DATE: May.23.2008 PREPARED BY: Y.ARAKI Y. Araki	SHARP SHARP CORPORATION 282-1 HAJIKAMI, KATSURAGI-SHI, NARA, 639-2198,JAPAN	SPEC No. TMVF08209
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SPECIFICATION FOR
SOLAR MODULE

MODEL No. ND-130T1J

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

   (1) Main applications of the modules as follows.

   (Grid-connected PV systems on house roofs or for large scale PV-installations, Telemeter system(Terminal), Village electrification, etc.)

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

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

   (Space equipment, Telecommunication system (Trunk), Nuclear control system, Medical system (relating to any fatal element), etc.)

CUSTOMER'S APPROVAL

DATE

BY

PRESENTED

BY H. Horinaka

H.HORINAKA
Department General Manager
Module Development Dept.

Revision Record

No.	DATE	CHANGE	PAGE	SIGNATURE		
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	Mar.28.2008	First Issue		H.HORINAKA	H.MAEDA	Y.Araki
1	May.23.2008	Add and modify the description	1, I-3	H.HORINAKA	H.MAEDA	Y.ARAKI

1. SCOPE

This document describes the specifications of solar module ND-130T1J.

2. APPLICATION STANDARD

This module is designed to meet the requirement of the following standards.

- IEC61215 (ed.2), EN61215:2005-08
  Crystalline silicon terrestrial photovoltaic (PV) modules-Design qualification and type approval
- IEC61730-1(ed.1), EN61730-1:2007-05
  Photovoltaic (PV) module Safety qualification
  Part 1: Requirements for construction
- IEC61730-2(ed.1), EN61730-2:2007-05
  Photovoltaic (PV) module Safety qualification
  Part 2: Requirements for testing
  Crystalline silicon terrestrial photovoltaic (PV) modules-Design

3. NORMATIVE REFERENCES △1

This module is based on the following reference documents. All normative documents are subject to revision and, if necessary, SHARP can be apply to the latest edition without notice.

- IEC60904-1:1987
  Photovoltaic Device, Part 1: Measurement of Photovoltaic Current-Voltage Characteristics
- IEC60904-3:1989
  Measurement principles for terrestrial Photovoltaic(PV) solar devices with reference spectrum irradiance data
- SS-S (SHARP Standard-Solar)
  Inspection 1000 Reference Photovoltaic module Rule

4. SPECIFICATION

4.1. Application class and Fire rating

4.1.1 Application class

This module is applied to application class A in accordance with IEC61730(EN61730).

4.1.2 Fire rating

This module is rated as "Fire safety class C" in accorance with IEC61730.

4.2. Materials

The materials used for the module shall comply with this specification and unless otherwise specified, the ones that fully meet the requirement of this specification shall be used in any case.

4.2.1. Solar cells

Solar cells shall be produced from poly-crystalline silicon.

4.2.2. Interconnectors

Interconnectors shall be solder coated copper or solder coated clad metal with copper.

4.2.3. Filling materials

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

4.2.4. Front cover

Front cover shall be low iron tempered glasses whose thickness is not less than 3mm.

4.2.5. Frames

Frames shall be aluminum alloy.

4.2.6. Back cover

Back cover shall be resistant films for weather.

4.2.7. Terminal Box

The termination shall be lead wire system. The main material of the terminal box shall be PPE/PPO resin.

4.2.8. Bypass diode

The bypass diode shall be installed in the terminal box.

4.3. Mechanical design

4.3.1. General

The design of module is suitable for long-term operation in general open-air climates.

4.3.2. Interconnection of solar cells

The all solar cells shall be interconnected in series using the interconnectors described in 4.2.2.

4.3.3. Termination

The termination shall be lead wire type with 4.0mm^2. Connector is Multi Contact connector (Model No.PV-KBT3 II ,PV-KST3 II).

4.3.4. Mass

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

4.3.5. Dimension

The tolerance in dimension of module is shown in Fig.1 and Fig.2.

4.4. Identification and product marking

The nameplate label as the identification and product marking is shown in Fig.3.

4.5. Appearance

The following shall be considered to be major visual defects:

1) Broken, cracked, or torn external surfaces, including front cover, frames and terminal box;
2) Bent or misaligned external surfaces, including front cover, frames and terminal box to the extent that the installation and/or operation of the module would be impaired.
3) A crack in a cell the propagation of which could remove more than 10 % of that cell's area from the electrical circuit of the module;
4) Bubbles or delaminations forming a continuous path between any part of the electrical circuit and the edge of the module;
5) Loss of mechanical integrity, to the extent that the installation and/or operation of the module would be impaired.

4.6. Performance characteristics

4.6.1. Environmental requirement

4.6.1.1. Storage temperature

The storage temperature of the modules shall be from –40℃ to +90℃.

4.6.1.2. Operating temperature of solar cells

The operating temperature of solar cells shall be from –40℃ to +90℃.

4.6.1.3. Storage humidity

The storage humidity of the modules shall be less than 90% of relative humidity.

4.6.2. Electrical performance

4.6.2.1. Electrical output

The electrical characteristics of the module under standard test conditions(irradiance of 1000W/m2 with IEC60904-3 reference solar spectral irradiance distribution, AM1.5 spectrum and cell temperature of 25℃) in accordance with IEC60904-1, shall be in compliance with the following table. When the maximum power is 130.0W, the electrical characteristics (open circuit voltage, voltage at point of maximum power, short circuit current, current at point of maximum power, maximum power) are shown in the appended data sheet. Detail procedure of measurement shall be done in accordance with SS-S Inspection 1000.

Table 1 Electrical characteristics

Characteristic	Symbol	Max.	Min.	Unit
Maximum power	Pm	143.0	123.5	W

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

4.6.2.2. Insulation

When the module shall be applied 4400 V-DC (maximum system voltage: 600V-DC) by the tester during 1min, the module shall not break down regarding the insulation.

