( ) Preliminary Specification
(V) Final Specification

Module	27” Color TFT-LCD
Model Name	M270HVN02.3
Suffix Name	Q0
Document version	D03

Document		
APPROVED BY	James. Kuo	Date :2015/01/28
PREPARED BY	Chris. Huang	Date :2015/01/28

CUSTOMER APPROVED AND FEEDBACK		
CUSTOMER		Date:
APPROVED BY		Date :

Note: This Specification is subject to change without notice.

Contents

Record of Revision

Document Version	Date (Y/M/D)	Page	Description
D01	2014/07/08		First Version
D02	2014/09/28	16	Modify1.LED Forward Current/ 2. Light Bar Operation Voltage 3.BLU: Power Consumption
D03	2015/01/28	30	Change the Label attached to the position

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 or modify the Module Assembly.
8. Do not press the reflector sheet at the back of the module to any directions.
9. In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the LED lightbar edge. Instead, press at the far ends of the LED light bar edge softly. Otherwise the TFT Module may be damaged.
10. At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11. After installation of the TFT Module into an enclosure, 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.
12. Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
13. Please avoid touching COF Position while you are doing mechanical design.
14. When storing modules as spares for a long time, the following precaution is necessary:
    a. Store them in a dark place. Do not expose the module to sunlight or fluorescent light.
    b. Keep the temperature between 5℃ and 35℃ at normal humidity.

2. General Description

This specification applies to the 27 inch-FHD Color a-Si TFT-LCD Module M270HVN02.3 The display supports the FHD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 8-bits data). The light source of this TFT-LCD module is W-LED. All input signals are 2-channel LVDS interface and this module doesn't contain a driver for backlight.

Display Characteristics

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

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	mm	685.65(27.0")
Active Area	mm	597.6 (H) x 336.15(V)
Pixels H x V		1920(x3) x 1080
Pixel Pitch	um	311.25 (per one triad) ×311.25
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		VA Mode, Normally Black
White Luminance (Center)	cd/m^2	300 cd/m^2 (Typ.)
Contrast Ratio		3000(Typ.)
Optical Response Time	msec	12ms (Typ., on/off)
Power Consumption (VDD line + LED line)	Watt	26.48 watt VDD line:PDD(typ),All white pattern at 60Hz=5.1W LED line: PBLU (typ)=21.38w(@110mA)
Color gamut	%	72
Weight	Grams	2370 (Typ.)
Physical Size	mm	608.8(H)x354.81(V)x14.39 (D)
Electrical Interface		Dual channel LVDS
Support Color		16.7M colors (RGB 8-bit)
Surface Treatment		Anti-Glare, 3H
Temperature Range Operating Storage (Shipping)	 °C °C	 0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance
TCO Compliance		TCO 6.0 Compliance

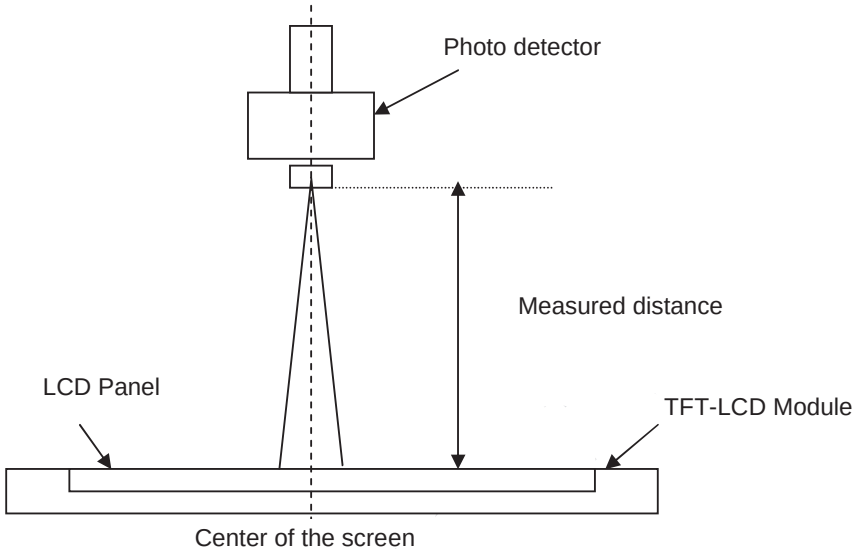
Optical Characteristics

The optical characteristics are measured under stable conditions at 25℃:

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	degree	Horizontal (Right) CR = 10 (Left)	150	178	- -	2
		Vertical (Up) CR = 10 (Down)	150	178	- -	
Contrast ratio		Normal Direction	1800	3000	-	3
Response Time	msec	Raising Time (T_{rR})	-	7	17-	
		Falling Time (T_{rF})	-	5	7	4
		Raising + Falling	-	12	24	
Color / Chromaticity Coordinates (CIE)		Red x	0.615	0.645	0.675	5
		Red y	0.300	0.330	0.360	
		Green x	0.285	0.315	0.345	
		Green y	0.590	0.620	0.650	
		Blue x	0.124	0.154	0.184	
		Blue y	0.034	0.064	0.094	
Color Coordinates (CIE) White		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Central Luminance	cd/m^2		240	300	-	6
Luminance Uniformity	%		75	80	-	7
Crosstalk (in 60Hz)	%				1.5	8
Flicker	dB				-20	9

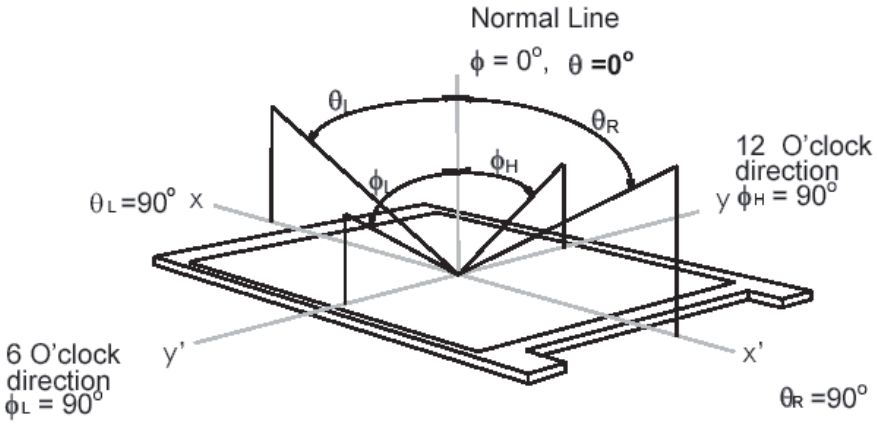
Note 1: Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35℃). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 2: Definition of viewing angle measured by ELDIM (EZContrast 88)

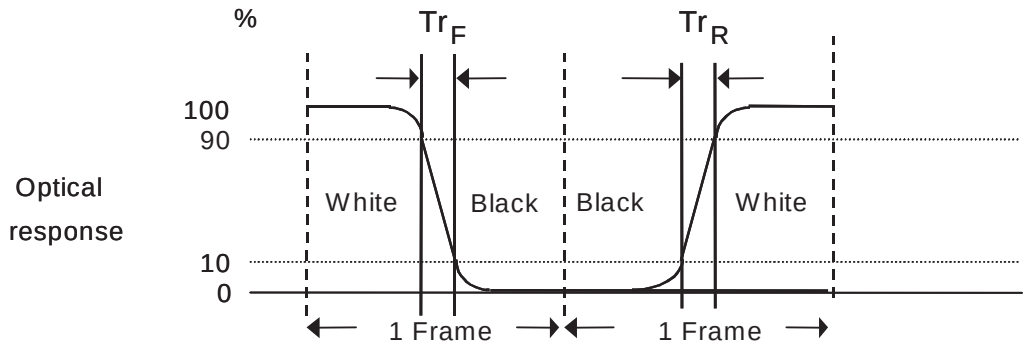
Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement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



