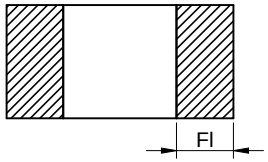
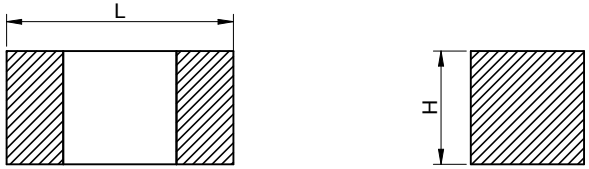
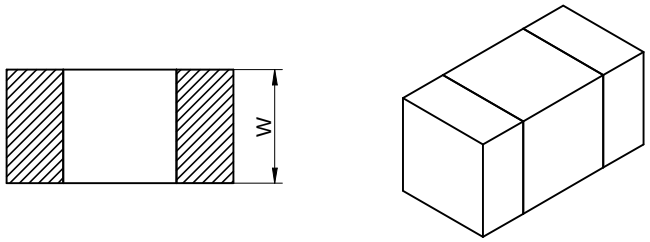
Dimensions: [mm]



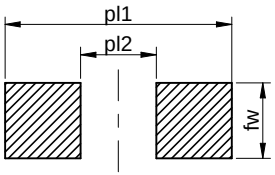




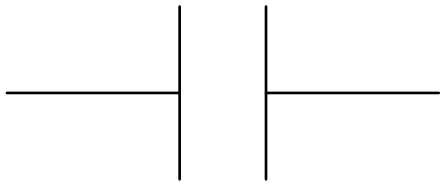
Properties		Value	Unit	Tol.
Length	L	4.5	mm	+0.5/-0.3
Width	W	3.2	mm	±0.3
Height	H	2.5	mm	±0.3
Pad Dimension	Fl	0.5	mm	±0.25

pl1 - Reflow	5.3	mm	**pl2 - Reflow**	3.5	mm	**fw - Reflow**	3.8	mm

Recommended Land Pattern: [mm]



Schematic:



Electrical Properties:

Properties	Test conditions		Value	Unit	Tol.
Capacitance	1 ±0.2 V_{RMS}, 1 kHz ±10% @25 °C	C	2.2	nF	±10%
Rated Voltage		U_R	3000	V (DC)	max.
Dissipation Factor	1 ±0.2 V_{RMS}, 1 kHz ±10% @25 °C	DF	2.5	%	max.
Insulation Resistance	Apply 500 V for 60 s max.	R_{ISO}	10	GΩ	min.

Precondition for Class II MLCC measurement: Apply a preheat treatment @150 ±10 °C for 1 hour. The measurement should be applied after 24 ±2 hrs the part was stored under ambient conditions. There is not any precondition necessary for Class I MLCC.

General Information:

Mid & High Voltage MLCC	
Ceramic Type	X7R Class II
Temperature Coeffecient	± 15 % max.
Storage Conditions	5-35 °C, < 75% RH
Operating Temperature	-55 °C up to +125 °C
Dielectric Strength	15 sec. @120 % U_R; Charge & Discharge Current <50 mA
Test conditions of Electrical Properties: +20°C, 35% RH if not specified differently	
FIT according to separate documentation	
Component conform to REACh and RoHS requirements and standards	

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WÜRTH ELEKTRONIK

CREATED	CHECKED	GENERAL TOLERANCE	PROJECTION METHOD
KaS	PSL	DIN ISO 2768-1m	

DESCRIPTION: **WCAP-CSMH Ceramic Capacitors**

TECHNICAL REFERENCE: X7R1812222KC00DFCT10000

ORDER CODE: **885342211010**

SIZE	REVISION	STATUS	DATE (YYYY-MM-DD)	BUSINESS UNIT	PAGE
1812	001.000	Valid	2016-09-19	eiCap	1/7

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Mechanical Properties:

Properties	Definition	
Termination		Cu/ Ni/ Sn
Adhesice Strength of Termination	≤ 0603 > 0603	10 ±1 sec; 5 N 10 ±1 sec; 10 N
Vibration Resistance		all 3 directions, 2 hours each @ 10 - 50 Hz/ min., amplitude 0.75 mm or 10 g
Resistance to Solder Heat	Specific	Refer to Soldering Profile

