



Product Specification

F104PET-TA1

- ☐ Draft Specifications
- ☒ Preliminary Specifications
- ☐ Final Specifications

Title	10.4-inches Touch Display Product Specifications
Model Name	F104PET-TA1
Version	0

Customer

Approved by

Date

Notice: This Specification is subject to change without notice.

Approved By	Prepared By
ZOE NIEN	ALLEN FANG
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REVISION HISTORY

Version	ECN No.	Description of Changes	Date	Prepared
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1. GENERAL DESCRIPTION

1.1. INTRODUCTION

F104PET-TA1 is a 10.4" IAV TFT LCD module G104XCE-LH1 with projected capacitive multi-touch B104PBU-E01 air bonding, with touch driver B000PDU-E03.

The display format is intended to support the XGA (1024 x 768) screen and 1 channel 30 pins LVDS interface, RGB 8-bits (6-bits colors with FRC), with white LEDs backlight built in PCBA.

1.2. FEATURES

- Excellent Brightness (1000 cd/m²)
- Ultra high contrast ratio (1000:1)
- Fast response time ($T_R+T_F=25\text{ms}$)
- XGA (1024 x 768 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- PSWG (Panel Standardization Working Group)
- Ultra wide viewing angle: 168(H)/ 168(V) (CR>10) AAS technology
- 180 degree rotation display option
- Wide operation temperature

1.3. APPLICATION

- TFT LCD monitor
- Industrial application

1.4. GENERAL SPECIFICATIONS

Parameter	Specification	Unit	Remarks
Active Area Size	10.4	inch	
Display Area	210.4 x 157.8 (V)	mm	
Outline Dimension	225.50 (H) x 176.30 (V) x 11.74 (D)	mm	D:PCAP+LCM
Weight	537	g	Typ.
Driver Element	a-Si TFT active matrix	-	
Display Colors	16,194,277 / 262,144	Colors	
Number of Pixels	1024 (H) x 768 (V)	pixels	
Pixel Pitch	0.2055 (H) x 0.2055(W)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Transmissive mode / Normal Black	-	
White Variation	80% (Typ.)	-	
Touch Technology	Projected Capacitive Multi-Touch Panel	-	
Touch Method	Finger or exclusive pen	-	
Numbers of Touch	10	Points	
Touch Driver	B000PDU-E03: USB	-	
Touch Sensor Glass Type	Strengthening Glass	-	
Touch Controller IC	EETI, EXC80W46	-	
Touch Driver Interface	USB 1.1 Full Speed / I ² C	-	
Support OS	Windows (Embedded/CE/XP/2000/Vista/7/8/10) / Linux / Android / MAC / QNX	-	

2. ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Parameter	Symbol	Min.	Max.	Unit	Remarks
Logic/LCD Drive Voltage	V _{DD}	-0.3	18	V	Note 1
Input Voltage of Signal	V _{In}	-0.3	5.0	V	
Operating Temperature	T _{op}	-20	+70	°C	Note 2
Operating Humidity	H _{op}	10	90	%RH	
Storage Temperature	T _{st}	-30	+80	°C	
Storage Humidity	H _{st}	10	90	%RH	
Touch DC Supply Voltage	USB_V _{DD}	-0.3	6.0	V	

Note:

1. Duration: 50 msec.
2. Maximum Wet-Bulb temperature should be 39°C and no condensation.

The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less. At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.

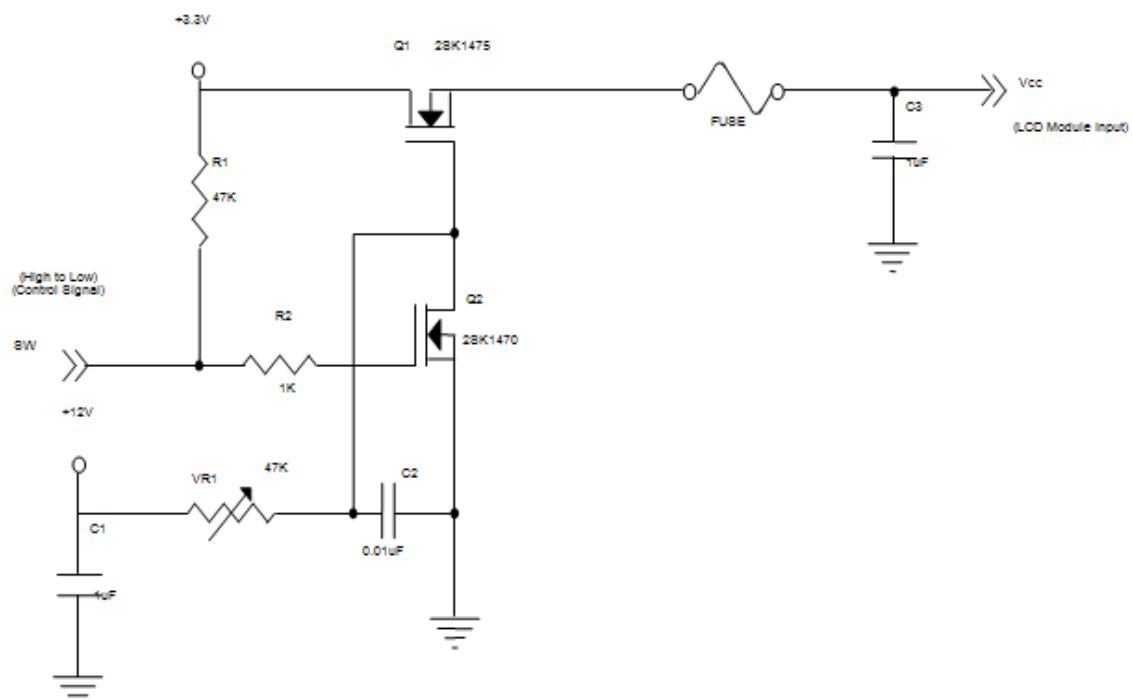
3. ELECTRICAL CHARACTERISTICS

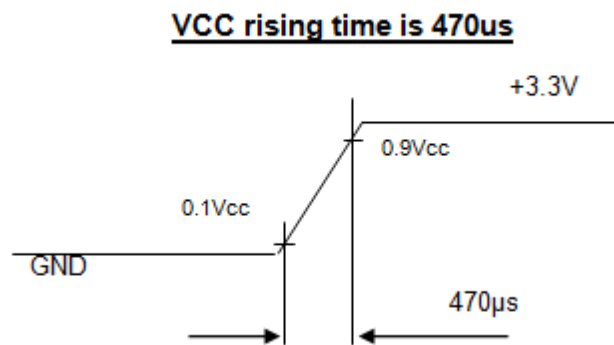
3.1. LCD MODULE

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Power Supply Input Voltage		V_{CC}	3.0	3.3	3.6	V	(1)
Power Supply Ripple Voltage		V_{RP}	-	-	100	mV	
Rush Current		I_{RUSH}	-	-	4.0	A	(2)
Power Supply Input Current	Black Pattern	I_{CC}	-	505	610	mA	(3)
	White Pattern		-	315	380	mA	
Power Consumption		P_L	-	1.67	2.01	W	
LVDS differential input voltage		V_{id}	100	-	600	mV	
LVDS common input voltage		V_{ic}	1.0	1.2	1.4	V	
Logic High Input Voltage		V_{IH}	2.3	-	V_{CC}	V	
Logic Low Input Voltage		V_{IL}	0	-	0.7	V	
LVDS terminating resistor		R_T	-	100	-	ohm	

Note (1) the assembly should be always operated within above ranges.

