| **REV.** | **Description** | | | | | | **Date** | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S00 | SPEC ISSUE (NEW MODEL) | | | | | | 02/26/2024 | |
| S01 | 102A-243128  CHANGE 1.1.7 SPEC & 1.1.8, 1.1.9, 1.2: add 19.5V SPEC & 2.1 SPEC | | | | | | 03/15/2024 | |
| S02 | 102A-243279  CHANGE ITEM 1.2 19.5V SPEC | | | | | | 04/08/2024 | |
| S03 | 102A-245246  CHANGE ITEM 1.2 48V SPEC | | | | | | 05/24/2024 | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  |  | | | | | |  | |
|  | | | **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-350BB SERIES | | |
| Date | | Drawn | | Design (EE) | Design (ME) | DOCUMENT NAME. :  ES-350BB SERIES | | REV. |
| 05/24/2024 | | 呂翠娥 | | 陳彥儒 | 蔡柏崢 | S03 |

Frame Name:DF-PSLA4V-2R01.DOC SHEET 1 OF 22

**MODEL LIST**

|  |  |  |  |
| --- | --- | --- | --- |
| ADP-350BB BA |  |  |  |

1. **ELECTRICAL**
   1. Input Characteristics:
      1. Nominal Voltage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Vin (Voltage Range)*** |  | **100-240** |  | **Vrms** |

* + 1. Input Voltage Range

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Vin (Voltage Range)*** | 90 |  | 264 | Vrms |

* + 1. Rated Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Vin (frequency)*** |  | **50-60** |  | **Hz** |

* + 1. Frequency Range

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Vin (frequency)*** | 47 |  | 63 | Hz |

* + 1. Current

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Iin (90VAC)*** |  |  | 4.8 | Arms |
| ***Iin (180VAC)*** |  |  | 2.4 | Arms |
| ***Rated Input current on label*** |  | TBD |  | Arms |

* + 1. Brown out

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Vin (turn-off)*** | 65 | 85 |  | Vrms |

* + 1. Inrush Current Limit ( cold start )

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Initial In-rush Current*** |  |  | <22% I^2t of Fuse spec | Amps (peak) |

At 115V/230V. Spec shown is for First power up (Cold). Repeat (Warmp) power ups may be higher. Use a 100m-ohm input line impedence to represent a typical home/office line impedance on test set up. The design may NOT need to have an Inrush imiting NTC or any bypass mechanism. Worst case measurement (90/270 deg) is expected to be taken and I2T analysis conducted on Fuse and Bridge diode.

