

0.1 SDEC LCD MODULE NUMBERING SYSTEM

LM	C	—	S	T	C	2	E	16	D	L	Y	Y	—	
[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]		[13]

LM	G	—	S	S		12	A	64	U	E	G	W	—	
[1]	[2]		[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]		[13]

0.2 SDEC LCD MODULE VARIATION LIST

NO	ITEM		DESCRIPTION											
[1]	LCD MODULE		LIQUID CRYSTAL DISPLAY MODULE											
[2]	LCM MODULE		D	DIGITS MODEL		C	CHARACTER MODEL		G	GRAPHIC MODEL				
[3]	LCM OF FUNCTION		B	BIG SIZE TYPE			S	SMALL/NORMAL TYPE						
[4]	LCD MODEL	T	TN LCD			H	HTN LCD							
		S	STN LCD			F	FSTN LCD							
[5]	IC PACKING			PACKAGE TYPE		C	CHIP(OR COG)TYPE			T	TAB TYPE			
[A]	STANDARD TYPE LCM	[6]	CHARACTER MODEL : NUMBER OF LINES				GRAPHIC MODEL : WIDE SIDE OF DOTS							
		[7]	FROM A TO Z											
		[8]	CHARACTER MODEL:NUMBER OF CHARACTER				GRAPHIC MODEL:HIGH SIDE OF DOTS							
[B]	STANDARD OR CUSTOM DESIGNED TYPE LCM	[6]	DIGITS MODEL : YEAR+MONTH+NUMBER											
		[7]	CHARACTER MODEL : CHARACTER+LINES+NUMBER											
		[8]	GRAPHIC MODEL : WIDE SIDE DOTS+HIGH SIDE DOTS+NUMBER											
[9]	VIEWING ANGLE		R	3 O'CLOCK		D	6 O'CLOCK		L	9 O'CLOCK		U	12 O'CLOCK	
[10]	BACKLIGHT	R	WITHOUT BACKLIGHT				E	EL (TRANSFLECTIVE)						
		L	ARRAY LED (TRANSFLECTIVE)				F	FL (TRANSMISSIVE)						
[11]	POLARIZER COLOR	G	GRAY				Y	YELLOW GREEN						
		N	NEGATIVE STN TYPE : BLUE											
			NEGATIVE FSTN TYPE : BLACK											
[12]	BACKLIGHT COLOR	B	BLUE				G	GREEN						
		O	ORANGE				R	RED						
		W	WHITE				Y	YELLOW GREEN						
[13]	VERSION	01	ENGLISH-JAPANESE				02	ENGLISH-EURPEAN						
		03	ENGLISH-RUSSIAN				E	EDGE LED BACKLIGHT						

※All of our STN Panel belong “WIDE TEMPERATURE”

CONTENTS

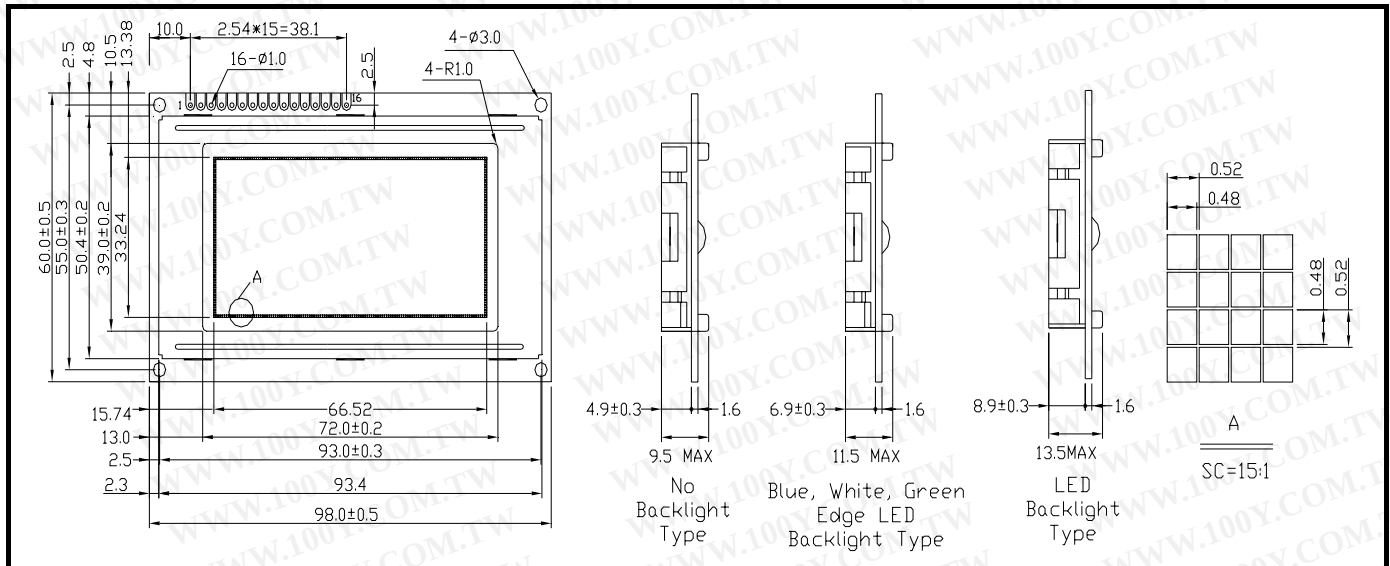
	PAGE
● LCM Sample Approval	2
0. LCD Module Number System	3
1. Mechanical Specification	5
2. Mechanical Diagram	5
3. Interface Pin Connections	5
4. Block Diagram	5
5. Absolute Maximum Ratings	6
6. Electrical Characteristics	6
7. Optical Characteristics	6
8. Optical Definitions	6
9. Display Address	6
10. Interface to MPU	7
10.1 Interface to Z-80 CPU	7
10.2 Interface to MC6800 CPU	7
10.3 Interface to 4-bit CPU (HMCS43C)	7
10.4 Interface to HD6805 MP	7
11. Timing Control	7
11.1 Write and Read Operation	7
11.2 Busy flag check timing	7
12. Initialization of LCM	8
13. Instruction Set	9
14. User Font Patterns, Icon RAM & Graph Display RAM Address	10
15. Software Example	11
15.1 8-bit operation (8 bits 2 lines)	11
15.2 4-bit operation (4 bits 2 lines)	11
16. Character Generator ROM Map	11
17. Reliability Condition	12
18. Function Test & Inspection Criteria	12
19. Test – Normal Temperature	15
20. Test – Wide Temperature	16
21. Precautions Against Product Handling	17
22. Warranty	18

勝特力材料 886-3-5753170
 勝特力电子(上海) 86-21-54151736
 勝特力电子(深圳) 86-755-83298787
[Http://www.100y.com.tw](http://www.100y.com.tw)

1. Mechanical Specification

ITEM	STANDARD VALUE			UNIT
NUMBER OF CHARACTERS	8 CHARACTERS X 4 LINES (128*64Dots)			--
CHARACTER FORMAT	16 X 16 DOTS			--
MODULE DIMENSION NO BACKLIGHT	98.0 (W) X 60.0 (H) X 9.5 (T)			mm
MODULE DIMENSION EDGE LED BACKLIGHT	--			mm
MODULE DIMENSION ARRAY LED BACKLIGHT	98.0 (W) X 60.0 (H) X 14.0 (T)			mm
MODULE DIMENSION EDGE LED BACKLIGHT (BLUE)	98.0 (W) X 60.0 (H) X 11.5 (T)			mm
VIEWING DISPLAY AREA	72.0 (W) X 39.0 (H)			mm
ACTIVE DISPLAY AREA	66.52 (W) X 33.24 (H)			mm
DOT SIZE	0.48 (W) X 0.48 (H)			mm
DOT PITCH	0.52 (W) X 0.52 (H)			mm
● ARRAY LED BACKLIGHT COLOR	YELLOW GREEN OR ORANGE OR RED			
BACKLIGHT INPUT	DC +4.2V	V	150	mA
BACKLIGHT HALF-LIFT TIME	30,000			HR.
● EDGE LED BACKLIGHT COLOR	BLUE OR GREEN OR WHITE			
BACKLIGHT INPUT	DC+3.2V	V	78	mA
BACKLIGHT HALF-LIFT TIME	3,000 (AVOID LIGHTING CONTINUOUSLY)			HR.

