Power Sensor Tag with Interference Reduction for Electricity Monitoring of Two-Wire Household Appliances

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ABSTRACT

This paper demonstrates a flexible nonintrusive power sensor tag with an interference reduction scheme for accurate electricity monitoring of the household appliances using typical SPT-2 18 AWG zip-cord power lines. Both current and voltage sensors with the design of a 50-turn inductive coil and two capacitive electrodes, respectively, in an area of 1.3 × 1 cm² are fabricated on a 100-μm-thick flexible polyethylene terephthalate substrate as a sensor tag. The tag exhibits a sensitivity of 271.6 mV/A and 0.38 mV/V via active low-pass filter circuits for the current and voltage detection. A compensation circuit inputted with the signals of the voltage sensor is applied for the interference reduction of the current sensor electrically coupled with the power cord so that the current sensor can achieve over a 40-dB signal-to-noise ratio for measuring the loaded current of 1 a, 60 Hz on the power line.