



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

Title	23.8-inches Touch Display Product Specifications
Model Name	F238PET-Z08
Version	0

Customer

Approved by

Date

Notice: This Specification is subject to change without notice.

Approved By	Prepared By
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2026-05-28	2026-05-28



REVISION HISTORY

Version	ECN No.	Description of Changes	Date	Prepared
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CONTENTS

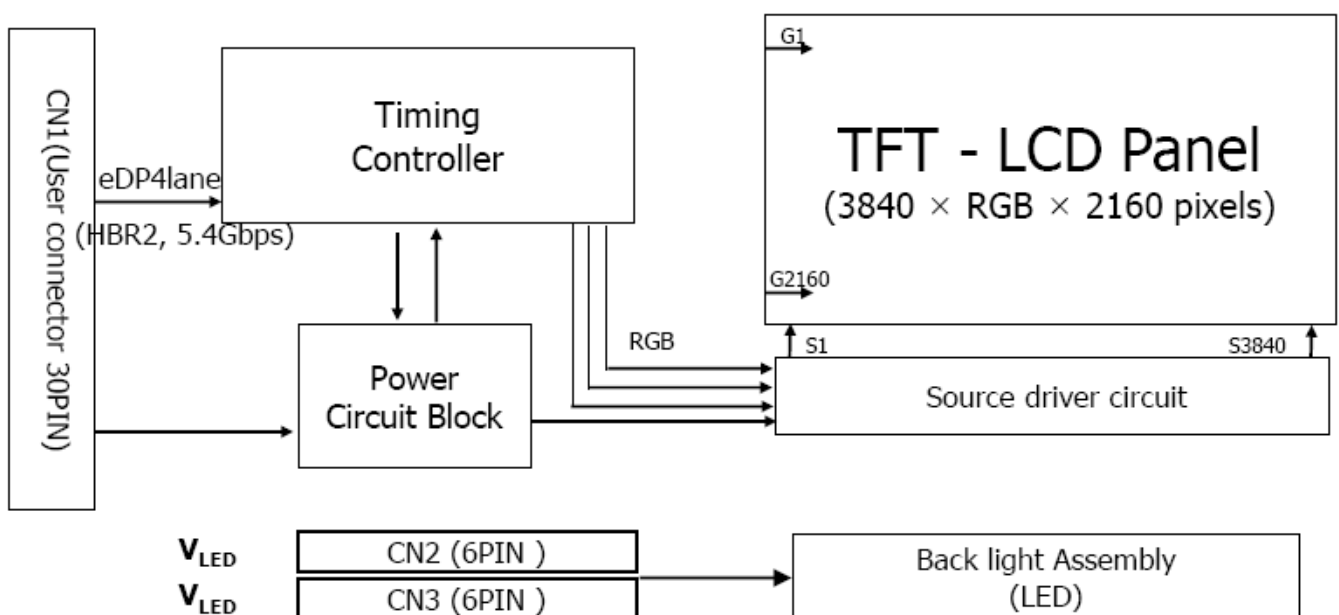
1. GENERAL DESCRIPTION	4
1.1. INTRODUCTION	4
1.2. FEATURES	4
1.3. APPLICATION	4
2. GENERAL SPECIFICATIONS	5
3. ABSOLUTE MAXIMUM RATINGS	6
4. ELECTRICAL CHARACTERISTICS	7
4.1. LCD MODULE	7
4.1.1. POWER SPECIFICATION	7
4.1.2. LCD BACKLIGHT UNIT	9
4.2. TOUCH CONTROL BOARD	9
5. INTERFACE CONNECTIONS	10
5.1. LCD MODULE	10
5.1.1. EDP SIGNAL SPECIFICATION	11
5.1.2. BACKLIGHT CONNECTOR PIN CONFIGURATION	15
5.1.3. SIGNAL TIMING SPECIFICATION	16
5.1.4. SIGNAL TIMING WAVEFORM	17
5.1.5. COLOR INPUT DATA REFERENCE	18
5.1.6. POWER SEQUENCE	19
5.1.7. VLCD POWER DIP CONDITION	20
5.2. TOUCH CONTROL BOARD PIN ASSIGNMENT	20
6. OPTICAL CHARACTERISTICS	22
7. RELIABILITY TEST ITEMS	26
8. LABEL	26
9. MECHANICAL CHARACTERISTICS	27
10. ENGINEERING DRAWING	29

1. GENERAL DESCRIPTION

1.1. INTRODUCTION

F238PET-Z08 is a 23.8" wide color TFT LCD module LM238WR2-SPE1 with projected capacitive multi-touch B238PBU-E01 air bonding, with touch driver ETP-MB-EXC84H5680STAG.

The display format is intended to support the UHD mode (3840(H) x 2160(V)) screen and 10-bit gray scale signal for each dot, 1.07Billion colors with A-FRC (Advanced Frame Rate Control). It have been designed to apply eDP (HBR2, 5.4Gbps) interface, with a LED backlight system without LED Driver.



1.2. FEATURES

- UHD (3840x2160) resolution
- 10-bit color depth, display 1.07Billion colors
- RoHS product

1.3. APPLICATION

- Desktop Type of PC & Workstation Use
- Display Terminals for Control System
- Monitors for Process Controller



2. GENERAL SPECIFICATIONS

Parameter	Specification	Unit	Remarks
Active Area Size	23.74	inch	
Display Area	525.658(H) x 295.704(V)	mm	
Outline Dimension	570.00 (H) x 343.00 (V) x 18.90 (D)	mm	D:PCAP+LCM
Weight	3960	g	Typ.
Driver Element	a-Si TFT active matrix	-	
Display Colors	1.07Billion, 10Bit (8Bits+A-FRC)	Colors	
Electrical Interface	eDP, 4 lane	-	
Number of Pixels	3840 (H) x 2160 (V)	pixels	
Pixel Pitch	0.1369 (H) x 0.1369 (W)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Transmissive mode, normal Black	-	
Color Gamut (CIE 1976)	98	%	DCI-P3
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	-	

3. 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	+12.0	V
LED Supply Voltage	V_F	-0.3	+50.0	V
Operating Temperature	T_{op}	0	+50	°C
Operating Humidity	H_{op}	10	90	%RH
Storage Temperature	T_{st}	-20	+60	°C
Storage Humidity	H_{st}	10	90	%RH
Touch DC Supply Voltage	USB	-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.

4. ELECTRICAL CHARACTERISTICS

4.1. LCD MODULE

4.1.1. POWER SPECIFICATION

It requires two power inputs. One is employed to power the LCD electronics and to drive TFT array and liquid crystal. The second input power for LED/Backlight is typically generated by a LED Driver. The LED Driver is an external unit to the LCDs.

