This test board unit can do several things. The main purpose was to test if a capacitor or a transistor are function or not function but it can do other test operations beyond that. The oscillator is based on a 555 timer circuit and therefore a function test of a 555 is possible. Even a test of a 4060, 4093, an optional dual operational amplifier (OP) or a comparator too. Diodes, SMD-diodes and SMD-transistors can be tested also.

The oscillator signal from the 555 timer can be utilized as a signal generator and the duty cycle can be adjusted for this purpose. The adjustment of the duty cycle can be done by the two toggle switches or the two trim potentiometers if you need better precision.

The T-board capacitor, diode and transistor test are especially useful fore them who repair electronic equipments such a radio or a television device. This components can be controlled if they are broken or not but it is also possible to decide the capacitance for a capacitor and the current gain for a transistor. To decide a capacitance you only need to measure the flash-time for one of the four LED's. When the time (between the changes of the light statement) in seconds is known, you can calculate the capacitance from a formula. The formula takes care for which of the resistances trough the toggle switches that is selected: 1k, 33k or 220k and the multiplier: 0.5; 8; 256; 8192 (for the LED). Just follow the rules in the formula. To avoid digression try to have a stable 9 voltage supply.

In the case of an transistor you can watch the two LED's which type of transistor (bipolar NPN/PNP) you have and with the trim potentiometer you can estimate the current gain (hfe) but you must know the pin configuration, the order of the B, C and E first. If the transistor is broken, ether the two LED's are off (break-circuit) or both will be on (short-circuit). The same is valid for a diode.

The dual OP test can only been used to get information if an OP is broken or not nothing else, besides to use it like a time reference. For a LM358 the LED's flash frequencies is 1 second.

Together with this project follows an extra module. This module can measure the value of an arbitrary resistor only to watch the LED alternate and then read the value from a trim potentiometer. In other words, take the resistance value that is selected and multiply it with the factor the trim potentiometer pointing at.

At last we have a very simple module (Z-1) that facilitates function tests of zener diodes.

For testing OP or comparators; just place it in the IC-socket and watch the LED's. If the green LED oscillate and the red LED reacting on different values on P3, then the OP is ok.

For testing diodes and transistors; connect the legs for each component into the terminals (use small clips that are soldered to the pads with a bit wire). Watch the green and red LED's (NPN or PNP). Adjust P4 and read the current gain value where the LED's intent to shifting.

For testing 555 circuits; place the IC in the socket and watch the yellow LED. If the LED oscillate then the 555 is ok.

For testing and measure a capacitance; put it first into the Cx-terminals on the T-board. Place S2 (a) and S3 (b) in an equal position. Try to make the LED's (the yellow and the red ones) to oscillate as slow as possible. If it is yellow or more LED's seems to illuminate without oscillating, then the oscillate-frequency is to fast for a human eye and you can't estimate the time between the flashes or in other words, it is a small capacitance. Read the time between one changes in the light statement for a LED. Look at the green LED on the OP test area and compare the LED's to each other if you not have any better time reference device (clock) available. Then follow the formula to calculate the right capacitance:

For NE555 **9.0 V**
or SA555

$$Cx = \frac{\text{Flash Time (sec.)}}{R_{ab} \times K \times \begin{matrix} 8192 \\ 256 \\ 8 \\ 0.5 \end{matrix}}$$

