

Display Elektronik GmbH

DATA SHEET

TFT- MODULE

**DEM 1280800C VMX-PW-N
(C1-TOUCH)
10,1" TFT + PCT**

Product Specification

Ver.: 5

16.08.2019

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1. General Description and Features

This TFT is a 10,1" transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT (IPS Technology) as a switching device. This model is composed of a TFT-LCD module, a receiver circuit and a back-light unit. Graphics and texts can be displayed on a WXGA 1280(W) x RGB x 800 (H) dots (16:10 aspect ratio) with 16.2Million colors. The following table described the features:

1.1 Features

- Transmissive and High-Brightness Backlight with 36 LEDs
- IPS mode
- Projected Capacitive Touch Panel with I2C-Interface
- LVDS Receiver 24-Bit-Interface
- Extreme Temperature Range
- RoHS Compliance

1.2 LCD Module

Item	Specification	Unit
Screen Size	10.1 Inches	Diagonal
Display Resolution	1280 x RGB x 800	Pixel
Active Area	216.96 x 135.60	mm
Outline Dimension	241.96 x 175.00 x 9.01	mm
Display Mode	Normally Black, IPS	--
Pixel Arrangement	R,G,B Vertical Stripe	--
Pixel Size	0.1695 x 0.1695	mm
Surface Treatment	Anti-Glare , Hard-Coating	
Display Color	16.2Million	--
Viewing Direction	Full View	--
Input Interface	LVDS Receiver 24-Bit-Interface	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	(241.66)	(241.96)	(242.26)	mm	
	Vertical (V)	(174.7)	(175.00)	(175.3)	mm	
	Thickness (T)	(8.71)	(9.01)	(9.31)	mm	(1)
Weight		--	(455)--		--	--

Note (1) Not Include Component. Refer to the Outline Dimension Drawing as attached.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

(Ta=25°C ± 2°C, VSS=GND=0)

Item	Symbol	Min.	Max.	Unit	Note
Storage Temperature	T _{STG}	-30	85	°C	(1)
Operating Temperature	T _{OPR}	-30	85	°C	(1,2,3)

Note (1) 95 % RH Max. (40 °C ≥ Ta). Maximum wet-bulb temperature at 39°C or less. (Ta > 40°C) No condensation.

Note (2) In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

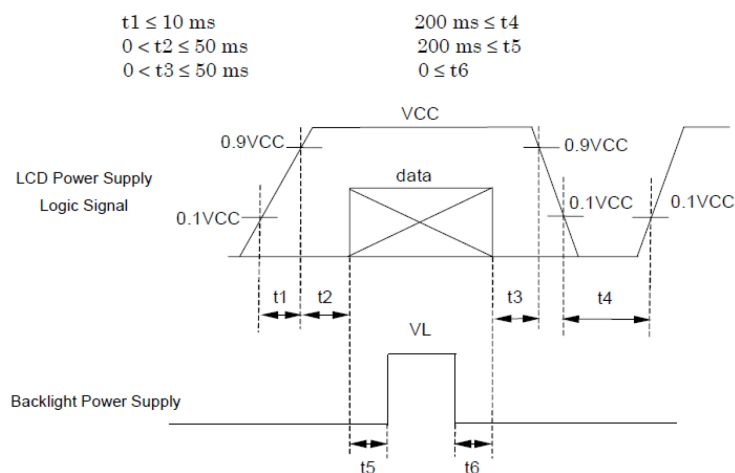
3.1.2 Electrical Absolute Maximum Ratings

3.1.2.1 TFT-LCD Module

(VSS=GND=0)

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply for LCM	V _{CC}	-0.3	4.0	V	
Permissible Input Ripple Voltage	V _{RF}	-	100	mVp-p	V _{CC} =+3.3V

Display On/Off Sequence :

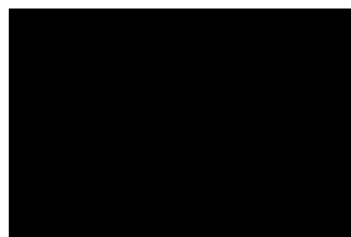


3.1.3 DC Electrical Characteristics of the TFT LCD

(Ta=25°C ± 2°C, V_{SS}=GND=0)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply for LCM		V _{CC}	3.0	3.3	3.6	V	
Input Voltage for Logic	Differential Input High Threshold	V _{TH}	-	-	+100	mA	
	Differential Input Low Threshold	V _{TL}	-100	-	-	mA	
Power Supply Current for LCM		I _{CC}	-	(270)	(300)	mA	Note 1

