

Version: 1.0

TECHNICAL SPECIFICATION [Luvia] Tcon Board: L-T1000

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Prepared By



Revision History

Rev.	Issued Date	Revised	Contents
1.0	2020/12/01	First draft	



TECHNICAL SPECIFICATION

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[Luvia] L-T1000

1. General Description

Eink 元太科技

L-T1000 board is a controller which designed for mini-LVDS interface driving and allows E Ink clients to access the hardware and software for below ePaper display module for further evaluation.

• E Ink's 28" Monochrome ePaper display

E Ink Holdings

- E Ink's 25.3" Monochrome ePaper display
- E Ink's 25.3" ACeP display

2. Features

- ▶ Drive 25.3" full color display (Operating temperature: 15 ~ 35 °C)
- Drive 28" & 25.3" monochrome display (Operating temperature: -15 ~ 65 °C)
- ► Tcon Storage Temperature: -25~ 70 °C
- ➢ 6-layer PCB, double-side SMT

1	
TCON	E Ink L-T1000
RAM	Embedded 64MB
Flash Memory	External 16MB
Display Interface	Mini -LVDS/FPC Connector
Debug Interface	UART J8
Host Interface	USB Port (Micro USB)
Power Adapter	DC +12V/6A
Dimension	Tcon board: 160mm x150mm
	TS board: 27mmx14.4mm
	FFC: 10cm
Weight	0.14kg
Environment	Operation Temperature: $-15 \sim 65^{\circ}C$
	Storage Temperature: -25~ 70°C
	5 ~ 50% Relative Humidity, non-condensing

3. Tcon Board Specifications



4. Mechanical Drawing

4-1) Mechanical Dimension



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4-2) Real Photographs



L-T1000 TCON Board with Mini-LVDS cables

5. Input/ Output Interface

5-1) Pin Assignment

Conn	ecto	r J5	to EF	PD .
D			a.	

1 VSS P Ground 2 LVOP_DO 1 Data signal source driver 3 LVOP_DD 1 Data signal source driver 4 VSS P Ground 5 LVIP_D2 1 Data signal source driver 6 LVIN_D3 1 Data signal source driver 7 VSS P Ground 8 LV2P_D4 1 Data signal source driver 10 VSS P Ground 11 LV3P_D6 I Data signal source driver 12 LV3N D7 I Ground 13 VSS P Ground 14 LV4P_D8 1 Data signal source driver 15 LV4N D9 I Data signal source driver 16 VSS P Ground 17 LVSP_D10 I Data signal source driver 18 LV5N D11 I Data signal source driver 20 CLKP CKH I Data signal source driver 21 CLKP CKH I Data signal source driver 22 VSS P Ground 23 LV6P_D13 I Data signal source driver	Pin #	Signal	I/O	Description			Remark	
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$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	36	L V ION	I		Data signal sour			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	37	VSS	P I		Ground			
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	38	I V11P	I		Data signal sour	e driver		
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	30	LV11N	I		Data signal sour			
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$\begin{array}{c c c c c c c } \hline 42 & V33 & I & I & I & I & I & I & I & I & I &$	41		I D		CIOCK gale u	livel		
$43 SPH1 I/O \frac{SHR}{H} \frac{Start pulse source driver}{SHR} \frac{Start pulse source driver}{Start pulse output} \\ \hline H SPH2 SPH1 SPH1 \\ \hline L SPH1 SPH2 \\ \hline I SPH2 I/O \frac{SHR}{H} \frac{Start pulse source driver}{SHR} \frac{Start pulse source driver}{SHR} \frac{Start pulse source driver}{SHR} \frac{SHR}{SPH2} \frac$	42	400	Г		Start pulso source	a drivar		
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4.5 5FH1 I/O H SPH2 SPH1 44 SPH2 L SPH1 SPH2 44 SPH2 I/O H Start pulse source driver 44 SPH2 I/O H SPH2 1/O H SPH2 Start pulse output 1/O H SPH2 SPH1 1/O H SPH2 SPH1 1/O H SPH2 SPH1 1/O H SPH2 SPH1	43	SPH1	T/O	SHR	Start pulse input	Start pulse output		
44ConstraintConst	-13	SIIII	I/O	Н	SPH2	SPH1		
44 SPH2 I/O SHR Start pulse source driver I/O I/O H SPH2 SPH1 L SPH1 SPH2				L	SPH1	SPH2		
44 SPH2 I/O SHR Start pulse input Start pulse output H SPH2 SPH1 L SPH1 SPH2					Start pulse source	e driver		
44 SPH2 I/O H SPH2 SPH1 L SPH1 SPH2				SHR	Start nulse input	Start pulse output	1	
L SPH1 SPH2 SPH1	44	SPH2	I/O					
L SPH1 SPH2			1/0	Н	SPH2	SPH1		
				L	SPH1	SPH2		



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45 5	(D) II		UD	Start pulse input	Start pulse output			
	SPVI	I/O	Н	SPV1	SPV2			
			L	SPV2	SPV1			
			-	Start pulse gate	e driver			
16		T/O	UD	Start pulse input	Start pulse output			
46	SPV2	I/O	Н	SPV1	SPV2			
			L	SPV2	SPV1			
				Shift direction control p	in source driver			
47	SHR	Ι	SHR =H: Data inputs read sequentially from S800 to S1.					
			SHR =	L: Data inputs read seque	ntially from S1 to S800.			
				Shift direction control	pin gate driver			
48	UD	Ι	UI					
			Ul	D = L: Data shift direction	n from G800 to G1.			
40	OEU	т		Outputs enabled when (DE is logic "H",			
49	UEH	1	0					
50	LEH	Ι		Latch enable source driver				
51	DSEL	Ι		Data Input s	elect			

