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DigiWise International Corporation

TFT Module Specification

MODEL: 13-116HIEB0GB1-S

< ◆ > PRELIMINARY SPECIFICATION
< ◇ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
RD 2020.08.19	PM 2020.08.19	批准 2020.08.19 PM

8 / 19 / 2020

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RECORD OF REVISION

Version	Revised Date	Page	Content
V1.0	2020/08/19	--	First Issued

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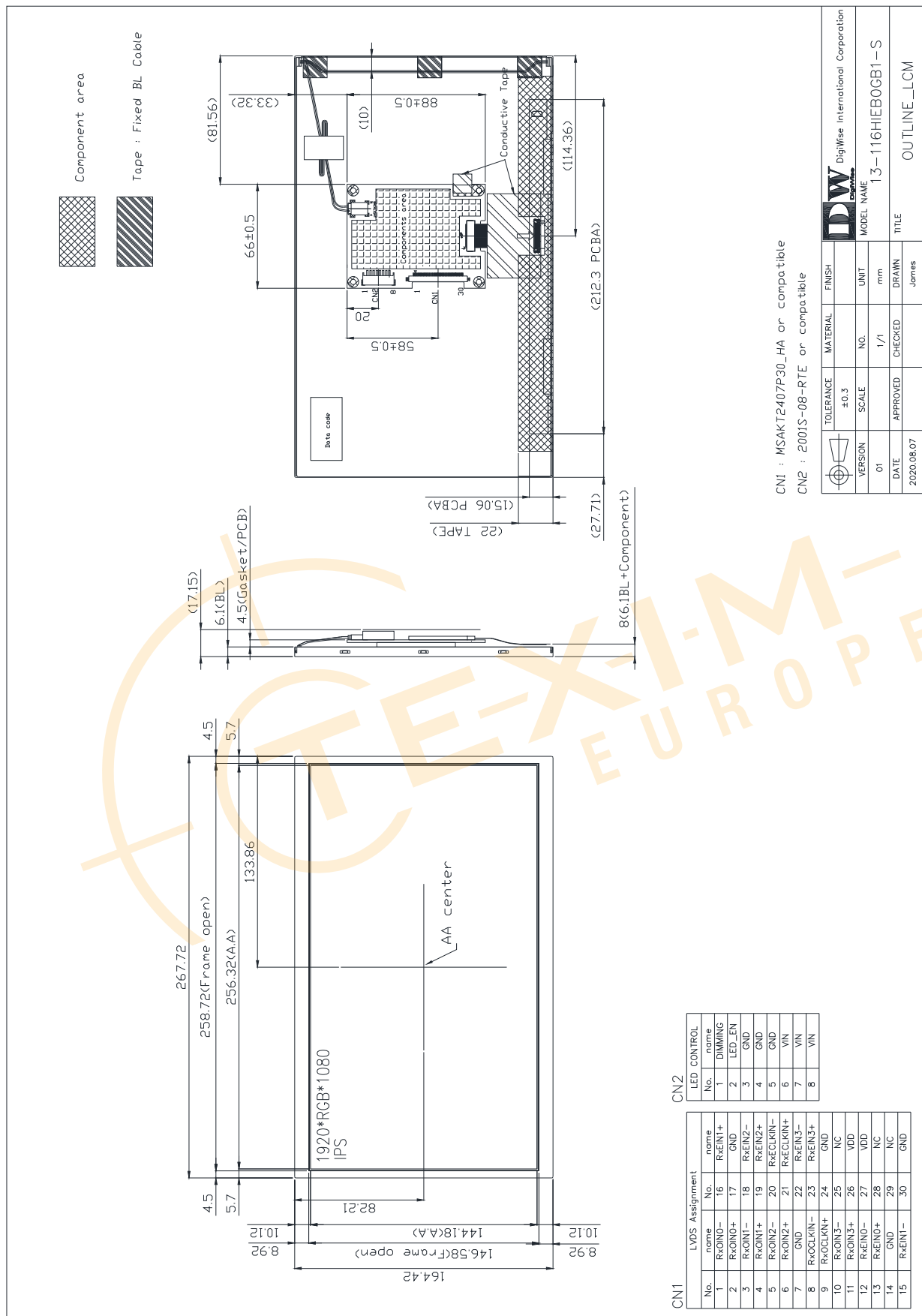**DigiWise International Corporation**

