

PASSIVE COMPONENTS

SECTION 1 OF 4 · SCHEMATIC SYMBOLS

01



RESISTOR

limits current flow · Ω
ANSI / US zigzag style

02



RESISTOR (IEC)

european-style rectangle
identical function · just notation

03



POTENTIOMETER

variable resistor · "pot"
wiper arrow = third terminal

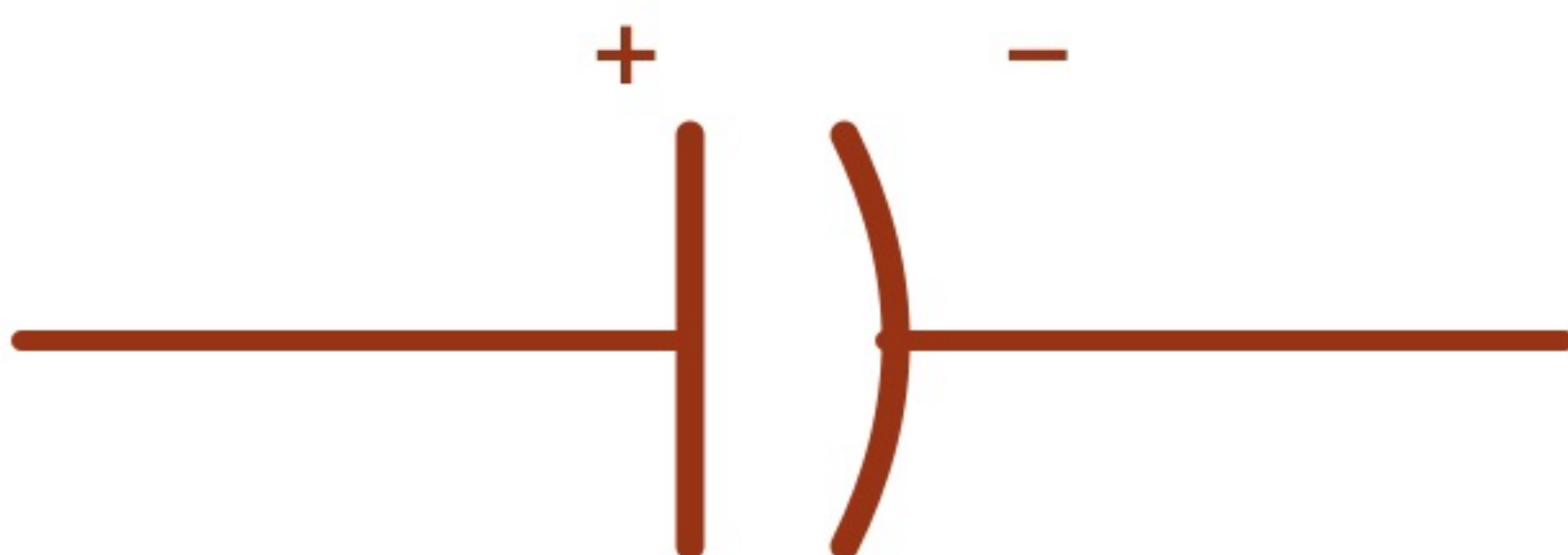
04



CAPACITOR

stores charge · F
non-polarized · either way up

05



ELECTROLYTIC CAP.

polarized capacitor
curved plate = negative side

06



INDUCTOR

stores magnetic energy · H
coiled wire · also "choke"

