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		PAGE 14 Pages
		REPRESENTATIVE DIVISION OPTO-ELECTRONIC DEVICES DIV.

DEVICE SPECIFICATION FOR

Dot Matrix LED unit

MODEL No. **LT1550ED**

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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;
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 - (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.)
• Gas leak detection breaker "Traffic signal • Fire box and burglar alarm box
• Other safety equipment, etc.]
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 - 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 (1).

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Apr. 17. 1995

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SHARPLT1550ED

1. Application

This specification applies to indoor-use Dot Matrix LED unit, **LT1550ED**.

2. Description

This unit is a 16x32dot indoor-use Dot Matrix LED unit which 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 scanning line select circuits built in it, and provides colorful displays using LINE AT A TIME DRIVE METHOD.(LEDs are lit by 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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|--|--------------------|
| 3. Outline dimensions and pin configuration | See Page 2/14 |
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4. Ratings and electro-optical characteristics

4-1. Absolute Maximum Ratings

Ta=25°C

Parameter	Symbol	Rating	Unit	Remark
IC supply voltage	V _{CC}	-0.3 to +5.5		
LED supply voltage	V _{LED}	-0.3 to +4.5	V	
Input voltage (CLOCK, ENABLE, LATCH A ₀ ~A ₃ , RDATA, GDATA)	v,	-0.3 to +5.5	V	
Current dissipation	I _{LED}	4.5	A	LED's current dissipation
LED on time	t _{ON}	1	ms	at 1/16 duty
Operating temperature	T _{opr}	-10 to +60	°C	at lighting rate:25% ⁽¹⁾
Storage temperature	T _{stg}	-20 to +70	°C	
Lighting rate ^(*)	t _{AVG}	50	%	both red and yellow-green

(1) Average lighting rate in five minutes.

4-2. Electrical characteristics

Ta=25°C, V_{CC}=5.0V, V_{LED}=4.0V

Parameter	Symbol	Rating			Unit	Remark
		Min.	Typ.	Max.		
IC supply voltage	V _{CC}	4.75	5.0	5.25	V	
LED supply voltage	V _{LED}	3.75	4.0	4.25	V	
IC current dissipation	I _{CC}	-	140	200	mA	lit up all dots
LED current dissipation	I _{LED}	-	3.8	4.2	A	lit up all dots
Input voltage(1)	V _{IL}	-	-	1.5	V	
	V _{IH}	3.5	-	-	V	
Input current(1)	I _{IL}	-	-	0.12	mA	
	I _{IH}	-	-	0.1	μA	
Clock frequency	f _{CLK}	-	-	10	MHz	

(1) It depends on IC's characteristics using at I/O part.

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4-3. Optical characteristics

Ta=25℃, Vcc=5.0V, VLED=4.0V

Parameter		symbol	Rating			Unit	Remark
			Min.	Typ.	Max.		
Luminance	Red	Lv	-	120	-	cd/m ²	Adjustable
	Yellow-green		-	180	-	cd/m ²	Adjustable
Peak emission wavelength	Red	λ _P	-	635	-	nm	
	Yellow-green		-	565	-	nm	
Spectrum radiation bandwidth	Red	Δλ	-	35	-	nm	
	Yellow-green		-	30	-	nm	

Condition 1) Ta=25℃, Vcc=5.0V, VLED=4.0V

- 2) The luminance immediately after turning on.
- 3) Tolerance = ± 10 %
- 4) Each luminance of red and yellow-green can be adjusted with a variable resistor in the circuit. Before delivering the luminance is set to approximately 120cd/m² of red and 180cd/m² of yellow-green.
If necessary to adjust, the luminance can be adjusted by means of VR1 (for red) and VR2(for yellow-green) on the PWB.



