UL TEST REPORT AND PROCEDURE

Standard:	UL 61010-1, 3rd Edition, 2012-05-11 (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - Part 1: General Requirements) CAN/CSA-C22.2 No. 61010-1, 3rd Edition, 2012-05, (ELECTRICAL EQUIPMENT FOR MEASUREMENT, CONTROL, AND LABORATORY USE - Part 1: General Requirements)
Certification Type:	Component Recognition
CCN:	QQHC2, QQHC8 (Power Supplies for Measurement, Control and Laboratory Use)
Product:	Switch Mode Power Supply
Model:	NV350 or NV3 or NV-350 (these models are identical). (May be prefixed by NS - # / or - where # may be any characters indicating non safety related model differences) Units may be additionally marked with a product code: K3x or Q3x where x may be any number of characters.
Rating:	100-240Vac nominal, (85-264Vac including tolerances). 47-440Hz, 5.5A rms Max.
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.

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

Prepared by: Dennis Butcher (Project handler) Reviewed by: Bartłomiej Żmijewski (Reviewer)

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

NV350 series. Switch mode power supplies for building into end equipment.

Model Differences

Unit Configuration Code:

a) Series NV350 or NV3 or NV-350 (these models are identical)
(May be prefixed by NS - # / where # may be any characters indicating non safety related model differences)
Products may additionally be marked with K3x or Q3x where x can be any characters indicating non-safety related model differences.

b) Followed by: S, R, Q, P, V, C, T, U or K. Where:

S	=	Forward airflow, standard fan
R	=	Reverse airflow, standard fan
Q	=	Forward airflow, quiet fan
P	=	Reverse airflow, quiet fan
V	=	Forward airflow, temperature controlled fan
C	=	Customer air, fan not fitted
T	=	Forward airflow, top fan
U	=	Customer air, fan not fitted, cover not fitted
L	=	Fixed speed fan (Non standards only)
K	=	Custom fan/chassis assembly (non -standard model X00004#

c) Followed by: S, I or J. Where:

S = Screw input terminals
I = IEC input
J = IEC input. Dual fused

d) Followed by: S, M, L, R, or T. Where:

S = Standard Leakage (Class B Filter)
M = Medium Leakage
L = Low Leakage

R = Reduced Leakage
T = Tiny Leakage

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

e) Optionally followed by: EN#V, EN*V, IN#V, IN*V, ES#V, ES*V, IS#V, IS*V.

Where	EN#V	=	AC good, global module good, PSU enable, 5-5.5V, 2A, standby output
	EN*V	=	AC good, global module good, PSU enable, 12-13.5V, 1A, standby output
	IN#V	=	AC good, global module good, PSU inhibit, 5-5.5V, 2A, standby output
	IN*V	=	AC good, global module good, PSU inhibit, 12-13.5V, 1A, standby output
	ES#V	=	AC good, PSU enable, 5-5.5V, 2A standby output
	ES*V	=	AC good, PSU enable, 12-13.5V, 1A standby output
	IS#V	=	AC good, PSU inhibit, 5-5.5V, 2A standby output
	IS*V	=	AC good, PSU inhibit, 12-13.5V, 1A standby output

Where # represents the standby output voltage and is in the range 5-5.5V
Where * represents the standby output voltage and is in the range 12-13.5V

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

NV350 Modules:

Up to 3 of the following modules types may be fitted:

@B
or @BH
or @C
or @CM

Where @ is the output voltage of the module and is within the range given in the single output module table.

or @/#DB (/ maybe replaced with a _)

Where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DB module tables.

or @/#DA (/ maybe replaced with a _)

Where @ is the output voltage of channel 1 and # is the output voltage of channel 2 of the module. Voltages are within the range given in the DA module tables. Only 1 DA module may be fitted.

or B/S

Where B/S indicates that a blanking plate is fitted in place of a module.

The following nomenclature may optionally be used for outputs connected in series:
(Note that outputs may be connected in series even when this nomenclature is not used)

@BB or @ BHB or @BBH or @BHBH or @CC or @CCM

Where @ is the total voltage of any two B, BH, C or CM modules connected in series.

or @/#BDB or @BHDB (/ maybe replaced with a _)

where @ is the total series voltage of any B or BH module and DB module channel 1. # is the output voltage of the DB module channel 2. Voltages for # are within the range given in the DB module tables.

or @HDB

where @ is the total series voltage of any DB module channel 1 and channel 2.

For all outputs connected in series:
Permissible min. value for @ is given by summing the min. voltage ratings of the outputs connected in series.
Permissible max. value for @ is given by summing the max. voltage ratings of the outputs connected in series.
.

Custom Models (as standard models unless specified otherwise):

Model: NV350 SJS 24B 24/24DB 12/12DB (K30012)
Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 12V, 13A; 12V, 5A (total power 350W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.
Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 SJS 24B 24/24DB 24/12DB (K30036)
Maximum outputs: 24V, 8A; 24V, 7A; 24V, 2A; 24V, 7A; 12V, 5A (total power 350W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.
Comments: PSU is fitted with dual fused IEC inlet and double pole mains switch (option J).

Model: NV350 LSS 24/24DB 15.5/5.5DB (K30045A)
Maximum outputs: 24V, 1A; 24V, 0.7A; 15.5V, 6.4A; 5.5V, 6.4A. (total power 175W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side.
Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 LSS 24/24DB (K30045B)
Maximum outputs: 24V, 7A; 24V, 0.7A. (total power 184.8W max.)
Maximum ambient: 50°C
Orientations: Horizontal with chassis lowest, on either side.
Comments: PSU has fan drive voltage fixed at 5.5V.

Model: NV350 TSS 24/15DB 5/15DB (K30052x where x can be any number of characters indicating non safety related differences)
Maximum outputs: 350W max.
Comments: PSU has top fan fitted.
Compliant with EN/IEC/UL/cUL 60950-1 only.

Model: NV350 KISES5V 12/12DB 5B (X00004# where # can be any number of characters indicating non safety related differences)
Maximum outputs: 350W max.
Comments: PSU has top fan, at an angle fitted. Output cables of 12 to 24AWG, Max. 50cm long are supplied

with this model.
Compliant with EN/IEC/UL/cUL 60950-1 only.

NV350FEP models as described below:

Unit Configuration Code:

a) NV350FEP or NF3 or NF3-350FEP (these models are identical)

followed by: S, R, C, T or U. Where:

S = Forward airflow, standard fan
R = Reverse airflow, standard fan
C = Customer air, fan not fitted
U = Customer air, fan not fitted, cover not fitted
T = Top fan, forward airflow

followed by: S, I or J. Where:

S = Screw input terminals
I = IEC input
J = IEC input. Dual fused

followed by: S. Where:

S = Standard Leakage (Class B Filter)

Unit configuration may be given using the above code and/or by the option description. The input terminal type (screw or IEC) may alternatively be determined by examination of the unit.

optionally followed by: ES#V or IS#V. Where:

ES5V = AC good, PSU enable, 5-5.5V, 2A standby output
ES12V = AC good, PSU enable, 12-13.5V, 1A standby output
IS5V = AC good, PSU inhibit, 5-5.5V, 2A standby output
IS12V = AC good, PSU inhibit, 12-13.5V, 1A standby output

where # represents the standby output voltage.

