



惠州市天興光电显示科技有限公司

LIQUID CRYSTAL DISPLAY **MODULE**

USER' MANUAL

MODEL: TX-19264FDLNW

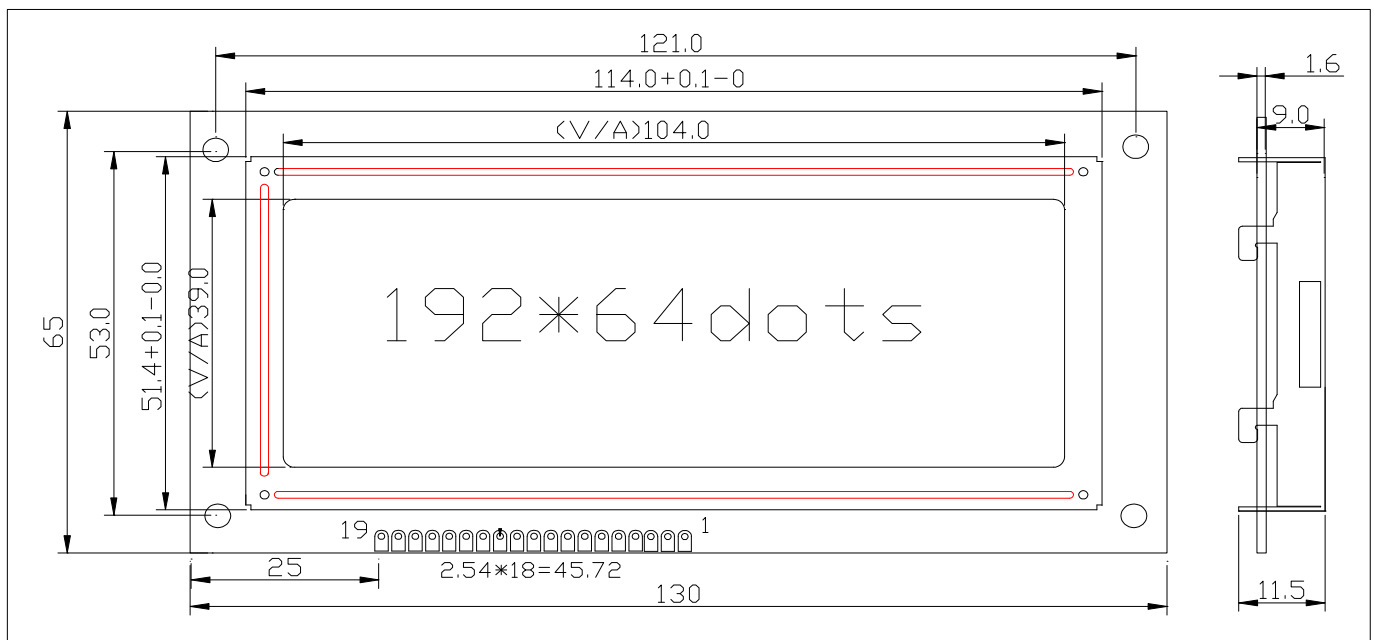
TEST	CHECK	APPROVED

TXEC TECHNOLOGY CORP.

1. Mechanical Specification

ITEM	STANDARD VALUE				UNIT
DOT MATRIX FORMAT	192 X 64 DOTS				--
MODULE DIMENSION	130.0 (W) X 65.0 (H) X12.5 (T)				mm
VIEWING DISPLAY AREA	104.0 (W) X 39.0 (H)				mm
ACTIVE DISPLAY AREA	95.95 (W) X 31.95 (H)				mm
DOT SIZE	0.45 (W) X 0.45 (H)				mm
DOT PITCH	0.5 (W) X 0.5 (H)				mm
APPROX. WEIGHT	—				g
LCD TYPE	STN, BLUE, 1/32 DUTY, 1/6 BIAS, 6 O'clock ,				
BACKLIGHT TYPE	LED(WHITE)		USE INVERTER		
BACKLIGHT INPUT	DC +3V	V	80	mA	Hz
INVERTER INPUT		V		mA	Hz
BACKLIGHT Half-Lift TIME	100,000				HR.

