vcofieldbox2 (D1100369-v1)

Circuit Board Documentation

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Abstract

Fieldbox for aLIGO PSL VCO of FSS.

Contents

Safety Instructions

In order to operate the circuit properly and safely, review the following guidelines before installing and using the unit. Failure to do so may result in equipment damage or bodily injury:

This circuit was designed as a laboratory equipment to be operated only by trained and qualified technicians in research institutes or development departments. For safety reasons, usage by other persons or in other environments is *not* recommended.

- This circuit uses extra-low voltage ($< 50\,V_{AC}$ and $< 75\,V_{DC}$) and is therefore exempt from the regulations of the *Low Voltage Directive* (2006/95/EC).
- The unit does not contain any mechanical drive system. Therefore, the regulations of the *Machinery Directive* (2006/42/EC) do not apply.

Sicherheitshinweise

Nehmen Sie vor Aufbau und Inbetriebnahme des Geräts folgende Empfehlungen zur Kenntnis, um die Schaltung korrekt und sicher zu betreiben sowie Schäden und Verletzungen zu vermeiden:

Diese Schaltung wurde als Laborausrüstung entworfen, die nur von qualifizierten und eingewiesenen Technikern in Forschungsinstituten oder Entwicklungsabteilungen benutzt wird. Aus Sicherheitsgründen wird die Verwendung durch andere Personen oder in anderer Umgebung *nicht* empfohlen.

- Diese Schaltung verwendet Kleinspannung ($< 50\,V_{AC}$ und $< 75\,V_{DC}$) und unterliegt daher nicht den Bestimmungen der *Niederspannungsrichtlinie* (2006/95/EC).
- Das Gerät enthält kein mechanisches Antriebssystem – die Bestimmungen der *Maschinenrichtlinie* (2006/42/EC) sind daher nicht anwendbar.

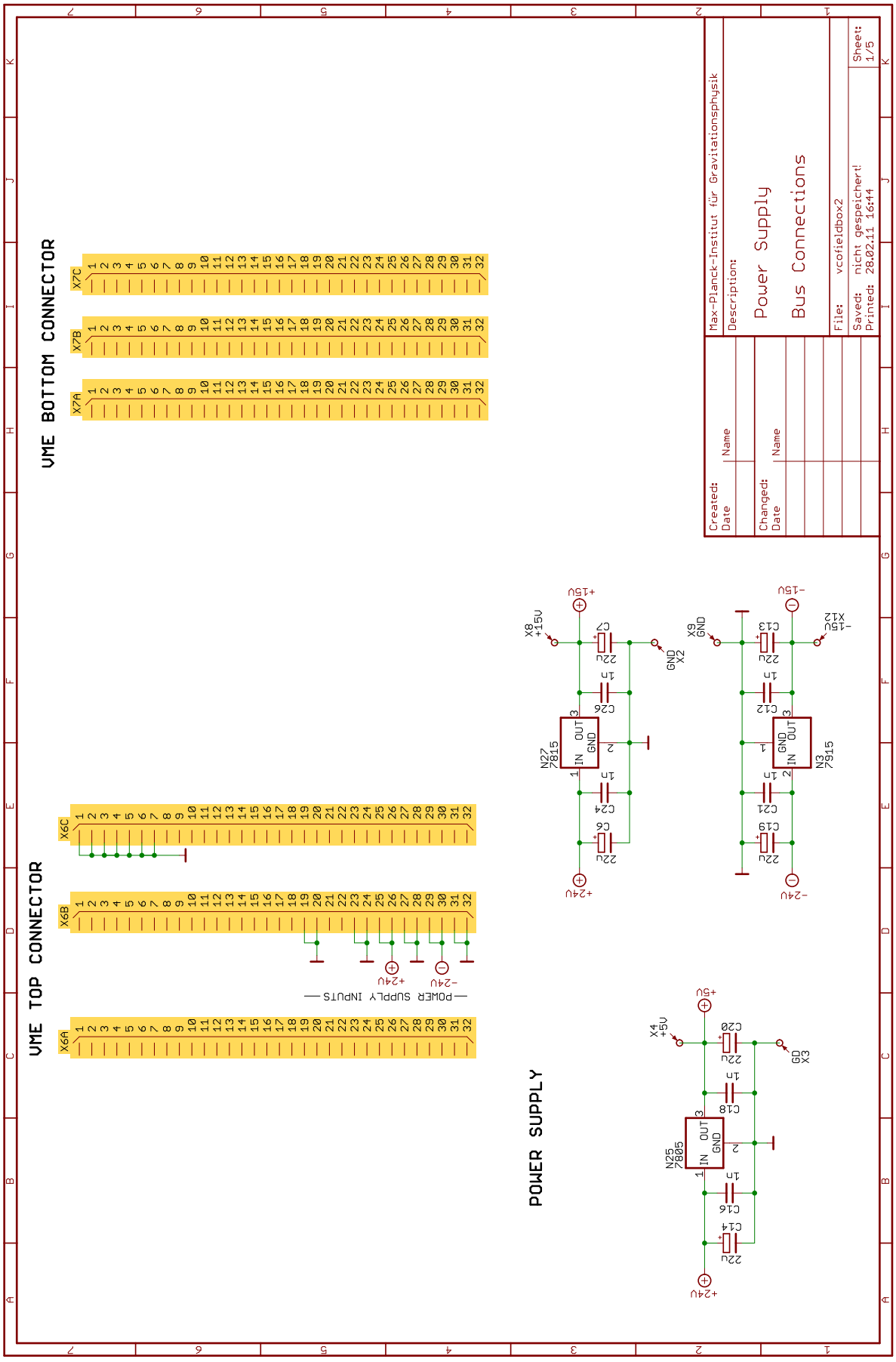

Figure 1: *Project schematics (sheet 1)*
Parts with undefined values are highlighted in orange

