

ASUS PD 3.0 65W 62368 ADAPTER SPEC

0. History:

REV	Description	Issue Day	Prepared By	Checked By	Approved By
01	First Issue	2019/6/11	Roger Hung		
02	Change Spec Title from “Revised” to “62368” Update 2.2.8 Power saving requirement Update 2.2.10 Peak load Update 4.4 Leakage Current Update 4.5 Surge & Impulse Test Add 4.8 Common Mode Noise (CMN)	2019/9/3	Roger Hung		

1. Introduction:

This specification define the input, output, performance characteristics, environment, noise and safety requirements for the power supply.

2. Electrical Requirements:

2.1 Input Requirements:

2.1.1 Input Voltage

- Normal voltage: 100~240Vrms
- Voltage Range: 90~264Vrms

2.1.2 Input Frequency

- Normal Frequency: 50~60Hz
- Frequency Range: 47~63Hz

2.1.3 Input Current

- Under **1.5A** Irms at 100Vac & Max. load

2.1.4 Configuration

- 2 Conductors (Line, Neutral)

2.1.5 Input Fuse

- An adequate internal fuse on the AC input line shall be provided.

2.1.6 Inrush Current

- The inrush current of the power supply shall be less than the rating of its critical components (include bridge diode, surge limiting device) for all condition of line voltage of 2.1.1
- The I^2t shall less than 22% of the fuse, surge limiting device and bridge diode rating.

2.1.7 Efficiency

- The power supply shall meet **DOE VI / COC V5 Tier 2** spec measuring at the cable end.

2.2 Output Requirements:

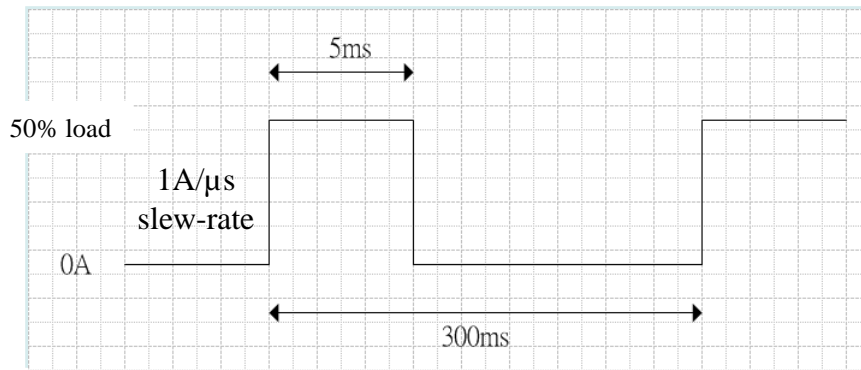
2.2.1 Electrical

Item	Content	Specification			
Vendor ID		ASUS (0x0b05)			
Safety Rating		5V/3A , 9V/3A , 15V/3A , 20V/3.25A			
PD Mode	PDO	5V Fixed	9V Fixed	15V Fixed	20V Fixed
	Output Voltage Range	4.85~5.5V	8.55V~9.45V	14.25~15.75V	19~21V
	Output Voltage Ripple	180mV	200mV	300mV	300mV
	Output Current Range	0~3A	0~3A	0~3A	0~3.25A
	Output Current Ripple	100mA	N/A	N/A	N/A
*Transient for 15V/20V	Transient Current Range	0.05A ~ Full Load			
	Transient Frequency	100Hz ~ 100KHz			
	Slew rate	2.5A/us			
	Criteria	Output voltage regulation shall be less than $\pm 5\%$			

* Ripple noise measure by **20M** Hz bandwidth in oscilloscope and applied **0.1uF** high frequency capacitor and **10uF** electrolytic capacitor across output connector terminals.

