

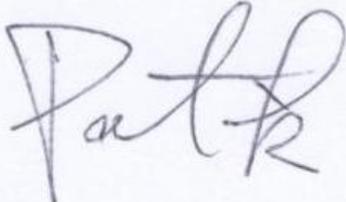
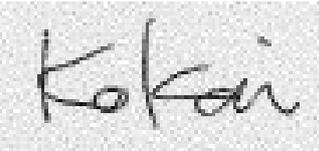


# SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AMA-104A01-DI2511-G010</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

- Approved For Specifications
- Approved For Specifications & Sample

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2018/2/9	-	New Release	Emil

## 1. General specification

AMA-104A01-DU2511-G010 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a back light system and pcap touch module. This TFT LCD has a 10.4 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixels) resolution.

- (1) Construction: 10.4" a-Si TFT active matrix, White LED Backlight.
- (2) Resolution (pixel): 1024(R.G.B) X 768
- (3) Number of the Colors : 16.2M (R , G , B 8 bit digital each)
- (4) LCD type : Normally black
- (5) Interface : 24bits LVDS interface.

### 1.1 Display Characteristics

Item	Specification	Unit
Display area	211.2(H) x 158.4(V) (10.4" diagonal)	mm
Number of Pixel	1024(H) x 768(V)	pixels
Pixel pitch	0.20625(H) x 0.20625(V)	mm
Pixel arrangement	RGB Vertical Stripe	
Display mode	Normally Black	
NTSC	70(Typ.)	%
Weight	TBD	g
Back-light	Single LED (Side-Light type)	

## 2. Optical Characteristics

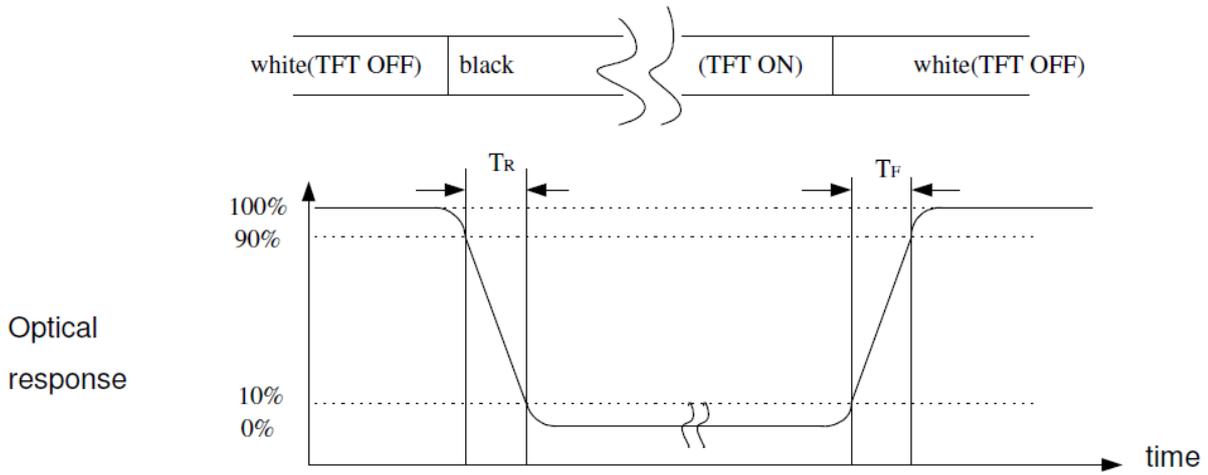
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	600	900	—		(1)(2)
Response time	Rising	TR+TF		—	30	40	msec	(1)(3)
	Falling							
White luminance (Center)		$Y_L$		400	500	—	cd/m <sup>2</sup>	(1)(4) ( $I_L=480mA$ )
Color chromaticity (CIE1931)	White	$W_x$		0.263	0.313	0.363	(1)(4)	
		$W_y$		0.279	0.329	0.379		
	Red	$R_x$			TBD			
		$R_y$			TBD			
	Green	$G_x$			TBD			
		$G_y$			TBD			
	Blue	$B_x$		TBD				
		$B_y$		TBD				
Viewing angle	Hor.	$\Theta_L$	$CR>10$	80	85	—		
		$\Theta_R$		80	85	—		
	Ver.	$\Theta_U$		80	85	—		
		$\Theta_D$		80	85	—		
Brightness uniformity		$B_{UNI}$	$\Theta=0$	70	80	—	%	(5)
Optima View Direction		Free						(6)

### Measuring Condition

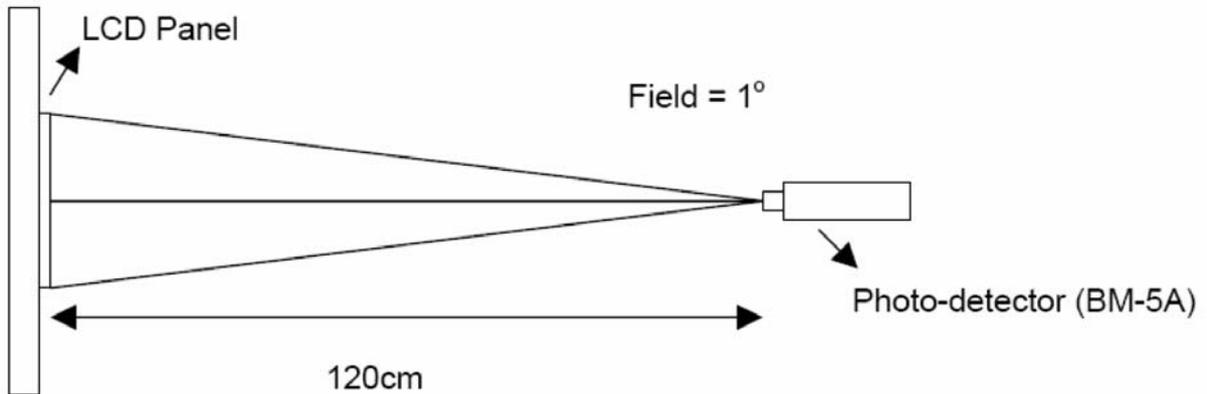
- Measuring surrounding: dark room
- LED current  $I_L$ : 480mA
- Ambient temperature:  $25 \pm 2^\circ C$
- 15min. warm-up time.



