

TEST REPORT

Applicant : MPP Solar Inc
Address : 4F, No. 50-1, Section 1, Hsin-Sheng S. Rd. Taipei, Taiwan 100

Manufacturer : MPP Solar Inc
Address : 4F, No. 50-1, Section 1, Hsin-Sheng S. Rd. Taipei, Taiwan 100

Product Name : Inverter Charger
Trade Mark : MPP SOLAR
Model No. : PIP 4048MS, PIP 3248MS
Ratings : See copy of marking plate
Standard : Safety of household and similar electrical appliances
Part 2: Particular requirements for battery chargers
AS/NZS 60335.1: 2011 and AS/NZS 60335.2.29:2004+A1: 2004+A2: 2010


Date of Receiver : February 08, 2014
Date of Test : February 08, 2014 to February 27, 2014
Date of Issue : March 07, 2014
Test Report Form No : NTCS-IEC60335-2-29-A1-A
Test Result : Pass *

This Test Report is Issued Under the Authority of :

Compiled by



Kadin Luo / Engineer



Han Song / Manager

*Remarks:

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Copy of marking plate:

INVERTER CHARGER

Model Name: PIP 3248MS
Color: Silver and Black
Operating Temperature Range: 0~ 55°C



92931210100001

Inverter Mode:

Rated Power: 4000VA/3200W
DC Input: 48VDC, 75A
AC Output: 230VAC, 50Hz, 18A, 1Φ

AC Charger Mode:

AC Input: 230VAC, 50Hz, 29A, 1Φ
DC Output: 54VDC, 30A
AC Output: 230VAC, 50Hz, 18A, 1Φ

Solar Charger Mode:

Rated Current: 60A
System Voltage: 48VDC
Min. Solar Voltage: 40VDC
Max. Solar Voltage (VOC): 145VDC



MPP Solar Inc

INVERTER CHARGER

Model Name: PIP 4048MS
Color: Silver and Black
Operating Temperature Range: 0~ 55°C



92931210100001

Inverter Mode:

Rated Power: 5000VA/4000W
DC Input: 48VDC, 93A
AC Output: 230VAC, 50Hz, 22A, 1Φ

AC Charger Mode:

AC Input: 230VAC, 50Hz, 29A, 1Φ
DC Output: 54VDC, 30A
AC Output: 230VAC, 50Hz, 22A, 1Φ

Solar Charger Mode:

Rated Current: 60A
System Voltage: 48VDC
Min. Solar Voltage: 40VDC
Max. Solar Voltage (VOC): 145VDC



MPP Solar Inc

Summary of testing:

Only clause 11, clause 17, clause 19 and clause 22.101 which requested by the applicant were considered in this test report. From the result of our inspection and tests on the submitted samples, we concluded they comply with requirements of the clause 11, clause 17, clause 19 and clause 22.101.

- Tested for moderate conditions
- EUT is designed for altitudes not exceeding 2000 m.

Test item particulars	:	
Classification of installation and use	:	Fixed appliance and household indoor use
Supply Connection	:	Permanent connection equipment
Possible test case verdicts:		
- test case does not apply to the test object	:	N
- test object does meet the requirement	:	P (Pass)
- test object does not meet the requirement	:	F (Fail)
General remarks:		
"(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a comma is used as the decimal separator.		
General product information:		
1) The battery charger for household indoor use only.		
1) The maximum ambient temperature is +55 °C		
2) Models differences:		
Models PIP 3248MS and PIP 4048MS are identical, except model name, appearance of enclosure (for color and silk-screed only), some components (e.g. PIP 4048MS with Q31, Q19, Q24, Q38 and Q40 but PIP 3248MS without them) and so on (for detail see appended table 24.1 and photos). Unless otherwise specified, all tests performed on model PIP 4048MS.		
3) The "Inverter Mode" and "Solar charger mode" requirement of the equipment are not covered by the scope of this standard, so they are not considered in this test report.		
4) CAUTION: Both of the 54Vdc DC output voltage in AC charger mode and the 48Vdc system voltage in solar charger mode exceeding 42 V between conductors, the no-load voltage exceeding 50 V that does not meet the requirements for safety extra-low voltage in this standard. The end users, operators and service personany persons neet to take steps to avoid this hazard.		
Name and address of factory (ies): Same as manufacturer		

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
11	HEATING		P
11.1	No excessive temperatures in normal use		P
11.2	Battery chargers are placed in the test corner as specified for heating appliances (AS/NZS 60335.2.29)		P
11.3	Temperature rises, other than of windings, determined by thermocouples	By thermocouples method	P
	Temperature rises of windings determined by resistance method, unless		N
	the windings are non-uniform or it is difficult to make the necessary connections	Winding for transformer and inductors	P
11.4	Heating appliances operated under normal operation at 1,15 times rated power input	Not a heating appliances	N
11.5	Battery chargers only supplied at 1,06 times rated voltage (AS/NZS 60335.2.29)	230Vac x 1.06 =243.8 Vac (for AC charger mode)	P
11.6	Combined appliances operated under normal operation, supply voltage at most unfavourable voltage between 0,94 and 1,06 times rated voltage	Not an combined appliances	N
11.7	Battery chargers are operated until steady conditions are established (AS/NZS 60335.2.29)		P
11.8	Temperature rises monitored continuously and not exceeding the values in table 3		P
	If the temperature rise of a motor winding exceeds the value of table 3, or	No such sealing compound	N
	if there is doubt with regard to classification of insulation,	(see appended table 11.8)	P
	tests of Annex C are carried out		N
	Sealing compound does not flow out		P
	Protective devices do not operate, except	Protective devices do not operate.	P
	components in protective electronic circuits tested for the number of cycles specified in 24.1.4		N
17	OVERLOAD PROTECTION OF TRANSFORMERS AND ASSOCIATED CIRCUITS		P
	No excessive temperatures in transformer or associated circuits in event of short-circuits likely to occur in normal use		P
	Appliance supplied with 1,06 or 0,94 times rated voltage and the most unfavourable short-circuit or overload likely to occur in normal use applied	230Vac x 1.06 =243.8 Vac (for AC charger mode) Overload and short-circuit	P
	Basic insulation is not short-circuited		P
	Temperature rise of insulation of the conductors of safety extra-low voltage circuits not exceeding the relevant value specified in table 3 by more than 15 K		P

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
	Temperature of the winding not exceeding the value specified in table 8		P
	however limits do not apply to fail-safe transformers complying with sub-clause 15.5 of IEC 61558-1		N
	Output terminals of battery charger are short-circuited (AS/NZS 60335.2.29)		P
19	ABNORMAL OPERATION		P
19.1	The risk of fire, mechanical damage or electric shock under abnormal or careless operation obviated		P
	Electronic circuits so designed and applied that a fault will not render the appliance unsafe		P
	Appliances incorporating heating elements subjected to the tests of 19.2 and 19.3, and		N
	if the appliance also has a control that limit the temperature during clause 11 it is subjected to the test of 19.4, and		N
	if applicable, to the test of 19.5		N
	Appliances incorporating PTC heating elements are also subjected to the test of 19.6		N
	Appliances incorporating motors subjected to the tests of 19.7 to 19.10, as applicable		N
	Appliances incorporating electronic circuits subjected to the tests of 19.11 and 19.12, as applicable		P
	Appliances incorporating contactors or relays subjected to the test of 19.14, being carried out before the tests of 19.11	No relay used.	N
	Appliances incorporating voltage selector switches subjected to the test of 19.15		N
	Unless otherwise specified, the tests are continued until a non-self-resetting thermal cut-out operates, or		N
	until steady conditions are established		P
	If a heating element or intentionally weak part becomes open-circuited, the relevant test is repeated on a second sample		N
	Modification: Instead of the lists specified, battery chargers are subjected to the tests of 19.11, 19.12 and 19.101 to 19.103, as applicable. (AS/NZS 60335.2.29)		P
19.2	Test of appliance with heating elements with restricted heat dissipation; test voltage (V): power input of 0,85 times rated power input(W) :	No such heating elements	N

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
19.3	Test of 19.2 repeated; test voltage (V): power input of 1,24 times rated power input(W)	No such heating elements	N
19.4	Test conditions as in cl. 11, any control limiting the temperature during tests of cl. 11 short-circuited	No controls	N
19.5	Test of 19.4 repeated on Class 0I and I appliances with tubular sheathed or embedded heating elements. No short-circuiting, but one end of the element connected to the elements sheath	No such heating elements	N
	The test repeated with reversed polarity and the other end of the heating element connected to the sheath		N
	The test is not carried out on appliances intended to be permanently connected to fixed wiring and on appliances where an all-pole disconnection occurs during the test of 19.4	No such heating elements	N
19.6	Appliances with PTC heating elements tested at rated voltage, establishing steady conditions	No PTC heating elements.	N
	The working voltage of the PTC heating element is increased by 5% and the appliance is operated until steady conditions are re-established. The voltage is then increased in similar steps until 1,5 times working voltage is reached or until the PTC heating element ruptures		N
19.7	Stalling test by locking the rotor if the locked rotor torque is smaller than the full load torque or	Motors used for approval DC fans only.	N
	locking moving parts of other appliances		N
	Locked rotor, motor capacitors open circuited or short-circuited, if required		N
	Locked rotor, capacitors open-circuited one at a time, unless		N
	capacitor is of class P2 of IEC 60252-1		N
	The test is repeated with the capacitors short-circuited one at a time if required		N
	Appliances with timer or controller supplied with rated voltage for each of the tests, for a period equal to the maximum period allowed		N
	Other appliances supplied with rated voltage for a period as specified:		N
	Winding temperatures not exceeding values specified in table 8		N
19.8	Three-phase motors operated at rated voltage with one phase disconnected	No such three-phase motors	N

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
19.9	Running overload test on appliances incorporating motors intended to be remotely or automatically controlled or liable to be operated continuously		N
	Motor-operated and combined appliances for which 30.2.3 is applicable and that use overload protective devices relying on electronic circuits to protect the motor windings, are also subjected to the test		N
	Winding temperatures not exceeding values as specified		N
19.10	Series motor operated at 1,3 times rated voltage for 1 min	No such series motor	N
	During the test, parts not being ejected from the appliance		N
19.11	Electronic circuits, compliance checked by evaluation of the fault conditions specified in 19.11.2 for all circuits or parts of circuits, unless		P
	they comply with the conditions specified in 19.11.1		N
	Appliances incorporating an electronic circuit that relies upon a programmable component to function correctly, subjected to the test of 19.11.4.8, unless		P
	restarting does not result in a hazard		N
	Appliances having a device with an off position obtained by electronic disconnection, or a device placing the appliance in a stand-by mode, subjected to the tests of 19.11.4		P
	If the safety of the appliance under any of the fault conditions depends on the operation of a miniature fuse-link complying with IEC 60127, the test of 19.12 is carried out		P
	During and after each test the following is checked:		P
	- the temperature of the windings do not exceed the values specified in table 8		P
	- the appliance complies with the conditions specified in 19.13		P
	- any current flowing through protective impedance not exceeding the limits specified in 8.1.4		N
	If a conductor of a printed board becomes open-circuited, the appliance is considered to have withstood the particular test, provided both of the following conditions are met:		N
	- the base material of the printed circuit board withstands the test of Annex E		N

