

# Handling MOSFETs

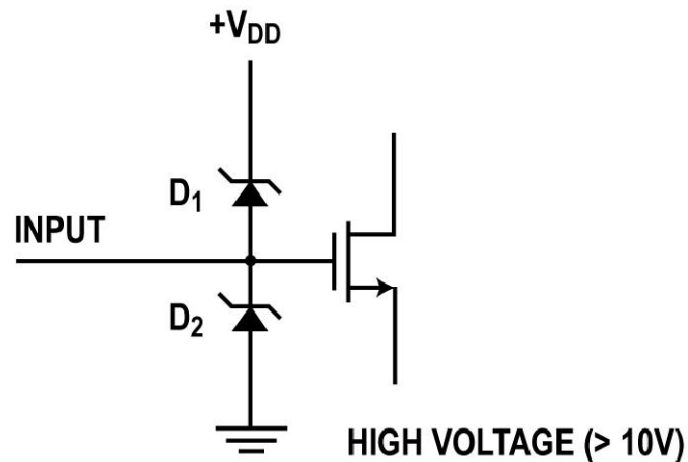
# MOSFET Circuits and Static Electricity

MOSFETs are very sensitive to outside voltages especially static electricity. The very thin silicon dioxide insulator between the gate and substrate is very easily penetrated thereby shorting the gate to the substrate if the voltage across it exceeds some small value.

Static electricity voltages can be hundreds or even thousands of volts. You have probably experienced this yourself on a dry winter day after walking on a carpet.

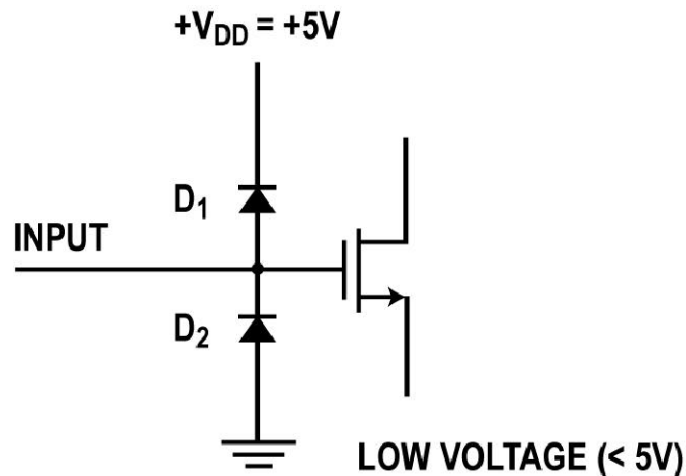
In discrete MOSFETs, this breakdown voltage may be 10 to 30 volts. In IC MOSFETs based circuits, this penetration voltage may be only a few volts. If the voltage rating is exceeded, the device will be destroyed.

# MOSFET Protection with Zener Diodes



To prevent this problem, most discrete MOSFETs and the inputs to IC MOSFET devices are protected by built in surge protection diodes. With two back to back Zeners, the input is protected for either positive or negative voltages between the source and gate. If the input is higher than the Zener breakdown voltage, one of the Zeners will conduct and clamp the input to the Zener value thereby saving the device.

# MOSFET Protection with Silicon Diodes



Another diode protection arrangement is shown here. Two ordinary silicon diodes are connected as voltage clamps. If a negative input pulse occurs,  $D_2$  conducts and clamps the input to a maximum of 0.7 volts. If the input is positive more than the +5 volts supply voltage,  $D_1$  conducts clamping the input to +5 volts.

# Handling Precautions

To minimize the possibility of damaging a MOSFET or CMOS IC, handling care is essential.

Always keep the leads of a MOSFET or an IC shorted together when the device is not being used. Conductive foam can be used.

If replacing or installing a MOSFET or CMOS IC, be sure all power is turned off and all input signals have been removed.

Ground your hand on some nearby metal object to discharge any built up static charge that may exist.

Do not touch the MOSFET leads or IC pins with your hands.

Be sure your soldering iron is grounded before soldering the leads.

## Test your knowledge

# Metal Oxide Semiconductor Field Effect Transistors (MOSFETs) and Common Electronic Circuits Knowledge Probe 5 Handling MOSFETs

Click on [Course Materials](#) at the top of the page.  
Then choose **Knowledge Probe 5**.