

5,0" Display touch module - BrightBond

RGB

This 5,0" multi-touch display panel impresses with its particularly high brightness of 900 cd/m² in combination with optical bonding and 10 finger detection.



EP Electronic Print assumes no responsibility for damage to this device resulting from improper use not specified in this specification. Please check all parameters mentioned in this specification before use.

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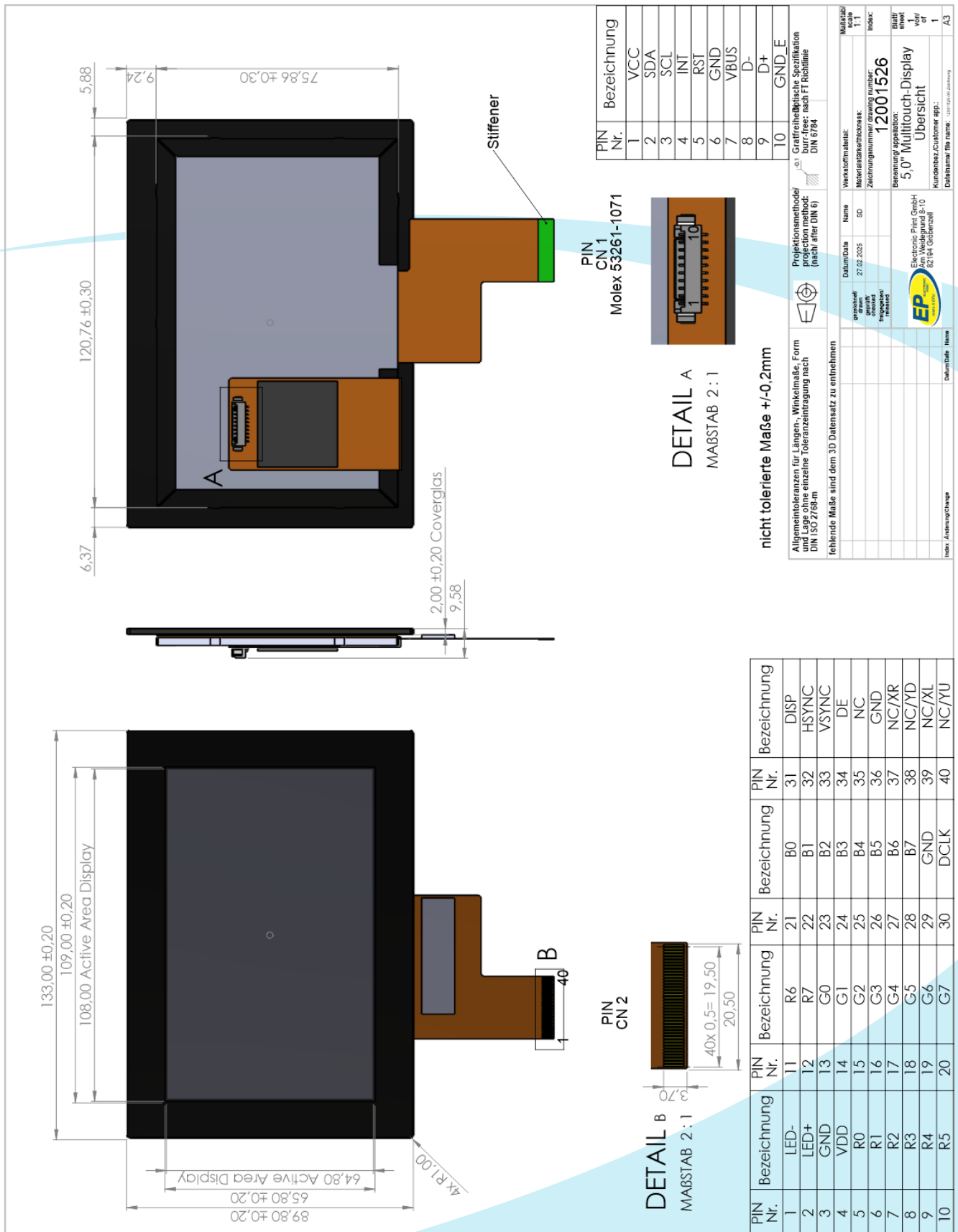
Revision	Description	page	Date
A	released	all	23.06.2025

