1.65" 240*295 IPS ST7789V3 262K 8 Bit B2B 24 Pin Connector

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).
- LCD Interface
  - ¨8 Bits parallel interface..
- Normally black.
- IPS, all view direction.
- Power Supply
  - VDD: 2.4V - 3.3V.
- Brightness: 500 cd/m^2.
- Low Profile Board-to-Board Connector.

1 General Specifications

No.	Item	Contents	Unit
1	**LCD size**	1.65	inch
2	**Display mode**	Normally black	-
3	**Resolution**	240(H)RGB x 295(V)	pixels
4	**Pixel pitch**	0.108(H) x 0.108(V)	mm
5	**Active area**	25.92(H) x 31.86(V)	mm
6	**Module size**	28.13(H) x 36.93(V) x 1.5 (D)	mm
7	**Pixel arrangement**	RGB vertical stripe	-
8	**Interface**	8 Bits 8080 MCU	-
9	**Display colors**	262K	colors
10	**Driver IC**	ST7789V3	-
11	**Luminance**	500 (TYP)	cd/m^2
12	**Viewing direction**	All view	-
13	**Backlight**	3 white LED parallel	-
14	**Operating temperature**	-20°C - +70°C	-
15	**Storage temperature**	-30°C - +80°C	-
16	**Weight**	3	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	°C
Storage Temperature	T_{ST}	-30	80	°C

2.2 Operating Conditions

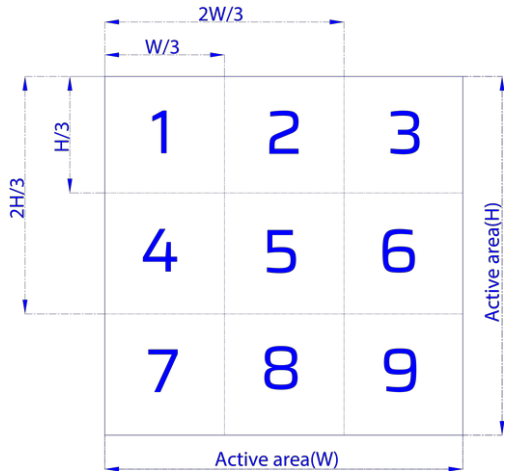
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage (IO)	V_{DD}	2.4	2.8	3.3	V
Gate Driver High Voltage	V_{GH}	12.2	-	14.97	V
Gate Driver Low Voltage	V_{GL}	-12.5	-	-7.16	V
Operating Current For VDD	I_{DD}	-	8	10	mA
Sleep_in Mode (VDD)	I_{DD}	-	15	30	µA

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]	**-**	450	500	-	cd/m^2	2
LED Life Time[3]		20000	-	-	hr	3

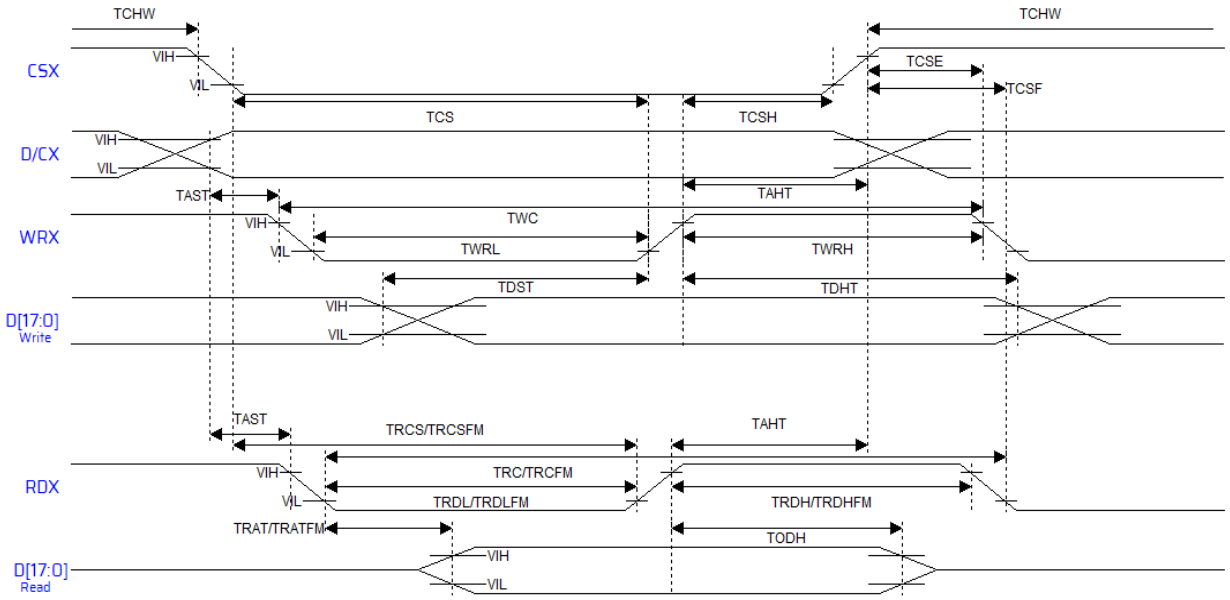
Notes:

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%.