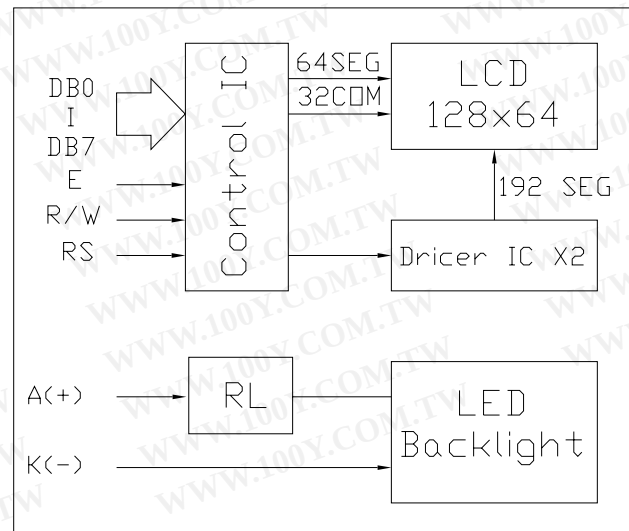
2. Mechanical Diagram



3. Interface Pin Connections

NO	SYMBOL	LEVEL	FUNCTION
1	VSS	--	GND (0V)
2	VDD	--	DC +5V
3	N.C	--	--
4	RS	H/L	Register select
5	R/W	H/L	Read/Write
6	E	H, H→L	Enable signal
7	DB0	H/L	Data Bit 0
8	DB1	H/L	Data Bit 1
9	DB2	H/L	Data Bit 2
10	DB3	H/L	Data Bit 3
11	DB4	H/L	Data Bit 4
12	DB5	H/L	Data Bit 5
13	DB6	H/L	Data Bit 6
14	DB7	H/L	Data Bit 7
15	A(+)	DC+5V	LED Backlight +
16	K(-)	0V	LED Backlight -

4. Block Diagram



5. Absolute Maximum Ratings

ITEM		SYMBOL	MIN.	TYPE	MAX.	UNIT
INPUT VOLTAGE		VI	VSS	—	VDD	V
SUPPLY VOLTAGE FOR LOGIC		VDD-VSS	—	5.0	6.5	V
SUPPLY VOLTAGE FOR LCD		V _{LCD}	—	—	6.5	V
STN FSTN	WIDE TEMPERATURE RANGE	OPERATING	-20~+70	STORAGE	-30~+80	°C
STATIC ELECTRICITY		Be sure that you are grounded when handing LCM.				

6. Electrical Characteristics

ITEM	SYN	CONDITION	MIN.	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	--	4.5	5.0	5.5	V
SUPPLY VOLTAGE FOR LCD	V _{LCD}	Ta= 25°C	5.6	5.8	6.0	V
INPUT HIGH VOLTAGE	VIH	--	0.7VDD	--	VDD	V
INPUT LOW VOLTAGE	VIL	--	0	--	0.3VDD	V
SUPPLY CURRENT (LOGIC)	IDD	VDD=+5V	--	--	4.0	mA

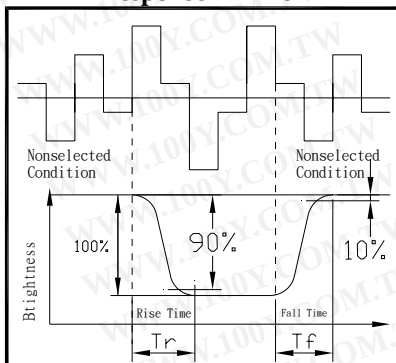
7. Optical Characteristics

Ta at 25°C

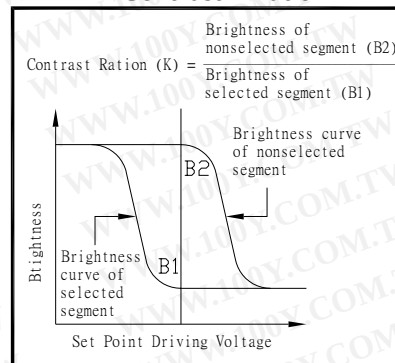
ITEM	SYM	CONDITION	MIN.	TYPE	MAX.	UNIT
VIEW ANGLE (TOP/BOTTOM)	$\theta 1 / \theta 2$	CR ≥ 5	--	45/35	--	deg.
VIEW ANGLE (LEFT/RIGHT)	$\phi 1 / \phi 2$	CR ≥ 5	--	35/35	--	deg.
CONTRAST RATIO	CR	--	--	5	--	—
RESPONSE TIME (RISE)	TON/Tr	--	--	170	--	mS
RESPONSE TIME (DECAY)	TOFF/Tf	--	--	220	--	mS

8. Optical Definitions

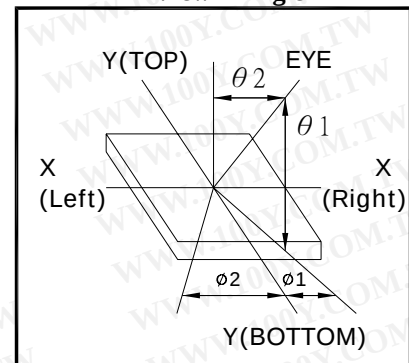
Response Time



Contrast Ration



View Angle



9. Display Address

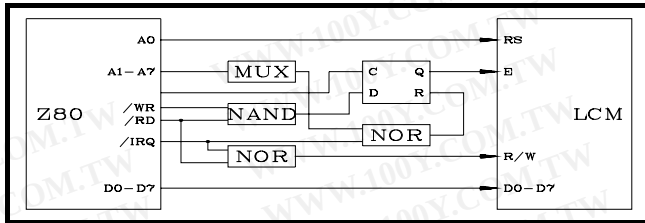
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Line 1	80H		81H		82H		83H		84H		85H		86H		87H	
Line 2	90H		91H		92H		93H		94H		95H		96H		97H	
Line 3	88H		89H		8AH		8BH		8CH		8DH		8EH		8FH	
Line 4	98H		99H		9AH		9BH		9CH		9DH		9EH		9FH	

	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Line 1																
Line 2																
Line 3																
Line 4																

