SPECIFICATION
FOR
APPROVAL

15.6"TFT-LCD Module with Projected Capacitive touch senor

MODEL : TP2B-Y156N02

BASE MODEL :

[Customer's Confirmation]

Approved by:

Reviewed by:

Prepared by:

[Supplier's Confirmation]

元眾實業有限公司

Y.J.E. Display Tech. Co.,Ltd.

Approved by:

Reviewed by:

Prepared by:

Product Specification

Contents

Record of Revision

Version & Date	Page	Old Description	New Description
2016/5/23	All	First Edition for Customer	

1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
5) Since the panel is made of glass, it may be broken or cracked if dropped or bumped on hard surface.
6) To avoid ESD (Electro Static Discharde) damage, be sure to ground yourself before handling TFT-LCD Module.
7) Do not open nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT Module may be damaged.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) Please pay attention for the matter as stated below at mounting design of the TFT module with Touch Sensor & enclosure:
    • After installation of the TFT Module with Touch Sensor into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module with Touch Sensor even momentary. At designing the enclosure, it should betaken into consideration that no bending/twisting forces are applied to the TFT Module with Touch Sensor from outside. Otherwise the TFT Module with Touch Sensor may be damaged.
    • Enclosure support to fix TFT Module with Touch Sensor must be out of view (transparent) area.(Do not design enclosure presses the view area to protect from miss input)
    • Enclosure edge must be between view area & Guaranteed active area. (Enclosure edge must not touch with view area)
    • We recommend the material of support to fix touch sensor is elastic material.
    • Do not bond top surface (film) of touch sensor with enclosure.
    • The corner parts have conductivity. Do not touch any metal part after mounting.
    • Special design is required for water resistance use.
    • Cleaning Touch panel by Air gun, pressure 2kg/cm2 below is suggested. This is preventing FPC to peel off when air is blowing to FPC from glass side.
    • The mounting structure must has a reserved space for the FPC tail and never touch or squeeze the FPC by case or another components preventing FPC to peel off.
12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13) Severe temperature condition may result in different luminance, response time.
14) Continuous operating TFT-LCD display under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
16) Continuous displaying fixed pattern may induce image sticking. It is recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.
17) Do not lift Touch Panel by cable(FPC).

Product Specification

2. General Description

• This specification applies to the 15.6 inch-wide Color a-Si TFT-LCD module with Projected Capacitive touch sensor.

• The screen format is intended to support HD (1366(H) X 768(V)) screen and 16.7M colors (RGB 6-bits+Hi-FRC data driver).

• All input signals are LVDS interface compatible.

• LED Driver is embedded.

• This is a RoHS product.

Display Characteristics

The following items are characteristics summary on the table under 25°C condition:

Item	Specifications	Unit
Active Area	344.232 (H) x 193.536 (V)	[mm]
Pixels H x V	1366x768	-
Pixel Pitch	0.252x0.252	[mm]
Pixel Arrangement	R.G.B. Vertical Stripe	-
Display Mode	TN Mode, Normally White	-
White Luminance	340	[cd/m²]
Contrast Ratio	500 : 1 (Typ)	-
Nominal Input Voltage VDD	+5V (Typ)	[Volt]
LCD Power Consumption	2.15(Typ)	[Watt]
Weight	2839.2 g	[Grams]
Electrical Interface	1 channel LVDS	-
Surface Treatment	Hardness:3H	-
Support Color	16.7M colors (RGB 6-bit + Hi-FRC)	-
Overall dimension	363.8(W) X 215.9(H) X 16.85 (D) Typ.	[mm]
Temperature Range		
Operating	-0 to +60 (Panel surface temperature)	[°C]
Storage (Non-Operating)	-20 to +60	[°C]
RoHS Compliance	RoHS Compliance	

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3. Functional Block Diagram

The following diagram shows the functional block of the 15.6 inches Color TFT-LCD Module:

Product Specification
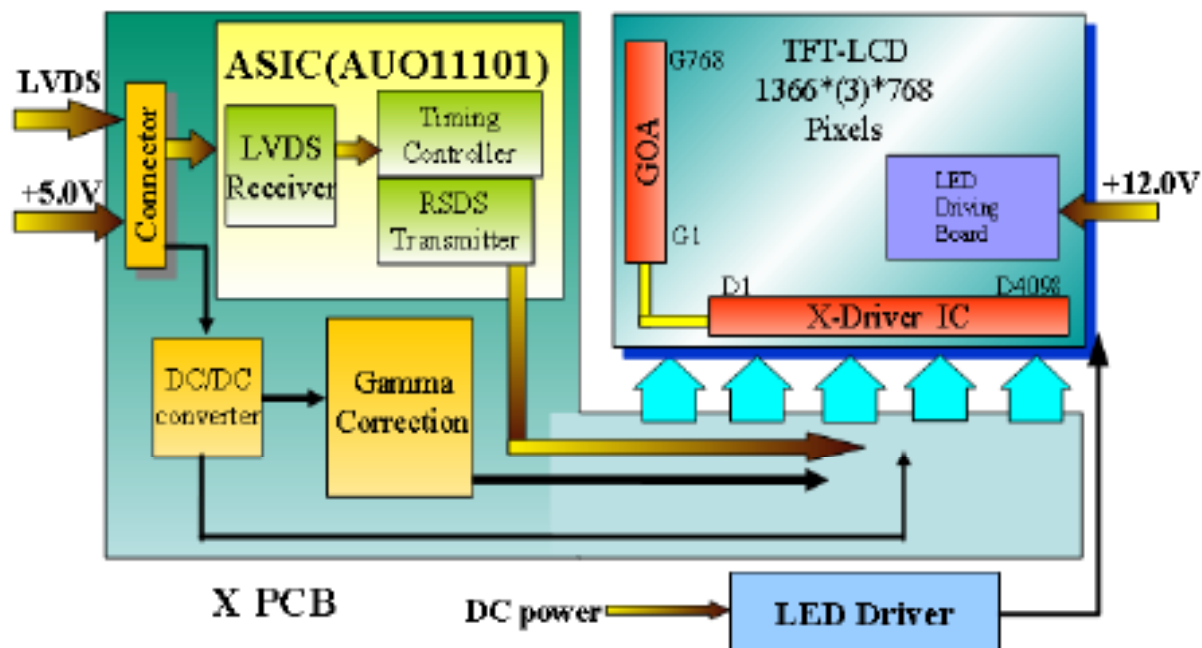
4. Absolute Maximum Ratings

