead wire)	The diameter out of spec.	Influence assembly for above the specification	8		Unstable supplier process	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
			Poor strength for below the specification	8		Unstable supplier process	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Thickness of Tin out of spec.	Whisker test NG	8		Process control failure	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Poor of solder ability	Soldering defect	8		The thickness of tin not enough Tin surface contamination	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Poor of heat resistance	Influence soldering	8		Plating defect	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Tensile strength out of spec.	Poor strength of termination	8		Raw material defect	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Bending cycle below the spec	Poor strength of termination	8		Raw material defect	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
		Elongation out of spec	Poor strength for below the specification	8		Raw material defect	Supplier inspection report	2	According to QA-INS-004 inspection	5	80	
			Influence assembly for above the specification	7		Raw material defect	Supplier inspection report	2	According to QA-INS-004 inspection	5	70	
	Meet specification (chip)	Chip size out of spec	Influence assembly	7		Unstable supplier process	Supplier provide PPAP	2	According to QA-INS-200 inspection	5	70	
		Capacitance out of spec.	Influence yield	7		Process control abnormal	Supplier provide PPAP	3	According to QA-INS-200 inspection 100% sorting test in CMC	4	84	
		DF Defect	Influence yield	7		Process control abnormal	Supplier provide PPAP	2	According to QA-INS-200 inspection 100% sorting test in CMC	4	56	
		IR defect	Influence yield	7		Process control abnormal	Supplier provide PPAP	3	According to QA-INS-200 inspection 100% sorting test in CMC	4	84	
		TV defect	Short	8		Process control abnormal	Supplier provide PPAP	2	According to QA-INS-200 inspection 100% sorting test in CMC	4	64	
		Poor of termination of strength	Open	8		Surface of tin oxidation	Supplier provide PPAP	2	Solder ability test	5	80	
				8		Poor contact between inner and outer electrode	Supplier provide PPAP	2	Pull strength test	5	80	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)

Item : MK new machine

Design Responsibility :

Mingrong Tang

FMEA Ur

Component(s) : MK normal Automotive parts

Key Date :

2017/6/1

Date (Ori

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Prepared by :

Mingrong Tang

Edition:

Requirements process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommendation
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
	Meet specification (epoxy powder)	Flow out of specification	Influence coating efficiency	4		Process control abnormal	Supplier inspection report	3	According to QA-INS-917 inspection	5	60	
		Gel time out of specification	Influence coating efficiency	4		The formula change	Supplier inspection report	2	According to QA-INS-917 inspection	5	40	
		Particle size distribution change	Influence coating quality	4		Process control abnormal	Supplier inspection report	2	According to QA-INS-917 inspection	5	40	
		Low volume resistivity	Influence product electrical characteristic	7		The formula changed	Supplier inspection report	2	According to QA-INS-917 inspection	5	70	
		High dielectric constant	Influence product electrical characteristic	7		The formula changed	Supplier inspection report	2	According to QA-INS-917 inspection	5	70	
		High dielectric loss of tangent	Influence product electrical characteristic	7		The formula changed	Supplier inspection report	2	According to QA-INS-917 inspection	5	70	
		High boiling water absorption	Rough coating surface	4		Process control abnormal	Supplier inspection report	3	According to QA-INS-917 inspection	5	60	
	Meet specification (Solder bar)	Solidus/Liquidus temperature abnormal	Melting point change	7		Component out of range	Supplier inspection report	2	According to QA-INS-933 inspection	5	70	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)

Item : MK new machine

Component(s) : MK normal Automotive parts

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Design Responsibility :

Mingrong Tang

Key Date :

2017/6/1

Prepared by :

Mingrong Tang

FMEA Ur

Date (Ori

Edition:

Requirements process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
Cap/DF test (X03)	sorting out cap/DF defect	Not entirely deaging	Influence yield	7	SC	The baking time less than 2hour	Set the automatic alarm in 2 hour	2	Baking record/alarm to remind	2	28	
				7		The baking temp less than 150°C	Setting temp:150°C	2	Baking record QA check samples	5	70	
		Wrong judgement on capacitance	Influence yield	7		Bad contact between test pin and chips	machine maintenance check list	2	Production inspection	5	70	
				7		Input error on capacitance range	According to MC-INC-003 control	2	Double check the range of capacitane	5	70	
				7		Ambient temperature/humidity out of room temperature	According to MC-INC-003 control	3	air conditioning control	2	42	
Packaging(X05)	Not mixture	Confusion on different products	Influence yield	7		Marking is unclear	Check according to traveller	2	Confirmed by receiver	6	84	
Lead style forming (P01)	lead style ,lead spacing,size meet with specification; can't damage the lead	Wrong wire	Affect assembly in customer side	8	SC	Using wrong material	Special P/N to control	2	First article inspection	5	80	
		Lead spacing out of spec	Affect assembly in customer side	8		1.Using wrong lead model fixture	Marked model fixture	2	1. First article inspection 2. 100% AOI	3	48	
				8		2.Unfitted machine adjustment	Standardized operation , Improve the operation skills	2	1. First article inspection 2. 100% AOI	3	48	
		Wrong lead style	Affect assembly in customer side	8		Using wrong lead model fixture	Marked model fixture	2	First article inspection	5	80	
		Dimension of H0 out of spec	Influence coating effect	6		Unfitted machine adjustment	According to MK-INS-022 and Datasheet control	3	First article inspection	5	90	
		Length of flattened portion out of Control range	Influence chip loading	6		Unfitted machine adjustment	According to MK-INS-022 control	2	First article inspection	5	60	
		Thickness of flattened portion lower than Control range	Influence chip loading	6		Air pressure less than 4Mpa/cm^2	According to MK-INS-022 setting	3	1.First article 2.Abnormal pressure alarm	3	54	
		Too deep indentation in kink	Not enough bending quantity	8		1.Mold damage	according to CD-PRO-001 to manage mould	2	First article inspection	5	80	
				8		Unfitted machine adjustment	According to MK-INS-022 control	2	First article inspection	5	80	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)

Item : MK new machine

Component(s) : MK normal Automotive parts

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Design Responsibility :

Mingrong Tang

Key Date :

2017/6/1

Prepared by :

Mingrong Tang

FMEA Ur

Date (Ori

Edition:

process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
Inserting chip(P01)	load chip in appropriate position	Chip loading offset	Influence coating size control	6		Unfitted machine adjustment	According to MK-INS-022 control	3	1. First article 2. 100% AOI	4	72	
				6		High vacuum negative pressure	1.According to MK-INS-022 control 2.setting max vacuum negative pressure alarm.	3	1.100% visual inspection 2.Abnormal pressure alarm	4	72	
		chip overturn	Influence coating size control	6		1.Unfitted machine adjustment	According to MK-INS-022 control	3	1.First article inspection 2.100% visual check	5	90	
				6		2. Poor clamping force of lead wire	Use wire material according to datasheet	3	1.First article inspection 2.100% visual check	5	90	
Soldering (P01)	Good soldering; no tin agglomeration; solder material is compliance with RoHS; chip surface is clean	Wrong solder	Affect assembly in customer side	8		Using wrong solder	Define p/n according to different series Remark in datasheet for special solder	2	First article inspection	5	80	
		Bad soldering	Poor electrical property/Reliability reduced	7		Soldering temperature less than 270°C or higher than 280°C	Tin temperature setting scope: 275±5°C	2	1.100% AOI 2.100% electric sorting 3.Abnormal temperature alarm	3	42	
				7		Soldering time is not enough	According to MK-INS-022 setting speed	2	1.100% AOI 2.100% electric sorting	3	42	
				7		Flux concentration is not enough	According to MK-INS-022 compound flux	2	1.100% AOI 2.100% electric sorting	3	42	
				7		wrong flux	CP/Cu wire with flux100 and nickel wire with flux 1544	2	1.100% AOI 2.100% electric sorting	3	42	
				7		Tin surface lower than the top of chip	According to MK-INS-022 control speed Low lever sensor alarm	2	1. First article inspection 2.100% AOI	4	56	
				7		Lead wire contamination or oxidation	Strengthen the incoming material control	2	100% AOI	4	56	
		Tin agglomeration in lead wire	Influence appearance (shallower)	4		The paper tape connection is not smooth	According to MK-INS-022 control(P)	3	100% AOI	4	48	
			Affect assembly in customer side (deeper)	8		Tin surface higher than corner position of wire	Setting soldering motor speed 145±15(P)	2	100% AOI	4	64	
		Hazardous substance in product out of RoHS standard	Hazardous substance out of RoHS standard in solder bath	8	SC	Hazardous heavy metal accumulated	Setting alarm limited according to MK-PRO-002	2	Test heavy metal in solder bath each half month	5	80	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(PFMEA)

Item : MK new machine

Design Responsibility : Mingrong Tang

FMEA Ur

Component(s) : MK normal Automotive parts

Key Date : 2017/6/1

Date (Ori

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Prepared by : Mingrong Tang

Edition:

Requirements process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
		Cleaning not enough	Influence coating	4		Cleaning temperature lower than 60 °C	Setting temperature range from 60°C to 80°C	2	1. First article inspection 2.Lower liquid level alarm	3	24	
				4		Liquid level lower than production	Adjust the liquid to the lowest position	3	1. First article inspection 2.Lower liquid level alarm	4	48	
				4		Liquor pollution	Replacing with cleanly liquor each shift	3	100% visual check	7	84	
Coating/ curing (P02)	No appearance defect; the coating length , width and thickness are within specification; SH is within specification; H+DR<=4,3mm, good coating curing, lead can't contamination by glue	Wrong coating powder	Affect product performance	8	SC	Using wrong coating powder	Define p/n according to different series Two machine to control different coating powder	2	First article inspection	5	80	
		Outline out of spec(length, width,thickness)	Affect assembly in customer side	8		Unfitted coating temperature	According to MK-INS-024 control	2	1. First article inspection 2.100% AOI for size 3. Temp. alarm	4	64	
				8		Unfitted coating speed	According to MK-INS-024 control	2	1. First article inspection 2.100% AOI for size	4	64	
				8		Coating wheels is not enough	Coating 4~ 8 wheels with current machine	3	1. First article inspection 2.100% AOI for size	4	96	Increase equipment
		H+DR out of specification	Affect assembly in customer side	8	SC*	Unfitted coating temperature	According to MK-INS-024 control	2	1.First article inspection 2.Temp. abnormal alarm	4	64	
				8		Unfitted coating speed	According to MK-INS-024 control	2	1. First article inspection 2.100% AOI	4	64	
				8		Unfitted coating depth	According MK-INS-024 to control	2	1.First article inspection 2. 100% AOI	4	64	
		SH/ SH+H out of specification	Affect assembly in customer side	8	SC*	Unfitted coating temperature	According to MK-INS-024 control	2	1. First article inspection 2.Temp. abnormal alarm 3.100% AOI	4	64	
				8		Unfitted coating speed	According to MK-INS-024 control	2	1. First article inspection 2.100% AOI	4	64	
				8		Unfitted wire forming mould	Apply for special mould for special requirement	2	1. First article inspection 2.100% AOI	4	64	
				8		Unfitted coating depth	According MK-INS-024 to control	2	1.First article inspection 2. 100% AOI	4	64	
		Rough surface	Influence appearance	4		Coating speed too fast	According to MK-INS-024 control	3	1.First article inspection 2.100% AOI	7	84	
				4		Not enough pre-heating temperature	According to MK-INS-024 control	3	1.First article inspection 2.100% AOI 3. Temp. abnormal alarm	5	60	
				4		Dampened epoxy powder	According to MK-INS-024 control	3	1.First article inspection 2. 100% AOI	7	84	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (PFMEA)

Item : MK new machine

Component(s) : MK normal Automotive parts

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Design Responsibility :

Mingrong Tang

Key Date :

2017/6/1

Prepared by :

Mingrong Tang

FMEA Ur

Date (Ori

Edition:

Requirements process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
		DR defect	Bad welding	7		Loosed fixture cause tape drop	Production inspection	4	1.First article inspection 2.100% AOI	3	84	
				7		Unmatch speed between tape and reel wheel	According to MK-INS-024 control	4		3	84	
		Crack of coating	Influence electrical property	7		Product contact each other during curing	Separation with thickness woven belt between paper tape	2	100% check appearance	6	84	
		Poor curing	Low pull force	6		Curing temperature lower than 140 °C	Setting temperature:150°C ± 10°C	2	1.Check coating with IPA/Pull test 2. Temp. alarm	4	48	
				6		Curing time less than 1.5 hours	Setting 1.5hour baking	2	1.Check coating with IPA/Pull test 2. Temp. alarm	4	48	
		Lead wire be contaminated by glue	Influence soldering	8		Adhesive tap be baked too long time	According to MK-INS-023 to control temp. & time	2	1,100% check appearance 2. Time/Temp alarm	4	64	
Marking (P04)	Mark is clear	Illegible fonts	Identification difficult	2		Wrong focus	According to MK-INS-025 to adjust machine	2	1.First article inspection 2,100% AOI check	4	16	
		Wrong fonts	Error identification	6		Creating wrong fonts	Scanning datasheet	2	1.First article inspection 2,100% AOI check	4	48	
		Parts missing in printing	Cannot be identified	5		Sensor moved away	Fixed sensors	2	100% AOI check	4	40	
				5		Marking speed is higher than 5MM/S	Setting speed:4±1MM/S	2	100% AOI check	4	40	
				5		Poor tape connection	According to MK-INS-022 connect tap	2	100% AOI check	4	40	
Electrical sorting (P04)	Cut the wire entirely	Not cut the wire entirely	Affects electrical performance test	8		The air pressure setting is lower	Setting the minual air pressure 4.0mpa	2	pressure alarm	4	64	
				8		The cutter is worn	According to MK-INS-022 control	2	First article inspection	4	64	
	Sorting out the electrical defect product	Missing cut off Cap defects	Electrical characteristics lost	8	SC	Wrong setting	According to datasheet and aging table to control	2	Double check	5	80	
				8		Poor contact between test pin and lead wire	According MK-INS-025 to control	2	1. First article inspection 2. Test cap/DF twice	4	64	
				8		Wrong aging rate calculation	According to QA-PES-102	2	Double check	5	80	
				8		Ambient temperature out of spec	According MK-INS-025 to control	2	Check on time	5	80	
				8		Not cut the wire entirely	According MK-INS-025 to control air pressure and cutter	2	First article inspection	5	80	
				8		Wrong setting	According datasheet to control	2	Double check	5	80	

附件七

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS (PFMEA)

Item : MK new machine

Component(s) : MK normal Automotive parts

Core team: Wenming Chen, Defu Xiong, Andy Ye, Mingrong Tang, Jieying Huang, Sam Li

Design Responsibility :

Mingrong Tang

Key Date :

2017/6/1

Prepared by :

Mingrong Tang

FMEA Ur

Date (Ori

Edition:

process	Requirement	Potential failure mode	Potential Effect(S) of Failure	Severity "S"	Classification	Potential Cause(s)/Mechanism(s) of Failure	Current state				R.P.N	Recommend
							Control prevent	Occurrence "O"	Control detect	Detection "D"		
		Missing cut off TV defects	Electrical characteristics lost	8		Poor contact between test pin and lead wire	According MK-INS-025 to control	2	First article inspection	5	80	
				8		Wrong step pitch	Adjust step pitch according to show on operation board	2	IR test after TV	4	64	
				8		Not cut the wire entirely	According MK-INS-025 to control air pressure and cutter	2	First article inspection	4	64	
		Missing cut off IR defects	Electrical characteristics lost	8		1.Wrong setting	According datasheet to control	2	Double check	5	80	
				8		2.Poor contact between test pin and lead wire	According MK-INS-025 to control	2	First article inspection	5	80	
				8		Not cut the wire entirely	According MK-INS-025 to control air pressure and cutter	2	First article inspection	5	80	
Appearance (P05)	sorting out appearance defect	Missing check	Reject by QA	4		Operator negligence	according to MK-INS-026	2	IPQC inspection	8	64	
Packaging (P07)	Meet the packaging specifications and no mixture	Carton be damaged	Safe trouble	8		Too sharp in head of bamboo stick	1.Add protect paper inner box 2.Application smooth bamboo stick)	2	100%check	5	80	
		Confusion on different products	Product being rejected	7		Pasted wrong lable	Control numbers of printing lable	2	100% scan check	4	56	
				7		Marking is not clear	According to MK-INS-029 control	2	QA random check samples	5	70	
		Packaging out of spec	Affect assembly in customer side	8		Operating error	1.According to product spec and MK INS-029 control 2.Training operator	2	QA check samples	5	80	

Remark: 1. SC* is only refer to special requirement parts.

2. When RPN≥100 or S≥9, correcte action must be performed

3. When AOI malfunction, The operator in VI station need 100% VI inspection for conerned quality of all parts without AOI



Section 7

CONTROL PLAN

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522					Original Date : 2004/03/20		
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang					Approved date by customer engineer dept(if		
								Approved date by customer quality dept(if re		
Part name/Description: MK automotive			Supplier/Plant Approved date							
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)							
Part/ Process Nr	Process name/ Operation description	Equipment	Characterisitic				Special char classify	Methods		
			No.	Product	Process	Product/Process tolerance		Evaluation/ Measurement tech	Size	
IQC	Lead wire		a	Diameter			Per QA-INS-004	Micrometer	Refer to WI <QA-INS-004>	
			b	Appearance			No oxidization,no bending etc	Naked eyes/ Magnifier(10x)		
			c	Solderability			Cover area >95%	Solder bath		
			d	Cure test			Per QA-INS-004	Oven		
			e	Solderability after curing			Cover area >95%	Solder bath		
			f	Bending test			Per QA-INS-004	Weight		
			g	Elongation test			Per QA-INS-004	Elongation tester		
			h	Aging test			No oxidization	Naked eyes/ Magnifier(10x)		
			i	Solderability after aging			Cover area >95%	Solder bath		
			j	Plating thickness			Per QA-INS-004	X-Ray		
		k	RoHS inspection	Inspection report	SC	Per QA-INS-929	X-Ray	Once		
	Chip		a	Chip size			Refer to <QA-INS-910>	Vernier caliper	5pcs	
			b	Appearance			Refer to <QA-INS-910>	Naked eyes/ Magnifier(10x)	500pcs	
			c	CAP		SC	Refer to <QA-INS-910>	capacitance tester	LEVEL II S4 AQL	
			d	DF			Refer to <QA-INS-910>	capacitance tester	LEVEL II S4 AQL	
			e	Withstanding voltage			Refer to <QA-INS-910>	Voltage tester	LEVEL II S4 AQL	
			f	Breakdown voltage			Refer to <QA-INS-910>	Voltage tester	30pcs	