07



TRANSFORMER

couples AC via magnetic core
two coils share flux · steps V up/down

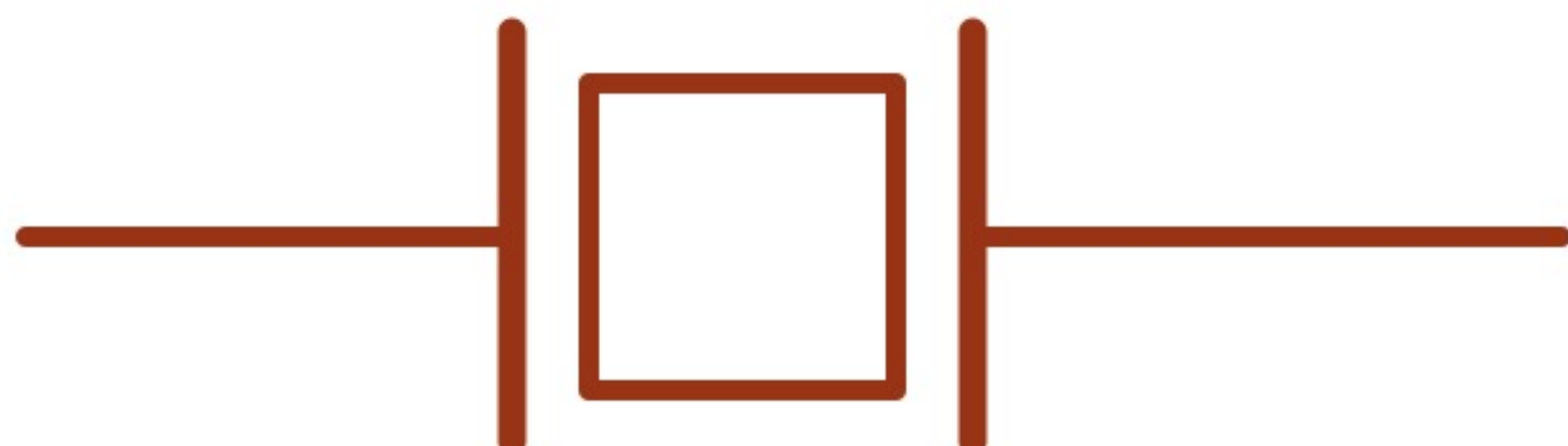
08



FUSE

breaks at overcurrent
sacrificial protection

09



CRYSTAL

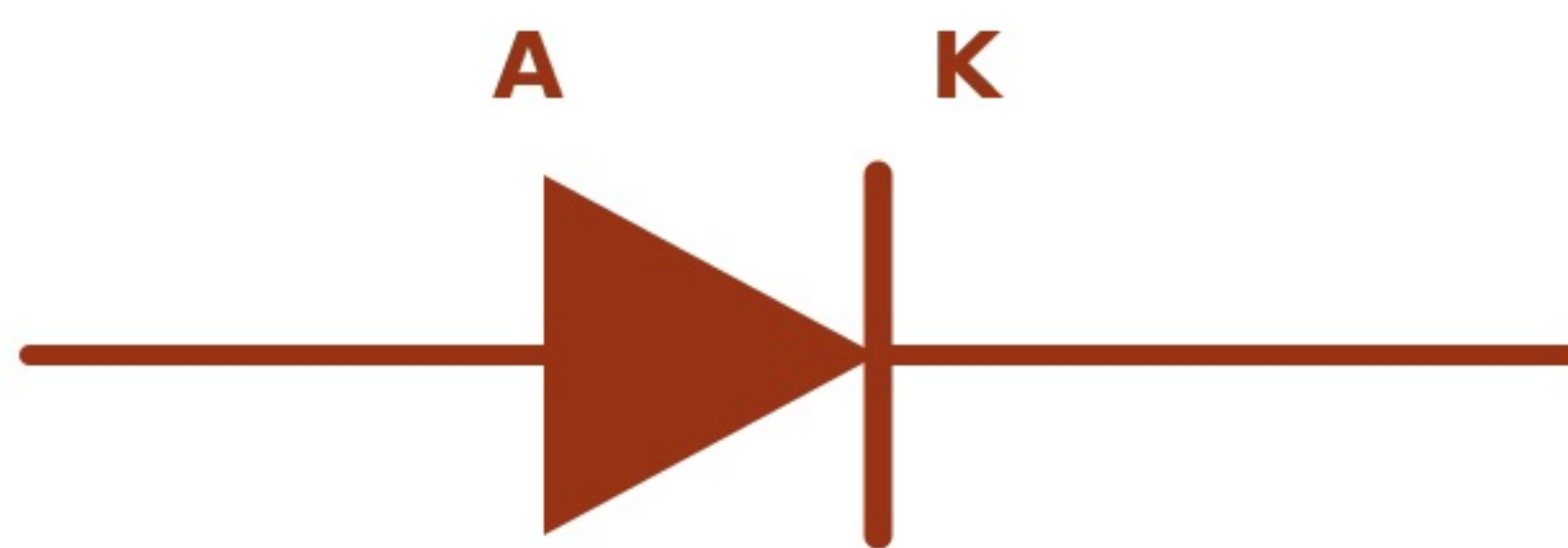
precise oscillator · Hz
"XTAL" · clocks μ Cs and radios

PASSIVE = no power source needed · just shapes the signal that passes through it
Next section → SEMICONDUCTORS

