

Specification of LCD Module

Product No.: GPG322403TBC1

Customer Approval	
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Approved by	Checked by	Organized by

Approval for specification only

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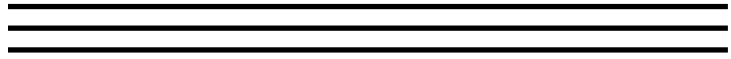


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1. GENERAL DESCRIPTION

The GPG322403TBC1 is a 320x240 dots matrix LCD module. It has a STN panel composed of 320 segments and 240 commons. The LCM can be easily accessed by micro-controller via parallel interface.

2. FEATURES

Display Mode	Transmissive Type
	STN LCD, Negative/Blue mode
Display Format	Graphic 320 × 240 Dots-matrix
Color	Monochrome
Input Data	4 bit parallel data input from MPU
Multiplexing Ratio	1/240 Duty 、 1/13 Bias
Viewing Direction	6 O'clock
Backlight	CCFL
Lamp Life Time	10000 hrs

3. MECHANICAL SPECIFICATION

Item	Specifications	Unit
Dimensional outline	166.0(W) × 109.0(H) × 7.3(D)	mm
Resolution	320 × 240	dots
View area	121(W) × 91.6(H)	mm
Active area	115.18(W) × 86.38(H)	mm
Dots pitch	0.24(W) × 0.24(H)	mm
Dots size	0.22(W) × 0.22(H)	mm

5. MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power Supply for Logic	$V_{DD}-V_{SS}$	-0.3	6.5	V	
Power Supply for LCD	$V_{EE}-V_{SS}$	0	26	V	
Input Voltage	V_I	-0.3	V_{DD}	V	
Operating Temperature	T_{OPR}	0	50	°C	
Storage Temperature	T_{STR}	-20	70	°C	
Humidity	---	---	85	%RH	Note2
Static Electricity	-	-	-	-	Note 1

Note 1: LCM should be grounded during handling LCM

Note 2: $T_a \leq 50^\circ\text{C}$: 85%RH Max

$T_a > 50^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 50°C

6. ELECTRICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	NOTE
Supply Voltage	Logic	V_{DD}	---	2.7	3.3	5.5	V	
Input Voltage	H level	V_{IH}	---	$0.8V_{DD}$	---	V_{DD}	V	
	L level	V_{IL}	---	0	---	$0.2V_{DD}$		
Supply Current for Logic		I_{DD}	$V_{DD}=3.3\text{ V}$ $V_{LCD}=19.4\text{ V}$	---	1.0	2.0	mA	
Supply Current for LCD		I_{VLCD}	FLM=70Hz	---	3.5	5.3	mA	
LCD Driving Voltage		V_{LCD}	$V_{DD}=3.3\text{ V}$ Bias=1/13 $T_a=25^\circ\text{C}$	18.9	19.4	19.9	V	
Luminance		L	25°C	80	120	---	Cd/m^2	
Frame frequency		Fr		---	70	---	Hz	

