


**Product Specification**




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Thin-Film-Transistor LCD Module  
Model: GWTY43NNBD1A0


Acceptance

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### Revise Records

Rev.	Date	Contents	Written	Approved
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### Special Notes

Note1.	


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### 1 General Description and Features

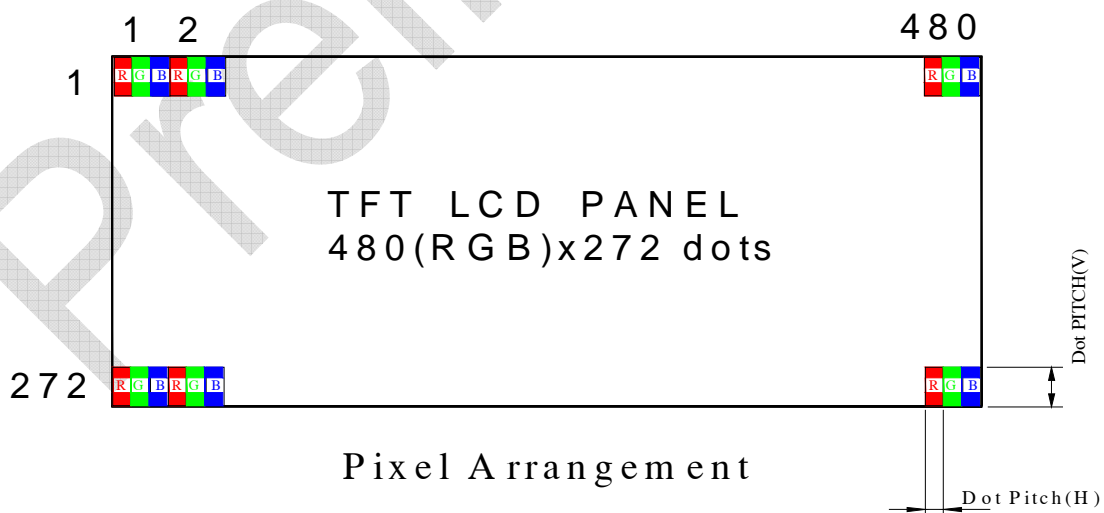
GWTY43NNBD1A0 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. The resolution of a 4.3" contains 480(RGB)x272 dots and can display up to 16.7M colors. The following table described the features of GWTY43NNBD1A0.

#### 1.1 Features

- Transmissive and back-light with ten LEDs are available.
- TN (Twisted Nematic) mode.
- 24bit RGB Interface

#### 1.2 LCD Module

Item	Specification	Unit
Screen Size	4.3 inches	Diagonal
Display Resolution	480(H) x RGB x 272(V)	Dot
Pixel Pitch	0.198 (H) x 0.066 (V)	mm
Active Area	95.040 (H) x 53.86 (V)	mm
Outline Dimension	105.5 (W) x 67.2 (H) x 2.9 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB Side-Stripe	--
Surface Treatment	Anti-glare (3H)	--
Display Color	16.7M	--
Viewing Direction (Gray Inversion)	12 o'clock (Gray Inversion)	--
Input Interface	Digital 24-bits parallel RGB	--
Color Gamut (NTSC%)	NTSC 50%	--



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### 2 Mechanical Information

Item	Min.	Typ.	Max.	Unit	Note	
Module Size	Horizontal (H)	--	105.5	--	mm	--
	Vertical (V)	--	67.20	--	mm	(1)
	Thickness (T)	--	2.9	--	mm	(1)
Weight	--	(TBD)	--	g	--	

Note (1) Not include FPC.

Refer to the Dimensional Outlines for further information.

