



T E C H N O L O G Y

Model No: MTD0460AZV18RF-2

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Record of Revision

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1. Scope

This data sheet is to introduce the specification of MTD0460AZV18RF-2 active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 4.6" display area contains 800(RGB) x 320 pixels.

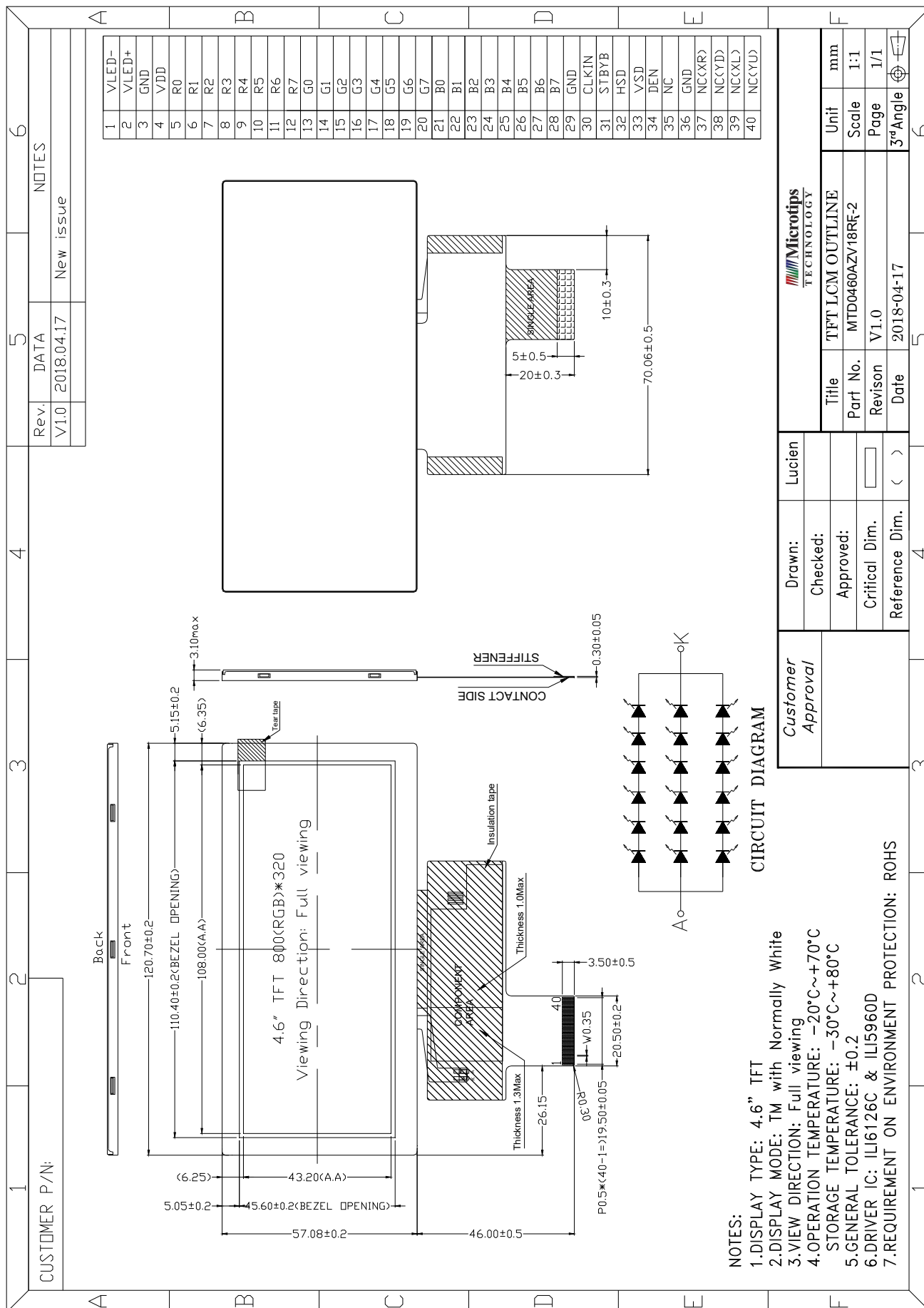
2. Application

Digital equipments which need color display, mobile phone, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	4.6	inch
Resolution	800(RGB) x 320	/
Interface	24-bit RGB interface	/
Technology type	MVA TFT	/
Pixel pitch	0.135x0.135	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	120.70 x57.08 x 3.10	mm
Active Area	108.00 x 43.20	mm
Display Mode	Transmissive , Normally White	/
Viewing Direction	Full viewing	/
Backlight Type	LED	/
Driver IC	ILI6126C & ILI5960D	/
Weight	42	g

4. Outline Drawing



5. Interface signals

Pin	Symbol	Description	Remark
1	VLED-	Backlight Cathode	
2	VLED+	Backlight Anode	
3	GND	Ground	
4	VDD	Power voltage	
5	R0	Red data signal	
6	R1	Red data signal	
7	R2	Red data signal	
8	R3	Red data signal	
9	R4	Red data signal	
10	R5	Red data signal	
11	R6	Red data signal	
12	R7	Red data signal	
13	G0	Green data signal	
14	G1	Green data signal	
15	G2	Green data signal	
16	G3	Green data signal	
17	G4	Green data signal	
18	G5	Green data signal	