1. GENERAL DESCRIPTION

1.1 Description

The specifications is model 13-116HIEB0GB1-S is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, and a back light system. This TFT LCD has a 11.6 (16:9) inch diagonally measured active display area with FHD (1920 horizontal by 1080 vertical pixels) resolution.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	11.6"	Inch
2	Number of Pixels	1920 (W) x RGB x 1080 (H)	Pixels
3	Active Area	256.32 (W) × 144.18 (H)	mm
4	Pixel Pitch	0.1335 (W) x 0.1335 (H)	mm
5	Outline Dimension	267.72 (W) × 164.42 (H) × 17.15 (T)	mm
6	Number of Colors	16.7M	- -
7	Display Mode	Normally Black	- -
8	View Direction	Free direction	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Anti-Glare (3H)	- -
11	Contrast Ratio	1000 (Typ.)	- -
12	Luminance (cd/m^2)	1200 (Typ.)	cd/m2
13	Interface	LVDS 8-bits Interface	- -
14	Backlight	White LED	- -
15	Operation Temperature	-20 ~ 70	°C
16	Storage Temperature	-30 ~ 80	°C
17	Weight	TBD	g

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2. MECHANICAL SPECIFICATION

CN1 : MSAKT2407P30_HA or compatible
CN2 : 2001S-08-RTE or compatible

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MODEL NAME: 13-116HIEBOGB1-S

TITLE: OUTLINE_LCM

TOLERANCE	MATERIAL	FINISH	
±0.3			
SCALE	NO.	UNIT	
	1/1	mm	
VERSION		DRAWN	James
01		CHECKED	
DATE	APPROVED		
2020.08.07			

CN2 LED CONTROL

No.	name
1	DIMMING
2	LED_EN
3	GND
4	GND
5	GND
6	VIN
7	VIN
8	VIN

CN1 LVDS Assignment

No.	name	No.	name
1	RxOIN0-	16	RxEIN1+
2	RxOIN0+	17	GND
3	RxOIN1-	18	RxEIN2-
4	RxOIN1+	19	RxEIN2+
5	RxOIN2-	20	RxECLKIN-
6	RxOIN2+	21	RxECLKIN+
7	GND	22	RxEIN3-
8	RxOCLKIN-	23	RxEIN3+
9	RxOCLKIN+	24	GND
10	RxOIN3-	25	NC
11	RxOIN3+	26	VDD
12	RxEIN0-	27	VDD
13	RxEIN0+	28	NC
14	GND	29	NC
15	RxEIN1-	30	GND

1920*RGB*1080
IPS

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3. PIN DESCRIPTION

3.1 LVDS 8-bits Interface (CN1)   [MSAKT2407P30HA or compatible]

Pin	Symbol	I/O	Function	Note
1	RxOIN0-	I	Negative LVDS differential data input (Odd data).	
2	RxOIN0+	I	Positive LVDS differential data input (Odd data).	
3	RxOIN1-	I	Negative LVDS differential data input (Odd data).	
4	RxOIN1+	I	Positive LVDS differential data input (Odd data).	
5	RxOIN2-	I	Negative LVDS differential data input (Odd data).	
6	RxOIN2+	I	Positive LVDS differential data input (Odd data).	
7	GND	P	Ground.	
8	RxOCLKIN-	I	Negative LVDS differential data input (Odd clock).	
9	RxOCLKIN+	I	Positive LVDS differential data input (Odd clock).	
10	RxOIN3-	I	Negative LVDS differential data input (Odd data).	
11	RxOIN3+	I	Positive LVDS differential data input (Odd data).	
12	RxEIN0-	I	Negative LVDS differential data input (Even data).	
13	RxEIN0+	I	Positive LVDS differential data input (Even data).	
14	GND	P	Ground.	
15	RxEIN1-	I	Negative LVDS differential data input (Even data).	
16	RxEIN1+	I	Positive LVDS differential data input (Even data).	
17	GND	P	Ground.	
18	RxEIN2-	I	Negative LVDS differential data input (Even data).	
19	RxEIN2+	I	Positive LVDS differential data input (Even data).	
20	RxECLKIN-	I	Negative LVDS differential data input (Even clock).	
21	RxECLKIN+	I	Positive LVDS differential data input (Even clock).	
22	RxEIN3-	I	Negative LVDS differential data input (Even data).	
23	RxEIN3+	I	Positive LVDS differential data input (Even data).	
24	GND	P	Ground.	
25	NC	-	Keep the NC pin open.	
26	VDD	P	Power +3.3V	
27	VDD	P	Power +3.3V	
28	NC	-	Keep the NC pin open.	
29	NC	-	Keep the NC pin open.	
30	GND	P	Ground.	