Note1: f_v =60Hz, Ta=25°C, Display pattern: Black pattern



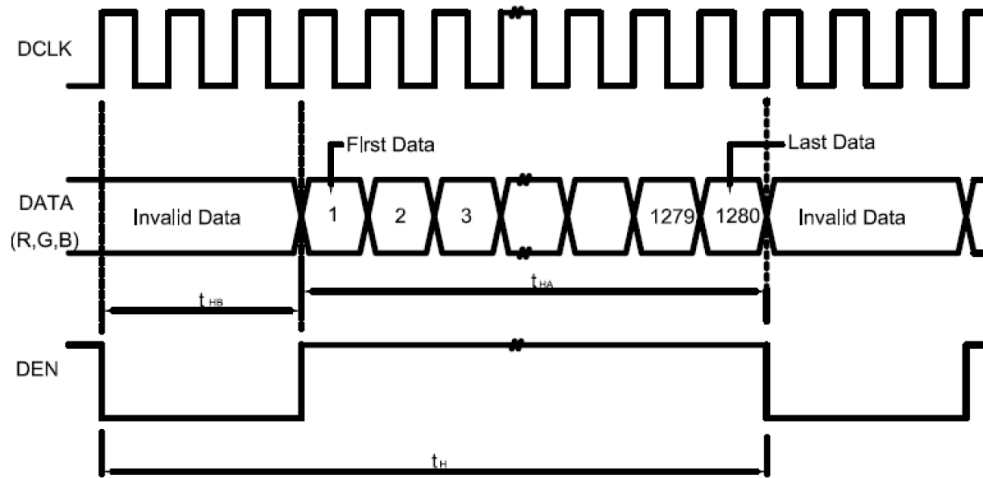
3.2 AC Timing Characteristic of The LCD

3.2.1 Timing Condition

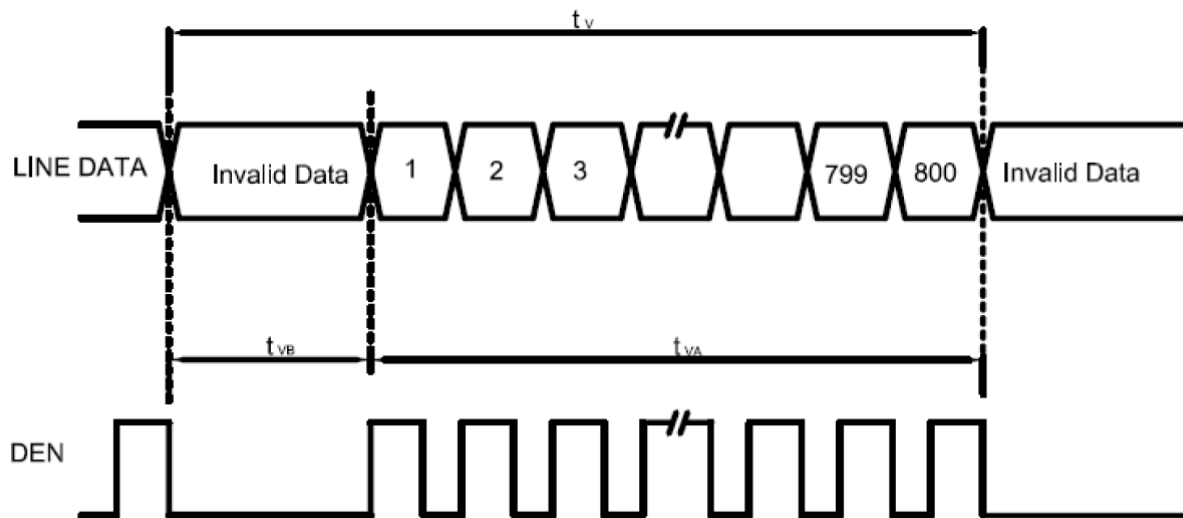
Signal		Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK		CLK Frequency	t _{clk}	68.9	71.1	73.4	MHz	
DE	Horizontal	Horizontal total Time	t _H	1410	1440	1470	tCLK	
		Horizontal effective Time	t _{HA}	1280			tCLK	
		Horizontal Blank Time	t _{HB}	90	160	190	tCLK	
	Vertical	Vertical total Time	t _V	815	823	1023	t _H	
		Vertical effective Time	t _{VA}	800			t _H	
		Vertical Blank Time	t _{VB}	15	23	33	t _H	

