| **REV.** | **Description** | **Date** |
| --- | --- | --- |
| 00 | SPEC ISSUE (NEW MODEL)  ADP-100BH BA | 04/14’23 |
| 01 | 102A-235119  1. Revise Item1.2.8 | 05/12’23 |
| 02 | 102A-237025  1. CHANGE MECHANICAL ITEM 14: WEIGHT FROM 370g+/-10% TO 325g+/-10% | 07/07’23 |
| 03 | 02A-239171  1. Add Model: ADP-100BH BA9T | 09/18’23 |
| 04 | 102A-239256  1. Add Model: ADP-100BH BB | 09/27’23 |
| 05 | 102A-244094  1. Add Model: ADP-100BH BC  2.1.1.11 12V Pout change from 36W to 60W | 04/12’24 |
| 06 | 102A-248145  Add Model: ADP-100BH BA9T1W, ADP-100BH BA9F1R, ADP-100BH BA9F1W | 08/16’24 |
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**MODEL LIST:**

|  |  |  |  |
| --- | --- | --- | --- |
| **ADP-100BH BA** | **ADP-100BH BA9T** | **ADP-100BH BB** | **ADP-100BH BC** |
| **ADP-100BH BA9T1W** | **ADP-100BH BA9F1T** | **ADP-100BH BA9F1W** |  |

1. **ELECTRICAL**
   1. INPUT
      1. Voltage

The power supply shall be capable of supplying full rated output power over the input range of 90 to 265 Vac RMS. Nominal voltage is 120 VAC. The power supply shall be capable of start- up (power-on) at 90 Vac and 50 Hz minimum.

* + 1. Power Factor

Adapter with PFC shall comply with harmonic input current requirements as detailed in EN61000-3-2 and JEIDA MITI standards. The harmonic input current requirements must be met under the following operating conditions:

Load Requirements: 100% and with output load set in order to have 75W input power. Input Voltage: 230Vac/50Hz.

For active power factor correction the power factor at 100% load shall be greater than 0.9 over

the entire input voltage 100Vac & 240Vac input.

* + 1. Range Switching

The power supply shall accept the full input range. No range switching is necessary or possible.

* + 1. Frequency

The supply shall operate with an input frequency of 47 – 63 Hz AC.

* + 1. Current

Maximum steady state input current shall be less than 1.6 Amperes RMS at 90 VAC and maximum load.

1.1.6 Input Power Rating

The supply true input power is less than 136 watts. (For reference only.)

* + 1. Inrush Current

Maximum inrush current, from power-on (with power on at any point on the AC sinewave) and including but not limited to, three line cycles, shall be limited to a 29% margin of the I2t rating of the input fuse and bridge rectifier:

* + - 1. Cold Start

Cool the disconnected power supply long enough to ensure that all components are within 3°C of the minimum temperature as specified in Section 2.1. Apply the maximum input voltage in section1.1.1 to the power supply.

* + - 1. Hot Start

Operate the power supply the maximum ambient operating air temperature as specified in Section 2.1 for 15 minutes. Cycle power to the power supply by removing and reconnecting maximum input voltage as specified in Section 1.1.1.

1.1.8 Brownout & Brownout Recovery

The adapter shall survive the application of the following tests at 25°C ambient temperature **80% load** condition.

During the test the output voltage shall remain within specified limit until shut down the adapter. No oscillate/fluctuate at any time.

1.1.8.1 Brownout Conditions

100Vac to 0Vac at 50 Hz at fixed slope of 6.6V/min, back to 100Vac.

1.1.8.2 Brownout Recovery Conditions

0Vac to 100Vac at 50 Hz at fixed slope of 6.6V/min

* + 1. LPS Requirement

The adapter shall be provided 2 options , 100W without LPS compliant and 90W with LPS compliant.

* + 1. Protection
       1. Under Voltage

The power supply shall not be damaged by applying an input voltage below the minimum specified in Section 1.1.1.

* + - 1. Catastrophic Failure Protection:

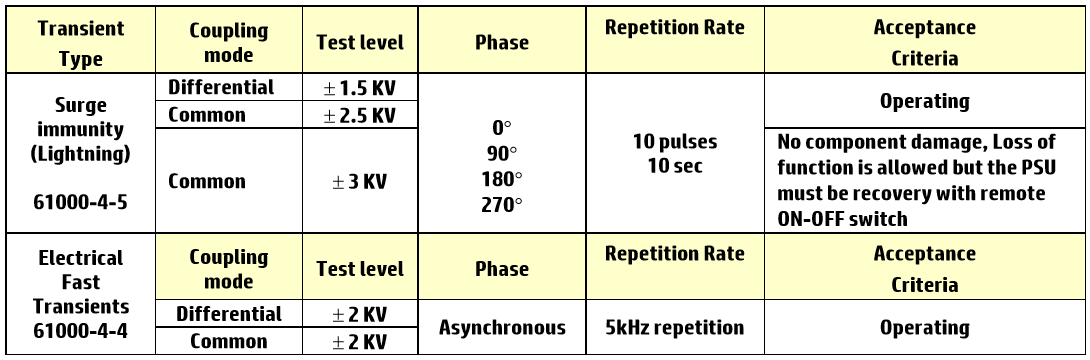
When any single component fails, the power supply will not exhibit any of the following effects:

