

## 10.2" Color TFT Display



### FEATURES

- Type: TFT
- Diagonal dimension: 10.2"
- Display format: 800 x 480 (RGB)
- Built-in controller: RA8875
- +3.3 V, +5 V power supply
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

MECHANICAL DATA		
ITEM	DIMENSION	UNIT
Dot matrix	800 x 480, RGB (TFT)	dots
Module dimension	235.0 x 145.8 x 12.1	mm
Active area	222.0 x 132.48	mm
Dot pitch	0.0925 x 0.276	mm
LCD type	TFT, normally white, transmissive	
View direction	12 o'clock	
Gray scale inversion direction	6 o'clock	
Backlight type	LED, normally white	
Controller IC	RA8875	
Interface	Digital 8080 family MPU	

### Note

- Color tone changed by temperature and driving voltage

ABSOLUTE MAXIMUM RATINGS					
ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN.	TYP.	MAX.	
Operating temperature	T <sub>OP</sub>	-20	-	+70	°C
Storage temperature	T <sub>ST</sub>	-30	-	+80	°C

### Notes

- Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above
- Temperature ≤ 60 °C, 90 % RH max. temperature > 60 °C, absolute humidity shall be less than 90 % RH at 60 °C

ELECTRICAL CHARACTERISTICS						
ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply voltage for LCM	V <sub>DD</sub>	-	3.0	3.3	3.6	V
Supply current for LCM	I <sub>DD</sub>	(1)	-	190	195	mA
Operation current for LED driver	I <sub>LED</sub>	V <sub>LED</sub> = +5 V (2)(3)	500	-	750	mA
Power consumption		V <sub>LED</sub> = +5 V (2)(3)	2500	-	3750	mW
Supply voltage for LED driver	V <sub>DD</sub>	V <sub>LED+</sub>	-	5	-	V
LED life time	t	(3)(4)(5)	20 000	-	-	h

### Notes

- (1) This value is test for V<sub>DD</sub> = 3.3 V, T<sub>amb</sub> = 25 °C only
- (2) Base on V<sub>LED</sub> = 5 V for the backlight driver IC specification
- (3) T<sub>amb</sub> = 25 °C
- (4) Brightness to be decreased to 50 % of the initial value
- (5) The single LED lamp case

INTERFACE PIN FUNCTION		
PIN NO.	SYMBOL	FUNCTION
1	GND	System ground pin of the IC; connect to system ground
2	V <sub>DD</sub>	Power supply: +3.3 V
3	NC	No connection
4	RS	Data / command select
5	WR	Write strobe signal
6	RD	Read strobe signal
7	DB0	Data bus
8	DB1	Data bus
9	DB2	Data bus
10	DB3	Data bus
11	DB4	Data bus
12	DB5	Data bus
13	DB6	Data bus
14	DB7	Data bus
15	DB8	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
16	DB9	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
17	DB10	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
18	DB11	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
19	DB12	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
20	DB13	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
21	DB14	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
22	DB15	Data bus (when select 8 bits mode, this pin is "no connection") <sup>(1)</sup>
23	WAIT	Wait signal output (H: active)
24	NC	No connection
25	CS	Chip select
26	RST	Hardware reset
27	L / R	Left / right selection, default L / R = H <sup>(2)(3)</sup>
28	U / D	Up / down selection, default U / D = L <sup>(2)(3)</sup>
29	NC	No connection
30	NC	No connection
31	NC	No connection
32	NC	No connection
33	VLED-	Power for LED driver IC (ground)
34	VLED-	Power for LED driver IC (ground)
35	VLED+	Power for LED driver IC (+5 V)
36	VLED+	Power for LED driver IC (+5 V)

**Notes**

- <sup>(1)</sup> When select 8 bit mode, DB0 to DB7 be used, DB8 to DB15 no connection. When select 16 bit mode, DB8 to DB15 be used  
<sup>(2)</sup> Selection of scanning mode

SETTING OF SCAN CONTROL INPUT		SCANNING DIRECTION
U / D	L / R	
GND	V <sub>DD</sub>	Up to down, left to right
V <sub>DD</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
V <sub>DD</sub>	V <sub>DD</sub>	Down to up, left to right

