DELTA OPTOELECTRONICS, INC.

Title：PLED 128x64 Graphic Module PDD2401GM04 Specifications

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DELTA OPTOELECTRONICS, INC.

PDD2401GM

PLED 128x64 Graphic Module PDD2401GM04 Specifications

1. Record of Revision

Revision	Comment	Page	Date
A0	New Specification	All	2005/5/12

2. Table of Contents

3. Features

Item	Contents
Display Format	128 x 64 dots
Dot Size	0.4 x 0.4 mm
View Area	60.0 x 32.5 mm
General Dimensions	76.65 x 52.7 x 6.2 (Max.) mm
Controller	PT6810 x 2
Driver	PT6807
Temperature Range	-20℃~50℃
Display Color	Green
Weight	28g

4. Recommended Operating Conditions

Symbol	Parameter	Min	Typ	Max	Unit
VDD	Supply voltage for Logic	3		5	V
Topr	Operating temperature	-20	25	50	°C
Tstg	Storage temperature	-30		70	°C
Pd	Module power consumption		70 *		mW

* All PIXEL-ON , when VDD=5V

Item	Operating		Storage	
	Min.	Max.	Min.	Max.
Ambient Temperature	-20°C	50°C	-30°C	70°C
Humidity	45°C,90%RH		-	

5. Electrical Characteristics

5.1 DC Electrical Characteristics

(Ta= -20 to 50 °C)

Parameter	*Symbol*	*Condition*	*Min.*	*Typ.*	*Max.*	*Unit*
Input low voltage	V_{IL}		*-0.5*	-	*0.2V_{DD}*[1]	*V*
Input high voltage	V_{IH}		*0.6V_{DD}*[2]	-	*V_{DD}+0.5*	*V*
Output low voltage	V_{OL}	*V_{DD} =5V*	-	-	*0.7*	*V*
Output high voltage	V_{OH}	*V_{DD} =5V*	*4*	-	-	*V*

[1] *"Max" means the highest value where the pin is guaranteed to be read as low*
[2] *"Min" means the lowest value where the pin is guaranteed to be read as high*

6. Optical specifications

Item		Condition	Min.	Typ.	Max.	Unit
Response time	Rise		-	10	-	us
	Fall		-	10	-	us
Contrast ratio		100 lux	-	100	-	
Viewing angle	Top		-	80	-	deg
	Bottom		-	80	-	deg
	Left		-	80	-	deg
	right		-	80	-	deg
Brightness		With polarizer	-	40	-	nits
Color			-	G[1]	-	

