






SPECIFICATIONS

CUSTOMER : _____
MODEL NO. : **GFTO0177CA128160**
VERSION : **B**
DATE : **2023.03.02**
CERTIFICATION : **ROHS**

Customer Sign	Approved By	Prepared By	Prepared By
			

晶發科技股份有限公司
GI FAR TECHNOLOGY CO., LTD.

新北市樹林區東豐街 81 號

No. 81, Dongfeng St, Shulin District, 238034, New Taipei City, Taiwan, R.O.C.

TEL: +886-2-8684-1188 FAX: +886-2-8684-8532



Revision Record

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1.SPECIFICATIONS

1.1 Features

Main LCD Panel

Item	Standard Value
Display Resolution	128 * (R · G · B) * 160 Dots
Display Mode	a-Si TFT , Normally White TN mode , Transmissive
Screen size(inch)	1.77" (Diagonal)
Viewing Direction	12 O'clock
Color configuration	R.G.B. vertical stripe
Backlight	White LED
Interface	4LINE SPI Interface
Other(controller / driver IC)	ST7735S
RoHS	YES

1.2 Mechanical Specifications

Item	Standard Value	Unit
Outline Dimension	34 (W) *43.78(L) * 2.6MAX (H)	mm

LCD Panel

Item	Standard Value	Unit
Active Area (LCD)	28.03 (W) * 35.04 (L)	mm

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	VDD	-	-0.3	+4.8	V
	VGH-VGL	-	-0.3	+30.0	V
Operating Temperature	T _{OP}	-	-20	+70	°C
Storage Temperature	T _{ST}	-	-30	+80	°C

1.4 DC Electrical Characteristics

Module

V_{CC} = 1.65~3.3V, T_a = 25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
System voltage	VDD		2.5	3.0	3.3	V
Interface operation voltage	VDDI		1.65	1.8	3.3	V
TFT Gate ON voltage	VGH			15		V
TFT Gate OFF voltage	VGL			-7.5		V
TFT Common voltage	V _{com}		-1.5		3.5	V
Input High Voltage	V _{IH}	-	0.7*VDD	-	VDD	V
Input Low Voltage	V _{IL}	-	GND	-	0.3*VDD	V
Output High Voltage	V _{OH}	I _{OH} =-1.0mA	0.8*VDD	-	VDD	V
Output Low Voltage	V _{OL}	I _{OL} =+1.0mA	GND	-	0.2*VDD	V
Supply Current	I _{DD}	VDD= 3.0V, Pattern= Black*1	-	10	-	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	Tr	Ta = 25°C θX, θY = 0°		2	4	ms	Note2	
	Tf		-	6	12			
Viewing angle	Top	θY+	CR ≥ 10	35	45	-	Deg.	Note4
	Bottom	θY-		10	20	-		
	Left	θX-		35	45	-		
	Right	θX+		35	45	-		
Contrast ratio	CR		400	500	-	-	Note3	
Color of CIE Coordinate (With B/L)	White	X	Ta = 25°C θX, θY = 0°	0.283	0.303	0.323	-	Note1
		Y		0.305	0.325	0.345		
	Red	X		0.606	0.626	0.646		
		Y		0.314	0.334	0.354		
	Green	X		0.257	0.277	0.297		
		Y		0.529	0.549	0.569		
	Blue	X		0.122	0.142	0.162		
		Y		0.102	0.122	0.142		
Average Brightness Pattern=white display (With B/L)	IV	IF= 30mA	150	220	-	cd/m2		
Uniformity(With B/L)	ΔB	IF= 30mA	75	-	-	%		

Note1:

1 : $\Delta B = B(\min) / B(\max) \times 100\%$.

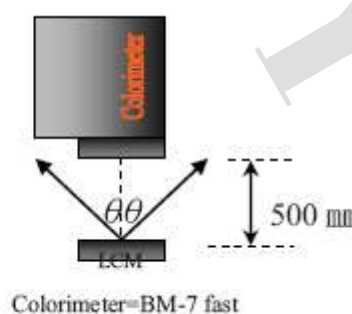
2 : Measurement Condition for Optical Characteristics:

a : Environment: 25°C±5°C / 60±20%R.H, no wind, dark room below 10 Lux at typical lamp current and typical operating frequency.

b : Measurement Distance: 500 ± 50 mm, (θ= 0°).

c : Equipment: TOPCON BM-7 fast, (field 1°), after 10 minutes operation.

d : The uncertainty of the C.I.E coordinate measurement ±0.01, Average Brightness ± 4%.



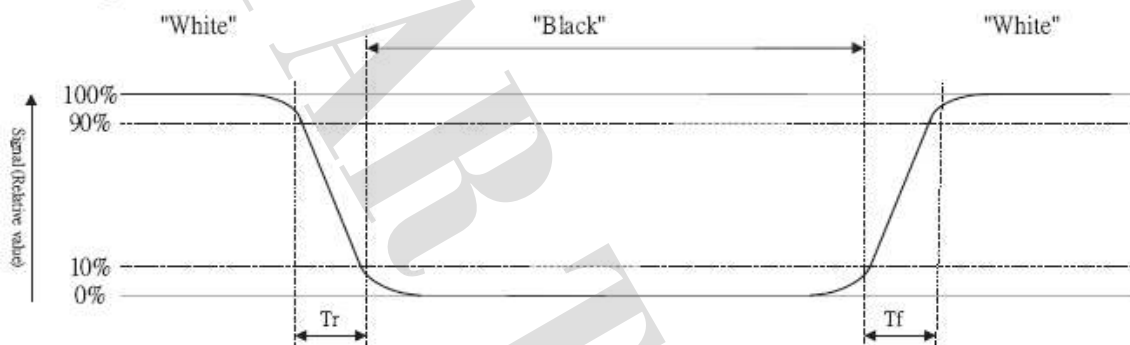


Note2: Definition of response time:

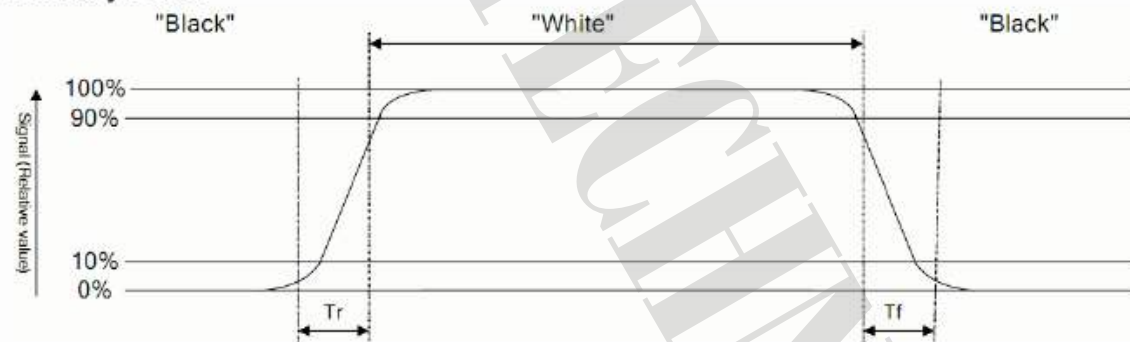
The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of Amplitudes.

