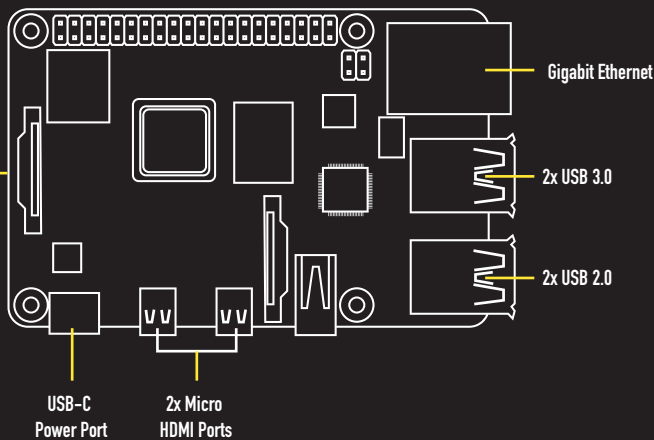




1. PLUG

Micro SD Card Slot



2. PLAY

Visit: www.okdo.com/getstarted



**Get Started
- Guides**

**Get Inspired
- Projects**

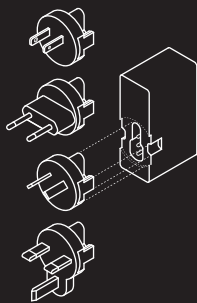
DESIGN THE WORLD



What's in the box

1.

Power Supply



Pick your local plug variant, slide into main power block

2.

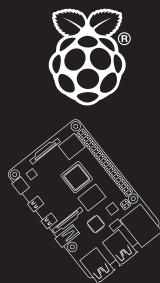
USB to USB-C Cable with in-line switch



Plug USB into power supply, USB-C into Raspberry Pi USB-C port

3.

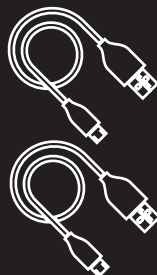
Raspberry Pi4 Board



Design The World

4.

2x Micro HDMI to HDMI Cables



Plug micro-HDMI into Pi board, HDMI into your screen

5.

32GB Micro-SD Card



Plug micro-SD card into Pi Board to run pre-loaded software

6.

SD Card Reader



An SD Card reader to help add additional software

7.

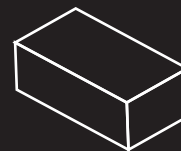
3x Heat Sinks



Apply onto chips to keep Pi running cool See online

8.

Raspberry Pi Case with integrated fan

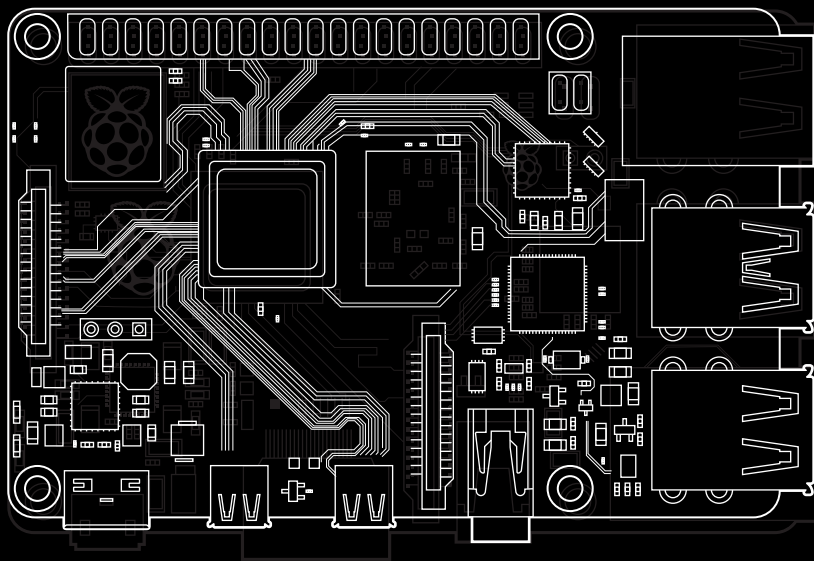


Put Pi into its case to keep it safe and cool

Visit www.okdo.com/getstarted for more detailed set-up instructions

OKdo™

DESIGN THE WORLD

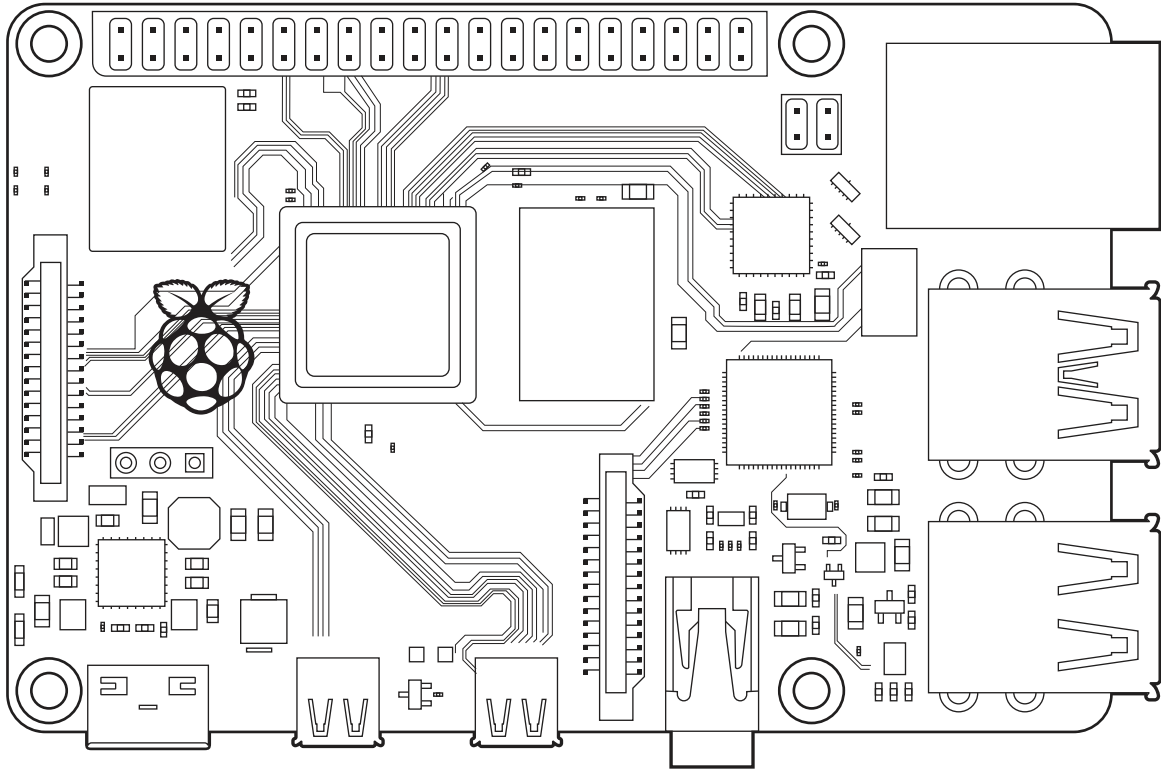


R A S P B E R R Y P i 4
T E C H N I C A L D A T A

www.OKdo.com

RASPBERRY Pi 4

TECHNICAL DATA



OVERVIEW

Raspberry Pi 4 Model B is the latest product in the popular Raspberry Pi range of computers. It offers ground-breaking increases in processor speed, multimedia performance, memory, and connectivity compared to the prior-generation Raspberry Pi 3 Model B+, while retaining backwards compatibility and similar power consumption. For the end user, Raspberry Pi 4 Model B provides desktop performance comparable to entry-level x86 PC systems.

This product's key features include a high-performance 64-bit quad-core processor, dual-display support at resolutions up to 4K via a pair of micro-HDMI ports, hardware video decode at up to 4Kp60, up to 4GB of RAM, dual-band 2.4/5.0 GHz wireless LAN, Bluetooth 5.0, Gigabit Ethernet, USB 3.0, and PoE capability (via a separate PoE HAT add-on).

The dual-band wireless LAN and Bluetooth have modular compliance certification, allowing the board to be designed into end products with significantly reduced compliance testing, improving both cost and time to market.

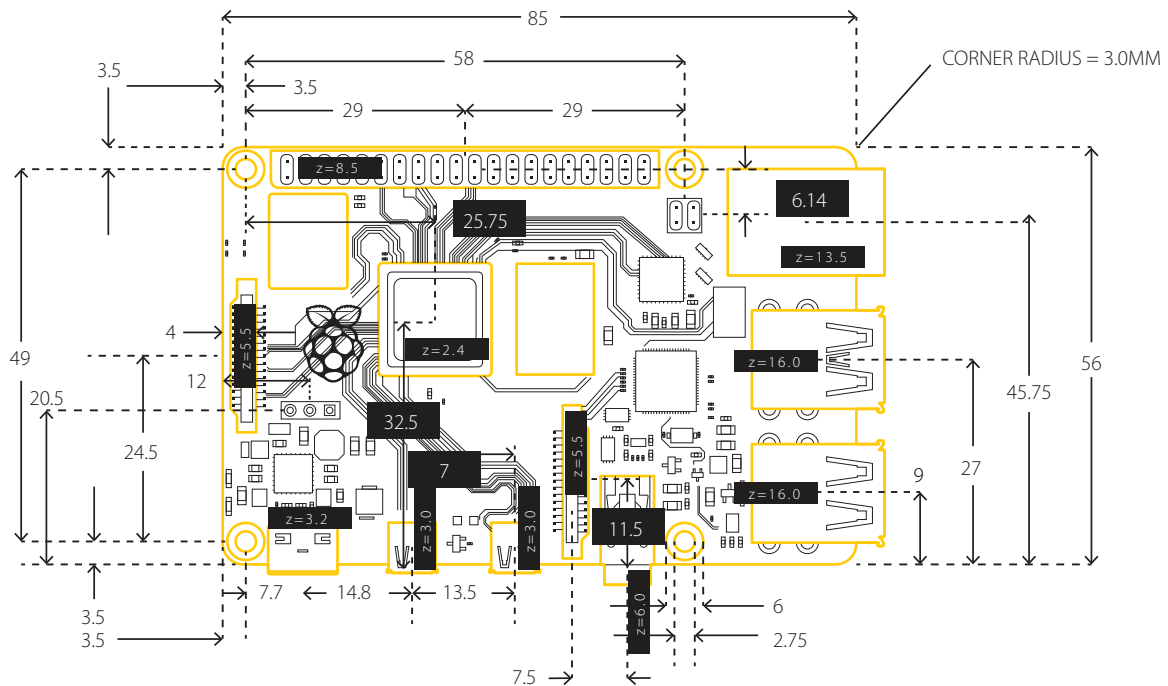
RASPBERRY Pi 4

TECHNICAL DATA

SPECIFICATIONS

Processor:	Broadcom BCM2711, quad-core Cortex-A72 (ARM v8) 64-bit SoC @ 1.5GHz
Memory:	1GB, 2GB or 4GB LPDDR4 (depending on model)
Connectivity:	2.4 GHz and 5.0 GHz IEEE 802.11b/g/n/ac wireless LAN, Bluetooth 5.0, BLE Gigabit Ethernet 2 ×USB 3.0 ports 2 ×USB 2.0 ports
GPIO:	Standard 40-pin GPIO header (fully backwards-compatible with previous boards)
Video & sound:	2 ×micro HDMI ports (up to 4Kp60 supported) 2-lane MIPI DSI display port 2-lane MIPI CSI camera port 4-pole stereo audio and composite video port
Multimedia:	H.265 (4Kp60 decode); H.264 (1080p60 decode, 1080p30 encode); OpenGL ES, 3.0 graphics
SD card support:	Micro SD card slot for loading operating system and data storage
Input power:	5V DC via USB-C connector (minimum 3A*) 5V DC via GPIO header (minimum 3A*) Power over Ethernet (PoE)-enabled (requires separate PoE HAT)
Environment:	Operating temperature 0–50°C
Compliance:	For a full list of local and regional product approvals, please visit https://www.raspberrypi.org/documentation/hardware/raspberrypi/conformity.md
Production lifetime:	The Raspberry Pi 4 Model B will remain in production until at least January 2026.

PHYSICAL SPECIFICATIONS



Warnings

- This product should only be connected to an external power supply rated at 5V/3A DC or 5.1V/ 3A DC minimum*. Any external power supply used with the Raspberry Pi 4 Model B shall comply with relevant regulations and standards applicable in the country of intended use.
- This product should be operated in a well-ventilated environment and, if used inside a case, the case should not be covered.
- This product should be placed on a stable, flat, non-conductive surface in use and should not be contacted by conductive items.
- The connection of incompatible devices to the GPIO connection may affect compliance and result in damage to the unit and invalidate the warranty.
- All peripherals used with this product should comply with relevant standards for the country of use and be marked accordingly to ensure that safety and performance requirements are met. These articles include but are not limited to keyboards, monitors and mice when used in conjunction with the Raspberry Pi.
- Where peripherals are connected that do not include the cable or connector, the cable or connector must offer adequate insulation and operation in order that the relevant performance and safety requirements are met.