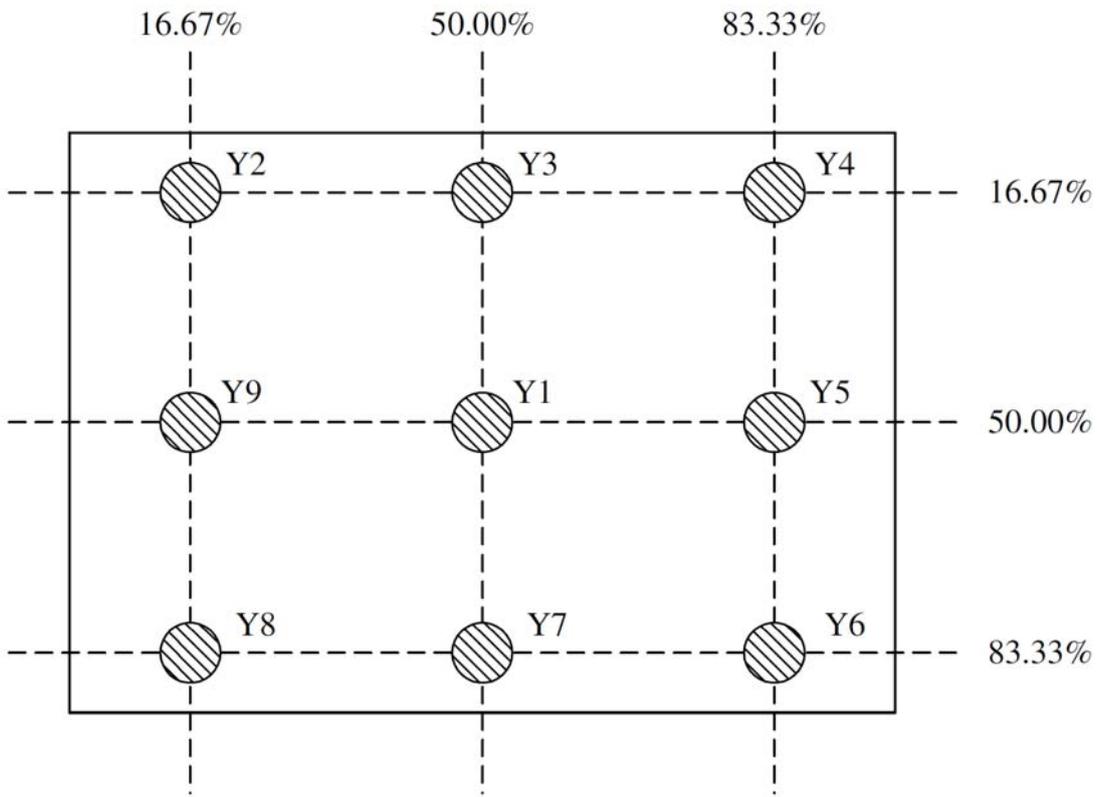
**Note (3)** Definition of Response Time : Sum of  $T_R$  and  $T_F$



**Note (4)** Definition of optical measurement setup



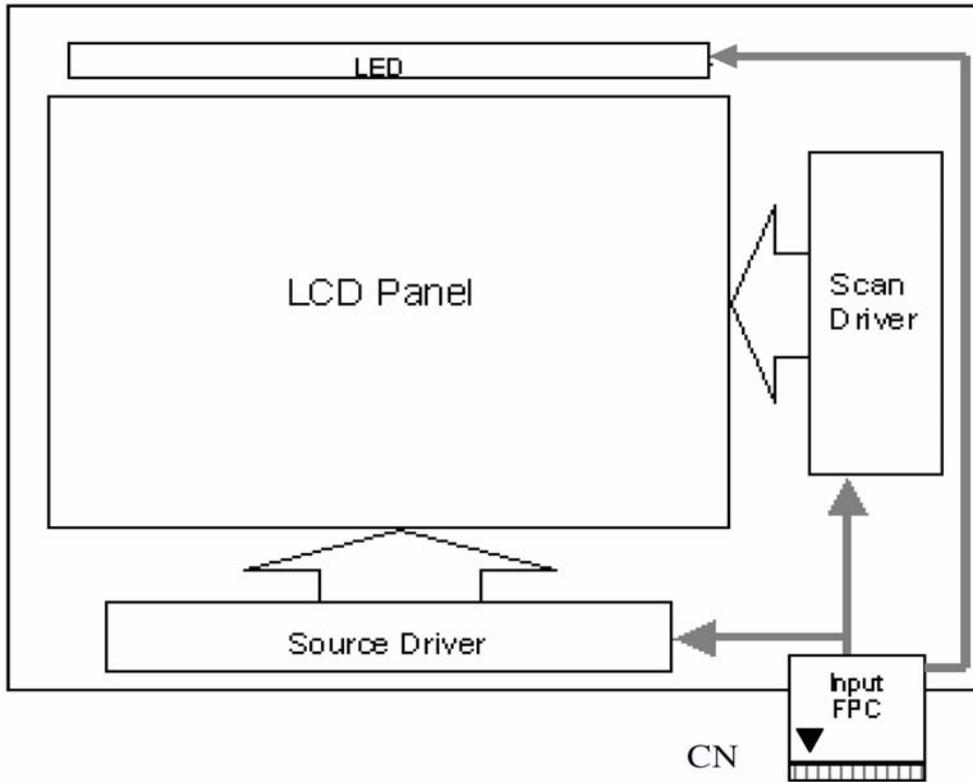
**Note (5)** Definition of brightness uniformity



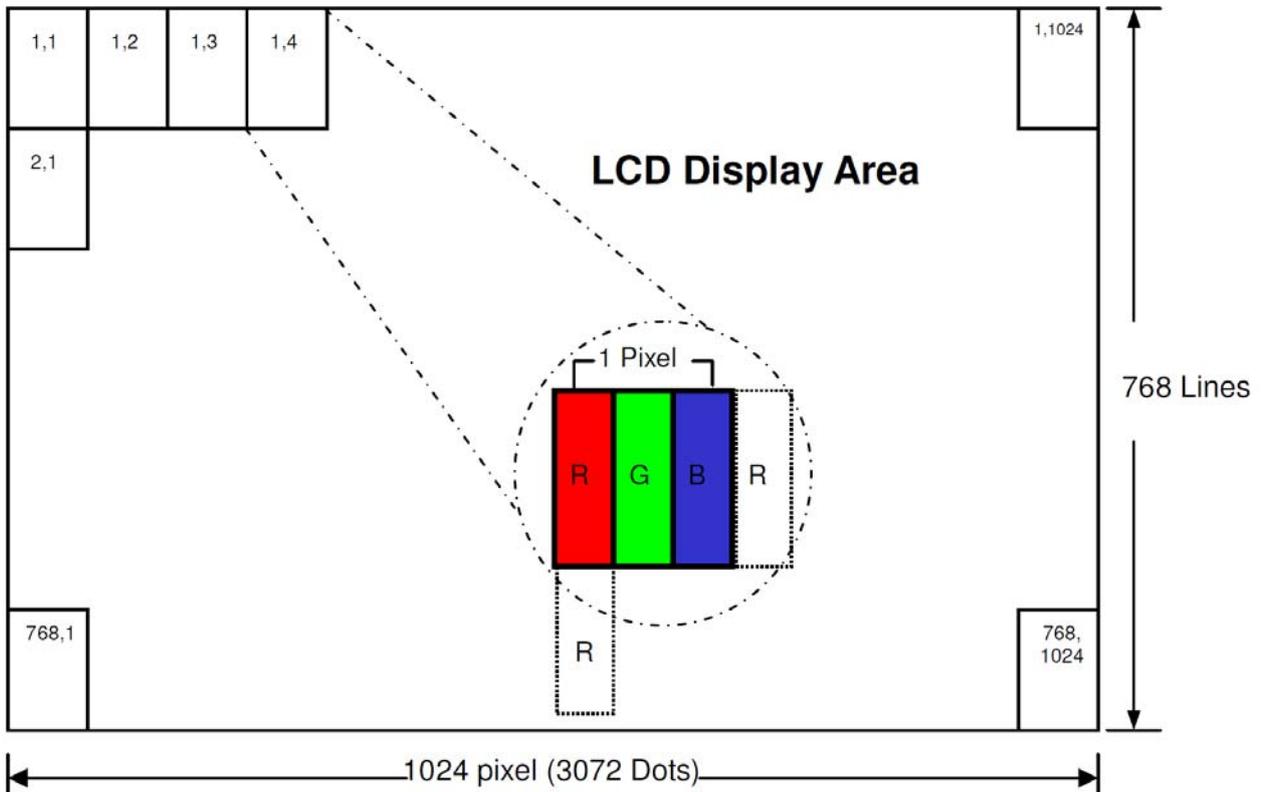
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

