DMC DMC Co., Ltd. **DUSH**

10.1" Wide (WSVGA)

Projected Capacitive Touchscreen Display

Simple Set

TK-S Series

Model: TK-SPA101WS-111

Simplified Specification

25A4A7-00010-1

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1 GENERAL DESCRIPTION

1-1 OVERVIEW

TK-SPA101WS-111 is a 10.1" (10.1" diagonal) a-Si & transmissive type thin film transistor liquid crystal display (TFT-LCD) module with LVDS interface. The module is composed of a TFT-LCD panel, driver circuit, backlight unit and projected capacitive touchscreen.

1-2 TFT LCD MODULES SPECIFICATIONS

The following items are characteristics summary on the table under 25℃ condition :

Parameter	Specifications	Unit
Screen Size	10.1(diagonal)	inch
LCD Outline Dimension	255.0 (H) x 161.0 (V) x 8.53 (D) (T.B.D)	mm
LCD Active Area	222.72(H) x 125.28(V)	mm
Resolution	1024 (H) x (R,G,B) x 600 (V)	
Pixel Pitch	0.2175(H) x 0.2088(V)	mm
Pixel Arrangement	RGB Vertical Stripe	
Display Mode	Normally Black	
Display Colors	16.7M	
View direction	All	
Luminance, White	440	cd/m^2
LCD Interface	LVDS	
Surface treatment	Clear	
Weight	(T.B.D)	g
RoHS Compliance	Yes	

1-3 TOUCHSCREEN SPECIFICATIONS

Parameter	Specifications	Unit
Method	Projected Capacitive	
Touchscreen Structure	Cover Glass + Film/Film (GFF)	
Host Interface	I2C (3.3V), USB	

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2 BLOCK DIAGRAM

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I2C  <------------------------------------->  ┌─────────────────────┐
                                              │ Projected capacitive│
USB  <------------------------------------->  │     touchscreen     │
                                              └─────────────────────┘

RXIN0(+/-)  ──────►  ┌───────────────┐
RXIN1(+/-)  ──────►  │               │   ┌──────────┐        ┌─────────────────┐
RXIN2(+/-)  ──────►  │   Driver and  │──►│  Gate    │  ====► │  10.1" TFT-LCD   │
RXIN3(+/-)  ──────►  │   Controller  │   │  Singal  │        │                  │
RXCLKIN(+/-)──────►  │               │   └──────────┘        │                  │
VDD         ──────►  │               │                       │                  │
GND         ──────►  │               │                       │       ▲          │
                     │               │                    ▲  └───────║──────────┘
                     │               │                    ║          │
                     │               │──────────────────► │ Source Signal │
                     └───────────────┘                    └───────────────┘

