

Laser Trimming Specifications

The following is a list of the different types of laser trim kerfs that can be achieved at Commonwealth Microtechnologies with a description of how these cuts work and the best situations for each.

PLUNGE CUT: This cut is the most simplistic and cost effective cut to use in most situations. It offers the least amount of physical deviation from the original resistor geometry. These cuts are good for $\pm 0.5\%$ accuracy.



THE "L" CUT: The "L" cut is used most often because of its' stability and accuracy. An "L" cut can achieve tolerances of $\pm 0.2\%$ on a 10K Ω resistor, (add 0.1% for each 10K Ω increment). With the addition of the horizontal leg of the "L" cut stability is added due to the fact that resistance is increased with cutting farther into an area of the same current density. When geometric or pre-trim values are not issues in an application these cuts are the ones preferred by Commonwealth Microtechnologies.



THE SHADOW CUT: The shadow cut adds a plunge cut to the left of the "L" cut to achieve even tighter tolerances. A shadow cut can provide tolerances as close as $\pm 0.05\%$.



Opposite "L" cuts: When pre-trim values are much lower than the targeted value the opposing "L" cut trim may be incorporated. This trim provides better accuracy than the Serpentine cut, which is commonly used in low pre-trim value situations. The drawback to the opposing "L" cut is that it is not conducive with Military Specification 883E requirements.



SERPENTINE CUT: When pre-trim values are much lower than the targeted value a serpentine cut can also be used. Resistance is increased by making multiple cuts in areas with the greatest current density and effectively increasing the geometric length of the resistor. However a full serpentine cut (cuts that can penetrate as far as 5 mils from the end of edge of the resistor) does not follow the Military Specification 883E guidelines.



EDGE CUT: The edge cut is a very time consuming trim and is not cost effective, but, in high voltage/frequency circuits it is the preferred cut to perform because it greatly decreases the likelihood of breakdown across the trim kerf.





The “J” and “U” cut: The “J” cut can be used for high accuracy trimming and where stability is of utmost importance. The “J” cut is similar to the “L” cut with a downward cut following on the end of the “L” cut, the “J” cut may get close to exiting the resistor but does not completely open the path. The “U” cut opens the path completely.

The ARC cut: In some special cases customers have circular geometries. When these situations are encountered our ARC cut is used to provide a smooth continuous trim which provides linear current flow through the resistor. This is an advantage over our competitors multiple plunge cut methods.



The PREDICT cut: When sensitive resistors are confronted the PREDICT cut is used as a last option. An example of this is a thermister which must stabilize in temperature prior to each bite that is taken away by the laser. Predict cuts may also have to be utilized when trimming resistors that are greater than 50M Ω . All other trim methods are exhausted before attempting a predict trim because of the amount of time the laser takes to perform one bite.

Commonwealth Microtechnologies Laser Trimming Capabilities

- Thick film resistor trimming from 2.5 Ω to 500M Ω .
- Thin film resistor trimming from 2.5 Ω to 500M Ω .
- Single circuit sizes of 3.0” x 3.0”
- Arrays up to 5.0” x 7.0”
- Thermister trimming.
- Variable resistor paste trimming.

Considerations and Needs for Laser Trimming at Commonwealth Microtechnologies

- Pre-trim values within 40% of targeted trim value.
- Resistor geometries that can incorporate an “L” cut for resistors that require $\pm 1.0\%$ or lower tolerances.
- Designated areas on the circuit to be used for reject marking.
- Designated areas to be used for lot number and date code marking.
- 10 circuits or one full plate that can be used for laser setup purposes (these circuits are for laser trim setup purposes and may be failures).
- Your company’s incoming inspection procedure for devices being trimmed or designation that devices must follow Military Specification 883-F for resistor trimming.
- An accurate drawing of devices being trimmed with any loops identified before trimming has begun.
- Whenever possible, a known good trimmed unit to be examined and returned to the customer.

The above list is not the limitations of Commonwealth Microtechnologies laser trimming. This list is to provide the customer with the preferences Commonwealth Microtechnologies likes to adhere to under normal circumstances. If your needs require deviation from the techniques and tolerances listed above, feel free to give us a call and let us try to add to our list. We are presented with new challenges regularly and are excited to accomplish them.