T-41-38

LCD

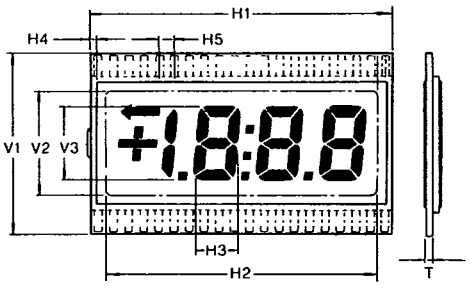
Liquid Crystal Displays

LIQUID CRYSTAL DISPLAYS (STANDARD PRODUCTS)

■ FEATURES

- Easy on the eyes due to the non-radiating display
- Low power consumption
- Variety of display patterns
- High contrast and wide viewing angle
- High reliability
- Pin type LCDs are available for easy mounting

■ DIMENSIONS INDEX



■ Notes
H1×V1: Panel size
H2×V2: Viewing area
H3×V3: Digit size
T: Glass thickness
H4: Glass edge to center of first contact pad
H5: Terminal pitch

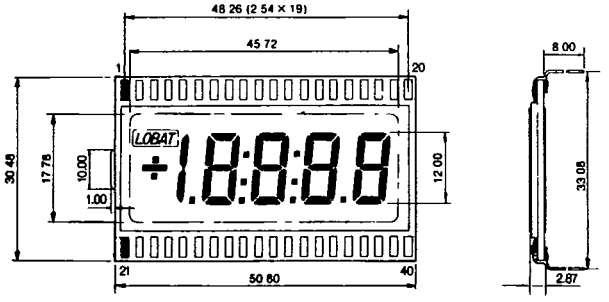
Unit: mm

Item / Model	Display contents	Panel size (H1×V1)	Viewing area (H2×V2)	Digit size (H3×V3)	T	H4	H5	Suitable LSI
SP501P	4½ digits÷LOBAT	50.80×30 48	45 72×17 78	5.50×12.00	1.10	1.65	2.54	INTERSIL ICM7224
SP503P	3½ digits÷←	50.80×30 48	45 72×17 78	7 00×12 70	1 10	1.27	2.54	INTERSIL ICL7106
SP505P	4 digits	50.80×30 48	45.72×17.78	7.00×12 70	1.10	1.27	2.54	OKI MSM5829GS
SP511P	6 digits	93.85×38 10	88 90×25 40	8.50×17 78	1.10	16.45	2.54	RCA CD4055A
SP513P	4 digits	93.85×38.10	88.90×25 40	14.00×17.78	1.10	1.27	2.54	—
SP516P	4½ digits÷←	50 80×22 86	45 72×12 70	4.50×7.62	1.10	1.27	2.54	INTERSIL ICM7224
SP521P/SP521	3½ digits÷LOBAT	50.80×30 48	45.72×17 78	7.00×12.70	1.10	1.27	2.54	INTERSIL ICL7106
SP530P/SP530	3½ digits÷←	50.80×22 86	45 72×12 70	5 59×8.89	1.10	1.65	2.54	INTERSIL ICL7106
SP531P	4 digits	50.80×22 86	45 72×12 70	5 59×8.89	1 10	1.65	2.54	OKI MSM5829GS
SP532P	6 digits	69.85×30 48	64 77×17 78	6.60×12.70	1.10	5.72	2.54	RCA CD4055A
SP538P	5 digits	81 28×38 10	76 20×25 40	9 14×17.78	1.10	10.16	2.54	RCA CD4055A

*SP□□□P Pin (DIP) type, SP□□□ · Rubber (zebra) connector type.

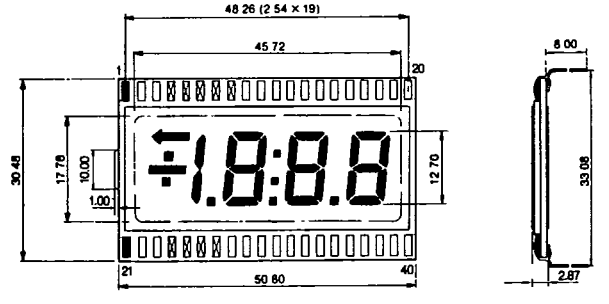
DRAWINGS Unit: mm (typ)

