

# SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-1024600L3TMQW-T56H
APPROVED BY	
DATE	

□ Approved For Specifications

□ Approved For Specifications & Sample

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## **RECORD OF REVISION**

Page	Contents	Editor
-	New Release	Patrick
-		
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# 1. FEATURES

The TFT is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching device. This module is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 10.1 (17:10) inch diagonally measured active display area with WSVGA(1024 x 600 pixel) resolution.

- (1) 10.1 (17:10 diagonal) inch configuration
- (2) One channel LVDS interface
- (3) 262K color by 6 bit R.G.B signal input
- (4) RoHS Compliance
- (5) Resistive type touch panel

Item	Specifications	Unit	Note
LCD size	10.1" (Diagonal)	inch	
Active area	222.72 (H) ×125.28 (V)	mm	
Number of pixels	1024(H) × 600(V)	pixels	
Pixel pitch	0.2715(H) × 0.2088(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262,144	colors	
Display mode	Normally white		
Dimensional outline	235.0 (Typ) ×145.8 (Typ) × 10.05 (D)	mm	
Back-light	Single LED (Side-Light type)		
Weight	TBD	g	
Surface treatment	Anti-glare		

# 2. PHYSICAL SPECIFICATIONS

# 3. ABSOLUTE MAX. RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

ltem	Symbol	Val	ues	UNIT	Note
	Cymbol	Min.	Max.		Note
Logic Supply Voltage	Vdd	-0.3	5.0	V	
Operating Temperature	Тора	-5	60	°C	
Storage Temperature	Тѕтс	-20	70	°C	

# 4. ELECTRICAL CHARACTERISTICS

#### 4.1 TFT LCD Module

ltem	Symbol		Values			Note	
nem	Symbol	Min.	Тур.	Max.	UNIT	Note	
Power voltage	VDD	3.0	3.3	3.6	V	Note1	
Current of power supply	IDD	-	0.3	-	А	VDD=3.3V Black pattern	

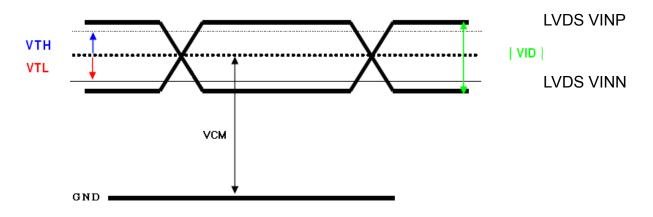
Note 1: VDD-dip condition :

when 2.7V  $\leq$  VDD<3.0V , td  $\leq$  10ms.

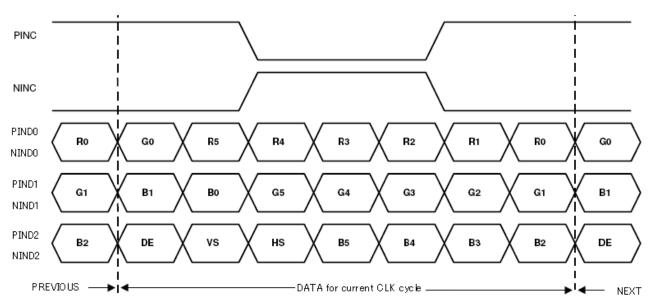
VDD>3.0V  $\,^{,}\,$  VDD-dip condition should be same as VDD-turn-con condition.

#### 4.2 Switching Characteristics of LVDS Receiver

Item	Symbol	Min.	Тур.	Max.	Unit	Condition
Differential Input High Threshold	VTH			100	mV	VCM=1.2V
Differential Input Low Threshold	VTL	-100			mV	
Input current	IIN	-10		+10	uA	
Differential input Voltage	VID	0.2		0.6	V	
Common Mode Voltage Offset	VCM	$\frac{ VID }{2}$	1.25	$2.4 - \frac{ VID }{2}$	V	



