


## Product Specification

<b>PRODUCT NUMBER</b>	82-029-00
<b>DESCRIPTION</b>	15.6" 1920 x 1080 1080P HD AHVA TFT, HDMI, USB PCT

<p><b>Approved: Product Manager</b></p> <div style="text-align: center;">         04/26/2020     </div> <hr style="width: 80%; margin: 0 auto;"/> <p style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;"> <span>Signature</span> <span>Date</span> </p>	<p><b>Approved: Doc Control</b></p> <div style="text-align: center;">         04/20/2020     </div> <hr style="width: 80%; margin: 0 auto;"/> <p style="display: flex; justify-content: space-between; width: 80%; margin: 0 auto;"> <span>Signature</span> <span>Date</span> </p>
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**REVISION HISTORY**

<b>Version</b>	<b>Date</b>	<b>Section</b>	<b>Comments</b>
REV 00	4/01/2018	All	Tentative Specification first issued.
REV 01	4/17/2018	2, 5.2	Add corrected 2D drawing, update module width
REV 02	5/17/2018	8	Add EDID Description
REV 03	04/26/2020	5	Drawing Updates

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## 1. GENERAL DESCRIPTION

### 1.1 OVERVIEW

82-028-00 is a 15.6" AHVA TFT module with LED Backlight, HDMI display interface and a USB PCT touch interface. This module supports 1920x1080 1080P mode.

### 1.2 FEATURES

- 1080P HD (1920x1080 pixels) resolution
- HDMI Display Interface
- Glass-Glass USB HID Compliant Projected Capacitive Touch Interface.
- PWM Backlight Control
- Wide operating temperature.
- Single 5 Volt Operation
- Industrial mounting via ABS carrier and 3M VHB gasket.
- "Industrial by Design" Long Product Availability.
- RoHS compliance
- SOLIDWORKS® model available with PixelNext NDA on file.

### 1.3 APPLICATION

- Medical Displays, Marine, Instrument, Point of Sale, Broadcast, Audio, Factory HMI, etc.

### 1.4 GENERAL PANEL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	344.16 (H) x 193.59 (V) (15.6" diagonal)	mm	(1)
Bezel Opening Area	346.16 (H) x 194.59 (V)	mm	
Technology Type	AHVA TFT	-	-
Pixel Number	1920 x 1080	pixel	-
Pixel Pitch	0.17925 (H) x 0.17925 (V)	mm	-
Pixel Arrangement	RGB vertical Stripe	-	-
Display Colors	16,194,277 / 262,144	color	-
Display Mode	Normally Black	-	-
Surface Treatment	(7H), Glare	-	-
Module Power Consumption	TBD	W	Typical

## 2. MECHANICAL SPECIFICATIONS

Item	Typ.	Unit	Note
Module Size	Horizontal(H)	386.98	(1)
	Vertical(V)	235.59	
	Depth(D)	20.00	
Weight	TBD	g	

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

### 3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Input Voltage	V <sub>CC</sub>	4.85	5.15	V <sub>DC</sub>	at 25 ± 5°C
Operating Ambient Temperature	T <sub>OP</sub>	-20	+70	°C	
Storage Temperature	T <sub>ST</sub>	-20	+70	°C	

Notes:

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature. The phenomenon is reversible.
3. Ta ≤ 40°C: 85% RH MAX Ta ≥ 40°C:
4. Absolute humidity must be lower than the humidity of 85% at 40°C.
5. Maximum wet-bulb temperature is 46°C.
6. Condensation of dew must be avoided as electrical current leaks will occur, causing degradation of performance specifications

