1.69" 240*280 IPS ST7789V2 262K SPI FPC Connector 12 Pin

ALP ELECTRONIX

- ST7789V2 is driven with 18 bit color depth.
- Single chip TFT-LCD Controller/Driver with On-chip Frame Memory (FM).
- Display Features
  - Programmable Partial Display Duty
  - CABC for saving current consumption
- Driving Algorithm
  - Dot Inversion.
  - Column Inversion.
  - Color enhancement.
- Display Colors (Color Mode)
  - Full Color: 262K, RGB=(666), Idle Mode Off
  - Color Reduce: 8-color, RGB=(111), Idle Mode On
- Programmable Pixel Color Format (Color Depth) for Various Display Data input Format
  - 12-bit/pixel: RGB=(444)
  - 16-bit/pixel: RGB=(565)
  - 18-bit/pixel: RGB=(666)
- SPI interface
  - 4 Line SPI Interface.
- Normally black.
- IPS, all view direction.
- Power Supply
  - VDD: 2.4V - 3.3V.
  - VDDIO: 1.65V - 3.3V.
- Brightness: 350 cd/m^2.
- FPC Connector.

1 General Specifications

No.	Item	Contents	Unit
1	**LCD Size**	1.69”	inch
2	**LCD Type**	TFT/TRANSMISSIVE	-
3	**Viewing Direction**	ALL view	-
4	**Outline Dimensions (WxHxT)**	30.07(W) x 37.43(H) x 1.56(T)	mm
5	**Viewing Area**	28.63 x 35.64	mm
6	**Active Area**	27.97(W) x 32.63(H)	mm
7	**Number of Dots**	240RGB x 280 Dots	-
8	**Pixel Pitch (WxH)**	0.073 x 0.219	mm
9	**Driver IC**	ST7789	-
10	**Interface Type**	4 Line SPI	-
11	**Input Voltage**	2.8V	-
12	**Module Power Consumption**	TBD	mW
13	**Colors**	262K	-
14	**Luminance**	350	cd/m^2
15	**Backlight**	3 White LED Parallel	-
16	**Operating Temperature**	-20ºC - +70ºC	-
17	**Storage Temperature**	-30ºC - +80ºC	-
18	**Weight**	-	gram

2 Electrical Characteristics

2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	V_{DD}	-0.3	4.6	V
Supply Voltage for Logic	V_{DDIO}	-0.3	4.6	V
Operation Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Humidity	R_H		90%(Max60 °C)	R_H

2.2 Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage for Logic	V_{DD}	2.7	2.8	3.3	V
Operating Current For VDD	I_{DD}		TBD	TBD	mA
Input Voltage	V_{IH}	0.7*V_{DD}	-	V_{DD}	V
	V_{IL}	V_{SS}		0.3*V_{DD}	V
Output Voltage	V_{OH}	0.8*V_{DD}	-	V_{DD}	V
	V_{OL}	V_{SS}	-	0.2*V_{DD}	V

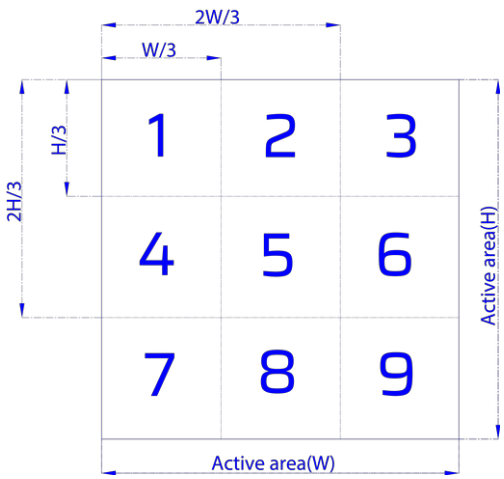
2.3 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Voltage for LED backlight	V_{LED}	3.0	3.2	3.4	V	
Current for LED backlight	I_{LED}	-	40	-	mA	2 LED
Power Consumption[1]	P_{bl}	-	128	-	mW	1
Connection Mode	-	-	Parallel	-	-	2
LED Life Time[3]		20000	-	-	hr	3

