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ELECTRONIC COMPONENTS GROUP

SHARP CORPORATION

TECHNICAL LITERATURE

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PAGE 1 2 Pages

REPRESENTATIVE DIVISION

OPTO-ELECTRONIC DEVICES DIV.

DEVICE TECHNICAL LITERATURE FOR

Dot Matrix LED unit

MODEL No. LT1560ED

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2. Please obey the instructions mentioned below for actual use of this device.
SHARP takes no responsibility for damage caused by improper use of the devices.

(1) This device is designed for general electronic equipment.
Main uses of this device are as follows;

[•OA equipment "Telecommunication equipment (Terminal)
. Measuring equipment • AV equipment • Home appliance, etc.]

(2) Please take proper steps in order to maintain reliability and safety, in case this device is used for the uses mentioned below which require high reliability.

[• Unit concerning control and safety of a vehicle (air plane, train, automobile etc.)
"Traffic signal • Gas leak detection breaker • Fire box and burglar alarm box
• Other safety equipment, etc.]

(3) Please do not use for the uses mentioned below which require extremely high reliability.

[.Space equipment "Telecommunication equipment (Trunk)
• Nuclear control equipment .Medical equipment etc.]

Contact a SHARP representative of sales office in advance when you intend to use SHARP devices for any applications other than those applications for general electronic equipment recommend by SHARP at (l).

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CUSTOMER'S APPROVAL

DATE

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LT1560ED

1. Application

This technical literature applies to the outline and characteristics of Dot Matrix LED unit, LT1560ED.

[Description]

This model is 96x192mm(16x32dot) Dot Matrix LED unit which is designed for indoor-used and is capable of 3-color display, red(GaAsP/GaP chip), yellow-green (GaP chip), and orange (by mixing the first two).

This unit has shift registers, latch circuits, LED driver ICS and seaming line select circuits built in it, and provides colorful displays using LINE AT A TIME DRIVE METHOD. (LEDs are lit by 1/16 duty dynamic lighting method.)

Due to the built-in luminance adjustment circuit, this unit contributes to unify the luminance on a large display board.

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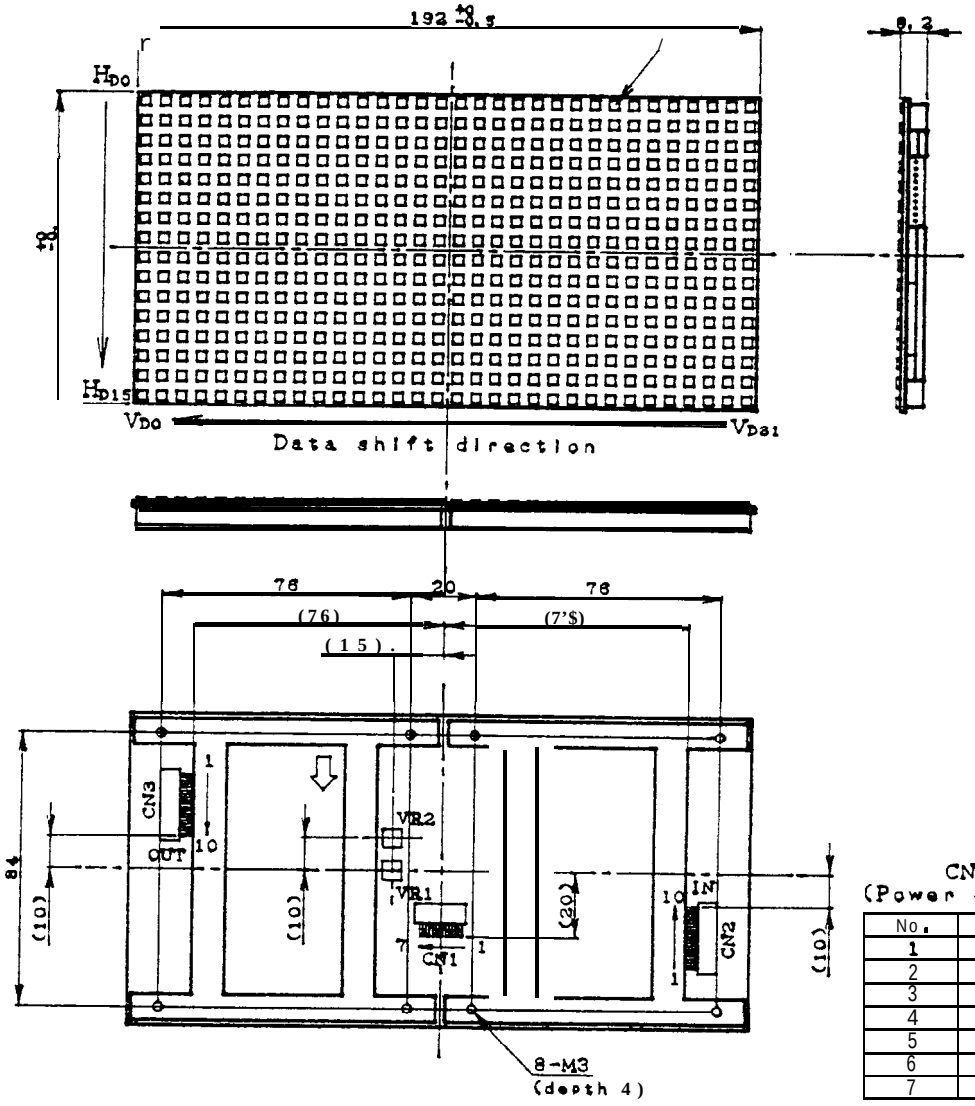
2. Outline and terminal arrangement

