

LED and Diode Markation Guidelines

Have you ever had an LED or other diode placed backwards? By us? By someone else? By yourself? We don't like it when that happens and we're sure you don't either. Screaming Circuits strives to place every component, from the largest, highest pin-count logic chip down to the smallest passive components and micro wafer scale BGAs, correctly every single time. A key element of that accuracy is our understanding of your board and the component markings.

If you use surface mount diodes or LEDs, you probably understand the challenges involved in correctly and consistently indicating diode polarity. LEDs are usually cathode negative, while zeners and uni-directional TVS diodes can be cathode positive. Barrier diodes can be either orientation. It all depends on whether the diode is a rectifier, an LED, a uni-directional TVS, part of a daisy-chain and a host of other considerations.

When you start looking at the CAD libraries, you not only have all the differences from that manufacturer, you may also have different markation schemes from each CAD package developer and from each library builder.

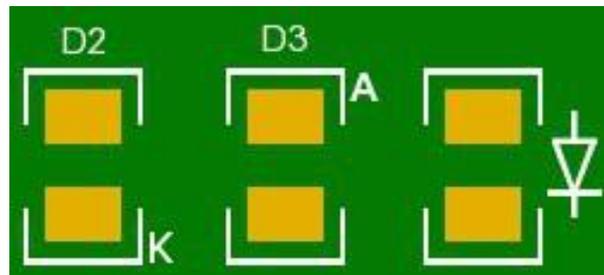
Guidelines for diode polarity mark silk-screening – The diode symbol, “K” for Cathode or “A” for Anode or.

To ensure the best accuracy, we recommend extra care in marking your diodes to remove any ambiguity.

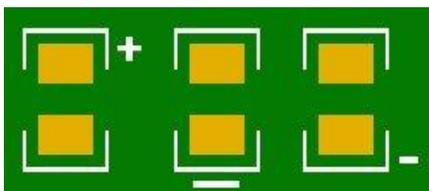
The preferred method is to place the diode schematic symbol in the silk screen, as shown on the far right. You may also place a "K" for Cathode adjacent to the cathode.

“K”, is used because “C” could imply that the spot wants a capacitor. An "A" adjacent to the Anode on the board works too, though it's less commonly used. If you are producing your board without silkscreen, you can put the mark in the copper layer, or submit a clear assembly drawing with the other board files.

RECOMMENDED



NOT RECOMMENDED



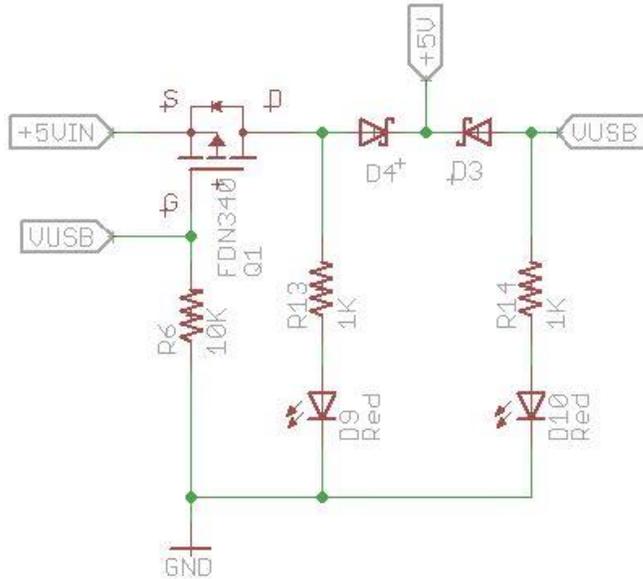
Relying on +, - or _ are not definitive in what they indicate and are not recommended.

Can you tell where the cathodes go on this pcb image?

(Answers: Cathode up on the first two, cathode down on the third. Or, maybe it's the other way around)

A “+” or “-“ sign isn’t good enough.

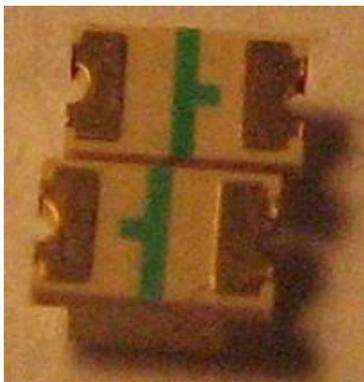
It’s not always true that current flows through a diode from the anode to the cathode. For the common barrier diode, or rectifier, it’s a pretty safe bet. However, with a zener diode, or TVS, it’s not necessarily true. And, that is why marking a diode, on your PC board, with the plus sign (+) is not good practice. Take a look at the schematic clip below.



Once you put this circuit on to a PC board, you could legitimately place a plus sign on the anodes of D3 and D4, and another on their cathodes.

We don't know what you had in mind, and, we don't have the schematic. If you use the practice of marking diodes with a (+) on the anode, we don't have any more information than if you didn't mark it at all. The same holds for using a minus (-) sign. It really doesn't give us any information.

It’s also not sufficient to just duplicate the marking that’s on the bottom of a surface mount diode.



Here’s a pair of nearly, but not quite identical 0805 surface mount diodes. They come from the same manufacturer, and the part numbers are very similar.

The punchline is that the cathode is on the left on both of these LEDs in the photo. I have empirically determined that to be the case, both by putting them on a board and by subjecting them to a diode checker. Punchline number two is that both are correct according to their respective datasheets. The following excerpts from their respective data sheets shows the problem.

If your board uses SMT LEDs, send the datasheet with your assembly order. Include it as a PDF in your files set. It would also behoove you to double check your CAD library footprint against your specific part number datasheet. IPC says the cathode is pin-one and pin-one zero degree orientation is with pin-one to the left.

