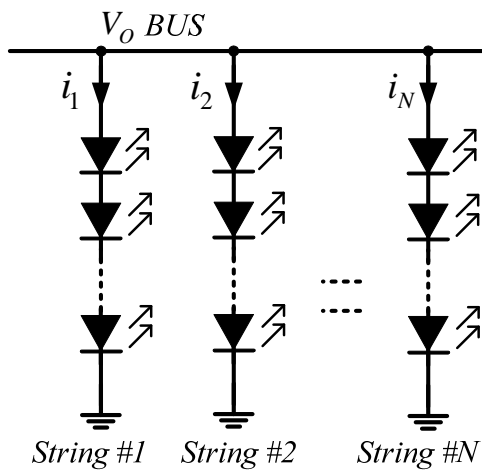


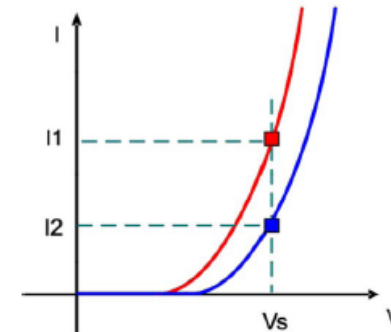
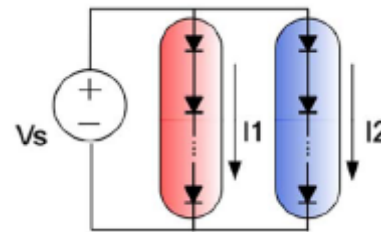
Review of Current Sharing Techniques In LED Drivers

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Southeast University,
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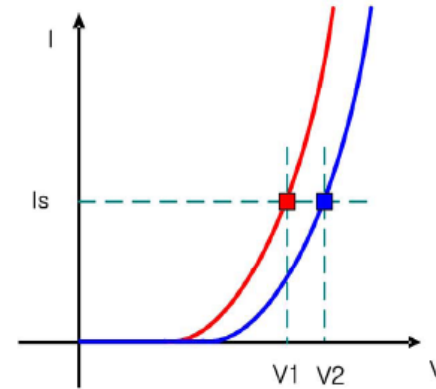
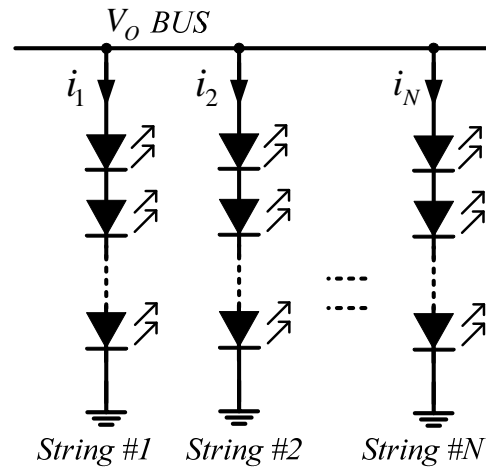
☹ Current Imbalance