Note 3: Contrast ratio is measured by TOPCON SR-3

Note 4: Definition of Response time measured by Westar TRD-100A

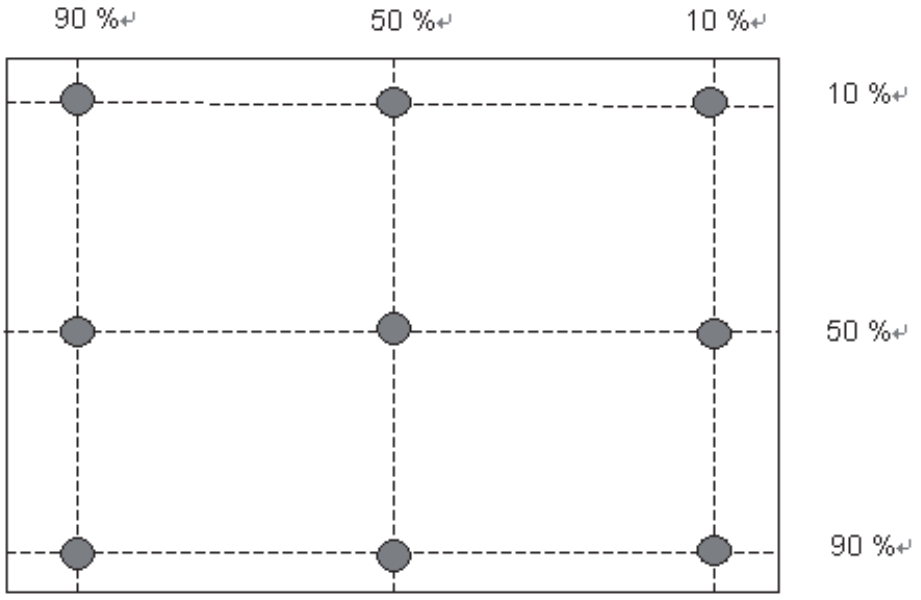
The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, Tr_R), and from "Full White" to "Full Black" (falling time, Trf), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.
Tr_R + Trf = 5 msec (typ.).



Note 5: Color chromaticity and coordinates (CIE) is measured by TOPCON SR-3

Note 6: Central luminance is measured by TOPCON SR-3

Note 7: Luminance uniformity of these 9 points is defined as below and measured by TOPCON SR-3



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

Note 8: Crosstalk is defined as below and measured by TOPCON SR-3

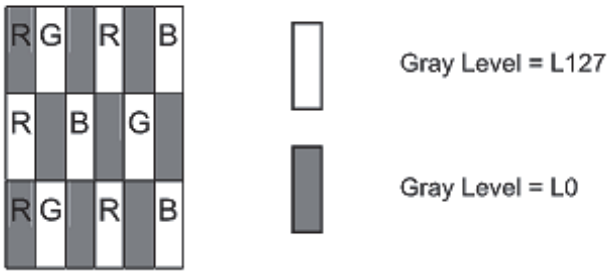
CT = | YB – YA | / YA × 100 (%)

Where

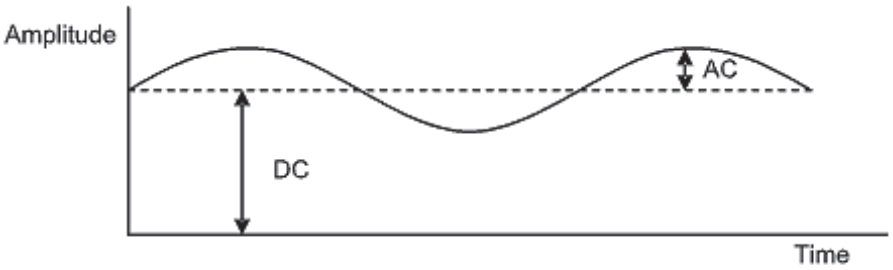
YA = Luminance of measured location without gray level 0 pattern (cd/m2)

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

Note 9: Test Pattern Sub-checker Pattern measured by TOPCON SR-3



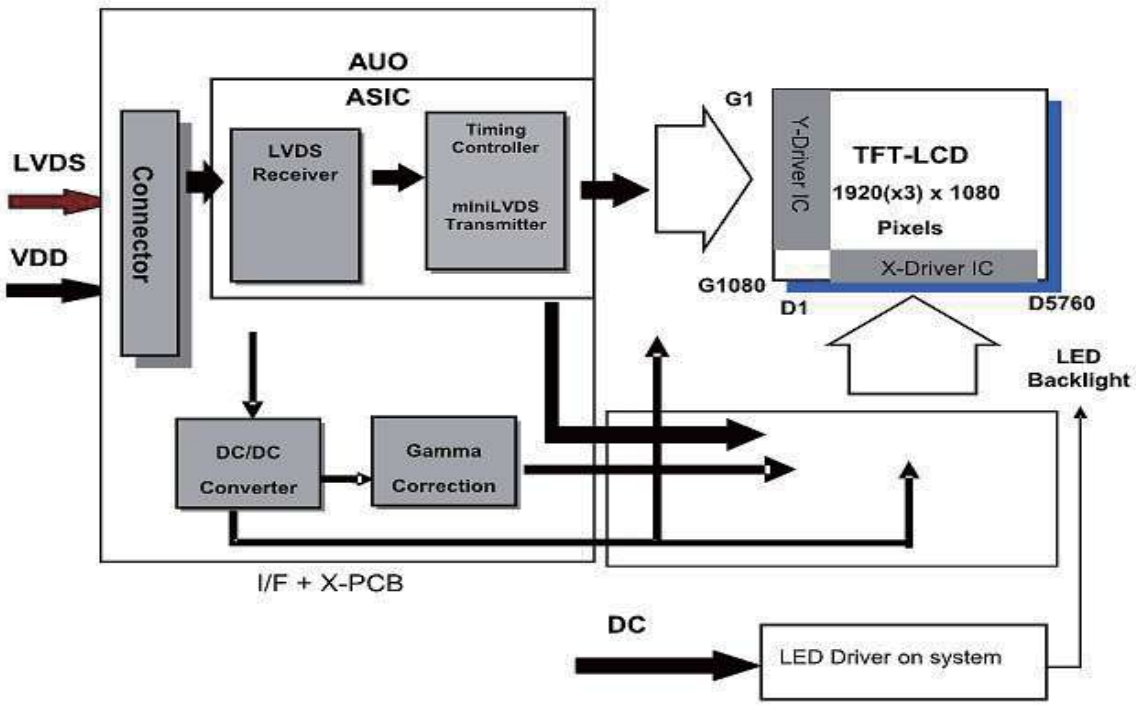
Method: Record dBV & DC value with TRD-100



$$\text{Flicker (dB)} = 20\log\frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$

3. Functional Block Diagram

The following diagram shows the functional block of the 27.0 inch Color TFT-LCD Module:



4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive	VDD	-0.3	6.0	[Volt]	*Note 1, 2*

Backlight Unit

	Symbol	Min	Typ	Max	Unit	Conditions
LED Forward Current	IFLED1~4	-	0	150	[mA]	*Note 1,2* *100% duty*
LED Pulse Forward Current	IPLED1~4			210		*Note 1,2,5* *100% duty@100Hz*
LED Forward Voltage variation(per string variation)	ΔVF			3	[Volt]	*Note 1,2*

Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	0	+50	[°C]	*Note 3*
Center Glass Surface temperature (Operation)	TGS	0	+65	[°C]	*Note 3* *Note 4*
Operation Humidity	HOP	5	90	[%RH]	*Note 3*
Storage Temperature	TST	-20	+60	[°C]	*Note 3*
Storage Humidity	HST	5	90	[%RH]	*Note 3*

Note 1: With in Ta (25℃)

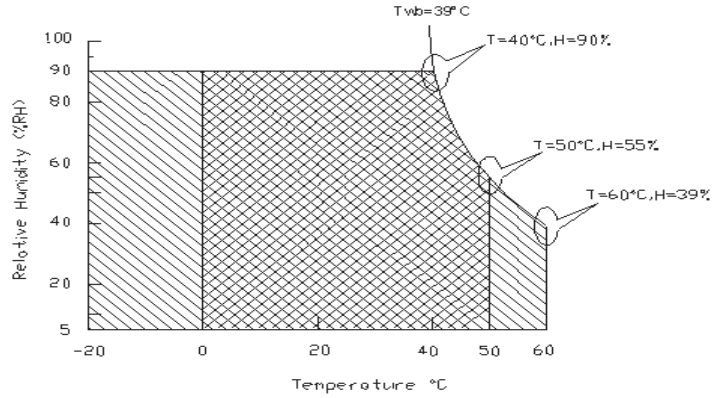
Note 2: Permanent damage to the device may occur if exceeding maximum values

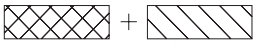
Note 3: For quality perfermance, please refer to AUO IIS(Incoming Inspection Standard).

