Land Grid Array, LGA3647 Socket

1. INTRODUCTION

This specification covers the requirements for application of land grid array LGA3647 Socket onto printed circuit board (PC board). The socket contacts are arrayed about a cavity in the center of the socket with lead-free solder balls for surface mounting on the motherboard. The socket contacts have 0.8585×0.9906mm pitch (X by Y) with a hexagonal pattern and are arranged in two C-shape regions as illustrated in Figure 1. LGA3647 socket is used with combination of Bolster assembly, Back plate assembly and Carrier.

1.1. Parts number and description

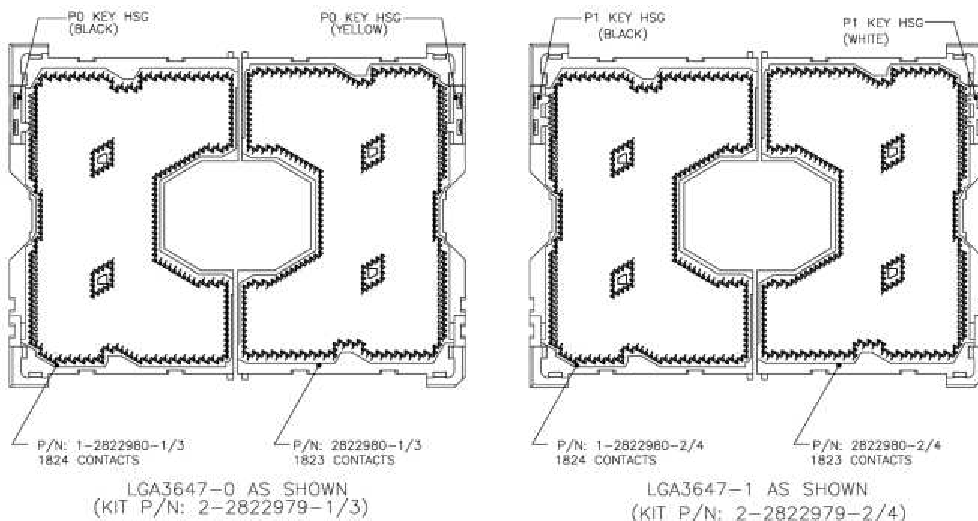
Table 1. Part number and description

TE P/N	Final-Assemble	Key Color	Description
2822980-1/3	Right segment for LGA3647-0	Yellow	LGA3647-0, Socket P0
1-2822980-1/3	Left segment for LGA3647-0	Black	
2822980-2/4	Right segment for LGA3647-1	White	LGA3647-1, Socket P1
1-2822980-2/4	Left segment for LGA3647-1	Black	
2299804-X	N/A	N/A	Narrow Non-fabric Bolster Plate Assembly
2310924-X	N/A	N/A	Narrow Fabric Bolster Plate Assembly
2299805-X	N/A	N/A	Narrow Back Plate Assembly
2299806-X	N/A	N/A	Narrow Non-fabric Carrier
2310927-X	N/A	N/A	Narrow Fabric Carrier

a: There are many package numbers, include kit package number and individual package number, detail please check customer drawing which show the relationship between package number and TE parts number.
b. For kit parts, include left and right segment, distinguish by key color
c. LGA3647 include 2 parts, they are LGA3647-0, LG3647-1, the different point are key shape, please check customer drawing.

1.2. Outline

LGA3647 socket provides solder balls on bottom of socket to make contact to PC board. The housing holds an array of the contact. Please refer to figure 1.



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1.3. Notices

The sockets are placed on the PC board by automatic application tooling (typically vacuum pick and place). The PnP cap on the socket is used to facilitate this process, the socket must be with PnP cap attached before mounting on the PC board.

1.4. Prohibitions

Do not touch contacts and solder balls

To prevent contact deformation and solder ball deformation, refrain to touch contacts and solder balls.

