

FEATURES

- Display Diagonal: 4.7"
- Display Format: 320 × 240
- Overall Dimensions:
147 (W) × 112 (H) × 25 (D) mm
- Active Area: 96 (W) × 72 (H) mm
- Dot Pitch: 0.30 (W) × 0.30 (H) mm

DESCRIPTION

The SHARP LJ32H028 EL display unit consists of a thin film EL panel, high voltage ICs for panel driving, and a display control circuit. By supplying seven input signals of CMOS level and two DC power supplies of +5 V and +12 V, arbitrary graph characters can be displayed.

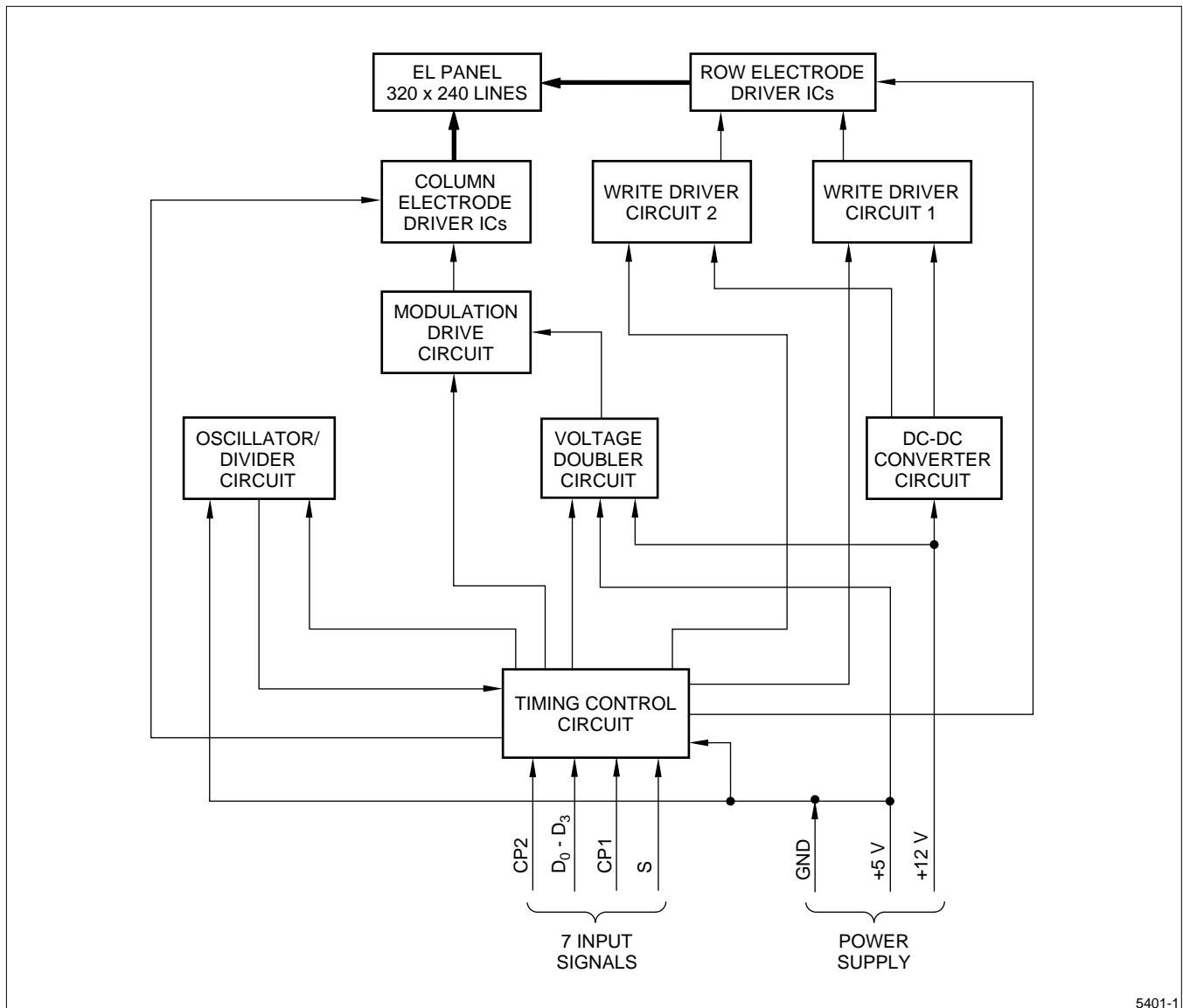


Figure 1. LJ32H028 Block Diagram

MECHANICAL SPECIFICATIONS

PARAMETER	SPECIFICATIONS	UNIT	NOTE
Outline Dimensions	147 (W) × 112 (H) × 28.0 (D)	mm	1
Number of Matrix Electrodes	320 (W) × 240 (H)	–	–
Active Area	95.9 (W) × 71.9 (H)	mm	–
Dot Pitch	0.3 (W) × 0.3 (H)	mm	–
Dot Pitch Ratio	1 (W) × 1 (H)	mm	–
Dot Size	0.22 (W) × 0.22 (H)	mm	–
Weight	270	g	–

