

KONNEKT Mounting Recommendations

Pad Geometry, Solder Paste, Reflow, Wave Soldering, Hand Soldering

Add Statement on scope of document (1812, 2220, 3640, 2/3/4 chip KONNEKT)

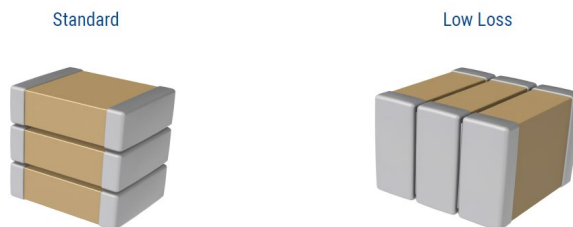


Figure 1 - KONNEKT Capacitors in Standard and Low-Loss Orientation (EIA 1812 Example)

Pad Geometry Recommendations

IPC-7351 provides Land Pattern Design Recommendations which provide geometric guidelines which are designed to result in adequate component to PCB shear strength and fillet height. In applying these guidelines for the standard orientation mounting, the land patterns will be the same as the single chip MLCC capacitor. For devices mounted in low-loss orientation KEMET recommends IPC-7351, Density Level B for Median (Nominal) Land Protrusion as providing optimal shear strength and fillet height.

Land pattern information is included in the table below as well as the KONNEKT datasheet. Density Level A guidelines also provide acceptable shear strength and adequate fillet height. Density Level C, the largest pad geometry, provided lower but adequate shear but with a minimal fillet height. Note: For mounting the device in a low loss orientation, “acceptable” fillet height was defined as 25% of the thickness of a single chip.

EIA Size Code	Metric Size Code	Thickness Code	Median (Nominal) Land Protusion																							
			STANDARD ORIENTATION						LOW LOSS ORIENTATION																	
			2,3,4-Chip Stack Pad Sizes						2-Chip Stack Pad Size						3-Chip Stack Pad Size						4-Chip Stack Pad Size					
			C	Y	X	V1	V2		C	Y	X	V1	V2	C	Y	X	V1	V2	C	Y	X	V1	V2			
1812	4532	GO	2.05	1.40	3.50	6.00	4.00							2.05	1.40	8.40	6.00	8.90								
2220	5750	JN	2.65	1.50	5.40	7.30	5.90	2.65	1.50	6.50	7.30	7.00		2.65	1.50	8.40	7.30	8.90	2.65	1.50	11.20	7.30	11.70			
3640	9210	JF	4.35	1.50	10.60	10.70	11.10							4.35	1.50	8.40	10.70	8.90	4.35	1.50	11.20	10.70	11.70			

Table 1- KONNEKT Capacitors in Standard and Low-Loss Orientation (EIA 1812 Example)

Recommended Solder Paste Quantity

Solder paste requirements for the Standard orientation are the same as mounting a typical single ceramic MLCC and should be treated similarly. However, there are other considerations that come into play when mounting a KONNEKT capacitor in the low-loss orientation.

The KONNEKT assembly process utilizes photo-location and automated chip placement followed by optical inspection that ensures the vertical and horizontal mis-alignment are kept to a minimum, with max overall offsets of any one chip specified to be below 0.12mm (0.005”); typical values within +/- 0.05mm (0.002”).

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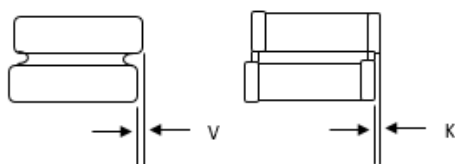


Figure 2 - KONNEKT Capacitors in Standard and Low-Loss Orientation (EIA 1812 Example)

For devices mounted in the standard orientation chip to chip locational variation has no effect and requires no adjustment to the soldering process, but in the case of the low loss mounting orientation it should be considered. This is especially true when determining paste and print screen thicknesses. For devices in this orientation it is best for the paste thickness to be at least as thick as the max potential chip offset within the stack. This ensures the solder contacts and wicks to all the chips in the assembly and all chips are directly mechanically and electrically connected to the PCB or substrate.



