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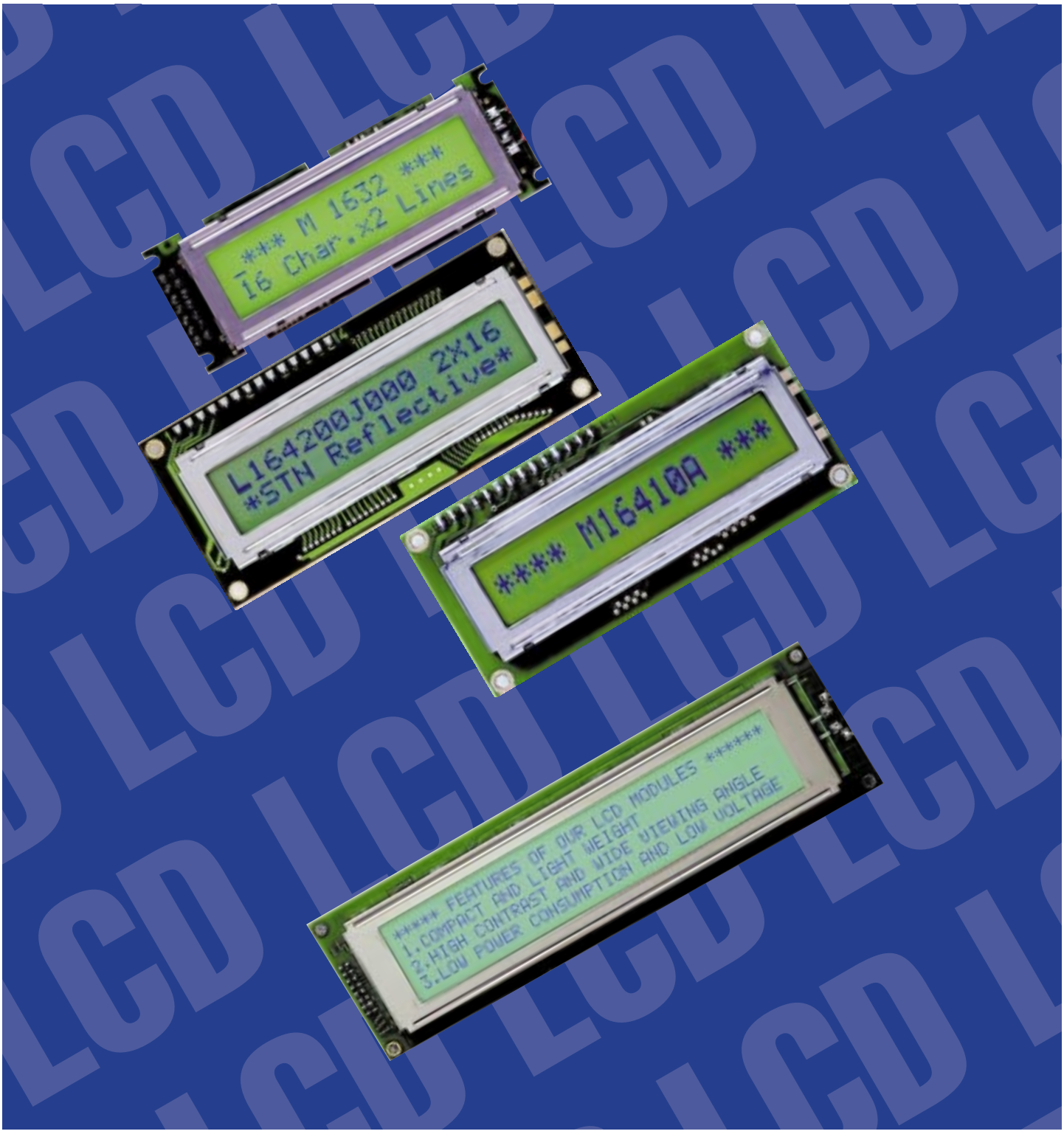
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LCM

Liquid Crystal Display Modules

Seiko Instruments GmbH



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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