[farad] **[ohm]**

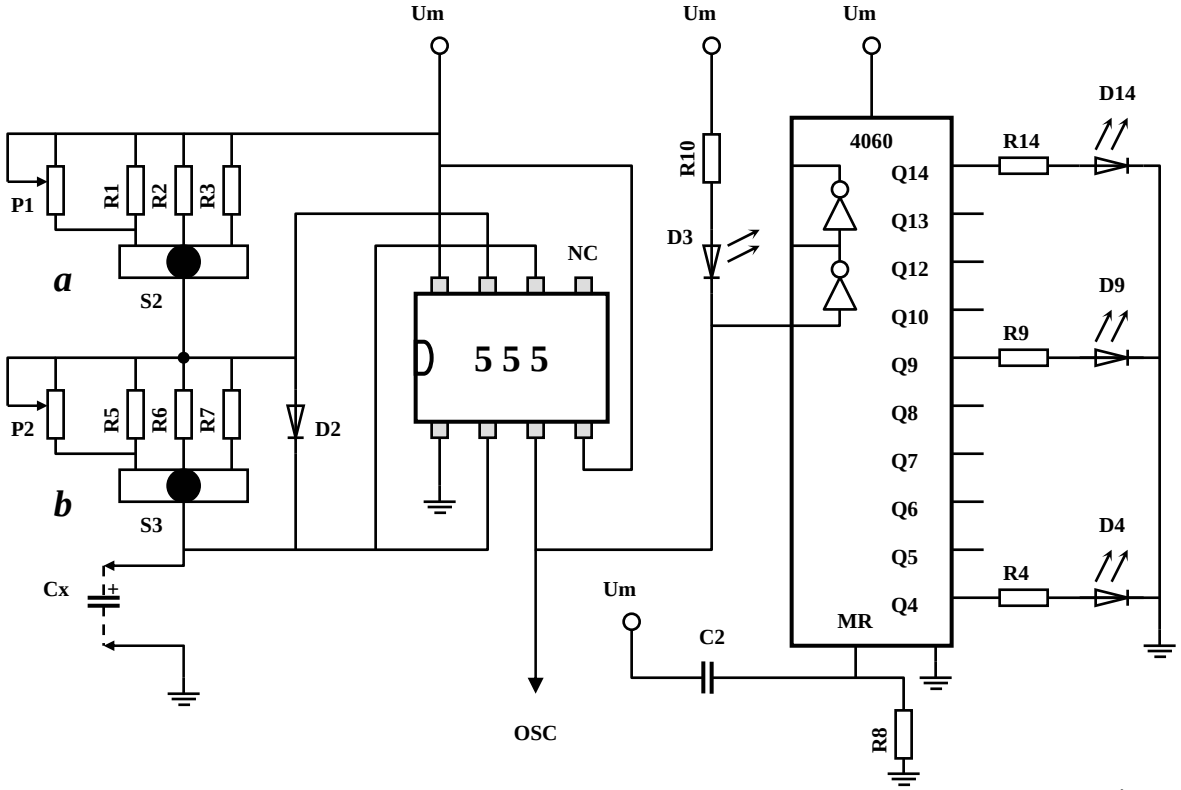
If Ra and Rb are 1kohm: K = 1.6

If Ra and Rb are 220kohm: K = 1.5

If Ra and Rb are 33kohm: K = 1.5

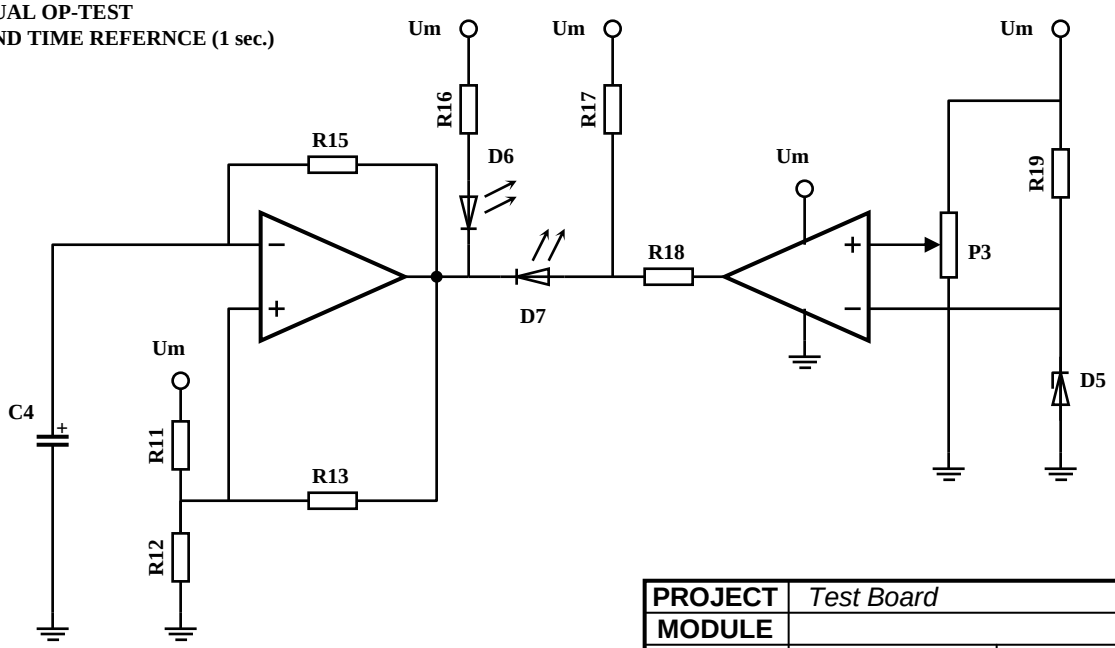
CIRCUIT DIAGRAM

CAPACITANCE-TEST, 555-TEST, 4060-TEST AND SIGNAL GENERATOR



Min 5V

