






# SPECIFICATIONS

**CUSTOMER** : \_\_\_\_\_  
**MODEL NO.** :           **GFT020AA320240**            
**VERSION** :   **B**    
**DATE** :   **2019.01.10**    
**CERTIFICATION** :   **ROHS**  

Customer Sign	Approved By	Prepared By	Prepared By
			

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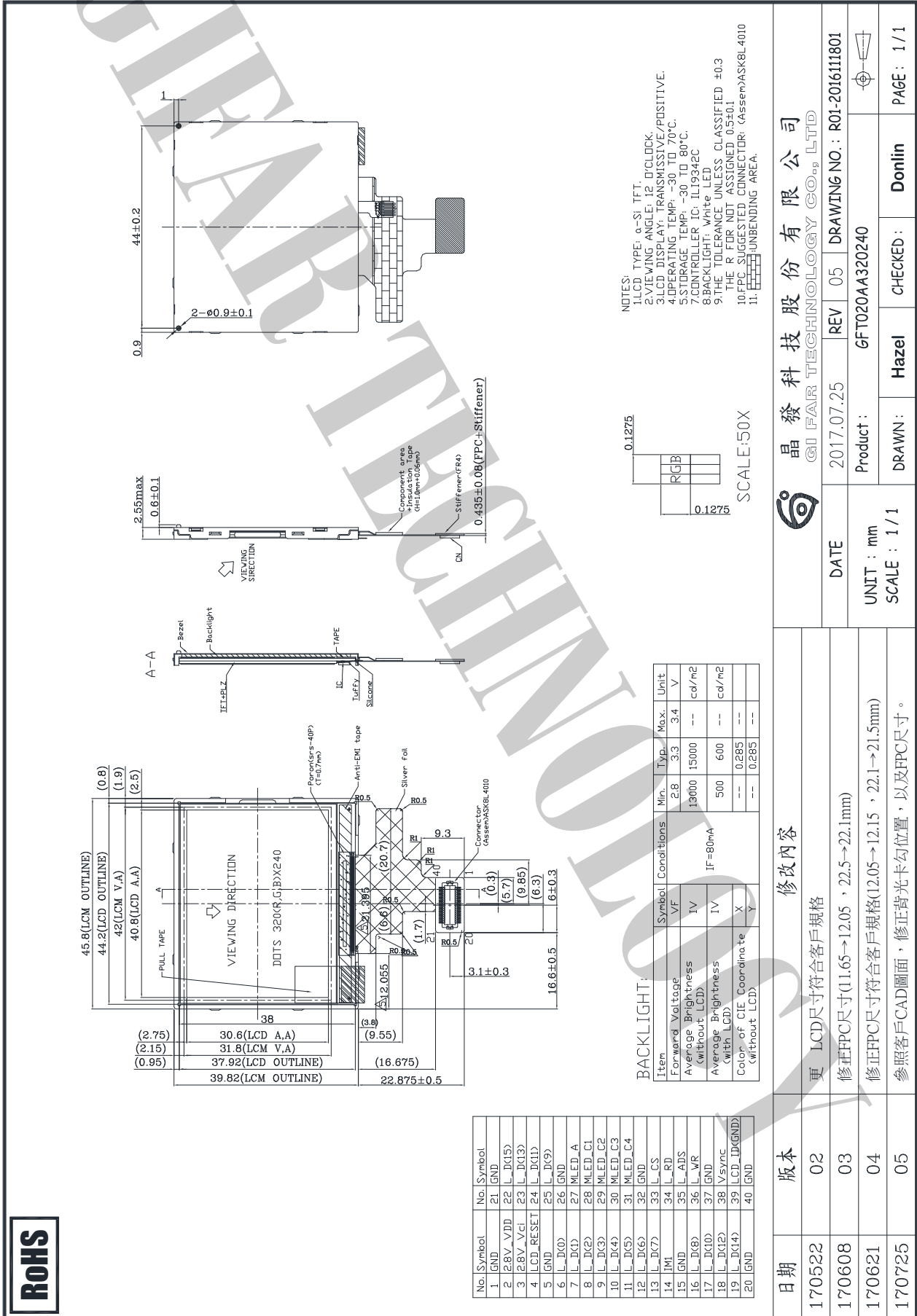
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## OUTLINE DIMENSIONS



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日期	版本	修改內容
170522	02	更 LCD尺寸符合客戶規格
170608	03	修正FPC尺寸(11.65→12.05, 22.5→22.1mm)
170621	04	修正FPC尺寸符合客戶規格(12.05→12.15, 22.1→21.5mm)
170725	05	參照客戶CAD圖面, 修正背光卡勾位置, 以及FPC尺寸。