LED_VCC  ──────►  ┌───────────────┐
LED_EN   ──────►  │ Backlight Unit│──────►  ┌───────────────┐
LED_PWM  ──────►  │               │         │ Backlight Unit│
                  └───────────────┘         └───────────────┘
```
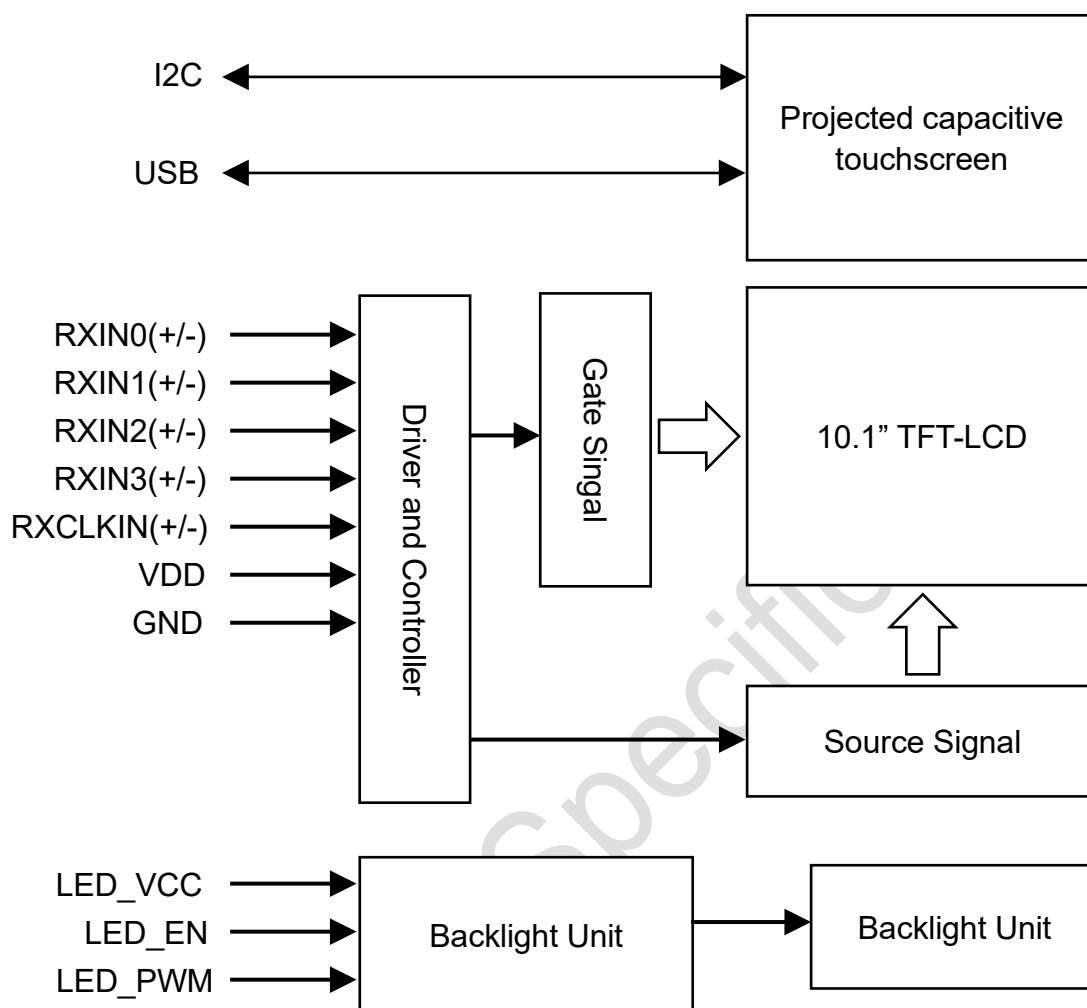
3 ABSOLUTE MAXIMUM RATINGS

3-1 ABSOLUTE RATINGS OF ENVIRONMENT

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Operating temperature	TOP	-20	70	°C	Ambient temperature
Storage temperature	TST	-30	80	°C	Ambient temperature

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4 TFT LCD MODULE SPECIFICATIONS

4-1 ELECTRICAL ABSOLUTE RATINGS

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power Supply voltage	V_{DD}	-0.5	3.96	V	

Note1: Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.

Note2: Liquid Crystal driving voltage Due to the characteristics of LCM Material, this voltage varies with environmental temperature

## 4-2 ELECTRICAL CHARACTERISTICS
4-2-1 TFT LCD MODULE

Ta=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V_{DD}	3.0	3.3	3.6	V	
Power Supply Current	I_{DD}		TBD		mA	V_{DD} =3.3V

4-2-2 BACKLIGHT UNIT SPECIFICATION

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage for LED Driver		LED_VCC	11	12	13	V	
EN Control level	Backlight ON	LED_EN	1.5	-	-	V	
	Backlight OFF		-	-	0.4	V	
PWM Control level	High Level	LED_PWM	1.5	-	-	V	
	Low Level		-	-	0.4	V	
PWM Control Duty Ratio		-	1	-	100	%	
PWM Control Frequency		F_{PWM}	100		30k	Hz	
LED Forward Voltage		VF	14.5	15.0	16.0		
LED Forward Current		IF	-	129	-	mA	
Power Consumption		P_{LED}	1.87	1.94	2.06	W	
LED Life Time		LT	50,000	-	-	Hours	

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4-3 PIXEL FORMAT IMAGE

1 Pixel = 3 Dots

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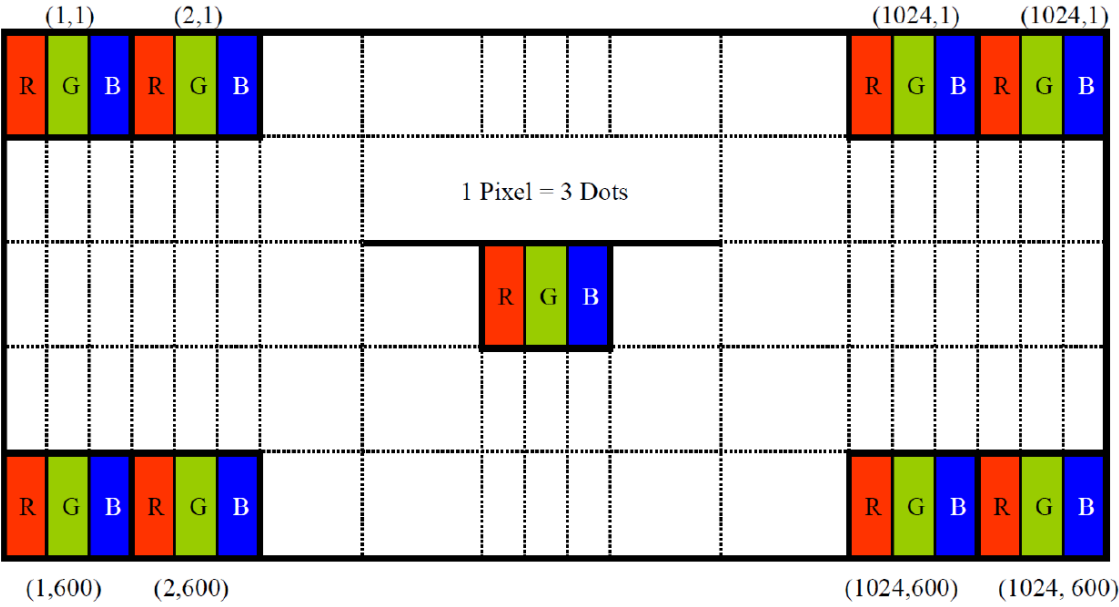
4-4 INTERFACE CONNECTION

Connector   Manufacturer I-PEX

Model Number 20455-040E-12 or equivalent

Pin No.	Symbol	Function
1	LED_VCC	Power supply for LED driver IC
2	LED_VCC	Power supply for LED driver IC
3	LED_VCC	Power supply for LED driver IC
4	NC	Not connect
5	LED_EN	Backlight enable input. High: On; Low: Off
6	LED_PWM	Backlight PWM dimming control input.
7	NC	Not connect
8	GND	Ground
9	GND	Ground
10	GND	Ground
11	NC	Not connect
12	NC	Not connect (1K ohm to GND)
13	GND	Ground
14	NC	Not connect (1K ohm to VDD)
15	NC	Not connect (1K ohm to GND)
16	GND	Ground
17	NC	Not connect