The Global Options Inhibit and Enable functions permit the customer to turn off or on the main psu outputs and the fan. The standby supply is for use by the customer and provides an SELV output that continues to operate when all the main psu outputs have been turned off using the Inhibit or Enable functions. All the functions of the Global Option pass through a single 8 way PWB socket and are all rated SELV.

NV350 FEP Module:

One of the following modules is fitted:

@FE

where @ is the output voltage of the module and is within the range given in the FE module table on the following page

NF350 and NV350 Output Interface Assembly:

One of the following output interface assemblies may optionally be fitted:

Wxxx

where xxx is a number between 001 and 999. These assemblies attach to the module output(s) and contain circuitry providing one or more of the following: current sharing, reduced current limit, fusing, sequencing, diode or-ing, module good, filtering, connectors or terminal blocks for outputs or signalling purposes, indicator lamps or LEDs.

Input Parameters

All models:

Nominal input voltage (V)	100 - 240
Input voltage range (V)	85 - 264
Input frequency range (Hz)	47 - 440
Maximum input current (A)	5.5
Inrush Current (A)	<15

For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input

NV350PFC model:

Main Output: Voltage	355-395
Main Output: Power	350W
Auxiliary Output: Voltage	12V nominal
Auxiliary Output: Current	0.25A
Maximum Ambient	65°C ‡
Derating above 50°C	2.5% per °C †

† The main output power and the auxiliary output current are derated by the given value.
‡ Refer to Customer Air Cooling section for details.

NV350 & NF350 models:

Code	Cooling Option	Range (Vac)	Power (W)	Ambient (°C)	Derating
S,V,T	Forward airflow standard fan fixed speed & Temp. controlled	90 - 264 ‡	350W continuous (400W peak if 350W average #)	65	2.5% per °C above 50°C
S,V	Forward airflow standard fan fixed speed & Temp. controlled	115 - 264	450W continuous (510W peak if 450W average #)	65	2.5% per °C above 50°C
S,V,T	Forward airflow standard fan fixed speed & Temp. controlled	180 - 264	664W continuous (740W peak if 600W average #)	65	2.5% per °C above 50°C
R	Reverse airflow	90-264 ‡	250W continuous	65	2.5% per °C

	standard fan		(no peak rating)		above 50°C
Q	Forward airflow Quiet fan	90-264 ‡	350W continuous (no peak rating)	65	2.5% per °C above 50°C
P	Reverse airflow quiet fan	90-264 ‡	250W continuous (no peak rating)	60	3.8% per °C above 50°C
C, U	Customer air fan not fitted		Refer to Customer Air Cooling section for details		

† Both the total output power and the module output currents are derated by the given value.
‡ For input voltages between 85 and 89.9V the output power is derated to 94% of the values given for 90V input.
# The PSU may output the given peak power for up to 10 seconds providing that the average power from the PSU does not exceed the stated value.
Continuous, peak and average power ratings may be linearly interpolated for input voltages between 90 and 180V.
Global Option standby outputs (12-13.5V at 1A or 5-5.5V at 2A) should not be included when calculating total PSU output power, but they are subject to the current deratings for operation above 50°C.
Global Options with output voltages between 5.01 and 5.5V have their max. output current linearly derated from 2A at 50°C ambient to 1.4A at 65°C ambient.
5V global options used in NV350FEP PSUs are derated to 1.8A max. when the PSUs is inhibited.
For reverse airflow cooling all B, BH and DB modules are limited to a maximum output power of 150W (total for both channels on dual output modules).
Permitted orientations: Horizontal with chassis lowest, on either side or vertical with the airflow upwards.

Output Parameters

Single Output Modules:

Module	Nom. Voltage (V)	Voltage Range (V) #	Max. Current
B	3.3	3.135 - 3.6	40A
	5	4.75 - 5.5	4.75-5.2V: 40A 5.2-5.5V: Linearly derate from 40 to 36A
	8	7 - 9	7-8V: 22.5A 8-9V: Linearly derate from 22.5 to 20A
	12	12 - 15.5	12-13.5V: 16A 13.5-15.5V: Linearly derate from 16 to 13A
	24	24 - 28	24-26V: 8A 26-28V: Linearly derate from 8 to 7A
BH	12	12 - 15.5	12-13.2V: 20A 13.2-15.5V: Linearly derate from 20 to 16.5A
	24	24 - 28	24-25.7V: 10A 25.7-28V: Linearly derate from 10 to 8.5A
C&CM †	12	12 - 13.2	12V:33.34A. Derated to 400W above 12V
	16	15 - 17.6	15V:26.67A. Derated to 400W above 15V
	24	24 - 26.4	24V:16.67A. Derated to 400W above 24V
	30	27 - 32	27V:14.82A. Derated to 400W above 27V

† C & CM modules may output up to 600W for up to 10 seconds providing that the converter ratings are not exceeded and the average power from the module does not exceed the following: 400W for 115 - 264Vac input or 350W for 90Vac input (average power may be linearly interpolated between 90 and 115Vac input).

Dual Output Modules:

Dual Output Modules, Output 1

Module	Nom. Voltage (V)	Voltage Range (V) #	Max. Current
DA	12	12.25	3A (forward air), 2A (reverse air)
DB	3.3	3.135 - 3.6	25A
	5	4.75 - 5.5	25A
	6 ‡	5.5 - 6.5	25A
	12	12 - 15.5	12 - 12.5V:13A 12.5 - 15.5V: Linearly derate from 13 to 10A
	24	24 - 28	24 - 25V: 7A 25 - 28V: Linearly derate from 7 to 6A

‡ DB modules with 6V nominal, Output 1

Cooling options C, S & V	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 195W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 195 to 170W total.
Cooling option Q	O/P 1 : 5.5 - 6V	O/P 1 + O/P 2 : 180W total.
	O/P 1 : 6 - 6.5V	O/P 1 + O/P 2 : Linearly derate from 180 to 140W total.
Cooling options P & R	O/P 1 : 5.5 - 6.5V	O/P 1 + O/P 2 : 120W total.

‡ DB modules with 6V nominal channel 1:
# Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.

Dual Output Modules, Output 2

Module	Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)
DA	-12	(-)11.9- (-)12	1.0 (forward air) 0.6 (reverse air)	12 (forward air), 7.2 (reverse air)
DB	5	3.3 - 5.5#	10	55*
	12	7 - 15.5	5	60
	24	24 - 32	2	50

* DB module output 2: Voltage range may be extended up to 6.0V (60W max.) for some PSU configurations. Consult factory for details.
# Voltage measured at the module power terminals. This voltage at the power terminals must not be exceeded when remote sense is used.

