



FORMIKE ELECTRONIC CO.,LTD

PRDUCT SPECIFICATON

TFT LCD MODULE

MODEL : KWH050GM02-F03

【 】 Preliminary Specification

【 ♦ 】 Finally Specification

CUSTOMER'S APPROVAL	
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- This specification is subject to change withouth notice.Please contact FORMIKE or it's representative before designing your product based on this specification.

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1. OVERVIEW

This specification is apply for "5"(12.70 cm)color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module(pixel number : 480×272)and contain 4 WireResistance touch panel(type name : KWH05002-F03) . This module composed of LCD panel, driver ICs, control circuit and backlight . The 12.70 cm ("5") screen produces 480 ×RGB×272 resolution image . By applying 8 bits digital data, 16.7 million color images are displayed on the "5" diagonal screen , LED Driver for backlight is not included in this module .

General specification are summarized in the following table :

ITEM	SPECIFICATION
Display Area (mm)	110.88 (W) x 62.83 (H) (5-inch diagonal)
Number of Pixels	480 x 3 (H) x 272 (V)
Pixel Pitch (mm)	0.231 (H) x 0.231 (V)
Color Pixel Arrangement	R,G,B vertical stripe
Display Mode	Normally white, TN
Number of Colors	16.7M
Optimum Viewing Angle	6 o'clock
Brightness (cd/m ²)	320nit (Typ.)
Viewing Angle CR ≥ 10	130 (H) / 110 (V)
Electrical Interface	TTL
Power Consumption (with B/L)(W)	(0.8W) (Typ.)
Module Size (mm)	120.7 (W) x 75.8 (H) x 4.21 (D)
Module Weight (g)	80 g (Typ.)
Backlight Unit	LED x 10 pcs
Surface Treatment (with Touch Panel)	Anti-Glare , Hardness : 3H
Touch Panel Mode	4 WireResistance

**2. ABSOLUTE MAXIMUM RATINGS**

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage for LCD	VCC	-0.3	6.0	V	
input voltage	V _i	-0.3	VCC+0.3	V	
Operate Temperature (sys)	T _{opa}	-30	85	°C	
Storage Temperature	T _{stg}	-55	125	°C	
Singal LED Forward Current	I _F	--	30	mA	
Singal LED Pulse Forward Current	I _{FP}	--	100	mA	
Singal LED Reverse Current	V _R	--	5	V	

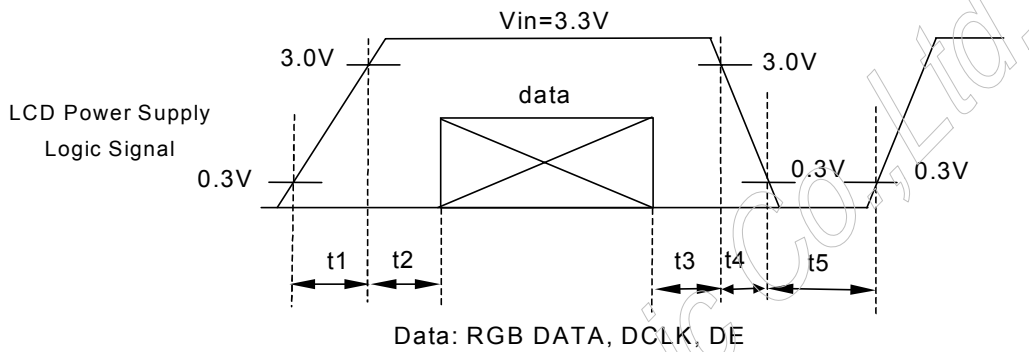
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3. ELECTRICAL CHARACTERISTICS

(a) Power Voltage

Ta=25°C						
ITEM	SYMBOL	MIN	TYP	MAX.	UNIT	NOTE
Power Supply Voltage for LCD	VCC	3.0	3.3	3.6	V	[Note1]
LCD Input Current *1)	ICC	-	60	--	mA	[Note2]
Logic Input Voltage	Input Voltage	VIN	0	-	VCC	
	Threshold Voltage (High)	VTH	0.7VCC	-	VCC	
	Threshold Voltage (Low)	VTL	0	-	0.3VCC	

[Note 1] Power · Signal sequence :



- 1ms < t1 ≤ 10ms
- 0 < t2 ≤ 50 ms
- 0 < t3 ≤ 50 ms
- 0 < t4 ≤ 10 ms
- 1 sec ≤ t5

[Note 2]

