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DEVICE TECHNICAL LITERATURE FOR

Dot Matrix LED unit

MODEL No. LT1560W

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(Precautions)

(1) This product is designed for use in the following application areas;

- | | | |
|--|--------------------------|------------------|
| • OA equipment | • Audio visual equipment | • Bone appliance |
| • Telecommunication equipment (Terminal) | • Measuring equipment | |
| • Tooling machine | • Computer | |

If the use of the product in the above application areas for equipment listed in paragraphs (2) or (3), please be sure to observe the precautions given in those respective paragraphs.

(2) Appropriate measures, such as fail-safe design and redundant design considering the safety design of the overall system and equipment, should be taken to ensure reliability and safety when this product is used for equipment which demands high reliability and safety in function and precision, such as:

- | | |
|--|---------------------------------|
| • Transportation control and safety equipment (aircraft, train, automobile etc.) | • Rescue and security equipment |
| • Traffic signal | • Gas leakage sensor breakers |
| • Other safety equipment | |

(3) Please do not use for this product for equipment which require extremely high reliability and safety in function and precision, such as:

- | | |
|-----------------------------------|---|
| • Space equipment | • Telecommunication equipment (for trunk lines) |
| • Nuclear power control equipment | • Medical equipment |

(4) please contact and result with a Sharp sales representative if there are any questions regarding interpretation of the above three paragraphs.

3. Please contact and result with a Sharp sales representative for any questions about this product.

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SHARPLT1560W**1. Application**

This technical literature applies to the outline and characteristics of Dot Matrix LED unit, LT1560W.

[Description]

This model is, 96x192mm(16x32dot) Dot Matrix LED unit which is designed for indoor-used and is capable of multi-color display, red(GaAsP/GaP chip), yellow-green(GaP chip), blue(GaN on SiC), and mixed colors.

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 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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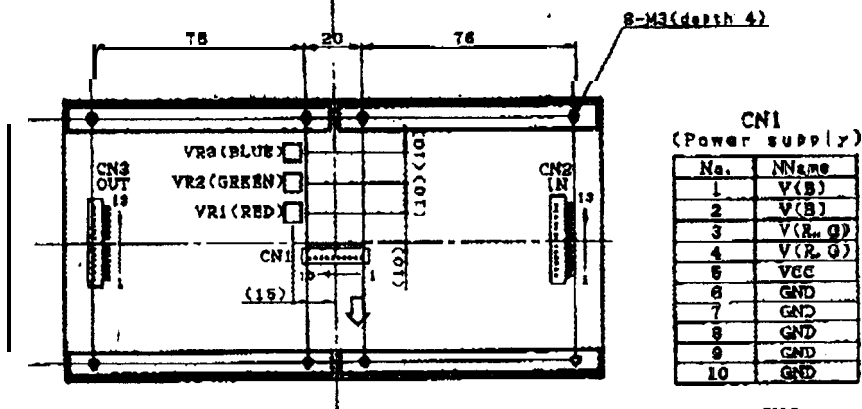
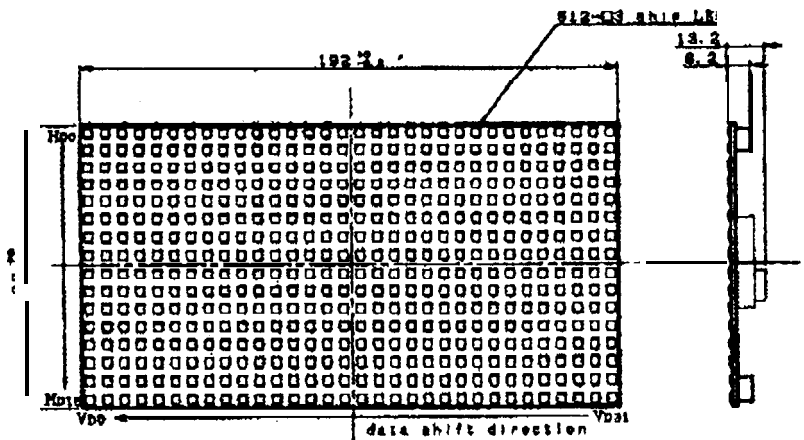
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2. Outline and terminal arrangement