Safety instructions

- Do not expose to water or moisture, or place on a conductive surface whilst in operation.
- Do not expose it to heat from any source; Raspberry Pi 4 Model B is designed for reliable operation at normal ambient room temperatures.
- Take care whilst handling to avoid mechanical or electrical damage to the printed circuit board and connectors.
- Avoid handling the printed circuit board whilst it is powered and only handle by the edges to minimise the risk of electrostatic discharge damage.

*A good quality 2.5A power supply can be used if downstream USB peripherals consume less than 500mA in total.

Assembly Guide For Metal Enclosure

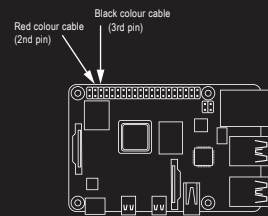
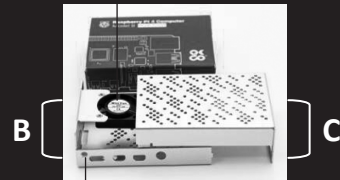


Fig. 1

A

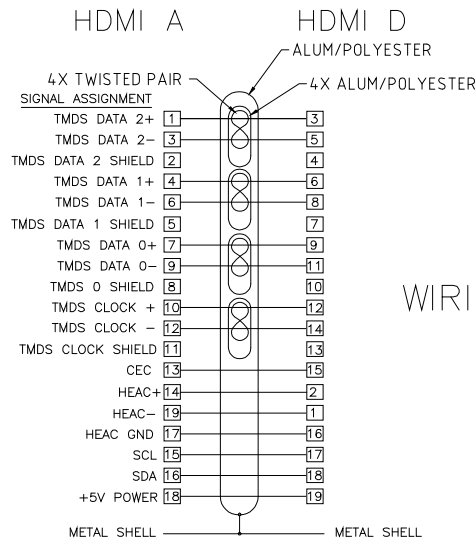
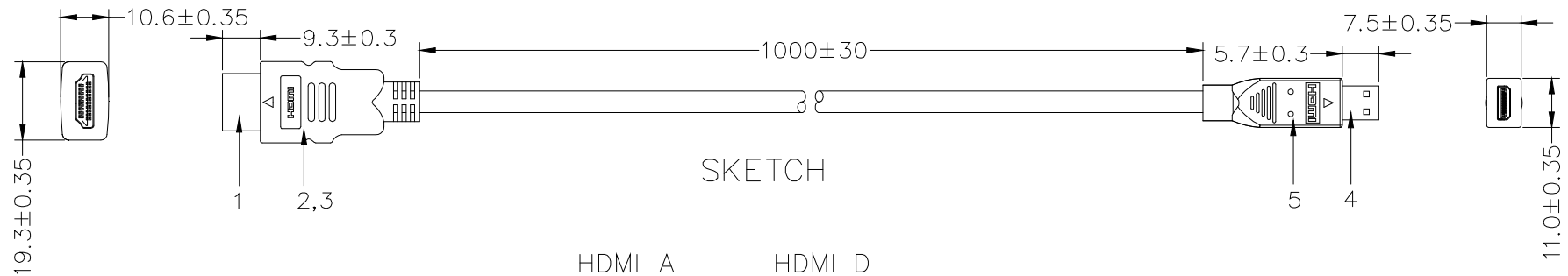


D

Fig. 2

1. Separate the top and lower parts by pulling them apart gently.
2. Insert your Raspberry Pi 4 board by firstly aligning the screw holes on the board with the screw holes inside the enclosure.
3. Use 4 of the smaller screws to secure the board in place.
4. Use the 2 longer screws to attach the fan in place. The white sticker on the fan should be facing upwards (**Fig. 2-A**).
5. Plug the red and black connecting cables onto the connector pins as shown on **Fig. 1**.
6. Snap the top cover into place by hooking the rear section (**Fig. 2-B**) together and pulling down the front section into place (**Fig. 2-C**).
7. Locate the screw hole (**Fig. 2-D**) on the side of the enclosure and use the remaining screw to secure in place.
8. Apply the plastic feet to the underside of the enclosure.

REV.	REV. NOTE	DATE	SIGNATURE	APPR.
A	INITIAL RELEASE	03-09/2019		



WIRING DIAGRAM

6	OVER MOLD 2	1	45P PVC WHITE(WHO5)
5	INNER MOLD 2	1	PE 888 NATURE
4	CONNECTOR 2	1	HDMI D,G-PLATED
3	OVER MOLD 1	1	45P PVC WHITE(WHO5)
2	INNER MOLD 1	1	PE 888 NATURE
1	CONNECTOR 1	1	HDMI A,G-PLATED
NO.	COMPONENT	QTY	DESCRIPTION

TOLERANCE
UNLESS OTHERWISE SPECIFIED

X. ±0.2 ANGLES: ±2°
X.X ±0.1
X. ±0.05

DO NOT SCALE DRAWING

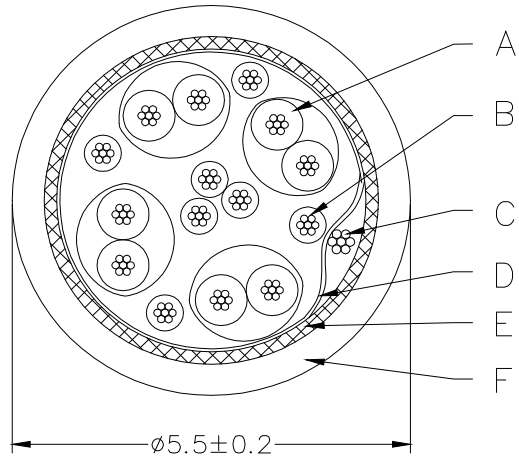
TITLE
HDMI A TO HDMI D MALE

THIRD ANGLE PROJECTION

SCALE	UNIT	SHEET	DATE
FREE	MM	1/3	03-09/2019

PART NO.		
DRAWING NO.		
SAHDAD01		
APPR. BY	CHECKED BY	DRAWN BY

REV.	REV. NOTE	DATE	SIGNATURE	APPR.	REV.	REV. NOTE	DATE	SIGNATURE	APPR.
A	INITIAL RELEASE	08-08/2019			A-1	Increase the specification.	29-08/2019		



CABLE SECTIONAL VIEW

Unit A: 4Pairs
 Conductor: 7/0.08BC (32AWG)
 Insulation: HDPE(3364) $\phi 0.65 \pm 0.05$
 Colour: White/Brown, White/Red, White/Green, White/Blue
 Shield: AL/Mylar: W=6mm

Unit B: 7C
 Conductor: 7/0.08BC (32AWG)
 Insulation: HDPE(3364) $\phi 0.50 \pm 0.05$
 Colour: Yellow, Orange, Black, Brown, Purple, White, Red

Unit C: DRAIN WIRE: 7/0.12BC

Unit D: AL/Mylar: W=16mm Shielded

Unit E: SHIELD: 16/4/0.12ALM , BRAID

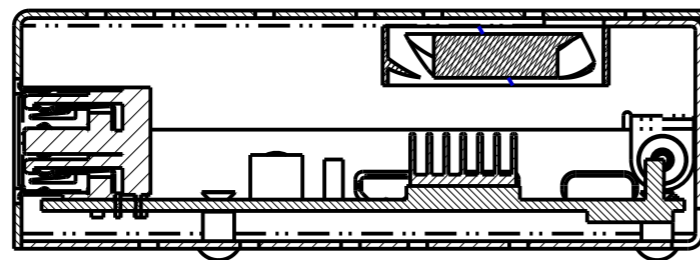
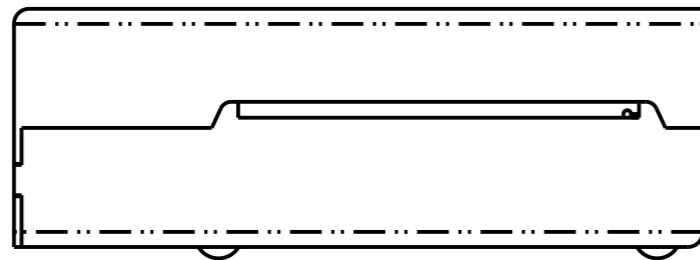
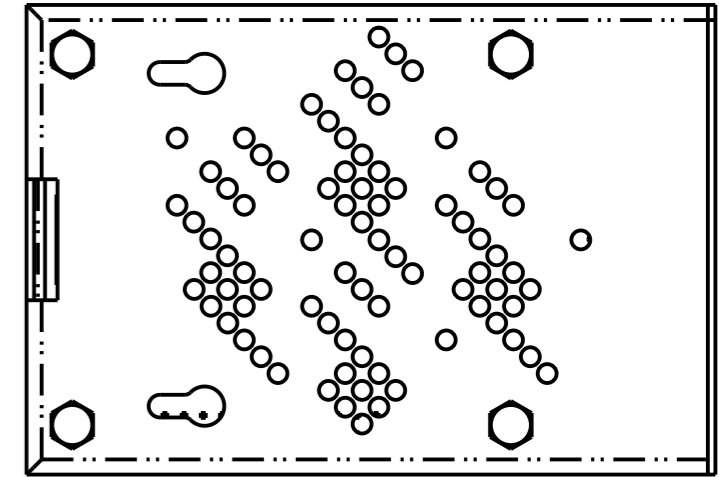
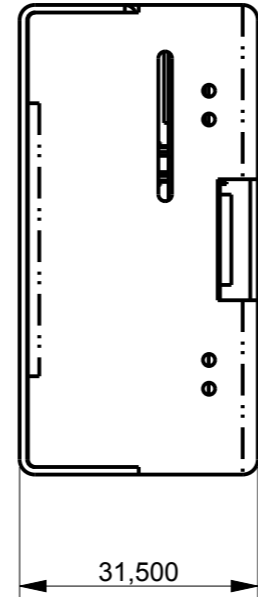
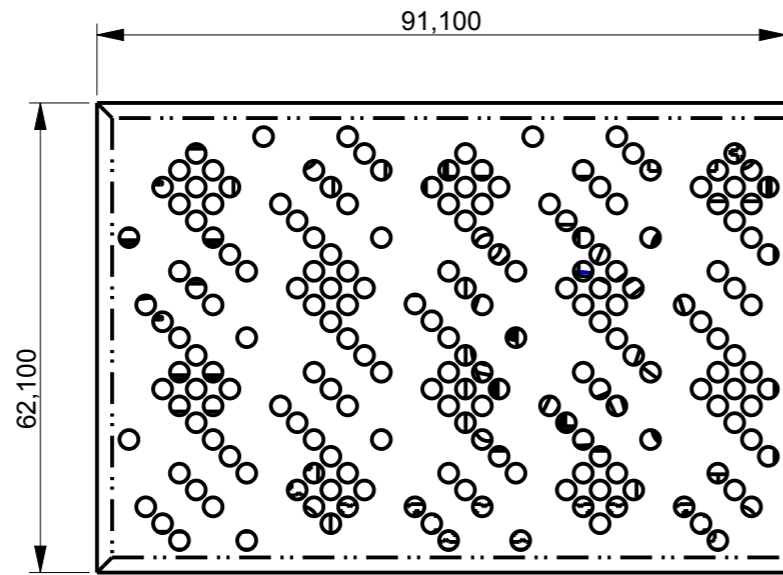
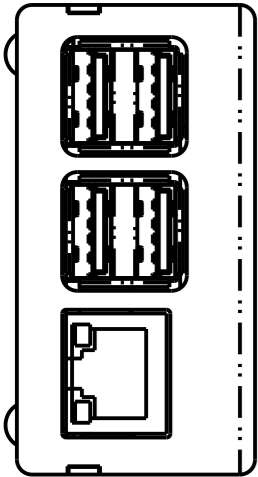
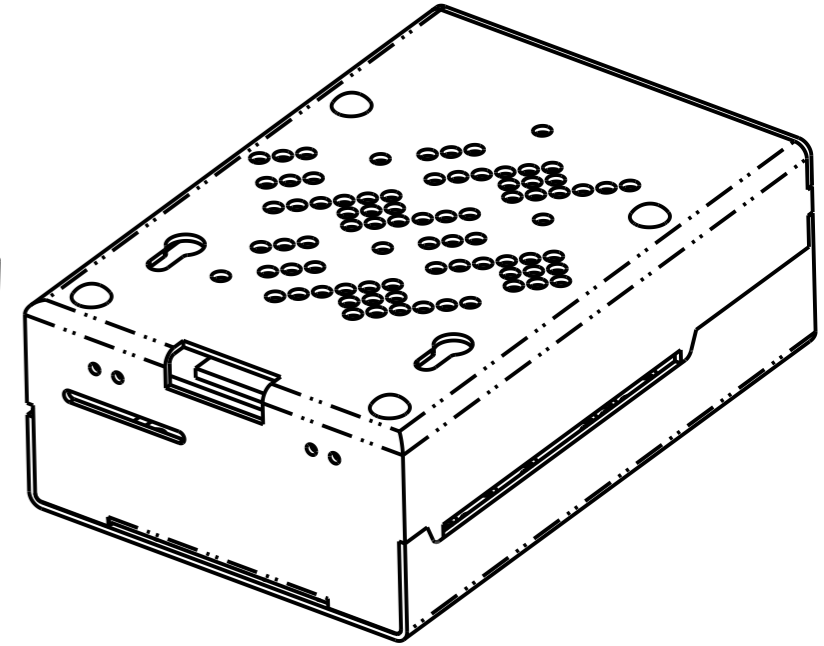
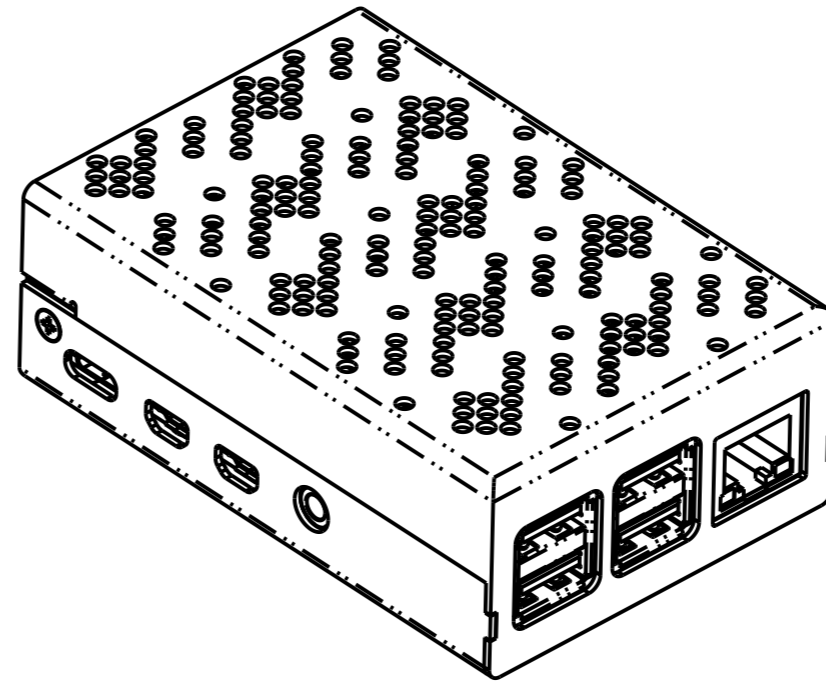
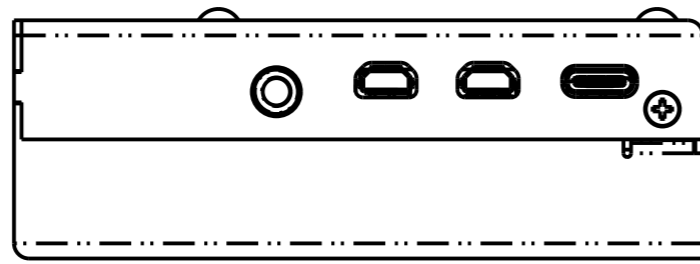
Unit F: Jacketed: 60P PVC White(WH05)

