

(V) Preliminary Specifications
() Final Specifications

Module	10.1" WSVGA Color TFT-LCD with LED Backlight design
Model Name	B101AW01 V1
Note (🗭)	LED Backlight with driving circuit design

Customer	Date
Checked & Approved by	Date
Note: This Specification is without notice.	subject to change

Approved by	Date					
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Record of Revision

Version and Date Page		Page	Old description	New Description	Remark
0.1	2008/07/15	All	First Edition for Customer		



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1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open nor modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the TFT Module into an enclosure (Notebook PC Bezel, for example), do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 11) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 12) Disconnecting power supply before handling LCD modules, it can prevent electric shock, DO NOT TOUCH the electrode parts, cables, connectors and LED circuit part of TFT module that a LED light bar build in as a light source of back light unit. It can prevent electrostic breakdown.



2. General Description

B101AW01 V0 is a Color Active Matrix Liquid Crystal Display composed of a TFT LCD panel, a driver circuit, and LED backlight system. The screen format is intended to support the WSVGA (1024(H) x 576(V)) screen and 262k colors (RGB 6-bits data driver) with LED backlight driving circuit. All input signals are LVDS interface compatible.

B101AW01 V0 is designed for a display unit of notebook style personal computer and industrial machine.

2.1 General Specification

The following items are characteristics summary on the table at 25 $^{\circ}\mathrm{C}$ condition:

Items	Unit		Specifications			
Screen Diagonal	[mm]	255.54 (10.1 W")				
Active Area	[mm]	222.72 x 12	25.28			
Pixels H x V		1024 x 3(R	GB) x 576			
Pixel Pitch	[mm]	0.2175 X 0	.2175			
Pixel Format		R.G.B. Ver	tical Stripe			
Display Mode		Normally W	/hite			
White Luminance (ILED=20mA) (Note: ILED is LED current)	[cd/m ²]	• • •	200 typ. (5 points average) 170 min. (5 points average)			
Luminance Uniformity		1.25 max. (5 points)				
Contrast Ratio		500:1 typ				
Response Time	[ms]	8 typ / 16 Max				
Nominal Input Voltage VDD	[Volt]	+3.3 typ.				
Power Consumption	[Watt]	3.0 max. (Ir	nclude Logic	and Blu po	wer)	
Weight	[Grams]	190 max.				
Physical Size without inverter,	[mm]		Min.	Тур.	Max.	
bracket.		Length	234.5	235.0	235.5	
		Width	142.5	143.0	143.5	
		Thickness	-	-	5.2	
Electrical Interface		1 channel LVDS				
Surface Treatment		Glare, Hardness 3H				
Support Color		262K colors	s (RGB 6-bi	t)		



Temperature Range Operating Storage (Non-Operating)	[°C] [°C]	0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance

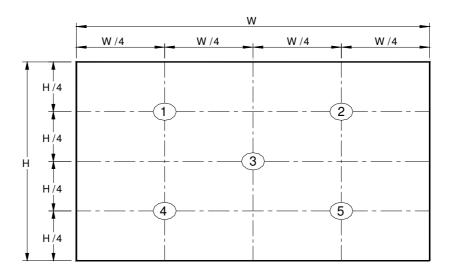
2.2 Optical Characteristics

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

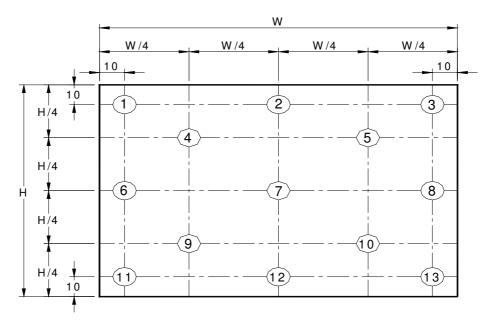
Item		Symbol	Condit		Min.	Тур.	Max.	Unit	Note
White Luminance ILED=20mA			5 points a	verage	170	200	-	cd/m ²	1, 4, 5.
		$ heta_{ m R} heta_{ m L}$	Horizontal (Right CR = 10 (Left		40	45	-	degree	ree
Viewing Ar	ngle	_		, ,	40	45	-		4, 9
		Ψн	Vertical CR = 10	(Upper)	10	15	-		, -
		Ψ∟		(Lower)	30	35	-		
Luminance Un	iformity	δ_{5P}	5 Poi	nts	-	-	1.25		1, 3, 4
Luminance Un	iformity	δ_{13P}	13 Po	ints	-	-	-		2, 3, 4
Contrast R	atio	CR			400	500	-		4, 6
Cross ta	lk	%					4		4, 7
		T_r	Risi	ng	-	-	-		
Response	Гіте	T_f	Falling		-	-	-	msec	4, 8
		T_{RT}	Rising +	Falling	-	8	16		
	Red	Rx			-	TBD	-		
		Ry			_	TBD	-		
	Green	Gx			-	TBD	-		
Color / Chromaticity	Green	Gy			-	TBD	-		
Coordinates	Divo	Bx	CIE 1	931	_	TBD	-		4
	Blue	Ву			-	TBD	-		
	Mhita	Wx			0.283	0.313	0.343		
	White	Wy			0.299	0.329	0.359		
NTSC		%			_	45	-		



Note 1: 5 points position (Ref: Active area)



Note 2: 13 points position (Ref: Active area)



Note 3: The luminance uniformity of 5 or 13 points is defined by dividing the maximum luminance values by the minimum test point luminance

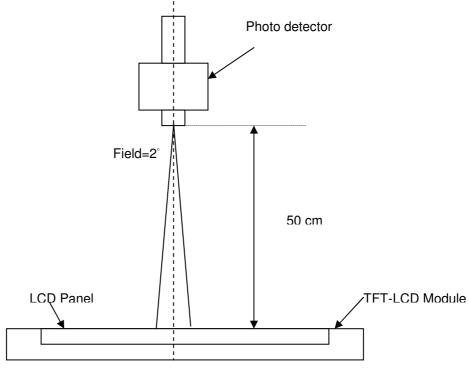
2	_	Maximum Brightness of five points
် w5	= -	Minimum Brightness of five points
2	_	Maximum Brightness of thirteen points
δ w13	=	Minimum Brightness of thirteen points

Note 4: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight



for 30 minutes in a stable, windless and dark room, and it should be measured in the center of screen.



Center of the screen

Note 5: Definition of Average Luminance of White (Y_L):

Measure the luminance of gray level 63 at 5 points \cdot $Y_L = [L(1) + L(2) + L(3) + L(4) + L(5)] / 5$ L (x) is corresponding to the luminance of the point X at Figure in Note (1).

Note 6: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

Contrast ratio (CR)=
$$\frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

Note 7: Definition of Cross Talk (CT)

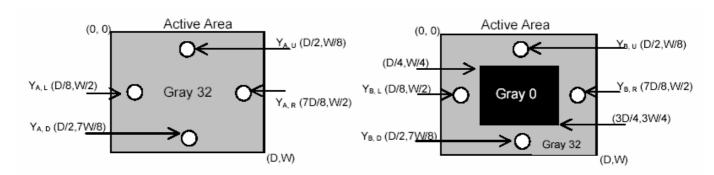
$$CT = |Y_B - Y_A| / Y_A \times 100 (\%)$$

Where

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

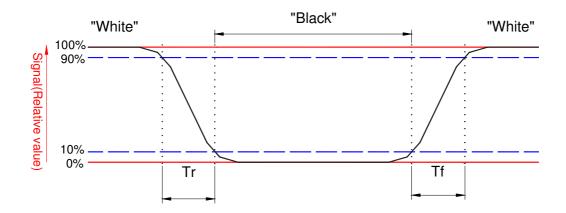
 $Y_B =$ Luminance of measured location with gray level 0 pattern (cd/m₂)





Note 8: Definition of response time:

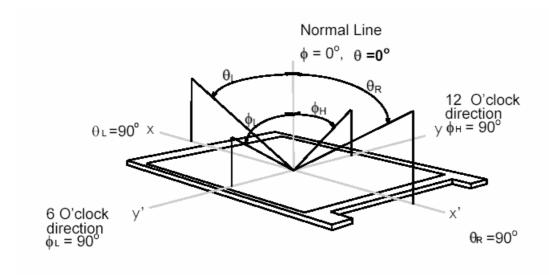
The output signals of BM-7 or equivalent are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval between the 10% and 90% of amplitudes. Refer to figure as below.





