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	DRAWN	HENRY HSIEH	2022/11/9			
	CHECKED					
	DSGN ENGR	HENRY HSIEH	2022/11/9			
	ENG					
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TABLE OF CONTENTS

1.	SCOPE	4
2.	REFERENCE DOCUMENTS	4
2.1	APPLICABLE DOCUMENTS	4
2.2	ORDER OF PRECEDENCE	6
3.	GENERAL FUNCTION DESCRIPTION	6
4.	ELECTRICAL	6
4.1	INPUT	6
4.1.1	Voltage	6
4.1.2	Power Factor	7
4.1.3	Range Switching	7
4.1.4	Frequency	7
4.1.5	Current	7
4.1.6	Input Power Rating	7
4.1.7	Inrush Current	7
4.1.8	Brownout & Brownout Recovery	7
4.1.9	LPS Requirement	8
4.1.10	Protection	8
4.1.11	Energy Efficiency	9
4.1.12	BMC Eyes Diagram	10
4.1.13	PD3.0 Compliance Test	10
4.2	OUTPUT	11
4.2.1	Voltage	11
4.2.2	Current	11
4.2.3	Power	11
4.2.4	Transient Response	11
4.2.5	Output Regulation	12
4.2.6	Protection	12
4.2.7	Over Voltage	13
4.2.8	Over Current	13
4.2.9	Short Circuit	13
4.2.10	Outputs/Ripple/Noise	13
4.2.11	Stability	14
4.2.12	Overshoot	14
4.2.13	Power-On Time	14
4.2.14	Rise Time	14
4.2.15	Hold Up	15
4.2.16	Acoustic Test	15
4.2.17	Thermal throttling function	Error! Bookmark not defined.
4.2.18	Thermal Shutdown	15
5.	ENVIRONMENTAL REQUIREMENTS	15
5.1	TEMPERATURE	15
5.1.1	Operating	15
5.1.2	Non-Operating	15
5.2	COOLING	15
5.3	HUMIDITY	15
5.4	ALTITUDE	15
5.4.1	Operating	15
5.4.2	Non-Operating	15
5.5	MECHANICAL SHOCK	16



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

2

OF

24

5.5.1	Operating	16
5.5.2	Non-Operating	16
5.5.3	UL Safety	16
5.5.4	Shipping	16
5.6	VIBRATION	16
5.6.1	Operating	16
5.6.2	Non-Operating	16
5.7	ELECTROSTATIC DISCHARGE (ESD).....	16
5.8	ECO ENVIRONMENTAL	17
5.8.1	General Requirements.....	17
5.8.2	Supplemental Environmental Specification	17
5.8.3	Other ECO Requirements.....	18
6.	AGENCY APPROVALS.....	19
7.	RELIABILITY	19
7.1.1	De-rating Guidelines	19
7.1.2	E-Caps life time.....	20
7.1.3	E-Caps Charge / discharge cycles	20
7.1.4	Critical Components.....	20
8.	INTERCONNECTION	22
9.	CABLE WRAPPING	23
THE OUTPUT CABLE SHALL MEET THE WRAPPING REQUIREMENT FOLLOWING DRAWINGS,		
23		
10.	MARKINGS	23
11.	MECHANICAL	23
11.1	DIMENSIONS.....	23
11.2	MATERIAL	23
11.3	COLOR.....	23
11.4	TEXTURE.....	23

LIST OF FIGURES

FIGURE 1 OUTPUT CABLE.....	22
FIGURE 3 OUTLINE DRAWING.....	23

LIST OF TABLES

TABLE 1 REFERENCE TABLE	4
TABLE 2 POWER LINE TRANSIENT REQUIREMENTS.....	8
TABLE 3 EPS CRITICAL COMPONENTS CRITERIA	20



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

3

OF

24

1. **SCOPE**

This document defines the functional requirements for an enclosed **100 WATT USB-PD + 10WATT USB-A of AC-TO-DC AC ADAPTER** intended for worldwide use in Information Technology Equipment. The power supply unit shall be convection cooled.

The information in this document must be used in accordance with HP policies with regard to the use and disclosure of HP Confidential information. Signed Confidential Disclosure Agreements (CDA's) must be on file prior to the disclosure of this Document with any external supplier.

This specification defines the EPS (External Power Supply) requirements. The design of this product must follow the supplier design guides (all suppliers), except where those guidelines conflict with the specified product requirements.

The HP part numbers directly influenced by this specification are defined in Table 1.