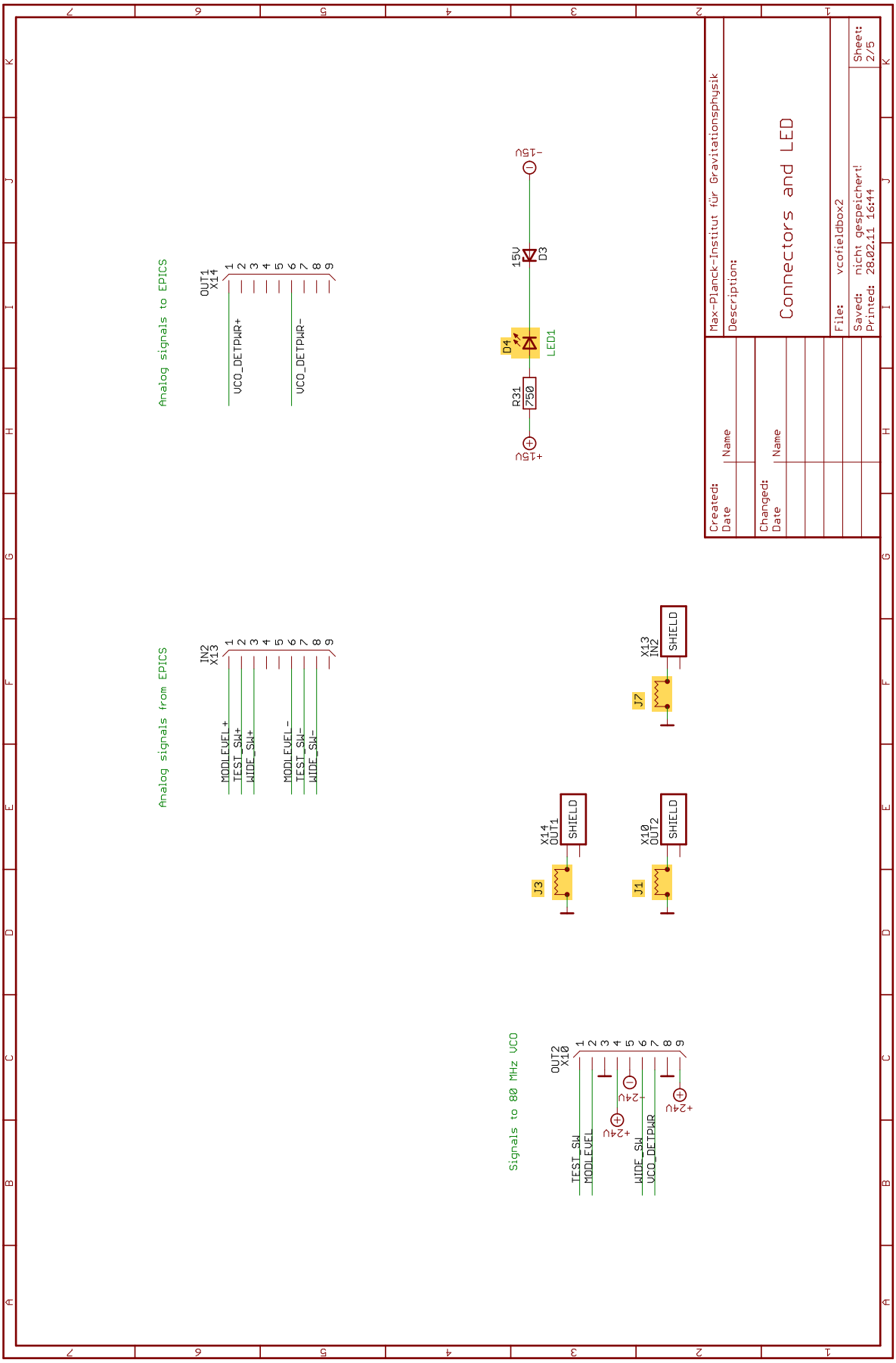

Figure 2: *Project schematics (sheet 2)*
Parts with undefined values are highlighted in orange

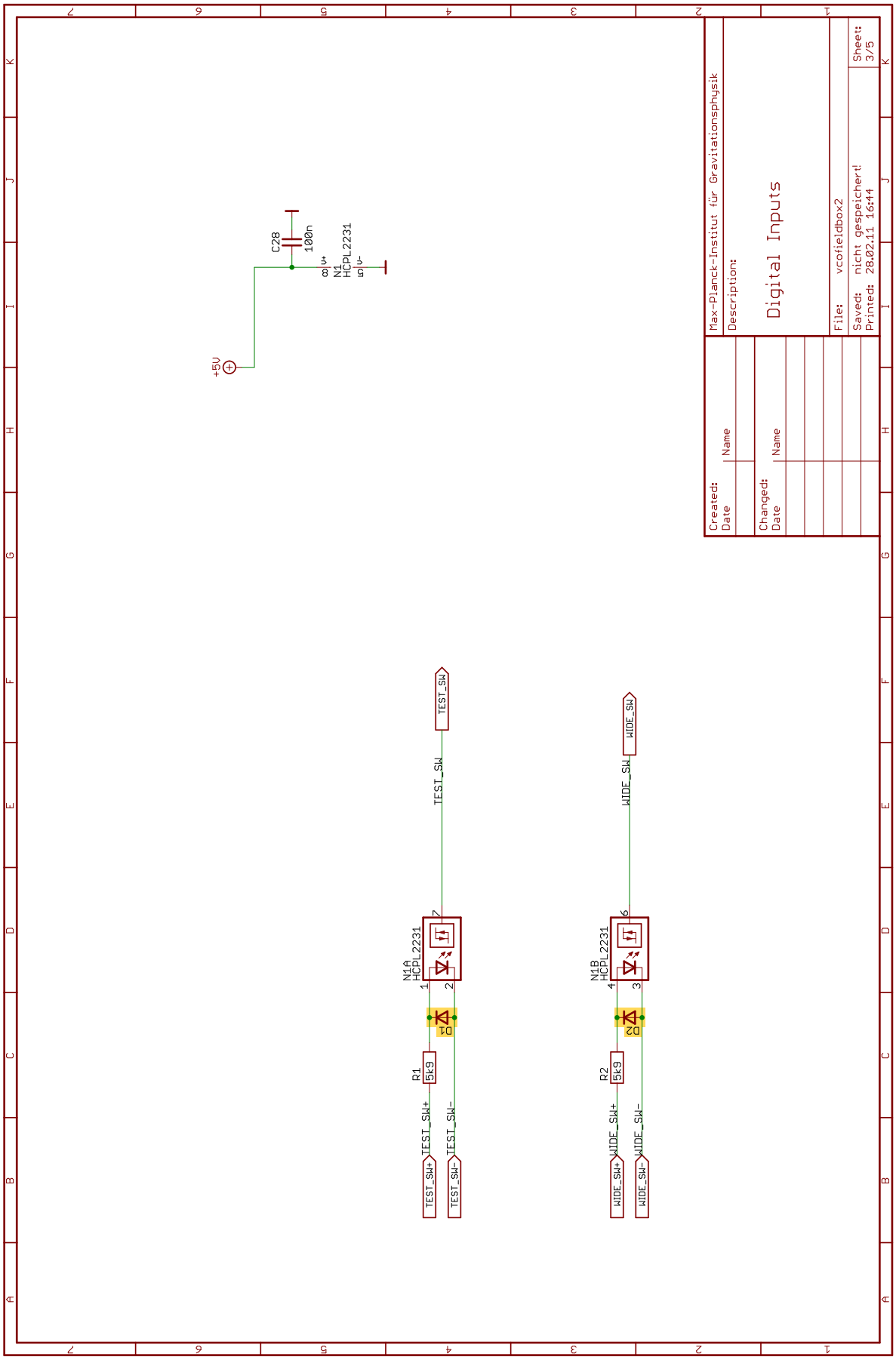

Figure 3: *Project schematics (sheet 3)*
Parts with undefined values are highlighted in orange