5. Terminal functions

5-1. Power supply (Connector 1)

Name	Functions
VLED	For LED +4V
Vcc	For IC +5V
GND	Ground

5-2. Input signal (Connector 2)

Name	Functions
A ₀ - A ₃	Address specification signal for row driver. (See Table 1)
RDATA	Serial signal of display data. ("H"=on, "L"=off)
GDATA	Shifts from right to left in unit. (direction of V _{D31} →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.)

5-3. Output signal (Connector 3)

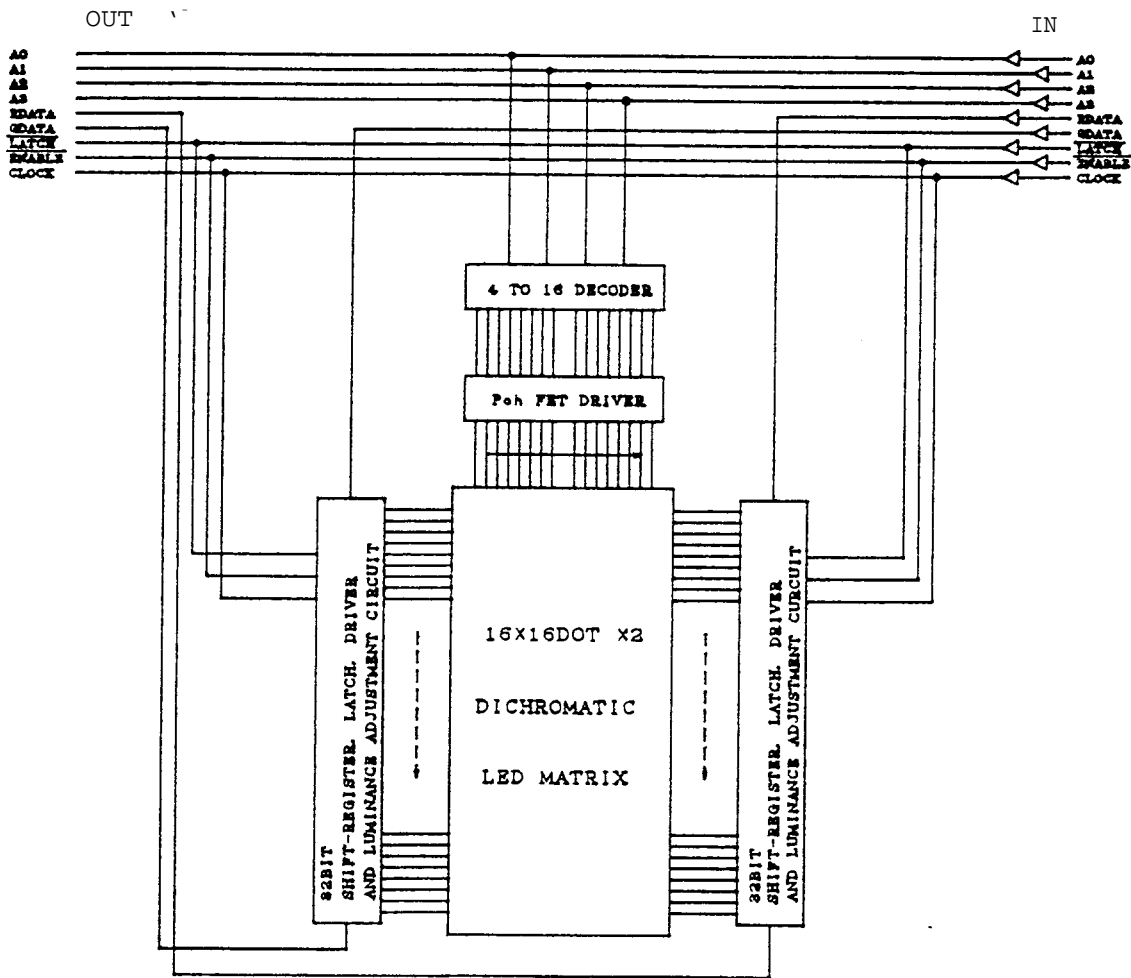
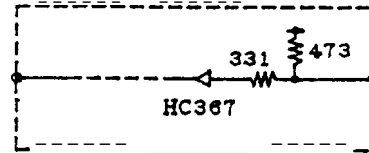
Name	Functions
A ₀ ~ A ₃	Buffered the input signals A ₀ ~A ₃ .
RDATA	Input signal is generated through 32-bit shift register in the unit.
GDATA	
LATCH	Buffered the input signal $\overline{\text{LATCH}}$.
ENABLE	Buffered the input signal $\overline{\text{ENABLE}}$.
CLOCK	Buffered the input signal $\overline{\text{CLOCK}}$.
GND1	Ground for signal. (Connected to ground for IC in unit.)

