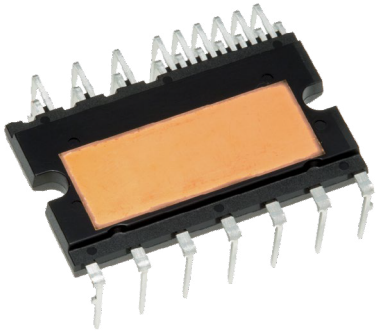
Bodo´s Power Systems®

An Intelligent Power Module for High Switching Speeds

Intelligent Power Module solutions are the preferred driver solution in home appliances, especially washing machines, resulting from several advantages. Low power drives should fulfil not only high efficiency, noise and reliability requirements, but also the requirement of optimized system cost. Mitsubishi Electric pioneered the DIPIPM™ concept in 1997, offering the solution to this market requirements since that time and continuing to present innovations in this segment.



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Introduction

Intelligent Power Module solutions are the preferred driver solution in home appliances, especially washing machines, resulting from several advantages. Low power drives should fulfil not only high efficiency, noise and reliability requirements, but also the requirement of optimized system cost. Mitsubishi Electric pioneered the DIPIPM™ concept in 1997, offering the solution to this market requirements since this time and continuing to present innovations in this segment.

The SLIMDIP™ family is the newest through-hole IPM, which offers reduced space requirements and an optimized pin layout compared to other DIPIPM™ products. The currently available products cover a motor power output range of 0.4kW (SLIMDIP-S) and 1.5kW (SLIMDIP-L).

Topology and protection functions

The SLIMDIP™ modules consists of six reverse conducting IGBTs (RC-IGBT), a high side driver IC, a low side driver IC and three bootstrap diodes with current limiting resistors. A direct control with a standard MCU is possible, due to the bootstrap diodes and the level shifter integrated in the HVIC, resulting in no need of a galvanic isolation and an isolated power supply to control the high side switches. All dies are directly mounted on the lead frame without using a PCB inside the module, offering a market leading lifetime performance. Figure 2 shows the used topology.

Sensor-less control of the spin drive in white goods is state-of-the-art. Therefore the SLIMDIP™ modules are built with open emitters on the low voltage side, to allow independent current measurements via shunt resistors. The output signals of the current measurement can be used for the internal short circuit protection, which prevents the

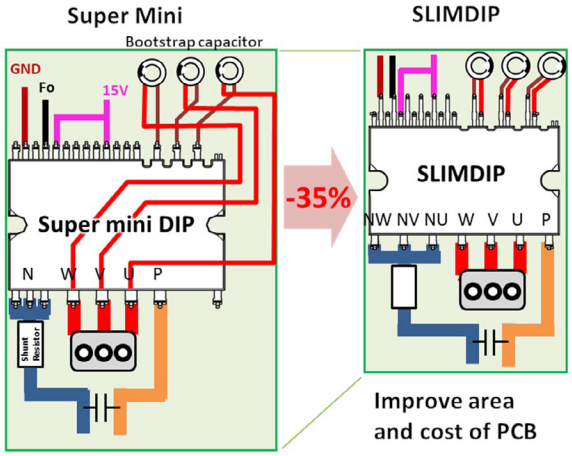

Figure 1: Reduced space requirements

module to operate outside of the SCSOA. Furthermore, the SLIMDIP-W integrates an over temperature protection with an additional temperature output with a linear temperature-voltage dependency, resulting in an easy-to-implement condition monitoring.

All SLIMDIP™ modules leaving the production line are tested regarding their static electrical characteristics and undergo a functional tests with an inductive load. The results are recorded in an individual end-of-line test report in the factory.

The newly developed SLIMDIP-W module is a high-speed switching optimized version of the SLIMDIP-L module to fulfil the market demand of low audible noise inverters, which requires high switching speeds above the audible range of a human. Especially for home