3.3 Timing Sequence (Timing Chart)

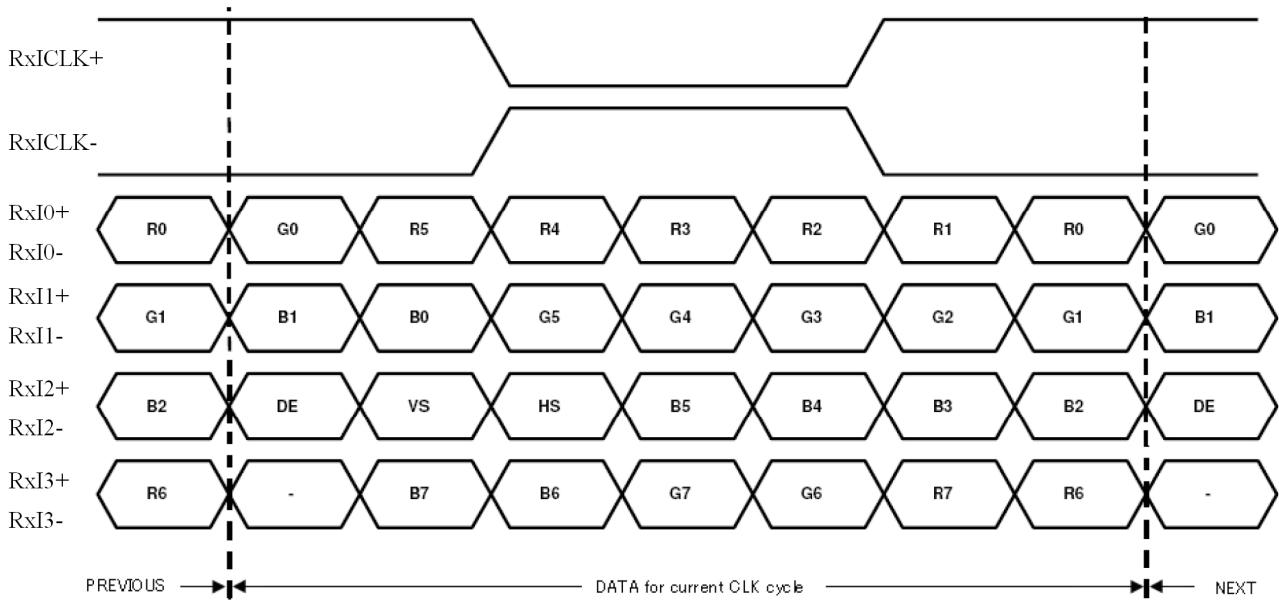
3.3.1 Horizontal Timing Sequence



3.3.2 Vertical Timing Sequence



3.3.3 LVDS Input Data Mapping(VESA)



3.4 Backlight Unit

The Backlight system is an edge-lighting type with 36 white LED (Light Emitting Diodes). The characteristics of 36 white LEDs are shown in the following tables.

(Ta= Room Temp)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Voltage	VB	(22)	(25)	(28)	V	
Forward Current	IB	-	(200)	-	mA	(1)
Power Consumption	P _{BL}	-	(5000)	-	mW	(2)

Note (1) LEDs in 9 series x 4 parallel type.

(2) Where $IB = (200mA)$, $VB = 25V$, $P_{BL} = VB \times IB$

(3) The environmental conducted under ambient air flow, at $Ta=25^{\circ}C \pm 2^{\circ}C$, $60\%RH \pm 5\%$

4. Optical Characteristics

4.1 Optical characteristic of the LCD

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

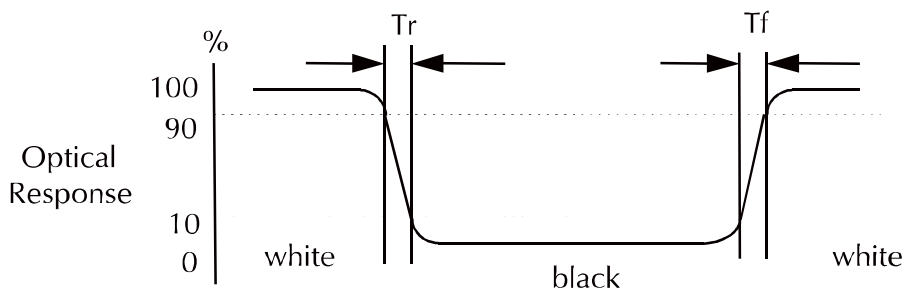
Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness	B		(1000)	(1100)	-	cd/m ²		
Response Time	T _r +T _f	θ=0°	-	(25)	(50)	ms	.	
Contrast Ratio (Center)	CR	At optimized viewing angle	(600)	(800)	-	-		
Luminance Uniformity (9 Points)	ΔL		80	-	-	%		
Color Chromaticity (CIE 1931)	White	W _x	θ=0° Normal Viewing Angle	(0.282)	(0.332)	(0.382)	--	BM-7A
		W _y		(0.343)	(0.393)	(0.443)		
Viewing Angle	Hor.	θ _R	CR≥10	(75)	(85)	--	Degree	
		θ _L		(75)	(85)	--		
	Ver.	θ _U		(75)	(85)	--		
		θ _D		(75)	(85)	--		
LED Lifetime	-	-	(50,000)	-	-			

