

SPECIFICATION FOR APPROVAL

(♦) Preliminary Specification
() Final Specification

Title	256 x 32 dots LCD Module
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BUYER	
MODEL	

SUPPLIER	DAW International Limited
Model	DSC-25632NBL1

SIGNATURE	DATE
/	_____
/	_____
/	_____
Please return 1 copy for your confirmation with your signature and comments.	

APPROVED BY	DATE
_____	_____
REVIEWED BY	
_____	_____
PREPARED BY	
_____	_____
DAW International Limited	

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MODEL NO. : DSC-25632NBL1

View Direction	☒ 6 O'clock		☐ 12 O'clock	
LCD Type	☐ FSTN Positive		☐ FSTN Negative	
	☒ STN Gray	☐ STN Yellow Green	☐ STN Blue	
Rear Polarizer	☐ Reflective	☒ Transflective		☐ Transmissive
Back light Type	☒ LED	☒ Internal Power	☐ EL	☒ 5V input
		☐ External Power	☐ CCFL	☐ 24V input
Back light Color	☒ White	☐ Amber	☐ Blue ☐ Green	☐ Yellow ☐ Other
Temperature Range	☒ Normal		☐ Wide	☐ Super Wide
EL Driver IC	☐ Build-in		☒ Not Build-in	
DC-DC Converter	☐ With		☒ Without	

TO BE VERY CAREFUL !

The LCD driver ICs are made by CMOS process, which are very easy to be damaged by static charge, make sure the user is grounded when handling the LCM.

GENERAL SPECIFICATION

Item	Content
Display Resolution	256(W)×32(H)
Dimensional Outline(mm)	129.0(W)×33.0(H)×11.4(D)
Display mode	STN Grey ,Transflective Type
Circuit	Common-Driver IC, Segment-driver IC with build-in SRAM
Interface	VSS,VDD,V0,RS,R/W,E,DB0-DB7,/CS1,/CS2,RET,VEE LEDA,LEDK

ABSOLUTE MAXIMUN RATING

(1) Electrical Absolute Ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	$V_{DD}-V_{SS}$	0	5.5	Volt	
Power Supply for LCD	$V_{DD}-V_0$	0	10.0	Volt	
Input Voltage	V_I	0	V_{DD}	Volt	
Current for LED backlight		-	80	mA	Vdd=5.0V

Note 1 : Operator should be grounded during handling LCM.

(2) Environmental Absolute Maximum Ratings

Item	Wide Temperature				Normal Temperature			
	Operating		Storage		Operating		Storage	
	Min.	Max,	Min.	Max,	Min.	Max,	Min.	Max,
Ambient Temperature	0℃	+50℃	-20℃	+70℃	-20℃	+70℃	-30℃	+80℃
Humidity(without condensation)	Note 2,4		Note 3,5		Note 4,5		Note 4,6	

Note 2 $T_a \leq 50^\circ\text{C}$: 80% RH max

$T_a > 50^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 50℃

Note 3 T_a at -20℃ will be <48hrs at 70℃ will be <120hrs when humidity is higher than 75%.

Note 4 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 5 $T_a \leq 70^\circ\text{C}$: 75RH max

$T_a > 70^\circ\text{C}$: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note 6 T_a at -20℃ will be <48hrs, at 80 ℃ will be <120hrs when humidity is higher than 75%.

ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit	note
Power Supply for Logic	$V_{DD}-V_{SS}$	-	3.0	5.0	5.5	Volt	
Input Voltage	V_{IL}	L level	V_{SS}	$0.2 V_{DD}$	-	Volt	
	V_{IH}	H level	$0.8 V_{DD}$	V_{DD}	-	Volt	
LCM Recommend LCD Module Driving Voltage	$V_{DD}-V_{ADJ}$	$T_a=0^{\circ}C$	8.7	9.0	9.3	Volt	
		$T_a=25^{\circ}C$	8.4	8.7	9.0		
		$T_a=50^{\circ}C$	7.7	7.9	8.2		
Power Supply Current for LCM	$I_{DD}(EL\ B/L\ OFF)$	$V_{DD}=5.0V$ $T_a=25^{\circ}C$	-	1.5	1.8	mA	-
	$I_{LED}(EL\ B/L\ ON)$	$V_{DD}-V_0=8.7V$		60	80		
Power Supply for EL Backlight	$V_{EL+}-V_{EL-}$	$T_a=25^{\circ}C$	-	5.0	-	V	DC

OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ	Max.	Unit	note
Viewing angle range	θ_f (12 o'clock)	When $Cr \geq 2$	35	-	-	Degree	
	θ_b (6 o'clock)		30	-	-		
	θ_l (9 o'clock)		30	-	-		
	θ_r (3 o'clock)		30	35	-		
Rise Time	T_r	$V_{DD}-V_0=8.7V$ $T_a=25^{\circ}C$		112		mS	
Fall Time	T_f			250			
Contrast	Cr		-	5.4	-		

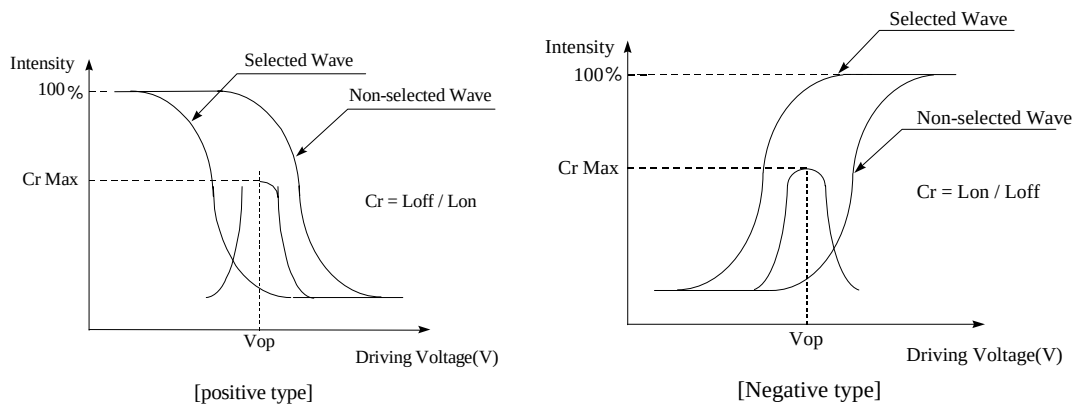
MECHANICAL SPECIFICATION

Product No.		DSC-25632NBL1
Module Size		129.0(W)×33.0(H)×11.4(D)
Dot Size		0.42 (H)mm×0.39(W)mm
Dot Pitch		0.44(H)mm×0.41(W)mm
Resolution		256(W)×32(H) Dots Matrix
Duty Ratio		1/64 Duty
LCD Display Mode	STN	☐ Yellow Mode ☒ Gray Mode ☐ Blue Mode
	FSTN	☐ Black & White(Normally White/Positive Image)
		☐ Black & White(Normally White/Negative Image)
	Rear Polarizer:	☐ Reflective ☒ Transflective ☐ Transmissive ☐ Transflective(High Transmissive)
Viewing Direction		☐ 12 O'clock ☒ 6 O'clock ☐ 3 O'clock ☐ 9 O'clock
Back light		☐ W/O ☐ CCFL ☐ EL ☒ LED
Controller		S6B0108 or compatible
DC/DC Converter		Not Built-in
EL Driver		Without EL driver

