Industrial Solutions Flatpanel Technology

DESIGN FOR TFT COLOR LCD MODULE

Design No.	doh201_65
Revision	i-sft ⇔ Rev. 01
Type	6,5“ 640 x 480
	SPECIFICATIONS
Version	**Internal Revision 0.4**
Date	09.06.2004
Preliminary ☒	
Final ☐	

This typical design can be used to manufacture dedicated products at i-sft according to the mentioned specification. Please send us a RFQ for this design and stating the number of displays to be build. We will send a formal quote including a final specification. With your formal order please also send a written approval of the final specification.
No further activities will start before formal order is processed and written approval of final specification is in!

1 DESCRIPTION

I-SFT doh201_65 is a TFT(thin film transistor) active matrix color liquid crystal display (LCD) comprising amorphous silicon TFT attached to each signal electrode, a driving circuit.

I-SFT doh201_65 is a **i-sft** GmbH specific design consisting out of a **i-sft** GmbH specific third party manufactured LCD-Glass-Matrix with backlight (which is NOT available in retail), a specific backlight to drive the panel to surface 400 nit and an integrated inverter.

The 6.5 inch diagonal display area contains 640x480 pixels and can display 262,144 colors simultaneously.

2 FEATURES

Backlight for 400 nit display surface
Thin and light weight
High contrast ratio, wide viewing angle, wide color gamut
Wide temperature range
Accepting high shock and vibration levels
Fixable connector
Integrated inverter for driving backlight
MTTH typ. >30.000h

3 APPLICATIONS

User specific

4 STRUCTURE AND FUNCTIONS

A TFT color LCD module comprises a TFT LCD panel, LSIs for driving liquid crystal. The TFT LCD panel is composed of a TFT array glass substrate superimposed on a color filter glass substrate with liquid crystal filled in the narrow gap between two substrates.

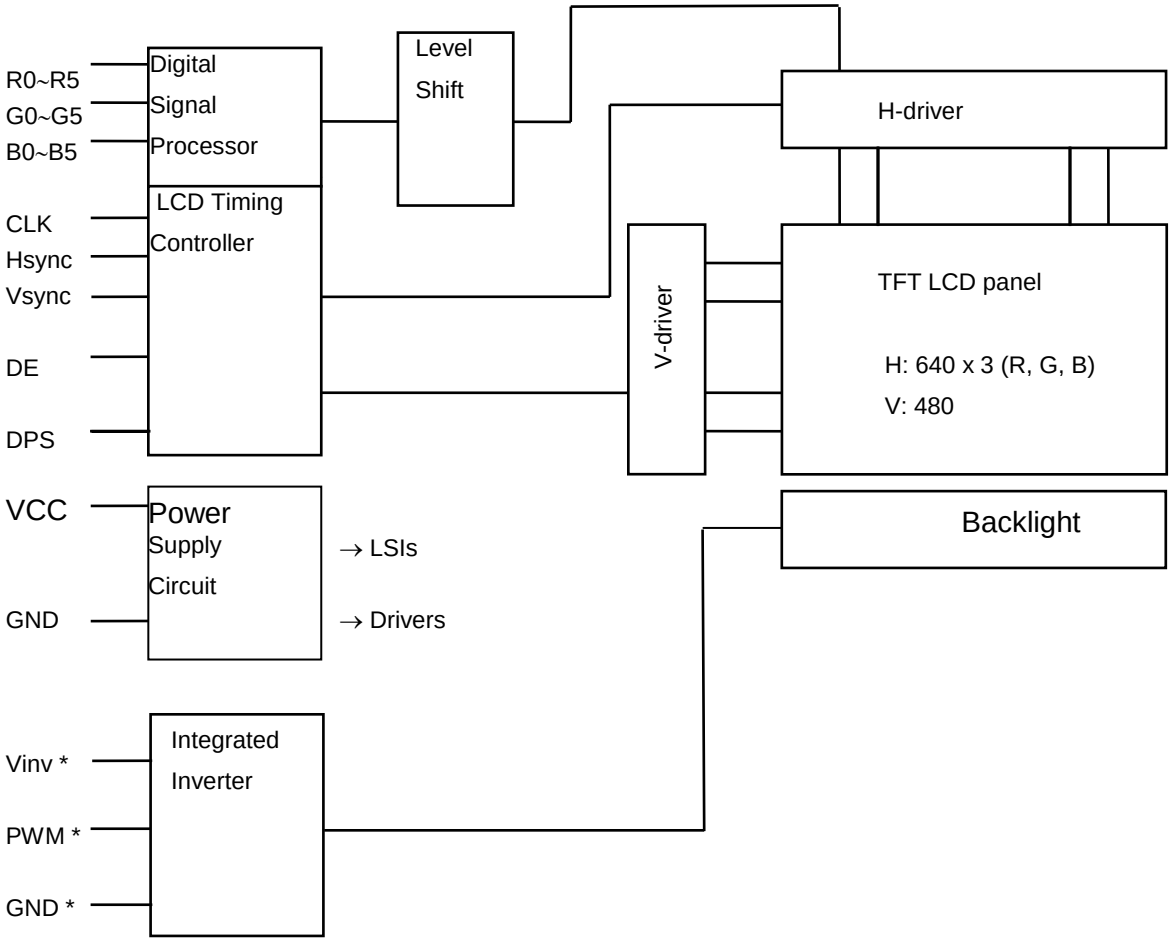
RGB (Red, Green, Blue) data signals are sent to LCD panel drivers after modulation into suitable forms for active matrix addressing through signal processor.

