



**Opto Plus LED Corp.**  
**0.39" SMD Type LED Display**  
**OPS-S40AAF6**

● **EDIT HISTORY**

Version A: FEB. 11, 2025

Preliminary Spec.

Confidential Document



# Opto Plus LED Corp.

## 0.39" SMD Type LED Display

### OPS-S40AAF6

#### ● FEATURES

- 0.40 inch (10.16 mm) digit height.
- SMD type.
- Low current operation.
- RoHS Compliant, Pb Free.

#### ● DESCRIPTION

The device are 0.40 inch (10.16 mm) height single digit 7-segment displays, Built-in programmable LEDs.

This device are 256-step gray-scale output to allow 16,777,216 color display, Built-in oscillator 20M.

The device is Opto Plus LED Corp standard LED Display.

The device has face and segment option, please refer to **PRODUCT APPEARANCE**.

#### ● DEVICE

PART NO.	DESCRIPTION
OPS-S40AAF6-GW	Single data line   Gray face   White segment
OPS-S40AAF6-BW	Single data line   Black face   White segment

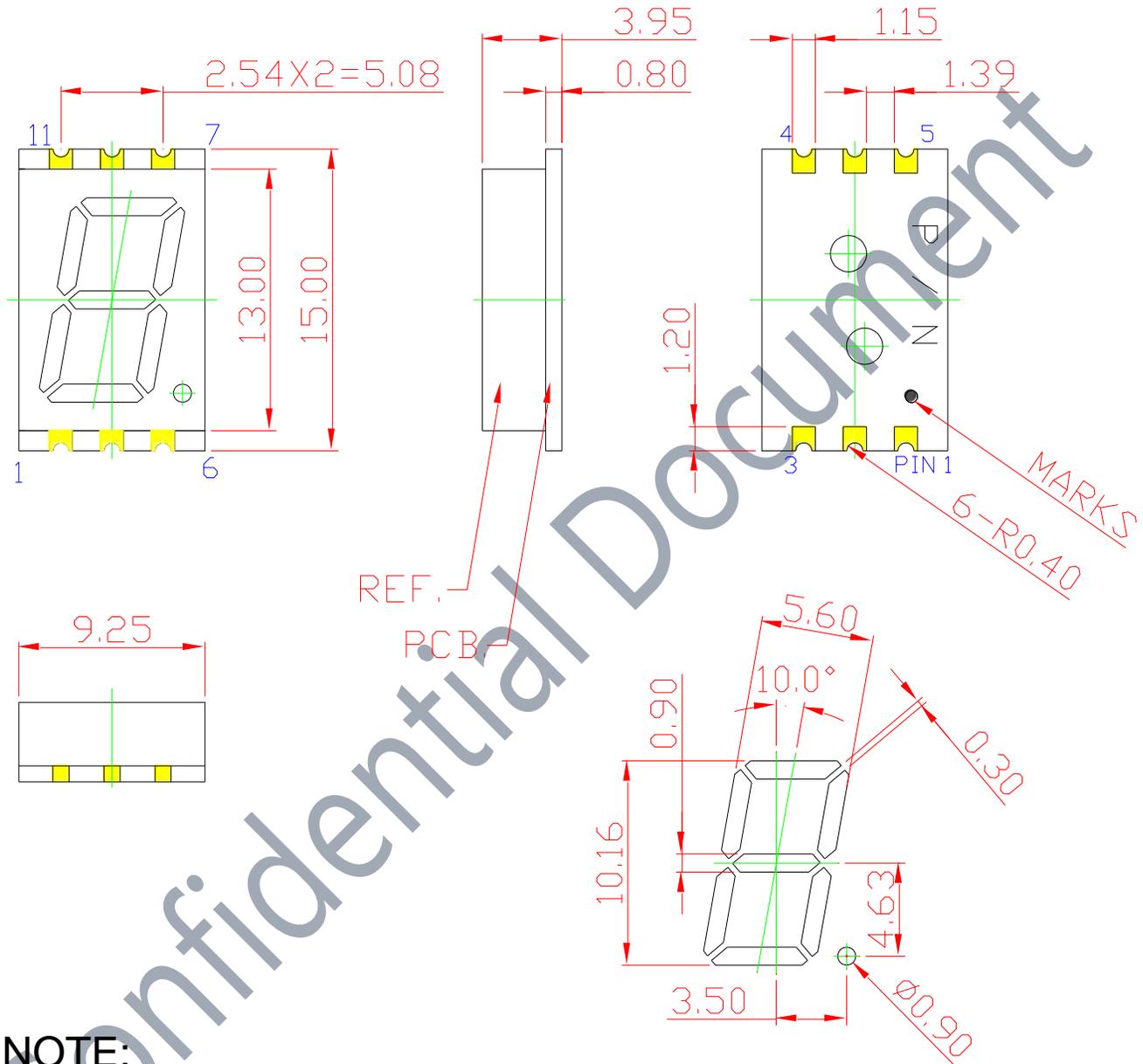
**RoHS Compliance**



**Pb Free.**



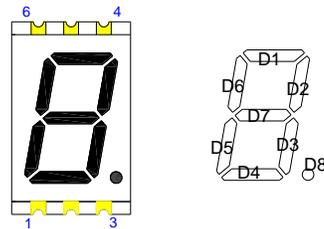
#### MECHANICAL DIMENSIONS



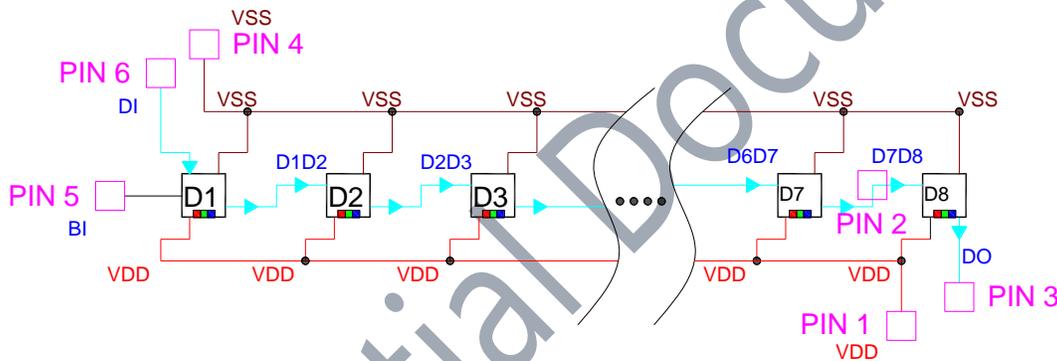
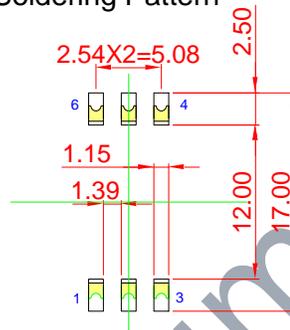
**NOTE:**  
 Dimension in millimeters (inches),  
 And tolerances are  $\pm 0.25\text{mm}$  (.01") specified.

### TYPICAL INTERNAL EQUIVALENT CIRCUIT

Turn On Color



Recommended Soldering Pattern



**PIN 1 : Power Supply.**

**PIN 2 : Backup Data Signal Input From D8. (Single Signal Wiring Diagram : BI is connected to GND.)**

**PIN 3 : Control Data Signal Output.**

**PIN 4 : Ground.**

**PIN 5 : Backup Data Signal Input.**

**PIN 6 : Control Data Signal Input**

#### ※ SUPPORT BI BACKUP [PIN 2] INPUT DATA LINE

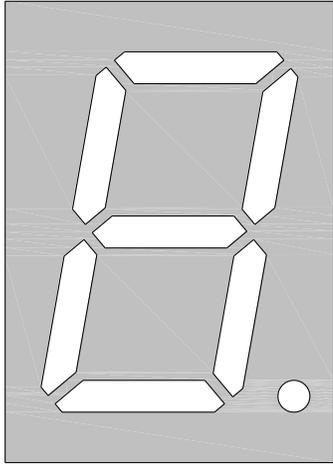
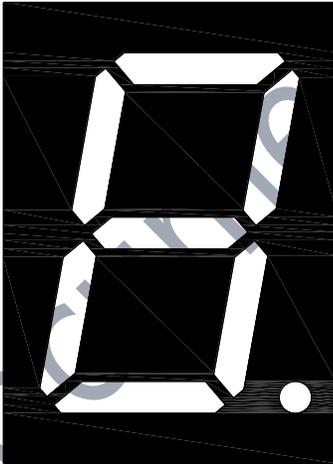
#### TO PREVENT DATA INPUT FAILURE FROM MALFUNCTION DI.