19	G6	Green data signal	
20	G7	Green data signal	
21	B0	Blue data signal	
22	B1	Blue data signal	
23	B2	Blue data signal	
24	B3	Blue data signal	
25	B4	Blue data signal	
26	B5	Blue data signal	
27	B6	Blue data signal	
28	B7	Blue data signal	
29	GND	Ground	
30	CLKIN	Clock for input data. Data latched at rising edge of this signal	
31	STBYB	Display on/off	
32	HSD	Horizontal synchronizing signal	
33	VSD	Vertical synchronizing signal	
34	DEN	Input data enable control.	
35	NC	No connection	
36	GND	Ground	
37	NC(XR)	No connection	
38	NC(YD)	No connection	

39	NC(XL)	No connection	
40	NC(YU)	No connection	

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

GND=0V, Ta = 25°C

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VDD	-0.5	5.0	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	

Note 1: If Ta below 50°C, the maximal humidity is 90% RH, if Ta over 50°C, absolute humidity should be less than 60% RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage	VDD	2.3	3.3	3.6	V	
Input Logic Voltage	VIL	0	--	0.3*VDD	V	
	VIH	0.7*VDD	--	VDD	V	
Output Logic Voltage	VOL	-	-	GND+0.4	V	
	VOH	VDD-0.4	-	-	V	

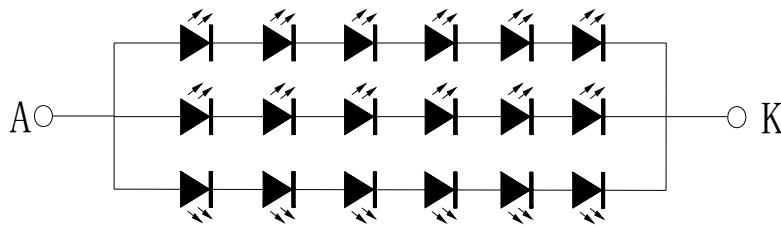
7.2 Backlight Characteristics

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Voltage	VF	-	19.2	-	V	Ta=25 °C, IF=20mA/LED
Forward Current	IF	--	60	--	mA	Ta=25 °C, IF=20mA/LED
Power dissipation	PD	--	1152	--	mW	
LED Life Time(25 °C)		--	30,000	--	Hr	

