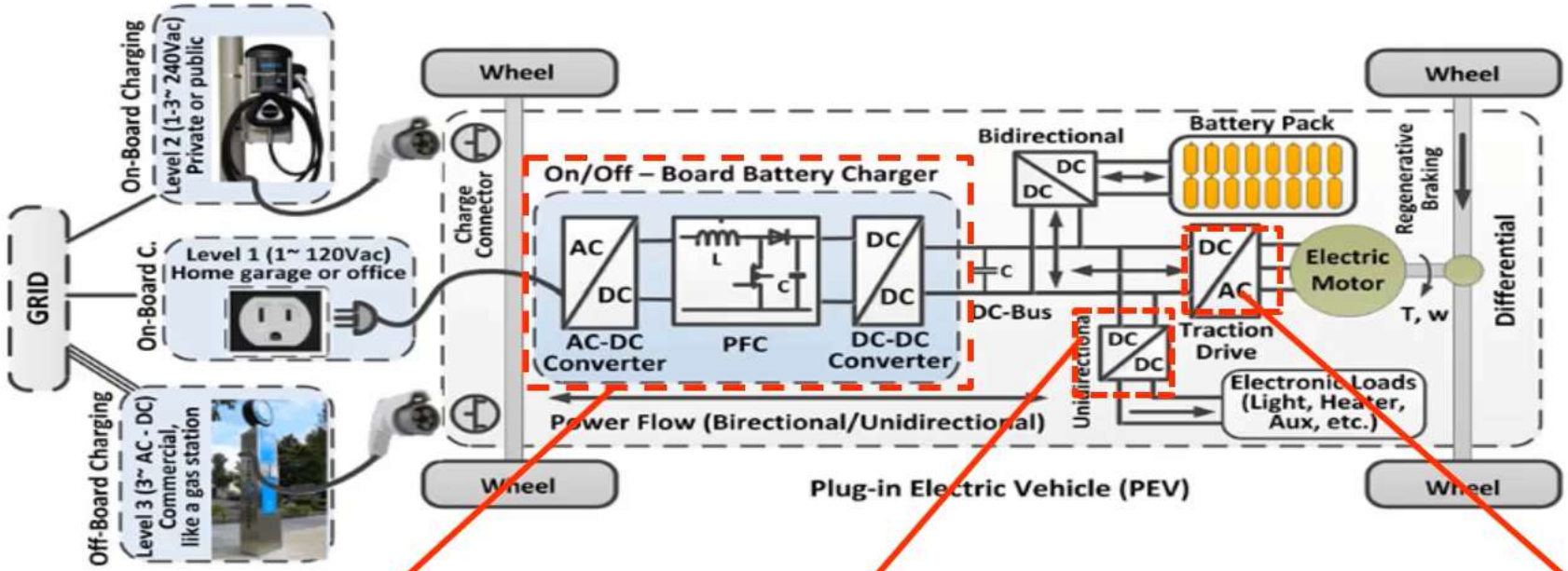
EV/PHEV 电力系统框图



On/off board charging system and power levels for EVs.

