

DIGITAL LIGHT PROJECTOR (DLP)

What Is Digital Light Projector (DLP)

DLP stands for digital light processing, and is a type of vat polymerization. Vat polymerization 3D printing technologies uses a liquidised photopolymer resin which is able to cure (solidify) under a light source.

In the category of 3D printing with vat polymerization, there are two main technologies: SLA and DLP. They both use resin and a light source to produce parts, the main difference being the type of light source which is used to cure the photopolymer resin.

It is considered that its predecessor is SLA (stereolithography). 3D printers that employ SLA, or stereolithography, use a build bed, an elevator that moves the bed upwards, a tank filled with resin, a light source and galvanometers.

SLA 3D printers start to operate by lowering the build bed into the resin-filled tank with only one layer of height left between the bottom of the tank and the build bed. Then the galvanometers take the control.

Galvanometers are mirror-like components used for directing the laser beam of an SLA printer to the bottom of the tank. With the G-code in use, galvanometers navigate the laser beam in a route which represents one layer of a certain part. The laser then cures the resin making a solid layer of a part. When one layer is complete, the build bed moves up by one layer and the process is repeated until the part is complete.

How Does DLP Works?

DLP is a “sister technology” to SLA as the only essential difference is the light source used to cure the resin. SLA printers use lasers combined with galvanometers to cure resin.

With a DLP 3D printer, the light source is a specially developed digital light projector screen. Thanks to this screen, DLP is generally considered to be faster than SLA, and hence with SLA, the laser has to individually cure the resin in a “point to point” approach. In contrary, the DLP projector screen flashes an image of a layer all in one pass. Thus, all points of a layer can be cured simultaneously. As a result, the print speed is increased in comparison to SLA since it takes less time to cure a layer.

Also, in DLP method, the 2D image that is projected is composed of pixels which they become voxels when translated into three dimensions.

The light source of a DLP 3D printer itself, an LED screen, means nothing without a digital micromirror device (DMD), which can be considered as the “heart” of DLP chipset. A DMD contains hundreds of thousands or even millions of small micromirrors that direct the light and create the pattern of a layer onto the bottom of the resin tank.

The resolution of a printed part using a DLP 3D printer usually corresponds to the number of micromirrors inside the DMD device.

Common DLP Applications

- Special customised parts
- Small batches of resin parts
- Dental molds and prototypes
- Provisional implants
- Medical models and prototypes

Design Requirements

Minimum wall thickness	0.5mm
Minimum hole diameter	0.5mm
Minimum feature size	0.5mm
Minimum printable font size	6pt
Minimum space and clearance	0.5mm
Minimum slit between walls	0.5mm

Available materials for DLP 3D Printing

Materials include metals, thermoplastic resins, and ultraviolet-curable resins.