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3.2 LED CONTROL(CN2)   [WAFER P2.0mm:2001S-08-RTE or compatible]

Pin	Symbol	I/O	Function	Note
1	DIMMING	I	Backlight Adjust	
2	LED_EN	I	Enable pin	
3	GND	P	Converter ground	Ground
4	GND	P	Converter ground	Ground
5	GND	P	Converter ground	Ground
6	VIN	P	Converter input voltage	12V
7	VIN	P	Converter input voltage	12V
8	VIN	P	Converter input voltage	12V

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4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 TFT LCD Module

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	VDD	-0.3	4.0	V	
BL input voltage	VIN	-0.3	20.0	V	

4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Topa	-20	-	70	°C	
Storage Temperature	Tstg	-30	-	80	°C	

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5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max.		
Supply Voltage	VDD	3.0	3.3	3.6	V	
Supply Current	IDD	-	TBD	-	mA	

5.2 Backlight Unit(LED CONTROL)

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max.		
Supply Voltage	VIN	11	12	20	V	
PWM frequency		100	-	10K	Hz	
PWM Duty		17	-	100	%	<17%=OFF
PWM Dimming Voltage	$V_{DIMMING-IH}$	2	3.3	8	V	
	$V_{DIMMING-IL}$	-	-	0.3	V	
LED Enable Control Voltage	V_{LED_EN-IH}	2	3.3	12	V	
	V_{LED_EN-IL}	-	-	0.5	V	
Supply Current	ICC(12V)	-	TBD	-	mA	
LED life time		-	50000	-	Hr	(1)

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25℃ 60% RH.

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6. INTERFACE SPECIFICATIONS

6.1 Timing

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	CLK frequency	$1/T_c$	-	138.5	-	MHz	*1
Data enable signal	Horizontal period	T_H	-	2080	-	T_c	
	Horizontal period (High)	T_{HD}	-	1920	-	T_c	
	Vertical Period	T_V	-	1111	-	T_H	
	Vertical Period (High)	T_{VD}	-	1080	-	T_H	

