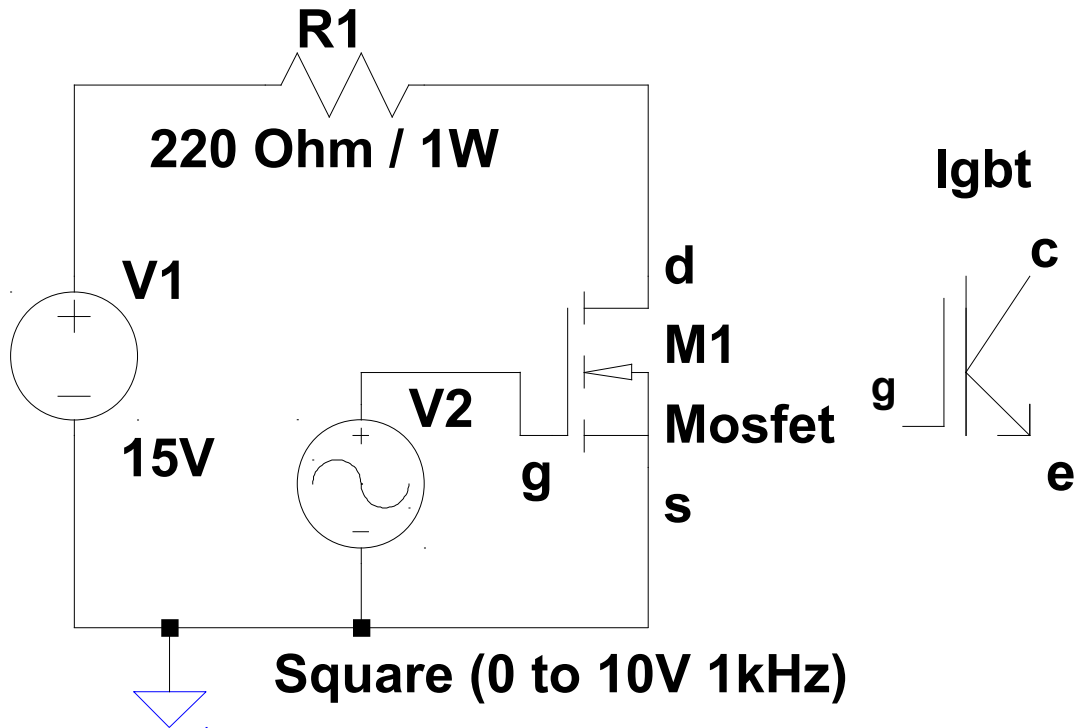


DT021-3 Power Electronics Laboratory 1.

Building and Analysing a Switching Circuit with Mosfet or IGBT



Objectives:

1. Re-familiarisation with basic laboratory equipment: Power Supply, Signal generator, Oscilloscope
2. Build a switching circuit using either a Mosfet or IGBT,
3. Measure circuit voltage and current waveforms and present the results in a report
4. Attempt to observe and measure Switching losses and Conduction losses in the switch,

Notes:

1. Mosfet and IGBTs are both voltage controlled switches. If the voltage from gate to source (gate to emitter) is 0V the device is off and will not conduct. If the voltage is greater than a threshold voltage the device will conduct. MOSFETs and IGBTs have slightly different threshold voltages but in both cases 10V is sufficient to ensure conduction.
2. I recommend setting up the signal generator to give 0 to 10V square wave at 1kHz. This will require the DC offset function to be enabled.
3. The important circuit waveforms are the Mosfet drain source voltage (collector emitter) and the drain (collector) current. The current can best be measured by

- using an **isolated** scope channel connected across R1. The gate source (emitter) voltage is also useful to observe.
4. Students are required to build the circuit in the lab and take results, to demonstrate their circuit to the supervisor and answer questions about it.
 5. A short report (1-2 pages including graphs) must be prepared and submitted prior to the next lecture session. The report should include circuit diagrams, transistor model numbers and should address the questions below.
 6. In order to get an accurate ground position on the oscilloscope I recommend using DC coupling and setting ground by shorting the probe tip to its ground clip.
 7. The small on - state voltage is hard to measure while the device is switching – I recommend turning the device on continuously with the same value of current and measuring the voltage drop that way.

Questions:

- (1) What is the minimum gate voltage need to turn the device on reliably (The threshold voltage)?
- (2) What is the voltage across the MOSFET/IGBT when it is on (and settled down)?
- (3) What is the on-state power loss?
- (4) Sketch (or photograph) the current waveform entering the gate terminal (ask for help when measuring this).