

# Product Specification

**Product Name: LH25664L280K**

**Product Code: 0016H**

<b>Customer</b>
<b>Approved by Customer</b>
<b>Approved Date:</b>

CONTENT

**REVISION RECORD..... 3**

**1 OVERVIEW..... 4**

**2 FEATURES..... 4**

**3 MECHANICAL DATA ..... 4**

**4 MECHANICAL DRAWING..... 5**

**5 MODULE INTERFACE..... 6**

**6 FUNCTION BLOCK DIAGRAM..... 7**

6.1 FUNCTION BLOCK DIAGRAM ..... 7

6.2 PANEL LAYOUT DIAGRAM..... 7

**7 ABSOLUTE MAXIMUM RATINGS..... 8**

**8 ELECTRICAL CHARACTERISTICS ..... 9**

8.1 DC ELECTRICAL CHARACTERISTICS..... 9

8.2 ELECTRO-OPTICAL CHARACTERISTICS..... 10

8.3 AC ELECTRICAL CHARACTERISTICS..... 11

**9 FUNCTIONAL SPECIFICATION AND APPLICATION CIRCUIT..... 17**

9.1 POWER ON AND POWER OFF SEQUENCE ..... 17

9.2 APPLICATION CIRCUIT ..... 18

9.3 EXTERNAL DC-DC APPLICATION CIRCUIT..... 23

9.4 DISPLAY CONTROL INSTRUCTION..... 24

9.5 RECOMMENDED SOFTWARE INITIALIZATION ..... 24

**10 PACKAGE SPECIFICATION..... 26**

**11 RELIABILITY..... 27**

11.1 RELIABILITY TEST..... 27

11.2 LIFETIME ..... 27

11.3 FAILURE CHECK STANDARD..... 28

**12 ILLUSTRATION OF OLED PRODUCT NAME ..... 28**

**13 OUTGOING QUALITY CONTROL SPECIFICATIONS..... 29**

13.1 SAMPLING METHOD ..... 29

13.2 INSPECTION CONDITIONS..... 29

13.3 QUALITY ASSURANCE ZONES ..... 29

13.4 INSPECTION STANDARD ..... 30

**14 PRECAUTIONS FOR OPERATION AND STORAGE..... 33**

14.1 PRECAUTIONS FOR OPERATION ..... 33

14.2 SOLDERING ..... 33

14.3 PRECAUTIONS FOR STORAGE ..... 33

14.4 WARRANTY PERIOD ..... 33



## PRODUCT SPECIFICATION

---

### 1 Overview

LH25664L28K03 is a grayscale OLED display module with 256×64 dot matrix. The characteristics of this display module are high brightness, self-emission, high contrast ratio, slim/thin outline, wide viewing angle, wide temperature range, and low power consumption.

### 2 Features

- Display Color: Amber
- Dot Matrix:256×64
- Driver IC: SSD1322UR1
- Interface:8-bit 8080,8-bit 6800, SPI
- Wide range of operating temperature: -40°C to 70°C

### 3 Mechanical Data

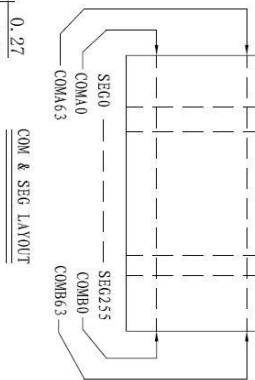
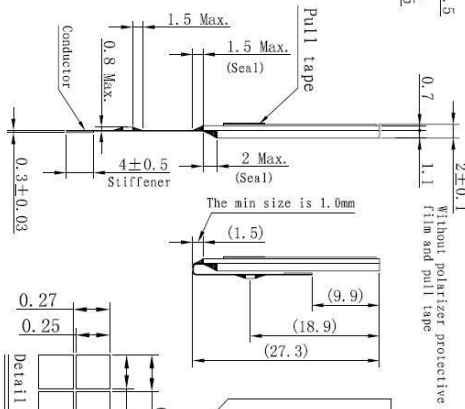
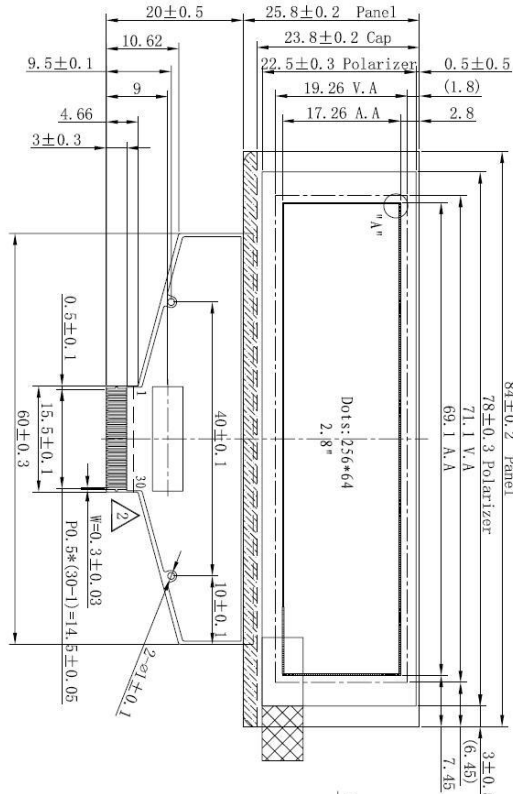
NO.	ITEM	SPECIFICATION	UNIT
1	Dot Matrix	256(W)×64(H)	-
2	Dot Size	0.25(W)×0.25(H)	mm <sup>2</sup>
3	Dot Pitch	0.27(W)×0.27(H)	mm <sup>2</sup>
4	Aperture Rate	85	%
5	Active Area	69.1(W)×17.26(H)	mm <sup>2</sup>
6	Panel Size	84(W)×25.8(H) ×1.81(T)	mm <sup>2</sup>
7	Module Size	84(W)×45.8(H) ×2(T)	mm <sup>3</sup>
8	Diagonal A/A Size	2.8	inch
9	Module Weight	9.2 ± 10%	gram

PRODUCT SPECIFICATION

4 Mechanical Drawing

如本印章非红色, 则表明该文件为非受控版本, 不会受到控制和更新. 请使用受控文件.  
分发号:

受控章



NO.	SYMBOL	Pin Assignment
1	NC (GND)	
2	VSS	
3	VCC	
4	VCOMH	
5	VSSS	
6	D7	
7	D6	
8	D5	
9	D4	
10	D3	
11	D2	
12	D1	
13	D0	
14	E/RD#	
15	R/W#	
16	BS0	
17	BS1	
18	DC#	
19	CS#	
20	RES#	
21	FR	
22	IREF	
23	NC	
24	VDDI0	
25	VDD	
26	VC1	
27	USL	
28	VSSS	
29	VCC	
30	NC (GND)	

- Specification
1. Display: OLED (Amber)
  2. Format: 256x64
  3. Driver IC: SSD1322UR1
  4. General Tolerance: ±0.3
  5. Operate temp.: -40°C~70°C
  6. Storage temp.: -40°C~85°C
  7. Duty: 1/64

Customer Approval	Part Name	Module ass'y	Date	Rev.	Unit	Sheet
Signature	Project Code	DES' D BY	2010.02.02	02	mm	1/1
	Part No.	CHK' D BY				APPROVED



Rev.	Date	Note
1	2009.12.02	Primary
2	2010.02.02	Add the mark of pin

## 5 Module Interface

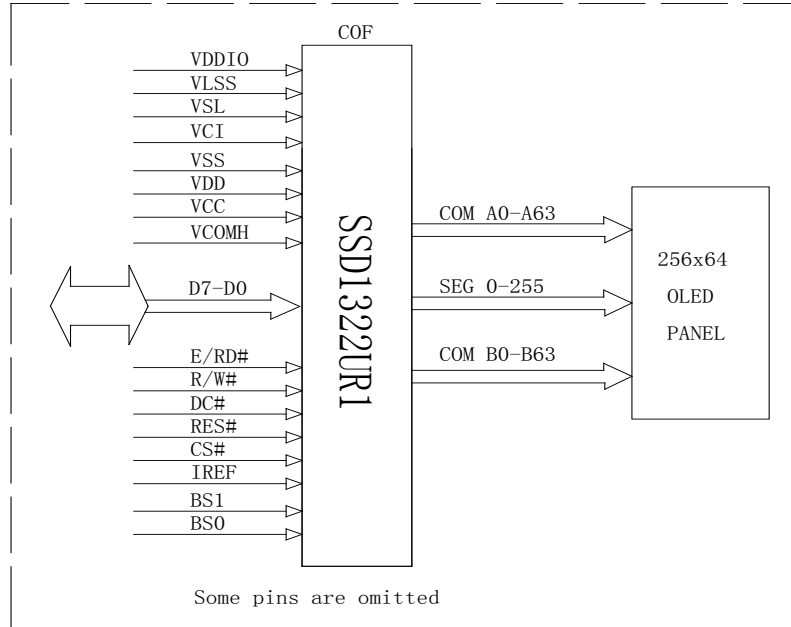
PIN NO.	PIN NAME	DESCRIPTION
1	NC(GND)	No Connection or Ground.
2	VSS	Ground.
3	VCC	OLED drive voltage, it should be supplied externally.
4	VCOMH	This is an input pin for the voltage output high level for COM signals. A capacitor should be connected between this pin and VSS.
5	VLSS	Analog system ground pin.
6~13	D7~D0	These pins are bi-directional data bus connecting to the MCU data bus. Unused pins are recommended to tie LOW. (Except for D2 pin in SPI mode)
14	E/RD#	This pin is MCU interface input. When interfacing to a 6800-series microprocessor, this pin will be used as the Enable (E) signal. Read/write operation is initiated when this pin is pulled HIGH and the chip is selected. When connecting to an 8080-microprocessor, this pin receives the Read (RD#) signal. Read operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin E(RD#) must be connected to VSS.
15	R/W#	This pin is read / write control input pin connecting to the MCU interface. When interfacing to a 6800-series microprocessor, this pin will be used as Read/Write (R/W#) selection input. Read mode will be carried out when this pin is pulled HIGH and write mode when LOW. When 8080 interface mode is selected, this pin will be the Write (WR#) input. Data write operation is initiated when this pin is pulled LOW and the chip is selected. When serial interface is selected, this pin R/W (WR#) must be connected to VSS.
16	BS0	Table 5-1
17	BS1	
18	DC#	Data/Command Select. H: Data; L: Command.
19	CS#	Chip Select, active low.
20	RES#	Reset, active low.
21	FR	No Connection.
22	IREF	This is a segment current reference pin. A resistor should be connected between this pin and VSS. Set the current at 10uA.
23	NC	No Connection.
24	VDDIO	Power supply for interface logic level.
25	VDD	Power supply pin for core logic operation.
26	VCI	Low voltage power supply
27	VSL	This is segment voltage reference pin.
28	VLSS	Analog system ground pin.
29	VCC	OLED drive voltage, it should be supplied externally.
30	NC(GND)	No Connection or Ground.

