

LIQUID CRYSTAL DISPLAY MODULE

Product Specification

CUSTOMER	Standard
CUSTOMER PART NUMBER	
PRODUCT NUMBER	DMT043QQNTCMI-1A

Authorised By	Created By
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Date: 11-July-17	Date: 11-July-17

TABLE OF CONTENTS

1	MAIN FEATURES	4
2	MECHANICAL SPECIFICATION	5
2.1	MECHANICAL CHARACTERISTICS.....	5
2.2	MECHANICAL DRAWING.....	6
3	ELECTRICAL SPECIFICATION	7
3.1	ABSOLUTE MAXIMUM RATINGS.....	7
3.2	DC ELECTRICAL CHARACTERISTICS	8
3.3	INTERFACE PIN ASSIGNMENT	9
3.4	TIMING CHARACTERISTICS	11
3.5	POWER SEQUENCE	19
4	OPTICAL SPECIFICATION	20
4.1	OPTICAL CHARACTERISTICS	20
5	BACKLIGHT SPECIFICATION	22
5.1	LED DRIVING CONDITIONS	22
5.2	LED CIRCUIT	22
6	QUALITY ASSURANCE SPECIFICATION	23
6.1	DELIVERY INSPECTION STANDARDS	23
6.2	DEALING WITH CUSTOMER COMPLAINTS.....	29
7	RELIABILITY SPECIFICATION	30
7.1	RELIABILITY TESTS.....	30
8	HANDLING PRECAUTIONS	31

REVISION RECORD

Rev.	Date	Page	Chapt.	Comment	ECN no.
1.0	11-July-17			Initial Release	

1 MAIN FEATURES

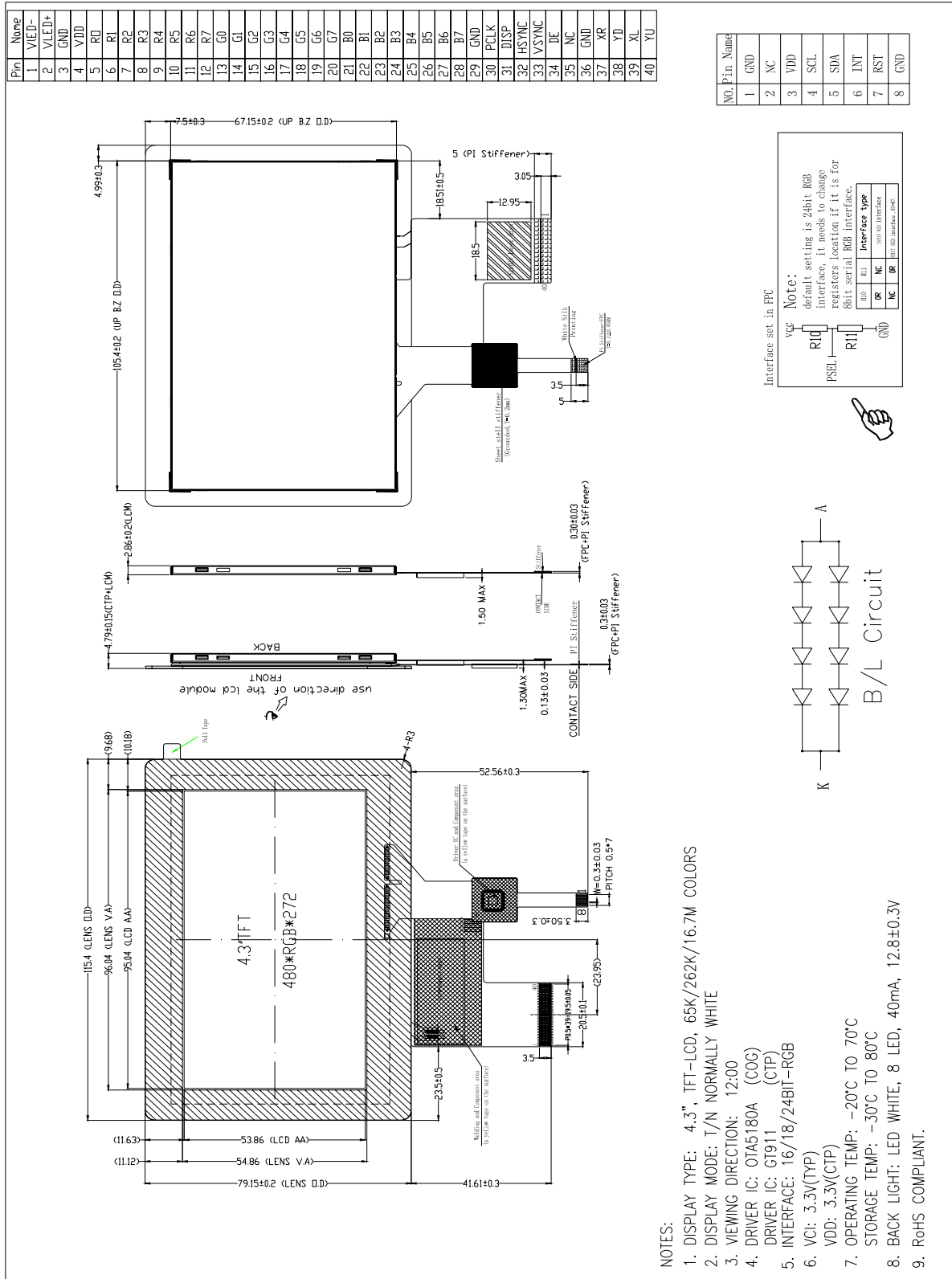
ITEM	CONTENTS
Screen Size	4.3" Diagonal
Display Format	480 x RGB x 272 Dots
N° of Colour	65K/262K/16.7M
TFT Active Area	95.04 mm (H) x 53.86 mm (V)
PCT View Area	96.04 mm (H) x 54.86 mm (V)
LCD Type	TFT
Mode	TN / Normally white
Viewing Direction	12 O'Clock
TFT Interface	16/18/24-Bit RGB interface
PCT Interface	I2C
TFT Driver IC	OTA5180A
PCT Driver IC	GT911
Simultaneous Touch Points	5
Backlight Type	LED
Operating Temperature	-20°C ~ +70°C
Storage Temperature	-30°C ~ +80°C
RoHS compliant	Yes

2 MECHANICAL SPECIFICATION

2.1 MECHANICAL CHARACTERISTICS

ITEM	CHARACTERISTIC	UNIT
Overall Dimensions	115.4mm (H) x 79.15 mm (V) x 4.79 mm (D)	mm
pixel Pitch	0.198 (H) x 0.198 (V)	mm
Weight	72.9	g

2.2 MECHANICAL DRAWING



3 ELECTRICAL SPECIFICATION

3.1 ABSOLUTE MAXIMUM RATINGS

3.1.1 TFT

Item	Symbol	Condition	Min	Max	Unit	Note
Power Supply Voltage	VDD	Ta=25°C	-0.3	7.0	V	
Operating Temperature	TOP		-20	70	°C	1
Storage Temperature	TST		-30	80	°C	1,2,3

Note 1. 90 % RH Max for Ta<50 °C, and 60% RH for Ta≥50°C.

Note 2. In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the colour of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's characteristic.

Note 3. Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at +25°C.

3.1.2 PCT

Item	Symbol	Condition	Min	Max	Unit	Note
Power Supply Voltage	VDD	Ta=25°C	2.66	3.47	V	4
Operating Temperature	TOP		-20	70	°C	-
Storage Temperature	TST		-30	80	°C	-

Note 4. If used beyond the absolute maximum ratings, GT911 may be permanently damaged. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the condition not within the electrical characteristics, it may affect the reliability of the device.

