晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	**AT-320240Q2 (Pure Driver)**
APPROVED BY	
DATE	

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APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Contents
2000/4/13	New Release

1 FEATURES

(1) Display format : 320 × 240 dot-matrix

(2) Construction : Paper type FSTN LCD, TAB type LCD driver and PCB.

(3) Option : Touch Panel, Touch Panel controller.

(4) **New Driving Method** CMOS LCD Driver for Low Power Consumption Driving ; Common driver is HD66137 and Segment is HD66130.

(5) 5V or 3.3V single power input. Built-in specific power supplies circuit for LCD driving. **Ultra Low Power Consumption.**

(6) Normal / Extended temperature type.

(7) Landscape or Portrait Display Type Selectable by Jumper Setting

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.225(W) × 0.225(H)	mm
Dot pitch	0.24(W) × 0.24(H)	mm
Viewing area	81.8 (W) × 62.0 (H)	mm
Module size (w/ LED backlight)	95.2(W) × 73.0(H) × 6.5 max (T)	mm
Module size (w/ Touch panel)	95.2(W) × 73.0(H) × 8.0 max (T)	mm

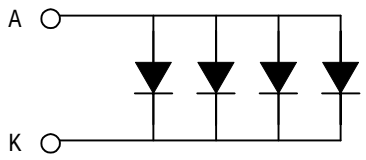
3 ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Min	Max	Unit
Logic Circuit Supply Voltage		VDD-VSS	-0.3	7.0	V
LCD Driving Voltage		--	-0.3	26.0	V
Input Voltage		VI	-0.3	VDD+0.3	V
Normal tmp. type	Operating Temp.	TOP	0	50	°C
	Storage Temp.	TSTG	-20	70	°C
Extended temp. type	Operating Temp.	TOP	-20	70	°C
	Storage Temp.	TSTG	-30	80	°C

4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	2.6	3.3	5.5	V	
LCD Driving Voltage	--	-20 °C	25.3	25.8	26.3	V	0 ~ 50 °C for Normal Temp. type -20 ~ 70 °C for Extended Temp. type
		0 °C	23.8	24.2	24.6		
		25 °C	22.5	22.9	23.3		
		50 °C	21.0	21.4	21.8		
		70 °C	20.1	20.5	20.9		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	ICC	VCC = 3.3V	--	1.5	--	mA	
----- Optical Characteristics -----							
Contrast	CR	FSTN type		7			Note 1
Rise Time	tr	25°C	--	305	450	ms	Note 2
Fall Time	tf	25°C	--	120	180	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	35	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	
----- White LED Back-light Characteristics -----							
Parameter	**Symbol**	**Condition**	**Min**	**Typ**	**Max**	**Unit**	**Note**
Forward Voltage	VF	--	--	3.2	3.8	V	Supply Voltage between A&K
Forward Current	IF	VF=3.2V	--	80	--	mA	
Bare LED Luminous intensity		VF=3.2V	--	60	--	cd/m^2	
LCM Luminous intensity		VF=3.2V	--	8	--	cd/m^2	