Table 5.1

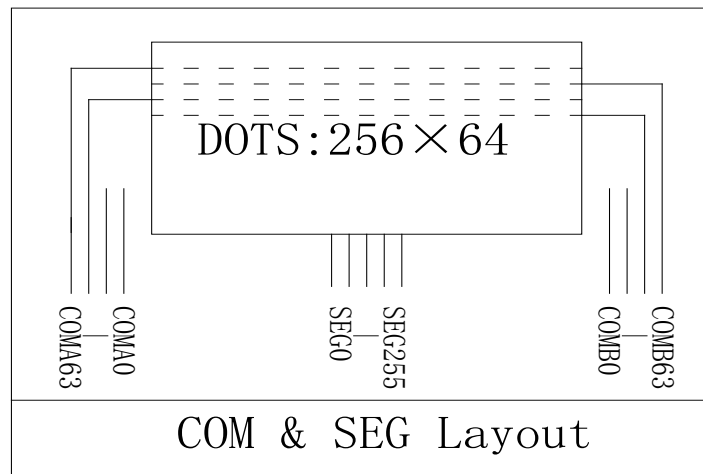
Pin Name	8-bit 6800	8-bit 8080	4 Line SP	3 Line SPI
BS0	1	0	0	1
BS1	1	1	0	0

## 6 Function Block Diagram

### 6.1 Function Block Diagram



### 6.2 Panel Layout Diagram



---

**PRODUCT SPECIFICATION**

---

## **7 Absolute Maximum Ratings**

<b>ITEM</b>	<b>SYMBOL</b>	<b>MIN</b>	<b>MAX</b>	<b>UNIT</b>	<b>REMARK</b>
Supply Voltage	V <sub>DD</sub>	-0.5	2.75	V	IC maximum rating
	V <sub>CC</sub>	-0.5	21	V	IC maximum rating
	V <sub>DDIO</sub>	-0.5	V <sub>CI</sub>	V	IC maximum rating
	V <sub>CI</sub>	-0.3	4.0	V	IC maximum rating
Operating Temp.	Top	-40	+70	°C	-
Storage Temp	Tstg	-40	+85	°C	-

Note (1): All of the voltages are on the basis of “VSS = 0V”.

Note (2): Permanent breakage of module may occur if the module is used beyond the maximum rating. The module can be normal operated under the conditions according to Section 8 “Electrical Characteristics”. Malfunctioning of the module may occur and the reliability of the module may deteriorate if the module is used beyond the conditions.



---

**PRODUCT SPECIFICATION**

---

**8 Electrical Characteristics****8.1 DC Electrical Characteristics**

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT
Logic Supply Voltage	$V_{DD}$	22±3°C, 55±15%R.H	2.4	-	2.6	V
Power Supply for I/O pins	$V_{DDIO}$	22±3°C, 55±15%R.H	1.65	-	$V_{CI}$	V
Low voltage power supply	$V_{CI}$	22±3°C, 55±15%R.H	2.4	-	3.5	V
OLED Driver Supply Voltage	$V_{CC}$	22±3°C, 55±15%R.H	11.5	12	12.5	V
High-level Input Voltage	$V_{IH}$	-	$0.8 \times V_{DDIO}$	-	$V_{DDIO}$	V
Low-level Input Voltage	$V_{IL}$	-	0	-	$0.2 \times V_{DDIO}$	V
High-level Output Voltage	$V_{OH}$	-	$0.9 \times V_{DDIO}$	-	$V_{DDIO}$	V
Low-level Output Voltage	$V_{OL}$	-	0	-	$0.1 \times V_{DDIO}$	V

Note : The  $V_{CC}$  input must be kept in a stable value; ripple and noise are not allowed.

## PRODUCT SPECIFICATION

### 8.2 Electro-optical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN	TYP	MAX	UNIT	
Normal Mode Brightness	$L_{br}$	All pixels ON(1)	60	80	-	cd/m <sup>2</sup>	
VDD Sleep mode Current	$I_{SLP\_VDD}$	VCI = VDDIO =2.8V, VCC =OFF VDD(external) = 2.5V, Display OFF, No panel attached	-	-	10	uA	
V <sub>DDIO</sub> Sleep mode Current	$I_{SLP\_VDDIO}$	VCI = VDDIO =2.8V, External VDD =2.5V VCC =OFF Display OFF, No panel attached	External VDD	-	-	10	uA
			Internal VDD	-	-	10	uA
VCI Sleep mode Current	$I_{SLP\_VCI}$	VCI = VDDIO =2.8V, External VDD =2.5V VCC =OFF Display OFF, No panel attached	External V <sub>DD</sub> =2.5V	-	-	10	uA
			Enable Internal VDD during Sleep mode	-	-	50	uA
			Disable Internal VDD during Sleep mode	-	-	10	uA
Normal Mode Power Consumption	$P_t$	All pixels ON(1)	-	420	504	mW	
C.I.E(Blue)	(x)	x,y(CIE1931)	0.50	0.54	0.58	-	
	(y)		0.40	0.44	0.48	-	
Dark Room Contrast	CR	-	≥2000:1	-	-	-	
Response Time	-	-	---	10	-	μ s	
View Angle	-	-	≥160	-	-	Degree	

Note(1): Normal Mode test conditions are as follows:

- Driving voltage : 12V
- Contrast setting : 0x9f
- Frame rate : 120Hz
- Duty setting : 1/64

## PRODUCT SPECIFICATION

### 8.3 AC Electrical Characteristics

#### (1)6800-Series MPU Parallel Interface Timing Characteristics

(VDDIO - VSS = 1.65V to 2.1V, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

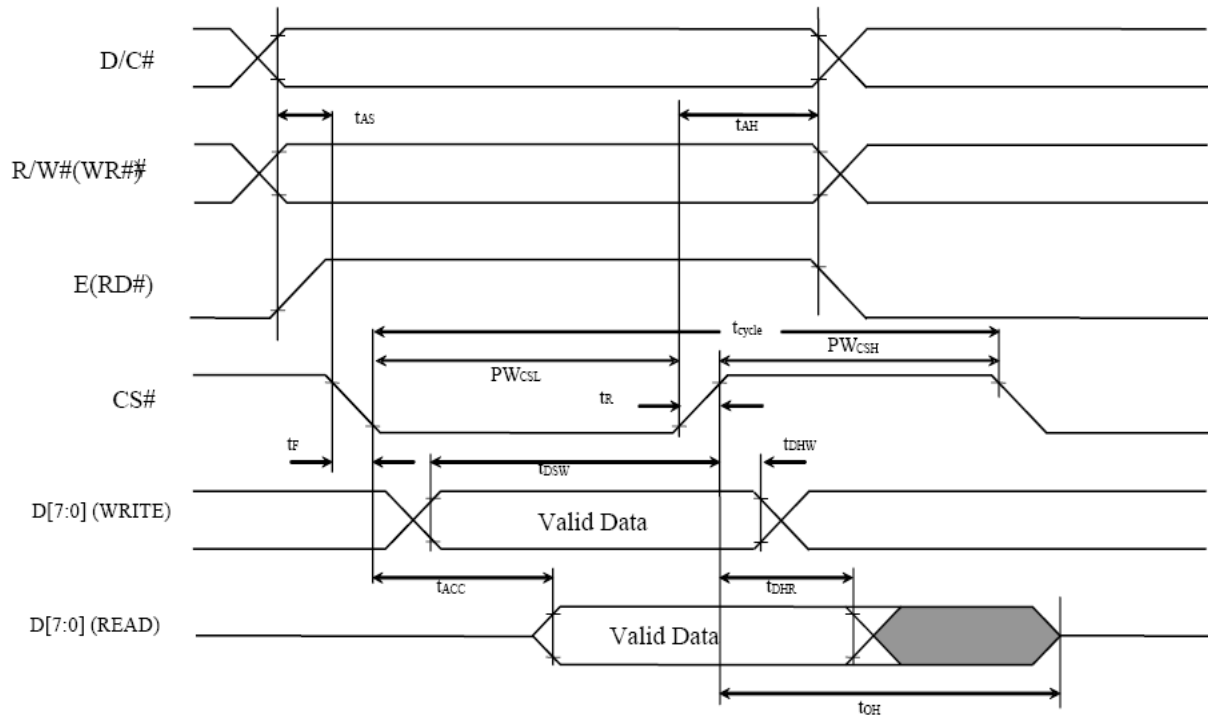
Symbol	Parameter	Min	Typ	Max	Unit
t <sub>CYCLE</sub>	Clock Cycle Time (read)	400	-	-	ns
	Clock Cycle Time (write)	100	-	-	ns
t <sub>AS</sub>	Address Setup Time	20	-	-	ns
t <sub>AH</sub>	Address Hold Time	0	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	40	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	10	-	-	ns
t <sub>DHR</sub>	Read Data Hold Time	20	-	-	ns
t <sub>OH</sub>	Output Disable Time	-	-	70	ns
t <sub>ACC</sub>	Access Time	-	-	200	ns
PW <sub>CSL</sub>	Chip Select Low Pulse Width (read)	450	-	-	ns
	Chip Select Low Pulse Width (write)	60	-	-	ns
PW <sub>CSH</sub>	Chip Select High Pulse Width (read)	60	-	-	ns
	Chip Select High Pulse Width (write)	60	-	-	ns
t <sub>R</sub>	Rise Time	-	-	15	ns
t <sub>F</sub>	Fall Time	-	-	15	ns

(VDDIO - VSS = 2.1V to VCI, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>CYCLE</sub>	Clock Cycle Time (read)	300	-	-	ns
	Clock Cycle Time (write)	100	-	-	ns
t <sub>AS</sub>	Address Setup Time	15	-	-	ns
t <sub>AH</sub>	Address Hold Time	0	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	40	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	10	-	-	ns
t <sub>DHR</sub>	Read Data Hold Time	20	-	-	ns
t <sub>OH</sub>	Output Disable Time	-	-	70	ns
t <sub>ACC</sub>	Access Time	-	-	140	ns
PW <sub>CSL</sub>	Chip Select Low Pulse Width (read)	150	-	-	ns
	Chip Select Low Pulse Width (write)	60	-	-	ns
PW <sub>CSH</sub>	Chip Select High Pulse Width (read)	60	-	-	ns
	Chip Select High Pulse Width (write)	60	-	-	ns
t <sub>R</sub>	Rise Time	-	-	15	ns
t <sub>F</sub>	Fall Time	-	-	15	ns

# PRODUCT SPECIFICATION

## 6800-series MCU parallel interface characteristics



## PRODUCT SPECIFICATION

### (2)8080-Series MPU Parallel Interface Timing Characteristics

(VDDIO - VSS = 1.65V to 2.1V, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