* + - * 1. Startling noise
        2. Flame
        3. Excessive smoke
        4. Charred PCB
        5. Fused PCB conductor
        6. Dielectric breakdown
        7. Chemical leak outside the case
      1. Power Line Transient

The power supply shall operate within specifications with the transients defined in IEC 61000-4- 4 and IEC 61000-4-5.

The adapter shall survive and the product in which it is installed shall continue to operate with no component failures during and after repeated applications of the following transients. In the event that an end use product is not available for these tests, the power supply shall be loaded at minimum per the load table.

HP recommends that the signal generator be used with low impedance of 12 Ohms.

**TABLE 2 POWER LINE TRANSIENT REQUIREMENTS**

1.1.10.4 AC Leakage Current:

Class I Equipment (Grounded Equipment)

The total combined leakage current when measure in accordance with IEC 60950-1, 2nd Edition shall not exceed 40 microamperes when tested at 250 VAC, 50 Hz in a normal operating condition.

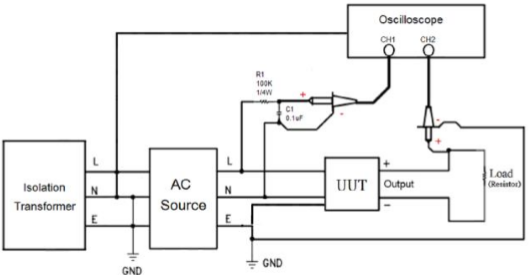
* + - 1. Common Mode Noise:

The common mode noise when measure in accordance with IEC 62684 shall not exceed follow below requirement

o AC Input Voltage: 90Vac/60Hz & 264Vac/50Hz

o The peak-to-peak voltage measured in the frequency range of 10KHz to 400KHz shall not exceed 150mV peak-to-peak.

o Test condition following with Full load (per step) by each 10% load



* + - 1. Primary to Secondary Ground:

The power supply shall have a 1 Meg Ohm 1/4W resistor and 0.1uF/100V capacitor parallel combination between earth ground (FG) and secondary DC ground.

* + - 1. ISN resistors:

The power supply shall have a 300Ohm(minimum) resistor between earth ground(FG) and secondary DC ground.

* + 1. Energy Efficiency

The device shall conform to the EPA Energy Star Requirements Level VI for External Power Supplies:

* The Average Active Mode Efficiency minimum (Calculated but testing at 100%, 75%, 50% and 25% of rated output power and then computing the average of these four values) must be greater than below table at 115Vac input and 230Vac input.
* In addition the device must meet the No Load/Light Load requirements as specified below (measured at 115Vac/60Hz and 230Vac/50Hz):
* > 90% Efficiency level at 100W (20V/5A) USB-PD output condition. (measured at 115Vac/60Hz and 230Vac/50Hz)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Output Voltage (V) | | Rated Max Output Power (W) | | Average Efficiency (%) | |
| 5V | | 15W | | 81.5% | |
| 9 V | | 27W | | 86.7% | |
| 12 V | | 60W | | 88% | |
| 15 V | | 75W | | 89% | |
| 20 V | | 100W | | 89% | |
| **No Load/Light Load (confirm with system load)** | | | |
| **Output Load** | | **Maximum Input Power** | |
| **0W** | | **0.21W** | |
| **0.25W** | | **0.5W** | |
| **0.5W** | | **1.0W** | |
| **1.0W** | | **1.7W** | |
| **1.5W** | | **2.4W** | |

o [Option] In order to fulfill future efficiency requirement, the PSU should have an optional design to meet he No Load requirements as specified below (measured at 115Vac/60Hz and 230Vac/50Hz):

|  |  |
| --- | --- |
| **No Load** | |
| **Output Load** | **Maximum Input Power** |
| **0W** | **0.15W** |

* + 1. BMC Eyes Diagram

The device shall conform to the **BMC EYES DIAGRAM** requirements for as below.