Each of the liquid crystal cells acts as an electro-optical switch that controls the incident light transmission by a signal applied to a signal electrode through the TFT switch.

5 OUTLINE OF CHARACTERISTICS

Display area	132.5 mm(H) × 99.4 mm(V)
Drive system	a-Si TFT active matrix
Display colors	262,144 colors
Number of pixels	640 × 480
Pixel arrangement	RGB, vertical stripe
Pixel pitch	0.207 mm(H) × 0.207 mm(V)
Module size	191 mm(H) × 123.3 mm(V) × 16 mm(D)
Weight	450 g (typ.)
Luminance	400 cd/m² (typ.)
Contrast ratio	900:1 (typ.)
Response time	13 ms (typ.), "white" to "black"
Signal system	6-bit digital signals for each of RGB primary colors, synchronous signals (hsync, vsync), Dot clock (CLK)
Supply voltage	5.0 V or 3.3 V (Logic, LCD driving), 12 VDC for integrated Inverter
Scanning direction	Vertical scanning is normal/reverse

6 BLOCK DIAGRAM



*** note 7-11** **INVERTER SPECIFICATIONS** PIN CONNECTION

7 SPECIFICATIONS

7-1 GENERAL SPECIFICATIONS

Item	Specifications	Unit
Module size	191 (H) × 123 (V) × 16 (D)	mm
Display area	132.5 (H) × 99.4 (V)	mm
Number of pixels	640×3 (H) × 480 (V)	pixel
Dot pitch	0.0690 (H) × 0.2070 (V)	mm
Pixel pitch	0.2070 (H) × 0.2070 (V)	mm
Pixel arrangement	RGB (Red, Green, Blue) vertical stripe	-
Display colors	262,144	color
Weight	450 (typ.)	g
connector	ODU Mini Fix SMT Serie 515 40pol.	