7. MODULE FUNCTION DESCRIPTION

7.1. Pin Description

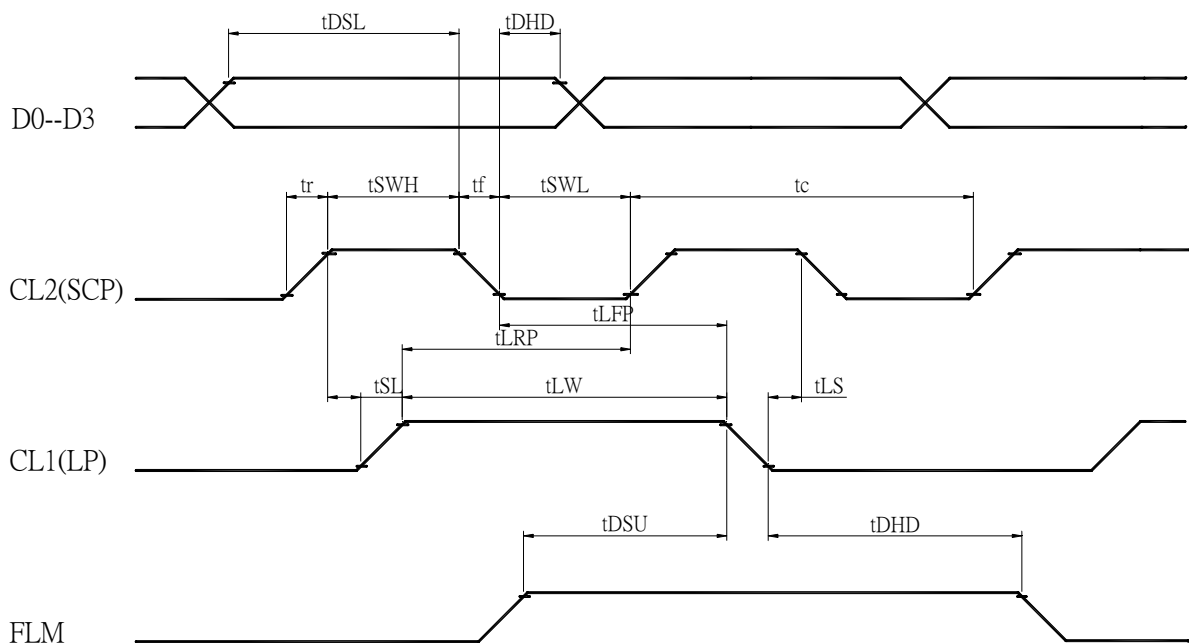
LCD

PIN NO.	SYMBOL	LEVEL	FUNCTIONS
1	FLM	H/L	SCAN START-UP SIGNAL
2	CL1	H→L	DATA LATCH PULSE
3	CL2	H→L	DATA SHIFT PULSE
4	NC	H/L	NO CONNECTION
5	DISP	H/L	H: DISPLAY ON, L: DISPLAY OFF
6	D0	H/L	DISPLAY DATA
7	D1	H/L	
8	D2	H/L	
9	D3	H/L	
10	VDD	-	POWER SUPPLY FOR LOGIC
11	VSS	-	POWER SUPPLY (0V)
12	VLCD		POWER SUPPLY FOR CONTRAST CONTROL

