Seminar #1

This section consists of 2 topics and both are required to be presented during the 1st seminar, week 5. Each group (2 or 3 people) should prepare for one presentation.

Topic 1

Select one power electronic equipment in your daily life and:

- Describe its function, input and output features
- Take a picture and then differentiate as well as mark down:
  - Power stage
  - Drive circuit
  - Control circuit
- Find the model of the power electronic device and component used in this equipment and describe its major parameters

(Such a power electronic equipment could be found in the **Lab of Department of Industrial Automation, 3-4153 room, NO.3 building, iHarbour**. Or you can find one on the Internet.)

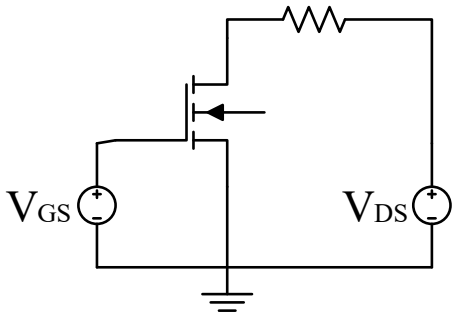
Topic 2

This topic aims to help you get a basic understanding of power electronic devices through simulation.

Each group will be assigned with a typical fully-controllable power device (MOSFET or IGBT) of certain model. The work to be done includes:

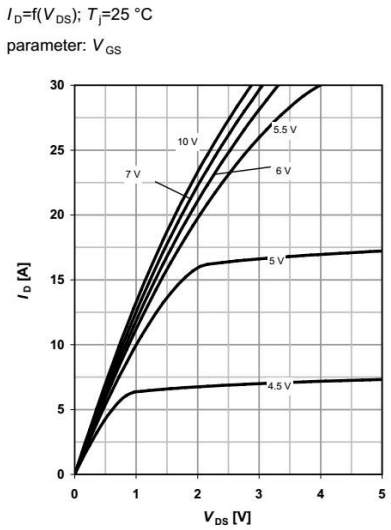
1. Carrying out simulation in LTspice to test the characteristics of the assigned device
2. Comparison between simulation results and the characteristics given by datasheet

The testing circuit for **MOSFET** is shown as below.

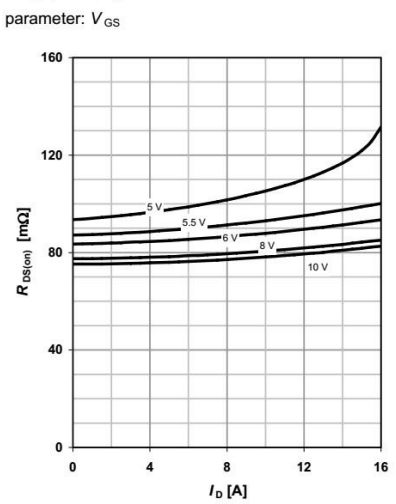


The characteristics required to test includes:

1. Output characteristics ($I_D = f(V_{DS})$ under different V_{GS})

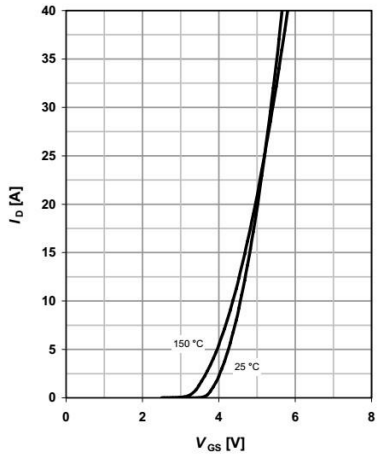


2. Drain-source on resistance ($R_{DS(on)} = f(I_D)$ under different V_{GS})



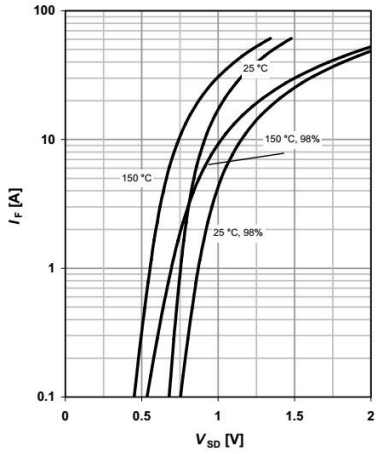
3. Transfer characteristics ($I_D = f(V_{GS})$ with fixed V_{DS})