1.1.13 PD3.1 Compliance Test

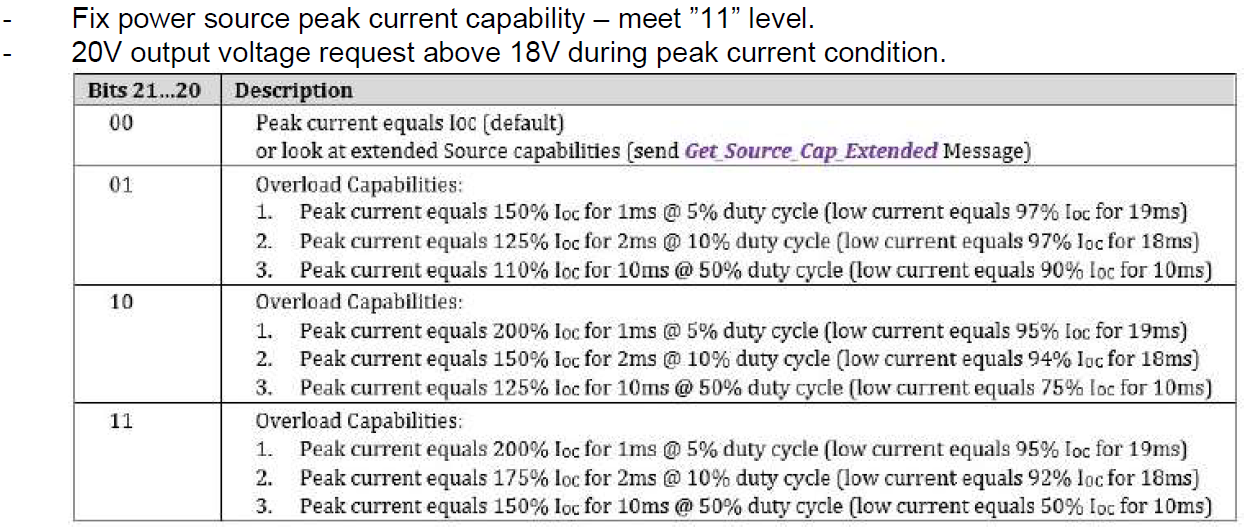
• Follow Ellisys to ran compliance testing for PD protocol validation

• Shall be apply PD3.1 of USB-IF certification

* 1. OUTPUT
     1. Voltage

Outputs shall be provided as defined and measured at the output connector of the supply:

|  |  |
| --- | --- |
| NOMINAL VOLTAGE (V) | REGULATION |
| 5 V | 4.75V - 5.25V |
| 9V | 8.55V-9.45V |
| 12 V | 11.40V - 12.60V |
| 15 V | 14.25V - 15.75V |
| 20V | 19.0V – 21.0V |

* + 1. Current

|  |  |  |
| --- | --- | --- |
| NOMINAL VOLTAGE (V) | Load Current (A) | |
| MIN. | MAX. |
| 5 V | 0 A | 3A |
| 9 V | 0 A | 3A |
| 12 V | 0 A | 5A |
| 15 V | 0 A | 5A |
| 20 V | 0 A | 5A |

* + 1. Power

The power supply shall be capable of continuously supplying, when installed in the end use system, 100 Watts under all specified conditions.

* + 1. Transient Response

(Step Load) The following transient loads are to be applied to the output. The frequency range of the transient loads described shall be from 1Hz, 100Hz and 5KHz. The waveform shall be a square wave with the slope of the rise and fall at 1 A/microsecond. Measurements should be made at output cable connector. External system capacitance shall be connected to the PSU output.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Condition | | | | Regulation |
| AC Input | Nominal Voltage (V) | Load Current (A) | | Design Requirement |
| (VAC) | Minimum | Maximum | (S/R=1A/uS, 1Hz ,100Hz& 5KHz, 50% duty) |
| 90-264 | +5.0V | 0.0 | 1.5 | 4.5V-5.5V |
| 1.5 | 3.0 |
| 0.0 | 3.0 |
| +9.0V | 0.0 | 1.5 | 8.1V-9.9V |
| 1.5 | 3.0 |
| 0.0 | 3.0 |
| +12.0V | 0.0 | 2.5 | 10.8V-13.2V |
| 2.5 | 5.0 |
| 0.0 | 5.0 |
| +15.0V | 0.0 | 2.5 | 13.5V-16.5V |
| 2.5 | 5.0 |
| 0.0 | 5.0 |
| +20.0V | 0.0 | 2.5 | 18.0V-22.0V |
| 2.5 | 5.0 |
| 0.0 | 5.0 |

* + 1. Output Regulation

At nominal input line voltage (120Vac), the output shall be subjected to the load described in Section 1.2.2, and shall remain within the regulation limits as defined in Section 1.2.1.

* + 1. Protection

The power supply shall automatically shut down under the conditions.

* + 1. Over Voltage

The power supply shall provide over voltage protection such that under single component Failure, the output voltage following with table as below and automatic shutdown and is latch mode, channel volts with a maximum duration of 250millseconds.

|  |  |
| --- | --- |
| NOMINAL OUTPUT | OVER VOLTAGE |
| VOLTAGE (V) | MAXIMUM |
| 5V | 7.25V |
| 9V | 13.05V |
| 12V | 17.40V |
| 15V | 21.75V |
| 20 | 29.00V |

* + 1. Over Current

The power supply shall limit the maximum steady state output current to an average current with below table definition. Over current trigger point should not exceed below table limitation.

|  |  |
| --- | --- |
| OUTPUT VOLTAGE (V) | CURRENT LIMIT (A) |
| 5 V  9 V  12 V  15 V  20V | <5.4A(+0.6A/-0A) |

* + 1. Short Circuit

The power supply shall be protected such that a short from output to return shall not result in a fire hazard, shock hazard, or damage to the power supply.

