

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Tel: (972) 437-3888 Fax: (972)437-2562

Web: <http://www.ocularlcd.com>

Email: lcd@ocularlcd.com

LCD Graphics STN Module Specification

Model: OG16161

Table of Contents

1 Construction and Outline	2
2 Module Specifications	2
Table 1 Module Mechanical Specification	
3 Mechanical Outline.....	2
4 Electrical Specifications and Electrical Configuration.....	3
4.1 Absolute maximum ratings.....	3
Table 2 Absolute Ratings	
4.2 Electrical characteristics	3
Table 3 Electrical Characteristics	
4.3 Timing Characteristics.....	4
Chart 3: Timing Chart	
Table 4 Bus Timing Characteristics	
4.4 Interface Signals	5
Table 5 Data Shift Direction	5
Table 6 Interface Signal	
4.5 Block Diagram.....	6
5 Optical Characteristics.....	7
5.1 When Backlight LED is OFF state	7
Table 8 Optical Characteristics	
Figure 5.1.1 Definition of Viewing Angle	
Figure 5.1.2 Optical Characteristics Test Method	
Figure 5.1.3 Definition of Response Time	
5.2 Characteristics of Typical Yellow Green Array LED Backlight.....	9
Table 9 Characteristics of Yellow Green Array LED Backlight	
6 Explanation of Part Numbering System	10
7 Precautions Relating to Product Handling.....	11

Revision History

Date	Page	Summary

Approved By:

Document Number: OG16161 r.0

Page 1 of 11

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

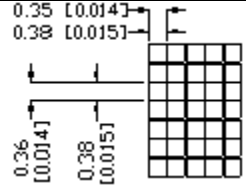
1 Construction and Outline

Construction: 160 × 160 Dot Matrix Graphics Module

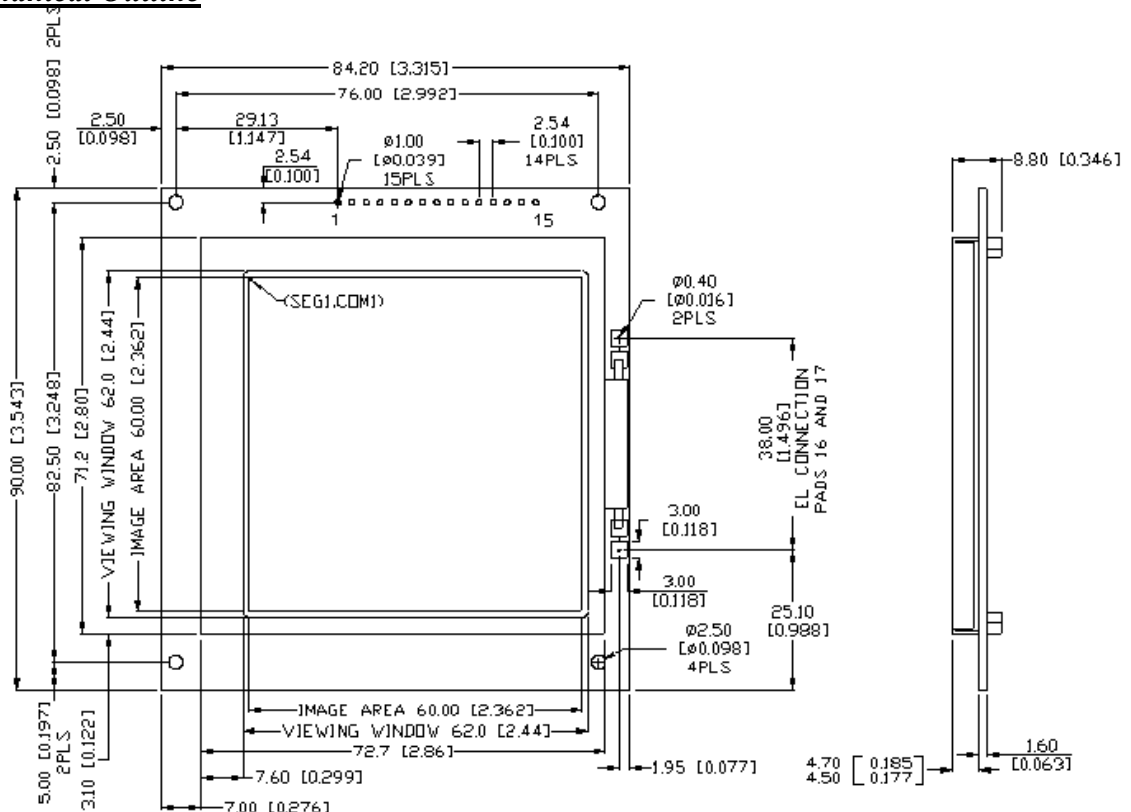
Controller: Samsung S6B0086X (2 for segment and 2 for common)

