

MDT020000R	240x320	SPI Interface	TFT Module
Specification			
Version: 1		Date: 10/10/2020	
Revision			
1	08/10/2020	First issue	

Display Features		 RoHS compliant	
Display Size	2.00"		
Resolution	240x320		
Orientation	Portrait		
Appearance	RGB		
Logic Voltage	1.8V		
Interface	SPI		
Brightness	360 cd/m ²		
Touchscreen	RTP		
Module Size	35.40 x 48.40 x 3.30 mm		
Operating Temperature	-20°C ~ +70°C		
Pinout	15 way FFC		
Pitch	0.50 mm		
		Created By	Checked By
		CL	TSB
		Box Quantity	Weight / Display
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DESIGN • MANUFACTURE • SUPPLY

* - For full design functionality, please use this specification in conjunction with the ST7789V2 display driver specification.(Provided Separately)

Display Accessories	
Part Number	Description
MDIB-CC1	Interconnect board for standard pitch pinouts to fine pitch wires. Providing pinouts for 2.54 pinout. 1.27, 1, 0.845, 0.8, 0.7, 0.65, 0.62, 0.6, 0.5 & 0.3 pads.

Optional Variants	
Appearances	Voltage



1. GENERAL SPECIFICATIONS

Item	Contents	Unit
LCD TYPE	TFT	
MODULE SIZE(W*H*T)	35.40*48.40*3.30	mm
ACTIVE SIZE(W*H)	30.6 (H) x 40.8 (V)	mm
Pixel Size	0.0425 (H) x 0.1275 (V)	mm
NUMBER OF DOTS	240 x RGB x 320	
DRIVER IC	ST7789V2	
INTERFACE TYPE	SPI	
RECOMMEND VIEWING DIRECTION	ALL	O'CLOCK
GRAY SCALE INVERSION DIRECTION	-	O'CLOCK
COLORS	262K	
BACKLIGHT TYPE	4-DIES WHITE LED	
TOUCH PANEL TYPE	RTP	

Touch Panel Features

Type:	4-Wire Analogy Resistive Touch Panel
Input Mode:	Stylus or Finger
ITO Film:	0.3 mm (T)
ITO Glass:	0.7 mm (T)
Connector:	FPC

TOUCH PANEL MECHANICAL CHARACTERISTICS

Surface Hardness: 3H or more (according to JIS-K5400).

TOUCH PANEL OPTICAL CHARACTERISTICS

Transmittance: 80% Typical.

TOUCH PANEL RATING

TOUCH PANEL ELECTRICAL CHARACTERISTICS

1. Resistance between Terminals

Direction "Y": 190~418Ω

Direction "X": 330~726Ω

2. Linearity

X axis: $\leq \pm 1.5\%$

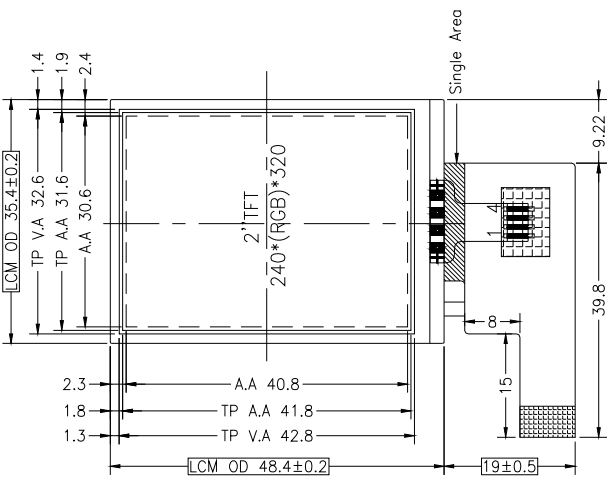
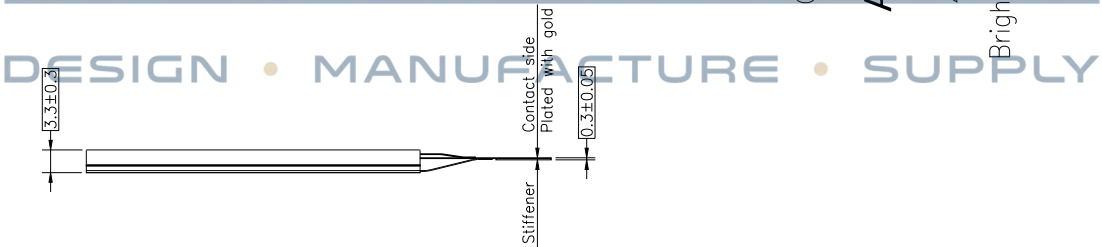
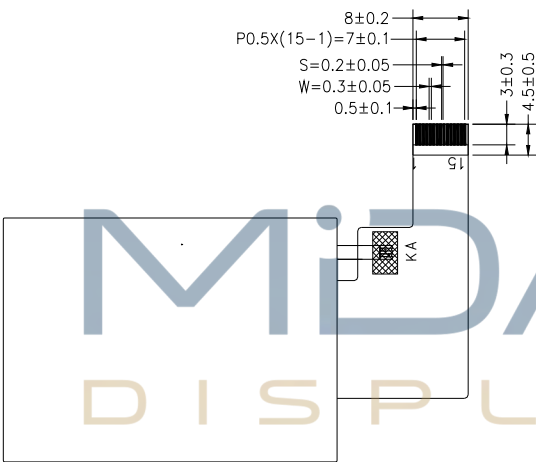
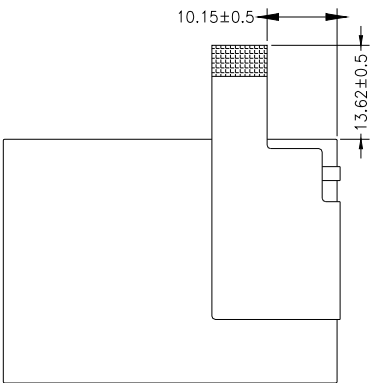
Y axis: $\leq \pm 1.5\%$

