CUSTOMER APPROVAL SHEET

Company Name	Kaufland
MODEL	
CUSTOMER APPROVAL	

☐ **APPROVAL FOR SPECIFICATIONS ONLY**

☐ **CUSTOMER REMARK:**

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Datasheet

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Summary

This datasheet presents the general performance and specifications of SOLUM Electronic Shelf Label (ESL) System.

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Table of Contents

1 GENERAL DESCRIPTION 5
1.1 FEATURES 6
1.2 TYPICAL APPLICATIONS 6
1.3 APPEARANCE 6
2 SPECIFICATION 7
2.1 PRODUCT SPECIFICATION 7
2.2 RADIO (RF) SPECIFICATION 8
2.3 NFC SPECIFICATION 8
2.4 FEATURES 9
2.5 LABEL MARKING 10
3 RELIABILITY TEST 11
4 PRODUCT HANDLING PRECAUTIONS 12
4.1 USAGE ENVIRONMENT 12
4.2 STORAGE AND USE 12
4.3 PRODUCT CLEANING 13
4.4 BATTERY REPLACEMENT 14
5 BATTERY HANDLING GUIDE 15
5.1 AVOIDING HAZARDS IN LITHIUM BATTERY HANDLING 15
5.2 PROPER STORING AND DISPOSING OF LITHIUM BATTERIES 17
6 CERTIFICATIONS 18
6.1 FCC 18
6.2 CE 18
6.3 ISED 19
6.4 KC 19

DOCUMENT HISTORY

Rev.	Date	Revision History	Page

1 General Description

Kaufland Label product is a part of the SOLUM Electronic Shelf Label (ESL) System, which includes Label, Gateway, and Remote Controller. The ESL System electronically displays customer content (i.e. price, product, and promotion information) on the Labels, which have traditionally been printed or written on paper in places such as retail markets and warehouses.

Kaufland Label wirelessly receives data from the Gateway and updates the display with the new information provided.

Kaufland Label is based on Bluetooth Low Energy (BLE) for low power wireless communication applications. It consists of an RF transceiver, RF circuitry and the ARM Cortex M3 MCU offering BLE based network protocol, MAC protocol and other peripheral devices.

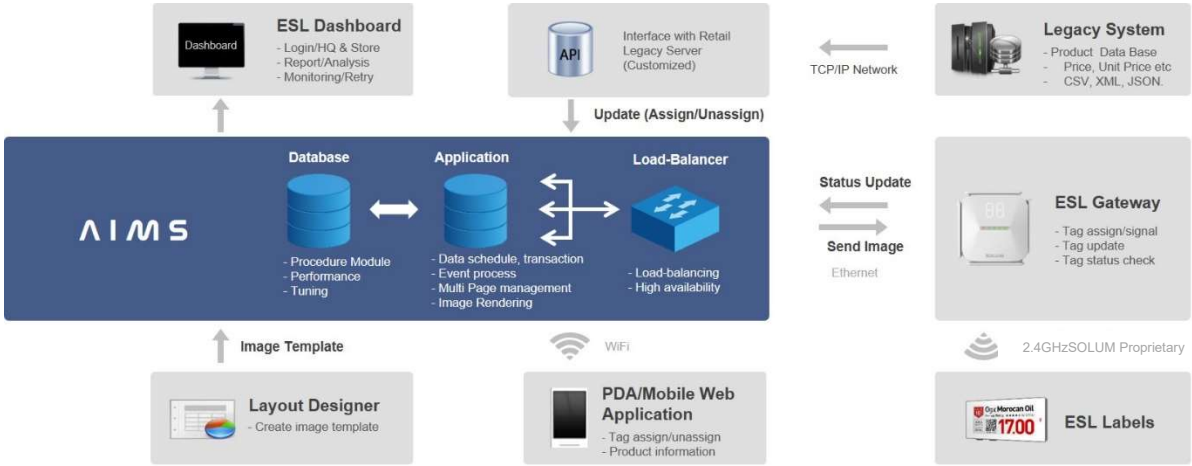


Figure 1. ESL System

1.1 Features

- Display: E-Paper Display (EPD) Active Type
- Sizes : 3.5”
- Display Color: BWRY (Black, White, Red, Yellow)
- Wireless Frequency: 2.4 GHz Unlicensed ISM band
- Communication Protocol: BLE physical layer with SOLUM proprietary protocol
- Battery operated low power consumption
- NFC (13.56MHz): NFC Forum Type 2
- Up to 7page display screens
- RoHS compliant

1.2 Typical Applications

- Retail industry with electronic displays, platforms, solutions and services
- Intelligently communicating, managing, and optimizing price and product informations
- Warehouse & factory picking labels

1.3 Appearance

Figure 2. SOLUM ESL Line-Up

2 Specification

This section details specification of each ESL by size. ESLs are identified by the diagonal measurement of the display in inches. For example, a 3.5” ESL is referring to an ESL with the diagonal display dimension of 3.5”.

