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<b>SPECIFICATION</b>		

SPECIFICATION FOR  
**SOLAR MODULE**  
MODEL No. **NE51A81E**

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2. Please obey the instructions □ entioned below for actual use of this module.
  - (1) Main applications of the □ odules as follows.
 

[	Telemeter system, Microwave repeater station, Other telecommunication system(Terminal), Village electrification, Monument, Toy, etc.	]
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  - (2) Please take proper steps in order to maintain reliability and safety, in case this □ odule is used for the uses □ entioned below which require high reliability.
 

[	Unit concerning control and safety of a vehicle(air plane, train, automobile, etc.), Traffic signal, Road sign, Security system, Other safety system, etc.	]
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  - (3) Please don't use for the uses mentioned below which require extremely high reliability.
 

[	Space equipment, Telecommunication system(Trunk), Nuclear control system, Medical system(relating to any fatal element), etc.	]
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CUSTOMER'S APPROVAL

PRESENTED

DATE

BY

K. TAGUCHI

Department General Manager of  
Engineering Dept.

BY

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## 1. SCOPE

This document describes the specifications of solar modules NE51A81E.

## 2. NORMATIVE REFERENCES

The following normative documents contain provisions which, through reference in this text, constitute provisions of this specifications. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this specifications are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below.

- IEC 1215 Crystalline silicon terrestrial photovoltaic (PV) modules- Design qualification and type approval
- IEC 904-1 Photovoltaic Device, Part 1: Measurement of Photovoltaic Current-Voltage Characteristics
- SSE96129 NE51A81E SOLAR MODULE (Front View) ·  
(Provided as Fig. 1)
- SSE96130 NE51A81E SOLAR MODULE (Back View)  
(Provided as Fig. 2)
- SSE96131 Position of Labels for NE51A81E  
(Provided as Fig. 3)
- SSE96132 Nameplate Label for NE51A81E  
(Provided as Fig. 4)
- SSE96118 Shipping Container Specification for NT51A81E  
(Provided as Fig. 5)

## 3. REQUIREMENTS

### 3.1 Materials

Modules shall consist of the materials provided in this specifications. The materials not provided shall be consisted by modules which shall be satisfied with performance requirements.

#### 3.1.1 Solar cells

Solar cells shall be produced from polycrystalline silicon.

#### 3.1.2 Interconnectors

Interconnectors shall be solder coated copper.

#### 3.1.3 Filling material

Filling material shall be transparent EVA (Ethylene Vinyl Acetate) resin.

#### 3.1.4 Front cover

Front cover shall be white tempered glasses with not less than 3mm thickness.

#### 3.1.5 Frames

Frames shall be aluminum alloy.

### 3. 1.6 Back cover

Back cover shall be resistant films for weather.

### 3.1.7 Terminal box

The termination shall be screw clamp type. The main material of the terminal box shall be ABS (Acrylonitril Butadiene Styrene) resin.

### 3.1.8 Bypass diode

The following bypass diode shall be installed in the terminal box.  
-Forward current (1 f) : 10A(DC)

## 3.2 Mechanical design

### 3.2.1 General

The structure of modules is same as the crystalline silicon terrestrial photovoltaic (PV) modules described in IEC 1215.

### 3.2.2 Interconnection of solar cells

The all solar cells shall be interconnected in serial using the interconnectors described in 3.1.2.

### 3.2.3 Termination

The termination shall be screw clamp type.

### 3.2.4 Mass

The typical mass of modules is shown in the appended data sheet.

### 3.2.5 Dimension

The permissible deviation in dimension of modules is shown in Fig.1. and Fig.2.

## 3.3 Identification and product marking

The nameplate label as the identification and product marking is shown in Fig. 4. The position of labels on the module is shown in Fig. 3.

## 3.4 Appearance

The following shall be considered to be major visual defects:

- 1) broken or cracked window;
- 2) a crack in a cell whose propagation could remove more than 10% of that cell's area from the electrical circuit of the module;
- 3) bubbles or delamination forming a continuous path between any part of the electrical circuit and the edge of the module;
- 4) loss of mechanical integrity, to the extent that the installation and/or operation of the module would be impaired.

## 3.5 Performance characteristics

### 3.5.1 Environmental requirement

#### 3.5.1.1 Storage temperature

The storage temperature of the modules shall be from -40°C to +90°C.

### 3.5.1. 2 Operating temperature

The operating temperature of the modules shall be from  $-40^{\circ}\text{C}$  to  $+90^{\circ}\text{C}$ .

## 3. 5.2 Electrical performance

### 3.5.2. 1 Electrical output

The electrical characteristics of the module under standard test conditions (irradiance of  $1000\text{W}/\text{m}^2$ , AM1.5 spectrum and cell temperature of  $25^{\circ}\text{C}$ ) in accordance with IEC 904-1, shall be in compliance with the following table. When the max mum power is 81.4 W, the electrical characteristics (open circuit voltage, max mum power voltage, short circuit current, maximum power current, max mum power) are shown in the appended data sheet.