The EPS Model Numbers are identified in Table 1 the EPS manufacturer name and model name listed in this document which is for AVL (Approved Vendor List Candidate). The AVL (Approved Vendor List) firm until production release.

In the event of a conflict between this specification and references cited herein, this specification shall take precedence.

**TABLE 1
REFERENCE TABLE**

HP P/N	DESCRIPTION	ASSY CODE	SPARES P/N	RMN P/N	VENDOR P/N

2. **REFERENCE DOCUMENTS**


2.1 **APPLICABLE DOCUMENTS**

The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the document is of the issue in effect on the date of invitation to bid or request for proposal.

ANSI C63.4 – 2009 "American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." American National Standards Institute (ANSI), 2009.

AS/NZS 60950.1:2011 "Information technology equipment - Safety, Part 1: General requirements" Australian Standards Association.

Australian Communications & Media Authority "Electromagnetic Compatibility Compliance and Labelling – Information for Suppliers of electrical and electronic devices, vehicles and devices with internal combustion engines in Australia, Sept 2008, URL: <http://www.acma.gov.au>.

	SIZE A	DRAWING NO. TBD			REV X01
	DRAWN	SCALE 1/1	SHEET 4	OF 24	

C.I.S.P.R. Pub. 32	"Limits and methods of measurement of radio interference characteristics of information technology equipment." International Special Committee on Radio Interference (C.I.S.P.R.).
CPS Scheme (PSB)	"Safety Authority for the Singapore Consumer Protection registration scheme. Information Booklet" – 4, 1991 as amended through 2014.
EN 55032	"Limits and methods of measurement of radio interference characteristics of information technology equipment." European Committee for Electro technical Standardization (CENELEC), 2010.
EN 55024	"Information technology equipment - Immunity characteristics - Limits and methods of measurement." European Committee for Electro technical Standardization (CENELEC), 2010.
EN 60320-1	"Appliance Couplers for Household and Similar General Purposes." European Committee for Electrotechnical Standardization (CENELEC), 1996, including A1:1996 and A2:1998.
EN 62368-1	Audio/video, information and communication technology equipment - Part 1: Safety requirements", Second Edition, European Committee For Electro technical Standardization (CENELEC), 2014.
EN 61000-3-2	"Electromagnetic Compatibility (EMC) Part 3: Limits, Section 2: Limits for Harmonics Current Emissions (Equipment input current $\leq 16A$ per phase)." European Committee for Electro technical Standardization (CENELEC).
EN 61000-3-3	"Electromagnetic compatibility (EMC) - Part 3-3 Limits - Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current $\leq 16 A$ " European Committee for Electro technical Standardization (CENELEC).
GB17625.1-	Electromagnetic compatibility – Limits – Limits for harmonic current emissions (equipment input current $\leq 16A$ Per Phase), Issued 9Feb2003, effective 1May2003
GB4943.1-2011	"Information Technology Equipment – Safety – Part 1: General Issued 2010-12-1, Effective 2012-12-1.
GB9254-2008	Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement, Issued 6Aug2008, effective 1Sep2009
IEC 60950-1	"Safety of Information Technology Equipment - Safety - Part 1: General requirements", Second Edition, International Electro technical Commission, 2005+A1:2009, +A2:2013
IEC 62368-1	"Audio/video, information and communication technology equipment - Part 1: Safety requirements", Second Edition, 2014
IEC 61000-4 Sections 2~6, 8, 11	"Electromagnetic Compatibility (EMC) – Part 4: Testing and measurement techniques." International Electrotechnical Commission (IEC).
Korea MSIP Approval	"EMC Registration Regulation", URL: http://rra.go.kr



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 5

OF

24

NOM-019-SCFI-1998 "Safety of Data-Processing Equipment" Norma Oficial Mexicana, 1998.

Taiwan EMC Law "Commodity EMC Regulation" (Taiwan EMC Law), Bureau of Standards, Metrology, and Inspection under auspices of the Ministry of Economic Affairs, URL: <http://www.bsmi.gov.tw> .

UL 62368-1 / Audio/video, information and communication technology equipment"
CAN/CSA C22.2 No. Underwriters Laboratories, Inc., Canadian Standards Association (operating
62368-1-14 as "CSA Group"), Second Edition, 2014.

NOTE: All regulatory standards shall be judged applicable at the most recently published and agency adopted revision of the standard for the certifying country.

2.2 ORDER OF PRECEDENCE

In the event of a conflict between this specification and references cited herein, this specification shall take precedence.

