Universitatea "Politehnica" din București
Facultatea de Electronică, Telecomunicații și Tehnologia Informației
Departamentul de Tehnologie Electronică și Fiabilitate
Anul II

Proiect TIE

-Generator de funcții-

PROFESOR COORDONATOR:

Prof. Dr. Ing. Codreanu Norocel

STUDENTI:

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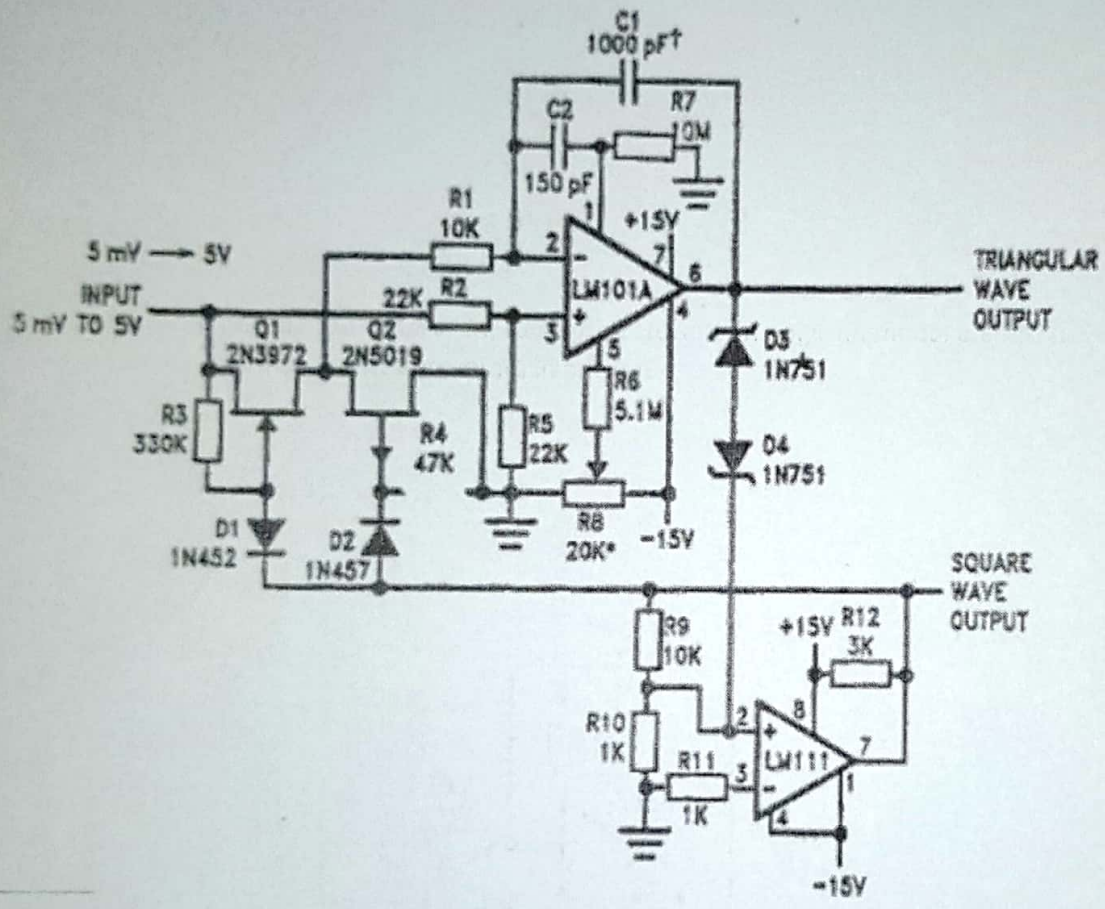
Sprîncenatu Mihai

Stoian Cezar-Iulian

11.06.2020

Utilizând metode CAE-CAD-CAM, să se proiecteze tehnologic un modul electronic PCB în conformitate cu schema electrica prezetată în anexa 1.

Schema electrică (Anexa 1):



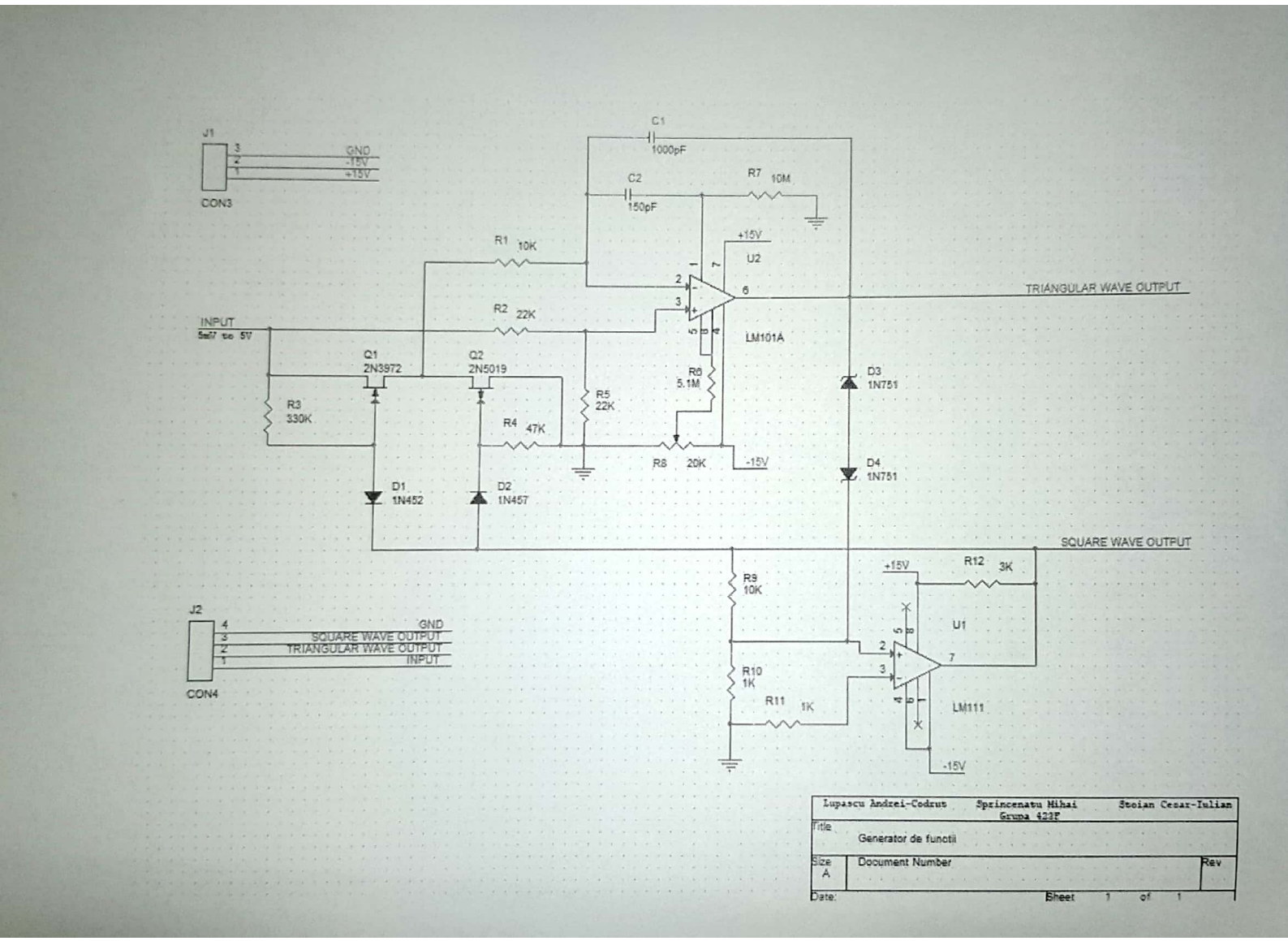
Date inițiale de proiectare (Anexa 2):

- Lățime trasee de semnal: 0.25 mm
- Lățime trasee de masă/alimentare: 1.2mm
- Spațiere: 0.35mm
- Forma și dimensiunile plăcii: Dreptunghi, 75x60mm
- Găuri de prindere: 4 găuri plasate la 2M (5.08mm) distanță de colțuri

Descrierea funcționării schemei proiectate

Schema proiectată reprezintă un generator de funcții. Acesta are în componența sa două oscilatoare electronice capabile să creeze forme de unde repetitive. Pot fi generate două tipuri de undă: triunghiulare, respectiv dreptunghiulare, corespunzătoare ieșirii fiecărui oscilator.

La intrare se aplică un semnal de curent alternativ ce poate varia de la 5mV la 5V, iar cu ajutorul acestuia se poate seta amplitudinea dorită pentru undele generate.