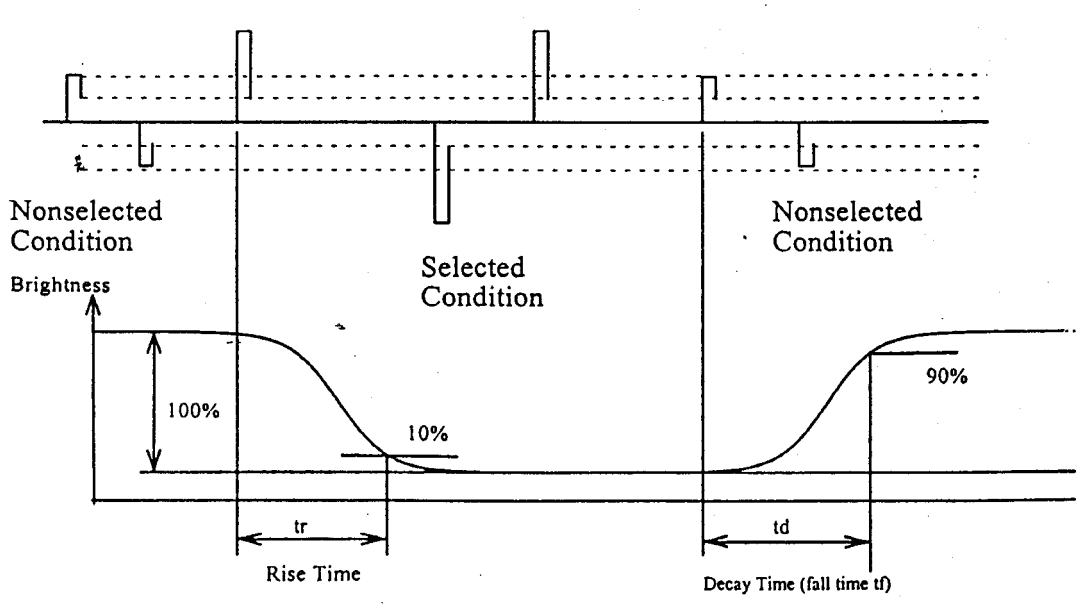
* LED Dice number = 4



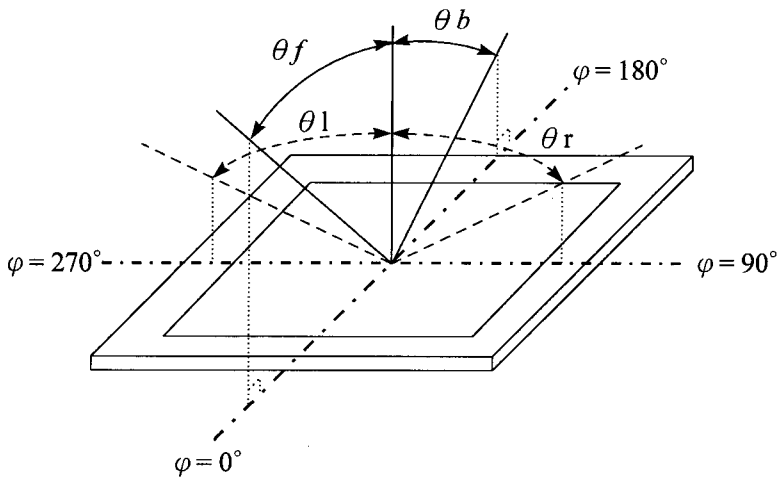
(NOTE 1) Contrast ratio :

CR = (Brightness in OFF state) / (Brightness in ON state)

(NOTE 2) Response time :