Table. electrical characteristics

Characteristic	Symbol	Min.	Unit
Open circuit voltage	Voc	21.8	v
Short circuit current	ISc	5.30	A
Maximum power	Pm	81.4	W

The above electrical characteristics are based on the result of the production line test.

### 3.5.2. 2 Insulation

When the module shall be applied 2200V-DC (maximum system voltage : 600V-DC) by the tester during 1 rein, the module shall not break down regarding the insulation.

## 3.5.3. Mechanical performance

### 3.5.3. 1 Withstanding mechanical load

After the front of the module shall be loaded with 2400Pa, there shall be no the major visual defects of the module described in 3.4.

### 3.5.3. 2 Withstanding twist

After the module shall be presented the twist test descr ibed in IEC 1215, there shall be no the major visual defects of the module described in 3.4.

### 3.5.3. 3 Withstanding the impact of hailstone

After a steel ball having a mass of  $227 \pm 2\text{g}$ , a diameter of about 38mm and smooth surface shal 1 be dropped from a height of 1m, without applying any force, on the center of the front cover, there shall be no the major visual defects of the module described in 3.4.

3. 5.3.4 Robustness of termination

The termination of the module have enough strength against external forces described in IEC 1215.

4. SHIPPING TEST

Each shipping lot shall successfully pass shipping test.

4.1 Sample size and rejection

Sample size and rejection shall be in compliance with LTPD 30 per test lot.

4.2 Test items

Test items shall be the dimension, the appearance and the maximum power ( $P_{MAX}$ ).

5. PREPARATION FOR DELIVERY

The shipping container specification is shown in Fig. 5.

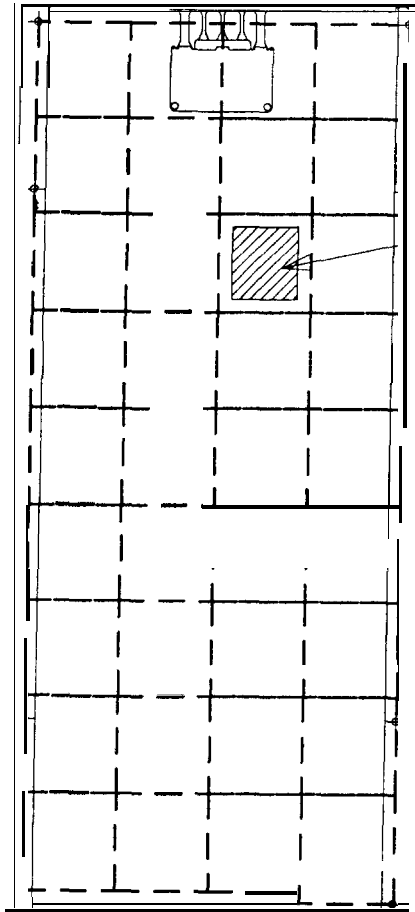
6. WARNING

The items regarding the warning are shown in the appended data sheet.

7. OTHERS

Any doubt as to this specification shall be determined in good faith upon mutual consultation of the both parties.

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Nameplate Label for NE51A8 E

Fig.3

機種種 APPL   CABLE MODEL	NE51A81E	尺度 SCALE	1/10	単位 UNIT	1/1mm	改訂日 DATE	改訂記事 REVISE	担当 CHARGE
厚 THICKNESS	員数 PIECES	材質 MATERIA	仕上 FINISH	名称 NAME	Position of Labels for NE51A81E			
日付 DATE	Apr. 24, 1996			コード CODE				
設計 DESIGN	製図 DRAW	検図 CHECK	検図 CHECK	承認 APPROVE	シャープ株式会社 電子部品事業本部			
71. <i>[Signature]</i>				太陽電池事業部 技術部		図番 DRAWING No.		
SHARP CORPORATION				SSE96131				



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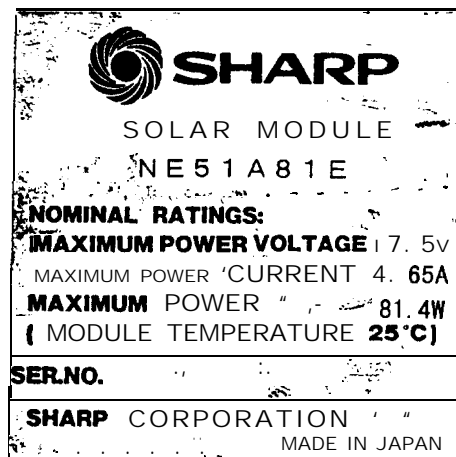


