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DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0160AUG

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Record of Revision

Date	Revision No.	Summary
2014 08 27	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0160AUG active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 1.60' display area contains 240X(RGB) x 240 pixels.

2. Application

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

3. General Information

Item	Contents	Unit
Size	1.60	inch
Resolution	240X(RGB) x 240	/
Interface	MCU	/
Technology type	a-Si TFT	/
Pixel pitch	0.12x0.12	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	31.20×35.10×1.58	mm
Active Area	28.80×28.80	mm
Display Mode	TRANSFLECTIVE, Normally White	/
Backlight Type	LED	/
Driver IC	ST7789H2	/
Weight	TBD	g

4. Outline Drawing

1	GND
2	/RESET
3	GND
4	DB8
5	DB7
6	DB6
7	DB5
8	DB4
9	DB3
10	DB2
11	DB1
12	DB0
13	IM1
14	/RD
15	/WR
16	RS
17	/CS
18	IOVCC
19	FMARK
20	VCI
21	GND
22	LEDA
23	LEDK
24	GND

(Diagram of FPC bending)

LEDKO ○ LEDA
 LEDK ○ LEDA
 IF=20mA VF=9V(TYP)
 LED CIRCUIT DIAGRAM:

NOTES:
 1.DISPLAY TYPE: TFT
 2.DISPLAY MODULE : Transflective
 3.OPERATING TEMP: -20°C ~ 70°C
 4.STORAGE TEMP: -30°C ~ 80°C
 5.RoHS Complicant

DRAWN BY:	
CHECKED BY:	
APPROVED BY:	
CONFIRMED BY:	

TITLE:	DLC0160AUG
DWG NO:	
DWG NAME:	

SCALE:	
UNIT:	mm
SHEET NO:	OF

5. Interface signals

NO.	SYMBOL	DISCRIPTION	Remark
1	GND	Power Ground	
2	/RESET	This signal will reset the device and it must be applied to properly initialize the chip. Signal is active low	
3	GND	Power Ground	
4~12	DB8~DB0	MCU parallel interface data bus	
13	IM1	The MCU interface mode select. IM1=0 is 80-8bit parallel I/F (DB[7:0]) .IM1=1 is 80-9bit parallel I/F (DB[8:0])	
14	/RD	Read enable in 8080 MCU parallel interface.	
15	/WR	Write Enable pin in MCU paralle interface	
16	RS	Display data/command selection pin in MCU interface Low: display data . High: command data.	
17	/CS	Chip selection pin Low enable. High disable.	
18	IOVCC	Power Supply for I/O system.IOVCC=1.65V ~3.3V	
19	FMARK	Tearing effect signal is used to synchronize MCU to frame memory writing	
20	VCI	Power Supply for Analog, Digital System and Booster Circuit.VCI=2.4V ~ 3.3V	
21	GND	Power Ground	
22	LEDA	LED Anode	
23	LEDK	LED Cathode	
24	GND	Power Ground	

Connector number: DF37B-24DF-0.4V(51)

Match connector number: DF37B-24DS-0.4V(51)

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Supply voltage for logic	VCI	-0.3	+4.6	V	
I/O power supply	IOVCC	-0.3	+4.6	V	
Input voltage	VIN	0.5	IOVCC +0.5	V	

6.2. Environment Conditions

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

Note: Absolute maximum ratings means the product can withstand short-term, NOT more than 120 hours.
If the product is a long time to withstand these conditions, the life time would be shorter

7. Electrical Specifications

7.1 Electrical characteristics

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply voltage for logic	VCI	2.4	2.8	3.3	V	
I/O power supply	IOVCC	1.65	1.8/2.8	3.3	V	
Input Current	I _{dd}		6.7	10.1	mA	
Input voltage 'H' level	VIH	0.7IOVCC		IOVCC	V	
Input voltage 'L' level	VIL	GND		0.3IOVCC	V	
Output voltage 'H' level	VOH	0.8IOVCC		0.2IOVCC	V	
Output voltage 'L' level	VOL	GND		0.2IOVCC	V	

7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	20		mA	
Forward Voltage	VF	7.8	9.0	10.0	V	
Number of LED		3				
Connection mode		Serial				

Using condition: constant current driving method If=20mA(+/-10%).

