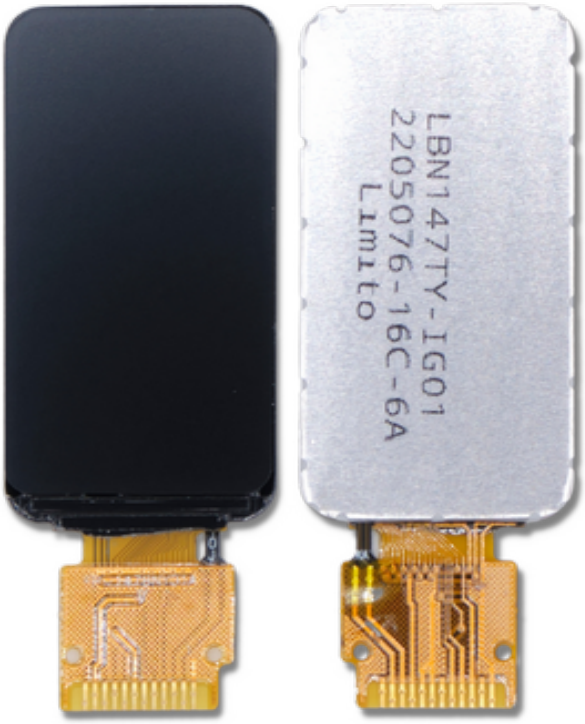
1.47" 172*320 IPS ST7789V3 262K SPI Solder 12 Pin

ALP ELECTRONIX



- ST7789V3 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.
- LCD can display 262K Colors (6R:6G:6B).
- SPI interface
  - 4 Line SPI Interface.
- Normally black.
- IPS, all view direction.
- Power Supply
  - VDD: 2.4V - 3.3V.
- Brightness: 600 cd/m^2.
- Solderable FPC, no connector required.

1 General Specifications

No.	Item	Contents	Unit
1	**LCD size**	1.47	inch
2	**Display mode**	Normally black	-
3	**Resolution**	172(H)RGB x 320(V)	pixels
4	**Pixel pitch**	0.0337(H) x 0.1011(V)	mm
5	**Active area**	17.3892(H) x 32.352(V)	mm
6	**Module size**	19.39(H) x 36.28(V) x 1.46 (D)	mm
7	**Pixel arrangement**	RGB vertical stripe	-
8	**Interface**	SPI	-
9	**Display colors**	262K	colors
10	**Driver IC**	ST7789V3	-
11	**Luminance**	600 (TYP)	cd/m^2
12	**Viewing direction**	All view	-
13	**Backlight**	3 white LED parallel	-
14	**Operating temperature**	-20ºC - +70ºC	-
15	**Storage temperature**	-30ºC - +80ºC	-
16	**Weight**	2.7	gram

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	ºC
Storage Temperature	T_{ST}	-30	80	ºC

2.2 Operating Conditions

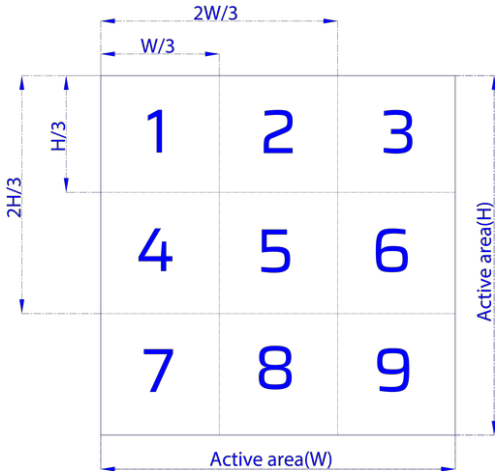
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	2.4	2.8	3.3	V
Gate Driver High Voltage	V_{GH}	12.2	-	14.97	V
Gate Driver Low Voltage	V_{GL}	-12.5	-	-7.16	V
Operating Current For VDD	I_{DD}		8	10	mA
Sleep_in Mode (VDD)	I_{DD}		15	30	μA

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[1]	P_{bl}	-	180	288	mW	1
Brightness[2]	-	550	600	-	cd/m^2	2
LED Life Time[3]		20000	-	-	hr	3