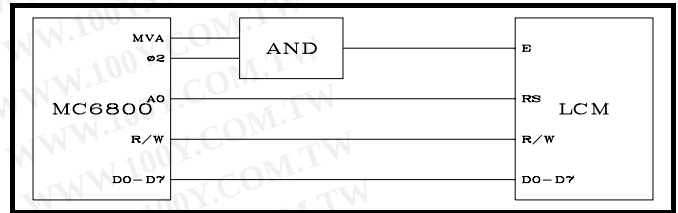
*A Ram Bank is 16 bits (2 bytes)

10. Interface to MPU

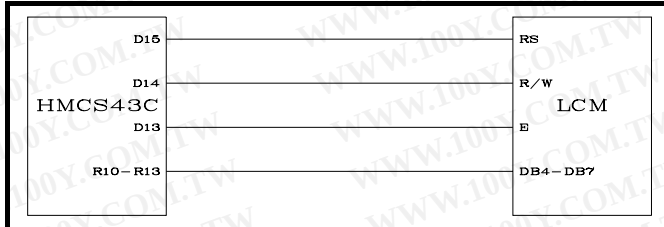
10.1 Interface to Z-80 CPU



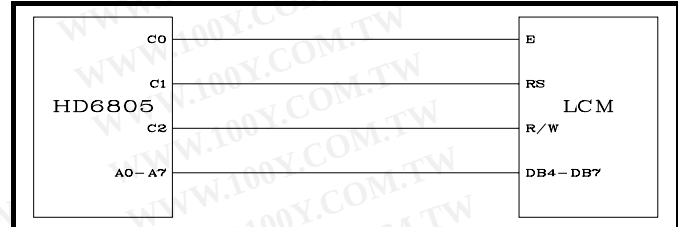
10.2 Interface to MC6800 CPU



10.3 Interface to 4-bit CPU (HMCS43C)



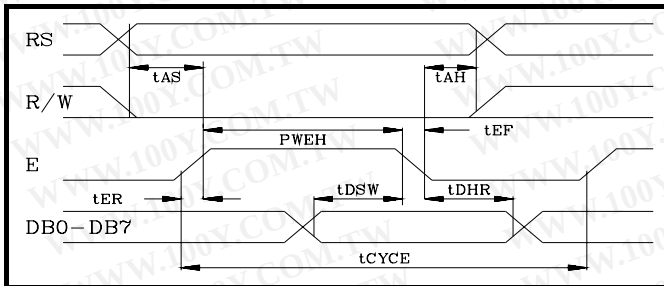
10.4 Interface to HD6805 MP



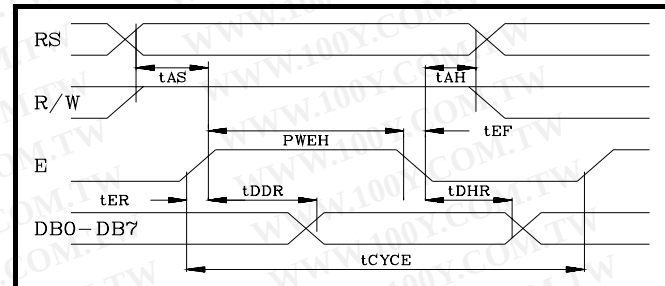
11. Timing Control

11.1 Write and Read Operation

Write Operation

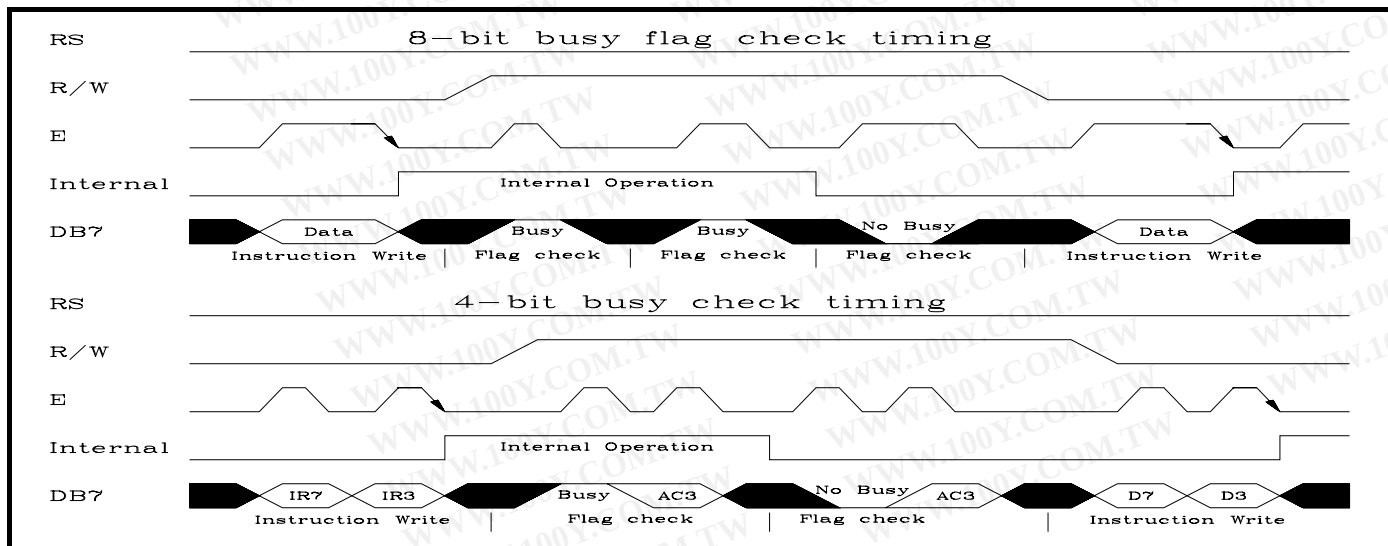


Read Operation



Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	tCYCE	1200	--	ns
Enable Pules Width (High level)	PWEH	140	--	ns
Enable Rise/Fall Time	tER,tEF	--	25	ns
Address Set-Up Time (RS,R/W,E)	tAS	10	--	ns
Address Hole Time	tAH	20	--	ns
Data Set-Up Time	tDSW	40	--	ns
Data Delay Time	tDDR	--	100	ns
Data Hold Time	tDHR	20	--	ns

11.2 Busy flag check timing

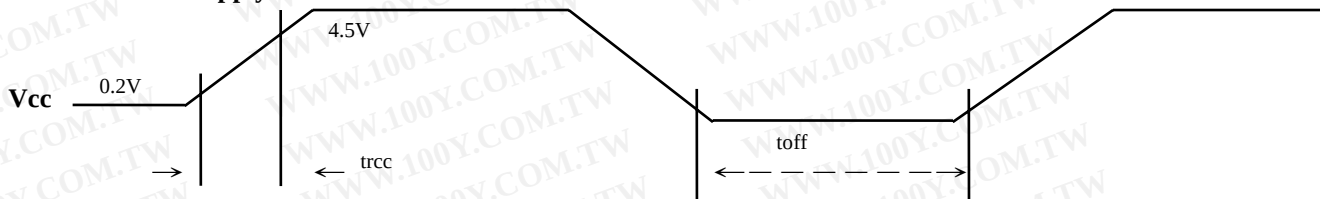


Note: IR7, IR3: Instruction 7th bit, 3rd bit; AC3: Address Counter 3rd bit.

