

# TECHNICAL DATA SHEET

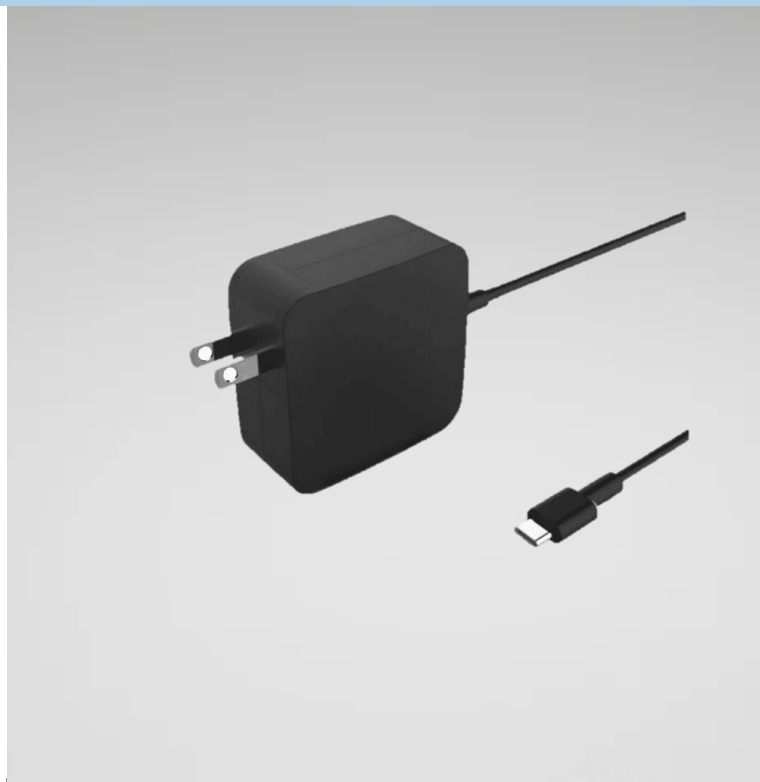


AA65A-59FKE-R



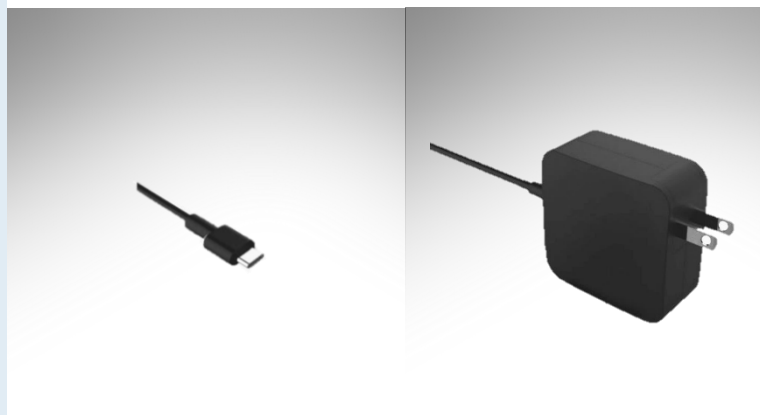
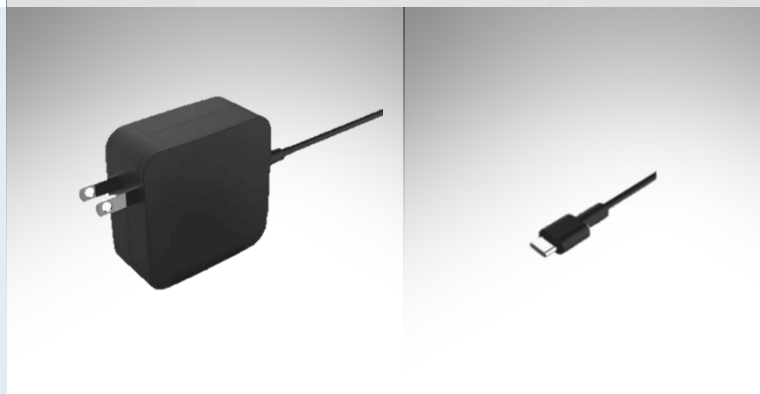
## DESCRIPTION

This 65-watt USB-C Power Delivery 3.0 Wall Adapter with USB-C Plug, built with the latest GaN technology. Designed for maximum versatility, this compact and lightweight charger delivers fast, reliable charging for smartphones, laptops, tablets, networking devices and more.



