works with
BY SILICON LABS
VIRTUAL CONFERENCE

SILICON LABS

How to Drive an ePaper Module with a wireless MCU

Introduction

- Introduction to Electronic Shelf Labels

  - Use Cases and environments

- Eink electronic paper display (EPD) overview

  - Operations and current consumption

- Walk through of the demo project with video tutorial

  - Configuration Details

- Q & A

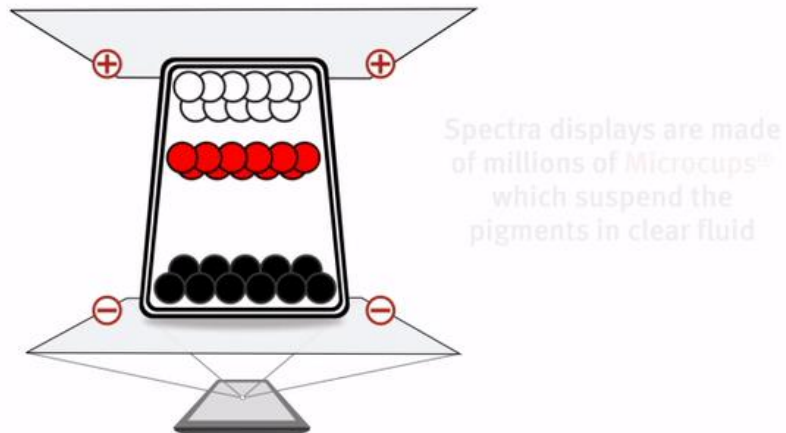w/ works with | SILICON LABS

What is an Electronic Shelf Label (ESL)

- **ESL is displaying product pricing on shelves**
  - Accurate and dynamic pricing
  - Geo-location in ESL tags increase picking productivity
  - Help to manage overall inventory level
  - Real-time in-store advertisement for customer interaction and personalized communication

- **Inside of a typical ESL device**
  - Electronic paper display (EPD)
  - Ultra low power wireless SoC
  - Coin cell battery
  - LED indication lights

- **Fundamental enabler of store digitalization**

Eink electronic paper display (EPD) overview

How does the EPD work?

Spectra displays are made of millions of Microcups® which suspend the pigments in clear fluid

Fundaments of operation

- Millions of tiny capsules

- Capsules diameter like human hair

- Filled with colored liquid

- Top and bottom electrodes to issue movement

Key characteristics

- No current draw when static frame on the picture

- Significant amount of current during frame update

- Image update takes typically several seconds

Figure from E Ink's Spectra product line

w/ works with | SILICON LABS

Connecting EPD module with host electronics

- **Chip on Glass (COG) driver**
  - Integrated into the EPD module's glass
  - Generates needed power rails needed by the panel
  - Drives the EPD display and the related circuit
  - Internal frame memory and registers
  - Interact with driver MCU
- **Connection through EPD's ribbon cable**
  - SPI connection interface for host MCU
  - External discrete devices needed for COG charge pump to operate