4.6.3. Mechanical performance

4.6.3.1. Withstanding mechanical load

After the module shall be loaded with 2400Pa (mounting methods are shown in the appended data sheet and installation manual), there shall be no major visual defects of the module described in 4.5.

4.6.3.2. Withstanding the impact of hailstone

After hail test, there shall be no major visual defects of the module described in 4.5.

4.6.3.3. Robustness of termination

The termination of the module has enough strength against external forces and satisfied wet leakage current test.

5. SHIPPING TEST

Each shipping lot shall successfully pass the shipping tests below.

5.1. Total inspection

5.1.1. Sampling way

All shipping lot is inspected.

5.1.2. Inspection items

The maximum power (Pm) is measured in the production line process.

5.2. Sampling inspection

5.2.1. Sampling way

Sampling shall be done by extracting at random 8 sets from 500 sets of production articles.

5.2.2. Inspection items

Inspection items shall be the dimension, the appearance and the Insulation tests.

6. PREPARATION FOR DELIVERY

6.1. The shipping carton box specification

The shipping carton box specification is shown in Fig.4, Fig.5.

6.2. Identification of serial number

The label that described serial number is stuck on front glass and on carton box.

7. WARNING

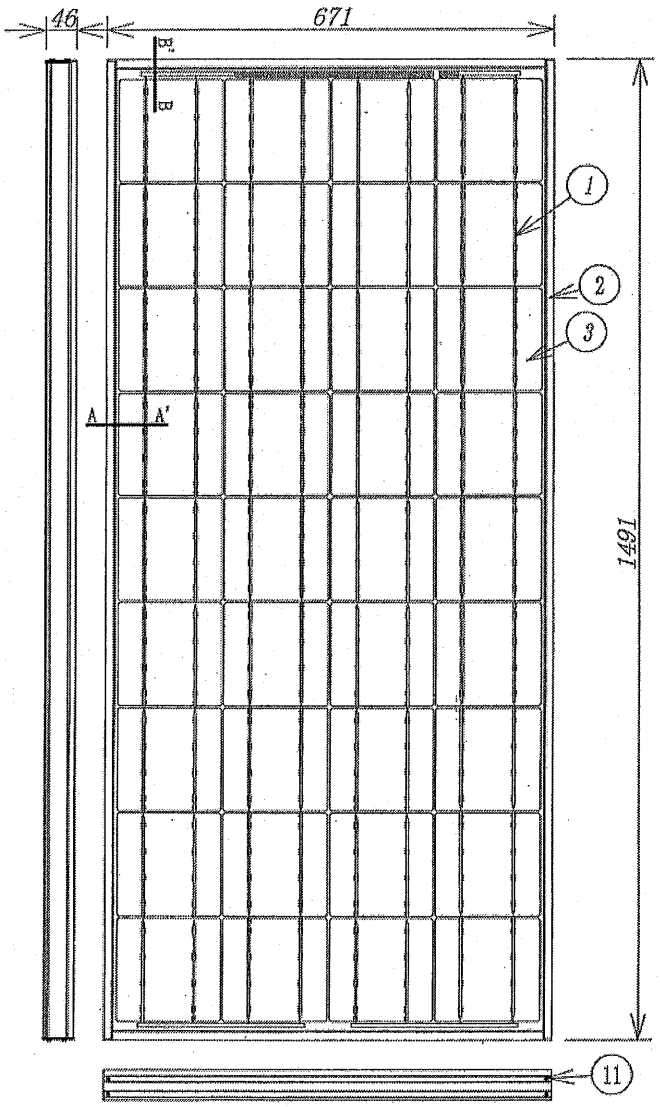
The items regarding the warning are shown in the appended data sheet, installation manual.

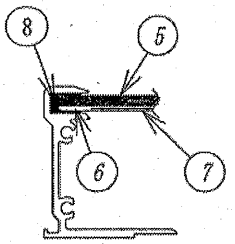
8. OTHERS

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

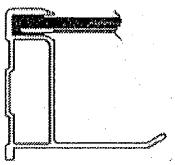
SHARP

No	NAME	PIECES	MATERIALS	No	NAME	PIECES	MATERIALS
1	Inter-Connector		Cu or Clad Metal with Copper	9	Electric Output Cable	2	CE 4.0mm^2, L=900±50mm
2	Frame	4	Al(Silver Color)	10	Connector		TPE(Thermoplastic Elastomer)
3	Solar Cell	36	Si(Dark Blue Color Group)	11	Screw	8	Stainless Steel
4	Terminal Box	1	PPE/PPO	12	Support Bar	1	Al(Silver Color)
5	Glass	1	Low Iron Tempered Glass	13	Cushion		EPDM
6	Resin		EVA	14	Screw for Support Bar	2	Stainless Steel
7	Back Cover		Weather-proof Film	15	Caution Label	1	Label





A－A′ Cross Section



B－B′ Cross Section

Fig. 1

Table A

Dimension ; L	Permissible Deviation	Dimension ; L	Permissible Deviation
0.5 ≦ L ≦ 3	±0.2	120 < L ≦ 400	±1.2
3 < L ≦ 6	±0.3	400 < L ≦ 1000	±2
6 < L ≦ 30	±0.5	1000 < L ≦ 2000	±3
30 < L ≦ 120	±0.8	2000 < L ≦ 4000	±4

Permissible deviations in dimensions without tolerance indication is shown in Table A.