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L2022



L2432



L4042



L2014



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

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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	Reflective	built-in RAM	-	-	-	-
(Gray mode)	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	Transmissive	-	-	-	-	-
(B&W mode)	with CFL backlight	built-in controller	-	-	-	-
	Transflective	built-in RAM	Y97031LF60W	-	-	-
Module size	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	-
(H x V x T)	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
mm	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		IDD	0,10	2,0	2,0	3,0
		IDD (built-in controller)	-	-	-	-
(mA, typ.)		ILC	-	1,8	1,8	2,0
Driving method (duty)			1/33	1/64	1/64	1/64
Built-in LSI		Driver	SED1530 or equivalent	HD61202 HD61203 or equivalent	HD61202 HD61203 or equivalent	KS0107 KS0108 or equivalent
		Controller	-	-	-	-
Operating temperature range (ºC)			- 20 to + 70	- 20 to + 70	- 20 to + 70	0 to + 50
Storage temperature range (ºC)			- 30 to + 80	- 30 to + 80	- 30 to + 80	- 20 to + 60
Weight	Reflective (Transflective no backlight)		10	23	35	-
(g, typ.)	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

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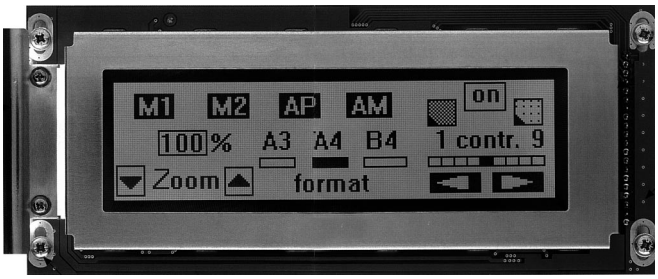
Dot format (HxV,dot)			240 x 64	240 x 128	320 x 200	320 x 240	640 x 200
Model			G2446	G242C	G321D	G324E	G649D
STN type (Gray mode)	Reflective	built-in RAM	-	-	-	-	-
	Reflective wide temp.	built-in RAM	-	-	-	-	-
	LED backlight	built-in RAM	-	-	-	-	-
	LED backlight wide temp	built-in RAM	-	-	-	-	-
FSTN 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	-
		ILC	-	-	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 (ºC)			0 to + 50	0 to + 50	0 to + 50	0 to + 50	0 to + 50
Storage temperature range (ºC)			- 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

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

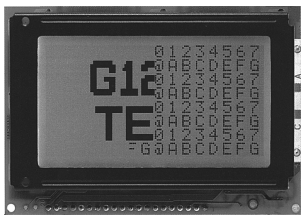
*2 : Use with external temperature compensation

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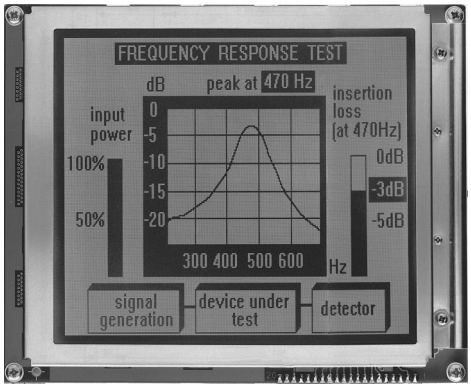
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G2446



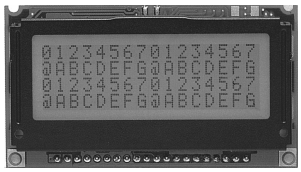
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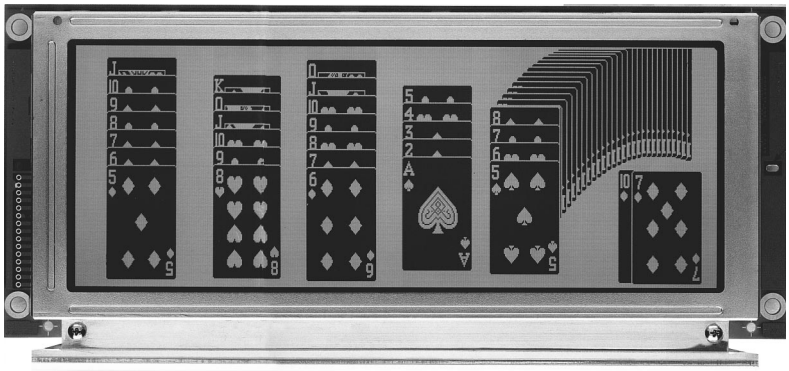
G321D



