FpcPlace

A Component Placement File Generator for FreePCB

User Guide

Project: minilausb35

  30 Footprints found.
  149 Parts found.

Units: INCH

Note: Bottom side coordinates are not mirrored.

⊗ Top SMD Centroids
⊗ Top Thru-Hole Centroids
⊗ Top Mixed Tech Centroids
⊙ Top Null Centroids
○ Top Glue

RefDes	Footprint	Side	Loc X	Loc Y	Glue X	Glue Y	Glu Dia	Technology	Pins
B1	BRECT	Top	1.8903	0.3603	1.8903	0.3603	0.0375	Thru-Hole	4
C1	C0805			2.4900	5.0274	2.4900	0.0375	SMD	2
C10	CHIP_C			2.9040	2.5760	2.9040	0.0375	SMD	2
C101	Radial1			0.3300	2.3191	0.3300	0.0375	Thru-Hole	2
C102	C0805			0.2000	2.7174	0.2000	0.0375	SMD	2
C103	Radial2			0.6800	2.2994	0.6800	0.0375	Thru-Hole	2
C104	C0805			2.0100	3.2826	2.0100	0.0375	SMD	2
C105	C0805			1.6200	3.6826	1.6200	0.0375	SMD	2
C106	C0805			2.0800	3.7426	2.0800	0.0375	SMD	2
C107	C0805			1.6400	3.2826	1.6400	0.0375	SMD	2
C108	C0805			0.7000	3.1674	0.7000	0.0375	SMD	2
C109	C0805			3.4800	2.9474	3.4800	0.0375	SMD	2
C110	C0805			2.9626	2.1000	2.9626	0.0375	SMD	2
C111	C0805			2.3500	2.7626	2.3500	0.0375	SMD	2
C112	C0805			3.8874	3.0500	3.8874	0.0375	SMD	2
C113	C0805						0.0375	SMD	2
C2	C0805						0.0375	SMD	2
C201	C0805						0.0375	SMD	2
C202	C0805	Bottom	0				0.0375	SMD	2
C203	C0805	Top	0				0.0375	SMD	2
C204	C0603	Bottom	0				0.0375	SMD	2
C205	C0805	Bottom	0				0.0375	SMD	2
C206	C0603	Bottom	1				0.0375	SMD	2
C207	C0603	Bottom	0				0.0375	SMD	2
C208	C0805	Top	1				0.0375	SMD	2
C209	C0805	Top					0.0375	SMD	2
C210	MyTANT_A	Top	1				0.0375	SMD	2
C3	C0805	Top	5				0.0375	SMD	2
C4	C0805	Top	4				0.0375	SMD	2
C5	C0805	Top	4				0.0375	SMD	2
C6	C0805	Top	4				0.0375	SMD	2
C7	C0805	Top	3.3400	3.4794	3.3400	3.4794	0.0375	SMD	2
C8	C0805	Top	3.8874	3.1000	3.8874	3.1000	0.0375	SMD	2
C9	CHIP_C	Bottom	3.5040	1.8500	3.5040	1.8500	0.0375	SMD	2

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Introduction

FpcPlace is a Win2K / WinXP console application that generates a component placement listing from the information contained in a *FreePCB* board file. An optional *.ini* file can be used to handle unusual components, override some default setting, add component values and control output formatting. RS-274X files can be generated from the placement data to verify data extraction.
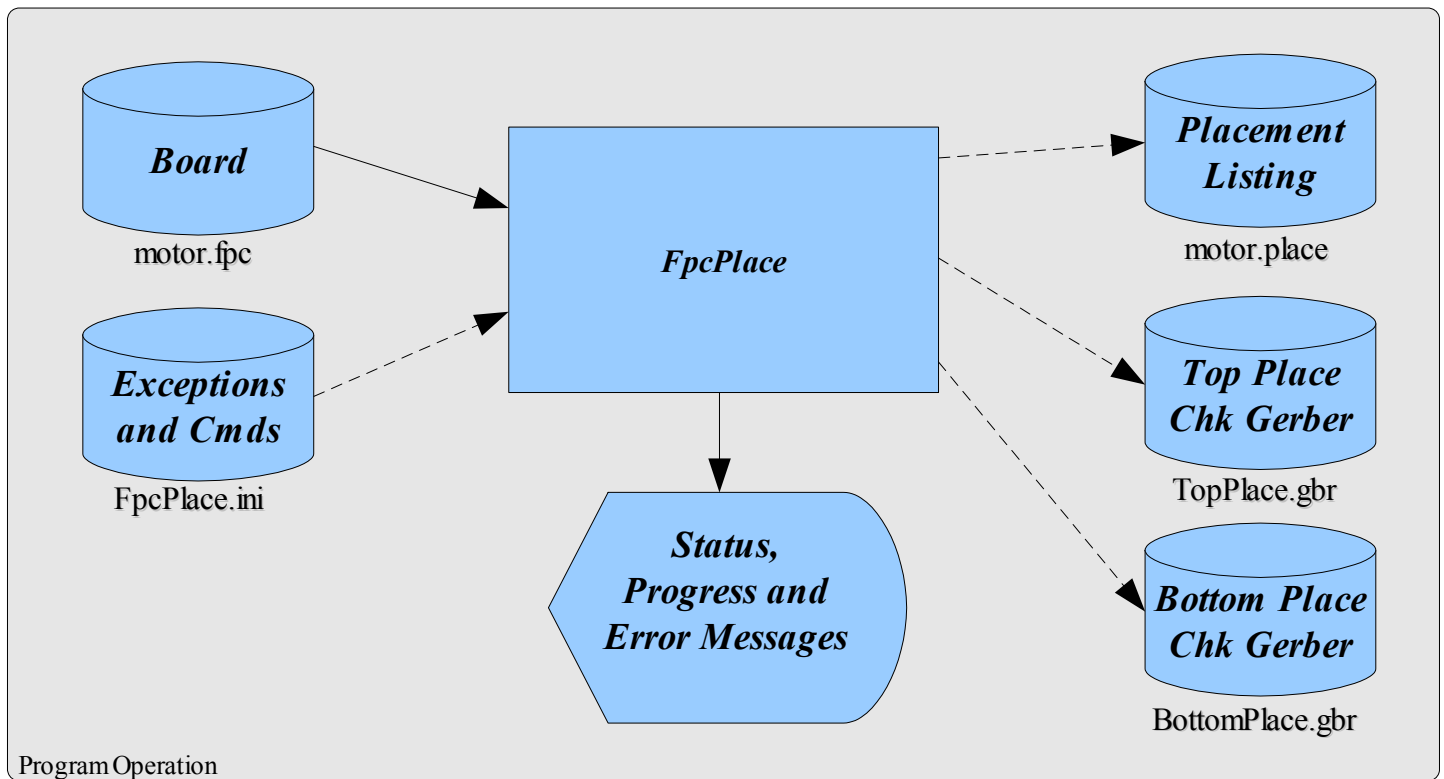
FpcPlace is a console filter which means that it uses the standard console devices *stdin* and *stdout* for data I/O. For stand alone operation, use file redirection to load the desired board file and control where the output listing goes. Additional control can be achieved by using an exceptions list file to handle asymmetric or virtual parts, change default values and control the output format.