**Note (6)** : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

### 3. Functional Block Diagram



### Pixel Format



### 3.1 Relationship between Displayed Color and Input

	Display	MSB				LSB				MSB				LSB				Gray scale Level								
		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 color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	↓ Light	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	↓ Light	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253	
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L254	
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
	↓ Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark ↑	L	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L1	
		L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	↓ Light	H	H	H	H	H	L	L	H	H	H	H	H	L	L	H	H	H	H	H	L	L	L	L252		
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L	H	L	H	L253	
		H	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L	H	L	L254	
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255

## 4. ABSOLUTE MAXIMUM RATINGS

### 4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	VDD	-0.3	5	V	
Logic Signal Input Level	$V_{DVDD}$ $V_{DVDD\_LVDS}$	-0.3	5	V	

### 4.2 Absolute Ratings of Environment

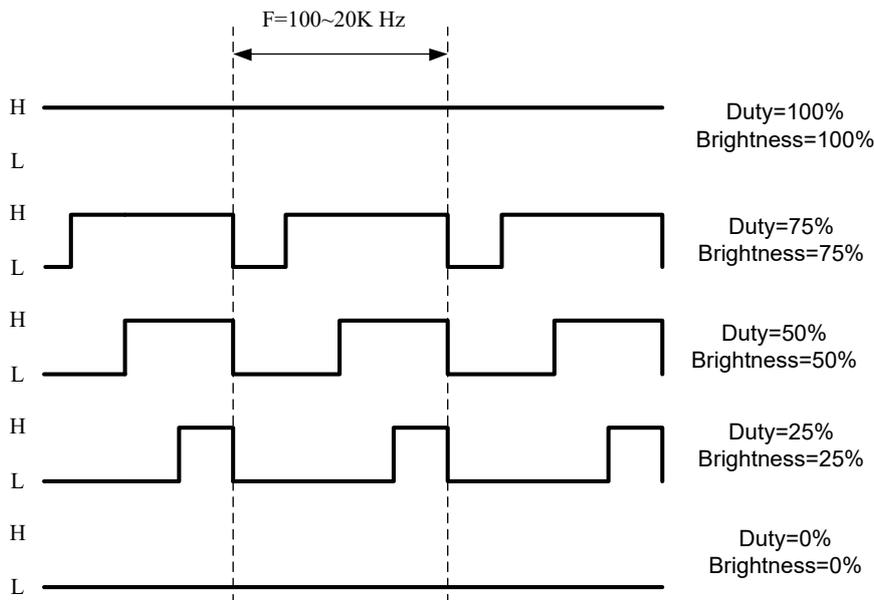
Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	$T_{opa}$	-20	70	°C	
Storage Temperature	$T_{stg}$	-30	80	°C	

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3	3.3	3.6	V	
	VLED		12		V	
	ADJ logic level High VADJ_H	2.4	--	--	V	
	ADJ logic level Low VADJ_L	--	--	0.7	V	
	f <sub>PWM</sub>	100		20K	Hz	Note1
Input signal voltage	ViH	0.8 VDD		VDD	V	
	ViL	0		0.2VDD	V	

Note1: PWM dimming duty.

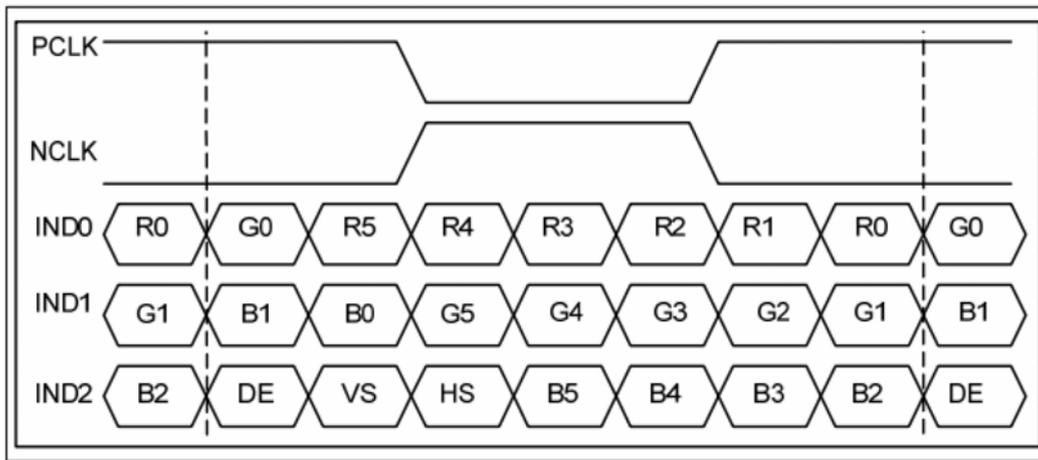


## 5.2 Switching Characteristics for LVDS Receiver

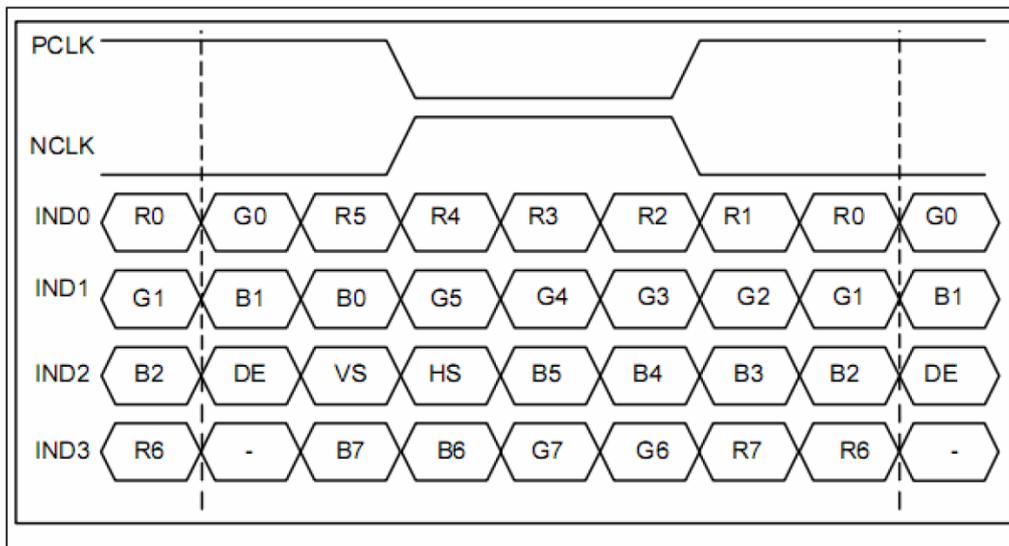
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V <sub>th</sub>			100	mV	V <sub>CM</sub> =1.2V
Differential Input Low Threshold	V <sub>tl</sub>	-100			mV	
Input Current	I <sub>IN</sub>	-10		10	uA	
Differential input Voltage	V <sub>ID</sub>	0.1		0.6	V	
Common Mode Voltage Offset	V <sub>CM</sub>	0.7	1.2	1.6	V	

