Doc. Number :

☐ Tentative Specification
☐ Preliminary Specification
■ Approval Specification

MODEL NO.: G070Y2
SUFFIX: L01(Rev.C6)

Customer:

APPROVED BY **SIGNATURE**

Name / Title
Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
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2016-09-05 16:55:05 CST	**2016-09-05 16:24:05 CST**	**2016-09-05 16:24:05 CST**

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REVISION HISTORY

Version	Date	Section	Description
Ver 2.0	Oct. 30, '09	All	G070Y2-L01 Approval specification was first issued.
Ver 2.1	May.13, 10	1.4 3.2 7.1 1.4	Module Power Consumption from 3.56 W to 3.71 W Converter Power Supply Current from 0.25A to 0.263mA Converter Power Consumption from 3W to 3.15W Note(2) I_L = 60 mA(Per EA) change to I_L = 55 mA(Per EA) TEST CONDITIONS Current from 60±4mA to 55±3mA Module Power consumption 3.71W ->4.04W
Ver 2.2	Sep. 9, 10	3.1 3.2 6.1	Power Supply Current White 140mA -> 250mA Black 170mA -> 270mA Add Note(3) Clock Frequency $1/T_{clock}$: Min. 27 MHz -> 28 MHz Max. 33 MHz -> 32MHz
Ver 2.3	Dec. 1, 10	2.2.2	Enable Voltage Max. from 4 to 5 Backlight Adjust Max. from 3.3 to 5
Ver 2.4	Aug. 23, 10	3.2	EN Control Level / Backlight on max. from 3.3 to 5 PWM Control Level / PWM High Level max. from 3.3 to 5 PWM Control Duty Ratio min. from 20 to 10 PWM Control Frequency min. from 190 to 100 max. from 210 to 300
Ver 2.5	Dec. 21,15	All 2.1 5.3 6.1 8 9.2 10.1 12	Change CHIMEI INNOLUX Logo to INNOLUX Modify Note(2) Add Note (4). Add UD & LR signal Add Note(3). Add Note(5)~(6) Add UN-PACKING METHOD Update Module label define Add Mechanical 2D Outline
Ver 2.6	Feb.19,16	1.3 3.2	Module Power Consumption from 4.04W to 3.8W Converter Power Supply Current Typ. Value from 0.263A to 0.24mA Converter Power Consumption Typ. Value from 3.15W to 2.8W
Ver 2.7	Jun.24,16	3.2 7.1	Note(2) I_L = 55 mA(Per EA) change to I_L = 50 mA(Per EA) Current from 55±3mA to 50±3mA
Ver2.8	Sep.2, 16	6.2 7.2	Add 6bit FRC remark "(RX3+/RX3-:floating)" Add measurement method remark "all items are measured at the center point of screen except white variation."

1. GENERAL DESCRIPTION

1.1 OVERVIEW

G070Y2-L01 is a 7inch IAV TFT Liquid Crystal Display module with a LED backlight unit and a-20pin 6/8bit LVDS interface controller board. The converter for the LED Backlight Unit is built in. This module supports 800 (R.G.B)x 480 WVGA mode which main application is the automotive display and industrial field.

1.2 FEATURES

- Wide viewing angle.
- Fast response time
- Wide operating temperature
- Reversible scan function
- 6/8 bit convertible
- High Color gamut (NTSC：72%)

1.3 APPLICATION

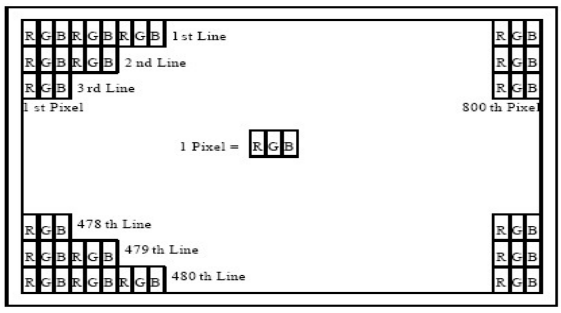
- Automotive Display
- Industry Application

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Diagonal Size	7	inch	
Active Area	152.4x91.44	mm	(1)
Bezel Opening Area	154.6x93.64	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	800 x R.G.B. x 480	pixel	-
Pixel Pitch	0.1905 x 0.1905	mm	-
Pixel Arrangement	RGB vertical stripe	-	(2)
Display Colors	262k or 16.2M	color	-
Display Mode	Normal White	-	-
Surface Treatment	Anti-glare, Hard Coating (3H)	-	-
Module Power Consumption	3.8	W	Typ.

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2)



1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	164.3	165	165.3	mm	(1)
	Vertical (V)	103.3	104	104.3	mm	
	Depth (D)	9.03	9.53	10.03	mm	
Weight			147	162	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

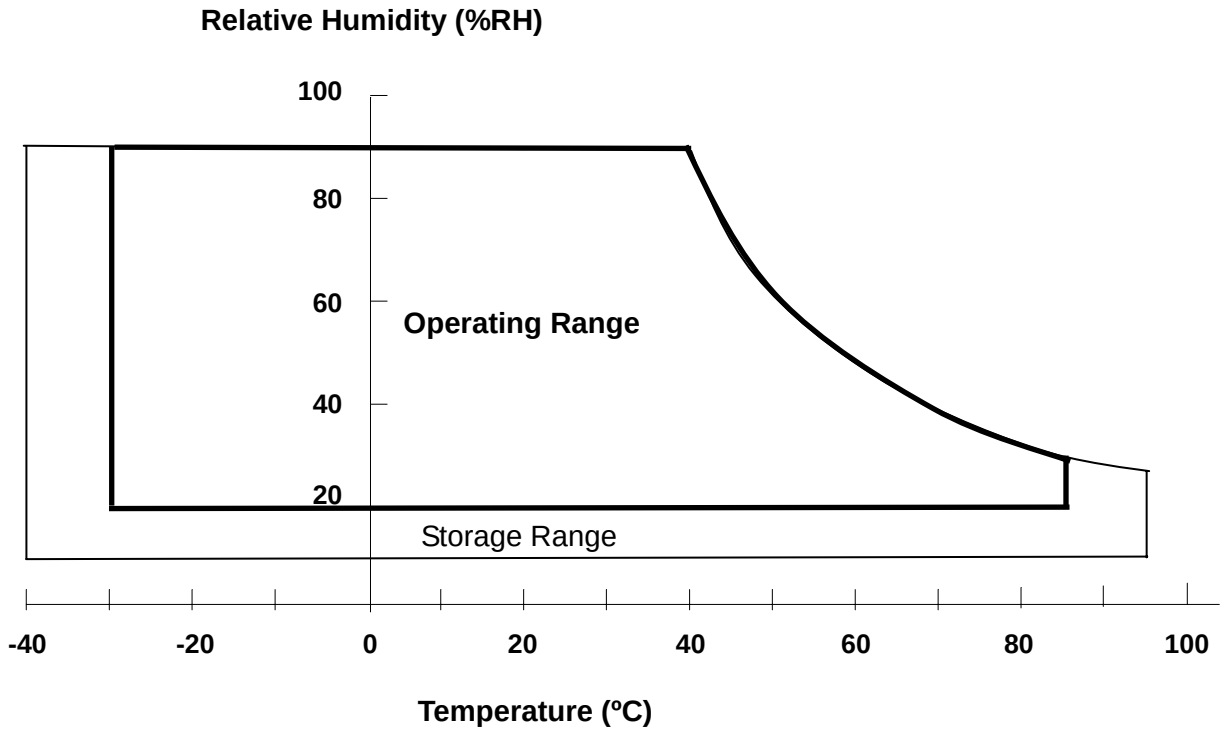
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T_{OP}	-30	+85	ºC	
Storage Temperature	T_{ST}	-40	+95	ºC	

Note (1) Temperature and relative humidity range is shown in the figure below.

(2) Wet-bulb temperature should be 39 ºC Max..

(3) No condensation.

(4) The absolute maximum rating values of this product are not allowed to be exceeded at any times. The module should not be used over the absolute maximum rating value. It will cause permanently unrecoverable function fail in such an condition.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	4	V	(1)

2.2.2 LED CONVERTER

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5	V	
Backlight Adjust	ADJ	---	5	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.

Note (2) Specified values are for LED converter (Refer to 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

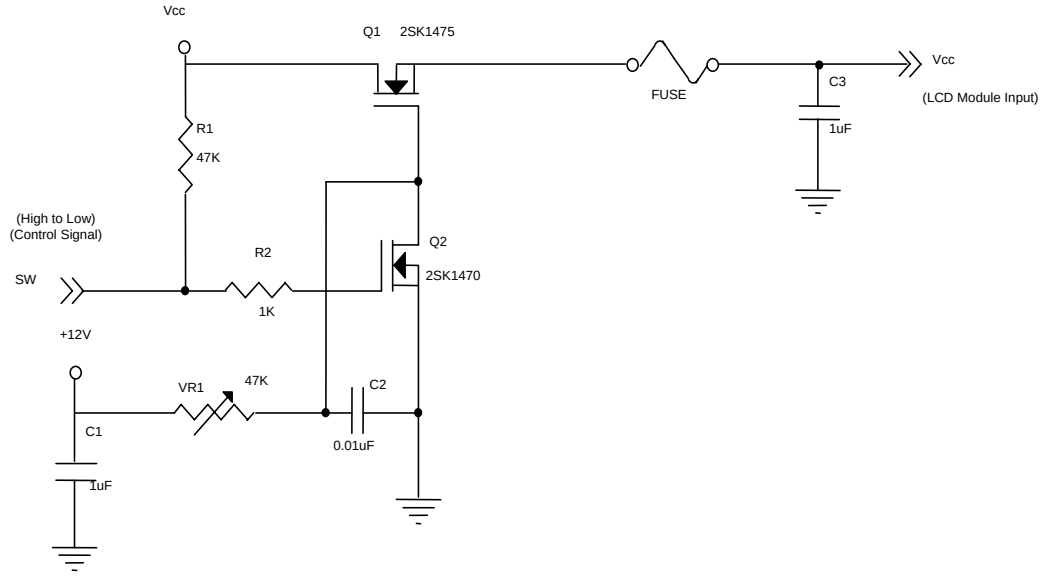
3.1 RECOMMENDED OPERATION CONDITION

Ta = 25 ± 2 ºC

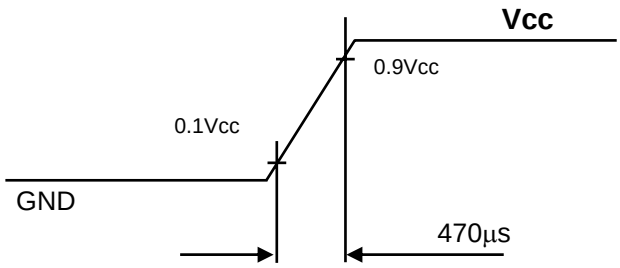
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	3.0	3.3	3.6	V	(1)
Rush Current		I_{RUSH}			1.5	A	(2)
Power Supply Current	White			140	168	mA	(3)a
	Black			170	204	mA	(3)b
LVDS Differential Input High Threshold		$V_{TH(LVDS)}$			100	mV	-
LVDS Differential Input Low Threshold		$V_{TL(LVDS)}$	-100			mV	-
LVDS Common Mode Voltage		V_{CM}		1.2		V	-