* + 1. No Load and small load Power Consumption

Vin=**115V/230Vac**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Minimum Efficiency @ Vin=minimum, max load @100Vac*** | 88 |  |  | % |
| ***Minimum Efficiency @ .1W, +48VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .2W, +48VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .25W, +48VDC*** | 33 |  |  | % |
| ***Minimum Efficiency @ .3W, +48VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .4W, +48VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .5W, +48VDC*** | 48 |  |  | % |
| ***Minimum Efficiency @ 1W, +48VDC*** | 64 |  |  | % |
| ***Minimum Efficiency @ 2W, +48VDC*** | 74 |  |  | % |
| ***Minimum Efficiency @ 5W, +48VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 10W, +48VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 15W, +48VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 20W, +48VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ .1W, +36VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .2W, +36VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .25W, +36VDC*** | 33 |  |  | % |
| ***Minimum Efficiency @ .3W, +36VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .4W, +36VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .5W, +36VDC*** | 48 |  |  | % |
| ***Minimum Efficiency @ 1W, +36VDC*** | 64 |  |  | % |
| ***Minimum Efficiency @ 2W, +36VDC*** | 74 |  |  | % |
| ***Minimum Efficiency @ 5W, +36VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 10W, +36VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 15W, +36VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 20W, +36VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ .1W, +28VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .2W, +28VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .25W, +28VDC*** | 33 |  |  | % |
| ***Minimum Efficiency @ .3W, +28VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .4W, +28VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .5W, 28VDC*** | 48 |  |  | % |
| ***Minimum Efficiency @ 1W, +28VDC*** | 64 |  |  | % |
| ***Minimum Efficiency @ 2W, +28VDC*** | 74 |  |  | % |
| ***Minimum Efficiency @ 5W, +28VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 10W, +28VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 15W, +28VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 20W, +28VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ .1W, +20VDC******/19.5VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .15W, +20VDC/19.5VDC*** | 55 |  |  | % |
| ***Minimum Efficiency @ .2W, +20VDC/19.5VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .25W, +20VDC/19.5VDC*** | 52 |  |  | % |
| ***Minimum Efficiency @ .3W, +20VDC/19.5VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .4W, +20VDC/19.5VDC*** | TBD |  |  | % |
| ***Minimum Efficiency @ .5W, 20VDC/19.5VDC*** | 62 |  |  | % |
| ***Minimum Efficiency @ 1W, +20VDC/19.5VDC*** | 66 |  |  | % |
| ***Minimum Efficiency @ 2W, +20VDC/19.5VDC*** | 75 |  |  | % |
| ***Minimum Efficiency @ 5W, +20VDC/19.5VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 10W, +20VDC/19.5VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 15W, +20VDC/19.5VDC*** | 83 |  |  | % |
| ***Minimum Efficiency @ 20W, +20VDC/19.5VDC*** | 83 |  |  | % |
| ***Max input power @ no load, +19.5VDC*** |  |  | 150 | mW |

* + 1. Average efficiency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Minimum average efficiency (25%, 50%, 75%, and 100%), +48VDC*** | 89 |  |  | % |
| ***Minimum average efficiency (25%, 50%, 75%, and 100%), +36VDC*** | 89 |  |  | % |
| ***Minimum average efficiency (25%, 50%, 75%, and 100%), +28VDC*** | 89 |  |  | % |
| ***Minimum average efficiency (25%, 50%, 75%, and 100%), +20VDC/19.5VDC*** | 89 |  |  | % |

* + 1. Power factor Correction ：

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***PFC @ 100% loasding and 115/230VAC*** | 0.95 |  |  |  |

* 1. Output Characteristics:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Output Voltage Regulation*** |  |  |  |  |
| ***+19.5VDC*** | 18.53 | 19.50 | 20.48 | Volts |
| ***+20VDC*** | 19.69 | 20.30 | 20.91 | Volts |
| ***+28VDC*** | 27.65 | 28.50 | 29.36 | Volts |
| **+36VDC** | 35.04 | 36.50 | 37.96 | Volts |
| **+48VDC** | 46.75 | 48.70 | 50.65 | Volts |
| ***Output Current*** |  |  |  |  |
| ***+19.5VDC*** | 0 |  | 9.50 | Amps |
| ***+20VDC*** | 0 |  | 9.30 | Amps |
| ***+28VDC*** | 0 |  | 7.80 | Amps |
| **+36VDC** | 0 |  | 6.44 | Amps |
| **+48VDC** | 0 |  | 6.78 | Amps |

