

LCOS

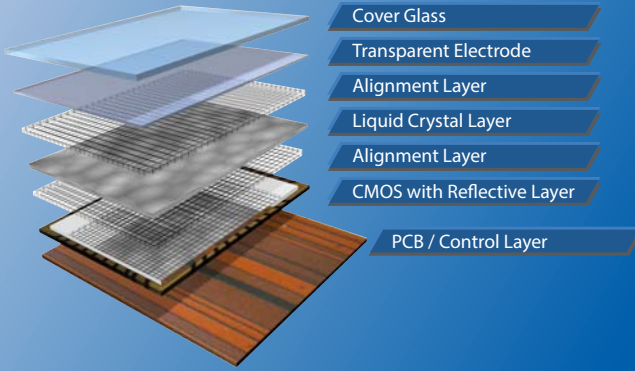
LCOS Microdisplays & Custom Developments



Pioneers in Photonic Technology

LCOS Microdisplays

LCOS (Liquid Crystal on Silicon) is a reflective microdisplay technology based on a silicon backplane.



LCOS technology is a powerful combination of two well-developed technologies: IC/CMOS and Liquid Crystal (LC). LCOS has a significant advantage in high-end projection applications due to the maturity and potential of both IC/CMOS and LC technologies.

Using standard CMOS processes, microdisplays with extremely small pixels, high fill factor (pixel aperture ratio) and low fabrication costs can be realized.

LCOS Display Applications

HOLOEYE is focussing on high demanding industrial imaging applications which have requirements beyond standard projection systems:

- ▶ Industrial Projection:
 - Fringe/Pattern Projection, Metrology, 3D-Sensor, Rapid Prototyping, Lithography
- ▶ Industrial Imaging:
 - Data-Displays, Medical, Simulation
- ▶ HUDs and HMDs
- ▶ High resolution NTE/EVF systems
- ▶ AR, VR applications

Standard LCOS Projection Developer Kits

HOLOEYE offers monochromatic and color field sequential microdisplays. For single panel color projection a color field sequential (CFS) display addresses three monochromatic images corresponding to the primary colors (RGB) in a repetitive sequence and is illuminated by a triggered light source.

For proof of concept and small volume applications, standard evaluation developer Kits are available for the following LCOS microdisplays:

HED 6001 Monochrome LCOS Microdisplay



Display Type	Reflective LCOS
Resolution	1920 x 1080 (full HD)
Display Mode	VAN normally black, nematic
Device Diagonal	0.7"
Active Area	15.36 x 8.64 mm
Aperture Ratio / Fill Factor	93%
Pixel Pitch	8.0 µm
Dynamic Range	8 bit grey level
Input Frame Rate	60 Hz monochrome
Contrast Ratio	>1000:1*
Reflectance	73% (@ 633 nm) / 78% (@ 1064 nm)
Recommended Waveband	420 – 700 nm / 650 – 1100 nm

HED 2220 Color LCOS Microdisplay



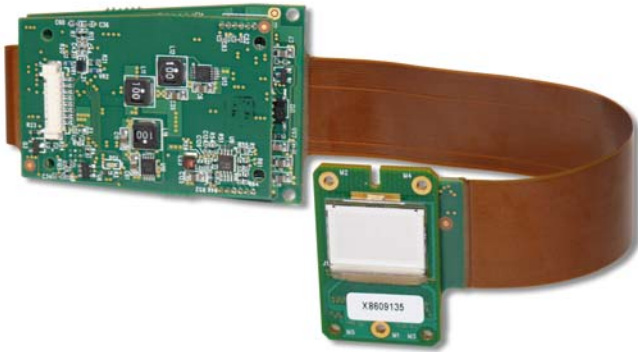
Display Type	Reflective LCOS
Resolution	1920 x 1080 (full HD)
Display Mode	TN, Normally White
Device Diagonal	0.39"
Active Area	8.64 mm x 4.86 mm
Aperture Ratio / Fill Factor	91%
Pixel Pitch	4.5 µm
Dynamic Range	8 Bit per color (using Dithering)
Input Frame Rate	60 Hz
Color Field Rate	360 Hz -6 color fields (RGBRGB)
Contrast Ratio	>1000:1*
Reflectance	65 % (typ.)
Recommended Waveband	460 - 700 nm

Custom LCOS Developments

For both conventional projection LCOS microdisplay components as well as for phase modulation LCOS products (Spatial Light Modulators) HOLOEYE offers comprehensive custom design and development engineering services.

In order to meet the requirements for industrial product integration, additional challenging adaption may be required in the fields of driver design, LCOS backplane processing, Liquid Crystal (LC) design, and mechanical packaging.

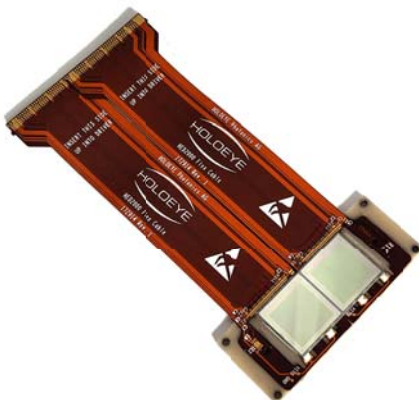
Electronics Design:



Electronics

- ▶ Drive Board Design (size, number of displays, signal input/interface)
- ▶ Design of custom flex cables
- ▶ Custom FPGA projects

Display Design:



Display

- ▶ Custom LC Design
- ▶ Simulation
- ▶ Custom display assemblies
- ▶ Custom display packaging

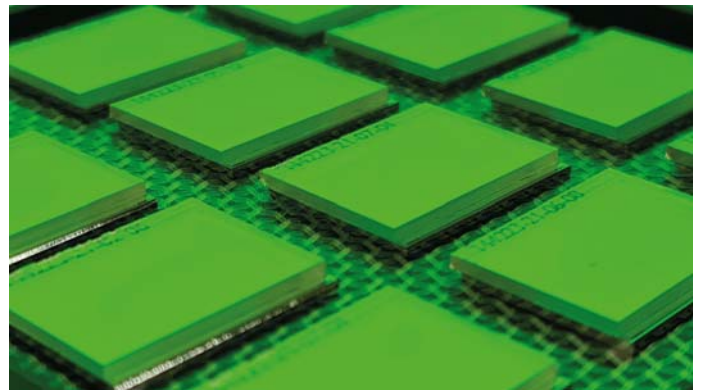
Programming:



Programming

- ▶ Firmware programming
- ▶ Drive sequence programming
- ▶ FPGA programming

Supply Chain:



Supply

- ▶ Management of development projects
- ▶ Component qualification for speciality markets (e.g. medical, avionics, telecommunication)
- ▶ Application based in house test systems
- ▶ Secure supply of components for long life products (LCOS Displays, Drive Electronics, ASICs or FPGAs)

*TN LCOS devices show a contrast in CFS mode >1000:1 using compensators like trim retarders or QWP's, whereas in monochrome applications the sequential contrast could be above 3000:1, even higher with VAN-type LCOS in normally black mode also with compensator optics.

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