

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


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 _{OP}	-20	-	+70	°C
Storage temperature	T _{ST}	-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 _{DD}	-	3.0	3.3	3.6	V
Supply current for LCM	I _{DD}	(1)	-	190	195	mA
Operation current for LED driver	I _{LED}	V _{LED} = +5 V (2)(3)	500	-	750	mA
Power consumption		V _{LED} = +5 V (2)(3)	2500	-	3750	mW
Supply voltage for LED driver	V _{DD}	V _{LED+}	-	5	-	V
LED life time	t	(3)(4)(5)	20 000	-	-	h

Notes

- (1) This value us test for V_{DD} = 3.3 V, T_{amb} = 25 °C only
- (2) Base on V_{LED} = 5 V for the backlight driver IC specification
- (3) T_{amb} = 25 °C
- (4) Brightness to be decreased to 50 % of the initial value
- (5) The single LED lamp case

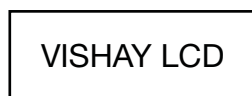
INTERFACE PIN FUNCTION		
PIN NO.	SYMBOL	FUNCTION
1	GND	System ground pin of the IC; connect to system ground
2	V _{DD}	Power supply: +3.3 V
3	NC	No connection
4	RS	Data / command select
5	WR	Write strobe signal
6	RD	Read strobe signal
7	DB0	Data bus
8	DB1	Data bus
9	DB2	Data bus
10	DB3	Data bus
11	DB4	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") ⁽¹⁾
16	DB9	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
17	DB10	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
18	DB11	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
19	DB12	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
20	DB13	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
21	DB14	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
22	DB15	Data bus (when select 8 bits mode, this pin is "no connection") ⁽¹⁾
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 ⁽²⁾⁽³⁾
28	U / D	Up / down selection, default U / D = L ⁽²⁾⁽³⁾
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

- ⁽¹⁾ 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
⁽²⁾ Selection of scanning mode

SETTING OF SCAN CONTROL INPUT		SCANNING DIRECTION
U / D	L / R	
GND	V _{DD}	Up to down, left to right
V _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V _{DD}	V _{DD}	Down to up, left to right