Note 1: In case of using the long vertical period, the deterioration of display quality, flicker, etc, may occur.
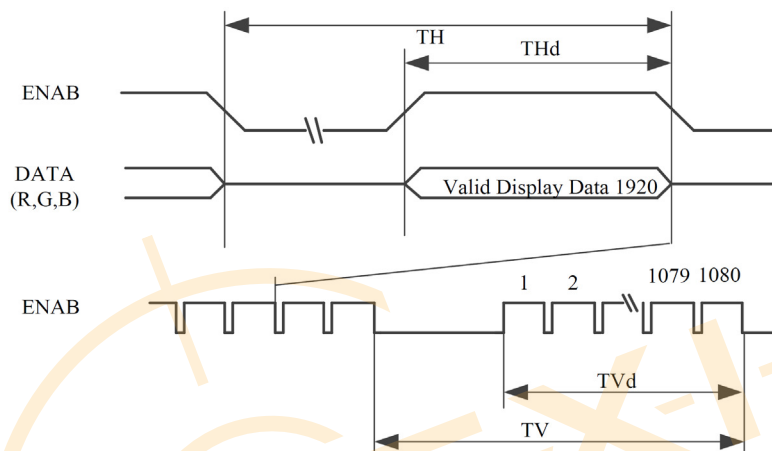
6.2 Input data signals and display position on the screen
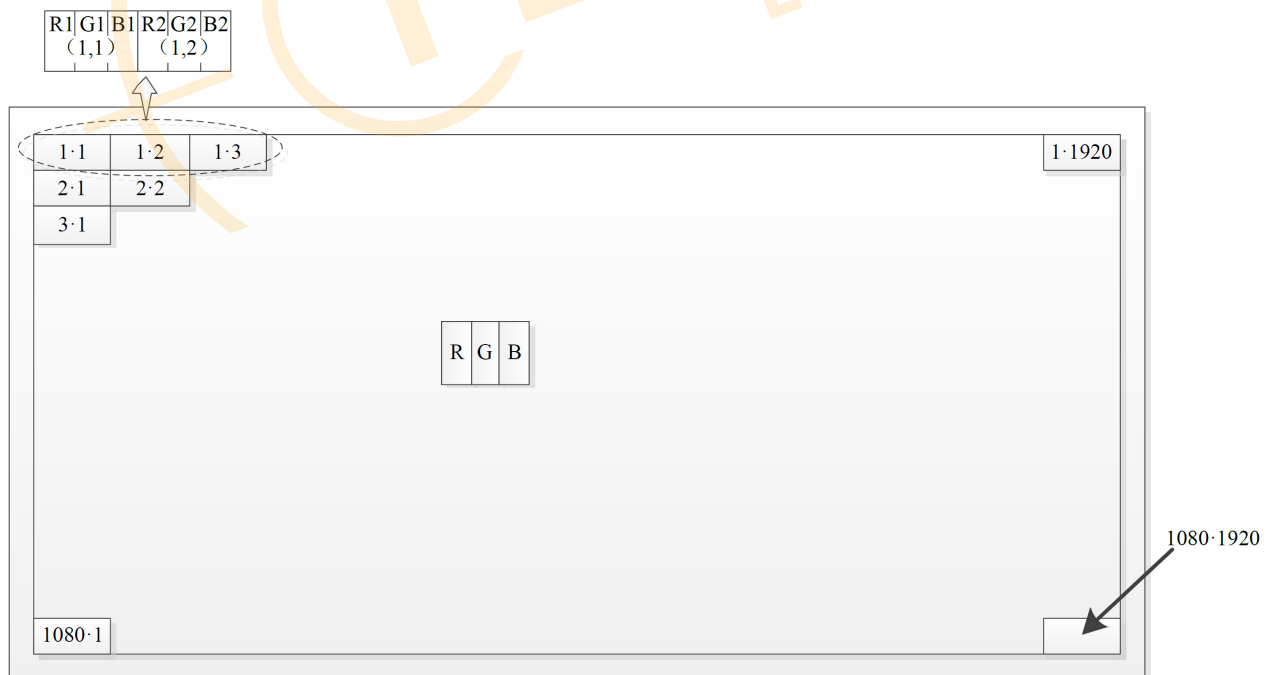
Display position of input data(V·H)

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7. Input signal, basic display colors and gray scale of each color

Colors & Gray Scale		Gray Scale	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
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
	Blue	–	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	–	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red	–	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	–	1	1	1	1	1	1	1	1	0	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	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	1
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓			↓								↓								↓					
	⇩	↓			↓								↓								↓					
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓			↓								↓								↓					
	⇩	↓			↓								↓								↓					
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓			↓								↓								↓					
	⇩	↓			↓								↓								↓					
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1
	⇩	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

0: Low level voltage, 1: High level voltage.

Each basic color can be displayed in 256 gray scales from 8 bit data signals.
According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.

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8. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Brightness		--		960	1200	--	cd/m2
Uniformity		B-uni		--	70	--	%
Contrast Ratio		CR		800	1000	--	--
Response Time		Tr	Note1, Note 3, ($\theta = 0°$, Normal Viewing Angle)	--	35	40	ms
		Tf		--			ms
Color Chromaticity	White	Wx		0.283	0.313	0.343	--
		Wy		0.299	0.329	0.359	--
	Red	Rx		0.619	0.649	0.679	
		Ry		0.316	0.346	0.376	
	Green	Gx		0.299	0.329	0.359	
		Gy		0.593	0.623	0.653	
	Blue	Bx		0.121	0.151	0.181	
		By		0.034	0.064	0.094	
View angle	Horizontal	θ x+	Center CR≥10	--	85	--	
		θ x-		--	85	--	
	Vertical	θ Y+		--	85	--	
		θ Y-		--	85	--	
NTSC		%		68	72	--	

Note：The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25℃±2℃. The measurement method is shown in Note1.