The output signals are transferred to the next unit and utilized as the input signals.

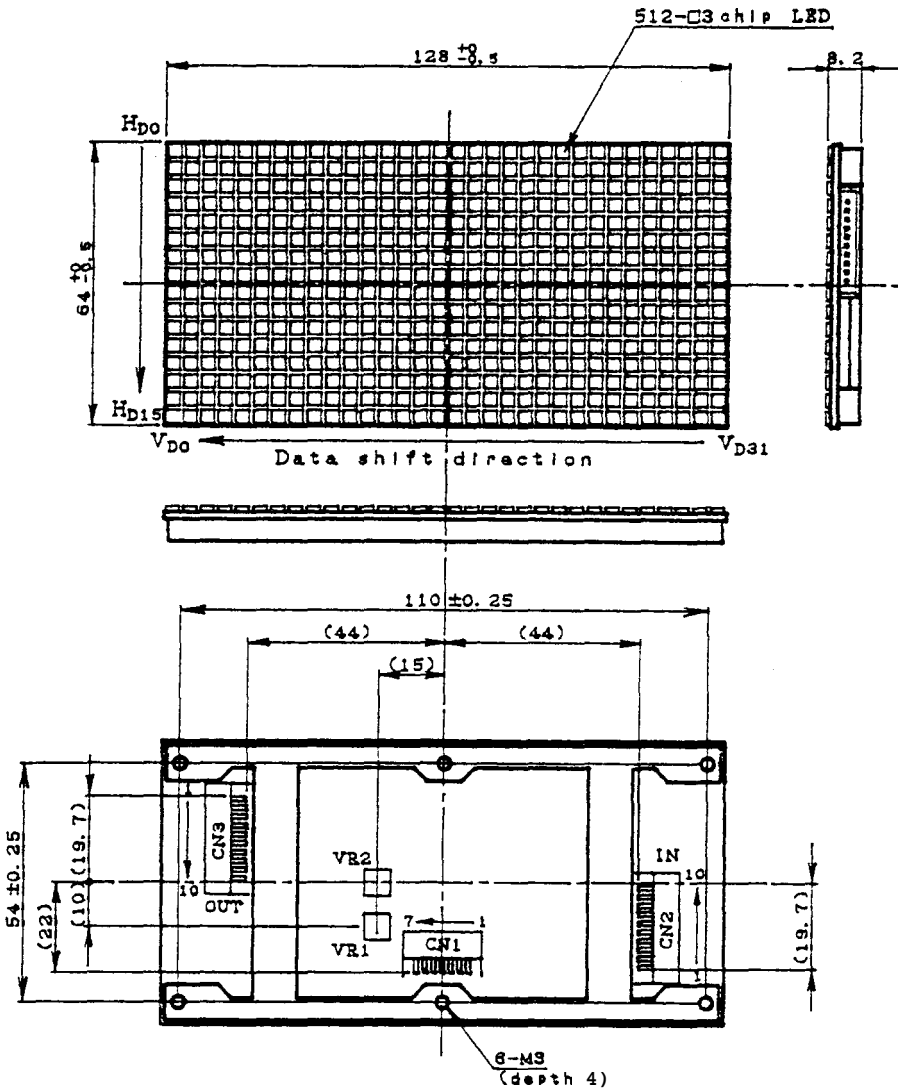
Table 1 ADDRESS(A₀~A₃) SET

A ₂	A ₁	A ₀	A ₃	
			0	1
0	0	0	H _{D0}	H _{D8}
0	0	1	H _{D1}	H _{D9}
0	1	0	H _{D2}	H _{D10}
0	1	1	H _{D3}	H _{D11}
1	0	0	H _{D4}	H _{D12}
1	0	1	H _{D5}	H _{D13}
1	1	0	H _{D6}	H _{D14}
1	1	1	H _{D7}	H _{D15}

I/O circuit



適用機種 APPLICABLE MODEL		尺度 SCALE		単位 UNIT			
LT1550ED						改訂日 DATE	
板厚 THICKNESS		員数 PIECES		材質 MATERIAL		改訂記事 REVISE	
				仕上 FINISH		担当 CHNG.	
						名称 NAME	