TYP range are 0 ~ 255 Gray scale

Pattern shown value

272 line mode

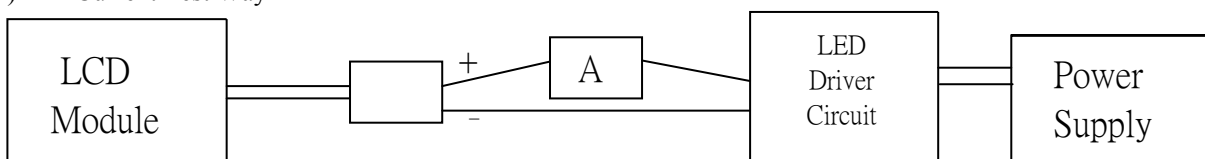
VCC= +3.3V

(b) Backlight

Ta=25°C						
ITEM	SYMBOL	MIN	STANDARD	MAX.	UNIT	NOTE
LED Voltage	VL	--	33.0	36.0	V	IL=20.0 mA
LED Current	IL	--	20.0	--	mA	*1)
Power consumption	WL	--	660.0	--	mW	*2)

[Note]

*1)LED Current Test Way



*2) VL×IL · IL= 20 mA

4.PIN ASSIGNMENT

Pin NO.	SYMBOL	DESCRIPTION	Remark
1	VSS	Ground	
2	VSS	Ground	
3	Vcc	Power Supply	
4	Vcc	Power Supply	
5	R0	Red Data Bit 0 (LSB)	
6	R1	Red Data Bit 1	
7	R2	Red Data Bit 2	
8	R3	Red Data Bit 3	
9	R4	Red Data Bit 4	
10	R5	Red Data Bit 5	
11	R6	Red Data Bit 6	
12	R7	Red Data Bit 7 (MSB)	
13	G0	Green Data Bit0 (LSB)	
14	G1	Green Data Bit1	
15	G2	Green Data Bit2	
16	G3	Green Data Bit3	
17	G4	Green Data Bit4	
18	G5	Green Data Bit5	
19	G6	Green Data Bit6	
20	G7	Green Data Bit7 (MSB)	
21	B0	Blue Data Bit0 (LSB)	
22	B1	Blue Data Bit1	
23	B2	Blue Data Bit2	
24	B3	Blue Data Bit3	
25	B4	Blue Data Bit4	
26	B5	Blue Data Bit5	
27	B6	Blue Data Bit6	
28	B7	Blue Data Bit7 (MSB)	
29	Vss	Ground	
30	DCLK	Dot Data Clock	
31	DISP	Display On / Display Off	Note1
32	Hsync	Horizotal Sync Input	
33	Vsync	Vertical Sync Input	
34	DE	Data Enable Control	Note2
35	U/D	Shift up or down Control	Note3
36	(L/R)	(Shift Left or Right Control)	
37	Vss	Ground	
38	Vss	Ground	
39	X1	Right(TP)	
40	Y1	Bottom(TP)	
41	X2	Left(TP)	
42	Y2	UP(TP)	
43	Vss	Ground	
44	Vss	Ground	
45	Vss	Ground	
46	VLED-	LED Ground	
47	VLED+	LED Power	
48	Vss	Ground	
49	Vss	Ground	
50	Vss	Ground	

Note1 : DISP set High, input data are valid. DISP set Low, input data are invalid.

Note2 : DE is High, data can be access. DE is Low, data can not be access.

