

Design considerations of Paralleled GaN HEMT

AE team



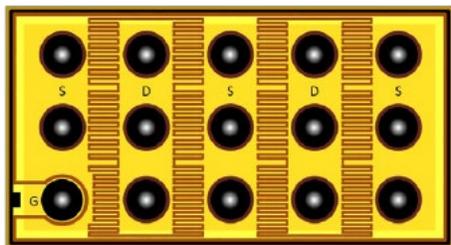
Reasons for Paralleled GaN HEMT

1. Increase power output

2. Increase efficiency

3. Lower temperature and power loss

- 60V InnoGaN Package



WLCSP 3*5

- Small parasitic inductance

- Drive difference between InnoGaN and Si MOS

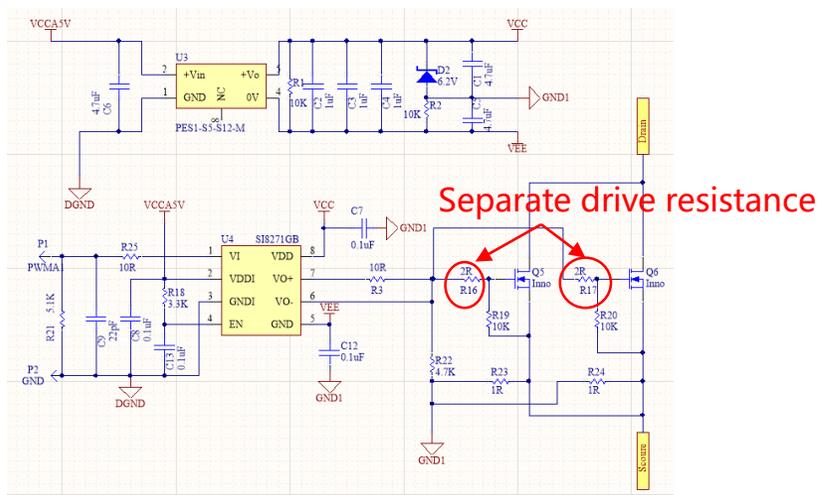
Parameters	60V InnoGaN	Si MOS
Continuous maximum Gate-Source voltage	-4V/+6V	-20V/+20V
V _{th}	0.8V--2.1V	2V--4V
Recommended operating Gate-Source voltage	4.8V--5.5V	8V--12V

1. Paralleled InnoGaN Drive Circuit Design

a. Small package, driving circuit easy to be symmetrical ;

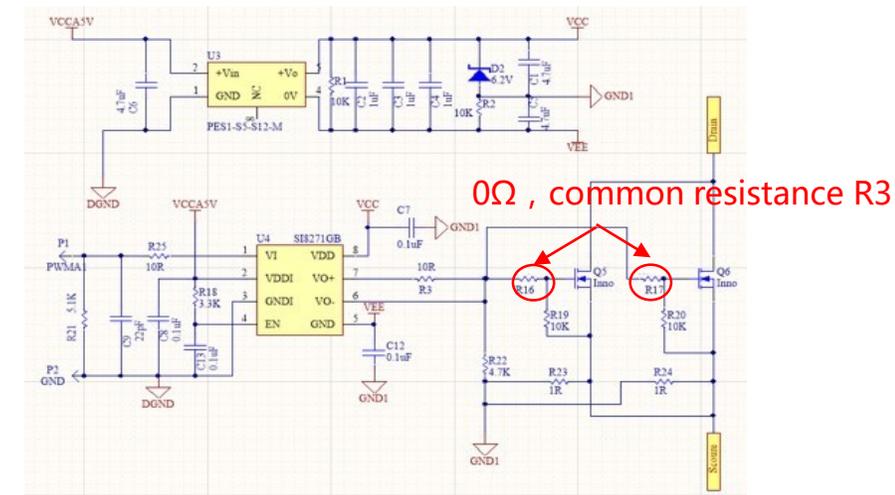
b. Driving circuit design :

b.1 Drive resistance design



Solution one : separate drive resistance

The switching speed can be adjusted independently to reduce the shock of the gate ;
Suitable for more than 3 parallel GaN



