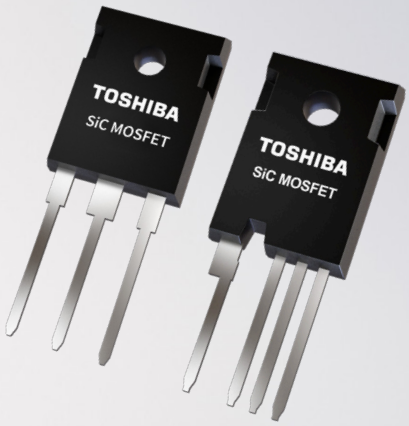
SiC Snacks

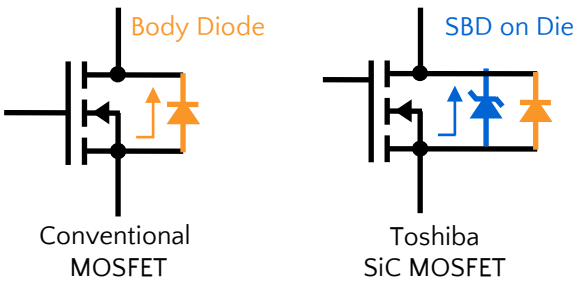
Bite Sized Benefits

Suppressing Body Diode Conduction Effects



What does it mean?

A MOSFET's body diode is an inherent parasitic element found in all such devices. Reducing the effects of body diode conduction during the switching process is something that needs addressing - otherwise it will cause an increase in the switching losses experienced and add to the on-resistance ($R_{DS(ON)}$) too. Normally this is done by putting an external Schottky Barrier Diode (SBD) in parallel with the MOSFET.



What's the benefit?

Research has shown the contribution that a MOSFET's body diode makes to turn-on losses will rise substantially as the junction temperature is increased. Likewise, its $R_{DS(ON)}$ will be very susceptible to heat variations and also get worse over its working lifetime. This is why SBD inclusion within the MOSFET is so important - as current will then pass through this rather than the parasitic body diode. It must be noted that the conventional external SBD arrangement takes up board real estate and adds to the component count.

In contrast to the SiC MOSFETs produced by other vendors, the 3rd generation of Toshiba SiC MOSFETs each feature a built-in SBD. These fast operating SBDs are able to take care of $R_{DS(ON)}$ fluctuation suppression and curb power losses, while simultaneously presenting engineers with a compact streamlined solution that is easy to implement. Their forward voltage (V_F) of just -1.35V (typical) means reverse conduction losses or minimal. The favourable V_F and $R_{DS(ON)}$ temperature characteristics are thanks to the advanced doping methods used.