NOTE:

- Compliance to the latest revision of HPInc General Specification for the Environment (GSE Document number HX-00011-00), including the RoHS Compliance Specification in the GSE, is required.
<http://www.hp.com/hpinfo/globalcitizenship/environment/pdf/gse.pdf>.
- Compliance to the latest revision of HPInc General Specification for the Environment (GSE Document number HX-00025-01 "Supplemental Environmental Specification"
<https://h20168.www2.hp.com/supplierextranet/index.do>

3. GENERAL FUNCTION DESCRIPTION


(For reference only.) This specification describes a self-contained **100 WATT USB-PD of AC-TO-DC AC ADAPTER**, powered from the AC Mains, and supplying a single direct current, constant voltage output. There is no power switch. Output power is supplied upon application of AC input through the line cord. The output cable is 1.8m long with 3 conductors - one for output power positive and one for return. The third conductor will provide a "CC" pin to communicate system power delivery.

4. ELECTRICAL

4.1 INPUT

4.1.1 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.

	SIZE A	DRAWING NO. TBD			REV X01
	DRAWN	SCALE 1/1	SHEET 6	OF 24	

4.1.2 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.

4.1.3 Range Switching

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

4.1.4 Frequency

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

4.1.5 Current

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

4.1.6 Input Power Rating

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

4.1.7 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 I_{2t} rating of the input fuse and bridge rectifier:

4.1.7.1 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 5.1. Apply the maximum input voltage in section 4.1.1 to the power supply.

4.1.7.2 Hot Start

Operate the power supply the maximum ambient operating air temperature as specified in Section 5.1 for 15 minutes. Cycle power to the power supply by removing and reconnecting maximum input voltage as specified in Section 4.1.1.

4.1.8 Brownout & Brownout Recovery

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

During the test shall not cause damage to the power supply unit. No oscillate/fluctuate at any time.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

7

OF

24

4.1.8.1 Brownout Conditions

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

4.1.8.2 Brownout Recovery Conditions

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

4.1.9 LPS Requirement

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

4.1.10 Protection

4.1.10.1 Under Voltage

The power supply shall not be damaged by applying an input voltage below the minimum specified in Section 4.1.1.

4.1.10.2 Catastrophic Failure Protection:

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

- a) Startling noise
- b) Flame
- c) Excessive smoke
- d) Charred PCB
- e) Fused PCB conductor
- f) Dielectric breakdown
- g) Chemical leak outside the case

4.1.10.3 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

Transient Type	Coupling mode	Test level	Phase	Repetition Rate	Acceptance Criteria
Surge immunity (Lightning) 61000-4-5	Differential	± 1.5 KV	0° 90° 180° 270°	10 pulses 10 sec	Operating
	Common	± 2.5 KV			No component damage, Loss of function is allowed but the PSU must be recovery with remote ON-OFF switch
	Common	± 3 KV			



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 8

OF

24

Electrical Fast Transients 61000-4-4	Coupling mode	Test level	Phase	Repetition Rate	Acceptance Criteria
	Differential	± 2 KV	Asynchronous	5kHz repetition	Operating
	Common	± 2 KV			

4.1.10.4 AC Leakage Current:

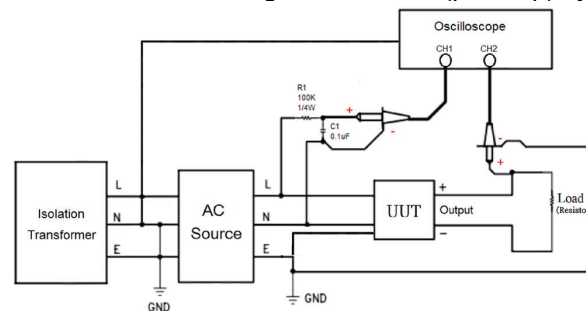
Class I Equipment (Grounded Equipment)

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.

4.1.10.5 Common Mode Noise:

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

- AC Input Voltage: **90Vac/60Hz & 264Vac/50Hz**
- The peak-to-peak voltage measured in the frequency range of 10KHz to 400KHz shall not exceed **150mV peak-to-peak.**
- Test condition following with Full load (per step) by each 10% load



4.1.10.6 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.

4.1.10.7 ISN resistors:

The power supply shall have a 470Ohm (minimum) resistor between earth ground (FG) and secondary DC ground.