Refer to figure as below:

Normally White



Normally Black



Note3: Definition of contrast ratio:

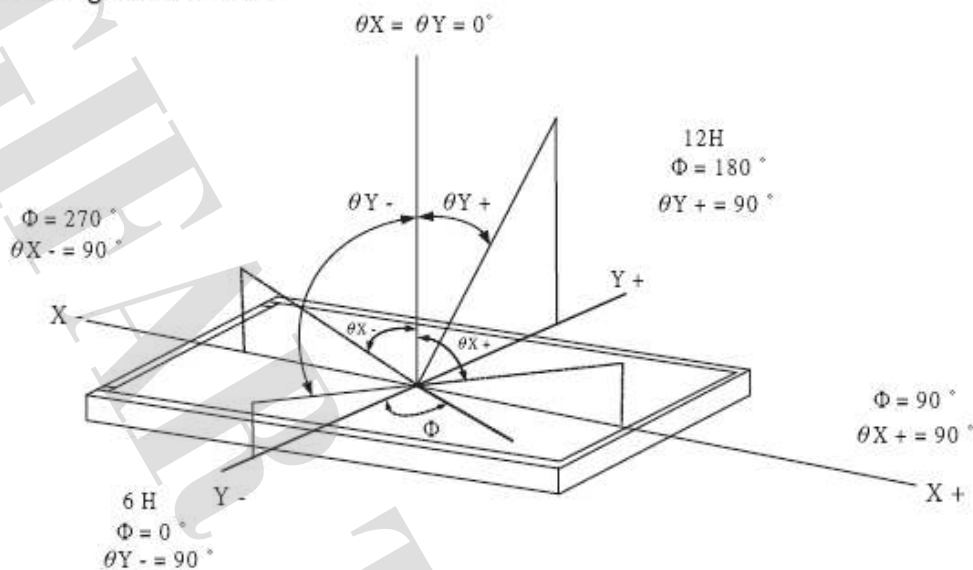
Contrast ratio is calculated with the following formula

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



Note4: Definition of viewing angle:

Refer to figure as below:



1.6 Backlight Characteristics

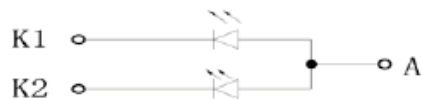
1.6.1 Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=30mA	2.9	3.0	3.1	V
Average Brightness (without LCD)	IV	IF=30mA	3000	3500	-	cd/m ²
Color of CIE Coordinate (without LCD)	X		0.24		0.29	-
	Y	0.24		0.29		
Color		White				

*1: This value will be changed while mass production.

*2: $\Delta B = B(\min)/B(\max) * 100\%$

B/L Internal Circuit Diagram

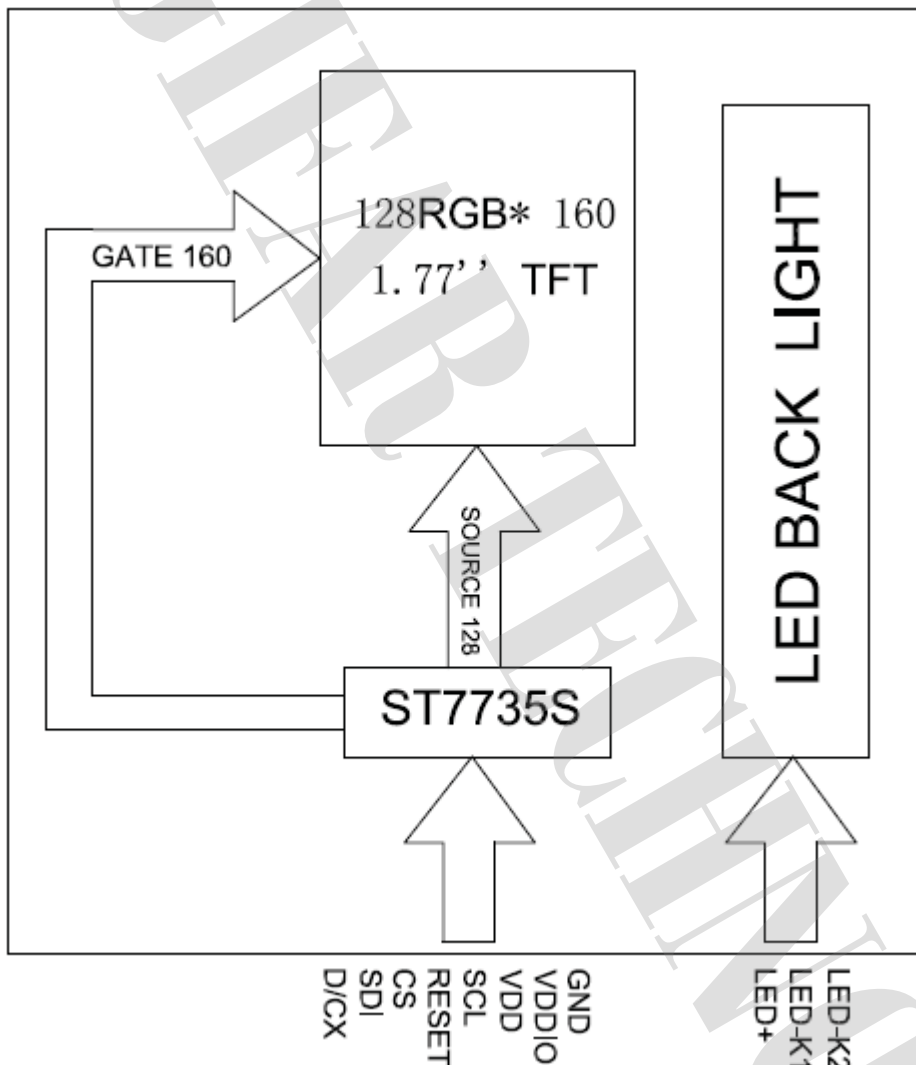


LED CIRCUIT:



2. MODULE STRUCTURE

2.1 Block Diagram

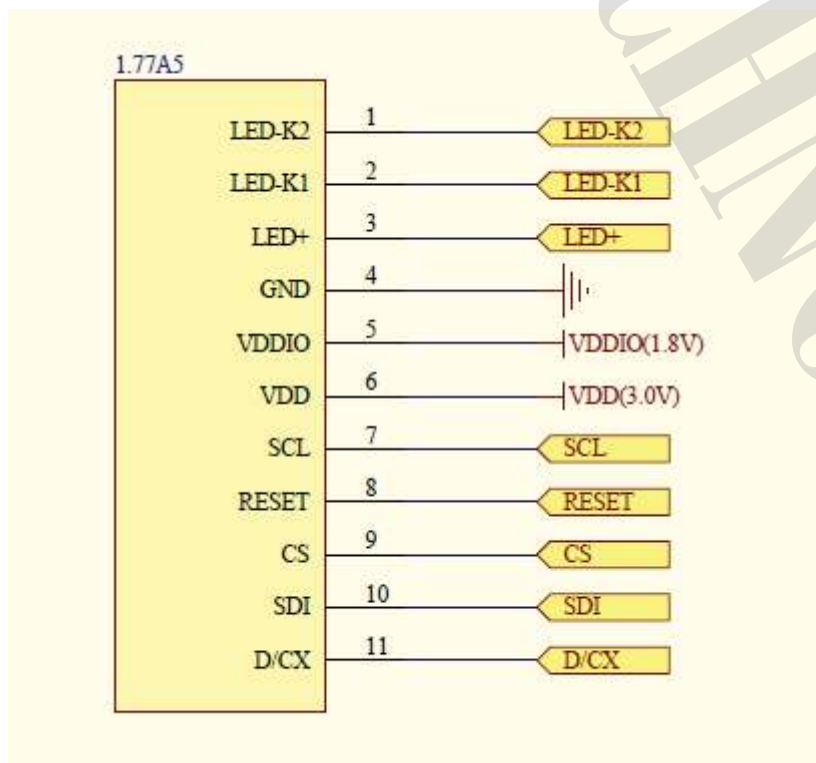




2.2 Interface Pin Description

Pin NO.	Symbol	Description
1	LED-K2	Back light cathode
2	LED-K1	Back light cathode
3	LED+	Back light anode
4	GND	Ground
5	VDDIO	Power supply 1.8V
6	VDD	Power supply 3.0V
7	SCL	Synchronors clock signal
8	RESET	Reset signal input terminal.Active at “L”
9	CS	Chip select signal input pin
10	SDI	Input/output signal
11	D/CX	Register select signal.