CN1
(Power supply)

No.	NName
1	V(B)
2	V(B)
3	V(R, G)
4	V(R, G)
5	VCC
6	GND
7	GND
8	GND
9	GND
10	GND

CN2 (Signal input) CN3 (Signal output)

No.	Name	No.	Name
1	A0	1	A0
2	A1	2	A1
3	A2	3	A2
4	A3	4	A3
5	RDATA	5	RDATA
6	GDATA	6	GDATA
7	BDATA	7	BDATA
8	LATCH	8	LATCH
9	SENABLE	9	SENABLE
10	GENABLE	10	GENABLE
11	SENABLE	11	SENABLE
12	CLOCK	12	CLOCK
13	GND	13	GND

Notes.

1. Tolerance ± 0.5
2. Dimensions in () are reference values.
3. Connector Adaptor
 CN1: B10B-PH-SM3 PHR-10
 CN2: B13B-PH-SM3 PHR-13
 CN3: B13B-PH-SM3 PHR-13
 (J. S. T Corp.)
4. VR1 (for red), VR2 (for yellow-green), VR3 (for blue) are variable resistors for adjusting the lumiance.

Scale: FRES Unit: mm

Name LT1560W outline and terminal arrangement

Drawing No. 50504040

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R.T1560W

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SHARP**3. Ratings and electro-optical characteristics****3-1. Absolute maximum ratings**

Parameter	symbol	Rating	Unit	Note
IC supply voltage	V _{CC}	-0.3 - +5.5	v	
LED supply voltage 1	V(R, G)	-0.3 - +5.5	v	for red, yellow-green
LED supply voltage 2	V(B)	-0.3 - +8.5	v	for blue
Signal input voltage ⁽¹⁾	V _i	-0.3 - V _{CC} +0.3	v	
LED on time	t _{ON}	1	ms	
Operating temperature ⁽²⁾	T _{OP}	-10 to +60	°C	
Storage temperature	T _{STG}	-20 to +70	°C	
Lighting rate ⁽³⁾	t _{AVE}	50	%	

(1) Voltage of input signals(A0, A1, A2, A3, R-G-BDATA, LATCH, R-G-BENABLE, CLOCK).

(2) Relation between temperature and lighting rate refers to page 4/9.

(3) Average lighting rate in five minutes.

3-2. Electro-optical characteristicsT_a=25°C

Parameter	Symbol	condition	Min.	Typ.	Max.	Unit
IC current dissipation	I _{CC}	V _{CC} =5V, V(R, G)=5V	-	300	500	mA
LED current dissipation 1	I(R, G)	V(B)=8V	-	4.5	5.5	A
LED current dissipation-2	I(B)	When lit up all dots	-	2.0	2.5	A
Luminance ⁽¹⁾	L _{V1}	V _{CC} =5V Red	-	(80)	-	cd/ma
	L _{V2}	V(R, G)=5V Yellow-green	-	(100)	-	
	L _{V3}	V(B)=8V Blue	-	(30)	-	
Peak emission wavelength	λ _{P1}	Red	-	635	-	nm
	λ _{P2}	Yellow-green	-	565	-	
	λ _{P3}	Blue	-	430	-	
Spectrum radiation bandwidth	Δλ ₁	Red	-	35	-	nm
	Δλ ₂	Yellow-green	-	30	-	
	Δλ ₃	Blue	-	65	-	

