New R_{thCH} data sheet values

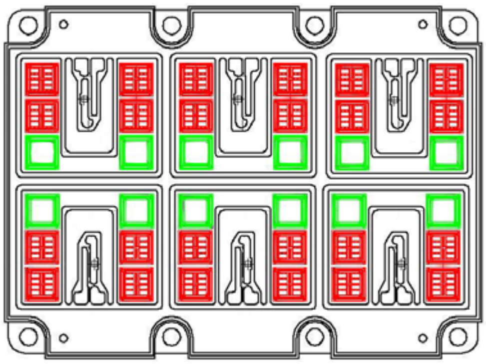
With the release of a new data sheet software for IGBT modules in 2003 the 'thermal resistance case to heat-sink per module' is supplemented by the therein included values for the 'thermal resistance case to heat-sink per IGBT' and the 'thermal resistance case to heat-sink per diode'.

Previous specification:

Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		6,00		K/kW

New specification:

Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Modul / per module λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		6,00		K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro IGBT / per IGBT λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		9,00		K/kW
Übergangs-Wärmewiderstand thermal resistance, case to heatsink	pro Diode / per diode λ_{Paste} = 1 W/(m·K) / λ_{grease} = 1 W/(m·K)	R_{thCH}		18,0		K/kW



Due to the distribution of separate chips for IGBT and diode across the module´s surface (e.g. on the right you find a view into an open FZ600R65KF1 with 24 IGBT chips (red) and 12 diode chips (green)) the assumption of a plane, homogenuous heat input to the base plate is not warranted under all operation conditions. In this case a separate thermal calculation for the IGBT as well as the diode part is necessary. As shown below, the values for the thermal resistance case to heat-sink per IGBT and diode can already be derived from the previous specification but were now added for more simplicity.

According to their geometrical proportions, the relation between the thermal resistances case to heat-sink of IGBT and diode remains the same as for the thermal resistances junction to case:

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$$\frac{R_{thJC,I}}{R_{thJC,D}} = \frac{R_{thCH,I}}{R_{thCH,D}}$$

The same consideration is applicable for the relation between the partial and total resistances: the relation from $R_{thCH,I}$ of the IGBT part (or $R_{thCH,D}$ for the diode part) to the total R_{thCH} of the module behaves like the $R_{thJC,I}$ of the IGBT (or $R_{thJC,D}$ of the diode) to their total value R_{thJC}. The total value is the result of the paralleled thermal resistances of IGBT and diode:

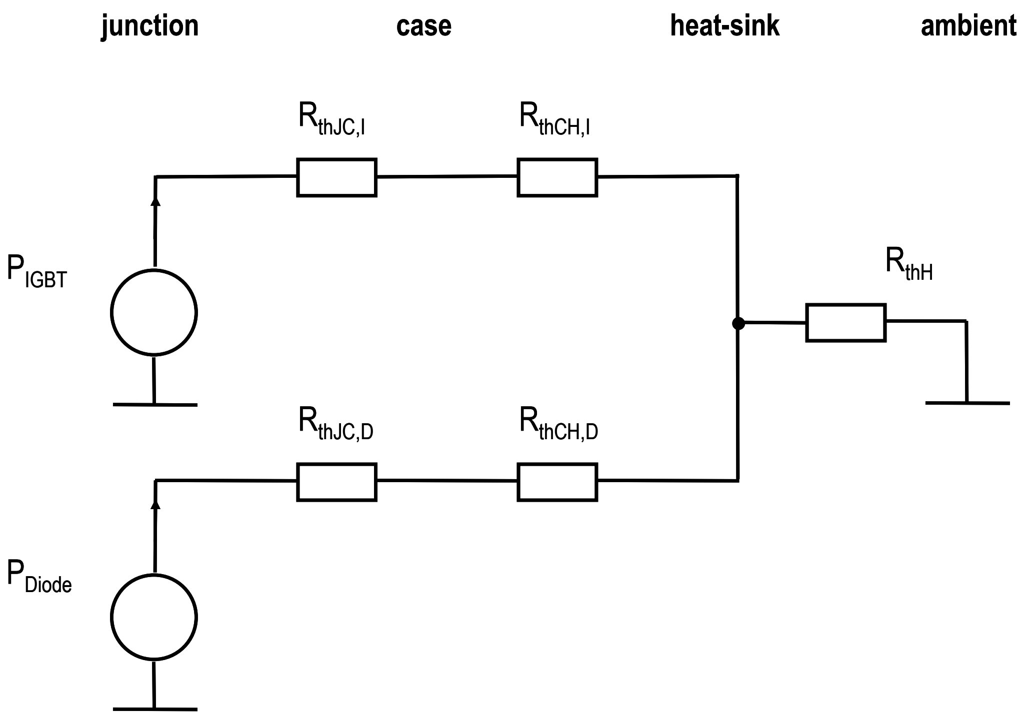
$$\frac{R_{thCH,I}}{R_{thCH}} = \frac{R_{thJC,I}}{R_{thJC}} = \frac{R_{thJC,I} + R_{thJC,D}}{R_{thJC,D}} \quad \text{with} \quad R_{thJC} = \frac{R_{thJC,I} * R_{thJC,D}}{R_{thJC,I} + R_{thJC,D}}$$

With a given R_{thCH} for the module, the thermal resistance case to heat-sink for the IGBT and diode part can be calculated as follows:

$$R_{thCH,I} = \frac{R_{thJC,I}}{R_{thJC}} * R_{thCH} = \frac{R_{thJC,I} + R_{thJC,D}}{R_{thJC,D}} * R_{thCH}$$

$$R_{thCH,D} = \frac{R_{thJC,D}}{R_{thJC}} * R_{thCH} = \frac{R_{thJC,I} + R_{thJC,D}}{R_{thJC,I}} * R_{thCH}$$

The equivalent thermal circuit diagram is shown in the following illustration:



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