Transient for 5V/9V

condition1



For 5V Mode

Output voltage range:

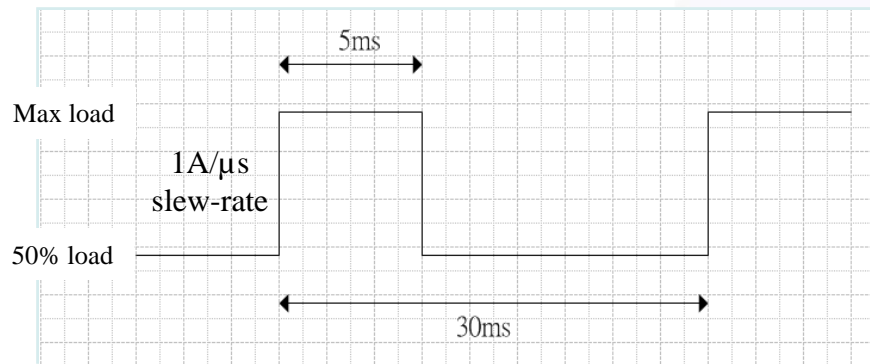
-Max. 5.8V

-Min. 4.6 V

For 9V Mode

Output voltage shall within +/-5%

condition2



2.2.2 Output Voltage Requirement

- The total output voltage regulation shall be meet the spec., including the effects of AC line voltage variation, load current, ripple and noise.
- The effect of transient load changes is included in this limit.
- Must comply with “Universal Serial Bus Power Delivery Specification Rev. 3.0”.

2.2.3 Overshoot

- The output overshoot at turn on shall not exceed **10%** of normal voltage value with or without the load connected.

2.2.4 Hold Up Time

- The power supply shall maintain voltage regulation within the specified limits in paragraph 2.2.1 for at least **5ms** after lost of input voltage measured at 100Vac and maximum output load.

2.2.5 Output Rise Time

- At turn on the rise time of output voltage shall be less than **40ms**.
- * Measured from the 10% point to the 90% point of the normal.

2.2.6 Turn On Delay Time

- No Load Power Consumption supply shall reach voltage regulation within the specified limits in table 2.2.1 for **3sec max.** after AC input the power supply.
- The input voltage measure at 100/240Vac and at maximum output load.

2.2.7 No Load Power Consumption

- Maximum no load power consumption is less than **0.075W at 115Vac/60Hz and 230Vac/50Hz**

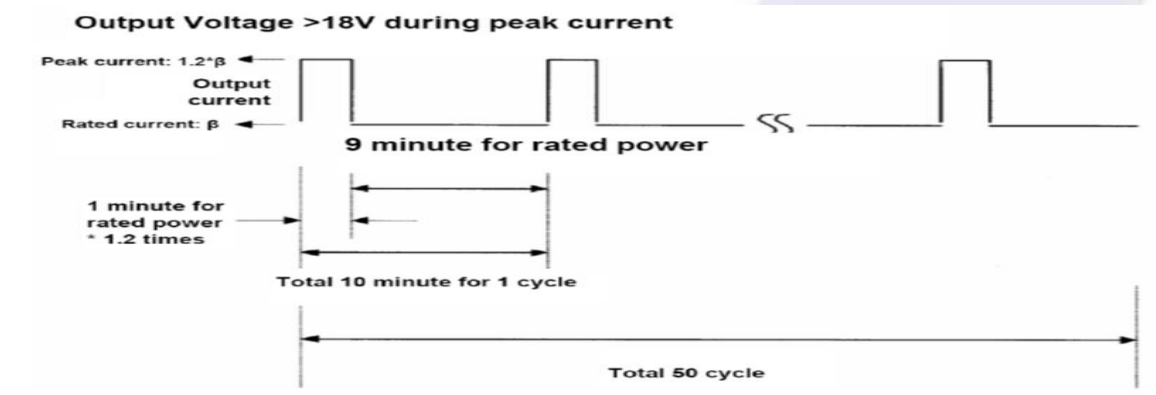
2.2.8 Power saving requirement

- Vin=115Vac/60Hz and 230Vac/50Hz

Output Power (W)	Pin Power (W)
18	< 21
11	< 14
5~6.5	Eff. > 80%
3	< 5
1.65	< 3
1.5	< 2.2
1	< 1.6
0.25	<0.48