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### 3 Electrical Specifications

#### 3.1 Absolute Max. Ratings

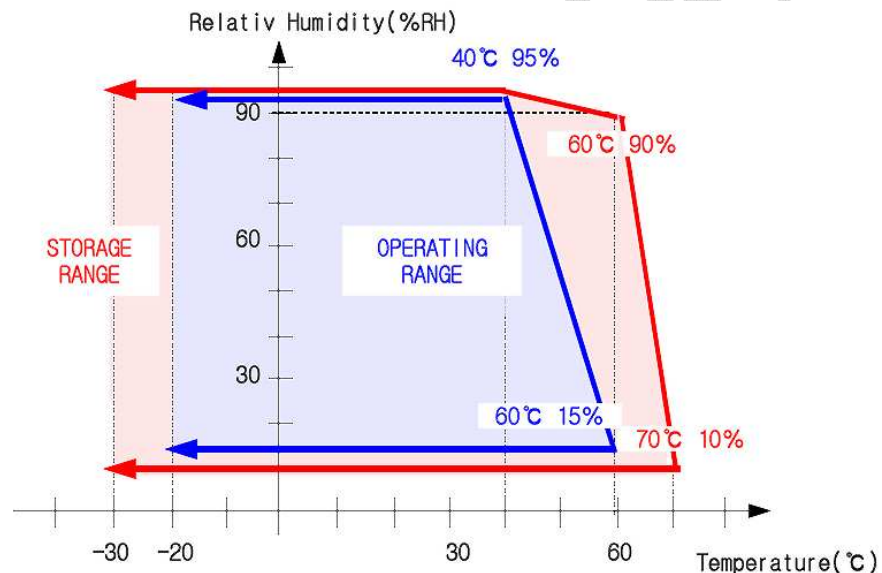
##### 3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25±2°C, V<sub>SS</sub>=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T <sub>STG</sub>	-30	80	°C	(1)
Operating temperature	T <sub>OPR</sub>	-20	70	°C	(1,2,3)

Note (1) 95 % RH Max. ( 40 °C ≥ Ta ). Maximum wet-bulb temperature at 39 °C or less. (Ta > 40 °C)  
No condensation.



Note (2) In case of below 0°, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

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### 3.2 Electrical Absolute Rating

#### 3.2.1 TFT-LCD Module

( $T_a=25\pm 2^\circ\text{C}$ ,  $V_{SS}=\text{GND}=0$ )

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
power supply voltage	$V_{DD}$	-0.3	4.0	V	


#### 3.2.2 Back-Light Unit

( $T_a=25\pm 2^\circ\text{C}$ )

Item	Symbol	Min.	Max.	Unit	Note
Forward Current	$I_f$	--	(25)	mA	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

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### 4 Electrical Characteristics

#### 4.1 TFT-LCD Module

(Ta=25±2°C, V<sub>DD</sub> =3.3V)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	V <sub>DD</sub>	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V <sub>IL</sub>	0	-	0.3xVDD	V
	High Level	V <sub>IH</sub>	0.7xVDD	-	VDD	V
Output Signal Voltage	Low Level	V <sub>OL</sub>	-	-	0.2xVDD	V
	High Level	V <sub>OH</sub>	0.8xVDD	-	VDD	V

#### 4.2 Backlight Unit

The back-light system is an edge-lighting type with white LED (Light Emitting Diode)s.

(Ta=25±2°C)


Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V <sub>L</sub>	-	(16)		V	
LED Current	I <sub>f</sub>	-	(40)	-	mA	
Power Consumption	P <sub>LED</sub>	-	(640)	-	mW	
LED Life Time (25°C)	-	(10000)	-	-	hr	

Note (1) 10 LEDs serial type.

