



# PP-rest Oy Poster Presentation

# WHAT DISPLAY TO CHOOSE FOR YOUR BATTERY POWERED IOT APPLICATION

Often, our customers wonder what the best display solution for their IoT application could be.

Simple criteria are defining environmental and power consumption requirement!

In short, for indoor application, we would recommend using EPD (Electronic Paper Display, an electrophoretic display), while outdoor usage reflective TFT LCD is better option!

Power consumption point of view, we see EPD best fit to IoT battery powered devices, however, it's operation condition: 0°C-50°C, 0°C-40°C and -25°C-+10°C are not enough for Nordic outdoor conditions ( -20°C to 50°C).

For outdoor/low ambient light application, EPD typically requires an integrated Front Light solution!

Most of IoT devices are meant to be cordless, wireless and powered by batteries. Therefore, one of the biggest challenge for engineers is usually the power consumption.





# Lora WAN™ DEVICE AS AN EXAMPLE!

In an indoor temperature and humidity sensor supplied with 2600mAh battery, equipped with 2.9" EPD (Electronic Paper Display, Black & White, e.g. DKE part no. [DEPG0290BNS800F6](#)), the major current consumption comes from:

1. sensor measurement
2. data transmission period (that say, station is nearby area within 10km, and payload is decent, and supposedly we need to measure and update the room condition every hour.)
3. idle mode

The sensor measurement and data transmission period take roughly 3 seconds with the average 10mA current consumption, while the idle period would be 3597 seconds.

In the current consumption and battery lifetime calculation (use same battery safety discharge e.g. 85%), the lifetime can be so highly dependent to the idle current consumption.

When idle current **1uA** (Deep Sleep Mode), battery life is 1743 days

Due to EPD characteristics, after loading the content to EPD (normally 1-3 seconds with 3mA), it retains the image while display goes to deep sleep mode, 1uA current consumption is required.