NV350FEP Module:

FE Module, Output 1

Nom. Voltage (V)	Voltage Range (V) #	Output Ratings
12	11.5 - 15.5	For 50°C max. ambient operation ‡: 11.5 - 12.5V: 350W total power † 12.5 - 13.7V: Linearly derate total power from 350 to 275W For 45°C max. ambient operation ¶: 13.71 - 15.5V: 210W total average power For 350W total output power (O/P 1 + O/P 2) †: 11.5 - 12.5V: 50°C max. ambient 12.5 - 13.7V: Linearly derate max. ambient from 50 to 42°C

FE Module, Output 2

Nom. Voltage (V)	Voltage Range (V)	Max. Current (A)	Max. Power (W)

-12	Fixed -12.1V	2	24.2

Voltage measured at the module power terminals. This voltage must not be exceeded when remote sense is used.
† Channel 1 current must not exceed 30A. Total power includes channel 2 and excludes global options.
‡ For ambient operation from 50 to 65°C apply an additional linear derating of 2.5% per °C.
¶ For ambient operation from 45 to 65°C apply an additional linear derating of 2.5% per °C.

SELV and Outputs Connected In Series:

All individual outputs are SELV. Outputs connected in series are non-SELV if the total output voltage + 1.3 times the highest of those outputs exceeds 60Vdc (the 30% addition allows for a single fault in any one individual channel).

If the total voltage of outputs connected in series exceed the 60Vdc SELV limit then all outputs must be considered non-SELV.

The total voltage of outputs connected in series must not exceed 160V.

Non-SELV outputs are hazardous and must be guarded or a deflector fitted during installation to avoid a service engineer making inadvertent contact with the output terminals, or dropping a tool onto them.

All outputs have operational spacings to earth, and due consideration must be given to this in the end product design.

Customer Air Cooling:

The following method must be used for determining the safe operation of PSUs when C or U option (Customer Air) is fitted, i.e. fan not fitted to PSU, and for the NV350PFC assembly. The minimum permitted airflow for customer air cooling is 0.5m/s.

For PSUs and assemblies cooled by customer supplied airflow the components listed in the following table must not exceed the temperatures given. Additionally ratings specified for units with an internal fan must still be complied with, e.g. mains input voltage range, maximum output power, module voltage / current ratings and maximum ambient temperature. To determine the component temperatures the heating tests must be conducted in accordance with the requirements of IEC60950-1:2005 Clause 4.5. Consideration should also be given to the requirements of other safety standards.

Test requirements include: PSU/assembly to be fitted in its end-use equipment and operated under the most adverse conditions permitted in the end-use equipment handbook/specification and which will result in the highest temperatures in the PSU/assembly. To determine the most adverse conditions consideration should be given to the end use equipment maximum operating ambient, the PSU/assembly loading and input voltage, ventilation, end use equipment orientation, the position of doors & covers, etc. Temperatures should be monitored using type K fine wire thermocouples (secured with cyanoacrylate adhesive, or similar) placed on the hottest part of the component (out of any direct airflow) and the equipment should be run until all temperatures have stabilized.

Circuit Ref.	Description	Max. Temperature (°C)
L2, L3, L4	Filter/PFC assy: Choke winding	155
C3, C4	Filter/PFC assy: X capacitors	100
L1	Filter/PFC assy: Boost choke winding	130
C1	Filter/PFC assy: Electrolytic capacitor	60 (105)
T1	Filter/PFC assy: Fly back transformer winding	130
RLY1	Filter/PFC assy: Relay	100

TX1, TX2	Modules: Power transformer windings	130
L1, XL1	B, BH & DB module chokes	130
L1	C & CM module chokes	140
Global option T2	Global Options: Transformer winding	90 (130)
Various	All other choke & transformer windings	110
Various	All <=10mm diameter electrolytic capacitors	80 (105)
Various	All 12.5mm diameter electrolytic capacitors	85 (105)
TX1	DA Module: Fly back transformer windings	100 (130)

Higher temperature limit (in brackets) may be used but product life may be reduced.

Technical Considerations

- Type of item tested : Laboratory
- Description of equipment function : Switch Mode Power Supply for building in.
- Connections to mains supply : None unless via the IEC60320 inlet.
- Overvoltage category : II
- Pollution degree : 2
- Means of Protection : Class I (PE connected)
- Environmental conditions : 50°C ambient
- For use in wet locations : No
- Equipment mobility : Built-in
- Operating conditions : continuous
- Overall size of the equipment: (W X D X H) (mm) : 280 x 95 x 41mm Max.
- Mass of the equipment (kg) : 2kg Max.
- Marked degree of protection to IEC 60529 : N/A
- Equipment classification: Commercial, Professional
- Equipment class: Class I
- Equipment type: For building in
- The product was submitted and tested for use at the maximum recommended ambient temperature (Tmra) of: 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.
- Multilayer PWB's accepted under CBTR Ref No: E349607-A23 dated 2014-07-31 and the letter report in Enclosure 8-08 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:

- This component has been judged on the basis of the creepage and clearances required in the indicated Standards, which would cover the component itself if submitted for Listing: UL 61010-1 3rd Ed., CAN/CSA 22.2 No. 61010-1-12 3rd Ed., IEC 61010-1:2010 3rd Ed., EN 61010-1:2010.
- The end-product shall consider that: The enclosure does not serve as a fire/electrical/mechanical enclosure excluding the external face of the IEC60320 inlet.
- The need for the following shall be considered in the end-product: Bonding to protective earthing terminal (Class I construction)

- The output connectors are: Suitable for factory wiring only
- Creepage and clearance distances were based on a maximum working voltage of: Primary to earth dead metal: 622Vpeak, 343Vrms., Primary to secondary: 650Vpeak, 363Vrms.
- Insulation between primary circuits and accessible dead metal complies with the requirements for : Basic insulation
- Insulation between primary and secondary circuits complies with the requirements for: Double and Reinforced insulation
- The following tests shall be performed in the end-product evaluation: Temperature for customer air models, Permissible Limits for Accessible Parts, Dielectric Strength
- The unit is considered acceptable for use at on a max branch circuit of: 20A
- The unit is considered acceptable for use in a max ambient of: 50°C. From 50°C to 65°C the total output power and the module current ratings are both derated at 2.5% per °C.
- End-product temperature tests for power supplies shall consider that the following transformers employ the indicated insulation system: Transformer TX1 Class F (155°C), Transformer TX2 Class F (155°C), Transformer T1 Class F (155°C), Transformer T2 Class F (155°C),
- End-product dielectric strength tests shall be based on the maximum working voltage of: Primary to earth dead metal: 622Vpeak, 343Vrms., Primary to secondary: 650Vpeak, 363Vrms.
- The leakage current tests have been provided for information only. This test must be considered in the end product application and must be repeated for frequencies above 63Hz.
- This product has been assessed for a maximum altitude of 3000m
- The risk associated with clause 5.4.5 shall be assessed in the end product.