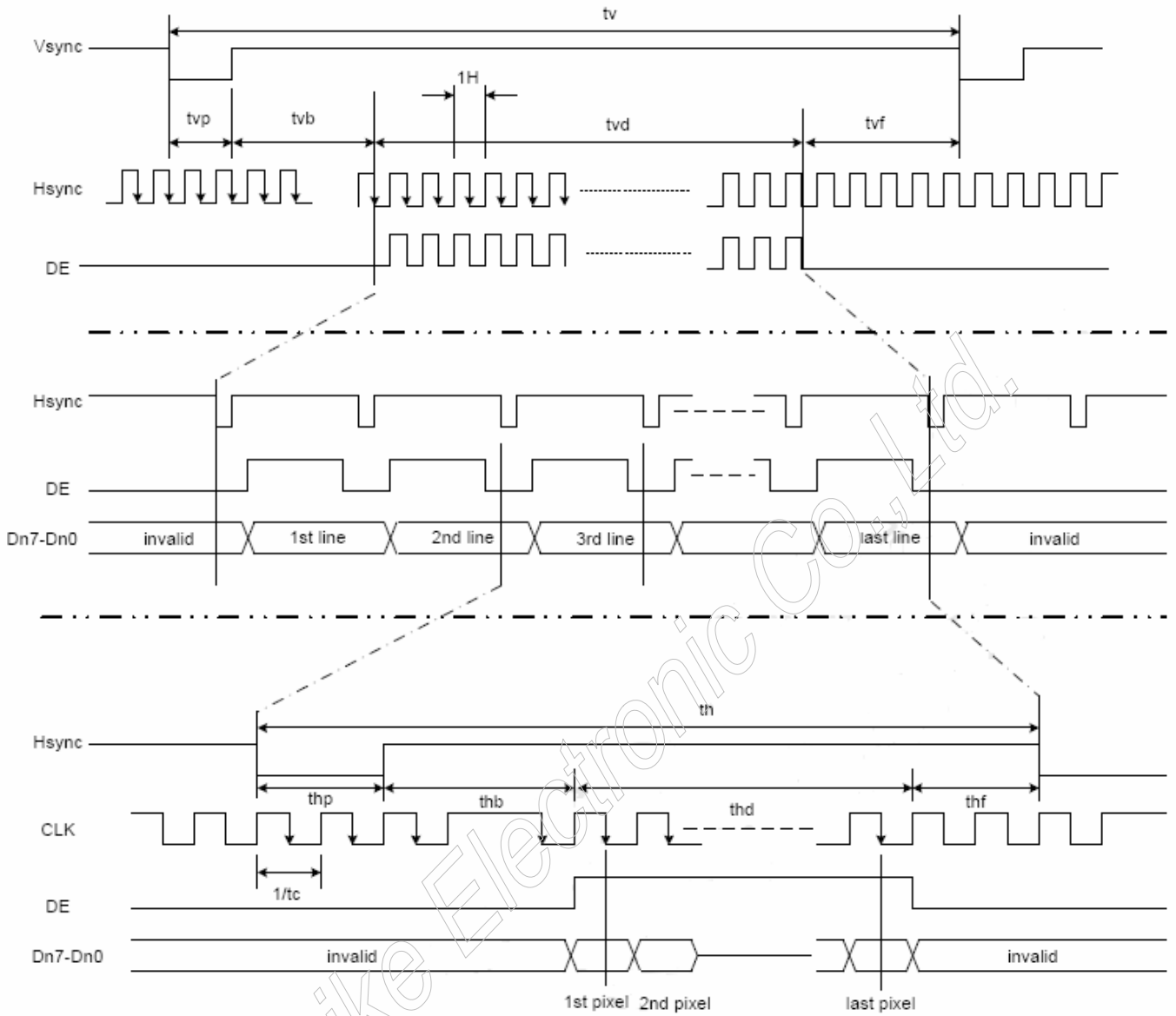
Note3 : U/D set High→UP to Down. U/D set Low→Down to UP.

L/R set High→Left to Right. L/R set Low→Right to Left



5. INPUT SIGNAL(DE ONLY MODE)

(1)Timing Chart





(2)Timing Specification

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	
CLK/Hsync/Vsync	CLK cycle	t_{CLK}	--	9	15	MHz
	Hsync cycle	1/th	--	17.14	--	kHz
	Vsync cycle	1/tv	--	59.94	--	Hz
Horizontal cycle	Horizontal cycle	th	--	525	--	CLK
	Horizontal display period	thd	--	480	--	CLK
	Horizontal front porch	thf	2	--	--	CLK
	Horizontal pulse width	thp	2	41	--	CLK
	Horizontal back porch	thb	2	2	--	CLK
Vertical cycle	Vertical cycle	tv	--	286	--	H
	Vertical display period	tvd	--	272	--	H
	Vertical front porch	tvf	1	2	--	H
	Vertical pulse width	tvp	1	10	--	H
	Vertical back porch	tvb	1	2	--	H



(3) Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB				LSB				MSB				LSB				MSB				LSB			
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(1)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

[Note]

- (1) Definition of gray scale
Color (n) : n means level of gray scale
Larger n means brighter level
- (2)Data: 1-High,0-Low