CABLE PRINTING(BLACK: 012-H86-9001YMBK):



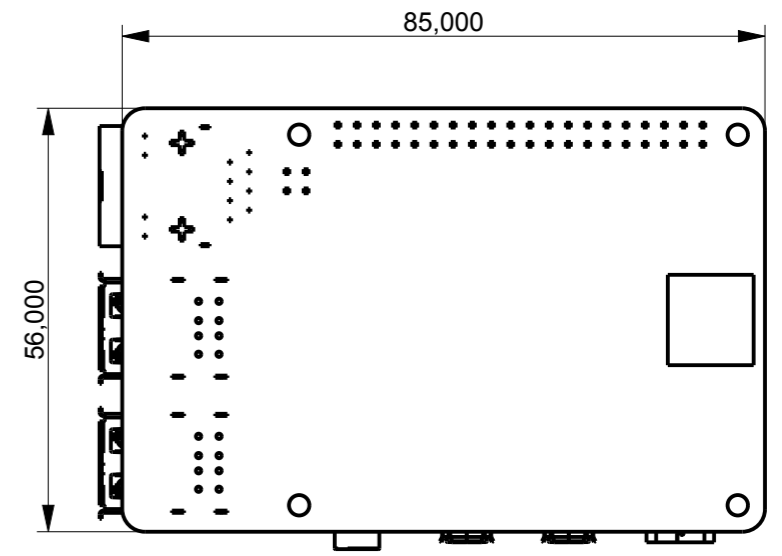
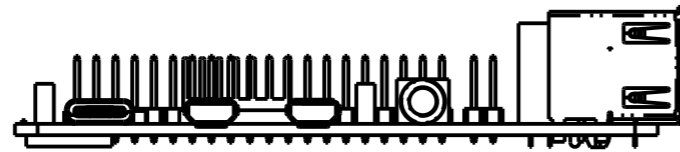
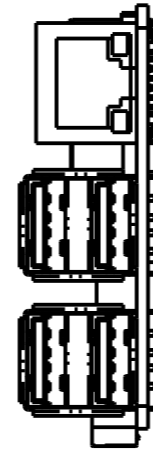
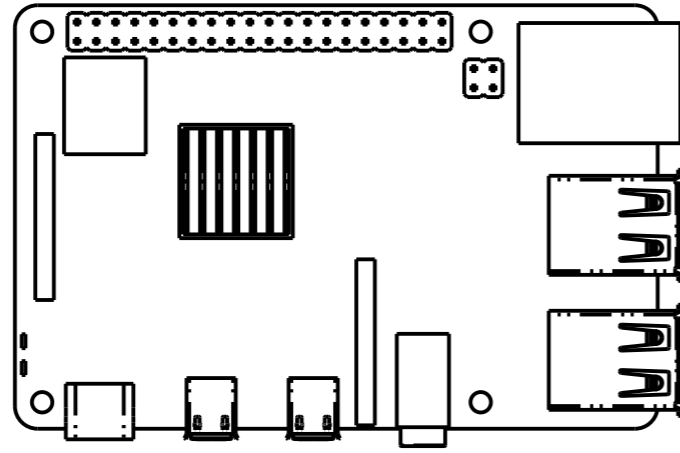
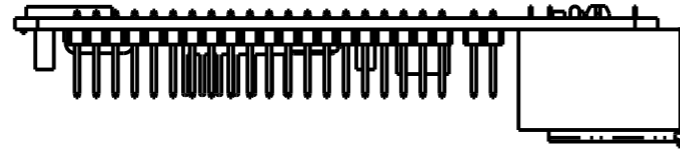
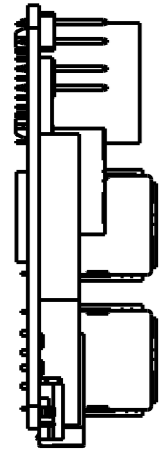
Resolution: Support 4K @ 60Hz (depends on HDTV spec)
 Up to 18Gbps band width

NO.	COMPONENT	QTY	DESCRIPTION	TOLERANCE UNLESS OTHERWISE SPECIFIED	TITLE	PART NO.
5				X. ± 0.2 ANGLES: $\pm 2^\circ$ X.X ± 0.1 X. ± 0.05 DO NOT SCALE DRAWING	HDMI A TO HDMI D MALE	P401
4					THIRD ANGLE PROJECTION	DRAWING NO.
3					SCALE	SAHDAD01
2					UNIT	APPR. BY
1					SHEET	CHECKED BY
				DATE	DRAWN BY	
				08-08/2019		

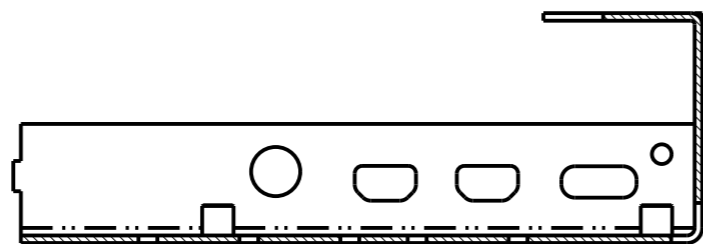
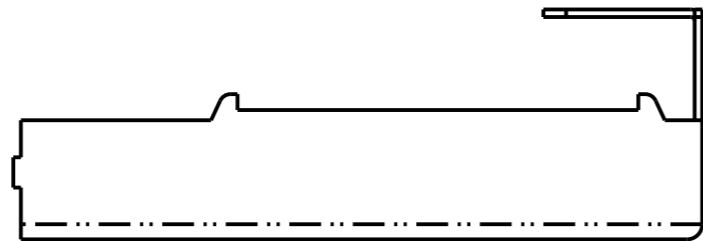
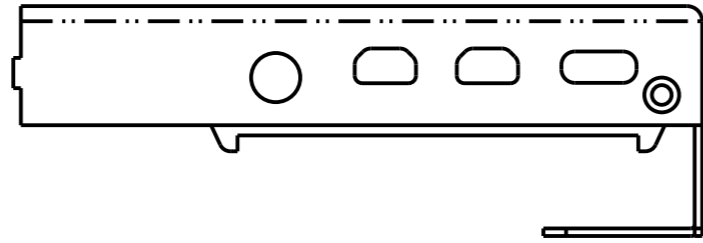
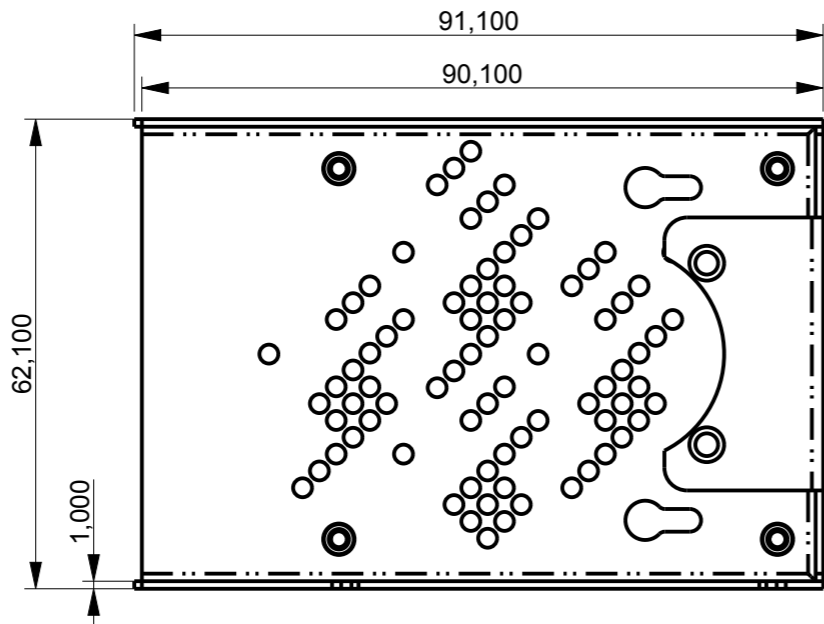
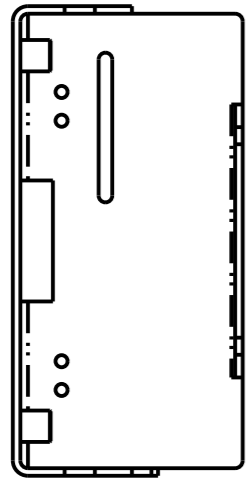


