



- ☒ Draft Specifications
☐ Preliminary Specifications
☐ Final Specifications

Title	21.5-inches Touch Display Product Specifications
Model Name	F215PET-T24
Version	0

Customer	
Approved by	Date
Notice: This Specification is subject to change without notice.	

Approved By	Prepared By
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REVISION HISTORY

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

1.1. INTRODUCTION

F215PET-T24 is a 21.5" wide color AHVA (IPS-like) TFT LCD module G215HAN01.3 with projected capacitive multi-touch B215PBU-E08 air bonding, with touch driver ETP-MB-EXC84H5680STAG.

The display format is intended to support the FHD mode (1920(H) x 1080(V)) screen and 2 channel 30 pins LVDS interface, 16.7M colors, with white LEDs backlight.

1.2. FEATURES

- FHD (1920 x 1080 pixels) resolution
- LVDS Interface with 2 pixel / clock
- 8-bit color depth, display 16.7M colors
- DE (Data Enable) only
- RoHS / Halogen Free

1.3. APPLICATION

- Desktop Type of PC & Workstation Use
- Slim-Size Display for Stand-alone Monitor
- Display Terminals for Control System
- Monitors for Process Controller

1.4. GENERAL SPECIFICATIONS

Parameter	Specification	Unit	Remarks
Active Area Size	21.5	inch	
Display Area	476.064 x 267.786(V)	mm	
Outline Dimension	497.60 (H) x 292.20 (V) x 14.30 (D)	mm	D:PCAP+LCM
Weight	2440	g	Typ.
Driver Element	a-Si TFT active matrix	-	
Display Colors	16.7M	Colors	
Number of Pixels	1920 (H) x 1080 (V)	pixels	
Pixel Pitch	0.27495(H) x 0.27495(W)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	AHVA Mode, Normal Black	-	
Touch Technology	Projected Capacitive Multi-Touch Panel	-	
Touch Method	Finger or exclusive pen	-	
Numbers of Touch	10	Points	
Touch Driver	ETP-MB-EXC84H5680STAG : USB	-	
Touch Sensor Glass Type	Strengthening Glass	-	
Touch Controller IC	EETI, EXC80H84	-	
Touch Driver Interface	USB 2.0	-	
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
Power Supply Voltage	V_{DD}	-0.3	5.5	V	Note 1
Converter Voltage	V_I	-0.3	77	V	
Enable Voltage	EN	-0.3	5.5	V	
Dimming Voltage	PWM	-0.3	5.5	V	
Operating Temperature	T_{op}	0	60	°C	Note 2
Operating Humidity	H_{op}	20	90	%RH	
Storage Temperature	T_{st}	-20	60	°C	
Storage Temperature	H_{st}	20	90	%RH	
Touch DC Supply Voltage	USB_ V_{DD}	-0.3	6.0	V	

Note:

1. Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.
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.