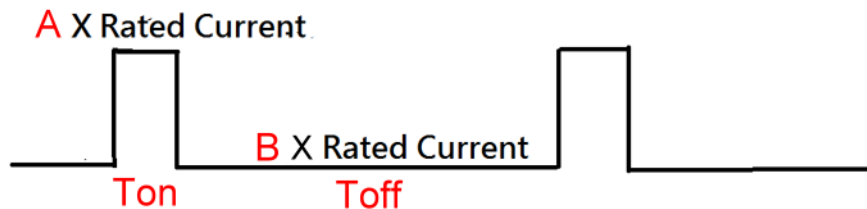
2.2.9 Surge load (For 20V/15V) :

The adapter shall support a surge load with 120% of maximum load for 1min, maximum load for 9min and output voltage shall be more than **18.5V/13.7V** at 100-240Vac/50Hz-60Hz.



2.2.10 Peak load (For 20V/15V) :

The adapter shall support below loading condition without any damage, safety issues and protection happened. The output voltage shall be more than **17.8V (20V Mode) / 13.0V (15V Mode)** at input voltage 100-240V/50Hz-60Hz.



Spec	Ton	Toff	A	B
1	2ms	18ms	200%	90%
2	250us	2.25ms	225%	87.5%

2.2.11 Hot Plugging

- Plugging a live AC adapter into the system with 100uF (for 5V Mode) and 1000uF (for 15V/20V Mode) capacitance shall not trigger any protections or cause the adapter to shut down.

2.2.12 Voltage Dips (for 20V Mode)

- Follow the test item “ >95% reduction , 0.5 period ” in IEC 61000-4-11 Standard.
- The output voltage shall be more than 14.5V at the below condition :
 - (a) AC Input = 100Vac/50Hz
 - (b) Load = 45W constant power (instead of constant current)

2.3 Power Output Protection:

2.3.1 Over Current Protection (OCP)

- The maximum constant current shall be less than **3.6A** for $V_o < 15V$ at 90Vac/264Vac.
- The maximum constant current shall be **3.9A ~ 5A** for $V_o \geq 15V$ at 90Vac/264Vac.
- Meet LPS.
- The adapter shall be **DC latch off** and no component damaged.
- When fault condition is removed and re-plug in DC plug , the output voltage must return to the normal condition.
- The adapter cannot have any safety issue or be damaged when the load condition is before over current protection point (OTP is allowed).

2.3.2 Over Voltage Protection (OVP)

- Maximum output voltage can't be over **35%** for $V_o \geq 15V$ and **50%** for other V_o rating.
- The adapter shall be **AC latch off** and no component damaged.
- When fault condition is removed and re-plug in AC plug , the output voltage must return to the normal condition.

2.3.3 Short Circuit Protection (SCP)

- The adapter shall be **DC latch off** and no component damaged.
- When fault condition is removed and re-plug in DC plug , the output voltage must return to the normal condition.

2.3.4 Over Temperature Protection (OTP)

- The adapter shall be **AC or DC latch off** and no component damaged.
- No fire and no melted of the enclosure.
- When fault condition is removed and re-plug in AC or DC plug , the output voltage must return to the normal condition.

3. Reliability:

3.1 MTBF:

- The power supply shall be designed and produced to have a MTBF of 150,000 operation hours at 90% confidence – level while operating under the following condition
- AC input voltage: 100 and 240Vrms
- Ambient Temp. : 25°C

3.2 Life/Power On Hours

- The power supply must be designed to operate for 13,140 power on hours.
- AC input voltage: 100 and 240Vrms
- Ambient Temp. : 25°C

3.3 Burn-in Test Condition

- More than 4 hours at 40°C, normal input voltage.
- AC on/off must be tested.

