



- ☐ Draft Specifications
☒ Preliminary Specifications
☐ Final Specifications

Title	6.5-inches Touch Display Product Specifications
Model Name	F065PET-T81
Version	0

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

Approved By	Prepared By
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2025-11-04	2025-11-04



REVISION HISTORY

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

1.1. INTRODUCTION

F065PET-T81 is a 6.5" color active matrix TFT LCD module G065VN01 V2 21 with projected capacitive multi-touch B065PBU-E01 air bonding and control board EXC80W462838SMAG.

The display format is intended to support the VGA, 640(H) x 480(V) screen and 16.7M (LVDS RGB 8-bits) or 262k colors (LVDS RGB 6-bits) with LED backlight driving circuit.

1.2. FEATURES

- Industrial application
- RoHS product

1.3. APPLICATION

- TFT LCD monitor
- Industrial application

1.4. GENERAL SPECIFICATIONS

Parameter	Specification	Unit	Remarks
Active Area Size	6.5	inch	
Display Area	132.48 x 99.36 (V)	mm	
Outline Dimension	153.00 (H) x 118.00 (V) x 14.24 (D)	mm	D:PCAP+LCM
Weight	300	g	Typ.
Driver Element	a-Si TFT active matrix	-	
Display Colors	16.7M (RGB 8-bits) / 262k (RGB 6-bits)	Colors	
Electrical Interface	LVDS	-	
Number of Pixels	640 (H) x 480 (V)	pixels	
Pixel Pitch	0.207 (H) x 0.207(W)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	AHVA, Normal Black	-	
Color Gamut	55	%	
Touch Technology	Projected Capacitive Multi-Touch Panel	-	
Touch Method	Finger or exclusive pen	-	
Numbers of Touch	10	Points	
Touch FPC Type	COB	-	
Touch Sensor Glass Type	Strengthening Glass	-	
Touch Controller IC	EETI, EXC80W46	-	
Touch Driver Interface	USB / I2C	-	
Support OS	Windows (Embedded/CE/XP/2000/Vista/7/8/10) / Linux / Android	-	

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
Logic/LCD Drive Voltage	V_{DD}	-0.3	3.6	V
LCD Input Signal Voltage	V_{signal}	-0.3	3.6	V
Converter Input Voltage	LED_V_{DD}	-0.3	16	V
Converter Control Signal Voltage	LED_PWM	0.3	6	V
Converter Control Signal Voltage	LED_EN	0.3	6	V
Operating Temperature	T_{op}	-20	+70	°C
Operating Humidity	H_{op}	20	90	%RH
Storage Temperature	T_{st}	-30	+80	°C
Storage Humidity	H_{st}	20	90	%RH
Touch DC Supply Voltage	I2C	-0.3	3.6	V
Touch DC Supply Voltage	USB	-0.3	6.0	V

Note: Maximum Wet-Bulb temperature should be 39°C and no condensation.

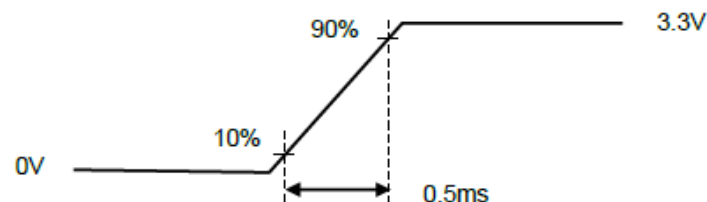
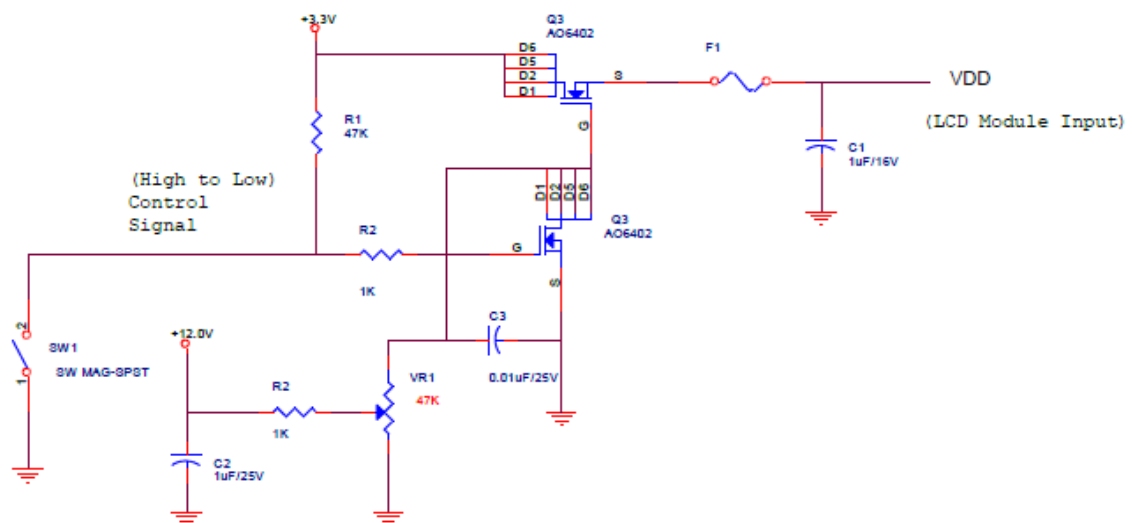
3. ELECTRICAL CHARACTERISTICS

3.1. LCD MODULE

3.1.1. POWER SPECIFICATION

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic/LCD Drive Voltage	VDD	3.0	3.3	3.6	V	
V _{DD} Current	I _{VDD}	-	82	100	mA	All White Pattern (VDD=3.3V at 59.9Hz)
LCD Inrush Current	I _{rush}	-	-	1.0	A	Note 1
V _{DD} Power	P _{VDD}	-	0.27		W	All White Pattern (VDD=3.3V at 59.9Hz)
Allowable Logic/LCD Drive Ripple Voltage	VDDrp	-	-	100	mV p-p	All White Pattern (VDD=3.3V at 59.9Hz)

