Semiconductors
The Zener Diode

well-defined "Zener" voltage
Voltage Regulator ICs

fixed-output
LM78XX (positive)
LM79XX (negative)
Voltage Regulator ICs

adjustable-output (1.2-25V)
LM317 (positive)
LM337 (negative)
semiconductor switches
Bipolar Junction Transistor (BJT)
rules of thumb: current gain = ~10x, Vbe = ~0.7V

Darlington (cascaded BJTs)
rules of thumb: current gain = ~100x, Vbe = ~1.4V

Metal-Oxide Semiconductor Field-Effect Transistor (MOSFET)
requires higher gate-source voltage, but “no” gate current

Driver ICs
integrated darlingtonss, etc. with logic-level inputs
NPN Bipolar Junction Transistor (BJT): 

(current controlled gate valve)

Current gain ~ 10x | V_{be} > 0.6V | V_{ce,sat} > 0.2V

TIP 31C (NPN Epitaxial Silicon Transistor):

- Collector-emitter breakdown = 100V
- Current gain = 10-50x
Darlington

(cascaded current controlled gate valves)

current gain ~ 100x | Vbe > 1.2V | Vce,sat > 0.8V

ULN2003A Darlington Array

common-emitter configuration
500mA single output maximum
internal snubber diodes
IRLZ34N (N-channel Power MOSFET)

gate threshold voltage = 1-2V
on resistance = 0.035Ω
max drain current = 30A
drain-source breakdown = 55V
The H-bridge
L293d (Quad Half-H Driver)

VCC1 (logic supply) = 4.5V - 7.0V
VCC2 (motor supply) = VCC1 - 36V
input high = 2.3V - VCC1
input low < 1.5V
600mA (1.2A peak) per channel
internal protection diodes