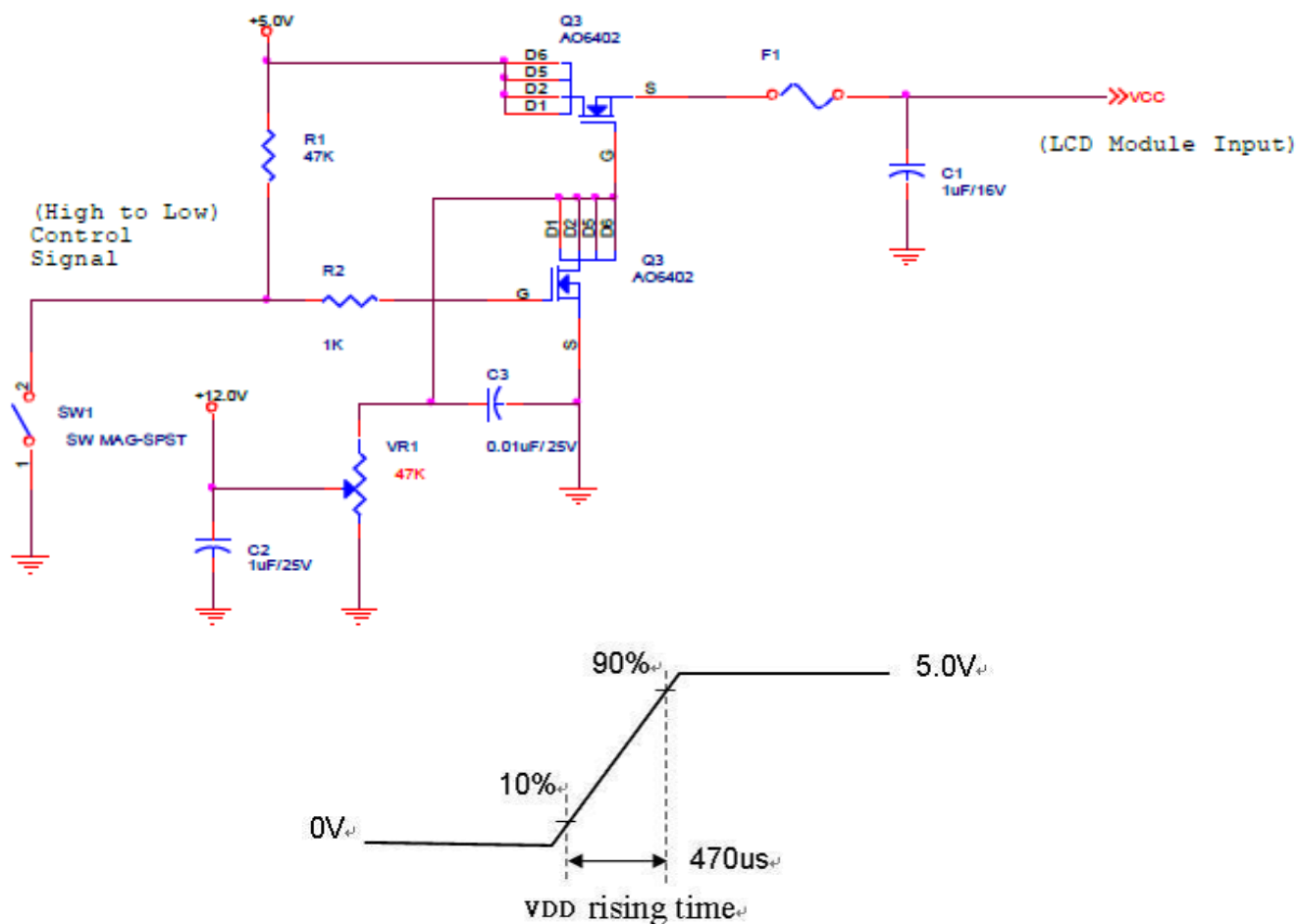
3.ELECTRICAL CHARACTERISTICS

3.1. LCD MODULE

Parameter	Symbol	Values			Unit	Notes
		Min.	Typ.	Max.		
Power Supply Voltage	V_{DD}	4.5	5.0	5.5	V	+/-10%
Power Supply Current	I_{DD}	-	0.46	0.55	A	$V_{DD}=5.0V$, All White pattern at 60Hz
In-Rush Current	I_{RUSH}	-	-	3.0	A	1
Permissible Input Ripple Voltage	V_{DDrip}	-	-	500	mV	$V_{DD}=5.0V$
High Level Differential Input Threshold Voltage	V_{TH}	-	-	100	mV	$V_{ICM}=1.2V$ 2
Low Level Differential Input Threshold Voltage	V_{TL}	-100	-	-	mV	$V_{ICM}=1.2V$ 2
Differential input voltage	$ V_{ID} $	100	400	600	mV	2
Differential input common mode voltage	V_{ICM}	1.0	1.2	1.5	V	$V_{TH}-V_{TL}=200mV(max)$ 2
LED Supply Voltage	V_F	-	3.05	3.4	V	$I_F=60mA$, $T_a=25^{\circ}C$
LED Supply Current	I_F		60		mA	$T_a=25^{\circ}C$
LED Power Consumption	P_{LED}		0.183		W	$I_F=60mA$, $T_a=25^{\circ}C$
LED Lifetime	LL	50,000	-	-	Hrs	$I_F=60mA$, $T_a=25^{\circ}C$
LED Channel Voltage	V_L	-	36.6	-	V	$I_F=60mA$, $T_a=25^{\circ}C$
Power Consumption	P_{DD}	-	2.3	2.75	W	$V_{DD}=5.0V$, All White pattern at 60Hz
	P_{BL}	-	8.784	-	W	$I_F=60mA$, $T_a=25^{\circ}C$
	P_{TOTAL}	-	11.04	-	W	$I_F=60mA$, $T_a=25^{\circ}C$

Note1. Measurement conditions:

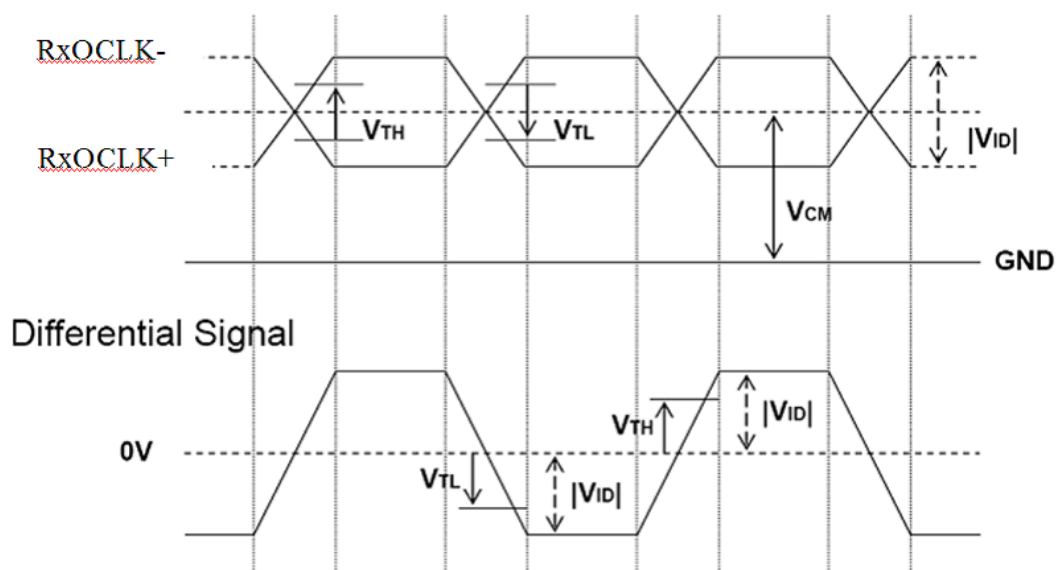
The duration of rising time of power input is 470us.



Note2. LVDS Signal Waveform

Use RxOCLK- & RxOCLK+ as example.

Single-End



Note3. Ta means ambient temperature of TFT-LCD module.