1 General specification

1.1 Features and general description

General	Description	Unit	remark
module size	5,0	inch	diagonal
structure	GG+LCD, Optical Bonding		
resolution	800 (RGB)x480		
display mode	normally black, transmissive		
pixel pitch	0,135(W)x0,135(H)	mm	
pixel arrangement	RGB stripe		
viewing direction	ALL		
outline dimensions	133,00(W)x89,80(H)x9,06(D)	mm	W/O PCBA
active area	108,00(W)x64,8(H)	mm	
LCD interface	RGB		
CTP Interface	USB or I ² C		
CTP IC	EXC81W32		
Surface hardness	6	H	
Touch point	10		
Usability	cotton gloves	full functionality available	
	latex gloves	full functionality available	
	welding gloves	not usable	
	water	liquid is detected, no ghosting on pcap	
	electrolyte	liquid is detected, no ghosting on pcap	
	disinfectant	liquid is detected, no ghosting on pcap	
	oil	no impairment, full functionality available	

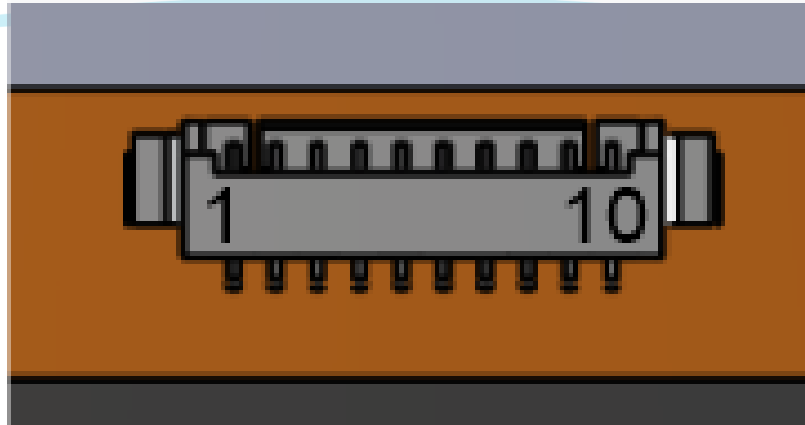
2 Mechanical drawing



3 Pin assignment

3.1 CTP Pin assignment

CN1: module side connector: Molex 53216-1071 or Compatible
user side connector Molex 51021-1000

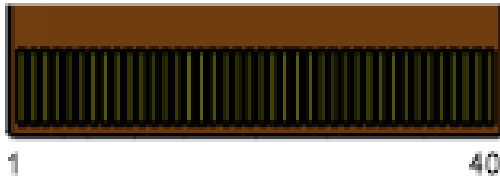


PIN	Symbol	Description
1	VCC	I ² C power supply: +3,3V
2	SDA	I ² C data signal
3	SCL	I ² C clock signal
4	INT	I ² C interrupt signal
5	RST	Reset pin, active low
6	GND	Power Ground
7	VBUS	USB Power Supply: +5V
8	D-	USB data port minus
9	D+	USB data port plus
10	GND_E	Power Ground

3.2 LCD Pin assignment

CN2: user side connector

Hirose FH12-40S-0.5SH



PIN	Symbol	Description
1	LED-	Power for LED Backlight (Cathode)
2	LED+	Power for LED Backlight (Anode)
3	GND	Ground
4	VDD	Power supply
5	R0	Red data, R0 is LSB
6	R1	Red data
7	R2	Red data
8	R3	Red data
9	R4	Red data
10	R5	Red data
11	R6	Red data
12	R7	Red data, R7 is MSB
13	G0	Green data, B0 is LSB
14	G1	Green data
15	G2	Green data
16	G3	Green data
17	G4	Green data
18	G5	Green data
19	G6	Green data
20	G7	Green data, G7 is MSB
21	B0	Blue data, B0 is LSB
22	B1	Blue data
23	B2	Blue data
24	B3	Blue data
25	B4	Blue data
26	B5	Blue data
27	B6	Blue data
28	B7	Blue data, B7 is MSB
29	GND	Ground
30	DCLK	Sample clock

PIN	Symbol	Description
31	DISP	Display ON/OFF control, internally pulled high
32	HSNC	Horizontal Sync input
33	VSNC	Vertical Sync input
34	DE	Data input enable
35	NC	not connected
36	GND	Ground
37	NC	not connected
38	NC	not connected
39	NC	not connected
40	NC	not connected

