OLED Push Switches

96RGBx96 (1.10") OLED Switches YOD1C

DISTINCTIVE CHARACTERISTICS

- Organic LED Technology
- Wide View Angle of 160°
- Exceptional Contrast and Brightness: 50times greater Brightness than previous LCD Products, four times more enhanced Resolution
- High Resolution provides sharp, clear Images of very small Characters
- Single Power / Built in DC to DC Converter for OEL Panel
- Distinct, Long travel of 5mm
- Sophisticated Housing for Assembly easily
- Support Parallel and Serial Interface

Example Picture

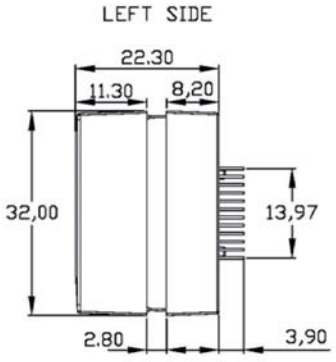
GERNERAL SPECIFICATIONS

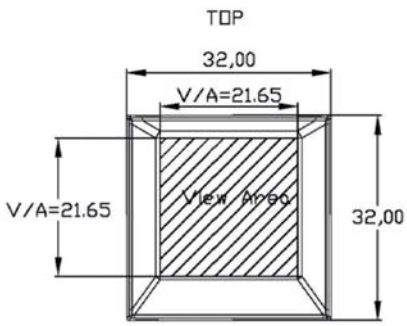
Dispaly Specifications
- Display Type: OLED
- Display Mode: Passive Matrix
- Display Color: 65,536 Colors (Maximum)
- Drive Duty: 1/96 Duty
- Number of Pixels: 96(RGB)x96
- Pixel Size: 0.049x0.191 mm
- Pixel Pitch: 0.069x0.207 mm

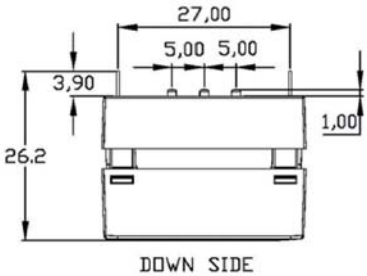
Mechanical Specifications
- Dimension: 32.0x32.0x22.3 mm (LxWxH)
- Window Size: 21.65x21.65 mm (LxW)
- Active Area: 19.852x 19.856 mm
- Assembly: Pitch 1.27mm / 12 Pin Connector*2
- Assembly on PCB Easy & Removable & Flexible

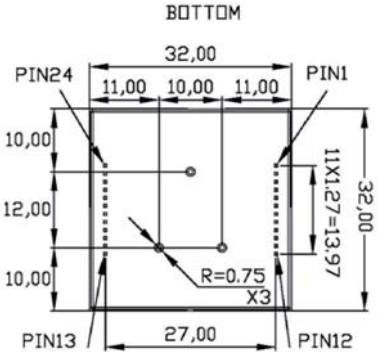
Electrical Characteristic
- Supply Voltage: 2.4 ~ 3.3 V
- Single Voltage Control Display Module
- Built-in DC to DC Power Supply to Drive OLED
- Driver IC: SEPS114A
- Interface: Parallel/Serial/68xx/80xx/4-wire SPI

