

PRODUCT SPECIFICATION

TFT LCD MODULE

MODEL : SPEC-KWH035ST28-F01 V.2 Version: 1.0

【 】 Preliminary Specification

【 ◆ 】 Finally Specification

CUSTOMER'S APPROVAL	
SIGNATURE:	DATE:

- It signifies that you fully understand and accept all the contents of this specification if you sign and send back the first page of this specifications.

Designed by	R&D Checked by	Quality Department by	Approved by
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- This specification is subject to change without notice. Please contact FORMIKE or it's representative before designing your product based on this specification.

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2. General Description

2.1 Description

KWH035ST28-F01 V.2 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver IC, FPC and backlight unit .

The following table described the features of FORMIKE KWH035ST28-F01 V.2.

2.2 Application

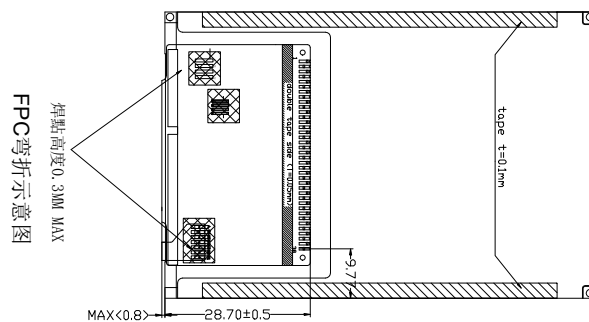
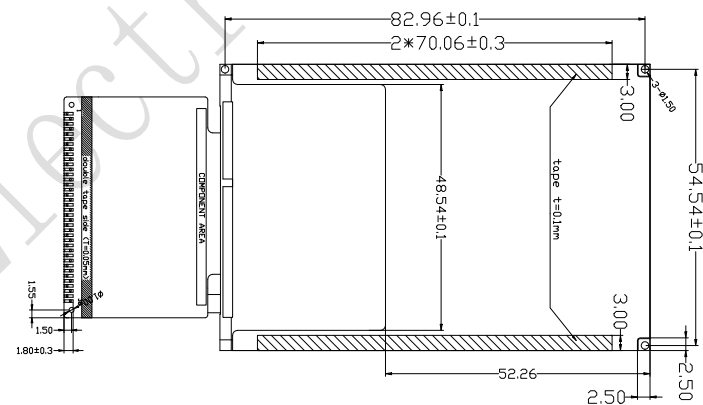
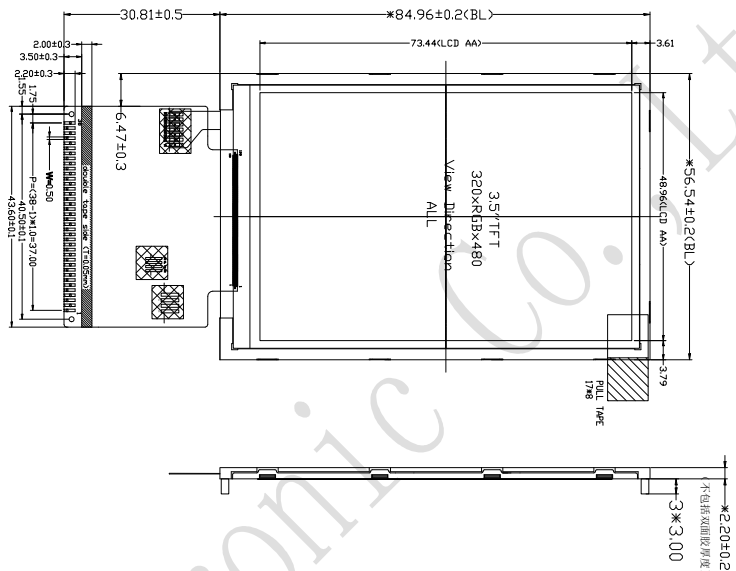
Mobile phone, Multimedia products
and other electronic Products
Etc.

2.3 Features:

Features	Description	UNITS
LCD type	3.5'TFT	--
Dot arrangement	320 (RGB) × 480	dots
Driver IC	ILI9488	--
Color Depth	65K	
Interface	MCU 16 or 8 bit Interface	
View Direction	ALL	
Module size	56.54(W) × 84.96 (H) × 2.2(T)	mm
Active area	48.96(W) × 73.44 (H)	mm
Dot pitch	0.153 (W) × 0.153 (H)	mm
Back Light	6 White LED In parallel	--
With/Without TSP	Without TSP	
Weight(g)	TBD	

3. External Dimensions

1	GND
2	VDD
3	VDD
4	I _{MO}
5	CS
6	RS
7	WR
8	RD
9	RESET
10	DB0
11	DB1
12	DB2
13	DB3
14	DB4
15	DB5
16	DB6
17	DB7
18	DB8
19	DB9
20	DB10
21	DB11
22	DB12
23	DB13
24	DB14
25	DB15
26	GND
27	Y<A>
28	X<A>
29	Y<A>
30	X<A>
31	LED-K1
32	LED-K2
33	LED-K3
34	LED-K4
35	ED-K5
36	ED-K6
37	LEDA
38	GND

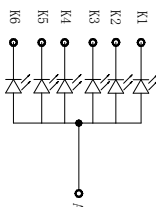


VERSION	DESCRIPTION	DATE
A	First Issue	2011-05-01

NOTES:

1. DISPLAY TYPE: TFT
2. MODULE SIZE: 3.5INCH
3. OPERATING TEMPERATURE: -20°C~+70°C
4. STORAGE TEMPERATURE: -30°C~+80°C
5. DRIVER IC: ILI9486L
6. VIEWING DIRECTION: ALL
7. BACKLIGHT: 6LED5/ PARALLEL
8. ROHS COMPLIANT
9. Unspecified tolerance is $\pm 0.20\text{mm}$

PIN	WIRING
1	YU
2	XL
3	YD
4	XR



(CIRCUIT DIAGRAM)

If=90mA(tpye)
Vf=3.2(tpye)

CUSTOMER APPROVE		 FORMIKE ELECTRONIC CO.,LTD. 深圳市科力宏电子有限公司 www.formike.com	
MODULE NO.		KWH0351Z8-F01 V.2	
MATERIAL NO.		SHEET: 1 OF 1	
ISSUED	CHECKED	APPROVED	UNIT: MM
DENG	ZENG	LIU	DATE: May-3-2012
			

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
1	GND	System ground.
2-3	VDD	Power supply (+2.5V-3.6V).
4	IM0	8 or 16 Bit Interface select: IM0=0 16-Bit 8080 system Interface. DB0-DB15 is used. IM0=1 8-Bit 8080 system Interface. DB0-DB7 is used.
5	CS	Chip select input pin(" low" enable).
6	RS	This pin is used to select "data or command" When RS="1", data is selected. When RS="0", command is selected.
7	WR	Write signal input, Active" L "
8	RD	Read signal input, Active" L "
9	RESET	Reset input pin, When reset is "L", Initialization is executed.
10-25	DB0-DB15	16-Bit Data Bus. Note: Please fix unused pin to ground.
26	GND	System ground.
27	NC(YD)	NC(Touch Panel Down Side Wire.)
28	NC(XL)	NC(Touch Panel Left Side Wire.)
29	NC(YU)	NC(Touch Panel Up Side Wire.)
30	NC(XR)	NC(Touch Panel Right Side Wire.)
31-36	LEDK1-K6	Power supply for LED backlight Cathode input.
37	LEDA	Power supply for LED backlight Anode input.
38	GND	System ground.

5. Absolute Maximum Ratings

The absolute maximum ratings are listed in Table 41. When the ILI9488 is used beyond the absolute maximum ratings, it may be permanently damaged. Using the ILI9488 within the following limits of electrical characteristics is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the ILI9488 will malfunction and cause poor reliability.

Table 41: Absolute maximum Ratings

Item	Symbol	Unit	Value
Supply voltage(Analog)	VCI - DGND	V	-0.3 ~ +3.3
Supply voltage (IO)	IOVCC - DGND	V	-0.3 ~ +3.3
OTP Supply voltage	DDVDH - DGND	V	-0.3 ~ +7.0
Supply voltage	DDVDH - DGND	V	-0.3 ~ +6.0
Supply voltage	DDVDL - DGND	V	0.3 ~ -6.0
Supply voltage	VGH - DGND	V	-0.3 ~ +25
Supply voltage	VGL - DGND	V	0.3 ~ -16
Driver supply voltage	VCI - VCL	V	≤ 6.0V
Driver supply voltage	VGH-VGL	V	≤ 32.0V
Input voltage	VIN	V	-0.3 ~ IOVCC + 0.3
HS Input voltage	VHSIN	V	-0.3 ~ + 1.65
Operating temperature	T _{opr}	℃	-30 ~ +70
Storage temperature	T _{stg}	℃	-55 ~ +110

Note: Even if the absolute maximum rating of one of the above parameters is exceeded only for a short while, the quality of the product may be degraded. Therefore, be sure to use the product within the range of the absolute maximum ratings.