- <sup>(3)</sup> Definition of scanning direction, refer to the figure as below:



1. U / D = L; L / R = H



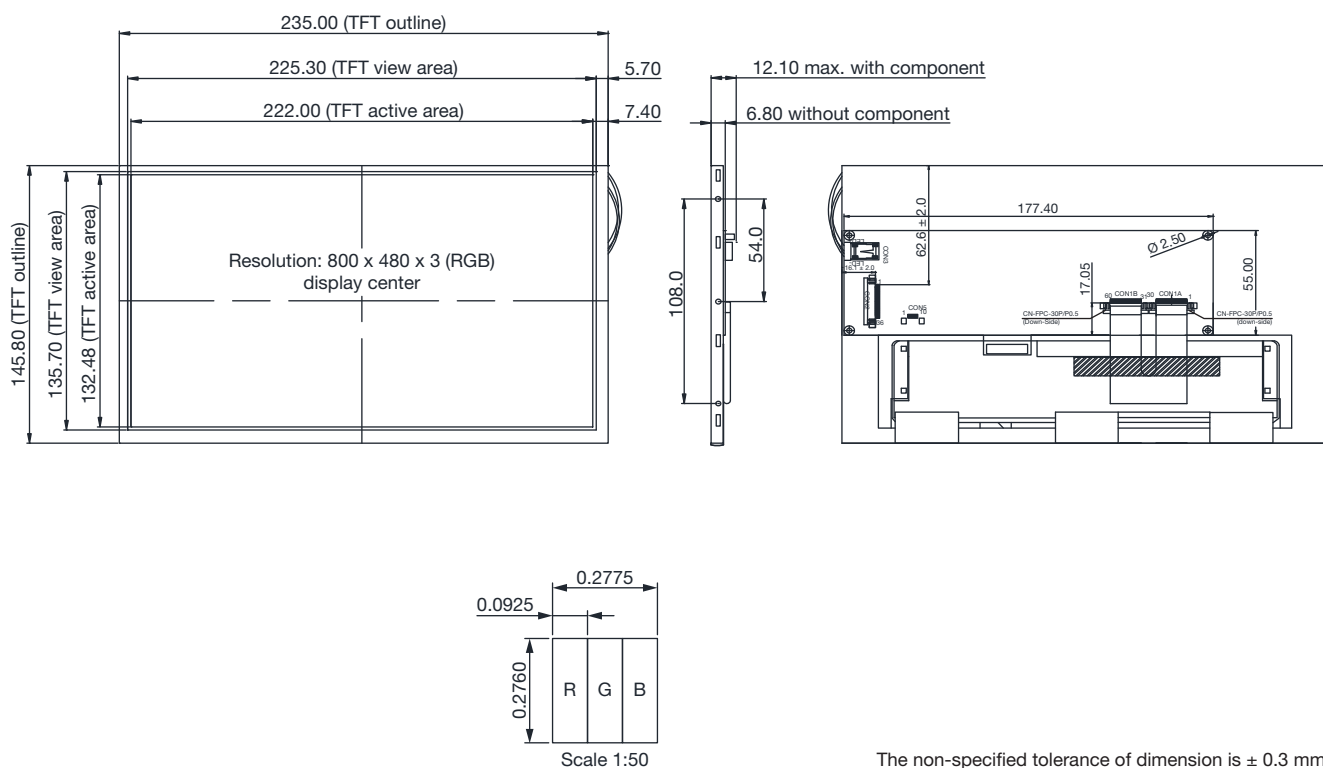
2. U / D = L; L / R = L



3. U / D = H; L / R = H



4. U / D = H; L / R = L

**DIMENSIONS** in millimeters


**MODULE CLASSIFICATION INFORMATION**

<table><tr><td>LC</td><td>F</td><td>-</td><td>102</td><td>P</td><td>T</td><td>I</td><td>F</td><td>G</td><td>D</td><td>B</td><td>N</td><td>0</td><td>H</td></tr><tr><td>1</td><td>2</td><td></td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td></tr></table>															LC	F	-	102	P	T	I	F	G	D	B	N	0	H	1	2		3	4	5	6	7	8	9	10	11	12	13
LC	F	-	102	P	T	I	F	G	D	B	N	0	H																													
1	2		3	4	5	6	7	8	9	10	11	12	13																													
1	Brand				Vishay Intertechnology, Inc.																																					
2	Display type				F: TFT type J: custom TFT																																					
3	Display size				10.2" TFT																																					
4	Model serials number				P																																					
5	Backlight type				F: CCFL, white S: LED, high light white T: LED, white Z: Nichia LED, white																																					
6	LCD polarize type, temperature range, gray scale inversion direction				A: transmissive, N.T, IPS TFT C: transmissive, N.T, 6:00 F: transmissive, N.T, 12:00 I: transmissive, W.T, 6:00 K: transfective, W.T, 12:00 L: transmissive, W.T, 12:00 N: transmissive, super W.T, 6:00 Q: transmissive, super W.T, 12:00 R: transmissive, super W.T, O-TFT V: transmissive, super W.T, VA TFT X: transmissive, W.T, VA TFT Y: transmissive, W.T, IPS TFT Z: transmissive, W.T, O-TFT																																					
7	TFT type				A: TFT LCD B: TFT + FR + control board C: TFT + FR + A/D board D: TFT + FR + A/D board + control board E: TFT + FR + power board F: TFT + control board G: TFT + FR H: TFT + D/V board I: TFT + FR + D/V board J: TFT + power board																																					
