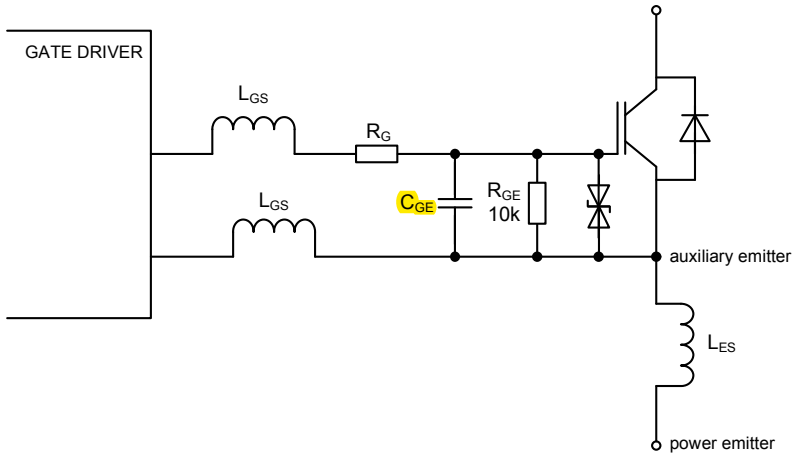
A few design tips on gate driver / IGBT connection for systems where wire connections are used are given below:

- Any parasitic inductances within the DC-link have to be minimized. Overvoltages may be absorbed by C- or RCD-snubbers between main terminals (plus and minus) of the power module.
- Make power patterns short and thick to reduce stray inductance and stray resistance.
- The connecting leads between gate driver and IGBT module must be kept as short as possible. Gate and emitter wiring must be twisted pair to minimize mutual induction, as magnetic field will be compensated for by equal current flow in opposite directions.
- The V_{CE} monitoring wiring must not be bundled together with the gate and emitter wiring.
- Gate wiring for top and bottom IGBT or other phases must not be bundled together.
- It is recommended that a 10kΩ resistor (R_{GE}) be placed between the gate and emitter. If wire connection is used, do not place the R_{GE} between printed circuit board and IGBT module. R_{GE} has to be placed very close to the IGBT module.
- Use auxiliary emitter contacts to minimize negative feedback effect on gate-emitter voltage.
- Use a suppressor diode (back-to-back Zener diode) between gate and emitter. The diode has to be placed very close to the IGBT module.
- The use of a capacitor (C_{GE}) between gate and emitter can be advantageous, even for high-power IGBT modules and parallel operation. The C_{GE} should be approximately 10% of the C_{GE} of the IGBT used. The C_{GE} has to be placed very close to the IGBT module.
- Current loops must be avoided.
- Place the gate resistances for turn-on and turn-off close together.
- Use an auxiliary printed circuit board with all of the components and solder to gate and emitter of the IGBT module, if the gate driver is used in higher-power applications.
- If external boost capacitors are used, the capacitors must be placed as close to the gate driver as possible in order to minimize parasitic inductance.

Gate Driver Connection & Stray Inductances



- If the ground of the driver is connected to the power emitter terminal, voltage is induced across L_{ES} due to the high di/dt of the load current. This voltage decreases the gate turn-on voltage and voltage is added to the gate turn-off voltage to slow down turn-on / turn-off. For this reason, stray inductances between auxiliary emitter and power emitter should not be shared.
- In order to ensure IGBT locking even when the driver supply voltage is turned off and voltage is being applied to the power circuit, a resistor (R_{GE}) has to be integrated.
- The suppressor diode must be placed very close to the IGBT module and can protect the IGBT gate in overvoltage conditions as well as limit the short circuit current should a short circuit occur. During short circuit, the gate emitter voltage may increase due to the miller capacitance between collector and gate. High dv/dt during short circuit causes a current to flow through the miller capacitor, in doing so increasing the gate emitter voltage. The suppressor diode will clamp this voltage. Furthermore, the suppressor diode can protect the gate driver from consequential damage should the IGBT module malfunction.
- The gate emitter capacitor C_{GE} is used as a smoothing capacitor, especially in the event of a short circuit, in order to reduce oscillation at the IGBT gate.