Rapoarte de postprocesare

- Design Rules Check (DRC)

```
Date and Time : 05/30/20 16:11:41

-------------------------------------------------
Checking Schematic: SCHEMATIC1
-------------------------------------------------
Checking Electrical Rules

Checking For Single Node Nets

Checking For Unconnected Bus Nets
```

- Cross Reference (CR)

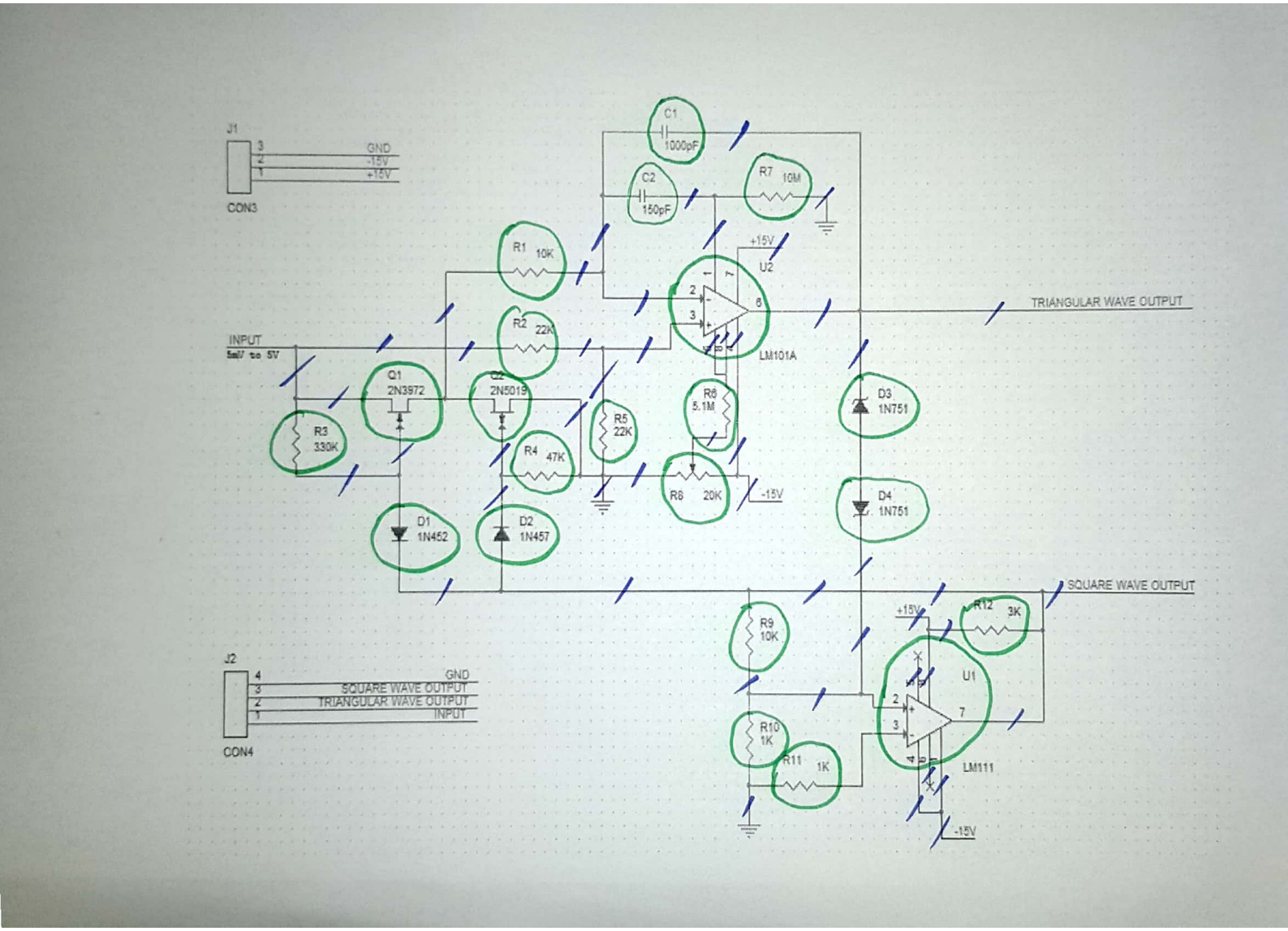
```
Generator de functii  Revised: Saturday, May 30, 2020
          Revision:




Design Name:  D:\ORCAD - PROIECTE\PROIECT TIE\PROIECTTIE.DSN

Cross Reference              May 30,2020      16:11:50  Page1

Item    Part    Reference   SchematicName   Sheet   Library X   Y
-------------------------------------------------------------------------------

1   1K   R10 SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  5.00    5.00
2   1K   R11 SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  5.40    5.40
3   1N452    D1  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  1.90    3.40
4   1N457    D2  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  2.80    3.40
5   1N751    D3  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  6.00    2.40
6   1N751    D4  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  6.00    3.20
7   2N3972   Q1  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\TRANSISTOR.OLB    1.90    2.50
8   2N5019   Q2  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  2.80    2.50
9   3K   R12 SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  7.10    4.20
10  5.1M     R6  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  4.80    2.40
11  10K R1   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  3.00    1.40
12  10K R9   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  5.00    4.20
13  10M R7   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  5.20    0.80
14  20K R8   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  4.40    3.00
15  22K R2   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  3.00    2.00
16  22K R5   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  3.70    2.60
17  47K R4   SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  3.10    3.00
18  150pF    C2  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\PSPICE\ANALOG.OLB     4.10    0.80
19  330K     R3  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\DISCRETE.OLB  1.00    2.70
20  1000pF   C1  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\PSPICE\ANALOG.OLB     4.30    0.30
21  CON3     J1  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\CONNECTOR.OLB     0.50    0.50
22  CON4     J2  SCHEMATIC1/PAGE1    1   D:\ORCAD\TOOLS\CAPTURE\LIBRARY\CONNECTOR.OLB     0.50    4.60
23  LM101A   U2  SCHEMATIC1/PAGE1    1   D:\ORCAD - PROIECTE\PROIECT TIE\PROIECTTIE.DSN   4.70    1.60
24  LM111    U1  SCHEMATIC1/PAGE1    1   D:\ORCAD - PROIECTE\PROIECT TIE\PROIECTTIE.DSN   6.50    4.80
```

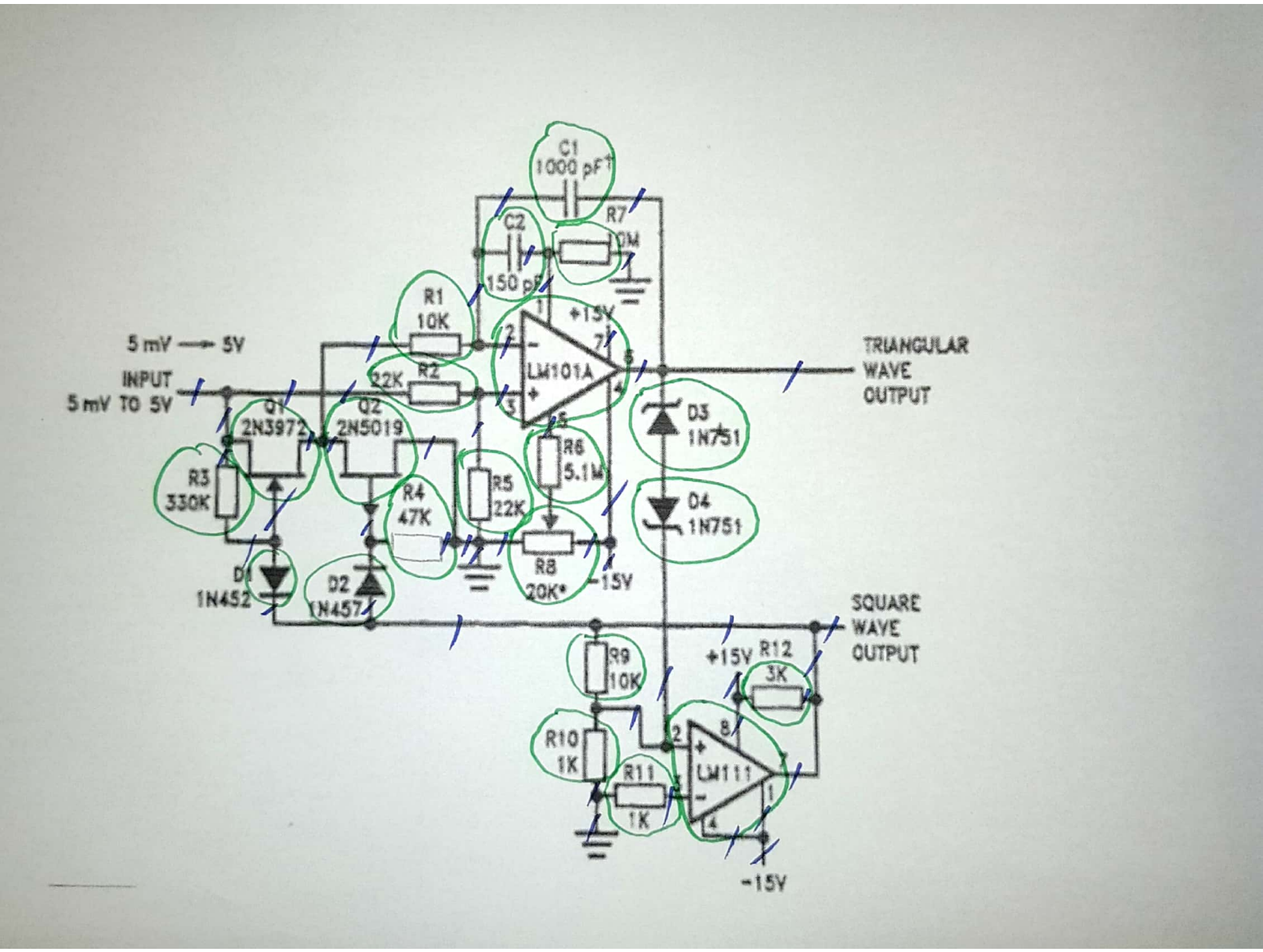
- Bill of materials (BOM)

Generator de functii Revised: Saturday, May 30, 2020
Revision:

Bill Of Materials May 30,2020 16:12:01 Page1

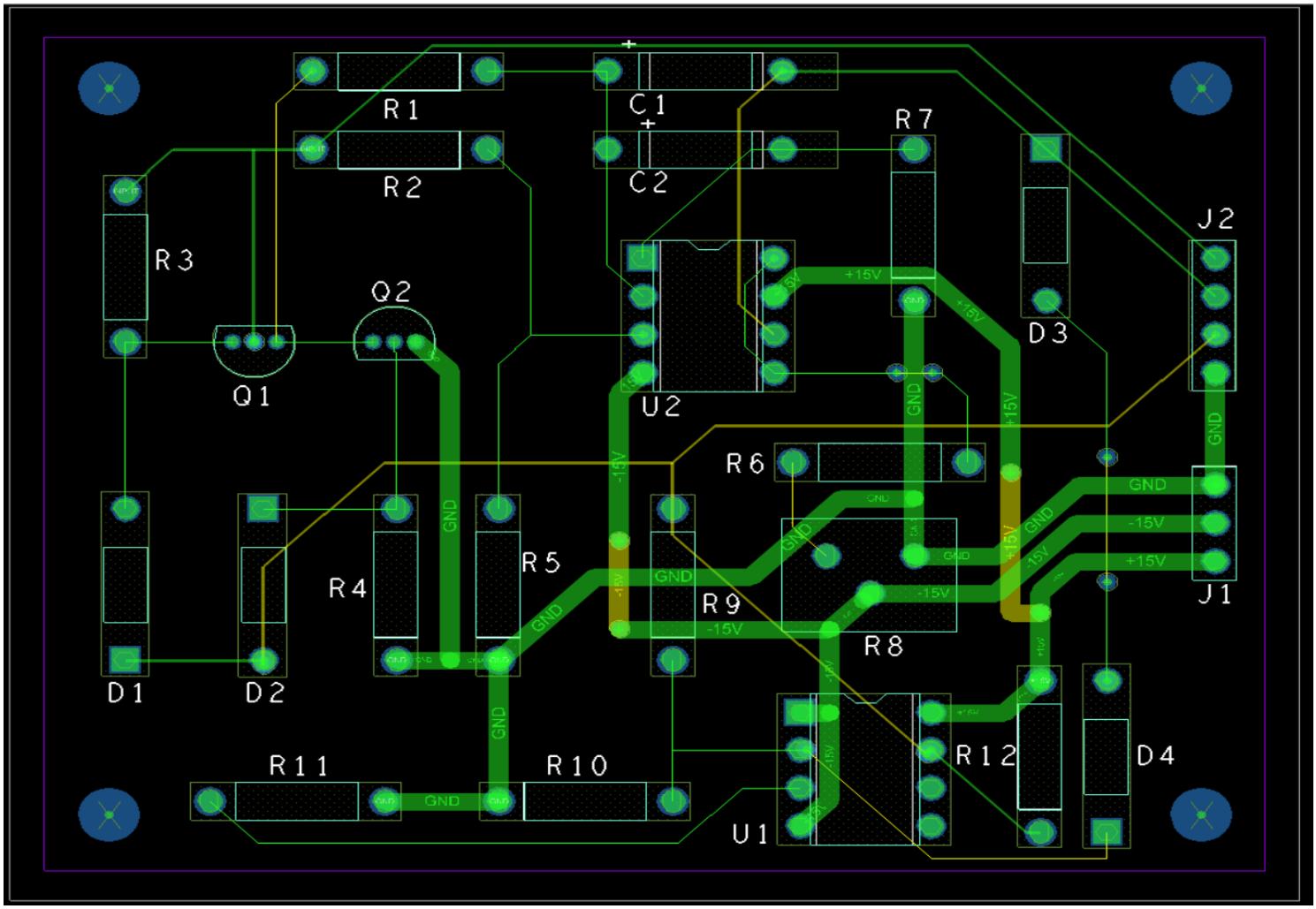
Item	Quantity	Reference	Part
1	1	C1	1000pF
2	1	C2	150pF
3	1	D1	1N452
4	1	D2	1N457
5	2	D3,D4	1N751
6	1	J1	CON3
7	1	J2	CON4
8	1	Q1	2N3972
9	1	Q2	2N5019
10	2	R1,R9	10K
11	2	R2,R5	22K
12	1	R3	330K
13	1	R4	47K
14	1	R6	5.1M
15	1	R7	10M
16	1	R8	20K
17	2	R10,R11	1K
18	1	R12	3K
19	1	U1	LM111
20	1	U2	LM101A