1. 90% RH Max (Ta ≦39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≦39°C)
3. No condensation

Note 4: Function Judged only

Note 5: IFLED1,2,3,4 and IPLED1,2,3,4 define as per strings LED current.



Operating Range  Storage Range 

5. Electrical characteristics-TFT LCD Module

Power Specification

5 Electrical Characteristics

5.1 TFT LCD Module

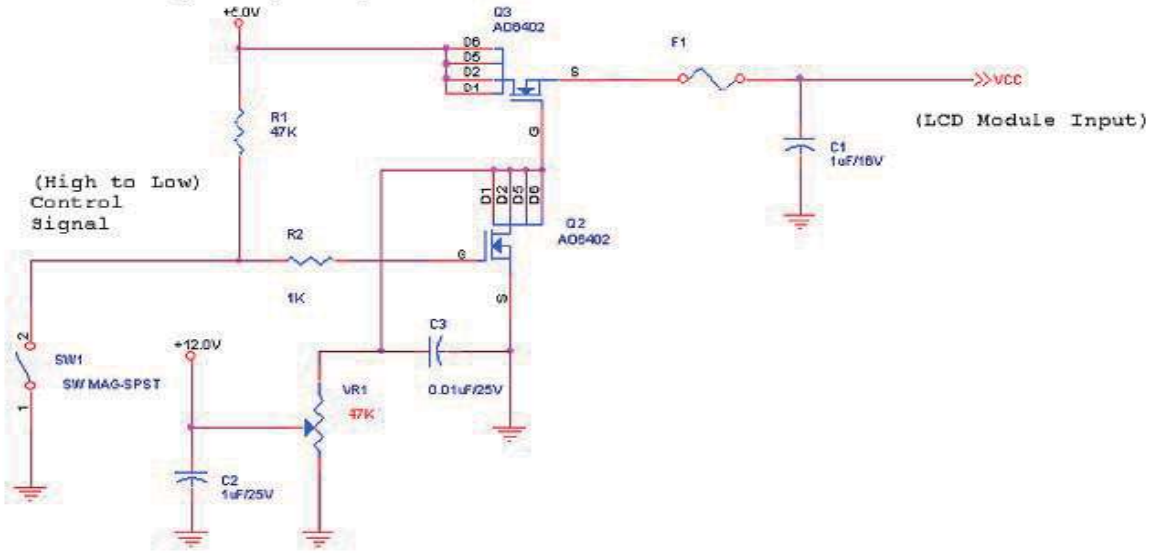
5.1.1 Power Specification

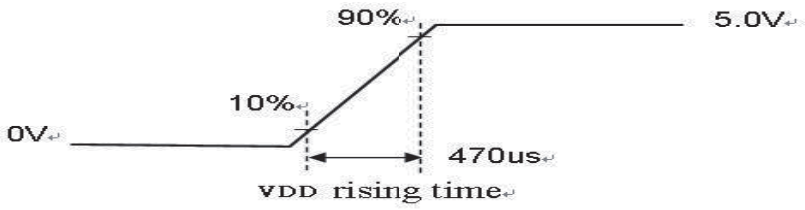
Input power specifications are listed as follows:

Symbol	Description	Min	Typ.	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	+/-10%
IDD1	Input Current	-	1.02	1.22	[A]	VDD= 5.0V, All white Pattern at 60 Hz
		-	1.21	1.45	[A]	VDD= 5.0V, All white Pattern at 75 Hz
PDD1	VDD Power	-	5.1	6.12	[Watt]	VDD= 5.0V, All white Pattern at 60 Hz
		-	6.05	7.26	[Watt]	VDD= 5.0V, All white Pattern at 75 Hz
IRush	Inrush Current	-	-	3	[A]	***Note 1***
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	500	[mV] p-p	VDD= 5.0V, All white Pattern at 75 Hz

Note 1: Measurement Conditions:

The duration of rising time of power input is 470 us.





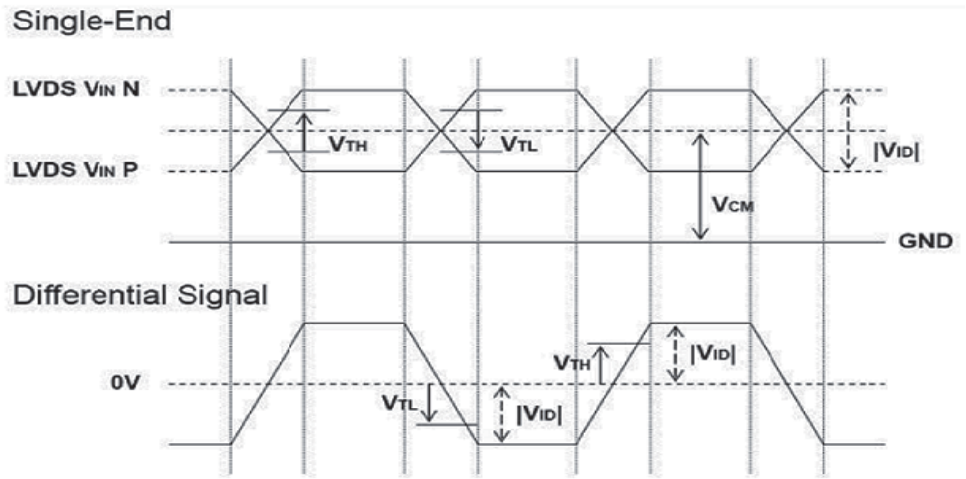
Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off. Please refer to specifications of SN75LVDS82DGG (Texas Instruments) in detail.

DC Characteristics of each signal are as following:

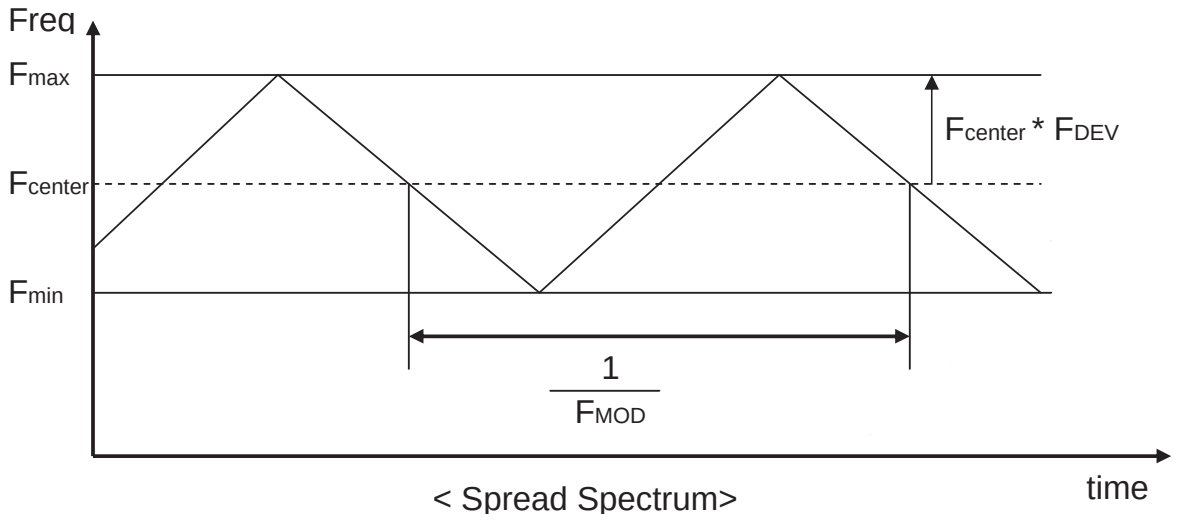
Symbol	Parameter	Min	Typ	Max	Units	Condition
VTH	Differential Input High Threshold	-	-	+100	mV	VICM = 1.2V *Note 1*
VTL	Differential Input Low Threshold	-100	-	-	mV	VICM = 1.2V *Note 1*
| VID |	Input Differential Voltage	100	-	600	mV	*Note 1*
VICM	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	V	VTH-VTL = 200MV (max) *Note 1*

