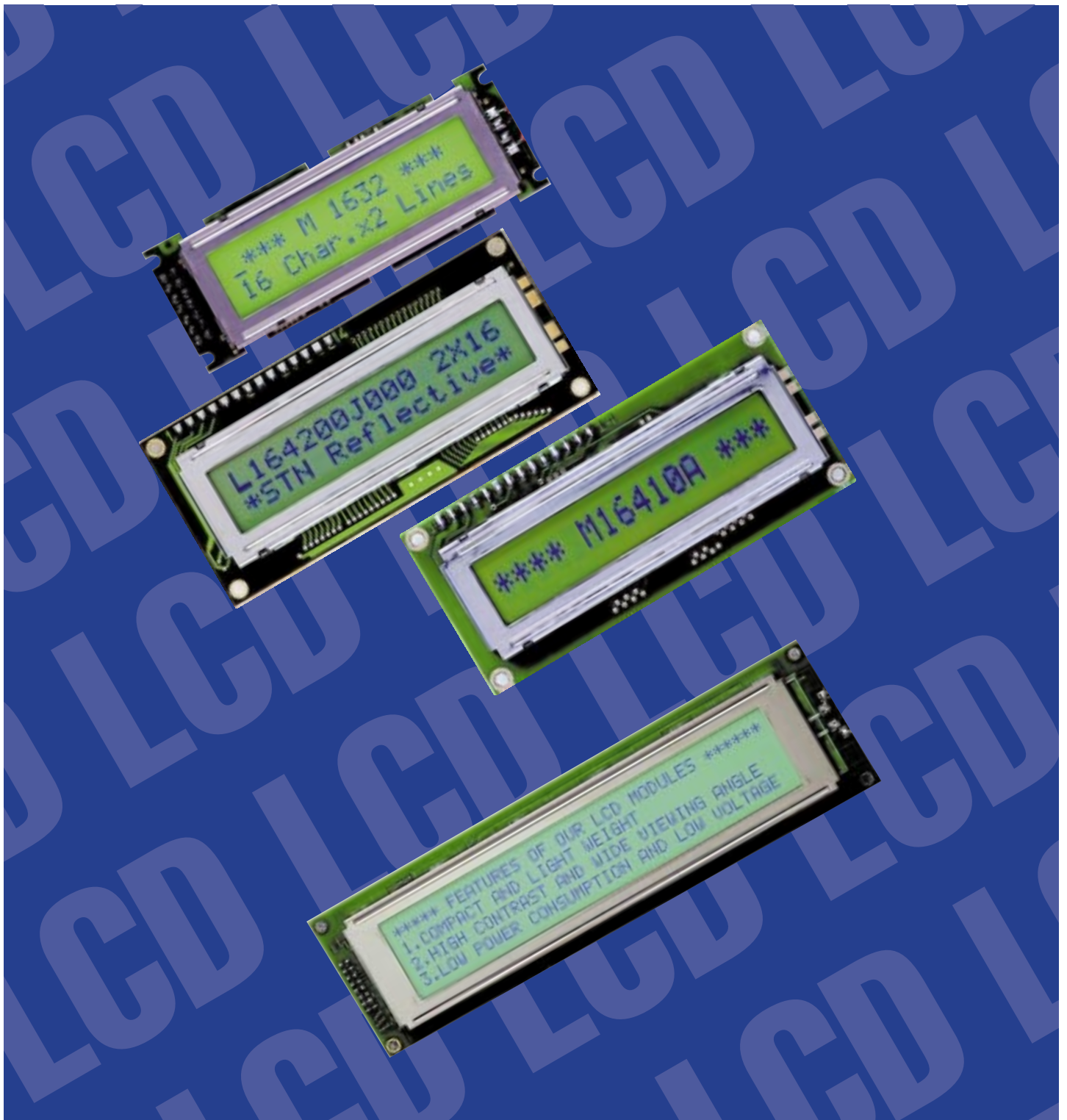


# LCM

Liquid Crystal Display Modules

Seiko Instruments GmbH



# Dot Matrix Liquid Crystal Display Modules

## CHARACTER TYPE

### • FEATURES :

- Slim, light weight and low power consumption
- High contrast and wide viewing angle
- Built-in controller for easy interfacing
- LCD modules with built-in EL or LED backlight