Absolute Ratings

Item	Symbol	Min.	Max.	Unit
Logic /LCD Drive Voltage	VDD	0	+6.0	[Volt]

Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit
Operating Temperature	TOP	0	+60	[°C]
Operation Humidity	HOP	5	90	%RH
Storage Temperature	TST	-20	+60	[°C]
Storage Humidity	HST	5	90	%RH

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5. Optical Characteristics

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

| Item	Conditions		Min.	Typ.	Max.	Unit	Note
Contrast Ratio			350	500	-	-	3
Response Time	Rising		-	6	9	[mesc]	4
	Falling		-	2	4		
	Rising + Falling		-	8	13		
White Luminance	(center point)		-	340	-	[cd/m²]	6
Luminance Uniformity			75	80		%	7
Color / Chromaticity Coordinates (CIE)	Red x		0.591	0.641	0.691	-	5
	Red y		0.293	0.343	0.393		
	Green x		0.276	0.326	0.376		
	Green y		0.567	0.617	0.667		
	Blue x		0.098	0.148	0.198		
	Blue y		0.014	0.064	0.114		
	White x		0.263	0.313	0.363		
	White y		0.279	0.329	0.379		
Cross talk			-	-	1.5	%	8
Flicker			-	-	-20	dB	9
Viewing Angle	Horizontal (Right)		75	85	-	[degree]	2
	CR = 10 (Left)		75	85			
	Vertical (Up)		70	80	-		
	CR = 10 (Down)		70	80			

Note 1: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35 °C). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.
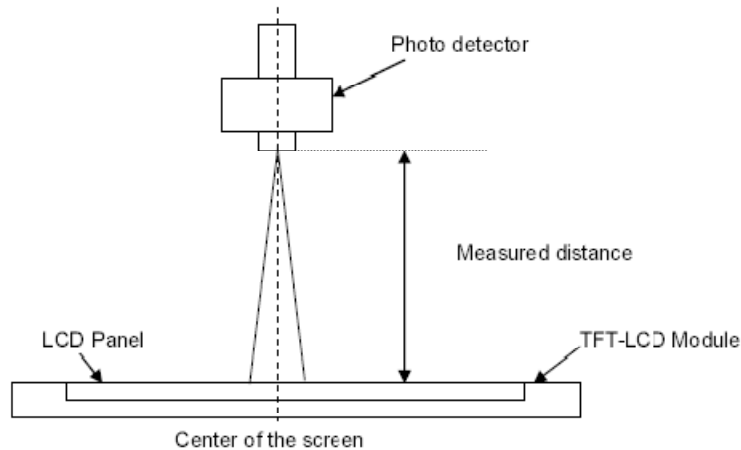
## Note 2: Definition of viewing angle measured by ELDIM (EZContrast 88)

Viewing angle is the measurement of contrast ratio ≥ 10 and ≥ 5, 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 follows; 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 about its center to develop the desired measurement viewing angle.
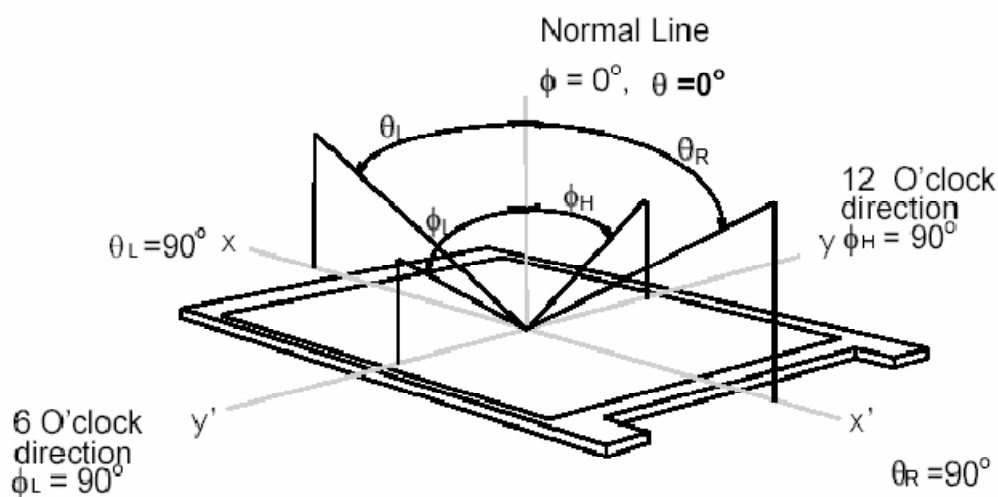
Note 3: Definition of Response time measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, TrR), and from "Full White" to "Full Black" (falling time, TfF), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.
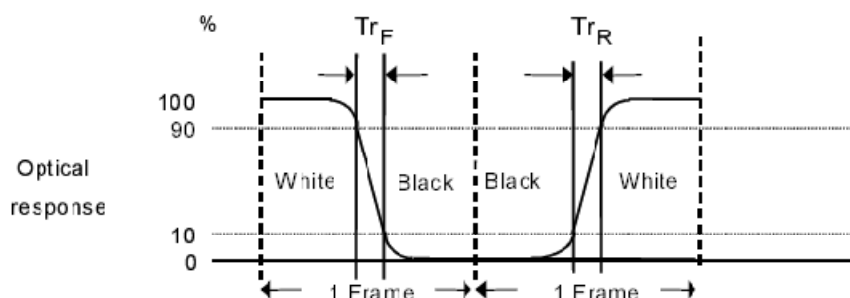
$Tr_R + Tf_F = 8\ msec$ (typ.).