3. Insulation Resistance: 20MΩ or more at DC 25 V.

4. Chattering Time: 10 msec or less at 100kΩ Pull-up.



2. EXTERNAL DIMENSIONS



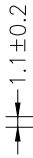
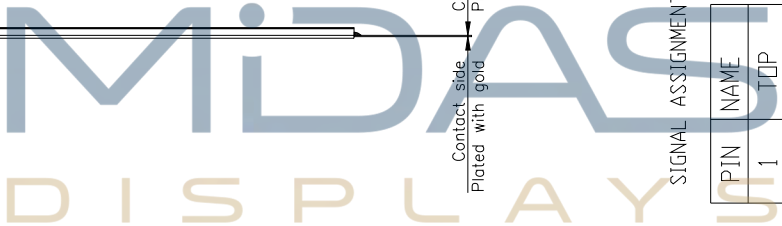
Circuit Diagram



40mA @ 6.3V

Brightness 360cd/m² (TYP)

- Remark:
- 1. Unmarked tolerance is ±0.3
 - 2. All materials comply with RoHS
 - 3. ...critical dimension.



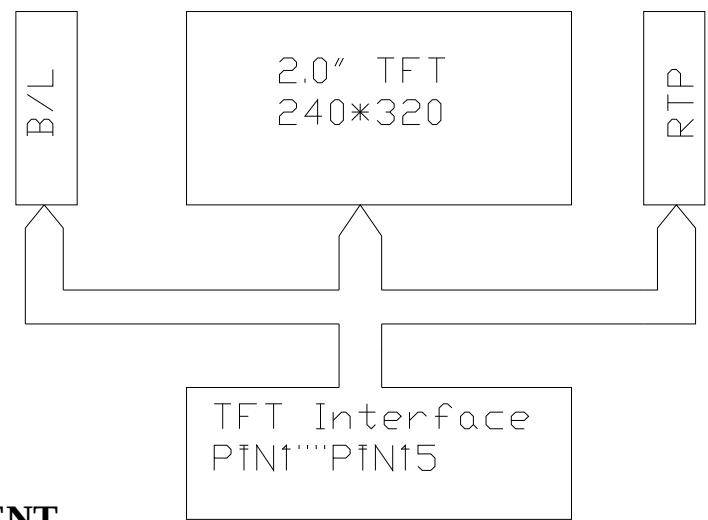
PIN	NAME
1	TOP
2	LEFT
3	BOTTOM
4	RIGHT

REMARK:

1. Glass THK:0.7mm
2. Total THK:1.1±0.2mm
3. Linearity:±1.5% or less
4. Transmittance:80% Typical
5. Resistance
330<X<726 ohm
190<Y<418 ohm
6. Connector:FPC
7. For prevention of detach of FPC from Glass,add
taping and gluing(Like LCD module)
8. Operating Force:20~100g
9. Silicon Rubber Measuring Head Contact Area: $\phi 0.3\text{mm} \sim \phi 0.8\text{mm}$
9. General Tolerance:±0.3mm.
10. All materials comply with RoHS
11. critical dimension.