Installation and Setup

FpfPlace is distributed as a set of files in a zip archive; no install utility is used. To install *FpcPlace*, extract the files **FpcPlace.exe** and **Font.XML** to any handy directory such as C:\Program Files\ FpcPlace\ or C:\Program Files\FreePCB\bin\.

If the path to **FpcPlace.exe** is not already included in the **PATH** variable, it must be added.

Additionally, this version of *FpcPlace* uses the file **Font.XML** file for Gerber text creation and the path variable **FPCfabFont** must be created and set to point to it. If *FPCfab* is already installed in your system, you can skip the font file installation.

For those unfamiliar with setting environment variables, assume for example that **FpcPlace.exe** is installed in the C:\Program Files\FreePCB\bin directory:

- Open the Control Panel
- Open the System tool
- Click the Advanced tab and open the Environment Variables
- Scroll the variable list down to and highlight the **path=** entry and click EDIT
- Click in the value field to clear the highlight
- Scroll to the end of the field and add **;C:\Program Files\FreePCB\bin** to the existing value
- Click OK to exit the edit window.
- Click NEW to create a new variable
- Set the **name** field to FPCfabFont and **value** field to C:\Program Files\FreePCB\bin.
- Click OK to exit the edit window.
- Click OK to save and exit the Environment Variables window

Parts and Exceptions

FpcPlace classifies parts, based on pin count and type, as SMD, Thru-Hole, Mixed Technology or Null. If a part is loaded with only smd pins, it is classed SMD. In like fashion, if all pads have holes, it considered a Thru-Hole part. If the part has a mix of pads with and without holes, it falls into the Mixed Technology class.
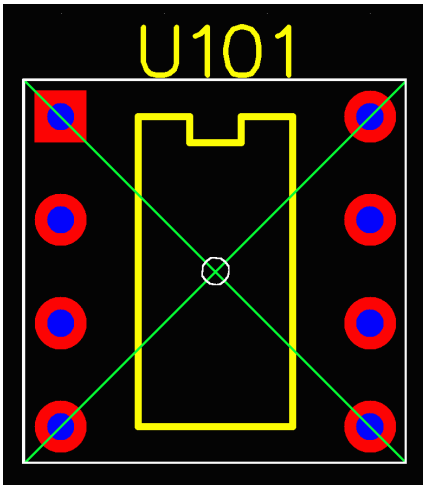
FreePCB defines the bounding box, called *sel_rect* in the board file, to be outside of all pads and lines by a fixed 10 mils without regard to text or refdes items.

By default **FpcPlace** uses the center of the component's bounding box as the centroid. The centroid, adjusted for rotation and board side, is used for both component and glue placement. For most symmetric parts, as shown at left, this method produces the correct result.
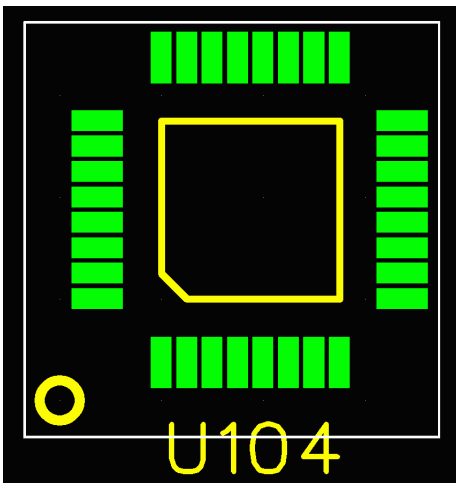
Unfortunately not all parts are symmetric. In this example, U104's footprint was modified to add a component orientation dot that extends beyond the pin area. This has skewed the bounding box down and to the left by 100 mils and, if uncorrected, would result in a placement error.
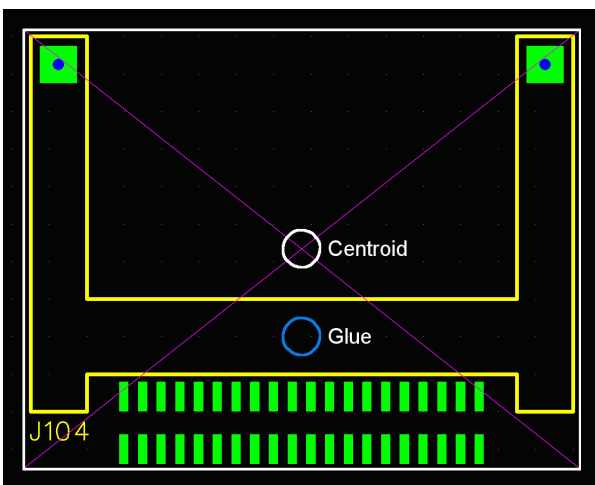
J104 is an example of an inherently irregular, asymmetric part. The part can be purchased with a detachable *pick-n-place* pad located at the centroid but glue, if used to anchor the part for reflow, would need to be under the body.

FpcPlace can compensate for problem parts, like those mentioned above, by including component exceptions in the **FpcPlace.ini** file. When **FpcPlace** starts, it looks for the file **FpcPlace.ini** in the current working directory. If found, it is loaded prior to loading the board file.

Operation

FpcPlace is a 32-bit console application; to use it, open a new command shell after the environment variables are edited. If the shell was opened prior to the environment edit, its copy of the environment <u>will not</u> be updated.

FpcPlace does not use any command line parameters to control its behavior; all optional controls are applied by including a *FpcPlace.ini* file in the working directory.

The following examples use an edited version of the motor.fpc board found in the tutorial section of FreePCB. Some parts were moved to the bottom side for illustration.

Run FpcPlace and send the results, in the default "show everything" format, to the console.