1.5 Basic terms and features of this product are provided as below (LGA3647-0 as shown).

Socket with PnP cap | Narrow Non-Fabric Bolster Plate Assembly | Narrow Fabric Bolster Plate Assembly | Back plate Assembly

Narrow Non-Fabric Carrier

Narrow Fabric Carrier

Figure2 Components

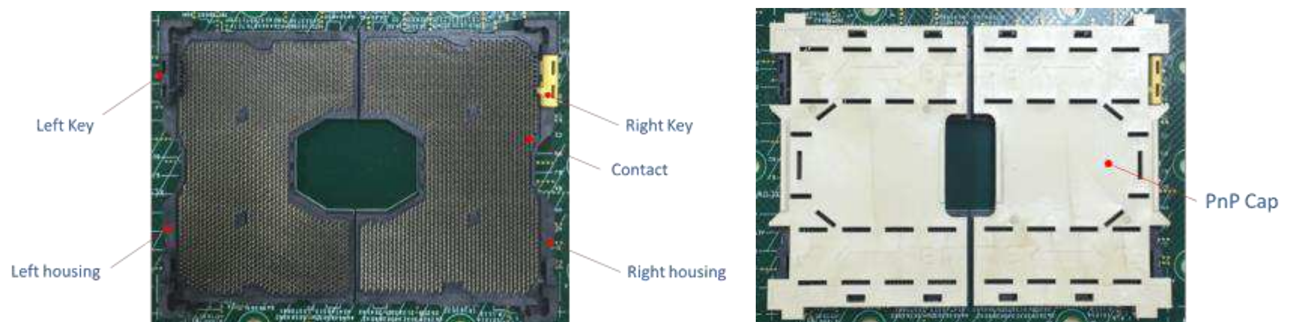

Fig 3a Socket in “Open” position
(Without PnP cap)

Fig 3b Socket in “Close” position
(With PnP cap)

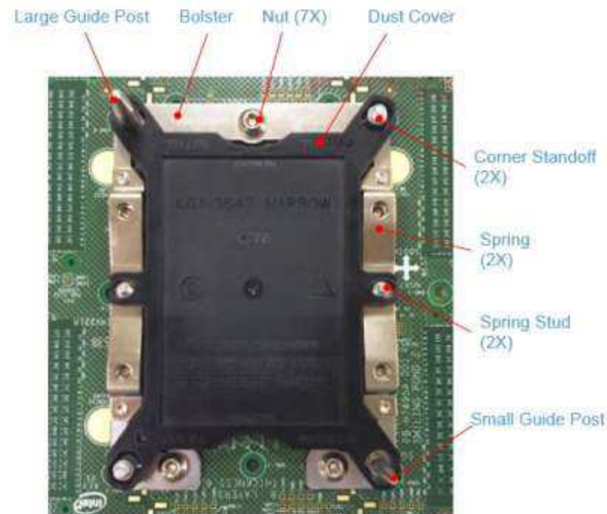

Fig 3c Socket with Bolster Assy and Dust Cover

2. REFERENCE MATERIAL

2.1. Drawings
Customer Drawings for product part numbers are available from service network. If there is a conflict between the information contained in the Customer Drawings and the specification or with any other technical documentation supplied, the Customer Drawings shall take precedence.
Customer drawing numbers: 2129710(individual package)/2822979(kit package).

2.2. Specification
Reference documents which pertain to this product are:
108-115115 : Product specification
501-115139 : Qualification test report
411-115005 : Instruction sheet

3. REQUIREMENTS

3.1. LGA package
The socket accept 3647-position LGA package provided by Intel.

3.2. Storage
A. Preferable condition
The sockets should remain in the shipping containers until ready for use to prevent deformation or oxidation to the solder balls. The sockets should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.
B. Chemical exposure
Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the socket material.
Do not store sockets near any chemical listed below as they may cause stress corrosion cracking in the solder balls.
Alkalies Ammonia Citrates Phosphates Citrates Sulfur Compounds
Amines Carbonates Nitrites Sulfur Nitrites Tartrates

3.3. PC board
A. Material
The PC board material shall be glass epoxy (FR-4).
B. Thickness
The PC board thickness shall be from 1.6mm to 2.4mm.