M1641



L1642



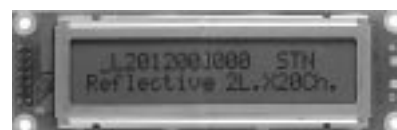
L1614



M1632



L1652



L2012

### • SPECIFICATIONS :

Standard products

Products of optional specification

Character Format (character x line)		16 x 1	16 x 2	16 x 2	16 x 2	16 x 4	20 x 2
Model		M1641	M1632	L1642	L1652	L1614	L2012
Reflective		M16410AS	M16320AS	L164200J000S	L165200J200S	L161400J000S	L201200J000S
EL backlight		M16419DWS	M16329DWS	L164221J000S	L165221J200S	L161421J000S	L201221J000S
LED backlight		M16417DYS	M16327DYS	L1642B1J000S	L1652B1J200S	L1614B1J000S	L2012B1J000S
Reflective (wide temp)		M16410CS	M16320CS	L164200L000S	L165200L200S	L161400L000S	L201200L000S
LED backlight (wide temp)		M16417JYS	M16327JYS	L1642B1L000S	L1652B1L200S	L1614B1L000S	L2012B1L000S
Character font		5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor
Module size (HxVxT) mm	Reflective	80,0 x 36,0 x 11,3	85,0 x 30,0 x 10,1	80,0 x 36,0 x 11,3	122,0 x 44,0 x 11,3	87,0 x 60,0 x 11,6	116,0 x 37,0 x 11,3
	EL backlight	80,0 x 36,0 x 11,3	85,0 x 30,0 x 10,1	80,0 x 36,0 x 11,3	122,0 x 44,0 x 11,3	87,0 x 60,0 x 11,6	116,0 x 37,0 x 11,3
	LED backlight	80,0 x 36,0 x 15,8	80,0 x 30,0 x 15,8	80,0 x 36,0 x 15,8	122,0 x 44,0 x 15,8	87,0 x 60,0 x 15,8	116,0 x 37,0 x 15,8
Viewing area (HxV) mm		64,5 x 13,8	62,0 x 16,0	64,5 x 13,8	99,0 x 24,0	61,8 x 25,2	83,0 x 18,6
Character size (HxV) mm *1		3,07 x 5,73	2,78 x 4,27	2,95 x 3,80	4,84 x 8,06	2,95 x 4,15	3,20 x 4,85
Dot size (HxV) mm		0,55 x 0,75	0,50 x 0,55	0,50 x 0,55	0,92 x 1,10	0,55 x 0,55	0,60 x 0,65
Power supply voltage (VDD-VSS) V		+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V
Current consumption (mA,typ)	IDD	1,5	2,0	1,6	2,0	2,7	2,0
	ILC *4	0,2	0,2	0,3	0,4	1,1	0,4
Driving method (duty)		1/16	1/16	1/16	1/16	1/16	1/16
Built-in LSI		KS0066 or equivalent	KS0066 MSM5839 or equivalent	KS0066 MSM5839 or equivalent	KS0066 MSM5839 or equivalent	KS0066 KS0063 or equivalent	KS0066 KS0063 or equivalent
Operating temperature (°C)	normal temp.	0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50
	wide temp. *2	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70
Storage temperature (°C)	normal temp.	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
	wide temp.	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80
Weight (g, typ.)	Reflective	25	25	25	50	50	40
	EL backlight	30	30	30	55	55	45
	LED backlight	35	40	35	65	65	60
Inverters for EL	Model	5S	5S	5S	5C	5A	5A
	Power supply (V)	+ 5.0	+ 5.0	+ 5.0	+ 5.0	+ 5.0	+ 5.0
	current consumption (mA) *3	10	10	10	35	45	45
LED backlight	Forward current consumption (mA)	100	112	100	240	200	154
	Forward input voltage (V,typ.)	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1

\*1 : Excluding cursor

H : Horizontal

V : Vertical

T : Thickness (max)

\*2 : With external temperature compensation

\*3 : Including EL backlight

\*4 : Based on normal temperature range

Since our policy is one of continuous improvements we reserve the right to change the specifications for the products in the catalogue without notice.



L2022



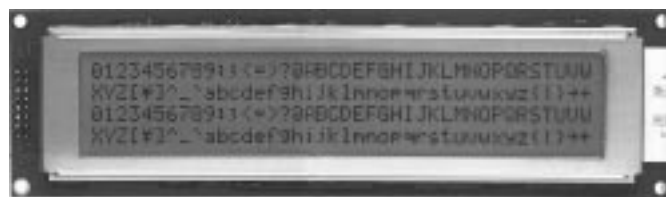
L2014



L2432



L4042



M4024

## • SPECIFICATIONS :

 : Standard products

 : Products of optional specification

Character Format (character x line)		20 x 2	20 x 4	24 x 2	40 x 2	40 x 4
Model		L2022	L2014	L2432	L4042	M4024
Reflective		-	L201400J000S	L243200J000S	L404200J000S	M40240AS
EL backlight		-	L201421J000S	L243221J000S	L404221J000S	M40249DWS
LED backlight		-	L2014B1J000S	L2432B1J000S	L4042B1J000S	M40247DYS
Reflective (wide temp)		L202200P000S	L201400L000S	L243200L000S	L404200L000S	M40240CS
LED backlight (wide temp)		L2022B1P000S	L2014B1L000S	L2432B1L000S	L4042B1L000S	M40247JYS
Character font		5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor	5x7 dots + cursor
Module size (HxVxT) mm	Reflective	180,0 x 40,0 x 10,5	98,0 x 60,0 x 11,6	118,0 x 36,0 x 11,3	182,0 x 33,5 x 11,3	190,0 x 54,0 x 10,1
	EL backlight	180,0 x 40,0 x 10,5	98,0 x 60,0 x 11,6	118,0 x 36,0 x 11,3	182,0 x 33,5 x 11,3	190,0 x 54,0 x 10,1
	LED backlight	180,0 x 40,0 x 14,8	98,0 x 60,0 x 15,8	118,0 x 36,0 x 15,8	182,0 x 33,5 x 16,3	190,0 x 54,0 x 16,3
Viewing area (HxV) mm		149,0 x 23,0	76,0 x 25,2	94,5 x 17,8	154,4 x 15,8	147,0 x 29,5
Character size (HxV) mm *1		6,00 x 9,66	2,95 x 4,15	3,20 x 4,85	3,20 x 4,85	2,78 x 4,27
Dot size (HxV) mm		1,12 x 1,12	0,55 x 0,55	0,60 x 0,65	0,60 x 0,65	0,50 x 0,55
Power supply voltage (VDD-VSS) V		+ 5 V	+ 5 V	+ 5 V	+ 5 V	+ 5 V
Current consumption (mA,typ)	IDD	4,2	2,9	2,5	3,0	8,0
	ILC *4	2,6	1,2	0,5	1,0	3,0
Driving method (duty)		1/16	1/16	1/16	1/16	1/16
Built-in LSI		KS0066 KS0063 or equivalent	KS0066 MSM5839 or equivalent	KS0066 KS0063 or equivalent	KS0066 KS0063 or equivalent	KS0066 MSM5839 or equivalent
Operating temperature (°C)	normal temp.	-	0 to + 50	0 to + 50	0 to + 50	0 to + 50
	wide temp. *2	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70	- 20 to + 70
Storage temperature (°C)	normal temp.	-	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
	wide temp.	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80	- 30 to + 80
Weight (g, typ.)	Reflective	80	55	40	70	90
	EL backlight	-	60	45	75	105
	LED backlight	110	70	60	95	140
Inverters for EL	Model	-	5A	5A	5C	5D
	Power supply (V)	+ 5.0	+ 5.0	+ 5.0	+ 5.0	+ 5.0
	current consumption (mA) *3	-	45	45	25	80
LED backlight	Forward current consumption (mA)	320	240	150	260	480
	Forward input voltage (V,typ.)	+ 4,1	+ 4,1	+ 4,1	+ 4,1	+ 4,1

