



# FOCUS LCDs

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Ph. 480-503-4295 | [NOPP@FocusLCDs.com](mailto:NOPP@FocusLCDs.com)

TFT | OLED | CHARACTER | GRAPHIC | UWVD | SEGMENT | CUSTOM

## TFT Display Module

Part Number  
E70GE1-RW780-R

### Overview:

- 7.0-inch TFT (165x104mm)
- 800x480 Pixels
- RGB Interface
- Wide Temp Range
- 12:00 Viewing Angle
- Transmissive
- Resistive Touch Panel
- 780 NITS
- TFT IC: EK9716 + EK73002
- RoHS Compliant

## Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT-LCD Panel, driver circuit, capacitive touch panel and backlight unit. The resolution of the 7.0" TFT-LCD contains 800x480 pixels and can display up to 16.7M colors.

## Features

Input Voltage: 3.3V

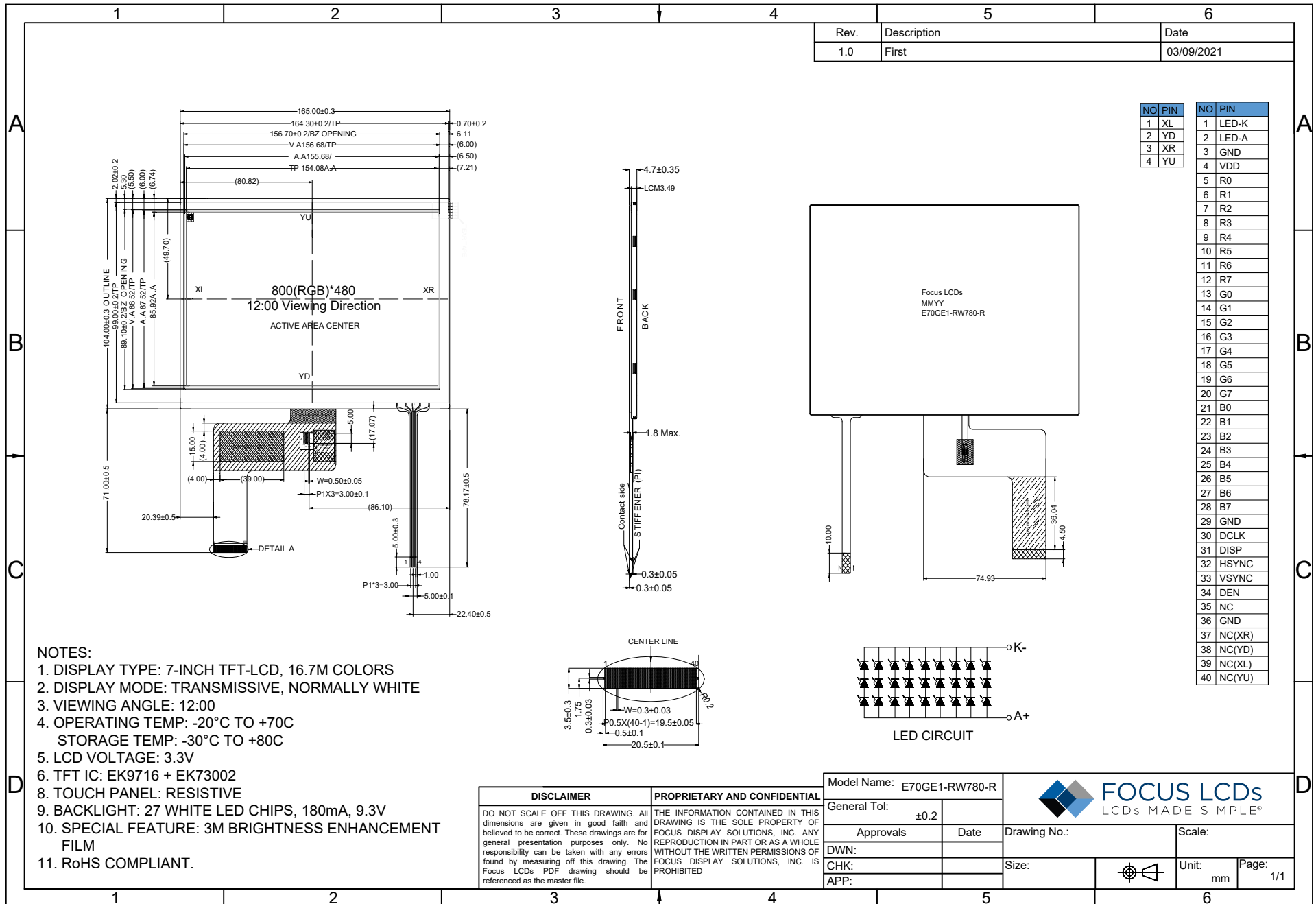
TFT Interface: 16/18/24-Bit RGB

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Display Area (AA)	154.08(H) x 85.92(V) (7.0 inch)	mm	--
Driver Element	TFT Active Matrix	--	--
Display Colors	16.7M	colors	--
Number of Pixels	800(RGB)x480	dots	--
TFT Pixel Arrangement	RGB Vertical Stripe	--	--
Viewing Angle	12:00	o'clock	--
TFT Controller IC	EK9716 + EK73002	--	--
Display Mode	Transmissive/Normally White	--	--
Operating Temperature	-20 to +70	°C	--
Storage Temperature	-30 to +80	°C	--

## Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	165	--	mm	--
	Vertical (V)	--	104	--	mm	--
	Depth (D)	--	4.7	--	mm	--
Weight		--	--	--	g	--

