

Mounting and storage conditions

●Recommended storage conditions

1. Temperature 5 to 40°C (Recommended : 20 to 30°C)
2. Humidity 30 to 80% RH (Recommended : 40 to 60% RH)
- 3.Recommended period One year after manufacturing
(This recommended period is for the soldering condition only. The characteristics and reliabilities of the products are not restricted to this limitation)

●Surface mounted mold diode of soldering and handling precautions

1. Handling precautions

(1) Absolute maximum ratings

Each semiconductor type has its own absolute maximum ratings. This is described in JIS7032 as that absolute maximum rating for which the limit value must not be exceeded even for a moment. In other cases, after supplying an excess value to a semiconductor, its life may shortened even if it operates well right after an excess. So keep the system design below maximum ratings.

(2) Derating

The Reliability of a semiconductor device is heavily influenced by the electrical, mechanical and environmental stress. Therefore, the design's reliability will be specific to the purpose of the application and derating to the absolute maximum rating will be defined by evaluating each stress depending on the required reliability. The Following table shows the standard generally recommended with respect to reliability test results from device manufacturers.

Example of derating design standard

Derating factor		Diode	Note
Temp.	T/J	Below 110°C (Tj=Below 60°C)	For high rel.
	T/A of diode	– (Ta=0 to 45°C)	For high rel.
	Others	Consumption power, T/A heat radiation $T_j = P \times \theta_{ja} + T_a$	
Humidity	Relative temp.	40 to 80% RH	
	Others	In case of moisture resulting from sudden temp. changes, implement corting PCB.	
Voltage	Voltage	Max. rating \times below 0.8 (Max. rating \times below 0.5)	
	Over voltage	Implement protection for overload including ESD.	
Current	Average current	$I_o \times$ below 0.5 ($I_o \times$ below 0.25)	For high rel.
	Peak current	I_F (peak) \times below 0.8	
Power	Average power	$P \times$ 0.5 (Especially in zener diodes)	
Pulse	Area of safe opration	Not to exceed absolute Max. ratings on each individual data sheet	
	Surge	below I_F (Surge)	

(3) Mounting of surface mount components

- 1) In the case of SMD components, minimize any bending of the board. Stress will directly influence SMD components. Furthermore, screw fasteners or board breaking near the SMD components is also prohibited.

Diodes

(4) Others notification

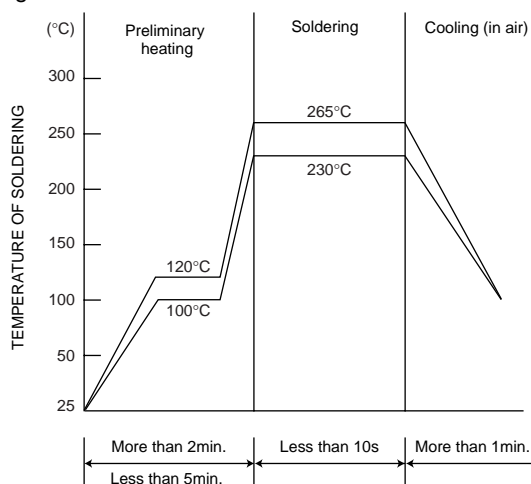
- 1) Regarding PCB component lay-out, do not put diodes near high voltage resistors etc, which may generate heat to the diode, nor in high density board. When designing the PCB, implement protection for the diode from electrical damage like surge, ESD and so on.
- 2) Do not storage diodes in the following places:
 - High temp. or High humidity.
 - Where corrosive gas is present.
 - Where mechanical stress or vibration exists.
 - Where electrostatic charges are possible.
- 3) When transporting diodes, keep vibration to a minimum or glass body of diode may be broken. Diode die may then be destroyed by electrostatics.