2. Mechanical Diagram



3. Interface Pin Connections

NO	SYMBOL	LEVEL	FUNCTION	NO	SYMBOL	LEVEL	FUNCTION
1	VSS	--	GND (0V)	11	DB1	H/L	Data Bit 2
2	VDD	H/L	DC +5V	12	DB2	H/L	Data Bit 3
3	V0	--	Contrast Adjust	13	DB3	H/L	Data Bit 4
4	/RST	0	RESET SIGNAL	14	DB4	H/L	Data Bit 5
5	RS(CS)	H/L	Register select	15	DB5	H/L	Data Bit 6
6	R/W(STD)	H/L	Read/Write	16	DB6	H/L	Data Bit 7
7	E1(SCLK)	H,H→L	Enable signal	17	DB7	H/L	Data Bit 8
8	E2(SCLK)	H,H→L	Enable signal	18	A(+)	DC +5V	LED Backlight +
9	PSB	0	H:PARALLEL L:SERIAL	19	K(-)	0V	LED Backlight -
10	DB0	H/L	Data Bit 1				

4. Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYPE	MAX.	UNIT
OPERATING TEMPERATURE	TOP	-20	--	+70	°C
STORAGE TEMPERATURE	TST	-30	--	+80	°C
INPUT VOLTAGE	V1	VSS	--	VDD	V
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	--	5.0	6.5	V
SUPPLY VOLTAGE FOR LCD	VDD-VO	--	--	6.5	V
STATIC ELECTRICITY	Be sure that you are grounded when handling LCM.				

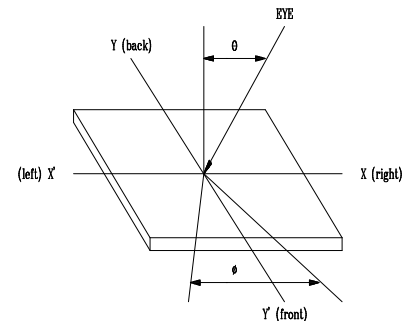
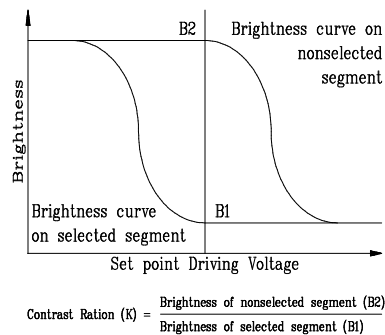
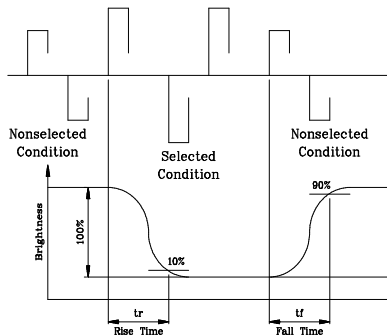
4. Electrical Characteristics

ITEM	SYN	CONDITION	MIN.	TYPE	MAX.	UNIT
SUPPLY VOLTAGE FOR LOGIC	VDD-VSS	--	4.5	5.0	5.5	V
SUPPLY VOLTAGE FOR LCD	VDD-VO	Ta= 0°C	--	6.1	--	V
		Ta=+25 0°C	--	5.8	--	V
		Ta=+50 0°C	--	5.5	--	V
INPUT HIGH VOLTAGE	VIH	--	2.2	--	VDD	V
INPUT LOW VOLTAGE	VIL	--	0	--	0.6	V
OUTPUT HIGH VOLTAGE	VOH	--	2.4	--	--	V
OUTPUT LOW VOLTAGE	VOL	--	--	--	0.4	V
SUPPLY CURRENT	IDD	VDD=+5V	--	3.0	4.5	mA

5. Optical Characteristics

ITEM	SYN	CONDITION	MIN.	TYPE	MAX.	UNIT
VIEW ANGLE (V)	θ	CR \geq 2	-10	--	40	deg.
VIEW ANGLE (H)	φ	CR \geq 2	-30	--	30	deg.
CONTRAST RATIO	CR	--	--	5	--	--
RESPONSE TIME	TON	--	--	180	230	mS
RESPONSE TIME	TOFF	--	--	100	150	mS