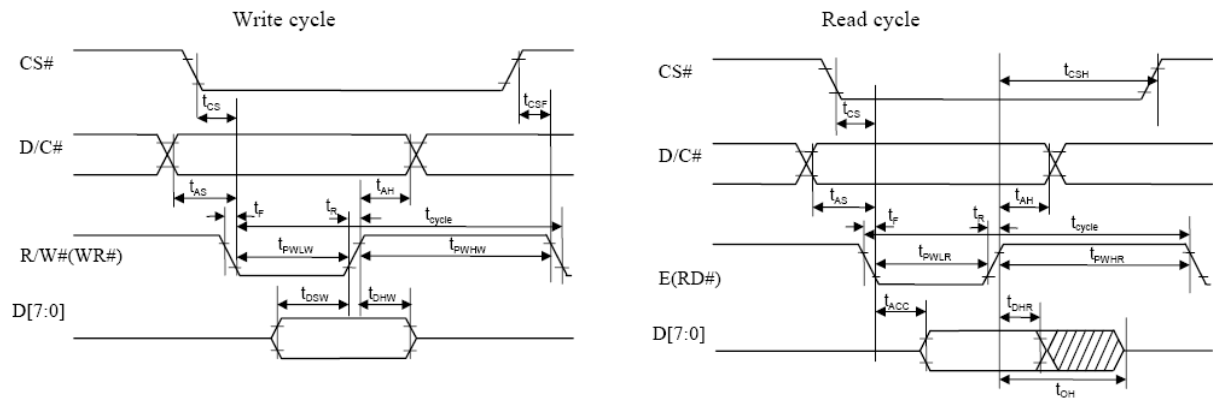
Symbol	Parameter	Min	Typ	Max	Unit
t <sub>CYCLE</sub>	Clock Cycle Time (read)	400	-	-	ns
	Clock Cycle Time (write)	100	-	-	ns
t <sub>AS</sub>	Address Setup Time	10	-	-	ns
t <sub>AH</sub>	Address Hold Time	0	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	40	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	10	-	-	ns
t <sub>DHR</sub>	Read Data Hold Time	20	-	-	ns
t <sub>OH</sub>	Output Disable Time	-	-	70	ns
t <sub>ACC</sub>	Access Time	-	-	220	ns
t <sub>PWLR</sub>	Read Low Time	200	-	-	ns
t <sub>PWLW</sub>	Write Low Time	60	-	-	ns
t <sub>PWHR</sub>	Read High Time	60	-	-	ns
t <sub>PWHW</sub>	Write High Time	60	-	-	ns
t <sub>R</sub>	Rise Time	-	-	15	ns
t <sub>F</sub>	Fall Time	-	-	15	ns
t <sub>CS</sub>	Chip select setup time	0	-	-	ns
t <sub>CSH</sub>	Chip select hold time to read signal	0	-	-	ns
t <sub>CSF</sub>	Chip select hold time	20	-	-	ns

(VDDIO - VSS = 2.1V to VCI, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
t <sub>CYCLE</sub>	Clock Cycle Time (read)	300	-	-	ns
	Clock Cycle Time (write)	100	-	-	ns
t <sub>AS</sub>	Address Setup Time	10	-	-	ns
t <sub>AH</sub>	Address Hold Time	0	-	-	ns
t <sub>DSW</sub>	Write Data Setup Time	40	-	-	ns
t <sub>DHW</sub>	Write Data Hold Time	10	-	-	ns
t <sub>DHR</sub>	Read Data Hold Time	20	-	-	ns
t <sub>OH</sub>	Output Disable Time	-	-	70	ns
t <sub>ACC</sub>	Access Time	-	-	140	ns
t <sub>PWLR</sub>	Read Low Time	150	-	-	ns
t <sub>PWLW</sub>	Write Low Time	60	-	-	ns
t <sub>PWHR</sub>	Read High Time	60	-	-	ns
t <sub>PWHW</sub>	Write High Time	60	-	-	ns
t <sub>R</sub>	Rise Time	-	-	15	ns
t <sub>F</sub>	Fall Time	-	-	15	ns
t <sub>CS</sub>	Chip select setup time	0	-	-	ns
t <sub>CSH</sub>	Chip select hold time to read signal	0	-	-	ns
t <sub>CSF</sub>	Chip select hold time	20	-	-	ns

# PRODUCT SPECIFICATION

## 8080-series MPU parallel interface characteristics



## PRODUCT SPECIFICATION

### (3)Serial Interface Timing Characteristics (4-wire SPI)

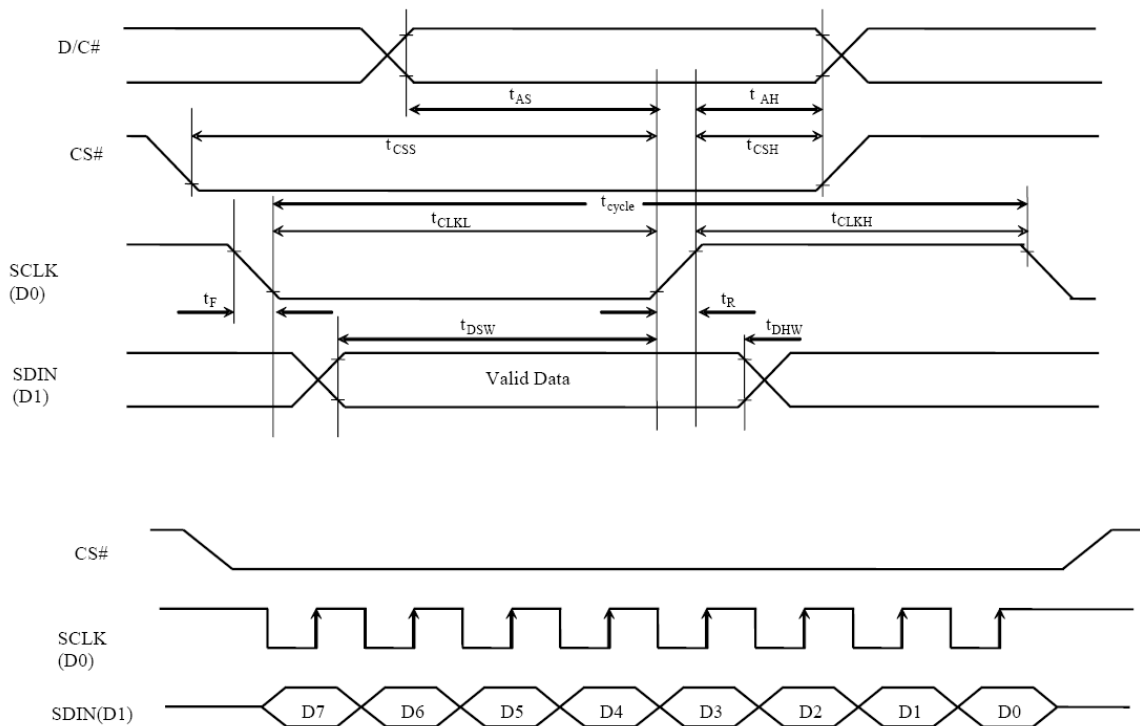
(VDDIO - VSS = 1.65V to 2.1V, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	15	-	-	ns
$t_{AH}$	Address Hold Time	35	-	-	ns
$t_{CSS}$	Chip Select Setup Time	20	-	-	ns
$t_{CSH}$	Chip Select Hold Time	10	-	-	ns
$t_{DSW}$	Write Data Setup Time	15	-	-	ns
$t_{DHW}$	Write Data Hold Time	20	-	-	ns
$t_{CLKL}$	Clock Low Time	40	-	-	ns
$t_{CLKH}$	Clock High Time	40	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

(VDDIO - VSS = 2.1V to VCI, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
$t_{cycle}$	Clock Cycle Time	300	-	-	ns
$t_{AS}$	Address Setup Time	15	-	-	ns
$t_{AH}$	Address Hold Time	25	-	-	ns
$t_{CSS}$	Chip Select Setup Time	20	-	-	ns
$t_{CSH}$	Chip Select Hold Time	10	-	-	ns
$t_{DSW}$	Write Data Setup Time	15	-	-	ns
$t_{DHW}$	Write Data Hold Time	20	-	-	ns
$t_{CLKL}$	Clock Low Time	25	-	-	ns
$t_{CLKH}$	Clock High Time	40	-	-	ns
$t_R$	Rise Time	-	-	15	ns
$t_F$	Fall Time	-	-	15	ns

#### Serial interface characteristics (4-wire SPI)



## PRODUCT SPECIFICATION

### (4) Serial Interface Timing Characteristics (3-wire SPI)

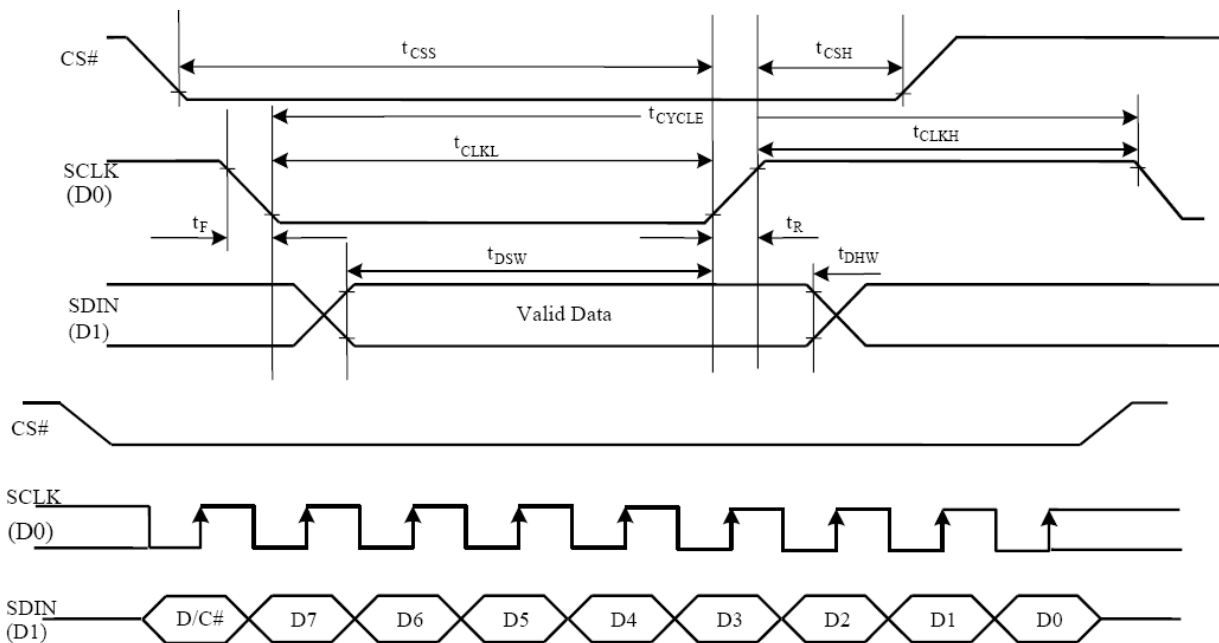
(VDDIO - VSS = 1.65V to 2.1V, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
$t_{\text{cycle}}$	Clock Cycle Time	300	-	-	ns
$t_{\text{CSS}}$	Chip Select Setup Time	20	-	-	ns
$t_{\text{CSH}}$	Chip Select Hold Time	35	-	-	ns
$t_{\text{DSW}}$	Write Data Setup Time	15	-	-	ns
$t_{\text{DHW}}$	Write Data Hold Time	20	-	-	ns
$t_{\text{CLKL}}$	Clock Low Time	40	-	-	ns
$t_{\text{CLKH}}$	Clock High Time	25	-	-	ns
$t_{\text{R}}$	Rise Time	-	-	15	ns
$t_{\text{F}}$	Fall Time	-	-	15	ns

