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MITSUBISHI ELECTRIC CORPORATION

SPECIFICATION			REV					
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	DATE:	*2019/8/8*		*2019/8/26*				

1. Type	ML562G86-02
2. Application	Light source for projector
3. Structure	Red Laser Diode
4. Outline	G880367

5. Absolute maximum ratings

No.	PARAMETER	SYMBOL	CONDITION	RATINGS	UNIT
(1)	Operation Current	Iop	Pulse(Duty Cycle≦30%)	Fig.1	
(2)	Reverse Voltage	V_{RL}	Pulse(Duty Cycle≦30%)	2	V
(3)	Anode-Case Voltage (*1)	Vac	Pulse(Duty Cycle≦30%)	−200～200	V
(4)	Operating Case Temperature	Tc	Pulse(Duty Cycle≦30%)	0～+55	℃
(5)	Storage Temperature	Tstg	−	−40～+85	℃
(6)	Soldering Temperature (Lead)	Tsol	Lead Length≧ 2mm	350℃, 3sec	

<Note> The maximum rating means the limitation over which the laser should not be operated even instant time, and this does not mean the guarantee of its lifetime. As for the lifetime, refer to the reliability report from Mitsubishi Semiconductor Quality Assurance Section.
<Note> This product is designed based on using more than 5 devices in a projector system.
*1: Voltage between Φ9 package and anode lead pin

6. Characteristics table

No.	PARAMETER	SYMBOL	CONDITION (Tc=25℃(*2) unless otherwise specified)	LIMITS			UINT
				MIN.	TYP.	MAX.	
(1)	Output Power	Pop	Pulse(*3), Iop=4.2A	3.9	4.2	4.5	W
			Pulse(*3), Iop=5.2A, Tc=45℃(*4)	3.5	3.8	4.2	
			Pulse(*3), Iop=4.2A, Tc=55℃(*5)	2.1	2.4	2.7	
(2)	Threshold Current	Ith	Pulse(*3)	0.6	0.7	0.8	mA
(3)	Operating Voltage	Vop	Pulse(*3), Iop=4.2A	2.3	2.5	2.7	V
(4)	Slope Efficiency	η	Pulse(*3)	1.0	1.2	1.4	W/A
(5)	Peak Wavelength	λ p	Pulse(*3), Iop=4.2A(*6)	634	638	642	nm
(6)	Beam Divergence (Full Width at 1/e2)	θ //	Pulse(*3), Iop=4.2A(*6)	7	9	11	°
		θ ⊥	Pulse(*3), Iop=4.2A(*6)	45	60	70	°

<Note> The typical output power varies depending on Tc.
Refer to the Fig.2 for the relationship between case temperature and typical output power.
*2: Actual measurement temperature is adjusted in order to match an active layer temperature to that of stable condition at Tc=25℃.
*3: Pulse condition 120Hz, Duty=30%
*4: Test is performed at Iop=4.7A,Tc=45℃. Devices are judged based on the correlation data between Iop=4.7A and 5.2A at Tc=45℃. These specifications are based on MITSUBISHI's method.
*5: Test is performed at Iop=4.7A,Tc=45℃. Devices are judged based on the correlation data between Iop=4.7A at Tc=45℃ and Iop=4.2A at Tc=55℃. These specifications are based on MITSUBISHI's method.
*6: Test is performed at Iop=2.0A. Devices are judged based on the correlation data between Iop=2.0A and 4.2A. These specifications are based on MITSUBISHI's method.