2 Module Specifications

Table 1

Parameter	Specification	Unit
Outline dimensions	84.2(W) × 90.0(H) × 8.8MAX (D)	mm
Effective display area	62.0 (W) × 62.0 (H)	mm
Display format	160 (Horizontal) x 160 (Vertical)	—
Image Area	60.0 (W) x 60.0 (H)	mm
Dot Size	0.355(W) × 0.355(H)	mm
Dot pitch	0.375 (Horizontal) x 0.375 (Vertical)	mm
Pixel Configuration		mm [inch]
Weight	Approx. 80	g

3 Mechanical Outline



Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

4 *Electrical Specifications and Electrical Configuration*

The OG16161 is module with flexible application that utilizes the S6B0086X LCD segment/common driver with data transfer in 4 bit data bus. The standard configuration is to be used in conjunction with an external LCD controller. Other options available, please consult Ocular for latest configurations.

4.1 Absolute maximum ratings

Table 2

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	$V_{DD} - V_{SS}$	0	7	V	
Operating Temperature	T_{opr}	0	50	°C	
Storage Temperature	T_{stg}	-20	60	°C	

4.2 Electrical characteristics

Table 3 ($T_a = 25^\circ\text{C}$)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Supply Voltage (Logic)		V_{DD} (Note)	4.5	5	5.5	V	
Operating Voltage		V_{DD}	4.5	5	5.5	V	-
Contrast Voltage	Std.	$V_{DD} - V_0$	6	18	20	V	
Input Voltage	Low	V_{IL2}	0	—	$0.2V_{DD}$	V	
	High	V_{IH2}	$0.8V_{DD}$	—	V_{DD}	V	
Output Voltage	Low	V_{OL}	-	—	0.4	V	$I_{OL} = 0.4\text{ mA}$
	High	V_{OH}	$V_{DD} - 0.4$	—	-	V	$-I_{OH} = 0.4\text{ mA}$
Input Leakage Current 1		I_{LKG1}	-10	-	10	μA	$V_{IN} = V_{DD} - V_{SS}$
Supply Current		I_{STB}	-	-	100	μA	$f_{CL1} = 32\text{ kHz}$ $f_M = 80\text{ Hz}$ V_{SS} $V_{DD} = 5\text{ V}$ $V_{DD} = 3\text{ V}$ $V_{DD} = 5\text{ V}$
		I_{DD}	-	-	5		
		I_{EE}	-	-	2		
			-	-	500		

Note: Reference to $V_{SS} = 0\text{ V}$.

