

ESP32 Robots

Wiring Cheat Sheet

TinyBot Forge

tinybotforge.com · v1.0 · 2026-09
ESP32 DevKit V1 · Arduino ESP32 core 3.x

1 Choosing ESP32 pins

Pins	Use
13, 16–19, 21–23, 25–27, 32, 33	Safe for I/O and PWM
34, 35, 36, 39	Input only, no internal pull-up. Good for sensors
0, 2, 5, 12, 15	Boot-strapping pins. Loads here can block boot or upload
6–11	Wired to internal flash. Never use
1, 3	USB serial (TX/RX), used for uploads

All GPIO are 3.3 V. Anything higher will damage the pin.

2 L298N motor driver

L298N	Connect to
ENA / ENB	ESP32 PWM pin (remove jumper)
IN1–IN4	Any ESP32 output pin
12V	Battery + (about 7–12 V)
5V	Out to ESP32 VIN (keep 5V jumper)
GND	Battery – and ESP32 GND (common)

IN1	IN2	Motor
HIGH	LOW	Forward
LOW	HIGH	Reverse
LOW	LOW	Stop (coast)

The L298N drops about 2 V: a 7.4 V pack gives the motors roughly 5 V.

3 HC-SR04 ultrasonic

VCC	5V
TRIG	Any output pin (3.3 V trigger works)
ECHO	Through a divider into the ESP32
GND	GND

ECHO – 1kΩ — GPIO
 └ 2kΩ – GND (5 V → 3.3 V)

distance (cm) = high time (μs) ÷ 58
pulseIn(ECHO, HIGH, 25000) with a timeout so a lost echo can't freeze the loop.

4 SG90 servo

Orange	Signal → any PWM pin
Red	5 V (not 3.3 V)
Brown	GND

50 Hz (20 ms period); pulse ~0.5 ms = 0°, ~2.4 ms = 180°
ledcAttach(pin, 50, 14);
duty = us × 16383 / 20000
Two or more servos: external 5 V plus a 100–470 μF capacitor.

5 Common sensors

Module	Wiring	Note
TCRT5000	VCC 3.3 V, DO → input pin	Tune sensitivity with the blue trimmer
Button	One side GPIO, other GND	INPUT_PULLUP; reads LOW when pressed
LED	GPIO → 220Ω → LED → GND	Long leg is +
Photoresistor	Divider into an ADC1 pin (32–39)	ADC2 is unavailable while Wi-Fi is on

6 PWM on ESP32 core 3.x

Old (2.x, now fails)	New (3.x)
ledcSetup(ch, f, bits)	ledcAttach(pin, f, bits)
ledcAttachPin(pin, ch)	
ledcWrite(ch, duty)	ledcWrite(pin, duty)

If a tutorial uses ledcSetup, it's written for the old core.

7 When something goes wrong

Symptom	Most likely cause
ESP32 resets when motors start	Voltage sag: charged batteries, not USB alone; 100 μF across VIN–GND
Upload: "Failed to connect"	Hold BOOT until Connecting... appears; check nothing loads GPIO 0/2/12/15
No serial port	Missing CP2102/CH340 driver, or a charge-only USB cable
Sensor readings jump around	No common ground; loose jumpers; take a median of several readings
Motor hums but won't turn	PWM too low (TT motors stall below ~120) or flat battery