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

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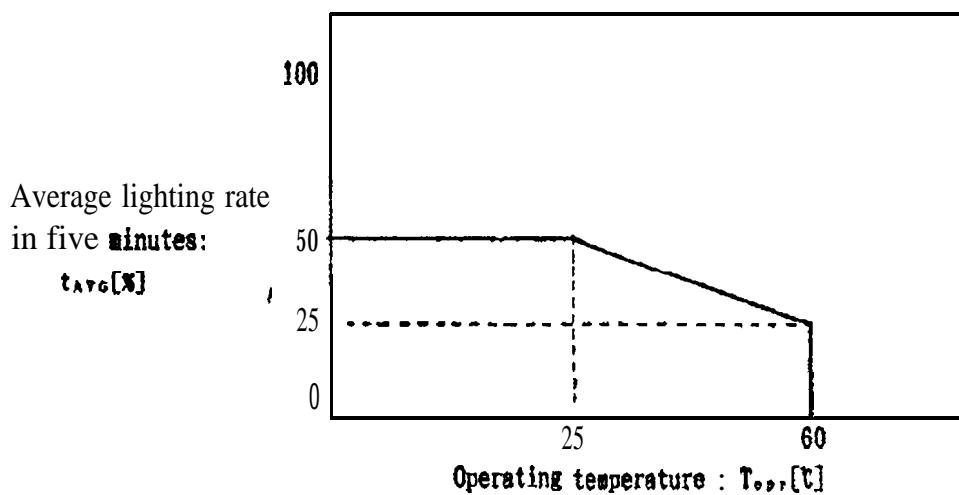
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SHARP**3-3. Using condition**

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
IC supply voltage	V_{CC}	4.75	5.0	5.25	v	
LED supply voltage 1	$V(R, G)$	4.75	5.0	5.25	v	for red, yellow-green
LED supply voltage 2	$V(B)$	7.75	8.0	8.25	V	for blue
Signal input voltage	V_{IL}	-	-	1.5	V	
	V_{IH}	3.5	-	-	V	
Signal input current	I_{II}	-	-	0.12	mA	
	I_{IH}	-	-	0.1	μA	
Clock frequency	f_{CLK}	-	-	10	MHz	

3-4. Derating curve

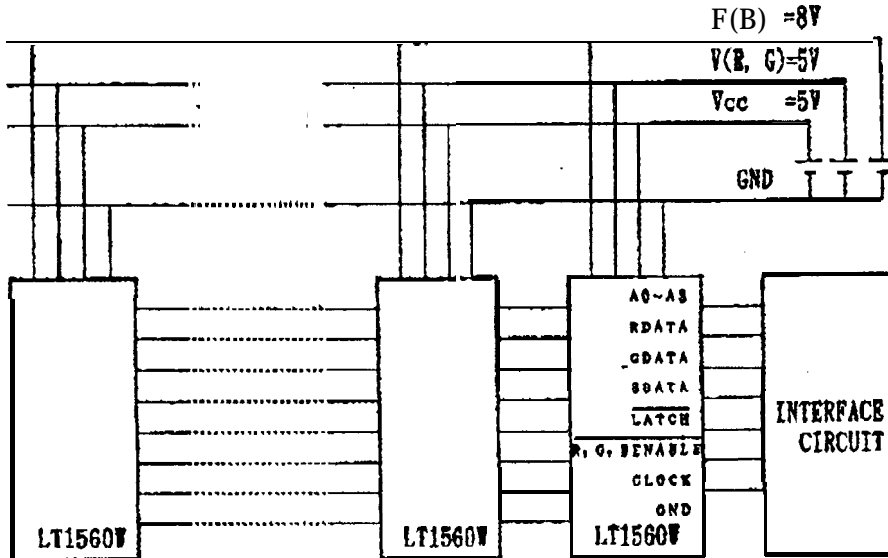
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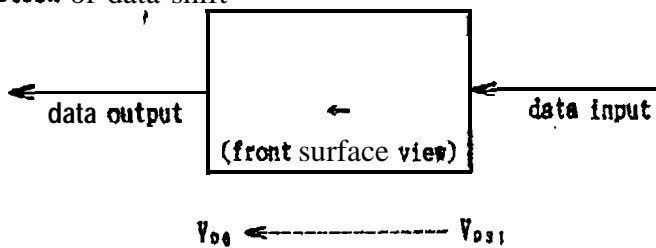
4. Supplement

4-1. Weight of the unit : Approx. () grams per unit.