C:\PCBS\Motor> FpcPlace < motor.fpc

```
     FpcPlace - A Component Placement File Generator for FreePCB
                      Ver 1.10R (c)2006 Bruce Parham

Project: motor

   12 Footprints found.
   25 Parts found.


Project: motor

   12 Footprints found.
   25 Parts found.

Units: INCH


Note: Bottom side coordinates are not mirrored. Rotation is CW.
```

RefDes	Footprint	Side	Loc X	Loc Y	Glue X	Glue Y	Glu Dia	Technology	Pins
C1	CHIP_D	Top	0.5400	0.7620	0.5400	0.7620	0.0250	SMD	2
C2	C1206	Bottom	0.5400 L	1.1649	0.5400	1.1649	0.0250	SMD	2
C3	CHIP_B	Top	2.5000	1.4215	2.5000	1.4215	0.0250	SMD	2
C4	CHIP_B	Top	2.5000	0.8215	2.5000	0.8215	0.0250	SMD	2
C5	C1206	Bottom	0.9449	1.2800	0.9449	1.2800	0.0250	SMD	2
C6	C0805	Bottom	1.7600	0.7826	1.7600	0.7826	0.0250	SMD	2
C7	C0805	Top	2.0574	1.5800	2.0574	1.5800	0.0250	SMD	2
D1	CHIP_B	Top	0.3785	1.5000	0.3785	1.5000	0.0250	SMD	2
H1	HOLE_125_SQR_250	Top	0.1500	0.1500	0.1500	0.1500	0.0250	Thru-Hole	1 *
H2	HOLE_125_SQR_250	Top	0.1500	1.8500	0.1500	1.8500	0.0250	Thru-Hole	1 *
H3	HOLE_125_SQR_250	Top	2.8500 L	1.8500	2.8500	1.8500	0.0250	Thru-Hole	1 *
H4	HOLE_125_SQR_250	Top	2.8500	0.1500	2.8500	0.1500	0.0250	Thru-Hole	1 *
J104	XYZ_Socket	Top	3.6750	4.6325	3.6750	4.6325	0.0250	Mixed	42
JP1	5X2HDR-100	Top	2.1000	1.8500	2.1000	1.8500	0.0250	Thru-Hole	10
JP2	5X2HDR-100	Top	2.8500	1.3000	2.8500	1.3000	0.0250	Thru-Hole	10
JP3	5X2HDR-100	Top	2.8500	0.7000	2.8500	0.7000	0.0250	Thru-Hole	10
JP4	5X2HDR-100	Top	0.1500 L	0.7000	0.1500	0.7000	0.0250	Thru-Hole	10
JP5	3X2HDR-100	Top	1.5000	1.8500	1.5000	1.8500	0.0250	Thru-Hole	6
JP6	1X2HDR-100	Top	0.1000	1.4500	0.1000	1.4500	0.0250	Thru-Hole	2
R1	C1206	Top	2.5000	1.1449	2.5000	1.1449	0.0250	SMD	2
R2	C1206	Top	2.5000	0.5449	2.5000	0.5449	0.0250	SMD	2
R3	C1206	Top	0.6551	1.5000	0.6551	1.5000	0.0250	SMD	2
U1	28DIP300_A5	Top	1.4500 L	0.9500	1.4500	0.9500	0.0250	Thru-Hole	28
U101	Dip8	Top	-0.1500	5.0500	-0.1500	5.0500	0.0250	Thru-Hole	8
U104	qfp-32	Top	2.2687	4.8487	2.2687	4.8487	0.0250	SMD	32
U2	14DIP300	Top	2.0500	1.1000	2.0500	1.1000	0.0250	Thru-Hole	14
U3	TO-220	Top	0.9900	1.6000	0.9900	1.6000	0.0250	Thru-Hole	3
Y1	8DIP300	Top	0.9500	0.9500	0.9500	0.9500	0.0250	Thru-Hole	8

```
Done!
```

And the same example with the output sent to motor.place.

C:\PCBS\Motor> FpcPlace < motor.fpc > motor.place

```
   FpcPlace - A Component Placement File Generator for FreePCB
                   Ver 1.10R (c)2006 Bruce Parham

Project: motor

  12 Footprints found.
  25 Parts found.

Done!
```

FpcPlace.ini Details

The *ini* file can contain a combination of exception records, embedded command, comments and blank lines.

Exceptions specify a footprint by name and apply to all instances of that footprint within the board file. A footprint exception can be used to suppress the listing of virtual parts, like mounting holes and test points, that do not correspond to any real parts. Exceptions can also specify the centroid and glue spot locations as well as the glue spot size. Exception records are somewhat free form in that leading white space can be freely used and parameters can be separated by one or more spaces and a record can include a trailing comment. A record may contain two, four, six or seven parameters. Any record with one, three or five parameter will be rejected. Blank lines and anything after a semicolon ";", including the semicolon, are ignored as comments. Leading white space (spaces or tabs) is ignored. All linear dimensions are in INCH units. All coordinate dimensions are relative to the unrotated footprint <u>origin</u> as viewed in the *FreePCB* Footprint Editor or Footprint Wizard. Coordinates are <u>not</u> based on the location of Pin-1. Single line comments and blank lines can be freely used for documentation and readability. Exception records for a given footprint may be entered more than once with the last entry overriding earlier entries.

Exception Record format:

Footprint_name Ignore [[[{LocX LocY}] {GlueX GlueY}] GlueDia]

Footprint_name   The name of the footprint that the listed actions will be applied to.
                      >>> <u>This FIELD IS CASE sensitive.</u> <<<

Ignore   Boolean flag. If TRUE, any part using this footprint will be omitted from the output
                      listing. Set for mechanical parts, mounting holes, SMT test points, etc.

 LocX LocY   New placement centroid location relative to the unrotated component origin. Set both
                      values to less than -9.0 to ignore the field and use the default values.

GlueX GlueY   New glue spot location relative to the unrotated component origin. Set both values to less
                      than -9.0 to ignore the field and use the default values.

GlueDia   Glue spot diameter. Use this field to override the default 0.025" spot size. Enter 0.0 for
                      no glue.

Ex:

MTH-8 1	Ignore mounting holes using the "MTH-8" footprint
SOIC-8 0 -10 -10 -10 -10 0.075	Change the glue spot size on "SOIC-8" parts to 75 mils. Placement and glue spot locations will use default values.
CFT-125 0 -10 -10 .625 .135	Change the glue spot location to 0.625,0.135 on "CFT-125" parts. Component placement and glue spot size will use default values.
FatParts 0 1.2345 1.1234	Relocate the placement center of "FatParts". Glue size and location use default values.