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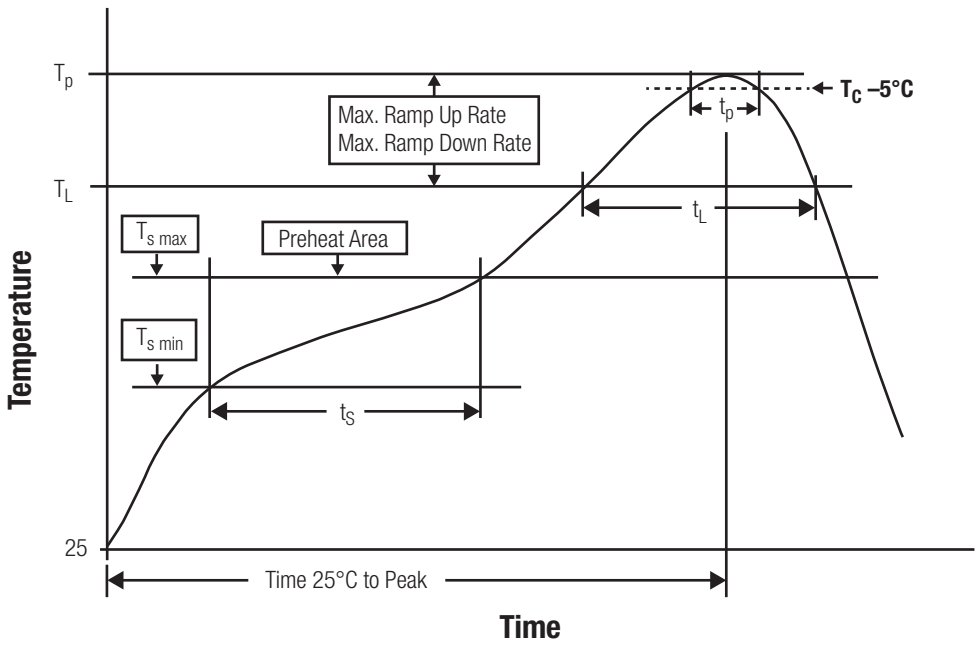
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Classification Reflow Profile for SMT components:



Classification Reflow Soldering Profile:

Profile Feature		Value
Preheat Temperature Min	$T_{s\ min}$	150 °C
Preheat Temperature Max	$T_{s\ max}$	200 °C
Preheat Time t_s from $T_{s\ min}$ to $T_{s\ max}$	t_s	60 - 120 seconds
Ramp-up Rate (T_L to T_P)		3 °C/ second max.
Liquidous Temperature	T_L	217 °C
Time t_L maintained above T_L	t_L	60 - 150 seconds
Peak package body temperature	T_p	see table
Time within 5°C of actual peak temperaure	t_p	20 - 30 seconds
Ramp-down Rate (T_L to T_P)		6 °C/ second max.
Time 25°C to peak temperature		8 minutes max.

refer to IPC/ JEDEC J-STD-020E

Package Classification Reflow Temperature:

Properties	Volume mm³ <350	Volume mm³ 350-2000	Volume mm³ >2000
PB-Free Assembly I Package Thickness < 1.6 mm	260 °C	260 °C	260 °C
PB-Free Assembly I Package Thickness 1.6 mm - 2.5 mm	260 °C	250 °C	245 °C
PB-Free Assembly I Package Thickness ≥ 2.5 mm	250 °C	245 °C	245 °C