Note 4: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3
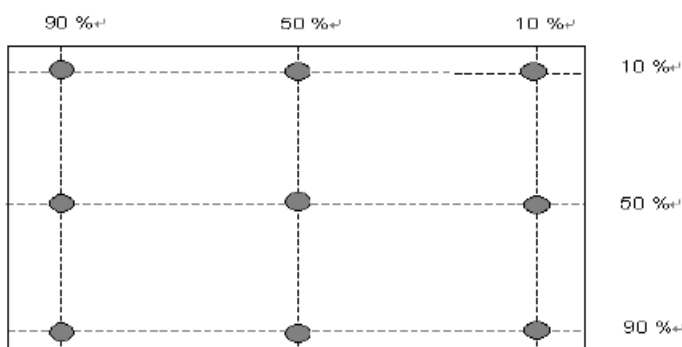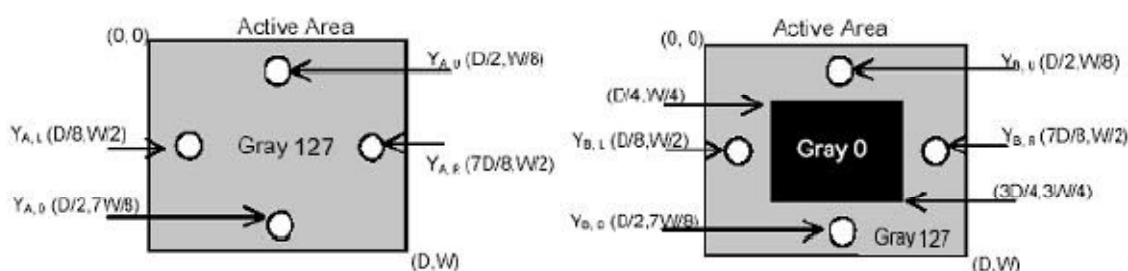

$$Uniformity = \frac{Minimum\ Luminance\ in\ 9\ points\ (1-9)}{Maximum\ Luminance\ in\ 9\ Points\ (1-9)}$$

Note 5: Crosstalk is defined as below and measured by TOPCON SR-3

$CT = |\ YB - YA\ |\ /\ YA \times 100\ (\%)$, Where

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

YB = Luminance of measured location with gray level 0 pattern (cd/m2)

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6. Electrical Characteristics

6.1 Power Specification

TFT-LCD Module

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Logic / LCD Drive Voltage	VDD	4.5	5	5.5	[Volt]	±10%
VDD Current	IDD	-	430	500	[mA]	64 Gray Bar Patten (VDD=3.3V, at 60Hz)
Inrush Current	IRush	-	-	2.5	[A]	Note 1
VDD Power	PDD	-	2.15	2.5	[Watt]	64 Gray Bar Patten (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:
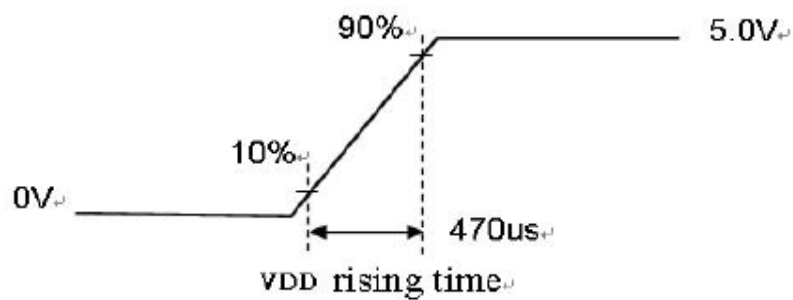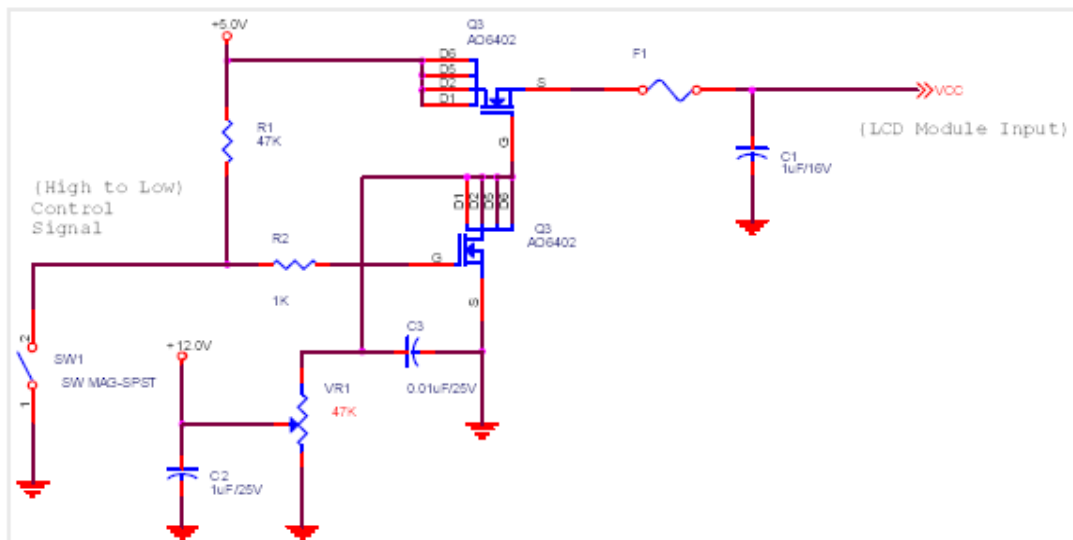
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Backlight Unit Driving

Parameter guideline for LED driver is under stable conditions at 25 ^{o}C (Room Temperature):

Symbol	Parameter	Min	Typ	Max	Unit	Remark
Vcc	Input Voltage	10.8	12	13.2	Volt	
Ivcc	Input Current	-	0.64	-	A	100% Dimming
PLED	Power Consumption	-	7.8	8.5	Watt	100% Dimming
FPWM	PWM Dimming Frequency	200	-	20k	Hz	
	Swing Voltage	3	3.3	5	V	
	Dimming Duty Cycle	5	-	100	%	
Enable	High-level	2			V	
	Low-level			0.2	V	
I_F	LED Forward Current	-	**50**		mA	Ta = 25°C
Operating Life		50000	-	-	Hrs	Ta = 25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: If TP2A-Y156N02 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Min. operating life time is estimated data.
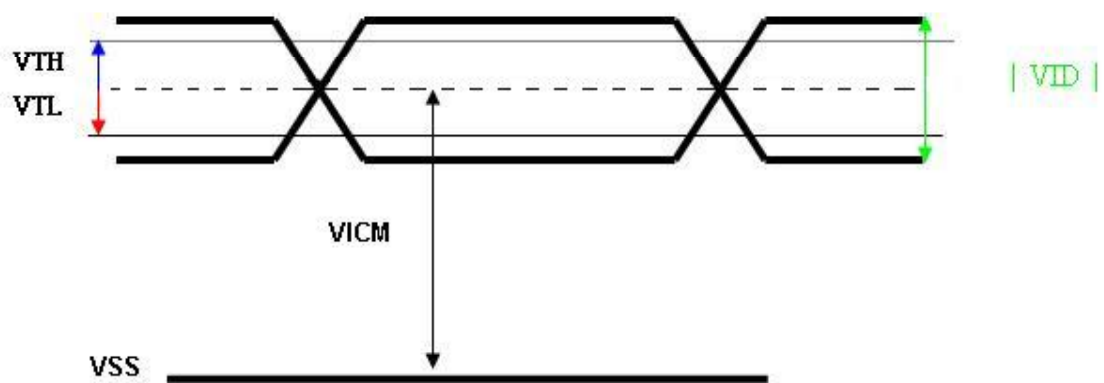
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6.2 Signal Electrical Characteristics

Input siganls shall be low or Hi-Z state when VDD is off.