※EMITTED COLOR : RED & GREEN & BLUE

IN THE PRACTICAL APPLICATION CIRCUIT, THE SIGNAL INPUT AND OUTPUT PINS OF THE IC SIGNAL INPUT AND OUTPUT PINS SHOULD BE CONNECTED TO THE SIGNAL INPUT AND OUTPUT TERMINALS. IN ADDITION, IN ORDER TO MAKE THE IC CHIP IS MORE STABLE, EVEN THE CAPACITANCE BETWEEN DISPLAY IS ESSENTIAL BACK; APPLICATION: DISPLAY TRANSMISSION DISTANCE IS SHORT, SUGGESTED IN SIGNAL IN TIME THE CLOCK LINE INPUT AND OUTPUT END OF EACH CONNECTED IN SERIES PROTECTION RESISTORS(ABOUT 470 OHMS). APPLICATION: FOR MODULE OR GENERAL SPECIAL-SHAPED PRODUCTS, DISPLAY TRANSMISSION DISTANCE IS LONG, BECAUSE OF DIFFERENT WIRE AND TRANSMISSION DISTANCE, IN THE SIGNAL IN TIME CLOCK AT BOTH ENDS OF THE LINE ON GROUNDING PROTECTION RESISTANCE WILL BE SLIGHTLY DIFFERENT; TO THE ACTUAL USE OF FIXED;

## ● PRODUCT APPEARANCE

The most common reflector color and segment color are show in below diagram.

-GW	-BW
	
<ul style="list-style-type: none"> <li>※ REFLECTOR COLOR: Gray</li> <li>※ SEGMENT COLOR: White</li> </ul>	<ul style="list-style-type: none"> <li>※ REFLECTOR COLOR: Black</li> <li>※ SEGMENT COLOR: White</li> </ul>

Opto Plus can customize reflector and segment colors by customer's request. If you have these request please visit [www.opledtw.com](http://www.opledtw.com) or contact [sales@opledtw.com](mailto:sales@opledtw.com) for more **Standard Product Customization** information.

Part NO. related to reflector and segment colors show as table below.

PART NO.	DESCRIPTION
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#### ● F6: FULL COLOR (AlInGaP/InGaP)

ABSOLUTE MAXIMUM RATING AT Ta=25°

Parameter	Symbol	Maximum Rating	Unit
Supply Voltage	VDD	6.5	V
Power Dissipation	PD	<400	mW
Maximum Output Current	I <sub>LEDOUT</sub>	5	mA
Operating temperature	T <sub>OP</sub>	-25 to + 85	°C
Storage temperature	T <sub>ST</sub>	-40 to + 100	°C
Welding temperature	T <sub>M</sub>	300(8S)	°C

ELECTRICAL - OPTICAL CHARACTERISTICS AT Ta=25°C

Characteristic	Symbol	Condition	Min.	Type.	Max.	Unit
Dominant Wavelength (Red) (Per SEG.)	$\lambda_D$	I <sub>SINK</sub> =5mA	-	622	-	nm
Dominant Wavelength (Green) (Per SEG.)	$\lambda_D$	I <sub>SINK</sub> =5mA	-	525	-	nm
Dominant Wavelength (Blue) (Per SEG.)	$\lambda_D$	I <sub>SINK</sub> =5mA	-	466	-	nm
Luminous Intensity (Red) (Per SEG.)	I <sub>v</sub>	I <sub>SINK</sub> =5mA	-	22	-	mcd
Luminous Intensity (Green) (Per SEG.)	I <sub>v</sub>	I <sub>SINK</sub> =5mA	-	55	-	mcd
Luminous Intensity (Blue) (Per SEG.)	I <sub>v</sub>	I <sub>SINK</sub> =5mA	-	13	-	mcd
Spectrum Radiation Bandwidth (Red) (Per SEG.)	$\Delta\lambda$	I <sub>SINK</sub> =5mA	-	16	-	nm
Spectrum Radiation Bandwidth (Green) (Per SEG.)	$\Delta\lambda$	I <sub>SINK</sub> =5mA	-	28	-	nm
Spectrum Radiation Bandwidth (Blue) (Per SEG.)	$\Delta\lambda$	I <sub>SINK</sub> =5mA	-	18	-	nm



