

# 1.69" 240\*280 IPS ST7789V2 262K SPI Solder 12 Pin



- 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.
- Brightness: 480 cd/m<sup>2</sup>.
- Solderable FPC, no connector required.



Ordering &  
Details



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Technical  
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# 1 General Specifications

No.	Item	Contents	Unit
1	LCD Size	1.69	inch
2	Display Mode	Normally black	-
3	Resolution	240(H)RGB x 280(V)	pixels
4	Pixel pitch	0.11655(H) x 0.11655(V)	mm
5	Active area	27.972(H) x 32.634(V)	mm
6	Module size	30.07(H) x 37.43(V) x 1.56 (D)	mm
7	Pixel arrangement	RGB Vertical stripe	-
8	Interface	4 Line SPI	-
9	Display Colors	262K	colors
10	Drive IC	ST7789V2	-
11	Luminance(cd/m2)	480 (TYP)	Cd/m2
12	Viewing Direction	All View	Best image
13	Backlight	3 White LED Parallel	-
14	Operating Temp.	-20°C~ + 70°C	°C
14	Storage Temp.	-30°C~+ 80°C	°C
15	Weight	3.4	g

## 2 Electrical Characteristics

### 2.1 Absolute Maximum Ratings

Parameter	Symbol	Min.	Max.	Unit
Supply Voltage	$V_{DD}$	-0.3	4.6	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	$V_{DD}$	2.4	2.8	3.3	V
Gate Driver Voltage	$V_{GH}$	12.2	-	14.97	V
	$V_{GL}$	-12.5	-	-7.16	V
Operating Current For $V_{DD}$	$I_{DD}$	-	8	10	mA
Sleep_In Mode $V_{DD}$	$I_{DD}$	-	15	30	μA

### 2.3 Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Voltage for LED backlight	$V_{LED}$	2.8	3.0	3.2	V	
Current for LED backlight	$I_{LED}$	-	60	90	mA	3 LED
Power Consumption	$P_{bl}$	-	180	288	mW	1
Brightness	$L_{br}$	420	480	-	-	2
LED Life Time <sup>3</sup>	-	20000	-	-	hr	3

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

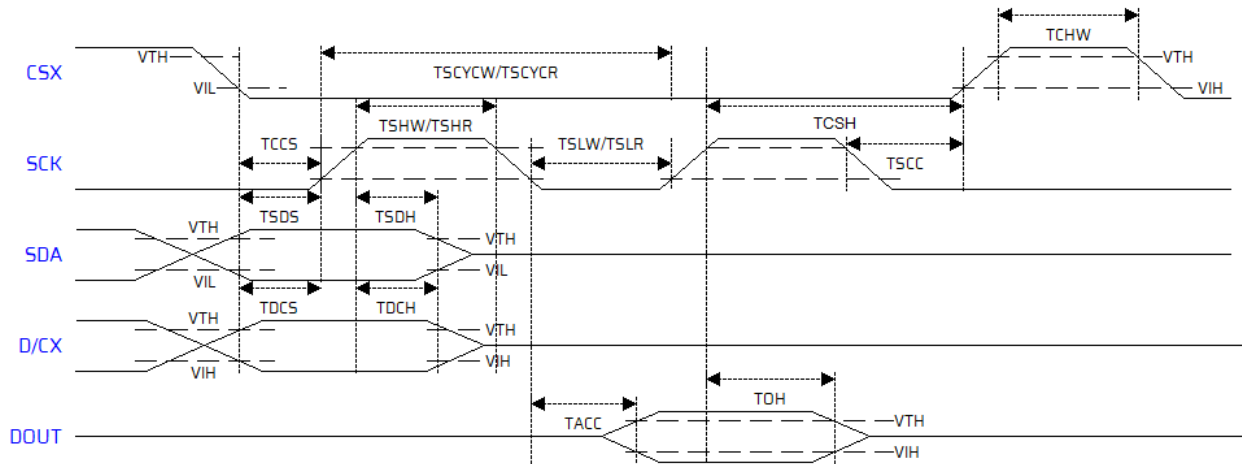
Notes:

- Where  $I_{LED} = 60mA$ ,  $V_{LED} = 3.0V$ ,  $P_{CONSUMPTION} = I_{LED} * V_{LED}$ .
- Uniform measure condition:
  - Measure 9 point, measure location is shown on the right side.
  - Uniform = (Min. brightness / Max brightness) \* 100%
  - Best contrast.
- The environmental conducted under ambient air flow ,at  $T_a=25\pm2^{\circ}C, 60\%RH\pm5\%$