* + 1. Outputs/Ripple/Noise

Maximum allowable peak-to-peak ripple and noise (as measured at the load with 100VAC input) on the output channel shall be 380mVpk-pk (or 250 mV RMS) ripple within 10 kHz to 20 MHz bandwidth. A resistive load (non-electronic) shall be used for this measurement. The output shall be bypassed to return by 1.0 microfarad ceramic capacitor in parallel with 1 0 microfarad tantalum capacitor at the point of load. The load cable shall be the specified output cable assembly. The printed wiring board assembly shall be installed in its enclosure for this measurement or have the measurement leads properly shielded and proper earth grounds applied to power supply. (5V /9V/12V/15V/20V); Maximum Load & Minimum Load.

* + 1. Stability

The power supply shall be unconditionally stable while operating within its normal operating specification.

* + 1. Overshoot

During power-on or power-off, the output voltage shall be monotonically increasing or decreasing with respect to the overshoot which shall neither exceed below table of volts peak nor be outside the regulation requirements for more than 10 milliseconds (mS).

|  |  |
| --- | --- |
| NOMINAL VOLTAGE (V) | REGULATION |
| 5V | 5.25V |
| 9V | 9.45V |
| 12V | 12.60V |
| 15V | 15.75V |
| 20V | 21.0V |

* + 1. Power-On Time

Output Regulation: Outputs (+5V) shall be in regulation within five (5) seconds after valid input power (90 VAC) has been applied.

* + 1. Rise Time

The output shall be in regulation within 275mS Maximum.

(Measured from 0% to 100% regulation)

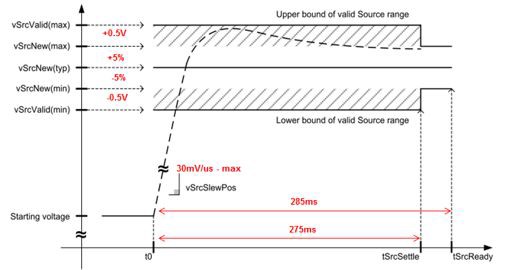
Output Voltage

0V to 5V

5V to 9V

5V to 12V

5V to 15V

5V to 20V

* + 1. Hold Up

• The power supply output voltage: 5V/9V/12V/15V/20V, shall maintain voltage regulation within the specified limits in paragraph 1.2.1 for at least 5 milliseconds after loss of input voltage measured at 115 VAC and at maximum load.

• The power supply output voltage: 5V/9V/12V/15V/20V, shall maintain voltage regulation within the specified limits in paragraph 1.2.1 for at least 10 milliseconds after loss of input voltage measured at 115 VAC and at 80% load.

• With Host board test turn off time maximum of 500mS

1.2.16 Acoustic Test

Position the microphone ten (10) centimeters above the x-y center of the AC Adapter.

Allow the AC adapter to warm-up for a minimum of 30 minutes prior to starting the test

Take a measurement with the AC Adapter configured for each of the test cases below:

* 1. 0~Full Load : < 25dB
  2. No Load - 120Vac/60Hz
  3. No Load - 240Vac/50Hz
  4. Nominal Load - 120Vac/60Hz
  5. Nominal Load - 240Vac/50Hz
  6. Maximum Load - 120Vac/60Hz

1.7 Maximum Load - 240Vac/50Hz

**Table – AC Adapter Acoustic Noise Levels**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Frequency (Hz) | Mag dBA  re 20 µPA |  | Frequency (Hz) | Mag dBA  re 20 µPA |
| 630 | 5.0 |  | 4.00 k | 12.0 |
| 800 | 7.5 |  | 5.00 k | 11.0 |
| 1 k | 9.0 |  | 6.30 k | 10.0 |
| 1.25 k | 12.0 |  | 8.00 k | 9.0 |
| 1.6 k | 11.0 |  | 10.00 k | 8.0 |
| 2.0 k | 12.0 |  | 12.50 k | 7.5 |
| 2.50 k | 12.0 |  | 16.00 k | 13.0 |
| 3.15 k | 12.0 |  | 20.00 k | 20.0 |

1.2.17 Thermal Shutdown

The power supply shall incorporate over temperature protection to prevent catastrophic failure from overheating.

**2.ENVIRONMENTAL REQUIREMENTS**

* 1. TEMPERATURE
     1. Operating

The supply shall operate from 0 to 35。C. The maximum temperature rise of any surface shall not exceed 45。C when measured at 100Vac and at maximum load.