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
	- any loosened conductor does not reduce clearance or creepage distances between live parts and accessible metal parts below the values specified in clause 29		N
19.11.1	Before applying the fault conditions a) to f) in 19.11.2, it is checked if circuits or parts of circuit meet both of the following conditions:		N
	- the electronic circuit is a low-power circuit, that is, the maximum power at low-power points does not exceed 15 W according to the tests specified		N
	- the protection against electric shock, fire hazard, mechanical hazard or dangerous malfunction in other parts of the appliance does not rely on the correct functioning of the electronic circuit		N
19.11.2	Fault conditions applied one at a time, the appliance operated under conditions specified in Cl. 11, but supplied at rated voltage, the duration of the tests as specified:		P
	a) short-circuit of creepage distances and clearances between live parts of different potential, if these distances are less than the values specified in 29		P
	b) open circuit at the terminals of any component		P
	c) short-circuit of capacitors, unless they comply with IEC 60384-14		P
	d) short-circuit of any two terminals of an electronic component, other than integrated circuits. This fault condition is not applied between the circuits of an optocoupler		P
	e) failure of triacs in the diode mode		P
	f) failure of an integrated circuit. In this case the possible hazardous situations of the appliance are assessed to ensure that safety does not rely on the correct functioning of such a component		P
	g) failure of an electronic power switching device		N
	Each low power circuit is short-circuited by connecting the low-power point to the pole of the supply source from which the measurements were made		N
19.11.3	If the appliance incorporates a protective electronic circuit which operates to ensure compliance with clause 19, the relevant test is repeated with a single fault simulated, as indicated in a) to f) of 19.11.2		P
19.11.4	Appliances having a switch with an off position obtained by electronic disconnection, or		P
	a switch that can be placed in the stand-by mode,		P
	subjected to the tests of 19.11.4.1 to 19.11.4.7		P

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
	Appliances incorporating a protective electronic circuit subjected to the tests of 19.11.4.1 to 19.11.4.7, except that		P
	Appliances operated for 30 s or 5 min during the test of 19.7 are not subjected to the tests for electromagnetic phenomena.		P
	Surge protective devices disconnected, unless		P
	They incorporate spark gaps		P
19.11.4.1	The appliance is subjected to electrostatic discharges in accordance with IEC 61000-4-2, test level 4		P
19.11.4.2	The appliance is subjected to radiated fields in accordance with IEC 61000-4-3, test level 3		P
19.11.4.3	The appliance is subjected to fast transient bursts in accordance with IEC 61000-4-4, test level 3 or 4 as specified		P
19.11.4.4	The power supply terminals of the appliance subjected to voltage surges in accordance with IEC 61000-4-5, test level 3 or 4 as specified		P
	Earthed heating elements in class I appliances disconnected	No heating elements	N
19.11.4.5	The appliance is subjected to injected currents in accordance with IEC 61000-4-6, test level 3		P
19.11.4.6	The appliance is subjected to voltage dips and interruptions in accordance with IEC 61000-4-11		N
	Appliances having a rated current exceeding 16 A are subjected to the Class 3 voltage dips and interruptions in accordance with IEC 61000-4-34		P
19.11.4.7	The appliance is subjected to mains signals in accordance with IEC 61000-4-13, test level class 2		P
19.11.4.8	The appliance is supplied at rated voltage and operated under normal operation. After 60s the power supply is reduces to a level such that the appliance ceases to respond or a programmable component cease to operate.		P
	The appliance continues to operate normally, or		P
	requires a manual operation to restart		P
19.12	If the safety of the appliance for any of the fault conditions specified in 19.11.2 depends on the operation of a miniature fuse-link complying with IEC 127, the test is repeated, measuring the current flowing through the fuse-link; measured current (A); rated current of the fuse-link (A)	No such fuse provided in AC charger mode.	N

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
19.13	During the tests the appliance does not emit flames, molten metal, poisonous or ignitable gas in hazardous amounts	Comply with requirements	P
	Temperature rises not exceeding the values shown in table 9	(see appended table 19)	P
	Enclosures not deformed to such an extent that compliance with Cl. 8 is impaired		P
	Appliance still operable and complying with 20.2		P
	Addition: During the tests, the values of Table 8 apply. There shall be no rupture of the battery. (AS/NZS 60335.2.29)		P
	If the appliance can still be operated it complies with 20.2		P
	Appliance, other than Class III, withstands the electric strength test of 16.3, however, the test voltage being:		P
	- basic insulation: 1250 V	L to N	P
	- supplementary insulation: 1750 V		P
	- reinforced insulation: 3000 V	L/N to output terminal, L/N to enclosure	P
	After operation or interruption of a control, clearances and creepage distances across the functional insulation withstand the electric strength test of 16.3, the test voltage being twice the working voltage		P
	The appliance does not undergo a dangerous malfunction, and		P
	no failure of protective electronic circuits, if the appliance is still operable		P
	Appliances tested with an electronic switch in the off position, or in the stand-by mode:		P
	- do not become operational, or		P
	- if they become operational, do not result in a dangerous malfunction during or after the tests of 19.11.4		P
	If the appliance contains lids or doors that are controlled by one or more interlocks, one of the interlocks may be released provided that:		N
	- the lid or door does not move automatically to an open position when the interlock is released, and		N
	- the appliance does not start after the cycle in which the interlock was released		N
19.14	Appliances operated under the conditions of clause 11, any contactor or relay contact operating under the conditions of clause 11 being short-circuited		N

AS/NZS 60335.2.29			
Clause	Requirement + Test	Result - Remark	Verdict
	For a relay or contactor with more than one contact, all contacts are short-circuited at the same time		N
	A relay or contactor operating only to ensure the appliance is energized for normal use is not short-circuited		N
	If more than one relay or contactor operates in clause 11, they are short-circuited in turn		N
19.15	For appliances with a mains voltage selector switch, the switch is set to the lowest rated voltage position and the highest value of rated voltage is applied	No such switch	N
19.101	Battery chargers supplied at rated voltage and operated under normal operation (controls operating during tests of Cl. 11 being short-circuited) (AS/NZS 60335.2.29)		P
19.102	Reverse connection of the battery charger to a fully charged battery as specified (AS/NZS 60335.2.29)	The appliance did not work when reverse	P
	Battery charger operated while supplied at rated voltage (AS/NZS 60335.2.29)		P
19.103	Battery chargers in combination with a d.c. distribution board supplied at rated voltage and operated under normal operation until steady conditions are established (AS/NZS 60335.2.29)	No combination with a d.c. distribution board	N
	Load increased as specified until protective device operates (AS/NZS 60335.2.29)		N
22	CONSTRUCTION		P
22.101	Void		--
24	COMPONENTS		P
24.1	Components comply with safety requirements in relevant IEC standards		P
	List of components	(see appended table 24.1)	P

11.8	TABLE: Heating test, thermocouple measurements			P
	Test voltage (V).....	Condition A: 230x1.06=243.8Vac, 50Hz (AC charger mode)		--
	T1 (°C)	Condition A : 24.3		--
	T2 (°C)	Condition A : 24.6		--
	Duration	Operated until steady conditions.		--
temperature rise dT of part/at:	dT (K)			Required dT (K)
	Condition A	Condition B	Condition C	
Input connector near "L"	5.9	--	--	Ref.
For main board				
Varistor MOV1 body	8.1	--	--	30 (T85-55)
C87 body	2.7	--	--	70 (T125-55)
L4 coil	39.6	--	--	REF.
C46 body	8.1	--	--	45 (T100-55)
Relay RY1 coil	22.8	--	--	30 (65-30)
Relay RY2 coil	21.5	--	--	30 (65-30)
C90 body	7.1	--	--	70 (T125-55)
CT1 coil	20.6	--	--	55 (85-30)
L1 coil	3.4	--	--	Ref.
L2 coil	9.7	--	--	Ref.
C70 body	5.4	--	--	30 (T85-55)
PCB under Q16	10.2	--	--	For Cl.30
PCB under Q18	11.4	--	--	For Cl.30
PCB under Q20	9.31	--	--	For Cl.30
HCT	6.8	--	--	Ref.
C84 body	17.7	--	--	70 (T125-55)
TX5 coil	5.7	--	--	55 (85-30)
TX5 bobbin	3.8	--	--	For Cl.30
TX2 coil	0.4	--	--	55 (85-30)
TX2 bobbin	0.7	--	--	For Cl.30
TX1 coil	21.8	--	--	55 (85-30)
TX1 bobbin	31.1	--	--	For Cl.30
C9 body	6.6	--	--	70 (T125-55)
Optocoupler U8 body	8.1	--	--	Ref.
PCB under Q3	12.5	--	--	For Cl.30
PCB under Q9	4.2	--	--	For Cl.30

PCB under Q12	8.5	--	--	For Cl.30
PCB under F3	8.5	--	--	For Cl.30
For charge board				
RY1 coil	4.6	--	--	30 (65-30)
Optocoupler U6 body	3.9	--	--	Ref.
16-500243-00G board				
TX1 coil	5.3	--	--	55 (85-30)
TX1 bobbin	5.3	--	--	For Cl.30
RY2 coil	5.2	--	--	30 (65-30)
Board 16-500271-00G-E				
TX1 coil	6.3	--	--	55 (85-30)
TX1 bobbin	6.9	--	--	For Cl.30
16-600056-00G-F board				
RY1 coil	0.5	--	--	30 (65-30)
RY2 coil	0.4	--	--	30 (65-30)
Varistor MOV2	0.14	--	--	30 (T85-55)
Optocoupler U3	1.1	--	--	Ref.
Y-capacitor C10	0.29	--	--	70 (T125-55)
Y-capacitor C38	0.2	--	--	70 (T125-55)
TX1 coil	0.9	--	--	55 (85-30)
TX1 bobbin	0.9	--	--	For Cl.30
PCB under TX1	0.9	--	--	For Cl.30
PCB under Q8	1.1	--	--	For Cl.30
PCB under Q14	0.9	--	--	For Cl.30
PCB near BAT+	0.56	--	--	For Cl.30
E-capacitor C8	0.9	--	--	Ref.
Battery wire (connected to BAT+)	0.45	--	--	50 (T105-55)
Internal wire bigger inductor 1	1.1	--	--	50 (T105-55)
Bigger inductor 1 coil (fixed to enclosure)	0.6	--	--	Ref.
Bigger inductor 2 coil (fixed to enclosure)	0.74	--	--	Ref.
R232 board(16-500245-00G)				
TX1 coil	4.8	--	--	55 (85-30)
TX1 bobbin	4.9	--	--	For Cl.30
AC output wire inside	7.3	--	--	50 (T105-55)
Enclosure top outside near Main board	1.1	--	--	30 (60-30)

Enclosure bottom outside near Main board	4.6	--	--	30 (60-30)	
Floor of test corner	3	--	--	35 (65-30)	
temperature rise dT of part/at:	R ₁ (Ω)	R ₂ (Ω)	dT (K)	Limit dT (K)	Insulation class
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information:					
1) appliance is test on horizontal position due to its normal working position.					