* + 1. Peak Current

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Peak Load Current(+48VDC )*** |  |  | 8.39 | Amps |
| Duty cycle |  |  | 10 | % |
| Maximum duration |  |  | 4 | s |
| ***Transient Load Current*** |  |  | 9.20 | Amps |
| Maximum duration | 1 |  |  | ms |
| ***Peak Load Current(+36VDC )*** |  |  | 7.40 | Amps |
| Duty cycle |  |  | 10 | % |
| Maximum duration |  |  | 4 | s |
| ***Transient Load Current*** |  |  | 8.24 | Amps |
| Maximum duration | 1 |  |  | ms |
| ***Peak Load Current(+28VDC )*** |  |  | 8.88 | Amps |
| Duty cycle |  |  | 10 | % |
| Maximum duration |  |  | 4 | s |
| ***Transient Load Current*** |  |  | 9.88 | Amps |
| Maximum duration | 1 |  |  | ms |
| ***Peak Load Current(+20VDC )*** |  |  | 10.48 | Amps |
| Duty cycle |  |  | 10 | % |
| Maximum duration |  |  | 4 | s |
| ***Transient Load Current*** |  |  | 11.67 | Amps |
| Maximum duration | 1 |  |  | ms |
| ***Peak Load Current(+19.5VDC )*** |  |  | 10.48 | Amps |
| Duty cycle |  |  | 10 | % |
| Maximum duration |  |  | 4 | s |
| ***Transient Load Current*** |  |  | 11.67 | Amps |
| Maximum duration | 1 |  |  | ms |

* + 1. Output Ripple and Noise

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Output ripple / noise*** |  |  |  |  |
| **+48VDC** |  |  | 450 | mVpp |
| **+36VDC** |  |  | 450 | mVpp |
| **+28VDC** |  |  | 450 | mVpp |
| **+20VDC*/19.5VDC*** |  |  | 300 | mVpp |

Measured methods:

T1. Performed by 20MHz bandwidth in oscilloscope.

T2. Applied 0.1uF ceramic capacitor and 10uF tantalum capacitor across output connector terminals.

T3. Measured at the end of DC cable.

* + 1. Acoustic noise

The sound quality of the Adapter shall meet all of the following criteria (metrics) for both left and right ear binaural measurements when tested in accordance with the Dell AC Adapter Sound Quality Test Procedure Document. For more complete specification refer to latest revision of Dell document AC0101 (Sound quality specification for AC Adapters)

Sound Quality Specifications for all Operational Modes

|  |  |  |  |
| --- | --- | --- | --- |
| **AC Adapter** | | | |
| **Operational Mode** | **Critical Band Loudness** | **Prominent Tones** | **Modulation** |
| **All Modes** | **<0.025** | **No** | **<25%** |

The Adapter must meet the specification at all test voltage/current combinations.

* Critical Band Loudness shall **be less than 25 millisone**s. This is not the sum total of the area under the curve rather this metric applies to each critical band along the Bark scale.
* No Prominent Tones **(Prominence Rati**o) allowed **(< 7.0 d**B) at any critical band.
* Degree of Amplitude Modulation in percentage shall **be less than 25%** in any critical band.

When testing Adapters for noise compliance, **all combinations of voltage and current will be use**d. Worst case for both input voltage ranges using all possible load currents should be documented. The Adapter must meet the specification at all test voltage/current combinations. The minimum number of finished product to be tested shall be 32 units. Out of the 32, two units should be tested for all the necessary Load/Line combinations to identify at least the two worst conditions for each input voltage range. These shall be tested at each individual stage of development. Additionally, in order to be in compliance with this specification the supplier shall pass 100% of all samples tested.

All testing for compliance to this specification shall be performed in an acoustic lab certified by Dell.

**All other results for compliance to this specification shall not be accepted.**

Pendec Acoustic Laboratory

4F, No. 388, Section 1, Nei Hu Rd.

Taipei, Taiwan R. O. C. 114

Contact: Mr. Robin Cheng

886-2-2657-1779

0928269919 (Cellular)

* + 1. Timing

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***T1(Output Turn On Delay) 19.5V only*** |  |  | 4000 | ms |
| ***T2 (Output Rise Time) 19.5V to 48V*** |  |  | 150 | ms |

* + 1. Fall time

DC output fall time from 90% to 10% of output voltage shall be between **0~275ms** at 90VAC and maximum load.

Discharge time 48V🡪19.5V <275ms for no load and full load.