SECTION A-A

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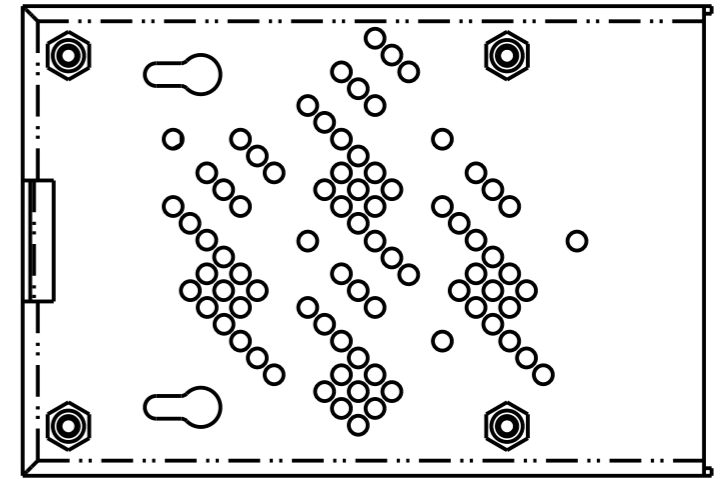
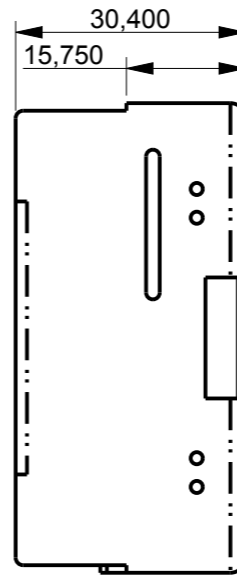
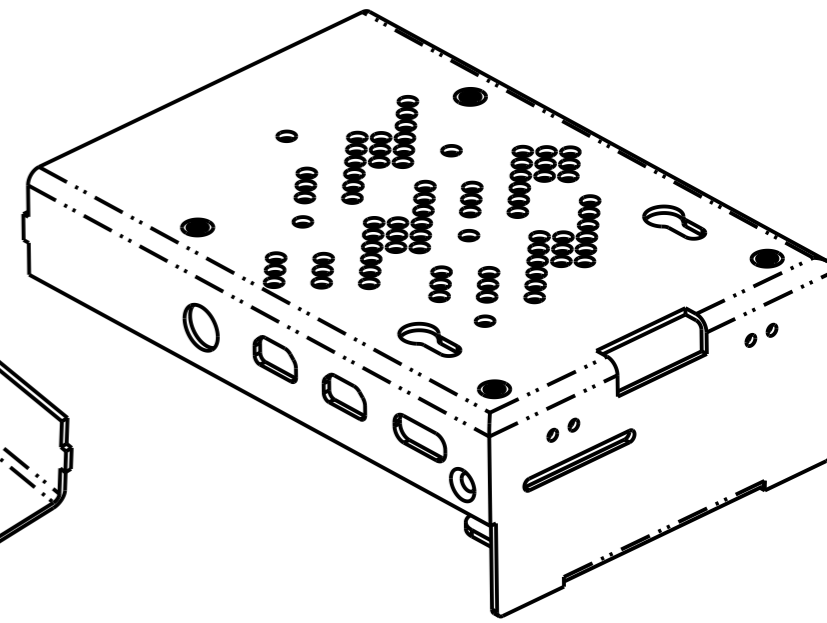
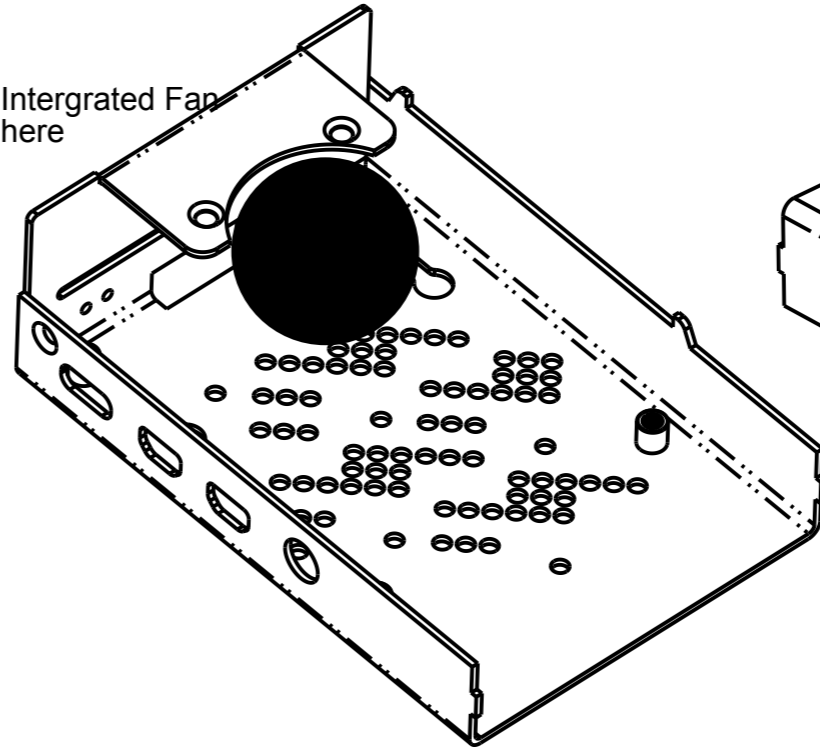


BOX_PCBA
SCALE 1:1

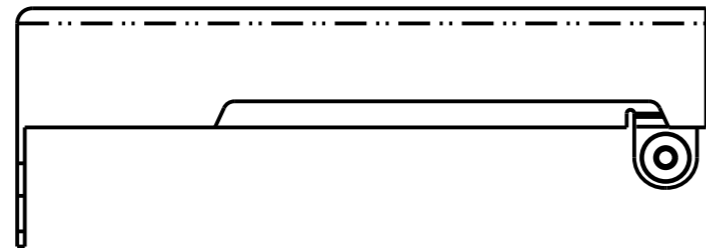
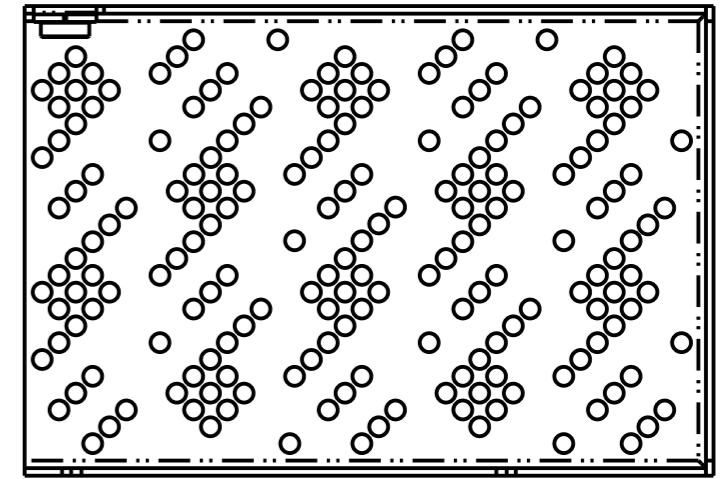
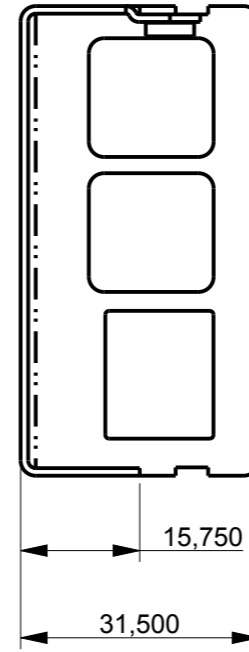
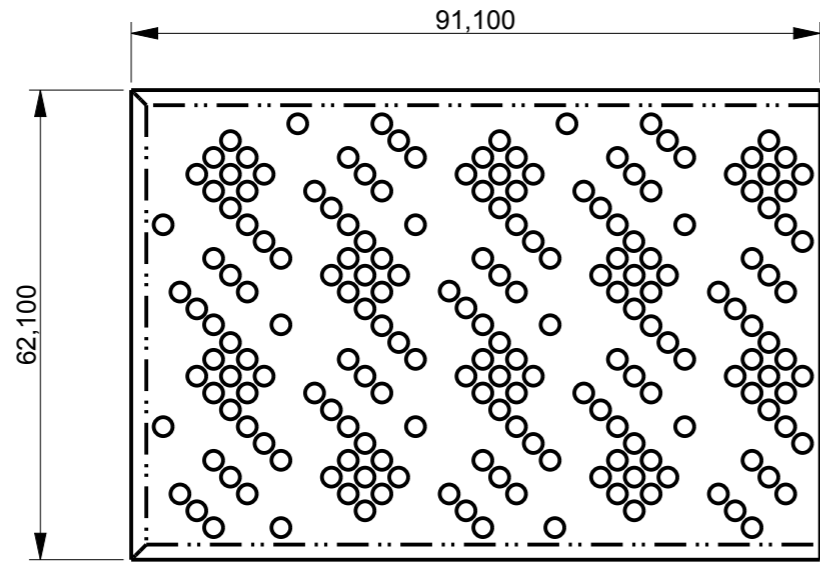
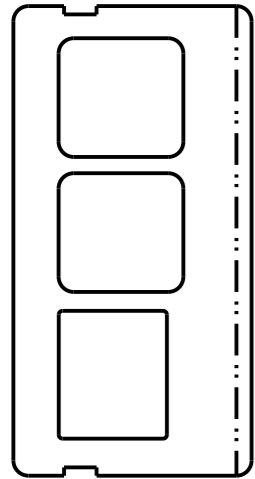
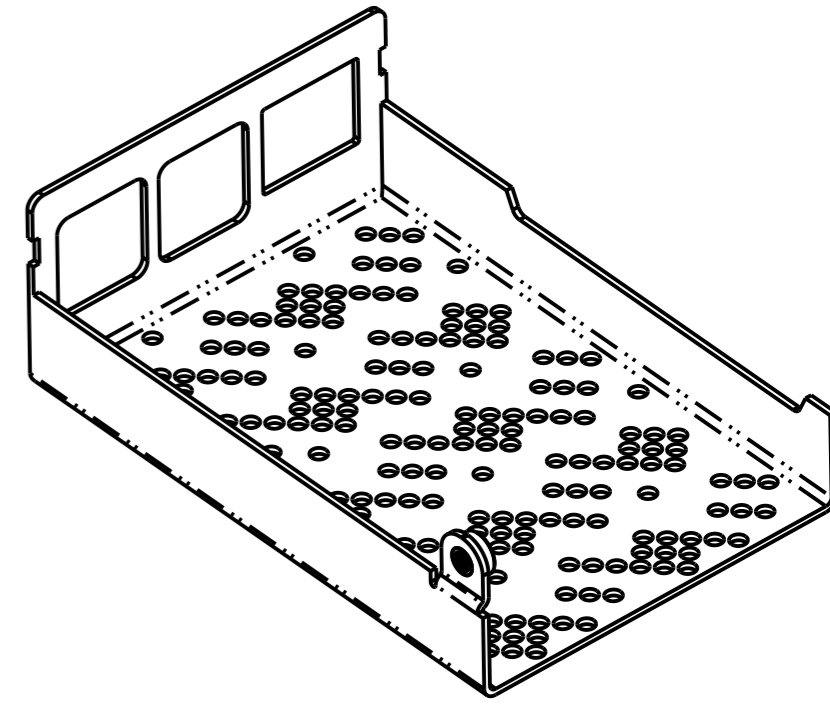
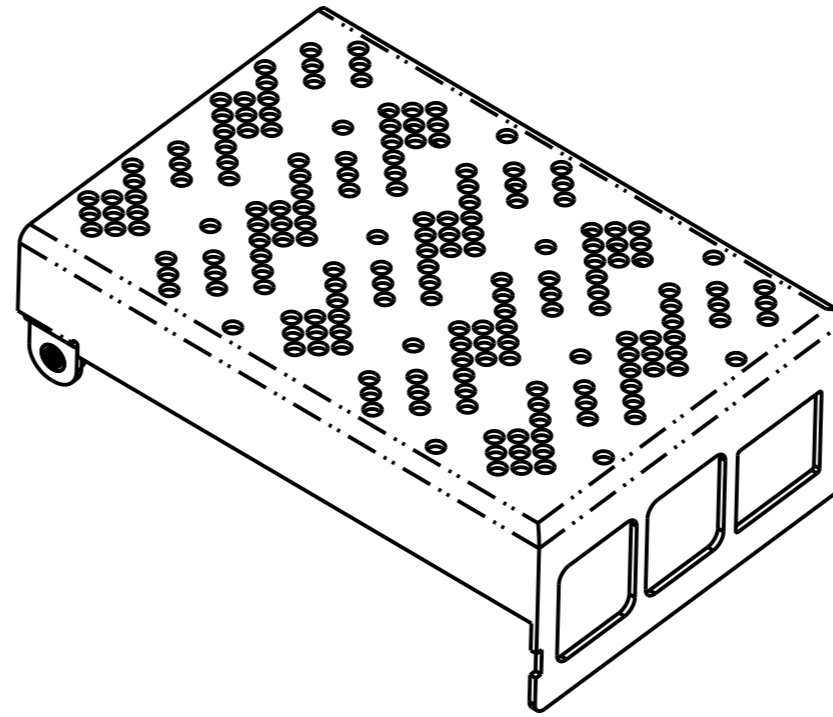
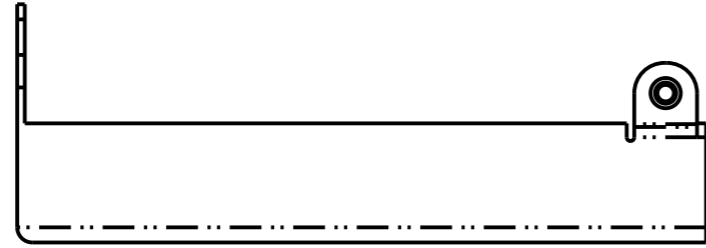