Note 1: LVDS Signal Waveform



Symbol	Description	Min	Max	Unit	Remark
F_{DEV}	Maximum deviation of input clock frequency during Spread Spectrum	-	± 3	%	
F_{MOD}	Maximum modulation frequency of input clock during Spread Spectrum	-	200	KHz	

AC Characteristics



< Spread Spectrum>

Backlight Unit

Parameter guideline for LED driving is under stable conditions at 25 °C (Room Temperature):

Symbol	Description	Min.	Typ.	Max.	Unit	Note
IFLED1 IFLED2 IFLED3 IFLED4	LED Forward Current	-	90	100	[mA]	*Note 1*
VSLED	Light Bar Operation Voltage (for reference)	53.1	59.4	64.8	[Volt]	*Note 2*
PBLU	BLU Power Consumption (for reference)	-	21.38	23.32	[Watt]	*Note 3*
LTLED	LED Life Time (Typical)	30,000	-	-	[Hour]	*Note 4*

Each module consists of 72 pcs LED (4 strings x 18 pcs / string)

Note 1: The specified current is 100% duty of LED chip input current, IRLED1,2,3,4 define as per strings LED current.

Note 2: The value showed is one string operation voltage.

Note 3: PBLU = VSLED *(IFLED1+IFLED2+IFLED3+IFLED4)

Note 4: Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of IFLED = 90 mA and 25±2°C (Room Temperature).

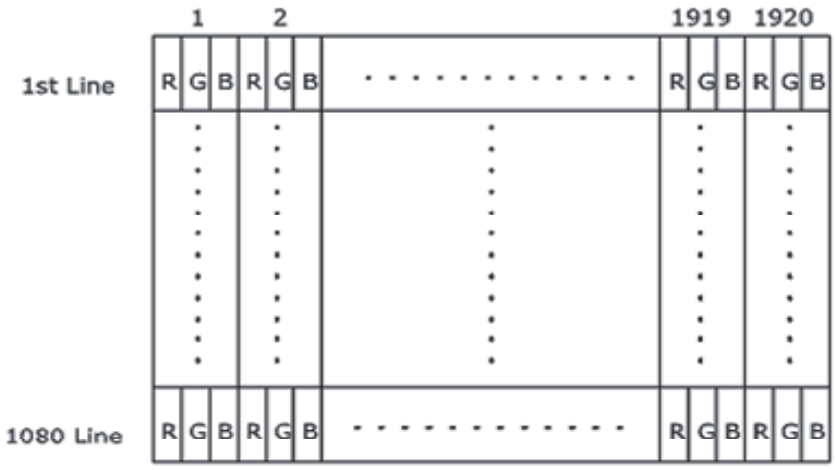
Note 5: Recommendation for LED driver power design:

Due to there are electrical property deviation in LED & monitor set system component after long time operation. Qisda strongly recommend the design value of LED driver board OVP (over voltage protection) should be 10% higher than max. value of LED string voltage (Vs) at least.