Note 9. Definition of viewing angle

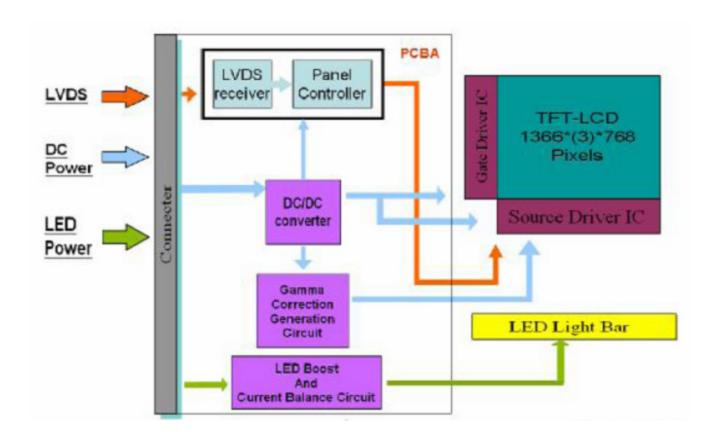
Viewing angle is the measurement of contrast ratio ≥ 10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.





3. Functional Block Diagram

The following diagram shows the functional block of the 10.1 inches wide Color TFT/LCD 40 Pin (One CH/connector Module)





4. Absolute Maximum Ratings

An absolute maximum rating of the module is as following:

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	Vin	-0.3	+4.0	[Volt]	Note 1,2

4.2 Absolute Ratings of Environment

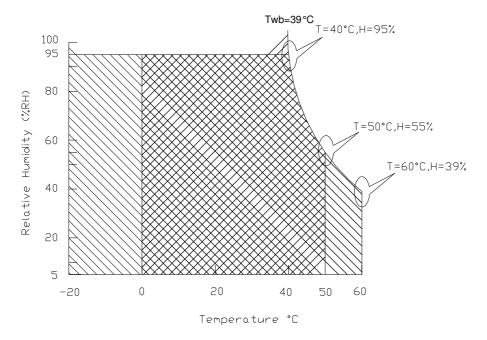
<u> </u>									
Item	Symbol	Min	Max	Unit	Conditions				
Operating Temperature	TOP	0	+50	[°C]	Note 4				
Operation Humidity	HOP	10	90	[%RH]	Note 4				
Storage Temperature	TST	-20	+60	[°C]	Note 4				
Storage Humidity	HST	10	90	[%RH]	Note 4				

Note 1: At Ta (25°C)

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: LED specification refer to section 5.2

Note 4: For quality performance, please refer to AUO IIS (Incoming Inspection Standard).



Operating Range

Storage Range

+



5. Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows;

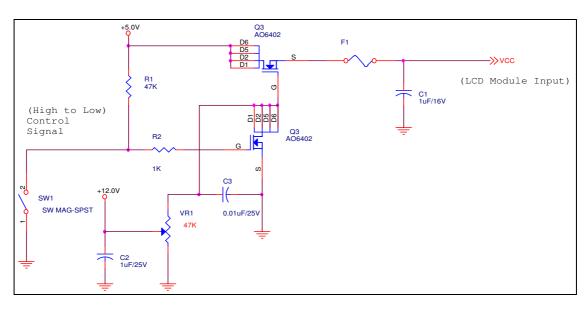
The power specification are measured under 25°C and frame frenquency under 60Hz