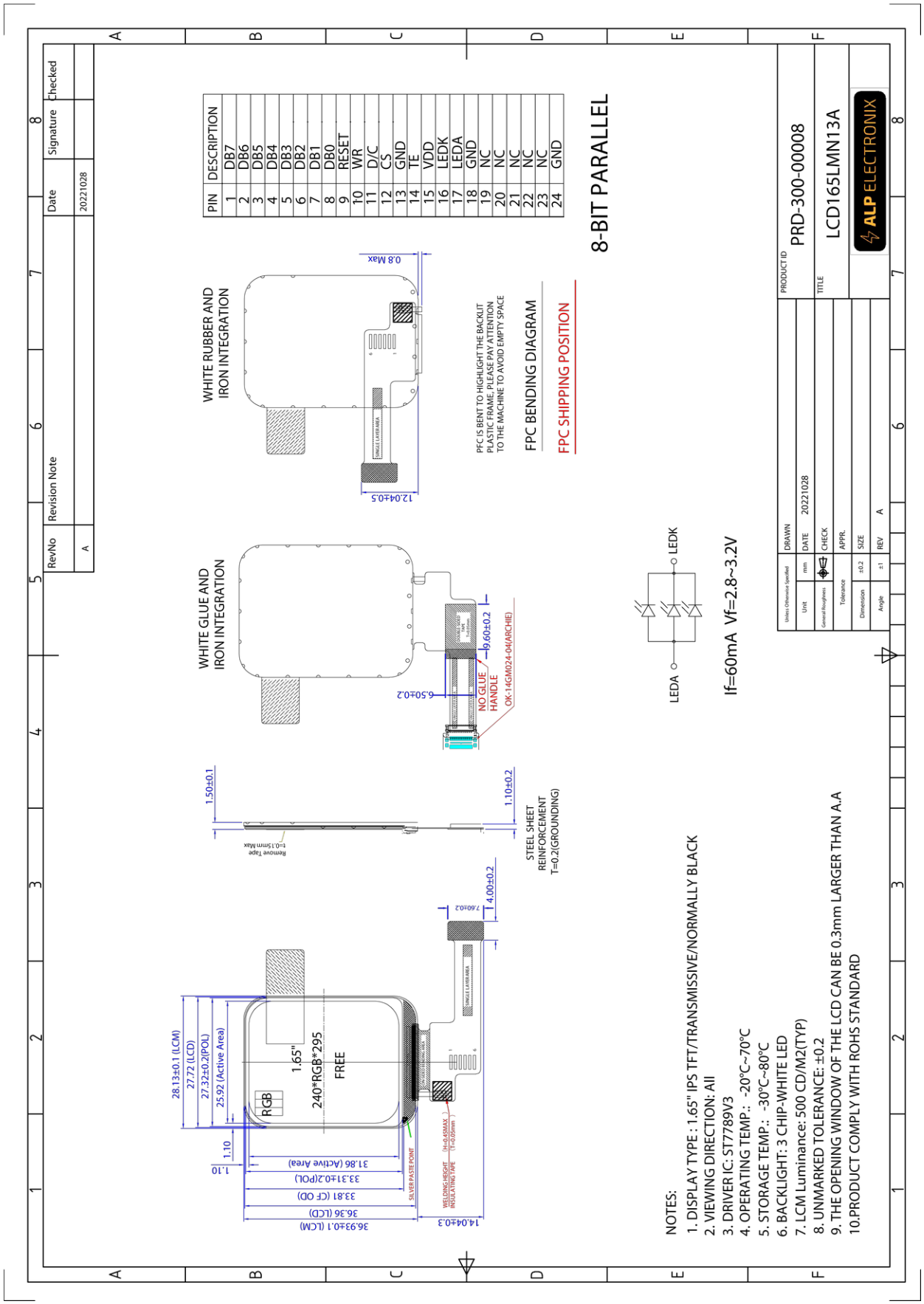
2.4 Timing Characteristic of The LCD

2.4.1 8080 Series MCU Parallel interface Characteristics:



Signal	Symbol	Parameter	Min	Max.	Unit	Description
D/CX	T_{AST}	Address setup time	0	-	ns	-
	T_{AHT}	Address hold time (Write/Read)	10	-	ns	
CSX	T_{CHW}	Chip select “H” pulse width	0	-	ns	-
	T_{CS}	Chip select setup time (Write)	15	-	ns	
	T_{RCS}	Chip select setup time (Read ID)	45	-	ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355	-	ns	
	T_{CSF}	Chip select wait time (Write/Read)	10	-	ns	
	T_{CSH}	Chip select hold time	10	-	ns	
WRX	T_{WC}	Write cycle	66	-	ns	-
	T_{WRH}	Control pulse “H” duration	15	-	ns	
	T_{WRL}	Control pulse “L” duration	15	-	ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160	-	ns	When read ID data
	T_{RDH}	Control pulse “H” duration (ID)	90	-	ns	
	T_{RDL}	Control pulse “L” duration (ID)	45	-	ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450	-	ns	When read from frame memory
	T_{RDHFM}	Control pulse “H” duration (FM)	90	-	ns	
	T_{RDLFM}	Control pulse “L” duration (FM)	355	-	ns	
D[17:0]	T_{DST}	Data setup time	10	-		For CL=30pF

3 Mechanical Drawing



4 Pin Definition

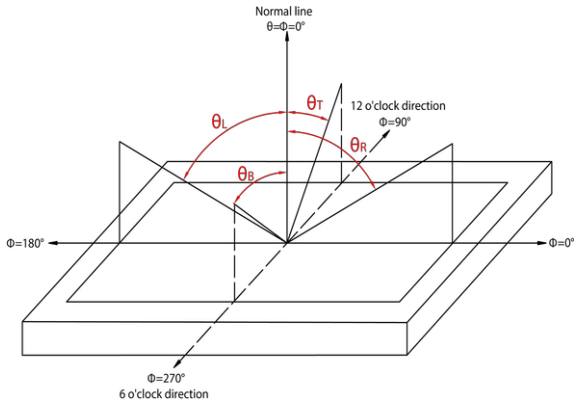
Pin no.	Symbol	Description
1	DB7	MCU parallel interface data.
2	DB6	MCU parallel interface data.
3	DB5	MCU parallel interface data.
4	DB4	MCU parallel interface data.
5	DB3	MCU parallel interface data.
6	DB2	MCU parallel interface data.
7	DB1	MCU parallel interface data.
8	DB0	MCU parallel interface data.
9	$\overline{\text{RESET}}$	Reset signal. It must be applied to properly initialize the chip. Active low.
10	WR	Write enable in MCU parallel interface.
11	D/C	Display data/command selection pin.
12	$\overline{\text{CS}}$	Chip select pin. Active low.
13	GND	Ground pin.
14	TE	Tearing effect signal is used to synchronize MCU to frame memory writing
15	VDD	Power supply pin, VDD=2.5-3.3V.
16	LEDK	Backlight LED cathode pin.
17	LEDA	Backlight LED anode pin.
18	GND	Ground pin.
19 - 23	NC	No connection.
24	GND	Ground pin.

5 Optical Characteristics

Item	Symbol	Measuring Conditions		Min.	Typ.	Max.	Unit	Remark
Viewing Angle[1]	θ	Φ = 0°	25°C	75	80	-	Degree	Note 1
		Φ = 180°	25°C	75	80	-		
	θ	Φ = 90°	25°C	75	80	-		
		Φ = 270°	25°C	75	80	-		
Brightness	L_{br}	--	-	450	500	-	cd/m^2	
Luminance Uniformity	ΔL	--	-	70	75			
Contrast Ratio[2]	CR	-	25°C	700	900	-		Note 2
Response Time	T_R+T_F	θ = 0° Φ = 0°	25°C	-	30	35	mS	
Color of CIE Coordinate	White	X	25°C	-0.03	0.288	+0.03	-	BM-7A
		Y	25°C		0.312			
	Red	X	25°C		0.602			
		Y	25°C		0.348			
	Green	X	25°C		0.321			
		Y	25°C		0.576			
	Blue	X	25°C		0.156			
		Y	25°C		0.107			
Transmittance (with polarizer)	--	--	--	4.3	5.0	-	%	--

Notes:

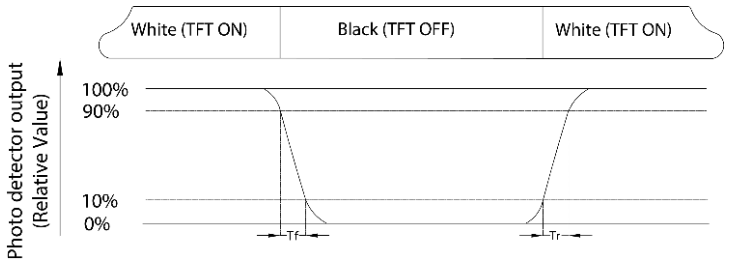
1. Definition of Viewing Angle:



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.
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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