						6. Internal Block Diagram	
日付 DATE		1995. 4 14		シャープ株式会社 電子部品事業本部		コード CODE	
設計 FIGN		製図 DRAW		検図 CHECK		承認 APPROVE	
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				SHARP CORPORATION		50704009	



Sots.

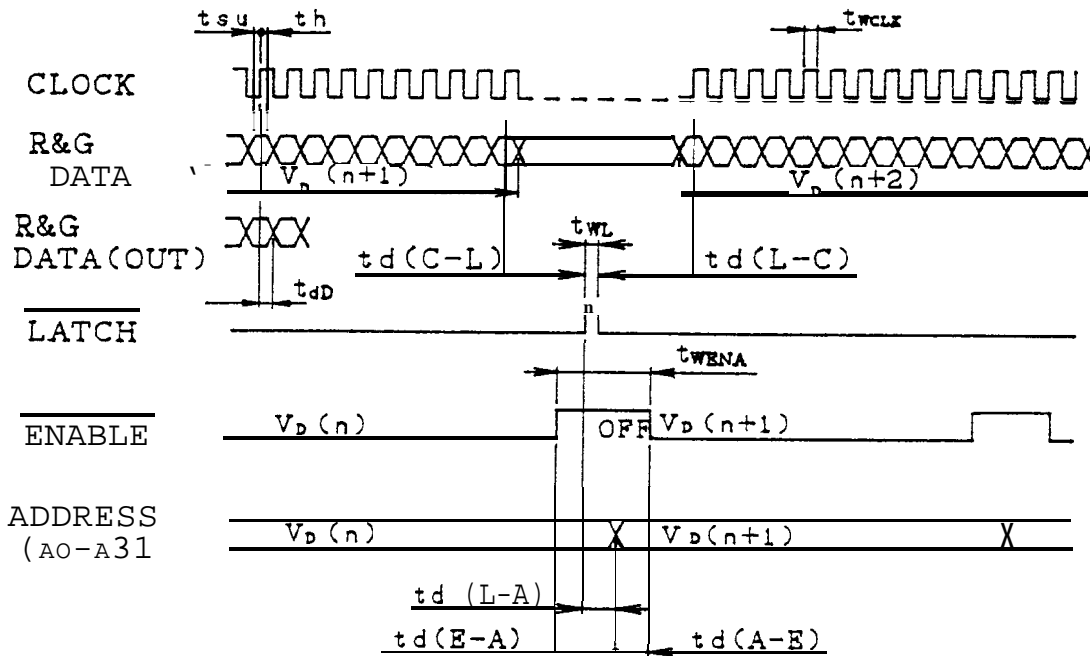
- Tolerance ± 0.5
- Connector Adapter
 CN1: S7B-PH-SM3 PHR-7
 CN2: S10B-PH-SM3 PHR-10
 CN3: S10B-PH-SM3 PHR-10
 (JST Corp.) (JST Corp.)
- VR1 (for red) and VR2 (for y-g) are variable resistor to adjust the luminance. (If necessary to adjust luminance, turn it clockwise.)