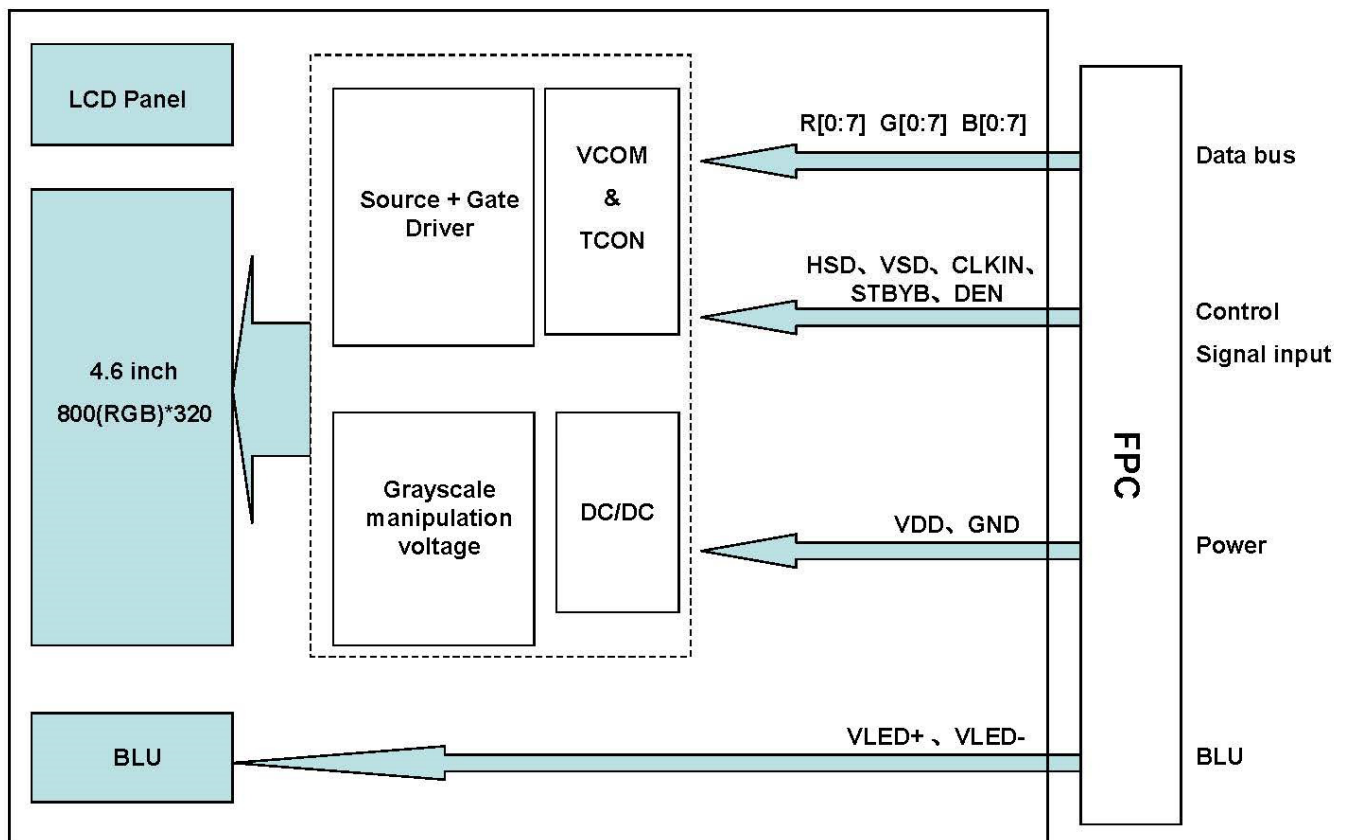
Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at Ta=25±2°C, 60%RH±5%, IF=20mA.