2. Handling precautions for soldering

- (1) Do not use a strong acid or alkaline flux, as it might corrode the diode terminations and have negative effect on the diode's electrical characteristics. Implement soldering after flux is fully dry.
- (2) In case of quickly applying high temperature to a diode body as in dip soldering, apply a pre-heat to the diode body which minimizes the temperature change at this operation.
- (3) For surface mounted diodes, the PCB condition after soldering has considerable influence on a diode's reliability, because surface mounted diodes are applied to the PCB directly. Do not use a PCB which is bent or twisted.
- (4) For flux washing after soldering, use a washing solvent for semiconductors.
- (5) Use a solder iron without AC leakage at the tip of iron. Use a grounded iron because leakage might damage the diode by overload.

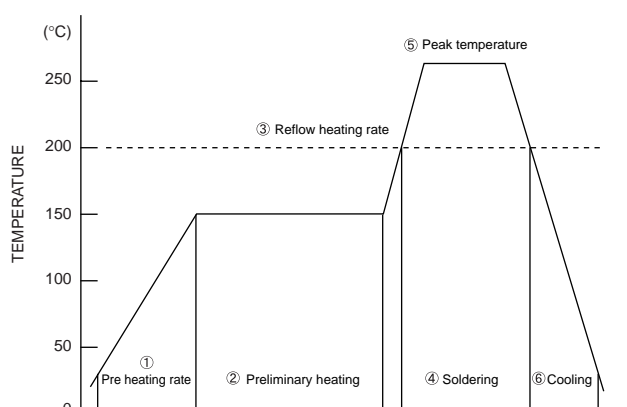
3. Recommended soldering conditions

(1) Recommended wave soldering conditions



Diodes

(2) Recommended reflow soldering conditions



Recommendable condition of reflow soldering

① Pre heating rate	1 to 5°C / s
② Preliminary heating	120 to 160°C, 50 to 120s
③ Reflow heating rate	1 to 5°C / s
④ Soldering	200°C, 30 to 60s
⑤ Peak temperature	230 to 260°C, 10s Max.
⑥ Cooling	60s Min.
⑦ Time	2 times Max.

Recommended peak temperature is over 230°C. If peak temperature is below 230°C, you may adjust the following parameters ; Time length of peak temperature (longer), Time length of soldering (longer), solder paste layer (thicker).

(3) Condition of hand soldering

Temperature	Less than 350°C
Time	Less than 3s

Mounting and storage conditions

Diodes

4. Recommend washing conditions

(1) Washing liquid

Washing liquid	Maker	Glass type	Mold type
Water		○	○
Ethanol		○	○
Methanol		○	○
Pine alpha ST-100S	ARAKAWA CHEMICAL	○	○
Cean through 750H	KAO	○	○
FRW-1	TOSHIBA TECHNOCARE	○	○

○ : Possible to use

× : No problem on characteristics, but marking may fade or disappear.

(2) Condition of washing

Washing bath		Time	Temperature	Remarks
First bath	Ultrasonic bath	less than 60s	Room temperature	Don't be boiled, please keep at normal temperature. (f=25 to 29kHz, 15W/ , 0.4W/cm ²)
Second bath	Immersion bath	less than 60s	Room temperature	
Third bath	Vapor bath *	less than 60s	less than 44.7°C	The boiling point varies depending on washing liquid