(VDDIO - VSS = 2.1V to VCI, VCI - VSS = 2.4V to 3.5V, TA = 25°C)

Symbol	Parameter	Min	Typ	Max	Unit
$t_{\text{cycle}}$	Clock Cycle Time	300	-	-	ns
$t_{\text{CSS}}$	Chip Select Setup Time	20	-	-	ns
$t_{\text{CSH}}$	Chip Select Hold Time	25	-	-	ns
$t_{\text{DSW}}$	Write Data Setup Time	15	-	-	ns
$t_{\text{DHW}}$	Write Data Hold Time	20	-	-	ns
$t_{\text{CLKL}}$	Clock Low Time	25	-	-	ns
$t_{\text{CLKH}}$	Clock High Time	25	-	-	ns
$t_{\text{R}}$	Rise Time	-	-	15	ns
$t_{\text{F}}$	Fall Time	-	-	15	ns

Serial interface characteristics (3-wire SPI)



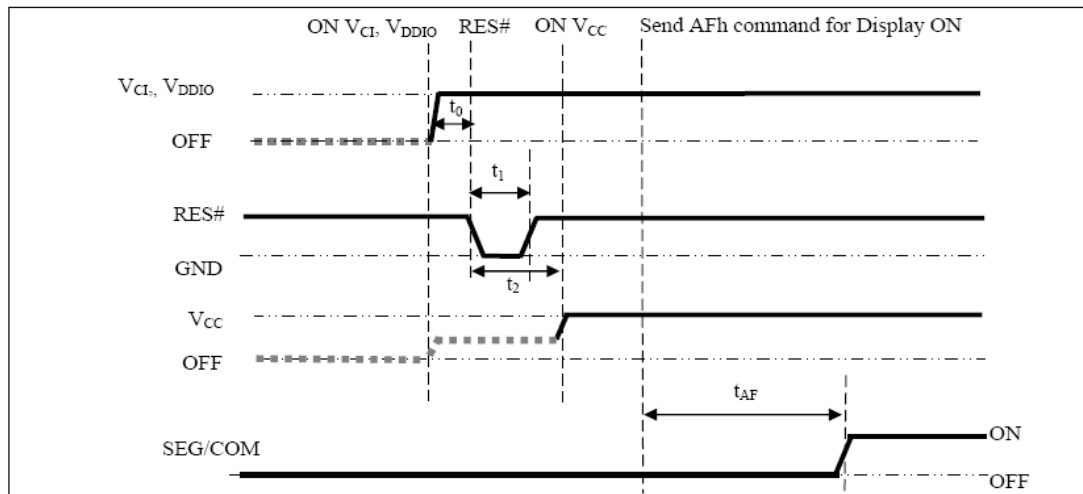


## 9 Functional Specification and Application Circuit

### 9.1 Power ON and Power OFF Sequence

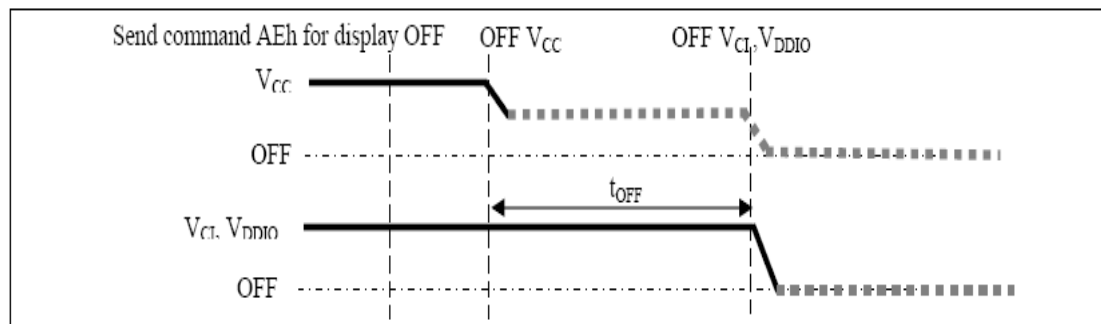
#### Power ON Sequence:

1. Power ON V<sub>CI</sub>, V<sub>DDIO</sub>.
2. After V<sub>CI</sub>, V<sub>DDIO</sub> become stable, set wait time at least 1ms ( $t_0$ ) for internal V<sub>DD</sub> become stable. Then set RES# pin LOW (logic low) for at least 100us ( $t_1$ )<sup>(4)</sup> and then HIGH (logic high).
3. After set RES# pin LOW (logic low), wait for at least 100us ( $t_2$ ). Then Power ON V<sub>CC</sub>.<sup>(1)</sup>
4. After V<sub>CC</sub> become stable, send command AFh for display ON. SEG/COM will be ON after 200ms( $t_{AF}$ ).
5. After V<sub>CI</sub> become stable, wait for at least 300ms to send command



#### Power OFF Sequence:

1. Send command AEh for display OFF.
2. Power OFF V<sub>CC</sub>.<sup>(1),(2)</sup>
3. Wait for  $t_{OFF}$ . Power OFF V<sub>CI</sub>, V<sub>DDIO</sub>. (where Minimum  $t_{OFF}=0ms$ <sup>(3)</sup>, Typical  $t_{OFF}=100ms$ )



Note:

- (1) Since an ESD protection circuit is connected between V<sub>CI</sub>, V<sub>DDIO</sub> and V<sub>CC</sub>, V<sub>CC</sub> becomes lower than V<sub>CI</sub> whenever V<sub>CI</sub>, V<sub>DDIO</sub> is ON and V<sub>CC</sub> is OFF as shown in the dotted line of V<sub>CC</sub> in above Figure.
- (2) V<sub>CC</sub> should be kept float (disable) when it is OFF.
- (3) V<sub>CI</sub>, V<sub>DDIO</sub> should not be Power OFF before V<sub>CC</sub> Power OFF.
- (4) The register values are reset after  $t_1$ .
- (5) Power pins (V<sub>DD</sub>, V<sub>CC</sub>) can never be pulled to ground under any circumstance.

## 9.2 Application Circuit

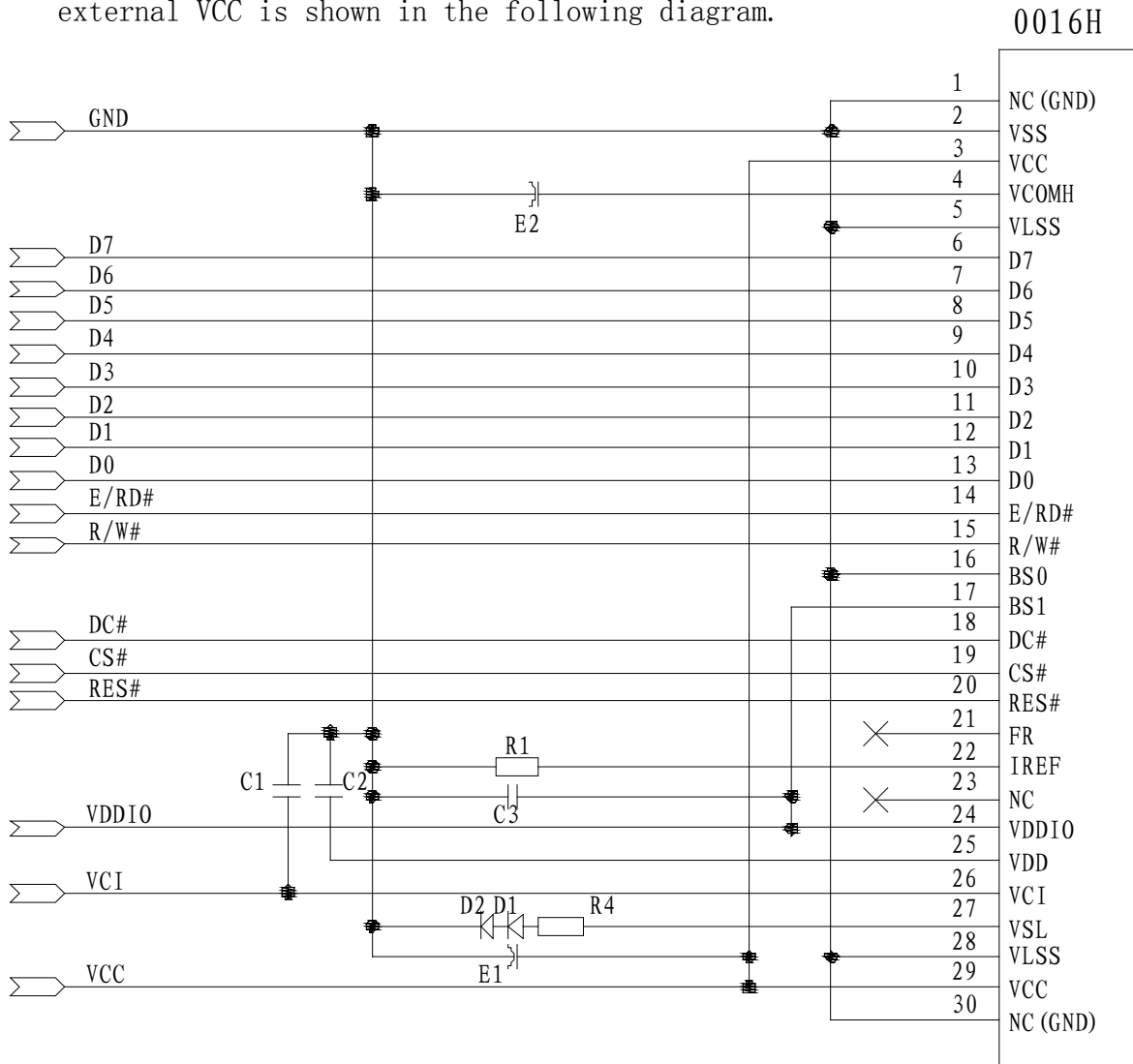
The double byte command for 0xAB is used to enable or disable the VDD regulator.

No matter VDD is supplied by external source or internal regulated ; VCI must always be set equivalent to or higher than VDD.

(A) VDD can be supplied regulated internally from VCI when A[0] is set to 1b.

(VCI must be > 2.6V)

(1).The configuration for 8-bit 8080-parallel interface mode, external VCC is shown in the following diagram.