Note 1: Measure Condition



VDD rising time

3.1.2. SIGNAL ELECTRICAL CHARACTERISTICS

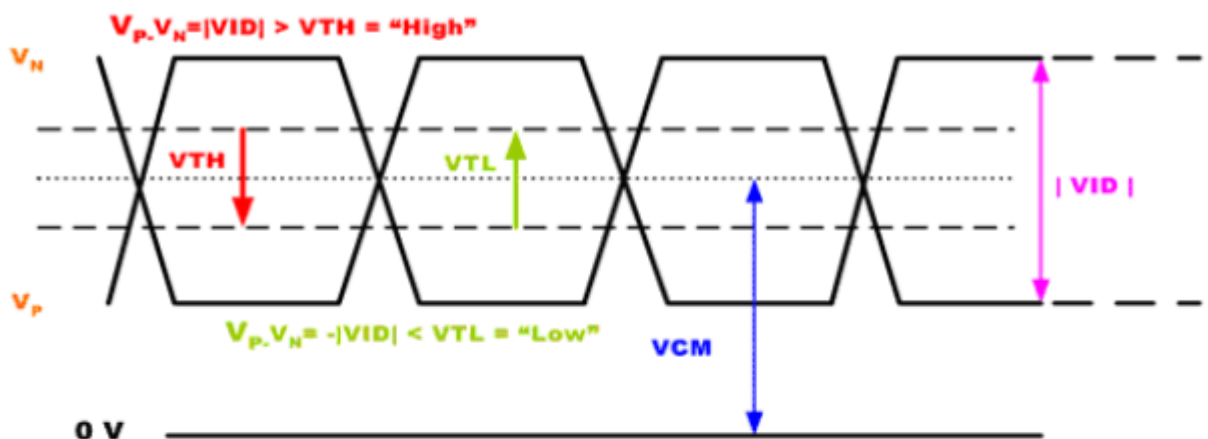
Input signals should be low or Hi-Z state when VDD is off.

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential Input High Threshold	VTH	-	-	100	mV	VCM=1.2V
Differential Input Low Threshold	VTL	-100	-	-	mV	VCM=1.2V
Input Differential Voltage	VID	200	400	600	mV	
Differential Input Common Mode Voltage	VICM	1.1	-	1.45	V	VTH/VTL=±100mV

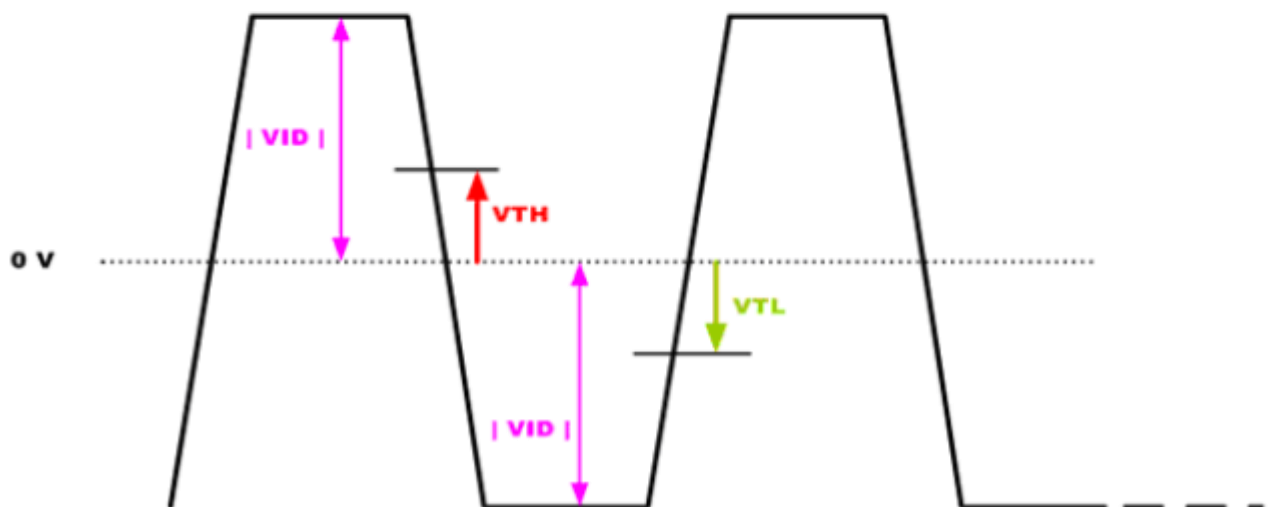
LVDS Transmitter: THC63LVDM83A (THINE) or equivalent

