



Al-Mustaqbal University / College of Technical Engineering
 Department (Computer Techniques Engineering)
 Class (2)

Subject (Electronics Circuit) / Code (UOMU0202044)
 Lecturer (Dr. Basim Atiyah Khudhair Al-Qargholi)

2nd term – Lecture No: 3. (JFET vs. MOSFET Transistor Comparison
 D-MOSFET vs. E-MOSFET Transistor Comparison)

JFET vs. MOSFET Transistor Comparison D-MOSFET vs. E-MOSFET Transistor Comparison

Feature	JFET	MOSFET
Gate Insulation	PN junction (reverse-biased)	Metal-oxide-semiconductor (insulating layer, typically SiO ₂)
Gate Contact	Direct contact with the channel	Insulated from the channel
Body Diode	Generally absent	Present in many types, can pass current in reverse bias
Operating Mode	Primarily depletion mode	Depletion and enhancement modes
Gate Control	Reverse-biasing a PN junction to vary channel width	Transverse electric field across an insulating layer to vary channel conductivity
Normally ON/OFF	Normally ON (conducts with zero gate voltage)	Enhancement-mode MOSFETs are normally OFF; Depletion-mode MOSFETs are normally ON
Input Impedance	Relatively high (due to reverse-biased PN junction)	Extremely high (due to insulated gate)
Noise Levels	Generally lower noise levels	Can have higher noise levels, especially on-chip
Capacitance	Generally lower capacitance	Can have much lower capacitances on-chip, but overall higher than JFETs in some configurations
Switching Speed	Slower due to capacitance effects	Faster switching speeds, especially power MOSFETs
ESD Sensitivity	Less prone to electrostatic discharge (ESD) damage	More prone to ESD damage
Low Noise	Preamplifiers, RF amplifiers, low-noise applications	Power amplifiers, switching power supplies, digital circuits
Switching	Electronic switches (low power)	High-speed switching, power control, motor drives



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Feature	JFET	MOSFET
Amplification	Buffer amplifiers, voltage-controlled resistors	Audio amplifiers, RF amplifiers, high-frequency applications
Other	Analog switches, choppers	Microprocessors, memory chips, integrated circuits (ICs)

D-MOSFET vs. E-MOSFET Transistor Comparison

Feature	D-MOSFET (Depletion-mode MOSFET)	E-MOSFET (Enhancement-mode MOSFET)
Channel Presence	Pre-fabricated during manufacturing	Induced by gate voltage; no channel initially
State at $V_{GS} = 0V$	Normally ON (conducts current)	Normally OFF (does not conduct current)
Operational Modes	Both depletion and enhancement modes	Enhancement mode only
Threshold Voltage (V_{th})	Voltage to turn OFF (pinch-off)	Voltage to turn ON (induce channel)
Gate Bias for Conduction	0V or forward bias	Must be $> V_{th}$ (forward bias)
Gate Bias for Non-conduction	Reverse bias (to pinch-off)	0 V or reverse bias
Symbol	Solid line between Source and Drain	Broken/Dashed line between Source and Drain
Typical Applications	Constant current sources, limiting circuits, high-input impedance amplifiers	Digital logic (CMOS), switching, power electronics, microprocessors