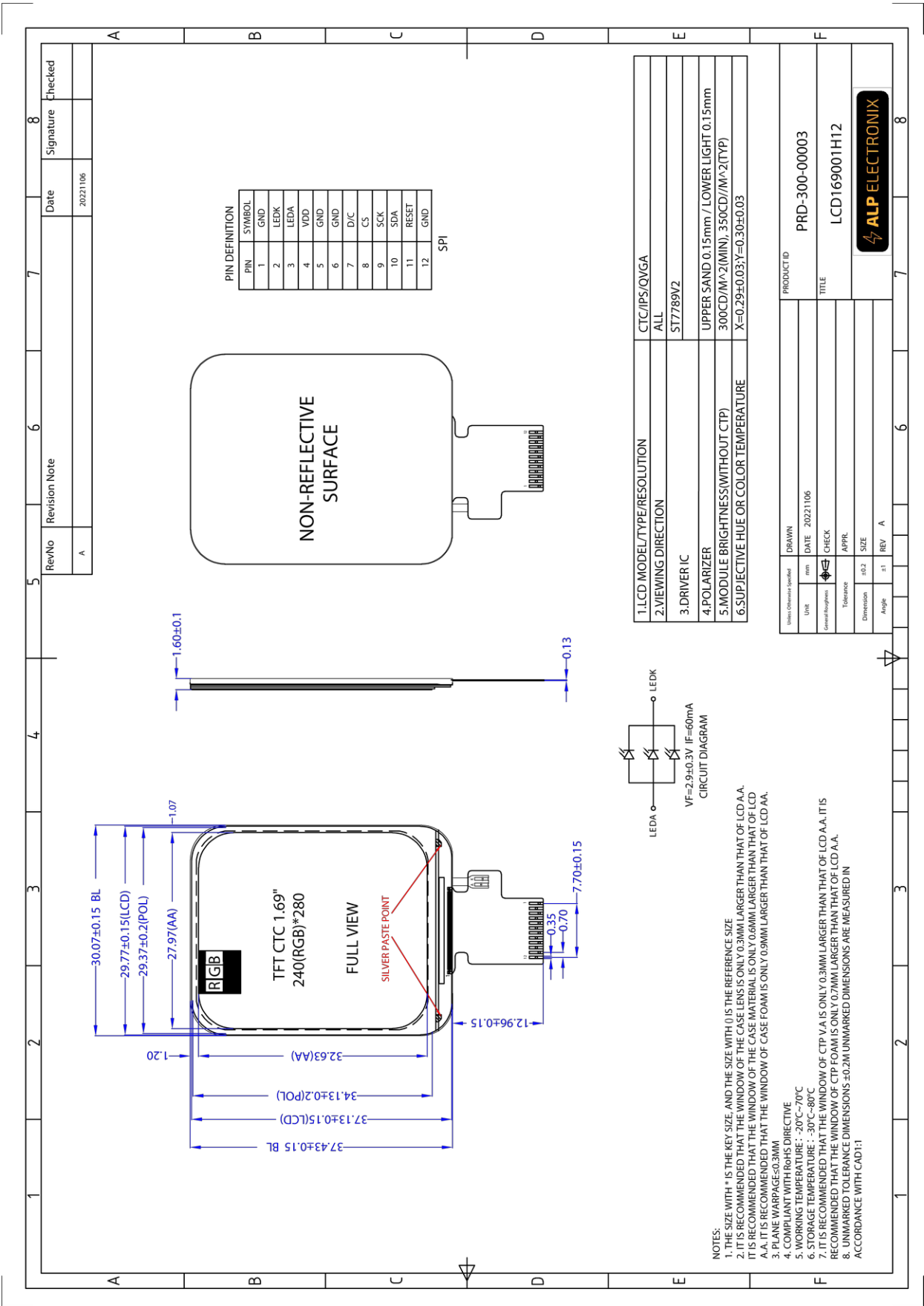
## 2.4 Timing Characteristic of The LCD

### 2.4.1 Serial interface Characteristics(4-line serial):



Signal	Symbol	Parameter	Min	Max.	Unit	Description
CSX	$T_{CSS}$	Chip select setup time (write)	15		ns	
	$T_{CSH}$	Chip select hold time (write)	15		ns	
	$T_{CSS}$	Chip select setup time (read)	60		ns	
	$T_{SCC}$	Chip select hold time (read)	65		ns	
	$T_{CHW}$	Chip select "H" pulse width	40		ns	
SCK	$T_{SCYCW}$	Serial clock cycle (write)	16		ns	-write command & data ram
	$T_{SHW}$	SCK "H" pulse width (write)	7		ns	
	$T_{SLW}$	SCK "L" pulse width (write)	7		ns	
	$T_{SCYCR}$	Serial clock cycle (read)	150		ns	-read command & data ram
	$T_{SHR}$	SCK "H" pulse width (read)	60		ns	
	$T_{SLR}$	SCK "L" pulse width (read)	60		ns	
D/DX	$T_{DCS}$	D/CX setup time	10		ns	
	$T_{DOH}$	D/CX hold time	10		ns	
SDA (DIN)	$T_{SDS}$	Data setup time	7		ns	
	$T_{SDH}$	Data hold time	7		ns	
DOUT	$T_{ACC}$	Access time	10	50	ns	For maximum CL =30pF For minimum CL=8pF
	$T_{OH}$	Output disable time	15	50	ns	