2.1 Product Specification

Item	Description
Label Dimensions	**3.5”:** 3.11 x 1.44 x 0.49 inches (100.2 x 49.6 x 13.1 mm)
Display Dimensions	**3.5”:** 3.19 x 1.50 inches (81.02 x 37.98 mm)
Display Resolution	**3.5”**: 480 x 224 Pixels (155 dpi)

Item	Description
Label Weight	3.5”: 49.7g / 1.8oz **The above label weight are subject to change.**
Viewing Angle	Nearly 180°
Display Colors	● ○ ● ● BWRY (Black, White, Red, Yellow) ** color options are not available for all sizes. ● ○ BW (Black, White)
Battery	Type and quantity of batteries defer based on ESL CR2450 Lithium Battery 2pcs: 3.5”
Wireless Communication	Wireless communication based on IEEE 802.15.4g 2.4GHz Unlicensed ISM band
Communication Distance	98 feet (30m) radius Line of Sight
Security	128-bit AES Encryption
Compliance	IC, FCC, CE, UKVA, KC, RoHS, WEEE
Operating Temperature	**Nominal ESLs** **BWRY:** 32F ~ 104F (0°C ~ 40°C) @45~70% RH

	Freezer BW: -25℃ ~ 0℃ / -13°F ~ 32°F
Storage Temperature	32F ~ 104F (0°C ~ 40°C) @45~70% RH

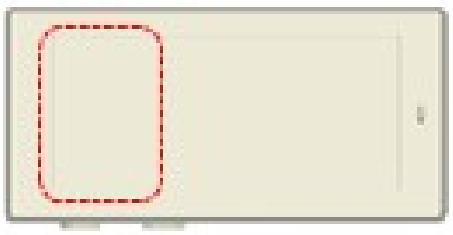
2.2 Radio (RF) Specification

Item	Parameter	Specification			Unit	Condition
		Min	Typ	Max		
Tx	Tx Power		4		dBm	
	[Carrier Frequency Offset and Drift]	-75	0	75	kHz	
	Tx Current		-	10	mA	total current at max Tx Power
Rx	Receiver Sensitivity	-85	-	-	dBm	PER < 5%

2.3 NFC Specification

Item	Parameter	Specification			Unit	Condition
		Min	Typ	Max		
NFC	Read Distance	-	0.7	-	in	
		-	20	-	mm	

NFC antenna location shown for each ESL size.



2.4 Features

Some of the features of SOLUM ESL.

- Low power consumption
- ‘Real time’ update speed
- SOLUM proprietary protocol communication with SOLUM Gateway for added security

Item	Description
LED	7 color
Usable Pages	7 pages
IP Rating	IP67
NFC	NFC Forum Type 2
Housing Bezel Color	Gray(RAL7024)

2.5 Label Marking

Figure 8. ESL Labels (Product)

ESL specific information can be found on the sticker label located on the back of the ESL. Information displayed are but not limited to: IC, FCC ID, Model, Manufacturing Information, ESL Media Access and Control (MAC) Address.

1) Model: EL-①②③**R3**④⑤⑥ (i.e. ELM35R3C4C)

- ① ② ③: ESL Display Size

  M35=3.5”

- ④: Housing Color

  C= Gray

- ⑤: ESL Display Color

  4 = Yellow (BWRY)

- ⑥: ESL Tag Type

  C : LED + NFC

Size	Model Name
3.5"	ELM35R3C4C

1) MFD (Manufacturing Date): [Mon.DD.YYYY]
2) S/N: Serial Number Information

MAC Label stickers can be found in multiple areas of the ESL. They are to be scanned for operation. If the ESL is not assigned to a product, the MAC barcode and 12-digits code will be shown on the display. Dimensions can be found in the image below.