4.1.11 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)



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

9

OF

24

Output Voltage (V)	Rated Max Output Power (W)	Average Efficiency (%)
5 V	15W	81.5%
9 V	27W	86.7%
12 V	36W	88.0%
15 V	75W	89.0%
20 V	100W	89.0%

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

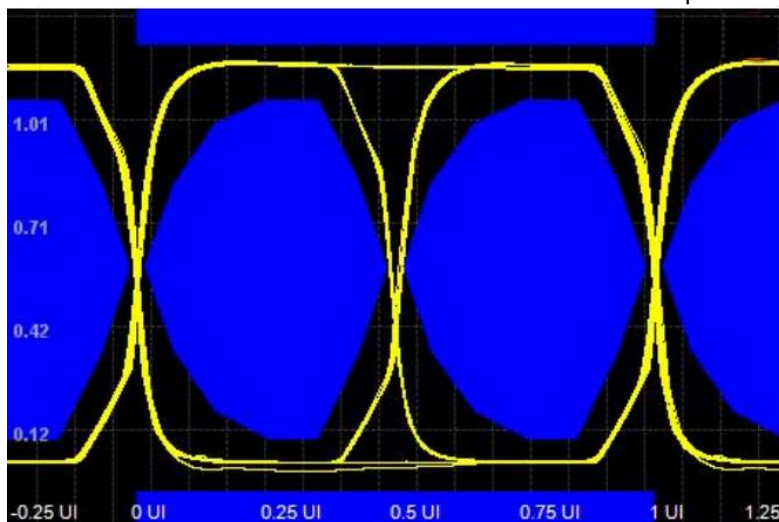
- [Option] In order to fulfill future efficiency requirement, the PSU should have an optional design to meet the No Load requirements as specified below (measured at 115Vac/60Hz and 230Vac/50Hz):

No Load

Output Load	Maximum Input Power
0W	0.15W

4.1.12 BMC Eyes Diagram

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



4.1.13 PD3.1 Compliance Test

Follow Ellisys to run compliance testing for PD protocol validation
Follow PD3.1 USB-IF certification.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 10

OF

24

4.2 OUTPUT

4.2.1 Voltage

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

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

4.2.2 Current

NOMINAL VOLTAGE (V)	Load Current (A)	
	MIN.	MAX.
5V	0 A	3.0A
9 V	0 A	3.0A
12 V	0 A	3.0A
15 V	0 A	5.0A
20 V	0 A	5.0A

- Fix power source peak current capability – meet "11" level.
- 20V output voltage request above 18V during peak current condition.

Bits 21...20	Description
00	Peak current equals I_{OC} (default) or look at extended Source capabilities (send <i>Get Source Cap Extended</i> Message)
01	Overload Capabilities: 1. Peak current equals 150% I_{OC} for 1ms @ 5% duty cycle (low current equals 97% I_{OC} for 19ms) 2. Peak current equals 125% I_{OC} for 2ms @ 10% duty cycle (low current equals 97% I_{OC} for 18ms) 3. Peak current equals 110% I_{OC} for 10ms @ 50% duty cycle (low current equals 90% I_{OC} for 10ms)
10	Overload Capabilities: 1. Peak current equals 200% I_{OC} for 1ms @ 5% duty cycle (low current equals 95% I_{OC} for 19ms) 2. Peak current equals 150% I_{OC} for 2ms @ 10% duty cycle (low current equals 94% I_{OC} for 18ms) 3. Peak current equals 125% I_{OC} for 10ms @ 50% duty cycle (low current equals 75% I_{OC} for 10ms)
11	Overload Capabilities: 1. Peak current equals 200% I_{OC} for 1ms @ 5% duty cycle (low current equals 95% I_{OC} for 19ms) 2. Peak current equals 175% I_{OC} for 2ms @ 10% duty cycle (low current equals 92% I_{OC} for 18ms) 3. Peak current equals 150% I_{OC} for 10ms @ 50% duty cycle (low current equals 50% I_{OC} for 10ms)

4.2.3 Power

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

4.2.4 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 330uF shall be connected to the PSU output.**



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 11 OF 24

Test Condition				Regulation
AC Input (VAC)	Nominal Voltage (V)	Load Current (A)		Design Requirement
		Minimum	Maximum	(S/R=1A/uS, 1Hz, 100Hz & 5KHz , 50% duty)
	+5.0V	0.1	1.5	4.5V-5.5V
		1.5	3.0	
		0.1	3.0	
	+9.0V	0.1	1.5	8.1V-9.9V
		1.5	3	
		0.1	3.0	
	+12.0V	0.1	1.5	10.8V-13.2V
		1.5	3.0	
		0.1	3.0	
	+15.0V	0.1	2.5	13.5V-16.5V
		2.5	5.0	
		0.1	5.0	
	+20.0V	0.1	2.5	18.0V-22.0V
		2.25	5.0	
		0.1	5.0	

4.2.5 Output Regulation

At nominal input line voltage (120Vac), the output shall be subjected to the load described in Section 4.2.2, and shall remain within the regulation limits as defined in Section 4.2.1.