12. Initialization of LCM

The LCM automatically initializes (reset) when power is turned on using the internal reset circuit. If the power supply conditions for correctly operating of the internal reset circuit are not met, initialization by instruction is required. Use the procedure is next page for initialization.

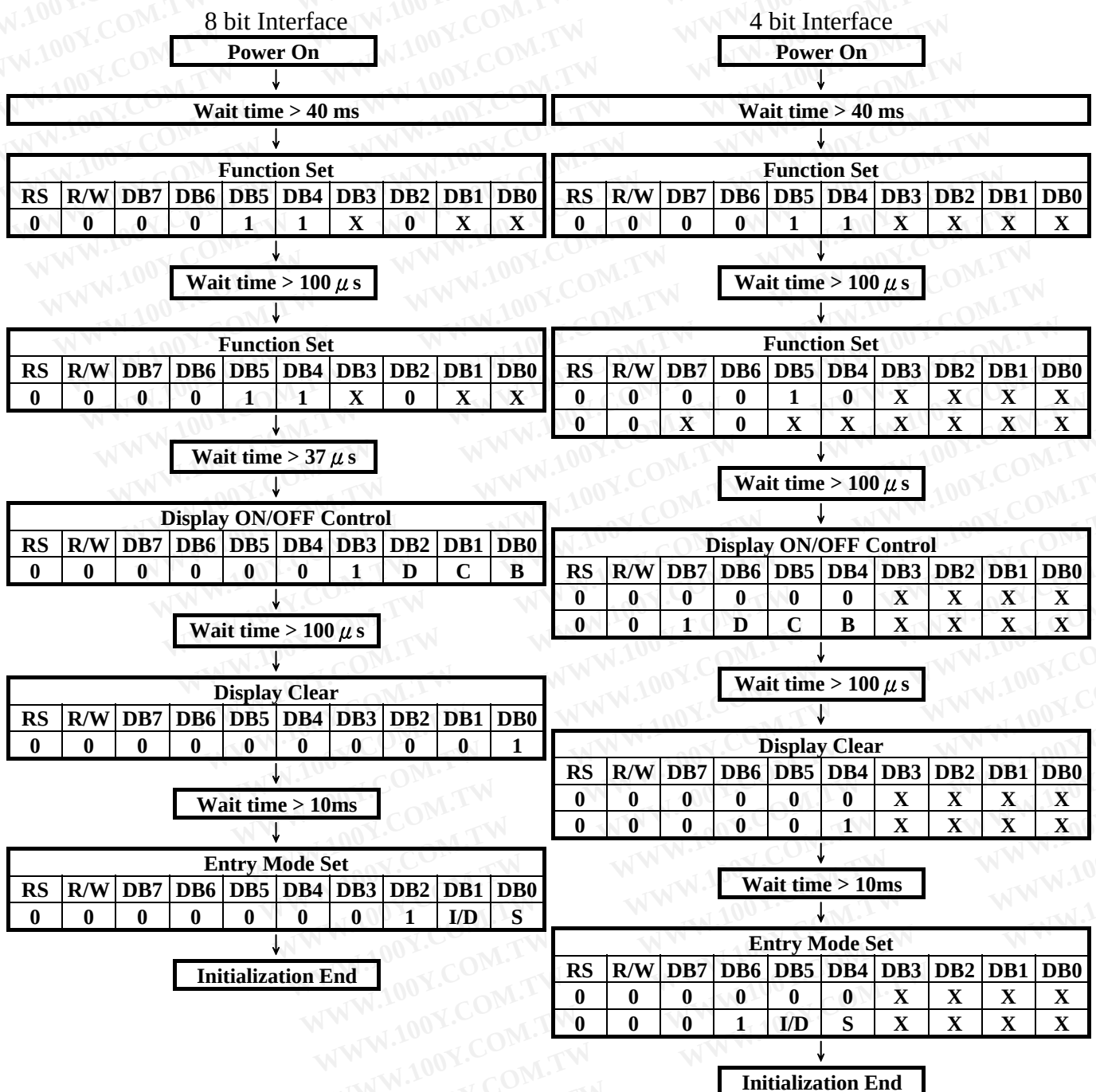
Internal Power Supply reset



(Note 1) $10\text{ ms} \geq \text{trcc} \geq 0.1\text{ ms}$, $\text{toff} \geq 1\text{ ms}$.

(Note 2) toff stipulates the time of power OFF for momentary power supply dip or when power supply cycles ON and OFF.

Item	Symbol	Test condition	Limit (Min.)	Limit (Max.)	Unit
Power supply rise time	trcc	--	0.1	10	ms
Power supply off time	toff	--	1	--	ms



13. Instruction Set

Instruction Table: (RE=0: Enable basic instruction.)

Instruction	Instruction Code										Description	Ex. Time 540KHz
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clear entire display and return the cursor to home position (address 0).	4.6ms
Return Home	0	0	0	0	0	0	0	0	1	X	Return cursor to the home position. Also returns the display being shifted to the original position. DDRAM contents remain unchanged.	4.6ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operation are performed during data rite/read. For normal operation. I/D=1 : increment ; 0 :decrement ; S=1 : accompanies display shift when data is written, for normal operation, set to zero.	72 μ s
Display ON/OFF control	0	0	0	0	0	0	1	D	C	B	D=1: ON display ; 0:OFF display. C=1: ON cursor ; 0: OFF cursor. B=1: ON blink cursor ; 0: OFF blink cursor.	72 μ s
Cursor or Display shift	0	0	0	0	0	1	S/C	R/L	X	X	S/C=1: Display shift; 0:Cursor move. R/L=1: shift to right; 0: shift to left.	72 μ s
Function Set (Modify)	0	0	0	0	1	DL	X	RE	X	X	DL=1: Interface is 8 bits. 0: Interface is 4 bits. RE=0: Normal instruction ,1: Extended instruction.	72 μ s
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	72 μ s
Set DDRAM address	0	0	1	0	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	72 μ s
Read Busy flag and address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0 μ s
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72 μ s
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72 μ s

Instruction Table (RE=1: Enable extension instruction.)

Instruction	Instruction Code										Description	Ex. Time 540KHz
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Standby Mode	0	0	0	0	0	0	0	0	0	1	Enter standby mode, only Icon areas display Standby mode can be released by any other instructions.	72 μ s
Start Row Enable	0	0	0	0	0	0	0	0	1	SR	SR=1: Allow change start display Row. SR=0: Disable start display Row change.	72 μ s
Reverse Line select	0	0	0	0	0	0	0	1	R1	R0	Choice one of 4 line which data is reverse display.	72 μ s
Sleep mode and set GRAM page	0	0	0	0	0	0	1	SL	X	X	SL=0:Enter sleep mode. 1:Wake-up from sleep mode	72 μ s
Function Set (Modify)	0	0	0	0	1	DL	X	RE	G	0	DL=1: Interface is 8 bits. 0: Interface is 4 bits. RE=1: Extended instruction.0: Normal instruction. G=1: Graphic display ON. 0: Graphic display OFF	72 μ s
Set Iram/Start Row address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5 – AC0 is start Row. SR=0: AC3 – AC0 is ICON RAM address.	72 μ s
Set Graphic RAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set GDRAM address in address counter. Execute once set the address of display row (AC6-AC0). Execute again set the address of display column (AC3-AC0).	72 μ s

14. User Font Patterns (CG RAM Character) , Icon RAM & Graph Display RAM Address

User Font Patterns (CG RAM Character)