Solution two : common drive resistance

Simple , the switching speed cannot be adjusted independently ;
Suitable 2 parallel GaN

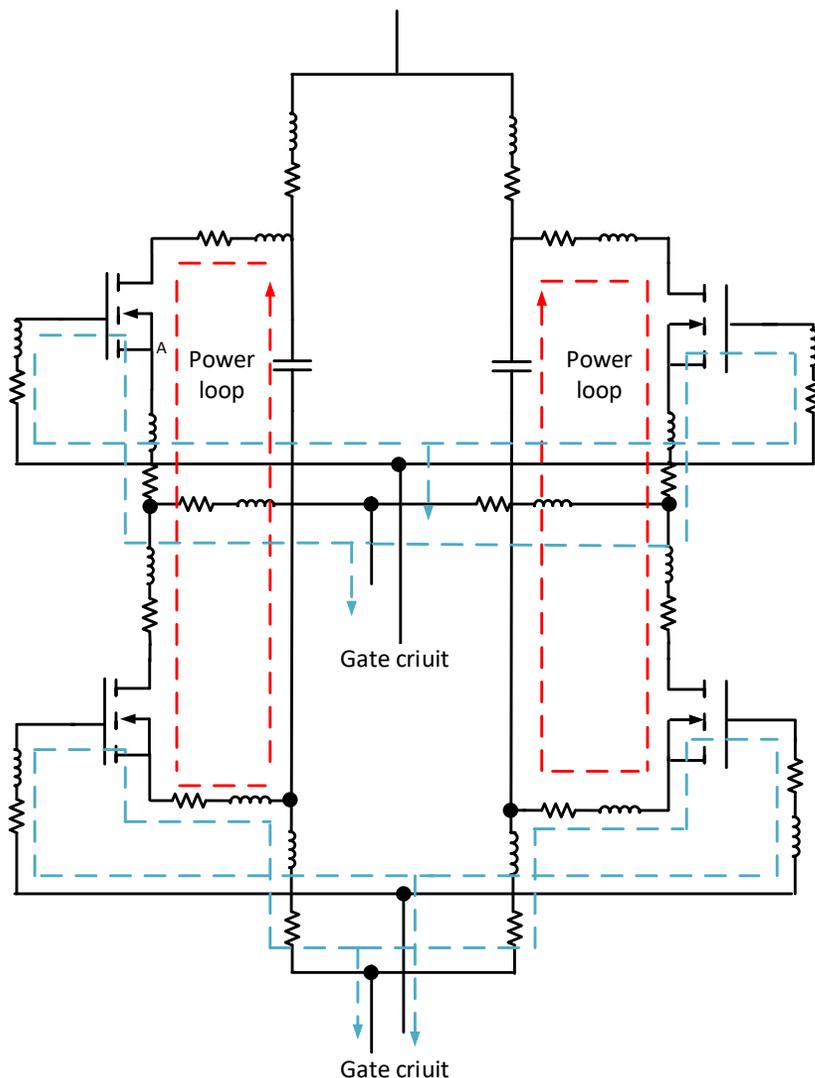
b.2. Drive voltage

- It is recommended to use a negative gate turn-off bias voltage to reduce turn-off loss and enhance the anti-interference ability of the gate.

b.3 Driver selection

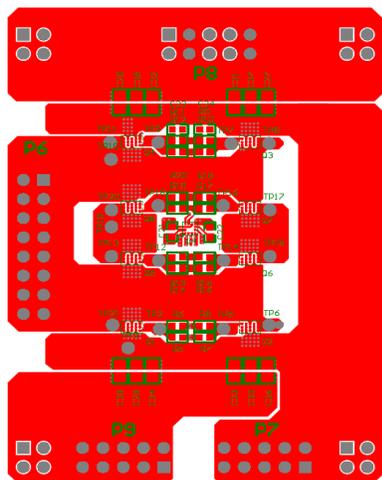
- The drive current of the driver needs to be appropriate to prevent insufficient drive capacity, which may cause the device fail to work.
- When the drive capacity of the driver is insufficient, a push-pull circuit can be added to increase the drive current