4 Absolute maximum rating

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Parameter	Symbol	MIN	MAX	UNIT
power supply voltage	VDD	-0,3	5,0	V
	VCC	-0,3	3,6	V
	VBUS	-0,5	5,5	V

Parameter	MIN	MAX	UNIT
operation temperature	-30	+80	°C
storage temperature	-30	+85	°C
relative humidity (non-condensing)		90	%RH

5 Electrical characteristics

5.1 Driving LCD panel

Parameter	Symbol	Values			Unit	Remark
		min	typ	max		
power supply voltage	VDD	3,0	3,3	3,6	V	Ta= 25°C
power supply current	I _{VDD}	-	70	-	mA	white picture
Input logic high voltage	V _{IH}	0,9xVDD	-	VDD	V	
Input logic low voltage	V _{IL}	0,0	-	0,1xVDD	V	

Note 1: VDD setting should match the signals output voltage of customer's system board.

5.2 CTP recommended operating condition

Parameter	Symbol	Values			Unit	Remark
		min	typ	max		
power supply voltage	VCC	3,0	3,3	3,6	V	Ta= 25°C
	Vbus	4,7	5,0	5,3	V	

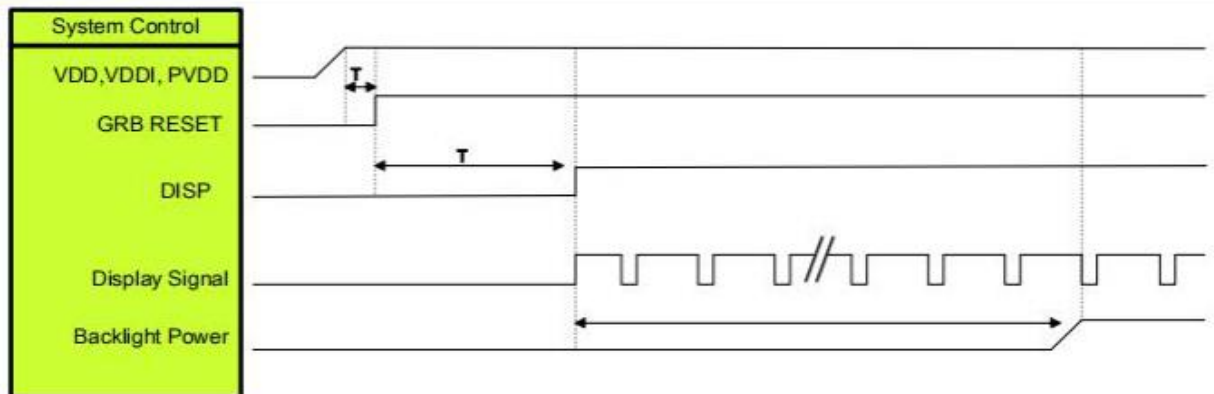
5.3 Driver LCD backlight

Parameter		Symbol	min	Typ	Max	Unit	Remark
power supply voltage		V_{LED}	10	12	15	V	Ta= 25°C
power supply current		I_{VLED}	-	150	200	mA	
EN signal voltage	High level	-	1,65	-	5,25	mA	
	Low level		0	-	0,4	V	
PWM contr. level	High level	-	1,65	-	5,25	V	
	Low level		0	-	0,4	V	
PWM frequency		F_{PWM}	100	-	20000	Hz	
PWM dimming duty		-	5	-	100	%	
LED Life time		-	20000	-	-	Hour	Note 1
power consumption		P_{LED}	-	1,8	-	W	

Note 1: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and 1/2 rated current . The LED lifetime could be decreased if operating IL is larger than 80 mA.

