

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

PRODUCT NUMBER	LMR5414EW320G240DNB
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INTERNAL APPROVALS		
Product Manager	Engineering	Document Control

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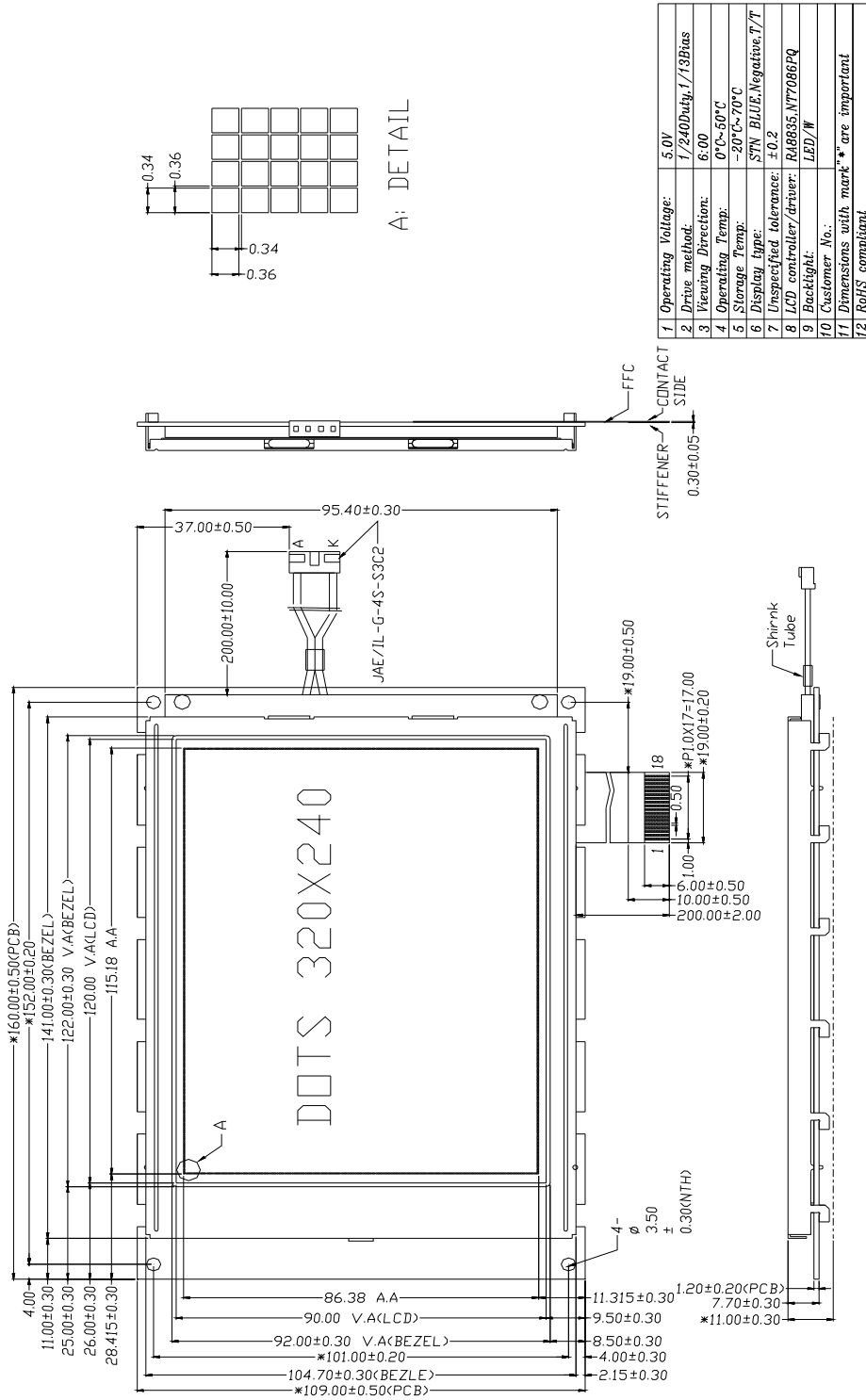
REVISION RECORD

Rev.	Date	Page	Par.	Comment	ECN no.
A	08/21/09	--	--	New DCA Specification	E4172
B	08/25/09	5	--	Updated Pin description	E4174