Fig.4

適用機種 APPL I CABLE MODEL	NE51A81E	尺度 SCALE	単位 UNIT	△2			
		1/1	1/1mm	△			
				改訂日 DATE	改訂記事	REVISE	担当 CHARGE
板厚 THICKNESS	員数 PIECES	材質 MATER I AL	仕上 FINISH	名称 NAME	Nameplate Label for NE51A81E		
				コード CODE			
日付 DATE	Apr .24.1996			シャープ株式会社 電子部品事業本部			
設計 DESIGN	製図 DRAW	検閲 CHECK	承認 APPROVE	太陽電池事業部 技術部			
	<i>H. Ohno</i>	<i>J. Sakuma</i>		図番 DRAWING No.	<b>SSE96132</b>		
			SHARP CORPORATION				

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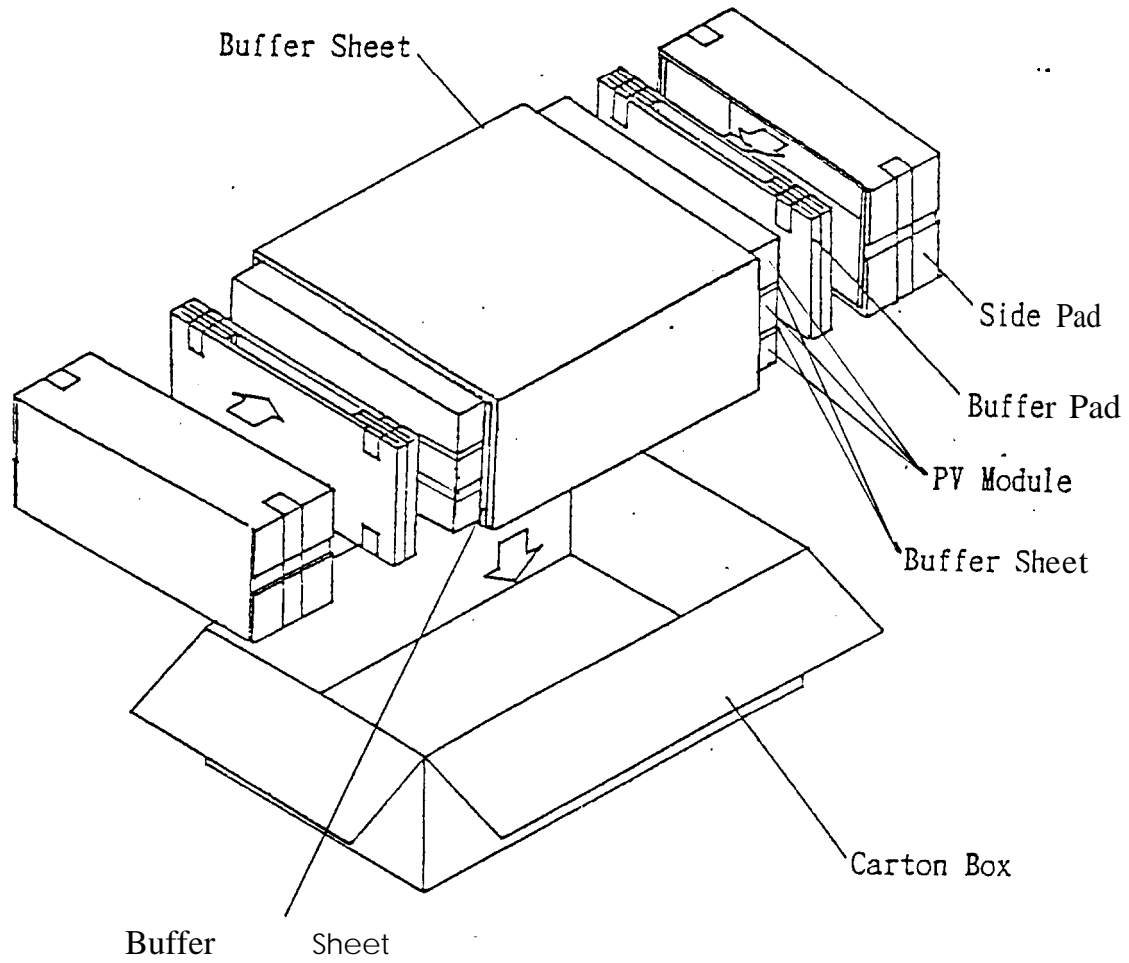


Fig.5

適用機種 APPL I CABLE MODEL	NE51A81E NE51A81U	尺度 SCALE	単位 UNIT	△2			
			1/1mm	△1			
厚 THICKNESS	員数 PIECES	材質 MATERIAL	仕上 FINISH	改訂日 DATE	改訂記事 REVISE	担当 CHARGE	
							名称 NAME Shipping Container <b>Specification</b>
日付 DATE	Apr .24, 1996			コード CODE			
図 SIGN	製 DRAW	検 CHECK	検 CHECK	承認 APPROVE	シャープ株式会社 電子部品事業本部 太陽電池事業部 技術部		図番 DRAWING No.
					SHARP CORPORATION		SSE961 18

D a t a   S h e e t

**I-1. SCOPE**

This data sheet describes the standard information (not items guaranteed) except specifications for the detail design and work. Users shall consider the other information.