C. Warpage
Maximum allowable bow of the PC board after reflow shall be 0.1mm per 25.4mm over the length of the socket grid area (Fig.4)

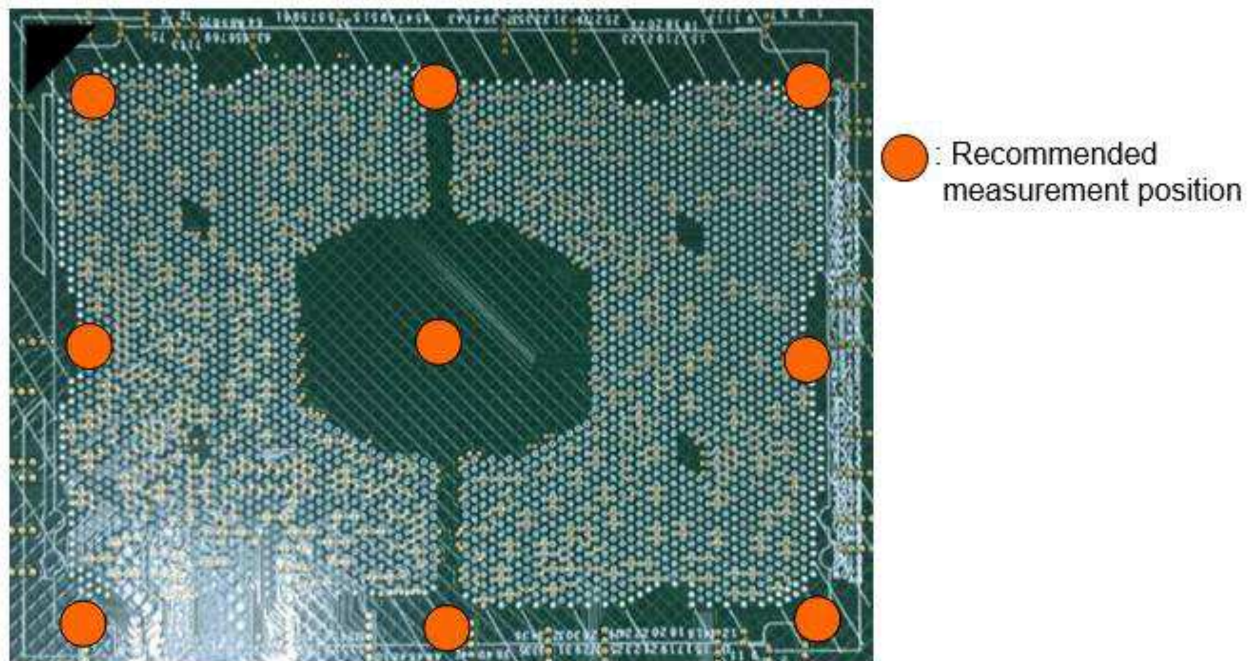

Figure4. Recommended measurement position of PC board warpage after SMT

D. Pads
The PC board circuit pads must be solder able in accordance with test specification EIA-364-52A.

E. Layouts and the volumetric zone for center cavity component
The circuit pads on the PC board must be precisely located to ensure proper placement and optimum performance of the socket. The PC board layout must be followed mechanical guide Intel provides.

3.4. Solder paste characteristics
A. For sockets with lead free solder balls, alloy type shall be Sn / Ag / Cu
(This type of alloy has a melting point temperature of 217deg C)
B. Recommended flux incorporated in the paste should be “no clean” type. Other fluxes, such as rosin mildly active (RMA) type, are acceptable. DO NOT WASH THE SOCKET.

3.5. Stencil design
Recommended stencil design is between 0.12mm and 0.15mm thickness with 0.483mm hole diameter.

3.6. Oxygen concentration
Recommended O_2 concentration is around 1000~1500PPM.

3.7. Soldering

The sockets should be soldered using hot air convection or nitrogen oven with a minimum of seven or eight chambers (zone) recommended. The solder paste should be applied using an automatic screening process.

Due to many variables involved with the reflow process (i.e. board size and thickness, component density, count and orientation), it is recommended that trial runs be conducted under actual manufacturing condition to ensure product and process compatibility. Reference reflow temperature profiles at solder ball positions are shown in the Fig.5.

Temperature at pick-up cap should be 260degC maximum.