5.4 Power on sequence

Power On Sequence

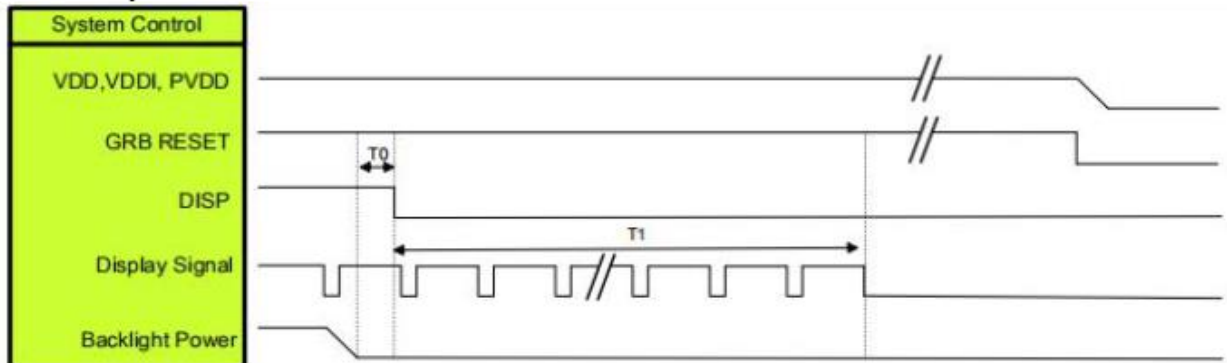


Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET = "High" to DISP = "High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Note: LVDS interface Display signal: DCLK P/N; RX[3:0]P/N

Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP = "Low"	5	ms
T1	DISP = "Low" to IC internal voltage discharge complete	100	ms

Note: RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

Note: LVDS interface Display signal: DCLK P/N; RX[3:0]P/N

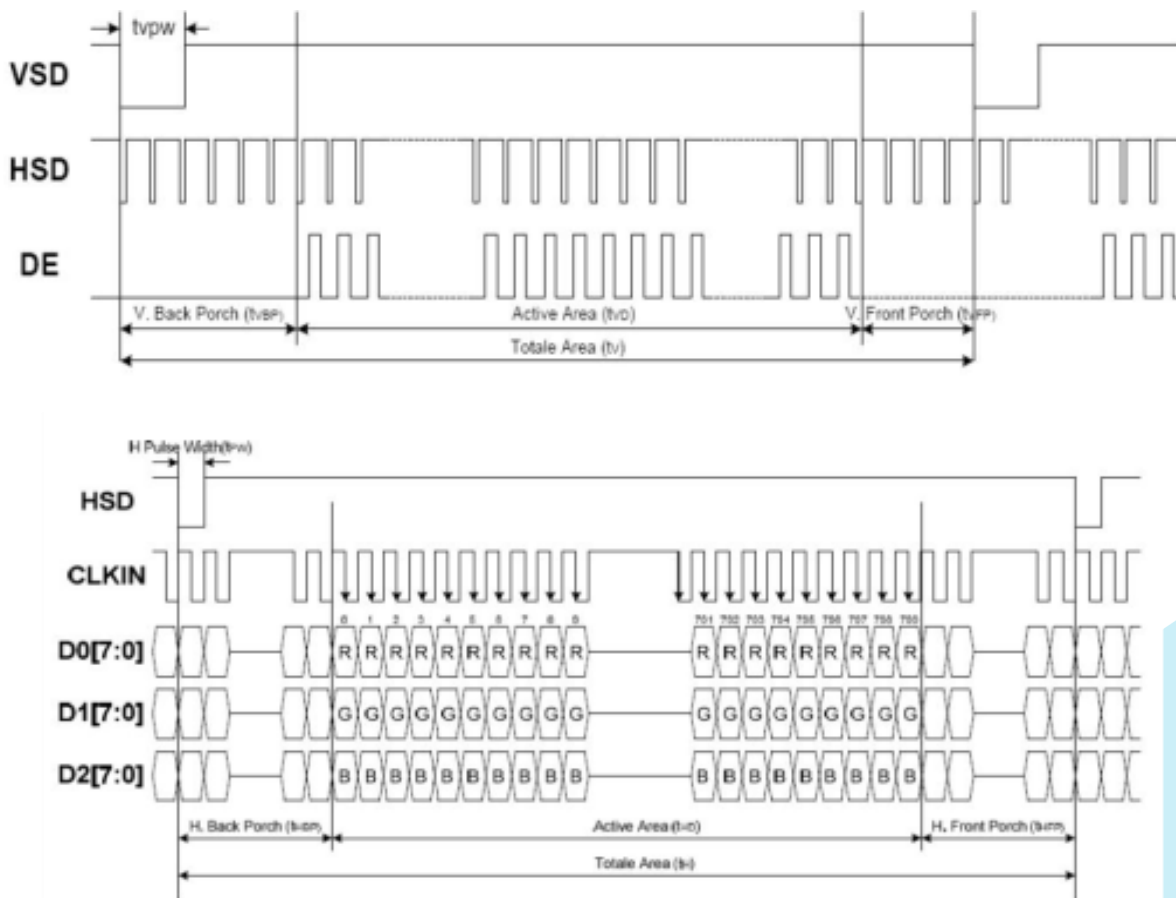
6 Signal timing specification

6.1 Timing controller

Parallel 24-bit RGB Input timing (PVDD=VDD=VDDI=3,3V/AGND=0V/ TA=25°C)