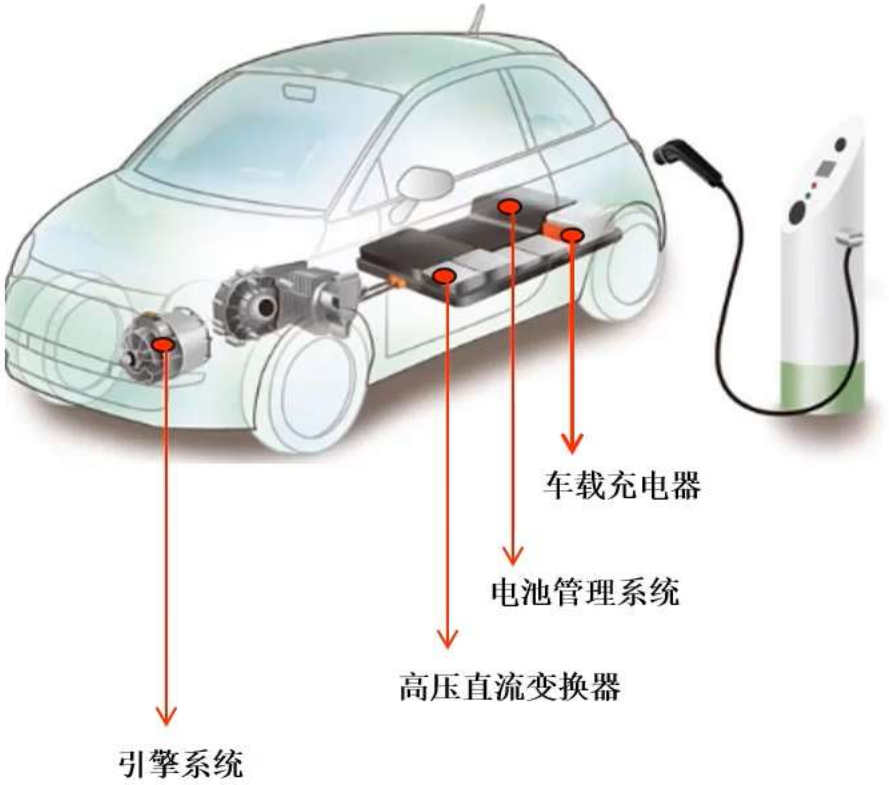
车载充电器
- 输入：85-265V AC
- 输出：200-450V DC

DC/DC直流变换器
- 从高压电池取电
- 输入：200-450V DC
- 输出：12V DC

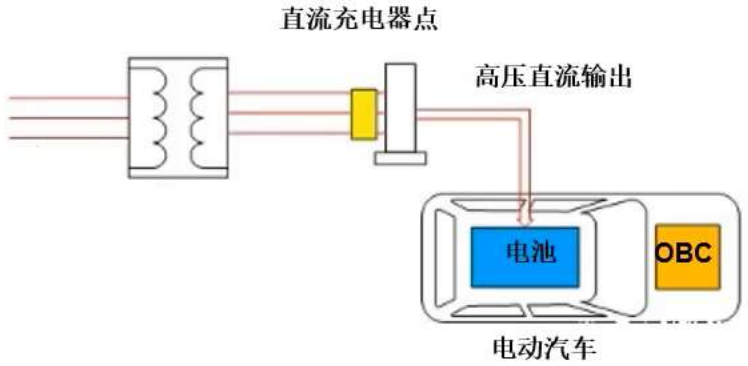
逆变电源
- 将直流DC逆变为交流AC
- 输入：200-450V DC
- 输出：110/220V AC

00:45 / 03:08

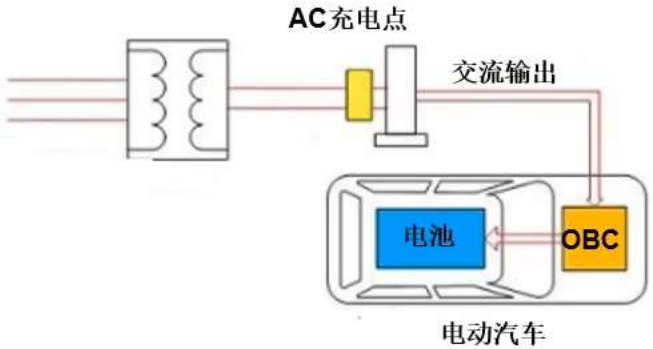
电动汽车充电系统



•直流充电器/离线式　　常规80~120KW
•充电快，高功率



•交流充电器/在板式　　常规3.3KW、6.6KW
•低速充电　　仅仅是个计费控制电表



充电等级分类

Level 1

Level 1 chargers use standard 120V electrical outlets. 120V circuits are also used by most home electronics.

7-8 miles of i3 range per hour charging

1.4 kW power delivery

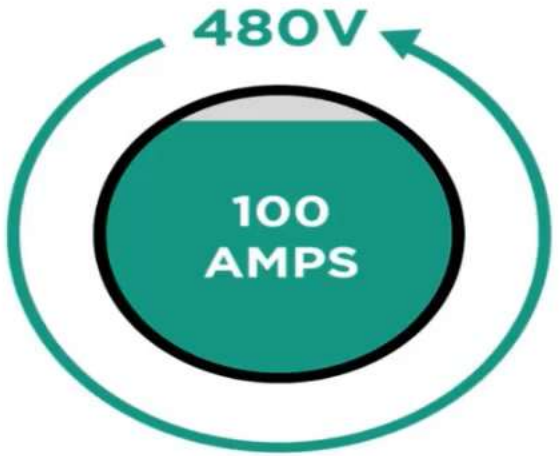
Level 2

Level 2 chargers use 240V electrical circuits. 240V circuits are also used by electric dryers & electric stovetops.

10 - 26 miles of i3 range per hour charging

3.7 - 7.7 kW power delivery

Level 3



Level 3 direct current fast chargers use ultra high-power 480V circuits at public charging stations.