1 MAIN FEATURES

ITEM	CONTENTS	UNIT
Outline Dimension	160.0 (W) x 109.0 (H) x 11.0 MAX (D)	mm
Display Format	320 x 240	dot
Viewing Area	120.0 (W) x 90.0 (H)	mm
Dot Size	0.34 x 0.34	mm
Dot Pitch	0.36 x 0.36	mm
LCD Type	STN / Negative - Blue	-
Backlight	LED / W, 5.0V, 120mA	-
IC Controller	RA8835	-
Viewing Direction	6:00	O'clock
Duty Ratio	1/240	Duty
Bias	1/13	Bias
Power Supply	5.0	V
Brightness of LCD surface	24	cd/m ²
Operating Temperature	0 ~ 50	°C
Storage Temperature	-20 ~ 70	°C
RoHS Complaint	Yes	-

2 MECHANICAL DRAWING



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3 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Ratings
Power Supply Voltage	VDD	-0.3V to +7.0V
Input Voltage range	Vin	-0.3V to VDD+0.3V
Power dissipation	Pd	300mW

4 INTERFACE PIN ASSIGNMENT

Pin No.	Symbol	Function
1	Vss	Ground(0v)
2	Vdd	Logic Supply Voltage(+5.0v)
3	V0	Regulate LCD
4	A0	Command/Data Select
5	R/W	Write Control or Read/Write Control. When the 8080 family interface is selected, this signal acts as the active-LOW write strobe. The bus data is latched on the rising edge of this signal. When the 6800 family interface is selected, this signal acts as the read/write control signal. Data is read from the RA8835A series if this signal is HIGH, and written to the RA8835A series if it is LOW.
6	E	Read Control or Enable. When the 8080 family interface is selected, this signal acts as the active-LOW read strobe. The RA8835A series output buffers are enabled when this signal is active. When the 6800 family interface is selected, this signal acts as the active-HIGH enable clock. Data is read from or written to the RA8835A series when this clock goes HIGH.
7-14	D0-D7	Data Bus Line
15	/CS	Chip select
16	RES	Reset signal
17	Vee	Power Supply Voltage for LCD
18	SEL1	Interface select