# 1. Outline Dimensions



## 2. Input Terminal Pin Assignment

### 2.1 TFT Pin Assignment

Recommended TFT Connector: FH12S-40S-0.5SH(55)

NO.	Symbol	Description	I/O
1	LED K-	Cathode Pin of Backlight	P
2	LED A+	Anode Pin of Backlight	P
3	GND	Power Ground	P
4	VDD	Power Supply	P
5	R0	Red Data Symbol	I
6	R1	Red Data Symbol	I
7	R2	Red Data Symbol	I
8	R3	Red Data Symbol	I
9	R4	Red Data Symbol	I
10	R5	Red Data Symbol	I
11	R6	Red Data Symbol	I
12	R7	Red Data Symbol	I
13	G0	Green Data Symbol	I
14	G1	Green Data Symbol	I
15	G2	Green Data Symbol	I
16	G3	Green Data Symbol	I
17	G4	Green Data Symbol	I
18	G5	Green Data Symbol	I
19	G6	Green Data Symbol	I
20	G7	Green Data Symbol	I
21	B0	Blue Data Symbol	I
22	B1	Blue Data Symbol	I
23	B2	Blue Data Symbol	I
24	B3	Blue Data Symbol	I
25	B4	Blue Data Symbol	I
26	B5	Blue Data Symbol	I
27	B6	Blue Data Symbol	I
28	B7	Blue Data Symbol	I
29	GND	Ground	P
30	DCLK	Clock signal for data latching and internal counter for the timing controller.	I
31	DISP	Display controller / standby mode selection, internal pull low. DISP = "LOW" : STANDBY; DISP = "HIGH" : NORMAL DISPLAY	I

32	HSYNC	Horizontal Sync Signal. When not used in DE mode, user should connect it to "LOW"	I
33	VSYNC	Vertical Sync Signal. When not used in DE mode, user should connect it to "LOW"	I
34	DE	Data Input Enable Control. When not used in SYNC mode, user should connect it to "LOW"	I
35	NC	--	--
36	GND	--	P
37	NC	--	--
38	NC	--	--
39	NC	--	--
40	NC	--	--

