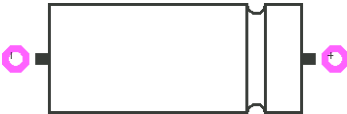
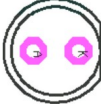
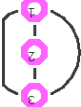
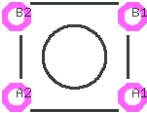
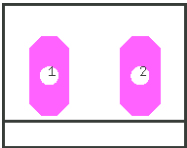
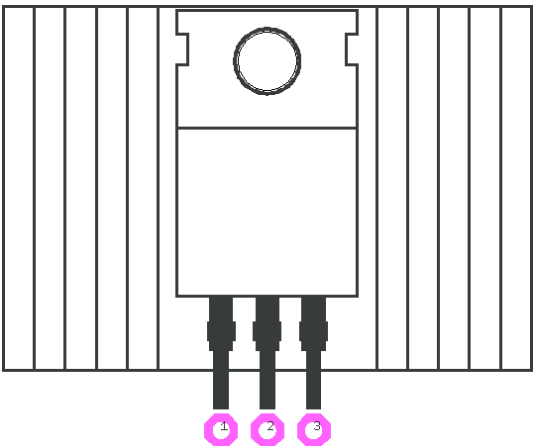


COMPONENTS

	Resistor: <table> <tr> <td>180</td><td>brown, grey, brown, gold</td></tr> <tr> <td>330</td><td>orange, orange, brown, gold</td></tr> <tr> <td>680</td><td>blue, grey, brown, gold</td></tr> <tr> <td>1k</td><td>brown, black, red, gold</td></tr> <tr> <td>1.5k</td><td>brown, green, red, gold</td></tr> <tr> <td>4.7k</td><td>yellow, purple, red, gold</td></tr> <tr> <td>10k</td><td>brown, black, orange, gold</td></tr> <tr> <td>22k</td><td>red, red, orange, gold</td></tr> </table>	180	brown, grey, brown, gold	330	orange, orange, brown, gold	680	blue, grey, brown, gold	1k	brown, black, red, gold	1.5k	brown, green, red, gold	4.7k	yellow, purple, red, gold	10k	brown, black, orange, gold	22k	red, red, orange, gold
180	brown, grey, brown, gold																
330	orange, orange, brown, gold																
680	blue, grey, brown, gold																
1k	brown, black, red, gold																
1.5k	brown, green, red, gold																
4.7k	yellow, purple, red, gold																
10k	brown, black, orange, gold																
22k	red, red, orange, gold																
	Ceramic capacitor: <table> <tr> <td>4.7n</td><td>marked "472"</td></tr> <tr> <td>10n</td><td>marked "103"</td></tr> <tr> <td>100n = 0.1μ</td><td>marked "104"</td></tr> </table>	4.7n	marked "472"	10n	marked "103"	100n = 0.1μ	marked "104"										
4.7n	marked "472"																
10n	marked "103"																
100n = 0.1μ	marked "104"																
	Electrolytic capacitor (notched end marks polarity)																
	Diode 1N4148 (glass, ring marks polarity)																
	Diode 1N400x (plastic, ring marks polarity)																
	LED (flat side marks polarity, short lead is on flat side)																
	NPN Transistor (marked BC547, BC548, or BC550) (flat side marks polarity)																
	PNP Transistor (marked BC557, BC558, or BC560) (flat side marks polarity)																
	Push button																
	Terminal block (openings facing towards PCB edge)																
	Voltage regulator (7812) on top of heatsink (flat side down) Bend pins 90° down in the appropriate location. Use screw & nut to fasten.																

All transistors in the kit are of the "C" classification (highest current gain), e.g. BC547C.

BUILD STEPS

The clock requires a 12V **AC** power supply (min. 200 mA), a DC supply won't work. A slightly higher voltage (up to 15 V AC) is acceptable. Suitable power supplies can be salvaged from halogen desk lamps and some dial-up modems.

The clock is designed to run on **50 Hz** power, it will run too fast in 60 Hz countries.

Build the circuit in the following groups (see next page for drawing) and **test after every step!**

1. Power Supply
 - Measure voltage on 1000 μ F capacitor: approx. 17 V DC (more if power supply with more than 12 V used). Turn off immediately if more than 25 V.
 - Measure voltage on 47 μ F capacitor: exactly 12 V DC.
2. Colon
 - Check that colon lights up.
3. Schmitt Trigger & Flip-Flop
 - Both LEDs will appear on with same brightness, a slight flicker (50 Hz) should be visible.
4. 1st Divider
 - The 5 LEDs should run in a circle 5 times per second.
5. 2nd Divider
 - The 5 LEDs should run in a circle once per second.
6. Seconds Ring (including components between 2nd Divider and Sec. Set)
 - Only one LED in the circle should be lit, and advance to the next LED every second.
7. Buttons & Sec. Set
 - Seconds Ring should advance every time the "Second" button is pushed.
8. Minutes Counter & Minutes Setting
 - Exactly one LED in the top row and one LED in the bottom row should be lit.
 - Minutes Counter should advance every time the "Minute" button is pushed (top row counts minutes, bottom row counts 10s of minutes).
9. Minutes Decoder & Minutes Display
 - Minutes display should display correct numbers (use "Minutes" button to advance).
10. Hours Counter & Hours Setting
 - Exactly one LED in the top row and one LED in the bottom row should be lit.
 - Hours Counter should advance every time the "Hours" button is pushed (bottom row counts hours, top row counts 10s of hours).
 - Counter should roll over from 23 to 00
11. Hours Decoder & Hours Display
 - Hours display should display correct numbers (use "Hours" button to advance).

If you want to build the clock into an enclosure (e.g. a deep picture frame), you can solder wires leading external buttons to the two spare pads next to each button. Your buttons must be momentary contact (normally open) type.

The board size is exactly 30×30 cm.

BOARD SECTIONS