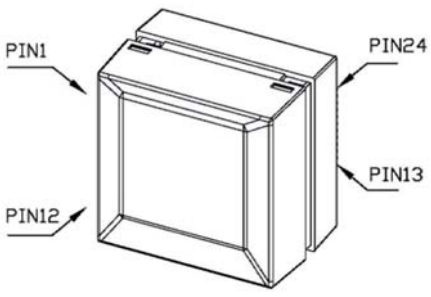
TYPICAL SWITCH DIMENSIONS











PIN ASSIGNMENTS

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Type</th><th>Function</th></tr>
<tr><td>1</td><td>VDD</td><td>P</td><td>Power Supply for Core VDD
This is a voltage supply pin. It must be connected to external source.</td></tr>
<tr><td>2</td><td>VSS</td><td>P</td><td>Ground for System
This is a ground pin. It must be connected to external source.</td></tr>
<tr><td>3</td><td>SW</td><td>I</td><td>Terminal of Switch. Normally Open.</td></tr>
<tr><td>4</td><td>SW</td><td>I</td><td>Terminal of Switch. Normally Open.</td></tr>
<tr><td>5</td><td>C80</td><td>I</td><td>Select the CPU Type
Low: 80XX-Series MCU
High: 68XX-Series MCU</td></tr>
<tr><td>6</td><td>PS</td><td>I</td><td>Select Parallel/Serial Interface Type
Low: Serial Interface
High: Parallel Interface</td></tr>
<tr><td>7</td><td>CS#</td><td>I</td><td>Chip Select
This is the chip select input. The chip is enable for MCU communication only when CS# is pulled low.</td></tr>
<tr><td>8</td><td>RES#</td><td>I</td><td>Power Reset for Controller and Drive
This is reset signal input. When the pin is low, initialization of the chip is executed.</td></tr>
<tr><td>9</td><td>D/C#</td><td>I</td><td>Data/ Command Control
This pin is Data/Command control pin. When the pin is pulled high, the input at D0~D7 is treated as display data. When the pin is pulled low, the input at D0~D7 will be transferred to the command register.</td></tr>
<tr><td>10</td><td>WR#
(R/W#)</td><td>I</td><td>Write or Read/Write Select
When 80xx interface mode is selected, the pin will be the Write (WR#) input.
When interfacing to a 68xx-series microprocessor, the pin will be used as Read/Write (R/W#) selection input. Pull this pin to "High" for read mode and pull it to "Low" for write mode.</td></tr>
<tr><td>11</td><td>RD#(E)</td><td>I</td><td>Read or Read/Write Enable
When 80xx interface mode is selected, the pin will be the Read (RD#) input.
When interfacing to a 68xx-series microprocessor, the pin will be used as the Enable (E) signal. Read/Write operation is initiated when this pin is pulled high and the CS# is pulled low.</td></tr>
<tr><td>12</td><td>NC</td><td>-</td><td>Reserved Pin</td></tr>
<tr><td>13~20</td><td>D0~D7</td><td>I/O</td><td>Host Data Input /Output Bus
These pins are 8-bit bi-directional data bus to be connected to the microprocessor's data bus.
<table>
<tr><th>PS</th><th>Description</th></tr>
<tr><td>0</td><td>D[0] SCL: Synchronous Clock Input
D[1] SDI: Serial Data Input
D[2]: SDO: Serial Data Output
D[3] R/W: Serial Read (High) / Write (Low)</td></tr>
<tr><td>1</td><td>8-bit Bus: D[7:0]</td></tr>
</table>
When using SPI, the unused pins must be connected to VSS.</td></tr>
<tr><td>21</td><td>VSS</td><td>P</td><td>Ground for System
This is a ground pin. It must be connected to external source.</td></tr>
<tr><td>22</td><td>VCC-CTL</td><td>I</td><td>OLED Driver Power Supply ON/ OFF Control
When this pin is pulled high, the panel power supply will be turned ON.
When this pin is pulled low, the panel power supply will be turned OFF.</td></tr>
</table>

23	**NC**	**-**	Reserved Pin
24	**VCC**	**P**	**OLED Driver Power Supply Output** This pin is OLED driver power supply output. When VCC-CTL is pulled high, the pin will be output about 13V voltage.

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	Notes
Supply Voltage for Operation	V_{DD}	-0.3	4	V	1,2
Supply Voltage for Display	Vcc_c	-0.3	16	V	1,2
Operating Temperature	T_{OP}	-30	70	℃	-
Storage Temperature	T_{STG}	-40	80	℃	-

Note1：All the above voltages are on the basis of "VSS=0V"

Note2：When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur. Also for normal operations, it is desirable to use this module under the conditions according to Section 6 "Electrical Characteristics". If this module is used beyond these conditions, malfunctioning of the module can occur and the reliability of the module may deteriorate.