SHARP

No	NAME	PCS	MATERIALS	No	NAME	PCS	MATERIALS
1	Inter-Connector		Cu or Clad Metal with Copper	9	Electric Output Cable	2	CE 4.0mm^2, L=900±50mm
2	Frame	4	Al (Silver Color)	10	Connector		TPE (Thermoplastic Elastomer)
3	Solar Cell	36	Si (Dark Blue Color Group)	11	Screw	8	Stainless Steel
4	Terminal Box	1	PPE/PPO	12	Support Bar	1	Al (Silver Color)
5	Glass	1	Low Iron Tempered Glass	13	Cushion		EPDM
6	Resin		EVA	14	Screw for Support Bar	2	Stainless Steel
7	Back Cover		Weather-proof Film	15	Caution Label	1	Label

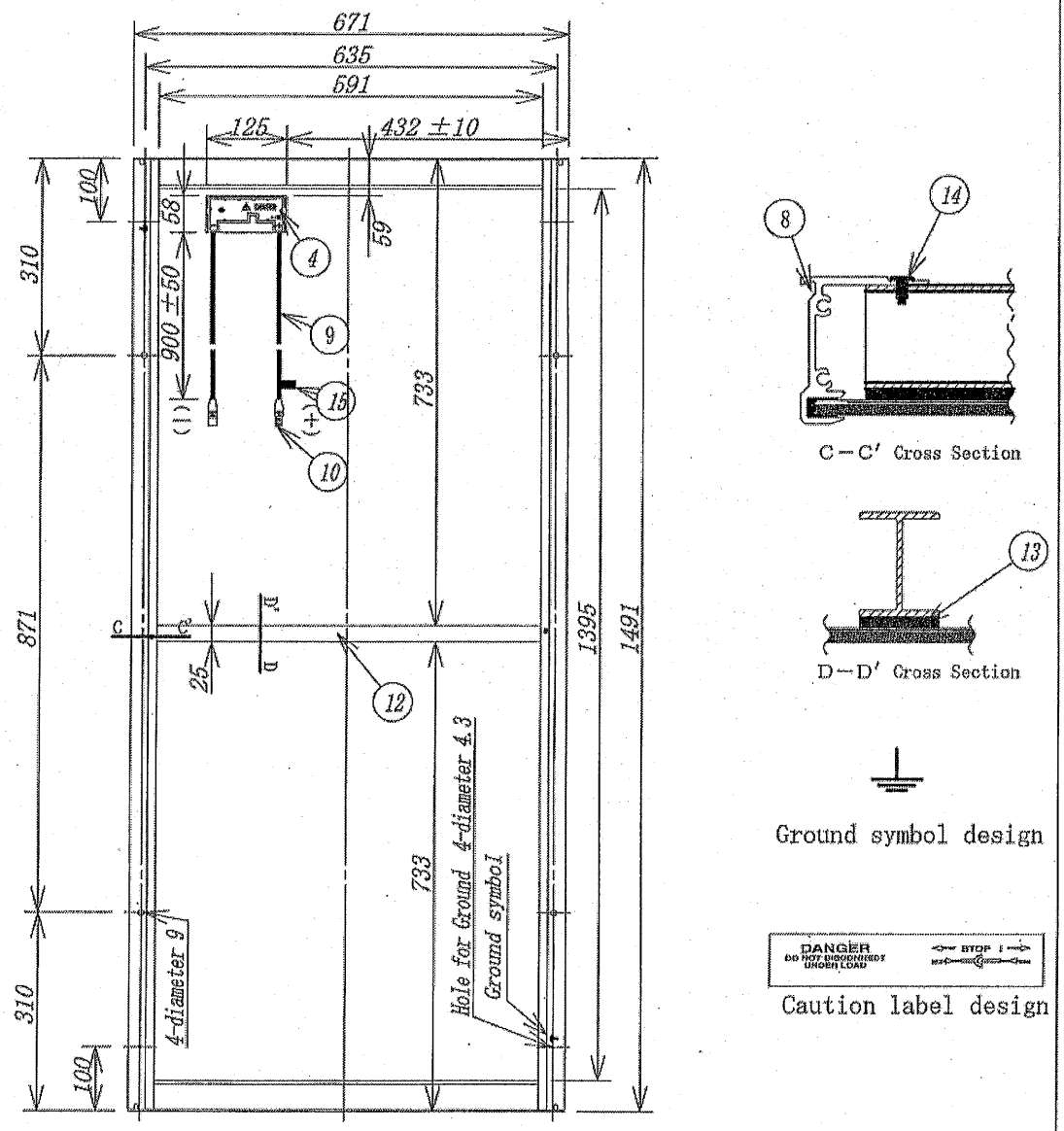


Fig. 2

Table A

Dimension : L	Permissible Deviation	Dimension : L	Permissible Deviation
0.5 ≦ L ≦ 3	±0.2	120 < L ≦ 400	±1.2
3 < L ≦ 6	±0.3	400 < L ≦ 1000	±2
6 < L ≦ 30	±0.5	1000 < L ≦ 2000	±3
30 < L ≦ 120	±0.8	2000 < L ≦ 4000	±4

Permissible deviations in dimensions without tolerance indication is shown in Table A.