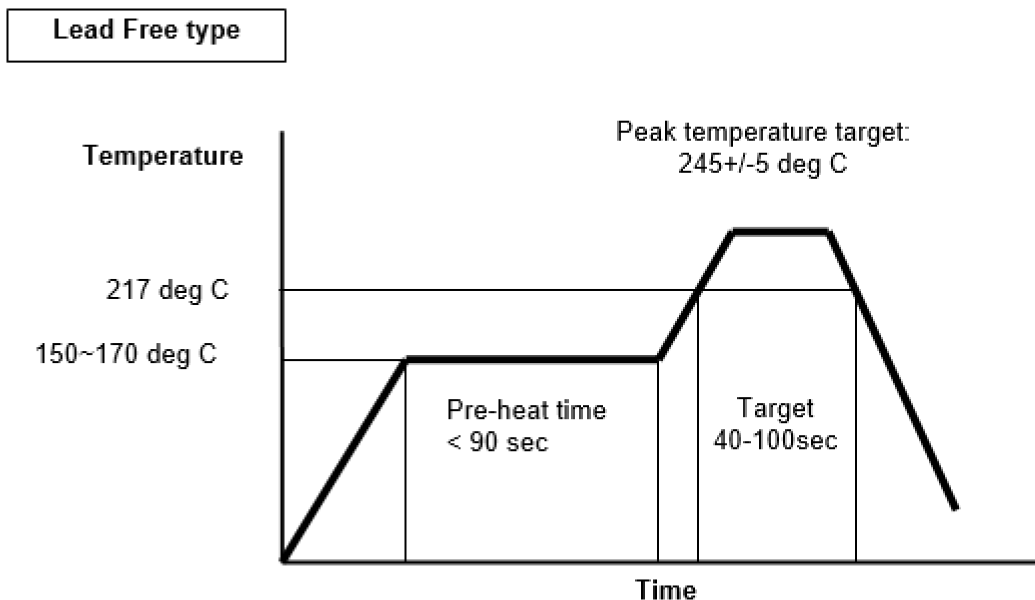

Figure5

Temperature measurement points should be on the surface of the pads under the solder ball of the socket. (Fig.6)

Temperature range in socket area should be less than 15degC

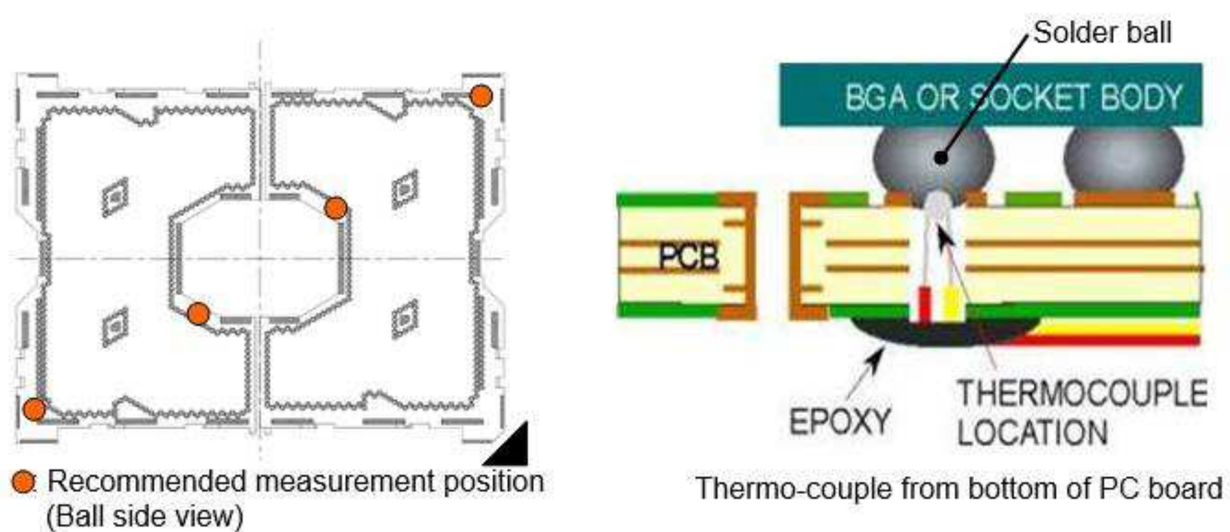

Figure6.Recommended temperature measurement position for SMT

3.8. Socket placement
The socket is supplied with JEDEC tray. Refer to the customer drawing for the parts position in the tray. PnP cap assembled on the socket is for socket pick and place process. The center of gravity position refers to customer drawing. (Fig.7)

LGA3647 socket weights up to 14.5g each segment, balance between appropriate nozzle selection and head traverse rate. When placing the socket on the board, make sure that the solder balls are aligned with the matching pads before seating the socket onto the board.