6. Electrical Characteristics

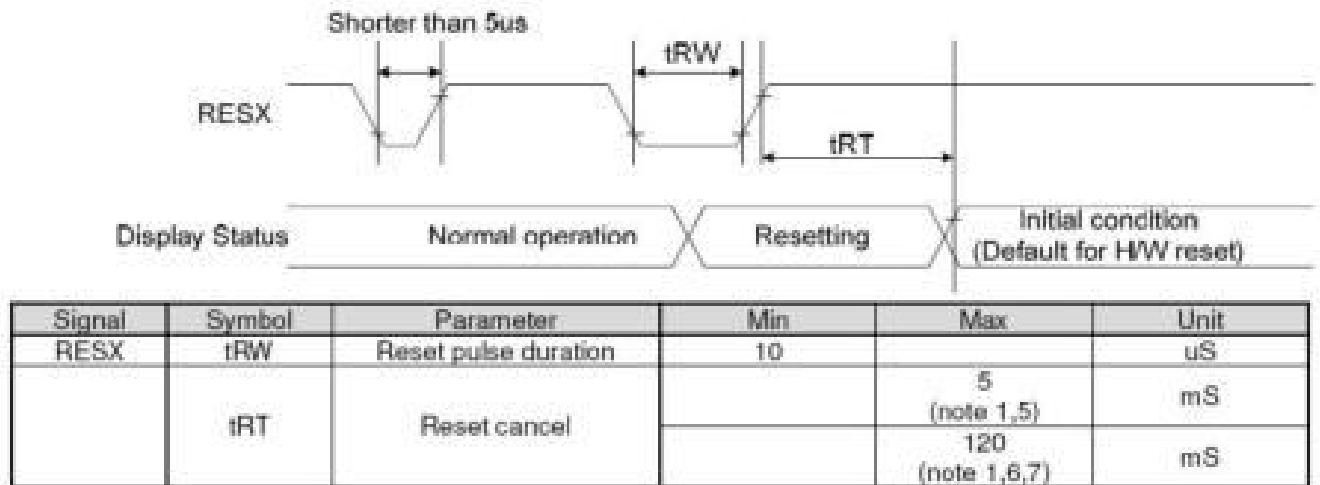
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Power & Operation Voltage							
Analog operating voltage	VCI	-	2.5	2.8	3.3	V	
Logic operating voltage	IOVCC	-	1.65	1.8	3.3	V	Note 1, 2
OTP Supply voltage	DDVDH	-	-	7	-	V	Note 1
Logic High level input voltage	V _{ih}	-	0.7*IOVCC		IOVCC	V	Note 1
Logic Low level input voltage	V _{il}	-	-0.3		0.3*IOVCC	V	Note 1
Logic High level output voltage TE, SDO (SDA), CABC, PWM	V _{oh}	I _{OH} = -1.0mA	0.8*IOVCC		IOVCC	V	Note 1
Logic Low level output voltage TE, SDO (SDA), CABC, PWM	V _{ol}	I _{OL} = +1.0mA	0		0.2*IOVCC	V	Note 1
Gate Driver High Voltage	V _{GH}	-	10.0	-	20	V	
Gate Driver Low Voltage	V _{GL}	-	-15.0	-	-6.0	V	
Driver Supply Voltage	-	[V _{GH} -V _{GL}]	16	-	32	V	
Input and Output							
Logic High Level Input Voltage	V _{IH}	-	0.7*IOVCC	-	IOVCC	V	
Logic Low Level Input Voltage	V _{IL}	-	DGND	-	0.3*IOVCC	V	
VCOM Operation							
DC VCOM Amplitude Voltage	V _{COM}	-	-2.0	-	-0.06	V	Note 3
Source Driver							
Source Output Range	V _{scut}	-	0.1	-	V _{REG1OUT} -0.1	V	Note 4
Positive Gamma Reference Voltage	V _{REG1OUT}	-	3.625	-	5.5	V	
Negative Gamma Reference Voltage	V _{REG2OUT}	-	-5.5	-	-3.625	V	
Source Output Setting Time	T _r	Below with 99% precision	-	10	-	μs	Note 3, 4
Output Deviation Voltage (Source Output channel)	V _{dew}	S _{out} ≥4.2V	-	-	20	mV	Note 3
		S _{out} ≤0.8V	-	-	15	mV	-
Output Offset Voltage	V _{offset}	-	-	-	35	mV	Note 3
Booster Operation							
Booster (VCIx2) Voltage	DDVDH	-			6	V	
Booster (VCIx2) Voltage	DDVDL	-	-6			V	
Booster (VCIx2 Drop Voltage)	VCI1x2 drop	loading=1mA	-	-	5	%	
Gate Driver High Voltage	V _{GH}	-	10.0	-	20	V	
Gate Driver Low Voltage	V _{GL}	-	-15.0	-	-6.0	V	
Standby mode current consumption (Ta = 25 °C, Interface: DDI and DPI)							
Sleep in mode	VCI	VCI=2.8V	-	100	-	μA	
Deep Standby mode	VCI	IOVCC=1.8V	-	1	-	μA	

Notes:

1. Ta = -30 to 70 °C (no damage up to 85°C (at maximum)), IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, DGND=0V.
2. Supply the digital IOVCC voltage equal to or less than the analog VCI voltage.
3. Source channel loading = 10K Ω , 30pF/channel
4. The maximum value is between 10K Ω , 30pF/channel and Gamma setting value.

7. Timing Characteristics.

7.1 Reset Timing Characteristics.



Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from EEPROM to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

Note 3: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out -mode. The display remains the blank state in Sleep In -mode.) and then return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:

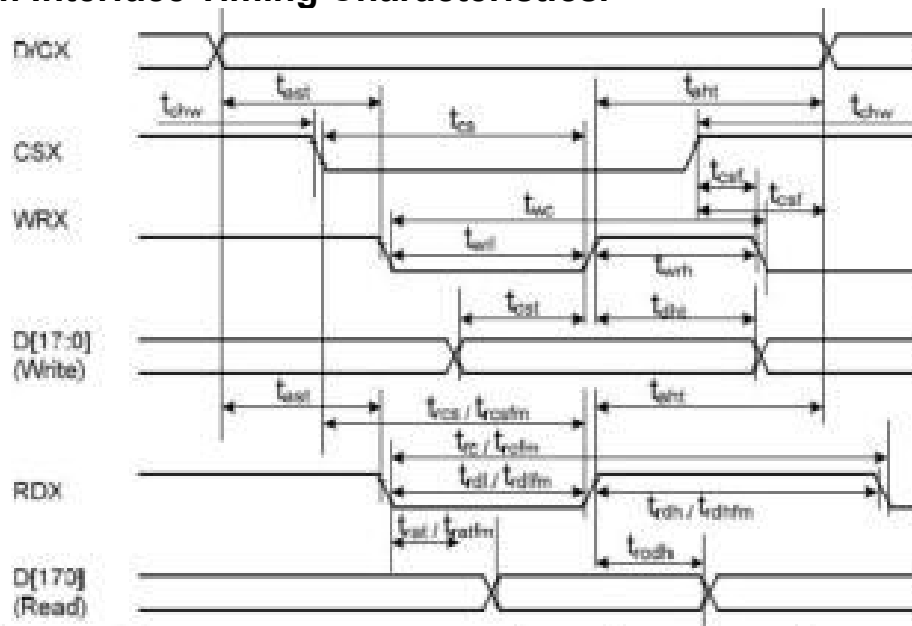


Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

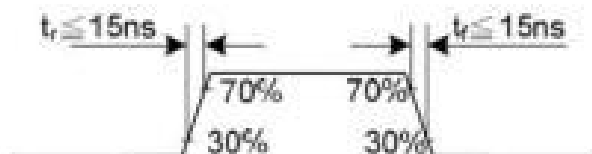
Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7.2. i80-System Interface Timing Characteristics.

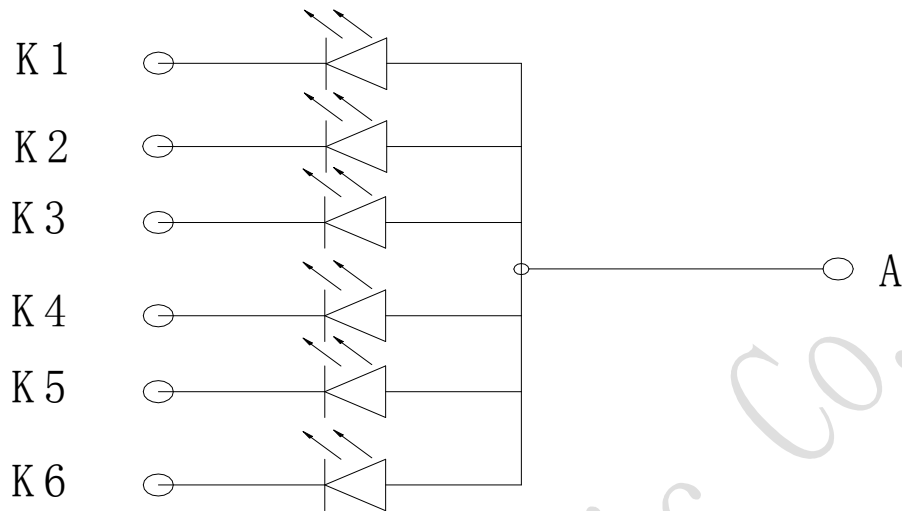


Signal	Symbol	Parameter	min	max	Unit	Description
DCX	t_{dst}	Address setup time	0	-	ns	-
	t_{dth}	Address hold time (Write/Read)	0	-	ns	-
CSX	t_{chwh}	CSX "H" pulse width	0	-	ns	-
	t_{cs}	Chip Select setup time (Write)	15	-	ns	-
	t_{rcs}	Chip Select setup time (Read ID)	45	-	ns	-
	t_{rcsfm}	Chip Select setup time (Read FM)	355	-	ns	-
WRX	t_{wc}	Write cycle	50	-	ns	-
	t_{wrh}	Write Control pulse H duration	15	-	ns	-
	t_{wrl}	Write Control pulse L duration	15	-	ns	-
RDX (FM)	t_{rcfm}	Read Cycle (FM)	450	-	ns	When read from Frame Memory
	t_{rdhfm}	Read Control H duration (FM)	90	-	ns	
	t_{rdlfm}	Read Control L duration (FM)	355	-	ns	
RDX (ID)	t_{rc}	Read cycle (ID)	160	-	ns	When read ID data
	t_{rdh}	Read Control pulse H duration	90	-	ns	
	t_{rdl}	Read Control pulse L duration	45	-	ns	
DB[17:0], DB[15:0], DB[8:0] DB[7:0]	t_{dst}	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	t_{dth}	Write data hold time	10	-	ns	
	t_{rat}	Read access time	-	40	ns	
	t_{rafm}	Read access time	-	340	ns	
	t_{rod}	Read output disable time	20	80	ns	

Note: (1) $T_a = -30$ to 70 °C, $IOVCC = 1.65V$ to $3.6V$, $VCI = 2.5V$ to $3.6V$, $AGND = DGND = 0V$



8. Backlight Characteristics.



Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition	Note
Supply Voltage	Vf	3.0	3.2	3.4	V	If=90 mA	-
Supply Current	If	-	90	-	mA	-	-
Reverse Voltage	Vr	-	-	5	V	10uA	
Power dissipation	Pd	-	282	-	mW	-	
Luminous Intensity for LCM		260	300	340	Cd/m²	If=90 mA	
Uniformity for LCM	-	80	-	-	%	If=90 mA	
Life Time	-	50000	-	-	Hr	If=90 mA	-
Backlight Color	White						