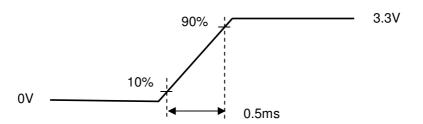
Symble	Parameter	Min	Тур	Max	Units	Note
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	
PDD	VDD Power	_	-	1.6	[Watt]	Note 1/2
IDD	IDD Current	-	350	450	[mA]	Note 1/2
IRush	Inrush Current	-	-	2000	[mA]	Note 3
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	[mV]	

Note 1: Maximum Measurement Condition: Black Pattern

Note 2: Typical Measurement Condition: Mosaic Pattern

Note 3: Measure Condition





Vin rising time



5.1.2 Signal Electrical Characteristics

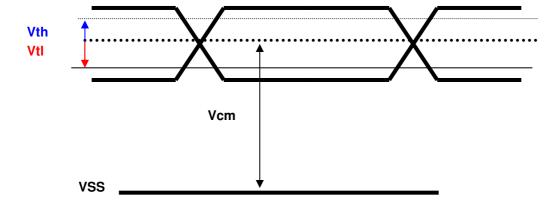
Input signals shall be low or High-impedance state when VDD is off.

It is recommended to refer the specifications of THC63LVDF84A (Thine Electronics Inc.) in detail.

Signal electrical characteristics are as follows;

Parameter	Condition	Min	Max	Unit
Vth	Differential Input High Threshold (Vcm=+1.2V)	-	100	[mV]
Vtl	Differential Input Low Threshold (Vcm=+1.2V)	-100	-	[mV]
Vcm	Differential Input Common Mode Voltage	0.6	1.4	[V]

Note: LVDS Signal Waveform





LED Parameter guideline for LED driving selection (Ref. Remark 1)

Parameter	Symbol	Min	Тур	Max	Units	Condition
LED Forward Voltage	V_{F}	2.95	3.15	3.4	[Volt]	(Ta=25℃)
LED Forward Current	I _F		20	-	[mA]	(Ta=25°ℂ)
LED Power consumption	P_{LED}		2.16		[Watt]	(Ta=25°C) Note 1
LED Life-Time	N/A	10,000	-	-	Hour	(Ta=25°C) I _F =20 mA Note 2
Output PWM frequency	F _{PWM}	-	200	1K	Hz	
Duty ratio		20		100	%	

Note 1: Calculator value for reference IF×VF =P

Note 2: The LED life-time define as the estimated time to 50% degradation of initial luminous.



6. Signal Characteristic

6.1 Pixel Format Image

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

	1						102	24
1st Line	R G B R	G B		R	G	В	R	G B
			,					
			· · ·					
			· ·					
			•		:			:
	;	-	'		:			
576th Line	R G B R	G B		R	G	В	R	G B



6.2 The input data format

RxCLKIN		/
RxIN0	G0 R5 R4 R3 R2	R1 R0
RxIN1	B1 B0 G5 G4 G3	G2 G1
RxIN2	DE VS HS B5 B4	B3 B2

Cianal Nama	Description	
Signal Name	Description (MCD)	Dad sixel Data
R5	Red Data 5 (MSB)	Red-pixel Data
R4	Red Data 4	Each red pixel's brightness data consists of
R3	Red Data 3	these 6 bits pixel data.
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
	Red-pixel Data	
	·	
G5	Green Data 5 (MSB)	Green-pixel Data
G4	Green Data 4	Each green pixel's brightness data consists of
G3	Green Data 3	these 6 bits pixel data.
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0 (LSB)	
	Green-pixel Data	
B5	Blue Data 5 (MSB)	Blue-pixel Data
B4	Blue Data 4	Each blue pixel's brightness data consists of
B3	Blue Data 3	these 6 bits pixel data.
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
	, ,	
	Blue-pixel Data	
RxCLKIN	Data Clock	The signal is used to strobe the pixel data and
		DE signals. All pixel data shall be valid at the
		falling edge when the DE signal is high.
DE	Display Timing	This signal is strobed at the falling edge of
		RxCLKIN. When the signal is high, the pixel
		data shall be valid to be displayed.
VS	Vertical Sync	The signal is synchronized to RxCLKIN.
HS	Horizontal Sync	The signal is synchronized to RxCLKIN.