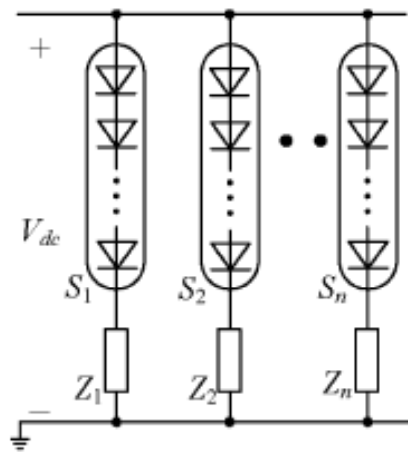
LED Strings in Parallel

- ☺ Reliability
- ☺ Safe terminal voltage

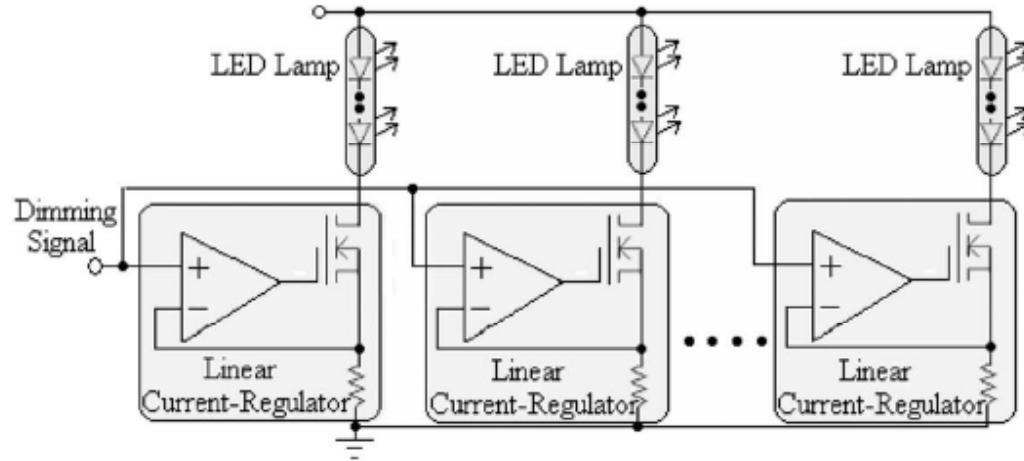
- Brightness uniformity
- Fast degradation or even failure



- The additional component is needed to absorb the voltage difference between the bus voltage and the voltage drops of LED string
- The additional component should be lossless
- The bus voltage can be in DC or AC type.



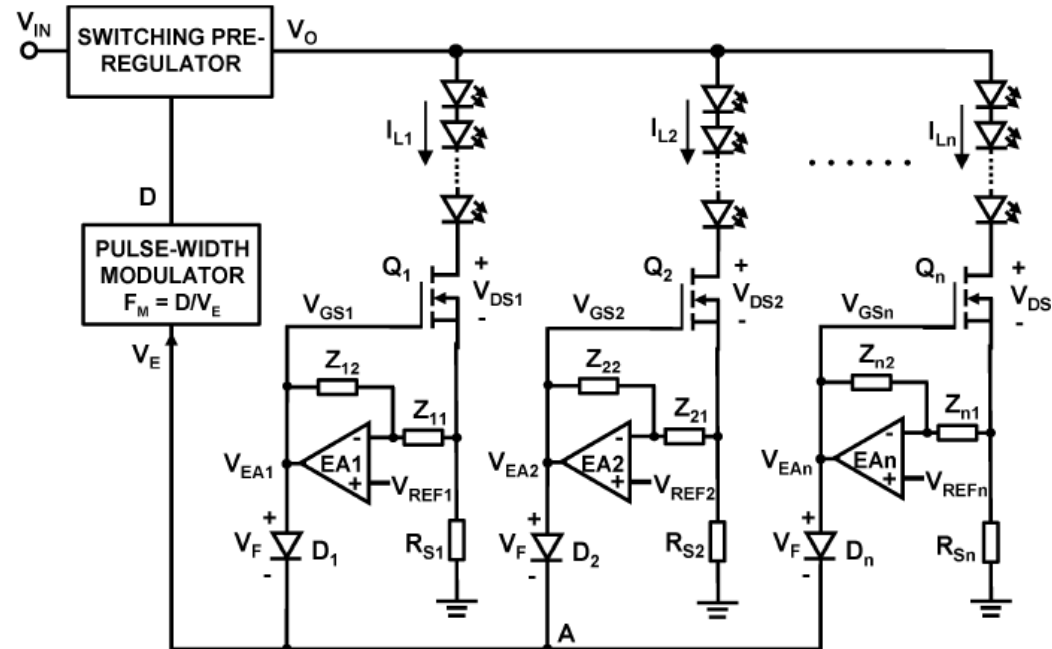
- Resistor
- Linear regulator
- Switched-Mode Current Regulator