Note 1. G=green

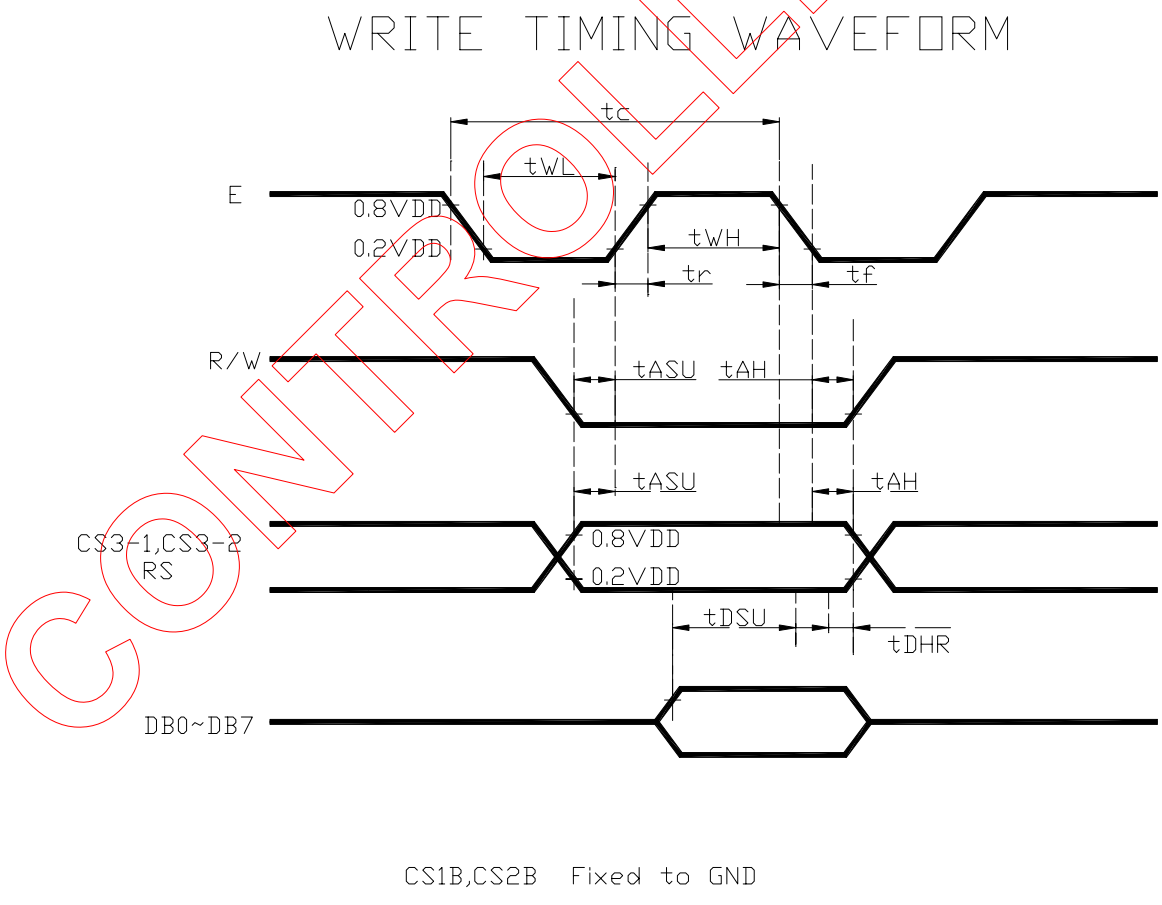
7. AC Electrical Characteristics

(Ta= -20 to 50 ^{o}C)

7.1 Write operation

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Unit*
E cycle	t_C	*1000*	-	-	ns
E High Level Width	t_{WH}	*450*	-	-	ns
E Low Level Width	t_{WL}	*450*	-	-	ns
E Rise Time	t_R	-	-	*25*	ns
E Fall Time	t_F	-	-	*25*	ns
Address Set-up Time	t_{ASU}	*140*	-	-	ns
Address Hold Time	t_{AH}	*10*	-	-	ns
Data Set-up Time	t_{DSU}	*200*	-	-	ns
Data Delay Time	t_D	-	-	*320*	ns
Data Hold Time (Write)	t_{DHW}	*10*	-	-	ns