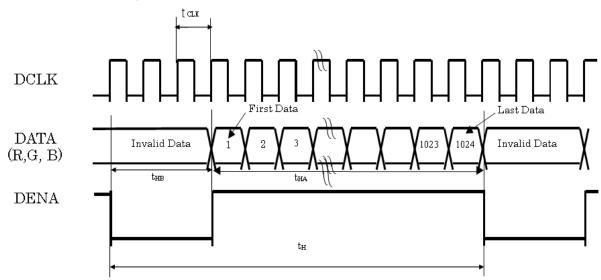




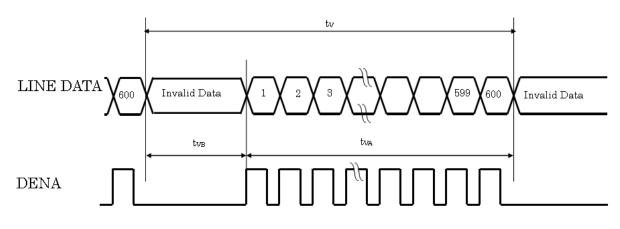
	Item					Тур.	Max.	Unit
LVDS input signal sequence		Frame F	Rate	tclk	41	51.2	57	MHz
			Horizontal total Timing	t <sub>H</sub>	1214	1344	1364	tCLK
		Horizontal	Horizontal effective Timing	t <sub>HA</sub>		1024		tCLK
LCD input signal sequence	DENA		Horizontal Blank Time	t <sub>HB</sub>	190	320	340	tCLK
(input LVDS Transmitter)			Vertical total Time	t∨	615	365	645	t <sub>H</sub>
		Vertical	Vertical effective Time	t <sub>VA</sub>		600		t <sub>H</sub>
			Vertical Blank Time	t <sub>VB</sub>	15	35	45	t <sub>H</sub>

#### 4.4 Timing characteristics of input signals

Horizontal timing sequence



# Vertical timing sequence

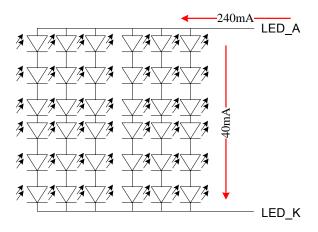


#### 4.5 Backlight Driving Conditions

ltem	Symbol		Values	Unit	Note	
nem	Symbol	Min.	Тур.	Max.	Onit	Note
LED voltage	VAK		18.9	21.6	V	l <sub>L</sub> =240mA Ta=25℃
LED current	IL		240		mA	Note (1)
LED current			205		mA	Note (1)
LED Life Time	-		30K		Hour	Note (2)

Note (1): The constant current source is needed for white LED back-light driving. When LCM is operated over 60 deg.C ambient temperature, the I<sub>L</sub> of the LED back-light should be adjusted to 205mA max

There are 6 Groups LED shown as below, VLEDA-LEDK=18.9V ,Ta=25 $^\circ$ C



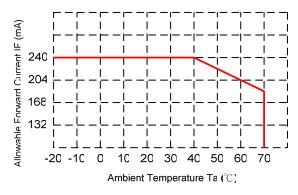
Note(2) : Condition: Ta=25 $^{\circ}$ C, continuous lighting

Life time is estimated data.

Definitions of failure:

- 1. LCM brightness becomes half of the minimum value.
- 2. LED doesn't light normally.

When LCM is operated over 40  $^{\circ}\mathrm{C}$  ambient temperature, the ILED should be follow :



# 5. OPTICAL SPECIFICATION

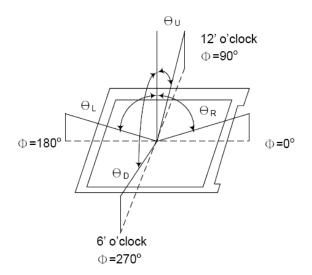
### 5.1 Optical specification

ltom	Symbol	Condition	Values			Unit	Note	
Item			Min.	Тур.	Max.	Unit	NOLE	
	θL		60	70				
Viewing angle	$\theta R$	(CR≧10)	60	70		dograa	Note1	
	θυ	(CR≦10)	60	70		degree	Note2	
	$\theta  D$		40	50				
Response time	Tr			5	7	msec	Note3	
Response time	TF			20	28	msec	NOLES	
Contrast ratio	CR		400	500			Note2	
	WX		0.26	0.31	0.36			
	WY		0.28	0.33	0.38			
	RX		0.54	0.59	0.64			
	RY	Normal <i>θ</i> =Φ=0°	0.28	0.33	0.38		Note1	
Color chromaticity	GX	θ-Φ-0	0.29	0.34	0.39		Note4	
	GY		0.54	0.59	0.64			
	BX		0.11	0.16	0.21			
	BY		0.05	0.1	0.15			
Luminance	L		350	440		cd/m <sup>2</sup>	Note4	
Luminance uniformity	YU		70			%	Note5	