## FEATURES

- ✓ Class B EMI
- ✓ GaN Solution
- ✓ Support USB PD 3.0
- ✓ Over-Voltage, Over-Current, Short Circuit, & Over-Temperature Protection
- ✓ Support PPS(Programmable Power Supply) protocol
- ✓ 5,000 Meters Operating Altitude





## TECHNICAL DATA

### AC Input

AC input voltage range	90 VAC to 264 VAC				
AC input voltage rating	100VAC ~ 240VAC				
AC input frequency	47Hz - 63 Hz				
AC input current	1.5A (RMS) Max. at 100Vac				
Leakage current	20uA Max. at 240Vac / 50Hz				
Inrush current	Parameter Description	Min	Typ	Max	Remark
	Inrush current			150A	@240Vac
	<i>The I<sup>Δ</sup>2t shall less than 22% of the fuse, surge limiting device and bridge diode rating at maximum input voltage, +/- 90o phase, Ta=25oC</i>				

### DC Output

Output voltage	5V/ 9V / 15V / 20V (PPS : 3.3V~21V)	
Output Voltage Regulation ± 5% (measured at cable end)	For 5Vdc output : For 9Vdc output: For 15Vdc output: For 20Vdc output: For 4.2Vdc output (For PPS Mode): For 12Vdc output (For PPS Mode):	4.75V to 5.25 V at output current 0A to 3A. 8.55V to 9.45 V at output current 0A to 3A. 14.25V to 15.75 V at output current 0A to 3A. 19V to 21 V at output current 0A to 3.25A 3.6V to 4.8V at output current 1A to 3A. 11.2V to 12.8 V at output current 1A to 3A.
Maximum load current	0A to 3A continuous with 5Vdc 0A to 3A continuous with 15Vdc	0A to 3A. continuous with 9Vdc 0A to 3.25A continuous with 20Vdc
Programmable Power Supply Voltage Ranges (PPS Mode)	20V Prog: 20mV +/-5mV per each time during the output voltage range of 3.3V~21V(+/-5%) @ Io of 1-3A(+/-5%) , CC mode. 50mA +/-5mV per each time during the output current range of 1A~3A(+/-5%) @ Vo of 3.3V-21V(+/-5%) , CV mode	
Ripple and noise	300mV (5 , 9 , 15 , 20V) at min~max load, 100Vac - 240Vac ( @ Amb 25°C) Note: 1) Measures at the cable end. 2) Measurements shall be made with an oscilloscope with 20MHz Bandwidth. 3) Outputs should be bypassed at a connector with a 0.1uF ceramic capacitor and a 10uF electrolytic capacitor (Low ESR).	

### Overall Performance

Output Power	65 Watt Max	
Efficiency	5V / 3A, DoE& Level VI	Average Efficiency >81.385%
	9V / 3A, DoE& Level VI	Average Efficiency >86.620%
	15V / 3A, DoE& Level VI	Average Efficiency >87.727%
	20V / 3.25A ,DoE& Level VI	Average Efficiency > 88.000%
	Note: Measured at the cable end. Testing at 100%, 75%, 50%, 25% of rated current output and then computing the arithmetic average of these four values. Measure efficiency at 100%, 75%, 50%, 25% load after burn in 30min , at 115Vac/60Hz & 230Vac/50Hz	
Power Saving	< 0.075 W at 115Vac/60Hz & 230Vac/50Hz (5V Only )	
	Min. Load Consumption : -Vin=115Vac/60Hz and 230Vac/50Hz	
	Output Power (W)	Input Power(W)
	0.25W (20V/0.0125A)	< 0.5W
AC Turn on Delay Time	< 3 sec Max.at 100Vac & 240Vac (5V Only)	
Hold Up Time	> 5 ms at 100Vac/60Hz & Max load	