3.2 DC ELECTRICAL CHARACTERISTICS

3.2.1 TFT

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	VDD		3.0	3.3	3.6	V	
Input Voltage for Logic	VIH		0.7 VDD	-	VDD	V	
	VIL		GND	-	0.3 VDD	V	
Output Voltage for Logic	VOH		0.8 VDD	-	VDD	V	
	VOL		GND	-	0.2 VDD	V	
Current Consumption	IDD		-	25	-	mA	1

Note 1: The specified power consumption is under the conditions of VDD=3.3V, FV=60Hz.

3.2.2 PCT

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	VDD		2.66	3.3	3.47	V	
Input Voltage for Logic	VIH		0.75VDDIO	-	VDDIO+0.3	V	
	VIL		-0.3	-	0.25VDDIO	V	
Output Voltage for Logic	VOH		0.85VDDIO	-	-	V	
	VOL		-	-	0.15VDDIO	V	
Normal operation mode Current Consumption	IOPR		-	8	14.5	mA	
Green mode Current Consumption	IMON		-	3.3	-	mA	
Sleep mode Current Consumption	ISLP		70	-	120	uA	
Doze mode Current Consumption	IDOZ		-	0.78	-	mA	

3.3 INTERFACE PIN ASSIGNMENT

3.3.1 LCM PIN ASSIGNMENT

Pin NO.	Symbol	Function
1	LED -	Cathode pin OF backlight
2	LED +	Anode pin of backlight
3	GND	Ground.
4	VDD	Supply voltage(3.3V).
5	R0	Red data input.
6	R1	Red data input.
7	R2	Red data input.
8	R3	Red data input.
9	R4	Red data input.
10	R5	Red data input.
11	R6	Red data input.
12	R7	Red data input.
13	G0	Green data input.
14	G1	Green data input.
15	G2	Green data input.
16	G3	Green data input.
17	G4	Green data input.
18	G5	Green data input.
19	G6	Green data input.
20	G7	Green data input.
21	B0	Blue data input.
22	B1	Blue data input.
23	B2	Blue data input.
24	B3	Blue data input.

Pin NO.	Symbol	Function
25	B4	Blue data input.
26	B5	Blue data input.
27	B6	Blue data input.
28	B7	Blue data input.
29	GND	Ground.
30	PCLK	Clock signal. Latching data at the rising edge
31	DISP	Standby setting for testing, it should be connected to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode.
32	HSYNC	Horizontal Sync input. Negative polarity.
33	VSYNC	Vertical Sync input. Negative polarity.
34	DE	Data input Enable. Active High to enable the data input Bus under "DE Mode".
35	NC	Not Connected
36	GND	Ground.
37	XR(NC)	Resistive touch panel Right Glass Terminal(Not Connected)
38	YD(NC)	Resistive touch panel Bottom Film Terminal(Not Connected)
39	XL(NC)	Resistive touch panel LIFT Glass Terminal(Not Connected)
40	YU(NC)	Resistive touch panel Top Film Terminal(Not Connected)

3.3.2 PCT PIN ASSIGNMENT

Pin NO.	Symbol	Function
1	GND	Ground.
2	NC	NC
3	VDD	Supply voltage.
4	SCL	I2C clock input.
5	SDA	I2C data input and output
6	INT	External interrupt to the host.
7	RST	External Reset, Low is active.
8	GND	Ground.

3.4 TIMING CHARACTERISTICS

Please refer to IC OTA5180A datasheet for more information

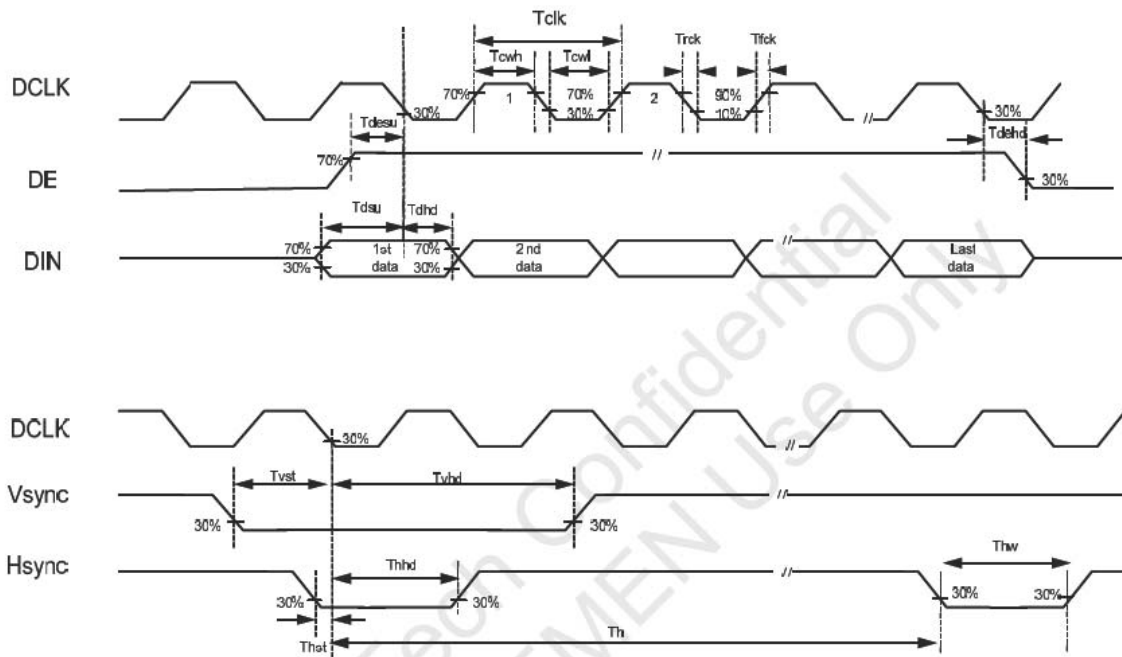
3.4.1 Input signal characteristics

AC Electrical Characteristics

VDDIO=1.8V, VDD = 3.3V, AVDD = 6V, AGND = 0V, T_A = -20°C to 80°C

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK pulse duty	T _{cw}	40	50	60	%	
Hsync width	T _{hw}	1.0	-	-	DCLK	
Hsync period	T _h	55	60	65	us	
Vsync setup time	T _{vst}	12	-	-	ns	
Vsync hold time	T _{vhd}	12	-	-	ns	
Hsync setup time	T _{hst}	12	-	-	ns	
Hsync hold time	T _{hhd}	12	-	-	ns	
Data set-up time	T _{dsu}	12	-	-	ns	
Data hold time	T _{dhd}	12	-	-	ns	
DE set-up time	T _{desu}	12	-	-	ns	
DE hold time	T _{dehd}	12	-	-	ns	
SD output stable time	T _{st}	-	10	12	us	
GD output rise and fall time	T _{gst}	-	500	1000	ns	
Serial communication						
Delay between CSB and Vsync	T _{cv}	1			us	
CS input setup time	T _{s0}	50			ns	
Serial data input setup time	T _{s1}	50			ns	
CS input hold time	T _{h0}	50			ns	
Serial data input hold time	T _{h1}	50			ns	
SCL pulse high width	T _{wh1}	50			ns	
SCL pulse low width	T _{wl1}	50			ns	
CS pulse high width	T _{w2}	400			ns	