\*1 : Excluding cursor

H : Horizontal

V : Vertical

T : Thickness (max)

\*2 : With external temperature compensation

\*3 : Including EL backlight

\*4 : Based on normal temperature range

# Dot Matrix Liquid Crystal Display Modules

## GRAPHIC TYPE

### • FEATURES :

- Wide viewing angle and high contrast
- Full dot configuration fits any application

- Slim, light weight and low power consumption
- Available in STN and FSTN

### • SPECIFICATIONS :

Dot format (HxV, dot)			97 x 32	128 x 32	128 x 64	128 x 64
Model			Y97031	G1213	G1216	G1226
STN type (Gray mode)	Reflective	built-in RAM	-	-	-	-
	Reflective wide temp.	built-in RAM	-	G121300N000S	G121600N000S	-
	LED backlight	built-in RAM	-	-	-	G1226B1J000S
	LED backlight wide temp.	built-in RAM	-	G1213B1N000S	G1216B1N000S	-
FSTN type (B&W mode)	Transmissive	-	-	-	-	-
	with CFL backlight	built-in controller	-	-	-	-
	Transflective	built-in RAM	Y97031LF60W	-	-	-
Module size (H x V x T) mm	Reflective (no backlight)		47,5 x 65,4 x 2,1	75,0 x 41,5 x 6,8	75,0 x 52,7 x 6,8	-
	LED backlight		-	75,0 x 41,5 x 8,9	75,0 x 52,7 x 8,9	93,0 x 70,0 x 11,4
	CFL backlight		-	-	-	-
Viewing area (HxV) mm			43,5 x 23,9	60,0 x 21,3	60,0 x 32,5	70,7 x 38,8
Dot size (H x V) mm			0,35 x 0,48	0,40 x 0,48	0,40 x 0,40	0,44 x 0,44
Dot pitch (H x V) mm			0,39 x 0,52	0,43 x 0,51	0,43 x 0,43	0,48 x 0,48
Power supply voltage (V)	(VDD - VSS)		+ 5,0	+ 5,0	+ 5,0	+ 5,0
	(VLC - VSS)		-	- 8,0	- 8,1	- 8,2
Current consumption (mA, typ.)	IDD		0,10	2,0	2,0	3,0
	IDD (built-in controller)		-	-	-	-
	ILC		-	1,8	1,8	2,0
Driving method (duty)			1/33	1/64	1/64	1/64
Built-in LSI	Driver	SED1530		HD61202	HD61202	KS0107
		or equivalent		HD61203	HD61203	KS0108
	Controller	-	-	-	-	-
Operating temperature range (°C)			- 20 to + 70	- 20 to + 70	- 20 to + 70	0 to + 50
Storage temperature range (°C)			- 30 to + 80	- 30 to + 80	- 30 to + 80	- 20 to + 60
Weight (g, typ.)	Reflective (Transflective no backlight)		10	23	35	-
	LED backlight		-	35	45	72
	CFL backlight		-	-	-	-
LED backlight	Forward current consumption (mA)		-	40	90	125
	Forward input voltage (V, typ.)		-	3,8	4,1	4,1
Inverter for CFL	Mode		-	-	-	-
	Power supply voltage (V)		-	-	-	-
	Current consumption (mA, typ.)		-	-	-	-

\*1 : built-in DC/DC converter (single power source)

\*2 : Use with external temperature compensation circuit

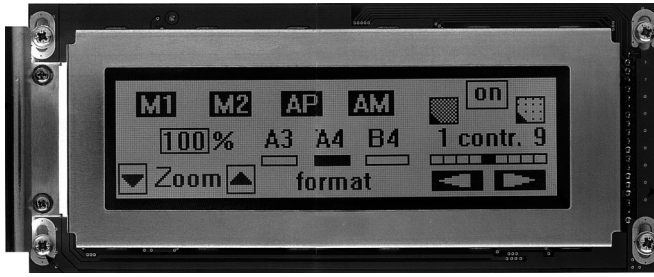
Since our policy is one of continues improvements we reserve the right to change the specifications of the products in the catalogue without notice.