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

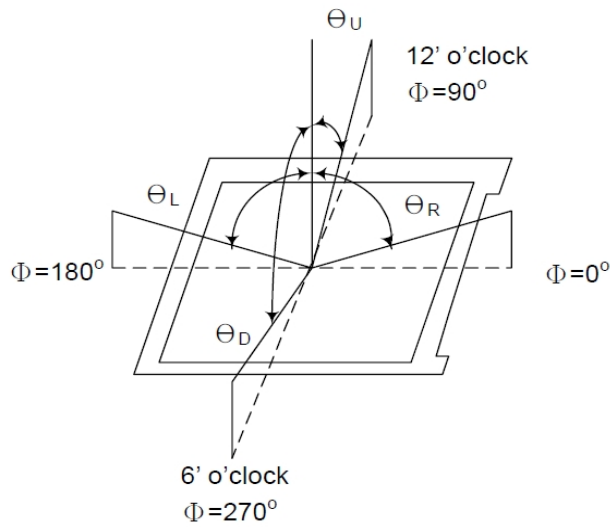


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
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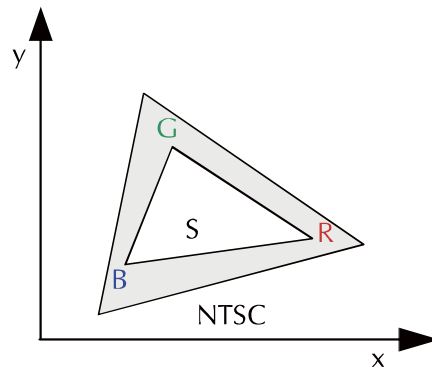
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

$$\text{Color Gamut : NTSC(\%)} = (\text{RGB Triangle Area} / \text{NTSC Triangle Area}) \times 100$$



5. I/O Terminal

5.1 Pin Assignment (Part No: 300E40-0010RA-G3(Starconn))

Pin No.	Symbol	I/O	Function	Remark
1	NC	—	Not Connect	
2	VCC	P	Power Supply for LCM	
3	VCC	P	Power Supply for LCM	
4	VCC_EDID	P	VCC_EDID (If not use, please keep floating)	
5	SCL_EDID	I/O	SCL_EDID (If not use, please keep floating)	
6	SDA_EDID	I/O	SDA_EDID (If not use, please keep floating)	
7	NC	—	Not Connect	
8	RXI0-	I	Negative LVDS differential data 0 input	
9	RXI0+	I	Positive LVDS differential data 0 input	
10	GND	P	Ground	
11	RXI1-	I	Negative LVDS differential data 1 input	
12	RXI1+	I	Positive LVDS differential data 1 input	
13	GND	P	Ground	
14	RXI2-	I	Negative LVDS differential data 2 input	
15	RXI2+	I	Positive LVDS differential data 2 input	
16	GND	P	Ground	
17	RXICLK-	I	Negative LVDS differential CLK input	
18	RXICLK+	I	Positive LVDS differential CLK input	
19	GND	P	Ground	
20	RXI3-	I	Negative LVDS differential data 3 input	
21	RXI3+	I	Positive LVDS differential data 3 input	
22	GND	P	Ground	
23	NC	—	Not Connect	
24	NC	—	Not Connect	
25	NC	—	Not Connect	
26	NC	—	Not Connect	
27	NC	—	Not Connect	
28	NC	—	Not Connect	
29	NC	—	Not Connect	
30	NC	—	Not Connect	
31	NC	—	Not Connect	
32	NC	—	Not Connect	
33	NC	—	Not Connect	
34	NC	—	Not Connect	
35	BIST	I	BIST Pin	
36	NC	—	Not Connect	
37	NC	—	Not Connect	
38	NC	—	Not Connect	
39	NC	—	Not Connect	
40	NC	—	Not Connect	

