Surface Mount Technology (SMT) and devices (SMD)

Surface-mount technology (SMT) is a method for producing electronic circuits in which the components are mounted or placed directly onto the surface of printed circuit boards (PCBs). An electronic device so made is called a surface-mount device (SMD). In the industry it has largely replaced the through-hole technology construction method of fitting components with wire leads into holes in the circuit board. Both technologies can be used on the same board for components not suited to surface mounting such as large transformers and heat-sinked power semiconductors.

An SMT component is usually smaller than its through-hole counterpart because it has either smaller leads or no leads at all. It may have short pins or leads of various styles, flat contacts, a matrix of solder balls (BGAs), or terminations on the body of the component.

Surface mounting was originally called "planar mounting".

Surface-mount technology was developed in the 1960s and became widely used in the late 1980s.

Much of the pioneering work in this technology was by IBM. The design approach first demonstrated by IBM in 1960 in a small-scale computer was later applied in the Launch Vehicle Digital Computer used in the Instrument Unit that guided all Saturn IB and Saturn V vehicles.

Components were mechanically redesigned to have small metal tabs or end caps that could be directly soldered to the surface of the PCB. Components became much smaller and component placement on both sides of a board became far more common with surface mounting than through-hole mounting, allowing much higher circuit densities.

Often only the solder joints hold the parts to the board, in rare cases parts on the bottom or "second" side of the board may be secured with a dot of adhesive to keep components from dropping off inside reflow ovens if the part has a large size or weight.

Adhesive is sometimes used to hold SMT components on the bottom side of a board if a wave soldering process is used to solder both SMT and through-hole components simultaneously.

Alternatively, SMT and through-hole components can be soldered together without adhesive if the SMT parts are first reflow-soldered, then a selective solder mask is used to prevent the solder holding the parts in place from reflowing and the parts floating away during wave soldering. Surface mounting

lends itself well to a high degree of automation, reducing labor cost and greatly increasing production rates. SMDs can be one-quarter to one-tenth the size and weight, and one-half to one-quarter the cost of equivalent through-hole parts.

Terms

Because "surface-mount" refers to a methodology of manufacturing, there are different terms used when referring to the different aspect of the method, which distinguishes for example the components, technique, and machines used in manufacturing. These terms are listed in the following table:

SMp term	Expanded form
SMD	Surface-mount devices (active, passive and electromechanical components)
SMT	Surface-mount technology (assembling and mounting technology)
SMA	Surface-mount assembly (module assembled with SMT)
SMC	Surface-mount components (components for SMT)
SMP	Surface-mount packages (SMD case forms)
SME	Surface-mount equipment (SMT assembling machines)

Packages

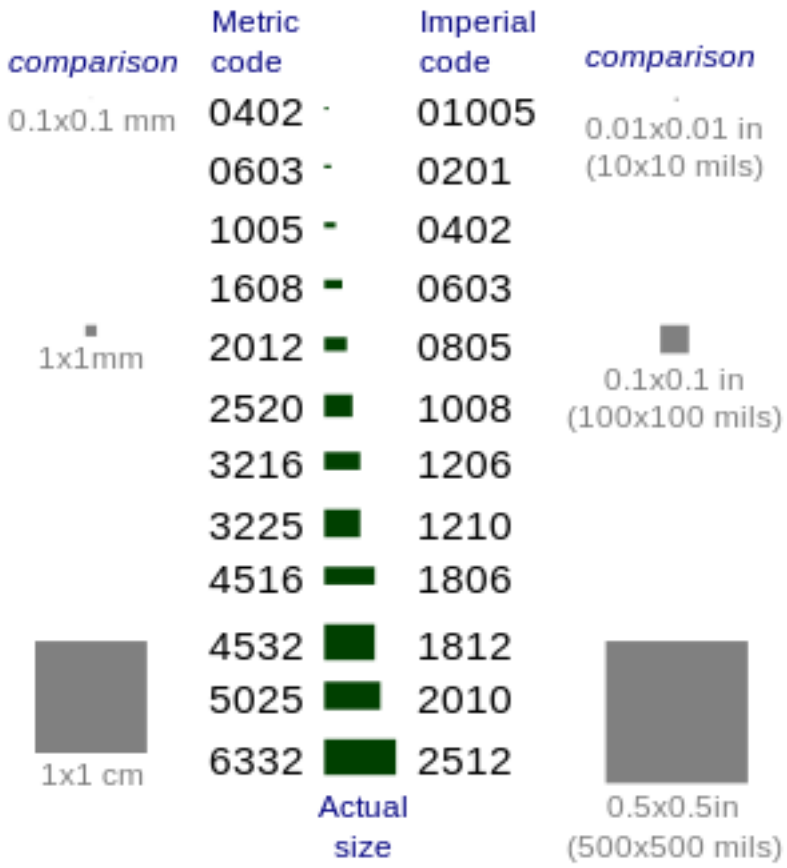
Surface-mount components are usually smaller than their counterparts with leads, and are designed to be handled by machines rather than by humans. The electronics industry has standardized package shapes and sizes (the leading standardization body is JEDEC).

The codes given in the chart below usually tell the length and width of the components in tenths of millimeters or hundredths of inches.

For example, a metric 2520 component is 2.5 mm by 2.0 mm which corresponds roughly to 0.10 inches by 0.08 inches (hence, its imperial size is 1008).

Exceptions occur for imperial in the two smallest rectangular passive sizes. The metric codes still represent the dimensions in mm, even though the imperial size codes are no longer aligned.

Problematically, some manufacturers are developing metric 0201 components with dimensions of 0.25 mm × 0.125 mm (0.0098 in × 0.0049 in), but the imperial 01005 name is already being used for the 0.4 mm × 0.2 mm (0.0157 in × 0.0079 in) package.



SMD LED Packages

0402 (1005 Metric) .04”L x .02”W 1.00mm x .5mm

0603 (1608 Metric) .06”L x .03”W 1.6mm x .8mm
0605 (1613 Metric) .06”L x .05”W 1.6mm x .5mm
0606 (1616 Metric) .06”L x .06”W 1.6mm x .6mm

0805 (2012 Metric) .08”L x .05”W 2.00mm x 1.25mm

The various manufacturers have a different height (Z scale) so the specification sheet should be used if the height is an important design factor.

There is always a recommended solder pad location provided by the manufacturer on the specification sheet.