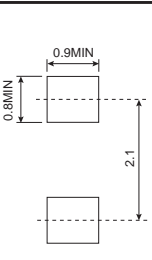
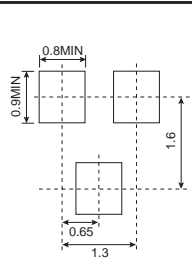
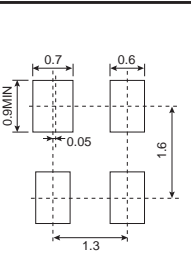
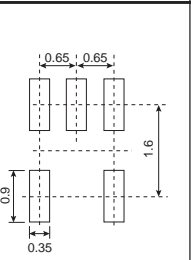
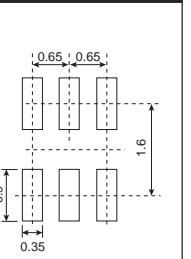
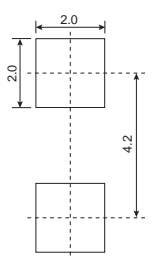
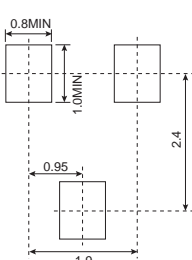
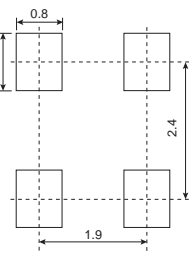
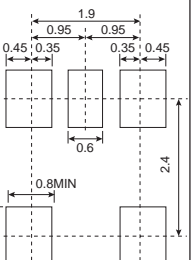
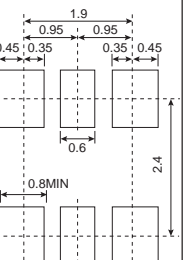
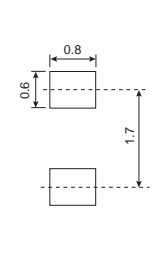
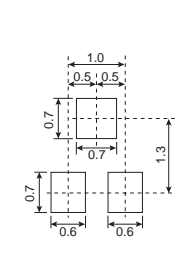
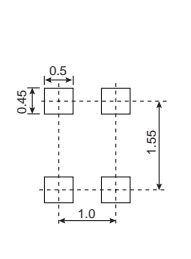
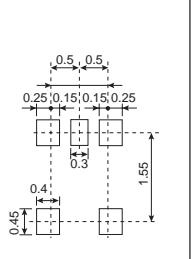
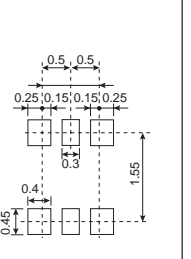
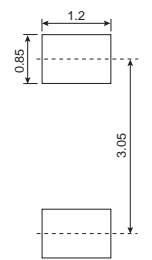
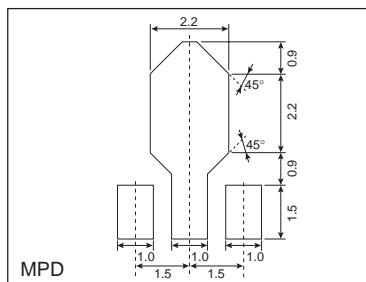
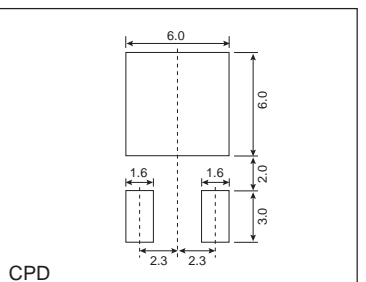
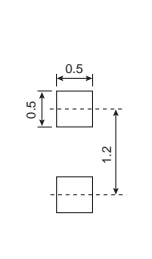
* In vapor bath, you can not use ethanol, methanol, and water due to their high boiling points.

Mounting and storage conditions

Diodes

5. Recommendable copper plate area dimension on printed circuit board

(Unit : mm)

Terminal 2pin	Terminal 3pin	Terminal 4pin	Terminal 5pin	Terminal 6pin
 <p>UMD2</p>	 <p>UMD3</p>	 <p>UMD4</p>	 <p>UMD5</p>	 <p>UMD6</p>
 <p>PMDS</p>	 <p>SMD3, SSD3</p>	 <p>SMD4</p>	 <p>SMD5</p>	 <p>SMD6</p>
 <p>EMD2</p>	 <p>EMD3</p>	 <p>EMD4</p>	 <p>EMD5</p>	 <p>EMD6</p>
 <p>PMDU</p>	 <p>MPD</p>		 <p>CPD</p>	
 <p>VMD2</p>				

Diodes

●Lead type diode condition of soldering and handling precautions

1. Handling precautions

(1) Absolute maximum ratings

Every semiconductor regulates its absolute maximum ratings and as it is described in JIS7032, It is not even allowed to exceed its maximum ratings even for a moment. Furthermore, if there is two value exceeding the absolute maximum ratings at the same time, it will definitely lead to breakdown of components. It may work properly right after but, it will certainly shorter the life time.

