



## FEATURES, OPERATION PRINCIPLE AND LIMITS OF SPI AND I<sup>2</sup>C COMMUNICATION PROTOCOLS FOR SMART OBJECTS: A NOVEL SPI-BASED HYBRID PROTOCOL ESPECIALLY SUITABLE FOR IoT APPLICATIONS

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**Abstract** – *The Internet of Things (IoT) is an expression, sometimes abused by companies given the absence of an unambiguous meaning, that indicates the upcoming evolution of Internet as it has been known so far. In fact, all objects will have network capabilities which will be exploited to overcome, in certain situations, human intervention. Thanks to the direct cooperation of new class of devices, aware of their operating scenario and interconnected in subnetworks, our life style will be strongly enhanced and simplified. IoT, however, is not yet the “El Dorado” of technology, capable of revolutionizing everyday life: some aspects and open issues have to be carefully analyzed. The huge complexity of this new technology forces companies to select a specific research field: for this reason, they focus only on some features that an IoT device should have to guarantee fulfillment of requirements. In this context, this research work concerns an analysis of features, operation principle and limits of SPI and I<sup>2</sup>C communication protocols followed by the proposal of a new hybrid protocol suited for embedded systems, named FlexSPI, thought as an evolution of the classic SPI. Thanks to a robust software architecture, it is able to provide many features that can be used by smart objects to enhance their capabilities. In this way, sensors and actuators or, more in general, subsystems, can quickly exchange data and efficiently react to malfunctioning; moreover, number of devices on bus can be safely increased even while smart object is performing operations.*

**Index Terms:** IoT, embedded system, SPI and I<sup>2</sup>C communication protocols, smart objects, FlexSPI.