Dot format (HxV, dot)			240 x 64	240 x 128	320 x 200	320 x 240	640 x 200
Model			G2446	G242C	G321D	G324E	G649D
STN type (Gray mode)	Reflective	built-in RAM	-	-	-	-	-
	Reflective wide temp.	built-in RAM	-	-	-	-	-
	LED backlight	built-in RAM	-	-	-	-	-
	LED backlight wide temp.	built-in RAM	-	-	-	-	-
FSTN type (B&W mode)	Transmissive	-	G2446X5R1A0S	G242CX5R1ACS	G321DX5R1A0S	G324EX5R1A0S	G649DX5R010S
	with CFL backlight	built-in controller	G2446X5R1ACS	G242CX5R1A0S	G321DX5R1ACS	G324EX5R1ACS	-
	Transflective	built-in RAM	-	-	-	-	-
Module size (H x V x T) mm	Reflective (no backlight)						
	LED backlight						
	CFL backlight		191,0 x 79,0 x 15,1	180,0 x 110,0 x 15,1	166,0 x 134,0 x 15,1	166,0 x 134,0 x 15,1	260,0 x 122,0 x 15,7
Viewing area (HxV) mm			134,0 x 41,0	134,0 x 76,0	128,0 x 110,0	128,0 x 110,0	216,0 x 83,0
Dot size (H x V) mm			0,49 x 0,49	0,47 x 0,47	0,34 x 0,48	0,32 x 0,39	0,30 x 0,36
Dot pitch (H x V) mm			0,53 x 0,53	0,51 x 0,51	0,38 x 0,52	0,36 x 0,43	0,33 x 0,39
Power supply voltage (V)	(VDD - VSS)		+ 5,0	+ 5,0	+ 5,0	+ 5,0	+ 5,0
	(VLC - VSS)		*1	*1	-24,0	-24,0	-24,0
Current consumption (mA, typ.)	IDD		12	30	8	7,5	11
	IDD (built-in controller)		15	40	23	23	-
		IIC	-	-	6	6,5	9
Driving method (duty)			1/64	1/128	1/200	1/240	1/200
Built-in LSI	Driver		MSM5298 MSM5299 or equivalent	KS0103 KS0104 or equivalent	MSM5298 MSM5299 or equivalent	HD66204 HD66205 or equivalent	MSM5298 MSM5299 or equivalent
	Controller		SED1330FB	SED1330FB	SED1330FB	SED1330FB	-
Operating temperature range (°C)			0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50
Storage temperature range (°C)			- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60	- 20 to + 60
Weight (g, typ.)	Reflective (Transflective no backlight)		-	-	-	-	-
	LED backlight		-	-	-	-	-
	CFL backlight		200	280	350	350	420
LED backlight	Forward current consumption (mA)		-	-	-	-	-
	Forward input voltage (V, typ.)		-	-	-	-	-
Inverter for CFL	Mode		4800210	4800210	4800210	4800210	4800120
	Power supply voltage (V)		+ 5,0	+ 5,0	+ 5,0	+ 5,0	+ 12,0
	Current consumption (mA, typ.)		250	350	365	365	390

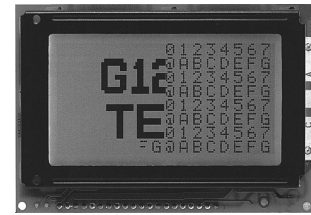
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\*2 : Use with external temperature compensation

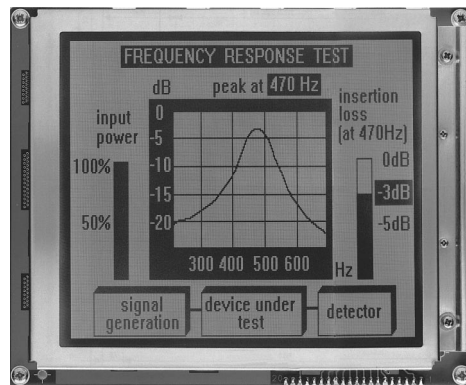
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G2446



G1226



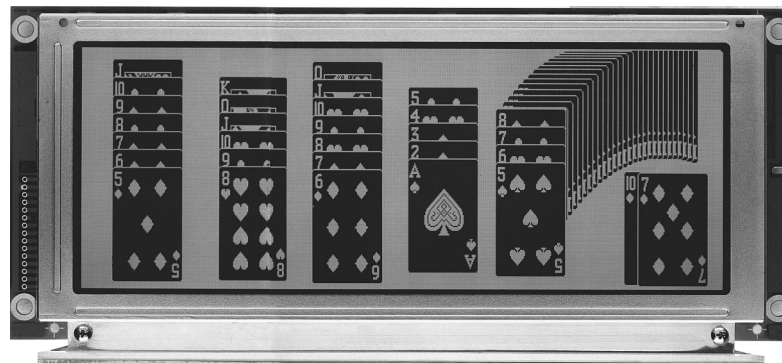
G321D



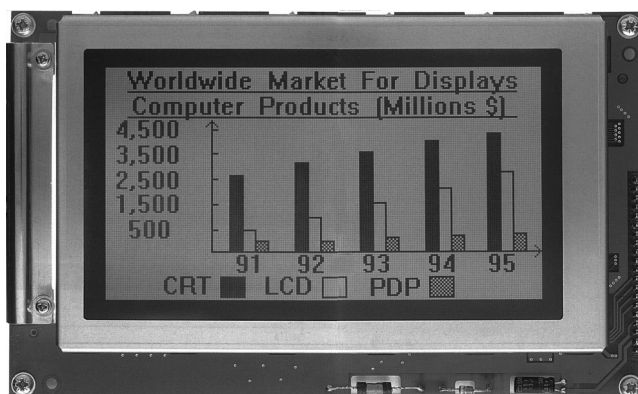
G1216



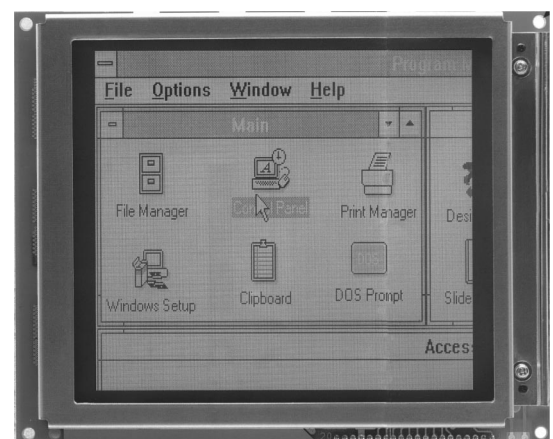
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G649D



G242C



G324E



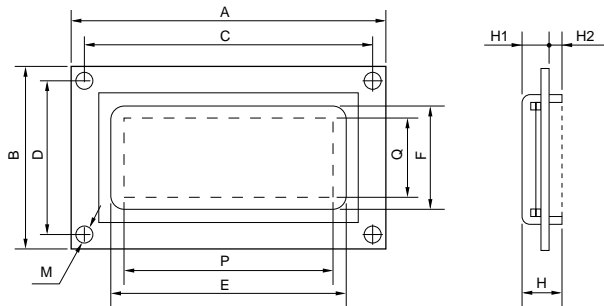
# CHECK LIST FOR CUSTOM DESIGNED LCD MODULE