(2) Derating

The reliability of semiconductor devices are always affected by electrical, mechanical and environmental stress. Therefore, the design of device is made based on the its purpose of application and derating to the absolute maximum rating will be defined by evaluating each stress depending on the required reliability. The following table shows generally recommended standard derating design.

Example of derating design standard

	Derating factor	Diode	Note
Temp.	T/J	Below 110°C (Tj=Below 60°C)	For high rel.
	Ambient temperature	– (Ta=0 to 45°C)	For high rel.
	Others	Consumption power, T/A heat radiation Tj=P×θja+Ta	
Humidity	Relative humidity	40 to 80% RH	
	Others	In case of moisture resulting from sudden temp. change, implement coating PCB.	
Voltage	Voltage	Max. rating × below 0.8 (Max. rating × below 0.5)	
	Over voltage	Implement protection for overload including ESD.	
Current	Average current	Io × below 0.5 (Io × below 0.25)	For high rel.
	Peak current	If (peak) × below 0.8	
Power	Average power	P × 0.5 (Especially in zener diodes)	
Pulse	Area of safe operation	Not to exceed the absolute Max. ratings on each individual data sheet	
	Surge	below If (Surge)	

(3) Mounting electrical devices on PCB.

- 1) Pitch of the PCB must be in accordance with the terminal pitch of the device.
In case it is not accordance, reliability will be spoiled during the mounting and soldering, or after soldering by mechanical stress.
- 2) Do not pull the terminal too strongly when inserting the device terminal to the hole of circuit board.

(4) Lead forming of terminals

- 1) In case of lead forming, chuck the lead first and form by setting the body free shown in Fig.1.
However, do not bend over 90°C.
- 2) Ribbon terminal must not be bent to the direction of thicker side as shown in Fig.2.
- 3) Do not repeat the bending.

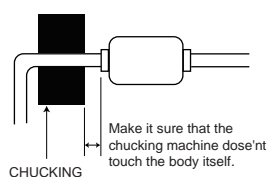


Fig.1

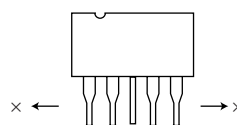


Fig.2

Diodes

(5) Others notification

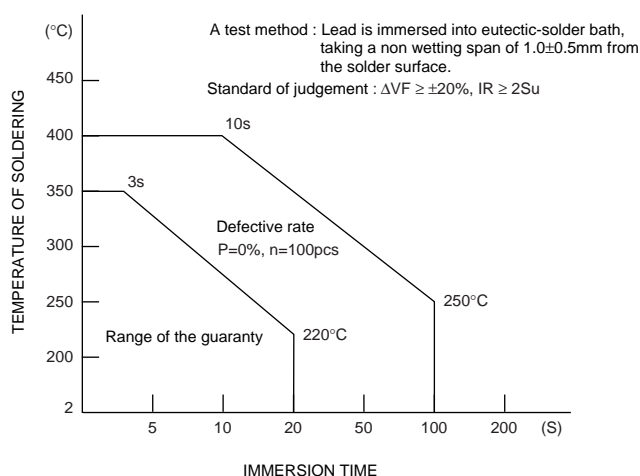
- 1) Regarding position of diodes on PCB, please do not mount the diode close to high current resistor and even close to heat elements. It may generate the over heat to its components.
And please design diodes not to have surge current, electrical shock so that it will not affect diode itself.
- 2) Do not storage diodes in the following places:
 - High temp. or High humidity.
 - Where corrosive gas would occur.
 - Where mechanical stress or vibration exists.
 - Where electrostatic charges are possible.
- 3) When transporting diodes, keep vibration to a minimum. Diode die may then be destroyed by ESD.
So please take care of handling.
- 4) Please avoid a condition that the diode is wet with dew. Especially, some bias loaded into the glass sealed diode covered with dew, there is possibility that air-tight condition in the diode is deteriorated.
We recommend that the diode be used under the condition of RH=20 to 80%.