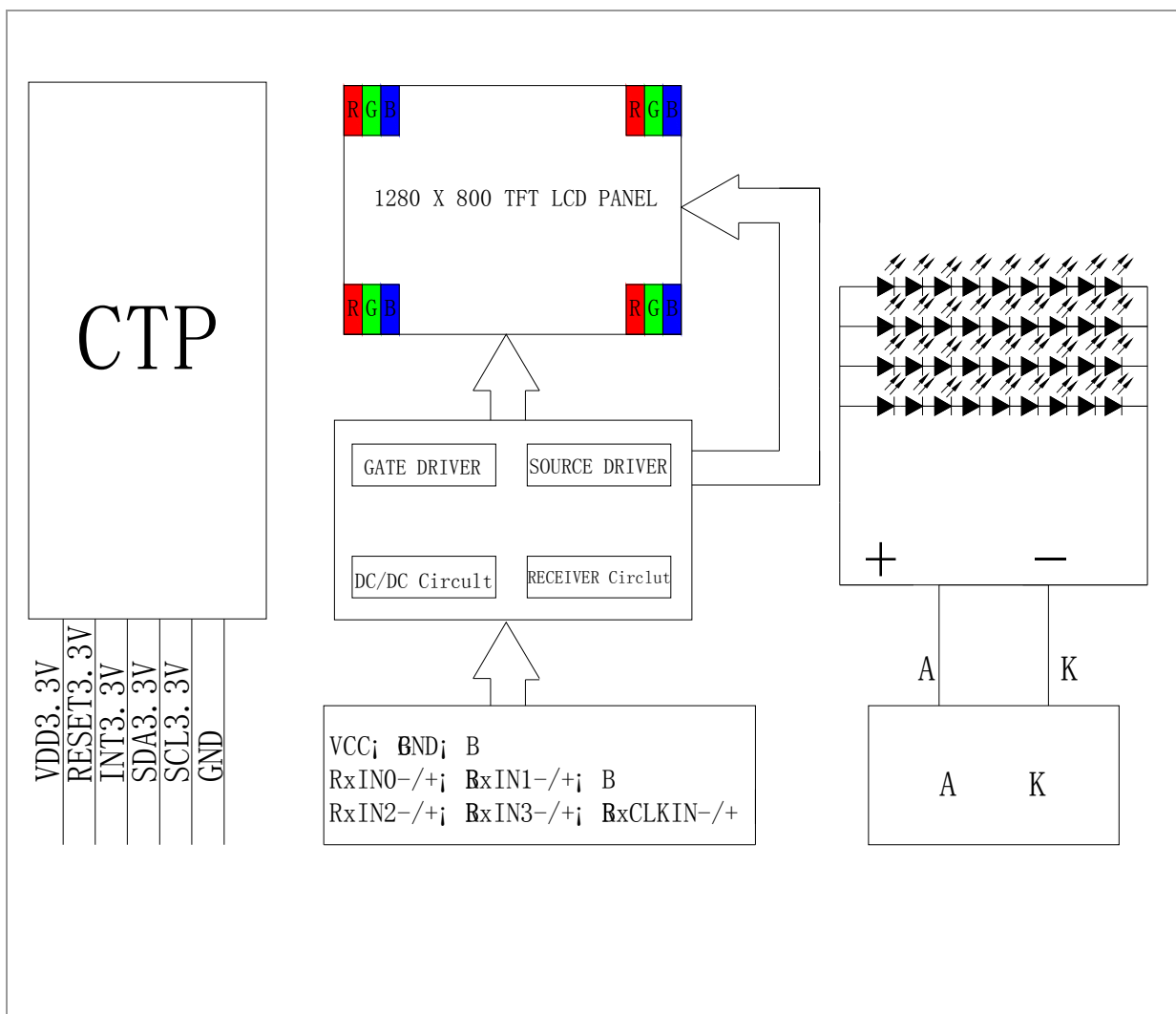
I: Input, P: Power

Notes: NC Pin must be retained; this pin can't contact GND or other signal.
GND Pin must ground contact, can not be floating.

5.2 Backlight Unit (CN1: Part No: JST: BHSR-02VS-01(N) or equivalent.)

Pin No.	Symbol	Function	Remark
1	LEDA	Power Supply for LED backlight	RED
2	LEDK	GND for LED backlight	BLACK

5.3 Block Diagram



6. Displayed Color and Input Data

	Color & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

7. Projected Capacitive Touch Panel**7.1 Main Feature**

Item	Specification	Unit
Screen Size	10.1 Inches	Diagonal
Type	Capacitive Touch Panel	--
Input Mode	Human's Finger	--
Active Area	217.56 x 136.2 (typ.)	mm
Module Outline	241.96 x 175.00 (typ.)	mm
Interface	I2C	--
Cover Glass Pencil-Hardness	7H (min)	--
Digital Power Supply	3.3V DC (typ)	V
IC Solution	HY4635	-

7.2 Pin Assignments and Definitions

Pin No.	Symbol	I/O	Function	Remark
1	GND	P	Ground	
2	VDD	P	Power Supply For CTP	
3	RESET	I	Reset Pin	
4	INT	O	INT Pin	
5	SDA	I/O	I2C Data Pin	
6	SCL	I/O	I2C Clock Pin	
7	NC	-	NO Connect	
8	NC	-	NO Connect	
9	NC	-	NO Connect	
10	NC	-	NO Connect	

8. Reliability Condition

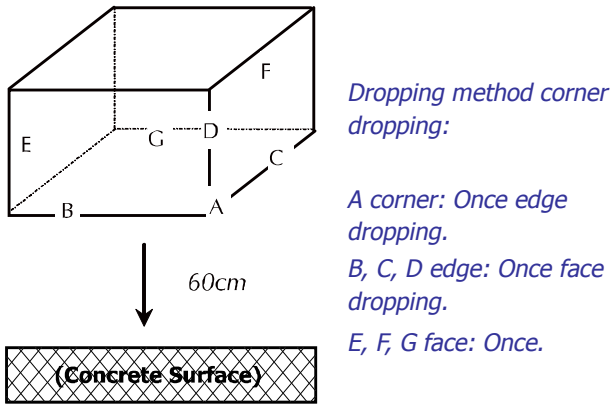
No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20°C ± 5°C.