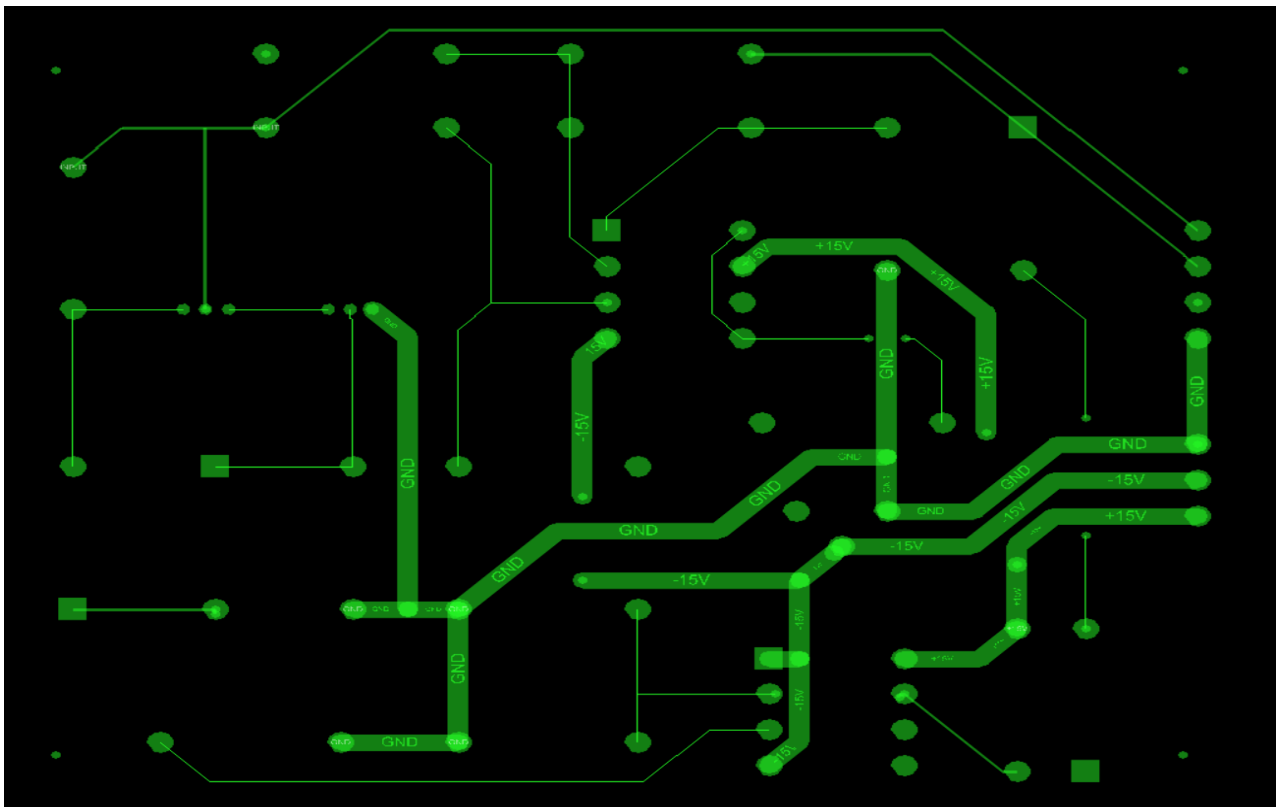


Layer-ele electrice si neelectrice

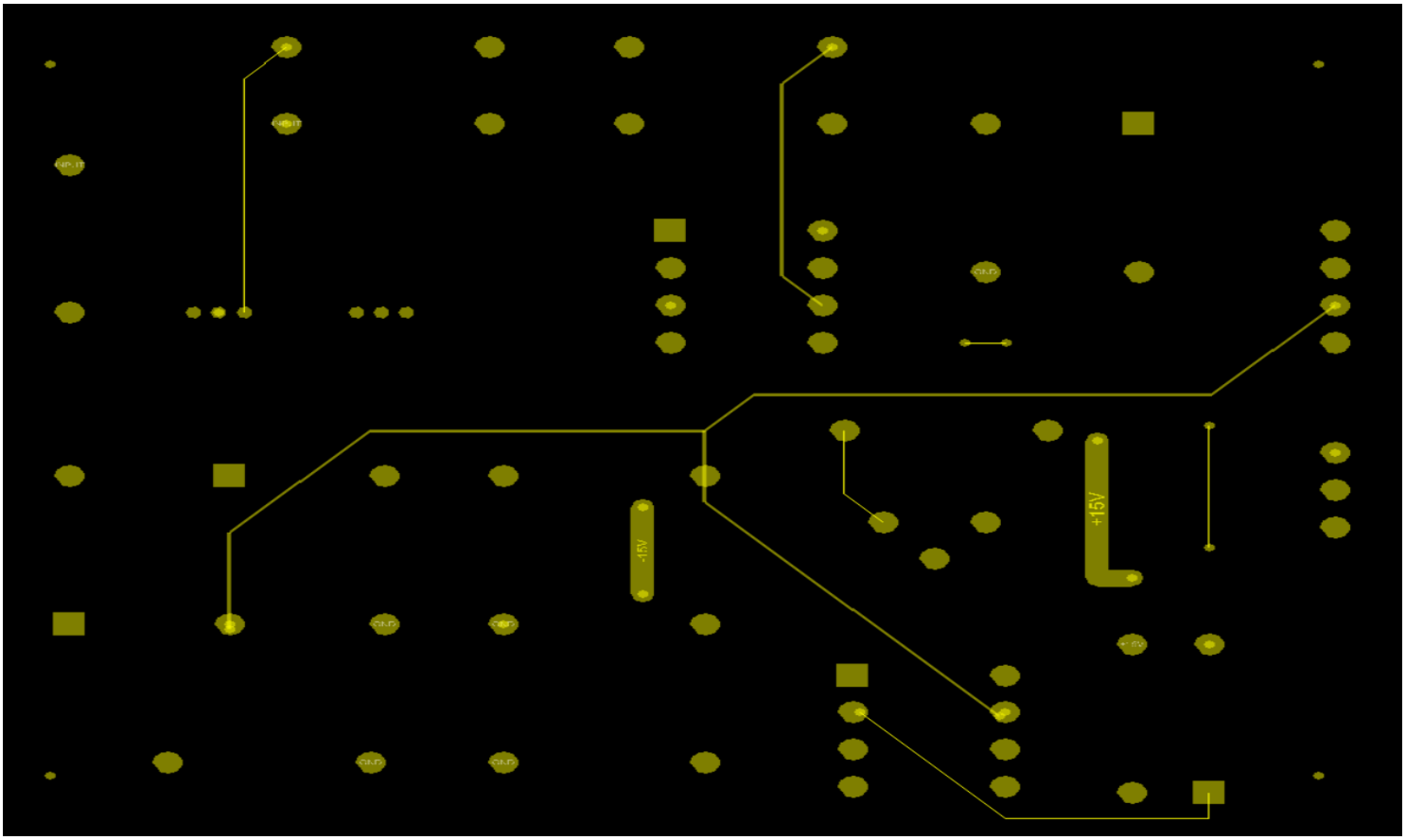
PCB


R1
R2
C1
C2
R7
R3
Q2
Q1
U2
D3
J2
R6
R4
R5
R9
R8
D1
D2
J1
R11
R10
U1
R12
D4
GND
+15V
-15V

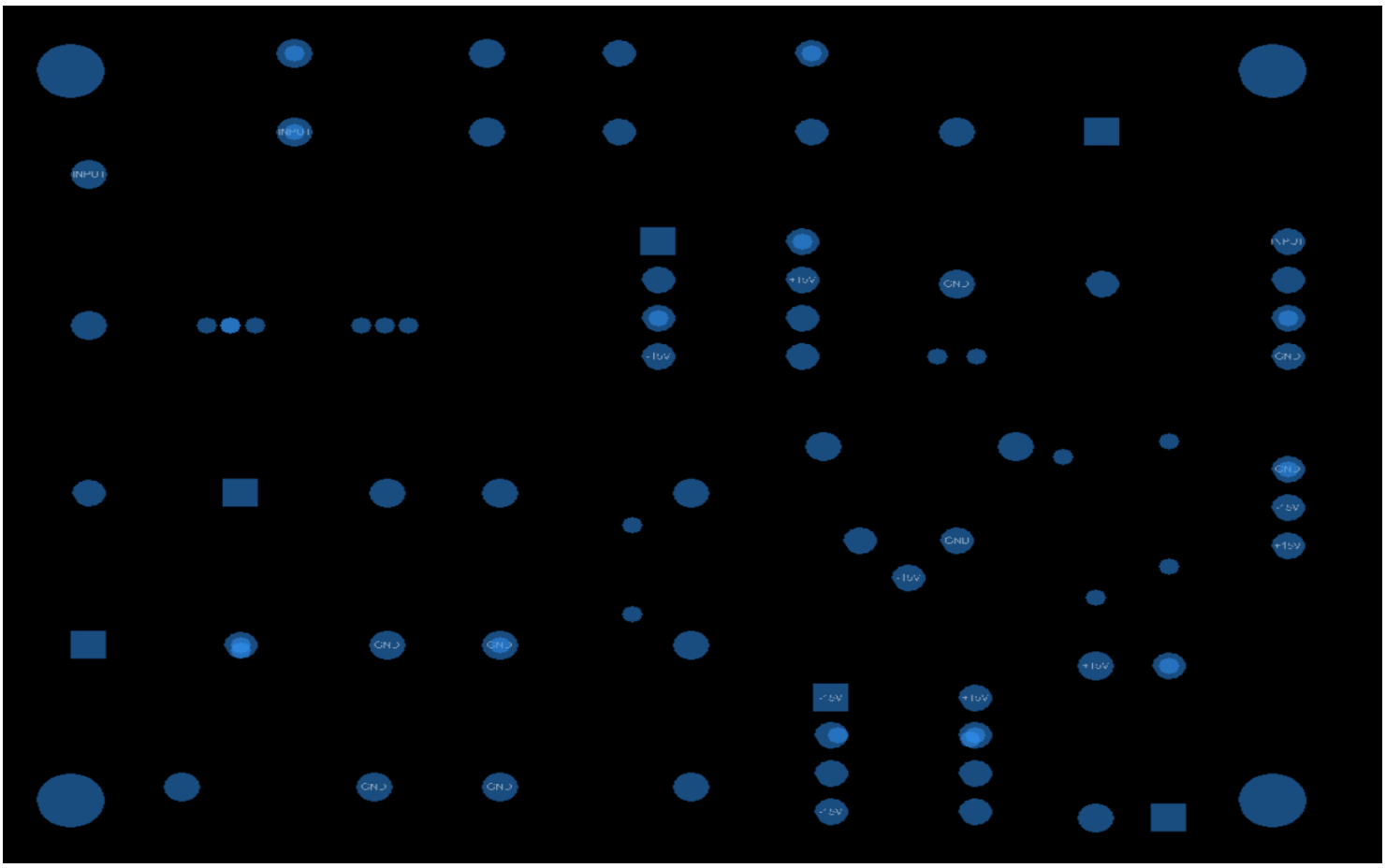
TOP


GND
+15V
-15V