SEMICONDUCTORS

SECTION 2 OF 4 · SCHEMATIC SYMBOLS

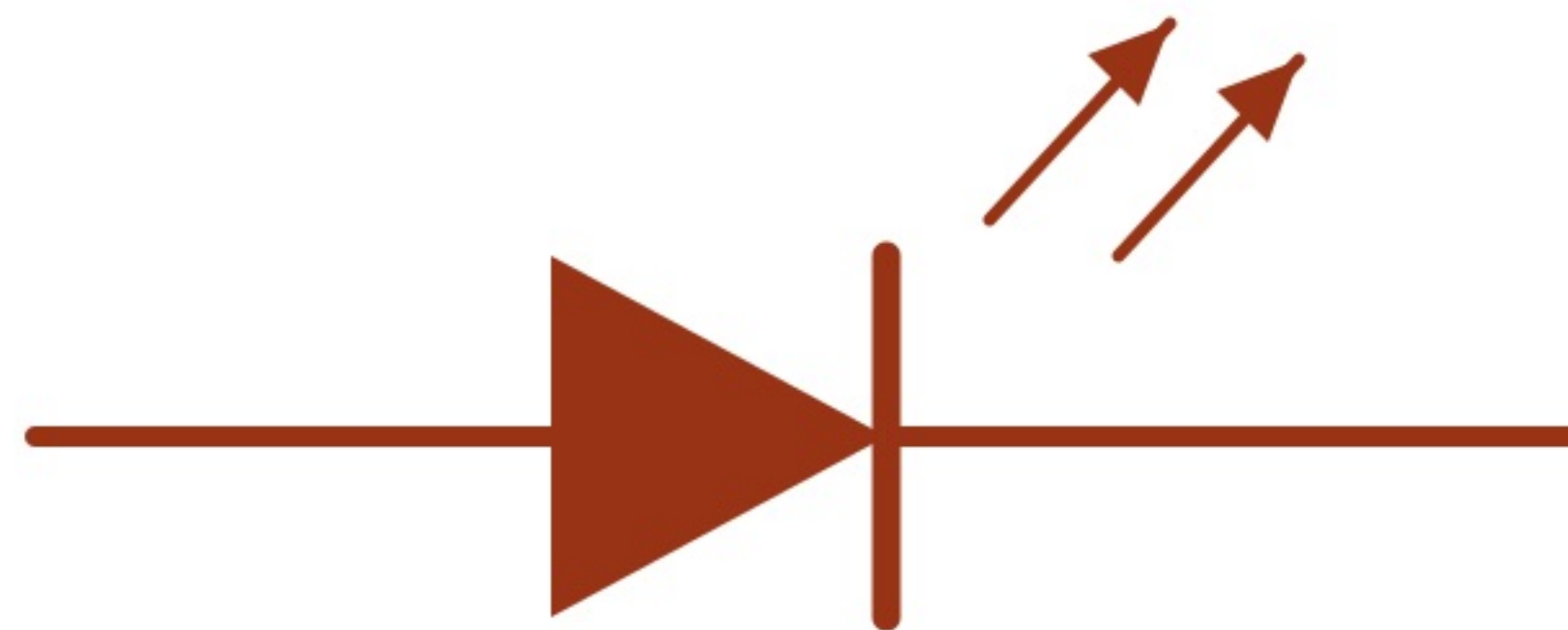
01



DIODE

one-way current valve
anode → cathode only

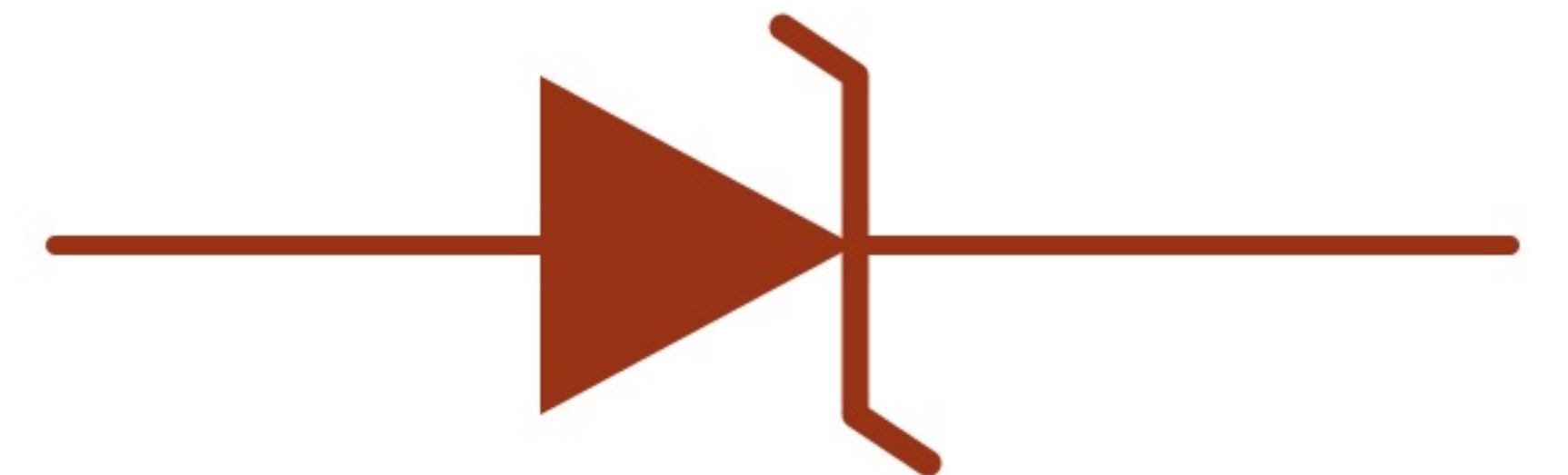
02



LED

light-emitting diode
arrows point AWAY · emits light

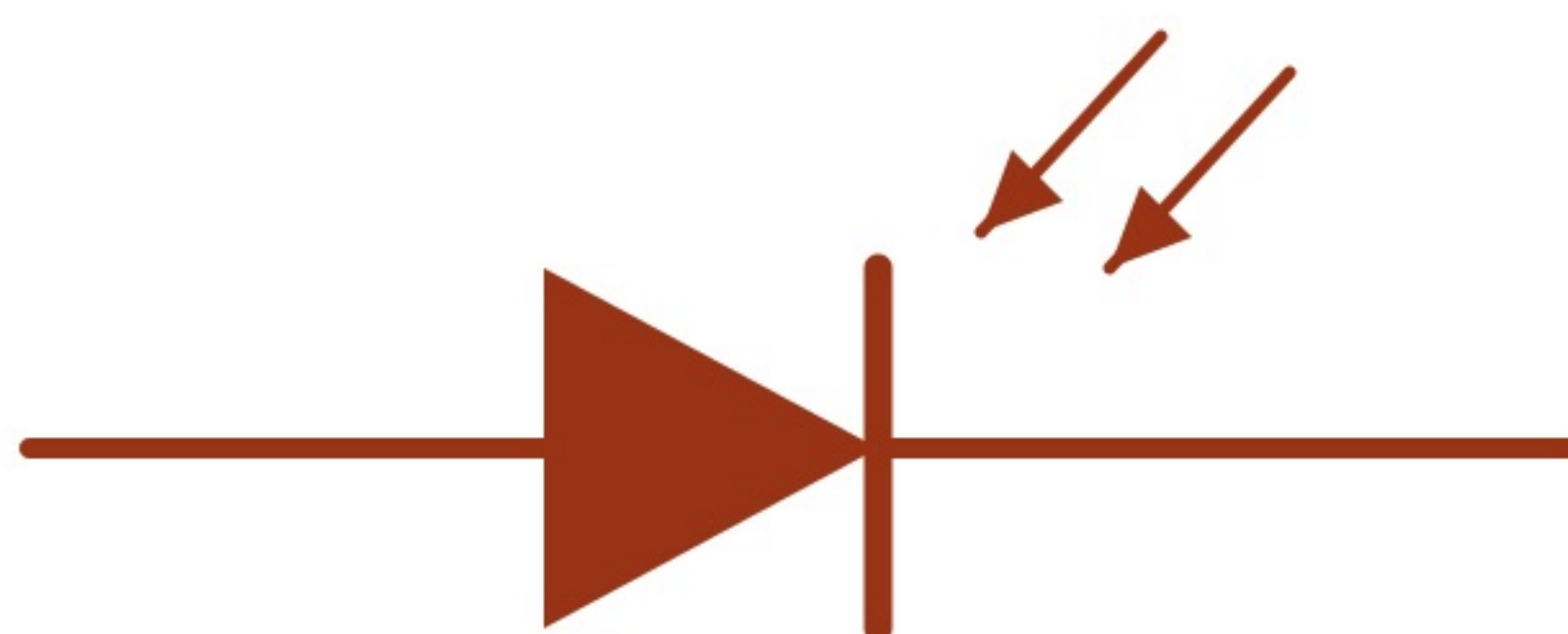
03



ZENER DIODE

conducts in reverse at V_z
voltage reference · regulation

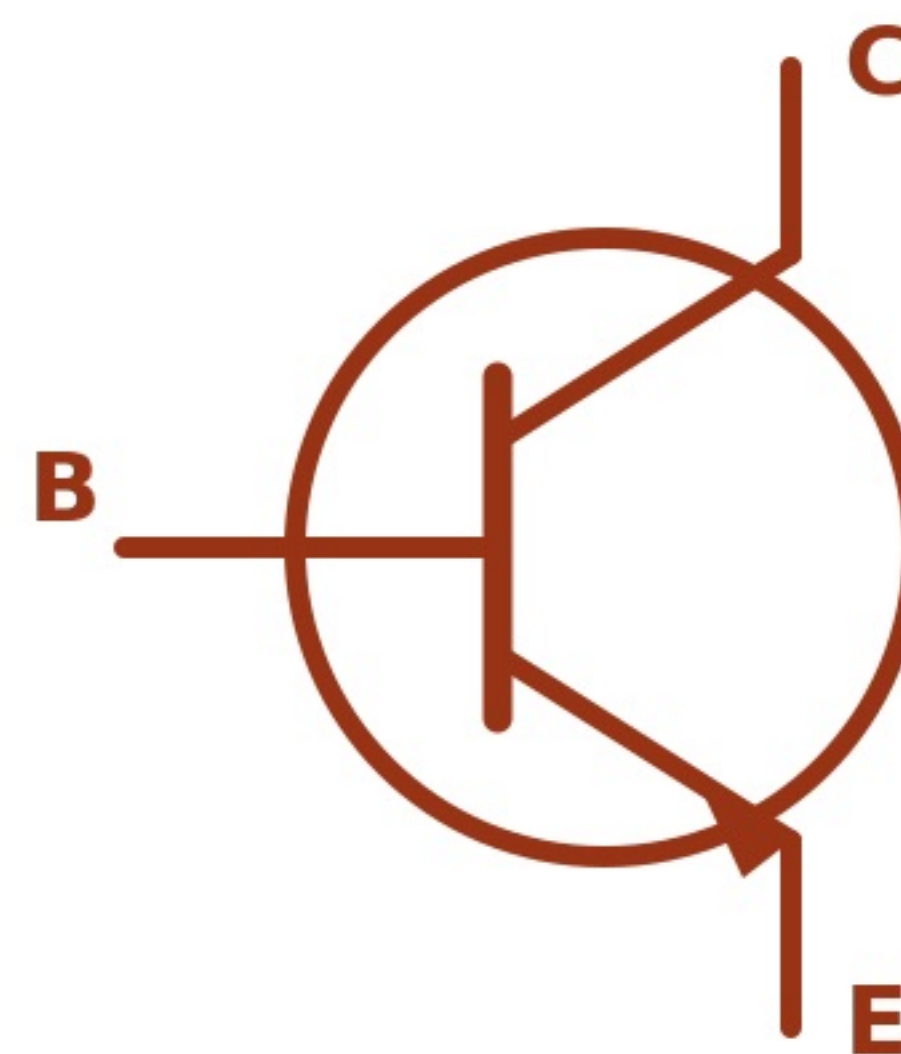
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PHOTODIODE

