UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2007-03-27 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No. 60950-1-07, 2nd Edition, 2007-03 (Information Technology Equipment - Safety - Part 1: General Requirements)
Certification Type:	Component Recognition
CCN:	QQGQ2, QQGQ8 (Power Supplies for Information Technology Equipment Including Electrical Business Equipment)
Product:	Power Supply
Model:	HWS100-3, HWS100-5, HWS100-12, HWS100-15, HWS100-24, HWS100-48, HWS80-3, HWS80-5, HWS80-12, HWS80-15, HWS80-24, HWS80-48 (Maybe followed by suffix "/xyz" (x is R, B or blank, y is A or blank, z is CO or blank) and may be followed by suffix HD or HDA.), and HWS100-24/CQC
Rating:	Input: AC 100-240 V, 50/60 Hz, 1.0 A (for Model HWS100-3) AC 100-240 V, 50/60 Hz, 0.8 A (for Model HWS80-3) AC 100-240 V, 50/60 Hz, 1.1 A (for Models HWS80-5, HWS80-12, HWS80-15, HWS80-24, and HWS80-48) AC 100-240 V, 50/60 Hz, 1.4 A (for Models HWS100-5, HWS100-12, HWS100-15, HWS100-24, HWS100-48, and HWS100-24/CQC) Output: DC 3.3 V (2.97V-3.96V), 20 A (for Model HWS100-3) DC 5 V (4.0V-6.0V), 20 A (for Model HWS100-5) DC 12 V (9.6V-14.4V), 8.5 A (for Model HWS100-12) DC 15 V (12.0V-18.0V), 7 A (for Model HWS100-15) DC 24 V (19.2V-28.8V), 4.5 A (for Models HWS100-24 and HWS100-24/CQC) DC 48 V (38.4V-52.8V), 2.1 A (for Model HWS100-48) DC 3.3 V (2.97V-3.96V), 16 A (for Model HWS80-3) DC 5 V (4.0V-6.0V), 16 A (for Model HWS80-5) DC 12 V (9.6V-14.4V), 6.7 A (for Model HWS80-12) DC 15 V (12.0V-18.0V, 5.4 A (for Model HWS80-15) DC 24 V (19.2V-28.8V), 3.4 A (for Model HWS80-24) DC 48 V (38.4V-52.8V), 1.7 A (for Model HWS80-48)
Applicant Name and Address:	TDK-LAMBDA CORP NAGAOKA TECHNICAL CENTER R&D DIV 2704-1 SETTAYA-MACHI NAGAOKA-SHI NIIGATA 940-1195 JAPAN

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

UL authorizes the applicant to reproduce the latest pages of the referenced Test Report consisting of the first page of the Specific Technical Criteria through to the end of the Conditions of Acceptability.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by: Kosuke Kawamaura Reviewed by: Michael Neuffer

Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

A. Authorization - The Authorization page may include additional Factory Identification Code markings.

B. Generic Inspection Instructions -

i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.

ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.

iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

The product covered in this Test Report is building-in type switching power supply with a single output circuit and optional cover.

This component is intended to be connected to a protective earth of the end-product via Chassis.

Model Differences

All models are identical, except for model designation, output rating, secondary winding of isolation transformer, and some minor secondary components.

Suffix "/xyz" (x is R or blank, y is A or blank, z is CO or blank) and may be followed by suffix HD or HDA. Definition of the variations of construction as follows:
"x": R - Optional remote on/off control function provided.
B - Optional input connector instead of terminal block (standard model)
"y": A - Optional cover provided.
"z": CO - Optional conformal coating (QMJU2) provided on SOLDER side PWB (Not required for compliance with the requirements in the standard).

Suffix HD - The model without the optional cover, but provided with optional conformal coating (QMJU2) on COMPONENT side of PWB.
Suffix HDA - Same as the HD model but with cover.

Same size and designed PWB is used for all models.

Model HWS80 Series is identical to Model HWS100 Series except for model designation, output rating, components, which are described in this Test Report, and minor components.

Suffix B applies only to Models HWS100-12, HWS100-15, HWS100-24, HWS100-48, HWS80-3, HWS80-5, HWS80-12, HWS80-15, HWS80-24, and HWS80-48, which designates alternate Connectors used instead of Terminal Block.

Model HWS100-24/CQC is identical to Model HWS100-24 except for model designation.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : N/A
- Operating condition : continuous
- Access location : N/A (for building-in)
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- Class of equipment : Class I (earthed)
- Considered current rating (A) : 20 A (branch circuit)
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : up to 2000 m
- Altitude of test laboratory (m) : approximately 10 to 20 m
- Mass of equipment (kg) : approximately 0.39 kg
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: For models except /HD, the Tma are different in accordance with load %, mounting position and with or without cover. See Enclosure #7-01 for details. For / HD, 100% load at 50°C ambient and 20% load at 71°C ambient for mounting position A, B, C, and D for without cover or with cover. See Heating Test and Enclosure #7-01 for details.
- The product is intended for use on the following power systems: TN

Engineering Conditions of Acceptability

For use only in or with complete equipment where the acceptability of the combination is determined by UL LLC. When installed in an end-product, consideration must be given to the following:

- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-Secondary: 274 Vrms, 556 Vpk, Primary-Ground: 232 Vrms, 412 Vpk
- The following secondary output circuits are SELV: Output of all models
- The following secondary output circuits are at non-hazardous energy levels: Output of all models
- The power supply terminals and/or connectors are: Suitable for factory wiring only
- The maximum investigated branch circuit rating is: 20 A
- The investigated Pollution Degree is: 2
- Proper bonding to the end-product main protective earthing termination is: Required
- An investigation of the protective bonding terminals has: Not been conducted
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY2 insulation system with the indicated rating greater than Class A (105°C): T2 (Class F)
- The following end-product enclosures are required: Electrical and Fire
- Line to Ground Capacitors (C2, C3, C9) maybe rated maximum 4700 pF or not provided; therefore, this shall be considered in the Touch Current Test in end product.
- This component is intended to be connected to a protective earth of the end-product via Chassis.
- Chassis and Cover have not been evaluated as internal enclosure.
- Line to Line Capacitor (C1) maybe rated maximum 0.68 µF or not provided; therefore, this shall be considered in the Capacitance Discharge Test in end product.
- Terminal block (TB1) has not been evaluated other than flammability rating of material.

Additional Information

See Enclosure #7-01 (Load Derating and Mounting Position vs. Tma) details.

Markings and instructions

Clause Title	Marking or Instruction Details
Power rating - Ratings	Ratings (voltage, frequency/dc, current)

Power rating - Model	Model Number
Power rating - Company identification	Listee's or Recognized company's name, Trade Name, Trademark or File Number
Fuses - Rating	Rated current and voltage and type located on or adjacent to fuse or fuseholder.

Special Instructions to UL Representative

The manufacturer ALPS LOGISTICS FACILITIES CO LTD (Sub. #100553-903) will receive the complete power supply shipped from other manufacturers within the same Volume. ALPS LOGISTICS FACILITIES CO LTD is allowed to modify the items marked '#' in Table 1.5.1. The modified complete power supply model will be marked the Factory ID 'F' on the product or smallest unit container in which the product is packed.

Production-Line Testing Requirements

Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.

Model	Component	Removable Parts	Test probe location	V rms	V dc	Test Time, s
HWS100 Series	Transformers (T2)	N/A	Primary to Secondary	3000	4242	1 second

Earthing Continuity Test Exemptions - This test is not required for the following models:

HWS100-3, HWS100-5, HWS100-12, HWS100-15, HWS100-24, HWS100-24/CQC, HWS100-48, HWS80-3, HWS80-5, HWS80-12, HWS80-15, HWS80-24, and HWS80-48.

Electric Strength Test Exemptions - This test is not required for the following models:

HWS100-3, HWS100-5, HWS100-12, HWS100-15, HWS100-24, HWS100-24/CQC, HWS100-48, HWS80-3, HWS80-5, HWS80-12, HWS80-15, HWS80-24, and HWS80-48.

Electric Strength Test Component Exemptions - The following solid-state components may disconnected from the remainder of the circuitry during the performance of this test:

N/A

Sample and Test Specifics for Follow-Up Tests at UL

Model	Component	Material	Test	Sample(s)	Test Specifics
--	--	--	--	--	--

TABLE: List of Critical Components

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
Terminal Block (TB1)	Emuden Musen Kogyo K K	T7277	Base Material: (QMFZ2), EI Dupont De Nemours & Co., Inc., Type CE15315, V-0, minimum 0.71 mm thick.	--	--
Input Connector (CN1) for suffix B only	Japan Solderless Terminal Mfg. Co., Ltd.	VH	250V, 7A Material: (QMFZ2), Mitsubishi Engineering-Plastic Corp., Type 1010N2.	ECBT2	UL
Fuse (F1)	Littelfuse Inc.	215	250V, 3.15A	JDYX2	UL
Bleeder Resistors (R101, R102, R103)	Various	Various	220kohm, 1/4 W Connected in series.	--	--
Line-to-Line Capacitor (C1)	Panasonic Corporation, Panasonic Corporation of North America.	ECQUL	250V, maximum 0.68µF Certified to IEC60384-14 as X2. (40/100/21/C)	FOWX2	UL
Alternate Line-to-Line Capacitor (C1)	OKAYA Electric Industries Co Ltd	LE	250V, maximum 0.68µF Certified to IEC60384-14 as X2. (55/100/56/C)	FOWX2	UL
Alternate Line-to-Line Capacitor (C1)	Epcos Electronic Components S.A.	B3293	305V, maximum 0.68µF Certified to IEC60384-14 as X2. (40/105/56/B)	FOWX2	UL
Inductors (L1, L2)	Tamura Corp.	CMTUB1091	Core: Ferrite. Overall approximately OD 19.9 mm, ID 8.6 mm.	--	--
Core Case for Inductors (L1, L2)	Wintech Polymer Ltd.	CRN7000	PBT, RTI 140°C, minimum 0.32 mm thick.	QMFZ2	UL
Alternate Inductors (L1, L2)	Tokyo Parts Ind. Co., Ltd.	DBK18-S080532A	Core: Ferrite. Overall approximately 20.4 by 18.75 by 20.4 mm.	--	--
Core Case for Alternate Inductors (L1, L2)	Wintech Polymer Ltd.	CRN7000	PBT. RTI 140°C, minimum 0.4 mm thick.	QMFZ2	UL
Line-to-Ground Capacitors (C2, C3, C9)	Murata Mfg. Co., Ltd.	KX	250V, maximum 2200pF Certified to IEC60384-14 as Y1. (25/125/21/C)	FOWX2	UL
Surge Absorber (SA1)	Panasonic Corporation, Panasonic	V10471U	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
	Corporation of North America.				
Alternate Surge Absorber (SA1)	Nippon Chemi-Con Corp	TND12V-471K or TNR12V471K	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA1)	Epcos (Zhuhai Ftz) Co., Ltd.	S10K300E2K1 or SIOVS10K300E2K1	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA1)	Thinking Electronic Industrial Co., Ltd.	TVR10471-V	Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Surge Absorber (SA2)	Panasonic Corporation, Panasonic Corporation of North America.	V10471U	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Nippon Chemi-Con Corp	TND12V-471K or TNR12V471K	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Epcos (Zhuhai Ftz) Co., Ltd.	S10K300E2K1 or SIOVS10K300E2K1	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Thinking Electronic Industrial Co., Ltd.	TVR10471-V	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Diode Bridge (D1) for Model HWS100 Series	Various	Various	600V, 10A	--	--
Diode Bridge (D1) for Model HWS80 Series	Various	Various	600V, 2.3A	--	--
Inductor (L3)	TDK-Lambda Corp.	A22701_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 28 by 21 by 11 mm. Bobbin: (QMFZ2), Phenolic, (RTI 150°C), minimum 0.75 mm thick.	--	--
FETs (Q1, Q2, Q3) for Model HWS100 Series	Various	Various	500V, minimum 12A.	--	--
FETs (Q1, Q2, Q3) for Model HWS80 Series	Various	Various	500V, minimum 8A.	--	--
Insulation Cap for FETs	Fuji Polymer	Sarcon HR	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
(Q1, Q2, Q3), Diode (D2)	Industries Co., Ltd.				
Alternate Insulation Cap for Cap for FETs (Q1, Q2, Q3), Diode (D2)	Shin-Etsu Chemical Co., Ltd.	TC-45A	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL
Alternate Insulation Cap for Cap for FETs (Q1, Q2, Q3), Diode (D2)	Shin-Etsu Chemical Co., Ltd.	TC-45S2	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL
Thermistor (TH1) for Model HWS100 Series	Semitec Corp.	M10010C	10ohm at 25°C	XGPU2	UL
Thermistor (TH1) for Model HWS80 Series	Semitec Corp.	M10007C	10ohm at 25°C	XGPU2	UL
Electrolytic Capacitor (C6) for Model HWS100 Series	Various	Various	Minimum 420V, maximum 120µF, 105°C	--	--
Electrolytic Capacitor (C6) for Model HWS80 Series	Various	Various	420V, 82µF, 105°C	--	--
Transformer (T2) for Models HWS100-3 and HWS80-3	TDK-Lambda Corp.	A22711_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Transformer (T2) for Models HWS100-5 and HWS80-5	TDK-Lambda Corp.	A22712_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Transformer (T2) for Models HWS100-12 and HWS80-12	TDK-Lambda Corp.	A22713_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Transformer (T2) for Models HWS100-15 and HWS80-15	TDK-Lambda Corp.	A22714_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Transformer (T2) for Models HWS100-24 and HWS80-24	TDK-Lambda Corp.	A22715_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
Transformer (T2) for Models HWS100-48 and HWS80-48	TDK-Lambda Corp.	A22716_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Triple Insulation Wire of Transformer (T2)	Totoku Electric Co., Ltd.	TIW-3	Reinforced Insulation.	OBJT2	UL
Insulation System for Transformer (T2)	TDK-Lambda Corp.	NLF2	Insulation Class F.	OBJY2	UL
Optical Isolators (PC1, PC2)	NEC Compound Semiconductor Devices Ltd. or Renesas Electronics Corporation	PS2581	Isolation 5000V. (Double Protection Type)	FPQU2	UL
Optical Isolator (PC3, Option)	NEC Compound Semiconductor Devices Ltd. or Renesas Electronics Corporation	PS2581	Isolation 5000V. (Double Protection Type)	FPQU2	UL
Insulation Sheet	Sabic Innovative Plastics	LEXAN FR700	V-0 Overall approximately 158.4 by 78.3 by 26 mm, 0.25 mm thick.	QMFZ2	UL
Alternate Insulation Sheet	Sabic Innovative Plastics	LEXAN FR60	V-0 Overall approximately 158.4 by 78.3 by 26 mm, 0.25 mm thick.	QMFZ2	UL
Printed Wiring Board (PWB)	Various	Various	V-0, 130°C, ANSI Type FR-4, CEM-1 and CEM-3	ZPMV2	UL
Coating for Printed Wiring Board (PWB) only for models with suffix "/CO" and suffix "/HD"	Dow Corning Toray Co., Ltd.	Pelgan Z	V-0, 105°C, 0.203 mm thick minimum	QMJU2	UL
Alternate Coating	Humiseal, Div. of Chase Corp.	1B73	V-1, 100°C, 0.0254 mm thick minimum	QMJU2	UL
Alternate Coating	Dow Corning Corp.	1-2577	V-0, 130°C, 0.203 mm thick minimum	QMJU2	UL
Alternate Coating	Dow Corning Corp.	1-2577 Low VOC	V-0, 130°C, 0.203 mm thick minimum	QMJU2	UL
Alternate coating	Humiseal, Div. of Chase Corp.	1A27NS	V-0, 100°C, 0.0254 mm thick minimum	QMJU2	UL

Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
Chassis	--	--	Aluminum. Overall approximately 160 by 81.5 by 28 mm.	--	--
Cover (Optional) Not provide with Suffix B	--	--	Steel. Overall approximately 152.7 by 80.5 by 32.5 mm.	--	--
Output Connector (CN51) for suffix B only	Japan Solderless Terminal Mfg. Co., Ltd.	VH	250V, 7A Material: (QMFZ2), Mitsubishi Engineering-Plastic Corp, Type 1010N2.	ECBT2	UL
For Model HWS100-24/CQC only	--	--	--	--	--
Terminal Block (TB1)	Emuden Musen Kogyo K K	T7277	Base Material: (QMFZ2), El Dupont De Nemours & Co., Inc., Type CE15315, V-0, minimum 0.71 mm thick.	--	--
Fuse (F1)	Littelfuse Inc.	215	250V, 3.15A	JDYX2	UL
Bleeder Resistors (R101, R102, R103)	Various	Various	220kohm, 1/4W Connected in series.	--	--
Line-to-Line Capacitor (C1)	Panasonic Corporation, Panasonic Corporation of North America.	ECQUL	250V, maximum 0.68µF Certified to IEC60384-14 as X2. (40/100/21/C)	FOWX2	UL
Alternate Line-to-Line Capacitor (C1)	OKAYA Electric Industries Co Ltd	LE	250V, maximum 0.68 µF Certified to IEC60384-14 as X2. (55/100/56/C)	FOWX2	UL
Alternate Line-to-Line Capacitor (C1)	Epcos Electronic Components S.A.	B3293	305V, maximum 0.68µF Certified to IEC60384-14 as X2. (40/105/56/B)	FOWX2	UL
Inductors (L1, L2)	Tamura Corp.	CMTUB1091	Core: Ferrite. Overall approximately OD 19.9 mm, ID 8.6 mm.	--	--
Core Case for Inductors (L1, L2)	Wintech Polymer Ltd.	CRN7000	Material: PBT, RTI 140°C, minimum 0.32 mm thick.	QMFZ2	UL
Alternate Inductors (L1, L2)	Tokyo Parts Ind. Co., Ltd.	DBK18-S080532A	Core: Ferrite. Overall approximately 20.4 by 18.75 by 20.4 mm.	--	--
Core Case for Alternate Inductors (L1, L2)	Wintech Polymer Ltd.	CRN7000	Material: PBT, RTI 140°C, minimum 0.4 mm thick.	QMFZ2	UL
Line-to-Ground	Murata Mfg. Co., Ltd.	KX	250V, maximum 2200pF Certified to IEC60384-14	FOWX2	UL

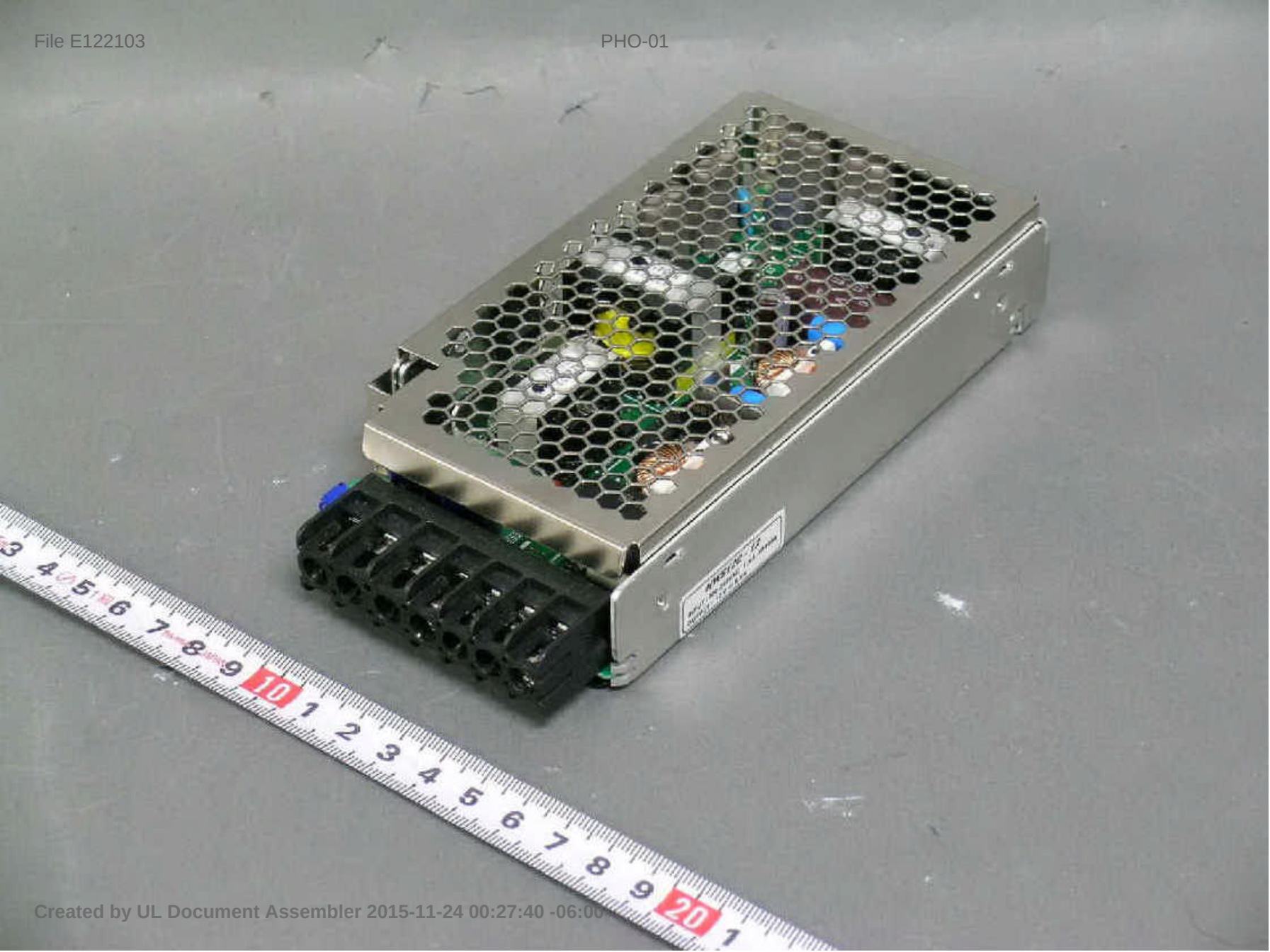
Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
Capacitors (C2, C3, C9)			as Y1. (25/125/21/C)		
Surge Absorber (SA1)	Panasonic Corporation, Panasonic Corporation of North America.	V10471U	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA1)	Nippon Chemi-Con Corp.	TND12V-471K or TNR12V471K	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA1)	Epcos (Zhuhai Ftz) Co., Ltd.	S10K300E2K1 or SIOVS10K300E2K1	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA1)	Thinking Electronic Industrial Co., Ltd.	TVR10471-V	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Surge Absorber (SA2)	Panasonic Corporation, Panasonic Corporation of North America.	V10471U	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Nippon Chemi-Con Corp	TND12V-471K or TNR12V471K	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Epcos (Zhuhai Ftz) Co., Ltd.	S10K300E2K1 or SIOVS10K300E2K1	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Alternate Surge Absorber (SA2)	Thinking Electronic Industrial Co., Ltd.	TVR10471-V	(Line-to-Line. Maximum continuous operation 300Vac)	VZCA2	UL
Diode Bridge (D1)	Various	Various	600V, 10A	--	--
Inductor (L3)	TDK-Lambda Corp.	A22701_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 28 by 21 by 11 mm. Bobbin: (QMFZ2), Phenolic, (RTI 150°C), minimum 0.75 mm thick.	--	--
FETs (Q1, Q2, Q3)	Various	Various	500V, minimum 12A.	--	--
Insulation Cap for FETs (Q1, Q2, Q3), Diode (D2)	Fuji Polymer Industries Co., Ltd.	Sarcon HR	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL

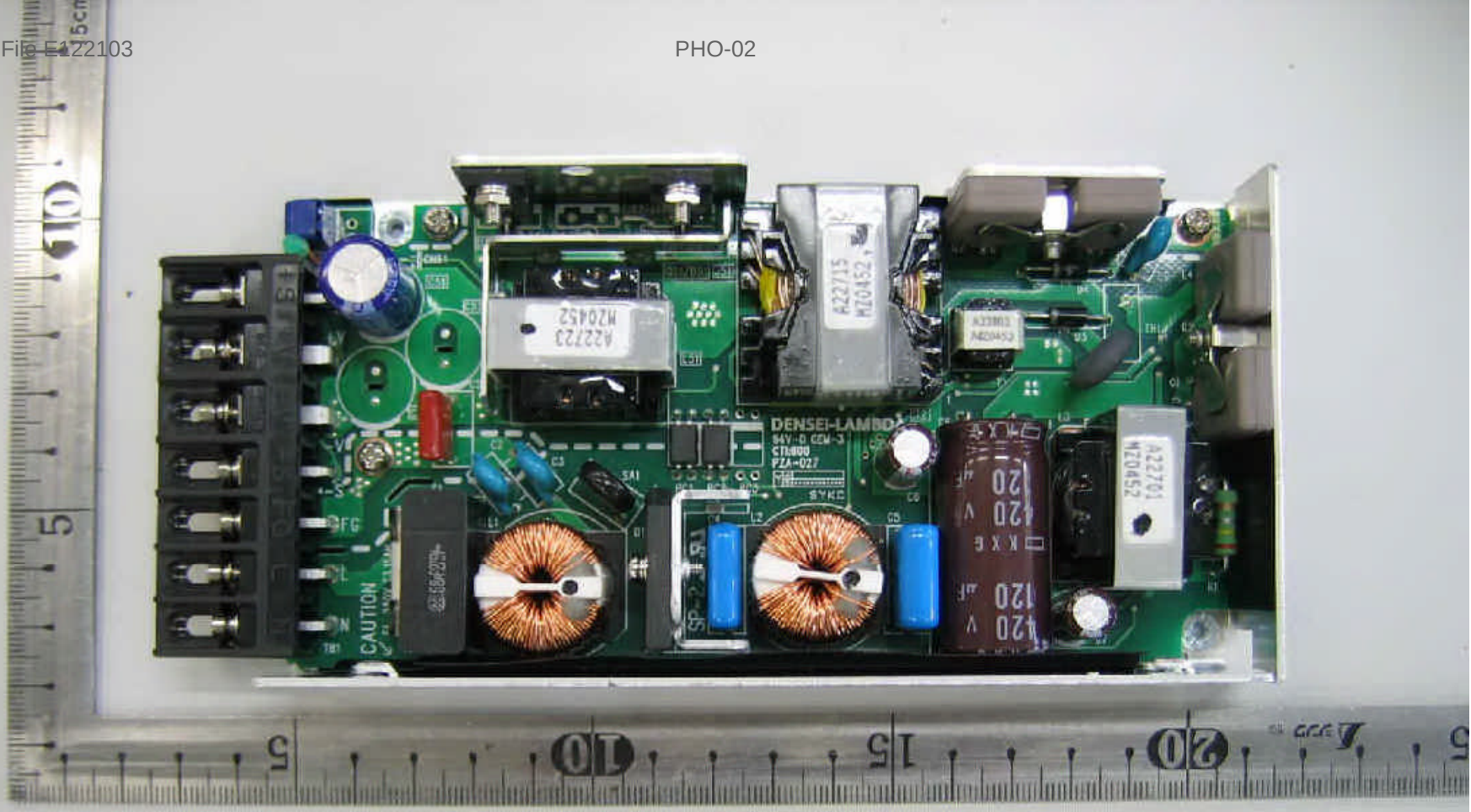
Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
Alternate Insulation Cap for FETs (Q1, Q2, Q3), Diode (D2)	Shin-Etsu Chemical Co., Ltd.	TC-45A	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL
Alternate Insulation Cap for FETs (Q1, Q2, Q3), Diode (D2)	Shin-Etsu Chemical Co., Ltd.	TC-45S2	V-0, 150°C, minimum 0.45 mm thick.	QMFZ2	UL
Thermistor (TH1)	Semitec Corp.	M10010C	10ohm at 25°C	XGPU2	UL
Electrolytic Capacitor (C6)	Various	Various	Minimum 420V, maximum 120µF, 105°C	--	--
Transformer (T2)	TDK-Lambda Corp.	A22715_ (_ is any letter A to Z or blank)	Core: Ferrite. Overall 32 by 22 by 20.5 mm. Bobbin: (QMFZ2), Sumitomo Bakelite Co., Ltd., Type PM-9820, Color BK or BN, minimum 0.7 mm thick.	--	--
Insulation System for Transformer (T2)	TDK-Lambda Corp.	NLF2	Insulation Class F.	OBJY2	UL
Optical Isolators (PC1, PC2)	NEC Compound Semiconductor Devices Ltd. or Renesas Electronics Corporation	PS2581	Isolation 5000V. (Double Protection Type)	FPQU2	UL
Optical Isolator (PC3) (Optional)	NEC Compound Semiconductor Devices Ltd. or Renesas Electronics Corporation	PS2581	Isolation 5000V. (Double Protection Type)	FPQU2	UL
Insulation Sheet	Sabic Innovative Plastics	LEXAN FR700	V-0 Overall approximately 158.4 by 78.3 by 26 mm, 0.25 mm thick.	QMFZ2	UL
Alternate Insulation Sheet	Sabic Innovative Plastics	LEXAN FR60	V-0 Overall approximately 158.4 by 78.3 by 26 mm, 0.25 mm thick.	QMFZ2	UL
Printed Wiring Board (PWB)	Various	Various	V-0, 130°C, ANSI Type FR-4, CEM-1 and CEM-3	ZPMV2	UL
Coating for Printed Wiring Board (PWB)	Dow Corning Toray Co., Ltd.	Pelgan Z	V-0, 105°C, 0.203 mm thick minimum	QMJU2	UL
Alternate Coating	Humiseal, Div. of	1B73	V-1, 100°C, 0.0254 mm thick minimum	QMJU2	UL

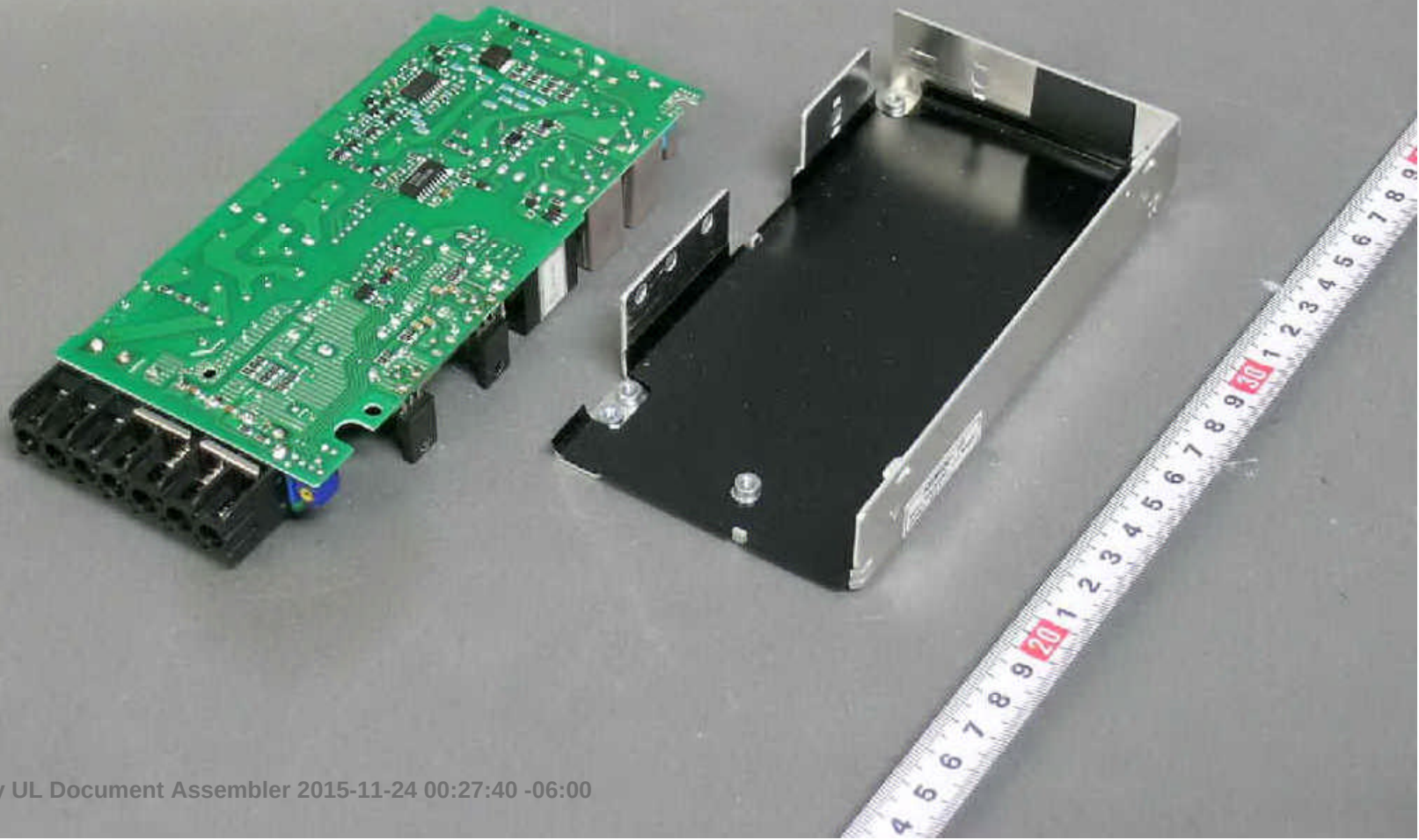
Object/part or Description	Manufacturer/ trademark	type/model	technical data	CCN	Marks of Conformity
	Chase Corp.				
Alternate Coating	Dow Corning Corp.	1-2577	V-0, 130°C, 0.203 mm thick minimum	QMJU2	UL
Alternate Coating	Dow Corning Corp.	1-2577 Low VOC	V-0, 130°C, 0.203 mm thick minimum	QMJU2	UL
Alternate coating	Humiseal, Div. of Chase Corp.	1A27NS	V-0, 100°C, 0.0254 mm thick minimum	QMJU2	UL
Chassis	--	--	Aluminum. Overall approximately 160 by 81.5 by 28 mm.	--	--
Cover (Optional)	--	--	Steel. Overall approximately 152.7 by 80.5 by 32.5 mm.	--	--

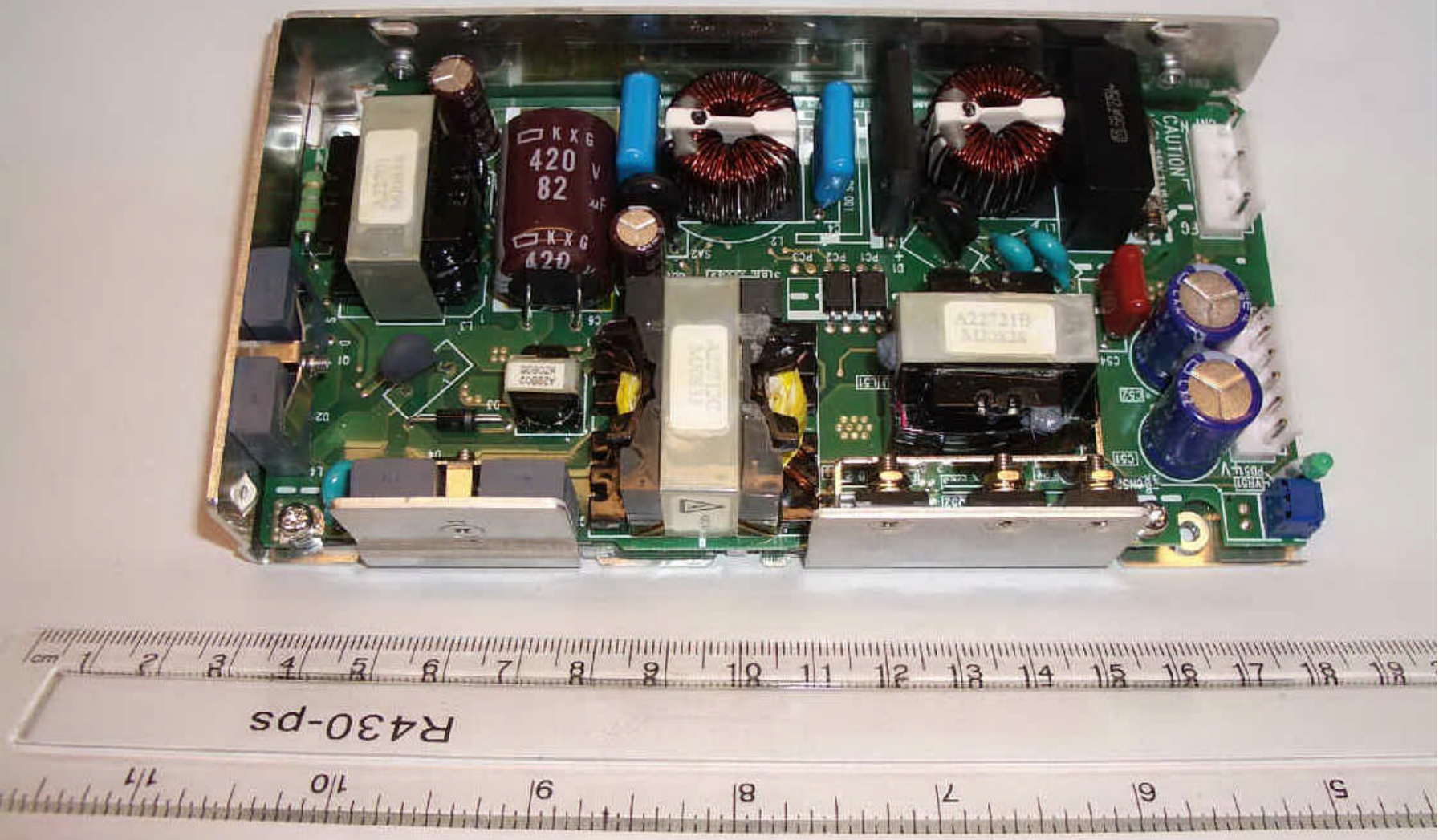
Enclosures

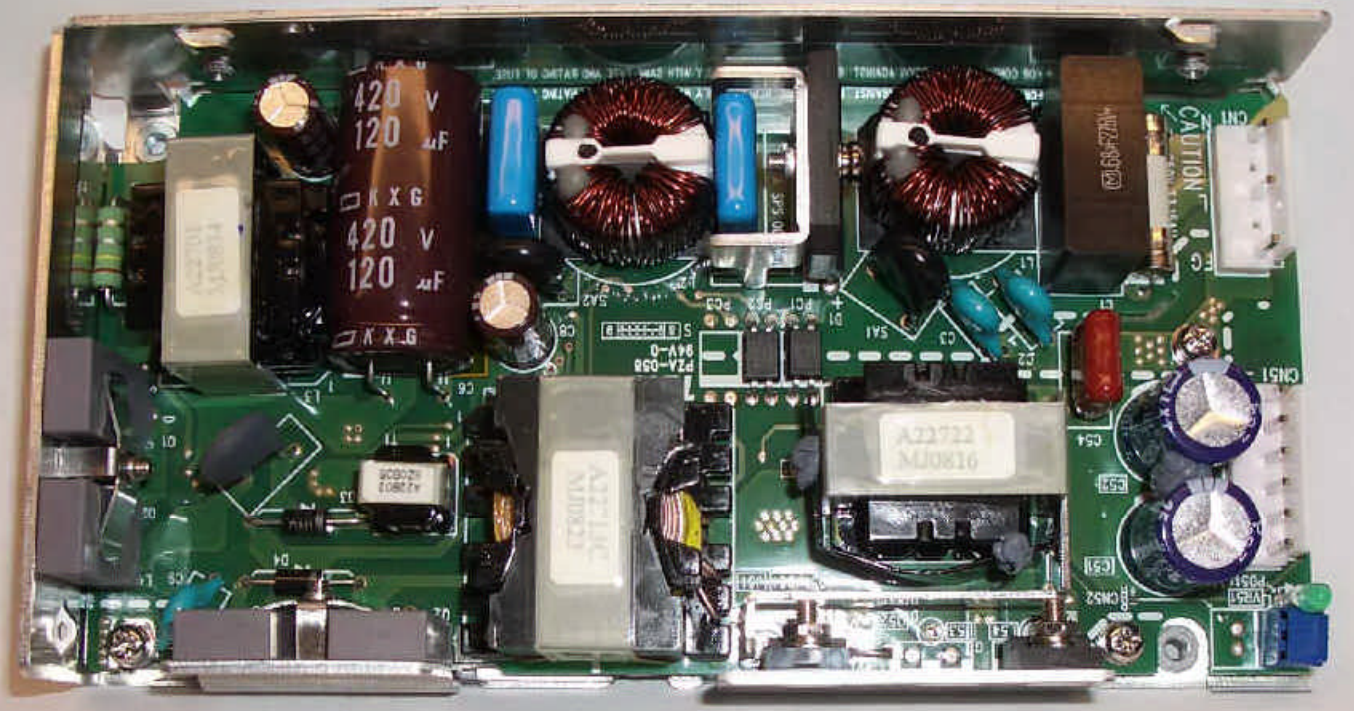
Type	Supplement Id	Description
Photographs	3-01	Overall View (Top/Front/Right Side) with optional Cover
Photographs	3-02	Overall View (Top) without Optional Cover
Photographs	3-03	Overall View (Bottom) without Chassis
Photographs	3-04	Overall View (Component Side) with Input and Output Connectors (HWS80-5B)
Photographs	3-05	Overall View (Component Side) with Input and Output Connectors (HWS100-12B)
Diagrams	4-07	Insulation Sheet (HWS80 and HWS100)
Diagrams	4-10	Transformer (T2) Specification (HWS100-5)
Diagrams	4-11	Transformer (T2) Specification (HWS100-12)
Diagrams	4-12	Transformer (T2) Specification (HWS100-15)
Diagrams	4-13	Transformer (T2) Specification (HWS100-24)
Diagrams	4-14	Transformer (T2) Specification (HWS100-48)
Diagrams	4-15	Terminal Block Drawing
Schematics + PWB	5-01	HWS100 Schematics
Schematics + PWB	5-03	Printed Wiring Board Trace Layout 1
Schematics + PWB	5-04	Printed Wiring Board Trace Layout 2
Schematics + PWB	5-05	Printed Wiring Board Component Layout
Manuals	6-01	Specifications (HWS80)
Manuals	6-02	Specifications (HWS80/A)
Manuals	6-03	Specifications (HWS100)
Manuals	6-04	Specifications (HWS100/A)
Miscellaneous	7-01	Load Derating and Mounting Position vs. Tma
Miscellaneous	7-02	PCB Coating