Caution: The socket must be handled only by the outer perimeter of the socket to avoid deformation, contamination, or damage to the solder balls.

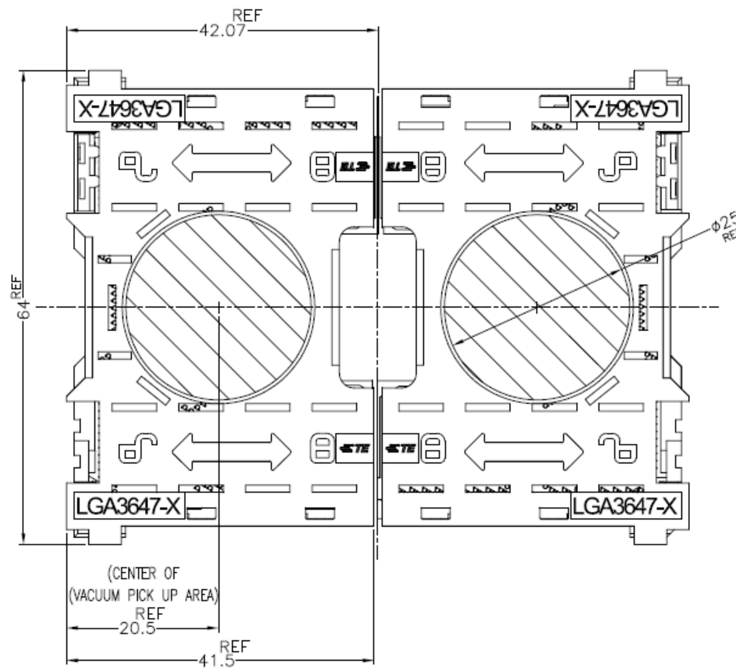

Figure7. Recommended pick up area

3.9. Checking Installed Socket

The housing must be seated on the PC board with recommended dimension shown in Fig.8

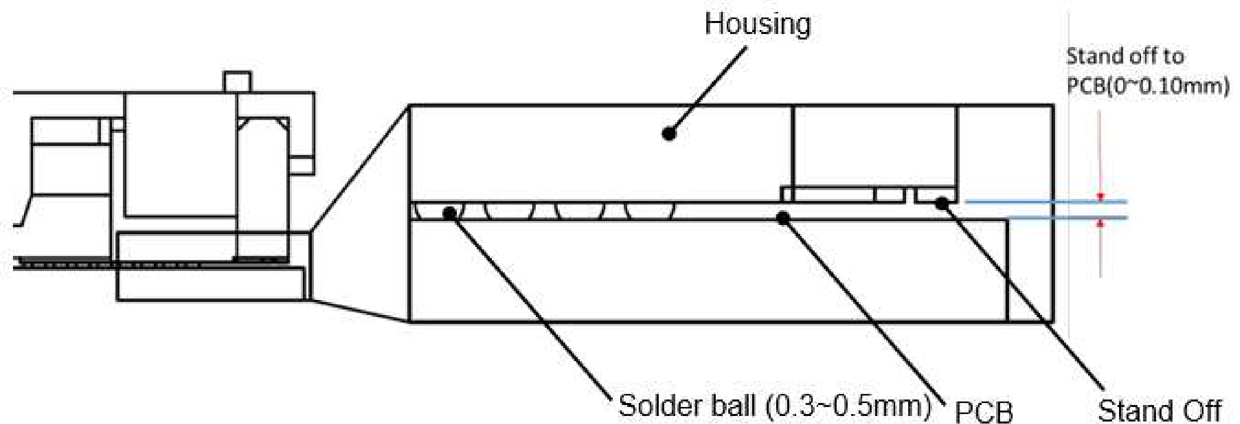

Figure8. After SMT on PC board

The PnP cap on top of the socket must be removed right before CPU installation (the device must not be installed unless this pick-up cap is removed). Please refer to “arrow” on PnP cap to remove the PnP cap.

Note: Due to the tight pattern associated with these solder balls, inspection techniques must provide a clear picture of possible areas of shorting, X-ray or electrical test equipment will be used to inspect solder joints.