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### OPS-S40AAF6

#### ELECTRICAL - OPTICAL CHARACTERISTICS AT TA=25°C (PER SMD CHIP)

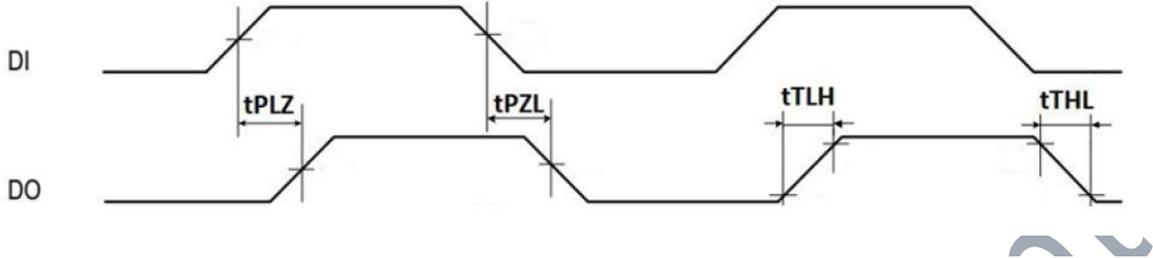
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3.3	5	5.5	V	
Operation Current	I <sub>DD</sub>		1		mA	R/G/B without load
Sleep Mode Current	I <sub>sleep</sub>		5		uA	
Input High "H" of DI、BI	V <sub>IH</sub>	0.7*VDD		VDD+0.4	V	
Input Low "L" of DI、BI	V <sub>IL</sub>	-0.4		0.2*VDD	V	
Output High "H" of DO	V <sub>OH</sub>	4.5			V	I <sub>OH</sub> =3mA
Output Low "L" of DO	V <sub>OL</sub>			0.4	V	I <sub>OL</sub> =3mA
R/G/B Sink Current	I <sub>SK</sub>	2.9	3	3.1	mA	Max. 3mA option
		4.8	5	5.2	mA	Max. 5mA option
R/G/B Current Gain	G <sub>level</sub>		3/17		mA/level	Max. 3mA option
			5/17		mA/level	Max. 5mA option
DI / BI Input Leakage	I <sub>leak</sub>			1	uA	V <sub>DI</sub> =V <sub>BI</sub> =VDD=5V
R/G/B off Leakage Current	I <sub>off</sub>			1	uA	V <sub>R/G/B</sub> =5V, PWM off

Parameter	Symbol	Min.	Typ.	Max.	Units	Note
Propagation delay time	t <sub>PLZ</sub>			80	ns	DI → DO, load=30pF
	t <sub>PZL</sub>			80	ns	
Rising time	t <sub>THL</sub>		15		ns	I <sub>SK</sub> (R/G/B) =3/5mA, load=30pF
Falling time	t <sub>TLH</sub>		15		ns	
Rising time	t <sub>R</sub>		50		ns	
Falling time	t <sub>F</sub>		50		ns	
Data rate	F <sub>data</sub>		800		KHz	

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#### Data Transfer Protocol

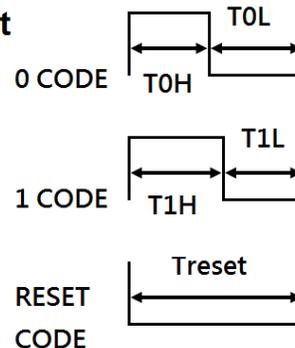


The single wire data transfer protocol supports 24-bit data for each LED RGB display data refresh. The IC receives 24-bit data and passes the remaining data to next LED. The 24-bit data consist of green, red and blue data, each with 8-bit width, and are transferred with MSB first.