refer to IPC/ JEDEC J-STD-020E

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KaS	PSL	DIN ISO 2768-1m	

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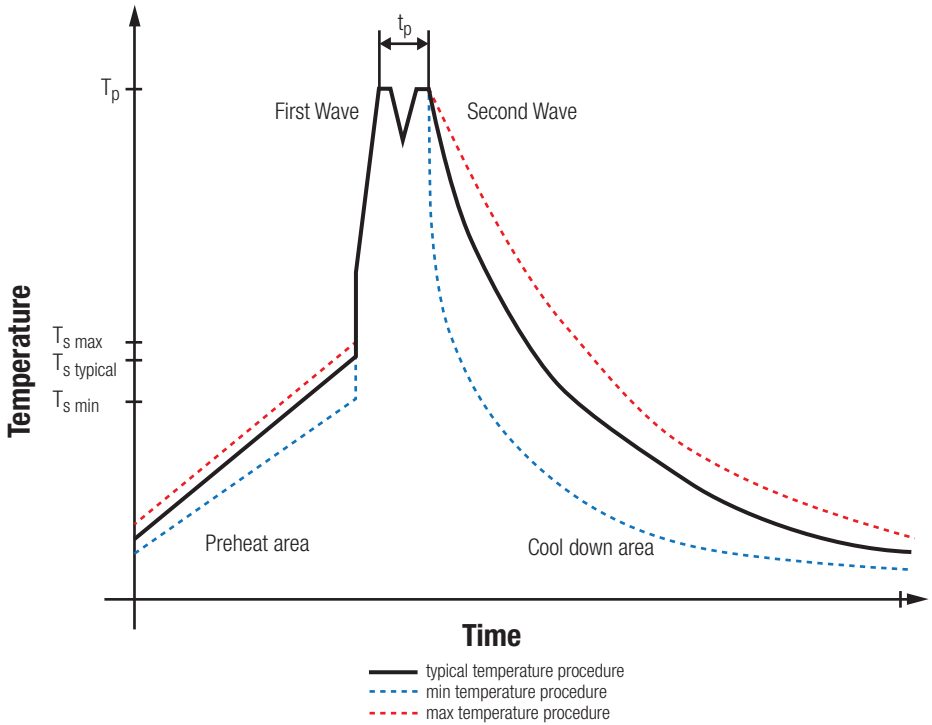
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Classification Wave Soldering Profile:



Classification Wave Soldering Profile:

Profile Feature		Pb-Free Assembly	Sn-Pb Assembly
Preheat Temperature Min	$T_{s\ min}$	100 °C	100 °C
Preheat Temperature Typical	$T_{s\ typical}$	120 °C	120 °C
Preheat Temperature Max	$T_{s\ max}$	130 °C	130 °C
Preheat Time t_s from $T_{s\ min}$ to $T_{s\ max}$	t_s	70 seconds	70 seconds
Ramp-up Rate	ΔT	150 °C max.	150 °C max.
Peak temperature	T_p	250 °C - 260 °C	235 °C - 260 °C
Time of actual peak temperature	t_p	max. 10 seconds max. 5 seconds each wave	max. 10 seconds max. 5 seconds each wave
Ramp-down Rate, Min		~ 2 K/ second	~ 2 K/ second
Ramp-down Rate, Typical		~ 3.5 K/ second	~ 3.5 K/ second
Ramp-down Rate, Max		~ 5 K/ second	~ 5 K/ second
Time 25°C to 25°C		4 minutes	4 minutes

refer to EN61760-1:2006

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KaS	PSL	DIN ISO 2768-1m	

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Cautions and Warnings:

The following conditions apply to all goods within the product series of WCAP-CSMH of Würth Elektronik eiSos GmbH & Co. KG:

1. General

- The capacitor is engineered, designed and manufactured to be used within the datasheet specified values.
- Do not use the capacitor neither short term nor long term outside the specified values, which are given in the data sheet.
- Do not apply any kind of flexural or compressive force onto soldered or unsoldered component.
- Prevent the capacitor surface from any damage or scratches with sharp edges (e.g. chassis, screwdrivers, pincers).

2. Product specific

The responsibility for the applicability of customer specific products and use in a particular customer design is always within the authority of the customer. All technical specifications for standard products do also apply to customer specific products.

Follow all instructions mentioned in the data sheet, especially the following items:

2.01 Storage conditions

- These ceramic capacitors must be stored in stable conditions within an ambient temperature between 5°C to 40°C with a relative humidity of
- The environment in which the capacitors are operated and stored has to have atmospheric characteristics and must be free of dew condensation and toxic gases (e.g. chlorine, ammonia, sulfur, hydrogen sulphide and hydrogen sulfate).
- All products shall be used before the end of the period of 12 months based on the product date code, if not, a 100% solderability cannot be guaranteed.
- The capacitance tolerance as specified within the datasheet is only valid on the date of delivery.

2.02 Operating climatic conditions

- Do not exceed the lower nor the upper specified temperature under no condition.
- Be aware that the specified capacitance tolerance is only valid at the date delivery and according specified measurement criteria.
- Do not use the capacitors under high humidity, high temperature nor under high or low atmospheric pressure which may affect capacitors reliability.
- Surface temperature including self-heating must be kept below the maximum operating temperature.
- The temperature rise of the capacitor´s temperature compared to ambient temperature shall be below 20°C.
- Avoid any water or heavy dust on capacitors surface, which may cause electrical leakage, damage, overheating or corrosion.