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20		
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if		
							Approved date by customer quality dept(if re		
Part name/Description: MK automotive			Supplier/Plant Approved date						
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)						
Part/ Process Nr	Process name/ Operation description	Equipment	Characteristic			Special char classify	Methods		
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech	Size
IQC			g	IR			Refer to <QA-INS-910>	IR tester	LEVEL II S4 AQL I
			h	Temperature coefficient			Refer to <QA-INS-910>	TC machine	5pcs
			i	Pull test			Refer to <QA-INS-910>	Pull machine	5pcs
			j		Ambient		Refer to <QA-INS-301>	Temperature/ humidity meter	1 time
	EPOXY		a		Outgoing report		Refer to outgoing report	Outgoing report	1time
			b		Production try		Normal	Try report	1time
			c	RoHS inspection	Inspection report	SC	Per QA-INS-929	X-Ray	Once
	SOLDER		a	Chip size			Refer to <QA-INS-200>	Vernier caliper	5pcs
			b	RoHS inspection	Inspection report	SC	Per QA-INS-929	X-Ray	Once
CMC	Baking	oven	a	Class 2 only	Temperature/ Time		150±5°C/1hr	Presetting meter	100%
	CAP /DF Sorting	Sorting machine	a	CAP		SC	Refer to product specification	Presetting machine	100%
			b	DF					100%
			c		Ambient		Temperature: 25±3°C Humidity: ≤75%	Temperature/ humidity meter	2 times

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20		
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if		
							Approved date by customer quality dept(if re		
Part name/Description: MK automotive			Supplier/Plant Approved date						
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)						
Part/ Process Nr	Process name/ Operation description	Equipment	Characteristic			Special char classify	Methods		
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech	Size
CMC	QA inspection		a	CAP		SC	Refer to product specification	capacitance tester	50pcs
			b	DF/Q					50pcs
	Packaging	Balance	a	Quantity			Error < 5/1000	Balance	Weigh 3 boards
			b		Label		No error	Naked eyes	100%
P01	Assembly	Forming machine	a	Lead space		SC	Refer to product specification	Vernier caliper AOI	5pcs
			b	Lead style			Refer to product specification	Model	5pcs
			c	Seated height H0			Refer to product specification	Caliper/model	5pcs
			d	flattened portion thickness/length			Refer to WI <MK-INS-022>	Vernier caliper	5pcs
			e	Bending strength			>5time		5pcs
			f	K/θ			Refer to product specification	projector	1pc
		Inserting machine	a		Speed		Refer to WI <MK-INS-022>	Speed meter	1 time
			b		Flux concentration (not applicable to 1544)		Refer to WI <MK-INS-022>	Balance	1 time
			c		Flux temperature (not applicable to 1544)		Refer to WI <MK-INS-022>	Temperature meter	2 time
			a		Preheating temperature		Refer to WI <MK-INS-022>	Temperature meter	1 time
			b		Soldering temperaton		Refer to WI <MK-INS-022>	Temperature meter	1 time
			c		Soldering moter speed		Refer to WI <MK-INS-022>	Speed meter	1 time
			d		Ultrasonic cleaning		Refer to WI <MK-INS-022>		100%

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20	
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if	
							Approved date by customer quality dept(if re	
Part name/Description: MK automotive			Supplier/Plant Approved date					
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)					
Part/ Process Nr	Process name/ Operation description	Equipment	Characteristic			Special char classify	Methods	
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech
		Soldering machine	e		Cleaning temperature		Refer to WI <MK-INS-022>	Temperature meter
			f		Cleaning heigh		immersed chip	Naked eyes
			g		Change cleaning liquid		Refer to WI <MK-INS-022>	Checking reord
			h	Appearance			Refer to WI<MK-INS-022>	AOI (When AOI out of order,used naked eyes/10XMagnifier)
			i	RoHS test for solder bath		SC	Refer to WI<MK-PRO-002>	X-Ray machine
P02	Coating	Coating machin	a		Epoxy storage temp.		<10°. C	Temperature meter
			b		Storage at room temp. before using		≥8hrs	
			c		Preheating temperature		Refer to WI<MK-INS-024>	Temperature meter
			d		Speed		Refer to WI<MK-INS-024>	Speed meter
			e		Air pressure(flux)		Refer to WI<MK-INS-024>	Pressure meter
			f	Size (Length,width, thickness)		SC	Refer to specification	Vernier caliper
								AOI
			g	H+DR		SC*	Refer to specification	Projector/model
								AOI
			h	Seated height		SC*	Refer to specification	Projector/model
								AOI
			i	Seated height + body height (SH+H)		SC*	Refer to specification	Projector/model
								AOI
			k	Appearance			Refer to WI<MK-INS-024>	AOI

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20	
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if	
							Approved date by customer quality dept(if re	
Part name/Description: MK automotive			Supplier/Plant Approved date					
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)					
Part/ Process Nr	Process name/ Operation description	Equipment	Characteristic			Special char classify	Methods	
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech
	Curing	oven	a		Temperature		150°C ± 10°C	Temperature meter
			b		Time		90min	Time meter
			c	Curing level			Refer to <MK-INS-023>	Wipe with Acetone
P03	Marking	Laser printing machine	a	Marking number			Refer to specification	Naked eyes
			b		Speed		4±1mm/s	Speed meter
			c	Appearance			Refer to specification	AOI (When AOI out of order,used naked eyes/10XMagnifier)
			d	Cutting			Wire break	Naked eyes
P04	Electricity sorting	Sorting machine	a		Cap, DF, TV, IR critical samples confirm.		Refer to <MK-INS-024>	
			b	CAP		SC	Refer to specification	capacitance tester
			c	DF/Q			Refer to specification	
			d		Ambient		Temperature:25±3°C Humidity: ≤75%	Temperature/ humidity meter
			e	Withstanding voltage			Refer to specification	Voltage tester
			f	IR			Refer to specification	IR tester
			g	CAP		SC	Refer to specification	capacitance tester
			h	DF/Q			Refer to specification	
			i		Air pressure		≥4.0mpa	Pressure meter
P05	Appearance		a	Pin defect			Refer to <MK-INS-026>	Naked eyes/ Magnifier(10x)
			b	Coating defect				
			c	Marking defect				

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample		● Try run	● Production	Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20	
Part Nr/Lastest change level				Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if	
								Approved date by customer quality dept(if re	
Part name/Description: MK automotive				Supplier/Plant Approved date					
Supplier/Plan: Vishay components(Huizhou)				Other Approved date(if req'd)					
Part/ Process Nr	Process name/ Operation description	Equipment	Characterisitic			Special char classify	Methods		
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech	Size
P06	QA inspection	capacitance tester	a	CAP		SC	QA-INS-508	capacitance tester	AQL=0.1(accept lev
			b	DF/Q					
			c		Ambient		Temperature:25±3°C Humidity: ≤75%	Temperature/ humidity meter	2 time
		IR tester	d	IR			QA-INS-508	IR tester	Reduction 0.1 acc level:s-4
		Voltage tester	e	Withstanding voltage				Voltage tester	AQL=0.025
			f	Diameter of wire			Specification	Vernier caliper	10pcs
			g	Lead space		SC	Specification	Steel ruler	10pcs
			h	Size (Length,width, thickness)		SC		Vernier caliper	10pcs
			i	Seated height (SH)		SC*		Projector/model	5pcs
			j	Seated height + body height (SH+H)		SC*		Projector/model	5pcs
			k	Lead style				Naked eyes	10pcs
			l	Ho/L				Vernier caliper	10pcs
			m	Hole space				Ho board	16pcs
			n	Diameter of hole				Vernier caliper	10pcs
			o	Pull test			QA-INS-906	Pull machine	20pcs