512-93 chip LED



CN1
(Power supply)

No.	Name
1	VLED
2	VLED
3	VLED
4	VCC
5	GND
6	GND
7	GND

CN2
(Signal InPut)

No.	Name
1	A0
2	A1
3	A2
4	A3
5	RDATA
6	GDATA
7	LATCH
8	ENABLE
9	CLOCK
10	GND

CN3
(Signal output)

No.	Name
1	A0
2	A1
3	A2
4	A3
5	RDATA
6	GDATA
7	LATCH
8	ENABLE
9	CLOCK
10	GND

ote.

.. Tolerance ±0.5

?. Dimensions in ( ) are reference values,

I. Connector

		Adaptor
CN1 :	S7B-PH-SM3	PHR-7
CN2 :	S10B-PH-SM3	PHR-10
CN3 :	S10B-PH-S,M3 (J.S.T Corp.)	PHR-10

.. VR1 (for red). VR2 (for yellow-green) are variable resistors for adjusting the luminance.

Scale: FREE	Unit: mm
Name	LT1560ED outline and terminal arrangement
Drawing No.	50801022

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3. Ratings and electro-optical characteristics

3-1. Absolute maximum ratings

Parameter	Symbol	Rating	Unit
IC supply voltage	V_{CC}	-0.3- +5.5	V
LED supply voltage	V_{LED}	-0.3- +4.5	V
Signal input voltage(1)	V_I	-0.3 ~V_{CC}+0. 3	V
LED on time	t_{ON}	1	ms
Operating temperature(2)	T_{opr}	-10 to +60	℃
Storage temperature	T_{stg}	-20 to +70	℃
Lighting rate(3)	tAVG	50	%

(1) Voltage of input signals(A0, A1, A2, A3, RDATA, GDATA, $\overline{LATCH}$, $\overline{ENABLE}$, CLOCK).

(2) Relation between temperature and lighting rate refers to page 4/12.

(3) Average lighting rate in five minutes.