Note (2) Measurement Condition :





Note (3) the specified power supply current is under the conditions at $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



Active Area

b. Black Pattern

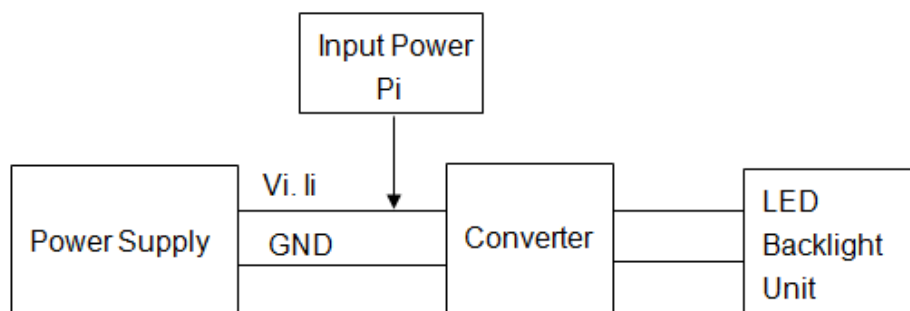


Active Area

3.2. LCD BACKLIGHT UNIT

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Converter Input Voltage		V_i	10.8	12	13.2	V	(Duty 100%)
Converter Input Ripple Current		V_{iRP}	-	-	350	mV	
Converter Input Current		I_i	-	0.67	0.79	A	@ $V_i=12V$ (Duty 100%)
Converter Inrush Current		I_{iRUSH}	-	-	3.0	A	@ V_i rising time =20ms ($V_i=12V$)
Input Power Consumption		P_{BL}	-	8.2	9.5	W	(1)
EN Control Level	Backlight on	ENLED (BLON)	2.5	3.3	5.0	V	
	Backlight off		0	-	0.3	V	
PWM Control level	PWM High	Dimming (E_PWM)	2.5	3.3	5.0	V	
	PWM Low		0	-	0.15	V	
PWM Noise Range		V_{Noise}	-	-	0.1	V	
PWM Control Frequency		f_{PWM}	190	200	20K	Hz	(2)
PWM Control Duty Ratio		-	5	-	100	%	(2), Suggestion @ 190Hz< f_{PWM} <1kHz
			20	-	100	%	(2), @ 1kHz≤ f_{PWM} <20kHz
LED Life Time		LT_{LED}	50,000	-	-	Hr	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:



Note (2) at 190 ~1K Hz PWM control frequency, duty ratio range is restricted from 5% to 100%.

1K ~20KHz PWM control frequency, duty ratio range is restricted from 20% to 100%.

If PWM control frequency is applied in the range from 1K Hz to 20K HZ, The “non-linear” phenomenon on the Backlight Unit may be found. It’s a suggestion that PWM control frequency should be less than 1K Hz.

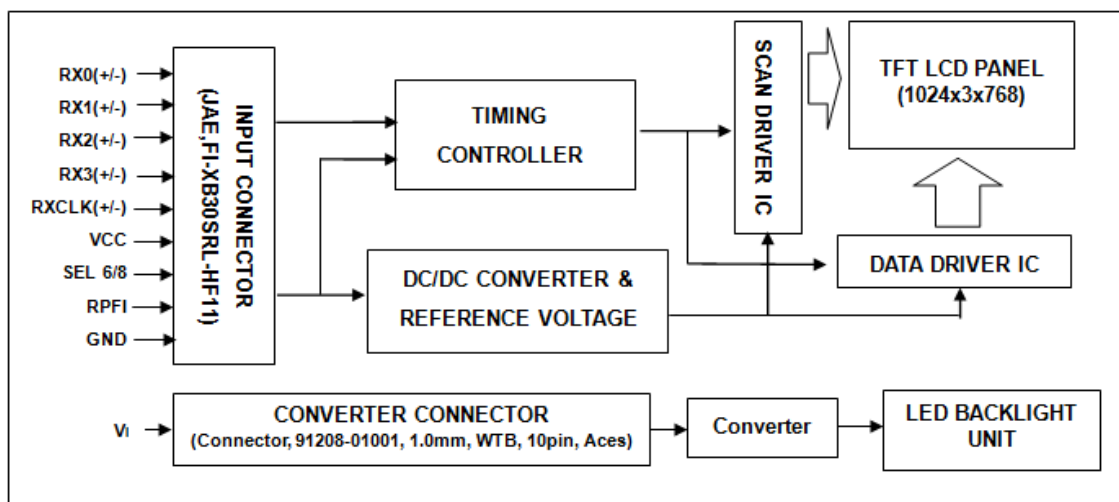
Note (3) The lifetime of LED is estimated data and defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2^\circ\text{C}$ and Duty 100% until the brightness becomes $\leq 50\%$ of its original value. Operating LED at high temperature condition will reduce life time and lead to color shift.

3.3. TOUCH CONTROL BOARD

B000PDU-E03

Parameter	Values			Unit	Notes
	Min.	Typ.	Max.		
Input Voltage	3.5	5	5.5	V	
Touch Controller	EETI, EXC80W46				
Interface	USB:1.1 Full Speed / I ² C			-	
Max Resolution	4096*4096			-	
Precision	≤ 2.5			mm	
Two points separate distance	≥ 15 (pitch of finger center)			mm	
Touch point	1~10 points			-	
Power consumption (mA)	Active Mode: About 50mA			mA	
Report rate (points/sec)	≥ 120			Hz	
Response time	15			ms	

3.4. LCD BLOCK DIAGRAM



3.5. INPUT TERMINAL PIN ASSIGNMENT

Pin	Symbol	Description	Note
1	VCC	Power supply: +3V	
2	VCC	Power supply: +3V	
3	VCC	Power supply: +3V	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	RPMI	Reverse Panel Function (Display Rotation)	3
8	N.C.	No connection	4
9	N.C.	No connection	4
10	N.C.	No connection	4
11	SEL 6/8	LVDS 6/8 bit select function control, Low or NC → 8bit Input mode / High → 6bit Input mode	3
12	GND	Ground	
13	N.C.	No connection	4
14	GND	Ground	
15	RX0-	Negative transmission data of pixel 0	
16	RX0+	Positive transmission data of pixel 0	
17	GND	Ground	
18	RX1-	Negative transmission data of pixel 1	
19	RX1+	Positive transmission data of pixel 1	
20	GND	Ground	
21	RX2-	Negative transmission data of pixel 2	
22	RX2+	Positive transmission data of pixel 2	
23	GND	Ground	
24	RXCLK-	Negative of clock	
25	RXCLK+	Positive of clock	
26	GND	Ground	
27	RX3-	Negative transmission data of pixel 3	
28	RX3+	Positive transmission data of pixel 3	
29	GND	Ground	
30	NC	No connection	4