## 5.3 Bit LVDS input

### 5.3.1 6Bit LVDS input



### 5.3.2 8Bit LVDS input

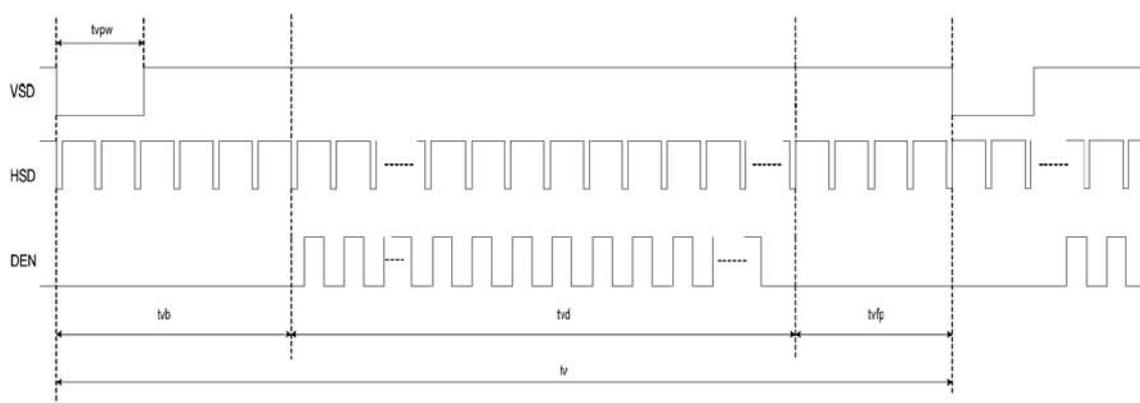


## 5.4 Interface Timing (DE mode)

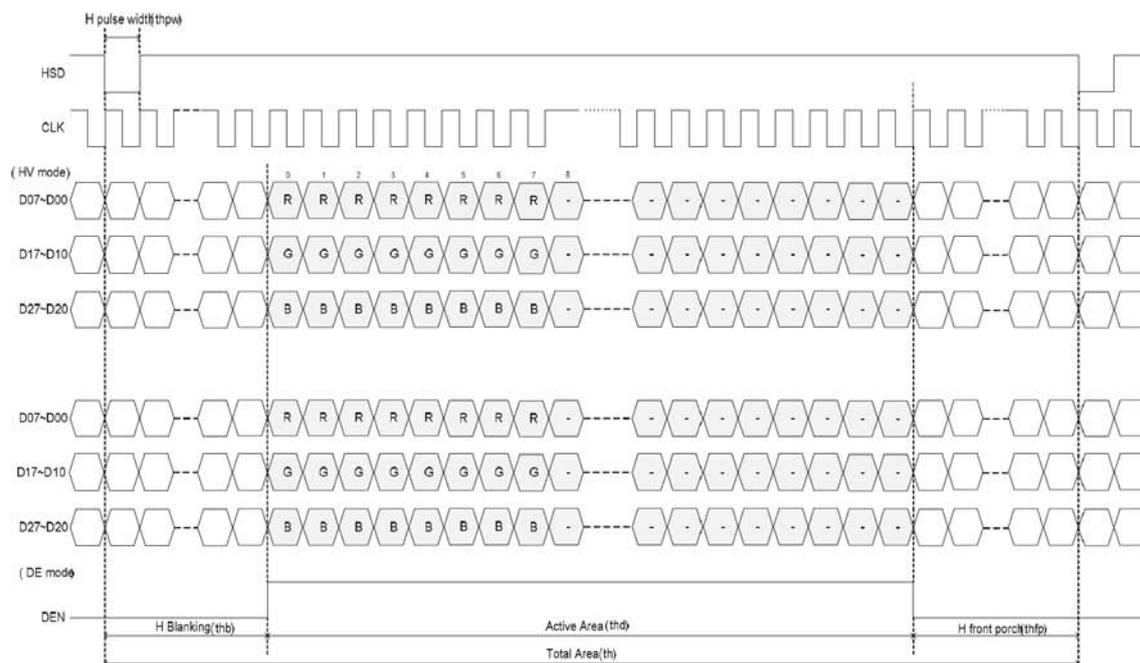
DE mode					
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	52	65	71	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	768			H
VSYNC period time	tv	778	806	845	H
VSYNC blanking	tvb+tvfp	10	38	77	H

### Timing Diagram of Interface Signal (DE mode)

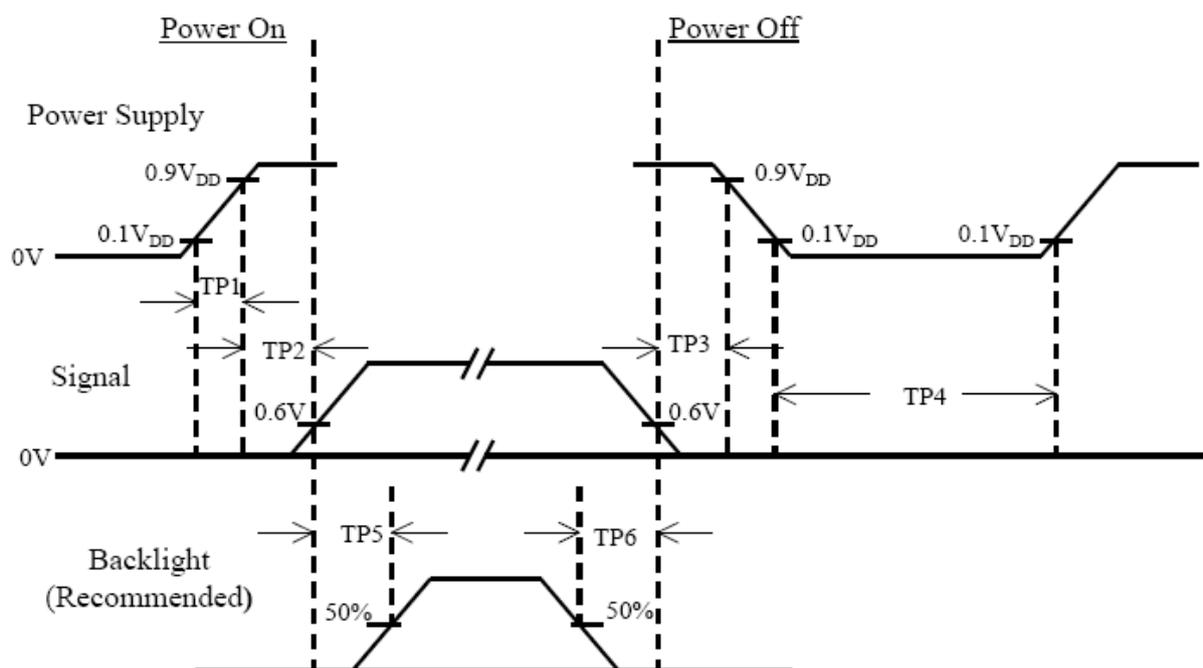
#### (1). Vertical input timing



#### (2). Horizontal input timing



## 5.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	500	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	

Note :

- (1) The supply voltage of the external system for the module input should be the same as the definition of VDD.
- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
- (3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 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.