Up to 80% of i3 range in just 30 mins charging

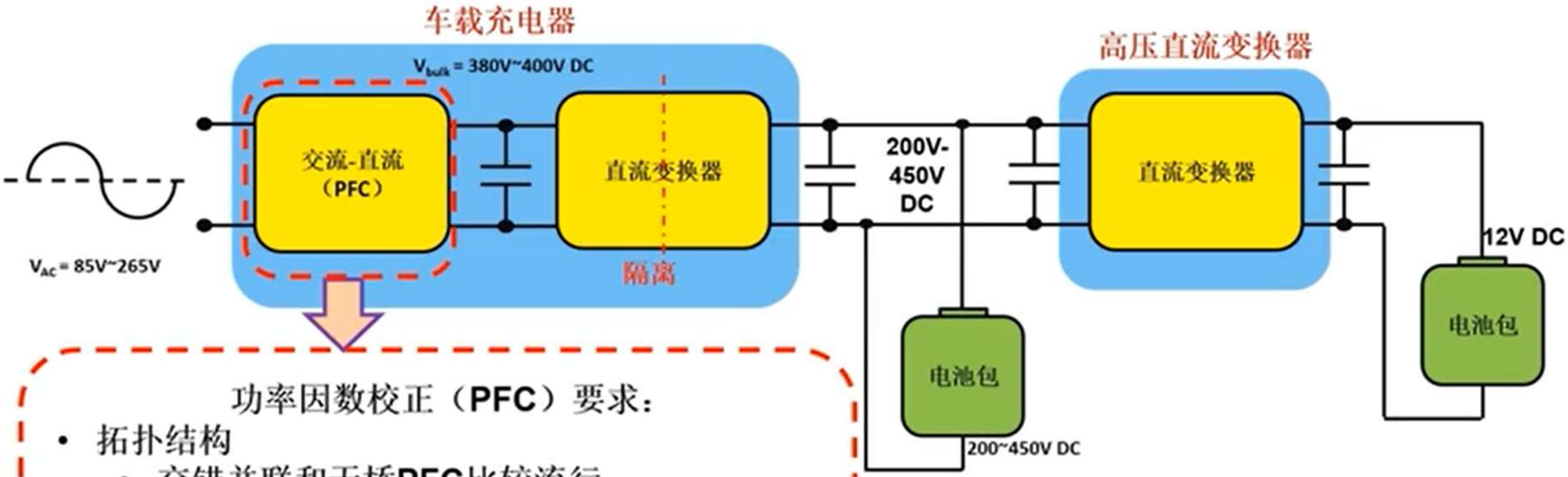
Up to 50 kW power delivery

充电等级分类

Charging Level	Power Supply	Charger Power	Charging Times From Empty to Full*	
			BEV	PHEV
Level 1	120VAC Single Phase	1.4 kW @ 12 amp (on-board charger)	~17 Hours	~7 Hours
Level 2	240VAC Single Phase up to 19.2 kW (up to 80 amps)	3.3 kW (on-board)	~7 Hours	~3 Hours
		6.6 + kW (on-board)	~3.5 Hours	~1.4 Hours
DC Fast Charge Level 3	200 – 450 VDC up to 90 kW (approximately 200 amp)	45 kW (off-board)	~30 - 45 Minutes (to ~80%)	~10 Minutes (to ~80%)

