

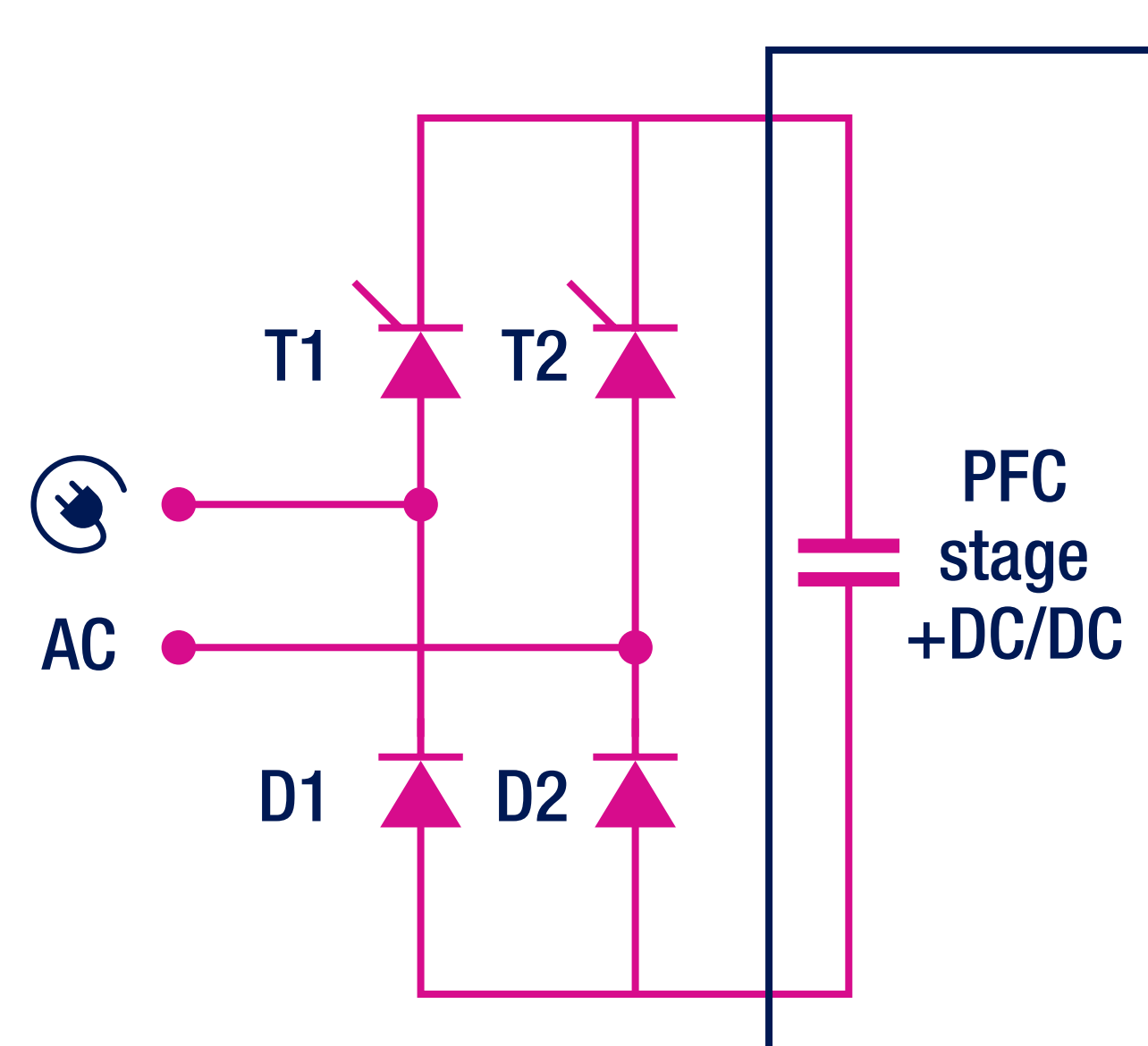
# AC/DC input stage for onboard chargers with built-in inrush-current limitation