Humidity: 65% ± 5%RH.

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	+85°C ± 2°C, 240hrs (Operation state).	
2	Low Temperature Operating	-30°C ± 2°C, 240hrs (Operation state).	1
3	High Temperature Storage	+85°C ± 2°C, 240hrs.	2
4	Low Temperature Storage	-30°C ± 2°C, 240hrs.	1,2
5	High Temperature and High Humidity Storage Test	+60°C ± 2°C, 90%, 240hrs.	1,2
6	Vibration Test	Total fixed amplitude: 1.5mm. Vibration Frequency: 10~55Hz. One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	3
7.	Drop Test	To be measured after dropping from 60cm high on the concrete surface in packing state.  <p><i>Dropping method corner dropping:</i> <i>A corner: Once edge dropping.</i> <i>B, C, D edge: Once face dropping.</i> <i>E, F, G face: Once.</i></p>	

- Notes:
1. No dew condensation to be observed.
 2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
 3. Vibration test will be conducted to the product itself without putting I in a container.

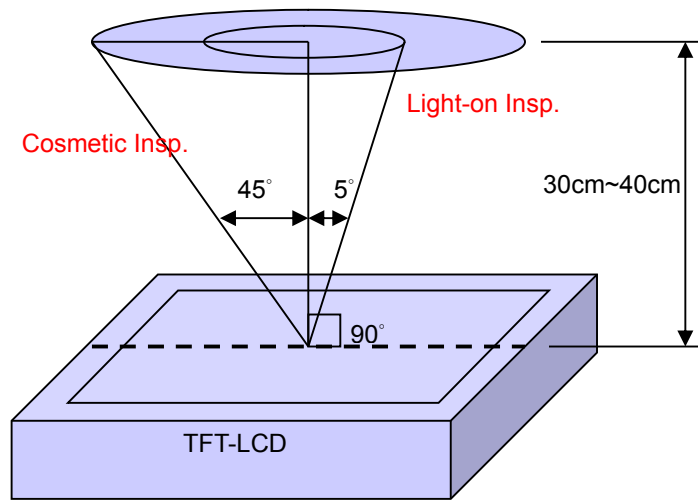
Inspection Criteria:

This document shall be applied to TFT-LCD Module for 10.1" TFT

Inspection and Environment Conditions

Inspection Conditions:

- (1) Inspection Distance: 35 cm±5cm
- (2) View Angle:
Light-on Inspection Angle : ±5°
Cosmetic Inspection Angle : ±45°



(perpendicular to LCD panel surface)

4.2 Environment Conditions:

Ambient Temperature		23°C ± 5°C
Ambient Humidity		55% ± 10% RH
Ambient Illumination	Cosmetic Inspection	more than 600 Lux
	Functional Inspection	300~500 Lux

4.3 Sampling Conditions:

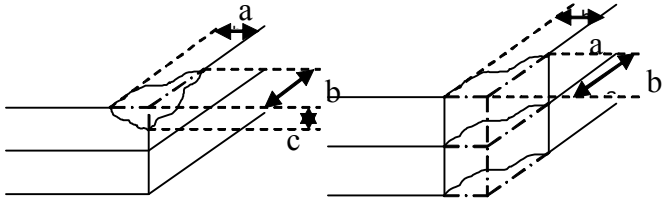
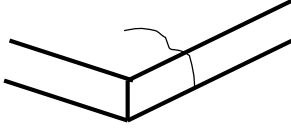
- (1) Lot Size: Quantity of shipment lot per model
- (2) Sampling Method:

Sampling Plan		MIL-STD-105E
		Normal Inspection, Single Sampling
		Level II
AQL	Major Defect	1.0%
	Minor Defect	1.5%

- (3) (Major and Minor Defects)

The classification of Major (MA) and Minor (MI) defects is shown as below Inspection Criteria.