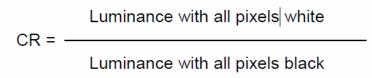
#### 5.2 Measuring Equipment

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7 of view : 1° / Height : 120mm.)

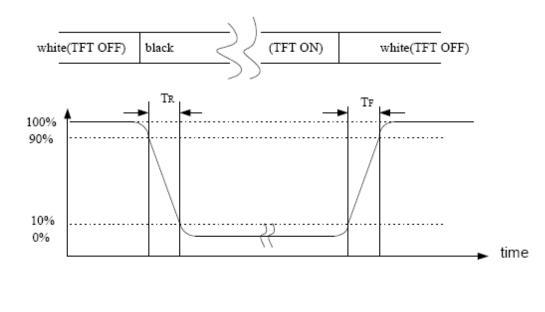
Note 1 : Definition of viewing angle range

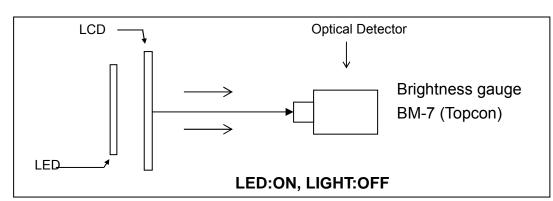


Note 2 : Definition of Contrast Ratio (CR) : measured at the center point of panel

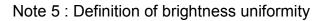


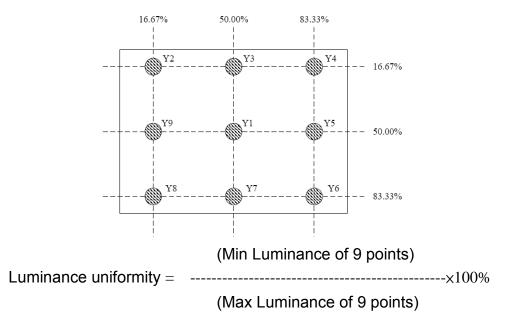
Note 3 : Definition of Response time : Sum of TR and T





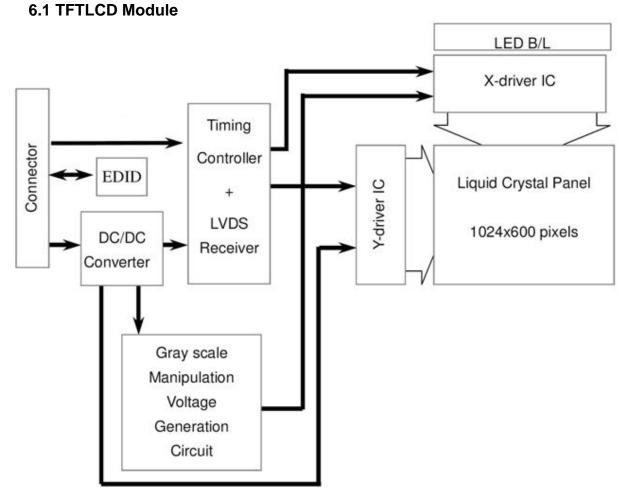




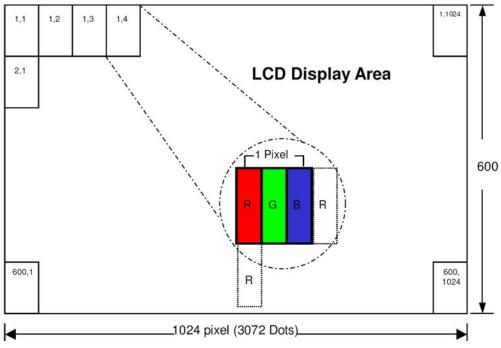


- Note 6 : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction
- Note 7 : Condition: Ta= $25^{\circ}$ C, Life time is estimated data. Definitions of failure:
  - i. LCM brightness becomes half of the minimum value.
  - ii. LED doesn't light normally.

