

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

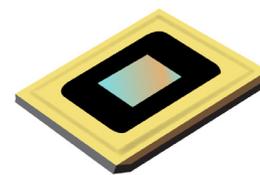
DLP solutions for lithography

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

TI DLP Technology for Lithography

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.

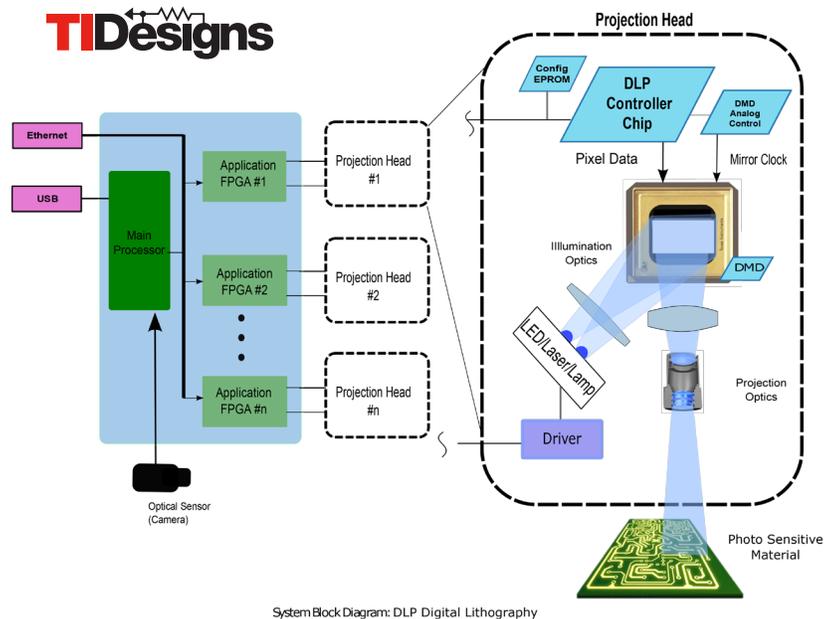


System Block Diagram

A DLP-based digital lithography system consists 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.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com