NOTE:

1. Details of outline dimensions are shown in the Outline Dimensions diagram.

ABSOLUTE MAXIMUM RATINGS ($t_A = 25^\circ\text{C}$)

SYMBOL	PARAMETER	RATING	UNIT
V_{IH}	Interface Signal (Logic 'H')	$V_L + 0.3$	V
V_{IL}	Interface Signal (Logic 'L')	-0.3	V
V_L	Supply Voltage (Logic)	+7	V
V_D	Supply Voltage (Panel Drive)	+14	V

ENVIRONMENTAL CONDITIONS

ITEM	Tstg		Topr		CONDITION	NOTE
	MIN.	MAX.	MIN.	MAX.		
Ambient Temperature	-40°C	+80°C	-5°C	+55°C	–	1
Humidity	–	–	–	–	No condensation	2
Vibration	–	–	–	–	No operating	3 (Tstg only)
Shock	–	–	–	–	No operating	4 (Tstg only)

NOTES:

1. Survival: -20°C to +65°C. No permanent damage will occur.
2. $t_A \leq 40^\circ\text{C}$, 95% RH maximum.
 $t_A > 40^\circ\text{C}$, Absolute humidity shall be less than $t_A = 40^\circ\text{C}/95\%$ RH.
3. 5 to 55 Hz Frequency range: Sweep time: 15 minutes each axis. Dwell at resonance: 10 minutes each resonance.
Peak-to-peak amplitude: 3.17 mm over 5 to 10 Hz range, 1.52 mm over 10 to 25 Hz range, 0.38 mm over 25 to 55 Hz range.
55 to 500 Hz Frequency range: Sweep time: 120 minutes each axis. Dwell at resonance: 30 minutes each resonance.
Peak-to-peak amplitude: 30 m/s² peak acceleration.
4. Acceleration: 981 m/s² Pulse width: 6 ms, three times for each direction of $\pm X/\pm Y/\pm Z$.

ELECTRICAL CHARACTERISTICS ($t_A = 25^\circ\text{C}$, Frame Frequency = 120 Hz)

SYMBOL	PARAMETER	MIN.	TYP.	MAX.	UNIT	NOTE
V_L	Supply Voltage (Logic)	+4.75	+5.0	+5.25	V	–
I_L	Supply Current (Logic, $V_L = +5\text{ V}$)	30	–	300	mA	–
V_D	Supply Voltage (Panel Drive)	+11.4	+12.0	+12.6	V	–
I_D	Supply Current (Panel Drive, $V_D = +12\text{ V}$)	–	–	700	mA	1
P_T	Total Power ($V_L = +5\text{ V}$, $V_D = +12\text{ V}$)	–	5	–	W	–

NOTE:

- 10 mA in condition with no signals nor V_L supplying.

OPTICAL CHARACTERISTICS ($t_A = 25^\circ\text{C}$, Frame Frequency = 120 Hz)

SYMBOL	PARAMETER	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
L_{ON}	Luminance	All Dots Lit	137	200	–	cd/m^2	1
L_{OFF}	OFF Luminance	All Dots Turned Off	–	–	3.4	cd/m^2	
ΔL_{DIS}	Luminance Distribution	All Dots Lit	–	–	35	%	
–	Fill Factor	–	–	0.54	–	–	2
ΔL_{SD}	Shadowing Characteristics	Fixed Pattern	–	3	–	%	3
–	Viewing Angle	–	–	160	–	degrees	–

NOTES:

1. Average luminance measured at the dots in circular windows (R1 to R5) is shown in Figure 2. (Circular window diameter: $\phi 13\text{ mm}$).

The following formula defines the luminance distribution:

$$\Delta L_{DIS} = \left(1 - \frac{L_{MIN}}{L_{MAX}}\right) \times 100 (\%)$$

where L_{MAX} is the maximum luminance and L_{MIN} is the minimum luminance taken at the five locations shown in Figure 2.

2. The ratio of the emission area to the display area. SHARP's Electro-Luminescence has comparatively high fill factor, and therefore, the visibility of display is excellent.

3. Shadowing characteristics mean the variation of luminance according to the number of dots lit on a scanning line. Because the shadowing compensation circuit has been added, the display quality of SHARP's Electro-Luminescence is improved.

The following formula defines the shadowing characteristics:

$$\Delta L_{SD} = \left(\frac{L_N}{L_L} - 1\right) \times 100 (\%)$$

where L_L is the luminance at R6 and L_N is the luminance at R7.