Parallel 24-bit RGB interface timing table						
Item	Symbol	min	Typ	Max	Unit	remark
DCLK frequency	Fclk	23	25	27	MHz	
HSYNC	period time	Th	808	816	848	DCLK
	display time	Thdisp	800		DCLK	
	back porch	Thbp	4	8	24	DCLK
	front porch	Thfp	4	8	24	DCLK
	pulse width	Thw	2	4	8	DCLK
VSYNC	period time	Tv	496	512	528	HSYNK
	display time	Tvdisp	480		HSYNK	
	back porch	TVbp	8	16	24	HSYNK
	front porch	Tvfp	8	16	24	HSYNK
	pulse width	Tvw	2	4	8	HSYNK

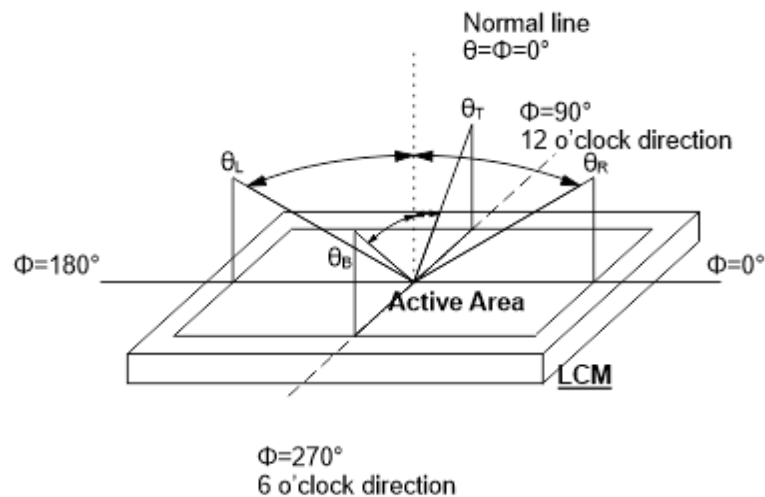
6.2 Data input format



7 Optical characteristics

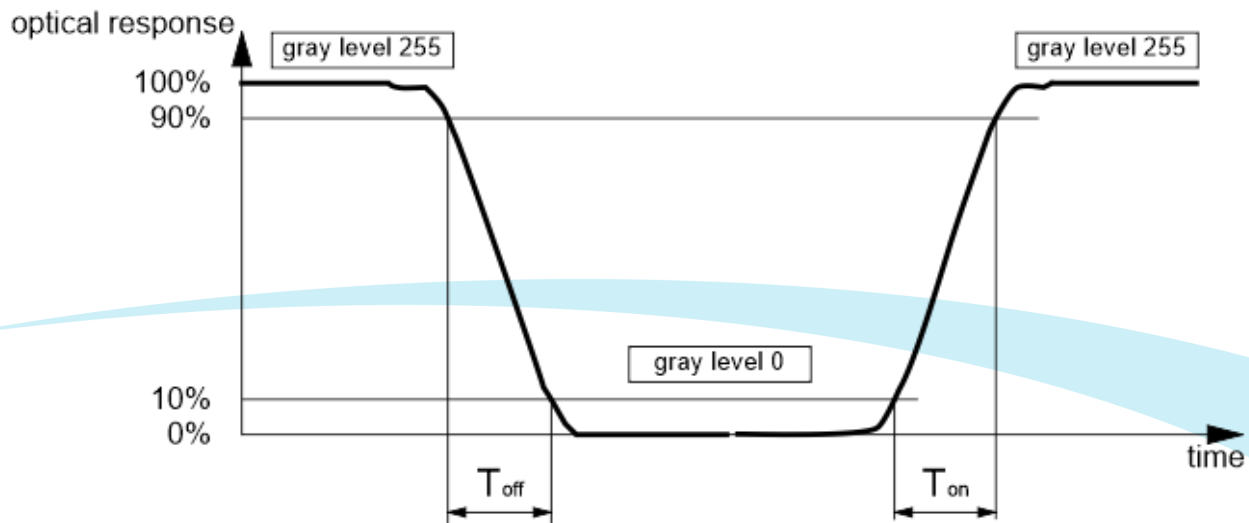
Item		Symbol	Cond.	min.	typ.	max.	Unit	Note
viewing angle (CR≥10)	horizontal	θ _{x+}	Φ=180° (9 o'clock)	70	80	-	°	1, 5
		θ _{x-}	Φ=0° (3 o'clock)	70	80	-	°	
	vertical	θ _{y+}	Φ=90° (12 o'clock)	70	80	-	°	
		θ _{y-}	Φ=270° (6 o'clock)	70	80	-	°	
luminance (W/CTP)		L _v	θx=0 θy=0	750	900	-	cd/m²	4, 5
uniformity		ΔY9		70	75	-	%	5, 6
contrast ratio		CR		700	1000	-		2, 5
color chromaticity (CIE1931)		W _x	θx=0 θy=0	0,26	0,31	0,36		1, 5
		W _y		0,30	0,35	0,40		
repose time	T _{off} +T _{on}				-	30	40	ms