Additional Information

Project 4787707401 information:
This is Amendment 2 to the CB Test Report E331788-A17-CB-1 dated 2013-07-26 with CB Test Certificate DK-33998-UL and with Amendment 1 dated 2015-08-07 with CB Test Certificate DK-33998-A1-UL.
This Amendment is published due to changes provided in Report Summary.
No additional testing has been done.
This amendment shall be read in conjunction with Original Test Report and Test Certificate and with previous Amendment 1.

This report is a reissue of CBTR Ref. No: E331788-A17-CB-1 dated 2013-07-26 and CB test certificate No: DK-33998-UL. Based on the previously conducted testing, limited testing and the review of product technical documentation including photos, schematics, wiring diagrams and similar, it has been determined that the product complies with the standard.

The original report was modified to include the following changes/additions:
Range approval for a dual fused input connector (option J). Thermal comparison with worst case configuration to allow use across the range.
Range approval for a top fan (option T). Thermal comparison with worst case configuration to allow use across the range.
F2, alternative fuse testing (not mains input fuse)
Alternative second source fan testing (Y S Tech)
Removed Avnet from the manufacturers list
Model: NV3KISE5V 12/12DB 5B (X00004#) should have been: NV3KISES5V 12/12DB 5B (X00004#)
Assessed for 5000M
Addition/deletion and new certificates to the CCL.

Additional Standards
The product fulfills the requirements of: UL 61010-1 3rd Ed. CAN/CSA 22.2 No. 61010-1-12 3rd Ed. EN 61010-1:2010 3rd Ed.
Markings and instructions

Clause Title	Marking or Instruction Details
Company	Listee's or Recognized company's name, Trade name, Trademark or File
Manufacturers identification	Factory identification
Model identification	Model number
Nature and ratings of mains supply	Equipment mains supply voltage and nature of voltage or symbols,  for dc,  for ac,  for ac/dc or  for 3-phase, frequency or frequency range, power in watts or VA or input current in amperes

Special Instructions to UL Representative
N/A

Production - Line Testing Exemptions	
BD1.1	**Grounding Continuity Test** - This test is not required for the following models.
-	Required
BD1.2	**Dielectric Strength Test** - This test is not required for the following models.
-	Required
BD1.3	**Dielectric Strength Test Component** - The following solid-state components may disconnected from the remainder of the circuitry during the performance of this test.
-	None

Sample and Test Specifics for Follow-Up Tests at UL

Plastic Enclosure or Part	Test	Sample(s)	Test Specifics
N/A			

TABLE: List of components and circuits relied on for safety

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
PWBs	Interchangeable	Interchangeable	94V-1 (Minimum) 130°C	ZPMV2	Ul
IMS PWBs	Interchangeable	Interchangeable	94V-1 (Minimum)120°C	ZPMV2	UL
Multi layer PWBs	As below	Primary winding Converter B/DB & C modules Pri control board (B & DB) DC-DC boards Output option (Vitesse)	-	-	-
PWB's (alternate) (multi-layer)	Eurotech	2	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.60mm)	ZPMV2	UL (E76441)
PWB's (alternate) (multi-layer)	Tak Shing Technology (Hong Kong) Ltd	TS-M	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.58mm)	ZPMV2	UL (E305886)
PWB's (alternate) (multi-layer)	Oki Printed Circuits Co.Ltd.	OM-11	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.403mm)	ZPMV2	UL (E48977)
PWB's (alternate) (multi-layer)	MFS Technology (PCb) Co., Ltd	MDL10	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.36mm)	ZPMV2	UL (E94919)
PWB's (alternate) (multi-layer)	Yan Tat Technology Ltd	Y-16	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.57mm)	ZPMV2	UL (E152990)
PWB's (alternate) (multi-layer)	Garner Osbourne Circuits	3	94V-1 (Minimum) 130°C, (Min. internal spacing, Reinforced tested at 0.60mm)	ZPMV2	UL (E176375)
FILTER / PFC	-	-	-	-	-

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
ASSEMBLY (NV350, NV350FEP,NV350PFC)					
J1 Mains terminal block. (Alternate)	Molex Inc. (Beau)	old p/n 70 series, new number: 38700-7503	UL: 300V, 20A, 130°C	XCFR2	UL E48521
J1 Mains terminal block. (Alternate)	Tyco (Buchanan)	1437667-7 (4DB series, type 4DB-P107-03)	UL: 300V, 20A, (105°C)	XCFR2	UL E54800
J1 Mains terminal block. (Alternate)	Tianli Electrical Machinery (Ningbo) Co. Ltd	B825 Series	UL: 300V, 20A, 105°C	XCFR2	UL E206029
Wiring from IEC 60320 inlet to terminal block Live and Neutral	Interchangeable	Interchangeable	20AWG min, 300V min. 80°C min.	AVLV2	UL
Wiring from IEC 60320 inlet to terminal block Earth	Interchangeable	Interchangeable	18AWG min, 300V min. 80°C min.	AVLV2	UL
IEC 60320 Inlet (Input option I only)	Schurter AG	6100-41xx, where xx is a number (panel thickness)	250V, 10A, 250V, 15A UL	AXUT2	UL E96454
Dual fused IEC inlet (Input option J)	Bulgin Components PLC now part of Elektron	PF0033	250V, 10A,	AYVZ2	UL E92187
Mains switch (Input option J). (Alternate)	Arcolectric/ Elektron Components Ltd	R8550	250V, 10A, 250V, 15A UL, 105°C	W0YR2	ULE45221
Mains switch (Input option J). (Alternate)	Solteam	MR22-N2BB-F2	250V, 12A, 85°C	W0YR2	UL E148157
F1 fuse (Alternate)	Schurter AG	0001.1012PT, (SP series)	F6.3AH, 250V, 5x20mm	JDYX2	UL E41599
F1 fuse (Alternate)	Littelfuse	21606.3	F6.3AH, 250V, 5x20mm	JDYX2	UL E10480