## ABSTRACT

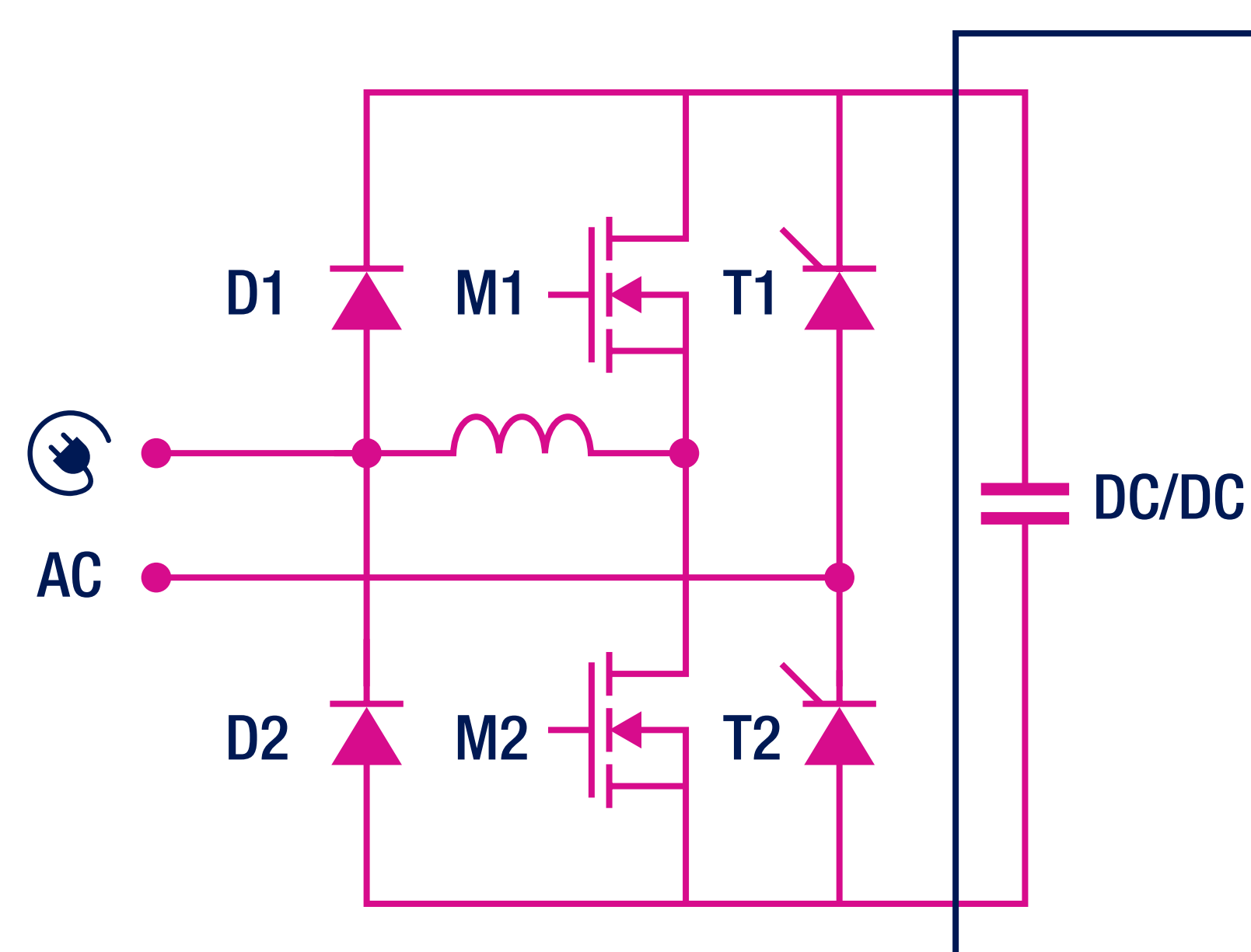
Thyristor-based topologies offer many advantages for the AC/DC input stage of onboard chargers (OBCs) used in electric vehicles. In addition to controlling the inrush-current and allowing full OBC disconnection in standby to suppress undesired losses, these full-silicon solutions do not require any inrush-current limiting resistors or mechanical relays.