7-2 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Ratings	Unit	Remarks	
Supply voltage inverter	Vinv	typ. 12 VDC *4	V	Ta = 25°C	
Supply voltage	Vcc	-0.3 to 6.5	V	Ta = 25°C	
	V_{DD}	-0.3 to 6.5	V	VI – Vcc < 3.0	
Input voltage	Vi	-0.3 to Vcc +0.3	V		
Storage temp.	Tst	-45 to 90 *1	°C		
Operation temp.	Top	-25 to 70 *2	°C		
Humidity	RH	≤ 95% relative humidity *3		Ta ≤ 40°C	no condensation
		≤ 85% relative humidity *3		Ta ≤ 50°C	
		Absolute humidity shall not exceed Ta=50C°, 85% relative humidity level *3		Ta > 50°C	

*1: for 24h

*2: measured at center display area (Front side)

*3: without any protection

*4: specified values for inverter valid for fixed input of 12 VDC only

7-3 ELECTRICAL CHARACTERISTICS

(1) Logic, LCD driving Ta = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage	Vcc	4.75 (3.0)	5.0 (3.3)	5.25 (3.6)	V	-
Logic input "L" voltage	VIL	0	-	V_{cci}×0.3	V	CMOS level ‡2
Logic input "H" voltage	VIH	V_{cci}×0.7	-	Vcc	V	
Supply current	Icc	- -	200 ‡1 (320)	450 (600)	mA	Vcc = 5.0 V (Vcc = 3.3 V)

‡1: Checker flag pattern (in EIAJ ED-2522)

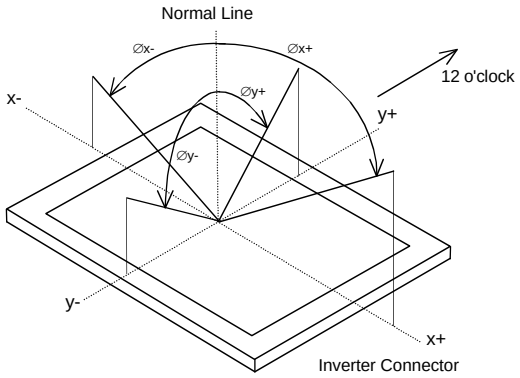
‡2: V_{cci} = 3.3 V, V_{cci} is given by an internal DC/DC converter.

7-4 OPTICAL CHARACTERISTICS

Ta = 25°C ± 5°C

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	∅x+	CR>10, ∅y = ±0°	-	65	-	deg.	note 1
		∅x-	CR>10, ∅y = ±0°	-	60	-	deg.	note 1
	Vertical	∅y+	CR>10, ∅x = ±0°	-	40	-	deg.	note 1
		∅y-	CR>10, ∅x = ±0°	-	55	-	deg.	note 1
Contrast ratio		CR	∅y=0°, ∅x=±0°	-	900	-	-	note 2
Response time		tpd	white to black black to white	- -	50 50	- -	ms	note 3
Luminance (center of screen)		Lw	at center		1200		cd/m^2	note 4
Dimming range Opt. Dimsens.		DR			1000 : 1 4 : 1			

note 1: Definitions of viewing angle are as follows. (matrix facing up, connector on the right side)



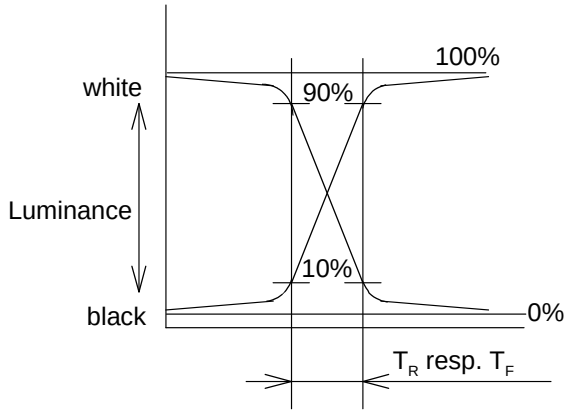
note 2: The contrast ratio is calculated by using the following formula:

$$\text{Contrast ratio} = \frac{\text{Brightness (Luminance) with all pixels in “White”}}{\text{Brightness(Luminance) with all pixels in “Black”}}$$

the brightness is measured in darkroom.

note 3: Definition of response time is as follows.

Photodetector output signal is measured when the brightness changes "white" to "black". Response time is the time between 10% and 90% of the photodetector output amplitude.