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## 1. SPECIFICATIONS

### 1.1 Features

#### Main LCD Pan

Item	Standard Value
Display Type	320 * (R、G、B) * 240 Dots
LCD Type	a-Si TFT , Normally White ,TN, Transmissive
Screen size(inch)	2.0 (Diagonal)
Viewing Direction	12 O'clock
Color configuration	R.G.B. vertical stripe
Weight	--
Backlight	White LED
Interface	8 &16 bit interface for i80 system
Other(controller / driver IC)	ILI9342C

### 1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	45.8 (W) * 39.82 (L) 2.55 (H)(MAX)	mm

#### TFT LCD Panel

Item	Standard Value	Unit
Viewing Area (LCD)	42.0 (W) * 31.8 (L)	mm
Active Area (LCD)	40.8 (W) * 30.6 (L)	mm
Pixel Size	0.1275(W) * 0.127 (H)	

Note: For detailed information please refer to LCM drawing.



### 1.3 Absolute Maximum Ratings

#### Module

Item	Symbol	Condition	Min.	Max.	Unit
System Power Supply Voltage	2.8V_VDD	-	-0.3	4.2	V
	2.8V_VCI	-	-0.3	4.2	
	VGH-VGL	GND	0	+32	
Input Voltage	VIN	-	-0.3	VDD+0.3	V
Operating Temperature	TOP	-	-30	+70	°C
Storage Temperature	TST	-	-30	+80	°C
Storage Humidity	HD	Ta ≤ 60 °C	--	90	%RH

### 1.4 DC Electrical Characteristics

#### Module

GND = 0V, Ta = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	2.8V_VDD	-	2.5	2.8	3.3	V
Power Supply Voltage	2.8V_VCI	-	2.5	2.8	3.3	V
Input High Voltage	VIH	-	0.7*VDD	-	VDD	V
Input Low Voltage	VIL	-	ND	-	0.3*VDD	V
Output High Voltage	VOH	-	0.8*VDD	-	VDD	V
Output Low Voltage	VOL	-	GND	-	0.2*VDD	V
Supply Current	IDD	VDD&VCI= 2.8V, Pattern= Photo	-	3	-	mA
		VDD&VCI= 2.8V, Pattern= Black	-	4	6	mA

Note1 : Maximum current display.



### 1.5 Optical Characteristics

#### TFT LCD Panel

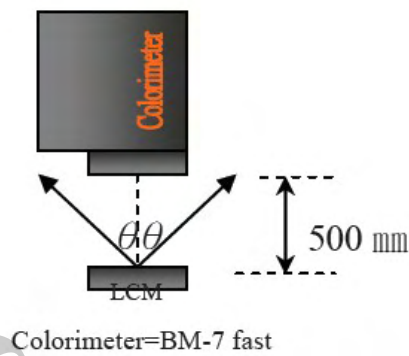
VDD = 2.8V, Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	unit		
Response time	Rise	Ta=25°C θX, θX=0°	--	30	45	Ms	Note2	
	all							
Viewing angle	Top	CR ≥ 10	-	60	-	Deg.	Note4	
	Bottom							
	Left							
	Right							
Contrast ratio	CR	25°C θX, θX=0°	500	600	-	-	Note3	
Color of CIE Coordinate (With B/L)	White	Ta= °C θX θX=0°	0.25	0.30	0.35	-	Note1	
			Y	0.28	0.33			0.38
	Red		X	0.55	0.60			0.65
			Y	0	0.34			0.39
	Green		X	0.28	0.33			0.38
			Y	0.56	0.61			0.66
	Blue		X	0.09	0.14			0.19
			Y	0	0.06			0.11
Average Brightness Pattern=white display (With B/L)	IV	IF=80mA	500	600	-	Cd/m <sup>2</sup>	Note1	
Uniformity (With B/L)	Δ B	IF=80mA	80	-	-	%	Note1	



Note1:

- 1 :  $\Delta B = B(\min) / B(\max) \times 100\%$ .
- 2 : Measurement Condition for Optical Characteristics:
  - a : Environment  $25^{\circ}\text{C} \pm 5^{\circ}\text{C} / 60 \pm 20\% \text{R.H}$ , no wind, dark room below 10 Lux at typical lamp current and typical operating frequency.
  - b : Measurement Distance:  $500 \pm 50$  mm, ( $\theta = 0^{\circ}$ ).
  - c : Equipment: TOPCON M-7 fast, (field  $1^{\circ}$ ), after 10 minutes operation.
  - d : The uncertainty of the C.I.E coordinate measurement  $\pm 0.01$ , Average Brightness  $\pm 4\%$ .