Attachment 6

Quality Control Plan of MK

Nr.: APQP-MONO KAP-06

Sample ● Try run ● Production			Contactor:Zheng Y.L/Tel Nr 0752-3355373 EXT.7522				Original Date : 2004/03/20		
Part Nr/Lastest change level			Core team , Leader: Zheng Y.L Member: Bangyou Chen//MingrongTang/Wei Li /Xiangwei Ye/Defu Xiong/Jieying Huang				Approved date by customer engineer dept(if		
							Approved date by customer quality dept(if re		
Part name/Description: MK automotive			Supplier/Plant Approved date						
Supplier/Plan: Vishay components(Huizhou)			Other Approved date(if req'd)						
Part/ Process Nr	Process name/ Operation description	Equipment	Characterisitic			Special char classify	Methods		
			No.	Product	Process		Product/Process tolerance	Evaluation/ Measurement tech	Size
			p	Solderability			QA-INS-765	Solder bath	10pcs
			q	Appearance			QA-INS-508	naked eyes /Magnifier(10x)	AQL=0.4(Accept lev
		r	All function and dimension measurement			specification		1.Cap/DF/TV/IR:500 2.Mechanical performance/ Solderability: 30pcs	
P07	Packaging	Packing machine	a	Quantity			Refer to WI<MK-INS-029>	Balance/counter	100%
			b	label			Refer to packing specification	SCAN	100%
			c	Packing method			Refer to packing specification	Naked eyes	100%
P8	QA final inspection	Scanner	a	SPQ			Refer to packing specification	Naked eyes	1 box
			b	label			Refer to packing specification	Naked eyes	10%
Lab	Reliability test	Life oven	a	Life test	Temperature/ time		QA-INS-607	capacitance tester IR tester voltage tester	20pcs
		Humidity chamber	b	Humidity test	Humidity/ time		QA-INS-608		20pcs
		Thermal change chamber	c	Thermal shock	High/low temperature, time		QA-INS-602		10pcs
		Solder bath	d	Resistance to soldering heat	Temperature/ time		QA-INS-611		10pcs
	Whisker test	Humidity & thermal shock chamber	E	Whisker test	Humidity/ Temperature/time		Vishay specification(<40um whisker)	Microscope	3pcs/each lot , for 3 lots .
	AEC-Q200 test		f				QA-INS-626		Once

Note: 1. SC* Only for products with special requirements on product specifications.



Section 8

MEASUREMENT SYSTEM ANALYSIS STUDIES



Gage and Test Equipment Evaluation

Vishay Components (Huizhou) Co., Ltd. perform annual Gage R&R studies on items of major test equipment.

The current Gage R&R results as below:

Variable	Gage Type	Gage R&R
Wb (Body width)	Digital caliper (2012487921)	7.43%
SH (Seat height)	Projector (PJ3006E0105)	0.02%
Capacitance	E4981A Capacitance testr (My48311633)	1.26%



Section 9

DIMENSION RESULTS



Vishay C

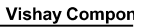
Layout Inspection and Functional Testing
全功能尺寸测试报告

Lot No.:	16X2230S02	P/N:	K331J15C0GH53H5H				Tester 测试员	Rui ying Yu	Test date 测试日期
Equipment: 使用仪器	Digital callipers 数显卡尺	Steel ruler 钢尺	Projector 投影仪	Hi-pot tester 电压机		Pull tester 拉力	Solder oven 锡炉		Solder content 锡成份
Equipment No. 仪器编号	500-196-20 12487921	SRENRB-30	PJ300 6E0105	19073 0003593		20FGN 0001731	REX-C100 TCRX00-23		Sn96.5/ Ag3.0/Cu0

Test data 测试数据如下

Immersing in IPA for 5 minutes, Pass

NO.	Wb(mm)	H (mm)	T(mm)	F (mm)	L(mm)	SH (mm)	G(mm)	K左(mm)	K右(mm)	左θ角度	右θ角度	P(mm)	PO(mm)	DO(mm)	HO(mm)	H1(mm)	W(t
1	3.21	2.58	1.98	5.18	26.0	1.802	0.49	1.621	1.492	108	109	NA					
2	3.23	2.62	2.01	5.12	26.0	1.770	0.49	1.550	1.512	109	111						
3	3.21	2.61	2.05	5.05	26.0	1.717	0.49	1.548	1.532	109	110						
4	3.25	2.76	2.05	5.13	26.0	1.745	0.49	1.547	1.550	109	109						
5	3.23	2.67	2.11	5.07	26.0	1.737	0.50	1.536	1.501	108	111						
6	3.24	2.62	2.06	5.16	26.0	1.833	0.50	1.531	1.511	109	111						
7	3.23	2.58	2.08	5.04	26.0	1.792	0.50	1.532	1.506	108	110						
8	3.23	2.68	2.05	5.13	26.0	1.772	0.49	1.561	1.503	109	111						
9	3.26	2.71	2.05	5.14	26.0	1.758	0.49	1.557	1.492	109	111						
10	3.30	2.70	2.10	5.07	26.0	1.731	0.49	1.546	1.507	109	111						
11	3.33	2.61	1.99	5.12	26.0	1.809	0.49	1.553	1.503	109	111						
12	3.24	2.73	2.02	5.22	26.0	1.746	0.49	1.539	1.522	109	111						
13	3.24	2.64	2.03	5.06	26.0	1.823	0.49	1.518	1.510	108	110						
14	3.20	2.70	2.00	5.09	26.0	1.804	0.49	1.527	1.509	108	110						
15	3.20	2.51	2.01	5.10	26.0	1.972	0.50	1.526	1.498	109	110						
16	3.22	2.51	1.98	5.11	26.0	1.912	0.50	1.553	1.531	109	110						
17	3.20	2.65	2.02	5.15	26.0	1.767	0.50	1.562	1.511	109	110						
18	3.23	2.66	2.05	5.18	26.0	1.723	0.50	1.567	1.506	109	110						
19	3.23	2.69	2.01	5.14	26.0	1.793	0.50	1.553	1.501	109	111						
20	3.23	2.45	2.00	5.13	26.0	2.031	0.50	1.549	1.502	109	111						
21	3.24	2.68	2.05	5.14	26.0	1.874	0.49	1.556	1.492	108	111						
22	3.23	2.60	1.96	5.12	26.0	1.767	0.49	1.538	1.498	108	111						
23	3.25	2.77	2.06	5.13	26.0	1.686	0.49	1.541	1.502	108	111						
24	3.22	2.62	1.94	5.07	26.0	1.889	0.49	1.543	1.506	108	111						
25	3.20	2.53	1.99	5.21	26.0	1.935	0.49	1.563	1.511	108	110						
26	3.23	2.69	1.98	5.06	26.0	1.892	0.49	1.571	1.497	108	110						
27	3.21	2.72	2.03	5.03	26.0	1.877	0.49	1.563	1.499	108	110						
28	3.21	2.86	2.04	5.07	26.0	1.863	0.49	1.559	1.504	109	110						
29	3.21	2.83	2.01	5.13	26.0	1.739	0.49	1.562	1.507	109	110						
30	3.21	2.67	1.93	5.05	26.0	1.820	0.49	1.548	1.532	109	110						
Min	3.20	2.45	1.93	5.03	26.0	1.686	0.49	1.518	1.492	108	109	0.0	0.0	0.00	0.0	0.00	0.0
Max	3.33	2.86	2.11	5.22	26.0	2.031	0.50	1.621	1.550	109	111	0.0	0.0	0.00	0.0	0.00	0.0
Mean	3.23	2.66	2.02	5.11	26.0	1.813	0.49	1.551	1.508	109	110	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DI
Stdev	0.03	0.09	0.04	0.05	0.0	0.082	0.00	0.019	0.013	0	1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DI
Spec	3.81 Max mm	3.81 Max mm	2.54 Max mm	5.0 ± 0.5 mm	30 ± 5 mm	2.54Ma x mm	0.5±0.0 5 mm	1.60±0.15 mm		110 ± 10 mm							
Result	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed	Passed						



全功能尺寸测试报告

Test data 测试数据如下

Immersing in IPA for 5 minutes, Pass

NO.	Wb(mm)	H (mm)	T (mm)	F (mm)	L(mm)	DR (mm)	G (mm)	SH (mm)	K左(m m)	K右(m m)	左θ 角度	右θ 角度	PO (mm)	DO (mm)	HO (mm)	H1 (mm)	W(mm)	Pu 拉	
1	3.35	2.59	2.31	2.62	29.0	1.0	0.50	NA											2
2	3.28	2.37	2.24	2.60	29.0	0.9	0.50											2	
3	3.36	2.73	2.41	2.61	29.0	0.8	0.50											2	
4	3.33	2.74	2.36	2.59	29.0	0.8	0.49											2	
5	3.40	2.74	2.36	2.65	29.0	0.8	0.49											2	
6	3.31	2.65	2.23	2.62	29.0	0.8	0.49											2	
7	3.36	2.68	2.34	2.65	28.5	0.9	0.49											2	
8	3.37	2.77	2.33	2.65	29.0	0.9	0.49											2	
9	3.36	2.62	2.24	2.65	29.0	1.0	0.49											2	
10	3.36	2.76	2.36	2.65	29.0	1.0	0.49											2	
11	3.42	2.60	2.34	2.65	29.0	1.0	0.49											2	
12	3.34	2.82	2.36	2.65	29.0	1.0	0.49											2	
13	3.39	2.59	2.29	2.65	29.0	1.0	0.49											2	
14	3.46	2.61	2.23	2.65	29.0	1.0	0.49											2	
15	3.39	3.03	2.35	2.62	29.0	1.0	0.49											2	
16	3.39	2.62	2.26	2.62	29.5	0.9	0.49											2	
17	3.29	2.59	2.24	2.61	29.0	0.9	0.49											2	
18	3.38	2.46	2.34	2.69	29.0	0.9	0.49											2	
19	3.37	2.58	2.22	2.65	29.0	0.9	0.49											2	
20	3.34	2.45	2.39	2.67	29.0	0.9	0.49											2	
21	3.36	2.25	2.38	2.67	29.0	0.9	0.49											2	
22	3.34	2.73	2.42	2.65	29.0	1.0	0.49											2	
23	3.37	2.83	2.44	2.65	29.5	1.0	0.49											2	
24	3.35	2.94	2.32	2.65	29.0	1.0	0.49											2	
25	3.32	2.80	2.29	2.65	29.0	1.0	0.49											2	
26	3.33	2.63	2.34	2.65	29.0	1.0	0.49											2	
27	3.33	2.41	2.25	2.65	29.0	1.0	0.51											2	
28	3.35	2.86	2.43	2.66	29.0	1.0	0.50											2	
29	3.33	2.68	2.30	2.65	29.5	1.0	0.49											2	
30	3.38	2.62	2.42	2.65	29.0	1.0	0.49											2	
Min	3.28	2.25	2.22	2.59	28.5	0.80	0.49											2	
Max	3.46	3.03	2.44	2.69	29.5	1.00	0.51											2	
Mean	3.36	2.66	2.33	2.64	29.0	0.94	0.49											2	
Stdev	0.04	0.17	0.07	0.02	0.2	0.07	0.00											0	
Spec	3.81 Max mm	3.81 Max mm	2.54 Max mm	2.50 ± 0.5 mm	30 ± 5 mm	1.58Ma x mm	0.5±0.0 5 mm											10 r	
Result	Passed	Passed	Passed	Passed	Passed	Passed	Passed											Pass	