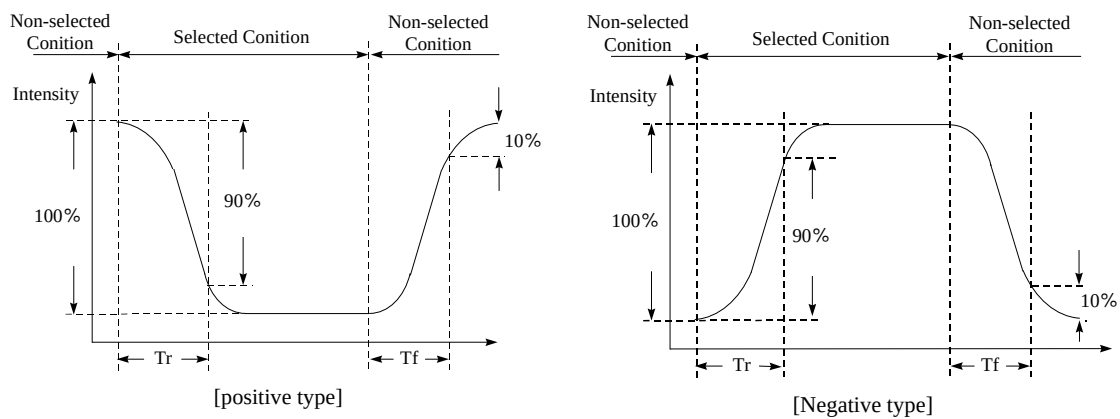
INTERFACE PIN ASSIGNMENT

Pin No.	Pin Out	Description
1	VDD	Logic supply voltage (3.0~5.0V)
2	VSS	GND
3	RS	Data/Instruction RS=high : Indicates that data of DB0~DB7 is display data. RS=low : Indicates that data of DB0~DB7 is instruction
4	V0	Power supply for LCD
5	E	Enable When write(R/W=low) : Data of DB0~DB7 is latched at the fall of E When read(R/W=high) : Data is read while E is at high level
6	R/W	Read/Write R/W=high : Data of DB0~DB7 can be read by CPU. R/W=low : Data of DB0~DB7 can be written into LCD driver IC at the falling edge of E when CS1 and CS2 is low
7	DB0	Data Bus bit0
8	RST	Reset Signal, low level of RET is for reset and keep RET='h'
9	DB2	Data Bus bit2
10	DB1	Data Bus bit1
11	DB4	Data Bus bit4
12	DB3	Data Bus bit3
13	DB6	Data Bus bit6
14	DB5	Data Bus bit5
15	CS1	Chip-select for IC1. Active H
16	CS7	Data Bus bit5
17	NC	No connected
18	CS2	Chip-select for IC2. Active H
19	VEE	Output of supply negative voltage by the DC-DC converter on the module
20	NC	No connected
21	LEDK	Power supply for backlight(0V)
22	LEDA	Power supply for backlight(+5.0V)

[Note 7] Definition of Operation Voltage (Vop)



[Note 8] Definition of Response Time (Tr, Tf)



Conditions:

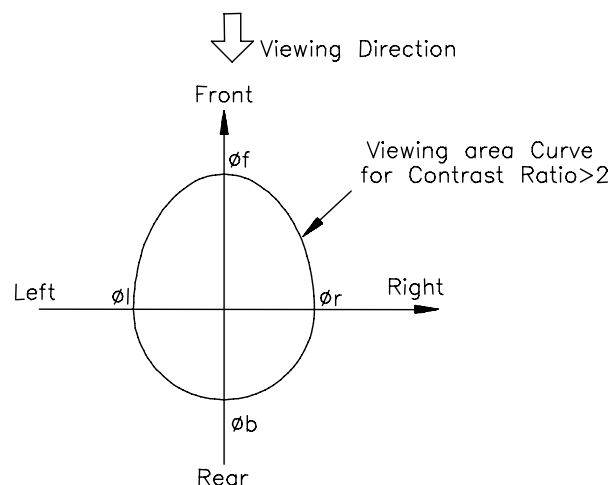
Operating Voltage : Vop

Frame Frequency : 64 Hz

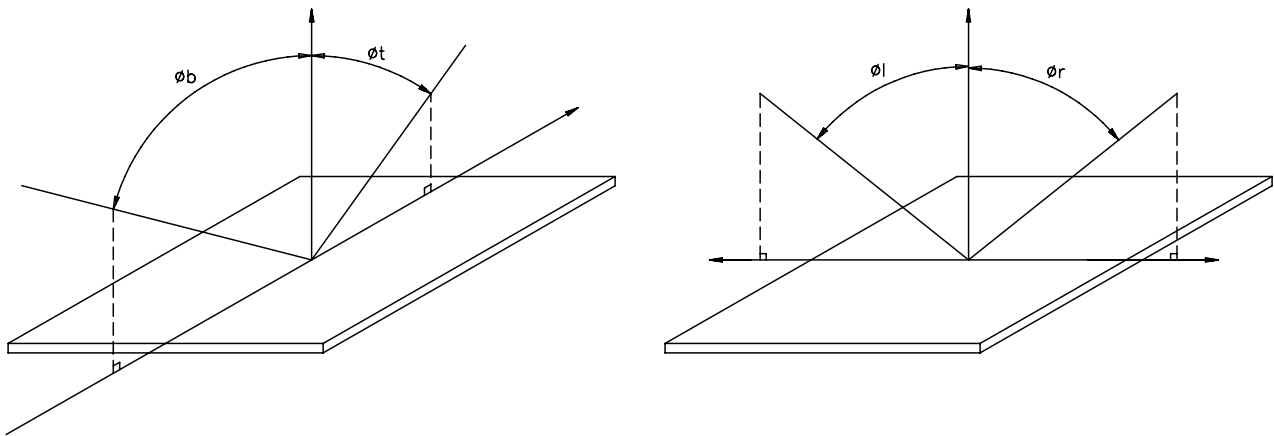
Viewing Angle(θ , φ): 0°, 0°

Driving Wave form : 1/N duty, 1/a bias

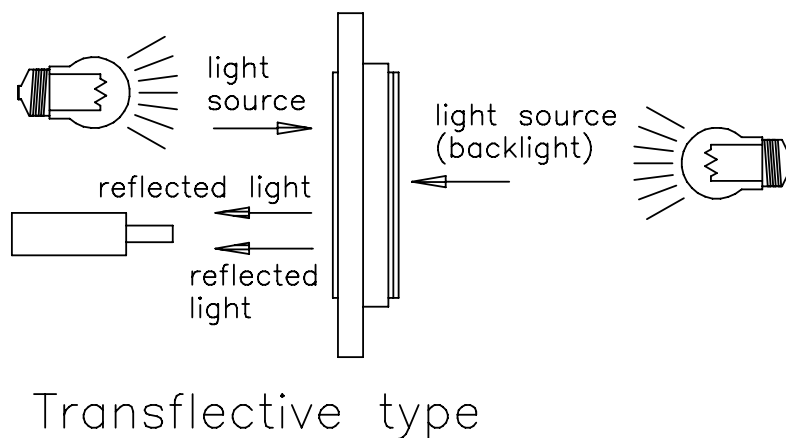
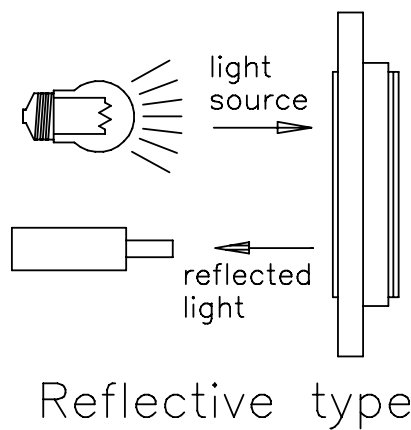
[Note 9] Definition of Viewing Direction