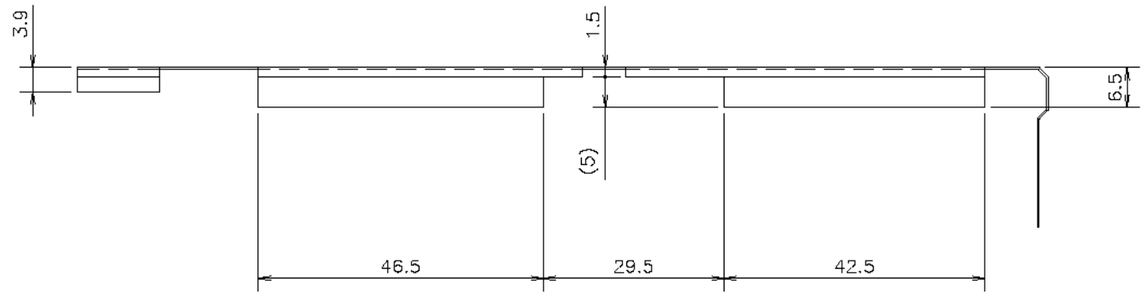



DENSEI-LAMBDA
CAUTION
SYKC

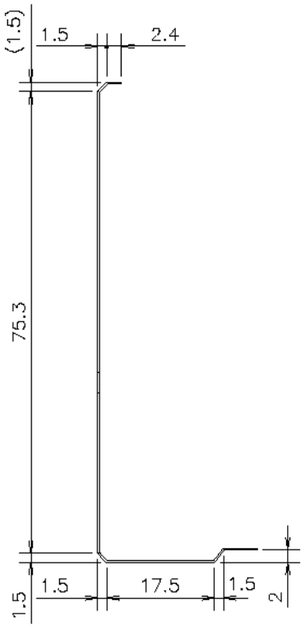


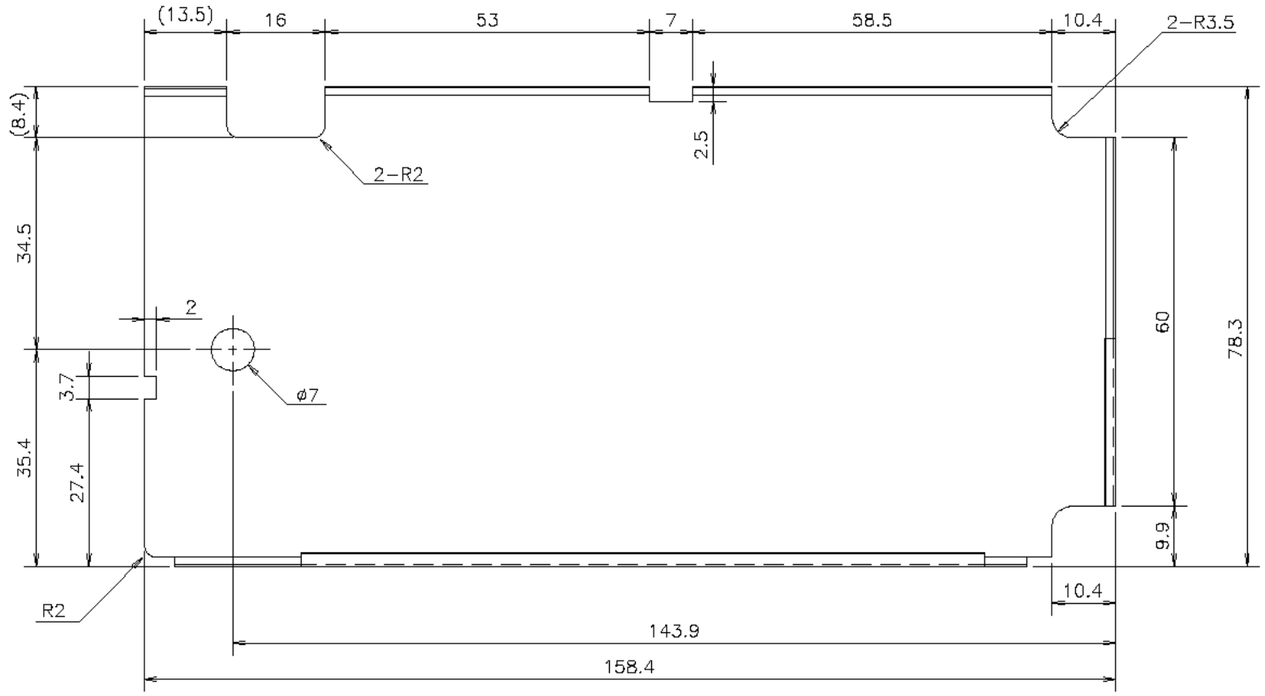

R430-ps

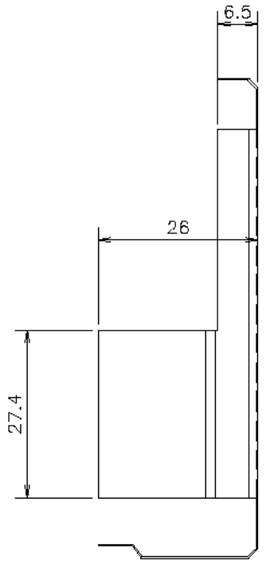


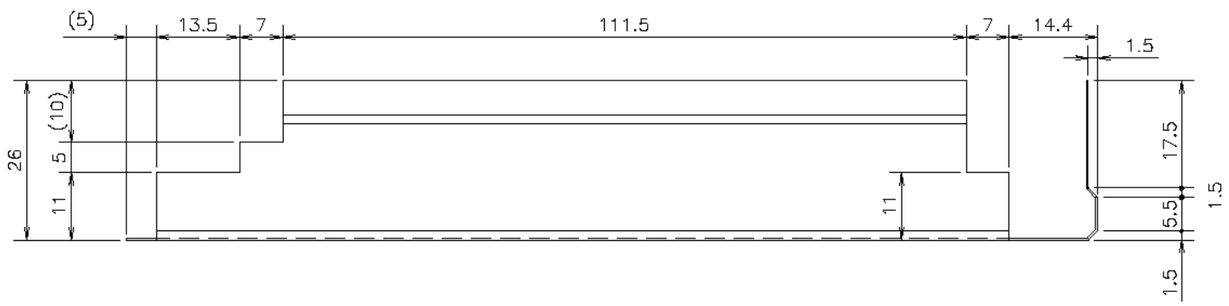


⚠ RoHS COMPLIANCE









TENTATIVE
22.Nov.'06
H.Matsumoto

NOTE :

*TOLERANCE : ±0.3mm

⚠*RoHS Compliance :
Refer to D-L Group Green Procurement Guideline : DL-EMS-010_

*MATERIAL : LEXAN
FR700(t=0.25mm, COLOR : BLACK) or
⚠FR60(t=0.25mm, COLOR : CLEAR)

D	REV	CONTENTS	DATE	ENGR	CHK	APPD
B	–	⚠ ADD MATERIAL				
A	B3	⚠ ADD NOTE ⚠ ADD RoHS COMPLIANCE	5.Sep.'05	K.Shimamune	H.Matsumoto	M.Isa
–	–1	NEW RELEASE	13.Dec.'04	K.Shimamune	M.Watanabe	M.Isa

SCALE	1/1
UNITS	m/m
3RD ANGLE PROJECTION	
MATERIALS	SEE NOTE
FINISH	
TITLE	HWS100 INSULATION SHEET
DRAWING No.	A227-33-01 -B

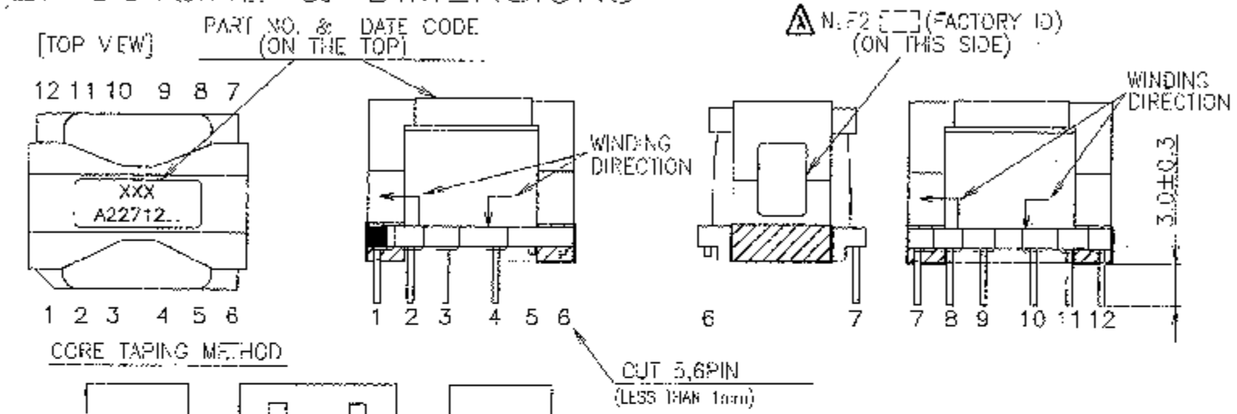
DENSEI-LAMBDA

R:\HWS100\DWG\OTHERS\A227330 1B.DWG

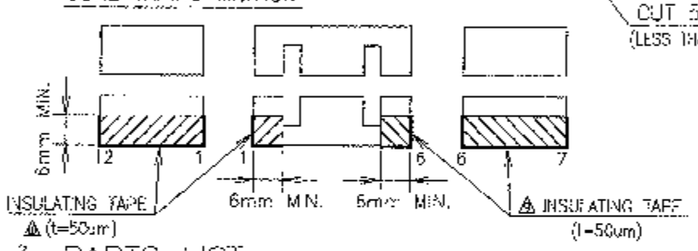
MODEL : HWS100--5

1. TITLE : TRANSFORMER SPEC (△A22712B)

2. OUTLINE & DIMENSIONS



CORE TAPING METHOD



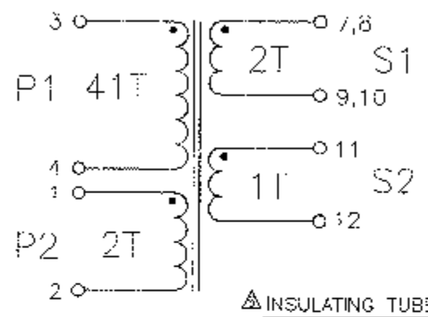
WRAPPED WIRES (INCLUDING SOLDER) TO PIN MUST NOT EXCEED BOTTOM OF BOBBIN.

3. PARTS LIST

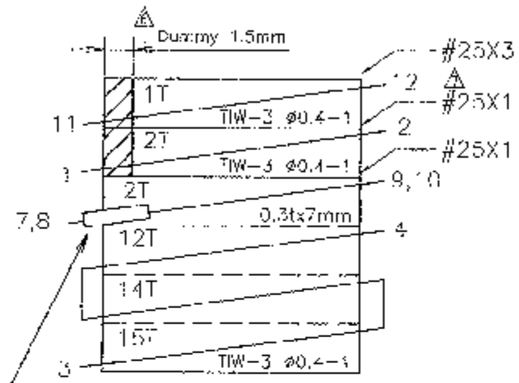
	PARTS LIST		CATALOG No.	MANUFACTURE	REMARKS
1	CORE		PC95 PQ32/20Z-12	TDK	
		SUB			
2	BOBBIN	SUB	PQ3217	HOLD JINN	
		SUB	△		
3	WINDING WIRE		TIW-3	TOTOKU	ø0.4
		SUB			
4	WINDING WIRE		COPPER FOIL		0.3tx7mm
		SUB			
5	INSULATING TAPE		△1351-*	3M	△t=25um,50um
	(COLOR : YELLOW)	SUB	△No.630F	TERAOKA	△t=25um,50um
		SUB			
6	COIL FIXING TAPE		1351-1	3M	t=25um
	(COLOR : YELLOW)	SUB	No.630F #25	TERAOKA	t=25um
		SUB			
7	CORE FIXING TAPE		553H-UL	NICHIBAN	t=25um
	(COLOR : MILKY WHITE)	SUB	No.3161F #25	NITTO DENKO	t=25um
		SUB			
8	COPPER INSULATION		NOMEX410	E. DUPONT	t=50um
		SUB			
9	INSULATING TUBE △		PI-TUBE	FURUKAWA	
		SUB	E-651U-1	NIKKAN	
10	DUMMY TAPE △		No.530F	TERAOKA	
		SUB	1351-*	3M	
		SUB	No.630F	TERAOKA	

4. SPECIFICATIONS

1. CONNECTIONS

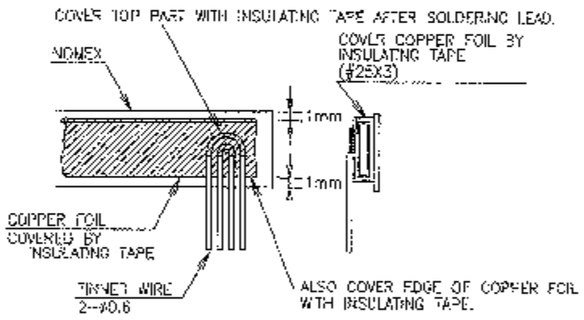


5. CONSTRUCTION



△ INSULATING TUBE
THIS TUBE PREVENTS THE CONTACT OF THE TWINED WIRE AND THE CORE EDGE.

S1 CONSTRUCTION



2. WINDING SPECIFICATIONS

LAYER	CONNECTION		WINDING DIA.	NE	TURNS	REMARKS
1	3	→	TIW-3 ø0.4	1	15	P1
2		→	TIW-3 ø0.4	1	14	P1
3		→ 4	TIW-3 ø0.4	1	12	P1
4	7,8	→ 9,10	0.3tx7mm	1	2	S1
		→	(COPPER FOIL)			
5	1	→ 2	TIW-3 ø0.4	1	2	P2
6	11	→ 12	TIW-3 ø0.4	1	1	S2
		→				
		→				
		→				

3	WITHSTAND VOLTAGE	COIL(P)-COIL(S)	4kVAC, 1min
		COIL(S)-CORE	600VAC, 3sec or 500VAC, 1min
4	INSULATION RESISTANCE	———	———
5	INDUCTANCE	f=1kHz	15.3mH±20%(3-4)
6	TEMPERATURE RATING		CLASS F
7	APPLICABLE SAFETY STANDARDS		UL, CSA, EN
8	INSULATION SYSTEM		NLF2 TABLE 1

6. INSTRUCTIONS

		CONTENTS
1	MARKING	SEAL OR STAMP
2	FIXING MATERIAL	TAPE
3	CUT PIN	5,6PIN
4	SPRING	NO
5	IMPREGNATION	YES VARNISH : BC-346A OR TVR-2180T
6	SOLDER	LEED FREE NECESSARY

△7. ROHS COMPLIANCE

Refer to D-L Group Green Procurement Guideline : DL-EMS-010_

UNCONTROLLED COPY Dec 7 14

REV		DESCRIPTION	DATE	ENGR	CHK	APPD
B	A6	△ ADD ROHS COMPLIANCE △ No.630F #25 => No.630F △ 1351-1 => 1351-* △△△ ADD t=50um △ ADD INSULATING TAPE (t=50um) △ A22712A => A22712B	4 Jul '05	M. Miyata	M. Watanabe	M. Oga
A	A1	△ ADD ø25x1 △△ ADD DUMMY TAPE △△ ADD INSULATING TUBE △ DELETE ALT MATERIAL : P-3201(PIN SHINE) △ A22712 => A22712A	28.Feb.'05	N.Miyata	M.Watanabe	M.Iso
—	—1	NEW RELEASE	3.Dec '04	Okouchi	M.Watanabe	M.Iso
D	REV	CONTENTS	DATE	ENGR	CHK	APPD

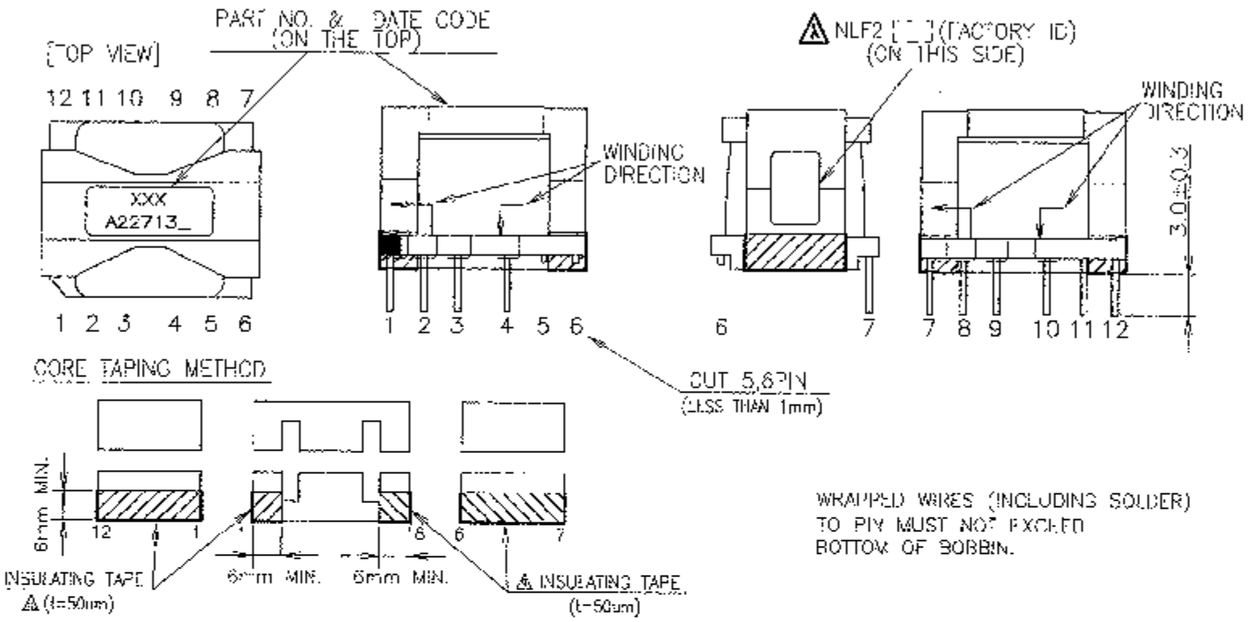
SCALE	/	MATERIALS	———
UNITS	m/m	FINISH	———
3RD ANGLE PROJECTION		TITLE	HWS100-5 TRANSFORMER SPEC
		DRAWING No.	A227-35-12-[B]
			DENSEI-LAMBDA

R:\HWS100\A22735123.DWG

MODEL : HWS100-12

1. TITLE : TRANSFORMER SPEC (⚠A22713B)

2. OUTLINE & DIMENSIONS



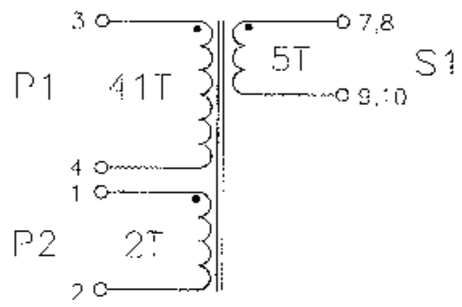
WRAPPED WIRES (INCLUDING SOLDER) TO PIV MUST NOT EXCEED BOTTOM OF BOBBIN.