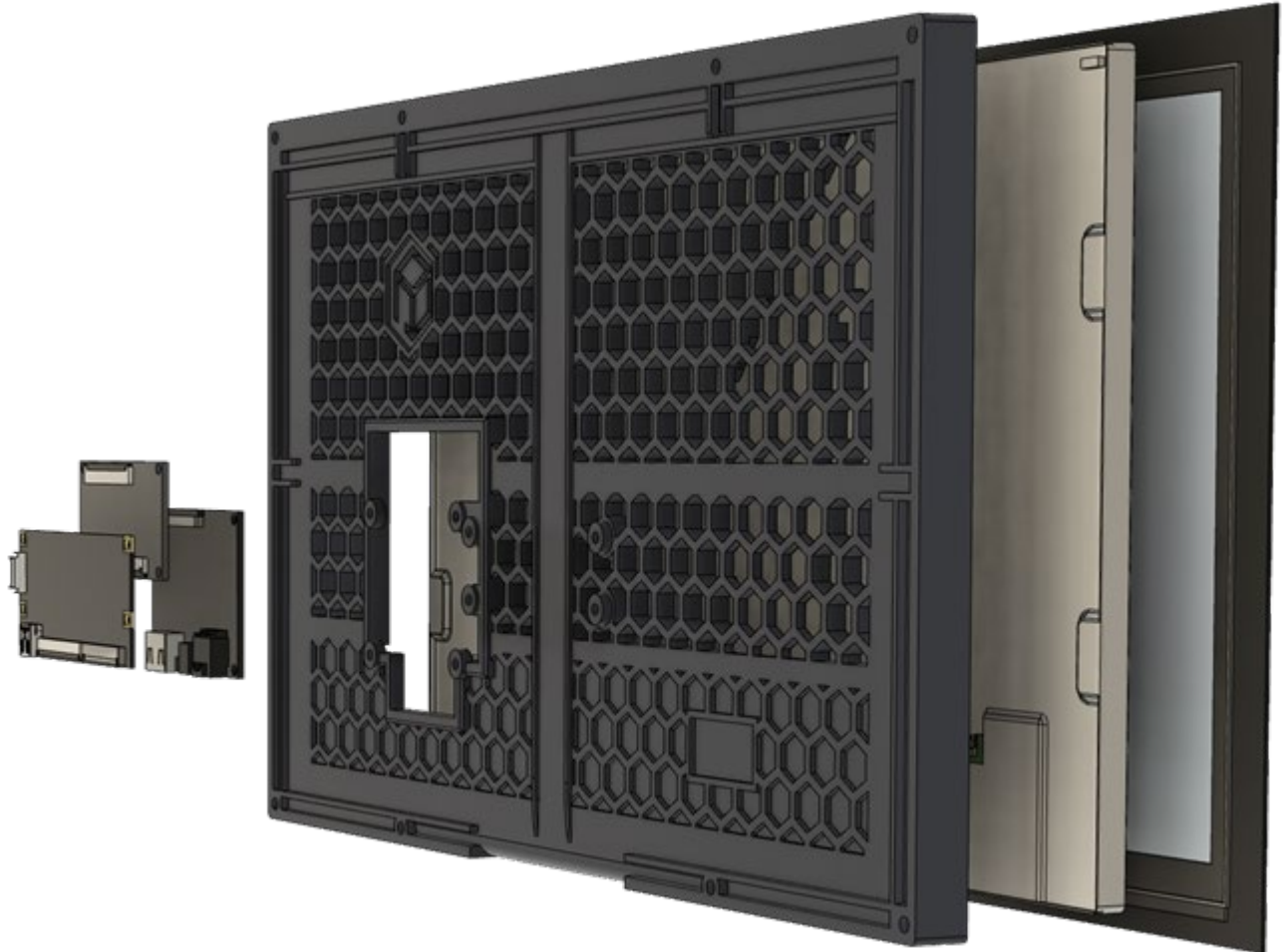
## 4. ELECTRICAL CHARACTERISTICS

## 5. MECHANICAL