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470μs



Note (3) The specified power supply current is under the conditions at Vcc = 3.3V , Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

3.2 BACKLIGHT UNIT

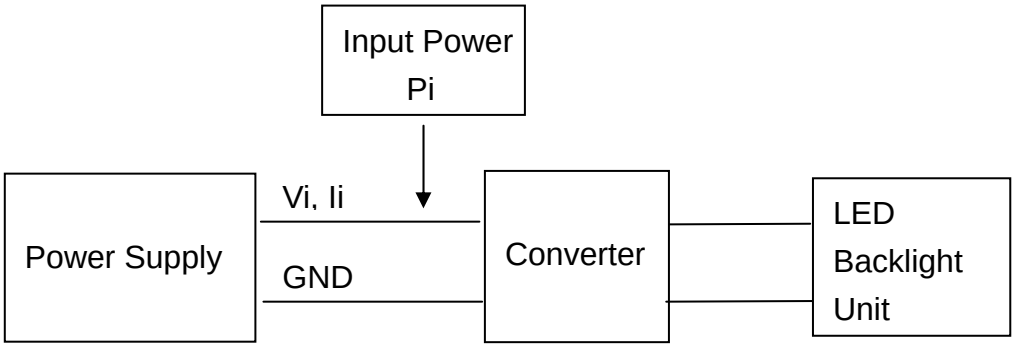
Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	
Converter Power Supply Current		I_i	---	0.24	---	A	@ Vi = 12V (Duty 100%)
Converter Power Consumption		P_{LED}	---	2.8	---	W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on		2.0	---	5	V	
	Backlight off		0	---	0.8	V	
PWM Control Level	PWM High Level		2.0	---	5	V	
	PWM Low Level		0	---	0.15	V	
PWM Control Duty Ratio			10		100	%	
PWM Control Frequency		f_{PWM}	100	200	300	Hz	
LED Life Time		L_L	50,000			Hrs	(2)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

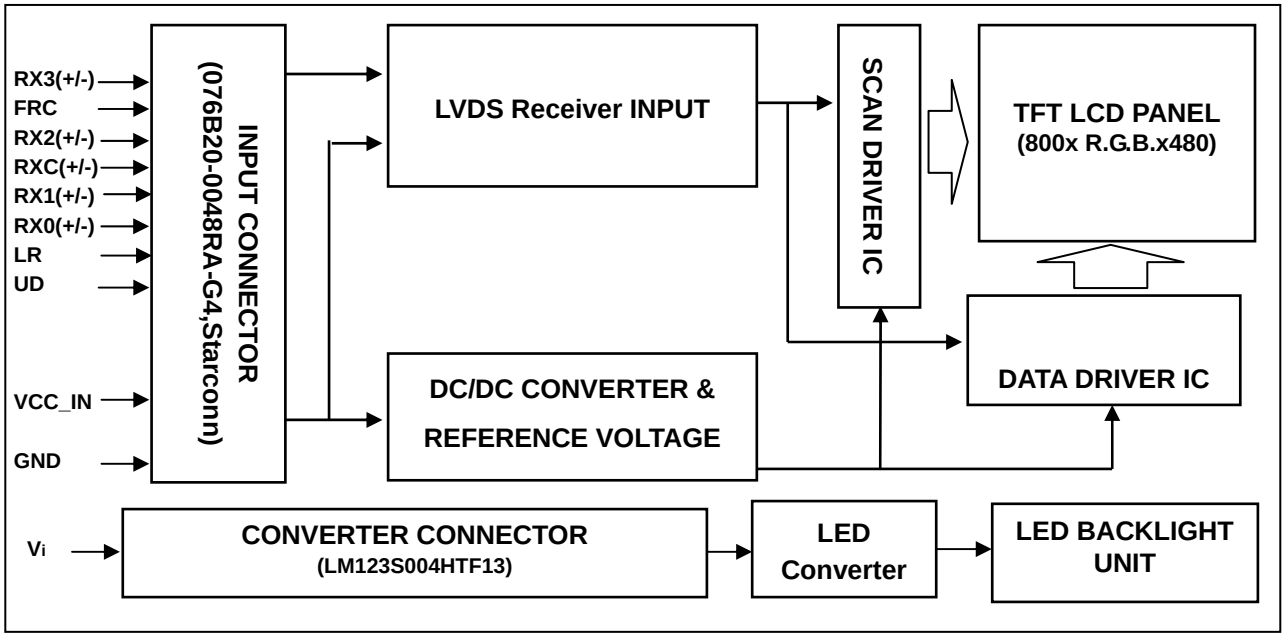
Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and I_{LED} = 50mA_{DC}(LED forward current) until the brightness becomes ≦ 50% of its original value.

Note (3) Please note that LED life will be shorter than the average life described in the specification if operate in higher ambient temperature.



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 LVDS I/O PIN ASSIGNMENT

Pin	Name	I/O	Description
1	RX3+	I	LVDS differential data input Pair 3.
2	RX3-	I	
3	NC	I	No Connected
4	FRC	I	Dithering control setting When FRC=H, the width of data input 8 bits When FRC=L, the width of data input 6 bits (Default pull low)
5	GND	I	Ground
6	RXC+	I	LVDS differential Clock input Pair
7	RXC-	I	
8	GND	I	Ground
9	RX2+	I	LVDS differential data input Pair 2
10	RX2-	I	
11	GND	I	Ground
12	RX1+	I	LVDS differential data input Pair 1
13	RX1-	I	
14	GND	I	Ground
15	RX0+	I	LVDS differential data input Pair 0
16	RX0-	I	
17	LR	I	Shift direction of Source Driver IC internal shift register is controlled by this pin as show below: LR=H SO1→ ……SO1200 (Default pull high) LR=L SO1200→…….SO1
18	UD	I	Gate Driver Up/down scan setting When UD=H, reverse scan When UD=L, normal scan (Default pull low)
19	VCC_IN	I	Digital power supply (+3.3V)
20	VCC_IN	I	Digital power supply (+3.3V)

Note (1) Connector Part No.: 076B20-0048RA-G4,Starconn or equivalent

5.2 BACKLIGHT PIN ASSIGNMENT (Converter connector pin)

No	Symbol	I/O	Description
1	Vi	I	Converter input voltage
2	ADJ	I	Backlight Adjust
3	EN	I	Enable pin
4	V_{GND}		Converter ground

Note (1) Connector Part No: LM123S004HTF13,4 PIN,UNE

5.3 SCANNING DIRECTION

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

Fig.1 Normal Scan

Fig.2 Reverse Scan

Fig.3 Reverse Scan

Fig.4 Reverse Scan

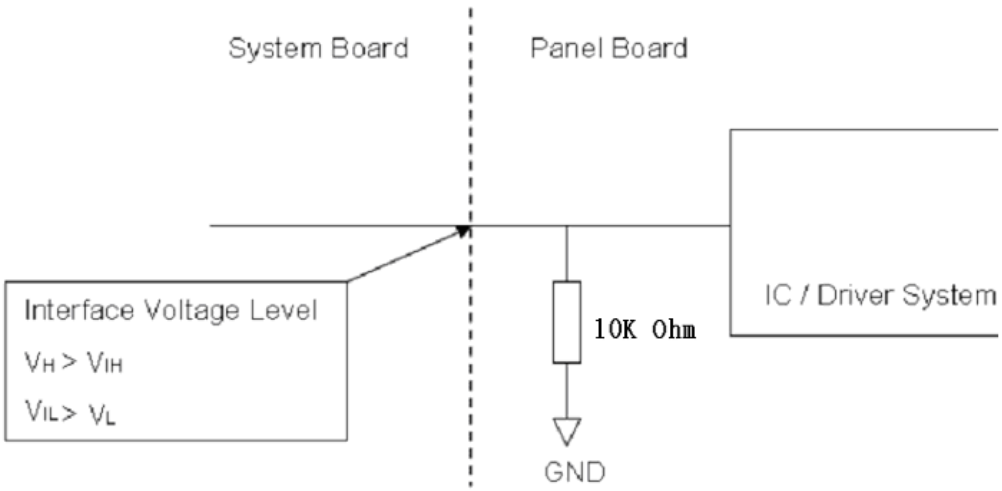
Fig. 1 Normal scan (pin 17, LR = High ; pin 18, UD = Low)

Fig. 2 Reverse scan (pin 17, LR = Low ; pin 18, UD = Low)