6. Optical Definitions



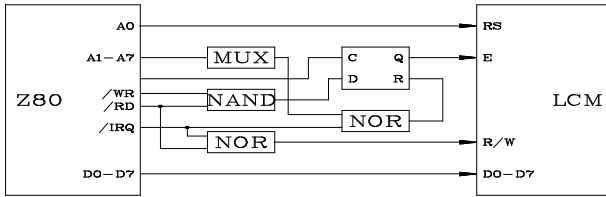
8. Display Address

	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	88H	89H	8AH	8BH	8CH	8DH	8EH	8FH
Line 2	A0H	A1H	A2H	A3H	A4H	A5H	A6H	A7H	A8H	A9H	AAH	ABH	ACH	ADH	AEH	AFH
Line 3	80H	81H	82H	83H	84H	85H	86H	87H	88H	89H	8AH	8BH	8CH	8DH	8EH	8FH
Line 4	A0H	A1H	A2H	A3H	A4H	A5H	A6H	A7H	A8H	A9H	AAH	ABH	ACH	ADH	AEH	AFH

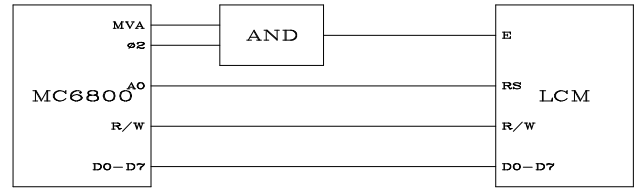
	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Line 1	90H	91H	92H	93H	94H	95H	96H	97H	98H	99H	9AH	9BH	9CH	9DH	9EH	
Line 2	B0H	B1H	B2H	B3H	B4H	B5H	B6H	B7H	B8H	B9H	BAH	BBH	BCH	BDH	BEH	
Line 3	90H	91H	92H	93H	94H	95H	96H	97H	98H	99H	9AH	9BH	9CH	9DH	9EH	
Line 4	B0H	B1H	B2H	B3H	B4H	B5H	B6H	B7H	B8H	B9H	BAH	BBH	BCH	BDH	BEH	