3-2. Electro-optical characteristics

Ta=25℃

Parameter	Symbol	Condition		Min.	Typ.	Max.	Unit
IC current dissipation	I_{CC}	V_{CC}=5V, V_{LED}=4V		-	140	200	mA
LED current dissipation	I_{LED}	When lit up all dots		-	4.5	5.5	A
Luminance(1)	L_{V1}	V_{CC}=5V	Red	-	(100)	-	cd/m²
	L_{V2}	V_{LED}=4V	Yellow-green	-	(loo)	-	
Peak emission wavelength	λ_{P1}		Red	-	635	-	nm
	λ_{P2}		Yellow-green	-	565	-	
Spectrum radiation bandwidth	$\Delta\lambda_1$		Red	-	35	- 1	nm
	$\Delta\lambda_2$		Yellow-green	-	30	-	

(1) It is immediate luminance after turning on. Before delivering, the luminance is set to above-stated typical value. (Tolerance = ± 10%)

3-3. Using condition

Parameter	Symbol	Min.	Typ.	Max.	Unit
IC supply voltage	V_{CC}	4.75	5.0	5.25	V
LED supply voltage	V_{LED}	3.75	4.0	4.25	V
Signal input voltage	V_{IL}	-	-	1.5	V
	V_{IH}	3.5	-	-	V
Signal input current	I_{IL}	-	-	0.12	mA
	I_{IH}	-	-	0.1	μA
Clock frequency	f_{CLK}	-	-	10	MHz

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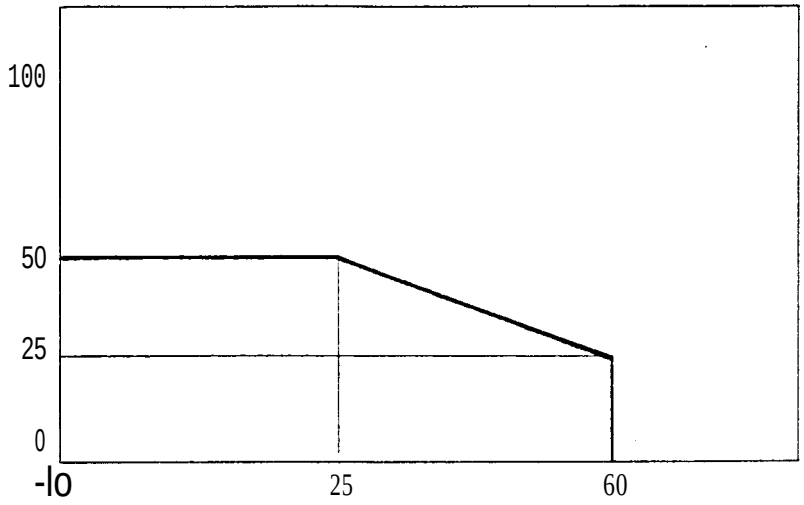
3-4. Derating curve



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4. Re iability

4-1. Test items and condition

Confidence level 60%

No.	test items	condition	Sample	Defect	LTPD[%]
1	Mechanical shock	1000m/s^2; 6ms; 3times/X, Y, Z	5	0	20
2	Vibration	1.5mm; 10-55 Hz/1min; 2h/X, Y, Z	5	0	20
3	Temperature cycling	-20℃(60min)~70℃(60min); 10times	5	0	20
4	Humidity (steady state)	Ta= 40℃ 90%RH; t=500h	5	0	20
5	High temp. storage	Ta= 70℃; t=500h	5	0	20
6	Low temp. storage	Ta=-20℃; t=500h	5	0	20
7	Operation life	Ta= 25℃; V_{LED}=4V, Vcc=5V; t=500h	5	0	20

4-2. Measured items and acceptable limit

No.	Measured items	symbol	Acceptable limit
1	IC current dissipation	Icc	MAX. U. S. L. x 1.2
2	LED current dissipation	I_{LED}	MAX. U. S. L. x 1.2
3	Luminance	Lv_1, Lv_2	Initial value x 0.5
4	Operating check		No defect

* Measuring condition is based on specification.

*U. S. L. is Upper Specification Limit.

