REV.	Description	Date
00	ECN:102A-15A077 SPEC ISSUE(ADP-130DB DA/DB Re-Modify from ADP-130DB FA)	10/16’15
01	ECN:102A-15A187 ADD MODEL:ADP-130DB DC	12/31’15
02	ECN:102A-162087 ADD MODEL:ADP-130DB DA9	02/19’16
03	ECN:102A-163082 ADD MODEL: ADP-130DB DD	03/11’16
04	ECN:102A-166092 ADD MODEL: ADP-130DB DE/DF	06/22’16
05	ECN:102A-167246 ADD Product Ingress protection(IP) rating: Not requirement	08/08’16
06	ADD MODEL: ADP-130DB DG	11/09’16
07	ECN:102A-16C223 ADD MODEL: ADP-130DB DD8	12/29’16
08	ECN:102A-18C061 ADD MODEL: ADP-130DB DE12	12/17’18
09	ECN: 102A-198063 ADD MODEL: ADP-130DB DH	08/14’19
10	102A-206059 ADD MODEL: ADP-130DB DK/DL	06/12’20
11	102A-218034 ADD MODEL: ADP-130DB DM	08/09’21
12	102A-222132 1. Change item 1.1.10 Average efficiency from 87% to 89%.	02/23’22
13	102A-225225 1.Item 1.2.12.1 add OVP then AC ON 只看 latch 功能不看電壓.	05/26’22
14	102A-22A191 ADD MODEL: ADP-130DB DM8	10/31’22

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DESCRIPTION :
電氣規格(Electrical Specification)

MODEL NO. :
ADP-130DB D SERIES

Date	Drawn	Design (EE)	Design (ME)	DOCUMENT NAME. :	REV.
10/31’22	王玉玲	陳嘉佑	曾映澍	ES-130DB D SERIES	14

FOR MODEL: ADP-130DB DA/DB/DC/DA9/DD/DE/DF/DG/DD8/DE12/DH/DK/DL/DM/DM8

1. ELECTRICAL

1.1 Input Characteristics:

1.1.1 Nominal Voltage

It is normal for **100 ~ 240Vac** input AC voltage.

1.1.2 Input Voltage Range

The Adapter shall operate from **90 ~ 264Vac**.

1.1.3 Rated Frequency

It is normal for **50Hz ~ 60Hz.**.

1.1.4 Frequency Range

The Adapter shall operate with an input frequency from **47 Hz** to **63 Hz**.

1.1.5 Extended Frequency Range

The Adapter shall operate normally when input frequency is **400 Hz**.

1.1.6 Current

Maximum steady state input current shall be less than **1.8 A** RMS at 90 VAC and **0.9A** RMS at 180VAC and maximum load.

1.1.6 Brown out

The Adapter shall turn off when input voltage less then **85Vac** and more then **65Vac**.

1.1.7 Inrush Current Limit (cold start)

Maximum inrush current less than 140A at 264VAC or calculated energy I^2*t less than fuse and bridge diode.

1.1.8 No Load and small load Power Consumption

Vin=**115V/230Vac**

Output load(W)	Input power (max)
0.25W	**0.48W**
0.5W	**1W**
1W	**1.7W**
1.5W	**2.4W**

1.1.9 Full load efficiency

The Adapter efficiency shall be more then **87%** at output full load and 90Vac input voltage. (after Warm Up 30minute)

1.1.10 Average efficiency

That is the average value of 25%、50%、75% and 100% load with both 115Vac and 230Vac input voltage condition , average efficiency need more than **89%** (after Warm Up 30minute)

1.1.11 Active PFC (Power factor Correction)

Parameter Description	Min
PF at 100% load, 60Hz, 115/230Vac	**0.92**
PF at 40% load, 60Hz, 115/230Vac	**0.6**

1.2 Output Characteristics:

1.2.1 Rated Voltage

The rated output voltage is specified at **19.5V.**

1.2.2 Voltage Range

The output voltage will be performed **18.5~ 20.5V** when the load is **0A ~6.67A** steadily.