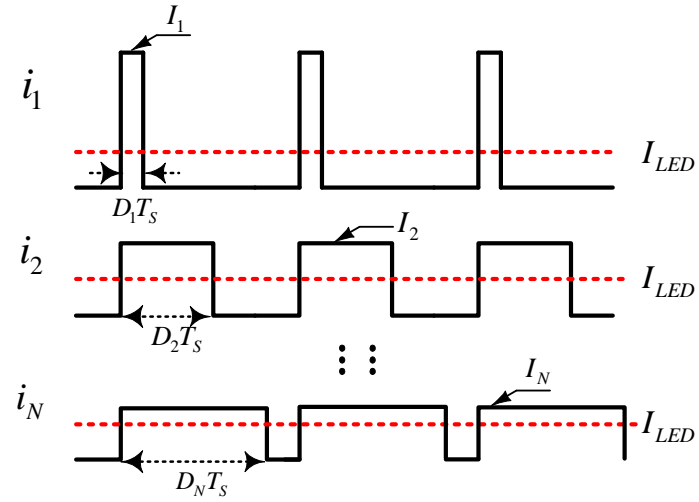
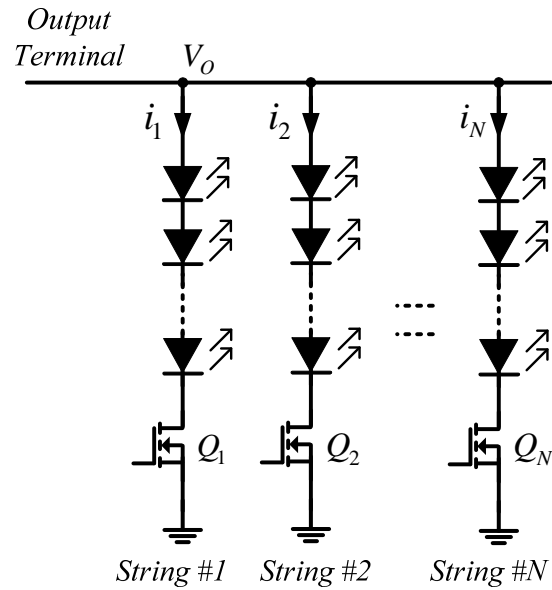