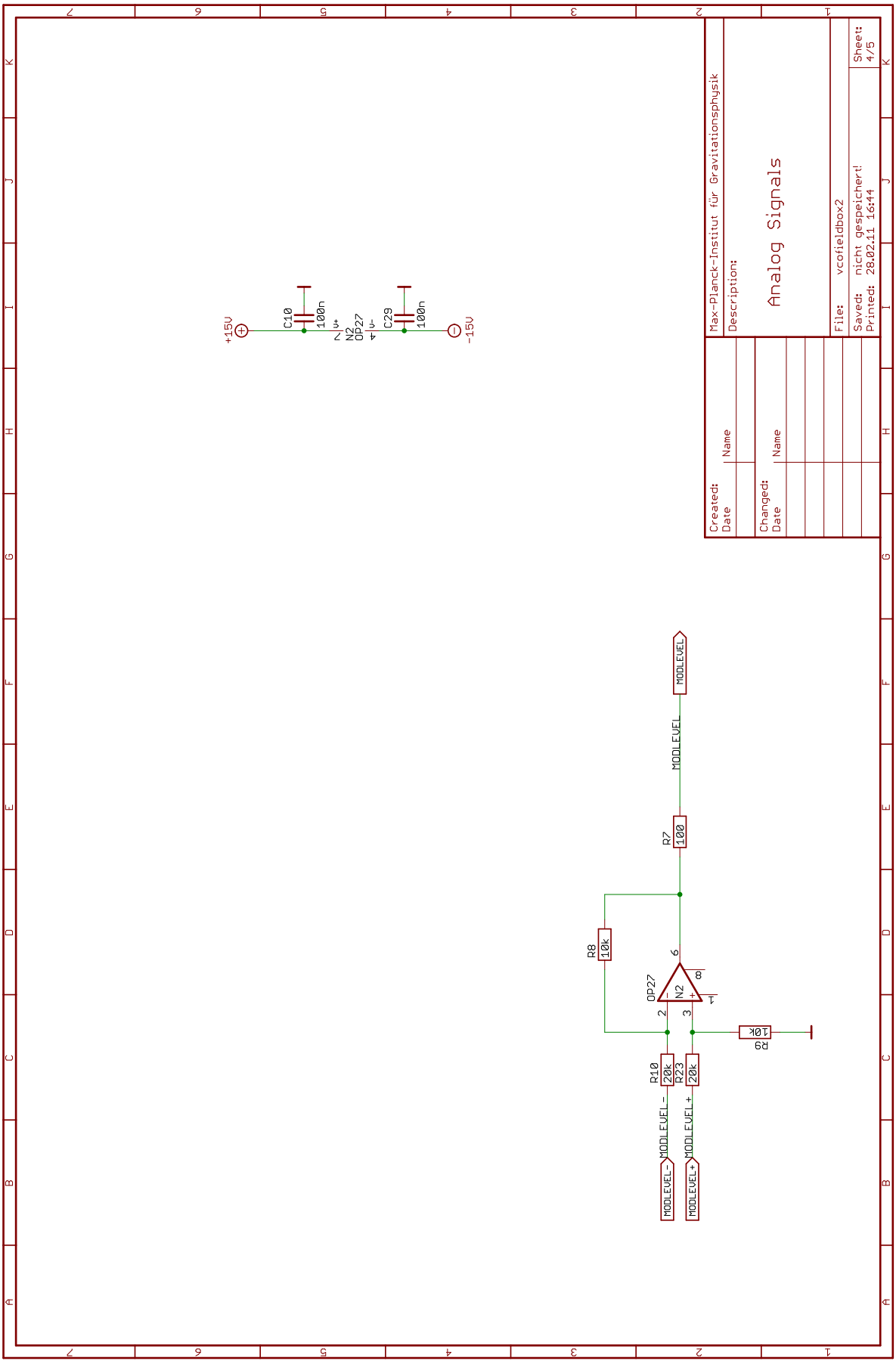

Figure 4: *Project schematics (sheet 4)*

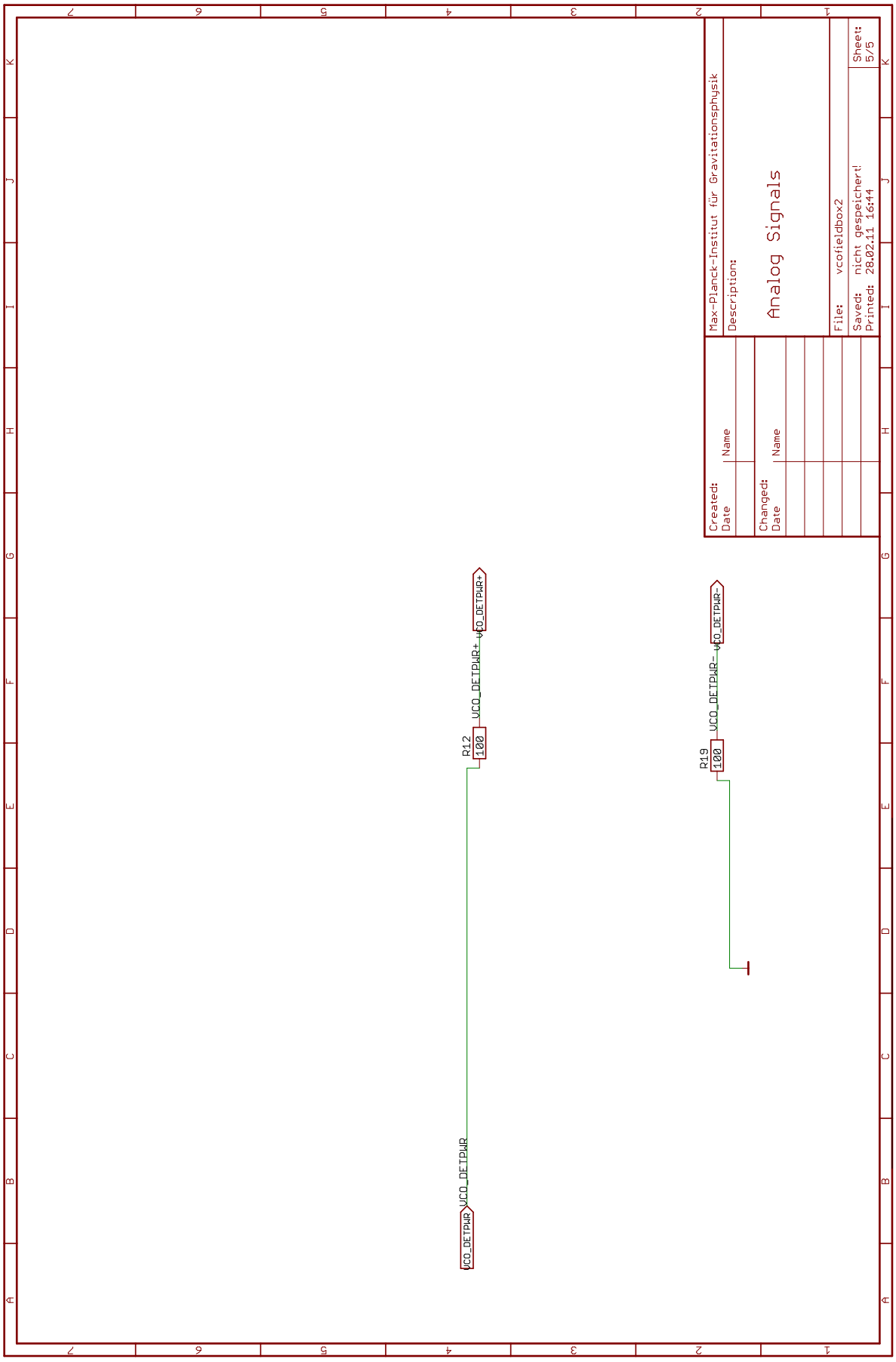

Figure 5: *Project schematics (sheet 5)*

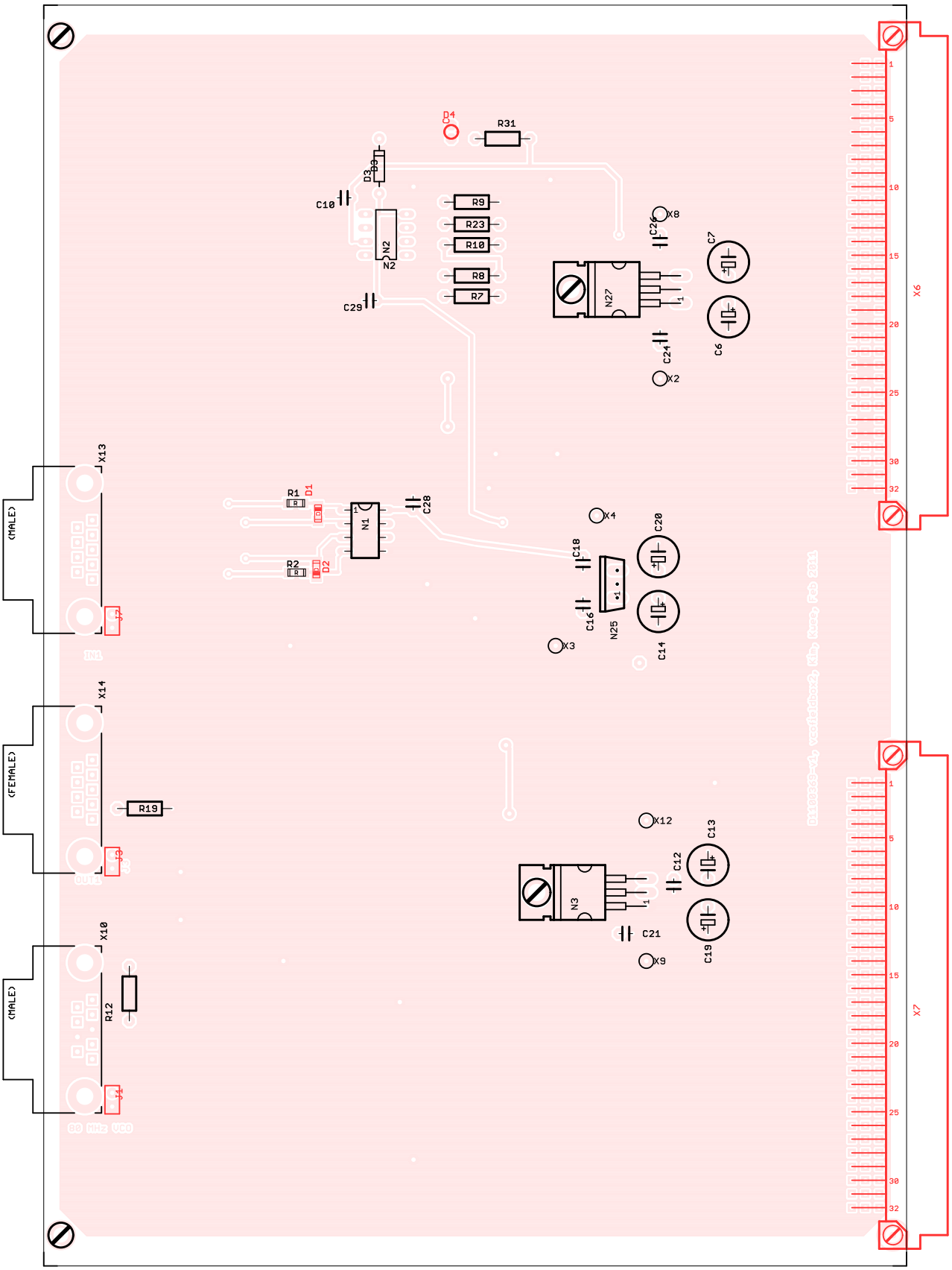

Figure 6: *Board top view showing placeplan with component names*