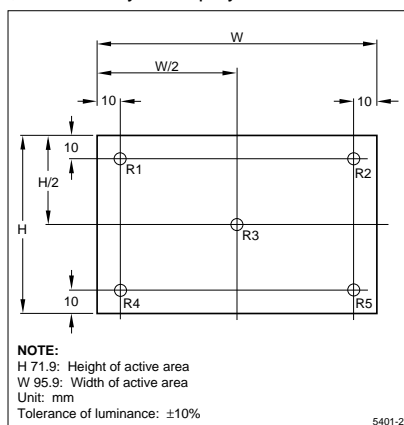


Figure 2. Luminance Test Method

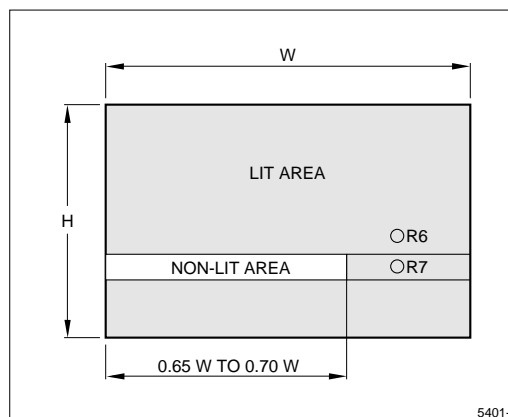


Figure 3. Shadowing Characteristics Measurement

INPUT SIGNALS

This unit is driven by line-at-a-time scanning method with the following seven CMOS level input signals.

SYMBOL	PARAMETER	DESCRIPTION	
CP2	Data Input Clock Signal	Clock signal for inputting the display data into the EL unit.	
D ₀ – D ₃	Display Data Signal	Data signal for the upper part of display	The signals are sampled at every falling edge of the data input clock signal. The display is 'ON' while the logic is 'H' and 'OFF' while the logic is 'L.'
CP1	Input Data Latch Signal	This signal controls the 'timing of line-at-a-time scanning' and the 'latch timing of the data side shift register on falling edge.'	
S	Scan Start-Up Signal	This signal controls frame frequency. The contents of the display data signal are displayed on the first line by combination with this signal.	

TIMING CHARACTERISTICS OF INPUT SIGNALS (t_A = 25°C)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	NOTE
1/t _{FRM}	Frame Frequency	60	–	120	Hz	–
t _{CP2}	CP2 Clock Cycle	152	–	–	ns	–
t _{CWH}	High Level Clock Width	60	–	–	ns	–
t _{CWL}	Low Level Clock Width	60	–	–	ns	–
t _{CP1}	CP1 Clock Cycle	33	–	–	μs	–
t _{LWH}	High Level Latch Clock Width	60	–	–	ns	–
t _{SU}	Data Setup Time	50	–	–	ns	–
t _H	Data Hold Time	40	–	–	ns	–
t _{S21}	CP1 ↑ Clock Allowance Time from CP2 ↓	0	–	–	ns	–
t _{S12}	CP2 ↓ Clock Allowance Time from CP1 ↓	200	–	–	ns	–
t _R , t _F	Clock Rise/Fall Time	–	–	t _{RF}	ns	1

NOTE:

1. $t_{RF} = (t_{CP2} - t_{CWH} - t_{CWL})/2 \leq 30 \text{ ns}$

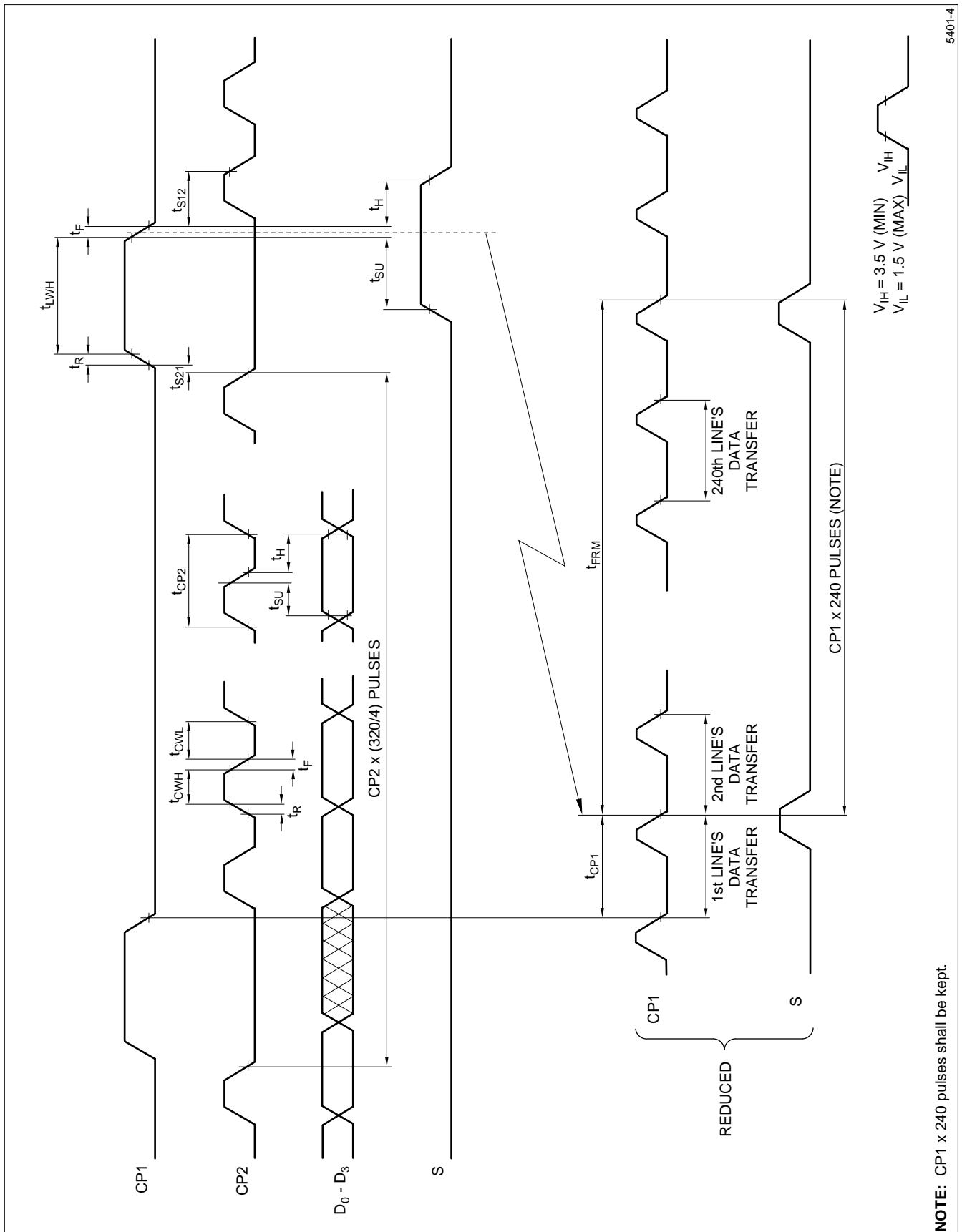
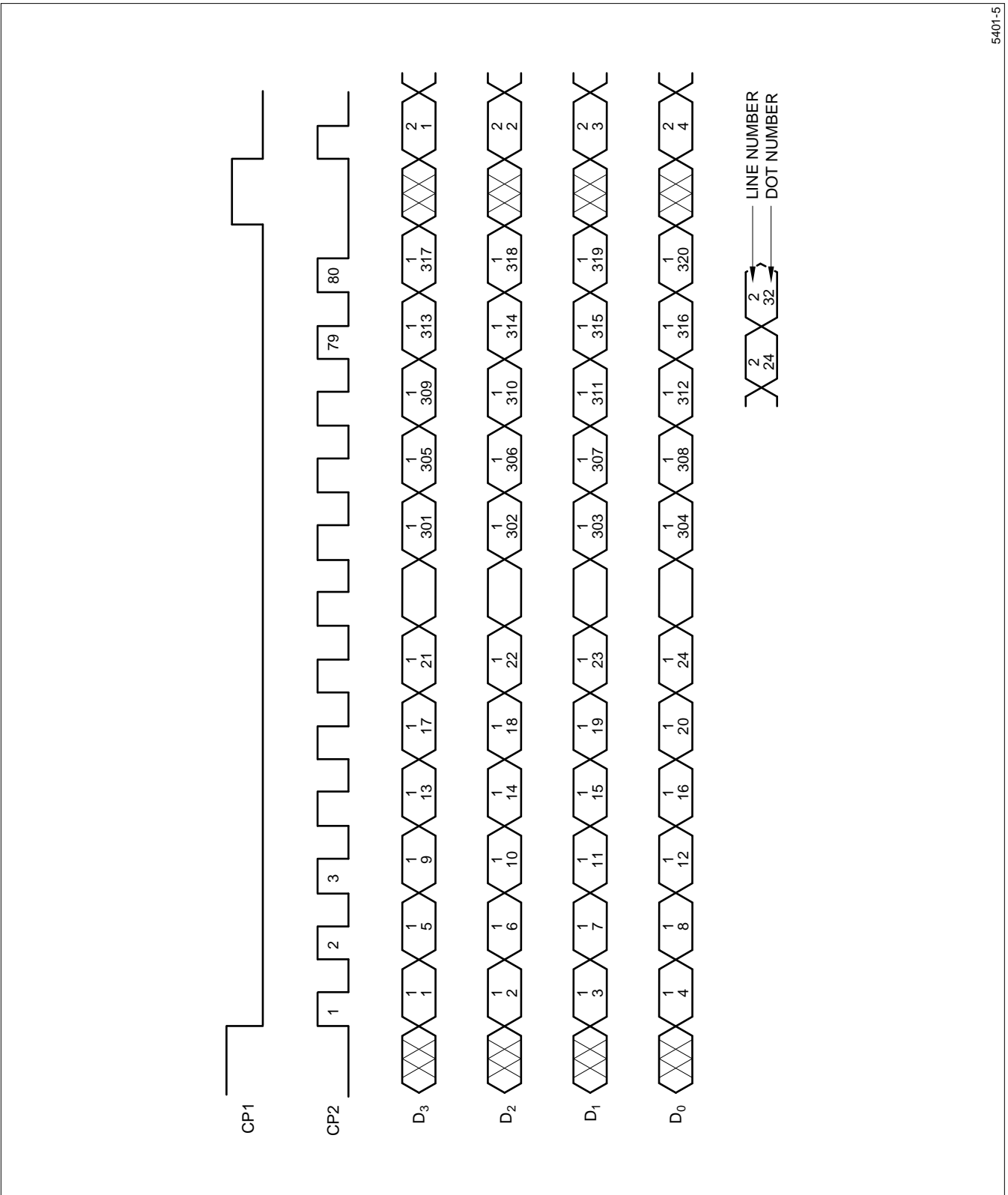