7.2. Timing Characteristics

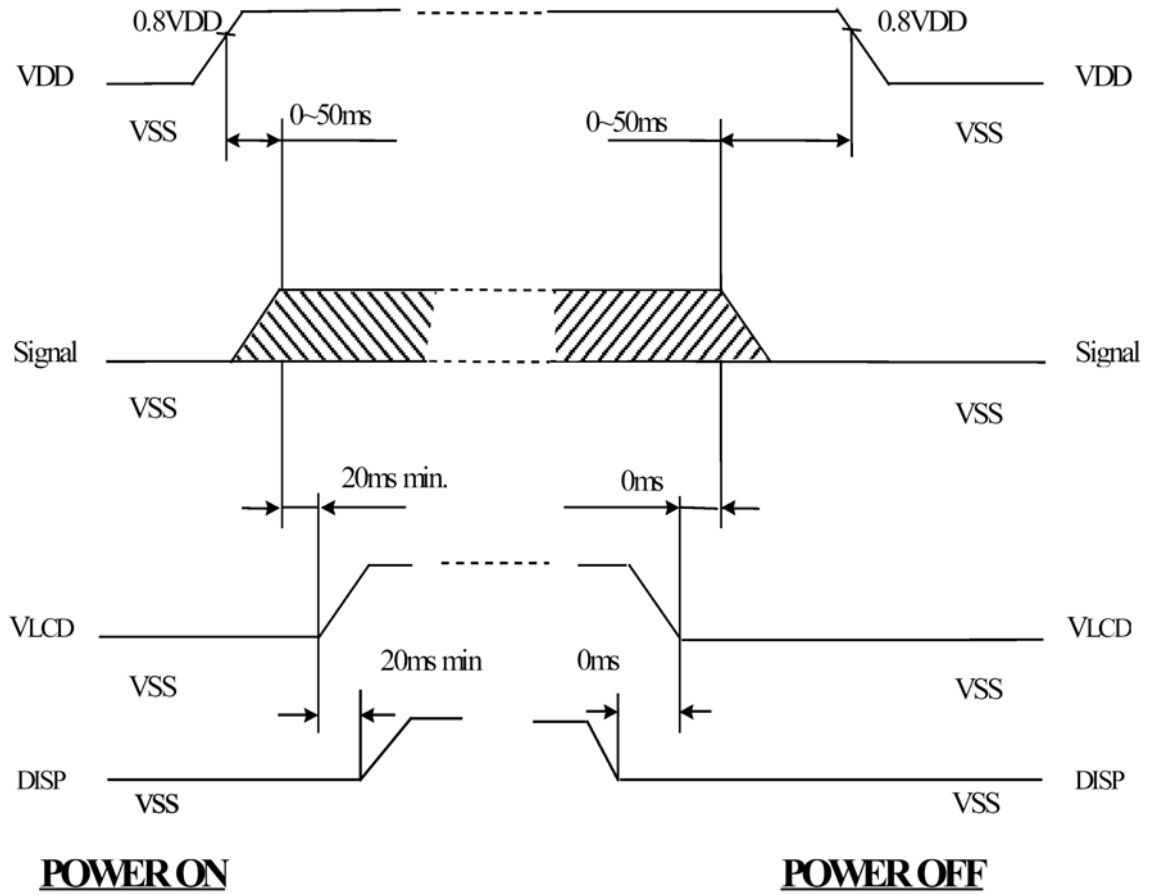
Common & Segment Interface timing

ITEM	symbol	Min.	Typ.	Max.	Unit
Clock Cycle	tC	160			ns
SCP Pulse Width	tSWH,tSWL	65			ns
Data Set Up Time	tDSU	50			ns
Data Hold Time	tDHD	50			ns
SCP Rise/Fall Time	tr,tf			30	ns
LP Rise Time	tLRP	80			ns
LP Fall Time	tLFP	80			ns
LP Pulse Width	tLW	65			ns
SCP To LP Delay Time	tSL	80			ns
LP To SCP Delay Time	tLS	80			ns