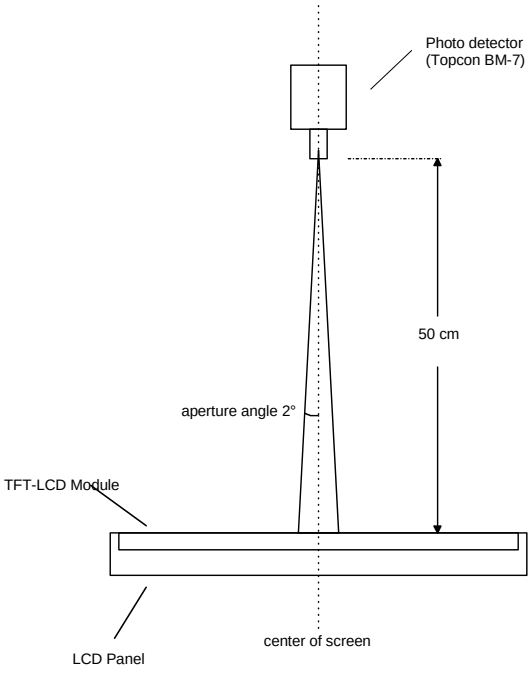


Reference data

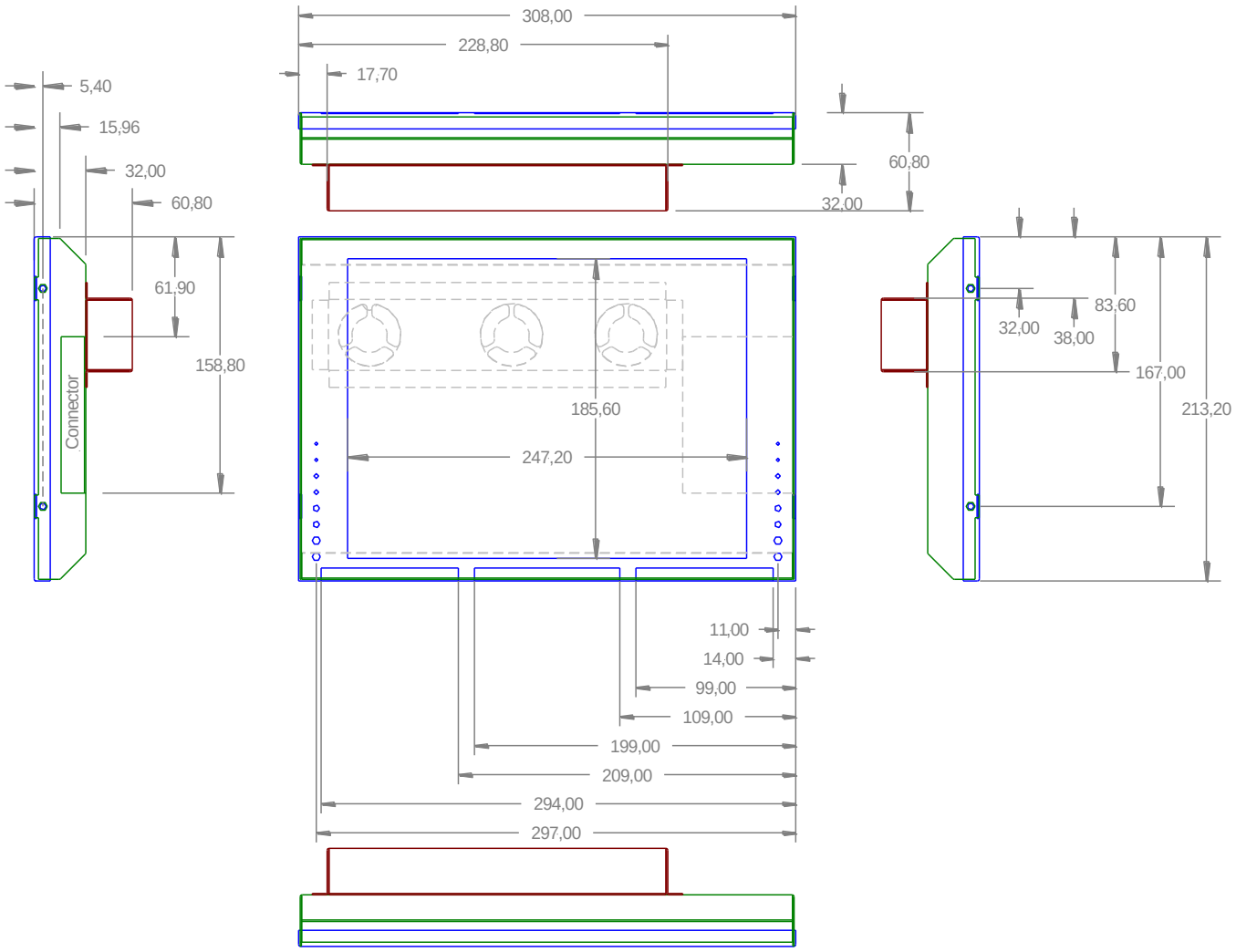
Ta = 0°C white to black tpd = 15 ms typ.