2.2.1 Refer Initial code:





2.3 Refer Initial code:

Init code on D63x

```
p_lcdspi_LcdResetHigh();
delayMs(10);
p_lcdspi_LcdResetLow();
delayMs(10);
p_lcdspi_LcdResetHigh();
delayMs(120);

p_LcdDriver_SendCmd(DRLCDC_CMD_SW_RESET); //0x01
delayMs(120);

p_LcdDriver_SendCmd(DRLCDC_CMD_SLEEP_OUT_BOOST_ON); //0x11
delayMs(120);

p_LcdDriver_SendCmd(DRLCDC_CMD_FRM_CTR1); //0xB1
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR1_RTNA); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR1_FPA); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR1_BPA); //0x2d

p_LcdDriver_SendCmd(DRLCDC_CMD_FRM_CTR2); //0xB2
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR2_RTNB); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR2_FPB); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR2_BPB); //0x2d

p_LcdDriver_SendCmd(DRLCDC_CMD_FRM_CTR3); //0xB3
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_RTNC); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_FPC); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_BPC); //0x2d
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_RTND); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_FPD); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_FRMCTR3_BPD); //0x2d

//Display Inversion Control
p_LcdDriver_SendCmd(DRLCDC_CMD_INVCTR); //0xB4
p_LcdDriver_SendData(DRLCDC_DATA_INVCTR_NL); //0x03
```



```
p_LcdDriver_SendCmd(DRLCDC_CMD_DISSET5); //0xB6
    p_LcdDriver_SendData(DRLCDC_DATA_DISSET5_D1); //0xB4
    p_LcdDriver_SendData(DRLCDC_DATA_DISSET5_D2); //0xF0
    //Power Control-1
    p_LcdDriver_SendCmd(DRLCDC_CMD_PWCTR1); //0xC0
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR1_D1); //0x22
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR1_D2); //0x02
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR1_D3); //0x84
    delayMs(5);
    //Power Control-2
    p_LcdDriver_SendCmd(DRLCDC_CMD_PWCTR2); //0xC1
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR2_D1); //0xC5
    delayMs(5);
    //Power Control-3
    p_LcdDriver_SendCmd(DRLCDC_CMD_PWCTR3); //0xC2
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR3_D1); //0x0A
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR3_D2); //0x00
    delayMs(5);
    //Power Control-4
    p_LcdDriver_SendCmd(DRLCDC_CMD_PWCTR4); //0xC3
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR4_D1); //0x8A
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR4_D2); //0x2A
    delayMs(5);
    //Power Control-5
    p_LcdDriver_SendCmd(DRLCDC_CMD_PWCTR5); //0xC4
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR5_D1); //0x8A
    p_LcdDriver_SendData(DRLCDC_DATA_PWCTR5_D2); //0xEE
    delayMs(5);
    //VMCTR1
    p_LcdDriver_SendCmd(DRLCDC_CMD_VMCTR1); //0xC5
    p_LcdDriver_SendData(DRLCDC_DATA_VMCTR1_D1); //0x18
```



delayMs (5) ;

```
//Setup Gamma
p_LcdDriver_SendCmd(DRLCDC_CMD_GAMCTR1); //0xE0
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D1); //0x03
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D2); //0x0a
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D3); //0x08
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D4); //0x0a
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D5); //0x3a
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D6); //0x35
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D7); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D8); //0x2e
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D9); //0x2b
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D10); //0x26
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D11); //0x2c
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D12); //0x3c
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D13); //0x00
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D14); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D15); //0x03
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D16); //0x10
p_LcdDriver_SendCmd(DRLCDC_CMD_GAMCTR1); //0xE1
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D1); //0x04
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D2); //0x0a
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D3); //0x08
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D4); //0x0a
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D5); //0x24
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D6); //0x22
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D7); //0x1f
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D8); //0x26
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D9); //0x28
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D10); //0x29
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D11); //0x33
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D12); //0x3c
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D13); //0x00
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D14); //0x01
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D15); //0x03
p_LcdDriver_SendData(DRLCDC_DATA_GAMCTR1_D16); //0x10
```



```
p_LcdDriver_SendCmd(DRLCDC_CMD_EXTCTRL);           //0xF0
p_LcdDriver_SendData(DRLCDC_DATA_EXTCTRL_D1);       //0x01

p_LcdDriver_SendCmd(DRLCDC_CMD_RAM_POWERSAVE);      //0xF6
p_LcdDriver_SendData(DRLCDC_DATA_RAM_POWERSAVE_D1); //0x00

// Pixel Format:
p_LcdDriver_SendCmd(DRLCDC_CMD_INT_PIXEL_FORMAT);   //0x3A
p_LcdDriver_SendData(DRLCDC_DATA_INT_PIXEL_FORMAT_D1); //0x05

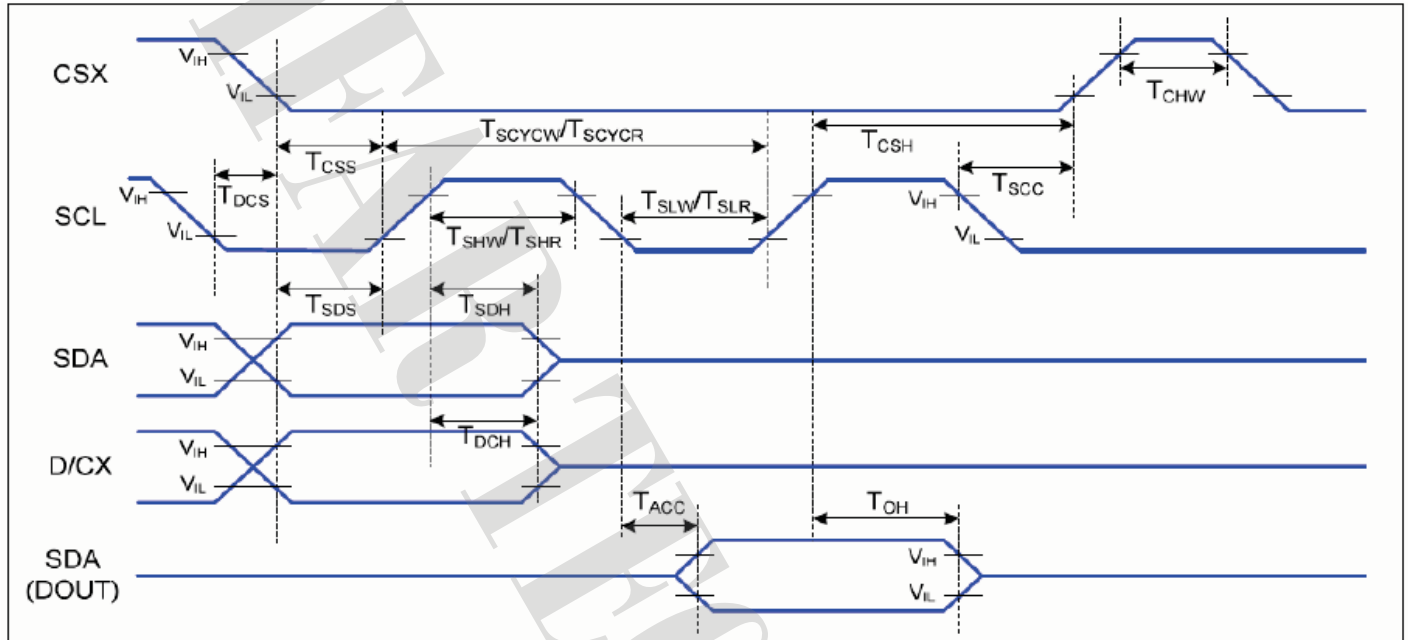
//Memory access control
p_LcdDriver_SendCmd(DRLCDC_CMD_MEM_ACCESS_CTL);     //0x36
p_LcdDriver_SendData(DRLCDC_DATA_MEM_ACCESS_CTL_D1); //0xc8
delayMs(5);

p_LcdDriver_SendCmd(DRLCDC_CMD_SLEEPOUT_BOOST_ON);  //0x11
delayMs(120);
```