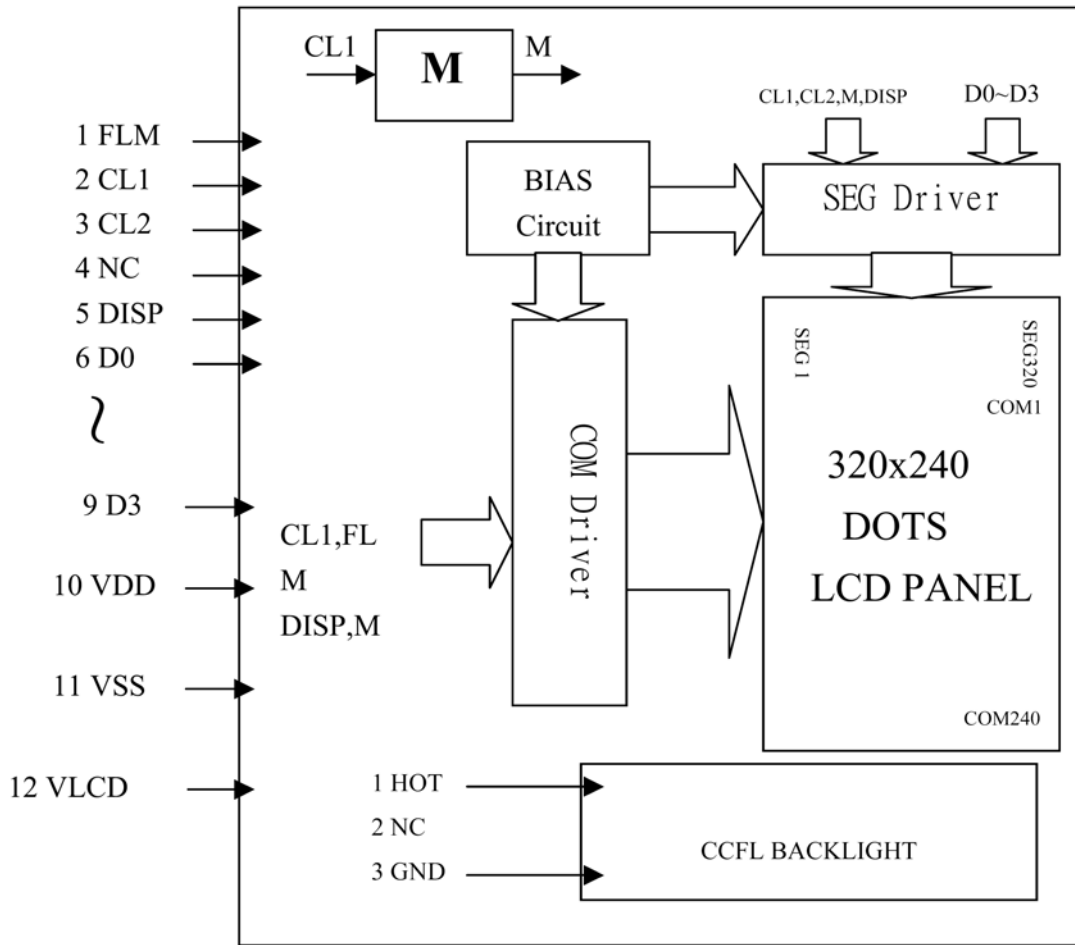


7.3. Power ON/OFF sequence





7.4. Block Diagram of LCM





8. ELECTRO-OPTICAL CHARACTERISTICS

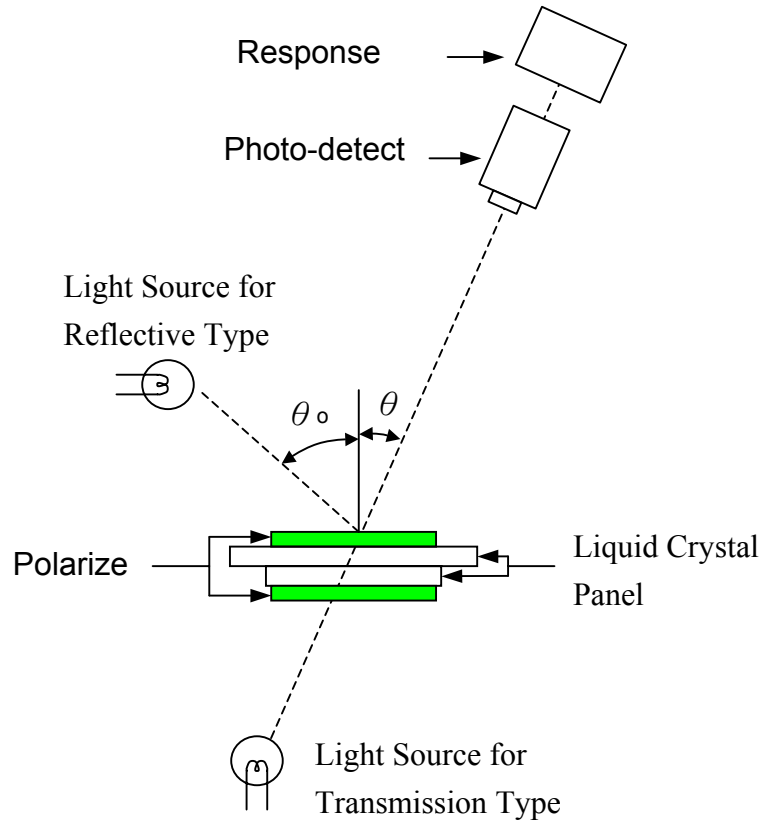
Item	Symbol	Condition	Temp	Min	Typ	Max	Units	Note
LCD driving voltage	V_{LCD}	$\theta = \phi = 0$	0°C	---	---	---	V	3
			25°C	8.6	9.0	9.5		
			50°C	---	---	---		
Response Time	Rise Time (Tr)	$\theta = \phi = 0$	0°C	---	---	---	msec	4
	Decay Time (Td)			---	---	---		
	Rise Time (Tr)		25°C	---	175	---		
	Decay Time (Td)			---	235	---		
	Rise Time (Tr)		50°C	---	---	---		
	Decay Time (Td)			---	---	---		
Contrast Ratio	Cr	$\theta = \phi = 0$	25°C	---	3.9	---	---	5