Embedded commands

Embedded commands can be used in the ini file to change system default setting like the glue spot size and what type has glue applied. The format for embedded commands is similar to exception records in that trailing white space and comments can be freely used but commands <u>must start with a hyphen '-' in column 1</u> (NO LEADING WHITE SPACE) followed immediately in column 2 with the command character. The command character is <u>not</u> case sensitive, upper or lower case produce the same results. Any accompanying parameter(s) may follow immediately or be separated one or more white space characters.

String parameters are delimited by white space. To include spaces within the string, enclose the whole string within quotes (″). The *Header* and *Ival* parameter strings are both limited to 16 characters and if longer, will be truncated. The *Ref* string can contain one or more *RefDes* substrings. *Ref* itself is limited 256 characters while any *RefDes* substrings are limited to 32 characters. The EOF *Message* string is limited to 127 characters.

Commands can be entered more than once with the last entry overriding earlier entries.

The following commands are currently defined:

-C *n* [*x.xx y.yy*] Control Gerber check plot file generation. Boolean flag *n*, when TRUE, enables file generation. The optional x.xx y.yy coordinate pair, if present, override the default (0.5, -0.5) location of the icon table. (The point defined is the upper left corner). Set *n* to 1 to enable multiple data layers or 2 to use a single data layer for all objects. A file is created for each side that contains any unsuppressed parts.

-D *x.xxxx*   Glue spot Diameter. Change the default 0.025 inch glue spot diameter to *x.xxxx* inch.

-E [M*essage*]   End Of File. This command is optional and, if found, will stop exception file processing. If present, the Message string is displayed on the console.

-F *n* [*Header*]   Output listing Format. Change the output format to *n*. If present, the *Header* string will enable the optional **Info** column and become the column header. See the **Output Formats** section for more details.

-G *n1 n2 n3 n4* Glue spot control by technology. Boolean values globally control glue spot size. A zero value forces a glue spot size of zero for the selected technology, a non-zero value allows the default or specified size to be used. N1 controls SMD parts, N2 thru-hole parts, N3 mixed technology parts an N4 Null parts. The N1 SMD parameter must be entered. If fewer than four parameters are entered, the last one entered is applied to the remaining empty fields.

Embedded commands continued

-I *Ref Ival*   Add *Ival* to component *Ref*. If the **Info** column output is enabled, *Ival* will be listed for component *Ref*. *Ref* can consist of a single entry like <u>C101</u> or multiple entries separated by commas and/or spaces. *Ref* and/or *Ival* must be quoted if spaces are included.
Some valid examples for *Ref:*

   R1,R2,R3,R4 4.7K   Comma separated list without spaces.
  ″R1 R2 R3 R4″ ″4.7K 1W″   Quoted space separated list.
  ″R1, R2, R3, R4″ ″1.00M 1%″ Quoted comma separated list with embedded spaces.

-M *n*   Boolean flag *n* controls how mechanical parts are handled. If *n* is zero, mechanical parts are classed as Null (no pins). If not zero, mechanical parts are treated like any other thru-hole part. (Mechanical parts are found by pin analysis and are defined as parts with drilled pins without any copper or round pads the same diameter as the drill.)

-R *n*   Boolean flag *n* controls displayed component rotation. ***FreePCB*** measures component rotation as positive in the clockwise direction. Standard math and most CAD systems consider positive rotation to be counter-clockwise. With this flag set, rotations are displayed as CCW equivalent values, i.e. 0->0, 90->270, 180->180, 270->90. This only effects the displayed values, centroid rotations are handled per the ***FreePCB*** defined angle.

-T *s.sss*   Scale the targets used in Gerber check plots. Allowable range 0.01 – 1.35.

-V *n*   Boolean flag *n* controls verbose debug output.

Embedded command examples:

-C 1 3.500 2.750	Enable Gerber check plots with multiple data layers and move the target icon table to 3.5,2.75.
-c 2	Enable Gerber check plots using a single data layer within each file.
-c 0	Gerber plots off (default).
-d 0.052	Change the default glue spot size to 52 mils.
-F 0	Use format 0 without **Info** column display. This is the normal default display.
-F 1	Use format 1 for output. No **Info** column displayed.
-f 0 Value	Use format 0 and include the **Info** column. Title the **Info** column **Value**.
-f 0 ″New Value″	Format 0 with **Info** column title **New Value**.
-F 2	Use CSV format 2. (No Info column option with this format.)
-G 1 0	Enable glue for SMD, all others off.
-G 0 1 0	Glue off for SMD and mixed, on for thru-hole.
-G 0	Glue off for all.
-g 1	Glue on for all. This is the default value.
-I C101 220pf	Add <u>220pf</u> to the **Info** column entry for C101.
-I C3 ″220pf 200V″	Add <u>220pf 200V</u> to the Info column entry for C3.
-I C1,C2,C3 ″.1uF 15V″	Add <u>.1uF 15V</u> to the Info column entry for C1, C2 and C3.
-i ″C1 C3 C7″ ″33pf 1%″	Add <u>33pf 1%</u> to the Info column entry for C1, C3 and C7
-i R1 ″4700 100 Watt 10%″	Add <u>4700 100 Watt 10</u> to the Info column entry for C3. Note that only the first sixteen characters are used.
-I R201 Omit	Omit R201 in this configuration.
-M 1	Treat mechanical parts as normal Thru-Hole parts. Default value.
-m 0	Treat mechanical parts as Null without regard to the number of pins.
-R 1	Set displayed rotation to CCW. Default is CW.
-T 0.5	Scale Gerber targets by 0.5. Default is 1.000.
-v 1	Enable debug output (to stderr).
-E ″Normal Config Loaded″	End exception processing now, ignore the rest of the file.
-G 1 ; Glue everything!	A command with a trailing comment.
; A comment line	A comment only line.