2.4 Timing Characteristics

2.4.1 4LINE SPI I TYPE

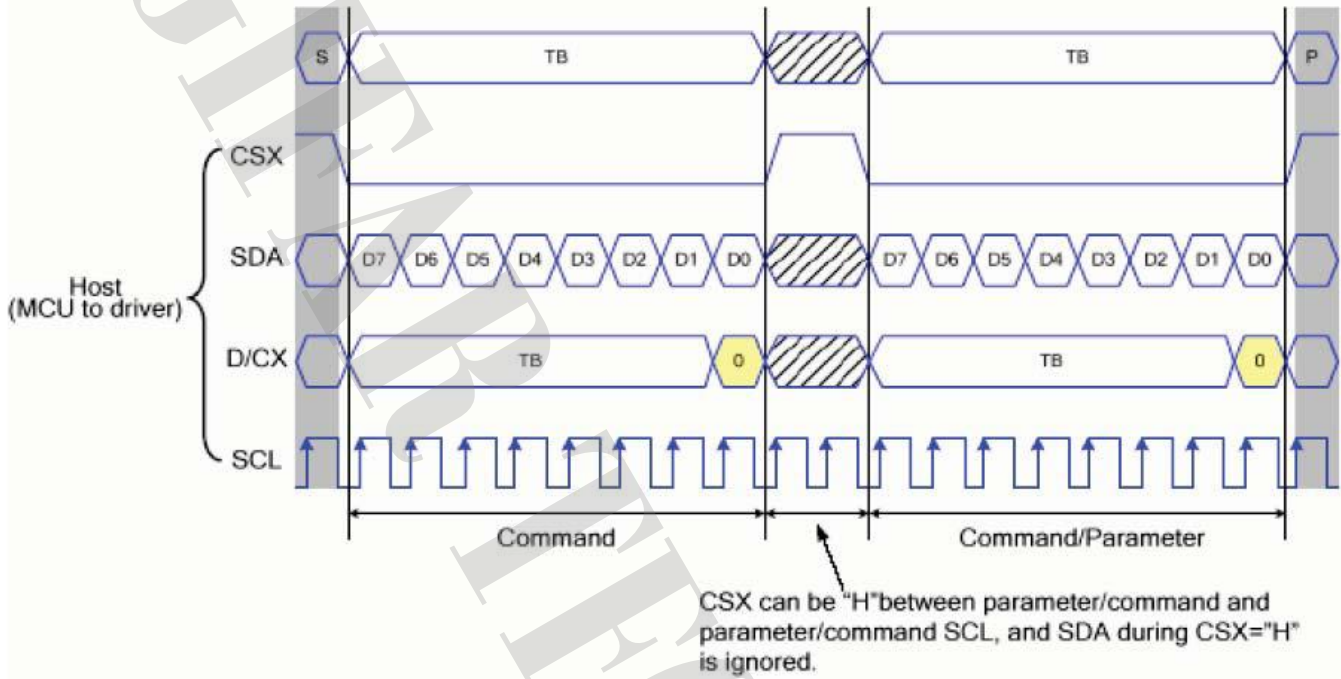


Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select "H" Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL "H" Pulse Width (Write)	15		ns	
	TSLW	SCL "L" Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL "H" Pulse Width (Read)	60		ns	
	TSLR	SCL "L" Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