8	Resolution				A: 128160    F: 640480    K: 800600    Q: 480800    V: 176220    2: 1024324 B: 320234    G: 800480    L: 240400    R: 640320    W: 1280398    3: 7201280 C: 320240    H: 1024600    M: 1024768    S: 480128    X: 1024250 D: 480234    I: 320480    N: 128128    T: 800320    Y: 1920720 E: 480272    J: 240320    P: 1280800    U: 8001280    Z: 800200																																					
9	-				D: digital L: LVDS M: MIPI																																					
10	Interface				A: 8 bit B: 16 bit H: HDMI I: I <sup>2</sup> C interface N: without control board R: RS232 S: SPI interface U: USB																																					
11	Touch panel				C: capacitive touch panel (G-F-F) G: capacitive touch panel (G-G) N: without touch panel T: resistive touch panel																																					
12	Version				0																																					
13	Special code				H: RoHS-compliant with RoHS Directive regulations																																					

**SUMMARY**

TFT 10.2" is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT\_LCD module. It is usually designed for industrial application and this module follows RoHS compliance.

**GENERAL SPECIFICATIONS**

ITEM	DIMENSION	UNIT
Size	10.2	inch
Dot matrix	800 x 480 (RGB)	dots
Module dimension	235.0 x 145.8 x 12.1	mm
Active area	222.0 x 132.48	mm
Dot pitch	0.0925 x 0.276	mm
LCD type	TFT, normally white, transmissive	
View direction	12 o'clock	
Gray scale inversion direction	6 o'clock	
Aspect ratio	16:9	
Backlight type	LED, normally white	
Controller IC	RA8875	
Interface	Digital 8080 family MPU 8 bit / 16 bit	
With or without touch panel	Without touch panel	
Surface	Anti-glare	

**Note**

- Color tone slight changed by temperature and driving voltage

**DC CHARACTERISTICS**

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Low level input voltage	$V_{IL}$	-	GND	-	0.2 $V_{DD}$	V
High level input voltage	$V_{IH}$	-	0.8 $V_{DD}$	-	$V_{DD}$	V

**INTERFACE TIMING****8080 Mode**

The following timing charts are used to describe the timing specification of the standard 8080 interfaces.

