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Aspects of using optical commands for galvanic isolation in industrial applications

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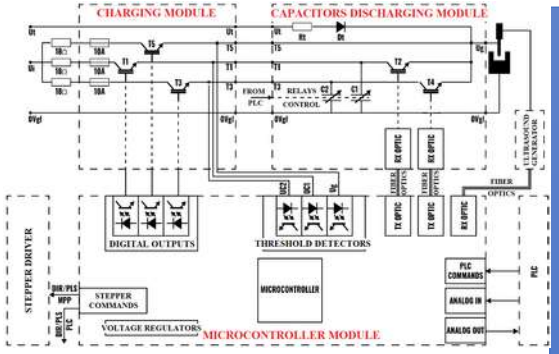
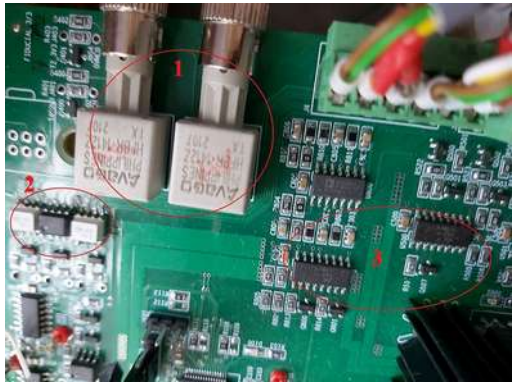
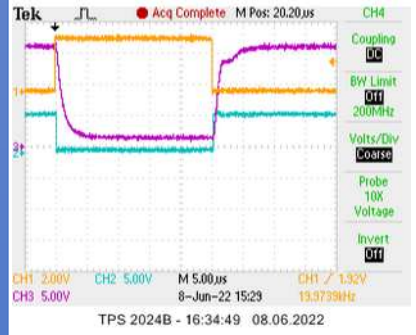


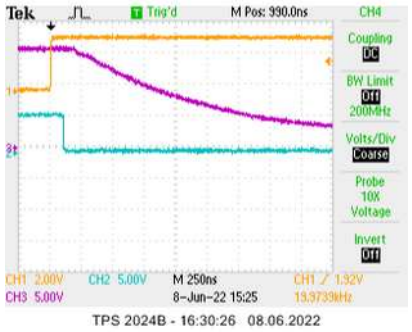
Structure of proposed electric discharge machining system and a close-up of optocouplers on microcontroller board



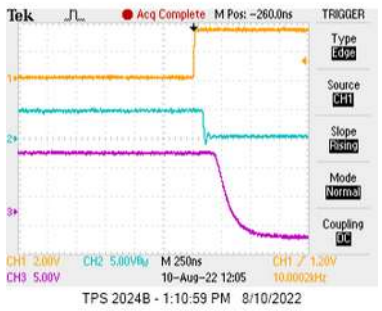
Some industrial applications like electrical discharge machining involve large currents and voltages that can lead to severe EMC (electro-magnetic compatibility) problems. These environments are susceptible to large surges of electricity which may potentially damage the sensible modules/devices or may modify commands sent over communication lines. One solution to reduce the magnitude of these problems is the galvanic isolation, especially by using optical medium for sensible signals like switching and discharge commands. The paper focuses on practical aspects of implementing galvanic isolation using optocouplers and fiber optics between microcontroller-based control board and power board with switching devices, as well as measuring the delays on the signal chain.

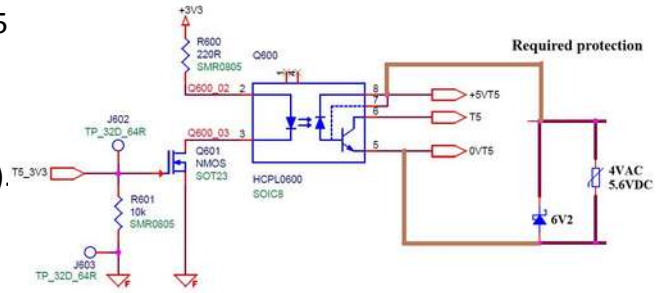


Discharge command in full period (left) and in detail (right) using low-speed IGBT driver implemented with standard components.



Charge/power on command on T5 power transistor for electric discharge (below) and its optocoupler connection and proposed protection circuit (right).





Conclusions

Power electronics applications like electric discharge machining involve large fast-changing voltages and currents that can lead to severe EMC problems. Galvanic isolation using optocouplers represents a good solution to these problems but requires attention to specific details like propagation times and protection circuits.

ACKNOWLEDGMENT

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