❶ SP501P



Pin No.	Name	Pin No.	Name	Pin No.	Name
1	B.P	15	3F	29	2E
2	D/D	16	3A	30	2D
3	LOBAT	17	3B	31	2C
4	1G	18	4G	32	3DP
5	1F	19	4F	33	3E
6	1A	20	4A	34	3D
7	1B	21	B.P	35	3C
8	COL1	22	□	36	4DP
9	2G	23	K	37	4E
10	2F	24	1DP	38	4D
11	2A	25	1E	39	4C
12	2B	26	1D	40	4B
13	COL2	27	1C		
14	3G	28	2DP		

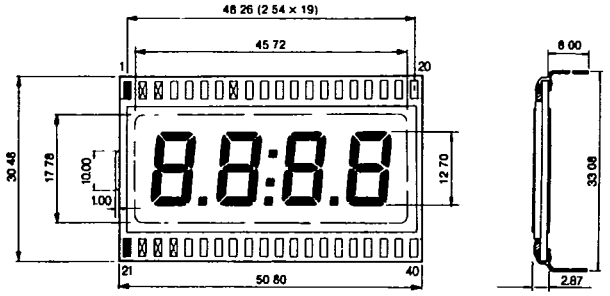
❷ SP503P



Pin No.	Name	Pin No.	Name	Pin No.	Name
1	B.P	15	2F	29	1E
2	0DP	16	2A	30	1D
3	SP	17	2B	31	1C
4	N.C	18	3G	32	2DP
5	N.C	19	3F	33	2E
6	N.C	20	3A	34	2D
7	N.C	21	B.P	35	2C
8	N.C	22	TP	36	3DP
9	1G	23	K	37	3E
10	1F	24	N.C	38	3D
11	1A	25	N.C	39	3C
12	1B	26	N.C	40	3B
13	COL	27	N.C		
14	2G	28	1DP		

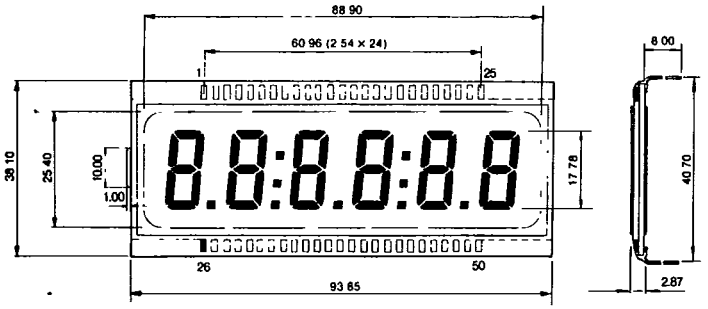
DRAWINGS Unit: mm (typ.)

❸ SP505P



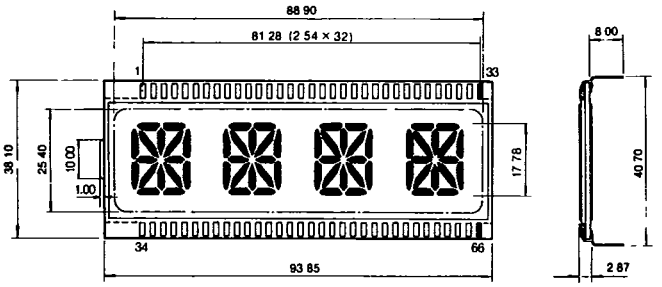
Pin No.	Name	Pin No.	Name	Pin No.	Name
1	B.P	15	3F	29	2E
2	N.C	16	3A	30	2D
3	N.C	17	3B	31	2C
4	1G	18	4G	32	2DP
5	1F	19	4F	33	3E
6	1A	20	4A	34	3D
7	1B	21	B.P	35	3C
8	N.C	22	N.C	36	3DP
9	2G	23	N.C	37	4E
10	2F	24	N.C	38	4D
11	2A	25	1E	39	4C
12	2B	26	1D	40	4B
13	COL	27	1C		
14	3G	28	1DP		

❹ SP511P



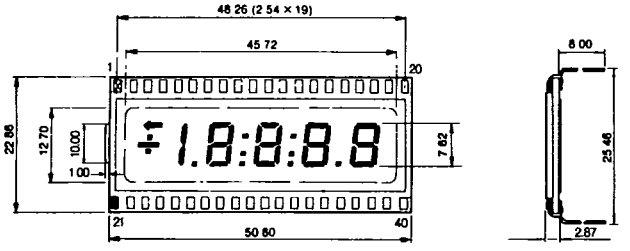
Pin No.	Name	Pin No.	Name	Pin No.	Name	Pin No.	Name
1	1G	15	4F	29	1C	43	5E
2	1F	16	4A	30	1DP	44	5D
3	1A	17	4B	31	2E	45	5C
4	1B	18	COL2	32	2D	46	5DP
5	2G	19	5G	33	2C	47	6E
6	2F	20	5F	34	2DP	48	6D
7	2A	21	5A	35	3E	49	6C
8	2B	22	5B	36	3D	50	6B
9	COL1	23	6G	37	3C		
10	3G	24	6F	38	3DP		
11	3F	25	6A	39	4E		
12	3A	26	B.P	40	4D		
13	3B	27	1E	41	4C		
14	4G	28	1D	42	4DP		