I: Input, O: Output, P: Power

### 3. LCD Optical Characteristics

#### 3.1 Optical Specifications

Item	Symbol	Condition	Min	Typ.	Max	Unit	Note	
Contrast Ratio	CR	$\theta=0$ Normal Viewing Angle	350	500	--		(2)	
Response Time	Rising		$T_R$	--	10	20	ms	(4)
	Falling		$T_F$	--	15	30		
Color Filter Chromaticity	White		$W_X$	0.25	0.29	0.33		(5)(6)
		$W_Y$	0.26	0.30	0.34			
Viewing Angle	Hor.	$\Theta_L$	60	70	--	degree	(1)(6)	
		$\Theta_R$	60	70	--			
	Ver.	$\Theta_T$	50	60	--			
		$\Theta_B$	60	70	--			

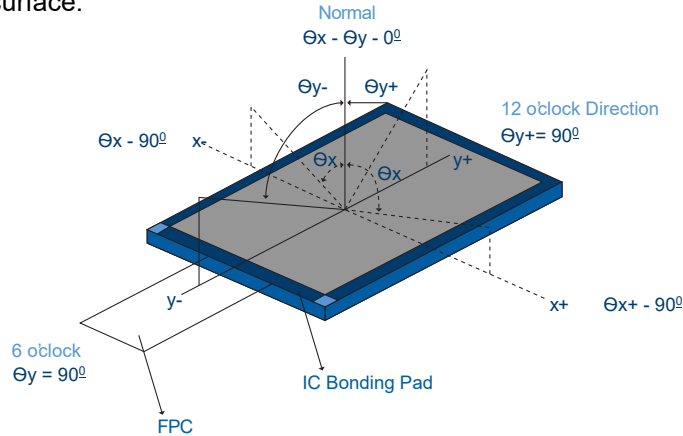
#### Measuring Conditions:

1. Dark Room
2. Ambient Temperature of  $25\pm 2^\circ\text{C}$
3. 15 Minute Warm up

## Optical Specification Reference Notes:

### (1) Definition of Viewing Angle:

The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



### (2) Definition of Contrast Ratio:

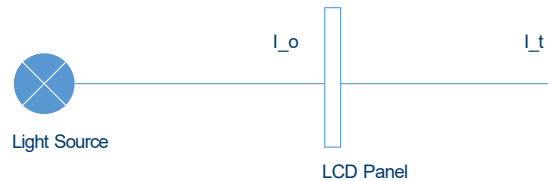
Measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

### (3) Definition of Transmittance (T%):

The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{It}{Io} \times 100\%$$

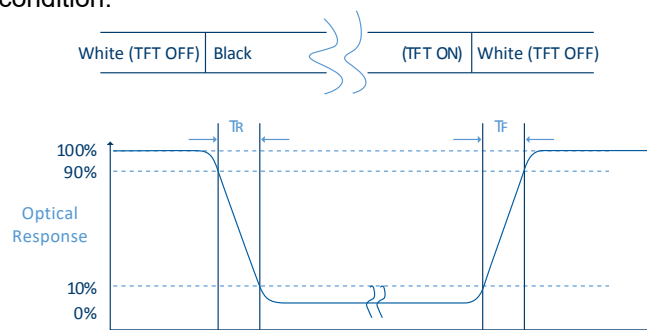


*Io = the brightness of the light source.*

*It = the brightness after panel transmission*

### (4) Definition of Response Time (TR, TF):

The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.



**(5) Definition of Color Gamut:**

Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y), G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