* + 1. Protection
       1. Over Voltage Protection (Non pre-short test item due to system limit and 100Vac test)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Output Over Voltage*** |  |  |  | Volts |
| **+48VDC** | 50.0 |  | 56.0 | Volts |
| **+36VDC** | 40.0 |  | 46.0 | Volts |
| **+28VDC** | 30.0 |  | 36.0 | Volts |
| **+20VD****C/+19.5VDC** | 22.0 |  | 26.0 | Volts |

* + - 1. Short Circuit protection(Non pre-short test item due to system limit)

1. When any pin shorting on the cc pin, The AC adapter cannot be damaged. It is still able to keep functionality after removing pin shorting.
2. When Vo shorting on the GND, the AC adapter cannot be damaged. It can be auto-recovery (less 15 times). If the Vo to GND keep shorting after auto-recovery, the AC adapter must be latch.
   * + 1. Over Current Protection

When AC adapter output over current, it must be latch after delay time.****

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Over Current Inception Level*** |  |  |  |  |
| **+48VDC** | 9 |  | 11 | Amps |
| **+36VDC** | 8 |  | 11 | Amps |
| **+28VDC** | 10 |  | 13 | Amps |
| **+20VDC/+19.5VDC** | 11 |  | 14 | Amps |
| ***Over Current Time Delay*** |  |  |  |  |
| td | 30 | 300 |  | ms |

* + - 1. 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. Dynamic LoadChang (50Hz,100Hz,1Khz)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Transient Loading Conditions*** |  |  |  |  |
| +48VDC capacitive loading | 100 |  |  | uF |
| ***Output Transient Starting Load*** |  |  |  |  |
| +48VDC | 0 |  |  | Amps |
| ***Output Transient Load Step*** |  |  |  |  |
| +48VDC |  |  | 100 | % of max loading |
| ***Voltage Overshoot*** |  |  |  |  |
| +48VDC |  |  | 4.8 | V |
| ***Voltage Undershoot*** |  |  |  |  |
| +48VDC |  |  | 4.8 | V |
| ***Transient Response Load Slew Rate*** |  |  | 2.5 | A/usec |
| ***Transient Loading Conditions*** |  |  |  |  |
| +36VDC capacitive loading | 100 |  |  | uF |
| ***Output Transient Starting Load*** |  |  |  |  |
| +36VDC | 0 |  |  | Amps |
| ***Output Transient Load Step*** |  |  |  |  |
| +36VDC |  |  | 100 | % of max loading |
| ***Voltage Overshoot*** |  |  |  |  |
| +36VDC |  |  | 3.6 | V |
| ***Voltage Undershoot*** |  |  |  |  |
| +36VDC |  |  | 3.6 | V |
| ***Transient Response Load Slew Rate*** |  |  | 2.5 | A/usec |
| ***Transient Loading Conditions*** |  |  |  |  |
| +28VDC capacitive loading | 100 |  |  | uF |
| ***Output Transient Starting Load*** |  |  |  |  |
| +28VDC | 0 |  |  | Amps |
| ***Output Transient Load Step*** |  |  |  |  |
| +28VDC |  |  | 100 | % of max loading |
| ***Voltage Overshoot*** |  |  |  |  |
| +28VDC |  |  | 2.8 | V |
| ***Voltage Undershoot*** |  |  |  |  |
| +28VDC |  |  | 2.8 | V |
| ***Transient Response Load Slew Rate*** |  |  | 2.5 | A/usec |
| ***Transient Loading Conditions*** |  |  |  |  |
| **+19.5VDC/**+20VDC capacitive loading | 100 |  |  | uF |
| ***Output Transient Starting Load*** |  |  |  |  |
| **+19.5VDC/**+20VDC | 0 |  |  | Amps |
| ***Output Transient Load Step*** |  |  |  |  |
| **+19.5VDC/**+20VDC |  |  | 100 | % of max loading |
| ***Voltage Overshoot*** |  |  |  |  |
| **+19.5VDC/**+20VDC |  |  | 2 | V |
| ***Voltage Undershoot*** |  |  |  |  |
| **+19.5VDC/**+20VDC |  |  | 2 | V |
| ***Transient Response Load Slew Rate*** |  |  | 2.5 | A/usec |