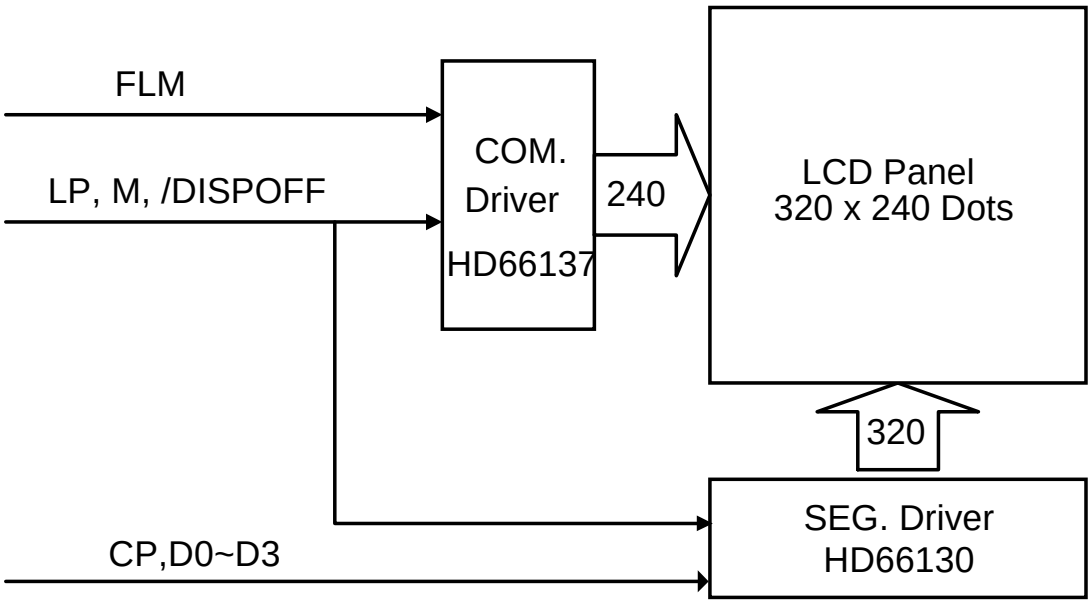
(NOTE 3) Viewing angle



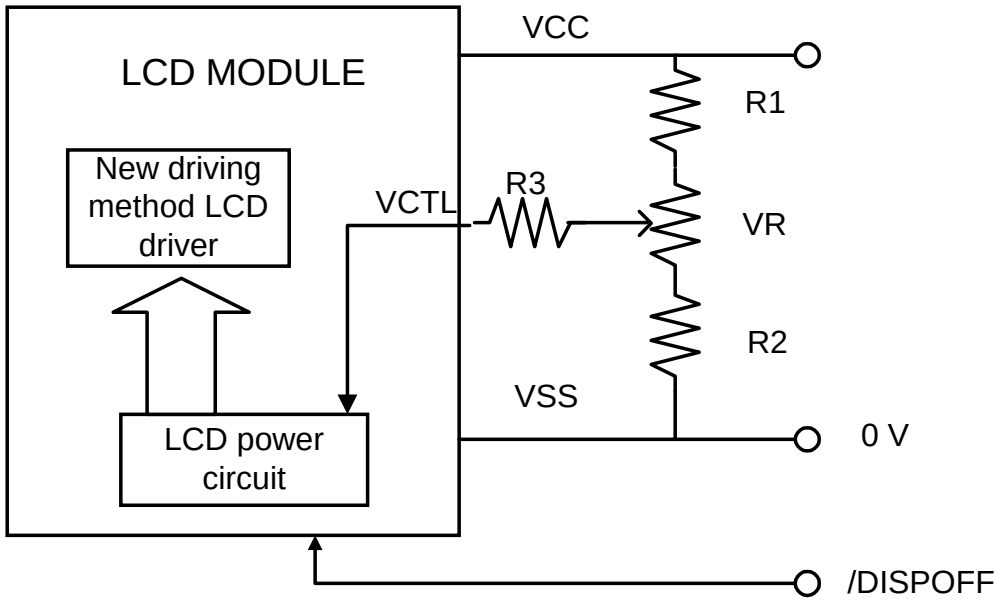
Touch Panel Electrical Specification

Parameter	Specification	Condition
ON Resistance	400 Ω ~ 800 Ω	X Axis
	260 Ω ~ 600 Ω	Y Axis
Insulating Resistance	More than 10MΩ	DC 25 V
Chattering	Less Than 15 ms	100KΩ Pull-Up

