

Sealed to Deliver!

Encapsulated transformers for electronic, electrical applications

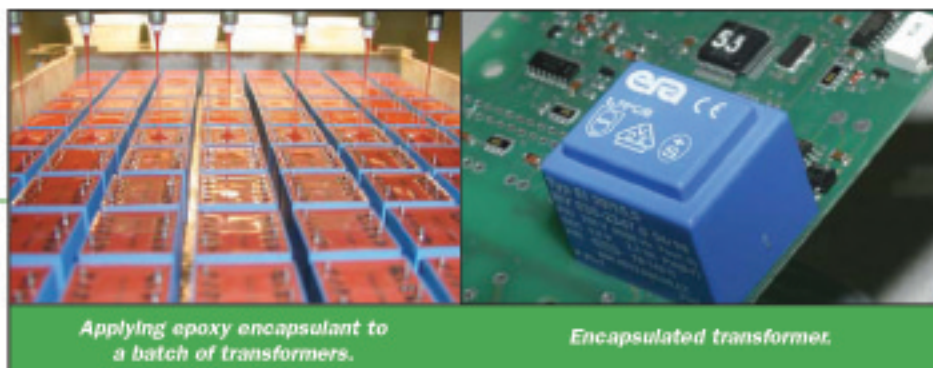
By Stefan Alchele, vice-president, operations, TransERA Electronics Inc., Waterloo ON

Power transformers have been an essential part of the electrical engineer's toolkit since the time of Nikolai Tesla. While transformers are a mature technology, enhancements are still being made to improve their performance and usability. One of the most significant improvements to transformer technology has been the introduction of epoxy encapsulation for small power transformers (up to 50 VA).

Encapsulated transformers are high-quality devices designed to meet the most demanding requirements. Steps such as winding of the magnet wire, soldering of magnet wire to connecting pins/leads, preparation of the core, encapsulation and final testing are fully automated. The potting material (or encapsulant) is an epoxy compound with high thermal conductivity, injected

under vacuum conditions to ensure there are no voids or air pockets around the windings or core. The whole unit is enclosed in a tough plastic shell to protect the internal components while presenting a clean, businesslike face to the world. And naturally, all units are fully tested before they are shipped!

Encapsulated transformers are available off-the-shelf in a wide range of ratings, sizes and configurations. The most common configuration takes a cue from integrated circuit components and has connector pins that permit installation directly onto printed circuit boards. Other models, typically larger, have quick-connect terminals or wire leads and mounting flanges that make them convenient to mount on DIN rails, control panels and other types of enclosures.



Applying epoxy encapsulant to a batch of transformers.

Encapsulated transformer.

Encapsulated advantages

Epoxy encapsulated transformers have a number of advantages when compared to traditional open-style designs. Because internal components are sealed inside a tough, waterproof enclosure, encapsulated transformers are an obvious choice for applications where they will be subjected to humidity, dust or other environmental hazards. And, since the casing and encapsulant provide excellent physical support for the windings and core, the transformers are highly resistant to mechanical damage, shock and vibration. Encapsulated transformers are also easy to install with automated assembly equipment, since their simple, regular shapes make them easy to grip and manipulate.

Epoxy encapsulated transformers typically have very favorable thermal and electrical characteristics. Thanks to the thermal conductivity of the epoxy encapsulant, it also makes encapsulated transformers a good choice for 'internationalized' products, since the same unit can be easily adapted to run with 115V or 230V line voltages.

When running at 115V, the transformer would be switched to use a tap on the primary winding. This would mean that only half of the primary winding is carrying current and that that part of the winding would get relatively hot. However, because of the superior heat conducting properties of the encapsulant, this heat is dissipated without causing problems.

The epoxy encapsulant increases insulation between windings and reduces potential for breakdown or corona under high voltage surge conditions.

Because the encapsulation process is less likely to damage windings than tape or paper wrapping, very fine gauges of magnet wire can be used successfully. With the resulting high internal resistance in the windings, the transformers can meet Class 2 requirements for temperature limits under short circuit conditions, without having

to resort to fuses or other current-limiting devices.

Finally, epoxy encapsulated transformers have a tidy, efficient appearance that helps make products that incorporate them look more "professional". And, if brand identity is a priority, TransERA can produce custom runs of transformers that display the OEM's name or logo in a prominent location on the transformer casing.

Transformers in action

Epoxy encapsulated transformers were first introduced in Europe, where they currently account for an estimated 80% of the transformers in the 0 - 10 VA range. In North America, encapsulated transformers have a smaller market share, but this is growing rapidly as manufacturers recognize their cost effectiveness in demanding applications. High-growth areas include household and industrial appliances, HVAC systems, standby power sources and power meters.

"Encapsulated transformers are an especially good choice for the new generation of 'smart' power meters," says Keith Robertshaw, engineering manager at Waterloo-based TransERA Electronics. "These meters typically have time-of-use measurement capabilities and can be read remotely, using a low-power radio link. They are moisture-proof, heat tolerant and highly resistant to voltage surges caused by lightning strikes or other disturbances."

Availability

TransERA's catalog includes off-the-shelf encapsulated transformers with power ratings that range from 0.08VA to 50VA. To fit different space and installation requirements, TransERA's standard transformers come in three different formats: low profile, print-line, and the extremely compact mini-line series. Customized designs and value-added assemblies are also available.

For more information on power transformers from TransERA Electronics, circle 220 or <http://ept.lms.ca/6329-220>.

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