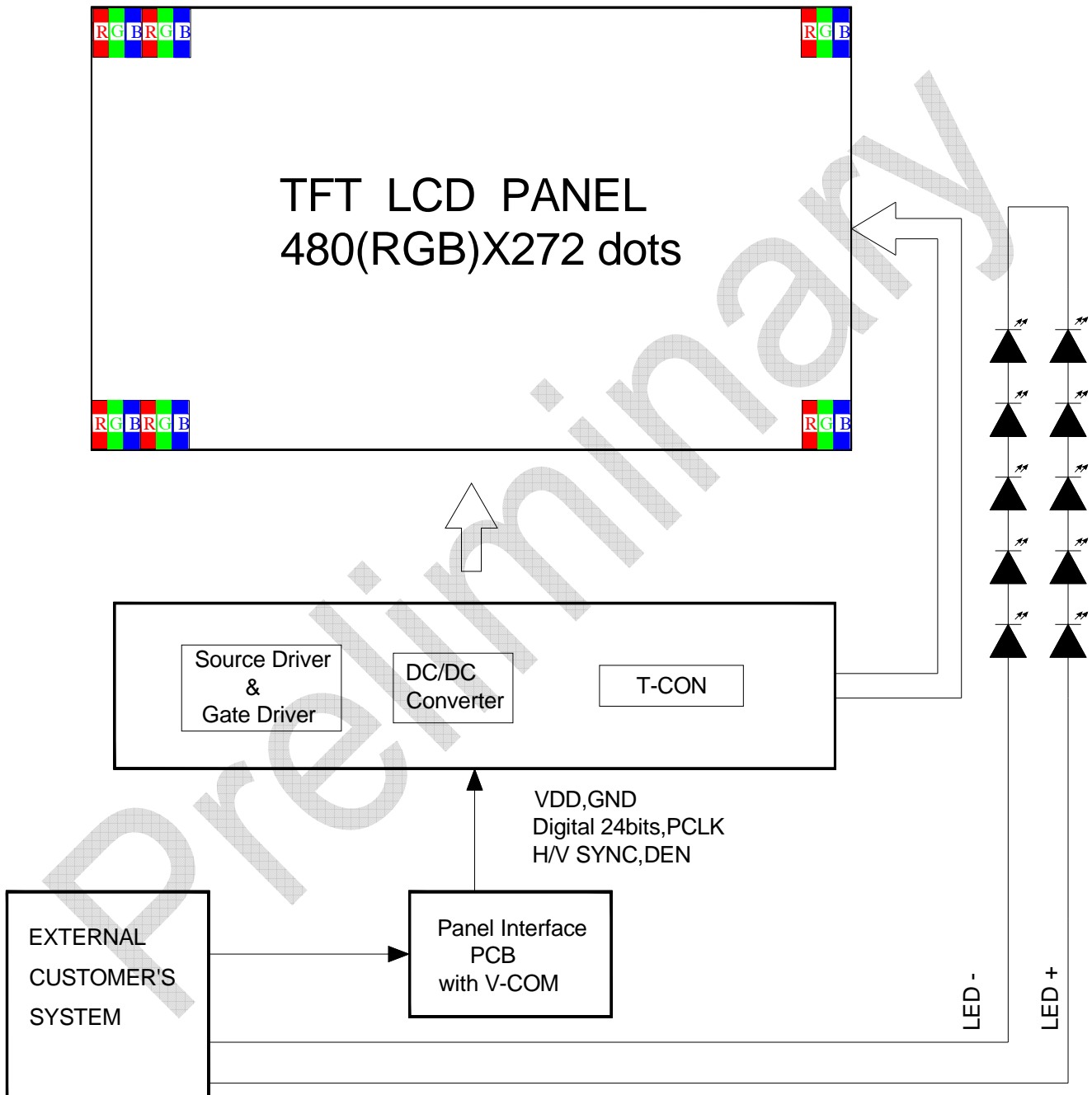
(2) Where I<sub>B</sub> = 20mA, V<sub>F</sub> = 16V, P<sub>BL</sub> = V<sub>F</sub> × I<sub>B</sub>



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## 5 Block Diagram



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### 6 Input Terminal Pin Assignment

#### 6.1 Pin Assignment

Pin No.	Symbol	I/O	Function	Remark
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power Supply	
5	R0	I	Data input	
6	R1	I	Data input	
7	R2	I	Data input	
8	R3	I	Data input	
9	R4	I	Data input	
10	R5	I	Data input	
11	R6	I	Data input	
12	R7	I	Data input	
13	G0	I	Data input	
14	G1	I	Data input	
15	G2	I	Data input	
16	G3	I	Data input	
17	G4	I	Data input	
18	G5	I	Data input	
19	G6	I	Data input	
20	G7	I	Data input	
21	B0	I	Data input	
22	B1	I	Data input	
23	B2	I	Data input	
24	B3	I	Data input	
25	B4	I	Data input	
26	B5	I	Data input	
27	B6	I	Data input	
28	B7	I	Data input	
29	GND	P	Ground	
30	DCLK	I	Clock for input data . Data latched at rising edge of this signal .	
31	DISP	I	Standby mode DISP = "1" : Normally operation. DISP = "0" : Standby mode.	