❺ SP513P



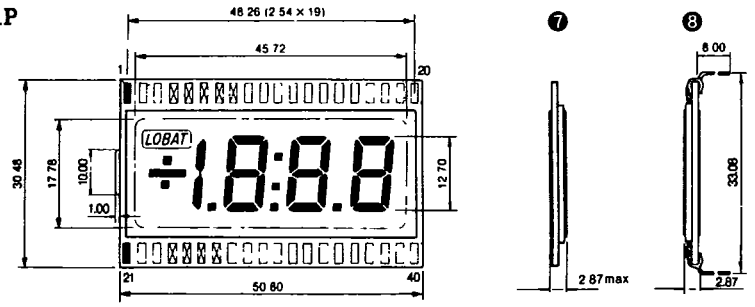
Pin No.	Name	Pin No.	Name	Pin No.	Name	Pin No.	Name	Pin No.	Name
1	1S	15	2L	29	4K	43	2R	57	3M
2	1H	16	2C	30	4B	44	2F	58	4G
3	1J	17	3S	31	4L	45	2P	59	4R
4	1A	18	3H	32	4C	46	2E	60	4F
5	1K	19	3J	33	B.P	47	2N	61	4P
6	1B	20	3A	34	1G	48	2D	62	4E
7	1L	21	3K	35	1R	49	2M	63	4N
8	1C	22	3B	36	1F	50	3G	64	4D
9	2S	23	3L	37	1P	51	3R	65	4M
10	2H	24	3C	38	1E	52	3F	66	B.P
11	2J	25	4S	39	1N	53	3P		
12	2A	26	4H	40	1D	54	3E		
13	2K	27	4J	41	1M	55	3N		
14	2B	28	4A	42	2G	56	3D		

❻ SP516P



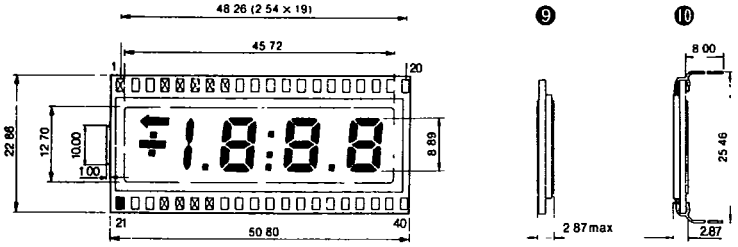
Pin No.	Name	Pin No.	Name	Pin No.	Name
1	N.C	15	3F	29	2E
2	X	16	3A	30	2D
3	Z	17	3B	31	2C
4	1G	18	4G	32	3DP
5	1F	19	4F	33	3E
6	1A	20	4A	34	3D
7	1B	21	B.P	35	3C
8	COL1	22	Y	36	4DP
9	2G	23	K	37	4E
10	2F	24	1DP	38	4D
11	2A	25	1E	39	4C
12	2B	26	1D	40	4B
13	COL2	27	1C		
14	3G	28	2DP		

❼ SP521
❽ SP521P



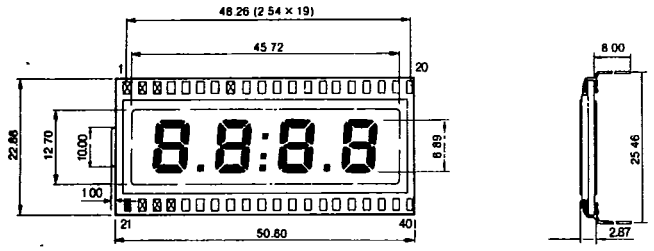
Pin No.	Name	Pin No.	Name	Pin No.	Name
1	B.P	15	2F	29	1E
2	0DP	16	2A	30	1D
3	SP	17	2B	31	1C
4	N.C	18	3G	32	2DP
5	N.C	19	3F	33	2E
6	N.C	20	3A	34	2D
7	N.C	21	B.P	35	2C
8	N.C	22	TP	36	3DP
9	1G	23	K	37	3E
10	1F	24	N.C	38	3D
11	1A	25	N.C	39	3C
12	1B	26	N.C	40	3B
13	COL	27	N.C		
14	2G	28	1DP		