2. Handling precautions for soldering

- (1) Do not use strong acid or alkali flux, since it may lead to corrosion of lead, and affects characteristic of the component.
Please enforce soldering after confirming flux is fully dry.
- (2) In case of quickly applying high temperature to a diode in dip soldering, apply a pre-heat to the diode body which minimizes the temperature change at this operation.
- (3) For flux washing after soldering, use the washing solvent for semiconductor.
- (4) Do not be stuck flux liquid to glass body of diode, or glass body might have high temperature graduation ration, and then have crack or breakage because some area have high temperature from solder bath (soldering iron) at soldering and the other area have low temperature from flux vaporate cooling. In case of being stuck flux liquid, implement soldering after fully dry flux vapor with below 80°C degree condition.
- (5) Use the solder iron which has no leakage at the top of iron and have earth operation because leakage might cause damage by overload to diode.

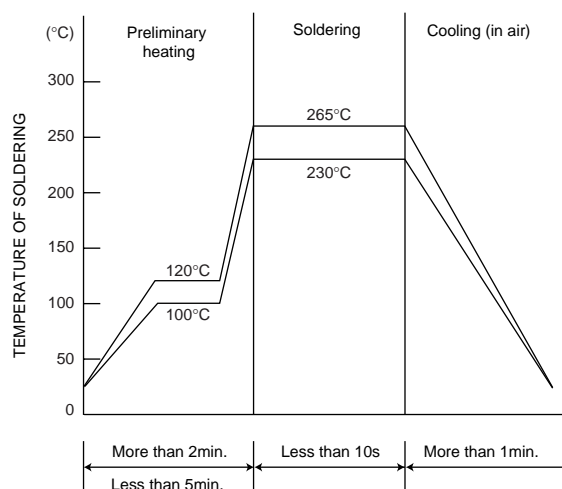
3. Handling precaution for soldering

- (1) Soldering proof temperature range is until 260°C degree for 10 s. (Full soldering), and 350°C degree for 10 s. (solder iron) with more than 1mm distance. But this is the worst condition which be allowed to our leadless diode. So from the reliability point of view, we recommend lower and shorter soldering condition as much as it can be.



Diodes

4. Recommendable condition of soldering



5. Recommend washing conditions

(1) Washing liquid

Washing liquid	Maker	Glass type	Mold type
Water		○	○
Ethanol		○	○
Methanol		○	○
Pine alpha ST-100S	ARAKAWA CHEMICAL	○	○
Cean through 750H	KAO	○	○
FRW-1	TOSHIBA TECHNOCARE	○	○

○ : Possible to use

× : No problem on characteristics, but marking may fade or disappear.

(2) Condition of washing

Washing bath		Time	Temperature	Remarks
First bath	Ultrasonic bath	less than 60s	Room temperature	Don't boiled, please keep at normal temperature. (f=25 to 29kHz, 15W/ℓ, 0.4W/cm ²)
Second bath	Immersion bath	less than 60s	Room temperature	
Third bath	Vapor bath *	less than 60s	less than 44.7°C	The boiling point varies depending on washing liquid

* In vapor bath, you can not use ethanol, methanol, and water due to their high boiling points.

Diodes

●Surface mounted glass seal diode condition of soldering and handling precautions

1. Handling precautions

(1) Absolute maximum ratings

Semiconductor has its own absolute maximum ratings. This is prescribed in JIS7032 as that absolute maximum ratings is the limited value which must not be exceeded even a moment. If it is exceeded even a moment, semiconductor is fallen into degradation or destroyed. In other case, after supplying excess value to semiconductor, its life become shorter even if it can work well right after. So keep the system design which do not exceed any ratings.

