UL TEST REPORT AND PROCEDURE

Standard:	UL 62368-1, 3rd Ed, 2021-10-22 (Audio/video, information and communication technology equipment Part 1: Safety requirements) CAN/CSA C22.2 No. 62368-1:19, 3rd Ed, 2021-10-22 (Audio/video, information and communication technology equipment Part 1: Safety requirements)
Certification Type:	Component Recognition
CCN:	QQJQ2, QQJQ8 (Power Supplies for Use in Audio/Video, Information and Communication Technology Equipment)
Complementary CCN:	N/A
Product:	AC-DC Power Supply
Model:	EFE300M Series or EFE-300M Series may be prefixed by NS - # or SP followed by / or – where # may be any characters indicating non-safety related model differences or additionally be marked with U5x or Y5x where x can be any characters indicating non-safety related model differences. may be followed by xy-a-b-cdef-ghijk. See model differences for details of models and nomenclature.
Rating:	100-240Vac nom, 4.9Arms max, 45-440Hz 133-318Vdc nom, 3.5Adc max (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: Maggie Chiu / Project Handler Reviewed By: David Snook / 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

EFE300M or EFE-300M Series. Switch mode power supplies for building into end equipment.

Model Differences

Nominal Input Voltage Range 100 – 240Vac or 133 – 318Vdc

Maximum Input Voltage Range 90** – 264Vac or 120 – 350Vdc

Input Frequency 45 – 440*Hz Maximum or DC

Maximum Input Current 4.9Arms or 3.5A dc

** Channel 1 output is linearly derated from 90Vac to 85Vac, 4W per volt to 280W

All ratings apply for ambient temperatures up to 50°C. From 50 to 70°C the output power is derated at 2.5% per °C.

EFE300M or –EFE300M models as described below:

(may be prefixed by NS - # / where # may be any characters indicating non-safety related model differences) Products may additionally be marked with U5x or Y5x where x can be any characters indicating non-safety related model differences excluding itemized models shown below.

May be prefixed by SP followed by / or – (SP represents a sales code)

Unit Configuration Code: EFE300Mxy-a-b-cdef-ghijk

Where:

x = Nothing or J for Japanese models (may have non-safety differences).

y = Blank for Y2 capacitors from output to earth, P for Y1 capacitors from output to earth.

a = Channel 1 output voltage: see Ch1 in the outputs table below, adjustment range column.

b = Standby voltage: see standby voltage table below or 0 for omitted.

c = HN for open frame, no fan, 12V/1A fan supply. HU for U-chassis, no fan, 12V/1A fan supply. HC for cover + chassis, no fan, 12V/1A fan supply. EC for cover + chassis, end fan (temp controlled). NN for open frame, no fan, no fan supply. NU for U-chassis, no fan, no fan supply. NC for cover + chassis, no fan, no fan supply. CN for open

frame, no fan, 12V/0.25A fan supply. CU for U-chassis, no fan, 12V/0.25A fan supply. CC for cover + chassis, no fan, 12V/0.25A fan supply.

d = M for Molex input connector or equivalent, J for JST connector or equivalent.

e = D for dual fused input or L for single fuse in the live line.

f = S for standard leakage, L for low leakage, R for reduced leakage, T for tiny leakage.*

g = Y for Oring FET included or N for nothing.

h = E for enable, T for inhibit, N for no inhibit, no enable.

i = Nothing for horizontal output connector, -V for vertical output connector, -S for screw terminal.

j = Nothing for standard channel 1 output voltage, -xD or -xPD where D is for units with programmed negative load regulation, PD is for units with programmed positive load regulation, x is the voltage of the regulation in 100mV and is within the output adjustment range (example, 7D = 0.7V of negative load regulation, 24PD = 2.4V of positive load regulation.

k = Nothing or -x where x is three numbers from 0 to 9 which denotes various output voltage/current settings within the specified ranges of each output for a particular unit or blank for standard output settings (may define non-safety related parameters/features e.g. reduced primary current limit, reduced OVP).

Output Parameters:

O/P Channel	Vout nom (V)	Range (V)	Max O/P (A)	Max O/P (W)
CH1	12	11.4 – 13.2*	25	300 (400**)
	24	22.8 – 26.4*	12.5	300 (400**)
	28	27 – 32*	10.72	300 (400**)
	40	36 – 42*	7.5	300 (350***)
	48	47 – 50*	6.25	300 (350***)
	50	50.1 – 54*	6.0	300 (350***)
Standby	5	Fixed	2	10
	12	12	1	12
	13.5	12 – 13.5*	1	13.5
Fan output	12	Fixed	0.25	3
	12	Fixed	1	12

* Can be adjusted from nominal at the factory only.