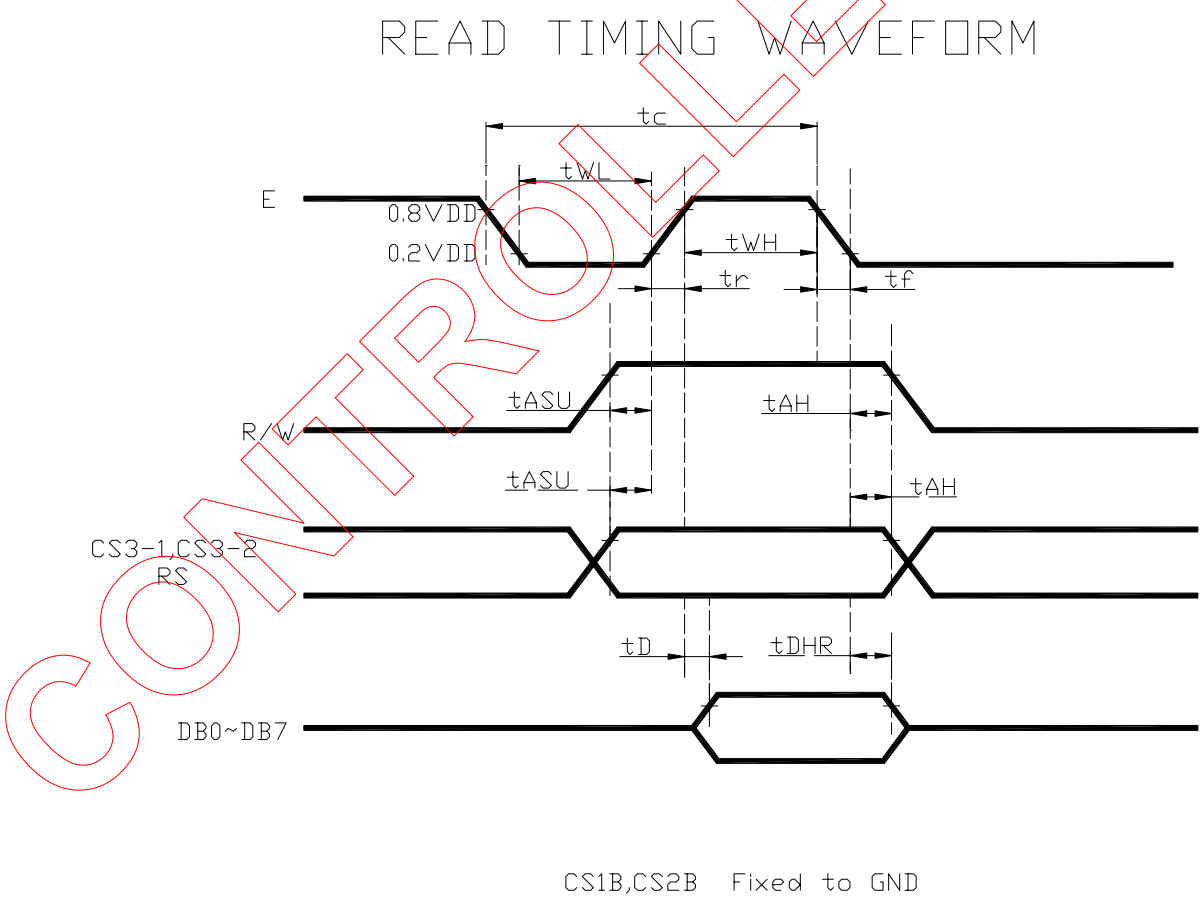
Timing Chart



7.2 Read operation

Characteristic	*Symbol*	*Min*	*Typ*	*Max*	*Unit*
E cycle	t_C	*1000*	-	-	ns
E High Level Width	t_{WH}	*450*	-	-	ns
E Low Level Width	t_{WL}	*450*	-	-	ns
E Rise Time	t_R	-	-	*25*	ns
E Fall Time	t_F	-	-	*25*	ns
Address Set-up Time	t_{ASU}	*140*	-	-	ns
Address Hold Time	t_{AH}	*10*	-	-	ns
Data Set-up Time	t_{DSU}	*200*	-	-	ns
Data Delay Time	t_D	-	-	*320*	ns
Data Hold Time (Read)	t_{DHR}	*20*	-	-	ns