6. TOUCH PANEL

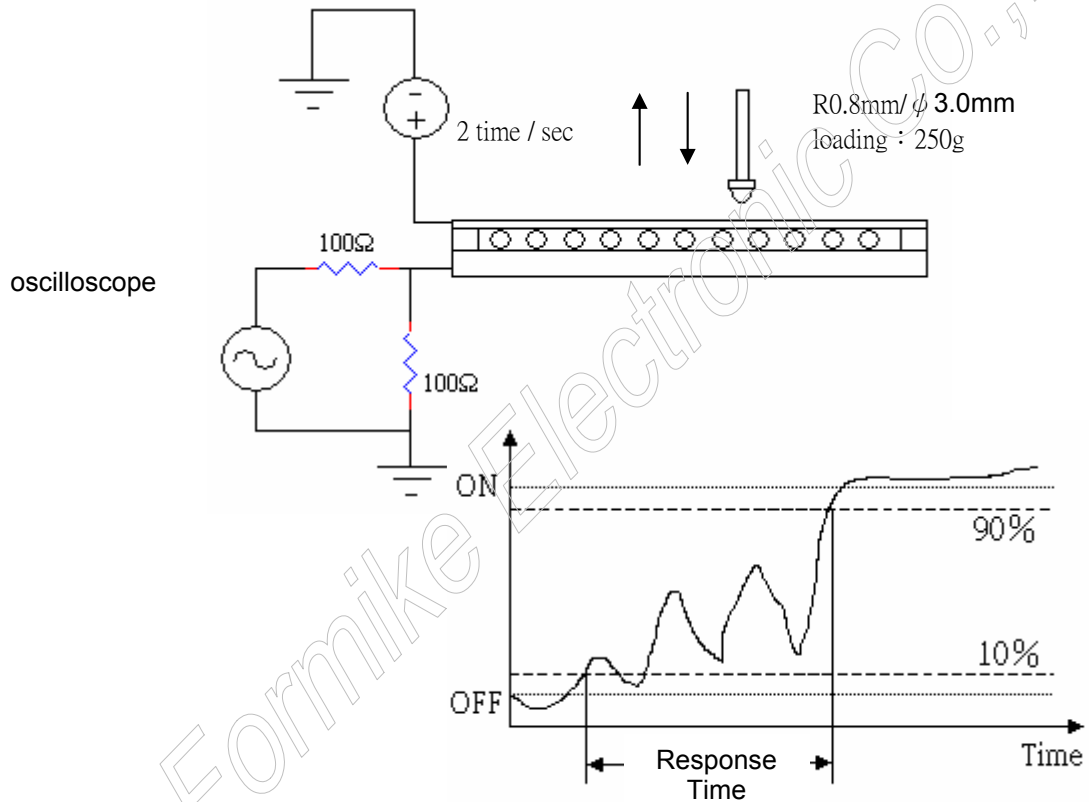
(1) ELECTRICAL CHARACTERISTICS :

ITEM	MIN	TYP	MAX	UNIT	NOTE
Linearity error	-1.5	--	1.5	%	
Resistance Between Terminals *1)	500	--	1500	Ω	X (Film Side)
	200	--	900	Ω	Y (Glass Side)
Insulation Resistance	20	--	--	M Ω	DC 25V
Operation Voltage	--	--	5	V	
Response Time	--	--	10	ms	*2)
Transmittance	--	80	--	%	
Haze	4	8	12	%	*3)

[Note]

*1)Type : four-wire resistance

*2)



*3)JIS K7105 , measure equipment=>Haze-gard plus : BYK-Gardner

(2) mechanical and reliability characteristics :

Item	MIN	TYP	MAX	UNIT	NOTE
lowest. Activation Force	--	--	80	g	*1)
Durability-surface pitting	1,000,000			time	*2)
Durability-surface scratching	100,000			time	*3)
Surface Treatment	3			H	45°/4.9 Nt

[Note]

*1) with stylus pen : R 0.8mm/ψ3.0mm 、 with finger : R 8.0mm/ψ12.0mm ◦

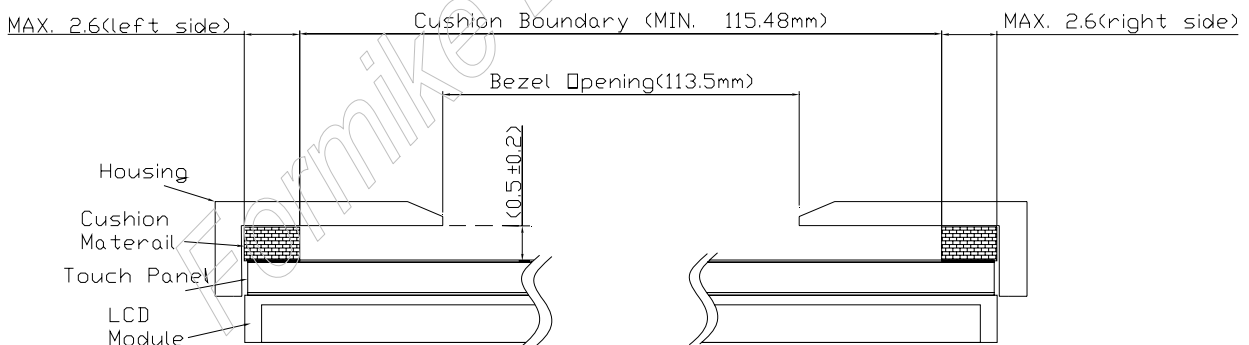
*2) writing with the Silicon Rubbe pen (R 8.0mm/ψ12.0mm) on the same point of the touch panel with 250g force , frequency : 5Hz