# 6. BLOCK DIAGRAM



#### 6.2 Pixel format



# 7.INTERFACE

# CN1(Input signal): CSTAR DS100-430-H23 (equivalent JAE FI-XB30SSRL-HF16)

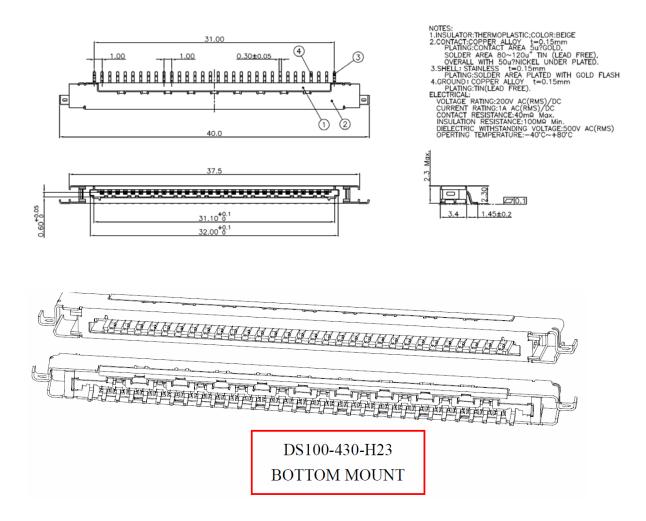
Pin No.	Symbol	Description	Note
1	GND	Ground	
2	VDD	3.3V Power	
3	VDD	3.3V Power	
4	V_EDID	3.3V Power for EDID	
5	NC	No connection	
6	CLK_EDID	EDID Clock Input	
7	DATA_EDID	EDID Data Input	
8	RXIN0-	LVDS Signal - channel0-	
9	RXIN0+	LVDS Signal+ channel0+	
10	GND	Ground	
11	RXIN1-	Data Input channel1-	
12	RXIN1+	Data Input channel1+	
13	GND	Ground	
14	RXIN2-	Data Input channel2-	
15	RXIN2+	Data Input channel2+	
16	GND	Ground	
17	RXCLKIN-	Data Input CLK-	
18	RXCLKIN+	Data Input CLK+	
19	GND	Ground	
20	NC	No connection	
21	NC	No connection	
22	GND	Ground	
23	GND	Ground	
24	NC	No connection	
25	NC	No connection	

26	NC	No connection
27	NC	No connection
28	NC	No connection
29	NC	No connection
30	NC	No connection

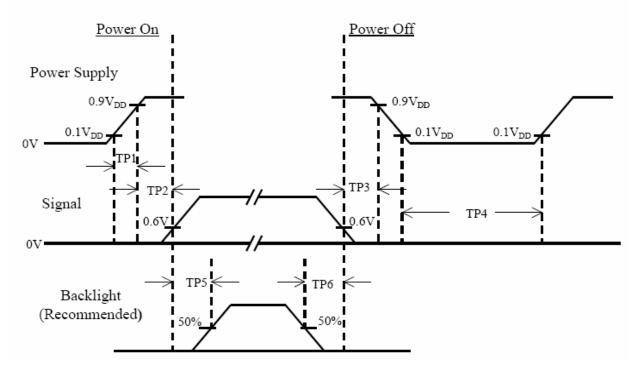
CN2(LED backlight): BHSR-02VS-1 (JST or equivalent)

Pin No.	Symbol	Description	Note
1	А	Anode for LED backlight (+18.9V, 160mA)	
2	К	Cathode for LED backlight	

(3) LVDS Connector : CSTAR DS100-430-H23



### 8. Power On/Off Sequence



ltem	Min.	Тур.	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.