Pin connected to MCU interface: D[7:0], E/RD#, R/W#, DC#, CS#, RES#

### Recommended components

E1,E2: 4.7μF/25V.ROHS (Tantalum Capacitors)

C1, C2, C3: 0.1uF-0603-X7R±10%.ROHS

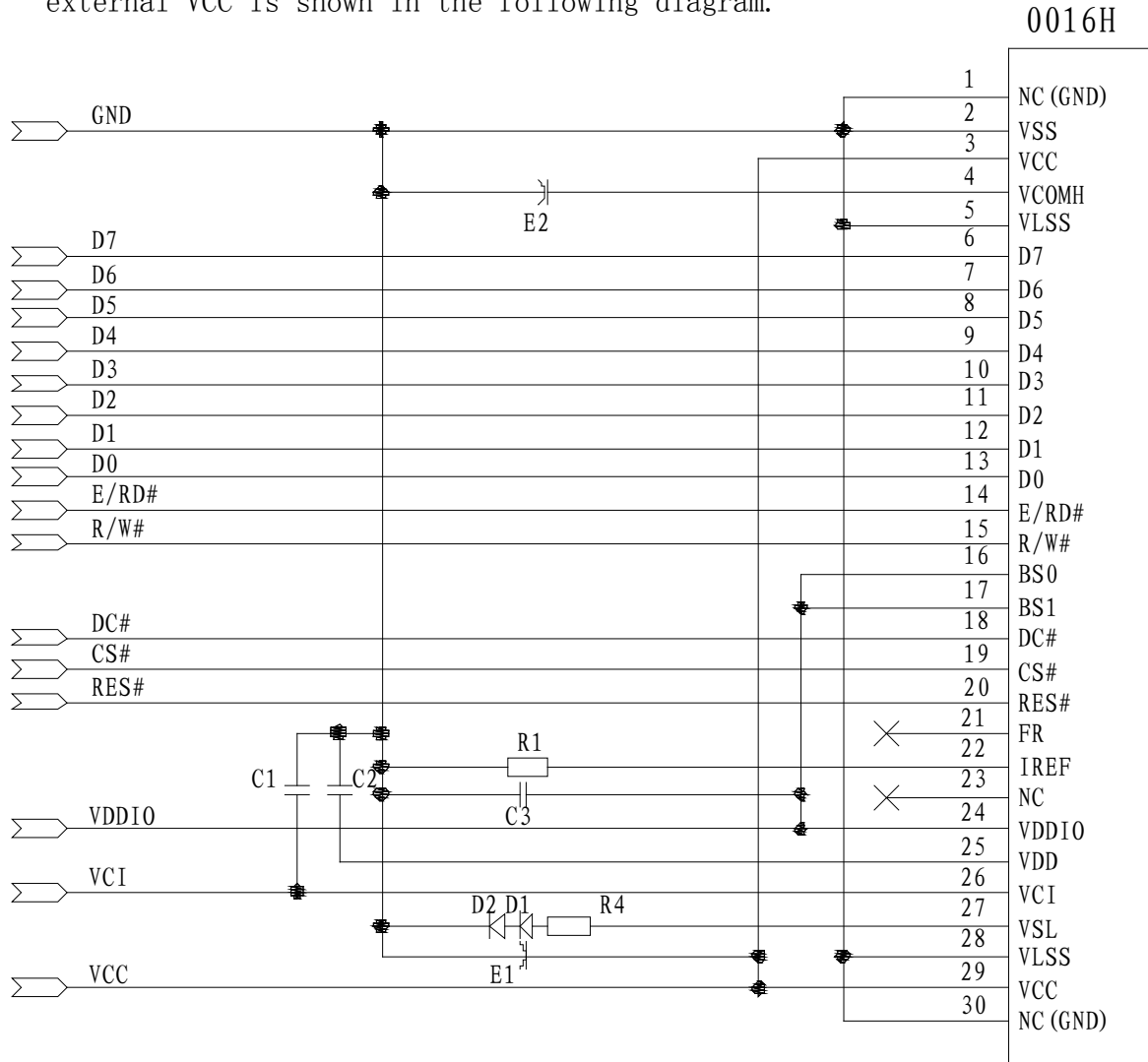
R1: 680K ohm 0603 1/10W +/-5%.ROHS

R4: 51 ohm 0603 1/10W +/-5%.ROHS

D1,D2: 1N4148

## PRODUCT SPECIFICATION

(2).The configuration for 8-bit 6800-parallel interface mode, external VCC is shown in the following diagram.



Pin connected to MCU interface: D[7:0], E/RD#, R/W#, DC#, CS#, RES#

### Recommended components

E1,E2: 4.7 $\mu$ F/25V.ROHS (Tantalum Capacitors)

C1, C2, C3: 0.1 $\mu$ F-0603-X7R $\pm$ 10%.ROHS

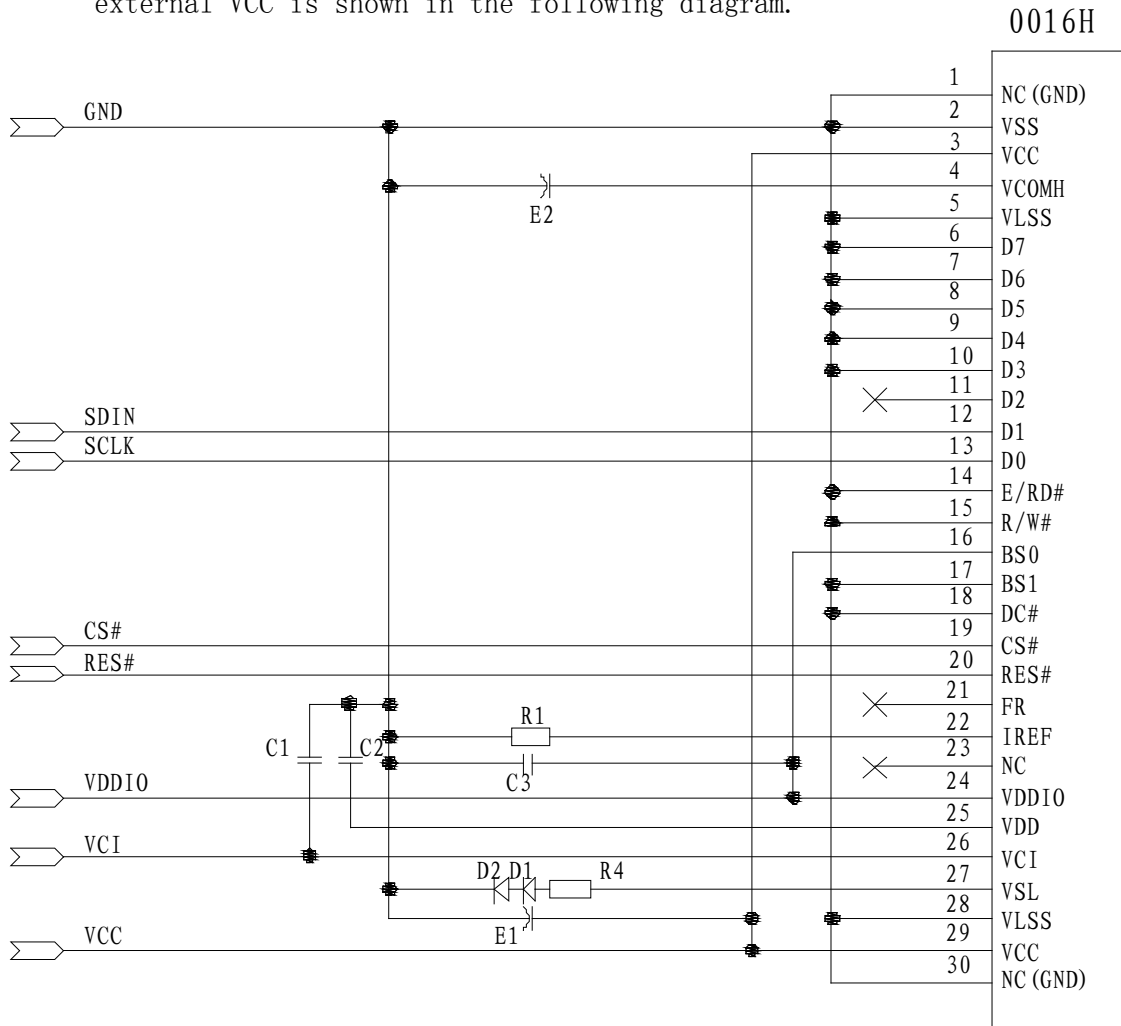
R1: 680K ohm 0603 1/10W +/-5%.ROHS

R4: 51 ohm 0603 1/10W +/-5%.ROHS

D1,D2: 1N4148

## PRODUCT SPECIFICATION

(3).The configuration for 3-wire SPI interface mode, external VCC is shown in the following diagram.



Pin connected to MCU interface: SDIN,SCLK, CS#, RES#

### Recommended components

E1,E2: 4.7 $\mu$ F/25V.ROHS (Tantalum Capacitors)

C1, C2, C3: 0.1 $\mu$ F-0603-X7R $\pm$ 10%.ROHS

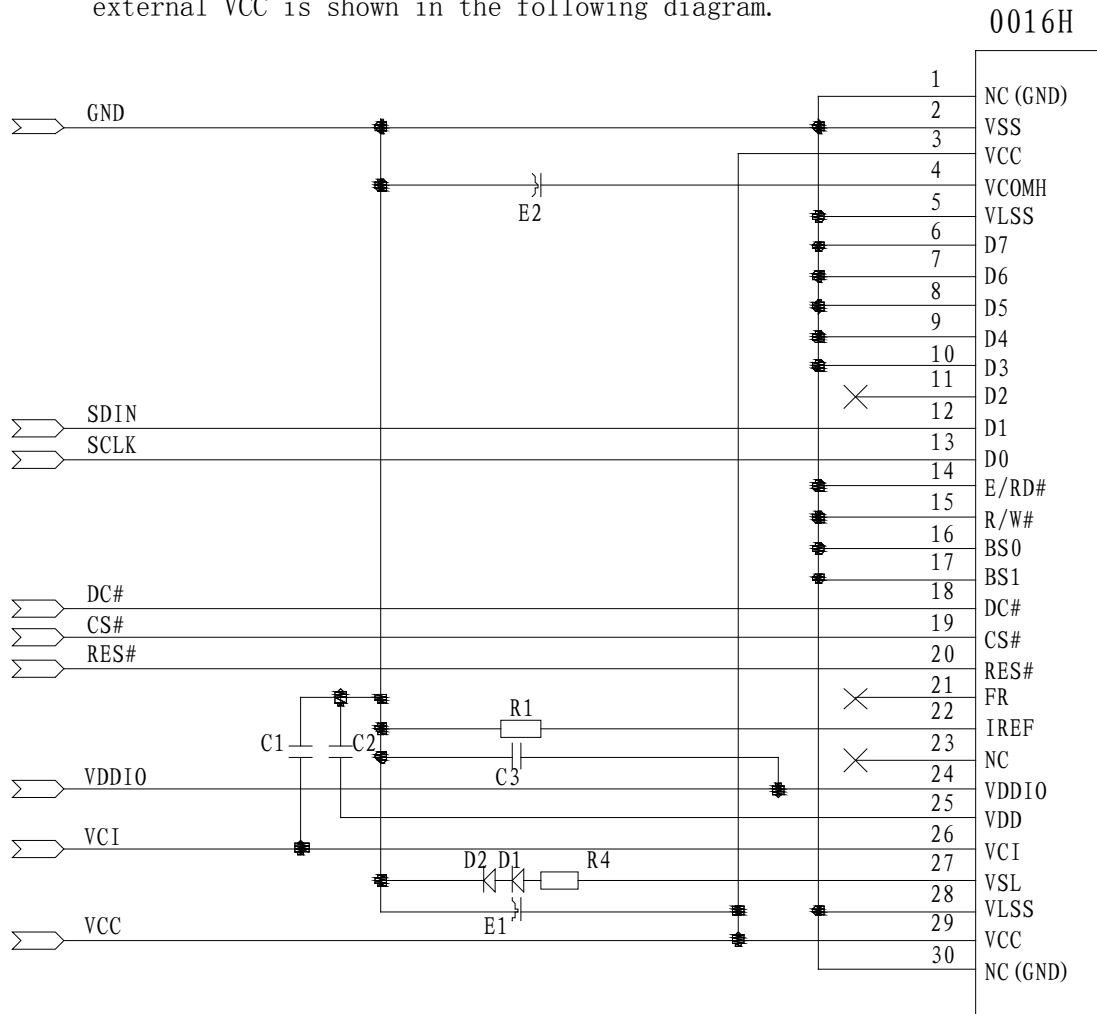
R1: 680K ohm 0603 1/10W +/-5%.ROHS

R4: 51 ohm 0603 1/10W +/-5%.ROHS

D1,D2: 1N4148

## PRODUCT SPECIFICATION

(4).The configuration for 4-wire SPI interface mode, external VCC is shown in the following diagram.