RTP02008

3.BLOCK DIAGRAM



4. PIN ASSIGNMENT

PIN NO.	Symbol	Function
1	LED+	Backlight LED Power
2	LED-	Backlight LED Ground
3	TE	Tearing effect signal is used to synchronize MCU to frame memory writing.If not used, please let this pin open
4	SDA	The data is latched on the rising edge of the SCL signal.
5	WRX	Display data/command selection pin in 4-line serial interface.
6	SCL	This pin is used to be serial interface clock.
7	CSX	Chip selection pin.
8	RESX	This signal will reset the device and it must be applied to properly initialize the chip. -Signal is active low.
9	VDDI(1.8V)	Power supply for logic circuit
10	VDD(2.75V)	Power supply for analog circuit.
11	GND	Ground
12	YU	Touch panel control
13	XL	Touch panel control
14	YD	Touch panel control
15	XR	Touch panel control

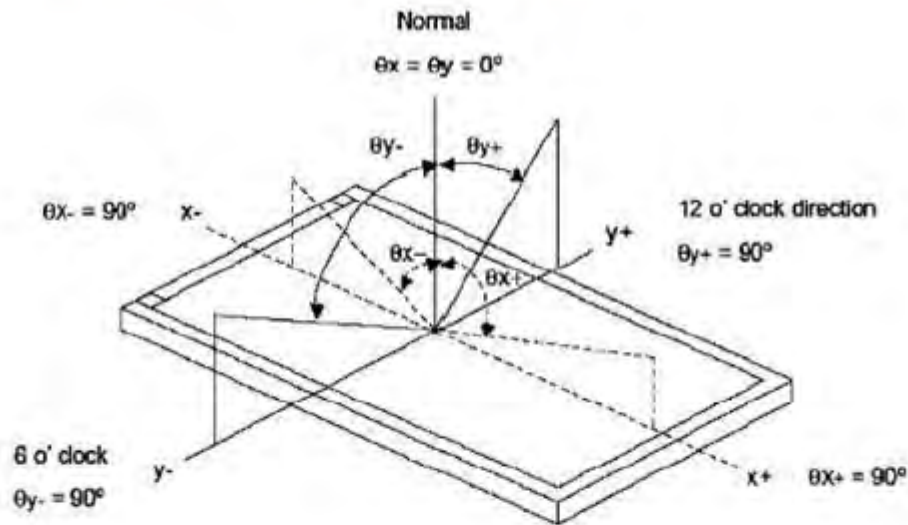


5. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN	TYP.	MAX		
Luminance		L			360		Cd/m²	
Contrast ratio		CR	$\theta = 0^\circ$	640	800			
Response time		T _{ON}			30	40	ms	
		T _{OFF}						
CIE COLOUR COORDINATE	RED	RX	VIEWING NORMAL ANGLE					
		RY						
	GREEN	GX						
		GY						
	BLUE	BX						
		BY						
	WHITE	WX		-0.015	0.307	+0.015		
		WY		-0.015	0.344	+0.015		
VIEWING ANGLE	Hor.	θ_{x+}	CR≥10	75	85		Degree	
		θ_{x-}		75	85			
	Ver.	θ_{y+}		75	85			
		θ_{y-}		75	85			



Note 1: Definition of Viewing Angle θ_x and θ_y :