3.4 Surge Voltage (For 450V Type Only)

- Follow ASUS RD Test Plan for NB Adapter Rev04

4. Safety & EMC:

4.1 Safety Certificate

- The power supply unit shall follow the safety standard (IEC60950 , IEC62368)
- Certificate : Follow safety control table
- Trademark : ASUS

4.2 Insulation Resistance

- Insulation resistance shall be $> 30M$ ohm at 500Vdc between primary Live, Neutral and secondary.

4.3 Hi-Pot Test

- Primary to Secondary : 3.0KVac or 4242Vdc for 1minute
- Primary to F.G :1.5KVac for 1minute

4.4 Leakage Current

- The power supply leakage current shall be less than **20 uA @240Vac/50Hz**
- Test with AC cable **90cm** (DT Type)

4.5 Surge & Impulse Test

- Lighting Surge : $\pm 1\text{KV}$ (L-N) ; $\pm 2\text{KV}$ (L-FG; N-FG)
- Impulse Noise Test: **1KV**
- Criteria A

4.6 EMI standard

- The power supply shall comply with a following RFI/EMI standards when tested in a system configuration.
- F.C.C part15
- CISPR22 class B
- The limits shall be meet with a margin more than **6dB** with all system applicable.

4.7 Electrostatic Discharge (ESD)

This Adapter is capable to withstand ESD test voltage at any point around the enclosure as below.

- $\pm 15\text{KV}$ air discharge Performance Criterion B
- $\pm 12\text{KV}$ air discharge Performance Criterion A.
- $\pm 8\text{KV}$ contact discharge Performance Criterion A.

4.8 Common Mode Noise (CMN)

- Follow ASUS RD Test Plan for NB Adapter Rev05

5. Environment Requirements:

5.1 Temperature

-Operation: 0~40°C ;Storage: -30~80°C

5.2 Humidity (no condensing)

-Operation: 5~90% ; Storage: 5~95%

5.3 Surface Temperature rise

- Follow ASUS RD Test Plan for NB Adapter Rev04

5.4 Acoustic test:

Input Condition

Vin: 90Vac~264Vac Frequency : 47Hz to 63 Hz

Load Condition:

Dynamic Load : Follow ASUS Transient Load Current Spec

Static Load : From 0A to Full Load , 0.1A per step

NB ADAPTER SPEC :

Static Load

WM Type : Microphone at a distance of 10cm from the surface and noise level is less than **20dB**

Desktop Type : Microphone at a distance of 5cm from the surface and noise level is less than **20dB**

Dynamic Load

WM Type : Microphone at a distance of 10cm from the surface and noise level is less than **25dB**

Desktop Type : Microphone at a distance of 5cm from the surface and noise level is less than **25dB**

6. Mechanical Requirements:

6.1 Bending test:

- 200g weight, 90° angle to each side (Total angle 180°), 3000 cycles of arbitrary direction 40 cycles/min.

Disconnection rate $\leq 10\%$ between case to S/R

Disconnection rate $\leq 30\%$ between plug to coil

Without damage to the insulations

6.2 Winding test:

- 200g weight, 1080° angle on X-axis and Y-axis, 500 cycles of each direction 4 cycles/min.

Disconnection rate of the wire shall be less than 30%

6.3 Drop Test

Drop 8 times (**6 faces and 2 AC plug corners**) on each cycles from a height of 1.0M onto a **concrete surface**. Increase the height in steps of 0.2M until the case is broken. Must has 10cm margin during design stages

Electrical

- The unit should meet all specification and no function error after test. 1.1M testing

Mechanical

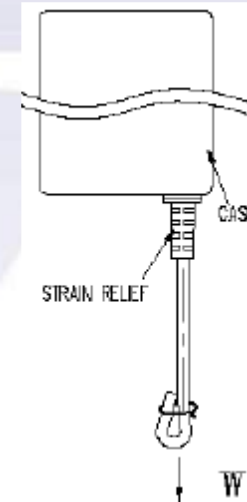
- There shall be no visual damage and safety concern after 1.5M testing

6.4 Tensile Test :

Load : 10Kgf at Plug end and Bushing each for 1minute

Angle: 90° /180°

Criteria: The withdrawal of cord should be less than 2mm or without disconnection of cord