9. Interface to MPU

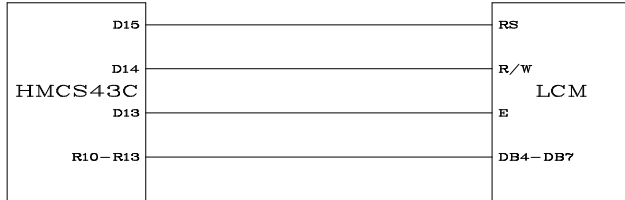
9.1 Interface to Z-80 CPU



9.2 Interface to MC6800 CPU



9.3 Interface to 4-bit CPU (HMCS43C)



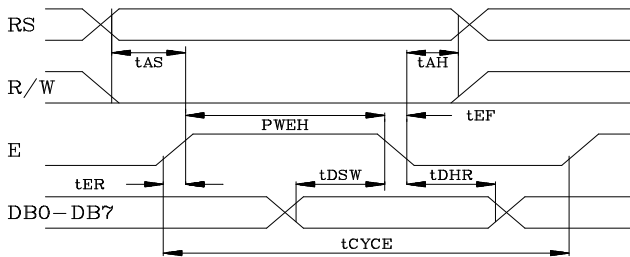
9.4 Interface to HD6805 MP



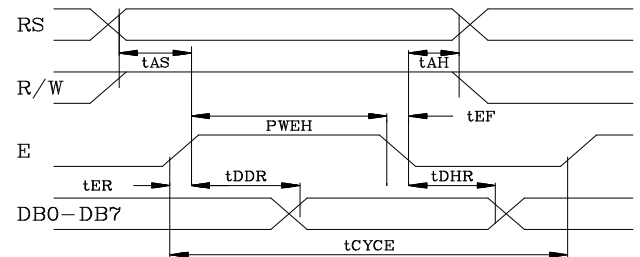
10. Timing Control

10.1 Write and Read Operation

Write Operation

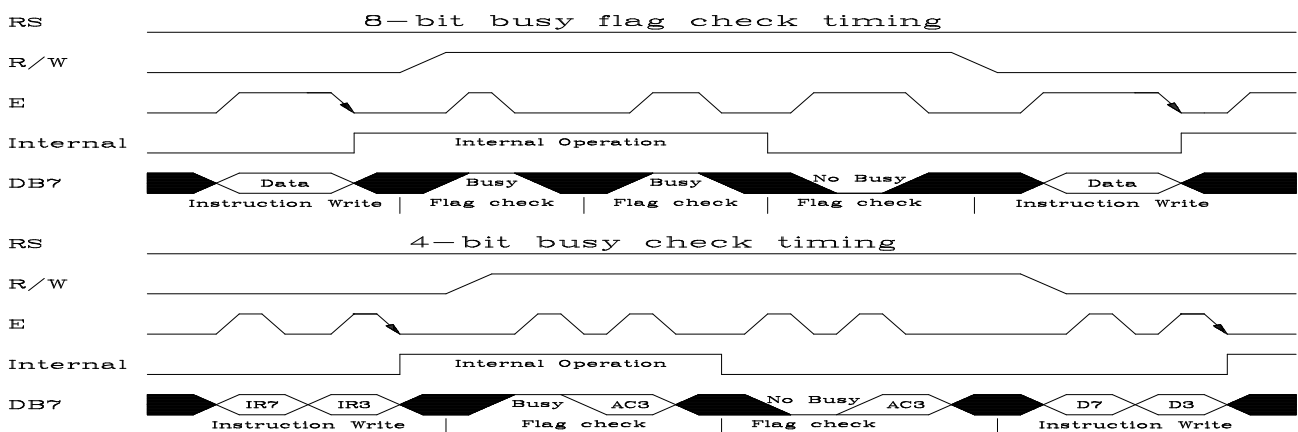


Read Operation



Item	Symbol	Limit (Min.)	Limit (Max.)	Unit
Enable Cycle Time	tCYCE	1000	--	ns
Enable Pules Width (High level)	PWEH	450	--	ns
Enable Rise/Fall Time	tER,tEF	--	25	ns
Address Set-Up Time (RS,R/W,E)	tAS	100	--	ns
Address Hole Time	tAH	10	--	ns
Data Set-Up Time	tDSW	100	--	ns
Data Delay Time	tDDR	--	190	ns
Data Hold Time	tDHR	20	--	ns

10.2 Busy flag check timing

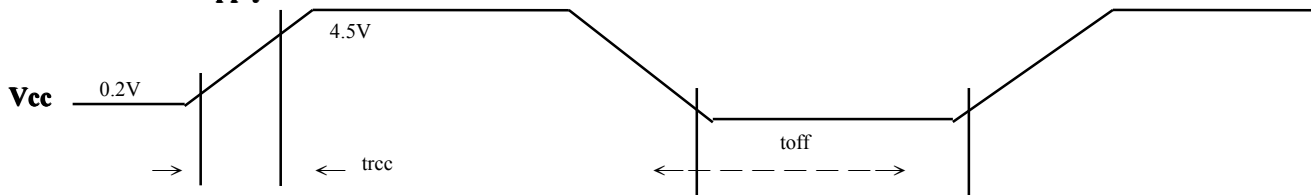


Note : IR7, IR3 : Instruction 7th bit , 3rd bit ; AC3 : Address Counter 3rd bit.