Timing Chart

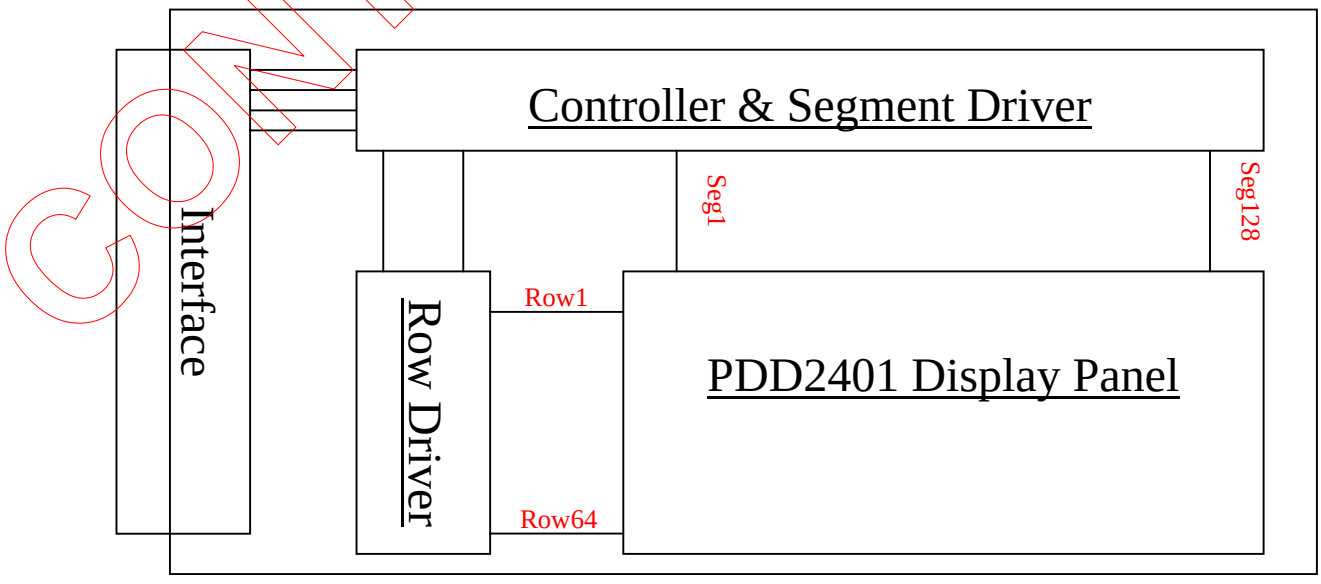


8. Instruction set

The display control instructions control the internal state of the controller. Instruction is received from MPU to the controller for the display control. The following table shows various instructions.

Command Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display On/Off	L	L	L	L	H	H	H	H	H	L/H	H: Display On L: Display Off
Set Address (Y-Address)	L	L	L	H	Y-Address (0~63)						Sets the Y-Address in the Y Counter.
Set Page (X-Address)	L	L	H	L	H	H	H	Page (0~7)			Sets the X-Address in the X-Address register.
Display Start Line (Z-Address)	L	L	H	H	Display Start Line (0~63)						Determines the display data RAM displayed at the top of the screen
Status Read	L	H	Busy	L	On/Off	Reset	L	L	L	L	Read Status Busy: L=Ready H=In operation On/Off: L=Display on H=Display Off Reset: L=Normal H=Reset
Write Display Data	H	L	Write Data								Writes data (DB0 to DB7) to the display data RAM. After writing instruction, Y-Address is automatically incremented by 1.
Read	H	H	Read Data								Reads data (DB0 to DB7) form display data RAM to the data bus.

