

氏名	LEE Yonghwa (い よんは)
学位の種類	博士 (工学)・甲 (課程博士) 第5号
博士論文題目	Functional and structural integration for advanced modular motor drives
審査委員	(主査) NAMAZU Takahiro
	(副査) FUNAKI Tsuyoshi (Osaka University) CASTELLAZZI Alberto FUKUSHIMA Hiroaki KAWAKAMI Hiroshi
論文の概要	<p>Traditionally, motor drive systems require separate space due to the volume of the cooling system and power electronics. As a result, long cables were used to connect the motor and the inverter. However, these long cables caused issues such as Electromagnetic interference problems, poor reliability, additional electricity loss, and increased cost. In modern applications, where motors are used in various fields, significant efforts have been made to reduce the volume of the drive system in many studies. The ultimate goal of these studies is the physical integration of the motor and the inverter. If physical integration is achieved, the volume of the motor drive can be greatly reduced by increasing the power density. Furthermore, the motor drive doesn't need long cables between the motor and the inverter, which is very helpful in resolving the problems mentioned above.</p> <p>To realize these forward-looking ideas, new research is needed on wide-band-gap power semiconductors that enable high-temperature operation and high-speed switching, as well as on special power module packaging technologies and topologies that can increase power density using these semiconductors. Additionally, research on motor control using high-speed switching is required.</p> <p>Therefore, this study reviewed high-power density topologies using wide-band-gap semiconductors and designed an original bidirectional power module that can be physically integrated with the motor wire and operate at temperatures up to 200 degrees Celsius. Based on this, a novel current controller without a motor current measured sensor, suitable for a wide-band-gap-based current source inverter, was proposed and implemented to increase the power density further.</p>
論文審査結果要旨	<p>All the members of the examination Committee examined the submitted thesis thoroughly and assisted the internal defense presentation by the Candidate. The Examination Committee unanimously found that the thesis and defense fully satisfied the expectations associated with a Doctoral Degree level for quality and quantity of the results and innovation presented, the multi-faceted and highly specialized methodologies and tools employed and the clarity and scientific register of the manuscript and presentation. Having the Candidate also fully satisfied the formal requirements in place for graduation, at the Examination Committee Meeting all members agreed to award a "Pass" evaluation and allow the Candidate to enter the Final Defense stage.</p>
口頭試問結果要旨	<p>After the final defense, in the presence of an additional External Examiner, who also independently reviewed the thesis written document, the positive impression and assessment were confirmed and re-iterated. The candidate was requested to enter minor correction to the thesis, but it was unanimously decided that his work and results were without doubt meriting the award of a doctoral degree, thus awarding a "Pass" evaluation.</p>