# 9. TOUCH PANEL ELECTRICAL SPECIFICATION

#### 9.1 Electrical characteristics

	ITEM	SPEIFICATION	REMARKS	
1	Rated Voltage	DC 7V Max.		
2	Desistance	X axis:400Ω ~ 1100Ω(FILM)	FPC At connector	
2	Resistance	Y axis:100Ω ~ 450Ω(GLASS)	FPC At connector	
		10ms Max		
4	Chattering	At connector pin		
_	Insulation	25MΩ 以上(DC 25V)		
5	Resistance	25MΩ Min(DC 25V)		

#### 9.2 Life test condition

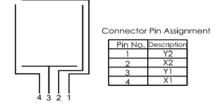
	ITEM SPEIFICATION		REMARKS	
1	Notes life	20000 words Min	Note A.	
2	Input life	1000000 times Min.	Note B.	

#### > Measurement condition of minimum input force

#### Resistance between X & Y axis must be equal or lower than $2k\Omega$ (Ron $\leq 2k\Omega$ )

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on (by pen) fer Fig.1) Note B. Input life test condition( by finger ) Sharp of rubber end : R8 Hardness 60°(Refer fig.2) Load : 200g
Load : 200g Frequency : 3H

#### 9.3 Touch Screen Pane & Interface

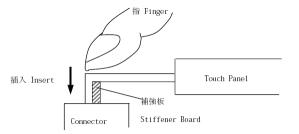


No.	Symbol	Function
1	Y2	Touch Panel Top Signal in Y Axis
2	X2	Touch Panel Right Signal in X Axis
3	Y1	Touch Panel Bottom Signal in Y Axis
4	X1	Touch Panel Left Signal in X Axis

#### Attention

- (1) Since touch panel is consist of Glass, pls. be careful your hand and other part from injury at handling. You must wear gloves at handling.
- (2) Do not put a heavy shock or stress on touch panel.
- (3) Do not lift Touch Panel by cable (FPC).
- (4) Do not add any stress only film face.
- (Ex. Don't transfer the panel by film face with vacuum)
- (5) Pls. use dry cloth or soft cloth with neutral detergent (after wring dry) or one with ethanol at cleaning. Do not use any organic solvent, acid or alkali solution.
- (6) Do not pile Touch Panel. Do not put heavy goods on Touch Panel.
- (7) Do not bend a cable of Touch Panel for prevent happen to line cut failure.

Please don't uses following method for insert the cable to connector



- (8) Please pay attention for the matter as stated below at mounting design of touch panel & enclosure
- -1. Enclosure support to fix touch panel must be out of view (transparent) area.(Do not design enclosure presses the view area to protect from miss input)
- -2. Enclosure edge must be between view area & Guaranteed active area. (Enclosure edge must not touch with view area)
- -3. We recommend the material of support to fix touch panel is elastic material.
- -4. Do not bond top surface (film) of touch panel with enclosure.
- -5. The corner parts (fig.\*) has conductivity. Do not touch any metal part after mounting.
- -6. Special design is required for water resistance use.

# **10.RELIABILITY TEST CONDITIONS**

Test Item	Test Conditions	Note
High Temperature Operation	60±3°C, Dry t=240 hrs	
Low Temperature Operation	-5±3°C, Dry t=240 hrs	
High Temperature Storage	70±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-20±3°C ,Dry t=240 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. ( 1 cycle ) Total 100 cycle(Dry)	1,2
Humidity Test	40 °C, Humidity 90%, 240 hrs	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).

# **11. HANDLING & CAUTIONS**

#### 11.1 Cautions when taking out the module

Pick the pouch only, when taking out module from a shipping package.

#### 11.2 Cautions for handling the module

- 11.2.1 As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- 11.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- 11.2.3 As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- 11.2.4 Do not pull the interface connector in or out while the LCD module is operating.
- 11.2.5 Put the module display side down on a flat horizontal plane.
- 11.2.6 Handle connectors and cables with care.