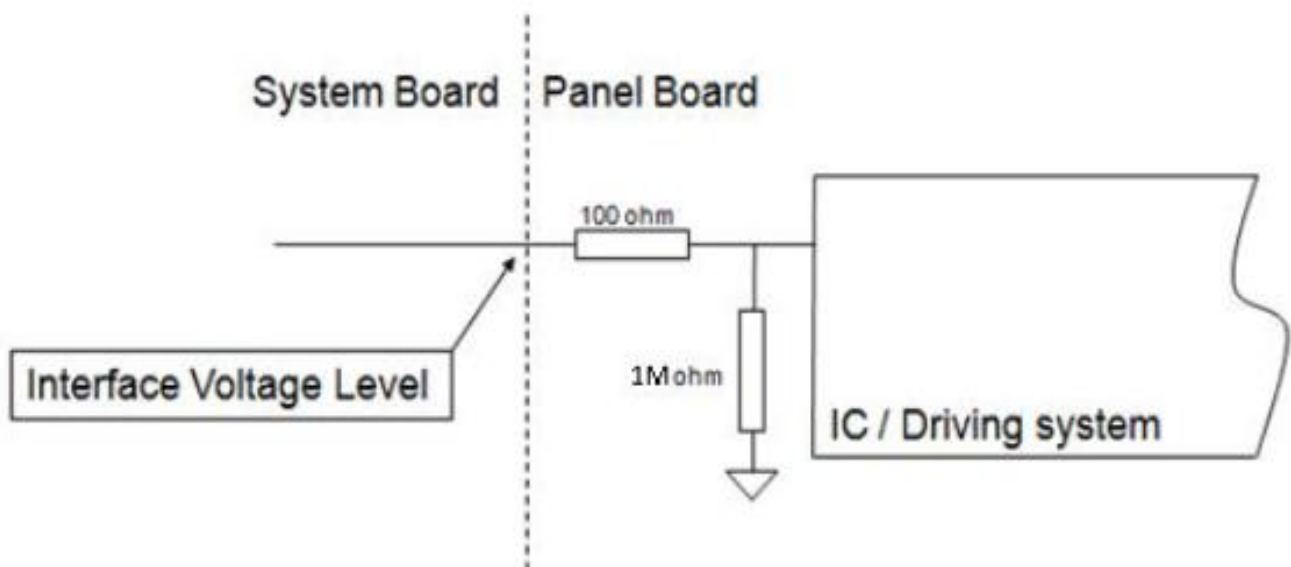
Note1. LCD connector: P-TWO 187106-30091 or STM, MACK2407P30.D or equivalent

Note2. User's connector Part No.: JAE FI-X30H(L) or equivalent

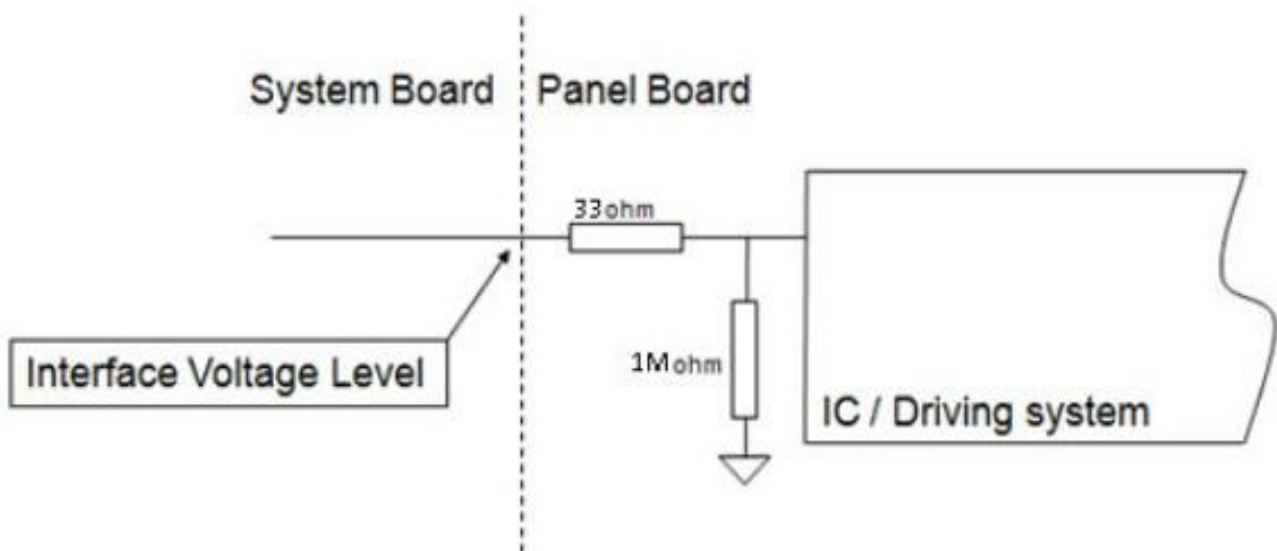
Note3."Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected".

Note4. Pin8, Pin9, Pin10, Pin13, Pin30 input signals should be set to no connection or ground, this module would operate normally.

RPFI pin:



SEL 6/8 pin:



3.6. LCD BACKLIGHT UNIT (CONVERTER CONNECTOR PIN)

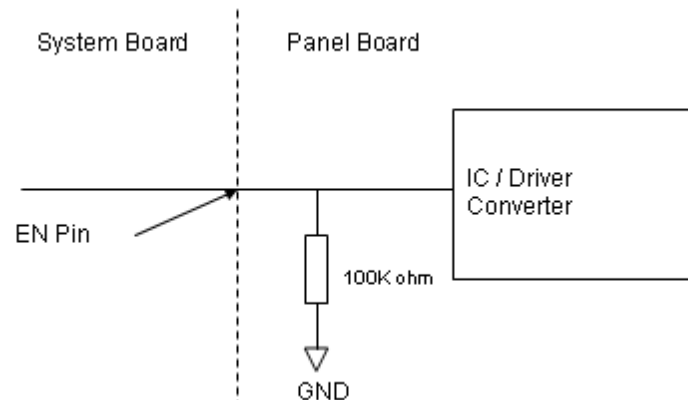
Pin	Symbol	Description	Remark
1	V _i	Converter Input Voltage	12V
2	V _i	Converter Input Voltage	12V
3	V _i	Converter Input Voltage	12V
4	V _i	Converter Input Voltage	12V
5	V _{GND}	Converter Ground	Ground
6	V _{GND}	Converter Ground	Ground
7	V _{GND}	Converter Ground	Ground
8	V _{GND}	Converter Ground	Ground
9	EN	Enable pin	3.3V, Note3
10	ADJ	Backlight Adjust	PWM Dimming (190-210Hz, Hi: 3.3VDC, Lo: 0VDC), Note3

