

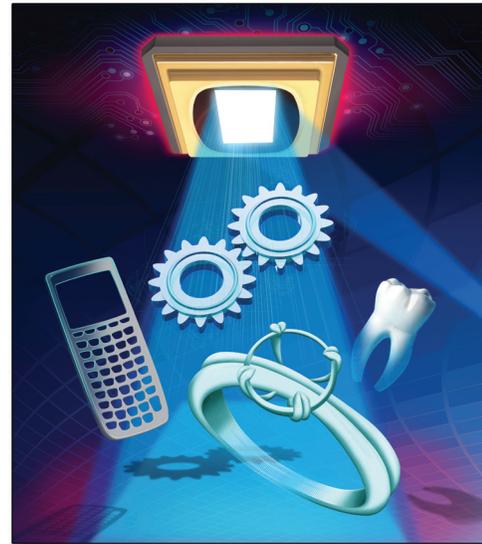
TI DLP® Technology for 3D Printing

Design scalable high-speed stereolithography systems using TI DLP® technology



3D Printing is the additive manufacturing process of building a three-dimensional object by laying down successive layers of material. A 3D Computer Aided Design (CAD) model of the object is converted into a series of cross-sectional slices that are sent to the 3D printer. The process allows manufacturers to speed up development cycles, make quick adjustments to molds and prototypes, and create highly detailed and customizable parts.

These printers make use of liquid photopolymer resins to build objects. For each cross-sectional slice of the object, the TI DLP® DMD (Digital Micromirror Device) projects patterned light that selectively exposes and hardens the resin. Because an entire layer is exposed with a single pattern, fast build speeds are achieved independent of layer complexity. Projection optics can also be used to control the resolution on the image plane and adjust the layer thickness, leading to smooth and accurate finished parts. These benefits, combined with its proven reliability, make DLP technology the ideal solution for stereolithography 3D printing systems



Features and benefits

- **Programmable micromirrors expose entire layer in one shot**
 - Faster build speed than point-by-point technologies
 - Improved throughput
 - Eliminate need for print heads
 - Print speed is independent of design complexity or number of parts
- **High-resolution patterns with micromirror size (7, 10, 13 μm)**
 - Achieve micron-level features for high accuracy
 - Easily adjust layer thickness
- **Optically efficient from 363 nm to 700 nm**
 - Cure a wide range of photo-polymers and resins

Example applications

- Rapid prototyping
- Molds for tooling and casting
- Direct part manufacturing



DLP solutions for 3D printing

DLP chipsets are available with different DMD sizes, pixel pitches, resolutions, and other specifications. DLP products also offer devices targeted for use with UV exposure. The best choice for a DLP chipset may depend on the desired object feature size, patterning speed and necessary wavelengths to cure the resin.

Evaluation modules

Accelerate your design cycle by evaluating DLP technology with any of the evaluation modules (EVMs). The development modules provide flexible light steering solutions with high brightness and resolution for industrial, medical and scientific applications. Our portfolio of EVMs offer a compelling combination of resolution, brightness, pattern speed, and programmability of DLP technology.

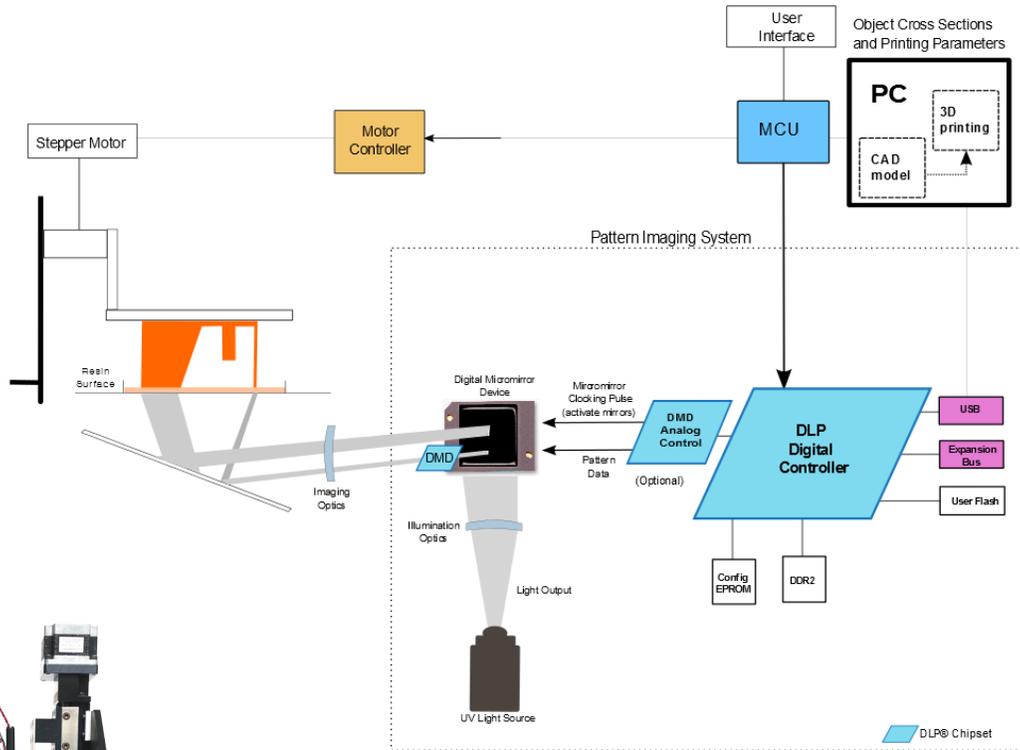
TI provides free software and firmware downloads allowing developers to easily create, store, and display high-speed pattern sequences through USB-based application programming interface (API) and easy-to-use graphical user interface (GUI).