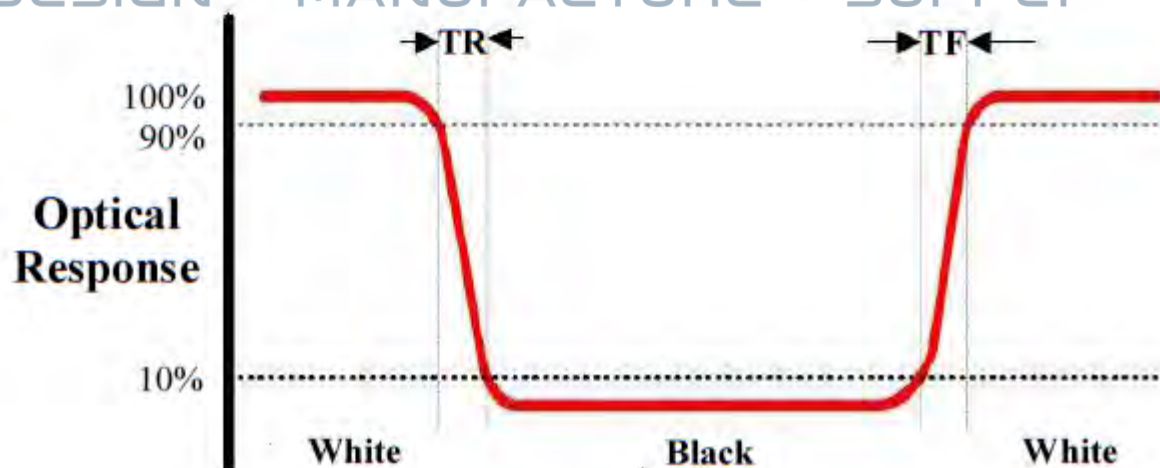


Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

Note 3: Definition of Response Time (T_r, T_f)

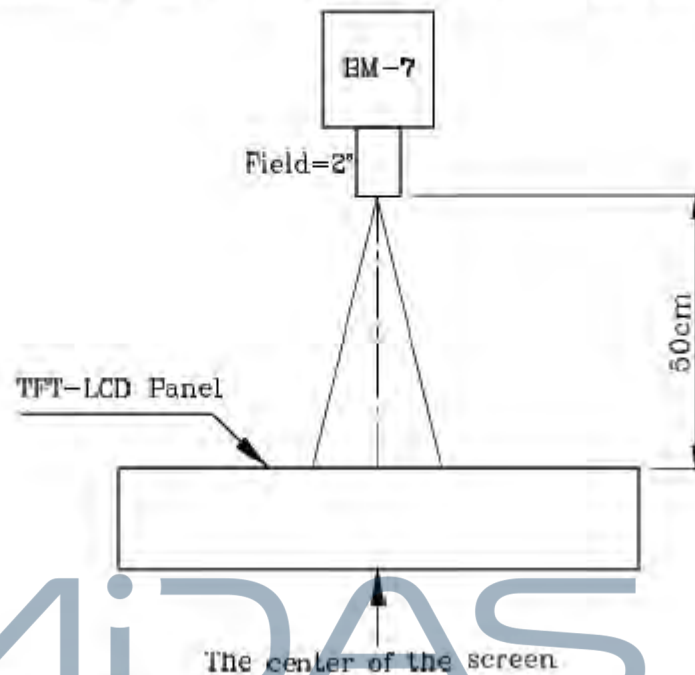
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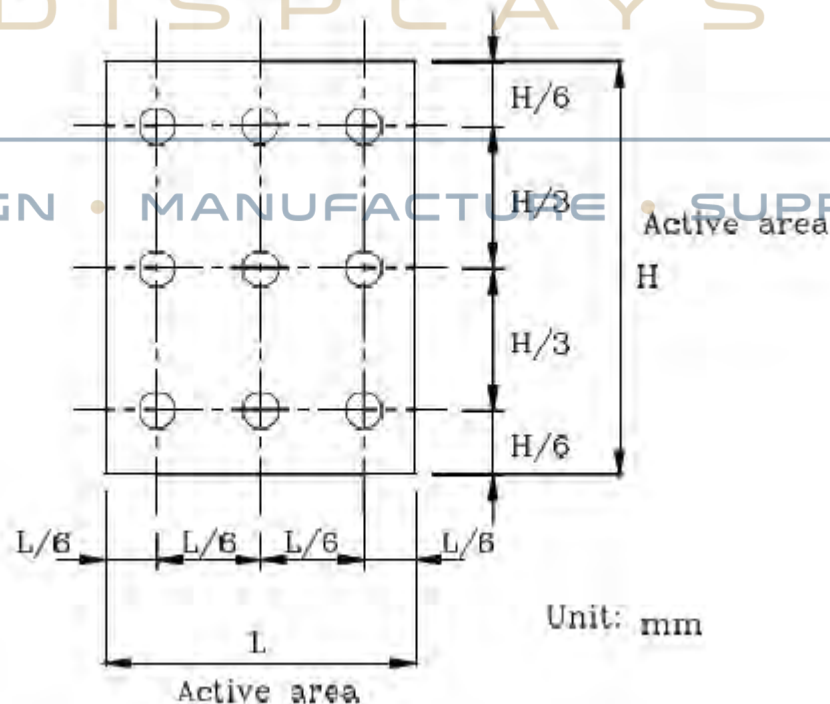
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