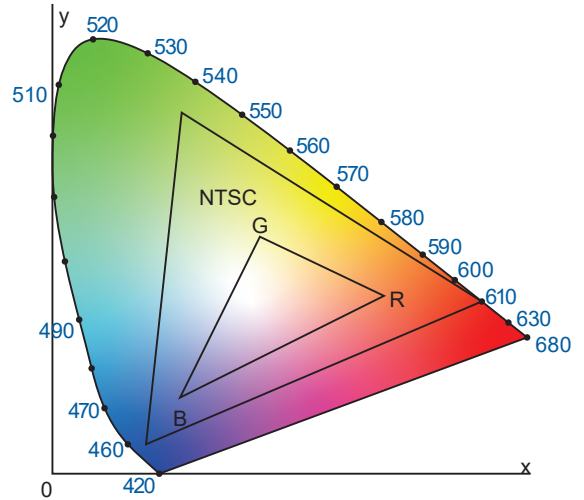
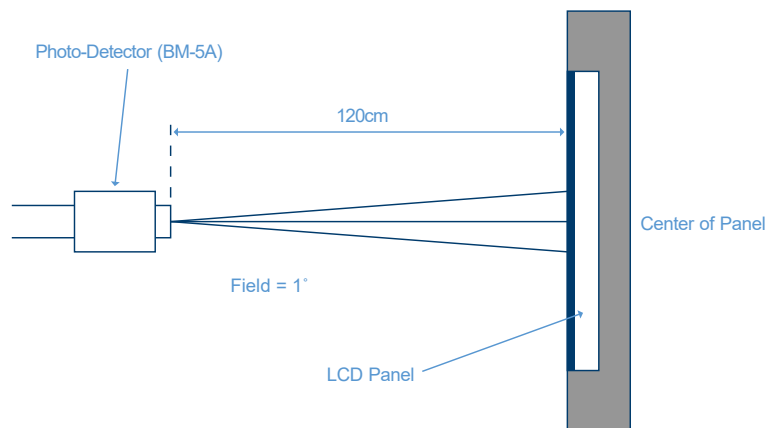
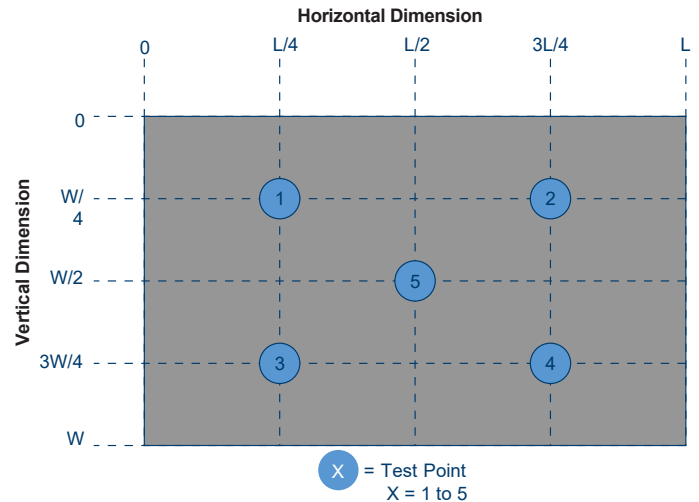
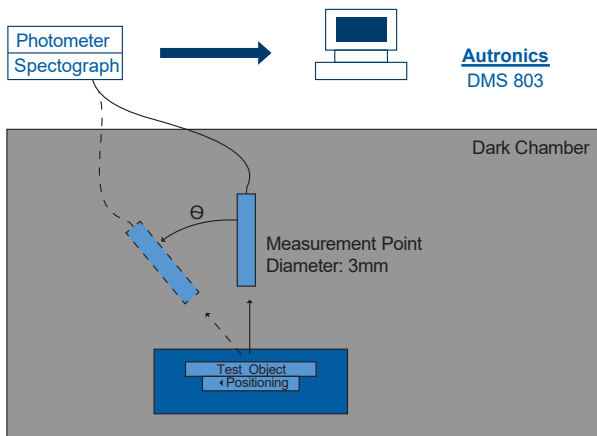


Fig. 1931 CIE Chromaticity Diagram

Color Gamut:  $S = \frac{\text{Area of RGB Triangle}}{\text{Area of NTSC Triangle}} \times 100\%$

**(6) Definition of Optical Measurement Setup:**

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.