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
XR1, XR2, XR3, XR4 Discharge resistors	Interchangeable	Interchangeable	470K Ohm max, 1W min	-	-
C3, C4 X capacitor (Alternate)	Kemet	PHE840MB series	0.47uF max., 275V, X2 105°C	FOWX2	UL E73869
C3, C4 X Capacitor ((Alternate))	Vishay	MKP338-2 series	0.47uF max., 275V, 105°C	FOWX2	UL E354331
C3, C4 X Capacitor ((Alternate))	Carli Electronics Co. Ltd.	MPX series	0.47uF max, 275Vac (250Vac UL), X2, 100°C	FOWX2	UL E120045
C3, C4 X Capacitor (Alternate)	Xiamen Faratronic Co. Ltd.	MKP62 series	0.47uF max, 275Vac (250Vac UL), X2, 110°C	FOWX2	UL E186600
C3, C4 X Capacitor (Alternate)	Kemet	R.46 series	1uF max., 250V, 110°C	FOWX2	UL E97797
C5, C6, C7 Y capacitors (Alternate)	Kemet	PME271Y	1.5nF max, 250Vac, Y2, 100°C	FOWX2	UL E73869
C5, C6, C7 Y capacitors (Alternate)	Kemet	PHE850 series	1.5nF max., 300Vac (UL 250Vac), Y2 110°C	FOWX2	UL E73869
C5, C6, C7 Y capacitors (Alternate)	Wilhelm Westermann Spezialvertrieb Elektronischer (WIMA)	MP 3-Y2 series	1.5nF max., 250Vac, Y2, 110°C	FOWX2	UL (E100438)
C5, C6, C7 Y capacitors (Alternate)	Faratronic (Xiamen)	MKP-63 series	1.5nF max, 250Vac, Y2, 105°C	FOWX2	UL E186600
C5, C6, C7 Y capacitors (Alternate)	Vishay	338-6 series	1.5nF max, 250Vac, Y2, 105°C	FOWX2	UL E354331
C5, C6, C7 Y capacitors (alternate)	Kemet Electronics Corp	ERP 610 Series	1.5nF max, 500Vac, Y1, 125°C	FOWX2	UL (E356389)
C5, C6, C7 Y capacitors (alternate)	Vishay	VY1 series	1.5nF max, 500Vac, Y1, 125°C	FOWX2	UL E183844
C5, C6, C7 Y capacitors (alternate)	Murata mfg Co. Ltd.	KX series	1.5nF max, 250Vac, Y1, 125°C	FOWX2	UL (E37921)
L2, L3 Common mode	Interchangeable	Interchangeable	Core: OD 22mm ID 13mm, depth 13mm. Wire:	-	-

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
choke			ECW Class F min., 0.71mm min.		
L2, L3 cradle	EI Dupont	Rynite FR530 or FR530L	94V-0, 155°C (RTI), 0.9mm min. thick	QMFZ2	UL E41938
L4, Common mode choke	Interchangeable	Interchangeable	Core: OD 16mm ID 11mm, depth 7mm. Wire: ECW Class F min., 0.71mm min.	-	-
RL1 Relay	Tyco	RE030012 (1393217-4)	250V, 6A, coil 12V	NLDX2	UL E214025
XTH101 Thermistor. (Alternate)	Murata	PRF18BA471+++ ++ where + may be any number or letter	125°C Required for safety.	XGPU2	UL (E137188)
XTH101 Thermistor. (Alternate)	Murata	PRF18BB471+++ ++ where + may be any number or letter	115°C Required for safety.	XGPU2	UL (E137188)
L1 Boost choke	Interchangeable	Interchangeable	Cores: 27 by 24 by 19mm overall. Wire: ECW Class B min., 35 min. strands of 0.12mm min.	-	-
L1 bobbin	Sumitomo Bakelite	PM9820	94V-0, 150°C (RTI), 0.9mm min. thick	QMFZ2	ULE41429
C1 Reservoir capacitor	Interchangeable	Interchangeable	270uF max, 400V min., 105°C.	-	-
XFS1 or F2 Fuse. (Alternate)	Schurter	OMF250 series.	F1AL, 250V	JDYX2	UL E41599
XFS1 or F2 Fuse. (Alternate)	Schurter	OMT250 series	T2AL, 250Vac, 125Vdc	JDYX2	UL E41599
XFS1 or F2 Fuse. (Alternate)	Bussman	PC-Tron PCB 1A	F1AL, 450Vdc, 250Vac	JDYX2	UL E19180
F2 Fuse (alternate)	Daito	DCP 1A	F1AL, 450Vdc	JDYX2	UL (E59783)
F2 Fuse (alternate)	Daito	DCP 2A	F2AL 450Vdc	JDYX2	UL (E59783)
F2 Fuse (alternate)	Hollyland Co. Ltd.	5EF series	F1AL, 250Vac	JDYX2	E156471
T1 flyback transformer	TDK-Lambda UK Ltd or Trio Engineering	TDKL Part No: 33037. May be	Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1	OBJY3 or OBJY2	UL, (E148927 or

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
	Co Ltd	followed by T.			E182446)
T1 Flyback transformer core	Interchangeable	Interchangeable	2 E-cores total 16mm x 16mm x 4mm	-	-
T1 flyback transformer bobbin	Interchangeable	Interchangeable	Material manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI), 1.0mm thick	QMFZ2	UL E41938
T1 Flyback transformer triple insulated wire. (Alternate)	Totoku	3S-ETFE or TIW-E	Triple insulated wire. 26 AWG (0.4mm dia.) min. Provides reinforced insulation Class F	OBJT2	UL E166483
T1 Flyback transformer triple insulated wire (Alternate)	New England Wire Technologies Corp.	WxxT1.5EyyyTC1A (xx may be 26 or 24 and y may be any number between 0-9)	Triple insulated wire 26AWG (0.4mm diameter) min. Provides reinforced insulation. Class F	OBJT2, EN/IEC60950-1	UL E205791
XU4 Opto coupler	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and numbers	4420Vac min (UL). Provides Reinforced insulation.	FPQU2	UL E52744
XU4 Opto coupler. Alternate	Renesas Electronics Corporation	PS2581L2	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU4 Opto coupler Alternate	Renesas Electronics Corporation	PS2561L2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU4 Opto coupler Alternate	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
J20 to J24 Connector	Molex	38-00-1335 (4455	250V, 2.5A UL94 V-0	ECBT2	UL E29179

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
		series)			
CHASSIS & COVER INSULATORS:	-	-	-	-	-
Insulation on chassis	Interchangeable	Interchangeable	Polyester or polyimide tape. Provides Basic and Reinforced insulation	OANZ2	UL
Insulation on cover	Interchangeable	Interchangeable	Polyester or polyimide tape. Provides Basic and Reinforced insulation	OANZ2	UL
Insulator for module heatsinks (Alternate)	Bergquist Co.	GPVOUS-0.040 Gap Pad V0 Ultra Soft	Provides Supplementary Insulation	QMFZ2	UL E59150
Insulator for module heatsinks (Alternate)	Shiu Li Technology Co Ltd	L37-3 or H48-2	Provides Supplementary Insulation	QMFZ2, OCDT2	UL E256821 E317540
B, BH and DB MODULES:	-	-	-	-	-
Module cradle	EI Dupont	Rynite FR530 or FR530L	94V-0, 155°C (RTI), 0.9mm min. thick	QMFZ2	UL E41938
L1 choke (optional)	Interchangeable	Interchangeable	Core: OD 8mm ID 4mm, depth 3mm. Wire: ECW Class B min., 0.3mm min. Nema rated to 140°C	-	-
3.3V & 5V Ch. 1: XL1 choke (base board)	Interchangeable	Interchangeable	Cores: 12 by 12 by 9mm max. overall. Rated 40.5A min.	-	-
12V Ch. 1: XL1 choke (base board)	Interchangeable	Interchangeable	Cores: 12 by 12 by 9mm max. overall. Rated 22.2A min.	-	-
24V Ch. 1: XL1 choke (base board)	Interchangeable	Interchangeable	Cores: 12 by 12 by 9mm max. overall. Rated 11.2A min.	-	-
XR23 Thermistor (fitted to module base PWB. Protects single modules and channel 1 on twin output modules).	Murata	PRF18AR471+++ ++ where + may be any number or letter	135°C Required for safety	XGPU2	UL (E137188)
XR23 Thermistor (fitted	Murata	PRF18BB471+++	115°C Required for safety	XGPU2	UL