11. 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

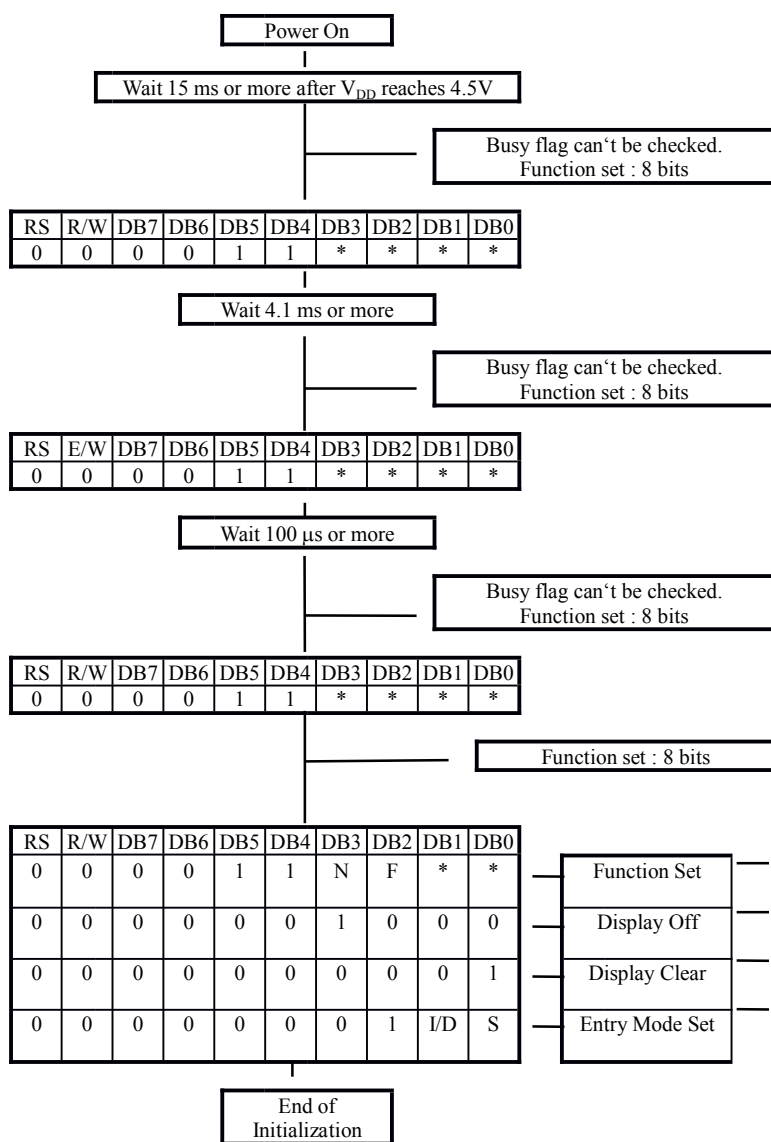


(Note 1) $10\text{ ms} \geq \text{trcc} \geq 0.1\text{ ms}$, $\text{toff} \geq 1\text{ ms}$.

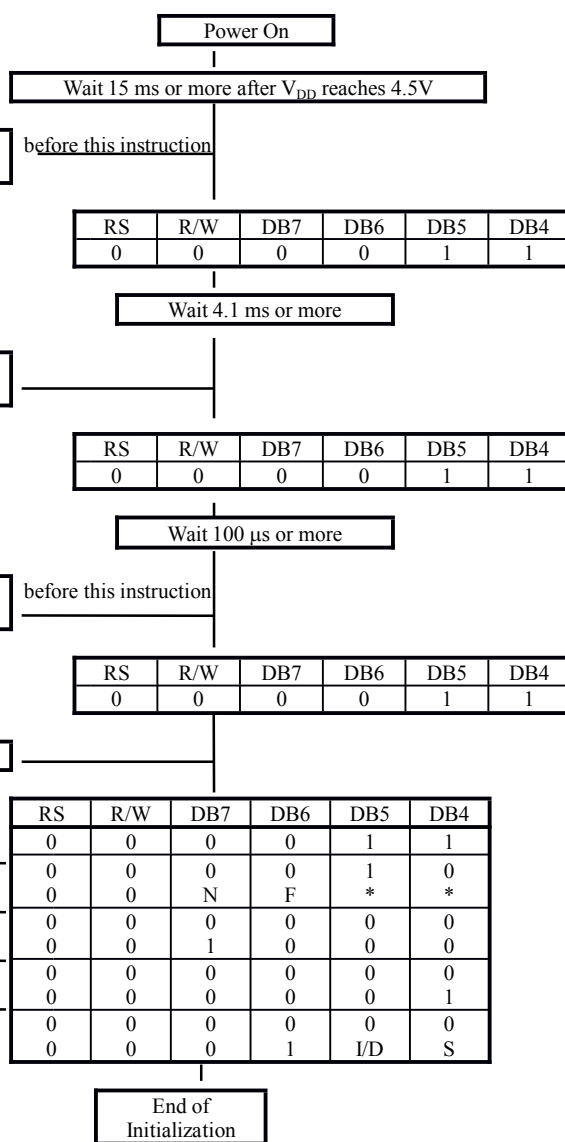
(Note 2) toff stipulates the time of power OFF for momentary power supply dip or when power supply cycles ON and OFF.

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

1) 8 Bit Interface



2) 4 Bit Interface



- Busy flag is checked after instructions are completed. If busy flag isn't checked, the waiting time between instructions should be longer than execution time of these instructions.