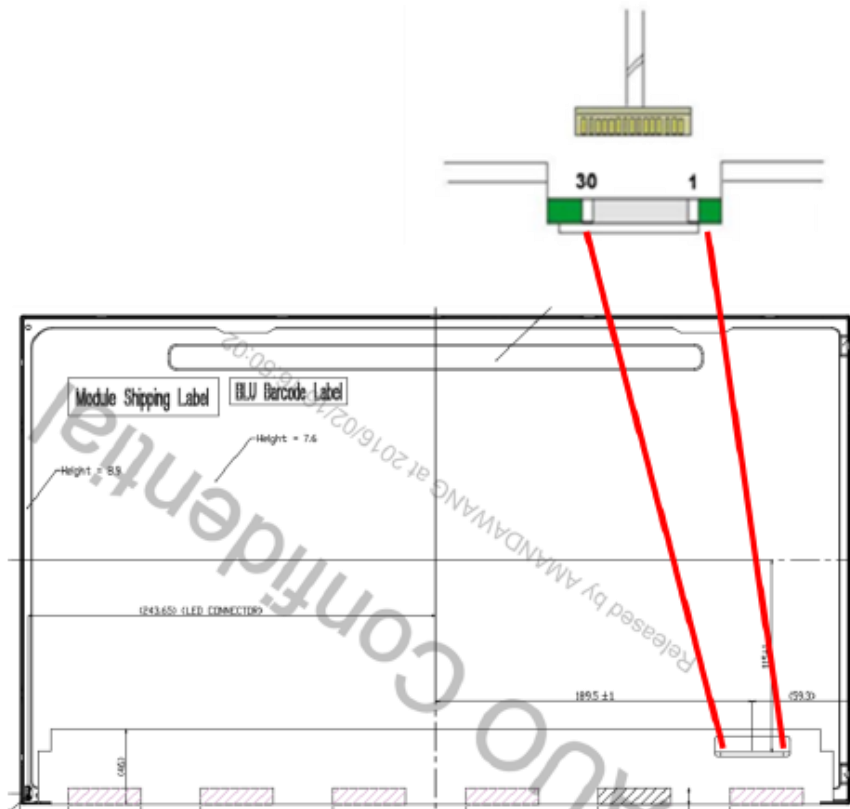
3.4. LCD INPUT TERMINAL PIN ASSIGNMENT

Pin	Symbol	Description	Note
1	RXO0-	Negative LVDS differential data input Channel O0 (odd)	
2	RXO0+	Positive LVDS differential data input Channel O0 (odd)	
3	RXO1-	Negative LVDS differential data input Channel O1 (odd)	
4	RXO1+	Positive LVDS differential data input Channel O1 (odd)	
5	RXO2-	Negative LVDS differential data input Channel O2 (odd)	
6	RXO2+	Positive LVDS differential data input Channel O2 (odd)	
7	GND	Ground	
8	RXOC-	Negative LVDS differential clock input (odd)	
9	RXOC+	Positive LVDS differential clock input (odd)	
10	RXO3-	Negative LVDS differential data input Channel O3 (odd)	
11	RXO3+	Positive LVDS differential data input Channel O3 (odd)	
12	RXE0-	Negative LVDS differential data input Channel E0 (even)	
13	RXE0+	Positive LVDS differential data input Channel E0 (even)	
14	GND	Ground	
15	RXE1-	Negative LVDS differential data input Channel E1 (even)	
16	RXE1+	Positive LVDS differential data input Channel E1 (even)	
17	GND	Ground	
18	RXE2-	Negative LVDS differential data input Channel E2 (even)	
19	RXE2+	Positive LVDS differential data input Channel E2 (even)	
20	RXEC-	Negative LVDS differential clock input (even)	
21	RXEC+	Positive LVDS differential clock input (even)	
22	RXE3-	Negative LVDS differential data input Channel E3 (even)	
23	RXE3+	Positive LVDS differential data input Channel E3 (even)	
24	GND	Ground	
25	NC	No connection (for AUO test only. Do not connect)	
26	NC	No connection (for AUO test only. Do not connect)	
27	NC	No connection (for AUO test only. Do not connect)	
28	V _{CC}	+5.0V power supply	
29	V _{CC}	+5.0V power supply	
30	V _{CC}	+5.0V power supply	

The module be using a pair of LVDS receiver **SN75LVDS82 / SN75LVDS83** (Texas Instruments) or

compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83 (negative edge sampling) or compatible. The first LVDS port (RxOxxx) transmits odd pixels while the second LVDS port (RxExxx) transmits even pixels

Note1: Start from right side



Note2. Input signals of clock shall be the same timing.

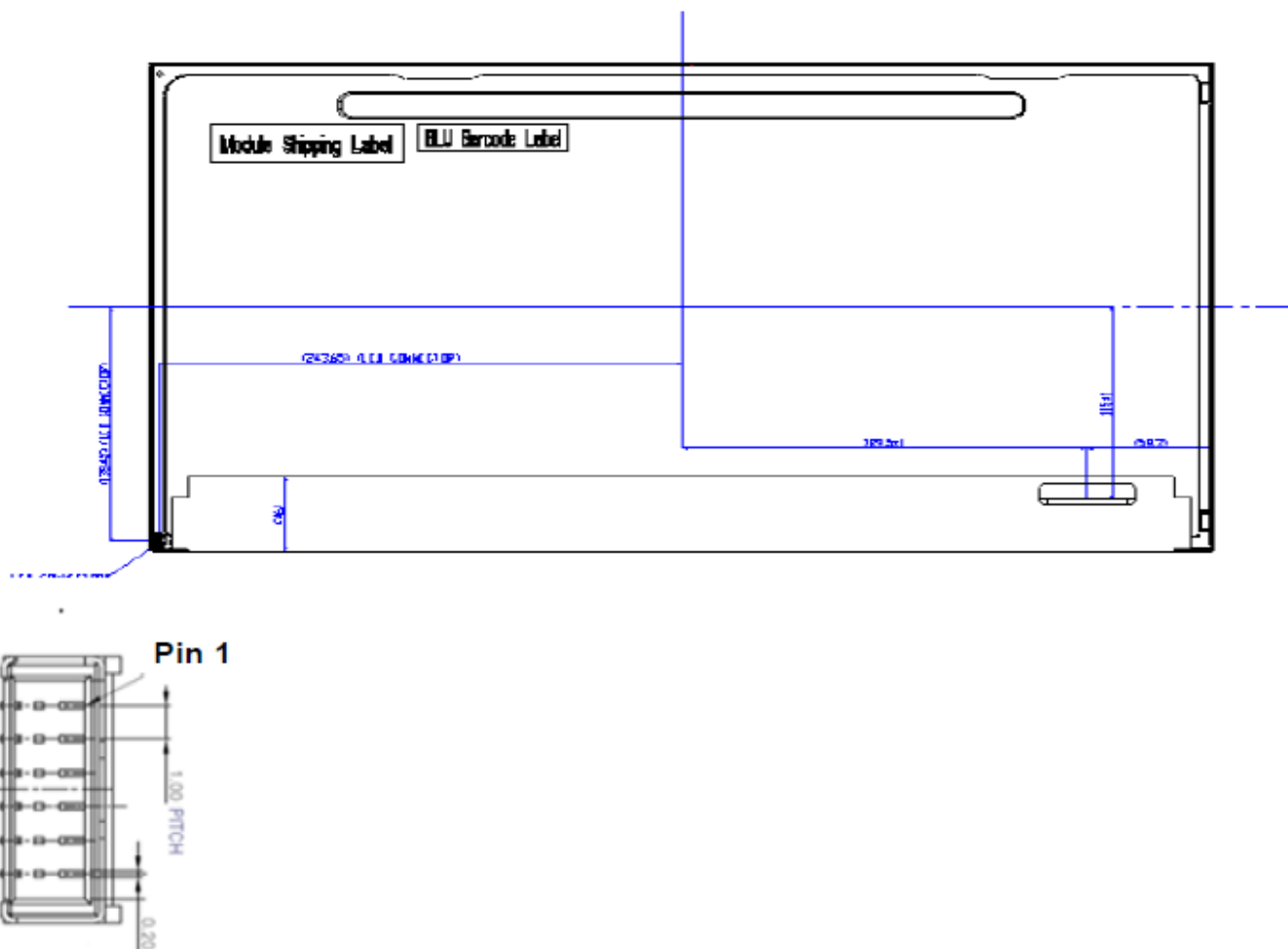
Note3. Please follow TV VESA Pin Assignment

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	STM / P-TWO
Type Part Number	MSBKT2407P30HB / I87034-3009
Mating Housing Part Number	JAE / FI-X30H (unlocked Type)