ELECTRICAL CHARACTERISTICS

1. DC Characteristics

Characteristics	Symbol	Conditions	Min	TYP	Max	Unit
Supply Voltage for Operation	V_{DD}		2.4	2.8	3.3	V
Supply Voltage for Display	V_{CC_C}	Note 3	12.5	13	13.5	V
High Level Input	V_{IH}		0.8×V_{DD}	-	V_{DD}	V
Low Level Input	V_{IL}		0	-	0.4	V
High Level Output	V_{OH}	I_{OH} = -0.1mA	V_{DD}-0.4	-		V
Low Level Output	V_{OL}	I_{OL} = -0.1mA		-	0.4	V
Operating Current for V_{DD}	I_{DD}		-	2.5	3.5	mA
Operating Current for V_{CC_C}	I_{CC}	Note 4 Note 5	-	9.5 17.1	11.9 21.4	mA mA

Note 3: Brightness (L_{br}) and Supply Voltage for Display (Vcc_c) are subject to the change of the panel characteristics and the customer's request.
Note 4: V_{DD} = 2.8V, V_{CC_C} = 13V, 50% Display Area Turn on.
Note 5: V_{DD} = 2.8V, V_{CC_C} = 13V, 100% Display Area Turn on.

2. Optics Characteristics

Characteristics	Symbol	Conditions	Min	Typ	Max	Unit
Brightness	Lbr	With Polarizer	80	100	-	cd/m^2
C.I.E. (White)	(x) (y)	With Polarizer	0.26 0.29	0.30 0.33	0.34 0.37	
C.I.E. (Red)	(x) (y)	With Polarizer	0.60 0.30	0.64 0.34	0.68 0.38	
C.I.E. (Green)	(x) (y)	With Polarizer	0.27 0.58	0.31 0.62	0.35 0.66	
C.I.E. (Blue)	(x) (y)	With Polarizer	0.10 0.12	0.14 0.16	0.18 0.20	
Dark Room Contrast	CR		-	>2000:1	-	
View Angle			>160	-	-	degree

* Optical measurement taken at V_{DD} = 2.8V, V_{CC_C} = 13V.

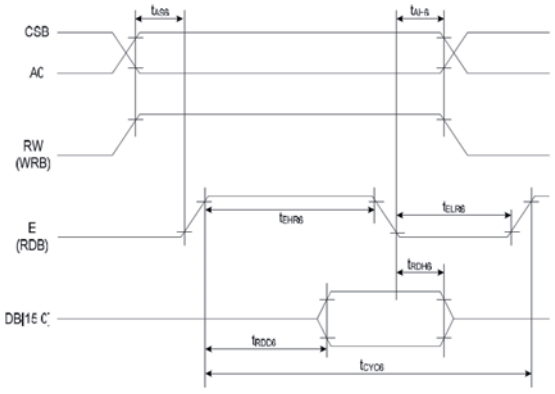
TIMING CHART

1. 68XX-Series MPU Parallel Interface Timing Characteristics

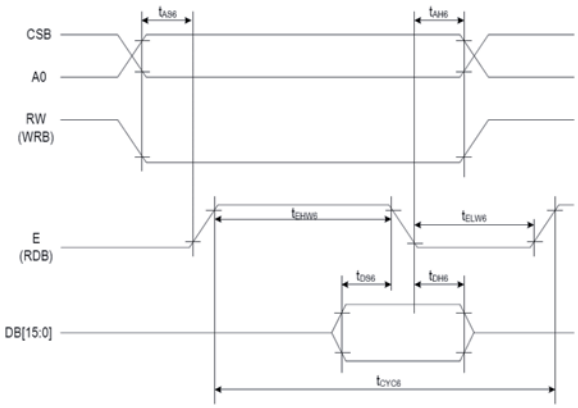
Symbol	Description	Min	Max	Unit	Port
t_{AH6}	Address Setup Timing (Read)	10	-	ns	CSB RS
	(Write)	5	-	ns	
t_{AS6}	Address Hold Timing (Read)	10	-	ns	
	(Write)	5	-	ns	
T_{CYC6}	System Cycle Timing	200	-	ns	E
t_{ELR6}	Read "L" Pulse Width	90	-	ns	
t_{EHR6}	Read "H" Pulse Width	90	-	ns	
T_{CYC6}	System Cycle Timing	100	-	ns	
t_{ELW6}	Write "L" Pulse Width	45	-	ns	
t_{EHW6}	Write "H" Pulse Width	45	-	ns	
t_{RDD6}	Read Data Output Delay Time *CL**15PF	0	70	ns	D[17:9]
t_{RDH6}	Data Hold Timing	0	70	ns	
t_{DS6}	Data Setup Timing	40	-	ns	
t_{DH6}	Data Hold Timing	10	-	ns	