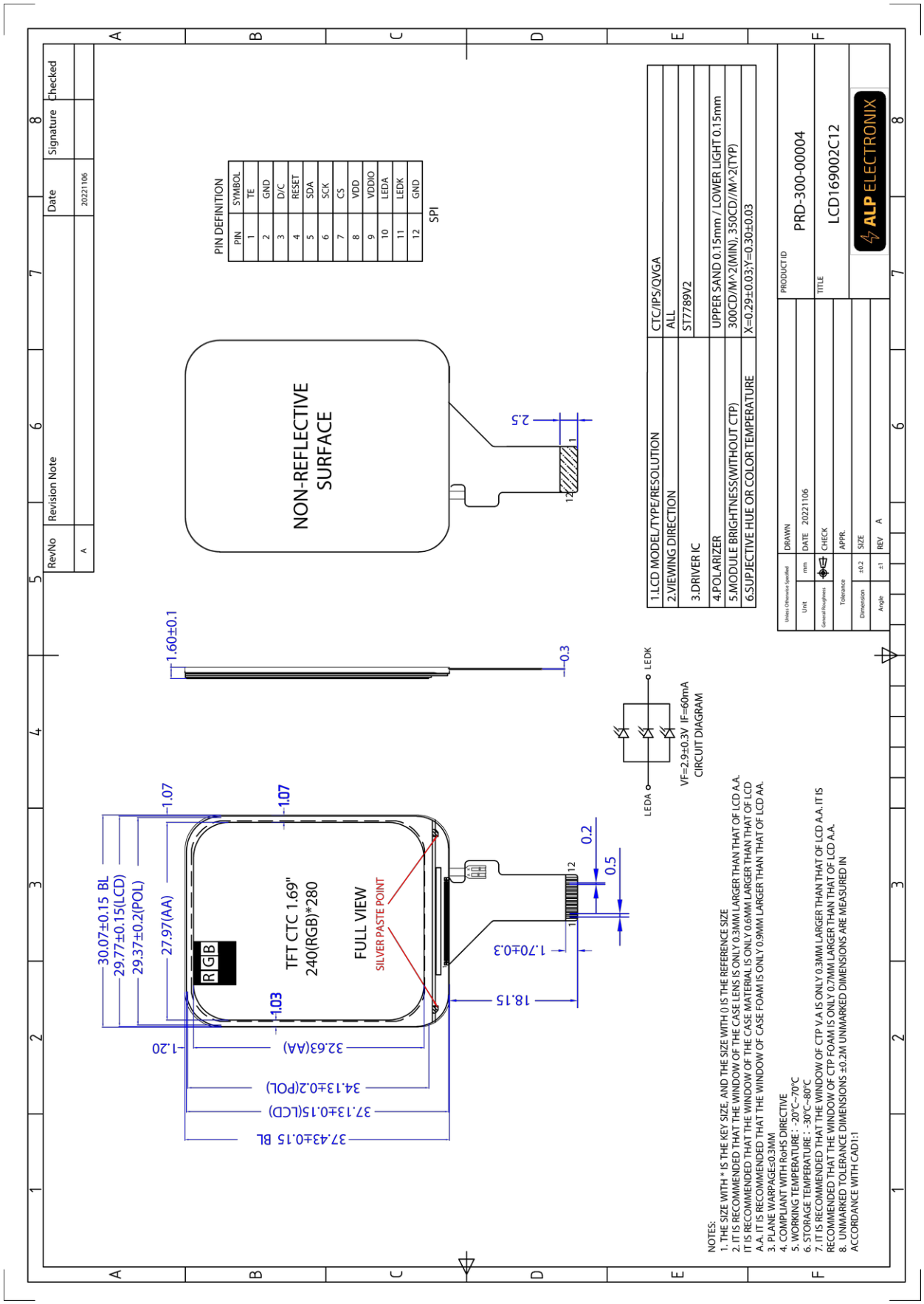
Using condition: constant current driving method If=40mA(+/-10%).

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 test has been conducted under ambient air flow
   at T_A = 25±2°C, 60%RH±5%.



3 Mechanical Drawing



4 Pin Definition

Pin no.	Symbol	Description
1	TE	
2	GND	Power Ground.
3	D/C	Data or command select signal input
4	$\overline{\text{RESET}}$	This signal will reset the device. Signal is active low.
5	SDA	SPI interface input/output pin .the data is latched on the rising edge of the SCL signal.
6	SCK	This pin is used to be serial interface clock
7	$\overline{\text{CS}}$	Chip selection pin. Active low.
8	VDD	Power supply, VDD = 2.4V-3.3V.
9	VDDIO	Power supply for interface logic.
10	LEDA	LED anode pin.
11	LEDK	LED cathode pin.
12	GND	Power Ground.