1.2.3 Current

This Adapter can work from **0 A** to **6.67A** and output voltage is in section 1.2.2 specified range.

1.2.4 Peak Current

This Adapter can work output current **7.7A** (4 second duration and duty cycle 10%) and output voltage is in section 1.2.3 specified range.

1.2.5 Output Ripple and Noise

Output ripple voltage is **500 mV** peak to peak or less.

1.2.6 Common mode noise

Common mode noise shall be less than **400mV**.

1.2.7 Loop Gain

The phase margin shall be more than **45 deg** and the gain margin shall be less than **-12dB**.

1.2.8 Switch-on time

The adapter shall switch on in less than **3 seconds** at maximum load and 90VAC input(Delay from Min. AC input to 10% Vo; Cold start inclusive.)

1.2.9 Time to LED turn on

The adapter shall switch on in less than **4 seconds** at maximum load and 90VAC input(Delay from Min. AC input to LED on. Cold start inclusive.)

1.2.10 rise time

DC output rise time from 10% to 90% of output voltage shall be between **2~400ms** at 90VAC and maximum load

1.2.11 fall time

DC output rise time from 90% to 10% of output voltage shall be less than **350ms** at 90VAC and maximum load(at 10% load; No external capacitance)

1.2.12 Protection

1.2.12.1 Over Voltage Protection

The Adapter will be latch while any single component failure and output voltage will be limited between **21.2~25V.** Pre-OVP base on latch only **OVP then AC turn on 只看 latch function 無需看電壓.**

1.2.12.2 Short Circuit protection

Output can be short ed without damage.

1.2.12.3 Over Current Protection

Output current will be limited between **8A~10.5A** by itself. And the protection delay time shall be less than **650ms**.

1.2.12.4 Over Thermal Protection

The adapter shall use electronic circuitry to limit the unit case temperature **95**℃ maximum.

It return to normal operation only after AC power line recycles.

1.2.13 Dynamic Load Change

The output need parallel a **100uF** capacitor, output change between **0.05A-90%** load, slew rate is **0.25A/us**,frequency is **50**、**100**、**1K**、**10KHz**, input voltage is 90/264V. The overshoot and undershoot of output voltage shall be less then **1.5V**.

1.2.14 Overshoot and undershoot

During power-on or power-off, the output voltage shall be monotonically increasing or decreasing with respect to the overshoot which shall neither exceed **21 volts** peak.

1.2.15 System Capacitive Load

The system load capacitance is **100uF** and ESR is **30mohm.** Plugging a live AC Adapter into the system capacitance shall not cause the adapter to shut down.

2. Environmental

2.1 Temperature

2.1.1 Operating

The Adapter is capable to operate from **0 to 40**℃.

2.1.2 Shipping/Storage

The Adapter is capable to be stored from **–40 to 70**℃.

2.1.3 Surface temperature rise

The maximum temperature rise of any surface shall not exceed **55degC** when measured at bakelite and 100Vac/maximum load. And shall be meet safety specification **95degC** max.

2.2 Humidity

2.2.1 Operating

The Adapter is capable to operate less than **95%** RH maximum .

2.2.2 Shipping/Storage

The Adapter is capable to be stored less than **95%** RH (non-condensing) maximum.

2.3 Altitude

2.3.1 Operating

The Adapter is capable to operate at **10000** feet above sea level.

2.3.2 Storage

The Adapter is capable to operate at **35000** feet above sea level.

2.4 Leakage Current :

The AC leakage current is less than **80uA** when adapter is connected to 264Vac(50Hz).

2.5 Electromagnetic Interference(EMI) :

The adapter shall comply with the following national standards.