3. PARTS LIST

	PARTS LIST		CATALOG No.	MANUFACTURE	REMARKS
1	CORE		PC95 PQ32/20Z--12	TDK	
		SUB			
		SUB			
2	BOBBIN		PQ3217	HOLD JINN	
		SUB	⚠		
		SUB			
3	WINDING WIRE		TIW-3	TOTOKU	ø0.4
		SUB			
4	WINDING WIRE		TIW-3	TOTOKU	ø0.64
		SUB			
5	INSULATING TAPE		⚠1351--*	3M	⚠t=25um,50um
	(COLOR : YELLOW)	SUB	⚠No.630F	TERAOKA	⚠t=25um,50um
		SUB			
6	COIL FIXING TAPE		1351-1	3M	t=25um
	(COLOR : YELLOW)	SUB	No.630F #25	TERAOKA	t=25um
		SUB			
7	CORE FIXING TAPE		553H-UL	NICHIBAN	t=25um
	(COLOR : MILKY WHITE)	SUB	No.3161F #25	NITTO DENKO	t=25um
		SUB			
8	DUMMY TAPE		No.630F	TERAOKA	
		SUB	1351-*	3M	
		SUB	No.630F	TERAOKA	

4. SPECIFICATIONS

1. CONNECTIONS

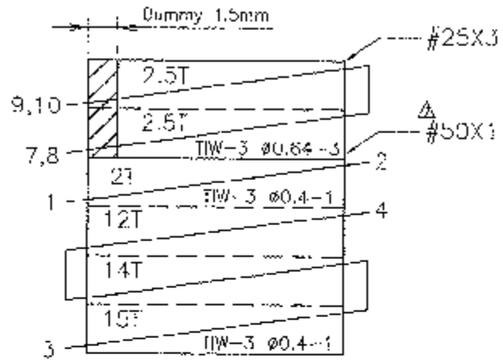


2. WINDING SPECIFICATIONS

LAYER	CONNECTION	WINDING DIA.	NET	TURNS	REMARKS
1	3 →	TIW-3 ø0.4	1	15	P1
2	→	TIW-3 ø0.4	1	14	P1
3	→ 4	TIW-3 ø0.4	1	12	P1
4	1 → 2	TIW-3 ø0.4	1	2	P2
5	7,8 →	TIW-3 ø0.64	3	2.5	S1
6	→ 9,10	TIW-3 ø0.64	3	2.5	S1
	→				
	→				
	→				
	→				

3	WITHSTAND VOLTAGE	COIL(P)-COIL(S)	4kVAC, 1min
		COIL(S)-CORE	500VAC, 3sec or 500VAC, 1min
4	INSULATION RESISTANCE	----------	----------
5	INDUCTANCE	f=1kHz	15.3mH±20%(3-4)
6	TEMPERATURE RATING		CLASS F
7	APPLICABLE SAFETY STANDARDS		UL, CSA, EN
8	INSULATION SYSTEM		NLF2 TABLE I

5. CONSTRUCTION



6. INSTRUCTIONS

		CONTENTS
1	MARKING	SEAL OR STAMP
2	FIXING MATERIAL	TAPE
3	CUT PIN	5,6PIN
4	SPRING	NO
5	IMPREGNATION	YES VARNISH : BC-346A OR TVE-2180T
6	SOLDER	LEED FREE NECESSARY

⚠7. ROHS COMPLIANCE

Refer to D-L Group Green Procurement Guideline : DL-EMS-010...

CONTROLLED COPY '05.7.14 DENSEI-LAMBDA

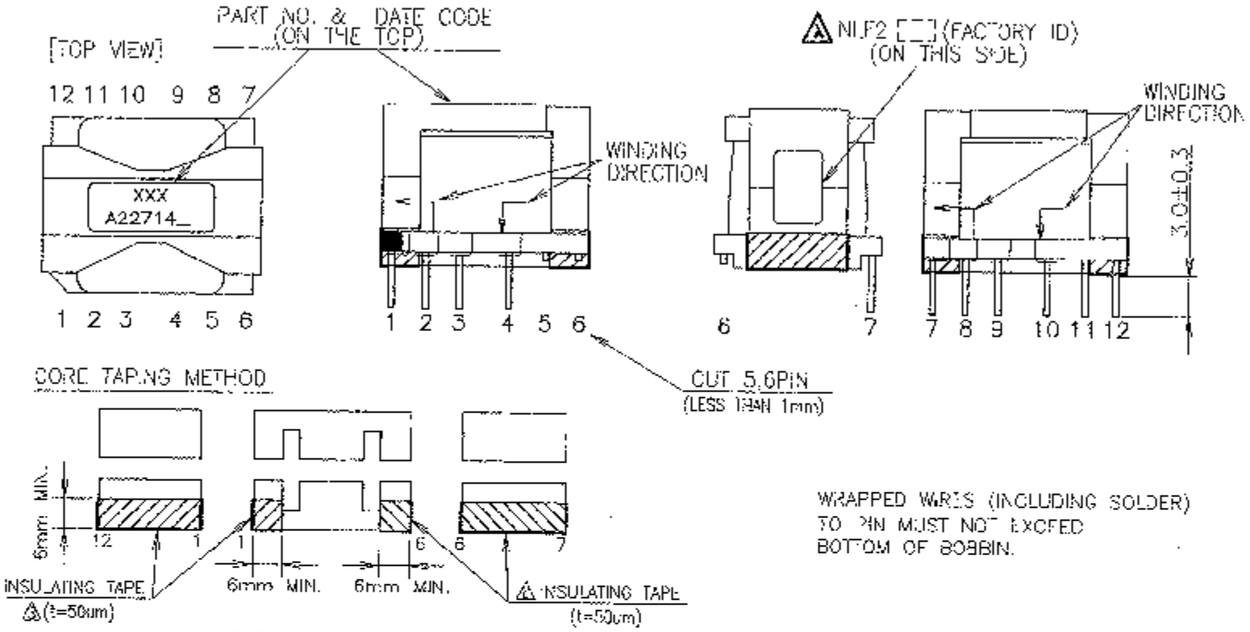
B	A6	⚠ ADD ROHS COMPLANCE ⚠ ADD t=50um ⚠ ADD INSULATING TAPE (t=50um) ⚠227-36 ⚠3 A22713B	M.Jul.'05	M. Miyata	H. Watanabe	M. Ise	SCALE		MATERIALS	TITLE	HWS100-12
							UNITS	m/m	FINISH		TRANSFORMER SPEC
							3RD ANGLE PROJECTION			DRAWING No.	A227--35--1.1--B
A	A1	⚠#25X1 => ⚠50X1 ⚠⚠ADD t=50um ⚠No.630F #25 => No.630F ⚠1351-1 => 1351-* ⚠DELETE AIT MATERIAL : P-3201(PIN SPINE) ⚠A22713 --> A22713A	28.Feb.'05	N.Miyata	M.Watanabe	M.Ise					DENSEI-LAMBDA
-	-1	NEW RELEASE	3.Dec.'04	Okouchi	M.Watanabe	M.Ise					
D	REV	CONTENTS	DATE	ENGR	CHK	APPD					

S:\HWS100\A22713B.DWG

MODEL : HWS100-15

1. TITLE : TRANSFORMER SPEC (⚠1 A22714A)

2. OUTLINE & DIMENSIONS



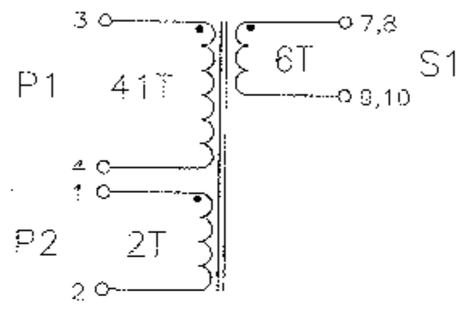
WRAPPED WIRES (INCLUDING SOLDER) TO PIN MUST NOT EXCEED BOTTOM OF BOBBIN.

3. PARTS LIST

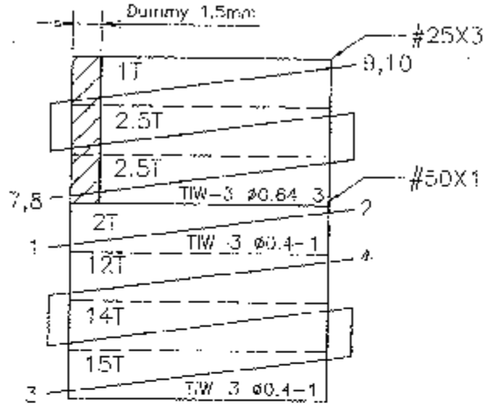
	PARTS LIST		CATALOG No.	MANUFACTURE	REMARKS
1	CORE		PC95 PQ32/20Z-12	TDK	
		SUB			
		SUB			
2	BOBBIN		PQ3217	HOLD JINN	
		SUB			
		SUB			
3	WINDING WIRE		TIW-3	TOTOKU	φ0.4
		SUB			
4	WINDING WIRE		TIW-3	TOTOKU	φ0.64
		SUB			
5	INSULATING TAPE		1351-*	3M	t=25um,50um
	(COLOR : YELLOW)	SUB	No.630F	TERAOKA	t=25um,50um
		SUB			
6	COIL FIXING TAPE		1351-1	3M	t=25um
	(COLOR : YELLOW)	SUB	No.630F #25	TERAOKA	t=25um
		SUB			
7	CORE FIXING TAPE		555H-UL	NICHIBAN	t=25um
	(COLOR : MILKY WHITE)	SUB	No.3161F #25	NITTO DENKO	t=25um
		SUB			
8	DUMMY TAPE		No.530F	TERAOKA	
		S,B	1351-*	3M	
		SUB	No.630F	TERAOKA	

4. SPECIFICATIONS

1. CONNECTIONS



5. CONSTRUCTION



2. WINDING SPECIFICATIONS

LAYER	CONNECTION	WINDING DIA.	NFT	TURNS	REMARKS
1	3 →	TIW-3 φ0.4	1	15	P1
2	→	TIW-3 φ0.4	1	14	P1
3	→ 4	TIW-3 φ0.4	1	12	P1
4	1 → 2	TIW-3 φ0.4	1	2	P2
5	7,8 →	TIW-3 φ0.64	3	2.5	S1
6	→	TIW-3 φ0.64	3	2.5	S1
7	→ 9,10	TIW-3 φ0.64	3	1	S1
	→				
	→				
	→				

3	WITHSTAND VOLTAGE	COIL(P)-COIL(S)	4kVAC, 1min
		COIL(S)-CORE	600VAC, 3sec or 500VAC, 1min
4	INSULATION RESISTANCE	—	—
5	INDUCTANCE	f=1kHz	15.3mH±20%(3-4)
6	TEMPERATURE RATING		CLASS F
7	APPLICABLE SAFETY STANDARDS		UL, CSA, EN
8	INSULATION SYSTEM		NLF2 TABLE I

6. INSTRUCTIONS

		CONTENTS
1	MARKING	SEAL OR STAMP
2	FIXING MATERIAL	TAPE
3	CUT PIN	5.6PIN
4	SPRING	NO
5	IMPREGNATION	YES VARNISH : BC-346A OR TVB-2180T
6	SOLDER	LEED FREE NECESSARY

⚠7. ROHS COMPLIANCE

Refer to D-L Group Green Procurement Guideline : DL-EMS-010_

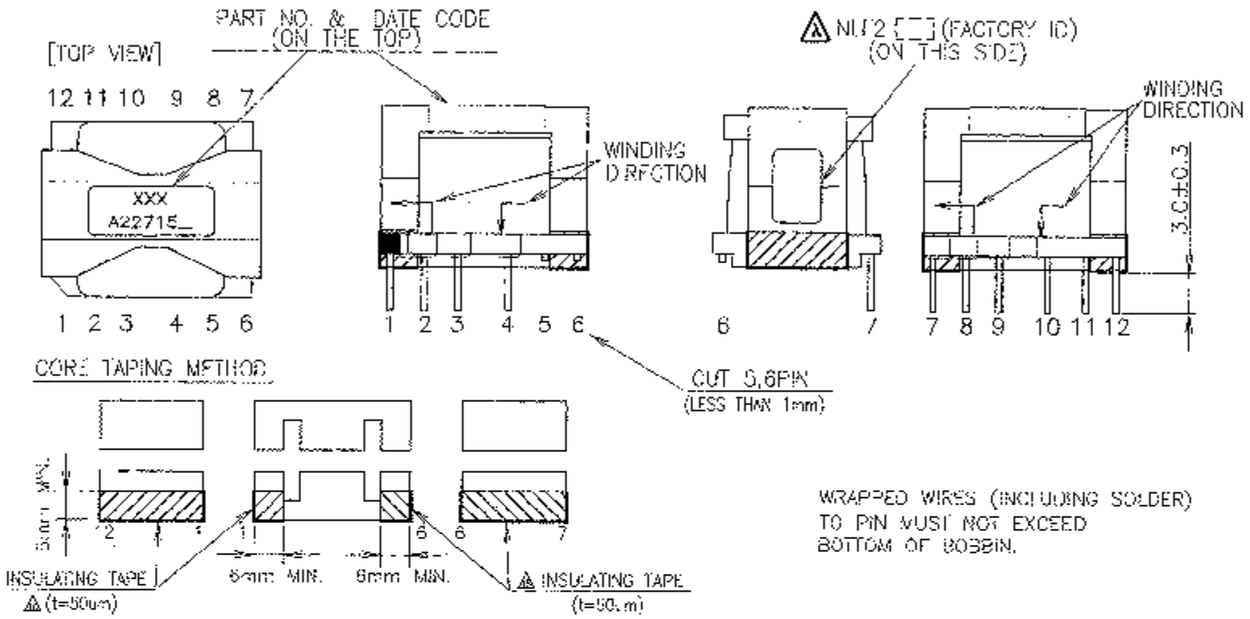
REV		CONTENTS	DATE	ENGR	CHK	APPD
A	A6	⚠4 ADD ROHS COMPLIANCE ⚠5 ADD t=50um ⚠6 ADD INSULATING TAPE (t=50um) ⚠7 A22714 → A22714A	14 Jul '05	N.Miyata	H.Matsumoto	M.Oka
—	A5	NEW RELEASE	8 Apr '05	S.Sasaki	H.Matsumoto	M.Isa

SCALE —
UNITS m/m
3RD ANGLE PROJECTION
MATERIALS —
FINISH —
TITLE HWS100-15 TRANSFORMER SPEC
DRAWING No. A227--35--14--A
DENSEI-LAMBDA

MODEL : HWS100-24

1. TITLE : TRANSFORMER SPEC (⚠A22715B)

2. OUTLINE & DIMENSIONS

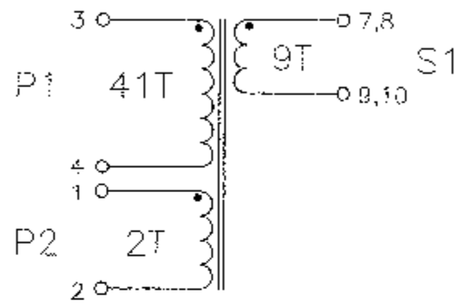


3. PARTS LIST

	PARTS LIST		CATALOG No.	MANUFACTURE	REMARKS
1	CORE		PC95 P032/20Z-12	TDK	
		SUB			
2	BOBBIN		PQ3217	HOLD JINN	
		SUB	⚠		
		SUB			
3	WINDING WIRE		TIW-3	TOTOKU	φ0.4
		SUB			
4	WINDING WIRE		TIW-3	TOTOKU	φ0.64
		SUB			
5	INSULATING TAPE		⚠1351-* ⚠No.630F	3M TERAOKA	⚠t=25um,50um ⚠t=25um,50um
	(COLOR : YELLOW)	SUB			
		SUB			
6	COIL FIXING TAPE		1351-1	3M	t=25um
	(COLOR : YELLOW)	SUB	No.630F #25	TERAOKA	
		SUB			
7	CORE FIXING TAPE		5534-L □□	NICHIBAN	t=25um
	(COLOR : MILKY WHITE)	SUB	No.3161F #25	NITTO DENKO	t=25um
		SUB			
8	DUMMY TAPE		No.630F	TERAOKA	
		SUB	1351-*	3M	
		SUB	No.630F	TERAOKA	

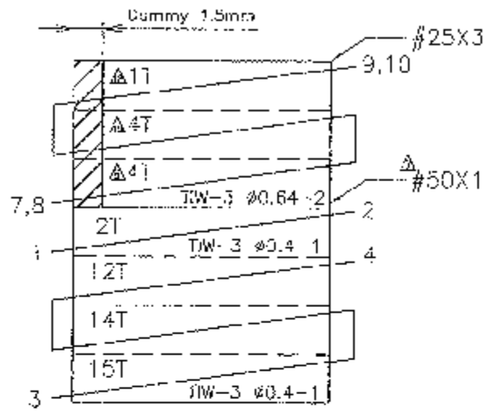
4. SPECIFICATIONS

1. CONNECTIONS



WRAPPED WIRES (INCLUDING SOLDER) TO PIN MUST NOT EXCEED BOTTOM OF BOBBIN.

5. CONSTRUCTION



2. WINDING SPECIFICATIONS

LAYER	CONNECTION	WINDING DIA.	NET	TURNS	REMARKS
1	3 →	TIW-3 φ0.4	1	15	P1
2	→	TIW-3 φ0.4	1	14	P1
3	→ 4	TIW-3 φ0.4	1	12	P1
4	1 → 2	TIW-3 φ0.4	1	2	P2
5	7,8 →	TIW-3 φ0.64	2	⚠4	S1
6	→	TIW-3 φ0.64	2	⚠4	S1
7	→ 9,10	TIW-3 φ0.64	2	⚠5	S1
	→				
	→				

3	WITHSTAND VOLTAGE	COIL(P)--COIL(S)	4kVAC, 1min
		COIL(S)--CORE	600VAC, 3sec or 500VAC, 1min
4	INSULATION RESISTANCE	———	—— ———
5	INDUCTANCE	f=1kHz	15.3mH±20%(3-4)
6	TEMPERATURE RATING		CLASS F
7	APPLICABLE SAFETY STANDARDS		UL, CSA, EN
8	INSULATION SYSTEM		NLF2 TABLE I

6. INSTRUCTIONS

		CONTENTS
1	MARKING	SEAL OR STAMP
2	FIXING MATERIAL	TAPE
3	CUT PIN	5,6PIN
4	SPRING	NO
5	IMPREGNATION	YES VARNISH : BC-346A OR JVR-2160T
6	SOLDER	LEAD FREE NECESSARY

⚠7. ROHS COMPLIANCE

Refer to D-L Group Green Procurement Guideline : DL-EMS-010_.

REV		CONTENTS	DATE	ENGR	CHK	APPD
A	A1	⚠3T => 4T ⚠4T => 1T ⚠#25X1 => #50X1 ⚠ADD t=50um ⚠ADD t=25um,50um ⚠No.630F #25 => No.630F ⚠1351-1 => 1351-* ⚠DELETE ALT MATERIAL : 2-320(FIX SPAC) ⚠A22715 => A22715A	28.Feb.'05	N.Miyata	M.Watanabe	M.Ise
-	-1	NEW RELEASE	3.Dec.'04	Okouchi	M.Watanabe	M.Ise
R	A6	⚠ADD ROHS COMPLIANCE ⚠ADD t=50um ⚠ADD INSULATING TAPE (t=50um) ⚠A22715A => A22715B	14 Jan. '05	N. Miyata	H. Iguchi	M. Ise

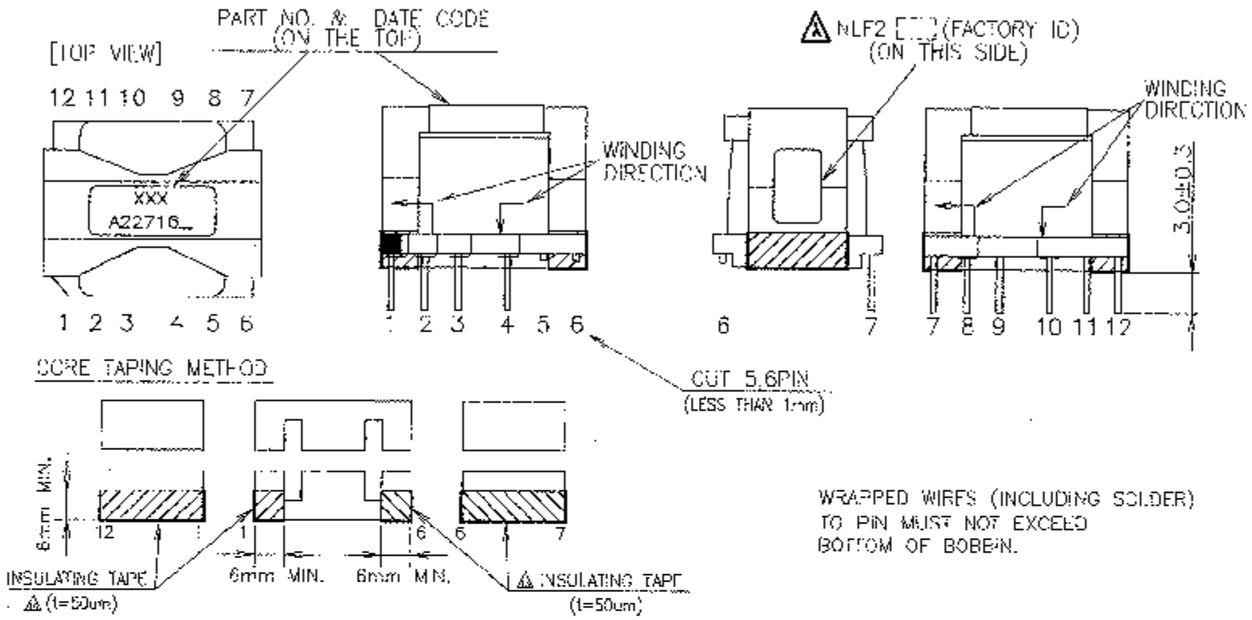
SCALE	
UNITS	m/m
3RD ANGLE PROJECTION	
MATERIALS	———
FINISH	———
TITLE	HWS100 24 TRANSFORMER SPEC
DRAWING No.	A227-35-15-⚠B

DENSEI-LAMBDA

MODEL : HWS100-48

1. TITLE : TRANSFORMER SPEC (⚠A22716B)

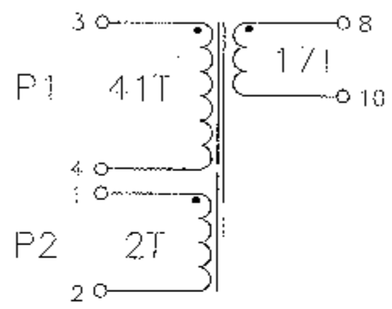
2. OUTLINE & DIMENSIONS



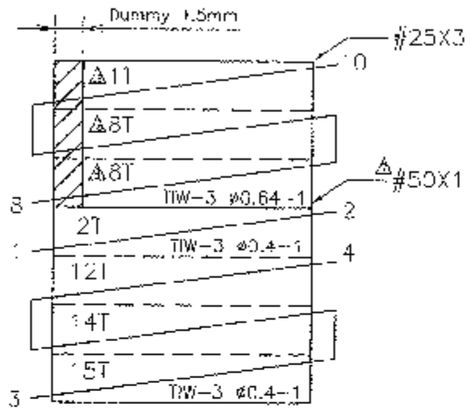
WRAPPED WIRES (INCLUDING SOLDER) TO PIN MUST NOT EXCEED BOTTOM OF BOBBIN.