black to white tpd = 35 ms typ.

note 4: Brightness measurements setup.
measurement should be executed in a dark room 30 min.
after lightning the backlight. Matrix: off state.
The brightness is measured in the center of the screen.
Environment condition: T = 25 ± 2 °C, it has to be assured that a sufficient heat flow / air circulation is given



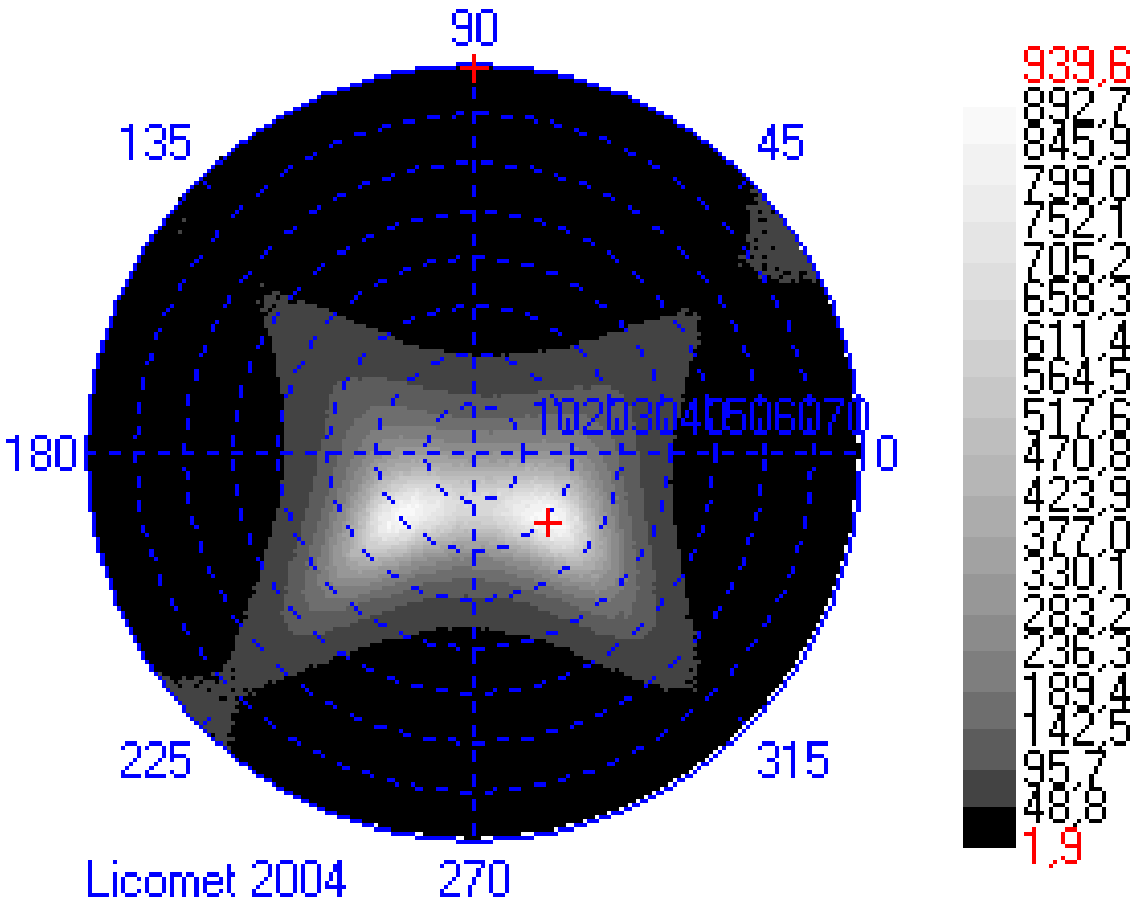
7-5 OUTLINE DIMENSIONS



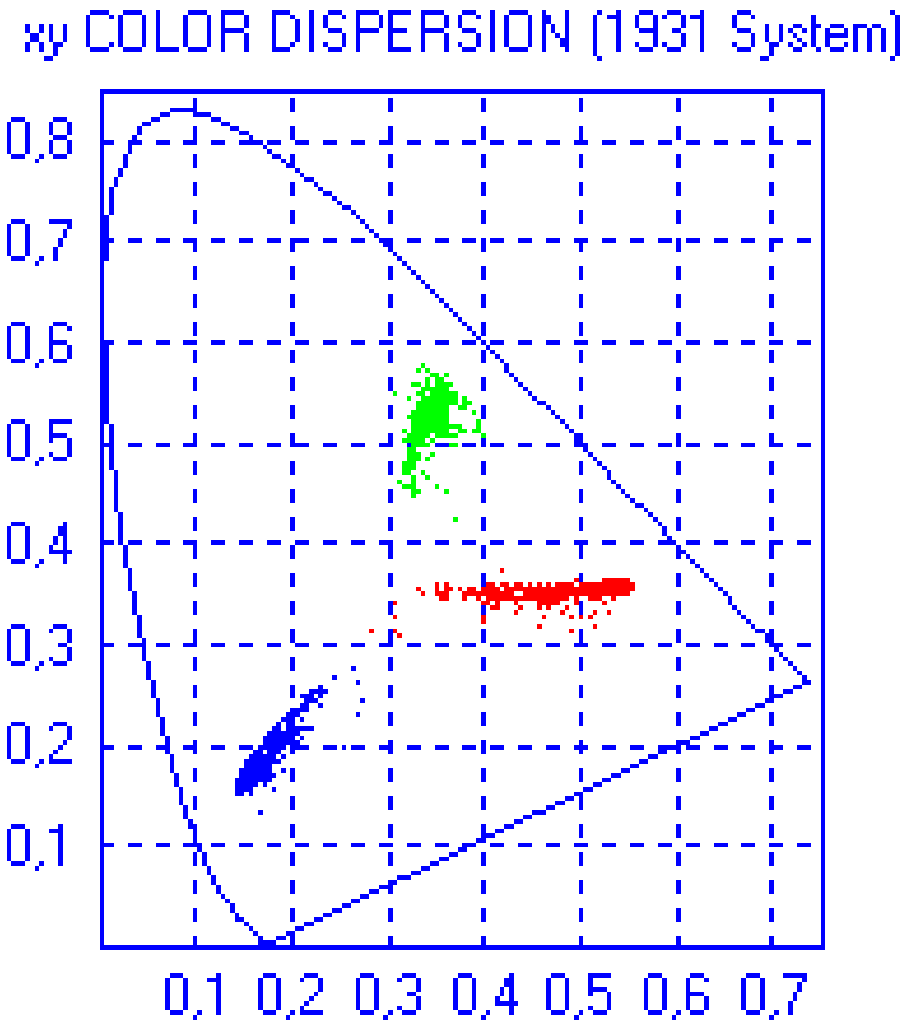
tolerances in DIN ISO 2768 T1 class m

7-6 MEASUREMENTS

7-6-1 CONTRAST



7-6-2 COLOR DISPERSION



7-7 DEFECT SPECIFICATIONS

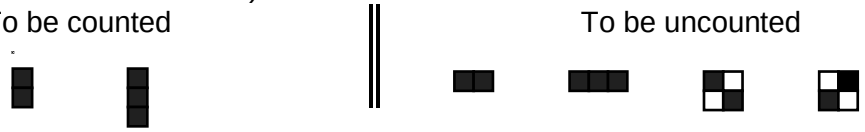
a)Inspection conditions

Distance : the distance between the inspector's eye and the LCD panel is 20cm.
Luminance : the distance between a 20-W fluorescent lamp and the LCD panel is 25-30 cm.
Temperature: Room temperature is 25C°±5C°.
Viewing angle:
Display specifications : $-20° \le \theta x \le +20°$, $0° \le \varnothing y \le +20$
Appearance specifications: $-45° \le \theta x \le +45°$, $-45° \le \varnothing y \le +45°$