**8080 MODE WRITE CYCLE**

SYMBOL	PARAMETER	RATING		UNIT	SYMBOL
		MIN.	MAX.		
$t_{CYC8}$	Cycle time	50	-	ns	$t_C$ is one system clock period: $t_C = 1/SYS\_CLK$
$t_{CC8}$	Strobe pulse width	20	-	ns	
$t_{AS8}$	Address setup time	0	-	ns	
$t_{AH8}$	Address hold time	10	-	ns	
$t_{DS8}$	Data setup time	20	-	ns	
$t_{DH8}$	Data hold time	10	-	ns	
$t_{ACC8}$	Data output access time	0	20	ns	
$t_{OH8}$	Data output hold time	0	20	ns	

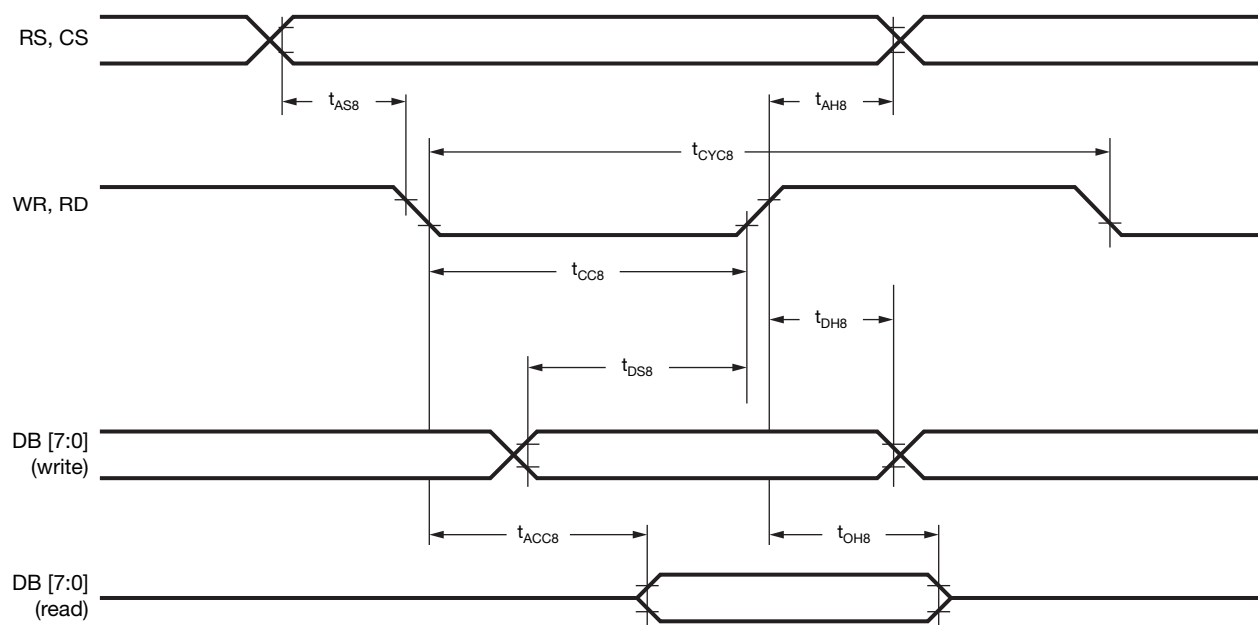
**8080 8-bit / 16-bit Interface**


Fig. 1

The data bus width of RA8875 can be selected to 8-bit / 16-bit by setting the bit [1:0] of SYSR. When bit [1:0] of SYSR is cleared to “00”, then the data bus is 8-bit. If bit [1:0] of SYSR is set to “11”, then the data transition is set as 16-bit.

**Pixel Data Format**

16-bit mode color

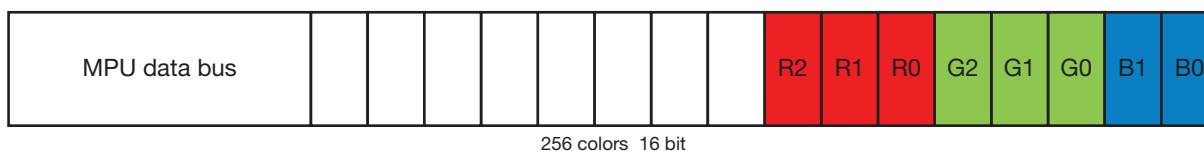
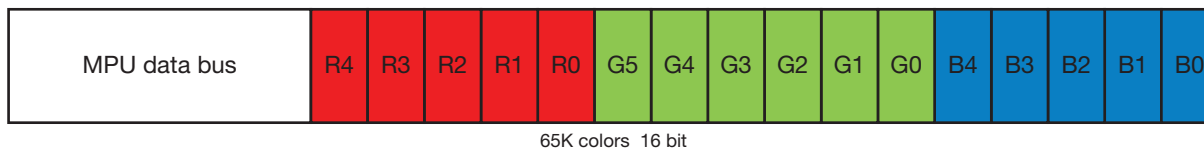