17	TABLE: overload of transformer and associated circuit				P
	ambient temperature (°C)			25°C or see below	—
No.	location	fault	test voltage (V)	test time	result
Test on model PIP 4048MS (under AC charger mode condition)					
1	Transformer TX2 (on main board) output pin	o-l	243.8Vac	30min	Due to the design of equipment, it was difficult to make overload for secondary of transformer. the unit was abnormal when overload, no hazard.
2	Transformer TX5 (on main board) output pin	o-l	243.8Vac	30min	Due to the design of equipment, it was difficult to make overload for secondary of transformer. the unit was abnormal when overload, no hazard.
3	Transformer TX6 (on main board) output pin	o-l	243.8Vac	30min	Due to the design of equipment, it was difficult to make overload for secondary of transformer. the unit was abnormal when overload, no hazard.
4	Transformer TX8 (on main board) output pin	o-l	243.8Vac	30min	Due to the design of equipment, it was difficult to make overload for secondary of transformer. the unit was abnormal when overload, no hazard.
5	Transformer TX9 (on main board) output pin	o-l	243.8Vac	30min	Due to the design of equipment, it was difficult to make overload for secondary of transformer. the unit was abnormal when overload, no hazard.

6	Transformer TX1 (on main board) output pin	o-l	243.8Vac	3hours 50min	Unit temperature sable load to 30A Max, no damaged, no hazards. The Max. Temperature rise were: For main board: PCB under Q18: 15.3K; PCB under Q20: 12.4K; PCB under Q12: 10.5K; PCB under F3: 9.7K; TX1 coil: 28.9K, TX2 coil: 4.5K, TX5 coil: 7.1K; For board 16-500243-00G: TX1 coil: 4.3K; For board 16-500271-00G-E: TX1 coil: 4.7K; For board 16-600056-00G-F: TX1 coil: 4.8K; For board 16-500245-00G: TX1 coil: 8.4K, Ambient: 24.7°C.
7	DC output	o-l	243.8Vac	5hours	Unit temperature sable load to 30A Max, no damaged, no hazards. The Max. Temperature rise were: For main board: TX1 coil: 74.7K, TX2 coil: 21.4K, TX5 coil: 21.3K; For board 16-500243-00G: TX1 coil: 18.8K; For board 16-500271-00G-E: TX1 coil: 22.0K; For board 16-600056-00G-F: TX1 coil: 15.0K; For board 16-500245-00G: TX1 coil: 18.3K, Ambient: 24.8°C.
8	DC output	S-C	243.8Vac	10min	The DC fuse opened, the unit is working in fault mode, no any output, no hazards.
Test on model PIP 4048MS (under solar charger mode condition)					
Remark: "s-c"= short circuit, "o-l"=overload					

19		TABLE: abnormal operation tests				P
		ambient temperature (°C)			25°C	—
No.	component No.	fault	test voltage (V)	test time	result	
Test on model PIP 4048MS (under AC charger mode condition)						
1	Battery	Reverse d	230Vac	10min	Unit is working in fault mode immediately, no any output, no damaged, no hazards.	

2	Ventilation	Block	230Vac	1h36 min	Unit temperature sable, no hazards, no damaged. The Max. Temperature rise were: For main board: TX1 coil: 59.0K, TX2 coil: 21.0K, TX5 coil: 23.0K; For board 16-500243-00G: TX1 coil: 13.3K; For board 16-500271-00G-E: TX1 coil: 24.6K; For board 16-600056-00G-F: TX1 coil: 19.3K; For board16-500245-00G: TX1 coil: 8.8K, Ambient: 24.8°C.
3	Fan 1	Lock	230Vac	30min	Unit temperature sable, no hazards, no damaged. The Max. Temperature rise were: For main board: TX1 coil: 74.4K, TX2 coil: 16.5K, TX5 coil: 24.2K; For board 16-500243-00G: TX1 coil: 21.2K; For board 16-500271-00G-E: TX1 coil: 23.7K; For board 16-600056-00G-F: TX1 coil: 14.0K; For board16-500245-00G: TX1 coil: 20.1K, Ambient: 24.6°C.
4	Fan 2	Lock	230Vac	30min	Unit temperature sable, no hazards, no damaged. The Max. Temperature rise were: For main board: TX1 coil: 74.7K, TX2 coil: 21.4K, TX5 coil: 21.3K; For board 16-500243-00G: TX1 coil: 18.8K; For board 16-500271-00G-E: TX1 coil: 22.0K; For board 16-600056-00G-F: TX1 coil: 15.0K; For board16-500245-00G: TX1 coil: 18.3K, Ambient: 24.8°C.
Test on model PIP 4048MS for main board (under AC charger mode condition)					
5	Q36 Pin 2-3	S-C	230Vac	10min	Unit shutdown immediately, no damaged, no hazards
6	Q37 Pin 2-3	S-C	230Vac	10min	R242 damaged, no hazards.
7	C37	S-C	230Vac	10min	Normal operation, no damaged, no hazards.
8	Transformer TX1 output pin	S-C	230Vac	10min	Unit shutdown immediately, unrecoverable, no hazards
9	Transformer TX2 output pin	S-C	230Vac	10min	Unit shutdown immediately, unrecoverable, no hazards
10	Transformer TX5 output pin	S-C	230Vac	10min	Unit shutdown immediately, unrecoverable, no hazards

11	Transformer TX6 output pin	S-C	230Vac	10min	Q37 damaged, no hazards.
12	Transformer TX8 output pin	S-C	230Vac	10min	Unit shutdown immediately, unrecoverable, no hazards
13	Transformer TX9 output pin	S-C	230Vac	10min	Unit shutdown immediately, no damaged, no hazards
14	U8 Pin 1-2	S-C	230Vac	10min	Unit normal operation, no damaged, no hazards
15	U8 Pin 3-4	S-C	230Vac	10min	Unit shutdown immediately, no damaged, no hazards
16	U8 Pin 1	O-C	230Vac	10min	Unit normal operation, no damaged, no hazards
17	U18 Pin 1-2	S-C	230Vac	10min	Unit normal operation, no damaged, no hazards
18	U18 Pin 3-4	S-C	230Vac	10min	Unit normal operation, no damaged, no hazards
19	U18 Pin 1	O-C	230Vac	10min	Unit normal operation, no damaged, no hazards
Test on model PIP 4048MS for board 16-600056-00G-F (under AC charger mode condition)					
20	C8	S-C	230Vac	10min	Normal operation, no damaged, no hazards.
21	Q8 Pin 2-3	S-C	230Vac	10min	Unit will word in fault mode, no damaged, no hazards
22	Q14 Pin 2-3	S-C	230Vac	10min	Unit will word in fault mode, no damaged, no hazards
Remark: "S-C"= short circui, "O-C"= open circui					

24.1	TABLE: Components					P
object/part No.	manufacturer/ trademark	type/model	technical data	standard	mark(s) of conformity ¹⁾	
Metal enclosure	--	--	Min. thickness: 1.5m m	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance	
AC terminal blocks	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO., LTD.	TR-6N-01-3P- BK	600V, 50A	UL 1059	UL E332956	
DC terminal blocks	SHENZHEN SUCCEED ELECTRONICS TECHNOLOGY CO., LTD.	TR-6N-01-2P- BK	600V, 50A	UL 1059	UL E332956	
Switch	Rong Feng Industrial Co., Ltd	RF-1033	250Vac, 6A	EN 61058-1	VDE 40021707, UL E94138	
Circuit breaker	TOPSTONE	L1	125/250Vac,	EN 60934:2001	TUV RH(R	

	CORP (E244552)		40A		50046704)
DC Fans	ADDA CORPORATION	AD0812XB- A7BGP	DC12V, 0.55A	UL 507	UL E132139
Bigger choke 1 and 2 (fixed to enclosure)	DINGMEI	41-110135-00G	130°C	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
Mylar sheet (above main board)	SHIN-ETSU CHEMICAL CO LTD	TC-(xxxx)TCI	V-0, 0.2mm, 150°C	UL 94	UL E48923
Insulation sheet (under display board)	TEIJIN LIMITED RESIN AND PLASTIC	PC- (c1)(b2)(c2)(#)	115°C, Min. 1.5mm thickness	UL 94	UL E50075
Internal wiring	VEGA TECHNOLOGIE S INDUSTRIAL (AUSTRIA) CO	1015	10AWG, 105°C	UL758	UL E189529
Alternate	YONG HAO ELECTRICAL INDUSTRY CO LTD	1015	10AWG, 105°C	UL758	UL E240426
Alternate	Various	Various	Min. 10AWG, 105°C	UL758	UL
Heat shrink tube	CHANGYUAN ELECTRONICS (SHENZHEN) CO LTD	CB-HFT	600V, 125°C	UL224	UL E180908
For Main board(16-500242-00G)					
Varistor (MOV1) (for model PIP 4048MS),	BRIGHTKING (SHENZHEN) CO., LTD	561KN20	300Vac, 385Vdc	EN 61051-1, IEC61051- 2/A1, UL 1449	VDE UL E327997
Varistor (MOV1) (for model PIP 3248MS)	BRIGHTKING (SHENZHEN) CO., LTD	471KN20	300Vac, 385Vdc	EN 61051-1, IEC61051- 2/A1, UL 1449	VDE UL E327997
Y-Cap (C59, C60)	JUHONG ELE CO	JA	1000pF, min. 250Vac, min. 85°C	IEC 60384- 14	VDE UL E253194
Alternate	Various	Various	1000pF, min. 250Vac, min. 85°C	IEC 60384- 14	VDE UL
Y-Cap (C119, C120, C121, C122, C52, C53, C70, C71)	JUHONG ELE CO	JA	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384- 14	VDE UL E253194
Alternate	Various	Various	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384- 14	VDE UL
X-Cap(C72)	FARAD ELECTRONICS CO., LTD	PXK	Max. 0.22uF, Rated: 275Vac, min. 100°C	IEC 60384- 14	VDE UL E247953
X2-Cap (C33)	FARAD ELECTRONICS CO LTD	PXK	Max. 20uF, Rated: 275Vac, min. 100°C	IEC 60384- 14	VDE, UL E247953
X2-Cap (C17)	FARAD ELECTRONICS	PXK	Max. 0.47uF, Rated: 275Vac,	IEC 60384- 14	VDE, UL E247953