**I-2. MASS**

The typical mass of the module is 8.5kg.

**I-3. ELECTRICAL OUTPUT**

When the maximum power is 81.4 W, the electrical characteristics of the module under standard test conditions is shown in the following table.

Table. electrical characteristics

Characteristic	symbol	Pm=81.4W	Unit
Open circuit voltage	Voc	21.8	v
Maximum power voltage	Vpm	17.5	v
Short circuit current	Isc	5.30	A
Maximum power current	Ipm	4.65	A
Maximum power	Pm	81.4	w

The above electrical characteristics are based on the result of the production line test. These electrical characteristics are different from the rated electrical characteristics described in the name plate label.

These electrical characteristics of the module under not standard test conditions is shown in the following.

- (1). Fig. I-1 :Characteristics regarding Open circuit voltage and Short circuit current versus Irradiance
- (2). Fig. I-2: Characteristics regarding Current and Power versus Voltage per Irradiance
- (3). Fig.I -3:Normalized characteristics regarding Open circuit voltage, Short circuit current and Maximum power versus Cell temperature.

#### I -4. WARNING

Please obey the instructions mentioned below for actual use of this module.

##### 1-4.1 Use

(1). Main applications of the modules as follows.

“Telemeter system    “Microwave repeater station

·Other telecommunication system(Terminal)

“Village electrification    “Monument    ·Toy    etc.

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

“Fallen snow area    “Extremely cold area    “Strong wind area

·Over water    “Always poured water area

·Salt water damage area    ·Small island    -Desert area

·Unit concerning control and safety of a vehicle(air plane, train, automobile etc.)    “Traffic signal·Road sign

“Security system    ·Other safety system    etc.

(3). Please don't use for the uses mentioned below which require extremely high reliability.

·Space equipment    “Telecommunication system(Trunk)

“Nuclear control system    “Medical system(relating to any fatal element)    etc.

##### I-4.2 Handling

(1). Never touch the output terminals with bare hands when the module is irradiated.

Cover the surface of the module by sufficiently thick cloth or something suitable to prevent incident light, and handle the output terminals with rubber-gloved hands not to receive the electric shock.

(2). Do not drop tools or hard things on the front cover of the module.

When broken the front cover of the module, never use the module.

(3). Do not scratch the back cover by hard things.

Do not wear a metallic jewelry which may become cause of the electric shock during installation.

##### I-4.3 Installation

(1). When mounting the module on structure, keep the displacement of the forth corner of the module smaller than 2mm for 1000mm of the diagonal of the module after other 3 corners are placed on structure.

(2). Be careful in handling polarity of insulated output wires.

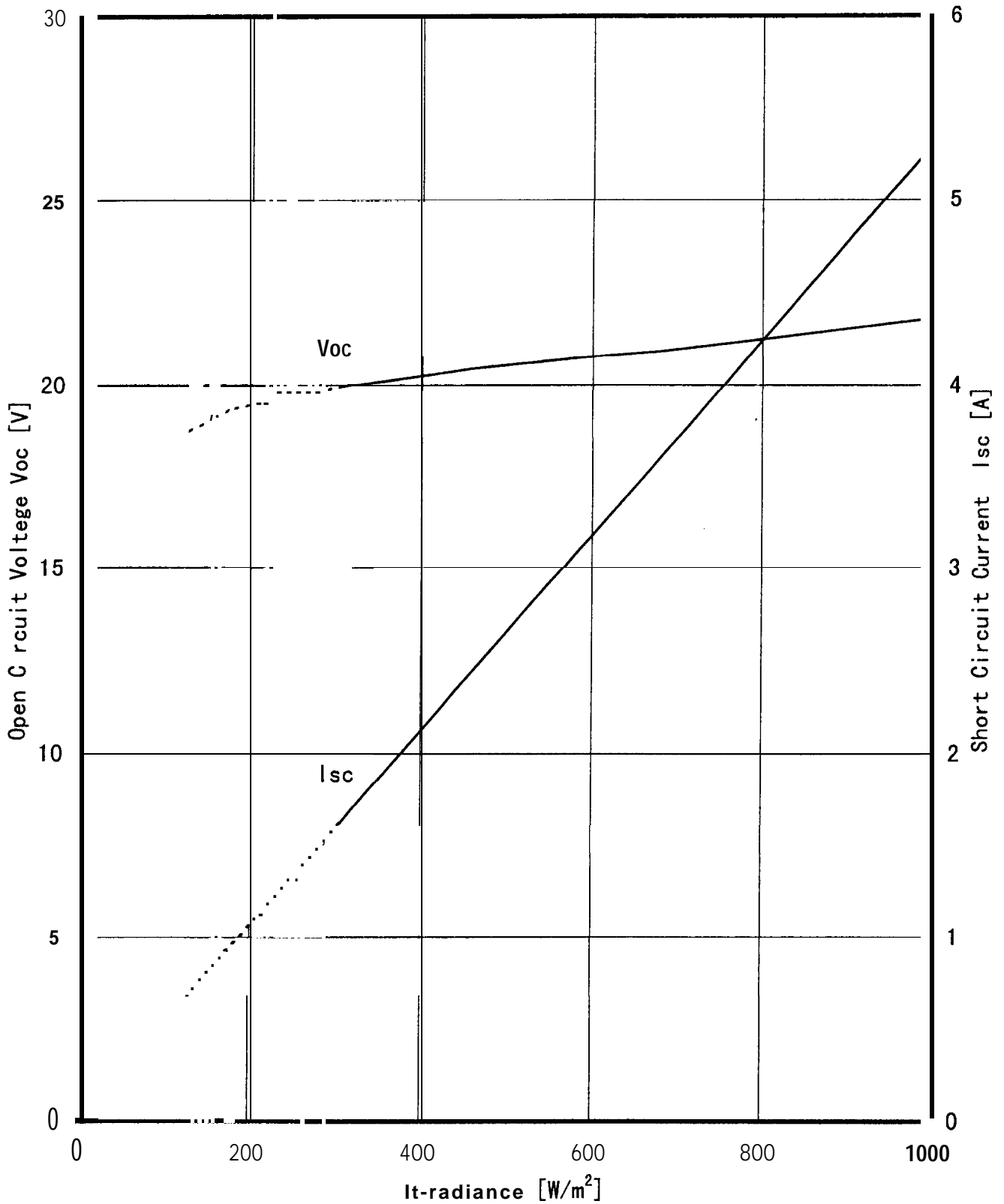
(3). install modules and ground frames (support structure) in accordance with applicable law of each country.

