

R&D Electronics Newsletter (2014 Issue 4)

Welcome to our 4th issue of newsletter!

Power cycle and thermal cycle are the most important parameters for the reliability and lifetime of the power modules. In this issue we will present you how our supplier partner TECHSEM substantially improves the captioned parameters by using **pressure contact technology** and thus ensuring a much higher reliability and durability of the products.

To allow you to better know our products, we provide now for certain types of products with limited quantities as **free samples** at your disposal. For more information please visit our webshop: www.rd-ebusiness.com

Yours faithfully

R&D Electronics Team

Solder contact vs. pressure contact

1. Power cycle and thermal cycle

Power cycles and thermal cycles serve as simulation of the heat stress of the power modules in the operation modus. These can be presented in two operation models:

- Operation model 1 (Fig.1) shows few changes of the case temperature (or base plate temperature) but frequent changes of the junction temperature. This is also known as power cycles life.

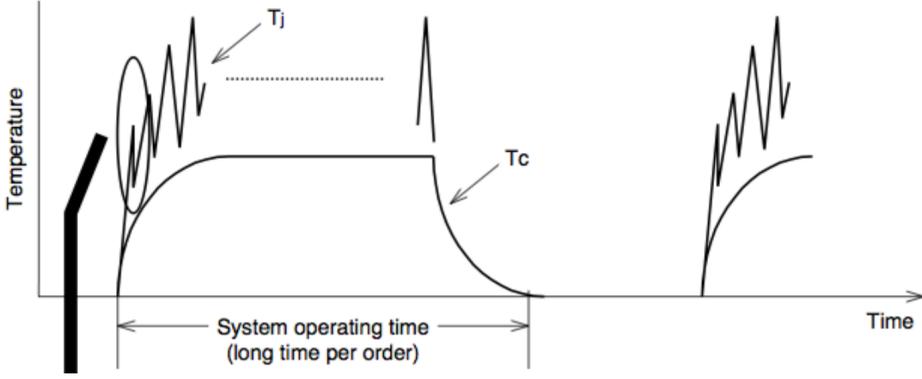


Fig.1: Simulation of the power cycles

- Operation model 2 (Fig.2) shows frequent switch-on and -off of the semiconductor within short time. This is referred to as thermal cycle operation.

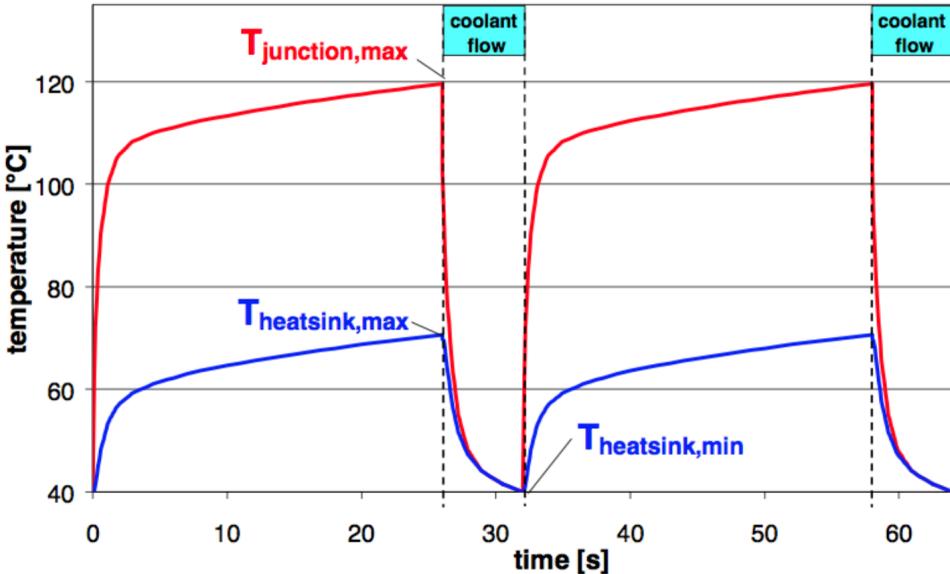


Fig.2: Simulation of the thermal cycles

The both operation models occur and are often combined in the real application. Due to the different coefficient of thermal expansion (COE) of the materials, the resulting heat stress leads to mechanical stress between the different materials.