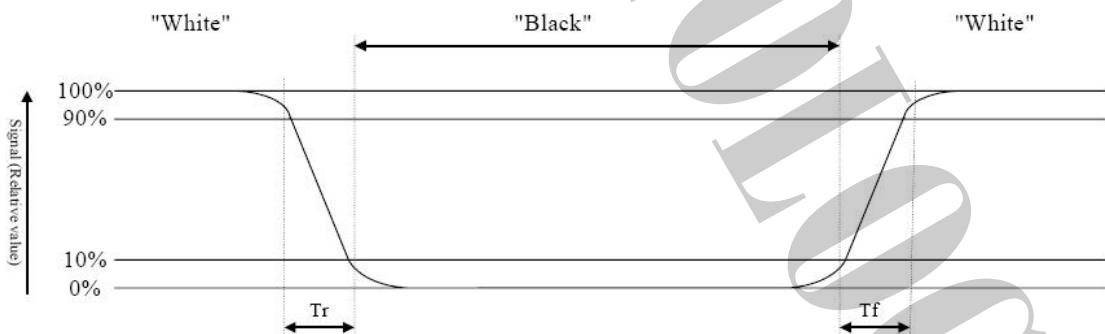


Note2: Definition of response time:

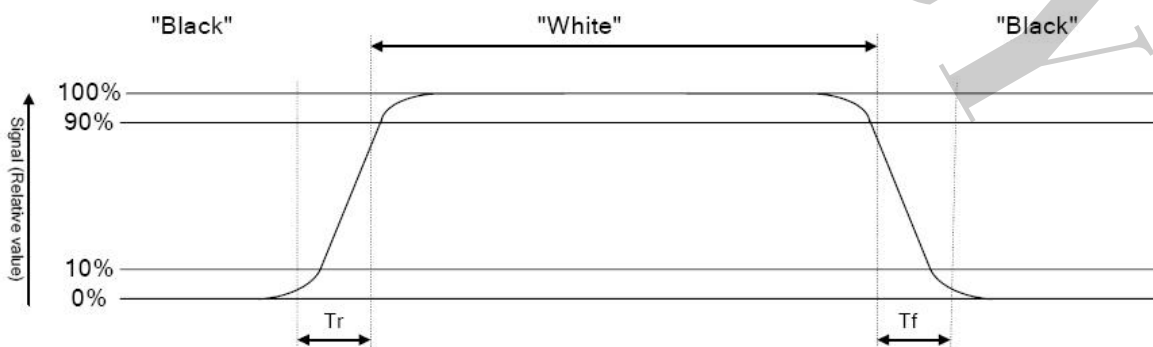
The output signals of photo detector are measured when the input signals are changed from "black" to "white" (falling time) and from "white" to "black" (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:

Normally White



Normally Black







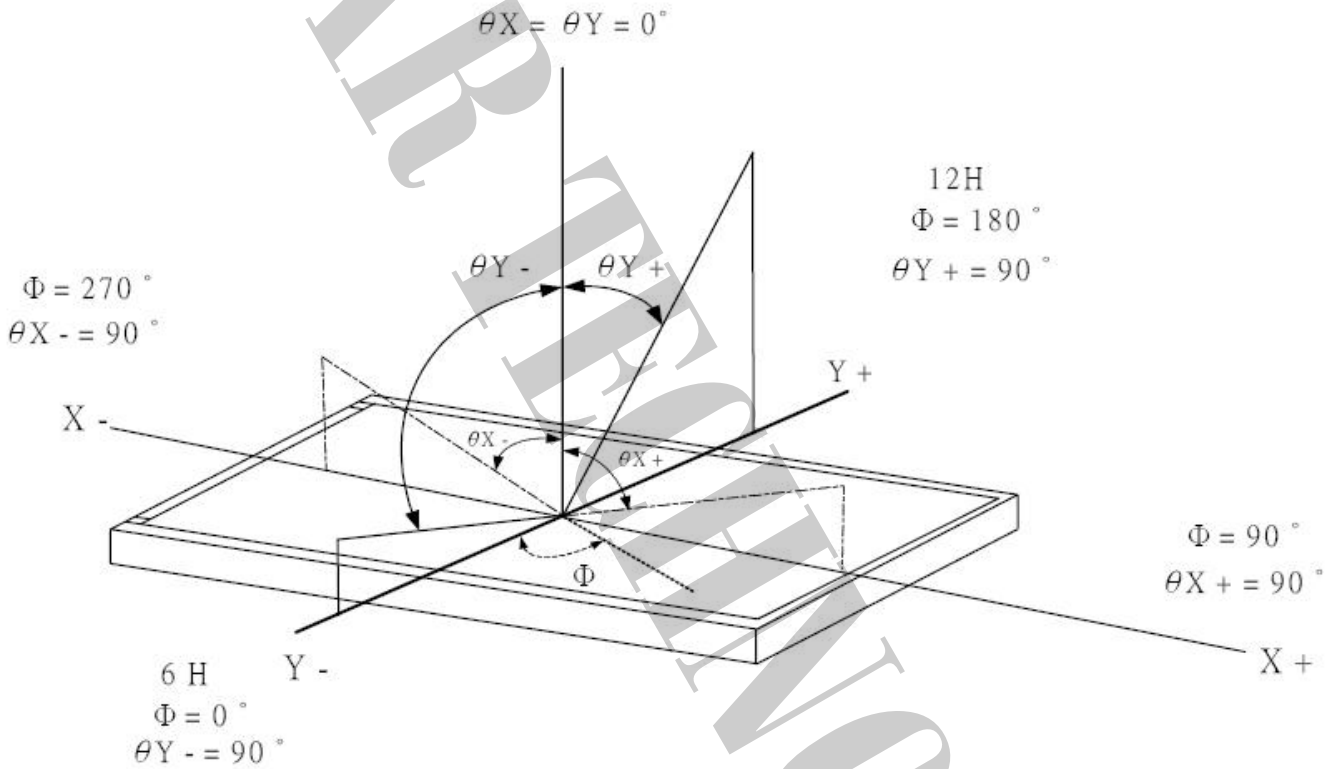
Note 3: Definition of contrast ratio:

Contrast ratio is calculated with the following formula

$$\text{Contrast ratio (R)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 4: Definition of viewing angle:

Refer to figure as below:





## 1.6 Backlight Characteristics

### Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25°C	-	120	mA
Reverse Voltage	VR	Ta =25°C	-	5	V
Power Dissipation	PD	Ta =25°C	-	408	mW

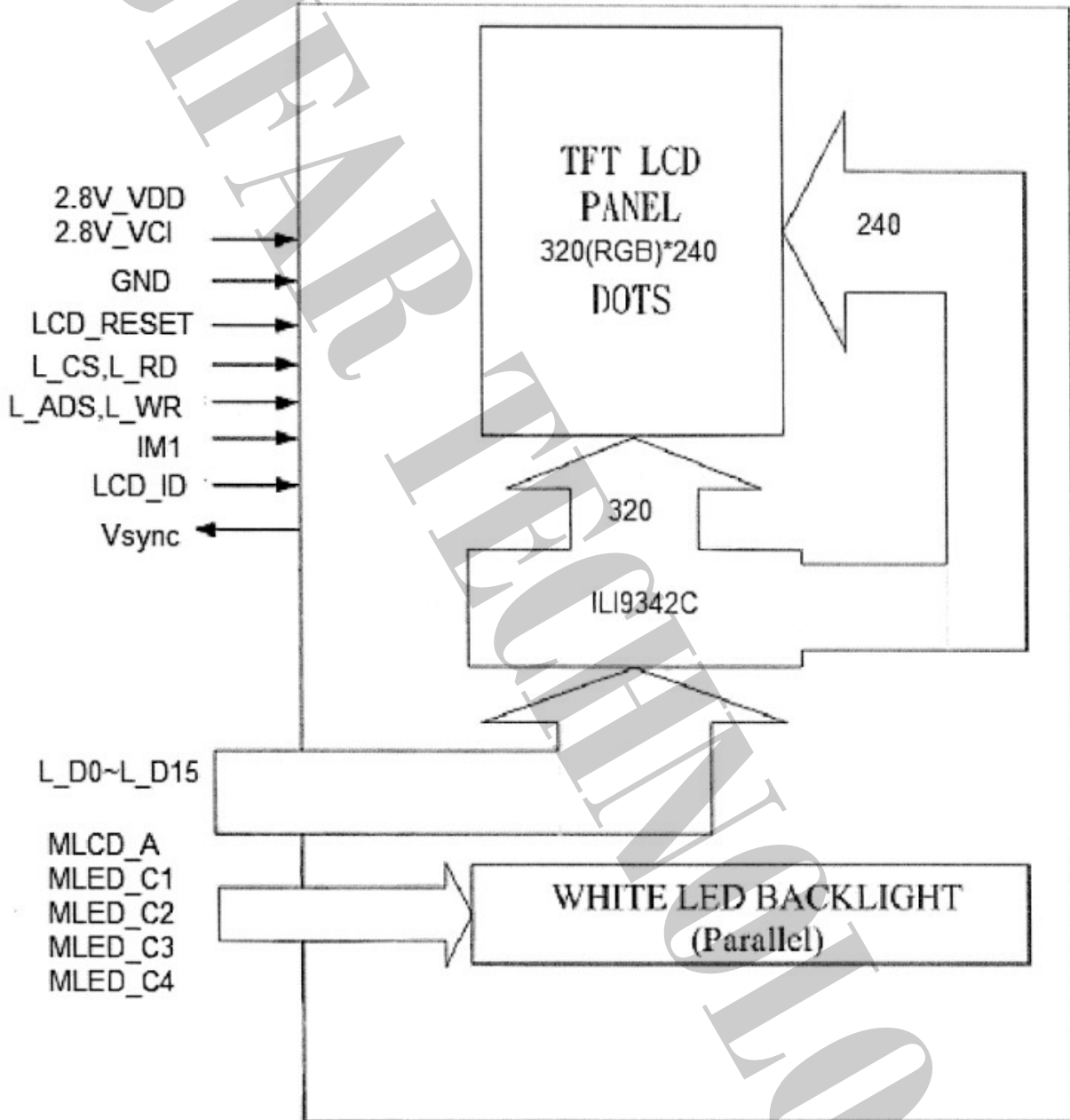
### Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=80mA	2.8	3.3	3.4	V
Average Brightness (without LCD)	IV		13000	15000	-	cd/m <sup>2</sup>
Color of CIE Coordinate (without LCD)	X		-	0.285	-	-
	Y		-	0.285	-	
Color		White				