Note1. Connector Part No.: ACES, 91208-01001-H01 or equivalent

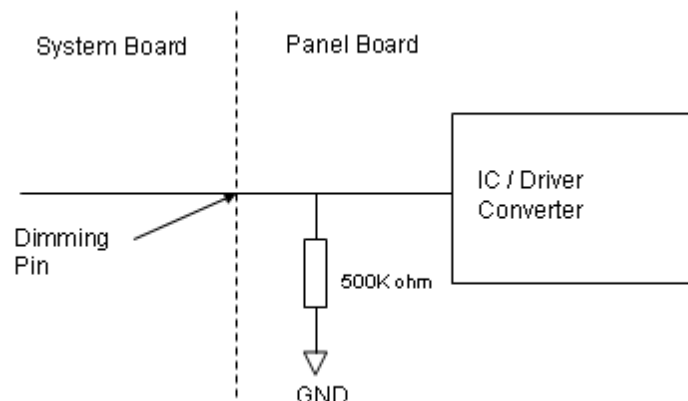
Note2. User's connector Part No.: ACES, 91209-01011 or equivalent

Note3. EN (BL ON), ADJ (E_PWM) as shown below,

BLON Pin



E_PWM Pin



3.7. TOUCH CONTROL BOARD PIN ASSIGNMENT

B000PDU-E03

JP1 : USB

Brand: JST

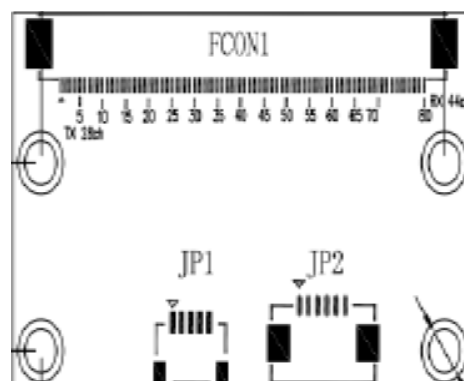
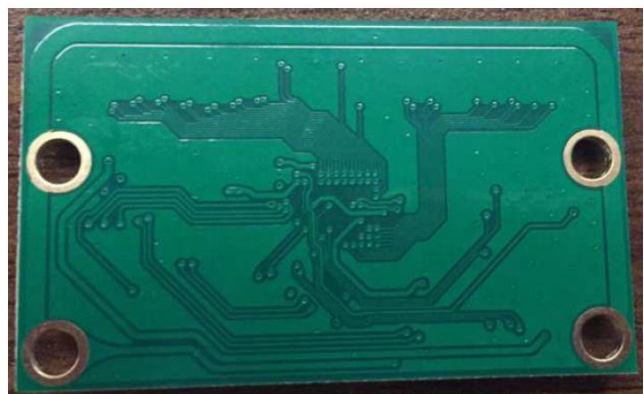
Part number: SM05B-SRSS-TB or equivalence

JP2 : I2C

Brand: Centenary Materials

Part number: ZIF-FPC-1.0mm-SMT-6P-Bottom flap or equivalence

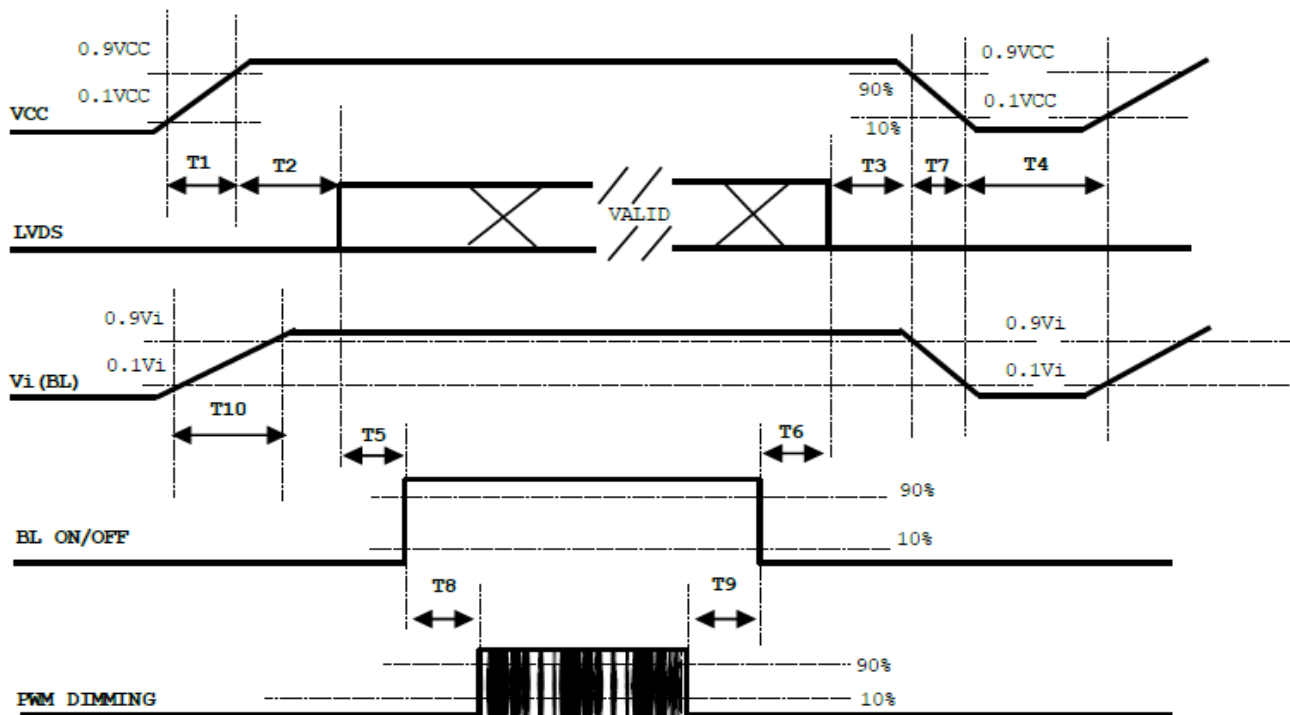
FCON1				JP1 USB		JP2 I2C	
Pin	Name	Pin	Name	Pin	Name	Pin	Name
1	Shielding(TX0)	33	GND	1	5V	1	RST
2~29	TX1-TX28	34	Shielding(RX0)	2	D-	2	INT
30	NC	35~78	RX1-RX44	3	D+	3	SCL
31	Shielding(TX29)	79	NC	4	GND	4	SDA
32	GND	80	Shielding(RX45)	5	GND	5	3.3V
						6	GND



3.8. POWER SEQUENCE FOR LCD

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.