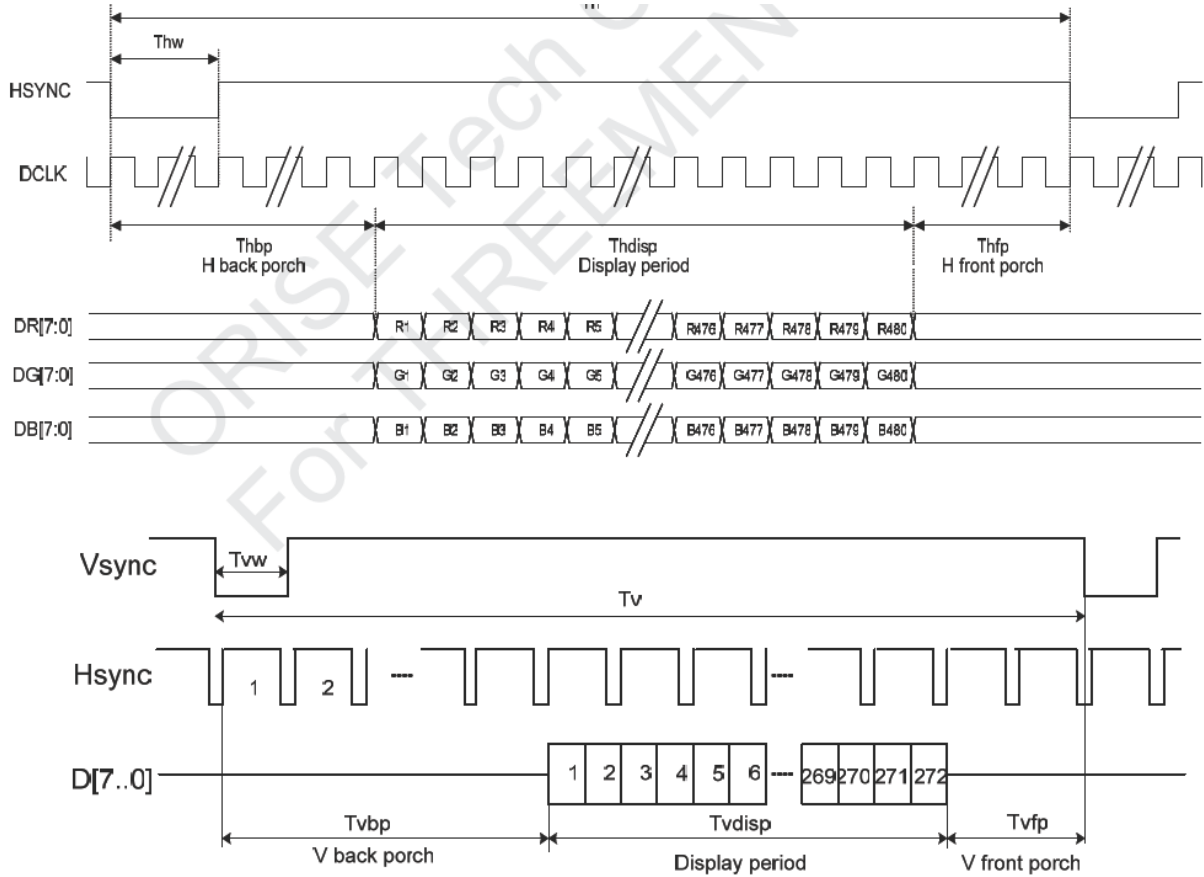
3.4.2 RGB Interface Timing Characteristics



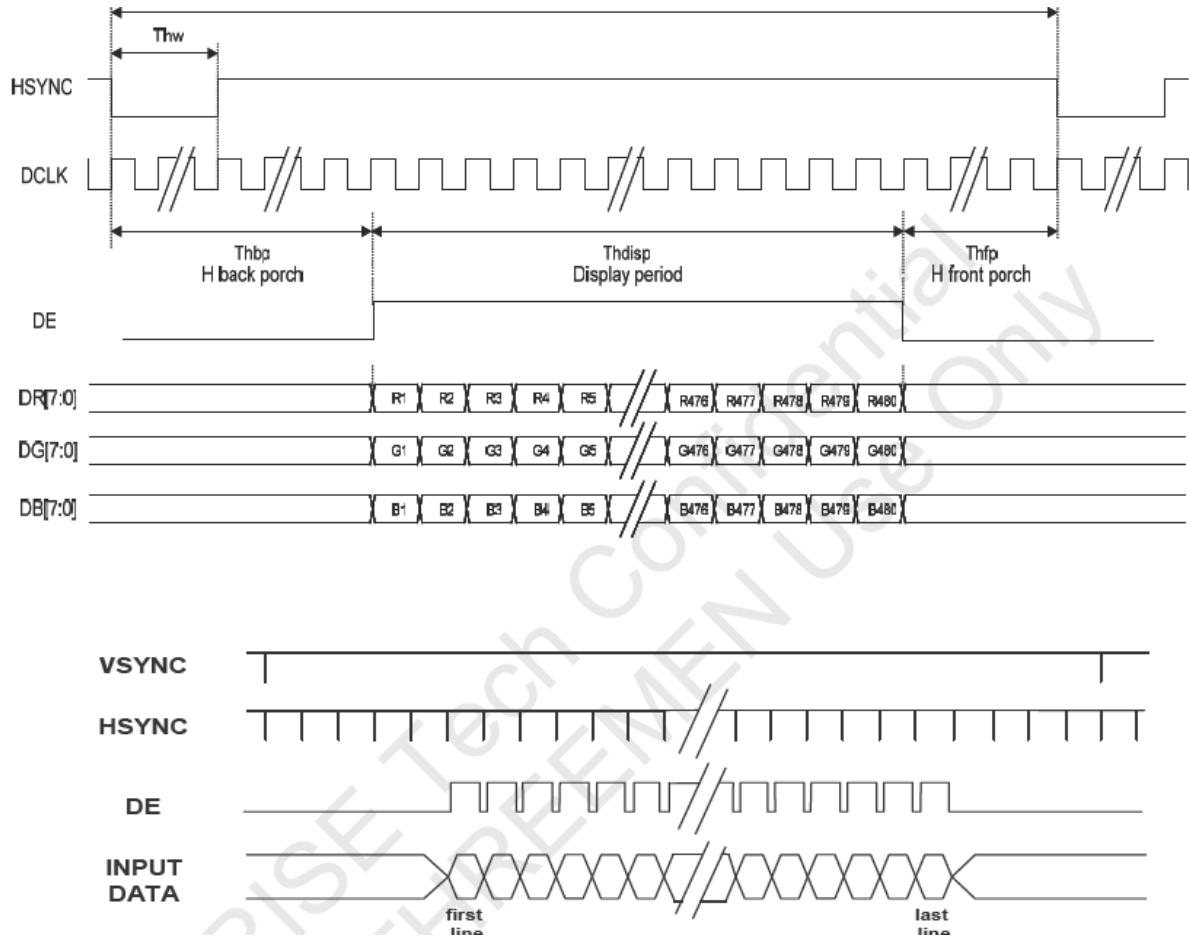
3.4.3 Parallel RGB Timing Input table

Item	Symbol	Min.	Typ.	Max.	Unit		
DCLK Frequency	Fclk	5	9	12	MHz		
DCLK Period	Tclk	83	110	200	ns		
Hsync	Period Time	Th	490	531	605	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	8	43		DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8		DCLK	
	Pulse Width	Thw	1			DCLK	
Vsync	Period Time	Tv	275	288	335	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12		H	By V_BLANKING setting
	Front Porch	Tvfp	1	4		H	
	Pulse Width	Tvw	1	10		H	

