

IMPROVED RESONANT-SWITCH POWER CONVERTER

This technology improves resonant-switch converters in electrical systems. A novel zero voltage switching topology allows for high voltage and high-frequency operation without sacrificing efficiency.

This technology is part of the wireless power transfer system for electric vehicles, a patented technology commercialized through Sustainable Electrified Transportation (SELECT).

PROBLEM

Hard switching in electrical power converters results in increased losses, can damage or destroy switching devices, and generate unwanted noise and interference. Resonant converters use phase-shift modulation and by operating in zero voltage switching (ZVS) mode, they become more efficient than conventional hard-switching converters. However, operating conditions in these converters can become such that ZVS is lost and hard switching occurs.

The loss of ZVS at light loads and the excessive reactive power at high loads becomes problematic and can result in wasted energy and damaged parts. Furthermore, modeling and controlling resonant-switch converters is more difficult than with conventional converters, significantly increasing costs.

SOLUTION

USU's technology uses phase-shift modulated half-bridge (PSM-HB) circuits for ZVS assistance, employing a novel approach to determine the amount of ZVS assistance and the subsequent feedback control that must be applied to the PSM-HB to assist ZVS in half- and full-bridge circuits that operate in various conditions. Feedback control of the PSM-HB allows minimum currents to be maintained at all operating points, allowing PSM-HB circuitry to be added to existing topologies with minimal additional losses.

BENEFITS

Using USU's novel PSB-HB circuits and controllable ZVS assistance for half- and full-bridge converter topologies reduces hard-switching and mitigates wasted energy, damaged parts and higher costs in various conditions with unknown or linear circuit parameters.

APPLICATIONS

This technology can be applied to all areas of power electronics, specifically those using or wanting to use ZVS-mode resonant-switch converters.

CONTACT

Questions about this technology including licensing availability can be directed to:

ALAN EDWARDS

Manager

Technology Transfer Services
(435) 797-2328

alan.edwards@usu.edu

INVENTORS

REGAN ZANE, PH.D.

*Electrical and Computer
Engineering Dept.*

DANIEL SELTZER, PH.D.

University of Colorado at Boulder

DEVELOPMENT STAGE

TRL 3

PATENT STATUS

Patents applied for.

WEBSITE

[rgs.usu.edu/techtransfer/
resonant-switch-power-converter](https://rgs.usu.edu/techtransfer/resonant-switch-power-converter)