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



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



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



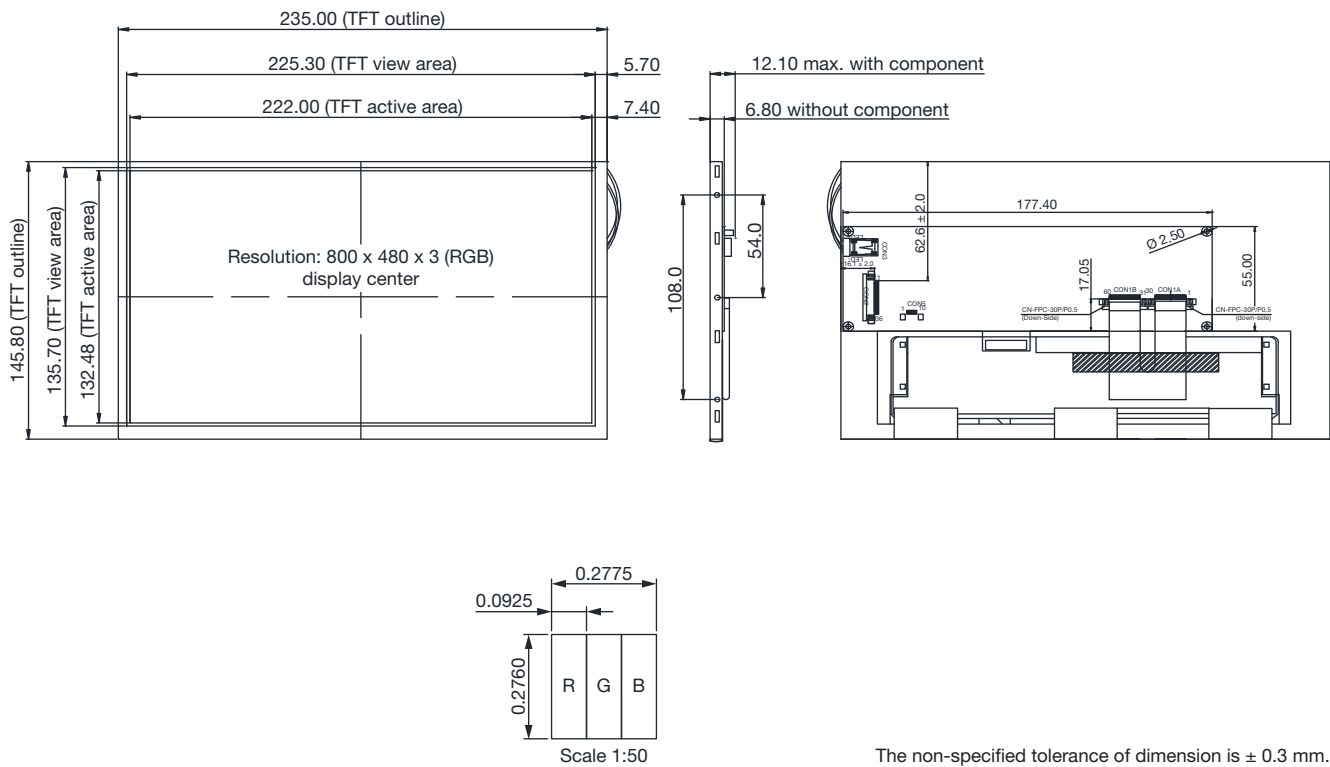
3. U / D = H; L / R = H



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



DIMENSIONS in millimeters





MODULE CLASSIFICATION INFORMATION														
	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 ² 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		