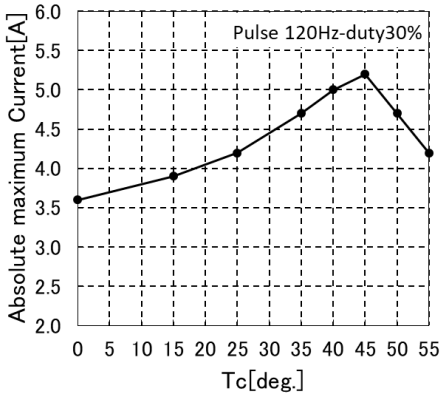

Fig.1 Absolute maximum ratings of operating current

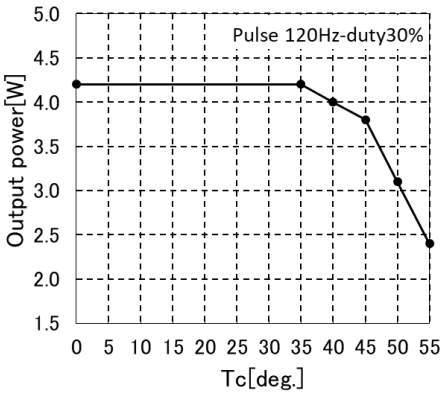

Fig.2 Relation between Tc and Typical output power

7. Notes on optical pulse waveform

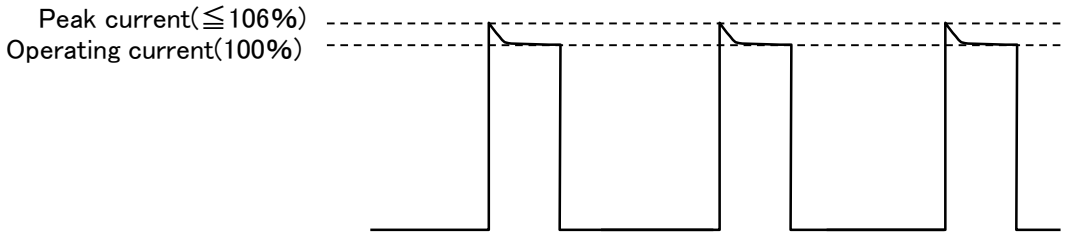

Fig.3 Injection current waveform

Peak value of injection current should be suppressed to 106% of average operating current during pulse as shown in Fig.3.

8. LD packing specification

8-1. This specification is applied to **ML562G86-02** packing.

8-2. Materials

	Item	Material	Use (Purpose)
[1]	Tray	Polystyrene	Prevent electric static damage
[2]	Wrapping bag	Polyethylene	Sealing tray body
[3]	buffer material	Paper	Prevent vibration
[4]	Packing box	Corrugated cardboard	Package

8-3. Packing method

(1) LD is inserted in an electrically conductive tray [1], in order to prevent the electrically static damage.
Basically, each LD-tray includes 80pcs LDs.
However there is the tray filled below 80 pcs.
(2) The LD tray is piled up. (Maximum 5 trays)
(3) (2) is sealed by a wrapping bag [2].
(4) Sealed LD trays (3) are piled up and put with air cap [3] in a Packing box [4].