## 2. MODULE STRUCTURE

### 2.1 Block Diagram





## 2.2 Interface Pin Description

Pin No.	Symbol	Function
1	GND	Ground.
2	2.8V_VDD	Power supply.(2.8V) .
3	2.8V_Vci	Power Supply for LDI
4	LCD_RESET	Reset
5	GND	Ground.
6	L_D(0)	Bi-Direction Data Bus
7	L_D(1)	Bi-Direction Data Bus
8	L_D(2)	Bi-Direction Data Bus
9	L_D(3)	Bi-Direction Data Bus
10	L_D(4)	Bi-Direction Data Bus
11	L_D(5)	Bi-Direction Data Bus
12	L_D(6)	Bi-Direction Data Bus
13	L_D(7)	Bi-Direction Data Bus
14	IM1	8080 bus interface mode 8-bit = 0 or 16-bit = 1
15	GND	Ground.
16	L_D(8)	Bi-Direction Data Bus
17	L_D(10)	Bi-Direction Data Bus
18	L_D(12)	Bi-Direction Data Bus
19	L_D(14)	Bi-Direction Data Bus
20	GND	Ground.
21	GND	Ground.
22	L_D(15)	Bi-Direction Data Bus



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Pin No.	Symbol	Function
23	L_D(13)	Bi-Direction Data Bus
24	L_D(11)	Bi-Direction Data Bus
25	L_D(9)	Bi-Direction Data Bus
26	GND	Ground.
27	MLED_A	Anode of LED
28	MLED_C1	Cathode of LED 1
29	MLED_C2	Cathode of LED 2
30	MLED_C3	Cathode of LED 3
31	MLED_C4	Cathode of LED 4
32	GND	Ground.
33	L_CS	Chip Select Signal
34	L_RD	Read-Strobe Signal
35	L_ADS	Data/Command Identification Signal
36	L_WR	Write-Strobe Signal
37	GND	Ground.
38	Vsync	Vsync Output Signal from LDI
39	LCD_ID(GND)	Maker ID (GND)
40	GND	Ground.



### 2.2.1 Application Notes:

CON			
GND	40	GND	
LCD_ID	39	LCD ID	GND
VSYNC	38	VSYNC	
GND	37	GND	
L_WR	36	L WR	
L_ADS	35	L ADS	
L_RD	34	L RD	
L_CS	33	L CS	
GND	32	GND	
MLED_C4	31	MLED C4	
MLED_C3	30	MLED C3	
MLED_C2	29	MLED C2	
MLED_C1	28	MLED C1	
MLED_A	27	MLED A	
GND	26	GND	
L_D9	25	L D9	
L_D11	24	L D11	
L_D13	23	L D13	
L_D15	22	L D15	
GND	21		
GND	20	GND	
L_D14	19	L D14	
L_D12	18	L D12	
L_D10	17	L D10	
L_D8	16	L D8	
GND	15	GND	
IMI	14	IMI	VCC
L_D7	13	L D7	
L_D6	12	L D6	
L_D5	11	L D5	
L_D4	10	L D4	
L_D3	9	L D3	
L_D2	8	L D2	
L_D1	7	L D1	
L_D0	6	L D0	
GND	5	GND	
LCD_RESET	4	LCD RESET	
2.8V_VCI	3	2.8V VCI	
2.8V_VDD	2	2.8V VDD	
GND	1	GND	
FPC			