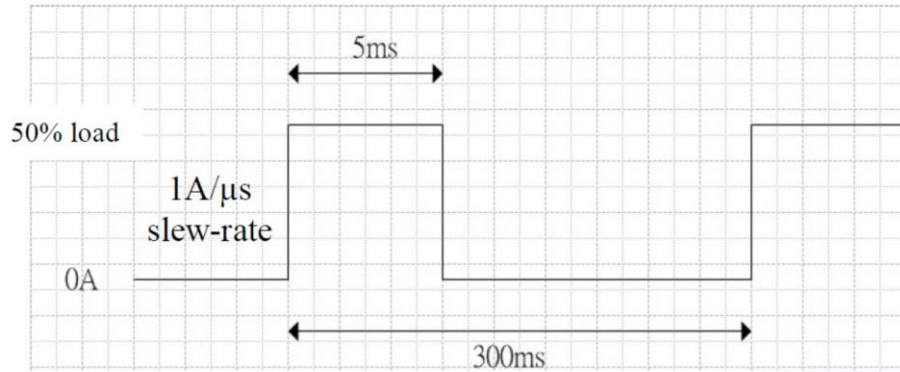


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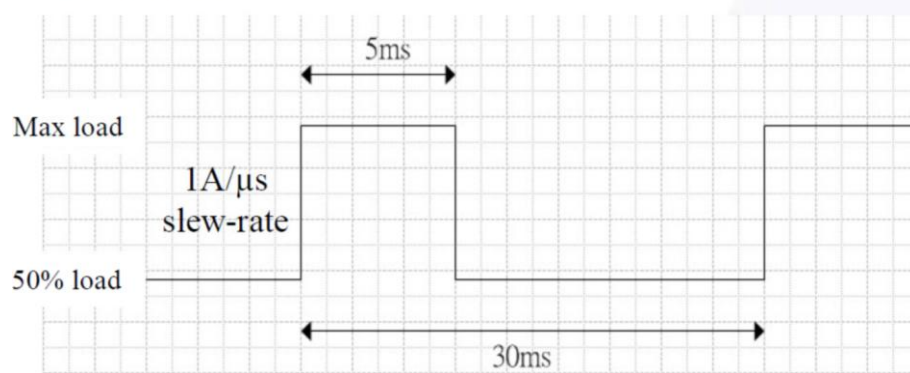
### Transient Load Step Response

Output Voltage within +/- 10% for 9V , 5.75V~ 4.25V for 5V  
1) Input = 115Vac / 230Vac 2) Measures at cable end.  
Test condition as below :

#### condition1



#### condition2



<b>Overshoot</b>	The output overshoot at turn on shall not exceed 10% of normal voltage value with or without the load connected.
<b>Output Rise Time</b>	At turn on the rise time of output voltage shall be less than 40ms (5V Only). <i>* Measured from the 10% point to the 90% point of the normal</i>
<b>Audible Noise</b>	Input Condition: @ Vin: 90Vac~264Vac , Frequency : 47Hz to 63 Hz Load Condition: Static Load : From 0A to Full Load , 0.1A per step Static Load: Desktop Type : Microphone at a distance of 10cm from the surface and noise level is less than 25dB
<b>Peak load ( For 20V/15V )</b>	The adapter shall support below loading condition without any damage, safety issues and protection happened. The output voltage shall be more than 17V (20V Mode) / 13V (15V Mode) at input voltage 100-240V/50Hz-60Hz. 1. Peak current equals 200% Ioc for 1ms @5% duty cycle (low current equals 95% Ioc for 19ms) 2. Peak current equals 150% Ioc for 2ms @10% duty cycle (low current equals 94% Ioc for 18ms)
<b>Hot Plugging</b>	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.
<b>Voltage Dips (for 20V Mode)</b>	Follow the test item " 30% reduction , 25 periods " in IEC 61000-4-11 Standard. Criteria : A (a) AC Input = 100Vac/50Hz (b) Load = 100W constant power (instead of constant current)