Note: Output signals from any system shall be low or High-impedance state when VDD is off.



6.3 Integration Interface and Pin Assignment

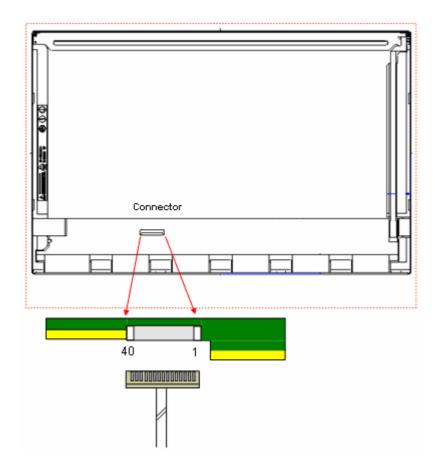
LVDS is a differential signal technology for LCD interface and high speed data transfer device.

PIN#	Signal Name	Description	
1	NC	No Connection (Reserve)	
2	AVDD	PowerSupply,3.3V(typical)	
3	AVDD	PowerSupply,3.3V(typical)	
4	DVDD	DDC 3.3Vpower	
5	NC	No Connection (Reserve)	
6	SCL	DDCClock	
7	SDA	DDCData	
8	Rin0-	-LVDSdifferential data input(R0-R5,G0)	
9	Rin0+	+LVDSdifferential data input(R0-R5,G0)	
10	GND	Ground	
11	Rin1-	-LVDSdifferential data input(G1-G5,B0-B1)	
12	Rin1+	+LVDSdifferential data input(G1-G5,B0-B1)	
13	GND	Ground	
14	Rin2-	-LVDSdifferential data input(B2-B5,HS,VS,DE)	
15	Rin2+	+LVDSdifferential data input(B2-B5,HS,VS,DE)	
16	GND	Ground	
17	ClkIN-	-LVDSdifferential clock input	
18	ClkIN+	+LVDSdifferential clock input	
19	GND	Ground-Shield	
20	NC	No Connection (Reserve)	
21	NC	No Connection (Reserve)	
22	GND	Ground-Shield	
23	NC	No Connection (Reserve)	
24	NC	No Connection (Reserve)	
25	GND	Ground-Shield	
26	NC	No Connection (Reserve)	
27	NC	No Connection (Reserve)	
28	GND	Ground-Shield	
29	NC	No Connection (Reserve)	
30	NC	No Connection (Reserve)	
31	VLED_GND	LED Ground	
32	VLED_GND	LED Ground	
33	VLED_GND	LED Ground	



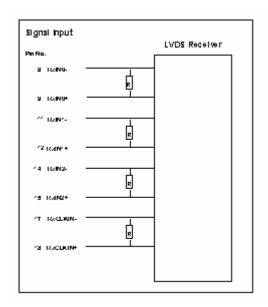
34	NC	No Connection (Reserve)	
35	PWM	System PWM Signal Input	
36	LED_EN	LED enable pin(+3V Input)	
37	NC	No Connection (Reserve)	
38	VLED	LED Power Supply 5V	
39	VLED	LED Power Supply 5V	
40	VLED	LED Power Supply 5V	

Note1: Start from right side



Note2 : Input signals shall be low or High-impedance state when VDD is off. Internal circuit of LVDS inputs are as following.

The module uses a 100ohm resistor between positive and negative data lines of each receiver input.