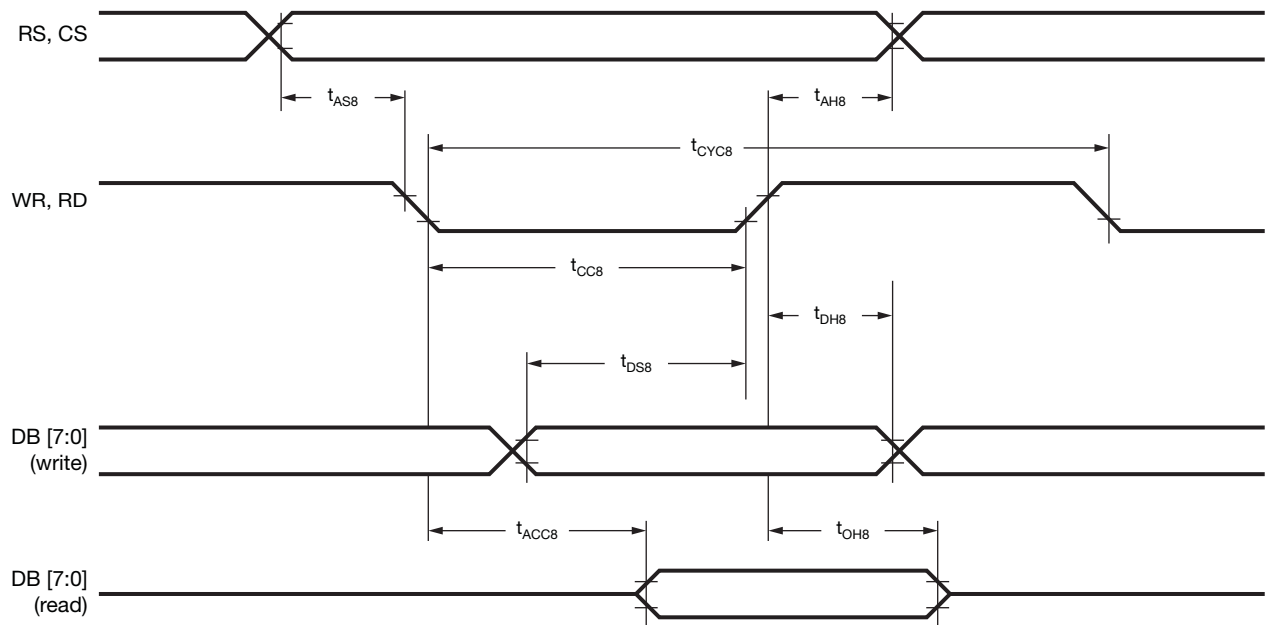
8080 8-bit / 16-bit Interface


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

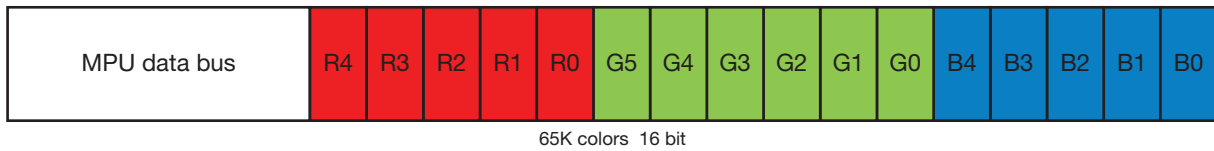


Fig. 2

8-bit mode color



Fig. 3

OPTICAL CHARACTERISTICS

TFT LCD CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C} \pm 2\text{ }^\circ\text{C}$)						
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Response time ⁽³⁾⁽⁵⁾	t_r	$\Theta = 0^\circ, \Phi = 0^\circ$	-	15	30	ms
	t_f		-	20	40	ms
Contrast ratio ⁽⁴⁾⁽⁵⁾	CR	At optimized viewing angle	250	300	-	
Color chromaticity	White	W_x ⁽²⁾⁽⁶⁾⁽⁷⁾	$\Theta = 0^\circ, \Phi = 0^\circ$	0.26	0.31	0.36
		W_y		0.28	0.33	0.38
Viewing angle (gray scale inversion direction) ⁽¹⁾	Horizontal	Θ_R	CR ≥ 10	55	65	-
		Θ_L		55	65	-
	Vertical	Φ_T		35	45	-
		Φ_B		55	65	-
Brightness	-	Center of display	250	350	-	cd/m ²