Note: IM1 Pull High for 8080 16 bit Interface

LCD\_ID Pull Low



## 2.2.2 Refer Initial code:

The referential initial code is shown below.

```
void Initial_Main(void) // For ILI9342c
{
    WriteCOM_Main(0x00,0xC8);
    WriteDAT_Main(0x00,0xFF);
    WriteDAT_Main(0x00,0x93);
    WriteDAT_Main(0x00,0x42);

    WriteCOM_Main(0x00,0xC5);
    WriteDAT_Main(0x00,0xDB);

    WriteCOM_Main(0x00,0x3A);
    WriteDAT_Main(0x00,0x55);

    WriteCOM_Main(0x00,0x36);
    WriteDAT_Main(0x00,0xC8);
//-----set gamma-----
    WriteCOM_Main(0x00,0xe0); //set gamma
    WriteDAT_Main(0x00,0x00);
    WriteDAT_Main(0x00,0x05);
    WriteDAT_Main(0x00,0x18);
    WriteDAT_Main(0x00,0x02);
    WriteDAT_Main(0x00,0x10);
    WriteDAT_Main(0x00,0x08);
    WriteDAT_Main(0x00,0x2E);
    WriteDAT_Main(0x00,0x8A);

    WriteDAT_Main(0x00,0x41);
    WriteDAT_Main(0x00,0x08);
    WriteDAT_Main(0x00,0x0F);
    WriteDAT_Main(0x00,0x0C);
    WriteDAT_Main(0x00,0x17);
    WriteDAT_Main(0x00,0x19);
    WriteDAT_Main(0x00,0x0F);
}
```



```
WriteCOM_Main(0x00,0xe1); //set gamma
```

```
WriteDAT_Main(0x00,0x00);
```

```
WriteDAT_Main(0x00,0x29);
```

```
WriteDAT_Main(0x00,0x2F);
```

```
WriteDAT_Main(0x00,0x03);
```

```
WriteDAT_Main(0x00,0x0f);
```

```
WriteDAT_Main(0x00,0x05);
```

```
WriteDAT_Main(0x00,0x42);
```

```
WriteDAT_Main(0x00,0x56);
```

```
WriteDAT_Main(0x00,0x53);
```

```
WriteDAT_Main(0x00,0x06);
```

```
WriteDAT_Main(0x00,0x0F);
```

```
WriteDAT_Main(0x00,0x0C);
```

```
WriteDAT_Main(0x00,0x38);
```

```
WriteDAT_Main(0x00,0x3A);
```

```
WriteDAT_Main(0x00,0x0F);
```

```
WriteCOM_Main(0x00,0x11); //exit sleep
```

```
Delay(120);
```

```
WriteCOM_Main(0x00,0x29); //Display on
```

```
}
```







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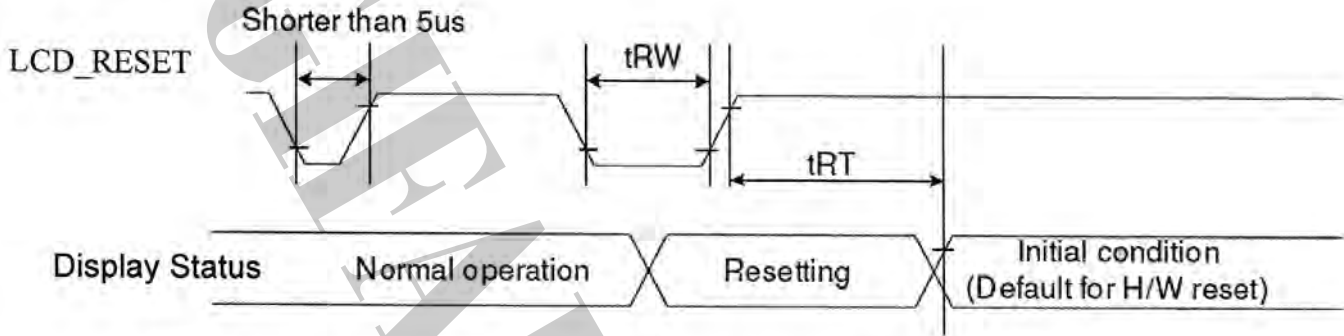


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L_RD(ID)	trc	Read Cycle(ID)	160		ns
	trdh	Read Control pulse H duration	90		ns
	trdl	Read Control pulse L duration	45		ns
L_D0~L_D15	tDST	Write Data setup time	10		ns
	tDHT	Write Data hold time	10		ns
	tRAT	Read access time		40	ns
	tRATFM	Read access time	-	340	ns
	tODH	Read Output disable time	20	80	ns



### LCD Reset



Signal	Symbol	Parameter	Min.	Max.	Unit
LCD_RE SET	tRW	Reset pulse duration	10	-	us
	tRT	Reset cancel	-	5 (Note1,5)	ms
			-	120 (Note1,6,7)	ms