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

4.3 Timing Characteristics

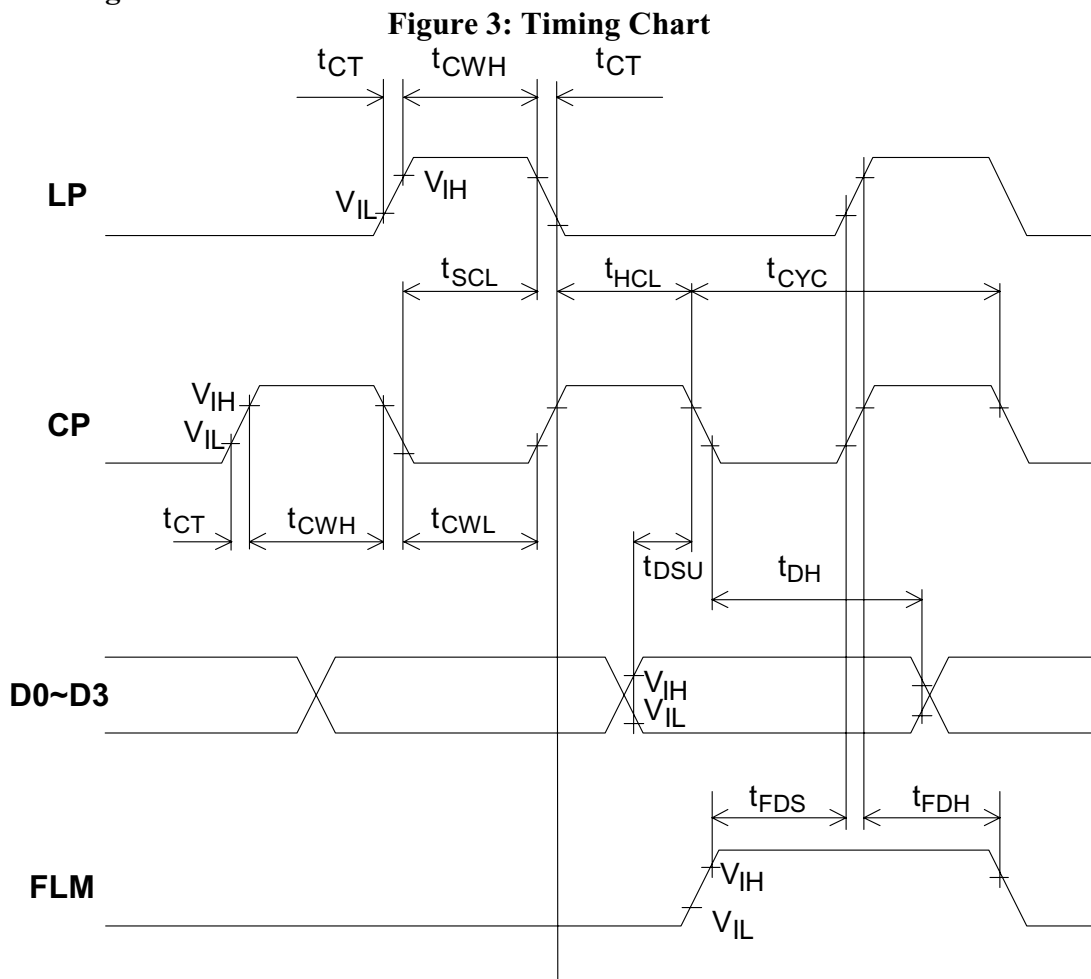


Table 4 Bus Timing Characteristics

$V_{DD} = 5.0V \pm 5\%$, $T_a = -20 \sim +75^\circ C$

Parameter	Symbol	Min.	Typ.	Max.	Unit
Enable Cycle Time	t_{cyc}	125	—	—	ns
Enable Pulse Width	t_{CWH}, t_{CWL}	45	—	—	ns
Clock Set Up Time	t_{SCL}	80	—	—	ns
Clock rise / fall time	t_{CT}	—	—	30	ns
Clock Hold Time	t_{HCL}	80	—	—	ns
Data Setup Time	t_{DSU}	60	—	—	ns
Data Hold Time	t_{DHW}	60	—	—	ns
FLM Data Set Up Time	t_{FDS}	60	—	—	ns
FLM Data Hold Time	t_{FDH}	60	—	—	ns

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

4.4 Interface Signals

Table 5 Data Shift Direction according to control signals

C1 C160	S1	S2	S3	-----				S160
	DB0	DB1	DB2	DB3	DB0	DB1	DB2	DB3

Table 6 Standard Interface (CN1)

Pin No.	Symbol	Description	Connection
1	V _{SS}	Ground Potential	Logic Power Ground. V _{SS} : 0 V
2	M	Alternate (Invert) Signal for LCD Drive	
3	FLM	Frame Sync. Signal	
4	CL1	Data Latch Signal	
5	CL2	Data Shift Clock Signal	
6	DB ₃	Code I/O Data MSB	(For Details, see section 4.5.)
7	DB ₂	Code I/O Data 3rd Bit	
8	DB ₁	Code I/O Data 2nd Bit	
9	DB ₀	Code I/O Data LSB	
10	V _{ee}	Power Supply for LCD Drive	Min. -23Volt
11	V _{DD}	Logic Power (+5V)	± 0.5 Volt
12	V ₀	LCD Contrast Adjustment Voltage	Typ. -13 Volt
13	INH	Display Enable	“H”: Display ON “L”: Display OFF
14	EL1	EL Power Supply	Power supply for EL
15	EL2		
16	EL3		
17	EL4		

Notes for V₀ and V_{ee} (V_{LCD}): This Module is available with and without on-board voltage generator for the LCD drive voltage. If the voltage convertor is not installed, a negative voltage of -15 Volt or less should be applied at V_{ee}. Contrast can be adjusted by changing V₀ between V_{DD} and V_{ee}. When V₀ is most negative, the contrast is at maximum.

