

UL TEST REPORT AND PROCEDURE

Standard:	UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12 (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:	Switching Power Supply
Model:	NTS503, NTS505, NTS508, NTS506, NTS503-CEF, NTS505-CEF, NTS508-CEF & NTS508-R
Rating:	<p>NTS503: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz DC 120 Vmin-300 Vmax., 7.1 A</p> <p>Output: DC +12 V, 41.67 A; DC +5Vstby, 2 A; DC +12 V(Fan_out), 1 A</p> <p>NTS505: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz DC 120 Vmin-300 Vmax., 7.1 A</p> <p>Output: DC +24 V, 20.84 A; DC +5Vstby, 2 A; DC +12V(Fan_out), 1 A</p> <p>NTS508: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz DC 120 Vmin-300 Vmax., 7.1 A</p> <p>Output: DC +48 V, 10.42 A; DC +5Vstby, 2 A; DC +12V(Fan_out), 1 A</p> <p>NTS503-CEF: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz Output: DC +12 V, 41.67 A; DC +5Vstby, 2 A; DC +12 V(Fan_out), 1 A</p> <p>NTS505-CEF: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz Output: DC +24 V, 20.84 A; DC +5Vstby, 2 A; DC +12V(Fan_out), 1 A</p> <p>NTS508-CEF & NTS508-R: Input: AC 100-250 V, 7.1 A, 50/60/440 Hz Output: DC +48 V, 10.42 A; DC +5Vstby, 2 A; DC +12V(Fan_out), 1 A</p> <p>NTS506 Input: AC 100-250 V, 7.1 A, 50/60/440 Hz DC 120 Vmin-300 Vmax, 7.1 A</p> <p>Output: DC +18 V, 27.80 A; DC +5Vstby, 2 A; DC +12V(Fan_out), 1A</p> <p>Maximum continuous output power:</p>

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Report Reference #

E186249-A203-UL

500W with 30CFM Forced Air Cooling or with Cover fan or with fan on front panel
200W with Natural Convection Cooling

Applicant Name and Address:

ASTEC INTERNATIONAL LIMITED
16TH FLOOR, LU PLAZA, 2 WING YIP STREET, KWUN TONG,
KOWLOON, HONG KONG

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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Reviewed by: Ken Ho

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

Class I equipment for building in.

For models NTS503, NTS505, NTS506, NTS508, NTS503-CEF, NTS505-CEF & NTS508-CEF:
Maximum recommended ambient (T_{mra}): 50°C at max. output power of 500W (with 30CFM Forced Air Cooling or with Cover and built-in fan) and 200W with Natural Convection Cooling. Output power derates 2.5% per degree from 50°C to 70°C ambient temperature.

For model NTS508-R only:

Maximum recommended ambient (T_{mra}): 50°C at max. output power of 500W (with 30CFM Forced Air Cooling or with Cover and built-in fan) and 200W with Natural Convection Cooling.

Operating Conditions:

For NTS503, NTS503-CEF:

Loading condition 1:

(500W with Fan or with 30CFM Forced Air cooling)

41.67A +12V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 2:

(500W with Fan or with 30CFM Forced Air cooling)

39.84A +12V
2.0A +5Vstby
1.0A +12V(Fan_Out)

Note: Fan load of 0.5A is subtracted from 1.0A if unit is with Cover or front panel Fan.

Loading condition 3:

(200W with Natural Convection Cooling)

16.67A +12V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 4:

(200W with Natural Convection Cooling)

16.67A +12V
1.0A +5Vstby
0.5A +12V(Fan_Out)

Loading condition 5: Half-load at 70°C

(100W with Natural Convection Cooling)

8.125A +12V
0.5A +5Vstby
0A +12V(Fan_Out)

For NTS505, NTS505-CEF:

Loading condition 1:

(500W with Fan or with 30CFM Forced Air cooling)

20.84A +24V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 2:
(500W with Fan or with 30CFM Forced Air cooling)

19.92A +24V
2.0A +5Vstby
1.0A +12V(Fan_Out)

Note: Fan load of 0.5A is subtracted from 1.0A if unit is with Cover or front panel Fan.

Loading condition 3:
(200W with Natural Convection Cooling)

8.34A +24V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 4:
(200W with Natural Convection Cooling)

7.875A +24V
1.0A +5Vstby
0.5A +12V(Fan_Out)

Loading condition 5: Half-load at 70°C
(100W with Natural Convection Cooling)

4.1A +24V
0.5A +5Vstby
0A +12V(Fan_Out)

For NTS508, NTS508-CEF:

Loading condition 1:
(500W with Fan or with 30CFM Forced Air cooling)

10.42A +48V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 2:
(500W with Fan or with 30CFM Forced Air cooling)

9.96A +48V
2.0A +5Vstby
1.0A +12V(Fan_Out)

Note: Fan load of 0.5A is subtracted from 1.0A if unit is with Cover or front panel Fan.