works with | SILICON LABS

Creating the displayed image
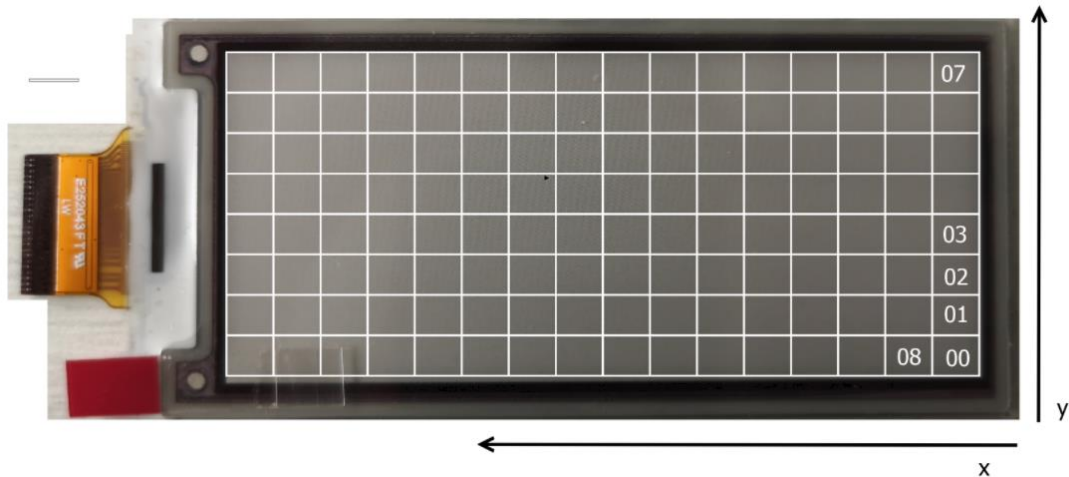

- **Image preparation for EPD**
  - Image conversion to 1 dimensional array
  - Separate image buffers for each color

- **To draw an image on the EPD panel MCU**
  - Powers up and initialize the COG
  - Writes the new image data to buffers
  - COG manages display update process causing the display to flicker for some seconds
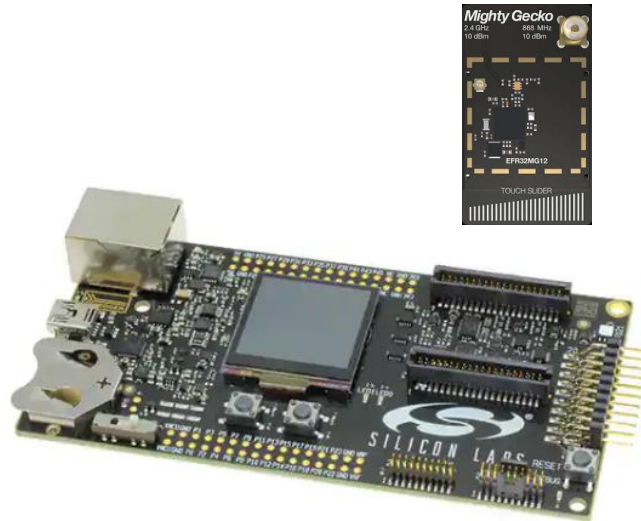 - Power off the COG driver once update complete

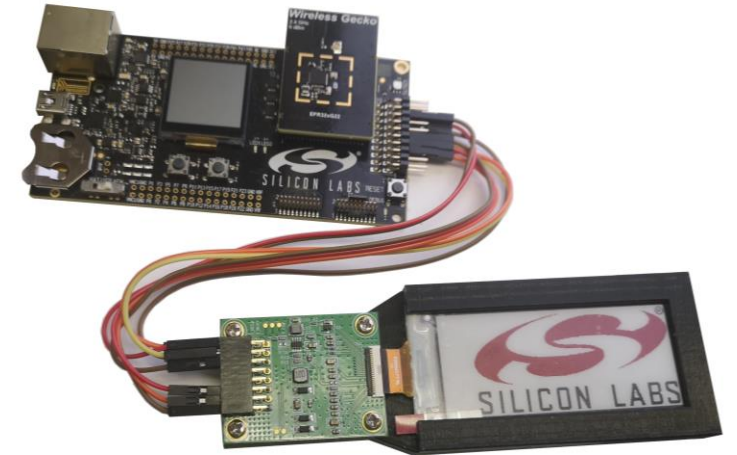# Demo project - Driving Electronic Paper Displays (E-Paper)