## MIXED SCR / RECTIFIER BRIDGE

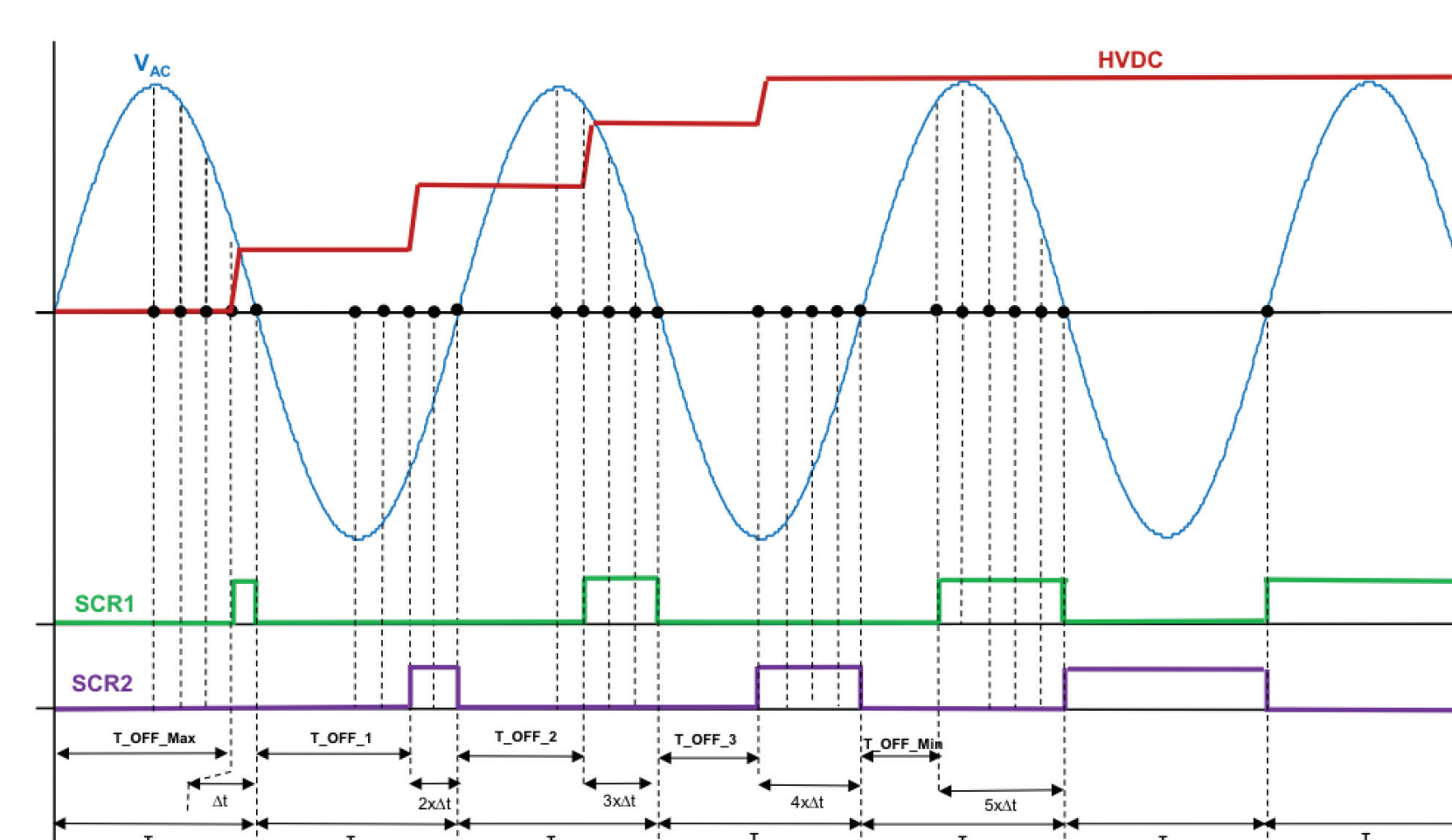


## BRIDGELESS TOTEM POLE