Pin connected to MCU interface: SDIN,SCLK, CS#, RES#,DC#

### Recommended components

E1,E2: 4.7 $\mu$ F/25V.ROHS (Tantalum Capacitors)

C1, C2, C3: 0.1 $\mu$ F-0603-X7R $\pm$ 10%.ROHS

R1: 680K ohm 0603 1/10W +/-5%.ROHS

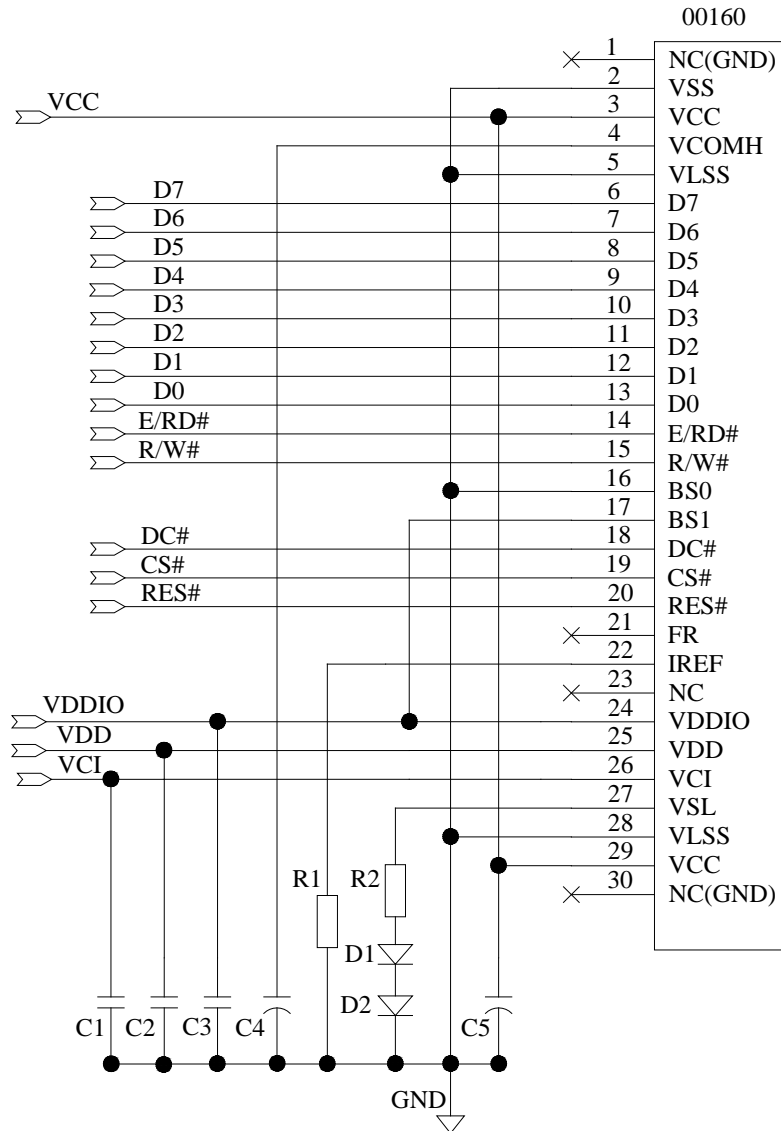
R4: 51 ohm 0603 1/10W +/-5%.ROHS

D1,D2: 1N4148

## PRODUCT SPECIFICATION

(B) VDD can be supplied externally (with the range of 2.4V to 2.6V, VCI must always be set equivalent to or higher than VDD and VDDIO.) when A[0] is set to 0b.

(1)The configuration for 8080-parallel interface mode, external VCC is shown in the following diagram:



Pin connected to MCU interface: D[7:0], E/RD#, R/W#, DC#, CS#, RES#

### Recommended components

C4,C5: 4.7 $\mu$ F/25V.ROHS (Tantalum Capacitors)

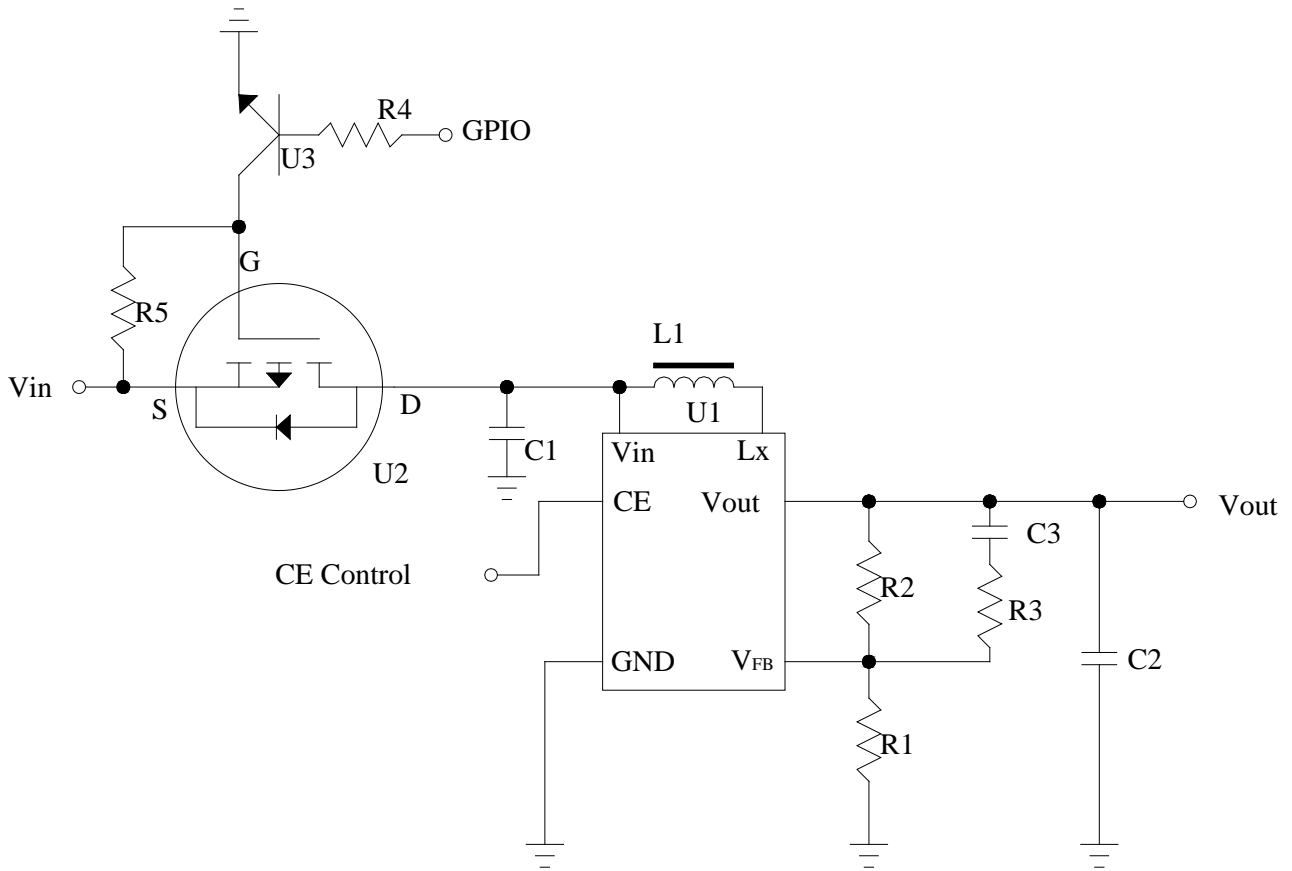
C1,C2,C3: 0.1 $\mu$ F-0603-X7R $\pm$ 10%.ROHS

R1: 0603 1/10W  $\pm$ 5% 680Kohm.ROHS

R2: 0603 1/10W  $\pm$ 5% 50ohm.ROHS

D1,D2: 1N4148

9.3 External DC-DC application circuit



Recommend component

The C1	: 1 uF-0603-X7R±10%.ROHS
The C2	: 1 uF-0603-X7R±10%.ROHS
The C3	: 220pF-0603-X7R±10%.ROHS
The R1	: 0603 1/10W +/-5% 10Kohm.ROHS
The R2	: 0603 1/10W +/-5% 110Kohm.ROHS
The R3	: 0603 1/10W +/-5% 2Kohm.ROHS
The R4	: 0603 1/10W +/-5% 1Kohm.ROHS
The R5	: 0603 1/10W +/-5% 10Kohm.ROHS
The L1	: 22uH
The U1	: R1200
The U2	: FDN338N
The U3	: 8050

#### 9.4 Display Control Instruction

Refer to SSD1322 IC Specification.