DUAL OP-TEST AND TIME REFERNCE (1 sec.)

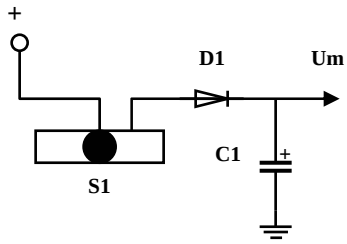


Min 5V

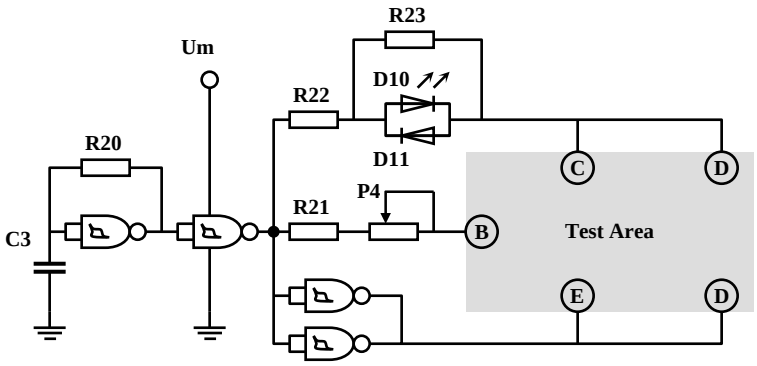
PROJECT	*Test Board*	
MODULE		
MODEL	**T-board**	
AUDIT	A-1	**DRAWING: 1 of 1**
SUPPLY	9V	Battery > 5V
CURRENT		
OTHER	*Tested!*	
B. Lindqvist		*2009-12*