	CO LTD		min. 100°C		
Relay (RY1, RY2, RY3, RY4)	SONG CHUAN PRECISION CO., LTD	832HA-1A-F-C	277Vac, 40A	EN 60255-23, EN 61810-1, EN 61810-5, UL508.	UL E88991
E-Cap (C40, C41)	--	--	470uF, 500Vac, 105°C	--	--
IGBT(QB2, QD2, QA1, QC1, Q28, Q27, Q29, Q30, Q31, Q32,)	--	--	45A, 600V	--	--
Mosfet (Q19, Q13, Q18, Q23, Q24, Q11, Q17, Q20, Q38, Q21, Q22, Q12, Q40, Q26, Q25, Q14) (for model PIP 4048MS)	--	--	120A, 75V	--	--
Mosfet (Q13, Q18, Q23, Q11, Q17, Q20, Q21, Q22, Q12, Q26, Q25, Q14) (for model PIP 3248MS)	--	--	120A, 75V	--	--
Thermistor (NTCCN4-HS3, NTCCN8-HS1)	Latron Co., Ltd	LNTA153@W*	15Kohm at 25°C	UL 1434	UL E306546
Chock(L2)	CLICK	41-110111-00G	1mH, 130°C	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
Chock(L4)	DINGMEI	SP36123B-00SS	400uH, 130°C	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
Chock (L1)	DINGMEI	41-110103-00G	120uH, 130°C	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
Current transformer (CT1)	DINGMEI	41-020027-00G	Class B (130°C)	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of CT1	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
Current transformer (HCT1)	DINGMEI	41-025003-00G	Class B (130°C)	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of HCT1	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
Opto coupler (U8, U13, U11, U17,	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. ≥6,5 mm / ≥6,5	IEC 60747-5-2: 1997 + A1: 2002	VDE 101347 UL E169586

U18)			mm / >0,4 mm, 55/115/21		
Transformer (TX1)	CLICK	41-070237-00G	Class F(155°C)	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin	E I DUPONT DE NEMOURS & CO INC	410	V-0, 200°C, Min. 0.51mm thickness	UL 94	UL E34739
--Insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF	180°C	UL 510	UL E165111
--Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF	180°C	UL 510	UL E165111
--Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	PEWF/U, UEWN/U	155°C	UL 1446	UL E201757
Alternate	TAI-I ELECTRIC WIRE & CABLE CO LTD	UEWF	155°C	UL 1446	UL E85640
--Tubing	GREAT HOLDING INDUSTRIAL CO LTD	TFL	200°C	UL 224	UL E156256
--Varnish	JOHN C DOLPH CO	BC-346A	Min. 200°C	UL 1446	UL E317427
Alternate	ELANTAS ELECTRICAL INSULATION ELANTAS PDG INC	V1630FS	Min. 155°C	UL 1446	UL E75225
Transformer (TX10, TX11)	CLICK	41-070183-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of TX10, TX11	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
Transformer (TX5, TX8)	Rong Chyuan Technology Corporation	EE16	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Triple insulated wire of TX5, TX8	FURUKAWA ELECTRIC CO., LTD	TEX-E	130°C	UL 2353	UL E206440
--Bobbin of TX5, TX8	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
Transformer (TX7)	CLICK	41-070184-00G	Class B	AS/NZS 60335.1, AS/NZS	Test with appliance

				60335.2.29	
--Bobbin of TX7	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
Transformer (TX6)	CLICK	41-070185-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of TX6	CHANG CHUN PLASTICS CO LTD	T375J	Phenolic, V-0, 150°C, Min. 0.75mm thickness	UL 94	UL E59481
Transformer (TX2)	CLICK	41-070186-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of TX2	CHANG CHUN PLASTICS CO LTD	T375J	Phenolic, V-0, 150°C, Min. 0.75mm thickness	UL 94	UL E59481
Transformer (TX9)	CLICK	41-070194-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of TX9	CHANG CHUN PLASTICS CO LTD	T375J	Phenolic, V-0, 150°C, Min. 0.75mm thickness	UL 94	UL E59481
DC fuse (F3)	LITTELFUSE AUTOMOTIVE GMBH	BTF1	200A, 58Vdc	UL 248-1 UL 248-14	UL E211637
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB6160	V-0, 130°C	UL94	UL E123995
Charge board(16-500244-00C)					
Opto coupler (U6, U8)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. ≥6,5 mm / ≥6,5 mm / >0,4 mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE 101347 UL E169586
Relay (RY1)	SONG CHUAN PRECISION CO., LTD	897P1-1AH-C	14Vac,70A	IEC/EN 60950- 1	Test in appliance
X-Cap(C5)	FARAD ELECTRONICS CO., LTD	PXK	Max. 0.1uF, min. 250Vac, min. 100°C	IEC 60384- 14	VDE UL E247953
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB6160	V-0, 130°C	UL94	UL E123995
Mini board(16-500237-00G)					
Transformer (TX1)	Rong Chyuan Technology Corporation	41-070193-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin of TX1	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
-Triple insulated wire	FURUKAWA ELECTRIC CO.,	TEX-E	130°C	UL 2353	UL E206440

	LTD				
Opto coupler (U1, U2)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE(101347) UL(E169586)
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB5150	V-0, 130°C, Min. thickness 1.6mm	UL94	UL E123995
Board 16-600056-00G					
Transformer (TX1)	Rong Chyuan Technology Corporation	41-070209-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
--Insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ	130°C	UL 510	UL E165111
--Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF	130°C	UL 510	UL E165111
--Magnet wire	SHENZHEN DAYANG INDUSTRY CO LTD	xUEW-NY	130°C	UL 1446	UL E176101
--Tubing	ZEUS INDUSTRIAL PRODUCTS INC	TFE-TW-300	300V, 200°C	UL 224	UL E64007
Opto coupler (U3, U5, U6)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE(101347) UL(E169586)
Alternate	COSMO Electronics Corporation	KPC 357 NT	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, Min. 100°C	DIN EN 60747-5-2: 2001-01	VDE 40014684
Y-Cap (C37, C10, C11, C38)	JUHONG ELE CO	JA	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL E253194
Alternate	Various	Various	Max. 10000pF, min. 250Vac, min. 85°C	IEC 60384-14	VDE UL
Varistor (MOV1, MOV2)	JOYIN CO LTD	14N471K	300Vac, 385Vdc	EN 61051-1, IEC61051-2/A1, UL 1449	VDE UL E325508
Relay (RY1, RY2)	NEC TOKIN CORP	897P1-1AH-C	12Vdc, 133mA	EN 60255-23, EN 61810-1, EN 61810-5, UL508.	UL E73266 TUV
PCB	KINGBOARD LAMINATES	KB5150	V-0, 130°C, Min. thickness	UL94	UL E123995

	HOLDINGS LTD		1.6mm		
Board 16-500243-00G					
Opto coupler (U1,U3,U7,U8,U9,U10)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE(101347) UL(E169586)
Alternate	COSMO Electronics Corporation	KPC 357 NT	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, Min. 100°C	DIN EN 60747-5-2: 2001-01	VDE 40014684
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB5150	V-0, 130°C	UL94	UL E123995
Board 16-500271-00G					
Transformer (TX1, TX2)	Rong Chyuan Technology Corporation	41-070209-00G	Class B	AS/NZS 60335.1, AS/NZS 60335.2.29	Test with appliance
--Bobbin	SUMITOMO BAKELITE CO LTD	PM-9820	V-0, 150°C, Min. 0.51mm thickness	UL 94	UL E41429
--Insulation tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PZ	130°C	UL 510	UL E165111
--Margin tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF	130°C	UL 510	UL E165111
--Magnet wire	SHENZHEN DAYANG INDUSTRY CO LTD	xUEW-NY	130°C	UL 1446	UL E176101
--Tubing	ZEUS INDUSTRIAL PRODUCTS INC	TFE-TW-300	300V, 200°C	UL 224	UL E64007
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB5150	V-0, 130°C, Min. thickness 1.6mm	UL94	UL E123995
Board 16-000285-00G					
Opto coupler (U2)	COSMO ELECTRONICS CORP	K1010	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, 55/115/21	IEC 60747-5-2: 1997 + A1: 2002	VDE(101347) UL(E169586)
Alternate	COSMO Electronics Corporation	KPC 357 NT	Int. CR / Ext. CR / Dti. $\geq 6,5$ mm / $\geq 6,5$ mm / $> 0,4$ mm, Min. 100°C	DIN EN 60747-5-2: 2001-01	VDE 40014684
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB5150	V-0, 130°C, Min. thickness 1.6mm	UL94	UL E123995
PCB (for	KINGBOARD	KB5150	V-0, 130°C,	UL94	UL E123995

board16-000225-00G-A, 16-000290-00G-A)	LAMINATES HOLDINGS LTD		Min. thickness 1.6mm		
Supplementary information: ¹⁾ An asterisk indicates a mark which assures the agreed level of surveillance					

Photo documentation
Photo 1 (for all models)



Photo 2 (for all models)



Photo 3 (for all models)



Photo 4 (for model PIP 4048MS)



Photo 5 (for model PIP 4048MS)