Note2: Backlighting circuit



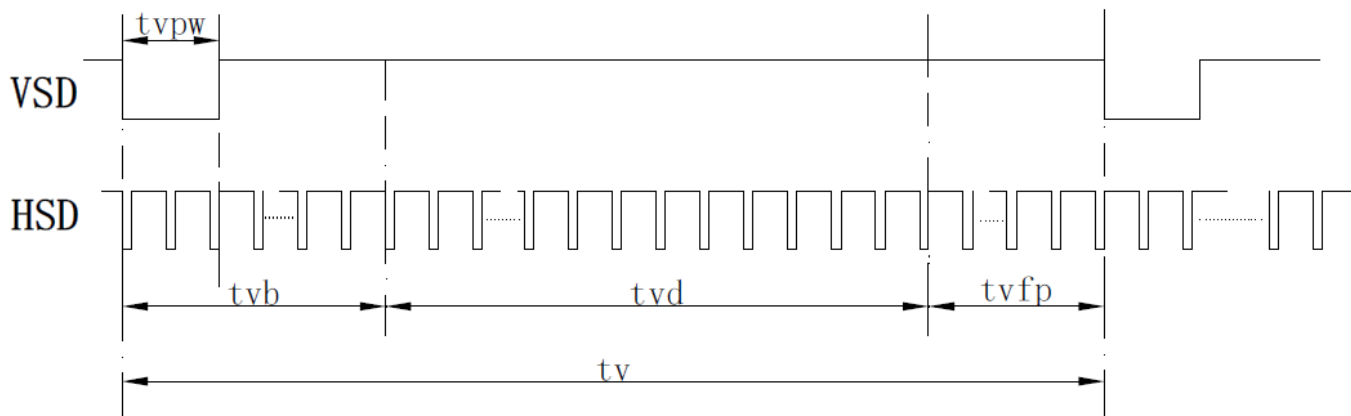
7.3 Schematic of LCD module system



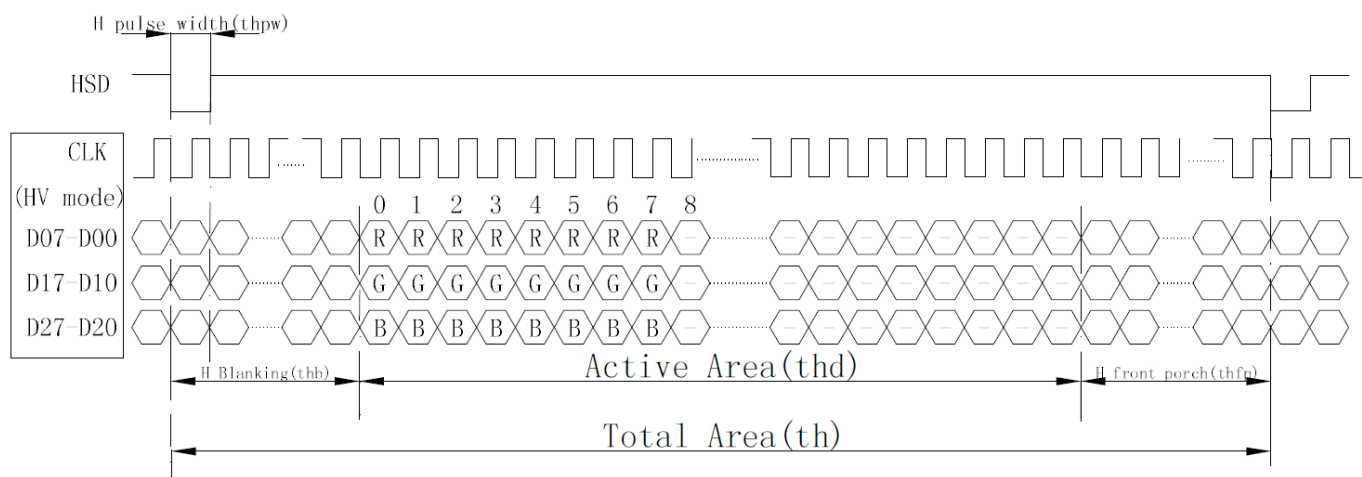
8. Command/AC Timing

8.1 Data Input Format

Vertical input Format



Horizontal input timing



8.2 Timing Parameters

Horizontal input timing