SECTION A-A

Intergrated Fan
here

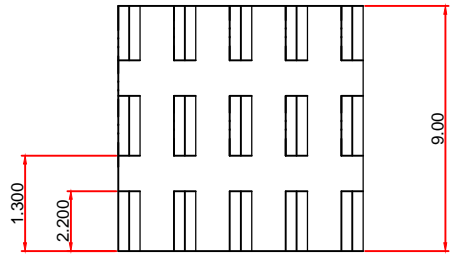
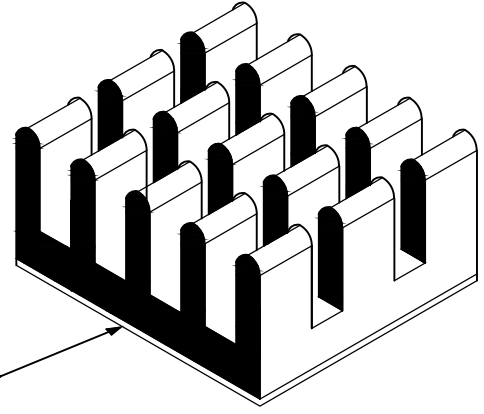
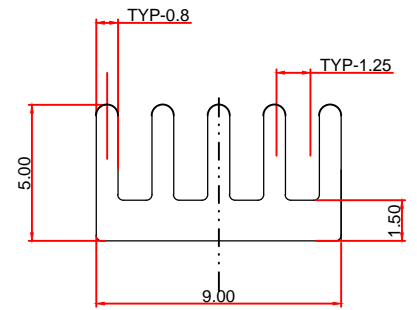


BOX_BTM
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BOX_TOP
SCALE 1:1

ECN. DATE	ECN. SYMBOL	REV.	NOTE

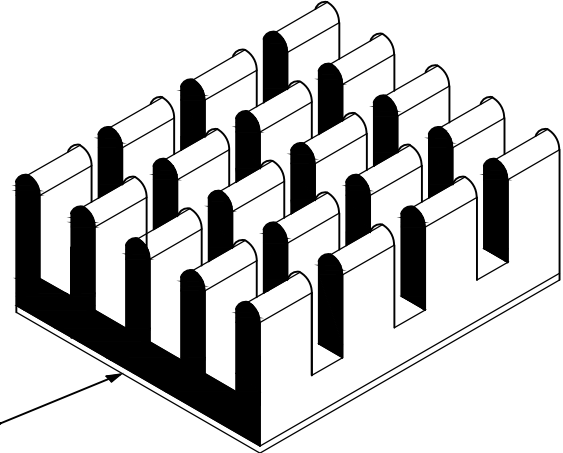
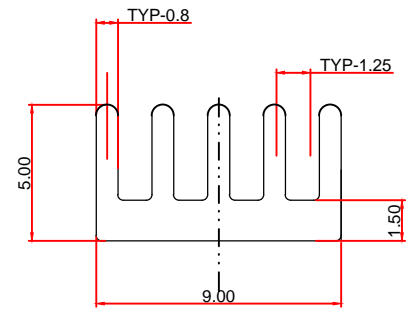


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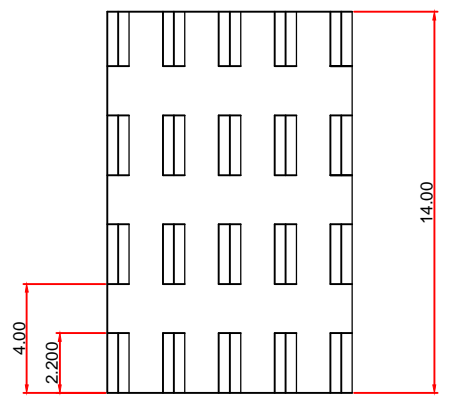
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2. Adhesive Backing-3M8810, 0.25mm Thickness
3. Components are ROHS compliant
4. Part is to be clean

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CHK.	TOLERANCES						
DAW.	DIMENSIONS		ANGELES				
	. xx ± 0.5		± 1°	MATERIAL : AL6063-T5		UNIT:-	Rev A

ECN. DATE	ECN. SYMBOL	REV.	NOTE



Adhesive Backing on the bottom side

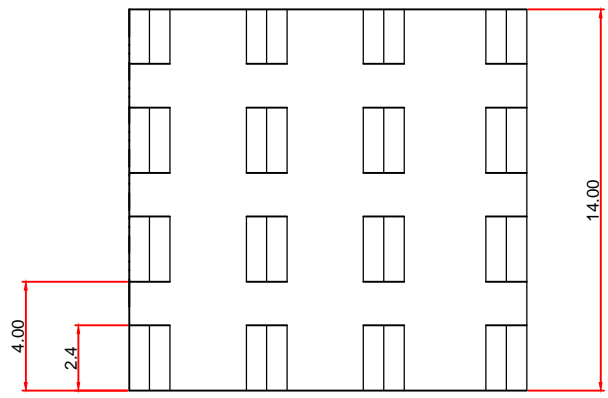
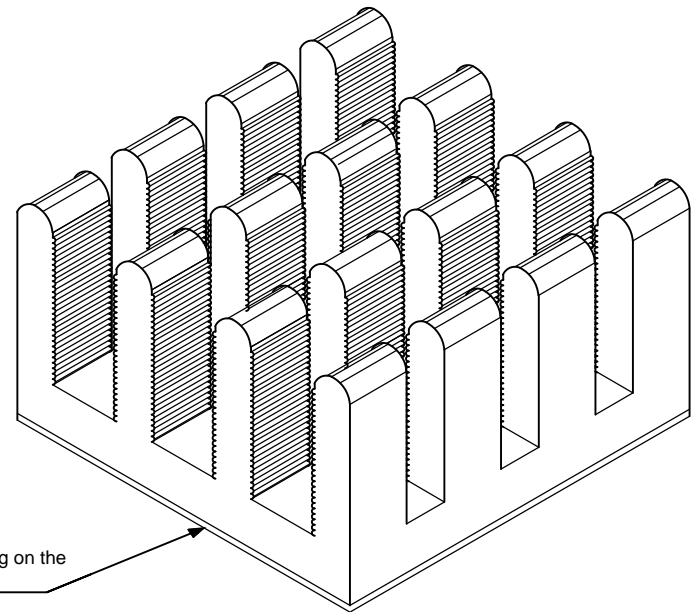
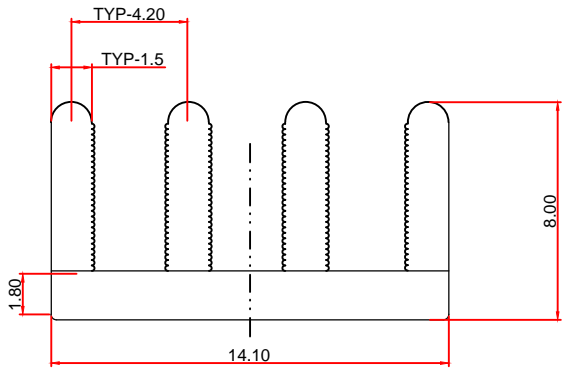


Note:

1. Material Specifications: AL-6063-T5
2. Adhesive Backing-3M8810, 0.25mm Thickness
3. Components are ROHS compliant
4. Part is to be clean

	DATA	2019-7-21	A. W.	mm ²	KG. M	28one Limited	
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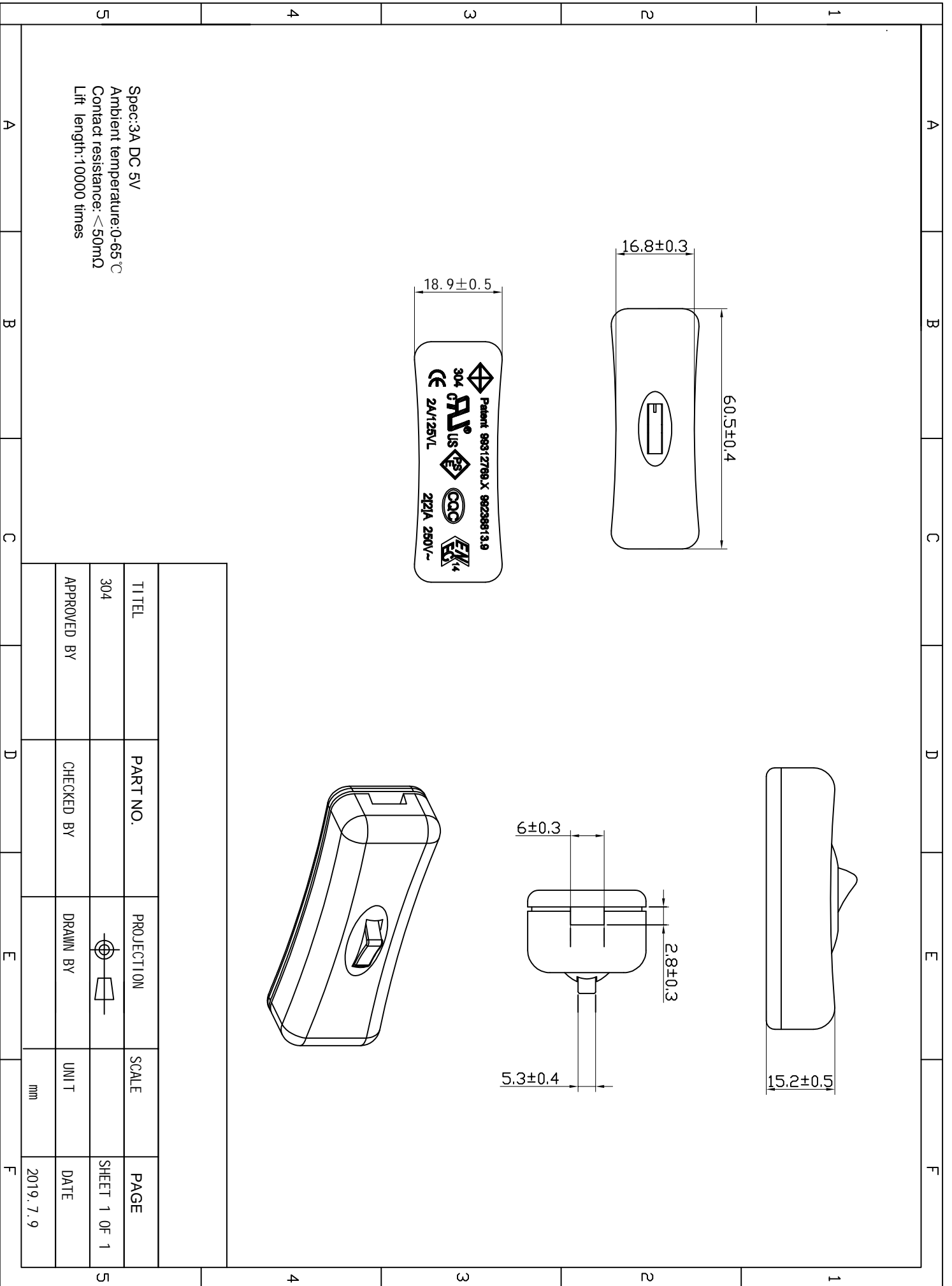
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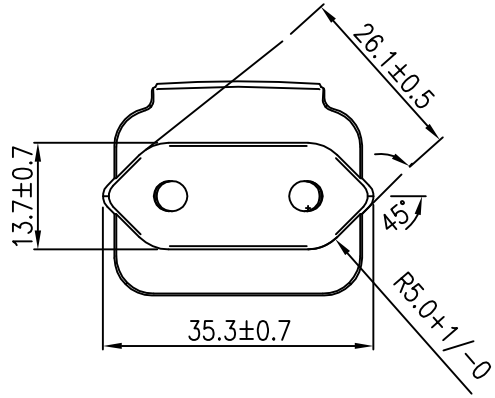
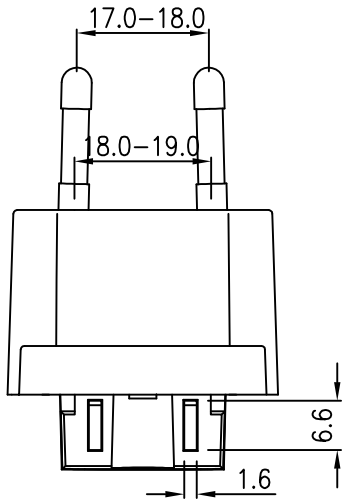
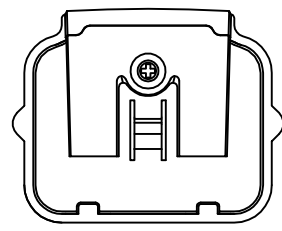
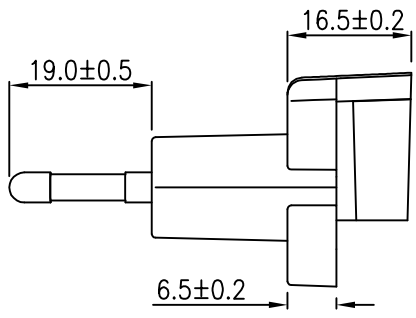
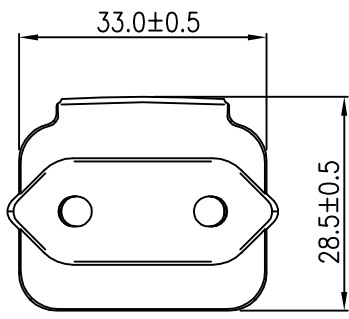
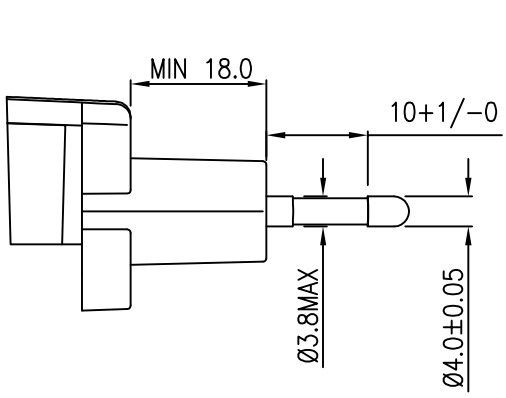
Note:

1. Material Specifications: AL-6063-T5
2. Adhesive Backing- 3M 8810 0.25mm thickness
3. Components are ROHS compliant
4. Part is to be clean

	DATA	2019-7-21	A. W.	mm ²	KG. M	28one Limited	
APP.	HARDNESS		PERI.		SCALE 10:1	PART NO. :SA141408	
CHK.	TOLERANCES						
DAW.	DIMENSIONS		ANGELES				
	. xx ± 0.5		± 1°	MATERIAL : AL6063-T5		UNIT:-	Rev A



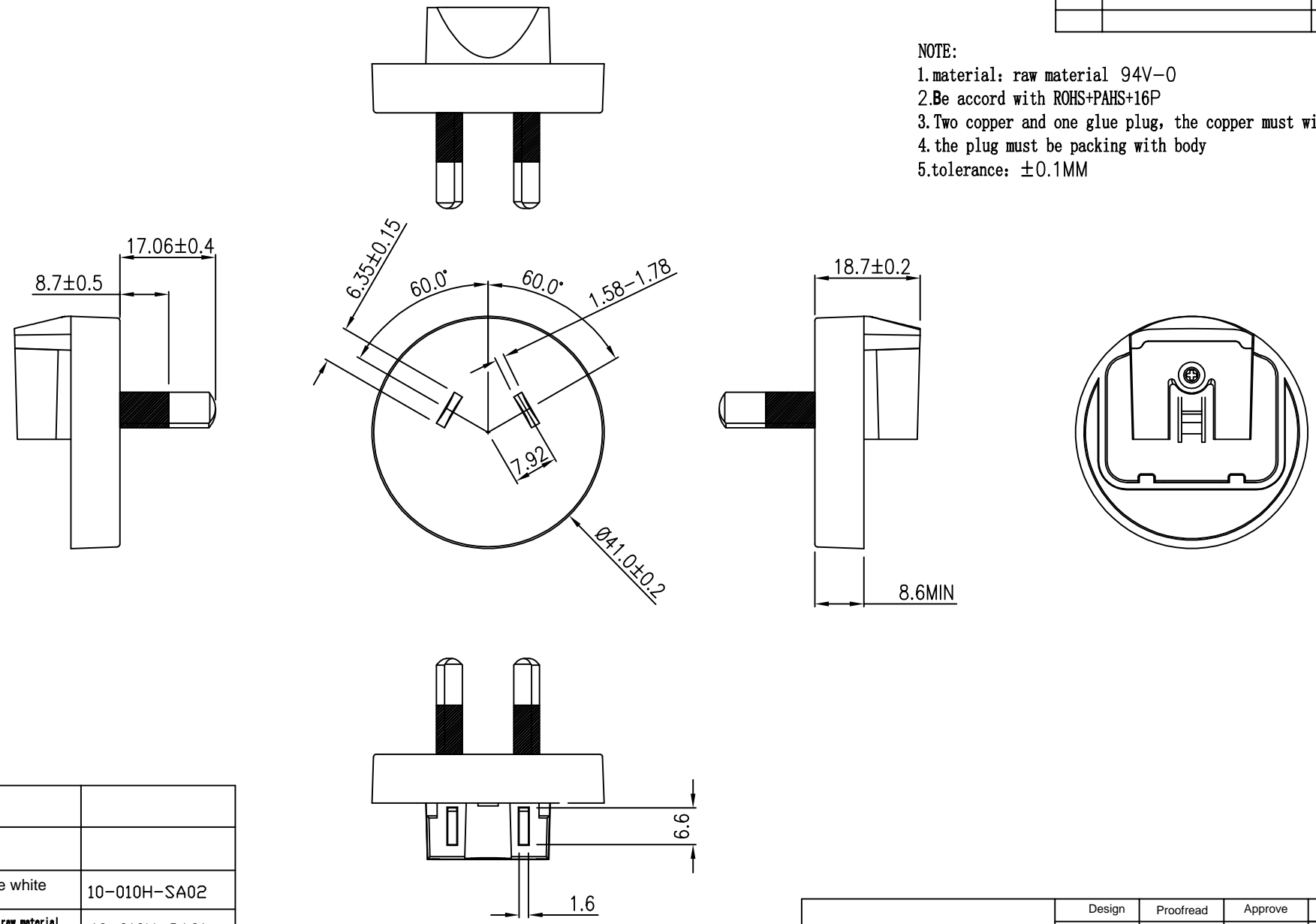
NOTE:
 1. materia: raw material 94V-0
 2. Be accord with ROHS+PAHS+16P
 3. Two copper and one glue plug, the copper must with Ni.
 4. the plug must be packing with body
 5. tolerance: ±0.1MM



●	Apple white	10-010H-GS02
	Black PG raw material	10-010H-GS01
choose	color	P/N

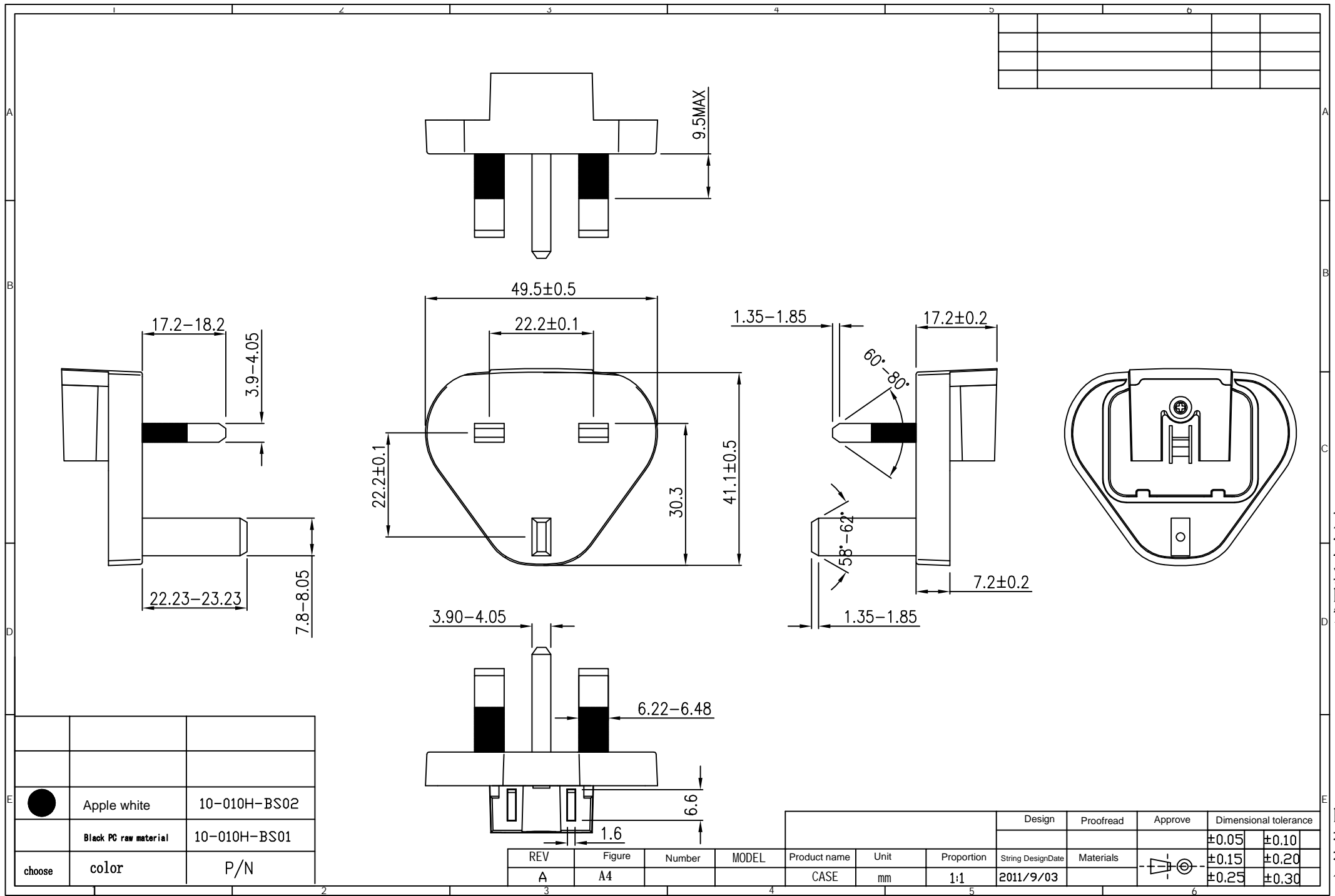
REV	Figure	Number	MODEL	Product name	Unit	Proportion	Design	Proofread	Approve	Dimensional tolerance	
A	A4			CASE	mm	1:1	String DesignDate	Materials		±0.05	±0.10
							2011/9/03			±0.15	±0.20
										±0.25	±0.30

NOTE:
 1. material: raw material 94V-0
 2. Be accord with ROHS+PAHS+16P
 3. Two copper and one glue plug, the copper must with Ni.
 4. the plug must be packing with body
 5. tolerance: $\pm 0.1\text{MM}$



●	Apple white	10-010H-SA02
	Black PG raw material	10-010H-SA01
choose	color	P/N

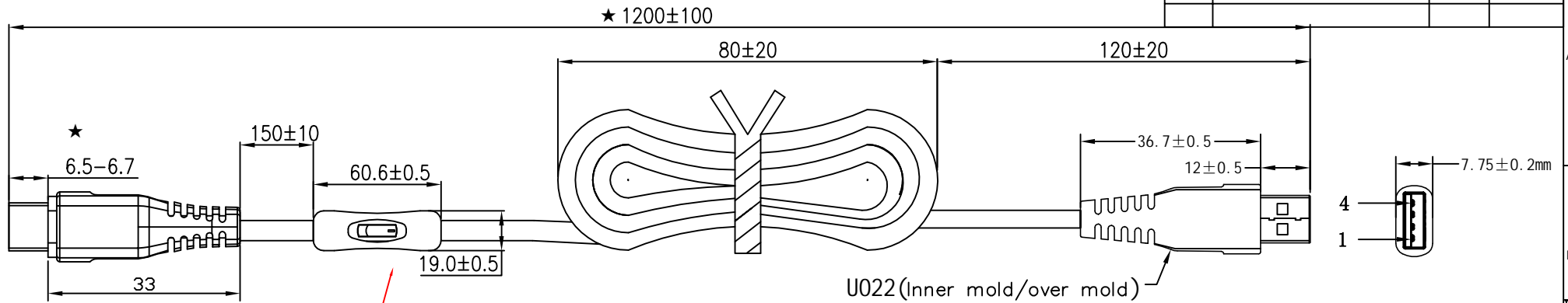
REV	Figure	Number	MODEL	Product name	Unit	Proportion	Design	Proofread	Approve	Dimensional tolerance	
A	A4			CASE	mm	1:1	String DesignDate	Materials		± 0.05	± 0.10
							2011/9/03			± 0.15	± 0.20
										± 0.25	± 0.30



