TRANSFORM
Energy Systems through Game-changing Technology

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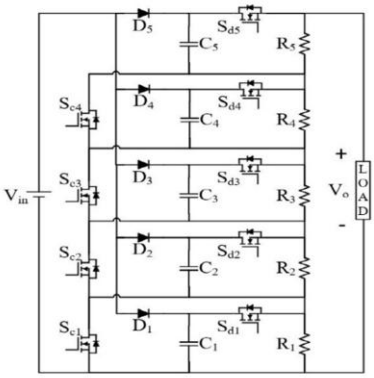

Fig. Proposed Modular

TESTING THE LIMITS OF EV MOTOR INSULATION

Shasha H. Jayaram

As electric vehicles (EVs) evolve, they're moving from 400-volt systems to 800-volt systems that use fast-switching semiconductors like silicon carbide and gallium nitride to boost performance. The resulting vehicles require shorter charging times and longer driving ranges.

However, the higher voltages and fast-switching electronics put more stress on the insulation that protects the electric motor, increasing the risk of premature failure. That means auto manufacturers need a new testing tool to ensure their motor insulation can withstand these added pressures.

So WISE researcher Shesha Jayaram and her colleague Ali Kholgh Khiz set out to create a system to accurately mimic the wide range of conditions that occur inside an 800-volt EV motor. They designed a high-voltage pulse generator that incorporates a wide bandgap (WBG) silicon carbide (SiC) based switches, allowing it to generate fast high-frequency transients and overshoots.

Unlike other pulse generators, their modular system allows engineers to fine-tune important characteristics like amplitude, rise time, frequency, duty cycle and overshoot. It can generate voltages up to 3.2 kV and produce multi-level waveforms, key to testing how insulation holds up under different stress levels.

Jayaram and Kholgh Khiz tested their system using simulations as well as physical experiments with samples of the motor coils used in EVs. The results proved it could deliver powerful pulses with rise times as quick as 66 nanoseconds while remaining stable and accurate.

As automakers continue to adopt high-efficiency power electronics, this robust tool can help them ensure the reliability of next-generation EV motors.

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