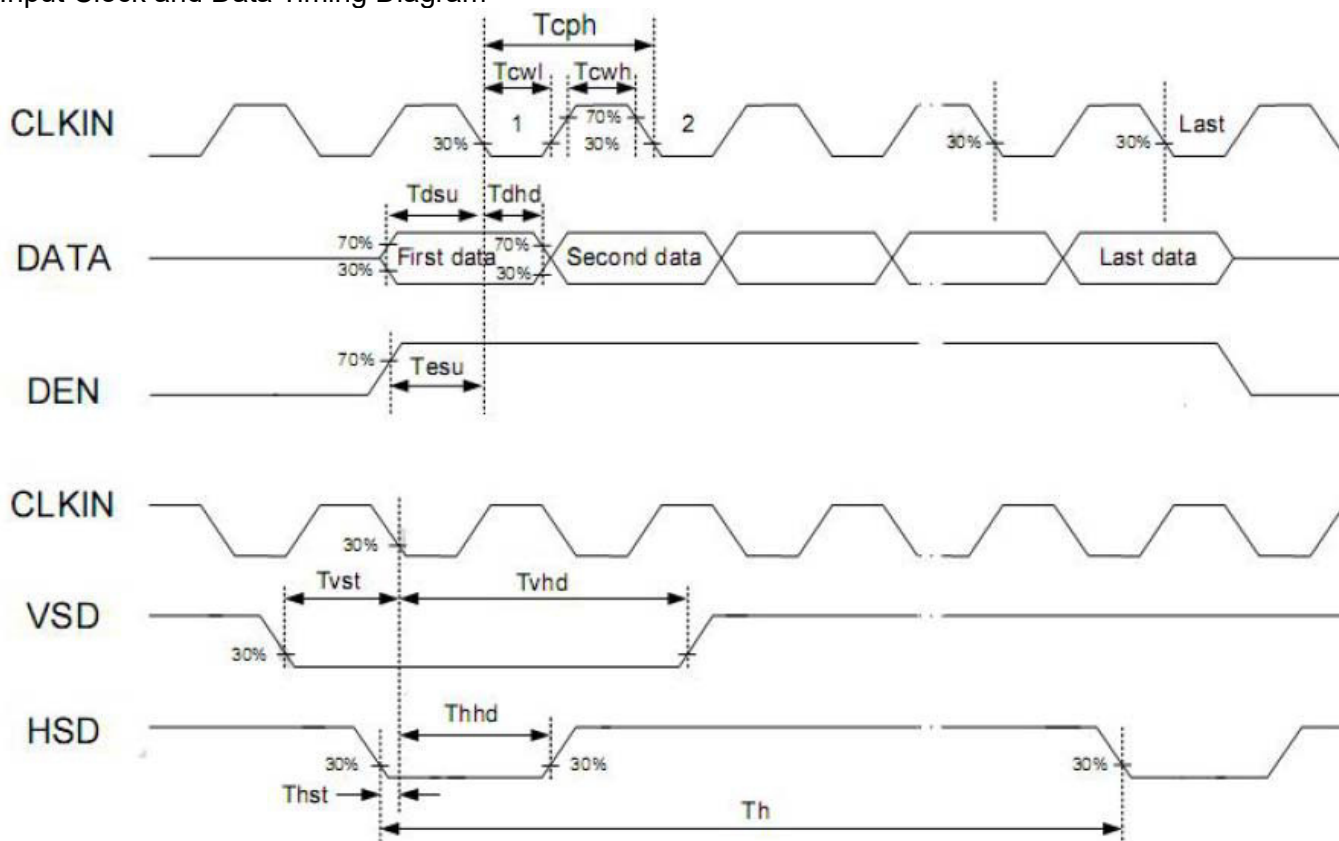
Parameter		Symbol	Value			Unit
			Min	Typ	Max	
Horizontal display area		thd	800			DCLK
DCLK Frequency		fclk	-	30	-	MHz
1 Horizontal Line		th	898			DCLK
HSD Pulse width	Min	thpw	1			
	Typ		2			
	Max		-			
HSD Back Porch(Blanking)		thb	-	88	-	
HSD Front Porch		thfp	-	10	-	