CN1(Power ● um91Y) CN2(Input) CN3(Output)

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	VL3D	1	A0	1	A0
2	VLED	2	A1	2	A1
3	VLED	3	A3	3	A2
4	Vcc	4	A3	4	A3
5	GND	5	B DATA	5	B DATA
6	GND	6	G DATA	6	G DATA
7	GND	7	LATCH	7	LATCH
		8	ENABLE	8	ENABLE
		8	CLOCK	9	CLOCK
		10	GND	10	GND

適用機種 PL ICATABLE MODEL	LT1550ED	R 度 SCALE	単位 UNIT	△			
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板厚 THICKNESS	張数 PIECES	材質 MATERIAL	仕上 FINISH	改訂日 DATE	改訂記事 REVISE	担当 CHARG	
							名称 NAME 3. Outline dimensions
交付 DATE	1995. 4. 14			コード CODE			
設計 SIGN DRAW	承認 APPROVE	シャープ株式会社 電子部品事業本部		番 DRAWING No.			
鈴木		シャープ株式会社 電子部品事業本部 SHARP CORPORATION		番 DRAWING No.			50704008

7. Timing Chart



Recommendatory timing condition $T_a=25^\circ\text{C}$ $V_{cc}=5.0\text{V}$

Parameter	Symbol	Rating			Unit	Remarks
		Min.	TYP.	Max.		
Clock pulse width	t_{wclk}	50	-	-	ns	
Latch pulse width	t_{wl}	100			ns	
Enable pulse width	t_{wbna}	4			us	
Data setup time	t_{su}	60			ns	
Data hold time	t_h	20			ns	
Clock-Latch time	$t_{d(C-L)}$	100	-		ns	
Latch-Clock time	$t_{d(L-C)}$	100			ns	
Enable-Address time	$t_{d(E-A)}$	2	-	-	μs	
Address-Enable time	$t_{d(A-E)}$	2	-	-	μs	
Latch-Address time	$t_{d(L-A)}$	0	-	-	μs	
I/O delay time	t_{PLH}, t_{PHL}	-	24	-	ns	● except data terminal
Data delay time	t_{dD}		104	-	ns	RDATA, GDATA
Frame frequency	f_{FR}	70	250	1000	Hz	
Enable frequency	f_{ENA}			16	kHz	

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8. Reliability test standard

8-1. Test item and condition

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

8-2. Failure criterion

No.	Parameter	symbol	Acceptance limit
1	IC current dissipation	I _{CC}	MAX. U. S.L.x1.2
2	LED current dissipation	I _{LED}	MAX. U. S.L.x1.2
3	Luminance	L _v	MIN. Initial value x 0.5
4	Operating check		No defect

* Parameter condition is based on specification.

* U. S.L. is Upper Specification L: init.

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9. Incoming inspection standard

9-1. Method of incoming inspection

Unless otherwise agreed in writing, method of incoming inspection shall be in accordance with a sampling inspection based on MIL-STD-105D.

9-2. Method of sampling inspection

- (a) sampling table : table in MIL-STD-105D
- (b) sampling type : single sampling
- (c) inspection type : normal inspection
- (d) inspection level : level II

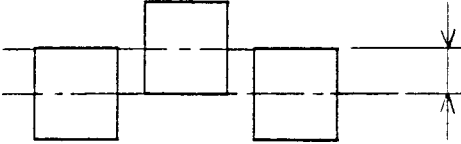
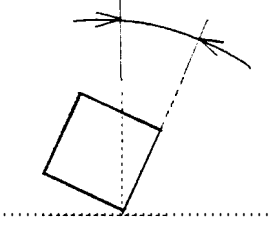
9-3. Acceptable Quality Level ("AQL")