18	NC	Not connect
19	GND	Ground
20	RXIN3+	Positive LVDS differential data input
21	RXIN3-	Negative LVDS differential data input
22	GND	Ground
23	RXCLKIN+	Positive LVDS differential clock input
24	RXCLKIN-	Negative LVDS differential clock input
25	GND	Power ground
26	RXIN2+	Positive LVDS differential data input
27	RXIN2-	Negative LVDS differential data input
28	GND	Ground
29	RXIN1+	Positive LVDS differential data input
30	RXIN1-	Negative LVDS differential data input
31	GND	Power ground
32	RXIN0+	Positive LVDS differential data input
33	RXIN0-	Negative LVDS differential data input
34	NC	Not connect
35	NC	Not connect
36	NC	Not connect
37	NC	Not connect
38	VDD	Power supply for TFT LCD
39	VDD	Power supply for TFT LCD
40	NC	Not connect

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5 TOUCHSCREEN SPECIFICATIONS

5-1 MECHANICAL CHARACTERISTICS

Parameter	Value
Operating Life	Input (finger) 5,000,000 hits
Light Transmittance	Min 87%
Surface Hardness	(T.B.D)
Surface Treatment	None (Clear)

5-2 TOUCHSCREEN CONTROLLER SPECIFICATIONS

Item		Specifications	Remark
Host Interface		I2C, USB	
Number to Output		10 [Finger]	
Report rate		100Hz	Note1
I2C Interface	Support mode	Standard-mode, Fast-mode	
	Data Rate	Standard-mode : 100KHz Fast-mode : 400KHz	
USB Interface	USB Standards	USB2.0 Full-Speed	

Note 1   Values are for 5 points. Varies depending on usage environment and conditions.

5-3 ELECTRICAL ABSOLUTE RATINGS

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power Supply Voltage	V_{DD_I2C}	-0.3	3.63	V	I2C

5-4 ELECTRICAL CHARACTERISTICS
5-4-1 I2C INTERFACE

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V_{DD}	2.97	3.3	3.63	V	
Power Supply Current	I_{DD}		75		mA	Operation
			20		mA	Idle
"H" level logical input voltage	V_{IH}	0.9	-	3.63	V	
"L" level logical input voltage	V_{IL}	0	-	0.5	V	
"H" level logical output voltage	V_{OH}	V_{DD}-0.4	-	V_{DD}	V	
"L" level logical output voltage	V_{OL}	0		0.4	V	

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5-4-2　USB INTERFACE

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply Current	I_{DD}		85		mA	Operation
			40		mA	Idle
"H" level logical input voltage	V_{IH}	0.9	-	3.63	V	RESET
"L" level logical input voltage	V_{IL}	0	-	0.5	V	RESET

5-5　INTERFACE CONNECTION
5-5-1　I2C INTERFACE CONNECTION
Connector　　Manufacturer CONTACT TECHNOLOGY

Model Number FPC05L-1506-BHF-S304 or Compatible