Vertical input timing

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Vertical display area	tvd	320			H
VSD period time	tv	-	524	-	H
VSD pulse width	tvpw	-	2	-	H
VSD Back Porch(Blanking)	tvb	-	191	-	H
VSD Front Porch	tvfp	-	13	-	H

8.3 Timing Diagram

Input Clock and Data Timing Diagram



Parallel 24-bit RGB mode

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
CLKIN Frequency	Fclk	-	33	50	UHz	VDD=2.7V~3.6V
CLKIN Cycle Time	Tclk	20	30	-	ns	
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	64	-	CLKIN	
Time from HSD to LD	Thld	-	64	-	CLKIN	
Time from HSD to STV	Thstv	-	2	-	CLKIN	
Time from HSD to CKV	Thckv	-	20	-	CLKIN	
Time from HSD to OEV	Thoev	-	4	-	CLKIN	
LD Pulse Width	Twld	-	10	-	CLKIN	
CKV Pulse Width	Twckv	-	66	-	CLKIN	
OEV Pulse Width	Twoev	-	92	-	CLKIN	

9. Optical Specification

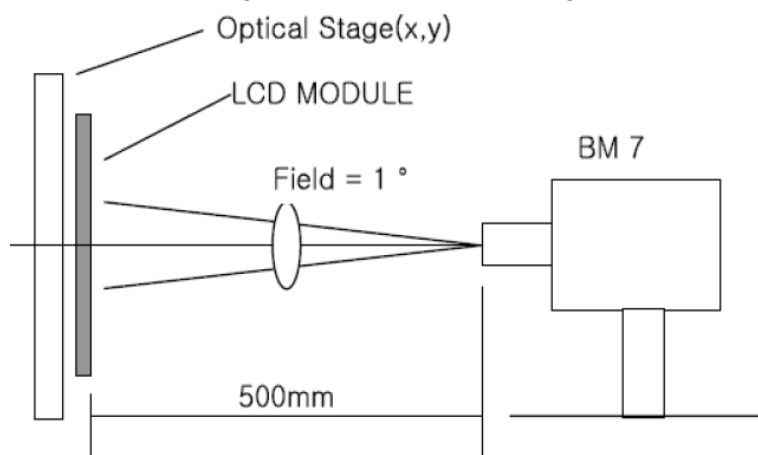
Ta=25°C

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	$\theta=0^{\circ}$	-	350	-		Note1 Note2
Response Time		Ton/ Toff	25℃	-	20	-	ms	Note1 Note3
View Angles		ΘT	$CR \cong 10$	55	75	-	Degree	Note 4
		ΘB		55	75	-		
		ΘL		55	75	-		
		ΘR		55	75	-		
Chromaticity	White	x	Brightness is on	0.248	0.298	0.348		Note5, Note1
		y		0.276	0.326	0.376		
	Red	x		0.560	0.610	0.660		
		y		0.300	0.350	0.400		
	Green	x		0.285	0.335	0.385		
		y		0.558	0.608	0.658		
	Blue	x		0.100	0.150	0.200		
		y		0.056	0.106	0.156		
NTSC		S		-	50	-	%	Note5
Luminance		Lv		400	500	-	cd/m ²	