2.5.1 Conducted Emissions

Conform to the “class B ” requirement of **CISPR 22(EN55022)**

2.5.2 Radiated Emissions

Conform to the “class B ” requirement of **CISPR 22(EN55022)**

2.6 EMC item :

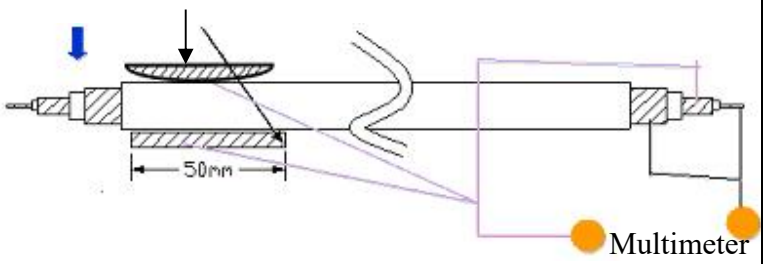
ITEM	CONDITION	SPECIFICATION
Electric Fast Transients:	Refer to IEC1000- 4-4 level 3	No function error
		No damage
Lightning Surge:	Refer to IEC1000-4-5 level 3	No function error
		No damage
Electron Static Discharge: (Refer to IEC1000-4-2 Energy Storage, Capacitor 150pF; Discharge Resistor 330W)	Air Discharge: ± 12kV min.	No function error
	Air Discharge: ± 15kV min	No damage
	Contact Discharge: ±6kV min.	No function error
	Contact Discharge: ±8kV min	No damage
Cooling	Natural air cooling	
Insulation Resistance:	Between AC input and secondary applied 500Vdc for 1 minute	≥ 30MΩ
Dielectric Strength: (Hi-Pot)	Between AC input and secondary AC 3kV, test time 1 minute, and cut off current shall be less than 10mA Hi-pot1 AC 3kV, test time 1s. Hi-pot2 DC 4242V, test time 1s. In production line	

Mechanical characteristics

<table>
<tr><th colspan="2">Item</th><th>Conditions</th><th>Specification</th></tr>
<tr><td>1</td><td>Bending test</td><td>
<table>
<tr><th></th><th>Load</th><th>Angle (θ)</th><th>Arbitrary direction</th><th>Cycles in every minute</th><th>Sample size</th></tr>
<tr><td>Case - DC cord</td><td>500 g</td><td>0~180°</td><td>6250 Cycles</td><td>15 Cycles</td><td>24 Pcs</td></tr>
<tr><td>DC Cord-Plug</td><td>227 g</td><td>0~180°</td><td>6250 Cycles</td><td>15 Cycles</td><td>24 Pcs</td></tr>
</table>
Test Procedure:

a. Adjust the tester to count for 6250 cycles with a rate of 15 cycles per minute. Timing is listed below:
i. 0 – 180 degrees: 1.5 second, Dwell at 180 degrees: 1 second
ii. 180 – 0 degrees: 1.5 second, Dwell at 0 degrees: 0 second
b. Rotate each direction 180 degrees. One cycle is 180 degrees.
c. Connect the monitoring systems (monitoring event <=5sec) to record the voltage during test.
d. Connect the 19.5V voltage source through the Adapter for Power, PSID, and GRD.
e. PSU rated current to be applied to Power and GRD, with minimum of 1A applied to PSID. Deviation to be approved by Dell.
f. Voltage across all three lines (PSID, GRD, Power) must be continuously monitored continuously and test equipment must be programmed to stop when the voltage drops below 18.5V.
</td><td>Failure Criteria:

a. Any voltage that falls below 18.5V. Must be repeatable.
b. Any structural cracks, breaks, or tearing in the cable. No Exposed Metal.
c. Minor cosmetic damage is acceptable</td></tr>
</table>