2. Differences between solder contact and contact pressure:

In terms of packaging technologies, there are two common ways of module assembly:

- The components have been soldered (Fig.3)

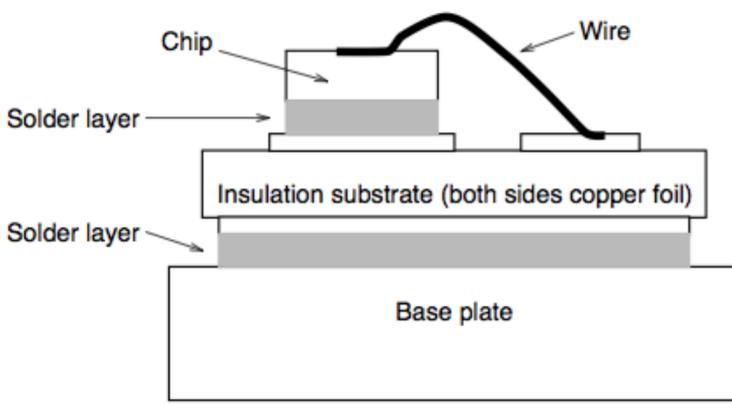


Fig.3: Sectional view of a solder contact module

- Connecting of the components in the module using a pressing element. The components are connected through mechanical force (Fig. 4).

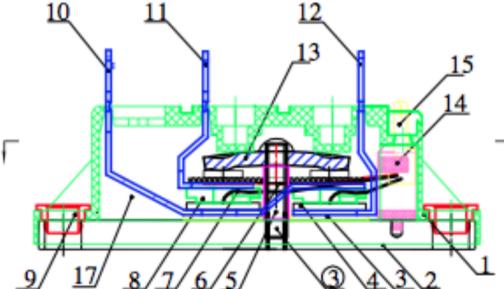


Fig.4: Sectional view of a pressure contact module

Because of the power cycles and thermal cycles as well as different COE, the mechanical stress is produced between the materials in a power module. The mechanical stress caused by power cycles occurs primarily at the connecting points of the chip. For solder contact this stress often leads to cracks (Fig. 5).

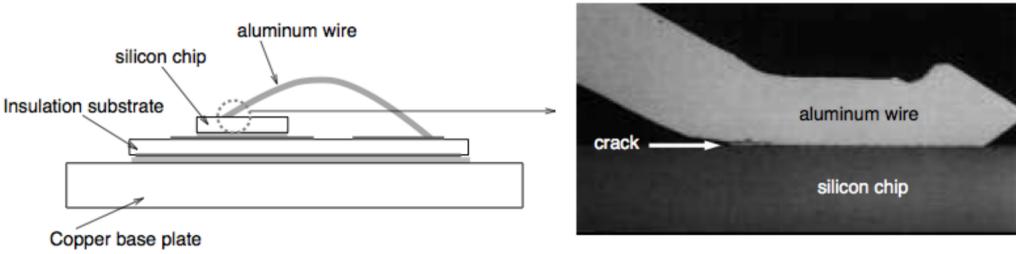


Fig. 5: State of fatigue with solder contact after the power cycle test

The mechanical stress caused by thermal cycles may occur in the solder layer between DCB and base plate. This could also lead to crack formation when the heat stress and related mechanical stress cannot be timely released (Fig.6). In case of pressure contact, however, all of the components in the module are connected elastically. The heat-induced mechanical stress can be compensated by expansion of the elements.

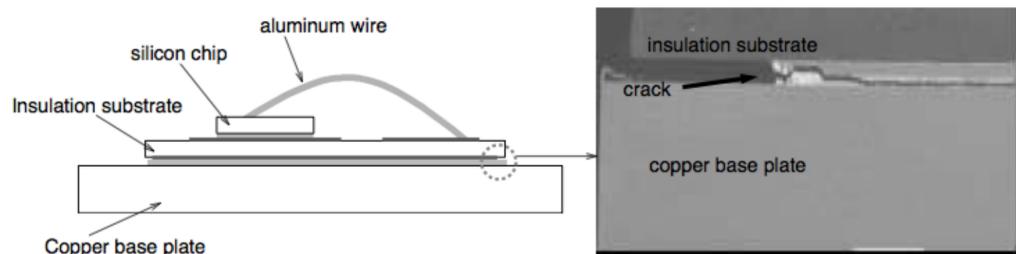


Fig. 6: State of fatigue with solder contact after the thermal cycle test

3. Conclusion

Both packaging technologies have advantages and disadvantages. With regard to reliability and service life of the power modules, **pressure contact offers considerable advantages**. Many power electronic manufacturers provide the modules below 200A exclusively with solder contact only. However, **TECHSEM is offering all the modules based on pressure contact technology!**

Just request samples and see it yourself.

Visit us at our booth during the PCIM in Nuremberg

- When: from 20th - 22nd May 2014
- Where: at booth 9-548 in hall 9

We are looking forward to meeting you. For meeting arrangement please contact us via info@rd-ebusiness.com or by phone +852-3421-2216.

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