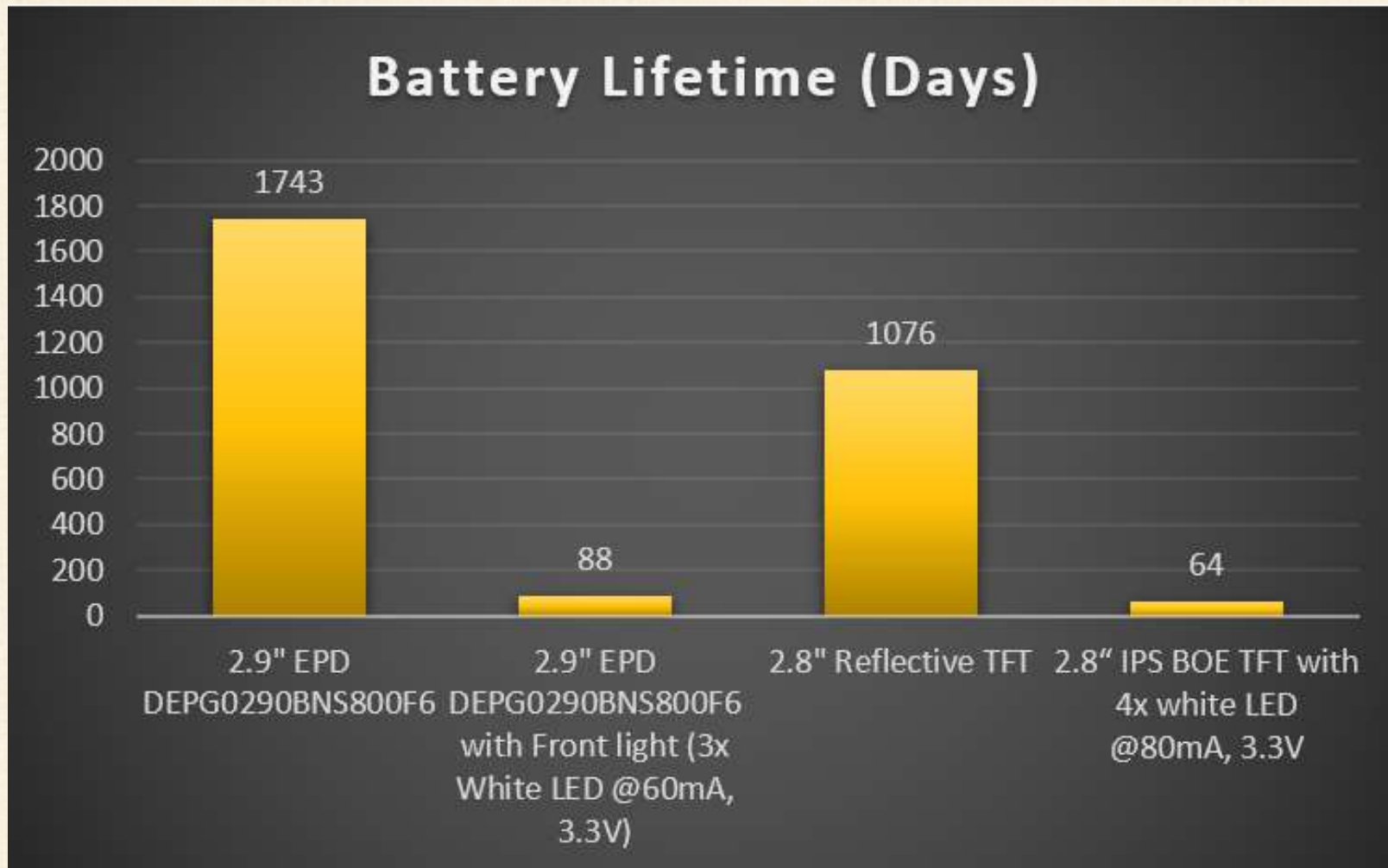
# POWER CONSUMPTION COMPARISON

	Refresh time (s)	Idle time (s)	Power consumption during code execution [mA]	Power consumption Sleep Mode [uA]	Battery Power (mAh)	Battery discharge safety (%)	Battery Lifetime (hrs)	Battery Lifetime (days)	Average Power Consumption per Hour [mA/h]
2.9" EPD DEPG0290BNS800F6	3	3597	10	1	2600	85	41820	1743	0.01
2.9" EPD DEPG0290BNS800F6 with Front light (3x White LED @60mA, 3.3V)	10	3590	66	1	2600	85	2115	88	0.18
2.8" Reflective TFT	0.06	3599.94	6	15	2600	85	25828	1076	0.02
2.8" IPS BOE TFT with 4x white LED @80mA, 3.3V	10	3590	86	15	2600	85	1536	64	0.25

Above, a comparison of typical small size IoT Device Displays:

1. 2.9" EPD
2. 2.9" EPD with Front Light
  - Calculations are based on the worst-case scenario, where Front Light is activated every time, when content is updated
3. 2.8" Reflective TFT
4. 2.8" Transmissive TFT
  - Calculations are based on the worst-case scenario, where Back Light is activated every time, when content is updated

# POWER CONSUMPTION COMPARISON





# CONCLUSION

Power consumption in IoT (Internet of Things) devices is a critical consideration as these devices are often deployed in remote or hard-to-access locations and are expected to operate for extended periods without frequent battery replacements or recharges. Several factors influence the power consumption of IoT devices in the perspective of Display selection:

- 1. Display technology:** The choice of Display components greatly affects power consumption. Low-power variants of these components are often preferred for IoT applications.
- 2. Data Transmission Frequency and Payload:** Transmitting data consumes more power than other operations. IoT devices should be programmed to transmit data only when necessary and to optimize the payload size to minimize power consumption.
- 3. Sleep Modes and Wake-up Mechanisms:** IoT devices can be programmed to enter low-power sleep modes when not actively performing tasks. Wake-up mechanisms, such as timers, interrupts from sensors, or communication events, are used to bring the device back to an active state when needed.
- 4. Battery Life:** The choice of battery type and capacity directly impacts the operational lifespan of IoT devices. Optimizing power consumption ensures longer battery life and reduces maintenance requirements.
- 5. Environmental Conditions:** Extreme temperatures, humidity, and other environmental factors can affect power consumption and battery performance in IoT devices. Design considerations should account for these factors to ensure reliable operation in diverse conditions.

Overall, optimizing power consumption is essential for prolonging the operational lifespan, reducing maintenance costs, and improving the reliability of IoT devices in various applications.