3.4.4 SYNC Mode Timing Diagram

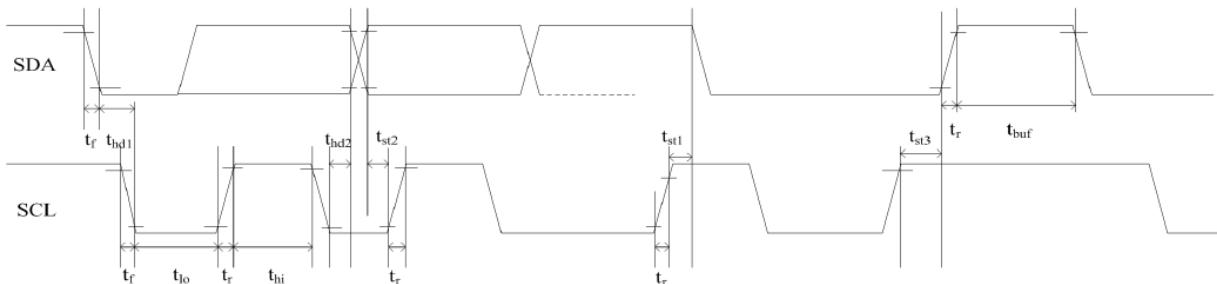


3.4.5 SYNC-DE Mode Timing Diagram



3.4.6 PCT I2C Interface Timing

GT911 provides a standard I2C interface for SCL and SDA to communicate with the host. GT911 always serves as slave device in the system with all communication being initialized by the host. It is strongly recommended that transmission rate be kept at or below 400Kbps. The I2C timing is shown below:



Test condition 1: 1.8V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

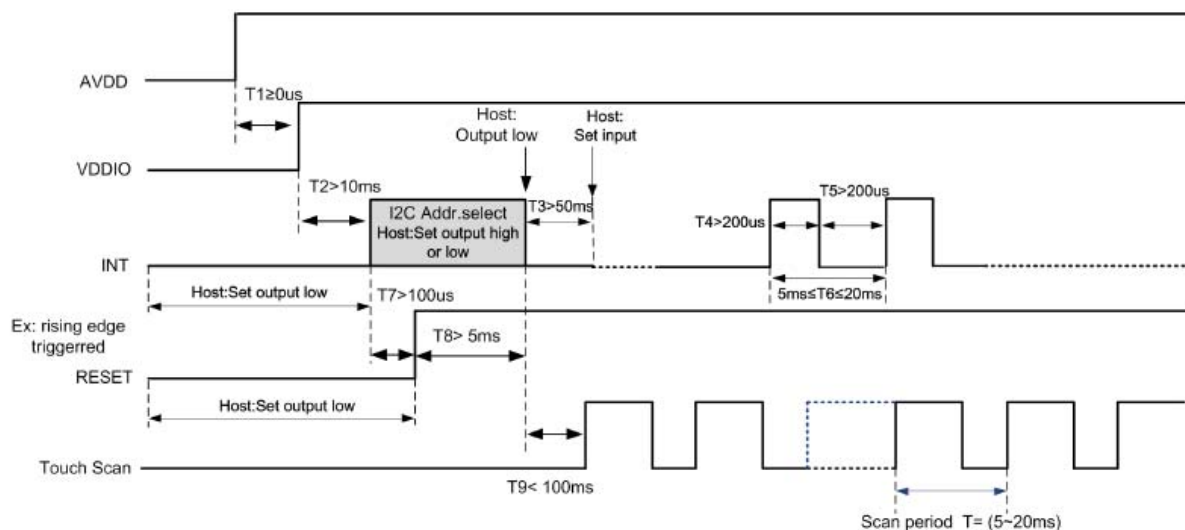
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	US
SCL high period	t_{hi}	0.6	-	US
SCL setup time for Start condition	t_{st1}	0.6	-	US
SCL setup time for Stop condition	t_{st3}	0.6	-	US
SCL hold time for Start condition	t_{hd1}	0.6	-	US
SDA setup time	t_{st2}	0.1	-	US
SDA hold time	t_{hd2}	0	-	US

Test condition 2: 3.3V host interface voltage, 400Kbps transmission rate, 2K pull-up resistor

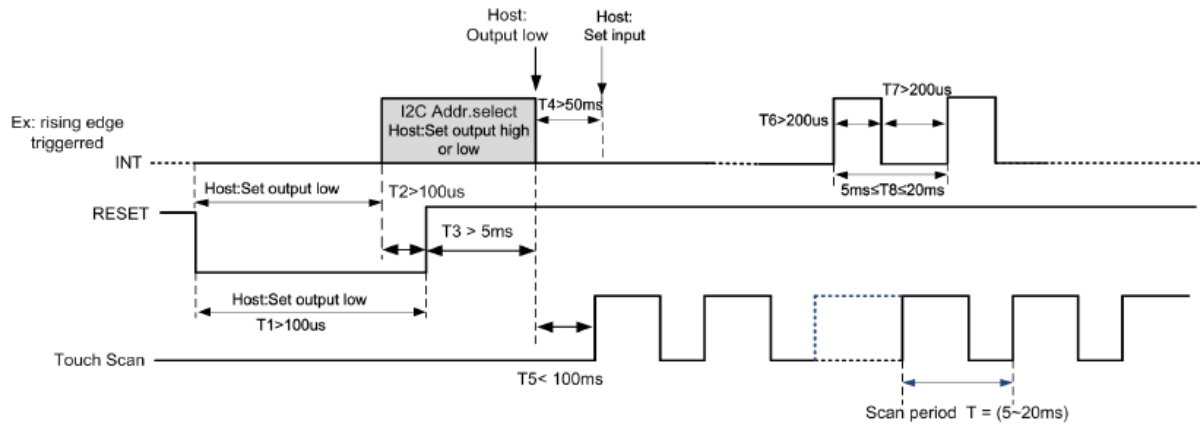
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	US
SCL high period	t_{hi}	0.6	-	US
SCL setup time for Start condition	t_{st1}	0.6	-	US
SCL setup time for Stop condition	t_{st3}	0.6	-	US
SCL hold time for Start condition	t_{hd1}	0.6	-	US
SDA setup time	t_{st2}	0.1	-	US
SDA hold time	t_{hd2}	0	-	US

GT911 supports two I2C slave addresses: 0XBA/0Xbb and 0x28/0x29. The host can select the address by changing the status of Reset and INT pins during the power-on initialization phase. See the diagram below for configuration methods and timings:

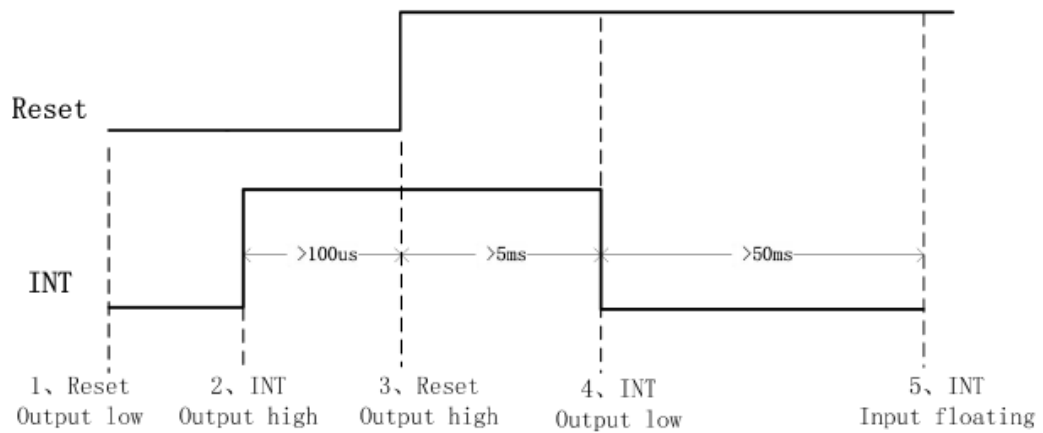
Power-On Timing:



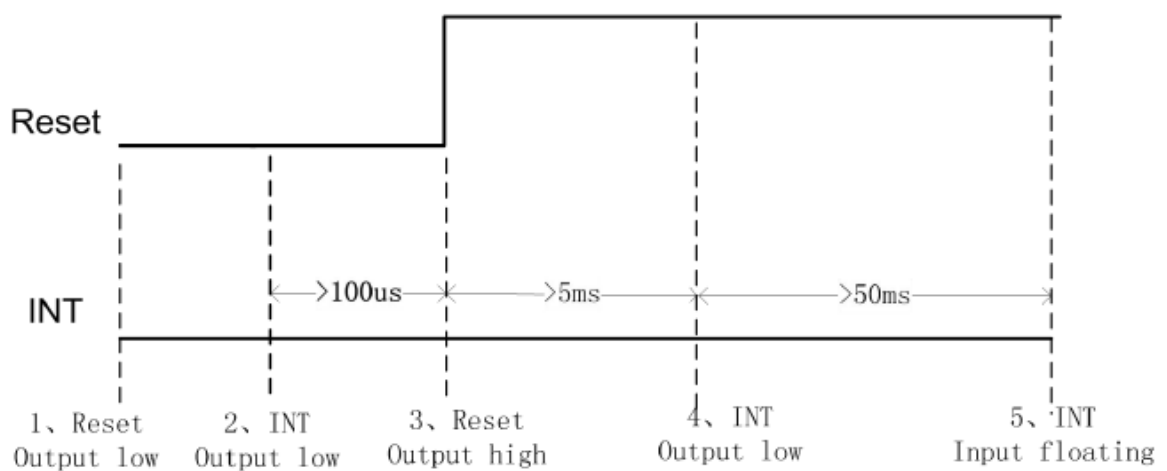
Timing for host resetting GT911:



Timing for setting slave address to 0x28/0x29:



Timing for setting slave address to 0XBA/0XBB:



A) Data Transmission

(For example : device address is 0xBA/0xBB)

Communication is always initiated by the host. Valid Start condition is signalled by pulling SDA line from “high” to “low” when SCL line is “high” . Data flow or address is transmitted after the Start condition.

All slave devices connected to I2C bus should detect the 8-bit address issued after Start condition and send the correct ACK. After receiving matching address, GT911 acknowledges by configuring SDA line as output port and pulling SDA line low during the ninth SCL cycle. When receiving unmatched address, namely, not 0xBA or 0xBB, GT911 will stay in an idle state.

For data bytes on SDA, each of 9 serial bits will be sent on nine SCL cycles. Each data byte consists of 8 valid data bits and one ACK or NACK bit sent by the recipient. The data transmission is valid when SCL line is “high” .

When communication is completed, the host will issue the STOP condition. Stop condition implies the transition of SDA line from “low” to “high” when SCL line is “high” .

B) Writing Data to GT911

(For example: device address is 0xBA/0xBB)



Timing for Write Operation

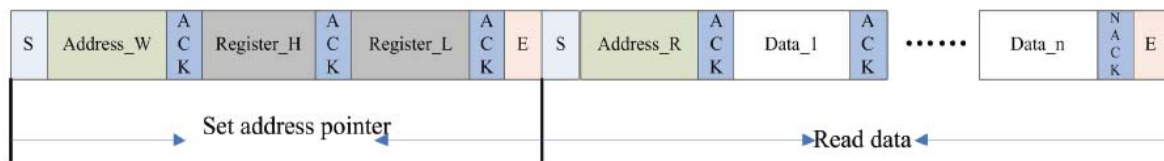
The diagram above displays the timing sequence of the host writing data onto GT911. First, the host issues a Start condition. Then, the host sends 0xBA (address bits and R/W bit; R/W bit as 0 indicates Write operation) to the slave device.

After receiving ACK, the host sends the 16-bit register address (where writing starts) and the 8-bit data bytes (to be written onto the register).

The location of the register address pointer will automatically add 1 after every Write Operation. Therefore, when the host needs to perform Write Operations on a group of registers of continuous addresses, it is able to write continuously. The Write Operation is terminated when the host issues the Stop condition.

C) Reading Data from GT911

(For example: device address is 0xBA/0xBB)



Timing for Read Operation

The diagram above is the timing sequence of the host reading data from GT911. First, the host issues a Start condition and sends 0XBA (address bits and R/W bit; R/W bit as 0 indicates Write operation) to the slave device.

After receiving ACK, the host sends the 16-bit register address (where reading starts) to the slave device. Then the host sets register addresses which need to be read.

Also after receiving ACK, the host issues the Start condition once again and sends 0XBB (Read Operation). After receiving ACK, the host starts to read data.

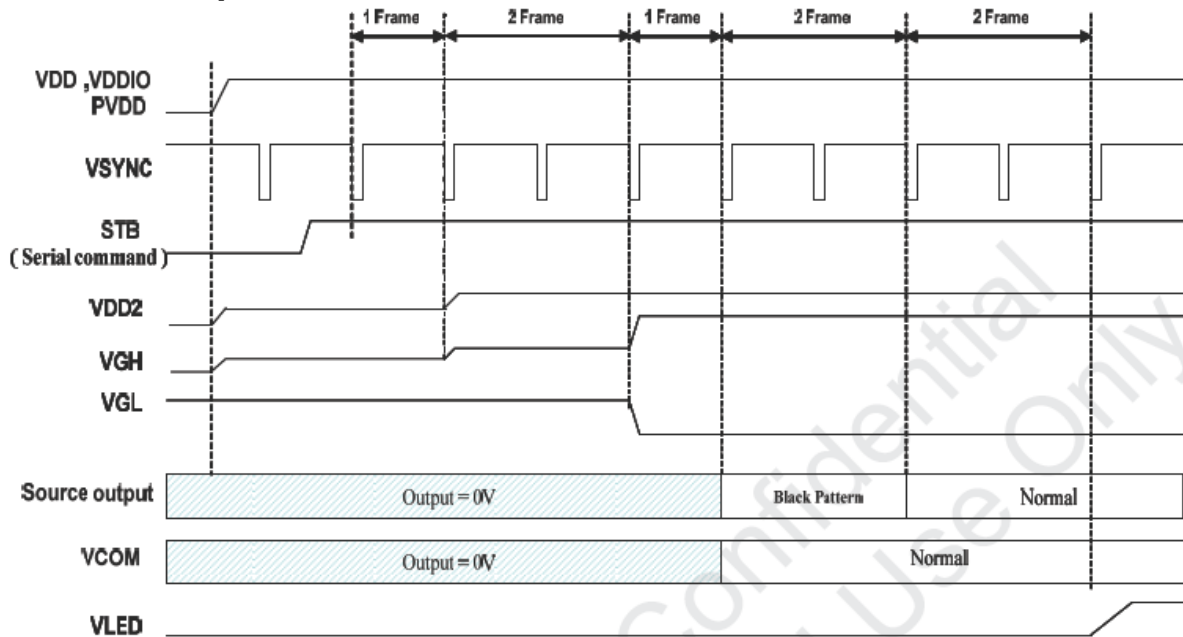
GT911 also supports continuous Read Operation and, by default, reads data continuously. Whenever receiving a byte of data, the host sends an ACK signal indicating successful reception. After receiving the last byte of data, the host sends a NACK signal followed by a STOP condition which terminates communication.