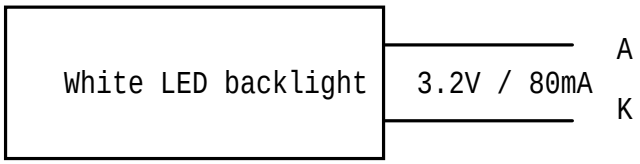
5 BLOCK DIAGRAM



Power Supply Example



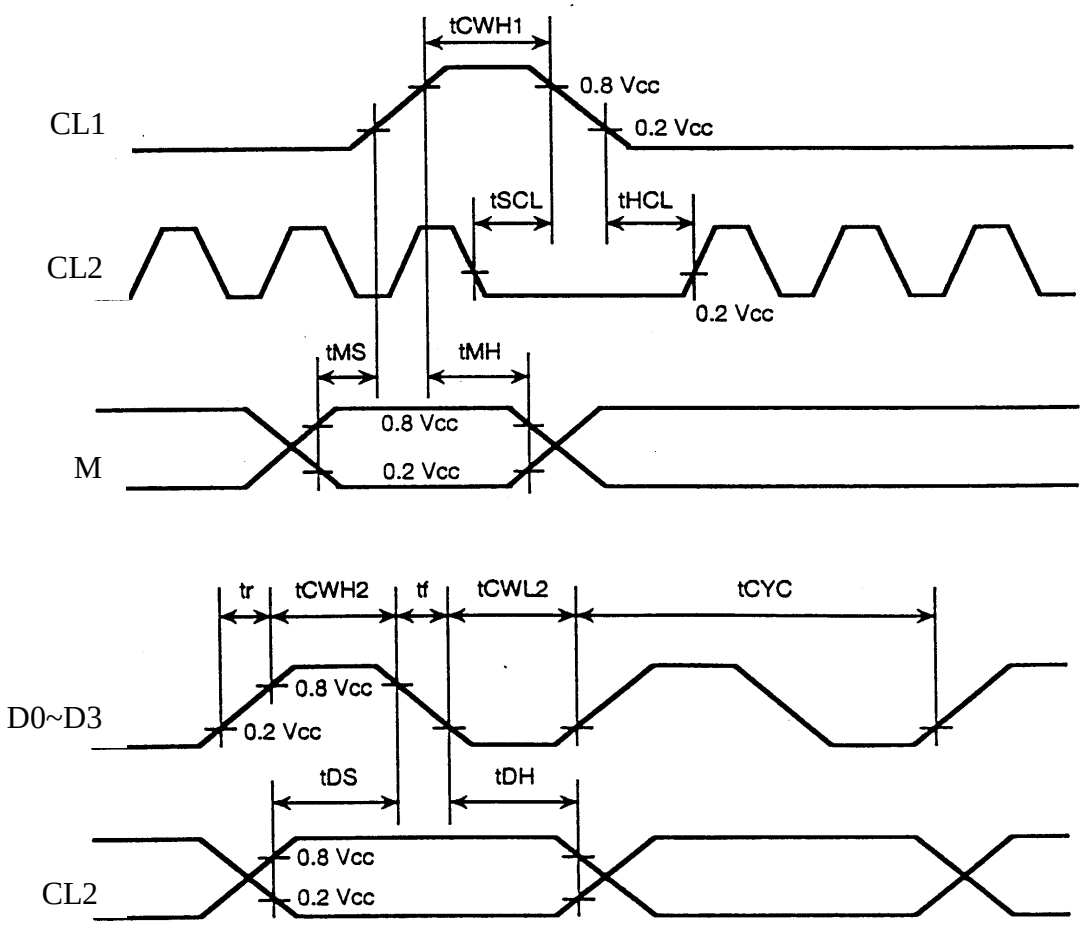
Note: VR = 20 K, R1=5K, R2=10K, R3=27K



6 TIMING CHARACTERISTICS

AC Electrical Characteristics

Item	Symbol	Pin	Min	Max	Unit
Clock Cycle Time	tCYC	CL2	152	-	ns
Clock High Pluse Width1	tCWH2	CL2	65	-	ns
Clock Low pluse Width1	tCWL2	CL2	65	-	ns
Clock high Pluse Width 2	tCWH1	CL1	65	-	ns
Clock Setup Time	tSCL	CL1,CL2	80	-	ns
Clock Hold Time	tHCL	CL1,CL2	80	-	ns
Clock Rise Time	Tr	CL1,CL2	-	30	ns
Clock Fall Time	Tf	CL1,CL2	-	30	ns
Data Setup Time	tDS	D0 to D3, CL2	50	-	ns
Data Hold Time	tDH	D0 to D3, CL2	50	-	ns
M Setup time	tMS	M,CL1	20	-	ns
M Hold Time	tMH	M,CL1	20	-	ns
Output Delay Time1	tPD1	CL1, Y1 to Y320	-	TBD	ns