4.2.6 Protection

The power supply shall automatically **shut down** under the conditions described below.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

12

OF

24

4.2.7 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.

NOMINAL OUTPUT VOLTAGE(V)	OVER VOLTAGE MAXIMUM
5V	7.25V
9V	13.05V
12V	17.4V
15V	21.75V
20V	29.00V

4.2.8 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 9V 12V 15V 20V	< 135% maximum output current

4.2.9 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.

4.2.10 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 10 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.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 13 OF 24

4.2.11 Stability

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

4.2.12 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
12 V	12.60V
15 V	15.75V
20V	21.0V

4.2.13 Power-On Time

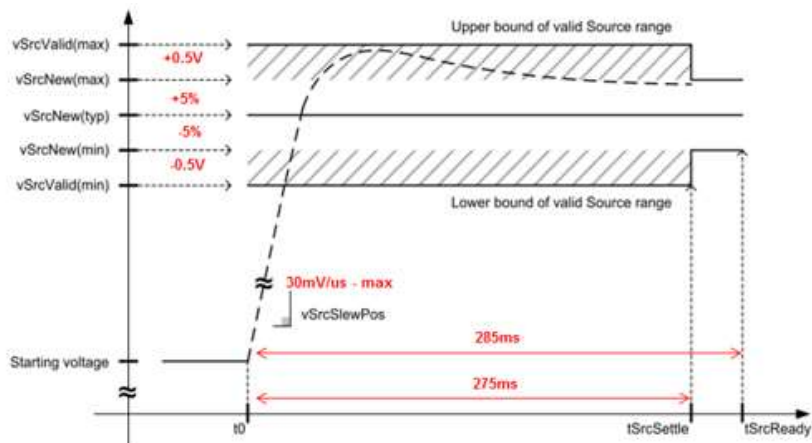
Output Regulation: Outputs (+5V) shall be in regulation within five (3) seconds after valid input power (90 VAC) has been applied.

4.2.14 Rise Time

The output shall be in regulation within 275mS Maximum.
(Measured from 0% to 100% regulation)

Output Voltage

- 0V to 5V(USB-C)
- 5V to 9V
- 5V to 12V
- 5V to 15V
- 5V to 20V



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

14

OF

24

4.2.15 Hold Up

- The power supply output voltage: 5V/9V/12V/15V/20V, shall maintain voltage regulation within the specified limits in paragraph 4.2.1 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 4.2.1 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.

4.2.16 Acoustic Test

The power supply when tested in an anechoic chamber shall not exceed the sound pressure levels per the HP AC Adapter Acoustic Noise Test Specification under all output load and ac input conditions. Acoustic noise measurements shall be conducted in accordance with ISO 7779 (or ECMA-74) and declared in accordance with ISO 9269 (or ECMA-109).

(AC Source: 90Vac and 264Vac; Room voltage: 110V and 220Vac)

4.2.17 Thermal Shutdown

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

5. **ENVIRONMENTAL REQUIREMENTS**

5.1 **TEMPERATURE**

5.1.1 Operating

The supply shall operate from 0 to 35°C. The maximum temperature rise of any surface shall **not exceed 40°C** when measured at 100Vac and at maximum load.

5.1.2 Non-Operating

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

5.2 **COOLING**

The power supply shall be convection cooled only.

5.3 **HUMIDITY**

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

5.4 **ALTITUDE**

5.4.1 Operating

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

5.4.2 Non-Operating

50,000 feet above sea level.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 15

OF

24

5.5 MECHANICAL SHOCK

(Power supply inside assembly.)

5.5.1 Operating

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

5.5.2 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.

5.5.3 UL Safety

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

5.5.4 Shipping

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

5.6 VIBRATION

(Supply inside assembly.)

5.6.1 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.

5.6.2 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.

5.7 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:

- a) ± 15 kV with no abnormal operation, but test to 20kV and report results
- b) ± 15 kV with no damage to power supply, but test to 20kV and report results

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



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 16

OF

24

5.8 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.

5.8.1 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>

5.8.2 Supplemental Environmental Specification

All commodity, component, and part materials shall comply with the HP Standard HX-00025-01 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), Substance and Materials Requirements, All Products (HX-00011-01) and Product Requirements, EEE Products (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 HX-00011-01B; GSE Id 090807-92, & 080715-34, & 090807-37 AND Antimony; GSE section HX-00011-01B; 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>

	SIZE A	DRAWING NO. TBD				REV X01
	DRAWN	SCALE 1/1	SHEET 17	OF	24	

5.8.3 Other ECO Requirements

Energy Requirements

6. **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.