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32	Hsync	I	Horizontal SYNC	
33	Vsync	I	Vertical SYNC	
34	DE	I	Data input enable . If unused , please pull low level .	
35	NC	--	NC	
36	GND	P	Ground	
37	NC	--	NC	
38	NC	--	NC	
39	NC	--	NC	
40	NC	--	NC	

I: Input, O: Output, P: Power

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### 7 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).  
 Measuring equipment: BM-5A/BM-7

(Ta=25±2°C , VDD =3.3V, If=20mA)

Item		Symbol	Condition	Min	Type	Max	Unit	Note
Brightness		--	--	(250)	(300)	--	cd/m <sup>2</sup>	--
Response time		T <sub>R</sub>	θ=0°	--	20	30	ms	--
		T <sub>F</sub>		--			ms	
Contrast ratio		CR	At optimized viewing angle	(400)	(500)	--	--	--
Color Chromaticity	Red	R <sub>X</sub>	θ=0° Normal Viewing Angle	(0.531)	(0.581)	(0.631)	--	--
		R <sub>Y</sub>		(0.295)	(0.345)	(0.395)		
	Green	G <sub>X</sub>		(0.298)	(0.348)	(0.395)	--	
		G <sub>Y</sub>		(0.531)	(0.581)	(0.631)		
	Blue	B <sub>X</sub>		(0.103)	(0.153)	(0.203)	--	
		B <sub>Y</sub>		(0.045)	(0.095)	(0.145)		
	White	W <sub>X</sub>		(0.265)	(0.315)	(0.365)	--	
		W <sub>Y</sub>		(0.285)	(0.335)	(0.385)		
Viewing Angle (6H)	Hor.	θ <sub>R</sub>	CR≥10	60	(70)	Degree	--	
		θ <sub>L</sub>		60	(70)			
	Ver.	φ <sub>H</sub>		60	(70)			
		φ <sub>L</sub>		40	(50)			
Uniformity		U		75	80		%	

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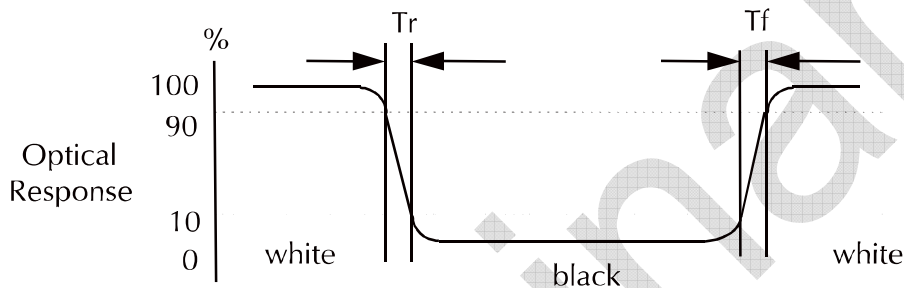
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a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A/BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".




c. Definition of contrast ratio:

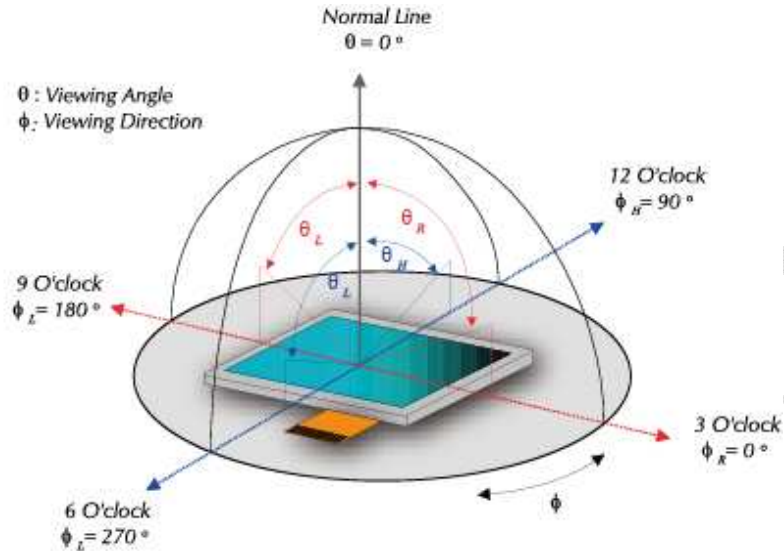
$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

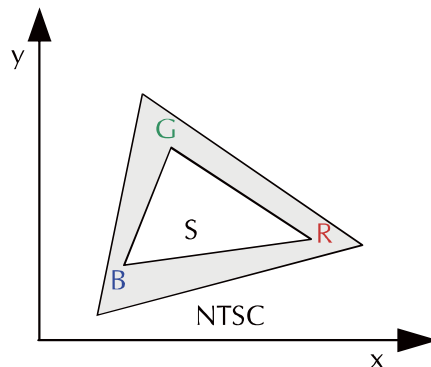
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}}$$


h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

$$\text{Color Gamut : NTSC(\%)} = ( \text{RGB Triangle Area} / \text{NTSC Triangle Area} ) \times 100$$



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### 8 Basic Display Color and Gray Scale

	Color & Gray Scale	Data Signal																							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(0)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(0)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Red(127)	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0		
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Green(127)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0		
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0		
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Blue(127)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1		
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:		
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1		
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1		

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. With the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

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### 9 AC Timing

#### 9.1 Parallel RGB input timing requirement

(480RGB x 272 , TA = 25°C , VDDIO=1.8V to 3.6V , DVSS=0V)

Parameter	Symbol	Min	Typ	Max	Unit
Clock cycle	fclk	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
<b>Horizontal Signal</b>					
Horizontal cycle	Th		525	605	CLK
Horizontal display period	Thd	480	480	480	CLK
Horizontal front porch	Thf	2	2	82	CLK
Horizontal pulse width	Thp	2	41	41	CLK
Horizontal back porch	Thb	2	2	41	CLK
<b>Vertical Signal</b>					
Vertical cycle	Tv	285	286	399	H
Vertical display period	Tvd	272	272	272	H
Vertical front porch	Tvf	1	2	227	H
Vertical pulse width	Tvp	1	10	11	H
Vertical back porch	Tvb	1	2	11	H