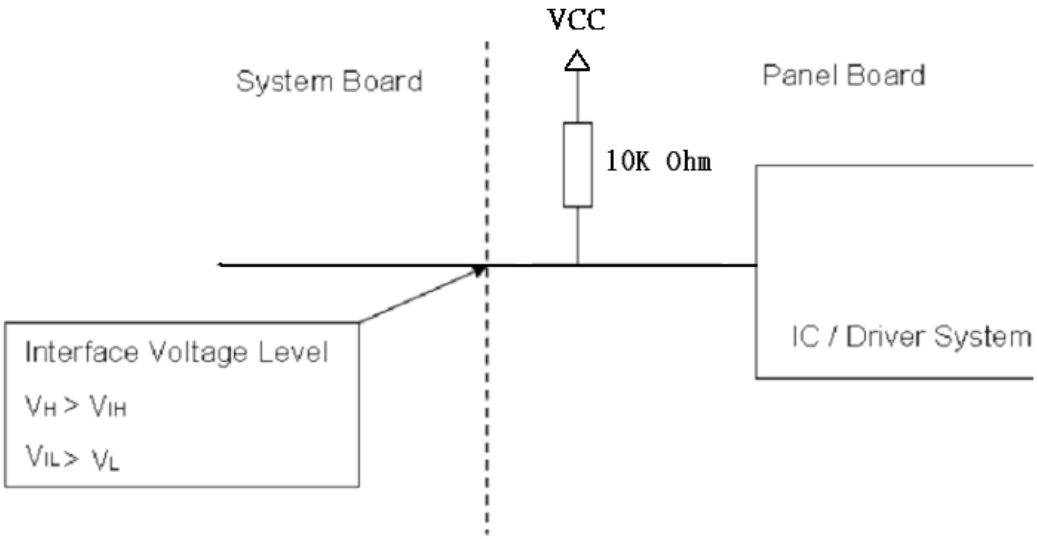
Fig. 3 Reverse scan (pin 17, LR = High ; pin 18, UD = High)

Fig. 4 Reverse scan (pin 17, LR = Low ; pin 18, UD = High)

UD Signal



LR Signal



5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input. (0: Low Level Voltage, 1: High Level Voltage)

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

The brightness of each primary color (red, green and 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 the assignment of color versus data input.

(0: Low Level Voltage, 1: High Level Voltage)

Color		Data Signal																							
		Red								Green								Blue							
		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 Colors	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
	Red	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale Of Red	Red(0) / Dark	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(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/ Dark	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	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(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

6. INTERFACE TIMING

6.1 TIMING CHARACTERISTICS

The input signal timing specifications are shown as the following table and timing diagram

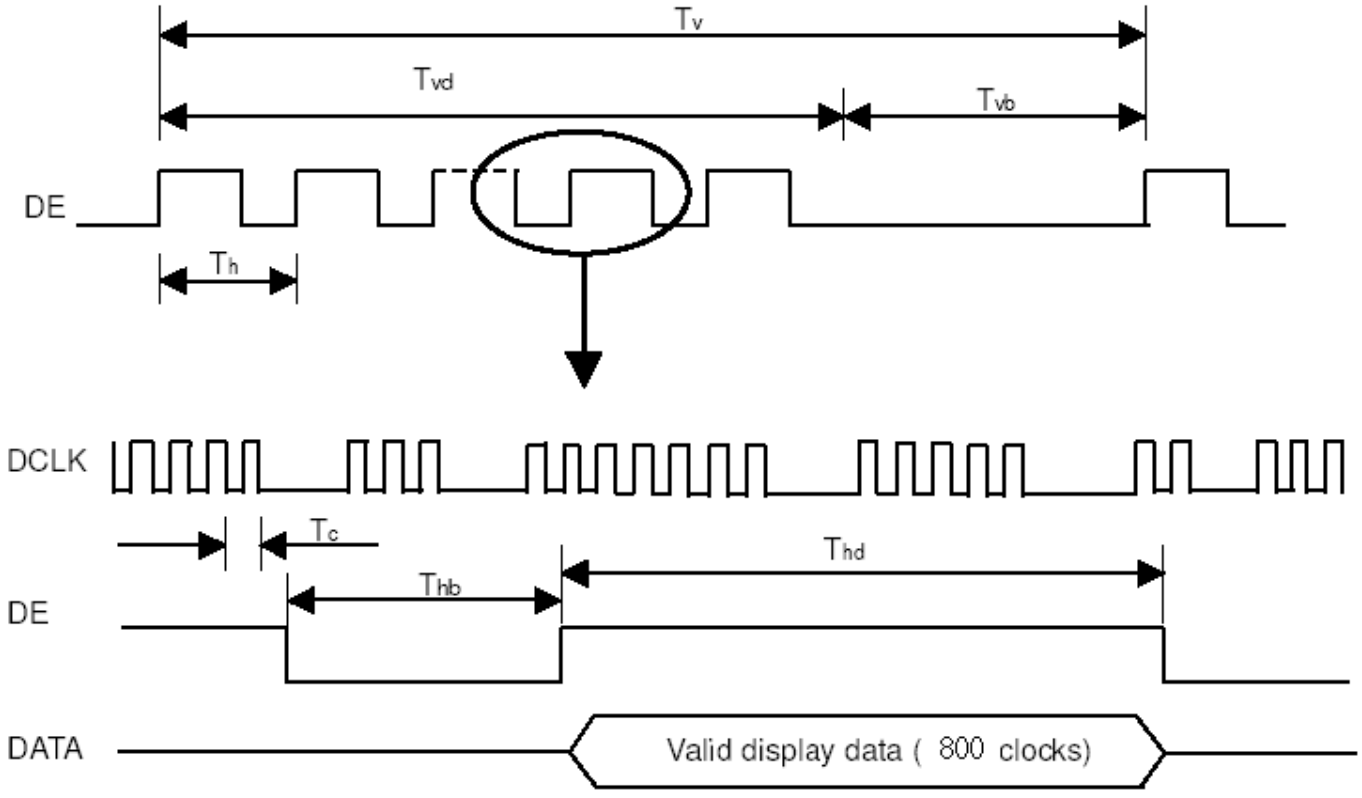
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Vertical Display	Period	Tv	490	500	550	T_h	Tv=Tvd+Tvb
	Active	Tvd	-	480	-	T_h	-
	Blanking	Tvb	10	20	70	T_h	-
Horizontal Display	Period	T_h	930	992	1090	Tclock	Th=Thd+Thb
	Active	T_{hd}	-	800	-	Tclock	-
	Blanking	T_{hb}	130	192	290	Tclock	-
Clock Frequency		$1/T_{clock}$	28	29.5	32	MHz	-

Note(1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

(2) Frame rate is 60Hz.

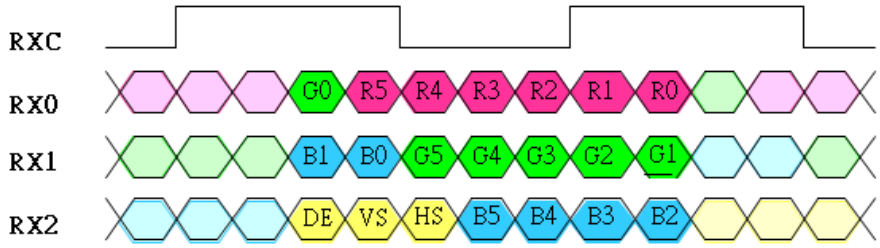
(3) The Tv(Tvd+Tvb) must be integer, otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM

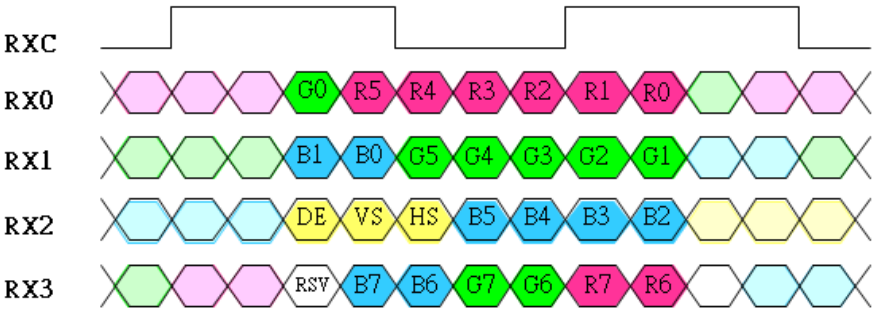


6.2 LVDS INPUT DATA FORMAT

FRC = "Low" or "NC" for 6 bit LVDS Input (RX3+/RX3- : floating)