Note 1: Definition of viewing angle ($\theta x=0$, $\theta y=0$)



Note 2: Definition of contrast ratio (CR)
The contrast ratio can be calculated by following expression:
Contrast ratio (CR) = L_{255}/L_0
with
L255: luminance of gray level 255
L0: luminance of gray level 0
CR= CR (5)
CR(X) is corresponding to the contrast ratio of point X at figure in note 6

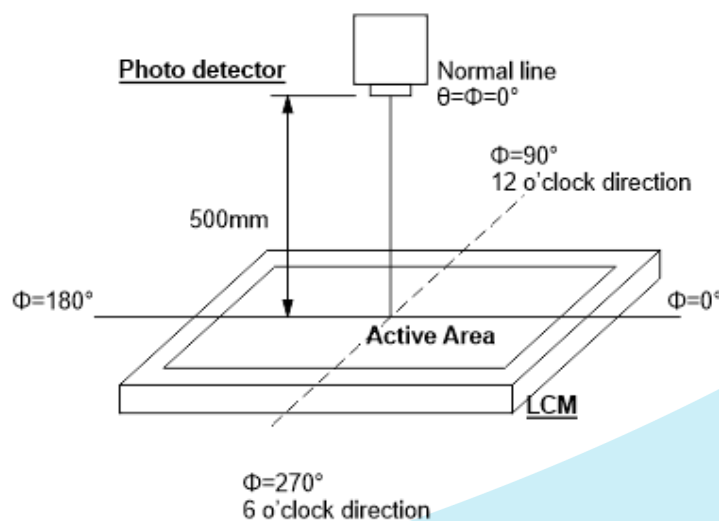
Note 3: Definition of reponse time (T_{on}, T_{off})



The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

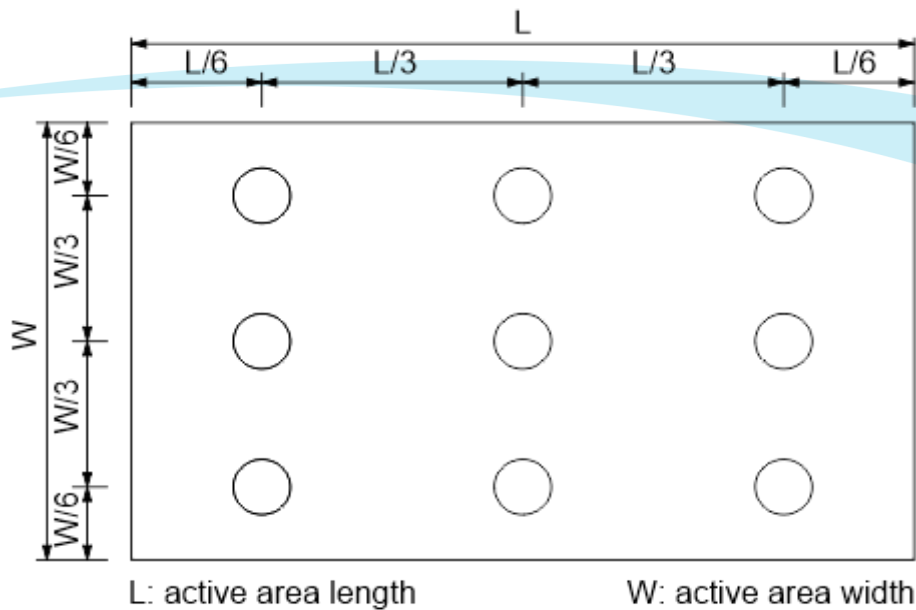
Note 4: Definition of luminance of white (LC)
measure luminance of gray level 255 at center point
 $LC = L(5)$
 $L(x)$ is corresponding to luminance of point X at figure in note 6.