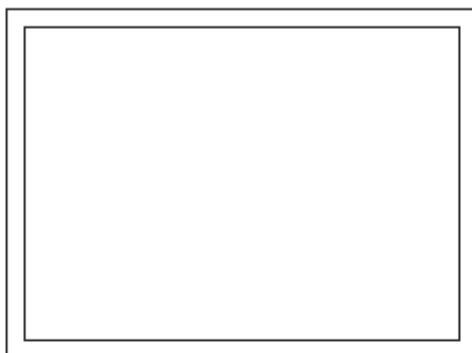
Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
Power Supply Input Voltage	V_{LCD}	9.5	10.0	10.5	Vdc	5
Permissive Power Input Ripple	V_{dRF}			400	mV _{p-p}	1
Power Supply Input Current	I_{LCD}	-	630	788	mA	2
		-	840	1050	mA	3
Power Consumption	P_C TYP	-	6.3	7.88	Watt	2
	P_C Max	-	8.4	10.5	Watt	3
Rush current	I_{RUSH}	-	-	3	A	4

Notes:

- 1) Permissive power ripple should be measure under the condition of $V_{LCD} = 10.0V$, $25^{\circ}C$, $*f_v = 60Hz$
- 2) The specified current and power consumption can be measured under the $V_{LCD} = 10.0V$, $25^{\circ}C$, $f_v = 60Hz$ and the pattern should be changed according to the typical or maximum power condition.
The max current can be measured only with the maximum power pattern and the max current is based on the peak value using oscilloscope, not the RMS value.
(Measurement condition : Sample Mode, Time division 40ms, Sampling Rate 2.5MS/s)
- 3) Maximum condition of inrush current :
The duration of rush current is about 5ms and rising time of power input is $500\mu s \pm 20\%$ (Min).
- 4) V_{LCD} level must be measured between two points on PCB of LCM V_{LCD} (test point) ~ LCM Ground.
(Test condition : Maximum power pattern, $25^{\circ}C$, $f_v = 60Hz$)

* f_v = Frame frequency

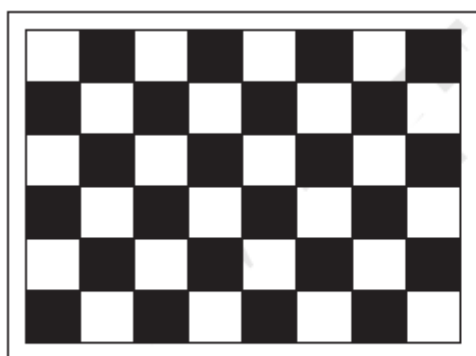
- Permissive Power input ripple ($V_{LCD} = 10.0V$, $25^{\circ}C$, f_v (frame frequency) = MAX condition)



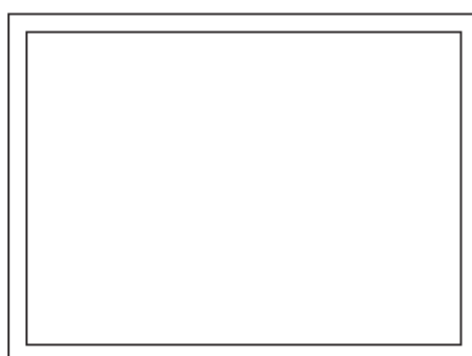
White pattern

For the exact ripple measurement, the condition of Max 20MHz is recommended in the bandwidth configuration of oscilloscope.

- Power consumption ($V_{LCD} = 10.0V$, $25^{\circ}C$, f_v (frame frequency) = 60Hz condition)



Typical power Pattern



Maximum power Pattern

4.1.2. LCD BACKLIGHT UNIT

Parameter	Symbol	Min.	Typ.	Max.	Units	Notes
LED String Current	I _s	-	100	105	mA	1, 2
LED Supply Voltage	V _s	37.7	40.5	43.3	V	1, 3
Power Consumption	P _{Bar}	-	32.4	34.6	Watt	2, 5
LED Life Time	LED_LT	30,000	-	-	Hrs	4

Notes : The LED Bar consists of 56 LED packages, 4 strings (parallel) x 14 packages (serial) x 2 bar

1) The specified values are for single LED bar.

2) The specified current is defined as the input current for single LED string with 100% duty cycle.

3) The specified voltage is the input LED string voltage at typical current 100% duty cycle.

4) The LED life time is defined as the when brightness of LED itself reach to the 50% of initial value under the conditions at T_a = 25±2°C and typical LED string current.

5) The power consumption shown above does not include the loss of external LED driver.

The typical power consumption is calculated as P_{Bar} = V_s (Typ.) x I_s (Typ.) x No. of strings.

The maximum power consumption is calculated as P_{Bar} = V_s (Max.) x I_s (Typ.) x No. of strings.

4.2. TOUCH CONTROL BOARD

ETP-MB-EXC84H5680STAG

Parameter	Values			Unit	Notes
	Min.	Typ.	Max.		
Input Voltage	3.5	5	5.5	V	
Interface	USB:2.0			-	
Max Resolution	16384 x 16384 resolution			-	
Channels of panel	Max. TX: 48 Rx:80 channels			mm	Including shielding pin
Linearity	Line drawing accuracy: 1pt +/- 1 mm offset /10 mm Touch (point) accuracy: 1pt +/- 1mm			mm	
Power consumption (mA)	Active Mode: <90 mA Idle Mode: depends on firmware			mA	
Report rate (points/sec)	≥100			Hz	
Response time	Average <25			ms	

5. INTERFACE CONNECTIONS

5.1. LCD MODULE

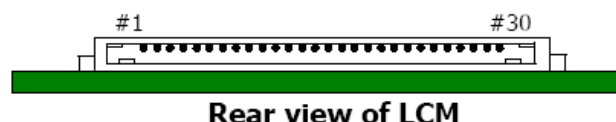
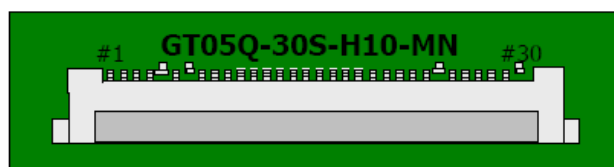
- LCD Connector (CN1) : GT05Q-30S-H10-MN (LSMtron), HD2S030HA2 (JAE), KN38B-30S-0.5H (HIROSE)
- Mating Connector : 20453-030T-## (Manufactured by I-PEX) or Equivalent

Module LVDS connector (CN1) Pin Configuration

No.	Symbol	Description	No.	Symbol	Description
1	VLCD	Power Supply +10.0V	16	Lane0P	True signal for Main Link 0
2	VLCD	Power Supply +10.0V	17	Lane0N	Component signal for Main link 0
3	VLCD	Power Supply +10.0V	18	GND	Ground
4	VLCD	Power Supply +10.0V	19	Lane1P	True signal for Main Link 1
5	VLCD	Power Supply +10.0V	20	Lane1N	Component signal for Main link 1
6	NC	No Connection	21	GND	Ground
7	GND	Ground	22	Lane2P	True signal for Main Link 2
8	NC	No Connection (I2C for LCM)	23	Lane2N	Component signal for Main link 2
9	NC	No Connection (I2C for LCM)	24	GND	Ground
10	GND	Ground	25	Lane3P	True signal for Main Link 3
11	HPD	Hot Plug Detect Signal	26	Lane3N	Component signal for Main link 3
12	GND	Ground	27	GND	Ground
13	AUX_CHN	Component signal for Auxiliary Channel	28	GND	Ground
14	AUX_CHP	True signal for Auxiliary Channel	29	BL_EN	Enable signal for Backlight
15	GND	Ground	30	GND	Ground

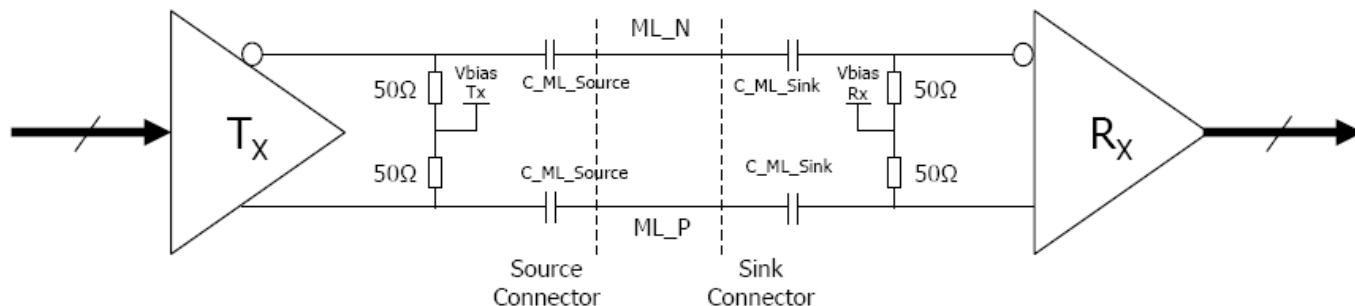
Notes :