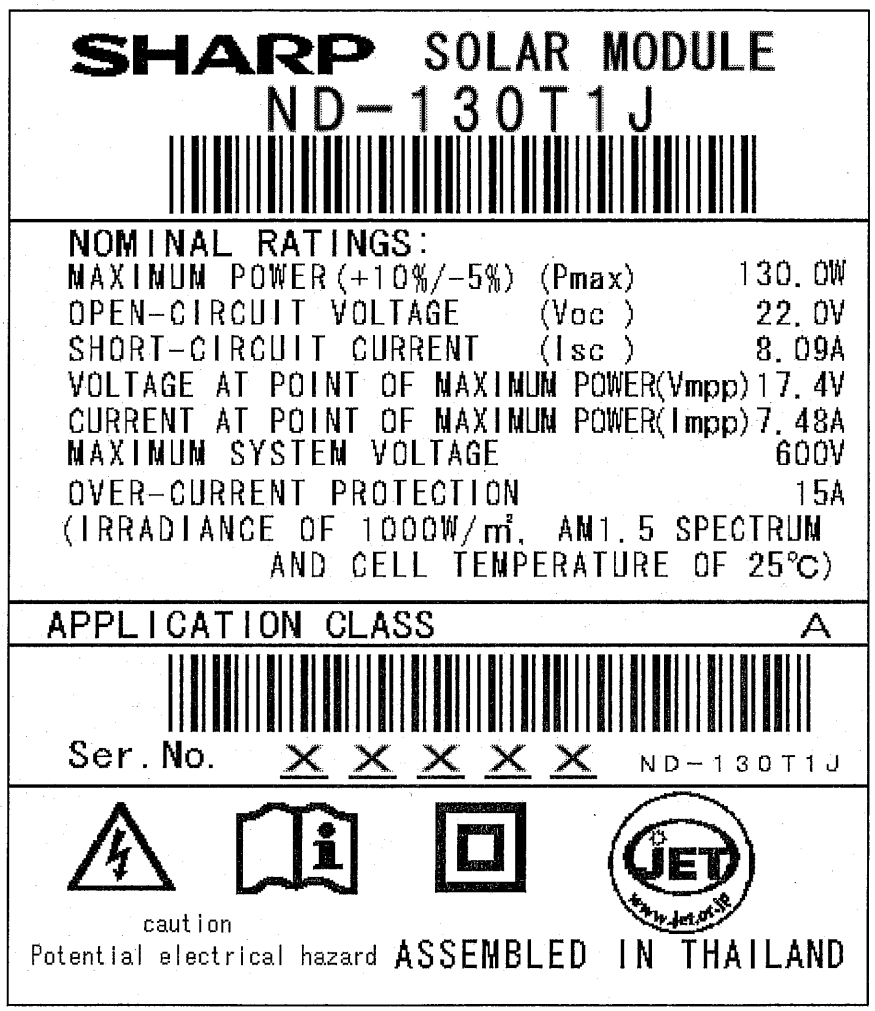

SHARP SOLAR MODULE
ND-130T1J
NOMINAL RATINGS:
MAXIMUM POWER(+10%/-5%) (Pmax) 130.0W
OPEN-CIRCUIT VOLTAGE (Voc) 22.0V
SHORT-CIRCUIT CURRENT (Isc) 8.09A
VOLTAGE AT POINT OF MAXIMUM POWER(Vmpp) 17.4V
CURRENT AT POINT OF MAXIMUM POWER(Impp) 7.48A
MAXIMUM SYSTEM VOLTAGE 600V
OVER-CURRENT PROTECTION 15A
(IRRADIANCE OF 1000W/m², AM1.5 SPECTRUM
AND CELL TEMPERATURE OF 25℃)
APPLICATION CLASS A
Ser.No. XXXXX ND-130T1J
caution
Potential electrical hazard
ASSEMBLED IN THAILAND

