

TI DLP® Technology for Lithography

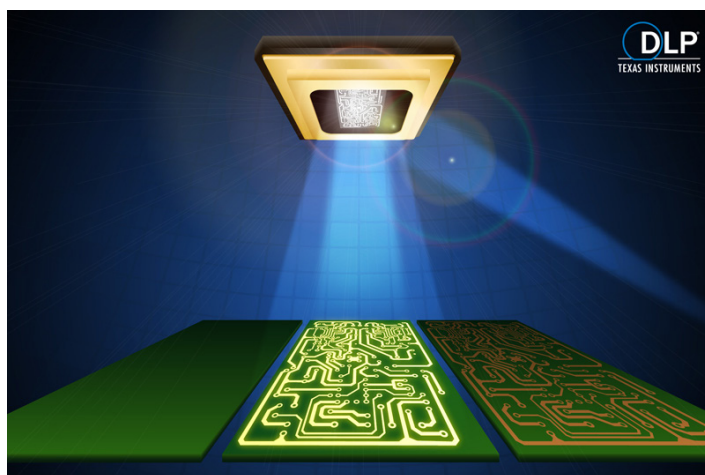
Accurate digital exposure for high-speed maskless lithography



TI DLP® technology enables high speed and high-resolution maskless lithography solutions for PCB patterning, solder masks, flat panel displays, laser marking, and other digital exposure systems requiring high speed and precision.

Programmable light steering DLP technology is used to directly expose patterns onto photoresist films without the need for contact masks. This reduces material cost, improves production rates, and allows for rapid changes of the pattern, which is ideal when minimum feature sizes require double patterning.

Direct imaging increases productivity compared to narrow laser beam or masked systems. A key advantage of maskless lithography is the ability to change lithography patterns from one run to the next, without incurring the cost of generating a new photomask.



Features and benefits

- High speed digital pattern rates up to 32 kHz
- High speed digital pixel rates up to 61 GHz
- Improve throughput and eliminate the needs for masks or print plates
- Micromirror size (7,10,13 μm)
 - Achieve micron-level features for high accuracy and demanding applications
- Efficient from 363 to 700 nm
 - Cure a variety of photosensitive materials

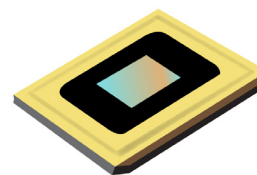
DLP solutions for lithography

DLP chipsets are available with different DMD (Digital Micromirror Device) speed, pixel pitches, and resolutions. DLP products also offers devices targeted for use with UV exposure. The best choice for a DLP chipset may depend on the desired feature size, patterning speed, system form factor, and wavelength range. DMDs optimized for direct imaging solutions are available with one, two, and four mega pixel arrays.

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).

Example applications

PCB manufacturing
Flat panels
Computer-to-plate printing
Laser marking
Direct imaging



Recommended DMDs for Lithography

Cost Efficient	Max Speed	Max Resolution
DLP6500FYE DLP6500FLQ	DLP7000 DLP7000UV DLP9000X DLP9500 DLP9500UV	DLP9000 DLP9000X