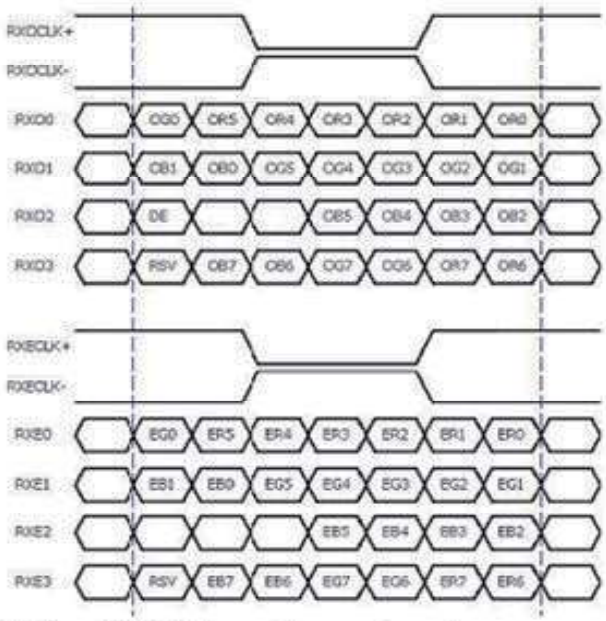
6. Signal Characteristic

Pixel Format Image

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



6.2 Input Data Format Definition

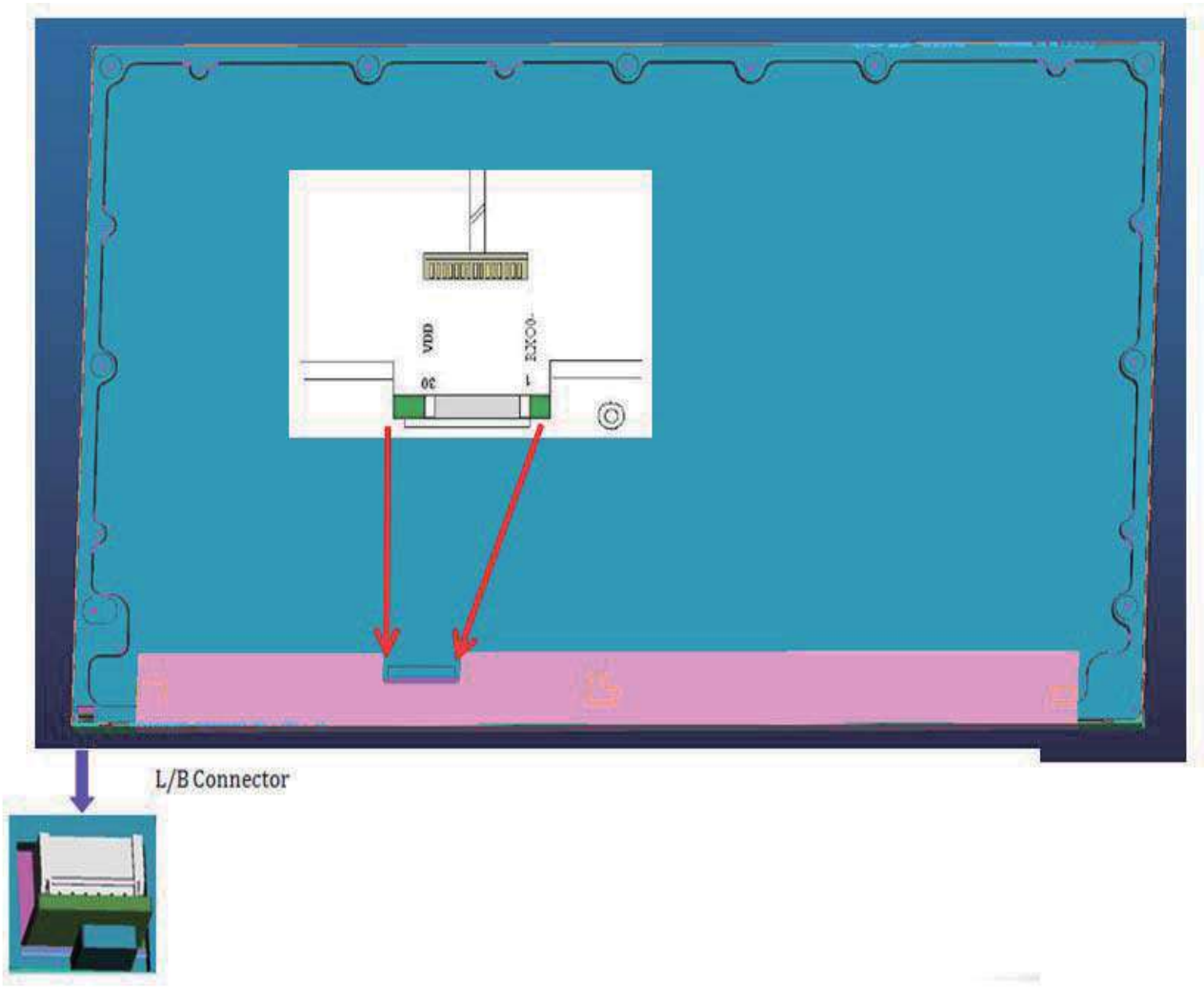


Note1: Normally, DE, VS, HS on EVEN channel are not used.
Note2: Please follow PSWG.
Note3: 8-bit in

6.3 Signal Description

PIN #	SIGNAL NAME	DESCRIPTION
1	RXO0-	Negative LVDS differential data input (Odd data)
2	RXO0+	Positive LVDS differential data input (Odd data)
3	RXO1-	Negative LVDS differential data input (Odd data)
4	RXO1+	Positive LVDS differential data input (Odd data)
5	RXO2-	Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
6	RXO2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	GND	Power Ground
8	RXOCLK-	Negative LVDS differential clock input (Odd clock)
9	RXOCLK+	Positive LVDS differential clock input (Odd clock)
10	RXO3-	Negative LVDS differential data input (Odd data)
11	RXO3+	Positive LVDS differential data input (Odd data)
12	RXE0-	Negative LVDS differential data input (Even data)
13	RXE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RXE1-	Negative LVDS differential data input (Even data)
16	RXE1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RXE2-	Negative LVDS differential data input (Even data)
19	RXE2+	Positive LVDS differential data input (Even data)
20	RXECLK-	Negative LVDS differential clock input (Even clock)
21	RXECLK+	Positive LVDS differential clock input (Even clock)
22	RXE3-	Negative LVDS differential data input (Even data)
23	RXE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No contact
26	NC	No contact
27	NC	No contact
28	VDD	+5.0V Power Supply
29	VDD	+5.0V Power Supply
30	VDD	+5.0V Power Supply

Note 1: Input signals of odd and even clock shall be the same timing.



Note 3-1: Input signals of port 1 to port 4 clocks shall be th same timing.

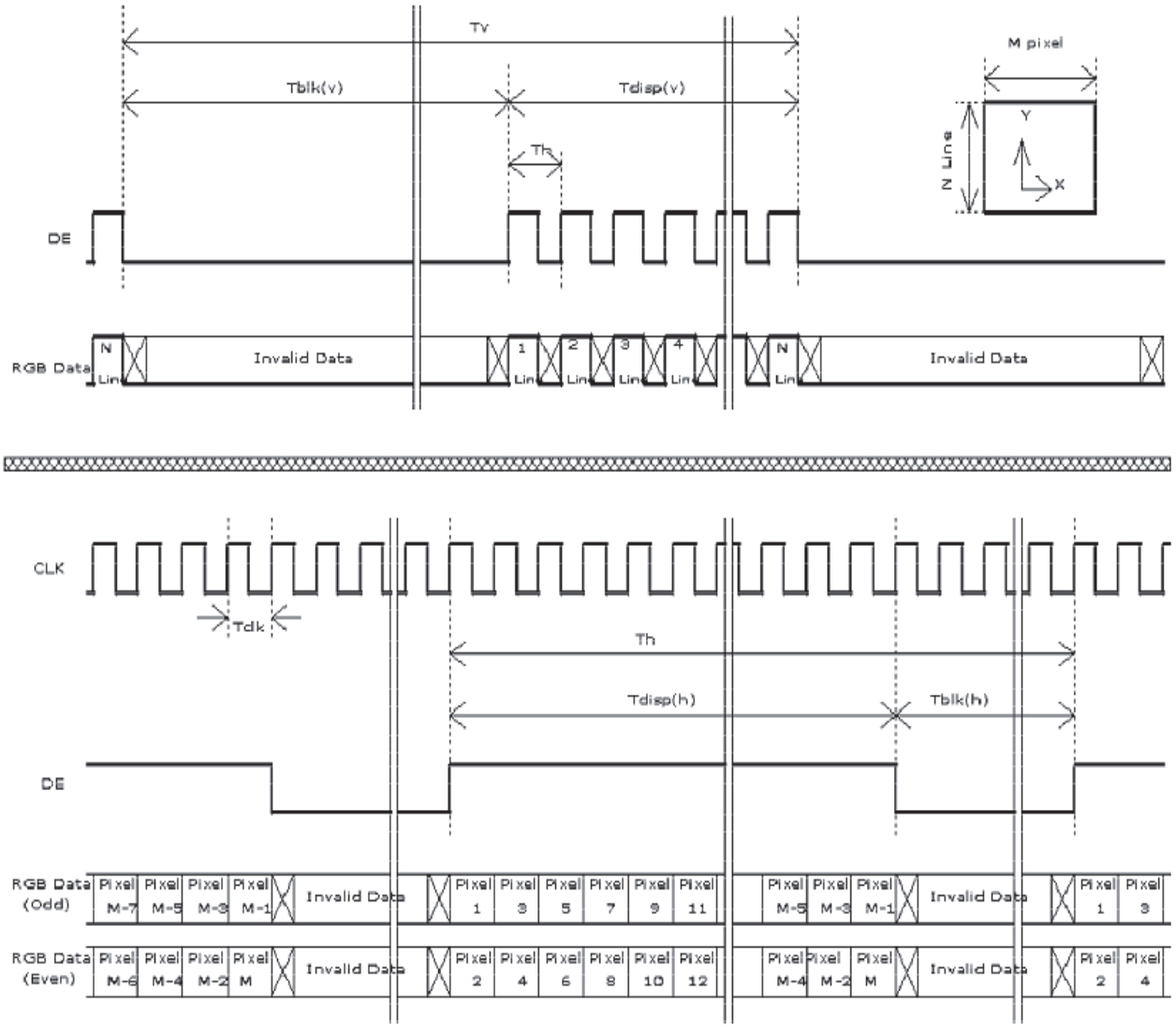
6.4 Timing Characteristics

The input signal timing specifications are shown as the following table

Signal	Item	Symbol	Min	Typ	Max	Unit
Vertical Section	Period	Tv	1092	1130	1793	Th
	Active	Tdisp(v)	1080	1080	1080	Th
	Blanking	Tblk(v)	12	50	713	Th
Horizontal Section	Period	Th	1004	1050	1100	Tclk
	Active	Tdisp(h)	960	960	960	Tclk
	Blanking	Tblk(h)	44	90	140	Tclk
Clock	Period	Tclk	11.1	14.0	18.2	ns
	Frequency	Freq	54.8	71.2	90.0	MHz
Frame rate	Frame rate	VFreq	50	60	76	Hz
Hsync Frequency	Hsync Frequency	HFreq	55	68	90	KHz