light-sensitive diode
arrows point IN · detects light

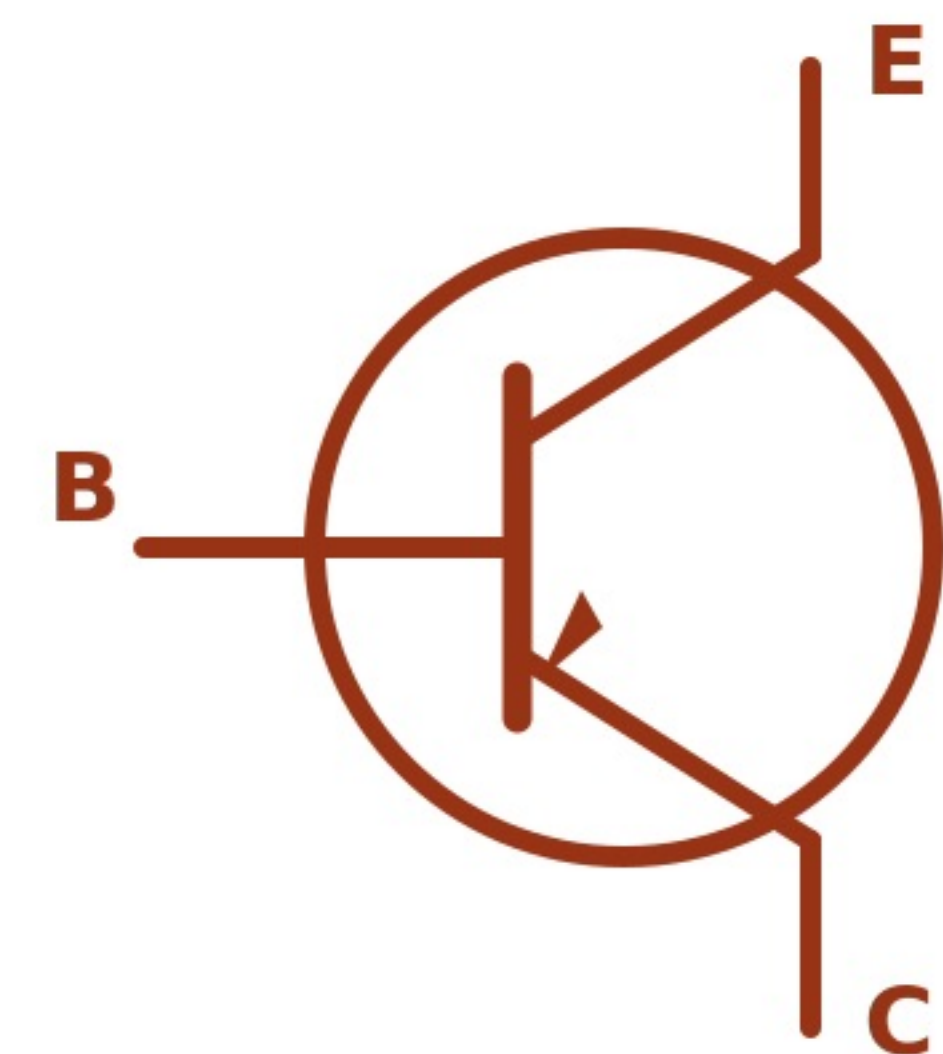
05



NPN TRANSISTOR

arrow points OUT
"Not Pointing iN" mnemonic

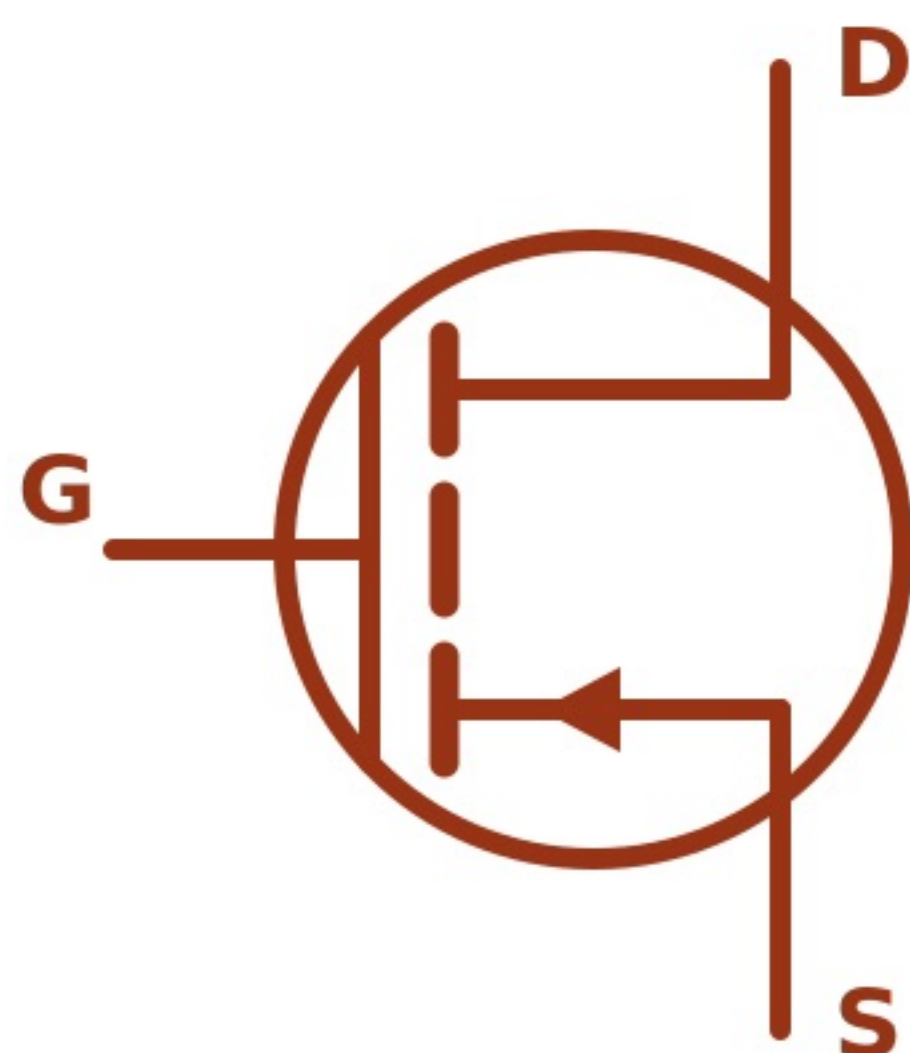
06



PNP TRANSISTOR

arrow points IN
"Pointing iN Permanently"