Note: Pin 18 "SEL1" set to 0 = 8080 interface

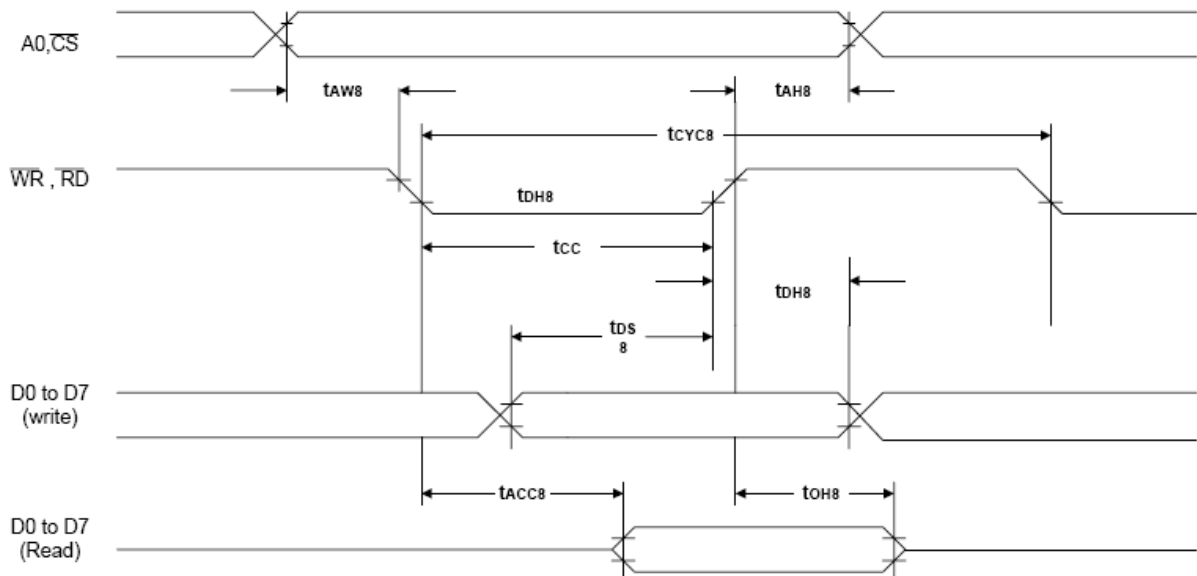
Pin 18 "SEL1" set to 1 = 6800 interface

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5 AC CHARACTERISTICS

8080 Family Interface Timing



Ta = -20 to 75°C

Signal	Symbol	Parameter	V _{DD} = 4.5 to 5.5V		V _{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, \overline{CS}	t _{AH8}	Address hold time	10	—	10	—	ns	CL = 100pF
	t _{AW8}	Address setup time	0	—	0	—	ns	
\overline{WR} , \overline{RD}	t _{CYC8}	System cycle time	note.	—	note.	—	ns	
	t _{CC}	Strobe pulse width	120	—	150	—	ns	
D0 to D7	t _{DS8}	Data setup time	120	—	120	—	ns	
	t _{DH8}	Data hold time	5	—	5	—	ns	
	t _{ACC8}	\overline{RD} access time	—	50	—	80	ns	
	t _{OH8}	Output disable time	10	50	10	55	ns	

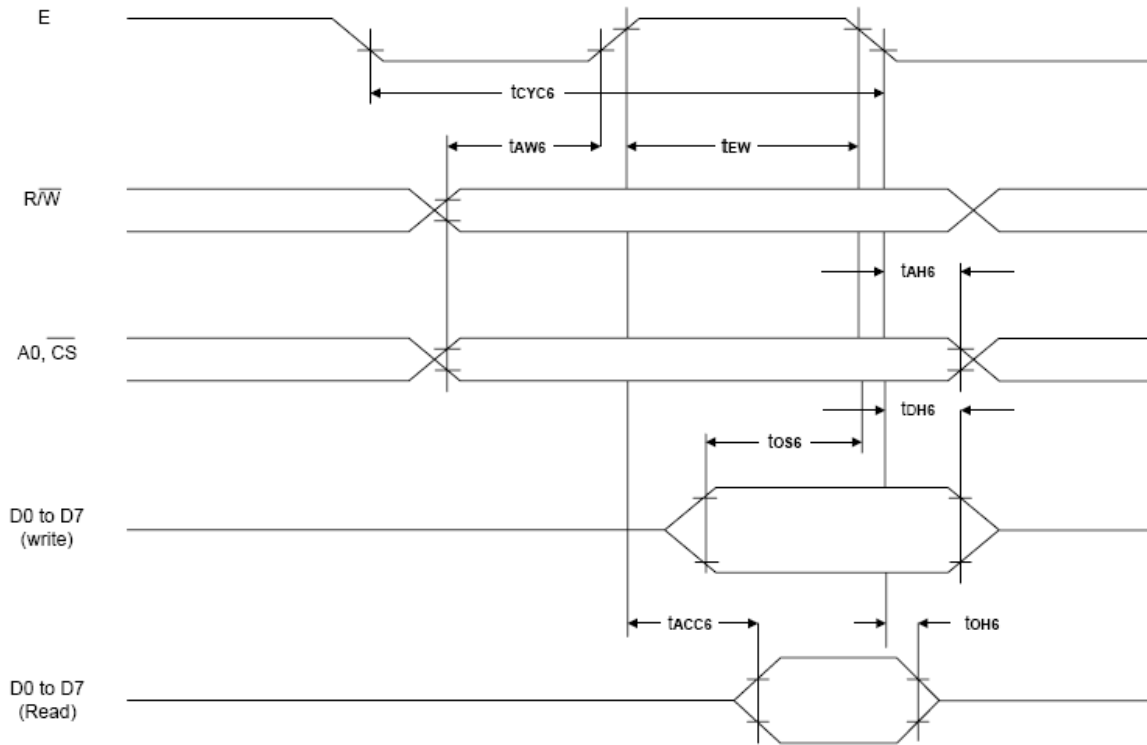
Note: For memory control and system control commands:

$$t_{CYC8} = 2t_C + t_{CC} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC8} = 4t_C + t_{CC} + 30$$