Fig. 2

8-bit mode color

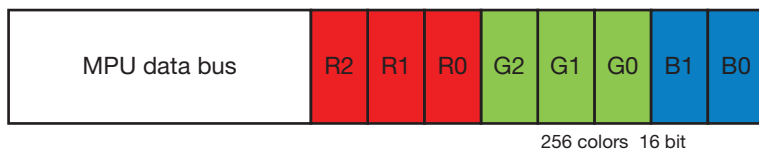
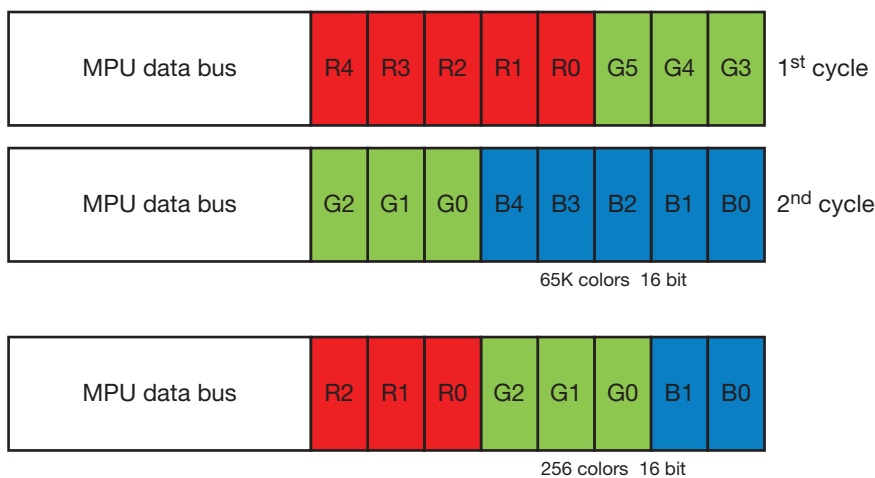


Fig. 3

**OPTICAL CHARACTERISTICS**

<b>TFT LCD CHARACTERISTICS</b> ( $T_A = 25\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ )						
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Response time <sup>(3)(5)</sup>	$t_r$	$\Theta = 0^{\circ}, \Phi = 0^{\circ}$	-	15	30	ms
	$t_f$		-	20	40	ms
Contrast ratio <sup>(4)(5)</sup>	CR	At optimized viewing angle	250	300	-	
Color chromaticity	White	$W_x$ <sup>(2)(6)(7)</sup>	0.26	0.31	0.36	
		$W_y$	0.28	0.33	0.38	
Viewing angle (gray scale inversion direction) <sup>(1)</sup>	Horizontal	$\Theta_R$	55	65	-	deg
		$\Theta_L$	55	65	-	
	Vertical	$\Phi_T$	35	45	-	deg
		$\Phi_B$	55	65	-	
Brightness	-	Center of display	250	350	-	cd/m <sup>2</sup>

**Notes**

<sup>(1)</sup> Definition of viewing angle range

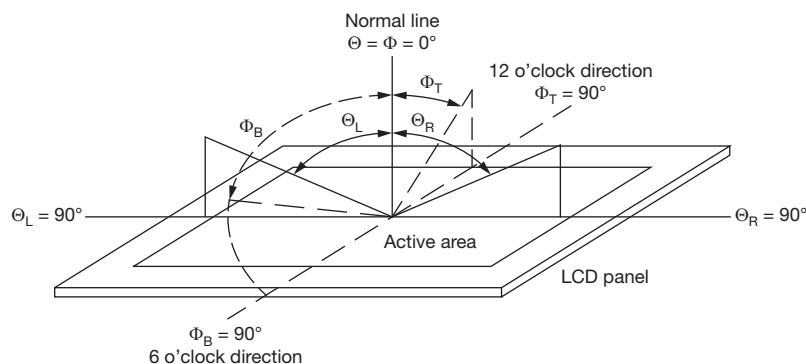


Fig. 4 - Definition of Viewing Angle

<sup>(2)</sup> Test equipment setup:

after stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50 cm and normal direction