Note 1: The method of optical measurement:

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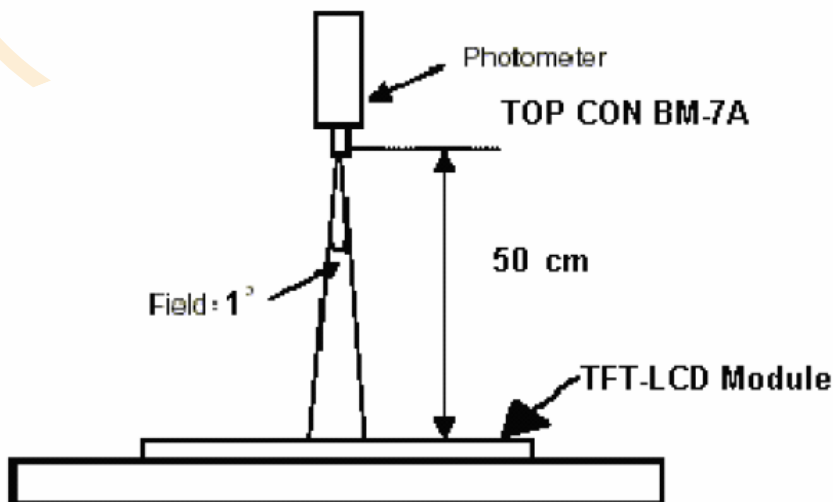
Note 2: Measured at the center area of the panel and at the viewing angle of the $\theta x = \theta y = 0°$

Note 3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state ÷ Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:
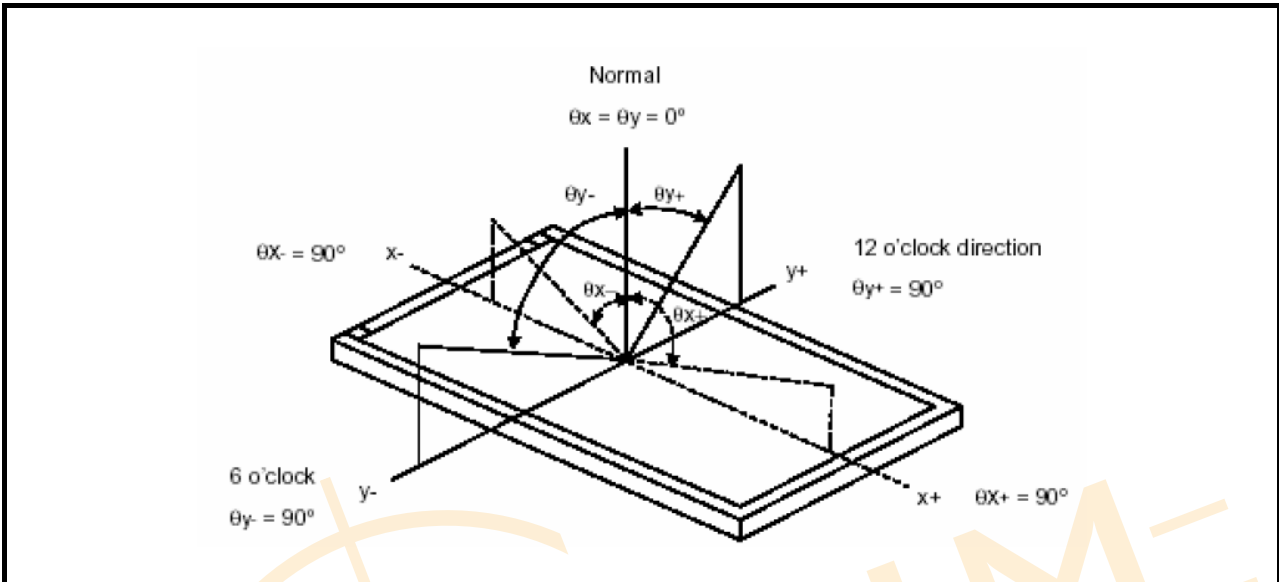
Note 5: Definition of Brightness Uniformity (B-uni):
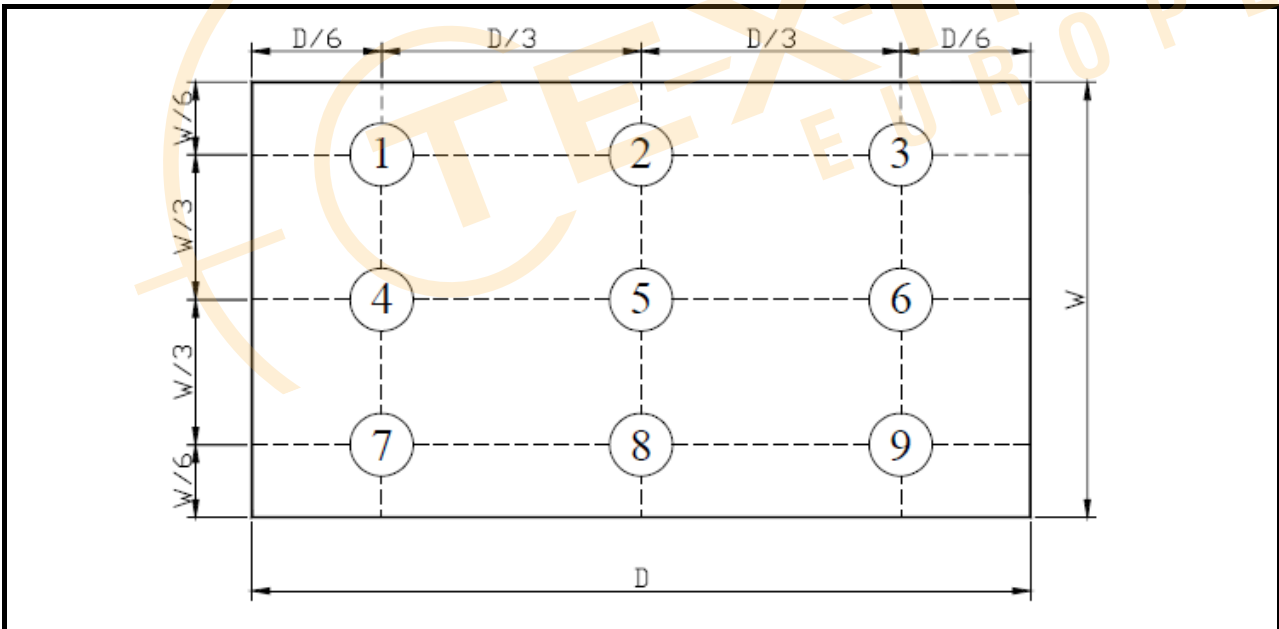
B-uni ＝(Minimum luminance of 9 points÷Maximum luminance of 9points)X100%