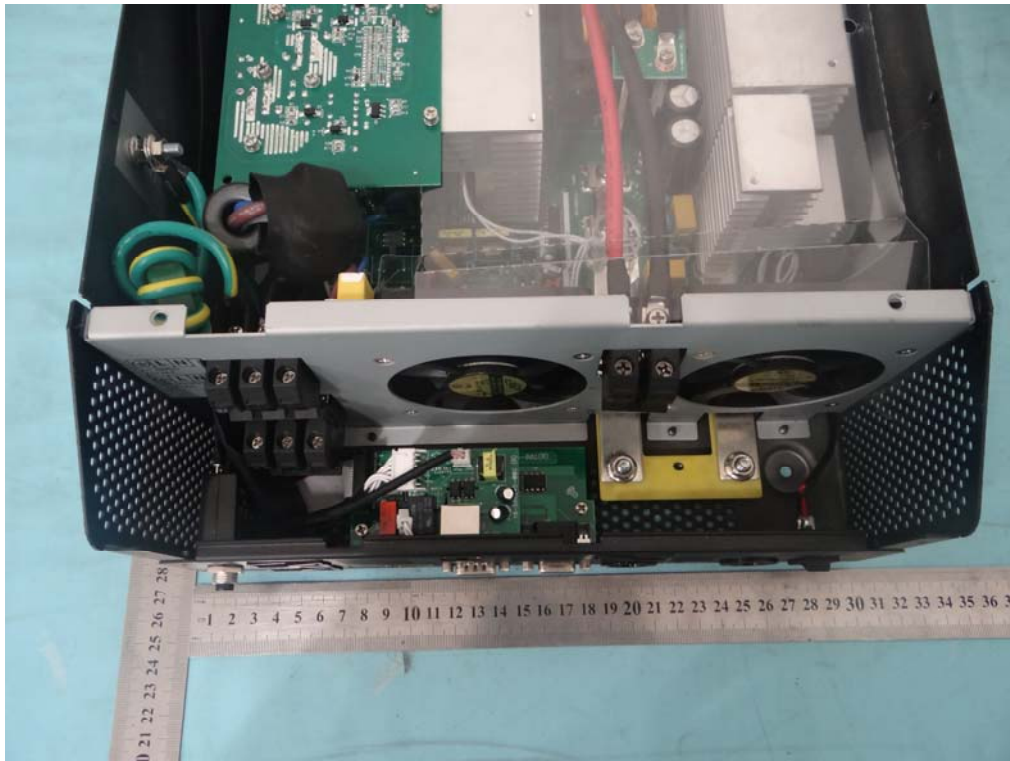


Photo 6 (for model PIP 3248MS)

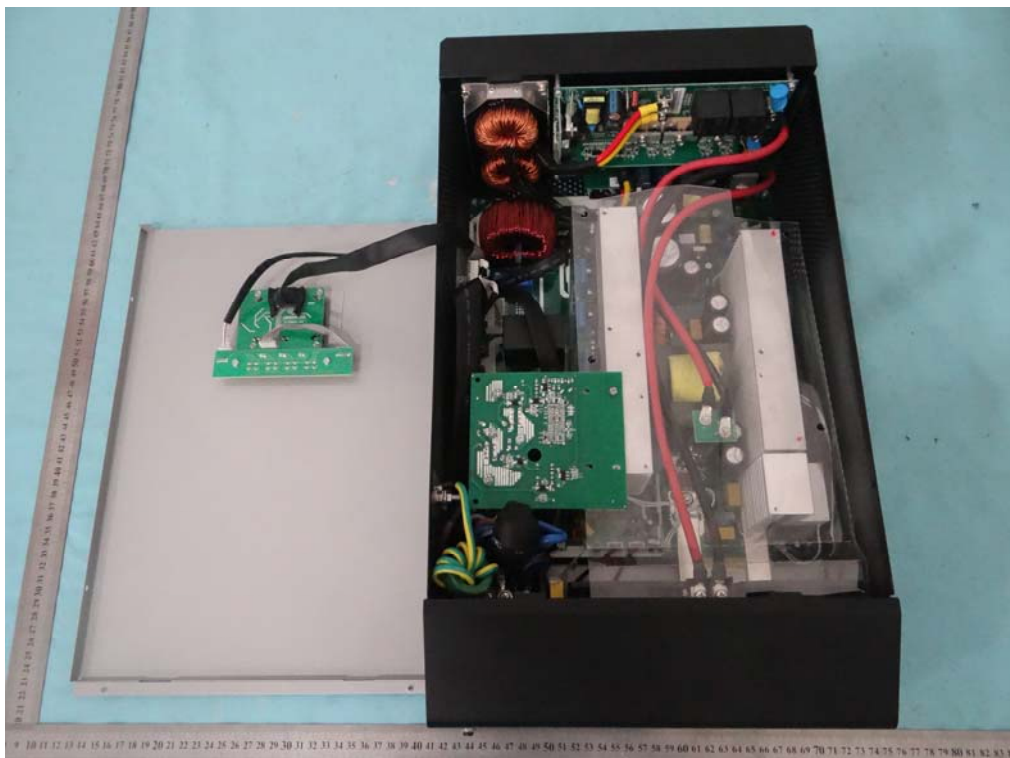


Photo 7 (for all models)

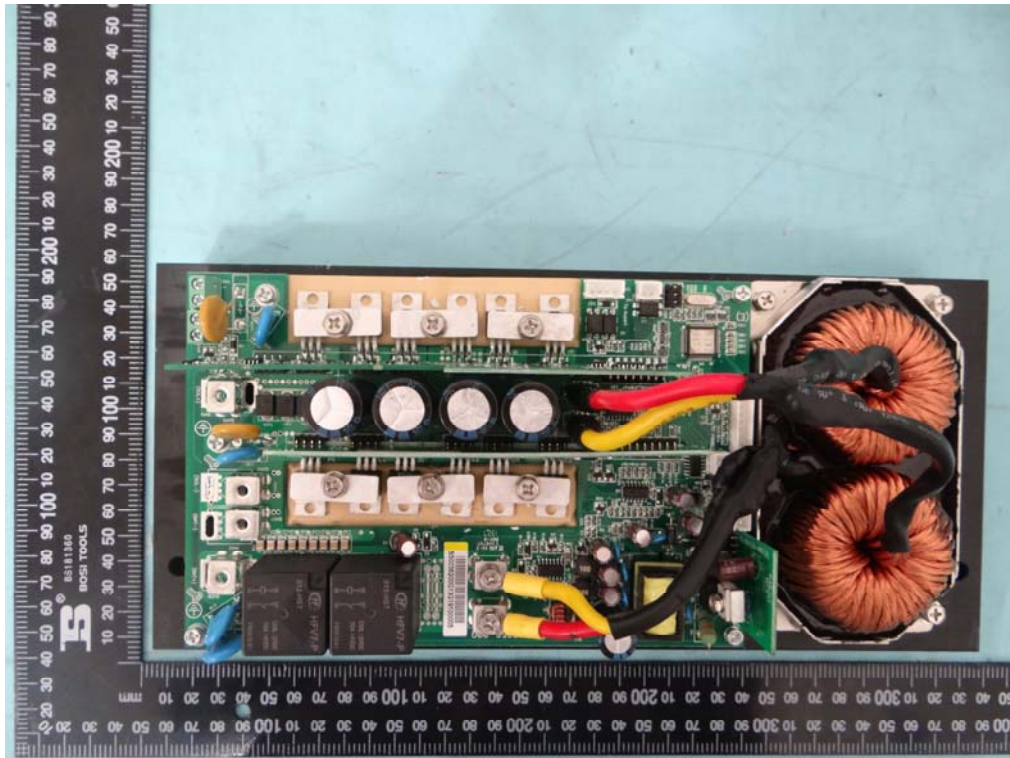


Photo 8 (for all models)

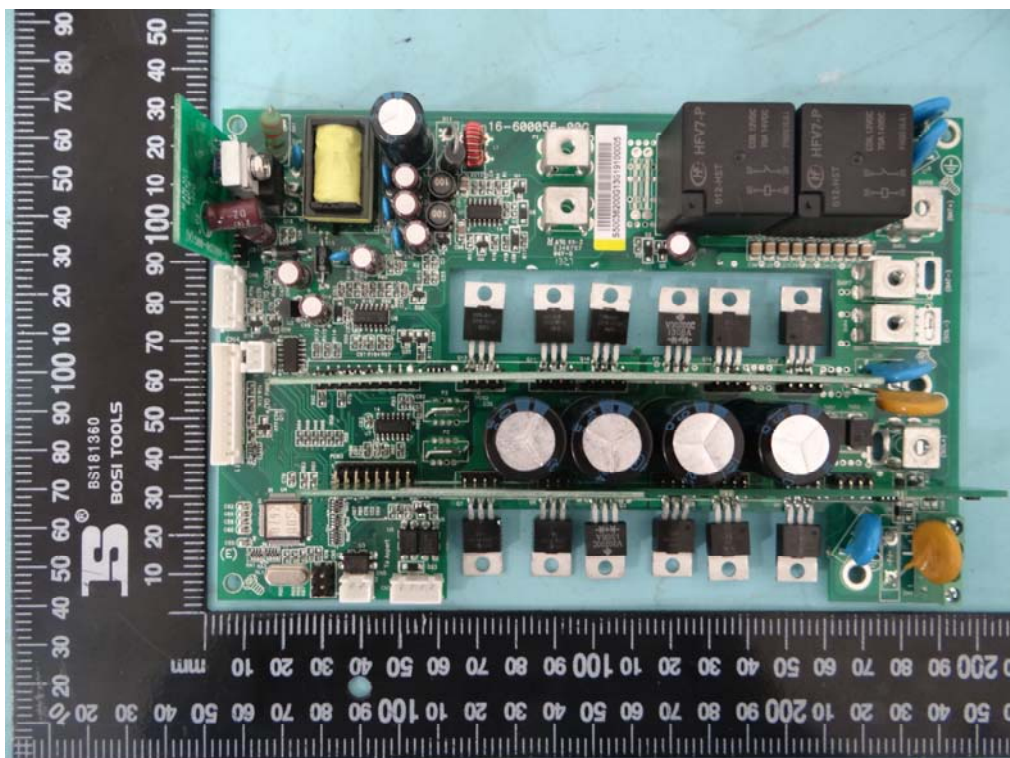


Photo 9 (for all models)

