1.72" 356*400 IPS WAE2012 16.7M QSPI B2B Connector 24 Pin – In Cell Touch

ALP ELECTRONIX

- WEA2012 is driven with 24 bit color depth.
- LCD can display 16.7M Colors (8R:RG:8B).
- Low Power Touch Standby Mode.
- In Cell Touch
  - 8 Channel Virtual Touch Keys.
  - Supports Vblank touch sensing mode up to 60Hz report rate.
- SPI interface
  - Supports SPI / DSPI / QSPI
  - 1 / 2 / 4 data and 1 clock lane
  - Data rate up yo 40Mbps
- RAM
  - Embedded 80000 bytes RAM (400*400/2).
- Low Current Sleep Mode and 8-color display mode for power saving.
- Supports Vblank touch sensing mode up to 60Hz report rate.
- CABC dynamics backlight control with PWM output.
- Programmable Gamma Correction Curve.
- Power Supply
  - VDD: 2.5V – 3.3V.
  - VDDIO: 1.65V – 3.3V.
- Normally black.
- IPS, all view direction.
- Brightness: 480 cd/m^2.
- Low Profile Board-to-Board Connector.

1 General Specifications

No.	Item	Contents	Unit
1	**LCD Size**	1.72	inch
2	**Display Mode**	Normally black	-
3	**Resolution**	356(H)RGB x 400(V)	pixels
4	**Pixel pitch**	0.08175(H) x 0.08175(V)	mm
5	**Active area**	29.10(H) x 32.70(V)	mm
6	**Module size**	31.50(H) x 37.22(V) x 1.56 (D)	mm
7	**Pixel arrangement**	RGB Vertical stripe	-
8	**Interface**	QSPI	-
9	**Display Colors**	16.7M	colors
10	**Drive IC**	WAE2012	-
11	**Luminance(cd/m2)**	480 (TYP)	cd/m2
12	**Viewing Direction**	All View	-
13	**Backlight**	3 White LED Parallel	-
14	**Operating Temp.**	-20°C~ + 70°C	°C
15	**Storage Temp.**	-30°C~+ 80°C	°C
16	**Weight**	3.9	gram

2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	-0.3	3.3	V
Supply Voltage for Interface	V_{DDIO}	-0.3	3.3	V
Operation Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C

2.2 Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
System Voltage	V_{DD}	2.5	2.8	3.3	V
Supply Voltage for Interface	V_{DDIO}	1.65	1.8	3.3	V
Gate Driver Voltage	V_{GH}	6	-	15	V
	V_{GL}	-14	-	-5	V
Operating Current For V_{DD}	I_{DD}	-	TBD	TBD	mA
Sleep_In Mode V_{DD}	I_{dd}	-	TBD	TBD	μA
Sleep_In Mode V_{DDIO}	I_{ddio}	-	TBD	TBD	μA

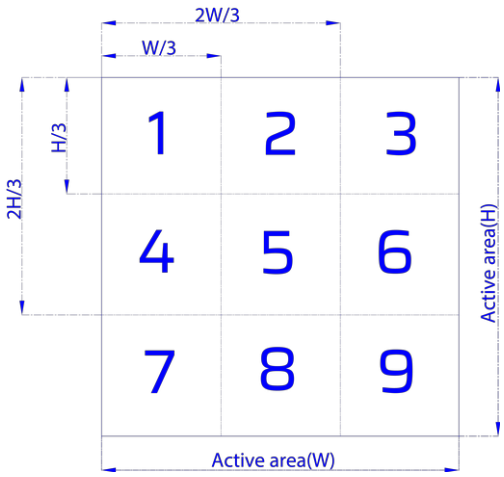
2.3 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Voltage for LED backlight	V_{LED}	2.9	3.0	3.1	V	
Current for LED backlight	I_{LED}	-	60	90	mA	3 LED
Power Consumption	P_{bl}	-	180	279	mW	1
Brightness	L_{br}	420	480	-	-	2
LED Life Time	-	20000	-	-	hr	3

Using condition: constant current driving method If=40mA(+/-10%).