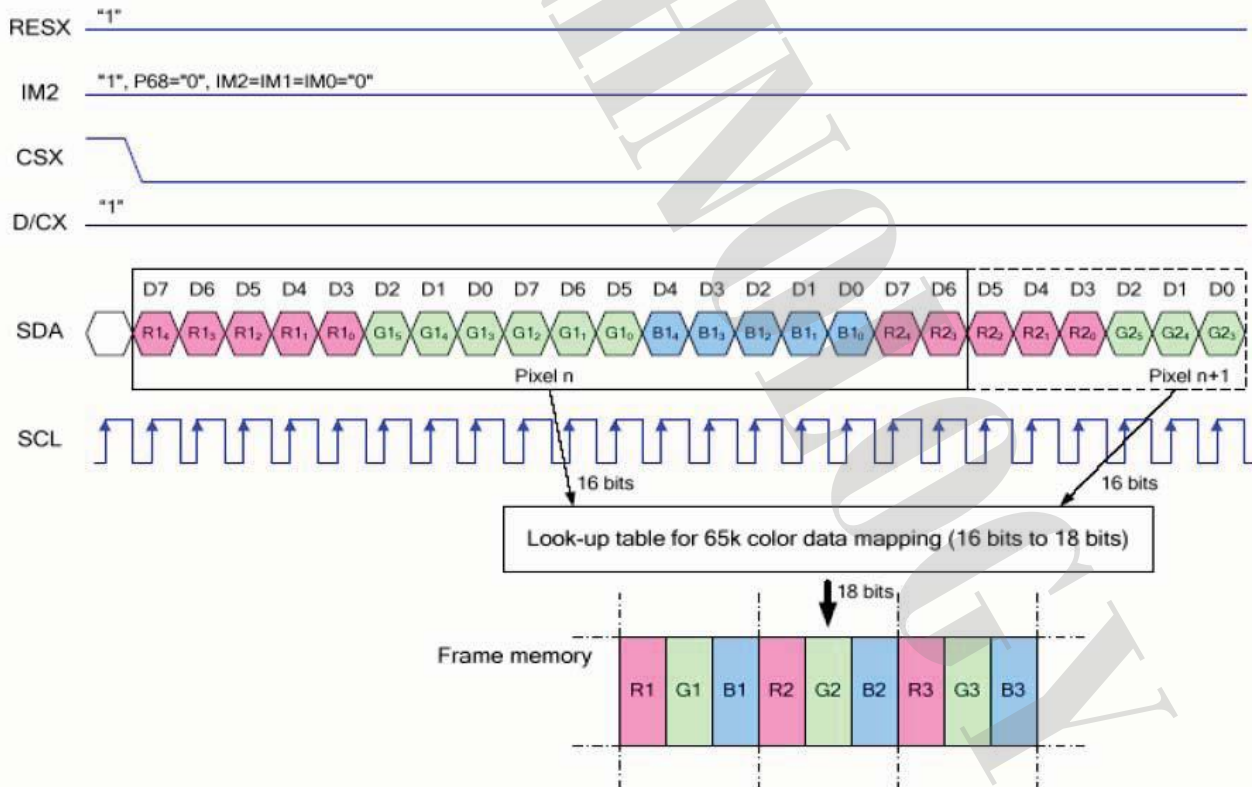


2.4.2 4line SPI Write Protocol

Write to Register with Control Bit in Transmission



2.4.3 4line write Data for 16-bit/Pixel

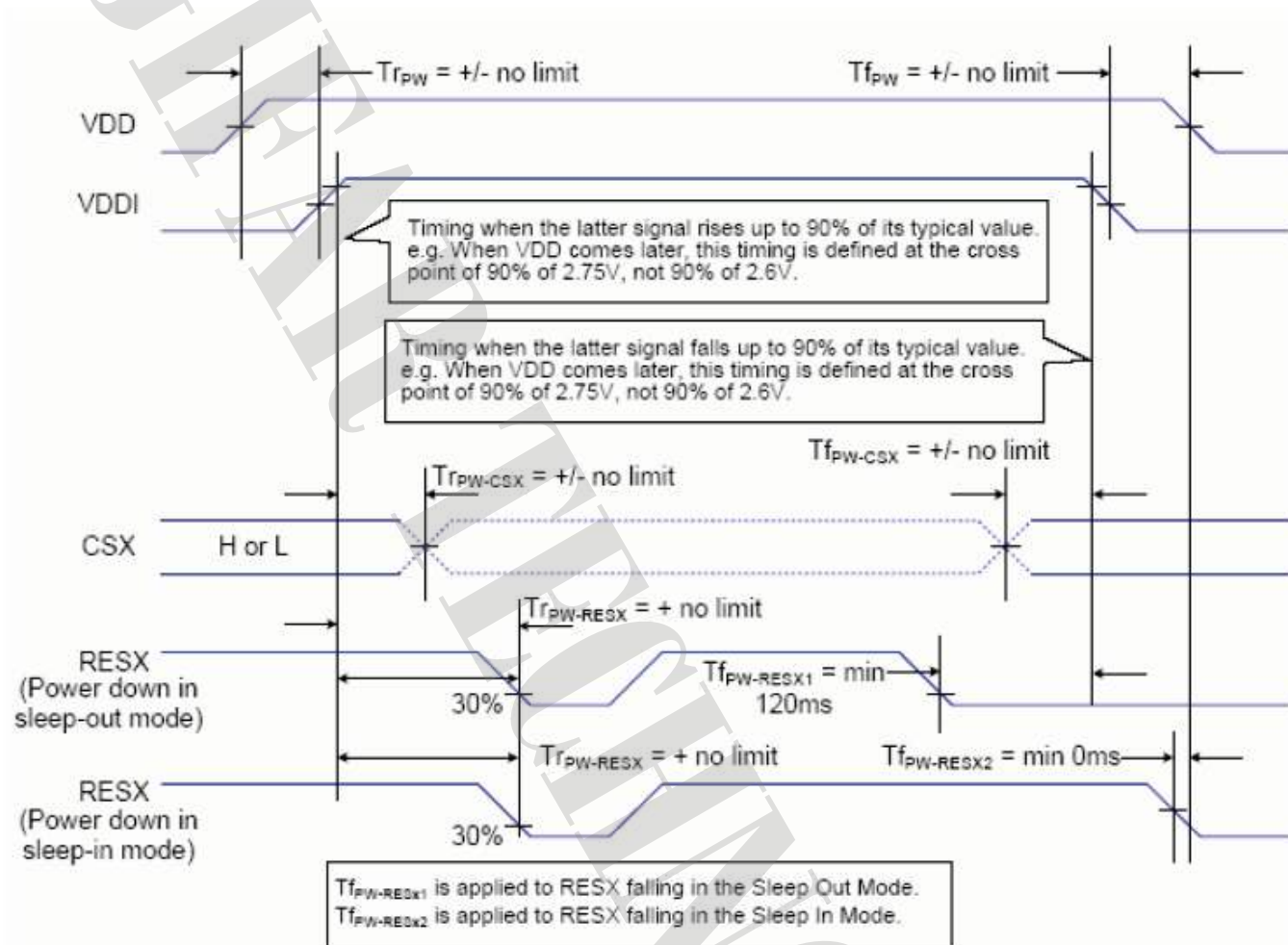


- Note 1. pixel data with the 16-bit color depth information
- Note 2. The most significant bits are: Rx4, Gx5 and Bx4
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0