#### 9.5 Recommended Software Initialization

```
void Init_IC()
{
    Write_Command(0xfd);
    Write_Data(0x12);
    Write_Command(0xAE);
    Write_Command(0x15);
    Write_Data(0x1C);
    Write_Data(0x5B);
    Write_Command(0x75);
    Write_Data(0x00);
    Write_Data(0x3F);
    Write_Command(0xA0);
    Write_Data(0x14);
    Write_Data(0x11);
    Write_Command(0xA1);
    Write_Data(0x00);
    Write_Command(0xA2);
    Write_Data(0x00);
    Write_Command(0xAB);
    Write_Data(0x00);
    Write_Command(0xB1);
    Write_Data(0xE2);
    Write_Command(0xB3);
    Write_Data(0x91);
    Write_Command(0xB4);
    Write_Data(0xA0);
    Write_Data(0xFD);
    Write_Command(0xB5);
    Write_Data(0x00);
    Write_Command(0xB6);
    Write_Data(0x08);
    Write_Command(0xB9);
    Write_Command(0xBB);
    Write_Data(0x1F);
    Write_Command(0xBE);
}
```




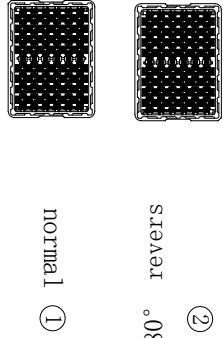

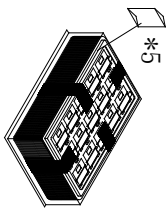
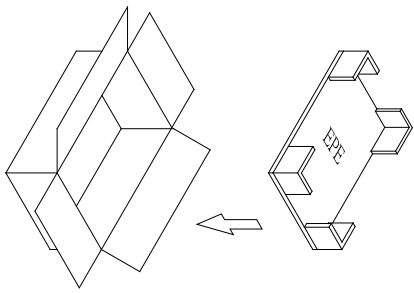
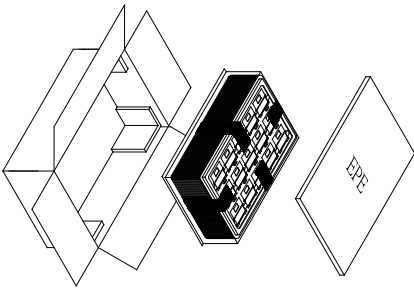
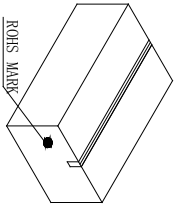
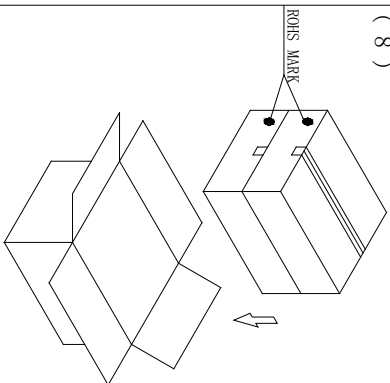
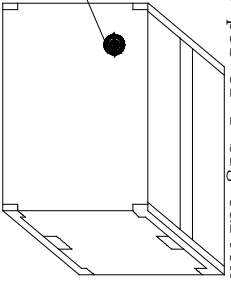

## PRODUCT SPECIFICATION

---

```
Write_Data(0x07);  
Write_Command(0xC1);  
Write_Data(0x9F);  
Write_Command(0xC7);  
Write_Data(0x0F);  
Write_Command(0xCA);  
Write_Data(0X3F);  
Write_Command(0xD1);  
Write_Data(0x82);  
Write_Data(0x20);  
Write_Command(0xA6);  
Write_Command(0xAF);  
}
```

10 Package Specification

Controlled Seal  
Packing Process (1) ~ (9)

<p>( 1 ) TRAY Type:</p> 	<p>( 2 )</p>  <p>severe .081 ②</p> <p>normal ①</p> <p>TRAY</p>	<p>( 3 ) order ① ② ① ②</p> <p>fix trays with tape</p> <p>240 pcs of 1 small carton</p> <p>1 tray contain 12 pcs</p> <p>20 contained trays, 1 empty tray</p> 	<p>( 4 ) package with plastic bags</p> <p>add five desiccants</p> <p>create a power vacuum</p> <p>*5</p> 
<p>( 5 )</p> 	<p>( 6 )</p> 	<p>( 7 )</p>  <p>small carton package</p> <p>L425*W330*L175 mm</p>	<p>( 8 )</p>  <p>ROHS MARK</p> <p>2 small cartons in 1 big carton</p>
<p>( 9 ) 40 contained trays, 2 empty trays,</p> <p>Package quantity products: 480 pcs of 1 big carton</p>  <p>ROHS MARK</p> <p>Package finished</p> <p>L450*W350*L360 mm</p>	<p>NOTE:1、The inner carton and master carton must be sealed with adhesive tape.</p> <p>2、Fill up the gap with tray.</p> <p>3、If the customer has special needs with the RoHS making, the inner carton and master carton need adhesive new RoHS marking at .</p>		

## PRODUCT SPECIFICATION

### 11 Reliability

#### 11.1 Reliability Test

NO.	ITEM	CONDITION	QUANTITY
1	High Temperature (Non-operation)	85°C,240hrs	4
2	Low Temperature (Non-operation)	-40°C,240hrs	4
3	High Temperature (Operation)	70°C,240hrs	4
4	Low Temperature (Operation)	-40°C,240hrs	4
5	High Temperature / High Humidity (Operation)	60°C,90%RH,240hrs	4
6	Thermal shock (Non-operation)	-40°C~85°C(-40°C/30min;transit/3min;85°C/30min;transit/3min) 1cycle: 66min,30cycles	4
7	Vibration	Frequency: 5~50Hz,0.5G Scan rate: 1 oct/min Time: 2 hrs/axis Test axis: X, Y, Z	1 Carton
8	Drop	Height: 100 cm Sequence: 1 angle, 3 edges and 6 faces	1 Carton

#### Test and measurement conditions

1. All measurements shall not be started until the specimens attain to temperature stability, the stable time is at least 15 minutes.
2. The degradation of polarizer is ignored for item 5.
3. The tolerance of temperature is  $\pm 3^{\circ}\text{C}$ , and the tolerance of relative humidity is  $\pm 5\%$ .

#### Evaluation criteria

1. The function test is OK.
2. No observable defects.
3. Luminance:  $\geq 50\%$  of initial value.
4. Current consumption: within  $\pm 50\%$  of initial value.

#### 11.2 Lifetime

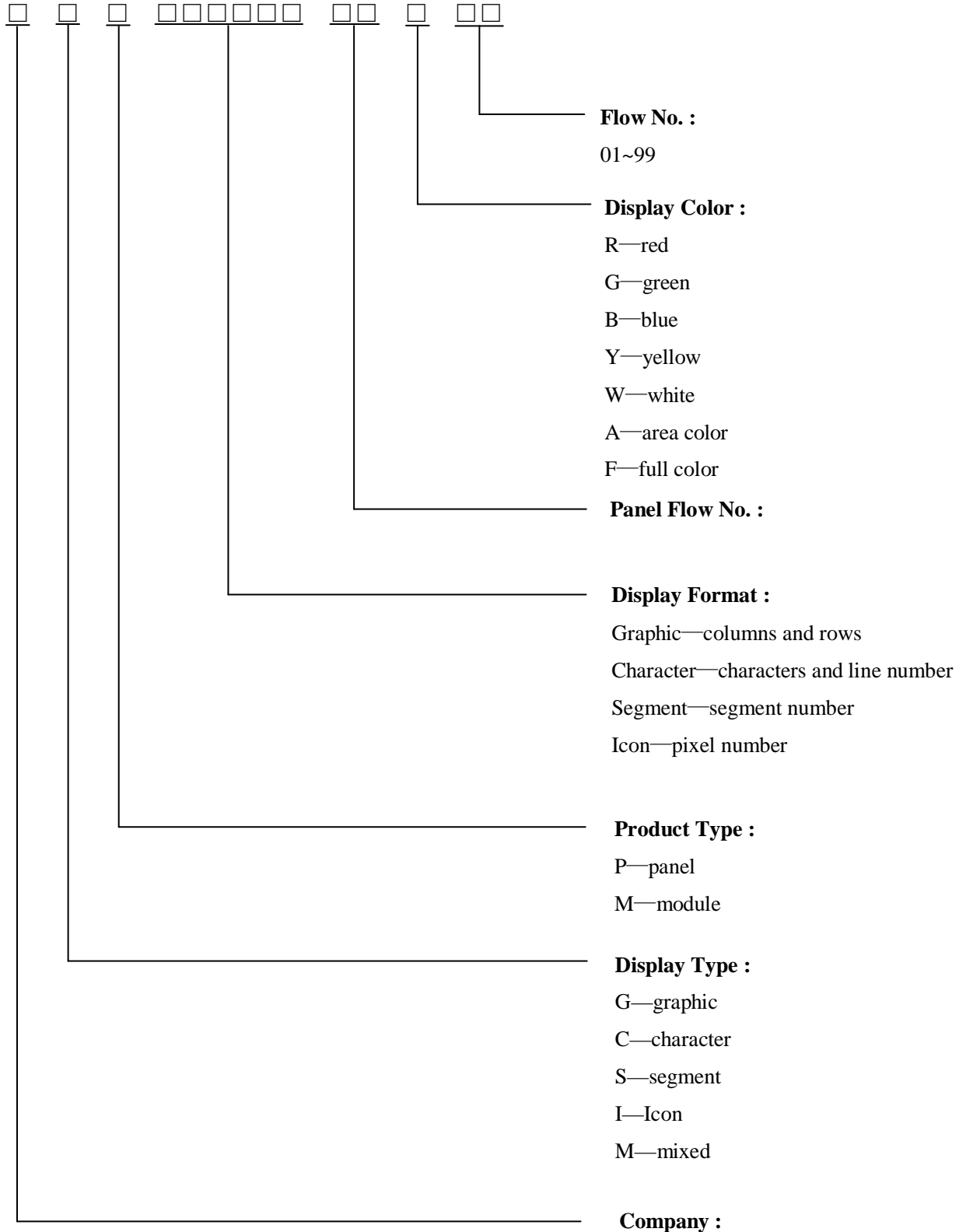
End of lifetime is specified as 50% of initial brightness and the test pattern at operating condition is 50% alternating checkerboard.

ITEM	MIN	MAX	UNIT	CONDITION
Operation Life Time	40,000	-	hrs	80 cd/m <sup>2</sup> ,50% Checkerboard

**11.3 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 22±3°C; 55±15% RH.

**12 Illustration of OLED Product Name**



### 13 Outgoing Quality Control Specifications

#### 13.1 Sampling Method

- (1) GB/T 2828.1-2003/ISO2859-1: 1999, inspection level II, normal inspection
- (2) AQL: Major 0.65; Minor 1.0

#### 13.2 Inspection Conditions

The environmental conditions for test and measurement are performed as follows.

Temperature:  $22\pm 3^{\circ}\text{C}$

Humidity:  $55\pm 15\% \text{R.H}$

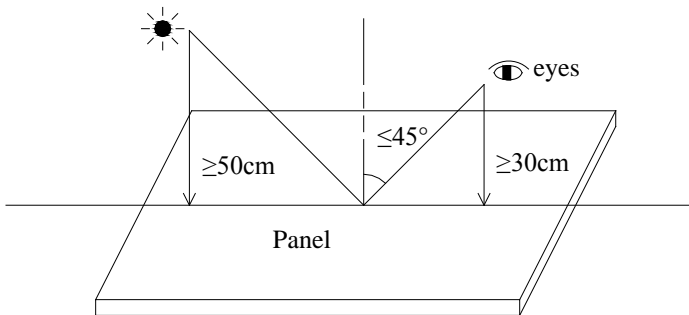
Fluorescent Lamp: 30W

Distance between the Panel & Lamp:  $\geq 50\text{cm}$

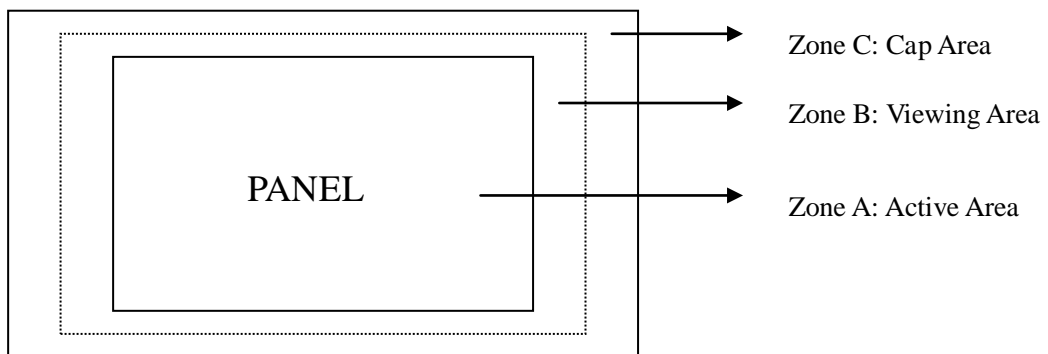
Distance between the Panel & Eyes:  $\geq 30\text{cm}$