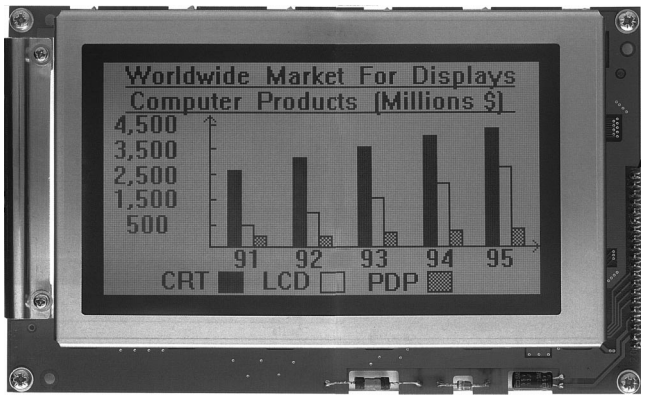
G1216



G1213



G649D



G242C



G324E

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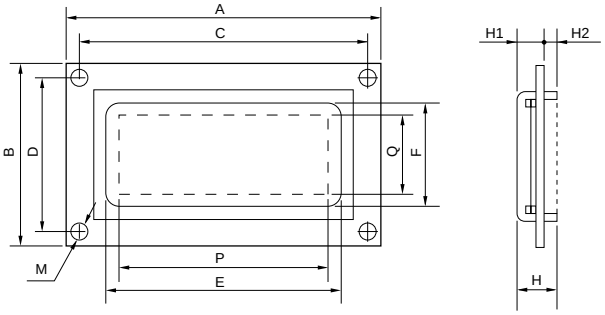
CHECK LIST FOR CUSTOM DESIGNED LCD MODULE

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_{DD}-V_{SS}) : ☐ 5V ☐ _____V
For LC drive: (V_{LC}-V_{SS}) : ☐ _____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^2
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

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CHECK LIST FOR CUSTOM DESIGNED LCD

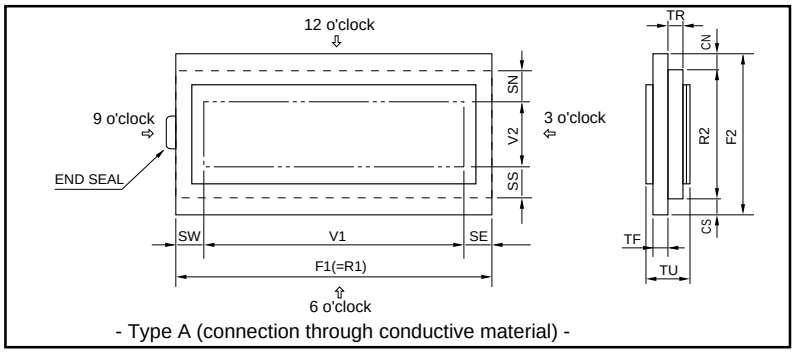
1. Company_____ **2. Application**_____ **3. Customer Specified Part No.**_____

4. Design

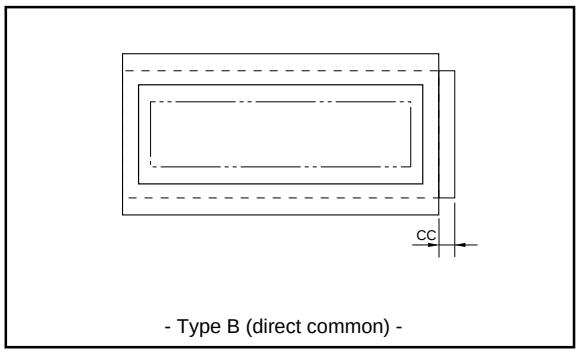
☐New ☐Modified: Manufacturer _____ , Part No. _____ , Remarks _____

☐Equivalent: Manufacturer _____ , Part No. _____ , Remarks _____

5. Panel Dimensions



- Type A (connection through conductive material) -



- Type B (direct common) -

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

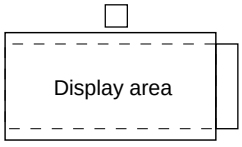
V1 :Horizontal length of viewing area _____ mm
V2 :Vertical length of viewing area _____ mm
CN**: Terminal length _____ mm
CS**:Terminal length _____ mm
**CN or CS=0 in case of one side terminal type.
CC: Terminal length _____ mm
SE,SW,SN,SS : Seal width
(According to design or manufacturing condition: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