*3) writing with the test pen (R 0.8/ψ3.0mm/POM material) on the touch area of the touch panel with 250g (2.45N) force , moving velocity : 70mm/sec

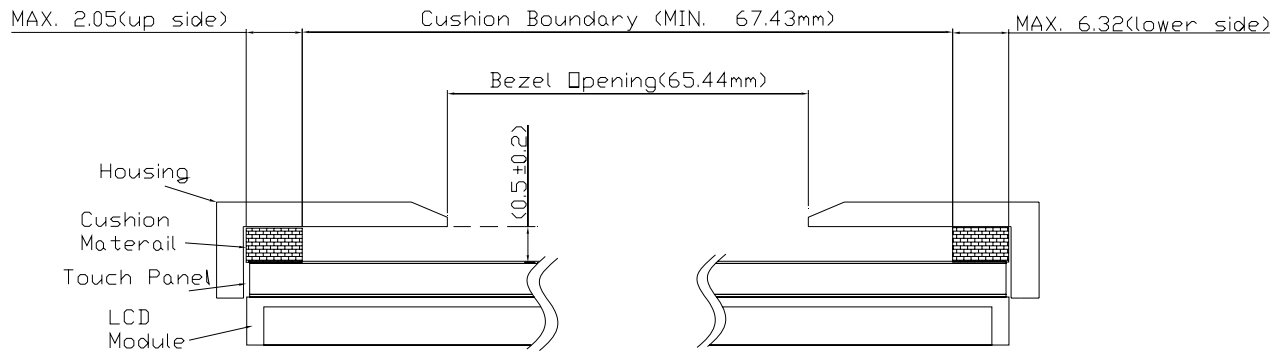
(3)Design guideline for Touch Panel

- (a)The Housing Cushion on touch-panel must be set at outside of Cushion Boundary, the Cushion material must be elastic material.
- (b) The recommend width of housing cushion as follows :
(left side)=2.4mm ;(right side)=2.4mm ; (up side)=1.8mm ;(lower side)=6.1mm ;
real condition must depend on design value of customer.
- (c)The recommend opening of housing as follows
(horizontal direction)=113.5mm ; (vertical direction)=65.44mm
- (d)The housing must avoid to touch the T.P, the gap between housing and T. P. should be 0.5 ± 0.2 mm
- (e)To combine, the housing should not be stuck on T.P.
- (f)The housing design limit as follows :