An example ini file with <u>two</u> configurations:

```
;       FpcPlace Ini for XYZ co. A12345 board

; Comment out the first EOF command to enable the Option 1 configuration.

-v 1                    ; debug display on

-c 1 3.5 2              ; do Gerber check plots using separate data layers
-c 2                    ; Gerber plots on a single data layers
-c 0                    ; Gerbers off (default)
-t .75                  ; scale targets to 75% of default

-f 1 "Comp Value"       ; select format, add value column

-m 1                    ; class mech parts as Null

        ; List values for all passives

; All caps
-I C101 "100pF 16V"
-I C102 "220pF 16V"
-I C103 ".1uF 25V"
-I C104,C106 "10uF 6.3V"
-I C105 "22pF 16V"

; All res
-I R101 "100K 1%"
-I R102 "4.7K 1%"
-I R103 "330 5%"
-I R104 "49.9 1%"
-I "R105 R106" "1.12M 1%"

-i J101 "2x6 header"

  R1206 0 -10 -10 -10 -10 0.04      ; 1206 parts use 40 mil glue spots
  C1206 0 -10 -10 -10 -10 0.04

  XYZ_Logo 1                        ; unlist some null parts
  MTH-6    1
  TP40mil  1

-r 1                    ; rotation CCW
-g 1 0                  ; just glue smd parts
-d 0.032                ; change default to 32 mils

-e "Standard Configuration Loaded"  ; end "Standard Configuration" load

; Option 1 configuration

      ; Item that differ from standard (override previous entries)

-I C101 "470pF 16V"
-I C102 Omit

-I R104 "100 1%"

-e "Opt-1 Configuration Loaded"     ; end "Standard Configuration" load
```

Verbose (Debug) display

With the output listing redirected to a file, the only information displayed on the terminal is a sign-on message and, if an ini file is used, some line and item counts. If the board file is corrupted, some error messages may also show up.

Ex.:

```
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                    Ver 1.20R (c)2006 Bruce Parham

 29 lines examined
 11 valid embedded commands found
  4 info records loaded
  5 exceptions loaded

Project: motor_mod

 19 Footprints found.
 32 Parts found.

Done!
```

With the <u>Verbose</u> display enabled, additional information, currently limited to ini file parsing, is displayed. Each exception and embedded command encountered in the ini file produces a message. This feature can be used to diagnose unexpected operation. In the example below, line 14 contains an undefined command and line 24 redefined the exception settings for *Circ200*.

```
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 Line  3: Verbose output enabled
 Line  4: Output Format changed to 1  Info Hdr: Component Value
 Line  5: Mechanical parts are Null
 Line  7: Adding Info: C1 100pf
          Adding Info: C3 100pf
 Line  8: Adding Info: C2 2.2  25V
 Line  9: Adding Info: R1 4.7K  1/2W
          Adding Info: R3 4.7K  1/2W
          Adding Info: R5 4.7K  1/2W
 Line 10: Replaced Info: R1 4.7K  1206
 Line 11: Adding Info: Mech1 Antenna support
 Line 13: Rotation set to CCW
 Line 14: Bogus Command Ignored: -z bad
 Line 16: Added: XYZ_Socket 0 -10 -10 0.475 0.30 0.10
 Line 18: Added: HOLE_125_SQR_250 1
 Line 20: Added: SMD-TP50 1
 Line 22: Added: Circ200 0
 Line 24: Replaced: Circ200 1
 Line 26: Added: Logo1 1
 Line 28: Verbose output disabled

 Line 29 - EOF: End of Demo Ini Processing

 29 lines examined
 11 valid embedded commands found
  4 info records loaded
  5 exceptions loaded

Project: motor_mod

 19 Footprints found.
 32 Parts found.

Done!
```

Output Formats

FpcPlace currently supports three distinct output formats. The default "show everything" format 0 displays all relevant information for each part with the parts sorted by RefDes. Format 1 uses the same general layout but groups the parts based on board side and technology. Format 2 is a special CSV (Comma Separated Values) layout requested by an early user.

Format 0 example without any INI file used:

```
Project: motor_mod

  19 Footprints found.
  32 Parts found.

Units: INCH

Note: Bottom side coordinates are not mirrored. Rotation is CW

  RefDes        Footprint           Side    Loc X     Loc Y    Rot  Glue X   Glue Y   Glu Dia  Technology  Pins
  --------   --------------------   ------  -------   -------   ---  -------  -------  -------  ----------  ----
  C1         CHIP_D                 Top     0.5400    0.7620     90  0.5400   0.7620   0.0250   SMD           2
  C2         C1206                  Bottom  0.5400 L  1.1649    270  0.5400   1.1649   0.0250   SMD           2
  C3         CHIP_B                 Top     2.5000    1.4215     90  2.5000   1.4215   0.0250   SMD           2
  C4         CHIP_B                 Top     2.5000    0.8215     90  2.5000   0.8215   0.0250   SMD           2
  C5         C1206                  Bottom  0.9449    1.2800      0  0.9449   1.2800   0.0250   SMD           2
  C6         C0805                  Bottom  1.7600    0.7826    270  1.7600   0.7826   0.0250   SMD           2
  C7         C0805                  Top     2.0574    1.5800      0  2.0574   1.5800   0.0250   SMD           2
  CIR1       Circ200                Top     1.0000    0.5000      0  1.0000   0.5000   0.0250   Null          0 *
  CIR2       Logo1                  Top     2.1750    0.1300      0  2.1750   0.1300   0.0250   Null          0 *
  D1         CHIP_B                 Top     0.3785    1.5000      0  0.3785   1.5000   0.0250   SMD           2
  H1         HOLE_125_SQR_250       Top     0.1500    0.1500      0  0.1500   0.1500   0.0250   Thru-Hole     1 *
  H2         HOLE_125_SQR_250       Top     0.1500    1.8500      0  0.1500   1.8500   0.0250   Thru-Hole     1 *
  H3         HOLE_125_SQR_250       Top     2.8500 L  1.8500      0  2.8500   1.8500   0.0250   Thru-Hole     1 *
  H4         HOLE_125_SQR_250       Top     2.8500    0.1500      0  2.8500   0.1500   0.0250   Thru-Hole     1 *
  J104       XYZ_Socket             Top     2.1750 L  2.9325      0  2.1750   2.9325   0.0250   Mixed        42
  JP1        5X2HDR-100             Top     2.1000    1.8500      0  2.1000   1.8500   0.0250   Thru-Hole    10
  JP2        5X2HDR-100             Top     2.8500    1.3000     90  2.8500   1.3000   0.0250   Thru-Hole    10
  JP3        5X2HDR-100             Top     2.8500    0.7000     90  2.8500   0.7000   0.0250   Thru-Hole    10
  JP4        5X2HDR-100             Top     0.1500 L  0.7000     90  0.1500   0.7000   0.0250   Thru-Hole    10
  JP5        3X2HDR-100             Top     1.5000    1.8500      0  1.5000   1.8500   0.0250   Thru-Hole     6
  JP6        1X2HDR-100             Top     0.1000    1.4500    180  0.1000   1.4500   0.0250   Thru-Hole     2
  Mech1      Mech part              Top     0.7000    3.1000      0  0.7000   3.1000   0.0250   Thru-Hole     5 *
  R1         C1206                  Top     2.5000    1.1449     90  2.5000   1.1449   0.0250   SMD           2
  R2         C1206                  Top     2.5000    0.5449     90  2.5000   0.5449   0.0250   SMD           2
  R3         C1206                  Top     0.6551    1.5000      0  0.6551   1.5000   0.0250   SMD           2
  TP101      SMD-TP50               Top     1.0000    0.5000      0  1.0000   0.5000   0.0250   SMD           1 *
  U1         28DIP300_A5            Top     1.4500 L  0.9500     90  1.4500   0.9500   0.0250   Thru-Hole    28
  U101       Dip8                   Top     0.0000    2.5500     90  0.0000   2.5500   0.0250   Thru-Hole     8
  U104       qfp-32                 Top     0.7188    2.5688      0  0.7188   2.5688   0.0250   SMD          32
  U2         14DIP300               Top     2.0500    1.1000     90  2.0500   1.1000   0.0250   Thru-Hole    14
  U3         TO-220                 Top     0.9900    1.6000    270  0.9900   1.6000   0.0250   Thru-Hole     3
  Y1         8DIP300                Top     0.9500    0.9500     90  0.9500   0.9500   0.0250   Thru-Hole     8
```