Note: LVDS Signal Waveform

Single-end Signal

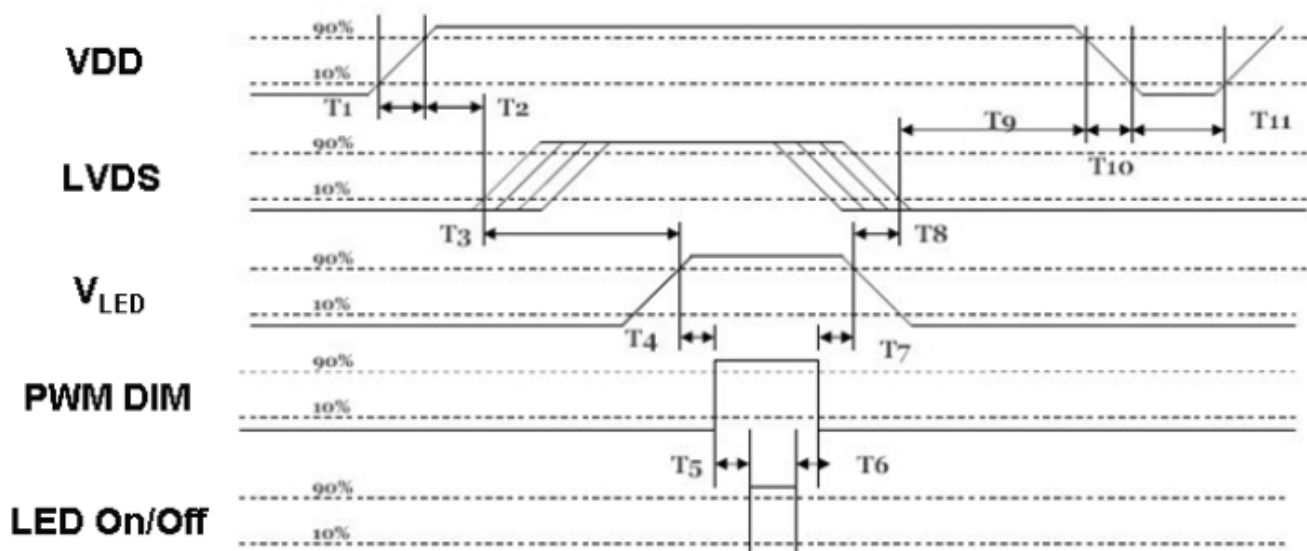


Differential Signal



3.1.3. POWER ON/OFF SEQUENCE

VDD power and backlight on/off sequence is as below. 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 Sequence Timing

Parameter	Values			Unit
	Min.	Typ.	Max.	
T1	0.5	---	3	ms
T2	30	40	50	ms
T3	200	---	---	ms
T4	10	---	---	ms
T5	10	---	---	ms
T6	0	---	---	ms
T7	10	---	---	ms
T8	100	---	---	ms
T9	0	16	50	ms
T10	---	---	10	ms
T11	1000	---	---	ms

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

3.2. LCD BACKLIGHT UNIT

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Input Voltage		V_{LED}	9	12	13.2	V	
Input Current		I_{LED}	-	0.167		A	100% PWM duty
Power Consumption		P_{LED}	-	2		W	100% PWM duty
Inrush Current		$I_{rush_{LED}}$	-	0.22	0.47	A	100% PWM duty
EN Control Level	Backlight on	LED_EN	3.0	3.3	5.0	V	
	Backlight off		0	-	0.15	V	
PWM Control level	PWM High	V_{PWM}	3.0	3.3	5.0	V	
	PWM Low		0	-	0.1	V	
PWM Control Duty Ratio		D_{PWM}	1	-	100	%	
PWM Control Frequency		F_{PWM}	200	-	20K	Hz	
LED Life Time		LT_{LED}	70,000	-	-	Hrs	Note 1, 2, 3

Note:

1. If G065VN01 V2 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.
2. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.
3. Test condition is 49mA and 25°C room temperature.

LED Backlight Unit Interface Signal Description

Pin#	Symbol	Pin Description
1	V_{LED}	12V input
2	V_{LED}	12V input
3	GND	Ground
4	GND	Ground
5	LED_EN	3.3V-On ; 0V/NC-Off
6	PWM DIM	Dimming Signal

Note1: "NC" stands for "No Connection".

Note2. LCD connector: STM MS24016RHD, compatible with MOLEX 53261-0671.

Note3. User's connector Part No.: STM P24016 or compatible

3.3. TOUCH CONTROL

EXC80W462838MAG



NO.	Item	Specification
1	Touch Controller IC	EXC80W46
2	Firmware Version	eGalaxWorks80H46~20240611-TWS_Touch-2838-v065003V1PA
3	Number Of Support	10 Fingers Touch
4	FPC Type / Interface	USB / I ² C

Interface	Symbol	Condition	Min.	Typ.	Max.	Unit
I ² C	JP2	DC		3.3	3.5	V
USB	JP1	DC		5	5.5	V

Connector Pin Configuration

J1 USB	
PIN	DEFINE
1	GND_E
2	VDD
3	GND
4	D+
5	D-

J2 I2C	
PIN	DEFINE
1	GND
2	I2C_SDA
3	I2C_SCL
4	VDD
5	I2C_INT



Connector Type: 50271-00501-001

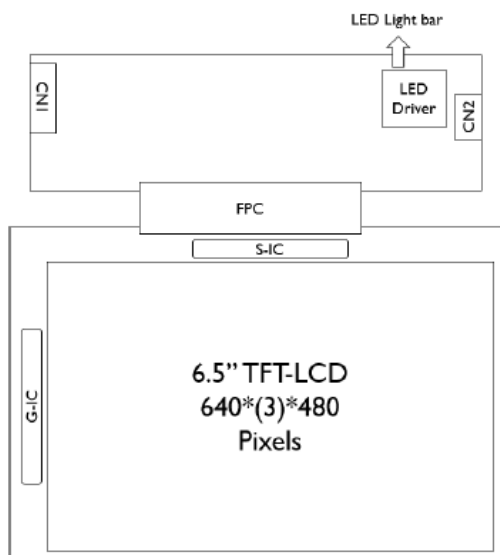
FPC Pin Description

PIN	Description	PIN	Description	PIN	Description	PIN	Description
1	RX_S1	21	RX 19	41	N/A	61	TX 10
2	RX 38	22	RX 18	42	TX_S1	62	TX 9
3	RX 37	23	RX 17	43	TX 28	63	TX 8
4	RX 36	24	RX 16	44	TX 27	64	TX 7
5	RX 35	25	RX 15	45	TX 26	65	TX 6
6	RX 34	26	RX 14	46	TX 25	66	TX 5
7	RX 33	27	RX 13	47	TX 24	67	TX 4
8	RX 32	28	RX 12	48	TX 23	68	TX 3
9	RX 31	29	RX 11	49	TX 22	69	TX 2
10	RX 30	30	RX 10	50	TX 21	70	TX 1
11	RX 29	31	RX 9	51	TX 20	71	TX_S0
12	RX 28	32	RX 8	52	TX 19		
13	RX 27	33	RX 7	53	TX 18		
14	RX 26	34	RX 6	54	TX 17		
15	RX 25	35	RX 5	55	TX 16		
16	RX 24	36	RX 4	56	TX 15		
17	RX 23	37	RX 3	57	TX 14		
18	RX 22	38	RX 2	58	TX 13		
19	RX 21	39	RX 1	59	TX 12		
20	RX 20	40	RX_S0	60	TX 11		

FPC Connector : 51607-0710M-001

3.4. LCD BLOCK DIAGRAM

The following diagram shows the function block of the 6.5 inch color TFT/LCD module.