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

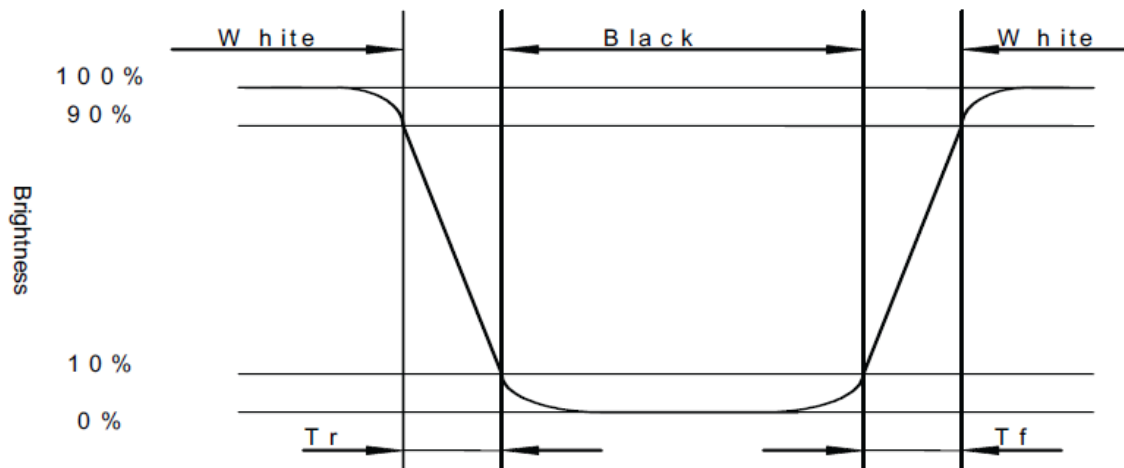


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

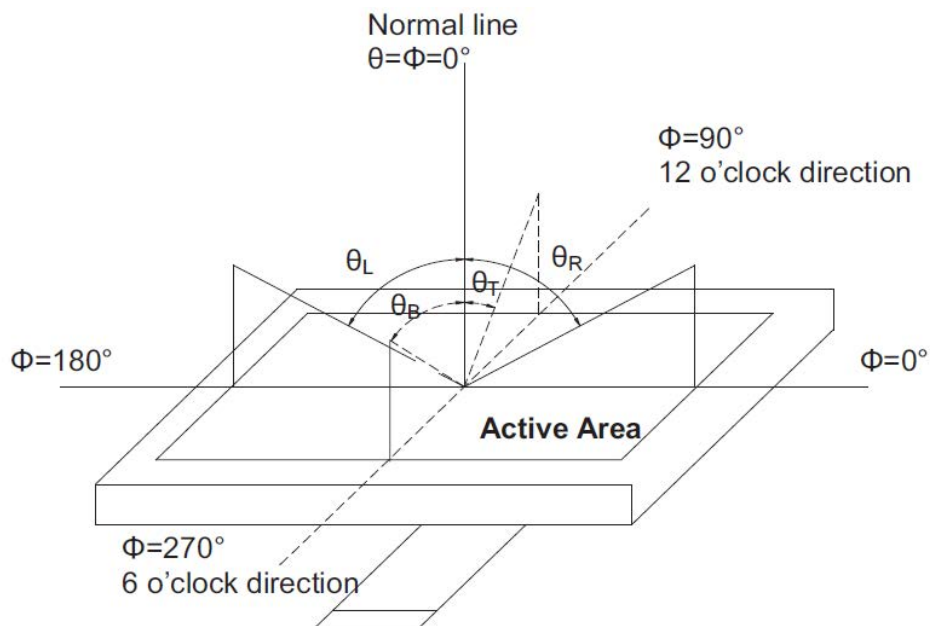
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, T_r) and from white to black (Decay Time, T_f).



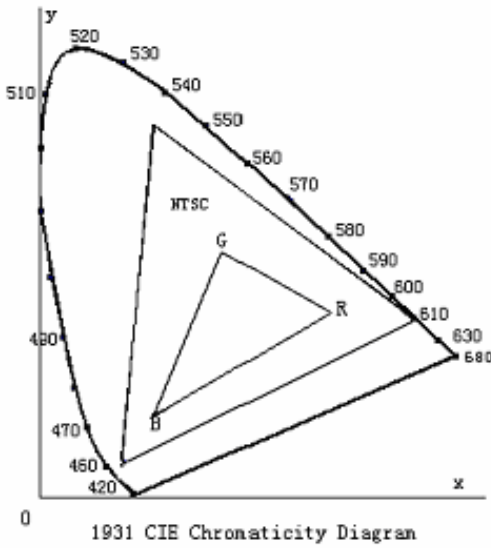
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels "White" at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