In the case the voltage convertor is installed, the module will operate from a single +5V supply. The contrast can be adjusted by varying the voltage applied to V₀ (-13~0 Volt). Maximum contrast is achieved when V₀ = -13.0 Volt.

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

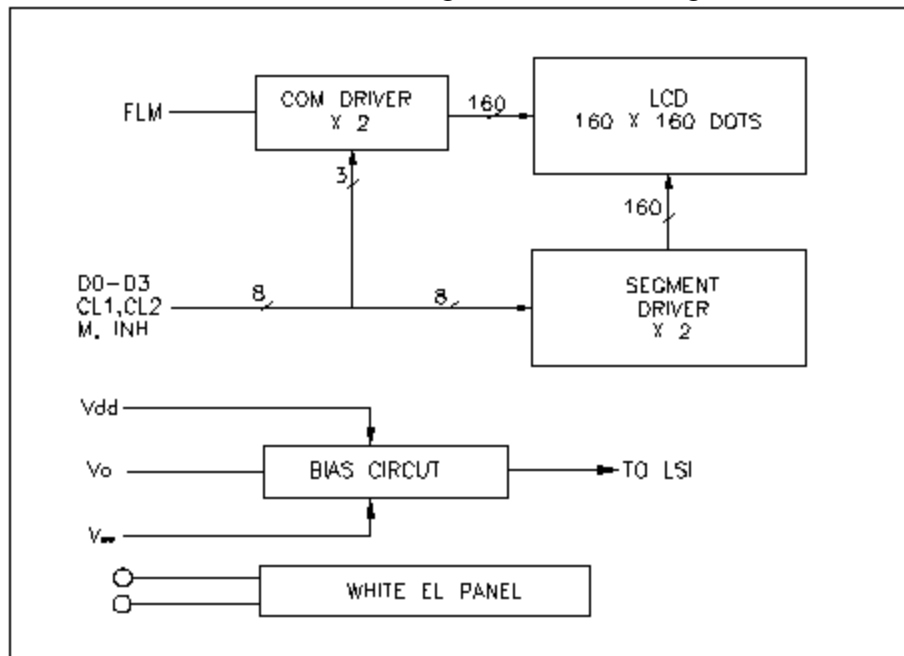
Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

4.5 Block Diagram

4.6.1 Standard Configuration Block Diagram



Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

5 Optical Characteristics

5.1 When Backlight LED is OFF state

Note: Data is typical for “-GSS” module configuration.

Table 8 Typical LCD Optical Characteristics

Parameter		Symbol	Condition		Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range		$\theta_2 - \theta_1$	$\phi = 0^\circ$	$C_O \geq 2.0$	60	—	—	°	Note 1.
		θ_1		$C_O = 2.0$	—	—	-25	°	Note 1.
		θ_2			25	—	—	°	Note 1.
		$\theta_2 - \theta_1$	$\phi = 45^\circ$ 315° $\theta_1 < \theta_2$	$C_O \geq 2.0$	60	—	—	°	Note 1.
		θ_1		$C_O = 2.0$	—	—	-25	°	Note 1.
		θ_2			25	—	—	°	Note 1.
Contrast ratio		C_O	$\theta = 15^\circ$	5	8	—		Note 2.	
Response Time	Rise	t_r		$\theta = 15^\circ$	—	150	300	ms	Note 3.
	Decay	t_d			$\theta = 15^\circ$	—	200	400	ms

Note 1) The viewing angle range is defined as shown below:

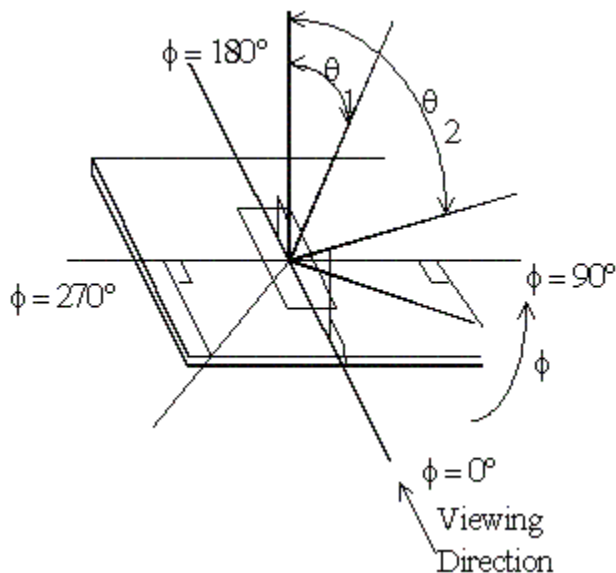


Fig. 5.1.1: Definition of viewing angle

*Angles θ_1 , θ_2 and ϕ shall fall within the range over which the displayed character can be read.

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

Note 2) Contrast ratio is defined as follows:
When input signal is applied to the unit to select (turn on), the LCD dots (pixels) to be measured in the optical characteristics test method as defined in Fig. 5.1.2:

$$\text{Contrast ratio} = \frac{\text{Photodetector output voltage with non-select waveform being applied}}{\text{Photodetector output voltage with select waveform being applied}}$$

Note 3) When input signal for selecting or non-selecting the dots to be measured are applied using the optical characteristics test method shown in Fig. 5.1.2. The response characteristics of the photo-detector output are measured as shown in Fig. 5.1.3.

Note 4) This optical data is specified on condition that the LCD temperature is 25°C. When designing, be sure to check the rating of V_0 in table 3.

Note 5) The response characteristics of photo-detector output are measured as shown in Fig. 5.1.3, assuming that input signals are applied so as to select and deselect the dots to be measured, in the optical characteristics test method shown in Fig. 5.1.2.

Note 6) Table 8 shows the optical characteristics detected when the LCD applied voltage waveforms are in the highest frequency *.

* The most critical condition for the characteristics of LCD.