Note 5: Measurement setup:
The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize luminance, measurement should be executed after lighting backlight for 30 minutes in a windless room.



Note 6: Definition of Luminance Uniformity:
Active area is divided into 9 measuring areas(Refer to Fig. 4-4). Every measuring point is placed at the center of each measuring area

$$\text{Luminance uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$



$B_{\min}$: The measured minimum luminance of all measurement position.

$B_{\max}$: The measured maximum luminance of all measurement position.

8 Reliability test

Test Item	Test conditions	Note
High temperatur storage test	85°C, 240 hours	1,3,4,5
Low temperatur storage test	-30°C, 240 hours	1,3,4
High temperatur operation test	85°C, 240 hours	2,3,4,5
Low temperatur operation test	-30°C, 240 hours	1,3,4
High temperature and high humidity operation test	60°C, 90%RH, 240 hours	3,4,5
Thermal shock (no operation)	-30°C/30 min ~ +80°C/30 min, change time: 5 min, for a total of 100 cycles. Starting with low temperature and ending with high temperature.	3,4,5
Vibration test	Sweep: 10Hz~55Hz~10Hz 2G 2 hours for each direction of X. Y. Z. (6 hours for total)	
ESD	Contact: ±4kV, Air: ±8kV (R=330R, C=150pF)	EN 61000-x-x

Note 1: Ta is the ambient temperature of samples

Note 2: Ts is the temperature of panel's surface

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 5: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura. The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.

9 Appearance inspection

9.1 Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below

Major defect:	Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..
Minor defect:	A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc

The criteria on major or minor judgment will be according with the classification of defects.

9.2 Inspection conditions

The environmental condition and visual inspection shall be conducted as below.

Light:	Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 30~40cm or more between the LCD module and inspectors eyes Ambient Illumination : 500~600Lux for external appearance inspection Ambient Illumination : 200~500 Lux for light on inspection
Inspection background:	black and white board below product
Inspection distance:	20-30 cm between inspectors eye and inspected surface
Inspection angle:	a) ± 45 degree to the front surface of display panel in vertical direction. b) ± 45 degree to the front surface of display panel in horizontal direction.
Ambient temperature:	25 $\pm$ 5 °C
Humidity:	25~75 % RH

9.3 Defect code comparison table

Code	Name (unit)	Code	Name (unit)
N	number	D	diameter (mm)
L	length (mm)	H	depth (mm)
W	width (mm)	S	distance (mm)
S	area (mm ²)		

9.4 Inspection precaution

1. Inspector must wear finger gloves and electrostatic bracelets
2. Product in front of inspector
3. Product must be handled carefully, use both hands
4. Do not bend product

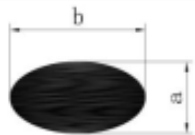
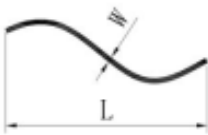
9.5 Product region division

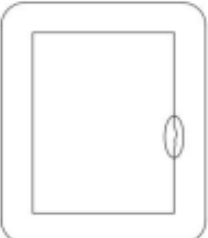
Divide the product into 9 parts. The centerpart is defined as area A, surrounding areas as B

