Injecting Digital into Power Electronics: Programmable Digital Gate Driver IC for Power Transistors

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Abstract—A gate driver IC is an important circuit bridging the voltage gap between control ICs operating at less than 5 V and the power electronics operating above 30 V. The conventional gate driver IC, however, just turns on/off the power transistors and shows the trade-off between the switching loss and the switching noise of the power transistors. In addition, the conventional gate driver IC need to be customized for a large variety of power transistors. To solve the problems, we proposed a programmable general-purpose digital gate driver IC, which dynamically changes the gate drive current during the turn-on/off transient with digital control bits. In the developed gate driver IC fabricated with 40 V, 0.18 μm BCD process, the 6-bit gate control signals with four 160-ns time steps are globally optimized using a simulated annealing algorithm, reducing the switching noise by 37 % and the switching loss by 47 % at the double pulse test of 300 V, 50 A insulated gate bipolar transistor (IGBT).

Keywords—Gate driver, Power transistor, IGBT, Switching loss, Switching noise

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REFERENCES