Notes:

1. Where I_{LED} = 60mA, V_{LED} = 3.0V, $P_{CONSUMPTION}$ = I_{LED} * V_{LED}.
2. Uniform measure condition:
   a) Measure 9 point, measure location is shown on the right side.
   b) Uniform = (Min. brightness / Max brightness) * 100%
   c) Best contrast.
3. The environmental conducted under ambient air flow ,at Ta=25±2°C,60%RH±5%



2.4 Timing Characteristic of The LCD

2.4.1 QSPI Interface Characteristic of The LCD

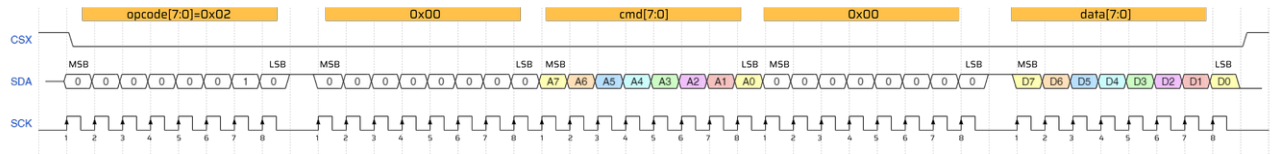


Figure 1: QSPI write command and write data (1 data lanes)

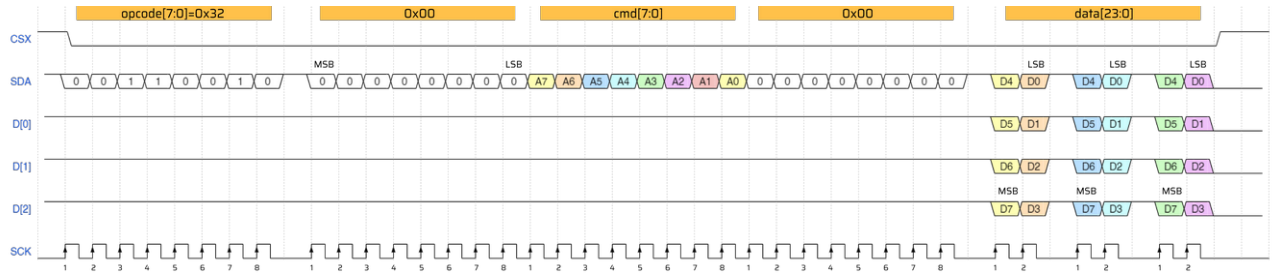
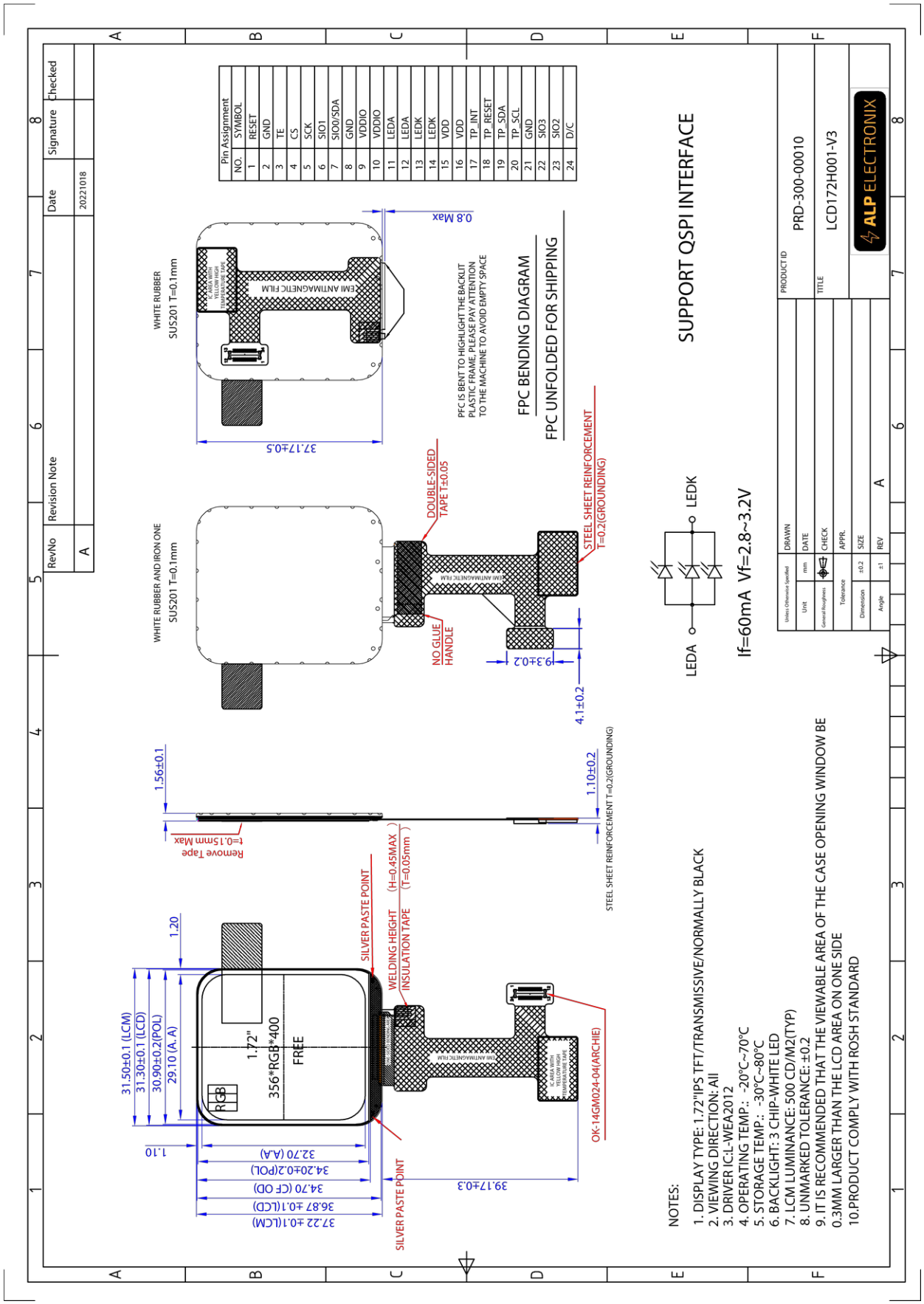