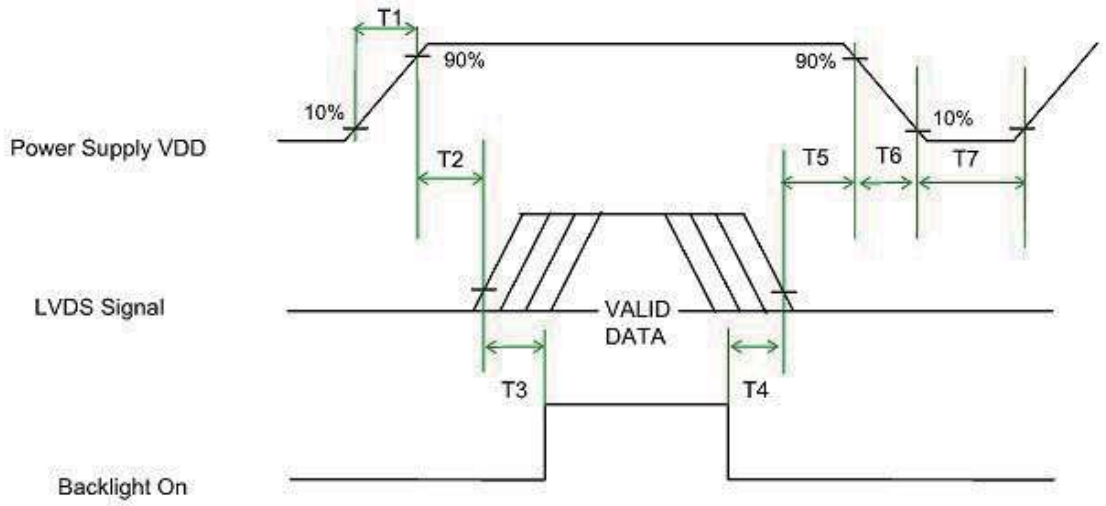
Note 1: DE mode only

6.5 Timing Diagram



6.6 Power ON/OFF Sequence

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



Power Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	-	50	[ms]
T3	500	-	-	[ms]
T4	100	-	-	[ms]
T5	0	-	50	[ms] *Note1,2*
T6	5	-	100	[ms] *Note1,2*
T7	1000	-	-	[ms]

Note1 : Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note2 : During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.

7. Connector & Pin Assignment

7 Connector and Pin Assignment

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

7.1 TFT LCD Module

Connector Name / Designation	Interface Connector / Interface Card
Manufacturer	STM P-TWO
Type Part Number	MSCKT2407P30HB AL230F-A0G1D-P
Mating Housing Part Number	FI-X30HL (Locked Type)

7.1.1 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	RXO0-	2	RXO0+
3	RXO1-	4	RXO1+
5	RXO2-	6	RXO2+
7	GND	8	RXOCLK-
9	RXOCLK+	10	RXO3-
11	RXO3+	12	RXE0-
13	RXE0+	14	GND
15	RXE1-	16	RXE1+
17	GND	18	RXE2-
19	RXE2+	20	RXECLK-
21	RXECLK+	22	RXE3-
23	RXE3+	24	GND
25	NC	26	NC
27	NC	28	VDD
29	VDD	30	VDD

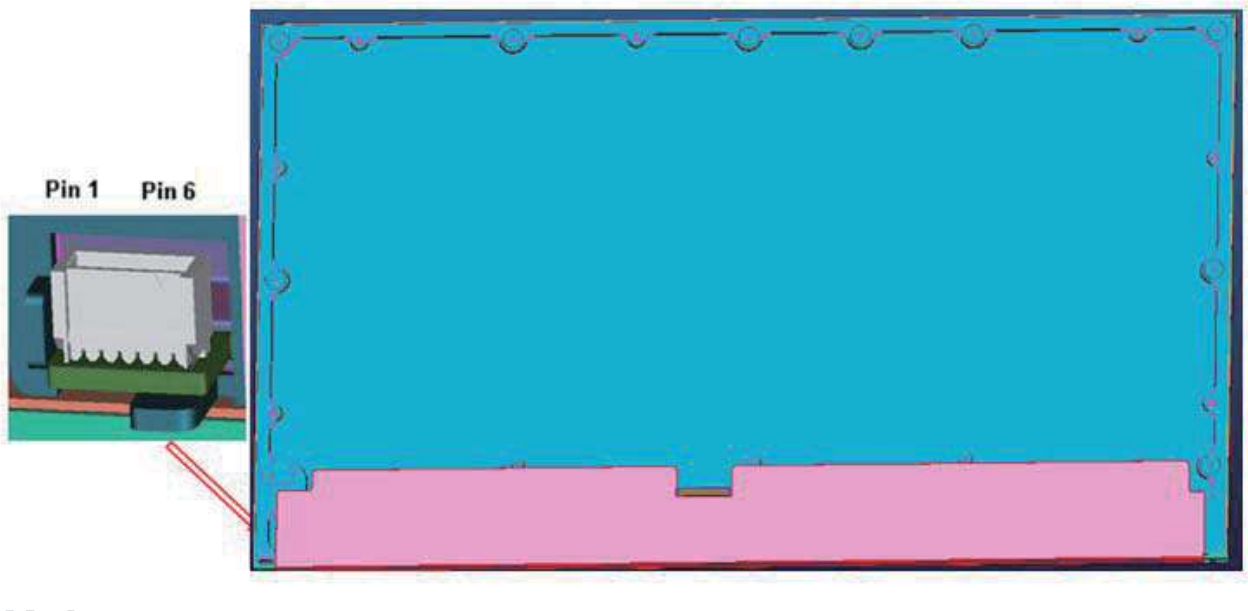
7.2 LED Connector on Backlight Unit

This connector is mounted on LED light bar.

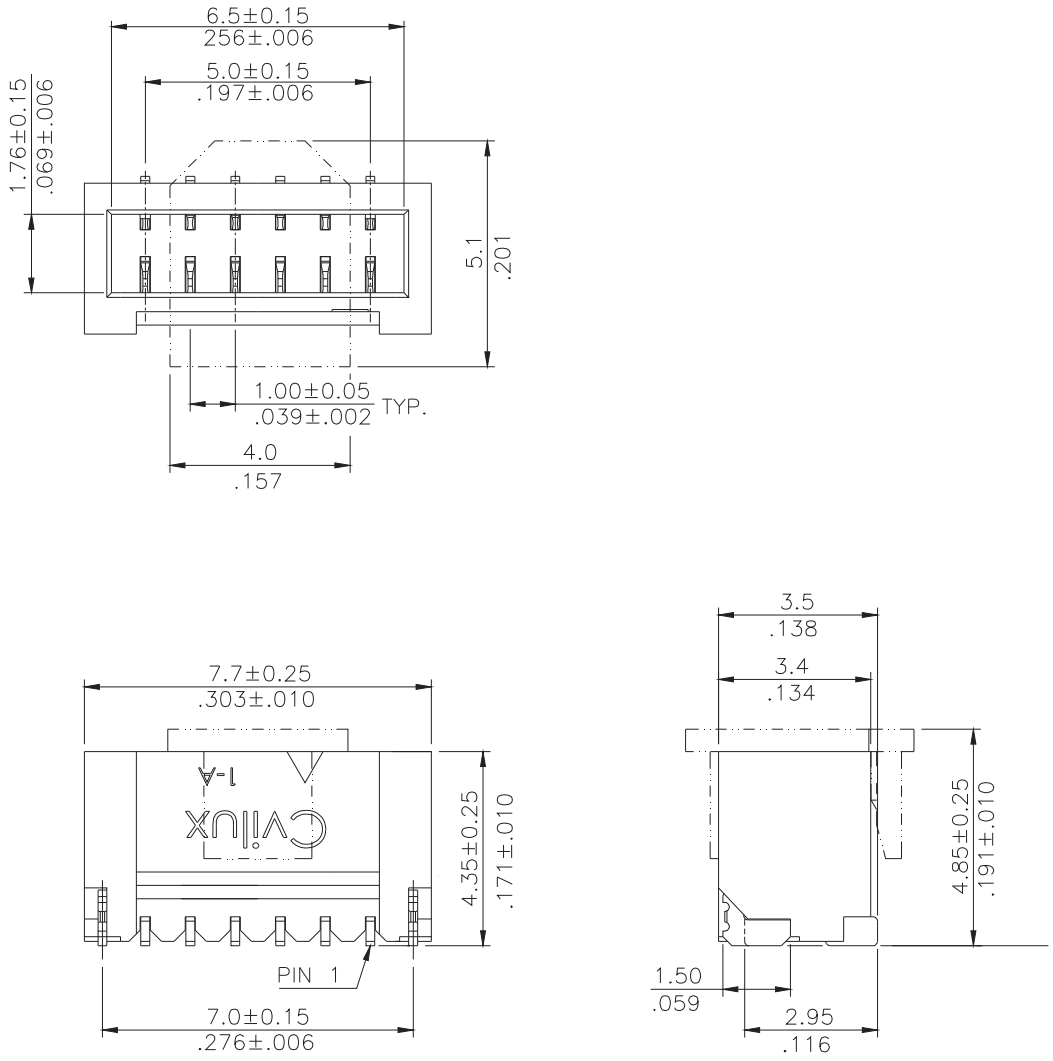
Connector Name / Designation	Light Bar Connector
Manufacturer	Cvilux
Type Part Number	CI1406M1VL0-NH
Mating Housing Part Number	H112K-P06N-13B (Locked Type)