Fig.3

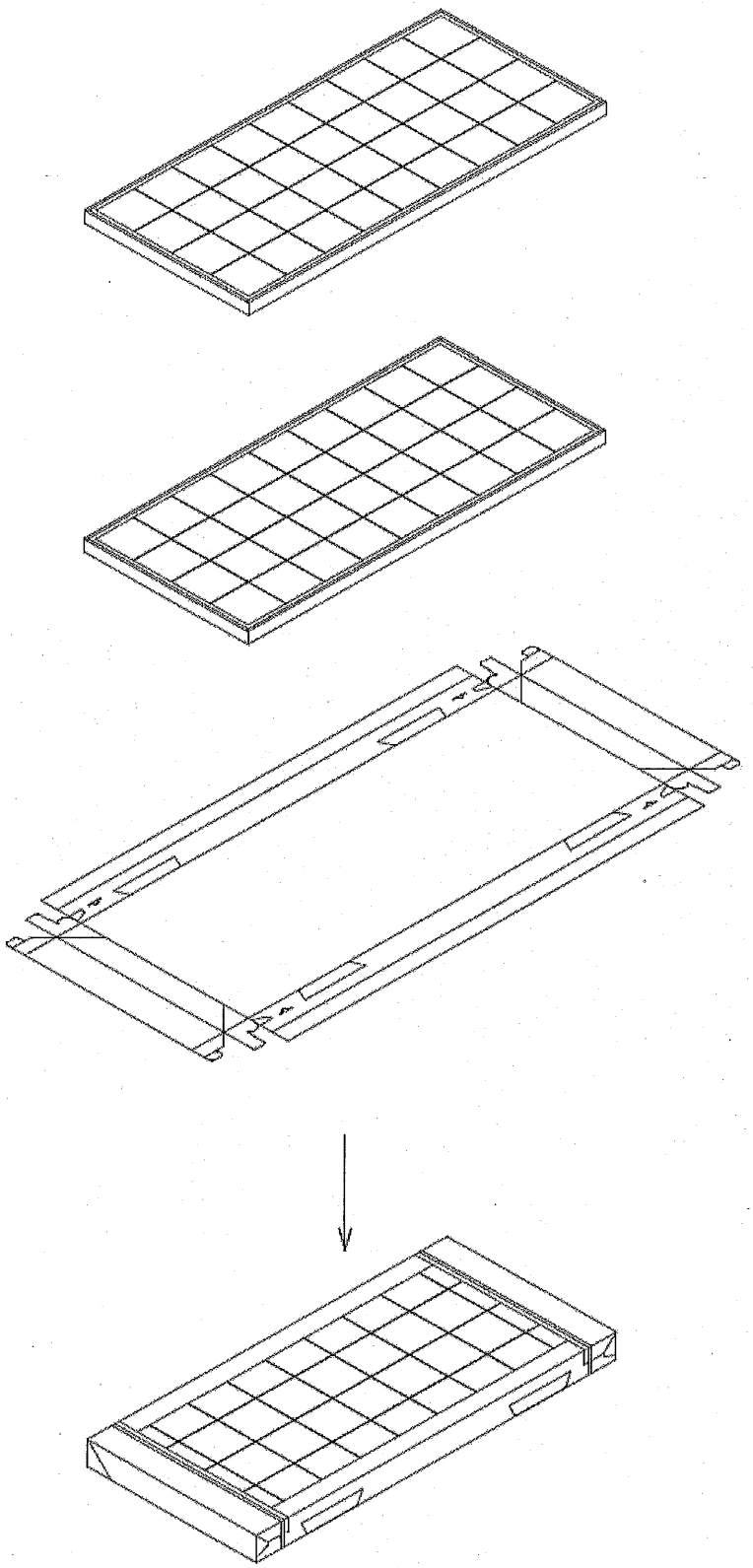


Fig.4

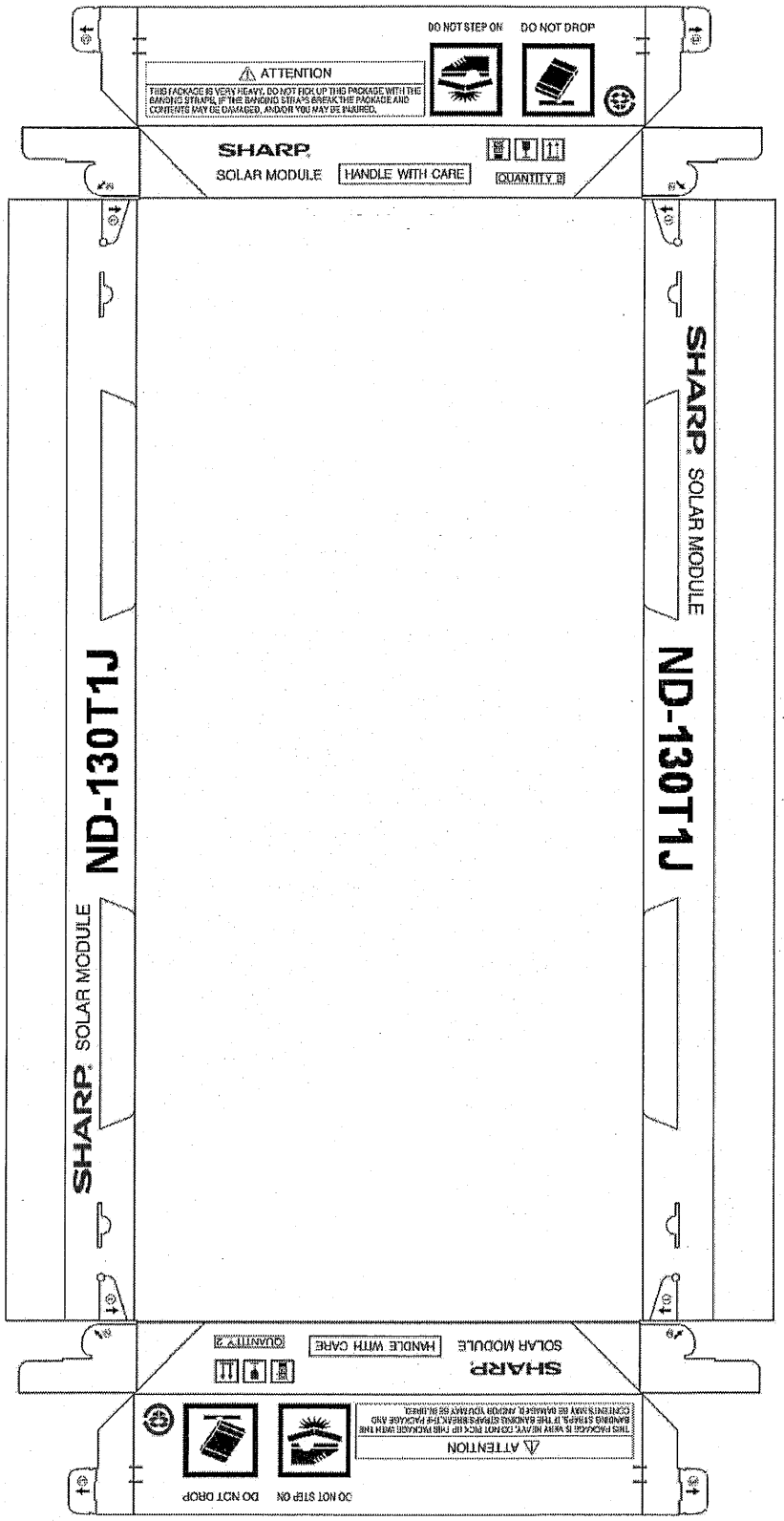

DO NOT STEP ON
DO NOT DROP
ATTENTION
THIS PACKAGE IS VERY HEAVY. DO NOT PICK UP THIS PACKAGE WITH THE BANDING STRAPS. IF THE BANDING STRAPS BREAK THE PACKAGE AND CONTENTS MAY BE DAMAGED, AND/OR YOU MAY BE INJURED.
SHARP
SOLAR MODULE
HANDLE WITH CARE
QUANTITY 2
SHARP SOLAR MODULE ND-130T1J
SHARP SOLAR MODULE ND-130T1J
SHARP
SOLAR MODULE
HANDLE WITH CARE
QUANTITY 2
ATTENTION
DO NOT STEP ON
DO NOT DROP

Fig.5

《APPENDED I》

Data Sheet

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. MECHANICAL CHARACTERISTICS

Cell Type	156.5mm square(Typ.), poly crystalline silicon
Frame material	Anodized aluminum alloy (Color: Silver)
Front cover material	Low iron temperd glasses
Encapsulation material	EVA(Ethylene Vinyl Acetate) resin
Back film material	Resistant films for weather
Dimension	Length: 1491mm Width: 671mm Depth: 46mm
Weight(Typical)	12.5kg
Solar cell strings	36 in series (4 strings)
Terminal box	Length: 58mm Width: 125mm Depth: 15mm Material:PPE/PPO resin IP-rating 65 (at live parts with the silicone potting)
Bypass Diode	The bypass diode shall be installed in the terminal box.
Cable	CE cable 4.0mm sq. / Length 900mm(Typ.) DC1000V, -40℃～110℃
Connector	Multi-Connact PV-KBT3 II／KST3 II IP-rating 67

I -3. ELECTRICAL OUTPUT AND THERMAL CHARACTERISTICS

Rated electrical characteristics are within ±10 percent of the indicated values of Isc, Voc, and +10/-5 percent of Pmax under STC (standard test conditions) (irradiance of 1000W/m^2, AM 1.5 spectrum, and a cell temperature of 25 °C (77°F)). The warranty conditions are specified elsewhere in this manual.