Components with undefined values are shown in red

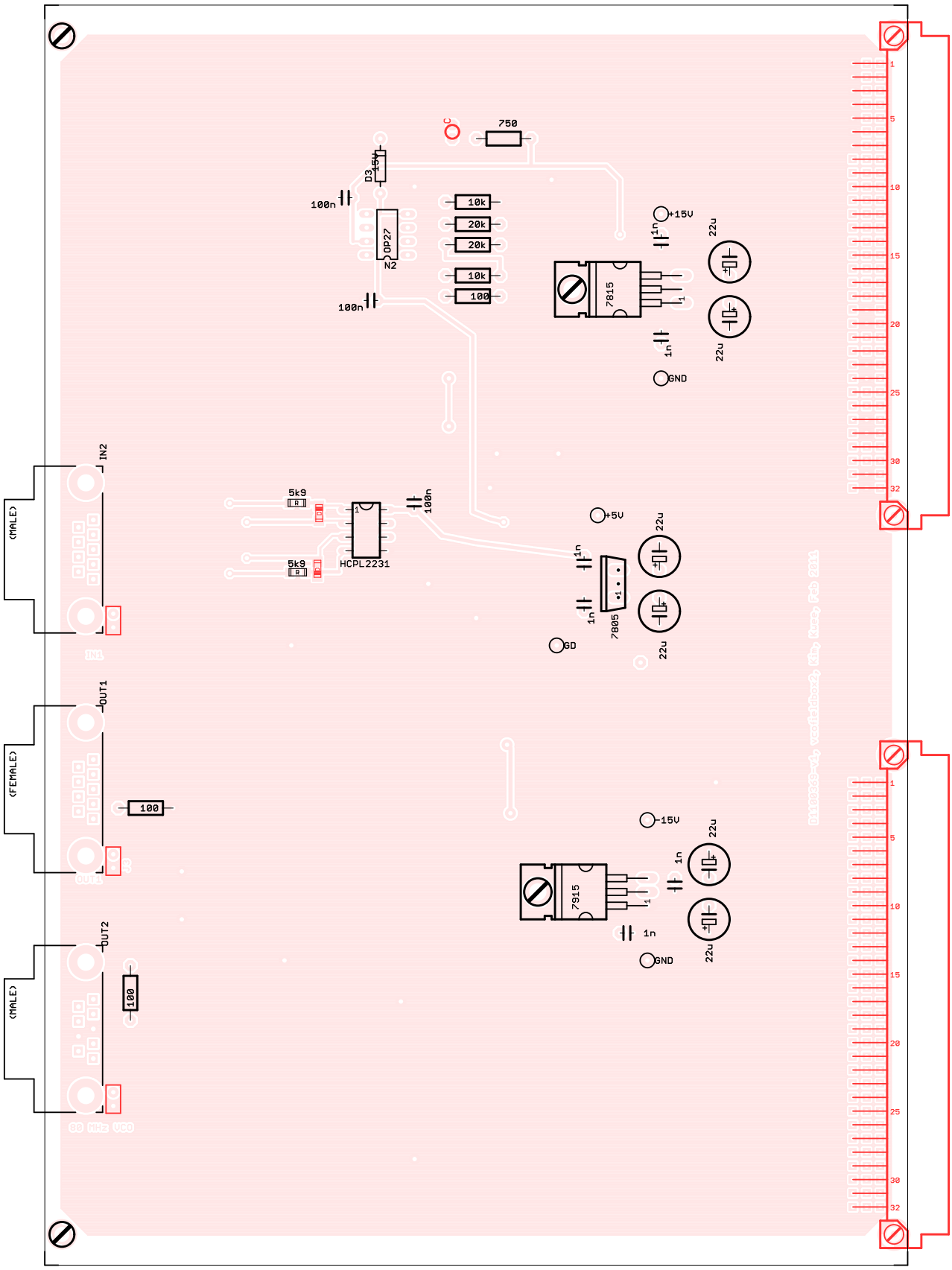

Figure 7: *Board top view showing placeplan with component values*
Components with undefined values are shown in red