3.5. INPUT TERMINAL PIN ASSIGNMENT

LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

Pin	Symbol	Description	Note
1	V _{DD}	Power supply: +3V	
2	V _{DD}	Power supply: +3V	
3	GND	Ground	
4	SEL68	Selection for either 6bit or 8bit LVDS input: SEL68="Low" or "NC", accepts 6bit LVDS data input SEL68="High", accepts 8bit LVDS data input.	
5	RX1-	Negative LVDS differential input (R0-R5, G0)	
6	RX1+	Positive LVDS differential input (R0-R5, G0)	
7	GND	Ground	
8	RX2-	Negative LVDS differential input (G1-G5, B0-B1)	
9	RX2+	Positive LVDS differential input (G1-G5, B0-B1)	
10	GND	Ground	
11	RX3-	Negative LVDS differential input (B2-B5, DE)	
12	RX3+	Positive LVDS differential input (B2-B5, DE)	
13	GND	Ground	
14	RXCLK-	Negative LVDS differential clock input	
15	RXCLK+	Positive LVDS differential clock input	
16	NC	No Connection	
17	U/D	Vertical Reverse ("L" or NC: Normal, "H": Reverse)	
18	R/L	Horizontal Reverse ("L" or NC: Normal, "H": Reverse)	
19	RX4-	Negative LVDS differential input (R6-R7, G6-G7, B6-B7) VDD for 6bit LVDS input. Note 5	
20	RX4+	Positive LVDS differential input (R6-R7, G6-G7, B6-B7) GND for 6bit LVDS input, Note 5	

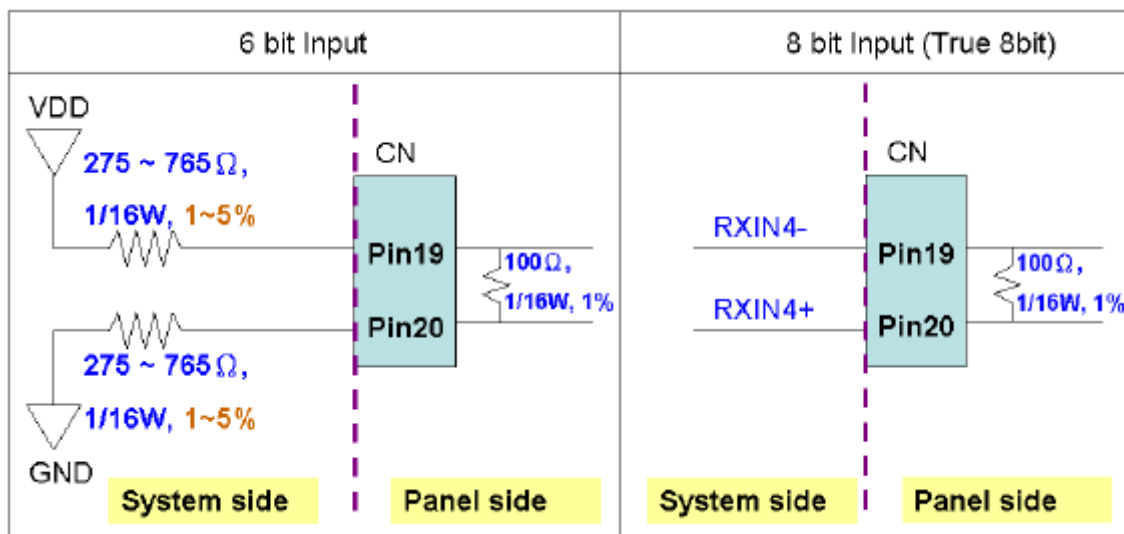
Note1. LCD connector: STM MSB24013P20, compatible with IPEX 20268-020E.

Note2. User's connector Part No.: Hirose DF19-20S-1C or compatible

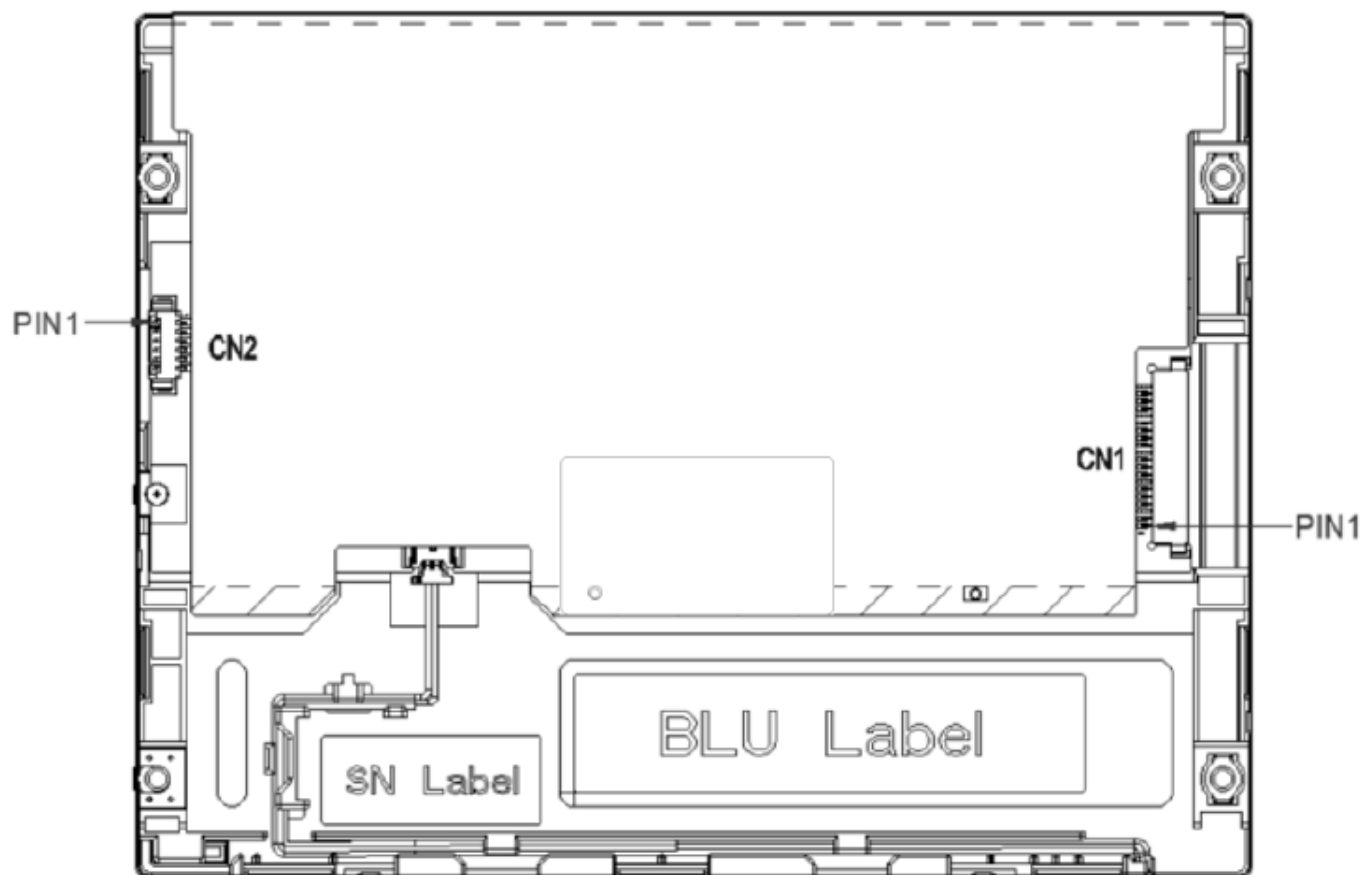
Note3. Input Signals should be in low status when VDD is off.