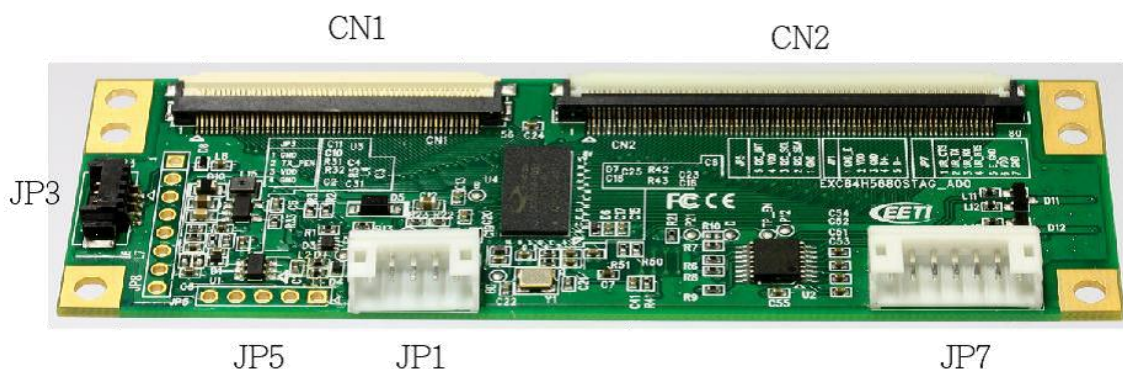
3.5. LCD BACKLIGHT UNIT (LED LIGHT BAR CONNECTOR PIN)

Pin	Symbol	Function
1	IRLED1	LED current sense for string1
2	IRLED2	LED current sense for string2
3	VLED	LED Power Supply
4	VLED	LED Power Supply
5	NC	NC
6	IRLED3	LED current sense for string3

Connector Name / Designation	LED Connector
Manufacturer	ENTERY
Connector Model Number	3707K-S06N-21R
Mating Connector Model Number	H112K-P06N-00B (Non-Locking type) H112K-P06N-13B (Locking type)



3.6. TOUCH CONTROL BOARD PIN ASSIGNMENT



FPC Pin Description

CN1					
PN		PN		PN	
1	NC	21	TX34	41	TX14
2	NC	22	TX33	42	TX13
3	NC	23	TX32	43	TX12
4	NC	24	TX31	44	TX11
5	NC	25	TX30	45	TX10
6	NC	26	TX29	46	TX9
7	NC	27	TX28	47	TX8
8	NC	28	TX27	48	TX7
9	TX_S1	29	TX26	49	TX6
10	TX45	30	TX25	50	TX5
11	TX44	31	TX24	51	TX4
12	TX43	32	TX23	52	TX3
13	TX42	33	TX22	53	TX2
14	TX41	34	TX21	54	TX1
15	TX40	35	TX20	55	TX0
16	TX39	36	TX19	56	TX_S0
17	TX38	37	TX18		
18	TX37	38	TX17		
19	TX36	39	TX16		
20	TX35	40	TX15		

CN2							
PN		PN		PN		PN	
1	RX_S1	21	RX58	41	RX38	61	RX18
2	RX77	22	RX57	42	RX37	62	RX17
3	RX76	23	RX56	43	RX36	63	RX16
4	RX75	24	RX55	44	RX35	64	RX15
5	RX74	25	RX54	45	RX34	65	RX14
6	RX73	26	RX53	46	RX33	66	RX13
7	RX72	27	RX52	47	RX32	67	RX12
8	RX71	28	RX51	48	RX31	68	RX11
9	RX70	29	RX50	49	RX30	69	RX10
10	RX69	30	RX49	50	RX29	70	RX9
11	RX68	31	RX48	51	RX28	71	RX8
12	RX67	32	RX47	52	RX27	72	RX7
13	RX66	33	RX46	53	RX26	73	RX6
14	RX65	34	RX45	54	RX25	74	RX5
15	RX64	35	RX44	55	RX24	75	RX4
16	RX63	36	RX43	56	RX23	76	RX3
17	RX62	37	RX42	57	RX22	77	RX2
18	RX61	38	RX41	58	RX21	78	RX1
19	RX60	39	RX40	59	RX20	79	RX0
20	RX59	40	RX39	60	RX19	80	RX_S0

Connector Pin Configuration

JP1 USB connector

JP1	
1	GND_E
2	VDD
3	GND
4	D +
5	D -

JP5 I2C connector

JP5	
1	GND
2	I2C_SDA
3	I2C_SCL
4	VDD
5	I2C_INT

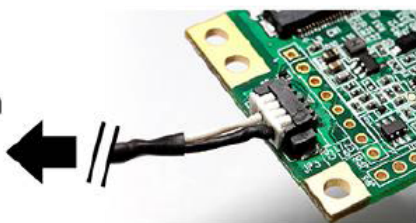
JP7 RS232 connector

JP7	
1	UR_CTS
2	UR_TX
3	UR_RX
4	UR_RTS
5	GND_E
6	VDD
7	GND

JP3 Tethered active stylus connector

JP3	
1	GND_D
2	TX_PEN
3	VDD
4	GND_D

eGalaxPen
Type E
Type T



*JP3 connector is reserved for EETI tethered active stylus :