2. Power loop PCB layout (Half-bridge circuit)

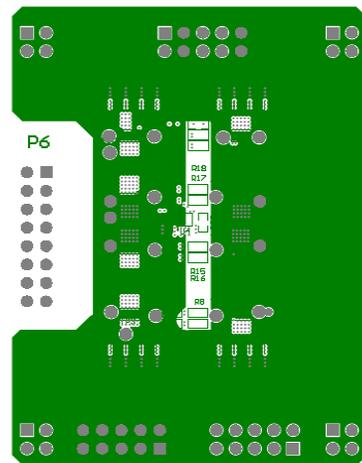


- Reduce the length of the power loop (including InnoGaN) and decoupling capacitors ;
- Reduce common source inductance ;
- Reduce inductance of the power loop :
Use the principle of magnetic flux cancellation (when two adjacent conductors are placed close and their current directions are opposite, the magnetic fluxes generated by currents in the two directions cancel each other out).

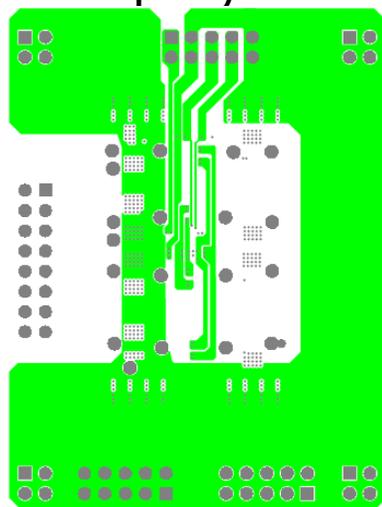
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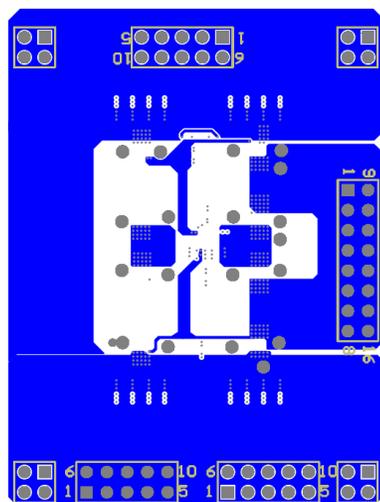
Top layer



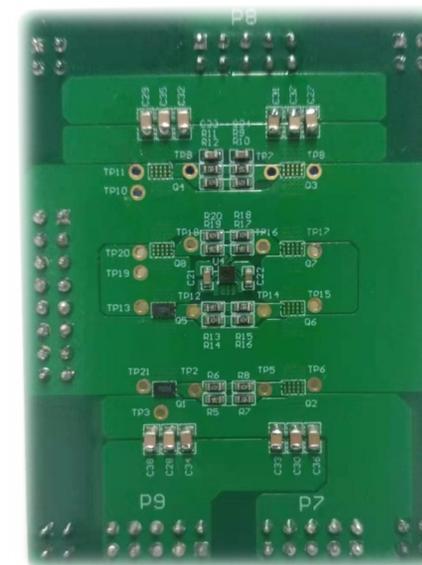
second layer



third layer



bottom layer



Characteristics :

- Driver in the center, symmetrical structure ;
- CSI is minimized, drive and power loops are isolated; power ground returns on the second layer;
- On the bottom layer, the direct-current positive bus connection are made .

Suitable for
high current
applications

High current AC/DC or DC/DC power converter

Motor drive, traction inverter

New Energy System (Household Photovoltaic-Single
Phase Inverter)



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