6. Panel Form

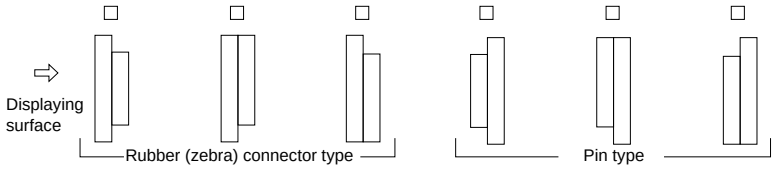
• Terminal ☐



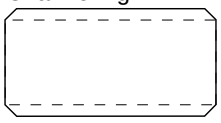
- Type A -



- Type B -

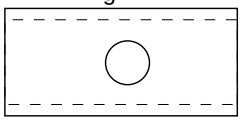


• Chamfering



☐ Yes
☐ No

• Drilling



☐ Yes
☐ No

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: _____ μA

10. Temperature Range

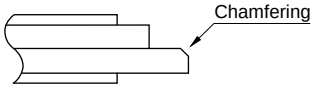
Operating temperature range
☐With temperature compensation circuit (or volume)
(☐ 0°C to 50°C ☐_____°C to_____°C)
☐Without temperature compensation circuit
(☐ 0°C to 50°C ☐_____°C to_____°C)
Storage temperature range
(☐ - 20°C to 60°C ☐_____°C to_____°C)

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

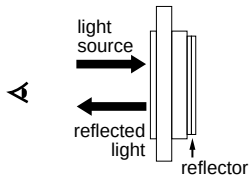
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Liquid Crystal Display Modules

■ REFLECTIVE/TRANSFLECTIVE/TRANSMISSIVE LCD

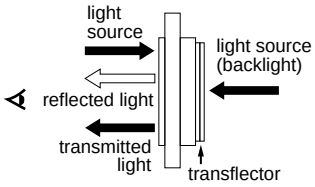
❶ Reflective LCD

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



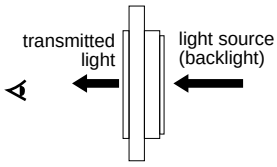
❷ Transflective LCD

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.



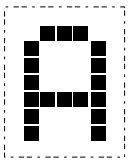
❸ Transmissive LCD

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

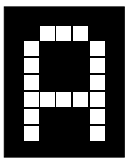


■ POSITIVE/NEGATIVE MODE

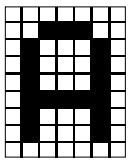
Positive type



Negative type



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



■ TN TYPE/STN TYPE/FSTN TYPE

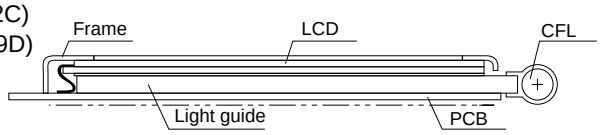
TN	(Background/dot color) Gray/Black	TN(Twisted Nematic) type is most conventional and economical. It is used for static drive LCD and low-duty drive LCD (watch,calculator, etc.)
STN	Yellowgreen/Dark blue Gray/Dark blue White/Blue	STN (Super Twisted Nematic) type has a higher twist angle, and thus provides 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

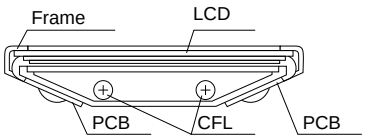
CFL (Cold Cathode Fluorescent Lamp) backlight

Features: high brightness, long service life, inverter required

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

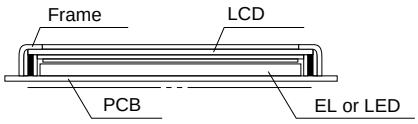


- Backlight type



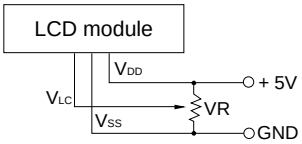
EL (Electroluminescent Lamp) backlight
LED (Light Emitting Diode) backlight

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

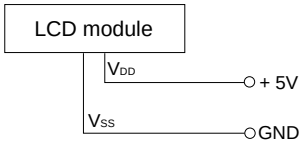


■ POWER SUPPLY

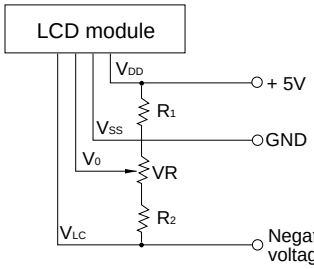
- Character modules (single power supply)



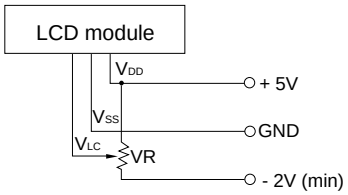
- G2446,G242C (Built-in DC-DC conv.)