Figure 4. Input Signals Timing Chart



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Figure 5. Data Transmission Timing

TRANSMISSION DATA AND RELATIVE POSITION ON PANEL

LINE ↓	DOT →					319	320
	1	2	3				
1	1-1	1-2	1-3	--	--	1-319	1-320
2	2-1	2-2	2-3	--	--	2-319	2-320
3	3-1	3-2	3-3	--	--	3-319	3-320
•	----	----	----	--	--	----	----
•	----	----	----	--	--	----	----
•	----	----	----	--	--	----	----
239	239-1	239-2	239-3	--	--	239-319	239-320
240	240-1	240-2	240-3	--	--	240-319	240-320

INTERFACE SIGNALS AND POWER SUPPLY CONNECTORS

Assignment of Pins of Connector CN4

NUMBER	SIGNAL	NUMBER	SIGNAL
1	D ₁	9	S
2	D ₀	10	GND
3	D ₃	11	GND
4	D ₂	12	GND
5	CP2	13	+5 V
6	GND	14	+5 V
7	CP1	15	+12 V
8	GND	16	+12 V

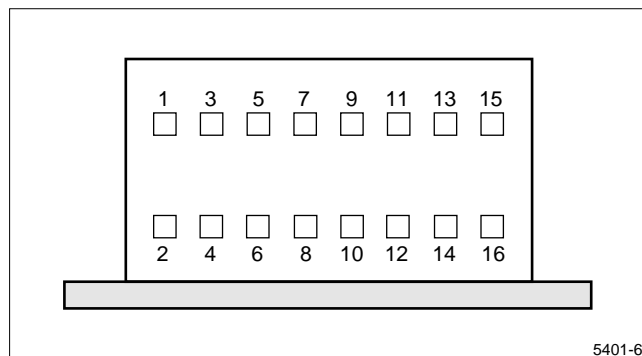


Figure 6. Arrangement of Pins of Connector CN4

Connectors

DESCRIPTION	MODEL NUMBER	MANUFACTURER
Unit-Side Pin Header	DF11-16DP-2DSA or equivalents	Hirose Electric Co.
Fitting Socket (Crimp Contact)	DF11-16DS-2C or equivalents (DF11-2428SC)	

NOTES:

- The length of the cable shall not exceed 50 cm.
- This unit is not supplied with the fitting socket and the cable.

HANDLING INSTRUCTIONS

- Handle the unit carefully to avoid ESD. The operator and surroundings must be protected against ESD. Hold the mounting arms of four corners of the unit when you handle it.
- Since the Electro-Luminescent panel is made of glass, use care when handling it to avoid breakage.
- Do not remove the display control board or disassemble the unit. To prevent damage due to static electricity, do not touch the unit's ICs.

PRECAUTIONS

- Operate the unit within the rated operating conditions specified in this literature. When you mount the unit on your product, design your product to give the unit adequate ventilation.
- Avoid operation of the unit at high temperatures with high humidity. Dew on the connector or on the circuits will cause malfunction, which can damage the unit.
- While in operation, do not touch the display control board on the rear side of the unit. It generates AC pulse of approximately 200 V.
- To avoid image retention caused by luminance change due to time lapse and to increase panel life, avoid displaying a fixed pattern for prolonged periods and try to use all parts of the viewing area evenly. Also, use the unit at the lowest ambient temperature possible. Temperature contributes to acceleration of luminance change due to time lapse.

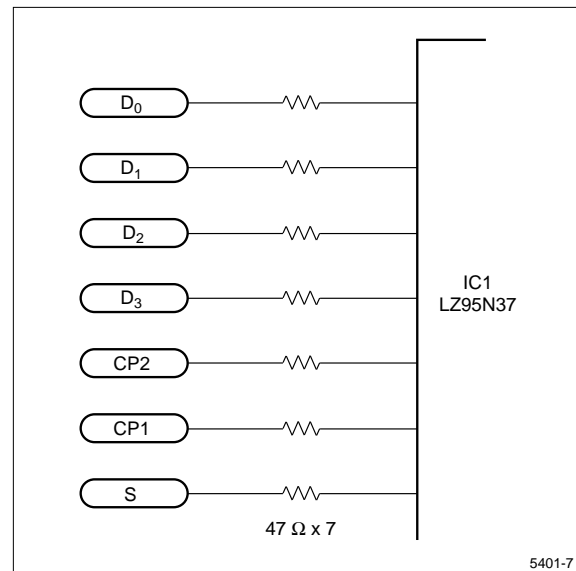


Figure 7. Circuit Schematic of the Signal Input Block

OTHER INFORMATION

If any problem should arise from this specification, the supplier and user should work out a mutually acceptable solution.