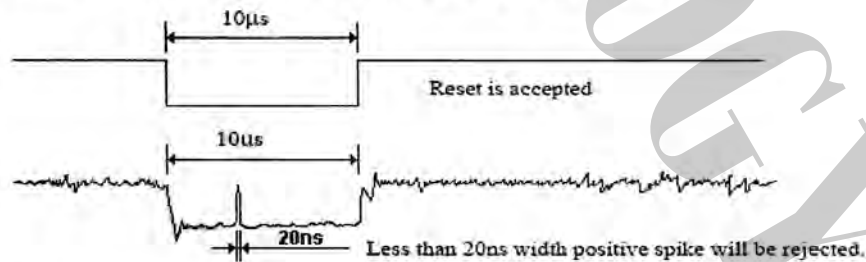
**Note 1:** The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

**Note 2:** Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

**Note 3:** During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out -mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

**Note 4:** Spike Rejection also applies during a valid reset pulse as shown below:



**Note 5:** When Reset applied during Sleep In Mode.

**Note 6:** When Reset applied during Sleep Out Mode.

**Note 7:** It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.



### 3. RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage Test	Keep in +80 ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.
2	Low Temperature Storage Test	Keep in -30 ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.
3	High Temperature High Humidity Storage Test	Keep in +60°C / 90% RH duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)
4	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge each polarity+/-
		Contact Discharge: Apply 250V with 5 times Discharge for each polarity+/-
4	ESD Test	1. Temperature: 15°C~35°C 2. Humidity relative: 30%~60% 3. Energy Storage capacitance(Cs+Cd): 150pF±10% 4. Discharge Resistance(Rd): 330Ω±10% 5. Discharge mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance if the output voltage indication: ±5%)
5	Temperature Cycling Storage Test	<p style="text-align: center;">           °C → +2 → +85°C → +25°C            (30mins) (5 mins) (30mins) (5mins)         </p> <p style="text-align: center;">←-----→</p> <p style="text-align: center;">10 Cycle</p> <p style="text-align: center;">Surrounding temperature, then storage at normal condition 4hrs.</p>
6	Vibration Test (Packaged)	1. Sine wave 10~55 Hz frequency(1 min) 2. The amplitude of vibration 1mm 3. Each direction(X、Y、Z) duration for 2 Hrs
7	Drop Test (Packaged)	Packing Weight(Kg)
		Drop Height(cm)
		0 ~ 45.4
		45.4 ~ 90.8
		90.8 ~ 454
Over 454		
Drop direction : ※ 1 corner / 3 edges / 6 faces each 1 times		



## 4. NOTES

### ■ Safety

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

### Handling

- Avoid static electricity as this can damage the CMOS LSI.
- The LCD panel is plate glass; do not hit or crush it.
- Do not remove the panel or frame from the module.
- The polarizing plate of the display is very fragile; handle it very carefully

### Mounting and Design

- Mount the module by using the specified mounting part and holes.
- To protect the module from external pressure, leave a small gap by placing transparent plates (e.g. acrylic or glass) on the display face, frame, and polarizing plate
- Design the system so that no input signal is given unless the power-supply voltage is applied.
- Keep the module dry. Avoid condensation, otherwise the transparent electrodes may break.

### Storage

- Store the module in a dark place where the temperature is  $25^{\circ}\text{C}\pm 10^{\circ}\text{C}$  and the humidity below 65% RH.
- Do not store the module near organic solvent or corrosive gases.
- Do not crush, shake, or jolt the module (including accessories).

### Cleaning

- Do not wipe the polarizing plate with a dry cloth, as it may scratch the surface.
- Wipe the module gently with soft cloth soaked with a petroleum benzene.
- Do not use ketonic solvents (ketone and acetone) or aromatic solvents (toluene and xylene), as they may damage the polarizing plate.

## 5. OPERATION PRECAUTIONS

Any changes that need to be made in this specification or any problems arising from it will be dealt with quickly by discussion between both companies.

Quality warranty period: Within one year after shipment date (excluding abnormal usage way and abnormal environments.)