CIRCUIT DIAGRAM

SUPPLY CIRCUIT



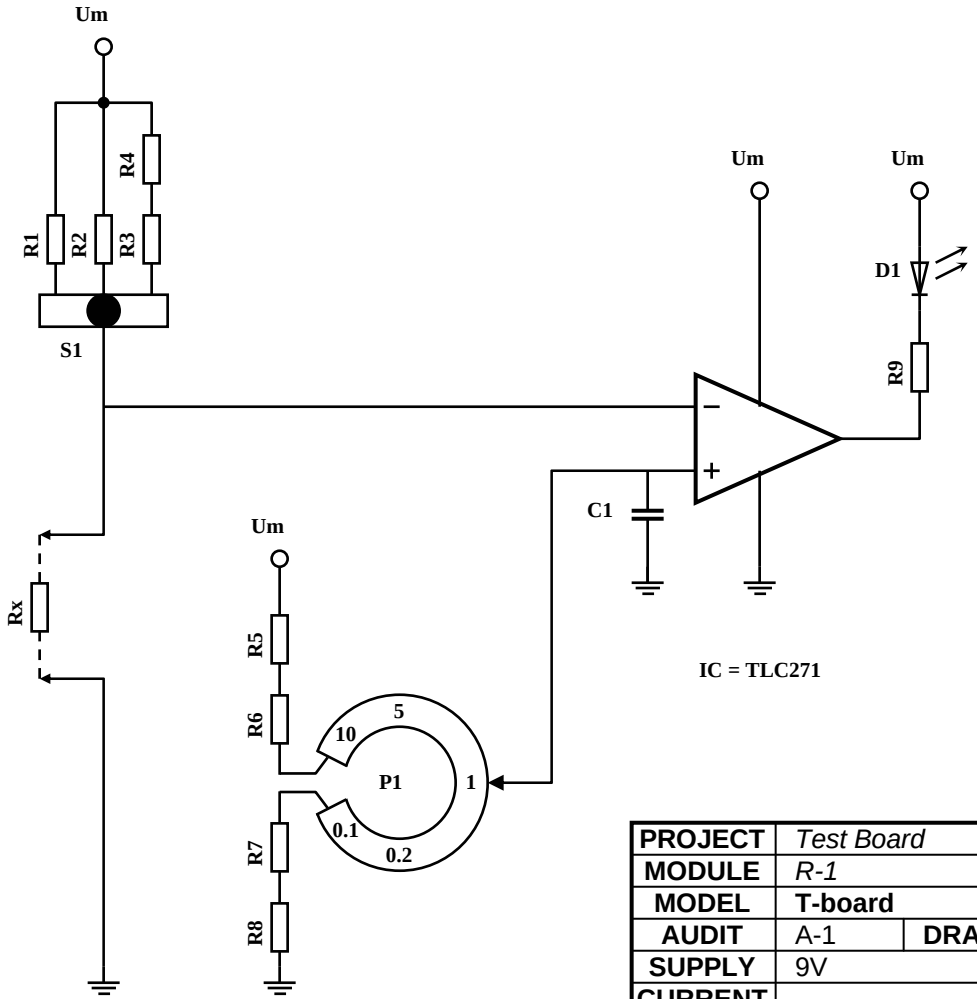
TESTDEVICE FOR SEMICONDUCTORs



IC = 4093

Min 8V

MODULE R-1
(test and measure resistors)