Type E : Entry-type active stylus

Type T : Tethered USB active stylus

JP1 : USB

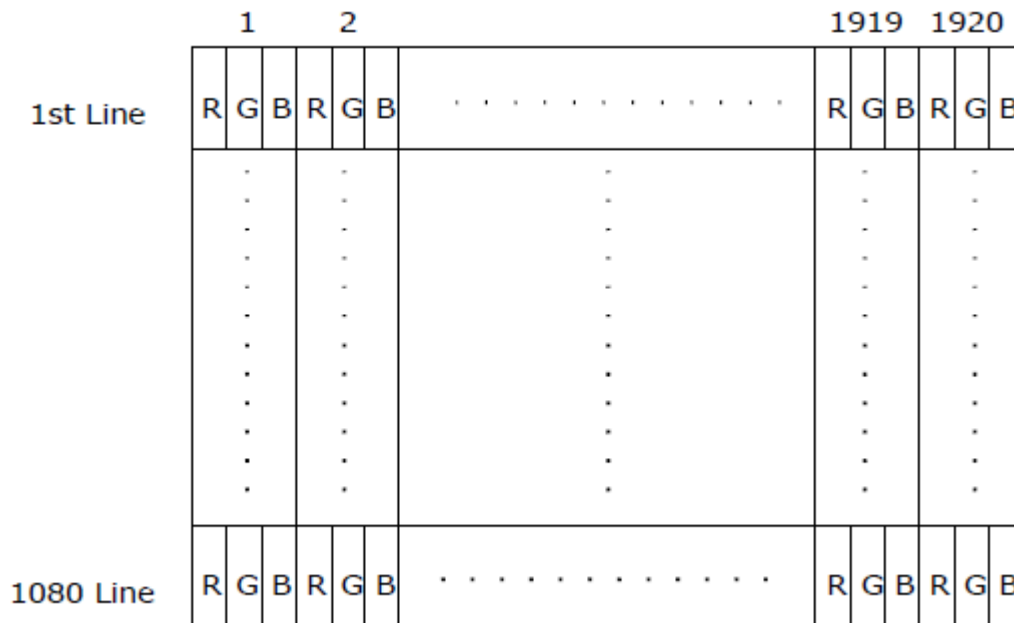
Brand: JST

Part number: SM05B-SRSS-TB or equivalence

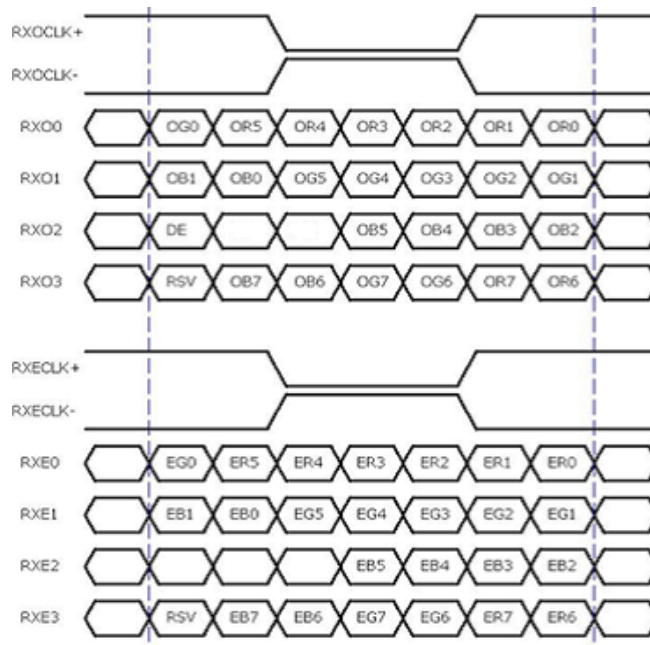
4. SIGNAL TIMING SPECIFICATION

4.1. PIXEL FORMAT IMAGE

Following figure shows the relationship of the signals and LCD pixel format.



4.2. THE INPUT DATA FORMAT



8 Bit Color Bit Order			
MSB	R7	G7	B7
	R6	G6	B6
	R5	G5	B5
	R4	G4	B4
	R3	G3	B3
	R2	G2	B2
	R1	G1	B1
LSB	R0	G0	B0

Note1. Normally is DE mode only. VS and HS on EVEN channel are not used.

Note2. Please follow VESA.

Note3. 8-bits signal input.

4.3. LCD COLOR INPUT DATA REFERENCE

Signal	Item	Symbol	Min.	Typ.	Max.	Unit
V-section	Total	T_v	1094	1130	1836	T_h
	Active	$T_{disp(v)}$	1080	1080	1080	T_h
	Blanking	$T_{bp(v)}+T_{fp(v)}+PW_{vs}$	14	50	756	T_h
H-section	Total	T_h	1000	1050	1678	T_c
	Active	$T_{disp(h)}$	960	960	960	T_c
	Blanking	$T_{bp(h)}+T_{fp(h)}+PW_{hs}$	40	90	718	T_c
Clock	Frequency	F_{Clk}	53.7	71.2	90	MHz
	Period	Freq.	11.2	14	18.6	ns
Frame Rate	Frequency	$1/T_v$	49	60	76	Hz