3.5 POWER SEQUENCE

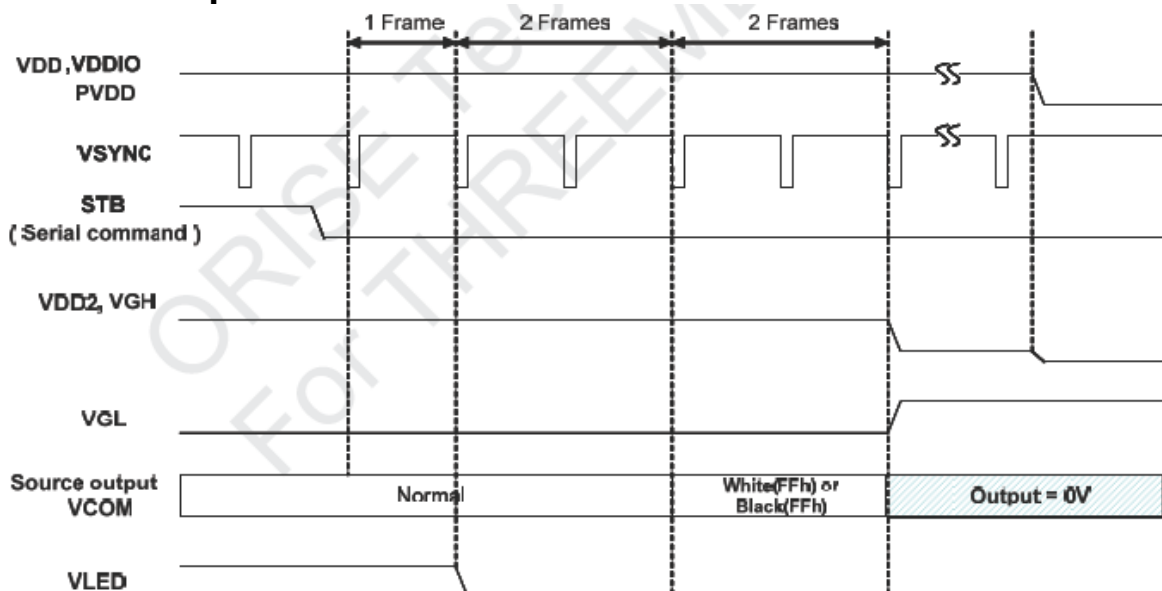
3.5.1 Power on/off Sequence

Please refer to IC OTA5180A datasheet.

Power On Sequence



Power Off Sequence



Note:

- When normally-black LC is used, please send black pattern to discharge the panel.
- When normally-white LC is applied, please send white pattern to discharge the panel.

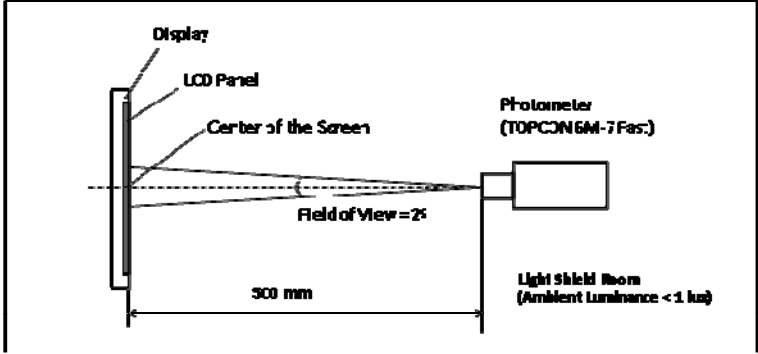
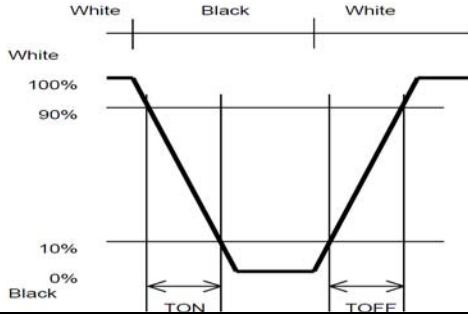
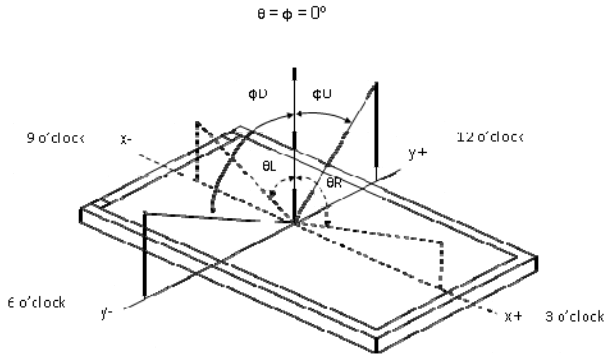
4 OPTICAL SPECIFICATION

4.1 OPTICAL CHARACTERISTICS

Driving condition: VCI = 3.3V, VSS = 0V
 Backlight: IF=40mA
 Measured temperature: Ta = 25° C

Item	Symbol	Condition	MIN	TYP	MAX	Unit	Note
Response Time	TR+TF	$\theta=\phi=0^\circ$ Normal Viewing Angle	-	30	45	ms	2
Contrast Ratio	CR			350	-		3
Viewing Angle	Left	CR \geq 10	-	70	-	deg	4
	Right		-	70	-	deg	
	Up		-	60	-	deg	
	Down		-	70	-	deg	
Colour Chromaticity	Red	Rx	0.578	0.598	0.618	-	5
		Ry	0.326	0.346	0.366	-	
	Green	Gx	0.321	0.341	0.361	-	
		Gy	0.587	0.607	0.627	-	
	Blue	Bx	0.130	0.150	0.170	-	
		By	0.066	0.086	0.106	-	
	White	Wx	0.259	0.299	0.339	-	
		Wy	0.293	0.333	0.373	-	
Centre Brightness		If=40mA	350	400	-	cd/m ²	6
Brightness Distribution			80	-	-	%	7

4.1.1 Test Method

Note	Item	Test method
1	Setup	<p>The display should be stabilised at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilise the luminance, measurements should be executed after lighting the backlight for 30 minutes in a windless room.</p> 
2	Response time	<p>Measure output signal waveform by the luminance meter when raster of window pattern is changed from white to black and from black to white.</p> 
3	Contrast ratio	<p>Measure maximum brightness and minimum brightness at the centre of the screen by displaying raster or window pattern. Then calculate the ratio between these two values.</p> $\text{Contrast Ratio (CR)} = \frac{\text{Brightness of unselected position (white)}}{\text{Brightness of selected position (black)}}$
4	Viewing angle Horizontal θ Vertical ϕ	<p>Move the luminance meter from right to left and up and down and determinate the angles where contrast ratio is 10</p> 
5	Colour chromaticity	Measure chromaticity coordinates x and y of CIE1931 colorimetric system
6	Centre brightness	Measure the brightness at the centre of the screen
7	Brightness distribution	<p>(Brightness distribution) = $100 \times B/A \%$ A: max. brightness of the 9 points B: min. brightness of the 9 points</p>