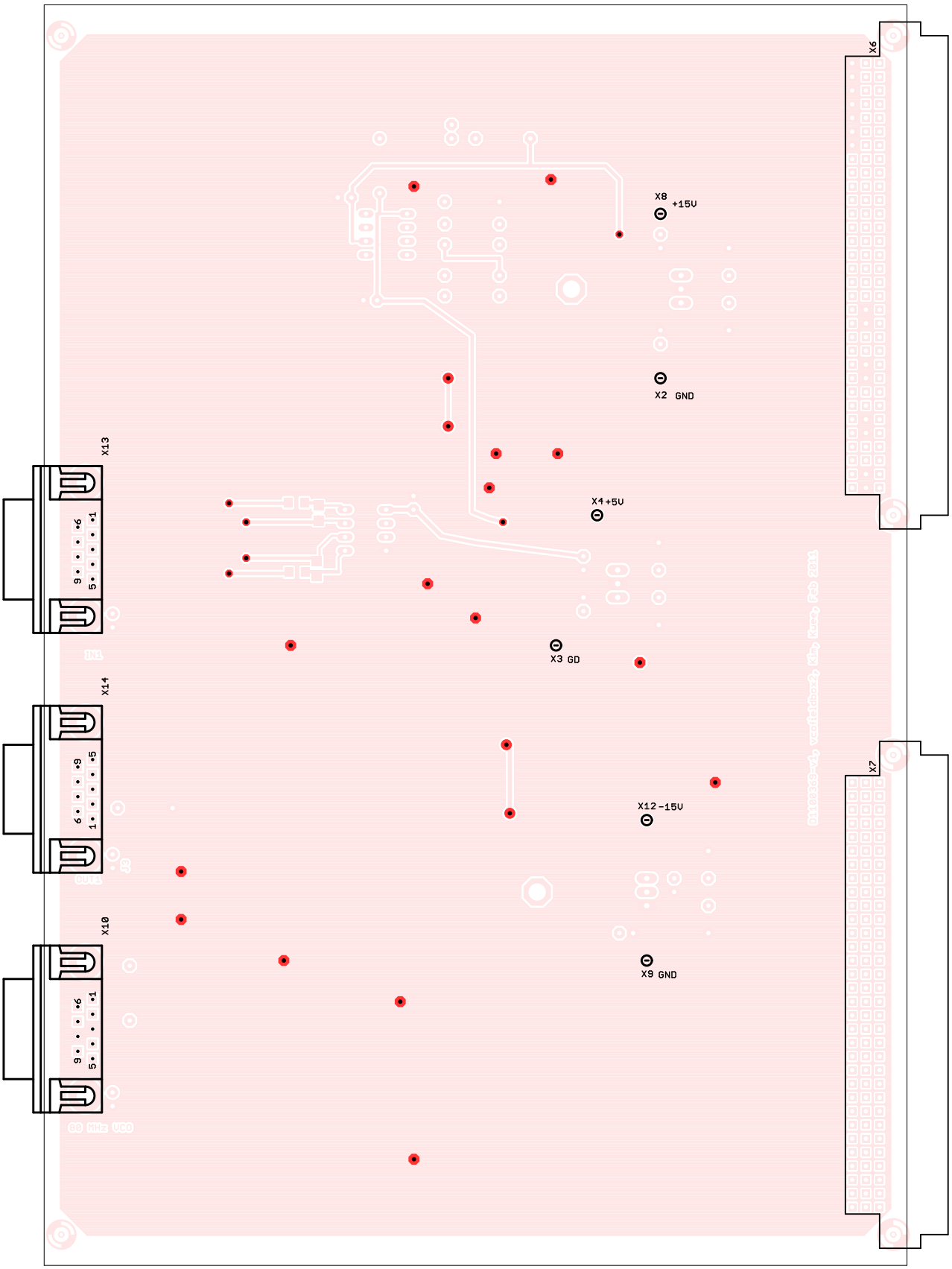

Figure 8: *Board top view showing connectors, test points, vias and wired components*