Character Code (DDRAM data)					CGRAM Address						CGRAM data (High byte)										CGRAM data (Low byte)										
B15-B4	B3	B2	B1	B0	B5	B4	B3	B2	B1	B0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0					
0	X	00	X	00			0	0	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0					
							0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0			
							0	0	1	0	1	1	1	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0		
							0	0	1	1	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0		
							0	1	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1	0	0	0	
							0	1	0	1	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	
							0	1	1	0	0	1	0	1	0	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0	
							0	1	1	1	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	
							1	0	0	0	1	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0
							1	0	0	1	1	0	0	0	0	1	0	1	0	0	0	0	1	1	1	1	1	1	1	1	0
							1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0
							1	0	1	1	0	1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0
							1	1	0	0	1	1	0	0	1	1	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0
							1	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0
							1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
					0	X	01	X	01			0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	0
		0	0	0						1	0	0	1	0	0	0	0	1	0	1	0	1	0	1	0	1	0	0	0		
		0	0	1						0	0	1	0	1	0	0	0	1	0	0	1	1	1	1	1	1	1	0	0		
		0	0	1						1	1	1	1	1	1	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	
		0	1	0						0	1	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	
		0	1	0						1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
		0	1	1						0	0	0	0	0	1	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	
		0	1	1						1	1	1	1	1	1	1	1	0	0	0	1	0	0	0	0	1	0	0	0	0	
		1	0	0						0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	
		1	0	0						1	0	0	1	0	0	1	0	0	0	0	0	1	1	1	1	1	1	1	0	0	
		1	0	1						0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	
		1	0	1						1	1	1	1	0	1	0	1	0	1	0	0	0	1	1	1	1	1	0	0	0	
		1	1	0						0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
		1	1	0						1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	
		1	1	1						0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	
		1	1	1						1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Icon RAM Data

Icon RAM Address				Icon RAM Data															
				High Byte								Low Byte							
AC3	AC2	AC1	AC0	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	Seg0	Seg1	Seg2	Seg3	Seg4	Seg5	Seg6	Seg7	Seg8	Seg9	Seg10	Seg11	Seg12	Seg13	Seg14	Seg15
0	0	0	1	Seg16	Seg17	Seg18	Seg19	Seg20	Seg21	Seg22	Seg23	Seg24	Seg25	Seg26	Seg27	Seg28	Seg29	Seg30	Seg31
0	0	1	0	Seg32	Seg33	Seg34	Seg35	Seg36	Seg37	Seg38	Seg39	Seg40	Seg41	Seg42	Seg43	Seg44	Seg45	Seg46	Seg47
0	0	1	1	Seg48	Seg49	Seg50	Seg51	Seg52	Seg53	Seg54	Seg55	Seg56	Seg57	Seg58	Seg59	Seg60	Seg61	Seg62	Seg63
0	1	0	0	Seg64	Seg65	Seg66	Seg67	Seg68	Seg69	Seg70	Seg71	Seg72	Seg73	Seg74	Seg75	Seg76	Seg77	Seg78	Seg79
0	1	0	1	Seg80	Seg81	Seg82	Seg83	Seg84	Seg85	Seg86	Seg87	Seg88	Seg89	Seg90	Seg91	Seg92	Seg93	Seg94	Seg95
0	1	1	0	Seg96	Seg97	Seg98	Seg99	Seg100	Seg101	Seg102	Seg103	Seg104	Seg105	Seg106	Seg107	Seg108	Seg109	Seg110	Seg111
0	1	1	1	Seg112	Seg113	Seg114	Seg115	Seg116	Seg117	Seg118	Seg119	Seg120	Seg121	Seg122	Seg123	Seg124	Seg125	Seg126	Seg127
1	0	0	0	Seg128	Seg129	Seg130	Seg131	Seg132	Seg133	Seg134	Seg135	Seg136	Seg137	Seg138	Seg139	Seg140	Seg141	Seg142	Seg143
1	0	0	1	Seg144	Seg145	Seg146	Seg147	Seg148	Seg149	Seg150	Seg151	Seg152	Seg153	Seg154	Seg155	Seg156	Seg157	Seg158	Seg159
1	0	1	0	Seg160	Seg161	Seg162	Seg163	Seg164	Seg165	Seg166	Seg167	Seg168	Seg169	Seg170	Seg171	Seg172	Seg173	Seg174	Seg175
1	0	1	1	Seg176	Seg177	Seg178	Seg179	Seg180	Seg181	Seg182	Seg183	Seg184	Seg185	Seg186	Seg187	Seg188	Seg189	Seg190	Seg191
1	1	0	0	Seg192	Seg193	Seg194	Seg195	Seg196	Seg197	Seg198	Seg199	Seg200	Seg201	Seg202	Seg203	Seg204	Seg205	Seg206	Seg207
1	1	0	1	Seg208	Seg209	Seg210	Seg211	Seg212	Seg213	Seg214	Seg215	Seg216	Seg217	Seg218	Seg219	Seg220	Seg221	Seg222	Seg223
1	1	1	0	Seg224	Seg225	Seg226	Seg227	Seg228	Seg229	Seg230	Seg231	Seg232	Seg233	Seg234	Seg235	Seg236	Seg237	Seg238	Seg239
1	1	1	1	Seg240	Seg241	Seg242	Seg243	Seg244	Seg245	Seg246	Seg247	Seg248	Seg249	Seg250	Seg251	Seg252	Seg253	Seg254	Seg255

Graph Display RAM Address

GDRAM Column Address		GDRAM Row Address			
		0	1	-----	15
0		D15 → D0	D15 → D0	D15 → D0	D15 → D0
1		D15 → D0	D15 → D0	D15 → D0	D15 → D0
2		D15 → D0	D15 → D0	D15 → D0	D15 → D0
:		:	:	:	:
61		D15 → D0	D15 → D0	D15 → D0	D15 → D0
62		D15 → D0	D15 → D0	D15 → D0	D15 → D0
63		D15 → D0	D15 → D0	D15 → D0	D15 → D0

15. Software Example

15.1 8-bit operation (8 bits 2 lines)

Function	R S	R W	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	Display	Description
Power on delay												Initialization. No display appears.
Function set	0	0	0	0	1	1	0	0	0	0		Sets to 8-bit operation and selects 2-line display character font. (Note: number of display lines and character fonts cannot be change after this.)
Display OFF	0	0	0	0	0	0	1	0	0	0		Turn off display.
Display ON	0	0	0	0	0	0	1	1	1	0	—	Turn on display and cursor
Entry Mode Set	0	0	0	0	0	0	0	1	1	0	—	Set mode to increment the address by one and to shift the cursor to the right, at the time of write, to the DD/CG RAM Display is not shifted.
Write data to CG/DD RAM	1	0	1	0	1	1	0	1	1	0	雄	Write “雄”. Cursor incremented by one and shift to right.
Write data to CG/DD RAM	1	0	1	1	0	0	0	1	0	1	鐸	Write “鐸”.
Set DD RAM	0	0	1	0	0	1	0	0	0	0	雄鐸	Set RAM address so that the cursor is propositioned at the head of the second line.
Write data to CG/DD RAM				*							雄鐸 CR	Write “C”, and “R”.
Cursor or display shift	0	0	0	0	0	1	0	0	x	x	雄鐸 CR	Shift only the cursor position to the left.
Write data to CG/DD RAM				*							雄鐸 CO., LTD.	Write “O., LTD.”.
Entry Mode Set	0	0	0	0	0	0	0	1	1	1	雄鐸 CO., LTD.	Set display mode shift at the time during writing operation.
Write data to CG/DD RAM	1	0	0	1	1	1	1	0	0	0	鐸 ., LTD. x	Write “ x”. Cursor incremented by one and shift to right. (The display move to left.)
Write data to CG/DD RAM				*								Write other characters.
Return Home	0	0	0	0	0	0	0	0	1	0	雄鐸 CO., LTD.	Return both display and cursor to the original position (Set address to zero).