Figure 3 - KONNEKT Capacitors mounted in Low-Loss Orientation. From left to right: 3640 4-chip, 2220 4-chip, 1812 4-chip

Since KEMET's maximum offset specification allows up to $\pm 0.12\text{mm}$ (0.005") in shift, offset and twist, KEMET recommends a wet paste thickness of 0.15mm (0.006").

Solder Volume Recommendations

When mounting in low-loss orientation, KEMET recommends a solder fillet height (X) no greater than 1mm and no less than 0.5mm. This ensures the solder contacts and wicks to all the chips in the KONNEKT stack, and ensures all chips are mechanically and electrically connected to the PCB.

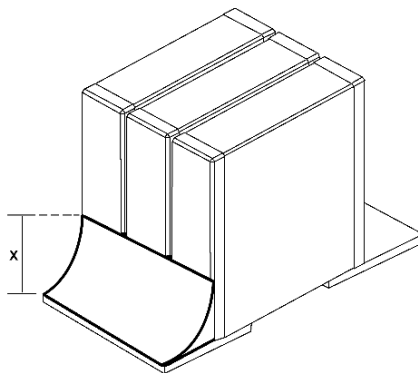


Figure 4 – KONNEKT solder fillet height in Low-Loss Orientation

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Solder Reflow Recommendations

KEMET's KONNEKT family of high-density surface mount multilayer ceramic capacitors (SMD MLCCs) are compatible with convection and IR reflow techniques. Preheating of these components is recommended to avoid extreme thermal stress. KEMET's recommended profile conditions for convection and IR reflow reflect the profile conditions of the IPC/J-STD-020 standard for moisture sensitivity testing. These devices can safely withstand a maximum of three reflow passes at these conditions.

Profile Feature	Termination Finish
	100% matte Sn
Preheat/Soak	
Temperature Minimum (T_{min})	150°C
Temperature Maximum (T_{max})	200°C
Time (t_p) from T_{min} to T_{max}	60 – 120 seconds
Ramp-Up Rate (T_L to T_p)	3°C/second maximum
Liquidous Temperature (T_L)	217°C
Time Above Liquidous (t_L)	60 – 150 seconds
Peak Temperature (T_p)	260°C
Time Within 5°C of Maximum Peak Temperature (t_p)	30 seconds maximum
Ramp-Down Rate (T_p to T_L)	6°C/second maximum
Time 25°C to Peak Temperature	8 minutes maximum

Note: All temperatures refer to the center of the package, measured on the capacitor body surface that is facing up during assembly reflow.

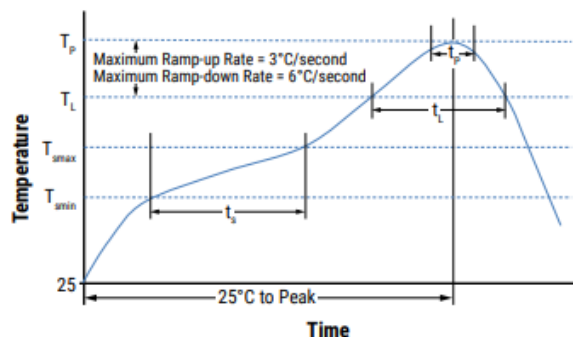


Figure 5 - KONNEKT Recommended Solder Reflow Profile using Pb-Free profile

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Solder Wave

KEMET does not recommend solder wave for KONNEKT capacitors

Hand Soldering Recommendations

The preferred method of attachment for KEMET's KONNEKT Capacitors is IR or convection reflow where temperature, time and air flow are well controlled. However, it is understood that the manual attachment of KONNEKT capacitors is necessary for prototype and lab testing. In these instances, care must be taken not to introduce excessive temperature gradients in the KONNEKT part type that may lead to cracking in the ceramic or separation of the TLPS material.