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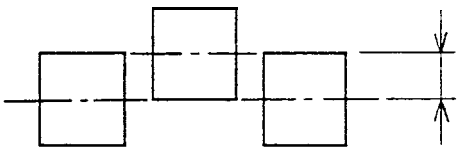
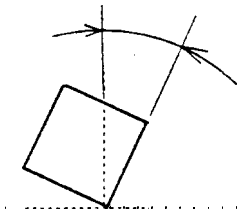
5. Outgoing inspection

5-1. Applied standard : ISO2859-

5-2. Sampling method and level : \ s: ngle sampling plan, normal inspection level II
\QL Major defect: O. 4%
Minor defect: 2.5%

5-3. Inspection items, judgement criterion, and defect class

No	Inspection items	Judgement criterion	defect class
1	Wrong lighting	(1) LEDs completely remains off. (2) LEDs are lit unusually.	Major defect
2	Wrong marking	(1) Lot number is not marked. (2) Lot number can not be read.	Major defect
3	Characteristics	Not satisfy specification. (Ice, ILED, L_{V1}, L_{V2})	Minor defect
4	Outline dimensions	Not satisfy specification. (except for reference values)	Minor defect
5	Uneven brightness	More than one dot is dimmer than the other dots (for the same color). Judged by limit sample.	Minor defect
6	Gap of LED's positio	0. 5mm or more : NG 	Minor defect
7	Inclination of LED	15" or more : NG 	Minor defect

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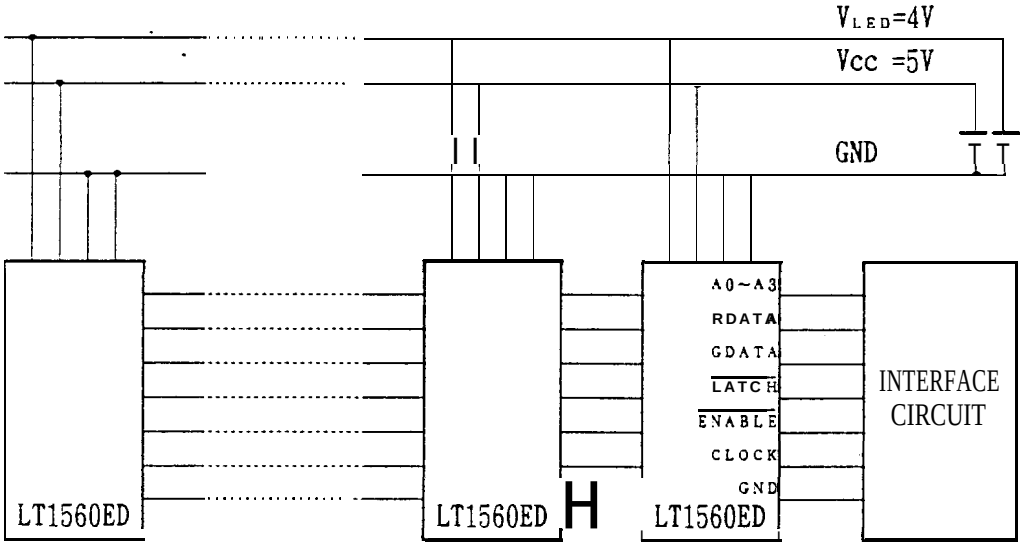
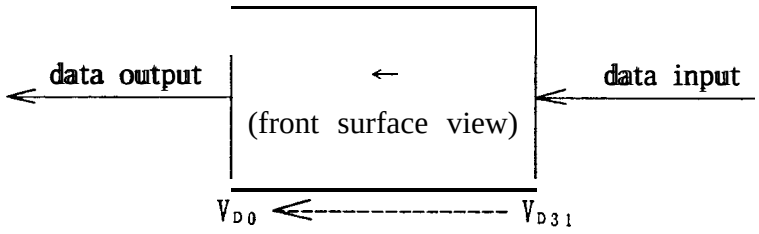
6. Supplement

6-1. Weight of the unit : Approx. (130) grams per unit.