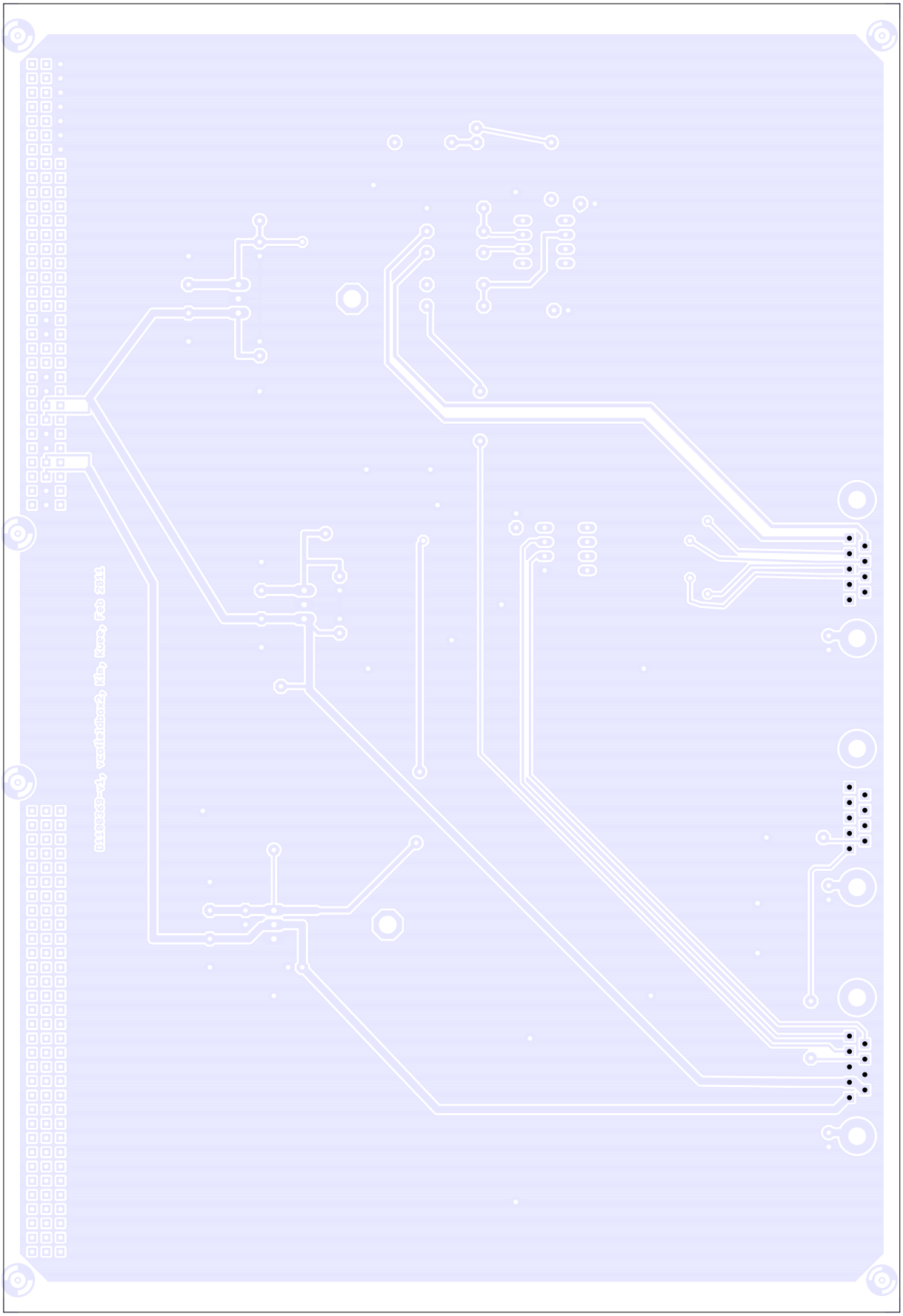

Figure 9: *Board bottom view showing drills with 0.9 mm (0.035 in) diameter*

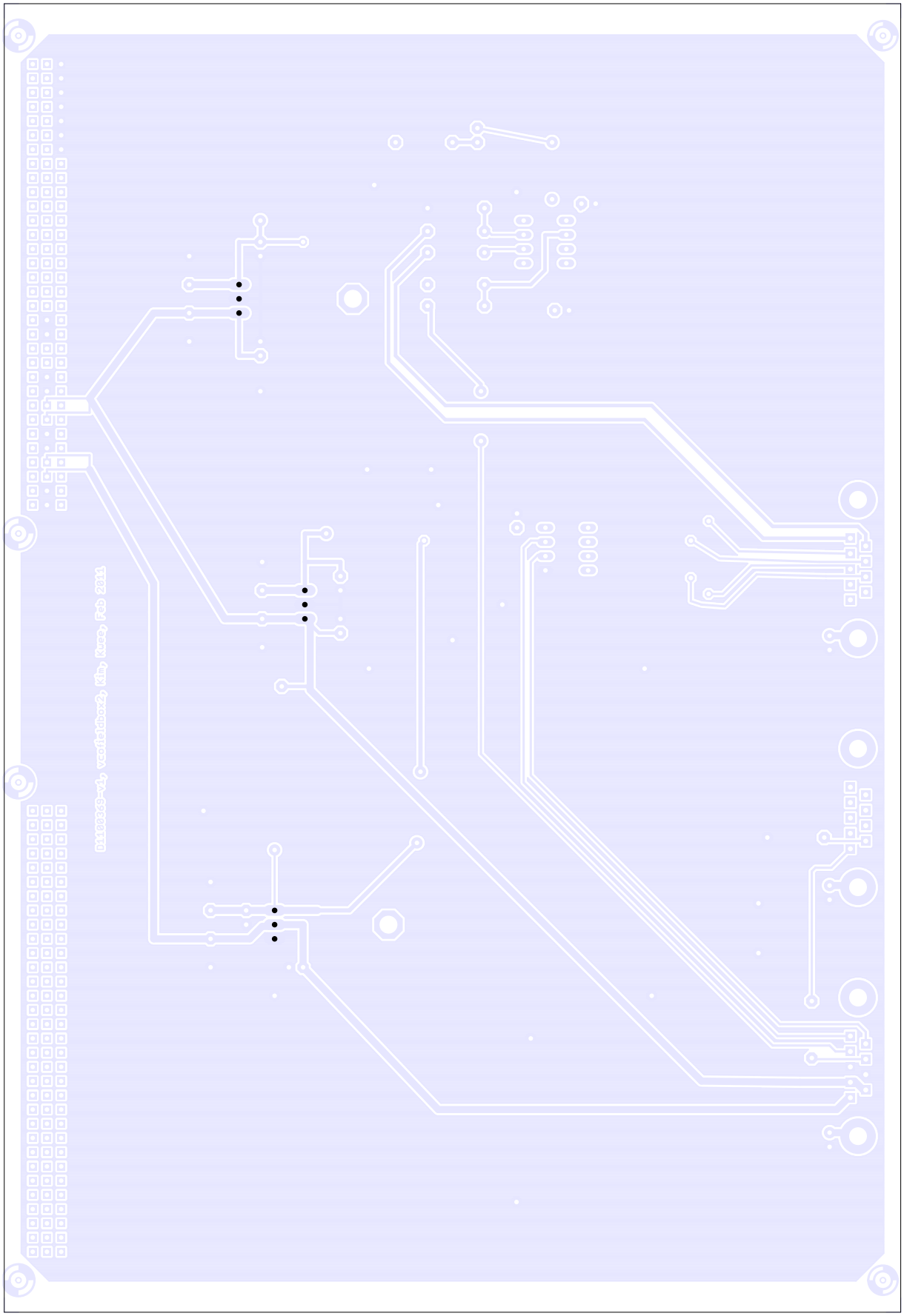

Figure 10: *Board bottom view showing drills with 1.0 mm (0.039 in) diameter*

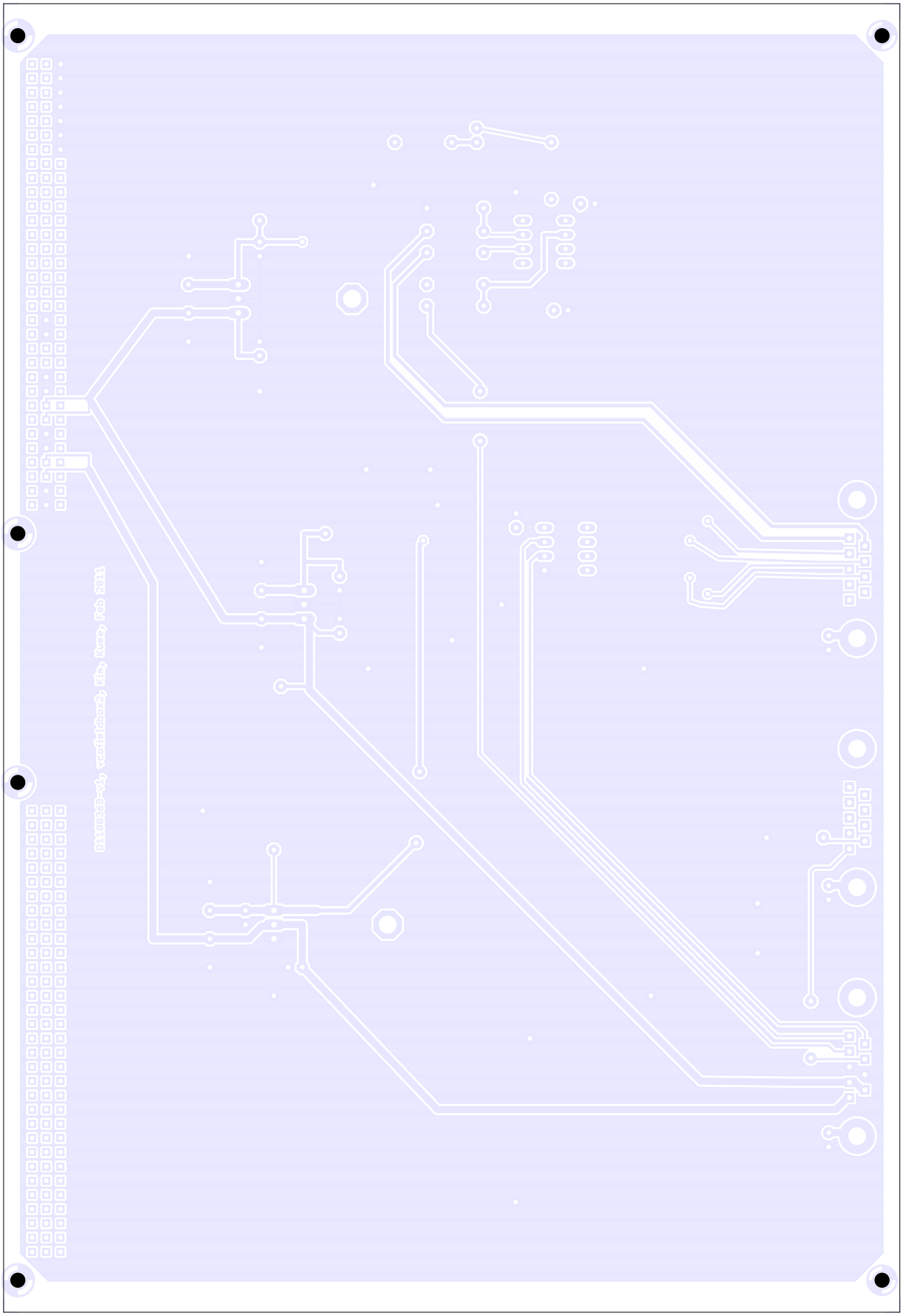

Figure 11: *Board bottom view showing drills with 2.7 mm (0.106 in) diameter*

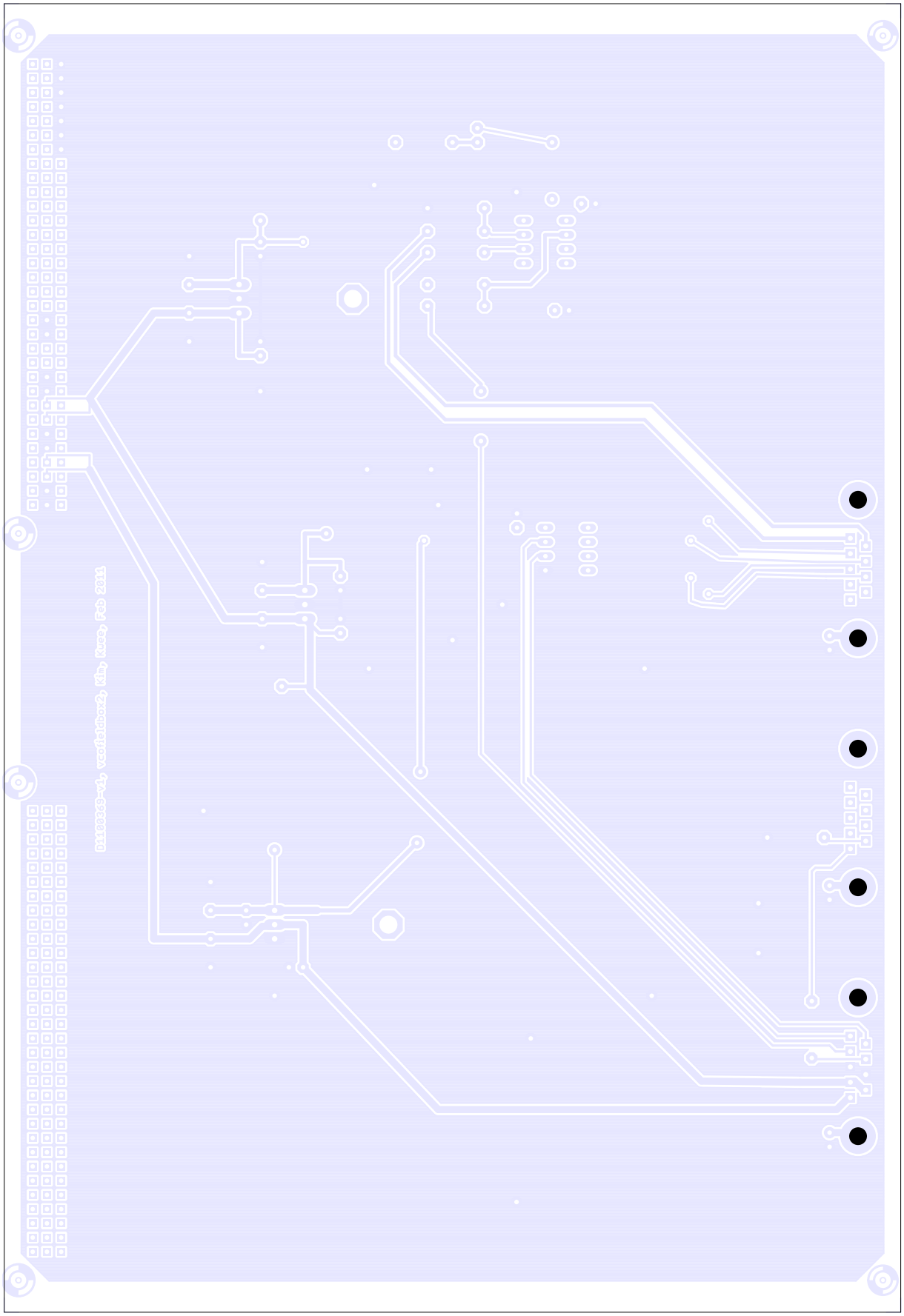

Figure 12: *Board bottom view showing drills with 3.2 mm (0.125 in) diameter*

