Current Limiter with Active Damping for Dimmable Lighting Systems

- **Description**
  - Lighting systems, such as an LED driver, can utilize a current limiter for surge protection and active damping
  - Current limiter includes a switchable resistor whose impedance can be varied by either a surge control or a damper control circuit
  - Surge control circuit can increase the impedance of the switchable resistor when the rectified voltage $V_{RECT}$ is greater than a surge threshold
  - Damper control circuit can increase the impedance of the switchable resistor after the dimmer circuit switches on to dampen input current $I_{IN}$
  - Damper control circuit can reduce the impedance when $V_{RECT}$ reaches a damper threshold to stop damping

- **Benefits**
  - Allows a lighting system to withstand high energy surges while simultaneously providing active damping for dimmer circuits
  - Improves overall efficiency
  - Could be used with: LED drivers, LinkSwitch-PH, LinkSwitch-PL

*Figure 1. Lighting system with a current limiter which includes a switchable resistor, surge control, and damper control*
Example Current Limiter with Active Damping

- **Low side coupled switchable resistor, includes R9, VR2 and Q3**
  - Q3 varies impedance of the current limiter by turning ON or OFF; impedance equal to R9 when Q3 is OFF, R9 shorted when Q3 is ON

- **Surge control circuit includes R3, R4, R5, VR1 and Q2**
  - Adjusts voltage at the control input of Q3 in response to voltage across R5
  - Q3 is turned off when the voltage across R5 is greater than or equal to the sum of the breakdown voltage of VR1 and the turn on voltage of Q2

- **Damper control circuit includes R6, R7, R8, D1, Q1 and C1**
  - When dimmer circuit is first turned ON, Q3 is turned OFF
  - Q3 turns ON when the voltage across C1 reaches a damper threshold
  - Q1 is turned ON to discharge C1 when voltage on C1 exceeds the voltage across R8 by the turn-on voltage of Q1

*Figure 2. Example current limiter with low side coupled switchable resistor*