1. Company \_\_\_\_\_ 2. Application \_\_\_\_\_ 3. Customer Specified Part No. \_\_\_\_\_

## 4. Design

☐ New ☐ Modified : Manufacturer \_\_\_\_\_, Part No. \_\_\_\_\_, Remarks \_\_\_\_\_  
☐ Equivalent: Manufacturer \_\_\_\_\_, Part No. \_\_\_\_\_, Remarks \_\_\_\_\_

## 5. LCM Dimensions



A x B : Module size \_\_\_\_\_ x \_\_\_\_\_ mm  
E x F : Viewing area \_\_\_\_\_ x \_\_\_\_\_ mm  
P x Q : Active display area \_\_\_\_\_ x \_\_\_\_\_ mm  
C : Length between mounting holes \_\_\_\_\_ mm  
D : Length between mounting holes \_\_\_\_\_ mm  
M : Diameter of mounting hole \_\_\_\_\_ mm  
H : Total thickness \_\_\_\_\_ mm  
H1 : Upper thickness \_\_\_\_\_ mm  
H2 : Lower thickness \_\_\_\_\_ mm

## 6. Display Contents

☐ Character type: \_\_\_\_\_ characters \_\_\_\_\_ lines  
Character font \_\_\_\_\_ x \_\_\_\_\_ dots + cursor  
Character pitch \_\_\_\_\_ x \_\_\_\_\_ mm  
Dot pitch \_\_\_\_\_ x \_\_\_\_\_ mm  
Dot size \_\_\_\_\_ x \_\_\_\_\_ mm  
☐ Graphics (Full dot) type: \_\_\_\_\_ x \_\_\_\_\_ dots  
Dot pitch \_\_\_\_\_ x \_\_\_\_\_ mm  
Dot size \_\_\_\_\_ x \_\_\_\_\_ mm  
☐ Segment type: \_\_\_\_\_ digits \_\_\_\_\_ lines  
☐ Others \_\_\_\_\_

## 7. LCD Panel

Viewing angle: ☐ 6 o'clock ☐ 12 o'clock ☐ \_\_\_\_\_ o'clock  
Type: ☐ TN ☐ FSTN (Black and white)  
☐ STN (☐ Yellow green ☐ Gray ☐ Blue)  
Chromaticity coordinates  
( \_\_\_\_\_ ≤ x ≤ \_\_\_\_\_, \_\_\_\_\_ ≤ y ≤ \_\_\_\_\_ )  
☐ Positive type ☐ Negative type  
☐ Reflective ☐ Transflective ☐ Transmissive  
☐ Others \_\_\_\_\_  
Gray scale: ☐ Yes \_\_\_\_\_ gray scale ☐ No  
Preferential specifications:  
☐ Response time  $t_{on}$  \_\_\_\_\_ ms ( \_\_\_\_\_ °C)  $t_{off}$  \_\_\_\_\_ ms ( \_\_\_\_\_ °C)  
☐ Viewing angle \_\_\_\_\_ deg. ( \_\_\_\_\_ °C) ☐ Contrast \_\_\_\_\_ ( \_\_\_\_\_ °C)  
☐ Others \_\_\_\_\_

LCD surface finishing:

☐ Normal ☐ Anti-glare ☐ \_\_\_\_\_  
Polarizer color: ☐ Normal (neutral gray) ☐ Red  
☐ Green ☐ Blue ☐ \_\_\_\_\_

## 8. Driving Method

Multiplexing: 1/ \_\_\_\_\_ duty, 1/ \_\_\_\_\_ bias  
Frame frequency: \_\_\_\_\_ Hz

## 9. IC

LCD driver: ☐ Specified ☐ Unspecified  
Segment driver \_\_\_\_\_ (Manufacturer \_\_\_\_\_)  
Common driver \_\_\_\_\_ (Manufacturer \_\_\_\_\_)  
Controller: ☐ Internal ☐ External  
Type No. \_\_\_\_\_ (Manufacturer \_\_\_\_\_)  
MPU: ☐ Internal ☐ External  
Type No. \_\_\_\_\_ (Manufacturer \_\_\_\_\_)  
RAM: ☐ Internal ☐ External  
Type No. /Memory size \_\_\_\_\_ (Kbit) (Manufacturer \_\_\_\_\_)

## 10. Power Supply

☐ Single power supply: ☐ 5V ☐ \_\_\_\_\_ V  
☐ 2 power supplies  
For logic: (V<sub>DD</sub>-V<sub>SS</sub>) : ☐ 5V ☐ \_\_\_\_\_ V  
For LC drive: (V<sub>LC</sub>-V<sub>SS</sub>) : ☐ \_\_\_\_\_ V

## 11. Temperature Compensation Circuit

☐ Internal ☐ External ☐ Unnecessary  
Compensation range: ☐ 0°C to 50°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C

## 12. Current Consumption

For logic: typ. \_\_\_\_\_ mA, max. \_\_\_\_\_ mA  
For LC drive: typ. \_\_\_\_\_ mA, max. \_\_\_\_\_ mA  
Others ( \_\_\_\_\_ ) : typ. \_\_\_\_\_ mA, max. \_\_\_\_\_ mA

## 13. Contrast Adjustment

☐ Internal ☐ External ☐ Unnecessary  
Method: ☐ Temp. compensation circuit ☐ Volume ☐ \_\_\_\_\_

## 14. Temperature Range

Operating temperature range: ☐ 0°C to 50°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C  
Storage temperature range: ☐ - 20°C to 60°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C