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
to module base PWB. Protects 12B, 12BH, DB24/5, 12, 24 modules)		++ where + may be any number or letter			(E137188)
XR23 Thermistor (fitted to module base PWB. Protects 24B & 24BH modules)	Murata	PRF18BC471+++ ++ where + may be any number or letter	105°C Required for safety	XGPU2	UL (E137188)
XR23 Thermistor (fitted to module base PWB. Protects 24B & 24BH modules)	Murata	PRF18BB471+++ ++ where + may be any number or letter	115°C Required for safety	XGPU2	UL (E137188)
XR23 Thermistor (fitted to module base PWB. Protects 24B & 24BH modules)	Murata	PRF18AR471+++ ++ where + may be any number or letter	135°C Required for safety	XGPU2	UL (E137188)
XR9 (18 & 24V O/Ps) Thermistor for channel 2 on twin output modules).	Murata	PRF18BB471+++ ++ where + may be any number or letter	115°C Required for safety	XGPU2	UL (E137188)
XR16 (5 & 12V O/Ps) (Thermistor for channel 2 on twin output modules).	Murata	PRF18BA471+++ ++ where + may be any number or letter	125°C Required for safety	XGPU2	UL (E137188)
XU1, XU3 & XU4 Opto coupler	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and numbers	4420Vac min. (UL). Provides Reinforced Insulation.	FPQU2	UL E52744
XU1, XU3 & XU4 Opto coupler	Renesas Electronics Corporation	PS2581L2	5000Vac May be marked NEC and/or Renesas	FPQU2	UL (E72422)
XU1, XU3 & XU4 Opto	Renesas Electronics	PS2561L2-1	5000Vac	FPQU2	UL

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
coupler	Corporation		May be marked NEC and/or Renesas		(E72422)
XU1, XU3 & XU4 Opto coupler	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas	FPQU2	UL (E72422)
Twin output modules: 12V Ch. 2: XL1 choke	Interchangeable	Interchangeable	Cores: 12 by 12 by 5mm overall.	-	-
B, BH & DB Module Power Transformers:	-	-	-	-	-
TX1 Power trx. Bobbin	Interchangeable	TDKL Part No: 66757	Manufactured from Rynite FR530 or FR530L (155°C-RTI), 1mm thick	QMFZ2	UL E41938
TX1 Power trx. Clip	Interchangeable	TDKL Part No: 66765	Manufactured from Rynite FR530 or FR530L (155°C-RTI) or Sumikasuper E4008 (130°C-RTI), 1mm thick	QMFZ2	UL E41938
TX1 Power trx. Cores	Interchangeable	Interchangeable	Cores: 27 by 19 by 18mm overall	-	-
TX1 Power trx. PWB 11 turn, type A	Interchangeable	TDKL Part No: 12634	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 11 turn, type B	Interchangeable	TDKL Part No: 12635	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 12 turn, type A	Interchangeable	TDKL Part No: 12636	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 12 turn, type B	Interchangeable	TDKL Part No: 12637	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 14 turn, type A	Interchangeable	TDKL Part No: 13922	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 14 turn, type B	Interchangeable	TDKL Part No: 13923	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 16 turn, type A	Interchangeable	TDKL Part No: 12638	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 Power trx. PWB 16 turn, type B	Interchangeable	TDKL Part No: 12639	UL94V-1 min, 130°C.	ZPMV2	UL
TX1 triple insulated wire	New England Wire Technologies Corp.	W21T1.5EyyyMW 80S60A (where	Triple insulated 21AWG winding wire rated (Class F). Provides reinforced insulation	OBJT2	UL (E205791)

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
		yyy may be any number between 000-999)			
Note: The TX1 Power Trx. PWBs listed above provide Reinforced insulation.	-	-	-	-	-
Secondary winding, 1 turn	Interchangeable	TDKL Part No: 52121, 52321, 52331	Secondary winding, 1 turn	QMTS2	UL E124294 E192337
Secondary winding, 2 turn	Interchangeable	TDKL Part No: 52122, 52322, 52332	Secondary winding, 2 Turn (assessed in application)	QMTS2	UL E124294 E192337
Secondary winding, 3 turn	Interchangeable	TDKL Part No: 52123, 52323, 52333	Secondary winding, 3 Turn (assessed in application)	QMTS2	UL E124294 E192337
Secondary winding, 4 turn	Interchangeable	TDKL Part No: 52124, 52324, 52334	Secondary winding, 4 Turn	QMTS2	UL E124294 E192337
Secondary winding, 5 turn	Interchangeable	TDKL Part No: 52125, 52325, 52335	Secondary winding, 5 Turn	-QMTS2	UL E124294 E192337
Secondary winding, 6 turn	Interchangeable	TDKL Part No: 52126, 52326, 52336	Secondary winding, 6 Turn	QMTS2	UL E124294 E192337
C & CM MODULES:	-	-	-	-	-
Module cradle	EI Dupont	Rynite FR530 or FR530L	94V-0, 155°C (RTI), 0.9mm min. thick	QMFZ2	UL E41938
L1 choke (optional)	Interchangeable	Interchangeable	Core outer dimension: 9mm; inner dimension: 4mm; 4mm depth Class F 0.22mm min. ECW. Base:- Manufactured by EI Dupont Rynite FR530 or FR530L, 0.8mm thick rated 94V-0, RTI 155°C. Or	-	-

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
			interchangeable manufacturers, Nema FR4, 1.6mm 94V-0, RTI 140°C		
TX2 transformer	TDK-Lambda UK Ltd or Trio Engineering Co Ltd	TDKL Part No: 33600, 33601, 33602, 33603. May be followed by T.	Class F Reinforced insulation, system CEL-CF4 or TEC-CF4	OBJY3	UL, (E148927)
TX2 cradle	EI Dupont	Rynite FR530 or FR530L	94V-0, 155°C (RTI), 1mm thick	QMFZ2	UL E41938
TX2 bobbin	EI Dupont	Rynite FR530 or FR530L	94V-0, 155°C (RTI), 0.8mm thick	QMFZ2	UL E41938
TX2 cores	Interchangeable	Interchangeable	Core dimension: 27 x 18 x 13mm	-	-
TX2 triple insulated wire	New England Wire Technologies Corp.	W21T1.5EyyyMW 80S60A (where yyy may be any number between 000-999)	Triple insulated 21AWG winding wire rated (Class F) providing reinforced insulation.	OBJT2	UL E205791
XR23 Thermistor (Alternate)	Murata	PRF18BB471+++ ++ where + may be any number or letter	115°C	XGPU2	UL (E137188)
XR23 (Alternate)	Murata	PRF18BC471+++ ++ where + may be any number or letter	105°C	XGPU2	UL (E137188)
XU1, XU3, XU4 opto-couplers	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and numbers	4420V	FPQU2	UL E52744
XU1, XU3, XU4 opto-	Renesas Electronics	PS2581L2	5000Vac	FPQU2	UL