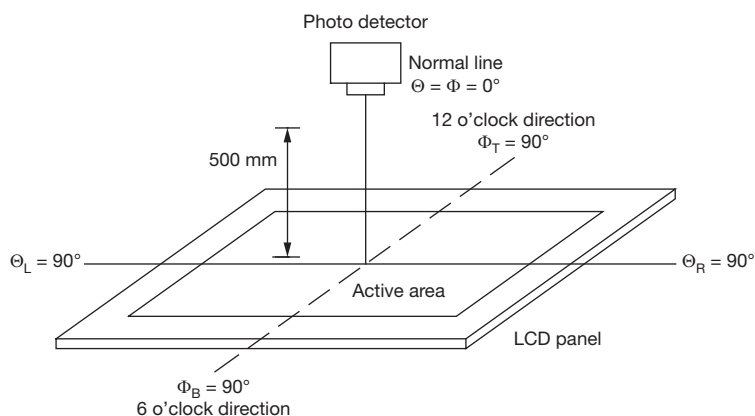


Fig. 5 - Optical Measurement System Setup



(3) Definition of response time:

the response time is defined as the LCD optical switching time interval between “white” state and “black” state. Rise time,  $t_r$ , is the time between photo detector output intensity changed from 90 % to 10 %. And fall time,  $t_f$ , is the time between photo detector output intensity changed from 10 % to 90 %

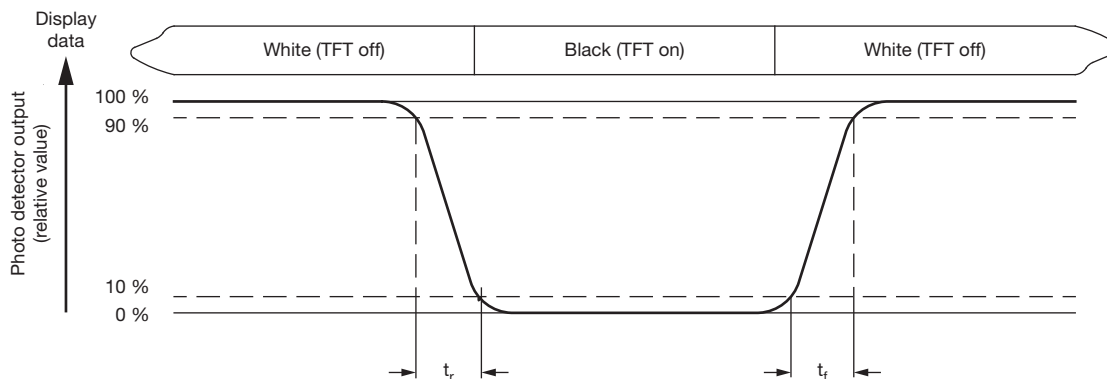


Fig. 6

(4) Definition of contrast ratio:

the contrast ratio is defined as the following expression

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the white state}}{\text{Luminance measured when LCD on the black state}}$$

(5) White  $V_I = V_{I50} \pm 1.5 \text{ V}$

Black  $V_I = V_{I50} \pm 2.0 \text{ V}$

“±” means that the analog input signal swings in phase with  $V_{COM}$  signal.

“±” means that the analog input signal swings out of phase with  $V_{COM}$  signal.

The 100 % transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened

(6) Definition of color chromaticity (CIE 1931): color coordinates measured at the center point of LCD