| Pin No.	Symbol	Function
1	VDD	Power supply for Touchscreen
2	SCL	I2C Clock
3	SDA	I2C Data
4	INT	I2C Interrupt
5	RESET	Terminal for external reset signal input. Setting this pin "active Low(L)" makes the Touchscreen controller to the reset. Minimum pulse width 10msec.
6	GND	Ground

5-5-2　USB INTERFACE CONNECTION
Connector　　Manufacturer JST

Model Number SM06B-SRSS-TB or Compatible

Mating Connecter Model Number SHR-06V-S-B

Pin No.	Symbol	Function
1	VBUS	VBUS (5V), Power supply for Touchscreen
2	D-	USB D-
3	D+	USB D+
4	USB_GND	USB Ground
5	RESET	Terminal for external reset signal input. Setting this pin "active Low(L)" makes the Touchscreen controller to the reset. Minimum pulse width 10msec.
6	GND	Ground

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6 OPTICAL SPECIFICATIONS

6-1 OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle	Horizontal	Θx+	CR≥10	-	85	-	Deg.	Note 1,4
		Θx-		-	85	-		
	Vertical	Θy-		-	85	-		
		Θy+		-	85	-		
Contrast ratio		CR	At optimized viewing angle	-	800	-		Note 1,3
Response time		Tr+Tf	θ=0°	-	30	40	ms	Note 1,6
Uniformity		B-uni	θ=0°	75	80	--	%	Note 1,5
Luminance of white			θ=0°	380	440	--	cd/m2	Note 1,2
White chromaticity	Wx		θ=0°	Typ -0.05	0.311	Typ +0.05		Note 1,7
	Wy				0.323			

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C. The measurement method is shown in Note1.

Note1: The method of optical measurement
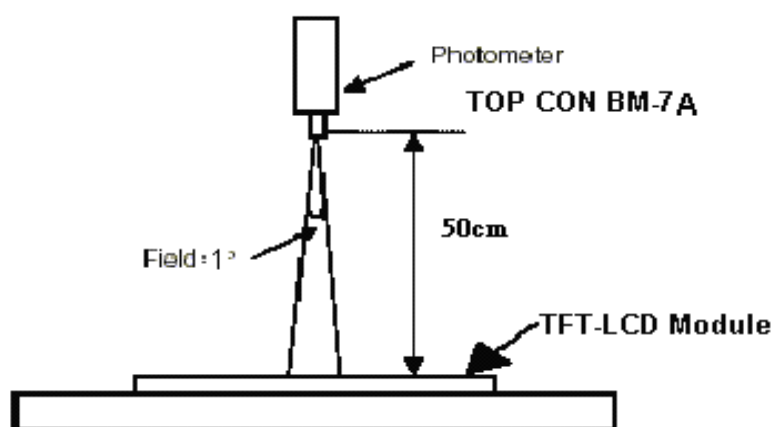
Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°
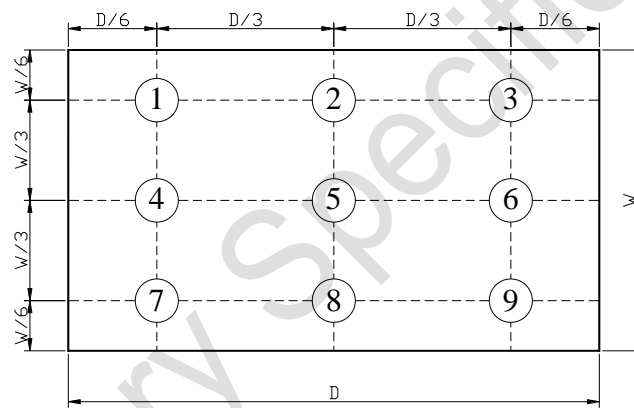
Note3: Definition of contrast ratio (CR):

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)}=\frac{\text{Luminance with all pixels in White state}}{\text{Luminance with all pixels in Black state}}$$

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Note 4: Definition of viewing angle:
     Refer to figure as below.
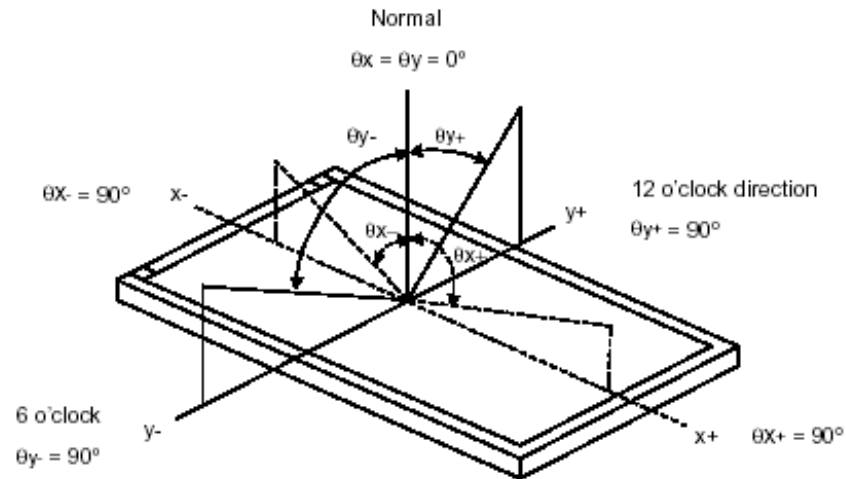
Note 5: Definition of Brightness Uniformity (B-uni):

$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \qquad \text{(Note 5)}.$$

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Note6: Definition of Response Time:

The Response Time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. Tr and Tf are defined as following figure.
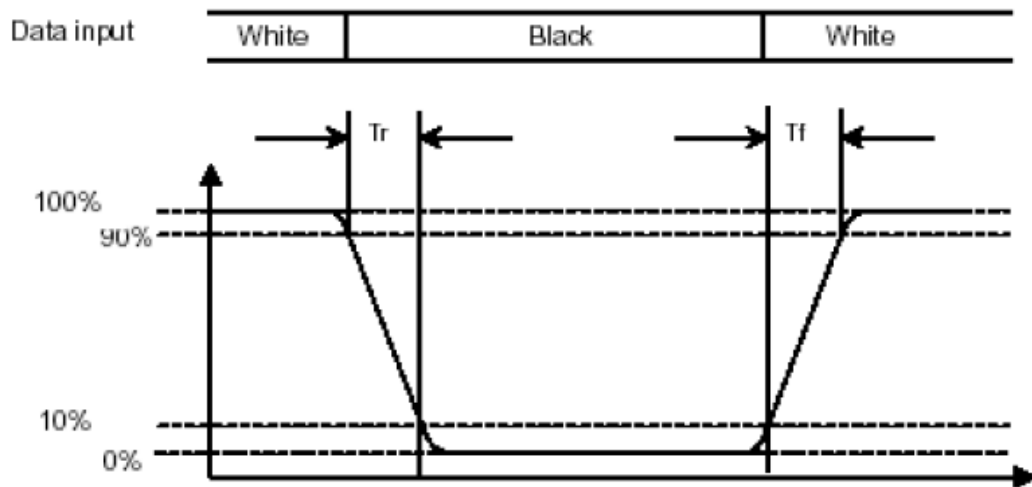
Note 7: Definition of Chromaticity:

The color coordinates (Wx,Wy), are obtained with all pixels in the viewing field at white states, respectively.