●	Apple white	10-010H-BS02
	Black PC raw material	10-010H-BS01
choose	color	P/N

REV	Figure	Number	MODEL	Product name	Unit	Proportion	Design	Proofread	Approve	Dimensional tolerance	
A	A4			CASE	mm	1:1	String DesignDate	Materials		±0.05	±0.10
							2011/9/03			±0.15	±0.20
										±0.25	±0.30

REV	Change content	Change a person	change time



304 White mini rocker switch controls positive pole

Wire specification: apple white AB301(185669) 18# 1185Ø3.5 wire specification: AS41*0.16 or AS52*0.12

Switch lettering:

Patent 99312769.X 99238813.9

304

CE

C US 2A/125VL

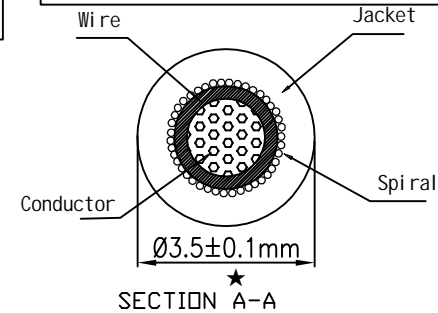
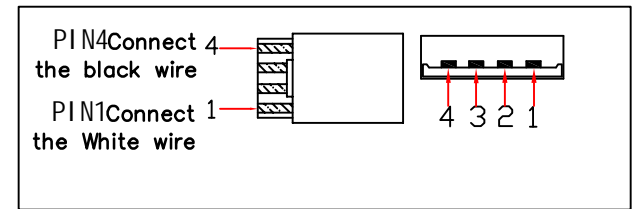
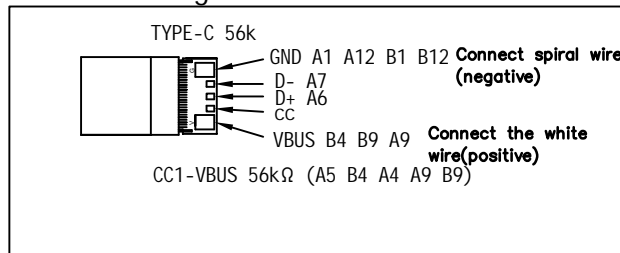
PS E

CQC

EN EC 14

2 [2] A 250~

circuit diagram:

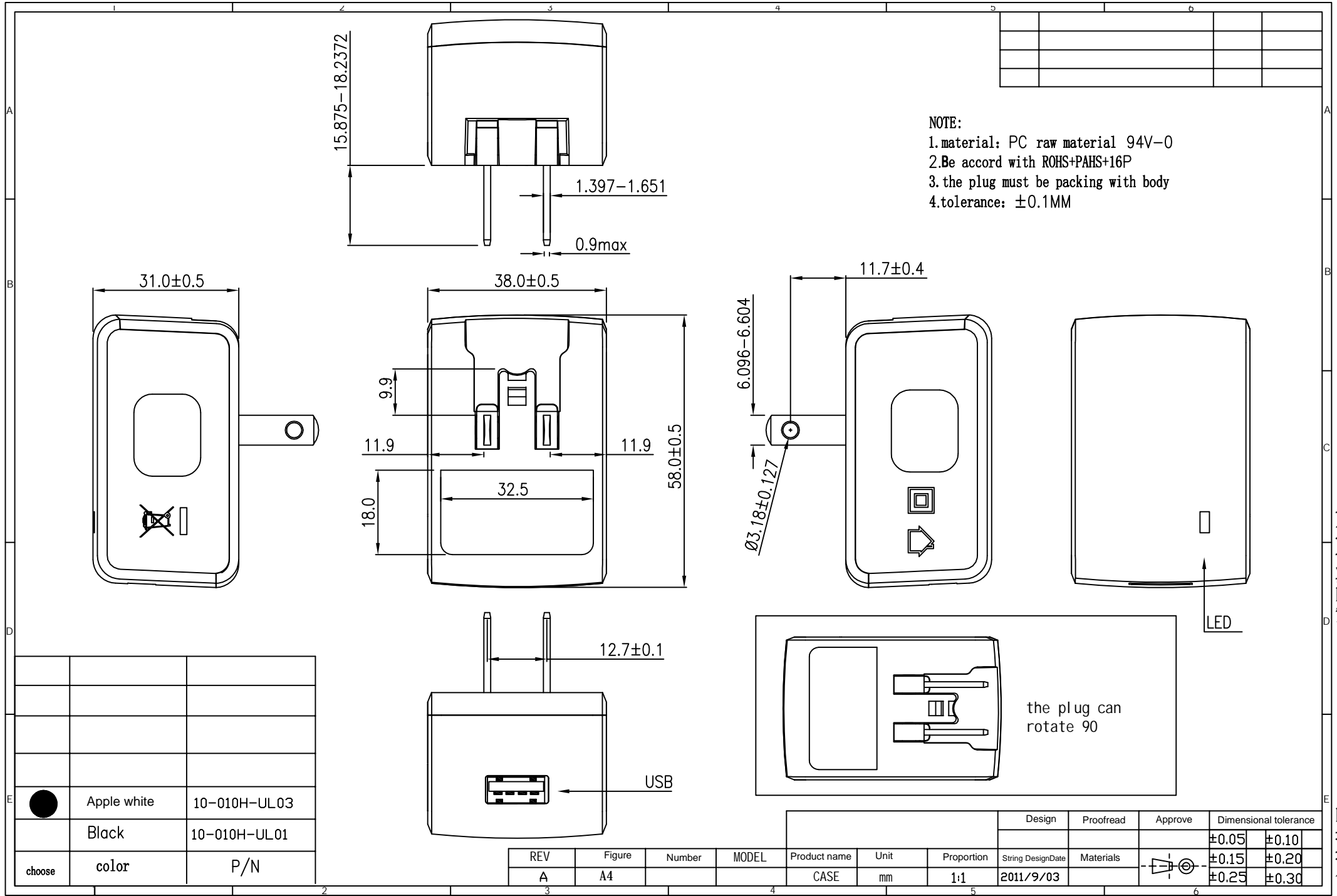


technical requirements:

1. The SR/DC reliability test of the wire material is based on the 《IQC standard annex 8》
2. Products must comply with ROHS+PAHS+16P requirements.
3. Pay attention to tolerance requirements.

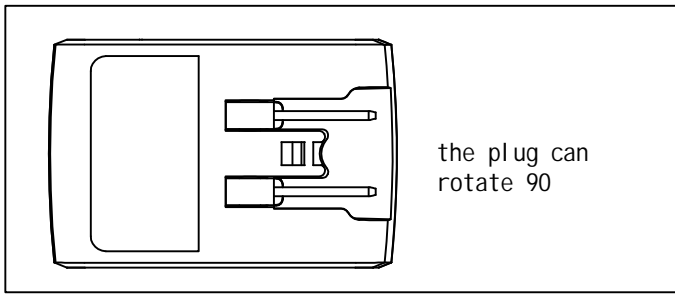
★ is the critical dimension 15-0618-0141

REV	Figure	Number	MODEL	product name	unit	proportion	design	proofread	approve	dimensional tolerance	
B	A4		SA015-SH	inline switch	mm	1:1	string DesignDate	materials		±0.05	±0.10
										±0.15	±0.20
										±0.25	±0.30



NOTE:
 1. material: PC raw material 94V-0
 2. Be accord with ROHS+PAHS+16P
 3. the plug must be packing with body
 4. tolerance: $\pm 0.1\text{MM}$

●	Apple white	10-010H-UL03
	Black	10-010H-UL01
choose	color	P/N



REV	Figure	Number	MODEL	Product name	Unit	Proportion	Design	Proofread	Approve	Dimensional tolerance	
A	A4			CASE	mm	1:1	String DesignDate	Materials		±0.05	±0.10
							2011/9/03			±0.15	±0.20
										±0.25	±0.30

3D Gen3 X3 256Gb 2-Plane NAND Flash Die for 32GB microSD Card

June 28, 2017
Advance, Revision 0.3

Part Numbers

SDWFR-256GB3ED3D

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All specifications are subject to change without notice.

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Product Overview

SanDisk® 3D Gen3 X3 256Gb 2-Plane NAND Flash memory is available in wafer form for customers requiring post processing. Die specifications and dimensions are provided in this data sheet. For detailed device operation characteristics, see the SanDisk 3D Gen3 X3 256Gb 2-Plane NAND Flash package data sheet.

Die Features

Table 1: 256Gb Die Features

For devices operating above 100 MHz, V_{CCQ} is 1.8V.

Feature		General Physical Specifications
Three-bits-per-cell (3bpc) technology		Backside die surface: Polished bare silicon
Power supply voltage: 3.3V (2.35–3.6V)		Processed wafer thickness: $785\mu\text{m} \pm 25\mu\text{m}^1$
I/O Supply Voltage: 3.3V (2.7–3.6V)/1.8V (1.7–1.95V)		Bond pad metalization: Al
Organization		Bond pad metalization thickness: $0.6\mu\text{m}$
Page size	18,336 bytes	Passivation: SiO ₂ /SiN/Polyimide
Block size:	TLC: 12MB	Passivation thickness: $6.37\mu\text{m}$
	SLC: 4MB	
Device size:	1478 blocks/plane	
		Die Database and Die Outline
		Die size: $12.175\text{mm} \times 6.286\text{mm}^2$
		Scribe line: $70\mu\text{m} \times 70\mu\text{m}$
		Pads per die: 56
		Ordering information:
		SDWFR-256GB3ED3D

Note 1. Wafer form only.

2. Including scribe line.

Erase Before Initial Program Operation

The device might not be erased prior to shipment. This is done to protect the device in the event that the device will be subjected to IR reflow for the SMT process. If the cells are erased at the factory, the reflow process could cause cell degradation and/or make the device susceptible to data-retention failures.

SanDisk strongly recommends that prior to the reflow process, the host should erase only the blocks intended to be programmed.

When it is necessary to perform a firmware download **before** SMT:

- Do not erase the entire NAND Flash device.
- Perform a bad-block scan.
- Only erase those blocks that are needed to hold the firmware.
- After the firmware is downloaded, the device can go through SMT.
- When starting the normal operation of the device, do not erase the entire NAND Flash before starting. Over the lifetime of the device, only erase blocks just prior to programming them.

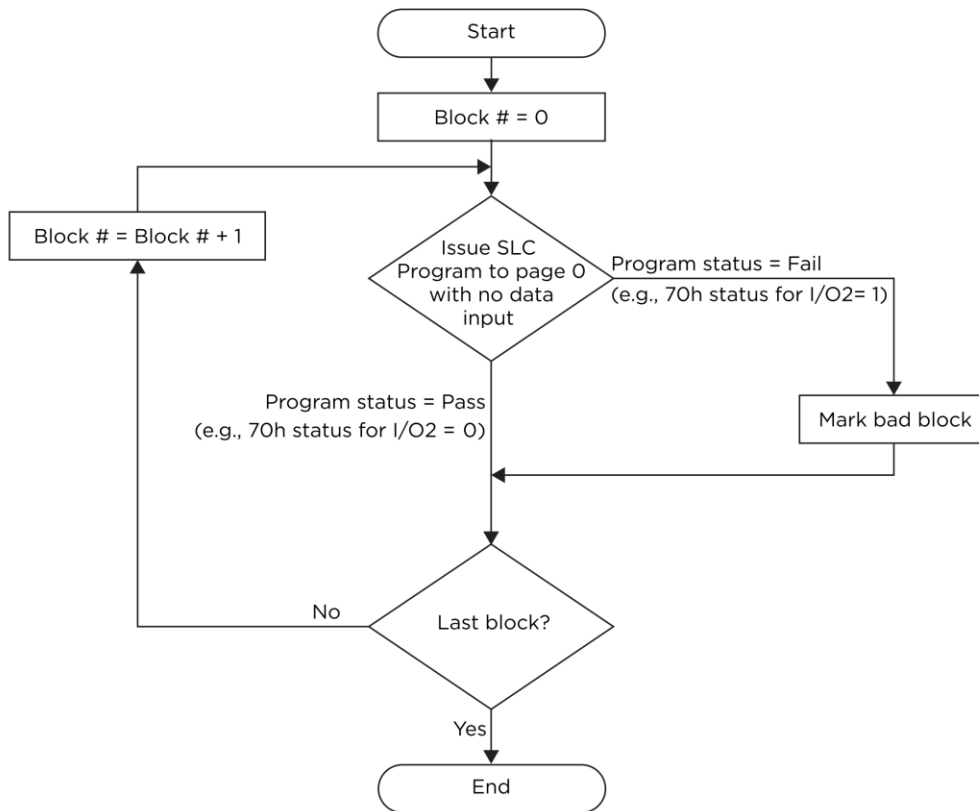
When it is necessary to perform a firmware download **after** SMT:

- Do not erase the entire NAND Flash device.
- The device can go through SMT.
- Perform a bad block scan.
- Only erase those blocks that are needed to hold the firmware.
- When starting the normal operation of the device, do not erase the entire NAND Flash before starting. Over the lifetime of the device, only erase blocks just prior to programming them.