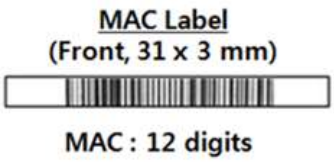


Figure 9. ESL Labels (MAC)

3 Reliability Test

High Temperature Operation

Low Temperature Operation

High Temperature/Humidity Operation

High Temperature Storage

Temperature Shock (Storage)

ESD

Package Drop Test

Package Random Vibration Test

Test Item	Test Condition	Pass Criteria
High Temp Resistance	60℃ / 35%, 240hrs	Normal operation after test
High Temp Operation	40℃ / 35%, 240hrs	
Thermal Shock	-25℃ (for 30mins) ~ 60℃ (for 30mins) for 240 cycles	
High Temp & Humidity Operation	40℃ / 70%, 240hrs	
Low Temp Operation	Normal ESL: 0℃ (240hrs) Freezer ESL: -23℃ (240hrs)	
ESD Test	Air ±10KV, 150pF, 330Ω, 10 times/Point	
RF Sensitivity (Communication Distance)	Gateway <-> Tag distance: 100 meters	Tag receives RF signal from Gateway.

4 Product Handling Precautions

Provisions should be made to protect against any damage to the product caused by improper handling. The purchaser assumes any responsibility for damage to the product caused by improper handling.

Product should be stored in 32F ~ 104F (0C ~ 40C) @45~70% RH environment and should be installed within **90 days** of receipt.

4.1 Usage Environment

Take extra caution when using this RF device in the vicinity of other electronic devices and appliances. Most electronic devices and appliances use electromagnetic waves. Electromagnetic waves emitted by this RF device can affect other electronic devices and appliances.

If using the device in an explosion hazard area, follow all safety regulations, instructions, and signals.

4.2 Storage and Use

- The product is shipped in sleep-mode (white screen), so it should be activated through NFC remote control or mobile app.
- Moisture and liquids can damage internal parts and circuit boards if allowed to enter into the device itself.
- Do not place or store the product on a sloped surface. The product may slide and fall off the surface and become damaged.
- Use the product in temperatures ranges of **0℃~40℃/32~104℉(BWRY), or -25℃~0℃/-13~32℉(Freezer)**. Parts and circuits may be damaged if operated or stored in extreme temperature.
- The display panel needs extra care during handling.
  - Do not apply any impacts on the e-Paper display as it is fragile.
  - Continuous exposure to excessive moisture (over 70% RH) or UV shortens display lifetime.
  - Ghosting image may appear in temperature conditions of less than **15℃/59℉ for normal tags and -25℃/ -13℉ for freezer tags**. (If ΔL* >2, we call it ghosting phenomenon)
- Avoid areas with strong magnetism or subject to magnetism.
  Contact between the device and a magnetic object can lead to malfunctions.
- Do not place the product near heat-producing kitchen appliances like a stove or a microwave or in the vicinity of highly pressurized containers.
- External impact to the product, such as from being dropped, can damage the product.

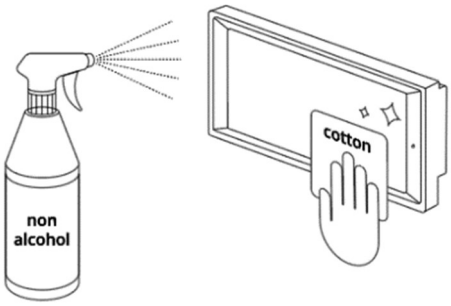
- Twisting and bending the product can damage the exterior casing and the internal components.
- If this product operates abnormally while removing battery or replacing battery, it needs to be discharged by contacting the battery terminals (+) and (-) in the product.
- This product uses the 2.4 GHz frequency band for the wireless communication network. Radio communications can be limited or affected by other applications that share the same frequency band, such as WiFi, Bluetooth, Zigbee, etc.
- A prior investigation into the radio environment is strongly required for efficient and smooth installation.
- Frequent communications, updates and screen renewals may reduce battery life time.
- Low temperature environments may reduce battery life.
- FIFO (First In First Out)

4.3 Product Cleaning

For Spray Cleaning:

Steps

① Lightly spray all surfaces and wait a few seconds.
② Gently wipe clean using a cloth or tissue.
③ Let the labels dry.



Notes:

- Use mild, non-alcoholic detergents or glass cleaner.
- Recommend non-abrasive cloths: Microfiber, Cotton T-shirt, Cotton handkerchief, Cotton tea towel

For Wet Tissue Cleaning:

Steps

① Stand or lay down the labels.
② Wipe using wet tissues.
③ Let the labels dry.

4.4 Battery Replacement

Audience

- Authorized personnel with the following knowledge are allowed to replace the battery:
  Battery / Electronic assemblies (e.g. circuit board) / Compliance with the instruction

※ Note: Warranty is voided if battery is replaced by unauthorized personnel.
(When batteries require replacement, please contact the authorized personnel)

Instructions

- Risk of short circuit if battery is incorrectly installed/stored.
- Check that hands are dry before and at all times during the replacement process.
- Keep batteries away from children and infants.
- Do not heat, charge, bend, drop, short-circuit and/or disassemble battery.
- Do not mix together used and new batteries or different battery types.