2.03 Operating load conditions

- Do not use the capacitor with any higher than specified voltage.
- Violation of the technical product specifications such as exceeding the specified voltage will void the warranty.
- Operating voltage across the terminals including AC and DC peaks and AC or pulse overshooting, Vp-p as well as irregular voltage because of resonance or switching must be below the rated voltage.
- Due to self-heating the reliability of the capacitor may be reduced, if high frequency AC or pulse is applied.
- Avoid any overload or conditions that are not specified in the capacitors datasheet.
- Consider carefully possible specific changes of electrical characteristics like capacitance over temperature, voltage and time as well as the specific performance over frequency for the actual use conditions. For detailed information see datasheet.

2.04 Design of the P.C. board

- The chip capacitor shall be located to minimize any possible mechanical stress from deflection or board wrap.
- It is recommended to position the chip capacitor in parallel to slits and perforations and as far away from slits, perforations, separation points, screw holes, frames and edges of the P.C. board to avoid mechanical stress.
- Determine the shape and size of the solder pads to have proper amount of solder on the terminations as the amount of solder at the terminations has a direct effect on the reliability of the capacitor.
- Provide individual solder pads for each termination. Solder pads are specified in the datasheet.
- The PCB design (e.g. land pattern design and grounding planes) must be evaluated for each individual circuit to achieve the optimal soldering results.

2.05 Mounting

- Avoid any stress from the mounting head to avoid cracks.
- Adjust the bottom dead center of the mounting head not to press on the P.C. board surface.
- The mounting head pressure has to be adjusted to 1 N up to 3 N of static force.
- Provide support from the bottom side of the P.C. board by a support pin for minimizing the impact energy from the mounting head.
- Provide sufficient close up dimension, preventive maintenance and replacement of the centering jaw to avoid a crack when it is worn out.

2.06 Adhesive

Selection of adhesive

- The adhesive should have sufficient coating and viscosity and should harden rapidly.
- The adhesive should be strong enough to hold parts on the board during the mounting and solder process and should have sufficient strength at high temperatures.
- The adhesive should have corrosion resistance, excellent insulation characteristics and no emission of toxic gasses nor any effect on the human body.

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KaS	PSL	DIN ISO 2768-1m	

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- Do not use too much adhesive to avoid pollution of the soldering pads.

2.07 Soldering

- The detailed soldering instructions for reflow and wave soldering are given within Soldering Specification in the datasheet.
- The soldering profile has to be compliant with the technical soldering specification, otherwise this will void the warranty.
- Avoid any other than specified temperature and / or time conditions during soldering.
- Customer needs to ensure that the applied solder paste, the paste thickness and solder conditions are applicable to guarantee a sufficient solder result according to the relevant criteria of IPC-A-610.
- Excessive amount of solder may lead to higher tensile force and chip cracking. Insufficient amount of solder may detach the capacitor due to defective contacts.
- Do not use excessive nor insufficient flux.
- Provide enough washing when water-soluble flux is used.
- Consider the preheating conditions as follows to avoid thermal shock:

1. Wave soldering - 0603, 0805 - Temperature difference $\Delta T \leq 150°C$
2. Reflow soldering - 1206 or less - Temperature difference $\Delta T \leq 190°C$
3. Reflow soldering - 1210 or more - Temperature difference - $\Delta T \leq 130°C$
4. Manual soldering - 1206 or less - Temperature difference $\Delta T \leq 190°C$
5. Manual soldering - 1210 or more - Temperature difference $\Delta T \leq 130°C$

- It is recommended to use air for natural cooling. When dipping the chips into a solvent for cleaning, the temperature difference (ΔT) must be less than 100°C.
- For reflow soldering two times limitation is recommended.
- Wave soldering is recommended only for the following case sizes: 0603 and 0805, thickness
- Please ensure for manual soldering (solder iron) not to exceed the general temperature capabilities as specified above.
- The following conditions are recommended for solder repair by solder iron:

Size	Temp. (°C)	Preheating Temp. (°C)	Temperature difference (ΔT)	Atmosphere
1206 or less	330 ± 20°C	>150°C	$\Delta T \leq 190°C$	
1210 or more	280°C max	>150°C	$\Delta T \leq 130°C$	Room air

Typical time of actual peak temperature:

Do not make direct contact with the ceramic dielectric.