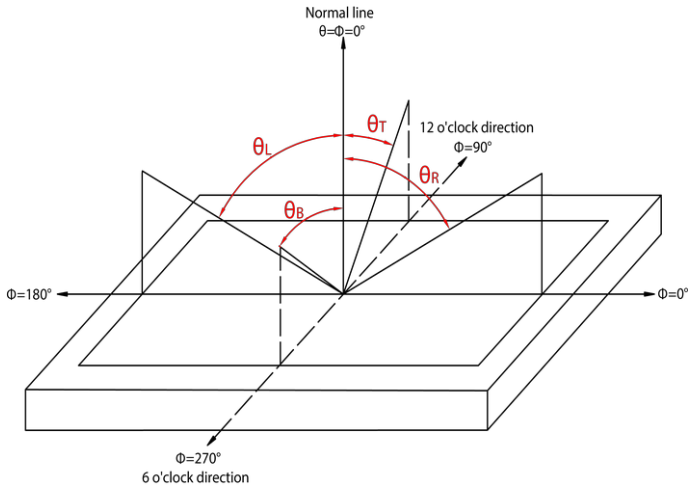
Note: The voltage power of the interface logic pin depend on VDDIO and GND, Such as DBn, IMn and function pins.

5 Optical Characteristics

Item	Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit
Viewing Angle[1]	θ	Φ = 0°	25°C		45	-	Degree
		Φ = 180°	25°C	-	45	-	
	θ	Φ = 90°	25°C	-	35	-	
		Φ = 270°	25°C	-	15	-	
Brightness	L_{br}	--	-	100	-	-	cd/m^2
Surface Luminance (LCM)	L_v	--	-	75			
Contrast Ratio(LCM)	CR	-	25°C	-	150	-	
Response Time	T_R+T_F	θ = 0° Φ = 0°	25°C	-	50	-	mS
Transmittance(LCM)	T(%)				5		%
Color of CIE Coordinate	White	X	25°C	0.205	0.275	0.346	-
		Y	25°C	0.244	0.314	0.384	
	Red	X	25°C	0.516	0.566	0.616	
		Y	25°C	0.262	0.312	0.362	
	Green	X	25°C	0.271	0.321	0.371	
		Y	25°C	0.540	0.590	0.640	
	Blue	X	25°C	0.095	0.145	0.195	
		Y	25°C	0.042	0.092	0.142	

Notes:

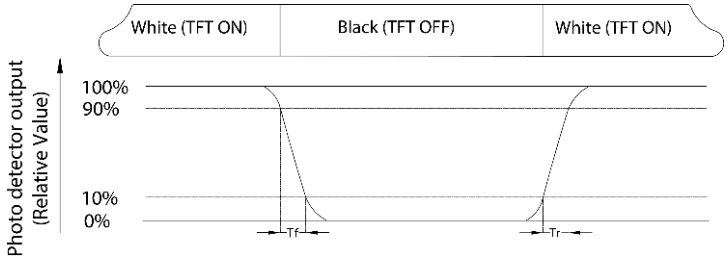
1. Definition of Viewing Angle:



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

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

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



6 Reliability

6.1 Contents of Reliability Tests

No.	Item	Conditions	Inspection After Test
1	**High Temperature Operation**	70°C ±2°C, 120 hrs	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Seal leak; 3. Non-display; 4. missing segments; 5. Glass crack; 6. Current I_{DD} is twice higher than initial value.
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**	-30°C 30min↔70°C 30min 24 cycle. Temperature conversion time: Less than 5min	
7	**Vibration Test**	Vibration Frequency:10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 10 minutes.	
8	**Dropping Test**	08m LCD≥3.0inch	Not allowed cosmetic and electrical defects.

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.

7 Precautions For Use of Lcd Modules

7.1 Handling Precautions

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched.
- Handle this polarizer carefully.
- If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:
    - Isopropyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Do not attempt to disassemble the LCD Module.
- If the logic circuit power is off, do not apply the input signals.
- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
- a. Be sure to ground the body when handling the LCD Modules.
- b. Tools required for assembly, such as soldering irons, must be properly ground.
- c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

7.2 Storage Precautions

- When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:
  Temperature : 0°C ~ 40°C
  Relatively humidity: ≤80%
- 10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.
- The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

8 Revision History

Revision	Details
1.0	Initial Release – 01.01.2023

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