#### 11.3 Cautions for the operation

- 11.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.
- 11.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

#### 11 .4 Cautions for the atmosphere

- 11.4.1 Dewdrop atmosphere should be avoided.
- 11.4.2 Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

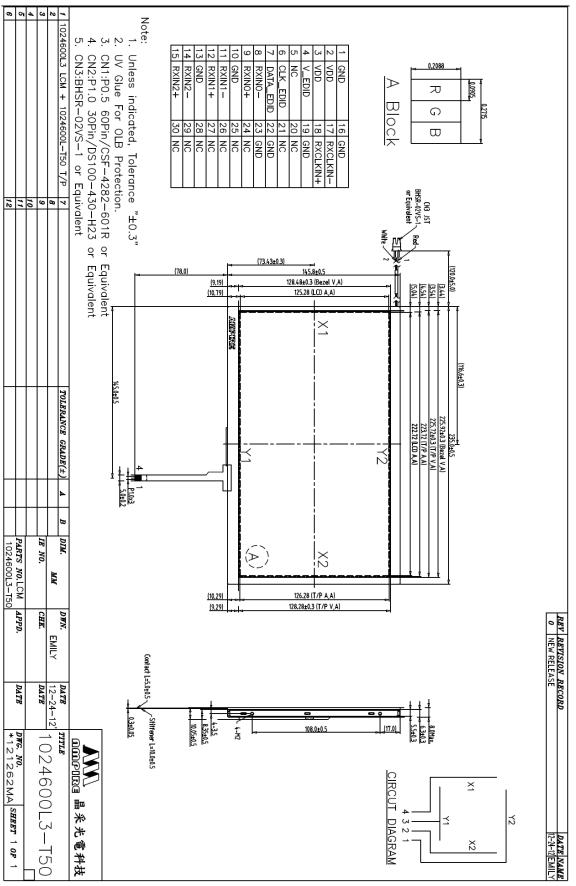
#### 11.5 Cautions for the module characteristics

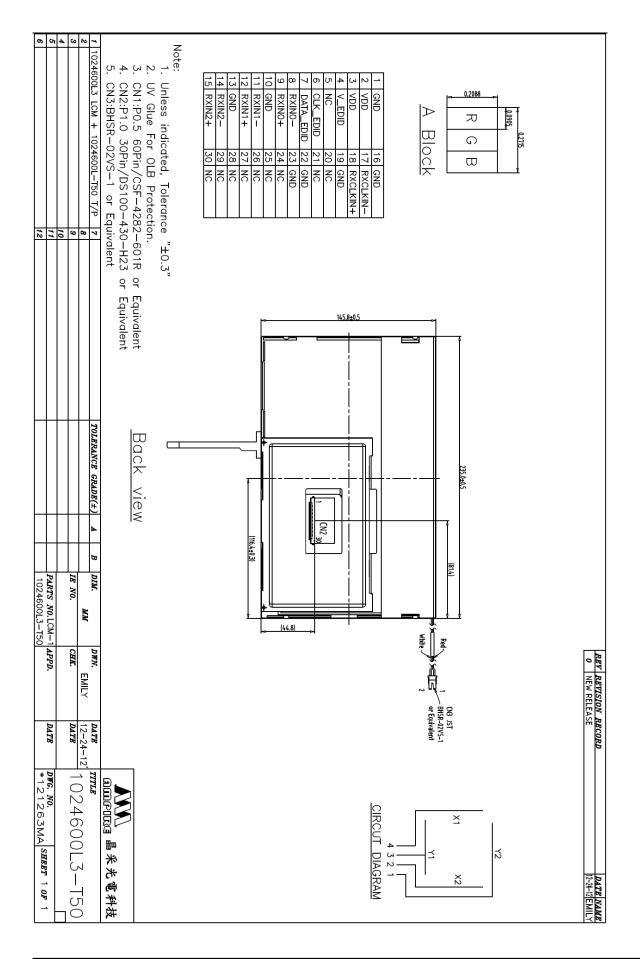
- 11.5.1 Do not apply fixed pattern data signal to the LCD module at product aging.
- 11.5.2 Applying fixed pattern for a long time may cause image sticking.

#### 11.6 Other cautions

- 11.6.1 Do not disassemble and/or re-assemble LCD module.
- 11.6.2 Do not re-adjust variable resistor or switch etc.
- 11.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.
- 11.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