⑨ SP530
⑩ SP530P



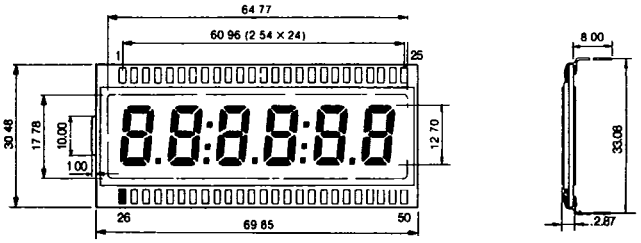
Pin No.	Name	Pin No.	Name	Pin No.	Name
1	N.C	15	2F	29	3E
2	□	16	2A	30	3D
3	DES	17	2B	31	3C
4	N.C	18	1G	32	2DP
5	N.C	19	1F	33	2E
6	N.C	20	1A	34	2D
7	N.C	21	B.P	35	2C
8	N.C	22	▭	36	1DP
9	3G	23	K	37	1E
10	3F	24	N.C	38	1D
11	3A	25	N.C	39	1C
12	3B	26	N.C	40	1B
13	COL	27	N.C		
14	2G	28	3DP		

⑪ SP531P



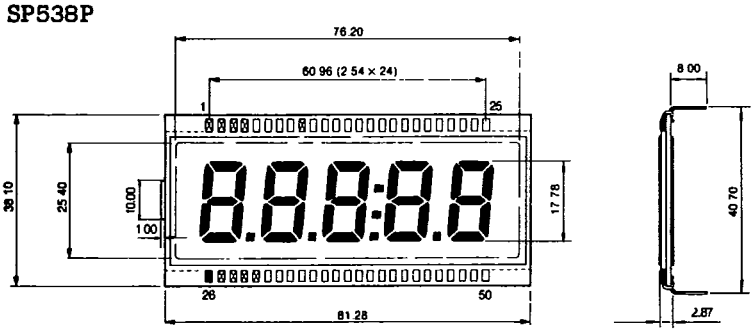
Pin No.	Name	Pin No.	Name	Pin No.	Name
1	N.C	15	2F	29	3E
2	N.C	16	2A	30	3D
3	N.C	17	2B	31	3C
4	4G	18	1G	32	2DP
5	4F	19	1F	33	2E
6	4A	20	1A	34	2D
7	4B	21	B.P	35	2C
8	N.C	22	N.C	36	1DP
9	3G	23	N.C	37	1E
10	3F	24	N.C	38	1D
11	3A	25	4E	39	1C
12	3B	26	4D	40	1B
13	COL	27	4C		
14	2G	28	3DP		

⑫ SP532P



Pin No.	Name	Pin No.	Name	Pin No.	Name	Pin No.	Name
1	6G	15	3F	29	6C	43	2E
2	6F	16	3A	30	5DP	44	2D
3	6A	17	3B	31	5E	45	2C
4	6B	18	COL1	32	5D	46	1DP
5	5G	19	2G	33	5C	47	1E
6	5F	20	2F	34	4DP	48	1D
7	5A	21	2A	35	4E	49	1C
8	5B	22	2B	36	4D	50	1B
9	COL2	23	1G	37	4C		
10	4G	24	1F	38	3DP		
11	4F	25	1A	39	3E		
12	4A	26	B.P	40	3D		
13	4B	27	6E	41	3C		
14	3G	28	6D	42	2DP		

⑬ SP538P



Pin No.	Name	Pin No.	Name	Pin No.	Name	Pin No.	Name
1	N.C	15	3F	29	N.C	43	2E
2	N.C	16	3A	30	N.C	44	2D
3	N.C	17	3B	31	5E	45	2C
4	N.C	18	COL	32	5D	46	1DP
5	5G	19	2G	33	5C	47	1E
6	5F	20	2F	34	4DP	48	1D
7	5A	21	2A	35	4E	49	1C
8	5B	22	2B	36	4D	50	1B
9	N.C	23	1G	37	4C		
10	4G	24	1F	38	3DP		
11	4F	25	1A	39	3E		
12	4A	26	B.P	40	3D		
13	4B	27	N.C	41	3C		
14	3G	28	N.C	42	2DP		