Viewing Angle Range	$\phi = 0^\circ$ (6")	$\phi = 90^\circ$ (3")	$\phi = 180^\circ$ (12")	$\phi = 270^\circ$ (9")	備註
θ (25°C) CR \geq 2	42	22	38	22	Deg Note2

For Panel Only

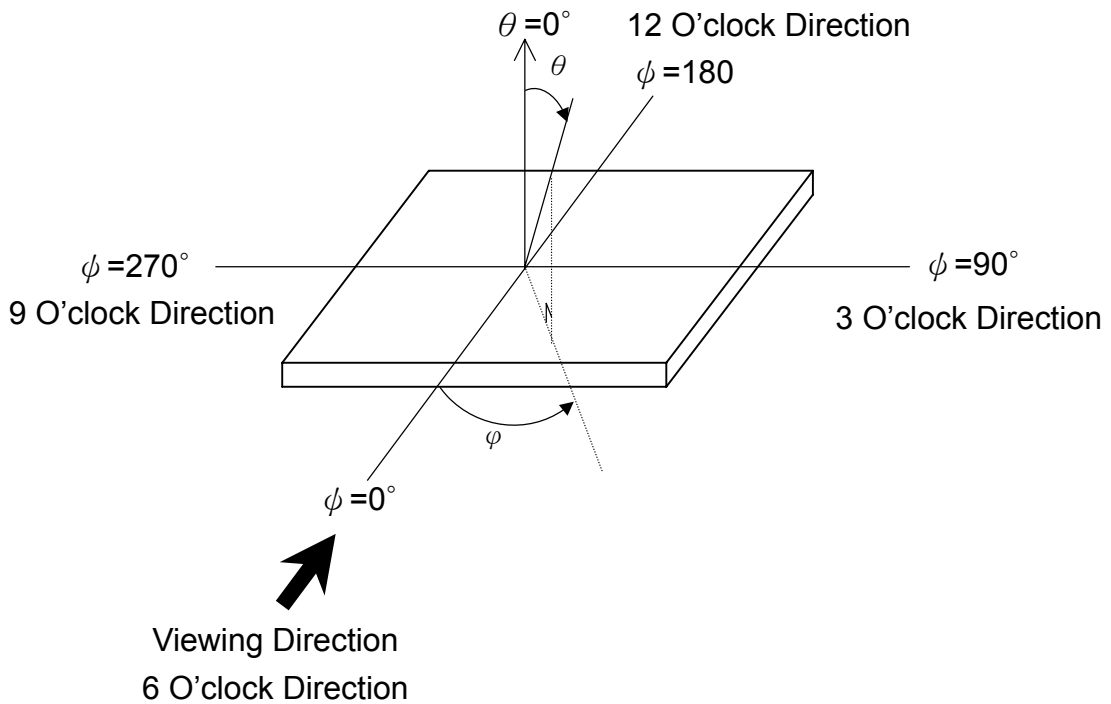


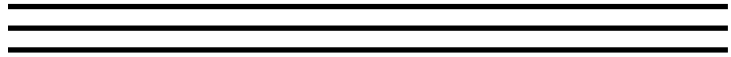
Note 1: Electro-Optical Characteristics Test Method.



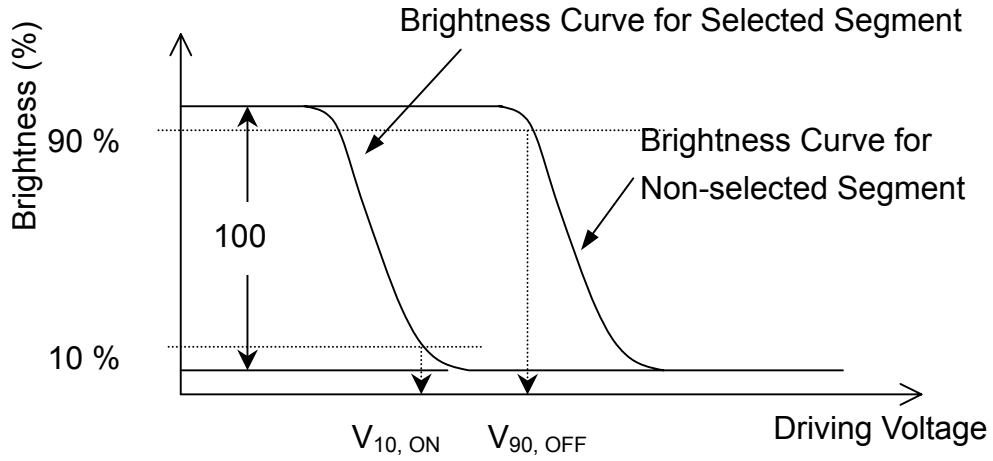
Note 2: Definition of Viewing Angel. ($CR \geq 2$)

