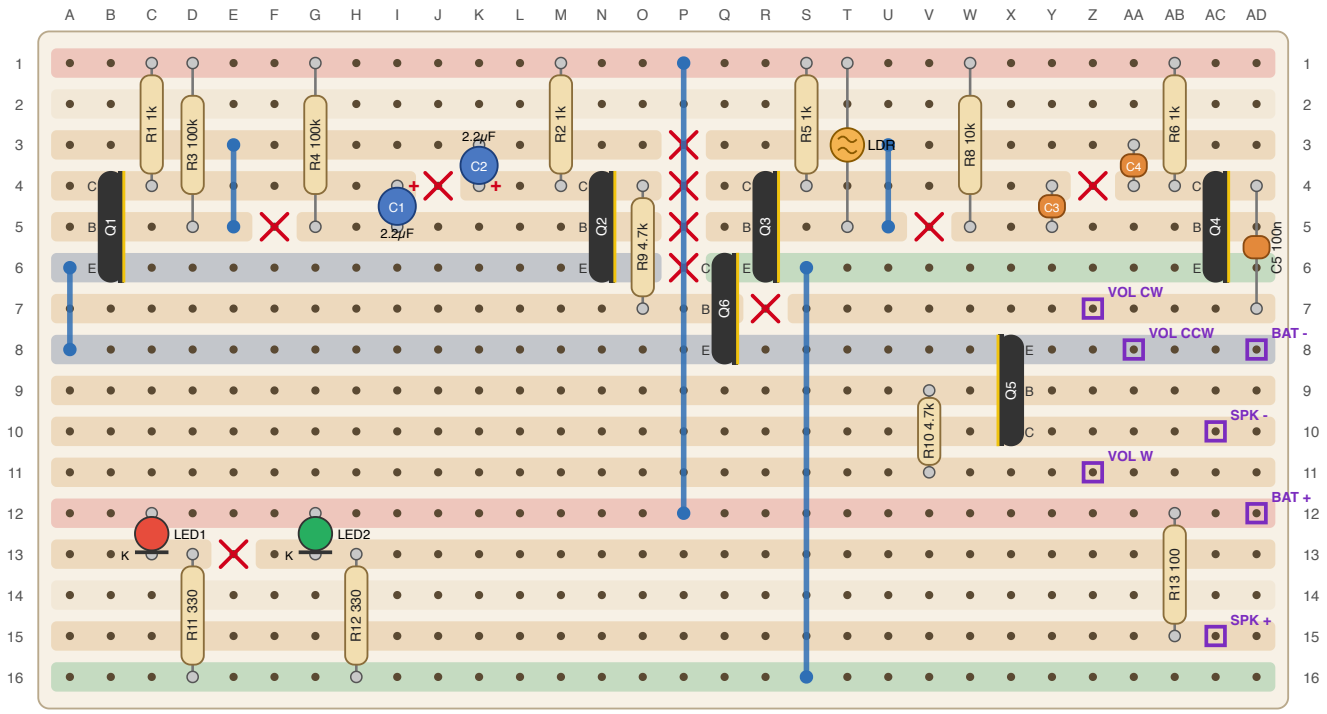
Transistor beat machine — stripboard layout

Component side (top view). 30 × 16 holes, 2.54 mm pitch, copper strips run left–right. Rev. 2 (corrected circuit), verified by a netlist connectivity check.



+9V strip | GND strip | switched GND (Q6) | signal strip | × track cut | • wire link | □ off-board wire