## 15. Input/Output Terminals

Specifying allocation: ☐ Yes ☐ No  
Specifying position: ☐ Yes ☐ No

## 16. Weight

typ. \_\_\_\_\_ g, max. \_\_\_\_\_ g

## 17. Connector

☐ Internal ☐ External ☐ Unnecessary  
Type No. \_\_\_\_\_ (Manufacturer \_\_\_\_\_)

## 18. Backlight

☐ Internal ☐ External ☐ Unnecessary  
☐ EL: ☐ Green ☐ White ☐ \_\_\_\_\_  
☐ LED: ☐ Yellow green ☐ Amber ☐ \_\_\_\_\_  
☐ CFL: ☐ White ☐ \_\_\_\_\_  
☐ Incandescent lamp ☐ Others \_\_\_\_\_  
☐ Backlight type ☐ Edge backlight type  
Brightness: \_\_\_\_\_ cd/m<sup>2</sup>  
Inverter: ☐ Internal ☐ External ☐ Unnecessary  
Power supply voltage \_\_\_\_\_ V  
Current consumption (backlight included) \_\_\_\_\_ mA  
Brightness control: ☐ Yes ☐ No

## 19. Others

## 20. Schedule

Estimate: \_\_\_\_\_  
Sample: Delivery \_\_\_\_\_, Quantity: \_\_\_\_\_ pcs  
Mass production: Target price: \_\_\_\_\_  
Delivery \_\_\_\_\_, Total quantity: \_\_\_\_\_ pcs  
Quantity per month \_\_\_\_\_ pcs

# Liquid Crystal Displays

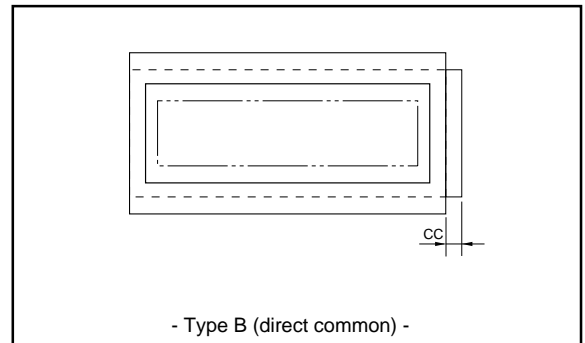
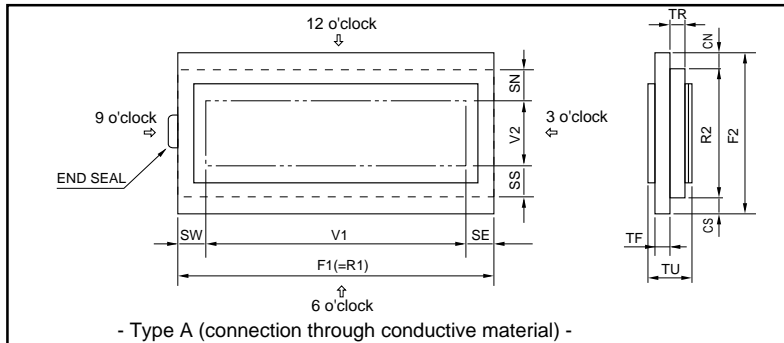
## CHECK LIST FOR CUSTOM DESIGNED LCD

1. Company \_\_\_\_\_ 2. Application \_\_\_\_\_ 3. Customer Specified Part No. \_\_\_\_\_

### 4. Design

☐ New ☐ Modified: Manufacturer \_\_\_\_\_, Part No. \_\_\_\_\_, Remarks \_\_\_\_\_  
☐ Equivalent: Manufacturer \_\_\_\_\_, Part No. \_\_\_\_\_, Remarks \_\_\_\_\_

### 5. Panel Dimensions

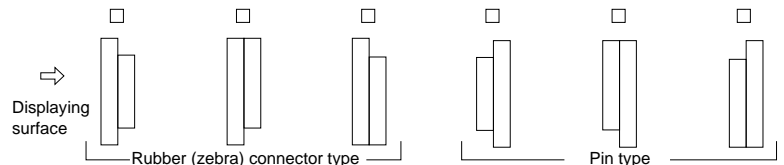
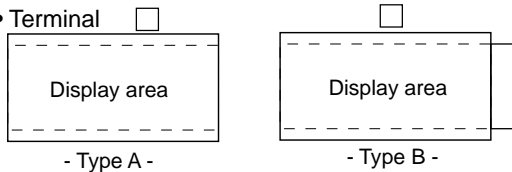


F1: Horizontal length of upper glass \_\_\_\_\_ mm  
 F2: Vertical length of upper glass \_\_\_\_\_ mm  
 R1: Horizontal length of lower glass \_\_\_\_\_ the same as F1  
 R2\*: Vertical length of lower glass \_\_\_\_\_ mm  
 \*R2 is generally longer than F2 when terminals are with pin.  
 TF, TR\*\*\*: Thickness of glass \_\_\_\_\_ mm  
 \*\*\*Standard type: 1.1 mm or 0.7 mm  
 TU: Thickness of LCD \_\_\_\_\_ mm  
 End seal: ☐ Right ☐ Left ☐ Right or Left

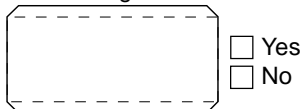
V1: Horizontal length of viewing area \_\_\_\_\_ mm  
 V2: Vertical length of viewing area \_\_\_\_\_ mm  
 CN\*\*: Terminal length \_\_\_\_\_ mm  
 CS\*\*: Terminal length \_\_\_\_\_ mm  
 \*\*CN or CS=0 in case of one side terminal type.  
 CC: Terminal length \_\_\_\_\_ mm  
 SE, SW, SN, SS: Seal width  
 (According to design or manufacturing condition:  
 about 2.0 mm to 4.0 mm)