5 BACKLIGHT SPECIFICATION

5.1 LED DRIVING CONDITIONS

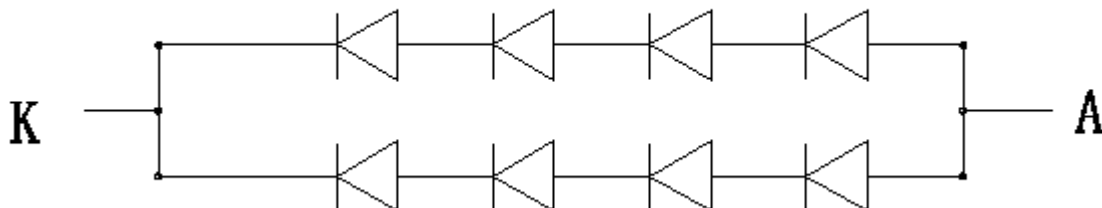
The back light system is edge-lighting type with 8 chips White LED

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Current	IF	Ta=25 °C,	30	40	-	mA
Forward Voltage	VF	Ta= 25°C,		12.8		V
LED life time	Hr	Ta= 25°C,	-	50K	--	Hour

Note:

- The lifetime of the LED is defined as a period till the brightness of the LED decreases to the half of its initial value.
- This figure is given as a reference purpose only, and not a guarantee.
- This figure is estimated for an LED operating alone.
The performance of an LED may differ when assembled as a monitor together with a TFT panel due to different environmental temperature.
- Estimated lifetime could vary on a different temperature and usually higher temperature could reduce the life significantly.

5.2 LED CIRCUIT

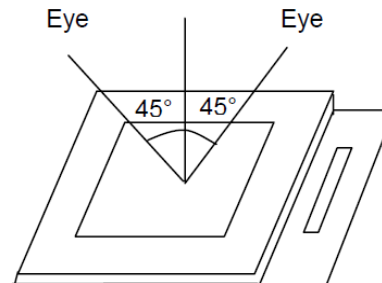


6 QUALITY ASSURANCE SPECIFICATION

6.1 DELIVERY INSPECTION STANDARDS

6.1.1 Inspection Conditions

Inspection distance: 30 cm \pm 2 cm
Viewing angle: $\pm 45^\circ$



6.1.2 Environmental Conditions

Ambient temperature: 25°C \pm 5°C
Ambient humidity: 65 \pm 10% RH
Ambient illumination: 300~700 lux

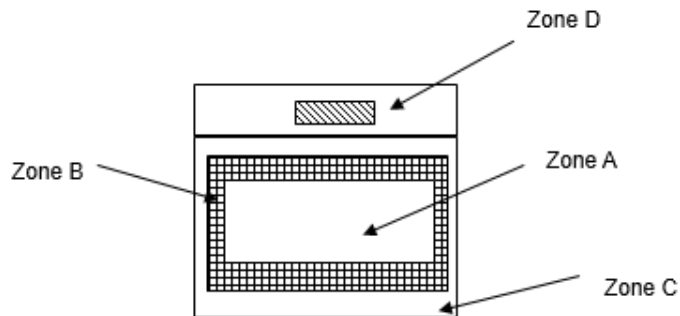
6.1.3 Sampling Conditions

1. Lot size: quantity of shipment lot per model
2. Sampling method:

Sampling Plan		GB/T 2828-2003
		Normal inspection, Single Sampling, ClassII
AQL	Major Defect	0.65
	Minor Defect	1.5

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot , Dim spot,Polarizer Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

6.1.4 Definition of Area



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

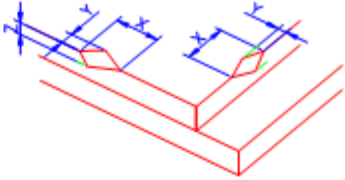
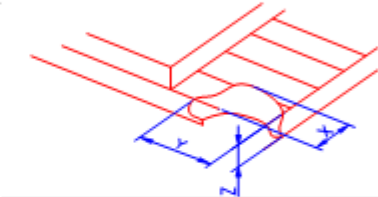
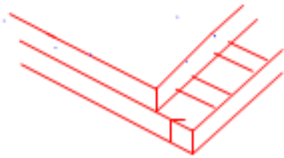
Note:

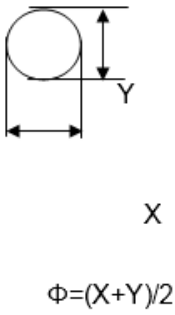
As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

6.1.5 Basic Principle

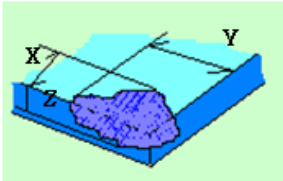
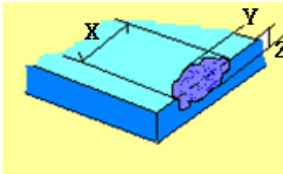
A set of sample to indicate the limit of acceptable quality level shall be discussed should a dispute occur.

6.1.6 Inspection Criteria

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="764 631 1386 763"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2) LCD corner broken	 <table border="1" data-bbox="834 1041 1316 1128"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>							

2.0	Spot defect	 $\Phi=(X+Y)/2$	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)		
	Zone		Acceptable Qty		
	Size (mm)		A	B	C
	$\Phi \leq 0.10$		Ignore		Ignore
	$0.10 < \Phi \leq 0.25$		3(distance $\geq 10\text{mm}$)		
$0.25 < \Phi \leq 0.3$	2				
$\Phi > 0.35$	0				
			② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)		
Zone	Acceptable Qty				
Size (mm)	A	B	C		
$\Phi \leq 0.1$	Ignore		Ignore		
$0.10 < \Phi \leq 0.25$	3(distance $\geq 10\text{mm}$)				
$0.25 < \Phi \leq 0.3$	2				
$\Phi > 0.35$	0				
			③ Polarizer accidented spot		
Zone	Acceptable Qty				
Size (mm)	A	B	C		
$\Phi \leq 0.2$	Ignore		Ignore		
$0.3 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)				
$\Phi > 0.5$	0				
			④ Pixel bad points (light dot, Dim dot, color dot)		
Zone	Acceptable Qty				
Size (mm)	A	B	C		
$\Phi \leq 0.1$	Ignore		Ignore		
$0.15 < \Phi \leq 0.25$	2(distance $\geq 10\text{mm}$)				
$\Phi > 0.3$	0				
			⑤ Polarizer Bubble		
Zone	Acceptable Qty				
Size (mm)	A	B	C		
$\Phi \leq 0.2$	Ignore		Ignore		
$0.3 < \Phi \leq 0.4$	3(distance $\geq 10\text{mm}$)				
$0.4 < \Phi \leq 0.5$	2				