7.2.1 LED Pin assignment

Pin#	Signal Name
1	IFLED (current return)
2	IFLED (current return)
3	VSLED (voltage in)
4	VSLED (voltage in)
5	IFLED (current return)
6	IFLED (current return)



7.2.2 LED Connector Dimension



8. Reliability Test

8 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50°C, 80%RH, 300 hours	
High Temperature Operation (HTO)	Ta= 50°C, 50%RH, 300 hours	
Low Temperature Operation (LTO)	Ta= 0°C, 300 hours	
High Temperature Storage (HTS)	Ta= 60°C, 300 hours	
Low Temperature Storage (LTS)	Ta= -20°C, 300 hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Duration: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Drop Test	Height: 46 cm, package test	
Thermal Shock Test (TST)	-20°C/30min, 60°C/30min, 100 cycles	*Note 1*
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (Electro Static Discharge)	Contact Discharge: ± 15KV, 150pF(330Ω) 1sec, 15 points, 25 times/ point	*Note 2*
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 15 points, 25 times/ point	
Altitude Test	Operation: 18,000 ft Non-Operation: 40,000 ft	*Note 3*

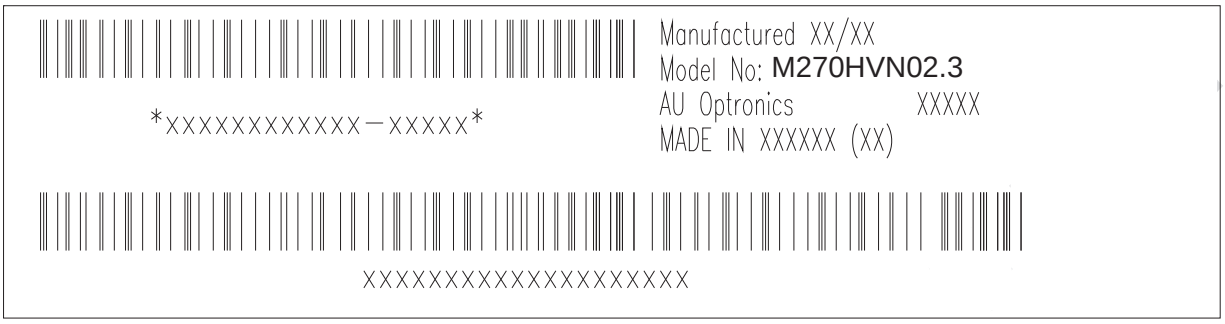
Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

Note 2: EN61000-4-2, ESD class B: Certain performance degradation allowed:

- No data lost
- Self-recoverable
- No hardware failure

9. Shipping label

The label is on the panel as shown below:



Note 6-1: For Pb Free products, AUO will add for identification.

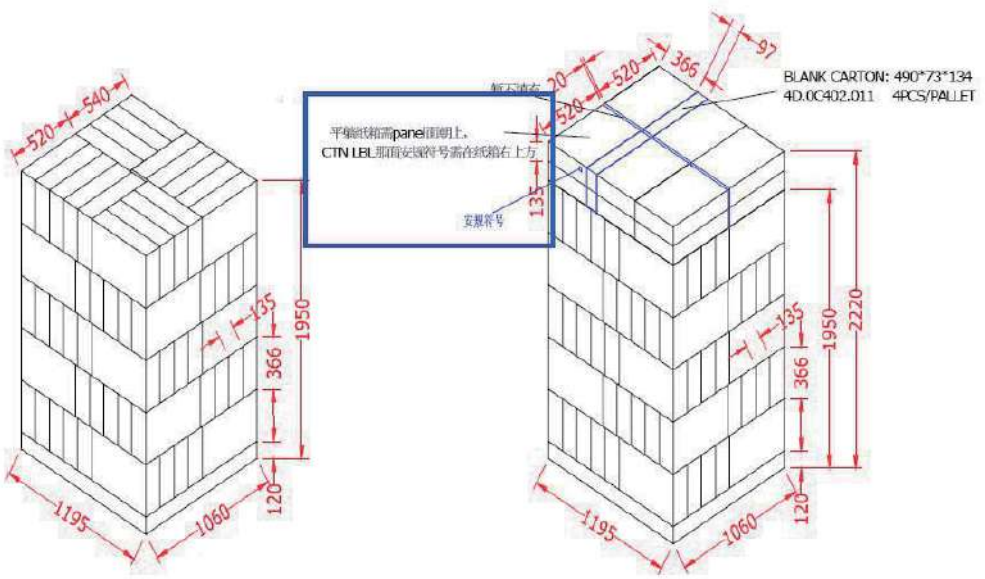
Note 6-2: For RoHS compatible products, AUO will add for identification.

Note 6-3: For China RoHS compatible products, AUO will add for identification.