By using the following ini file...

```
;       FpcPlace ini file for motor_mod.fpc

-f 0  ; "Component Value"
-m 0                        ; mech parts are null

-i C1,C3,C4,C6 100pf
-i "C2 C5 C7" "2.2  25V"
-i R1 "4.7K  1206"
-i Mech1 "Antenna support"

-r 1        ; show rotation as CCW
-z bad

    XYZ_Socket 0 -10 -10 0.475 0.30 0.10  ; relocate glue spot and make bigger
    HOLE_125_SQR_250 1        ; suppress mounting holes
    SMD-TP50 1               ; and test points
    Circ200 1               ; graphic or mech part
    Logo1 1

-e "End of Demo Ini Processing"  ; End of File with optional message
```

The same board file listing looks like:

```
Project: motor_mod

  19 Footprints found.
  32 Parts found.

Units: INCH

Note: Bottom side coordinates are not mirrored. Rotation is CCW


  RefDes   Component Value        Footprint         Side    Loc X     Loc Y    Rot  Glue X   Glue Y   Glu Dia  Technology  Pins
  -------- ----------------  --------------------   ------  -------   -------   ---  -------  -------  -------  ----------  ----
  C1       100pf             CHIP_D                 Top     0.5400    0.7620   270  0.5400   0.7620   0.0250   SMD            2
  C2       2.2  25V          C1206                  Bottom  0.5400 L 1.1649    90  0.5400   1.1649   0.0250   SMD            2
  C3       100pf             CHIP_B                 Top     2.5000    1.4215   270  2.5000   1.4215   0.0250   SMD            2
  C4       100pf             CHIP_B                 Top     2.5000    0.8215   270  2.5000   0.8215   0.0250   SMD            2
  C5       2.2  25V          C1206                  Bottom  0.9449    1.2800    0   0.9449   1.2800   0.0250   SMD            2
  C6       100pf             C0805                  Bottom  1.7600    0.7826   90   1.7600   0.7826   0.0250   SMD            2
  C7       2.2  25V          C0805                  Top     2.0574    1.5800    0   2.0574   1.5800   0.0250   SMD            2
  D1                         CHIP_B                 Top     0.3785    1.5000    0   0.3785   1.5000   0.0250   SMD            2
  J104                       XYZ_Socket             Top     2.1750 L 2.9325    0   2.1750   2.7000   0.1000   Mixed         42
  JP1                        5X2HDR-100             Top     2.1000    1.8500    0   2.1000   1.8500   0.0250   Thru-Hole     10
  JP2                        5X2HDR-100             Top     2.8500    1.3000   270  2.8500   1.3000   0.0250   Thru-Hole     10
  JP3                        5X2HDR-100             Top     2.8500    0.7000   270  2.8500   0.7000   0.0250   Thru-Hole     10
  JP4                        5X2HDR-100             Top     0.1500 L 0.7000   270  0.1500   0.7000   0.0250   Thru-Hole     10
  JP5                        3X2HDR-100             Top     1.5000    1.8500    0   1.5000   1.8500   0.0250   Thru-Hole      6
  JP6                        1X2HDR-100             Top     0.1000    1.4500   180  0.1000   1.4500   0.0250   Thru-Hole      2
  Mech1    Antenna support   Mech part              Top     0.7000    3.1000    0   0.7000   3.1000   0.0250   Null           5 *
  R1       4.7K  1206        C1206                  Top     2.5000    1.1449   270  2.5000   1.1449   0.0250   SMD            2
  R2                         C1206                  Top     2.5000    0.5449   270  2.5000   0.5449   0.0250   SMD            2
  R3                         C1206                  Top     0.6551    1.5000    0   0.6551   1.5000   0.0250   SMD            2
  U1                         28DIP300_A5            Top     1.4500 L 0.9500   270  1.4500   0.9500   0.0250   Thru-Hole     28
  U101                       Dip8                   Top     0.0000    2.5500   270  0.0000   2.5500   0.0250   Thru-Hole      8
  U104                       qfp-32                 Top     0.7188    2.5688    0   0.7188   2.5688   0.0250   SMD           32
  U2                         14DIP300               Top     2.0500    1.1000   270  2.0500   1.1000   0.0250   Thru-Hole     14
  U3                         TO-220                 Top     0.9900    1.6000   90   0.9900   1.6000   0.0250   Thru-Hole      3
  Y1                         8DIP300                Top     0.9500    0.9500   270  0.9500   0.9500   0.0250   Thru-Hole      8
```

Some comments about Format 0:

RefDes strings can be up to 32 characters long, only the first 8 are displayed. Footprint names can be up to 128 characters long, only the first 20 are displayed. The "L" between the X and Y location values indicates a locked or "Glued" part.

The Technology column lists parts based on footprint pads. If no pad has a hole the part is classified as "SMD". If all pads have holes, the part is considered "Thru-Hole". If some pads have holes and some not, the part is called "Mixed". This can happen when an otherwise SMD part contains mounting holes and/or holes for alignment pins. If a part has no pads, it is classed as Null.

The Pins column lists the number of pins from the footprint and is a handy way to spot single pin items like mounting holes and test points that should be omitted from the listing. Also note that all parts with less than two pins and mechanical parts are flagged with a trailing asterisk to aid in identification.

