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ADVANCED LASER DYNAMIC IMAGING

新一代的激光动态成像（光刻）技术和系统在PCB行业的应用

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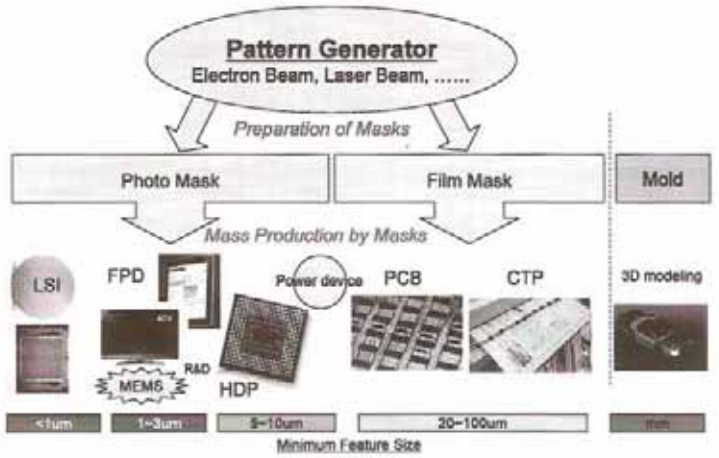
Standard Lithography & Exposure Industry



大陆主要PCB生产厂地区分布

PCB和LCD产业分布类似，多集中于珠三角和长三角，主要由于消费类电子产业基地多于此缘故. 由于全球PCB产业超过80%集中于亚洲地区，而中国及台湾更是PCB生产重镇. 预计2013年PCB在全世界的市场份额将会是600亿RMB.

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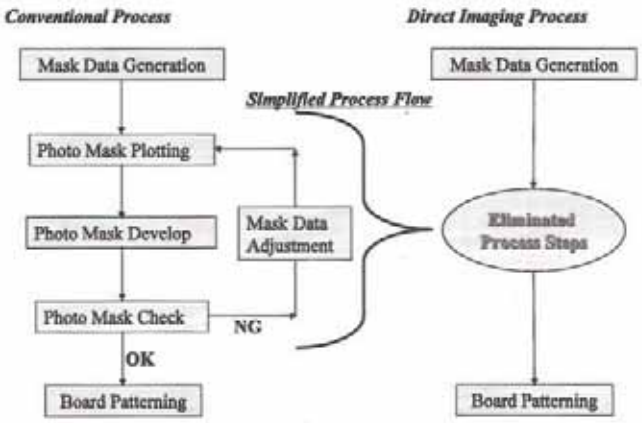
Comparison



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Maskless Technology Advantages

① *No Mask*
- a. Significant Expense Saving
- b. Significant Reduction of R&D Time
- c. Save the Hassles for Design Changes & Mask Handling Liability
- d. Flexible to combine different designs.

② *Available in 50um~1um Resolution*
- a. Explore the New Possibilities
- b. Add Value to your Products and Services
- c. Gain an Edge over the Competitors

③ *Scaling Compensation*
- a. Improve Registration Accuracy
- b. Compensate PCB distortion to Improve Yield

④ *High Power Semiconductor Laser Illumination*
- a. Improved Throughput
- b. Save energy—high efficient
- c. No mercury contamination
- d. Long lifetime
- e. Low maintaining cost

⑤ *Conventional Gerber / Bitmap Format Data Input*
- a. Compatible with Existing Design Data

⑥ *Conventional Process Compatibility*
- a. Compatible with most of conventional materials
- b. Adapts to existing process lines

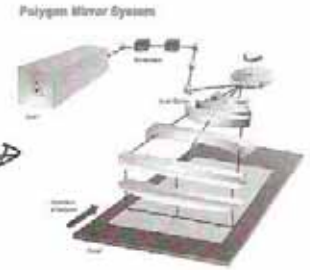
Maskless Lithography System

随着印刷电路板(PCB)朝向高密度连接HDI板、多层板等趋势，对于PCB电路线宽及对位精度要求愈来愈高，传统的光罩(Mask)曝光微影制程已面临生产技术瓶颈。为了解决良率与产出率的问题，新兴的无光罩微影技术，愈来愈受到PCB产业的重视，这种直接成像的数码影像设备(Direct-write Digital Imaging System)，预料将在未来数年之内，成为微影制程技术的主流。目前全球市场有5万台以上的传统式接触曝光机，也就意味着未来几年随着技术不断创新和更新，即将出现5万台以上的数码影像曝光机所取代。传统曝光机还是有着一定的优势，因为它速度快，价格相对便宜，但其缺陷是无法克服多层板之间失真及缩放处理。随着多层板及高密度连接HDI板的发展，更能凸显Maskless的技术优势。这种光刻技术与市场上的其它产品相比，具有更高的成品率和投资回报率。这种产品在传统的干膜抗蚀剂上具有超高曝光速度，同时还能进行畸变校正。直接成像的数码影像设备具有高产出(High Throughput)、高良率、最低综合成本等特色。