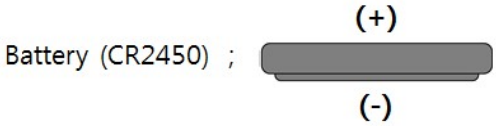
※ Note: Battery rarely has minor stain or leak.

Steps

① Open the battery cover.
② Take out the batteries.
③ Put in the new batteries.
④ Check the batteries direction.
⑤ Put back in the battery cover.

Battery Direction

Top: (+) Positive
Bottom: (-) Negative



Red Wire: (+) Positive
Black Wire: (-) Negative

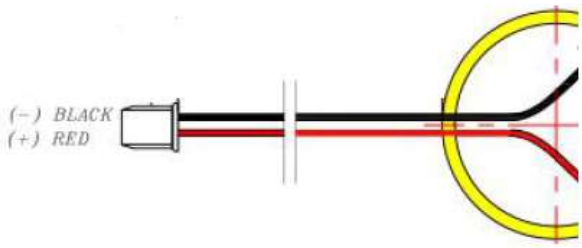


Figure 11. Battery Direction

5 Battery Handling Guide

5.1 Avoiding hazards in lithium battery handling

1. Do not short circuit (Fig. 1)

. Direct connection of plus (+) and minus (-) poles may result in leakage, heat generation, explosion and/or fire.

. Do not store and/or carry batteries with metallic items, such as a necklace.

2. Do not stack and/or jumble batteries (Fig. 2)

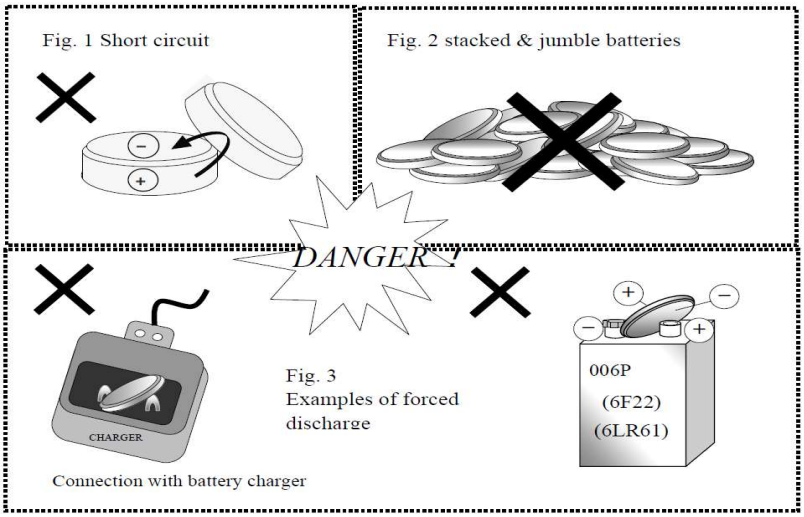
. Stacked and/or jumbled batteries may cause a short circuit and/or forced discharge from contact with other batteries.

. This may result in leakage, heat generation, explosion and/or fire.

3. Do not make forced discharge batteries (Fig. 3)

. On a forced discharge by an external power source, the battery voltage goes to negative and this causes gas generation in inside of the battery.

. This may result in leakage, heat generation, explosion and/or fire.



4. Do not dispose of batteries in fire

. Disposal of batteries in fire is extremely dangerous with a risk of explosion and violent flaring.

5. Do not heat batteries

. Heating batteries above 100℃/212°F may damage the resin in crimping, separator and other parts, potentially causing an electrolyte leak, internal short circuit, fire and/or explosion.

6. Do not solder directly onto batteries

. Direct soldering onto batteries may damage the resin in crimping, separator and other parts, potentially causing an electrolyte leak, internal short circuit, fire and/or explosion.

7. Do not recharge batteries

. Recharging of batteries may result in internal gas generation, causing electrolyte leak, battery swelling, fire and explosion.

8. Do not disassemble batteries

. Disassembly of batteries may generate gas that may irritate your throat.

. Lithium may also react with moisture to generate heat and fire.

9. Do not deform batteries

. Applying extreme pressure to batteries may cause deformation of the crimping and internal short circuit, causing electrolyte leak, battery swelling, fire and explosion.