6-2. Connection between each unit and the next



6-3. Direction of data shift



Shift from right to left in unit. (direction of $V_{D31} \rightarrow V_{D0}$)

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6-4. Terminal functions

	Name	Functions
CN1	V_{LEO}	For LED +4V
	Vcc	For IC +5V
	GND	Ground
CN2 IN)	A_0, A_1, A_2, A_3	Address specification signal for row driver. (See Table 1)
	RDATA GDATA	Serial signal of display data. ("H"=on, "L"=off) Shifts from right to left in unit. (direction of $V_{D31} \rightarrow V_{D0}$)
	$\overline{\text{LATCH}}$	Latch signal for the contents of shift register. "H": serial data → parallel data. "L": the contents are latched.
	$\overline{\text{ENABLE}}$	Output enable for LEDs. "H": LEDs are all off. "L": LEDs are lit by data.
	CLOCK	Clock signal for data transmission in the shift register. "L"→"H": The data are shifted.
	GND	Ground for signal. (Connected to ground in unit.)
CN3 OUT:	A_0, A_1, A_2, A_3	Buffered the input signals $A_0 \sim A_3$.
	RDATA GDATA	Input signal is generated through 32-bit shift register in the unit.
	$\overline{\text{LATCH}}$	Buffered the input signal $\overline{\text{LATCH}}$.
	$\overline{\text{ENABLE}}$	Buffered the input signal $\overline{\text{ENABLE}}$.
	CLOCK	Buffered the input signal CLOCK.
	GND	Ground for signal. (Connected to ground in unit.)

Table 1 ADDRESS($A_0 \sim A_3$) SET

	Address signals					Address signals			
	A_3	A_2	A_1	A_0		A_3	A_2	A_1	A_0
H_{D0}	0	0	0	0	H_{D8}	1	0	0	0
H_{D1}	0	0	0	1	H_{D9}	1	0	0	1
H_{D2}	0	0	1	0	H_{D10}	1	0	1	0
HD_3	0	0	1	1	H_{D11}	1	0	1	1
H_{D4}	0	1	0	0	H_{D12}	1	1	0	0
HD_5	0	1	0	1	H_{D13}	1	1	0	1
H_{D6}	0	1	1	0	H_{D14}	1	1	1	0
H_{D7}	0	1	1	1	H_{D15}	1	1	1	1