Power ON/OFF sequence



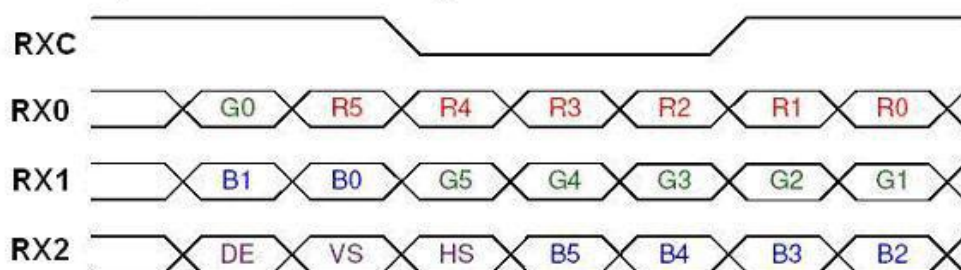
Note:

- (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.
- (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.
- (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.
- (4) T4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.
- (6) INX won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.
- (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "T7 spec".

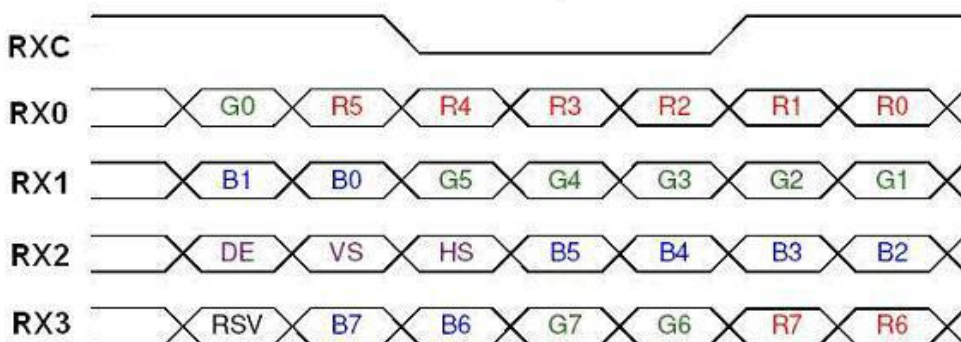
Parameter	Values			Unit
	Min.	Typ.	Max.	
T1	0.5	---	10	ms
T2	0	---	50	ms
T3	0	---	50	ms
T4	500	---	---	ms
T5	450	---	---	ms
T6	200	---	---	ms
T7	10	---	100	ms
T8	10	---	---	ms
T9	10	---	---	ms
T10	20	---	50	ms

3.9. THE INPUT DATA FORMAT

SEL 6/8 = “High” for 6 bits LVDS Input



SEL 6/8 = “Low” or “NC” for 8 bits LVDS Input



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

Note (2) Please be follow PSWG

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel's brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 (MSB) GreenData 6 GreenData 5 GreenData 4 GreenData 3 GreenData 2 GreenData 1 GreenData 0 (LSB)	Green-pixel Data Each green pixel's brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel's brightness data consists of these 8 bits pixel data.
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

3.10. SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.

Fig.1 Normal Scan



PCBA on the top side

Fig.2 Reverse Scan



PCBA on the top side

Fig. 1 Normal scan (pin7, RPFI = Low or NC)

Fig. 2 Reverse scan (pin7, RPFI = High)

4. SIGNAL TIMING SPECIFICATION

4.1. LCD COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Red (0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Green (0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	Green (61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note1. 0: Low Level Voltage, 1: High Level Voltage



Product Specification

F104PET-TA1

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale of Red	Red (0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (254)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	Green (0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note1. 0: Low Level Voltage, 1: High Level Voltage

4.2. LCD COLOR INPUT DATA REFERENCE

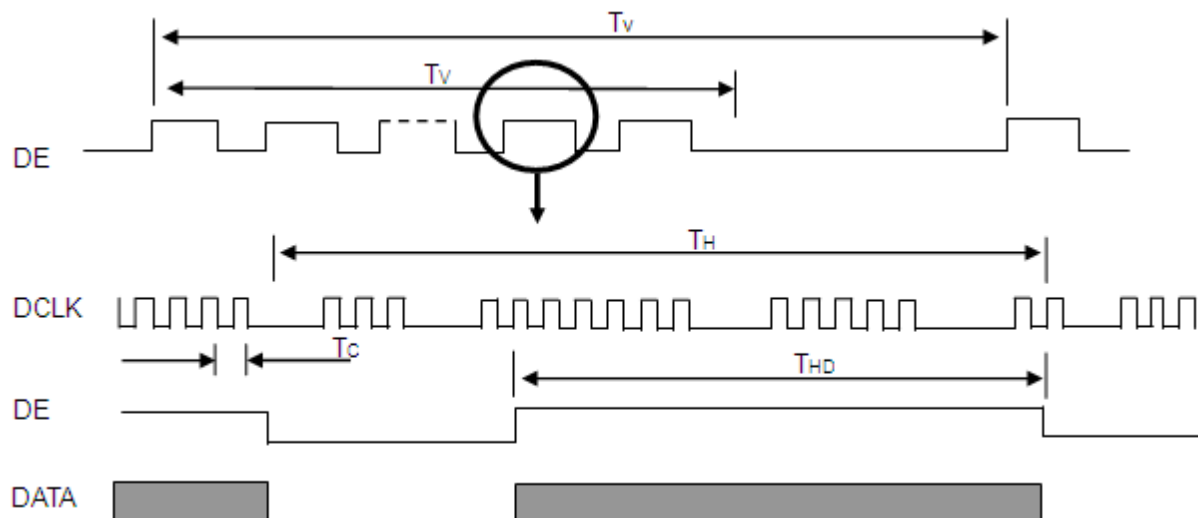
The signal input timing specification as shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	F_C	57.7	65	73.6	MHz	
	Period	T_C	13.6	15.4	17.3	ns	
	Input cycle to cycle jitter	T_{rcl}	-	-	200	ns	a
	Input Clock to data skew	TLVCCS	$-0.02 \cdot T_C$	-	$0.02 \cdot T_C$	ps	b
	Spread spectrum modulation range	F_{clk_mod}	$0.987 \cdot F_C$	-	$1.013 \cdot F_C$	MHz	c
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	
	High Time	T_{ch}	-	4/7	-	T_{ch}	
	Low Time	T_{cl}	-	3/7	-	T_{ch}	
Vertical Display Term	Frame Rate	F_r	-	60	-	Hz	$T_v = T_{vd} + T_{vb}$
	Total	T_v	776	806	838	T_h	
	Active Display	T_{vd}	768	768	768	T_h	
	Blank	T_{vb}	8	38	70	T_h	
Horizontal Display Term	Total	T_h	1240	1344	1464	T_c	$T_h = T_{hd} + T_{hb}$
	Active Display	T_{hd}	1024	1024	1024	T_c	
	Blank	T_{hb}	216	320	440	T_c	