4. SPECIFICATIONS

1. CONNECTIONS



5. CONSTRUCTION



3. PARTS LIST

	PARTS LIST		CATALOG No.	MANUFACTURE	REMARKS
1	CORE		PC95 PQ32/20Z-12	TDK	
		SUB			
2	BOBBIN		PQ3217	HOLD JINN	
		SUB	⚠		
		SUB			
3	WINDING WIRE		TIW-3	TOTOKU	ø0.4
		SUB			
4	WINDING WIRE		TIW-3	TOTOKU	ø0.64
		SUB			
5	INSULATING TAPE (COLOR : YELLOW)		⚠1351-*	3M	⚠t=25um,50um
		SUB	⚠No.630F	TERAOKA	⚠t=25um,50um
		SUB			
6	COIL FIXING TAPE (COLOR : YELLOW)		1351-1	3M	t=25um
		SUB	No.630F #25	TERAOKA	t=25um
		SUB			
7	CORE FIXING TAPE (COLOR : MILKY WHITE)		553H-UL	NICHIBAN	t=25um
		SUB	No.3161F #25	NITTO DENKO	t=25um
		SUB			
8	DUMMY TAPE		No.530F	TERAOKA	
		SUB	1351-*	3M	
		SUB	No.630F	TERAOKA	

2. WINDING SPECIFICATIONS

LAYER	CONNECTION	WINDING DIA.	NET	TURNS	REMARKS
1	3	TIW-3 ø0.4	1	15	P1
2		TIW-3 ø0.4	1	14	P1
3	4	TIW-3 ø0.4	1	12	P1
4	1 — 2	TIW-3 ø0.4	1	2	P2
5	8	TIW-3 ø0.64	1	⚠8	S1
6		TIW-3 ø0.64	1	⚠8	S1
7	10	TIW-3 ø0.64	1	⚠7	S1

3	WITHSTAND VOLTAGE	COIL(P)-COIL(S)	4kVAC, 1min
		COIL(S)-CORE	600VAC, 3sec or 500VAC, 1min
4	INSULATION RESISTANCE	———	———
5	INDUCTANCE	f=1kHz	15.3mH±20%(3-4)
6	TEMPERATURE RATING		CLASS F
7	APPLICABLE SAFETY STANDARDS		UL, CSA, EN
8	INSULATION SYSTEM		NLI'2 TABLE I

6. INSTRUCTIONS

		CONTENTS
1	MARKING	SEAL OR STAMP
2	FIXING MATERIAL	TAPE
3	CUT PIN	5,6PIN
4	SPRING	NO
5	IMPREGNATION	YES VARNISH : BC-346A OR TVB-2180
6	SOLDER	LEED FREE NECESSARY

⚠7. **ROHS COMPLIANCE**

Refer to D-L Group Green Procurement Guideline DL-EMS-010.

A	A1	⚠~⚠7T -> 8T ⚠⚠3T -> 4T ⚠#25X1 => #50X1 ⚠⚠ADD t=50um ⚠No.630F #25 => No.630F ⚠1351-* => 1351-* ⚠DELETE ALT MATERIAL : P-320! (PIN SHINE) ⚠A22716 => A22716A	28.Feb.'05	N.Miyato	M.Watanabe	M.Isa
-	-1	NEW RELEASE	3.Dec.'04	Okouchi	M.Watanabe	M.Isa
D	REV	CONTENTS	DATE	ENGR	CHK	APPD

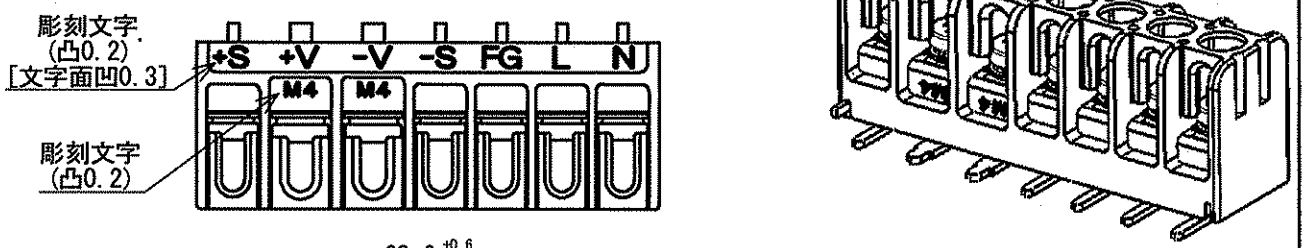
B	A6	⚠ ADD ROHS COMPLIANCE ⚠ ADD t=50um ⚠ ADD INSULATING TAPE (t=50um) ⚠ A22716A => A22716B	14.Jan.'05	M. Miyato	M. Watanabe	M.Isa

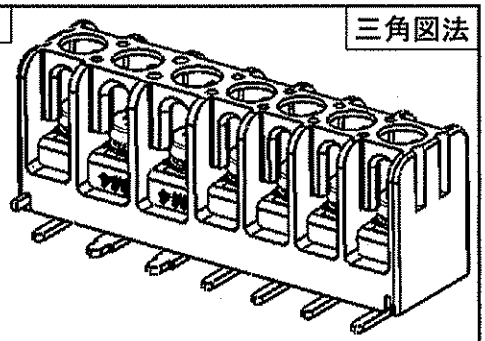
SCALE	/
UNITS	mm
3RD ANGLE PROJECTION	
MATERIALS	———
FINISH	———
TITLE	HWS100-48 TRANSFORMER SPEC
DRAWING No.	A227-35-16-[B]
	DENSEI-LAMBDA

\\HWS100\A2273516E.DWG

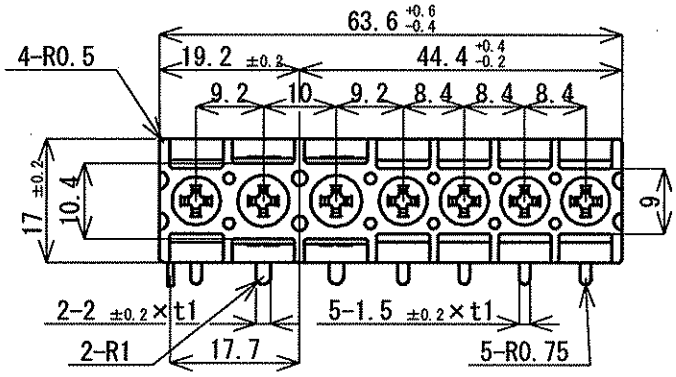
マーク	日付	変更者	照査	承認	変更内容

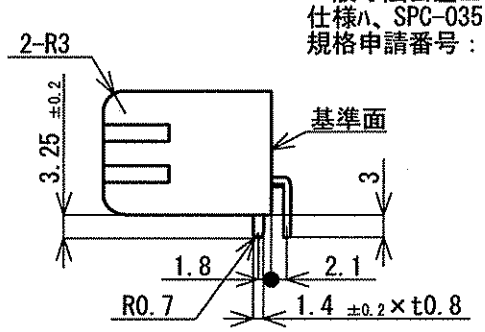
三角図法

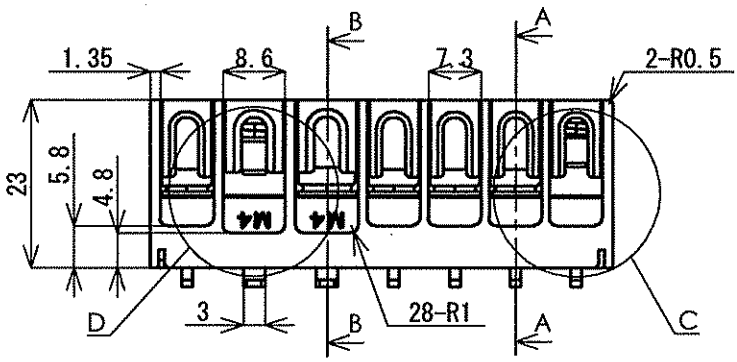


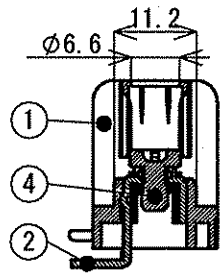


一般寸法公差±0.4
仕様ハ、SPC-0351ニヨル
規格申請番号：T7277

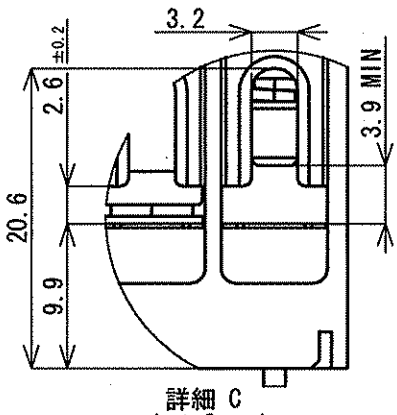




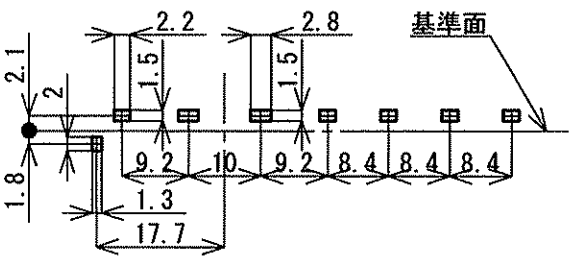




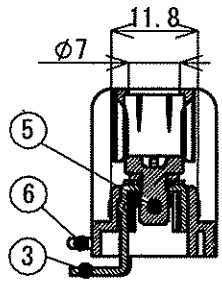
断面図 A-A



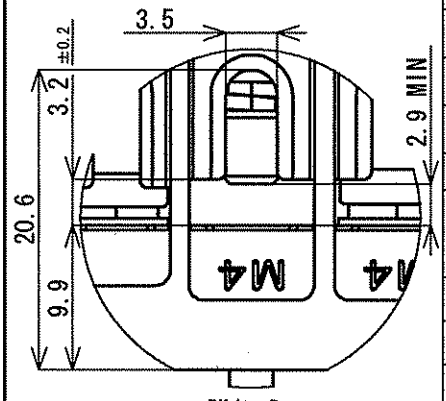
詳細 C
ｽｹｰﾙ 2 : 1
(M3.5部ネジ上昇時)



基板孔位置参考寸法(部品面)



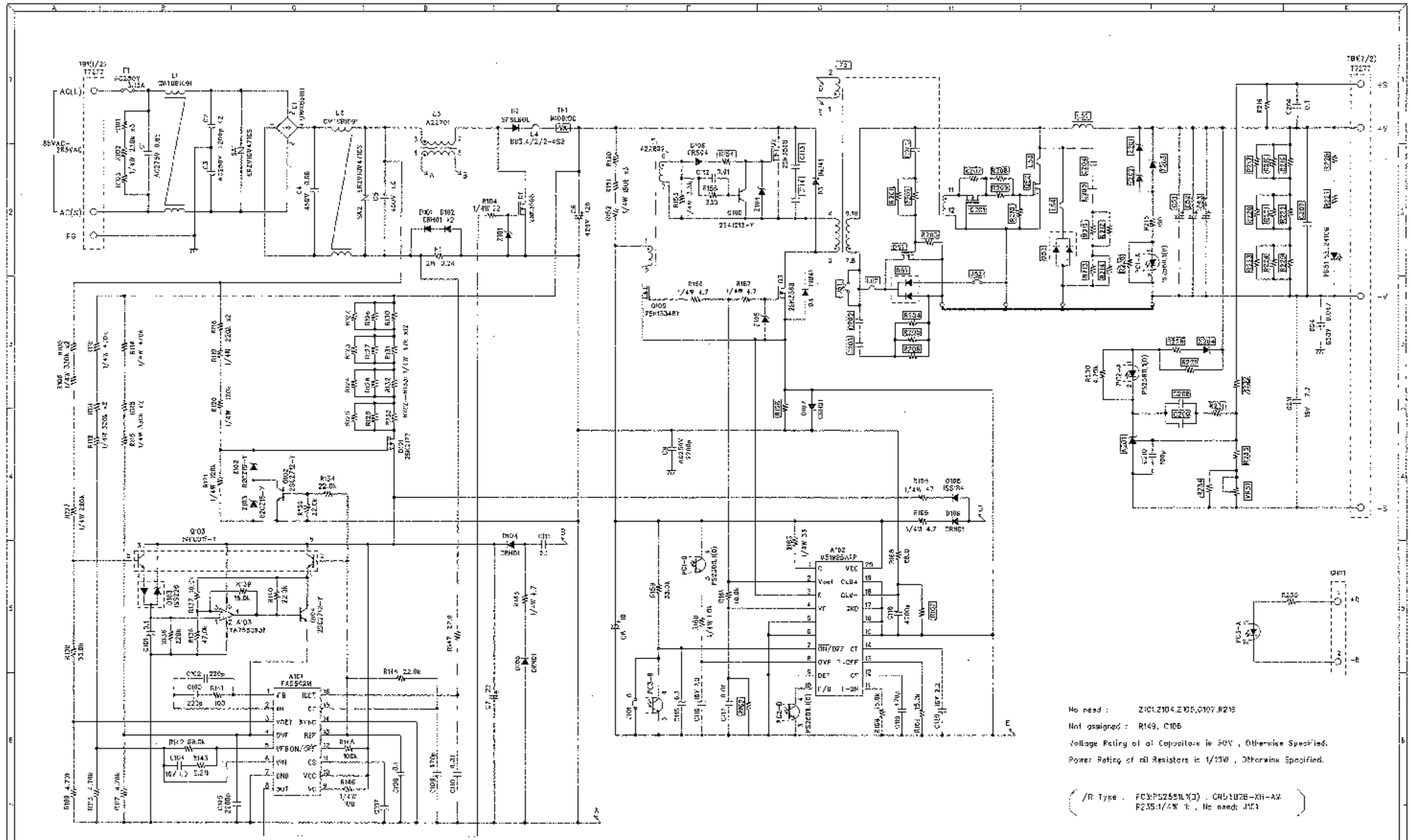
断面図 B-B



詳細 D
ｽｹｰﾙ 2 : 1
(M4部ネジ上昇時)

1	6	T10589	固定金具	C2680 t0.8	Ep-Cu/ Cu1,Sn2m
2	5	X1203	M4組込平小ﾈｼﾞ	鉄	Niﾒｯｷ
5	4	X1225	M3.5組込平小ﾈｼﾞ	鉄	Niﾒｯｷ
2	3	T10743	M4端子(L)	C2680 t1	Ep-Cu/ Ni1,Sn2m
5	2	T10750	M3.5端子(L)	C2680 t1	Ep-Cu/ Ni1,Sn2m
1	1	T7277-1	7P端子台ﾎﾞﾃﾞｨ	PBT 94V-0	黒色
個数	符号	部品番号	部品名	材質	仕上

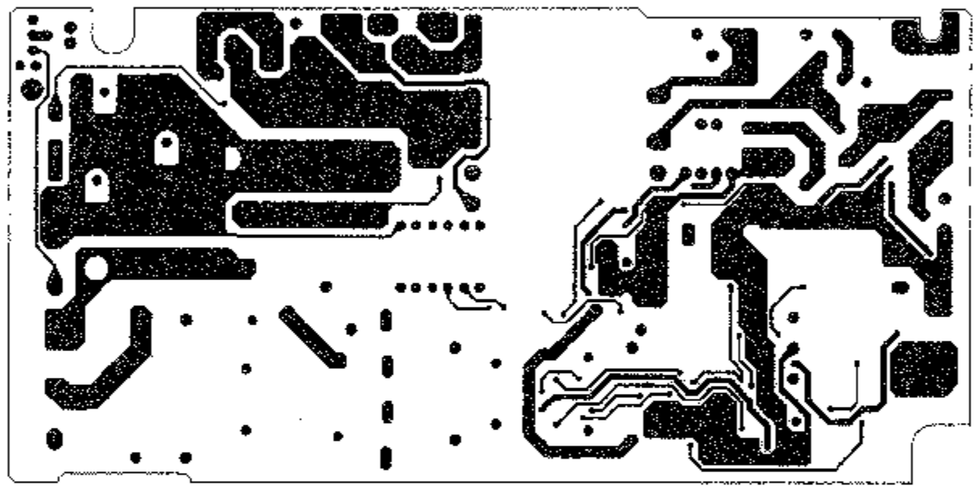
部品名	7Pｽｸﾘｭｰﾎｰﾙﾄﾞ端子台(M3.5&M4)			
仕上		材質		
照査	2004 05 07 小田切	設計	2004 04 高橋	尺度
製図	2004 05 07 高橋	承認	2004 05 07 藤原	1:1
エムデン無線工業株式会社		図番	T7277	



D	01	ADD : SA2	6-Nov-06			M.Ise
C	H1	ADD : R238	23.AUG.05	K.Miyata	H.Matsumoto	M.Ise
B	AR	CHANGE : R118 : 1/4W 100k => 1/4W 220k R119 : 1/4W 100k => 1/4W 220k R120 : 1/4W 150k => 1/4W 120k R121 : 1/4W 100k => 1/4W 120k	14.JUL.06	K.Miyata	H.Matsumoto	M.Ise
A	A1	CHANGE C1 : 0.47 -> 0.68 R154 : 1/4W 15 => 1/4W 22 R155 : 470 => 330 R158 : 1/3W 0.22 => UNFUSE	28.FEB.05	K.Shimamoto	M.Watanabe	M.Ise
-	-1	NEW RELEASE	30.NOV.04	K.Shimamoto	M.Watanabe	M.Ise
S	REV	CONTENTS	DATE	ENGR	CHK	APPD

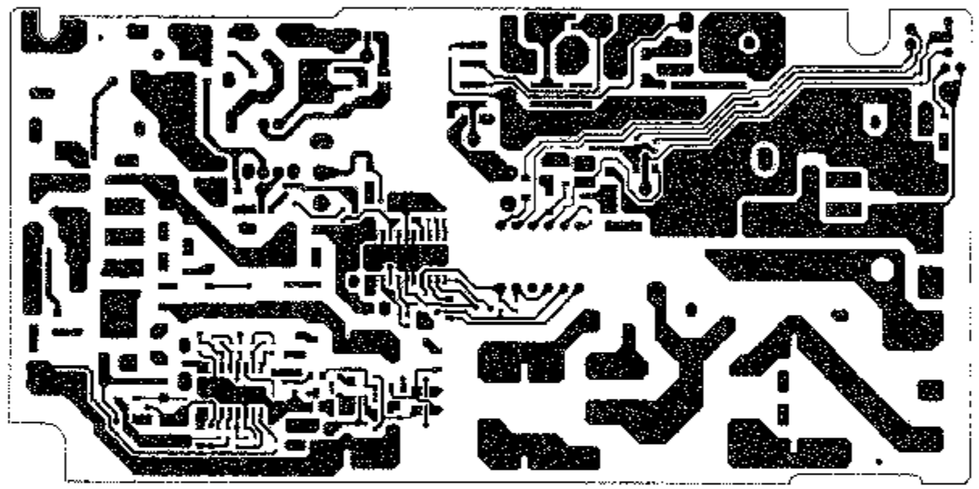
FILE NAME	A2273001D.SCH
MATERIALS	
TITLE	HWS100 SCHEMATICS
SCALE	
UNITS	
FINISH	
DRAWING No.	A227-30-01-D
3RD ANGLE PROJECTION	

DENSEI-LAMBDA



C	m	CHANGE PATTERN	6.Nov.'06				SCALE 1/1	MATERIALS
B	B1	PZA-027A ==> PZA-027B	23.AUG.'05	N.Miyata	H.Matsumoto	M.Iso	UNITS m/m	
A	A1	CHANGE PATTERN	28.FEB.'05	K.SHIMAMUNE	M.WATANABE	M.ISA		DWG. DATE
-	-1	NEW RELEASE	13.DEC.'04	K.SHIMAMUNE	M.WATANABE	M.ISA	ANGLE	
D	REV	CONTENTS	DATE	ENGR	CHK	APPD	NON MIRROR	'06.11.06