②The Brightness Test Point Setup



6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage	VDD	-0.3	4.6	V
Supply voltage for logic	VDDI	-0.3	4.6	V
Supply current (One LED)	I _{LED}		30	mA
Operating temperature	Top	-20	+70	°C
Storage temperature	Tst	-30	+80	°C

7. ELECTRICAL CHARACTERISTICS

7.1 ELECTRICAL CHARACTERISTICS

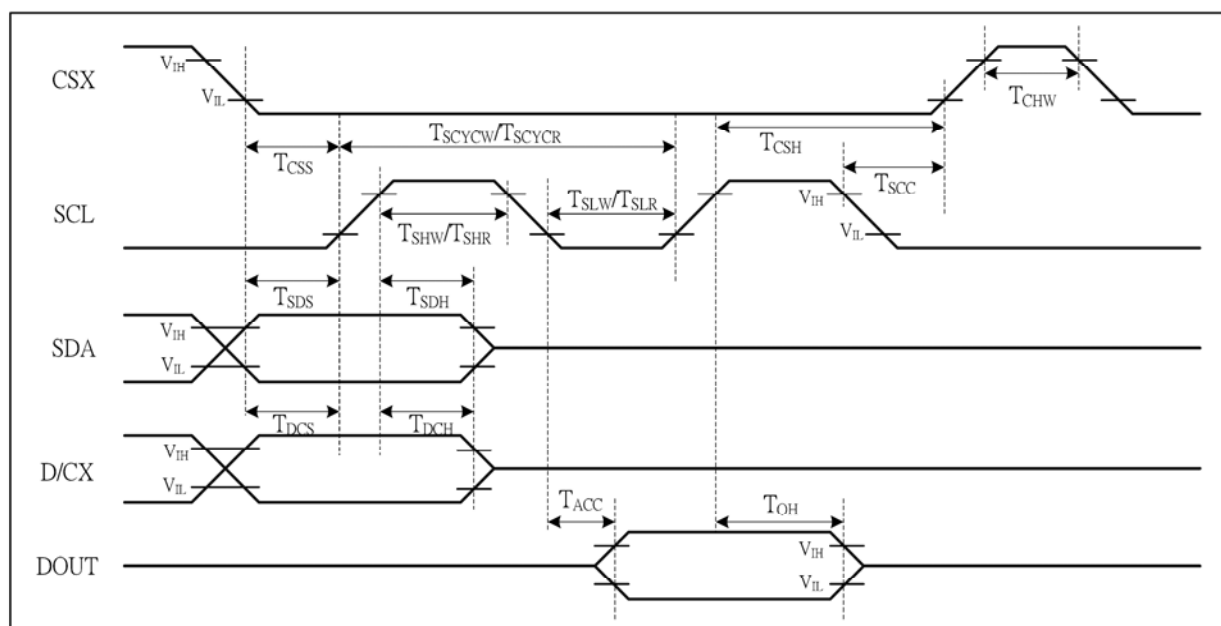
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply	VDD	Ta=25°C	2.4	2.75	3.3	V	
Power supply	VDDI	Ta=25°C	1.65	1.8	3.3	V	
Input voltage	V _{IH}	Ta=25°C	0.7VDDI	-	VDDI	V	
	V _{IL}	Ta=25°C	GND	-	0.3VDDI	V	

7.2 BACKLIGHT CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _r	-	5.8	6.3	6.8	V	
Supply current	I _f	-		40		mA	
Power consumption	P		0.232	0.252	0.272	W	
LED life time	-	-	30,000	-	-	Hr	



8.TIMING CHARACTERISTICS



4-line serial Interface Timing Characteristics

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	16		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SDH}	Data hold time	7		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

4-line serial Interface Characteristics

9.RELIABILITY TEST ITEMS AND CRITERIA

NO.	TEST ITEM	CONDITIONS	
1	HIGH TEMPERATURE STORAGE	TA=+80℃	240H
2	LOW TEMPERATURE STORAGE	TA=-30℃	240H
3	HIGH TEMPERATURE OPERATION	TA=+70℃	240H
4	LOW TEMPERATURE OPERATION	TA=-20℃	240H
5	HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	+60℃, 90%RH	240H



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10. LCD MODULES HANDLING PRECAUTIONS

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If
- The substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD module.
 - Tools required for assembly, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
- Storage precautions
When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

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11. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
 - Exposed area of the printed circuit board
 - Terminal electrode sections.