## 4. TFT Electrical Characteristics

### 4.1 Absolute Maximum Rating (Ta=25°C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Operating Temperature	TOP	-20	+70	°C
Storage Temperature	TST	-30	+80	°C

*NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.*

### 4.2 DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
System Voltage	VDD	3.0	3.3	3.6	V	--
Normal Mode Current Consumption	IDD	--	--	200	mA	--
Level Input Voltage	V <sub>IH</sub>	0.7*VDD	--	VDD	V	--
	V <sub>IL</sub>	0	--	0.3*VDD	V	--



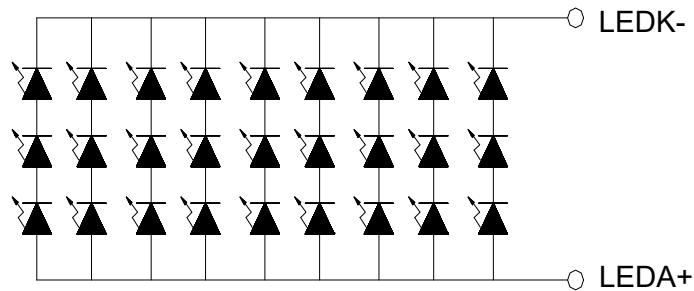
### 4.3 LED Backlight Characteristics

The backlight system is edge lighting type with 27 LED Chips

Item	Symbol	Min	Typ.	Max	Unit	Note
Forward Current	$I_F$	--	180	--	mA	--
Forward Voltage	$V_F$	8	9.3	11	V	--
LCM Luminance	$L_V$	--	780	--	cd/m <sup>2</sup>	(3)
LED Lifetime	$H_r$	--	25000	--	hour	(1)(2)
Uniformity	Avg	75	85	--	%	(3)

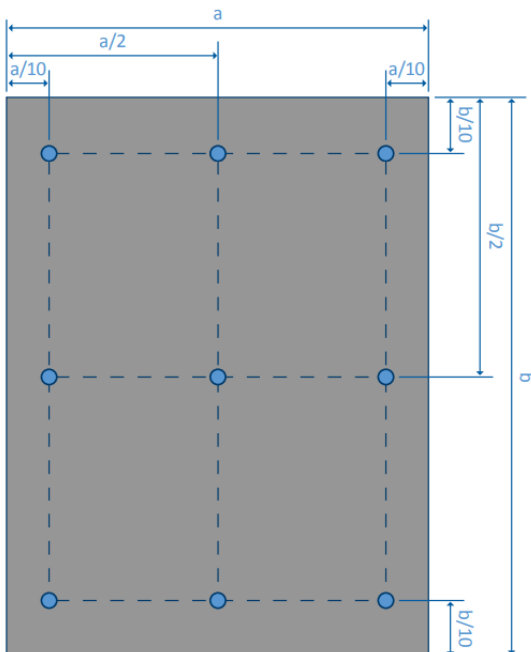
**Note 1:** LED lifetime ( $H_r$ ) can be defined as the time in which it continues to operate under the condition:  $T_a=25 \pm 2^\circ\text{C}$ , typical  $I_F$  value indicated in the above table until the brightness becomes less than 50%.

**Note 2:** The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$  and  $I_F = 180\text{mA}$ . The LED lifetime could be decreased if operating  $I_F$  is larger than 180mA. The constant current driving method is suggested.



**BL CIRCUIT DIAGRAM**

**Note 3:** Luminance Uniformity of these 9 points is defined as below:



$$\text{Luminance} = \frac{(\text{Total Luminance of 9 Points})}{9}$$

$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 Points(1-9)}}{\text{Maximum Luminance in 9 Points(1-9)}}$$