# PORTOLIO



## EPD Modules

- Front Light
- Touch
- Customized Cover Lens



## LCD - Distributor

- All sizes and form factors and Solutions
- All technologies
- Flexible MOQ



## Lamination

- OCA & OCR
- CG & PMMA Lenses



## TDM

- Customized Touch + Lamination
- SigmaSense Driver IC portfolio integration
- Driver Boards



## Embedded Solutions


- HW solutions for EPD and TDM
- HMI Boards



## Consulting Service

- Project Management
- Design
- Supply Chain Management

# EPD PRODUCTS



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03/10/2023

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EPD PRODUCTS

Size	PIN	Resolution	Cover Glas	PMMA Le	Front Light	Touch
2.9"	SOLISD_EPD_2.9_00	128x296		x	PC	No
2.9"	SOLISD_EPD_2.9_00	128x296	x		PC	No
2.9"	SOLISD_EPD_2.9_00	128x296	x		No	No
2.9"	SOLISD_EPD_2.9_00	128x296	x		PC	Yes
2.9"	SOLISD_EPD_2.9_00	128x296		x	No	No
2.9"	SOLISD_EPD_2.9_00	128x296			PC	No
2.9"	SOLISD_EPD_2.9_00	128x296				RTP
4.2"	SOLISD_EPD_4.2_00	400x300	x		PC	No
4.2"	SOLISD_EPD_4.2_00	400x301			PC	RTP
5.83"	SOLISD_EPD_5.83_0	648x480	x		PC	No
5.83"	SOLISD_EPD_5.83_0	648x480	x		PC	Yes
7.5"	SOLISD_EPD_7.5_00	640x384	x		PC	Yes
9.7"	SOLISD_EPD_9.7_00	1200x825		x	PC	No
9.7"	SOLISD_EPD_9.7_00	1200x825		x	PC	Yes
10.3"	SOLISD_EPD_10.3_00	1872*1404	x		PC	No
11.3"	SOLISD_EPD_11.3_00	2400x1034		x	PC	No
11.3"	SOLISD_EPD_11.3_00	2400x1034	x		PC	No
11.3"	SOLISD_EPD_11.3_00	2400x1034		x	PC	Yes
13.3"	SOLISD_EPD_13.3_00	960 x 680		x	PC	No
13.3"	SOLISD_EPD_13.3_00	960 x 680	x		PC	No
13.3"	SOLISD_EPD_13.3_00	960 x 680	x		PC	Yes
13.3"	SOLISD_EPD_13.3_00	1600x1200		x	PC	Yes
13.3"	SOLISD_EPD_13.3_00	1600x1200	x		PC	No
13.3"	SOLISD_EPD_13.3_00	960 x 680			PC	
13.3"	SOLISD_EPD_13.3_00	960 x 680	x			
28"	SOLISD_EPD_28_002	3840x1080			PC	No
31.2"	SOLISD_EPD_31.2_00	2560x1440	x		PC	Yes
31.2"	SOLISD_EPD_31.2_00	2560x1440	x		PC	No
42"	SOLISD_EPD_42_001	2160x2280			PC	No

We have Front Light solutions for 2.9", 4.2", 5.83", 7.5", 9.7", 10.3", 11.3", 13.3", 28", 31.2" and 42" EPD modules.

We have different Cover Glass and Touch Screen option for EPD Modules.





# LCD

- We have wide portfolio/vendor base for standard TFT Display Modules. Also, good co-operation with MIP, ESL, PMOLED and AMOLED Displays.
- Various sizes and technologies are available!
- We will also do customized Display and Display & Touch Modules together with fully customized Driver Boards.
- Please send as an RFQ – We'll provide you a competitive, customized, solution!

LCD Portfolio:

<https://solisdisplay.com/tft-lcd/>

# INFO

## Business name:

PP-rest Oy

VAT FI19636842

## Business structure:

Limited Company

## Business location(s):

Saukonkatu 6 C 15, 20760 Piispanristi, Finland

### c/o Nordiska Partners Limited

Unit 617, 4/F, Spaces, Lee Garden Three, 1 Sunning Road,  
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### c/o Right Linkage Limited

Unit 903, 9/F, Tower 2, Enterprise Square,  
No. 9 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong

## Date established:

04.05.2005

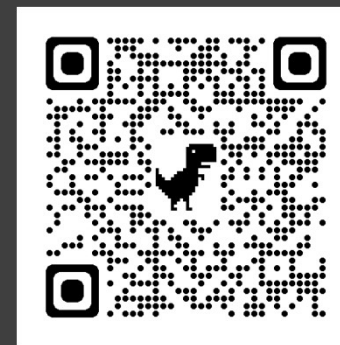
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[www.solisdisplay.com](http://www.solisdisplay.com)



A serene sunset scene over a calm body of water. The sun is a bright, glowing orb on the horizon, casting a long, shimmering reflection down the center of the water. In the distance, a range of mountains is silhouetted against the orange and yellow sky. A small boat with a person on board is visible on the left side of the water. The overall mood is peaceful and contemplative.

# THANK YOU!