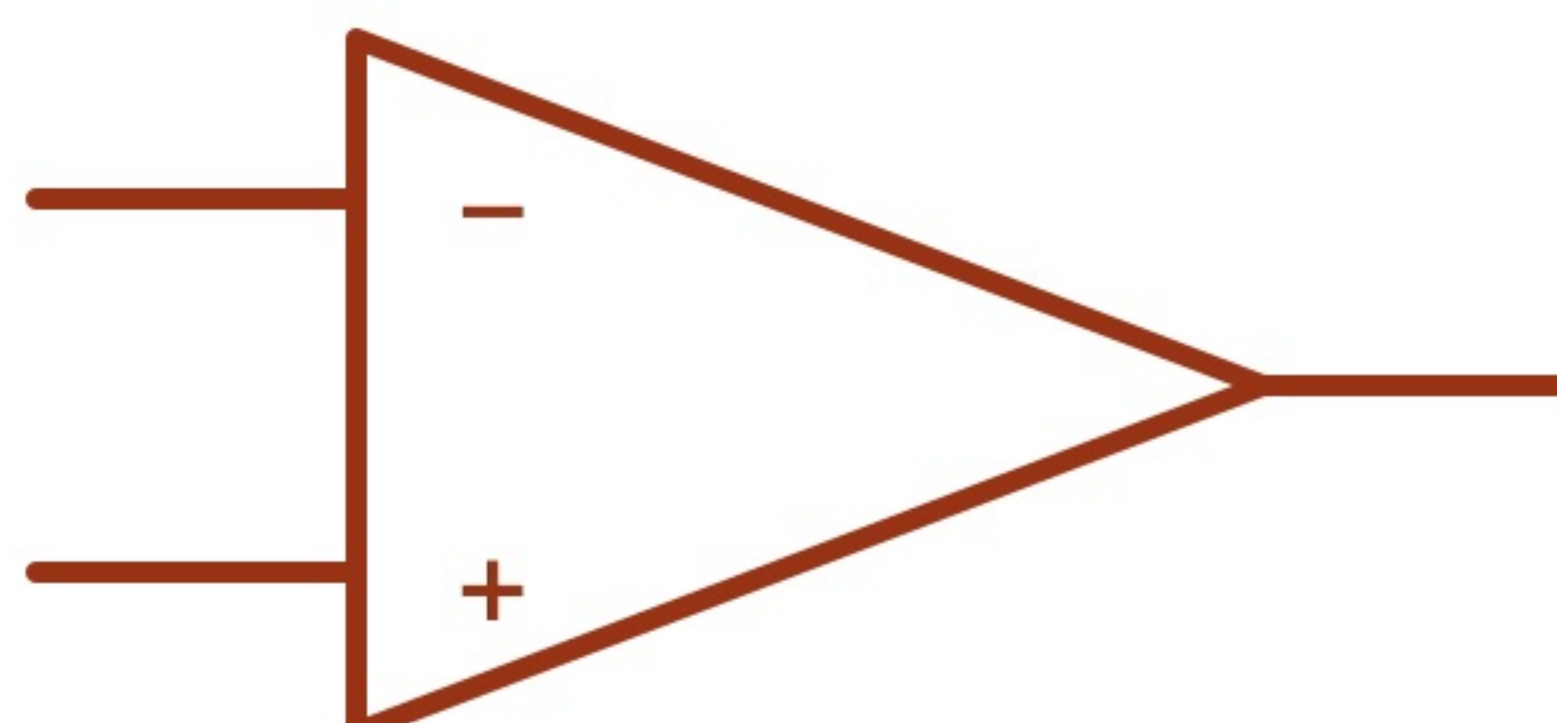
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N-CH MOSFET

voltage-controlled switch
enhancement mode · most common

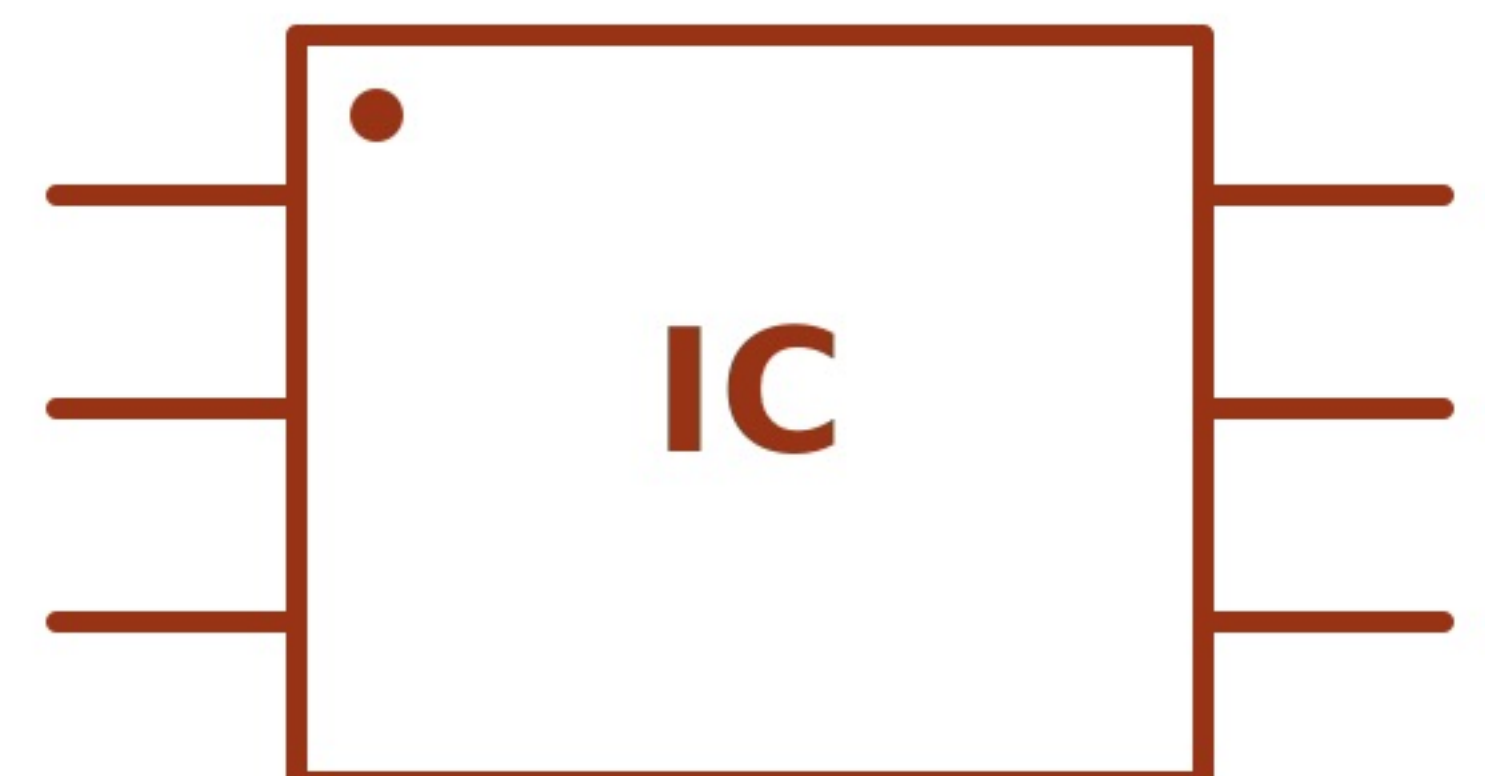
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OP-AMP