- (4). Consult the government office before the installation of the modules in case that the permission of the installation is required by law.
- (5). The modules shall be installed and maintained by qualified personnel.
- (6). Follow safety precautions of the battery manufacturer if batteries are used with modules.
- (7). Consult manufacturer for proper installation on special vehicles such as boats and campers.
- (8). At the four corners of modules, the end of longer (aluminum) frames equipped with the semicircular scuppers.  
Be careful not to stop up these hole by the inappropriate installation.

#### I-4.4 Operation

- (1). When a part of the module is shadowed, the hot spot may be caused. Therefore do not shadow cells.
- (2). The modules shall be maintained by qualified personnel.
- (3). The electrical characteristics degrade when the front cover of the module becomes dirty.
- (4). Do not pour solvent on the modules when cleaning.
- (5). Do not produce sparks near flammable vapors.
- (6). Do not expose the module to sunlight concentrated with mirrors, lenses or similar means.
- (7). Keep modules away from children.

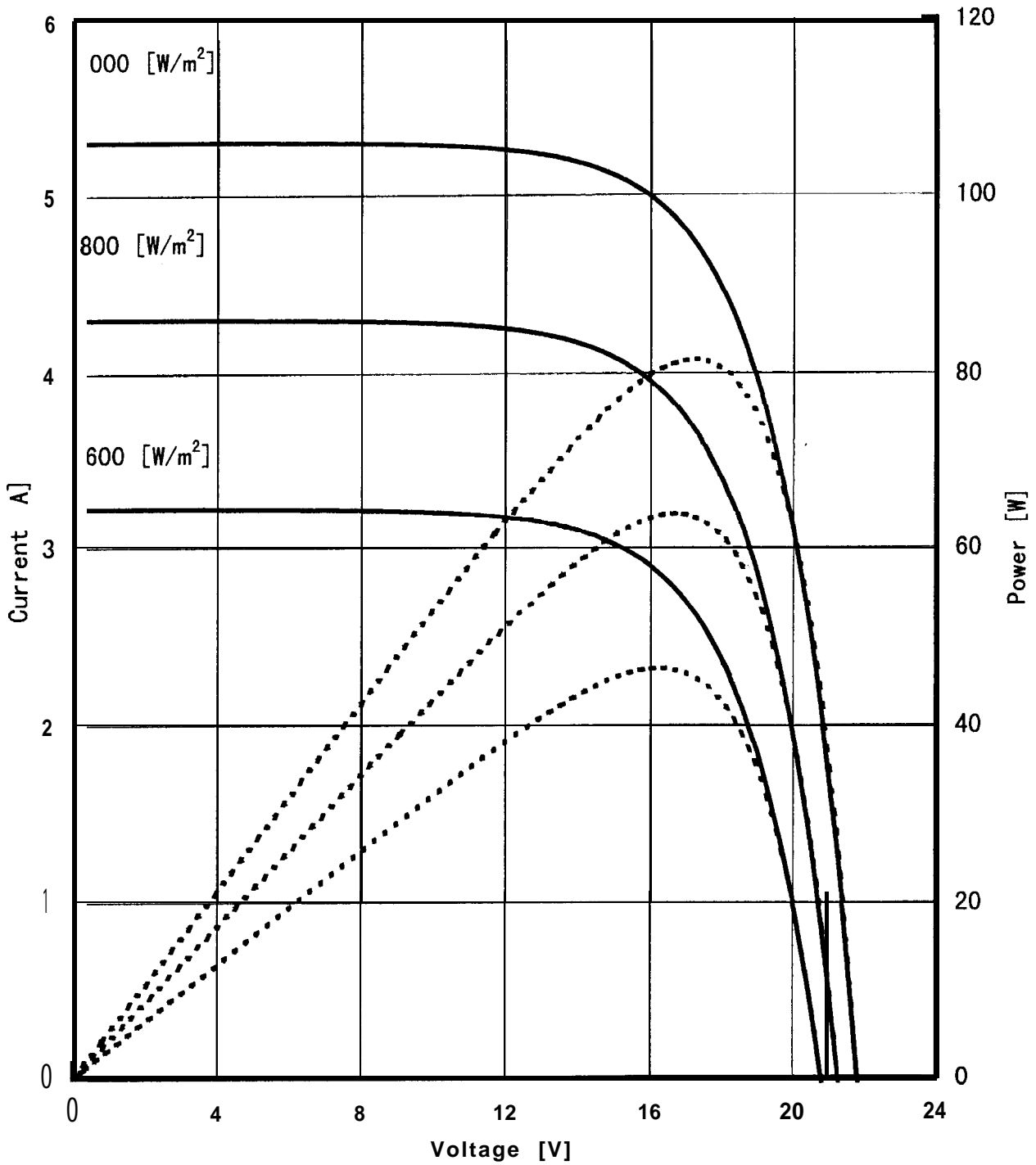
**Model NE51A81E**  
 (Module Temperature : 25°C)