## 5.6 Backlight Unit

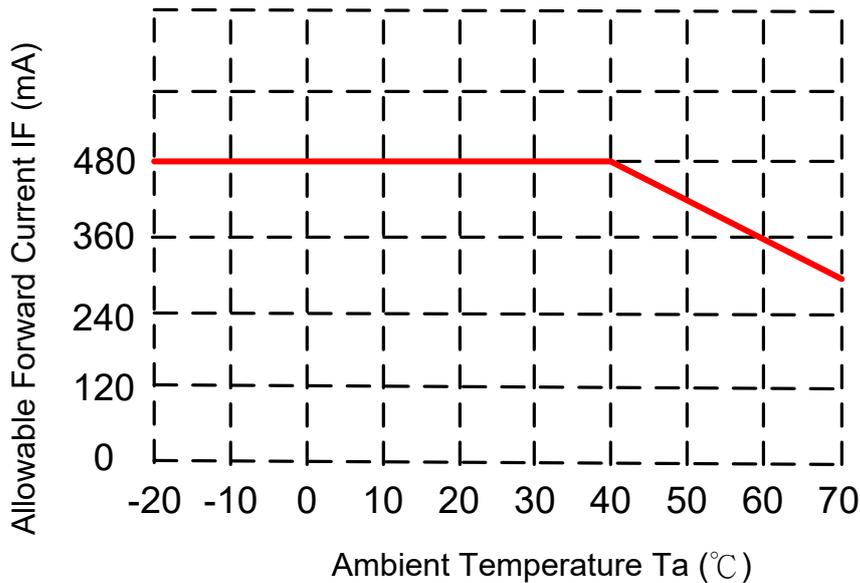
Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	$I_L$	--	480	--	mA	Ta=25°C
LED Voltage	$V_L$	--	12.9	13.6	Volt	Ta=25°C
LED Life-Time	N/A	30,000	--	--	Hour	Ta=25°C I <sub>F</sub> =60mA Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=480mA. The LED lifetime could be decreased if operating IL is larger than 480mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

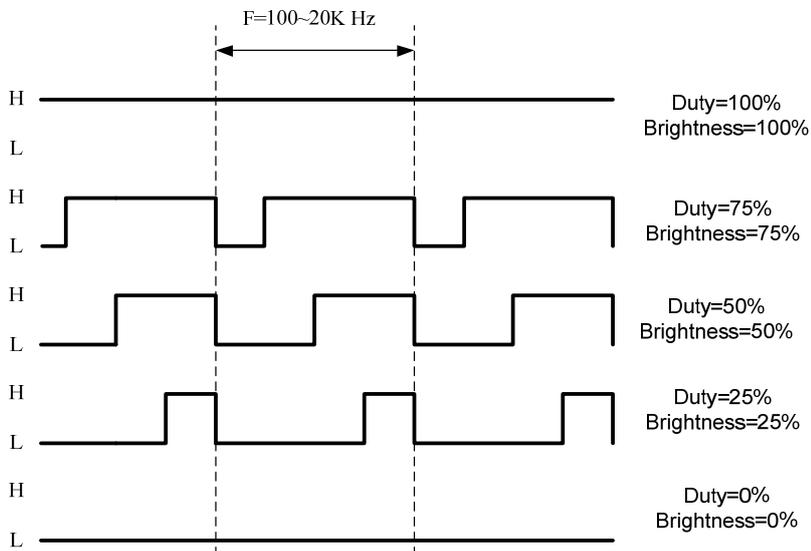
When LCM is operated over 40°C ambient temperature, the IL should be follow :



## 7. INTERFACE PIN CONNECTION

CN2 LVDS connector: P1.0 20pin/CP100-S20G-H16

Pin No.	Symbol	I/O	Description	Note
1	VDD	P	Power Voltage for Logic: 3.3V	
2	VDD	P	Power Voltage for Logic: 3.3V	
3	GND	P	Ground	
4	GND	P	Ground	
5	IN0-	I	- LVDS differential data input	
6	IN0+	I	+ LVDS differential data input	
7	GND	P	Ground	
8	IN1-	I	- LVDS differential data input	
9	IN1+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	IN2-	I	- LVDS differential data input	
12	IN2+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	CLK-	I	- LVDS differential data input	
15	CLK+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	IN3-	I	- LVDS differential data input	
18	IN3+	I	+ LVDS differential data input	
19	VLED	P	Power Voltage for Logic: 12V	
20	ADJ	I	BL dimming pin, PWM signal	



## 8. TOUCH PANEL ELECTRICAL SPECIFICATION

### 8-1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Multi-touch
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx 100 points/sec
Interface/Protocol	IIC/V3.X
Control IC	ILI2511
Conductive susceptibility IEC/EN61000-4-6	10Vrms
Radiated Susceptibility IEC/EN61000-4-3	30V/m
Cover Glass	1.1mm chemically strength glass with black border
Bonding method	CG to sensor: optical bonding
	TP module to LCM: tape bonding

### 8-2 Electrical Characteristic

#### 8-2-1 IIC Interface

Specify the normal operating condition

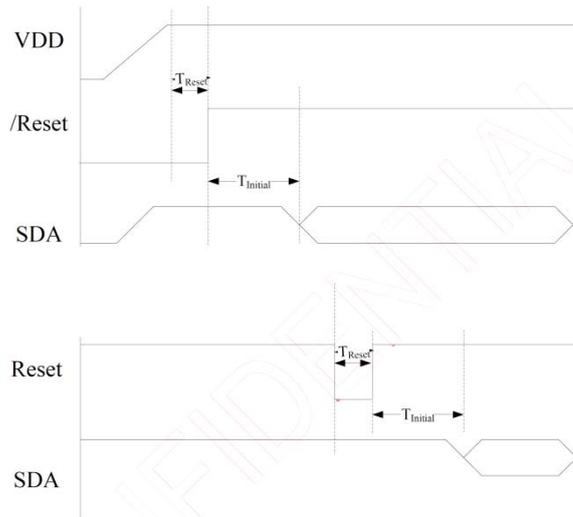
(GND=0V)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	V <sub>IN</sub>	3	3.3	3.6	V	
Signal IIC Interface Logic level	Low	V <sub>IL</sub>	0	-	0.3*V <sub>IN</sub>	V
	High	V <sub>IH</sub>	0.7*V <sub>IN</sub>	-	V <sub>IN</sub>	V
Power Consumption	I <sub>VIN</sub>		50		mA	Ref.