1. 100万 pixel 在扫描
2. 中国人是此扫了发明者.

价钱: $

Major Maskless Players



Polygon Mirror Orbotech

DMD+Point Array

Fuji Film

Pentax(ORC)

Hitachi via

直接成像系统技术比较

Technology	Direct DMD Imaging	Point Array DMD maskless	New Aiscent Maskless	Polygon Mirror	Single MEMS Mirror Scanning	XY galvo scanning Mirror
Light Source	UV light source	UV light source	UV light source	Single mode UV laser	Single mode UV laser	Single mode UV laser
Optical System	Small Optical Lens	Small Optical Lens	Small Optical Lens	24" Large f-thta lens	f-thta lens	f-thta lens
Light Efficiency	Good	Medium	Medium	Medium	High	Medium
Light uniformity	Good	Poor	Good	Good	Poor	Good
DOF	Excellent	Poor	Good	Good	Good	Good
Resolution	Poor	Excellent	Excellent	Poor	Poor	Good
Feature Size	Poor	Good	Excellent	Poor	Poor	Medium
Productivity	Medium	High	High	Good	Medium	Low
Stitch	Good	Good	Good	Good	Poor	Good
Reliability	Good	Poor*	Good	Good	Poor	Good
Cost	Low	Medium	Medium	High**	Medium	Medium
Maintainance Cost	Low	High	Medium	High**	High	High

Note:

* DMD alignment is difficult;
**Large f-thta lens, big power single mode laser and precision polygan mirror are very high cost;

***Laser cost is very high and lifetime is limited;

Other Players

Maskless Lithography Inc., USA
Aiscent Technologies, Inc., Canada
Heidelberg Instruments, German
ASML
Fuji Film, Japan
Hitachi
Orbotech
Intelligent Micro Patterning, LLC, USA
DNS(Dai Nippon Screen)
大族数控
.....

*This does not include e-beam , x-ray, ink jet printing and nano-printing players

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Aiscent-Maskless Lithography System Its Key Technologies

- 第一个大功率蓝紫激光技术（和产品）：它的重要应用是在激光直接光刻和激光制版领域，我们具有一种特别的光功率合成技术，可以生产出功率超过25W蓝紫激光（内部可以含有超过250个LD），单光束输出，光强均匀分布，非相干，高可靠性的激光光源，这是特别为我们动态成像系统设计的一种光源，我们是国际上唯一一家能够提供这样高功率的蓝紫激光公司，包括紫外激光波长在370nm），这种高功率光源应用于激光制版和光刻领域，将具备高速、稳定、均匀曝光的优点。
- 另外一关键技术即我们特别的基于微反射镜阵列的动态成像和扫描系统，这不是一个简单的微镜阵列器件（DMD器件），其成像系统中包括一种特别的微透镜阵列，使得微镜元列阵（像元大小为10um*10um）成像成"点列列阵"，Point-Array"，每个点列像元大小压缩到2.5um*2.5um，另外我们采用DMD偏向扫描和缩放光学系统，从而达到更精细的扫描线宽，但又能进行大面积的扫描（因此高速）；加上我们特别的数据处理软件和硬件使得系统工作在连续扫描状态，而不是传统的象盖印章的"stepper"状态，这样可以大大提高扫描速度，并且能够保证图像扫描的均匀性和无缝图像拼接。

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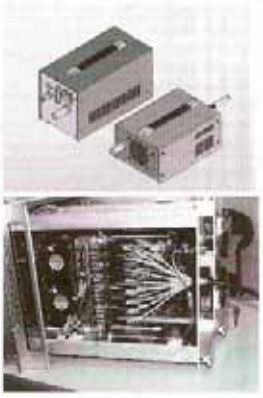
Laser Diode Array Module