全功能尺寸测试报告

Immersing in IPA for 5 minutes, Pass

[illegible]



Section 10

MATERIAL PERFORMANCE TEST RESULTS



Environmental Test Summary

SUPPLIER		USER PART NUMBER : MK series			
Vishay Components (Huizhou) Co, Ltd		K331J15C0GH53H5H (L/N: 16X2230S02) ;			
		K104K15X7RH53L2G (L/N: 16X2208602) ;			
		K472K15X7RH53L2G (L/N: 16X2208605)			
NAME OF LABORATORY		PART NAME			
Laboratory at Vishay Components (Huizhou) Co, Ltd		Mono Kap Leaded Multilayer Ceramic Capacitors			
Test #	Description	Test Conditions	# Lots Tested	Qty Tested	Number Failed
1	Pre-and Post-Stress Electrical Test	User Spec	3 (3 different PNs)	All qualification parts submitted for testing	0
2	High Temperature Exposure	MIL-STD 202 Method 108	3 (3 different PNs)	3 x 77	0
3	Temperature Cycling	JESD22 Method JA-104	3 (3 different PNs)	3 x 77	0
4	Biased Humidity	MIL-STD 202 Method 103	3 (3 different PNs)	3 x 77	0
5	High Temperature Operating Life	MIL-STD 202 Method 108	3 (3 different PNs)	3 x 77	0
6	External Visual	MIL-STD 883 Method 2009	3 (3 different PNs)	All qualification parts submitted	0
7	Physical Dimensions	JESD22 Method JB-100	3 (3 different PNs)	3 x 30	0
8	Terminal Strength	MIL-STD 202 Method 211	3 (3 different PNs)	3 x 30	0
9	Resistance to Solvent	MIL-STD 202 Method 215	3 (3 different PNs)	3 x 5	0
10	Mechanical Shock	MIL-STD 202 Method 213	3 (3 different PNs)	3 x 30	0
11	Vibration	MIL-STD 202 Method 204	3 (3 different PNs)	3 x 30	0
12	Resistance to Solder Heat	MIL-STD 202 Method 210	3 (3 different PNs)	3 x 30	0
13	ESD	AEC-Q200-002	3 (3 different PNs)	3 x 15	0
14	Solderability	J-STD-002	3 (3 different PNs)	3 x 15	0



Section 11

INITIAL PROCESS STUDY



Layout Inspection and Functional Testing

全功能尺寸测试报告

Lot No.:	16X2230S02	P/N:	K331J15C0GH53H5H			
Ambient temperature 测试环境温度:		24℃	Relative humidity: 测试环境湿度:	50%	Test condition: 测试條件:	1MHZ 1.0vrms
Test result 检验结果						
item	Specification: 规格:	Qty Rejected	Result	Equipment 测量仪器	Equipment No. 仪器编号	Spec. version: 规格版本:
Capacitance 电容	313.5--346.5 pF	0/150	Passed	E4981A	My48311633	A 0
DF	0.1 % max	0/150	Passed	E4981A	My48311633	
IR	100 GΩ min	0/150	Passed	TH 2684A	R4-115-00124	
TV	250 VDC	0/150	Passed	WVT 600	VT600-04	
Visual inspection 外观检查			Passed	N/A	N/A	

Label & Packing inspection result:

产品包装和标签检查结果:

Passed

Test data 测试数据如下

No.	Cap(pF)	DF(%)	IR(GΩ)	TV	No.	Cap(pF)	DF(%)	IR(GΩ)	TV	No.	Cap(pF)	DF(%)	IR(GΩ)	TV
1	327.05	0.05	>100GΩ	Passed	51	332.30	0.05	>100GΩ	Passed	101	331.94	0.04	>100GΩ	Passed
2	334.96	0.03	>100GΩ	Passed	52	330.53	0.05	>100GΩ	Passed	102	334.88	0.04	>100GΩ	Passed
3	323.97	0.05	>100GΩ	Passed	53	332.04	0.04	>100GΩ	Passed	103	323.71	0.05	>100GΩ	Passed
4	329.40	0.04	>100GΩ	Passed	54	331.19	0.03	>100GΩ	Passed	104	330.59	0.04	>100GΩ	Passed
5	329.84	0.04	>100GΩ	Passed	55	323.46	0.05	>100GΩ	Passed	105	330.96	0.05	>100GΩ	Passed
6	329.07	0.04	>100GΩ	Passed	56	333.49	0.04	>100GΩ	Passed	106	331.45	0.06	>100GΩ	Passed
7	323.74	0.03	>100GΩ	Passed	57	337.70	0.03	>100GΩ	Passed	107	328.52	0.06	>100GΩ	Passed
8	332.85	0.04	>100GΩ	Passed	58	326.60	0.04	>100GΩ	Passed	108	327.58	0.04	>100GΩ	Passed
9	329.68	0.05	>100GΩ	Passed	59	331.90	0.03	>100GΩ	Passed	109	330.60	0.04	>100GΩ	Passed
10	327.82	0.04	>100GΩ	Passed	60	332.01	0.04	>100GΩ	Passed	110	331.77	0.04	>100GΩ	Passed
11	330.75	0.04	>100GΩ	Passed	61	331.64	0.03	>100GΩ	Passed	111	328.33	0.03	>100GΩ	Passed
12	328.32	0.05	>100GΩ	Passed	62	329.23	0.03	>100GΩ	Passed	112	325.38	0.04	>100GΩ	Passed
13	327.33	0.05	>100GΩ	Passed	63	323.73	0.04	>100GΩ	Passed	113	333.74	0.04	>100GΩ	Passed
14	328.43	0.04	>100GΩ	Passed	64	323.88	0.05	>100GΩ	Passed	114	331.02	0.04	>100GΩ	Passed
15	328.47	0.06	>100GΩ	Passed	65	332.47	0.03	>100GΩ	Passed	115	333.10	0.04	>100GΩ	Passed
16	334.42	0.06	>100GΩ	Passed	66	327.87	0.03	>100GΩ	Passed	116	335.69	0.05	>100GΩ	Passed
17	330.77	0.04	>100GΩ	Passed	67	334.45	0.04	>100GΩ	Passed	117	332.64	0.06	>100GΩ	Passed
18	324.47	0.04	>100GΩ	Passed	68	327.72	0.03	>100GΩ	Passed	118	330.30	0.06	>100GΩ	Passed
19	329.68	0.05	>100GΩ	Passed	69	329.66	0.05	>100GΩ	Passed	119	325.90	0.04	>100GΩ	Passed
20	334.49	0.05	>100GΩ	Passed	70	332.30	0.05	>100GΩ	Passed	120	328.52	0.04	>100GΩ	Passed
21	327.46	0.03	>100GΩ	Passed	71	331.46	0.03	>100GΩ	Passed	121	327.89	0.05	>100GΩ	Passed
22	334.06	0.04	>100GΩ	Passed	72	328.43	0.03	>100GΩ	Passed	122	332.30	0.05	>100GΩ	Passed
23	331.99	0.04	>100GΩ	Passed	73	325.03	0.03	>100GΩ	Passed	123	326.79	0.06	>100GΩ	Passed
24	323.73	0.04	>100GΩ	Passed	74	328.07	0.03	>100GΩ	Passed	124	332.73	0.06	>100GΩ	Passed
25	333.64	0.03	>100GΩ	Passed	75	327.11	0.04	>100GΩ	Passed	125	325.67	0.05	>100GΩ	Passed
26	331.17	0.06	>100GΩ	Passed	76	329.35	0.03	>100GΩ	Passed	126	325.04	0.06	>100GΩ	Passed
27	323.66	0.06	>100GΩ	Passed	77	327.56	0.03	>100GΩ	Passed	127	329.28	0.06	>100GΩ	Passed
28	331.13	0.06	>100GΩ	Passed	78	334.49	0.03	>100GΩ	Passed	128	331.00	0.04	>100GΩ	Passed
29	334.61	0.06	>100GΩ	Passed	79	329.37	0.03	>100GΩ	Passed	129	334.44	0.06	>100GΩ	Passed
30	328.95	0.04	>100GΩ	Passed	80	333.01	0.03	>100GΩ	Passed	130	327.91	0.06	>100GΩ	Passed
31	331.02	0.04	>100GΩ	Passed	81	331.57	0.04	>100GΩ	Passed	131	330.86	0.04	>100GΩ	Passed
32	331.18	0.04	>100GΩ	Passed	82	332.61	0.04	>100GΩ	Passed	132	327.68	0.06	>100GΩ	Passed
33	328.54	0.04	>100GΩ	Passed	83	330.00	0.04	>100GΩ	Passed	133	324.99	0.03	>100GΩ	Passed
34	328.90	0.03	>100GΩ	Passed	84	330.53	0.03	>100GΩ	Passed	134	334.02	0.04	>100GΩ	Passed
35	325.93	0.03	>100GΩ	Passed	85	331.01	0.03	>100GΩ	Passed	135	333.48	0.04	>100GΩ	Passed
36	327.16	0.06	>100GΩ	Passed	86	326.05	0.05	>100GΩ	Passed	136	330.62	0.05	>100GΩ	Passed
37	330.00	0.04	>100GΩ	Passed	87	327.43	0.03	>100GΩ	Passed	137	329.95	0.05	>100GΩ	Passed
38	325.47	0.06	>100GΩ	Passed	88	334.66	0.03	>100GΩ	Passed	138	327.59	0.05	>100GΩ	Passed
39	331.20	0.04	>100GΩ	Passed	89	332.43	0.04	>100GΩ	Passed	139	328.20	0.04	>100GΩ	Passed
40	328.78	0.05	>100GΩ	Passed	90	332.74	0.04	>100GΩ	Passed	140	331.96	0.04	>100GΩ	Passed
41	334.94	0.06	>100GΩ	Passed	91	330.13	0.05	>100GΩ	Passed	141	332.75	0.04	>100GΩ	Passed
42	325.11	0.04	>100GΩ	Passed	92	329.90	0.04	>100GΩ	Passed	142	332.47	0.05	>100GΩ	Passed
43	332.45	0.03	>100GΩ	Passed	93	330.99	0.03	>100GΩ	Passed	143	327.62	0.04	>100GΩ	Passed
44	331.63	0.03	>100GΩ	Passed	94	326.02	0.03	>100GΩ	Passed	144	328.05	0.04	>100GΩ	Passed
45	331.01	0.04	>100GΩ	Passed	95	330.06	0.03	>100GΩ	Passed	145	328.61	0.04	>100GΩ	Passed
46	332.14	0.04	>100GΩ	Passed	96	330.99	0.04	>100GΩ	Passed	146	328.47	0.04	>100GΩ	Passed
47	330.20	0.05	>100GΩ	Passed	97	336.41	0.06	>100GΩ	Passed	147	324.00	0.05	>100GΩ	Passed
48	325.79	0.04	>100GΩ	Passed	98	325.11	0.06	>100GΩ	Passed	148	335.46	0.03	>100GΩ	Passed
49	322.59	0.06	>100GΩ	Passed	99	329.08	0.05	>100GΩ	Passed	149	328.25	0.03	>100GΩ	Passed
50	329.54	0.04	>100GΩ	Passed	100	330.21	0.05	>100GΩ	Passed	150	325.73	0.03	>100GΩ	Passed