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7 MECHANICAL SPECIFICATIONS

7-1 OUTLINE DRAWING

(T.B.D)

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8 PACKAGING

(T.B.D)

9 PRECAUTION

9-1 HANDLING PRECAUTIONS

(1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.

(2) Be sure to fix the LCD when mounting the module to a chassis. Since the LCD and the touchscreen are attached with double-sided tape, the LCD may fall off if only the touchscreen side is fixed.

(3) For stable brightness and display, connect the GND via the mounting hole on the LCD.

(4) Make sure the specified temperature and humidity between the module and other structures or parts are taken into consideration to secure ventilation.

(5) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.

(6) Use fingerstalls or soft gloves in order to keep the display clean during the incoming inspection and assembly process.

(7) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they are left on panel for a long time.

(8) The LCD contains irritants inside. If by any chance the liquid should flow out due to damage and come in contact with the skin, wash immediately under running water for more than 15 minutes and consult a physician.

(9) LCD may have uneven brightness depending on the contents displayed. Please note that this is not a malfunction.

(10) LCD elements may have spots (black spots/ bright spots). This is a characteristic of the LCD and not a malfunction.

(11) When the screen is viewed outside the viewing angle, the color displayed may appear to change. This is a basic characteristic of the LCD and not a malfunction.

(12) When the same image is displayed for a certain long period of time, the image may remain as an afterimage. This is a basic characteristic of the LCD.
In order to avoid afterimages, use a screensaver or other similar functions to periodically change the displayed image and avoid displaying the same image for a long period of time.

(13) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.

(14) Operators should take anti-static measures such as wearing earthing bands for grounding.

(15) To prevent malfunction or damage, make sure the connectors of the connecting cables are inserted securely.

(16) Do not disassemble the module.

(17) Do not pull or fold the LED wire.