** Peak power of 400W for 10 seconds maximum, maximum RMS power of 300W

*** Peak power of 350W for 10 seconds maximum in any 1 minute cycle, maximum RMS power of 300W:

Where T1 = peak power time on and T2 = reduced power time on

Maximum continuous power output 300W (excluding fan output)

Output Limitations

All standard outputs are ES1 up to and including 40V. Voltage variants above the 40V variant are ES2 and must not be accessible to an end operator.

All outputs have basic spacing to earth and due consideration must be given to this in the end product design except for Y50029# which has functional spacing to earth.

Series connection

It is possible to connect two EFE300M units in series. Doing so changes the working voltages and also changes the Energy Source Classification. Refer to Conditions of Acceptability.

Non-standard Models.

(These are P/Ns created for customer specific applications. This can be EFE300Mxy-a-b-cdef-ghijk or same as EFE300M series or EFE-300M series under Model and Ratings section of this report).

Model: Y5J008# (where # can be any letter) or EFE300MJ-12.1-5-008 or EFE300MJ-12.1-5-008-SGP

Maximum Outputs: 12.1V, 21.49A plus 5V, 2A standby

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Fan speed is controlled at 6600rpm up to and between 45 to 50 degrees C ambient after which the fan resumes its normal nominal voltage rating. Can be fitted with or without fan guard.

Model: Y5J006# (where # can be any letter) or EFE300MJ-12-5-006

Maximum Outputs: 11.4V to 13.2V*, 25A (300W max) plus 5V, 2A standby

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Longer version than standard model to accommodate additional reservoir capacitor for a greater hold up time

Model: Y5J015# (where # can be any letter) or EFE300MJ-12.1-5-009 or EFE300MJ-12.1-5-009-SGP

Maximum Outputs: 12.1V, 24.79A plus 5V, 2A standby. Main output may also be 11.4V to 13.2V at 25A max. Limited to 300W max.

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Model is the same as Y5J008# but is an NN

Model: Y50016# (where # can be any letter), NS-TLA/EFE300M-48.5-12-HNMDL-YE-V

Maximum Outputs: 47V – 54V, 6.25A 300W plus 12V, 1A standby plus 12V, 1A fan output

Maximum Ambient: As standard model

Orientations: As standard model

Comments: OCP raised by 5% compared to standard model

Model: Y50018# (where # can be any letter), NS-TLG/EFE300M-54-5-ECMDL-YT

Maximum Outputs: 54V, 5.5A plus 5V, 2A standby

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Extended U-chassis with non-standard OVP to maintain SELV/ES1

Model: Y50029# (where # can be any letter except E), EFE300M-13-5-HNMDS-NT-S/NS-TLA

Maximum Outputs: As standard model

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Elongated PWB to accommodate additional filtering components

Model: Y50029E, EFE300M-13-5-HNMDS-NT-S/NS-TLA

Maximum Outputs: As standard model

Maximum Ambient: As standard model

Orientations: As standard model

Comments: Based on Y50029# but with a larger value boost capacitor, up to a values of 220 micro-farads for a better hold up time

Test Item Particulars	
Product group	built-in component
Classification of use by	Skilled person
Supply Connection	AC Mains DC Mains
Supply tolerance	+10%/-10%
Supply connection – type	mating connector
Considered current rating of protective device	20 A; Location: building
Equipment mobility	for building-in
Over voltage category (OVC)	OVC II
Class of equipment	Class I
Special installation location	N/A
Pollution degree (PD)	PD 2
Manufacturer's specified Tma (°C)	50°C (Full Load); 70°C (Output power decreased linearly by 2.5%/°C above 50°C)
IP protection class	IPX0
Power systems	TN
Altitude during operation (m)	5000 m
Altitude of test laboratory (m)	2000 m or less
Mass of equipment (kg)	0.5

Technical Considerations

- 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); 70°C (output power decreased linearly by 2.5%/°C above 50°C).
- The product is intended for use on the following power systems : TN, IT (Norway Only)
- Considered current rating of protective device as part of the building installation (A) : 20
- Mains supply tolerance (%) or absolute mains supply : +10%/-10% , DC Mains: +20%/-15%
- The equipment disconnect device is considered to be : Provided by the end equipment.
- 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
- Equipment was evaluated for a maximum supply range of 85-264Vac and 120-350Vdc.
- Capacitors are rated for 230V due to the IT power system used in Norway. Further evaluation may be required in the end use product.