- 1) All GND (ground) pins should be connected together to the LCD module's metal frame.
- 2) All V_{LCD} (power input) pins should be connected together.
- 3) BL_EN (Enable signal for Backlight) : If you don't use this pin, it should be NC (No connection)
(High : 3.3V, Low : GND)



5.1.1. EDP SIGNAL SPECIFICATION

1) eDP Main Link Signal



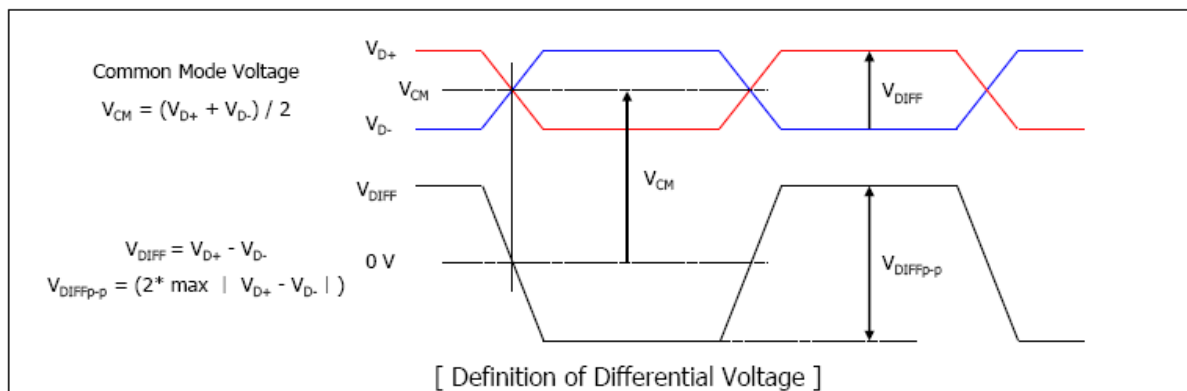
[Main Link Differential Pair]

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Unit Interval for high bit rate (5.4Gbps / lane)	UI_HBR2	-	185	-	ps	
Link Clock Down Spreading	Amplitude	0	-	0.5	%	
	Frequency	30		33	kHz	
Maximum output voltage level at Source side connector	$V_{TX-DIFFp-p-Max}$	-	-	1.38	V	Note 6)
Differential peak-to-peak voltage at Sink side connector	$V_{RX-DIFFp-p}$	0.09	-	-	V	Note 7)
EYE width at Sink side connector	$T_{RX-EYE-CONN}$	0.38	-	-	UI	Note 6,7)
Lane intra-pair skew	$L_{RX-SKEW-INTRA_PAIR}$	-	-	50	ps	
AC Coupling Capacitor	$C_{SOURCE-ML}$	75		200	nF	Source side

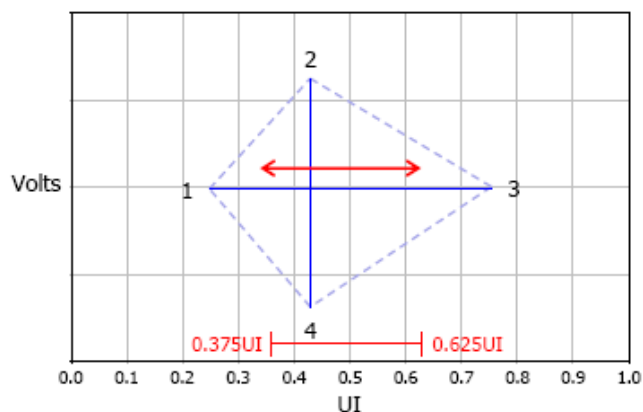
Note)

1. In cabled embedded system, it is recommended the system designer ensure that EYE width and voltage are met at the sink side connector pins.
2. Mismatched common mode voltage will occur abnormal display.
3. All eDP electrical spec is measured at sink connector side.

Definition of differential Voltage



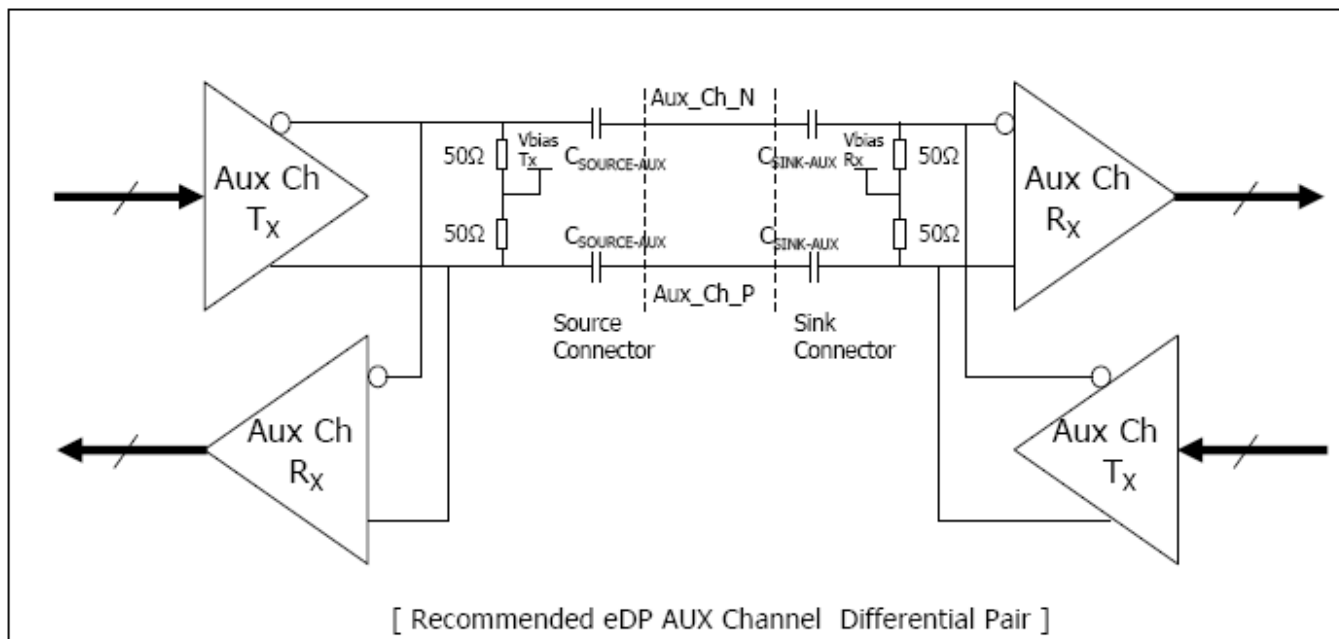
Main Link EYE Diagram



Point	High Bit Rate 2 @ TP3 EQ	
	Time(UI)	Voltage(V)
1	Any UI location (x) where the eye width is open from x to x+0.38UI	0.000
2	Any passing UI location between 0.375UI-0.625UI	0.045
3	Point 1 + 0.38UI	0.000
4	Same as Point 2	-0.045