(18) Pins of I/F connector should not be touched directly with bare hands.

(19) This product is intended for use in general electronic equipment and is not intended for use in special environments such as a corrosive gas atmosphere. If use in a special environment is anticipated, please evaluate thoroughly or take precautions not to expose the LCD to corrosive gases, etc.

(20) This product is intended for use in standard applications (office equipment, industrial, communication, household equipment, etc.). Do not use the products for special applications that require extremely high reliability (e.g., aerospace, nuclear power control, medical applications for life support, etc.) or where malfunctions or failures may directly cause injuries to the human body.

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(21) Do not rub or press the product with hard or sharp objects.

(22) Keep away from flames/fire.

(23) Avoid wiping the product with excessive pressure.

(24) Avoid locally rubbing the product with strong pressure. It may cause damage to the function of the touchscreen.

(25) Do not pull off or disassemble the product.

(26) If there are changes in the ambient environment or some elements that change electric fields (capacitors with large capacity, power units, and materials with high permittivity such as metals) are close to the product, they might affect the coordinate detection. Make sure to keep a good distance from the above unstable elements as much as possible when designing.

(27) The touchscreen surface is made of glass. Glass becomes easy to break if scratched. Please handle with care and avoid glass from hitting other glass and hard objects.

(28) Due to the characteristics of the touchscreen, a position slightly outside the displayed area might be recognized as a coordinate position. Please give adequate consideration to it and design applications.

(29) Be careful when handling the end face of the glass as operators easily get injured.

9-2 STORAGE PRECAUTIONS

(1) High temperature or humidity may reduce the performance of the module. Please store LCD module at room temperature: 25+/-5℃, humidity: 30~65%.

(2) It is dangerous that moisture comes into or contacts the LCD module, because the moisture may damage LCD module when it is operating.