Note4. "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".

Note5.



PIN 1 definition of CN1 and CN2

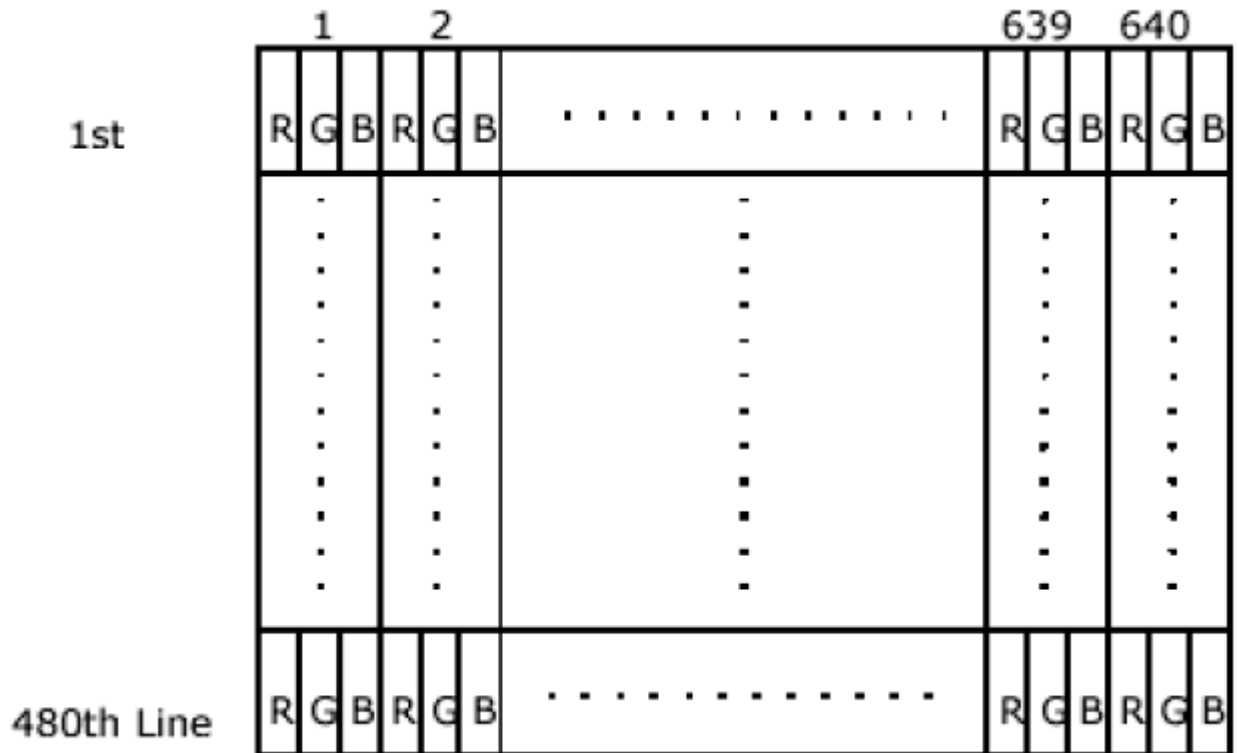


(Rear side of TFT-LCD)

4. LCD SIGNAL CHARACTERISTIC

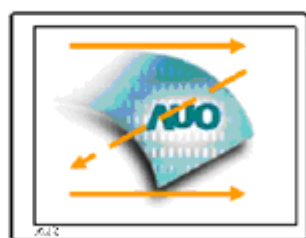
4.1. PIXEL FORMAT IMAGE

Following figure shows the relationship between input signal and LCD pixel format.



4.1.1. SCANNING DIRECTION

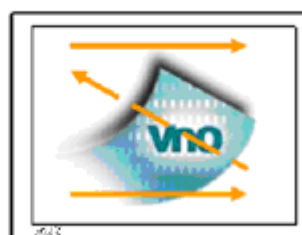
The following figures show the image seen from the front view. The arrow indicates the direction of scan.