CHARACTERISTICS

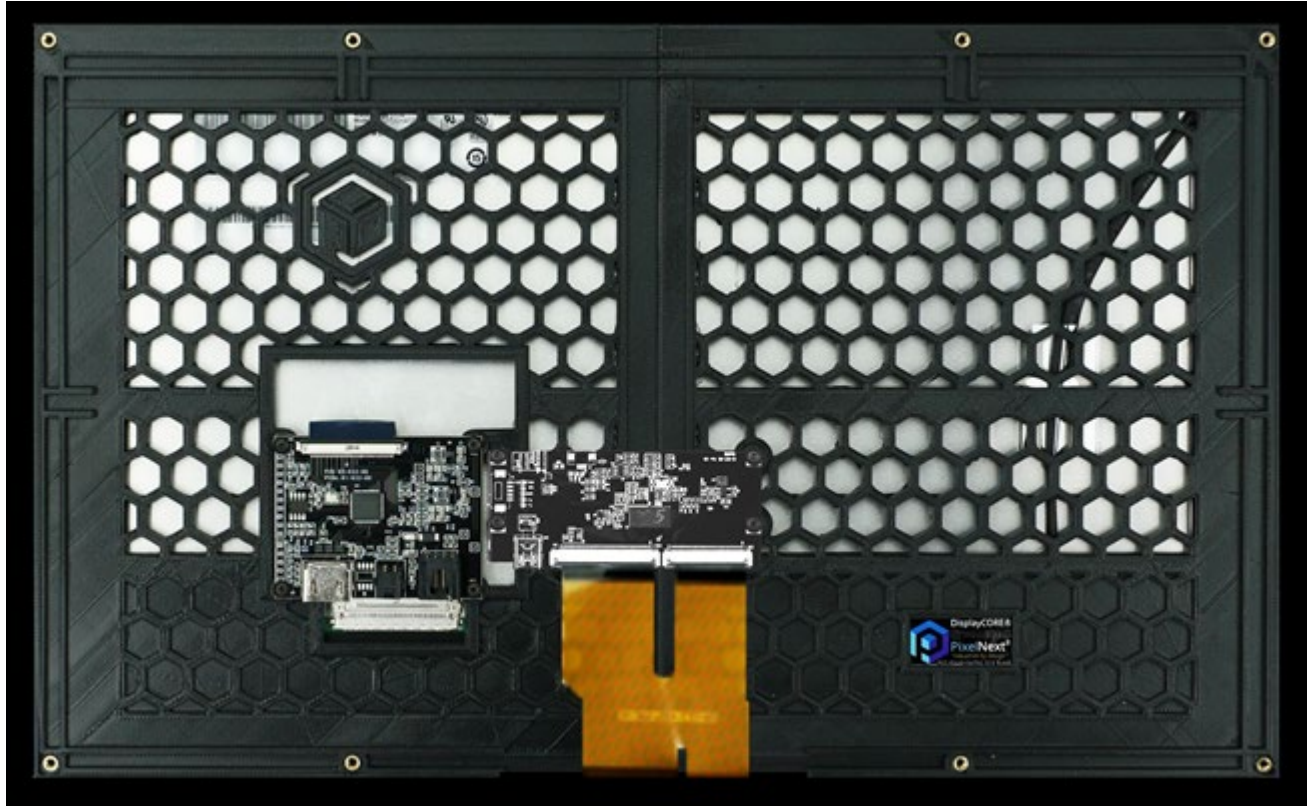
### 5.1 SLDPRT Model available upon request.