operational amplifier
triangle = high-gain amplifier

09



INTEGRATED CIRCUIT

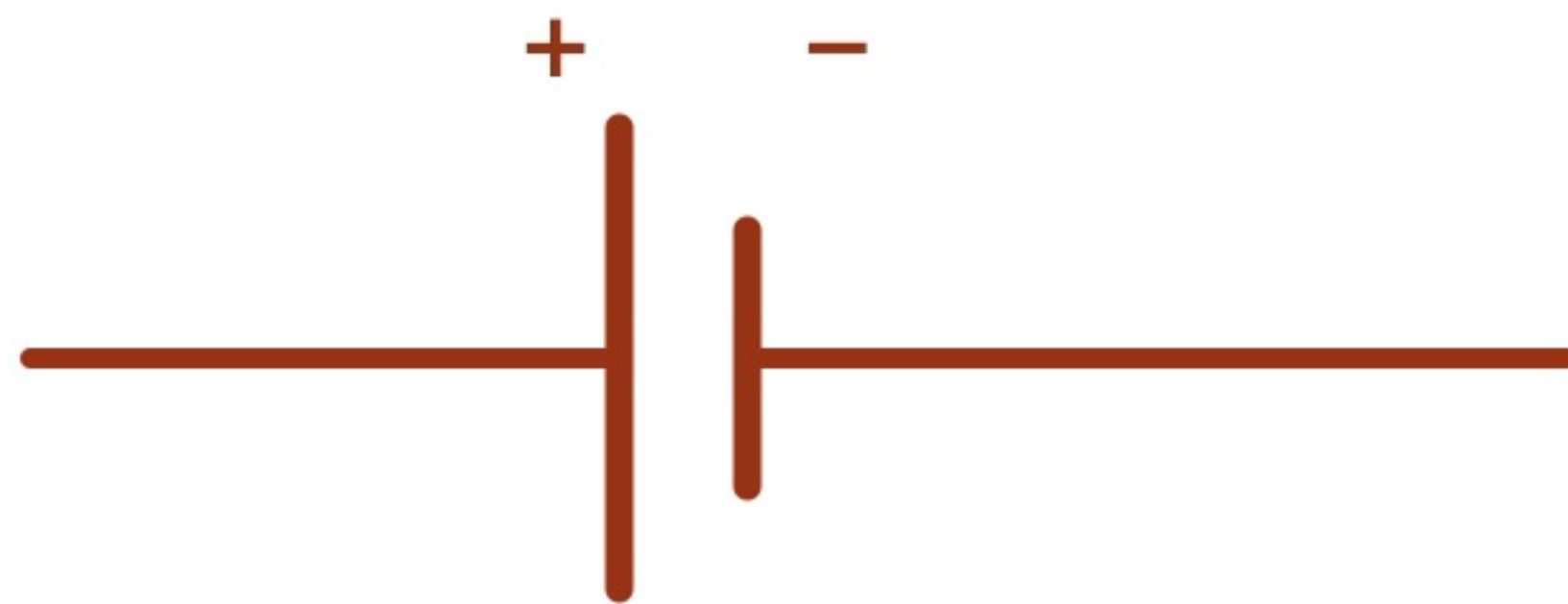
multi-pin chip
dot = pin 1 reference mark

RULE OF THUMB · Arrows on semiconductor symbols always point TOWARD the N-type material