4-2. Connection between each unit and the next



4-3. Direction of data shift



Shift from right to left in unit. (direction of $V_{031} \rightarrow V_{00}$)

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4-4. Terminal functions

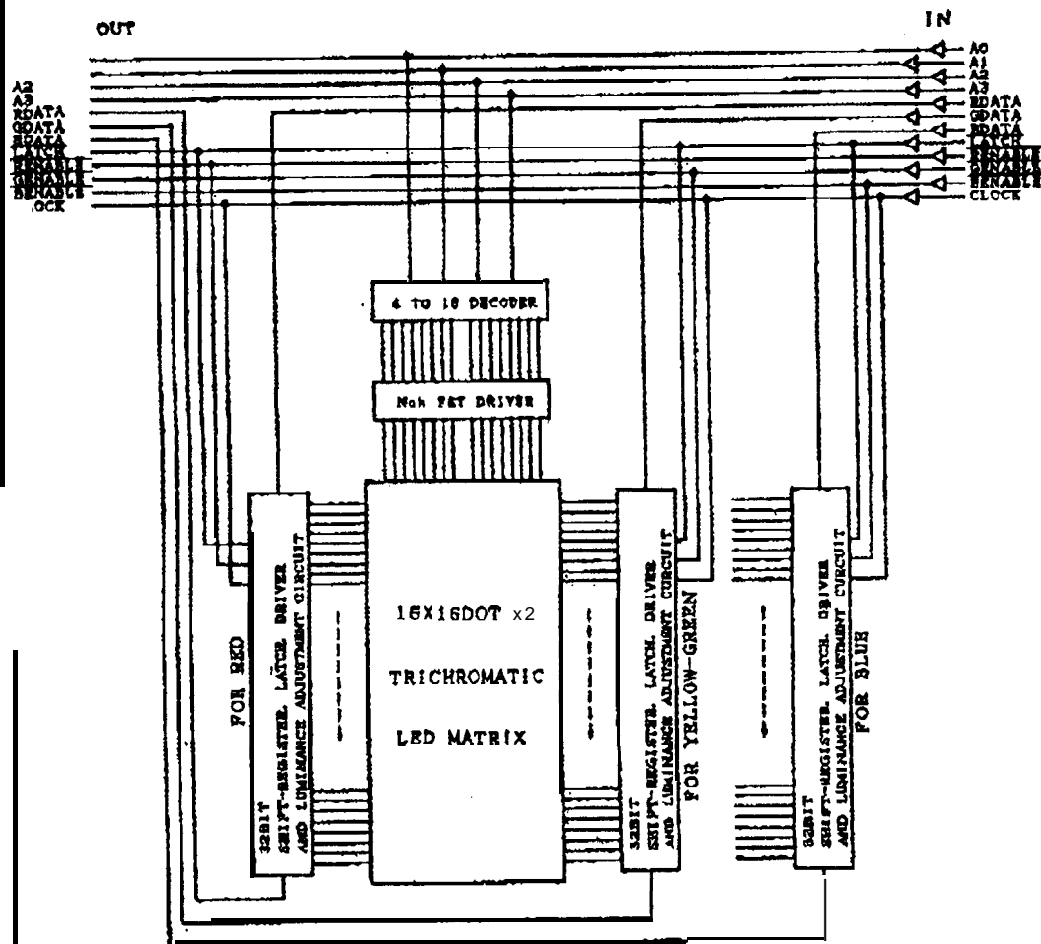
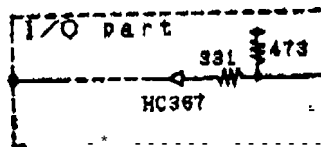
	Name	Functions
CN1	V(B)	For LED (blue). +8V
	V(R, G)	For LED (red and yellow-green) +5V
	Vcc	For IC +5V
	GND	Ground
CN2 (IN)	A ₀ , A ₁ , A ₂ , A ₃	Address specification signal for row driver. (See Table1)
	RDATA	Serial signal of display data. ("H"=on, "L"=off)
	GDATA	Shifts from right to left in unit. (direction of V _{D31} -V _{D0})
	BDATA	
	LATCH	Latch signal for the contents of shift register. "H": serial data → parallel data, "L": the contents are latched.
	RENABLE GENABLE BENABLE	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 - A ₃ .
	RDATA	Input signal is generated through 32-bit shift register in the unit.
	GDATA	
	BDATA	
	LATCH	Buffered the input signal LATCH.
	R·G·BENABLE	Buffered the input signal R·G·BENABLE.
	CLOCK	Buffered the input signal CLOCK.
	GND	Ground for signal. (Connected to ground in unit.)