* + 1. Non-Operating

The power supply can be stored from -20 to 85。C**.**

* 1. COOLING

The power supply shall be convection cooled only.

* 1. HUMIDITY

The power supply shall withstand without degradation with 95% relative humidity, non-condensing, both operating and non-operating.

* 1. ALTITUDE
     1. Operating

The power supply can be operated at 5,000 m above sea level

* + 1. Non-Operating

50,000 feet above sea level.

* 1. MECHANICAL SHOCK

(Power supply inside assembly.)

* + 1. Operating

10 G, 11ms, half sine, one shock input in each of three mutually perpendicular axes, for a total of six shock inputs.

* + 1. 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 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.

* + 1. UL Safety

36-inch drop onto hardwood surface, after which no safety hazard is encountered regardless of operational capabilities.

* + 1. Shipping

42-inch drop, all edges, surfaces — while enclosed in appropriate shipping container.

* 1. VIBRATION

(Supply inside assembly.)

* + 1. 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.

* + 1. Non-Operating

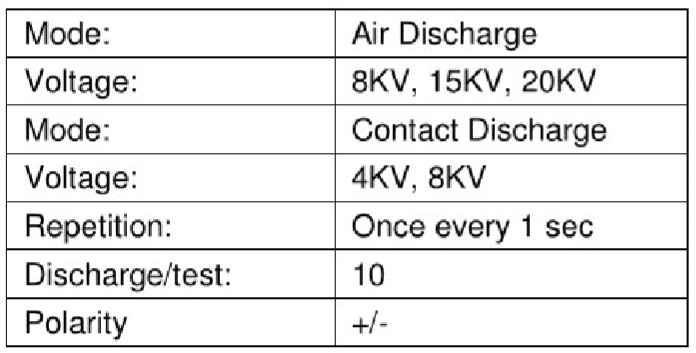
1.5 G zero to peak, 5 to 500 Hz, 0.5 octaves/minute, one cycle, 5 to 500 to 5 Hz per axis in each of three mutually perpendicular axes.

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.

* 1. ELECTROSTATIC DISCHARGE (ESD)

The AC adapter shall withstand ESD test voltage conditions at any point on the enclosure using the test setups and conditions found in Document 131296 and with transients as defined in IEC 61000- 4-2. As an infrequently user touchable subassembly, the following test levels shall be used.

˙ Input Voltage: 110Vac/220Vac and Output Load: Maximum Load (Dummy Load)

˙ After Air discharge ±15KV and Contact discharge ±8KV, adapter is no allowed error and damage. ˙ After Air discharge ±20KV, need report result

The storage capacitance shall be 150 pF and the discharge resistance shall be 330 ohms.

* 1. Production Line Hi-pot Test

One hundred percent (100%) of the AC Adapter shall comply with the minimum Production Line Hi-pot (High Potential) Test as noted below.  The test shall be applied between the PRIMARY (AC LINE and NEUTRAL) to SECONARY (Vo and GND)

|  |  |
| --- | --- |
| **PARAMETERS** | **SETTING** |
| VOLTAGE | 3000Vac Minimum |
| TRIP CURRENT SENSITIVITY | 10mA Maximum |
| VOLTAGE RAMP TIME | 500 V/Second ramp Minimum |
| DWELL TIME | 1 Second Minimum |
| BREAKDOWN ARC DETECTION | 10 Microseconds Maximum |

**NOTE：**The ROD-L DC Hi-pot Tester Model M100DC can be set to comply to the above test parameters.

* 1. ECO ENVIRONMENTAL

This section defines environmental requirements that are applicable to all products and product components. Individual components specifications may amend or append requirements to this base set as part of their component-specific requirements, but otherwise these requirements are applicable in all cases.

2.9.1 General Requirements

All products, components, and materials shall comply with the latest revision of HP Standard 011-00 General Specification for the Environment (GSE) including all referenced documents throughout the product life cycle.

Access to the public version of GSE is available from the URL. http://h20195.www2.hp.com/V2/GetDocument.aspx?docname=c04932490

2.9.2 Supplemental Environmental Specification

All commodity, component, and part materials shall comply with the HP Standard HX-0002501 Supplemental Environmental Specification – Commodity and Component (Supplemental Environmental Spec) requirements. Component categories are created to allow different material restriction requirements for each category. The Supplemental Environmental Spec is a supplement to the HP GSE.

The Supplemental Environmental Spec references the Substances and Materials Future Requirements (HX-00011-01A), Substances and Materials Business-Specified Requirements (HX-00011-01B) and Product Requirements (HX-00011-11) sections of the GSE with technical material and product specifications.

The product shall comply with all requirements in Supplemental Environmental Spec at the time of release, regardless of any future regulatory effective date.

The Supplier shall provide the required data to HP’s System Integrator for the completion of the HP Environmental Data Sheet (EDS), HP Recyclability Assessment Tool (RAT), and Disassembly Instructions.