■ STANDARD SPECIFICATIONS

(1) Driving method
- Static • Operating voltage: 3.0V

(2) Environmental condition
- Operating temperature range: −10°C to +60°C
- Storage temperature range: −20°C to +60°C

(3) Connector
- Rubber (zebra) connector type or pin type

(4) Viewing angle • 6 o'clock

(5) Polarizer • Normal color • Reflective type

■ OPTION

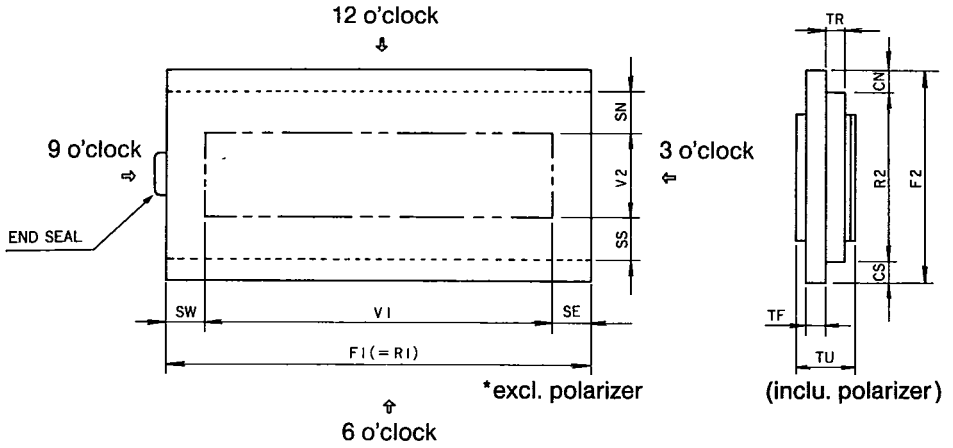
(1) Environmental condition
(Wide temperature range: High reliability type)
- Operating temperature range: −30°C to +80°C
- Storage temperature range: −40°C to +85°C

(2) Viewing angle
- 12 o'clock

(3) Polarizer
- Color: Gold, Red, Blue, Green
- Type: Transmissive, Transflective

CHECK LIST FOR CUSTOM DESIGNED LCD

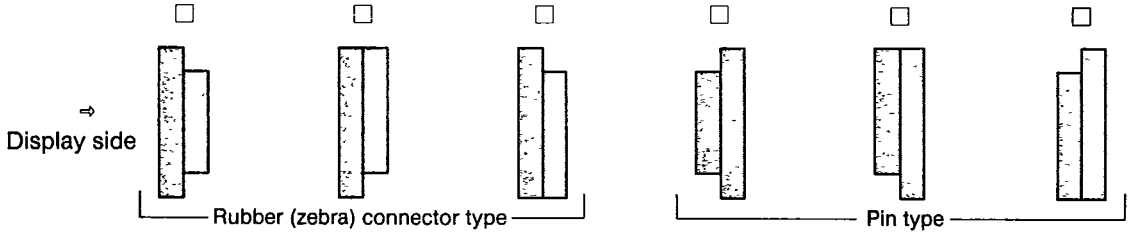
1. Dimensions



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.
TU: Thickness of LCD _____ mm
TF: Thickness of upper glass _____ mm
TR: Thickness of lower glass _____the same as TF
(Standard type: 1.1mm or 0.7mm)
End seal: ☐Right ☐Left

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

2. Panel Form



3. Connector
☐Rubber (zebra) connector ☐Pin (DIP: Pin length _____mm, SIP: Pin Length_____ mm) ☐Others

4. Viewing Angle
☐6 o'clock ☐12 o'clock ☐Others (o'clock)

5. Polarizer
*Front polarizer ☐Attached type ☐Separate type
*Rear polarizer ☐Attached type ☐Separate type
☐Transmissive ☐Transflective ☐Reflective
*Color ☐Normal ☐Others ( )

6. Driving Method
☐Static ☐Multiplexing (1/____duty, 1/____bias)
*Operating voltage _____V
*Frame frequency _____Hz
*Driving LSI _____(Manufacturer)