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6.4 Interface Timing

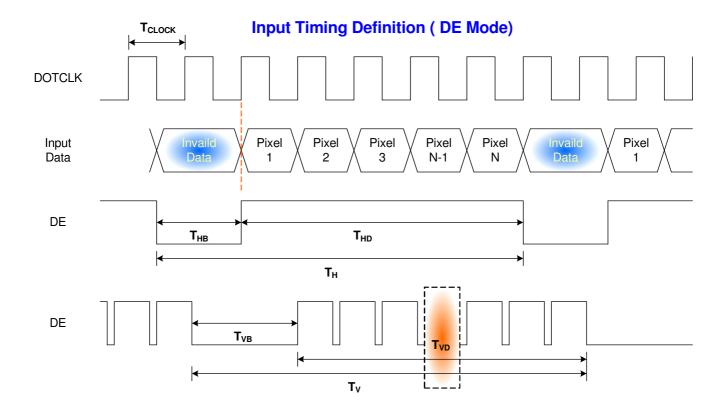
6.4.1 Timing Characteristics

Basically, interface timings should match the $1024 \times 576 / 60 \text{Hz}$ manufacturing guide line timing.

Parameter		Symbol	Min.	Тур.	Max.	Unit
Frame	e Rate	-	50	60	-	Hz
Clock frequency		1/ T _{Clock}	20	49.5	72	MHz
	Period	T _V	584	614	1023	
Vertical	Active	T _{VD}	-	576	-	T_Line
Section	Blanking	T _{VB}	8	38	447	
	Period	T _H	1054	1344	1424	
Horizontal	Active	T _{HD}	-	1024	-	T _{Clock}
Section	Blanking	T _{HB}	30	320	400	

Note: DE mode only

6.4.2 Timing diagram

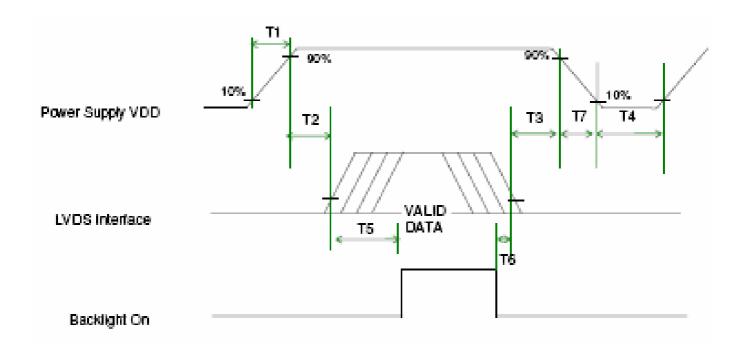




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6.5 Power ON/OFF Sequence

VDD power on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off



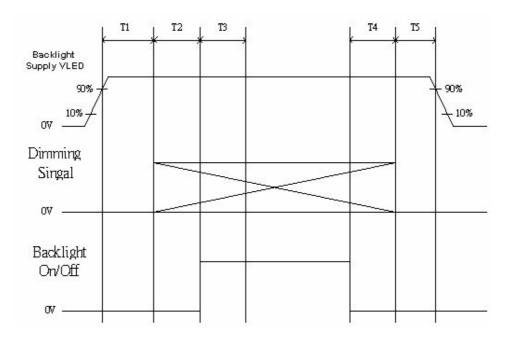
Power Sequence Timing

	Value			
Parameter	Min.	Тур.	Max.	Units
T1	0.5	-	10	
T2	0	-	50	
Т3	0	-	50	
T4	400	-	-	ms
T5	200	-	-	
Т6	200	-	-	
Т7	0	-	10	



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LED on/off sequence is as follows. Interface signals are also shown in the chart.



	1			
		Values		
Symbol	Min	Тур	Max	Unit
T1	10			
T2	10			
Т3	50			ms
T4	0			
T5	10			

Note: The duty of LED dimming signal should be more than 20% in T2 and T3.



7. Connector Description

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	For Signal Connector
Manufacturer	IPEX
Type / Part Number	IPEX 20455-040E-12
Mating Housing/Part Number	IPEX 20453-040T-11



8. LED Driving Specification

8.1 Connector Description

It is a intergrative interface and comibe into LVDS connector. The type and mating refer to section 7.