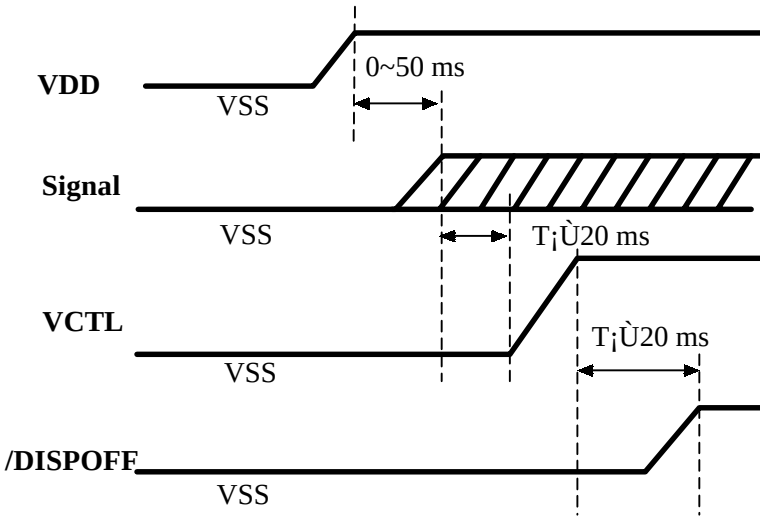


AC Electrical Characteristics

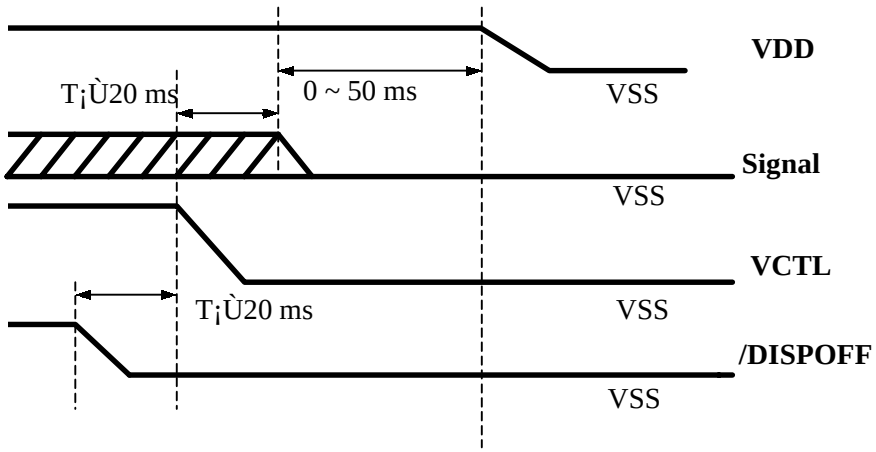
6.1 Power ON/OFF Sequence

Please maintain the blow sequence when turning on and off the power supply of the module. If /DISPOFF is supplied to the module while internal alter signal for LCD driving (M) is unstable, DC component will be supplied to the LCD panel. This may cause damage the LCD module.