Recommended Parts

Small Form Factor	High Resolution	High Speed
DLP3000	DLP6500FYE	DLP7000
DLP4500	DLP6500FLQ	DLP7000UV
	DLP9000	DLP9000X
	DLP9000X	DLP9500
		DLP9500UV

System Block Diagram

In a DLP 3D printing solution, the object is specified by a 3D CAD model produced with software running on a PC then converted into 2D cross-section layers generated by an image slicing tool. The best choice for a DLP chipset will depend on the desired object feature size, resolution, printing speed and exposure wavelength. The system control and signal processing is accomplished by the embedded processor, such as TI MSP430®. Power is provided by TI Power devices.



TI Designs

Stereolithography 3D printer development platform

To enable customers to get to market faster, Texas Instruments also provides a TI Design for 3D printing applications. A TI Design is a comprehensive reference design that includes schematics, block diagrams, bill of materials, design files, software, and test reports. The 3D printer development platform employs the DLP 3D structured light software development kit and enables developers to build high resolution 3D objects. The free TI Design features the DLP LightCrafter 4500 EVM, showcasing the DLP4500 DMD, to accurately expose object layers. The system also uses TI's low power MSP430 embedded processor to synchronize layer exposure with motor control for precise incremental 3D builds. Get started at ti.com/tool/TIDA-00293

DLP chipsets for 3D printing														
DMD Number	Micromirror Array	Array Diagonal	Controller	Micromirror Driver	Max Pattern Rate	Max Pixel Data Rate	Optimized Wavelengths	Pixel Pitch	Pixel Orientation	EVM	DMD Package Dimensions (lxwxh)	DMD 100u Price (\$ U.S.)	Controller 100u Price (\$U.S.)	Micromirror Driver 100u Price (\$U.S.)
DLP3000	608 x 684	0.30"	DLPC300	—	4,000 Hz (binary)	1.7 Gbps	420-700 nm	7.6 µm	Diamond	LightCrafter	16.6 x 7 x 3.54 mm	95	16	—
DLP4500	912 x 1140	0.45"	DLPC350	—	4,225 Hz (binary)	4.4 Gbps	420-700 nm	7.6 µm	Diamond	LightCrafter 4500	20.7 x 9.1 x 3.33 mm	143	56	—
DLP6500FYE	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	19.7 Gbps	420-700 nm	7.6 µm	Orthogonal	LightCrafter 6500	32 x 32 mm	588	160	—
DLP6500FLQ	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	19.7 Gbps	400-700 nm	7.6 µm	Orthogonal	—	32 x 41 mm	1,137	160	—
DLP7000	1024 x 768	0.7"	DLPC410	DLPA200	32,552 Hz (binary)	25.2 Gbps	400-700 nm	13.6 µm	Orthogonal	Discovery 4100	40.64 x 31.75 x 6.01 mm	787	193	12.36
DLP7000UV	1024 x 768	0.7"	DLPC410	DLPA200	32,552 Hz (binary)	25.2 Gbps	363-420 nm	13.6 µm	Orthogonal	Discovery 4100	40.64 x 31.75 x 6.01 mm	3,763	193	12.36
DLP9000	2560 x 1600	0.9"	DLPC900 (qty 2)	—	9,500 Hz (binary)	39 Gbps	400-700 nm	7.6 µm	Orthogonal	LightCrafter 9000	42.2 x 42.2 x 7 mm	2,783	160	—
DLP9000X	2560 x 1600	0.9"	DLPC910	—	14,989 Hz (binary)	61.1 Gbps	400-700 nm	7.6 µm	Orthogonal	—	42.2 x 42.2 x 7 mm	4,449	295	—
DLP9500	1920 x 1080	0.95"	DLPC410	DLPA200 (qty 2)	23,148 Hz (binary)	48 Gbps	400-700 nm	10.8 µm	Orthogonal	Discovery 4100	42.2 x 42.2 x 7 mm	2,446	193	12.36
DLP9500UV	1920 x 1080	0.95"	DLPC410	DLPA200 (qty 2)	23,148 Hz (binary)	48 Gbps	363-420 nm	10.8 µm	Orthogonal	Discovery 4100	42.2 x 42.2 x 7 mm	6,999	193	12.36

Visit ti.com/dlp3Dprinting for more information.

DLPT019E

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