8. Optical Specification

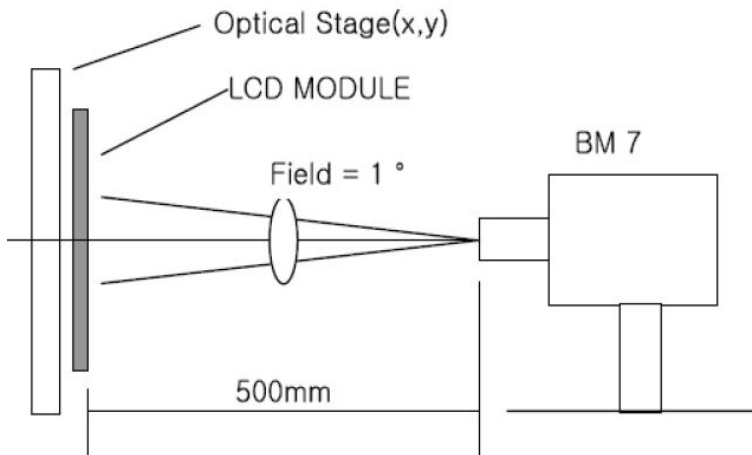
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark		
Contrast Ratio (Transmissive mode)	CR	$\theta=0^\circ$	90	130			Note1		
Contrast Ratio (Reflective mode)	CR			5.8			Note2		
Response Time	Ton+Toff	25°C		35	45	ms	Note1 Note3		
View Angles	θT	$CR \geq 10$	30	40		Degree	Note 4		
	θB		40	50					
	θL		40	50					
	θR		30	40					
Chromaticity	Red	x	Brightness is on	TYP 0.05	0.5309	TYP+0.05	Note5, Note1		
		y			0.3027				
	Green	x			0.3174				
		y			0.5721				
	Blue	x			0.1709				
		y			0.1395				
	White	x			0.2263			0.2863	0.3463
		y			0.2651			0.3151	0.3751
Luminance	L		160	210		cd/m ²	Note1 Note6		
Uniformity	U		70			%	Note1 Note7		
NTSC ratio (Transmissive mode)				40		%			
NTSC ratio (Reflective mode)				1.86		%			
Reflectance	R%			9.9		%			

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

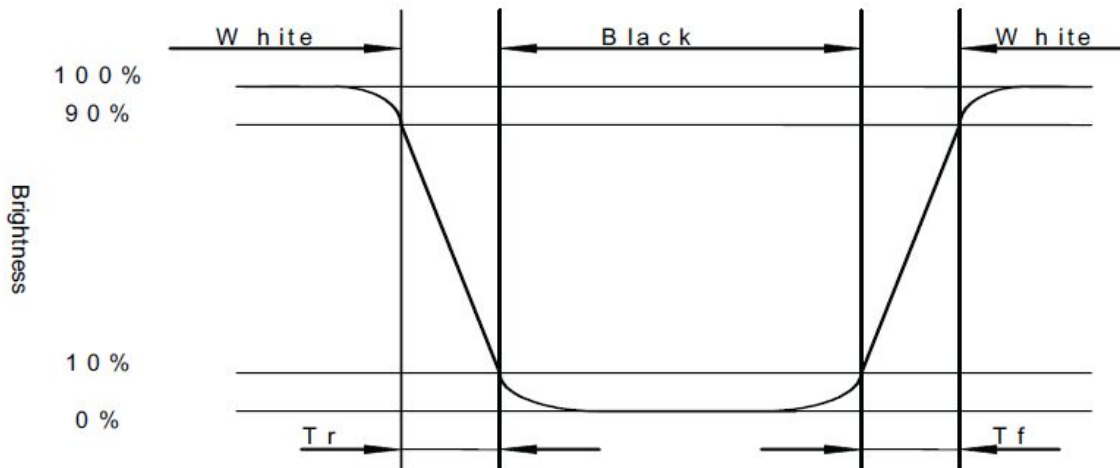


Note 2: Contrast ratio is defined as follow:

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

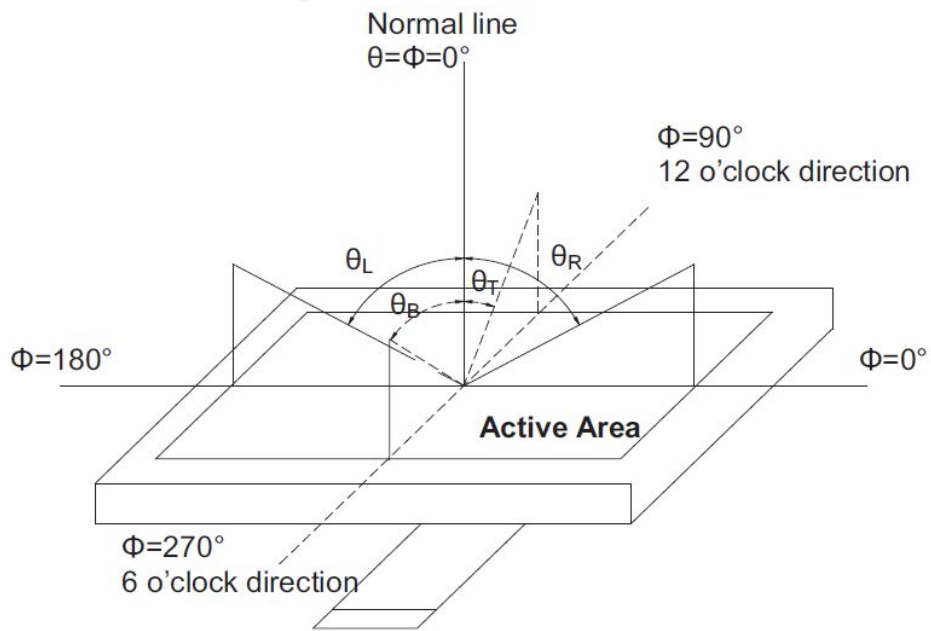
Note 3: Response time is defined as follow:

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).



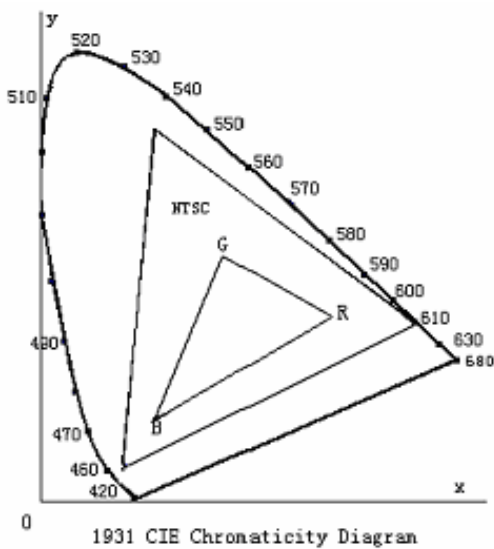
Note 4: Viewing angle range is defined as follow:

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.

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

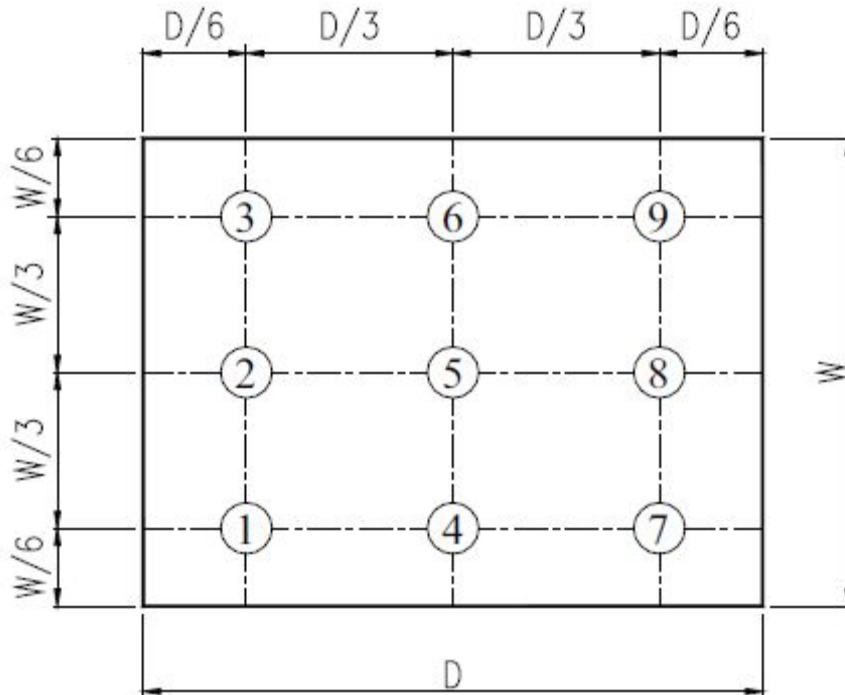


Fig. 2 Definition of uniformity

9. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 120hrs	Per table in below
2	Low Temp Operation	Ta= 20°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 200hrs	Per table in below
4	Low Temp Storage	Ta= 30°C, 200hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+50°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non operation)	20±2°C~25~70±2°C×10cycles (30min.) (5min.) (30min.)	Per table in below
7	ESD (Operation)	Voltage:±8KV R: 330Ω C: 150pF Air discharge, 10time	Per table in below
8	Vibration (Non operation)	Frequency : 10Hz~55Hz~10Hz Amplitude : 1.5mm, X · Y · Z direction for total 3hours (Packing condition)	Per table in below
9	Shock (Non operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Drop to the ground from 1m height, one time, every side of carton. (Packing condition)	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

10. Precautions for Use of LCD Modules

10.1 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.

10.2 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.

10.3 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.

10.4 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.

10.5 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.

10.6 Cautions for installing and assembling

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.