Normal:

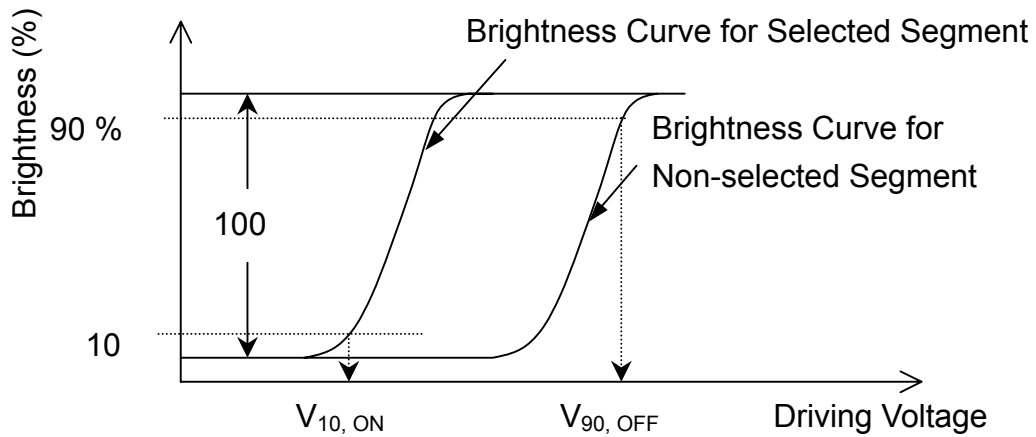




Note 3: Definition of Driving Voltage, $V_{LCD} = (V_{10, ON} + V_{90, OFF}) / 2$.



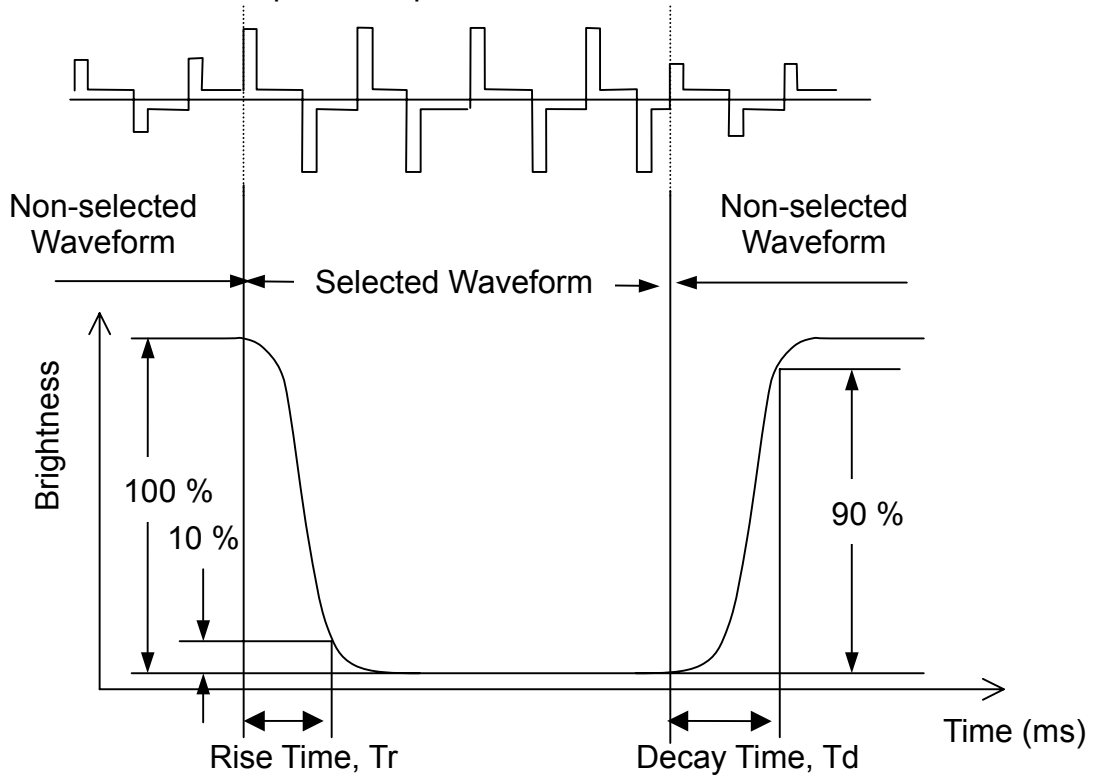
(Positive Type)