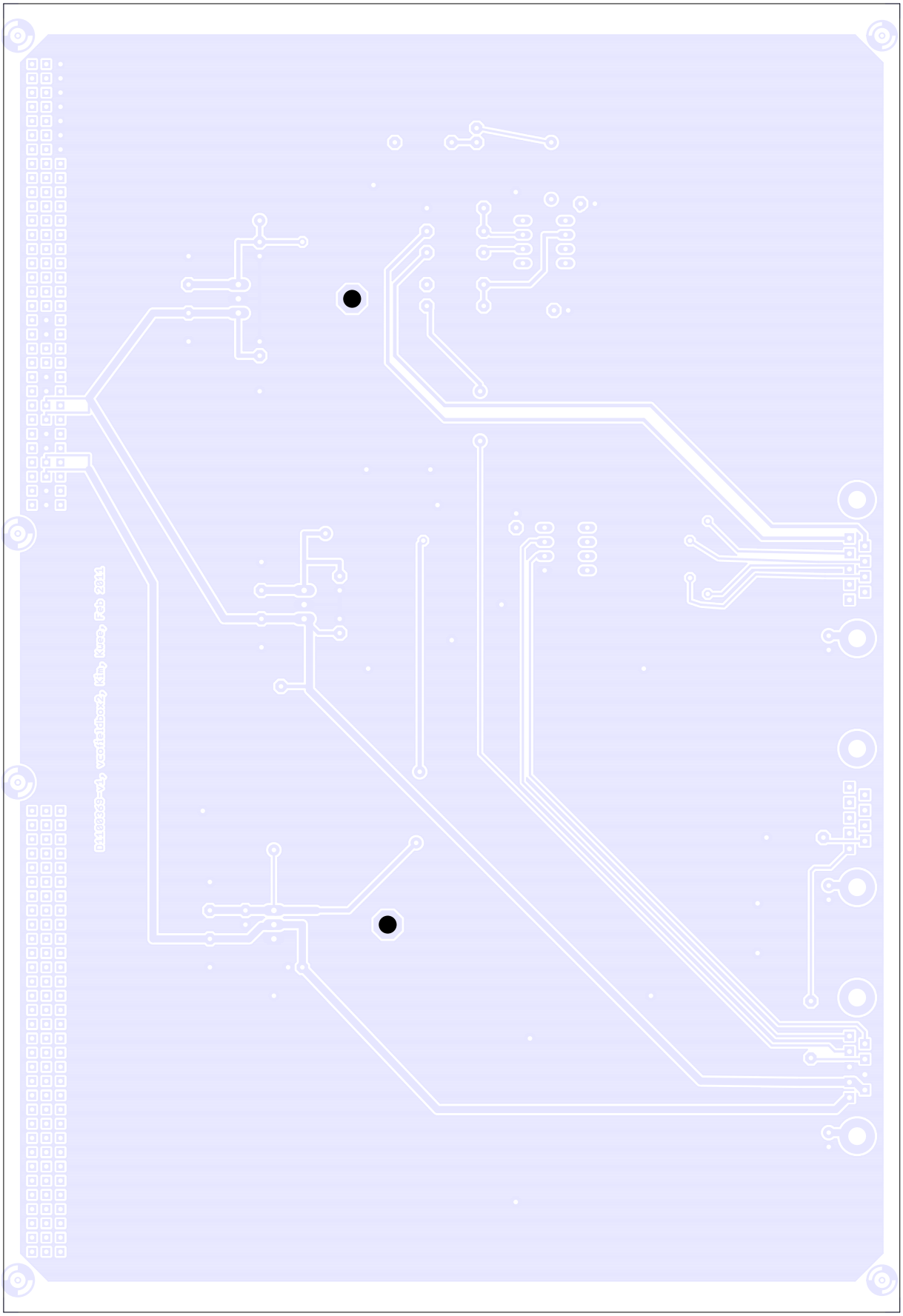

Figure 13: *Board bottom view showing drills with 3.2 mm (0.126 in) diameter*

Circuit Lists

Drill list: The following table shows all *final* drill diameters used in the board. When manually drilling the clearance holes, round up to the nearest available drill bit diameter, ensuring that all components fit well. When manufacturing *through-plated* boards, adjust for the additional copper coating by increasing the diameter accordingly.