8.2 Pin Assignment

Ref. to 6.3



9. Vibration and Shock Test

9.1 Vibration Test

Test Spec:

Test method: Non-Operation

Acceleration: 1.5 G

Frequency: 10 - 500Hz Random

Sweep: 30 Minutes each Axis (X, Y, Z)

9.2 Shock Test Spec:

Test Spec:

Test method: Non-Operation

Acceleration: 220 G, Half sine wave

Active time: 2 ms

Pulse: X,Y,Z .one time for each side



10. Reliability

Items	Required Condition	Note
Temperature Humidity Bias	Ta= 40°C, 90%RH, 300h	
High Temperature Operation	Ta= 50°C, Dry, 300h	
Low Temperature Operation	Ta= 0°C, 300h	
High Temperature Storage	Ta= 60°C, 35%RH, 300h	
Low Temperature Storage	Ta= -20°C, 50%RH, 250h	
Thermal Shock Test	Ta=-20°C to 60°C, Duration at 30 min, 100 cycles	
ESD	Contact : ±8 KV Air : ±15 KV	Note 1

Note1: According to EN 61000-4-2, ESD class B: Some performance degradation allowed. No data lost

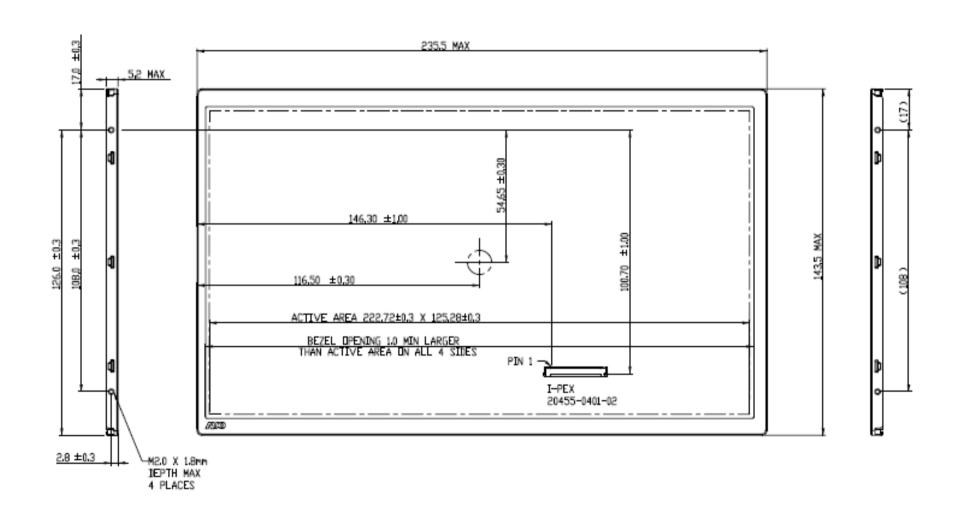
Self-recoverable. No hardware failures.