9.Optical Characteristics

Item		Symbol	Conditions	Specifications (typ)	Unit	Note
Transmittance		T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	4.0	%	All left side data are based on CMI's following condition – 1.CG : NTSC 70% 2.AR : 67.5% 3.Light Source : CMI LED BLU 4.Machine : DMS 803 5. $V_{white} > 5.0V$, $V_{dark} < 0.4V$ 6. Polarizer : NPF-TEGQ1465DUHC
Contrast Ratio		CR		700	—	
Response Time		Ton+ Toff		30	ms	
Viewing Angle	Hor.	θ_{x1}	Center CR>10	80	deg.	Under C light Simulation
		θ_{x2}		80		
	Ver.	θ_{y1}		80		
		θ_{y2}		80		
CF only Chromaticity	Red	X_R	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	0.654	—	
		Y_R		0.326	—	
	Green	X_G		0.271	—	
		Y_G		0.586	—	
	Blue	X_B		0.150	—	
		Y_B		0.083	—	
	White	X_W		0.306	—	
		Y_W		0.318	—	

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

L63: Luminance of gray level 63

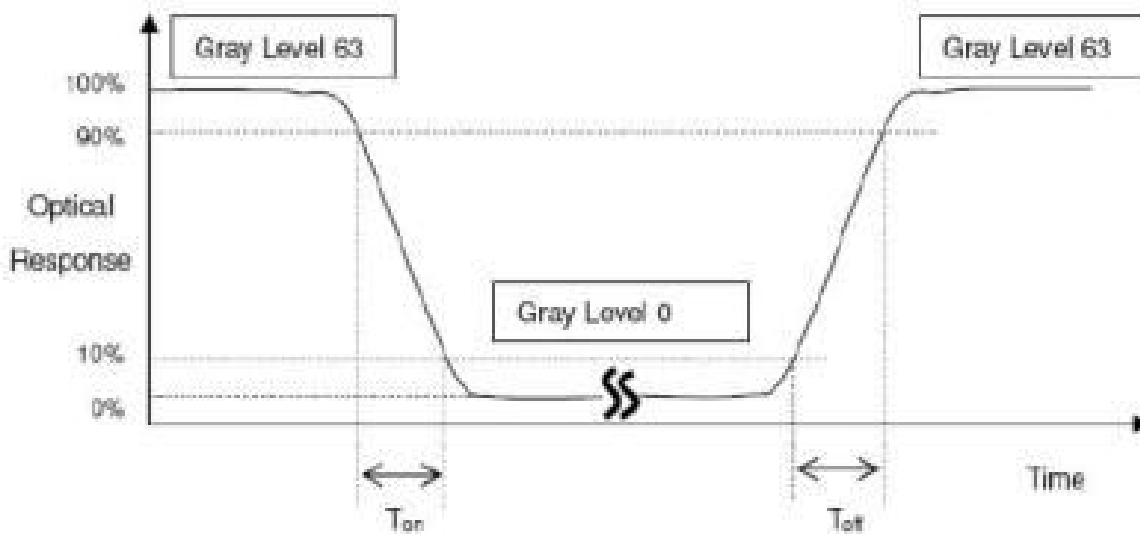
L0: Luminance of gray level 0

$$CR = CR (5)$$

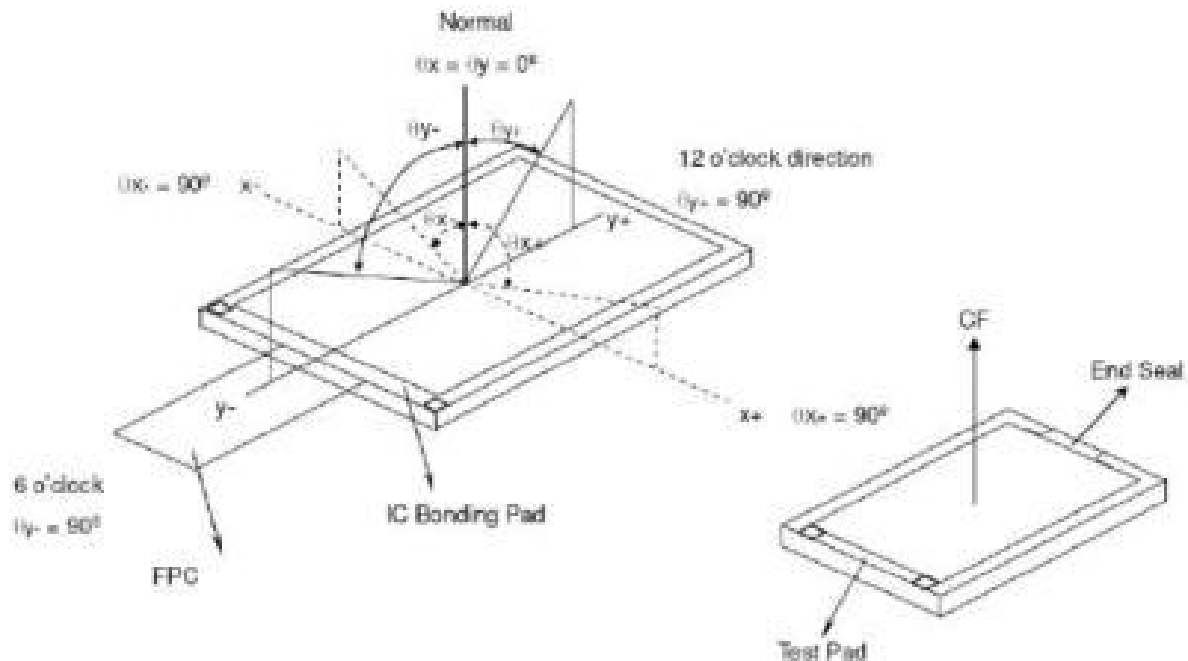
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Form