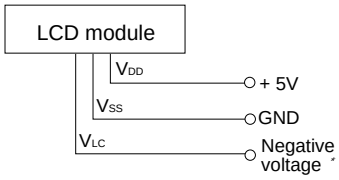
- G321D, G324E and G649D



- 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.

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Precautions

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

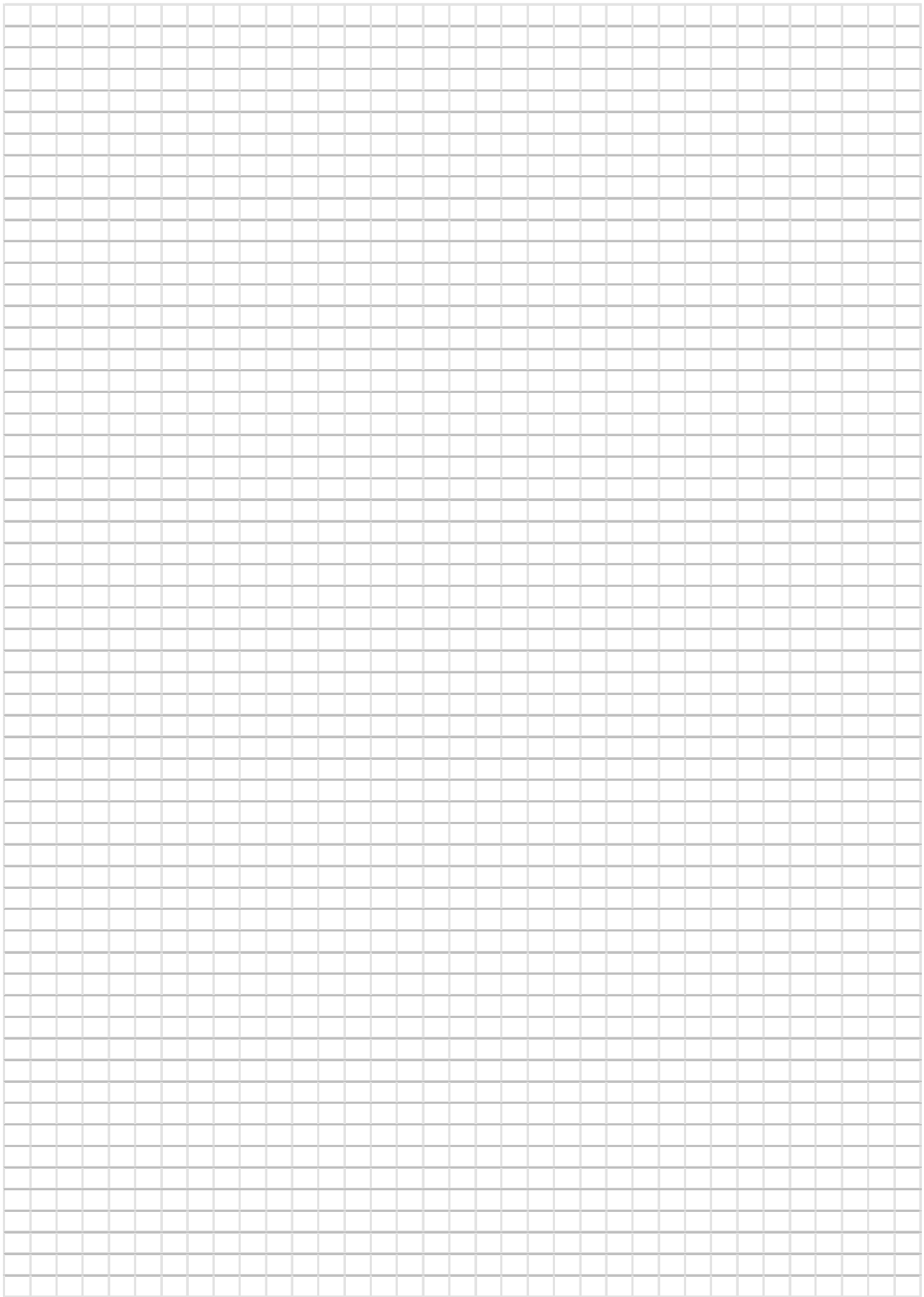
- Store the LCD panel in a dark place, where the temperature is 25°C±10°C and the relative humidity below 65%. If possible, store the LCD panel in the packaging situation when it was delivered.
- Do not store the module near organic solvents or corrosive gases.
- Keep the module (including accessories) 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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