Measuring light conditions: for Cold Cathode Fluorescent Lamp
Chromaticity coordinates (x = 0.320, y = 0325) typ.
Luminance of backlight surface for inspection: 1200 cd/m²

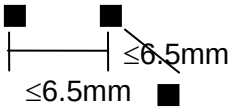
b)Display specifications

Item	Specifications			
Line defect	Not allowed			
Luminous dots *1	Color	Brightness	Distance between same color dots	Quantity
	Red, Green	F + H	-	R + G ≤ 6
		F	-	R ≤ 6 , G ≤ 3
	Blue	F + H	-	≤ 6
		F	-	≤ 6
	Red, Green, Blue	F	≤ 6.5 mm *4	R, G, B ≤ 0
			Linked two or more dots *3	R, G, B ≤ 0
Dark dots *2	Color	Distance between dark dots		Quantity
	Black	-		R + G + B ≤ 16 R, G, B ≤ 7
		Linked two dots *3		≤ 1 pair
		Linked three or more dots *3		≤ 0
		≤ 6.5 mm *4		≤ 0

*1 F: Full luminous dots (Bright point independent of viewing angle)
H: Half luminous dots (Bright point dependent on viewing angle)
Luminous dots are measured while the screen is black.
*2 Dark dots are measured while the screen is illuminated with Red, Green, or Blue.
*3 Linkage means linked two or more dots.