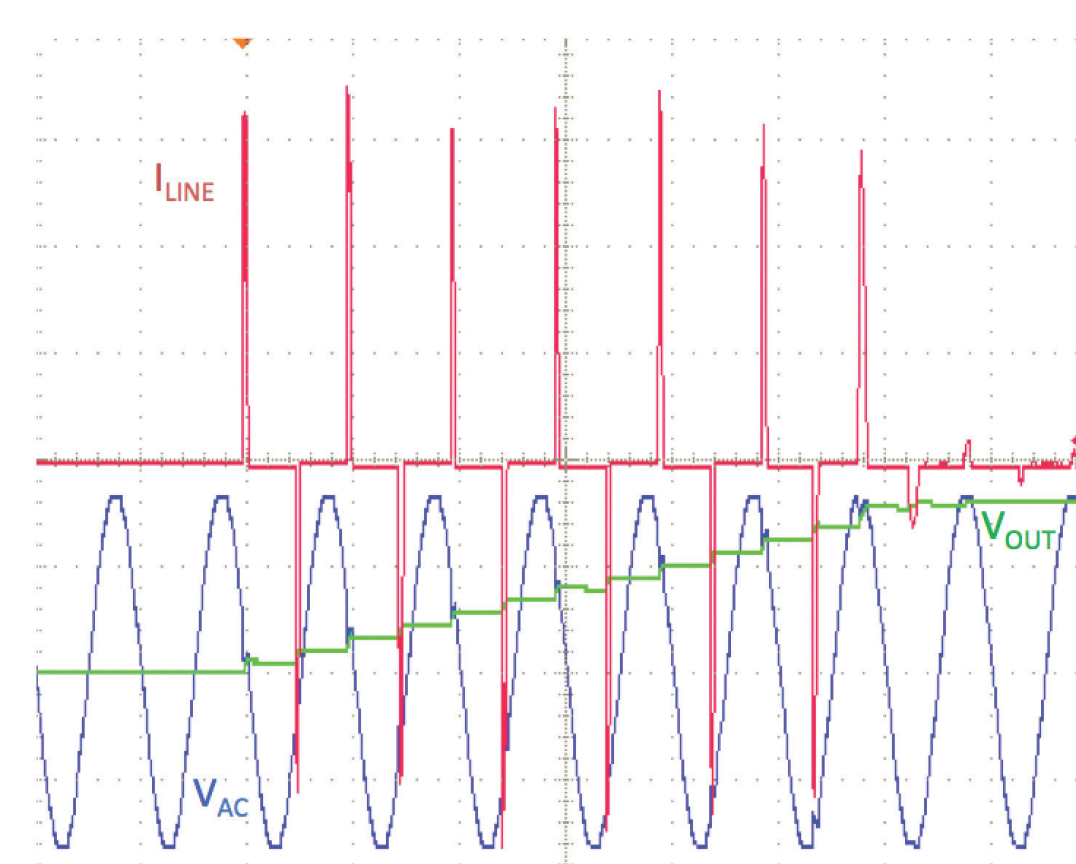
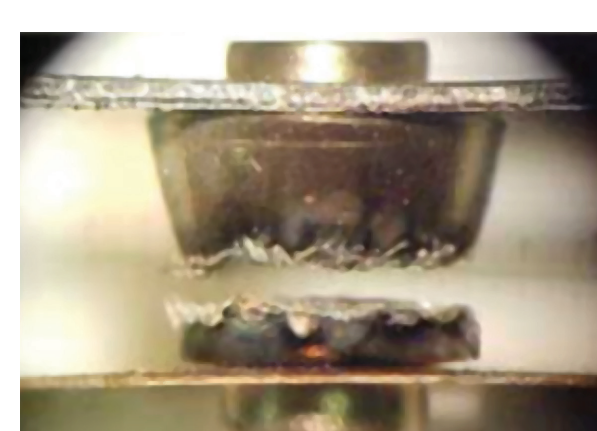
## INRUSH CURRENT LIMITATION OPERATION