[EYE Mask Vertices at embedded DP Sink Connector Pins]

2) eDP AUX Channel Signal

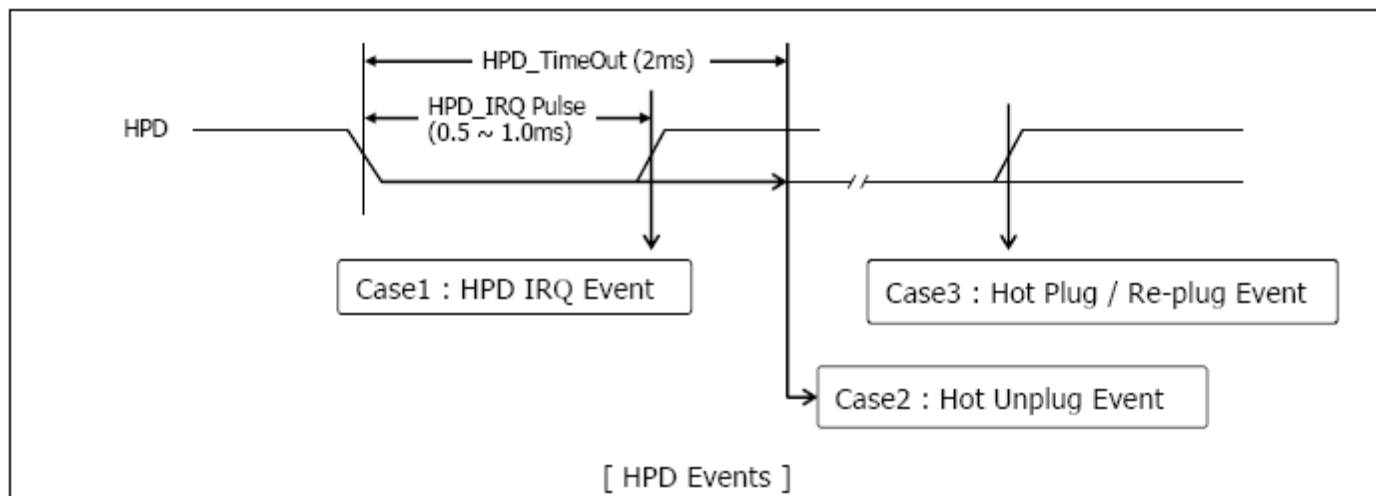


Parameter	Symbol	Min	Typ	Max	Unit	Notes
AUX Unit Interval	UI	0.4	-	0.6	us	
AUX Jitter at Rx IC Package Pins	T_{jitter}	-	-	0.05	UI	Equal to 30ns
AUX Peak-to-peak voltage at Connector Pins of Receiving	$V_{AUX-DIFFp-p}$	0.32	-	1.36	V	
AUX Peak-to-peak voltage at Connector Pins of Transmitting		0.39	-	1.38	V	
AUX EYE width at Connector Pins of Tx and Rx		0.98	-	-	UI	
AUX AC Coupling Capacitor	$C_{SOURCE-AUX}$	75		200	nF	Source side

Note)

- $V_{AUX-DIFFp-p} = 2 * |V_{AUXP} - V_{AUXN}|$
- Termination resistor should be 50ohm $\pm 5\%$ at source side to AUX level.
- Mismatched common mode voltage will occur abnormal display.

3) eDP HPD Signal



Parameter	Symbol	Min	Typ	Max	Unit	Notes
HPD Voltage	HPD	2.25	-	3.6	V	Sink side Driving
Hot Plug Detection Threshold		2.0	-	-	V	Source side Detecting
Hot Unplug Detection Threshold		-	-	0.8	V	
HPD_IRQ Pulse Width	HPD_IRQ	0.5	-	1.0	ms	
HPD_TimeOut		2.0	-	-	ms	HPD Unplug Event

Note)

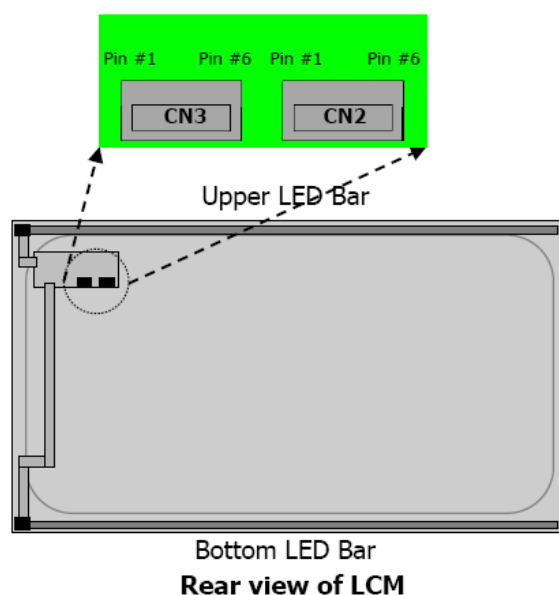
1. HPD IRQ : Sink device wants to notify the Source device that Sink's status has changed so it toggles HPD line, forcing the Source device to read its Link / Sink Receiver DPCD field via the AUX-CH
2. HPD Unplug : The Sink device is no longer attached to the Source device and the Source device may then disable its Main Link as a power saving mode
3. Plug / Re-plug : The Sink device is now attached to the Source device, forcing the Source device to read its Receiver capabilities and Link / Sink status Receiver DPCD fields via the AUX-CH

5.1.2. BACKLIGHT CONNECTOR PIN CONFIGURATION

The LED interface connector is a model 10035WS-H06D (HF) Manufactured by YEONHO
The mating connector is a SHJP-06V-S (HF) or 10035HS-H06C (HF) and equivalent.
The pin configuration for the connector is shown in the table below.

Pin	Symbol	Description (CN2)	Notes
1	FB1	Channel 1 Current Feedback	Upper LED Bar
2	FB2	Channel 2 Current Feedback	
3	VLED	LED Power Supply	
4	VLED	LED Power Supply	
5	FB3	Channel 3 Current Feedback	
6	FB4	Channel 4 Current Feedback	

Pin	Symbol	Description (CN3)	Notes
1	FB1	Channel 1 Current Feedback	Bottom LED Bar
2	FB2	Channel 2 Current Feedback	
3	VLED	LED Power Supply	
4	VLED	LED Power Supply	
5	FB3	Channel 3 Current Feedback	
6	FB4	Channel 4 Current Feedback	