Fuse Specifications

PART NUMBER	MODEL NUMBER	RATING	MELT TYPE	MANUFACTURER	AUTHORIZATION STANDARD	NOTE
F1	TR-5 19374 or equivalents	800 mA	Slow	Wickmann	UL, CSA	1
F2	TR-5 19374 or equivalents	1.25 A				

NOTE:

1. Fuses are not open in case current capacity of the power supply is small. On the other hand, fuses are open by surge current if the current capacity of the power supply is big or supply power to the unit uses relays. Therefore, thoroughly investigate the unit.

POWER SUPPLY INPUT CIRCUIT

Over Current Protection

This unit uses fuses in the power supply input circuit to protect against over current in the internal circuit. Fuses may blow if the specifications are not adhered to or in the event of a short circuit.

Refer to Figure 8 for the Power ON/OFF Sequence. Refer to Figure 9 for 5 VDC input rise time and fall time of 5 VDC.

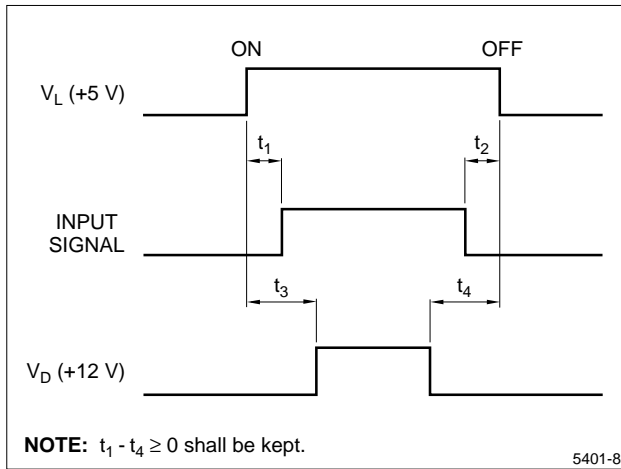


Figure 8. Power ON/OFF Sequence

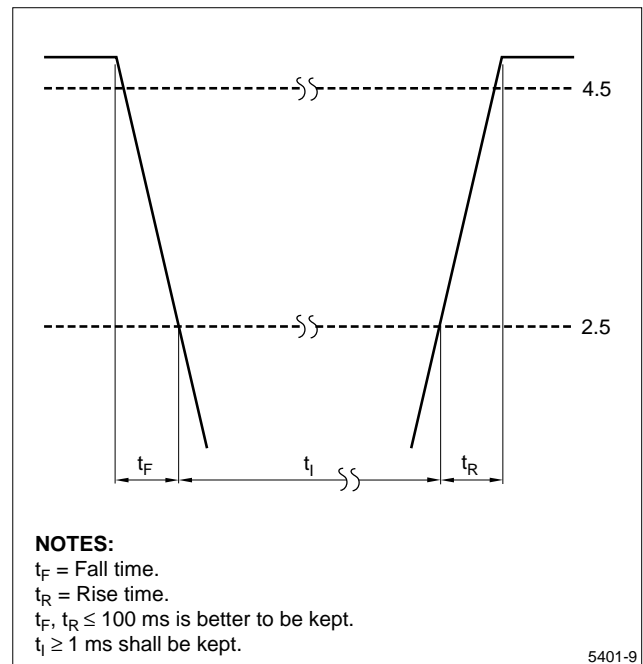
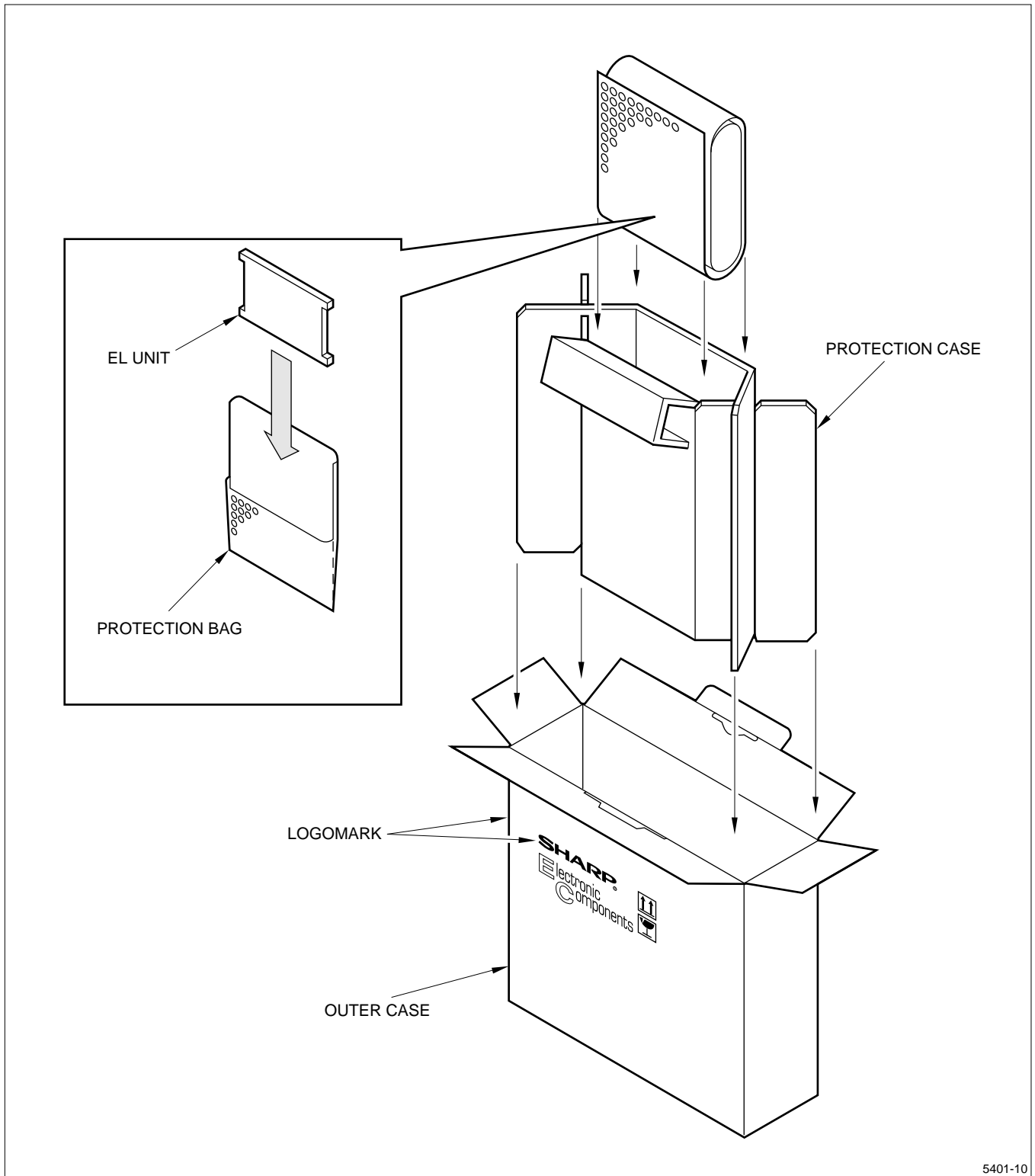