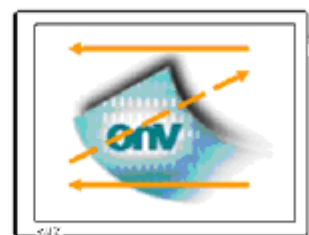
R/L=Low or NC; U/D= Low or NC



R/L=High; U/D= Low or NC



R/L=Low or NC; U/D= High



R/L=High; U/D= High

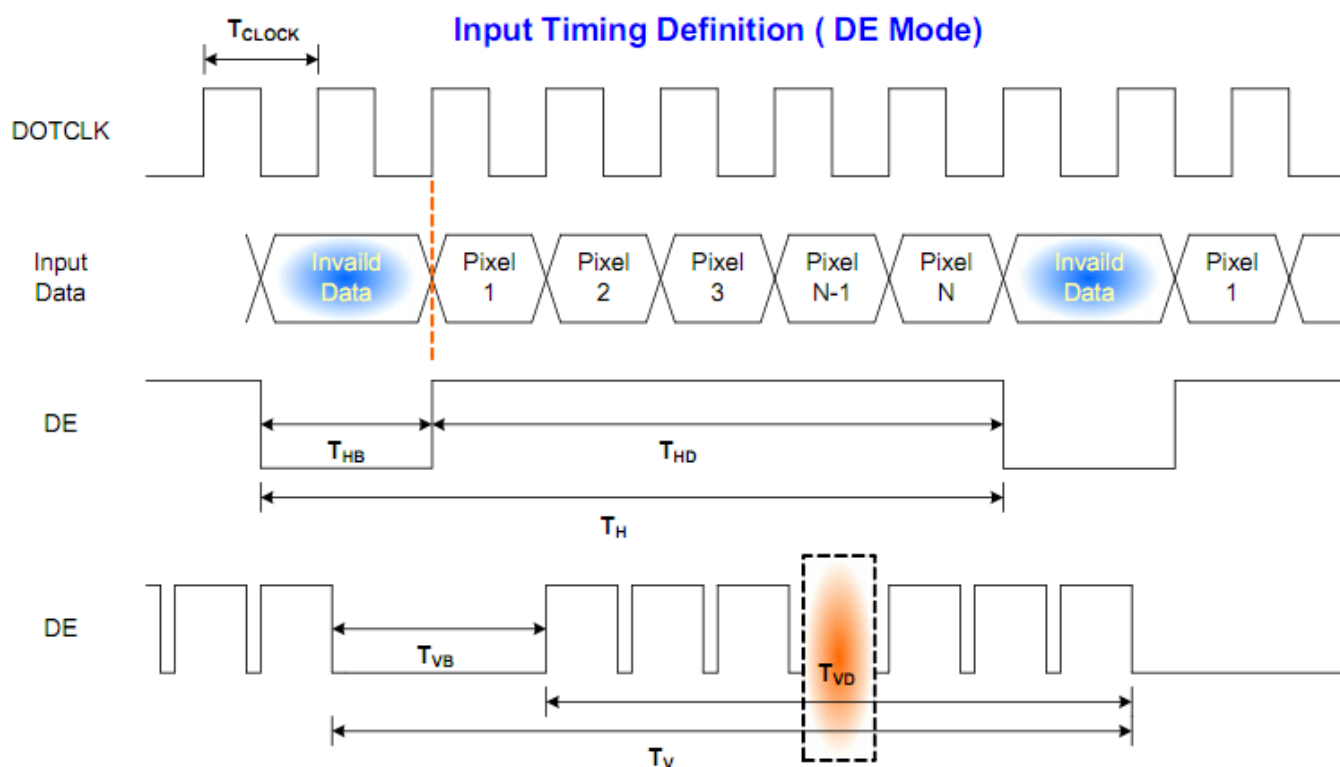
4.2. LCD INTERFACE TIMING

4.2.1. LCD TIMING CHARACTERISTICS

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		T _{dclk}	20	25.2	50	MHz
Horizontal Section	Period	T _H	770	800	1070	T _{dclk}
	Active	T _{HD}	640			
	Blanking	T _{HB}	130	160	430	
Vertical Section	Period	T _V	520	525	622	T _{Line}
	Active	T _{VD}	480			
	Blanking	T _{VB}	40	45	142	
Frame Rate		F	--	60	--	Hz

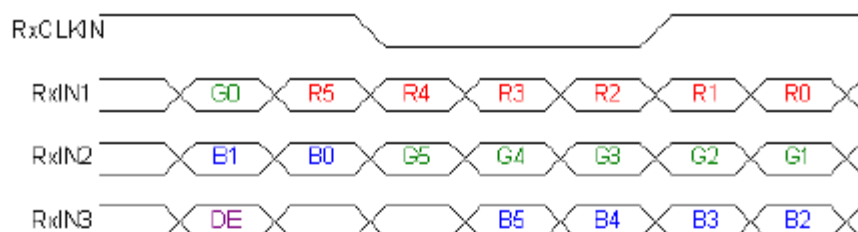
Note: DE mode only.

4.2.2. LCD INPUT TIMING DIAGRAM

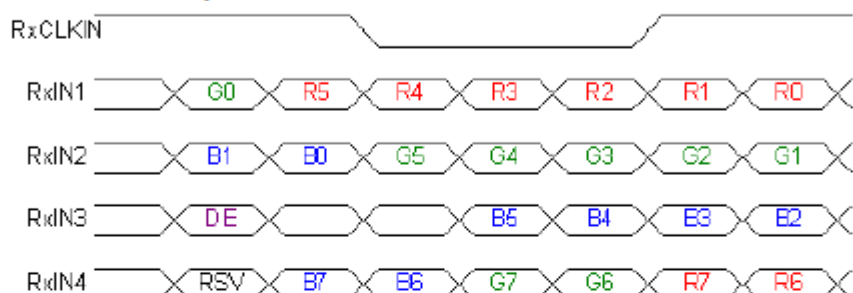


4.2.3. LCD INPUT DATA FORMAT

SEL68 = "Low" or "NC" for 6 bits LVDS Input



SEL68 = "High" for 8 bits LVDS Input



Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0	Red-pixel Data For 8Bits LVDS input MSB: R7 ; LSB: R0 For 6Bits LVDS input MSB: R5 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0	Green-pixel Data For 8Bits LVDS input MSB: G7 ; LSB: G0 For 6Bits LVDS input MSB: G5 ; LSB: G0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0	Blue-pixel Data For 8Bits LVDS input MSB: B7 ; LSB: B0 For 6Bits LVDS input MSB: B5 ; LSB: B0
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
RSV	Reserved Signal	"High" or "Low" is acceptable

Note 1: Output signals from any system shall be low or Hi-Z state when VDD is off.