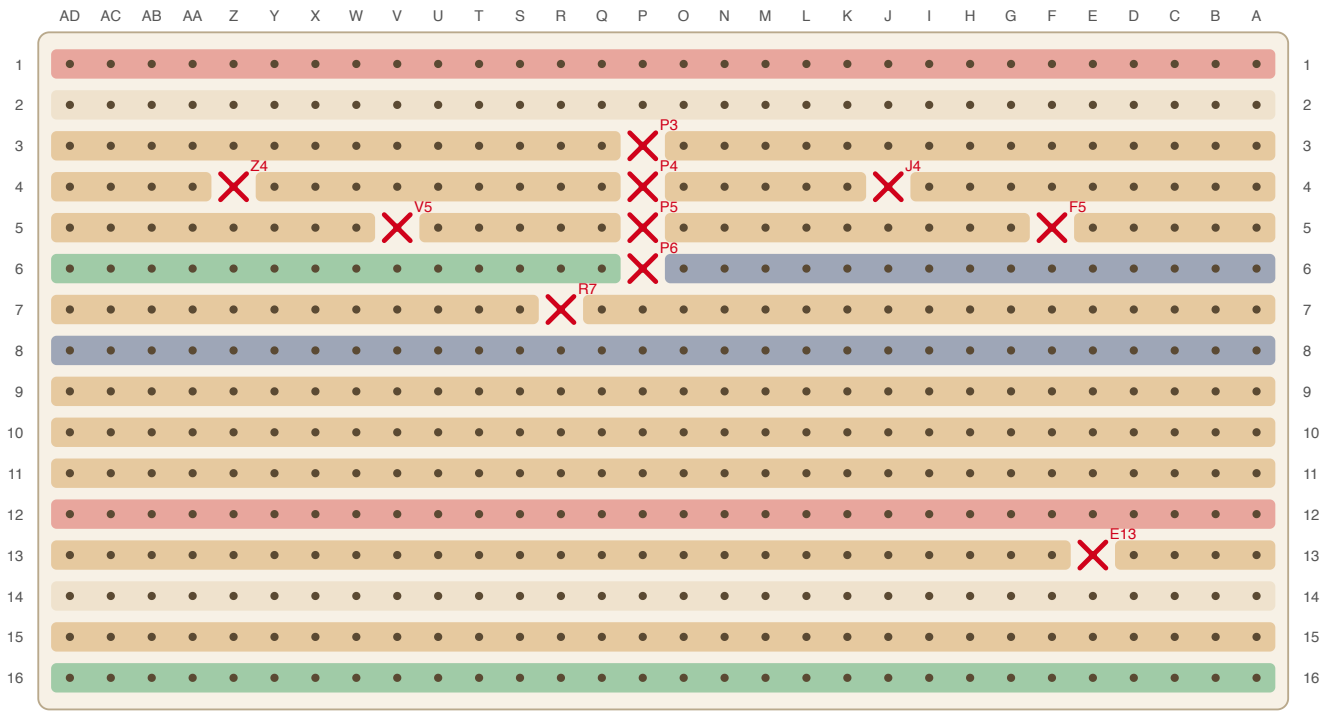
Transistors stand with their legs in one column. The yellow line marks the **flat face**; C/B/E are labelled next to each leg. **C1, C2** are polarised: + goes to the collector side (marked). **LED**: K (short leg, flat edge) is marked.

How the circuit works

Q1/Q2 form the clock oscillator (R3=R4=100k, C1=C2=2.2µF, ≈3.3 Hz). Its output (collector of Q2) drives Q6 through R9. Q6 is a low-side switch: on each beat it grounds the emitters of the tone oscillator Q3/Q4 and the two LEDs, so the tone and the LEDs pulse together. The tone oscillator frequency is set by the LDR and R8 with C3=C4=68nF (≈190–1900 Hz). The tone goes through C5 and the volume pot to Q5 (via R10), which drives the speaker with R13 in series.

Copper side — track cuts

Board flipped over (mirror image of page 1). Cut the strip at every ✕ with a 3–4 mm drill bit turned by hand, then check with a multimeter that the two sides are not connected.



Track cuts (10)

P3, J4, P4, Z4, F5, P5, V5, P6, R7, E13

Hole names: column letter (A–AD, left to right in the component-side view) + row number (1–16, top to bottom).

Wire links (5)

- E3 – E5
- U3 – U5
- A6 – A8
- P1 – P12
- S6 – S16

Use insulated wire; the long links (P1–P12 and S6–S16) pass over other parts.

Off-board wires

Part	Pads
BAT	+: AD12, -: AD8
SPK	-: AC10, +: AC15
VOL	CW: Z7, W: Z11, CCW: AA8

VOL: 10k linear pot — CW = outer lug that goes to C5, W = wiper, CCW = other outer lug (GND). Turning towards CW = louder.