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential Input High Threshold	VTH	-	+50	+100	[mV]	VICM=1.2V
Differential Input Low Threshold	VTL	-100	-50	-	[mV]	VICM=1.2V
Input Differential Voltage	∣VID∣	100	-	600	[mV]	
Differential Input Common Mode Voltage	VICM	+1.0	+1.2	+1.5	[V]	VTH/VTL=±200mV

Note : LVDS Signal Waveform.

6.3 Pixel Format Image

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

Product Specification
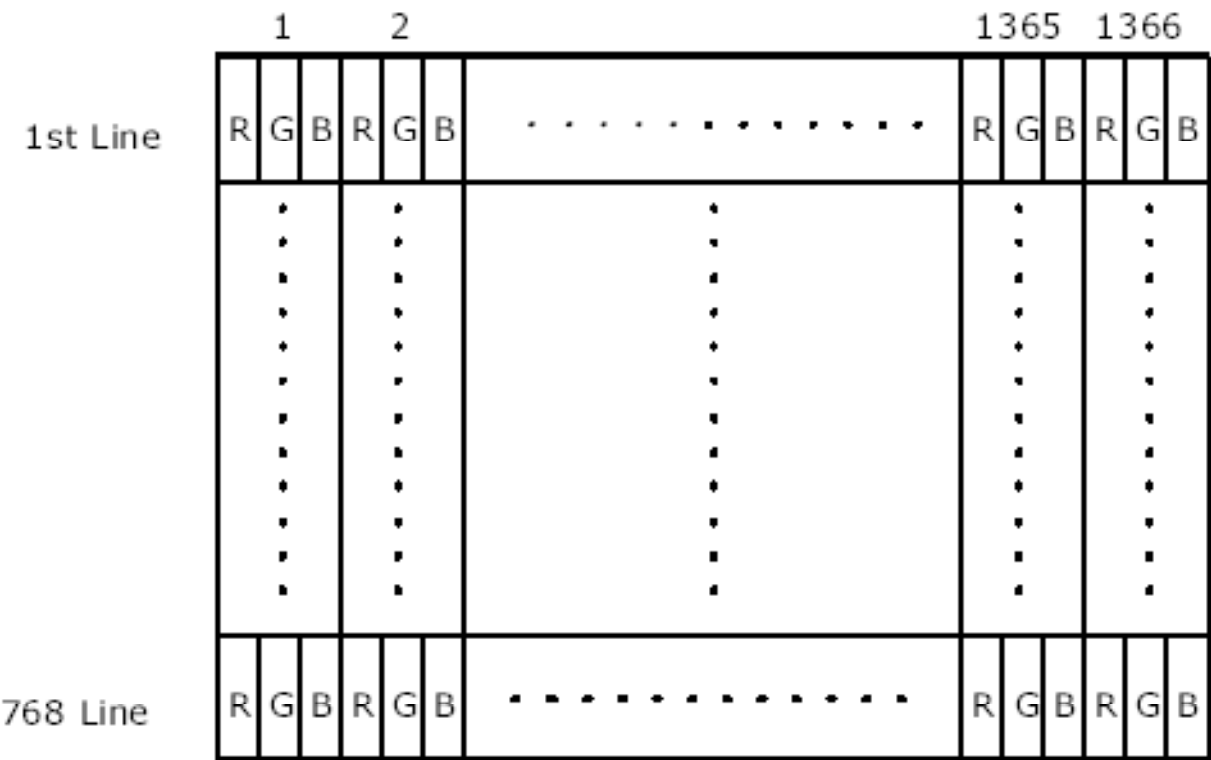
6.5 The Input Data Format

Product Specification

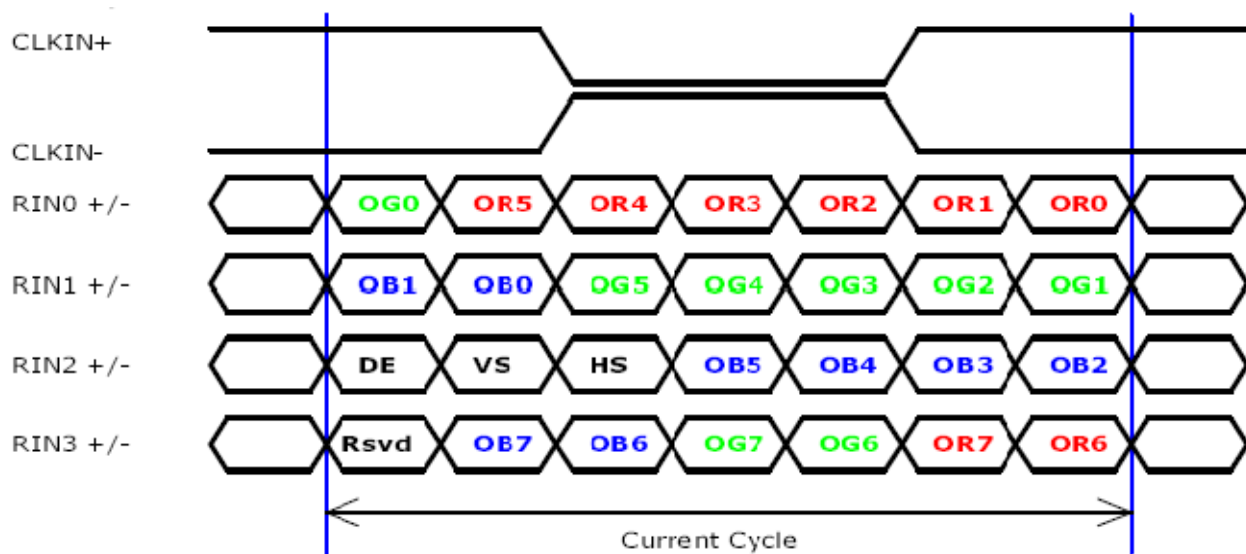### 6.6 Timing Characteristics

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Clock frequency		1/ T Clock	60	76	90	MHz	
Vertical Section	Period	Tv	778	806	888	TLine	
	Active	TVD	768	768	768		
	Blanking	TVB	10	38	120		
Horizontal Section	Period	TH	1446	1560	1936	TClock	
	Active	THD	1366	1366	1366		
	Blanking	THB	80	200	570		
Frame Rate			50	60	75	Hz	