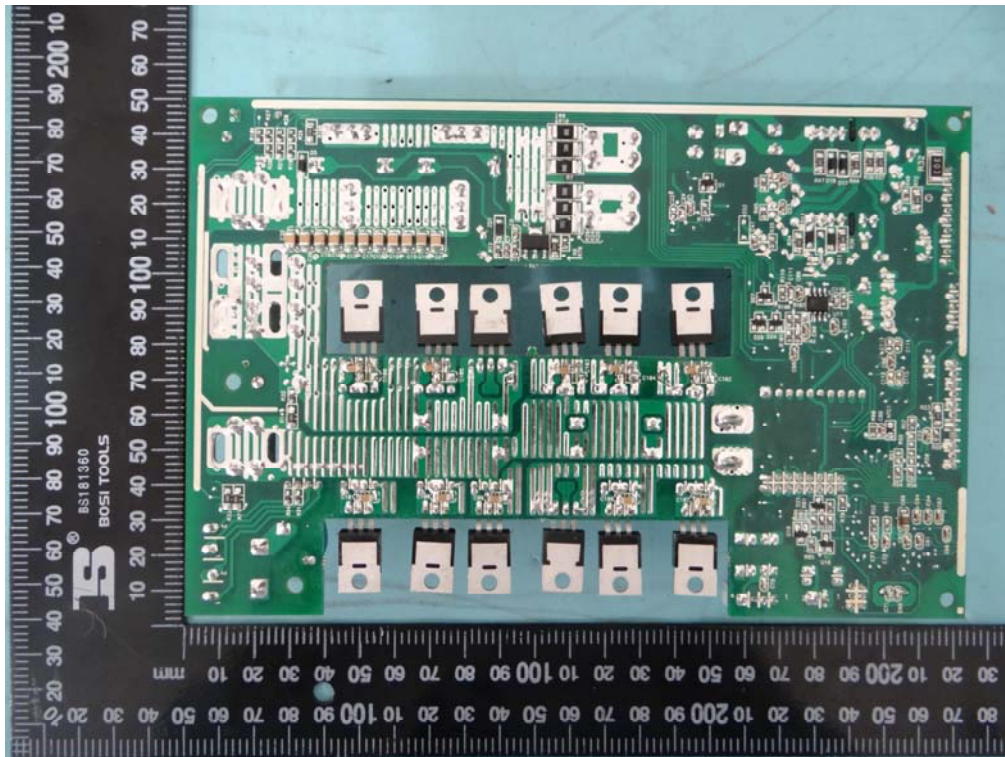


Photo 10 (for model PIP 4048MS)

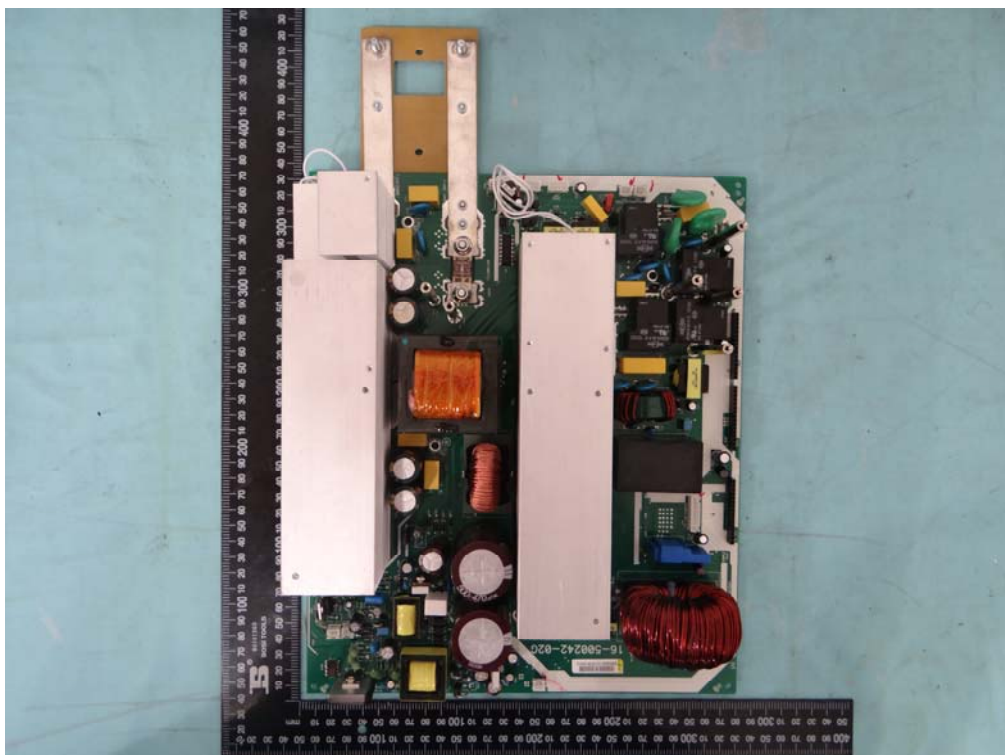


Photo 11 (for model PIP 4048MS)

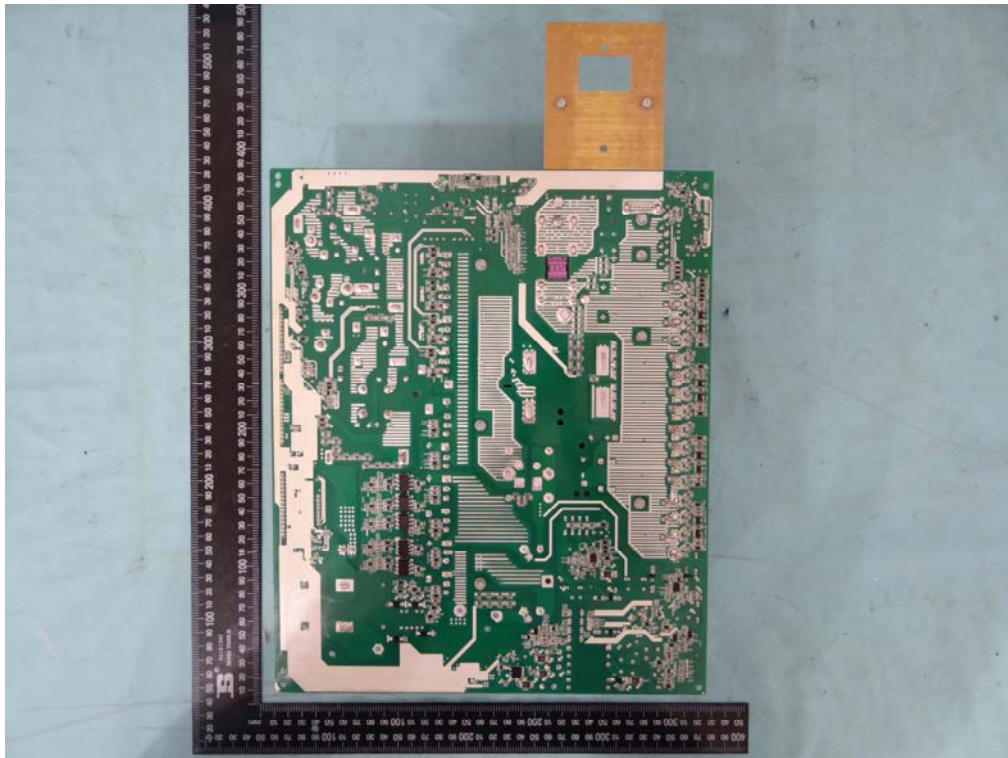


Photo 12 (for all models)

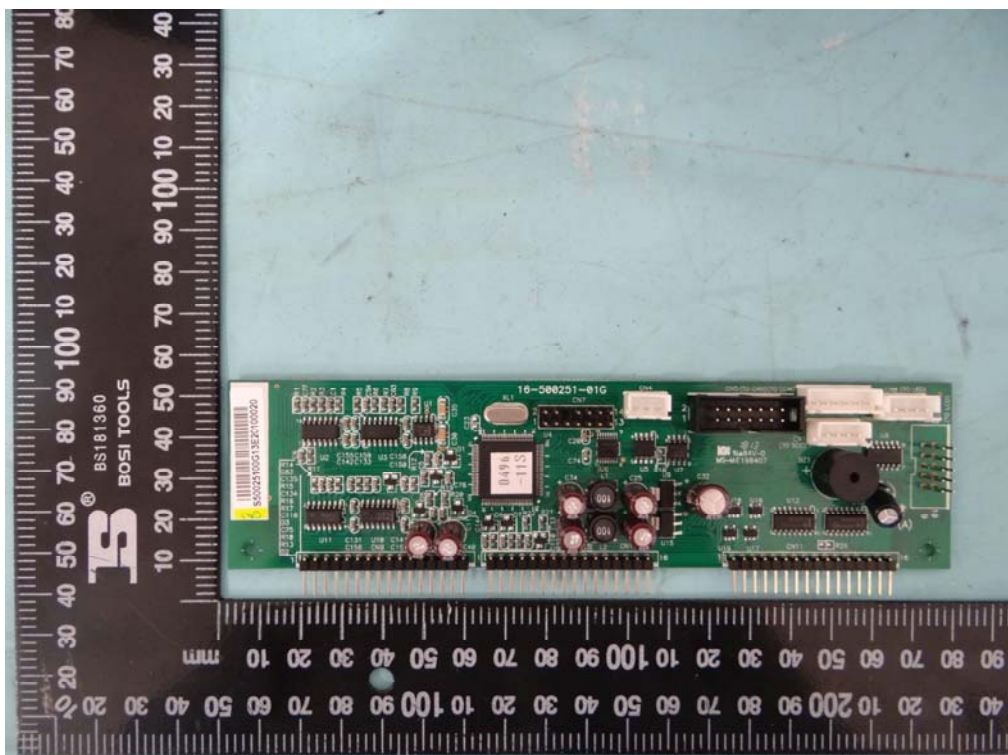


Photo 13 (for all models)

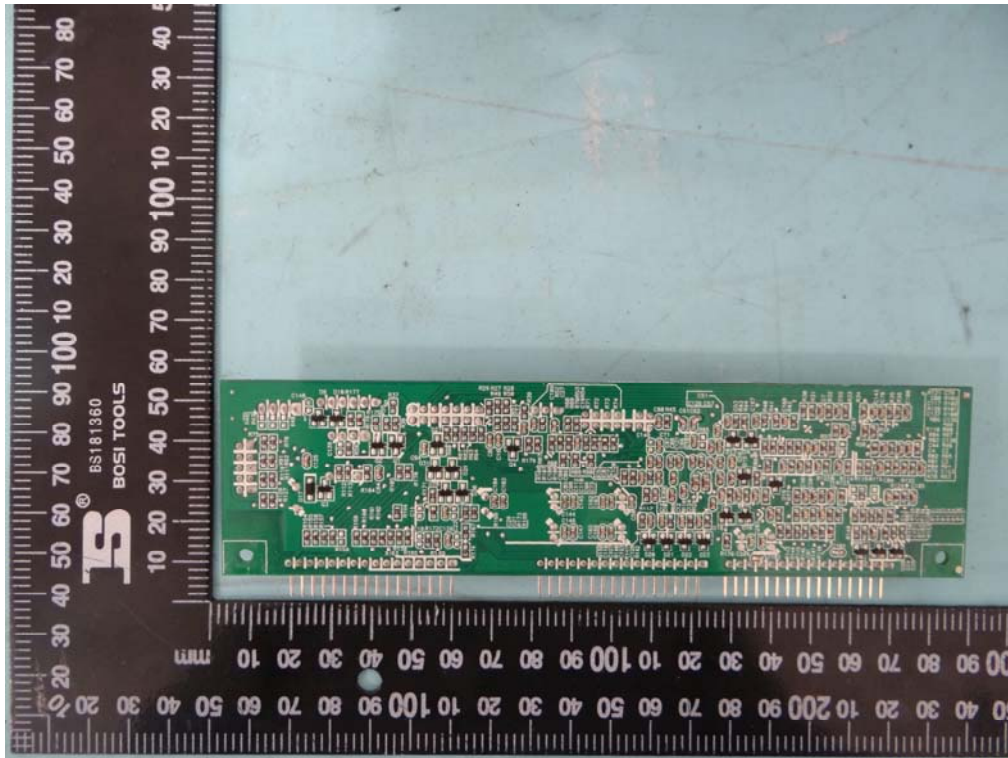


Photo 14 (for all models)