**Fig. I-1 Characteristics regarding Open circuit voltage and Short circuit current versus Irradiance.**

**Model · NE51A81E**

(Module Temperature : 25 °C)



— Current vs. Voltage  
· · · Power vs. Voltage

Fig. I-2 Characteristics regarding Current and Power versus Voltage per Irradiance.



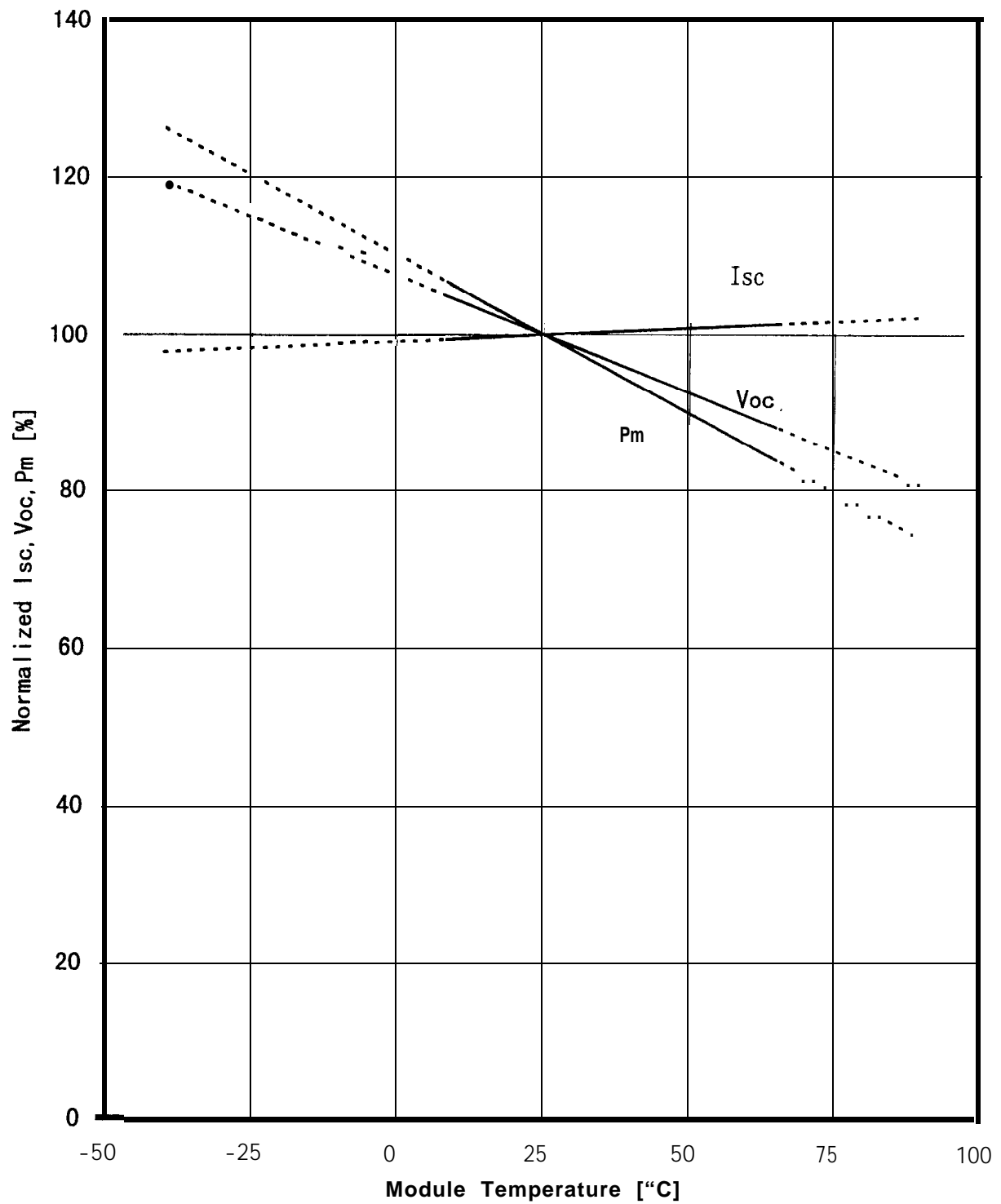
Model · NE51A81E

Fig. I-3 Normalized characteristics regarding Open circuit voltage, Short circuit current and Maximum power versus Cell temperature.

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No	N A M E	PIECES	MATERIAL	FINISH	NOTE