FRC = "High" for 8 bit LVDS Input



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

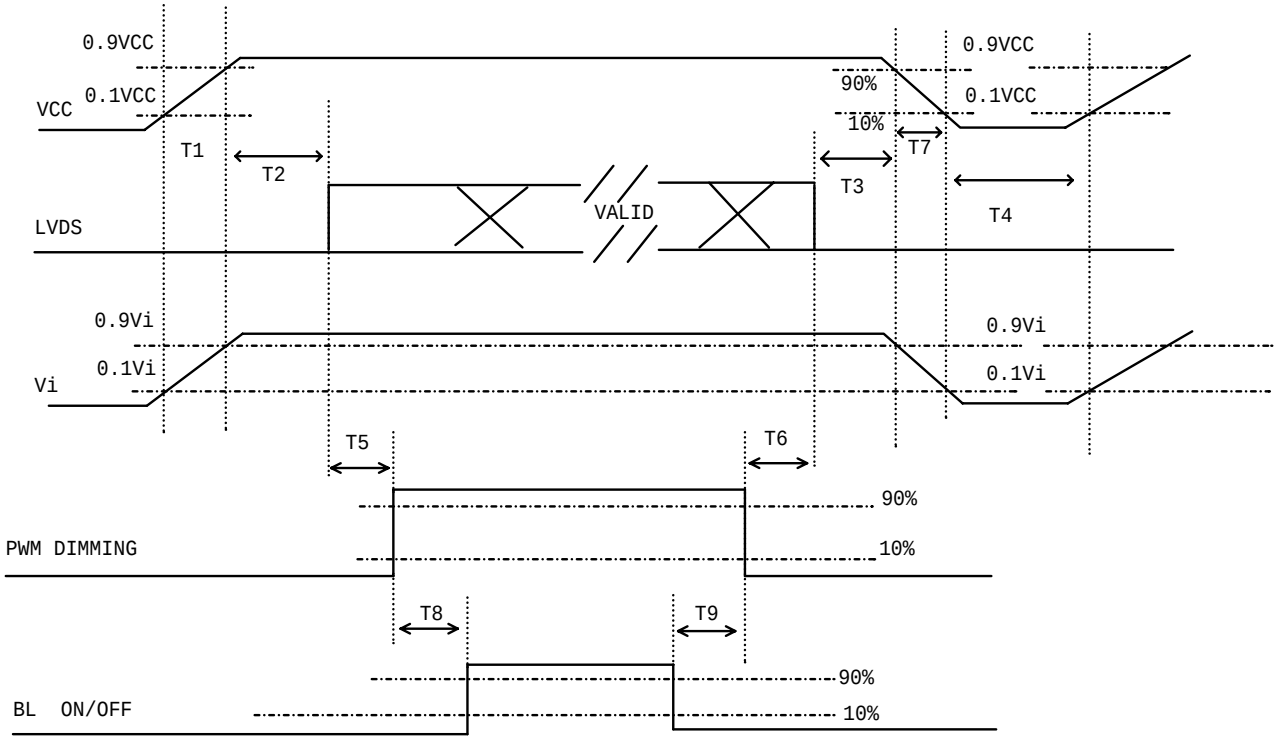
Note (2) Please follow PSWG

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	Red-pixel Data
R6	Red Data 6	Each red pixel's brightness data consists of these
R5	Red Data 5	8 bits pixel data.
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Data 7 (MSB)	Green-pixel Data
G6	GreenData 6	Each green pixel's brightness data consists of these
G5	GreenData 5	8 bits pixel data.
G4	GreenData 4	
G3	GreenData 3	
G2	GreenData 2	
G1	GreenData 1	
G0	GreenData 0 (LSB)	
B7	Blue Data 7 (MSB)	Blue-pixel Data
B6	Blue Data 6	Each blue pixel's brightness data consists of these
B5	Blue Data 5	8 bits pixel data.
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

Note (3) Output signals from any system shall be low or Hi-Z state when VCC is off.

6.3 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	20	-	-	ms
T6	10	-	-	ms
T7	5		300	ms
T8	10	-	-	ms
T9	10	-	-	ms

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Current	I_f	50±3	mA
Converter Duty		100	%

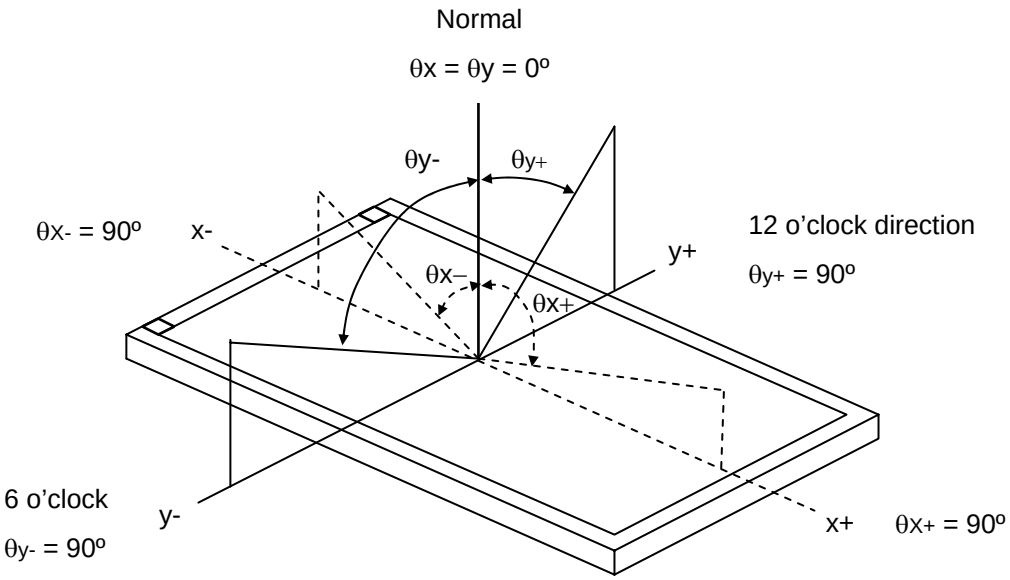
Note (1) I_f means the forward current of each channel

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2 and all items are measured at the center point of screen except white variation. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing Normal Angle	Typ – 0.03	0.645	Typ + 0.03		(1), (6)
		Ry			0.341			
	Green	Gx			0.312			
		Gy			0.625			
	Blue	Bx			0.153			
		By			0.053			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White		L_C		400	500		cd/m^2	(4), (6)
Contrast Ratio		CR		500	600		-	(2), (6)
Response Time		T_R			5	10	Ms	(3)
		T_F			11	16	Ms	
White Variation		δW			1.25	1.4	-	(5), (6)
Viewing Angle	Horizontal	θ_x+	CR ≧ 10	60	70		Deg.	(1), (6)
		θ_x-		60	70			
	Vertical	θ_Y+		50	60			
		θ_Y-		50	60			

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

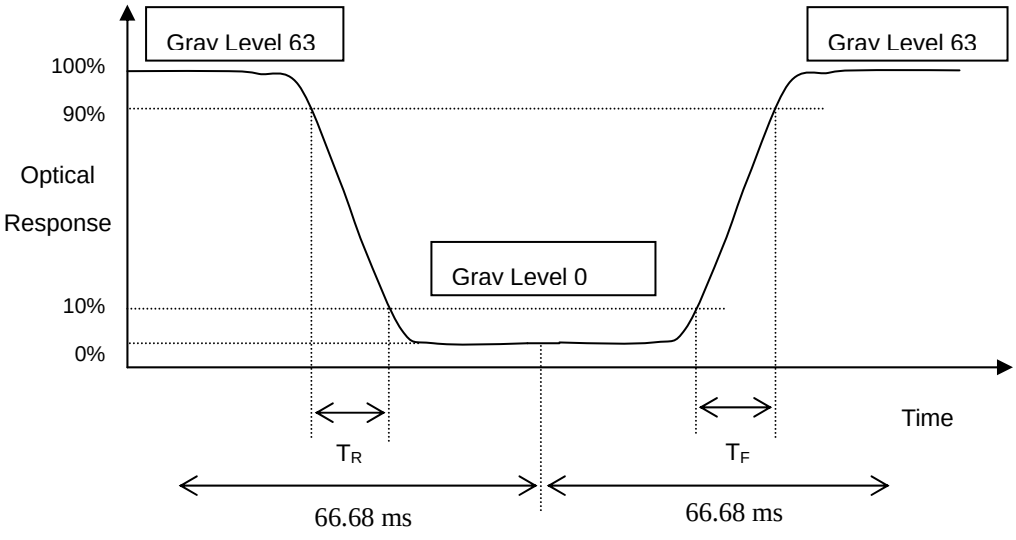
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time (T_R, T_F) and measurement method:



Note (4) Definition of Luminance of White (L_C):

Measure the luminance of gray level 63 at center point

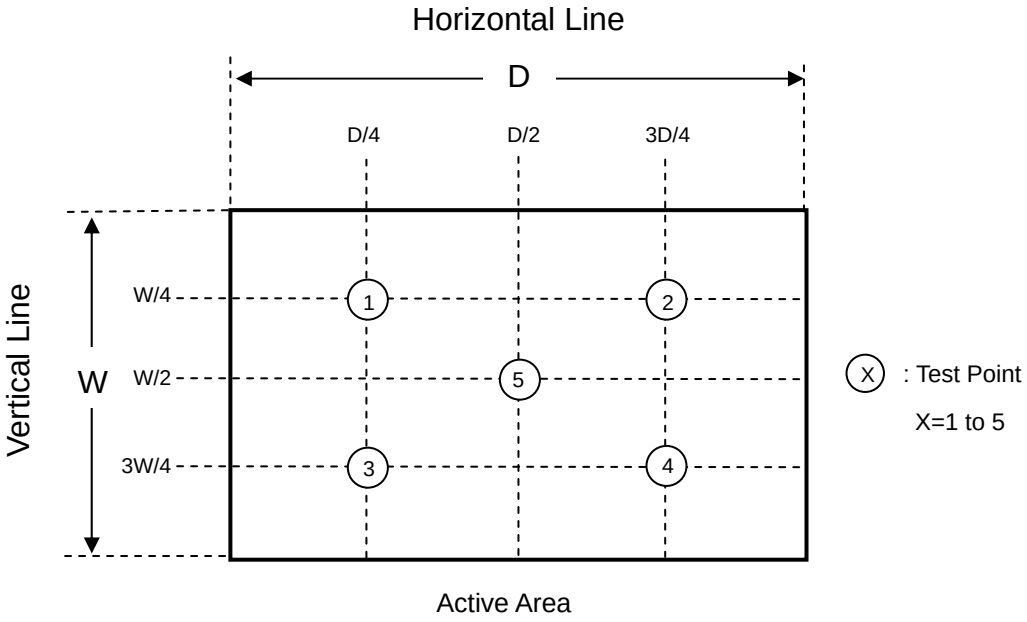
L_C = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (5).

