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Flexible resonant tank for a combined converter to achieve an HPS and LED compatible driver

Key words: High pressure sodium (HPS), Light emitting diode (LED), Compatible driver, Ballast

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Motivation (I)

- LED does not have obvious advantages compared with HPS lighting source in high power applications. HPS and LED will coexist for a long time.

For a typical large-scale application

Conventional solution

Many different types of drivers or ballasts are used.

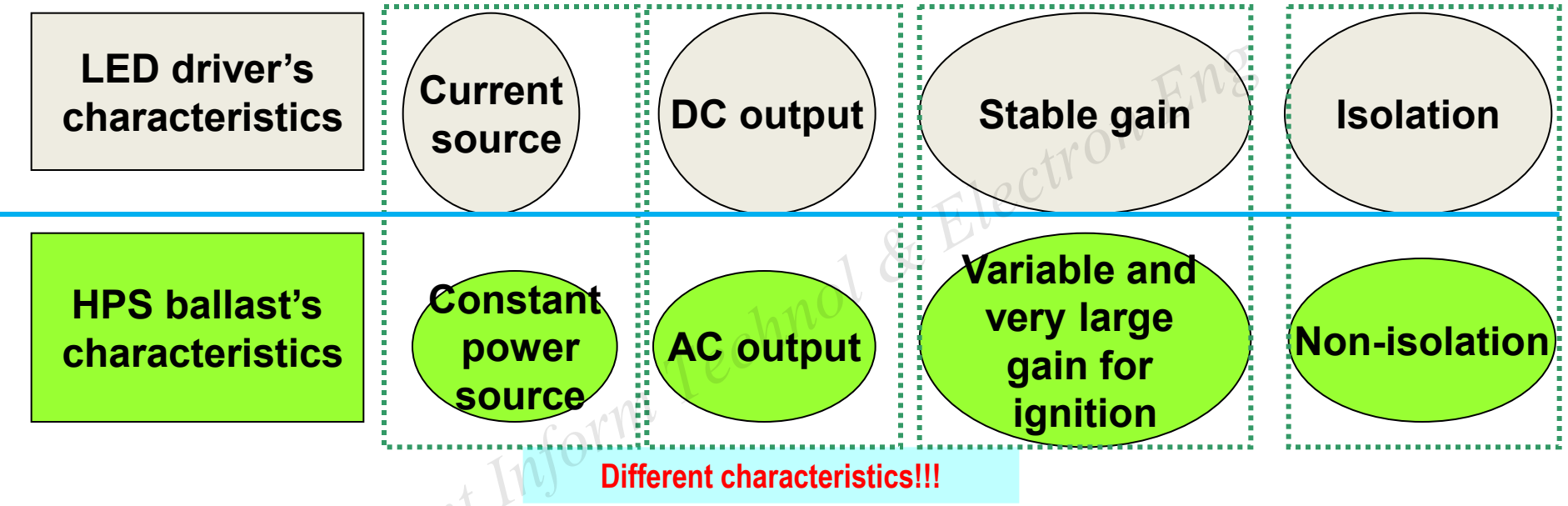
Disadvantages:
Not convenient and high cost about repairing, installing, and type management for users and manufacturers

Multi-functional/compatible solution

Fewer drivers or ballasts are used.

Advantages:
Simple about repairing, installing, and type management for users and manufacturers.
Saving development and using cost.

Motivation (II)



How to make the driver involve both their different characteristics is a challenge.

Proposed HPS and LED compatible driver (I)