6800 Family Interface Timing



Ta = -20 to 75°C

Signal	Symbol	Parameter	V _{DD} = 4.5 to 5.5V		V _{DD} = 2.7 to 4.5V		Unit	Condition
			Min.	Max.	Min.	Max.		
A0, \overline{CS} , R/(\overline{W})	t _{CYC6}	System cycle time	note.	—	note.	—	ns	CL = 100 pF
	t _{AW6}	Address setup time	0	—	10	—	ns	
	t _{AH6}	Address hold time	0	—	0	—	ns	
D0 to D7	t _{DS6}	Data setup time	100	—	120	—	ns	
	t _{DH6}	Data hold time	0	—	0	—	ns	
	t _{OH6}	Output disable time	10	50	10	75	ns	
	t _{ACC6}	Access time	—	85	—	130	ns	
E	t _{EW}	Enable pulse width	120	—	150	—	ns	

Note: For memory control and system control commands:

$$t_{CYC6} = 2t_c + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC6} = 4t_c + t_{EW} + 30$$

6 ELECTRO-OPTIC CHARACTERISTICS

Temp.: 23 ± 3°C

Item	Symbol	Condition	Min	Typ	Max	Unit	
Supply Voltage(Logic)	Vdd-Vss	-	4.5	5.0	5.5	V	
LCD Operating Voltage	Vdd- V ₀	0°C	-	22.2	-	V	
		25°C	-	22.0	-	V	
		50°C	-	21.8	-	V	
Response Time	Ton	-	-	88	-	ms	
	Toff	-	-	308	-	ms	
Contrast	CR	-	2	-	-	-	
Viewing Angle	12H	∠1	CR≥2.0	-	56	-	Deg.
	6H	∠2		-	63	-	
	3H	∠3		-	60	-	
	9H	∠4		-	60	-	

7 CHARACTERISTICS OF BACKLIGHT (LED UNIT)

(1). Absolute Maximum Ratings:

Item	Symbol	Rating	Unit	Condition
Forward Current	IFM	200	mA	Ta=25°C
Reverse Voltage	VR	1.0	V	Ta=25°C
Power Dissipation	PD	600	mW	Ta=25°C

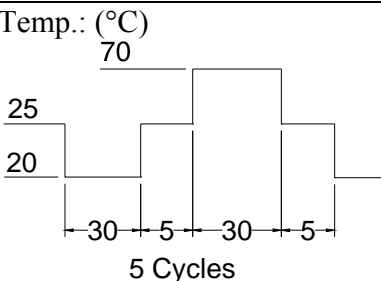
(2). Electrical-Optical Characteristics:

Item	Symbol	Min	Typ	Max	Unit	Condition
Forward Current	IF	80	120	160	mA	VF=5V
Reverse Current	IR	-	30	-	mA	VR=0.8V
Luminance	LV	-	220	-	cd/m ²	-
Color	White					

WARNING:

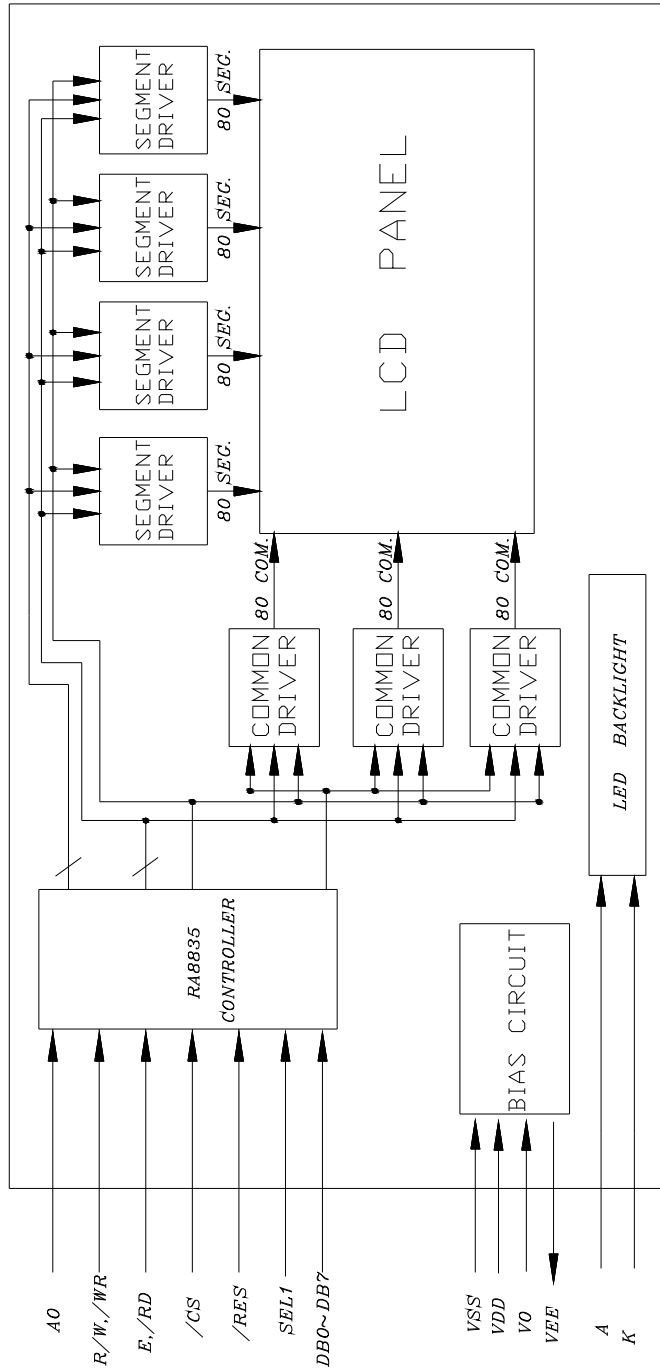
A BACKLIGHT IS A KIND OF CURRENT DEVICE. IT MUST BE CONNECTED TO A RESISTOR TO LIMIT CURRENT, OR IT WILL BE DAMAGED.