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Note 6: Definition of Response Time:

The Response Time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. Tr and Tf are defined as following figure
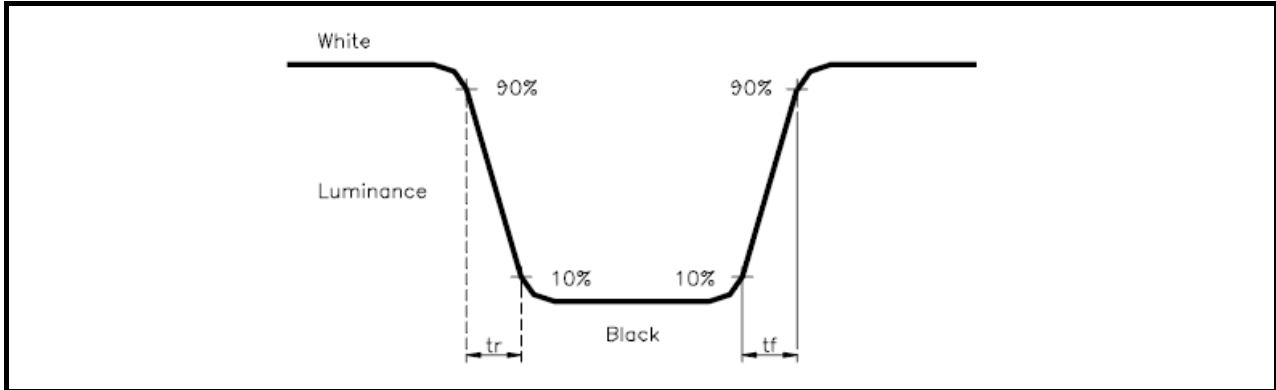
Note 7: Definition of Chromaticity:

The color coordinates (Wx,Wy),(Rx,Ry),(Gx,Gy),and (Bx,By) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