POWER & GROUND

SECTION 3 OF 4 · SCHEMATIC SYMBOLS

01



CELL

single voltage cell
long line = positive terminal

02



BATTERY

multiple cells in series
voltages add: 3 cells $\approx$ 4.5V

03



DC SOURCE

constant voltage · V
generic supply · $\pm$ symbols inside

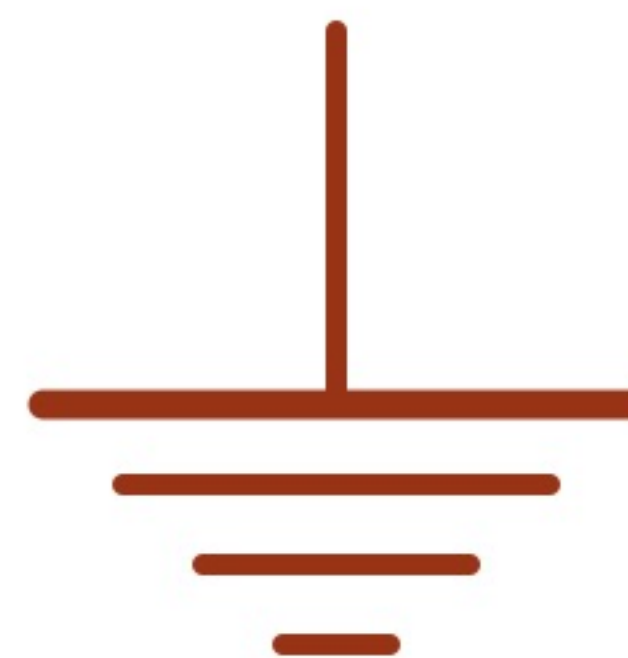
04



AC SOURCE

alternating voltage
sine wave · wall outlet, signal gen

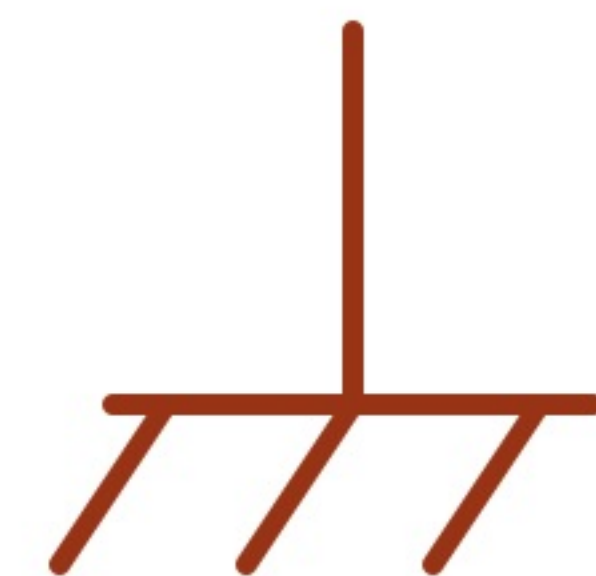
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EARTH GROUND

0V reference
all voltages measured from here

06



CHASSIS GROUND

connection to enclosure
may differ from earth ground

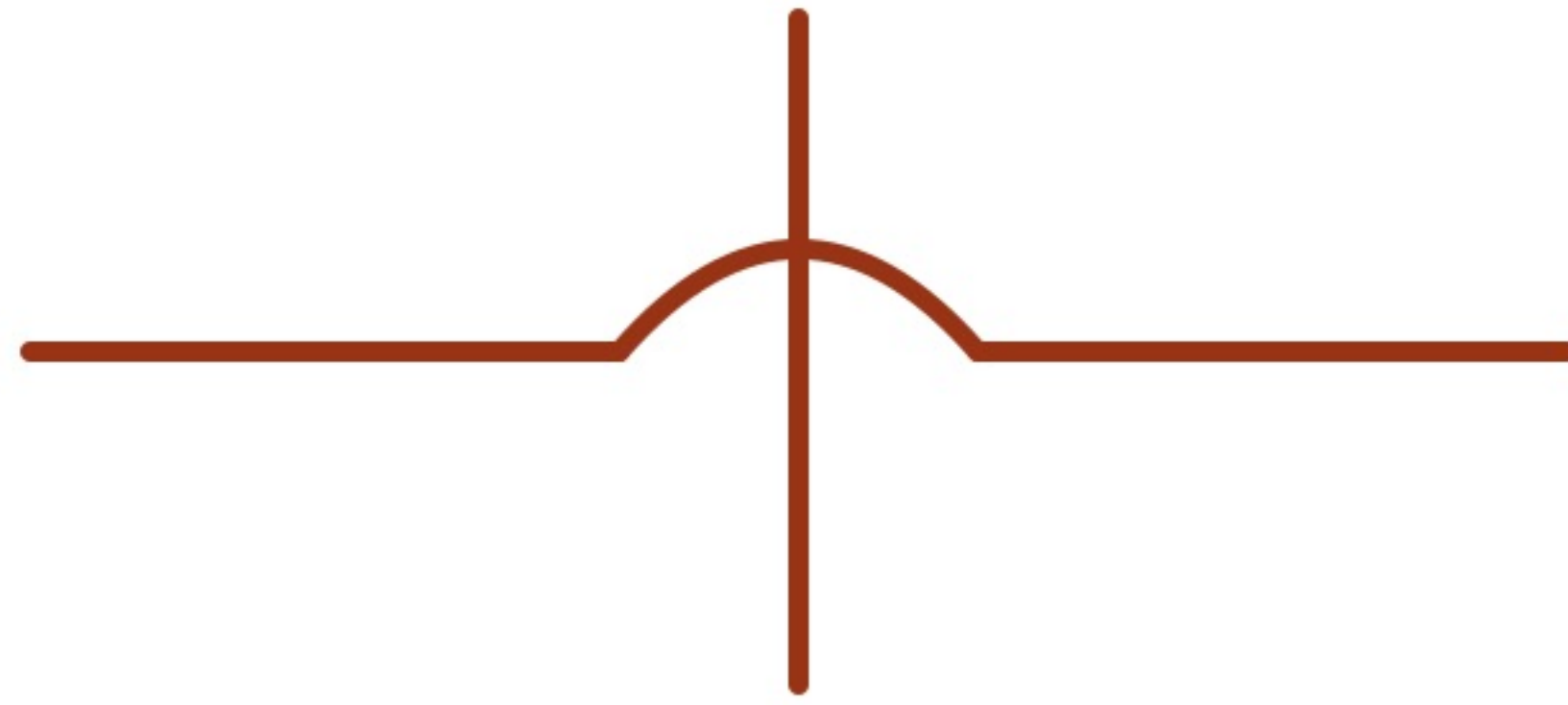
CONVENTION · Current flows from + to - externally · "Vcc" or "+V" marks supply rails

Earth ground is most common in hobby schematics · separate symbols matter in mixed-voltage designs