*Note (2) Definition of Response Time (TR, TF):



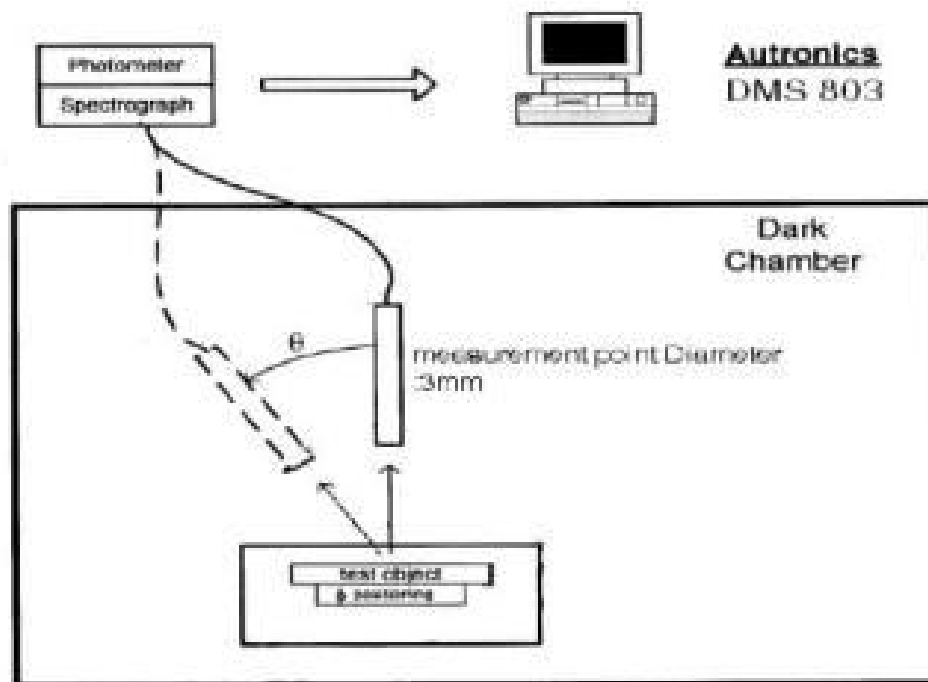
*Note(3) Definition of Viewing Angle



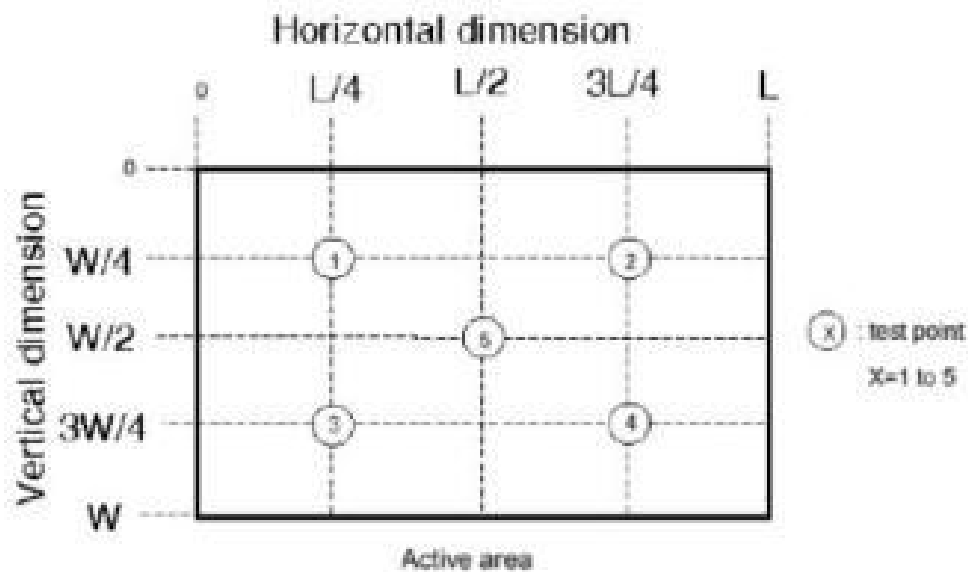
*** The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is Free. Module maker can increase the "Viewing Angle" by applying Wide View Film.

*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



*Note (5)



10. RELIABILITY

No.	Test Item	Test Condition	Remark
1	High Temperature Storage	+80℃± 2℃, 96 hrs	Note
2	Low Temperature Storage	-30℃± 2℃, 96 hrs	Note
3	High Temperature Operation	+70℃± 2℃, 96 hrs	Note
4	Low Temperature Operation	+20℃± 2℃, 96 hrs	Note
5	High Temperature & High Humidity Storage Test	+50℃± 5℃, 90%R.H, 96 hours	Note
6	Temperature Cycle (non operation)	-30℃ ← +25℃ → +80℃ (30mins ← 5mins → 30mins) 10 Cycles	Note
7	Electronic Static Discharge	Air Discharge: 2KV to with 5 times	Discharge for each polarity Mode of Operation: Single Discharge, successive discharge at least 1 sec
		Ambiance: 15℃~35℃, 30%~60%R.H Resistance(Rd): 330Ω ±10% Capacitance(Cs + Cd): 150pF±10%	
8	Vibration (Packaged)	Frequency range: 10Hz ~ 55 Hz Amplitude: 1.5mm Direction of X.Y. Z for 3 Hrs in total	
9	Drop Test (Packaged)	Height: 80cm, Time: 1 1 corner, 3 edged, 6 surfaces	

Note : Recovery Time should be 2~4 hours at room temperature (20±8℃) and humidity (below 60% R.H). No abnormalities in functions and appearance

11.INSPECTION CRITERION

11.1 Scope

Display Quality Evaluation

Mechanics Specification

11.2 Sampling Plan

MIL-STD-105E

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E

Lot size: Quantity per shipment as one lot (different model as different lot).