(2) Derating

Reliability of semiconductor device is heavily influenced to the electrical, Mechanical and environmental stress. Therefore, design for reliability will be made according to the purpose of application and derating against the max rating will be defined by selecting each stress depending on required reliability. Following table shows the standard recommended generally with the reference to the reliability test results of each device manufacturers.

Example of derating design standard

Derating factor		Diode	Note
Temp.	T/J	Below 110°C (Tj=Below 60°C)	For high rel.
	T/A of diode	– (Ta=0 to 45°C)	For high rel.
	Others	Consumption power, T/A heat radiation $T_j = P \times \theta_{ja} + T_a$	
Humidity	Relative temp.	40 to 80% RH	
	Others	In case of existing the dew due to sudden temp. change, implement coating PCB.	
Voltage	Voltage	Max. rating \times below 0.8 (Max. rating \times below 0.5)	
	Over voltage	Implement protection for overload including ESD.	
Current	Average current	$I_o \times$ below 0.5 ($I_o \times$ below 0.25)	For high rel.
	Forward current	I_f (peak) \times below 0.8	
Power	Average power	$P \times 0.5$ (Especially in zener diode)	
Pulse	ASO	Not exceed absolute Max. ratings on each individual catalog	
	Surge	below I_f (Surge)	

(3) Mounting on PCB.

- 1) In case of SMD components, minimize the bending of board also. Especially, Being stress will directly influence the SMD components. Furthermore, Screw fastener or board breaking near the SMD components is also prohibited.

(4) Others

- 1) As for components lay-out on PCB, Do not put diode near high voltage resistors etc which may generate heat to diode, Nor in high density board. When design the PCB, Implement protection to diode from electrical damage like surge, ESD and so on.
- 2) Do not storage diodes in the following places:
 - High temp. or High humidity.
 - From which corrosive gas exposed.
 - From which mechanical stress or vibration is supplied.
 - Possibly having electrostatic.
- 3) When transporting diode, keep supplying vibration as little as possibly or grass body of diode may be broken and diode die may be destroyed with electrostatics.
- 4) Please avoid a condition that the diode is wet with dew. Especially, some bias loaded into the glass sealed diode covered with dew, there is possibility that air-tight condition in the diode is deteriorated.
We recommend that the diode be used under the condition of RH=20 to 80%.