#### 7-2-2 Pin definition

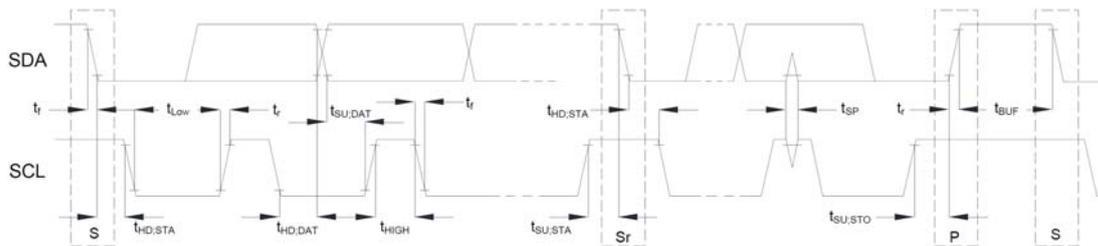
Pin	Name	Description
1	V <sub>IN</sub>	Power supply 3.3V
2	SCL	IIC Clock
3	SDA	IIC Data
4	INT	Interrupt signal Active "Low"
5	RESET	Reset touch panel controller Active "Low"
6	GND	Power GND

### 8-2-3 Power- on Timing Chart (IIC interface)



Symbol	Parameter	MIN.	MAX.	Unit
$T_{Initial}$	After powering-on or resetting the device, the device needs $T_{Initial}$ time to configure the system.	-	100	ms
$T_{Reset}$	/Reset pin low hold time	50	-	$\mu$ s

### 8-2-4 IIC AC Waveform



### 8-2-5 IIC Characteristics

Symbol	Parameter	100KHz			400KHz		
		Min	Max	Unit	Min	Max	Unit
$f_{SCL}$	SCL clock frequency	0	100	kHz	0	400	KHz
$t_{HD,STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	-	$\mu$ s	0.6	-	$\mu$ s
$t_{LOW}$	LOW period of the SCL clock	4.7	-	$\mu$ s	1.3	-	$\mu$ s
$t_{HIGH}$	HIGH period of the SCL clock	4.0	-	$\mu$ s	0.6	-	$\mu$ s
$t_{SU,STA}$	Set-up time for a repeated START condition	4.7	-	$\mu$ s	0.6	-	$\mu$ s
$t_{HD,DAT}$	Data hold time	0	3.45	$\mu$ s	0	0.9	$\mu$ s
$t_{SU,DAT}$	Data set-up time	250	-	ns	100	-	ns
$t_r$	Rise time of both SDA and SCL signals	-	1000	ns	-	300	ns
$t_f$	Fall time of both SDA and SCL signals	-	300	ns	-	300	ns
$t_{SU,STO}$	Set-up time for STOP condition	4.0	-	$\mu$ s	0.6	-	$\mu$ s
$t_{BUF}$	Bus free time between a STOP and START condition	4.7	-	$\mu$ s	1.3	-	$\mu$ s

## 7-2-6 Format Protocol

### Protocol V3.X Command List

CMD Code	Name	Set /Get	Note	b7	b6	b5	b4	b3	b2	b1	b0			
0x10	Touch Information	Get		0: No touch 1: Last Report at ID 0 to ID 5 (include release status) 2: Last Report at ID 6 to ID 9 (include release status)										
			ID0	1: Touch Down, 0: Touch Off	0	X_High direction coordinate								
				X_Low direction coordinate										
				0	0	Y_High direction coordinate								
				Y_Low direction coordinate										
				Touch Pressure										
			ID1	1: Touch Down, 0: Touch Off	0	X_High direction coordinate								
				X_Low direction coordinate										
				0	0	Y_High direction coordinate								
				Y_Low direction coordinate										
				Touch Pressure										

				ID2	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
					X_Low direction coordinate							
					0	0	Y_High direction coordinate					
					Y_Low direction coordinate							
					Touch Pressure							
				ID3	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
					X_Low direction coordinate							
					0	0	Y_High direction coordinate					
					Y_Low direction coordinate							
					Touch Pressure							
				ID4	1: Touch Down, 0: Touch Off	0	X_High direction coordinate					
					X_Low direction coordinate							
					0	0	Y_High direction coordinate					
					Y_Low direction coordinate							
					Touch Pressure							

			ID5	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
0x14	Touch Information 2	Get	ID6	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID7	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID8	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID9	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
0x20				The maximum X coordinate (bit 7:0)		
				The maximum X coordinate (bit 15:8)		
				The maximum Y coordinate (bit 7:0)		
				The maximum Y coordinate (bit 15:8)		
				The channel numbers of X direction		
				The channel numbers of Y direction		
				The maximum report points		

				The channel numbers of TouchKey / Scrolling Bar
				For Touch Key Application (Maximum supports 31 Touch Key) Byte 8 : The Touch Key number (<32) Byte 9: 0xFF
0x30	Enter Sleep Mode	Set		--
0x40	Firmware Version	Get		Chip ID Code
				Major firmware version
				Minor firmware version
				Release firmware version
				For Customer Firmware Version
				For Customer Firmware Version
				For Customer Firmware Version
				For Customer Firmware Version
0x42		Get		Major protocol version : 0x03
				Minor protocol version : XX
				Release protocol version : XX

### Protocol V3.X Data Format

CMD Code	Name	Set / Get	Note	b7	b6	b5	b4	b3	b2	b1	b0			
0x10	Touch Information	Get	Packet Number	0: No touch 1: Last Report at ID 0 to ID 5 (include release status) 2: Last Report at ID 6 to ID 9 (include release status)										
			ID0	1: Touch Down, 0: Touch Off	0	X_High direction coordinate								
				X_Low direction coordinate										
				0	0	Y_High direction coordinate								
				Y_Low direction coordinate										
				Touch Pressure										

			ID1	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID2	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID3	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
			ID4	1: Touch Down, 0: Touch Off	0	X_High direction coordinate
X_Low direction coordinate						
0	0	Y_High direction coordinate				
Y_Low direction coordinate						
Touch Pressure						

				X_Low direction coordinate		
				0	0	Y_High direction coordinate
				Y_Low direction coordinate		
				Touch Pressure		
				ID5	1: Touch Down, 0: Touch Off	0
			X_Low direction coordinate			
			0		0	Y_High direction coordinate
			Y_Low direction coordinate			
			Touch Pressure			

## 7-2-7 Interrupt Pin (INT) Control

When a finger touches on the sensor surface, the INT pin will be pull low. TP controller supports two different type control method.