Sampling type: Normal inspection, single sampling

Sampling level: Level II.

11.3 Acceptable Quality Level

Item	Major	Minor
Appearance	1.0%	1.5%
Electrical	0.65	1.0%

11.3.1 Classification of defects:

11.3.1.1 Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For

Example: Electrical failure, deformation and etc.

11.3.1.2 Minor defect

The criteria on major or minor judgment will be according with the classification of defects.

11.4 Panel Inspection Condition

11.4.1 Environment:

11.4.2 Room Temperature: $25 \pm 5^{\circ}$ C.

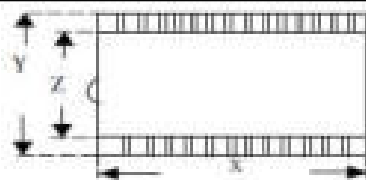
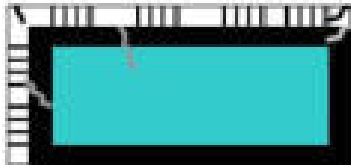
11.4.3 Humidity: $50 \pm 20\%$ RH.

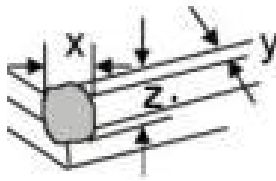
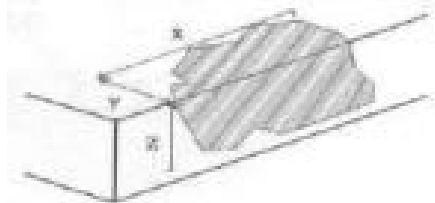
Illumination: 300 ~ 700 Lux.

11.4.4 Inspection Distance: 35 ± 5 cm

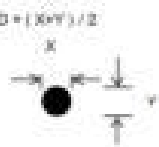
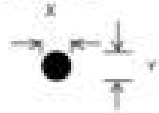
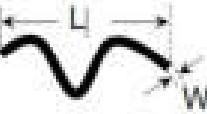
11.5 TFT Inspection Criteria

11.5.1 Visual inspection criterion in cosmetic / appearance

Glass defect			
No	Item	Criteria	Remark
1	Dimension (Minor)	By engineering diagram	
2	Crack (Major)	Extensive crack	

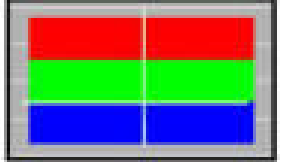
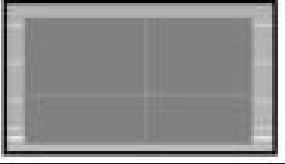
3	Corner (Minor)	$X \leq 3 \text{ mm}$ $Y \leq 3 \text{ mm}$ $Z \leq T$ Ignore	 T: Glass thickness Z: Thickness X: Length Y: Width
4	Side (Minor)	$X \leq 5 \text{ mm}$ $Y \leq 3 \text{ mm}$ $Z \leq T$ Ignore	 T: Glass thickness Z: Thickness X: Length Y: Width

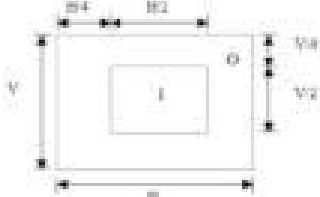
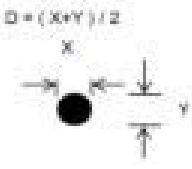
TFT defect in appearance

No	Item	Criteria	Remark
1	Foreign Spot (Minor) Including: Black spot, White spot Pin hole Foreign particle	$D \leq 0.15 \text{ mm}$, Ignore $0.15 \text{ mm} < D \leq 0.3 \text{ mm}$, $N \leq 3$ $0.3 \text{ mm} < D$, $N = 0$ Distance $\geq 5 \text{ mm}$ Ignore if out of Area AA	$D = (X+Y)/2$, X: Length, Y: Width 
2	Foreign Line(Minor) Including: Black line White line Bright line	$W \leq 0.03 \text{ mm}$, Ignore $0.03 \text{ mm} < W \leq 0.05 \text{ mm}$, $L \leq 4 \text{ mm}$, $N \leq 3$ $0.05 \text{ mm} < W \leq 0.08 \text{ mm}$, $L \leq 4 \text{ mm}$, $N \leq 1$ $W > 0.08 \text{ mm}$, $N = 0$ Ignore if out of Area AA	L: Length, W: Width 
3	Polarizer Dent/Air Bubble (Minor)	$D \leq 0.2 \text{ mm}$, Ignore $0.2 \text{ mm} < D \leq 0.3 \text{ mm}$, $N \leq 3$ $0.3 \text{ mm} < D \leq 0.5 \text{ mm}$, $N \leq 1$ $D > 0.50 \text{ mm}$, $N = 0$ Distance $\geq 5 \text{ mm}$	$D = (X+Y)/2$, X: Length, Y: Width 
4	Polarizer Scratches (Minor)	$W \leq 0.03 \text{ mm}$, Ignore $0.03 \text{ mm} < W \leq 0.05 \text{ mm}$, $L \leq 4 \text{ mm}$, $N \leq 3$ $0.05 \text{ mm} < W \leq 0.08 \text{ mm}$, $L \leq 4 \text{ mm}$, $N \leq 1$ $W > 0.08 \text{ mm}$, $N = 0$ Ignore if out of Area AA	L: Length, W: Width 