Loading condition 3:
(200W with Natural Convection Cooling)

4.167A +48V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 4:
(200W with Natural Convection Cooling)

3.94A +48V
1.0A +5Vstby
0.5A +12V(Fan_Out)

Loading condition 5: Half-load at 70°C
(100W with Natural Convection Cooling)

2.04A +48V
0.5A +5Vstby
0A +12V(Fan_Out)

For NTS506:

Loading condition 1:

(500W with Fan or with 30CFM Forced Air cooling)

27.8A +18V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 2:

(500W with Fan or with 30CFM Forced Air cooling)

26.56A +18V
2.0A +5Vstby
1.0A +12V(Fan_Out)

Loading condition 3:

(200W with Natural Convection Cooling)

11.12A +18V
0A +5Vstby
0A +12V(Fan_Out)

Loading condition 4:

(200W with Natural Convection Cooling)

10.5A +18V
1.0A +5Vstby
0.5A +12V(Fan_Out)

Loading condition 5: 50% load at 70°C

(100W with Natural Convection Cooling)

5.42A +18V
0.5A +5Vstby
0A +12V(Fan_Out)

Loading condition 6: 75% load at 60°C

(150W with Natural Convection Cooling)

8.2A +18V
0.5A +5Vstby
0A +12V(Fan_Out)

Note: Loading conditions are the output settings of the power supply during test. Loading conditions at the end-system may vary. However, it should not exceed the output ratings given (see page 1).

Model Differences

Model NTS503 is identical to Models NTS505, NTS506 and NTS508 except for the

1. Output Rating
2. P/N of Power Transformer (T102)
3. P/N of Auxiliary Transformer (T106)
4. P/N of Common Mode Choke (L9)
5. P/N of Common Mode Choke (L10)
6. Component Reference name of Y-Capacitor (C2, C122)
7. Rating of Bridge Rectifier (DB1)

8. Rating of PFC Transistors (Q3, Q19)
9. Rating of Power Transistors (Q6, Q15, Q17, Q18, Q20, Q23, Q24, Q40)
10. Rating of Power Transistors (Q43)
11. Rating of Power Transistors (Q44)
12. Types of Fan used

Model NTS503-CEF is similar to base model NTS503 except employ front panel with fan and AC inlet
Model NTS505-CEF is similar to base model NTS505 except employ front panel with fan and AC inlet
Model NTS508-CEF is similar to base model NTS508 except employ front panel with fan and AC inlet

NTS508-R is identical to model NTS508-CEF except for reversed fan application with reversed airflow direction.

Technical Considerations

- Equipment mobility : for building-in
- Connection to the mains : for building-in
- Operating condition : continuous
- Access location : restricted access location
- 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 of protective device as part of the building installation (A) : See Cover Page
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 4000
- Altitude of test laboratory (m) : less than 500
- Mass of equipment (kg) : 1.0
- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: 50°C
- The means of connection to the mains supply is: Pluggable A or AC/DC Input terminals
- The product is intended for use on the following power systems: TT, TN
- The product was investigated to the following additional standards: EN 60950-1:2006 + A11:2009 + A12:2010 + A12:2011 (which includes all European national differences, including those specified in this test report).
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- The clearance and creepage distance have additionally been assessed for suitable up to 4000 m elevation. Clearance distances were calculated using IEC 60664-1, Table A.2, correction factor 1.29.

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: 400.4 Vrms, 716 Vpk, Primary-Earthed Dead Metal: 401.4 Vrms, 707 Vpk
- The following secondary output circuits are SELV: All outputs
- The following secondary output circuits are at hazardous energy levels: +12V output for Model NTS503, NTS503-CEF, +24V output for Model NTS505, NTS505-CEF, +48V output for Model NTS508, NTS508-CEF, +18V output for Model NTS506
- 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): T102, T106 (Class F)
- The following end-product enclosures are required: Electrical, Fire, Mechanical
- The maximum continuous power supply output (Watts) relied on forced air cooling from: 500W fan at 30 cfm applied for all models
- The equipment is suitable for direct connection to: AC and/or DC mains supply
- This power supply is not equipped with a power cord. A safety agency approved power cord and plug with appropriate wire gauge for the rated input current must be provided by the end system manufacturer.
- This equipment was not evaluated for end system mounting. When installed in the end system, the proper evaluation should be considered in end system.
- Additional UL Recognized Fuse, rated 300 Vdc suitable for DC application must be provided in the end-system for DC Input.