(7) Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened

## BLOCK DIAGRAM

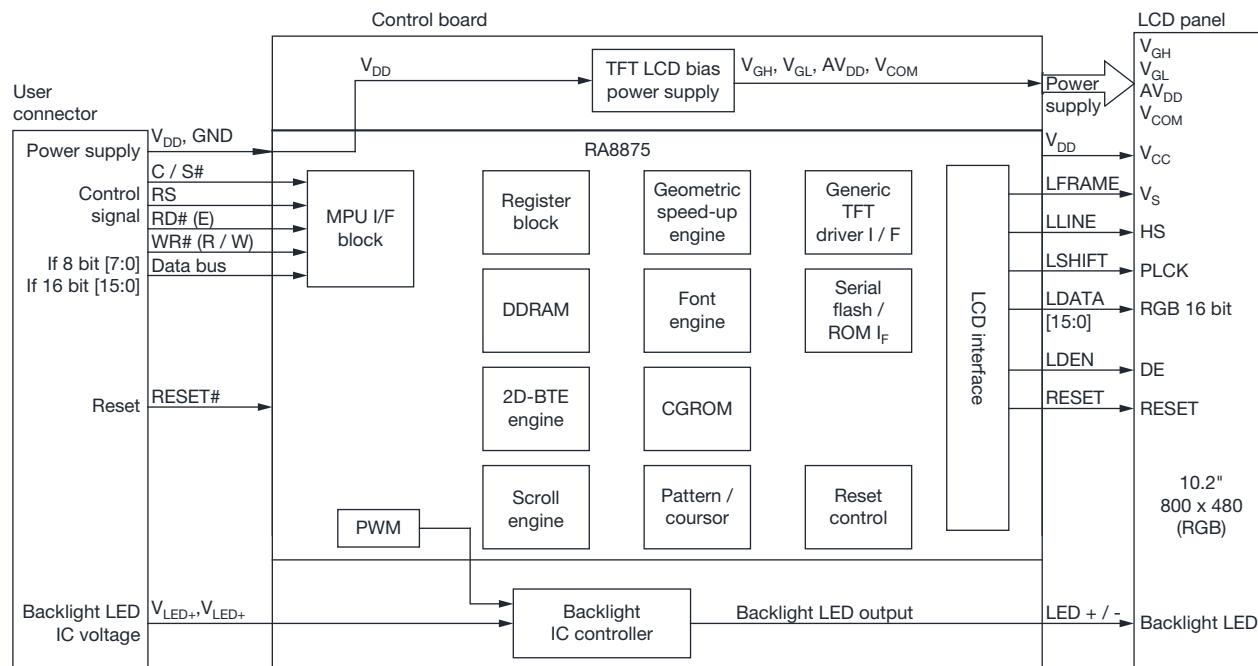
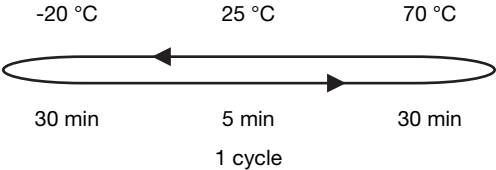


Fig. 7



RELIABILITY		
ENVIRONMENTAL TEST		
TEST ITEM	CONTENT OF TEST	TEST CONDITION
High temperature storage <sup>(1)</sup>	Endurance test applying the high storage temperature for a long time.	80 °C, 200 h
Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C, 200 h
High temperature operation	Endurance test applying the electric stress (voltage and current) and the thermal stress to the element for a long time.	70 °C, 200 h
Low temperature operation <sup>(2)</sup>	Endurance test applying the electric stress under low temperature for a long time.	-20 °C, 200 h
High temperature / humidity operation <sup>(1)(2)</sup>	The module should be allowed to stand at 60 °C, 90 % RH max.	60 °C, 90 % RH, 96 h
Thermal shock resistance	<p>The sample should be allowed stand the following 10 cycles of operation</p>  <p>-20 °C      25 °C      70 °C</p> <p>30 min      5 min      30 min</p> <p>1 cycle</p>	-20 °C / 70 °C, 10 cycles
Vibration test <sup>(3)</sup>	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 1.5 mm, vibration frequency: 10 Hz to 55 Hz, one cycle 60 s to 3 directions of X, Y, Z for each 15 minutes
Static electricity test	Endurance test applying the electric stress to the terminal.	$V_S = \pm 600 \text{ V}$ (contact), $\pm 800 \text{ V}$ (air), $R_S = 330 \Omega$ , $C_S = 150 \text{ pF}$ , 10 times

**Notes**

- (1) The function test shall be conducted after 4 hours storage at the normal temperature and humidity after remove from the test chamber
- (2) No dew condensation to be observed
- (3) The packing have to including into the vibration testing