5.1.3. SIGNAL TIMING SPECIFICATION

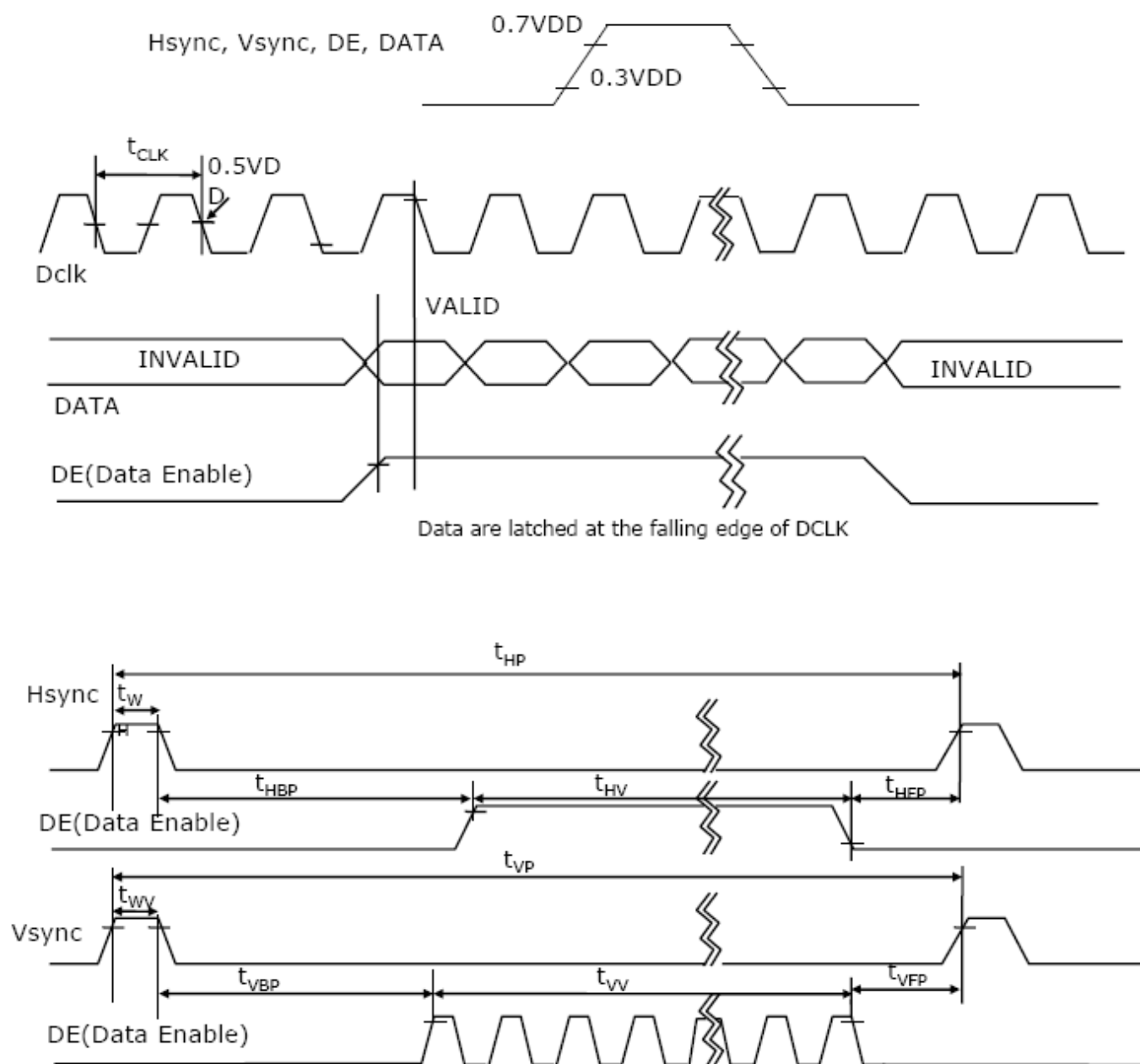
This is signal timing required at the input of the TMDS transmitter. All of the interface signal timing should be satisfied with the following specifications for its proper operation.

ITEM		SYMBOL	Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	1.82	1.875	1.93	ns	
	Frequency	fCLK	518.25	533.25	548.25	MHz	-
Hsync	Period	tHP	3968	4000	4032	tCLK	1,2,3,4
	Width-Active	tWH	28	32	36		
Vsync	Period	tVP	2220	2222	2268	tHP	2,4 ※ Adaptive sync :40~60Hz
	Frequency	fV	58.2	59.997	61.68	Hz	
	Width-Active	tWV	5	5	5	tHP	
Data Enable	Horizontal Valid	tHV	3840	3840	3840	tCLK	1,2,3,4
	Horizontal Back Porch	tHBP	52	80	108		
	Horizontal Front Porch	tHFP	48	48	48		
	Horizontal Blank	-	128	160	192		tWH+ tHBP+ tHFP
	Vertical Valid	tVV	2160	2160	2160	tHP	2,4
	Vertical Back Porch	tVBP	52	54	100		
	Vertical Front Porch	tVFP	3	3	3		
	Vertical Blank	-	60	62	108		tWV+ tVBP+ tVFP

Notes :

- 1.The value of Hsync period, Hsync width and Hsync valid should be even number times of tCLK.
If the value is odd number times of tCLK, it can make asynchronous signal timing and cause abnormal display.
 - 2.The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
 - 3.The value of Hsync Period, Hsync Width, and Horizontal Back Porch should be divided by 4 without a remainder.
 4. The polarity of Hsync, Vsync is not restricted.
- ※ This panel supports adaptive sync timing(40~60Hz) only under moving picture in room temperature(25 ± 5°C).
- It would not work usually under still image & reliability test.
Under those condition, the phenomenon such as image sticking and flickering could be found on the screen.

5.1.4. SIGNAL TIMING WAVEFORM

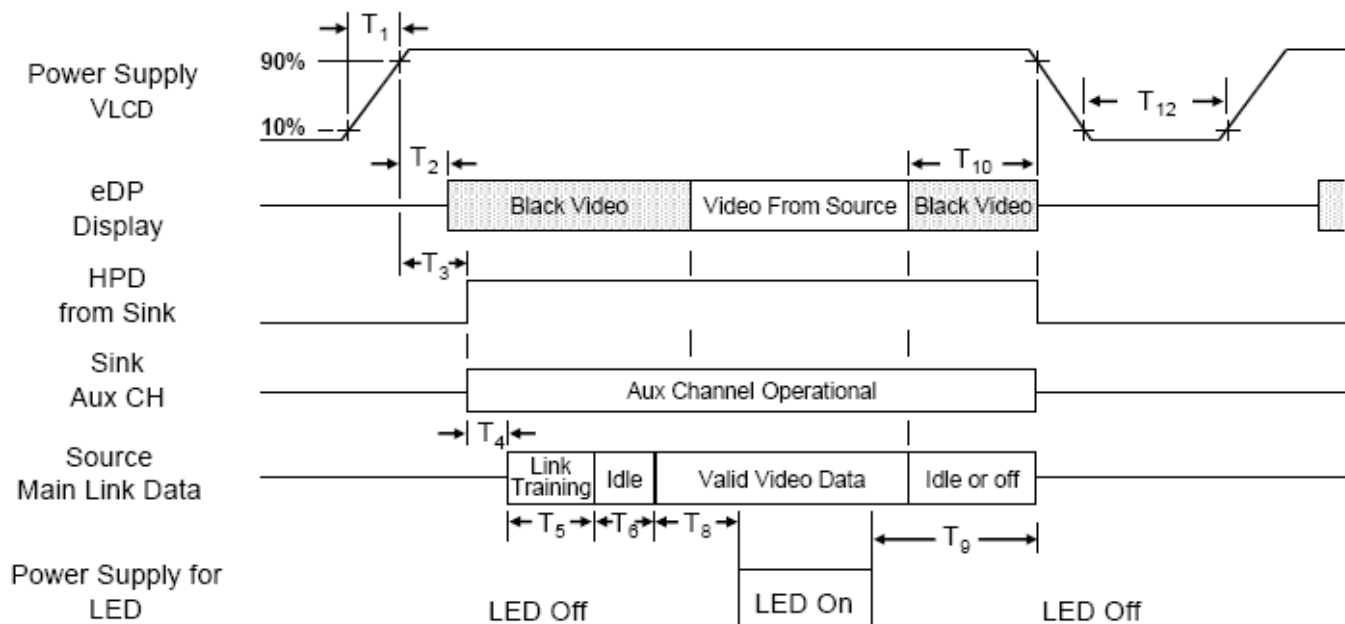


5.1.5. COLOR INPUT DATA REFERENCE

The Brightness of each primary color (red, green, 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		Input Color Data																														
		RED										GREEN										BLUE										
		MSB					LSB					MSB					LSB					MSB					LSB					
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0	
Basic Color	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	0	0	0	0	0	0	
	Red (1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	
	Blue (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	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	1	1	1	1	0	0	0	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	1	1	1	1	1	1	1
RED	RED (000)	0	0	0	0	0	0	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 (001)	0	0	0	0	0	0	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 (1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED (1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (000)	0	0	0	0	0	0	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 (001)	0	0	0	0	0	0	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 (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
	GREEN (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
BLUE	BLUE (000)	0	0	0	0	0	0	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 (001)	0	0	0	0	0	0	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 (1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	
	BLUE (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1

