E-Paper

Basics of the E-Paper Technology

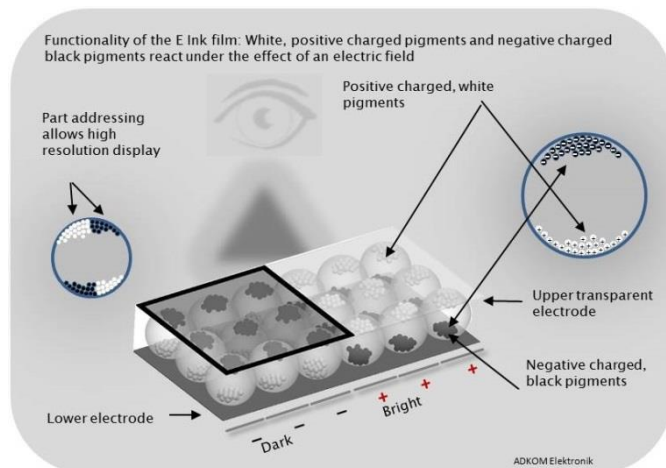## Basics of the E-Paper Technology

1975 Development at the Xerox Palo Alto Research Center

1990 Formation of the MIT Spin off Eink
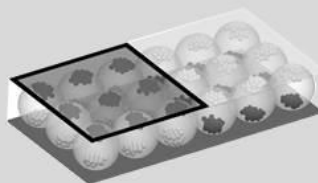
Operating mode of the E-Paper technology:

The E INK fluid consists of pellets which contain negatively charged black – and positively charged white flakes. They are enclosed in the sphere.

The medium (pellet) is embedded in a light oil. By applying voltage, the flakes can be drawn either to the front- or back of the layer / fluid to display the desired content.

Functionality of the E Ink film: White, positive charged pigments and negative charged black pigments react under the effect of an electric field

Part addressing allows high resolution display

Positive charged, white pigments

Upper transparent electrode

Negative charged, black pigments

Lower electrode

Dark Bright

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Construction of an E-Paper:

Construction of an E-Paper

Layer 1: transparent protection foil, water proof
Layer 2: E Ink film
Layer 3: Baseplate, PCB, FPC, Glass, PET
Layer 4: Protection foil, water proof

Remark: Layer 1 can be removed if the baseplate is glass type.

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The structure of an e-paper is obvious:

Layer 1 is a transparent, waterproof protective foil, which is followed by layer 2, the actual E INK film. The 3rd layer includes the base substrate which may consist of PCB, FPC, PET or glass. A waterproofed protection foil in Layer 4 is finally covering the construction.

E-paper, also named as electrophoretic displays or in short form EPDs, are high-resolution and can by partial addressing of the particles represent several scales of grey.

E-Paper are available as:

|	
Graphic E-Paper	Glass based E-Paper within standard sizes.
Colors E	B/W and B/W/R
Segment E-Paper	Customized
Color	B/W
Basic materials	Glass, PCB, FPC, PET

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Advantages of E-Papers:

- Bi-stable Display
  Power consumption only by
  changing of display content
  Powerless during periods of
  unchanged representation of
  the displayed content
  Information can be displayed
  unchanged over a long
  period of time
- High Contrast
- Wide viewing angle from all sides
- High-resolution
- Representation of grey scales
- Partial update, since Release 3.0
- Very low overall height
- Reflective – good readability without backlighting –
- Good readability in direct sun exposure
- Suitable for battery applications.
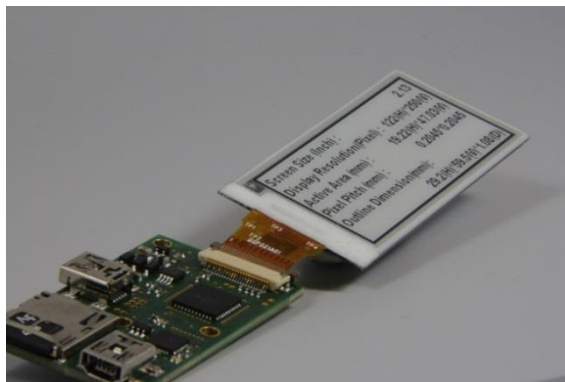
Currently valid data for the service life time, switching cycles and Temperature:

- By manufacturer guaranteed:
- 1.000.000 Refreshes – or
- 5 Years
- –20°C up to +50°C as standard temperature range
- –15°C up to +10°C in "freeze" design
- –25°C up to +10°C in "deep freeze" design
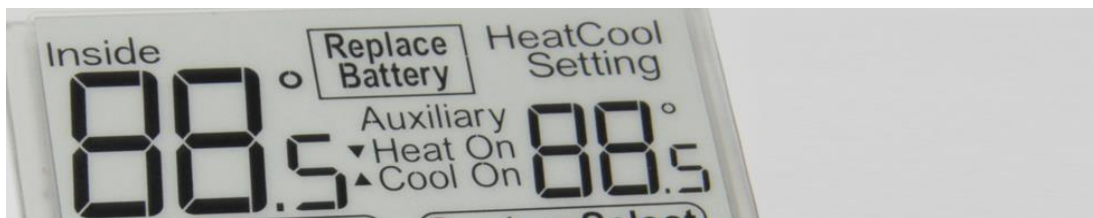
E–Paper compared to other technologies:

Specific application criteria	E-Paper			TFT		PMOLED		LCD					
	Segm.	Graph.	Flex.	IPS	TN	Full Color	Mono-chrome	Graph.	Segm.	Graph.	Segm.	Graph.	Segm.
Operating temperature	0℃– +50℃			−20℃ – +70℃				−10℃ – +55℃					
Operating temperature – freeze	−10℃ – +10℃												
Operating temperature – deep freeze	−25℃ – +10 ℃												
Ultra wide temperature	✖			−30℃ – +85℃		−40℃ – +105℃		−30℃ – +85℃					
Storage temperature	−25℃ – +70℃			−30℃ – +85℃		−40℃ – +105℃		−20℃ – +65℃					
UV protection	optional			optinal		optional		optional					
Sunlight readable	★★	★★	★★	★	★	✖	✖	★★	★★	★	★	✖	✖
Viewing angle	★★	★★	★★	★★	★	★★	★★	to be defined					
Bistabile display	★	★	★	✖	✖	✖	✖	available		✖	✖	✖	✖
Backlight	✖	✖	✖	★★	★★	✖	✖	✖	✖	★	★	★★	★★
Thickness display unit	★★	★★	★★	medium		★★	★★	high					
Lifetime	dep. on application			★	★	dep. on appl.		★★	★★	★★	★★	★★	★★
Refresh time	higher than other			★	★	★	★	★	★	★	★	★	★
Customization poosible	★	△	★	△		★	★	★★	★★	★★	★★	★★	★★

★★ very good	★ good	✖ not available	△ high volume	ADKOM™ Elektronik GmbH

Access to E–Paper production via ADKOM:

• leading E–Paper producer with own production lines
• Authorized E INK partner since 2011
• ISO 9001:2008 and ISO/TS 16949:2009 certified

Standard size graphik E-Paper

An actual release of the standard sizes available you will find at:

www.adkom.de/en/display-technology/e-paper/grafic-e-paper.html

All sizes of our partner's own series production. Thereby:

- better scheduling
- better availability
- direct knowledge about changes and EOL notices

ADKOM Services around E-Papers:

- Design-in services
- Development, design and production of controller boards

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