A <u>Format 1</u> example using the same ini file:

```
Project: motor_mod

  19 Footprints found.
  32 Parts found.

Units: INCH

Note: Bottom side coordinates are not mirrored. Rotation is CCW
```

RefDes	Component Value	Footprint	Side	Loc X	Loc Y	Rot	Glue X	Glue Y	Glu Dia	Technology	Pins
C1	100pf	CHIP_D	Top	0.5400	0.7620	270	0.5400	0.7620	0.0250	SMD	2
C3	100pf	CHIP_B	Top	2.5000	1.4215	270	2.5000	1.4215	0.0250	SMD	2
C4	100pf	CHIP_B	Top	2.5000	0.8215	270	2.5000	0.8215	0.0250	SMD	2
C7	2.2 25V	C0805	Top	2.0574	1.5800	0	2.0574	1.5800	0.0250	SMD	2
D1		CHIP_B	Top	0.3785	1.5000	0	0.3785	1.5000	0.0250	SMD	2
R1	4.7K 1206	C1206	Top	2.5000	1.1449	270	2.5000	1.1449	0.0250	SMD	2
R2		C1206	Top	2.5000	0.5449	270	2.5000	0.5449	0.0250	SMD	2
R3		C1206	Top	0.6551	1.5000	0	0.6551	1.5000	0.0250	SMD	2
U104		qfp-32	Top	0.7188	2.5688	0	0.7188	2.5688	0.0250	SMD	32

RefDes	Component Value	Footprint	Side	Loc X	Loc Y	Rot	Glue X	Glue Y	Glu Dia	Technology	Pins
JP1		5X2HDR-100	Top	2.1000	1.8500	0	2.1000	1.8500	0.0250	Thru-Hole	10
JP2		5X2HDR-100	Top	2.8500	1.3000	270	2.8500	1.3000	0.0250	Thru-Hole	10
JP3		5X2HDR-100	Top	2.8500	0.7000	270	2.8500	0.7000	0.0250	Thru-Hole	10
JP4		5X2HDR-100	Top	0.1500 L	0.7000	270	0.1500	0.7000	0.0250	Thru-Hole	10
JP5		3X2HDR-100	Top	1.5000	1.8500	0	1.5000	1.8500	0.0250	Thru-Hole	6
JP6		1X2HDR-100	Top	0.1000	1.4500	180	0.1000	1.4500	0.0250	Thru-Hole	2
U1		28DIP300_A5	Top	1.4500 L	0.9500	270	1.4500	0.9500	0.0250	Thru-Hole	28
U101		Dip8	Top	0.0000	2.5500	270	0.0000	2.5500	0.0250	Thru-Hole	8
U2		14DIP300	Top	2.0500	1.1000	270	2.0500	1.1000	0.0250	Thru-Hole	14
U3		TO-220	Top	0.9900	1.6000	90	0.9900	1.6000	0.0250	Thru-Hole	3
Y1		8DIP300	Top	0.9500	0.9500	270	0.9500	0.9500	0.0250	Thru-Hole	8

RefDes	Component Value	Footprint	Side	Loc X	Loc Y	Rot	Glue X	Glue Y	Glu Dia	Technology	Pins
J104		XYZ_Socket	Top	2.1750 L	2.9325	0	2.1750	2.7000	0.1000	Mixed	42

RefDes	Component Value	Footprint	Side	Loc X	Loc Y	Rot	Glue X	Glue Y	Glu Dia	Technology	Pins
Mech1	Antenna support	Mech part	Top	0.7000	3.1000	0	0.7000	3.1000	0.0250	Null	5 *

RefDes	Component Value	Footprint	Side	Loc X	Loc Y	Rot	Glue X	Glue Y	Glu Dia	Technology	Pins
C2	2.2 25V	C1206	Bottom	0.5400 L	1.1649	90	0.5400	1.1649	0.0250	SMD	2
C5	2.2 25V	C1206	Bottom	0.9449	1.2800	0	0.9449	1.2800	0.0250	SMD	2
C6	100pf	C0805	Bottom	1.7600	0.7826	90	1.7600	0.7826	0.0250	SMD	2

Some comments about <u>Format 1</u>:

The same capabilities and limitations of <u>Format 0</u> apply to <u>Format 1</u>. Additionally, as in the example above where no *Thru-Hole, Mixed* or *Null* parts were found on the *Bottom* side, if a category is empty, no header is listed.

Format 2 example:

```
Report Origin = (0.0, 0.0)
Units used = "mil"
"RefDes","Layer","LocationX","LocationY","Rotation"

"C1","Top","540","762","90"
"C2","Top","600","1245","90"
"C3","Top","2500","1422","90"
"C4","Top","2500","822","90"
"C5","Top","955","1280","0"
"C6","Top","1760","763","90"
"C7","Top","2057","1580","0"
"D1","Top","379","1500","0"
"H1","Top","150","150","0"
"H2","Top","150","1850","0"
"H3","Top","2850","1850","0"
"H4","Top","2850","150","0"
"JP1","Top","2100","1850","0"
"JP2","Top","2850","1300","90"
"JP3","Top","2850","700","90"
"JP4","Top","150","700","90"
"JP5","Top","1500","1850","0"
"JP6","Top","100","1450","180"
"R1","Top","2500","1145","90"
"R2","Top","2500","545","90"
"R3","Top","655","1500","0"
"U1","Top","1450","950","90"
"U2","Top","2050","1100","90"
"U3","Top","990","1600","270"
"Y1","Top","950","950","90"
```

Gerber Check plots

FpcPlace can generate Gerber files that include both placement and glue spot location data. These files can be used in a Gerber viewer to overlay the board data and verify placement. At most, two file, named **TopPlace.gbr** and **BottomPlace.gbr** are created. If a side has no unsuppressed parts, that sides file is not be generated.
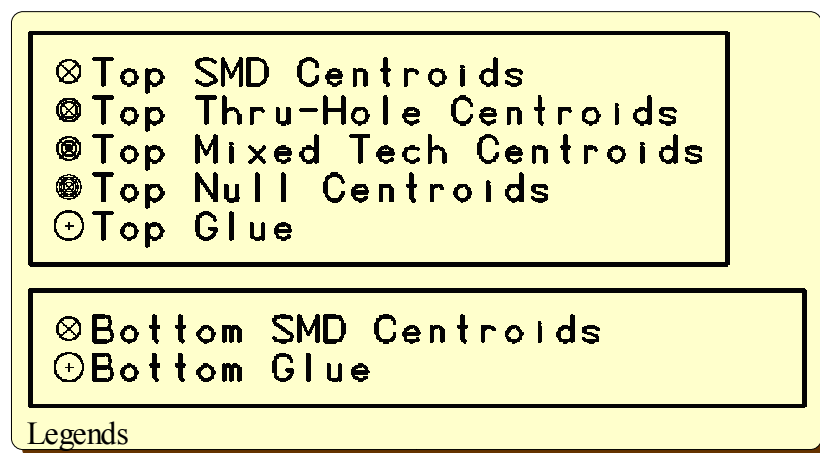
The Gerber files use, by default, 100 mil diameter targets to mark the centroid location of each unsuppressed part. As shown below, each class of part uses a unique target shape.

