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| 作品名稱 | 具有電能回收煞車功能之電動載具驅動 IC 之設計 Design of the Electric Vehicle Driver Integrated Circuit with Energy Braking Method |
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作品摘要 Abstract

傳統無刷直流馬達驅動控制是採用微處理器或數位訊號處理器和各種控制方法來實現高轉速、高扭力、高效率、低噪音之馬達控制。然而這些方法須耗費許多開發時間、人力與成本。另外現有之馬達煞車是以煞車皮摩擦機構，但這種方法會造成摩擦之熱源損耗，且須定期更換煞車片等缺點。另一種現有之馬達電子煞車技術是額外設計馬達煞車控制電路，以達到煞車之功能，但這種技術之缺點為需增加馬達煞車控制電路，造成成本之增加和控制之複雜性。針對上述問題，本文提出具有電能回收煞車功能之無刷直流馬達驅動 IC 之設計，以降低開發時間、人力與成本。利用無刷直流馬達驅動電路本身架構，不添加額外元件，設計煞車控制法則，達到無刷直流馬達再生式電能回收煞車。以 FPGA 硬體整合及驗證無刷直流馬達驅動與煞車控制功能，並設計成積體電路控制晶片。並將此控制晶片應用到電動機車，由實驗成果驗證此無刷直流馬達控制晶片具有良好的驅動與電能回收煞車性能。

Conventionally micro-processors, digital signal processors and a variety of control methods are used for high speed, high torque, high efficiency, low-noise brushless DC motor control. However, these methods require a lot of development time, manpower and cost. The brake skin is used for motor braking, but this method will cause brake skin friction shortcomings resulting in heat energy loss and regular brake skin changes. The other existing motor electronic braking technology is the additional motor brake control circuit design to achieve motor braking. However, the disadvantages of this technology are the increase in motor braking control circuit, resulting in increased costs and more complex control. This paper proposes a brushless DC motor drive integrated circuit with energy recovery to reduce the development time, manpower and cost. The brushless DC motor drive circuit architecture does not require additional components. The brake control law is designed to achieve braking regenerative energy recovery. FPGA hardware is used to integrate and verify the drive and braking control function of the brushless DC motor, which is designed into an integrated circuit control chip. The integrated circuit control chip is applied to the electric vehicle. The experimental results demonstrate that the brushless DC motor control chip produces high-performance drive and brake energy recovery.

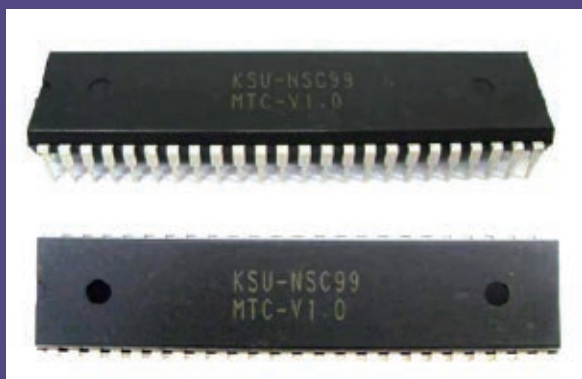


Fig.1 > 具有能源回收之無刷直流馬達控制晶片