Table I -1. Electrical characteristics (at STC:ND-130T1J)

Maximum Power	(Pmax)	130.0		W
Tolerance		+10	-5	%
Open-Circuit Voltage	(Voc)	22.0		V
Short-Circuit Current	(Isc)	8.09		A
Voltage at Point of Maximum Power	(Vmpp)	17.4		V
Current at Point of Maximum Power	(Impp)	7.48		A
Maximum System Voltage		600		V
Over-Current Protection		15		A
Application Class		A		
Temperature Coefficient of Pmax		-0.485		%/℃
Temperature Coefficient of Voc		-0.078		V/℃
Temperature Coefficient of Isc		0.053		%/℃

⚠1

The above electrical characteristics (Pmax,Voc, Isc,Vmpp,Impp) are based on the result of the production line test. Each module have individual charactristics and the value might be different from the rated electrical characteristics described in the name plate label. There electrical characteristic of the module under not standard test condition 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

NOTE: 1

Under normal conditions, a photovoltaic module is likely to experience conditions that produce more current and/or voltage than reported at Standard Test Conditions.Accordingly, the values of Isc and Voc marked on this module should be multiplied by a factor of 1.25 when determining component voltage ratings, conductor capacities, fuse sizes and size of controls connected to the module output.

Table I -2. Electrical characteristics (at NOCT:ND-130T1J)

Maximum Power	(Pmax)	90.3	W
Open-Circuit Voltage	(Voc)	19.7	V
Short-Circuit Current	(Isc)	6.63	A
Voltage at Point of Maximum Power	(Vmpp)	15.2	V
Nominal Operating Cell Temperature	(NOCT)	47.5	℃

NOCT: Module operation temperature at 800W/m^2 irradiance in the plane of module, air temperature 20℃, wind speed 1m/s and open circuit condition.

I -4. WARNING

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

I -4.1. Use

(1) Main applications of the modules as follows.

・Grid-connected PV systems on house roofs or for large scale PV-installations

・Telemeter system(Terminal) ・Village electrification 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.

(4) Please do not connect the modules directly to the loads such as motor since the variation of the output power depending on the solar irradiation causes the damage for the connected motor.

1: In case of brush-less motor, the lock function gets active and the hall IC is most likely to be damaged.

2: In case of the motor with brush, the coil is most likely to be damaged.

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.

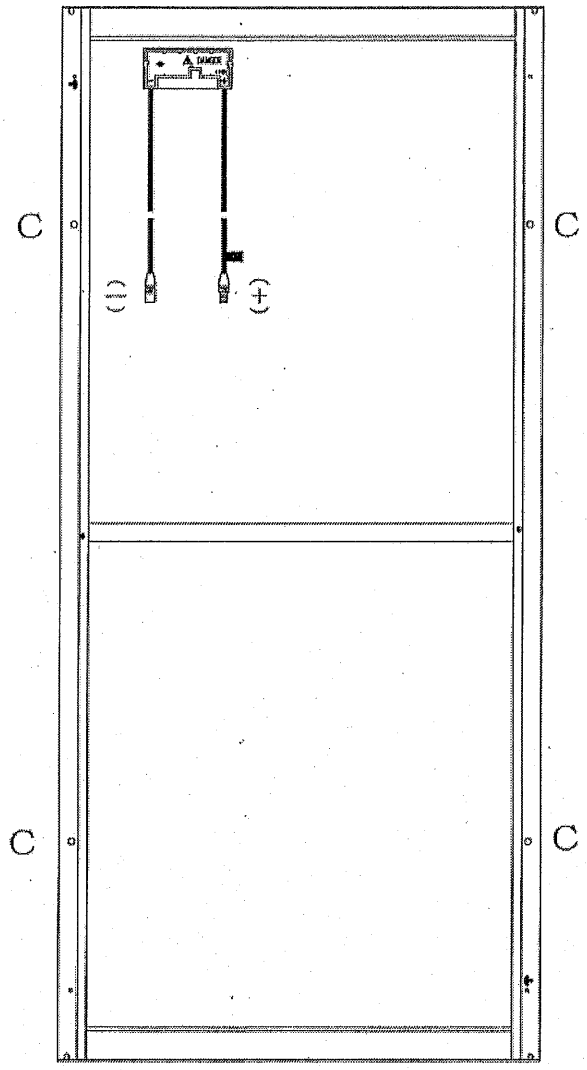
(4) Consult the government office before the installation of the modules in case that the permission of the installation is required by law.

(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) Module shall be fastened with 4C-holes with M8-bolts for withstanding load 2400Pa.



I -4.4. Operation

(1) When a part of the modules 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 modules to sunlight concentrated with mirrors, lenses or similar means.

(7) Keep modules away from children.