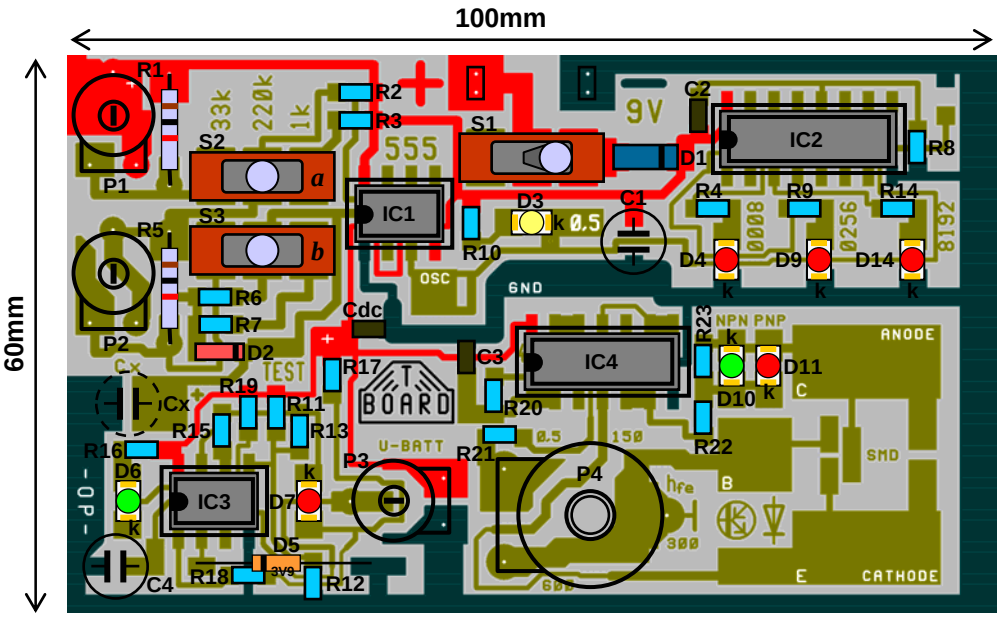


IC = TLC271

Min 5V

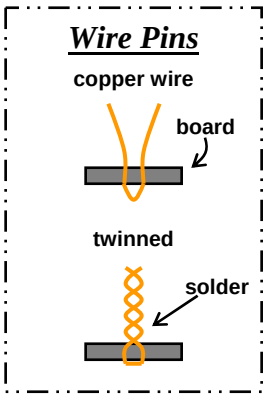
PROJECT	*Test Board*	
MODULE	*R-1*	
MODEL	**T-board**	
AUDIT	A-1	**DRAWING: 1 of 1**
SUPPLY	9V	Battery
CURRENT		
OTHER	*Tested!*	
B. Lindqvist		*2009-12*

PLACING OF COMPONENTS



SMR1206:
R2 = 220k
R3 = 39k
R4 = 1k
R6 = 220k
R7 = 39k
R8 = 22k
R9 = 1k
R10 = 680Ω
R11 = 100k
R12 = 100k
R13 = 100k
R14 = 1k
R15 = 68k*
R16 = 3k9
R17 = 3k9
R18 = 680Ω
R19 = 1k
R20 = 100k
R21 = 390Ω
R22 = 220Ω
R23 = 220Ω

SMC1206:
C2 = 100n
C3 = 100n
Cdc = 100n



Other Components:
R1 & R5 = 1k , hole mount
C1 = 22µ , 15V , E-lytic , SMD or hole mount
C4 = 10µ *, 15V , E-lytic , SMD or hole mount
P1, P2 & P3 = 100k , PT-10LV , hole mount
P4 = 470k , PT-15NV(17) , hole mount

Semiconductors:
D1 = LL5817, SMD
D2 = BAS32 , SMD
D5 = Zener diode 3V9 , hole mount
D3 = Yellow LED, EL42-21UYC (or similar)
D6 & D10 = Green LED, EL42-21SYGC (or similar)
D4, D7, D9, D11 & D14 =
Red LED, EL42-21SURC (or similar)

IC (hole mount):
IC1 = Test of 555 (over IC-socket)
IC2 = 4060B, 14-stage ripple… (over IC-socket)
IC3 = Test of dual OP (over IC-socket)
IC4 = 4093B, NAND-schmittrigger

IC-sockets (hole mount):
IC1 & IC3 = DIL8
IC2 = DIL16
IC4 = DIL14 (optional)

Switches (hole mount):
S1 = Toggle Switch , 1-pole , 2-states
S2 = Toggle Switch , 1-pole , 3-states
S3 = Toggle Switch , 1-pole , 3-states

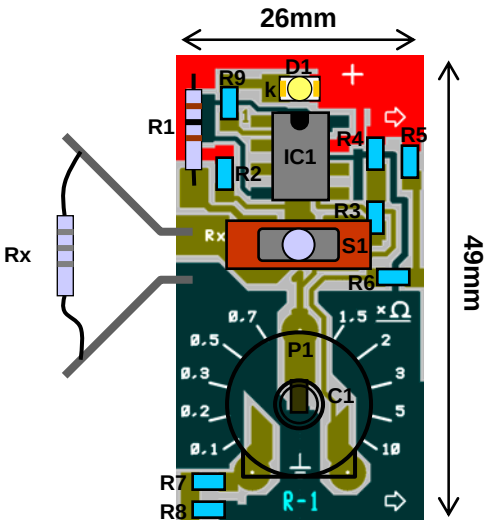
**** = 1 sec.***

A single side board is enough for this construction. No holes need to be drilled except for the two wire pins (voltage supply). All components shall be handled as SMD, thus all soldering take place on the component side.