①	Inter-connector		Cu	Solder	
②	Aluminium frame	4	Al		
③	Solar cell	36	Si		5"sq
④	Terminal box	1	ABS		Include Bypass diode
⑤	Glass	1			
⑥	Resin		EVA		
⑦	Film				
⑧	Rubber				
⑨	Screw	8	Stainless steel		
⑩	Screw	2	Stainless steel		

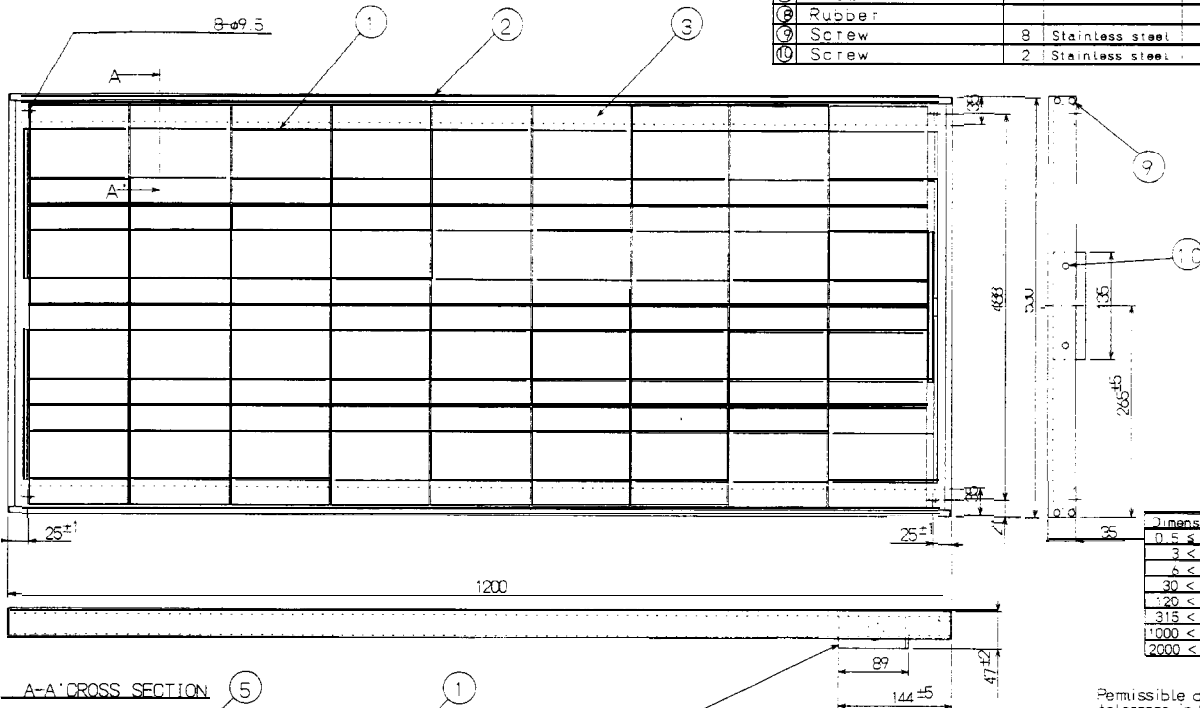
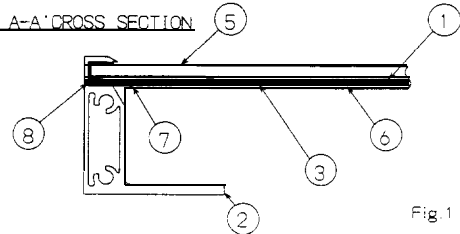


Table A

Dimension	Permissible Deviation
0 ≤ L ≤ 3	+ 0.2
3 < L ≤ 6	+ 0.3
6 < L ≤ 30	+ 0.5
30 < L ≤ 120	+ 0.8
120 < L ≤ 315	+ 1.2
315 < L ≤ 1000	+ 2
1000 < L ≤ 2000	+ 3
2000 < L ≤ 4000	+ 4



Specifications will be subject to modification without prior notice for performance improvement.