Individual commodity or component specifications may exempt requirements to the Supplemental Environmental Spec as part of component-specific requirements, but otherwise the requirements in Supplemental Environmental Spec are applicable in all instances.

Low Halogen Exemption: Brominated and Chlorinated Flame Retardants; GSE section HX00011-01B; GSE Id 090807-92, & 080715-34, & 090807-37 AND Antimony; GSE section HX00011-01B; GSE Id 110727-47 & 110727-63 are not required.

Access to the HP Commodity/Component Spec (HX-00025-01), Substances and Materials Future Requirements (HX-00011-01A), Substances and Materials Business-Specified Requirements (HX-00011-01B), and Product Requirements (HX-00011-11) require access to the HP Supplier Handbook, Restricted Access.

Register or sign in from the URL.

https://h20168.www2.hp.com/supplierextranet/index.do

2.9.3 Other ECO Requirements

Energy Requirements

**3. KOREA EPS-MEPS**

• The External power supply must comply with the Korea Mandatory Energy Performance Specification (MEPS). The detailed requirements can be found in the HP GSE - Product Requirements.

• Please note since this requirement is now mandatory by the HP GSE, it will be deleted in future releases of the product specification.

**4. AUSTRALIA AND NEW ZEALAND EPS REGISTRATION**

• The External power supply must be registered in Australia and New Zealand. The detailed requirements can be found in the HP GSE - Product Requirements.

Accessibility

**5. SECTION 508 ACCESSIBILITY – US**

• The system must comply with the section 508 Accessibility – US requirements. Please reference: http://www.section508.gov/index.cfm?FuseAction=content&ID=12

EU Energy Related Products (formerly EuP)

EUP LOT 7

System must comply with EU regulation EU 1782/2019 for external power supplies. The detailed requirements will be found in the HP GSE - Product Requirements.

Belarus External Power Supply Certification

External power supplies must comply with energy efficiency standard STB 2463-2016.

The detailed requirements can be found in the HP GSE – Product Requirements

Ukraine External Power Supply Certification

For products placed on market September 6th, 2020 and later: External power supplies must comply

with Ukraine technical regulation No. 150. Detailed requirements will be found in the HP GSE –

Product Requirements.

Deliverables:

• In country certification of each EPS – Ukraine national statement of conformity (NSoC)

• Ukraine Conformity Mark on external power supplies

NRCan (Canada) EPS certification and Registration

External power supplies must tested and registered according to Amendment 14, part 2 of the Canada

energy efficiency regulation.The EPS must be certified by an accredited body and registered with the

Canadian government by the supplier.

Deliverables:

• The external power supply must be marked with the roman numeral corresponding to the efficiency level met through the international efficiency protocol (VI or higher).

• A signed report and certificate issued by an ISO/EN 17025 accredited laboratory showing compliance with this requirement.

• Confirmation of registration with the applicable Canadian government agency.

Mexico NOM-029

External power supplies must comply with the Mexico NOM-029 energy efficiency specification.

Products must be tested for OFF mode at 127V/60Hz and labeled with the power consumption as

required. The detailed requirements can be found in the HP GSE- Product Requirements.

Deliverables:

• In-country testing and certification of the EPS.

**6. AGENCY APPROVALS**

This product shall comply with all Regulatory requirements set forth in HPInc Specification 481605.

NOTE: EN60601-1-2 EMC MOOP [Design Compliance]

EN 60601-1-2 consisting of:

IEC 61000-4-2 Electrostatic Discharge………………………….[8kV contact, 15kV air discharge]

IEC 61000-4-3 RF Fields……………………………………………[10V/m, 80-2700MHz, 1kHz 80%AM modulation Home Healthcare Environment]

IEC 61000-4-4 Elec. Fast Transients…………………………[±2kV on AC and DC 5KHz Repetition]

IEC 61000-4-5 Surge…………………………………………………[±0.5KV, ±1KV line to line/±0.5KV, ±1KV, ±2KV line to earth on AC power port; ±2KV for outdoor cables]

IEC 61000-4-6 Conducted RF……………………………………………[3V; 0.15-80 MHz; 1kHz 80% AM modulation; 6Vrms in ISM bands (I/O cables < 3m excluded)]

IEC 61000-4-11 Voltage variations………………………………………..[>95% dip,0.5 period; 30% dip,

25 periods;>95% reduction, 250 periods]

**7. RELIABILITY**

LIFE EXPECTANCY: The power supply shall have a field failure rate of less than 0.1% annually within the first

three years of operation.

7.1.1 De-rating Guidelines

The following component de-rating requirements shall be followed:

• Semiconductor junction temperature shall be less than 130℃.

• Thermal De-rating at normal operation shall be <90%. Thermal measurements will be verified with the

power supply mounted in a representative product enclosure. OTP shall not result in any damage and

safety or reliability degradation. Need to meet HP Life time requirement is any load, Voltage and

ambient temperature.