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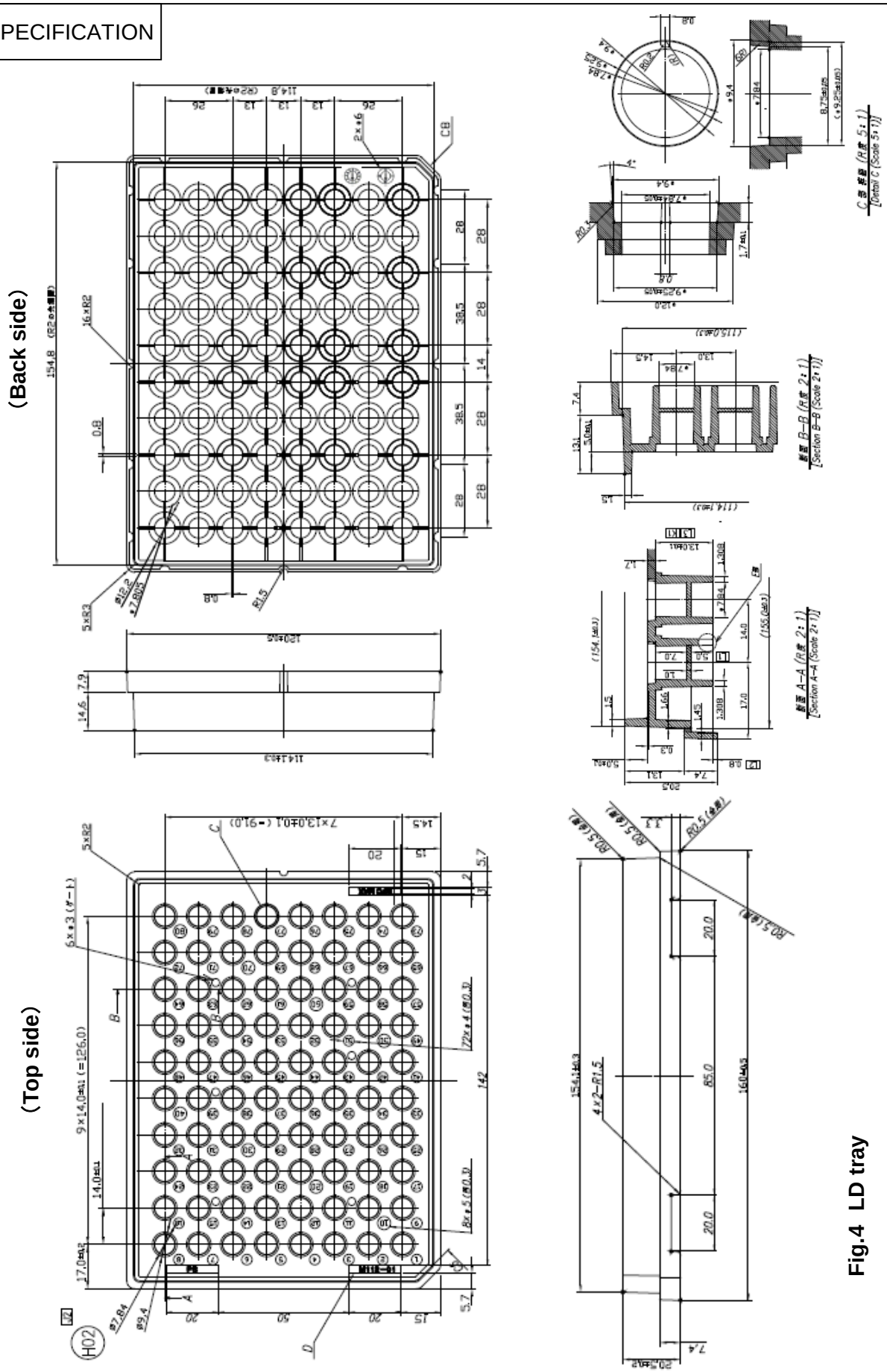


Fig.4 LD tray

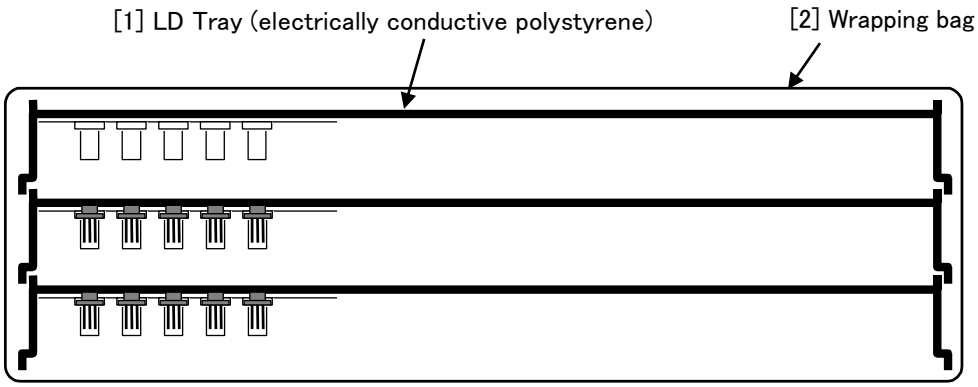
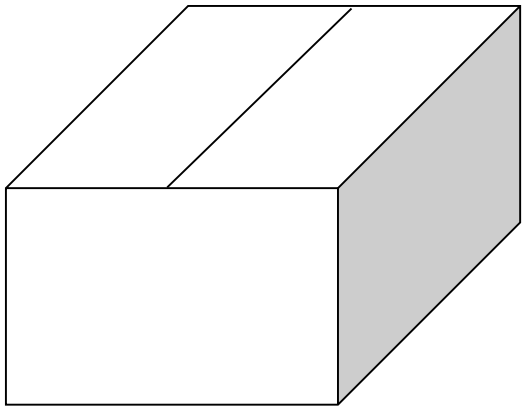