Figure 9. Rise/Fall Time



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Figure 10a. Packing Specification

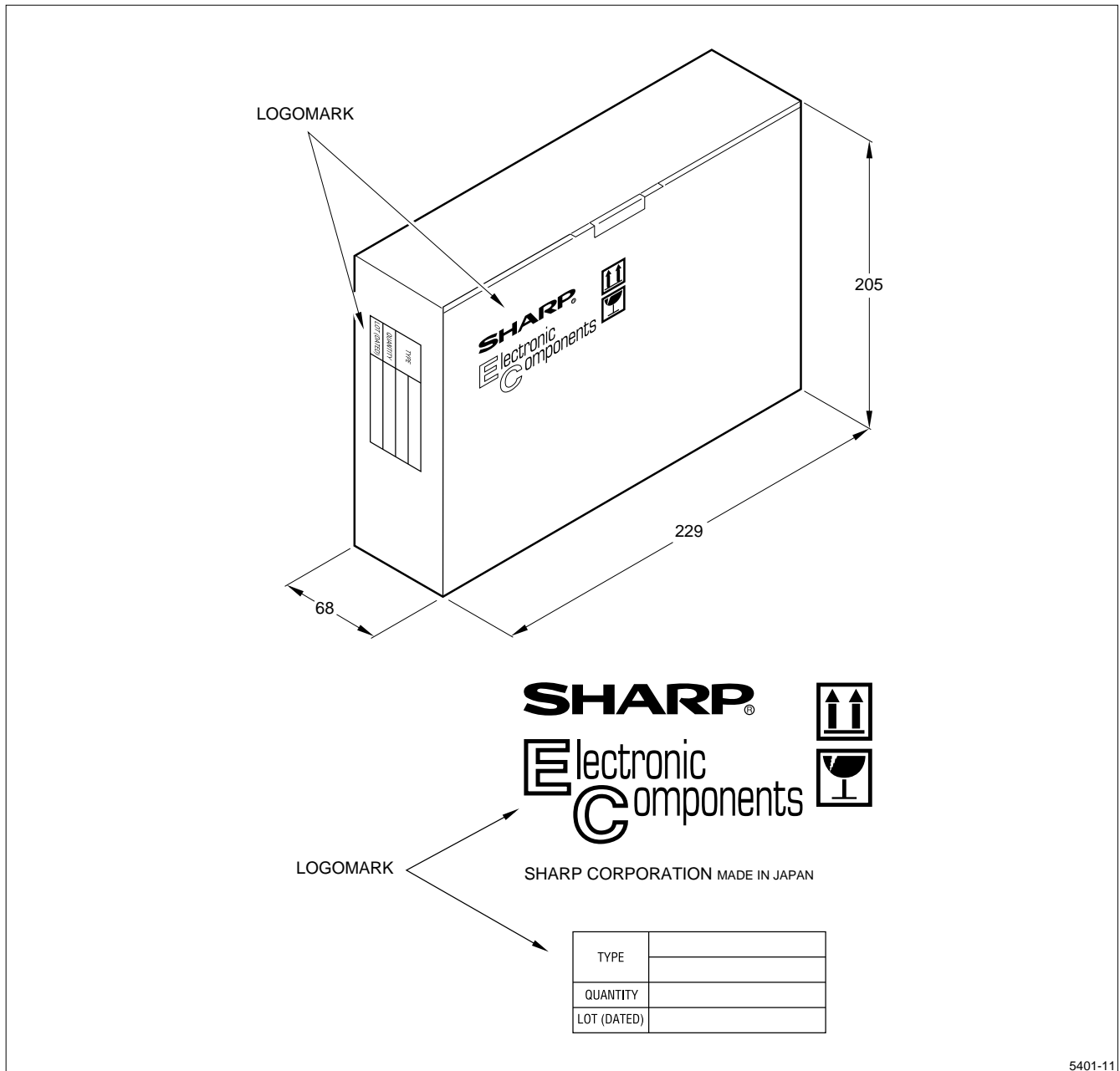