• Resistor power de-rating will be consistent with the resistor type and application

• Component voltage de-rating shall be < 95% for all continuous conditions.

• Components shall not exceed 100% of their voltage rating during start-up and transients; exception:

Bulk Capacitors shall not exceed 110% during transients.

• Component current de-rating shall be <90% for all continuous conditions. Exception: Bulk Capacitors

shall not exceed 100% for all continuous conditions. The effects of ripple current heating shall be

accounted for in this de-rating.

• All components shall be de-rated to insure meeting the calculated MTBF

• All magnetic devices shall be rated for 130℃ minimum

•All capacitors must be rated at 2000 hours or greater at maximum rated temperature, unless otherwise

approved by HP. In any load, voltage and temperature, all capacitor must meet HP lifetime define

7.1.2 E-Caps life time

• All Aluminum electrolytic capacitors shall have a minimum lifetime of 8,736 hours at ambient

Temperature of 35degC and 80% load.

• Usage profile 8h x 52 weeks x 3 yrs = 8,736 hours

7.1.3 E-Caps Charge / discharge cycles

If the design presents operational modes where sustained regular repetitive heavy E-cap charge / discharge

cycles are used, the supplier has to ensure that the E-caps are suitable for such use and that these charge /

discharge cycles are within the components specification limits.

7.1.4 Critical Components

The critical components list defines components with critical functionality, specifications, attributes, and

parameters essential to the proper operation of the power supply and completed system. Once the list is

complete for production, any deviation from this list requires documented completion of an agreed upon

test plan. Final approval requires written HP acknowledgment. Due to the critical nature of these

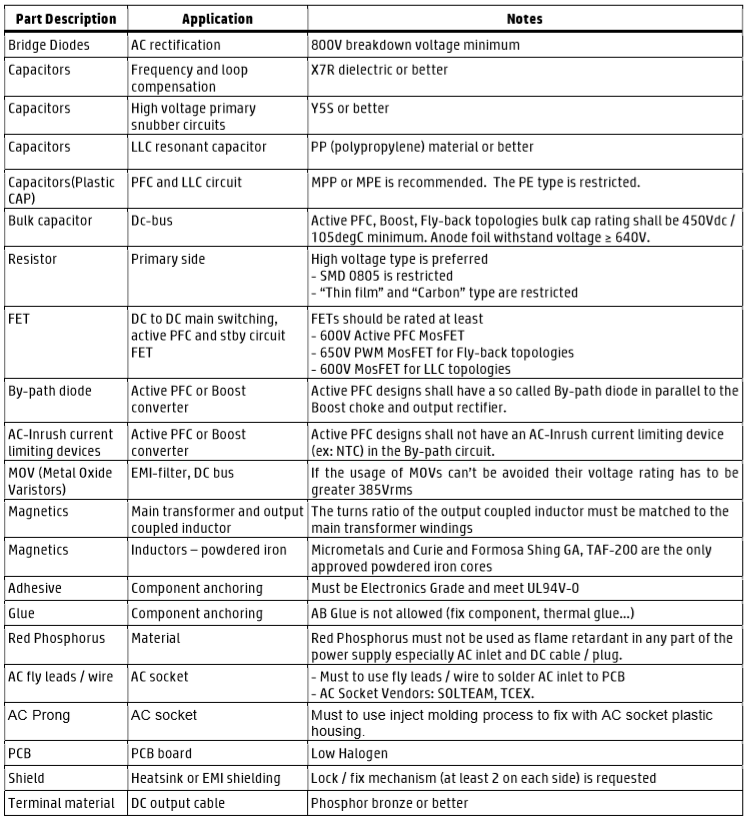
components, any deviation from the agreed upon BOM/AVL will jeopardize the stability, robustness

and/or operation of the board. The timeframe for AVL proposals and finalization is described in the

appropriate Statement of Work and schedule milestones. Specific application criteria for critical

components are defined in Table 3.