5. OPTICAL CHARACTERISTICS

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Surface Luminance (White)		LWH	F _{PWM} =100% (center point)	600	800	--	Cd/m2	1
Contrast Ratio		CR		700	1000	--		4
Uniformity		δW5p	5 points	---	--	1.25	%	1,2,3
Response Time		TR	Rising	--	15	20	ms	5
		TF	Falling	--	10	15	ms	
		TR+TF	Rising + Falling	--	25	35	ms	
Color Coordinates	White	W _x		0.263	0.313	0.363		
		W _y		0.279	0.329	0.379		
	Red	R _x		0.554	0.604	0.654		
		R _y		0.301	0.351	0.401		
	Green	G _x		0.277	0.327	0.377		
		G _y		0.555	0.605	0.655		
	Blue	B _x		0.103	0.153	0.203		
		B _y		0.063	0.113	0.163		
Viewing Angle	Horizontal	θ _r	CR=10	80	89	--	degree	6
		θ _l		80	89	--	degree	
	Vertical	θ _u		80	89	--	degree	
		θ _d		80	89	--	degree	
Color Gamut				50	55	--	%	

Note 1: Measurement method

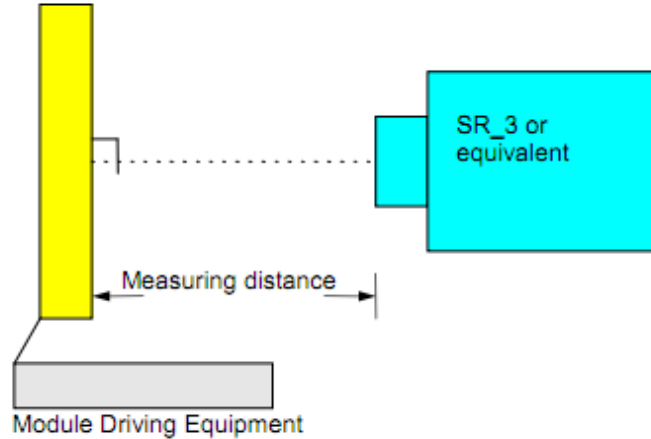
Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

Aperture 1° with 50cm viewing distance

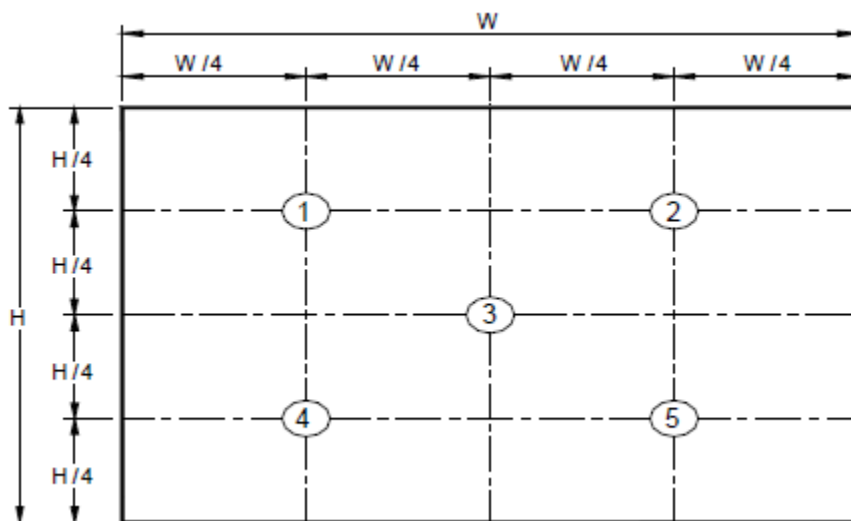
Test Point Center

Environment < 1 lux

LCD Module



Note 2: Definition of 5 points position (Display active area: 132.48(W) x99.36 (H))



Note 3: The luminance uniformity of 5 points is defined by dividing the minimum luminance values by the maximum test point luminance

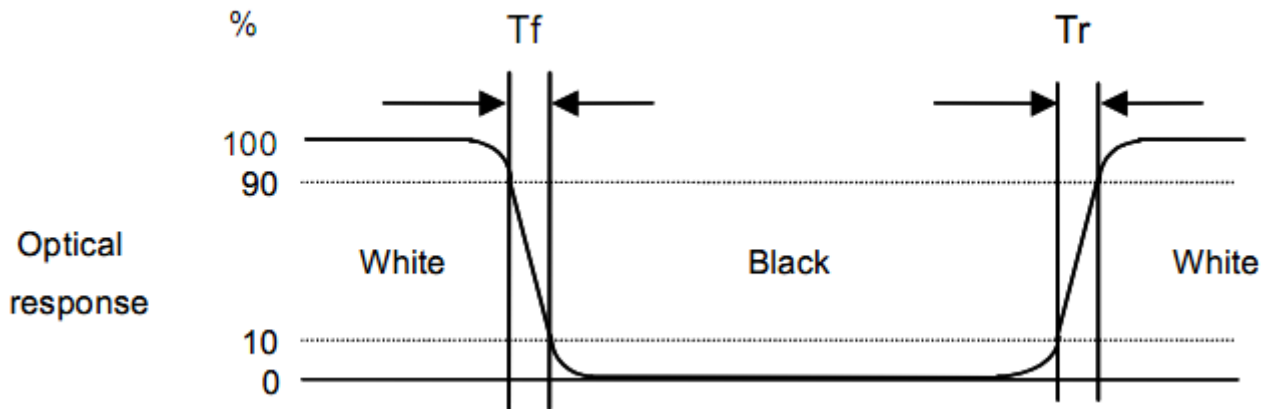
$$\delta_{w5} = \frac{\text{Minimum Brightness of five points}}{\text{Maximum Brightness of five points}}$$

Note 4: Definition of contrast ratio (CR)