Inspection Criteria:**5.1 Cosmetic Inspection (Panel):**

Item	Judgment Criteria	Classification
Chipping on Panel	 <p>$a \leq 3.0\text{mm}$、$b \leq 3.0\text{mm}$、$c \leq t$ (Bottom glass thickness)</p>	MA
Scratch on Panel *Note-2	<p>1.BM: Ignored 2.Pixel area $W \leq 0.05\text{mm}$ or $L < 5\text{mm}$: Ignored $0.05\text{mm} < W \leq 0.1\text{mm}$ and $L \leq 5\text{mm}$: $N \leq 5$ $W > 0.1\text{mm}$ or $L > 5\text{mm}$: Not allowed</p>	MI
Bubble or Dent on Panel/Touch Panel *Note-3	<p>1.BM: Ignored 2.Pixel area $D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.5\text{mm}$: $N \leq 4$ $D > 0.5\text{mm}$: Not allowed</p>	MI
Panel Crack	 <p>Not Allowed crack</p>	MA
Bezel Deformation	Obvious deformation is not allowed.	MI
Bezel Oxidation	Not allowed if it rusts continuously over 1 cm (It is out of warranty with rusted tin plate)	MI
Bezel Scratch	$L \leq 20\text{mm}$, $W \leq 0.2$, $N \leq 3$	MI
Total Squash Dent Flange (Front Side)	$D(W) \leq 1, L \leq 3, N \leq 3$;	MI
B/L High Voltage Wire Denudation	Not allowed	MA
Polarizer flaw or leak out resin	Defect is defined as the active area.	MI
Outline Dimension	Product Spec. Must in Spec, refer to related product spec.	MI

5.2 Functional Inspection:

Item	Judgment Criteria			Classification
	Area(Note 1)	I	O	
Point Defect	Bright dot	Random	3	
		2 dots adjacent	0	1
		3 dots adjacent or more	0	0
	Dark dot	Random	4	
		2 dots adjacent	1	
		3 dots adjacent or more	0	0
	Total Dot Defect		5	
	Distance	Distance between Bright and Bright dot	$L \geq 15\text{mm}$	
		Distance between Bright and Dark dot	$L \geq 5\text{mm}$	
		Distance between Dark dot	$L \geq 5\text{mm}$	
(1) $>0.5\text{dot}$ It is defined as Point Defect if defect area $>0.5\text{dot}$ (2) $\leq 0.5\text{dot}$ It is ignored if defect area $\leq 0.5\text{dot}$ (3) ND Filter 6% Weak point defect will be defined as Bright Dot if it can be observed through ND filter 6% (Full Screen Black Inspection)				
Line Defect	Obvious vertical or horizontal line defect is not allowed.			MA
Mura	ND Filter 6 % Mura Not allowed if it can be observed through ND Filter 6 %			MI
Foreign Material in spot shape *Note-3	Visible under : ND6% $D \leq 0.2\text{mm}$: Ignored $0.2\text{mm} < D \leq 0.5\text{mm}$: $N \leq 5$ $D > 0.5\text{mm}$: Not allowed			MI
Foreign Material in line or spiral shape *Note-4	Visible under : ND6% $W \leq 0.05\text{mm}$ or $L \leq 6.0\text{mm}$: Ignored $0.05\text{mm} < W \leq 0.5\text{mm}$ and $L \leq 6.0\text{mm}$: $N \leq 5$ $W > 0.5\text{mm}$ or $L > 6.0\text{mm}$: Not allowed			MI
Display Function Abnormal	No Malfunction can be allowed			MA

5.3 Appearance Inspection (Touch Panel)

(1) Scratch

Width	Length	Pitch	Criterion
$W \leq 0.05\text{mm}$	$L \leq 15\text{mm}$	---	Acceptable
$0.05\text{mm} < W \leq 0.1\text{mm}$	$L \leq 10\text{mm}$	5mm	Acceptable if such foreign objects are 4 or less
$0.1\text{mm} < W \leq 0.1\text{mm}$	$L \leq 10\text{mm}$	5mm	Acceptable if such foreign objects are 2 or less
$0.15\text{mm} < W$	$L > 10\text{mm}$	---	Unacceptable

(2) Granular foreign object

Diameter	Pitch	Criterion
$D \leq 0.2\text{mm}$	---	Acceptable
$0.2\text{mm} < D \leq 0.5\text{mm}$	5mm	Acceptable if such foreign objects are 5 or less
$0.5\text{mm} < D$	---	Unacceptable

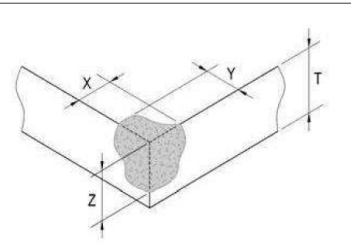
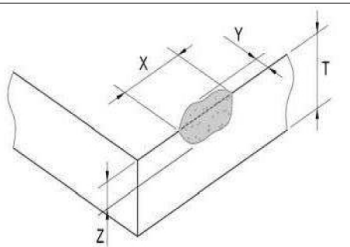
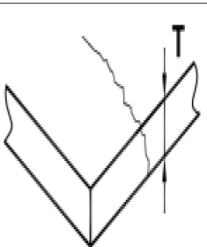
(3) Linear foreign object

Width	Length	Pitch	Criterion
$W \leq 0.05\text{mm}$	$L \leq 8\text{mm}$	---	Acceptable
$0.05\text{mm} < W \leq 0.1\text{mm}$	$L \leq 8\text{mm}$	5mm	Acceptable if such foreign objects are 4 or less
$0.1\text{mm} < W \leq 0.15\text{mm}$	$L \leq 8\text{mm}$	5mm	Acceptable if such foreign objects are 2 or less
$0.15\text{mm} < W$	$L > 8\text{mm}$	---	Unacceptable