Note1: Recommended frame rate is 60HZ

6.7 Input Timing Diagram

Product Specification
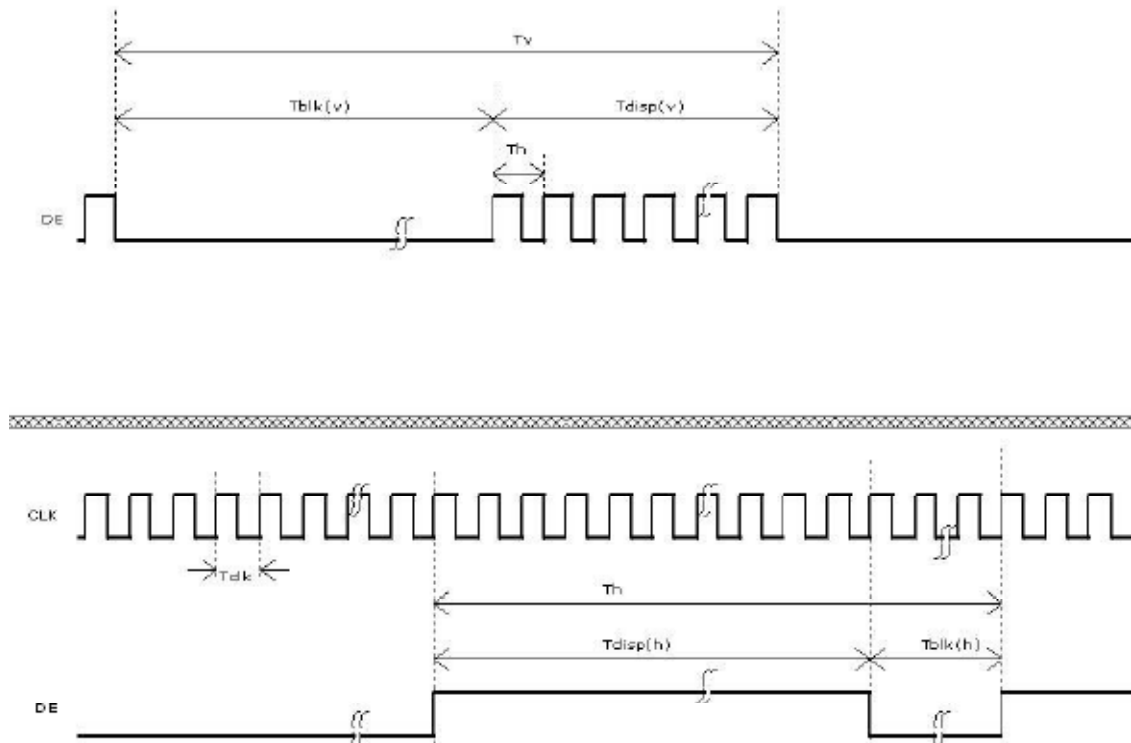
6.8 Power ON/OFF Sequence

VDD power and lamp 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.
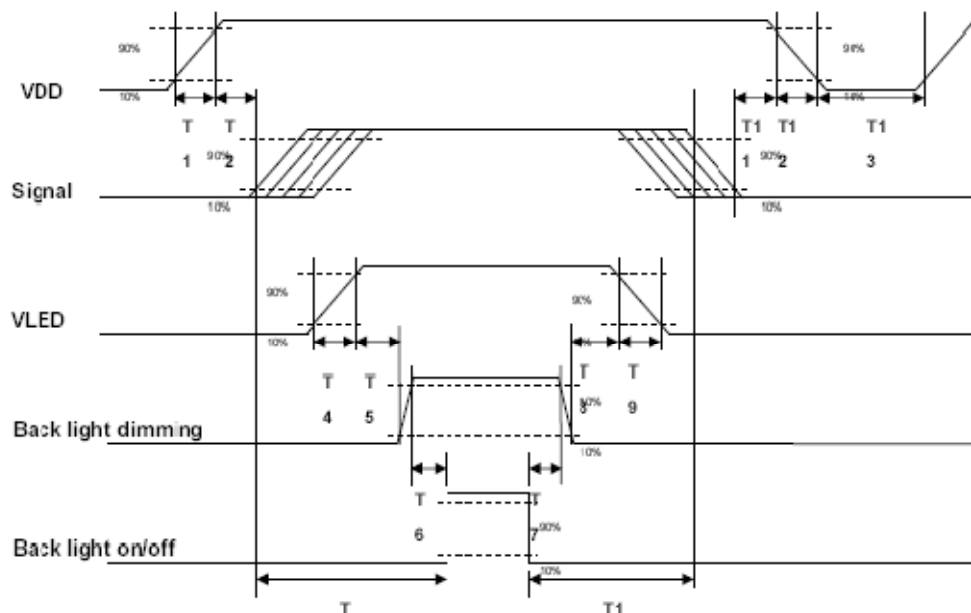
Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	40	50	[ms]
T3	200	-	-	[ms]
T4	0.5	-	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	-	-	10	[ms]
T10	110	-	-	[ms]
T11	0.5	16	50	[ms]
T12	-	-	100	[ms]
T13	1000	-	-	[ms]

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.

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7. Connector Pin Assignment

Physical interface is described as for the connector on module.These connectors are capable of accommodating the following signals and will be following components.

