

# Flat Panel Displays

**Coherent Delivers Laser Solutions that Drive Innovation in Display Performance and Production, Especially for Mobile Devices!**

# Laser Solutions for Flat Panel Displays

Coherent covers the largest range of laser products to support high volume manufacturing of displays.

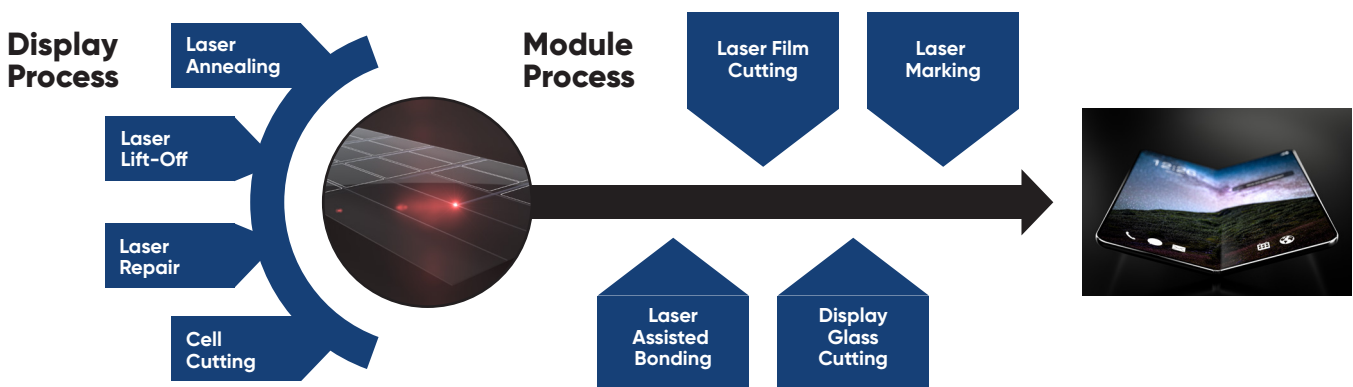
Lasers are utilized for numerous processes in flexible OLED production, just as they are in the manufacture of other display technologies. In fact, it can be reasonably claimed that lasers are a key enabling technology in the fabrication of modern, flat panel displays. And it's likely that they will continue to perform essential fabrication steps as flexible and foldable displays become more commonplace.

There is a variety of processes within the flexible display production line where lasers have an essential contribution to enable high throughput, high yield mass production. Nowadays, the complexity of the displays is getting larger and the number and tasks of lasers within flexible OLED production is increasing.

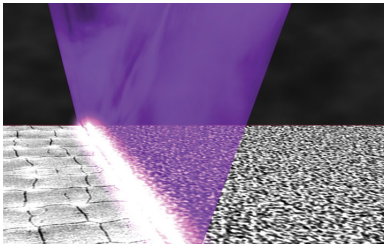
For this reason, choosing the right laser really means choosing the right laser supplier. Manufacturers need a partner who has the specific technical and applications development resources to identify the best and most cost-effective solution.

Coherent is that partner. The unparalleled breadth and depth of our product offering means that we have the right laser technology for your specific application – no matter what it is and where you are. Discover why flat panel manufacturers throughout the world rely on Coherent products to help cut cost, improve results, and maximize uptime. Come and leverage our worldwide applications labs and unmatched product portfolio.

## Flexible OLED Process

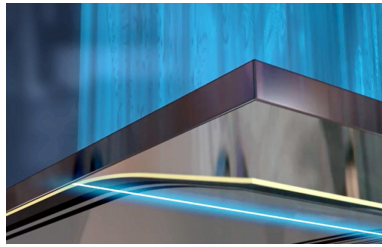


## Applications



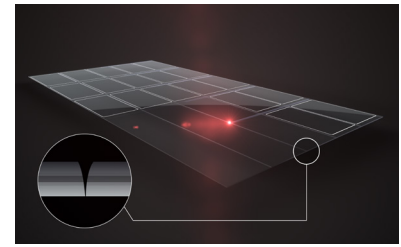
### Low Temperature Poly Silicon (LTPS) Annealing

Laser annealing of poly silicon (LTPS) is the foundation of any high-resolution display today. For highest electron mobilities and high-quality displays the annealing of large glass formats with very regular grain structures are required. Coherent supplies different LineBeam systems with UV laser lines lengths according to industrial panel sizes. Coherent lasers with the best UV energy stability, power scalability, and the matching LineBeam systems are the standard for industrial LTPS annealing today.