(V_{DD} = 2.8V, Ta = 25°C)

* All the timing reference is 10% and 90% of V_{DD}



(Read Timing)



(Write Timing)

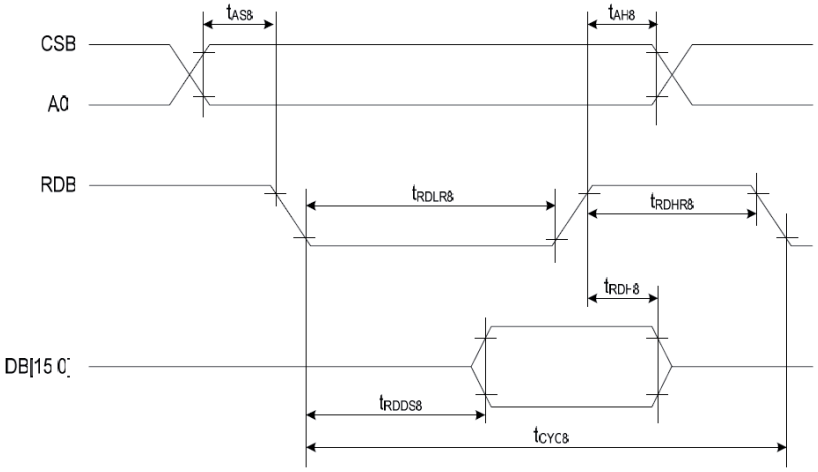
TIMING CHART

2. 80XX-Series MPU Parallel Interface Timing Characteristics

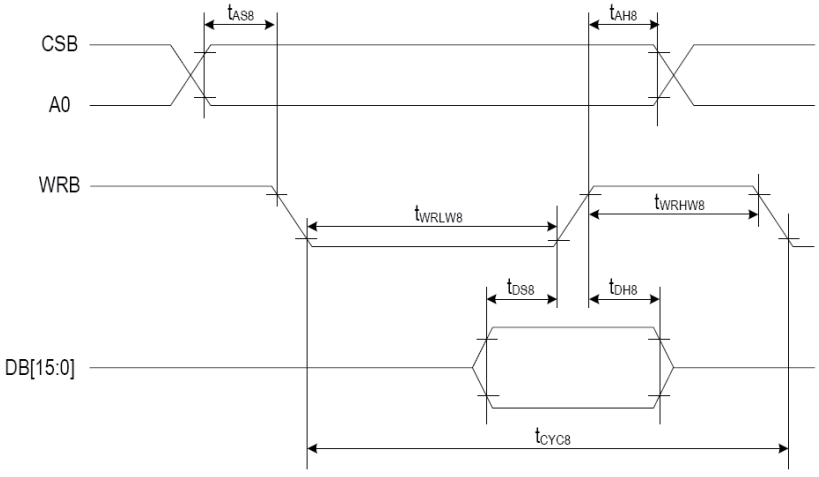
Symbol	Description	Min	Max	Unit	Port
t_{AS8}	Address Setup Timing	5	-	ns	CSB
t_{AH8}	Address Hold Timing	5	-	ns	A0
t_{CYC8}	System Cycle Timing	200	-	ns	RDB
t_{RDLR8}	Read "L" Pulse Width	90	-	ns	
t_{RDHR8}	Read "H" Pulse Width	90	-	ns	
t_{CYC8}	System Cycle Timing	100	-	ns	WRB
t_{WRLW8}	Write "L" Pulse Width	45	-	ns	
t_{WRHW8}	Write "H" Pulse Width	45	-	ns	
t_{RDD8}	Read Data Output Delay Time *CL = 15pF	-	60	ns	D[7:0]
t_{RDH8}	Data Hold Timing	0	60	ns	
t_{DS8}	Data Setup Timing	30	-	ns	
t_{DH8}	Data Hold Timing	10	-	ns	

(V_{DD} = 2.8V, Ta = 25°C)

* All the timing reference is 10% and 90% of V_{DD}.