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
couplers	Corporation		May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm		(E72422)
XU1, XU3, XU4 opto-couplers	Renesas Electronics Corporation	PS2561L2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU1, XU3, XU4 opto-couplers	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
Insulator on module heatsinks. (Alternate)	Bergquist Co	GPVOUS-0.040 Gap pad V0	Rated VTM-0	QMFZ2	UL E59150
Insulator on module heatsinks. (Alternate)	Shiu Li Technology Co Ltd	L-37-3 or H48-2	Rated VTM-0	QMFZ2, OCDT2	UL E256821
C6 CM module secondary to earth capacitor	Murata MFG Co. Ltd.	KY Series	10nF maximum, 250V Y2, 125˚C	FOWX2	UL E37921
C6 CM module secondary to earth capacitor	Murata MFG Co. Ltd.	KX Series	10nF maximum, 250V Y1, 125˚C	FOWX2	UL E37921
DA MODULE:	-	-	-	-	-
XU3 Opto coupler	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and numbers	4420Vac min(UL). Provides Reinforced insulation.	FPQU2	UL E52744
XU3 Opto coupler	Renesas Electronics Corporation	PS2581L2	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
XU3 Opto coupler	Renesas Electronics Corporation	PS2561L2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU3 Opto coupler	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
TX1 transformer assembly.	TDK-Lambda UK Ltd or Trio Engineering Co Ltd	TDKL Part No: 33349 Components manufactured by Trio Engineering Co have been identified by the suffix 'T'	Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1	TDK-Lambda UK Ltd or Trio Engineering Co Ltd	UL
TX1 transformer bobbin.	Interchangeable	TDKL Part No: 20172	Manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI) or Sumitomo Bakelite E4008 (130°C - RTI), 0.6mm thick	Interchangeable	UL
TX1 transformer E cores	TDK-Lambda UK Ltd.	Interchangeable	2 E-cores total 20mm x 20mm x 7mm	TDK-Lambda UK Ltd.	-
TX1 transformer triple insulated wire. (Alternate)	Totoku	3S-ETFE or TIW-E	Triple insulated wire. 0.4mm dia. minimum. Provides reinforced insulation. (Class F)	OBJT2	UL E166483
TX1 transformer triple insulated wire (Alternate)	New England Wire Technologies Corp.	WxxT1.5EyyyTC1A (xx may be 26, 24 or 22 and yyy may be any number between 000-999)	Triple insulated wire. 26 AWG minimum. Provides reinforced insulation. (Class F)	OBJT2	UL E205791

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
GLOBAL OPTIONS:	-	-	-	-	-
XU3, XU4, XU5, XU6, XU7 Opto couplers (Optional dependant upon global option type)	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and numbers	4420Vac (UL). Provides Reinforced insulation.	FPQU2	UL E52744
XU3, XU4, XU5, XU6, XU7 Opto couplers (Optional dependant upon global option type)	Renesas Electronics Corporation	PS2581L2	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU3, XU4, XU5, XU6, XU7 Opto couplers (Optional dependant upon global option type)	Renesas Electronics Corporation	PS2561L2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU3, XU4, XU5, XU6, XU7 Opto couplers (Optional dependant upon global option type)	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
Global option trx. T2 assembly. (Alternate)	TDK-Lambda UK Ltd.	CLL Assy Part No 32456, 32457, 33408, 33407	Class F Reinforced insulation, systems CEL-CF2 or CEL-CF4	OBJY3	UL
Global option trx. T2 assembly. (Alternate)	TDK-Lambda UK Ltd or Trio Engineering Co Ltd	TDKL Part No: 33407, 33408. Components manufactured by Trio Engineering Co have been identified by the suffix 'T'	Class F Reinforced insulation, systems CEL-CF4 or TEC-CF4 or CEL-CF2 or TEC-CF2 or NLF1	OBJY3	UL
Global option trx. T2 bobbin	Interchangeable	TDKL Part No: 20172	Manufactured by EI Dupont Rynite FR530 or FR530L (155°C - RTI)	QMFZ2	UL

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
			or Sumitomo Bakelite E4008 (130°C - RTI), 0.6mm thick		
Global option trx. T2 E cores	TDK-Lambda UK Ltd.	Interchangeable	2 E-cores total 20mm x 20mm x 7mm Assessed in-application	-	-
Global option trx. T2 wire.	Totoku	3S-ETFE or TIW-E	Triple insulated wire. 24 AWG minimum. Provides reinforced insulation. (Class F)	OBJT2	ULE166483
Global option trx. T2 wire (Alternate)	New England Wire Technologies Corp.	WxxT1.5EyyyTC1A (xx may be 24 or 22 and yyy may be any number between 000-999)	Triple insulated wire. 24 AWG minimum. Provides reinforced insulation. (Class F)	OBJT2	ULE205791
12FE Module (for use in NV350FEP only):	-	-	-	-	-
XF1 fuse. (Alternate)	Littelfuse	R451 004 (Nano2 series, gold plated)	FF4AL, 125V (surface mount)	JDYX2	UL (E10480)
XF1 fuse. (Alternate)	Littelfuse	R453 004 (Nano2 series, silver plated)	FF4AL, 125V (surface mount)	JDYX2	UL (E10480)
XL1 choke	Interchangeable	Interchangeable	12 by 12by 9mm max. overall	-	-
XR23 Thermistor	Murata	PRF18BB471QB1RB	115°C Required for safety	XGPU2	UL (E137188)
XR23 Thermistor Alternate	Murata	PRF18BA471QB1RB	125°C Required for safety	XGPU2	UL (E137188)
XU3 & XU4 Opto coupler	Vishay	SFH6156 or Model SFH61, may be followed by additional letters and	4420Vac min. (UL). Provides Reinforced insulation.	FPQU2	UL (E52744)