Fig.5 Inside packing (Tray and Wrapping bag)
(An empty tray is put on the top stage as a lid.)



Handling Warning

Fig.6 Packing
Handling warning are shown on the box.

9. Safety precautions relating to handling of optical semiconductor devices

General:
Although manufacturer is always striving to improve the reliability of its products, problems and errors may occur with semiconductor devices. Hence, it is necessary that user's own products are designed with full regard to safety by incorporating redundancy, fire prevention, and error prevention, so any problems or errors with semiconductor device do not cause accidents, which might result in injury, death, fire, or environmental hazard. The following requirements must be strictly observed.

Warning!
1. Safety standard of laser devices
Please follow closely to international standard (e.g. IEC 60825-1) or standard of each country (ex. JIS C 6802 in Japan).

2. Laser characteristics and its danger
When laser device is operated at over-driven condition, low temperature, pulsing mode, and so on, it could emit higher optical power than absolute maximum rating, and peak optical power might increase in conjunction with relaxation oscillation. Laser device could lase at different wavelength with different case temperature, or different output power. Laser devices are deviated on threshold current, operating current, operating voltage, slope efficiency, peak wavelength, beam divergence, and so on. Not only light output power, but also polarization or far field patterns might change as operating time goes by. If customers need more information of laser device, please contact Mitsubishi Electric.

Laser light from each device might seriously injure human eyes and skin. Customer should design and manufacture carefully their application products based on not only laser light characteristics but also LD characteristics, in order to avoid human injury. Mitsubishi Electric is not responsible for any accidents that are caused by customer's products.

If customers plan to release medical or aesthetic products with laser device, they should obtain their government's laser safety authorization.

3. Avoid laser light from entering human eyes
In normal operation, semiconductor laser device emits laser light. Laser light entering eyes could cause extreme damage. Never look against laser beam direction, and never look directly through an optical system such as a lens. Use an ITV camera to observe laser light. Mitsubishi Electric recommends that customers should explicitly label their laser products with warning sign of eye injury.

4. Handling of device
Gallium arsenide (GaAs) and beryllium oxide (BeO) are used in laser device. To avoid danger, strictly observe the following cautions:

Never place the device in human mouth. Never burn or break the device. Never use any type of chemical treatment to reduce it to gas or powder. When disposing device, always follow any applicable laws, as well as customer's internal waste treatment regulations.

5. Disposal of device
Laser device uses Gallium arsenide (GaAs) and beryllium oxide (BeO). It should be disposed as a specially controlled industrial waste, and it should be separated from general industrial and household wastes, according to any "Law of Wastes and Cleaning".

Caution!
1. High temperature
During operation device may become hot, therefore do not directly touch it during operation. The device could remain hot even after power is turned off, so wait until it cools down prior to touching to avoid any burn. Never place any inflammable substance that may cause fire near the device.

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Warranties

Within the conditions stated on the specification sheet, Mitsubishi Electric warrants that Products conform to specification. If Products should fail to conform to Specification, Mitsubishi Electric shall replace such defective Products. Provided that, Mitsubishi's warranty shall not cover, extend or apply to any defect attributable to :
(a) any change, modification or alteration on Products made by any other party than Mitsubishi Electric;
(b) improper handling, use or repair by any other party than Mitsubishi Electric;
(c) use outside the conditions stated on the specification sheet; or
(d) ordinary wear and tear.

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