7. Temperature Range
*Operating temperature range _____°C to _____°C
*Storage temperature range _____°C to _____°C

8. Others
☐Print

9. Application

_____

10. Schedule
*Estimate: _____
*Sample delivery: _____ Quantity _____pcs
*Mass production: _____ Quantity _____ pcs

■ BASIC SPECIFICATIONS

1. Standard Type

1.1 Maximum ratings D : duty

Item	Static	1/2D	1/3D	1/4D	1/8D	1/16D	Unit
AC applied voltage	10						V
Residual DC element	50	25					mV
Storage temperature range	−20−+60						℃
Operating temperature range	−10−+60	0−+50			−10−+50*		℃

*With temperature compensation circuit

1.2 Operating conditions

Item	Symbol	Static	1/2D	1/3D	1/4D	1/8D	1/16D	Unit
Operating voltage	V_{opr}	3−6	3±0.15			*4.5±0.15	*4.8±0.15	V
Operating frequency	f_{opr}	32−128	—					Hz
Frame frequency	f_{FRM}	—	32−128					Hz

*When Ta=25℃

1.3 Standard operating characteristics

Item		Symbol	Static	1/2D	1/3D	1/4D	1/8D	1/16D	Unit
Contrast		C	60	40	35	30	20	20*	—
Response time 25°C	Rise	t_{on}	100	200	250	150	50	50*	ms
	Fall	t_{off}	80	100	100	100	200	100*	ms
Response time 0°C	Rise	t_{on}	500	1000	1000	1000	200	200*	ms
	Fall	t_{off}	300	350	300	300	800	500*	ms
Current consumption		I	0.8	1.0	1.3	1.7	1.8	2.4	μA/cm²

*By observating from maximum viewing angle

2. Wide Temperature Range Type

2.1 Maximum ratings D : duty

Item	Static	1/2D	1/3D	Unit
AC applied voltage	10			V
Residual DC element	50	25		mV
Storage temperature range	−40−+85			℃
Operating temperature range	−30−+80	−30−+70		℃

2.2 Operating conditions

Item	Symbol	Static	1/2D	1/3D	Unit
Operating voltage	V_{opr}	3−6	3±0.15 5±0.15	4.5±0.15	V
Operating frequency	f_{opr}	32−128	—		Hz
Frame frequency	f_{FRM}	—	32−128		Hz

2.3 Standard operating characteristics

Item		Symbol	Static	1/2D	1/3D	Unit
Contrast		C	60	35	30	—
Response time 25°C	Rise	t_{on}	30	30	50	ms
	Fall	t_{off}	30	20	20	ms
Response time 0°C	Rise	t_{on}	100	150	250	ms
	Fall	t_{off}	100	100	60	ms
Current consumption		I	1.5	1.5	2.5	μA/cm²

■ RELIABILITY

1. Standard Type

Test item	Test condition
Operation at high temperature and humidity	40℃ ±2℃, 90% RH, for 500 hrs
Operation at high temperature	60℃ ±2℃, for 500 hrs
Thermal shock	−20℃⇄+60℃, left for 1 hour each temperature, transition time 5 minutes, 10 cycles
Standing at low temperature	−20℃ ±2℃, for 500 hrs

2. Wide Temperature Range Type

Test item	Test condition
Operation at high temperature and humidity	60℃ ±2℃, 90% RH, for 500 hrs
Operation at high temperature	80℃ ±2℃, for 500 hrs
Thermal shock	−20℃⇄+85℃, left for 1 hour each temperature, transition time 5 minutes, 10 cycles
Standing at low temperature	−40℃ ±2℃, for 500 hrs

Notes: The values may be different by LCD size.
The table above is applied to SP516 size LCD or larger.
We will present you the reliability test report on your request.

HANDLING INSTRUCTIONS

Safety
- If the LCD panel breaks, do not allow the liquid crystal to get in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately with soap and water.

Handling
- Keep static electricity away from the CMOS LSI. (LCD module)
- Since the LCD panel is made of plate glass, do not apply mechanical shocks or press hard on it.
- The polarizer on the front of the display is easily scratched. Handle with care.
- Do not remove the panel or frame from the liquid crystal display module. (LCD module)
- Do not soil or damage LCD panel terminals.
- Keep the display surface clean. Do not touch it with your skin.

Storage
- Store in a dark place at 25°C±10°C and 65% RH maximum.
- Do not store where there are organic solvents or corrosive gases.
- Do not crush, vibrate, or jolt the module or its components.

Cleaning the Panel
- Do not wipe with a dry cloth, as it may scratch the polarizer.
- Wipe gently with a soft cloth soaked in a petroleum benzine.
- Do not use ketone (methylethyl ketone, acetone) or aromatic (toluene, xylene) solvents, as they dissolve or damage the polarizer.