■(Luminous or Dark dot)



*4 ≤ 6.5 mm is considered with:
■ (:Luminous or Dark dot)



	To be counted	To be uncounted
Luminous dots	Same color	Different color
Dark dots	Same screen	Different screen

*5 The dot-amounts of linkage and <6.5 mm are counted when the dots are only full luminous.

c) Appearance specifications

Item	Specifications		
	Measurement criteria		Quantity
Other objects Stains Dust (dot shape)	Average diameter(∅) mm		Allowed value
	∅ ≤0.2		all allowed
	0.2< ∅ <0.3		≤10 points
	0.3< ∅ ≤0.5		≤ 3 points
	0.5< ∅ Linked other objects		0 point
Other objects Stains Dust (line shape)	Width(W) mm	Length(L) mm	
	W ≤ 0.05	-	all allowed
	0.05 ≤ W ≤ 0.1	L < 0.7	
		0.7 ≤ L ≤ 1.0	≤ 4 points
		1.0 < L	0 point
	0.1 < W	-	
Polarizer Bubbles	Average diameter(∅) mm		
Wrinkles Dent	∅ ≤ 0.5		< 2 points
Panel dent	∅ ≤ 0.5		< 2 points
Polarizer scratch	Remarkable scratches		0 point
Form	Specified labels and parts are put		

The relevant data for the values above are only valid under the conditions described in 7-9 “a”.