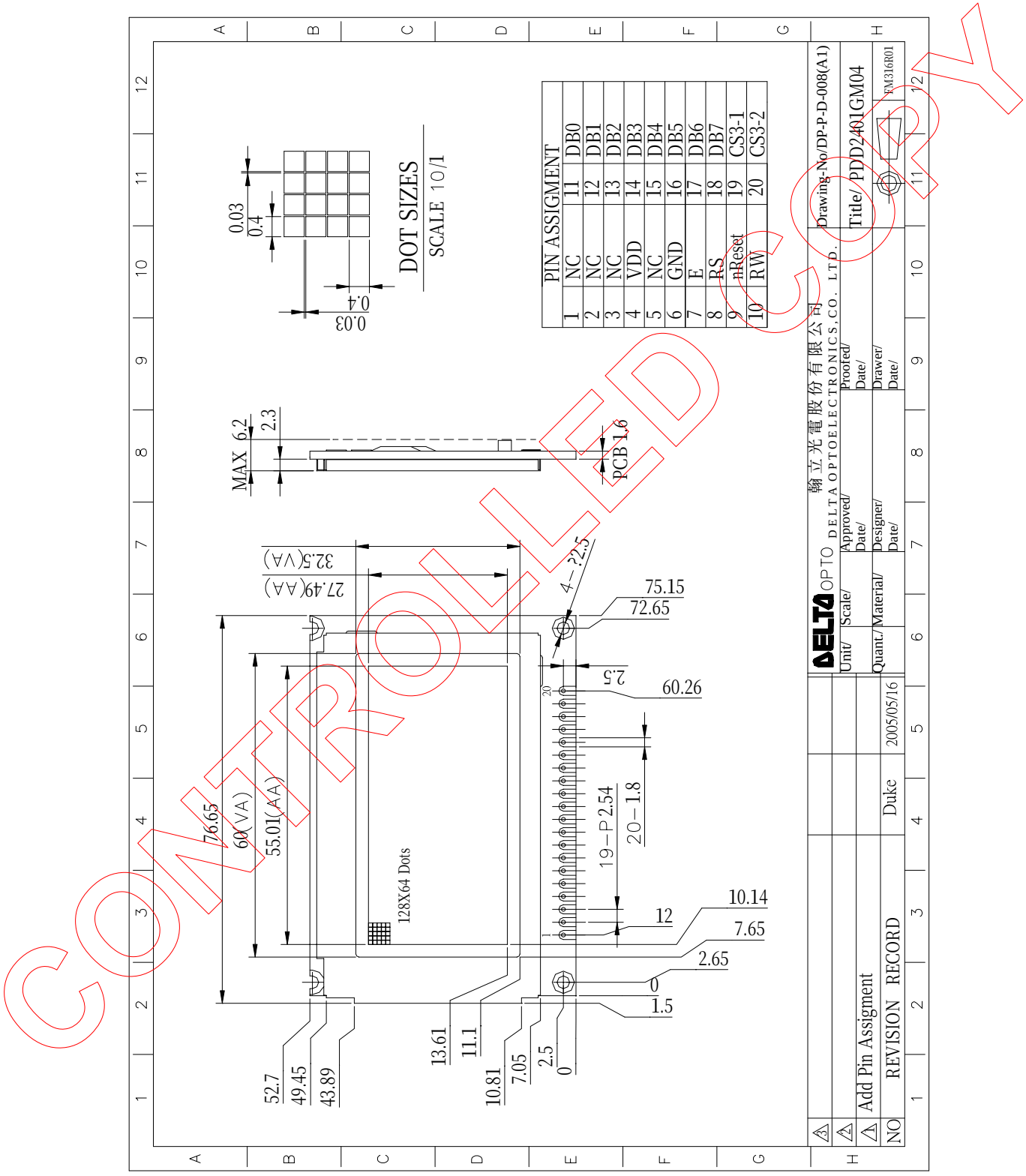
9. Block Diagram



10. Interface Pin Function

Mnemonic	*Pin No.*	*I/O*	*Description*
NC	*1*	*-*	*No connection*
NC	*2*	*-*	*No connection*
NC	*3*	*-*	*No connection*
V_{DD}	*4*	*I*	*Logic supply voltage*
NC	*5*	*-*	*No connection*
Gnd	*6*	*-*	*Ground*
E	*7*	*I*	Enable Signal Input Pin
RS	*8*	*I*	*Data or Command Instruction Select Input Pin* *When this pin is set to "H", DB0 to DB7 display the RAM Data. When this pin is set to "L", DB0 to DB7 display the instruction data.*
nReset	*9*	*I*	*Negative reset function*
RW	*10*	*I*	*Read/Write Input Pin* *When this pin is set to "H", Read mode is active. Data is displayed at DB0 to DB7 and can be read by CPU when E="H".* *When this pin is set to "L", Write mode is active. Data is displayed at DB0 to DB7 and are latched at the falling edge of E.*
DB0~DB7	*11~18*	*I/O*	*Parallel 8 bits data bus*
CS3-1	*19*	*I*	*Chip Select Pin* *H: Enable Chip1* *L: Disable Chip1*
CS3-2	*20*	*I*	*Chip Select Pin* *H: Enable Chip2* *L: Disable Chip2*