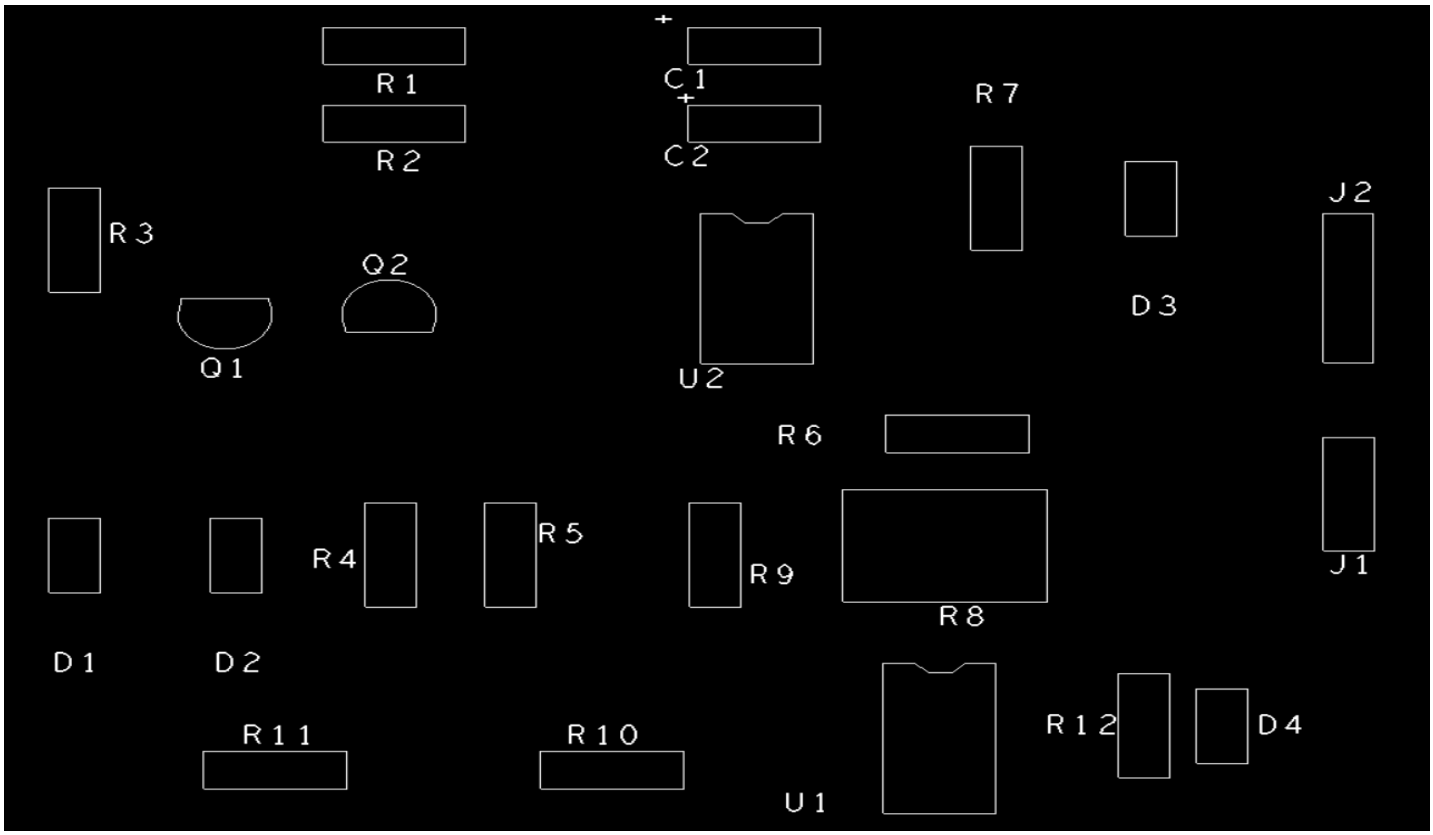
BOTTOM



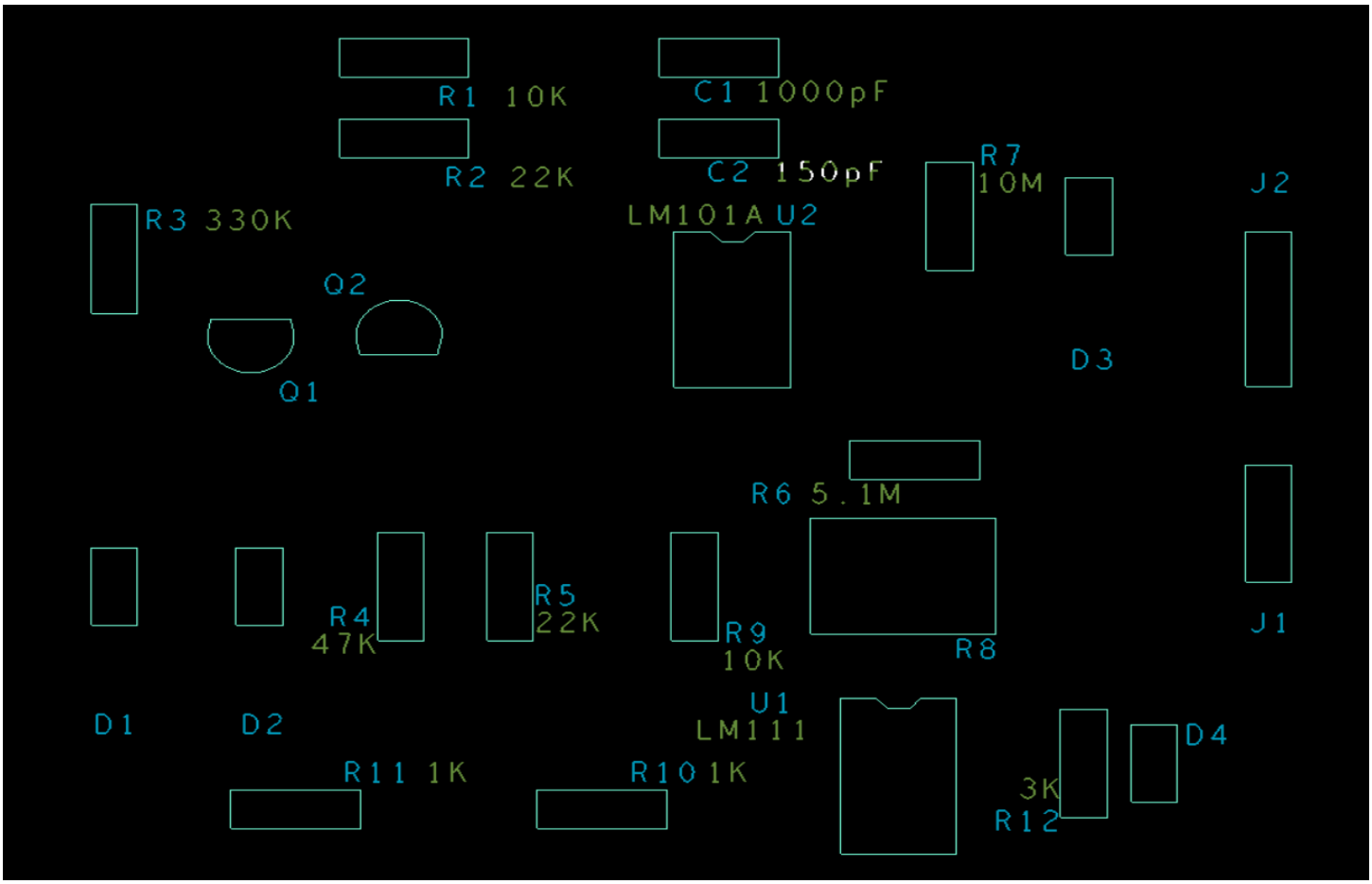
SOLDER MASK



SILK SCREEN TOP

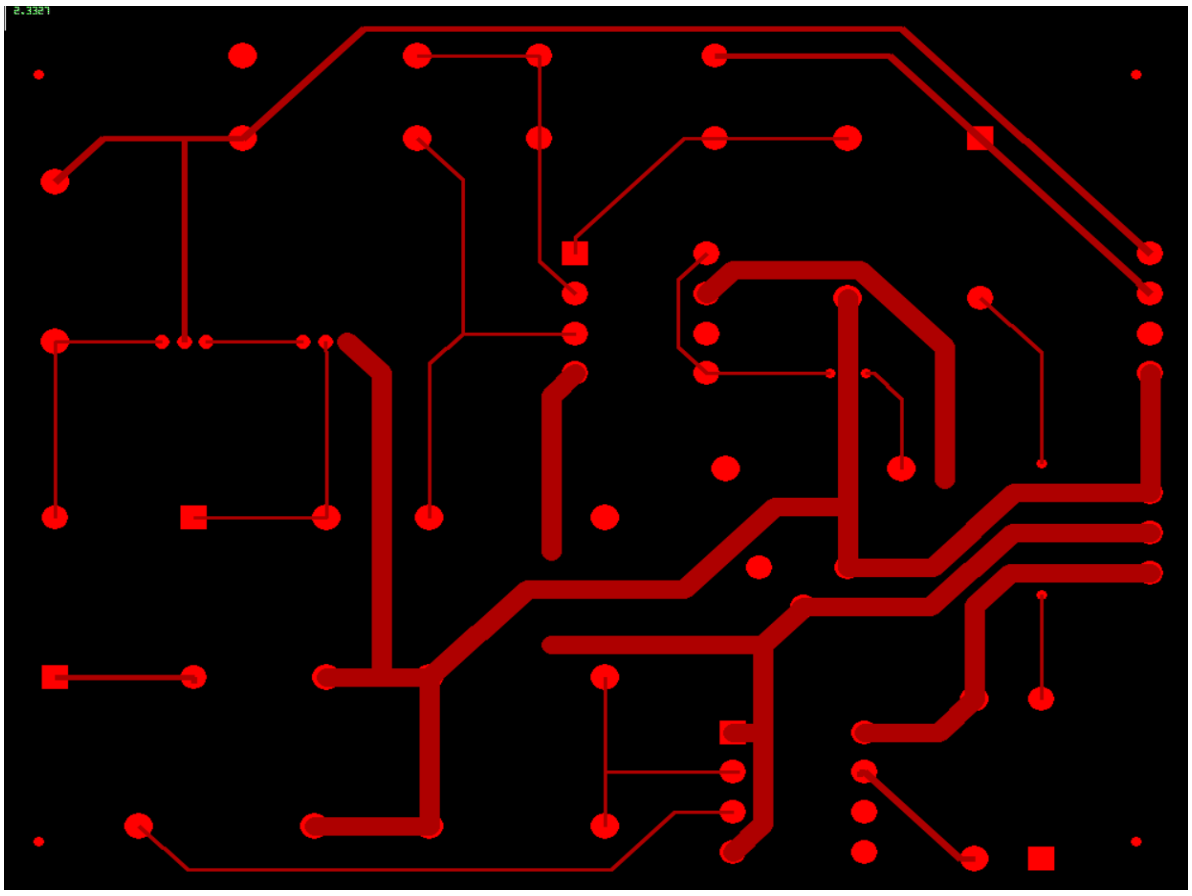


ASSEMBLY DRAWING TOP



Fișiere Gerber

TOP



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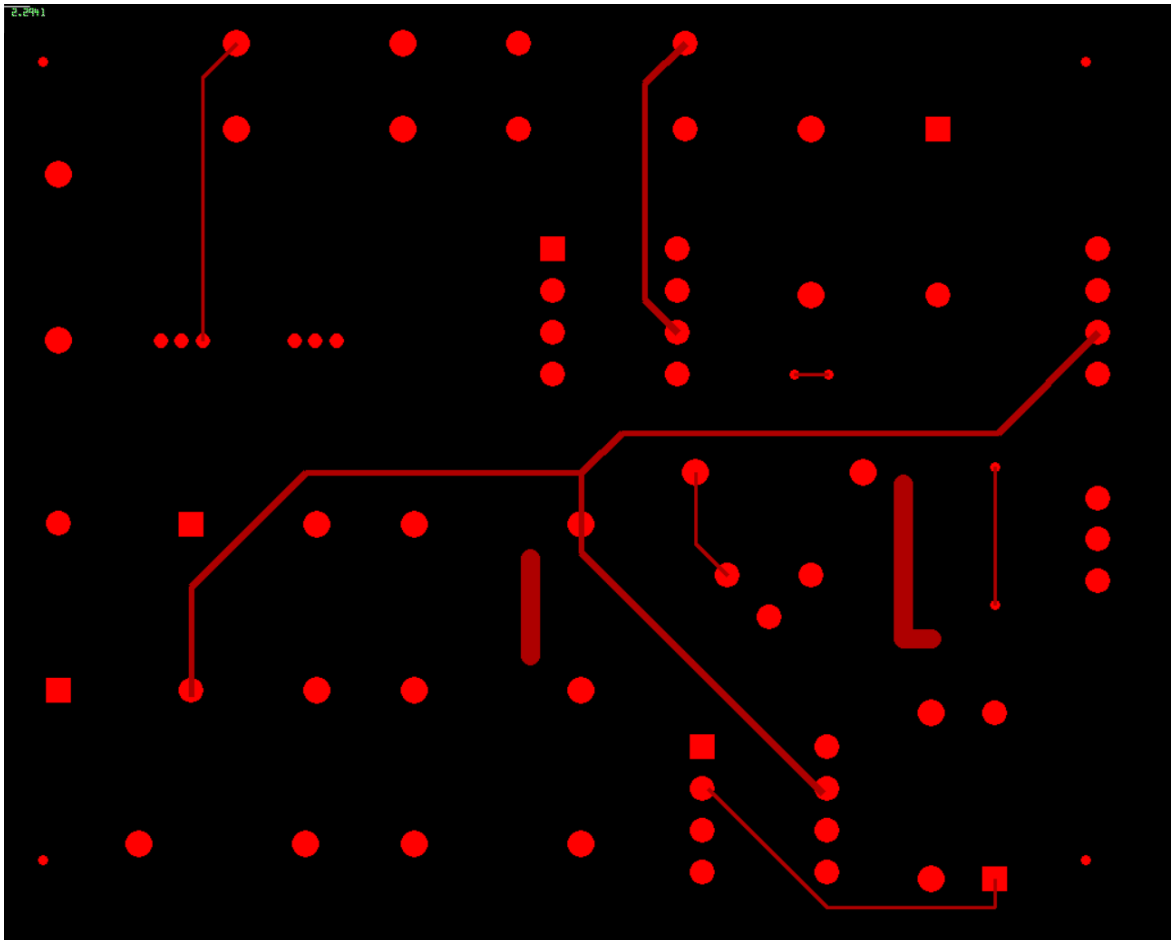