2.5 Power On/Off Sequence

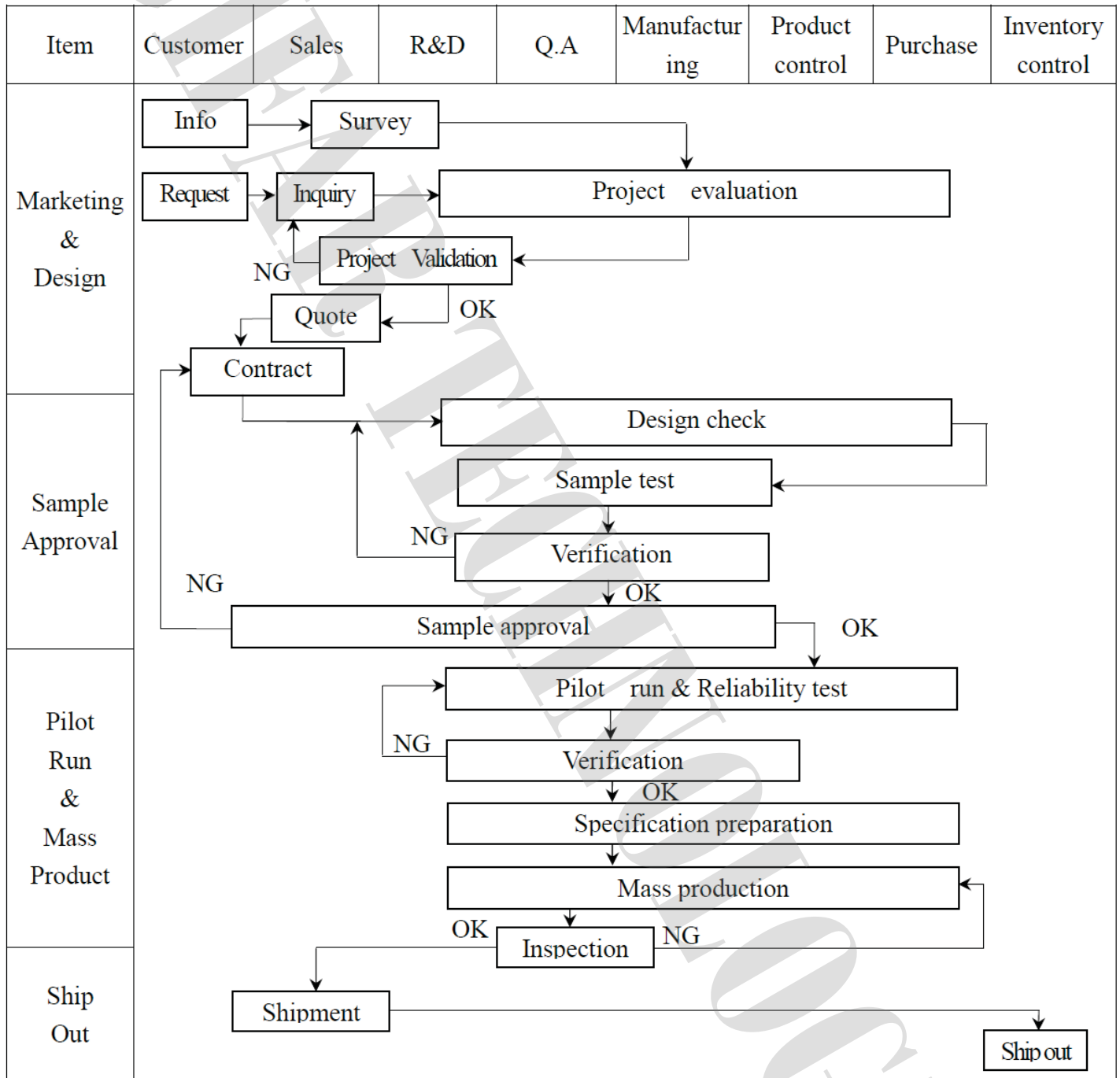
2.5.1 Power On/Off sequence





3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart





Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service	<pre> graph TD Info[Info] --> Claim[Claim] Claim --> AnalysisReport[Analysis report] Claim --> FailureAnalysis[Failure analysis] FailureAnalysis --> CorrectiveAction[Corrective action] CorrectiveAction --> Tracking[Tracking] </pre>							
Q.A Activity	1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management				2. Process improvement proposal 4. Education And Training Activities			

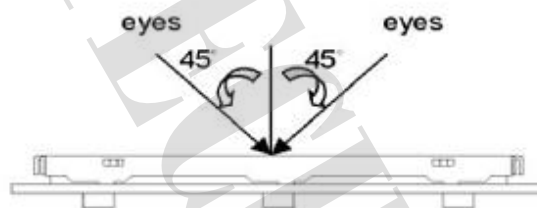


3.2. Inspection Specification

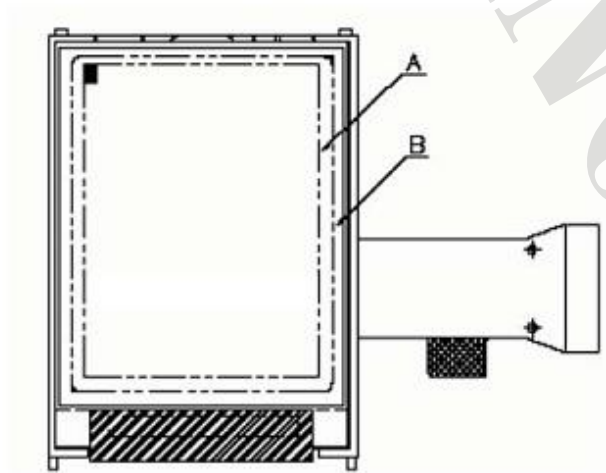
- ◆ Scope : The document shall be applied to TFT-LCD Module for less than 3.5"
- ◆ Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II.
- ◆ Equipment : Gauge 、 MIL-STD 、 Sample
- ◆ Defect Level : Major Defect AQL : 0.4 ; Minor Defect AQL : 1.5
- ◆ OUT Going Defect Level : Sampling.
- ◆ Standard of the product appearance test :

a. Manner of appearance test :

- (1). The test best be under 20W×2 fluorescent light , and distance of view must be at 30 cm.
- (2). The test direction is base on about around 45° of vertical line.



(3). Definition of area.



A area : viewing area

B area : Outside of viewing area

(4). Standard of inspection : (Unit : mm)

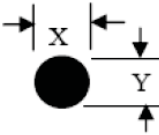
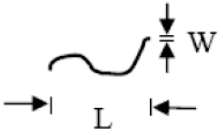


◆ Specification For TFT-LCD Module Less Than 3.5" :

NO	Item	Criterion	Level												
01	Product condition	1. 1 The part number is inconsistent with work order of production.	Major												
		1. 2 Mixed product types.	Major												
		1. 3 Assembled in inverse direction.	Major												
02	Quantity	2. 1 The quantity is inconsistent with work order of production.	Major												
03	Outline dimension	3. 1 Product dimension and structure must conform to structure diagram.	Major												
04	Electrical Testing	4. 1 Missing line character and icon.	Major												
		4. 2 No function or no display.	Major												
		4. 3 Display malfunction.	Major												
		4. 4 LCD viewing angle defect.	Major												
		4. 5 Current consumption exceeds product specifications.	Major												
05	Dot defect (Bright dot 、 Dark dot) On -display	<table border="1"> <thead> <tr> <th></th> <th>Item</th> <th>Acceptance (Q'ty)</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Dot Defect</td> <td>Bright Dot</td> <td>≤ 2</td> </tr> <tr> <td>Dark Dot</td> <td>≤ 3</td> </tr> <tr> <td>Joint Dot</td> <td>≤ 2</td> </tr> <tr> <td>Total</td> <td>≤ 3</td> </tr> </tbody> </table>		Item	Acceptance (Q'ty)	Dot Defect	Bright Dot	≤ 2	Dark Dot	≤ 3	Joint Dot	≤ 2	Total	≤ 3	Minor
			Item	Acceptance (Q'ty)											
		Dot Defect	Bright Dot	≤ 2											
			Dark Dot	≤ 3											
			Joint Dot	≤ 2											
Total	≤ 3														
5. 1 Inspection pattern : full white , full black , Red , Green and blue screens.															
5. 2 It is defined as dot defect if defect area $> 1/2$ dot.															
5. 3 The distance between two dot defect ≥ 5 mm.															

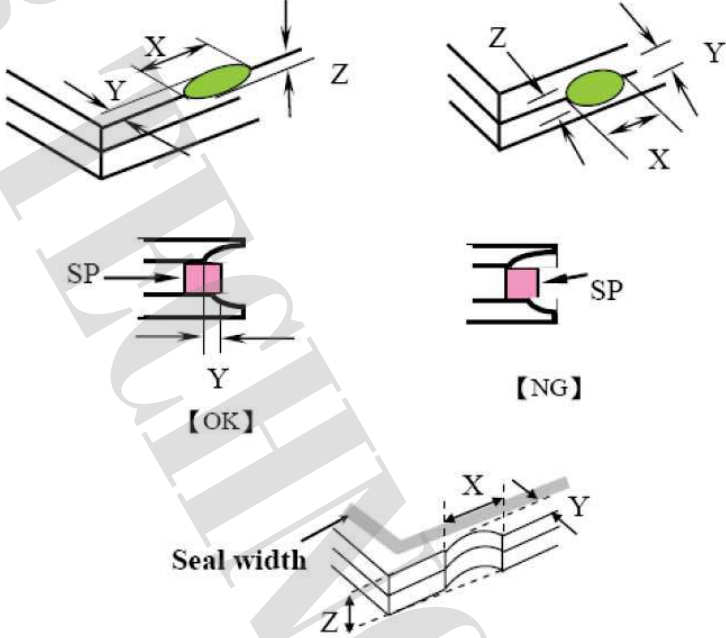


◆Specification For TFT-LCD Module Less Than 3.5" :