2.	Compression Test	For coaxial design, the positive of multimeter is connected to center conductor and the outer spiral conductor, and the negative is connected to inner spiral conductor and fixtures. For flat cable, each wire V+, GND, and PSID must be checked independently for shorting with each other under pressure. The material of the fixtures is stainless and it is a curved fixture, its thickness is 5 mm; length is 50 mm (See the figure). Compress speed is 1 ±.1 Kg/min. Sample size:12 Pcs Fixture  	Failure Criteria The cable should not short with pressure less than 100 Kg.
3.	Vibration	Only endurance conditioning by sweeping shall be made. Operating 0.75 G zero to peak, 5 to 500 Hz, 0.5 octaves/minute, one cycle, 5 to 500 to 5 Hz per axis in each of three mutually perpendicular axes. Non-Operating 1.5 G zero to peak, 5 to 500 Hz, 0.5 octaves/minute, one cycle, 5 to 500 to 5 Hz per axis in each of three mutually perpendicular axes. 0.025 G squared/Hz, 10 to 500 Hz, nominal 3.5 G RMS level, one hour per axis, in each of three mutually perpendicular axes for a total duration of three hours.	Output voltage ± 0.5V. Dielectric strength：Without ignition smoke, damage, arcing or breakdown. Insulation resistance ：100MΩ or more Appearance：There shall be no blistering of the specification label or other damage to the construction.
4.	shock	Operating 10 G, 11 ms, half sine, one shock input in each of three mutually perpendicular axes, for a total of six shock inputs. Non-Operating 100 G peak, trapezoid, 180 in/s velocity change, one shock input per direction in each of three mutually perpendicular axes, for a	Output voltage ± 0.5V Dielectric strength：Without ignition smoke, damage, arcing or breakdown. Insulation resistance：100MΩ or more.

		total of six shock inputs. 240 G peak, 2 ms, half sine, one shock input in each of three mutually perpendicular axes, for a total of six shock inputs.	Appearance：There shall be no blistering of the specification label or other damage to the construction.
5.	Drop test	Delta Drop Test Standard for Portable Power Supply Test height：1 meter for every surface(six sides) 3 times Test surface material：hardwood surface or concrete	1. Electrical characteristic shall be satisfied. 2. PWB 銅箔無掀起或傷害 3. 無銲錫破損 4. 無零件破損 5. 若測試造成外殼(Enclosure)裂縫,必須 Repeat test 5 times. 並進行 root cause analysis And provide corrective action. 6. 測試 Hi-pot 為"PASS"時,產品若有破洞，裂縫時需檢查 User Accessible area 與 Hazardous voltage parts,必須 keep Double or Reinforced insulation.
6.	AC inlet insertion and withdrawal	DENAN-LAW：Rated load 5000 times, and rated load 1.5 folds/100 times (20 times/min.) UL/CSA：Rated load 1.5 folds/250 times (10 times/min) IEC：Rated load 1000 times, and without rated load 3000 times (15 times/min.)	Without distinct damage in appearance. Electrical characteristic shall be satisfied.
7.	AC inlet weight test	The plug shall be connected to AC inlet then direction of plug X and Y shall be applied to there condition. Weight: 100 N. Time: 5 sec. Test times: 3 times.	Without distinct damage in appearance. Electrical characteristic shall be satisfied without solder crack of mounted board on AC inlet

8	Ball impact	Delta Impact Test Standard for Portable Power Supply 1 The sample is placed on the laminated wood surface with the surface to be impacted positioned horizontally. If the sample needs to be stabilized or held in place, the stabilizing device must be solid to allow for the intended force to be delivered to the sample. For example, if blocks are used to support the samples, the blocks shall be secured together so that the sample sits securely and doesn't move due to the impact delivered by the steel ball. The sample must be in contact with the laminated wood surface at all times. 2 The steel ball is allowed to fall freely from rest through the guide tube for a vertical distance of 1.3M to the point of impact. 3 Only one impact per sample shall be made. Use new samples for additional impacts.	1. 若測試造成外殼(Enclosure) 裂縫,必須 Repeat test 5 times. 並進行 root cause analysis and provide corrective action. 2.測試 Hi-pot 為"PASS"時,產品若有破洞, 裂縫時需檢查 User Accessible area 與 Hazardous voltage parts,必須 keep Double or Reinforced insulation.
9.	Acoustic Noise	Measurements to determine the AC adapter sound pressure are made using a 1/2" low noise free-field microphone in a inner size with 45(W)×45(D)×65(H) cm^3 Anechoic chamber.	Delta Spec.: 20~15kHz Max 25dB; 15k~20kHz Max 30dB
		Measurements to determine the AC Adapter sound quality are made using a binaural (artificial) head in a qualified chamber that meets the requirements of ISO 3744, Clause 4.3.	Dell Spec.: Please kindly refer to DELL AC Adapter Sound Quality Test Procedure (Number: AC0103) "AC Adapters Sound Quality Test Procedur
10.	Adhesion of specification labels	1. Tape peeling test 2. High temperature storage The AC adaptor shall be stored at a temperature of 65 ± 2℃ with relative humidity of 90% to 95% for 6 to 7 h 3. Low temperature storage The d. c. power supply shall be stored at a temperature of -20 ± 3℃ for 6 to 7 h.	There shall be no blistering or peeling of the specification label.