(4) Bubble / Stain on film

Diameter	Pitch	Criterion
$D \leq 0.15\text{mm}$	---	Acceptable
$0.15\text{mm} < D \leq 0.25\text{mm}$	5mm	Acceptable if such foreign objects are 3 or less
$0.25\text{mm} < D \leq 0.4\text{mm}$	5mm	Acceptable if such foreign objects are 2 or less
$0.4\text{mm} < D \leq 0.6\text{mm}$	---	Acceptable if such foreign objects are 1 or less
$0.6\text{mm} < D$	---	Unacceptable

(5) Breakage on glass

	Corner Fragment			Side Fragment			Crack
Judgment Criterion							
Unit : mm	X	Y	Z	X	Y	Z	Unacceptable
	$OK \leq 0.3$	$OK \leq 0.3$	$OK \leq 1/2T$	$OK \leq 0.3$	$OK \leq 0.3$	$OK \leq 1/2T$	

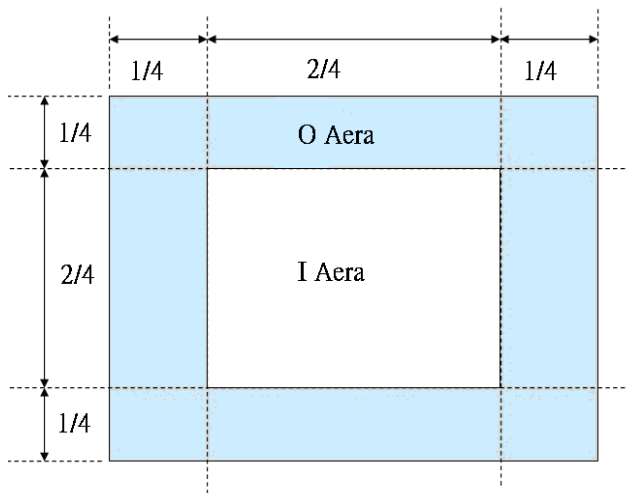
T : Thickness

If any value of "X", "Y" and "Z" is out of allowable range, it shall be regarded as defective.

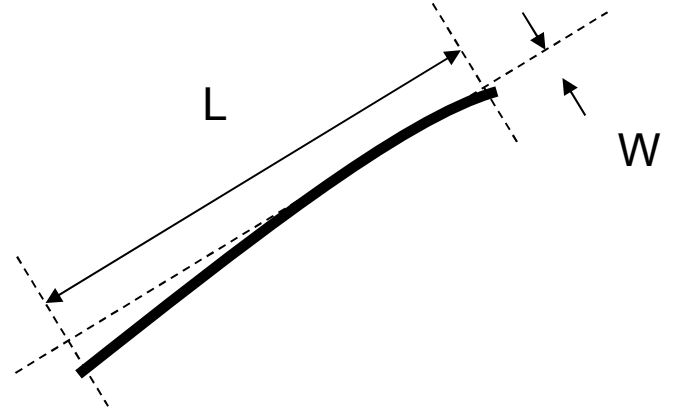
(6) Printing Area (BM Area)

No.	Items	Spec.	Criterion
1	White / Dichroic speck	---	According to Granular foreign object spec.
2	Scratch	---	According to Scratch spec.
3	Pin Hole	$D \leq 0.15\text{mm}$ $D > 0.15\text{mm}$	Acceptable Unacceptable

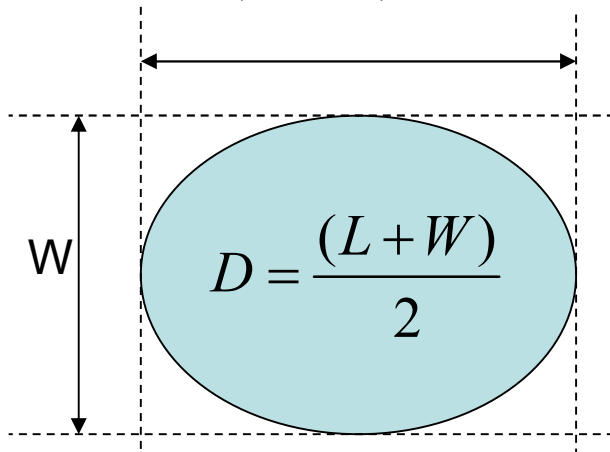
Note-1 : I/O Area Definition



Note-2 : Polarizer / Polarizer Scratch



Note-3 : Spot Foreign Material
($W \geq L / 4$)



Note-4 : Line or Spiral Foreign Material
($W < L / 4$)