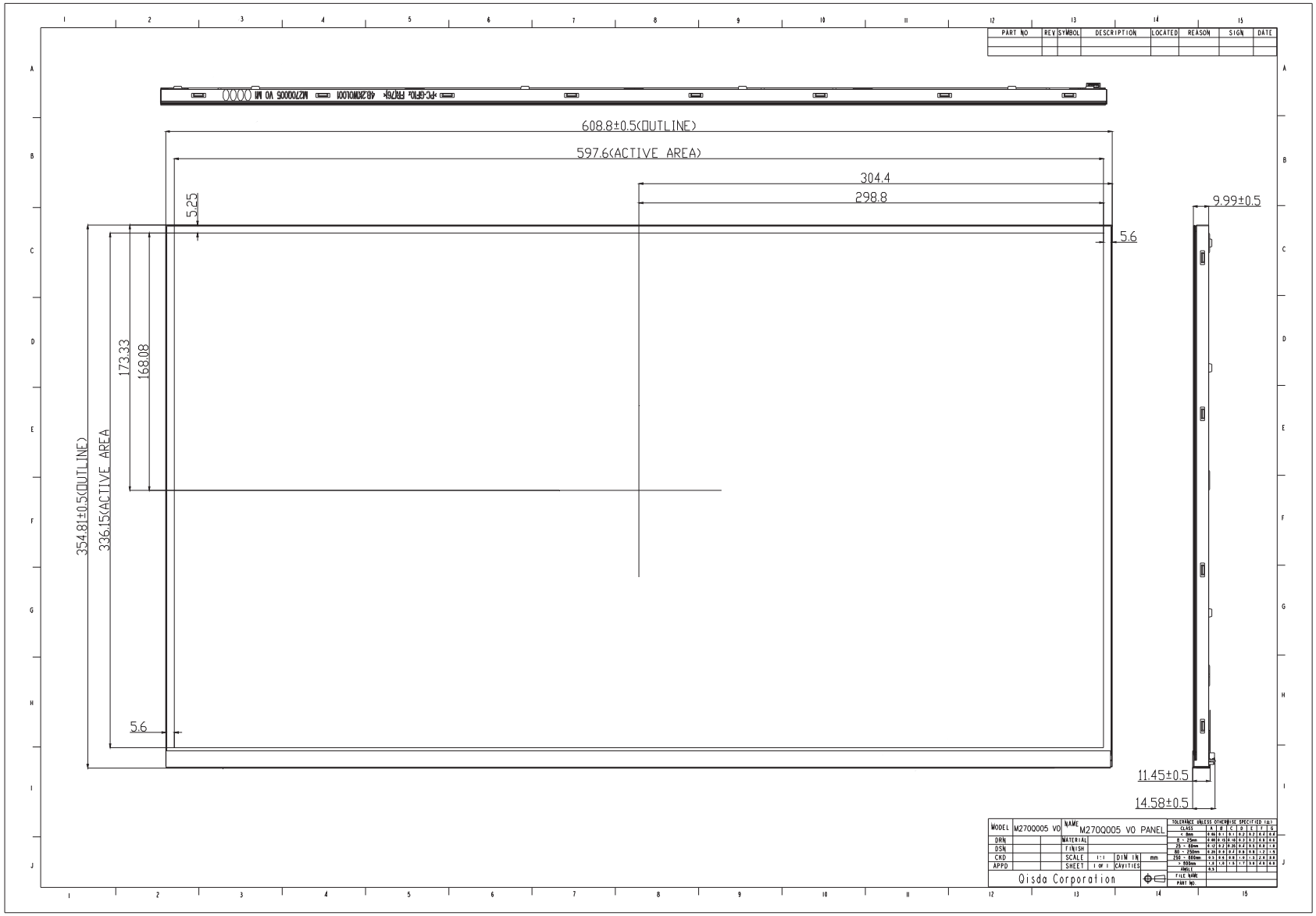
Note 6-4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

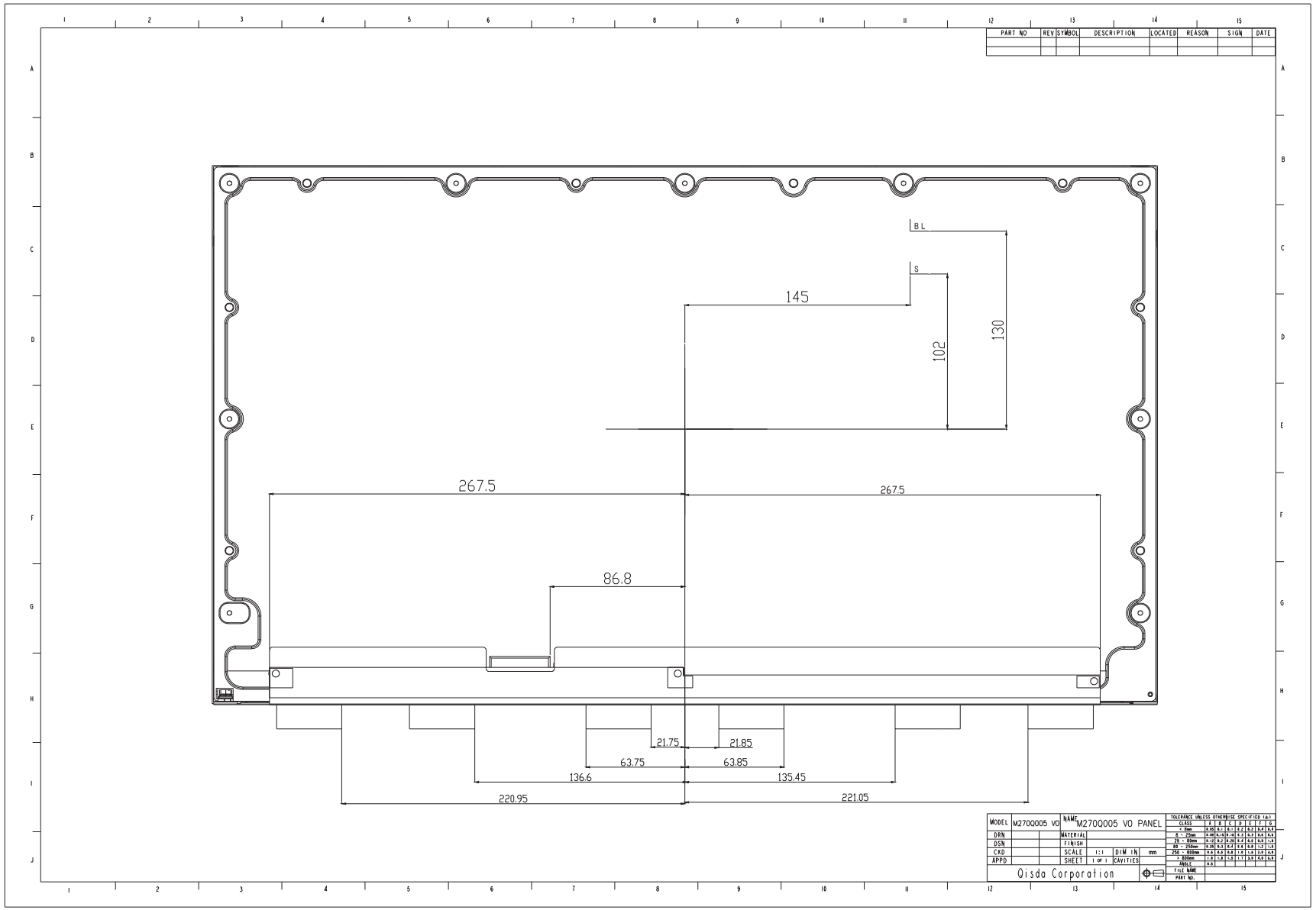
10. Packing Precautions

TFT-LCD Module (or monitor) should be stand or be placed face up in traffic or storage conditions; please do not keep TFT-LCD Module face down (polarizer side down).
Monitor maker should add the notice above in packing description; See the configuration example as below:



栈板尺寸参照: 1199*1061*120
18*5+12=102 PCS


608.8±0.5(OUTLINE)
597.6(ACTIVE AREA)
304.4
298.8
5.25
5.6
354.81±0.5(OUTLINE)
336.15(ACTIVE AREA)
173.33
168.08
5.6
9.99±0.5
11.45±0.5
14.58±0.5
PART NO
REV
SYMBOL
DESCRIPTION
LOCATED
REASON
SIGN
DATE
MODEL
M2700005 V0
NAME
M270Q005 V0 PANEL
DRN
DSN
CKD
APPD
MATERIAL
FINISH
SCALE
DIM IN
mm
SHEET
CAVITIES
Qisda Corporation
TOLERANCE UNLESS OTHERWISE SPECIFIED (±)
FILE NAME
PART NO.


PART NO
REV
SYMBOL
DESCRIPTION
LOCATED
REASON
SIGN
DATE
BL
S
145
130
102
267.5
267.5
86.8
21.75
21.85
63.75
63.85
136.6
135.45
220.95
221.05
MODEL
M2700005 V0
NAME
M2700005 V0 PANEL
DRN
DSN
CKD
APPD
MATERIAL
FINISH
SCALE
1:1
DIM IN
mm
SHEET
1 OF 1
CAVITIES
Qisda Corporation
TOLERANCE UNLESS OTHERWISE SPECIFIED (±)
CLASS
FINE
MEDIUM
COARSE
VERY COARSE
ANGLE
FILE NAME
PART NO.