2.08 Cleaning

- Cleaning agents that are used to clean the customer application might damage or change the characteristics of the component, body, pins or termination.
- Avoid Halogen in the flux or any contaminated flux as well as excessively high ultrasonic cleaning.

2.09 Coating, molding and potting of the P.C. board

- When coating and molding the P.C. board verify the quality influence on the capacitor.
- Verify the curing temperature and assure that there is no harmful decomposing or reaction gas emission during curing.
- Do not exceed the maximal temperature rise of 20°C.
- If the product is potted in customer applications, the potting material might shrink during and after hardening. The product is exposed to the pressure of the potting material with the effect that the body and termination is possibly damaged and so the electrical as well as the mechanical characteristics are endangered to be affected. After the potting material is cured, the body and termination of the product have to be checked if any reduced electrical or mechanical functions or destructions have occurred.

2.10 Handling after chip is mounted

- Direct mechanical impact to the product shall be prevented.
- After soldering please pay attention not to bend, twist or distort the P.C. board in handling and storage.
- Avoid excessive pressure during the functional check of the P.C. board.
- Avoid bending stress while breaking the P.C. board.

2.11 Handling of loose chip capacitor

- Once dropped do not use the chip capacitor.
- After mounting avoid piling up P.C. boards to avoid hitting the chip capacitor of another board.

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Important Notes

The following conditions apply to all goods within the product range of Würth Elektronik eiSos GmbH & Co. KG:

1. General Customer Responsibility

Some goods within the product range of Würth Elektronik eiSos GmbH & Co. KG contain statements regarding general suitability for certain application areas. These statements about suitability are based on our knowledge and experience of typical requirements concerning the areas, serve as general guidance and cannot be estimated as binding statements about the suitability for a customer application. The responsibility for the applicability and use in a particular customer design is always solely within the authority of the customer. Due to this fact it is up to the customer to evaluate, where appropriate to investigate and decide whether the device with the specific product characteristics described in the product specification is valid and suitable for the respective customer application or not.

2. Customer Responsibility related to Specific, in particular Safety-Relevant Applications

It has to be clearly pointed out that the possibility of a malfunction of electronic components or failure before the end of the usual lifetime cannot be completely eliminated in the current state of the art, even if the products are operated within the range of the specifications. In certain customer applications requiring a very high level of safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health it must be ensured by most advanced technological aid of suitable design of the customer application that no injury or damage is caused to third parties in the event of malfunction or failure of an electronic component. Therefore, customer is cautioned to verify that data sheets are current before placing orders. The current data sheets can be downloaded at www.we-online.com.

3. Best Care and Attention

Any product-specific notes, cautions and warnings must be strictly observed. Any disregard will result in the loss of warranty.

4. Customer Support for Product Specifications

Some products within the product range may contain substances which are subject to restrictions in certain jurisdictions in order to serve specific technical requirements. Necessary information is available on request. In this case the field sales engineer or the internal sales person in charge should be contacted who will be happy to support in this matter.

5. Product R&D

Due to constant product improvement product specifications may change from time to time. As a standard reporting procedure of the Product Change Notification (PCN) according to the JEDEC-Standard inform about minor and major changes. In case of further queries regarding the PCN, the field sales engineer or the internal sales person in charge should be contacted. The basic responsibility of the customer as per Section 1 and 2 remains unaffected.

6. Product Life Cycle

Due to technical progress and economical evaluation we also reserve the right to discontinue production and delivery of products. As a standard reporting procedure of the Product Termination Notification (PTN) according to the JEDEC-Standard we will inform at an early stage about inevitable product discontinuance. According to this we cannot guarantee that all products within our product range will always be available. Therefore it needs to be verified with the field sales engineer or the internal sales person in charge about the current product availability expectancy before or when the product for application design-in disposal is considered. The approach named above does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.

7. Property Rights

All the rights for contractual products produced by Würth Elektronik eiSos GmbH & Co. KG on the basis of ideas, development contracts as well as models or templates that are subject to copyright, patent or commercial protection supplied to the customer will remain with Würth Elektronik eiSos GmbH & Co. KG. Würth Elektronik eiSos GmbH & Co. KG does not warrant or represent that any license, either expressed or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, application, or process in which Würth Elektronik eiSos GmbH & Co. KG components or services are used.

8. General Terms and Conditions

Unless otherwise agreed in individual contracts, all orders are subject to the current version of the “General Terms and Conditions of Würth Elektronik eiSos Group”, last version available at www.we-online.com.

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