11. Drawing


DOT SIZES
SCALE 10/1
0.03
0.4
0.4
0.03
PIN ASSIGMENT
1 NC 11 DB0
2 NC 12 DB1
3 NC 13 DB2
4 VDD 14 DB3
5 NC 15 DB4
6 GND 16 DB5
7 E 17 DB6
8 RS 18 DB7
9 nReset 19 CS3-1
10 RW 20 CS3-2
MAX 6.2
2.3
PCB 1.6
32.5(VA)
27.49(AA)
4-R2.5
75.15
72.65
2.5
60.26
76.65
60(VA)
55.01(AA)
128X64 Dots
19-P2.54
20-1.8
12
10.14
7.65
2.65
0
1.5
52.7
49.45
43.89
13.61
11.1
10.81
7.05
2.5
0
Drawing-No/DP-P-D-008(A1)
Title/ PDD2401GM04
FM316R01
Add Pin Assigment
REVISION RECORD
Duke
2005/05/16
Unit/
Scale/
Material/
Quant./
Approved/
Date/
Proofed/
Date/
Designer/
Date/
Drawer/
Date/
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12. Reliability Test Items

12.1 Reliability test item

NO.	Test items	Conditions
1	High temperature storage	70 °C ,240 hrs
2	Low temperature storage	-30 °C,240 hrs
3	High temperature operation	50 °C,240 hrs
4	Low temperature operation	-20 °C,240 hrs
5	High temperature and high humidity storage test	40°C, 90% RH, 240 hrs
6	Temperature Shock (operating)	-20 °C (30 mins.) -->25 °C(5 mins.) --> +60 °C (30 mins.) --> 25 °C(5 mins.) --> -20 °C (30 mins.), 20 Cycles

12.2 Life

Item	Standard value	Unit
Operation	10000	Hours
Storage	5	Years

Note :
1.Simulation pattern for operation test: interchanging with all-pixels on, chess, reversed chess, all-pixels off.
2.The brightness decay does not exceed 50%.