8 RELIABILITY TEST

Test Item	Test Condition	Equipment	Test Result
High Temperature Storage	Temp.: $70 \pm 2^{\circ}\text{C}$ Time: 96 hours Restore: 24 hours	Tenny	Passed
Low Temperature Storage	Temp.: $-20 \pm 3^{\circ}\text{C}$ Time: 96 hours Restore: 24 hours	Tenny	Passed
High Temperature Static drive	Temp.: $50 \pm 2^{\circ}\text{C}$ Vop: 5V Time: 24 hours Restore: 24 hours	Tenny	Passed
Low Temperature Static drive	Temp.: $0 \pm 3^{\circ}\text{C}$ Vop: 5V Time: 24 hours Restore: 24 hours	Tenny	Passed
High Temperature / High Humidity Storage	Temp.: $40 \pm 2^{\circ}\text{C}$ Hum.: 95% RH Time: 96 hours Restore: 24 hours	Tenny	Passed
Thermal Shock Storage	Temp.: ($^{\circ}\text{C}$)  5 Cycles Restore: 24 hours	Tenny	Passed

LOW FREQUENCY VIBRATION	Frequency: 10 ~ 60hz, Constant amplitude: 1.5 mm Directions: x-, y-, z- axis Duration: 2 hour each axis Linear sweeping: 10 ~ 60 ~ 10 hz / 5 min
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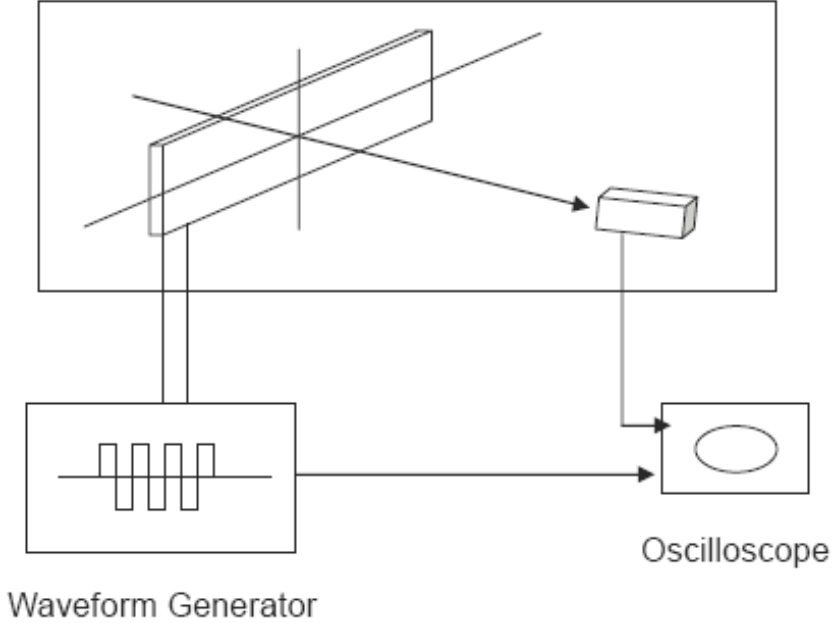
9 BLOCK DIAGRAM