TFT-LCD Module

Connector Name / Designation	LCD Connector
Manufacturer	JAE or Compatible
Connertor Model Number	FI-XB30SSL-HF15
Mating Housing Part Number	FI-X30HL (Locked Type)

LVDS Pin Assignment

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

PIN #	SIGNAL NAME	DESCRIPTION
1	Reserved	No Connection
2	Reserved	No Connection
3	Reserved	No Connection
4	GND	Ground
5	RXIN0-	-LVDS Differential Data Input, CH0
6	RXIN0+	+LVDS Differential Data Input, CH0
7	GND	Ground
8	RXIN1-	-LVDS Differential Data Input, CH1
9	RXIN1+	+LVDS Differential Data Input, CH1
10	GND	Ground
11	RXIN2-	-LVDS Differential Data Input, CH2
12	RXIN2+	+LVDS Differential Data Input, CH2
13	GND	Ground
14	RXCLKIN-	-LVDS Differential Clock Input, CH3
15	RXCLKIN+	+LVDS Differential Clock Input, CH3
16	GND	Ground
17	RXIN3-	-LVDS Differential Data Input, CH3
18	RXIN3+	+LVDS Differential Data Input, CH3
19	GND	Ground
20	Reserved	Internal used (recommend no connection)
21	Reserved	Internal used (recommend no connection)
22	Reserved	Internal used (recommend no connection)
23	GND	Ground
24	GND	Ground
25	GND	Ground
26	AVDD	Power +5V, (typical)
27	AVDD	Power +5V, (typical)
28	AVDD	Power +5V, (typical)
29	AVDD	Power +5V, (typical)
30	AVDD	Power +5V, (typical)

8. Reliability Test

Items	Required Condition	Note
Temperature Humidity Bias	60°C, 80%RH, 300hours	
High Temperature Operation	60°C, 300hours	
Low Temperature Operation	0°C, 300hours	
Hot Storage	60°C, 300hours	
Cold Storagr	-20°C, 300hours	

9. Safety

● Sharp Edge Requirements
There will be on sharp edges or comers on the display assembly that could cause injury.

-Flammability
All components including electrical components that do not meet the flammability grade UL94-V1
in the module will complete the flammability rating exception approval process.
The printed circuit board will be made from material rated 94-V1 or better.
The actual UL flammability rating will be printed on the printed circuit board.

● Capacitors
If any polarized capacitors are used in the display assembly, provisions will be made to keep them
from being inserted backwards.
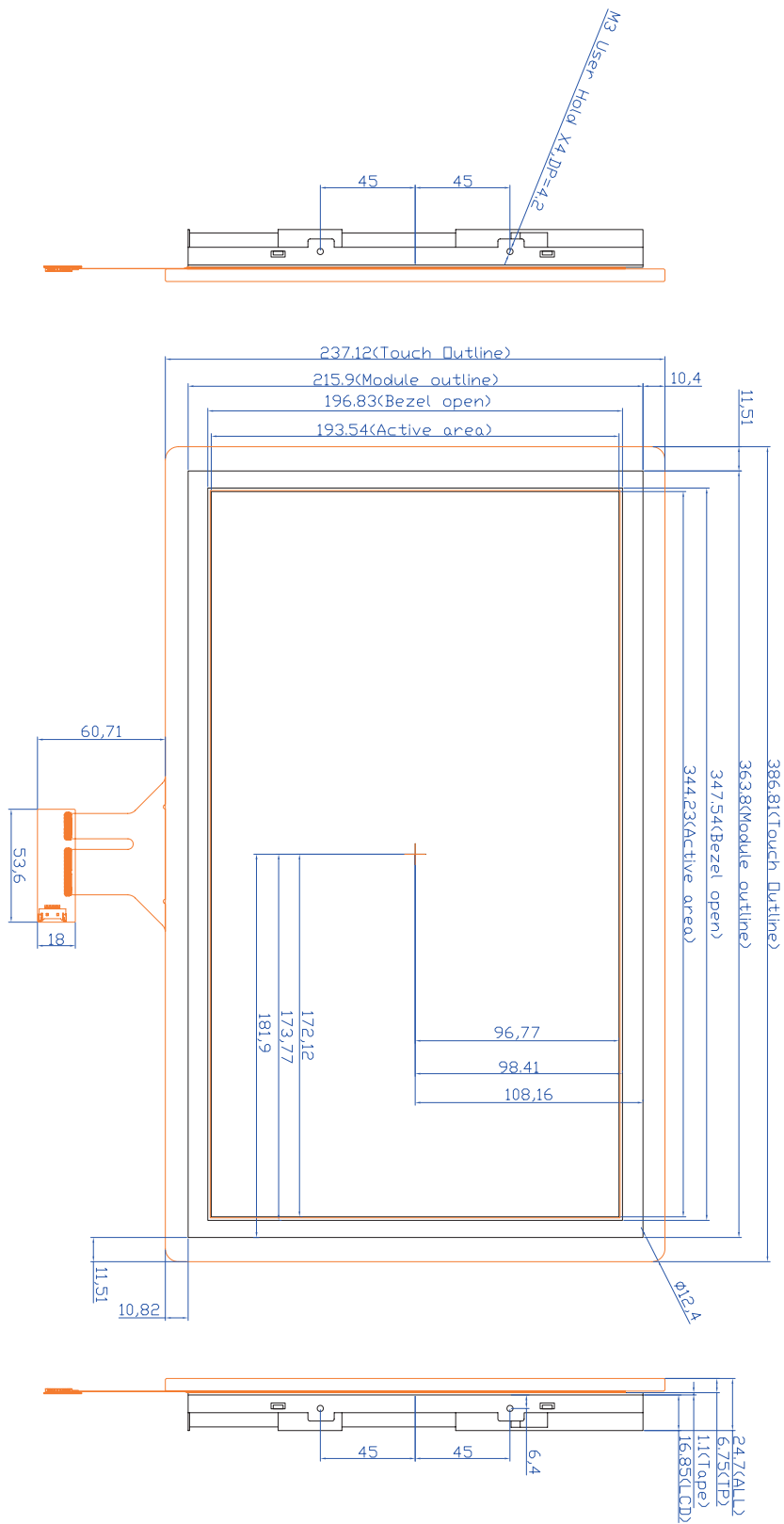
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10. Mechanical Characteristics

The contects provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	363.8	mm
	Vertical	215.9	mm
	Depth	16.85	mm
Bezel Area	Horizontal	347.54	mm
	Vertical	196.83	mm
Active Display Area	Horizontal	344.23	mm
	Vertical	193.54	mm
Weight	2839.2 g (Typ.)		
Surface Treatment	Hardness:3H		