Figure 2: QSPI write command and write data (4 data lanes)

(Note: for each time using 0x2C or 0x3C cmd to write RAM data, please write 4 pixels data or more.)

Please refer to the driver IC specification.

3 Mechanical Drawing



4 Pin Definition

FPC Connector is used for the module electronics interface.

Pin No.	Symbol	Description
1	$\overline{\text{RESET}}$	Reset signal. It must be applied to properly initialize the chip. Active low.
2	GND	Ground pin.
3	TE	Tearing effect signal is used to synchronize MCU to frame memory writing.
4	$\overline{\text{CS}}$	QSPI chip select input pin. Active low.
5	SCK	QSPI interface clock.
6	SIO1	Serial input signal in QSPI serial data interface.
7	SIO0/SDA	QSPI interface input/output pin. The data is latched on the rising edge of the SCL.
8	GND	Ground pin.
9	VDDIO	Power supply for interface logic.
10	VDDIO	Power supply for interface logic.
11	LEDA	Backlight LED anode.
12	LEDA	Backlight LED anode.
13	LEDK	Backlight LED cathode.
14	LEDK	Backlight LED cathode.
15	VDD	Power supply, VDD=2.5V-3.3V.
16	VDD	Power supply, VDD=2.5V-3.3V.
17	TP-INT	Touch panel interrupt.
18	$\overline{\text{TP-RESET}}$	Touch panel reset signal. Active low.
19	TP-SDA	Touch panel I^2C data input and output.
20	TP-SCL	Touch panel I^2C clock input.
21	GND	Ground pin.
22	SIO3	QSPI serial data interface.
23	SIO2	QSPI serial data interface.
24	D/C	Display data/command selection pin.