NO	Item	Criterion	Level																																								
06	<p>Black or white dot、scratch、contamination</p> <p>Round type</p>  <p>$\Phi = (x + y) / 2$</p> <p>Line type</p> 	<p>6.1 Round type (Non-display or display) :</p> <table border="1"> <thead> <tr> <th rowspan="2">Dimension (diameter : Φ)</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.15$</td> <td colspan="2">Ignore</td> </tr> <tr> <td>$0.15 < \Phi \leq 0.20$</td> <td>2</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$0.20 < \Phi \leq 0.30$</td> <td>2</td> </tr> <tr> <td>$\Phi > 0.30$</td> <td>0</td> </tr> <tr> <td>Total</td> <td colspan="2">3</td> </tr> </tbody> </table> <p>6.2 Line type(Non-display or display) :</p> <table border="1"> <thead> <tr> <th colspan="2">Dimension</th> <th colspan="2">Acceptance (Q'ty)</th> </tr> <tr> <th>Length (L)</th> <th>Width (W)</th> <th>A area</th> <th>B area</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> </tr> <tr> <td>---</td> <td>$W > 0.05$</td> <td>As round type</td> </tr> <tr> <td colspan="2">Total</td> <td colspan="2">3</td> </tr> </tbody> </table>	Dimension (diameter : Φ)	Acceptance (Q'ty)		A area	B area	$\Phi \leq 0.15$	Ignore		$0.15 < \Phi \leq 0.20$	2	Ignore	$0.20 < \Phi \leq 0.30$	2	$\Phi > 0.30$	0	Total	3		Dimension		Acceptance (Q'ty)		Length (L)	Width (W)	A area	B area	---	$W \leq 0.03$	Ignore	Ignore	$L \leq 5.0$	$0.03 < W \leq 0.05$	3	---	$W > 0.05$	As round type	Total		3		Minor
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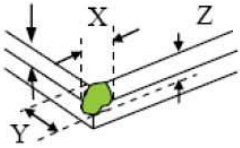
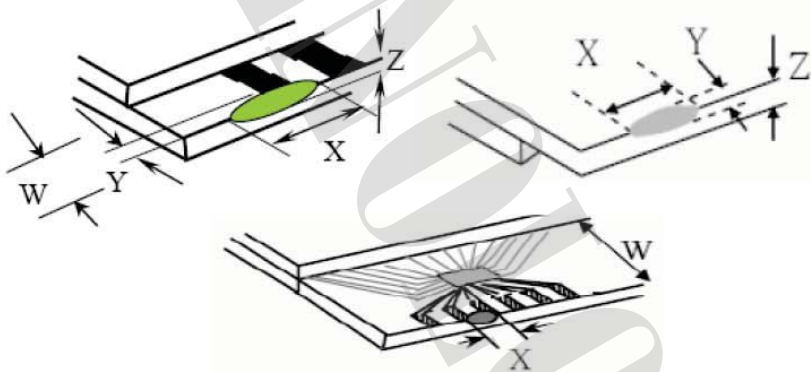


◆ Specification For TFT-LCD Module Less Than 3.5" :

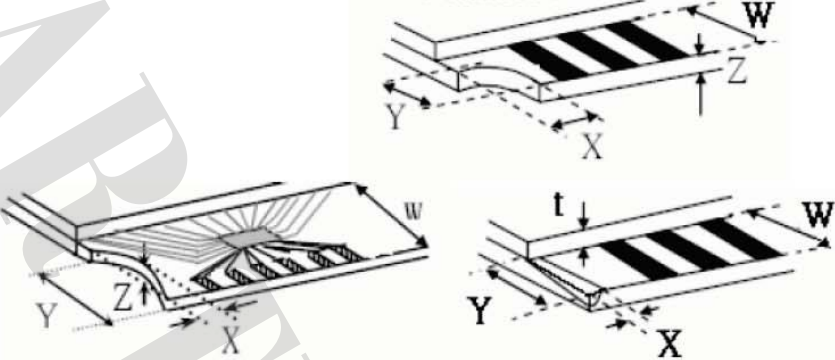
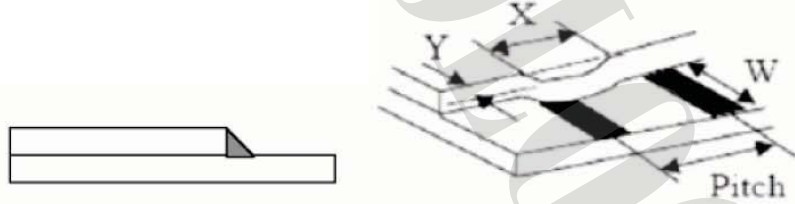
NO	Item	Criterion	Level									
08	The crack of glass	<p>Symbols :</p> <p>X : The length of crack Z : The thickness of crack t : The thickness of glass</p> <p>Y : The width of crack. W : terminal length a : LCD side length</p> <hr/> <p>8.1 General glass chip : 8.1.1 Chip on panel surface and crack between panels:</p>  <table border="1" data-bbox="555 1447 1334 1722"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>Crack can't enter viewing area</td> <td>$\leq 1/2 t$</td> </tr> <tr> <td>$\leq a$</td> <td>Crack can't exceed the half of SP width.</td> <td>$1/2 t < Z \leq 2 t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq a$	Crack can't enter viewing area	$\leq 1/2 t$	$\leq a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$	Minor
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		X	Y	Z									
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$\leq 1/5 a$	Crack can't exceed the half of SP width.	$1/2 t < Z \leq 2 t$											
<p>8.2 Protrusion over terminal :</p> <p>8.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="582 1675 1340 1843"> <thead> <tr> <th></th> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>Front</td> <td>$\leq a$</td> <td>$\leq 1/2 W$</td> <td>$\leq t$</td> </tr> <tr> <td>Back</td> <td>$\leq a$</td> <td>$\leq W$</td> <td>$\leq 1/2 t$</td> </tr> </tbody> </table>		X	Y	Z	Front	$\leq a$	$\leq 1/2 W$	$\leq t$	Back	$\leq a$	$\leq W$	$\leq 1/2 t$	
	X	Y	Z										
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◆ Specification For TFT-LCD Module Less Than 3.5" :

NO	Item	Criterion	Level												
08	The crack of glass	<p>Symbols :</p> <p>X : The length of crack Y : The width of crack.</p> <p>Z : The thickness of crack W : terminal length</p> <p>t : The thickness of glass a : LCD side length</p> <p>8. 2. 2 Non-conductive portion :</p>  <table border="1" data-bbox="638 963 1252 1108"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq 1/3 a$</td> <td>$\leq W$</td> <td>$\leq t$</td> </tr> </tbody> </table> <p>⊙ If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>8. 2. 3 Glass remain :</p>  <table border="1" data-bbox="558 1736 1228 1859"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>$\leq a$</td> <td>$\leq 1/3 W$</td> <td>$\leq t$</td> </tr> </tbody> </table>	X	Y	Z	$\leq 1/3 a$	$\leq W$	$\leq t$	X	Y	Z	$\leq a$	$\leq 1/3 W$	$\leq t$	Minor
		X	Y	Z											
$\leq 1/3 a$	$\leq W$	$\leq t$													
X	Y	Z													
$\leq a$	$\leq 1/3 W$	$\leq t$													



◆Specification For TFT-LCD Module Less Than 3.5" :

NO	Item	Criterion	Level
09	Backlight elements	9.1 Backlight can't work normally.	Major
		9.2 Backlight doesn't light or color is wrong.	Major
		9.3 Illumination source flickers when lit.	Major
10	General appearance	10.1 Pin type 、 quantity 、 dimension must match type in structure diagram.	Major
		10.2 No short circuits in components on PCB or FPC .	Major
		10.3 Parts on PCB or FPC must be the same as on the production characteristic chart .There should be no wrong parts , missing parts or excess parts.	Major
		10.4 Product packaging must the same as specified on packaging specification sheet.	Minor
		10.5 The folding and peeled off in polarizer are not acceptable.	Minor
		10.6 The PCB or FPC between B/L assembled distance(PCB or FPC) is ≤ 1.5 mm.	Minor



