

## 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	

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

### Note

- Color tone changed by temperature and driving voltage

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 us 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

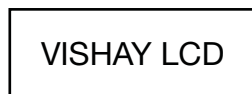
INTERFACE PIN FUNCTION		
PIN NO.	SYMBOL	FUNCTION
1	GND	System ground pin of the IC; connect to system ground
2	V <sub>DD</sub>	Power supply: +3.3 V
3	NC	No connection
4	RS	Data / command select
5	WR	Write strobe signal
6	RD	Read strobe signal
7	DB0	Data bus
8	DB1	Data bus
9	DB2	Data bus
10	DB3	Data bus
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



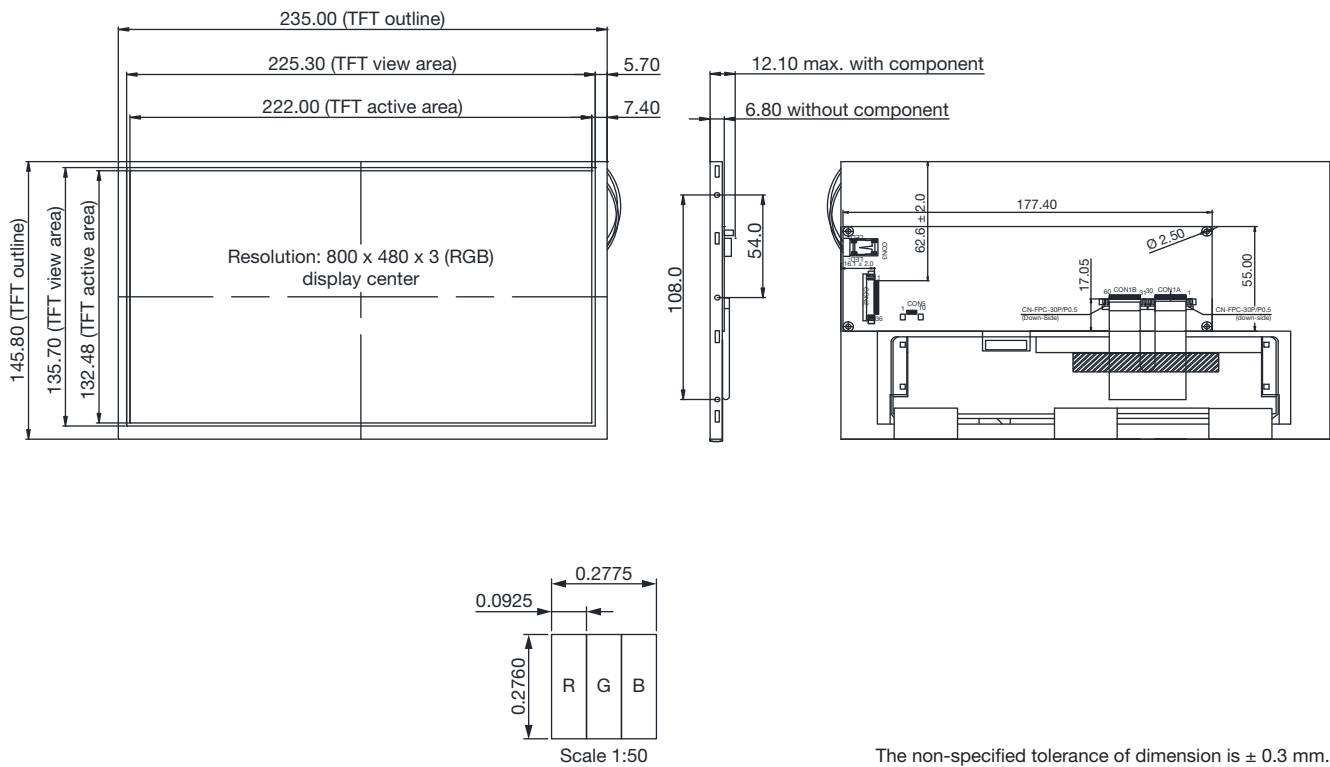
3. U / D = H; L / R = H



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



## DIMENSIONS in millimeters



The non-specified tolerance of dimension is  $\pm 0.3$  mm.