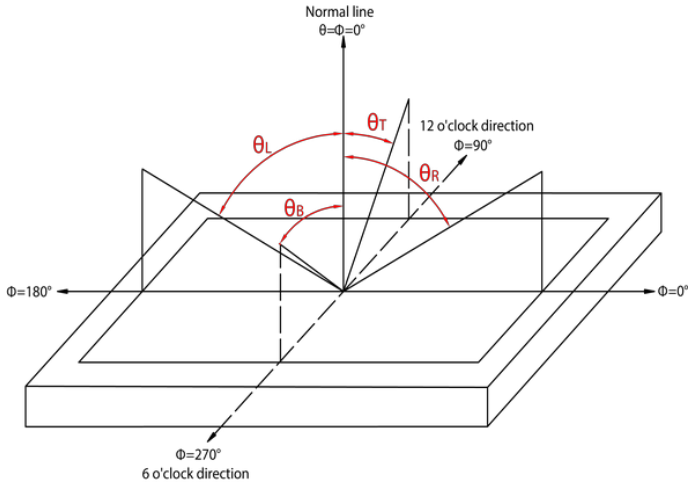
5 Optical Characteristics

Item	Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit	Remark
Viewing Angle[1]	θ	Φ = 0°	25°C	-	80	-	Degree	Note 1
		Φ = 180°	25°C	-	80	-		
	θ	Φ = 90°	25°C	-	80	-		
		Φ = 270°	25°C	-	80	-		
Brightness	L_{br}	--	-	420	480	-	cd/m^2	
Luminance Uniformity	ΔL	--	-	75	80			
Contrast Ratio	CR	-	25°C	1200	1500	-		Note 2
Response Time	T_R+T_F	θ = 0° Φ = 0°	25°C	-	35	40	mS	Note 3
Color of CIE Coordinate	White	X	25°C	-0.03	0.277	+0.03	-	BM-7A
		Y	25°C		0.300			
	Red	X	25°C		0.649			
		Y	25°C		0.338			
	Green	X	25°C		0.323			
		Y	25°C		0.620			

	Blue	X	25ºC		0.151			
		Y	25ºC		0.076			
Transmittance (with polarizer)	-	-	-	2.7	3.0	-	%	

Notes:

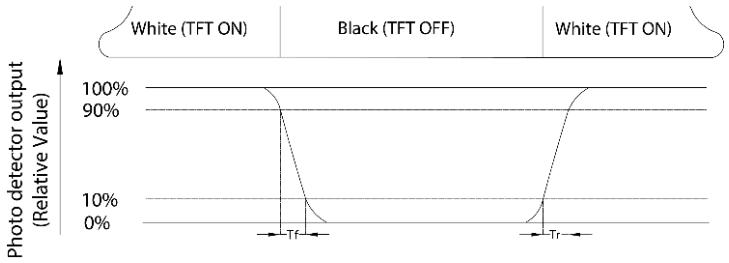
1. Definition of Viewing Angle:



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

$$Contrast\ Ratio\,(CR)=\frac{Luminance\ measured\ when\ LCD\ is\ on\ the\ White\ state}{Luminance\ measured\ when\ LCD\ is\ on\ the\ Black\ state}$$

3. Definition of Response Time: Sum of T_R and T_F



6 Reliability

6.1 Contents of Reliability Tests

No.	Item	Conditions
1	**High Temperature Operation**	70°C ±2°C 120 hrs
2	**Low Temperature Operation**	-20°C ±2°C 120 hrs
3	**High Temperature Storage**	80°C ±2°C, 120 hrs
4	**Low Temperature Storage**	-30°C ±2°C, 120 hrs
5	**High Temperature /Humidity Operation**	60°C ±2°C, 90% RH, 120 hrs
6	**Temperature Cycling**	-10°C→25°C→60°C→25°C→-10°C 30min 5min 30min 5min 30min 10 cycle.
7	**Vibration Test**	Total fixed amplitude:1.5mm. Vibration Frequency:10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.
	ESD Test	Air Discharge: ±4KV with 5 times.
		Contact Discharge: ±2KV with 5 times.

Note: No charge on display and in operation under the following test condition. Please note that the reliability test project requires the use of virgin samples.

Condition: Unless otherwise specified ,tests will be conducted under the following condition.

Temperature:20°C ±5°C.

Humidity:65±5%RH.

Tests will be not conducted under functioning state.

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7 Revision History

Revision	Details
1.0	Initial Release – 01.01.2023

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