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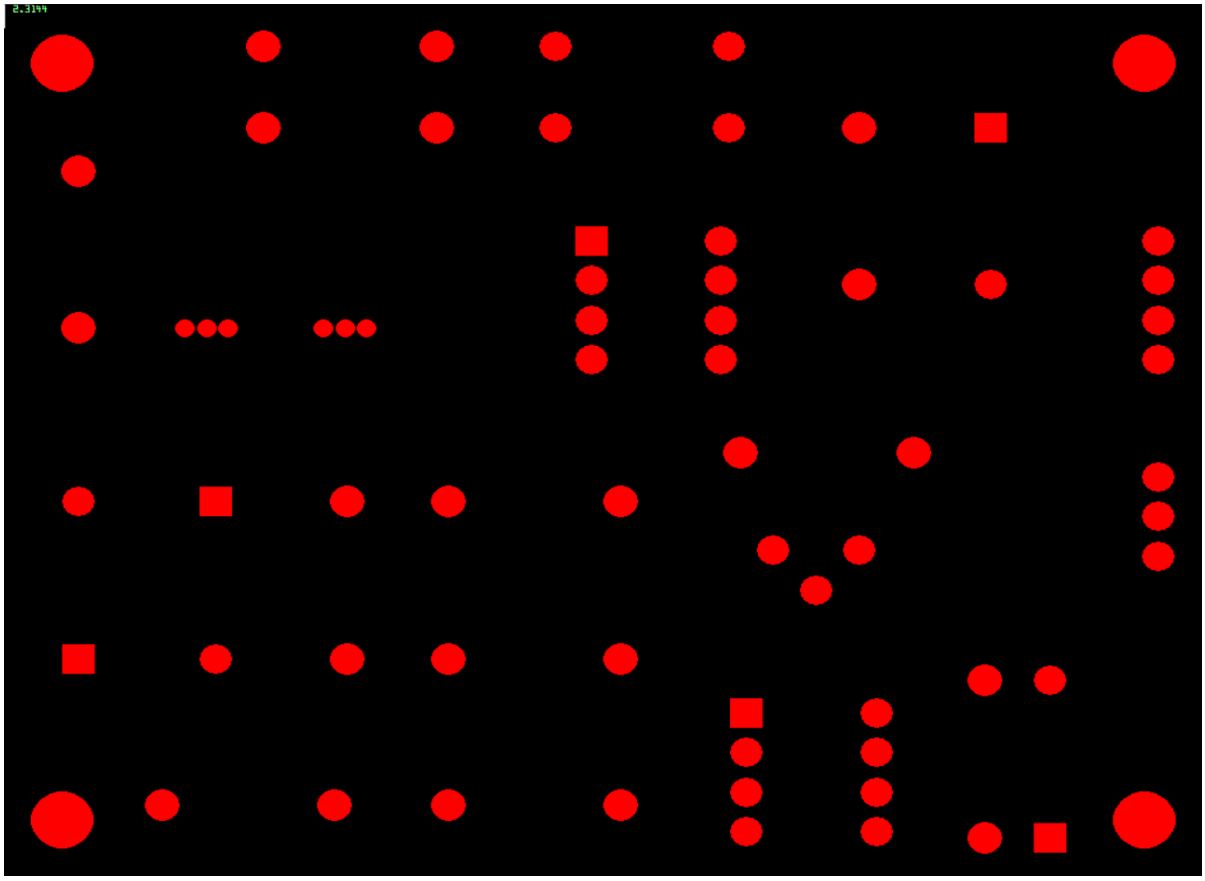

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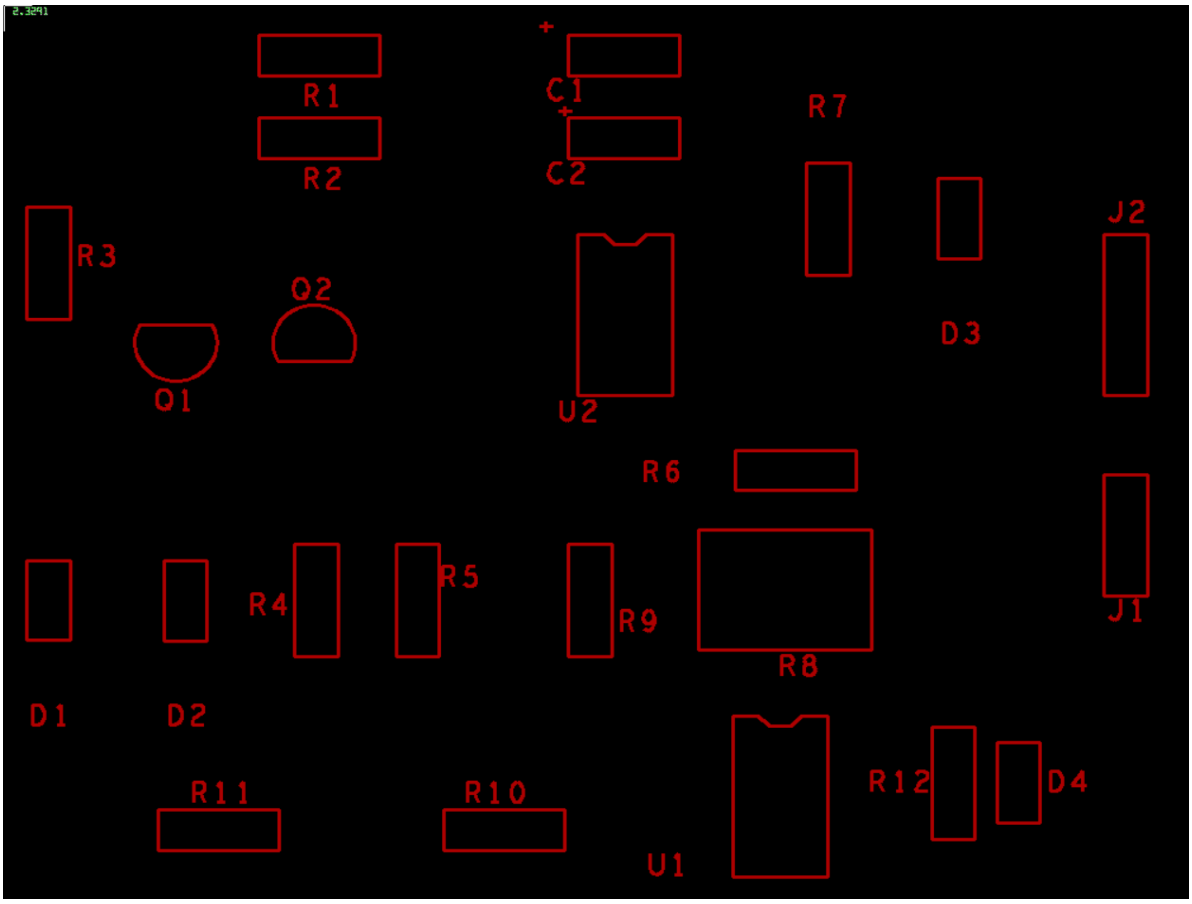
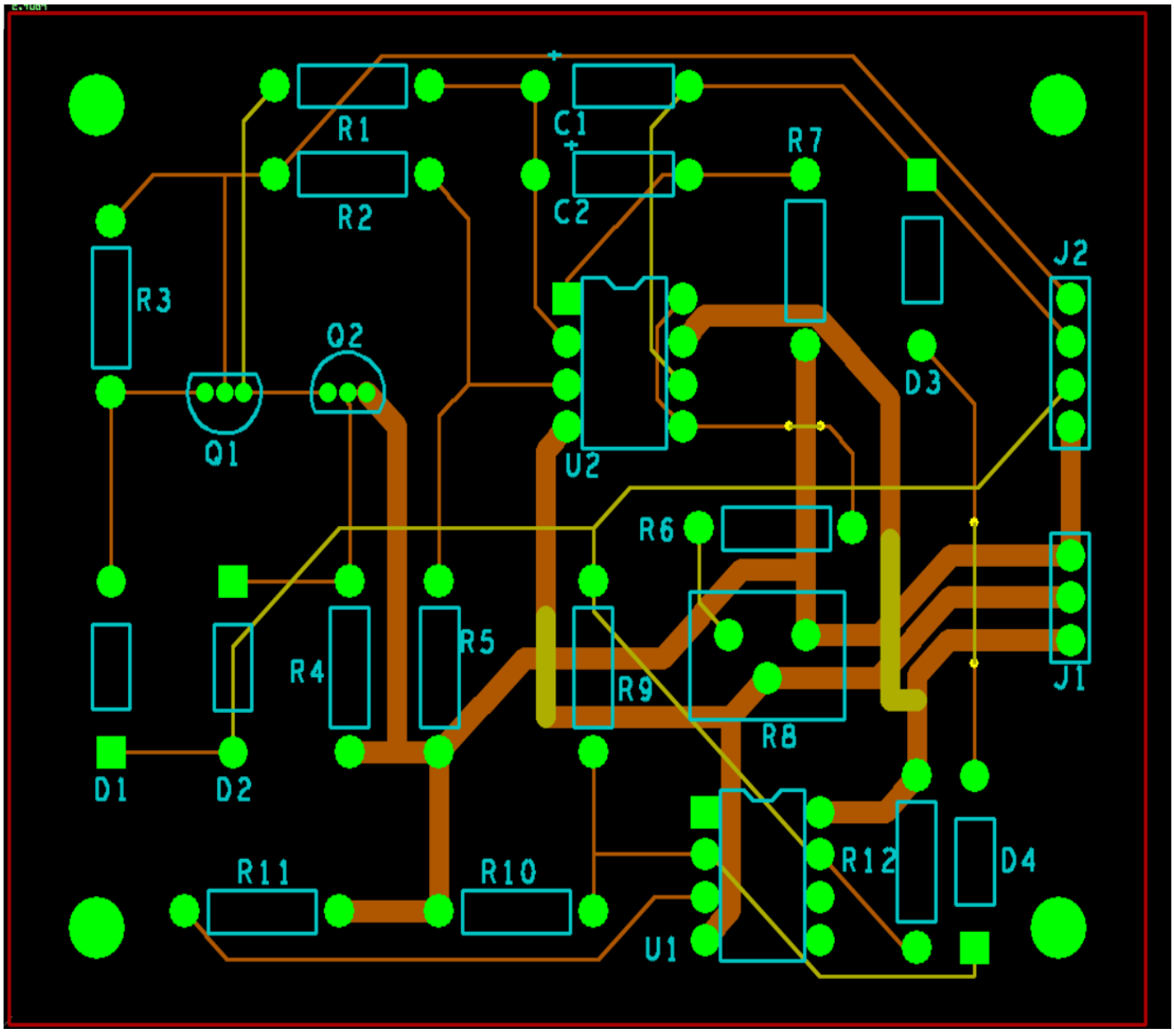