WIRING & CONTROL

SECTION 4 OF 4 · SCHEMATIC SYMBOLS

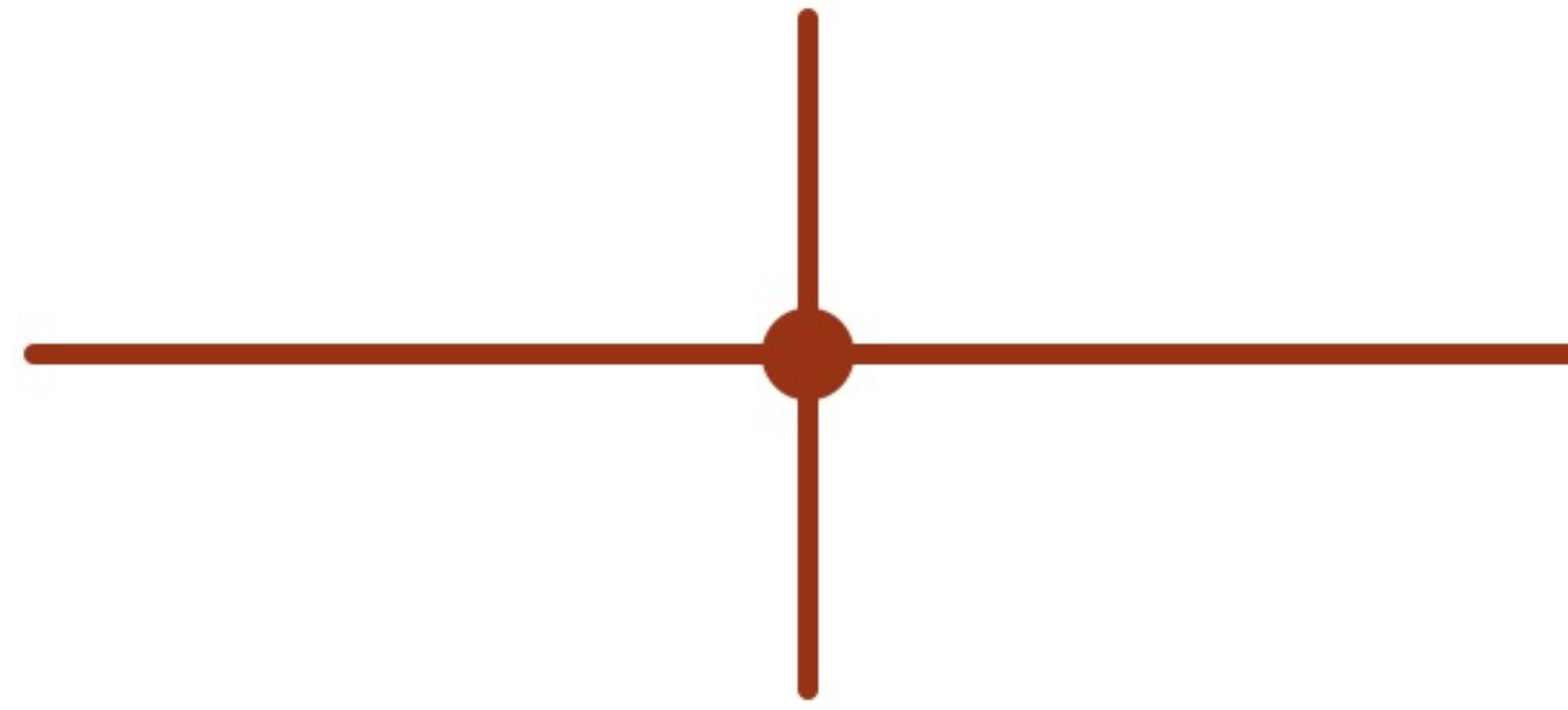
01



CROSSING WIRES

no connection (hop-over)
arc = wires pass without touching

02



JUNCTION

wires connected
filled dot = electrical connection

03



SWITCH (SPST)

single pole · single throw
shown OPEN · simplest on/off

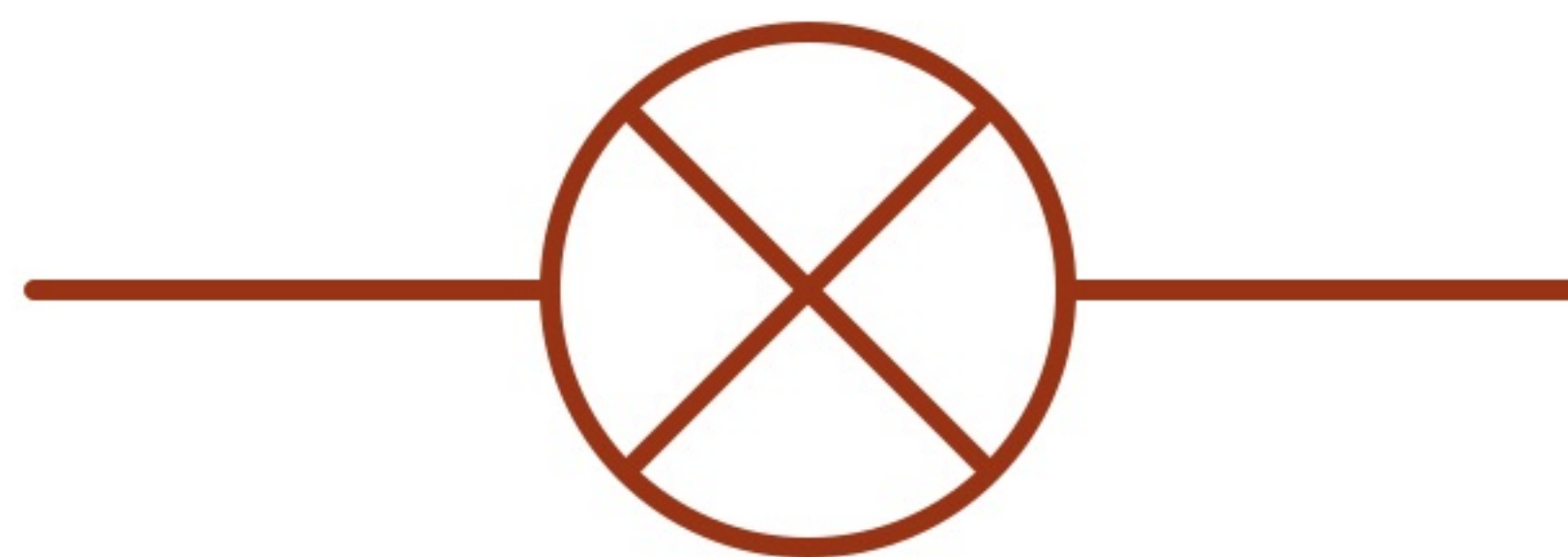
04



PUSH BUTTON

momentary switch
closes only while pressed

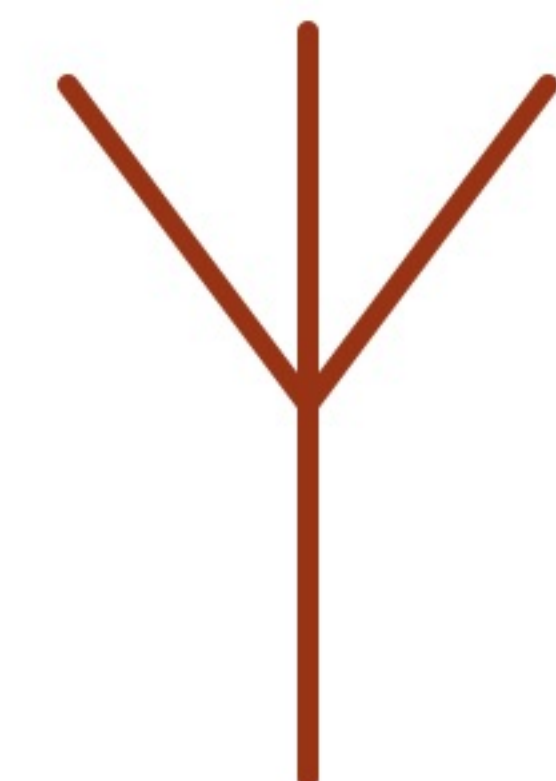
05



LAMP

incandescent bulb
indicator or load

06



ANTENNA

RF radiator / receiver
also drawn as a triangle

DOT OR NO DOT · The single most-misread convention in schematics — always look closely

End of guide · Combine these symbols with wires to draw any beginner schematic