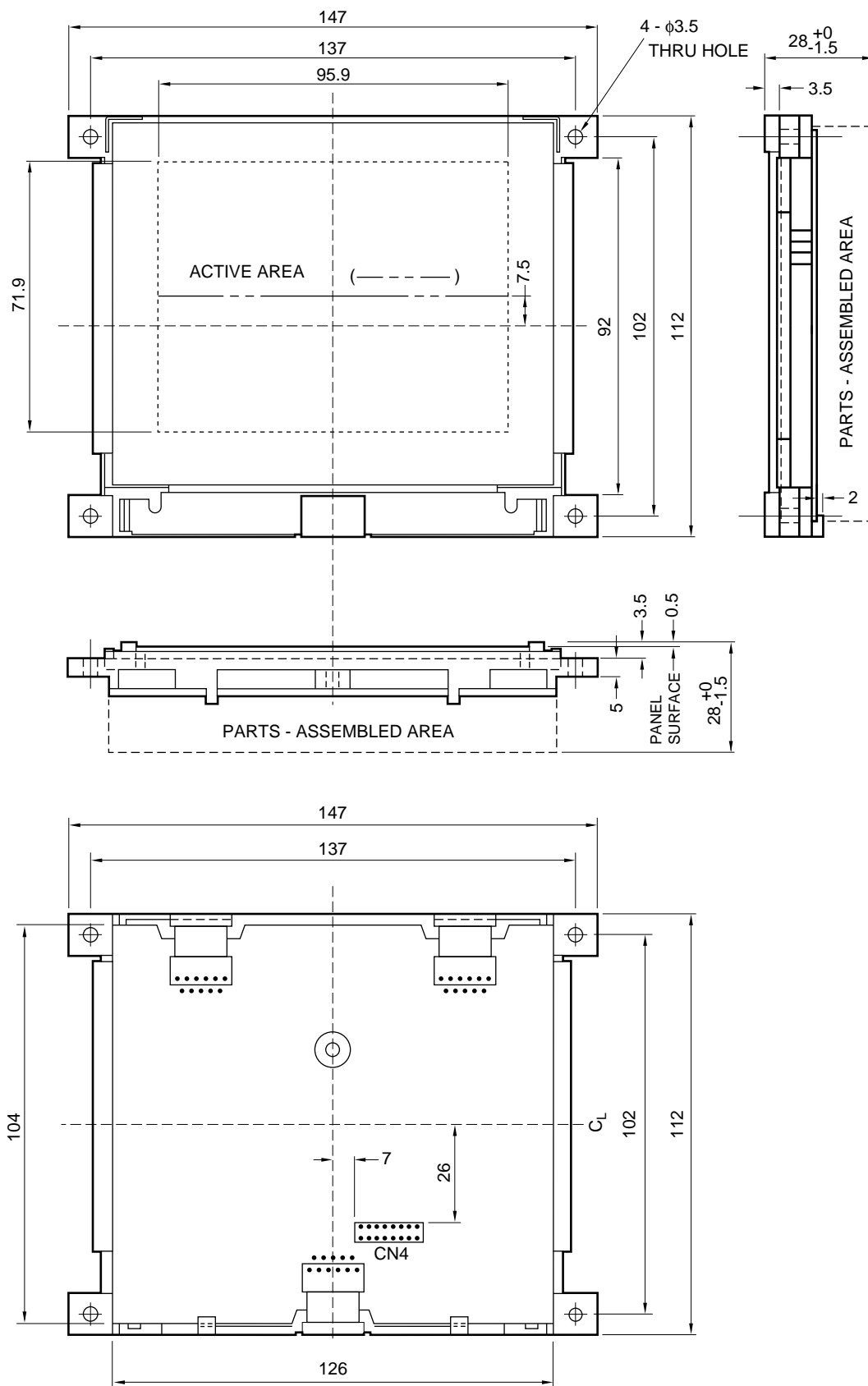


Figure 10b. Packing Specification

OUTLINE DIMENSIONS



NOTE: Dimensions in mm.

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