Wavelength: 395nm~415nm



- Output power : 300 mW
- Spot size: 0.96 mm x 0.96 mm
- Numerical Aperture: 0.48
- Coupling Efficiency: min 70 %, > 90 % Achievable

-Specs available:
300mW~30W

- Combining 400 lasers to single laser source
- Power output level > 25W
- Better uniformity than conventional UV lamp
- Improved reliability > 10X operational lifetime

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Aiscent Maskless lithography System Optical Engine-Dynamics Photo-Mask

Optical spots by MLSFA

DGB

DMD

MLSFA

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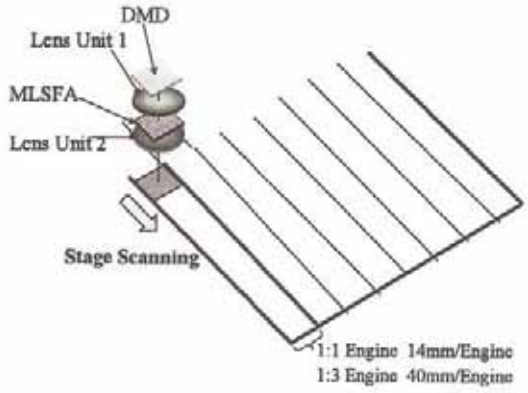
Single-Engines System



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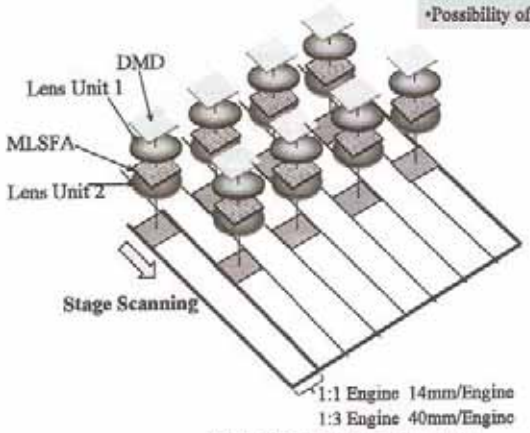
Multi-Engines System

- No need of large diameter lens
- Possibility of cost reduction



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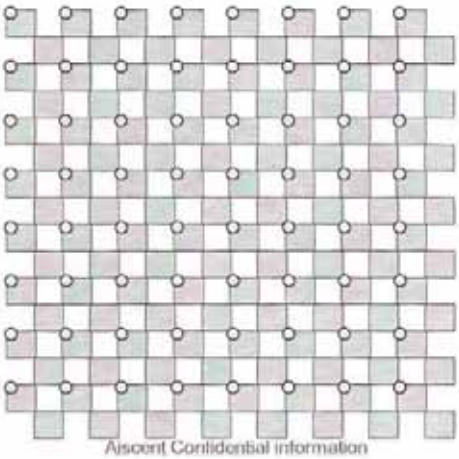
平板电视 →

超大面积显示面板的无掩膜光刻系统
8x8-optic-engine maskless system



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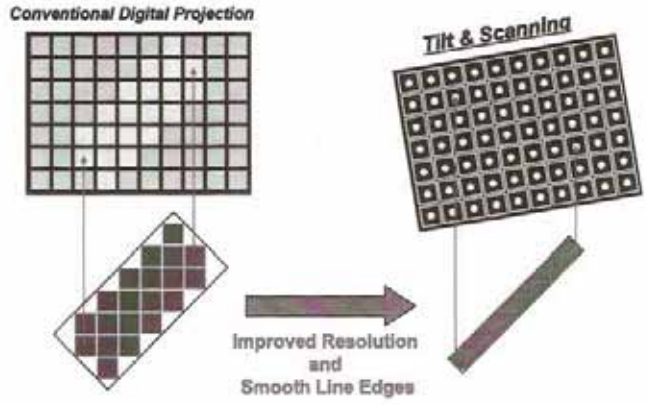
Analog Like Exposure Result