The transferred data are recognized based on the pulse widths received by the IC. A low bit 0 is represented by a 0.3us high pulse followed by a 0.9us low pulse. A high bit 1 is represented by a 0.9us high pulse followed by a 0.3us low pulse. A low pulse  $\geq 200\mu s$  is used to issue a reset command to the IC to start a new cycle of serial commands.

#### Sequence Chart



(T0H:0.3us+0.15us,T0L:0.9us+0.15us)

(T1H:0.9us+0.15us,T1L:0.3us+0.15us)



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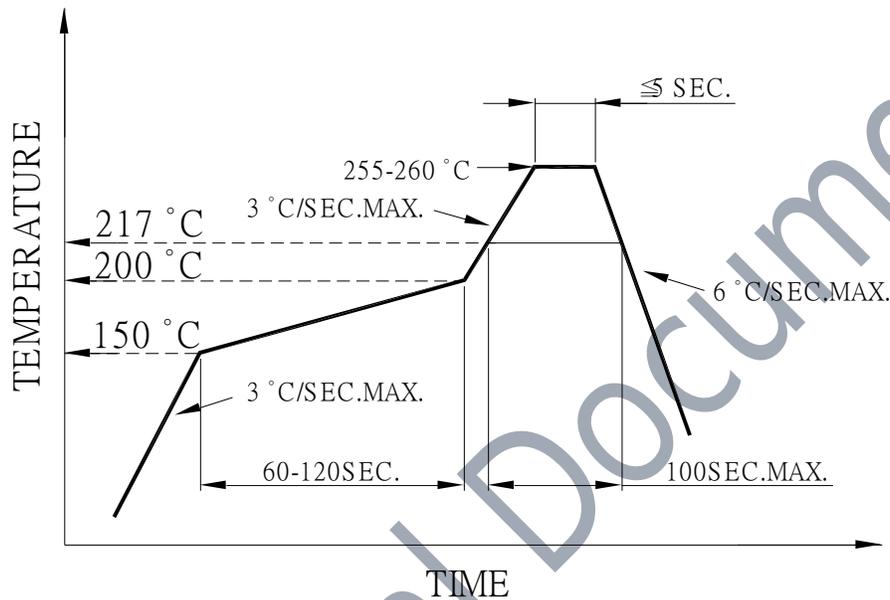
## Sample CODE

```
// Please write using Arduino IDE.
// Make sure that the Adafruit_NeoPixel library has been installed.
#include <Adafruit_NeoPixel.h>
#define LED_PIN    4    // Signal pin for the LED Display.
#define LED_COUNT  8    // Number of LEDs in the LED Display.
Adafruit_NeoPixel strip(LED_COUNT, LED_PIN, NEO_GRB + NEO_KHZ800);
// Function used to create colorful effects
void setup() {
  strip.begin();
  strip.show();
  strip.setBrightness(127); //Set brightness to approximately 1/2 (maximum value = 255)
}
void loop() {
  strip.setPixelColor(0, 255, 0, 0); // Turn on D1-Red
  strip.setPixelColor(1, 255, 0, 0); // Turn on D3-Red
  strip.setPixelColor(8,  0, 0, 0); // Turn off
  strip.setPixelColor(9,  0, 0, 0); // Turn off
  strip.show(); // Update to display
  delay(500); // delay 0.5 seconds.
  strip.setPixelColor(0, 0, 0, 0); // Turn off
  strip.setPixelColor(1, 0, 0, 0); // Turn off
  strip.setPixelColor(8, 0, 255, 0); // Turn on D9-Green
  strip.setPixelColor(9, 0, 255, 0); // Turn on D10-Green
  strip.show(); // Update to display
  delay(500); // delay 0.5 seconds.
}
```

● **SMT REFLOW SOLDERING INSTRUCTIONS**

SMT Soldering Profile

Pb free reflow soldering Profile



- We recommend the reflow temperature 245°C (+/- 5°C).  
The maximum soldering temperature should be limited to 260°C.
- Number of reflow process shall be 2 times or less.