15.2 4-bit operation (4-bit, 1 line)

Function	R S	R W	D 7	D 6	D 5	D 4	Display	Description
power on delay								initialization. No display appears.
Function set	0	0	0	0	1	0		Sets to 4-bit operation. In this case, operation is handled as 8-bits by initialization, and only this instruction completes with one write.
Function set	0	0	0	0	1	0		Sets 4-bit operation and selects 1-line display character font on and resetting is needed. (number of display lines and character fonts cannot be changed hence after).
Display ON/OFF Control	0	0	0	0	0	0	—	Turn on display and cursor.
Entry Mode Set	0	0	0	0	0	0	—	Set mode to incremented the address by one and to shift the cursor to the right, at the time of write, to the DD/CG RAM display is not shifted.
Write data to CG/DD RAM	1	0	1	0	1	1	雄	Write “雄”. Cursor incremented by one and shift to right.
	1	0	0	1	1	0		
	1	0	1	0	1	0		
	1	0	1	1	1	1		

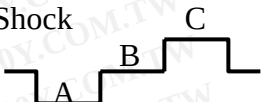
same as 8-bit operation

16. Character Generator ROM Map

High 4-bit	Low 4-bit															
0	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0			☺	♥	♦	♣	♠	•	•	◦	◦	♂	♀	♪	♪	☀
1	▶	◀	↑	!!	¶	§	■	↑	↑	↓	→	←	└	↔	▲	▼
2		!	“	#	\$	%	&	‘	(	)	*	+	,	—	•	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
6	‘	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	△

The front 127 codes of character code is ASCII and it was regarded as half-height character. After A140 it should be BIG-5 Chinese code has 8192 word.

17. Reliability Condition

		TN Type		STN/FSTN Type	
		Normal Temp.	Wide Temp.	Normal Temp.	Wide Temp.
Viewing Angle	Horizontal (Φ 1/Φ 2)	±30°	±30°	±40°	±40°
	Vertical (Θ 2/Θ 1)	15° to 35°	15° to 35°	35° to 55°	35° to 55°
Operating Temperature		0 to 50℃	-20 to 70℃	0 to 50℃	*-20 to 70℃
Storage Temperature		-10 to 60℃	-30 to 80℃	-10 to 60℃	*-30 to 80℃
High Temperature (Power Off)		240 Hours @60℃	240 Hours @80℃	240 Hours @60℃	240 Hours @80℃
Low Temperature (Power Off)		240 Hours @-10℃	240 Hours @-30℃	240 Hours @-10℃	240 Hours @-30℃
High Temperature (Power On)		240 Hours @50℃	240 Hours @70℃	240 Hours @50℃	240 Hours @70℃
Low Temperature (Power On)		240 Hours @0℃	240 Hours @-20℃	240 Hours @0℃	240 Hours @-20℃
High Temperature & High Humidity (Power Off)		40℃/90%RH 240 Hours	40℃/90%RH 240 Hours	40℃/90%RH 240 Hours	40℃/90%RH 240 Hours
Thermal Shock 5 Cycle		A	60min@0℃	60min@-20℃	60min@0℃
		B	5min@25℃	5min@25℃	5min@25℃
		C	60min@50℃	60min@70℃	60min@50℃
LCD Lift (25℃/ 45%RH)		50,000 Hours	50,000 Hours	50,000 Hours	50,000 Hours

*Wide temp. version may not available for some products, Please consult our sales engineer or representatives.

18. Functional Test & Inspection Criteria

18.1 Sample plan

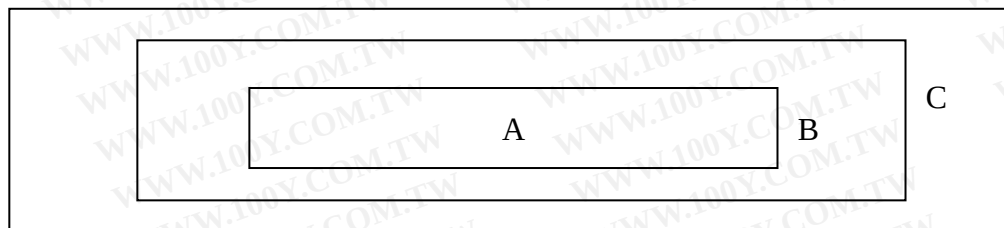
Sample plan according to MIL-STD-105D level 2, and acceptance/rejection criteria is.

Base on: Major defect: AQL 0.65 Minor defect: AQL 2.5

Inspection condition

Viewing distance for cosmetic inspection is 30cm with bare eyes, and under an environment of 800 lus (20W) light intensity. All direction for inspecting the sample should be within 45° against perpendicular line.

18.3 Definition of Inspection Zone in LCD



Zone A: Character / Digit area

Zone B: Viewing area except Zone A (Zone A + Zone B = minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

18.4 Major Defect

All functional defects such as open (or missing segment), short, contrast differential, excess power consumption, smearing, leakage, etc. and overall outline dimension beyond the drawing. Are classified as major defects.

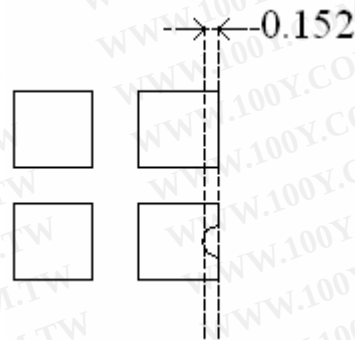
18.5 Inspection Parameters And Glass Pixel(偏光板和玻璃圖像檢驗)

NO	Polarizer(偏光板)	Criteria		
1	Black or White spots And Piercing (黑/白點和刺孔)	Dimension (面積)		Acceptable number (可接受數量)
		D<0.15		*
		0.15≤D≤0.2		4
		0.2≤D≤0.25		2
		D≤0.3		0
		D/面積=(Length/長度+Width/寬度)/2 => *：Disregard(忽略)		
2	Scratch (刮傷)	X(mm)	Y(mm)	Acceptable number (可接受數量)
		*	0.04≥W	*
		3.0≥L	0.06≥W	4
		2.0≥L	0.08≥W	2
		—	0.1≥W	0
		X：Length(長度) Y：Width(寬度) *：Disregard(忽略)		
3	Air Bubbles (between glass & polarizer) 氣泡(玻璃跟偏光板之間)	Dimension (面積)		Acceptable number (可接受數量)
		D≤0.15		*
		0.15<D≤0.25		2
		0.25<D		0
		*：Disregard (忽略)		