6.5 DC Power Cord Wire Push Test

Test condition : a) Fixture: 6mm, 10.5mm & 20mm aluminum block and $\varnothing 12$ mm aluminum bar

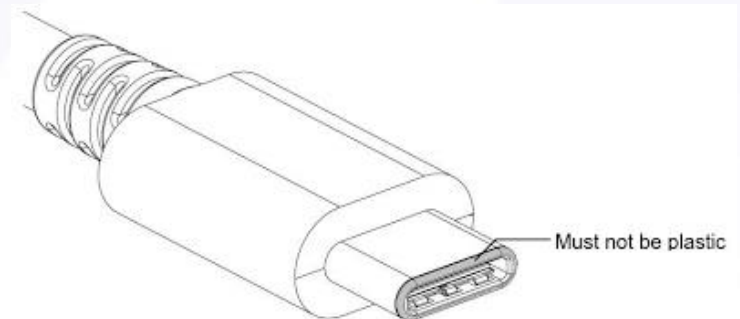
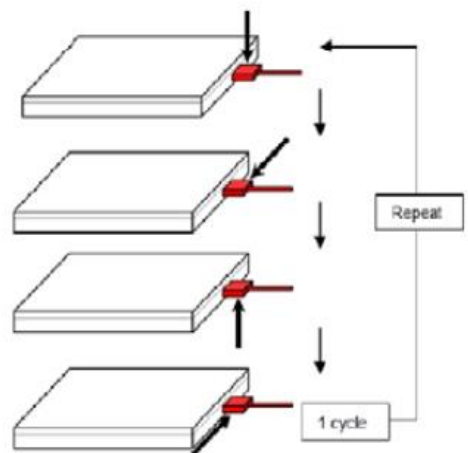
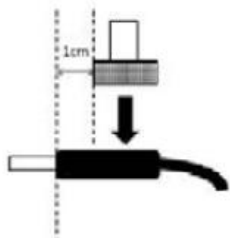
b) Increase pressure by speeding up 2 mm per minute on the tested item until maximum force reached to 130 kg

Criteria: After testing the V+ wire and Ground wire can't short

6.6 Type C Plug Requirements

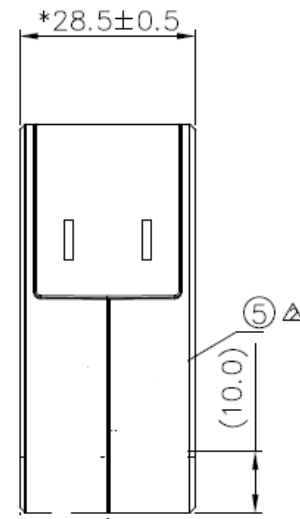
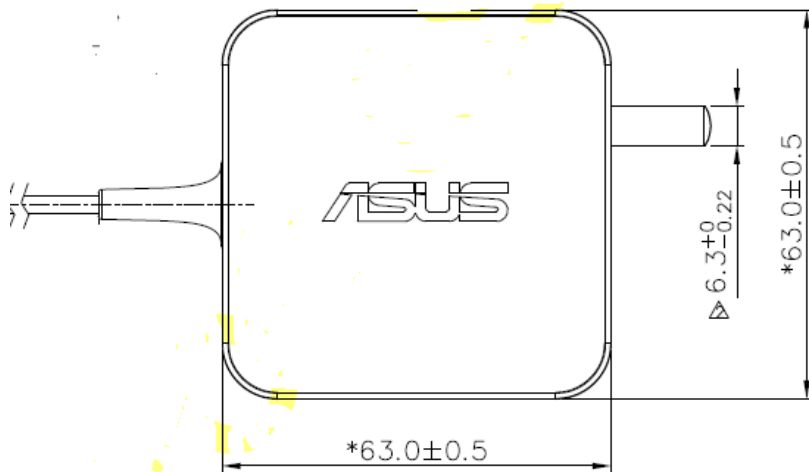
Type-C plugs for use with devices must comply with the standard, with the following exceptions:

- Must demonstrate a minimum strength of 1.75 Nm in all 4 orientations, rather than 0.75 Nm as defined in section 3.8.1.7 (USB Type C Spec)
- Can exceed the maximum plug strength of 2.0 and 3.5 Nm as defined in section 3.8.1.7
- Transverse overload force in all 4 orientations should meet 9Kg/1cm/50 cycles (as below)



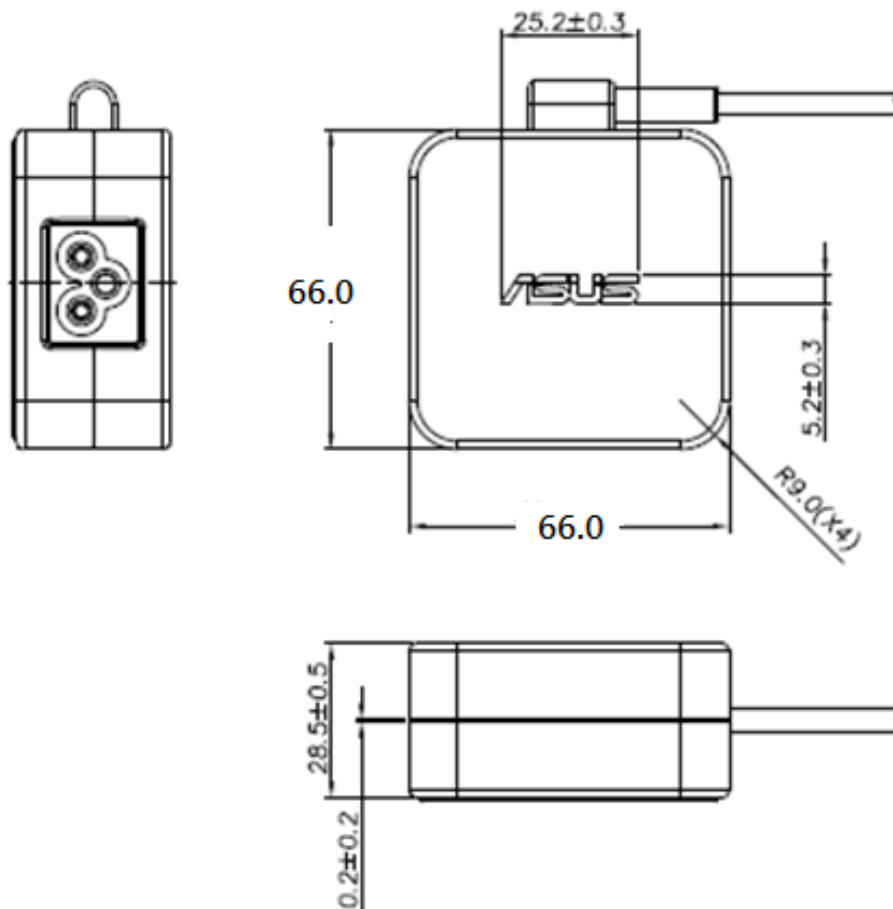
7.1 Power unit Dimension: (Wall Mount Type)

-Dimension **63.0 x 63.0 x 28.5mm:**



7.2 Power unit Dimension: (Desktop Type)

-Dimension **66.0 x 66.0 x 28.5mm**



8. Input AC Inlet:

- For WM Type : Fixed Pin US/EU/CCC
AC plug material cannot include ferrous alloy
- For Desktop Type : Socket C6 Type

9. Output Cable:

- For WM Type
 - 2000mm (+100mm -50mm) (ID design by ASUS)
- For Desktop Type
 - 1800mm (± 80 mm) (ID design by ASUS)

10. Output Plug:

- TYPE C
- Should support BC1.2 DCP to allow charging older devices through legacy cable
(D+/D- should be short at connect side)

11. Environmental Laws and Regulations

- Meet the deduct 50% condition of Swedish “Law (2016:1067) about tax on chemicals in certain electronic products”.

Thank You!