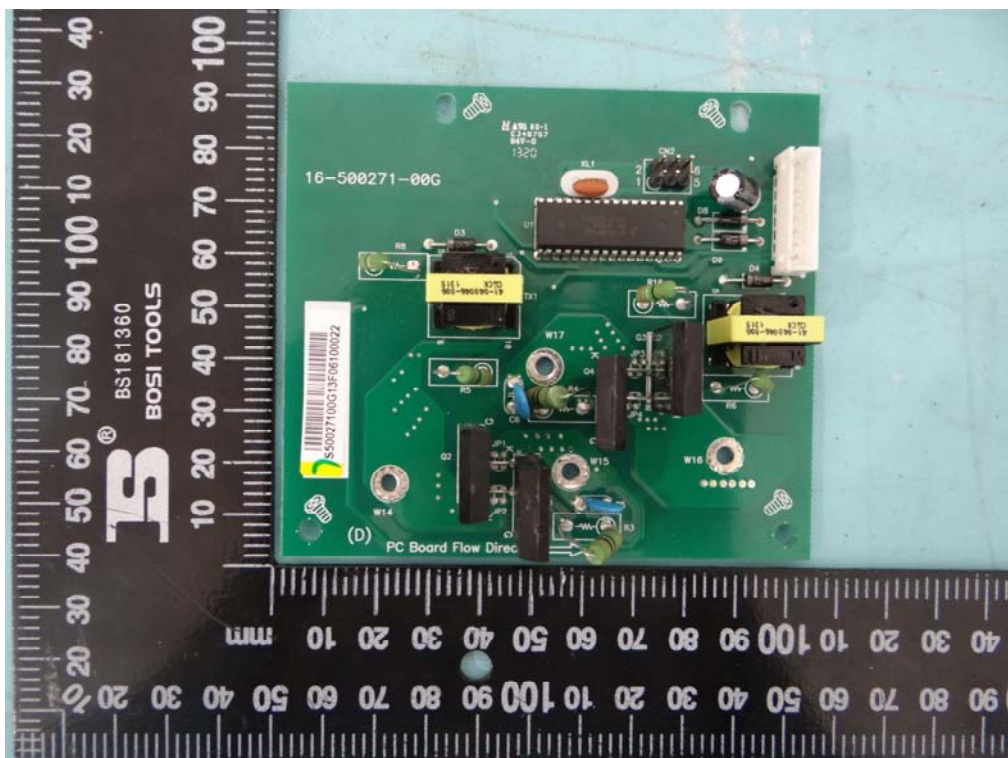


Photo 15 (for all models)

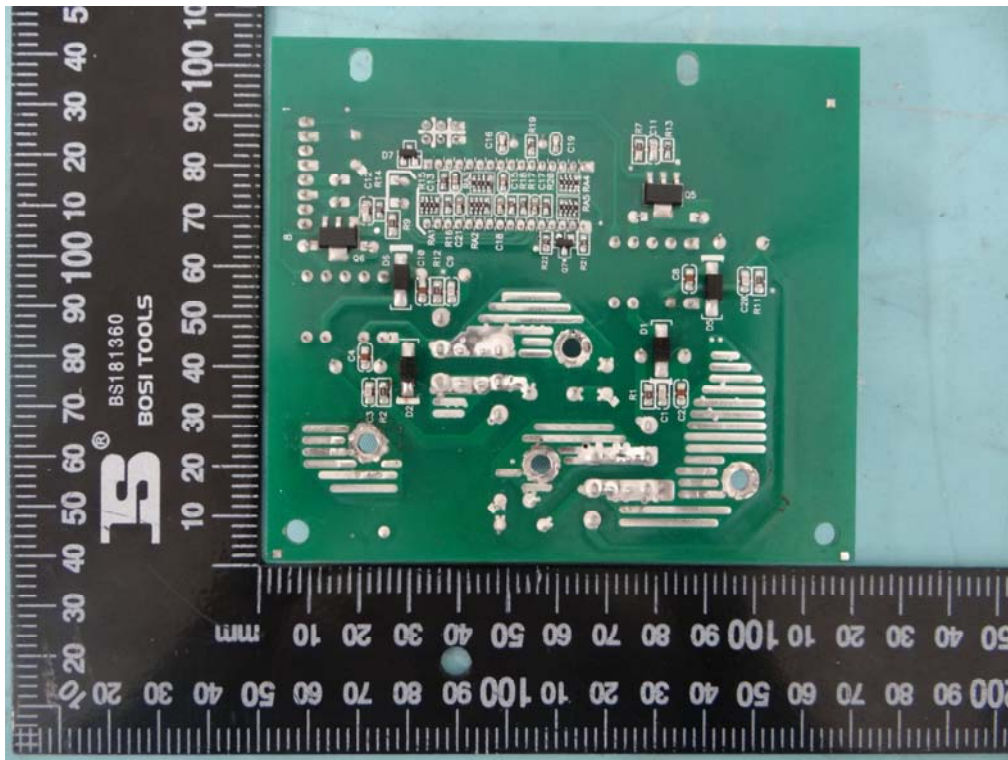


Photo 16 (for all models)

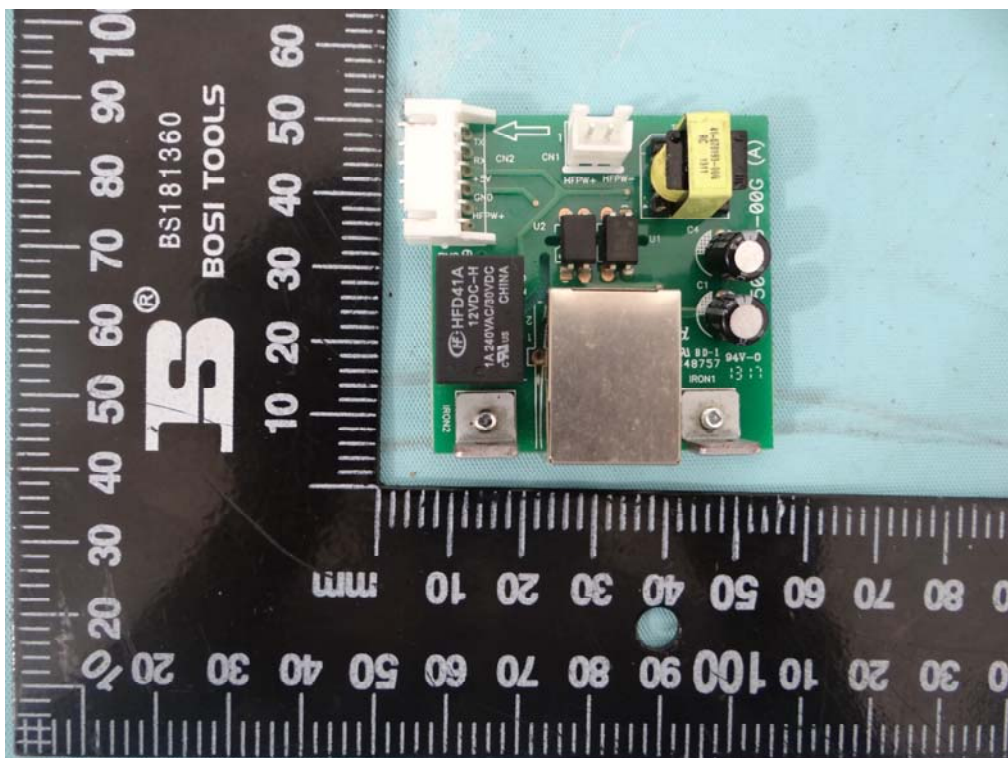


Photo 21 (for all models)

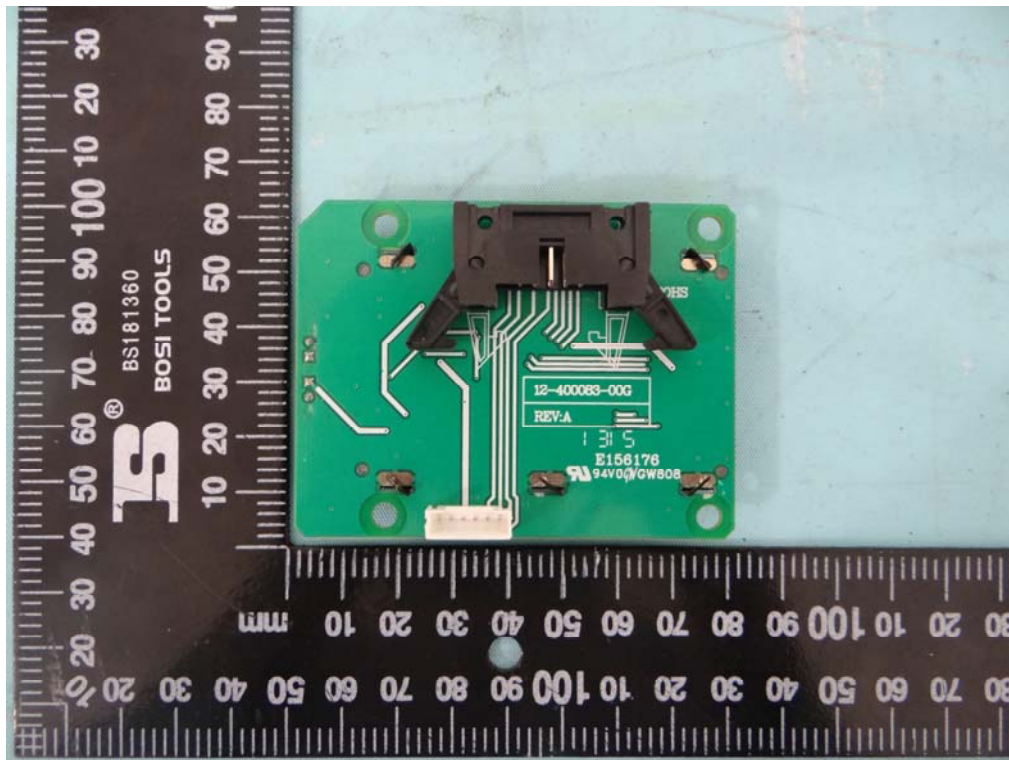


Photo 22 (for all models)