Min	322.59	0.03	>100GΩ	/
Max	337.70	0.06	/	/
Mean	329.71	0.04	/	/
Stdev	3.176	0.01	/	/
Cpk	1.701	1.33	/	/
Spec low	313.50		100 GΩ	
Spec up	346.50	0.1		

Tester : Rui ying Yu

Test date: 2022.8.13

Approved by: Andy Ye

Date:2022.8.13



Layout Inspection and Functional Testing

全功能尺寸测试报告

Lot No.:	16X22208602	P/N:	K104K15X7RH53L2G			
Ambient temperature 测试环境温度:		24℃	Relative humidity: 测试环境温度:	50%	Test condition: 测试条件:	1KHZ 1.0vrms
Test result 检验结果						
item	Specification: 规格:	Qty Rejected	Result	Equipment 测量仪器	Equipment No. 仪器编号	Spec. version: 规格版本:
Capacitance 电容	90000~110000 pF	0/150	Passed	E4981A	My48311633	A 0
DF	2.5 % max	0/150	Passed	E4981A	My48311633	
IR	10 GΩ min	0/150	Passed	TH 2684A	R4-115-00124	
TV	250 VDC	0/150	Passed	WVT 600	VT600-04	
Visual inspection 外观检查			Passed	N/A	N/A	

Label & Packing inspection result:

产品包装和标签检查结果:

Passed

Test data 测试数据如下

No.	Cap(nF)	DF(%)	IR(GΩ)	TV	No.	Cap(nF)	DF(%)	IR(GΩ)	TV	No.	Cap(nF)	DF(%)	IR(GΩ)	TV
1	95.496	1.51	>10GΩ	Passed	51	95.809	1.61	>10GΩ	Passed	101	94.917	1.55	>10GΩ	Passed
2	95.264	1.53	>10GΩ	Passed	52	95.667	1.57	>10GΩ	Passed	102	97.231	1.58	>10GΩ	Passed
3	96.201	1.55	>10GΩ	Passed	53	96.186	1.61	>10GΩ	Passed	103	95.565	1.59	>10GΩ	Passed
4	94.407	1.55	>10GΩ	Passed	54	96.239	1.58	>10GΩ	Passed	104	95.392	1.52	>10GΩ	Passed
5	95.734	1.57	>10GΩ	Passed	55	95.464	1.55	>10GΩ	Passed	105	95.391	1.58	>10GΩ	Passed
6	96.258	1.57	>10GΩ	Passed	56	95.226	1.55	>10GΩ	Passed	106	96.161	1.60	>10GΩ	Passed
7	95.596	1.57	>10GΩ	Passed	57	95.467	1.55	>10GΩ	Passed	107	95.532	1.65	>10GΩ	Passed
8	94.958	1.58	>10GΩ	Passed	58	95.537	1.53	>10GΩ	Passed	108	95.856	1.56	>10GΩ	Passed
9	97.056	1.61	>10GΩ	Passed	59	95.352	1.57	>10GΩ	Passed	109	96.049	1.59	>10GΩ	Passed
10	95.392	1.56	>10GΩ	Passed	60	95.356	1.57	>10GΩ	Passed	110	96.162	1.58	>10GΩ	Passed
11	95.042	1.56	>10GΩ	Passed	61	96.598	1.60	>10GΩ	Passed	111	98.441	1.60	>10GΩ	Passed
12	95.437	1.57	>10GΩ	Passed	62	97.534	1.58	>10GΩ	Passed	112	96.488	1.57	>10GΩ	Passed
13	95.621	1.60	>10GΩ	Passed	63	94.839	1.58	>10GΩ	Passed	113	95.592	1.63	>10GΩ	Passed
14	95.695	1.56	>10GΩ	Passed	64	95.097	1.55	>10GΩ	Passed	114	95.478	1.57	>10GΩ	Passed
15	96.131	1.57	>10GΩ	Passed	65	97.216	1.61	>10GΩ	Passed	115	95.481	1.59	>10GΩ	Passed
16	95.923	1.61	>10GΩ	Passed	66	95.612	1.62	>10GΩ	Passed	116	95.642	1.59	>10GΩ	Passed
17	95.886	1.61	>10GΩ	Passed	67	94.616	1.61	>10GΩ	Passed	117	94.698	1.54	>10GΩ	Passed
18	95.401	1.57	>10GΩ	Passed	68	96.127	1.60	>10GΩ	Passed	118	97.343	1.59	>10GΩ	Passed
19	95.378	1.55	>10GΩ	Passed	69	96.719	1.58	>10GΩ	Passed	119	95.028	1.56	>10GΩ	Passed
20	97.239	1.58	>10GΩ	Passed	70	96.482	1.60	>10GΩ	Passed	120	95.134	1.57	>10GΩ	Passed
21	98.791	1.61	>10GΩ	Passed	71	95.898	1.59	>10GΩ	Passed	121	95.892	1.39	>10GΩ	Passed
22	96.041	1.59	>10GΩ	Passed	72	95.169	1.61	>10GΩ	Passed	122	95.254	1.55	>10GΩ	Passed
23	97.773	1.59	>10GΩ	Passed	73	95.237	1.64	>10GΩ	Passed	123	96.234	1.56	>10GΩ	Passed
24	97.196	1.59	>10GΩ	Passed	74	95.686	1.61	>10GΩ	Passed	124	95.272	1.58	>10GΩ	Passed
25	95.106	1.62	>10GΩ	Passed	75	94.881	1.58	>10GΩ	Passed	125	95.174	1.49	>10GΩ	Passed
26	96.040	1.59	>10GΩ	Passed	76	95.785	1.60	>10GΩ	Passed	126	96.324	1.57	>10GΩ	Passed
27	97.554	1.59	>10GΩ	Passed	77	96.514	1.61	>10GΩ	Passed	127	95.324	1.49	>10GΩ	Passed
28	96.663	1.59	>10GΩ	Passed	78	96.167	1.59	>10GΩ	Passed	128	96.401	1.60	>10GΩ	Passed
29	95.778	1.56	>10GΩ	Passed	79	94.972	1.57	>10GΩ	Passed	129	94.642	1.59	>10GΩ	Passed
30	95.647	1.62	>10GΩ	Passed	80	96.201	1.57	>10GΩ	Passed	130	95.147	1.57	>10GΩ	Passed
31	95.215	1.53	>10GΩ	Passed	81	96.067	1.58	>10GΩ	Passed	131	98.031	1.57	>10GΩ	Passed
32	96.648	1.53	>10GΩ	Passed	82	96.126	1.56	>10GΩ	Passed	132	97.557	1.58	>10GΩ	Passed
33	96.351	1.58	>10GΩ	Passed	83	96.309	1.52	>10GΩ	Passed	133	95.968	1.55	>10GΩ	Passed
34	97.143	1.62	>10GΩ	Passed	84	97.504	1.57	>10GΩ	Passed	134	95.401	1.58	>10GΩ	Passed
35	96.333	1.60	>10GΩ	Passed	85	95.096	1.60	>10GΩ	Passed	135	95.485	1.54	>10GΩ	Passed
36	96.257	1.58	>10GΩ	Passed	86	95.468	1.61	>10GΩ	Passed	136	95.516	1.55	>10GΩ	Passed
37	96.034	1.61	>10GΩ	Passed	87	95.586	1.59	>10GΩ	Passed	137	97.426	1.54	>10GΩ	Passed
38	95.808	1.42	>10GΩ	Passed	88	95.174	1.56	>10GΩ	Passed	138	95.938	1.55	>10GΩ	Passed
39	96.184	1.53	>10GΩ	Passed	89	96.364	1.61	>10GΩ	Passed	139	96.248	1.47	>10GΩ	Passed
40	95.939	1.57	>10GΩ	Passed	90	96.128	1.57	>10GΩ	Passed	140	97.746	1.56	>10GΩ	Passed
41	96.081	1.62	>10GΩ	Passed	91	95.655	1.59	>10GΩ	Passed	141	96.069	1.59	>10GΩ	Passed
42	95.759	1.57	>10GΩ	Passed	92	96.798	1.62	>10GΩ	Passed	142	95.906	1.55	>10GΩ	Passed
43	95.884	1.60	>10GΩ	Passed	93	97.924	1.60	>10GΩ	Passed	143	95.283	1.57	>10GΩ	Passed
44	95.978	1.54	>10GΩ	Passed	94	96.632	1.58	>10GΩ	Passed	144	95.233	1.54	>10GΩ	Passed
45	95.274	1.57	>10GΩ	Passed	95	96.083	1.60	>10GΩ	Passed	145	96.423	1.56	>10GΩ	Passed
46	95.608	1.59	>10GΩ	Passed	96	95.742	1.64	>10GΩ	Passed	146	95.402	1.54	>10GΩ	Passed
47	95.998	1.60	>10GΩ	Passed	97	96.452	1.62	>10GΩ	Passed	147	96.737	1.61	>10GΩ	Passed
48	95.612	1.61	>10GΩ	Passed	98	95.932	1.55	>10GΩ	Passed	148	95.601	1.55	>10GΩ	Passed
49	95.610	1.62	>10GΩ	Passed	99	95.989	1.60	>10GΩ	Passed	149	96.801	1.47	>10GΩ	Passed
50	96.418	1.58	>10GΩ	Passed	100	96.284	1.64	>10GΩ	Passed	150	96.526	1.45	>10GΩ	Passed