## 6. Inspection Standard

種類		GFT020AA320240_TFT 類																
編號	檢驗項目	檢驗內容及判定標準		區域	類別	缺陷等級												
1	點類(一)	氣泡 狀 $\phi = \frac{(X+Y)\phi}{2}$	兩點距離須超過 5 mm <table border="1"> <thead> <tr> <th><math>\phi</math>(mm)</th> <th>允收數</th> </tr> </thead> <tbody> <tr> <td><math>\phi \leq 0.15</math></td> <td>無視</td> </tr> <tr> <td><math>0.15 &lt; \phi \leq 0.20</math></td> <td>2</td> </tr> <tr> <td><math>0.20 &lt; \phi \leq 0.30</math></td> <td>2</td> </tr> <tr> <td><math>\phi &gt; 0.3</math></td> <td>0</td> </tr> <tr> <td>Total</td> <td>3</td> </tr> </tbody> </table>	$\phi$ (mm)	允收數	$\phi \leq 0.15$	無視	$0.15 < \phi \leq 0.20$	2	$0.20 < \phi \leq 0.30$	2	$\phi > 0.3$	0	Total	3	A	外觀	次要 AQL0.65%
$\phi$ (mm)	允收數																	
$\phi \leq 0.15$	無視																	
$0.15 < \phi \leq 0.20$	2																	
$0.20 < \phi \leq 0.30$	2																	
$\phi > 0.3$	0																	
Total	3																	
2	線類	刮傷、毛屑...等線狀 	<table border="1"> <thead> <tr> <th>L (mm)</th> <th>W (mm)</th> <th>允收數</th> </tr> </thead> <tbody> <tr> <td>--</td> <td><math>W \leq 0.01</math></td> <td>無視</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.01 &lt; W \leq 0.05</math></td> <td>3</td> </tr> <tr> <td><math>L &gt; 3.0</math></td> <td><math>&gt; 0.05</math></td> <td>0</td> </tr> </tbody> </table>	L (mm)	W (mm)	允收數	--	$W \leq 0.01$	無視	$L \leq 3.0$	$0.01 < W \leq 0.05$	3	$L > 3.0$	$> 0.05$	0	A	外觀	次要 AQL0.65%
L (mm)	W (mm)	允收數																
--	$W \leq 0.01$	無視																
$L \leq 3.0$	$0.01 < W \leq 0.05$	3																
$L > 3.0$	$> 0.05$	0																
3	FPC 外觀	※ FPC 上刺傷導致線路無法導通 拒收 ※ FPC 上髒污或是殘留異物以致線路無導通 拒收 ※ FPC 直角折痕、斷裂 拒收		C	外觀	次要 AQL0.65%												
4	點類(二)	<table border="1"> <thead> <tr> <th>類型</th> <th>允收數</th> </tr> </thead> <tbody> <tr> <td>亮點</td> <td><math>N \leq 2</math></td> </tr> <tr> <td>暗點</td> <td><math>N \leq 3</math></td> </tr> </tbody> </table> ※ 缺陷點面積暫全點 1/2 則為一個缺陷點 ※ 亮點：於黑畫面中使用 8% ND Filter 遮蓋須不可見 ※ 暗點：在純紅、綠、藍模式下判定	類型	允收數	亮點	$N \leq 2$	暗點	$N \leq 3$		AA	電訊	次要 AQL0.65%						
類型	允收數																	
亮點	$N \leq 2$																	
暗點	$N \leq 3$																	
5	無動作	顯示畫面一直處於起始畫面而無法進行切換 拒收		AA	電訊	主要 AQL 0.4%												
6	無畫面	通電後，完全無任何畫面顯示 拒收		AA	電訊	主要 AQL 0.4%												
7	斷線	顯示畫面中少直、橫線 拒收		AA	電訊	主要 AQL 0.4%												
8	ICON	顯示畫面缺少部份顯示圖案 拒收		AA	電訊	主要 AQL 0.4%												



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Quality Certified  
ISO 9001:2015  
Licence No: TA1062-QC-EC



Environmentally Certified  
ISO 14001:2015  
Licence No: TA1062-QC-EC

9	深淺不一	顯示畫面的對比，比其他顯示深或淺並依電氣規格(VOP)值判定 拒收或與客端簽訂限度樣	AA	電訊	次要 AQL0.65%
10	畫面異常	通電後畫面出現未定義之電訊不良現象 拒收	AA	電訊	主要 AQL 0.4%
11	牛頓環	點亮後目視有環、圓或曲線狀 拒收	A	電訊	次要 AQL0.65%
12	背光色不均	※ 點亮後 LED 有明暗不均現象依其均勻度判定 拒收 ※ 點亮後 LED 色澤不一致 拒收	A	電訊	次要 AQL0.65%
13	亮度不足	波長、色座標、輝度與圖面標示定義不符 拒收	A	電訊	主要 AQL 0.4%
14	觸控	測試時無法點觸或劃，其靈敏度判定則依 SPEC 上定義判定 拒收	A	電訊	主要 AQL 0.4%
15	尺寸量測	未依圖面上標示 拒收	ALL	外觀	主要 AQL 0.4%
16	其他	如發現有上述未定義之不良則與客端簽訂限度樣	ALL	電訊 外觀	次要 AQL0.65%