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### Protection

<b>Over Current Protection (OCP)</b>	<p>The maximum constant current shall be less than 3.6A for <math>V_o &lt; 15V</math> at 90Vac/264Vac. The maximum constant current shall be 3.9A ~ 5A for <math>V_o \geq 15V</math> at 90Vac/264Vac. The adapter shall be DC auto-recovery and no component damaged.</p> <table> <tr> <th>Output Voltage</th><th>Specification</th></tr> <tr> <td>5V &amp; 9V</td><td>&lt; 3.6A</td></tr> <tr> <td>15V &amp; 20V</td><td>3.9A~5A</td></tr> </table>	Output Voltage	Specification	5V & 9V	< 3.6A	15V & 20V	3.9A~5A				
Output Voltage	Specification										
5V & 9V	< 3.6A										
15V & 20V	3.9A~5A										
<b>Over Voltage Protection (OVP)</b>	<p>Maximum output voltage can't be over 35% for <math>V_o \geq 15V</math> and 50% for other <math>V_o</math> rating. The adapter shall be DC auto-recovery and no component damaged.</p> <table> <tr> <th>Output Voltage</th><th>Specification</th></tr> <tr> <td>5V</td><td>&lt; 7.5V</td></tr> <tr> <td>9V</td><td>&lt; 13.5V</td></tr> <tr> <td>15V</td><td>&lt; 20.25V</td></tr> <tr> <td>20V</td><td>&lt; 27V</td></tr> </table> <p>The SMPS must shut-down in an over voltage condition and automatically return to normal operating condition once the fault condition has been removed.</p>	Output Voltage	Specification	5V	< 7.5V	9V	< 13.5V	15V	< 20.25V	20V	< 27V
Output Voltage	Specification										
5V	< 7.5V										
9V	< 13.5V										
15V	< 20.25V										
20V	< 27V										
<b>Short Circuit Protection (SCP)</b>	<p>The adapter shall be DC auto-recovery and no component damaged. The SMPS must shut-down in output short condition and automatically return to normal operating condition once the fault condition has been removed.</p>										
<b>Over Temperature Protection (OTP)</b>	<p>The adapter shall be DC auto-recovery and no component damaged. No fire and no melted of the enclosure. The SMPS must shut-down in an over temperature condition and automatically return to normal operating condition once the fault condition has been removed. ( For 20V/3.25A Mode @ 90Vac &amp; 264Vac )</p>										

### Other Specifications

<b>Environmental Requirements</b>	<table> <tr> <td>Operating Temperature</td><td>0°C to 40°C</td></tr> <tr> <td>Storage Temperature</td><td>-30°C to 80°C</td></tr> <tr> <td>Operating Relative Humidity</td><td>10% - 90% RH</td></tr> <tr> <td>Storage Relative Humidity</td><td>5% - 95% RH</td></tr> <tr> <td>Operation Altitude</td><td>5000 M</td></tr> <tr> <td>Surface Temperature rise</td><td>&lt; 40 °C @ Ambient 25°C</td></tr> </table> <p>( For Input 100Vac &amp; Output 20V/95% Load )</p>	Operating Temperature	0°C to 40°C	Storage Temperature	-30°C to 80°C	Operating Relative Humidity	10% - 90% RH	Storage Relative Humidity	5% - 95% RH	Operation Altitude	5000 M	Surface Temperature rise	< 40 °C @ Ambient 25°C
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Storage Temperature	-30°C to 80°C												
Operating Relative Humidity	10% - 90% RH												
Storage Relative Humidity	5% - 95% RH												
Operation Altitude	5000 M												
Surface Temperature rise	< 40 °C @ Ambient 25°C												
<b>Reliabilities</b>	<p>E-Cap lifetime : &gt; 2 years E-Cap lifetime at 80% load, 115Vac or 230Vac, @Ambient Temperature = 25°C</p> <p>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</p> <p>Burn-in Test Condition : More than 4 hours at 40°C, normal input voltage (100Vac~240Vac ). @AC on/off must be tested.</p> <p>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 ( For Reference )</p>												