4

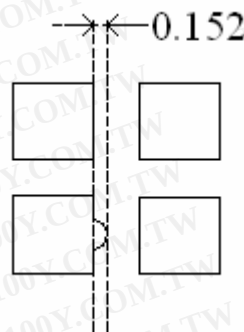
Glass of Pixel
(玻璃的圖像)

(1) Pixel shape (with Dent) / 圖像凹度



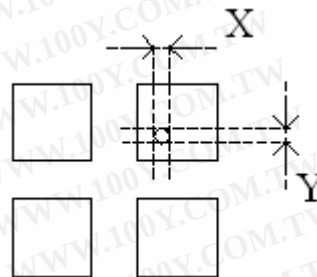
- Less than 0.152 mm is no counted
(小於 0.152mm 者不計)

(2) Pixel shape (with Projection) / 圖像凹度



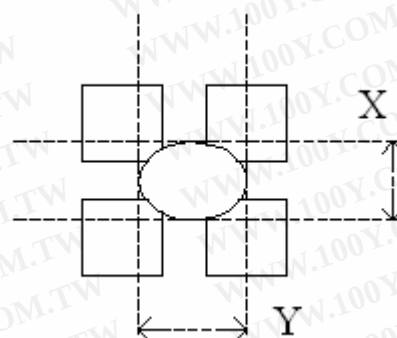
- Should not be connected
next pixel
(點與點間不可先連接)

(3) Deformation / 變形



- $(X + Y) / 2 \leq 0.15\text{mm}$
- Less than 0.1 mm is no counted
(小於 0.15mm 者不計)

(4) Deformation / 變形



- $(X + Y) / 2 \leq 0.3\text{mm}$
- Less than 0.3 mm is no counted
(小於 0.3mm 者不計)

19. Test (測試條件) – Normal Temperature (常溫)

No change no display and in operation under the following text condition.

(在不改變原先顯示下進行以下測試操作)

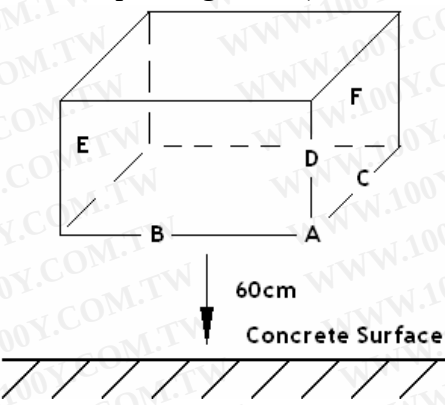
Conditions : Unless otherwise specified, test will be conducted under the following condition.

Temperature : $20 \pm 5^\circ\text{C}$

Humidity : $40 \pm 5\%\text{RH}$

Tests will be not conducted under functioning state.

(條件：除非其他特殊情況，否則測試將以溫度： $20 \pm 5^\circ\text{C}$ ，濕度： $40 \pm 5\%\text{RH}$ 為主)

NO	Parameter	Conditions	Notes
1	High Temperature Operating	$50^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (operation state) (96 小時，溫度 $50^\circ\text{C} \pm 2^\circ\text{C}$ 電源開啟的操作情況下)	
2	Low Temperature Operating	$0^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (operation state) (96 小時，溫度 $0^\circ\text{C} \pm 2^\circ\text{C}$ 電源開啟的操作情況下)	1
3	High Temperature Storage	$60^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (96 小時，溫度 $60^\circ\text{C} \pm 2^\circ\text{C}$ 電源關閉靜態操作下)	2
4	Low Temperature Storage	$-10^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (96 小時，溫度 $-10^\circ\text{C} \pm 2^\circ\text{C}$ 電源關閉靜態操作下)	1, 2
5	Damp Proof Test	$40^\circ\text{C} \pm 2^\circ\text{C}$, $85 \sim 90\%\text{RH}$, 96hr (96 小時，溫度： $40^\circ\text{C} \pm 2^\circ\text{C}$ ，濕度： $85 \sim 90\%\text{RH}$ 電源關閉靜態操作下)	1, 2
6	Vibration Test	Total fixed amplitude : 1.5 mm (完全固定輻射：1.5mm) Vibration Frequency : 10 ~ 55 Hz (震動頻率：10~55 Hz) One cycle 60 seconds to 3 directions of X, Y, Z for each 15 minutes (每一個循環 X, Y, Z 軸方向各做 60 秒，連續做 5 次，共計 15 分鐘)	3
7	Shock Test	To be measured after dropping from 60cm high on the concrete surface in packing state. (包裝材從 60 公分高的地方向地面落下)  Dropping method comer dropping (角落落方式) A comer : once Edge dropping (側邊落下) B, C, D edge : once Face dropping (表面落下) E, F, G face : once	

Note 1 : No dew condensation to be observed. (不要在“水氣凝結點”下觀察)

Note 2 : The function test shall be conducted after 4 hours storage at the normal

Temperature and humidity after removed from the test chamber

(從實驗室移出後，放在一般常溫 (溫度： 25°C ，濕度： $45\%\text{RH}$)，

且四小時後通電流或電壓，看它是否能正常動作)

Note 3 : Vibration test will be conducted to the product itself without putting it in a container.

(在震動測試下，產品本身不需容器即能自行傳導)

20. Test (測試條件) – Wide Temperature (廣溫)

No change no display and in operation under the following test condition.

(在不改變原先顯示下進行以下測試操作)

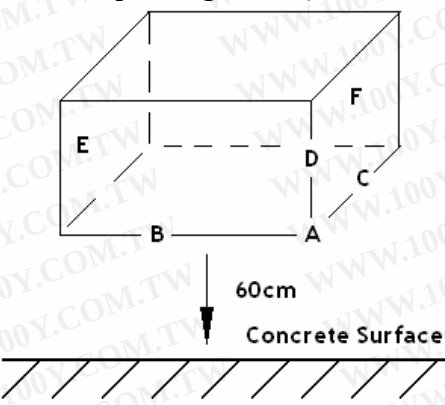
Conditions : Unless otherwise specified, test will be conducted under the following condition.

Temperature : $20 \pm 5^\circ\text{C}$

Humidity : $40 \pm 5\%\text{RH}$

Tests will be not conducted under functioning state.

(條件：除非其他特殊情況，否則測試將以溫度： $20 \pm 5^\circ\text{C}$ ，濕度： $40 \pm 5\%\text{RH}$ 為主)

NO	Parameter	Conditions	Notes
1	High Temperature Operating	$70^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (operation state) (96 小時，溫度 $70^\circ\text{C} \pm 2^\circ\text{C}$ 電源開啟的操作情況下)	
2	Low Temperature Operating	$-20^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (operation state) (96 小時，溫度 $-20^\circ\text{C} \pm 2^\circ\text{C}$ 電源開啟的操作情況下)	1
3	High Temperature Storage	$80^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (96 小時，溫度 $80^\circ\text{C} \pm 2^\circ\text{C}$ 電源關閉靜態操作下)	2
4	Low Temperature Storage	$-30^\circ\text{C} \pm 2^\circ\text{C}$, 96 hrs (96 小時，溫度 $-30^\circ\text{C} \pm 2^\circ\text{C}$ 電源關閉靜態操作下)	1, 2
5	Damp Proof Test	$40^\circ\text{C} \pm 2^\circ\text{C}$, $85 \sim 90\%\text{RH}$, 96hr (96 小時，溫度： $40^\circ\text{C} \pm 2^\circ\text{C}$ ，濕度： $85 \sim 90\%\text{RH}$ 電源關閉靜態操作下)	1, 2
6	Vibration Test	Total fixed amplitude : 1.5 mm (完全固定輻射：1.5mm) Vibration Frequency : 10 ~ 55 Hz (震動頻率：10~55 Hz) One cycle 60 seconds to 3 directions of X, Y, Z for each 15 minutes (每一個循環 X, Y, Z 軸方向各做 60 秒，連續做 5 次，共計 15 分鐘)	3
7	Shock Test	To be measured after dropping from 60cm high on the concrete surface in packing state. (包裝材從 60 公分高的地方向地面落下)  Dropping method corner dropping (角落落方式) A corner : once Edge dropping (側邊落下) B, C, D edge : once Face dropping (表面落下) E, F, G face : once	