* + 1. Overshoot and undershoot

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Voltage Overshoot*** |  |  |  |  |
| +48VDC |  |  | 50.65 | Volts |
| +36VDC |  |  | 37.96 | Volts |
| +28VDC |  |  | 29.36 | Volts |
| +20VDC |  |  | 20.91 | Volts |
| +19.5VDC |  |  | 20.48 | Volts |

* + 1. System Capacitive Load

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***CapacitiveLoad*** |  |  |  |  |
| +19.5VDC,+20VDC,+28VDC,+36VDC,+48VDC, |  |  | 100 | uF |
| ***ESR Load*** |  |  |  |  |
| +19.5VDC,+20VDC,+28VDC,+36VDC,+48VDC, | 30 |  | 100 | m-ohms |

1. **Environmental** 
   1. Temperature(safety demand)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Operating Temperature (in operation)*** | 0 |  | 35 | degrees Celsius |
| ***Non-Operating Ambient*** | -40 |  | 70 | degrees Celsius |
| ***Max Case Temperature Rise*** |  |  | Side: Δ T≤ 48  Top: Δ T≤ 55  Bottom: Δ T≤ 60 | degrees Celsius |

* 1. Humidity

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Humidity (Operating and NonOperating)*** |  |  | 95 | % non-condensing |

* 1. Altitude

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter Description** | **Min** | **Typ** | **Max** | **Units** |
| ***Altitude Operating*** |  |  | 5,000 | meter |
| ***Altitude Non-operating*** |  |  | 35,000 | feet |

|  |  |  |
| --- | --- | --- |
| **ITEM** | **CONDITION** | **SPECIFICATION** |
| **Environmental Characteristics:** |  |  |
| * + 1. Electric Fast Transients: | Refer to IEC1000- 4-4 level 3 | No function error |
| * + 1. Lightning Surge: | Refer to IEC1000-4-5 level 3 | No function error |
| * + 1. Electron Static Discharge:   (Refer to IEC1000-4-2  Energy Storage Capacitor 150pF; Discharge Resistor 330Ω) | Air Discharge: ± 12kV min.  Air Discharge: ± 15kV min  Contact Discharge: ±6kV min.  Contact Discharge: ±8kV min | No function error  No damage  No function error  No damage |
| * + 1. Cooling | Natural air cooling |  |
| * + 1. EMI: | CISPR 32: CLASS B | Under 2db with resistive load |
| * + 1. Leakage Current | 264Vac/50Hz  Add DELL NFPA99 | ≤50 uA  Meet safety(follow DELL demand test form) |
| * + 1. Insulation Resistance: | Between AC input and secondary applied 500Vdc for 1 minute Add DELL HJ741 Primary to Earth (Ground) | ≥ 30MΩ |
| * + 1. 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  Hi-pot arcing sense level=5 |  |
| * + 1. Common mode noise | 1. The peak-to-peak voltage measured in the frequency range of 10 KHz to 40 KHz shall not exceed 500 mVp-p. 2. The peak-to-peak voltage measured in the frequency range of 40 KHz to 80 KHz shall not exceed 150 mVp-p. 3. The peak-to-peak voltage measured in the frequency range of 80 KHz to 400 KHz shall not exceed 250 mVp-p. |