12. 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 (address0).	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 write/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.	72us
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.	72us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	X	X	S/C=1: Interface data is 8 bits. DL=0: Interface data is 4 bits. N=1&RE=0: 3 line setting. Others: 2 line setting. G=1: Graphic display ON. G=0: Graphic display OFF. RE=0: Normal instruction setting. RE=1: Extended instruction setting.	72us
Function Set (Modify)	0	0	0	0	1	DL	N	0 RE	G	X	D=1: Interface data is 8 bits. DL=0: Interface data is 4 bits. N=1&RE=1: 4 line setting. Others: 2 line setting. G=1: Graphic display ON. G=0: Graphic display OFF. RE=0: Normal instruction setting. RE=1: Extended instruction setting.	72us
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	72us
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	72us
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.	0us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	READ data from internal RAM. (DDRAM/CGRAM/IRAM/GRAM)	72us

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.	72us
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.	72us
Reverse Line select	0	0	0	0	0	0	0	1	R1	R0	Choice one of 4 line which data is reverse Display.	72us
Sleep mode And set GRAM page	0	0	0	0	0	0	1	SL	GD	GW	SL=0: Enter sleep mode. SL=1: Wake-up from sleep mode. GD: Display graphic page 0 or 1. GW: Write data to graphic page 0 or 1. (Effective while GP=1)	72us
Display Shift By dot	0	0	0	0	0	1	OA	L R	L1	L0	OA=1: One of 4 lines shift enable. OA=0: All lines shift enable. LR=1: Dot by dot shift right. LR=0: Dot by dot shift left. L1, L0: Choice one of 4 lines shift.	72us
Function Set (Modify)	0	0	0	0	1	CL	N	1 RE	G	GP	CL=1: Select 16 character line. CL=0: Select 8 character line. N=1&RE=1: 4 line display. RE=1: Extended instruction setting. RE=0: Normal instruction setting. G=1: Graphic display ON. G=0: Graphic display OFF GP=1: Two page GRAM. GP=0: One page GRAM.	72us
Set IRAM or Start Row address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	SR=1: AC5 - AC0 is start Row. SR=0: AC - AC0 is ICON RAM address.	72us
Set Graphic RAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set graphic RAM address in address Counter. Execute once set the address of Display row. Execute again set the address Of display column. Each address of display Column has data of 16 bits. Therefore write data should execute 2 times.	72us

13. 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	SEG 0	SEG 1	SEG 2	SEG 3	SEG 4	SEG 5	SEG 6	SEG 7	SEG 8	SEG 9	SEG 10	SEG 11	SEG 12	SEG 13	SEG 14	SEG 15
0	0	0	1	SEG 16	SEG 17	SEG 18	SEG 19	SEG 20	SEG 21	SEG 22	SEG 23	SEG 24	SEG 25	SEG 26	SEG 27	SEG 28	SEG 29	SEG 30	SEG 31
0	0	1	0	SEG 32	SEG 33	SEG 34	SEG 35	SEG 36	SEG 37	SEG 38	SEG 39	SEG 40	SEG 41	SEG 42	SEG 43	SEG 44	SEG 45	SEG 46	SEG 47
0	0	1	1	SEG 48	SEG 49	SEG 50	SEG 51	SEG 52	SEG 53	SEG 54	SEG 55	SEG 56	SEG 57	SEG 58	SEG 59	SEG 60	SEG 61	SEG 62	SEG 63
0	1	0	0	SEG 64	SEG 65	SEG 66	SEG 67	SEG 68	SEG 69	SEG 70	SEG 71	SEG 72	SEG 73	SEG 74	SEG 75	SEG 76	SEG 77	SEG 78	SEG 79
0	1	0	1	SEG 80	SEG 81	SEG 82	SEG 83	SEG 84	SEG 85	SEG 86	SEG 87	SEG 88	SEG 89	SEG 90	SEG 91	SEG 92	SEG 93	SEG 94	SEG 95
0	1	1	0	SEG 96	SEG 97	SEG 98	SEG 99	SEG 100	SEG 101	SEG 102	SEG 103	SEG 104	SEG 105	SEG 106	SEG 107	SEG 108	SEG 109	SEG 110	SEG 111
0	1	1	1	SEG 112	SEG 113	SEG 114	SEG 115	SEG 116	SEG 117	SEG 118	SEG 119	SEG 120	SEG 121	SEG 122	SEG 123	SEG 124	SEG 125	SEG 126	SEG 127
1	0	0	0	SEG 128	SEG 129	SEG 130	SEG 131	SEG 132	SEG 133	SEG 134	SEG 135	SEG 136	SEG 137	SEG 138	SEG 139	SEG 140	SEG 141	SEG 142	SEG 143
1	0	0	1	SEG 144	SEG 145	SEG 146	SEG 147	SEG 148	SEG 149	SEG 150	SEG 151	SEG 152	SEG 153	SEG 154	SEG 155	SEG 156	SEG 157	SEG 158	SEG 159
1	0	1	0	SEG 160	SEG 161	SEG 162	SEG 163	SEG 164	SEG 165	SEG 166	SEG 167	SEG 168	SEG 169	SEG 170	SEG 171	SEG 172	SEG 173	SEG 174	SEG 175
1	0	1	1	SEG 176	SEG 177	SEG 178	SEG 179	SEG 180	SEG 181	SEG 182	SEG 183	SEG 184	SEG 185	SEG 186	SEG 187	SEG 188	SEG 189	SEG 190	SEG 191
1	1	0	0	SEG 192	SEG 193	SEG 194	SEG 195	SEG 196	SEG 197	SEG 198	SEG 199	SEG 200	SEG 201	SEG 202	SEG 203	SEG 204	SEG 205	SEG 206	SEG 207
1	1	0	1	SEG 208	SEG 209	SEG 210	SEG 211	SEG 212	SEG 213	SEG 214	SEG 215	SEG 216	SEG 217	SEG 218	SEG 219	SEG 220	SEG 221	SEG 222	SEG 223
1	1	1	0	SEG 224	SEG 225	SEG 226	SEG 227	SEG 228	SEG 229	SEG 230	SEG 231	SEG 232	SEG 233	SEG 234	SEG 235	SEG 236	SEG 237	SEG 238	SEG 239
1	1	1	1	SEG 240	SEG 241	SEG 242	SEG 243	SEG 244	SEG 245	SEG 246	SEG 247	SEG 248	SEG 249	SEG 250	SEG 251	SEG 252	SEG 253	SEG 254	SEG 255

