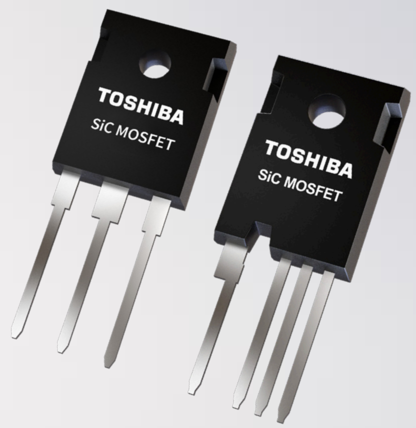
SiC Snacks

Bite Sized Benefits

Optimal $R_{DS(ON)}$ * Q_{gd}



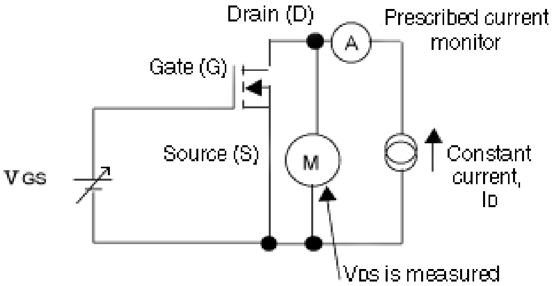
What does it mean?

$R_{DS(ON)}$, which is known as the on-resistance, is an intrinsic property of the MOSFET that will contribute to the power losses witnessed. This is influenced by the architecture and the semiconductor material used.

Basically, $R_{DS(ON)}$ signifies the resistance between the MOSFET's drain and source elements when a specific gate-to-source voltage (V_{GS}) is applied. As the V_{GS} increases, the $R_{DS(ON)}$ generally decreases. For this reason, datasheets will state the typical $R_{DS(ON)}$ at particular V_{GS} values.

While $R_{DS(ON)}$ is concerned with static (or conduction) losses, the gate charge (Q_{gd}) relates to dynamic power losses (which are the ones associated with switching operation). The Q_{gd} consists of several component elements and defines the amount of charge needed to activate the MOSFET.

The combination of $R_{DS(ON)}$ with the Q_{gd} results in a figure of merit (FoM) that proves invaluable for assessing MOSFET performance - with information on both types of power loss covered.



What's the benefit?

The lower that the $R_{DS(ON)}$ * Q_{gd} FoM is, the smaller the power losses of the MOSFET will be. It will thereby mean that higher degrees of system efficiency can be attained. In addition, less heat will be generated, so thermal management will not be as problematic.

Improvements in the $R_{DS(ON)}$ and Q_{gd} values of Toshiba's 3rd generation silicon carbide (SiC) MOSFETs (with a 80% reduction on the previous generation) are helping engineers to keep pushing the performance envelope of their power system designs. With less heat needing to be dissipated, these systems can also be simpler and more compact - with board space and component cost savings.