Note (5) Definition of White Variation (δW):

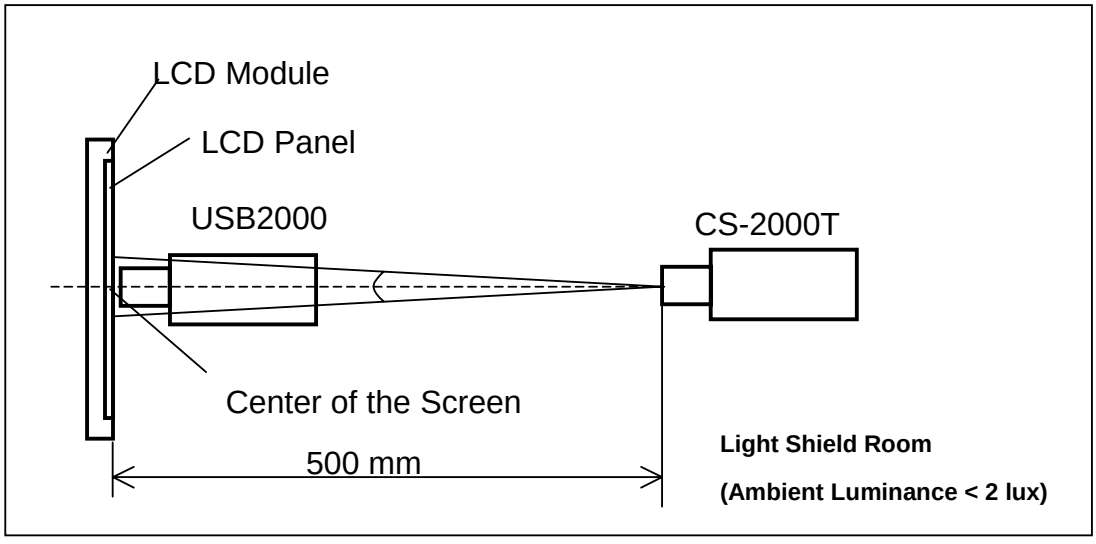
Measure the luminance of gray level 63 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



8. RELIABILITY TEST

8.1 RELIABILITY TEST CONDITION

No.	Test Item	Test Condition	Note
1	High Temperature Storage	95℃, 240 hours	(1),(2) (4),(5)
2	Low Temperature Storage	-40℃, 240 hours	
3	Thermal Shock Storage	{(-40℃, 0.5 hour) (85℃, 0.5 hour)}, 100 cycles	
4	High Temperature Operating	85℃, 240 hours	
5	Low Temperature Operating	-30℃, 240 hours	
6	High Temperature & High Humidity Operating	60℃, 90% RH, 240hours	(1),(2) (4),(6)
7	Shock (Non-Operating)	100G, 6ms, half sine wave, 3 times for ± X, ± Y, ± Z.	(3)
8	Vibration (Non-Operating)	3G, 10 ~ 200 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) The temperature of panel display surface area should be 95℃ Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

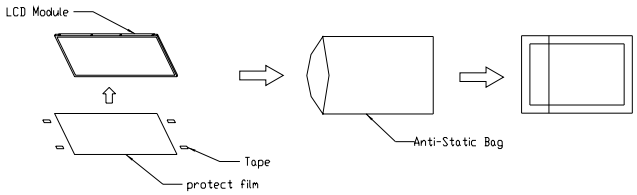
Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before the reliability test.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note (6) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

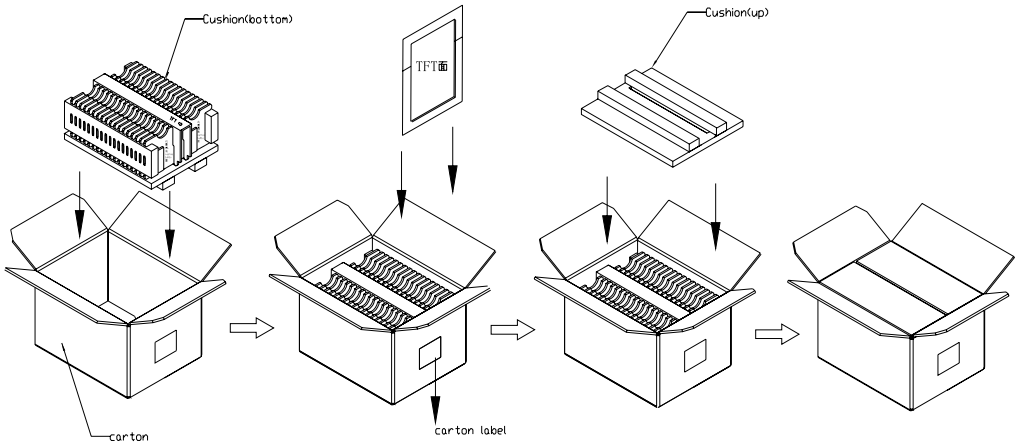
9. PACKAGING

9.1 PACKING METHOD

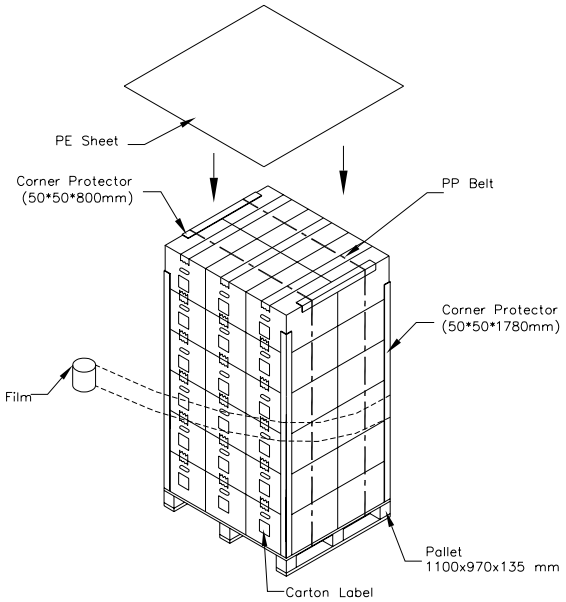


(1) 34pcs Modules/1 box

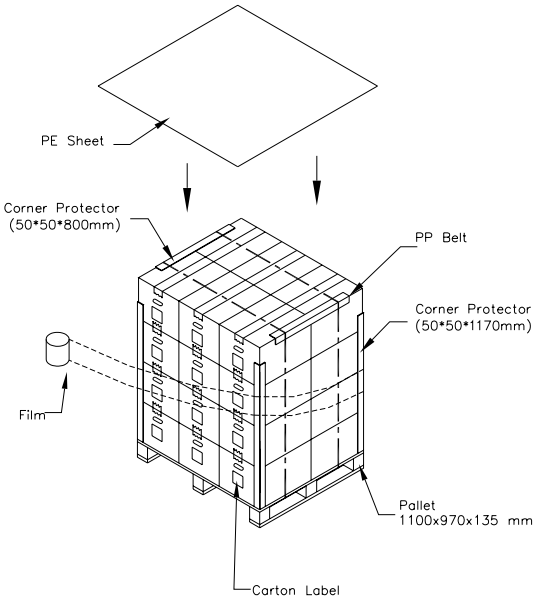
(2) Carton dimensions : 465(L)x362(W)x314(H)mm



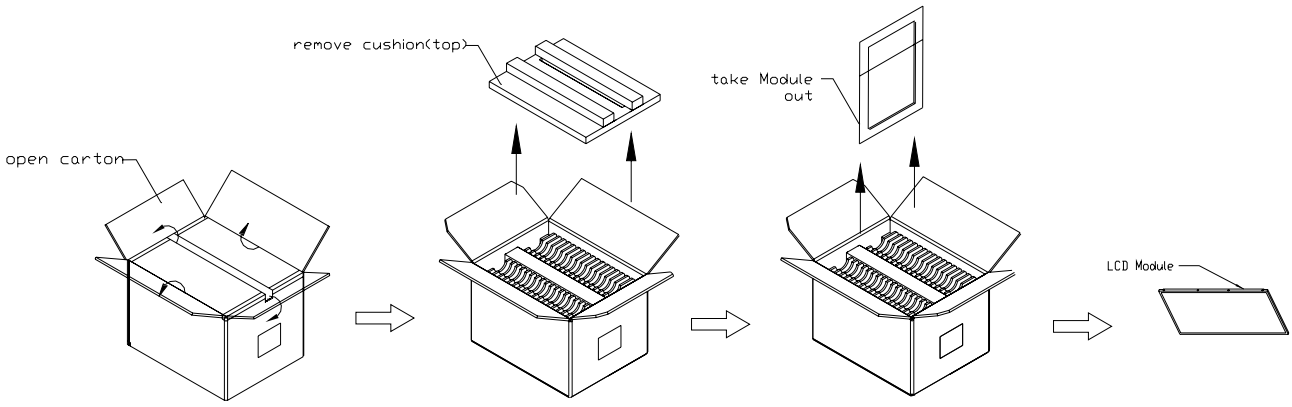
Sea / Land Transportation (40ft Container)



Air Transportation



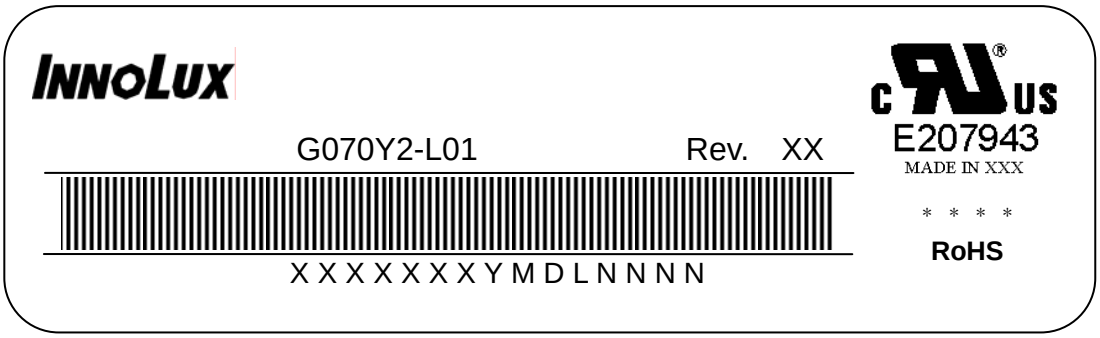
9.2 UN-PACKING METHOD



10. DEFINITION OF LABELS

10.1 INNOLUX MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.

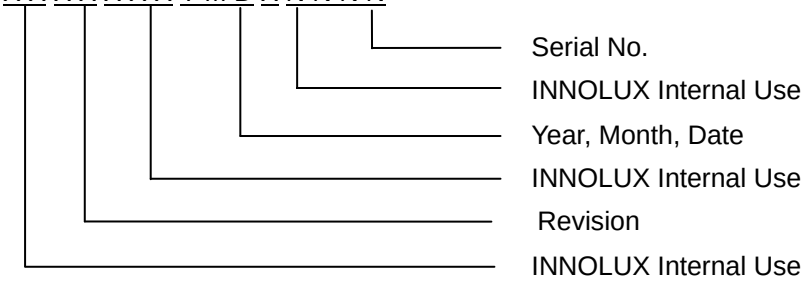


(a) Model Name: G070Y2 -L01

(b) Revision: Rev. XX, for example: A1, …, C1, C2 …etc.