Min	94.407	1.39	>10GΩ	/
Max	98.791	1.65	/	/
Mean	95.977	1.57	/	/
Stdev	0.788	0.04	/	/
Cpk	2.527	7.35	/	/
Spec low	90.000		10GΩ	
Spec up	110.000	2.5		

Tester :Rui ying Yu

Test date: 2022.3.30

Approved by: Andy Ye

Date: 2022.3.30



Vishay Components (Huizhou) Co., Ltd.

Layout Inspection and Functional Testing
全功能尺寸测试报告

Lot No.:	16X22208605	P/N:	K472K15X7RH53L2G			
Ambient temperature 测试环境温度:	24℃	Relative humidity: 测试环境温度:	50%	Test condition: 测试条件:	1KHZ 1.0vrms	
Test result 检验结果						
item	Specification: 规格:	Qty Rejected	Result	Equipment 测量仪器	Equipment No. 仪器编号	Spec. version: 规格版本:
Capacitance 电容	4230~5170 pF	0/150	Passed	E4981A	My48311633	A 0
DF	2.5 % max	0/150	Passed	E4981A	My48311633	
IR	100 GΩ min	0/150	Passed	TH 2684A	R4-115-00124	
TV	250 VDC	0/150	Passed	WVT 600	VT600-04	
Visual inspection 外观检查			Passed	N/A	N/A	

Label & Packing inspection result:

产品包装和标签检查结果:

Passed

Test data 测试数据如下

No.	Cap(nF)	DF(%)	IR(GΩ)	TV	No.	Cap(nF)	DF(%)	IR(GΩ)	TV	No.	Cap(nF)	DF(%)	IR(GΩ)	TV
1	4.601	1.15	>100GΩ	Passed	51	4.698	1.17	>100GΩ	Passed	101	4.672	1.17	>100GΩ	Passed
2	4.784	1.13	>100GΩ	Passed	52	4.718	1.12	>100GΩ	Passed	102	4.728	1.16	>100GΩ	Passed
3	4.786	1.12	>100GΩ	Passed	53	4.716	1.14	>100GΩ	Passed	103	4.642	1.13	>100GΩ	Passed
4	4.766	1.12	>100GΩ	Passed	54	4.612	1.11	>100GΩ	Passed	104	4.780	1.17	>100GΩ	Passed
5	4.745	1.13	>100GΩ	Passed	55	4.727	1.13	>100GΩ	Passed	105	4.671	1.14	>100GΩ	Passed
6	4.658	1.17	>100GΩ	Passed	56	4.703	1.14	>100GΩ	Passed	106	4.647	1.07	>100GΩ	Passed
7	4.728	1.12	>100GΩ	Passed	57	4.699	1.16	>100GΩ	Passed	107	4.754	1.13	>100GΩ	Passed
8	4.703	1.12	>100GΩ	Passed	58	4.801	1.17	>100GΩ	Passed	108	4.636	1.17	>100GΩ	Passed
9	4.647	1.12	>100GΩ	Passed	59	4.758	1.18	>100GΩ	Passed	109	4.659	1.15	>100GΩ	Passed
10	4.731	1.16	>100GΩ	Passed	60	4.669	1.18	>100GΩ	Passed	110	4.729	1.15	>100GΩ	Passed
11	4.733	1.16	>100GΩ	Passed	61	4.605	1.16	>100GΩ	Passed	111	4.752	1.16	>100GΩ	Passed
12	4.676	1.16	>100GΩ	Passed	62	4.754	1.15	>100GΩ	Passed	112	4.642	1.15	>100GΩ	Passed
13	4.622	1.17	>100GΩ	Passed	63	4.795	1.08	>100GΩ	Passed	113	4.741	1.17	>100GΩ	Passed
14	4.663	1.16	>100GΩ	Passed	64	4.703	1.15	>100GΩ	Passed	114	4.741	1.14	>100GΩ	Passed
15	4.782	1.13	>100GΩ	Passed	65	4.762	1.15	>100GΩ	Passed	115	4.739	1.15	>100GΩ	Passed
16	4.788	1.15	>100GΩ	Passed	66	4.650	1.16	>100GΩ	Passed	116	4.724	1.14	>100GΩ	Passed
17	4.615	1.16	>100GΩ	Passed	67	4.789	1.15	>100GΩ	Passed	117	4.684	1.16	>100GΩ	Passed
18	4.849	1.10	>100GΩ	Passed	68	4.644	1.13	>100GΩ	Passed	118	4.675	1.12	>100GΩ	Passed
19	4.626	1.13	>100GΩ	Passed	69	4.705	1.12	>100GΩ	Passed	119	4.824	1.13	>100GΩ	Passed
20	4.682	1.17	>100GΩ	Passed	70	4.725	1.15	>100GΩ	Passed	120	4.756	1.15	>100GΩ	Passed
21	4.672	1.13	>100GΩ	Passed	71	4.714	1.17	>100GΩ	Passed	121	4.706	1.15	>100GΩ	Passed
22	4.776	1.13	>100GΩ	Passed	72	4.836	1.13	>100GΩ	Passed	122	4.723	1.13	>100GΩ	Passed
23	4.691	1.16	>100GΩ	Passed	73	4.795	1.13	>100GΩ	Passed	123	4.895	1.13	>100GΩ	Passed
24	4.769	1.15	>100GΩ	Passed	74	4.876	1.15	>100GΩ	Passed	124	4.807	1.13	>100GΩ	Passed
25	4.728	1.17	>100GΩ	Passed	75	4.746	1.16	>100GΩ	Passed	125	4.808	1.14	>100GΩ	Passed
26	4.701	1.13	>100GΩ	Passed	76	4.708	1.18	>100GΩ	Passed	126	4.857	1.08	>100GΩ	Passed
27	4.741	1.12	>100GΩ	Passed	77	4.732	1.12	>100GΩ	Passed	127	4.649	1.10	>100GΩ	Passed
28	4.741	1.16	>100GΩ	Passed	78	4.772	1.13	>100GΩ	Passed	128	4.771	1.16	>100GΩ	Passed
29	4.604	1.13	>100GΩ	Passed	79	4.816	1.13	>100GΩ	Passed	129	4.758	1.14	>100GΩ	Passed
30	4.742	1.17	>100GΩ	Passed	80	4.685	1.15	>100GΩ	Passed	130	4.705	1.13	>100GΩ	Passed
31	4.624	1.12	>100GΩ	Passed	81	4.742	1.18	>100GΩ	Passed	131	4.661	1.11	>100GΩ	Passed
32	4.815	1.14	>100GΩ	Passed	82	4.665	1.16	>100GΩ	Passed	132	4.748	1.12	>100GΩ	Passed
33	4.710	1.13	>100GΩ	Passed	83	4.887	1.14	>100GΩ	Passed	133	4.696	1.13	>100GΩ	Passed
34	4.634	1.14	>100GΩ	Passed	84	4.694	1.14	>100GΩ	Passed	134	4.742	1.15	>100GΩ	Passed
35	4.623	1.15	>100GΩ	Passed	85	4.667	1.13	>100GΩ	Passed	135	4.615	1.15	>100GΩ	Passed
36	4.718	1.15	>100GΩ	Passed	86	4.726	1.14	>100GΩ	Passed	136	4.629	1.18	>100GΩ	Passed
37	4.708	1.13	>100GΩ	Passed	87	4.639	1.17	>100GΩ	Passed	137	4.653	1.15	>100GΩ	Passed
38	4.639	1.14	>100GΩ	Passed	88	4.751	1.16	>100GΩ	Passed	138	4.692	1.15	>100GΩ	Passed
39	4.801	1.16	>100GΩ	Passed	89	4.674	1.16	>100GΩ	Passed	139	4.627	1.16	>100GΩ	Passed
40	4.745	1.16	>100GΩ	Passed	90	4.852	1.15	>100GΩ	Passed	140	4.727	1.12	>100GΩ	Passed
41	4.712	1.07	>100GΩ	Passed	91	4.763	1.12	>100GΩ	Passed	141	4.647	1.17	>100GΩ	Passed
42	4.696	1.17	>100GΩ	Passed	92	4.672	1.15	>100GΩ	Passed	142	4.693	1.15	>100GΩ	Passed
43	4.733	1.13	>100GΩ	Passed	93	4.827	1.14	>100GΩ	Passed	143	4.766	1.18	>100GΩ	Passed
44	4.592	1.13	>100GΩ	Passed	94	4.682	1.13	>100GΩ	Passed	144	4.678	1.15	>100GΩ	Passed
45	4.716	1.14	>100GΩ	Passed	95	4.671	1.13	>100GΩ	Passed	145	4.752	1.15	>100GΩ	Passed
46	4.731	1.14	>100GΩ	Passed	96	4.727	1.14	>100GΩ	Passed	146	4.615	1.13	>100GΩ	Passed
47	4.741	1.12	>100GΩ	Passed	97	4.562	1.19	>100GΩ	Passed	147	4.598	1.16	>100GΩ	Passed
48	4.781	1.12	>100GΩ	Passed	98	4.765	1.15	>100GΩ	Passed	148	4.650	1.16	>100GΩ	Passed
49	4.792	1.14	>100GΩ	Passed	99	4.658	1.18	>100GΩ	Passed	149	4.702	1.14	>100GΩ	Passed
50	4.713	1.14	>100GΩ	Passed	100	4.686	1.12	>100GΩ	Passed	150	4.665	1.13	>100GΩ	Passed

Min	4.562	1.07	>100GΩ	/
Max	4.895	1.19	/	/
Mean	4.715	1.14	/	/
Stdev	0.065	0.02	/	/
Cpk	2.318	20.20	/	/
Spec low	4.230		100GΩ	
Spec up	5.170	2.5		

Tester : Rui ying Yu

Test date: 2022.3.29

Approved by: Andy Ye

Date: 2022.3.29



Section 12

QUALIFIED LABORATORY DOCUMENTATION

INTERNAL LABORATORY

&

CTI 17025 CERTIFIED LABORATORY

**(Legal Entity: Centre Testing International Group Co., Ltd.,
CTI Building, Xingdong Community, Xin'an Sub-district, Bao'an
Shenzhen, Guangdong, China**

**is accredited in accordance with ISO/IEC 17025: 2003
Requirements for the Competence of Testing and
Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of
Testing and Calibration Laboratories) for the competence to provide
the service described in the schedule attached to this certificate.**

**The scope of accreditation is detailed in the attached schedule
bearing the same registration number as above. The schedule is an
integral part of this certificate.**

Effective Date: 2020-04-03

Expiry Date: 2024-03-04

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation scheme for conformity assessment. CNAS is a signatory of the International Laboratory Accreditation Cooperation Mutual Recognition Arrangement (ILAC MRA) and the Asia Pacific Accreditation Cooperation Mutual Recognition Arrangement (APAC MRA). The validity of the certificate can be checked on CNAS website at <http://www.cnas.org.cn/english/findanaccreditation>



Section 13

APPEARANCE APPROVAL REPORT

Not Applicable



Section 14

SAMPLE PRODUCT

Not Required



Section 15

MASTER SAMPLE

Not applicable



Section 16

CHECKING AID

Not Applicable



Section 17

**RECORDS OF
COMPLIANCE**

Not Applicable



Section 18

PART SUBMISSION WARRANT

Part Submission Warrant

No. : APQP- MK series -20 edition: A/0

Part name Mono Kap Capacitor

Cust. Part Number NA/

Safety and/Government Regulation ☒ Yes ☐ No Engineering Change level N/A Dated N/A

Addition Engineering Changes N/A Dated N/A Org. part Number N/A

Shown Drawing No N/A Purchase Order No. N/A Weight N/A kg

Checking Aid No N/A Checking Aid Engineering Change Level N/A Dated N/A

ORGANIZATION MANUFACTURING INFORMATION

Vishay Components (Huizhou) Co.,Ltd.

Supplier Name& Supplier/Vendor Code

CUSTOMER SUBMITTAL INFORMATION

☒ Dimensions

☒ Material/Functions

☐ Appearance

Customer Name/Division N/A Buyer/Buyer Code N/A IMDS number N/A

Street Address

46 Renmin 4 Road, Danshui Town, Huiyang Zone, Huizhou City, Guangdong, P.R.China Application Automotive

City/Region/Postal code Country

Has customer-required Substances of concern information been reported? ☐ Yes ☒ No

Are polymeric parts identified with appropriate ISO marking codes? ☐ Yes ☒ No

REASON FOR SUBMISSION (Check one)

☐ Initial Submission

☐ Change to optional Construction or Material

☐ Engineering Change(s)

☒ Supplier or material source Change

☐ Tooling: Transfer, replacement, Refurbishment or addition ☐ Change in Part Processing

☐ Correction of Discrepancy

☐ Parts Produced at additional location

☐ Tooling inactive> than 1 year

☐ Other-please specify

REQUESTED SUBMISSION LEVEL (Check one)

☐ Level 1—Warrant only(and for designated appearance items, an appearance Approval Report) submitted to customer.

☐ Level 2—Warrant with product samples and limited supporting data submitted to customer.

☒ Level 3—Warrant with Product samples and complete supporting data submitted to customer

☐ Level 4—Warrant and other requirements as defined by customer.

☐ Level 5—Warrant with Product samples and complete supporting data reviewed at organization's manufacturing location.

SUBMISSION RESULTS

The Results for: ☒ Dimensional measurements ☒ Materials and Function Test ☐ Appearance Criteria ☐ Statistical process package: These results meet all design record requirements ☒ Yes, ☐ No (IF "NO" Explanation Required)

Mold/Cavity/Production Process N/A

Declaration

I affirm that the samples represented by this warrant are representative of our parts, which were made by a process that meets all production Part Approval Process manual 4th Edition Requirements, I further affirm that these samples were produced at the production rate of 1.6kpcs/ hours. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below.

Explanation/Comments: N/A

Is each Customer Tool properly tagged and numbered?, ☐ Yes ☐ No ☒ N/A

Print Name Zheng Yanling Title QA Manager Phone no (+86)752-3355373 Fax no (+86)752-3356842

Organization Authorized Signature _____ Date _____ E mail address Yanling.Zheng@vishay.com

For CUSTOMER USE ONLY (IF APPLICABLE)

PPAP Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other

Customer Name _____ Customer Signature _____ Date _____

Print Name----- Customer Tracking Number (Optional)