MODEL No. ND-130T1J

(Cell Temperature : 25℃)

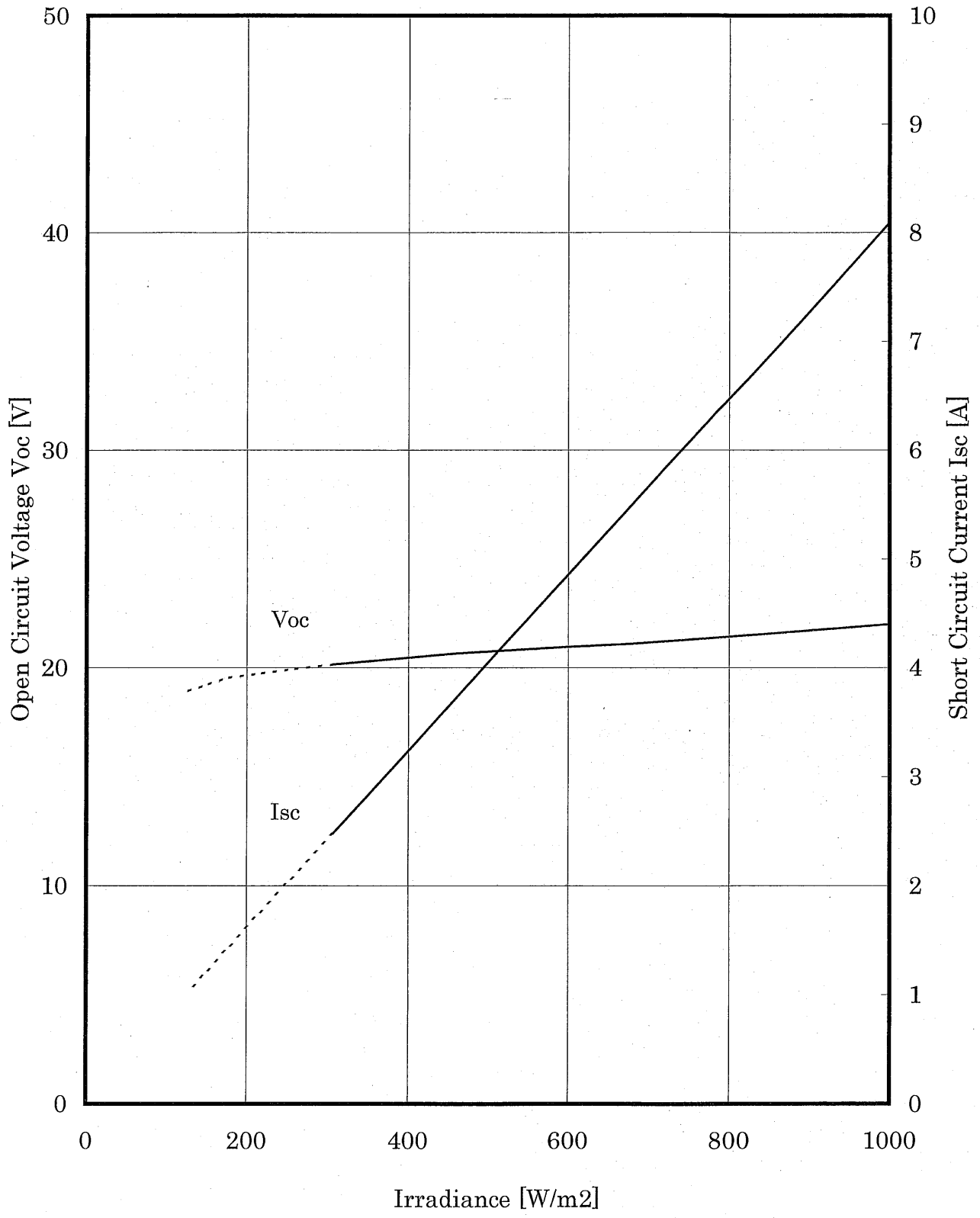


Fig. I -1 Open Circuit Voltage , Short Circuit Current vs. Irradiance Characteristics

MODEL No. ND-130T1J

(Cell Temperature : 25℃)