3 Mechanical Drawing



## 4 Pin Definition

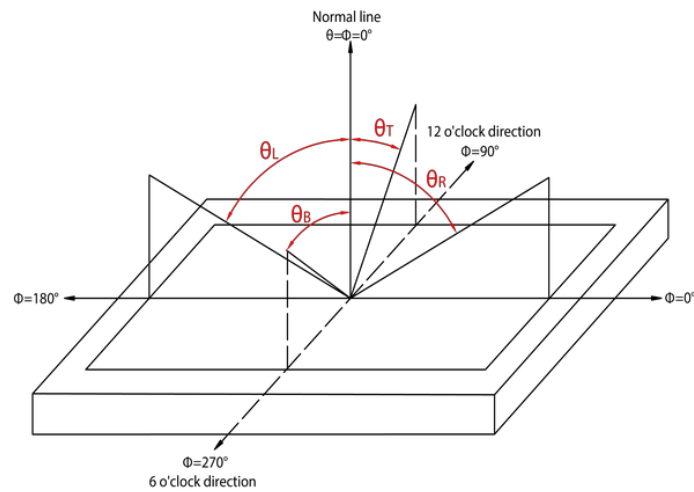
Pin No.	Symbol	Description
1	<b>GND</b>	Ground pin.
2	<b>LEDK</b>	Backlight LED Cathode.
3	<b>LEDA</b>	Backlight LED Anode.
4	<b>VDD</b>	Power supply pin.
5	<b>GND</b>	Ground pin.
6	<b>GND</b>	Ground pin.
7	<b>D/C</b>	Display data/command selection pin.
8	<b><math>\overline{\text{CS}}</math></b>	SPI chip select input pin. Active low.
9	<b>SCK</b>	SPI interface clock.
10	<b>SDA</b>	SPI interface input/output pin. The data is latched on the rising edge of the SCL signal.
11	<b><math>\overline{\text{RESET}}</math></b>	This signal will reset the device and it must be applied to properly initialize the chip. Active low.
12	<b>GND</b>	Ground pin.

## 5 Optical Characteristics

Item	Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit	Remark
Viewing Angle <sup>1</sup>	$\theta$	$\Phi = 0^\circ$	25°C	70	80	-	Degree	Note 1
		$\Phi = 180^\circ$	25°C	70	80	-		
	$\theta$	$\Phi = 90^\circ$	25°C	70	80	-		
		$\Phi = 270^\circ$	25°C	70	80	-		
Brightness	$L_{br}$	--	-	420	480	-	cd/m <sup>2</sup>	
Luminance Uniformity	$\Delta L$	--	-	70	75			
Contrast Ratio	CR	-	25°C	800	1000	-		Note 2
Response Time	$T_R + T_F$	$\theta = 0^\circ$ $\Phi = 0^\circ$	25°C	-	35	40	mS	Note 3
Color of CIE Coordinate	White	X	25°C	-0.03	0.345	+0.03	-	BM-7A
		Y	25°C		0.369			
	Red	X	25°C		0.605			
		Y	25°C		0.353			
	Green	X	25°C		0.372			
		Y	25°C		0.588			
	Blue	X	25°C		0.163			
		Y	25°C		0.116			
Transmittance (with polarizer)	-	-	-	4.5	5	-	%	

## Notes:

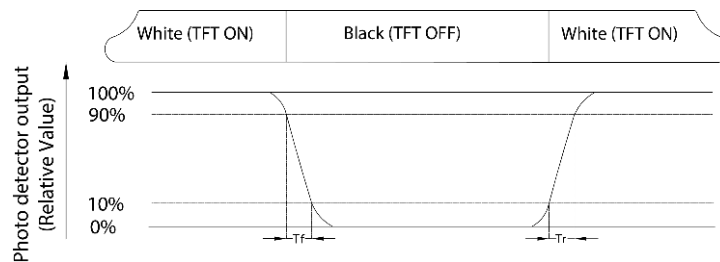
1. Definition of Viewing Angle:



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

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

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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Mailing Address: Alp Electronix, Sjöhogvägen 6A, Västerås 721 32, Sweden  
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