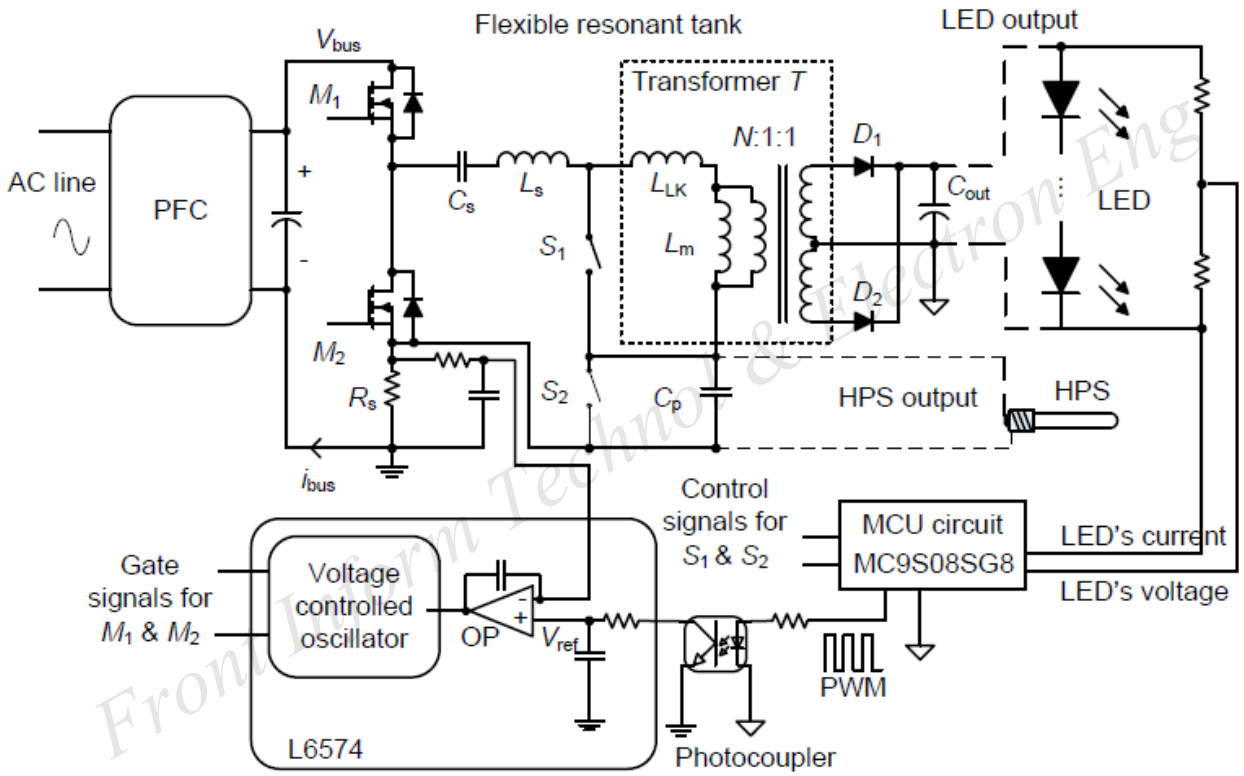
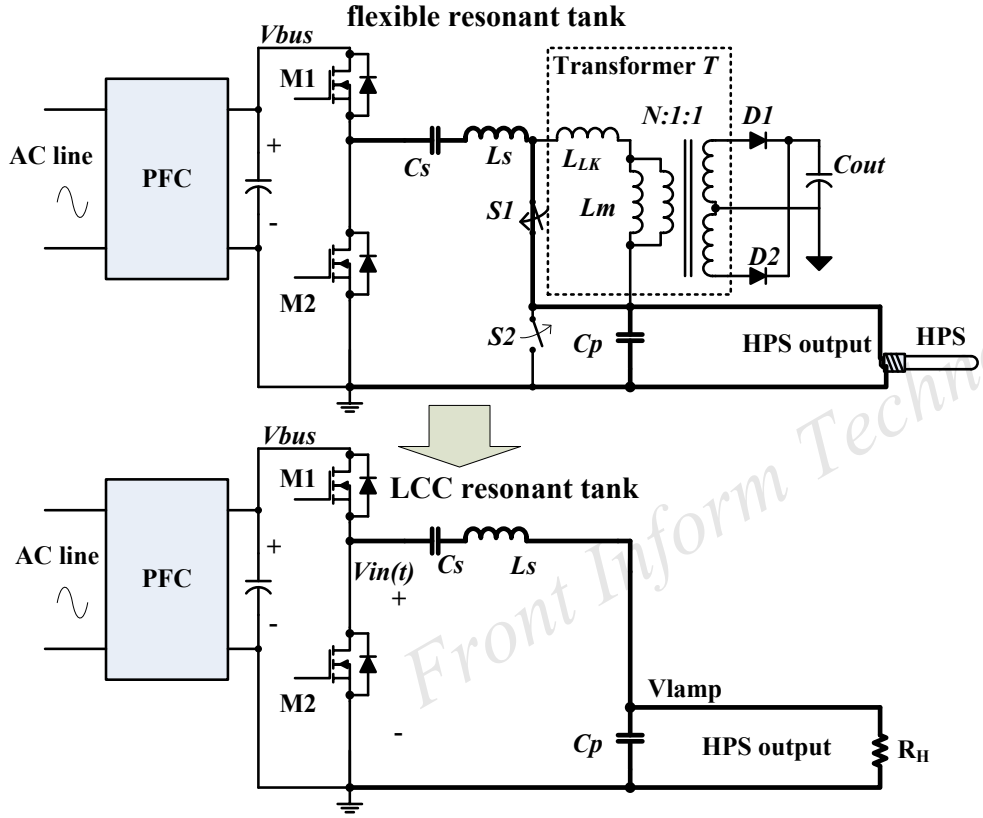
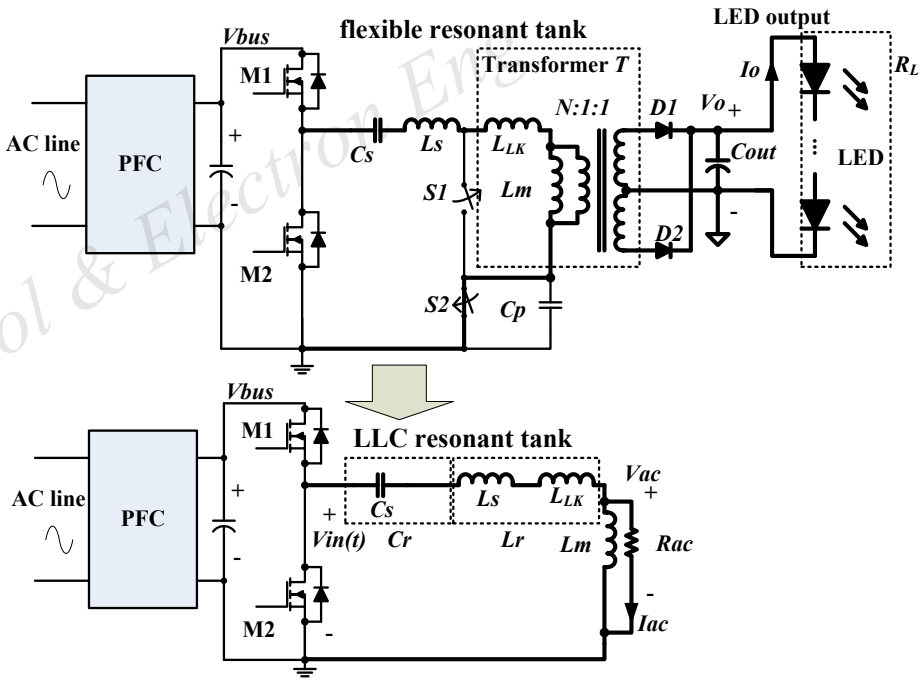


Fig. 2 HPS and LED compatible driver

Here a driver with a flexible resonant tank is proposed as a candidate for the compatible solution. A half bridge with two MOSFET M1 and M2 drives a resonant tank. The resonant tank is controlled by two switches S1, S2. S1 is on and S2 off, and the driver comes to HPS driving mode. S1 is off and S2 on, and the driver comes to LED driving mode.

Proposed HPS and LED compatible driver (II)





LCC converter for HPS

LLC converter for LED

Experimental verification on a prototype

❑HPS driving mode

- High voltage ignition is realized.
- ZVS is realized.
- Dimming property.

❑LED driving mode

- ZVS is realized.
- Dimming property.

Conclusions

Advantages of the proposed driver:

- The proposed driver featured with a flexible resonant tank has compatible driving ability for HPS and LED. It is convenient for using and helpful for lowering the cost of production and application.
- Isolation for LED.
- ZVS for both modes.
- Dimming

A candidate as a compatible driver for different lighting source applications.