5.1.6. POWER SEQUENCE



Power Sequence Table

Timing	Required By	Limits		Units	Notes
		Min	Max		
T ₁	Source	0.5	10	ms	-
T ₂	Sink	10	200	ms	-
T ₃	Sink	15	200	ms	-
T ₄	Source	-	-	ms	Note 5)
T ₅	Source	-	-	ms	Note 5)
T ₆	Source	-	100	ms	Note 6)
T ₈	Source	200	-	ms	-
T ₉	Source	200	-	ms	Note 4)

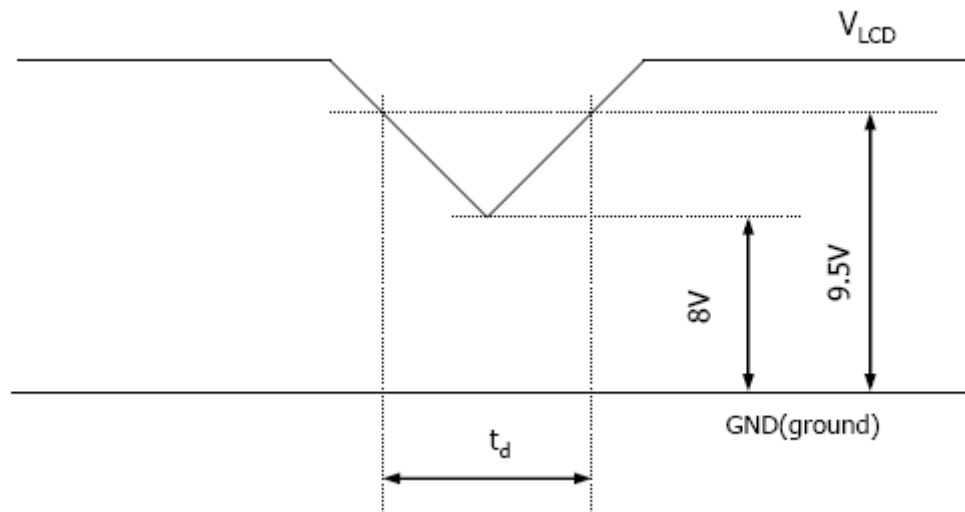
Timing	Required By	Limits		Units	Notes
		Min	Max		
T ₁₀	Source	0	500	ms	-
T ₁₂	Source	1000	-	ms	-

Note:

- Power sequence should be kept all the time including below cases for normal operation.
 - AC/DC Power On/Off
 - Mode change (resolution, frequency, timing, sleep mode, color depth change, etc.)
 The violation of power sequence can cause a significant trouble in display and reliability.
- Please avoid floating state of interface signal during signal invalid period.
- When the interface signal is invalid, be sure to pull down the VLCD.(0V)
- Please turn off the power supply for LED when the level of VLCD changes to prevent noise issue.
- Link training duration is dependent on the customer's system.
- It includes Source Frame Synchronization time.

Source Frame Synchronization: Time to prepare before Tx(Source) sends valid data(Invalid period)

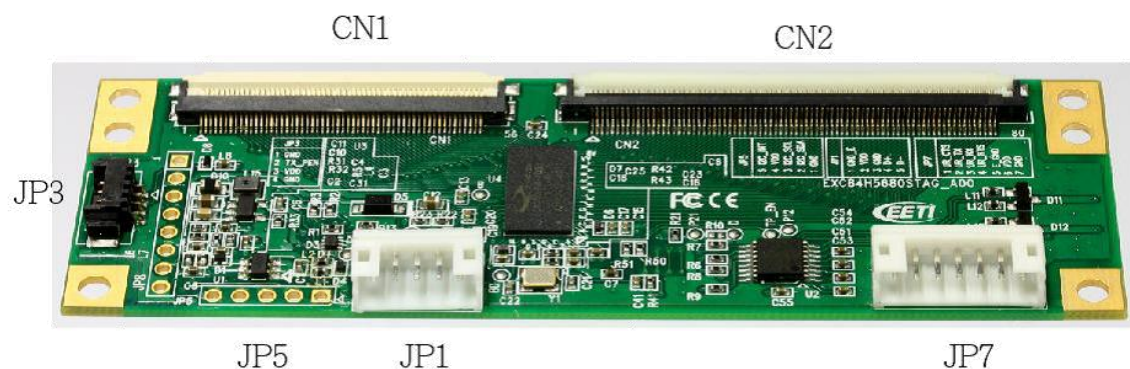
5.1.7. VLCD POWER DIP CONDITION



Dip condition

$$8V \leq V_{LCD} < 9.5V, t_d \leq 20ms$$

5.2. 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	
1	RX_S1	21	RX58	41	RX38
2	RX77	22	RX57	42	RX37
3	RX76	23	RX56	43	RX36
4	RX75	24	RX55	44	RX35
5	RX74	25	RX54	45	RX34
6	RX73	26	RX53	46	RX33
7	RX72	27	RX52	47	RX32
8	RX71	28	RX51	48	RX31
9	RX70	29	RX50	49	RX30
10	RX69	30	RX49	50	RX29
11	RX68	31	RX48	51	RX28
12	RX67	32	RX47	52	RX27
13	RX66	33	RX46	53	RX26
14	RX65	34	RX45	54	RX25
15	RX64	35	RX44	55	RX24
16	RX63	36	RX43	56	RX23
17	RX62	37	RX42	57	RX22
18	RX61	38	RX41	58	RX21
19	RX60	39	RX40	59	RX20
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

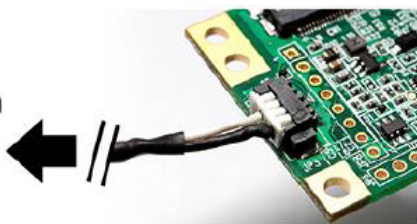
JP7 RS232 connector

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

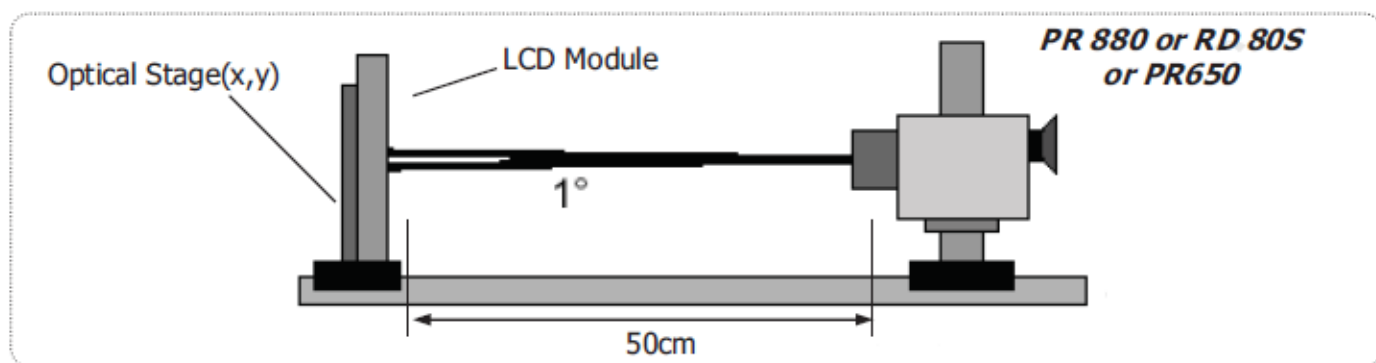


*JP3 connector is reserved for EETI tethered active stylus :
Type E : Entry-type active stylus
Type T : Tethered USB active stylus

JP1 : USB
Brand: JST
Part number: SM05B-SRSS-TB or equivalence

6. OPTICAL CHARACTERISTICS

Optical characteristics are determined after the unit has been 'ON' for approximately 30 minutes in a dark environment at $25\pm 2^{\circ}\text{C}$. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0° and aperture 1 degree.