10. Do not mix different type batteries

. For some applications, mixing different types of batteries or new and old batteries, can cause an over discharge due to differences in voltage and discharge capacities.

. This may lead to the risk of swelling and/or explosion.

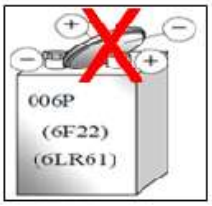
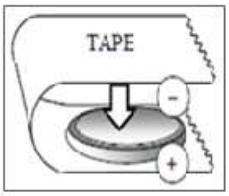
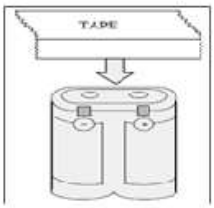
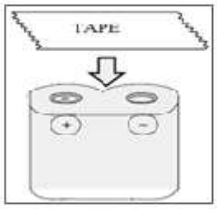
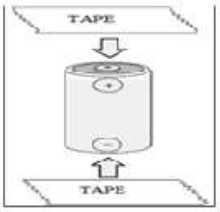
11. Do not insert batteries with opposite polarity

. For some applications, battery insertion with opposite polarity (reverse insertion of plus and minus) may result in leakage, heat generation, explosion and/or fire.

※ Please ensure the above precautions are strictly observed by related divisions including production, warehouse, product technology, sales, quality, customer stores, S/I companies, part-time workers, and external service companies.

5.2 Proper Storing and Disposing of Lithium Batteries

■ To minimize risk of fire and explosion of batteries, be sure to follow the instructions below.

NG	Do not stack batteries	Do not stack batteries in a vinyl bags	Do not Short circuit	Do not make forced discharge batteries	
					
OK	Using battery tray → Tape sealing	Tape attachment to "+/- electrodes			
					

■ Proper use of battery tray is outlined below.

With batteries properly placed into each tray slot ➔ stack the trays in the same orientation ➔ use an empty tray on the top stack ➔ tape the stack together to avoid falling apart.

OK	Use the battery tray	Stack on the tray	Seal the tray with tape

■ Follow local regulations for proper battery disposal guideline.

6 Certifications

6.1 FCC

FCC ID : 2AFWN-ELM35R3C4C

FCC Information to User

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Caution

THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE.

SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

IMPORTANT NOTE : FCC RF Radiation Exposure Statement

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

6.2 CE

We hereby declare under our sole responsibility that the electrical product above is in compliance with the essential requirements of the Radio Equipment Directive (2014/53/EU) by application of

EN IEC 62368-1:2020+A11:2020EN 62479:2010

EN 300 328 V2.2.2

EN 300 330 V2.1.1

EN 62479: 2010

EN 301 489-1 V2.2.3

EN 301 489-3 V2.3.2

EN 301 489-17 V 3.2.0

and the Directive (2011/65/EU) on the restriction of the use of certain hazardous substances in electrical and electronic equipment by application of EN 62321 Series.

Manufacturer : SOLUM CO., LTD

Tarde mark :

Address : 7F, 2354, Yonggu-daero, Giheung-gu, Yongin-si, Gyeonggi-do, Republic of Korea

6.3 ISED

IC : 22800-ELM35R3C4C

ISED Information to User

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :(1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, meme si le brouillage est susceptible d'en compromettre le fonctionnement.

Attention: Tout changement ou modification non expressément approuvé par le fabricant peut annuler le droit de l'utilisateur à utiliser l'équipement.

exposition aux rayonnements radiofréquences. Pour se conformer aux exigences de conformité de l'exposition IC RF, une distance de séparation d'au moins 20 cm doit être maintenue entre l'antenne de cet appareil et toutes les personnes.

This device complies with Industry Canada NRCs applicable to licence-exempt radio devices. The operation is authorized under the following two conditions: (1) the device shall not cause interference, and (2) the user of the device shall accept any radio interference suffered, even if the interference is likely to compromise its operation.

Caution: Any change or modification not expressly approved by the manufacturer may void the user's right to use the equipment.

exposure to radiofrequency radiation. To comply with the ICRF exposure compliance requirements, a separation distance of at least 20 cm must be maintained between the antenna of this device and all persons.

-PMN(Product Marking Name) ESL Label

-FVIN(Firmware Version Identity Number) V38

6.4 KC

인증받은 자의 상호명 : 주식회사 솔루엠

제품명 : 특정소출력 무선기기(무선데이터통신시스템용 무선기기)

모델명 : ELM35R3C4C

제조사 : 주식회사 솔루엠

제조국 : 한국, 베트남

제조일자 : 2024. . .