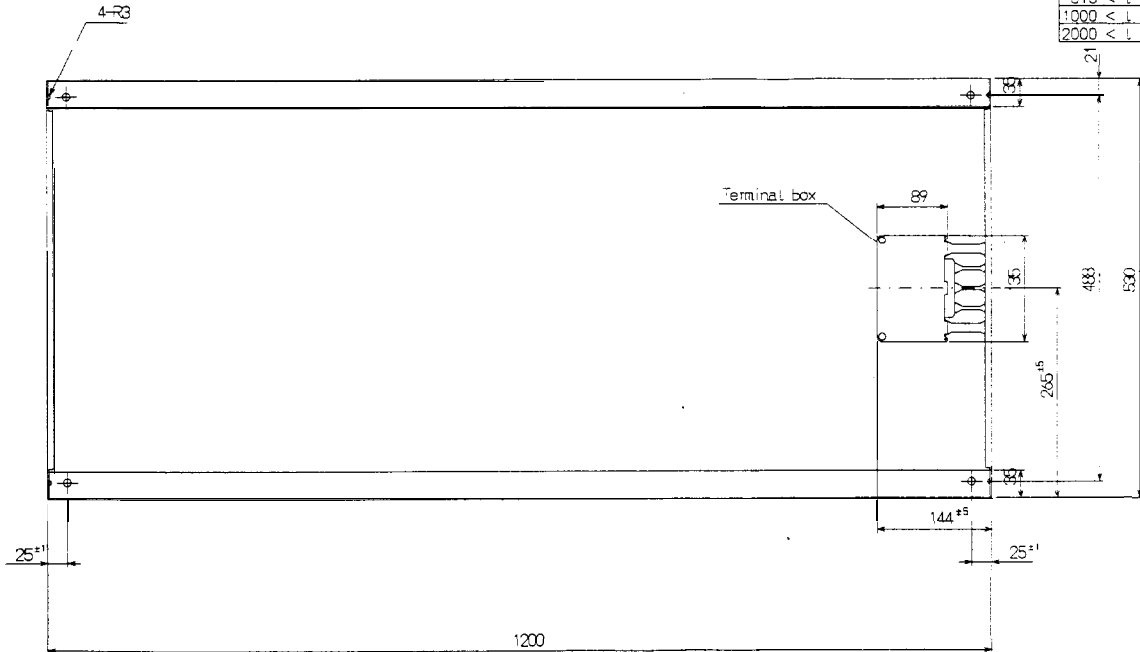
Fig 1

Permissible deviations in dimensions without tolerance indication is showed in table A.

適用機種	NE5181E	尺度	SCALE	単位	UNIT	△		
APPLICABLE MODEL			1/5		1/mm			
版厚 THICKNESS	数量 PIECES	材質 MATERIAL	仕上 FINISH	名称 NAME	NE5181E SOLAR MODULE (Front View)			
DATE	DATE	Apr. 24, 1996		CODE				
DESIGN	DRAM	CHECK	CHECK	APPROVE				
SHARP CORPORATION					図番	DRAWING No. SSE96129		

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Dimension	Permissible Deviation
0.5 < L ≤ 3	± 0.2
3 < L ≤ 6	± 0.3
6 < L ≤ 30	± 0.5
30 < L ≤ 120	± 0.8
120 < L ≤ 315	± 1.2
315 < L ≤ 1000	± 2
1000 < L ≤ 2000	± 3
2000 < L ≤ 4000	± 4



Permissible deviations in dimensions without tolerance indication is showed in table A.

Specifications will be subject to modification without prior notice for performance improvement.

Fig.2

適用機種 APPLICABLE MODEL	NES1A81E		尺数 SCALE	1/5	単位 UNIT	1mm	△		
板厚 THICKNESS	数量 PIECES	材質 MATERIAL	仕上 FINISH		名称 NAME	NT51A81E SOLAR MODULE (Back View)			
日付 DATE	Apr. 24, 1996		コード CODE		④番 DRAWING No.	SSE96130			
DESIGN	DRAW	CHECK	CHECK	APPROVE	シャープ株式会社 電子部品事業本部 太陽電池事業部 技術部		SHARP CORPORATION		