Linear Mode Switch

- simple
- loss

To improve the efficiency,
minimize the V_o

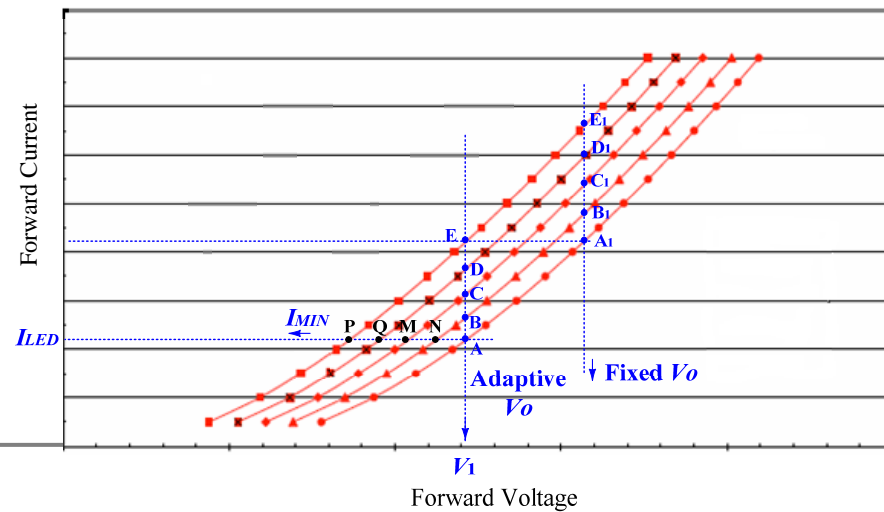


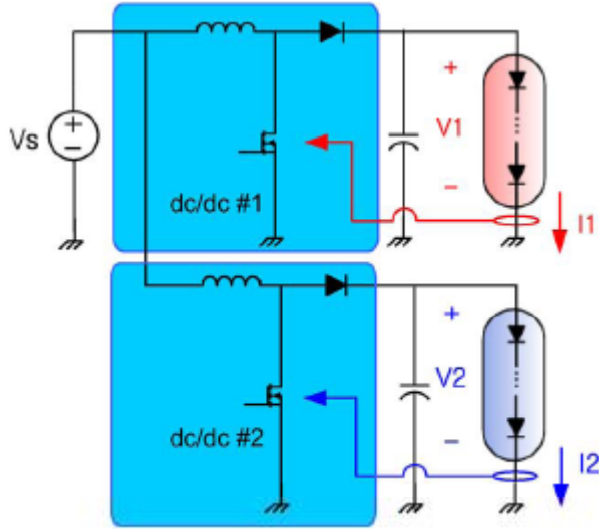


$$I_{LED} = I_1 D_1 = I_2 D_2 = \dots = I_N D_N$$

❁ Pulse Width Modulation

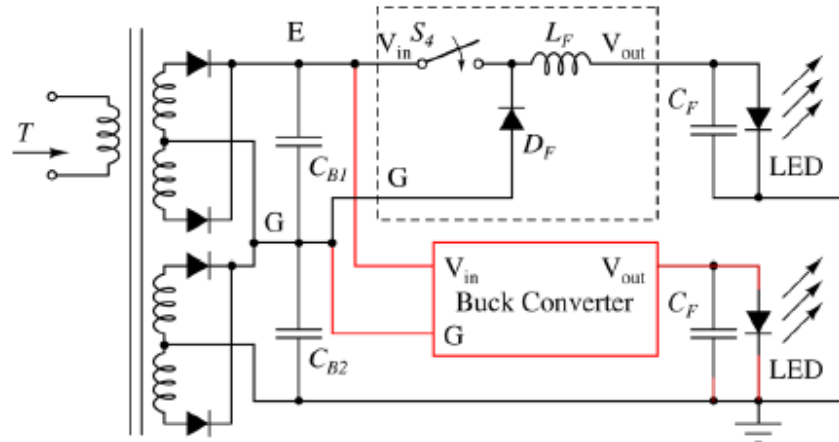