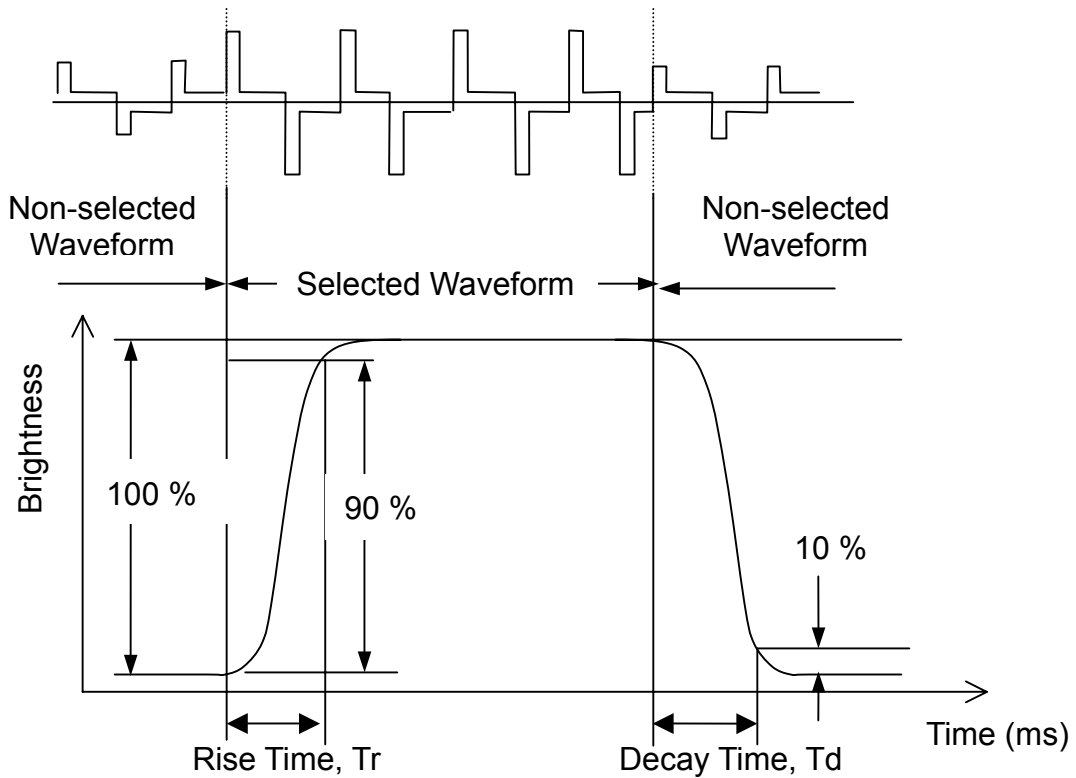
(Negative Type)



Note 4: Definition of Optical Response Time.