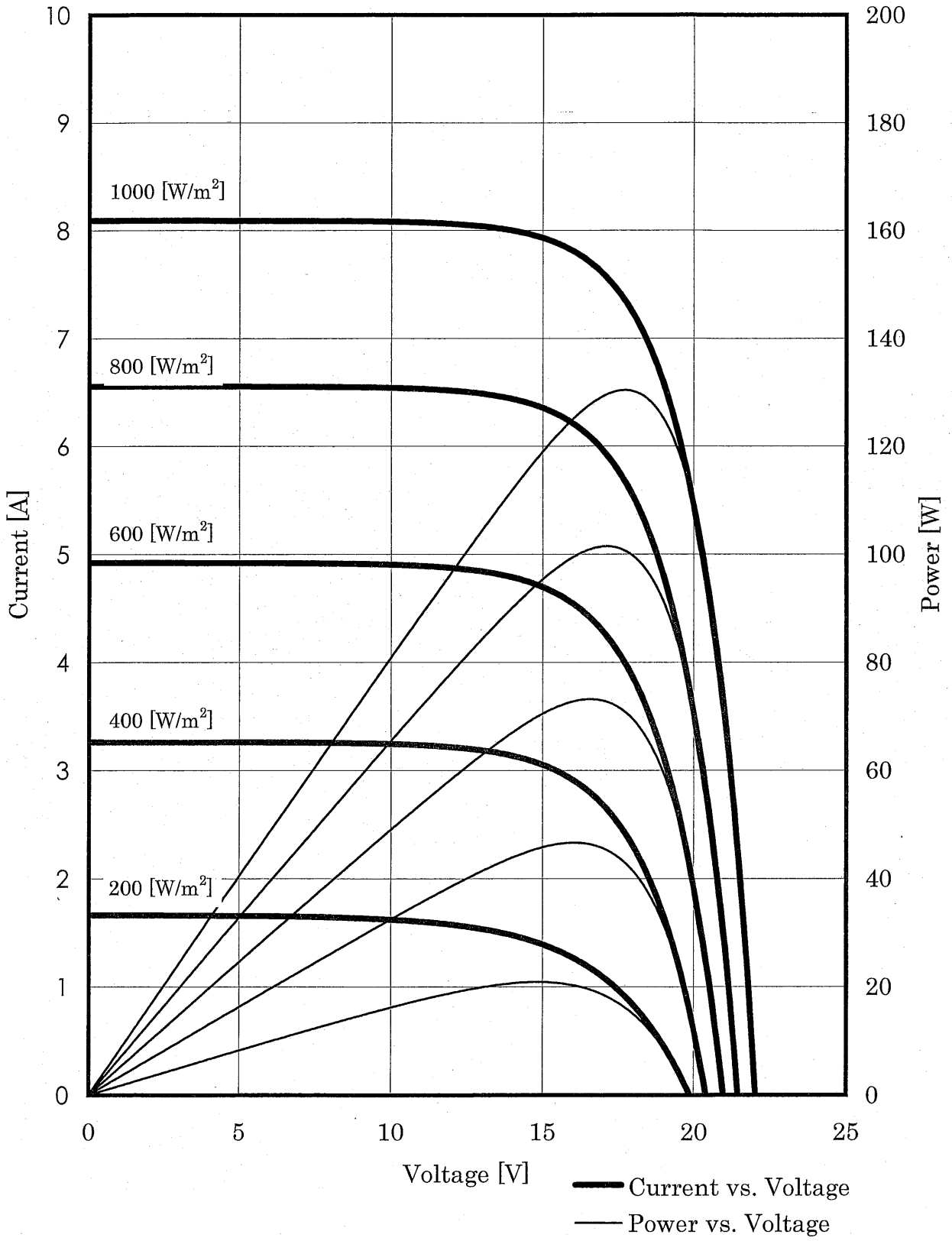


Fig. I -2 Current , Power , vs. Voltage Characteristics

MODEL No. ND-130T1J

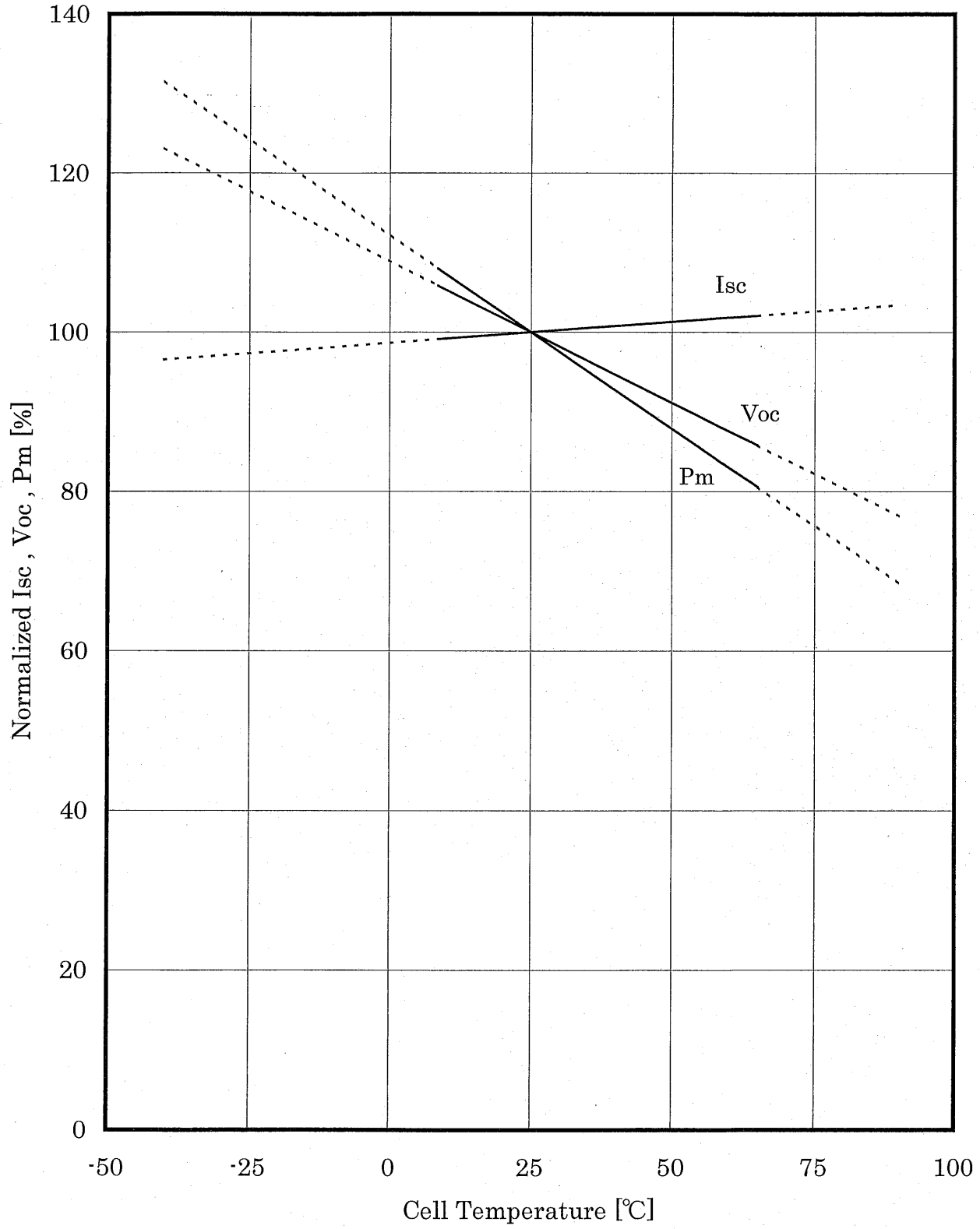


Fig. I -3 Normalized Isc , Voc , PM vs Cell Temperature Characteristics