(c) * * * *: Factory ID

(d) Serial ID: X X X X X X X Y M D X N N N N



Serial ID includes the information as below:

(a) Manufactured Date: Year: 1~9, for 2001~2009

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I , O and U

(b) Revision Code: cover all the change

Serial No.: Manufacturing sequence of product

11. PRECAUTIONS

11.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) To assemble or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

(11) Do not keep same pattern in a long period of time. It may cause image sticking on LCD

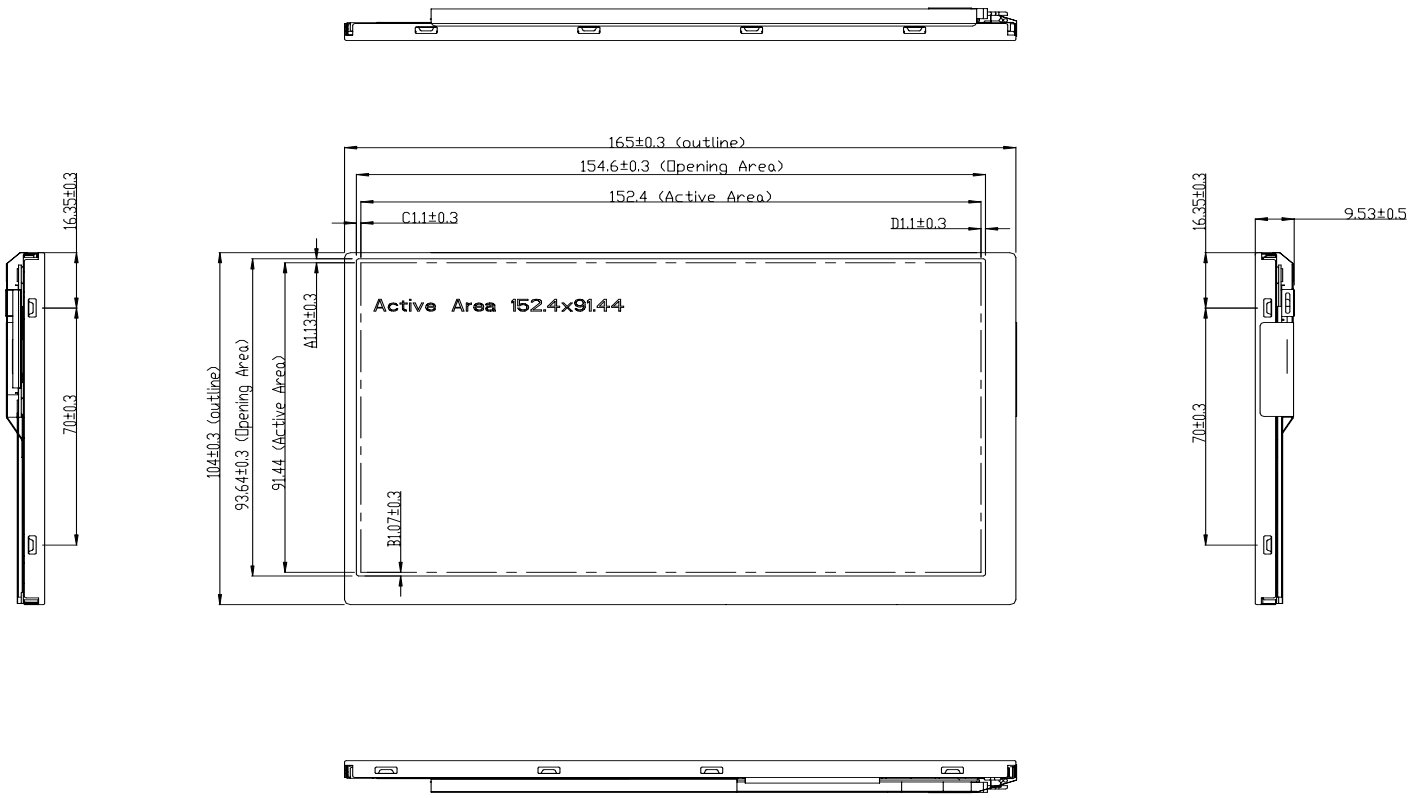
11.2 SAFETY PRECAUTIONS

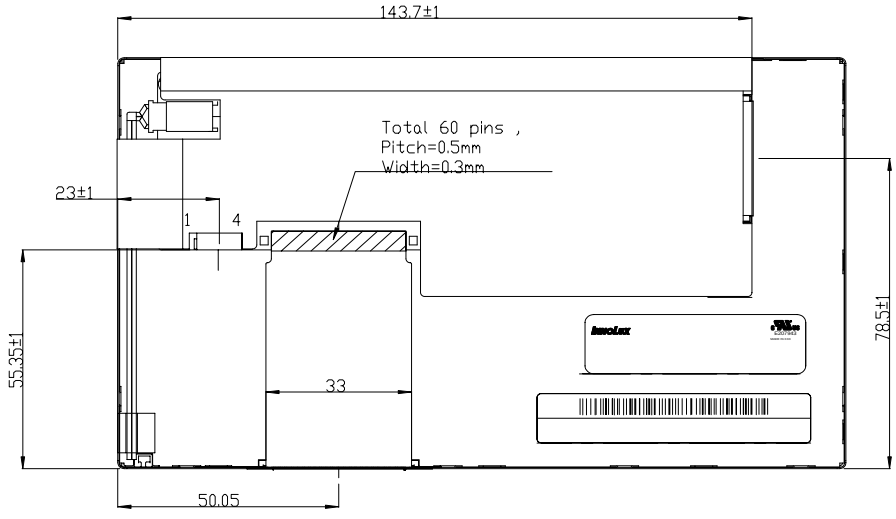
(1) Do not disassemble the module or insert anything into the Backlight unit to prevent electrical shock.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

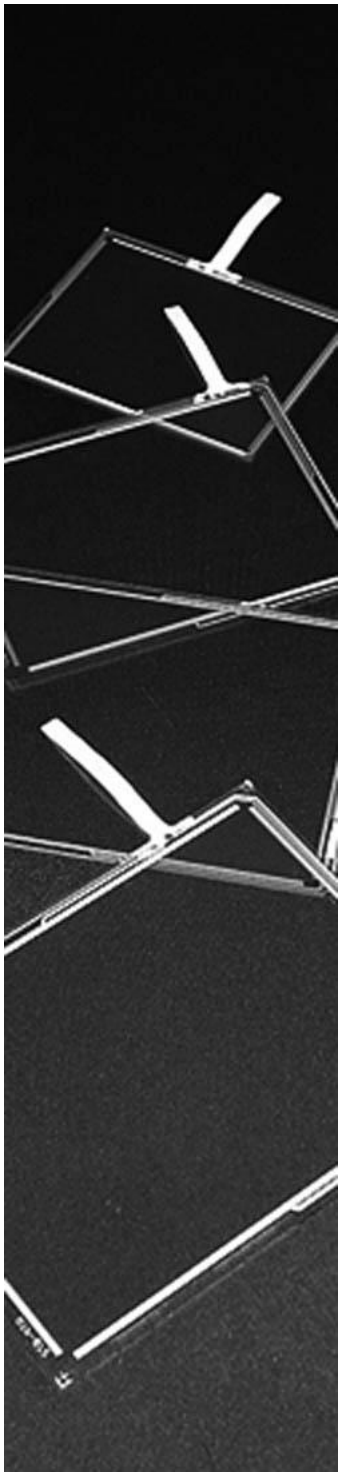
(3) After the module's end of life, it is not harmful in case of normal operation and storage.

12. MECHANICAL CHARACTERISTICS





Note:
1.UNSPECIFIED TOLERANCE=±0.3mm.
2.DISPLAY AREA POSITION TOLERANCE: |A-B|<=1mm
3.LVDS CONNECTOR: 73B20-0048RA-G4 (Starcon).
4.P/I CONNECTOR: LM123S004HTF13 (Unicorn).
5.THOSE SCREWS AT PCBA BOARD TO TWIST WITH FORCE IS 0.6 Kgf-cm AND REPEAT TIMES<= 4 .
6.THE WIRE IS UNDER THE PCB PROTECTOR FILM.



DMC Co., Ltd.

Analog Resistive Touchscreen
ATP/AST Series Product Specifications

Table of Contents

1. Product Specifications

1-1. Product Applicable

§ This specification is applied to the analog resistive touchscreen: ATP/AST Series.

1-2. Structure

§ Dimensions, structure, and shape are referred on the drawing attached.

1-3. Environmental Specifications

Specification	Value
Operating Temperature	-20°C to 70°C (no condensation)
Operating Humidity	-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)
Storage Temperature	-40°C to 80°C (no condensation)
Storage Humidity	-40°C to 60°C Less than 95%RH (no condensation) Exceeding 60°C 142.9g/m^3 (no condensation)
Chemical Resistance (top surface)	Toluene, Tricholoroethylene, Athetone, Alcohol, Gasoline, Machine Oil, Ammonia, Glass Cleaner, Mayonnaise, Ketchup, Wine, Salad Oil, Vinegar, Lipstick, etc.

1-4. Mechanical Characteristics

Specification	Value	
Activation Force	0.05N to 0.8N	
Operating Life	Input (finger)	10,000,000 hits
	Character Input (pen)	100,000 characters
Light Transmittance	Over 80% (typical value at full wavelength)	
Surface Hardness	Over 2H (by JIS pencil hardness)	

1-5. Electrical Characteristics

Specification	Value			
Maximum Voltage	DC6V			
Maximum Current	Top Electrode		100mA	
	Bottom Electrode		100mA	
	Between the Top and Bottom		0.5mA	
Linearity	Under ±2% (Under ±1% (typical value))			
Terminal Resistance	Aspect Ratio (Active Area)	4:3	Top Electrode	200~1kΩ
			Bottom Electrode	200~1kΩ
		16:9 (Wide Type)	Top Electrode	400~1.3kΩ
			Bottom Electrode	150~600Ω
		26:10 (Wide Type)	Top Electrode	500~2.0kΩ
			Bottom Electrode	100~400Ω
Insulation Resistance	Neighboring Terminals		Over 20MΩ at 25V	
	Active Area Electrodes		Over 20MΩ at 25V	
Chattering	Less than 10msec at ON/OFF.			