To improve the
luminous efficiency



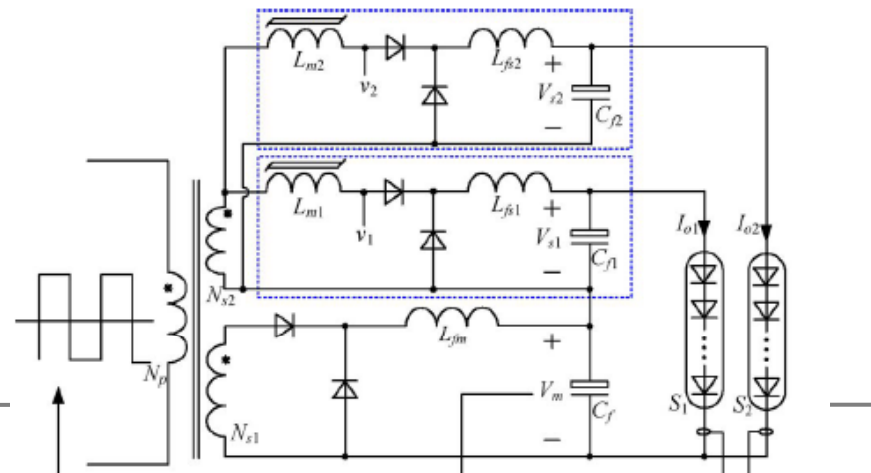


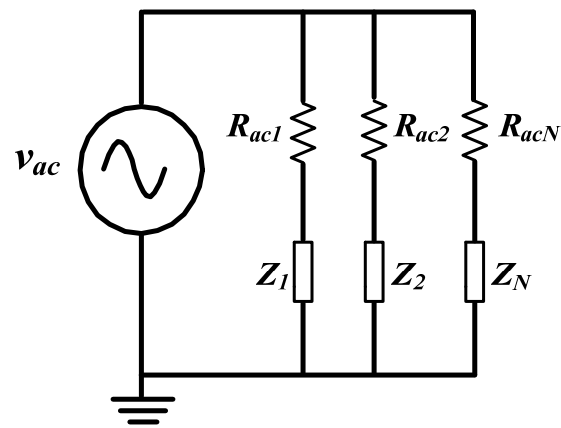
Individual circuit and logic

- Complexity, Efficiency

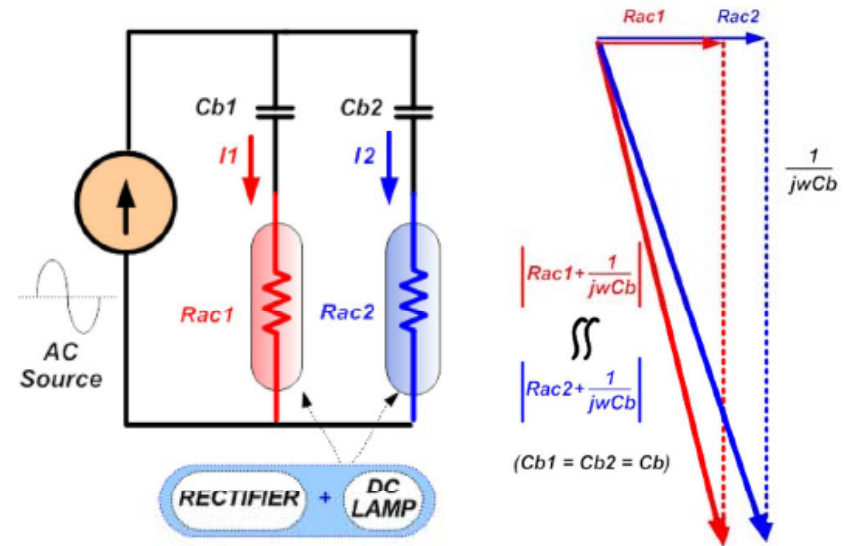
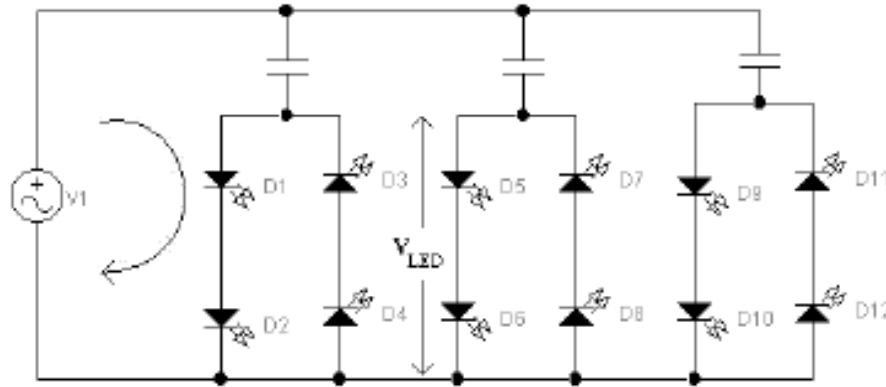