∅ [µm]	∅ [mm]	∅ [in]	Count
812	0.8	0.032	295
889	0.9	0.035	27
990	1.0	0.039	9
2692	2.7	0.106	6
3175	3.2	0.125	6
3200	3.2	0.126	2
		Total	345

Table 1: *Drill diameters used in the board*

Standard properties: If not explicitly stated otherwise in the schematics or value and part lists, the circuit components have the following standard properties. Parts with 'better' properties can be easily substituted, but care should be taken if the specifications are *not* met.

- Wired resistors: Metal film 0.6 W, 1%, 200 V, TK 100
- SMD resistors: 1%, 150 V, TK 50, MiniMELF in thin film, other packages in thick film technology

Value list: The following list shows all components available on the board (sorted by part *values*) and can be used to quickly gather components. Names of components with undefined values are shown in red. Additional information can possibly be found directly on the board (or in the schematics).

```
EAGLE Version 5.11.0 Copyright (c) 1988-2010 CadSoft
Board value list of 'vcofieldbox2.brd'
Exported at 2011-02-28 16:45
Created with macro 'plot.ulp' (c) Andreas Weidner
Shown are: Value/Type,Package,Number,Names (Library)

---C---
1n              C-0.1"                  (6*)    C12,C16,C18,C21,C24,C26 (divers)
100n            C-0.1"                  (3*)    C10,C28,C29 (divers)
22u             CE-TANTAL:0.2"          (6*)    C6,C7,C13,C14,C19,C20 (divers)

---D---
15V             DZ-0.4"                 (1*)    D3 (diodes)
[undefined]     D-SMD:MiniMELF          (2*)    D1,D2 (divers)
                LED-3mm                 (1*)    D4 (opto)

---J---
[undefined]     JMP:Wire-0.1"           (3*)    J1,J3,J7 (connectors)

---N---
7805            TO-220                  (1*)    N25 (ic)
7815            TO-220                  (1*)    N27 (ic)
7915            TO-220                  (1*)    N3 (ic)
HCPL2231        DIP-8                   (1*)    N1 (ic_neu)
OP27            DIP-8                   (1*)    N2 (opamps)

---R---
100             R-0.4"                  (3*)    R7,R12,R19 (divers)
750             R-0.4"                  (1*)    R31 (divers)
```

```
5k9           R-SMD:1206              (2*)    R1,R2 (divers)
10k           R-0.4"                  (2*)    R8,R9 (divers)
20k           R-0.4"                  (2*)    R10,R23 (divers)

---X---
-15V          Testpin:0.8mm/ceramic   (1*)    X12 (connectors)
+5V           Testpin:0.8mm/ceramic   (1*)    X4 (connectors)
+15V          Testpin:0.8mm/ceramic   (1*)    X8 (connectors)
GD            Testpin:0.8mm/ceramic   (1*)    X3 (connectors)
GND           Testpin:0.8mm/ceramic   (2*)    X2,X9 (connectors)
IN2           D-SUB:9-pin/US/male     (1*)    X13 (connectors)
OUT1          D-SUB:9-pin/US/female   (1*)    X14 (connectors)
OUT2          D-SUB:9-pin/US/male     (1*)    X10 (connectors)
[undefined]   Backplane:96-pin/ABC    (2*)    X6,X7 (connectors)
```

Part list: The following list shows all components available in the schematics (sorted by part *names*) and can be used to quickly locate components. The column *Layer/Cell* shows the position of the part on the board: *T* for top side and *B* for bottom side, followed by the cell of the surrounding frame (if available). The column *Sheets/Cells* shows the position of *all* the part's gates in the schematics: Sheet number followed by the cell of the surrounding frame (if available). Names of components with undefined values are shown in **red**. Additional information can possibly be found directly in the schematics.

```
EAGLE Version 5.11.0 Copyright (c) 1988-2010 CadSoft
Schematics part list of 'vcofieldbox2.sch'
Exported at 2011-02-28 16:45
Created with macro 'plot.ulp' (c) Andreas Weidner
Shown are: Name,Value/Type,Package,Device,Layer/Cell,Sheets/Cells

---C---
C6    22u           CE-TANTAL:0.2"          CE02D                T  1
C7    22u           CE-TANTAL:0.2"          CE02D                T  1
C10   100n          C-0.1"                  C01N                 T  4
C12   1n            C-0.1"                  C01N                 T  1
C13   22u           CE-TANTAL:0.2"          CE02D                T  1
C14   22u           CE-TANTAL:0.2"          CE02D                T  1
C16   1n            C-0.1"                  C01N                 T  1
C18   1n            C-0.1"                  C01N                 T  1
C19   22u           CE-TANTAL:0.2"          CE02D                T  1
C20   22u           CE-TANTAL:0.2"          CE02D                T  1
C21   1n            C-0.1"                  C01N                 T  1
C24   1n            C-0.1"                  C01N                 T  1
C26   1n            C-0.1"                  C01N                 T  1
C28   100n          C-0.1"                  C01N                 T  3
C29   100n          C-0.1"                  C01N                 T  4

---D---
D1    [undefined]   D-SMD:MiniMELF         DS                   T  3
D2    [undefined]   D-SMD:MiniMELF         DS                   T  3
D3    15V           DZ-0.4"                 DZ                   T  2
D4    [undefined]   LED-3mm                 DL                   T  2

---J---
J1    [undefined]   JMP:Wire-0.1"           J01                  T  2
J3    [undefined]   JMP:Wire-0.1"           J01                  T  2
J7    [undefined]   JMP:Wire-0.1"           J01                  T  2

---N---
N1    HCPL2231      DIP-8                   HCPL2231             T  3
```

```
N2    OP27          DIP-8                  OP27                 T  4
N3    7915          TO-220                 79XXL                T  1
N25   7805          TO-220                 78XX                 T  1
N27   7815          TO-220                 78XXL                T  1

---R---
R1    5k9           R-SMD:1206             RS                   T  3
R2    5k9           R-SMD:1206             RS                   T  3
R7    100           R-0.4"                 R                    T  4
R8    10k           R-0.4"                 R                    T  4
R9    10k           R-0.4"                 R                    T  4
R10   20k           R-0.4"                 R                    T  4
R12   100           R-0.4"                 R                    T  5
R19   100           R-0.4"                 R                    T  5
R23   20k           R-0.4"                 R                    T  4
R31   750           R-0.4"                 R                    T  2

---X---
X2    GND           Testpin:0.8mm/ceramic  XT                   T  1
X3    GD            Testpin:0.8mm/ceramic  XT                   T  1
X4    +5V           Testpin:0.8mm/ceramic  XT                   T  1
X6    [undefined]   Backplane:96-pin/ABC   XB96                 T  1
X7    [undefined]   Backplane:96-pin/ABC   XB96                 T  1
X8    +15V          Testpin:0.8mm/ceramic  XT                   T  1
X9    GND           Testpin:0.8mm/ceramic  XTN                  T  1
X10   OUT2          D-SUB:9-pin/US/male    XO9-2S-DSUBMALE-US   T  2
X12   -15V          Testpin:0.8mm/ceramic  XTN                  T  1
X13   IN2           D-SUB:9-pin/US/male    XO9-2S-DSUBMALE-US   T  2
X14   OUT1          D-SUB:9-pin/US/female  XO9-2S-DSUBFEMALE-US T  2
```