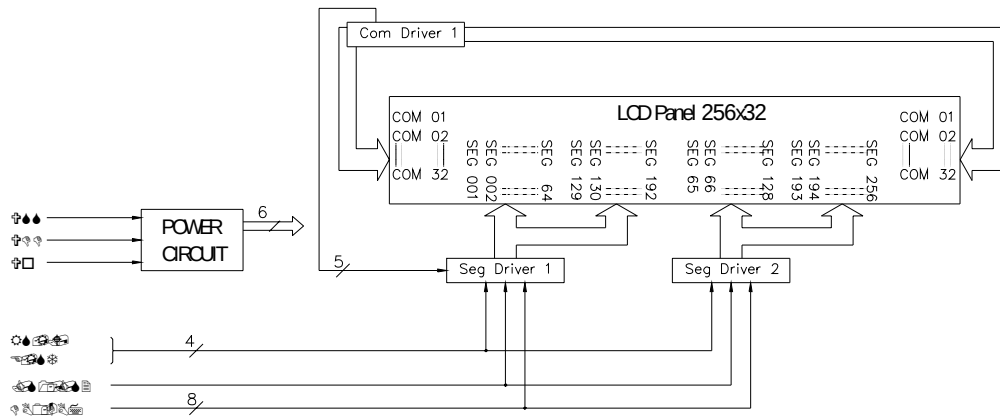
[Note 10] Definition of viewing angle



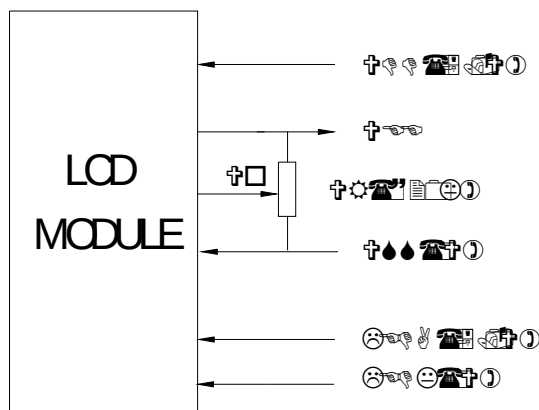
[Note 11] Description of Measuring Equipment



