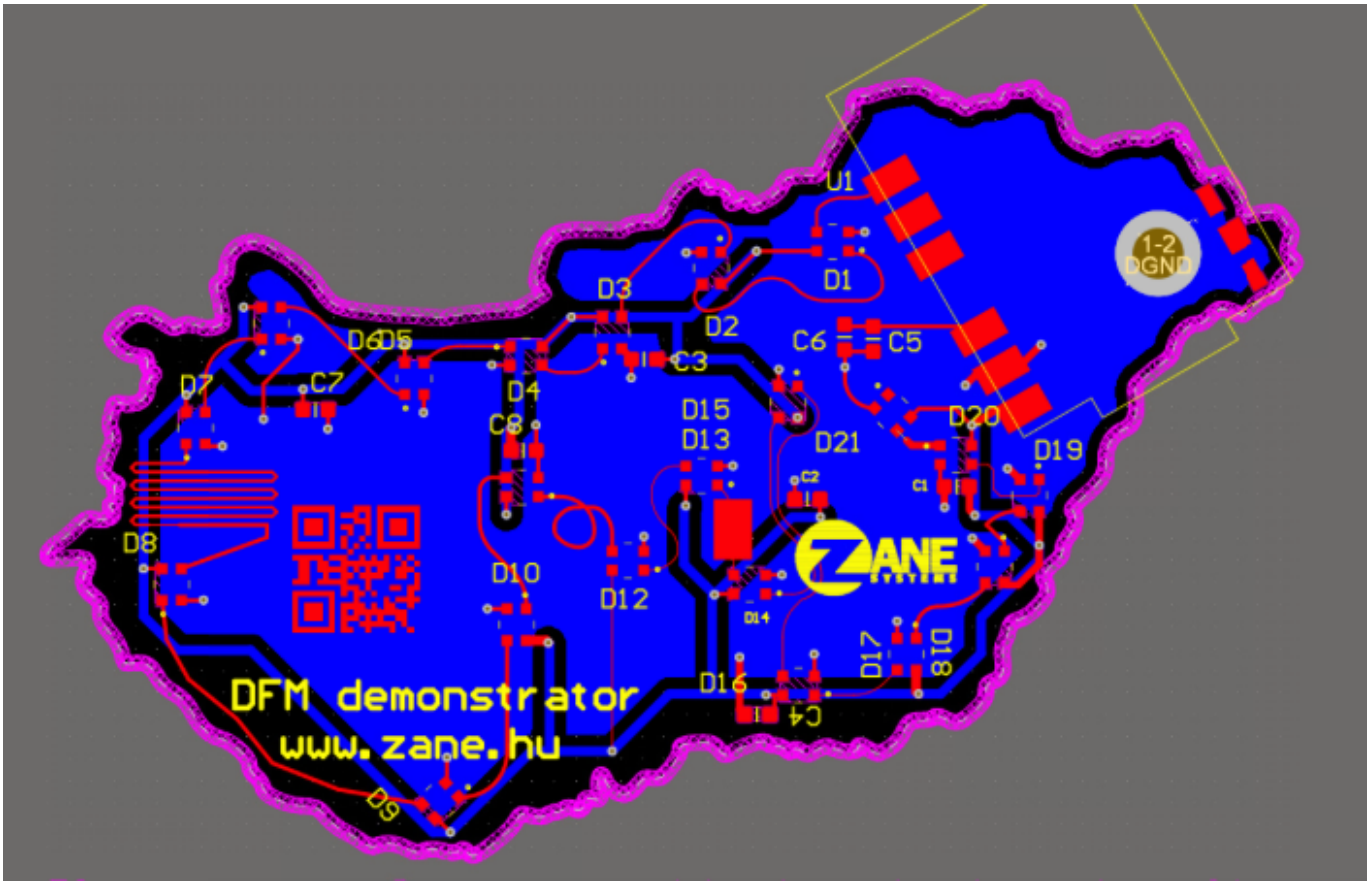
ZANE DFM Demonstration Board

A detailed guide to 28 intentional design errors



PCB layout overview. Reference designators identify the locations discussed in the numbered explanations.

Designed to demonstrate what can go wrong.
This board deliberately includes layout, routing, identification and manufacturing issues. The following pages explain all 28 points in sequence.

Placement & routing

ISSUES 01-10

01 **U1 - The footprint extends beyond the board outline.**

02 **U1 - The pads are too close to the board edge.**

03 **D13-D14 - An unnecessarily large copper area sits between the components, serving no purpose.**

04 **D3/C3 - The components overlap.**

05 **D7-D8 - Unnecessarily long meander routing.**
The tightly folded trace adds considerable length for no apparent reason.

06 **D7-D8 - The meander turns approach the board edge.**
The leftmost turns extend into the narrow peripheral area.

07 **The meander contains an unjustified change in trace width.**

08 **D11 - The LED’s reference designator is missing.**

09 **D11-D12 - An unnecessary circular trace loop.**
Instead of taking a direct route, the trace forms what appears to be a complete loop.

10 **D1-D2 - An unnecessary routing detour.**
The trace takes a long, curved route through otherwise empty space.

Copper & identification

ISSUES 11-19

11 **D18-D19 - An abrupt, sharp change in direction.**
The routing is untidy and poorly executed.

12 **Below D19, the trace runs along the board edge.**

13 **D12 is supplied through a long, thin power trace.**
D13’s power trace is immediately adjacent and could have provided a much shorter connection.

14 **Bottom copper layer - A deeply slotted, fragmented reference plane.**
The black copper-free channels divide the blue copper area into narrow branches, severely disrupting the reference plane.

15 **Several top-layer traces cross gaps in the bottom-layer copper.**
Examples can be seen around D3/D4 and along the right-hand component chain.

16 **Several footprints have vias directly at the pad edge or inside the pad.**
Examples appear around D9 and at components near the board perimeter. Check for unfilled via-in-pad structures and insufficient separation between the via and component-pad solder-mask openings.

17 **D5/D6 - Overlapping reference designators.**

18 **D13/D15 - Two reference designators appear to belong to a single footprint.**

19 **D17/D18 - It is unclear which reference designator belongs to which component.**

Markings & manufacturing

ISSUES 20-28

20 **C4 - The reference designator is upside down.**
Its orientation differs from neighbouring labels, making it awkward to read.

21 **Inconsistent silkscreen text sizes and orientations.**
The C1/C2 and D14 designators are much smaller than several others, while other labels are vertical or diagonal. This makes inspection more difficult.

22 **U1 - The large component outline extends far beyond the finished board and overlaps the pads.**

23 **The D20 reference designator overlaps a pad of U1.**

24 **D21’s data line is not connected.**

25 **There are no panel rails, preventing the board from being held in the intended production equipment.**

26 **There are no fiducials on the board.**

27 **The board outline cannot be machined accurately with a standard routing tool.**

28 **The board has no revision number.**
If we ever manage to fix all the issues above, adding a revision number would probably be a good idea too. :-)