

# A Novel Optical Coherence Tomography for Non-Destructive Characterisation of Electrical-Thermal-Mechanical Deformation of Bonding Wires

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## Abstract

Bonding wire is one of the most failure-prone components of power electronics modules, and silicone gel is usually employed to encase bonding wires. In this talk I will report the use of optical coherence tomography (OCT) technique to precisely measure the electrical–thermal–mechanical (ETM) deformation of bonding wires under silicone gel. A spectral-domain line-field OCT system was developed to capture the whole cross-sectional image of the bonding wire sample in a single-shot fashion without the need of any mechanical scanning. The time-resolved displacement/deformation of the bonding wire under silicone gel can be measured with sub-nanometre sensitivity by extracting the phase information recorded in the raw OCT spectrogram. The achieved temporal resolution is 2.5 ms for monitoring the ETM deformation dynamics of the bonding wire. We found that the ETM deformation of the gel-encased bonding wire was about three times smaller than that of the bare bonding wire. These experimental results suggest that the spectral-domain line-field OCT could be a useful analytical tool for studying the time-dependent ETM deformation of bonding wires encased by silicone gel.

## Reference

- [1] Z. Zhao, Z. Zhang, S. Lawman, Z. Yin, Y. Hu, J. Xu, and Y.C. Shen, *Characterisation of Electrical-Thermal-Mechanical Deformation of Bonding Wires Under Silicone Gel Using LF-OCT*, *IEEE Transactions on Power Electronics*, (<http://doi.org/10.1109/TPEL.2021.3068128>)