(Read Timing)



(Write Timing)

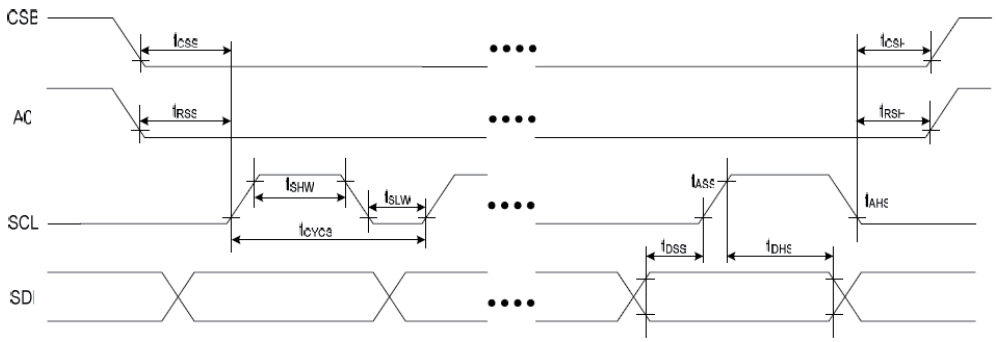
TIMING CHART

3. Series Interface Timing Characteristics

Symbol	Description	Min	Max	Unit	Port
t_{CYCS}	Serial Clock Cycle	200	-	ns	SCL
t_{SHW}	SCL "L" Pulse Width	90	-	ns	
t_{SLW}	SCL "H" Pulse Width	90	-	ns	
t_{DSS}	Data Setup Timing	25	-	ns	SDI
t_{DHS}	Data Hold Timing	25	-	ns	
t_{CSS}	CSB-SCL Timing	25	-	ns	CSB
t_{CSH}	CSB-Hold Timing	25	-	ns	
t_{RSS}	RS-SCL Timing	25	-	ns	RS
t_{RSH}	RS-Hold Timing	25		ns	

(V_{DD} = 2.8V, Ta = 25°C)

* All the timing reference is 10% and 90% of V_{DD}.



FUNCTION SPECIFICATION

1. Commands

Refer to the Technical Manual for the SEPS114A

2. Power Down and Power up Sequence

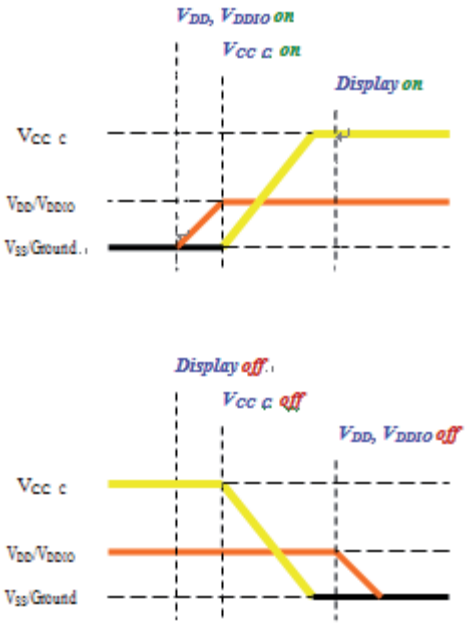
To protect OEL panel and extend the panel life time, the driver IC power up/down routine should include a delay period between high voltage and low voltage power sources during turn on/off. It gives the OEL panel enough time to complete the action of charge and discharge before/after the operation.

2.1. Power up Sequence

1. Power up V_{DD} & V_{DDIO}
2. Send Display off command
3. Initialization
4. Clear Screen
5. Power up V_{CC_C}
6. Delay 100ms
   (when V_{CC_C} is stable)
7. Send Display on command

2.2. Power down Sequence

1. Send Display off command
2. Power down Vcc_c
3. Delay 100ms
   (when Vcc_c is reach 0 and panel is completely discharges)
4. Power down V



FUNCTION SPECIFICATION

3. Reset Circuit

When RSTB input is low, the chip is initialized with the following status:

1. Standby Mode: On
2. Frame Frequency: 95Hz
3. Oscillation: Internal Oscillator Off
4. DDRAM Write Horizontal Address: XS = 0x00, XE = 0x5F
5. DDRAM Write Vertical Address: YS = 0x00, YE = 0x5F
6. Display Data RAM Write: MDIR1 = 0, MDIR0 = 0, VH = 0
7. Row Scan Shift Direction: R0, R1, … , R94, R95
8. Column Data Shift Direction: C0, C1, … , C286, C287
9. Display On/Off: Off
10. Panel Display Size: FX = 0x00, TX = 0x5F, FY = 0x00, TY = 0x5F
11. Display Data RAM Read Column/Row Address: DX = 0x00, DY = 0x00
12. Discharge Time: 8 Clock
13. Peak Pulse Delay: 5 Clock
14. Peak Pulse Width Time (R/G/B): 5 Clock
15. Precharge Current (R/G/B): 0μA
16. Driving Current (R/G/B): 0μA

COMMAND APPLICATION EXAMPLE

Command usage and explanation of an actual example

<Initialization>

```
OLED_VCC_CTL=0;                    //Off power up Panel Vcc
OLED_RESET=0;                      //Reset driver IC for 100ms
Delay_100ms (1);
OLED_RESET=1;
Set SOFT_RESET (0x01, 0x00);
Set STANDBY_ON_OFF (0x14, 0x00);
Set DISP_ON_OFF (0x02, 0x00);
Set ANALOG CONTROL (0x0F, 0x40);
Set OSC_ADJUST (0x1A, 0x03);
Set DISPLAYSTART_X (0x38, 0x00);
Set DISPLAYSTART_Y (0x39, 0x00);
Set RGB_IF (0xE0, 0x00);
Set RGB_POL (0xE1, 0x00);
Set DISPLAY_MODE_CONTROL (0xE5, 0x00);
Set CPU_IF (0x0D, 0x00);
Set MEMORY_WRITE/READ (0x1D, 0x01);
Set ROW_SCAN_DIRECTION (0x09, 0x00);
Set ROW_SCAN_MODE (0x13, 0x00);
Set COLUMN_CURRENT_R (0x40, 0x7F);
Set COLUMN_CURRENT_G (0x41, 0x65);
Set COLUMN_CURRENT_B (0x42, 0x7B);
Set ROW_OVERLAP (0x48, 0x03);
Set DISCHARGE_TIME (0x18, 0x03);
Set PEAK_PULSE_DELAY (0x16, 0x00);
Set PEAK_PULSE_WIDTH_R (0x3A, 0x03);
Set PEAK_PULSE_WIDTH_G (0x3B, 0x03);
Set PEAK_PULSE_WIDTH_B (0x3C, 0x02);
Set PRECHARGE_CURRENT_R (0x3D, 0x09);
Set PRECHARGE_CURRENT_G (0x3E, 0x09);
Set SCAN_OFF_LEVEL (0x49, 0x0F);
Set DISPLAY_X1 (0x30, 0x00);
Set DISPLAY_X2 (0x31, 0x5F);
Set DISPLY_Y1 (0x32, 0x00);
Set DISPLAY_Y2 (0x33, 0x5F);
Clear Screen;
Set DISP_ON_OFF (0x02, 0x01);
OLED_VCC=1;                        //Power up Vcc
Delay_100ms(1);                    //Dealy 100ms
Set_Display_On(0xAF);              // Display On (0x00/0x01)
```

If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

RELIABILITY

1. Contents of Reliability Test

Item	Conditions	Criteria
High Temperature Operation	70°C, 240hrs	The operational functions work.
Low Temperature Operation	-30°C, 240hrs	
High Temperature Storage	80°C, 240hrs	
Low Temperature Storage	-40°C, 240hrs	
High Temperature/ Humidity Operation	60°C, 90% RH, 120hrs	
Thermal Shock	-40°C <=> 85°C, 24 cycles 60 mins dwell	

*The samples used for the above test do not include polarizer.

*No moisture condensation is observed during tests.

2. Lifetime

End of lifetime is specified as 50% of initial brightness.

Parameter	Min	Max	Unit	Condition	Notes
Operating Life Time	10,000	-	hr	100 cd/m^2, 50% checkerboard	*
Storage Life Time	20,000	-	hr	Ta = 25°C, 50% RH	

*The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

10.3. Failure Check Standard

After the completion of the described reliability test, the samples were left at room temperature for 2 hrs prior to conducting the failure test at 23 ± 5°C ; 55 ± 15% RH.