Optical Characteristics

($T_a = 25^{\circ}\text{C}$, $V_{LCD} = 10\text{V}$, $f_v = 60\text{ Hz}$, $D_{clk} = 533.25\text{MHz}$, $I_s = 100\text{mA}$)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	840	1200	-	-	1
Surface Luminance, White		L_{WH}	430	540	-	cd/m^2	2
Luminance Variation		δ_{WHITE}	75	-	-	%	3
Response Time	Gray to Gray	T_{GTG_AVR}	-	14	25	ms	4
Color / Chromaticity Coordinates (CIE)	Red	Rx	Typ. -0.03	0.681	Typ. +0.03		
		Ry		0.312			
	Green	Gx		0.264			
		Gy		0.689			
	Blue	Bx		0.152			
		By		0.051			
	White	Wx		0.313			
		Wy		0.329			
View Angle (CR>10, General)	Horizontal	θ_H	170	178	-	degree	5
	Vertical	θ_V	170	178	-		
Gray Scale		-		2.2			6

Notes:

1) **Contrast Ratio (CR)** is defined mathematically as: **(By PR880)**

It is measured at center point (1)

Surface luminance with all white pixels

$$\text{Contrast ratio} = \frac{\text{Surface luminance with all white pixels}}{\text{Surface luminance with all black pixels}}$$

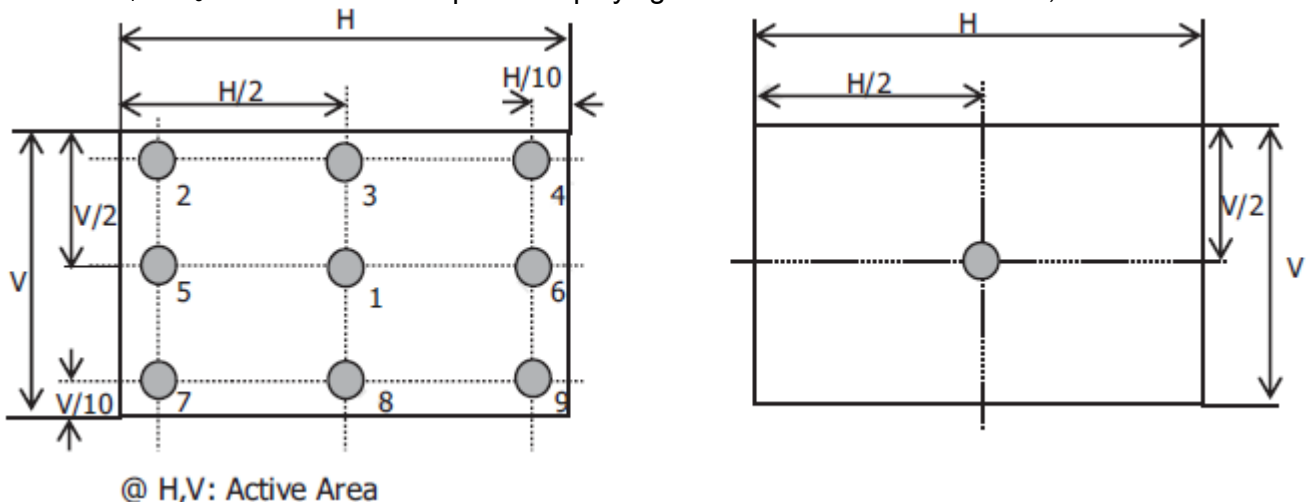
2) **Surface Luminance (L_{WH})** is the luminance value at center 1 point (1) across the LCD surface 50cm from the surface with all pixels displaying white. **(By PR880)**

3) The **Variation in Surface Luminance**, δ_{WHITE} is defined as: **(By PR880)**

Minimum ($L_{P1}, L_{P2}, \dots, L_{P9}$)

$$\delta_{WHITE} = \frac{\text{Maximum } (L_{P1}, L_{P2}, \dots, L_{P9})}{\text{Minimum } (L_{P1}, L_{P2}, \dots, L_{P9})} \times 100(\%)$$

Where are L_1 to L_9 luminance with all pixels displaying white at 9 locations as below,



4) The **Gray to Gray Response Time** is defined as the following figure and shall be measured by switching the input signal for "Gray to Gray". **(By RD80S)**

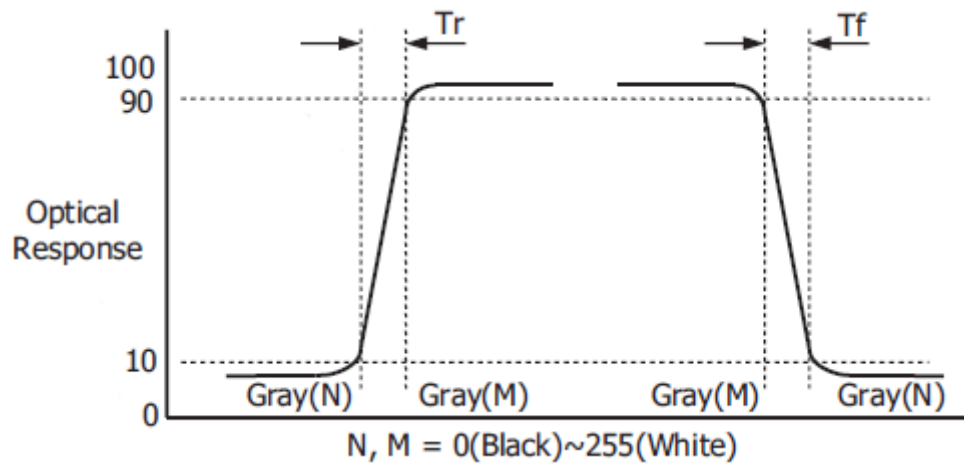
- Gray step: 5 Step

- T_{GTG_AVR} is the total average time at rising time and falling time for "Gray to Gray".