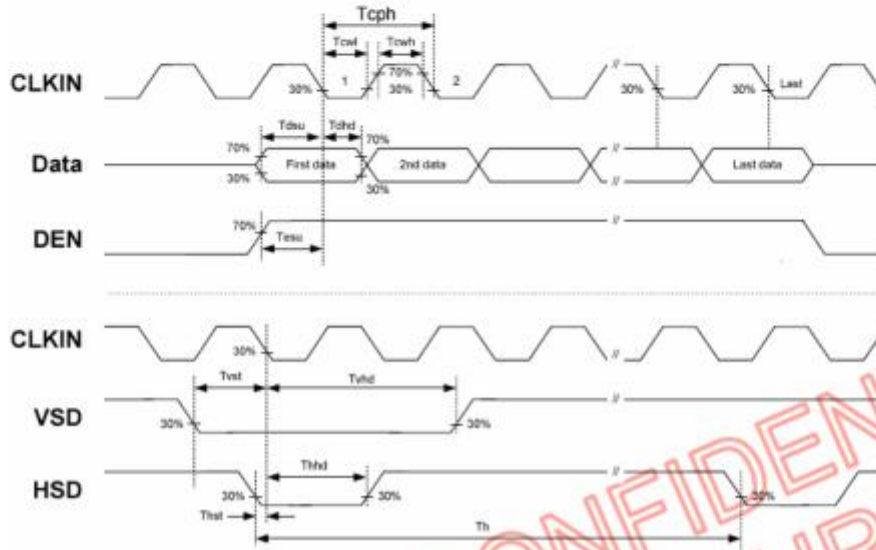
## 5.0 TFT AC Characteristics

For further timing tables and diagrams, please see the data sheets for controllers EK9716 and EK73002.

### 5.1 Interface Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	$T_{hst}$	8	-	-	ns	
HS hold time	$T_{hhd}$	8	-	-	ns	
VS setup time	$T_{vst}$	8	-	-	ns	
VS hold time	$T_{vhd}$	8	-	-	ns	
Data setup time	$T_{dsu}$	8	-	-	ns	
Data hole time	$T_{dhd}$	8	-	-	ns	
DE setup time	$T_{esu}$	8	-	-	ns	
DE hole time	$T_{ehd}$	8	-	-	ns	
DV <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ms	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	1	-	-	ms	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

#### 3.3.2. Input Clock and Data Timing Diagram

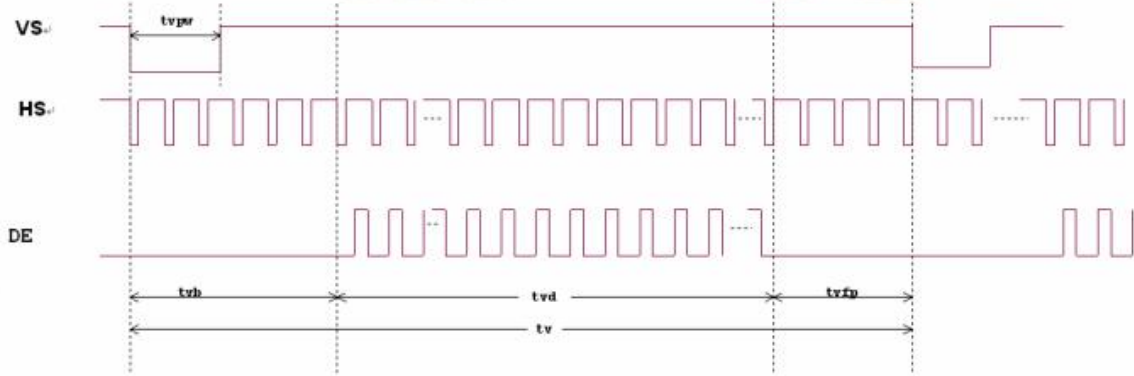


Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	



Figure 3. 1 Horizontal input timing diagram.



## 7.0 Quality Inspection Standards

For TFT quality inspection standards, please see the following link: <https://focuslcds.com/tft-quality-inspection-standards/>

## **8.0 Cautions and Handling Precautions**

### **8.1 Handling and Operating the Module**

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
8. Protect the module from static; it may cause damage to the CMOS ICs.
9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
10. Do not disassemble the module.
11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
12. Pins of I/F connector shall not be touched directly with bare hands.
13. Do not connect, disconnect the module in the "Power ON" condition.
14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

### **8.2 Storage and Transportation.**

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
2. Do not store the TFT-LCD module in direct sunlight.
3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.