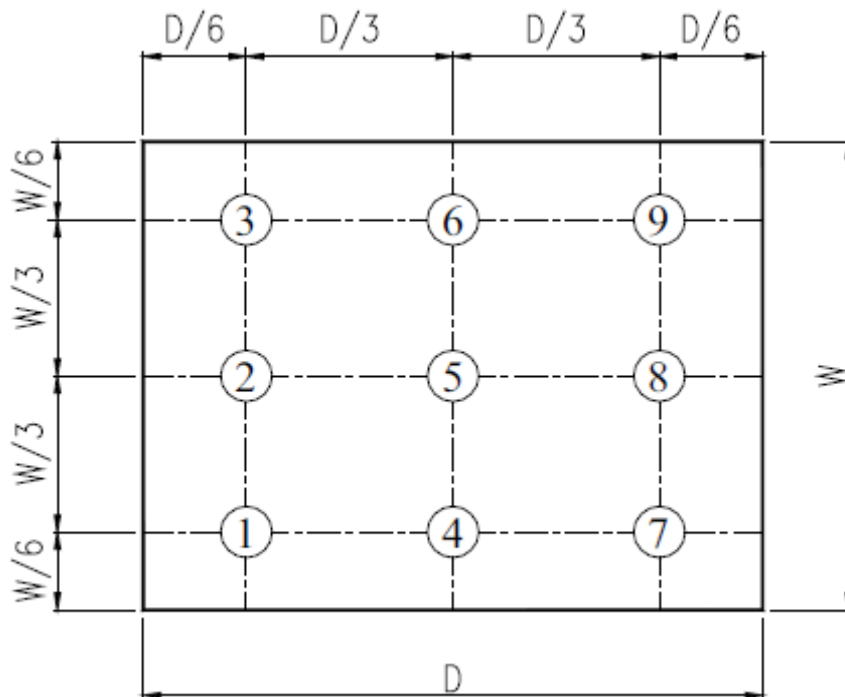


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70℃, 96hrs	Per table in below
2	Low Temp Operation	Ta=-20℃, 96hrs	Per table in below
3	High Temp Storage	Ta=+80℃, 96hrs	Per table in below
4	Low Temp Storage	Ta=-30℃, 96hrs	Per table in below
5	High Temperature & High Humidity Operation	Ta=+50℃, 90%RH, 96hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-20℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10Hz~50Hz Acceleration of gravity:5G X,Y,Z 30 min for each direction	Per table in below
9	Shock (Non-operation)	Height:80 cm, 1 corner, 3 edges, 6 surfaces.	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability

C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

D. Provide a space so that the panel does not come into contact with other components.

E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.

B. Ground your body when handling the products.

C. Power on the LCD module before applying the voltage to the input terminals.

D. Do not apply voltage which exceeds the absolute maximum rating.

E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

A. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH).

Don't expose to sunlight or fluorescent light.

B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.

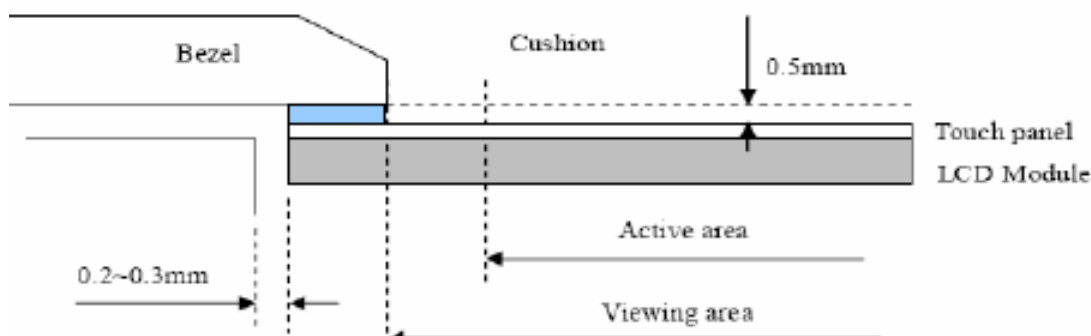
B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

A. Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

B. In order to make the display assembly stable and firm, MTU recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.

C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.



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