(Positive Type)

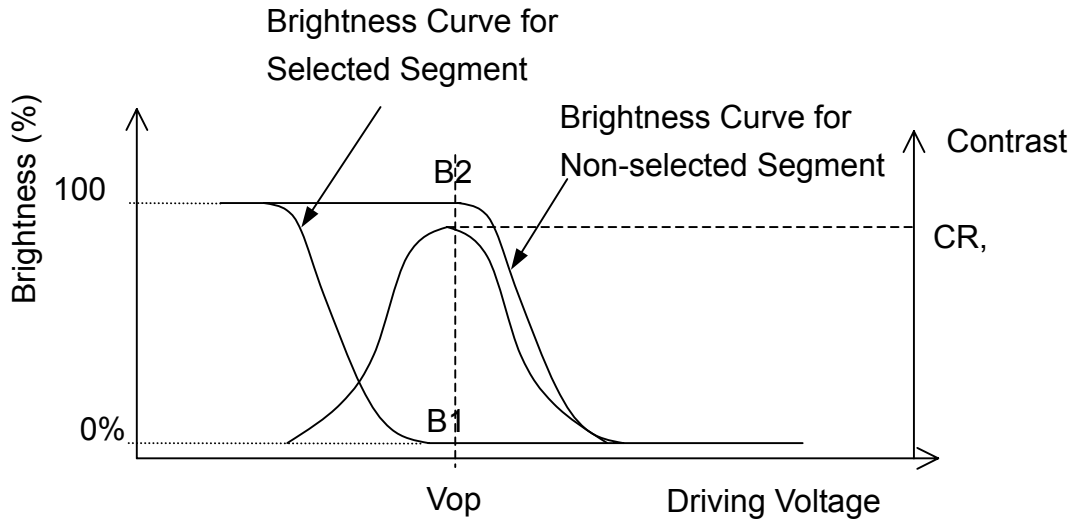


(Negative Type)



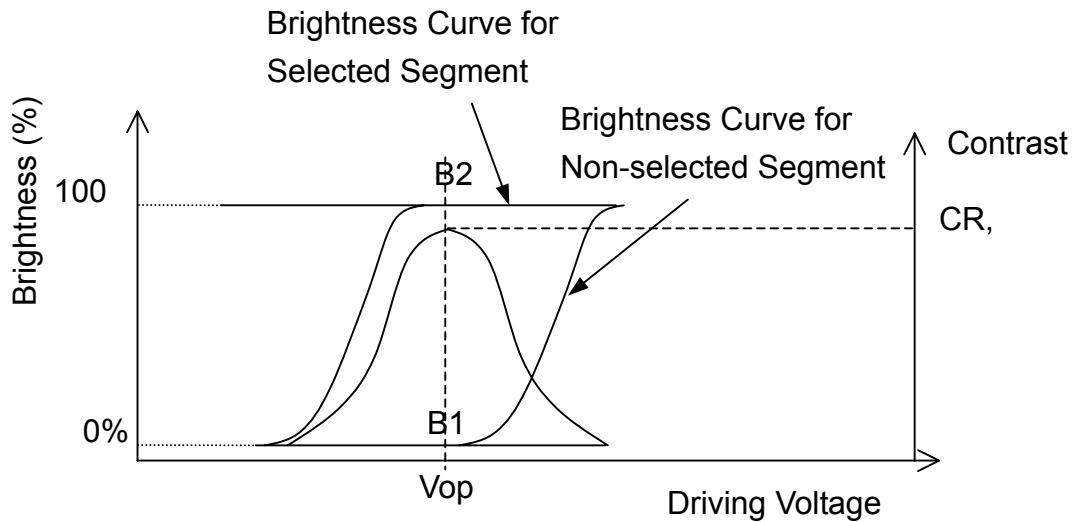
Note 5: Definition of Contrast Ratio (CR).

$$CR = \frac{\text{Brightness of Non-selected Segment}}{\text{Brightness of Selected Segment (B1)}}$$

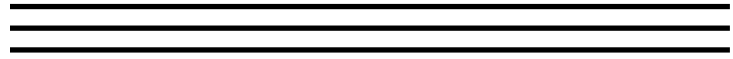


(Positive Type)

$$CR = \frac{\text{Brightness of Selected Segment (B2)}}{\text{Brightness of Non-selected Segment}}$$



(Negative Type)



9. REVISION HISTORY

Version	Revise record	Date
A	Original version	2003/5/16