*Method 1(Polling): The  $\overline{INT}$  will continue to be low until the finger leaves the sensor surface.*

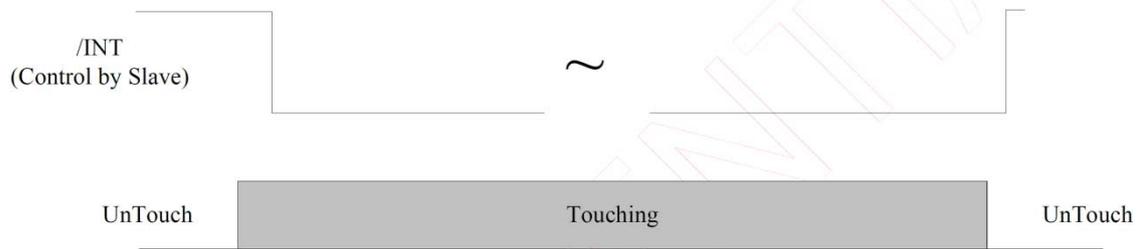


Fig 9: Method 1:  $\overline{INT}$  Pin Control Diagram (Finger Touch)

*Method 2(Interrupt): The  $\overline{INT}$  will continue to be pull low until host read 0x10 command.*

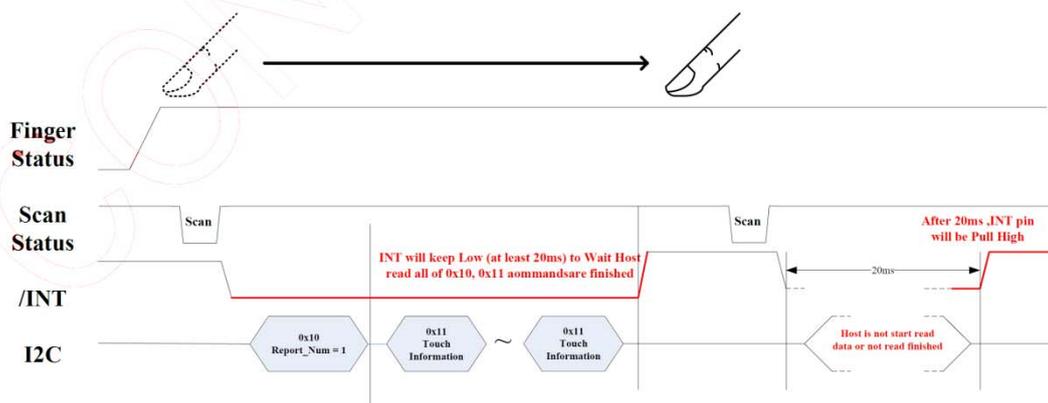


Fig 10: Method 2:  $\overline{INT}$  Pin Control Diagram (Finger Touch)

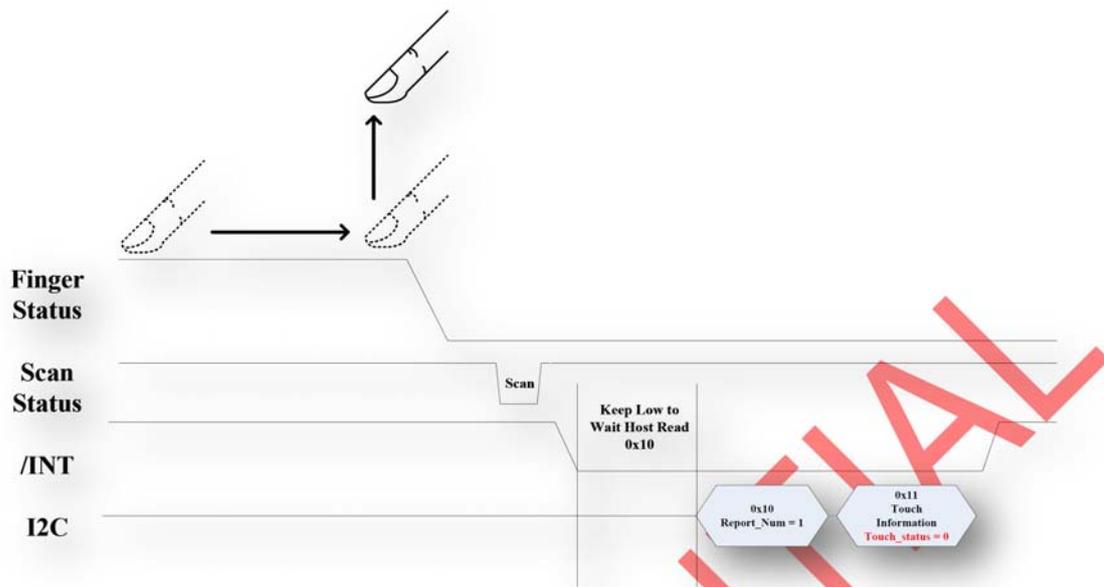


Fig 11: Method 2:  $\overline{\text{INT}}$  Pin Control Diagram (Finger Release)

## 7-2-8 Device Address

MSB							LSB	
1	0	0	0	0	0	1	0/1	
Device Address							R/W	

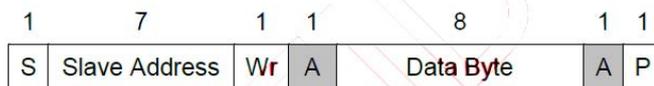
7-bit Device Address: 0x41

8-bit Device Read Address: 0x83

8-bit Device Write Address: 0x82

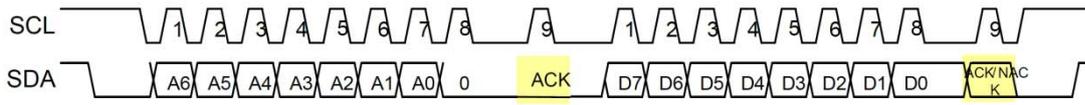
## 7-2-9 Data Transfer

Data is transferred over the IIC bus with 8-bit address and 8-bit data.



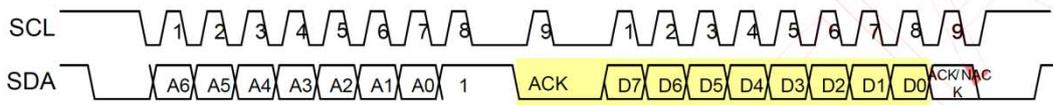
- S Start Condition
  - Sr Repeated Start Condition
  - Rd Read (bit value of 1)
  - Wr Write (bit value of 0)
  - A/NA Acknowledge (this bit position may be '0' for an ACK or '1' for a NACK)
  - P Stop Condition
- |     |                 |
|-----|-----------------|
| □   | Master-to-Slave |
| ■   | Slave-to-Master |
| --- | Continue        |