Viewing angle from the vertical in each direction:  $\leq 45^{\circ}$

(See the sketch below)



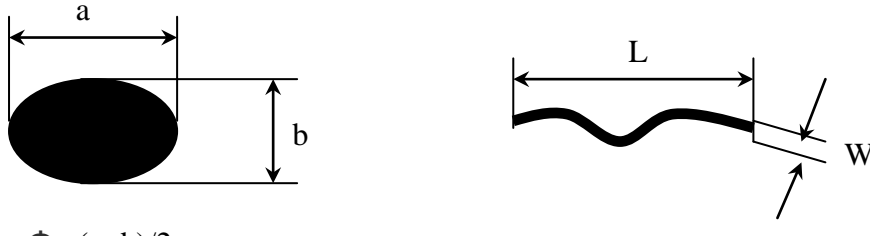
#### 13.3 Quality Assurance Zones



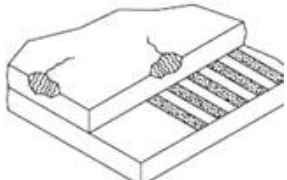
**PRODUCT SPECIFICATION**

**13.4 Inspection Standard**

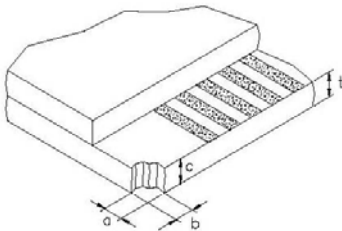
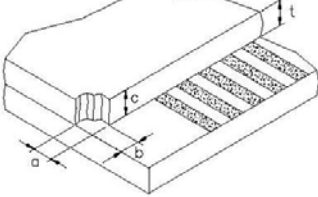
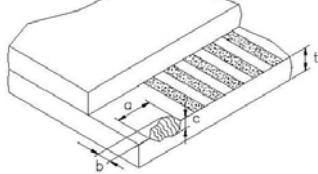
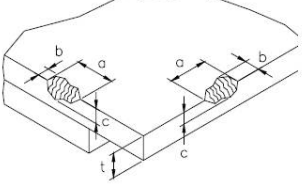
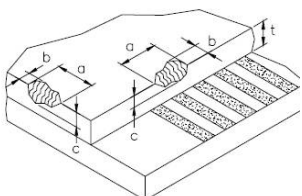
Definition of  $\Phi$ &L&W (Unit: mm)



**I. Appearance Defects**

NO.	ITEM	CRITERIA	CLASSIFICATION																
1	Polarizer Black or White spot, Dirty spot, Foreign matter, Dent on the polarizer	<table border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.15</math></td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.30</math></td> <td>3</td> </tr> <tr> <td><math>\Phi &gt; 0.30</math></td> <td>0</td> </tr> </tbody> </table>	Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi \leq 0.15$	Ignore	Ignore	$0.15 < \Phi \leq 0.30$	3	$\Phi > 0.30$	0	Minor				
Average Diameter (mm)	Acceptable Number																		
	Zone A,B	Zone C																	
$\Phi \leq 0.15$	Ignore	Ignore																	
$0.15 < \Phi \leq 0.30$	3																		
$\Phi > 0.30$	0																		
2	Scratch/line on the glass/Polarizer	<table border="1"> <thead> <tr> <th rowspan="2">Width (mm)</th> <th rowspan="2">Length (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.03</math></td> <td>---</td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.08</math></td> <td><math>L \leq 5.0</math></td> <td>3</td> </tr> <tr> <td><math>W &gt; 0.08</math></td> <td>---</td> <td>0</td> </tr> </tbody> </table>	Width (mm)	Length (mm)	Acceptable Number		Zone A,B	Zone C	$W \leq 0.03$	---	Ignore	Ignore	$0.03 < W \leq 0.08$	$L \leq 5.0$	3	$W > 0.08$	---	0	Minor
Width (mm)	Length (mm)	Acceptable Number																	
		Zone A,B	Zone C																
$W \leq 0.03$	---	Ignore	Ignore																
$0.03 < W \leq 0.08$	$L \leq 5.0$	3																	
$W > 0.08$	---	0																	
3	Polarizer Bubble	<table border="1"> <thead> <tr> <th rowspan="2">Average Diameter (mm)</th> <th colspan="2">Acceptable Number</th> </tr> <tr> <th>Zone A,B</th> <th>Zone C</th> </tr> </thead> <tbody> <tr> <td><math>\Phi &gt; 0.5</math></td> <td>0</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.5</math></td> <td>3</td> </tr> <tr> <td><math>\Phi \leq 0.2</math></td> <td>Ignore</td> </tr> </tbody> </table>	Average Diameter (mm)	Acceptable Number		Zone A,B	Zone C	$\Phi > 0.5$	0	Ignore	$0.2 < \Phi \leq 0.5$	3	$\Phi \leq 0.2$	Ignore	Minor				
Average Diameter (mm)	Acceptable Number																		
	Zone A,B	Zone C																	
$\Phi > 0.5$	0	Ignore																	
$0.2 < \Phi \leq 0.5$	3																		
$\Phi \leq 0.2$	Ignore																		
4	Any Dirt & Scratch on Polarizer's Protective Film	Ignore for not affect the polarizer.	Acceptable																
5	Glass Crack	 <p>Propagation crack is not acceptable.</p>	Major																

**PRODUCT SPECIFICATION**

6	Corner Chip	 <p>t= Glass thickness Accept <math>a \leq 2.0\text{mm}</math> or <math>b \leq 2.0\text{mm}</math>, <math>c \leq t</math></p>	Minor
7	Corner Chip on Cap Glass	 <p>t= Glass thickness Accept <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math></p>	Minor
8	Chip on Contact Pad	 <p>t= Glass thickness Accept <math>a \leq 3.0\text{mm}</math> or <math>b \leq 0.8\text{mm}</math>, <math>c \leq t</math> (on the contact pin) <math>a \leq 3.0\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math> (outside of the contact pin)</p>	Minor
9	Chip on Face of Display	 <p>t= Glass thickness Accept <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>c \leq t</math></p>	Minor
10	Chip on Cap Glass	 <p>t= Glass thickness Accept <math>a \leq 3.0\text{mm}</math> or <math>b \leq 3.0\text{mm}</math>, <math>c \leq t/2</math> <math>a \leq 1.5\text{mm}</math> or <math>b \leq 1.5\text{mm}</math>, <math>t/2 \leq c \leq t</math></p>	Minor
11	Stain on Surface	Stain removable by soft cloth or air blow is acceptable.	Minor
12	TCP/FPC Damage	<p>(1) Crack, deep scratch, deep hole and deep pressure mark on the TCP/FPC are not acceptable.  (2) Terminal lead twisted or broken is not allowable.  (3) Copper exposed is not allowed by naked eye inspection.</p>	Minor
13	Dimension Unconformity	Checking by mechanical drawing.	Major

**PRODUCT SPECIFICATION**

---

**II. Displaying Defects**

NO.	Items	Criteria		Classification										
1	Black/White spot Dirty spot Foreign matter	Average Diameter (mm)	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="794 416 1259 450">Pieces Permitted</th> </tr> <tr> <th data-bbox="794 450 1003 483">Zone A,B</th> <th data-bbox="1003 450 1259 483">Zone C</th> </tr> </thead> <tbody> <tr> <td data-bbox="794 483 1003 517"><math>\Phi \leq 0.10</math></td> <td data-bbox="1003 483 1259 517">Ignore</td> </tr> <tr> <td data-bbox="794 517 1003 562"><math>0.10 &lt; \Phi \leq 0.20</math></td> <td data-bbox="1003 517 1259 562">3</td> </tr> <tr> <td data-bbox="794 562 1003 618"><math>\Phi &gt; 0.20</math></td> <td data-bbox="1003 562 1259 618">0</td> </tr> </tbody> </table>	Pieces Permitted		Zone A,B	Zone C	$\Phi \leq 0.10$	Ignore	$0.10 < \Phi \leq 0.20$	3	$\Phi > 0.20$	0	Minor
Pieces Permitted														
Zone A,B	Zone C													
$\Phi \leq 0.10$	Ignore													
$0.10 < \Phi \leq 0.20$	3													
$\Phi > 0.20$	0													
2	No Display	Not allowable.		Major										
3	Irregular Display	Not allowable.		Major										
4	Missing Line (row or column)	Not allowable.		Major										
5	Short	Not allowable.		Major										
6	Flicker	Not allowable.		Major										
7	Abnormal Color	Refer to the SPEC.		Major										
8	Luminance NG	Refer to the SPEC.		Major										
9	Over Current	Refer to the SPEC.		Major										



## **14 Precautions for operation and Storage**

### **14.1 Precautions for Operation**

- (1) Since OLED panel is made of glass, do not apply any mechanical shock or impact or excessive force to it when installing the OLED module. Any strong mechanical impact due to falling dropping etc. may cause damage (breakage or cracking).
- (2) The polarizer on the OLED surface is made of soft material and is easily scratched. Please take most care when handing. When the surface of the polarizer of OLED Module is contaminated, please wipe it off gently by using moisten soft cloth with isopropyl alcohol, do not use water, ketone or aromatics. If there is saliva or water on the OLED surface, please wipe it off immediately.
- (3) When handling OLED module, please be sure that the body and the tools are properly grounded. And do not touch I/O pins with bare hands or contaminate I/O pins, it will cause disconnection or defective insulation of terminals.
- (4) Do not attempt to disassemble or process the OLED module.
- (5) OLED module should be used under recommended operating conditions shown in the specification. Since the higher voltage leads to the shorter lifetime, be sure to use the specified operating voltage.
- (6) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.
- (7) An afterimage is created by the difference in brightness between unused dot and the fixed dot, according to the decrease of brightness of the emitting time. Therefore, to avoid having an afterimage, the full set should be thoroughly used instead of using a fixed dot. When the fixed dot emits, an afterimage can be created.
- (8) Flicker could be come out at full on display. And it disappears when frame frequency increase, but brightness decreases too.

### **14.2 Soldering**

- (1) Soldering should be performed only on the I/O terminals.
- (2) Use soldering irons with proper grounding and no leakage.
- (3) Iron: no higher than 300°C and 3~4 sec during soldering.

### **14.3 Precautions for Storage**

- (1) Please store OLED module in a dark place. Avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.
- (2) Keep the environment temperature between 10°C and 35°C and the relative humidity less than 60%. Avoid high temperature and high humidity.
- (3) Keep the OLED modules stored in the container when shipped from supplier before using them is recommended.
- (4) Do not leave any article on the OLED module surface for an extended period of time.

### **14.4 Warranty period**

Leehon warrants for a period of 12 months from the shipping date when stored or used under normal condition.