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
		numbers			
XU3 & XU4 Opto coupler	Renesas Electronics Corporation	PS2581L2	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU3 & XU4 Opto coupler	Renesas Electronics Corporation	PS2561L2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
XU3 & XU4 Opto coupler	Renesas Electronics Corporation	PS2561DL2-1	5000Vac May be marked NEC and/or Renesas provides reinforced insulation. 0.4mm internal insulation, external creepage 8mm	FPQU2	UL (E72422)
TX1, TX2 Transformers. (Alternate)	TDK-Lambda UK Ltd.	CLL Part No. 33364	Class F Reinforced insulation, systems CEL-CF2 or CEL-CF4	OBJY3	UL
TX1, TX2 Transformers. (Alternate)	Trio Engineering Co. Ltd.	CLL Part No. 33364T	Class F Reinforced insulation, TEC-CF2 or TEC-CF4	OBJY3	UL
TX1, TX2 Transformer moulding	Interchangeable Fabrications	Sumitomo Bakelite PM9820	94V-0, 150°C (RTI), 0.9mm min. thick. Mechanical support only	QMFZ2	UL
TX1, TX2 Transformer cores	Interchangeable	Interchangeable	PQ Cores: 26mm x 25mm x 19mm overall	-	-
TX1,TX2 Transformer triple insulated wire. (Alternate)	Totoku	3S-ETFE	Triple insulated wire. 0.4mm dia. minimum. Provides reinforced insulation	OBJT2	UL E166483
TX1,TX2 Transformer triple insulated wire. (Alternate)	Totoku	TIW-E	Triple insulated wire. 0.4mm dia. minimum. Provides reinforced insulation	OBJT2	UL
TX1,TX2 Transformer triple insulated wire. (Alternate)	New England Wire Technologies Corp	WxxT1.5EyyyTC1A where xx can be 22, 24 or 26 & yyy can be any number	Triple insulated wire. 22, 24 or 26 AWG. Provides reinforced insulation. Class F	OBJT2	UL E205791

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
TX1, TX2 Transformer foil	Interchangeable	Interchangeable	13mm wide x 0.1mm thick copper covered by 2 layers of Kapton tape. Provided reinforced insulation	-	-
Insulator on side of chassis	Interchangeable	Interchangeable	145.8mm by 35.8mm min. polyester or polyimide tape with cut-outs. Provides Basic insulation	OANZ2	UL
Insulator on cover	Interchangeable	Interchangeable	168 by 84mm min. polyester or polyimide tape. Provides Basic insulation	-	-
12FE Module channel 2 components	-	-	-	-	-
XL601 Output Inductor	Interchangeable	Interchangeable	13 by 13 by 6mm max overall	-	-
OUTPUT INTERFACE ASSEMBLIES:	-	-	-	-	-
Output interface assemblies may contain any of the following critical components. Additional non-critical components (not described) may also be used. Documentation to be made available to the customer detailing ratings of all assembly outputs.	-	-	-	-	-
Fuse	Interchangeable	Interchangeable	Used within the manufacturers voltage and current rating. 40Adc max. Max circuit voltage 160Vdc. Secondary circuit only. Not operator accessible	JDYX2	UL
Fuse holder	Interchangeable	Interchangeable	Used within the manufacturers voltage and current rating, UL94V-1 min. 40Adc max. Max circuit voltage 160Vdc. Secondary circuit only. Not operator accessible	JDYX2	UL
Connector-Secondary	Interchangeable	Interchangeable	Used within the manufacturers voltage and current	ECBT2	UL

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
			rating UL94V-1 min.		
Choke	Interchangeable	Interchangeable	Used within the manufacturers voltage and current rating UL94V-1 min.	-	-
Indicator lamps or LEDs	Interchangeable	Interchangeable	Any colour except red. Class 1- 565nm pk Wavelength	-	-
MISC. ITEMS:	-	-	-	-	-
Fan (S, R and V cooling options only)	YS Tech	FD124020UB-H-NAH	12V, 14.4cfm	GPWV2	UL, (E187205)
Fan (S, R and V cooling options only)	Sunonwealth	PMD1204PKB3	12V, 13.3cfm,	GPWV2	UL E77551
Fan (P & Q cooling options only) (Alternate)	Sanyo	109P0412Hxxx, where xxx is any number	12V, 8.0cfm,	GPWV2	UL E46810
Fan (P & Q cooling options only) (Alternate)	ARX	FD1240-C2041M or FD1240-C2042M	12V, 12.95cfm,	GPWV2	UL E145724
Fan (P and Q cooling option only)	Sunonwealth	PMD1204PKB3 Series	, 12V 13.3cfm	GPWV2	UL (E77551)
Fan (T cooling option only)	Sanyo Denki Co. Ltd.	109P0812H7xx where x is any number from 0 to 9	12V, 32.1cfm,	GPWV2	UL E46810
Fan (T cooling option only) (Alternate)	Yen Sun Technology Corp.	FD128015(X)(Y), where (X) may be E, H, M or L, (Y) may be B or S	12V, 35.8cfm,	GPWV2	UL E145724
Fan (K cooling option only)	EBM-Papst	3412NG	12V, 49.4 CFM	GPWV2	UL (E38324)
Blanking plates (fitted to close unused module	Interchangeable	Interchangeable	Aluminium, having overall dimensions 127 by 37 by 38mm or 127 by 37 by 26mm or 127 by 37 by	-	-

Object/part or Description	Manufacturer/ trademark (NOTE 1)	type/model	technical data (NOTE 2)	CCN	Marks of Conformity (NOTE 3 and 4)
slots)			22mm or 143 by 37 by 12mm or 82 by 37 by 13 mm		
Sleeving, used on fan leadouts	Interchangeable	Interchangeable	Rated 300V minimum 125°C, VW-1	UZFT2	UL
Sleeving, used on fan leadouts - (Alternate)	Interchangeable	Interchangeable	Rated 300V minimum 125°C, VW-1	YDPU2	UL
Non-conformal coating (optional)	Dymax Corp	984-LVUF	V-1 120°C	QMJU2	UL (E140512)
Non-conformal coating (optional)	Lackwerke Peters GmbH & Co	KG DSL 1600E-FLZ	V-0, 125°C	QMJU2	UL (E80315)
Non-conformal coating (optional)	Dow Corning Corp	1-2577 Low VOC	V-0, 130°C	QMJU2	UL (E81611)
Non-conformal coating (optional)	Dow Corning Corp	1-2577	V-0, 130°C	QMJU2	UL (E81611)
Supplementary information: 1. List all different manufacturers of the above components 2. May include electrical, mechanical values s 3. List license no or method of acceptance 4. asterisk indicates mark assuring agreed level of surveillance					

Enclosures

Type	Supplement Id	Description
Photographs	3-01	NV350 complete PSU
Photographs	3-02	NV350 psu with cover removed
Photographs	3-03	NV350FEP psu with cover removed
Photographs	3-04	NV B, DB and DA modules
Photographs	3-05	NV C module
Photographs	3-06	NV global option
Photographs	3-07	Example of NV output interface assemblies
Diagrams	4-01	Barrier transformer drawings
Schematics + PWB	5-01	NV350 range PWB drawings
Manuals	6-01	NV350 handbook
Manuals	6-02	NV350FEP handbook