# **12. OUTLINE DIMENSION**





# 13. EDID TABLE

Byte#	rte# Byte# Field Name & Commonte Value Value				
(Decimal)	(HEX)	Field Name & Comments	(HEX)	(BIN)	(DEC)
0	00	Header	00	00000000	0
1	01	Header	FF	11111111	255
2	02	Header	FF	11111111	255
3	03	Header	FF	11111111	255
4	04	Header	FF	11111111	255
5	05	Header	FF	11111111	255
6	06	Header	FF	111111111	255
7	07	Header	00	00000000	0
8	08	ISA Manufacture Code LSB(3 character ID = AM	05	00000101	5
9	00	Compressed ASCII	B0	10110000	176
10	09 0A	Product Code "1001"	60	01100000	96
10	0A 0B	Hex, LSB first	12	00010010	18
11	0D 0C	LCD module Serial No-Preferred but Optional	58		88
12	0C 0D		A2	01011000	
	0D 0E	LCD module Serial No-Preferred but Optional	0F	10100010	162
14		LCD module Serial No-Preferred but Optional		00001111	15
15	0F	LCD module Serial No-Preferred but Optional	00	00000000	0
16	10	Week of manufacture=25	19	00011001	25
17	11	Year of manufacture=2012	16	00010110	22
18	12	EDID Structure Version#=1	01	0000001	1
19	13	EDID revision#=3	03	00000011	3
20	14	Video input definition=Digital input, CRGB	80	10000000	128
21	15	Max H image size=22cm	16	00010110	22
22	16	Max V image size=13cm	0D	00001101	13
23	17	Display Gamma=2.2	78	01111000	120
24	18	Feature support(DPMS)=Active off, RGB color	<b>0</b> A	00001010	10
25	19	Red/green low bits(10000110)	86	10000110	134
26	1A	Blue/white low bits(00100110)	26	00100110	38
27	1B	Red x, Red x=0.592	97	10010111	151
28	1C	Red y, Red y=0.340	57	01010111	87
29	1D	Green x, Green x=0.341	57	01010111	87
30	1E	Green y, Green y=0.592	97	10010111	151
31	1F	Blue x, Blue x=0.156	28	00101000	40
32	20	Blue y, Blue y=0.127	20	00100000	32
33	21	White x, White x=0.321	52	01010010	82
34	22	White y, White y=0.33	54	01010100	84
35	23	Established timing 1	00	00000000	0
36	24	Established timing 2	00	00000000	0
37	25	Manufacturer's timings	00	00000000	0
38	26	Standard timing#1 was not used	01	00000001	1
		Standard timing#1 was not used			
39 40	27	Standard timing#2 was not used	01	00000001	1
41	28		01	00000001	1
41	29 2A	Standard timing#3 was not used	01	00000001	1
42		Stanuaru timing#S was not useu	01	00000001	
	2B	Standard timing #4 was not used			1
44	2C	Standard timing#4 was not used	01	00000001	1
45	2D	Chan dand tinsing #5 was not was d	01	0000001	1
46	2E	Standard timing#5 was not used	01	0000001	1
47	2F		01	0000001	1
48	30	Standard timing#6 was not used	01	0000001	1
49	31		01	0000001	1
50	32	Standard timing#7 was not used	01	00000001	1
51	33		01	00000001	1
52	34	Standard timing#8 was not used	01	00000001	1
53	35		01	00000001	1
54	36	Detailed timing/monitor(descriptor#1)	00	00000000	0
55	37	1024×600@60Hz: Pixel Clock=51.2MHz	14	00010100	20
56	38	Horizontal active= 1024 pixels (L8b)	00	00000000	0
57	39	Horizontal blanking= 320 pixels (L8b)	40	01000000	64