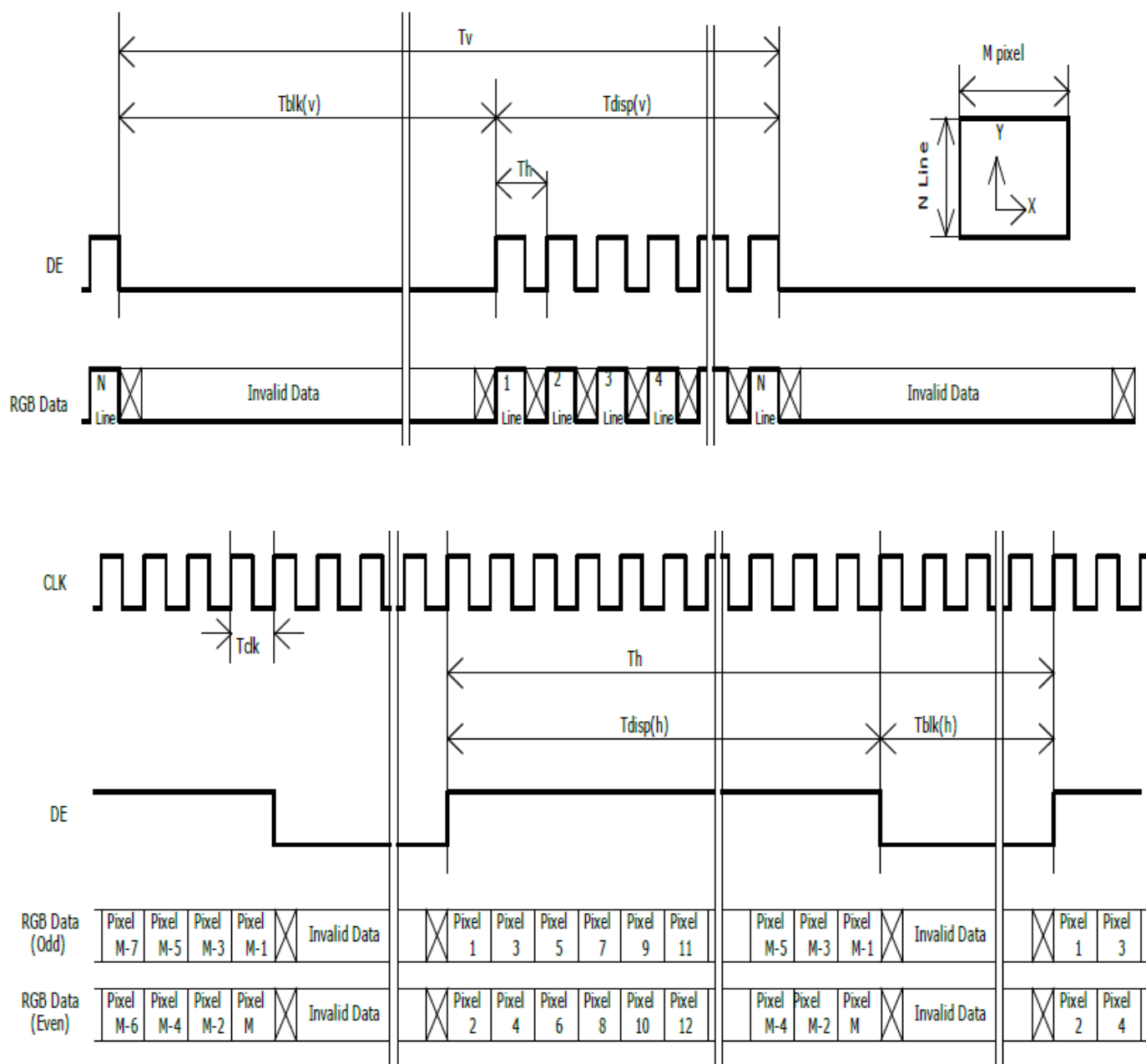
Note1. DE mode only

The input of Hsync & Vsync signal does not have an effect upon the LCD normal operation.

Note2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.

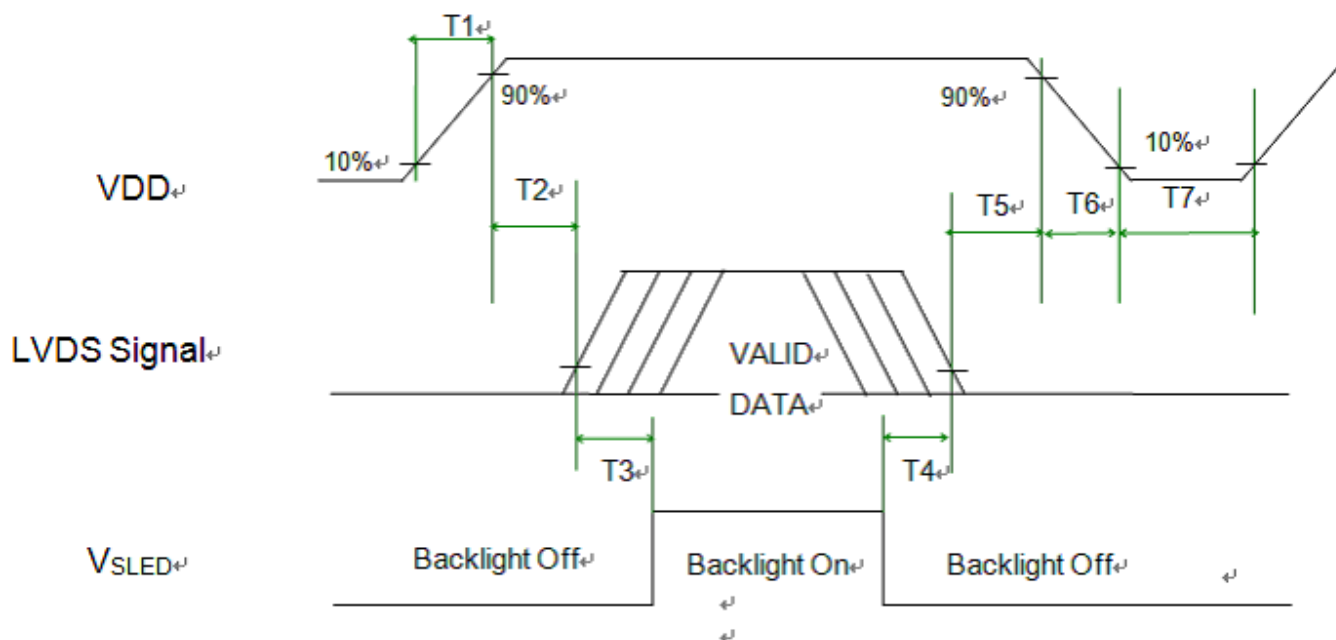
Note3. Horizontal period should be even.

Timing Diagram



4.4. POWER SEQUENCE FOR LCD

VDD power and LED on/off sequence are as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units	Remark
	Min.	Typ.	Max.		
T1	0.5	-	10	ms	
T2	0	-	50	ms	
T3	500	-	-	ms	
T4	100	-	-	ms	
T5	0	-	50	ms	Note 1, 2
T6	0	-	200	ms	Note 2, 3
T7	1000	-	-	ms	

Note:

1. Recommend setting T5=0ms to avoid electronic noise when VDD is off.
2. During T5 and T6 period, please keep the level of input LVDS signals with Hi-Z state.
3. Voltage of VDD must decay smoothly after power-off. (customer system decide this value)

5. OPTICAL CHARACTERISTICS

[VDD = 5.0V, Frame rate = 60Hz, Clock = 74MHz, I_{BL} = 240mA, T_a = 25±2 °C]

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Luminance of White		Y _W	I _{LED} =60mA (Center point)	200	250	-	Cd/m²	1
Luminance uniformity		ΔY	9 points	75	80	-	%	2, 3
Contrast Ratio		CR	Normal Direction	600	1000	-		4
Response Time		T _R	Raising		12	22	ms	5
		T _F	Falling		10	20		
		T _R +T _F	Raising + Falling		22	42		
Viewing Angle	Horizontal	θ _r	CR>10		89		degree	6
		θ _l			89			
	Vertical	θ _u			89			
		θ _d			89			
Color Coordinates	Red	R _x		0.602	0.652	0.702	-	5
		R _y		0.288	0.338	0.388		
	Green	G _x		0.268	0.318	0.368		
		G _y		0.566	0.616	0.666		
	Blue	B _x		0.098	0.148	0.198		
		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		
Color Gamut					72		%	

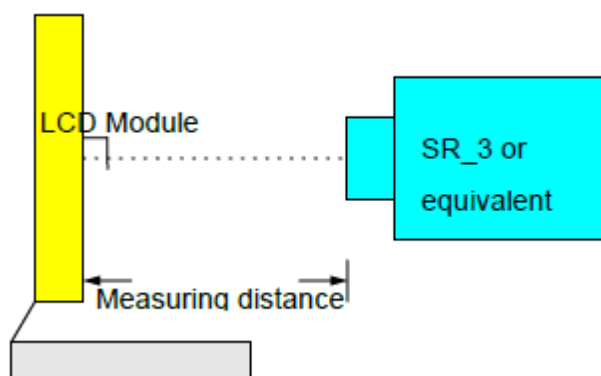
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