Note: Please refer to a mechanic drawing in terms of tolerance at the next page.
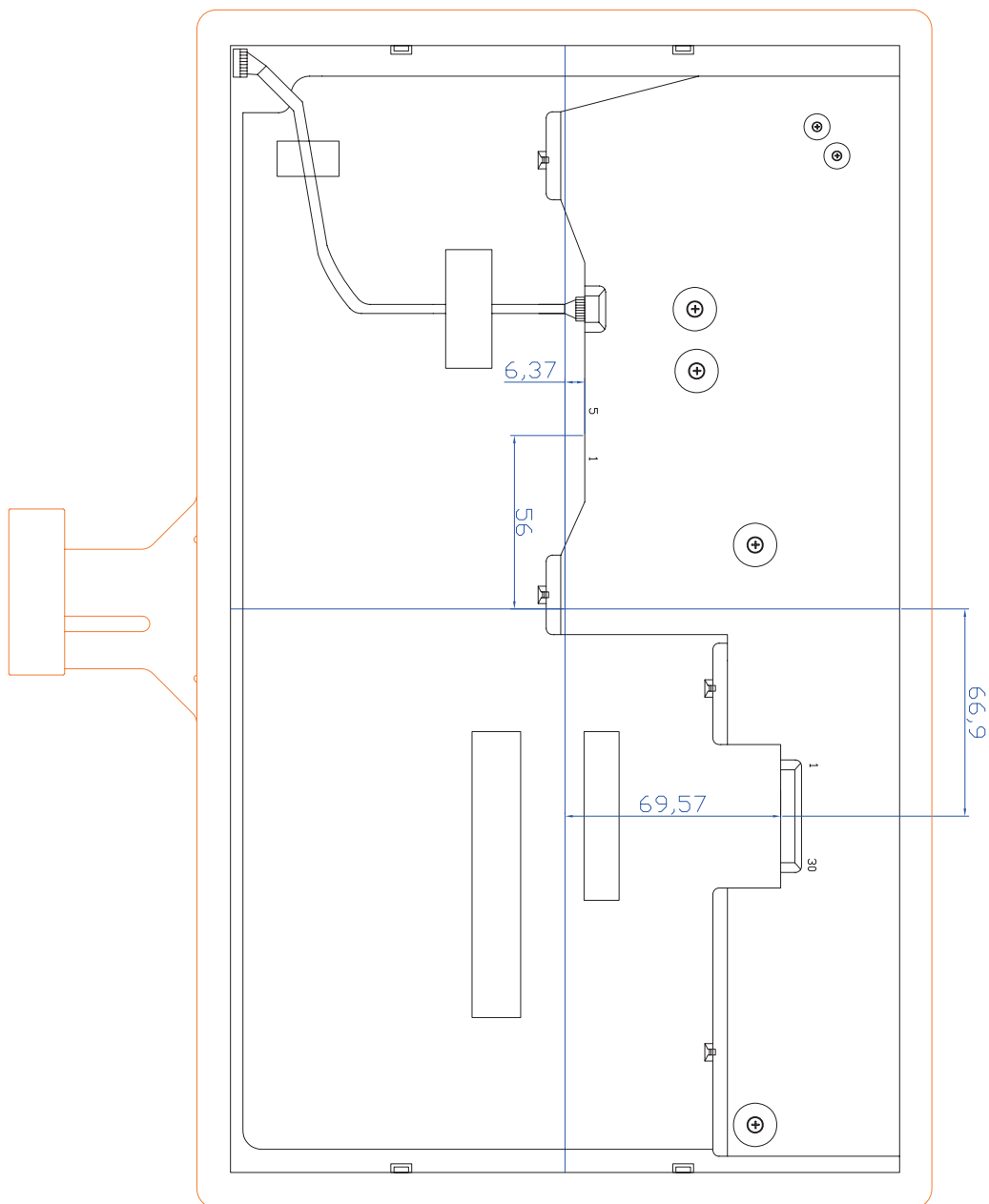
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10.1 Panel+Touch(Front View)

M3 User Hold X4,DP=4.2

45　45

237.12(Touch Outline)
215.9(Module outline)
196.83(Bezel open)
193.54(Active area)

10,4

11,51

60,71

53.6

18

386.81(Touch Outline)
363.8(Module outline)
347.54(Bezel open)
344.23(Active area)

172.12
173.77
181.9

96,77
98.41
108,16

11,51
10,82

Φ12.4

45　45

6,4

24.7(ALL)
6.75(TP)
1.1(Tape)
16.85(LCD)

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10.2 Panel+Touch(Rear View)

Product Specification

11. Touch Specifications

Application

The Touch Panel can be used on electronic devices, such as Tablet PC, Panel PC, Vehicle Display and Instrument. It senses the alternation of capacitance value to measure input points, and coordinates with software to perform multi-touch function.

General Description

No	Item	Specification	Remark
1	Touch Panel Size	15.6 inch (Diagonal)	
2	Touch Panel Type	Projected Capacitive Type	
3	Structure	Cover Lens + ITO Glass + FPCA	Note2
4	Sensor Outline	360.73(W) x 211.04(H) x 6(D) mm	
5	Cover Lens Outline	386.81(W) x 237.12(H) x 6(D) mm	Note1
5	Sensor Active Area	346.23(W) x 195.54(H) mm	
6	FPC Type	USB interface, 6Pin male connector	
7	Surface Treatment	Chemical strengthened	Note3
8	Weight	TBD	

Interface

Pin Define

Pin No.	Symbol	Description	Remark
1	NC	No connection	
2	NC	No connection	
3	D+	Differential "1"	
4	D-	Differential "0"	Note
5	VCC	Power supply 5V	
6	GND	Power ground	

Note: TP2A-Y156N02　provides USB interface to communicate with host system.

User interface

Item	Description	Remark
User Connector	Molex 537800670	
Input	Finger or Stylus	Detects 5~10 points Stylus ≥ Ø8
OS supported	Windows 8, Windows 7 Linux, Android	HID Device Win8 Embedded

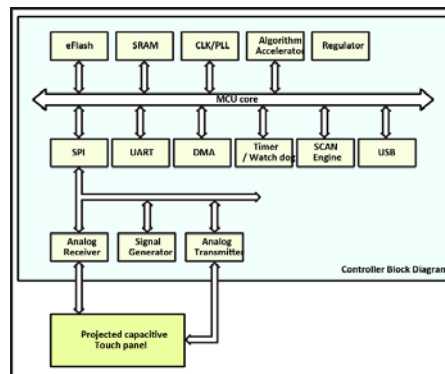# Product Specification

Touch Controller

Main chip: EXC3160

Figure 1. Controller Block Diagram

Characteristics

Environmental characteristics

No	Specification	Value	Remark
1	Operating Temperature	-20°C ~+70°C	No condensation
2	Operating Humidity	-20°C to 70°C Less than 90%RH Exceeding 60°C Less than 133.8g/m3	
3	Storage Temperature	-30°C~+80°C	
4	Storage Humidity	-30°C to 80°C Less than 90%RH Exceeding 60°C Less than 142.9g/m3	
5	Chemical Resistance	Toluene, Trichloroethylene, Acetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.	