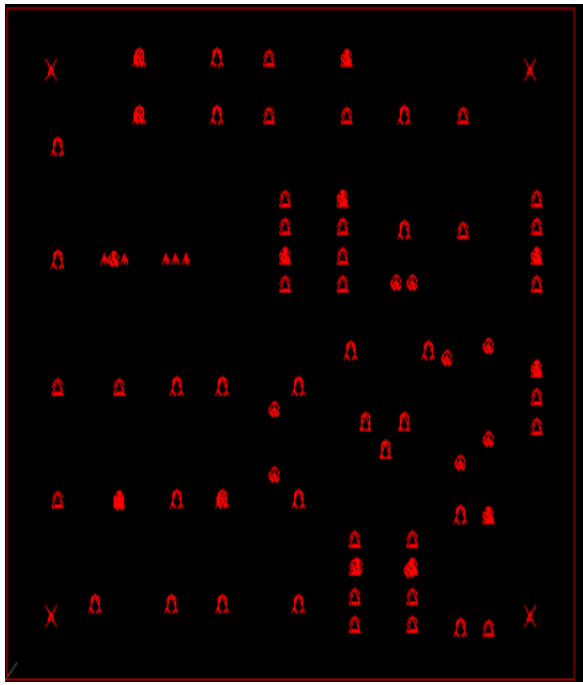
BOARD OUTLINE

PCB



FABRICATION

FABRICATION



DRILL CHART: TOP to BOTTOM			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	SIZE	PLATED	QTY
⊕	0.3302	PLATED	23
+	0.635	PLATED	6
○	0.9144	PLATED	35
◇	1.0668	PLATED	25
X	3.2	NON-PLATED	4

DRILL CHART: TOP to BOTTOM			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	SIZE	PLATED	QTY
⊕	0.3302	PLATED	23
+	0.635	PLATED	6
○	0.9144	PLATED	35
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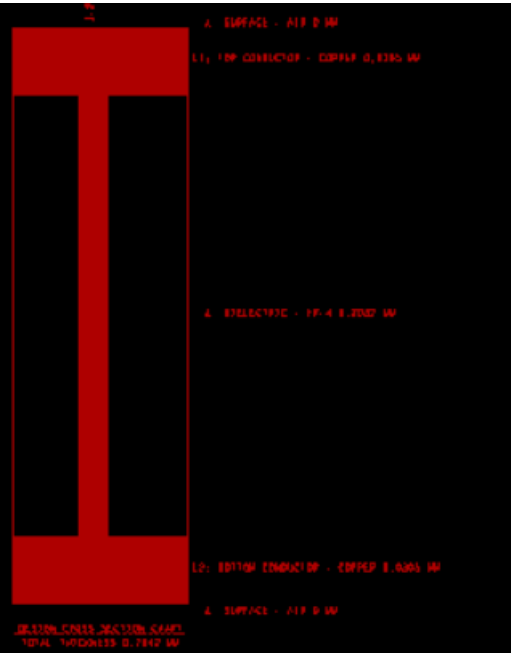
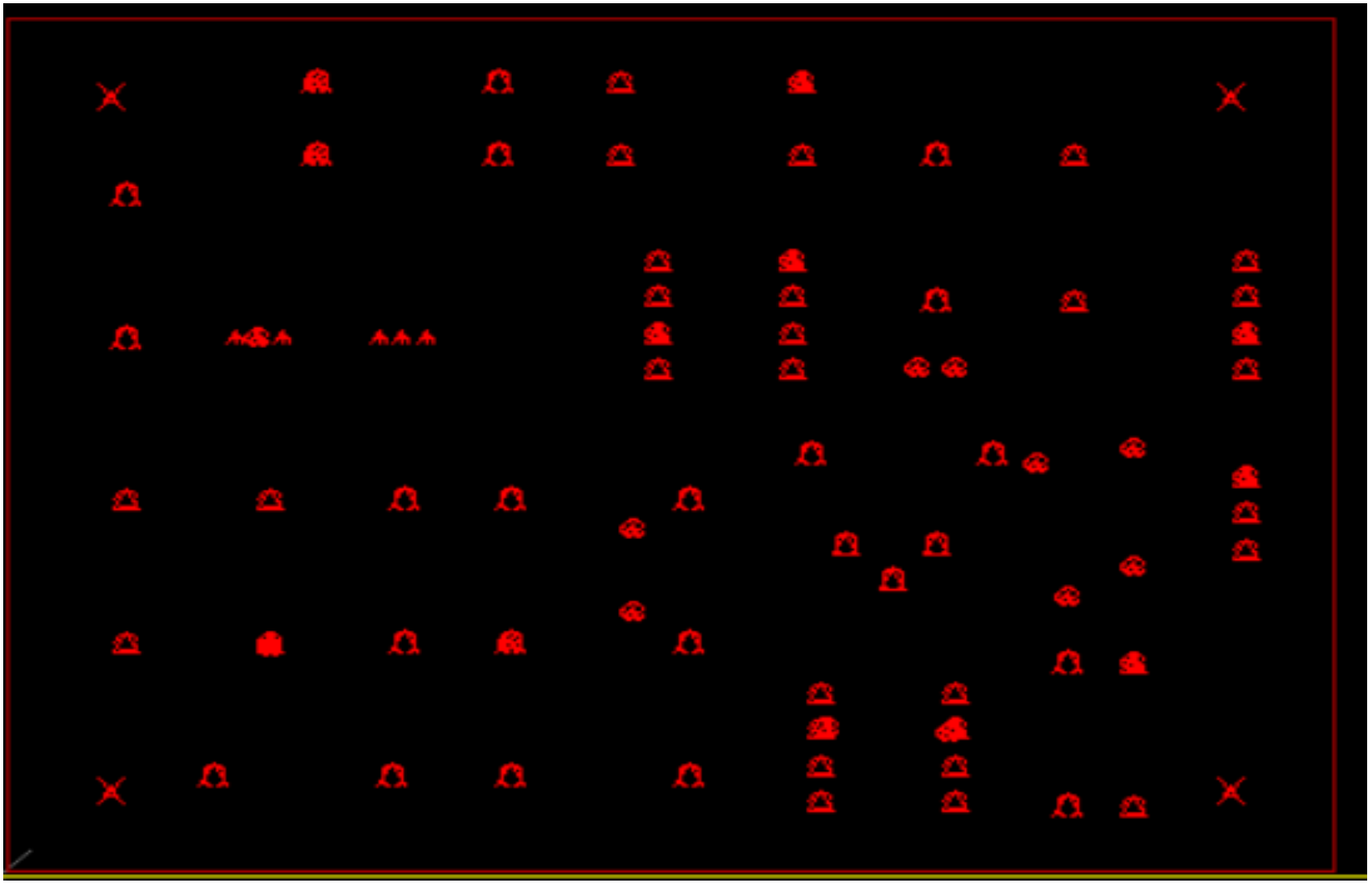
X	3.2	NON-PLATED	4