TABLE 3 EPS CRITICAL COMPONENTS CRITERIA



**MECHANICAL**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Item | Conditions | | | | | Specification | |
| 1. | Bending test | Bead core - DC cord | | | | |  | |
| Load | Angle (θ) | Arbitrary  direction | Cycles in every  minute | Sample size |
| 200 g | ±90° | 5000 Cycle | 40 Cycles | 5 Pcs | Disconnection rate of the wire shall be 30% or less, without damage to the insulations, etc.. | |
| DC plug over mold | | | | |  | |
| Load | Angle (θ) | Arbitrary  direction | Cycles in every  minute | Sample size |
| 200 g | ±180° | 1000 Cycle | 40 Cycles | 5 Pcs | Disconnection rate of the wire shall be 10% or less, without damage to the insulations, etc.. | |
| 200 g | ±180° | 5000 Cycle | 40 Cycles | 5 Pcs | Disconnection rate of the wire shall be 50% or less, without damage to the insulations, etc.. | |
| 200 g | ±180° | Until broken | 40 Cycles | 5 Pcs |  | |
| Case SR | | | | |  | |
| Load | Angle (θ) | Arbitrary  direction | Cycles in every  minute | Sample size |
| 200 g | ±180° | 1000 Cycle | 40 Cycles | 5 Pcs | Disconnection rate of the wire shall be 20% or less, without damage to the insulations, etc.. | |
| 200 g | ±180° | 5000 Cycle | 40 Cycles | 5 Pcs | Disconnection rate of the wire shall be 100% or less, without damage to the insulations, etc.. | |
| 200 g | ±180° | Until broken | 40 Cycles | 5 Pcs |  | |
| The test sample is hung by specified weight.  It shall be bent through angles of specified degrees in one direction, returned to its original position, then bent specified degrees in the opposite direction, after which it shall be returned to its original position to complete one cycle.  The rate flexing shall be specified cycle per min.  測試線材夾具/夾持方式如下圖要求.  C:\Users\wy.chen\AppData\Local\Microsoft\Windows\INetCache\Content.Word\SVTP USB-C DC Cable Test Conditions_Plug.bmp | | | | | | |
| Item | | Conditions | | | | | | Specification |
| 2. | Winding test | |  |  |  |  |  | | --- | --- | --- | --- | --- | | Load | Angle (θ) | Arbitrary  direction | Cycles in every  minute | Sample size | | 200 g | +/-1080° | 4000 Cycle | 2 Cycle | 3 Pcs |   Only for horizontal side. 纏繞線材需完整的繞在CASE上  15~45˚  a straight li Cable tail and disk need to set it to the Axis center into ne  Winding Test SOP  1. Base on Test Condition to set up winding machine  ( for example frequency, the numbers and laps etc...).  2. Block width (25±10mm) Debugging machine. Then tested the cable tail.  3. PLUG out mold side going to bend and tie it up, then follow hang weights request to hanging to the out mold.  4. Make sure winding setting parameters, after confirm then going winding test.  5. After finish winding test，remove cable and dissection step by step. | | | | | | Disconnection rate of the wire shall be 50% or less, without damage to the insulations, etc.. |
| Item | | Conditions | | | | | | Specification |
| 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: refer item 1.2.9 |
| 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 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. | | | | | | Output voltage: refer item 1.2.9 |
| 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. |
| 5. | Drop test | 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.  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. |
| Item | | Conditions | | | | | | Specification |
| 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 | Position the microphone ten (10) centimeters above the x-y center of the AC Adapter.  Allow the AC adapter to warm-up for a minimum of 30 minutes prior to starting the test  Take a measurement with the AC Adapter configured for each of the test cases below:  (1). 0~Full Load : < 25dB  (2). No Load - 120Vac/60Hz  No Load - 240Vac/50Hz  Nominal Load - 120Vac/60Hz  Nominal Load - 240Vac/50Hz  Maximum Load - 120Vac/60Hz  Maximum Load - 240Vac/50Hz  **Table – AC Adapter Acoustic Noise Levels**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Frequency (Hz) | Mag dBA  re 20 µPA |  | Frequency (Hz) | Mag dBA  re 20 µPA | | 630 | 5.0 |  | 4.00 k | 12.0 | | 800 | 7.5 |  | 5.00 k | 11.0 | | 1 k | 9.0 |  | 6.30 k | 10.0 | | 1.25 k | 12.0 |  | 8.00 k | 9.0 | | 1.6 k | 11.0 |  | 10.00 k | 8.0 | | 2.0 k | 12.0 |  | 12.50 k | 7.5 | | 2.50 k | 12.0 |  | 16.00 k | 13.0 | | 3.15 k | 12.0 |  | 20.00 k | 20.0 | | | | | | | Pass/Fail Criteria  Please refer to the Table Type in the title of the Dell Specification over the words “Specification Title”. Type in the Specification Number & Revision to the right of the colon. The Part Number line should ONLY be used if the Spec is structured in a BOM. If it is not, delete that row. Type Author and Owner to the right of the colon. If “Previous Owner” information applies, type in the Previous Owner to the right of the colon, otherwise, delete that row. |
| 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 |
| 12 | AC socket test | 1. Adapter is fixed by fixture and body of adapter extend 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. | | | | | | We stop pull force immediately when we hear break voice.  We test each side once time for 5 pcs sample to take data.  The force must be over 15Kg |
| 13 | Outline dimension  Case Color |  | | | | | | 136\*60\*22  Color: black |
| 14 | Weight |  | | | | | | 325g+/-10% |
| 15 | AC Inlet |  | | | | | | C6 |
| 16 | DC Connector |  | | | | | | USB TYPE-C |
| 17 | DC Cable Length |  | | | | | | 1800 mm |

Product Application: NB

Product Ingress protection (IP) rating: Not requirement