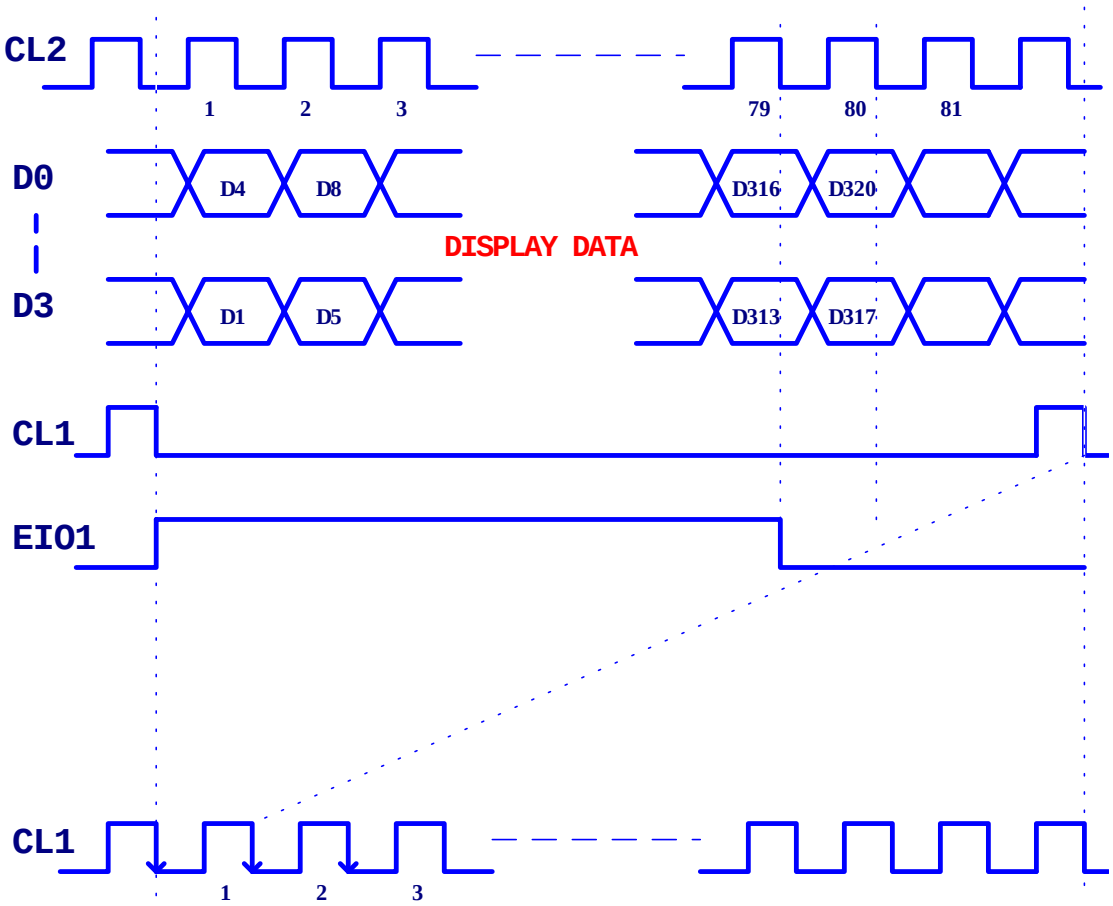
POWER ON SEQUENCE



POWER OFF SEQUENCE



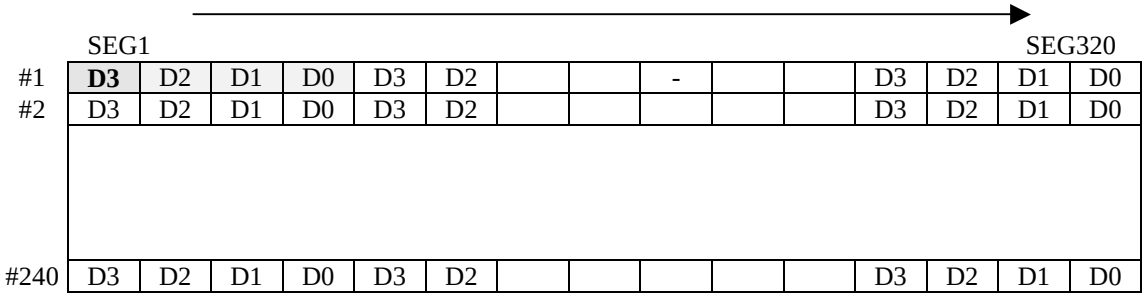
6.2 Interface Timing Chart



Display Data Fromat

	COM1									COM240
#1	**D3**	D3	D3							D3
#2	D2	D2	D2							D2
	D1	D1	D1							D1
	D0	D0	D0							D0
	D3									D3
	D2	D2								D2
	D1	D1								D1
#320	D0	D0								D0

Portrait Display Type (Top View)



Landscape Display Type(Top View)

7 INTERFACE DEFINITION

CN1: LCM Interface for Driver with Touch Panel

PIN NO.	SIGNAL	LEVEL	FUNCTION
1~4	D0~D3	H/L	Data Input(4 bits)
5	/DISPOFF	H/L	H: Display ON L: Display OFF
6	FLM	H/L	First Line Marker
7	M	H/L	AC Alternative Signal(M Signal)
8	LP	H/L	Data Latch Signal
9	CP	H/L	Clock Signal
10	VCC	-	Power Supply for Logic(+3.3V)
11	VSS	-	Power Supply(Ground:0V)
12	NC	-	No Connection
13	VCTL	-	Contrast Adjustment Input:
14	/RESET	H/L	Reset Signal
15*	SK / X1	-	Serial Clock Touch Panel Left Signal in X Axis
16*	DO / X2	-	Data Output Touch Panel Right Signal in X Axis
17*	DI / Y1	-	Data In Touch Panel Upper Signal in Y Axis
18*	CS / Y2	-	Chip Select Touch Panel Lower Signal in X Axis
19*	INT	-	Interrupt
20	A	-	LED Anode (3.2V +)
21	K		LED Cathode (3.2V -)
22~24	NC		No Connection