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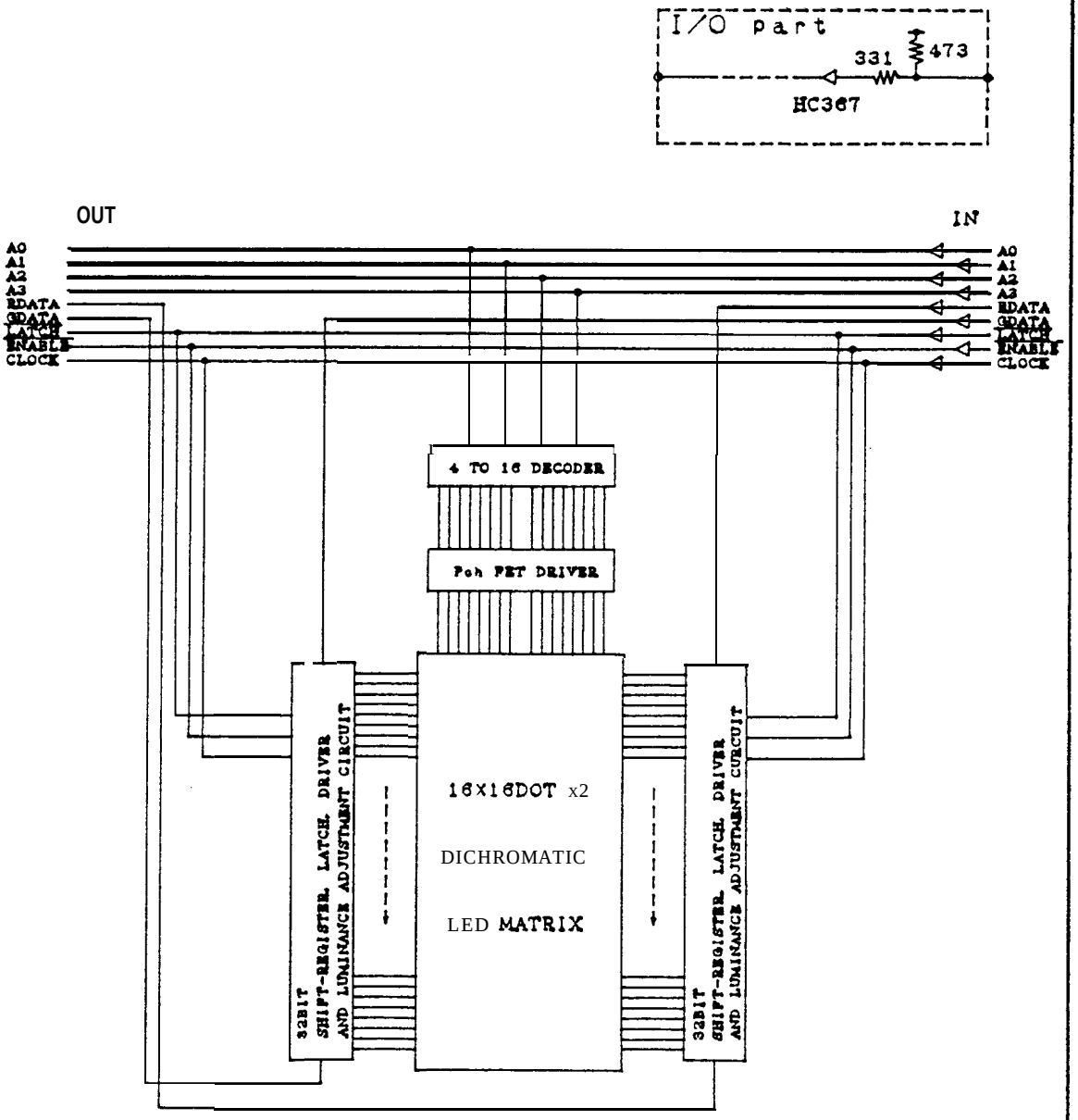
6-5. Internal block diagram



Name	LT1560ED Internal block diagram
Drawing No.	50801023

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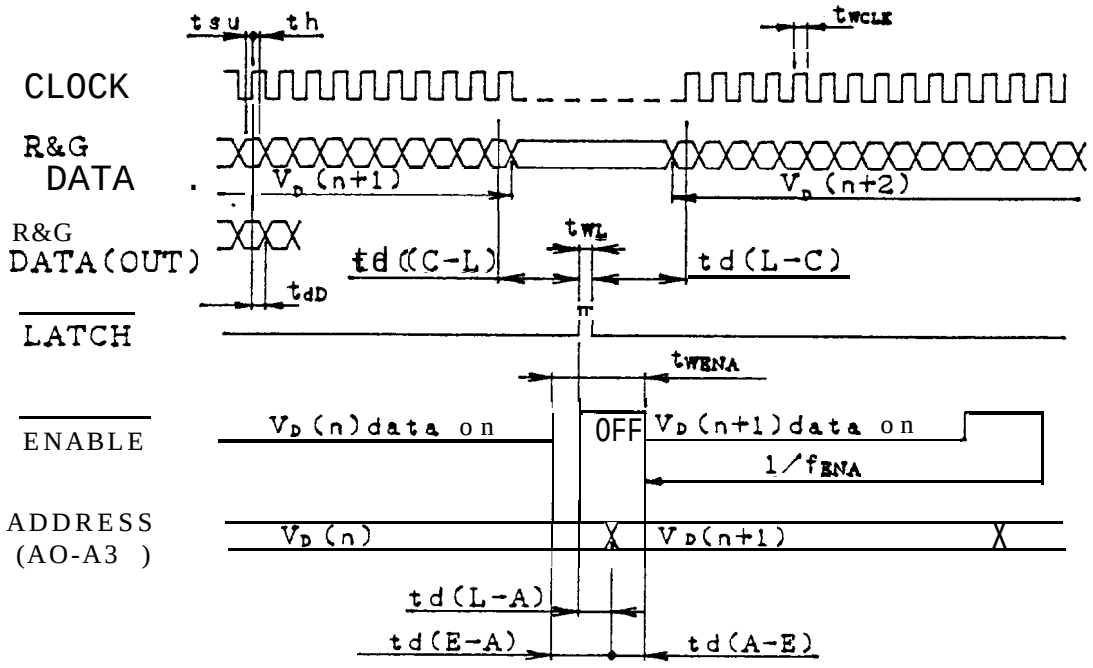
6-6. Timing chart