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

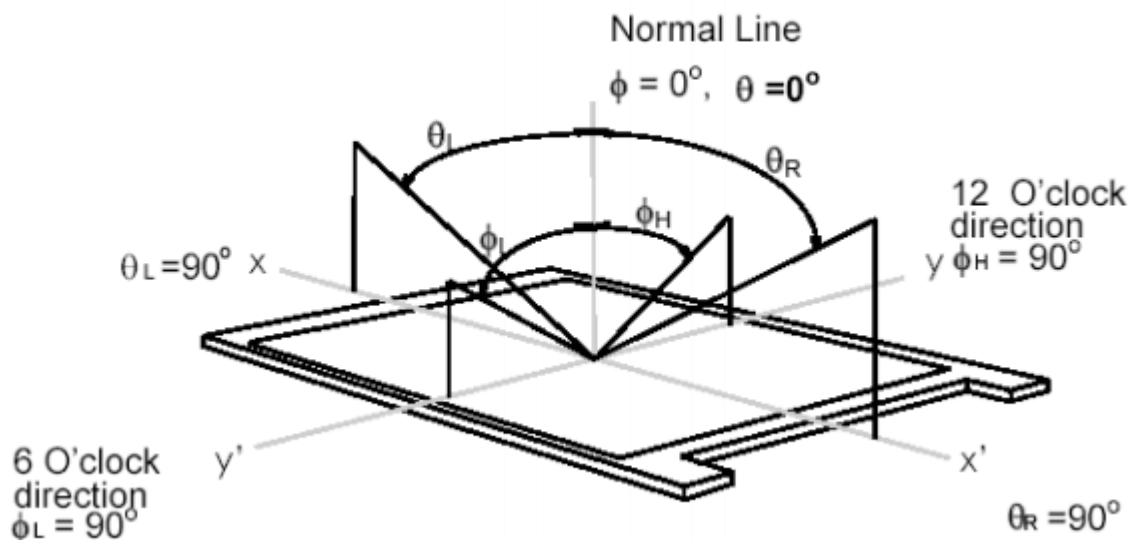
Note5: Definition of Response Time (T_R , T_F)

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.



Note6: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal view 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	80°C, 240hrs
2	Low temperature storage test	-30°C, 240hrs
3	High temperature/Humidity operation test	60°C, 90%RH, 240hrs
4	High temperature operation test	70°C, 240hrs
5	Low temperature operation test	-20°C, 240hrs
6	Thermal Cycle storage test	-30°C(30min)~80°C(30min), 10cycles

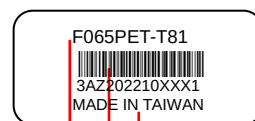
7. LABEL

Model NO. **F065PET-T81**

條碼

SN **3A Z 20 2 21 0 XXX1**

L=32mm



W=14mm

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

字型:Arial (6)

code:128

字型:Arial (8)

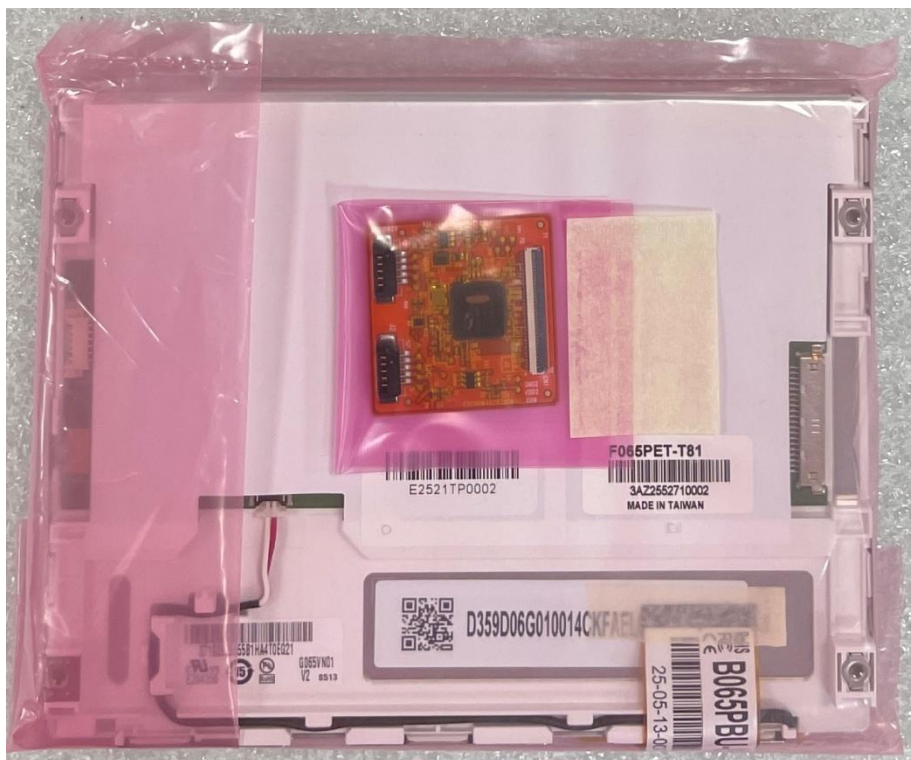
8. MECHANICAL CHARACTERISTICS

Item		Dimension	Unit	Note
Outline Dimension	Horizontal	153.00	mm	PCAP : B065PBU-E01
	Vertical	118.00	mm	
	Depth (min.)	2.7	mm	
	Horizontal	153.0	mm	LCD : G065VN01 V2 21
	Vertical	118.0	mm	
	Depth (min.)	10.9	mm	
	Horizontal	35.00	mm	Control Board : EXC80W462838MAG
	Vertical	35.00	mm	
	Depth (min.)	4.60 (Max.)	mm	
Weight		300	g	F065PET-T81
Item		Specification		Remarks
PCAP Viewing Area		152.00 mm x 117.00 mm		
PCAP Sensor Area		136.50 mm x 103.40 mm		
PCAP FPC Length		36.00 mm		
PCAP Input method		Finger or exclusive pen		
PCAP Light Transmission		90 ± 3 %		
PCAP Operation force		≤15g		Finger Input
PCAP Hardness of surface		≥7H		ASTM D3363, pressure 750g/45°
PCAP Surface Treatment		Haze <4%		BYK Gardner, ASTM D1003

Front View



Back View



9. ENGINEERING DRAWING