Contact Factory

### 5.2 Exploded Drawing

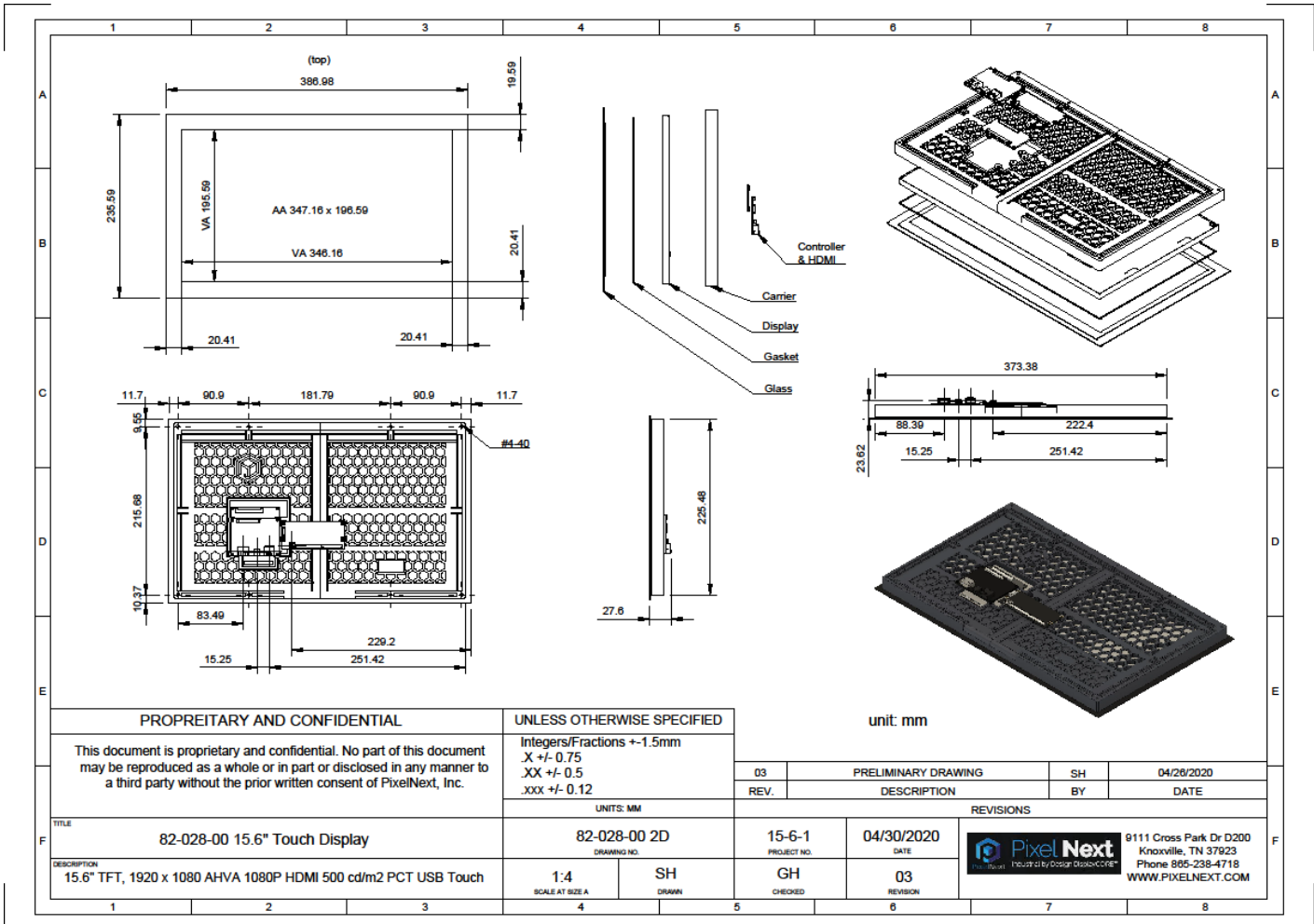


## 5.3 Photo





## 5.4 DRAWING



## 6. CONNECTORS

### 6.1 J1 – POWER

Pin	Name	Description
1	<b>5V</b>	Power – (Rated at 5V DC Current TBD)
1	<b>GND</b>	Ground

**TE Connectivity 5V Connector - 2-1445098-2**

### 6.2 J2 – USB TOUCH – MINI

Pin	Name	Description
1	5V	5V (sourced from USB 2.0 host) Used only to power PCT Touch IC
2	D-	Data differential pair minus
3	D+	Data differential pair plus
4	ID	ID (Host or Slave)
5	GND	Ground

### 6.3 J3 – HDMI A

Pin	Name	Description
1	TMDS Data2+	Digital Input Channel 2 True
2	TMDS Data2 Shield	Ground
3	TMDS Data2-	Digital Input Channel 2 Complement
4	TMDS Data1+	Digital Input Channel 1 True
5	TMDS Data1 Shield	Ground
6	TMDS Data1-	Digital Input Channel 1 Complement
7	TMDS Data0+	Digital Input Channel 0 True
8	TMDS Data0 Shield	Ground
9	TMDS Data0-	Digital Input Channel 0 Complement
10	TMDS Clock+	
11	TMDS Clock Shield	Ground
12	TMDS Clock-	
13	CEC	Control
14	Reserved/HEC Data-	No Connection
15	SCL	DDC clock
16	SDA	DDC data
17	DDC/HEC/CEC Ground	Ground
18	+5 V Power	power EDID/DDC
19	Hot Plug Detect/HEC Data+	

### 6.4 J4 – PWM

Pin	Name	Description
1	<b>TBD</b>	TBD
1	<b>TBD</b>	TBD

## 7. OPTICAL CHARACTERISTICS

### 7.1 TEST CONDITIONS

Item	Symbol	Value	Un
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%
Converter Voltage	V <sub>i</sub>	12	V
Converter Duty		100%	