#### EDID Table of 1024600L

58	3A	HA(U4b): HB(U4b)	41	01000001	65
59	3B	Vertical active= 600 lines (L8b)	58	01011000	88
60	3C	Vertical blanking= 35 lines (L8b)	23	00100011	35
61	3D	HA(U4b): HB(U4b)	20	00100000	32
62	3E	H sync. Offset=53 pixels	35	00110101	53
63	3F	H sync. Width=35 pixels	23	00100011	35
64	40	V sync. Offset=4 lines	45	01000101	69
65	41	V sync. Width=5 lines	00	00000000	0
66	42	H image size= 220 mm (L8b)	DC	11011100	220
67	43	V image size= 129 mm (L8b)	81	10000001	129
68	44	Horizontal Image (U4b): Vertical Image (U4b)	00	00000000	0
69	45	No Horizontal Border=0	00	00000000	0
70	46	No Vertical Border=0	00	00000000	0
70	40		00	0000000	0
71	47	Non-interlaced, Normal display, No stereo, Digital separate sync, H/V pol Negatives	19	00011001	25
72	48		44	01000100	68
		Detailed timing/monitor(descriptor#2)		01000100	
73	49	1024×600 @65Hz: Pixel Clock= 57MHz	16	00010110	22
74	4A	Horizontal active= 1024 pixels (L8b)	00	0000000	0
75	4B	Horizontal blanking= 340 pixels (L8b)	54	01010100	84
76	4C	HA(U4b): HB(U4b)	41	01000001	65
77	4D	Vertical active= 600 lines (L8b)	58	01011000	88
78	4E	Vertical blanking= 45 lines (L8b)	2D	00101101	45
79	4F	HA(U4b): HB(U4b)	20	00100000	32
80	50	H sync. Offset=93 pixels	5D	01011101	93
81	51	H sync. Width=35 pixels	23	00100011	35
82	52	V sync. Offset=17 lines	15	00010101	21
83	53	V sync. Width=5 lines	04	00000100	4
84	54	H image size= 220 mm (L8b)	DC	11011100	220
85	55	V image size= 129 mm (L8b)	81	10000001	129
86	56	Horizontal Image (U4b): Vertical Image (U4b)	00	00000000	0
87	57	No Horizontal Border=0	00	00000000	0
88	58	No Vertical Border=0	00	00000000	0
89	59	EDID Module revision	00	00000000	0
90	5A	Flag	00	00000000	0
91	5B	Flag	00	00000000	0
92	5C	Flag	00	00000000	0
93	5D	Dummy Descriptor	FE	11111110	254
94	5E	Flag	00	00000000	0
95	5F	PC Maker P/N 1st Character =M	00	00000000	0
96	60	PC Maker P/N 2nd Character =3	00	00000000	0
97	61	PC Maker P/N 3rd Character =4	00	00000000	0
98	62	PC Maker P/N 4th Character =9	00	00000000	0
99	63	PC Maker P/N 5th Character =5	00	00000000	0
100	64	LCD Supplier EEDID Revision # = 1.0	00	00000000	0
101	65	Manufacture $P/N = 1$	00	00000000	0
102	66	Manufacture $P/N = 5$	00	00000000	0
103	67	Manufacture P/N = P	00	00000000	0
104	68	Manufacture $P/N = X$	00	00000000	0
105	69	Manufacture $P/N = 1$	00	00000000	0
106	6A	Manufacture $P/N = 4$	00	00000000	0
107	6B	Manufacture P/N(If<13 char, then terminate with ASCII code, set remaining=20h)	00	00000000	0
108	6C	Flag	00	00000000	0
103	6D	Flag	00	00000000	0
109	6E	Flag	00		0
				00000000	-
111	6F	Data Type Tag	FE	11111110	254
112	70	Flag	00	00000000	0
113	71	SMBUS Value = 20 nit	00	0000000	0
114	72	SMBUS Value = 28 nit	00	00000000	0
115	73	SMBUS Value = 40 nit	00	0000000	0
116	74	SMBUS Value = 56 nit	00	00000000	0

117	75	CMPLIC Value - 70 mit	00	0000000	0
117	75	SMBUS Value = 79 nit	00	00000000	0
118	76	SMBUS Value = 111 nit	00	00000000	0
119	77	SMBUS Value = 156 nit	00	00000000	0
120	78	SMBUS Value = max nit	00	00000000	0
121	79	Number of LVDS channels=1	01	0000001	1
122	7A	Panel Self Test (00-Not Present, 01-Present)	00	0000000	0
123	123 7B	(If<13 char, then terminate with ASCII code	00	00000000	0
125	70	0Ah, set remaining char=20h)	00	0000000	U
124	7C	(If<13 char, then terminate with ASCII code	00	00000000	0
124	<i>R</i>	0Ah, set remaining char=20h)	00	00000000	U
125	7D	(If<13 char, then terminate with ASCII code	00	00000000	0
125	125 70	0Ah, set remaining char=20h)	00	0000000	0
126	7E	Extension Flag = 00	00	00000000	0
127	7F	Checksum	2E	00101110	46