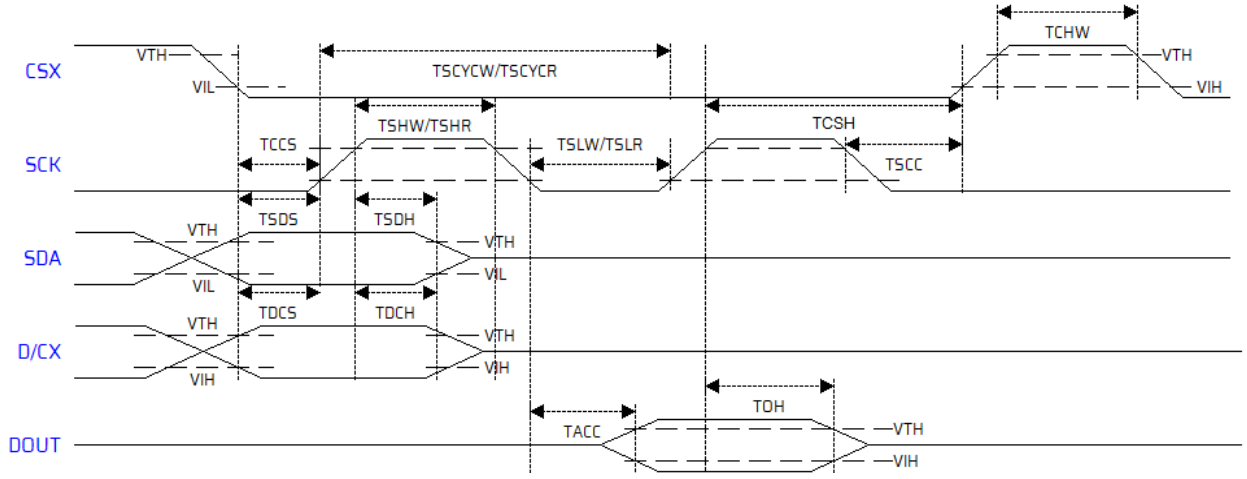
Notes:

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±2ºC, 60%RH±5%.