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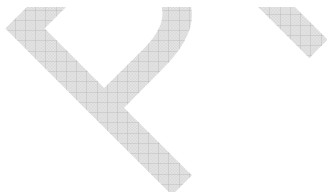
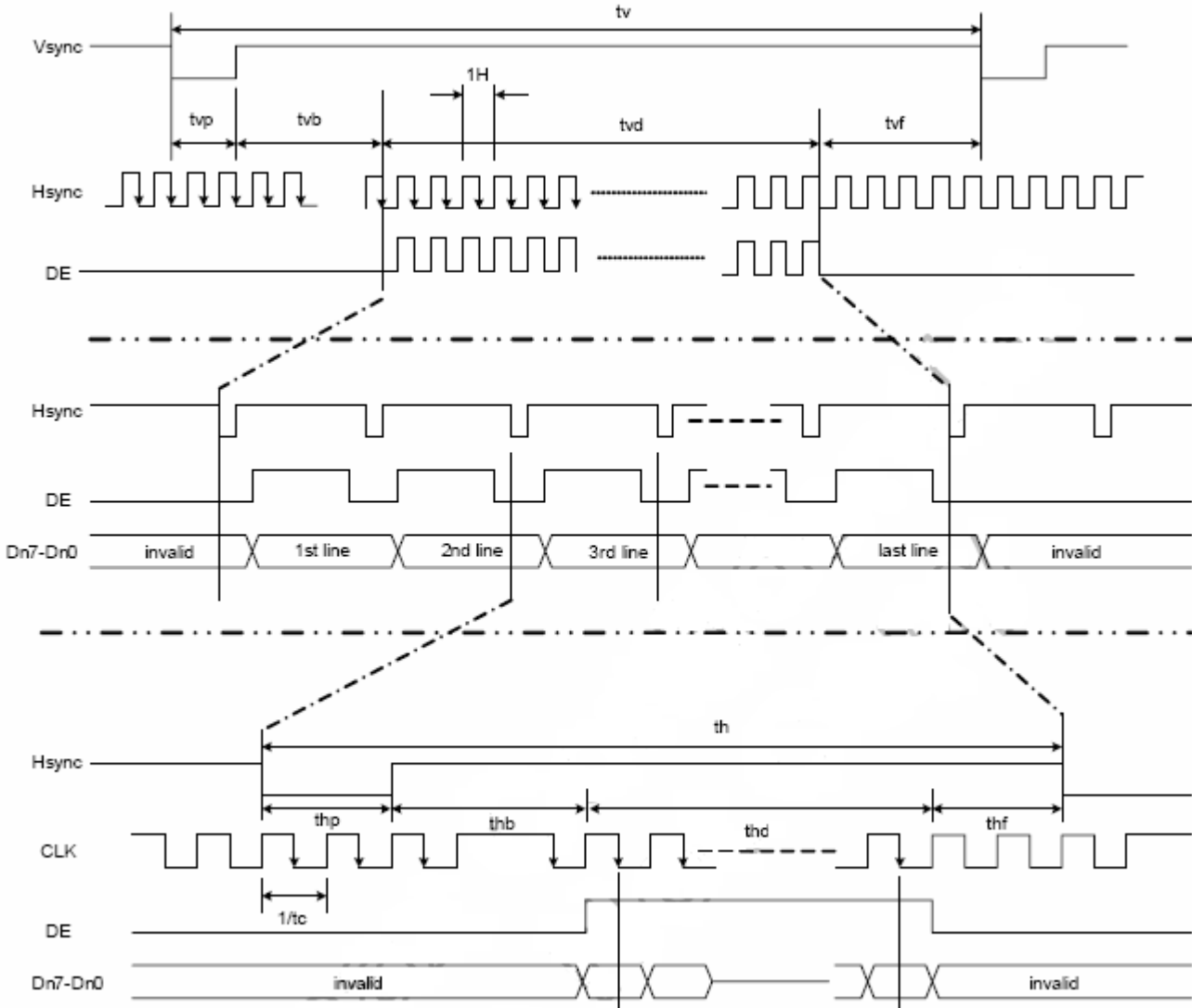
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### 10 Test

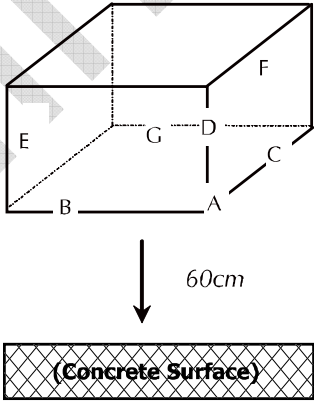
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C.

Humidity: 65±5%RH.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state).	1
3	High Temperature Storage	80°C±2°C, 240hrs.	2
4	Low Temperature Storage	-30°C±2°C, 240hrs.	1,2
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10–55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p> <div style="text-align: center;">  </div> <p style="text-align: right; color: blue;"><i>Dropping method corner dropping:</i></p> <p style="text-align: right; color: blue;"><i>A corner: Once edge dropping.</i></p> <p style="text-align: right; color: blue;"><i>B, C, D edge: Once face dropping.</i></p> <p style="text-align: right; color: blue;"><i>E, F, G face: Once.</i></p>	

- Notes:
1. No dew condensation to be observed.
  2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
  3. Vibration test will be conducted to the product itself without putting I in a container.

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**1.1 Dimensional outlines**