Note: **P** in I/O: Power pin

Connector J6 to EPD

Pin #	Signal	I/O	Description	Remark		
1	MODE	Ι	Output enable gate driver			
2	XON	Ι	XON signal gate driver			
3	STBYB	Ι	mini-LVDS enable.			
4	NC	-	NO Connection			
5	NC	-	NO Connection			
6	NC	-	NO Connection			
7	NC	-	NO Connection			
8	VGL	Р	Negative power supply gate driver.			
9	VGL	Р	Negative power supply gate driver.			
10	NC	-	NO Connection			
11	VN3	Р	Negative power supply source driver.			
12	VN3	Р	Negative power supply source driver.			
13	VN3	Р	Negative power supply source driver.			
14	NC	-	NO Connection			
15	VN2	Р	Negative power supply source driver.			
16	VN2	Р	Negative power supply source driver.			
17	VN2	Р	Negative power supply source driver.			
18	NC	-	NO Connection			
19	VN1	Р	Negative power supply source driver.			
20	VN1	Р	Negative power supply source driver.			
21	VN1	Р	Negative power supply source driver.			
22	NC	-	NO Connection			
23	VSS	Р	Ground			
24	VSS	Р	Ground			
25	NC	-	NO Connection			
26	VDD	Р	Logic power.			
27	VDD	Р	Logic power.			
28	NC	-	NO Connection			
29	VP1	Р	Positive power supply source driver.			
30	VP1	Р	Positive power supply source driver.			
31	VP1	Р	Positive power supply source driver.			
32	NC	-	NO Connection			



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33	VP2	Р	Positive power supply source driver.
34	VP2	Р	Positive power supply source driver.
35	VP2	Р	Positive power supply source driver.
36	NC	-	NO Connection
37	VP3	Р	Positive power supply source driver.
38	VP3	Р	Positive power supply source driver.
39	VP3	Р	Positive power supply source driver.
40	NC	-	NO Connection
41	VGH	Р	Positive power supply gate driver.
42	VGH	Р	Positive power supply gate driver.
43	NC	-	NO Connection
44	BORDER	Р	Border connection
45	NC	-	NO Connection
46	VCOM	Р	Common Voltage.
47	VCOM	Р	Common Voltage.
48	NC	-	NO Connection
49	VCOM	Р	Common Voltage.
50	VCOM	Р	Common Voltage.
51	VCOM	Р	Common Voltage.

Note: **P** in I/O: Power pin

Connector 2 – Power Pin (12V)



Pin	Signal	Description	Remark
1	+12	Input power	
2	+12	Input power	
3	G	Ground	
4	G	Ground	

Connector 3 – micro USB (Omitted)

Connector 4 – to Thermal Sensor (Omitted)

o I) I con Electrica									
SERVICE	SYMBOL	CONNECTOR	TYPE NUMBER	NUMBER OF PINS	MATING CONNECTOR				
To EPD	J5 \ J6	JAE	FI-RE51S-HF-R1500	51	0.5mm pitch				
Power Input (DC Jack)	J1	Qi Speed	KDCD-044D-25	5					
Power Input (Wafer, option)	J1	STM	M24264R	4					
To Host	CON1	Micro USB Port							

5-2) Tcon Electrical Connection



5-3) Function Block Diagram







6. Tcon Electrical Characteristics

- Power Supply: 12V DC,6A
- EPD Controller
- 1. 32-Bit RISC Microcontroller
- 2. Open RISC basic instruction set (ORBIS32)
- 3. 8KB instruction cache

• RAM

- 1. Built-in 128Mb/512Mb DDR2-SDRAM
- 2. Embedded 64MB RAM
- 3. External 16MB flash memory
- External Interfaces
- 1. Micro USB for control and data
- 2. UART debug interface
- 3. Mini LVDS EPD panel interface
- 4. 12V connector
- Internal Interfaces
- 1. I2C for programming of on-board devices (temp sensor)
- 2. SPI interfaces
- Source / Gate Driver Interface
- 1. Supports up to 8192x8192 resolution (limited frame rate)
- 2. Supports 8/16-bit source driver data bus
- 3. Mini LVDS interface for driver
- Display Engine
- 1. Supports partial-region display
- 2. Supports up to 63 pipelines
- LUT support: Supports LUT up to 4096 frames



7. Power Consumption

The power consumption is measured with following pattern transition: from pattern of repeated 1 consecutive black scan lines followed by 1 consecutive white scan line to that of repeated 1 consecutive white scan lines followed by 1 consecutive black scan lines.





ePaper display module	ePaper display module Condition		Max	Peak Current
28" monochrome display	Tcon board only	2W	22W	<2A
3840x1080, 75Hz	Tcon + EPD	12W	33W	<3A
25.3" monochrome display	Tcon board only	2.5W	22W	<2A
3200x1800, 75Hz	Tcon + EPD	12W	31W	<3A
25.3" full color display	Tcon board only	4W	28W	<3A
3200x1800, 65Hz	Tcon + EPD	10W	38W	<4A

Note: Power data is based on 12V voltage input.



8. Appendix (Tcon Light-on Inspection)

Signal Parameter

Parameter	Symbol	Min	Тур	Max	Unit	Remark
Gate negative supply	VGL	-22	-20	-19	V	
Gate positive supply	VGH	26	27	28	V	
Source negative supply	VN1	-16	Adjusted	-9	V	
Source negative supply	VN2	-16	Adjusted	-9	V	
Source negative supply	VN3	-16	Adjusted	-9	V	
Source positive supply	VP1	6	Adjusted	17	V	Voltage controlled by WFM setting.
Source positive supply	VP2	6	Adjusted	17	V	
Source positive supply	VP3	6	Adjusted	17	V	
Common voltage	VCOM	-20	Adjusted	20	V	

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