Technical Brief: Simple Printed Circuit Board Via Equivalent Trace Width Calculation

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Suppose you want to find the current carrying capability of a PCB via. One way to do this is to find the via's equivalent PCB trace width; here is a simple method to do just this.

Think of the copper inside of a via hole as a small pipe (or barrel) of copper as shown in Figure 1. Let's define the wall thickness of the pipe to be Tw (usually the interior of vias are plated up to a thickness of approximately 0.7mil, which is also the thickness of 0.5oz copper).

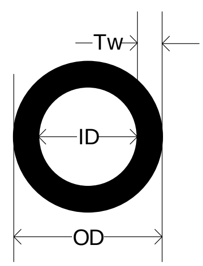

Figure 1
Via "Pipe", End View

There are two circles of diameter OD and ID. If we subtract the area of ID from the area of OD, we are left with the area of one end of the pipe, (i.e. the black portion of Figure 1).

Often in the fabrication process, the finished via hole diameter is specified. In this example, it will be equal to ID.

Let the radius of the finished hole be equal to r which is ID/2. In this case, the area of the circle with diameter ID = πr^2. Also, the radius of the circle OD is r + Tw. Its area therefore is = $\pi (r+Tw)^2$. So, the copper area of the end of the pipe is equal to: $\pi (r+Tw)^2 - \pi r^2$. Simplifying, this reduces to: Area = π Tw (2r+Tw). Since Area = x times y, if we divide this via area by the thickness of a trace (e.g., by Tw), then the equivalent trace width is equal to: **π (2r+Tw)** or just **π (ID+Tw)**.

Now we use the IPC 2152 charts from 2009 on page 7 to derive the current carrying capability of a PCB trace with the width calculated above. Alternatively, you can use any PCB trace current calculator in order to determine the current handling capability of the via.