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9. RELIABILITY

9.1 Test Condition

9.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5℃

Humidity : 65 ± 5%

9.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

9.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

9.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

9.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	80°C, 240 hrs
2	Low Temperature Storage	-30°C, 240 hrs
3	High Temperature Operating	70°C, 240 hrs
4	Low Temperature Operating	-20°C, 240 hrs
5	High Temperature/Humidity	40°C, 90%RH,300 hrs
6	Temperature Shock Non-Operating	-30°C ←→ 80°C (0.5hr each), 50 cycles
7	Vibration Test Non-Operating	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electro-static Discharge	Contact Discharge: ±8 KV, 150pF(330Ω) 1sec,8Points, 25times/point Air Discharge: ±15 KV, 150pF(330Ω) 1sec, 8Points,25times/point

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

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9.3 JUDGMENT STANDARD

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

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

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

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9.4 INCOMING INSPECTION STANDARDS

No.	Parameter	Criteria
1	Operating	Display function: No Display malfunction (Major)
		Contrast ratio (Black, White): Does not meet specified range in the spec. (Major) (Note:3)
		Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)
		Point Defect : Active area $\leq$ 5 dots (Minor) (Note:1)
		Non-uniformity: Visible through 5%ND filter. (Minor)
		Foreign material in Black or White spots shape (W>1/4L)
		Foreign Material in Line or spiral shape (W$\leq$1/4L) (Note: 4)
2	External Inspection (non-operating)	Dimension: Outline (Major)
		Bezel appearance: uneven (Minor)
		Scratch on the polarize: (Note:2)
		Dent or bubble on the polarize (Note:2)

Point Defect table:

Item	Acceptable number Active Area	Total
Bright	5	8
Dark	5	

Foreign material in Black or White spots shape (W>1/4L):

Zone Dimension	Acceptable number	Class Of Defects	AQL Level
D> 0.5	0		
0.3 < D $\leq$ 0.5	5	Minor	1.5
D $\leq$ 0.3	*		

D = (Long + Short) / 2   * : Disregard

Foreign Material in Line or spiral shape (W$\leq$1/4L) (Note: 4):

Zone L (mm)	W(mm)	Acceptable number	Class Of Defects	AQL Level
L >5	W>0.1	0		
0.5 < L $\leq$ 5	0.03 < W$\leq$0.1	5	Minor	1.5
L $\leq$0.5	W$\leq$0.03	*		

L : Length   W : Width   * : Disregard

Scratch on the polarize: (Note:2)

Zone L (mm)	W(mm)	Acceptable number	Class Of Defects	AQL Level
--	W>0.1	0	Minor	1.5
L $\leq$ 3	W$\leq$0.1	3		

L : Length   W : Width   * : Disregard

Dent or bubble on the polarize (Note:2)

Zone Dimension	Acceptable number	Class Of Defects	AQL Level
D$\leq$0.3	*	Minor	1.5
D$\leq$0.5	5		

D = (Long + Short) / 2   * : Disregard

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Class of defects	Major	AQL 0.65%	**Definition** It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5%	It is a defect that will not result in functioning problem with deviation classified.

Note1:

(a)Bright point defect is defined as point defect of R,G,B with area >1/2 pixel respectively

(b)Dark point defect is defined as visible in full white pattern.

(c)Definition of distribution of point defect is as follows:

   -minimum separation between dark point defects should be larger than 5mm.

   -minimum separation between bright point defects should be larger than 5mm.

(d)Definition of joined bright point defect and joined dark point defect are as follows:

   -Two joined bright point defects: $\leqq 2$

   -Three joined bright point defects: $\leqq 1$

   -Two joined dark point defects: $\leqq 2$

   -Three joined dark point defects: $\leqq 1$

   -Four or more joined bright point defects must be nil.

   -Four or more joined dark point defects must be nil.

   -Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 2 pair maximum.

   -Two Joined dark point is counted as two dark points with 2 pair maximum.

   -Flashing dot is counted as a Black dot.

Note2: The external inspection should be conducted at the distance 30± 5cm between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