Remark: MTBF (Excluding the LED): 30,000 hours with a confidence level 90%



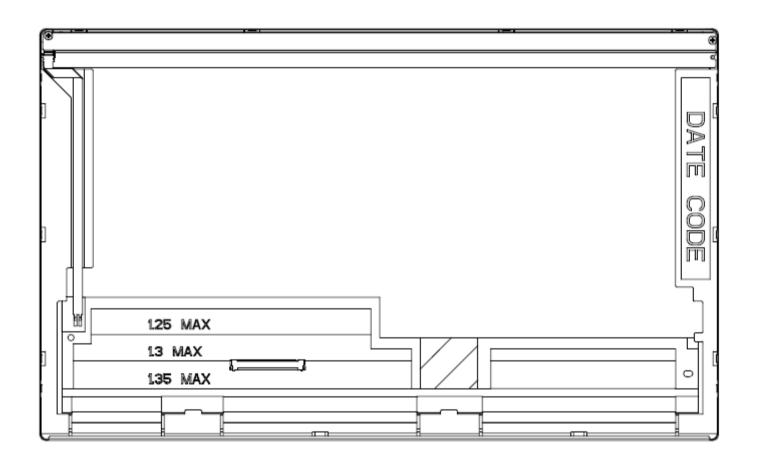
11. Mechanical Characteristics

11.1 LCM Outline Dimension



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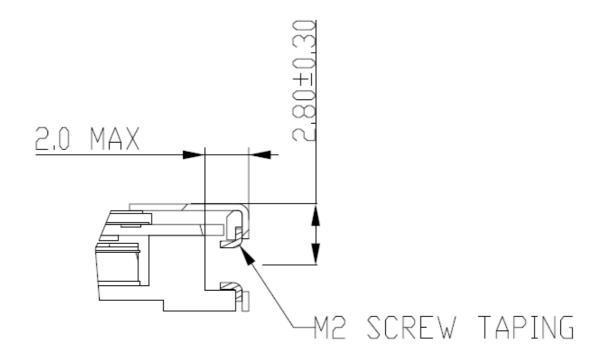


11.2 Screw Hole Depth and Center Position

Screw hole maximum depth, from side surface = 2.0 mm (See drawing)

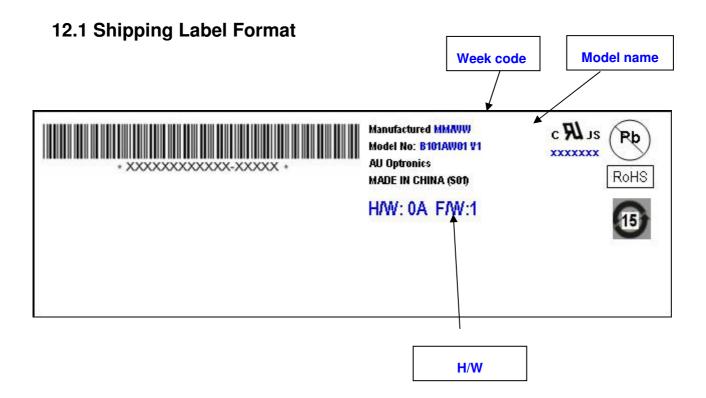
Screw hole center location, from front surface = 2.8 ± 0.3 mm (See drawing)

Screw Torque: Maximum 2.5 kgf-cm





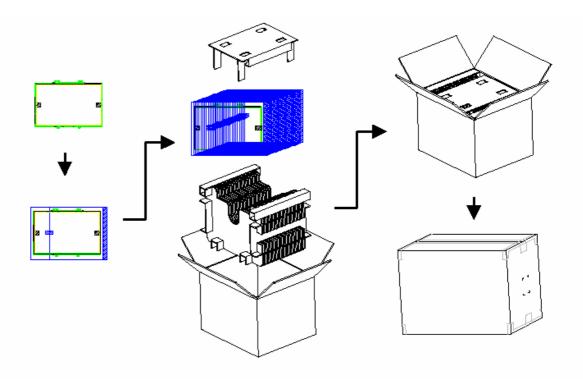
12. Shipping and Package





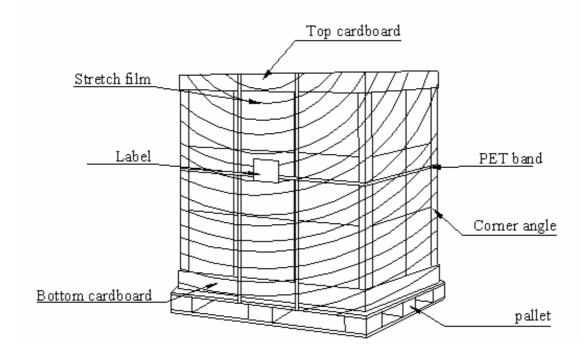
12.2 Carton package

The outside dimension of carton is 477 (L) mm x 375 (W) mm x 339 (H) mm





12.3 Shipping package of palletizing sequence





13. Appendix: EDID description

Address	FUNCTION	Value	Value	Value	Note
	TONOTION	value	value	value	NOTE
HEX 00					
01					
02					
03					
04					
05					
06					
07					
08					
09					
0A					
0B					
0C					
0D					
0E					
0F					
10					
11					
12					
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