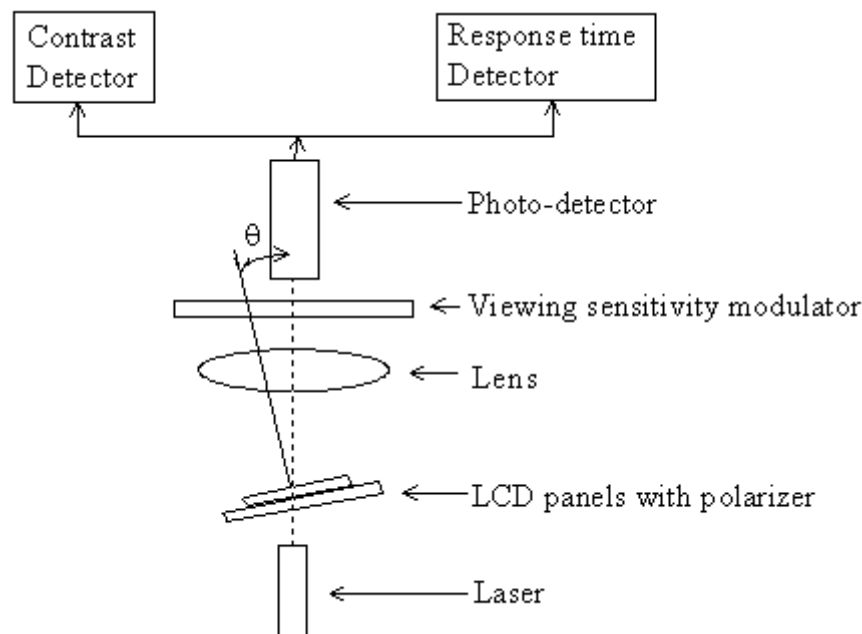


Fig. 5.1.2 Optical Characteristics Test Method

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

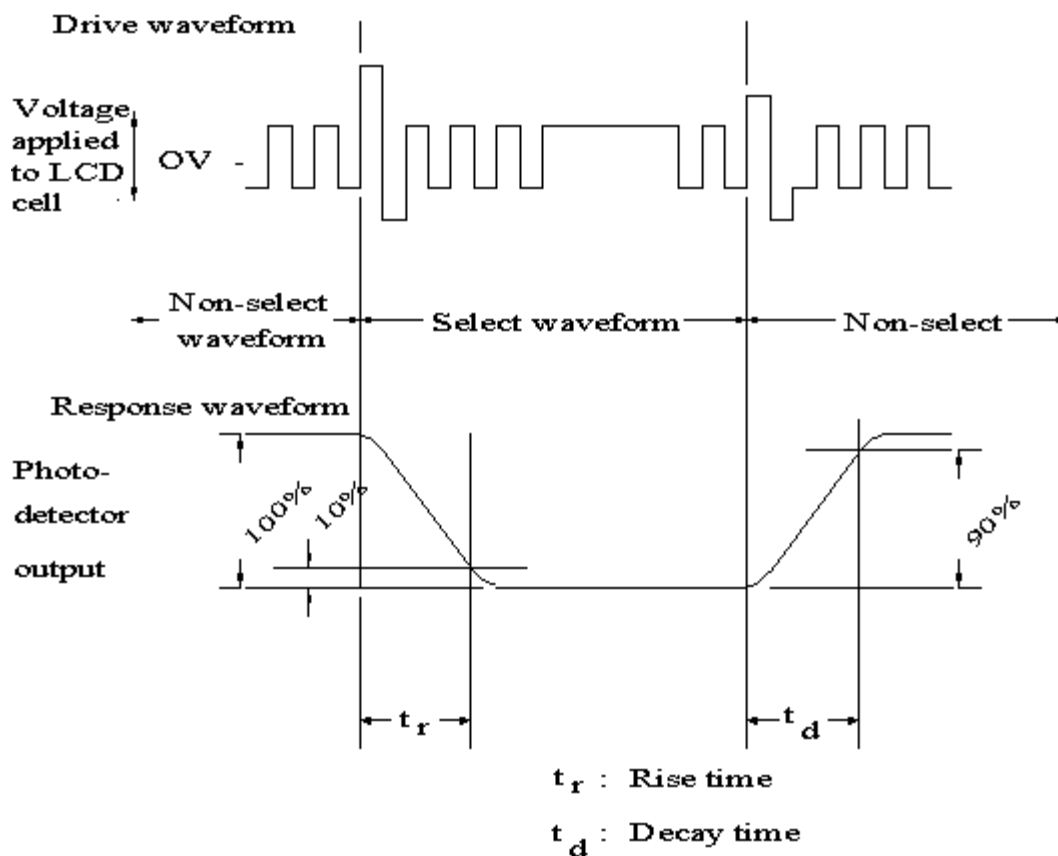


Figure 5.1.3: Definition of Response Time

5.2 Characteristics of Typical Yellow Green Array LED Backlight

(When LCD is OFF state)

Table 9 Characteristics of Yellow Green Array LED Backlight

$T_a = 25^\circ\text{C}$, $V_{\text{LED}+} - V_{\text{LED}-} = 4.2\text{V}$

Parameter	Min.	Typ.	Max.	Unit	Remark
Luminance *	10	27	—	cd/m ²	
Peak emission wavelength	—	565	—	nm	
Spectrum radiation bandwidth	—	30	—	nm	

* Note: Center of the unit with array type LED backlight lit.