3.10. Remove PnP cap operation

As figure 7 shown, arrow in PnP cap show the direction of remove or assembly cap.
This socket PnP cap is slide model, when remove PnP cap, please move the PnP cap in horizontal as arrow shown, when PnP cap reach the position as figure 9 shown, please pick up it in vertical direction.

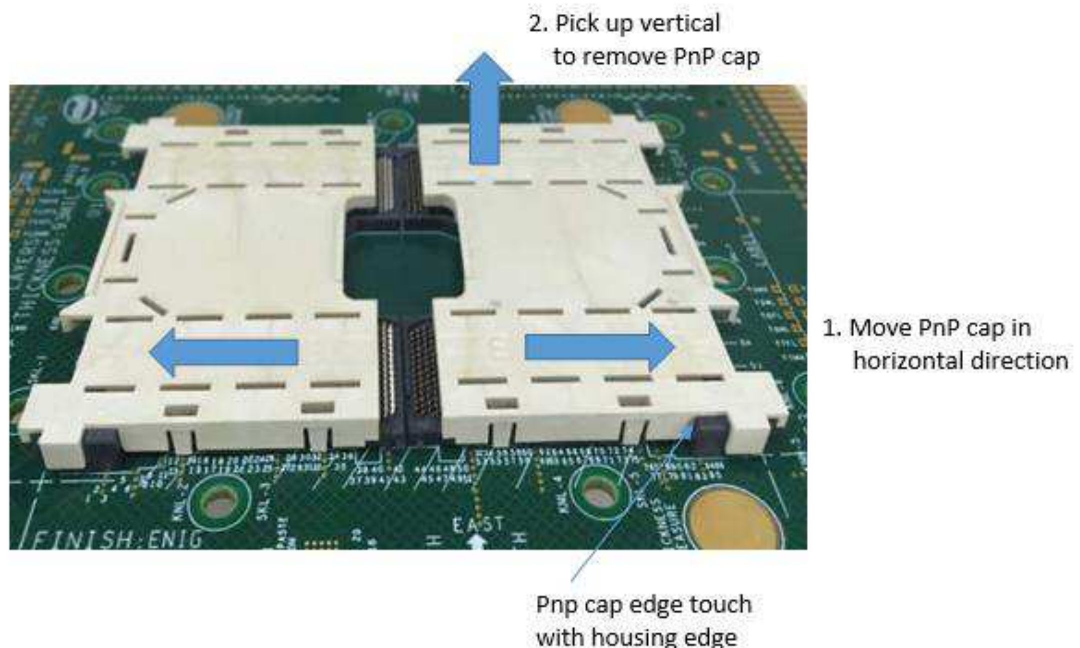

Fig 9 Remove PnP cap

3.11. Repair or rework

The socket is not repairable. Discard and replace any defective or damaged socket. Do not re-use the socket after removing it from the PC board.
The rework process specification is shown in Table 2 for LGA3647 socket (lead free).
Recommended rework profile measurement positions are at solder ball pad surface, same with Fig.6.
Housing surface should be monitored also

Table 2

LGA3647 socket (Lead free) rework process	Specification
Peak socket body temperature	260degC max.
Peak solder joint temperature	228-250 deg C
Time above liquidus	45-280 seconds
Critical ramp rate (210-220 deg C)	0.35-0.75 deg C/second
Placement force	50gf maximum
Peak solder joint temperature at post solidify time	190deg C maximum
Temperature readings difference between Thermo couples	15deg C maximum

3.12. Heat sink load

Static compressive load from heat sink, Bolster assy and Back plate assy must meet the requirement shown in Table 3.

Table 3

Maximum static total compressive load	1333N(300lbf)
Minimum static total compressive load	613N (138lbf)

REV	REV. RECORD	PREPARED		CHECK		APPROVAL	
1	Preliminary	Bill Lv	18th Jun ‘16	Simon Li	18th Jun ‘16	Corel Wang	18th Jun ‘16
2	Preliminary	Bill Lv	13th Jul ‘16	Simon Li	13th Jul ‘16	Corel Wang	13th Jul ‘16
A	Released	Jeff Wang	12th Dec ‘16	Simon Li	12th Dec ‘16	Corel Wang	12th Dec ‘16
B	Released	Jeff Wang	28th Jan ‘21	Bill Lv	28th Jan ‘21	Simon Li	28th Jan ‘21