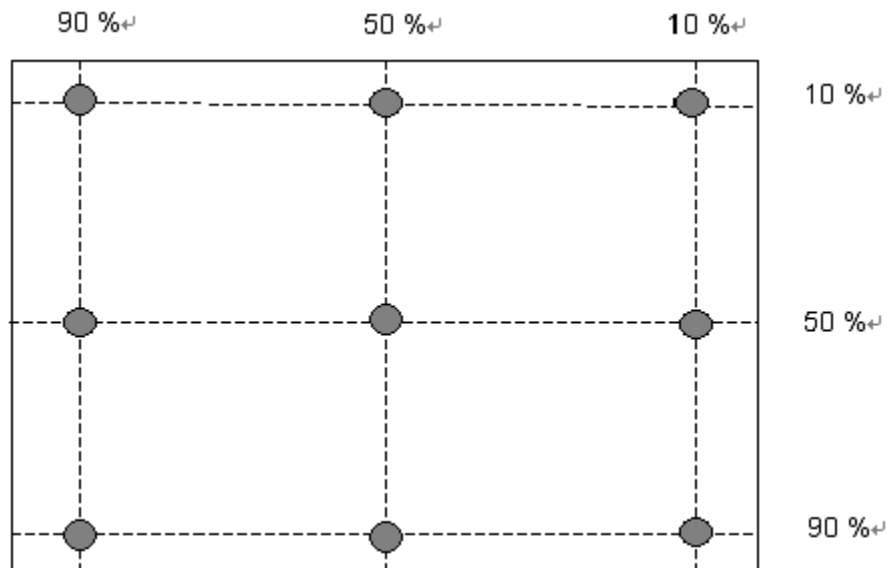
Aperture 1° with 50cm viewing distance

Test Point Center

Environment <1 lux



Note 2: Definition of 9 points position



Note 3: The luminance uniformity of 9 points is define by dividing the minimum luminance values by the maximum test point luminance

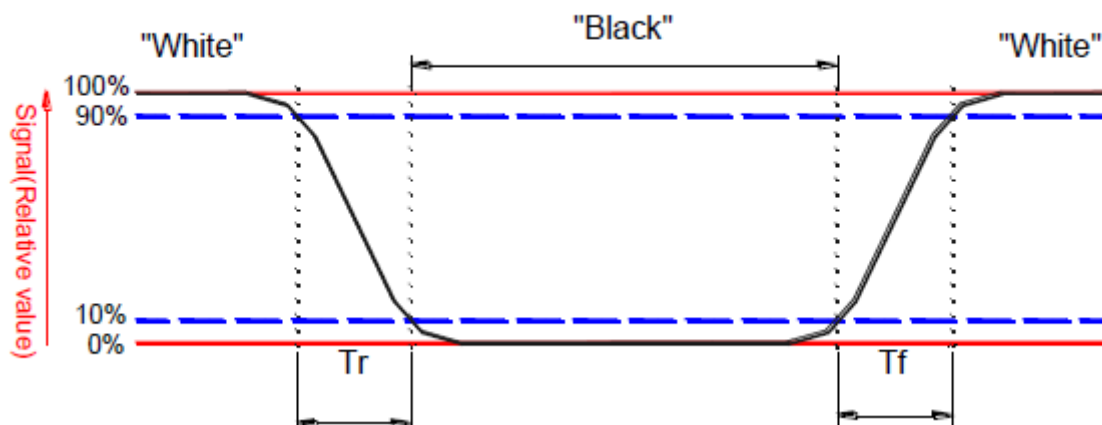
$$\delta_{W9} = \frac{\text{Minimum Brightness of 9 points}}{\text{Maximum Brightness of 9 points}}$$

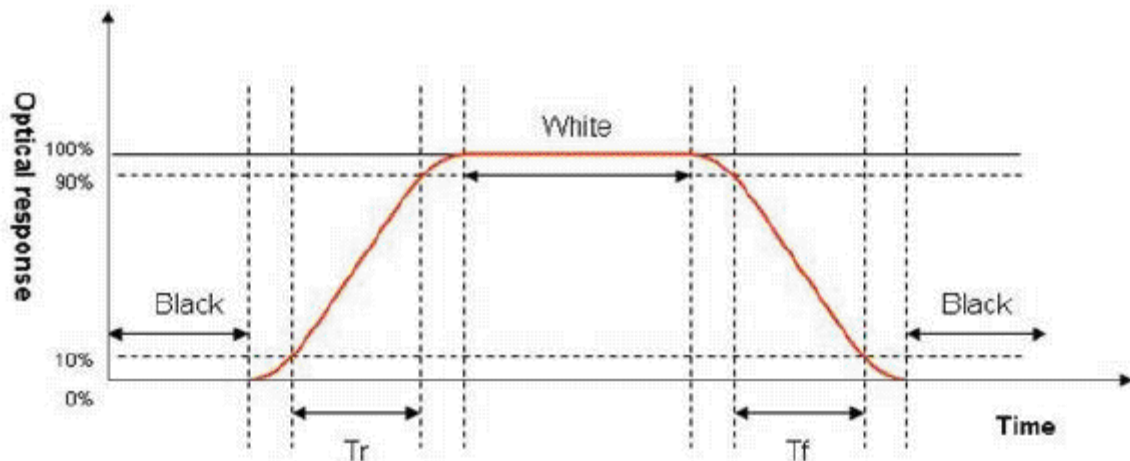
Note 4: Definition of contrast ratio (CR)

$$\text{Contrast ratio(CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 5: Definition of response time:

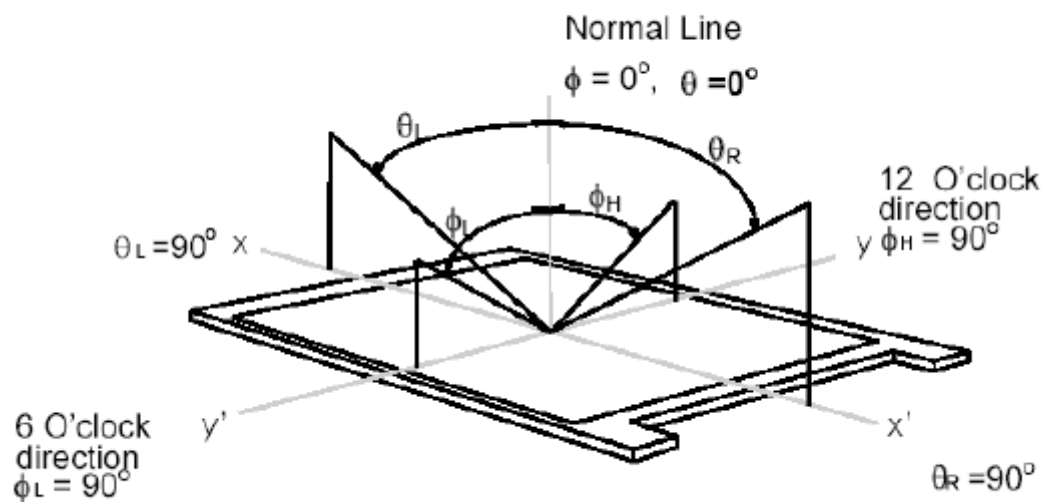
The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.