$I_D=f(V_{GS})$; $|V_{DS}|>2|I_D|R_{DS(on)max}$
parameter: T_j



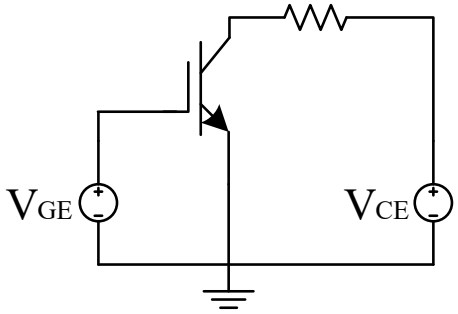
4. Forward characteristics of reverse diode ($I_F = f(V_{SD})$)

$I_F=f(V_{SD})$
parameter: T_j



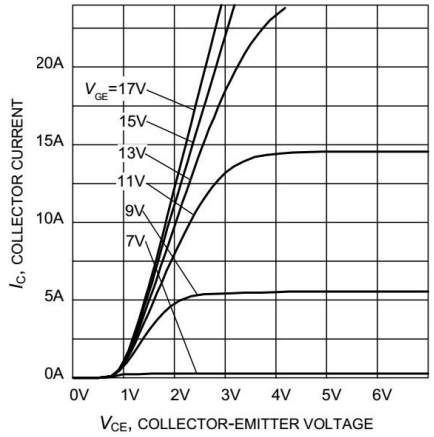
5. Switching waveform (real-time simulation, V_{GS} being pulsating signal)

The testing circuit for **IGBT** is shown as below.

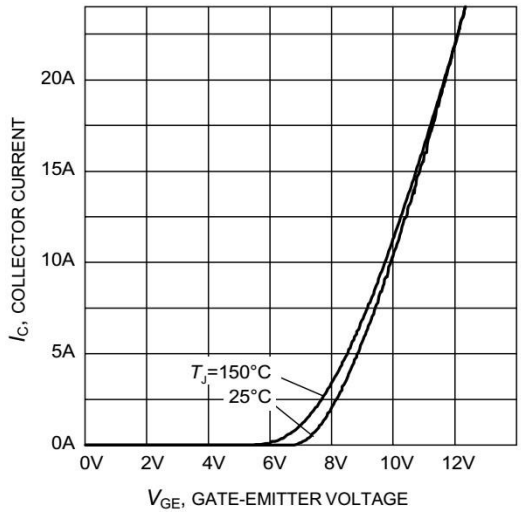


The characteristics required to test includes:

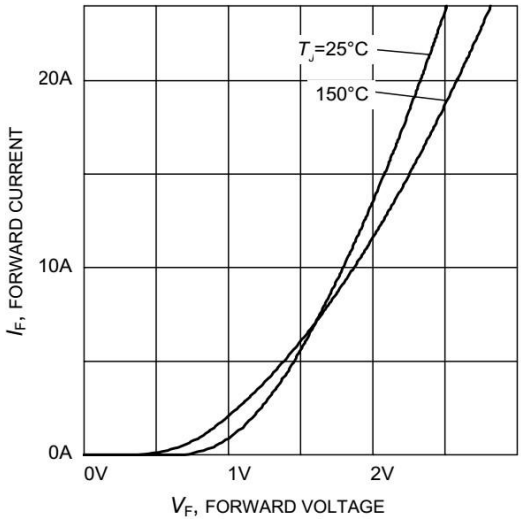
1. Output characteristics ($I_C = f(V_{CE})$ under different V_{GE})



2. Transfer characteristics ($I_C = f(V_{GE})$ with fixed V_{CE})



3. Forward characteristics of reverse diode ($I_F = f(V_{EC})$)



4. Switching waveform
   (real-time simulation, V_{GE} being pulsating signal)

The installation file of LTspice as well as corresponding datasheet, tutorial and guide documents are available in **Curriculum Resource**.