13. Quality standards

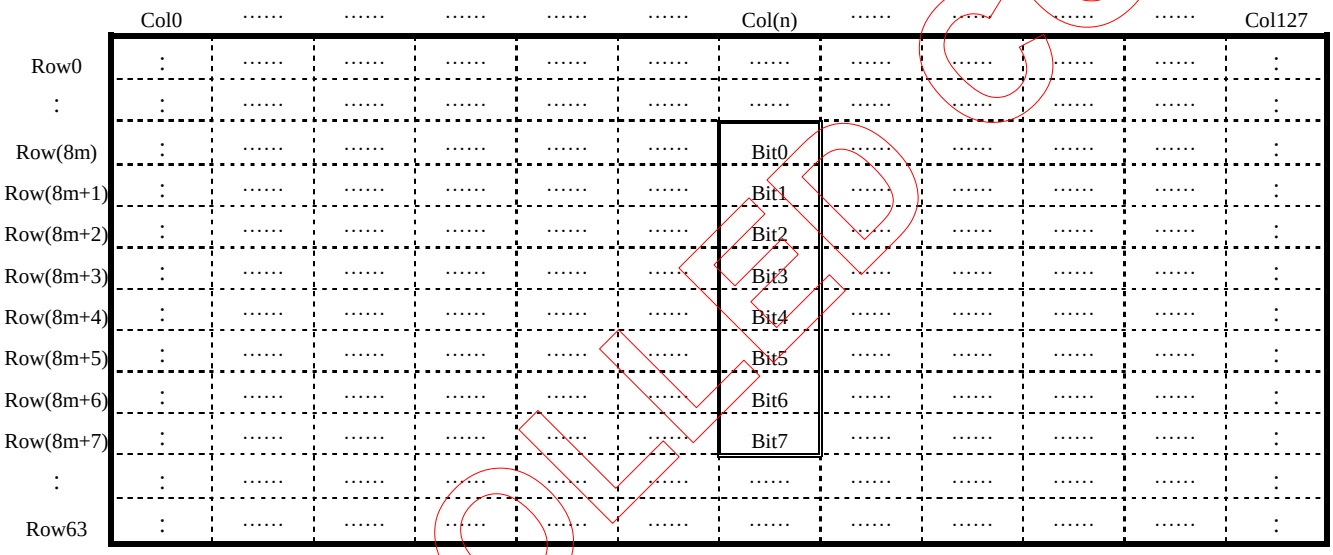
ITEM	SPEC	Quantity	Judgement	Inspection method
Black spot	1.＞ψ0.3mm	-	Not allowed	Visual inspection with Compare spot sheet
	2. ψ0.1mm≦ spot≦ψ0.3mm	≦3	Acceptable	
	3. < ψ0.1mm	-	Acceptable	
Crack	1.＞0.5mm	-	Not allowed	Visual inspection at active area and ITO pin area
	2. 0.3mm≦ crack≦ 0.5mm	≦3	Acceptable	
	3. < 0.3mm	-	Acceptable	
Line Scratches	1.Length >1mm & width >0.1mm	-	Not allowed	Visual inspection at active area and ITO pin area
	2.Length≦1mm & width≦0.1mm	≦1	Acceptable	
Active area protective film damaged	1. Length＞1mm & Width＞1mm	-	Not llowed	Visual inspection
	2. Length≦ 1mm &width≦ 1mm	≦1	Acceptable	
Brightness uniformity	≧ 80%	-	Acceptable	Min./Max.×100%

14. Application Note

14.1 Data sequence

Display location versus parallel 8 bits data sequence:
***[Row(8m),Col(n)]** is defined as **bit0**, and **[Row(8m+1),Col(n)]** is defined as **bit1**……**[Row(8m+7),Col(n)]** is defined as **bit7,** while n: 0~127, m: 0~7.*

For illustration given below, it specifies that the observed image maps to the data sequence transferred to the controller in this display module.