7. **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

8. **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:

	SIZE A	DRAWING NO. TBD				REV X01
	DRAWN	SCALE 1/1	SHEET 18	OF	24	

- 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.



481605-L.pdf

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°C.
- 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.

	SIZE A	DRAWING NO. TBD			REV X01
	DRAWN	SCALE 1/1	SHEET 19	OF	24

- 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°C 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

Part Description	Application	Notes
Bridge Diodes	AC rectification	800V breakdown voltage minimum
Capacitors	Frequency and loop compensation	X7R dielectric or better
Capacitors	High voltage primary snubber circuits	Y5S or better
Capacitors	LLC resonant capacitor	PP (polypropylene) material or better
Capacitors(Plastic CAP)	PFC and LLC circuit	MPP or MPE is recommended. The PE type is restricted.



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 20 OF 24

Part Description	Application	Notes
Bulk capacitor	Dc-bus	Active PFC, Boost, Fly-back topologies bulk cap rating shall be 450Vdc / 105degC minimum. Anode foil withstand voltage \geq 640V. Capacitance tolerance +20%/-10%.
Resistor	Primary side	High voltage type is preferred - SMD 0805 is restricted - "Thin film" and "Carbon" type are restricted
FET	DC to DC main switching, active PFC and stby circuit FET	FETs should be rated at least - 600V Active PFC MosFET - 600V PWM MosFET for Fly-back topologies - 600V MosFET for LLC topologies
By-path diode	Active PFC or Boost converter	Active PFC designs shall have a so called By-path diode in parallel to the Boost choke and output rectifier.
AC-Inrush current limiting devices	Active PFC or Boost converter	Active PFC designs shall not have an AC-Inrush current limiting device (ex: NTC) in the By-path circuit.
MOV (Metal Oxide Varistors)	EMI-filter, DC bus	If the usage of MOVs can't be avoided their voltage rating has to be greater 385Vrms
Magnetics	Main transformer and output coupled inductor	The turns ratio of the output coupled inductor must be matched to the main transformer windings
Magnetics	Inductors – powdered iron	Micrometals and Curie and Formosa Shing GA, TAF-200 are the only approved powdered iron cores
Adhesive	Component anchoring	Must be Electronics Grade and meet UL94V-0
Glue	Component anchoring	AB Glue is not allowed (fix component, thermal glue...)
Red Phosphorus	Material	Red Phosphorus must not be used as flame retardant in any part of the power supply especially AC inlet and DC cable / plug.
AC fly leads / wire	AC socket	Must to use fly leads / wire to solder AC inlet to PCB
AC Prong	AC socket	Must to use inject molding process to fix with AC socket plastic housing.
PCB	PCB board	Low Halogen
Shield	Heatsink or EMI shielding	Lock / fix mechanism (at least 2 on each side) is requested
Terminal material	DC output cable	Phosphor bronze or better