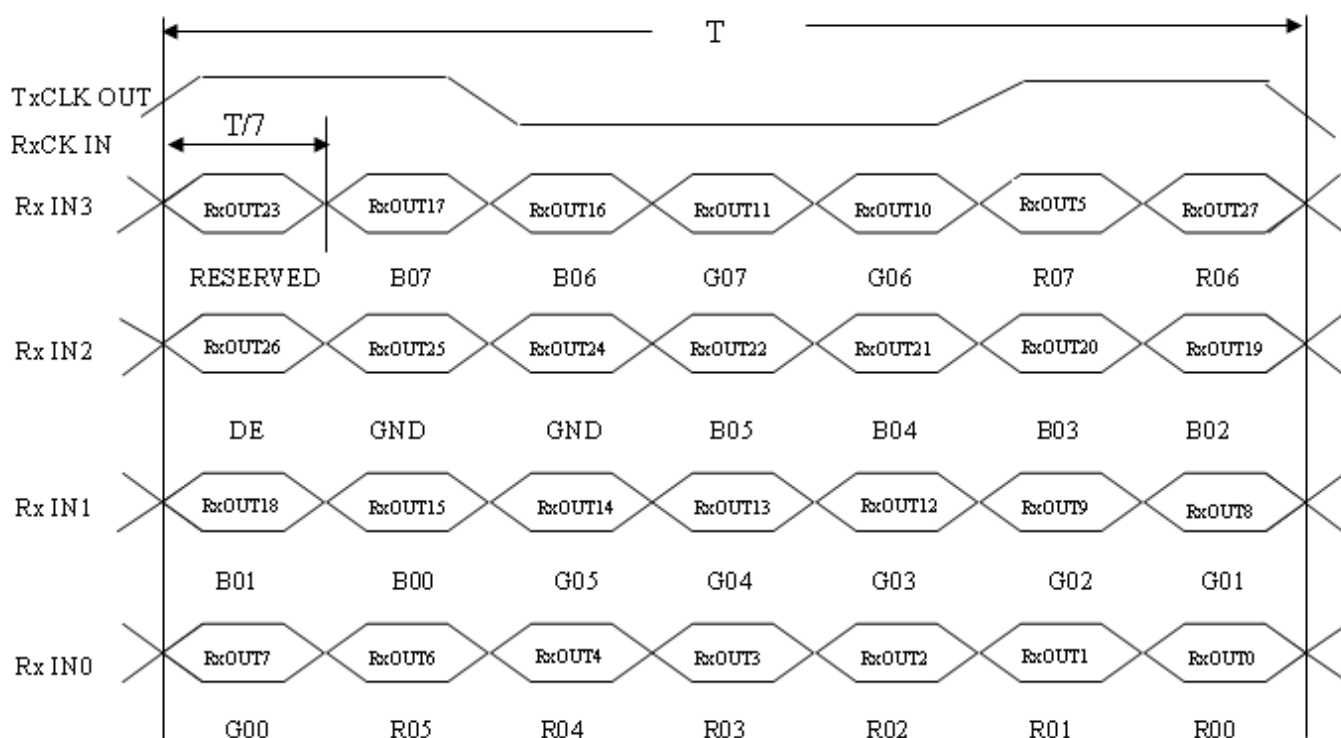
Notes :

- (1) Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormal.

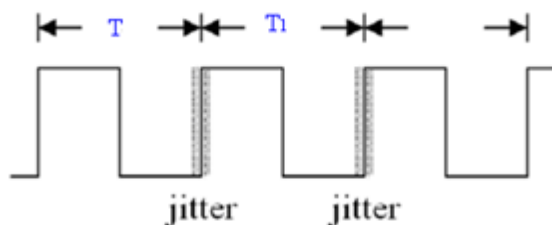
(2) The T_v ($T_{vd}+T_{vb}$) must be integer, otherwise, the module would operate abnormally.



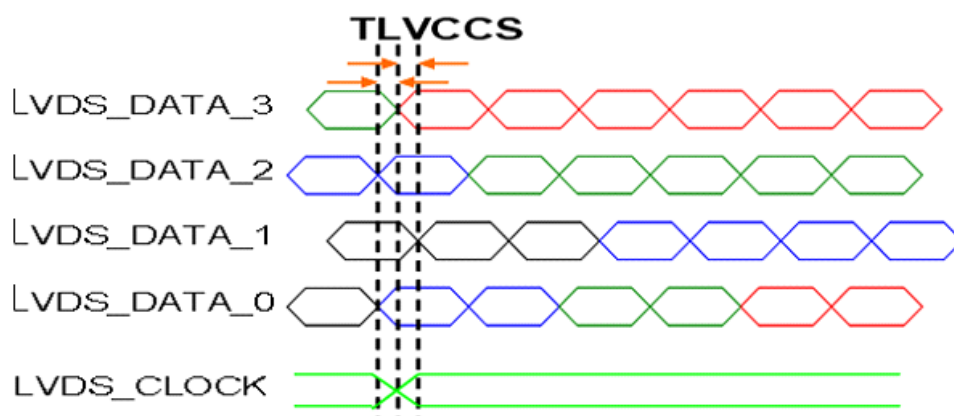
TIMING DIAGRAM of LVDS



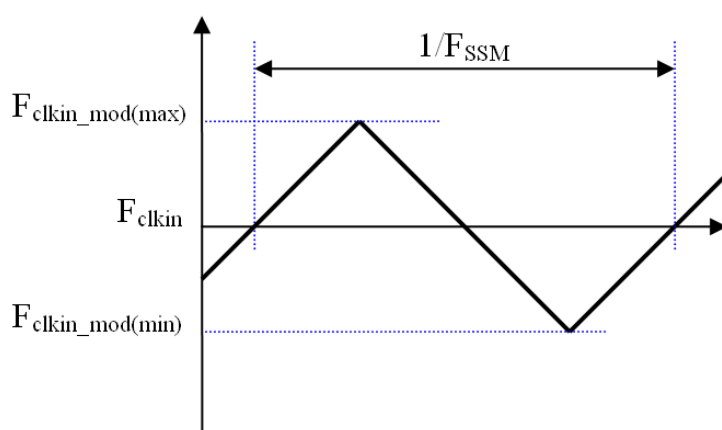
(a) The input clock cycle-to-cycle jitter is defined as below figures. $Trcl = |T1 - Tl|$



(b) Input Clock to data skew is defined as below figures.



(c) The SSCG (Spread spectrum clock generator) is defined as below figures.