### 6. Panel Form

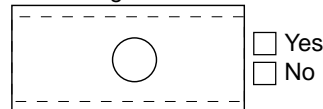
#### • Terminal



#### • Chamfering



#### • Drilling



### 7. Display Mode

Viewing angle: ☐ 6 o'clock ☐ 12 o'clock ☐ \_\_\_\_\_ o'clock  
 Type: ☐ TN ☐ FSTN (Black and white)  
☐ STN: (☐ Yellow green ☐ Gray ☐ Blue)  
 Chromaticity coordinates ( \_\_\_\_\_ ≤ x ≤ \_\_\_\_\_, \_\_\_\_\_ ≤ y ≤ \_\_\_\_\_)  
☐ Positive type ☐ Negative type  
☐ Reflective ☐ Transflective ☐ Transmissive  
 Preferential specifications:  
☐ Response time  $t_{on}$  \_\_\_\_\_ ms ( \_\_\_\_\_ °C)  $t_{off}$  \_\_\_\_\_ ms ( \_\_\_\_\_ °C)  
☐ Viewing angle \_\_\_\_\_ deg. ( \_\_\_\_\_ °C) ☐ Contrast \_\_\_\_\_ ( \_\_\_\_\_ °C)  
☐ Others \_\_\_\_\_

### 8. Polarizer

Surface finishing: ☐ Normal ☐ Anti-glare ☐ \_\_\_\_\_  
 Color: ☐ Normal (neutral gray) ☐ Red ☐ Green  
☐ Blue ☐ \_\_\_\_\_  
 Front polarizer: ☐ Attached type ☐ Separate type  
 Rear polarizer: ☐ Attached type ☐ Separate type

### 9. Driving Method

☐ Static ☐ Multiplexing: (1/ \_\_\_\_\_ duty, 1/ \_\_\_\_\_ bias)  
 Operating voltage ( $V_{opr}$ ): \_\_\_\_\_ V  
 Frame frequency: \_\_\_\_\_ Hz  
 Driving IC: \_\_\_\_\_ (Manufacturer \_\_\_\_\_)  
 Current consumption: \_\_\_\_\_  $\mu$ A

### 10. Temperature Range

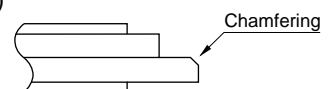
Operating temperature range  
☐ With temperature compensation circuit (or volume)  
☐ 0°C to 50°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C  
☐ Without temperature compensation circuit  
☐ 0°C to 50°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C  
 Storage temperature range  
☐ - 20°C to 60°C ☐ \_\_\_\_\_ °C to \_\_\_\_\_ °C

### 11. Terminal Connecting Method

☐ Rubber connector (Zebra rubber)  
☐ Pin: ☐ DIL ☐ SIL ☐ \_\_\_\_\_  
 Pitch (☐ 2.54 ☐ \_\_\_\_\_ mm) Length ( \_\_\_\_\_ mm)  
☐ Heat seal: ☐ Equipped ☐ Unnecessary

### 12. Others

Print (Characters, lines, masks etc.): ☐ Yes ☐ No  
 Protective film:  
☐ Yes (Color: ☐ Red ☐ Translucent ☐ Transparent) ☐ No  
 Chamfering (for heat-seal connector):  
☐ Yes (Position: \_\_\_\_\_)  
 (Quantity: \_\_\_\_\_)  
☐ No



### 13. Schedule

Estimate: \_\_\_\_\_  
 Sample: Delivery \_\_\_\_\_, Quantity: \_\_\_\_\_ pcs  
 Mass production: Target price: \_\_\_\_\_  
 Delivery \_\_\_\_\_, Total quantity: \_\_\_\_\_ pcs  
 Quantity per month: \_\_\_\_\_ pcs

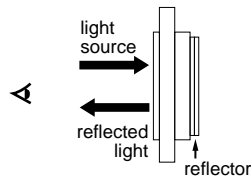


# Liquid Crystal Display Modules

## REFLECTIVE/TRANSFLECTIVE/TRANSMISSIVE LCD

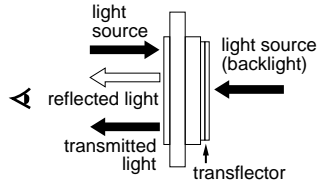
### 1 Reflective LCD

Reflector bonded to the rear polarizer reflects the incoming ambient light. Low power consumption because no backlight is required.



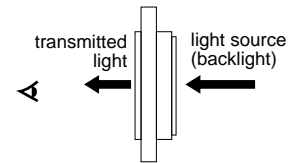
### 2 Transflective LCD

Transflector bonded to the rear polarizer reflects light from the front as well as enabling lights to pass through the back. Used with backlight off in bright light and with it on in low light to reduce power consumption.



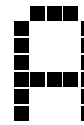
### 3 Transmissive LCD

Without reflector or transflector bonded to the rear polarizer. Backlight required. Most common is transmissive negative image.

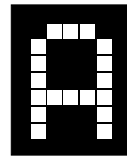


## POSITIVE/NEGATIVE MODE

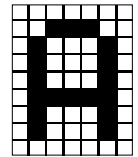
Positive type



Negative type



Negative type (inverse image) (when data is inverted)



## TN TYPE/STN TYPE/FSTN TYPE

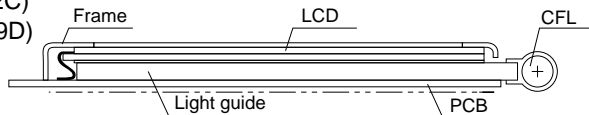
TN	(Background/dot color) Gray/Black	TN(Twisted Nematic) type is most conventional and economical. It is used for static drive LCD and low-duty drive LCD ( watch,calculator, etc.)
STN	Yellowgreen/Dark blue Gray/Dark blue White/Blue	STN (Super Twisted Nematic) type has a higher twist angle, and thus provides clear visibility and wider viewing angle. This is suitable especially for high-duty drive LCD.
FSTN	White/Black	FSTN (Film Super Twisted Nematic) type utilizes RCF (Retardation Control Film) to remove the coloring of STN LCD. Thus FSTN type provides easy-to-read black-and-white display.