11.	Wiggle test	1. Fasten adapter and cord firmly to their plates. 2. Adjust motor cam shaft so that AC adapter is in max forward position. 3. Connect cord to AC power and adapter output cable to DC load with LED to indicate that power is on. 4. Adjust plate distance so that adapter and cord just make connection and LED is lit. 5. Adjust DC load to maximum load for adapter (65W adapter = 3.75A). 6. Let adapter thermally soak for 15-20 minutes. 7. Adjust Variac to ~30VAC (~750RPM) and run for ~10 minutes. 8. Adjust Variac to ~0VAC and adjust motor cam shaft so that AC adapter is in max forward position. 9. Adjust plate distance so that adapter and cord just make connection and LED is lit. 10. Repeat steps 7 through 9 until adapter receptacle contacts begin to produce audible arcing noises. 11. Repeat steps 6 through 9 except lower Variac operational voltage to ~20VAC (~300RPM) until adapter begins to produce consistently Long or loud popping and arcing noises. 12. Remove adapter and plug from plates and attempt to manually twist cord slightly while varying the insertion distance, attempting to produce prolonged arcing, If manual manipulation should begin to prove unproductive, return to fixture and repeat step 11. 13. There is a "test to failure" pass criteria. This means continue to execute this test procedure until the adapter no longer conducts or the test ends in smoke or melting.	1. 如過程中有發煙,熔毀,停止後將樣品外殼拆開,觀察 SOCKET 後方如果 Pin 銷接處沒有晃動, 可判定為 "PASS", 如 SOCKET 後方零件有被燒毀的現象,則判定為 " FAIL" 2. 請注意卯接處發黑不是指塑膠熔毀後,覆蓋於卯接處的現象
12	Outline dimension Case Color	154.7 x 76.2 x 25.4 ,BLACK	L x W x H mm Color

台達電子工業股份有限公司 DELTA ELECTRONICS, INC.				DESCRIPTION : 電氣規格(Electrical Specification)	
THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DELTA ELECTRONICS, INC. AND SHALL NOT BE REPRODUCED OR USED AS THE BASIS FOR THE MANUFACTURE OR SELL OF APPARATUSES OR DEVICES WITHOUT PERMISSION.				MODEL NO. : ADP-130DB D SERIES	
Date	Drawn	Design (EE)	Design (ME)	DOCUMENT NAME. : ES-130DB D SERIES	REV. 14
10/31'22	王玉玲	陳嘉佑	曾映澍		

13	AC Inlet	C6	X Type
14	Weight	410±20g	XXX g
15	DC Connector	ADP-130DB DA/DB/DA9/DE/DH/DK/DM BARREL TYPE, 7.4x5.1x12.5mm ADP-130DB DC/DD/DF/DD8/DL BARREL TYPE, 4.5x0.6x9.2mm	X Type O.D. x I.D. x L mm
16	DC Cable Length	1800	XXXX mm

Product Application：Notebook

Product Ingress protection(IP) rating: Not requirement