- Bulk capacitor is smoothly charged thanks to the SCR's phase angle control
- T1 and T2 are synchronized according to the zero crossing (ZVS) of the AC line



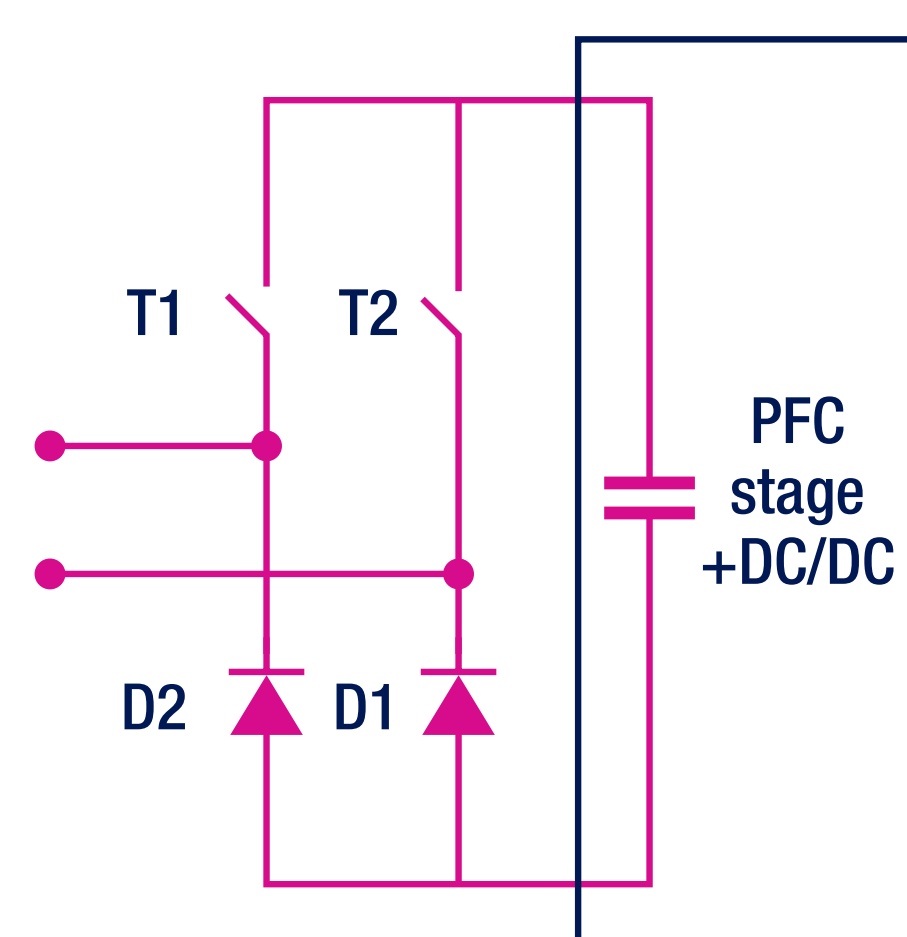
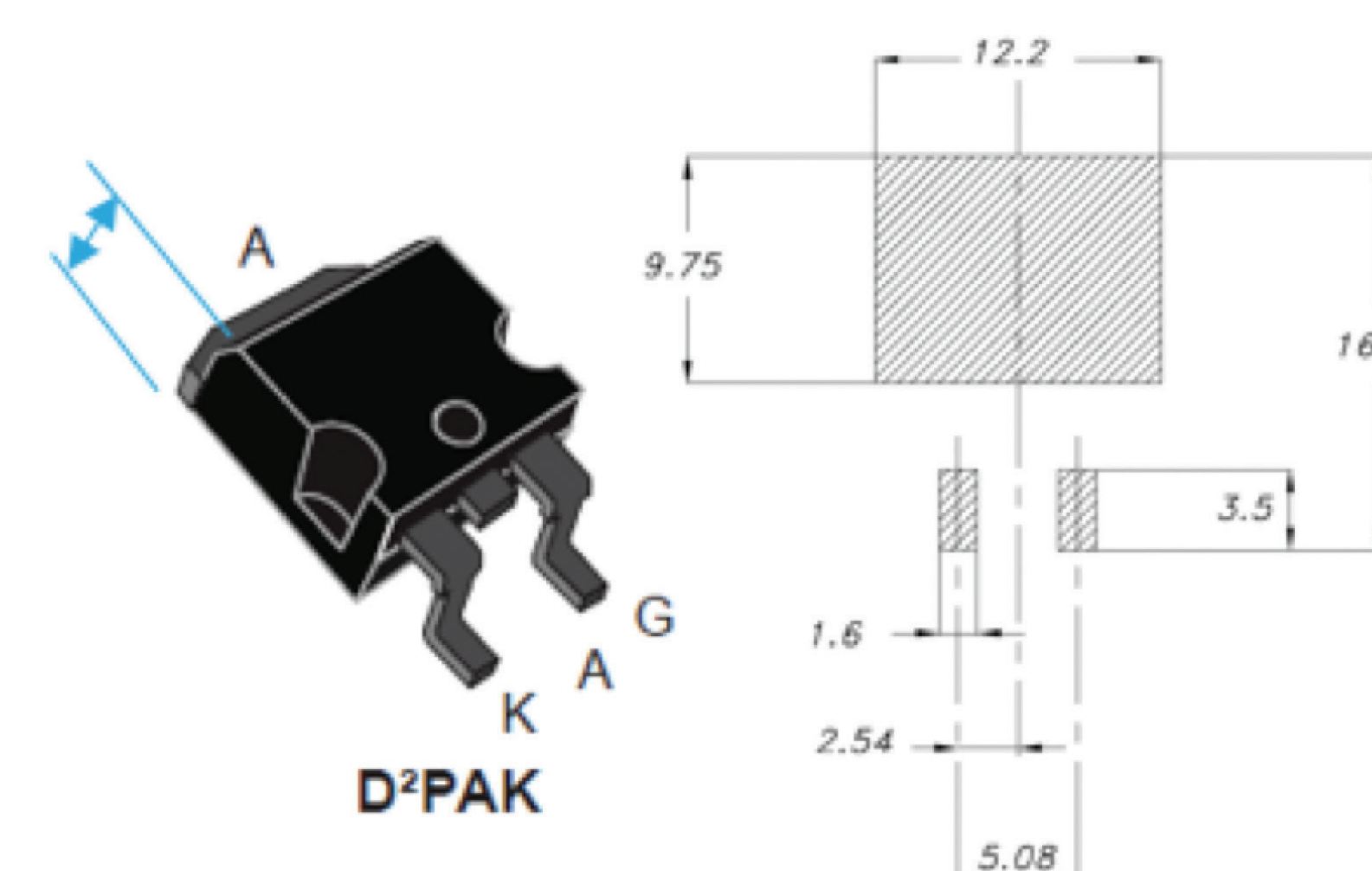
## FEATURES AND BENEFITS

- Smart inrush current limitation:
  - Peak current controlled by software
  - Increased system power-up speed
- High reliability:
  - No moving mechanical parts
  - No EMI noise
  - No contact aging issues
  - Zero Current Switching thanks to SCRs
- High power density:
  - SMD packages available
  - Power density increased
  - Industrial production costs optimized
- Embedded disconnection function:
  - DC bus is disconnected from the line thanks to the SCRs
- Stable and predictable efficiency
- Automotive grade



→ At system start-up or after line drops, the peak line current is controlled by choosing the most adapted SCR gate driving strategy

→ Thin designs possible through SMD packages



→ Both line and neutral functional disconnection ensured by the SCRs (valid for both mixed bridge and bridgeless totem poles)

Bridge		PFC	
A	TN3050H-12WY	A	STBR3012WY
G	TN3050H-12GY	K	STBR6012WY
K	TN5050H-12WY		STTH30L06-Y

PFC
STPSC20065DY
STPSC12065DY
STPSC20H065C-Y
STPSC12C065DY



→ Mechanical relay contact aging makes the solid state solution more stable and predictable