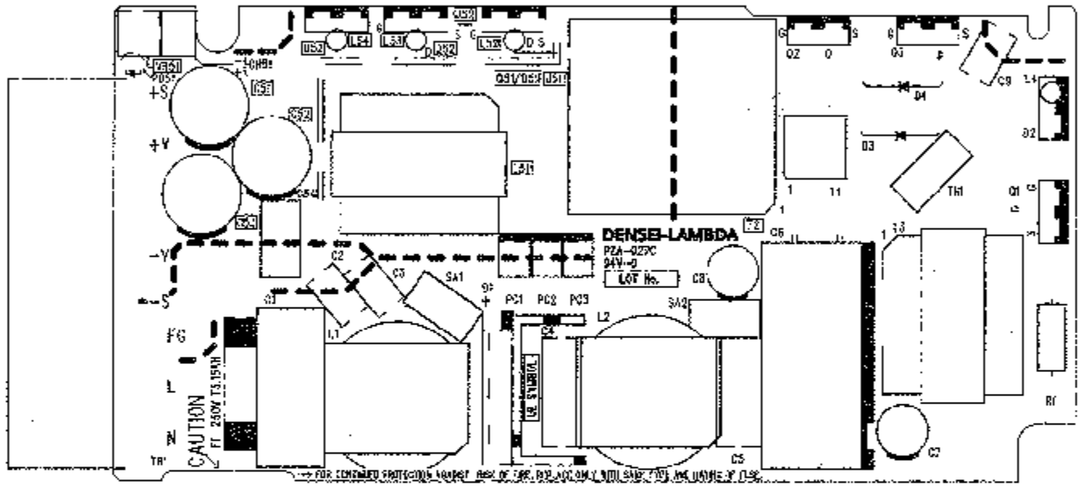
FILE NAME	PZA-027C.PCB
TITLE	PZA-027C.PCB PATTERN(COMP)
DRAWING No.	A227-31-03-C
	DENSEI-LAMBDA



C	D1	CHANGE PATTERN	6.Nov.'06			M.Oka	SCALE 1/1	MATERIALS
B	B1	CHANGE PATTERN	23.AUG.'05	N.Miyato	H.Motsumoto	M.Iso	UNITS m/m	
A	A3	CHANGE PATTERN	28.FEB.'05	K.SHIMAMUNE	M.WATANABE	M.ISA	ANGLE	DWG. DATE
–	-1	NEW RELEASE	13.DEC.'04	K.SHIMAMUNE	M.WATANABE	M.ISA	MIRROR	'06.11.06
D	REV	CONTENTS	DATE	ENGR	CHK	APPD		

FILE NAME	PZA-027C.PCB
TITLE	PZA-027C.PCB PATTERN(SOLD)
DRAWING No.	A227-31-04-C

DENSEI-LAMBDA



C	D1	CHANGE LEGEND	6.Nov.'06		H.Matsumoto	M.Isa	
B	B1	CHANGE LEGEND	23.AUG.'05	Y.Miyata	H.Matsumoto	M.Isa	
A	A1	CHANGE LEGEND	28.FEB.'05	K.SHIMAMUNE	M.WATANABE	M.ISA	
–	1	NEW RELEASE	13.DEC.'04	K.SHIMAMUNE	M.WATANABE	M.ISA	
D	REV	CONTENTS	DATE	ENGR	CHK	APPD	

SCALE	1/1
UNITS	m/m
ANGLE	NON MIRROR
MATERIALS	
DWG. DATE	'06.11.06
FILE NAME	PZA-027C.PCB
TITLE	PZA-027C.PCB LEGEND(COMP)
DRAWING No.	A227-31- 05- C
	DENSEI-LAMBDA

HWS80

SPECIFICATIONS

A233-01-01A

ITEMS / MODEL				HWS80 -3	HWS80 -5	HWS80 -12	HWS80 -15	HWS80 -24	HWS80 -48
1	Nominal Output Voltage		V	3.3	5	12	15	24	48
2	Maximum Output Current		A	16	16	6.7	5.4	3.4	1.7
3	Maximum Output Power		W	52.8	80	80.4	81	81.6	81.6
4	Efficiency (Typ) (*1)	100VAC	%	77	82	82	82	83	84
		200VAC	%	79	85	85	85	85	86
5	Input Voltage Range (*2)		-	85 ~ 265VAC (47 ~ 63Hz) or 120 ~ 370VDC					
6	Input Current (100/200VAC)(Typ) (*1)		A	0.72/0.36	1.04/0.52				
7	Inrush Current(Typ) (*3)		-	14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start					
8	PFHC		-	Built to meet IEC61000-3-2					
9	Power Factor (100/200VAC)(Typ) (*1)		-	0.98/0.90	0.99/0.95				
10	Output Voltage Range		V	2.97~3.96	4.0~6.0	9.6~14.4	12.0~18.0	19.2~28.8	38.4~52.8
11	Maximum Ripple & Noise	0≤Ta≤70°C	mV	120	120	150	150	150	200
	(*4)	-10≤Ta<0°C	mV	160	160	180	180	180	240
12	Maximum Line Regulation (*5)		mV	20	20	48	60	96	192
13	Maximum Load Regulation (*6)		mV	40	40	96	120	192	384
14	Temperature Coefficient		-	Less than 0.02% / °C					
15	Over Current Protection (*7)		A	16.8 ~	16.8 ~	7.04 ~	5.67 ~	3.57 ~	1.79 ~
16	Over Voltage Protection (*8)		V	4.13~4.95	6.25~7.25	15.0~17.4	18.8~21.8	30.0~34.8	55.2~64.8
17	Hold-up Time (Typ) (*9)		-	20ms					
18	Leakage Current (*10)		-	Less than 0.5mA. 0.2mA(Typ) at 100VAC / 0.4mA(Typ) at 230VAC					
19	Remote Sensing		-	Possible					
20	Parallel Operation		-	-					
21	Series Operation		-	Possible					
22	Operating Temperature (*11)		-	-10 ~+70°C (-10 ~+50°C:100%,+60°C:60%,+70°C:20%)					
23	Operating Humidity		-	30 ~ 90%RH (No dewdrop)					
24	Storage Temperature		-	-30 ~ +85°C					
25	Storage Humidity		-	10 ~ 95%RH (No dewdrop)					
26	Cooling		-	Convection Cooling					
27	Withstand Voltage		-	Input - FG : 2kVAC (20mA), Input - Output : 3kVAC (20mA) Output - FG : 500VAC (100mA) for 1min					
28	Isolation Resistance		-	More than 100MΩ at 25°C and 70%RH Output - FG : 500VDC					
29	Vibration		-	At no operating, 10 ~ 55Hz (Sweep for 1min) 19.6m/s^2 Constant, X,Y,Z 1hour each.					
30	Shock (In package)		-	Less than 196.1m/s^2					
31	Safety (*12)		-	Approved by UL60950-1, CSA60950-1, EN60950-1, EN50178 Built to meet UL508, DENAN					
32	Line DIP		-	Built to meet SEMI-F47 (200VAC Line only)					
33	Conducted Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
34	Radiated Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
35	Immunity		-	Built to meet IEC61000-4-2(Level 2,3), -3(Level 3), -4(Level 3), -5(Level 3,4), -6(Level 3), -8(Level 4), -11					
36	Weight(Typ.)		-	450g					
37	Size (W x H x D)		mm	28 x 82 x 160 (Refer to Outline Drawing)					

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. At 100/200VAC, Ta=25°C and maximum output power.
*2. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 ~ 240VAC(50/60Hz).
*3. Not applicable for the in-rush current to Noise Filter for less than 0.2ms.
*4. Measure with JEITA RC-9131A probe, Bandwise of scope :100MHz.
*5. 85 ~ 265VAC , constant load.
*6. No load-Full load, constant input voltage.
*7. Constant current limit and Hiccup with automatic recovery.
Not operate at over load or dead short condition for more than 30seconds.
*8. OVP circuit will shutdown output, manual reset (Re power on).
*9. At 100/200VAC , nominal output voltage and maximum output current.
*10. Measured by the each measuring method of UL,CSA,EN and DENAN(at 60Hz).
*11. Ratings - Derating at standard mounting.
- Load (%) is percent of maximum output power or maximum output current, whichever is greater.
- As for other mountings, refer to derating curve (A233-01-02_).
*12. As for DENAN, built to meet at 100VAC.

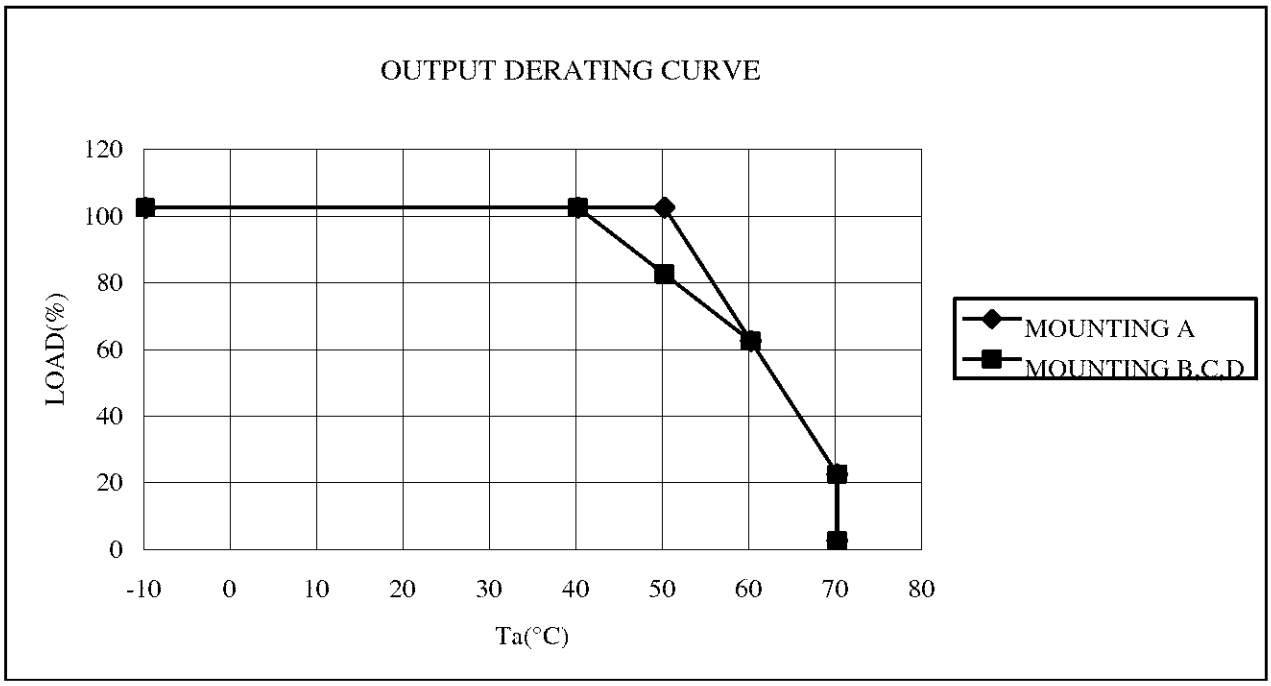
DENSEI-LAMBDA

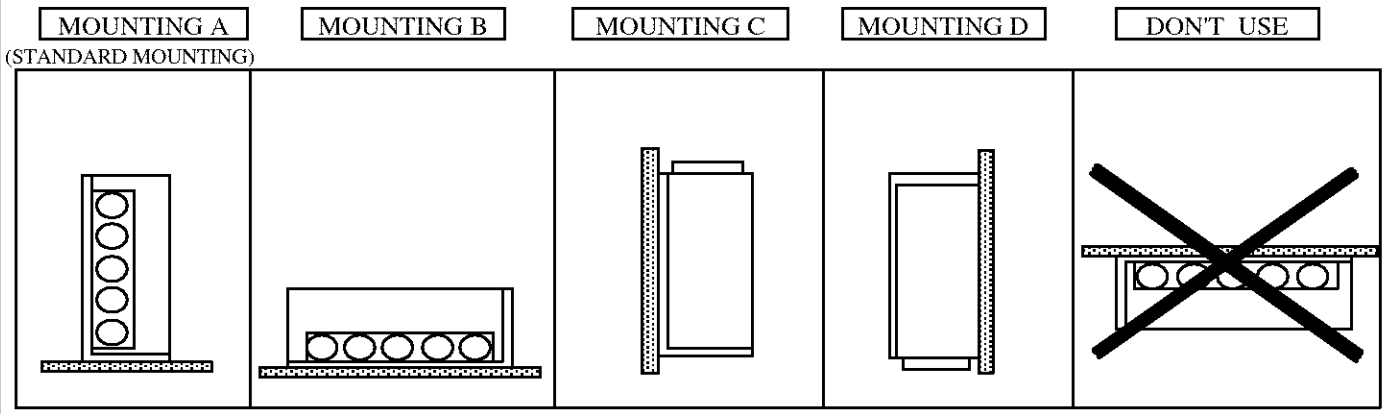
HWS80

OUTPUT DERATING

A233-01-02

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+40	100	100
50	100	80
60	60	60
70	20	20





HWS80/A

SPECIFICATIONS

A233-01-01/A-A

ITEMS \ MODEL				HWS80 -3/A	HWS80 -5/A	HWS80 -12/A	HWS80 -15/A	HWS80 -24/A	HWS80 -48/A
1	Nominal Output Voltage		V	3.3	5	12	15	24	48
2	Maximum Output Current		A	16	16	6.7	5.4	3.4	1.7
3	Maximum Output Power		W	52.8	80	80.4	81	81.6	81.6
4	Efficiency (Typ) (*1)	100VAC	%	77	82	82	82	83	84
		200VAC	%	79	85	85	85	85	86
5	Input Voltage Range (*2)		-	85 ~ 265VAC (47 ~ 63Hz) or 120 ~ 370VDC					
6	Input Current (100/200VAC)(Typ) (*1)		A	0.72/0.36	1.04/0.52				
7	Inrush Current(Typ) (*3)		-	14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start					
8	PFHC		-	Built to meet IEC61000-3-2					
9	Power Factor (100/200VAC)(Typ) (*1)		-	0.98/0.90	0.99/0.95				
10	Output Voltage Range		V	2.97~3.96	4.0~6.0	9.6~14.4	12.0~18.0	19.2~28.8	38.4~52.8
11	Maximum Ripple & Noise	0≤Ta≤60°C	mV	120	120	150	150	150	200
	(*4)	-10≤Ta<0°C	mV	160	160	180	180	180	240
12	Maximum Line Regulation (*5)		mV	20	20	48	60	96	192
13	Maximum Load Regulation (*6)		mV	40	40	96	120	192	384
14	Temperature Coefficient		-	Less than 0.02% / °C					
15	Over Current Protection (*7)		A	16.8 ~	16.8 ~	7.04 ~	5.67 ~	3.57 ~	1.79 ~
16	Over Voltage Protection (*8)		V	4.13~4.95	6.25~7.25	15.0~17.4	18.8~21.8	30.0~34.8	55.2~64.8
17	Hold-up Time (Typ) (*9)		-	20ms					
18	Leakage Current (*10)		-	Less than 0.5mA. 0.2mA(Typ) at 100VAC / 0.4mA(Typ) at 230VAC					
19	Remote Sensing		-	Possible					
20	Parallel Operation		-	-					
21	Series Operation		-	Possible					
22	Operating Temperature (*11)		-	-10 ~+60°C (-10 ~+40°C:100%,+50°C:60%,+60°C:20%)					
23	Operating Humidity		-	30 ~ 90%RH (No dewdrop)					
24	Storage Temperature		-	-30 ~ +85°C					
25	Storage Humidity		-	10 ~ 95%RH (No dewdrop)					
26	Cooling		-	Convection Cooling					
27	Withstand Voltage		-	Input - FG : 2kVAC (20mA), Input - Output : 3kVAC (20mA) Output - FG : 500VAC (100mA) for 1min					
28	Isolation Resistance		-	More than 100MΩ at 25°C and 70%RH Output - FG : 500VDC					
29	Vibration		-	At no operating, 10 ~ 55Hz (Sweep for 1min) 19.6m/s^2 Constant, X,Y,Z 1hour each.					
30	Shock (In package)		-	Less than 196.1m/s^2					
31	Safety (*12)		-	Approved by UL60950-1, CSA60950-1, EN60950-1, EN50178, UL508 Built to meet DENAN					
32	Line DIP		-	Built to meet SEMI-F47 (200VAC Line only)					
33	Conducted Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
34	Radiated Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
35	Immunity		-	Built to meet IEC61000-4-2(Level 2,3), -3(Level 3), -4(Level 3), -5(Level 3,4), -6(Level 3), -8(Level 4), -11					
36	Weight(Typ.)		-	500g					
37	Size (W x H x D)		mm	33 x 82 x 160 (Refer to Outline Drawing)					

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. At 100/200VAC, Ta=25°C and maximum output power.
*2. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 ~ 240VAC(50/60Hz).
*3. Not applicable for the in-rush current to Noise Filter for less than 0.2ms.
*4. Measure with JEITA RC-9131A probe, Bandwidth of scope :100MHz.
*5. 85 ~ 265VAC , constant load.
*6. No load-Full load, constant input voltage.
*7. Constant current limit and Hiccup with automatic recovery.
Not operate at over load or dead short condition for more than 30seconds.
*8. OVP circuit will shutdown output, manual reset (Re power on).
*9. At 100/200VAC , nominal output voltage and maximum output current.
*10. Measured by the each measuring method of UL,CSA,EN and DENAN(at 60Hz).
*11. Ratings - Derating at standard mounting.
- Load (%) is percent of maximum output power or maximum output current, whichever is greater.
- As for other mountings, refer to derating curve (A233-01-02/A_).
*12. As for DENAN, built to meet at 100VAC.

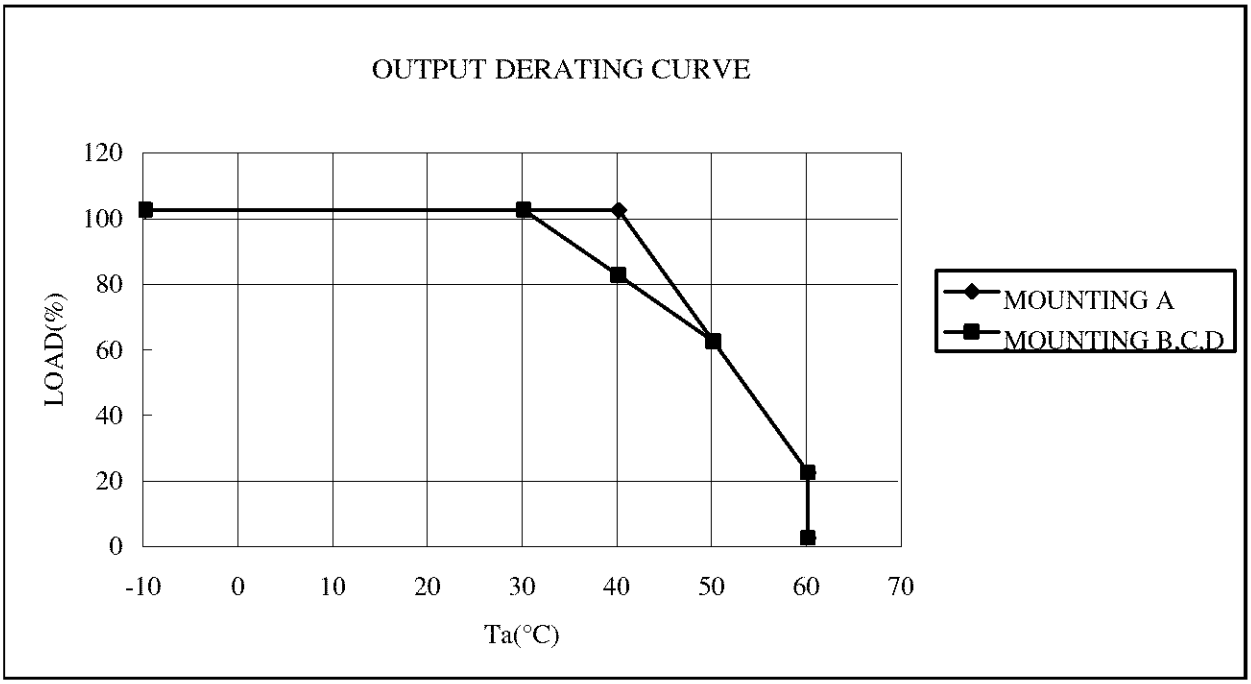
DENSEI-LAMBDA

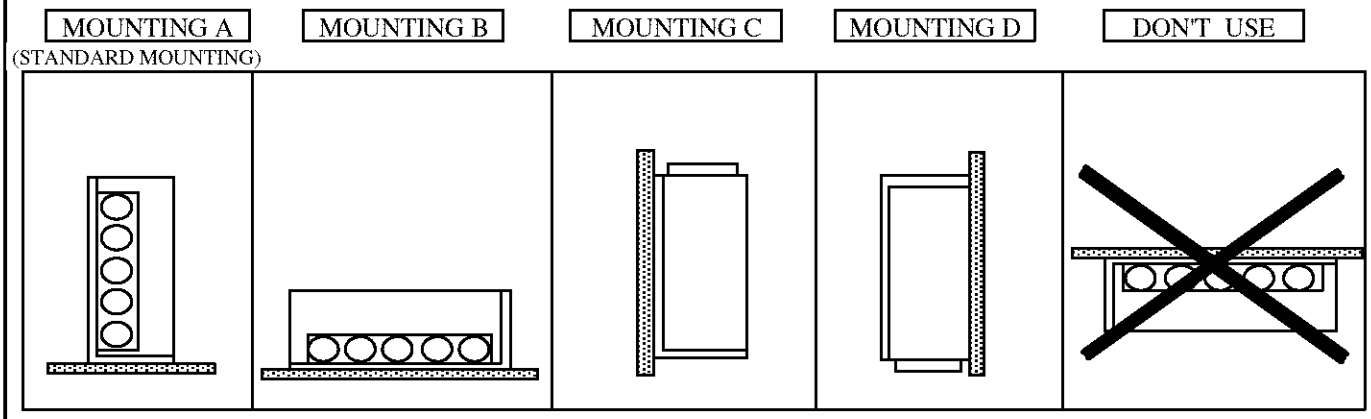
HWS80/A

OUTPUT DERATING

A233-01-02/A

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+30	100	100
40	100	80
50	60	60
60	20	20