### 7.2 OPTICAL SPECIFICATIONS

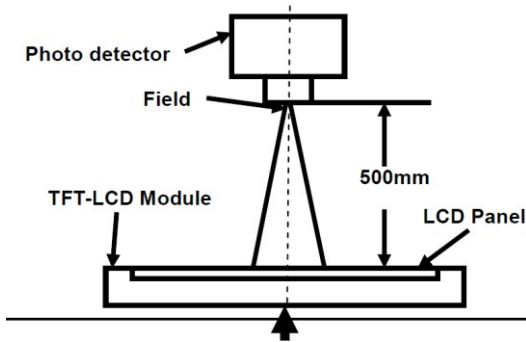
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Contrast Ratio	CR	θ=0°	700	1000	–		Note 8
Response Time	Tr(on)+Tf(off)	25°C	–	25	35	ms	Note1,5
Viewing Angles	θT	CR≥10	80	85	–	Degree	Note 2
	θB		80	85	–		
	θL		80	85	–		
	θR		80	85	–		
Luminance	L		–	470	–	cd/m <sup>2</sup>	Note 1,6
Uniformity	U		75	80	–	%	Note 1,7
Lifetime			--	50,000	–	Hours	Note 9

Test Conditions:

1. IF= 20mA (one channel), the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

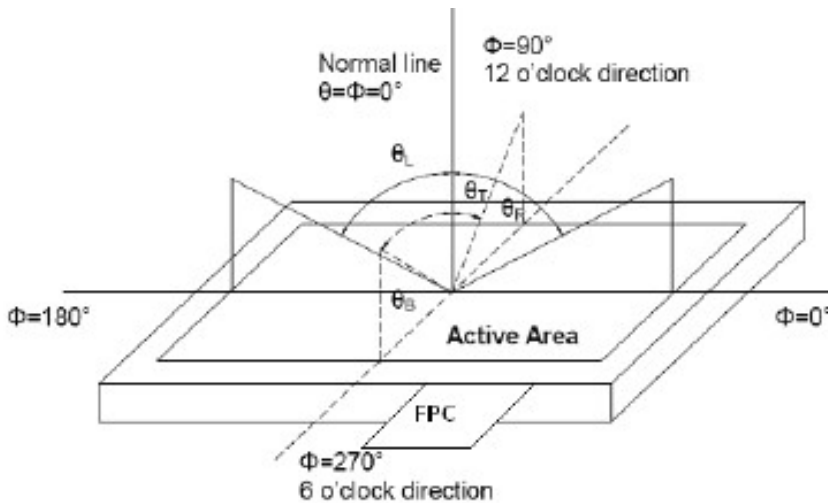
The optical characteristics should be measured in dark room. After 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo Detector	Field
Contrast Ratio	SR-3A	1°
Contrast Ratio		
Contrast Ratio		
Contrast Ratio		
Contrast Ratio	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)

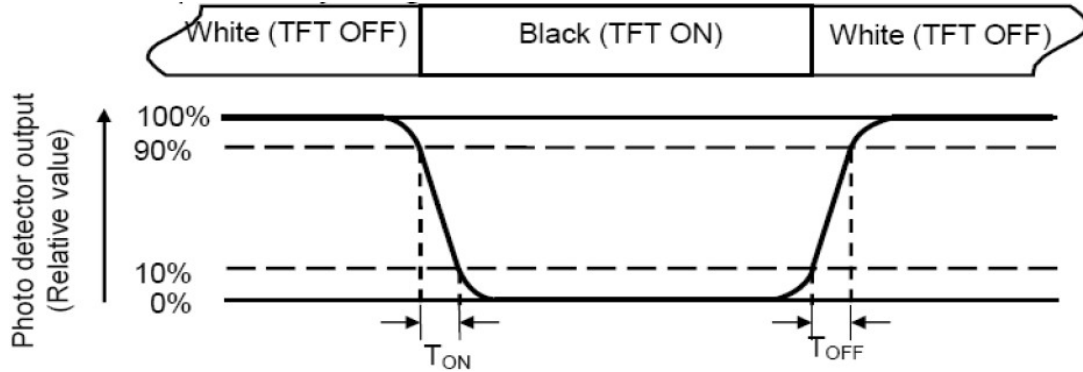


Note 3: Definition of contrast ratio

Contrast Ratio (CR)= Luminance measured when LCD is on “White” state/Luminance measured when LCD is on “Black” state

“White state “: The state is that the LCD should be driven by  $V_{white}$  ( $V_{white}$ : To be determined). “Black state: The state is that the LCD should be driven by  $V_{black}$  ( $V_{black}$ : To be determined).