MODULE CLASSIFICATION INFORMATION														
	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		

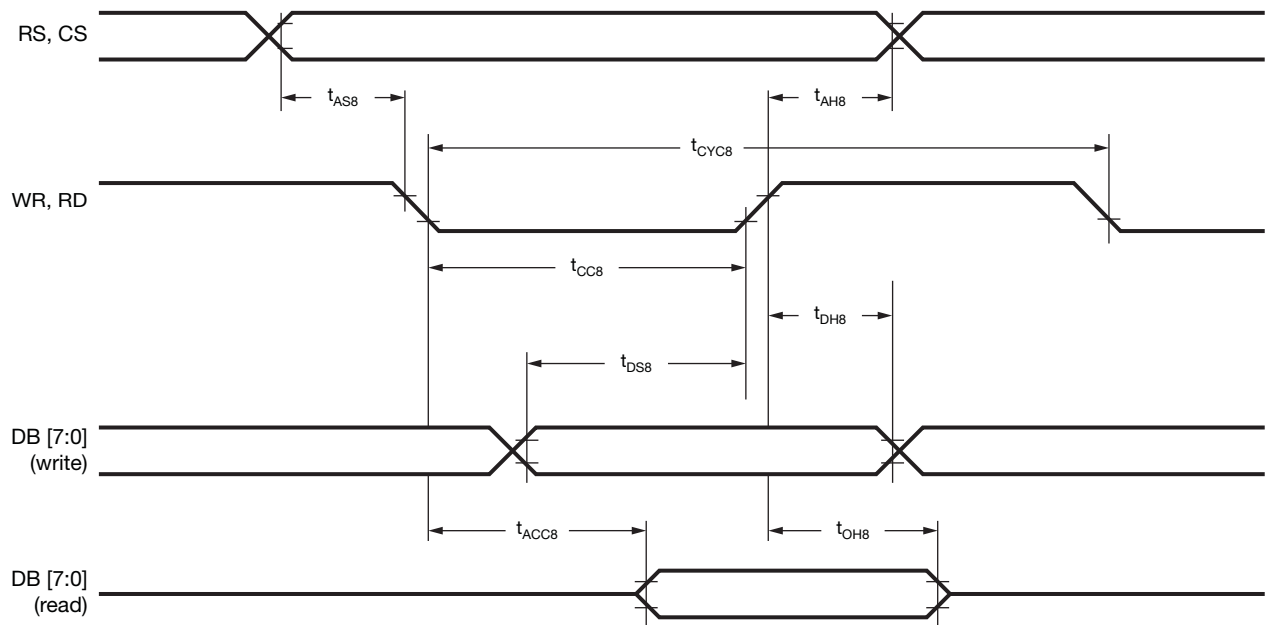
**8080 8-bit / 16-bit Interface**


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

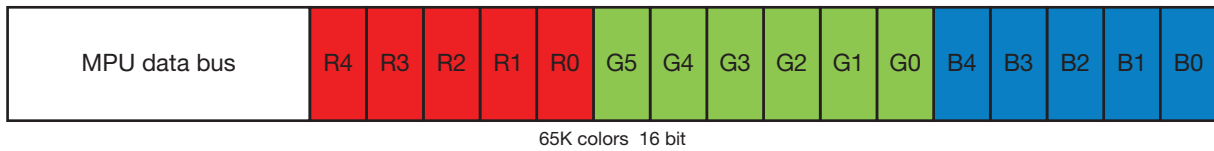


Fig. 2

8-bit mode color



Fig. 3

**OPTICAL CHARACTERISTICS**

TFT LCD CHARACTERISTICS (T <sub>A</sub> = 25 °C ± 2 °C)							
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	
Response time (3)(5)	t <sub>r</sub>	Θ = 0°, Φ = 0°	-	15	30	ms	
	t <sub>f</sub>		-	20	40	ms	
Contrast ratio (4)(5)	CR	At optimized viewing angle	250	300	-		
Color chromaticity	White	W <sub>x</sub> (2)(6)(7)	Θ = 0°, Φ = 0°	0.26	0.31	0.36	
		W <sub>y</sub>		0.28	0.33	0.38	
Viewing angle (gray scale inversion direction) (1)	Horizontal	Θ <sub>R</sub>	CR ≥ 10	55	65	-	deg
		Θ <sub>L</sub>		55	65	-	
	Vertical	Φ <sub>T</sub>		35	45	-	deg
		Φ <sub>B</sub>		55	65	-	
Brightness	-	Center of display	250	350	-	cd/m <sup>2</sup>	

**Notes**

(1) Definition of viewing angle range

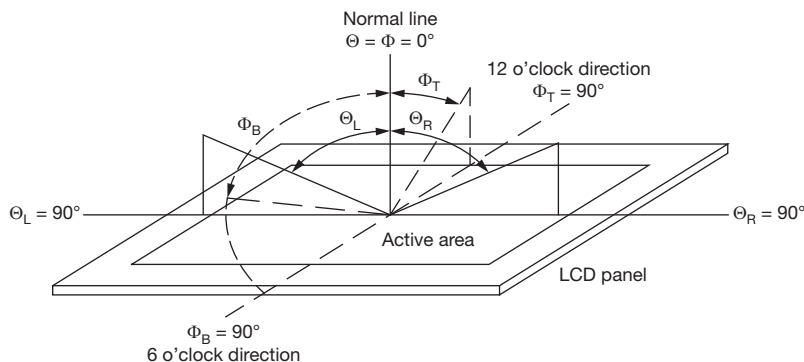


Fig. 4 - Definition of Viewing Angle

(2) 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-7 or BM-5 luminance meter 1.0° field of view at a distance of 50 cm and normal direction