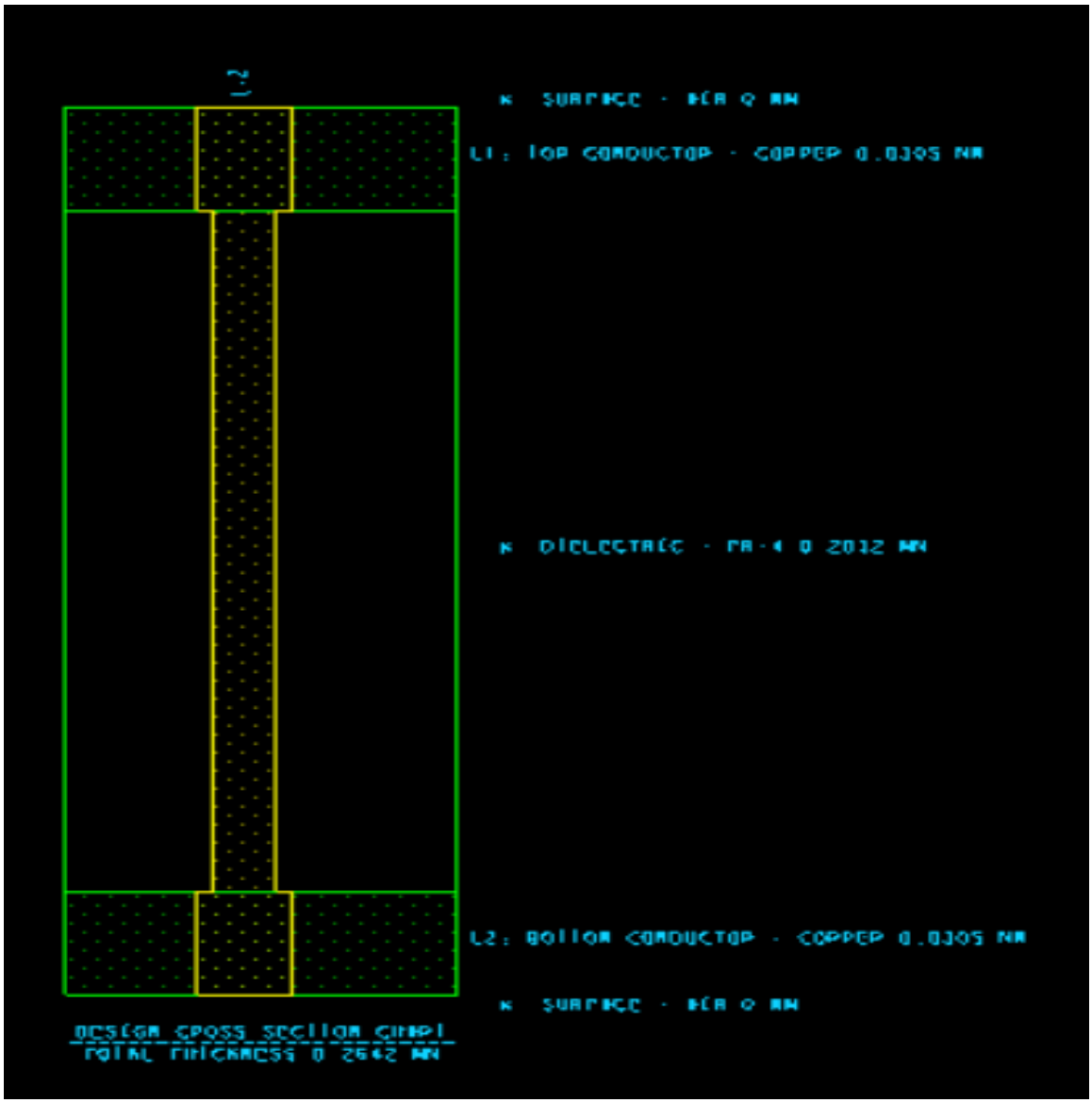


```
NC PARAMETERS
-------------

FORMAT                  2.5
MACHINE-OFFSET          x:0.00000       y:0.00000   (mm)
FEEDRATE                1
COORDINATES             ABSOLUTE
OUTPUT-UNITS            METRIC
TOOL-ORDER              INCREASING
REPEAT-CODES            NO
SUPPRESS-LEAD-ZEROES    YES
SUPPRESS-TRAIL-ZEROES   NO
SUPPRESS-EQUAL          NO
TOOL-SELECT             YES
HEADER                  none
LEADER                  12
CODE                    ASCII
SEPARATE                NO
SEPARATE-ROUTING        NO
OPTIMIZE_DRILLING       YES
ENHANCED_EXCELLON       YES
SCALE                   1.000000

WARNING(SPMHMF-368): Cannot find NC Drill tool file 'nc_tools.txt'
WARNING(SPMHMF-369): ... will auto-generate tool file 'nc_tools_auto.txt'.


    Auto-generating tool file 'nc_tools_auto.txt' ...

         Size  Plating  Tool        + Tolerance  - Tolerance

       0.3302  P        T01            0.000000     0.000000
       0.6350  P        T02            0.000000     0.000000
       0.9144  P        T03            0.000000     0.000000
       1.0668  P        T04            0.000000     0.000000
       3.2000  N        T05            0.000000     0.000000


Drill files being output to directory 'D:/ORCAD - PROIECTE/PROIECT TIE/allegro' ...


    'DRILLPROIECT-1-2.drl' created for holes connecting TOP and BOTTOM
    ------------------------------------------------------------------

    Tool  Num     Size      +/- Tolerance     Plating   Quantity

    T01    1.   0.3302    0.0000/  0.0000      PLATED         23
    T02    2.   0.6350    0.0000/  0.0000      PLATED          6
    T03    3.   0.9144    0.0000/  0.0000      PLATED         35
    T04    4.   1.0668    0.0000/  0.0000      PLATED         25
    T05    5.   3.2000    0.0000/  0.0000  NON_PLATED          4

    ---- Total holes:                                       93

    ---- Total head travel:              3.64 feet (1.11 meters)
```

DRILL CHART

DRILL CHART: TOP to BOTTOM			
ALL UNITS ARE IN MILLIMETERS			
FIGURE	SIZE	PLATED	QTY
•	0.3302	PLATED	23
+	0.635	PLATED	6
○	0.9144	PLATED	35
□	1.0668	PLATED	25
X	3.2	NON-PLATED	4

LAYER STACK-UP

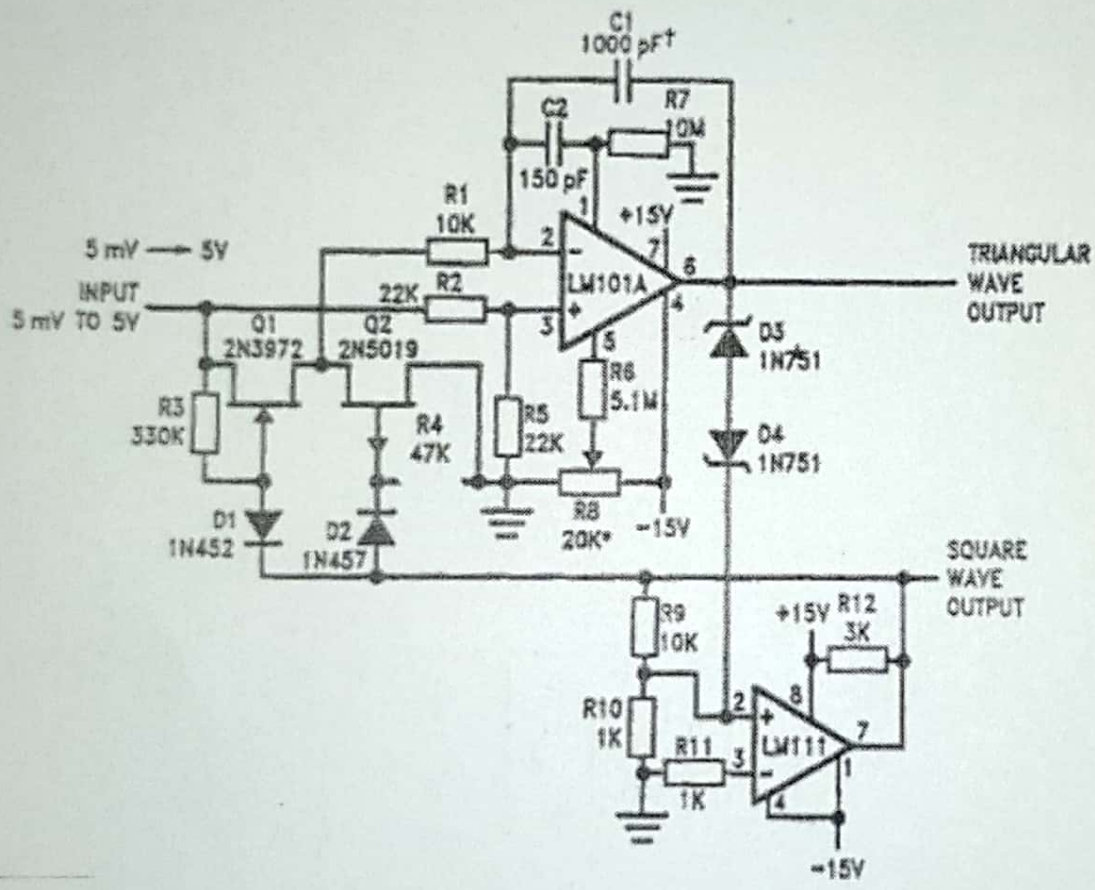


Bibliografie & webografie

1) http://www.cetti.ro/v2/labtie.php
2) http://blog.naver.com/kingreddrake/80185249306
3) Complete PCB Design Using OrCAD Capture and PCB Editor - Kraig Mitzner, Bob Doe, Alexander Akulin, Anton Suponin, Dirk Müller (https://books.google.ro/books?id=Uj6eDwAAQBAJ&printsec=frontcover&hl=ro&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false)
4) Laboratoare online (video).

Anexe

Anexa 1:



Anexa 2:

- Lățime trasee de semnal: 0.25 mm
- Lățime trasee de masă/alimentare: 1.2mm
- Spațiere: 0.35mm
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