1-6. Appearance

§ Scratch, dust (W = width, L = length, D = average diameter = (longest + shortest) /2)

Item	Width (mm)	Length (mm)	Acceptable Numbers	Total
Linear(Scratch/Dust) Over 0.1mm in diameter refer to the Circular.	0.1≥W>0.05	4≥L	1pcs in ϕ30mm	Within 5pcs /panel
	0.05≥W>0.03	10≥L	2pcs in ϕ20mm	
	0.03≥W	20≥L	Acceptable	
Circular (Scratch/Dust)	0.4≥D>0.3 *1		1pcs in viewing area *1	
	0.3≥D>0.2		2pcs in ϕ30mm	
	0.2≥D		Acceptable	

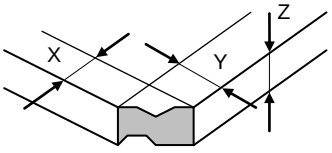
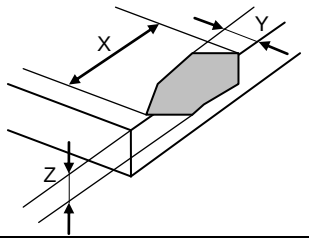
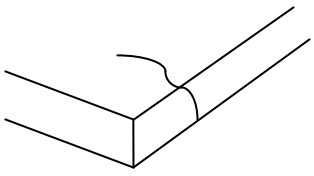
Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.

*1 Applied to the size of 14 inches or more.

§ Dirt

Acceptable if not noticeable on a black mat.

§ Chip, crack (t = glass thickness) (applicable only for the glass)

Item	Size (mm)			Acceptable Numbers
Corner		X	≤3	2pcs /panel
		Y	≤3	
		Z	≤t	
Side		X	≤5	2pcs /side
		Y	≤3	
		Z	≤t	
Crack				Not acceptable

2. Testing Regulation

2-1. Testing Regulation

§ If the regulation is not specified, the test is performed under the supplier's regulation.

§ Tests are performed under the room temperature unless specified. The room temperature is referred as follows:

Temperature: 20°C±5°C
Humidity: 65%±10%RH

2-2. Environmental Specifications

§ Chemical Resistance Test

Condition: Tested after leaving the chemical on the surface for 12 hours being wiped off by cloth.

Judgement: Must be no effect in appearance.

2-3. Mechanical Characteristics

§ Activation Force Test

Condition: Measured by depressing the point between the dots to the conduction by the testing rod (Figure 1).

Judgement: Must satisfy the specification.

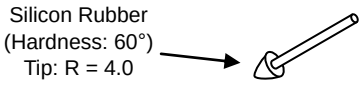


Figure 1. Testing rod 1

§ Operating Life Test (Finger)

Condition: Testing rod: Refer to Figure 1
Voltage: DC5V
Load: 3N
Cycle: 2 hits/sec

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

§ Operating Life Test (Pen)

Condition: Testing rod: Refer to Figure 2
Voltage: DC5V
Load: 2.5N
Input size: 10 x 10 mm
Input character: A to Z/minute

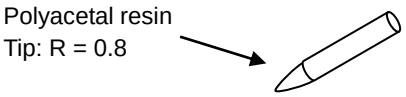


Figure 2. Testing rod 2

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.

2-4. Electrical Characteristics

§ Terminal Resistance Test

Condition: Top and bottom electrodes are measured at the terminal.

Judgement: Must satisfy the specification.

§ Insulation Resistance Test

Neighboring Terminals: Measured by applying the reference voltage to the terminals
Active Area Electrodes: Measured by applying the reference voltage to the top and bottom electrodes.

Judgement: Must satisfy the specification.

2-5. Appearance

§ Appearance Test

Condition: Tested by an examiner with over 1.0 eyesight at 30cm away from the product under the transmittable light at over 60° the surface of the product.

Judgement: Must satisfy the specification.

3. Reliability Condition

3-1. Temperature Condition

§ Temperature Condition Test

Following test are performed in the condition with no dew condensation:

Cold Test: Tested after leaving the parts in -40°C±3°C for 240 hours and in the room temperature for 2 hours.

Heat Test: Tested after leaving the parts in 80°C±3°C for 240 hours and in the room temperature for 2 hours.

Humidity Test: Tested after leaving the parts in the temperature 60°C±3°C, humidity 90 to 95% for 240 hours and in the room temperature for 2 hours.

Cycle Test: Tested after 5 cycles of leaving the parts in the temperature -30°C±3°C for 1 hour and in the room temperature for 0.5 hours, then leaving the parts in the temperature 70°C±3°C for 1 hour and in the room temperature for 0.5 hours.

Judgement: Must satisfy the following:

Activation Force:	Must satisfy the specification.
Linearity:	Must satisfy the specification.
Terminal Resistance:	Must satisfy the specification.
Insulation Resistance:	Must satisfy the specification.
Appearance:	Must satisfy the specification.

4. Recommended Connector

4-1. Recommended Connector

Part No.	Pins	Pitch
KCA-K4R	4 pin Double-sided	1.25mm

5. Handling Notes

5-1. Precautions

§ This product is intended for use in standard applications (computers, office automation, and other office equipment, industrial, communications, and measurement equipment, personal and household devices, etc.) Please avoid using this product for special applications where failure or abnormal operation may directly affect human lives, or cause physical injury or property damage, or where extremely high levels of reliability are required (such as aerospace systems, vehicle operating control, atomic energy controls, medical devices for life support, etc.).

5-2. Handling Notes

§ Do not depress or scratch the product with any object with a sharp edge or hard end.

§ Do not put this product close to fire.

§ Do not wipe this product with too much load.

§ Do not strongly rub this product locally. It may affect the product's functions.

§ Do not hit the product with a hard object.

§ Do not forcibly bend or fold the product.

§ When the product is stored, make sure it is packed in a packing box and stored in a storage temperature range, eliminating any outside load.

§ Do not use or store the product under a condition where the product will be exposed to water, organic solution or acid.

§ Do not use the product under the direct sunlight.

§ Do not disassemble the product.

§ When you handle the product, Hold the product by its body. Do not hold by the tail.

§ Clean the product with a soft cloth or a soft cloth with neutral detergent or alcohol. When contaminated by chemicals, wipe them off immediately with caution not to cause injury to human body.

§ The edge of the glass is not rounded and may cause injury.

5-3. Construction Notes

§ The environmental specifications, mechanical characteristics, and electrical characteristics are only applied to the Active Area.

§ Do not use the touchscreen when the condensation occurs. The condensation inside of the touchscreen is a natural phenomenon and should disappear after the touchscreen is warmed up.

5-4. Electrical & Software Notice

The best performance can be obtained when used with the original analog resistive touchscreen controller, "TSC-10" Series. If the touchscreen controller or controller software is to be developed by the customer, please note the following:

§ There is a contact resistance between the top and bottom electrodes and it changes by the pressure of a finger or a pen. The data must be read after the contact resistance becomes stabilized.

§ The terminal resistance of the analog resistive touchscreen varies by the individual, time, and environment. The controller software must have the calibration function to adjust the input position and the display position.

§ The analog resistive touchscreen outputs 2 point input as 1 point in between the 2 points. The controller software must not be designed to have the 2 point input function.

§ For drawing applications, the line may be intermittent when the pen comes on the dot spacers. A software compensation is needed.

5-5. Mounting Notes

§ At mounting the touchscreen, refer to the separate document, [Resistive Touch Screen Mounting Guidance]. The appropriate structure differs according to touchscreen size, LCD, chassis design, usage environment and so on. Please conduct the evaluation with actual products at the trial stage, and confirm that your structure is appropriate prior to fixing the structure design.

6. Warranty

6-1. Warranty Period

§ The warranty period is limited to 1 year from the date of shipping. The warranty for the initial defection such as appearance defection is limited to 1 month.

§ Any defected parts under proper use will be examined by the supplier and replaced by the new parts if the defection is considered to be caused by the supplier.

§ The replacement is subject to be included in the next lot.

6-2. Warranty Target

§ The warranty only covers the product itself and does not cover any damage to others caused by using this product. Onsite repair or replacement is not supported.

§ We will do our best for delivery problem and product defections, but the warranty for the production line is not covered.

§ Resistive touchscreens are structurally not repairable. All defections are subject to replacement.

6-3. Warranty Exceptions

Following conditions are not covered with the warranty and subject to charge.

§ Any malfunctions and damages during transportation and transfer by the user.

§ Any malfunctions and damages caused by a natural disaster or a fire.

§ Any malfunctions and damages caused by static electricity

§ Any malfunctions and damages caused by the failure of the associated equipment.

§ If the product is remodeled, disassembled or repaired by the user.

§ If the product is glued onto the equipment and uninstalled.

§ Any malfunctions and damages caused by an improper usage and handling against the specifications and notes.

6-4. Tools

§ All the tools, such as CAD data (except for the drawing for approval), block copies (films), printing screens, and die-cut plates are not to be provided for administrative purpose.

6-5. Changes

§ Because of the manufacturing process, changing the dimensions, circuit pattern, and the tail position requires replacing most of the tools and is subject to high tooling charge. Please be careful when ordering and approving the drawing.

§ Circuit pattern and the materials that does not affect the environmental, electrical, and mechanical characteristics such as film, glass, ink and glue are subject to change for the supplier’s reason or for improvement within the specifications.

§ Standard products are subject to change for improvement without notice.

6-6 RoHS Compliance

§ This product complies with RoHS

7. Revision History

Rev1 (April 15, 1998)

Initial release

Rev2 (June 1, 1999)

The overall revision by specification review.

Rev3 (April 1, 2002)

The address in the office was changed by the move.

Rev4 (August 16, 2002)

1-4.Activation Force is changed “50g± 30g” to “0.5N±0.3”.