### Safety and EMC

<b>Safety</b>	<p>Common: CB US type: UL/cUL IEC 62368-1 IEC 60950-1:2005+A1:2009+A2:2013 EN60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013 or latest UL 60950-1, 2nd Edition, 2014-10-14(Information Technology Equipment-Safety-Part1:General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014-10 (Information Technology Equipment-Safety-Part1:General Requirements) IEC62368-1, Edition 2.0 : 2014</p>
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<b>EMC</b>	<p>EMI: FCC part 15, Class B. CISPR22 , Class B. The limits shall be meet with a margin more than 3dB with all system applicable.</p> <p>EMS EN55024</p> <p>ESD: EN 61000-4-2 (ESD)</p> <table> <tr> <td>Contact discharges: +-8KV</td><td>Criterion A</td></tr> <tr> <td>Air discharge: +- 12KV</td><td>Criterion A</td></tr> <tr> <td>Air discharge: +- 15KV</td><td>Criterion B</td></tr> </table> <p>Radiated Immunity: EN 61000-4-3 (RS); 80-1000MHz, 3V/m, 80% AM(1KHz) Criterion A</p> <p>Electrical Fast Transients: EN 61000-4-4 (EFT) 1kV, 5/50Tr/Th ns, 100 kHz, Criterion B</p> <p>Surge: Lighting Surge : <math>\pm 1KV</math> (L-N) ; <math>\pm 2KV</math> (L-FG; N-FG) -Impulse Noise Test: 1KV -Criteria A</p> <p>Common Mode Noise (CMN): Vp-p Voltage <math>\leq 2 V</math></p> <p>Conducted Disturbances: EN 61000-4-6 (CS); 0.15-80MHz, 3V, 80% AM(1kHz), Criterion A</p> <p>Magnetic Field Immunity: EN 61000-4-8 (MF); 50 or 60Hz, 1A/m(rms), Criterion A</p> <p>Voltage Dips and interruptions: EN 61000-4-11 (DIP); Dips: &gt;95% reduction, 0.5 period, Criterion B 30% reduction, 25 period, Criterion C Interruption: &gt;95% reduction, 250 periods, Criterion C</p>	Contact discharges: +-8KV	Criterion A	Air discharge: +- 12KV	Criterion A	Air discharge: +- 15KV	Criterion B
Contact discharges: +-8KV	Criterion A						
Air discharge: +- 12KV	Criterion A						
Air discharge: +- 15KV	Criterion B						
<b>Voltage Fluctuations and Flicker</b>	EN61000-3-3						
<b>HI-POT test</b>	<p>Primary to Secondary : 3.0KVac or 4242Vdc for 1minute</p> <p>Primary to F.G :1.5KVac for 1minute</p>						
<b>Insulation Resistance</b>	> 30M ohm at 500Vdc between primary and secondary.						

## Mechanical Requirements

<b>Bending test</b>	<p>200g weight,90° angle to each side(Total angle 180°),3000 cycles of arbitrary direction 40 cycles/min.</p> <p>Disconnection rate <math>\leq 10\%</math> between case to S/R</p> <p>Disconnection rate <math>\leq 30\%</math> between plug to coil</p> <p>Without damage to the insulations</p>
<b>Winding test</b>	<p>200g weight,1080° angle on X-axis and Y-axis ,500 cycles of each direction 4 cycles/min.</p> <p>Disconnection rate of the wire shall be less than 30%</p>
<b>Drop Test</b>	<p>Drop 6 times (6 faces) on each cycles from a height of 1.0M onto a concrete surface.</p> <p>Must has 10cm margin during design stages</p> <p>Electrical : The unit should meet all specification and no function error after test.1.1M testing</p> <p>Mechanical : There shall be no visual damage and safety concern after 1.5M testing</p>
<b>Tensile Test</b>	<p>Load : 10Kgf at Plug end and Bushing each for 1minute , Angle: 90° /180°</p> <p>Criteria: The withdrawal of cord should be less than 2mm or without disconnection of cord</p>
<b>DC Power Cord Wire Push Test</b>	<p>Test condition:</p> <p>a) Fixture: 6mm, 10.5mm &amp; 20mm aluminum block and <math>\phi 12mm</math> aluminum bar</p> <p>b) Increase pressure by speeding up 2 mm per minute on the tested item until maximum force reached to 130 kg</p> <p>Criteria: After testing the V+ wire and Ground wire can't short</p>
<b>Type C Plug Requirements</b>	<p>Type-C plugs for use with devices must comply with the standard, with the following exceptions:</p> <p>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)</p> <p>@Can exceed the maximum plug strength of 2.0 and 3.5 Nm as defined in section 3.8.1.7</p> <p>@Transverse overload force in all 4 orientations should meet 9Kg/1cm/50 cycles (as below)</p>





## Model Information

AA65A-59FKE-R	AC plug	AC Pin
	Output Terminal	1800mm (±50mm) Type-C Cable
	Dimensions	53*53*29mm
	Weight	180±20g for reference

## Test Items in Production Line

Output voltage measures at cable end, cable resistance = 150mΩ. “\*” at CPK > 1.33