Parts, pins and build notes

Bill of materials

Ref	Value	Qty	Notes
Q1–Q6	BC547	6	NPN; 2N3904 works too (check pinout)
R1,R2,R5,R6	1k	4	1/4W
R3,R4	100k	2	clock timing, to +9V
R8	10k	1	tone timing, to +9V
R9,R10	4.7k	2	base resistors Q6, Q5
R11,R12	330	2	LED current
R13	100	1	in series with speaker
C1,C2	2.2µF	2	electrolytic 16V+, polarised
C3,C4	68nF	2	ceramic or film (683)
C5	100nF	1	ceramic (104), coupling
LDR	GL5528	1	1k–100k photoresistor
LED1/LED2	5mm	2	red / green
VOL	10k	1	linear pot, off-board
SPK	8Ω	1	small speaker, off-board
—	9V battery + snap	1	add a switch in the + lead
—	stripboard	1	at least 30 × 16 holes

Build order

1. Cut the board to 30 × 16 holes. Make all 10 track cuts (page 2) and check each one with a multimeter.
2. Fit the 5 wire links.
3. Solder the lowest parts first: resistors, ceramic caps C3–C5, then transistors, C1/C2, LEDs, LDR.
4. Solder the off-board wires: battery (with switch), speaker, volume pot.
5. Before powering up, check for no continuity between the +9V strip (row 1) and GND (row 8).

First test

1. Power on: both LEDs blink about 3 times per second.
2. Turn VOL up: the speaker beeps with each blink.
3. Cover the LDR: pitch drops; shine a light on it: pitch rises.
4. Current draw ≈ 60–100 mA, so a 9V battery lasts a few hours.

> Values come from the standard astable formula f ≈ 1 / (0.69·C·(Ra+Rb)); the layout was checked against the netlist, but this revision has not yet been built on a real board — expect to tweak R/C values to taste.

Component positions

Part	Value	Pins
Q1	BC547	C: B4, B: B5, E: B6
R1	1k	1: C1, 2: C4
R3	100k	1: D1, 2: D5
R4	100k	1: G1, 2: G5
C1	2.2µF	+: I4, -: I5
C2	2.2µF	+: K4, -: K3
R2	1k	1: M1, 2: M4
Q2	BC547	C: N4, B: N5, E: N6
R9	4.7k	1: O4, 2: O7
Q6	BC547	C: Q6, B: Q7, E: Q8
Q3	BC547	C: R4, B: R5, E: R6
R5	1k	1: S1, 2: S4
LDR	GL5528	1: T1, 2: T5
R8	10k	1: W1, 2: W5
C3	68n	1: Y4, 2: Y5
C4	68n	1: AA4, 2: AA3
R6	1k	1: AB1, 2: AB4
Q4	BC547	C: AC4, B: AC5, E: AC6
C5	100n	1: AD4, 2: AD7
Q5	BC547	E: X8, B: X9, C: X10
R10	4.7k	1: V11, 2: V9
R13	100	1: AB12, 2: AB15
LED1	red	A: C12, K: C13
R11	330	1: D13, 2: D16
LED2	green	A: G12, K: G13
R12	330	1: H13, 2: H16

Netlist

VCC	R1.1, R2.1, R3.1, R4.1, R5.1, R6.1, LDR.1, R8.1, LED1.A, LED2.A, R13.1, BAT.+
GND	Q1.E, Q2.E, Q6.E, Q5.E, VOL.CCW, BAT.-
Q1C	R1.2, Q1.C, C1.+
Q1B	R3.2, Q1.B, C2.-
Q2C	R2.2, Q2.C, C2.+, R9.1
Q2B	R4.2, Q2.B, C1.-
Q6B	R9.2, Q6.B
SWGND	Q6.C, Q3.E, Q4.E, R11.2, R12.2
LED1K	LED1.K, R11.1
LED2K	LED2.K, R12.1
Q3C	R5.2, Q3.C, C3.1
Q3B	LDR.2, Q3.B, C4.2
Q4C	R6.2, Q4.C, C4.1, C5.1
Q4B	R8.2, Q4.B, C3.2
AC	C5.2, VOL.CW
WIPER	VOL.W, R10.1
Q5B	R10.2, Q5.B
SPK+	R13.2, SPK.+
Q5C	SPK.-, Q5.C