Centroid Target Patterns

SMD   Thru-Hole   Mixed Tech   Null
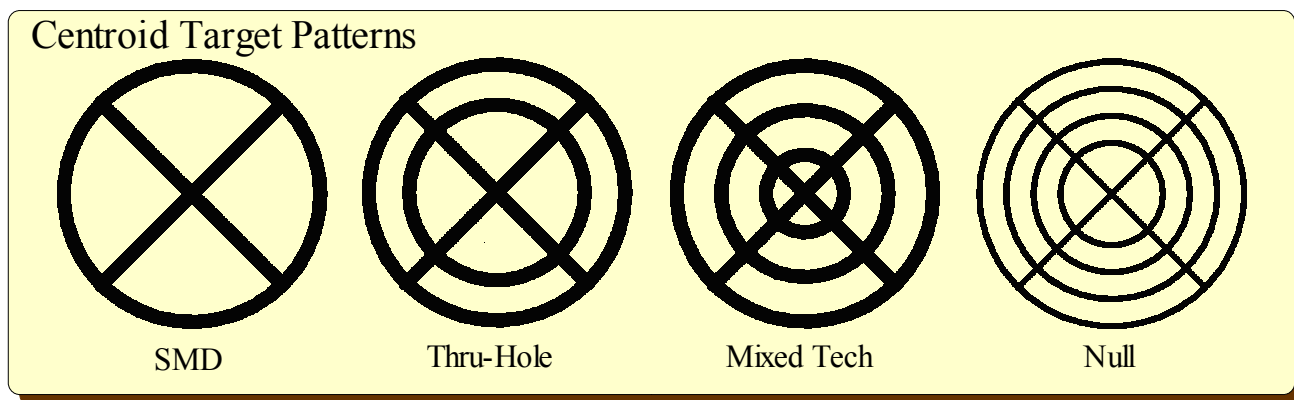
Glue Target

Also by default, 120 mil diameter targets, shaped as shown, are used to mark glue locations.

This size and shape allows the glue target to overlay a placement target and remain visible.

The target scaling command, -T, can be used to adjust target diameters over a limited range.

⊗ Top SMD Centroids
◎ Top Thru-Hole Centroids
◉ Top Mixed Tech Centroids
◉ Top Null Centroids
⊕ Top Glue

⊗ Bottom SMD Centroids
⊕ Bottom Glue

Legends

Each file includes a target legend. Only those items used are listed. The legends by default are located at 0.5, -0.5 but can be placed anywhere if the optional location is included in the -C command.

If both files are generated, the bottom side legend is located 100 mils below the top legend.
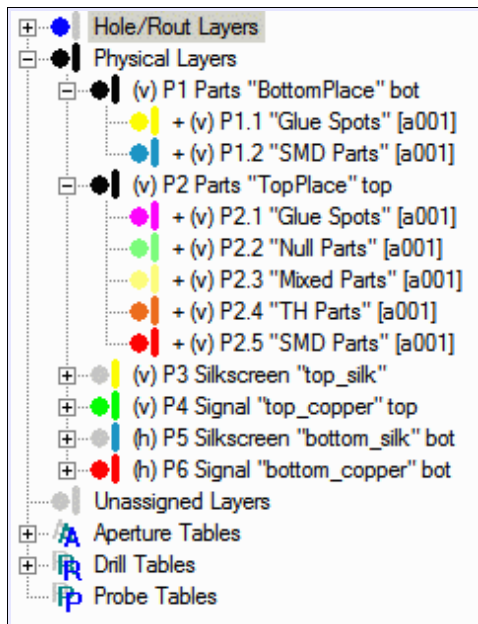
In the Gerber files, each object class is placed into a separate positive data layer. This allows the classes to be assigned unique colors for easy identification. The illustration at left shows how **GcPrevue** can be configured to take advantage of this feature.

The data layers are created by using empty clear data layers as separators. Some Gerber viewers may not tolerate empty data layers in the file. If this is the case with your viewer, the clear data layer separators can be omitted and all objects placed within a single data layer.
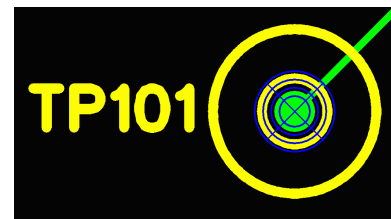
Some Target Examples:
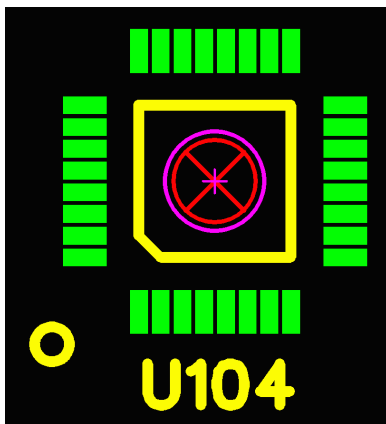
SMD part with glue
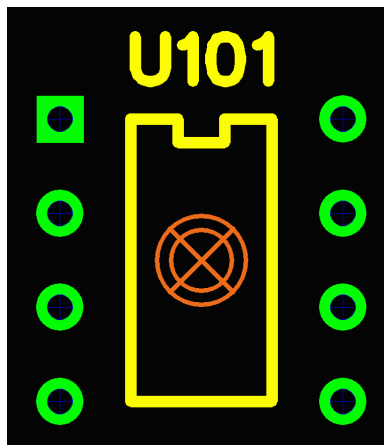
Thru-Hole part without glue

Unsuppressed Null part

Appendix A – Software limits

EOF message   128 characters max
Footprints   1024 max
Footprint exceptions   1024 max
Footprint names   128 characters max
Parts   2048 max
Pin names   16 characters max
RefDes strings   32 characters max
Text lines   1024 characters max
Target Scale Factor   0.010 to 1.350 (out of range values are forced into range)

User Guide Revision Record:

Ver	Date	Comments
1.10	3 July 06	Initial public release to FreePCB forum
1.20	8 July 06	New commands added, examples improved, appendix cleaned up.
1.30	15 July 06	Gerber check plot and Target scaling commands added.