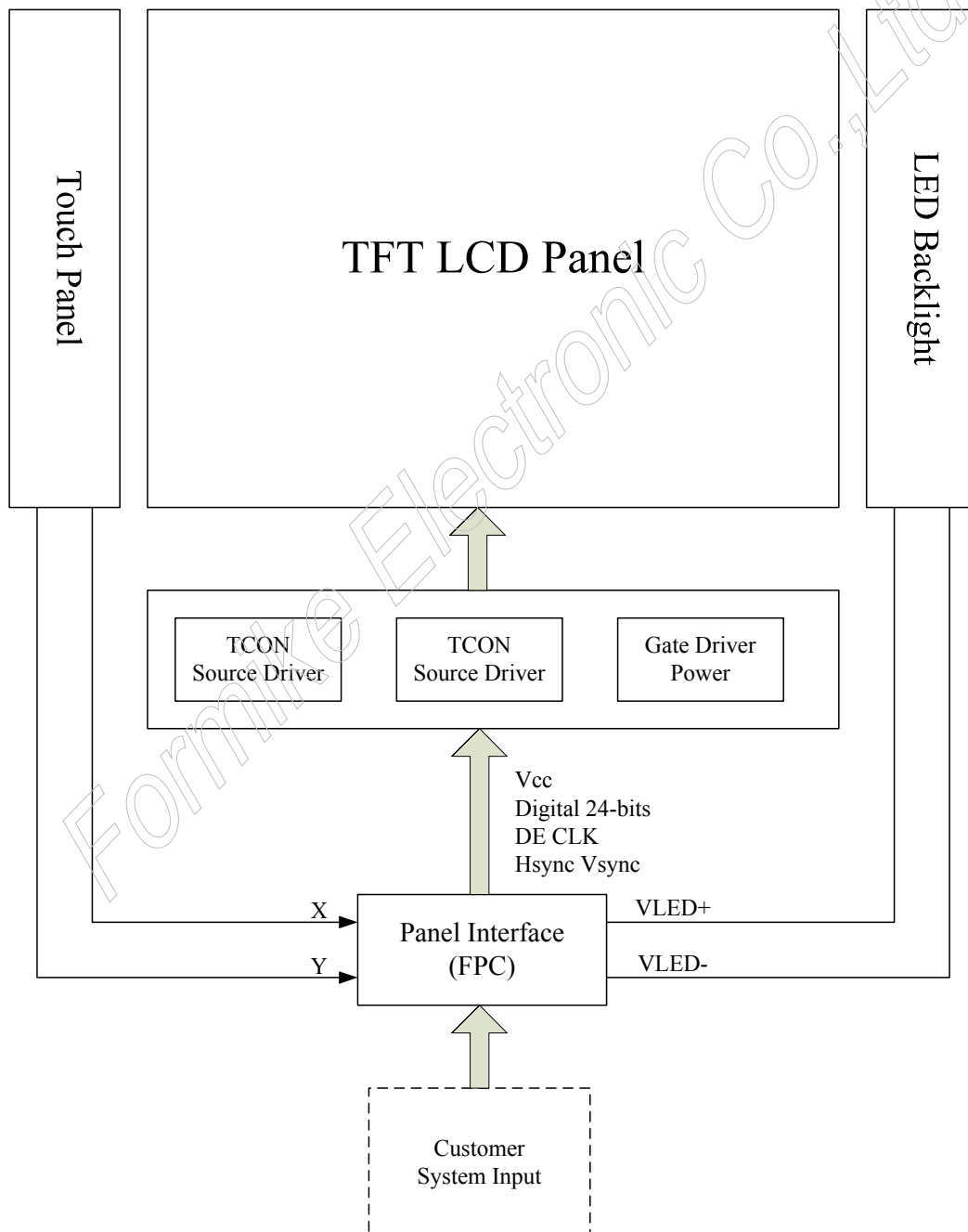
(Horizontal cross section)



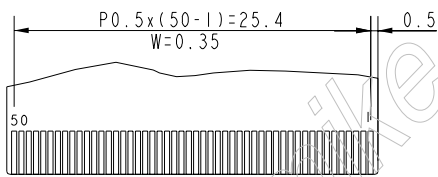
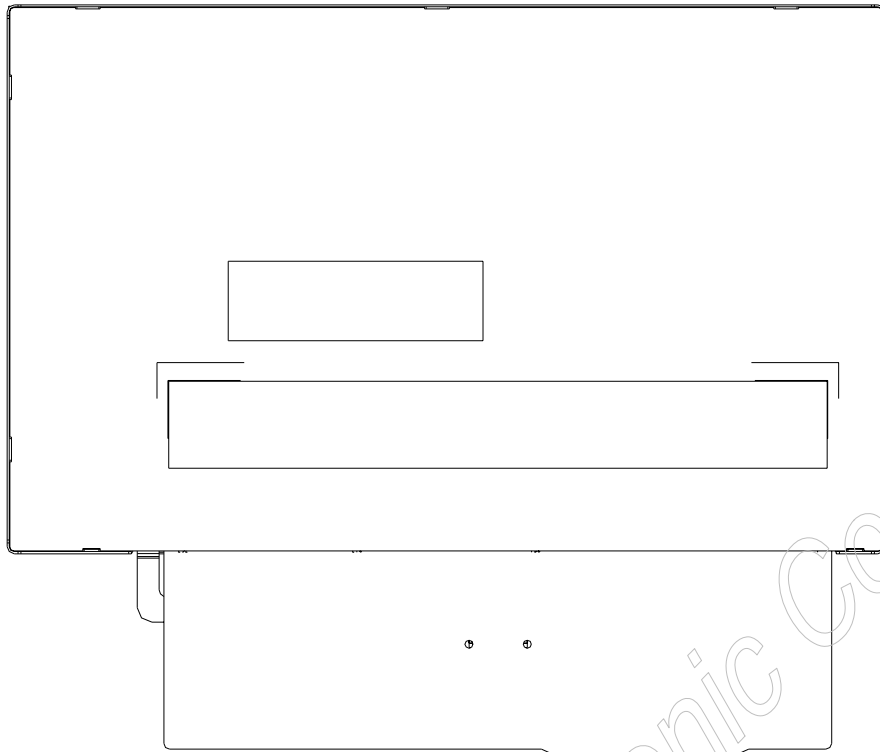
(Vertical cross section)