5. OPTICAL CHARACTERISTICS

5.1. TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	According to typical value and tolerance in “ELECTRICAL CHARACTERISTICS”		
Input Signal			
PWM Duty Ratio	D	100	%

5.2. OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown here and all items are measured at the center point of screen except white variation. The following items should be measured under the test conditions described in above and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Coordinates	Red	R _x	$\theta_x=0^\circ, \theta_y=0^\circ$ Grayscale Maximum	0.599	0.649	0.699	-	1, 5
		R _y		0.290	0.340	0.390		
	Green	G _x		0.270	0.320	0.370		
		G _y		0.556	0.606	0.656		
	Blue	B _x		0.099	0.149	0.199		
		B _y		0.005	0.055	0.105		
	White	W _x		0.263	0.313	0.363		
		W _y		0.279	0.329	0.379		
Contrast Ratio		CR		700	1000	--		2, 5
Surface Luminance (White)		L _{WH}		800	1000	--	Cd/m ²	4, 5
Luminance Variation		δ _W	$\theta_x=0^\circ, \theta_y=0^\circ$	72	80		%	5, 6
Response Time		T _R	$\theta_x=0^\circ, \theta_y=0^\circ$	--	13	18	ms	3
		T _F		--	12	17	ms	
Viewing Angle	Horizontal	θ _r	CR≥10	80	88	--	degree	1, 5
		θ _l		80	88	--	degree	
	Vertical	θ _u		80	88	--	degree	
		θ _d		80	88	--	degree	

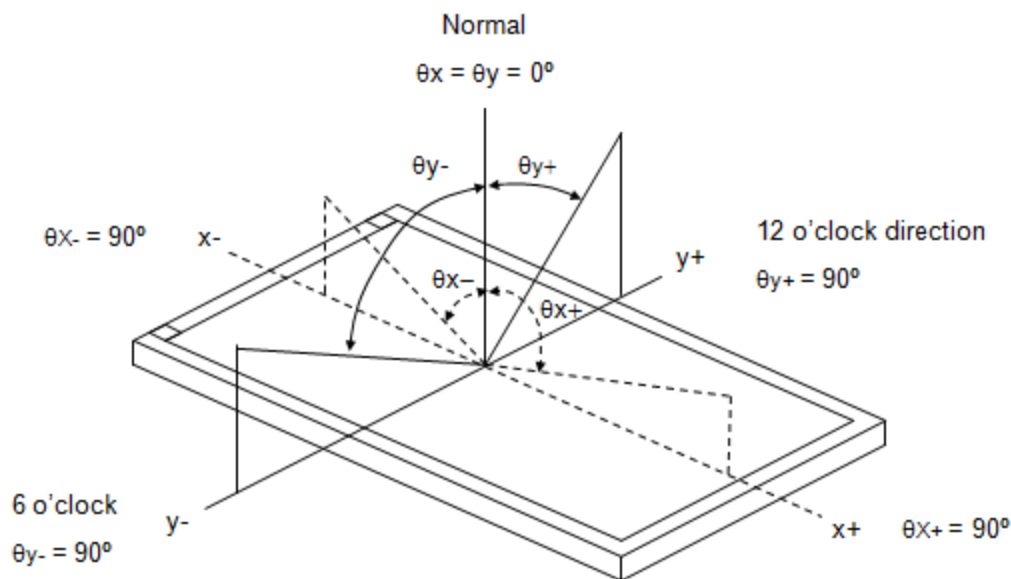
Definition :

Grayscale Maximum: Grayscale 255 (10 bits: grayscale 1023; 8 bits: grayscale 255; 6 bits: grayscale 63)

White: Luminance of Grayscale Maximum (All R, G, B)

Black: Luminance of grayscale 0 (All R, G, B)

Note 1: Definition of Viewing Angle (θ_x , θ_y):

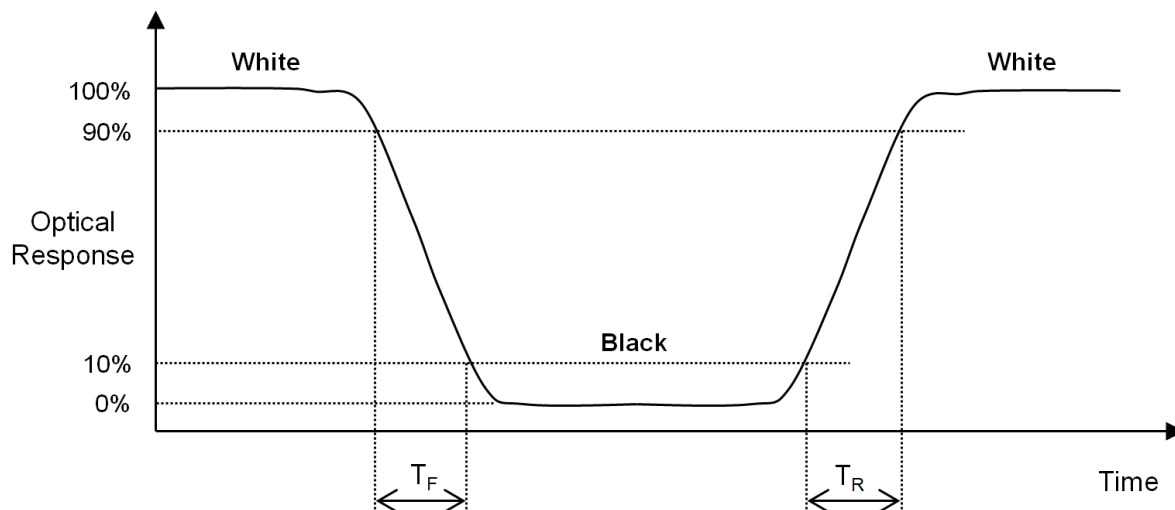


Note 2: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression at center point.

Contrast Ratio (CR) = White / Black Note

Note 3: Definition of Response Time (T_R , T_F)