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET 21

OF

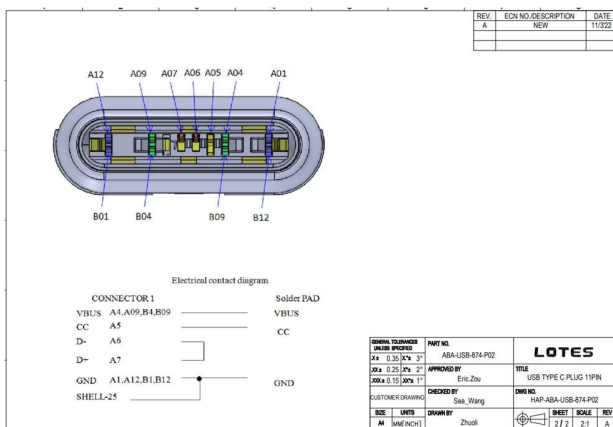
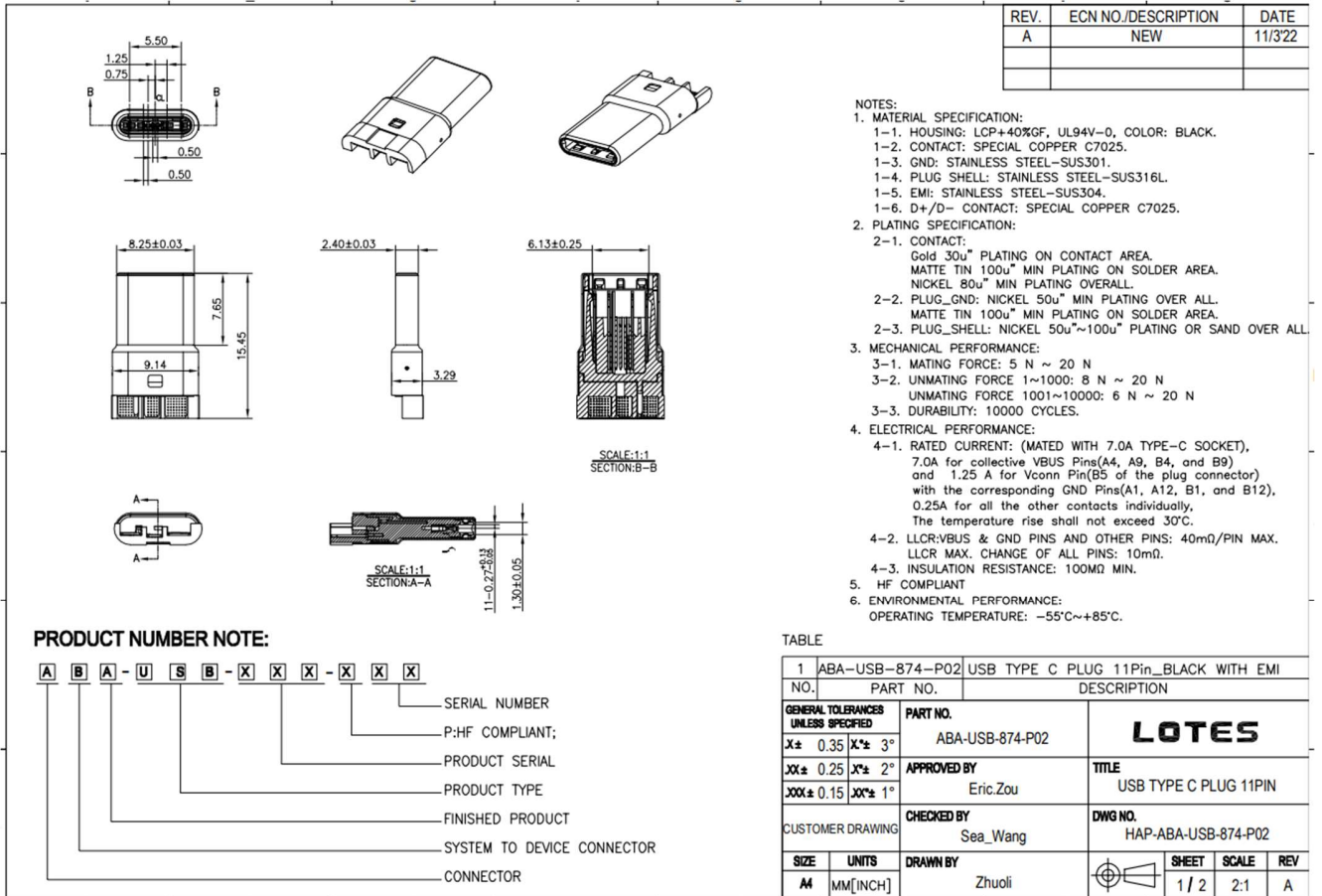
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8. INTERCONNECTION

The output cable shall meet the electrical and MTBF requirements of this specification and comply with the HP DC Cable Flexibility test Specification. (Lotes/Singatron/Linetek)

FIGURE 1 OUTPUT PLUG & CABLE

OUTPUT PLUG



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

22

OF

24

9. **CABLE WRAPPING**

The output cable shall meet the wrapping requirement following drawings,

TBD

10. **MARKINGS**

The OEM Power Supply Module nameplate label(s) shall have the following markings:

- a) HPInc.
- b) Series Number
- c) HPInc's Part Number/Spares Part Number
- d) Date Code
- e) All Required AGENCY MARKINGS (See Section 6.1)
- f) Country of Manufacture
- g) Electrical Rating: Output rating, Input rating in Volts, Amps, Hertz.
- h) Commodity Tracking Label
- i) Label request to use PET film only.

11. **MECHANICAL**

11.1 **DIMENSIONS**

The nominal external dimensions of the power supply should **not exceed 136x60x22mm**.
See Figure X.

11.2 **MATERIAL**

The enclosure material should be able to withstand the tests of Section 5.0 and conform to Document 100339. Following with GP file.