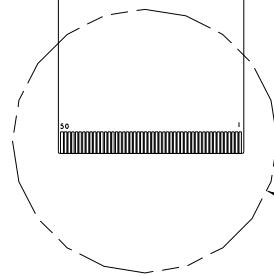
7. BLOCK DIAGRAM



8. MECHANICAL SPECIFICATION



DETAIL A
SCALE 2:1



SEE DETAIL A

9. OPTICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	Remarks	
Contrast	CR	$\theta = \phi = 0^\circ$ Point-5	280	350	--	--	*1)	
Luminance	Luminance (CEN)	L	$\theta = \phi = 0^\circ$	300	320	--	cd/m ²	*2)
	Luminance Uniformity	L	$\theta = \phi = 0^\circ$	--	80	--	%	*2)
Color saturation			--	50		%		
Response Time	tr+tf	$\theta = \phi = 0^\circ$	--	25	30	ms	*3)	
View angle	Horizontal	CR \geq 10 Point-5	--	130	--	°	*4)	
	Vertical		--	110	--	°	*4)	
Color Coordinate	White	Wx Wy	$\theta = \phi = 0^\circ$ Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	*2)*3)
	Red	Rx Ry		--	0.591 0.332	--	--	
	Green	Gx Gy		--	0.345 0.577	--	--	
	Blue	Bx By		--	0.153 0.109	--	--	

[Note] Measure Condition: IL= 20.0 mA

Measure Item Definition as follow :

*1) Definition of Contrast Ratio : (Measured by BM-5A (TOPCON) [dark room])

Contrast Ratio (CR)= (White) Luminance of ON \div (Black) Luminance of OFF

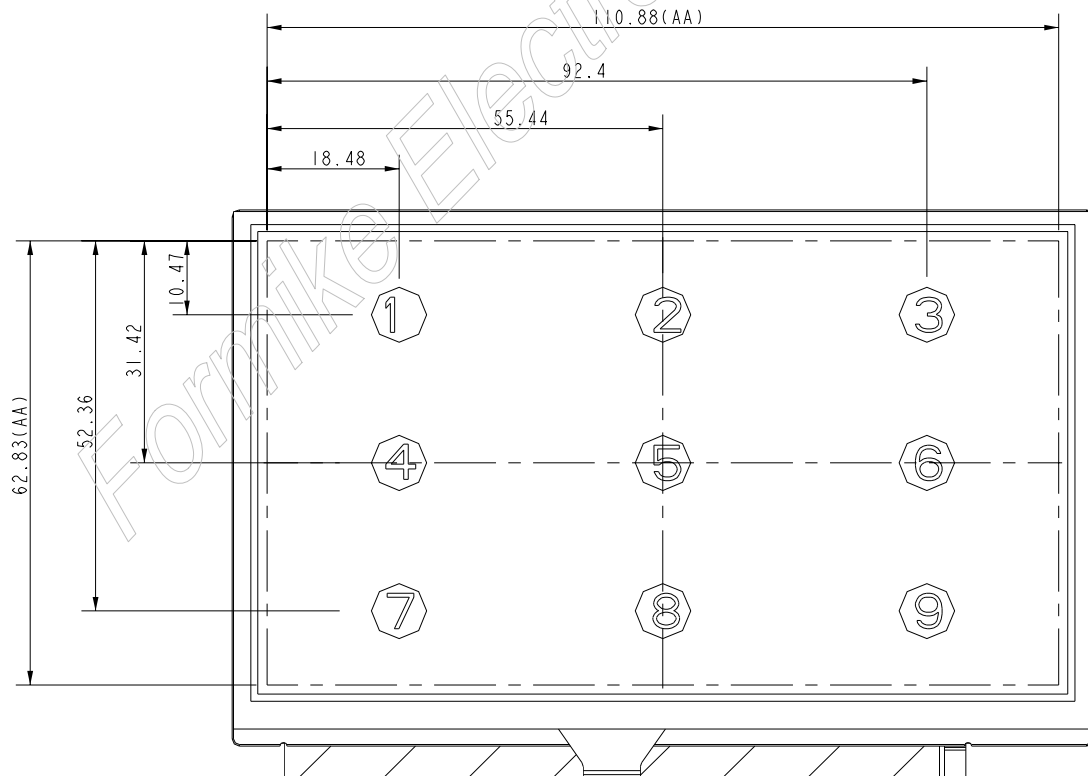


Fig.9-1: Test Point Position

*2) Definition of Center Luminance & Luminance Uniformity : (Measured by BM-5A)

(TOPCON) [dark room])

Center Luminance : Measure luminance on Point No5 as figure 9-1.