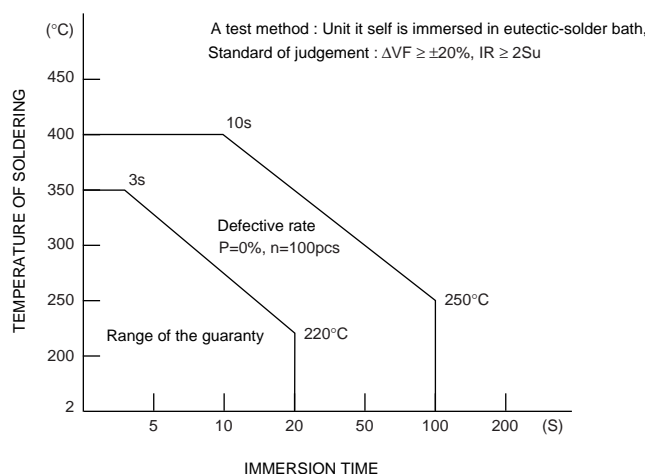
Diodes

2. Handling precautions for soldering

- (1) Do not use a strong acidity nor alkaline flux, or it might corrode the diode terminations and have bad influence on diode's electrical characteristics. Implement soldering after fully dry flux.
- (2) In case of supplying high temperature to a diode body suddenly for example dip soldering, supply pre-heating to diode body and then minimizes temperature change at operation.
- (3) In case of surface mounted diode, PCB condition after soldering have much influence on diode reliability, because surface mounted diode is put on PCB directly. Do not use PCB with is bended or twisted.
- (4) For flux washing after soldering, use a washing solvent for semiconductor.
- (5) Do not be stuck flux liquid to glass body of diode, or glass body might have high temperature graduation ration, and then have crack or brekage because some area have high temperature from solder bath (soldering iron) at soldering and the other area have low temperature from flux vaporate cooling. In case of being stuck flux liquid, implement soldering after fully dry flux vapor with below 80°C degree condition.
- (6) Use the solder iron which has no leakage at the top of iron and have earth operation because leakage might cause damage by overload to diode.

3. Handling precaution for soldering

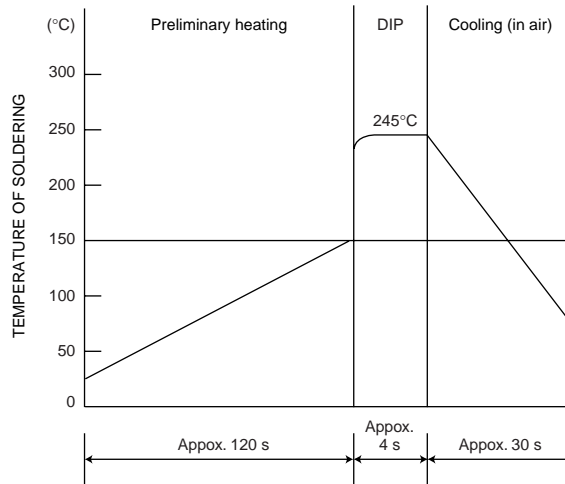
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Diodes

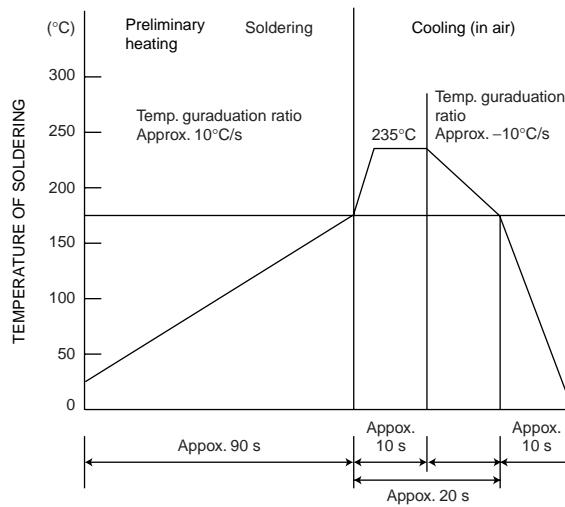
4. Recommendable condition of soldering

(1) Recommendable condition of flow soldering.



Notice : •Sn : Pb=63 : 37 eutectic solder

(2) Recommendable condition of reflow soldering.



Notice : •Sn : Pb=63 : 37 eutectic solder
•In case of infrared heater

Diodes

5. Recommend washing conditions

(1) Washing liquid

Washing liquid	Maker	Glass type	Mold type
Water		○	○
Ethanol		○	○
Methanol		○	○
Pine alpha ST-100S	ARAKAWA CHEMICAL	○	○
Cean through 750H	KAO	○	○
FRW-1	TOSHIBA TECHNOCARE	○	○

○ : Possible to use

× : No problem on characteristics, but marking may fade or disappear.

(2) Condition of washing

Washing bath		Time	Temperature	Remarks
First bath	Ultrasonic bath	less than 60s	Room temperature	Don't be boiled, please keep at normal temperature. (f=25 to 29kHz, 15W/l, 0.4W/cm ²)
Second bath	Immersion bath	less than 60s	Room temperature	
Third bath	Vapor bath *	less than 60s	less than 44.7°C	The boiling point varies depending on washing liquid

* In vapor bath, you can not use ethanol, methanol, and water due to their high boiling points.

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