Demo project overview
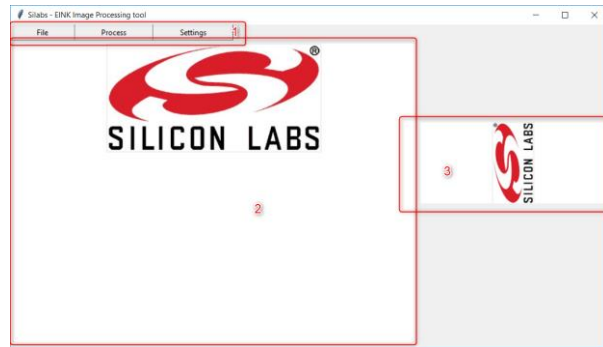
SETUP

Generate image suitable for EPD

Utilizing Python based tool

GATEWAY

**Connects wirelessly to the node**

Sends over the stored image

Controlled by host PC

EPD NODE (ESL DEVICE)

Receives wirelessly the sent image

Manages the EPD module update

Resumes to ultra low power mode

Details available in silabs.com AN0063: Driving Electronic Paper Displays (E-Paper)

w/ works with | SILICON LABS

Demo video – Project setup with Host

- **Software in use on Windows 10 PC**
  - Silabs Simplicity Studio V5 with SDKs
  - Python 3.9 with
    - Python Image module
    - PySerial
  - Image conversion tool coming with the demo package
- **Key demonstration**
  - Download of the demo project
  - HW and SW requirements and installation
  - Import projects to Studio V5, compile and flash
 - Ready to be used

w/ works with | SILICON LABS
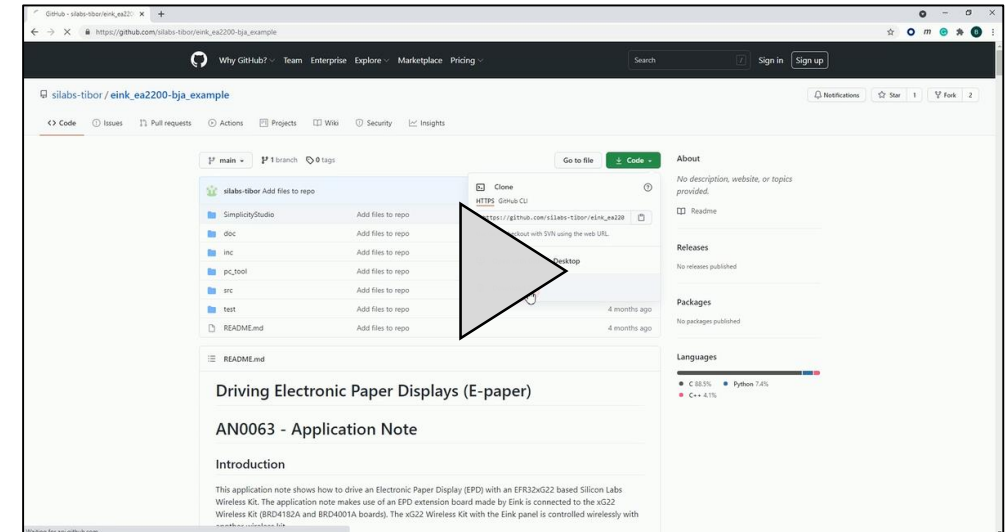
Demo video – Image setup for gateway

- **Used material**
  - SLWMB4001A : Wireless Starter Kit Mainboard
  - SLWRB4163A : EFR32MG12 radio board
  - eink_brd4163a_gateway project
  - Image conversion tool

- **Key demonstration**
  - HW and SW are ready
  - Usage of Image processing tool
  - Send the new frame to the EPD node
  - Usecase: Apple promotion