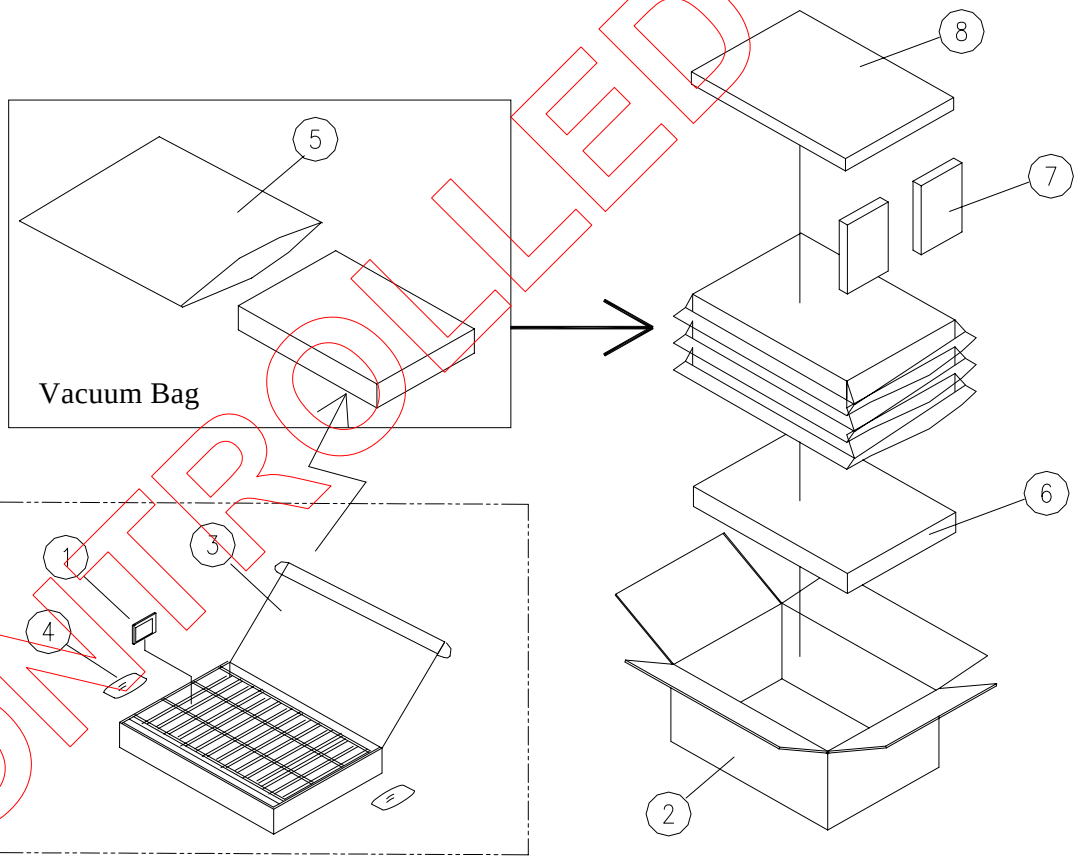
14.2 Display Data RAM addressing

The illustration is used to denote the mapping relation between display image and the Display Data RAM built in the module.

Y-Address / X-Address	Chip 1			Chip 2		
	Y0 Col0	……	Y63 Col63	Y0 Col64	……	Y63 Col127
Page0 (Row00~Row07)	(X0,Y0)	……	(X0,Y63)	(X0,Y0)	……	(X0,Y63)
Page1 (Row08~Row15)	(X1,Y0)	……	(X1,Y63)	(X1,Y0)	……	(X1,Y63)
Page2 (Row16~Row23)	:		:	:		:
Page3 (Row24~Row31)	:		:	:		:
Page4 (Row32~Row39)	:		:	:		:
Page5 (Row40~Row47)	:		:	:		:
Page6 (Row48~Row55)	(X6,Y0)	……	(X6,Y63)	(X6,Y0)	……	(X6,Y63)
Page7 (Row56~Row63)	(X7,Y0)	……	(X7,Y63)	(X7,Y0)	……	(X7,Y63)

15. Package

1.	912121014	PDD2401M03	120 pcs
2.	630100401	CARTON (Standard) size:395*326*297	1 pcs
3.	630100801	Packing Box 3 Column W/Sponge PDD2401M	3 pcs
4.	800400041	Drier (Silica Gel 20g)	12 pcs
5.	800203071	Vacuum Bag 100μ*W:400*L:500m/m	3 pcs
6.	800201011	PU size: 305*375*40 (CL1803U)	1 pcs
7.	800201041	EPE 120*200*25mm PLED	2 pcs
8.	800201051	PU 290*370*25mm PLED	1 pcs



16. Precaution in Design

(1) Please do not expose the module to mechanical stress, which will cause damage to the metal, plastic, and PLED glass.
(2) Polarizer is easily scratched and should be carefully handled. Please do not touch the polarizer use hard material, such as tweezers, pencil lead and glass. Please do not touch it by barehanded.
(3) This module is easily damaged when exposed to static discharge, please take care of static electricity and insure human body grounding.
(4) Do not bend the heat seal which connects pcb and glass panel. Otherwise, it would break the signal transmission path and the display might lose one column signal in the screen.
(5) It is strongly recommended roll the image(pattern) or to turn off the display instead of holding a still image on the screen continuously. Based on a better operation, the good uniformity and performance of this display would be kept for a longer time.