## STRUCTURE AND FEATURE OF LCD MODULE WITH BACKLIGHT

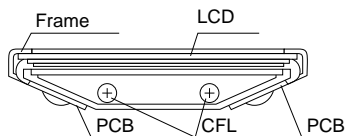
### CFL (Cold Cathode Fluorescent Lamp) backlight

Features: high brightness, long service life, inverter required

- Edge backlight type (G2446,G242C) (G321D,G649D)



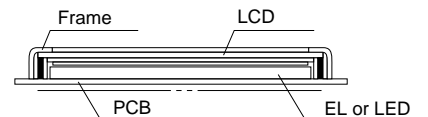
- Backlight type



### EL (Electroluminescent Lamp) backlight LED (Light Emitting Diode) backlight

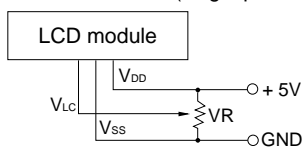
Features: EL: thin, inverter required

LED: long service life, low voltage driving, no inverter required

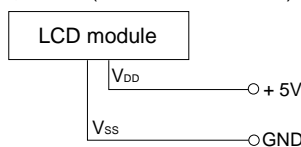


## POWER SUPPLY

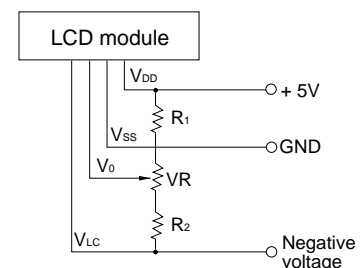
- Character modules (single power supply)



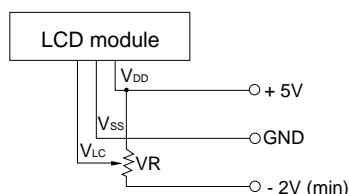
- G2446,G242C (Built-in DC-DC conv.)



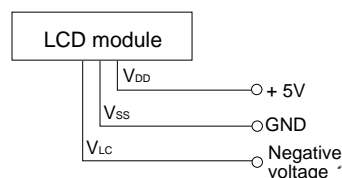
- G321D, G324E and G649D



- Character Modules(Dual power supply)



- Y1206 and G1226



·Negative voltage should be variable for contrast adjustment.

Note 1: Contrast can be adjusted by VR.  
Note 2: For module with backlight, power supply for backlight is necessary.

# Precautions

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## **Safety Instructions**

- If the LCD panel is damaged, be careful not to get the liquid crystal in your mouth and not to be injured by crushed glasses.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then, drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eye, flush your eye with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.
- EL or CFL backlight is driven by a high voltage with an inverter. Do not touch the connection part or the wiring pattern of the inverter.
- Do not use inverters without a load or in the short-circuit mode.
- Use the LCD module within the rated voltage to prevent overheating and/or damage. Also, take steps to ensure that the connector does not come off.

## **Handling Precautions**

- Since the LCD panel has glass substrate, avoid applying mechanical shock or pressure on the module. Do not drop, bend, twist or press the module.
- Do not soil or damage LCD panel terminals.
- Since the polarizer is made of easily-scratched material, be careful not to touch or place objects on the display surface.
- Keep the display surface clean. Do not touch it with your skin.
- CMOS LSI is used in the LCD module. Be careful of static electricity.
- Do not disassemble the module or remove the liquid crystal panel or the panel frame.
- Do not damage the film surface of the EL lamp; otherwise the lamp will be damaged by humidity.
- To set an EL lamp in an LCD module, push the EL lamp with its emitting side up, without pushing the rubber connectors too hard. If you damage them, the LCD module may not work properly.

## **Mounting and Designing**

- To protect the polarizer and the LCD panel, cover the display surface with a transparent plate (e.g., acrylic or glass) with a small gap between the transparent plate and the display surface.
- Keep the module dry. Avoid condensation to prevent the transparent electrodes from being damaged.
- Drive LCD panel with AC waveform in which DC element is not included to prevent deterioration in the LCD panel.
- Contrast of LCD varies depending on the ambient temperature. To offer the optimum contrast, LC drive voltage should be adjusted. LCD driven in a high duty ratio must be provided with drive voltage adjustment method.
- Mount a LCD module with the specified mounting part/holes.

- Design the equipment so that input signal is not applied to the LCD module while power supply voltage is not applied to it.
- Do not locate the CFL tube and the lamp lead wire close to a metal plate or a plated part inside the equipment. Otherwise stray capacity causes a drop in voltage, decreasing the brightness and the ability to start-up.

## **Cleaning**

- Do not wipe the polarizer with a dry cloth, as it may scratch the surface.
- Wipe the LCD panel gently with a soft cloth soaked with a petroleum benzine.
- Do not use ketonic solvents (ketone and acetone) or aromatic solvents (toluene and xylene), as they may damage the polarizer.

## **Storing**

- Store the LCD panel in a dark place, where the temperature is  $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$  and the relative humidity below 65%. If possible, store the LCD panel in the packaging situation when it was delivered.
- Do not store the module near organic solvents or corrosive gases.
- Keep the module (including accessories) safe from vibration, shock and pressure.
- Use an LCD module with built-in EL backlight within six months of delivery.
- EL backlight is easily affected by environmental conditions such as temperature and humidity; the quality may deteriorate if stored for an extended period of time. Contact Seiko Instruments GmbH for details.
- Some parts of the backlight and the inverter generate heat. Take care so that the heat does not affect the liquid crystal or any other parts.
- Dust particles attached to the surface of the LCD or the surface of the backlight degrade the display quality. Be careful to keep dust out in designing the structure as well as in handling the module.
- Black or white air-bubbles may be produced if the LCD panel is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD panel.

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Notes :

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