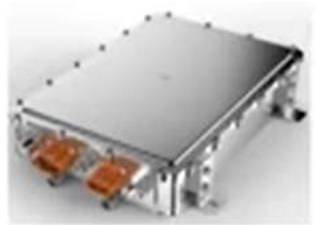
- 在中国，大多数车载充电器都处于等级**2**

车载充电器+直流变换器

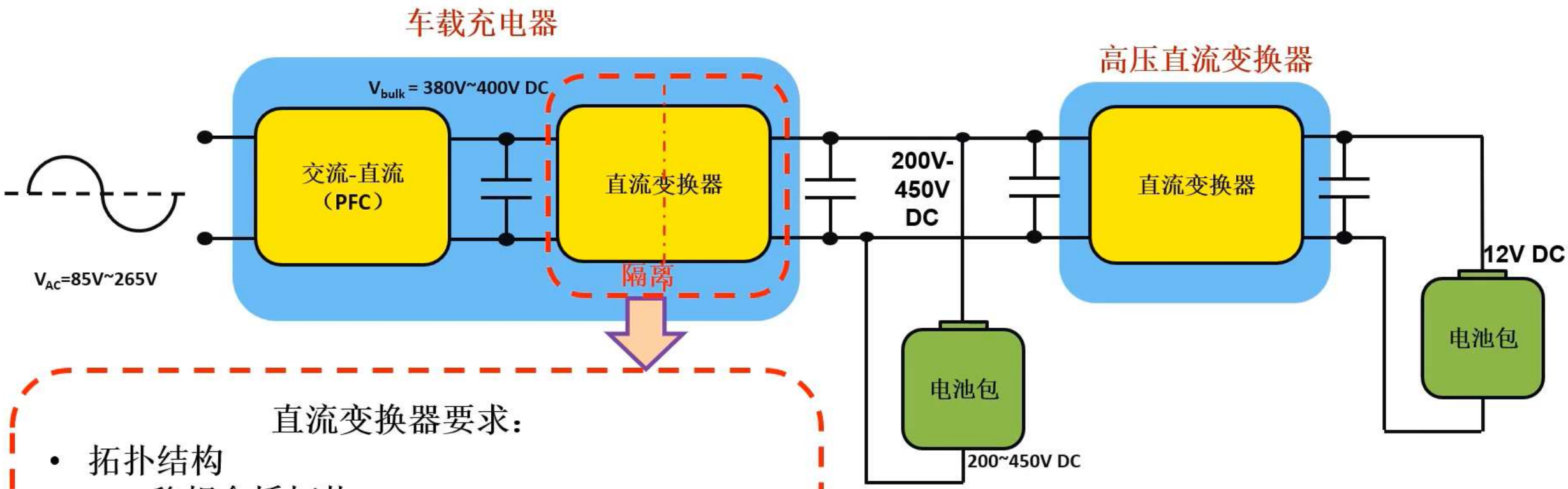


功率因数校正（PFC）要求：

- 拓扑结构
  - 交错并联和无桥PFC比较流行；
  - 高效率的图腾柱PFC是今后的主要应用趋势
- 数字控制是目前以及今后的主要方式；
- 不需要CAN外设；

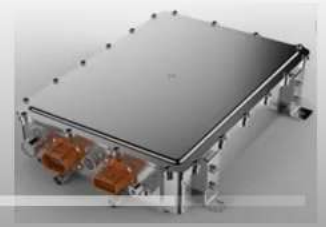


车载充电器+直流变换器

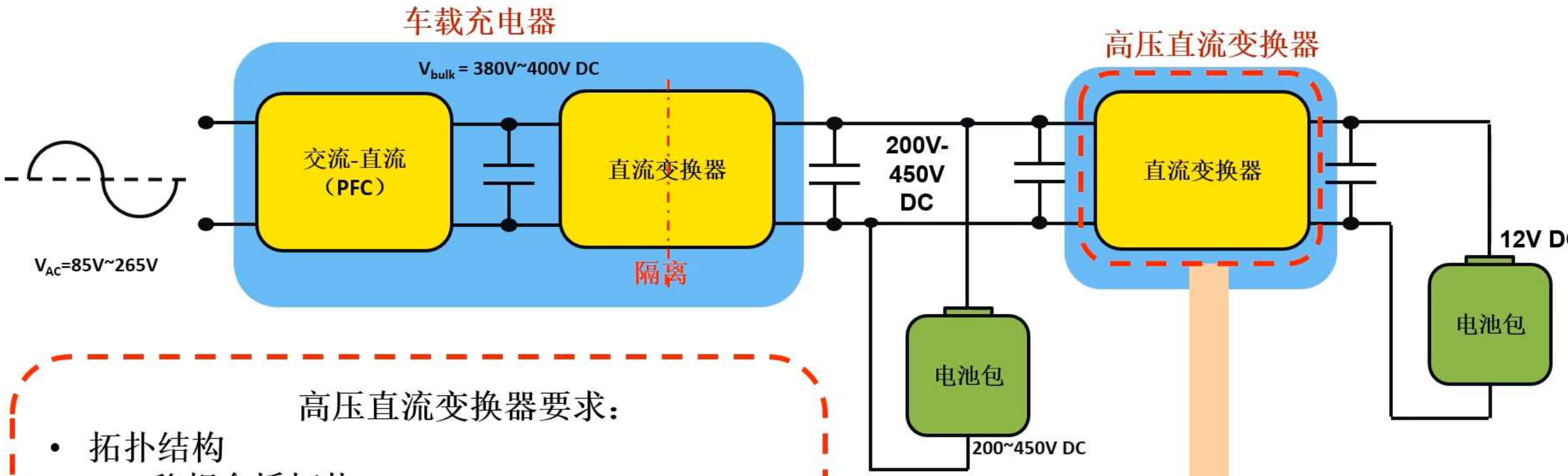


直流变换器要求：

- 拓扑结构
  - 移相全桥拓扑
  - LLC谐振拓扑
  - DAB双有源钳位拓扑
- 数字控制为主导；
- 通信方式：CAN



车载充电器+直流变换器



高压直流变换器要求：

- 拓扑结构
  - 移相全桥拓扑；
  - **LLC**谐振拓扑；
- 数字控制为主导；
- 通信方式：**CAN**
- 功能安全等级（**ASIL-B/C**）