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Evaluation modules

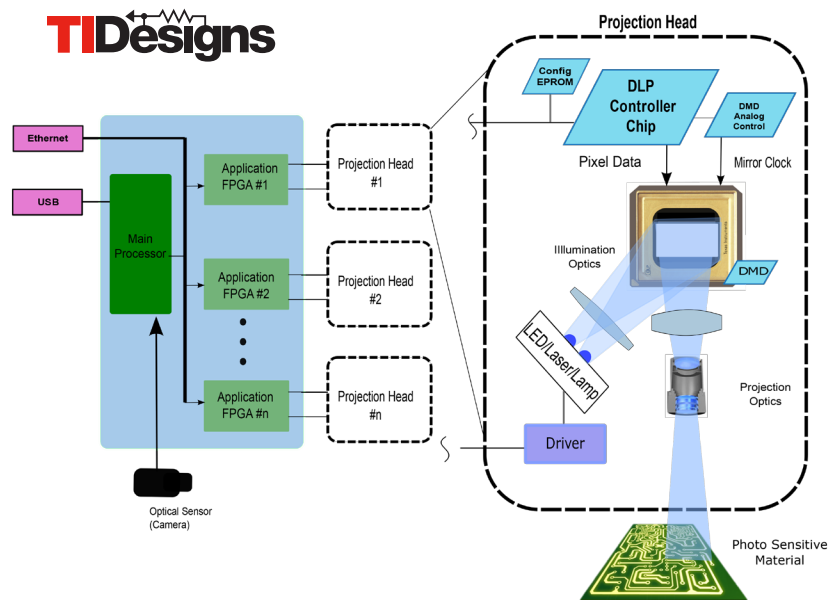
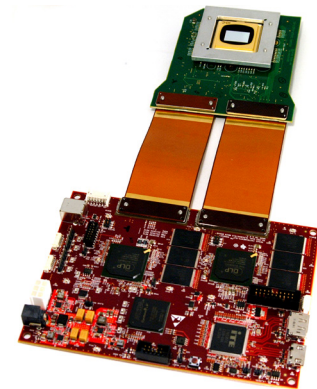
Accelerate your design cycle by evaluating DLP technology with any of the evaluation modules (EVMs). Our portfolio of EVMs offer a compelling combination of resolution, brightness, pattern speed, and programmability of DLP technology. [The DLP LightCrafter™ 6500, LightCrafter 9000 and Discovery™ 4100 EVMs](#) are high performance and highly flexible development kits recommended for lithography solutions. Both series offer exceptionally fast pattern rates for light exposure and image capture that enable competitive cycle times in industrial markets.

System Block Diagram

A DLP-based digital lithography system consist of machines with multiple DMD print heads to simultaneously expose a wide production surface. The block diagram shows how a DLP chipset is incorporated into such a system, with a DLP controller for each DMD and a master processor to coordinate the exposure and alignment of the patterns on the production surface. The high speed pixel data rate and micromirror timing control enables rapid exposure of boards with synchronization of print heads for a continuous production flow.

High Speed DLP Sub-system for Industrial 3D Printing and Digital Lithography

To enable customers to get to market faster, Texas Instruments also provides a TI Design suitable for digital lithography. This TI Design is a comprehensive electronics reference design that includes schematics, layout files, bill of materials, and a test report. It provides a system-level DLP development board with maximum throughput by integrating the highest resolution DLP digital micromirror device, the DLP9000X with more than 4 million micromirrors, and the fastest digital controller, the DLPC910. Get started at ti.com/tool/TIDA-00570.



System Block Diagram: DLP Digital Lithography

DLP chipsets for lithography														
DMD Number	Micromirror Array	Array Diagonal	Controller	Micromirror Driver	Max Pattern Rate	Optimized Wavelengths	Max Pixel Data Rate	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.)
DLP6500FYE	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	420-700 nm	19.7 Gbps	7.6 µm	Orthogonal	LightCrafter 6500	32 x 32 mm	588	160	—
DLP6500FLQ	1920 x 1080	0.65"	DLPC900	—	9,500 Hz (binary)	400-700 nm	19.7 Gbps	7.6 µm	Orthogonal	—	32 x 41 mm	1,137	160	—
DLP7000	1024 x 768	0.7"	DLPC410	DLPA200	32,552 Hz (binary)	400-700 nm	25.2 Gbps	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)	363-420 nm	25.2 Gbps	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)	400-700 nm	39 Gbps	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)	400-700 nm	61.1 Gbps	7.6 µm	Orthogonal	—	42.2 x 42.2 x 7 mm	4,449	295	—
DLP9500	1920 x 1080	0.95"	DLPC410	DLPA200	23,148 Hz (binary)	400-700 nm	48 Gbps	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	23,148 Hz (binary)	363-420 nm	48 Gbps	10.8 µm	Orthogonal	Discovery 4100	42.2 x 42.2 x 7 mm	6,999	193	12.36

Visit ti.com/dlpLithography for more information.

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