Evaluation and Efficiency study of high current class discrete IGBTs-based converter systems

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The most recent generation technologies of discrete insulated gate bipolar transistor (IGBT) could boost the power density and efficiency of converter systems significantly. This paper investigates the performance and consequences of single 140 A discrete IGBT-based converter systems, including a comprehensive comparison to state-of-the-art systems with 75 A devices in parallel and silicon carbide (SiC) metal-oxide-semiconductor field-effect transistor (MOSFET)-based converters. This study evaluates the improvements in the converter system by using the commercially available 1200 V IGBTs from different technologies in 140 A (G1) and 75 A (G2 and G3) in TO247 PLUS packages and 1200 V SiC MOSFET in 14 mΩ (G4) in TO247 package.

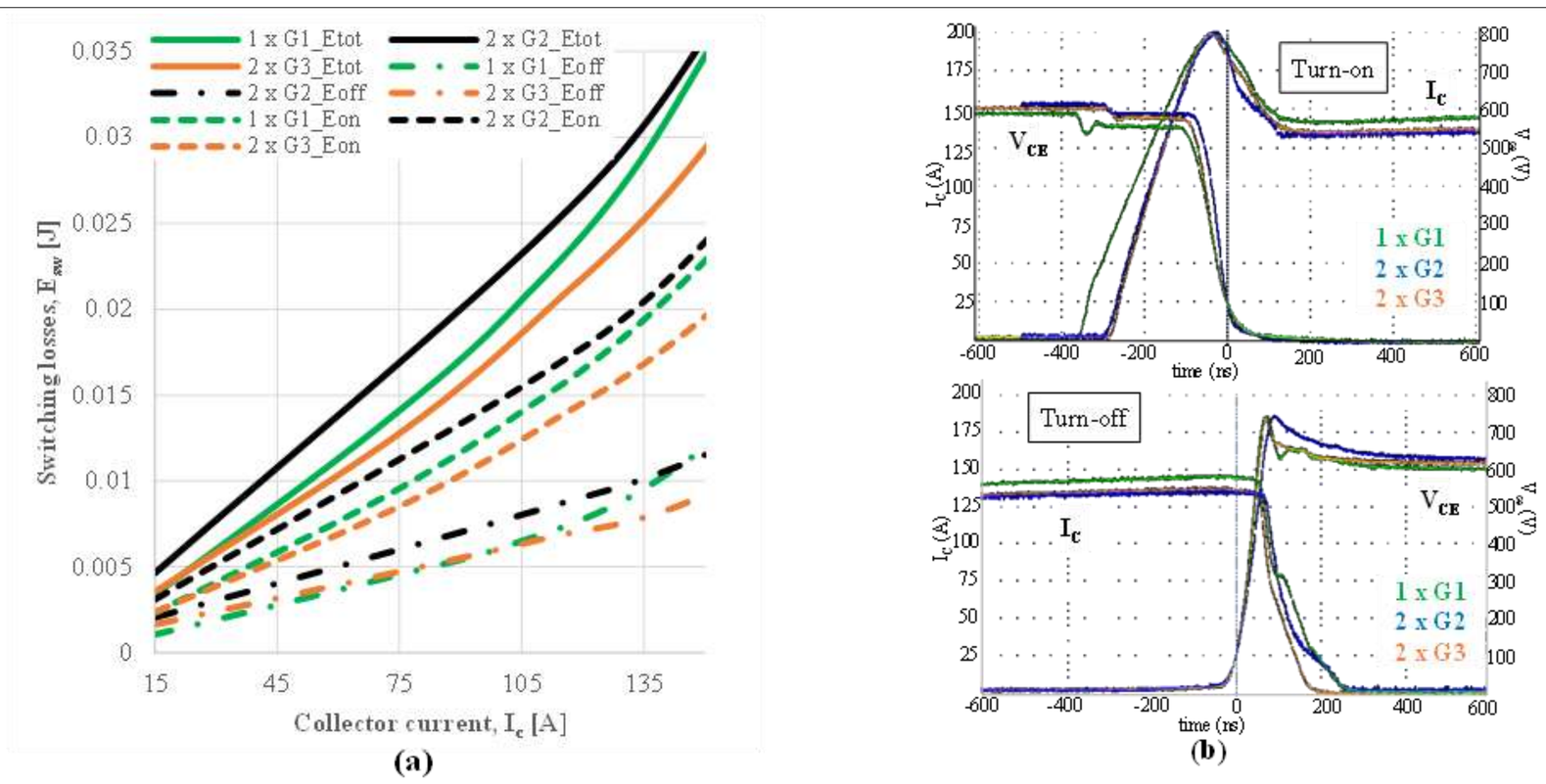

Fig. 1. switching losses of IGBTs at 600 V, 140 A, 175°C, Rgon and Rgoff - 5.2Ω, (b) turn-on and turn-off waveforms of IGBTs at 600 V, 140 A, 175°C, Rgon and Rgoff - 5.2Ω.