BLOCK DIAGRAM

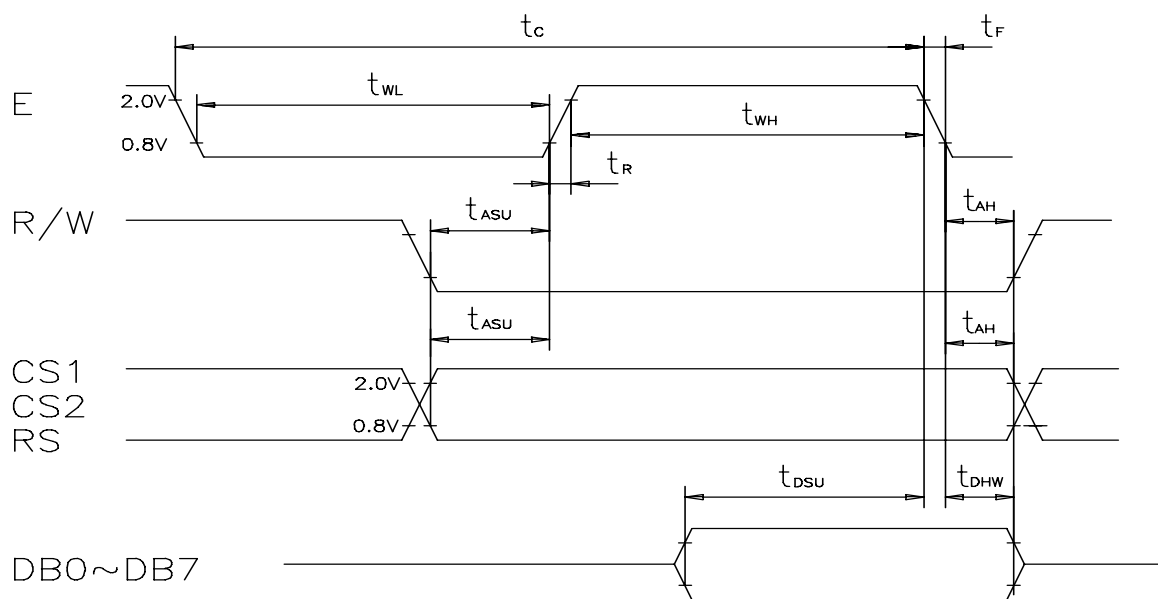


POWER SUPPLY

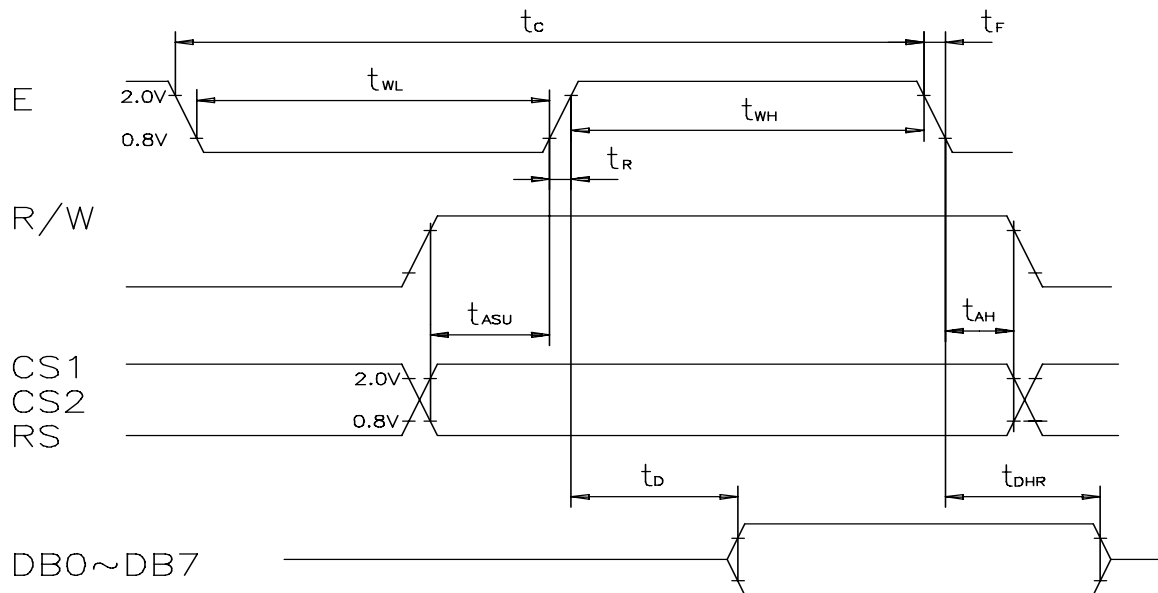


TIMING CHARACTERISTICSMPU interface timing: ($V_{SS}=0V$, $V_{DD}=4.5V\sim 5.5V$, $T_a=0$ to $50^{\circ}C$)

Item	Symbol	Min.	Typ.	Max.	Unit
E Cycle Time	t_C	1000	—	—	ns
E High Level Width	t_{WH}	450	—	—	ns
E Low Level Width	t_{WL}	450	—	—	ns
E Rise Time	t_R	—	—	25	ns
E Fall Time	t_F	—	—	25	ns
Address Setup Time	t_{ASU}	140	—	—	ns
Address Hold Time	t_{AH}	10	—	—	ns
Data Setup Time	t_{DSU}	200	—	—	ns
Data Delay Time	t_D	—	—	320	ns
Data Hold Time(Write)	t_{DHW}	10	—	—	ns
Data Hold Time(Read)	t_{DHR}	20	—	—	ns



MPU Write Timing



MPU Read Timing

DISPLAY COMMANDS

The display commands shown below control the internal state of the LCD driver ICs. Commands are sent from CPU to LCD module for the display control.

Command	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display ON/OFF	0	0	0	0	1	1	1	1	1	1/0	To control the display ON or OFF. The internal status and display RAM data are not affected. 0:OFF, 1:ON
Set address (Y address)	0	0	0	1	Y address (0~63)						To set the Y address in the Y address counter.
Set page (X address)	0	0	1	0	1	1	1	Page(0~7)			To set the X address at the X address register.
Display Start Line	0	0	1	1	Display Start Line(0~63)						To indicate the display data RAM displayed at the top of the screen.
Status Read	0	1	Busy	0	ON/OFF	Reset	0	0	0	0	To read status of the LCD controller IC: Busy 0:Ready, 1: In operation ON/OFF: 0:Display ON, 1:Display OFF Reset: 0:Normal, 1:Reset
Write display data	1	0	Write Data								To write data into display data RAM. Y address is increased by 1 after this command.
Read Display data	1	1	Read Data								To read data from display data RAM to the data bus.