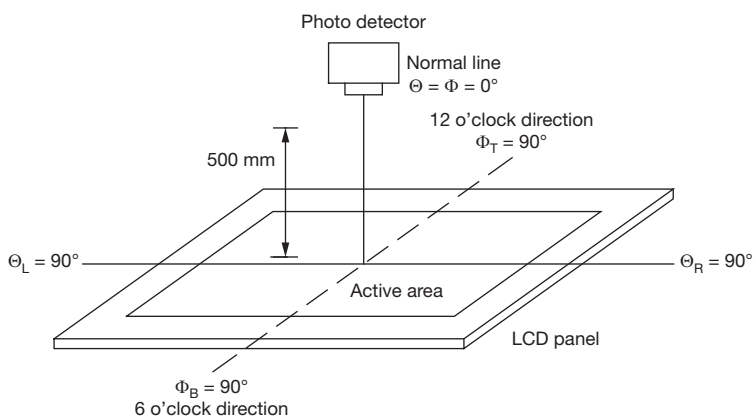


Fig. 5 - Optical Measurement System Setup



- (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 %

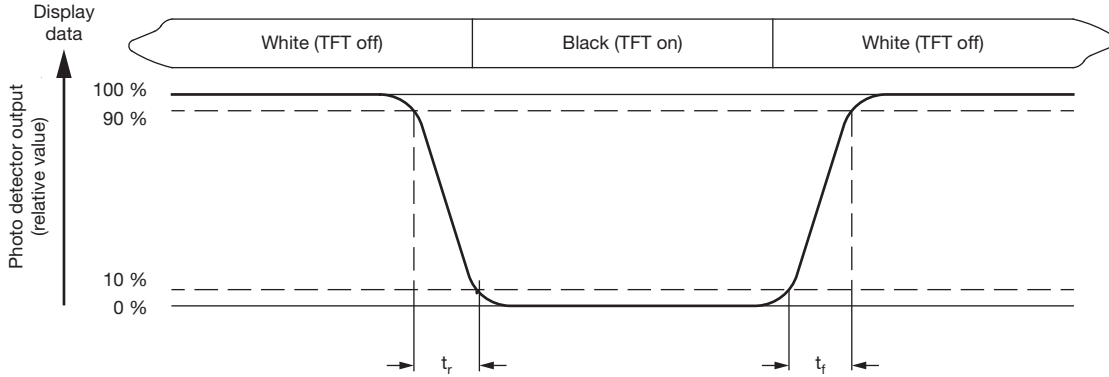


Fig. 6

- (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**

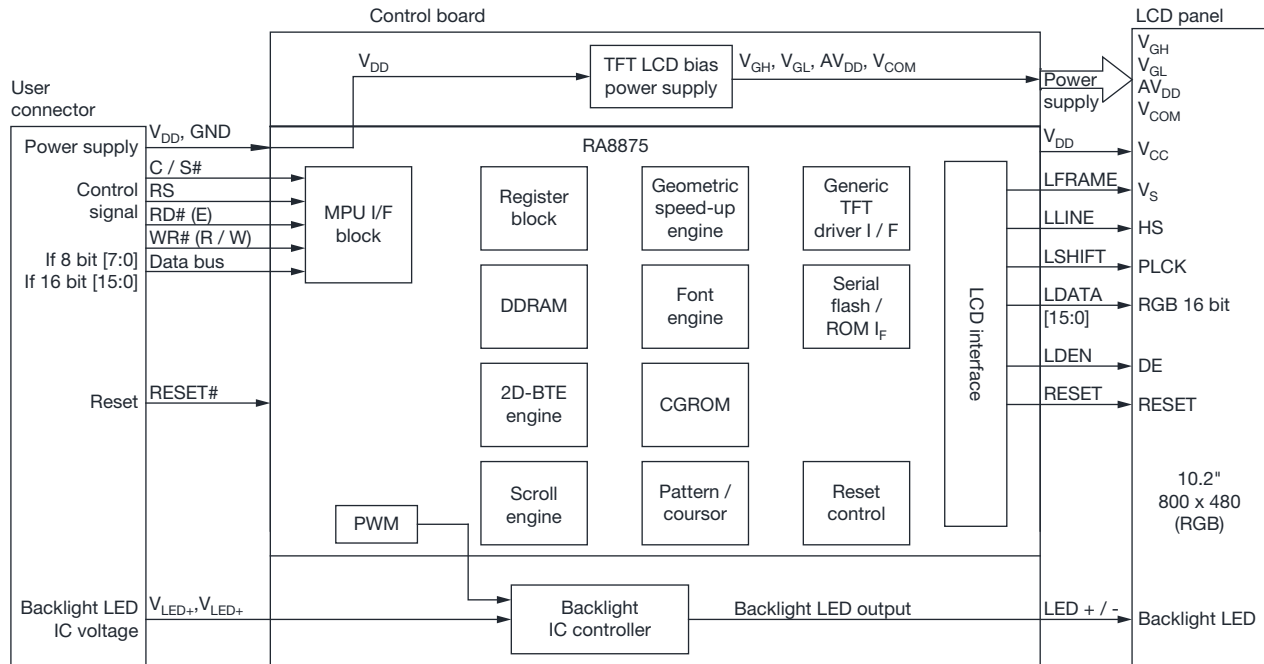


Fig. 7



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 style="text-align: center;">-20 °C                  25 °C                  70 °C</p> <p style="text-align: center;">30 min                  5 min                  30 min</p> <p style="text-align: center;">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.	$V_S = \pm 600$ V (contact), $\pm 800$ V (air), $R_S = 330 \Omega$ , $C_S = 150$ 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: [ ] Pass [ ] NG, \_\_\_\_\_
2. View direction: [ ] Pass [ ] NG, \_\_\_\_\_
3. Numbers of dots: [ ] Pass [ ] NG, \_\_\_\_\_
4. View area: [ ] Pass [ ] NG, \_\_\_\_\_
5. Active area: [ ] Pass [ ] NG, \_\_\_\_\_
6. Operating temperature: [ ] Pass [ ] NG, \_\_\_\_\_
7. Storage temperature: [ ] Pass [ ] NG, \_\_\_\_\_
8. Others: \_\_\_\_\_

2. Mechanical Specification

- 1. PCB size: [ ] Pass [ ] NG, \_\_\_\_\_
2. Frame size: [ ] Pass [ ] NG, \_\_\_\_\_
3. Material of frame: [ ] Pass [ ] NG, \_\_\_\_\_
4. Connector position: [ ] Pass [ ] NG, \_\_\_\_\_
5. Fix hole position: [ ] Pass [ ] NG, \_\_\_\_\_
6. Backlight position: [ ] Pass [ ] NG, \_\_\_\_\_
7. Thickness of PCB: [ ] Pass [ ] NG, \_\_\_\_\_
8. Height of frame to PCB: [ ] Pass [ ] NG, \_\_\_\_\_
