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SOLDER JOINT OF A MULTILAYER CERAMIC CAPACITOR ON A PRINTED CIRCUIT BOARD (PCB)

Objective:

The pores or other defects of the solder joint in the ceramic capacitor should be investigated. The samples were cut with Qcut 150 A, embedded with an epoxy base cold embedding material (KEM 92) and finally ground and polished with Qpol 250 Al Eco. Etching was not necessary for this examination. Detailed parameters and images can be found in the following sections.

CUTTING

Device	Qcut 150 A	
Cut-off disc	Diamond cut-off disc	Item no.: 92007707
Coolant and anti-corrosion agent	ATM Cool Cut	Item no.: 95004145
Clamping tool	- Table attachment	Item no.: Z1870020
	- Parallel cutting guide	Item no.: Z1870023
Cutting method	Manual table operation	
Parameter	- Feeding speed	Manual
	- Pulse setting	Without pulse
	- Rotational speed	1600 rpm
	of cut-off disc	

Note

In this step, we separate the assembled circuit board to make it smaller for the mounting. It is important not to cut through the capacitor, otherwise it will be damaged.



Cut-off machine Qcut 150 A

Rough cutting of the examined area



COLD MOUNTING



Cold mounting material KEM 92

Mounting Material	KEM 92
Mixing ratio	100 : 23.2 (Resin : Hardener)
Curing time	approx. 12 hours
Mounting mold	PP, ø 40 mm
Accessories	- Stirring sticks - Mixing cup - Infiltration device - Scale
Note	It is important to fill the mounting mold with the maximum height, because the sample is subsequently separated to the target level.

CUTTING



Cut-off machine Qcut 150 A

Device	Qcut 150 A	
Cut-off disc	Diamond cut-off disc	Item no.: 92007707
Coolant and anti-corrosion agent	ATM Cool Cut	Item no.: 95004145
Clamping tool	Rotation device	
Cutting method	Vertical cutting (Y-axis)	
Parameter	- Feeding speed - Pulse setting - Rotational speed of cut-off disc	0.05 mm/s - Without pulse 1600 rpm

Note The mounted PCB is cut just near to the target surface, with the rotation device. This technique supports the capacitor during the process and creates a plane-parallel surface.

Qcut 150 A, cutting near to the target surface



Automatic grinding and polishing machine Qpol 250 A1 Eco

GRINDING/POLISHING

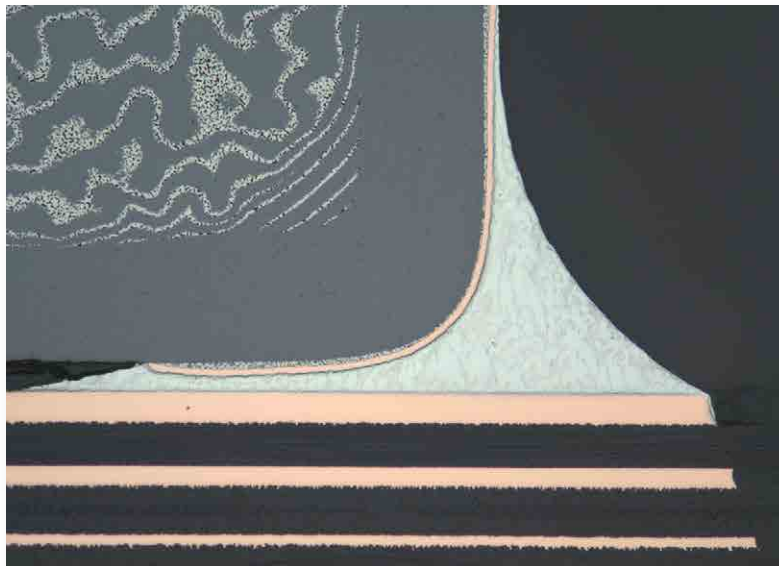
Device	Qpol 250 A1 Eco	
Sample holder	6 x 40 mm	Item no.: Z5445025
Pressure	Single pressure	

STEP	MEDIUM		 rpm	 rpm	 Single pressure N	 min
 Pre-Grinding	Galaxy green	H ₂ O	250	120 ▶▶ Synchronous Rotation	30	Until plane (approx. 1:00)
 Grinding	Galaxy blue	H ₂ O	250	120 ▶▶ Synchronous Rotation	30	1:00
 Pre-Polishing	BETA	Dia-Complete Poly, 9 µm	120	100 ◀▶ Counter Rotation	25	6:00
 Polishing	GAMMA	Dia-Complete Poly, 3 µm	120	100 ▶▶ Synchronous Rotation	25	4:00
 Final polishing	OMEGA	Eposil F 0.1 µm	100	90 ◀▶ Counter Rotation	20	1:30 (H ₂ O during final 0:15)
 Etching (chem.)	-	-	-	-	-	-
Notes	- Pre-dosing for 9 µm and 3 µm: 3 s - Dosing interval and dosing duration for Dia. complete 9 µm: Every 25 s for 1.3 s - Dosing interval and dosing duration for Dia. complete 3 µm: Every 30 s for 1.3 s - Dosing interval and dosing duration for Eposil F 0,1 µm: Every 20 s for 1.3 s - The images were taken with a Leica DM8000.					

RESULTS

After this preparation, the solder joint and the surrounding components are easily recognizable and can be further measured or investigated.

The microstructure of the sample under
the optical microscope- 100x



The microstructure of the sample under
the optical microscope- 200x



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