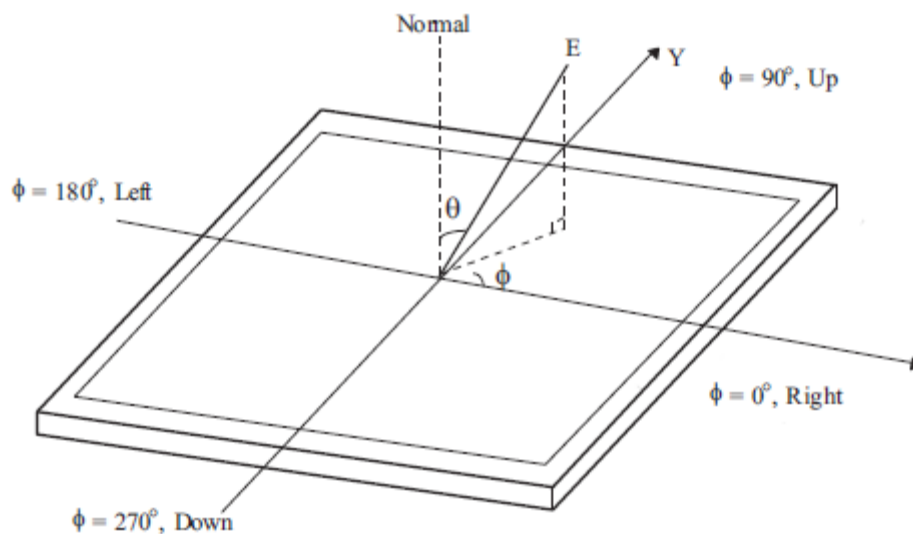
- For the GTG measurement, the sampling rate of oscilloscope is 500k/s.

Gray to Gray		Rising Time				
		G255	G191	G127	G63	G0
Falling Time	G255					
	G191					
	G127					
	G63					
	G0					

Response Time is defined as the following figure and shall be measured by switching the input signal for "Gray (N)" and "Gray (M)".



5) **Viewing Angle** is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. (By PR880)





6) Gamma Value more information see below table.

Gray Level	Relative Luminance [%] (Typ.)
0	0.10
63	0.30
127	1.08
191	2.50
255	4.71
319	7.70
383	11.52
447	16.18
511	21.72
575	28.15
639	35.51
703	43.81
767	53.07
831	63.30
895	74.52
959	86.75
1023	100

7. 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 operation test	50°C, 50%RH, 240hrs
4	Low temperature operation test	0°C, 240hrs
5	Thermal Cycle storage test	-20°C(30min)~60°C(30min), 10cycles

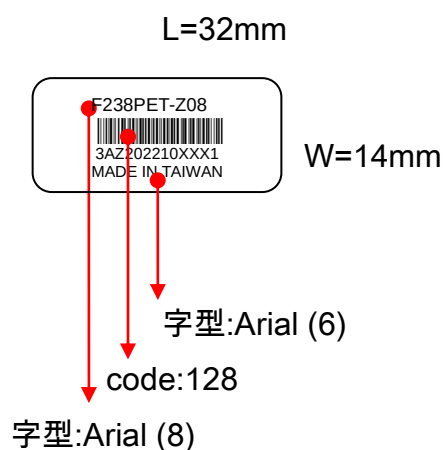
8. LABEL

Model NO. **F238PET-Z08**

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



9. MECHANICAL CHARACTERISTICS

Item		Dimension	Unit	Note
Outline Dimension	Horizontal	570.00	mm	PCAP : B238PBU-E01
	Vertical	343.00	mm	
	Depth	4.00	mm	
	Horizontal	544.70	mm	LCD : LM238WR2-SPE1
	Vertical	323.20	mm	
	Depth	13.8	mm	
	Horizontal	100.00	mm	Touch Driver : ETP-MB-EXC84H5680STAG
	Vertical	33.00	mm	
	Depth	7.20	mm	
Weight		3960	g	F238PET-Z08
Item		Specification		Remarks
PCAP Viewing Area		528.60 mm x 298.00 mm		
PCAP Sensor Area		542.00 mm x 320.89 mm		
PCAP FPC Length		94.36 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

TBD

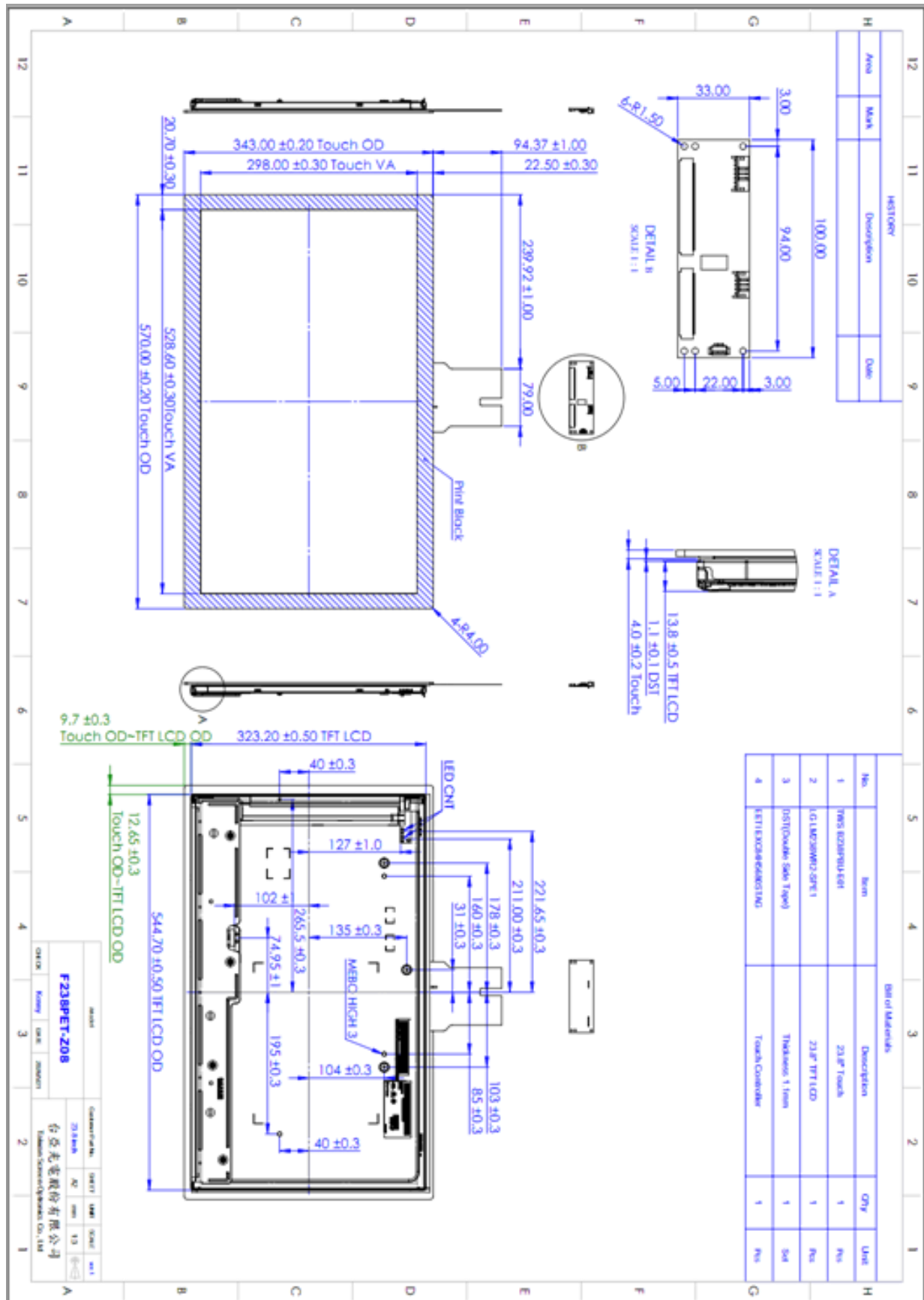
Back View

TBD

Product Specification

F238PET-Z08

10. ENGINEERING DRAWING



Touch Driving Board :

EXC84H5680STAG