*I2C Write timing*



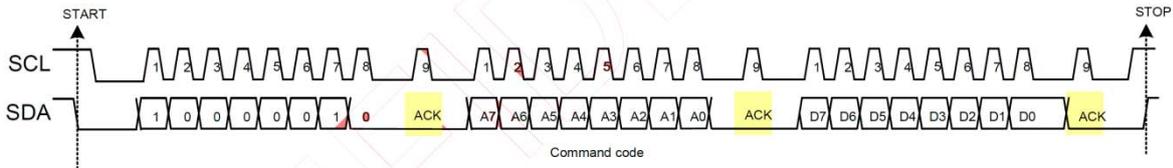
=> slave to master

*I2C Read timing*



=> slave to master

*Byte Write*



S	Slave Address	Wr	A	Command Code	A	Data Byte	A	P
---	---------------	----	---	--------------	---	-----------	---	---

Byte Write

*Byte Read*

c

S	Slave Address	Wr	A	Command Code	A	Sr	Slave Address	Rd	A	Data Byte	A	P
---	---------------	----	---	--------------	---	----	---------------	----	---	-----------	---	---

Byte Read

## 9. RELIABILITY TEST CRITERIA

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , Dry t=240 hrs	
Low Temperature Operation	-20±3°C , Dry t=240 hrs	
High Temperature Storage	80±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C , Dry t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-20°C (30min.) ~ 25°C(5min.) ~ 70°C (30min.) 100 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Note 3 : The module shouldn't be tested more than one condition, and all the test conditions are independent.

Note 4 : All the reliability tests should be done without protective film on the module.

## **10. USE PRECAUTIONS**

### **10-1 Safety**

Liquid crystal is poisonous. Do not put it your month. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

### **10-2 Handling**

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.

3. To avoid contamination on the display surface, do not touch the module surface with bare hands.

4. Keep a space so that the LCD panels do not touch other components.

5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.

6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.

7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

### **10-3 Static Electricity**

1. Be sure to ground module before turning on power or operation module.

2. Do not apply voltage which exceeds the absolute maximum rating value.

### **10-4 Storage**

1. Store the module in a dark room where must keep at  $+25\pm 10^{\circ}\text{C}$  and 65%RH or less.

2. Do not store the module in surroundings containing organic solvent or corrosive gas.

3. Store the module in an anti-electrostatic container or bag.

### **10-5 Cleaning**

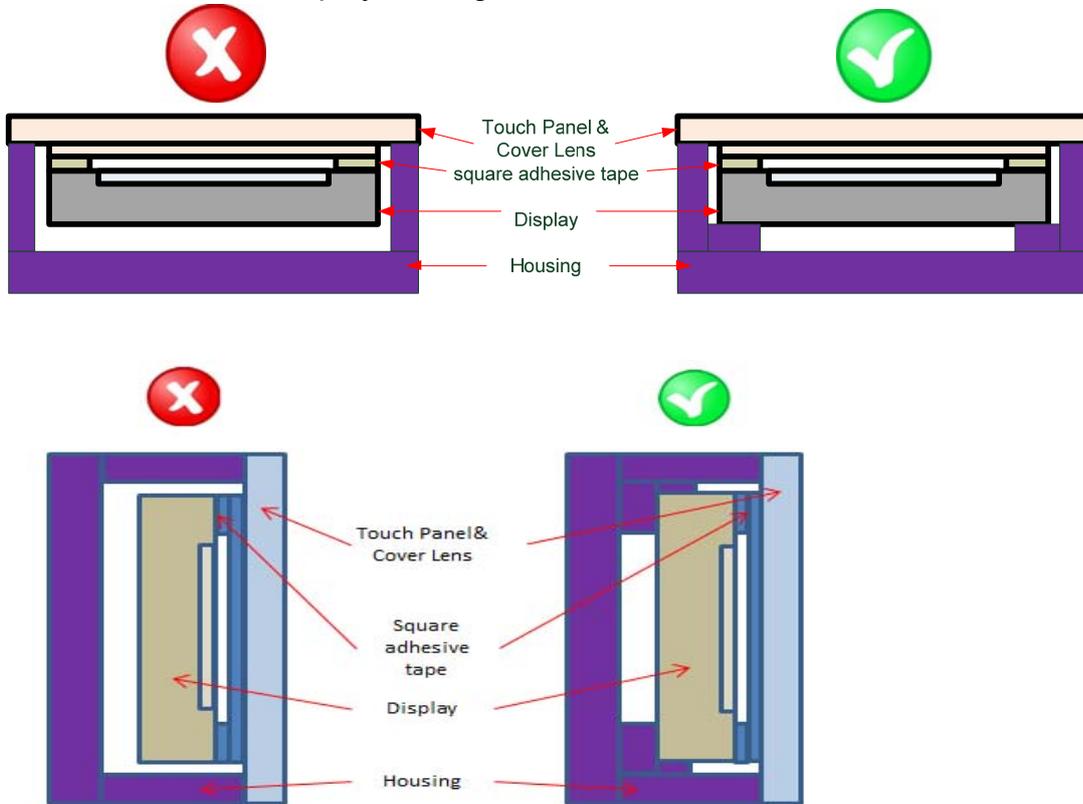
1. Do not wipe the polarizer with dry cloth. It might cause scratch.

2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

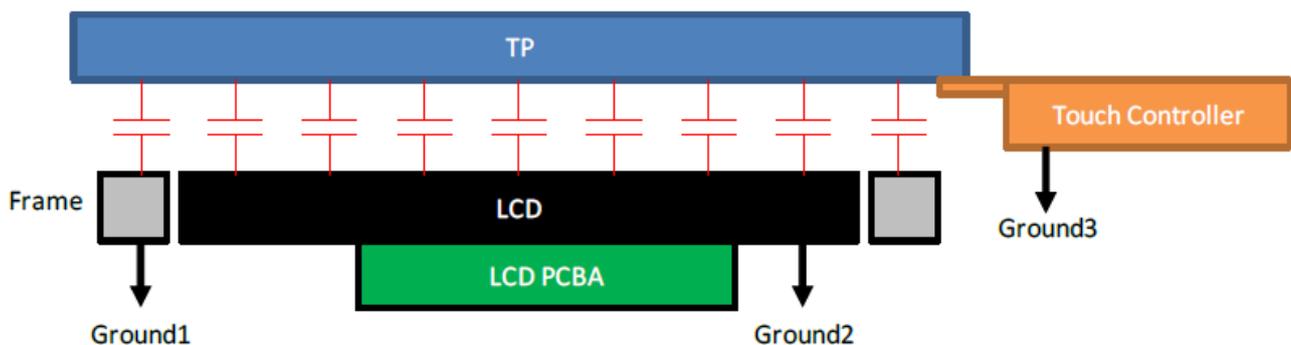
### 10-6 Mechanism

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.

(2) The square adhesive tape which is between the touch panel and display can't provide well supporting in the long term and high ambient temperature condition. Whether upright or horizontal position the support holder which is in the back side of the display is needed. Do not let the display floating.



(3) TP needs to work in environment with stable stray capacitance. In order to minimize the variation in stray capacitance, all conductive mechanical parts must not be floating. Intermittent floating any conductive part around the touch sensor may cause significant stray capacitance change and abnormal touch function. It is recommended to keep all conductive parts having same electrical potential as the GND of the touch controller module.



GND1, GND2 and GND3 should be connected together to have the same ground

### **10-7 Others**

1. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.
2. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen save

# 11. OUTLINEDIMENSION