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

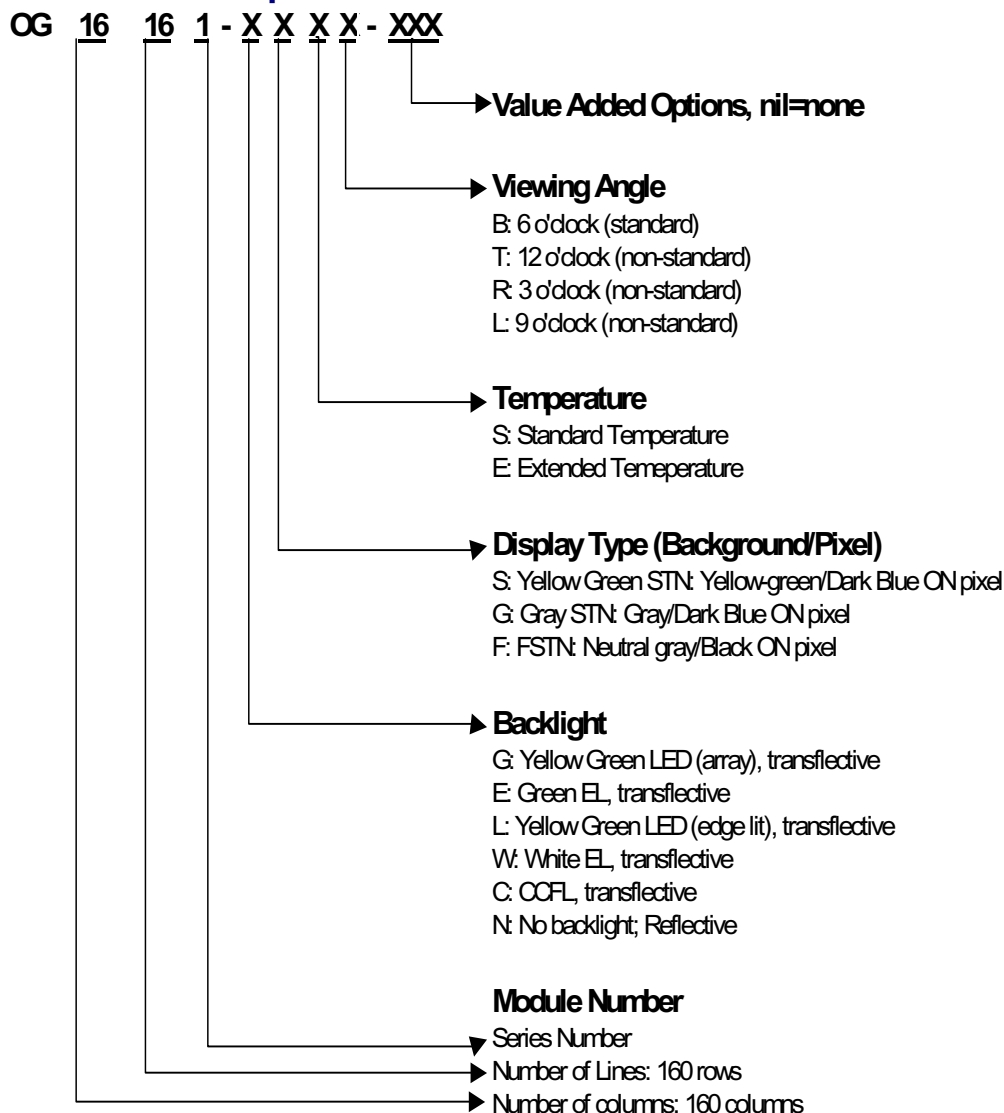
Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

6 Explanation of Part Numbering System

Part Number Example



Note: Not all possible configurations are possible or available for all models. If a specific configuration is required but is not listed as a current configuration, contact Ocular directly for availability.

Ocular Inc.

746 Lingco Drive, Richardson, TX75081

Web: <http://www.ocularlcd.com>

Tel: +1(972) 437 3888 Fax: +1(972) 437 2562

Email: lcd@ocularlcd.com

7 Precautions Relating to Product Handling

The following precautions will guide you in handling our product correctly.

1) Liquid crystal display devices

1. The liquid crystal display device panel used in the liquid crystal display module is made of glass. Avoid any strong mechanical shock. If the glass should break, handle it with care.
2. The polarizer on the surface of the LCD is relatively soft. Care must be taken to prevent scratches.

2) Protection of liquid crystal display module against static electricity discharge

1. When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend using anti-static mats, to protect worktables against the hazards of electrical shock.
2. We recommend wearing a ESP grounding strap when handling the module.
3. Slowly and carefully remove the protective film from the LCD module, since this can generate static electricity.

3) When the LCD modules must be stored for long periods of time

1. Protect the modules from high temperatures and humidity.
2. Keep the modules away from direct sunlight or direct exposure to ultraviolet rays.

4) Use the module with a power supply that is equipped with over current protection since the module does not employ current limiting protection circuitry.

5) Do not ingest the LCD fluid if it should leak out of a damaged LCD module. If hands or clothing come in contact with the LCD fluid, wash immediately with soap and water.

6) Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.

7) For models which use CCFL backlighting:

1. CCFL backlights operate at voltage levels greater than 200 volts. Precautions must be taken to avoid electrical shock.
2. Using CCFL backlighting for extended periods of time at low temperatures will significantly shorten their service life.

8) For models which used touch panels:

1. Do not stack modules because they can be damaged by components on neighboring modules.
2. Do not place heavy objects on top of the product because this can cause the glass to break.

9) Models which use flexible cable, heat seal or TAB:

1. In order to maintain reliability, do not touch or hold by the connector area.
2. Avoid bending, pulling, or any other excessive forces, which can result in broken connectors.