To improve the efficiency





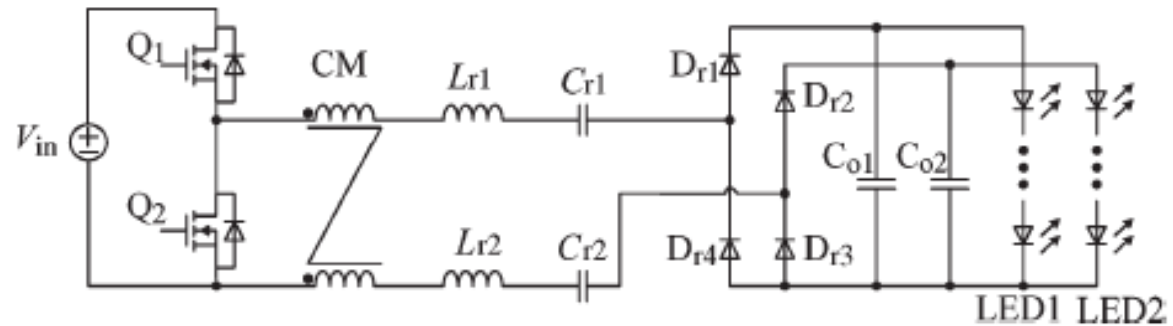
- Capacitor
- Inductor or Transformer

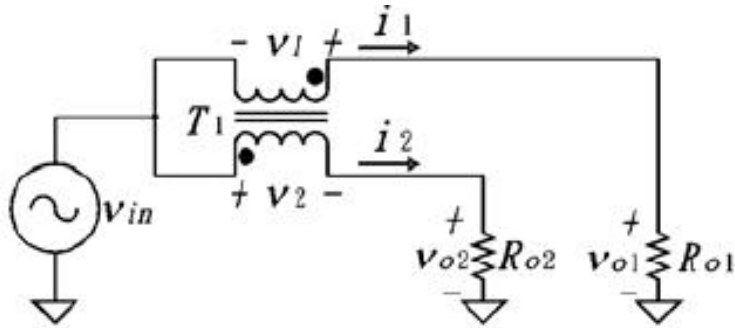


✿ Capacitor based

- Large voltage stresses

Capacitors isolation
with inherent current
sharing capacity





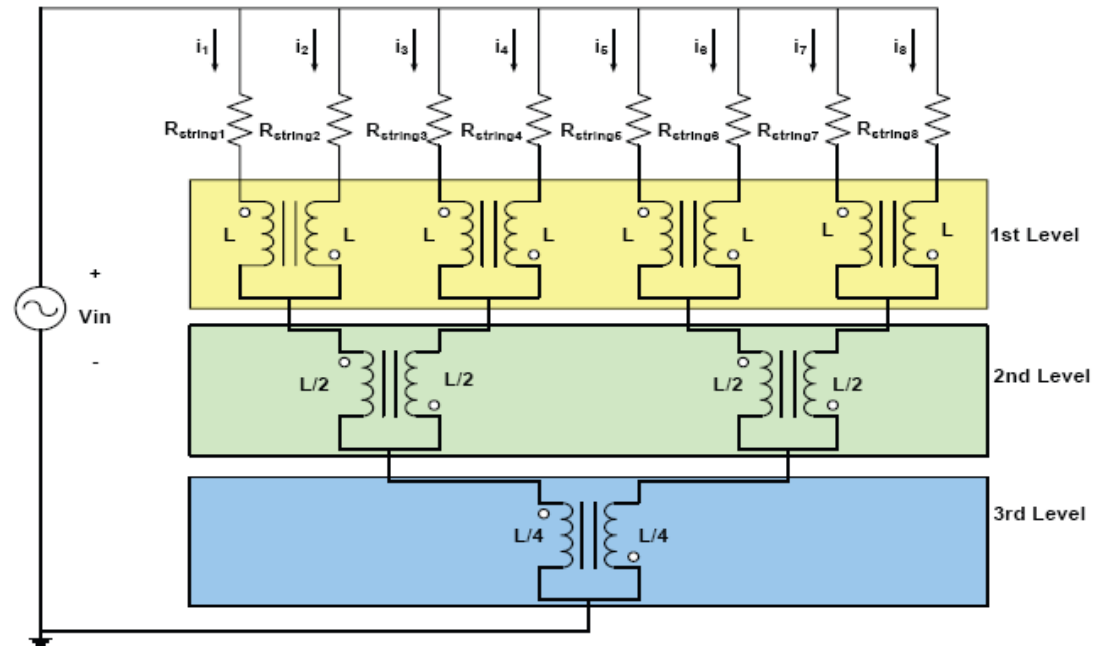
☀ Coupled inductor based

- Complexity increases exponentially

$$2^N$$

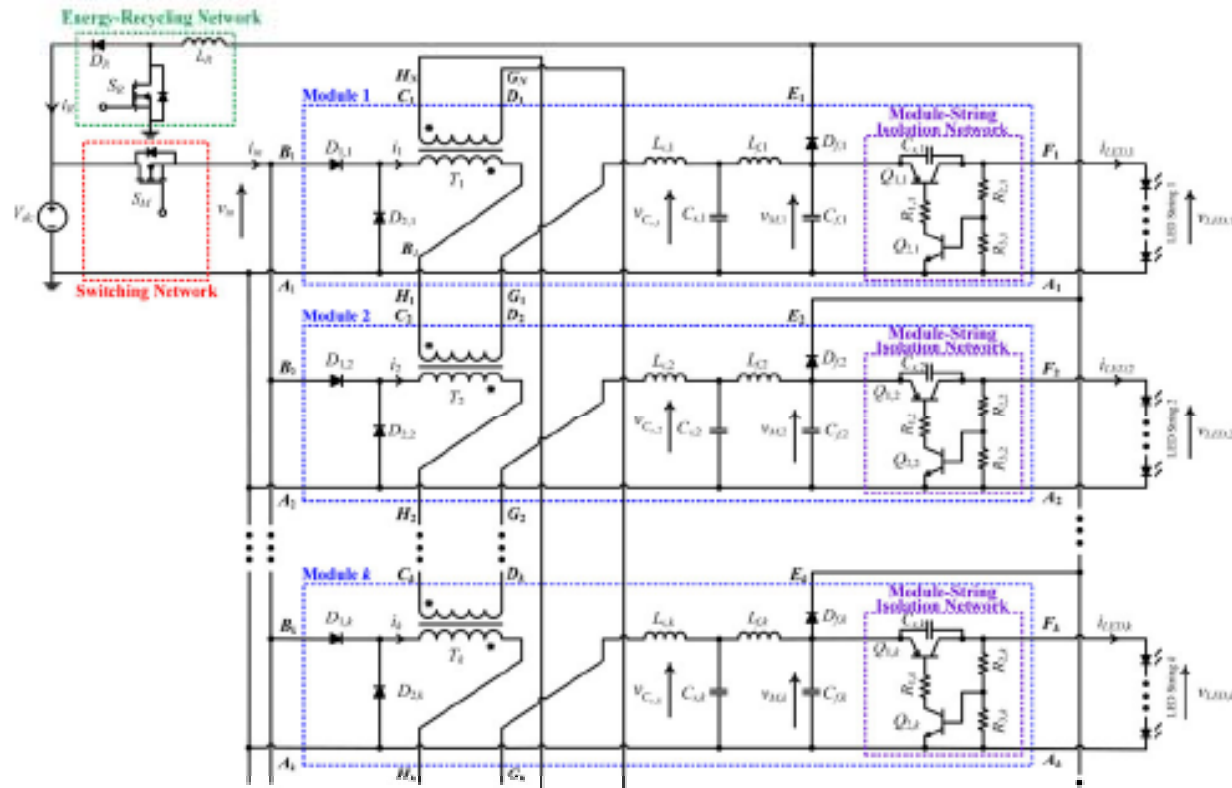
$$i_1 = i_2$$

$$v_1 = v_2 = \frac{v_{o1} - v_{o2}}{2}$$



❁ Coupled inductor based

To simplify, Daisy Chain structure with 2N



- Current sharing scheme is used to compensate the current imbalance due to variation of LED characteristics;
 - Each scheme has its pros and cons. Selection should depend on the application requirement, such as cost, bulk, efficiency, reliability and so on.
-

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