DENSEI-LAMBDA

HWS100

SPECIFICATIONS

A227-01-01C

	ITEMS / MODEL			HWS100 -3	HWS100 -5	HWS100 -12	HWS100 -15	HWS100 -24	HWS100 -48
1	Nominal Output Voltage		V	3.3	5	12	15	24	48
2	Maximum Output Current		A	20	20	8.5	7	4.5	2.1
3	Maximum Output Power		W	66	100	102	105	108	100.8
4	Efficiency (Typ) (*1)	100VAC	%	78	83	83	83	84	84
		200VAC	%	81	86	86	86	87	87
5	Input Voltage Range (*2)		-	85 ~ 265VAC (47 ~ 63Hz) or 120 ~ 370VDC					
6	Input Current (100/200VAC)(Typ) (*1)		A	0.9/0.45	1.3/0.65				
7	Inrush Current(Typ) (*3)		-	14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start					
8	PFHC		-	Built to meet IEC61000-3-2					
9	Power Factor (100/200VAC)(Typ) (*1)		-	0.98/0.90	0.99/0.95				
10	Output Voltage Range		V	2.97~3.96	4.0~6.0	9.6~14.4	12.0~18.0	19.2~28.8	38.4~52.8
11	Maximum Ripple & Noise	0≤Ta≤70°C	mV	120	120	150	150	150	200
	(*4)	-10≤Ta<0°C	mV	160	160	180	180	180	240
12	Maximum Line Regulation (*5)		mV	20	20	48	60	96	192
13	Maximum Load Regulation (*6)		mV	40	40	96	120	192	384
14	Temperature Coefficient		-	Less than 0.02% / °C					
15	Over Current Protection (*7)		A	21.0 ~	21.0 ~	8.92 ~	7.35 ~	4.72 ~	2.20 ~
16	Over Voltage Protection (*8)		V	4.13~4.95	6.25~7.25	15.0~17.4	18.8~21.8	30.0~34.8	55.2~64.8
17	Hold-up Time (Typ) (*9)		-	20ms					
18	Leakage Current (*10)		-	Less than 0.5mA. 0.2mA(Typ) at 100VAC / 0.4mA(Typ) at 230VAC					
19	Remote Sensing		-	Possible					
20	Parallel Operation		-	-					
21	Series Operation		-	Possible					
22	Operating Temperature (*11)		-	-10 ~+70°C (-10 ~+50°C:100%,+60°C:60%,+70°C:20%)					
23	Operating Humidity		-	30 ~ 90%RH (No dewdrop)					
24	Storage Temperature		-	-30 ~ +85°C					
25	Storage Humidity		-	10 ~ 95%RH (No dewdrop)					
26	Cooling		-	Convection Cooling					
27	Withstand Voltage		-	Input - FG : 2kVAC (20mA), Input - Output : 3kVAC (20mA) Output - FG : 500VAC (100mA) for 1min					
28	Isolation Resistance		-	More than 100MΩ at 25°C and 70%RH Output - FG : 500VDC					
29	Vibration		-	At no operating, 10 ~ 55Hz (Sweep for 1min) 19.6m/s^2 Constant, X,Y,Z 1hour each.					
30	Shock (In package)		-	Less than 196.1m/s^2					
31	Safety (*12)		-	Approved by UL60950-1, CSA60950-1, EN60950-1, EN50178 Built to meet UL508, DENAN					
32	Line DIP		-	Built to meet SEMI-F47 (200VAC Line only)					
33	Conducted Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
34	Radiated Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
35	Immunity		-	Built to meet IEC61000-4-2(Level 2,3), -3(Level 3), -4(Level 3), -5(Level 3,4), -6(Level 3), -8(Level 4), -11					
36	Weight(Typ.)		-	450g					
37	Size (W x H x D)		mm	28 x 82 x 160 (Refer to Outline Drawing)					

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. At 100/200VAC, Ta=25°C and maximum output power.
*2. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 ~ 240VAC(50/60Hz).
*3. Not applicable for the in-rush current to Noise Filter for less than 0.2ms.
*4. Measure with JEITA RC-9131A probe, Bandwise of scope :100MHz.
*5. 85 ~ 265VAC , constant load.
*6. No load-Full load, constant input voltage.
*7. Constant current limit and Hiccup with automatic recovery.
Not operate at over load or dead short condition for more than 30seconds.
*8. OVP circuit will shutdown output, manual reset (Re power on).
*9. At 100/200VAC , nominal output voltage and maximum output current.
*10. Measured by the each measuring method of UL,CSA,EN and DENAN(at 60Hz).
*11. Ratings - Derating at standard mounting.
- Load (%) is percent of maximum output power or maximum output current, whichever is greater.
- As for other mountings, refer to derating curve (A227-01-02_).
*12. As for DENAN, built to meet at 100VAC.

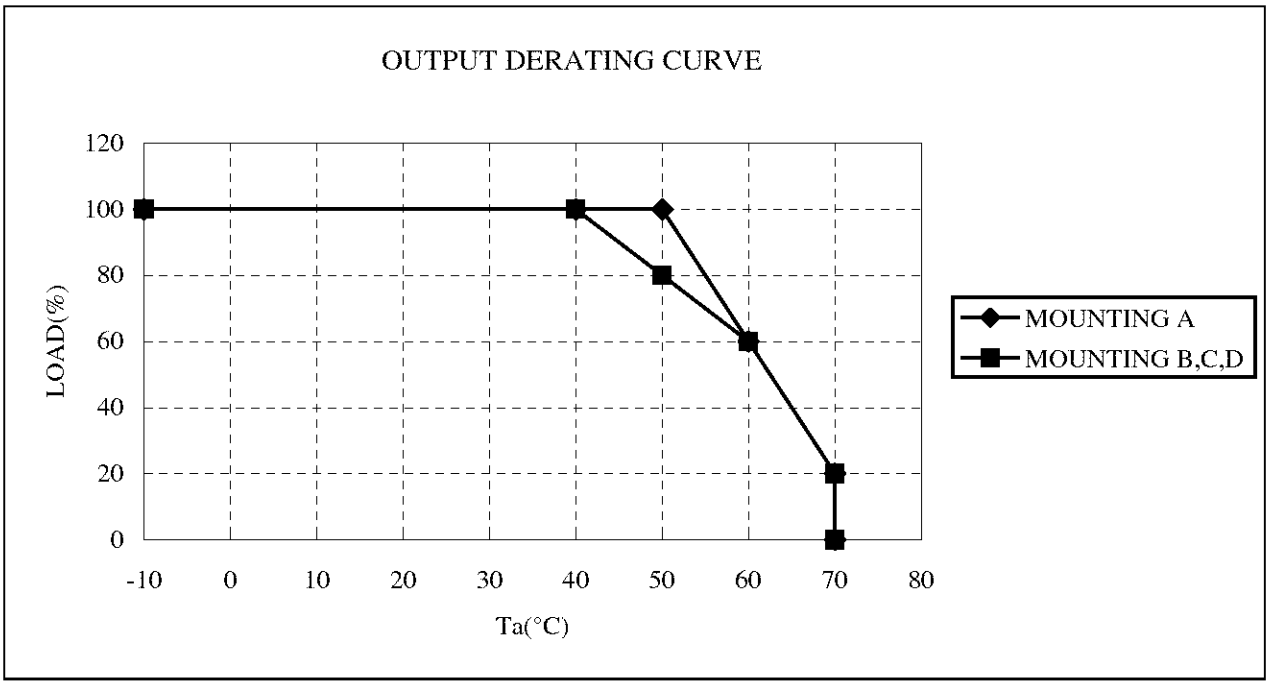
DENSEI-LAMBDA

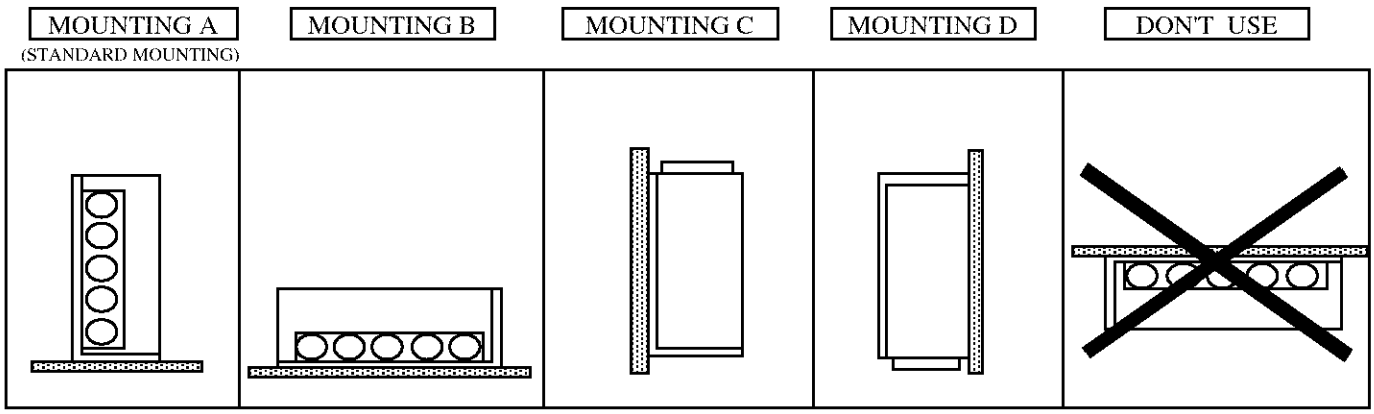
HWS100

OUTPUT DERATING

A227-01-02

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+40	100	100
50	100	80
60	60	60
70	20	20





DENSEI-LAMBDA

HWS100/A

SPECIFICATIONS

A227-01-01/A-C

	ITEMS / MODEL			HWS100 -3/A	HWS100 -5/A	HWS100 -12/A	HWS100 -15/A	HWS100 -24/A	HWS100 -48/A
1	Nominal Output Voltage		V	3.3	5	12	15	24	48
2	Maximum Output Current		A	20	20	8.5	7	4.5	2.1
3	Maximum Output Power		W	66	100	102	105	108	100.8
4	Efficiency (Typ) (*1)	100VAC	%	78	83	83	83	84	84
		200VAC	%	81	86	86	86	87	87
5	Input Voltage Range (*2)		-	85 ~ 265VAC (47 ~ 63Hz) or 120 ~ 370VDC					
6	Input Current (100/200VAC)(Typ) (*1)		A	0.9/0.45	1.3/0.65				
7	Inrush Current(Typ) (*3)		-	14A at 100VAC, 28A at 200VAC, Ta=25°C, Cold Start					
8	PFHC		-	Built to meet IEC61000-3-2					
9	Power Factor (100/200VAC)(Typ) (*1)		-	0.98/0.90	0.99/0.95				
10	Output Voltage Range		V	2.97~3.96	4.0~6.0	9.6~14.4	12.0~18.0	19.2~28.8	38.4~52.8
11	Maximum Ripple & Noise	0≤Ta≤60°C	mV	120	120	150	150	150	200
	(*4)	-10≤Ta<0°C	mV	160	160	180	180	180	240
12	Maximum Line Regulation (*5)		mV	20	20	48	60	96	192
13	Maximum Load Regulation (*6)		mV	40	40	96	120	192	384
14	Temperature Coefficient		-	Less than 0.02% / °C					
15	Over Current Protection (*7)		A	21.0 ~	21.0 ~	8.92 ~	7.35 ~	4.72 ~	2.20 ~
16	Over Voltage Protection (*8)		V	4.13~4.95	6.25~7.25	15.0~17.4	18.8~21.8	30.0~34.8	55.2~64.8
17	Hold-up Time (Typ) (*9)		-	20ms					
18	Leakage Current (*10)		-	Less than 0.5mA. 0.2mA(Typ) at 100VAC / 0.4mA(Typ) at 230VAC					
19	Remote Sensing		-	Possible					
20	Parallel Operation		-	-					
21	Series Operation		-	Possible					
22	Operating Temperature (*11)		-	-10 ~+60°C (-10 ~+40°C:100%,+50°C:60%,+60°C:20%)					
23	Operating Humidity		-	30 ~ 90%RH (No dewdrop)					
24	Storage Temperature		-	-30 ~ +85°C					
25	Storage Humidity		-	10 ~ 95%RH (No dewdrop)					
26	Cooling		-	Convection Cooling					
27	Withstand Voltage		-	Input - FG : 2kVAC (20mA), Input - Output : 3kVAC (20mA) Output - FG : 500VAC (100mA) for 1min					
28	Isolation Resistance		-	More than 100MΩ at 25°C and 70%RH Output - FG : 500VDC					
29	Vibration		-	At no operating, 10 ~ 55Hz (Sweep for 1min) 19.6m/s^2 Constant, X,Y,Z 1hour each.					
30	Shock (In package)		-	Less than 196.1m/s^2					
31	Safety (*12)		-	Approved by UL60950-1, CSA60950-1, EN60950-1, EN50178 Built to meet UL508, DENAN					
32	Line DIP		-	Built to meet SEMI-F47 (200VAC Line only)					
33	Conducted Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
34	Radiated Emission		-	Built to meet EN55011/EN55022-B, FCC-B, VCCI-B					
35	Immunity		-	Built to meet IEC61000-4-2(Level 2,3), -3(Level 3), -4(Level 3), -5(Level 3,4), -6(Level 3), -8(Level 4), -11					
36	Weight(Typ.)		-	500g					
37	Size (W x H x D)		mm	33 x 82 x 160 (Refer to Outline Drawing)					

*Read instruction manual carefully, before using the power supply unit.

=NOTES=

*1. At 100/200VAC, Ta=25°C and maximum output power.
*2. For cases where conformance to various safety specs (UL, CSA, EN) are required, to be described as 100 ~ 240VAC(50/60Hz).
*3. Not applicable for the in-rush current to Noise Filter for less than 0.2ms.
*4. Measure with JEITA RC-9131A probe, Bandwidth of scope :100MHz.
*5. 85 ~ 265VAC , constant load.
*6. No load-Full load, constant input voltage.
*7. Constant current limit and Hiccup with automatic recovery.
Not operate at over load or dead short condition for more than 30seconds.
*8. OVP circuit will shutdown output, manual reset (Re power on).
*9. At 100/200VAC , nominal output voltage and maximum output current.
*10. Measured by the each measuring method of UL,CSA,EN and DENAN(at 60Hz).
*11. Ratings - Derating at standard mounting.
- Load (%) is percent of maximum output power or maximum output current, whichever is greater.
- As for other mountings, refer to derating curve (A227-01-02/A_).
*12. As for DENAN, built to meet at 100VAC.

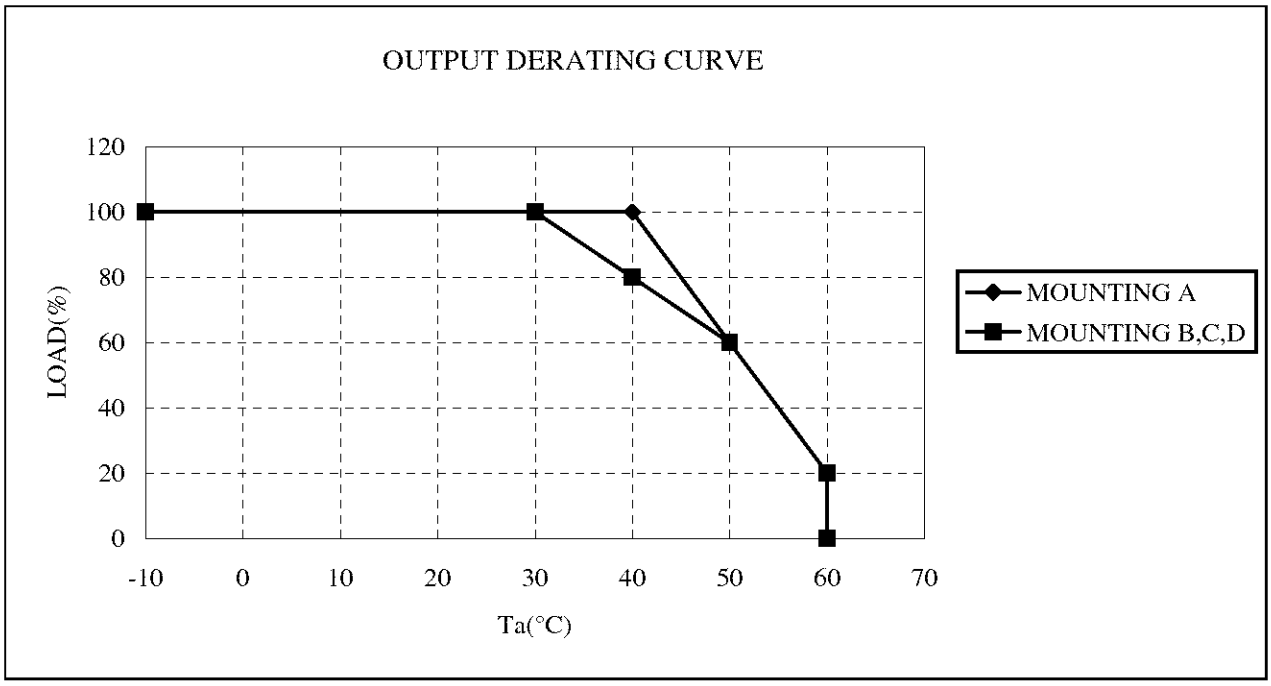
DENSEI-LAMBDA

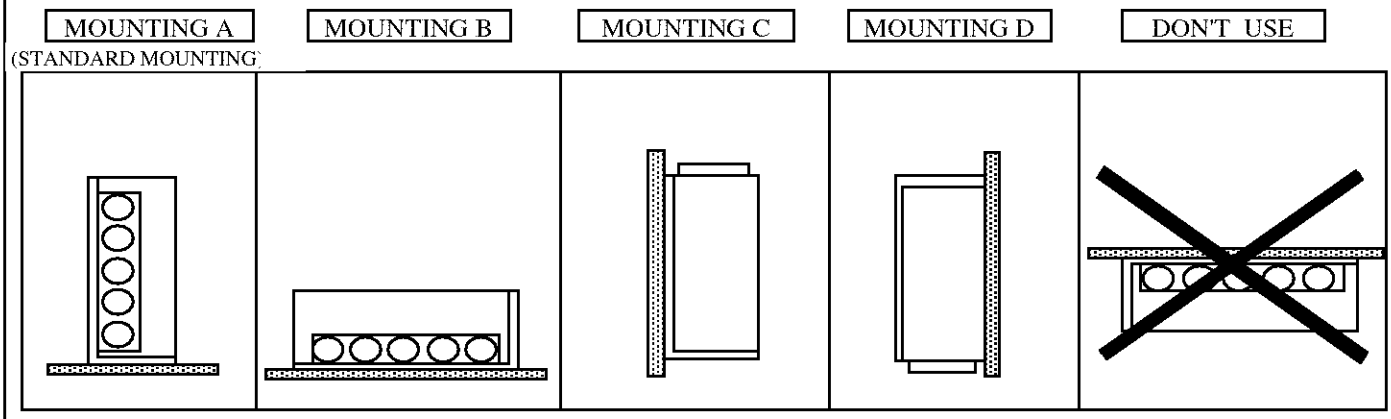
HWS100/A

OUTPUT DERATING

A227-01-02/A

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+30	100	100
40	100	80
50	60	60
60	20	20