MEMORY MAPPING

Relationship between RAM data and display

		RAM Y address(Y0 ~Y127)												Data	
1st page(X=0)	Line 0→	0	1	1	1	0	0	.....	0	0	1	0	0	0	←DB0(LSB)
	Line 1→	1	0	0	0	1	0	.....	0	0	1	1	0	0	←DB1
	Line 2→	1	0	0	0	1	0	.....	0	0	1	0	1	0	←DB2
	Line 3→	1	0	0	0	1	0	.....	0	0	1	0	1	0	←DB3
	⋮	1	1	1	1	1	0	.....	0	0	1	0	0	0	←DB4
		1	0	0	0	1	0	.....	1	1	1	0	0	0	←DB5
		1	0	0	0	1	0	.....	1	1	1	0	0	0	←DB6
Line 7→	0	0	0	0	0	0	.....	0	0	0	0	0	0	←DB7(MSB)	
2nd page(X=1)	Line 8→	1	1	1	1	0	0	.....	0	1	1	1	0	0	←DB0(LSB)
	Line 9→	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB1
	Line 10→	1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB2
	⋮	1	1	1	1	0	0	.....	1	1	1	0	1	0	←DB3
		1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB4
		1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB5
		1	1	1	1	0	0	.....	0	1	1	1	0	0	←DB6
Line 15→	0	0	0	0	0	0	.....	0	0	0	0	0	0	←DB7(MSB)	
⋮															
8th page(X=7)	Line 56→	1	0	0	0	1	0	.....	0	0	0	0	0	0	←DB0(LSB)
	⋮	1	0	0	0	1	0	.....	0	0	0	0	0	0	←DB1
		1	0	0	0	1	0	.....	0	1	0	0	1	0	←DB2
		1	1	1	1	1	0	.....	1	0	1	0	1	0	←DB3
		1	0	0	0	1	0	.....	1	0	0	1	0	0	←DB4
		1	0	0	0	1	0	.....	1	0	0	1	0	0	←DB5
	Line 62→	1	0	0	0	1	0	.....	0	1	1	0	1	0	←DB6
	Line 63→	0	0	0	0	0	0	.....							←DB7(MSB)

ADDRESS CONFIGURATION OF DISPLAY DATA RAM

	Y address		
	0	1 2 3	126 127
X=0→	DB0 To DB7	Page0	Line0 To Line7
X=1→	DB0 To DB7	Page1	Line8 To Line15
X=2→	DB0 To DB7	Page2	Line16 To Line23
X=3→	DB0 To DB7	Page3	Line24 To Line31
X=4→	DB0 To DB7	Page4	Line32 To Line39
X=5→	DB0 To DB7	Page5	Line40 To Line47
X=6→	DB0 To DB7	Page6	Line48 To Line55
X=7→	DB0 To DB7	Page7	Line56 To Line63
Address configuration of Display Data RAM			

