UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2014-10-14 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (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:	Switch Mode Power Supply
Model:	NV300 or NV-300 Series (NVx-abcde-f-g-ijk) (See model differences for details of models and nomenclature).
Rating:	100-240Vac nom, 5Arms max, 45-440Hz. 133-318Vdc nom, 3.8Adc. (See model differences for details of ratings)
Applicant Name and Address:	TDK-LAMBDA UK LTD KINGSLEY AVE ILFRACOMBE DEVON EX34 8ES UNITED KINGDOM

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: Mike Burns Reviewed by: David Snook

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

NV300 or NV-300 series. Switch mode power supplies for building into end equipment.

Model Differences

Input Parameters:

NOMINAL INPUT VOLTAGE RANGE	100 - 240V AC. 133 - 318Vdc.
MAXIMUM INPUT VOLTAGE RANGE	90 - 264V AC. 120 - 350Vdc.
INPUT FREQUENCY	45- 440Hz MAXIMUM *. dc.
MAXIMUM INPUT CURRENT	5Aac rms 3.8Adc
INRUSH CURRENT	<15A AT 25°C

All ratings apply for ambient temperatures up to 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per deg C.

Output Parameters
NV300 or NV-300 models as described below:
Unit Configuration Code:

NVx-abcde-f-g-ijk
(may be prefixed by NS - # / or - where # may be up to any four letters and may be followed by -$ where $ may be any number between 000 to 999, indicating non safety related model differences)
where:

-	=	can be blank
x	=	A3 for 300 or -300 or blank
a	=	Number of Outputs : 1, 2, 3 or 4 or blank
b	=	Channel 1 Output Voltage†: 5, T or G or blank
c	=	Channel 2 Output Voltage†: 1, 2, 2H 3, 3H, 5, 5H, T, F or 0 or blank
d	=	Channel 3 Output Voltage†: T, F, TH, FH, G or 0 or blank
e	=	Channel 4 Output Voltage†: 3H, 5H, T, F, TH, FH, 0H (fan only channel 4 output) followed by P for positive output or 0 or blank
f	=	Global Option : N3 for 5V version with ATX compatibility, N4 for 12V version with ATX, N5 for 13.5V version ATX compatibility or blank for no Global Option present
g	=	U for U chassis, C for U chassis and cover, F for U chassis and cover with fan, I for U chassis and cover with fan and IEC inlet or blank for Open Frame
ijk	=	Three numbers from 0 to 9 which denotes various output voltages and currents within the specified ranges of each output for a particular unit or blank for standard output settings

Output Voltage Cross Reference

Designation	Output Voltage
0	Omit output
A	1.5
1	1.8
B	2
2	2.7
3	3.3
5	5
7	7
T	12
F	15
G	24

All channels are adjustable except for Channel 4 and Global Options in accordance with the following table:

O/P Channel	Designation	Vout (V)	Range (V)I out (A)	Max Power (W)	
CH1	5	5	5 - 5.5	40A	200
	T	12	12 - 13.2	25A	300
	G	24	24 - 28.5	12.5A	300
CH2 (CH1 5V)	1	1.8	0.9 - 2.5	15A	37.5
	2	2.7	2.5 - 3.8	15A	50
	2H	2.7	2.5 - 3.8	24A	80
	3	3.3	2.5 - 3.8	15A	50
	3H	3.3	2.5 - 3.8	24A	80
CH2 (CH1 12V)	5	5	3.3 - 5.5	10A	50
	5H	5	3.3 - 5.5	16A	80
CH2 (CH1 24V)	5	5	5 - 5.5	8A	40
	5H	5	5 - 5.5	12.5A	62.5
	T	12	12 - 15.5	10A	150
	F	15	12 - 15.5	10A	150
CH3	T	12	12 - 15	5A	60
	F	15	12 - 15	5A	60
	TH	12	12 - 15	8A	96
	FH	15	12 - 15	8A	96
	G	24	18 - 24.5	2.5A	60
CH4	3H	+/-3.3	Fixed	2A	6.6
	5H	+/-5	Fixed	2A	10
	T	+/-12	Fixed	1A	12
	F	+/-15	Fixed	1A	15
	TH	+/-12	Fixed	2A	24
	FH	+/-15	Fixed	2A	30
CH4 (fan output)	OH	-	-	-	-
Global Option	N3	5 (ATX)	Fixed	2A	10
	N4	12-13.5*	(ATX)Fixed1A	12-13.5	
	N5	12-13.5*	(ATX)Fixed1A	12-13.5	

*12-13.5 is the range. Nomenclature kept for legacy purposes.

Variations and limitations of use:
Maximum 300W power output. With 180Vac and greater input voltage, output power 300W plus global option (max 313.5W)
Channels 1 and 2 combined output currents must not exceed 40A.

Channel 1 with G output, 25V max with 5V channel 2 fitted.