(3) It may reduce the display quality if the ambient temperature is lower than 10 ºC. For example, the response time will become slow and the starting voltage of LED will be higher than the room temperature.

(4) When storing the product, use the packing box and keep the product within the specified storage temperature and humidity and in an environment where it is free of excessive pressure and loads.

9-3 OPERATION PRECAUTIONS

(1) Do not pull the I/F connector in or out while the module is operating.

(2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

(3) When used outside the specification standards, it may significantly affect the product quality and service life, such as degradation of display quality and generation of air bubbles. Please be sure to use it within the standards.

(4) Touchscreen may not operate correctly when there is moisture on the surface.
    When moisture is detected on the touchscreen surface, please wipe it dry before use.

(5) When operating the product, please avoid striking it with a hard object.

(6) Avoid using the product in direct sunlight.

10 Warranty

The warranty period is limited to 12 months (1 year) from the date of shipment. Any defects that occur upon normal use under conditions specified herein will be repaired (factory repair) free of charge. (Warranty for any repair needed to the same repaired part of the same product is three months.)

You will be liable for all repair fees even within the warranty period for any conditions listed below.
(1) Any malfunctions, defects, and/or damages that occurred during transport, transfer, or mishandling by the user after delivery.
(2) Any malfunctions, defects, and/or damages caused by natural or man-made disaster.
(3) If the product is used under any condition, environment, or method other than those specified in the specifications, catalogs, manuals, notes, and/or other documents.
(4) Any malfunctions, defects, and/or damages caused by connected equipment and/or usage of inappropriate consumables and media.
(5) If the product is repaired, remodeled, modified, or disassembled by a party other than DMC Co., Ltd, or if a serial number label cannot be verified.
(6) Any failure, damage, or malfunction is deemed to be caused on your behalf.

This warranty covers only the product itself. No warranty is provided for damage, on-site repair, or replacement resulting from product failure.

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