11.3 **COLOR**

Texture shall conform to VDI-24 Specification and polished is SPI-A2.

- o Ra spec: 1.4µm~1.8µm
- o Draft Angle(PC): 2degrees Maximum

Following with GP file.

11.4 **TEXTURE**

- Texture shall conform to VDI-24 Specification and polished is SPI-A2.
 - o Ra spec: 1.5µm~1.7µm
 - o Draft Angle(PC): 2degrees Maximum



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

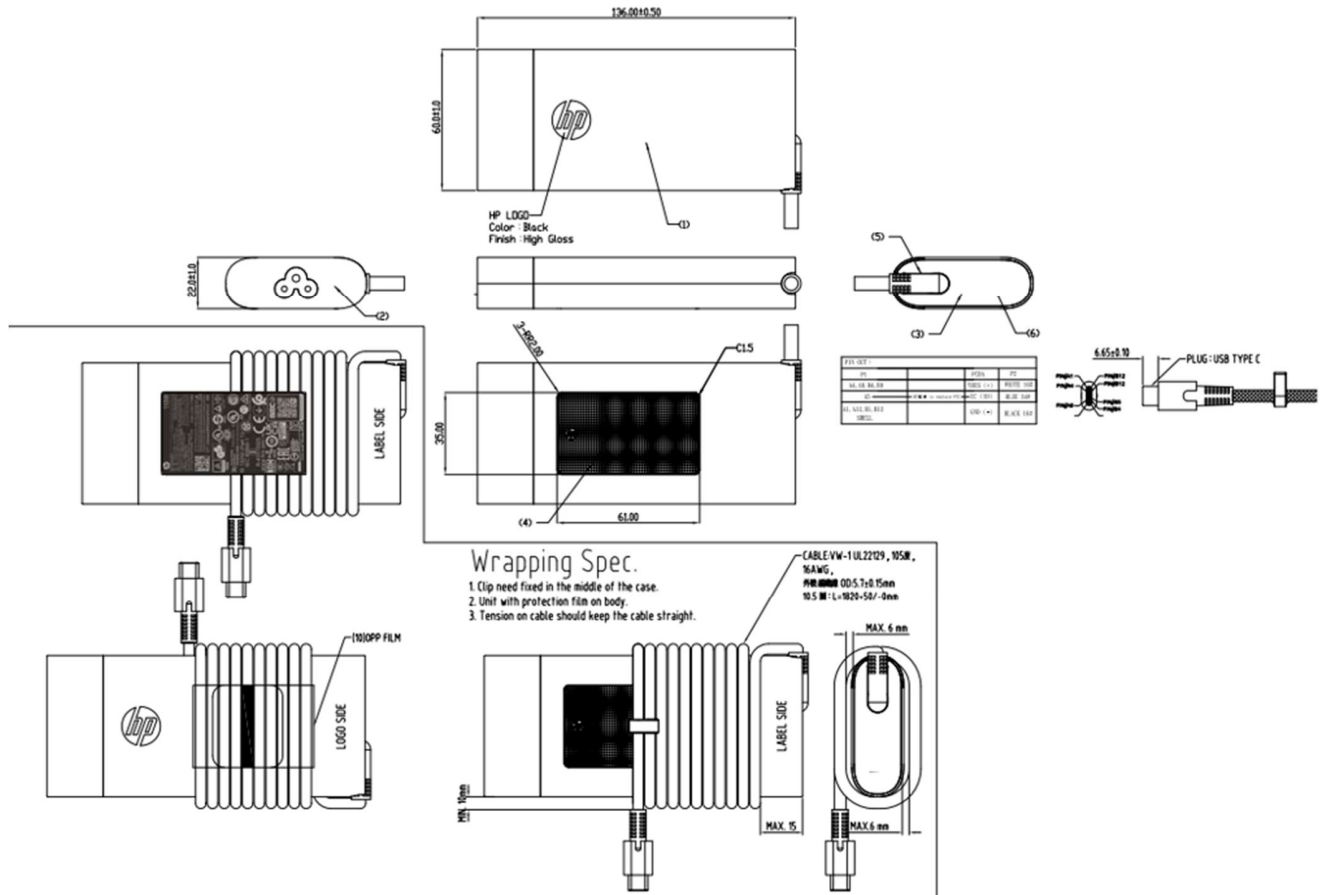
SHEET

23

OF

24

FIGURE 2 ADAPTER OUTLINE DRAWING



SIZE
A

DRAWING NO.

TBD

REV
X01

DRAWN

SCALE 1/1

SHEET

24

OF

24