The following methods of attachment and detachment are proposed based on successful demonstrations in our lab:

*The following methods are usable for both low-loss and traditional orientations.

Manual Attach using Solder Paste

1. Attach the KONNEKTTM capacitor using dispensed solder paste and soldering iron.
2. Dispense solder paste to appropriately cover solder pad. Using anti-static tweezers, place the KONNEKT capacitor on the land pattern.
3. While gently holding the capacitor in place using tweezers, touch the soldering iron to one side of the solder pad so that the tip of the iron is touching the solder paste. Moving the tip of the iron from side to side on the pad can help with even heating of the solder.
4. Once the solder paste has entered a liquidous state, move the tip of the iron close to the termination of the capacitor while trying to avoid direct contact with the termination. Moving the tip of the iron from side to side on the pad can help with even distribution of solder. Once a good fillet is formed, remove the soldering iron and repeat the process on the second termination.
5. It is best to solder the second termination immediately after the first to take advantage of the pre-heated capacitor.
6. Visually inspect both solder joints using a 10x magnifying eye loop for smooth consistent solder joints.



Figure 6 – Solder Paste on KONNEKT 1812 Land Patterns

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Manual Attach using Flux Cored Solder Wire

1. Attach the KONNEKTTM capacitor using flux cored solder wire and soldering iron.
2. Place the tip of the soldering iron on one of the land patterns to pre-heat the solder pad.
3. After the pad is heated feed a small amount of solder wire onto the surface coating the pad evenly. The iron can be removed at this point. (Note that too much heat may damage the pad thus this is a process that only takes a few seconds.)
4. Pick up the capacitor using tweezers and reheat the solder from the previous step with the soldering iron tip.
5. Once the solder becomes liquid, position the capacitor onto the pad and close to the solder tip without touching it.
6. Ensure that the capacitor is flat against the pad surface and in proper position for both pads. Moving the tip of the iron from side to side on the pad can help with even distribution of solder. After the surface of the capacitor is wetted remove the iron and begin the steps for soldering the second termination.
7. It is best to solder the second termination immediately after the first to take advantage of the pre-heated capacitor.
8. While touching the tip of the solder iron to the second pad, feed a small amount of additional solder onto the surface of the second pad allowing it to flow across the pad.
9. Remove the iron and visually inspect the joints using 10x magnification

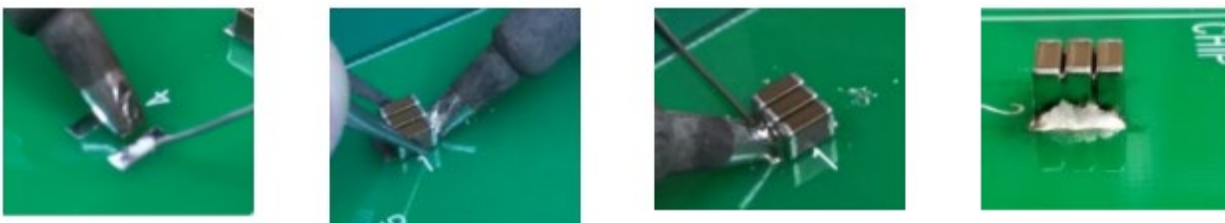


Figure 7 – Manual Attachment of KONNEKT using Soldering Iron and Flux Core Wire

Manual removal of KEMET KONNEKT™ Capacitor

1. The only approved method for removing a KEMET KONNEKTTM capacitor from a PCB is using soldering iron tweezers.
2. First place a small amount of liquid flux to the solder joints between the capacitor and the PCB on both sides.
3. Place the soldering iron tweezer on either side of the capacitor in contact with the solder joints.
4. Once the solder on both sides of the component have liquified, lift the capacitor from the PCB with the tweezers and set it aside. (Note that too much heat may damage the pads on the PCB. This is a process that only takes a few seconds.)
5. Once removed, the capacitor should be discarded and not reused.