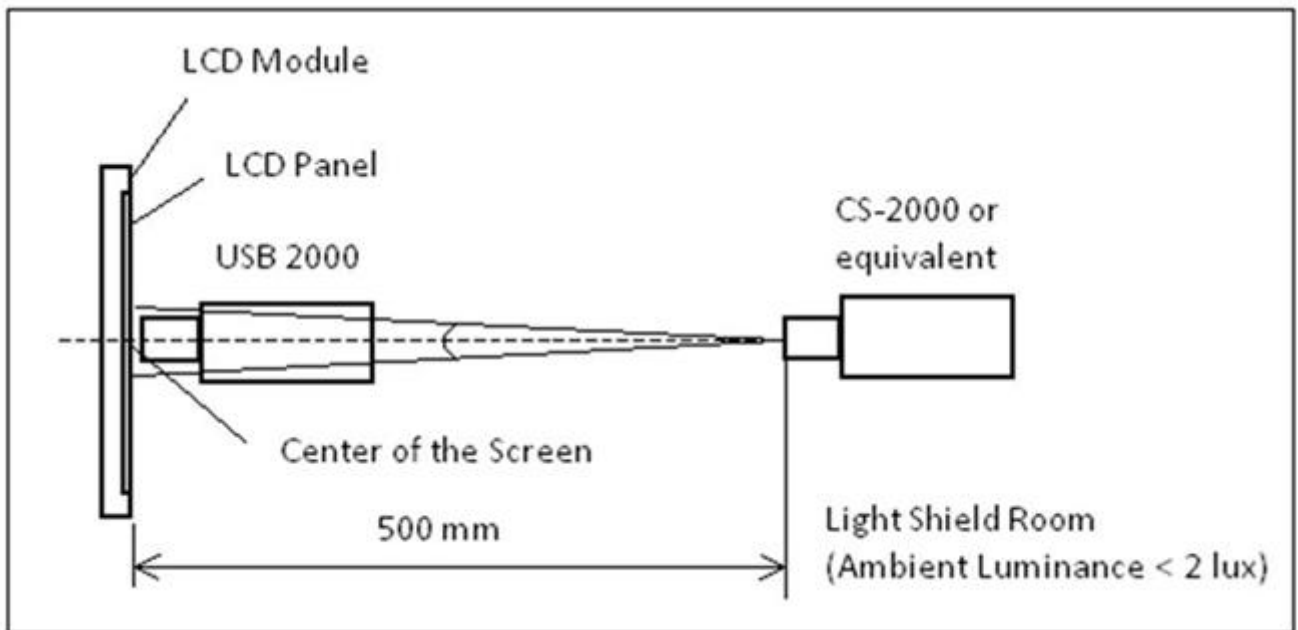


Note 4: Definition of Luminance of White (LC):

Measure the luminance of White at center point.

Note 5: Measurement Setup:

The LCD module should be stabilized at given temperature to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room. The measurement placement of module should be in accordance with module drawing.

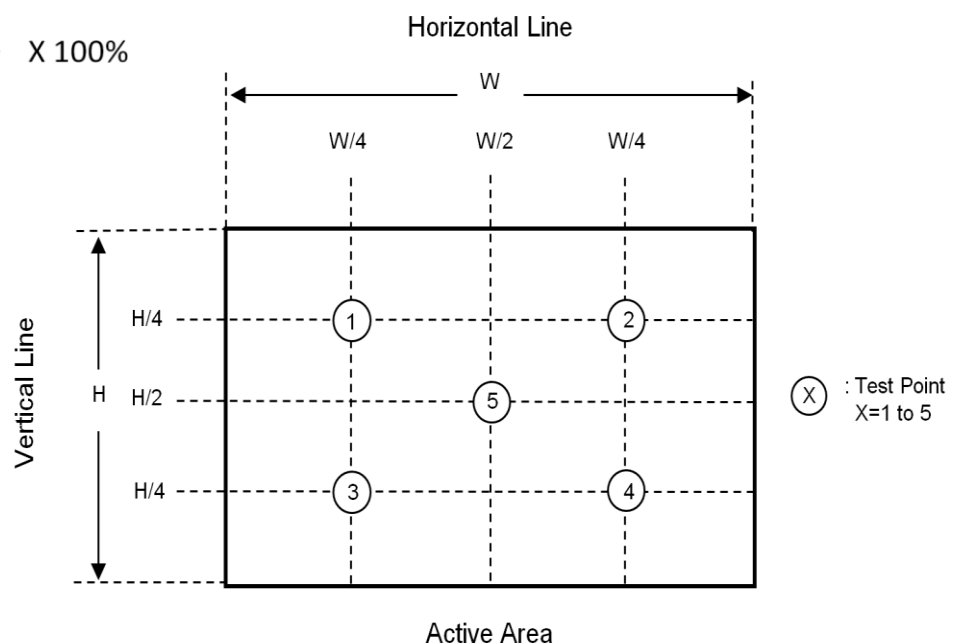


Note 6: Definition of White Variation (δW):

Measure the luminance of White at 5 points.

Luminance of White: $L(X)$, where X is from 1 to 5.

$$\delta W = \frac{\text{Minimum [} L(1) \text{ to } L(5) \text{]}}{\text{Maximum [} L(1) \text{ to } L(5) \text{]}} \times 100\%$$



6. RELIABILITY TEST ITEMS

Test Item		Condition
1	High temperature/Humidity storage test	80°C, 90% 240hrs
2	Low temperature storage test	-30°C, 240hrs
3	High temperature/Humidity operation test	70°C, 90%RH, 240hrs
4	Low temperature operation test	-20°C, 240hrs
5	Thermal Cycle storage test	-30°C(30min)~80°C(30min), 10cycles

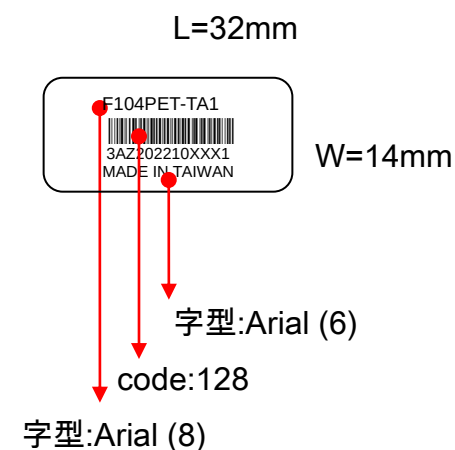
7. LABEL

Model NO. F104PET-TA1

條碼

SN 3A Z 20 2 21 0 XXX1

code 1,2 Production location
 code 3 Production version
 code 4,5 Production year
 code 6 Production month
 code 7,8 Production day
 code 9 Production code
 code 10,11,12,13 Serial number



8. MECHANICAL CHARACTERISTICS

Item		Dimension	Unit	Note
Outline Dimension	Horizontal	225.50	mm	PCAP : B104PBU-E01
	Vertical	176.30	mm	
	Depth	2.40	mm	
	Horizontal	225.50	mm	LCD : G104XCE-LH1
	Vertical	176.30	mm	
	Depth	8.70	mm	
	Horizontal	50.00	mm	Touch Driver : B000PDU-E03
	Vertical	30.00	mm	
	Depth	4.70	mm	
Weight		600	g	F104PET-TA1
Item		Specification		Remarks
PCAP Viewing Area		212.20 mm x 159.40 mm		
PCAP Sensor Area		224.50 mm x 175.30 mm		
PCAP FPC Length		65.30 mm		
PCAP Input method		Finger or exclusive pen		
PCAP Light Transmission		≥85%		
PCAP Operation force		≤10g		Finger Input
PCAP Hardness of surface		≥6H		Pressure 500gf test
PCAP Surface Treatment		Clear Type		

Front View



Back View



9. ENGINEERING DRAWING