Recommendatory timing condition Ta=25°C Vcc=5.OV

Parameter	Symbol	Rating			Unit	Remarks
		Min.	Typ.	Max.		
Clock pulse width	t WCLX	50	-	-	ns	
Latchpulse width	tWL	100	-	-	ns	
Enable pulse width	t WENA	4			μs	
Data setuptime	t SU	60			ns	
Data hold time	th	20	-	-	ns	
Clock-L~teh time	td(C-L)	100	-	-	ns	
Latch-Clock time	td(L-C)	100	-	-	ns	
Enable-Address time	td (E-A)	2	-	-	us	
Address-Enable time	td (A-E)	2	-	-	μs	
Latch-Add?ea8 time	td(L-A)	0	-	-	μs	
I/O delay time	tPLH, tPHL	-	24	-	ns	• xe.ot datatermina!
Data delay time	tdD		104	-	ns	RDATA, GDATA
Flame frequency	fFR	'70	250	1000	Hz	
Enable frequency	fENA			16	kHz	

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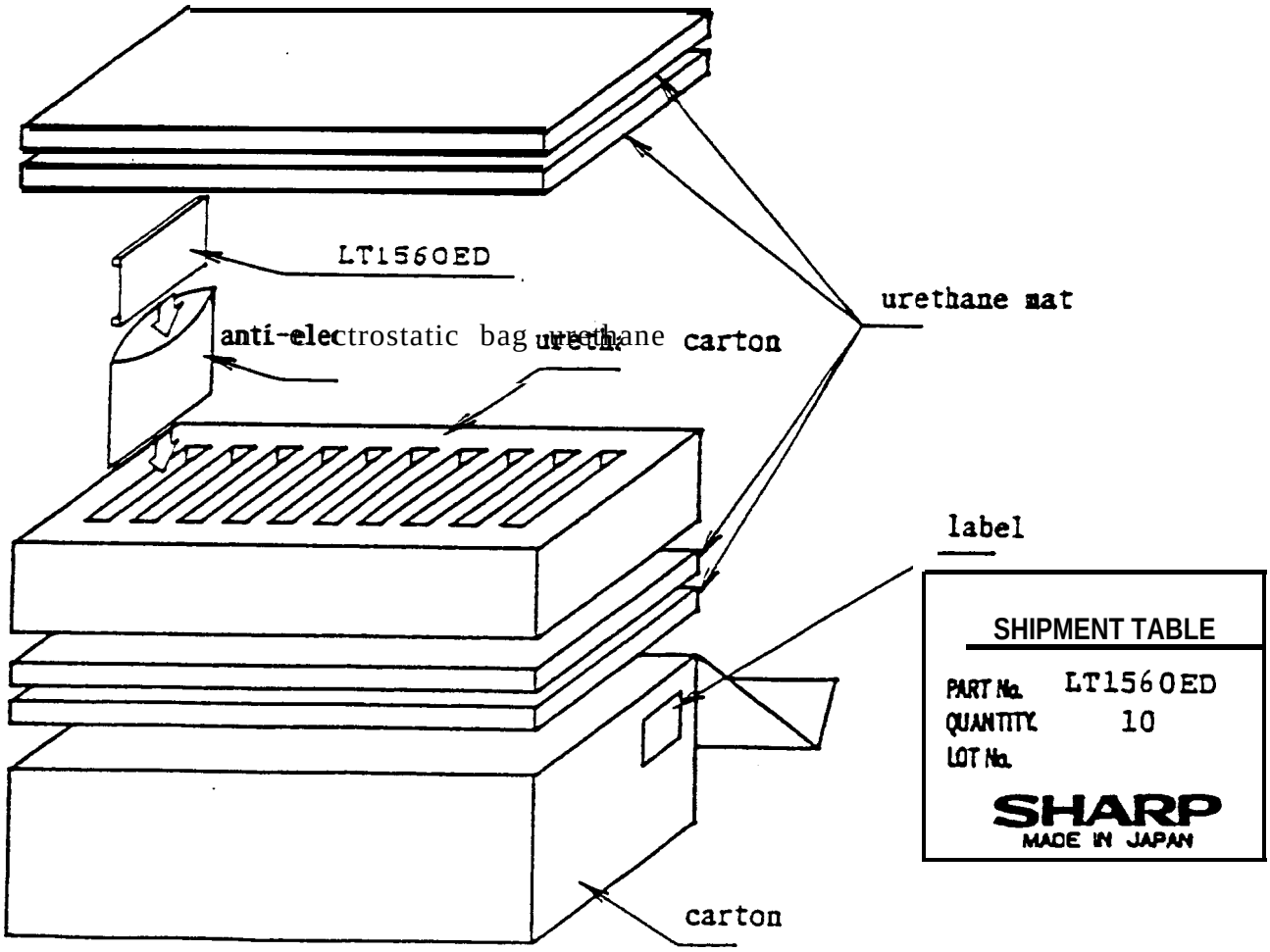
6-7. Packaging specification