Note 1 : No dew condensation to be observed. (不要在“水氣凝結點”下觀察)

Note 2 : The function test shall be conducted after 4 hours storage at the normal

Temperature and humidity after removed from the test chamber

(從實驗室移出後，放在一般常溫 (溫度： 25°C ，濕度： $45\%\text{RH}$)，

且四小時後通電流或電壓，看它是否能正常動作)

Note 3 : Vibration test will be conducted to the product itself without putting it in a container.

(在震動測試下，產品本身不需容器即能自行傳導)

21. Precautions Against Product Handling [產品使用注意事項]：

The following precautions will guide you in handling our product correctly.

[下列警戒引導正確地使用產品]

21.1 Care of the LCD module against static electricity discharge. [LCD 模組靜電注意事項]

21.1.1 When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats (made of rubber), to protect work tables against the hazards of electrical shock.

[操作模組時，避免操作者身體接地及任何造成靜電的設備同時使用，強烈建議(橡膠製)抗靜電墊的使用，以免工作台面遭受到電氣干擾]

21.1.2 Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.

[緩慢小心地移除 LCD 模組上的保護膜，以防靜電產生]

21.1.3 Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

[避免穿著人造合成的工作服，建議棉質或是有傳導性的纖維質料]

21.2 Liquid crystal display devices (LCD devices) [液晶螢幕顯示器的組成]

21.2.1 The polarizer adhering to the surface of the LCD is made of a soft material.

Guard against scratching it. [偏光板是軟性原料製成，請勿刮傷]

21.2.2 The LCD device panel used in the LCM is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.

[模組使用的玻璃為平面玻璃，避免任何強烈的機械撞擊，且觸碰時請小心]

21.3 When the LCD module alone must be stored form long periods of time

[當 LCD 模組須長時間存放時]

21.3.1 Protect the modules from excessive external forces. [避免外力壓迫]

21.3.2 Protect the modules from high temperature and humidity. [避免處於高溫高濕下]

21.3.3 Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.

[遠離陽光曝曬或直接曝露在紫外線下]

21.4 Use the module with a power supply that is equipped with an overcurrent protector circuit, since the module is not provided with this protective feature.

[因為模組本身沒有防護，所以模組的供應器應配有過高電流的保護迴路]

21.5 Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.

[LCD 破裂液晶外漏時，切勿食下液晶；若手或衣服接觸到液晶，請立刻用肥皂清洗]

21.6 Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

[當金屬框並沒焊接於 PCB 板上時，無法保證使用金屬框是具有傳導性，請連絡我們商討適當方式傳導]

21.7 For models which use CCFL [CCFL 的模組]:

21.7.1 High voltage of 1000V or greater is applied to the CCFL cable connector area.

[CCFL 排線連接器用於 1000V 以上的高電壓]

21.7.2 Protect CCFL cables from rubbing against the unit and thus causing the wire jacket to become worn. [CCFL 排線必須有保護 CCFL 與模組磨擦，以防 CCFL 外殼受到損害]

21.7.3 The use of CCFLs for extended periods of time at low temperatures will significantly shorten their service life. [長時間低溫使用 CCFL 會明顯縮減其使用壽命]

21.8 For models which use touch panels [觸控式面板模組]:

21.8.1 Do not stack up modules since they can be damaged by components on neighboring modules.
[勿堆疊模組以防損壞]

21.8.2 Do not place heavy objects on top of the product. This could cause glass breakage.
[勿將重物放置在產品上，會導致玻璃破損]

21.9 For models which use COG & TAB [COG 及 TAB 模組]:

21.9.1 The mechanical strength of the product is low since the IC chip is faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces.
[由於 IC 晶片表面無防護，所以抗壓力有限，須加強保護以防外力]

21.9.2 Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact.
[勿暴露 IC 晶片以防電氣干擾，且避免安裝 IC 時有任何電子接觸]

21.10 Models which use flexible cable, heat seal, or TAB [加有軟排線、熱封條或 TAB 的模組]:

21.10.1 In order to maintain reliability, do not touch or hold by the connector area.
[以維持產品信賴度，請勿觸碰或握住連接器]

21.10.2 Avoid any bending, pulling, or other excessive force, which can result in broken connections. [避免彎曲、拉扯或過度力量，會造成連接器損壞]

21.11 In case of acrylic plate is attached to front side of LCD panel, cloudiness (very small cracks) can occur on acrylic plate, being influenced by some components generated from polarizer film. Please check and evaluate those acrylic materials carefully before use.

[貼在 LCD 玻璃前面的壓克力板若有模糊情況(微小裂縫)，即會影響偏光板；使用前請仔細確認壓克力材質]

21.12 In case of buffer material such as cushion/gasket is assembled into LCD module, it may have an adverse effect on connecting parts (LCD panel-TCP/ HEAT SEAL/ FPC, PCB-TCP/HEAT SEAL/FPC, TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC) depending on its materials.

Please check and evaluate these materials carefully before use.

[緩衝原料像是減震墊/襯墊，或許會對連接器(LCD panel-TCP/ HEAT SEAL/ FPC, PCB-TCP/HEAT SEAL/FPC, TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC)造成反效果，使用前請仔細確認材料]

22. Warranty [保證]:

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

[此產品的製造是依照客戶的規格，被使用於客戶的一般電子產品上，保證產品製作根據出貨的規格，若產品的使用不是在一般電子設備，而組裝於下列產品上則無法受理（如醫療產品、核心電源控制設備、航空設備、防火及保全系統，或任何相關儀器會直接影響人類生命等），若模組使用於上述的儀器，則需商討各別產品責任義務的協定]

- 22.1 We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
[不受理因強大外力衝擊造成產品的缺陷]
- 22.2 We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
[不受理產品出貨後，因額外加工(包含拆裝及重新封包)造成的缺陷]
- 22.3 We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product, has passed your company's acceptance inspection procedures.
[不受理通過貴公司檢驗流程後，由於靜電造成產品的缺陷]
- 22.4 We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.
[不受理因在客戶產品生產線端所產生的第三人智慧財產權責任，除非與我司生產製造方法有直接關係的問題]
- 22.5 When the product is in CCFL models, CCFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.
[產品是 CCFL 模組時，CCFL 的壽命及亮度將取決於連接器的性能、漏電量等；無法受理因 CCFL 造成產品性能的缺陷]
- 22.6 SDEC will not be held responsible for any quality guarantee issue for defect products longer than 1(one) year from SDEC production which ever comes later.
[出廠超過一年的瑕疵品，任何品質擔保則不受理]