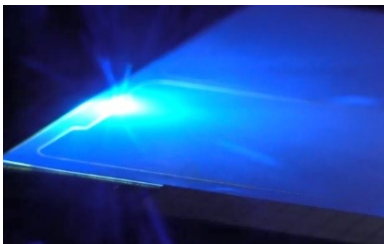
### Laser Lift-Off (LLO)

Laser Lift-Off is a key technology for flexible OLED displays and the fact that it happens near the end of production, when most of the value has been built into the display, makes it critical to provide a reliable and stable system that delivers high uptime and maximum production yield. To avoid damages the UV wavelength is mandatory. Energy stability of the laser source in combination with the best-in-class UVblade optical systems are offering a wide process window to process large displays. The product line covers all display sizes from a single cell to a large substrate. Coherents Laser Lift-Off process is capable of processing state-of-the art and next generation flexible and foldable displays.



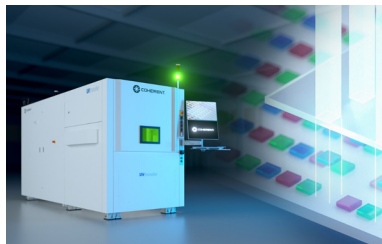
### Cell and Polarizer Cutting

CO<sub>2</sub> laser cell cut is the standard method in the FPD industry for high efficiency cutting of large display panels and polarizer films into individual device sizes. Excellent beam profiles, highly stable lasers, and the use of Q-Switch technology resulting in much shorter pulse duration are key to achieving a high quality cut. Coherent CO<sub>2</sub> lasers enable both half cut and through cut while avoiding damage to surrounding areas and layers below.



### FlexOLED Shape and Hole Cutting

The increasing sophistication and functionality of handheld devices, together with the complex foldable shapes, can often translate into the need to produce rounded corners and other contours, and even cutouts, during the singulation process. The need for a narrow cutting kerf width (e.g. 25 μm) and a minimal process affected zone, have made laser cutting the only realistic option. High power, ultraviolet (UV) output, ultrashort pulse (USP) industrial lasers are the industry benchmark for FlexOLED shape and hole cutting.



### MicroLED Lift-Off, Transfer, and Repair

MicroLED's represent an exciting emerging device type with tremendous potential for future displays. High energy, ultraviolet laser beams enable the processes for MicroLED display fabrication, specifically for Laser Lift-Off (LLO) and transfer (LIFT) as well as pixel repair. The developed system architecture is completely size-scalable enabling a smooth forward journey along the miniaturization road map of MicroLED's. The new product, the UVtransfer 3-in-1 tool (LLO, transfer, and repair), will set processing standards and demonstrates the potential of manufacturing large MicroLED displays practical and economical.



### Glass Cutting

A highly sophisticated glass cutting technique based on ultrashort pulse lasers delivers the results needed for the most demanding applications. The Coherent SmartCleave method specifically utilizes the unique characteristics of USP lasers. One of these is the so-called "burst mode" operation, where the laser delivers a rapid-fire series of pulses. Coherent has developed a small footprint, process optimized laser source. This laser provides sufficient output power at optimized costs to cut state-of-the-art display glass and camera lenses.

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APPLICATION	Your Need	Our Solution	Your Benefit	Laser Options
<b>LTPS Annealing</b>	Homogenous annealing quality on large glass substrates	Reliable optical systems incl. high-power high energy stability UV lasers	Constantly high annealing quality	LineBeam systems including high power UV laser sources
<b>Laser Lift-Off</b>	Releasing the flexible OLED stack from the rigid glass carrier without damaging the display material	High throughput mass production proven ns UV lasers and optical systems, the UVblade products	High throughput, high yield proven to process next generation displays e.g. CPI	UVblade systems including high power UV laser sources
<b>Cell and Polarizer Cutting</b>	High throughput cutting of polarizers and display cells	Industrially proven short pulsed CO <sub>2</sub> lasers with q-switch or AOM	Capable to cut polarizer and display cells without damaging underlying materials and the surrounding	Pulsed Mid-IR Lasers Nanosecond UV Lasers Picosecond UV and Green Lasers
<b>FlexOLED Shape Cutting and Hole Drilling</b>	Cut and drill flexible OLED stacks at high speeds without damaging heat sensitive display parts	Ultrashort pulsed UV lasers and highest power of up to 50 W	Smallest process affected zone Fast drilling and cutting speed Superior flexibility and performance	Picosecond and Femtosecond UV Lasers
<b>Glass Cutting</b>	High edge quality free form cutting of glass down to a few ten microns	A footprint and energy optimized ps laser capable to work with glass cutting optics	Easy to integrate, sufficient output power at optimized costs to cut state-of-the art display glass	Picosecond and Femtosecond IR Lasers
<b>MicroLED Lift-Off, Transfer, and Repair</b>	High Precise, high throughput MicroLED lift-off and transfer, Selectivity to address individual MicroLED's	OEM laser and optic system incl high resolution mask projection or turn-Key 3 in 1 system including integrated UV laser	Highest process flexibility, high precision laser processing with a scalability to high throughput mass production	Nanosecond 248 nm UV Lasers Optical Systems UVtransfer



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