3.0	Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)	<table border="1"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.05$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.05 < W \leq 0.06$</td> <td>$L \leq 3.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.07 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="3">$N \leq 1$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>			Width(mm)	Length(m m)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore			$0.05 < W \leq 0.06$	$L \leq 3.0$	$N \leq 2$			$0.07 < W \leq 0.08$	$L \leq 2.0$	$N \leq 1$			$0.08 < W$	Define as spot defect			
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$0.08 < W$	Define as spot defect																															
4.0	Electronic Comp onents SMT	Not allow missing parts , solderless connection , cold solder joint , mis match , The positive and negative polarity opposite																														
5.0	Display color& B rightness	<p>1. Color : Measuring the color coordinates, The measurement standar d according to the datasheet or samples.</p> <p>2. Brightness : Measuring the brightness of White screen, The measu rement standard according to the datasheet or Samples.</p>																														
6.0	CTP Related	CTP Cover sensor accidented black/white spot	<table border="1"> <thead> <tr> <th rowspan="2">Size Φ(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td colspan="3">3 (distance ≥ 10mm)</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.25$</td> <td colspan="3">2</td> </tr> <tr> <td>$\Phi > 0.3$</td> <td colspan="3">0</td> </tr> </tbody> </table>			Size Φ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	3 (distance ≥ 10 mm)			$0.20 < \Phi \leq 0.25$	2			$\Phi > 0.3$	0						
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		CTP Cover Pinhole/ Lack of ink	<table border="1"> <tr> <th>Zone</th> <th>Acceptable Qty</th> </tr> <tr> <td>Size (mm)</td> <td>C</td> </tr> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.2$</td> <td>3(distance ≥ 10mm)</td> </tr> <tr> <td>$0.25 < \Phi \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$\Phi > 0.35$</td> <td>0</td> </tr> </table>	Zone	Acceptable Qty	Size (mm)	C	$\Phi \leq 0.1$	Ignore	$0.1 < \Phi \leq 0.2$	3(distance ≥ 10 mm)	$0.25 < \Phi \leq 0.3$	2	$\Phi > 0.35$	0				
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CTP Bonding bubble/ accidented spot	<table border="1"> <tr> <th>Size Φ(mm)</th> <th colspan="2">Acceptable Qty</th> </tr> <tr> <td></td> <th>A</th> <th>B</th> </tr> <tr> <td>$\Phi \leq 0.1$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.2$</td> <td colspan="2">3(distance ≥ 10mm)</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.25$</td> <td colspan="2">2</td> </tr> <tr> <td>$\Phi > 0.25$</td> <td colspan="2">0</td> </tr> </table>	Size Φ (mm)	Acceptable Qty			A	B	$\Phi \leq 0.1$	Ignore		$0.15 < \Phi \leq 0.2$	3(distance ≥ 10 mm)		$0.2 < \Phi \leq 0.25$	2		$\Phi > 0.25$	0	
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Assembly detection	beyond the edge of backlight ≤ 0.2 mm																		
TP cover broken X : length Y : width Z : height	<table border="1"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td>$X \leq 0.5$mm</td> <td>$Y \leq 0.5$mm</td> <td>$Z < \text{cover thickness}$ s</td> </tr> </table> <p>* Circuitry broken is not allowed.</p>	X	Y	Z	$X \leq 0.5$ mm	$Y \leq 0.5$ mm	$Z < \text{cover thickness}$ s												
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X	Y	Z																	
$X \leq 0.3$ mm	$Y \leq 0.3$ mm	$Z < \text{LCD thickness}$ s																	

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

6.1.7 Classification of Defects

Visual defects (except no or wrong label) are treated as minor defects, while electrical defects are treated as major defects.

Two minor defects are equal to one major defect in lot sampling inspection.

6.1.8 Identification / Marking criteria

Any unit with illegible / wrong / double or no marking / label shall be rejected.

6.2 DEALING WITH CUSTOMER COMPLAINTS

6.2.1 Non-conforming analysis

Purchaser should supply Densitron with detailed data of non-conforming sample.

After accepting it, Densitron should complete the analysis in two weeks from receiving the sample.

If the analysis cannot be completed on time, Densitron must inform the purchaser.

6.2.2 Handling of non-conforming displays

If any non-conforming displays are found during customer acceptance inspection which Densitron is clearly responsible for, return them to Densitron.

Both Densitron and customer should analyse the reason and discuss the handling of non-conforming displays when the reason is not clear.

Equally, both sides should discuss and come to agreement for issues pertaining to modification of Densitron quality assurance standard.

7 RELIABILITY SPECIFICATION

7.1 RELIABILITY TESTS

Test Item		Test Condition	
Durability Test	High Temperature Storage	Ta= 80°C	96h
	Low Temperature Storage	Ta= -30°C	96h
	Temperature Cycle Storage	-20°C \leftrightarrow 70°C ON/OFF, 20 cycles. ON time over 10 seconds ,OFF time over 10 seconds	
	High Temperature Operation	Tp= 70°C	96h
	Low Temperature Operation	Tp= -20°C	96h
	High Temperature & Humidity Operation	Tp= 60°C RH= 90% 96h Non condensing	
	ESD Test	150Pf, 330Ω, ±6KV (Contact)/±8KV (Air), 5 Points/panel, 10 times/point	
	Thermal Shock Resistance	The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours	
	Box Drop Test	1 Corner 3 Edges 6 faces, 66 cm (Medium Box)	

Note: Ta=ambient temperature Tp= Panel temperature

Notes:

1. No dew condensation to be observed.
2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
3. No cosmetic or functional defects should be allowed.
4. Total current consumption should be less than twice the initial value.

8 HANDLING PRECAUTIONS

Safety

If the LCD panel breaks, be careful not to get the liquid crystal fluid in your mouth or in your eyes. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Mounting and Design

Place a transparent plate (e.g. acrylic, polycarbonate or glass) on the display surface to protect the display from external pressure. Leave a small gap between the transparent plate and the display surface.

When assembling with a zebra connector, clean the surface of the pads with alcohol and keep the surrounding air very clean.

Design the system so that no input signal is given unless the power supply voltage is applied.

Caution during LCD cleaning

Lightly wipe the display surface with a soft cloth soaked with Isopropyl alcohol, Ethyl alcohol or Trichlorotrifluoroethane.

Do not wipe the display surface with dry or hard materials that will damage the polariser surface. Do not use aromatic solvents (toluene and xylene), or ketonic solvents (ketone and acetone).

Caution against static charge

As the display uses C-MOS LSI drivers, connect any unused input terminal to VDD or VSS. Do not input any signals before power is turned on. Also, ground your body, work/assembly table and assembly equipment to protect against static electricity.

Packaging

Displays use LCD elements, and must be treated as such. Avoid strong shock and drop from a height. To prevent displays from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity.

Caution during operation

It is indispensable to drive the display within the specified voltage limit since excessive voltage shortens its life. Direct current causes an electrochemical reaction with remarkable deterioration of the display quality. Give careful consideration to prevent direct current during ON/OFF timing and during operation. Response time is extremely delayed at temperatures lower than the operating temperature range while, at high temperatures, displays become dark. However, this phenomenon is reversible and does not mean a malfunction or a display that has been permanently damaged. If the display area is pushed on hard during operation, some graphics will be abnormally displayed but returns to a normal condition after turning off the display once. Even a small amount of condensation on the contact pads (terminals) can cause an electro-chemical reaction which causes missing rows and columns. Give careful attention to avoid condensation.

Storage

Store the display in a dark place where the temperature is 25°C ± 10°C and the humidity below 50%RH. Store the display in a clean environment, free from dust, organic solvents and corrosive gases.

Do not crash, shake or jolt the display (including accessories).

Product No.	DMT043QQNTCMI-1A	REV. 1.0
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Page	31 / 31
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