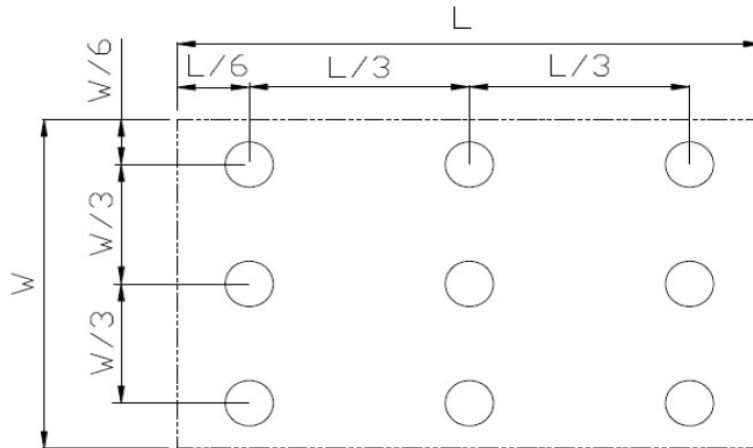
The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931) Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.  $L_{max}$ : The measured Maximum luminance of all measurement position.  $L_{min}$ : The measured Minimum luminance of all.



Note 7: Definition of Response time

Note 8: Definition of Luminance: Measure the luminance of white state at center point. Left/right 0° Top/bottom 5°

Note 9: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

## 8. EDID Description

Address	FUNCTION	Value	Value	Value	Value
HEX		HEX	BIN	DEC	ASCII
0	Header	0	00000000	0	
1		ff	11111111	255	
2		ff	11111111	255	
3		ff	11111111	255	
4		ff	11111111	255	
5		ff	11111111	255	
6		ff	11111111	255	
7		0	00000000	0	
8	EISA Manuf. Code LSB	43	01000011	67	
9	Compressed ASCII	0e	00001110	14	
A	Product Code	28	00101000	40	
B	hex, LSB first	20	00100000	32	
C	32-bit ser #	0	00000000	0	
D		0	00000000	0	
E		0	00000000	0	
F		0	00000000	0	
10	Week of manufacture	17	00010111	23	
11	Year of manufacture	1c	00011100	28	
12	EDID Structure Ver.	1	00000001	1	
13	EDID revision #	4	00000100	4	
14	Video input def. (digital I/P, non-TMDS, CRGB)	a2	10100010	162	
15	Max H image size (rounded to cm)	22	00100010	34	
16	Max V image size (rounded to cm)	13	00010011	19	
17	Display Gamma =(gamma*100)-100	78	01111000	120	
18	Feature support (no DPMS, Active OFF, RGB, tmg Blk#1)	0	00000000	0	
19	Red/green low bits (Lower 2:2:2:2 bits)	97	10010111	151	
1A	Blue/white low bits (Lower 2:2:2:2 bits)	75	01110101	117	
1B	Red x (Upper 8 bits)	a3	10100011	163	
1C	Red y/ highER 8 bits	55	01010101	85	
1D	Green x	4d	01001101	77	
1E	Green y	9f	10011111	159	
1F	Blue x	28	00101000	40	
20	Blue y	0e	00001110	14	
21	White x	50	01010000	80	
22	White y	54	01010100	84	
23	Established timing 1	0	00000000	0	
24	Established timing 2	0	00000000	0	

25	Established timing 3	0	00000000	0	
26	Standard timing #1	d1	11010001	209	
27		c0	11000000	192	
28	Standard timing #2	1	00000001	1	
29		0	00000000	0	
2A	Standard timing #3	1	00000001	1	
2B		0	00000000	0	
2C	Standard timing #4	1	00000001	1	
2D		0	00000000	0	
2E	Standard timing #5	1	00000001	1	
2F		0	00000000	0	
30	Standard timing #6	1	00000001	1	
31		0	00000000	0	
32	Standard timing #7	1	00000001	1	
33		0	00000000	0	
34	Standard timing #8	1	00000001	1	
35		0	00000000	0	
36	Pixel Clock/10000 LSB	1a	00011010	26	
37	Pixel Clock/10000 USB	36	00110110	54	
38	Horz active Lower 8bits	80	10000000	128	
39	Horz blanking Lower 8bits	a0	10100000	160	
3A	HorzAct:HorzBlnk Upper 4:4 bits	70	01110000	112	
3B	Vertical Active Lower 8bits	38	00111000	56	
3C	Vertical Blanking Lower 8bits	1f	00011111	31	
3D	Vert Act : Vertical Blanking (upper 4:4 bit)	40	01000000	64	
3E	HorzSync. Offset	30	00110000	48	
3F	HorzSync.Width	20	00100000	32	
40	VertSync.Offset : VertSync.Width	35	00110101	53	
41	Horz&Vert Sync Offset/Width Upper 2bits	0	00000000	0	
42	Horizontal Image Size Lower 8bits	40	01000000	64	
43	Vertical Image Size Lower 8bits	44	01000100	68	
44	Horizontal & Vertical Image Size (upper 4:4 bits)	21	00100001	33	
45	Horizontal Border (zero for internal LCD)	0	00000000	0	
46	Vertical Border (zero for internal LCD)	0	00000000	0	
47	Signal (non-intr, norm, no stero, sep sync, neg pol)	18	00011000	24	
48	Detailed timing/monitor	0	00000000	0	
49	descriptor #2	0	00000000	0	
4A		0	00000000	0	
4B		fc	11111100	252	
4C		0	00000000	0	
4D		38	00111000	56	8
4E		32	00110010	50	2