9. Height of module: [ ] Pass [ ] NG, \_\_\_\_\_
10. Others: [ ] Pass [ ] NG, \_\_\_\_\_

3. Relative Hole Size

- 1. Pitch of connector: [ ] Pass [ ] NG, \_\_\_\_\_
2. Hole size of connector: [ ] Pass [ ] NG, \_\_\_\_\_
3. Mounting hole size: [ ] Pass [ ] NG, \_\_\_\_\_
4. Mounting hole type: [ ] Pass [ ] NG, \_\_\_\_\_
5. Others: [ ] Pass [ ] NG, \_\_\_\_\_

4. Backlight Specification

- 1. Backlight type: [ ] Pass [ ] NG, \_\_\_\_\_
2. Backlight color: [ ] Pass [ ] NG, \_\_\_\_\_
3. Backlight driving voltage (reference for LED type): [ ] Pass [ ] NG, \_\_\_\_\_
4. Backlight driving current: [ ] Pass [ ] NG, \_\_\_\_\_
5. Brightness of backlight: [ ] Pass [ ] NG, \_\_\_\_\_
6. Backlight solder method: [ ] Pass [ ] NG, \_\_\_\_\_
7. Others: \_\_\_\_\_



5. Electronic Characteristics of Module

- 1. Input voltage:  Pass  NG, \_\_\_\_\_
- 2. Supply current:  Pass  NG, \_\_\_\_\_
- 3. Driving voltage for LCD:  Pass  NG, \_\_\_\_\_
- 4. Contrast for LCD:  Pass  NG, \_\_\_\_\_
- 5. Backlight driving method:  Pass  NG, \_\_\_\_\_
- 6. Negative voltage output:  Pass  NG, \_\_\_\_\_
- 7. Interface function:  Pass  NG, \_\_\_\_\_
- 8. LCD uniformity:  Pass  NG, \_\_\_\_\_
- 9. ESD test:  Pass  NG, \_\_\_\_\_
- 10. Others:  Pass  NG, \_\_\_\_\_

6. Summary

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

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

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



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