SUPPORT NOTE

SN022 | Water Washing Transformers

Dean Huumala

Water washing products that are hermetically sealed, such as encapsulated transformers, during the post solder cleaning process of printed circuit boards is safe.

Questions arise when it comes to transformers that are not hermetically sealed and run through a wash process. Roughly half of all non-hermetically sealed transformers in the industry are water-washed during the PCB cleaning process and the other half are washed with an alcohol based cleaner. Of the ones washed in water it is quite rare for any of them to exhibit problems during their life cycle. However in some case transformers in the industry have exhibited shorted turns and opens later in the life cycle which can be attributed to the water wash process.

How can water washing cause problems later in the life of the transformer? If care is not take in the spray direction of the water jets, in some case water and flux have been driven into the coil of the transformer and gotten underneath the finish tape and into the magnet wire windings. This leads to two possible modes of failure which are related to each other.

1. If the wash has a cleaning agent added to it, the cleaning agent can be caustic to the magnet wire insulation and lead to insulation break down between turns or even windings. The problem can be exasperated by any trapped water which can cause the copper itself to corrode if it comes in contact with the water. This can ultimately lead to transformer failure.
2. Another mode of failure can happen when water is trapped even if there is no cleaning agent in the water. During the winding process the insulation of magnetwire is cracked or crazed at a microscopic level due to the process of winding and bending the wire. If these cracks or crazing generates large enough cracks for water to reach the copper, this too can lead to copper corrosion.

While water washing is used by roughly half of the industry PCB cleaning processes and typically not a problem, Wurth Electronics Midcom understandably can not warrantee defects that are traced back to a water wash process as we have no control in such processes. However, we can give some tips and suggestions that have helped our customers with their water wash process. Some of the suggestions that we have include the following.

1. Direct water jets such that they do not spray at angle that would lead to water and flux penetrating under finish tape.
2. Be sure that the drying cycle leaves the transformer completely dry on the exterior.
3. If possible do not use cleaning agents in your wash.
4. Wire of small diameter is much more susceptible to wire cracks and crazing to penetrate to the copper. Use larger gauge wires where possible and bury small wires to the very inside of the coil.
5. Specify P180 wire where possible as it exhibits very good resistance to water wash processes.

Wurth Electronics Midcom in general takes precautions during the design process to make the transformer as robust as possible to withstand the water wash process. If you do have concerns about your water wash process be sure to follow as many of the five tips provided in this application note. Feel free to contact Wurth Electronics Midcom if you have questions or would like further clarification.

IMPORTANT NOTICE

The Application Note is based on our knowledge and experience of typical requirements concerning these areas. It serves as general guidance and should not be construed as a commitment for the suitability for customer applications by Würth Elektronik eiSos GmbH & Co. KG. The information in the Application Note is subject to change without notice. This document and parts thereof must not be reproduced or copied without written permission, and contents thereof must not be imparted to a third party nor be used for any unauthorized purpose.

Würth Elektronik eiSos GmbH & Co. KG and its subsidiaries and affiliates (WE) are not liable for application assistance of any kind. Customers may use WE's assistance and product recommendations for their applications and design. The responsibility for the applicability and use of WE Products 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 and investigate, where appropriate, 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.

The technical specifications are stated in the current data sheet of the products. Therefore the customers shall use the data sheets and are cautioned to verify that data sheets are current. The current data sheets can be downloaded at www.we-online.com. Customers shall strictly observe any product-specific notes, cautions and warnings. WE reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services.

WE DOES NOT WARRANT OR REPRESENT THAT ANY LICENSE, EITHER EXPRESS OR IMPLIED, IS GRANTED UNDER ANY PATENT RIGHT, COPYRIGHT, MASK WORK RIGHT, OR OTHER INTELLECTUAL PROPERTY RIGHT RELATING TO ANY COMBINATION, MACHINE, OR PROCESS IN WHICH WE PRODUCTS OR SERVICES ARE USED. INFORMATION PUBLISHED BY WE REGARDING THIRD-PARTY PRODUCTS OR SERVICES DOES NOT CONSTITUTE A LICENSE FROM WE TO USE SUCH PRODUCTS OR SERVICES OR A WARRANTY OR ENDORSEMENT THEREOF.

WE products are not authorized for use in safety-critical applications, or where a failure of the product is reasonably expected to cause severe personal injury or death. Moreover, WE products are neither designed nor intended for use in areas such as military, aerospace, aviation, nuclear control, submarine, transportation (automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network etc. Customers shall inform WE about the intent of such usage before design-in stage. In certain customer applications requiring a very high level of safety and in which the malfunction or failure of an electronic component could endanger human life or health, customers must ensure that they have all necessary expertise in the safety and regulatory ramifications of their applications. Customers acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of WE products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by WE.

CUSTOMERS SHALL INDEMNIFY WE AGAINST ANY DAMAGES ARISING OUT OF THE USE OF WE PRODUCTS IN SUCH SAFETY-CRITICAL APPLICATION.

USEFUL LINKS

Application Notes
www.we-online.com/appnotes

REDEXPERT Design Platform
www.we-online.com/redexpert

Toolbox
www.we-online.com/toolbox

Product Catalog
www.we-online.com/products

CONTACT INFORMATION

appnotes@we-online.com
Tel. +49 7942 945 - 0

Würth Elektronik eiSos GmbH & Co. KG
Max-Eyth-Str. 1 74638 Waldenburg Germany
www.we-online.com

REVISION HISTORY

Document Version	Release Date	Changes
SN022a	2023/10/05	Initial release of the application note
SN022a	2026/06/23	Contact person added

Note: *The current version of the document and the release date are indicated in the footer of each page of this document.*