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Development of brushless DC motor drive for appliance applications

Jun-Hyuck Choi, Joon Sung Park and Jin-Hong Kim
Korea Electronics Technology Institute, Korea

In order to prevent global warming and save resources, there has been a pressing need in recent years to improve the efficiency of home appliance. Appliance applications such as washers, dryers, air conditioners, and refrigerators, have long been users of conventional induction motor and DC motor for operating pumps, compressors, blowers, fans and agitators as common examples. To meet the increasing demand of energy saving, the induction motor and DC motor in home appliance applications are rapidly being replaced with brushless DC motor. However, the BLDC motor needs more complex motor drive comparing with the DC motor and induction motor drive. One of the complicated points is current delay problem in high speed which is induced by impedance of inductance at high frequency. For this reason, it is difficult to operate in a wide range of the speed, particularly such as high speed operation. In order to solve this problem, lead angle injection has been utilized. With lead angle adjustment, phase current in the motor winding is allowed to be built up before the back-EMF reaches any significant level. Also, the current waveform is closed to rectangular waveform and operates BLDC motor effectively over a wide range the switches must be turned on in advance of the rising back-EMF region so as to allow time for the current to be built up. This paper deals primarily with the design aspects of the brushless DC motor drive for appliance applications. Experimental results from laboratory prototype are presented to validate the feasibility.

Biography

Jun-Hyuk Choi received his MS and PhD degrees in Electrical and Electronic engineering from Sung Kyun Kwan University, Suwon, Korea, in 2003 and 2014, respectively. Since 2003, he has been with the Intelligent Mechatronics Research Center of Korea Electronics Technology Institute (KETI) in Bucheon, Korea. He is currently the Team manager of the Power Conversion & Motor Control Team of KETI. His research interests are power electronics and motor control

cjh@keti.re.kr