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 product-line tests are conducted for this product : Earthing Continuity, Electric Strength
- The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 408Vrms/880Vpk, Primary – Earthed Dead Metal: 392Vrms/668 Vpk
- The following output circuits are at ES1 energy levels : All standard models up to and including 40V nominal. Voltages above 48V nominal are ES2 and must not be accessible to an end operator.
- The following output circuits are at ES3 energy levels : All series connection models
- The following output circuits are at PS3 energy levels : All circuits
- 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 input terminals/connectors must be connected to the end-product supply neutral : J1 connector, pin 5
- The following end-product enclosures are required : Mechanical, Electrical, Fire
- The following components require special consideration during end-product Thermal (Heating) tests due to the indicated maximum temperature measurements during component-level testing : J1 (75°C); L1,L2 (140°C); C7,C8 (100°C); C9 (105°C); L3 (140°C); TX1 (130°C); TX2 (130°C); U2, U4, U5, U6 (100°C); Q1, Q2 or Q5 (125°C, min. coating rating); XU3 (125°C, min. coating rating); All other electrolytic capacitors (105). Customer air configurations considered for abnormal and single fault conditions through test data in this report.
- When operated at the frequencies in excess of 63Hz, the requirements of clause 5.7 must be considered in the end use equipment as the leakage current for input frequencies above 63Hz may exceed 5mA. --
- Fans: The fan provided in this sub-assembly is provided with a fan guard to reduce the risk of operator contact with the rotor. The fan provided in this sub-assembly is not intended for operator access.
- Rating in end-product needs evaluation due to input-voltage-dependent de-rating is used
- Products are restricted to connection to DC Mains conditioned power supply system with narrower tolerance +10%, -10%.
- Marking for equipment provided with fuses located in both line and neutral of a single phase mains to be considered in end-product.
- Series connection: The end-product Electric Strength Test is to be based upon a maximum working voltage of : Primary-Secondary: 482Vrms, 880Vpk; Primary-Earthed Dead Metal: 392Vrms, 668Vpk
- The following magnetic devices (e.g. transformers or inductor) are provided with an OBJY3 insulation system with the indicated rating greater than Class A (105°C) : Transformers TX1 & TX2: Class F (140°C) – See table 4.1.2 for details of insulation system used.
- Power Supplies is provided with Multilayer PWB. PWBs are accepted under CBTR Ref. No.: E349607-A23 dated 2014-07-31 and letter report included under Enclosure, Miscellaneous

Additional Information

This report is a reissue of CBTR Ref. No. E135494-A6010-CB-1 Amendment 3 , CB Test Certificate Ref. No. DK-90514-M2-UL based on previously conducted testing and the review of product construction, only 5.4.1.8 – DETERMINATION OF WORKING VOLTAGE and 5.4.9.1 – ELECTRIC STRENGTH TEST – TYPE TESTING OF SOLID INSULATION tests were deemed necessary.

Single sided or double sided boards refer to Daughter and IMS boards while Multi-layer boards refer to Main board.

The manufacturer submitted representative production sample(s) of EFE300M. The following samples ID 2348251 were used for construction review.
EFE300M-48-12-ECMDL-YT was used for test purposes and is considered representative of the entire series.

The following tests were selected as representative of the test program applicable to model covered by this CBTR:
5.4.1.8 DETERMINATION OF WORKING VOLTAGE, 5.5.2.2 CAPACITOR DISCHARGE AFTER DISCONNECTION OF A CONNECTOR, 5.6.6 RESISTANCE OF THE PROTECTIVE BONDING SYSTEM, B.2.5 INPUT TEST, B.2.6 NORMAL OPERATING CONDITIONS TEMPERATURE MEASUREMENT
These tests have been witnessed for models selected as representative of the standard covered by this report and the applicable test program.

Additional Standards

The product fulfills the requirements of: EN IEC 62368-1:2020+A11:2020, J62368-1(2023), CSA/UL 62368-1:2019, BS EN IEC 62368-1:2020+A11:2020, AS/NZS 62368.1:2022, , GB 4943.1-2022, National standard SASO-IEC 62368-1:2020

Markings and Instructions

Clause Title	Marking or Instruction Details
See Installation Instructions	The symbol 
Equipment identification marking – Manufacturer identification	Listee's or Recognized Company's name, Trade Name, Trademark or File Number
Equipment identification marking – model identification	Model Number
Equipment rating marking – ratings	"Input Ratings (voltage, frequency/dc, current/power)", "Output Ratings (voltage, frequency/dc, current/power)"
Fuses – replaceable by skilled person	(component ID:_____), Ratings (____A), "Ratings (____A, ____V)", and (symbol of required characteristics) located on or adjacent to fuse or fuseholder or in service manual.

Special Instructions to UL Representative

N/A