Luminance Uniformity : Measure maximum luminance(L(MAX))and minimum luminance (L(MIN))on the 9 points as figure 9-1.

$$\Delta L = [L(MIN)/L(MAX)] \times 100\%$$

*3) Response Time (White - Black)

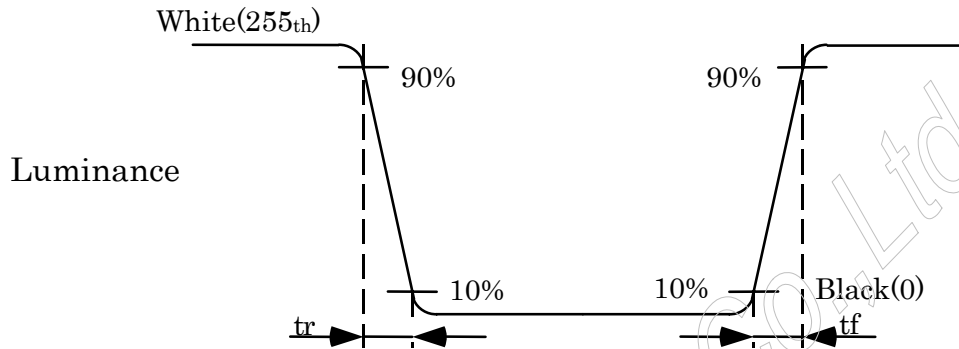


Fig.9-2: Definition of Response Time (White - Black)

*4) Definition of Viewing Angle (..) : (by EZ-CONTRAST (ELDIM) in the dark room.)

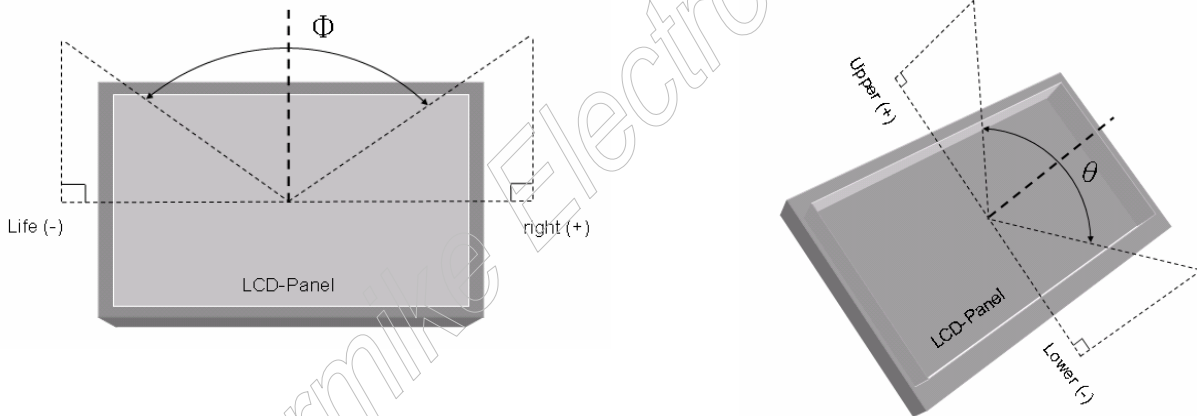


Fig.9-3: Definition of Viewing Angle



10. RELIABILITY TEST CONDITIONS

(1) Temperature and Humidity

TEST ITEM	CONDITIONS
High Temperature Operation	85 °C ; 240 hrs
High Temperature Storage	95 °C ; 240 hrs (TSP : 85 °C ; 240 hrs)
High Temperature High Humidity Operation	60 °C ; 90% RH ; 240 hrs (No condensation)
Low Temperature Operation	- 30 °C ; 240 hrs
Low Temperature Storage	- 40 °C ; 240 hrs
Thermal Shock	-30 °C (0.5 hrs) ~ 85 °C (0.5 hrs) 200 CYCLE

(2) Shock & Vibration

TEST ITEM	CONDITIONS
Shock (Non-Operation)	Shock Level: 980m/s ² (100G), Waveform: half sinusoidal wave Shock Time: 6ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
Vibration (Non-Operation)	Frequency range:8~33.3Hz Stoke : 1.3 mm Wave Form: sinusoidal wave,perpendicular axis(both x,z axis: 2Hrs , y axis: 4Hrs). Sweep: 2.9G,33.3~400Hz Cycle: 15 min



(3) Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF , 330Ω , ±15kV air test	(i)
	200pF , 0Ω , 200V contact test	(ii)

NOTE : Measure point (i)LCD glass and metal bezel
(ii)IF connector pins

(4)Pass Judgment Mode

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect.

Fail: No display image, obvious non-uniformity, or line defects.

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