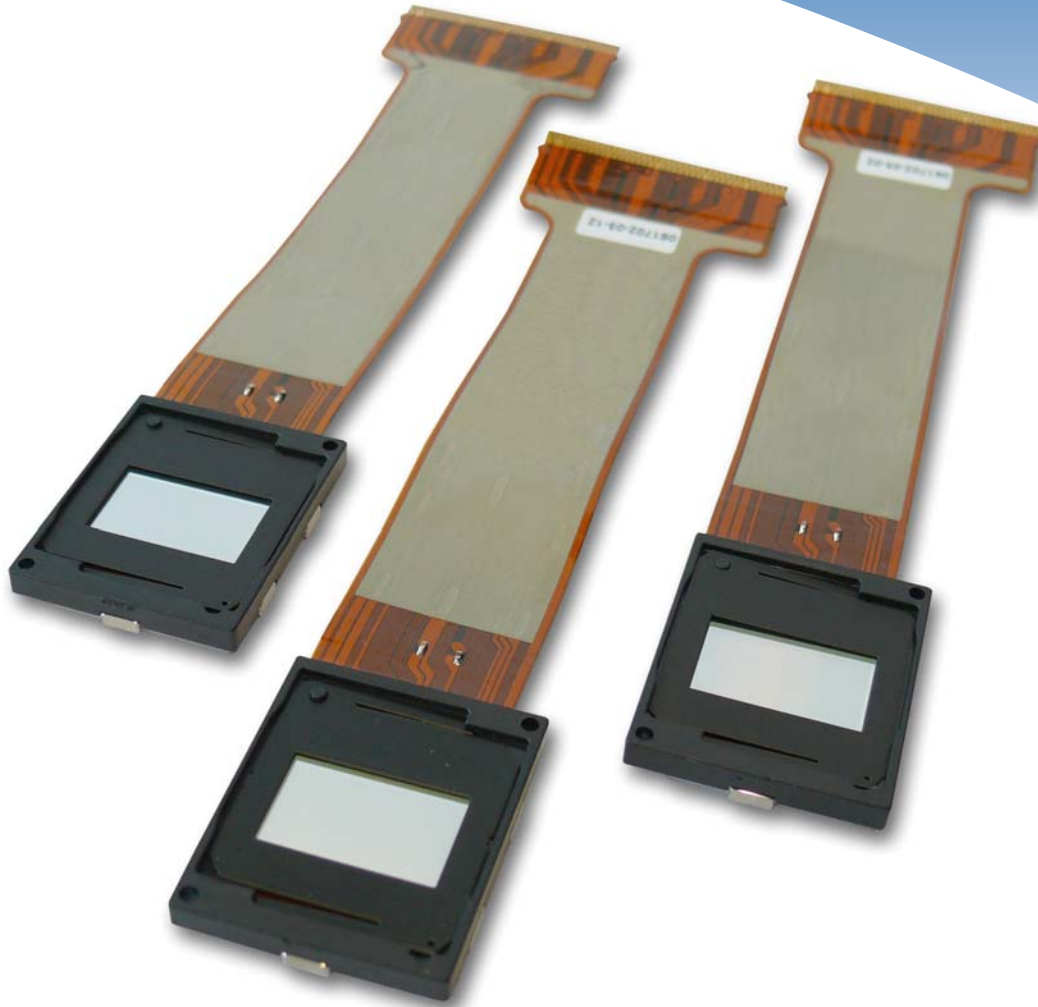


LCOS

Microdisplay Technology



Pioneers in Photonic Technology

LCOS Microdisplays

LCOS (Liquid Crystal on Silicon) is a reflective microdisplay technology based on a Silicon backplane. The electronic circuits controlling the liquid crystals are fabricated on a silicon chip, which is coated with a highly reflective surface. This results a very high fill factor (image is less pixelated) because the circuitry is behind the pixel (compared with transmissive LC, electronics surround the pixels) and does not create an obstruction in the light path ("screen door" effect). Using standard CMOS processes, microdisplays with extremely small pixels, high fill factor (pixel aperture ratio) and low fabrication costs can be created.

LCOS microdisplay technology can compete and in some cases even outperform all other display technologies with respect to resolution, size, ease of use, quality and price. HOLOEYE's OEM LCOS microdisplay service includes basic implementation assistance and performance specification for specialized applications. HOLOEYE offers modification of driver parameters for customer specific requirements resulting in low-cost intelligent driver boards ready for mass production.

LCOS Microdisplays offered by HOLOEYE:

- ⊗ Microdisplay size from 0.177" to 0.7" (display diagonal)
- ⊗ Resolution from 640 x 480 (VGA) to 1920 x 1080 (HDTV)
- ⊗ Frame rate from 60 Hz to 180 Hz
- ⊗ Digital drive schemes
- ⊗ Monochrome and Color-Field-Sequential LCOS microdisplays
- ⊗ Amplitude and phase modulating LCOS microdisplays



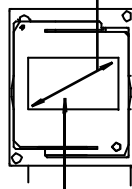
Microdisplays and drive ASICs

For the following LCOS microdisplay solutions HOLOEYE also offers drive ASICs and standard drive board solutions for evaluation. We also offer the customized development of drive electronics and flex cables and complete systems solution designs including optics, illumination, mechanics and electronics.