Mechanical characteristics

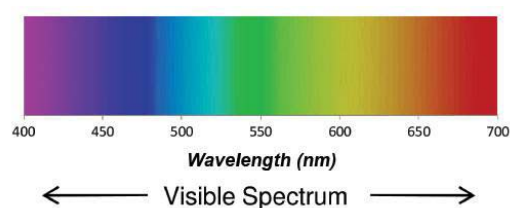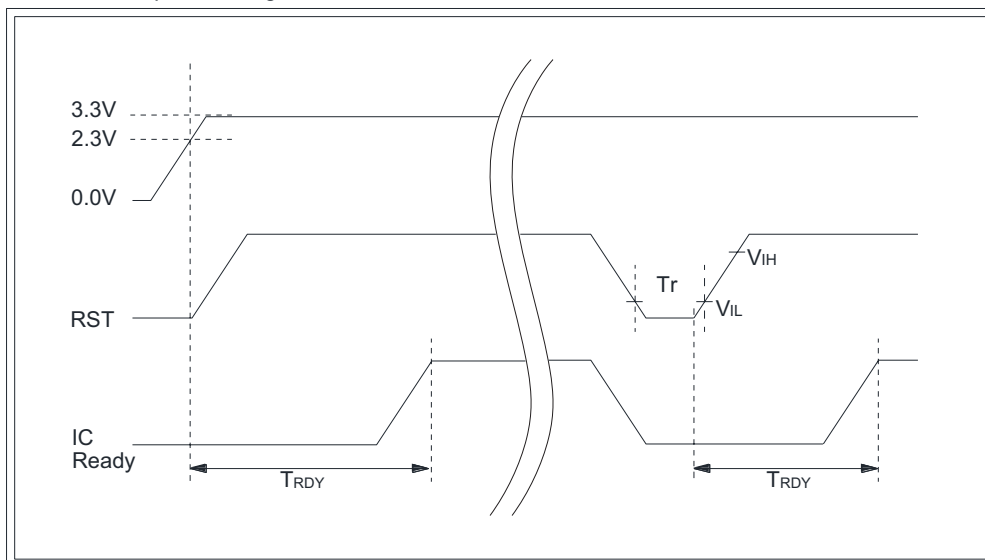| No	Item	Specification	Remark
1	Surface Hardness	≥ 7H	JIS K5400
2	Operating Life	50,000,000 times	Finger input
3	FPC Peeling Strength	500 g	Peeling upward by 90°
4	FPC Bending Strength	Bending 3 times	R 1.0mm, 90°
5	Light Transmittance	≥ 85%	Visible wavelength
6	Electrode Matrix Pitch	Approximately ≤ 5mm	

Figure 2. Visible Spectrum

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Electrical characteristics

| No	Item	Symbol	Unit	Min.	Typ.	Max.	Remark
1	Power supply voltage	VDD	V	4.75	5	5.75	Note1
2	Current consumption	I_{OPR}	mA	-	-	300	
3	Electrostatics Discharge Voltage(HBM)	Vesd	V	4000			

Note1: If used beyond the absolute maximum ratings, Controller may be permanently damaged. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the condition not within the electrical characteristics, it may affect the reliability of the device.

Power Sequence

Power On Sequence Diagram

Idle Sequence Diagram
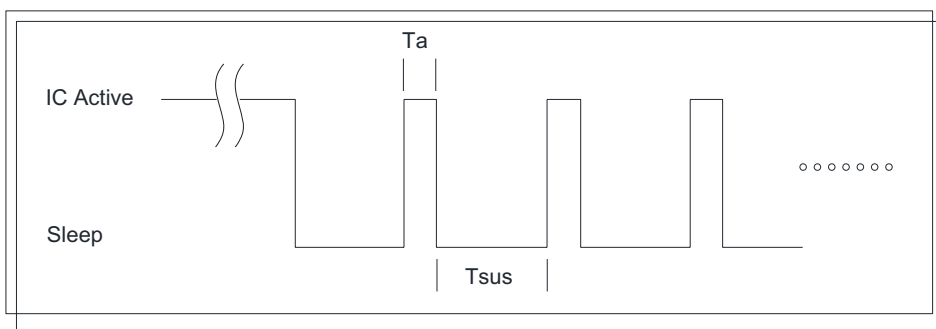
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Test Conditions

Impactl Test

Steel ball 227g, diameter 38mm, height 60 cm.
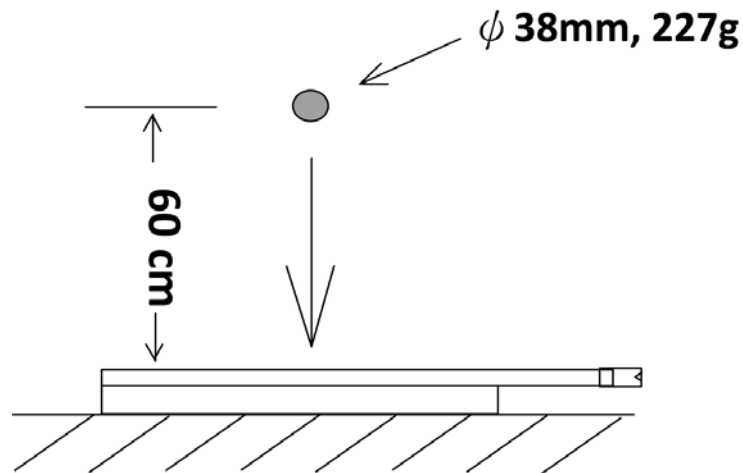One time impact at center area, no damage.

Figure 3. Demonstration of Impact Test

Environmental Test

No	Item	Specification	Remark
1	High temperature storage	80°C, 240 hr (Confirm after 4hr room temp.)	
2	Low temperature storage	-30°C, 240 hr (Confirm after 4hr room temp.)	No condensation.
3	High temperature high humidity storage	60°C, 80%RH, 240 hr (Confirm after 24hr room temp.)	
4	Thermal Cycling	-30°C ~+80°C (30min each), 10cycles (Confirm after 24hr room temp.)	