- (a) Major defects : AQL 0.1%
- (b) Minor defects : AQL 0.4%
- (c) Slight defects : AQL 2.5%

9-4. Inspection item, judgement standard, and defect type

No.	inspection items	judgement standard	defect type
1	Open circuit	(1) Internally opened LED LED completely remains off. (2) Open copper conductor LED completely remains off.	Major defect
2	Short circuit	(1) Internally shorted LED LED completely remains off or lights unusually. (2) Shorted copper conductor LED completely remains off or lights unusually.	Major defect
3	Soldering errors	(1) Short by solder LED completely remains off or lights unusually. (2) Soldering open LED completely remains off or lights unusually.	Major defect

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No.	inspection item	judgement standard	defect typ
4	Wrong LED type	Emission color is different.	Major def
5	Marking errors	Lot number is not printed.	Major def
6	Dimensions-	Dimensions exceed specified value,	Minor def
7	Characteristics	Electrical characteristics or luminance does not satisfy the specified value.	Minor def
8	Gap of LED's position	0.5mm or more : NG 	Minor def
9	Revolution of LED	15° or more : NG 	Minor def
10	Protrusion of bond	As a result of protrusion, outline dimensions do not satisfy the specified value.	Minor def
11	Soldering errors	(1) Insufficient solder or voids in solder. The amount of solder is too small to completely cover up the copper conductor, or solder has voids. (2) Solder splash Solder drops or chips are scattered on the PWB surface.	Slight de

* PWB : Printed Wiring Board

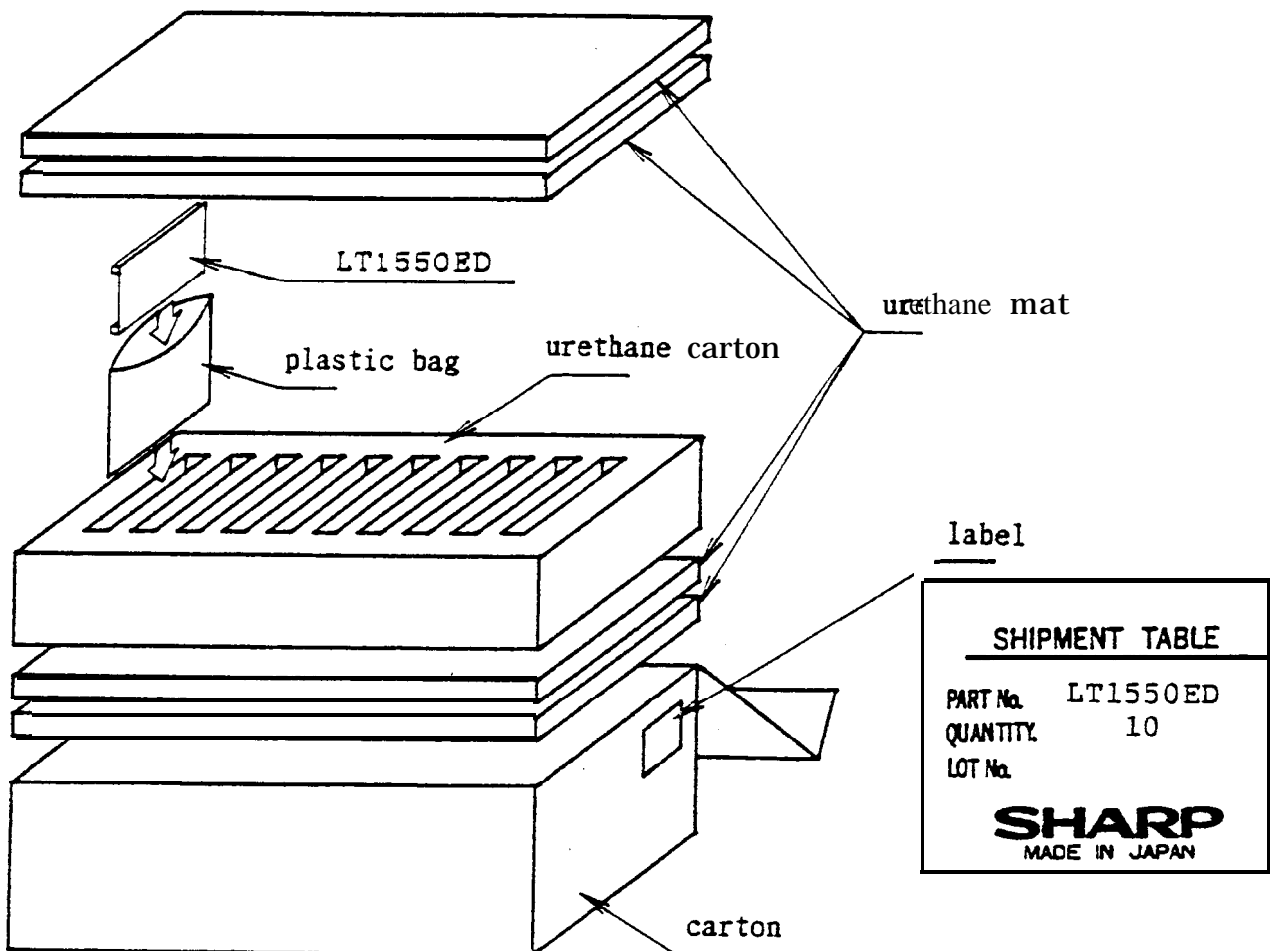
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No.	inspection item	judgement standard	defect type
12	Uneven brightness	More than one dot is dimmer than the other dots (for the same color). Judged by limited sample.	Slight defect
13	Dust	0.6mm ϕ or more (dust in lamp which can be recognized through resin)	Slight defect
14	Marking errors	Lot number is blurred or spotted by ink.	Slight defect