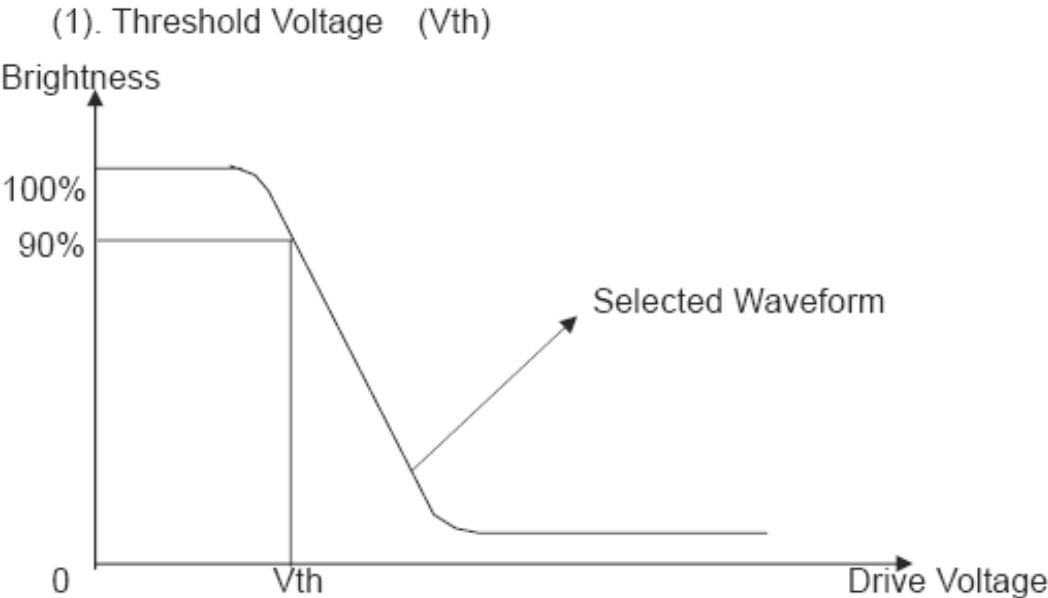
PIN NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SYMBOL	VSS	VDD	VO	VEE	A	K	D0	D1	D2	D3	D4	D5	D6	D7	/CS	RES	VEE	SEL1