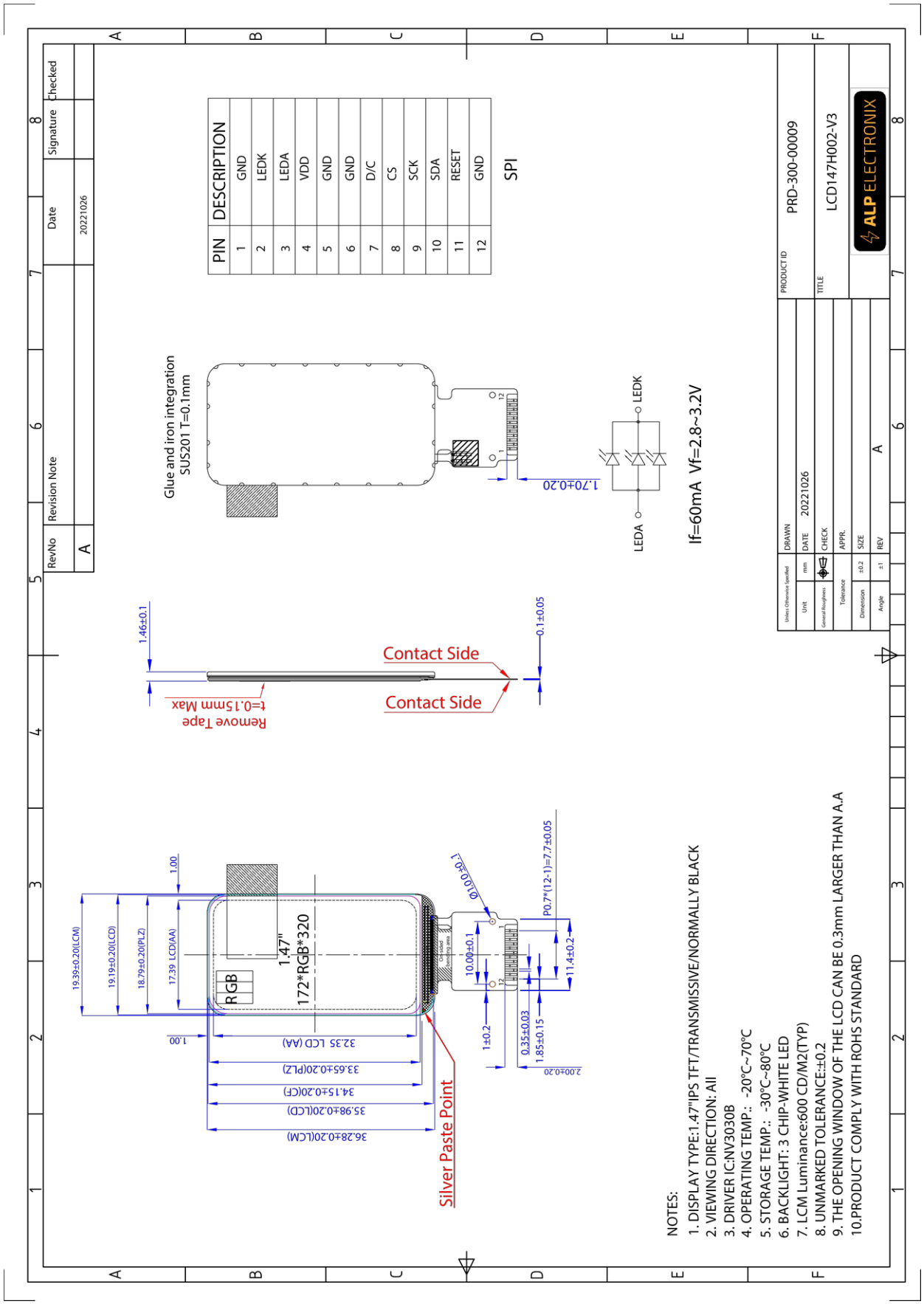
2.4 Timing Characteristic of The LCD

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}	SCL “H” pulse width (write)	7		ns	
	T_{SLW}	SCL “L” pulse width (write)	7		ns	
	T_{SCYCR}	Serial clock cycle (read)	150		ns	-read command & data ram
	T_{SHR}	SCL “H” pulse width (read)	60		ns	
	T_{SLR}	SCL “L” pulse width (read)	60		ns	
D/DX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SHD}	Data hold time	7		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL =30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

3 Mechanical Drawing



4 Pin Definition

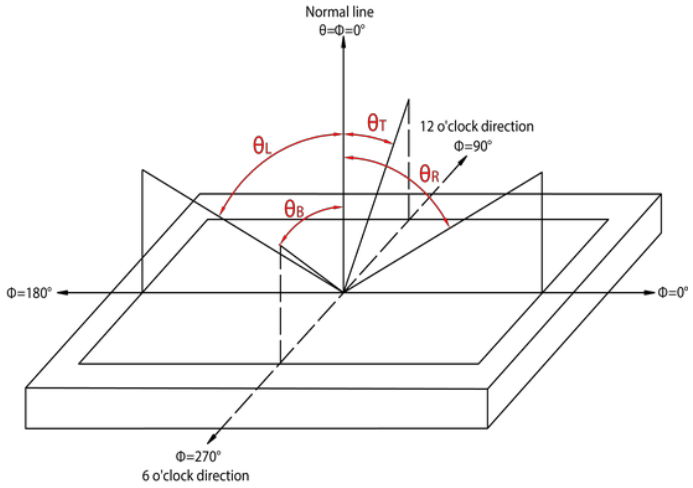
Pin no.	Symbol	Description
1	GND	Ground pin.
2	LEDK	Backlight LED cathode pin.
3	LEDA	Backlight LED anode pin.
4	VDD	Power supply pin, VDD = 2.4V-3.3V.
5	GND	Ground pin.
6	GND	Ground pin.
7	D/C	Display data/command selection pin.
8	$\overline{CS}$	SPI chip select input pin. Active low.
9	SCK	SPI interface clock.
10	SDA	SPI interface input/output pin. The data is latched on the rising edge of the SCL signal.
11	$\overline{RESET}$	Reset signal. It must be applied to properly initialize the chip. Active low.
12	GND	Ground pin.

5 Optical Characteristics

Item	Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit	Remark
Viewing Angle[1]	θ	Φ = 0°	25°C	80	85	-	Degree	Note 1
		Φ = 180°	25°C	80	85	-		
	θ	Φ = 90°	25°C	80	85	-		
		Φ = 270°	25°C	80	85	-		
Brightness	L_{br}	--	-	550	600	-	cd/m^2	
Luminance Uniformity	ΔL	--	-	75				
Contrast Ratio[2]	CR	-	25°C	1000	1500	-		Note 2
Response Time	T_R+T_F	θ = 0° Φ = 0°	25°C	-	30	40	mS	
Color of CIE Coordinate	White	X	25°C	-0.03	0.263	+0.03	-	BM-7A
		Y	25°C		0.275			
	Red	X	25°C		0.647			
		Y	25°C		0.338			
	Green	X	25°C		0.313			
		Y	25°C		0.628			
	Blue	X	25°C		0.151			
		Y	25°C		0.060			
Transmittance (with polarizer)	--	--	--	4.6	5.5	-	%	--

Notes:

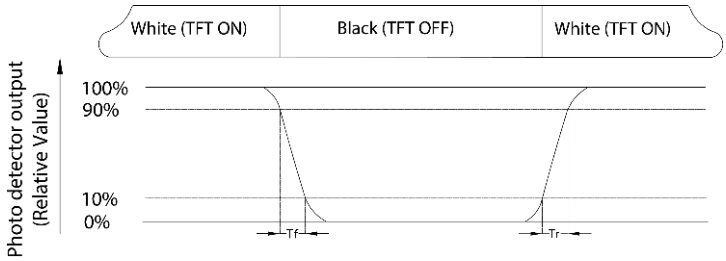
1. Definition of Viewing Angle:



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.
8	**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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