10. Packing specification

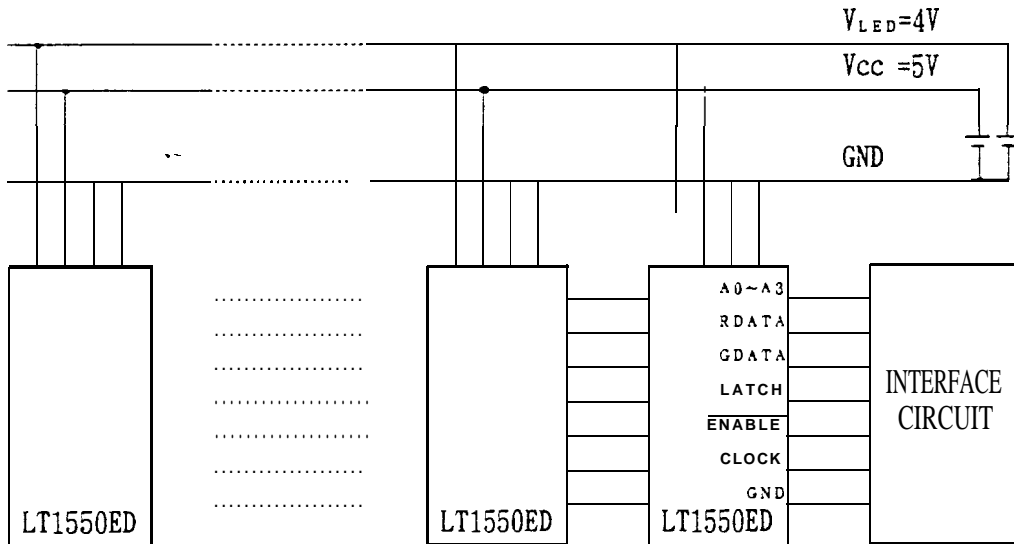
- 1) One(1) LED unit is packed in a conductive plastic bag.
- 2) Ten(TO) LED units are put into a carton.
The label is filled out the model No., quantity, lot No.
- 3) For quantities less than ten(10) LED units per carton, the packing form may differ from the one given in these specifications.