HDTV Resolution - Monochrome

HED-6001 Microdisplay (1920 x 1080 Pixel) - 0.7"

Device Diagonal: 0.7"



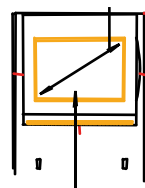
Active Area: 15.36 x 8.64 mm

Display Type:	Reflective LCOS
Dynamic Range:	10 bit grey level*
Resolution:	1920 x 1080 (HDTV)
Device Diagonal:	0.7"
Display Mode:	VAN, Normally black
Active Area:	15.36 x 8.64 mm
Aperture Ratio / Fill Factor:	>87%
Pixel Pitch:	8.0 μm
Frame Rate:	60 Hz
Contrast Ratio:	2500:1**
Reflectance:	55 % (typ.)
Weight:	12 grams
Operating Temperature:	+10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

WXGA Resolution - Monochrome

HED-5201 Microdisplay (1280 x 768 Pixel) - 0.55"

Device Diagonal: 0.55"



Active Area: 12.29 x 6.91 mm

Display Type:	Reflective LCOS
Dynamic Range:	10 bit grey level*
Resolution:	1280 x 768 (WXGA)
Device Diagonal:	0.55"
Display Mode:	VAN, Normally black
Active Area:	12.29 x 7.37 mm
Aperture Ratio / Fill Factor:	>89%
Pixel Pitch:	9.6 μm
Frame Rate:	60 Hz
Contrast Ratio:	2500:1**
Reflectance:	66 % (typ.)
Weight:	9 grams
Operating Temperature:	+10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

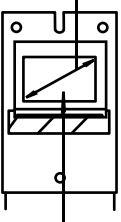
Color-Field-Sequential Microdisplays

A liquid crystal color field sequential (CFS) display presents three monochromatic images corresponding to the three primary colors (RGB) in a repetitive sequence and at a frame rate greater than the flicker fusion frequency for the human eye (180 Hz).

WXGA Resolution - CFS

HED-5216 Microdisplay (1280 x 768 Pixel) - 0.7" CFS

Device Diagonal: 0.55"



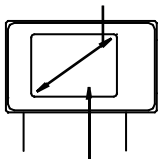
Active Area: 12.29 x 7.37 mm

Display Type:	Reflective LCOS
Dynamic Range:	8 bit per color
Resolution:	1280 x 768 (WXGA)
Device Diagonal:	0.55"
Display Mode:	VAN, Normally black
Active Area:	12.29 x 7.37 mm
Aperture Ratio / Fill Factor:	>89%
Pixel Pitch:	9.6 μm
Frame Rate:	180 Hz CFS
Contrast Ratio:	1000:1**
Reflectance:	66 % (typ.)
Weight:	12 grams
Operating Temperature:	+10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

SVGA Resolution - CFS

HED-8621 Microdisplay (800 x 600 Pixel) - 0.463" CFS

Device Diagonal: 0.463"



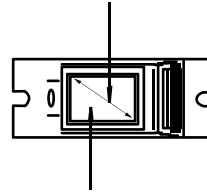
Active Area: 9.4 x 7.05 mm

Display Type:	Ferroelectric reflective LCOS
Dynamic Range:	10 bit per color
Resolution:	800 x 600 (SVGA)
Device Diagonal:	0.463"
Display Mode:	FLC
Active Area:	9.4 x 7.05 mm
Aperture Ratio / Fill Factor:	>91.7%
Pixel Pitch:	11.75 μm
Frame Rate:	180 Hz CFS
Contrast Ratio:	500:1**
Reflectance:	60 % (typ.)
Weight:	5 grams
Operating Temperature:	-10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

SVGA Resolution - CFS

HED-1316 Microdisplay (800 x 600 Pixel) - 0.364" CFS

Device Diagonal: 0.364"



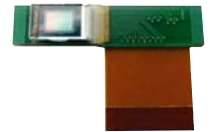
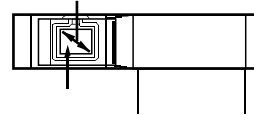
Active Area: 7.04 x 5.28 mm

Display Type:	Reflective LCOS
Dynamic Range:	8 bit per color
Resolution:	800 x 600 (SVGA)
Device Diagonal:	0.364"
Display Mode:	VAN, Normally black
Active Area:	7.04 x 5.28 mm
Aperture Ratio / Fill Factor:	>95%
Pixel Pitch:	8.8 μm
Frame Rate:	180 Hz CFS
Contrast Ratio:	1000:1**
Reflectance:	55 % (typ.)
Weight:	5 grams
Operating Temperature:	+10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

VGA Resolution - CFS

HED-1016 Microdisplay (640 x 480 Pixel) - 0.177" CFS

Device Diagonal: 0.177"



Active Area: 3.6 x 2.7 mm

Display Type:	Reflective LCOS
Dynamic Range:	8 bit per color
Resolution:	640 x 480 (VGA)
Device Diagonal:	0.177"
Display Mode:	VAN, Normally black
Active Area:	3.6 x 2.7 mm
Aperture Ratio / Fill Factor:	>88%
Pixel Pitch:	5.625 μm
Frame Rate:	180 Hz CFS
Contrast Ratio:	1000:1**
Reflectance:	53 % (typ.)
Weight:	3.5 grams
Operating Temperature:	+10°C to +70°C
Operating Waveband:	420 - 700 nm
Lifetime (RPTV Application):	> 20,000 hours

*after gamma correction **with compensator

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