1) One(1) LED unit is packed in an anti-electrostatic bag.
2) Ten(10) LED units are put into a carton.
   The label is filled out the model No., quantity, lot No.
3) For quantities less than ten(10) LED units per carton, the packing form may differ from the one given in these specifications.



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7. Notes

1) Cleaning is not allowed.
2) The LED unit includes **CMOS** devices. When handling, take adequate measures to prevent static electricity.
3) Wrong connection (CN1, CN2, CN3) causes malfunction of inner circuit.
4) If address signals(A_0~A_3) stop, LED may break. So t_{ON}(ON time of one line LEDs) must be shorter than lms.
5) A hard shock and drop cause permanent deformation of the unit. And do not scrub LED's edge or surface, so it may cause destruction of LED lamps.
6) To minimize noise, please observe the following:
   .Minimize the connection between a power supply and a unit.
   (Use wire as thick and short as possible for power line.)
   .Any 1/0 signal lines must be shorter than 15cm.
7) When usinga lot of LED units in a same display board, take adequate cooling measures such as a ventilation fan, so the surface temperature of any unit does not exceed 60℃.
8) For radiation, the mounting base should be designed not cover up the area of the unit's back where ICS are located.
9) When fixing the LED unit to its mounting base, use screw holes at its back side. (torque: 0.4 ~0.5N·m)
   And when using more than two(2) PCS. of LED units in a display board, they should be mounted at more than 96mm and 192mm pitch between each LED unit.
10) This unit does not have waterproof structure. Please do not wet the LED unit and do not use under a high percentage of humidity condition.
11) The LED units must be protected from direct exposure to dust, dirt, salty air, SO_2 gas, or other corrosive gases.
12) When adjusting the luminance, please use a screw driver suited for holes of the variable resistor, And please minimize to added pressure with a screw driver when adjusting. (less than 10N)
13) The luminance of LED gradually decrease, so that if specific LEDs are lit fora long time, it causes deterioration of lighting quality. Therefore please contrive to light all LED dots uniformly with display data.
14) Please be careful not to exceed the lighting ratio, because LED may be damaged or deteriorated by temperature rise.