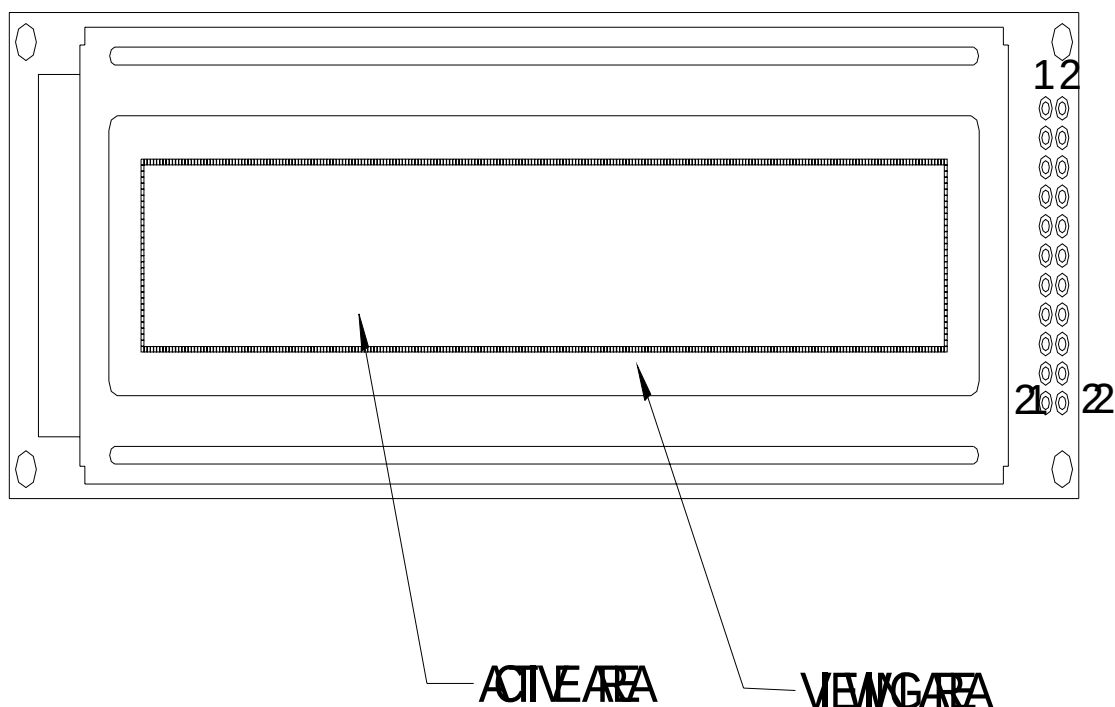
RELIABILITY TEST

No	Item	Conditions		Note
1	High Temp. Operation	50°C	120HR	
2	High Temp. Storage	60°C	120HR	
3	Low Temp. Operation	0°C	120HR	
4	Low Temp. Storage	-20°C	120HR	
5	High Temp./Humid Storage	60°C 90%RH	120HR	
6	Thermal Shock	-20°C ,30min 60°C ,30min	10 cycle	

APPEARANCE CHECK

CONDIITON OF APPEARANCE CHECK:

- (1) Specimen shall be checked by eyes in distance of 30cm under 40w-fluorescence lamp.
- (2) Checking direction shall be in 45 degree from perpendicular line op specimen surface.



HANDLING PRECAUTIONS

- (1) Treat polarizer very carefully since it is easy to be damaged.
(2) When cleaning the display surface, use soft cloth (e.g. gauss) with a solvent (recommended below) and wipe lightly.

- ◆ ethyl alcohol
- ◆ iso-propanol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvents:

- ◆ water
- ◆ ketone
- ◆ aromatics

- (3) Direct current causes electro-chemical reaction with remarkable degradation of the display quality. Give careful consideration to prevent direct current at ON/OFF timing and during operation.
(4) Avoid strong shock and drop from the height.
(5) To prevent LCD panels from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.
(6) Give careful consideration to avoid electrical static discharge with causes uneven contrast.
(7) Even a small condensation on the contact pads (terminals) causes electro-chemical reaction which makes missing row and column. Give careful attention to avoid condensation. When assembling with zebra connector, clean the surface of the pads with alcohol and keep the air very clean.

LCD PRODUCT QUALITY STANDARD

DISPLAY APPEARANCE

No	Item	Criteria
1	inclusions (black spot, white spot, dust)	(1)round type diameter mm(a*) no of defect* $a \leq 0.20$ neglect $0.20 < a \leq 0.35$ 5max $0.35 < a$ none (2)linear type length mm(l) width mm(W) no. of defect na $W \leq 0.03$ neglect $1 \leq 3$ $0.03 < W \leq 0.08$ 6 $3 < l$ $0.08 < W$ none
2	scratch	1.scratch on protective film is permitted. 2.scratch on polarizer shall be as follow: (1)round type diameter mm(a*) no of defect $a \leq 0.15$ neglect $0.15 < a \leq 0.20$ 2 max $0.20 < a$ none (2)linear type be judged by 1.-(2) linear type
3	dent	diameter < 1.5mm
4	bubble	not exceeding 0.5mm average diameter is acceptable between glass and polarizing film
5	pin hole	$(a+b)/2 \leq 0.15\text{mm}$ maximum number: ignored $0.15 < (a+b)/2 \leq 0.20\text{mm}$ maximum number:10
6	dot defect	$(a+b)/2 \leq 0.20\text{mm}$ maximum number: ignored $0.20 < (a+b)/2 \leq 0.30\text{mm}$ maximum number:5 x=width
7	contrast irregularity(spot)	diameter spec no of defect $a \leq 0.50\text{mm}$ neglect $0.50 < a \leq 0.75$ 5 $0.75 < a \leq 1.00$ 3 $1.00 < a$ none
8	dot width	design width $\pm 15\%$
9	color tone and uniformity	obvious uneven color is not permitted