Note 6: Definition of view angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



6. RELIABILITY TEST ITEMS

Test Item		Condition
1	High temperature Storage test	60°C, 240hrs
2	Low temperature storage test	-20°C, 240hrs
3	High temperature/Humidity operation test	60°C, 90%RH, 240hrs
4	Low temperature operation test	0°C, 240hrs
5	Thermal Cycle storage test	-20°C(30min)~60°C(30min), 10cycles

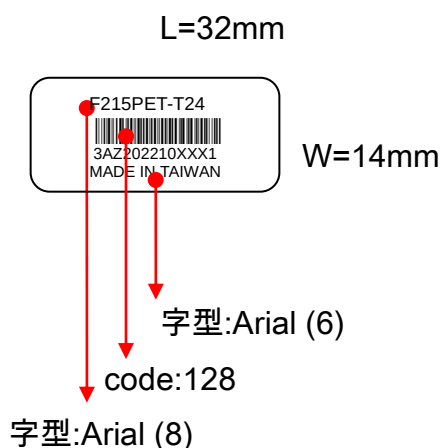
7. LABEL

Model NO. **F215PET-T24**

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	496.60	mm	PCAP : B215PBU-E08
	Vertical	291.20	mm	
	Depth (min.)	2.70	mm	
	Horizontal	497.60	mm	LCD : G215HAN01.3
	Vertical	292.20	mm	
	Depth (min.)	10.50	mm	
	Horizontal	100.00	mm	Touch Driver : ETP-MB-EXC84H5680STAG
	Vertical	33.00	mm	
	Depth (min.)	7.20	mm	
Weight		2440	g	F215PET-T24
Item		Specification		Remarks
PCAP Viewing Area		476.64 mm x 268.11 mm		
PCAP Active Area		481.20 mm x 272.70 mm		
PCAP FPC Length		96.70 mm		
PCAP Input method		Finger or exclusive pen		
PCAP Light Transmission		90 ± 3 %		
PCAP Operation force		≤10g		Finger Input
PCAP Hardness of surface		≥7H		ASTM D3363, Pressure 750g/45°
PCAP Surface Treatment		Haze < 4 %		BYK Gardner, ASTM D1003



Product Specification

F215PET-T24

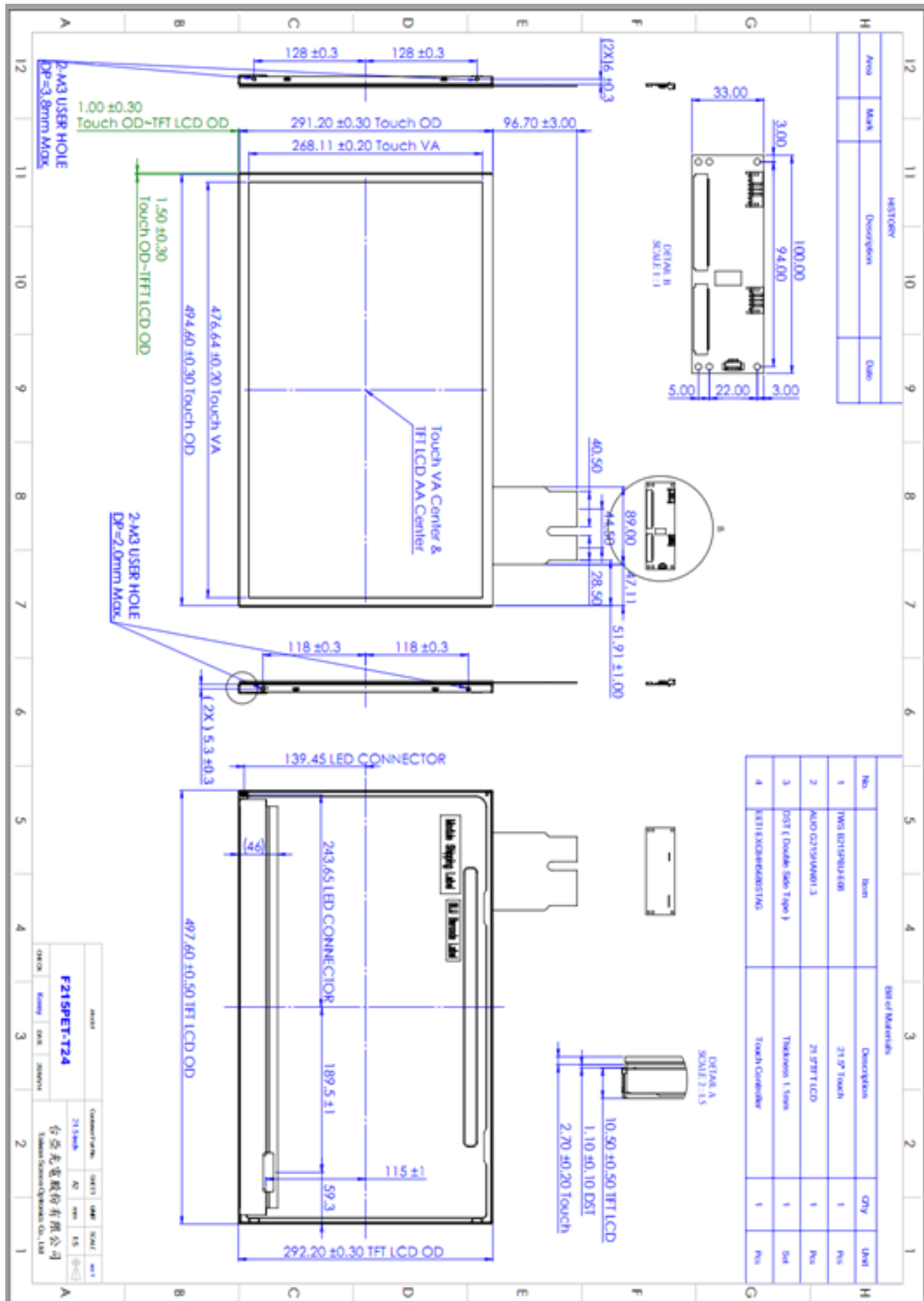
Front View

TBD

Back View

TBD

9. ENGINEERING DRAWING



Touch Driving Board :

