GEM CIRCUITS LTD

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Panelisation Guidelines

Specifying suitable panelisation instructions can help when boards are assembled. Some factors worth considering include panel strength, panel size, board spacing, and methods of breakout.

Reasons for Panelisation

Equipment used to process PCB's such as wave-solder machines or pick and place machines tend to have a minimum width setting for the conveyer that holds and transports the circuit through the machine. Boards that are smaller must typically be panelised inside a snap-off frame that holds one or more circuits within, so that it can be carried by the conveyer. Boards that are big enough will also normally require a snap-off frame, so that the full extent of the PCB is exposed to whatever processing is required in the machine. A frame will also help when handling weird shapes.

Module Strength

A suitable module size can be chosen based on the size of the circuit board and the spacing between each one within the module. For boards with very heavy components it may be more suitable to have bigger spacing between boards on a smaller module size, to ensure the module doesn't break easily or sag during assembly.

Breakout Methods

The method used to keep the circuits in a module will also impact on the strength of the module, and more generally with the ease of breaking out the finished circuit after processing.

The three most commonly used breakout methods are briefly explained, and can also be mixed together where requested.

Standard Pips

One of the most secure methods for holding circuits within the module will be standard pips, which can be equally spaced around the circuit. Normal pips might be about 1mm (from cutter edge to cutter edge) and be located along the straight edges (and possibly curved edges, for example round boards). Longer straight edges over 50mm might have more than 1 pip per edge, although on request any number can be used depending on your preference. One of the disadvantages for normal pips is they tend to cause strain in the pip vicinity when being broken out, which can be alleviated with breakout pips.

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Breakout Pips

Breakout pips are similar to normal pips, but have a number of small holes along the board edge (see figure 1), and are typically between 0.6mm to 0.9mm. Typical breakout pips have 1, 3, or 5 holes, and are positioned to help create a cleaner break whilst relieving some of the stress during de-panelling.

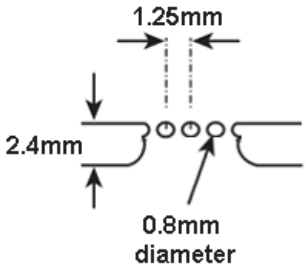

Figure 1: Breakout pip with 5 holes

Scoring

Another option is a scored module, where circuits are positioned without any gaps between them (see figure 2), and a score tool is used to create a V-cut around each circuit (see figure 3). The main advantage of scoring is they tend to be easier to de-panel after assembly, although disadvantages include a rougher edge, no allowance for overhanging components, encroachment of the score tool into the board, and possible warping issues during processing.

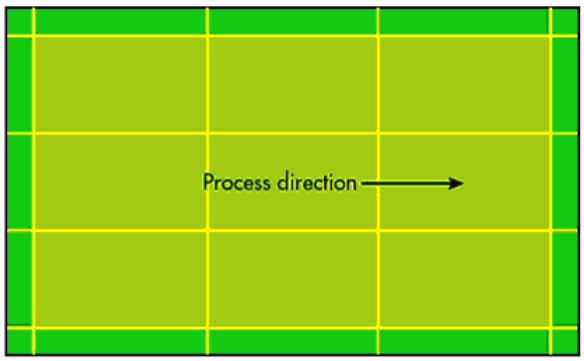

Figure 2: A typical scored panel

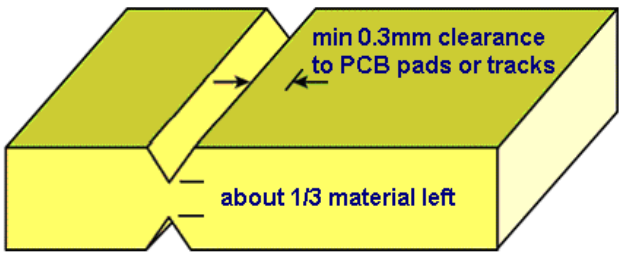

Figure 3: V-cut approximate positions

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Calculating Module Size

So considering the costs, assembly processing, and module strength, a suitable module size can be calculated. Alternatively we could suggest a suitable module, if you provide information on the minimum and maximum size, the spacing between circuits (6.35mm is our standard, although 10mm is also commonly requested), and the border size (also called snap-off) around the edge.

For any given circuit size of X_{size} by Y_{size}, with $X_{quantity}$ by $Y_{quantity}$ being how many are stepped, and using a border size of B_{size} and a spacing size of S_{size}, we can easily calculate the module size with the following equation:-

Module Width = $((X_{size} + S_{size}) \times X_{quantity}) + (2 \times B_{size}) - S_{size}$

Module Length = $((Y_{size} + S_{size}) \times Y_{quantity}) + (2 \times B_{size}) - S_{size}$

So for scored boards S_{size} could be 0mm, whilst everything else might be 6.35mm (Gem standard) or 10mm (also commonly used). Most modules will have a border B_{size} of 10mm, although different processing equipment could easily change this.

When using our online quotation system, our module panelisation tool can quickly work out the module size based on the circuit size, border, spacing, minimum and maximum module sizes, where you can then select the most suitable size provided.

Fiducials and Tooling

Many assemblers have their own module specification that includes details of the tooling and fiducials required. We can easily process such specifications, simply send in the details with the board information. Alternatively we can use our own specification which many customers currently use.

Our standard specification includes a 3mm non-plated hole in each corner of the module, 5mm in from the module edge. Fiducials are placed in 3 of the 4 corners of the module, 10mm away from the 3mm hole (to the side and above or below). The fiducials are 1.5mm round pads, in a 3.5mm round mask clearance (if mask is used). Fiducials are also placed on the paste files (for programming or orientation), along with a very thin outline for the board and module to indicate where the module extremities are (stencil manufacturers will ignore these thin lines).