14. Software Example

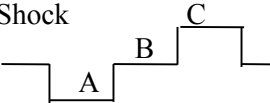
14.1 8-bit operation (8 bits 2 lines)

Function	R S	R W	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D0	Display	Description
Power on delay												Initialization. No display appears.
Function set	0	0	0	0	1	1	0	0	0	x		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	天	Write “天”. Cursor incremented by one and shift to right.
Write data to CG/DD RAM	1	0	1	1	0	0	0	1	0	1	天兴	Write “兴” .
Set DD RAM	0	0	1	0	1	0	0	0	0	0	天兴	Set RAM address so that the cursor is propositioned at the head of the second line.
Write data to CG/DD RAM				*							天兴 CR	Write “C” , and “R”.
Cursor or display shift	0	0	0	0	0	1	0	0	x	x	天兴 CR	Shift only the cursor position to the left.
Write data to CG/DD RAM				*							天兴 CO., LTD.	Write “O., LTD.” .
Entry Mode Set	0	0	0	0	0	0	0	1	1	1	天兴 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	兴 ., 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	天兴 CO., LTD.	Return both display and cursor to the original position (Set address to zero).

14.2 4-bit operation (4-bit, 1 line)

Function	RS	R/ W	D7	D6	D5	D4	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	0 0	0 0	1 0	0 x		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 1	0 1	0 1	0 0	—	Turn on display and cursor.
Entry Mode Set	0 0	0 0	0 0	0 1	0 1	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 1 1 1	0 0 0 0	1 0 1 1	0 1 0 1	1 1 0 1	1 0 0 1	天	Write “天”. Cursor incremented by one and shift to right.
same as 8-bit operation								