11. Notes

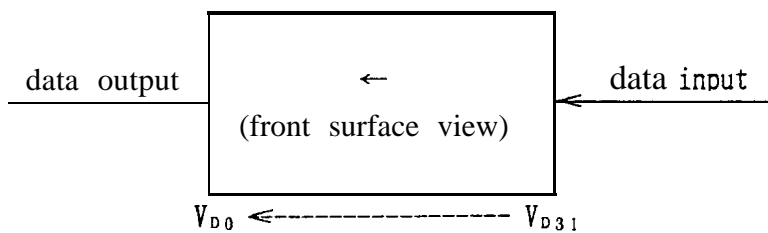
11-1. Connection



To minimize noise, observe the following instruction;

- Minimize the connection between a power supply and a unit.
(Use wire as thick and short as possible for power line.)
- Any I/O signal lines must be 15cm or less long.

11-2. Direction of data shift



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

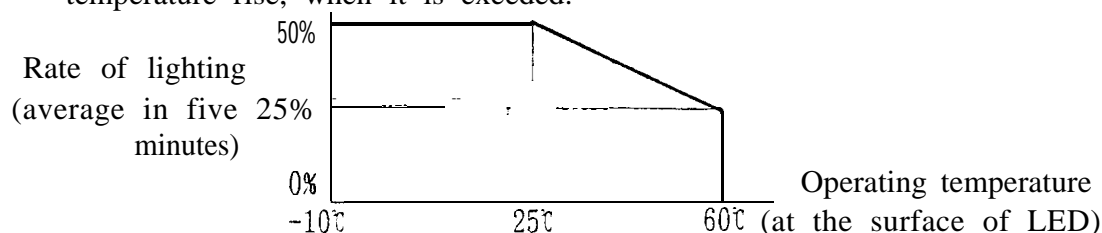
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11-3. Precautions on installing

- 1) Weight: Approx. 70 grams per unit.
- 2) When fixing the LED unit to its mounting base, use screw holes at its back side. (torque: $0.4 \sim 0.5\text{N}\cdot\text{m}$ or less)
And when using more than two(2) PCS. of LED units in a display board, they should be mounted at more than 128mm(parallel direction), 64mm(vertical direction) pitch between each LED unit.
- 3) When using a 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°C . So the mounting base should be made from a thermally well conductive material.
- 4) The mounting base should be designed so that it does not cover up the area of the unit's back where ICS are located.
- 5) The LED unit includes CMOS devices. When handling, take adequate electrostatic preventive measures.
- 6) Please do not use the LED units under a high temperature and a high percentage of humidity condition. And protect the units from direct exposure to dust, dirt, salty air, SO_2 gas, or other corrosive gases.
- 7) This unit does not have waterproof structure.
- 8) When fixing the LED unit to its mounting base, take adequate isolated preventive measures.
- 9) Cleaning is not allowed. When it is needed, please wipe with a dry cloth.
- 10) Exercise care not to give the unit a hard jolt from accidental drop or any other cause as it will cause permanent deformation. And do not scrub LED's edge or surface, so it will cause destruction of LED lamps.

11-4. Other precautions

- 1) In an ambience with extremely high EMI, the unit may malfunction.
- 2) While 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. (10N or less)
- 3) If an address signal($A_0 \sim A_3$) stops, LED may break.
- 4) The luminance of LED gradually decrease for lighting, and lighting specific LED for a long time, it causes deterioration of lighting quality. Therefore please contrive to light all LED dots uniformly with display data.
- 5) The rate of lighting derating curve is the following. Please be careful not to exceed the lighting ratio, as LED may be damaged or degraded by temperature rise, when it is exceeded.



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MODEL No.

LT1550ED

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