5Vdc Output	Test Condition	Measure	Specification
	Input: 90V/60Hz	Output Voltage(5V,0A) *	4.75V~5.25V
		Output Voltage(5V,3A) *	4.75V~5.25V
		Output Ripple & Noise(5V,3A) *	300 mVp-p max
		OCP(5V)	Max. 3.6A.
	Input: 264V/50Hz	Output Voltage(5V,0A) *	4.75V~5.25V
		Output Voltage(5V,3A) *	4.75V~5.25V
		Output Ripple & Noise(5V,3A) *	300 mVp-p max
9Vdc Output	Test Condition	Measure	Specification
	Input: 90V/60Hz	Output Voltage(9V,0A) *	8.55V~9.45V
		Output Voltage(9V,3A) *	8.55V~9.45V
		Output Ripple & Noise(9V,3A) *	300 mVp-p max
		OCP(9V)	Max. 3.6A.
	Input: 264V/50Hz	Output Voltage(9V,0A) *	8.55V~9.45V
		Output Voltage(9V,3A) *	8.55V~9.45V
		Output Ripple & Noise(9V,3A) *	300 mVp-p max
15Vdc Output	Test Condition	Measure	Specification
	Input: 90V/60Hz	Output Voltage(15V,0A) *	14.25V~15.75V
		Output Voltage(15V,3A) *	14.25V~15.75V
		Output Ripple & Noise(15V,3A) *	300 mVp-p max
		OCP(15V)	3.9A~5.0A.
	Input: 264V/50Hz	Output Voltage(15V,0A) *	14.25V~15.75V
		Output Voltage(15V,3A) *	14.25V~15.75V
		Output Ripple & Noise(15V,3A) *	300 mVp-p max
20Vdc Output	Test Condition	Measure	Specification
	Input: 90V/60Hz	Output Voltage(20V,0A) *	19V~21V
		Output Voltage(20V,3.25A) *	19V~21V
		Output Ripple & Noise(20V,3.25A) *	300 mVp-p max
		OCP(20V)	3.9A~5.0A.
	Input: 115V/60Hz	Maximum load Efficiency (20V)	88.5% min.
	Input: 264V/50Hz	Output Voltage(20V, 0A) *	19V~21V
		Output Voltage(20V, 3.25A) *	19V~21V
		Output Ripple & Noise(20V, 3.25A) *	300 mVp-p max

Note: Production line efficiency measurements are performed in accordance with ISO PHG-Q3-PE04 "1.5.4.2.4 Energy Efficiency Testing

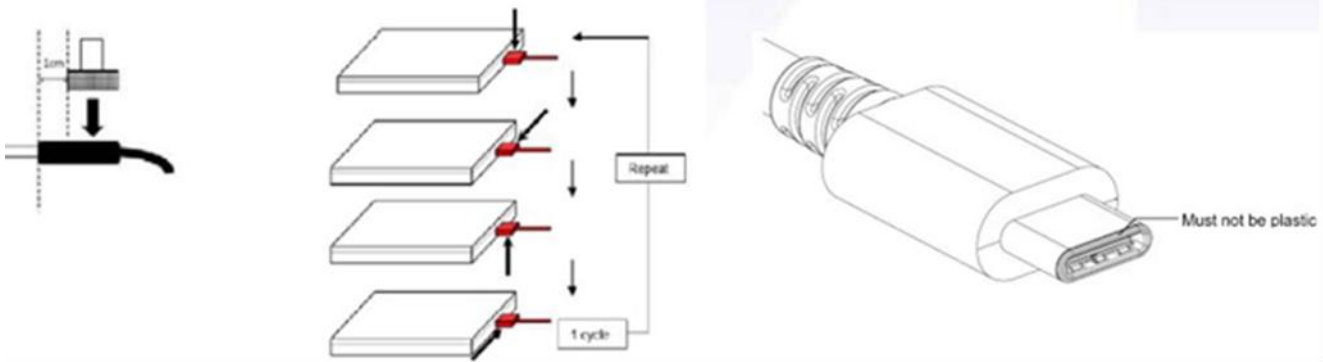
\*Hi-pot test: 3300VAC/3mA/2sec.





## TECHNICAL DATA

<Type C Plug>



### PHIHONG 50 YEARS OF HISTORY IN THE POWER SUPPLIES INDUSTRY

Since its founding in 1972, Phihong has emerged as a prominent power supply company, serving as a key supplier of solutions for consumer, mobile/portable, enterprise, telecom, datacom, and industrial applications.