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Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.
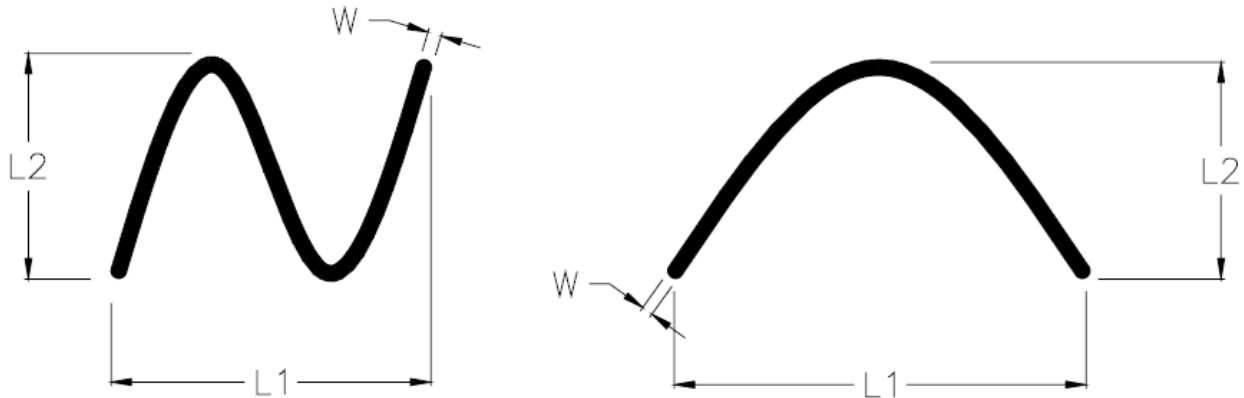
9.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling
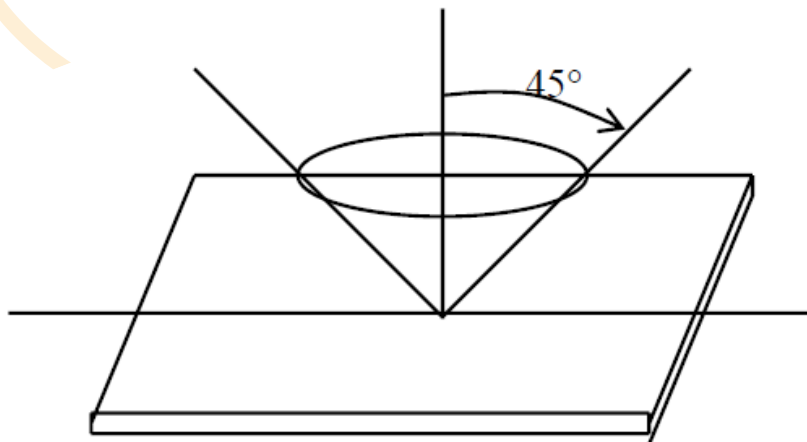
Sampling table: MIL-STD-105E

Inspection level: Level II

9.6 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45°$ inspection under non-operating condition.

$\theta \leq 5°$ inspection under operating condition

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10. PRECAUTION RELATING PRODUCT HANDLING

10.1 SAFETY

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

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

10.2 HANDLING

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

10.2.2   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.

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

10.2.4   The polarizing plate of the display is very fragile. So , 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.)

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

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

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

10.2.8   To control temperature and time of soldering is 280 ± 10°C and 3-5 sec.

10.2.9   To avoid liquid (include organic solvent) stained on LCM.

10.3 STORAGE

10.3.1   Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

10.3.2   Do not place the module near organics solvents or corrosive gases.

10.3.3   Do not crush, shake, or jolt the module.

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Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

Texim Europe – contact details

Headquarters & Warehouse

Elektrostraat 17
NL-7483 PG Haaksbergen
The Netherlands

T: +31 (0)53 573 33 33
E: info@texim-europe.com
Homepage: www.texim-europe.com

The Netherlands

Elektrostraat 17
NL-7483 PG Haaksbergen

T: +31 (0)53 573 33 33
E: nl@texim-europe.com

Belgium

Zuiderlaan 14, box 10
B-1731 Zellik

T: +32 (0)2 462 01 00
E: belgium@texim-europe.com

UK & Ireland

St Mary's House, Church Lane
Carlton Le Moorland
Lincoln LN5 9HS

T: +44 (0)1522 789 555
E: uk@texim-europe.com

Germany

Bahnhofstrasse 92
D-25451 Quickborn

T: +49 (0)4106 627 07-0
E: germany@texim-europe.com

Germany

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: muenchen@texim-europe.com

Austria

Warwitzstrasse 9
A-5020 Salzburg

T: +43 (0)662 216 026
E: austria@texim-europe.com

Nordic

Stockholmsgade 45
2100 Copenhagen

T: +45 88 20 26 30
E: nordic@texim-europe.com

Italy

Martin-Kollar-Strasse 9
D-81829 München

T: +49 (0)89 436 086-0
E: italy@texim-europe.com