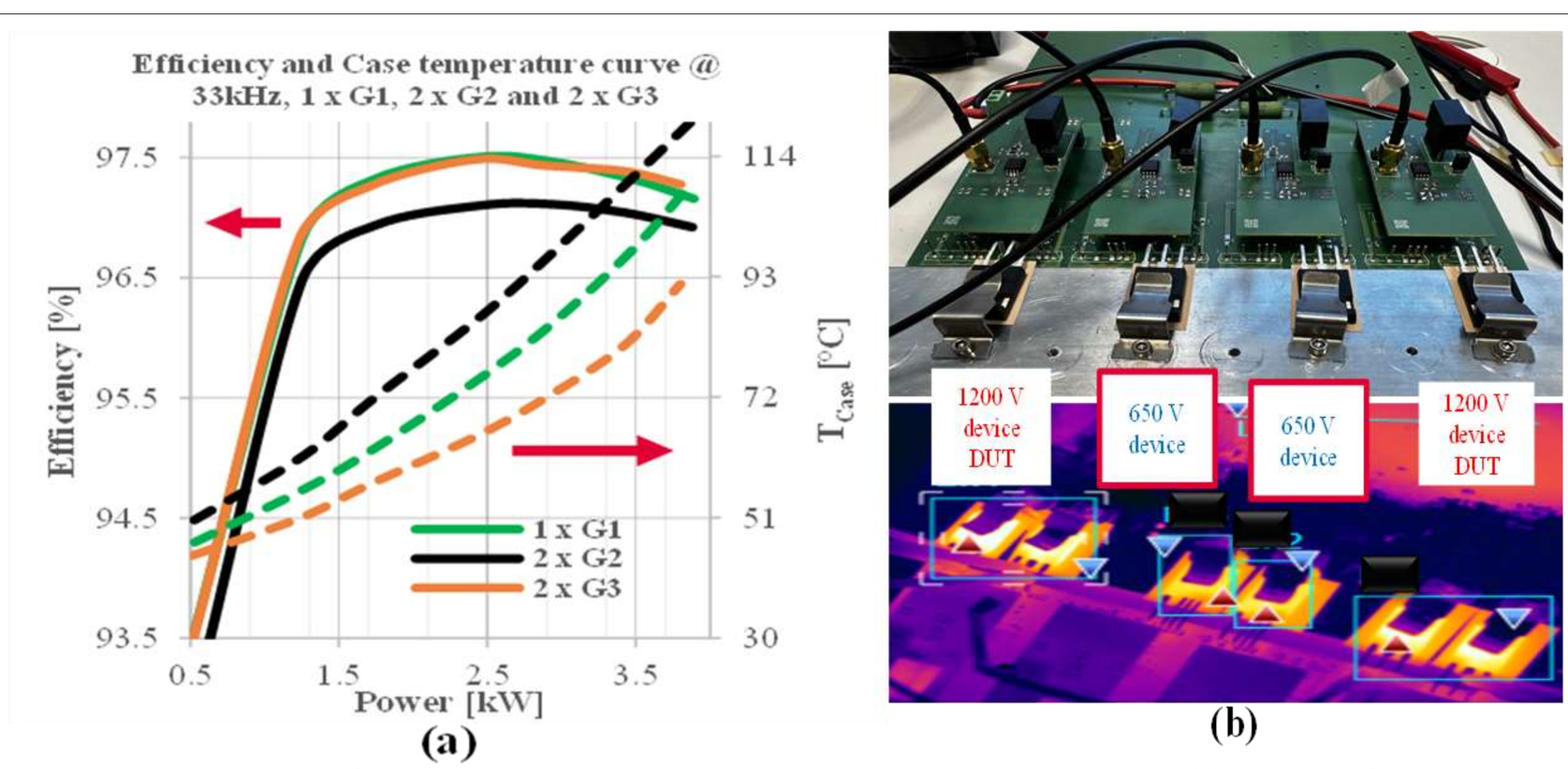

Figure 2. (a)Efficiency and case temperature performance in 3-level TNPC inverter with 1 x G1, 2 x G2 and 2 x G3 devices (b)Test setup of 3- level TNPC inverter and thermal image with 2 x G2 devices.