Table 1 ADDRESS(A₀-A₃) 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
H _{D3}	0	0	1	1	H _{D11}	1	0	1	1
H _{D4}	0	1	0	0	H _{D12}	1	1	0	0
H _{D5}	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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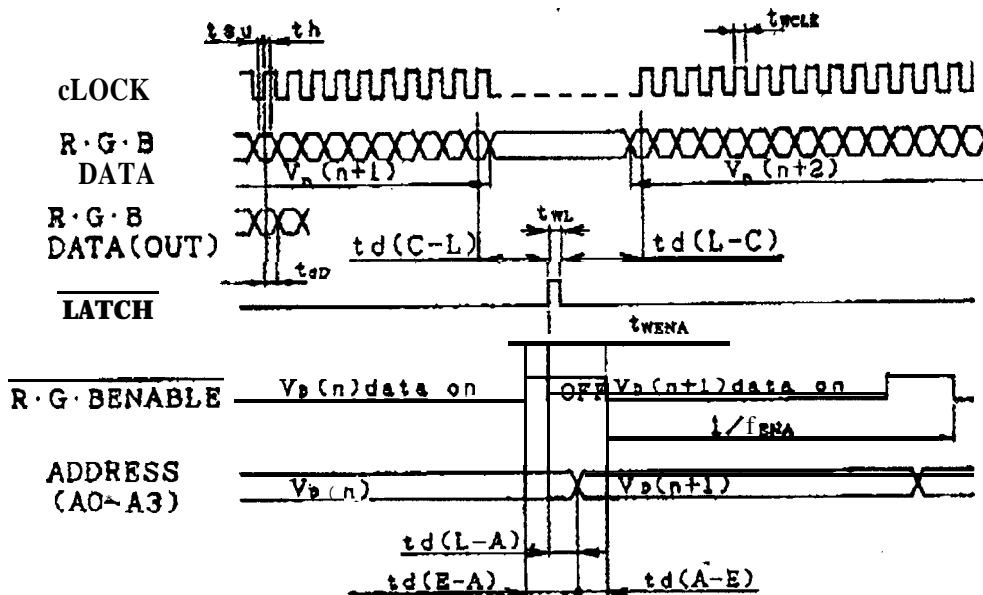
4-5. internal block diagram



Name	LT1560W Internal block diagram
Drawing No.	50804041



4-6. Timing chart



Recommendatory timing condition

$T_a=25^\circ C$ $V_{cc}=5.0V$

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_{WENA}	25	"	-	μs	
Data setup time	t_{SU}	60	-	-	ns	
Data hold time	t_H	2s	-	-	ns	
Clock-L*teh time	$t_{D(C-L)}$	100	-	-	ns	
Latch-Clock time	$t_{D(L-C)}$	100	-	-	ns	
Enable-Address time	$t_{D(E-A)}$	5	-	-	μs	
Address-Enable time	$t_{D(A-E)}$	20	-	-	μs	
Latch-Address time	$t_{D(L-A)}$	0	-	-	μs	
I/O delay time	t_{PLH}, t_{PHL}	-	26	-	ns	except data termina
Data delay time	t_D		91		ns	R·G·B·DATA
Frame frequency	f_{FR}	?0	250	1000	Hz	
Enable frequency	f_{ENA}			16	kHz	see Note. 1

Note. 1

If enable frequency approximates internal oscillation frequency(=100kHz), it causes flicker.

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SHARP**5. 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(A₀~A₃) stop, LED daybreak. So t_{ON}(ON time of one line LEDs) must be shorter than 1ms.**
- 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 I/O signal lines must be shorter than 15cm.**
- 7) **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.**
- 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, SO₂ gas, or other corrosive gases.**
- 12) **Then adjusting the luminance, please use a screwdriver 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 for a 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.**

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