* 15~19 : SK, DO, DI, CS, INT for Touch Panel controller MK715

/ X1, X2, Y1, Y2 for Touch Panel (without MK715)

8 JUMPER SETTING

Item	Option	Jumper Setting	Remark
Display Type	Portrait (default)	Pin 1,2 short on JP1&JP2	
	Landscape	Pin 2,3 short on JP1&JP2	

9 QUALITY AND RELIABILITY

9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 ± 5°C

Humidity : 60 ± 25% RH.

9.2 SAMPLING PLAN

Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

9.3 ACCEPTABLE QUALITY LEVEL

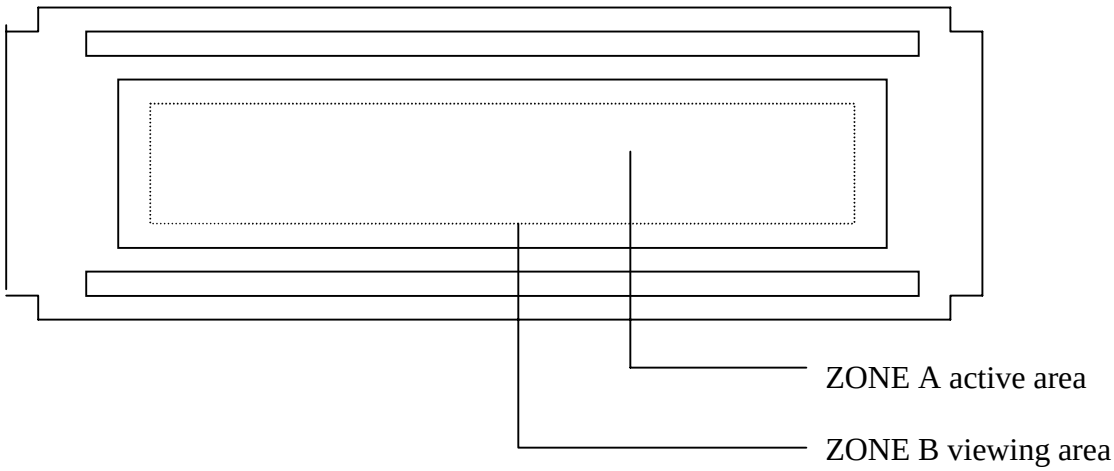
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

9.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under flourescent light. The inspection area of LCD panel shall be within the range of following limits.

9.5 INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut			Major	0.65
Dimension	Deviation from drawings			Major	1.5
Black spots	Ave . dia . D	area A	area B	Minor	2.5
	D≤0.2	Disregard			
	0.2<D≤0.3	3	4		
	0.3<D≤0.4	2	3		
	0.4<D	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	W≤0.03	disregard			
	0.03<W≤0.05	3	4		
	0.05<W≤0.07 , L≤3.0	1	1		
	See line criteria				
Bubbles in polarizer	Average diameter D 0.2 < D < 0.5 mm for N = 4 , D > 0.5 for N = 1			Minor	2.5
Color uniformity	Rainbow color or newton ring.			Minor	2.5
Glass Scratches	Obvious visible damage.			Minor	2.5
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5
Viewing angle	See note 3			Minor	2.5



9.6 RELIABILITY

Test Item	Test Conditions		Note
	Normal Temp. type	Extended Temp. type	
High Temperature Operation	50±3°C , t=96 hrs	70±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	-20±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	-30°C ~ 25°C ~ 80°C 30 min. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs		1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis		2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

10 HANDLING PRECAUTIONS

(1) A LCD module is a fragile item and should not be subjected to strong mechanical shocks.

(2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in color.

(3) Under no circumstances should the position of the bezel tabs or their shape be modified.

(4) Do not modify the display PCB in either shape or positioning of components.

(5) Do not modify or move location of the zebra or heat seal connectors.

(6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.

(7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.

(8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.

(9) Prior to initial power up input signals should not be applied.

(10) Protect the module against static electricity and observe appropriate anti-static precautions.

11 OUTLINE DIMENSION