Notes

⁽¹⁾ Definition of viewing angle range

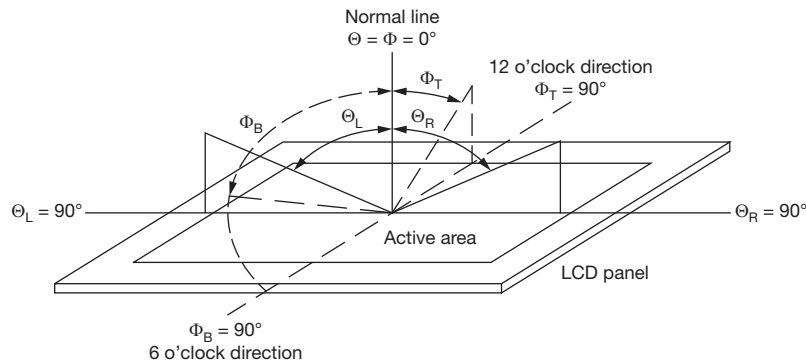


Fig. 4 - Definition of Viewing Angle

⁽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

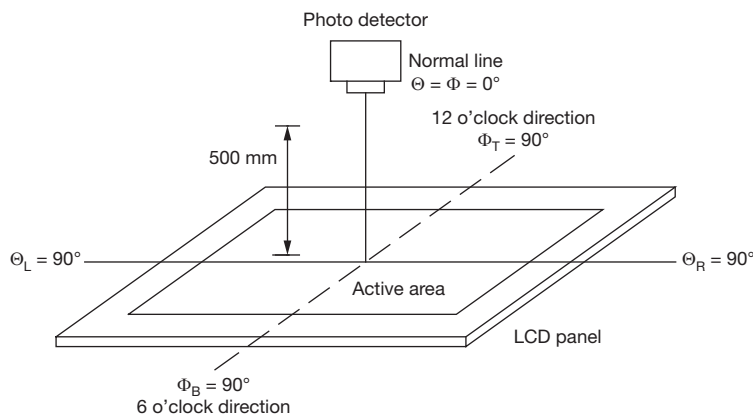


Fig. 5 - Optical Measurement System Setup

- (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 %

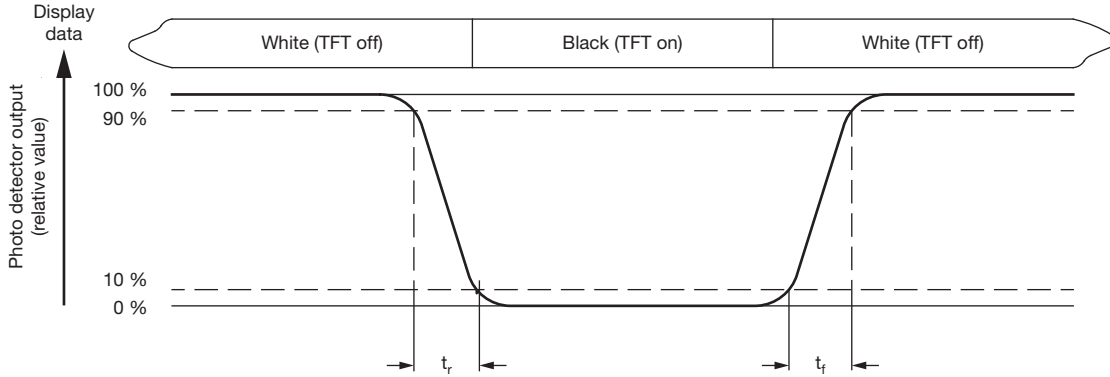


Fig. 6

- (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

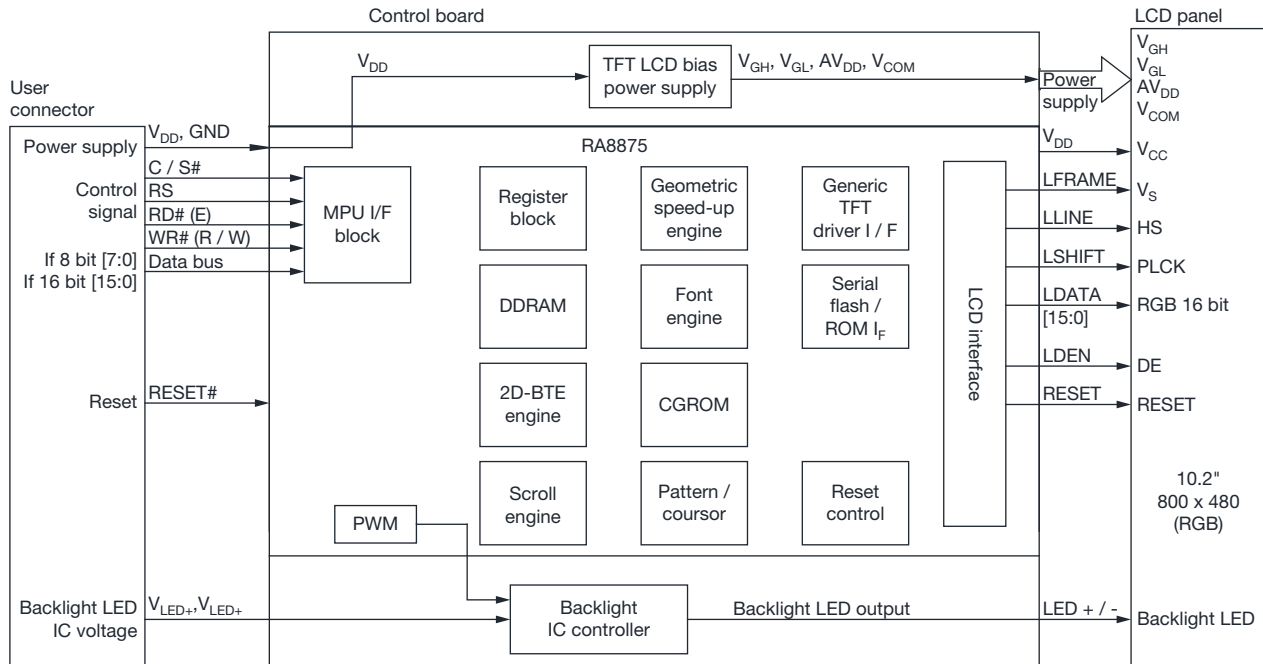
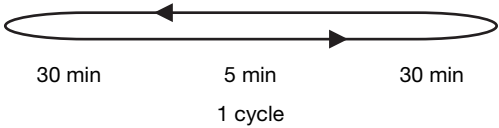


Fig. 7



RELIABILITY		
ENVIRONMENTAL TEST		
TEST ITEM	CONTENT OF TEST	TEST CONDITION
High temperature storage ⁽¹⁾	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 ⁽²⁾	Endurance test applying the electric stress under low temperature for a long time.	-20 °C, 200 h
High temperature / humidity operation ⁽¹⁾⁽²⁾	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 1 cycle</p>	-20 °C / 70 °C, 10 cycles
Vibration test ⁽³⁾	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 = ± 600 V (contact), ± 800 V (air), R _S = 330 Ω, 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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