4F		2d	00101101	45	-
50		30	00110000	48	0
51		32	00110010	50	2
52		38	00111000	56	8
53		2d	00101101	45	-
54		30	00110000	48	0
55		30	00110000	48	0
56		0a	00001010	10	
57		20	00100000	32	
58		20	00100000	32	
59		20	00100000	32	
5A		0	00000000	0	
5B		0	00000000	0	
5C		0	00000000	0	
5D		fe	11111110	254	
5E		0	00000000	0	
5F	UEFI PNP ID	50	01010000	80	P
60	UEFI PNP ID	58	01011000	88	X
61	UEFI PNP ID	4e	01001110	78	N
62		0a	00001010	10	
63		20	00100000	32	
64		20	00100000	32	
65		20	00100000	32	
66		20	00100000	32	
67		20	00100000	32	
68		20	00100000	32	
69		20	00100000	32	
6A		20	00100000	32	
6B		20	00100000	32	
6C	Detailed timing/monitor	0	00000000	0	
6D	descriptor #4	0	00000000	0	
6E		0	00000000	0	
6F		fe	11111110	254	
70		0	00000000	0	
71	Manufacturer	50	01010000	80	P
72	Manufacturer	69	01101001	105	i
73	Manufacturer	78	01111000	120	x
74	Manufacturer	65	01100101	101	e
75	Manufacturer	6c	01101100	108	l
76	Manufacturer	4e	01001110	78	N
77	Manufacturer	65	01100101	101	e
78	Manufacturer	78	01111000	120	x



79	Manufacturer	74	01110100	116	t
7A		0a	00001010	10	
7B		20	00100000	32	
7C		20	00100000	32	
7D		20	00100000	32	
7E	Extension Flag	1	00000001	1	
7F	Checksum	7f	01111111	127	

## 9. Environmental / RELIABILITY TEST CRITERIA

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 96hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 96hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 96hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 96hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 96 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 5Cycles	Per table in below
7	ESD (Operation)	Air discharge:+/-8KV, Contact discharge:4KV	Per table in below
8	Vibration (Non-operation)	10Hz~150Hz, 100m/s <sup>2</sup> , 120min	Per table in below
9	Shock (Non-operation)	Half- sine wave,300m/s <sup>2</sup> ,11ms	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

## 10. FCC Declaration

TBD

## 11. UL Material Declaration

- (1) 80-025-00 LVDS Display Manufacturer, AUO G156HAN02.1
- (2) 70-026-00 PCT Touch Screen – Inert Borosilicate Glass – Manufacturer Beijing Jinke Xingtai Co. Ltd
- (3) 90-031-00 Module Carrier – Firewire® FR-ABS is made using a premium UL94 V-0 rated ABS.
- (4) 61-017-00 HDMI to LVDS Controller PCBA – Manufacturer Shenzhen Jinjiaxing Electronic CO LTD. UL Certificate E353925
- (5) 61-020-00 DSI to LVDS Transition PCBA – Manufacturer Shenzhen Jinjiaxing Electronic CO LTD. UL Certificate E353925
- (6) 20-007-01, 20-008-001 Gaskets – 3M VHB RP25 - UL746C

## 12. PRECAUTIONS

### 12.1 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 chAHVA 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 10°C may reduce the display quality. For example, the response time will become slow.
- (11) Do not keep same pattern in a long period of time. It may cause image sticking on LCD.

### 12.2 SAFETY PRECAUTIONS

- (1) Do not disassemble the module or touch the backlight array.
- (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.