**3. Safety**

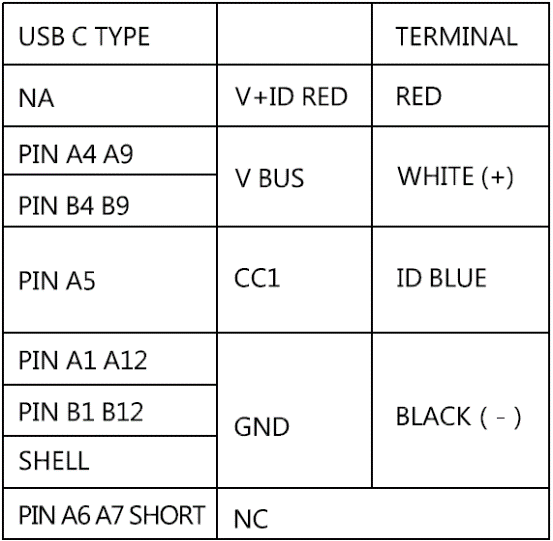
* 1. The Power supply shall be designed to comply with EN/IEC 62368-1 and IEC 60950-1 safety requirements.

**Mechanical characteristics**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Item** | | **Conditions** | | | | | | **Specification** |
| 1. | Bending test |  | Load | Angle  (θ) | Arbitrary  direction | Cycles in every  minute | Sample size | **Failure Criteria:**   1. Any voltage that falls below 18.5V. Must be repeatable. 2. Any structural cracks, breaks, or tearing in the cable. No Exposed Metal. 3. Minor cosmetic damage is acceptable. |
| Case -  DC cord | 227 g | 0~180° | 6250 Cycles | 15 Cycles | 24 Pcs |
| DC Cord-Plug | 227 g | 0~180° | 6250 Cycles | 15 Cycles | 24 Pcs |
| **Test Procedure:**   1. Adjust the tester to count for 6250 cycles with a rate of 15 cycles per minute. Timing is listed below:    1. 0 – 180 degrees: 1.5 second, Dwell at 180 degrees: 1 second    2. 180 – 0 degrees: 1.5 second, Dwell at 0 degrees: 0 second 2. Rotate each direction 180 degrees. One cycle is 180 degrees. 3. Connect the monitoring systems (monitoring event <=5sec) to record the voltage during test. 4. Connect the 19.5V voltage source through the Adapter for Power, PSID, and GRD. 5. PSU rated current to be applied to Power and GRD, with minimum of 1A applied to PSID. Deviation to be approved by Dell. 6. 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.   目前因吳江BENCH 無對應測試DELL DC CABLE 設備，  故短期內入料需要求供應商提供IST 測試報告，即  BENCH 暫不測試線材；長期BENCH TEAM 會架構與  IST 相仿的儀器做複測的動作 | | | | | |
| 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 | | | | | | Failure Criteria  The cable should not short with pressure less than 100 Kg. |
| 3. | Vibration | Only endurance conditioning by sweeping shall be made.  The entire frequency range from 10 Hz to 55 Hz and return to 10 Hz. shall be transversed in 1 min.  Amplitude（total excursion）：1.5 mm  This motion shall be applied for a period of 2 hrs in each  of 3 mutually perpendicular axis （a total of 6 hrs）. | | | | | | Output voltage refer to Item 1.2 |
| 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 | Peak acceleration:　981/m/s2  Duration of pulse:　6 ms  Three successive shocks shall be applied in both directions of mutually perpendicular axis (a total of 18 shocks). | | | | | | 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. |
| 4-1 | Random Vibration  (Non-Operational) | The random spectrum will be 3.08Grms.  Perform random vibration testing on three (3) mutually orthogonal axes.  Each vibration test will run for 30 minutes.  Random Vibration Breakpoints:   |  |  | | --- | --- | | **PSD Break Points for 3.08Grms** | | | Frequency (Hz) | Acceleration (G2/Hz) | | 7 | 0.004 | | 20 | 0.013 | | 33 | 0.003 | | 156 | 0.1 | | 200 | 0.026 | | 233 | 0.04 | | 282 | 0.0037 | | 312 | 0.01 | | 400 | 0.0002 | | 500 | 0.0002 | | 600 | 0.00009 | | 700 | 0.000023 | | 800 | 0.00003 | | | | | | | The voltage delta between pretest and posttest voltages shall not exceed 5%. |
| The function must be ok and no any solder crack be found. |
| All parts and glue must be no damage and movement. |