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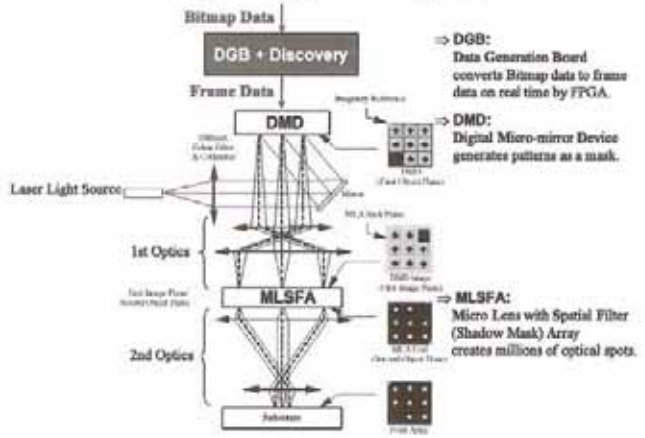
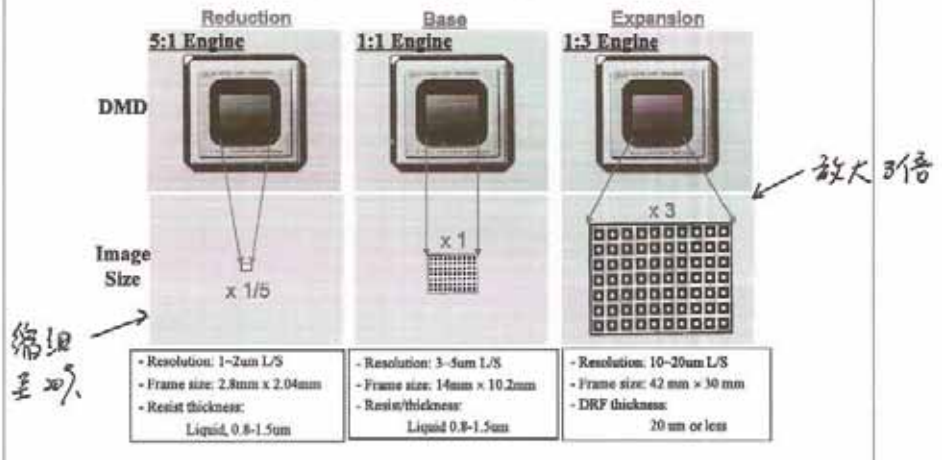
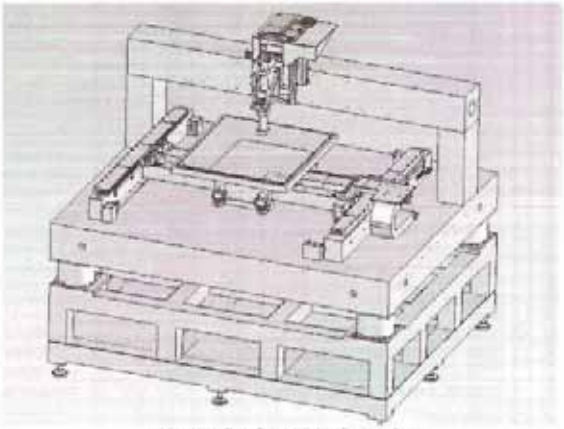
Design of Optical Engine



Optical Engine Types



Stage for 1000mmx1000mm



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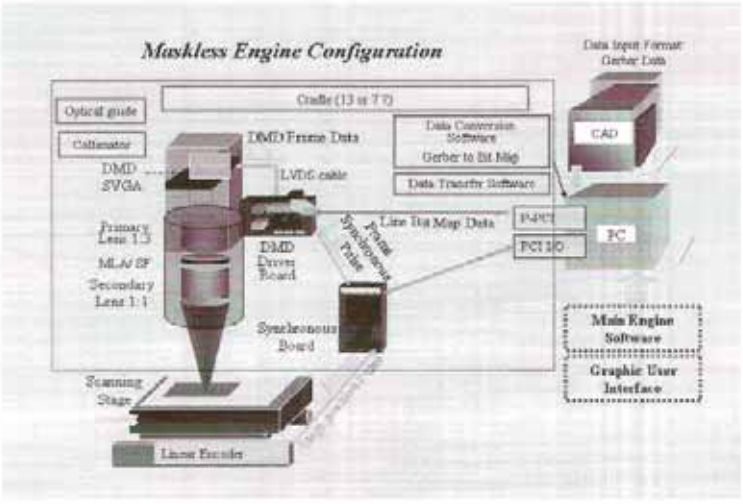

