VACTROL CELL (LED + LDR) — the heart — the CR element itself

DIY: 2835 LED + GL55xx LDR · sealed optical pair · the "CR"

WHAT IT IS

Not a chip — the core invention. An LED and a photoresistor (LDR) sealed face-to-face in the dark. Drive the LED brighter → the LDR's resistance drops. The LDR sits in the glitch signal path; the LED is driven digitally. Light is the only connection → total isolation.

KEY SPECS (what matters to us)

LDR = GL55xx CdS (5516/5528/5539…): bright→low R, dark→high R
Our usable range ~30–700 Ω · response ~3–5 Hz (slow = a feature)
White LED = floor king (~32 Ω); red = range king (~5 kΩ)

SIGNALS / PINS WE USE

IN = LED current (from PCA9745B) · OUT = the 2-terminal CR resistance

ELECTRICAL · GOTCHAS

Wildly NON-linear (drive→R) → we don't fight it, we characterize each unit and store the inverse curve (calibration). The ~3–5 Hz low-pass is what smooths any drive ripple into a steady resistance for free.

WHY IT'S IN OUR SYSTEM

This IS the device. "CR" (Control Resistance) = modulating a resistance a signal already sees, passively + isolated — vs "CV" which injects a voltage. The optical gap is a safety firewall by physics. Parallel cells (conductances add, $G=\Sigma G_i$) tile the 60–700 Ω envelope smoothly.