1-4.Light Transmission is changed 76% to 80%(TYP).

Rev5 (September 3, 2002)

1-3.Operating Temperature is changed “0°C to 60°C” to “-20°C to 70°C”.

1-3.Storing Temperature is changed “-20°C to 70°C” to “-40°C to 80°C”

1-4.Operating Life is changed “1,000,000 hits” to “10,000,000 hits”.

1-5.Linearity is changed “Under ±2%” to “Under ±1% (typical value)”.

Rev6 (June 28, 2004)

1-3.Operating Humidity is changed “Less than 90%RH (no condensation)” to “-20°C to 60°C Less than 90%RH (no condensation) Exceeding 60°C 133.8g/m^3 (no condensation)”.

1-3.Storing Humidity is changed “Less than 95%RH (no condensation)” to “-40°C to 60°C Less than 95%RH (no condensation), Exceeding 60°C 142.9g/m^3 (no condensation)”.

1-5.Maximum Voltage is changed “DC5V” to “DC6V”.

1-5.Linearity is changed “Under ±1% (typical value)” to “Under ±2% (Under ±1% (typical value))”.

Rev7 (October 15, 2004)

4-4.Electrical & Software Notice: Changed “FIT-10 series” to “TSC-10 series”.

Rev8 (April 7, 2005)

Added Item4 Recommended Connector.

Rev9 (September 6, 2005)

2-3.Mechanical Characteristics: Added Operating Life Test (Pen).

Rev10 (November 10, 2006)

The specification item name was changed.

1-3."Storing Temperature" to "Storage Temperature"

1-3."Storing Humidity" to "Storage Humidity"

1-4."Operating Load" to "Activation Force"

1-4."Light Transmissivity" to "Light Transmittance"

1-4."Top Surface Hardness" to "Surface Hardness"

2-3."Operating Load Test" to "Activation Force Test"

2-3."Operating Load" to "Activation Force"

3-1."Operationg Load" to "Activation Force"

1-4.Operating Force is changed "0.5N±0.3N" to "0.05N to 0.8N".

1-5.Insulation Resistance is changed "Over 100MΩ at 25V" to "Over 20MΩ at 25V".

1-6.Tip, crack: Deleted "Applied only in the Active Area. Scratches or dusts in the outside of the Active Area are acceptable unless the electrical characteristics are affected.".

2-3. § Operating Life Test (Pen) Load: 300g to 250g

5-5. § Cushion: Added an installation position of a cushion.

7.Added Revision History.

Rev11 (March 23, 2010)

1-6. Appearance specification was revised. Characters of scratch/dust were classified into Circular and Linear. The total acceptable number of scratch/dust was added.

2-3. Unit of Load (g) changed to (N) to unify the unit

2-3. Operating Life Test (Finger) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

2-3. Operating Life Test (Pen) Activation Force, Within ±50% of the specification → Must satisfy the specification. (Clerical error was corrected)

3-1. Temperature Condition Cold Test -30℃→ -40℃ (Clerical error was corrected)

3-1. Activation Force, Within ±50% of the specification. → Must satisfy the specification
(Clerical error was corrected)

Rev12 (Aug 25, 2011)

6-4. Tools: The below description has been deleted.

"To maintain the quality, the printing screens and the die-cut plates are generally limited to use up to 1 year. Reorders after 1 year from the initial order or from the last renewal are subject to the tooling charge for replacing the printing screens and the die-cut plates. Reorders for the discontinued standard parts are also subject to tooling charge."

6-6. RoHS Compliance: Description about RoHS compliance has been added.

Rev12.1(May 24, 2012)

Address has changed as Tokyo office had moved.

Rev13 (Feb 13, 2013)

1-6. Appearance

Tip → Chip (Scribal error corrected)

5-2. Handling Notes

- Do not depress or scratch the product with any object with a sharp edge or end. → Do not depress or scratch the product with any object with a sharp edge or hard end. (Description changed)
- Do not put this product close to fire. (Description added)
- Do not wipe this product with too much load. (Description added)
- Do not strongly rub this product locally. It may affect the product' s functions. (Description added)
- Do not hit the product with a hard object. (Description added)

Rev14 (Aug 17, 2015)

1-5. Electrical Characteristics

Terminal Resistance Wide Type aspect ratios were added (Indication method was changed)
Minimum values were added. (Indication method was changed)

Change of the building name in the address was reflected in the document.

Nisseki Takanawa Bldg. → Takanawa Sengakuji Ekimae Bldg.

Rev15 (Sept 9, 2015)

5-5. Mounting Notes

Details of the mounting notes are deleted from this document. Mounting notes are described in the separate document, [Resistive Touch Screen Mounting Guidance] instead.

ATP/AST Series Product Specifications
Rev15, September 9, 2015

DMC Co., Ltd.
http://www.dmccoltd.com/english/
11F Takanawa Sengakuji Ekimae Bldg., 2-18-10 Takanawa, Minato-ku, Tokyo 108-0074, Japan
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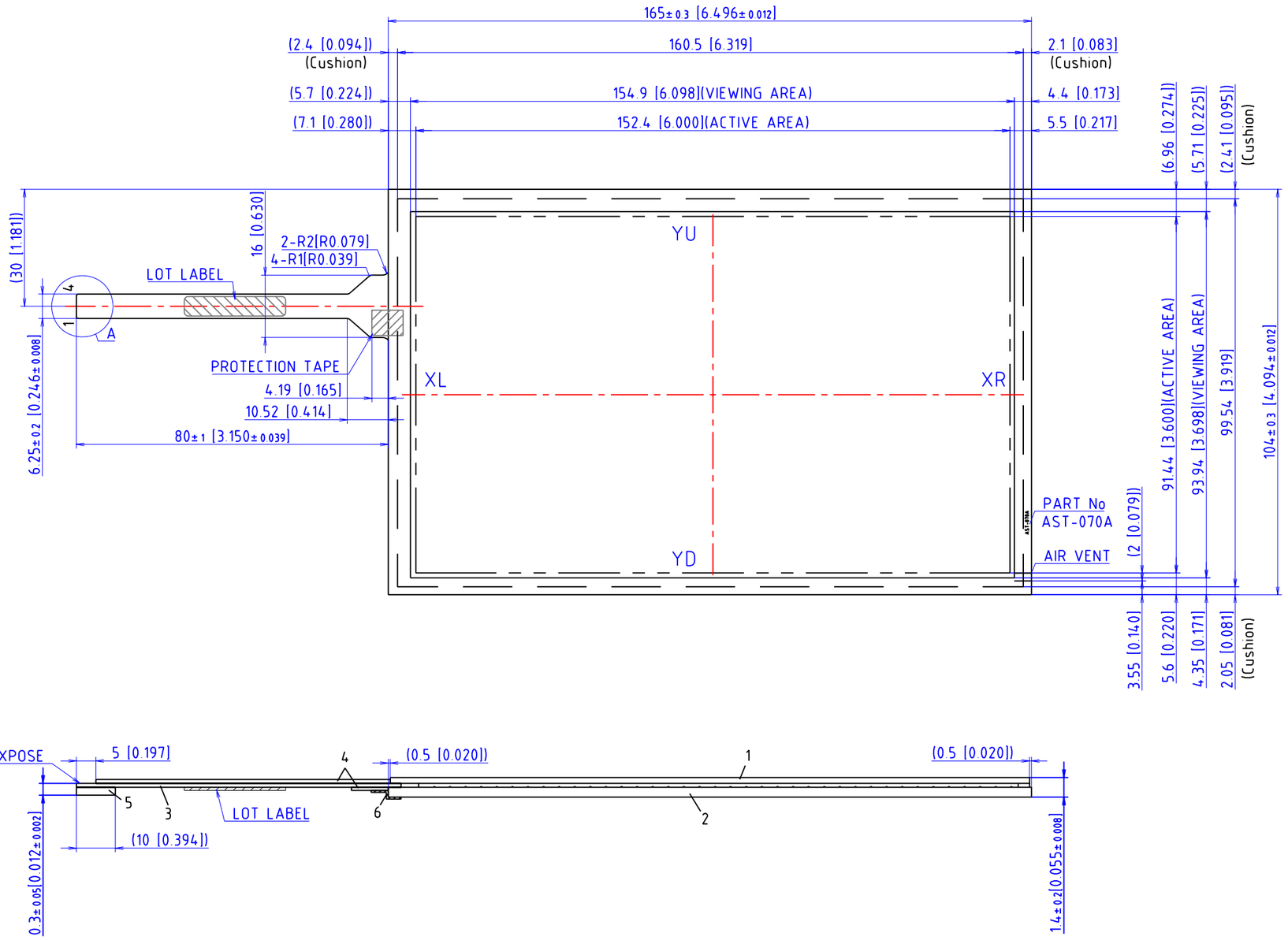
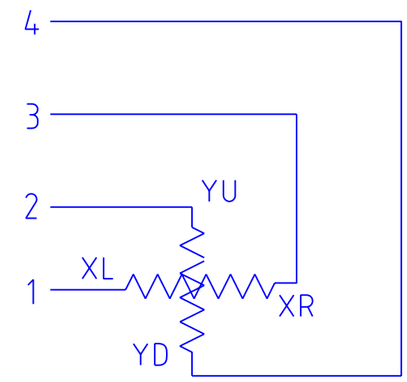
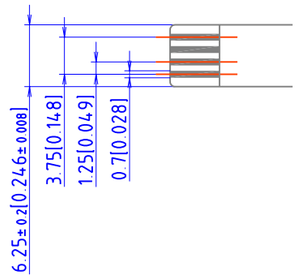


PIN ASSIGNMENT



SECTION A



TOLERANCE=± 0.5mm(0.02in)
EXCEPT WHERE INDICATED

UNIT=mm[inch]

1	ITO FILM (ANTI GLARE)
2	ITO GLASS
3	TAIL
4	REINFORCEMENT FILM
5	STIFFENER
6	PROTECTION TAPE

DATA MODUL

PART No.	DATE
AST-070A080A	Aug , 30 , 2006
TYPE STANDARD TOUCHSCREEN CIRCUIT DRAWING	DMC Co., Ltd.