Following the bad-block test, it is advisable to create a bad-block table to be used by the system software for mapping around any bad blocks.

For detailed specifications, commands, and operating modes, see the 3D Gen3 X3 256Gb 2-Plane NAND Flash package data sheet.

Figure 1: Bad Block Test Flow



Note 1. Following power-up, an FFh Reset is required before checking for bad blocks.

Functional Specifications

These specifications are provided for reference only. For detailed functional and parametric specifications, please refer to the package data sheet. Products and specifications are subject to change by SanDisk without notice.

Die Dimensions and Physical Specifications

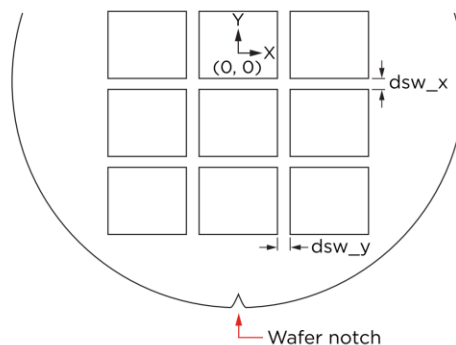
Table 2: Die Characteristics, Dimensions, and Specifications

Characteristic	Specification
Wafer diameter	300mm (12")
Wafer thickness	785 μ m \pm 25 μ m
Die size	X = 12.175mm, Y = 6.286mm (including scribe line)
Pad size	See Table 5 on page 7
Pads per die ¹	56
Die backside material	Bare silicon
Die backside finishing	Polished/bare silicon
Die backside potential	V _{SS} (GND)
Bond pad metalization	Al
Bond pad metalization thickness	0.6 μ m
Passivation	SiO ₂ /SiN/Polyimide
Passivation thickness	6.37 μ m

Note 1. For Legacy Mode, some pads may not require bonding out (see [Table 6 on page 8](#)).

Table 3: Die Street Widths

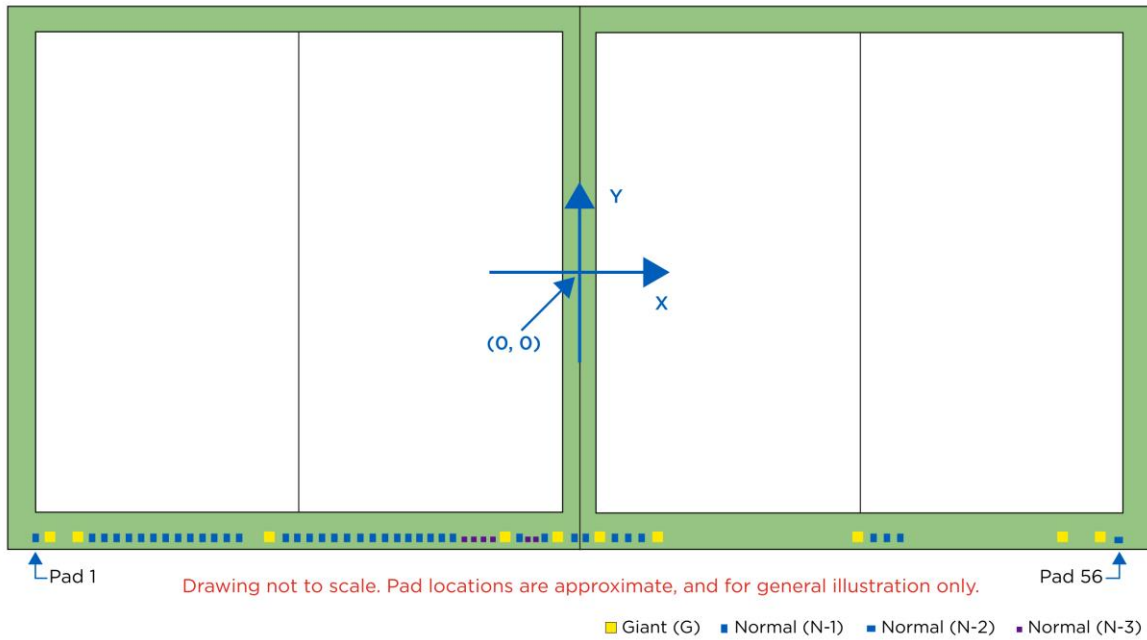
Street	Value	Unit
X-axis die street width (dsw_x)	70	μ m
Y-axis die street width (dsw_y)	70	μ m

Figure 2: Wafer Die Orientation




Pad Assignments

Figure 3: Floor Plan



Note 1. See Table 4, "Pad Coordinates at Centers of Pads," on page 6 for pad locations.



Table 4: Pad Coordinates at Centers of Pads

Pad #	Pad Type	Pad Name	X from Center	Y from Center
1	N-1	V _{SS}	-5972.5	-3009.9
2	G	V _{CC}	-5851.5	-3012.0
3	G	V _{SS}	-5019.0	-3009.9
4	N-1	I/O0	-4900.0	-3009.9
5	N-1	V _{CCQ}	-4761.0	-3009.9
6	N-1	I/O1	-4622.0	-3009.9
7	N-1	V _{SS}	-4511.0	-3009.9
8	N-1	I/O2	-4400.0	-3009.9
9	N-1	V _{CCQ}	-4261.0	-3009.9
10	N-1	I/O3	-4122.0	-3009.9
11	N-1	V _{SS}	-4011.0	-3009.9
12	N-1	DQS	-3900.0	-3009.9
13	N-1	V _{CCQ}	-3761.0	-3009.9
14	N-1	DQSn	-3622.0	-3009.9
15	N-1	V _{SS}	-3511.0	-3009.9
16	N-1	V _{CC}	-3405.0	-3001.5
17	G	V _{CCQ}	-2979.3	-3000.9
18	N-1	REn	-2834.6	-3009.9
19	N-1	RE	-2692.0	-3009.9
20	N-1	V _{SS}	-2576.0	-3009.9
21	N-1	I/O4	-2465.0	-3009.9
22	N-1	V _{CCQ}	-2326.0	-3009.9
23	N-1	I/O5	-2187.0	-3009.9
24	N-1	V _{SS}	-2076.0	-3009.9
25	N-1	I/O6	-1965.0	-3009.9
26	N-1	V _{CCQ}	-1826.0	-3009.9
27	N-1	I/O7	-1687.0	-3009.9
28	N-1	V _{SS}	-1577.0	-3009.9
29	N-1	ZQ	-1432.0	-3020.1
30	N-1	V _{CC}	-1307.0	-3020.1
31	N-1	CADD0	-1207.0	-3022.3
32	N-1	R/Bn	-1107.0	-3022.3
33	N-3	Option	-1032.0	-3024.5
34	N-3	Option	-963.0	-3024.5
35	N-3	Option	-894.0	-3024.5
36	N-3	Option	-825.0	-3024.5
37	G	NC	-692.0	-3020.0
38	N-1	CEn	-545.0	-3023.9
39	N-3	Option	-467.1	-3024.5
40	N-3	Option	-394.9	-3024.5
41	N-1	V _{REF}	-317.0	-3023.9
42	G	V _{CC}	-217.0	-3019.4



Table 4: Pad Coordinates at Centers of Pads

Pad #	Pad Type	Pad Name	X from Center	Y from Center
43	N-1	CADD1	-57.0	-3008.7
44	N-1	CADD2	57.0	-3008.7
45	G	V _{SS}	194.0	-3012.0
46	N-1	CLE	294.0	-3023.9
47	N-1	ALE	394.0	-3023.9
48	N-1	WEn	494.0	-3023.9
49	G	WPn	594.0	-3019.4
50	G	NC	3633.5	-2997.9
51	N-1	NC	3733.5	-3000.9
52	N-1	V _{SS}	3833.5	-3000.9
53	N-1	V _{CC}	3933.5	-3001.9
54	G	V _{CC}	5483.5	-3018.9
55	G	V _{SS}	5863.5	-3014.1
56	N-2	V _{CC}	5963.5	-3023.9

Table 5: Bond Pad Types

Pad Type	Pad Size (passivation opening)	
	X [μm]	Y [μm]
Normal (N-1)	64	70
Normal (N-2)	70	64
Normal (N-3)	55	55
Giant (G)	80	80



Table 6: Ball/Pin Functions

Pin Name	Type	Ball/Pin Function
ALE	Input	Address Latch Enable controls the activating path for addresses to internal address registers. Addresses are latched on the rising edge of WEn, ALE high.
CEn	Input	Chip Enable controls device selection. When the device is busy, CEn high is ignored, and the device does not return to standby mode following program or erase operations.
CLE	Input	Command Latch Enable controls the activating path for commands to the command register. When active high, commands are latched into the command register through the I/O ports on the rising edge of the WEn signal.
RE ¹	Input	Read Enable Complement is reserved for Toggle Mode DDR2.
REn	Input	Read Enable controls serial data out, and when active, drives data onto the I/O bus. Data is valid after tDQSRE of the rising and falling edges of REn; it also increments the internal column address counter by one for each edge.
WEn	Input	Write Enable controls writes to the I/O port. Commands and addresses are latched on the rising edge of the WEn pulse.
WPn	Input	Write Protect provides inadvertent program/erase protection during power transitions. The internal high voltage generator is reset when the WPn pin is active low.
DQS ¹	Input/Output	Data Strobe acts as an output when reading data, and as an input when writing data. DQS is edge-aligned with data read; it is center-aligned with data written.
DQSn ¹	Input/Output	Data Strobe Complement is reserved for Toggle Mode DDR2.
I/O[7:0]	Input/Output	Data Input/Output (I/O) inputs commands, addresses, and data, and outputs data during Read operations. The I/O pins float to High-z when the chip is deselected or when outputs are disabled.
R/Bn	Output	Ready/Busy indicates device operation status. R/Bn is an open-drain output and does not float to High-z when the chip is deselected or when outputs are disabled. When low, it indicates that a program, erase, or random read operation is in process; it goes high upon completion.
V _{CC} ²	Supply	Power supply for the device
V _{CCQ} ²	Supply	I/O power for input and output signals
V _{REF} ¹	Supply	Reference voltage, reserved for Toggle Mode DDR2
V _{SS} , V _{SSQ} ²	Supply	Ground
NC		No Connect

Note 1. Toggle Mode DDR 1 = DDR interface with DQS; Toggle Mode DDR 2 = Toggle Mode DDR1 + (V_{REF} and/or ODT and/or complementary signals).

2. Connect all V_{CC}, V_{CCQ}, V_{SS}, and V_{SSQ} pins of each device to common power supply outputs. Do not leave any power pins unconnected.

Wafer Handling and Storage Requirements

SanDisk die products are packaged for shipping in a clean room environment. Upon receipt, customers should transfer the die or wafers to a similar environment for storage.

SanDisk recommends that customers adhere strictly to the cautions listed below. Failure to do so will result in irreparable damage to the devices.

Caution: Avoid exposing NAND Flash die products to ultraviolet light

Caution: Avoid processing the die at temperatures greater than 250°C for more than five minutes.

SanDisk also recommends that die or wafers be maintained in a filtered nitrogen atmosphere until removed for assembly. The moisture content of the storage facility should be maintained at 30% ± 10% relative humidity. The storage facility temperature should be maintained at 25°C ± 20%.

Caution: Customers must take the necessary precautions to avoid ESD damage during handling. The die must be in an ESD-protected environment for inspection and assembly at all times.



Revision History

Table 7: Revision History

Status	Rev. #	Date	Changes
Preview	0.1	10/13/16	First draft release
Preview	0.2	11/29/16	<ul style="list-style-type: none"> Table 4, "Pad Coordinates at Centers of Pads," on page 6: Corrected pad #4 X from center value
Advance	0.3	6/28/17	<ul style="list-style-type: none"> Table 1, "256Gb Die Features," on page 1: Updated blocks per plane; updated power supply voltage range; corrected scribe line to 70μm \times 70μm Table 3, "Die Street Widths," on page 4: Added die street width values Removed all V_{PP} content: not supported Updated document status to Advance

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All specifications in this document are subject to change without notice. For memory capacity, 1 megabyte (MB) = 1 million bytes, and 1 gigabyte (GB) = 1 billion bytes. Some capacity is not available for data storage.