Additional variations and limitations of use for fan version with 5V channel 1:
Output power de-rated 3W per volt from 100Vac to 90Vac (at 90Vac input, 270W output)
Unit with global option, high current channel 2 de-rated to 21A
Unit without global option, high current channel 2 de-rated to 19A
Unit without global option, low current channel 2 de-rated to 13A

Additional variations and limitations of use for all fan version:
Channel 4 3H, 5H, TH and FH max output current 1.5A.
The products listed in the following table are typical examples:

Model	CH1	CH2	CH3	CH4	Global Option
NVA3-453FFH	5V/40A	3.3V/15A	15V/5A	-15V/2A	-
NVA3-453HFHFH-N3	5V/40A	3.3V/24A	15V/8A	-15V/2A	5V/2A
NVA3-4GFGT-N5	24V/12.5A	15V/10A	24V/2.5A	-12V/1A	13.5V/1A

Output Limitations

All outputs are SELV.
All outputs have functional spacings to earth, and due consideration must be given to this in the end product design.
Adjusting output voltage beyond the stated range may cause overvoltage protection (OVP) to operate. To reset for normal operation simply adjust the potentiometer to reduce the output voltage to within its range or cycle the input off then on if the unit has latched off after adjusting the potentiometer.
Seriesing of outputs are not allowed.
Products may additionally be marked with NV3xxxxx or Y3xxxxx where x can be any letter or number between 0 and 9 indicating non-safety related model differences.

Custom models:
Model: NVA3 4G5HFHFH-N3-I (Y30006#, where # can be any character except A)
Maximum outputs: CH1: 24V, 6A. CH2: 5V, 6A. CH3:15V, 3A. CH4: 15V, 0.5A.
Maximum ambient: 50°C
Orientation: Horizontal
Comments: Reverse air

Model: NVA3 4G5HFHFH-N3-I (Y30006A)
Maximum outputs: CH1: 24V, 6A. CH2: 5V, 6A. CH3:15V, 3A. CH4: 15V, 0.5A.
Maximum ambient: 40°C
Orientation: Horizontal
Comments: Reverse air, fixed speed fan: 8.2Vdc

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : Connection to the mains via host equipment
- Operating condition : continuous
- Access location : for building-in
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10% (AC) 120-350Vdc absolute values.

- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : no
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 20A
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 4000m
- Altitude of test laboratory (m) : 64m
- Mass of equipment (kg) : 1kg maximum
- The product was submitted and evaluated for use at the maximum ambient temperature (Tma) permitted by the manufacturer's specification of: 50°C (full load); 65° (output power decreasing linearly by 2.5%/°C above 50°C.
- The product is intended for use on the following power systems: DC mains supply,TN.
- The product was investigated to the following additional standards: EN 60950-1:2006 /A11:2009 /A1:2010 /A12:2011 /A2:2013, CSA C22.2 No. 60950-1-07 2nd Edition, 2014-10 (which includes all European national differences, including those specified in this test report).
- The following were investigated as part of the protective earthing/bonding: Printed wiring board trace (refer to Enclosure - Schematics + PWB for layouts)
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- The equipment disconnect device is considered to be: provided by the end equipment.
- Multilayer PWB's accepted under CBTR Ref. No. E349607-A23 dated 2014-07-31 and letter report, Enclosure 7-02 of this report.

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 following Production-Line tests are conducted for this product: Electric Strength Earthing Continuity
- The end-product Electric Strength Test is to be based upon a maximum working voltage of: Primary-SELV: 422Vrms, 676Vpk , Primary-Earthed Dead Metal: 391Vrms, 426Vpk
- The following secondary output circuits are SELV: All.
- The following secondary output circuits are at hazardous energy levels: CH1.
- The following secondary output circuits are at non-hazardous energy levels: CH2, CH3 and CH4 and option.
- The power supply terminals and/or connectors are: Not investigated for field wiring
- 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: 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): TX2, TX4, TX701 (class F) all OBJY3.
- The following end-product enclosures are required: Mechanical, Fire, Electrical

- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing: Models without a fan require component temperatures monitored as detailed in the handbook/user manual. (cooling for units with customer air, open frame , U and C options).,
- Fans: The fan provided in this sub-assembly is provided with a fan guard to reduce the risk of operator contact with the stator., The fan provided in this sub-assembly is not intended for operator access.

Additional Information

This report is an amendment to CBTR ref No: E135494-A86-CB-2 dated 2015-03-26 including amendments and corrections with CB Test Certificate Ref. No. DK-44380-UL dated 2015-03-26. Based on the previously conducted testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, has been determined that the product continues to comply with the standard. Only the tests listed below were deemed necessary, including the following changes/additions:

Non-standard reverse air, fixed speed 8.2Vdc thermal test. (Y30006A)
Updated handbook
Updated licenses
Addition of alternative components to the CCL

Additional Standards

The product fulfills the requirements of: EN 60950-1:2006 /A11:2009 /A1:2010 /A12:2011 /A2:2013, CSA C22.2 No. 60950-1-07 + 2nd Edition 2014-10