15. Reliability Condition

		TN Type		STN Type	
		Normal Temp.	Wide Temp	Normal Temp.	Wide Temp.
Viewing Angle	Horizontal Φ	$\pm 30^{\circ}$	$\pm 30^{\circ}$	$\pm 30^{\circ}$	$\pm 30^{\circ}$
	Vertical Θ (mm)	10° to 30°	10° to 30°	-10° to 40°	-10° to 40°
Operating Temperature		-10° to 70°C	-250° to 80°C	0° to 50°C	$*-20^{\circ}$ to 70°C
Storage Temperature		-20° to 80°C	-350° to 90°C	-20° to 70°C	$*-30^{\circ}$ to 80°C
High Temperature (Power Off)		240 Hours @- 70°C	240 Hours @- 90°C	240 Hours @ 650°C	240 Hours @ 75°C
Low Temperature (Power Off)		240 Hours @- 20°C	240 Hours @- 35°C	240 Hours @- 15°C	240 Hours @- 25°C
High Temperature (Power On)		240 Hours @- 70°C	240 Hours @ 80°C	240 Hours @ 60°C	240 Hours @ 70°C
Low Temperature (Power On)		240 Hours @- 10°C	240 Hours @- 25°C	240 Hours @- 10°C	240 Hours @- 20°C
Low Temperature & High Humidity		$55^{\circ}\text{C}/90\%\text{RH}$ 240 Hours	$75^{\circ}\text{C}/90\%\text{RH}$ 240 Hours	$45^{\circ}\text{C}/90\%\text{RH}$ 240 Hours	$65^{\circ}\text{C}/90\%\text{RH}$ 240 Hours
Thermal Shock 5 cycle		A	60min@- 20°C	60min@- 35°C	60min@- 20°C
		B	5min@- 25°C	5min@- 25°C	5min@- 25°C
		C	60min@ 70°C	60min@ 90°C	60min@ 70°C
Expected Lift		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 representative.

16. Functional Test & Inspection Criteria

16.1 Sample plan

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

Base on : Major defect : AQL 0.65

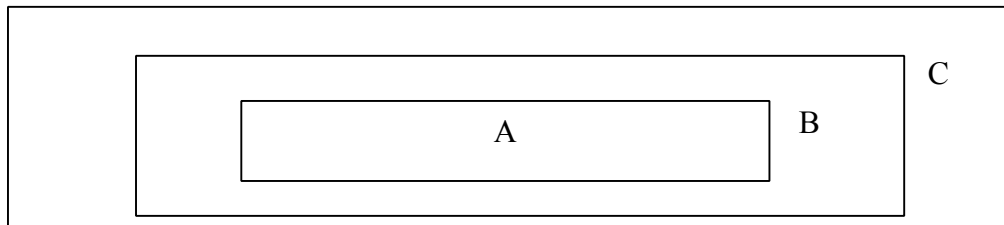
Minor defect : AQL 2.5

16.2 Inspection condition

Viewing distance for cosmetic inspection is 30cm with bare eyes, and under an environment of 800 lux (20W)

light intensity. All direction for inspecting the sample should be within 45° against perpendicular line.

16.3 Definition of Inspection Zone in LCD



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.

16.4 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.

16.5 Minor Defect

Except the Major defects above, all cosmetic defects are classified as minor defects.

Item No.	Item to be Inspected	Inspection Standard				Classification of defects	
1.	Spot defect (Defects in spot from)	Zone size (mm)	Acceptable Qty			Minor	
			A	B	C		
		$\Phi \leq 0.15$	Acceptable (clutering of spot not allowed)		Acceptable		
		$0.15 \leq \Phi \leq 0.20$	1	2			
		$0.20 \leq \Phi \leq 0.25$	0	1			
		$\Phi > 0.25$	0	0			
		Remarks : for dark/white spot, size Φ is defined as $\Phi = 1/2(X+Y)$					
2.	Line defect (Defects in spot from)	Size(mm)		Acceptable Qty			Minor
		L Length	W Width	Zone			
				A	B	C	
		Accep-table	$W \leq 0.02$	Accep-table		Accep-table	
		$L \leq 3.0$	$W \leq 0.03$	2			
		$L > 2.5$	$W \leq 0.03$	0			
		$L \leq 3.0$	$0.03 < W \leq 0.05$	2			
		$L \leq 2.5$	$0.03 < W \leq 0.05$	0			
			$W > 0.05$	Counted as spot defect (Follows item 16.5.1)			
		Remarks: The total of spot defect and line defect Shall not exceed four.					
3.	Orientation defect (such as misalignment of L/C)	Not allowed inside viewing area (Zone A or Zone B)				Minor	
4.	Polarizing	16.5.4.1 Polarizer Position 1. Shifting in Position Should not exceed the glass outline dimension. 2. Incomplete covering of the viewing area due to Shifting is not allowed.				Minor	
		Size (mm)	Acceptable Qty				
			Zone				
			A	B	C		
		$\Phi \leq 0.20$	Acceptable		Accep-table		
		$0.20 < \Phi \leq 0.50$	3				
		$0.50 < \Phi \leq 1.00$	2				
		$\Phi > 1.00$	1				



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