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Exposure Examples

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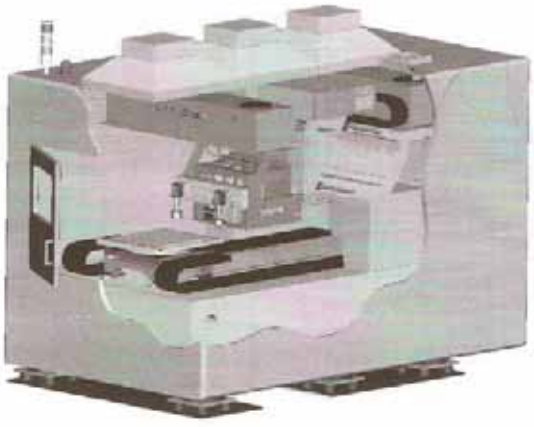
PCB Maskless Exposure System

DLP



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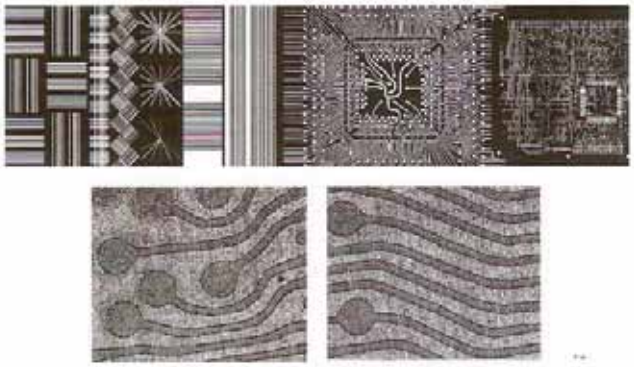
PCB Exposure Results



Minimum line feature: 45 um

SEM observation of 20um & 15um L/S Patterns

15um

Vertical Horizontal +45 Deg. -45 Deg.

20um

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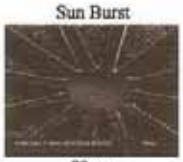
Exposure Result

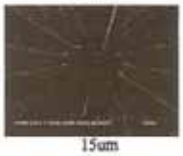
1 to 1 System

Various Features on 15um DFR

Sun Burst

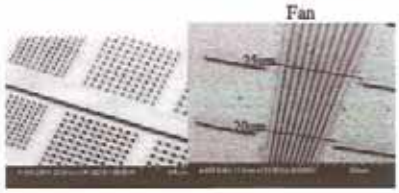


20um



15um

Fan



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SEM observation of 20um & 15um Holes/Projections

15um

Round Holes | Round Projection | Square Holes | Square Projection

20um

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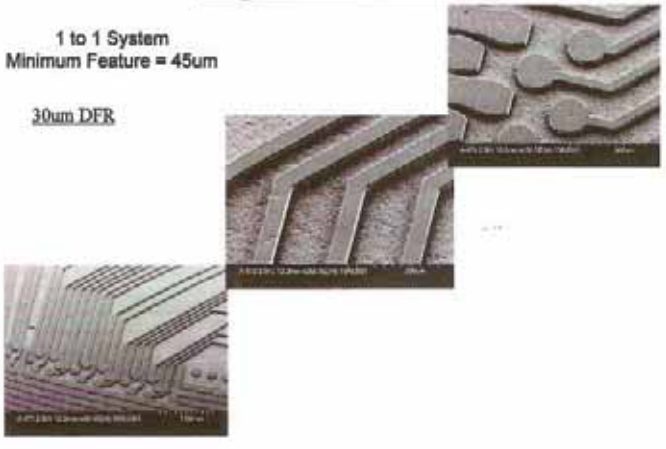
Exposure Result

1 to 1 System
Minimum Feature = 45um

30um DFR



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1:1 Engine Exposure Results

3um lines

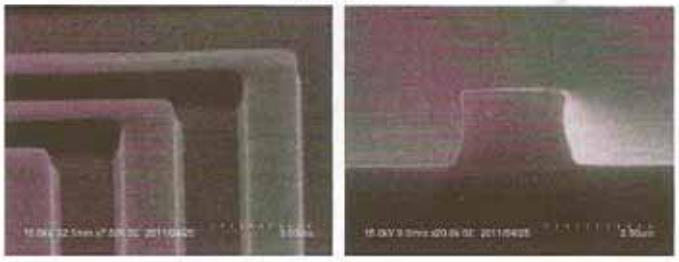

Photo Resist: NPR650P1

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Thank You

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