Other defects			
No	Item	Criteria	Remark
1	FPC (Minor)	Any crack or breakage which effect the function are not allowed Disregard if the dirty removed	
2	Backlight (Minor)	Power up is allowed. Breaking off is not allowed. The scratch which may causes a problem in practical use is not allowed	
3	Bezel (Minor)	Erasable dirt is ignore	

11.5.2 Visual inspection criterion in electrical display

Glass defect			
No	Item	Criteria	Remark
1	No display (Major) Abnormally Short circuit	Not allowed	
2	Missing line (Major)	Not allowed	
3	Darker or lighter line (Major)	Not allowed	
4	Weak line (Minor)	By limit sample	

Display Inspection						
No	Item	Criteria				Remark
1	Bright / Dark dot	Items	Area I	Area O	Tota I	 1.1sub-pixel: 1R or 1G or 1B 2.Point defect area ≥ 1/2 sub pixel
		Bright	1	1	1	
		Dark	1	3	3	
		Bright & Dark	2	3	4	
		2 adjacent dots	0	0	0	
		Minimum Distance ≥ 5mm				
2	Tiny bright dot	Visible through 6% ND filter D≤0.15mm, Ignore 0.15mm<D≤0.3mm, N≤3 0.3mm<D≤0.35mm, N≤1 D>0.35mm, N=0 Distance≥5mm Ignore if out of Area AA				D =(X+Y)/2, X: Length, Y: Width 
4	Mura/Waving/ Hot spot	Not visible through 6% ND filter in 50% gray or judge by limit sample if necessary				

* Note:

- Defect which is on the Black Matrix (outside of active area) are not considered as a defect.
- If any specific defect is not included in the above defect table, this defect should be judged by Formike.
- W: Width, L: Length D: Average Diameter N: Count.

12. PRECAUTION RELATING & PRODUCT HANDLING

Display is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification.

12.1 SAFETY

12.1.1 If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.

12.1.2 If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

12.2 HANDLING

12.2.1 Avoid any strong mechanical shock which can break the glass.

12.2.2 Avoid static electricity which can damage the CMOS LSI - When working with the module, be sure to ground your body and any electrical equipment you may be using. The followings should be noted:

12.2.2.1 CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.

12.2.2.2 Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.

12.2.2.3 Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.

12.2.2.4 The modules should be kept in anti-static bags or other containers resistant to static for storage.

12.2.2.5 Only properly grounded soldering irons should be used.

12.2.2.6 If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.

12.2.2.7 The normal static prevention measures should be observed for work clothes and working benches.

12.2.3.8 Since dry air is inductive to static, a relative humidity of 50-60% is recommended

12.2.3 Do not remove the panel or frame from the module.

12.2.4 The polarizing plate of the display is very fragile. Please handle it very carefully, do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass, tweezers, etc.)

12.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.

12.2.6 Do not touch the display area with bare hands, this will stain the display area.

12.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

12.2.8 To control temperature and time of soldering is $300 \pm 10^{\circ}\text{C}$ and 3-4 sec.

To avoid liquid (include organic solvent) stained on LCD Module.

12.3 STORAGE

12.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 60% RH.

12.3.2 Avoid exposure to direct sunlight or to the light of fluorescent lamps.

12.3.3 Do not place the module near organic solvents or corrosive gases.

Do not crush, shake, or jolt the module.

12.4 LIMITED WARRANTY

12.4.1 FORMIKE modules are not consumer products, but may be incorporated by FORMIKE's customers into consumer products or components thereof, FORMIKE does not warrant that its modules and components are fit for any such particular purpose.

12.4.2 The liability of FORMIKE is limited to repair or replacement on the terms set forth below. FORMIKE will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between FORMIKE and the customer, FORMIKE will only replace or repair any of its Modules which is found defective electrically or visually when inspected in accordance with FORMIKE INSPECTION CRITERIA

12.4.3 No warranty can be granted if any of the precautions state in handling liquid crystal display has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.

12.4.4 In returning the modules, they must be properly packaged; there should be detailed description of the failures or defect.

13. OTHERS

13.1 If there is any not specified quality standard in this specification as well as RMA , please refer to < INSPECTION CRITERIA>. Contact FORMIKE to get the complete <INSPECTION CRITERIA> by the contact window or feedback@wandisplay.com.

13.2 Special agreement of <INSPECTION CRITERIA> is recognized only in writhing between FORMIKE and the customer also indicated it before ordering.