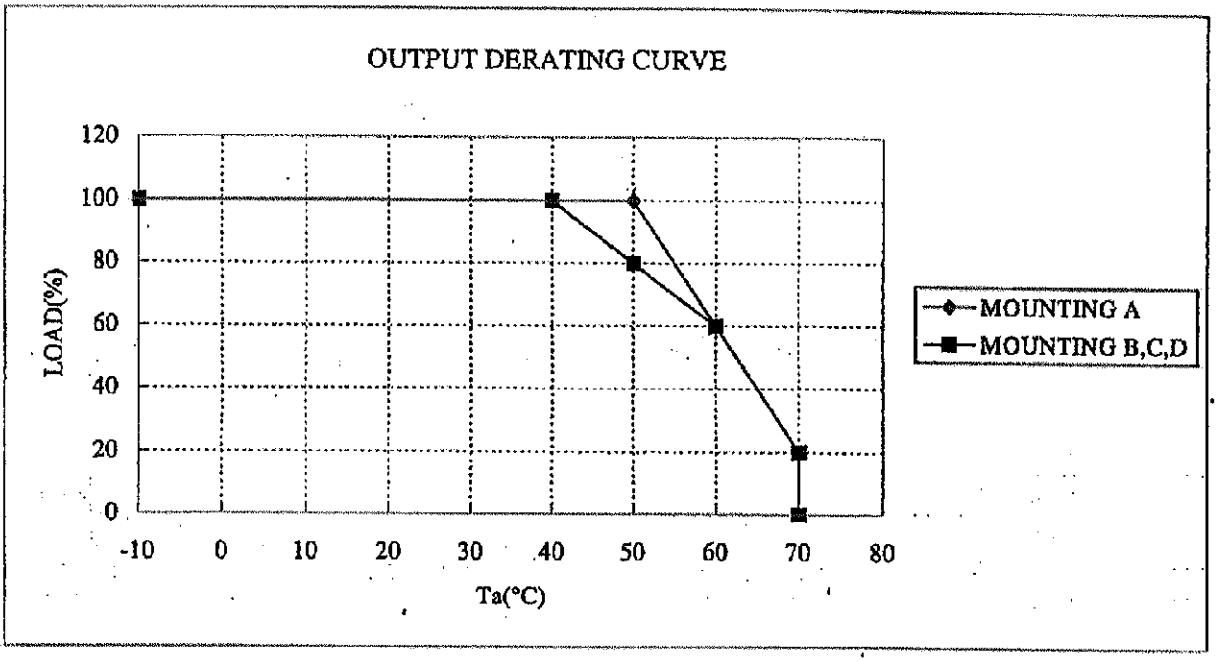


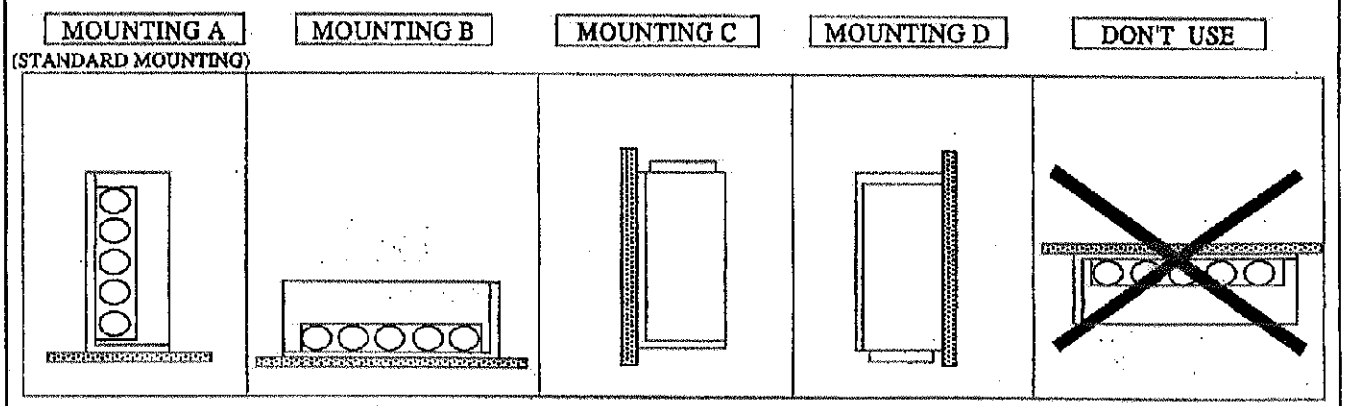
MOD STD		DWG. NO.	A227-01-02	

HWS100

OUTPUT DERATING

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+30	100	100
40	100	100
50	100	80
60	60	60
70	20	20





ENGR	
CHK	
APPD	
ISSUED	

DENSEI-LAMBDA

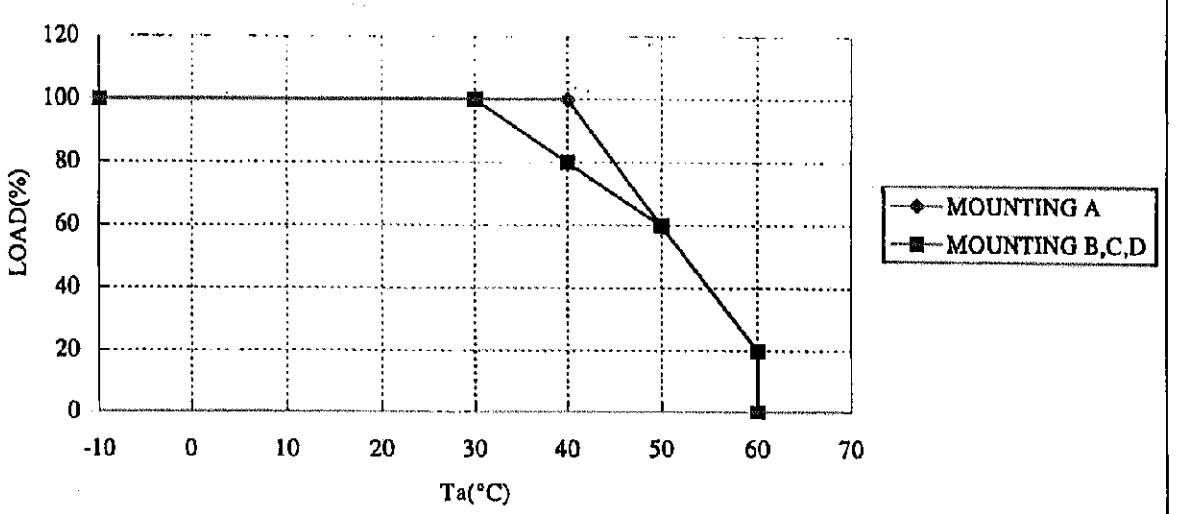
MOD STD	A	DWG. NO.	A227-01-02/A	

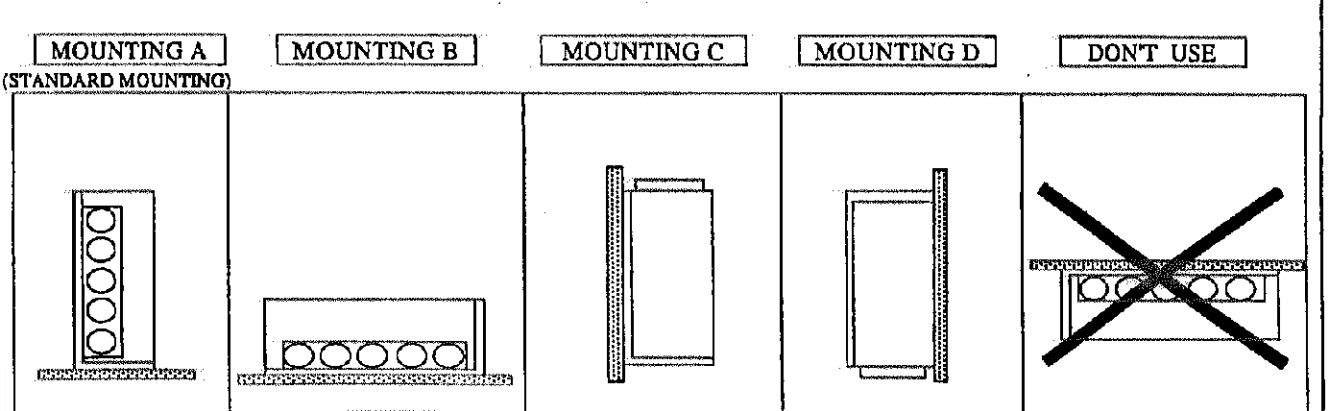
HWS100/A

OUTPUT DERATING

Ta(°C)	LOAD(%)	
	MOUNTING A	MOUNTING B,C,D
-10 ~+30	100	100
40	100	80
50	60	60
60	20	20

OUTPUT DERATING CURVE





ENGR	
CHK	
APPD	
ISSUED	

A227_SPC_A.xls

DENSEI-LAMBDA

PCB Coating

Apply coating on PCB solder side except the FG screw holes and the Slits under E-cap as shown below.

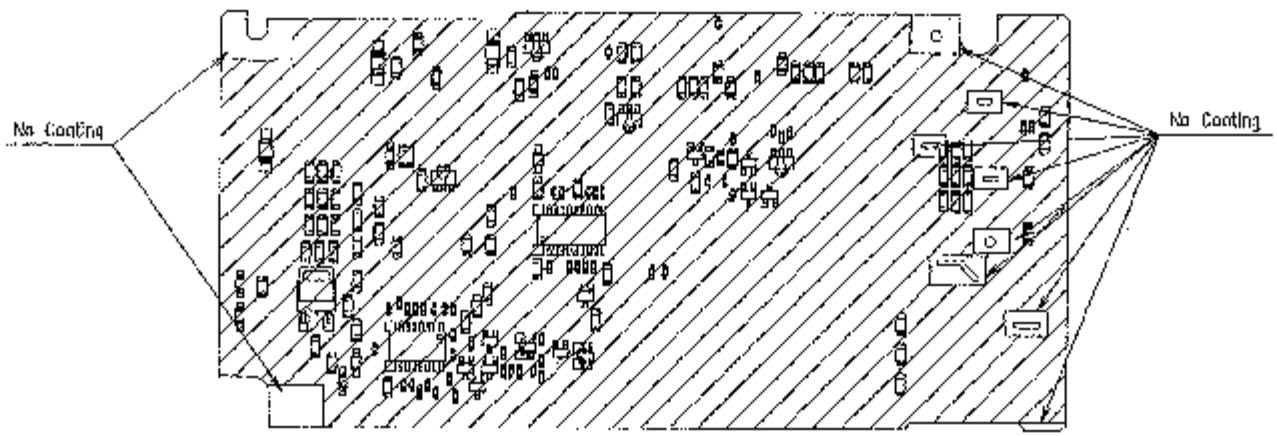
: to be coated.

Coating : 1B73 or Bectron PL42112 or 1-2577 or 1-2577 Low Voc or Pelgan Z

After coating, leave for 24 hours for dry-up.

Not to apply coating (10 locations)

PWA-027_ SOLDER SIDE



-	- 1	NEW RELEASE					
		CONTENTS	DATE	ENGR	CHK	APVD	

SCALE: NTS | MATERIALS: — | TITLE: HWS-00/ACO | PRODUCTION DWG(2)

UNITS: mm | FINISH: —— | DRAWING No: A227-30-81/ACO

3RD ANGLE PROJECTION

DENSEI-LAMBDA

PCB Coating

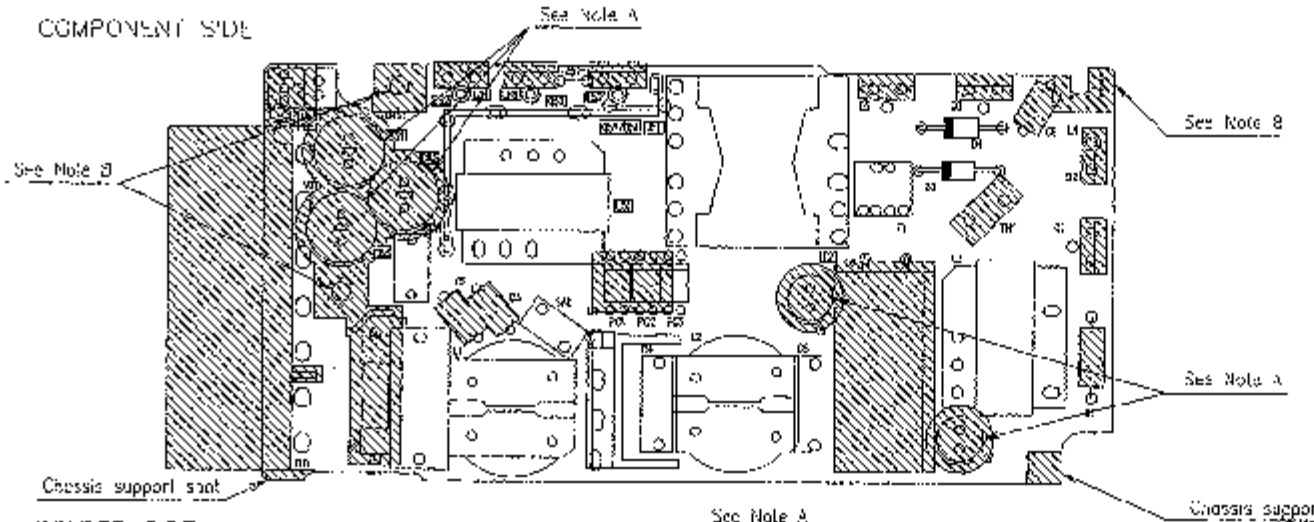
Coating : 1B73 or Bectron PL 42112 or 1-2577 or 1-2577 Low Voc or Pelgan Z

*At To : 25 deg.
*Shift to next process after tack free time.

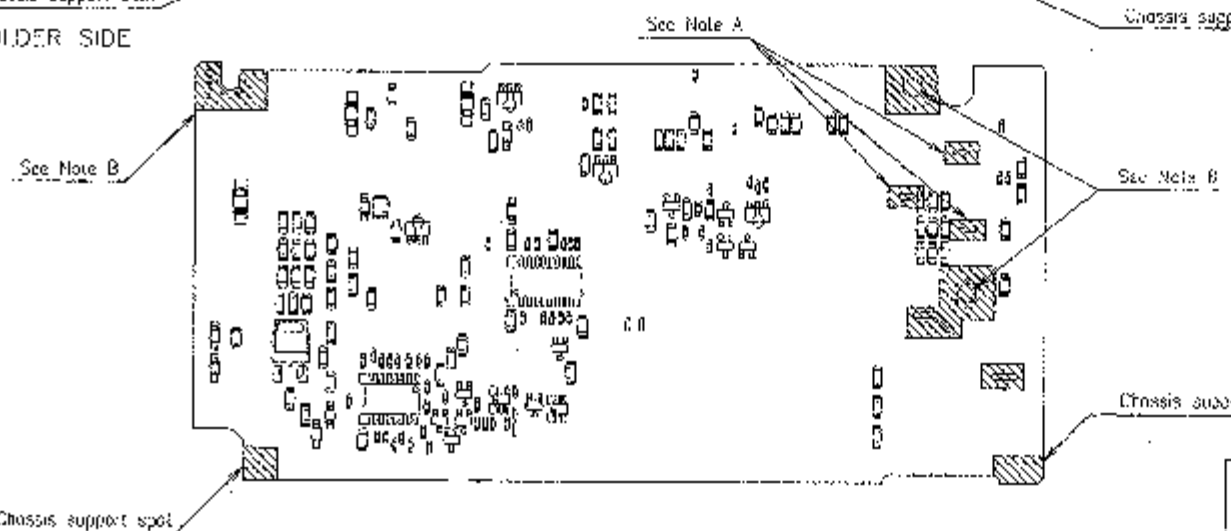
No coating area : *Component bodies below
(Q1~Q3, D51, D52, D7, D61, D62, PC1, PC2, PD51, C2, C3, C6~C9, C51~C53, VR51, F1, TB1
*PCB surface around VR51, F1, PC1, PC2, C7, C6, C51~C53.
(Around these components need clearance more than 2mm.)
*Slits under Electrolytic capacitor
*Ventilation holes, Mounting holes and FG screw holes
*Chassis support spot

▨ : no coating area

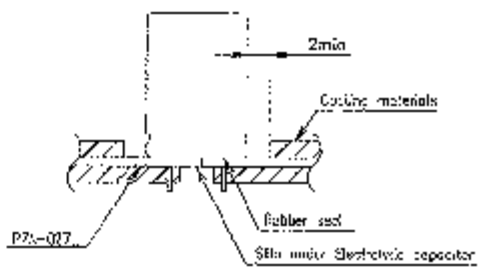
COMPONENT SIDE



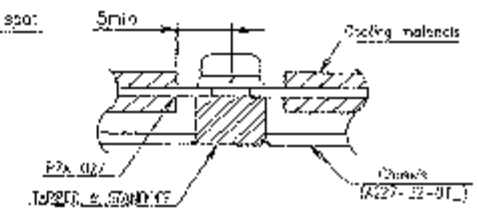
SOLDER SIDE



Note A : Electrolytic capacitor(C7,C8,C51~C53) coating method
Do not cover over the whole surface of the rubber seal with coating materials.



Note B : Mounting hole and FG screw holes coating method



SCALE		MATERIALS	TITLE	HWS100/HD			
UNITS	mm	FINISH	DRAWING No	PRODUCTION DWG			
3RD ANGLE PROJECTION				A227-50-50/HD-[ ]			
- 2 - 1	NEW RELEASE	12 Dec '05		M. Ota			
REVISION	CONTENTS	DATE	ENGR	CHK	APPD		

DENSEI-LAMBDA

Issue Date: 2010-06-01 Page 1 of 1 Report Reference # E122103-A29-UL
Revision Date 2010-06-01

The following supplement has been removed from this report:

Enclosure: Misc
ID: 7-03
Description: PCB Coating Process

Test Record No. 1

This report is a re-issued Test Report for the upgraded Test Report of Report Ref.#: E122103-A29-UL-3 including corrections and alternate construction as follows.
- Addition of Alternate Line-to-Line Capacitor (C1): Epcos Electronic Components S.A. type B3293.
- Addition of Alternate Surge Absorbers (SA1) and (SA2): Nippon Chemi-Con Corp type TND12V-471K or TNR12V471K.
- Addition of Alternate Surge Absorbers (SA1) and (SA2): Epcos (Zhuhai Ftz) Co., Ltd. type S10K300E2K1 or SIOVS10K300E2K1.
- Addition of Alternate Surge Absorbers (SA1) and (SA2): Thinking Electronic Industrial Co., Ltd. type TVR10471-V.

No Construction Compliance Review Record was necessary for these modifications of the Unit.
No test was performed due to this upgraded.

Test Record No. 2

This Test Record covers addition of Model HWS100-24/CQC, which is identical to Model HWS100-24 except for model designation; therefore no tests were considered necessary.

Construction Compliance Review Record was not considered necessary because no sample verification was required.

Test Record No. 3

Modifications are as follows.
(1). Addition of alternate Inductors (L1, L2). Tokyo Parts Ind. Co., Ltd., Type DBK18-S080532A.
(2). Addition of Core Case for Alternate Inductors (L1, L2). Wintech Polymer Ltd., Type CRN7000.
(3). Correction of rating information of Electrolytic Capacitor (C6). [From] 420V, 120µF [To] Minimum 420V, maximum 120µF.
No tests were considered necessary because the construction of additional Inductors were equivalent to existing Inductors. No Construction Compliance Review Record was required because sample verification was not necessary.

Test Record No. 4

This test record covers the following modifications.
1. Modification of Manufacturer, Type and Technical data of PWB as follow in table 1.5.1.
[From] Manufacturer: Shoei Print Seisakusyo Co., Ltd., Type: 001, Technical data: V-0, 130°C
[To] Manufacturer: Various, Type: Various, Technical data: V-0, 130°C, ANSI Type FR-4, CEM-1 and CEM-3
2. Deletion of Alternate PWB's.
3. Modification of Technical data of Coating for PWB only for models with suffix "/CO", type Pelgan Z in table 1.5.1.
[From] --
[To] V-0, 105°C, 0.203 mm thick minimum
4. Modification of Technical data of Coating for PWB only for models with suffix "/CO", type 1B73 in table 1.5.1.
[From] --
[To] V-1, 100°C, 0.0254 mm thick minimum
5. Modification of Technical data of Coating for PWB only for models with suffix "/CO", type 1-2577 in table 1.5.1.
[From] --
[To] V-0, 130°C, 0.203 mm thick minimum
6. Modification of Technical data of Coating for PWB only for models with suffix "/CO", type 1-2577 Low VOC in table 1.5.1.
[From] --
[To] V-0, 130°C, 0.203 mm thick minimum
7. Modification of Manufacturer of Thermistor (TH1) for Model HWS100 Series in table 1.5.1.
[From] Ishizuka Electronics Corp.
[To] Semitec Corp.
8. Modification of Manufacturer of Thermistor (TH1) for Model HWS80 Series in table 1.5.1.
[From] Ishizuka Electronics Corp.
[To] Semitec Corp.
9. Addition of Coating for PWB only for models with suffix "/CO", type 1A27NS in table 1.5.1.
10. Deletion of description in Sample and Test Specifics for Follow-Up Tests at UL.
11. Deletion of Enclosure Id 7-03, PCB Coating process.

No. 1-8: No tests were considered necessary due to modification of description.
No. 9, 10, 11: No tests were considered necessary due to combination of PWB and Coatings certified.

Construction Compliance Review Record was not considered necessary because no construction evaluation, which used a measurement instruments was conducted.

Test Record No. 5

This Test Record covers modification of Special Instruction to UL Representative.