4. RELIABILITY TEST

4.1 Reliability Test Condition

NO.	TEST ITEM	TEST CONDITION										
1	High Temperature Operation Test	Keep in +70°C ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.										
2	High Temperature Storage Test	Keep in +80°C ±2°C 240 hrs Surrounding temperature, then storage at normal condition 4hrs.										
3	Low Temperature Operation Test	Keep in -20°C ±2°C 96 hrs Surrounding temperature, then storage at normal condition 4hrs.										
4	Low Temperature Storage Test	Keep in -30°C ±2°C 240 hrs Surrounding temperature, then storage at normal condition 4hrs.										
5	High Temperature / High Humidity Storage Test	Keep in +60°C / 90% R.H duration for 240 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)										
6	Temperature Cycling Storage Test	$\begin{array}{ccccccc} -30^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} & \rightarrow & +80^{\circ}\text{C} & \rightarrow & +25^{\circ}\text{C} \\ (30\text{mins}) & & (5\text{mins}) & & (30\text{mins}) & & (5\text{mins}) \\ & & & & \leftarrow & & \rightarrow \\ & & & & 10 \text{ Cycle} & & \end{array}$ Surrounding temperature, then storage at normal condition 4hrs.										
7	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/-										
		Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-										
7	ESD Test	1. Temperature ambience : 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 sec) (Tolerance if the output voltage indication : ±5%)										
8	Vibration Test (Packaged)	1. Sine wave 10~55 Hz frequency (1 min/sweep) 2. The amplitude of vibration :1.5 mm 3. Each direction (X、Y、Z) duration for 2 Hrs										
9	Drop Test (Packaged)	<table border="1"> <thead> <tr> <th>Packing Weight (Kg)</th> <th>Drop Height (cm)</th> </tr> </thead> <tbody> <tr> <td>0 ~ 45.4</td> <td>122</td> </tr> <tr> <td>45.4 ~ 90.8</td> <td>76</td> </tr> <tr> <td>90.8 ~ 454</td> <td>61</td> </tr> <tr> <td>Over 454</td> <td>46</td> </tr> </tbody> </table>	Packing Weight (Kg)	Drop Height (cm)	0 ~ 45.4	122	45.4 ~ 90.8	76	90.8 ~ 454	61	Over 454	46
		Packing Weight (Kg)	Drop Height (cm)									
0 ~ 45.4	122											
45.4 ~ 90.8	76											
90.8 ~ 454	61											
Over 454	46											
9	Drop Test (Packaged)	Drop ※1 corner / 3 edges / 6 sides each 1time Direction :										

Note: The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.



5. PRECAUTION RELATING PRODUCT HANDLING

5.1 SAFETY

5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands , this will stain the display area.

5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is $260 \pm 5^{\circ}\text{C}$ and 3 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM

5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

5.3.3 Do not crush , shake , or jolt the module.

5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

The period is within one year since the date of shipping out under normal using and storage conditions.

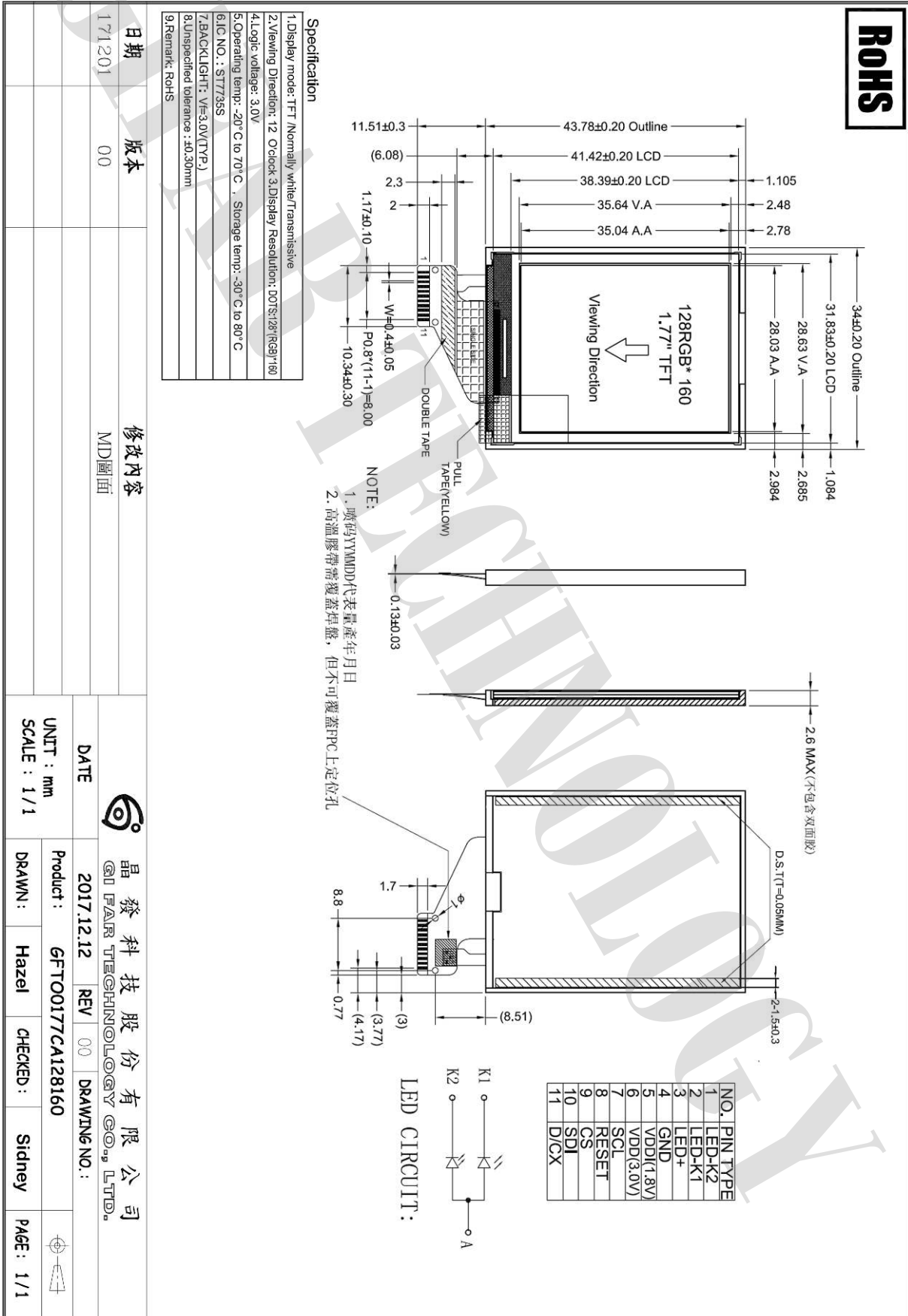
5.4.2 Unaccepted responsibility

This product has been manufactured to your company's specification as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.



6. Appendix

6.1 LCM Drawing



日期	版本	修改內容
171201	00	MD圖面

DATE	晶發科技股份有限公司 GI FAR TECHNOLOGY CO., LTD.
UNIT : mm SCALE : 1/1	2017.12.12 REV 00 DRAWING NO. : Product : GFT00177CA128160
DRAWN : Hazel	CHECKED : Sidney
PAGE : 1/1	