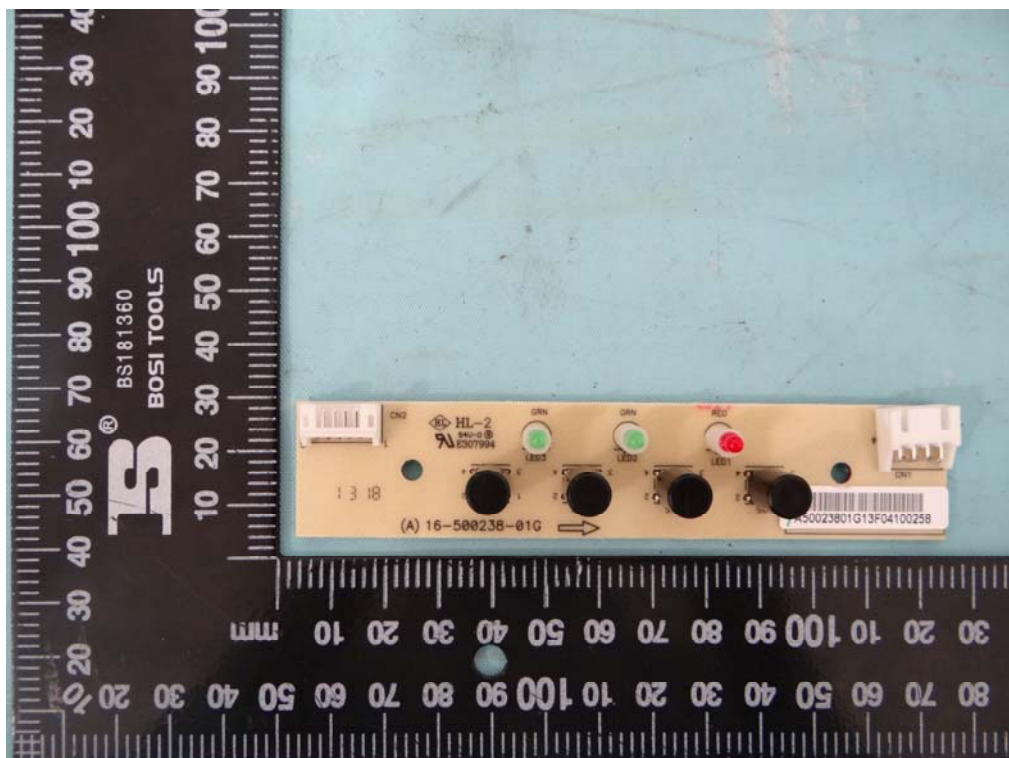


Photo 23 (for all models)

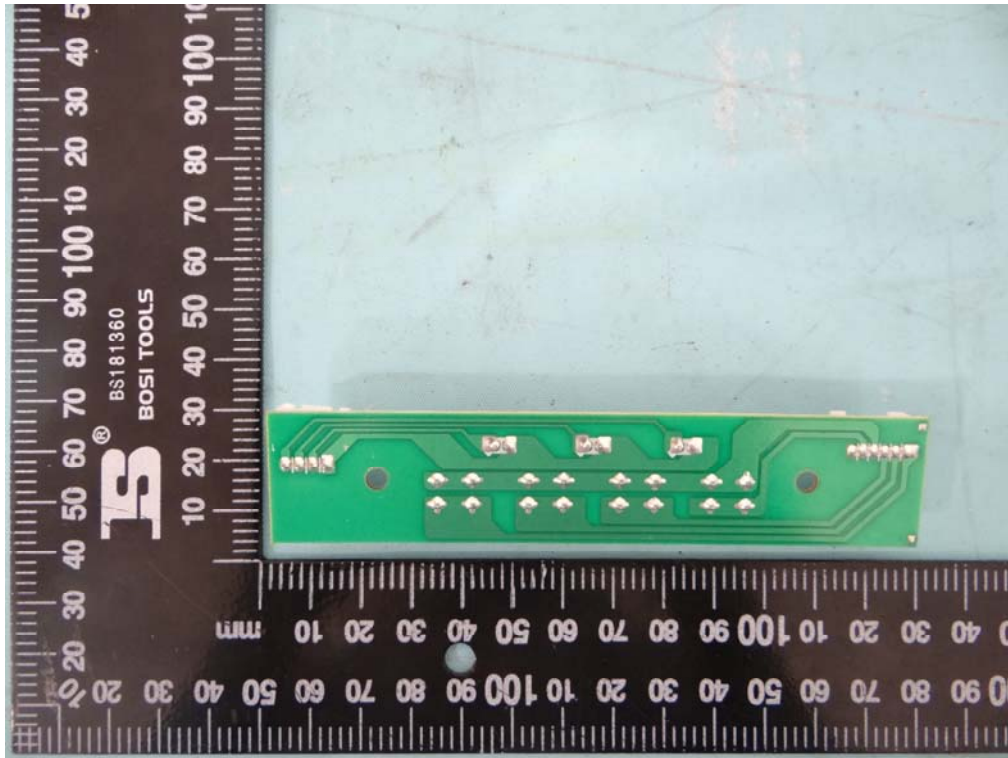


Photo 24 (for model PIP 3248MS)

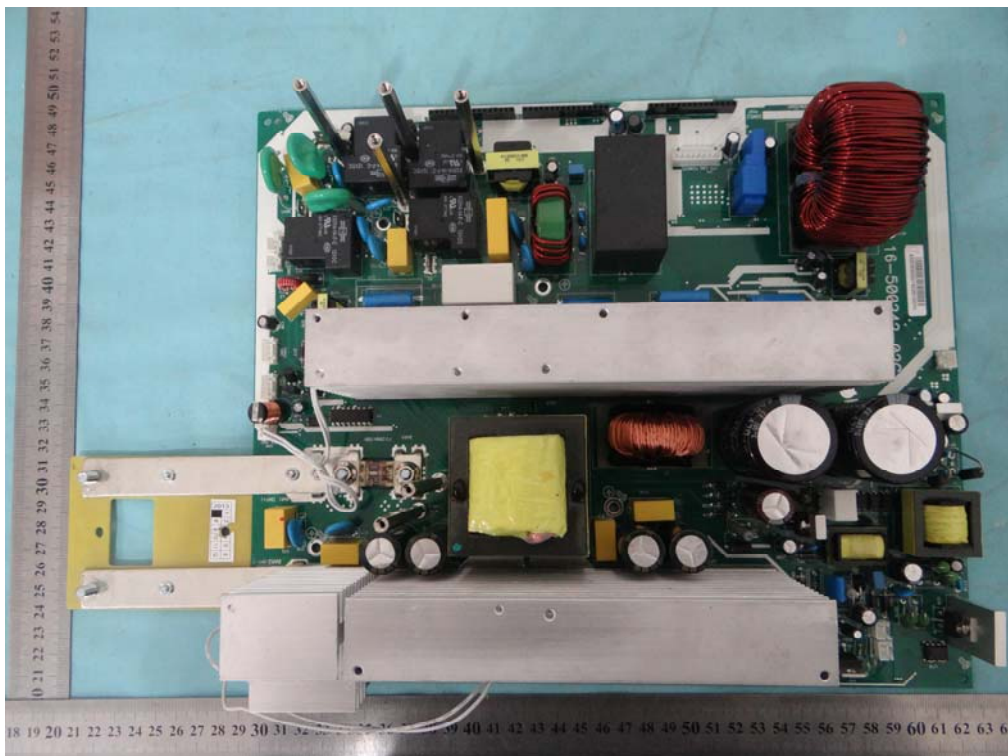
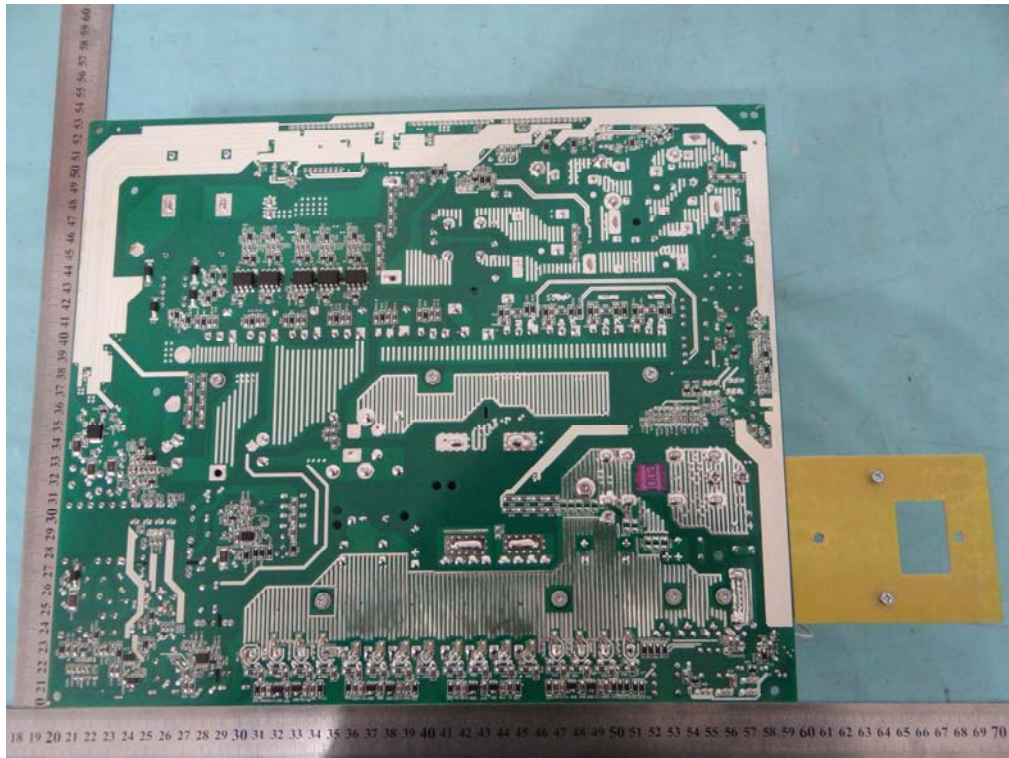


Photo 25 (for model PIP 3248MS)



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