| 4-2 | Random Vibration  (Operational) | The random spectrum will be 2.17Grms.  Perform random vibration testing on three (3) mutually orthogonal axes.  Each vibration test will run for 30 minutes.  A meter will be reading the voltage throughout testing.  The voltage will remain within the 5% allowance during testing.  Random Vibration Breakpoints:   |  |  | | --- | --- | | **PSD Break Points for 2.17Grms** | | | Frequency (Hz) | Acceleration (G2/Hz) | | 7 | 0.001 | | 21 | 0.007 | | 32 | 0.0027 | | 53 | 0.03 | | 80 | 0.005 | | 155 | 0.04 | | 190 | 0.01 | | 204 | 0.017 | | 234 | 0.006 | | 260 | 0.013 | | 600 | 0.0005 | | 700 | 0.0005 | | 800 | 0.00015 | | | | | | | The voltage delta between pretest and posttest voltages shall not exceed 5%. |
| The function must be ok and no any solder crack be found. |
| All parts and glue must be no damage and movement. |
| 5. | Drop test 1 | Delta Drop Test Standard for Portable Power Supply  Test height：1 meter for every surface (six sides) 1 times  Test surface material：hardwood surface or concrete | | | | | | 1. Electrical characteristic   shall be satisfied.   1. PWB 銅箔無掀起或傷害 2. 無銲錫破損 3. 無零件破損 4. 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. 5. 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. |
| Drop test 2 | Drop times: 30 times for every surface (six side),total 180 times”, Due to adapter weight >=400g  Test surface material : The concrete  Drop height: 10cm | | | | | |  |
| 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 insertion and withdrawal Push Test | The AC Power Cord receptacle shall remain securely mounted/fixed in place when a 20lb force is applied during insertion/ withdrawal of power cord. Test shall be repeated on each sample 50 times.(Sample size: 5 Pcs) | | | | | | Without distinct damage in appearance. |
| 8. | 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 |
| 8-1 | AC inlet  Bending Force  test | 1. Adapter is fixed by fixture and body of adapter extends 30mm from fixture. 2. The test inlet was reference C5 GO standard tool. 3. The distance between load point and inlet surface is 50mm. 4. We issue this test for both logo and label side. 5. Minimum bending force is 15 Kgf | | | | | | We stop pull force immediately when we hear break voice.  We test each side once time for 5 pcs sample to take data. |
| 9. | 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 1.5M 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. |
| 10. | 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.:  The AC Adapter shall produce no human perceivable audible noise (less then 30dB)  No load：< 30dB  0~Full Load:： 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) |
| 11. | 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   1. 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. |
| 12. | 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铆接處沒有晃動, 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 |
| 13 | Tumble test | Test condition should refer to Delta standard 10000-0258 | | | | | | 判定標準   1. 弱測試造成外殼(Enclosure)裂縫, 以不允許金手指插入作為判定標準 2. 測試Hi-pot為PASS時, 產品若有破洞或裂縫時需檢查User accessible area and Hazardous voltage parts, 必須keep double or reinforced insulation. |
| 13 | Outline dimension  Case Color | 205\*90\*34 ; BLACK | | | | | | L x W x H  Color |
| 14 | Weight | 1100 g +/-50g | | | | | | XX g |
| 15 | AC Inlet | C14 | | | | | | C6 or C8 or C14 or CX Type |
| 16 | DC Connector | Barrel type  7.4 x 5.1 x 12.5mm | | | | | | X Type  O.D. x I.D. x L |
| 17 | DC Cable Length | 1800 | | | | | | XXXX mm |

18. Product Application: Notebook

19. DC Cable Connector pin define and related test request, please refer to SN item 2.4



20. Product Ingress protection(IP) rating: No requirement(IP00)