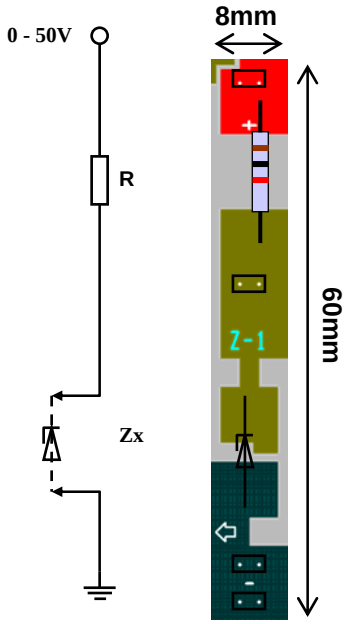
PROJECT	*Test Board*	
MODULE		
MODEL	**T-board**	
AUDIT	A-1	**DRAWING: 1 of 1**
OTHER		
B. Lindqvist		*2009-12*

MODULE PLACING OF COMPONENTS

MODULE R-1



MODULE Z-1 (test and measure zener diodes)

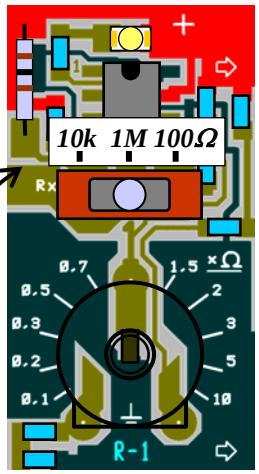


R = 1k / 0.5W , hole mount

SMR1206:
R2 = 1M
R3 = 10k
R4 = 100Ω
R5 = 3k9 } ***P1/10***
R6 = ..
R7 = .. } ***P1/10***
R8 = 3k9
R9 = 680Ω

SMC1206:
C1 = 100n

Other Components:
R1 = 100Ω , MF, hole mount
P1 = 47k , PT-15NV (hm)
S1 = Toggle Switch 1P/3S
D1 = Yellow LED, EL42-21UYC (or similar)
IC1 = TLC271 , hole mount



Measure P1 and adjust R5+R6 and R7+R8 to 1/10 of P1. That should best fit the scale pattern on the layout board. If the scale not correspond the real resistant, try to adjust R5+R6 and R7+R8 in some direction.

R-1 can be connected by solder or some contact device into the left side of the T-board, at the two arrows direction.

You can fix a bit of paper onto IC1 to increase the readability of the resistant factor that is going to be multiplies by the value P1 is pointing at.

A single side board is enough for this construction. No holes need to be drilled except for the wire pins on Z-1. All components shall be handled as SMD, thus all soldering take place on the component side.

PROJECT	*Test Board*	
MODULE	R-1 and Z-1	
MODEL	**T-board**	
AUDIT	A-1	**DRAWING: 1 of 1**
OTHER		
B. Lindqvist		*2009-12*

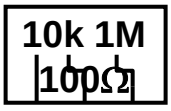
You can paste this formula card under the main board surface to look at if you need to calculate a capacitance.

NE555 or SA555 **9.0 V**

$$Cx = \frac{\text{Flash Time (sec.)}}{R_{ab} \times K \times M} \quad [farad]$$

K = 1.5 for 33 and 220 kohm
K = 1.6 for 1 kohm
M = 0.5 ; 8 ; 256 ; 8192

Chosen resistance fields (R-1)



PHOTOS