ID 128

Bidirectional Power Conversion Redefined: A review on the Superiority of Dual Active Bridge (DAB) Converters

Sachethana Ranasinghe[1#]

[1]Faculty of Engineering, General Sir John Kotelawala Defence University, Sri Lanka

[#]sachethana@kdu.ac.lk

Present-day energy systems widely employ the dual active bridge (DAB) converter, which is a very adaptable DC-DC power conversion technology. Its capacity to provide bidirectional power flow while maintaining galvanic separation between the input and output circuits is its main characteristic. Owing to this feature, it is especially well-suited for a variety of industries, including grid applications running at low to medium voltages, battery systems, solid-state transformers, and renewable energy. It is constructed using eight MOSFETs/IGBTs, one driver for each MOSFET, high frequency galvanic isolation transformer, auxiliary inductor, two DC link capacitors, and two semiconductor fuses. Using the MOSFETs, two full bridge circuits were designed, and those two full bridge circuits are connected using the high frequency galvanic isolation transformer. A driver is used for each individual MOSFET, which gives the respective high frequency switching signals to the MOSFET and the switching signals which are generated by the microcontroller are fed to the driver. According to the phase shift ratios of switching signals that are given to the MOSFETS and Dead Time ratio, the direction of the power flow is decided. When it comes to renewable energy, the DAB converter is essential because it effectively connects intermittent energy sources like wind and solar photovoltaic (PV) to the grid or storage systems. It guarantees excellent energy transfer efficiency, permits smooth power conversion, and adjusts to changing input circumstances. Similar to this, the DAB converter controls battery charging and discharging in battery energy storage systems (BESS), enabling bidirectional energy flow and preserving maximum efficiency.

Keywords: *Dual Active Bridge (DAB) converter, bidirectional power flow, galvanic isolation*