B	B	B
B	A	B
B	B	B

9.6 Inspection standards for modules

CTP and LCD fitting components

Items	Standard	Conclusion	inspection tool
Dot (white, black, heterochromatic)  $D = (a+b)/2$	A	$D \leq 0,15$ $0,15 < D \leq 0,3$ $D > 0,3$ ng	visual inspection
	B	$D \leq 0,2$ $0,2 \leq D \leq 0,5$ $D > 0,5$ ng	
		$D \leq 0,15$ can be disregarded allowed, if distance to another dent or bubble is bigger 15 mm	
		$D \leq 0,2$ can be disregarded allowed, if distance to another dent or bubble is bigger 15 mm	
		$D \leq 0,2$ can be disregarded allowed, if distance to another dent or bubble is bigger 15 mm	
		$D \leq 0,2$ can be disregarded allowed, if distance to another dent or bubble is bigger 15 mm	
Linear defects (fibers/ foreign bodies/ scratches, etc) 	A	$W \leq 0,04$ $0,04 < W \leq 0,06$ $0,06 < W \leq 0,09$ $W > 0,09, L > 6$ ng	visual inspection
	B	$W \leq 0,05$ $0,05 < W \leq 0,07$ $0,07 < W \leq 0,1$ $W > 0,125, L > 8$ ng	
		$W \leq 0,04$ can be disregarded allowed, if $L \leq 6$ and distance to another scratch or impurity is bigger than 15 mm	
		allowed, if $L \leq 6$ and distance to another scratch or impurity is bigger than 15 mm allowed, if $L \leq 6$ and distance to another scratch or impurity is bigger than 15 mm allowed, if $L \leq 6$ and distance to another scratch or impurity is bigger than 15 mm allowed, if $L \leq 6$ and distance to another scratch or impurity is bigger than 15 mm	
		$W \leq 0,05$ can be disregarded allowed, if $L \leq 7$ and distance to another scratch or impurity is bigger than 15 mm	
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		$W \leq 0,05$ can be disregarded allowed, if $L \leq 7$ and distance to another scratch or impurity is bigger than 15 mm	
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bubble	A	inspection according to point standard	visual inspection
	B	inspection according to point standard	
broken edge loss 	B	1. sensor edge cracks without damaging the line, funktion test passed and front side is not visible after fitting 2. Edge creak on front of coverglas: ng 3. Back: $X < 1,5$ mm, $Y < 1,5$ mm, $Z < GT$ (GT = thickness of coverglas), without affecting functionality: one allowed each side, maxi. two in total.	visual inspection
broken corner loss 	B	1. sensor edge cracks without damaging the line, funktion test passed and front side is not visible after fitting 2. Edge creak on front of coverglas: ng 3. Back: $X < 1,5$ mm, $Y < 1,5$ mm, $Z < GT$ (GT = thickness of coverglas), without affecting functionality: one allowed each side, maxi. two in total.	

Items		Standard	Conclusion	inspection tool
creak	A + B		ng	visual inspection
Newton`s rings	A		less than 1/3 of display area, light up invisible. If there are special requirements, a limited sample should be revaild	
panel color	A + B		consistent with sample, no serious color diffence	
size	B		product drawings	
Inkhole 	B	$D \leq 0,25$	Distance bigger than 15 mm: paint can be repaired with paint pen of the same color as Color of coverglas	visual inspection
Ink sawtooth 	A + B	$W > 0,2, L > 1$	distance between two serrations near VA is bigger than 50 mm, two serrations are allowed.	
circular white mura, lummination mura, black/white mura, etc.	B		less than 50% should be perceived refering to 5% ND filter, or a limited sample should be revaild	visual inspection

10 Notices

10.1 Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

10.2 Storage

Store in dark rooms! Storage temperature must be kept at $25\pm 10^{\circ}\text{C}$ and 65%RH (or less).

Do not store in surroundings containing organic solvent or corrosive gas.

Store in an anti-electrostatic container or bag.

10.3 Handling

Do not put heavy, hard or sharp objects on the product!

Do not bend in order to assure flexibility of the product!

Do not put a product on another! Products might be scratched or damaged.

Do not leave module in direct sunlight to avoid malfunction of the ICs

10.4 Operation

Light transmission is an important factor of the product. Please wear clean finger sacks, gloves and mask to protect surface from fingerprint or stain attach. Please ensure to touch the product outside viewing area, when handling the panel.

10.5 Cleaning

Do not use any organic solvent acid or alkali solution to clean the surface.

Use dry and soft foot-free cloths and Ethanol to clean the surface.

10.6 Others

1. Please note, that dew gathering inside the panel due to abrupt temperature or humidity change may cause deterioration of performance.
2. Although full care is taken, to ensure product quality, failure modes as degradation, short circuits or open circuits might be caused. Therefore please study effects of any single failure of the panel and consider the safety of the product configuration.