10 THE EQUIPMENT AND LCD MEASURING METHOD

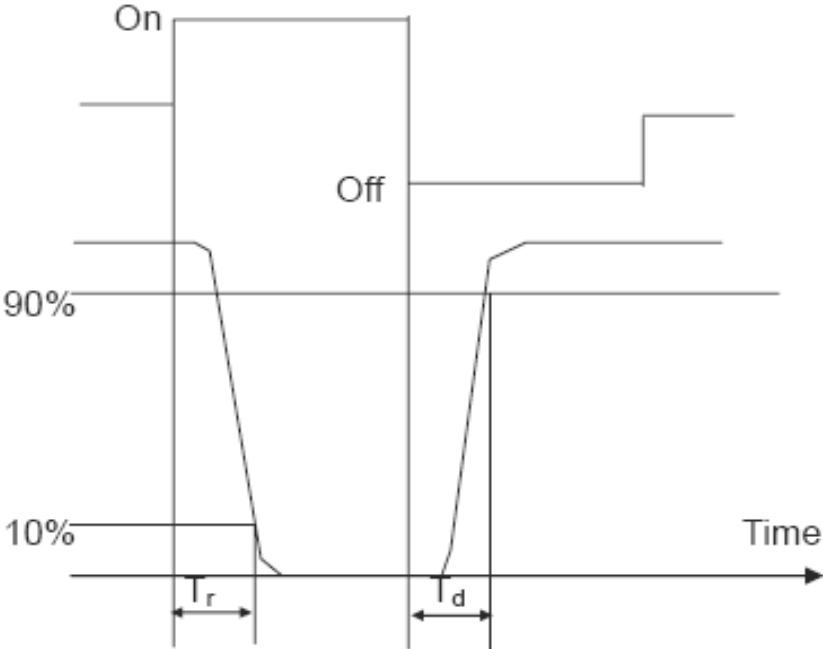
1. Equipment



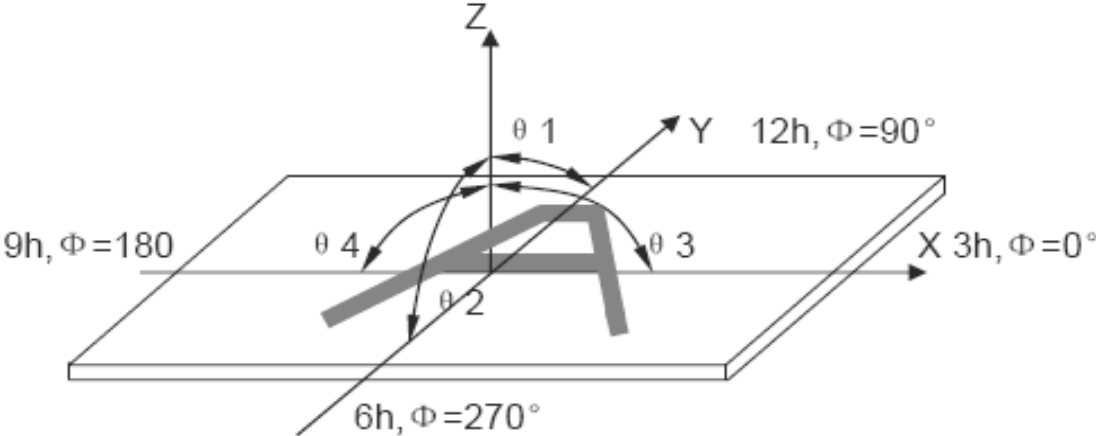
2. Definition



(2). Response Time



(3). Viewing Angle:



(4). Contrast Ratio (Positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

11 STANDARD SPECIFICATIONS FOR PRODUCT QUALITY

1. Manner of Test:

- 1.1. The test must be under 40w Fluorescent Light, and the distance of view must be at 30cm.
- 1.2. The test direction is based on around 15°- 45° of Vertical Line.

2. Definition of Defects:

2.1 Major Defects

- A: Non-Display
- B: Segment Missing
- C: Over Current
- D: Segment Short
- E: Sealant Disharden
- F: Wrong Polarizer Direction

2.2 Minor Defects: The Others.

3. Major Defects should be in AQL 0.25, and The Minor In AQL 1.00

4. Inspection Item and Standards: (D=Diameter, N=Quantity, Unit=mm)

Item	The Standard Of Quality Inspection	Checking Manner	Quality Ratio
Frame	Smooth and even surface, no crack, no scratch, no rust, and not be wrenched out of shape. The range between convex and concave is: $d \leq 0.35\text{mm}$, and the frame must be connected to the ground.	Checking With Eyes And Using Vernier Caliper, Multimeter	100%
LCD	The major defects would be rejected. No scratch and no dust on the LCD glass surface. $d \leq 0.15\text{mm}$, $n \leq 2$ diameter of bubble: $d \leq 0.5$ $n \leq 2$ damaged size of polarizer: $d \leq 0.15\text{mm}$, $n \leq 2$.	Check It When Displaying	100%
The Relative Position of LCD and Frame	The sealant mouth of the LCD must be at the same side with the frames.	Checking With Eyes	100%
The Relative Position of PCB Panel and Frame	The frame installing direction must be correct. The twisted angle of the pin is from 45° to 60°, the pin is vertical to PCB panel and it must be in the middle position of the installing holes.	Checking With Eyes	100%
Function Test	1. The major defects must be rejected. 2. Test flow chart (see attached chart) 3. Background changes evenly and no disorderly displaying phenomenon. 4. Display no shortage.	Check It When Displaying	100%

12 HANDLING PRECAUTIONS

Safety

If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes.
If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design

Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.
When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean. Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning

Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotrifluoroethane. Do not wipe the display surface with dry or hard materials that will damage the polariser surface. Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge

As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on. Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging

Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height.
To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation

It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life. Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation.
Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged. If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once. Even a small amount of condensation on the contact pads (terminals) can cause an electrochemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage

Store the display in a dark place where the temperature is 25°C ± 10°C and the humidity below 50%RH.
Store the display in a clean environment, free from dust, organic solvents and corrosive gases.
Do not crash, shake or jolt the display (including accessories).