POLITECNICO DI MILANO

PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 41st cycle

Research Area n. 2 - Electronics

THEMATIC Research Field: MULTILEVEL RESONANT SWITCHED-CAPACITOR DC/DC CONVERTERS

Monthly net income of PhDscholarship (max 36 months)
1500.0 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	With the continuous increase of the power requested by modern datacenter, the current power converter architecture seems to have reached a bottleneck. To match the specifications on both dynamic response and system efficiency, the intermediate-bus voltage - currently set at 12V - can be reduced to accommodate for the novel IVR solutions that are emerging in the market. Moreover, to reduce the series losses, the bus voltage may be increased from 48V to 400V. The research aims at developing multilevel resonant switched-capacitor converters compliant with future demands. Novel architectures and control strategies will be explored to achieve better efficiency and reduced silicon area occupation with respect to state-of-the-art implementations.
Methods and techniques that will be developed and used to carry out the research	The research activity will be carried out using system theory and dedicated tools for system analysis (SIMPLIS™, MATLAB™). The performance of the devised system will be assessed in a test-chip demonstrator. Magnetic and 3D simulations of the full board will be carried out using Ansys suite (SIwave, Maxwell 3D). Transistor level design of each circuit block will be performed in Cadence-Virtuoso™, and properly characterized over PVT variations and post-layout

	parasitic extraction.
Educational objectives	The PhD student will be involved in different areas such as system analysis and verification, analog microelectronics design, heterogeneous integration, laboratory measurements.
Job opportunities	1. Power electronics design expert in the R&D areas of major semiconductor companies 2. Academic career
Composition of the research group	2 Full Professors 0 Associated Professors 1 Assistant Professors 3 PhD Students
Name of the research directors	Prof. Massimo Ghioni

Contacts
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Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents	--

Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences). TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations. COMPUTER AVAILABILITY:

1st year: Yes
2nd year: Yes
3rd year: Yes

DESK AVAILABILITY:
1st year: Yes
2nd year: Yes
3rd year: Yes