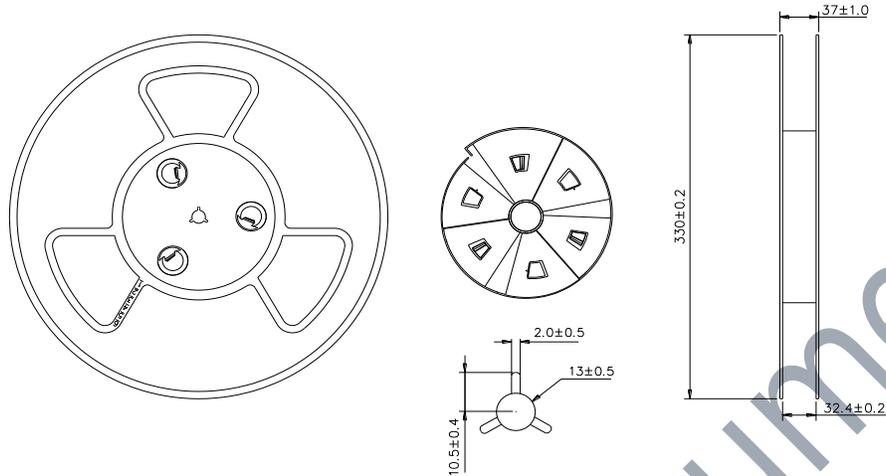
● **SOLDERING IRON**

Basic spec is  $\leq 4$  sec when 260°C. If temperature is higher, time should be shorter (+10°C → 1 sec). Power dissipation of Iron should be smaller than 15W, and temperature should be controllable. Surface temperature of the device should be under 230°C.

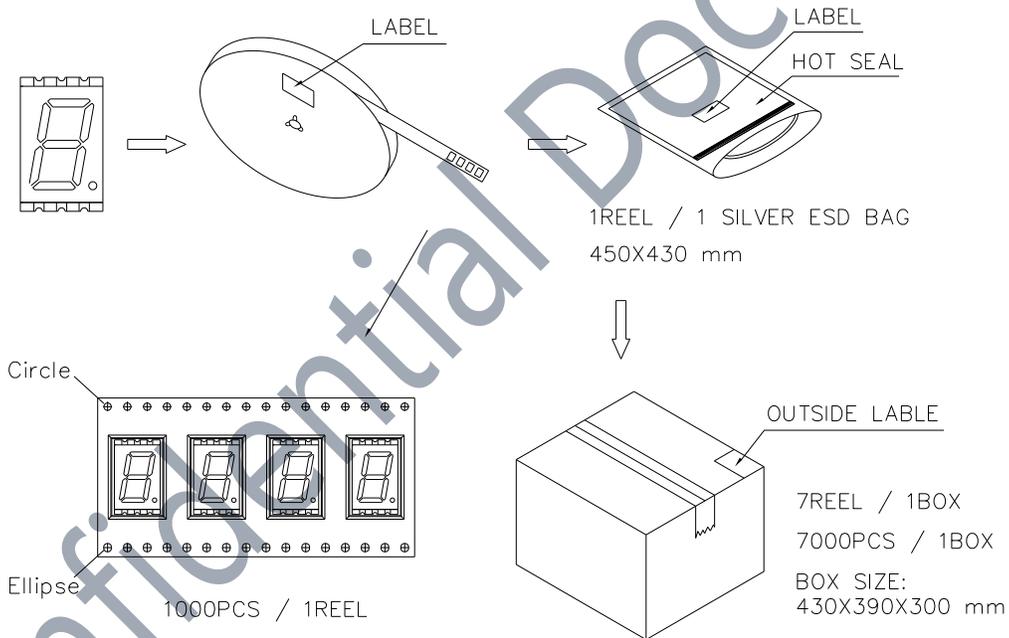
● **REWORK**

- Customer must finish rework within 3 sec. under 350°C.
- The head of soldering iron cannot touch copper foil.

### ● REEL DIMENSIONS



### ● PACKING & LABEL SPECIFICATIONS



### ● STORAGED CONDITION

In factory original sealed bag package

TEMPERATURE CONDITION	HUMIDITY CONDITION
5°C ~ 30°C	Below 60%RH

After opened and not in factory original sealed bag package

TEMPERATURE CONDITION	HUMDITY CONDITION	STORAGE TIME
5°C ~ 30°C	Below 60%RH	Within 4 weeks (MSL as level 2a)