**INITIAL CODE FOR REFERENCE**

```
void Initial_RA8875()
{
    RES = 1;
    Delay1ms(10);
    RES = 0;           //Active low
    Delay1ms(50);
    RES = 1;
    Delay1ms(100);
    LCD_CmdWrite(0x88);
    LCD_DataWrite(0x0c);
    Delay1ms(1);
    LCD_CmdWrite(0x89);
    LCD_DataWrite(0x02);
    Delay1ms(1);
    LCD_CmdWrite(0x10);
    LCD_DataWrite(0x0c);
    LCD_CmdWrite(0x04);
    LCD_DataWrite(0x81);
    Delay1ms(1);

    //Horizontal set
    LCD_CmdWrite(0x14);
    LCD_DataWrite(0x63);
    LCD_CmdWrite(0x15);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x16);
    LCD_DataWrite(0x03);
    LCD_CmdWrite(0x17);
    LCD_DataWrite(0x03);
    LCD_CmdWrite(0x18);
    LCD_DataWrite(0x0B);
    LCD_CmdWrite(0x19);
    LCD_DataWrite(0xdf);
    LCD_CmdWrite(0x1a);
    LCD_DataWrite(0x01);
    LCD_CmdWrite(0x1b);
    LCD_DataWrite(0x20);
    LCD_CmdWrite(0x1c);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x1d);
    LCD_DataWrite(0x16);
    LCD_CmdWrite(0x1e);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x1f);
    LCD_DataWrite(0x01);

    //setting active window X
    LCD_CmdWrite(0x30);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x31);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x34);
    LCD_DataWrite(0x1F);
    LCD_CmdWrite(0x35);
    LCD_DataWrite(0x03);

    //setting active window Y
    LCD_CmdWrite(0x32);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x33);
    LCD_DataWrite(0x00);
    LCD_CmdWrite(0x36);
    LCD_DataWrite(0xdf);
    LCD_CmdWrite(0x37);
    LCD_DataWrite(0x01);
}
```

**LCM SAMPLE ESTIMATE FEEDBACK SHEET**

Module Number: \_\_\_\_\_

**1. Panel Specification**

- |                           |                               |                                    |
|---------------------------|-------------------------------|------------------------------------|
| 1. Panel type:            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 2. View direction:        | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 3. Numbers of dots:       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 4. View area:             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 5. Active area:           | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 6. Operating temperature: | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 7. Storage temperature:   | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 8. Others:                | _____                         |                                    |

**2. Mechanical Specification**

- |                            |                               |                                    |
|----------------------------|-------------------------------|------------------------------------|
| 1. PCB size:               | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 2. Frame size:             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 3. Material of frame:      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 4. Connector position:     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 5. Fix hole position:      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 6. Backlight position:     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 7. Thickness of PCB:       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 8. Height of frame to PCB: | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 9. Height of module:       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 10. Others:                | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |

**3. Relative Hole Size**

- |                            |                               |                                    |
|----------------------------|-------------------------------|------------------------------------|
| 1. Pitch of connector:     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 2. Hole size of connector: | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 3. Mounting hole size:     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 4. Mounting hole type:     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 5. Others:                 | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |

**4. Backlight Specification**

- |  |                               |                                    |
|--|-------------------------------|------------------------------------|
| 1. Backlight type:                                     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 2. Backlight color:                                    | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 3. Backlight driving voltage (reference for LED type): | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 4. Backlight driving current:                          | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 5. Brightness of backlight:                            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 6. Backlight solder method:                            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 7. Others:   | _____                         |                                    |



**5. Electronic Characteristics of Module**

- |                              |                               |                                    |
|------------------------------|-------------------------------|------------------------------------|
| 1. Input voltage:            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 2. Supply current:           | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 3. Driving voltage for LCD:  | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 4. Contrast for LCD:         | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 5. Backlight driving method: | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 6. Negative voltage output:  | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 7. Interface function:       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 8. LCD uniformity:           | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 9. ESD test:                 | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |
| 10. Others:                  | <input type="checkbox"/> Pass | <input type="checkbox"/> NG, _____ |

**6. Summary**

Sales signature: \_\_\_\_\_

Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Customer signature: \_\_\_\_\_



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