w/ works with | SILICON LABS
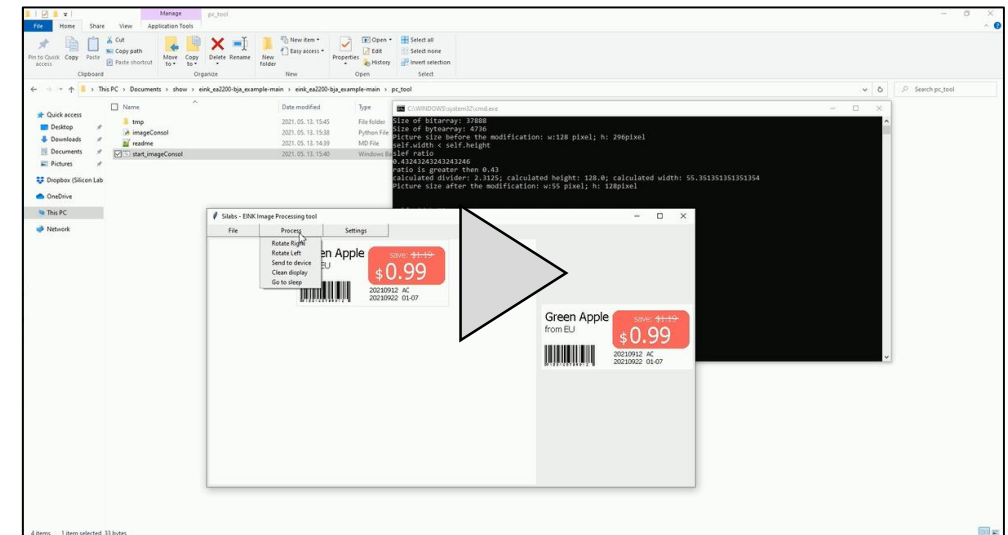
Demo video – EPD node project

- **Used material**
  - SLWMB4001A : Wireless Starter Kit Mainboard
  - SLWRB4182A : EFR32xG22 radio board
  - Eink HULK driving board : EPD display and driver
  - Jumper cables
  - eink_brd4182a_endnode project
- **Key demonstration**
  - HW and SW are ready
  - Running from coin cell battery
  - EPD performs the frame update
  - EPD current consumption
  - Usecase: Apple price promoted

w/ works with | SILICON LABS
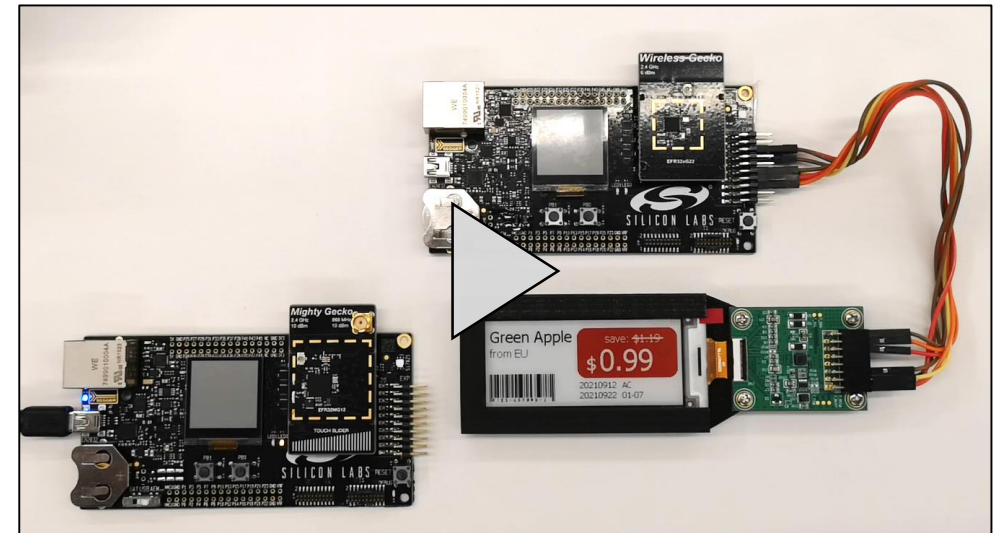
Demo resources

APPLICATION NOTE

@ silabs.com

https://www.silabs.com/documents/public/application-notes/an0063-efr32-epd.pdf

PYTHON AND TOOLS

@ github.com

https://github.com/silabs-tibor/eink_ea2200-bja_example/tree/main/pc_tool

DEMO PROJECT SOURCE

@ github

https://github.com/silabs-tibor/eink_ea2200-bja_example/

w/ works with | SILICON LABS

Thank you

Q & A